CHEETAHS:
A predator's role in the ecosystem

TEACHER'S RESOURCE GUIDE

A Letter from FNB Group CEO Vekuii Rukoro

Dear Educators,

It is with great pride and pleasure that FNB Namibia once again supports the Cheetah Conservation Fund with funding for this book. At FNB Namibia we not only support projects that will make a difference in areas of skills development, education and training, community development, SMEs, culture and heritage and healthcare, we also value the importance of our environment which is interlinked with tourism and conservation. If no conservation happens and natural habitats are destroyed or wildlife is decimated, there would be nothing in Namibia for tourists to come and enjoy anymore. This could mean the loss of income for many operators in the tourism industry, which will lead the loss of many jobs and the loss of a big tax base for Government.

As you all know our earth has numerous resources which include water, air, soil, minerals, trees, animals, oil, and gas. All of us depend on these natural resources for our livelihood and most of us cannot imagine life without lights, water, a car, etc., but also not a Namibia without our beautiful Camelthorn trees and our unique and free ranging animals. We all hope that our children and grandchildren can still run in forests, play in rivers, fish in dams, stroll along beaches and see our game in their natural environment. If we want this to happen, we need to conserve our natural habitat.

Conservation helps sustain the circle of life and our natural resources. We should only use what we need and respect the land we live in. Conservationists have helped a great deal throughout the years. The principle of conservation is intended to preserve the best outcome of change, which is necessary for any thriving society. We, at FNB Namibia, thank and salute the Cheetah Conservation Fund for the wonderful work they do. Namibia is an example of conservation for all African countries and has over 30% of the remaining cheetah population in the world. This is important as preserving a top predator benefits our entire eco-system.

This book should convey to you, the reader, the importance of conservation and how organisations such as the Cheetah Conservation Fund and businesses such as FNB Namibia can work together to preserve our fauna and flora for future generations. We hope that you will read the book carefully and also thank you for taking an interest in our country and its natural habitat. Because of you and your interest we will preserve Namibia for many generations to come.

Yours sincerely

Vekuii Rukoro
CEO FNB Namibia

Acknowledgments

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Introduction

Many people fear predators, especially big cats such as the lion, cheetah, and leopard. We are often taught to fear carnivores without understanding their unique behaviours, special adaptations, and essential roles in the maintenance of healthy ecosystems. Our attitudes and misconceptions about these species have led to their endangerment because many people deal with their fear of predators by eliminating them.

Endangered species exist in low population numbers and need intensive long-term management in order to survive. Attitudes toward predators must be changed if we hope to save endangered species such as the cheetah. By learning the reasons why species are endangered, students learn how clean and healthy ecosystems are crucial and what will occur if we continue to pollute the environment and destroy habitats.

Through environmental education, we can all work together to change the attitudes and behaviours that have led to the endangerment of predator species and help save them from extinction. Individuals can make a difference!

To appreciate predators, we must first understand their roles in wildlife communities. Because predators must kill other animals in order to survive, many myths about them have evolved over the centuries in many cultures. The plight of cheetahs symbolise the problems that many predators face throughout the world.
Cheetahs are endangered because of:

1. Loss of habitat and prey to commercial farming and land development
2. Persecution by farmers as vermin or livestock-killing "problem" animals
3. Poaching or the illegal taking of animals

If we are to conserve healthy wildlife populations in the 21st century, we must understand the ways of animals and recognise their importance to our survival. Wild species maintain healthy ecosystems, provide us with food, shelter, and clothing, benefit us economically, and improve the qualities of our lives by their existence.

Humans are predators and carnivores. We compete with wild animals for natural resources. Because of growing human populations and over-consumption of the earth's resources, the world is losing wild places and species as the demand for food, minerals, lumber, and other resources increases. Two hundred years ago there were fewer than one billion people on earth. Today, about seven billion people live on the planet, and there may be over eight billion of us by the year 2020.

EXTINCTION
Extinction is a natural process, and for hundreds of millions of years plants and animals have fallen to this phenomenon. But, the current rate of extinction is something new. Today the total number of species lost each year may be nearly 40,000. This rate of extinction is far greater today than at any other time in the last 65 million years.

The four most common causes of extinction created through human involvement are:

1. Destruction of habitat for development and to obtain lumber, minerals, oil, and other products
2. Introduction of exotic species into new habitats
3. Pollution
4. Overuse of animals and plants through collecting, hunting or poaching, use of animal and plant products for religious beliefs

The cheetah's survival depends on people and their ability to manage the wild population and protect its habitat.

When people destroy habitat by constructing buildings or grazing livestock, for example, they prevent nearly all animal populations from surviving there, both in the present as well as in the future. Animals compete poorly with humans for space. Humans change the environment rapidly, and animals cannot always adjust to these changes or adapt quickly enough in response. Large predators, like the cheetah, need large areas in which to roam; they usually are not found close together in great numbers. Loss of habitat and a limited geographical range (a reduced area in which to live) threaten the cheetah's survival. Low survivorship (few cheetahs live long or even become adults) also affects cheetahs and makes them more vulnerable to human competition. High cub mortality, up to 90% in the wild, makes it difficult for the cheetah to recover when its population size decreases. Helping predator species survive in spite of competition from people is one aspect of wildlife conservation.

CHEETAH POPULATION DECLINE
Loss of habitat and prey base, competition with large predators and agricultural interests, as well as poaching are taking a heavy toll on wild cheetah populations throughout Africa. Today, there are 10,000 of these endangered cats remaining in Africa and Asia. The vast majority of cheetahs live in small, isolated groups outside protected game reserves where they are often in conflict with humans and livestock, and most populations continue to decline. The largest wild population of cheetahs is found in Namibia; however, in the 1980's their numbers were reduced by half to less than 2,500. Lack of genetic variation, reproductive abnormalities, high infant mortality, and a greater susceptibility to disease place the species at further risk of extinction. Genetic variation allows species to adapt better to environmental and ecological changes and to fight off disease.

While cheetahs were once found all over Africa, they are now endangered in most of their former ranges. Cheetahs do not pose a threat to human life. People have carried on the campaign against cheetahs because they believe cheetahs actively kill livestock as well as other animals, such as small or young antelopes, causing excessive economic loss. In reality, the amount of damage to domestic stock is exaggerated and is usually caused by a limited number of livestock-preying cats, or "problem" animals, and inadequate livestock management practices. Despite these problems, cheetahs still have a chance for survival on the vast farmlands of southern Africa.

OUR PLANET'S DIVERSITY
Humans share this Earth with up to 33 million animals, plants, and other life forms. The diversity of life on our planet is amazing. All species - plants, mammals, invertebrates - depend on one another. People depend on many different plants and animals for food and medicines. Cheetahs are only one of the 33 million species living on the planet. Does it really matter if the cheetah becomes extinct? It is tempting to think that the loss of only one species will not affect us. We must remember that all things are connected and thus we should be obligated to further explore how important cheetahs are in their ecosystem. When we lose even one species, our world becomes inferior.

The cheetah has been revered by humans for almost 5,000 years and it deserves a place on this Earth. If it is lost to future generations it would leave a large hole not only in nature, but also in the psyche of the human mind, which so naturally feels and knows the uniqueness of this creature. Southern Africa, with its varied ecosystems and diversity of life, poses the greatest hope for the cheetah's future.

YOU CAN MAKE A DIFFERENCE
Youth education and understanding are paramount to helping the sleek hunter of Africa win its race for survival. The ultimate success of the Cheetah Conservation Fund's education programme depends on you, the teacher, who will take cheetah conservation to your students. In doing so, you become part of an international effort to save this endangered species, and together we can work to conserve our world's rich biological diversity. By participating in environmental education, you become someone who cares for our land, its wildlife, and the future your students will inherit.

The Cheetah Conservation Fund (CCF) appreciates your initiative in using this packet. We hope it will help you motivate students to think critically about individual and communal efforts to conserve wildlife and to act constructively to improve our world's environment.

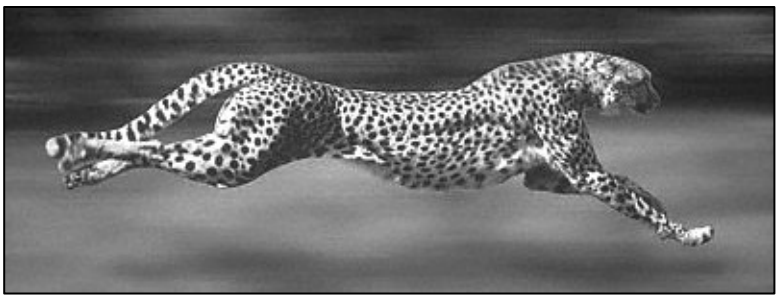
THE CHEETAH CONSERVATION FUND

The Cheetah Conservation Fund (CCF) was founded in 1990 and resides on a farm outside of Otjiwarongo, in North-central Namibia. CCF's mission is to be the internationally recognised centre of excellence in the conservation of cheetahs and their ecosystems; working with all stakeholders to develop best practices in research, education, and land use to benefit all species, including people. CCF, a non-profit Namibian Trust, is run by Founder and Executive Director, Dr. Laurie Marker, and a local Board of Directors representing the private, government, education and business communities of Namibia. In addition, CCF's International Research Advisory Board includes internationally recognised specialists in cheetah, predator, livestock and wildlife research.

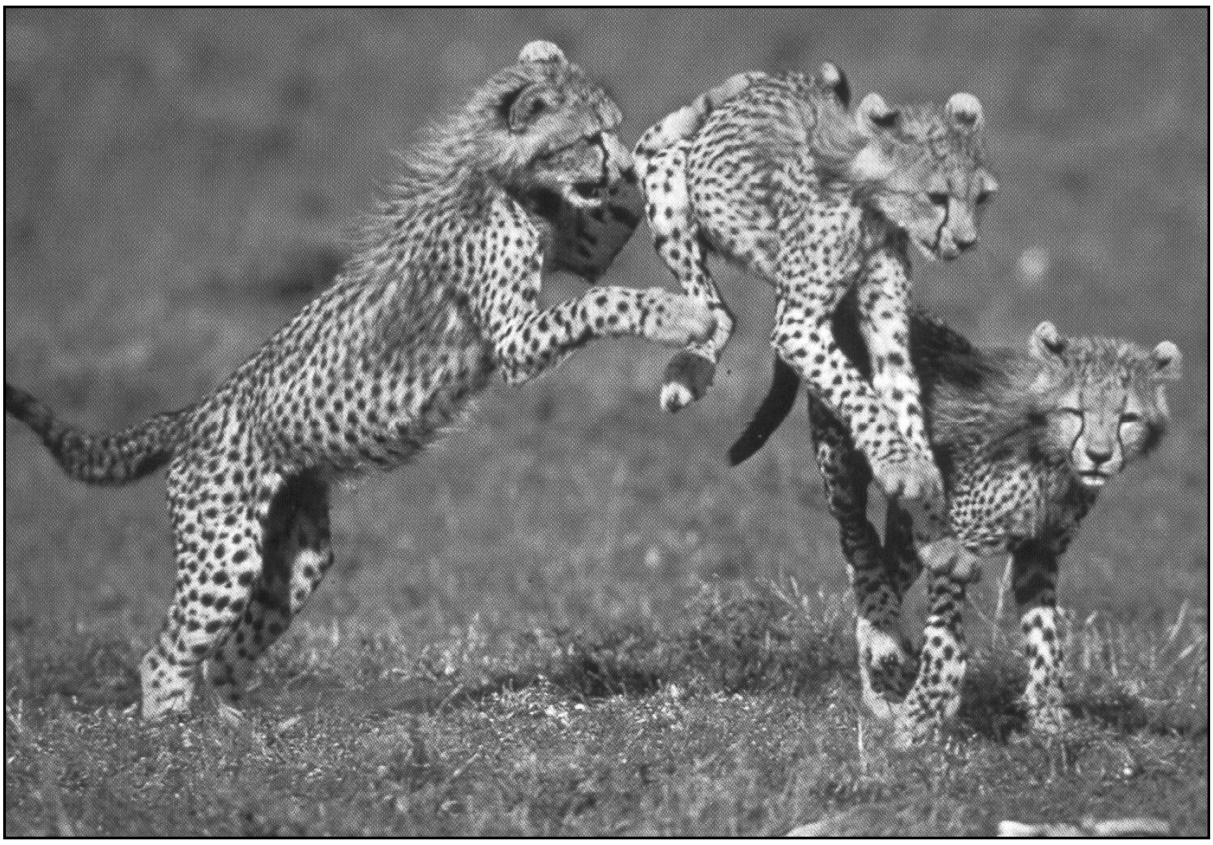
The Cheetah Conservation Fund's research is divided into four study areas: Cheetah Population Biology, Cheetah Ecology, Cheetah Health and Reproduction and Human Impacts on the Cheetah. The Cheetah Population Biology Programme gathers and analyses data on the demographics and genetics of the Namibian cheetah population. CCF is considered the central database worldwide for information regarding cheetah distribution. The Cheetah Ecology Programme considers the habitat, movements and behaviour of the cheetah in the Otjiwarongo farming area (15,000 km^2/9,300 mi^2), which surrounds the CCF Research Centre Farms. The soil, vegetation, and wildlife have been extensively studied and cheetah movements have been monitored via radio-tracking since 1993. The Cheetah Health and Reproduction Programme develops and maintains an extensive physiological database and Genome Resource Bank. This involves taking samples and measurements to better assess the health and genetics of the Namibian cheetah population and collecting sperm for use in *In vitro* fertilisation. The Human Impacts on the Cheetah Programme considers agricultural impact, hunting, and issues related to the cheetah in captivity. This programme assesses farmers' needs and works to develop non-lethal predator control methods, such as the Livestock Guarding Dog Programme. To monitor captive cheetah populations, the executive director of CCF created and maintains the International Cheetah Studbook and coordinates the Cheetah African Preservation Programme of the Pan African Association of Zoological, Aquaria and Botanical Gardens.

The Cheetah Conservation Fund's Education Programme targets a wide range of audiences worldwide. The focus of the programme is to build awareness among farmers, educators, students and the general public about the role of the cheetah in healthy ecosystems and the need to preserve Africa's rich biodiversity. CCF offers education programmes through its Visitor Education Centre and throughout Namibia via the CCF school outreach service. CCF also welcomes Namibian and international interns, conducts training workshops and heightens global awareness of the endangered status of the cheetah.

Much has been accomplished since the establishment of the Cheetah Conservation Fund, and CCF's work continues to grow as new issues necessitate creative problem solving, further scientific research, and increased education and conservation programming.



Cheetah Biology



Cheetah
CONSERVATION FUND

CAT COMPARISONS I

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 20 min
Activity 2: 20 min
Activity 3: 20 min

RECOMMENDED PREPARATION:
Review the 'cats of the world' sheet in the Reference section.

Activity 1:
Photocopy cat photographs in the Reference section

Activity 3:
Photocopy and cut out cat cards

MATERIALS NEEDED:
Activity 1:
One set of photocopies of cat photos in the Reference section

Activity 3:
8 copies of 'cat cards' page for each group

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Similarity
Difference
Species
Range
Nocturnal

OBJECTIVE:

Learners will study the cheetah by comparing and contrasting the cheetah to other members of the cat family

LESSON ACTIVITIES:

ACTIVITY 1:
Discussion on cheetah background, behaviour and history. Make a similarities and differences list and hold review discussion

ACTIVITY 2:
Discussion of family tree
Learners draw family tree

ACTIVITY 3:
Snap game

Teaching the Lesson

Activity 1 – similarities and differences

Divide the class into groups of two or three. Using the pictures given in the Reference, have the learners identify similarities and differences between the six cat species. Also use the Cat Comparison table provided in this lesson.
Some examples of leading questions are offered below:

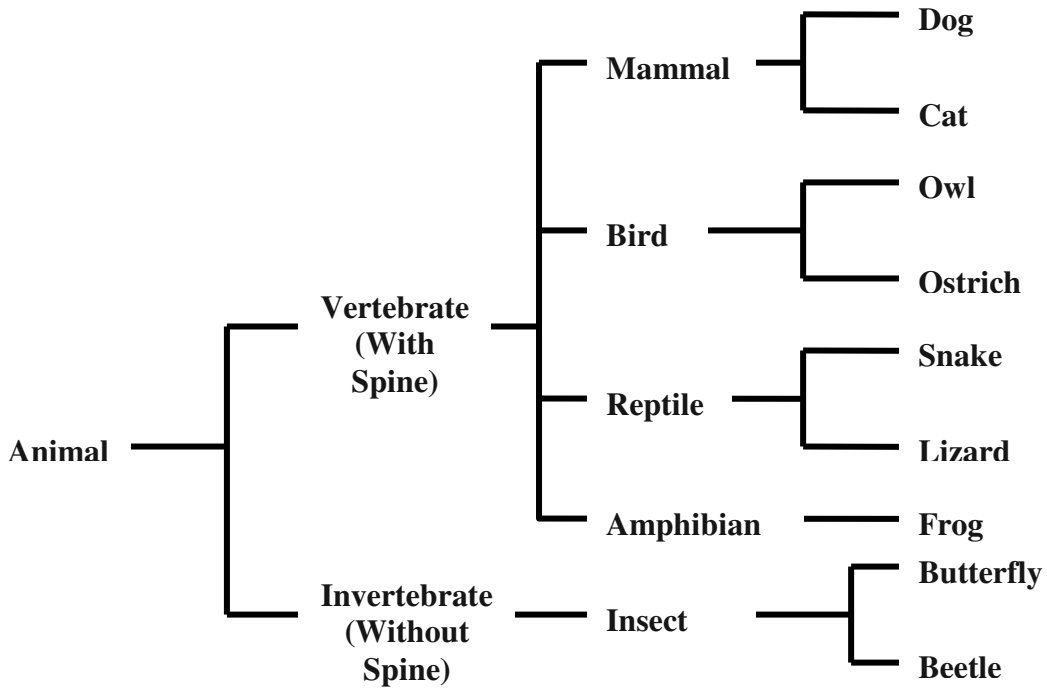
- Which cats look the same?
- Any similar patterns/shading? Body size? Body shape? Head size?
- Are their legs all the same size?

Let the learners write their observations on a sheet of paper headed "Similarities and differences." Give the learners 15 minutes to complete their lists before asking for feedback. Ask each group for one similarity or difference from their list. Using the table of comparison on the following pages discuss with the learners the main differences and similarities between the six cat species.

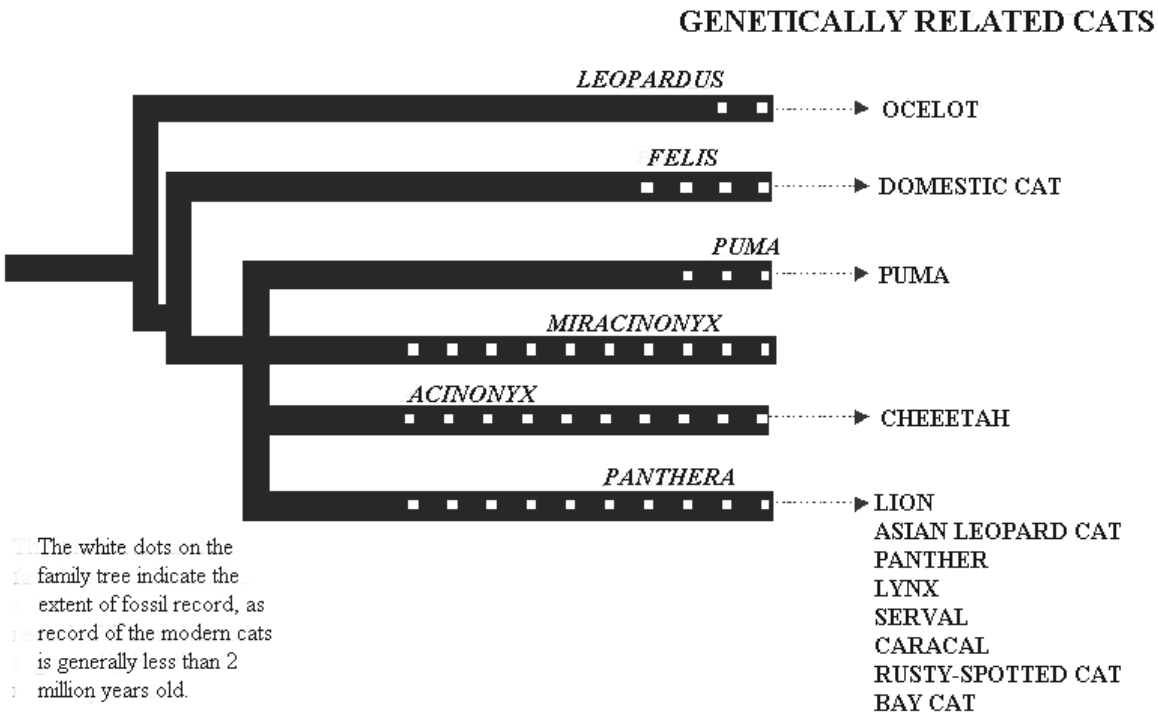
Activity 2 – family tree

Discuss the concept of a family tree (a method by which you show the relationship between different objects) with the learners by developing an example, like the one below in example 1, on the board with their input. Have the learners draw their own family tree of the cats using the similarities and differences previously identified. Give them another 15 minutes before showing them the correct tree in example 2.

Example 1: Basic Animal Family Tree



Example 2: The Cat Family Tree



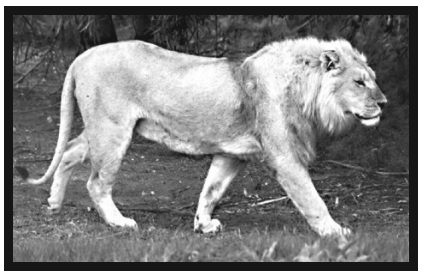
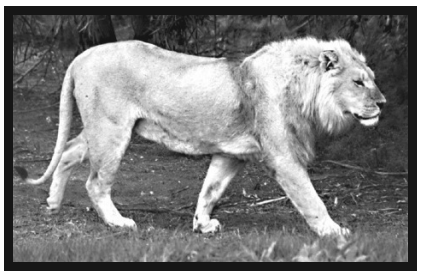
Activity 3 – snap game

Photostat (photocopy) the cards given so that you have 48 cards making sure you have 8 copies of all 6 cats. Divide the class into groups of four, and hand out a set of 48 cards to each group. Mix the cards and deal each learner in the group a hand of 12 cards. Starting with two of the four, start the game by placing each card face up, next to each other, so that all players can see them. The next two players in the group then place one card each on top of the two piles formed by the previous two players. At any time that these cards match, the learner, who calls "snap" first followed by the name of the cat, gets a point. Once all the cards have been dealt, the learner with the most points wins.

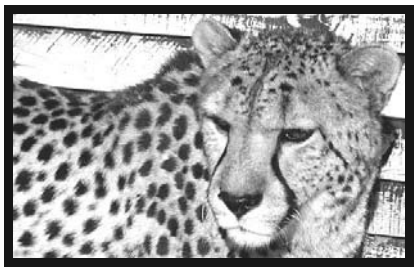
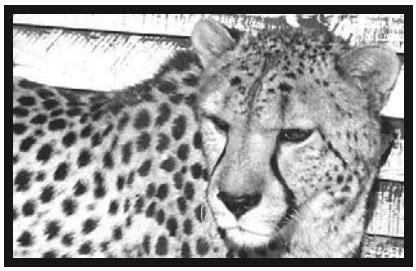
Have the learners assess themselves in the group as to whether they feel capable of moving up to the next level of the game. Use the second sheet of cards to produce 24 more cards. Remove half of the cards from the previous deck, making sure that you have four copies of each cat and add these to the 24 new cards. Play the games once again to see if the learners are still able to identify the different cats when they are in different positions. This game can be used to assess whether the learners can distinguish between the six cats based on their differences and similarities.

CAT CARDS *(Card setup for easier snap game)*





CAT CARDS *(Card setup for more difficult snap game)*

History:

The cheetah is Africa's most endangered big cat and is a protected species in southern Africa. It is considered endangered under the United States' Endangered Species Act and is listed on CITES Appendix 1. (CITES: Convention on International Trade in Endangered Species is an international treaty that monitors trade in wild species. 'Appendix 1' indicates that the species is threatened by trade and is in danger of extinction.)

Characteristics:

The oldest cat species on earth, fossil remains date back 3.5- 4 million years. The cheetah is a highly specialised animal adapted for speed, at a top speed of 110-120 km/h the cheetah is the fastest land animal. In appearance, cheetahs are of light build, making them the lightest of the big cats at 26-51kg for females, and 31-64kg for males. They have long streamlined bodies and long, slim legs. Their size and build is one of the ways that they can be distinguished from Africa's other spotted big cat, the leopard. The leopard, in comparison, is short and stocky, with a large, heavy bone structure and a lot of muscle mass. Cheetahs have on average 3,000 solid black spots covering their entire body, which together with their short tan fur, create camouflage. Leopards have brown spots surrounded by incomplete black circles called rosettes on their backs and sides. One of the most prominent, distinguishing features of the cheetah is the dark tear marks running from their eyes to their mouths.

Behaviour:

Cheetahs kill other animals for food; therefore we refer to them as predators. They are day hunters due to their speed and are mostly found in open savannah / grassland. They are normally solitary animals, sometimes forming groups amongst brothers. Mothers will spend up to two years with their young, teaching them how to hunt and to avoid other predators, which is not an instinct for a cheetah. Due to their slight build, they prefer to run from a threat, so we refer to them as non-aggressive. The cheetah is the only predator that has <u>not</u> been known to attack humans in the wild.

Table 1: Cat Comparison: general information

	Cheetah	Leopard	Lion	Caracal	Tiger	Domestic Cat
Scientific name	*Acinonyx jubatus*	*Panthera pardus*	*Panthera leo*	*Felis caracal*	*Panthera tigris*	*Felix domesticus*
Distinguishing features	• Long slender body • Tan coat with solid black spots • Black "tear marks" on face • Small head • Amber eyes • Semi-retractable claws	• Largest spotted cat, short and stocky, muscular • Coats marked with rosettes • No "tear marks" • Large head, powerful jaw • Green eyes • Retractable claws	• Largest African carnivore • Uniform tawny sandy coat • Males have long mane • Tail sometimes black on tip • Retractable claws	• Long, slender body • Yellow-grey to reddish-brown coat • Short tails, tapered • Ears narrow and pointed • Long black tufts on ears (4.5 cm) • Hind-legs longer than forelegs • Retractable claws	• Largest of all cats • Black stripes on an orange coat • Males have prominent ruff / collar • Retractable claws	• Belong to the small cats • Variety of colours and patterns • Retractable claws
Size	• Total length: 162-226 cm • Adult body length: 105-152 cm • Tail length: 51-87 cm • Shoulder height: 73-80 cm • Weight: 26-51 kg(F), 31-64 kg(M)	• Body length: 91-243 cm • Tail length: 68-110 cm • Shoulder height: 70-80 cm • Weight: 17-60 kg(F), 20-90 kg(M)	• Total length: 230-270cm (F), 250-330 kg(M) • Tail length: 100 cm • Shoulder height: 100 cm(F), 120 cm(M) • Weight: 110-152 kg(F), 150-222 kg(M)	• Body length: 60-92 cm(F), 80-105 cm(M) • Tail length: 20-35 cm • Shoulder height: 40-50 cm • Weight: 11-15 kg(F), 13-20 kg(M)	• Body length: 119-170 cm(F), 170-290 cm(M) • Tail length: 53-119 cm • Shoulder height: 85-124 cm • Weight: 75-300 kg	• Weight: 3-5 kg
Range	Africa: 24 countries Iran: 100 individuals	Africa: widely dispersed Also in South Asia, Far East, and Arabia	Africa; Southern/Eastern Few in Asia	Africa, Asia, Turkistan, Northwest India, Arabia	Not found in Africa Found in India, China, and Indonesia	Found world-wide where humans have settled
Habitat	Grasslands, savannahs, woodlands, bush lands, hill country	Very adaptable – woodlands, lowlands, forests, mountains, savannahs, dry steppes	Grassy plains, arid woodlands, semi-deserts (not in forests)	Wide range from open savannah and woodland to semi-arid areas. (Not found in forests)	Not found in open habitats, they tend to live in a variety of forests and mangrove swamps requiring cover and water	Human settlements
Period of activity	Hunt early morning, late afternoon	Nocturnal and diurnal	Nocturnal and diurnal	Mostly nocturnal, will be active during the day	Nocturnal	Mostly nocturnal
Threats to humans	Not a threat	Can and do attack humans	Are a threat	Are not a threat	Are a threat	Are not a threat

CAT COMPARISONS II

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 45 minutes

RECOMMENDED PREPARATION:
Activity 1:
Make photocopies of the cat tracking cards and cut out. Also, photocopy the incomplete field guides to be given to each group.

Prepare your classroom into divided habitats and disperse the cat tracking cards (clues) around the designated habitats.

MATERIALS NEEDED:
Activity 1:
Photocopies of the cat tracking cards and incomplete field guides.

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Species
Habitat
Track
Cub
Diet
Threat

OBJECTIVE:

For learners to gather a broader understanding between the differences of the cat species

LESSON ACTIVITIES:

ACTIVITY 1:
A discussion and game rules will begin the activity. Learners will participate in an energetic activity in the classroom. Learners in groups will search 'habitats' to look for clues (cat tracking cards) of their animal and fill in their incomplete field guide cards. At the end of the lesson, groups will present their findings to the class.

Learning Outcomes

This activity is designed to reinforce the differences between the cats. Learners will track the lion, leopard, cheetah, caracal, tiger and domestic cat through a simulated habitat, learning about each individual animal as they progress through the activity. They will also learn how to use and design field guides of their own.

Teaching the Lesson

Note that complete field guides are provided to assess the work of the learners.

Activity 1 – track a cat

(adapted from Cincinnati Zoo's "Track my cat" activity)

For this lesson the educator needs to adapt the classroom or the outdoor environment into a series of "habitats" suitable to each species of cat. Divide the area (the teacher can decide which size) into four sections designated for a savannah, mountainous area, forest and urban settlement. These can be shown as separated simply by using some string to mark off each area or placing representative props within the areas (to show trees, grass, bushes, rocks, etc). Use a sign to show what each area is to represent (savannah, forest, etc).

Each cat has six different cards with information about that species. These cards can be copied if you choose. Distribute the Cat Tracking Cards throughout the classroom in their respective habitat area as follows:

Savannah - Lion, cheetah, leopard, caracal
Forest - Tiger, caracal, leopard
Mountain - Leopard
Urban Settlement - Domestic cat

There should be three sets of cards copied for the leopard, two for the caracal and one each for the cheetah, lion, tiger and domestic cat. Place one set in the above areas. It is more fun if the cards are spread out through different levels of the room rather than simply on the floor. For example, lion and leopard can sometimes be found in trees, cheetah will try to hide in the shade of trees and bushes and domestic cats can be found everywhere within the urban settlement.

Divide the class into six groups. Each group will track one of the cats through one of the environments. Explain that the learners are scientific research teams with the task of finding out more about these cat species. They are going to create a field guide to help identify these cats. A field guide is a booklet designed to help identify animals from a picture with a brief description, including habitat, range, diet and behaviour so that the possessor of the guide can learn more about the animal they have seen. Learners only know what each cat looks like. Even the name of the cat is unknown. The learners need to follow, or track, the cats to discover more about them. Cat Tracking Cards have been distributed throughout the room in the specific location where people have spotted the cats. The goal is for each group to collect all six of their Cat Tracking Cards, identify their cat, and create a field guide using the attached field guide formats.

Assign each group of scientists a different species of cat to track; each group receives an incomplete field guide to their cat, which only gives information about the appearance of the cat, including an outline of its body. As the blanks indicate on the incomplete field guides, the learners need to discover their cat's period of activity, diet, social behaviour, hunting behaviour, reproduction, etc. Tracking is carried out in the following way: Learners move through the room looking for the tracking cards which match their cat's physical description. Although there is other information on the tracking card, the only way the learners can be certain that the card applies to their cat is to match it with the description on the provided Field Guide. Each group should collect six cards specific to their cat. If a learner finds a card that describes a cat other than their own, they should put it back in the exact same spot where they found it! However, if they find one of the blanks that states an unidentified cat was spotted, they can pick it up.

Once the learners have found all six cards, they should come to the teacher. The teacher will help the learners identify their cat by name through use of the Table of Comparisons found in the Cat Comparisons I activity. After tracking is complete and groups are settled, the group must take the information from their cards and fill in their Field Guide for their cat. They must write as neatly as possible so that other learners can use this as an identification guide. Explain that hunting behaviour will include the time of day, how the cat hunts, etc.

When each group has finished their Field Guide, have each group present their cat to the classroom. They should explain where their cat lives and what it eats as well as aspects of reproduction, hunting, etc. After learners present their cats, encourage them to make comparisons between cats. Discuss differences and similarities between some or all of the categories listed in the Comparison Tables. Finally, using the group's field guides, compile a class field guide of the cats.

Field guide cards

Lion Set: cat tracking cards

A group of adults: both male and female seen lying under a tree 	Seen feasting on a kill of large antelope during the night 	Group of females seen during the day stalking a kudu, finishing off with a short chase bringing the prey down 
Group of females seen with a litter of four cubs, about 6 months old, feeding on a rabbit 	Young male of about 5 seen attempting to court a female 	Confronted by a large male, growling and hissing 

Cheetah Set: cat tracking cards

Solitary female spotted under a bush 	Female with a litter of three young cubs seen chasing down an impala at high speed during the early morning 	Young male of about two years seen courting a female 
Pair of males seen stalking a springbok during the late afternoon 	Confronted a solitary male, which ran away 	Mother seen leaving cubs of about 18 months 

Leopard Set: cat tracking cards

Seen with kill up a tree 	Seen at night pouncing on a antelope and killing by strangulation 	Female seen with two cubs during the day 
Young male of about 3 years seen courting female 	Mother seen leaving cubs of just under two years of age 	Confronted by a solitary male, which attempted to attack 

Tiger Set: cat tracking cards

Solitary male seen stalking and pouncing on a wild pig 	Group seen sharing a meal at night 	Seen stalking a fellow scientist 
Seen dragging a deer under cover at night 	Young male of about 5 years seen courting female 	Mother seen leaving her cubs of about 2 years of age 

Domestic Cat Set: cat tracking cards

Small cat of indeterminate colour seen playing with a mouse 	Black and white cat with a litter of four kittens seen playing in a garden 	Small ginger tabby seen killing a small bird 
Young male of about one year seen courting female of similar age 	Small grey, long haired cat seen playing with a group of children 	Small black cat seen pouncing on locusts in a suburban field 

Caracal Set: cat tracking cards

Mother seen leaving cubs of one year of age 	Seen pouncing on a bird in flight at night 	Solitary male seen walking at night 
Seen taking baby antelope up a tree 	Ran away when approached by fellow scientist 	Young male of about 14 months seen courting female 

Your Cat's Name: _____

Appearance: This large spotted cat is short, stocky, and muscular. The coat is marked with brown spots surrounded by black. The head is large with a powerful jaw.

Habitat: _____

Diet: _____

Hunting Behaviour: _____

_____

Social Behaviour: _____

_____

Age of Sexual Maturity: _____

Threat to Man: _____

Your Cat's Name: _____

Appearance: This large cat has a long, slender body with a tan coat and solid black spots. The head is small with tear marks running from the corner of the eyes to the mouth and amber eyes.

Habitat: _____

Diet: _____

Hunting Behaviour: _____

_____

Social Behaviour: _____

_____

Age of Sexual Maturity: _____

Threat to Man: _____

Your Cat's Name: _____

Appearance: The largest of all cats has black stripes on an orange coat, with males having a prominent fur collar.

Habitat: _____

Diet: _____

Hunting Behaviour: _____

_____

Social Behaviour: _____

_____

Age of Sexual Maturity: _____

Threat to Man: _____

Your Cat's Name: _____

Appearance: This medium-sized cat has a long slender body with a yellow-grey to reddish-brown coat. Their tails are tapered, and ears narrow and pointed with long black tufts. The hind legs are longer than the forelegs.

Habitat: _____

Diet: _____

Hunting Behaviour: _____

_____

Social Behaviour: _____

_____

Age of Sexual Maturity: _____

Threat to Man: _____

Your Cat's Name: _____

Appearance: This small cat has a variety of coat patterns and colours.

Habitat: _____

Diet: _____

Hunting Behaviour: _____

_____

Social Behaviour: _____

_____

Age of Sexual Maturity: _____

Threat to Man: _____

Your Cat's Name: _____

Appearance: This large cat has a uniform tawny / sandy coat with some having a black tip on their tails. The males have a long mane.

Habitat: _____

Diet: _____

Hunting Behaviour: _____

_____

Social Behaviour: _____

_____

Age of Sexual Maturity: _____

Threat to Man: _____

ANSWERS: Complete Field Guides

Your Cat's Name: Cheetah (*Acinonyx jubatus*)

Appearance: This large cat has a long, slender body with a tan coat and solid black spots. The head is small with tear marks running from the corner of the eyes to the mouth and amber eyes.

Habitat: Savannah

Diet: Small antelope

Hunting Behaviour: Diurnal hunter. Stalks then chases at high speed. Ends with a trip and strangle.

Social Behaviour: Solitary cat, with some males forming coalitions. Mother leaves cubs at about 18 months.

Age of Sexual Maturity: Two years of age

Threat to Man: Are not a threat to man

Your Cat's Name: Leopard (*Panthera pardus*)

Appearance: This large spotted cat is short, stocky, and muscular. The coat is marked with brown spots surrounded by black. The head is large with a powerful jaw.

Habitat: Savannah, forest, mountain

Diet: Antelope

Hunting Behaviour: Nocturnal, will pounce on prey and kill by strangulation. Will take kill up a tree.

Social Behaviour: Solitary except with cubs, mother generally leaves cubs around 2 years of age.

Age of Sexual Maturity: About three years

Threat to Man: Are a threat to man

Your Cat's Name: Tiger (*Panthera tigris*)

Appearance: The largest of all cats has black stripes on an orange coat, with males having a prominent fur collar.

Habitat: Forest

Diet: Wild pig and deer

Hunting Behaviour: Nocturnal hunter, stalking and pouncing on prey

Social Behaviour: Generally solitary, will sometimes share a meal. Mother leaves cubs at about two years of age

Age of Sexual Maturity: Around five years

Threat to Man: Are a threat to man

Your Cat's Name: Caracal (*Felis caracal*)

Appearance: This medium-sized cat has a long slender body with a yellow-grey to reddish-brown coat. Their tails are tapered, and ears narrow and pointed with long black tufts. The hind legs are longer than the forelegs.

Habitat: Savannah, Forest

Diet: Birds and small antelope

Hunting Behaviour: Nocturnal hunter, able to pounce on a bird in flight. Will take its kill up a tree.

Social Behaviour: Solitary cat, mother leaves her young about one year of age.

Age of Sexual Maturity: About 14 months

Threat to Man: Are not a threat to humans

Your Cat's Name: Domestic Cat (*Felix domesticus*)

Appearance: This small cat has a variety of coat patterns and colours.

Habitat: Urban settlements, towns

Diet: Small animals including mice, birds, and insects. Domestic cat food.

Hunting Behaviour: Stalk and pounce, will play with food. Nocturnal and diurnal

Social Behaviour: Mostly solitary, but will form social groups

Age of Sexual Maturity: About one year

Threat to Man: Is not a threat to man

Your Cat's Name: Lion (*Panthera leo*)

Appearance: This large cat has a uniform tawny / sandy coat with some having a black tip on their tails. The males have a long mane.

Habitat: Savannah

Diet: Mainly large antelope

Hunting Behaviour: Nocturnal and diurnal hunter. Stalking as close as possible, finishing off with a short chase. Jumps on back to bring down prey.

Social Behaviour: Social animal, lives in family groups (prides).

Age of Sexual Maturity: Males reach maturity at about 5 years.

Threat to Man: These cats are a threat to man.

ADAPTATIONS

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 10 min
Activity 2: 30 minutes
Activity 3: 45 minutes
Experiment: 30 minutes

RECOMMENDED PREPARATION:
Activity 2: Gather supplies needed and make photocopies

Activity 3: Gather materials, insects (all the same kind), make photocopies and prepare your answer sheet.

MATERIALS NEEDED:
Activity 1:
Background sheet

Activity 2:
All supplies listed under 'build a cheetah' and photocopies of worksheet

Activity 3:
Insects for pair use
Materials listed
Backyard adaptations worksheet copied (2 pages)

Experiment:
Photocopy experiment worksheet

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Adaptation
Endoskeleton
Exoskeleton
Semi-retractable
Rudder
Variables
Manipulate
Investigate

OBJECTIVE:

Learners will understand and investigate animal adaptations.

LESSON ACTIVITIES:

ACTIVITY 1:
Discussion: what is adaptation? (use 'background' sheet on pg. 38)

ACTIVITY 2:
'Build-a-cheetah' hands-on discussion and worksheet on cheetah adaptations

ACTIVITY 3:
Backyard adaptations: learners investigate insects and complete a worksheet on their findings

EXPERIMENT:
Using the backyard adaptations information, learners form a hypothesis

Learning Outcomes

In this activity learners will learn about the adaptations of animals and the role these adaptations play in their survival. Cheetah adaptations are discussed using analogous objects and learners are given the opportunity to discover adaptations of backyard insects.

Teaching the Lesson

Activity 1 – Discussion on adaptations

Animals come in all different shapes, sizes and colours. These differences make each species or individual member of a species especially adapted for success in a different habitat or place within the habitat.

Use the following activity to begin a discussion with the learners on adaptations. To help learners understand the great diversity of life forms found in nature, generate a list of species with the colours and shapes listed below. Ask learners to come up with as many species as possible. Some examples are listed. Ask the learners why they think the animals have these adaptations. Try to draw a link to habitat.

Black (penguins, black wildebeest)
Green (plants, grasshoppers)
Striped (tiger, zebra)
Fur (mammals)
Short tail (hyena, wild dog)
Short legs (warthog)
No legs (snakes, whales)

Grey (elephant)
Spotted (cheetah, leopard, giraffe)
Wings (birds)
Gills (fish)
Long tail (cheetah, lion)
Long legs (giraffe, antelope)

What is an adaptation?
Animals are designed to survive in particular habitats. Just as we might try to guess where people of different cultures are from by observing the way they dress, talk and behave, we can tell a lot about an animal's habitat by observing its behaviours and appearance. Simply explained, an adaptation is a physical or behavioural characteristic that helps an animal survive in its habitat. Those best adapted to the conditions in which they live are more likely to survive and reproduce. For example, take a cheetah with solid black spots. The spots help to hide them in the shade of bushes and trees, making it harder for other predators, which are a threat to the survival of the cheetah, to see them.

Use the following lesson to teach learners the significance and benefit of adaptations using the cheetah and its adaptations.

Activity 2 - Build-A-Cheetah: built for speed

Explore with your learners the special body parts and adaptations cheetahs have that allow them to run so fast. Using supplies listed below and the adaptation fact sheets and diagrams, discuss with the learners the various adaptations of the cheetah. Next to each of the supplies listed is the body part and adaptation it represents. Go through items one by one and explain why each is an important piece to include in the cheetah. You may want to put up a picture of the cheetah to help learners visualise each part.

Supplies	Body Part	Adaptations	Function
Paper airplane	Long, thin body	Aerodynamic build	Speed
Running shoe / takkie	Paws	Semi-retractable claws	Better traction for running
Long, medium, short sticks	Legs	Long legs	Bigger stride
Piece of wire	Spine	Flexible spine	Increased stride length
Picture of a cheetah	Body / skeleton	Thin and light	Increased speed
Long piece of string	Tail	Long and narrow	Balance and steering
Paper heart	Heart	Strong, enlarged heart	Increased oxygen supply to muscles
Binoculars (two toilet rolls tied together can substitute)	Eyes	Enhanced vision	Vision of 5 km
Sunglasses	Face markings	Tear marks on eyes	Protect eyes from sun's glare

Paper airplane:

Throw it into the air and watch it fly. The cheetah has a long, thin body to create less resistance to wind while running, just as a paper airplane flies easily through the air. Now crumple the paper and throw it; it will not fly like the airplane. Animals that move quickly through the air like birds or through the water like fish are streamlined. Cheetahs' long, thin bodies help them to run so fast.

Running Shoe/takkie:

What type of shoe? *(Running shoe / takkie / sneaker)*
When do we wear these shoes? *(Running / sport / exercise)*
Why do we wear these shoes for these activities and not other shoes? *(Rough sole with grooves. Can slip easily with a smooth sole. The rough sole provides better grip decreasing the chances of slipping and falling)*
Do you think it will aid a cheetah to have such an adaptation providing grip?
(A cheetah's paw has two adaptations to grip: the non-retractable claws, which can dig into the ground and the grooves on the pads which work similar to the treads on a car tyre)

Sticks:

Ask learners which sticks they would use for a cheetah's legs. Long legs increase the stride of a cheetah, allowing it to cover a greater distance in less time.

Wire:

Bend and straighten the wire to show how flexible it is. This represents the cheetah's spine. The cheetah has a very flexible spine, which allows the body to stretch out in a run. Together with the long legs, this gives the cheetah a stride of 8 metres (pace out 8m).

String:

What is a rudder? The cheetah's tail acts like a rudder helping the cheetah turn while running. The cheetah uses its tail like we use handle bars on a bike to steer.

Heart:

What is the function of your heart? *(Pump blood with oxygen to your muscles)*
When you are active, would you need more to keep muscles working? *(Yes)*
Why do you get tired when active? *(Not enough oxygen getting to the muscles.)*
Do you think it will take a lot of oxygen to run at 120km/h? *(Yes)*
Therefore the cheetah has an enlarged heart to help it run that fast.

Binoculars:

If you are a springbok, are you going to live near a cheetah or far away? *(Far away)*
What do we use to see things that are far away from us? *(Binoculars)*
Do you think that it would be an advantage to a cheetah to be able to see far? *(Yes, will be able to see where food is / other predators are)*
Cheetahs' eyes work like a pair of binoculars (binocular vision), allowing the cheetah to see very far (5 km). Use a landmark 5 km from the school that the learners all recognise to explain to them just how far 5km is. Cheetahs will be able to see a bird at that distance.

Sunglasses:

Due to its speed a cheetah has to hunt by day in order to clearly see where it is going. At a cheetahs active times, early morning / late afternoon, the sun is low on the horizon, often resulting in the cheetah looking directly into the sun. When you look into the sun can you see clearly? Do you think this would be good for the cheetah while hunting and running fast? What do we use to protect our eyes from the sun? *(Sunglasses)* What do you think are the cheetah's sunglasses? *(Tear marks)*
The colour black absorbs light, attracting the glare of the sun below the eyes, not directly into the eyes.

Assessment:

Using both of the following activities, you can assess the learners' understanding of the lesson as well as their ability to access information from a variety of sources.

Worksheet – built for speed

Name: _____ Date: _____

Using the paragraph and diagram on the adaptations of a cheetah and what you have learned from the previous activity, fill in the blanks to show the relationships between structure, adaptation and function.

STRUCTURE	ADAPTATION	FUNCTION
Tail		
Body		
Paws		
Spine		
Heart		

Adaptations of a Cheetah for Speed:

The cheetah is the fastest animal on land, with a maximum speed of 110-120 km per hour. Running is the cheetah's main form of defence; its speed allows it to hunt and escape from danger.

The cheetah has many adaptations, which help it to run so fast. The cheetah has a very light skeleton and does not have a lot of muscles. The cheetah's body is thin and streamlined. The leg bones are longer than other cats and cheetahs run on the tips of their toes, giving them a bigger step. The cheetah's spine also can bend a lot more than other cats; this also allows them to increase the size of their steps by stretching their body out. Their hip bones can turn where they are attached to the rest of the skeleton; this allows them to stretch their hind legs out further. All these adaptations give the cheetah a stride of 8 metres while running at full speed. The cheetah's long, narrow tail helps it to keep its balance and steer around corners. The feet give them better grip on the ground to stop the cheetah from slipping while it is running. This grip is provided by grooves on the cushions of the feet as well as the claws which cannot be pulled into the paw completely (we say that they are semi-retractable). It takes a lot of energy for the cheetah to run that fast. It is the oxygen in their blood that provides that energy. The cheetahs have a very big heart and lungs to make sure that they get enough oxygen to their muscles while running to keep up their energy.

Answer Key for worksheet – built for speed

STRUCTURE	ADAPTATION	FUNCTION
Tail	Long and narrow	Balance and steering
Body	Slender, long-legged, streamlined, light	Less wild resistance, and longer stride, therefore increased speed
Paws	Semi-retractable claws Grooves in pad	Better traction for acceleration and faster movement
Spine	Flexible	Increases the stride by allowing the body to stretch out further
Heart	Enlarged	Increased oxygen supply to muscles

Activity 3 – backyard adaptations

Procedure:

In this activity, learners will investigate adaptations using a specimen (insect) from the school's backyard and apply the knowledge previously attained through the cheetah adaptations to give an informed opinion as to the purpose of these adaptations. The learners will also practice their skills at scientific drawing.

Select your insect or other invertebrate in advance of this lesson and research its traits and behaviours. This will become the answer key to the learner worksheet.

Materials:

Be sure to have enough insects (or other invertebrates) for the learners to investigate, one each or in groups of two to three, collected from the pupils' backyard or the schoolyard.

- Container for the insect to be kept in for easy observation (A small transparent bag, plastic container with a clear top, or a plastic Petri dish)
- One piece of white paper
- A spoon and small paintbrush or stick
- A metric ruler
- A hand lens if available

The lesson can be easily adapted to use other equipment if any of the above is not available, or simply make sure the learners collect large enough insects for easy observation by the naked eye. If time allows, it is encouraged that learners spend many days on this activity, which will enable them to create a sound and beneficial experiment.

Name: _____ Date: _____

Name of Insect: _____

Introduction Activity:

In this activity, you will learn some important things about the anatomy and behaviour of your insect. You will also learn how to handle it and that it will not harm you.

The knowledge and skills you acquire in this activity will be of help to you when you design and conduct your investigation in the second part of this activity.

Procedure:

Using the spoon and the brush, place two or three insects in the container. Gently work with the insects in order to answer the following questions.

1. What is the length in millimetres of the shortest insect? _____ mm
   How long is the longest? _____ mm

2. How many pairs of legs do they have? _____
   Do all of them have the same number of legs? _____

3. How many antennae does one have? _____
   What functions do you think the antennae may have?
   _____
   _____

4. How many eyes do they have? _____
   Are the eyes simple (with one lens on the outside) or compound (each eye is made of multiple sections of the lens)? _____

5. Do they have wings? _____ If so, how many? _____

6. Draw a sketch of your insect below. Label all of the parts you can clearly recognise.

7. Touch the back of the insect to determine if it has an endoskeleton (like yours) or an exoskeleton. If it seems hard and stiff, it has an exoskeleton; if it's soft and fleshy, it has an endoskeleton. Which type of skeleton does it have?

   _____

8. Place the insect on its back on the piece of paper. Describe how it turns over and what it does next.

   _____

   _____

   Describe what it does when it comes to an edge where there is a drop-off.

   _____

   Can it climb on steep, smooth surfaces like the edges of the Petri dish or container?

   _____

   Can it climb on your arm or another steep, rough surface? _____

9. How fast can it run/walk? (to measure, do the following)
   a. Mark a small X in the centre of your piece of paper.
   b. Place it on the X.
   c. After releasing it, record the time it takes for it to move off of the paper.
   d. Place another X where it left the paper.
   e. Measure the distance between the two X's in centimetres.
   f. Calculate the speed of the insect in centimetres per second (cm/sec) by dividing the distance travelled by the amount of time it took.
   g. The insect travelled _____ cm/sec.

Experiment – backyard adaptations

Now that you have become familiar with the insect's physical makeup, you are ready to design and perform a scientific investigation about the behaviour of your specimen. Also, you will record and report any observations you make about its behaviour.

1. Brainstorm with your partners about possible behaviour questions you would like to investigate. List at least three questions.

2. Select one of these questions to investigate and state it below. Make sure it is a question.

3. Write a hypothesis that relates to your problem question. Write your hypothesis in the form of an "if, then" statement.
   (For example, "**If** mopane worms are placed in a box where they can choose between light and dark surfaces, **then** they will choose dark surfaces.")

4. Give your project a descriptive title and write the title below.

5. Make a list of all of the variables that may influence your investigation.

6. Determine the variable that you will manipulate (it is the independent variable) and write it below. [Remember that you should manipulate only one independent variable at a time]. Also determine the variable that you will measure (the dependent variable), and the variables that will be consistent throughout the investigation (the controlled variables).
   Independent variable: _____
   Dependent variable: _____
   Controlled variables: _____

NOTE: The information above should help you in completing the investigation write up. Organise this information according to your teacher's instructions.

7. Develop a series of step-by-step instructions that you will follow to test the question in your problem. The instructions will be the design of your experiment. [Make sure that the design of the experiment will really do what it is supposed to do.] The design should include a way to answer the question in your problem.

8. Make a drawing to illustrate the design of your experiment.

9. Conduct the experiment that you designed.

10. Using a data table, record your data and summarise the results. Using the appropriate graph type (line or bar) supply a graph of your results. The graph should have a descriptive title and a label for each axis.

11. Write a paragraph that states your conclusions. It should include an answer to your problem question and state whether or not you confirmed your hypothesis and explain why. Also, discuss how the results of the experiment may relate to the ability of the insect to survive in its own natural environment.

Things to consider:

When designing your experiment, make sure that you can answer the following questions. [If you don't understand any of these questions, make sure to seek guidance from your teacher.]

- Have I identified all of the variables?
- How will the variables be controlled?
- How will variables be measured?
- How will variables be manipulated?
- What equipment and supplies do I need?
- Does my experimental design really do what it is supposed to do?
- Will my experiment answer my question?
- How many organisms will I use in my investigation?
- Is my experiment designed to avoid harming the organisms?
- How many times will I repeat the investigation to ensure that the results are valid?

Background – adaptations

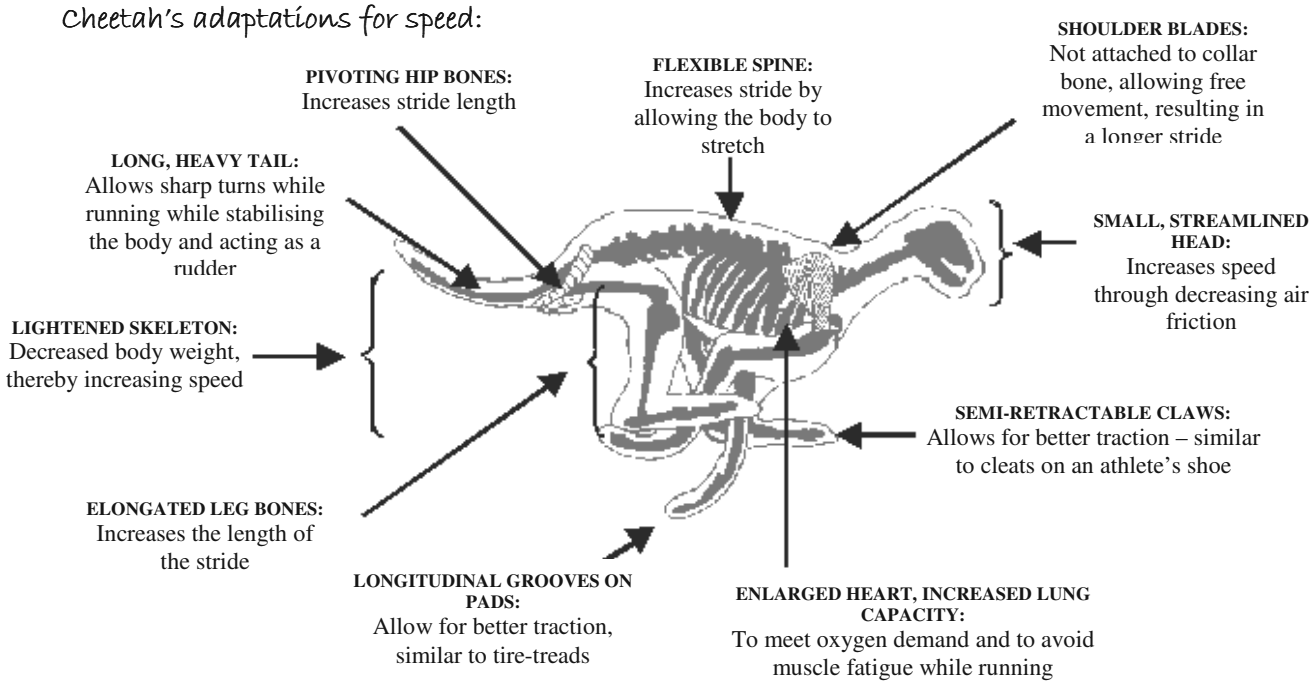
As the fastest animal on land, with a maximum speed of 110-120 km per hour, the cheetah can accelerate from 0-80km in 3 seconds. Their top speed can only be maintained for between 400-500 metres resulting in a short burst of speed (20-30s). They then need to rest for about 30 min. Running is a cheetah's main form of defence; its speed allows it to hunt and escape from danger. Over generations the cheetah has evolved many adaptations to facilitate a specialisation for speed.

Speed consists of the distance one covers in a certain time; therefore by increasing the distance covered one can increase one's speed. The cheetah is aerodynamic (stream-lined) for decreased resistance while running. The leg bones are longer in comparison to the other cats and they run on their toes, giving them a longer stride. The cheetah also has a very flexible backbone, which allows it to stretch its body out further. The cheetah's shoulder blades are not connected to the collarbone, thus allowing the shoulders to move freely and help increase the length of the forelegs while running. The hip bones pivot in their sockets, allowing for greater length of the hind legs while running. All these adaptations result in a stride of 8 m at full speed. The lightened skeleton and reduced muscles mass aid the cheetah in running faster by decreasing the weight carried (the larger you are the slower you are).

The long tail helps the cheetah to balance and helps the cheetah make sharp turns when running, stabilises the body and acts as a rudder. A cheetah' foot shows several modifications, allowing for greater grip while running. The pads on the base of the foot bear longitudinal ridges, the function of which is equivalent to tire-treads. The cheetah has semi-retractable claws, which serve a function similar to cleats on a track/soccer shoe.

It takes a lot of energy to sustain the top speed of a cheetah, and therefore the cheetah has several adaptations to allow more effective delivery of oxygen to the muscles. In comparison to the other large cats, the cheetah's heart, lungs, nostrils and sinuses are enlarged to increase oxygen supply to the muscles.

Cheetah's adaptations for speed:



LIFE CYCLES

SUBJECT AREAS:
Sciences
Mathematics

DURATION/TIME:
Activity 1: 45 minutes

RECOMMENDED PREPARATION:
Activity 1:
Read the 'background' sheet on the cheetah's lifecycle. Photocopy worksheet 'cheetah and me' for learners. Make one photocopy of the 'weight and age chart' to post.

MATERIALS NEEDED:
Activity 1:
Photocopies of the 'cheetah and me' worksheet for learners and graph paper, if necessary

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Captivity
Habitat
Maturity
Cub
Litter
Mortality
Den
Gestation
Graph axis

OBJECTIVE:

Learners will work on their graphing skills by comparing the similarities and differences in the growth of cheetah cubs and human children

LESSON ACTIVITIES:

ACTIVITY 1:
A warm-up 'guess the weight' game and then a discussion about activity and review of information in the 'background' sheet. Learners create a line graph in a weight/age activity and then learners compute results from graph. End with discussion

Learning Outcomes

In this activity learners will work on their graphing skills by comparing the increase in weight after birth of cheetah cubs and human children.

Teaching the Lesson

Activity 1 – cheetah and me

The major purpose of this activity is for learners to recognise similarities between cheetah cubs and human babies as well as develop mathematic skills.

Procedure

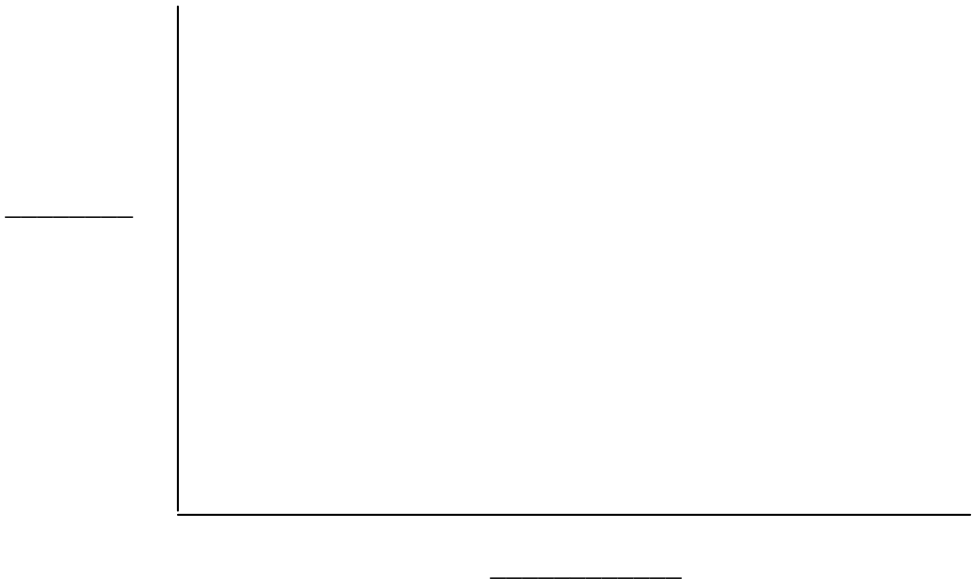
1. Begin a class discussion with learners about cheetahs (use information on the 'a cheetah's life cycle' background sheet). Ask learners to guess how much a cub (baby cheetah) might weigh when it is born. Learners can write down their guess on a piece of paper. Call for their guesses. Ask for their ideas about how long mother cheetahs are pregnant, what baby cheetahs eat when they are born, how much they might weigh when they are a year old, how many brothers and sisters they might have who are their same age, how much they weigh when they are full grown and how long they live. (Answers can be found on the development chart.)
2. Following discussion, post a copy of the 'weight and age chart' and provide as a handout found on the next page. Review with learners any of the background information not covered in the class discussion. Ask learners to plot the cheetah's weight and age.
3. Ask the learners to plot their own weight at the same ages as the cheetah shown on the chart. They will be required to estimate for years past their present age. Ask the learners to graph both sets of data. (Graph can be done on the 'cheetah and me' worksheet or separately on graph paper.)
4. Ask the learners to compute the following, and include their results with their graph and drawing:
    A. How much weight did the cheetah gain at each interval (that is, from birth to four months, 12 months to two years, etc).
    B. How much weight did you gain during the same intervals?
    C. How many times more weight did the cheetah gain during each period?
5. In discussion, ask the learners to comment on the similarities and differences between the lifecycles of cheetahs and people.

Worksheet – cheetah and me

Name: _____ Date: _____

Instructions: Create a line graph in which one line represents cheetahs and one line represents you. Don't forget to put the correct labels on the axis!

Graph Title: _____



Weight and Age Chart

The amounts for the cheetah have been rounded up for convenience; that for the child has been averaged for boys and girls and rounded to the nearest ½ kg.

Cheetah		**Child**	
Age	*Weight*	*Age*	*Weight*
Birth	0.3 kg	Birth	3.5 kg
2 months	3 kg	2 months	5.5 kg
4 months	7 kg	4 months	6.5 kg
6 months	12 kg	6 months	8 kg
12 months	25 kg	12 months	10 kg
16 months	30 kg	16 months	11 kg
24 months	35 kg	24 months	12 kg
Adult	35 - 40 kg	4 years	16 kg
		8 years	26 kg
		12 years	43 kg
		16 years	60 kg
		Adult	63 - ? kg

Development Chart

Stage of Development	Cheetah	Human
Gestation	*90-95 days*	*9 months*
Open eyes	*4-14 days*	*From birth*
First tooth	*3 weeks*	*6 months*
Milk teeth	*6 weeks*	*By 30 months*
Permanent teeth	*8 months*	*By 13 years*
Weaning	*Starts at 6 weeks*	*6 months to one year*
Walk	*3 weeks*	*12-16 months*
Life span	*8-12 years*	*70 years*

Assessment

Checklist for graph

Assessment statements	Yes	No
Graph has a heading		
Both axes are labelled (e.g. weight vs. age)		
Axis labels are correct		
Axis labels include the relevant units (e.g. grams vs. months)		
Axes are divided into relevant intervals		
Data is plotted accurately		
Both sets of data are plotted		
Both sets of data are distinguishable from each other		
The graph is neat and legible		

Background – a cheetah's life cycle

The average life expectancy for cheetahs in captivity is 10-12 years, although some may live longer. In the wild there has not been much research done regarding life expectancy, although it is thought to be slightly less, possibly only 7-8 years. Longevity and survival of the cheetah depends on availability of suitable habitat and its ability to hunt successfully.

Female cheetahs reach sexual maturity between 20-24 months and males between 2-3 years. Cheetahs do not have a particular breeding season. The sexes have a courtship period of up to three days. After breeding the male will leave the female. Gestation period is between 90-95 days. Litters vary in size from 1-8 cubs, with an average of 3 cubs. Birth takes place in bushy thickets, tall grass, rock cavities or "borrowed" burrows. Cheetah cubs are born blind and helpless around 150-300g and up to 30 cm long. Newborn cubs can move enough to reach their mother's teats and suckle, turn their heads, spit and give soft purring calls. Cheetah cubs develop more quickly than any young of any other big cat, gaining about 50g daily. Cubs open their eyes between 4 and 14 days (average 10 days). Cubs can crawl in about 2-3 days and walk at three weeks.

For first 6 weeks of their lives, the cubs are hidden in dense vegetation. The mother returns at night to suckle and groom the cubs. Cubs get their upper and lower canines at three weeks, full set of milk teeth at 6 weeks and their permanent set of teeth by 8 months. Cubs will nurse from 2-3 months with weaning usually beginning around 6 weeks. Cubs begin eating meat at 4-6 weeks. At 6 weeks cubs begin to follow their mother, but return to their den until about 8 weeks.

After 8 weeks they will follow her continuously, bedding down for the night wherever they are. From 6 weeks to 3-4 months is the most vulnerable time for cubs, with predation and starvation being the major causes of death. Cubs also succumb very easily to disease.

The mortality rate amongst cubs is very high; on average only 10 % survive the first year. Young cheetahs play spirited, athletic games consisting of stalking, pouncing, chasing, boxing, wrestling, and tug-of-war. Play is more related to hunting tactics than fighting. When cubs are about 18 months old the mother leaves them. They usually remain in a sibling group for another six months. At about 2 years the female cubs come into oestrous and leave the group. Young males may remain together, forming a life-long coalition, or separate.

When a cheetah cub reaches one year of age, cubs weigh about 25 kg. A mature cheetah weighs 26-64kg and has a shoulder height of 73+ cm. The male tends to be slightly larger than the female.

NUTRITION & TEETH

SUBJECT AREAS:
Sciences
Health

DURATION/TIME:
Activity 1: 15 min
Activity 2: 40 min

RECOMMENDED PREPARATION:
Activity 2:
If possible, borrow actual skulls to use. Also, photocopy of the 'learners skull page' and 'teeth talk' worksheets for each learner.

MATERIALS NEEDED:
Activity 2:
Skulls and photocopies

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Nutrition
Carnivore
Herbivore
Omnivore
Incisors
Canines
Premolars
Domestic

OBJECTIVE:

Learners will discover what the teeth of an animal can tell us about the animal

LESSON ACTIVITIES:

ACTIVITY 1:
Review terms and lead a discussion on a cheetah's nutritional diet and the teeth of different animals.
Explanation of different types of teeth and teeth functions.

ACTIVITY 2:
Categorising animals based on the skulls learners see. Complete the 'teeth talk' worksheet and discuss the reasons for grouping the skulls.

Learning Outcomes

Learners will discover what the teeth of an animal can tell us about the animal and they will use this information to group common animals.

Teaching the Lesson

Activity 1 – review

Review with the learners the terms: carnivore, omnivore and herbivore.
Explain the different types of teeth and their different functions, using the labelled picture of teeth found on the next page.

Molars (M) and Premolars (P)	- grind
Canines (C)	- tear / puncture
Incisors (I)	- slice / cut

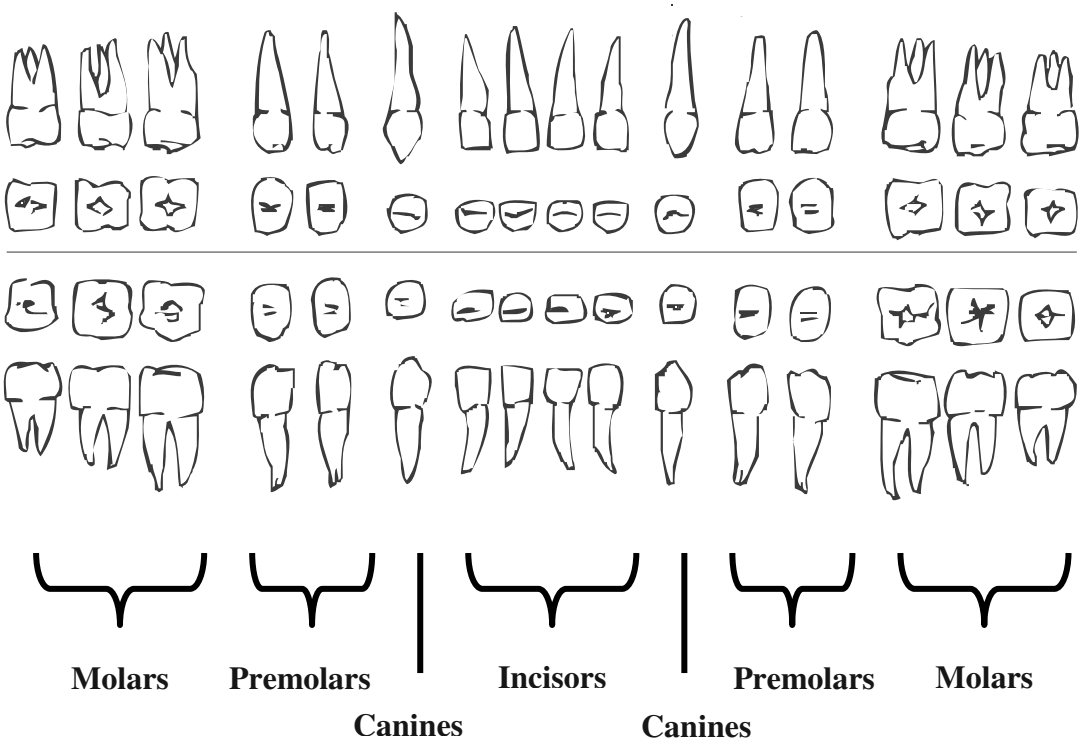
Activity 2 – teeth talk

Have the learners look at the pictures of the various skulls as shown on the Skull Sheet. If possible, try to have some actual skulls available (look into borrowing them from the local university or museum). Ask the learners to look at the teeth and predict the diet of the animal by the different teeth present. For example, do they see canines? Have the learners group the skulls into categories based on what they see, giving their reasons for that grouping. Fill in the 'teeth talk' worksheet. Allow for 10-15 minutes. (Have the learners write down their answers on an activity sheet)

Give the examples on the following page of the dentitions of an herbivore, carnivore, and omnivore and allow the learners to re-categorise with the new information. As a class, see if they can brainstorm ideas on which animal the skull belongs to, writing the list of animals up on the board.

Assessment

1	2	3	4
Learner was unable to identify the teeth and could not classify diet or category that the skulls fell under	Learners could identify the teeth, although reasoning behind classifications did not always show understanding	Learner completed the worksheet showing good reasoning behind the classifications	Learner exceeded expectations producing innovative reasoning behind classifications



Dentition Examples

CARNIVORE

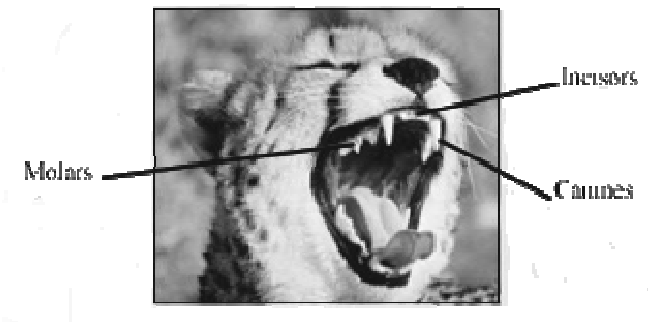
3 incisors, 1 canine, 4 premolars, 2 molars on one side of the top jaw
3 incisors, 1 canine, 4 premolars, 2 molars on one side of the lower jaw

OMNIVORE

2 incisors, 1 canine, 2 premolars, 3 molars on one side of the top jaw
2 incisors, 1 canine, 2 premolars, 3 molars on one side of the lower jaw

HERBIVORE

0 incisors, 0 canines, 3 premolars, 3 molars on one side of the top jaw
3 incisors, 1 canine, 3 premolars, 3 molars on one side of the lower jaw

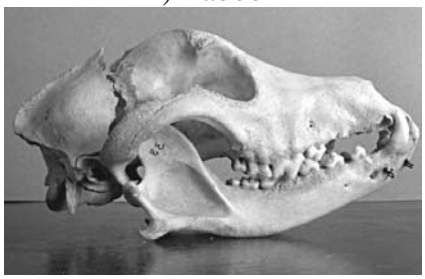


Learner's Skull Page

1) Cheetah

2) Baboon

3) Domestic Cat



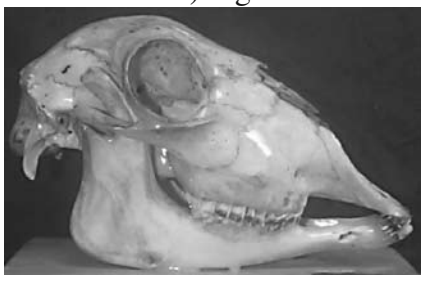
4) Domestic Dog

5) Goat

6) Horse

7) Pig

8) Human



9) Sheep

10) Impala

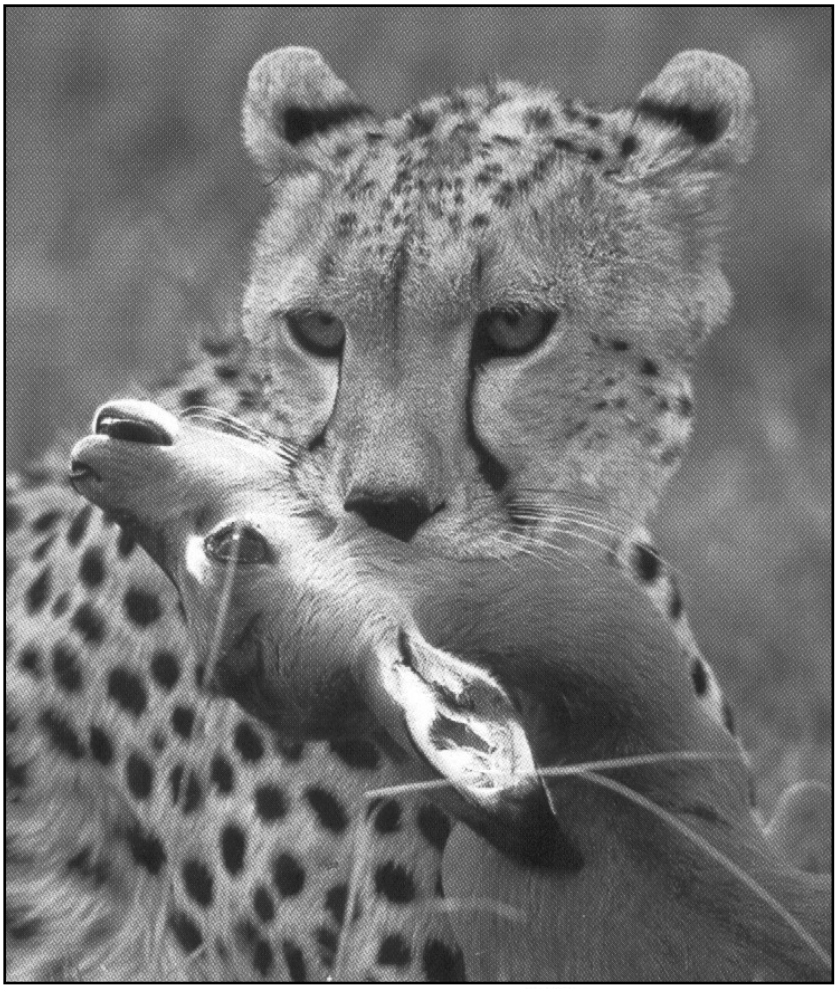
Using the pictures above, find the special teeth that help the animal eat its food. Place this animal in the table showing what you think their diet would be and whether it is a herbivore, carnivore, or omnivore.

Worksheet – teeth talk

Name: _____ Date: _____

Skull #	Diet	Category (*herbivore, carnivore, or omnivore)*	Reasoning	New Category
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Ecology



Cheetah
CONSERVATION FUND

HABITATS I

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 20 min
Activity 2: 25 min

RECOMMENDED PREPARATION:
Introduction:
Find rotten log
(for a habitat example)

Activity 2:
Read the 'background' sheet on habitats and have flashcards prepared and cut out

MATERIALS NEEDED:
Introduction:
Rotten log

Activity 2:
Animal flashcards

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Habitat
Need
Want
Neighbourhood
Conflict

OBJECTIVE:

Learners will become familiar with factors influencing an organism's habitat and will apply their knowledge to themselves and other living organisms to draw comparisons.

LESSON ACTIVITIES:

INTRODUCTION:
Use a rotten log as a habitat example

ACTIVITY 1:
Brainstorm activity on what learners need in their home. Next, explain the difference between need and want and identify the four common 'needs.' Also discuss classification of a habitat.

ACTIVITY 2:
Learners will list animals in a village and identify the needs of the animals. Learners will, lastly, have a discussion on a cheetah's needs and whether that leads to conflicts.

Learning Outcomes

The learners will become familiar with the factors that influence an organism's habitat, including food, water, shelter, and space. They will then apply their knowledge to themselves and other living organisms to draw comparisons.

Teaching the Lesson

Introduction – classification of a habitat

Bring in a rotten log from the school yard and start a discussion as to whether the log has the requirements to be classified as a habitat. This is just an introduction that habitats can be varying sizes as well as different depending on the life phase of a particular species.

Assessment

1	2	3	4
Learner was unable to associate the rotten log with the requirements for a habitat	Learner could only partially predict that the rotten log was a habitat	Learner achieved the assessment standard using previous knowledge to logically describe why the rotten log can be called a habitat	Learner exceeded expectations showing increased understanding of habitat requirements

Activity 1 –need vs. want

Introduce the terminology of habitat where an animal lives. With learner input draw up a list of all the things they need within their home (a home is bigger than a house, it includes where they live and the things they need to survive such as food, water, and fuel sources). Allow them to write anything that comes to mind such as TV, toys, water, bed, etc. Learners are encouraged to think about things they do or need to use every single day. Discuss the difference between a need (water) and a want (Coca Cola) and, using two columns on the board labelled "need" and "want," place all the previous suggestions under the correct heading with the learners' input. This will lead you into the four common needs: food, water, shelter and space.

Activity 2 – Animals and their habitat

Then have the learners write up a list of the animals in their village or neighbourhood (bird, goat, dog, insect, etc). Have them identify what they need to survive and where in the village or neighbourhood the animals live.

Hand out the animal flashcards (names of animals on pieces of paper) to groups of learners. Learners will place the cards together on a blank sheet of paper according to habitat similarities. Label the blank sheet with titles indicating the habitats:

- in the house
- tree
- wetland
- open field

Answer Key – Possible answers. Answers will differ depending on animals you chose for the flashcards

Bird	- Tree	Frog	- Wetland
Scorpion	- Open field	Dog	- House
Cat	- House	Monkey	- Tree
Tortoise	- Open field	Mouse	- House, open field
Lizard	- Open field	Beetle	- Tree, open Field

-OR-

If you do not make flashcards, the learners could just write on a separate sheet of paper, in columns labelled with the different habitats, the names of the animals found on the habitat sheet under the appropriate heading.

Lastly have the learners identify what a cheetah needs in order to survive in its habitat. Discuss the differences and similarities between the learner's environment and the cheetah's. This will emphasise that all living things have the same requirements. Discuss whether this would lead into conflict/competition between species if they all have similar needs.

Background - Habitats

What is a habitat?

All living things need a home, or habitat in which to live. A habitat is the environments, or place, in which the animal lives throughout its life. These range from mountain peaks to ocean bottoms, forests to deserts. Each animal is especially adapted to live in certain habitats. People also have habitats; this is bigger than just the house in which we live. It includes the entire environment that we come in contact with. Where we go to school, to shop or on holiday, it is all still our habitat.

What do animals need from their habitat?

A habitat provides the four basic needs that all animals share: food, water, shelter and space. Food and water supply us with the energy we need to live. Shelter protects from the weather and enemies. All animals need space in which to find their food, water and shelter. If there is not enough space for the living things within a habitat, there will not be enough resources for those animals to survive. Due to their speed, cheetah need to live in open spaces, such as grassland, savannahs, woodlands, bushlands, etc, where they have the space for a high speed sprint without risk of running into obstacles. They prefer to live in areas with low populations of competing predator species such as lion, leopard, baboon, hyena, etc. This generally means that they live outside of protected areas where the populations of other predator species are usually high.

HABITATS II

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 15 min
Activity 2: 35 min
Reflection: 15 min

RECOMMENDED PREPARATION:
Activity 2:
Review the cat fact sheets in the Reference section, photocopy one set of the habitat picture pages, photocopy the 'habitat watch' worksheet for each learner

MATERIALS NEEDED:
The cat fact sheets in the Reference section, copies of the habitat picture pages and the 'habitat watch' worksheet.

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Savannah
Desert
Wetland
Rainforest
City
Cultivated land
Habitat
Preferred

OBJECTIVE:

Learners will further investigate the factors that influence an animal's habitat and learners will predict the best habitat for each animal.

LESSON ACTIVITIES:

ACTIVITY 1:
Habitat hoop game and a discussion on what will happen if one element in the habitat is removed.

ACTIVITY 2:
Discuss habitats, review the 'cat facts' and do the 'habitat watch' worksheet.

REFLECTION QUESTIONS:
Hold a discussion on outlined points pertaining to habitats

Learning Outcomes

This activity will further investigate the factors that influence an animal's habitat. It also uses the learner's background knowledge on the major cat species to predict the best habitat for each.

Teaching the Lesson

Review the information within the Habitats I activity.

Activity 1 – habitat hoop (adapted from the project wild activity "Habitat lap sit")

Get the learners into a circle, front to back, and go around naming the learners by a habitat necessity: space, water, shelter and food. Tighten the circle until the learners are close enough together that they can sit on each other's knees. Remove one learner and see what happens to the circle. Remove all the waters and see what happens to the circle. This shows that while all four elements are present there is a balanced environment; a slight decrease in one of the elements results in only a little disturbance, while removing one of the elements results in the collapse of the environment / habitat. The learners can be led in a class discussion to achieve this conclusion on their own.

Activity 2 – habitat watch

The region or area that an animal lives in is called its habitat. A variety of different habitats are shown in this lesson. (Copy the 3 habitat picture pages and share with the class.) Each of these habitats will support a variety of plants and animals. The number and kind of plants and animals that each one supports depends on several factors.

A habitat can contain various amounts of food, water, shelter and open spaces. Since different animals have different needs for each of these factors, each habitat will usually have different animals found in them. Sometimes the same animal will be able to live in different habitats if all of its needs are met.

In addition to the animal's needs for these factors, its specific abilities and body type may influence what habitat it lives in.

Habitat Requirements Table

Instructions: After studying the provided pictures of five different habitat types, ask the learners to decide whether each habitat has LOW, MEDIUM, or HIGH levels of each of the habitat factors. Draw this table on the chalkboard for learners to copy into workbook or use attached learner worksheet.

Habitat Factors	Savannah	Rain Forest	Wetlands	City	Cultivated Lands	Desert
Food						
Water						
Shelter						
Space						

Animal Requirements Table

Instructions: Review the 'cat facts' provided in the Reference section to determine the requirements each of the animals below have for their habitat. After completing the Habitat Requirements table above, ask the learners to determine the preferred habitat of each cat species. Special factors such as specific abilities and body type may also influence an animal's habitat preference. Draw this table on the chalkboard for learners to copy into workbook or use attached learner worksheet.

Animal	Food	Water	Shelter	Space	Special Factors	Optimum Habitat
Cheetah						
Tiger						
Lion						
Domestic Cat						
Human						

Worksheet – habitat watch

Name: _____ Date: _____

Habitat Requirements Table

Instructions: After studying the provided pictures of five different habitat types, decide whether each habitat has LOW, MEDIUM, or HIGH levels of each of the habitat factors.

Habitat Factors	Savannah	Rain Forest	Wetlands	City	Cultivated Lands	Desert
Food						
Water						
Shelter						
Space						

Animal Requirements Table

Instructions: Review the 'cat facts' provided by your teacher to determine the requirements each of the animals below have for their habitat. After completing the Habitat Requirements table above, determine the preferred habitat of each cat species. Special factors such as specific abilities and body type may also influence an animal's habitat preference.

Animal	Food	Water	Shelter	Space	Special Factors	Optimum Habitat
Cheetah						
Tiger						
Lion						
Domestic Cat						
Human						

Answer Key to habitat watch worksheet

Habitat Requirements Table

Habitat Factors	Savannah	Rainforest	Wetlands	City	Cultivated Lands	Desert
Food	*High*	*High*	*Medium*	*Low*	*Medium*	*Low*
Water	*Medium*	*High*	*High*	*Medium*	*High*	*Low*
Shelter	*Low*	*High*	*Medium*	*High*	*Medium*	*Low*
Space	*High*	*Low*	*Medium*	*Low*	*High*	*High*

Animal Requirements Table

Animal	Food	Water	Shelter	Space	Special Factors	Optimum Habitat
Cheetah	*High*	*Low*	*Medium*	*High*	*Fast, small mouth, solitary hunter*	*Savannah*
Tiger	*High*	*Medium*	*High*	*Low*	*Large, powerful, solitary, camouflage*	*Rainforest*
Lion	*High*	*Medium*	*Medium*	*High*	*Group hunter, powerful, large mouth*	*Savannah*
Domestic Cat	*Low*	*Low*	*Medium*	*Low*	*Depends on humans*	*City / Cultivated Land*
Human	*Medium*	*Medium*	*High*	*Low*	*Modifies habitat*	*Various*

Reflection Questions:

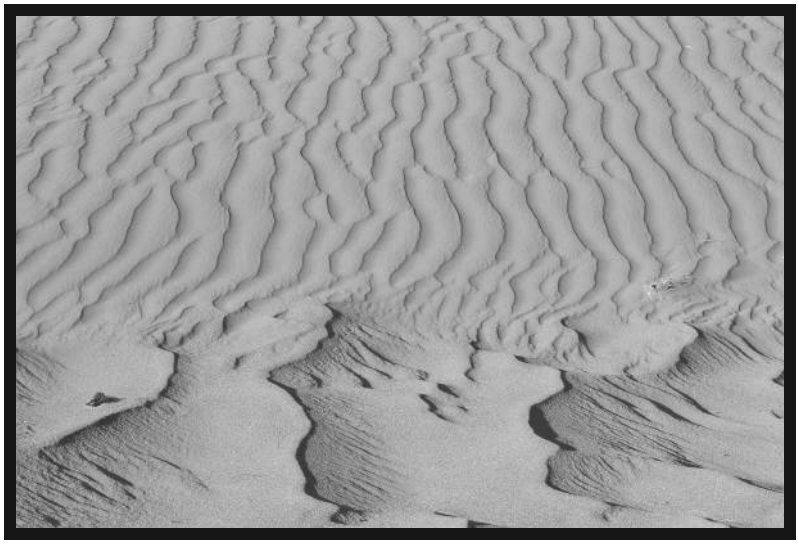
1. Which habitat has the HIGHEST levels of habitat factors? Which one has the LOWEST levels of habitat factors?
2. Which habitat will probably support the most animals? Which habitat will probably support the fewest animals? Why?
3. What other factors (besides those listed in the table) may be important in an animal being present in a particular habitat?
4. What ability do humans have that allows them to take advantage of more than one habitat type?
5. Explain why the cheetah is sometimes out competed by the lion for habitat space.

   Background information for question 5:

   The cheetah is a non-aggressive cat and avoids confrontation. Their mobility is crucial to their survival and confrontations with other predators could cause injury and jeopardise their survival. With this in mind, cheetahs will back down when confronted by a lion, leopard or pack of hyenas. The cheetah often loses its prey or territory to lions and leopards.

Habitat Picture Page 1:

Savannah



Desert

Habitat Picture Page 2:

Wetland

Rainforest

Habitat Picture Page 3:

City

Cultivated Land

ANIMAL BEHAVIOURS

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 10 min
Activity 2: 30 min
Research Project: 1 week

RECOMMENDED PREPARATION:
Activity 1:
Review background information provided.

Activity 2:
Make 40 'prey' cards to use in the outdoor activity and mark out the 20x20 metre outdoor area needed.

MATERIALS NEEDED:
Activity 2:
Prey cards

LOCATION:
Classroom &
Outdoor

KEY WORDS TO REVIEW:
Predator
Prey
Behaviour
Instinct
Cub
Survival
Strangle
'Pride' of lions

OBJECTIVE:

Learners will learn the behaviour of animals while using cheetahs as an example

LESSON ACTIVITIES:

ACTIVITY 1:
The class will take part in 'lion encounter,' a classroom activity, and will then hold a discussion.

ACTIVITY 2:
Outdoors the class will take part in a predator and prey activity and then discuss the activity.

RESEARCH PROJECT:
Collect data to compare social interactions between the cheetah and other animals

Learning Outcomes

This activity is designed as an introduction to animal behaviours using the cheetah as a focus. Classroom and outdoor activities introduce the topic of behaviour to the learners while the activity ends with a research project comparing the interactions of cheetahs and other animals sharing their environment.

Teaching the Lesson

Review the 'hunting development of cub' background information located at the end of this activity.

Activity 1 – lion encounter (classroom activity)

Select a number of volunteers from the class. Take the smallest volunteer separately and group the rest together. Ask the class to imagine that the front of the classroom is a savannah and the group represents a pride of lions and the individual is a cheetah. As a lone cheetah what would happen if the cheetah should try to pass through the lion's territory. Lead this into a discussion of how and why a cheetah must learn to interact with other predators to ensure its survival in the wild, using background information in this lesson.

Activity 2 – outdoor activity

Using paper, create a number of cards as follows to represent various prey items: (this representation can be through various colour paper, cut-out shapes or merely the name of the prey item written down on the piece of paper).

Make five cards per prey item

Prey items:

- zebra
- springbok
- snake
- grass
- mouse
- flower
- hare
- kudu

Divide the class into groups, which represent the following predators: give each individual a piece of paper, depicting by shape or writing, which of the following predators the individual learner represents.

- Insect
- Cheetah
- Lion
- Bird

Take the group outside where you spread the prey items over an area of 20 x 20 metres. Have the class line up at one side of the area and at the count of three, traverse the area searching for appropriate prey items for the predator they represent. Once all prey items have been picked up initiate a discussion of what was picked up and why.

- The insect should have grass and flowers
- The bird could have flowers if a nectar feeder or a snake and mouse if it's a bird of prey (possibly the hare if the learner has selected to be a bigger bird of prey)
- The cheetah should have selected the springbok and hare (possibly also the mouse).
- The lion should have a selection of kudu, zebra, springbok and hare.

Follow this with a discussion of how the cheetah hunts and what this means in terms of the mother having to teach the young. Review the hunting behaviour of a cheetah using the background information provided.

Teacher's Worksheet for Research Project – it is tough in the wild

Focus:
To compare the social interactions and relationships between the cheetah and other animals sharing its environment.

Question choices for research topic:
- How does a mother teach her cubs to avoid other predators and why would this be necessary?
- What survival strategies does a cub need in order to survive in the wild?
- How does a cheetah cub learn to hunt?

Data should be submitted in the form of a portfolio (this may include pictures and charts). This activity can be done as an individual or as a group.

After the portfolio has been put together the topic should be presented to the rest of the class and a discussion initiated as to the social interactions in the wild. The teacher can inform the learners as to any additional information provided in the Teacher's Guide, not presented by the learners.

Resources:
- Library
- Internet
- Background Information from resource
- Magazines
- Nature videos
- Zoo or organisation working with lions or cheetahs

Pre-preparation:
The teacher should first have the facts about this research and that requires him/her to make use of resources to get information. The teacher should be able to inform the learner exactly where to find the information.

Assessment:

Research Assessment Statements	Yes	No
Learner completed assignment within time limit		
Learner gave title and author		
Learner gathered information from a variety of sources		
Learner used information relevant to the topic		
Presentation was neat and well laid out		
Learner gave references correctly		

Background – hunting development of cubs

Chasing prey may be instinctive, but cubs must learn how to bring prey down, how to direct a bite at the throat, and how to hold the victim until it stops kicking, all from watching adults.

Cubs learn the stranglehold from watching their mother kill and practice it through play by biting napes of siblings. They sometimes stop eating to imitate stranglehold on dead prey.

Mother cheetah uses every opportunity to teach offspring how to hunt by:

- Releasing stranglehold of prey not yet dead and letting cubs finish it off.
- Bringing small live animals (fawns, hares, etc.) back to cubs as young as 4 months old to kill.

Cubs begin accompanying mother on hunts from 3 to 4 months. She conceals them when prey is spotted and induces them through vocalisations to remain hidden. If hunt is successful, she calls them to the kill.

Occasionally, cubs will alert the prey by standing up or moving forward too soon. Cubs start taking a more active role in the hunt from 6 to 7 months and will sometimes follow mother during chase, not staying behind to be called. While mother is strangling prey, they may help by holding the animal down with paws or with a bite to the flank, or will start eating immediately.

Cubs will attempt catching and killing small animals on their own from 7 months with little success. They may occasionally catch and kill hares they have flushed out.

By 12 to 14 months, cubs are capable of killing prey themselves. At 15 months, cubs are as big as or bigger than mother, and often take initiative in the hunt though they may still need assistance from mother with the actual kill. By 16 to 18 months, cubs are almost fully grown and can usually survive on their own.

Mistakes made by cubs learning to hunt on their own include:

- Not being properly concealed from prey.
- Not watching prey closely enough.
- Stalking animals too large for them.

During this time period the mother will also be teaching the cubs to avoid other predators in the area such as lion, leopard, baboon etc. Due to their delicate build for running, cheetah are very vulnerable to injury in a fight and so will prefer to avoid confrontation with a larger predator.

FOOD CHAINS

SUBJECT AREAS:
Sciences
Health
Arts

DURATION/TIME:
Activity 1: 30 minutes
Activity 2: 20 min
Activity 3: 30 min

RECOMMENDED PREPARATION:
Review background information

Activity 1 & 2:
Copy and cut out items on the 'food chain picture page' for individual learners or small groups

Activity 3:
Remind learners to bring cans. Have magazines/ pictures for learners to use and prepare paint (and other art materials) for activity

MATERIALS NEEDED:
Activity 1:
Copies and images cut out of the 'food chain picture page.'

Activity 3:
Soda cans or tin cans
Paint
Paint brushes
Water (to rinse brushes)
Magazines/pictures
Scissors
Glue or tape

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Producer
Consumer
Primary & Secondary
Herbivore
Carnivore
Food pyramid/web/chain
Ecosystem

OBJECTIVE:

Learners will study the difference between a food web, chain and pyramid.

LESSON ACTIVITIES:

ACTIVITY 1:
Lead a discussion explaining the food chain, web and pyramid and how animals depend on one another in an ecosystem. Use the background page. Then, learners will construct a food pyramid by using the pictures provided in the 'food chain picture page.'

ACTIVITY 2:
Learners use pictures from the 'food chain picture page' to form a food web and chain. Small groups will present to the class.

ACTIVITY 3:
Learners will take part in an arts activity and use cans and photos to create a food pyramid of their own. Groups will present their pyramids to the class.

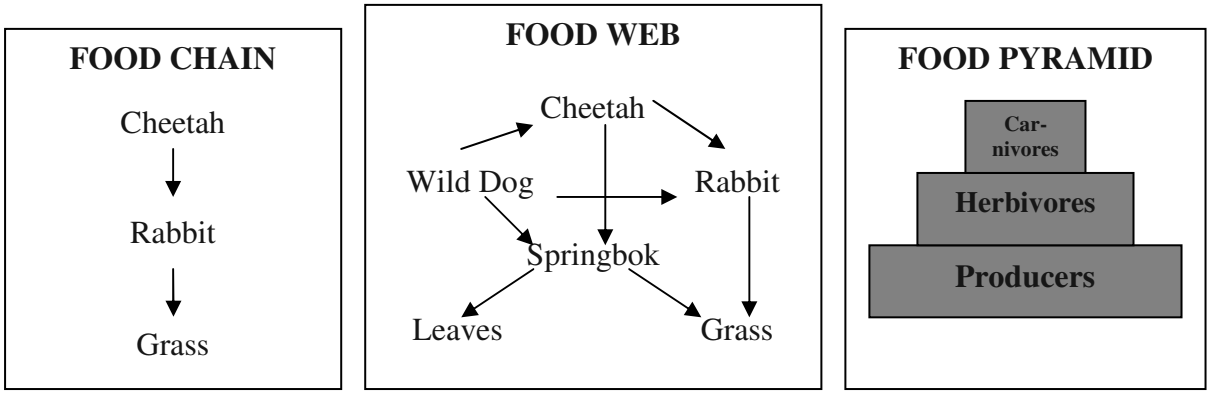
Learning Outcomes

In this activity learners study food chains, webs, and pyramids in relation to the cheetah. Learners use this information to make their own food pyramid in Activity 3.

Teaching the Lesson

Activity 1 – discussion & food pyramid

Review the food chain background information provided, and then explain the concepts to learners using the diagrams below.



(Arrows indicate what organism preys on another organism. If you want to show the flow of energy through the system reverse the direction of the arrows)

Using the 'Food Chain Picture Page,' cut out the pictures.

Paste the pictures on separate pages under the appropriate headings of Producer, Primary Consumer/Herbivore, and Secondary Consumer/Carnivore.
-OR-
Hand out the 'food chain picture page' to each group of learners and have learners write down the headings on a sheet of paper, filling the names of the animals shown on the picture page under the appropriate heading. The learners hand in the picture page after the activity, allowing you to reuse them for the next group.

Activity 2 – food chain

Use the 'Food Chain Picture Page' handout. Divide the class into three groups. Each group must use the pictures on this page (either cut out pictures or just the names of pictures) to form a food chain and food web. Each group is then given an opportunity to present to the class explaining why they used the pictures they did. (Alternatively they can just write the names of the organism down in a diagram as above, allowing you to reuse the picture page.)

Activity 3 – assemble a food pyramid

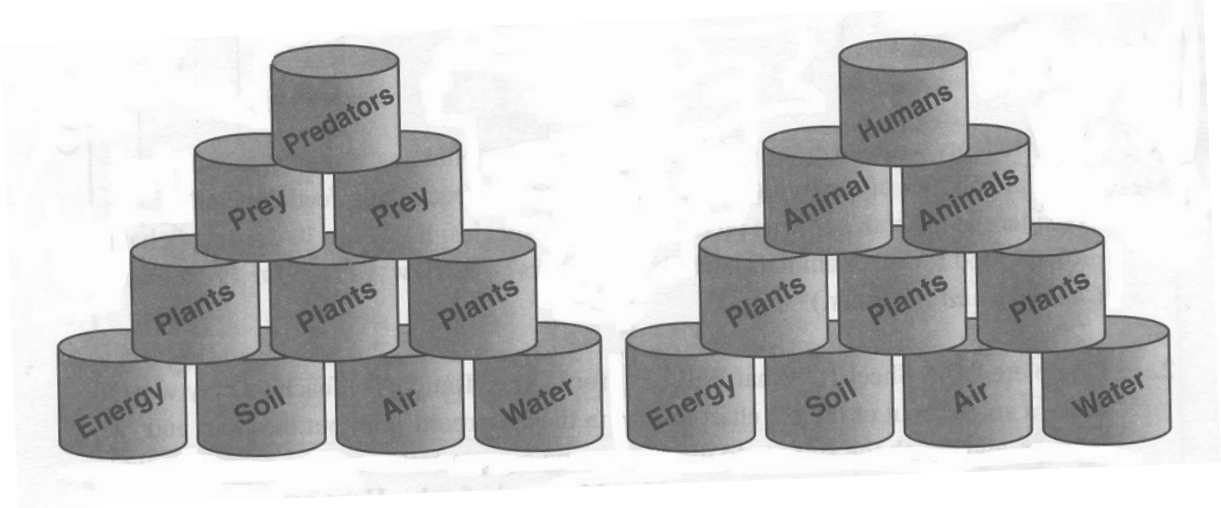
Have each learner bring in an empty soda can or tin can.

Have learners also bring pictures from magazines of plants, antelope, dogs, cats, etc (i.e., examples of producers, herbivores and predators) prior to the lesson.
-OR-
Hand out the 'Food Chain Picture Page' for the learners to cut out and use.

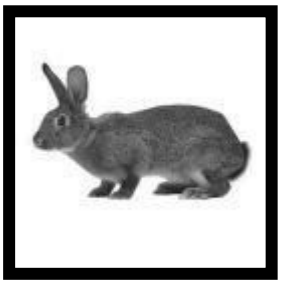
Break the class into groups of six learners with one 'Food Chain Picture Page' and six cans per group. Briefly explain the concepts of food pyramids to the learners. Then ask them to assemble a food pyramid of their own using the cans and pictures. Each pyramid should have a base of three cans each with a producer, the second level should consist of two cans with herbivores and one can with a carnivore on top. Let each group present their food pyramid to the class, describing the kinds of organisms that are a part of their food pyramid and the ways they depend on each other for energy. Groups should use the words: producers, herbivores, carnivores; and understand the energy flow through the pyramid. As an entire class, construct one giant pyramid from each groups' pyramids. Discuss the importance of maintaining balance in habitat. If one can is removed from the pyramid the whole system weakens or collapses. Stress the importance of each individual animal to the natural world.

Assessment

1	2	3	4
Learner did not show understanding of information in the building of their pyramid	Learner was mostly correct in their classifications showing some lack of recall of information discussed	Learner could correctly recall information necessary to build the pyramid, correctly classifying the animals	Learner showed a deeper understanding of the pyramid built. The pyramid was built accurately with correct classifications



FOOD CHAIN PICTURE PAGE



Cats and the Energy Cycle:

The speed of a cheetah and the strength of a lion aid them in catching their prey. Big cats are predators and play an important role in the energy cycle, fitting in with the overall balance of life. Every animal needs to get its energy from somewhere; food chains illustrate where a plant or animal gets its energy from within its habitat. A single food chain does not show all the sources of energy for an organism, merely examples. A food web, which is more complicated, takes into account all sources of energy between organisms within a given habitat. Therefore one can say that it is a compilation of all the food chains within a habitat.

How does Energy Cycle work?

FOOD WEB & FOOD CHAIN:
The sun is the source of energy within a food chain or web. Plants, one of the few organisms on earth that can transfer the sun's energy to make their own food, are called **producers**. The producers support all other life on earth, whether directly or indirectly. **Herbivores** (primary consumers) are the next step in the energy cycle; they consume only plants in order to get their energy. Herbivores include giraffe, antelope, many rodents, sheep, goats and cattle and are especially adapted to gathering, grinding and digesting plants. Some concentrate on only parts of the plants such as leaves, seeds, bark and / or roots. The next step in the energy cycle is the **carnivores** (secondary consumers). Carnivores are those animals that eat only other animals in order to get energy and include cats, dogs, birds of prey, sharks and some snake species. **Omnivores** are designed to obtain energy from a variety of sources, both animal and plant. Some examples of omnivores are pigs, porcupine and badgers. When plants and animals die, the energy still contained within their bodies is fed on by scavengers, beginning the process of decomposition. Other organisms known as **decomposers** (insects, fungi, and bacteria) recycle dead organisms back into nutrients and soil. The energy cycle then begins anew as the plants use the nutrients and soil to grow. Thus the food web is the cycle of energy through a habitat.

FOOD PYRAMID:
While food chains and food webs depict energy interrelationships, food pyramids show the relative amounts of producers, herbivores and carnivores within a habitat. Plants are the most numerous organisms; they have a permanent source of energy in the sun. Producers collectively weigh the most and hold the most energy, thereby forming the base of the food pyramid. Herbivores form the next level on the food pyramid as they obtain their energy directly from the producers. Due to the fact that energy is lost at each step of the pyramid, there will always be less herbivores than producers and less carnivores (the top step of the pyramid) than herbivores. Energy is lost at each step as some is not consumed, some is not digested and some is used to carry out bodily processes.

Why are these relationships (food webs and pyramids) so important?

Food webs and pyramids stress the important role of every creature by illustrating the interdependencies which exist in nature. Remove a part of the web of pyramid and the balance of nature will break. Each component depends on the other in the cycle of energy.

CHEETAH HUNT

SUBJECT AREAS:
Mathematics
Sciences
Agriculture

DURATION/TIME:
Activity 1: 10 minutes
Activity 2: 40 minutes

RECOMMENDED PREPARATION:
Activity 2:
Prepare and label 200 'prey' (use cups or blocks). Prepare outside area for game.

MATERIALS NEEDED:
Activity 2:
200 'prey'
Blindfold

LOCATION:
Outdoors (game)

KEY WORDS TO REVIEW:
Carrying capacity
Factor
Prey
Hunt
Shelter

OBJECTIVE:

Learners will discover limiting factors and carrying capacity by participating in a discussion and game.

LESSON ACTIVITIES:

ACTIVITY 1:
Discussion on carrying capacity, limiting factors and population.

ACTIVITY 2:
Game rules and discussion, outdoor game 'cheetah hunt' and questions relating to game.

Learning Outcomes

In this activity learners discover limiting factors and carrying capacity using a game in which they all play cheetahs competing in the savannah.

Teaching the Lesson

Activity 1 – discussion

It is possible for each of the nearly 7 billion people on Earth to fit in a country the size of Namibia. Discuss with the learners whether or not we would all survive in that much space. What else would we need? Review with them the four factors that affect an animal's habitat (food, water, shelter, and space).

The limiting factor is the factor which is in the shortest supply. For example, a cheetah can have excess space, food, and shelter, but if water is in short supply, it still will not be able to survive. This maximum number of animals that can survive in an environment is the carrying capacity. As long as the limiting factor increases, the carrying capacity can increase as well. But as soon as the limiting factor decreases, the carrying capacity must decrease as well.

This activity will demonstrate carrying capacity by using food as the limiting factor. The food is divided into different cheetah prey animals, each counting as a certain amount of energy. Each animal has a certain amount of energy it requires to survive, and those who do not meet that requirement will die.

Activity 2 – outdoor game 'cheetah hunt'

Before the activity begins, prepare 200 'prey.' Small, reusable cups are useful because they are easy to pickup, but even small blocks of wood will work. Label with a G, R, P, D, or S according to the chart below:

Prey animal	Population	kg of prey
Guinea Fowl (G)	100	1
Rabbit (R)	50	2
Porcupine (P)	30	7.5
Duiker (D)	19	20
Springbok (S)	1	75

You will also need a blindfold for one of the 'cheetahs.'

Procedure:

1. Begin by setting up the outside game area. Evenly spread the cups (prey) throughout the field.
2. Discuss with learners that they will be playing a game which demonstrates how many cheetahs can live in an area.

   Here are the rules of the game:
   - Each person will represent a cheetah
   - Together, you are a population of cheetahs in a defined habitat
   - You need to find enough food to survive for 1 month (50 kg)
   - Each cheetah must find a shelter where they can keep their prey
   - Cheetahs stalk their prey and only use their incredible speed when their prey runs. Your prey will not be running away, so you can't run either!
   - A cheetah can only take one prey at a time and take it back to its shelter
   - Cheetahs cannot fight over prey because they can get injured
   - Do not damage the prey! Be careful!
   - When all of the prey has been picked up, we are done. Stay at your shelter.

3. Ask for three volunteers. One volunteer will be injured and must hop on one leg the entire time. One is blind because of an unfortunate encounter with a porcupine, so it cannot see. Give them a blindfold to use. The last is a mother with two cubs. Each needs an extra 25kg of food to survive so she needs 100kg for her family to survive.
4. Send the learners to their shelter. Review that each needs 50kg to survive. There are five different prey animals and each one is worth so many kg of food. Review the prey and kg of each prey.
5. Begin the game! When the learners are finished, have them add up their kg's and meet up.
6. Ask each learner to tell how many kg's of prey they caught. Keep track of the number as you go. Ask the three volunteers to go last. When they are finished, tell them how many survived out of how many there were originally.
7. Ask the learners what the limiting factor to cheetah survival was in this case. (Food.) Then ask what the carrying capacity of this habitat is for cheetahs. This is the number that survived. Discuss why so many died. Also, how did the three volunteers do? Is it easy for a mother cheetah to get enough food for both her and her cubs?
8. Discuss what would happen to the cheetah population if a virus killed off the rabbit population. Conversely, what would happen to the rabbit population if hunters lowered the cheetah population? (It's all interrelated!)
9. There are nearly 7 billion people in the world today. If they stood side by side they could all fit in Namibia. Would we all survive? How does this relate to carrying capacity?

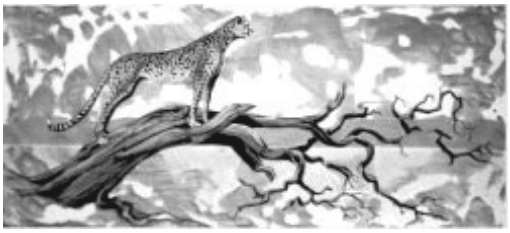
Now, using the descriptions on the following page, describe how a real cheetah would hunt its prey. How is it different than other large cats?

Cheetah Hunt

To achieve a successful hunt, a sequence of behaviours occurs. If the sequence is interrupted, the hunt will be abandoned. If it is successful, the cheetah may not have to hunt again for several days.

Visual Contact

The cheetah climbs termite mounds or trees as vantage points to locate potential prey.



Approaching Prey

The cheetah may either select or stalk prey from a hidden position or approach the prey at a walk or slow run.

Chase

The cheetah bursts into full speed after its prey. If the chase is unsuccessful, the cheetah will need to rest before another hunt is attempted.

Trip

Running at full speed the cheetah uses its front foot and dewclaw to strike at the hind legs of its prey, tripping and knocking it down

Killing Prey

Prey is killed by suffocation when the cheetah takes hold of the throat, closing off the windpipe.

Rest

The cheetah will sometimes be too exhausted to eat after a high speed chase. It may rest for up to 30 minutes before hunting or eating again.

Feeding

Cheetahs often drag their kills to a shaded area and begin eating the hindquarters of the carcass.

PREDATOR – PREY RELATIONSHIPS

SUBJECT AREAS:
Mathematics
Sciences
Agriculture

DURATION/TIME:
Activity 1: 10 min
Activity 2: 30 min
Activity 3: 20 minutes

RECOMMENDED PREPARATION:
Activity 1:
Review the sheet 'a place for predators' in the Reference section for the discussion.

Activity 2:
Photocopy and cut out cheetahs and gazelles for groups

MATERIALS NEEDED:
Activity 2:
All materials listed are needed **per group** of learners:
- Photocopy of one large cheetah
- Photocopy of 250 gazelles (3 copies of gazelle page)
- A 60cm square section of table top
- Masking tape or coloured sello tape
- Data table
- Graph paper

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Predator
Prey
Population
Generation

OBJECTIVE:

Learners will simulate the interactions between predators (cheetahs) and prey (gazelles) to discuss and understand population of species.

LESSON ACTIVITIES:

ACTIVITY 1:
Discussion on predator-prey relationships and preparation for the 'cheetah vs. gazelles' game.

ACTIVITY 2:
Predator and prey relations are discovered by playing the 'cheetah vs. gazelles' game.

ACTIVITY 3:
Graphing activity with information from data table in Activity 2 and discussion.

Teaching the Lesson

The purpose of this activity is to simulate the interactions between cheetahs and gazelles in order to understand what happens to the population of both species.

Materials:

Note the materials needed on previous page. Cheetah and gazelle images can be found in this lesson to be copied.

Activity 1 – cheetahs vs. gazelles game preparation

Begin by discussing what is a predator and prey and what the relationships are between the two. (Use the sheet 'a place for predators' in the Reference section to aid in discussion.)

Divide the class up into groups of 3-4. Each group needs the above materials. Cut-outs of the cheetahs and gazelles are provided. Before they begin, learners should create a data table that keeps track of the generation, cheetah population, and gazelle population.

A sample data table is below.

GENERATIONS																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	26	17	18	19	20	**21**	**22**	**23**	**24**	**25**
Cheetah Population																									
Gazelle Population																									

Activity 2 – cheetahs vs. gazelles game

Begin by discussing the rules of the game:

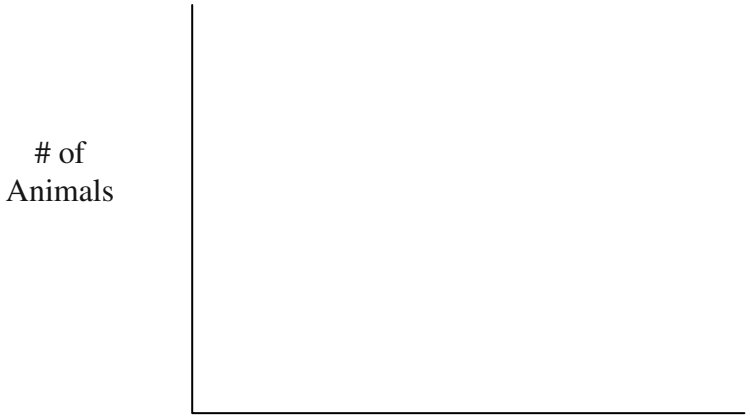
1. Begin with 3 cheetahs and 1 gazelle.
2. A cheetah needs to catch 3 gazelles to survive.
3. If the only cheetah dies, another will take its place.
4. If all gazelles die, 3 more will take their place.
5. A cheetah needs to catch 3 gazelles at one time to reproduce.
6. The gazelle population doubles after each generation.
7. If a gazelle is caught, it must be removed.

Activity Procedure:

1. Mark off your valley with a 60cm x 60cm square of masking tape.
2. Distribute 3 gazelles in a valley.
3. Toss the cheetah once to catch a gazelle.
4. Complete the data table for generation #1.
5. Double the gazelles left and disperse them in the meadow.
6. For each generation, toss each cheetah and remove caught gazelles.
7. Simulate 20 generations, recording data at each generation. Guess the last 5 generations.

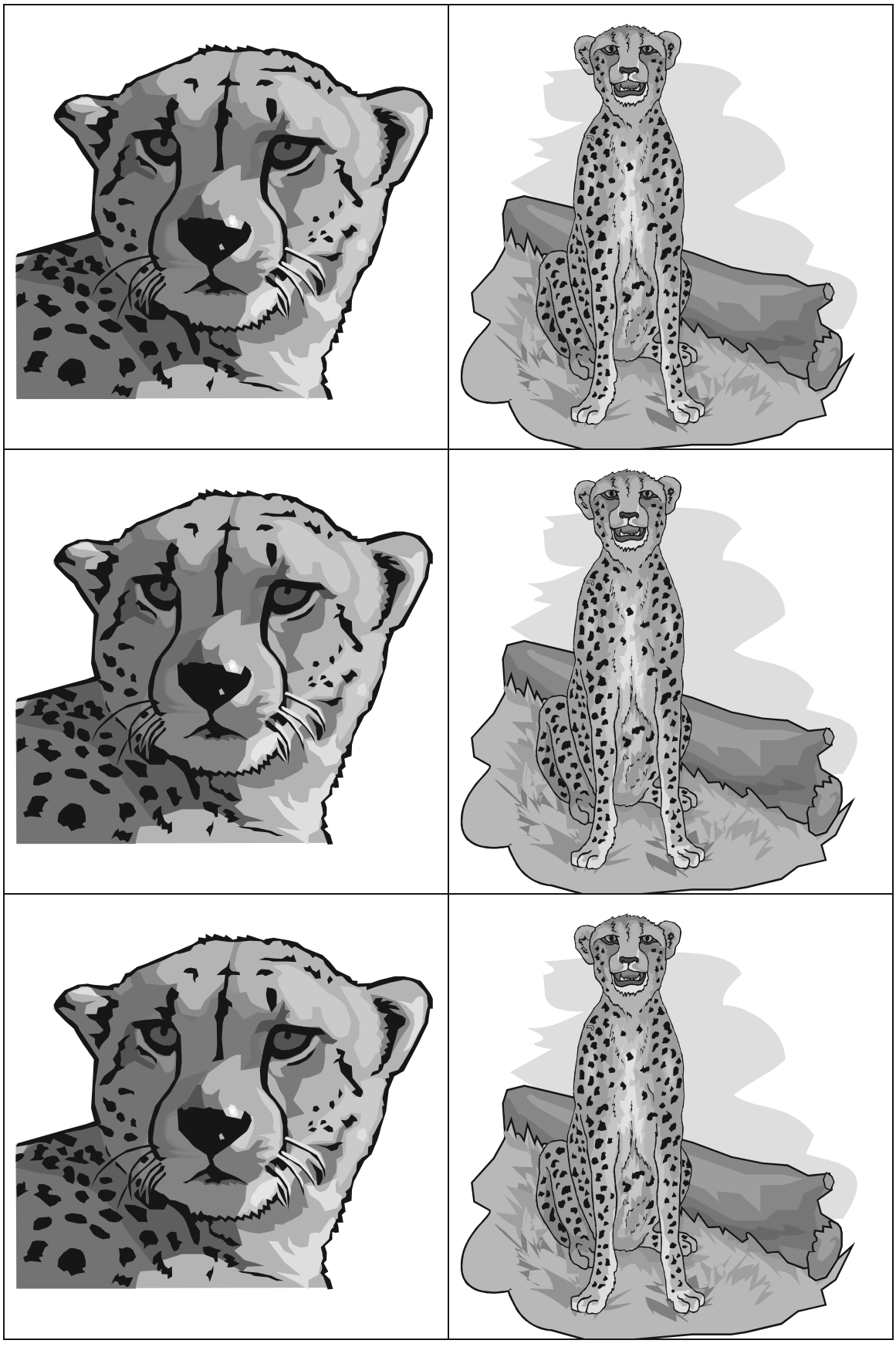
Activity 3 – cheetahs vs. gazelles graph & discussion

Graph the data for 25 generations. Place both the gazelle and cheetah data on the same group (in different colours). Label the vertical axis "Number of Animals" and the horizontal axis "Generations."

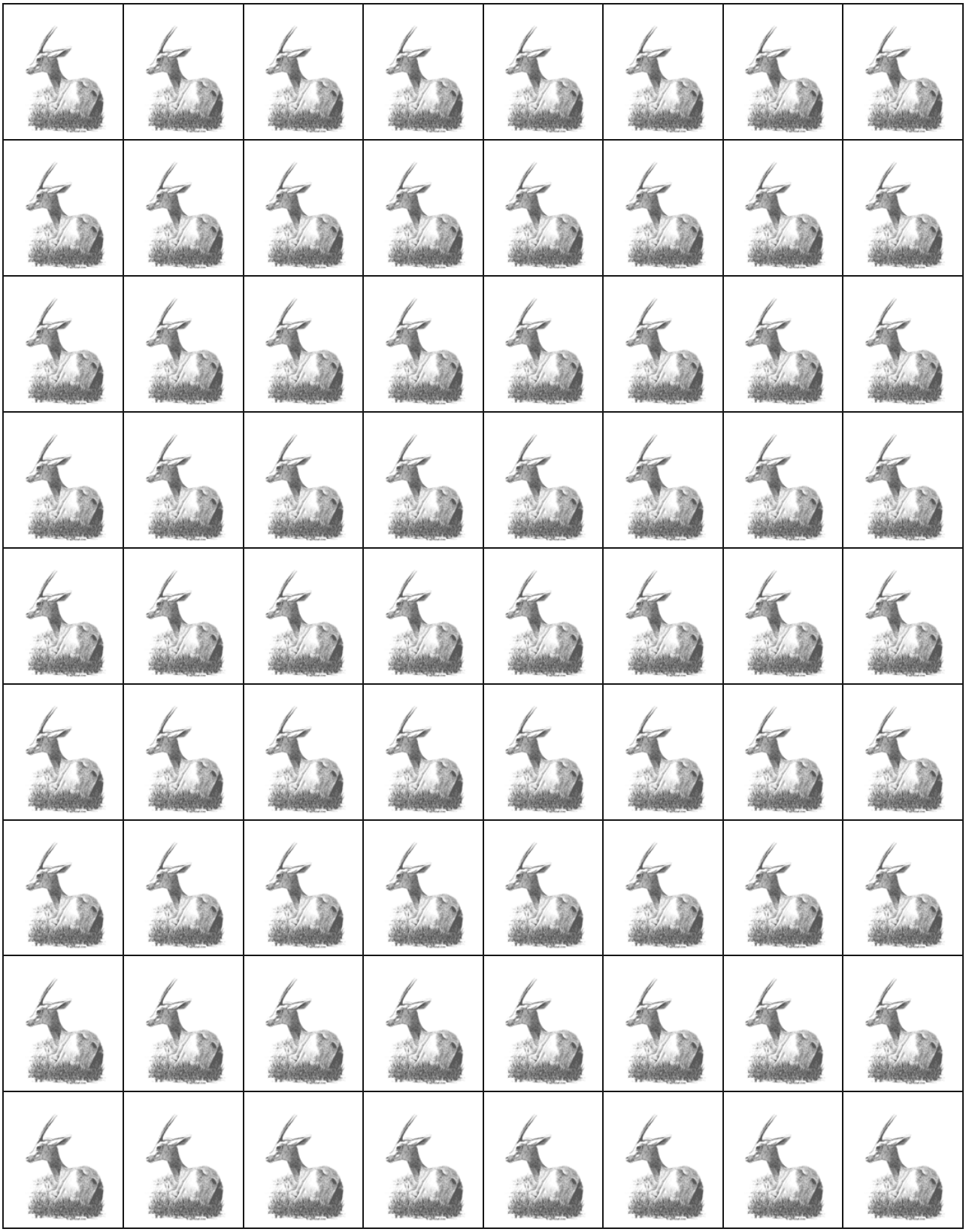


When the groups have finished and the graphs are complete, here are possible discussion topics:

- What shape do both the cheetah and gazelle population graphs have?
- Which graph peaks first, the cheetah or the gazelle? Why?
- If another predator is introduced to this game in addition to the cheetah, what do you predict would happen to both graphs?
- If the cheetah were removed from this game, what would happen to the gazelle population? What do you predict would happen if this occurred in real life?



(large cheetahs to use in cheetah vs. gazelles game)



(Gazelles to use in cheetah vs. gazelles game)

POPULATION CHANGE

SUBJECT AREAS:
Mathematics
Sciences
English

DURATION/TIME:
Activity 1: 40 min
Activity 2: 30 min
Activity3: 20 min

RECOMMENDED PREPARATION:
Activity 1:
Read the background 'threats to survival' sheet and prepare procedures for the game.

Activity 2:
Read the 'cheetahs and farmers' sheet in the Reference section

MATERIALS NEEDED:
Activity 1 & 2:
Graph paper

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Population
Community

OBJECTIVE:

Learners will look at the factors that influence populations. Learners will evaluate populations using math, English and science skills.

LESSON ACTIVITIES:

ACTIVITY 1:
Learners will play the 'cheetah challenge' game and discuss ecosystems and habitat. Learners will complete a graph activity and a writing activity.

ACTIVITY 2:
Learners will play the same 'cheetah challenge' game with the addition of the farmer.

ACTIVITY 3:
There are prompts for writing activities, based on the 'cheetah challenge' games, for learners to complete

Learning Outcomes

In this activity learners will look at which factors influence a population, including food, shelter, and space. They will play a game which simulates a population of cheetahs competing for food, shelter, and space. The data will then be graphed.

Teaching the Lesson

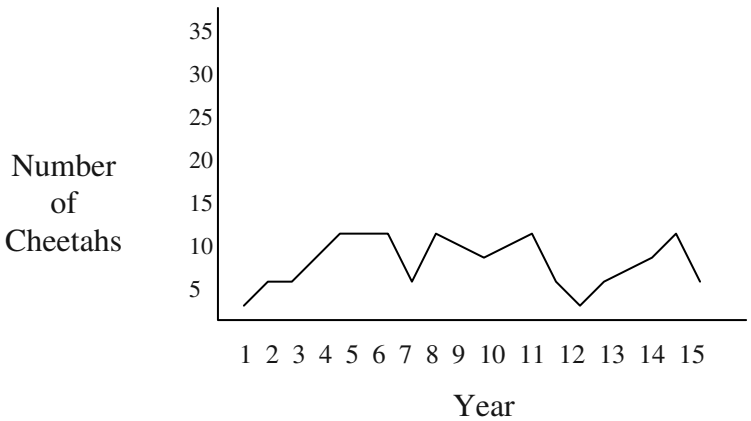
Introduce vocabulary:
Population: all the people in a country or region; number of animals in a region
Community: any group living in the same area or having interests in common

Activity 1 – 'cheetah challenge' game with graphing activity

Procedure

1. Ask the learners to count off in fours. Have all the "ones" go to one side of the activity area and the rest to the other side. Learners with these numbers 'become' the cheetah or habitat components listed below.
   Ones – Cheetahs
   Twos – Food
   Threes – Shelter
   Fours – Space
2. The "ones" become cheetahs. Ask the learners what a cheetah or any animal needs to survive - food, water, shelter and space. For the purpose of this activity, assume that the cheetahs have enough water to drink. The "ones" need to find food, shelter and space. If a cheetah (the "ones") wants to find food they clamp their paws over their stomachs. If the cheetah is looking for shelter, it puts its paws over its head. If it is looking for space, it crosses its paws across its chest (like hugging itself). A cheetah can choose to look for one of its needs during each round and can change what it is looking for in the next round, if it survives. The cheetah cannot change its sign when it sees what is available during that round.
3. The twos, threes, and fours are food, shelter and space - components of a habitat. At the beginning of each round, each learner is allowed to choose which component he or she will be during that round. The learners depict which component they are in the same way the cheetahs show what they are looking for; that is, hands on stomach for food, etc.
4. The activity starts with all players lined up on each side of the activity area (cheetah on one side, habitat components on the other side) and with their backs facing the learners along the other side of the area.

5. Begin the first round by asking the learners to make their signs - each cheetah deciding what it is looking for, each habitat component deciding what it is. Give the learners a few moments to put their hands in place. (The two lines of learners normally will display a lot of variety in signs. As the activity proceeds, sometimes the learners will confer with each other and all will make the same sign. That's okay, and you may encourage it. For example, all learners in the habitat might decide to be shelter. This could represent a drought year with no food or water.) Note: Switching symbols in the middle of a round can be avoided by telling the learners if they are caught cheating they will not participate.
6. When the learners are ready, say: "Cheetah Challenge!" Each cheetah and each habitat component turn to face the opposite group, continuing to hold their sign clearly.
7. When the cheetahs see the habitat component they need, they run to it. Each cheetah must hold the sign of what it is looking for until getting to the learner in the habitat with the same sign. Each cheetah that reaches its necessary habitat component takes the "food," "shelter," or "space" back to the cheetah side of the activity area.
8. "Capturing" a habitat component represents the cheetah successfully meeting its needs and successfully reproducing as a result. Any cheetah that fails to find its food, shelter, or space, dies and becomes part of the habitat. Note: When more than one cheetah reaches a habitat component, the learner who arrives first survives. Habitat components stay in place until a cheetah chooses them. If no cheetah needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. That habitat component can, however, change which component it is from round to round.
9. Record the number of cheetah at the beginning of the activity and at the end of each round. Continue the activity for approximately 15 rounds. If possible, have a learner or two assist you in recording the numbers.
10. After each round, ask the learners to observe what is happening to the cheetah population. Why did it increase?
11. At the end of 15 rounds, use an overhead projector, flip chart or chalkboard, and post the data recorded during the activity. The number of cheetah at the beginning of the activity and at the end of each round represents the number of cheetahs in a series of years. That is, the beginning of the activity is year one; each round is an additional year. Cheetah can be posted by fives for convenience. For example:



Graphing:
Have the learner record the posted data in the form of a graph. The learners will see this as a visual reminder of what they experienced during the activity: the cheetah population fluctuated over a period of years. This process is natural as long as the factors that limit the population do not become excessive, to the point where animals cannot successfully reproduce.

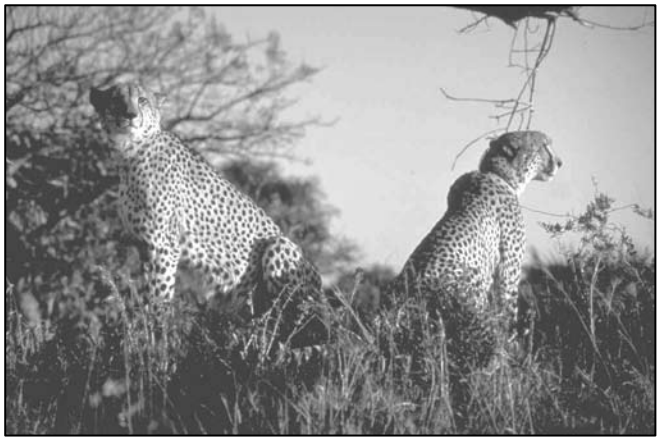
Writing:
With the graph, have the learners write a brief paragraph regarding what was happening with the cheetah population with thoughts on how habitat components are affecting the population numbers. (E.g., is the population stable - does it fluctuate within acceptable levels; does it crash and why; what would happen if one of the four components was totally removed from the system, etc.)

Extension:
Try to record numbers for all four of the habitat components as well as cheetah numbers on each round and graph the results with a discussion on what you see.

Assessment

Checklist for Graph:

Assessment statements	Yes	No
Graph has a heading		
Both axes are labelled		
Axis labels are correct (number of cheetahs vs. years)		
Axes are divided into relevant intervals		
Data is plotted accurately		
The graph is neat and legible		



Activity 2 – 'cheetah challenge' game incorporating farmer

This is a continuation of Activity 1: Use the data from that lesson or rerun the learners through the exercise and continue with the following steps. Also, use the 'cheetahs and farmers' sheet found in the Reference section as background.

12. Once you have completed a few rounds and observed the changes in the cheetah population, it is time to introduce the trapper / farmer. The trapper starts in his home, which is a designated area off to the side of the activity area. The trapper must skip or hop. This reduces the possibility of violent collisions between cheetah and trapper. Trappers can only tag a cheetah when they are going towards the habitat and are between the habitat and cheetah lines. Once a cheetah is tagged, the trapper escorts the cheetah back to the trapper's home. The caught cheetah is now another trapper. If a trapper fails to tag a cheetah during a round, the trapper becomes habitat.
13. After a few rounds with the trapper, ask the learners what happened to the cheetah population. Did it increase? Decrease? Why?
14. Have the learners add this data onto their graphs from Activity 1.
15. The learners will again see this visual reminder of what they experienced during the activity: the cheetah population fluctuated over a period of years. This process is natural as long as the factors that limit the population do not become excessive, to the point where animals cannot successfully reproduce.

Activity 3 – writing activity using 'cheetah challenge' games

Ask the learners to summarise some of the things they learned from this activity in an essay. You can give them the following questions/topics as a guideline:

- Would the trapper be a natural factor?

(ANSWER: *No. Farmers / trappers tend to remove too much from a system resulting in an imbalance.)*

- The wildlife populations will tend to peak, decline and rebuild; as long as there is good habitat and sufficient numbers of animals to reproduce successfully. How might the trapper affect this trend?

(ANSWER: *The trapper will disturb this trend by removing too much so that reproduction will not be successful enough to rebuild the population.)*

- What is realistic and unrealistic about this simulation?

(ANSWER: *Cheetahs that don't survive DO become recycled as nutrients but it is not instantaneous. Cheetahs need ALL habitat components to survive. Poor habitat usually results in weakened individuals that succumb to disease, not instant death.)*

- What do animals need to survive? And why?

(ANSWER: Food, water, space, shelter)

- How do these components influence carrying capacity?

(ANSWER: *If any of these components are absent or there is an insufficient amount it will decrease the number of animals that can live y in that habitat.*

- What are some of the "limiting factors" that affect the survival of animals?

(ANSWER: *Food, disease, water, space, shelter, increases in predation, etc.)*

- How do factors limiting carrying capacity affect health, numbers and distribution of animals?

(ANSWER: *Animals will be unhealthy, numbers will decrease, animals will move to other areas which could offer better chances of survival.)*

- How do these factors affect competition within species?

(ANSWER: *Competition will increase if there is insufficient food, water, space, or shelter.)*

- Are wildlife populations static, or do they tend to fluctuate as part of an overall "balance" or ecological systems involved in the process of constant change?

(ANSWER: *Wildlife populations tend to change all the time in response to changes in the environment, such as varying food availability, water availability, etc.)*

- How does the trapper affect this "balance" of nature?

(ANSWER: *Trappers can disturb this by taking too much out of the system.)*

Background – threats to survival

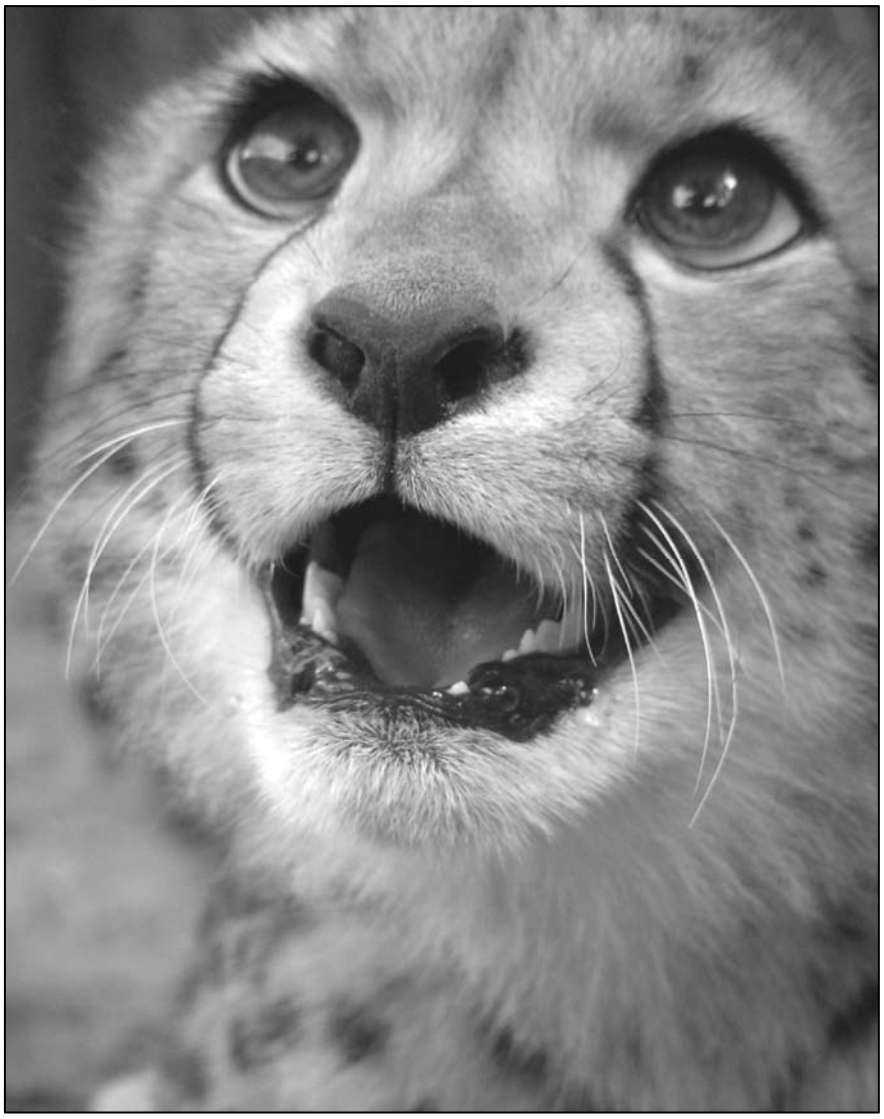
The cheetah is facing many threats to its survival, including the high death rate of cubs, loss of habitat, a reduction in its prey base, conflict with livestock farming and a reduced ability to survive in parks and reserves due to the presence of larger predators.

The cheetah's ideal habitat is open grassland and the cheetahs occupy quite large territories. Man wants this land for livestock farming, leading to an obvious conflict resulting in the cheetahs' survival being in doubt as an increasing amount of land is converted for human use. Furthermore, as a predator, the cheetah is seen as a threat to livestock and is generally trapped and shot by farmers under the perception that the cheetah is having an excessive economic impact. In some instances large corporate companies eliminate the wild herbivores to make space for livestock. This removes the cheetah's natural prey, resulting in starvation for many.

If the farmer employs effective livestock management practices, they suffer little or no livestock loss to cheetahs due to their hunting behaviour. The cheetah is not generally a livestock predator due to the fact that it relies on speed and does not have the weight for an ambush attack. Livestock does not run, therefore the cheetah is not stimulated to chase and kill. However, if desperate, the cheetah has been known to go for the easier kill, such as goats and sheep. This is generally when the cheetah is old, ill, injured or has no other alternative prey available. The problem has been a lack of education; many farmers do not understand the nature of the cheetah and have been blaming it for livestock kills due to the fact that it is a day hunter and therefore always seen.

In the past, our solution to conservation issues has been to put animals in a protected area such as game parks and nature reserves. This, however, is not an ideal situation for a cheetah due to the presence of larger predators such as lion, leopard, hyena, etc. These predators will kill cheetah adults and cubs since they are seen as competition; they will also steal their kills. If a cheetah loses too many kills they will starve to death. As a result of losing too many cubs as well as an increase in loss of kills, cheetah numbers are decreasing in game parks and nature reserves. This means that most of our cheetahs live outside of protected areas, mostly on livestock farms, where the farmer is the threat. Through education, it is possible to bring about a sharing of land between farmers and cheetahs and thereby ensure the survival of this species.

Conservation



Cheetah
CONSERVATION FUND

THE GENETIC BOTTLENECK

(Adapted with permission from the Smithsonian Institution's National Zoological Park School Outreach Programme, "Black-Footed Ferret Ambassador Programme, Secondary School Teacher guide," copyright 1999.)

SUBJECT AREAS:
Sciences
Mathematics

DURATION/TIME:
Activity 1: 45 min

RECOMMENDED PREPARATION:
Activity 1:
Review sheet, 'a singular species' found in the Reference section.
Prepare one set of small slips of paper labelled 1-15 and a photocopy of the 'cheetah population bottleneck' worksheet (for each group).

MATERIALS NEEDED:
Activity 1:
One set of cards and photocopy of worksheet per group.
Coloured items, 10 items per 10 different colours (paper or rocks) and a bottle

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Genetic
Genes
Dominant gene
Recessive gene
Diversity
Population
Susceptible
Characteristic

OBJECTIVE:

Learners will understand the importance of genetic diversity by demonstrating the concept of the genetic bottleneck.

LESSON ACTIVITIES:

ACTIVITY 1:
The lesson will begin with a discussion on genetic diversity (what it is and why/how it occurred) in the cheetah population.
The learners will then participate in the 'cheetah bottleneck scenario' activity and complete a worksheet before presenting findings to the class.

Learning Outcomes

This activity demonstrates the importance of genetic diversity in healthy populations by simulating a genetic bottleneck event.

Teaching the Lesson

Review with the learners the sheet 'A Singular Species' found in the Reference section which discusses the lack of genetic diversity in the cheetah population. Discuss why this occurred and what it means for the cheetah populations today.

Activity 1 – cheetah bottleneck scenario

This activity will demonstrate how a population with low genetic diversity is more susceptible to changes in the environment. You will need 100 different coloured objects to represent genes (10 colours, 10 objects per colour). Use coloured jellybeans, paper or beads for the activity. An empty bottle will also be needed to distribute the coloured objects.

Previous to the activity, make up small slips of paper labelled from 1 to 15. You will need a set for each group. (These numbers will be used in the 'key to environmental situations.')

Procedure:

1. Have the learners break up into teams of 2 to 4 students each. Distribute the worksheet 'cheetah population bottleneck.'
2. Review the concepts of genetic diversity and population bottlenecks.
3. Distribute a random number of genes (different coloured objects) to the teams from the bottle.
4. Have each group randomly choose five numbers (cards labelled 1-15) from the slips of paper and match numbers to the teachers 'key to environmental situations.'
5. Learners include the following on the worksheet:
    a. The population's percent genetic diversity.
    b. A description of their population based on its current genetic makeup.
    c. A scenario for their population for a one-year time frame. They must address the following:
        - Is their population genetically equipped to survive in its environment? How well or poorly?
        - Does a high or low percent genetic diversity impact their population's survival?
        - How do random changes in the environment affect their population?
6. Teams present results to class.

Worksheet – cheetah bottleneck scenario

Names: _____

List each **COLOUR/GENE** received and what genetic characteristic each represents:

Colour: _____ Characteristic: _____

Colour: _____ Characteristic: _____

Colour: _____ Characteristic: _____

Colour: _____ Characteristic: _____

Colour: _____ Characteristic: _____

Pick five **numbers** from the deck of slips of paper and record the numbers below:

_____ _____ _____ _____ _____

1. **Calculate the percent (%) genetic diversity of your population.**
   10 genes (colours) represent 100% genetic diversity in the original population. Calculate the % genetic diversity of your population.

   _____ genes received / 10 original genes = _____ (decimal) x 100 = _____%

2. **Describe your new population based on the genes you have.**
   Does your population have good night vision and a poor sense of smell? Are there any recessive genes present in your population? Etc.

3. **On another piece of paper or on the back of this paper, describe what happens to your population based on the five environmental cards drawn randomly from the stack.**
   Some of the scenarios relate to environmental situations while others are related to genes. Try putting your cards in a chronological order. How well is your population genetically equipped to survive random environmental situations? Does your population survive? Struggle? Thrive?

Worksheet Answer Key- cheetah bottleneck scenario

Key to Genetic Characteristics

Yellow	*camouflage*	**Green**	*agility*
Black	*precise vision*	**Purple**	*acute hearing*
Orange	*accurate sense of smell*	**White**	*strong immune system*
Red (R)*	*dominant gene for healthy rate of reproduction*	**Pink (r)***	*recessive gene for abnormal sperm*
Dark Blue (B)*	*dominant gene for healthy heart*	**Light Blue (b)***	*recessive gene for atrial septal heart defect*

*Notes on dominant/recessive genes: (1) **BB** (or **RR**) = dominant gene active; (2) **Bb** (or **Rr**) = dominant gene active; (3) **bb** (or **rr**) = recessive gene active.

Key to Environmental Situations

1. It will be difficult for your population to find and kill your preferred prey, springbok, because they have been over-hunted in your territory.

2. In search of prey, your population will often cross a roadway. Does your population have the gene for acute hearing to avoid approaching vehicles?

3. Cheetahs have a reputation for being shy and will generally avoid human contact. Does your population have the gene for camouflage to keep well hidden from the approaching tourists?

4. A highway has been built through your populations' territory. How does this affect your populations' regular hunting path?

5. The savannah in your populations' habitat has been overgrazed and bush encroachment has taken over. This significantly reduces the available hunting territory for your cheetah population.

6. The gene for an accurate sense of smell will help your population find their prey in the thick bush habitat.

7. Scientists have decided that genetic restoration is necessary for the survival of your population and have introduced Asiatic cheetahs into your territory. These cheetahs have the dominant genes for a healthy heart (dark blue) and a healthy rate of reproduction (red). Add these genes to your list.

8. In the past, the local and national governments sponsored programs to destroy predators such as the cheetahs. Although it is now illegal to shoot the cats, some are still killed every year. Does your population have the gene for agility to escape these dangerous poachers?

9. Some cheetahs carry diseases like Feline Immunodeficiency Virus (FIV). Does your population have the gene for a strong immune system?

10. The government built wildlife underpasses beneath a busy highway which your population can now use as a regular hunting path.

11. Cheetahs, animals high on the food chain, will ingest high levels of environmental toxins which build up in the body over time. Rabbits, a prey species for the cheetahs, are eating fish from a stream with high concentrations of mercury. How does this impact your population?

12. Territorial conflicts are a leading cause of death in male cheetahs. Does your population have the gene for precise vision to warn them of the threatening cheetah which has entered the territory?

13. Female cheetahs will have fewer offspring if the males in the population only carry the recessive gene for abnormal sperm.

14. If cheetahs carry the recessive gene for the atrial septal heart defect (hole in the heart), they risk passing on severe health problems to future generations, unless they also carry the dominant gene for a healthy heart.

15. The rapid decline of cheetahs living in the wild has caused an increase in inbreeding. Without the gene for a strong immune system, the cubs in your population will be born with many health problems.

CHEETAH: AN ANIMAL AT RISK

SUBJECT AREAS:
Sciences
English

DURATION/TIME:
Activity 1: 20 min
Activity 2: 30 min

RECOMMENDED PREPARATION:
Activity 1:
Review the 'endangered' sheet in the Reference section

Activity 2:
Photocopy of 'an animal at risk' worksheet for each learner

MATERIALS NEEDED:
Activity 2:
Photocopies of worksheet for each learner

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Endangered
Extinct
Adaptations
Species
Habitat
Characteristics
Threat
Conserve
Conservation

OBJECTIVE:

Learners will discover why animals become endangered and what can be done to save the endangered cheetah from extinction.

LESSON ACTIVITIES:

ACTIVITY 1:
Discussion on why species become endangered, why the cheetah is at risk and what we can do about it.

ACTIVITY 2:
Continues discussion on 'an animal at risk.' Use various sheets in the Reference section to aid discussion. Have learners complete 'an animal at risk' worksheet.'

Learning Outcomes

In this activity learners will look at the main reasons many animals become endangered. They will then look specifically at reasons why the cheetah is at risk and what will need to be done to save the cheetah.

Teaching the Lesson

Activity 1 – discussion

Endangered species are ones that exist in low numbers and could go extinct if they are not protected and managed. Unfortunately, thousands of species are endangered, and each year more species become extinct. The cheetah, pangolin, black rhino, wild dog and Cape vulture are a few endangered species.

As human populations increase, we change our planet at an ever faster rate, and many species of plants and animals suffer. Extinction has always been a natural process (for example, the dinosaurs went extinct before humans lived on the earth) but the current rate of extinction has increased dramatically. The introduction of exotic species, over-exploitation, and habitat loss are all responsible for the mass destruction of species occurring today. People are responsible for these problems. And people are capable of finding the solutions. But to find effective solutions and implement management programs wisely, we must understand why animals become endangered so that we can change our actions and prevent their extinction.

The number of cheetahs has decreased from 100,000 at the turn of the century to ±10,000 today. The cheetah suffers from habitat loss, declining prey bases, a lack of genetic diversity, conflicts with livestock farming, and an inability to survive in parks and reserves because of the presence of larger predators. If we learn more about the natural threats posed to the cheetah and work to reduce conflict with the species, we can reverse the current trends and save the cheetah from extinction.

Activity 2 – an animal at risk

1. Ask learners to identify problems that face cheetahs in the wild and in captivity. Identify threats that endanger the species in both environments. **(Answers: lack of genetic variation, high infant mortality, loss of habitat, declining prey numbers, illegal trade or poaching, human development and conflict with livestock and agricultural interests, and low reproduction in captivity all threaten the cheetah. Lack of genetic variation and high infant mortality affect the species in both the wild and captive environments.)**

2. Discuss with the learners why cheetahs are in trouble and have them complete the worksheet ‘an animal at risk.’ The fact sheets ‘Cheetah Fact Sheet’ and ‘Cheetahs and Farmers’ (found in the Reference section) may also be useful for learners.

Worksheet – an animal at risk

Name: _____ Date: _____

Many animals are endangered because of humans and their activities. In addition to threats caused by humans, some species are endangered because of their special adaptations and/or habitat requirements. Animals and plants that are more likely to become endangered share certain characteristics. For example, they:

- have limited geographical ranges
- suffer from overuse or poaching
- live in specialised habitats and eat special foods
- exist in low population numbers
- lack genetic variation
- come into conflict with humans and development or are affected by human disturbances; are sensitive to environmental changes
- have high mortality
- have few offspring and long gestation periods

Animals that have one or more of the special biological characteristics listed may not suffer adverse effects until people start to interfere with them by destroying habitat, polluting environments, poaching, over-utilising through trade or hunting, or eradicating because of misconception or interference with development. Many carnivores have been endangered by human fears and misconceptions about their behaviours, and therefore have suffered adversely from predator control programmes.

Instructions: Mark all of the characteristics that threaten the cheetah.

_____ Limited geographical range	_____ Habitat Loss
_____ Lack of genetic diversity	_____ Over-utilisation
_____ Specialised food and habitat needs	_____ Trapping by humans
_____ Sensitive to environmental changes	_____ High mortality
_____ Few offspring & long gestation periods	_____ Poaching
_____ Low population numbers	_____ Declining prey numbers
_____ In conflict with humans and development	

1) How many characteristics did you check? Is the cheetah an animal that is prone to extinction?

2) Do you think the cheetah may need special help to survive? Why or why not?

3) Which of the characteristics do you think poses the biggest threat to the cheetah?

4) Based on what you know about the cheetah, could it become extinct in the wild?

5) What can YOU do to help conserve the cheetah?

Answer Key to Worksheet – an animal at risk

_____ Limited geographical range	__x__ Habitat Loss
__x__ Lack of genetic diversity	_____ Over-utilisation
__x__ Specialised food and habitat needs	__x__ Trapping by humans
__x__ Sensitive to environmental changes	__x__ High mortality
_____ Few offspring & long gestation periods	__x__ Poaching
_____ Low population numbers	__x__ Declining prey numbers
__x__ In conflict with humans and development	

1 & 2) How many characteristics did you check? Is the cheetah an animal that is prone to extinction? Do you think the cheetah may need special help to survive? Why or why not?

Nine characteristics. Yes, the cheetah is an animal prone to extinction.

Answers will vary:

Yes, many answers are possible.

3) Which of the characteristics do you think poses the biggest threat to the cheetah?

Conflict with humans and development, sensitive to environmental changes; and lack of genetic diversity.

4) Based on what you know about the cheetah, could it become extinct in the wild?

Yes, the cheetah could become extinct in the wild. The cheetah's survival depends on people and their willingness to manage the population and secure habitat for the species in the wild. The species' lack of genetic variation makes it susceptible to diseases and viruses. In addition it is less able to adapt to environmental changes or ecological disruptions. The cheetah is a survivor and has lived on this earth for four million years. But in order for it to survive, the cheetah must have habitat and a healthy prey base, and it must be allowed to increase in the wild so natural selection can strengthen the population.

5) What can YOU do to help conserve the cheetah?

Answers will vary:

1) Help protect its habitat and ensure a place for it on African farmlands; (2) aid in the conservation of the wild prey base; (3) halt the indiscriminate capture and removal of the cheetah; (4) improve livestock management; and (5) educate everyone about the need to conserve biological diversity and the predator's unique role in healthy ecosystems.

FARMERS & CHEETAHS: CAN THEY LIVE TOGETHER?

SUBJECT AREAS:
Sciences
Agriculture
English

DURATION/TIME:
Activity 1: 30
Activity 2: 20
Activity 3: 20

RECOMMENDED PREPARATION:
Understand the role play and look up the sheets on 'cheetahs and farmers,' 'a place for predators' and 'conservation efforts' in the Reference section to assist with the activities and discussion.

MATERIALS NEEDED:
Activity 2:
Possible paper and/or art supplies for conservation ideas

Activity 2:
Worksheet 'farm management and planning for predators' photocopied for each learner

LOCATION:

KEY WORDS TO REVIEW:
Conservation
Management
Technique
Play-trees
Livestock
Wildlife
Conflict
Over-hunting
Guard

OBJECTIVE:

Learners will discuss the cheetah's threats to survival and come up with possible solutions to the cheetah's decrease in population.

LESSON ACTIVITIES:

ACTIVITY 1:
Role play/drama on Anatolian Sheperd guard dogs and discussion.

ACTIVITY 2:
Ideas for cheetah conservation are listed. Learners can choose one of the ideas to take action and help save the cheetah from extinction.

ACTIVITY 3:
Learners complete the worksheet 'farm management and planning for predators' and how farmers and cheetahs can live together.

Learning Outcomes

This role play lesson is designed to begin the discussion on possible solutions to the cheetah's decrease in population. It also allows learners to discuss how cheetahs and farmers can live together.

Teaching the Lesson

Review with learners the threats to the cheetah's survival from the previous lesson.

Activity 1 – Anatolian Shepherd role play/drama

Ask for 10 volunteers from the class: one 'farmer' (male learner), one 'cheetah' (female learner to play female cheetah), one 'Anatolian Shepherd' (larger learner than 'cheetah') and about six 'sheep' (any of learners can be called up for this) and one 'springbok.'

Call the six sheep up first and explain that they are the farmer's herd. Every time you, the educator, say sheep they are to baa. Then call up the farmer. He works long hours a day, starting early in the morning and ending late at night. This is necessary in order to be able to support his family. During this long day he takes a rest from looking after his sheep in order to have his lunch. The farmer then stands to one side of the room having "lunch." Before going off to lunch the farmer must count his sheep aloud. The next volunteer is designated as a female cheetah going out to find food for her cubs. The last volunteer is called aside so that the class cannot hear, told that he/she is a livestock guarding dog and when the cheetah is approaching the sheep looking for food, he/she is to go out and place itself in between the sheep and cheetah, barking and growling in order to scare off the cheetah.

With the sheep in one corner with the dog guarding, and the farmer away eating lunch, the cheetah approaches looking for food. In the far distance is a springbok (either a learner or a cut-out), but the sheep are nearer at hand and the cheetah is very tired and very hungry. The cheetah approaches the herd, but the dog comes out barking and scares her away.

When the "dog" starts barking the "cheetah" should get a fright, as she is not expecting this and back away from the herd. As the educator, you then ask her if she was frightened, and would she approach the herd again or go away looking for prey without the dog guarding it. Then call up the farmer and ask him if he had a good lunch and while he was away did he lose any of his sheep. Have him recount them out aloud. Was he happy with the dog, and if he had lost no sheep would he then go out and shoot the cheetah?

DISCUSSION:
Lead this role play into a discussion on how CCF uses the Anatolian shepherd and Kangal dogs as a protection for the cheetah on the Namibian farmlands. Guide the learners in a discussion/brainstorming session on other ways to protect the cheetah, both in Namibia and South Africa, using the fact sheets in the reference section (listed in the lesson cover page) to stimulate ideas if necessary.

Activity 2 – ideas on cheetah conservation

Ask the learners to write a letter to Cheetah Outreach or the Cheetah Conservation Fund submitting their ideas for cheetah conservation. The Cheetah Conservation Fund will respond with a letter acknowledging receipt, thanking them for the letter and reinforcing cheetah conservation. (The address for Cheetah Conservation Fund can be found on the first page of this book.)

Learners can then commit to individual / class actions. Ideas are:

- letter to government official
- poster
- poem
- song
- fund-raiser for CCF

Activity 3 – worksheet 'farm management and planning for predators'

In this worksheet learners look at common management problems faced by farmers. They then try to match management techniques that would begin to solve these problems.

Answer Key for Worksheet – farm management and planning for predators

2, 3, 5, 6, 7	1) Carnivores have access to domestic livestock during calving time
10	2) Drought has caused the death of a large amount of wildlife on your farm and cheetahs have begun to attack small stock for food
1	3) Cheetahs are killing young hartebeest in your game farm. They have managed to get through the game fence by crawling through warthog holes in the fence
2, 3, 4, 6, 7	4) Heifers continue to lose a large number of calves to predators each year
2	5) Cows giving birth in camps (where cheetah tracks are seen) that have play-trees lose more young calves than those in camps closer to the homestead that have only acacia trees
11	6) Over-hunting of wildlife on a farm to provide more grazing area for cattle has caused predators in the area to hunt livestock

Worksheet – farm management and planning for predators

Name: _____ Date: _____

Instructions	You are a member of the Cheetah Conservation Fund team. Find the best management technique(s) that you might use to reduce cheetah/human conflicts. Write the correct numbers of the management techniques you would recommend next to the management problems. There may be more than one correct number for each problem.

Farm Management Problem

_____1) Carnivores have access to domestic livestock during calving time
_____2) Drought has caused the death of a large amount of wildlife on your farm and cheetahs have begun to attack small stock for food
_____3) Cheetahs are killing young hartebeest in your game farm. They have managed to get through the game fence by crawling through warthog holes in the fence
_____4) Heifers continue to lose a large number of calves to predators each year
_____5) Cows giving birth in camps (where cheetah tracks are seen) that have play-trees lose more young calves than those in camps closer to the homestead that have only acacia trees
_____6) Over-hunting of wildlife on a farm to provide more grazing area for cattle has caused predators in the area to hunt livestock

Management Techniques

1. Electrify fence and barb the lower wires to prevent warthogs from digging holes. A less expensive option is the use of swing gates (comparable to cat flaps). These allow small digging animals to move across farms, but when closed, they leave no visible opening for predators to move through.
2. Reduce calf losses by moving calving herds out of the areas where play-trees are located.
3. Bring cows closer to the homestead during calving times.
4. Keep a few older cows with heifers, because many losses of calves in herds occur because the heifers are inexperienced.
5. Keep a larger concentration of livestock in camps during calving to help protect the calves.
6. Keep a few cows or oxen with horns together with the calving herd.
7. Place a few female donkeys with calving herds, as donkeys are aggressive toward intruders and chase away cheetahs.
8. Rotate livestock more rapidly through camps.
9. Promote more aggressive breeds of cattle such as the Brahman, Afrikaner, Nguni, or a cross with one of these breeds.
10. Employ herders and large breeds of livestock guard dogs with small stock.
11. Promote wildlife repopulation on farms, because farms with larger wildlife populations experience fewer predator problems.

Other Subjects

Cheetah
CONSERVATION FUND

CHEETAH COMPUTATIONS

SUBJECT AREA:
Mathematics

TOPICS:
Activity 1:
Number facts
Averages
Unit conversion

Activity 2:
Fractions
Percentages

Activity 3:
Acceleration
Velocity

DURATION/TIME:
Activity 1: 30 min
Activity 2: 30 min
Activity 3: 30 min

RECOMMENDED PREPARATION:
Review the 'cheetah fact sheet' in the Reference section

MATERIALS NEEDED:
Graph paper

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Facts
Average
Conversion
Unit
Fraction
Percentage
Acceleration
Velocity

OBJECTIVE:

Learners will solve mathematical problems by using the cheetah as a guide.

LESSON ACTIVITIES:

ACTIVITY 1:
Covers the topics number facts, averages and unit conversion. There are questions for the learners and an answer key for the teachers.

ACTIVITY 2:
Covers the topics fractions and percentages. There are questions for the learners and an answer key for the teachers.

ACTIVITY 3:
Covers the topics acceleration and velocity. There are questions for the learners and an answer key for the teachers.

Learning Outcomes

This activity includes possible mathematics problems that centre on the cheetah. Topics include number facts, averages, unit conversions, fractions, percentages, acceleration, and velocity.

Teaching the Lesson

These mathematics problems can be used on their own or in conjunction with the other activities in a science class. For background on cheetahs, refer to the fact sheets, especially the 'Cheetah Fact Sheet' in the Reference section.

Cheetah Computations:

Activity 1 – number facts, averages and unit conversion

1. A cheetah can cover 7-8 metres in each stride. If a large cheetah that covers 8 metres in a stride were to run 200 metres, how many strides would it take? At what speed is the cheetah running? (Assume a cheetah runs 4 strides/sec.) **(Answer: 25 strides, 32 m/sec.)**

   A second cheetah can cover only 7 metres in a stride. How many strides would it take to run 200 metres? How fast is the cheetah running? How many seconds more does it take the second cheetah to run 200 metres? **(Answer: 28.5 strides, 28 m/sec., .75 sec)**

2. At maximum speed (110 km/h), how long will it take a cheetah to run a distance equal to the diameter of the Earth? (The earth's diameter is 12,700 km). **(Answer: 115 hr.)**

3. If a cheetah runs 110 km/h, how many seconds will it take for the cheetah to run 300 metres? **(Answer: 9.8 sec.)**

4. If a cheetah and a human were to run 100 metres, how long would the cheetah wait at the finish line for the human to finish? Assume the cheetah runs 30 m/sec and the human 10 m/sec. **Note**: To increase the difficulty level of this problem give learners the speed in km/h and ask them to convert the speed to m/sec. **(Answer: 6.7 sec.)**

5. If a cheetah kept in captivity eats 2 kg of meat a day, how many kilograms of meat will it eat in a year? How many grams? (There are 365 days in a year)
   (Answer: 730 kg/year, 730,000 g/year)

6. If a cheetah weighs 300 g at birth and 45 kg when full grown, how much weight will it gain? **(Answer: 44.7 kg or 44,700 g)**

7. If a cheetah is 219 cm from the tip of its nose to the end of its tail and its tail is 84 cm long, how long is the cheetah's body? **(Answer: 135 cm)**

8. If the gestation period (pregnancy) for a cheetah is 95 days, would a cheetah be pregnant for 20 weeks? **(Answer: 13.6 weeks, no)**

9. In the captive population in 1992, 180 cubs were born in 55 litters. What was the average litter size? If you were to round this figure to a whole number, what would the average litter size be? **(Answer: 3 cubs/litter)**

Activity 2 - fractions and percentages

1. In the Serengeti National Park, 20 cheetah cubs are born in a study area and 90 percent die before they are 3 months old. How many of the cubs survive? **(Answer: 2 cubs)**

2. Namibia has the largest number of cheetahs in the world. A total of 3,500 wild cheetahs live in Namibia. The world's population of wild cheetahs is approximately 10,000 animals. What percentage of the total population lives in Namibia? If two-fifths of the cheetahs found in Namibia die or are killed, how many will be left in Namibia? How many cheetahs will be left in the world?
(Answer: 35%, 2,100 in Namibia, 8,600 world)

3. In 2010, there were 1,500 captive cheetahs in the world. What percentage of the world population of cheetahs does this represent if the total wild population is 10,000 animals. **(Answer: 15% of the world population)**

4. Cheetahs successfully catch half of the prey they hunt. How many times would a cheetah have to hunt in order to catch 5 animals? **(Answer: 10 attempts)**

5. The following is a list of all the cheetahs in one study area that had cubs, the number of cubs each one had, and the number that survived the first 3 months.

Cheetah	# of Cubs Born	# of Cubs Alive after 3 Months
Malkia	3	1
Sukari	6	0
Gizzy	2	2
Khama	5	3
Tamu	4	4

- How many cubs were born in this area? **(Answer: 20 cubs)**
- What was the average number of cubs born? **(Answer: 4 cubs/litter)**
- How many cubs survived the first 3 months? **(Answer: 10 cubs)**
- What percentage of the cubs did not live to be 3 months old? **(Answer: 50%)**
- Which mother successfully raised the most cubs? **(Answer: Tamu)**
- Which of the mothers raised the highest percentage of her cubs?
(Answer: Gizzy and Tamu)

Activity 3 – acceleration and velocity

1. If a cheetah can go from 0 km/h to 72 km/h in 2 seconds, what is its rate of acceleration? (Assume a constant rate of acceleration.) If prior to acceleration the cheetah's initial velocity was 5 m/sec, what is its rate of acceleration over 2 seconds?
   (Answer: 10 5m/sec^2, 7.5m/sec^2)

2. What is the distance in metres travelled by a cheetah accelerating from 0 km/h to 72 km/h in 2 seconds? What is the distance travelled if the cheetah's initial velocity was 5 m/sec?
   (Answer: 20 metres travelled, 25 metres travelled)

3. Assume a cheetah runs at 20 m/sec and a wildebeest at 15 m/sec, the wildebeest is 60 metres ahead of the cheetah, how long before the cheetah catches up with the wildebeest?
   (Answer: 12 sec.)

4. A resting cheetah sees a wildebeest 60 metres away. How long before it catches the wildebeest? (Assume the cheetah can accelerate at 20 m/sec^2.) **(Answer: 16.7 sec.)**

HOW FAST IS A CHEETAH?

SUBJECT AREAS:
Physical Education
Mathematics

DURATION/TIME:
Discussion: 10 minutes
Activity 1: 35 min

RECOMMENDED PREPARATION:
Activity 1::
Review the sheet 'a cheetah's speed' in the Reference section

Activity 2:
Set up a 28 metre track and photocopy the worksheet 'how fast is the cheetah?' for each learner.

MATERIALS NEEDED:
Activity 2:
Track
Clock/watch (with a second hand)
Photocopies of worksheets for each learner

LOCATION:
Classroom &
Outdoors

KEY WORDS TO REVIEW:
Adaptations
Unique
Stride
Sprinter

OBJECTIVE:

Learners will compare their speed to the cheetah's and develop an appreciation for the for the cheetah's unique adaptations.

LESSON ACTIVITIES:

ACTIVITY 1:
Learners will discuss the cheetah's speed and the adaptations cheetahs have that make them the fastest land animals.

ACTIVITY 2:
Learners will compare their speed to the speed of the cheetah's by running on a 28 metre track and timing themselves for various activities. Learners will complete the worksheet 'how fast is the cheetah?' with the information gathered.

Learning Outcomes

The learners will develop an appreciation for the cheetah's unique adaptations and amazing speed by comparing their speed to the cheetah's.

Teaching the Lesson

Outside set up a 28 metre track. You will also need a stopwatch or clock with a second hand and a tape measure.

Activity 1 – a cheetah's adaptations for speed

Have the learners review the fact sheet (found in the Reference section) 'the cheetah's speed' to review the unique adaptations cheetahs have that allow them to be the fastest land animal. This information will allow the learners to complete the worksheet 'how fast is the cheetah?'

Activity 2 – how fast is the cheetah?

Learners will time themselves in various events on the 28 metre track in order to complete the worksheet.

Time the learners on the following events:
- Run 28 metres (on two legs)
- Run 28 metres (on four legs)

Also:
- Measure the learner's distance of one stride
- Take a breathing rate when the learners are resting
- Run for three minutes, then take a breathing rate

Answers to Worksheet – how fast is the cheetah?

Note: answers will vary depending on individual times

1. A sprinter can run 40 km/h.

2. Individual answer

3. Individual answer
   It takes cheetah 7 strides to cover 56 metres.

4. A cheetah's breathing increases by 90 breaths per minute.
   It is a 60% increase. (90 / 150 * 100)
   Individual answers

Worksheet – how fast is the cheetah?

Name: _____ Date: _____

Instructions: Today you are going to compare your speed to that of the fastest animal on land, the cheetah. Remember, the cheetah has many special adaptations to its body that help it run so fast. As you are running and working on the problems today, think of the differences between your body and the cheetah's which help it run so much faster than you! Review the fact sheet 'the cheetah's speed' with your teacher before you begin in order to help you answer some of these questions.

Cheetah Olympics:

1. A cheetah can run up to 110 km/h.
   A sprinter can run _____ km/h.

2. At 100 km/h, a cheetah can run 28 metres in 1 second.
   I can run 28 metres on two legs in _____ seconds and on four legs in _____ seconds.
   How many seconds faster can a cheetah run this distance? _____
   How much faster can a cheetah run this distance in a percent? _____
   (Example: If you run 28 metres in 9 seconds, the cheetah is 8 seconds faster. Divide 8 by 9 to find the percent that the cheetah is faster.)

3. A cheetah can cover 8 metres in one stride.
   I can cover _____ metres in one stride.
   (A stride is one cycle of sequential footsteps, that is, two steps for a human and four steps for a cheetah.)
   How many more metres can a cheetah cover in a stride than you? _____
   How many more strides does it take you to cover 8 metres? _____
   How many strides does it take a cheetah to run 56 metres? _____

4. A cheetah's breathing rate goes from 60 breaths per minute to 150 breaths per minute after running.
   How much does the cheetah's breathing increase? _____
   What percentage increase is this? _____

   Count your breath rate before and after running for 3 minutes. To count your rate, place your hand on your chest where your bottom ribs meet. Count one breath for each time your chest rises. Count the number of breaths you take in one minute.

   What is your resting breath rate per minute? _____
   What is your breath rate after running for 3 minutes? _____
   How much did your breathing rate increase? _____
   What percentage increase is this? _____

English

WRITING ABOUT CHEETAHS

SUBJECT AREA:
English

TOPICS:
Activity 1:
Writing exercises

Activity 2:
Composition topic ideas

Activity 3:
Reading activity
and language study

DURATION/TIME:
Activity 1: 40 min
Activity 2: 40 min
Activity 3: 40 min

RECOMMENDED PREPARATION:
Preparation will vary

MATERIALS NEEDED:
Activity 3:
Copies of the story

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Words are listed in Activity 3

OBJECTIVE:

Learners will develop language skills and expand their vocabulary through creative writing and thinking.

LESSON ACTIVITIES:

ACTIVITY 1:
There are 7 different ideas listed for writing exercises for learners

ACTIVITY 2:
There are 4 ideas listed for composition topics

ACTIVITY 3:
Read the story 'how the cheetah got its spots' and answer the 'language study' worksheet.

Learning Outcomes

These activities are designed to develop language skills and to help learners realise their relationship with nature through creative writing and thinking.

Teaching the Lesson

The expression of our relationships with nature is an important way for us to learn more about how we feel toward the natural world and to clarify these relationships. Creative writings, poems, essays, and compositions provide learners with the means to share their attitudes, beliefs, and fears about the environment and the plants and animals with which they share the world. Words and phrases associated with wildlife conservation and environmental issues have implied and emotional connotations as well as literal meanings. Therefore, an understanding of vocabulary words associated with wildlife conservation and the environment is necessary to express these ideas.

Suggested activities in this subject area are focused on the development of communication skills and expansion of the learners' vocabularies. Composition topics are designed to encourage learners to explore their relationships with the natural world, understand their responsibilities as stewards of the land, and appreciate the importance of predators in their societies.

The vocabulary list used in these activities is located in the Reference section. Educators and learners may wish to review the reference materials within this section in order to provide background information for essays and compositions.

Activity 1 – writing & reading exercises

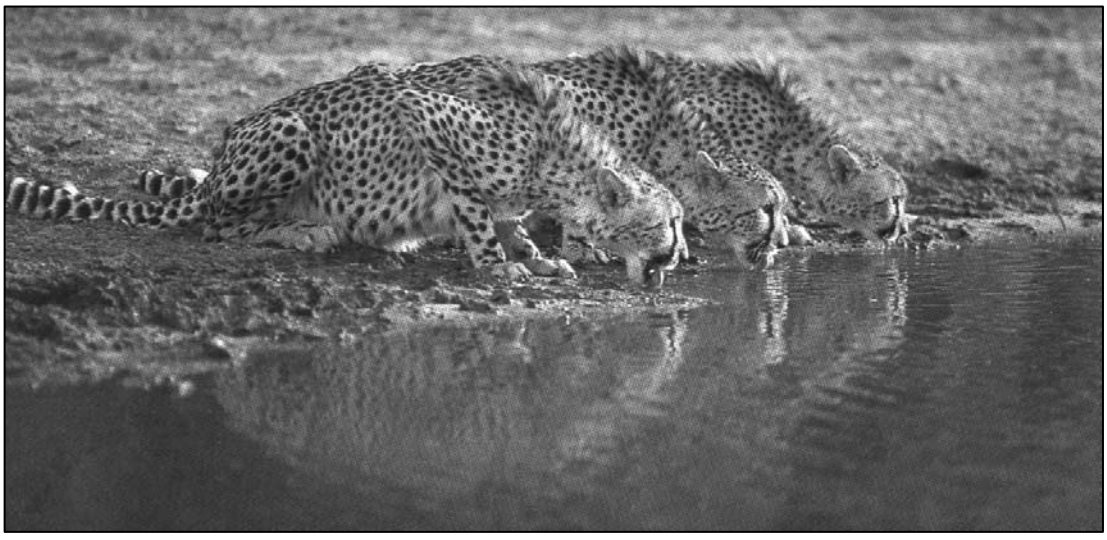
1. Write down all the adjectives your class can think of to describe a cheetah. Have each learner write a poem or short paragraph using 10 to 15 of these words.

2. Have your learners write a short story or poem about predators, their habitats, and/or threats to their survival. Have your learners read the poems and stories to the class.

3. Read to your class or have your learners read the story in the worksheet 'how the cheetah got its spots.' Answer the questions at the end of the story.

4. What African folk tales involving the cheetah or other predators do you know? Learners can collect traditional stories by talking with elders and storytellers in their community. You can divide the stories into categories depending on their content.

   Build a library and share these stories with teachers and learners from other regions. Send copies of myths, stories, and sayings to the Cheetah Conservation Fund (CCF).



5. Chat with a Cheetah

   By interviewing people and writing articles for newspapers and magazines, we learn more about the world around us. Explain to your learners how journalists find out information about subjects by interviewing people.

   Have your learners imagine they are reporters interviewing a cheetah. Write down questions that a reporter would ask a cheetah about its habitat, the food it likes to eat, fears about extinction, threats from humans, and how it feels about the misconceptions humans have of the species.

   Have the learners take turns interviewing and being interviewed. While they are being interviewed they will play the role of a cheetah and answer questions about their behaviours, habitats, adaptations, and other interesting topics. As the interviewers asking the questions, your learners can learn more about a particular aspect of the cheetah and its lifestyle. You may want to expand interviews to include other predators, prey species, farmers, and wildlife managers. Allow time for learners to research the cheetah; encourage the use of reference materials, contact with non-government organisations, and government officials. As interviewers they should take notes just like a journalist. After taking turns interviewing and being interviewed, have your learners write articles for newspapers and magazines, draw illustrations, and then publish a cheetah magazine. Send copies of the newspaper to CCF for possible publication in our international newsletter.

6. Have your learners learn the vocabulary words found at the end of the story and use them in a sentence. For words that may be used as verbs or nouns, ask learners to write two sentences using the words in both forms.

7. Complete the worksheets ‘composition topics’ and/or ‘language study.’

Activity 2 – composition topics

1. Have your learners write a composition about a cheetah's or another predator's perspective on people.

2. Why should we save cheetahs and predators for the future? Consider some of the following points:

   a) Aesthetic value - beauty and uniqueness of species.

   b) Ethical/Moral value - humans have been responsible for the extinction of many species. Plants, insects, animals, and fungi are each unique and represent millions of years of evolution, but humans can destroy these species in a short time. Because we have caused many problems for these species and threatened their survival, we are obligated to help endangered species recover.

   c) Ecological value - all living organisms fulfil a unique part of delicate, natural systems; humans depend on animals and plants for survival in ways we do not fully understand. Besides their role as food sources, organisms break down wastes and return elements to the system. Without these elements, life on earth would eventually end. The future of our planet is dependent on this important role of plants and animals.

   d) Scientific value - wildlife contributes to human health through medicine, medical research, etc. By destroying plant and animal habitats, we risk an immeasurable loss. The possible benefits to humans could compensate for the cost of their conservation.

   e) Economic value - income can be generated from utilising wildlife in a sustainable manner. Some say that the best way to save wildlife is to make it pay for itself. What are the good and bad points of this argument? Sustainable utilisation requires sound management and planning. Utilising wild species or developing tourism in wild areas can bring new sources of income to people trying to improve their standards of living and is another reason to preserve wildlife.

3. The following are some famous quotes concerning wildlife conservation and species extinction. You may want to have your learners memorise a few or write an essay or composition using the quote as the thesis.

It is also true that when there is no wildlife left in the land the rain does not come...Because wild animals are God's animals, if He looks down and sees the animals under the trees without food, He will send rain.

-Herero/Himba belief

Never kill the cat that cries.

-Ovambo saying

When the sky has been swept clean of eagles
And the winds carry echoes of the past,
What will you answer when the children ask,
' Where are the animals? Did you see them go?'

-Tom Knothe

What is man without beasts? If all the beasts were gone, man would die from great loneliness of spirit, for whatever happens to the beasts also happens to man. All things are connected.

-Chief Seattle

Destroyed buildings can be rebuilt; destroyed works of art may possibly be replaced by new creations; but every animal and every flower which becomes extinct is lost forever in the most absolute of all deaths.

-Joseph Wood Krutch

...everyone shares a deep need for meaning. Everyone wants to know where he or she belongs, how he or she fits into the world. I am convinced that some of the essential answers can and must come from the source that shaped our origins and still underpins our lives: nature.

As we work to reinforce connections in the environment, so we build connections of our own. As we care for natural communities, so we strengthen our own communities' sense of well-being. As we heal the living world around us, so the healing begins inside. All this, too, is part of biodiversity. What I don't understand is why the hope held out by environmentalism has not captured more attention...Here, in plain sight, is a means of restoring a sense of wholeness.

-Douglas Chadwick

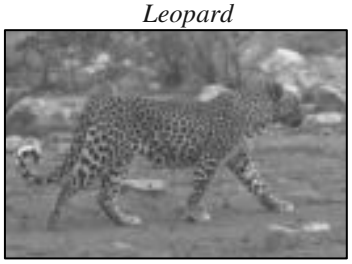
4. The management of natural resources to provide for future generations requires long-term planning; otherwise, animals that are endangered today may be extinct by the time our children or grandchildren are adults. While we may have legal ownership of some resources, for example wildlife and real estate, and control of their use during our lifetimes, ethically we are not the owners of these resources, but rather stewards for future generations. As stewards of the African environment, how will you provide a future for predators and other wildlife on commercial farmlands and in rural areas?

Story – how the cheetah got its spots

Stories are important tools for learning. They teach us about our past and share how we feel about our world. This story is based on an African tale on how the cheetah got its spots. Words underlined in the text are in the vocabulary list at the end of the story.

One day two children, Moffet and Elisabeth, were walking in the bush. In the distance they saw a water hole where three big cats were drinking. In order to get a better look at the animals, they tried to approach the water hole. As soon as they stepped closer, the predators saw the two children and ran away.

Leopard



Elisabeth said, "Moffet, did you see how fast those cheetahs ran? And how well their coats concealed them in the thick bush?"

"Those were not cheetahs," Moffet exclaimed, "they were leopards! You better stay away from them, they are very strong animals."

The two argued all the way back to their village. Elisabeth was sure the three cats were cheetahs. Moffet insisted they were leopards. The two children decided to speak with the headman to find out about cheetahs and leopards. Hopefully, he could help put an end to their argument.

The headman, a wise old man, wanted to help the two children. He asked Moffet and Elisabeth about the animals at the water hole. Elisabeth described them in great detail.

"The bodies of the three cats were slender with long legs. Their coats were the colour of dry grass and black spots covered their bodies. Their heads were small and they seemed to be crying. When we approached them, they sprinted away, running faster than any animal I have ever seen."

"Crying?" exclaimed Moffet "They were not crying."

The headman, being very wise, asked, "Why do you think they were crying, Elisabeth?"

Cheetahs

Elisabeth answered, "Because, wise headman, the long black lines on their faces looked like tear marks."

Moffet agreed with her description of the animals. But, he thought "tear marks" was a silly way to describe the black lines. The headman told the children that they had seen three cheetahs drinking at the water hole. Elisabeth could not help saying, "I told you so, Moffet."

The headman continued, "The cheetah is one of the most unique animals found on this earth. Thousands of years ago, we could find cheetahs throughout the world; in North America, Asia, Europe, and of course, Africa.

There were a great many cheetahs all over Africa. Today, the populations have declined because people feared big cats and hunters killed cheetahs for their beautiful skins."

"Where do most of the cheetahs live?" Elisabeth wondered.

"Namibia is the cheetah capital of the world; it has more cheetahs than any other country in Africa. Even here, our cheetahs are becoming less and less. Humans and cheetahs live on the same land. Most humans do not want to share the land with the cheetah. Farmers remove cheetahs from their land if they think the cheetahs are eating their young livestock. And people kill cheetahs even when the cats are not eating livestock."

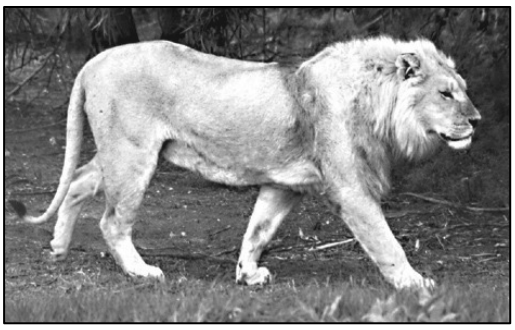
"Cheetahs are beautiful animals. It seems wrong to kill them out of fear," Moffet said. "Headman, could you tell us how the cheetahs that Elisabeth and I saw at the water hole got their spots?"

"I will be happy to tell you how the cheetah got its spots," the headman said. And this is his story:

A very long time ago when the earth was first created, all the animals came down onto the savannah. The animals, birds, and insects were all different shapes and different colours. When the cheetah first came to earth, just like all the other animals, it shook its body and stretched its legs, and took a deep breath of the new clean air. The cheetah thought it felt very good to be alive. Each animal had to get used to its own body, so the cheetah started running and found out that it could run very, very fast.

The cheetah ran and ran across the vast plains of the world. After a time of wandering the plains alone, the cheetah became lonely and decided to look for friends of its own kind. One day, the cheetah, with its great eyesight, spotted some large cats off in the distance and eagerly went running as fast as she could toward these cats. As she was running toward them, one of the cats, which was much, much larger than the others, stood up and roared. The loud noise frightened the cheetah and she dug her claws into the dirt and came to an abrupt halt. The cat was a big male lion, and he roared out to the cheetah in a very low booming voice, "Who are you and what do you want?"

Lion



The cheetah, which is much smaller in size than a lion and who by nature is a very shy and timid animal, said, "I am lonely and have been searching the savannah trying to find friends of my own kind."

The lion roared, "Well, you are not a lion! Look at your legs and body; you are much thinner than we are. And look at your feet; you have claws like a dog's. Your claws do not retract all the way back into your feet like ours do. You are not a cat, you are a dog. So, you better run away fast and try to find someone in your own family."

The cheetah lowered her head and put her tail down, and crept away feeling a bit discouraged. She thought big cats were very unfriendly. The cheetah continued her search, looking for a friend of her own kind. The days went by. Then one day, the cheetah saw a pack of wild dogs playing in the sun. The cheetah went racing up to the pack. The whole pack was yelping and barking furiously. The cheetah stopped immediately, and the pack leader yelped at her, "Who are you and what do you want?"

The cheetah began to tell the wild dogs her story about trying to find a family of her own. During her search, she was scared by a lion and saddened when he told her that the cheetah was not a cat but a dog. The whole pack of wild dogs howled in laughter, and barked at her, "You are not a dog at all. Look at your round head and ears, and your rough tongue. They are like a cat's. Your tail is long just like other cats. You are not a dog at all!" The pack chased the cheetah off, biting at her heels.

This time the cheetah raced away very fast because she was scared. After running a safe distance from the dogs, the cheetah laid down to rest under a big camel thorn tree. She felt sad. She thought about how the lion roared and did not want her, and how the wild dogs yelped and bit at her feet, and she felt sadder and sadder. The cheetah felt so sad that she started to cry. She was very lonely.

African Wild Dogs

The cheetah did not realise that any other animals were near her. A giraffe had walked up quietly while the cheetah was crying. The giraffe, looking down at the cheetah with its big brown eyes, asked, "Why are you crying?" The cheetah was very surprised when the giraffe spoke. The cheetah looked up tearfully at the giraffe and proceeded to tell her sad story about the lions roaring and telling her she was not a cat, and the wild dogs chasing her and saying she was not a dog.

Sniffling, the cheetah said, "I have been sitting here crying, and I have cried so long and so hard. Look at my beautiful face, the tears have burnt marks in my face."

The giraffe, hearing the cheetah's story, also began to cry. And the giraffe's tears fell so far that they burnt spots in the cheetah's coat.

A bird, which was flying by the camel thorn tree, saw the beautiful cheetah and chirped, "I have travelled throughout this land. And you, cheetah, are the most splendid and unique of all the cats I have seen."

The headman concluded his story and said, “The cheetah has had spots ever since that lonely day. And it chirps like a bird to show how proud it is of being the most unique of all cats.”

'How the cheetah got its spots' discussion ideas:

1. What can you tell about the cheetah from the story?
2. Why do you think the cheetahs ran away when they saw Moffet and Elisabeth?
3. What marks on the cheetah's face made Elisabeth believe that the cheetah was crying? In the headman's story how does the cheetah say it got these markings?
4. What reasons did the headman give for why there are fewer cheetahs in the world today?
5. Which country has the most cheetahs in the world? Can you name other countries where cheetahs are found?
6. What characteristics of the cheetah made the lion say that it was a dog? And what features did the wild dog say made the cheetah a cat? Is the cheetah a dog or a cat?
7. What markings of the cheetah help it hide in the dry grass?
8. Why do you think humans are fearful of predators?

Vocabulary List:

Abrupt	sudden
Approach	to come near or nearer to
Cheetah	the fastest land mammal on earth; today, it is found only in 23 African countries and Iran (in Asia); the cheetah has a thin body with long legs
Chirp	a short high-pitched sound, as of a small bird
Conceal	to hide, to keep from discovering or seeing
Crept	moved slowly
Describe	to tell about in detail
Decline	to slowly become less in number
Frighten	to make suddenly afraid, cause fear
Leopard	solitary cat found in Africa and Asia; it is a powerful, stocky cat with muscular limbs and a coat with small black spots and spots in a circle
Predator	an animal that hunts and kills another animal for food
Proceed	to continue on
Realise	to understand or be aware of
Retractable claws	nails on an animal's foot (claws) which can be pulled back into the animal's foot
Savannah	a large treeless area, grassland
Species	a group of animals or plants of the same kind, that give birth to young like themselves. The leopard and cheetah are two different species of cat
Slender	thin or lean
Sprint	to run very fast; a short run at top speed
Surprise	to occur without warning, something that is not expected
Timid	shy, fearful
Wise	having knowledge, knowing much information
Yelp	a short bark or cry

Worksheet: how the cheetah got its spots – language study

Name: _____ Date: _____

1. Use the following words or expressions in sentences:

   running faster than
   out of fear
   savannah

2. For the following words, write a word that has the same meaning and a word that has the opposite meaning.

   abrupt
   conceal
   retract
   timid

3. Find three words or phrases on the first page of "How the Cheetah Got it Spots" that describe the cheetah.

4. Make up the conversation between the cheetah and giraffe as you think it might have sounded.

5. Change the following sentences from the past tense to present tense:

   Moffet, did you see how fast those cheetahs ran? And how well their coats concealed them in the thick bush?

Activities: Choose One

1. Make up your own story or poem of how the cheetah got its spots. Act out the story with your friends. Draw pictures to illustrate your story.

2. Ask elders and community leaders about stories they were told about cheetahs or other predators, their beliefs about the species, or if they have ever seen cheetahs. Write down the stories you're told.

3. Tell a story about being kind to animals. Discuss why it is important for humans to conserve animals.

4. Write to environmental groups asking about a specific animal and what you can do to help conserve the species.

5. Learn more about predators and their adaptations and report to the class about what you found. Why do predators play such an important role in ecosystems?

6. Write to your President, and the Minister of Environment and Tourism. Thank them for their commitment to protecting Africa's environment and encourage them to maintain southern Africa's cheetah population.

7. Write an Animal Cinquain. A cinquain is a five-lined oriental poem that will help you describe a cheetah or other predator in a few words.

Cinquain Form

Line 1 _____
Animal Name

Line 2 _____ _____
Two words that describe the animal

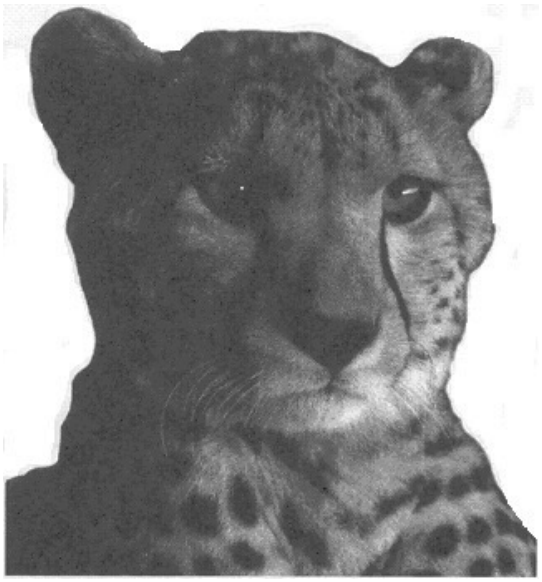
Line 3 _____ _____ _____
Three action words or words expressing one action

Line 4 _____ _____ _____ _____
Four word phrases that tell how or what the poet feels about the animal

Line 5 _____
Word that sums up the animal

Example:

Cheetah
Spotted Sphinx
Swift African Hunter
The cat that cries
Unique



Answer key to worksheet: how the cheetah got its spots – language study

Note: Answers will vary

1. Use the following words or expressions in sentences:

   running faster than
   out of fear
   savannah

   Examples:
   The cheetah was running faster than a Mercedes.
   People kill carnivores out of fear.
   The savannah is full of wild prey for the cheetah to hunt.

2. For the following words, write a word that has the same meaning and a word that has the opposite meaning.

   Examples:

abrupt -	sudden, hasty, hurried (synonyms)
	gradual, slow (antonyms)
conceal-	hide, mask, camouflage (synonyms)
	expose, reveal (antonyms)
retract -	withdraw, recede, take back (synonyms)
	reveal, expose, bare (antonyms)
timid -	shy, quiet, apprehensive (synonyms)
	brave, unafraid, confident (antonyms)

3. Find three words or phrases on the first page that describe the cheetah.

   Slender, long legs, coats were the colour of dry grass, they seemed to be crying, long black lines on their faces, tear marks, etc.

4. No specific answer to this question.

5. Change the following sentences from the past tense to present tense:

   Moffet, did you see how fast those cheetahs ran? And how well their coats concealed them in the thick bush?

   Moffet, do you see how fast those cheetahs run? And how well their coats conceal them in the thick bush?

6. No specific answer to this question.

7. No specific answer to this question.

Social Science

MAPPING THE CHEETAH

SUBJECT AREAS:
Geography
Social Sciences
Agriculture

DURATION/ TIME:
Activity 1: 20min
Activity 2: 20 min
Activity 3: 20 min
Activity 4: 20 min

PREPARATION NEEDED:
Review the 'cats of the world' sheet in the Reference section.

Activity 1 -4:
Photocopies of map worksheets for each learner

MATERIALS NEEDED:
Activity 1 -4:
Colouring materials (pencils, crayons)
Photocopies of map worksheets for each learner

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Protect
Distribution
Population
Vegetation
Region
Geography
Delta

OBJECTIVE:

Learners will learn about cheetah populations by studying different maps.

LESSON ACTIVITIES:

ACTIVITY 1:
Map worksheet on 'cheetahs of Namibia.' Learners have a colouring activity and questions to answer.

ACTIVITY 2:
Map worksheet on 'cheetahs of Botswana.' Learners have a colouring activity and questions to answer.

ACTIVITY 3:
Map worksheet on 'cheetahs of Zimbabwe.' Learners have a colouring activity and questions to answer.

ACTIVITY 4:
Discuss the 'broad vegetation regions of Africa' map and have learners complete the 'cheetah distribution throughout Africa and Asia' worksheet. Learners have a colouring activity and questions to answer.

Learning Outcomes

These activities deal with the distribution of the remaining cheetah populations throughout Africa and Asia. Learners are asked to get specific information from world and local maps concerning geography and the location of human and cheetah populations. Maps, worksheets and answers are all provided in this lesson.

Teaching the Lesson

These activities are designed to give learners a better understanding of where people and cheetahs live. Each worksheet contains a detailed map with areas of cheetah population drawn in. Learners should begin by shading or colouring in the areas of cheetah population before answering the questions. More detailed questions can be added to these worksheets to better integrate the topic of study.

Activity 1 – 'cheetahs of Namibia' worksheet

Answer Key to worksheet

"*Cheetahs of Namibia*": (1) Otavi and Otjiwarongo; (2) No; (3) north-central farmlands; (4) Orange and Kunene Rivers; (5) Yes; (6) surveying people who live in area and sightings of cheetahs and their spoor.

Activity 2 – 'cheetahs of Botswana' worksheet

Answer Key to worksheet

"*Cheetahs of Botswana*": (1) Yes; (2) a delta is a fertile area of land formed at the mouth of a river, the Okavango Delta is a good habitat for cheetahs because the water and vegetation support a wide range of prey species; (3) Ghanzi, Mamuno, Maun; (4) Central Kalahari Gemsbok National Park, Kruger National Park; (5) North.

Activity 3 – 'cheetahs of Zimbabwe' worksheet

Answer Key to worksheet

"*Cheetahs of Zimbabwe*": (1) Zambezi River, Lake Kariba, Limpopo River; (2) Hwange National Park, Yes; (3) Yes; (4) Yes, there is less competition from larger predators such as lions and hyenas; (5) No.

Activity 4 – cheetah distribution throughout Africa and Asia

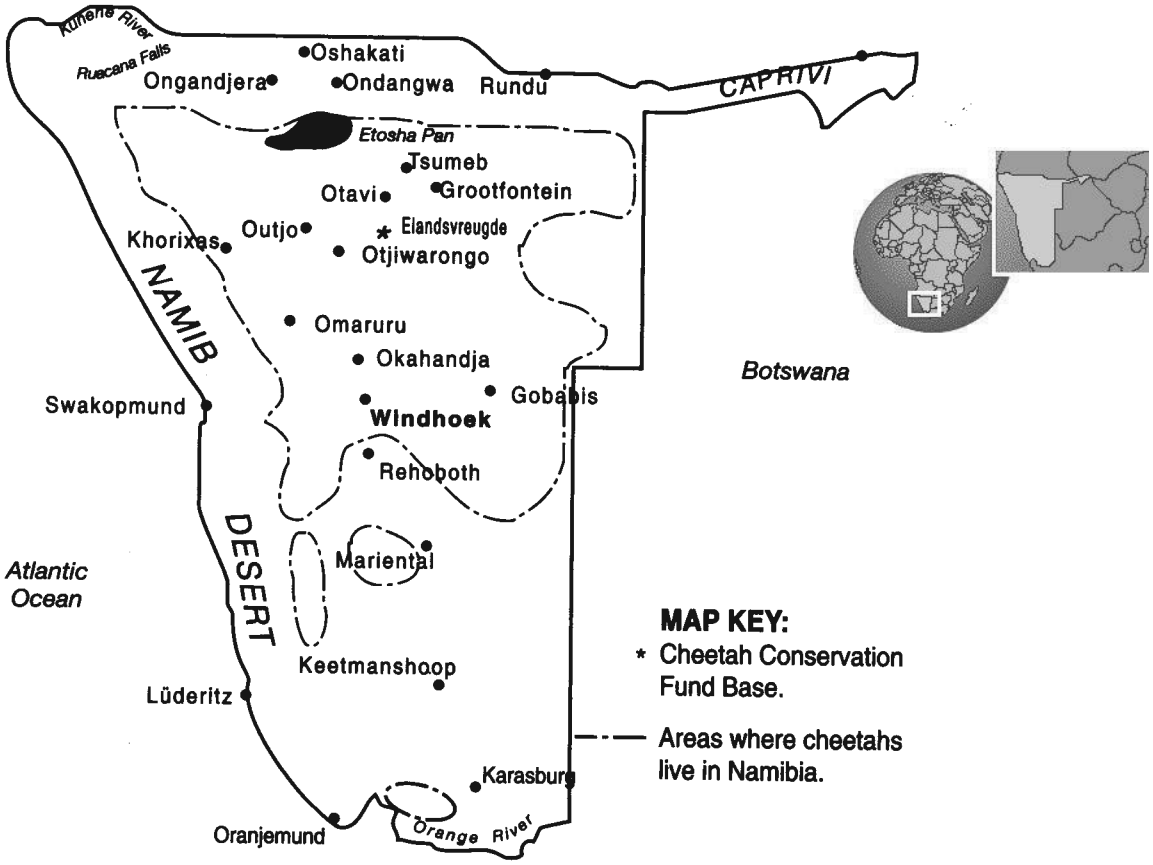
Maps and worksheets are provided to learners in order to better understand the broad distribution of cheetahs throughout Africa and Asia. Answer key is in lesson.

1. Begin by asking the learners to look at the 'broad vegetation regions of Africa' map. Using what they know about the best habitats for cheetahs (review the 'cheetah fact sheet' found in the Reference section if necessary), ask learners to predict the regions that cheetahs would most likely be found.
2. Have the learners complete the worksheet 'cheetah distribution throughout Africa and Asia' using the map of Africa provided.

Worksheet – cheetahs of Namibia

Name: _____ Date: _____

Instructions: Colour in the areas on the map where cheetahs live and answer the questions using the information provided on the map.



Map Questions:

1. Name the two towns closest to the Cheetah Conservation Fund's base at Elandsvreugde.

2. Are cheetahs found in Oshakati and Ondangwa?

3. Which region inhabited by cheetahs is Namibia's largest?

4. Name two rivers that cheetahs live near.

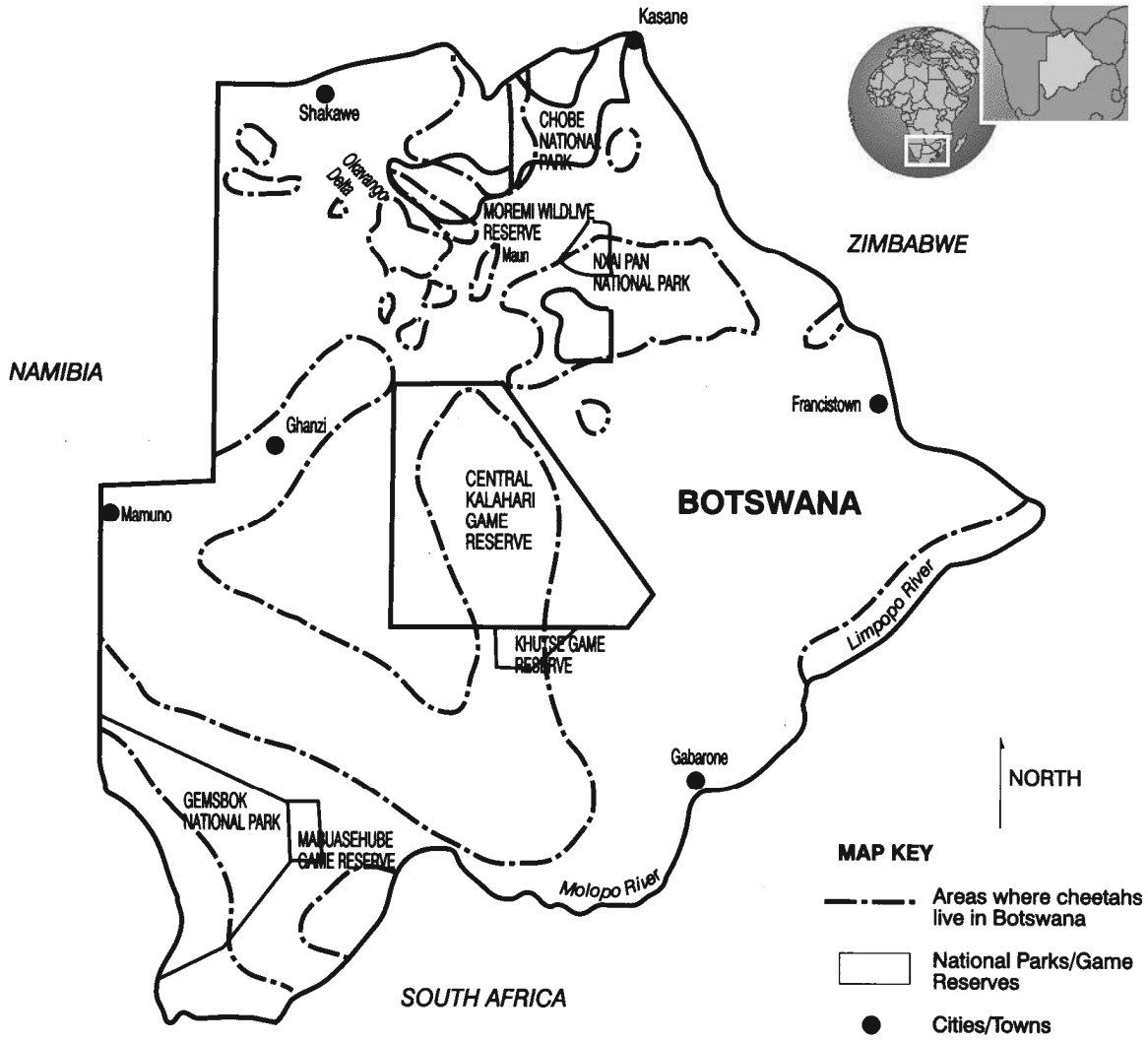
5. Do the Namibian and Botswana cheetahs form a geographically connected population?

6. How do you think researchers have discovered where cheetahs live in Namibia?

Worksheet – cheetahs of Botswana

Name: _____ Date: _____

Instructions: Colour in the areas on the map where cheetahs live and answer the questions using the information provided on the map.



Map Questions:

1. Do cheetahs in Botswana form a geographically connected population with cheetahs in Namibia?

2. What is a delta? Why might the Okavango Delta be a good habitat for cheetahs?

3. What three towns are within the range of the cheetah in Botswana?

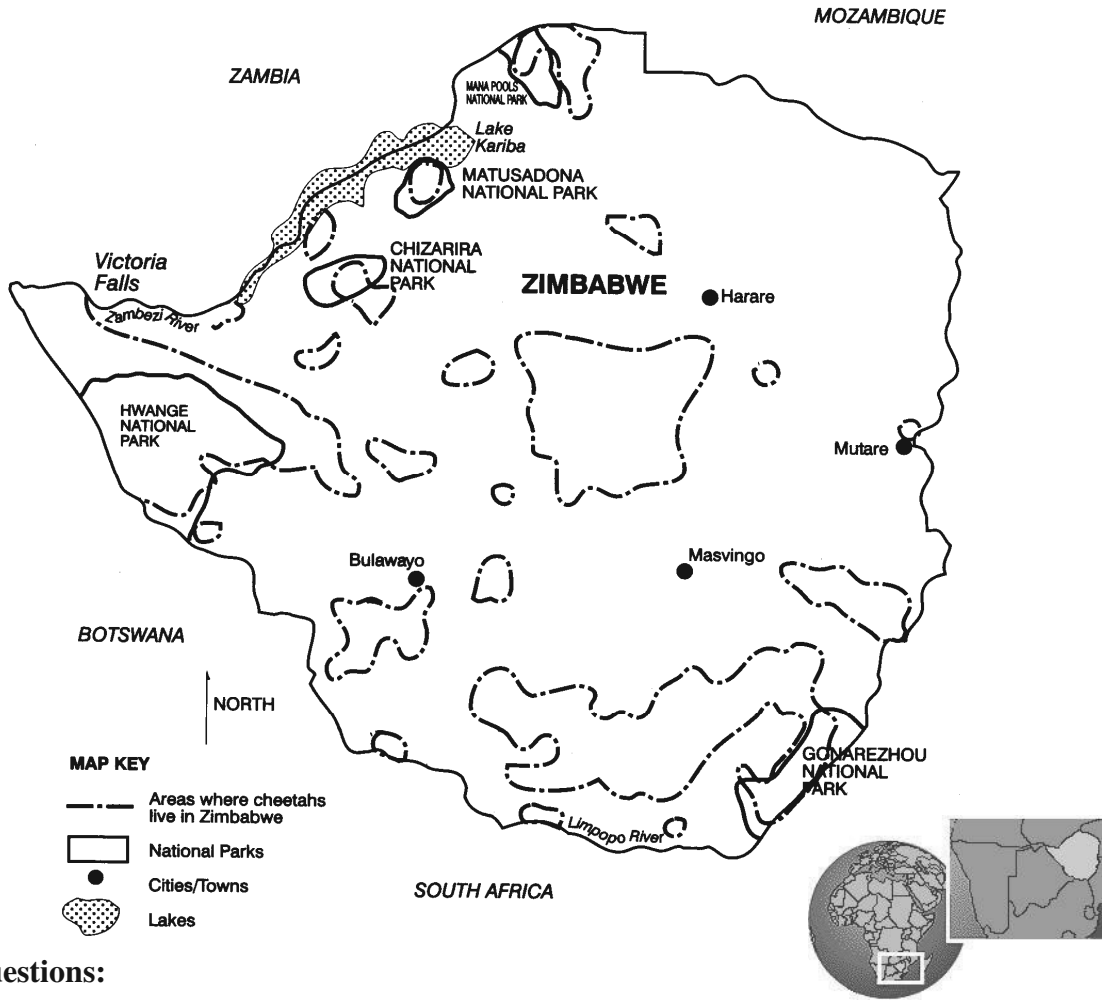
4. What is the largest game reserve in Botswana? Do cheetahs live there?

5. What river do cheetahs live near?

Worksheet – cheetahs of Zimbabwe

Name: _____ Date: _____

Instructions: Colour in the areas on the map where cheetahs live and answer the questions using the information provided on the map.



Map Questions:

1. What large sources of water do cheetah populations live near in Zimbabwe?

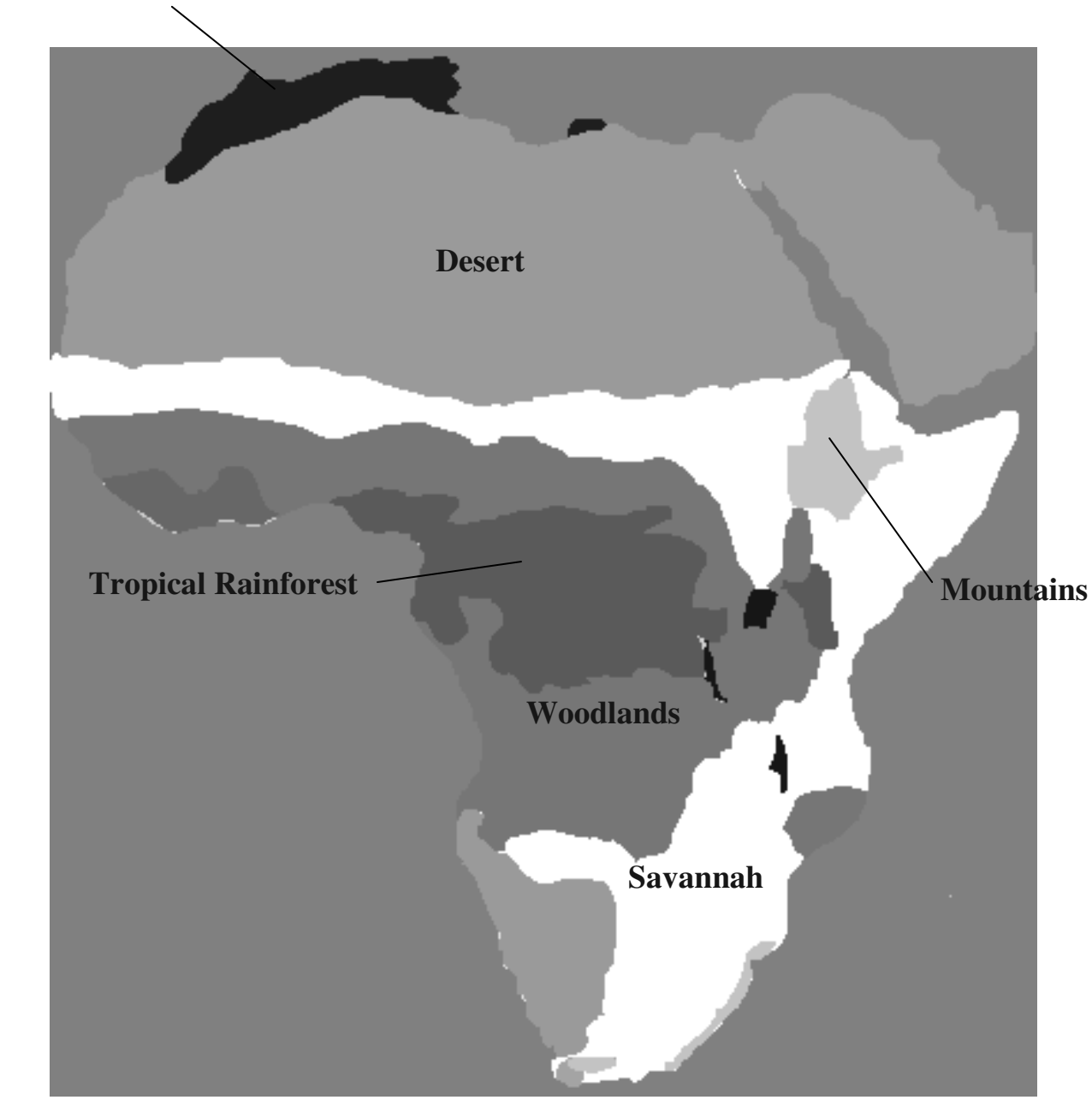
2. What is the largest national park in Zimbabwe? Do cheetahs live there?

3. Are cheetah populations in Zimbabwe geographically connected to cheetah populations in Botswana?

4. Are cheetahs living outside of protected national parks in Zimbabwe? If so, why might this occur?

5. Are any of the cities listed on the map within areas where cheetahs live? If so, name the cities.

BROAD VEGETATION REGIONS OF AFRICA

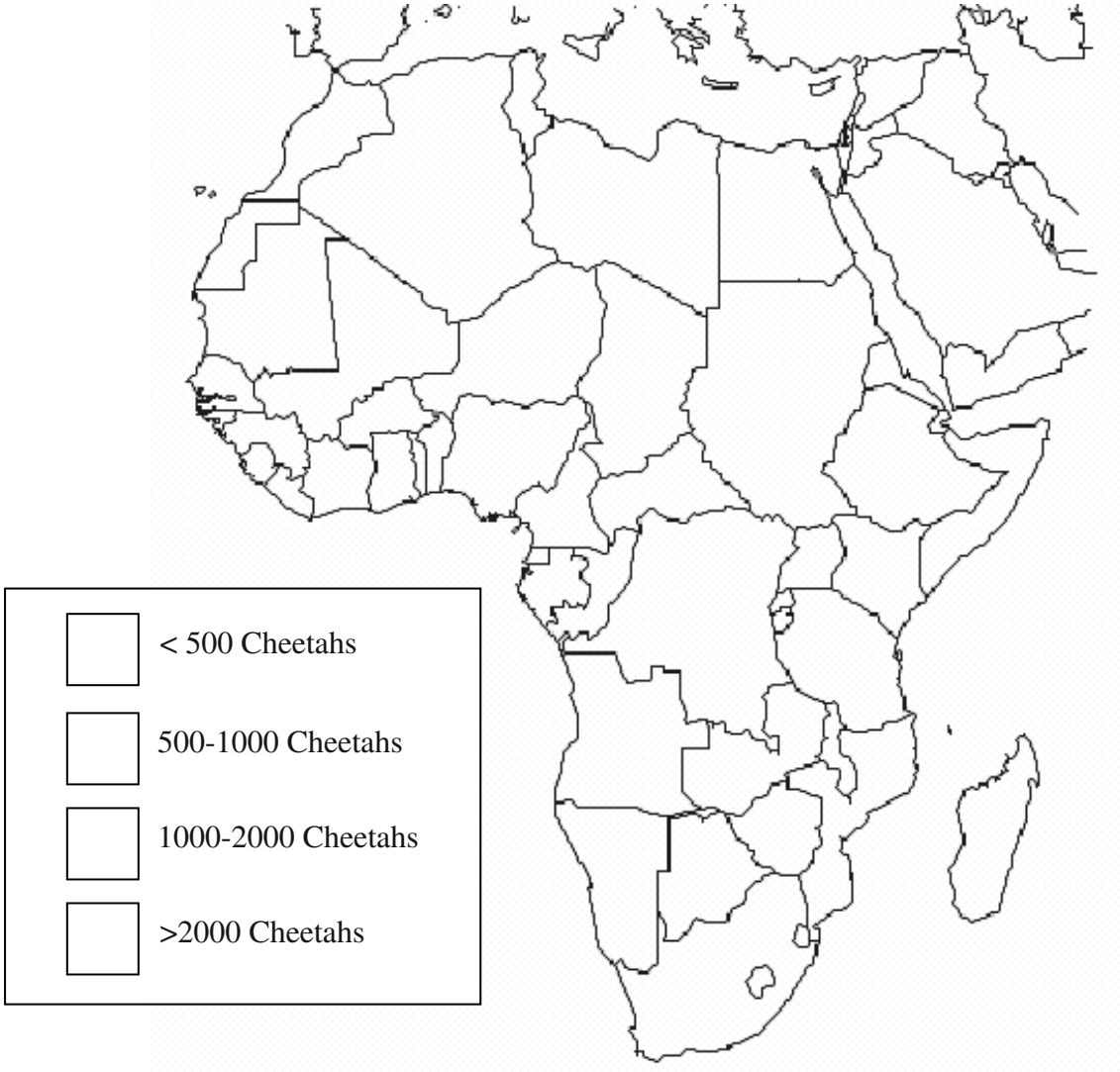


COUNTRIES OF AFRICA

Worksheet - distribution of cheetahs in Africa and Asia

Name: _____ Date: _____

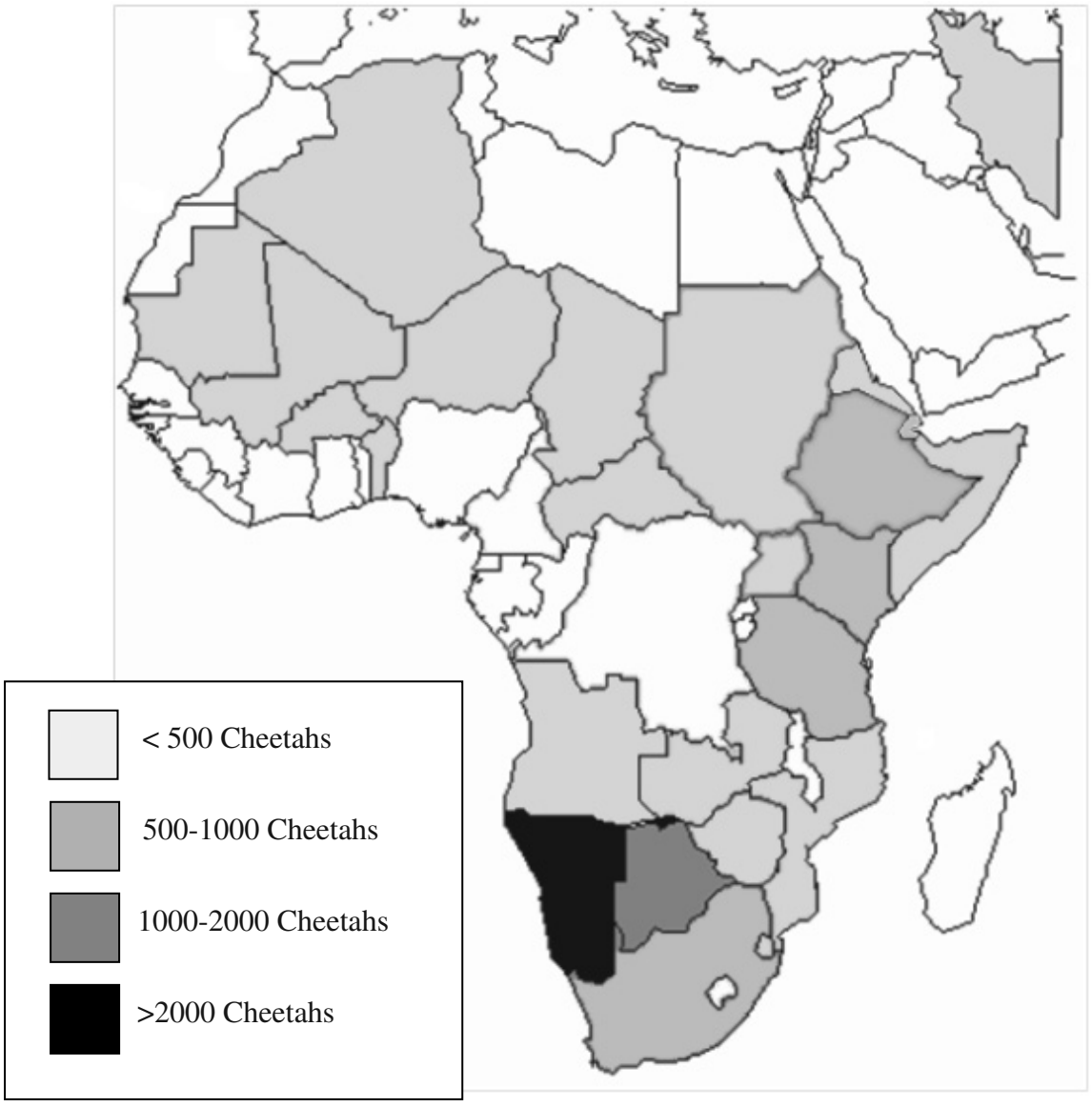
Instructions: This map will help show where cheetahs live today. Begin by choosing 4 colours or shades for the key below. Shade all countries with cheetah populations of <500 one colour; between 500 and 1000 another, between 1000 and 2000 another, and over 2000 another. Be sure to label each country with its name.



Country	# of Cheetahs
Algeria	100
Angola	250
Benin	10
Botswana	1,800
Burkina Faso	100
Central African Republic	50
Chad	50
Djibouti	50
Ethiopia	500
Iran	100
Kenya	800
Mali	100

Country	# of Cheetahs
Mauritania	100
Mozambique	20
Namibia	3,500
Niger	100
Somalia	300
South Africa	500
Sudan	450
Swaziland	20
Tanzania	800
Uganda	10
Zambia	200
Zimbabwe	250

Answer key to worksheet - distribution of cheetahs in Africa and Asia



CHEETAHS THROUGHOUT HISTORY

SUBJECT AREAS:
Social Science
History

DURATION/TIME:
Activity 1: 15 min
Activity 2: 20 min

RECOMMENDED PREPARATION:
Activity 1:
Review 'the cheetah's history' sheet in the Reference section.

Activity 2:
Make photocopies of the worksheet 'cheetah history' for each learner

MATERIALS NEEDED:
Activity 2:
Worksheet

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Prehistoric
Migrate
Extinct
Evolve
Timeline

OBJECTIVE:

Learners will discover the history and movement of the cheetah and predict the cheetah's future.

LESSON ACTIVITIES:

ACTIVITY 1:
On prehistoric cheetahs, cheetah history and movement.

ACTIVITY 2:
Learners construct a timeline in the worksheet 'cheetah history.'

Learning Outcomes

Learners will discover the prehistoric history of the cheetah and its movement from North America to its present home in Africa. An activity to create a timeline of cheetah history is also included.

Teaching the Lesson

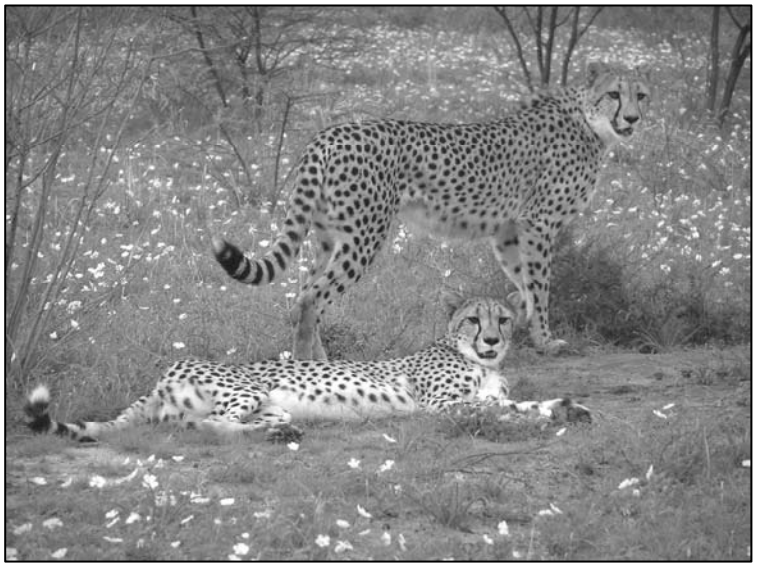
Activity 1 – discussion on prehistoric cheetahs

Cheetahs were once one of the most widely distributed of all land mammals. They migrated over land and ice bridges from North America into the southern regions of the Commonwealth of Independent States (formerly the Soviet Union), eastern Asia, and through deserts and steppe regions into the Middle East, southern Europe, and Africa.

Using the map on the following page, discuss with learners the movement of cheetahs in prehistoric times. Make special note of how the cheetah actually evolved in North America, but now has become extinct in all of its former home ranges except for Africa and Iran. Also, ask the learners how they could have made it through the Bering Strait between North America and Asia. (During the Ice Age this was a land bridge of frozen ice).

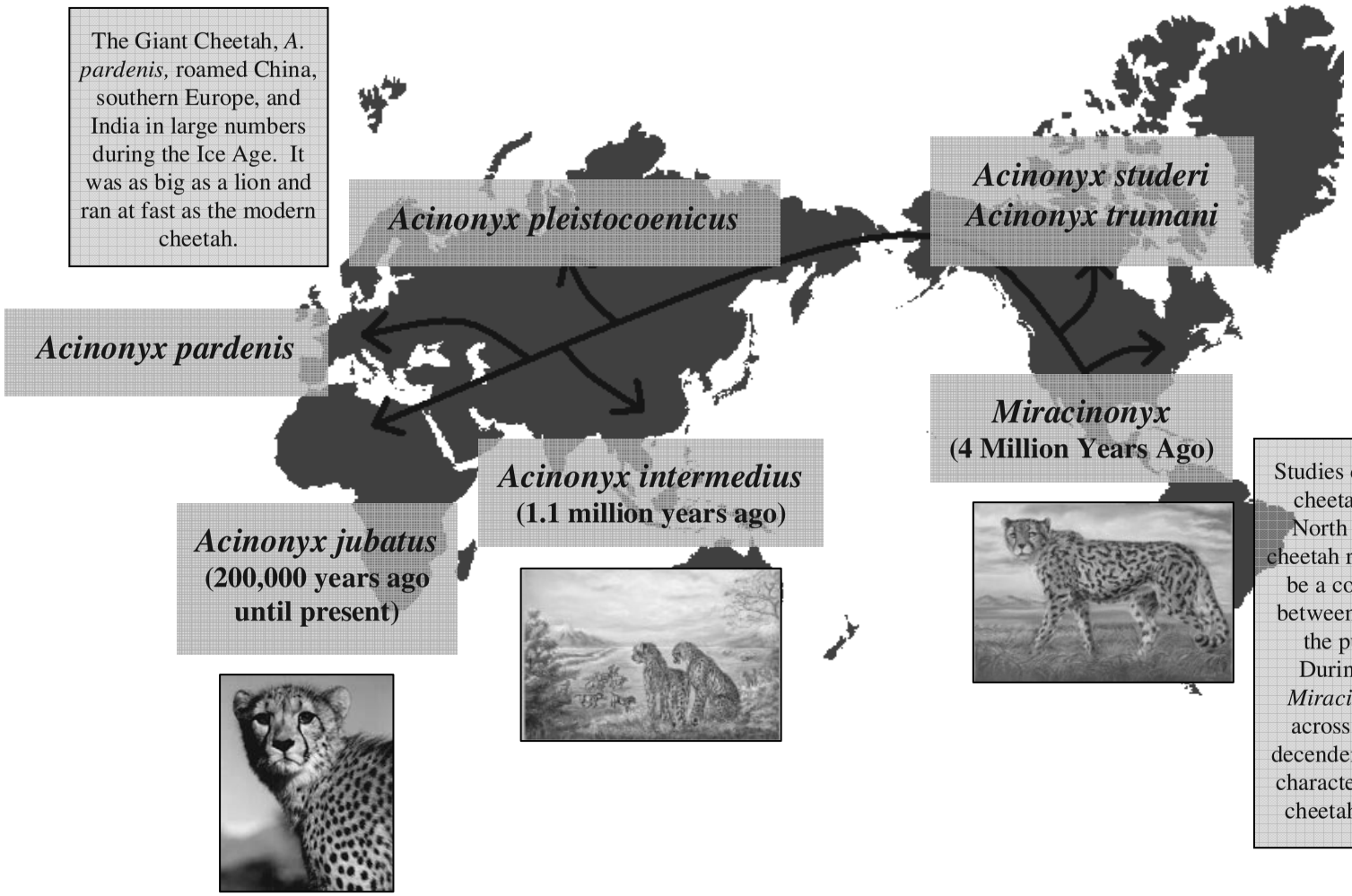
Activity 2 – cheetah history

Review with the learners the purpose of a timeline in understanding history. Have them complete the worksheet 'cheetah history' and create a timeline of the cheetah's history. Any other historical events can be added to better integrate it into any time period study.



The Prehistoric Range of the Cheetah
4 Million Years Ago

The Giant Cheetah, *A. pardenis,* roamed China, southern Europe, and India in large numbers during the Ice Age. It was as big as a lion and ran at fast as the modern cheetah.



Studies conclude that the cheetah originated in North America. This cheetah relative appears to be a common ancestor between the cheetah and the puma (cougar). During the Ice Age, *Miracinonyx* migrated across continents. Its decendents developed the characteristics that make cheetahs unique today.

Worksheet – cheetah history

Name: _____ Date: _____

Instructions: Draw a timeline referencing changes in cheetah history to historic events and scientific discoveries. Start the timeline 4 million years ago.

Events to consider for a cheetah history:

- 3,500,000 to 4,000,000 years ago, cheetahs first appear.
- 15,000 to 20,000 years ago, during the Pleistocene Epoch, cheetahs cross land bridges from North America into Asia, Europe and Africa and live on all 4 continents.
- 10,000 years ago, cheetahs become extinct on every continent except Africa and Asia, causing a genetic bottleneck.
- 5,000 years ago, African cheetah population splits into East African and southern African subspecies. Sumerians begin taming cheetahs for hunting at Court.
- 1,500 years ago, Italians use cheetahs to hunt for sport.
- 1,000 years ago, over-hunting causes sharp decline in the southern African cheetah, making it more inbred than the East African cheetah.
- 500 years ago, Akbar the Great keeps 9,000 cheetahs in Court during his 49 year reign.
- 120 years ago, India and Iran begin to import cheetahs from Africa for hunting purposes.
- 60 years ago, the Indian cheetah becomes extinct and the first cheetah reproduces successfully in captivity.
- 37 years ago, the cheetah is placed on Appendix I of C.I.T.E.S.
- 22 years ago, Namibia gains independence and the Cheetah Conservation Fund is established to help protect wild cheetahs.

IDEAS FOR ART ACTIVITIES

Learning Outcomes

Learners will be introduced to the natural world, animals and animal behaviour through arts drama and music.

Ideas for art activities:

1) Act out the story of how the cheetah got its spots. The story can be found in the English section of this book. Present the story to your school.

2) Write a song about the cheetah and sing it at your school's morning assembly.

3) Write a song about the cheetah and use traditional instruments and dance to tell the story. Perform the song and dance at your school.

4) Do drawings and illustrations of cheetahs and share these drawings at a school art show. Invite parents and community members to the event and have someone give a speech on conservation and the plight of the cheetah.

5) Write and decorate a poem about the cheetah. Send the poem to the Cheetah Conservation Fund and to a local government official.

6) Host a 'cheetah day' at your school. Have learners dress in 'spots' and host an Olympic competition with running contests.

7) Make a cheetah sculpture out of materials found in your village or town.

8) Paint rocks with cheetah images and give away the rocks as prizes.

9) Make a poster about good livestock management techniques (refer to the 'farmer and cheetahs' lesson in the Conservation section of this book.) Share these ideas with parents, community members, farmer's associations and conservancies.

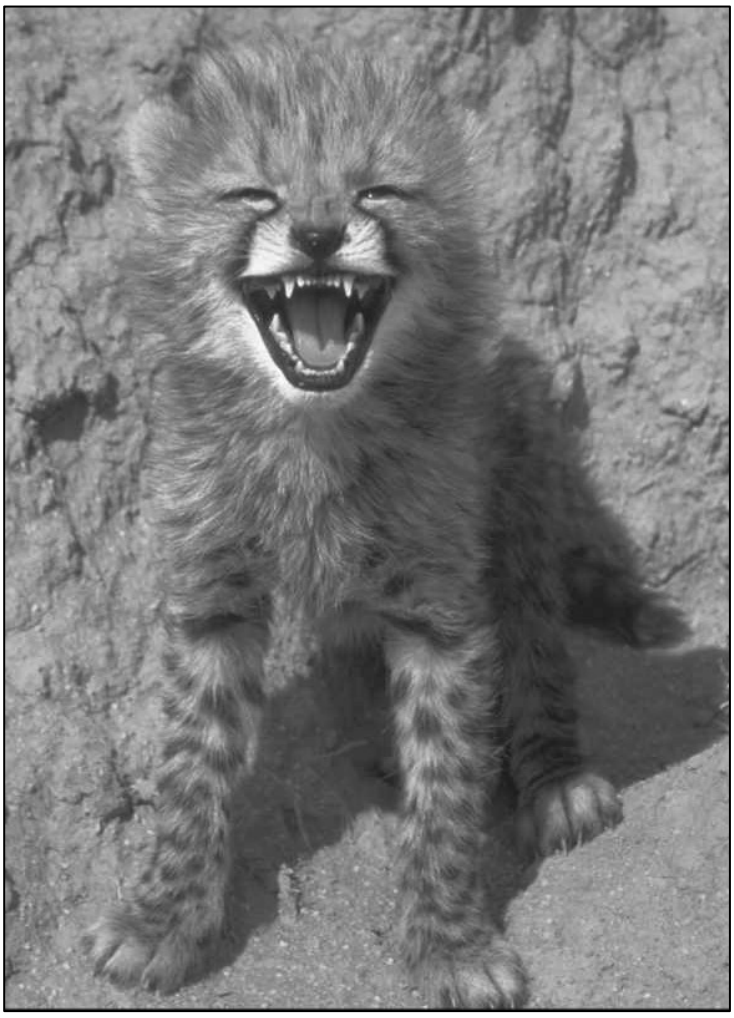
10) Design a t-shirt (with a cheetah on it!) for your school's conservation club

11) Make a mobile with images of a cheetah and its habitat. Hang the mobiles on your classroom.

12) Paint a cheetah mural on a wall at your school.

13) Make cheetah illustrations or sculptures and sell the items. Use the funds to support your school's conservation club.

Reference



Cheetah
CONSERVATION FUND

Cheetah

FACT SHEET

Status

Protected species in Namibia. Endangered under the United States Endangered Species Act. List on C.I.T.E.S. Appendix I

Description

The cheetah has a slender, long-legged body with blunt semi-retractable claws. Its coat is tan with small, round, black spots, and the fur is coarse and short. The cheetah has a small head with high-set eyes. Black "tear marks," which run from the corner of its eyes down the sides of the nose to its mouth, keep the sun out of its eyes and aid in hunting.

Size

Adult body length 105-152 cm; tail length 51-87 cm; shoulder height 73+ cm; weight 26-64 kg. The male is slightly larger than the female.

Specialisations

The cheetah's flexible spine, oversized liver, enlarged heart, wide nostrils, increased lung capacity, and thin muscular body make this cat the swiftest hunter in Africa. Covering 7-8 metres in a stride, with only one foot touching the ground at a time, the cheetah can reach a speed of 110 km/h in seconds. At two points in the stride, no feet touch the ground.

Habitat

Cheetahs thrive in areas with vast expanses of land where prey is abundant. In Namibia cheetahs have been found in a variety of habitats, including grasslands, savannahs, dense vegetation, and mountainous terrain. Over ninety percent live on farmland.

Range

Once found throughout Asia and Africa, the species is now only scattered in Iran and various countries in sub-Saharan Africa. Home ranges in Namibia for males can be up to 1500 square km and for females, 1200-1500 square km.

Behaviour

Cheetahs have a unique, well-structured social order. Females live alone except when they are raising cubs. The females raise the cubs on their own. The first 18 months of a cub's life are important - cubs learn many lessons because survival depends on knowing how to hunt wild prey species and avoid other predators such as the leopards, lions, hyenas, and baboons. At 18 months, the mother leaves the cubs, which then form a sibling group, staying together for another 6 months. At about 2 years, the female siblings leave the group, and the young males remain together for life. Males live alone or in coalitions made up of brothers from the same litter. Some coalitions maintain territories in order to find females with which they will mate. Territories are often located in areas where there is a rich supply of wild game and/or water. Fierce fights between male coalitions, resulting in serious injury or death, can occur when defending territories.

Cheetahs hunt in the late morning and early evening. They capture their prey by stalking - until the prey is within 10-30 metres - before chasing. The prey is suffocated when a cheetah bites the underside of the throat. Chases last about 20 seconds, and rarely longer than 1 minute. About half of the chases are successful. In Namibia, cheetahs use play-trees (trees with sloping trunks and large horizontal limbs, usually camelthorns) to observe their surroundings and mark the area. Cheetahs make chirping sounds, and hiss or spit when angered or threatened. They purr very loudly when content. **Cheetahs do not pose a threat to humans.**

Reproduction	Sexual maturity occurs at 20-23 months. The gestation period is about 95 days, and the average litter size is 4-5 cubs. Cubs are smoky-grey in colour with long hair, called a mantle, running along their backs; they are up to 30 cm long and weigh 250-300 grams at birth. The mantle has several purposes: it is thought to camouflage the cub in dead grass, hiding it from predators, and to work as a mimicry defence, causing the cub to resemble a honey badger (ratel).
Population	Only 10,000 cheetahs remain in 23 African countries, and 100 cats survive in Iran. Namibia has the world's largest number of cheetahs, yet only 3,500 remain the wild.
Life Expectancy	Studies have not been conducted in the wild on longevity; 8-12 years is average in captivity. Cub mortality is high for the species in both the wild and captivity. On average 30 percent of all cubs born in captivity die within one month of birth, and in Tanzania's Serengeti National Park, about 90 percent die before reaching 3 months of age.
Diet	Small antelope, young of large antelope, warthog, hare, and game birds.
Natural History	Cheetahs have been kept in captivity for some 5,000 years. However, they breed poorly, and the captive population has been maintained through wild collection. Cheetahs suffer from a lack of genetic diversity, making them more susceptible to disease and decreasing reproduction. The many parks and reserves of Africa offer protection for only a small amount of cheetahs. In these parks, lion and hyena numbers increase, and the cheetahs cannot compete with these large predators which kill cheetah cubs and steal their prey. Evolution has favoured speed and not strength for this species.
Survival Threats	Decline in prey, loss of habitat, poaching, and indiscriminate trapping and shooting threaten the survival of the cheetah throughout its range.
Legal Protection	As a protected species in Namibia, people are allowed to remove cheetahs only if they pose a threat to livestock or human life. Unfortunately, some farmers will capture cheetahs indiscriminately (the "problem" animals may not be singled out), often removing or killing those that have not taken any livestock. Limited international trade in live animals and skins is permitted from Namibia, Zimbabwe, and Botswana. Illegal trade in other parts of Africa and indiscriminate capture and removal in southern Africa continue to threaten the survival of this species.
Conservation	To help this sleek hunter of the African wild win its race against extinction, we must (1) help protect its habitat and ensure a place for it on Namibian farmlands, (2) aid in the conservation of the wild prey base, (3) halt the indiscriminate capture and removal of the cheetah, (4) improve livestock management, and (5) educate everyone about the need to conserve biological diversity, and the predators' unique role in a healthy ecosystem.
Captivity	CHEETAHS ARE WILD ANIMALS. Capture of wild cheetahs threatens the survival of the species in two ways. First, the removal of individuals reduces the species' genetic diversity in the wild. And secondly, cheetahs do not breed well in captivity. The Asian cheetah is nearly extinct because of its capture for private use. Special dietary requirements, special needs, and unpredictable behaviour make this a poor pet. Wild instincts remain intact even with tamed and captive raised animals.

FACT SHEETS

Leopard

Appearance and body size	The leopard is the largest spotted cat, and its coat is handsomely marked with rosettes over most of the body. Males weigh an average of 60kg, and females 32 kg. Leopards have retractable claws. Leopards have large heads and powerful jaws. Shoulder height: 70 cm.
Habitat	Very adaptable - generally mountainous and rocky areas as well as forests, they also occur in semi-desert. Quite independent of water supplies, they rely on prey to meet moisture requirements.
Hunting styles and prey species	Kills after careful and short chase (less than 30m) and suffocating prey, or biting the head or neck. Mainly nocturnal in behaviour. Hunts a variety of prey, including steenbok, duiker, warthogs and baboons. Larger mammals such as kudu, hartebeest, as well as smaller mammals such as hares and birds are also hunted.
Reproduction	Not seasonal; average litter size is 2 cubs every one and a half years. Gestation: 106 days.
Status	Widely dispersed throughout West Africa and southern Africa, scattered populations are found in North Africa, South Asia, the Far East and Arabia.

Lion

Appearance and body size	Tawny, sandy colour, males are usually maned. Largest African carnivore. Males average 190 kg, while females average 126 kg. Tail sometimes black on tips, white under parts. Related females found with attendant males in a pride. Shoulder height: ±120 cm.
Habitat	Wide habitat tolerance, but not found in forest areas. Anywhere with ample, medium to large size prey animals.
Hunting styles and prey species	Both nocturnal and diurnal behaviour. Wide range of mammals, mice to buffalo, as well as carrion. Mainly larger sized mammals such as wildebeest and kudu. Lions are expert stalkers and the chases are short (100-200m). Prey brought down by jumping on their backs and killed by strangulation. Females usually do the hunting, although the males eat first, then the females and lastly the juveniles.
Reproduction	Males do not get the opportunity to mate until about five years of age. Females reproduce at about 43 months. Gestation: 110 days. Litters average three cubs, weighing an average of 1.5 kg each at birth.
Status	Extinct in Europe and North Africa. A few exist in Asia, including North West India. Found mainly in game parks and protected areas in Southern Africa, East Africa and the Kalahari Desert.

Caracal

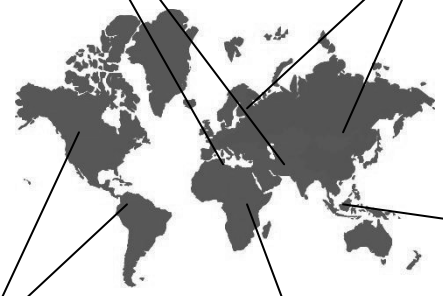
Appearance and body size	Robustly built. Males weigh an average of 17 kg and females average 11.5 kg. Colour varies from yellow-grey to reddish-brown. Characterised by short tails and long tufts on tips of ears. Shoulder height: ±40 cm.
Habitat	Found in wide range of habitats. Found in open savannah woodland, semi-arid areas, but absent from forest areas.
Hunting styles and prey species	Live predominantly on small and medium-sized prey, including young of larger antelope, and birds, which they pounce on in flight.
Reproduction	Litters produced throughout the year. Gestation: 79 days. Litter size averages two. Sexual maturity for both sexes: ±14 months.
Status	Large populations in Africa, Asia, Turkistan, North West India and Arabia.

Tiger

Appearance and body size	Largest of all the cats. Orange coat with black stripes. Weight: ±200 kg. Shoulder height: ±91cm.
Habitat	Unlike the cheetah and lion, tigers are not found in open habitats. They prefer tropical rain forests, snow-covered coniferous/deciduous forests, as mangrove swamps and drier forest types. Require cover and access to water.
Hunting styles and prey species	Stalks prey and pounces from behind. Solitary, but sometimes come together for kill. Deer, wild pigs, guar and water buffalo.
Reproduction	Gestation: 103 days. Sexual maturity reached at three to four years. Average litter size is three cubs, weighing an average of 3 kg each.
Status	Endangered species. Found in India, Manchuria, China and Indonesia.

Geography

CATS OF THE WORLD



North Africa & Southwest Asia

African Wildcat
Asiatic Lion
Caracal
Cheetah
Jungle Cat
Leopard
Serval
Sand Cat

Eurasia

Asiatic Wildcat
Chinese Mountain Cat
Eurasian Lynx
European Wildcat
Iberian Lynx
Manul
Snow Leopard

Tropical Asia

Asiatic Golden Cat
Bornean Bay Cat
Clouded Leopard
Fishing Cat
Flat-Headed Cat
Iriomote Cat
Jungle Cat
Leopard
Leopard Cat
Marbled Cat
Rusty-Spotted Cat
Tiger

Americas

Andean Mountain Cat
Bobcat
Canadian Lynx
Geoffroy's Cat
Jaguar
Jaguarundi
Kodkod
Margay
Ocelot
Oncilla
Puma
Pampas Cat

Sub-Saharan Africa

African Wildcat
African Golden Cat
Black Footed Cat
Caracal
Cheetah
Leopard
African Lion
Sand Cat
Serval

There are 36 cat species!
Some of them occur in more than one region.

CHEETAH CONSERVATION FUND

CHEETAH CONSERVATION FUND - NAMIBIA
Namibia is home to over a third of the world's cheetahs, making this the world's largest population of cheetah. If we want to save the species we need to save this population because 90% of Namibia's cheetahs do not live in protected environments. Instead, cheetahs are found on the farmlands where there had been human and predator conflict. Dr. Laurie Marker is the Founder and Executive Director of the Cheetah Conservation Fund (CCF) that was established in 1990. The CCF has research, conservation and education programmes that work to ensure the long term survival of the cheetah. CCF also works with the farmers in trying to provide the cheetah with a safe habitat by reducing farmer/predator conflict.

The cheetah is not naturally a threat to livestock due to its adaptations for running and hunting. Other predators which hunt habitually at night are livestock threats and are to blame for livestock losses on the farmland. However, the farmer does not always see them and it is the predator that hunts by day, the cheetah, which has in the past received the blame. One solution to the farmers' problem is to find a way to reduce predation on the livestock without killing the predator. In order to accomplish this, CCF initiated a programme, Non-Lethal Predator Control, in 1998, using a specific breed of livestock guarding dog, the Anatolian Shepherd, and later the Kangal. These dogs have been used in Turkey for over 5,000 years as livestock protection against bears and wolves. The dogs have been specifically bred for this purpose and do not need to be trained. CCF breeds the Anatolians and Kangals at their home farm and gives the puppies to various farmers and institutions in Namibia to protect livestock. Through intimidation techniques, this large dog will deter predators from attacking livestock, reducing livestock loss and removing the reason for shooting the predators.

CCF runs education programmes for schools, institutions, and farmers, educating the public on the nature of the cheetah. They work with the farmers on improving farm practices to better protect the livestock. In addition to the introduction of the Livestock Guarding Dogs, CCF encourages simple farming techniques to reduce predation on livestock, such as keeping young animals near the homestead until they are large enough to avoid becoming prey.

CCF is involved in the relocation of cheetah from farms where farmers have trapped them and do not want them on their land. Any cheetah received by CCF will undergo medical assessment and, if healthy, will be re-released on appropriate land. If the cheetah is a proven livestock threat, then the individual will be released into a game park or nature reserve so that it won't come in contact with any livestock.

CCF also does research into behaviour, disease, mortality, territory size, etc. in the wild. The more information gathered about the wild cheetah, the more programmes that can be developed for their protection. This information has been gathered by radio-collaring released individuals so that they can be tracked and their movements and behaviour monitored. Camera traps and scat-detection dogs are also used to study wild cheetahs. In the last few years CCF has also researched the feasibility of re-introducing wild-born, captive cheetahs, back in the wild.

For more information please visit our website: **www.cheetah.org**.

A PLACE FOR PREDATORS

Imagine a cheetah sprinting after a steenbok, a bird of prey diving out of the sky after a mouse, an ant colony feeding on a beetle. All of these animals catch, kill, and eat other animals: they are predators. There are different degrees of predation. Some animals, such as the cheetah, leopard, and lion, are strict predators, called carnivores, and eat only meat. Other animals, such as the jackal, are omnivores. They catch prey when they can, but also eat fruits, nuts, and other plants. Animals can be both predators and prey. The cheetah hunts small antelope, the young of large antelope, hare, warthogs, and game birds; however, the cheetah, especially when it's young, can also become a prey species to other predators, such as the hyena, lion, leopard, and baboon.

Predators are an important part of a healthy ecosystem. Predators cull vulnerable prey, such as the old, injured, sick, or very young, leaving more food for the survival and prosperity of healthy prey animals. Also, by controlling the size of prey populations, predators help slow down the spread of disease. Predators will catch healthy prey when they can, but catching sick or injured animals helps in natural selection and the establishment of healthier prey populations as the fittest animals are left to survive and reproduce.

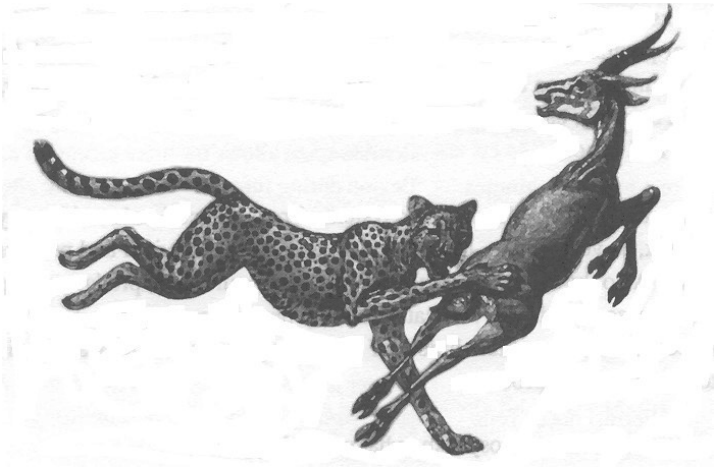
If carnivores were removed from an ecosystem, what would happen?

1. Antelope herds would grow and grow.
2. Only bad weather such as a drought, or disease such as rabies, would slow down the herd growth.
3. Large antelope herds would overgraze their food source, and as the food disappeared, the whole herd would begin to starve.

Lion at kill

Ecosystems where Cheetahs or other predators are <u>not</u> present

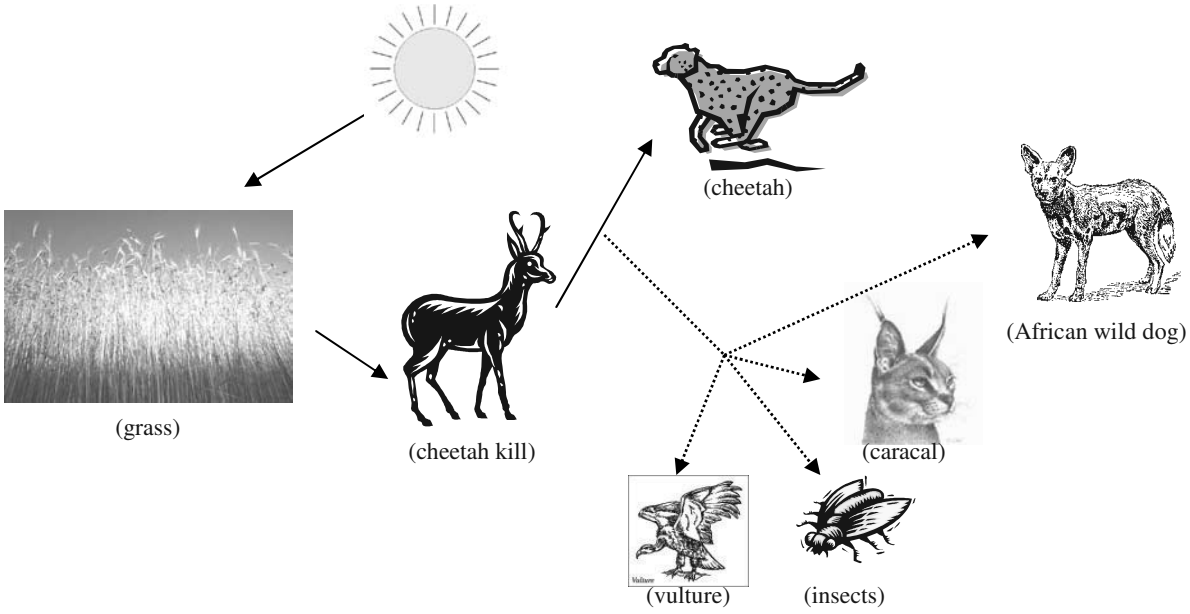
Cheetahs and other predators help limit the growth of prey populations and prevent overgrazing of ranges. While human hunters can sometimes replace predators in the control of antelope populations, they generally do not remove the injured, sick, or older animals. Predators play an important role in maintaining healthy prey populations.



Ecosystems where cheetahs are present

The cheetah is a valuable member of its community. In addition to its role as a predator, cheetahs feed other animals, such as vultures, jackals, beetles, and other scavengers. After a cheetah kills an animal it usually begins eating at the hind quarters, which provide the greatest amount of meat. Because the cheetah is not an aggressive carnivore, larger predators, as well as jackals and vultures, can scare the cheetah off its kill.

By leaving the remains of a carcass, the cheetah feeds other animals in the ecosystem.



Why does a cheetah lack genetic diversity?

A SINGULAR SPECIES

The cheetah, *Acinonyx jubatus*, is the sole member of its genus. Twenty thousand years ago, cheetahs roamed throughout the savannahs and plains of four continents: Africa, Asia, Europe, and North America.

About 10,000 years ago - because of climate changes - all but one species of the cheetah, *A. jubatus*, became extinct. With the drastic reduction in their numbers, close relatives were forced to breed, and the cheetah became genetically inbred, meaning all cheetahs are closely related. Inbreeding occurs when members of the same family or close relatives breed only among themselves. For example, when you look around, you see different hair colours, eye colours, and heights. If you took blood from everybody in the room, and looked at the proteins in the blood, you would see proteins also vary between each person, just like hair colour. When you look at the proteins in the blood of cheetahs, they are very similar; it looks as if they are identical twins of one another, meaning they are closely related.

The study of biological inheritance is called ‘genetic research.’ Genes, which are composed of DNA, store the information that an individual inherits from his or her parents. Genes in one animal vary from the same genes in another animal of the same species. By looking at the amount of variation existing in genes, scientists, called "geneticists," can begin to understand the relationships of animals within a population, and how infectious diseases may affect that population. Also, by comparing the amount of variation between different species, geneticists can help us understand the evolutionary process.

When geneticists looked at the amount of variation within the genes of the cheetah, they found that cheetahs exhibit much lower levels of variation than other mammals. In most species, related individuals share about 80 percent of the same genes. With cheetahs, this figure rises to approximately 99 percent. The genetic inbreeding in cheetahs has led to low survivorship (a large number of animals dying), poor sperm quality, and greater susceptibility to disease. Inbred animals suffer from a lack of genetic diversity. This means cheetahs lack the ability to adjust to sudden changes in the environment, such as disease epidemics, and have unusually high susceptibility to certain viruses. For example, if a virus gets into a healthy population of leopards, not every animal dies; just some do, because leopards are genetically diverse. But if every animal is genetically the same, like the cheetah, and one gets infected, all of them may become infected and die off. Because of their lack of genetic diversity, a deadly virus could wipe out all of the worlds' wild cheetahs instead of just the susceptible animals. It depends on a species' genetic differences.

Evolution eliminates traits in organisms that are least suited for survival. Some of the decline in the cheetah's genetic diversity is accounted for by its specialisation through natural selection. The decrease in genetic diversity resulting from natural selection has benefitted the species' survival as it has made the cheetah better adapted to its environment. However, the effects of this occurrence are small when compared to the effects of the inbreeding that occurred 10,000 years ago from a population bottleneck.

To increase genetic diversity in captivity, zoos take great care to make sure that only unrelated animals mate. Scientists are working on ways to enhance breeding through artificial insemination and *in vitro* fertilisation (IVF). Because of genetic inbreeding, male cheetahs have poor sperm quality. Abnormal sperm cannot swim properly, reducing the chance of fertilising eggs and producing offspring. Artificial insemination (A-I) is a laboratory technique in which scientists place sperm in the reproductive tract of a female. This means the sperm have less distance to swim before reaching the eggs. Mating between male and female animals does not take place. Artificial insemination has produced cheetah cubs in the United States. Using these technologies, A-I and IVF, semen and eggs can be collected from wild Namibian cheetahs for use in captive breeding programs. Because Namibia has the largest population of cheetahs, the genes represented in this population are important to captive cheetah survival worldwide.

A RACE FOR SURVIVAL

Cheetahs have existed on earth for at least 3.5 to 4 million years - long before any of the other big cats alive today. About 20,000 years ago, cheetahs were common throughout Africa, Asia, Europe, and North America. Through the dating of fossil remains, it appears that the cheetah originated in the United States of America in the present-day states of Nevada, Texas, and Wyoming. Approximately 10,000 years ago, at the end of a time called the Pleistocene Epoch, also known as the Great Ice Age (a geographical time period from approximately 2 million to 10,000 years ago), the world's environment underwent drastic changes in climate. Over a few thousand years, 75 percent of the mammal species in North America and Europe died. When mammals began to die, so did all the cheetahs in North America and Europe and most of those in Asia and Africa. Cheetahs may have migrated to a more suitable environment as ice covered a large part of the northern hemisphere and sea levels fell.

The cheetah survived the mass extinction of the Pleistocene Epoch, but its numbers were greatly reduced. Brothers were left to reproduce with sisters and parents with siblings, who led to the founding of the next generation and inbreeding. This occurrence - a severe reduction in population - is called a "bottleneck." Every cheetah alive today appears to be so inbred that genetically they are as closely related as twins (two offspring, or individuals born at the same time).

Cheetahs have been kept in captivity since 3,000 BC when Sumerians, people who lived in present-day Iraq, began taming cheetahs for pets. In Egypt, during the time of the pharaohs, the cheetah was considered a goddess named "Mafdet." Pharaohs kept cheetahs as close companions, which symbolised protection by Mafdet. Symbols of the cheetah are found on ritual and magic knives, statues, and in paintings on royal tombs. The ancient Egyptians believed that the cheetah would carry the Pharaoh's soul to the after-world. The cheetah was admired for its speed, hunting ability, and beauty, and was honoured as a symbol of royalty and prestige.

As early as the fifth century, cheetahs were used by Italian nobles to hunt for sport. Adult cheetahs were caught in the wild, and tamed within a few months of capture. With their heads covered by a hood so they could not see the prey, cheetahs were led to the hunting area on a leash, in a cart, or on the back of a horse, sitting on a pillow behind the rider. The cheetah was taken near the prey, and the hood was removed. It then sprinted after the prey, and after catching it, the trainer rewarded the cheetah with a piece of meat. Cheetahs were commonly known as "hunting leopards," as people often confused the cheetah and the leopard. The use of this term may account for some of the confusion between the differences in the two cats: the cheetah and the leopard are two distinct species.

Russian princes in the 11th and 12th centuries also hunted with cheetahs. During the Renaissance (the time period from the 14th through the 16th centuries), every Italian family of nobility and many French nobles kept cheetahs for hunting. The Crusaders observed cheetahs being used to hunt gazelles in Syria and Palestine during this time. Marco Polo, the famous Italian explorer, brought back accounts of the hundreds of cheetahs kept by Kublai Khan, the founder of the Mongol dynasty in China, during the 13th century. Akbar, a Mongolian ruler of the 16th century, was said to have owned 9,000 cheetahs during his 49-year reign. He kept detailed records of his collection, which showed the birth of only one litter. Unfortunately, cheetahs do not reproduce well in captivity, and cubs suffer high mortality - none of Akbar's cubs lived. It was not until 1956 that the first cheetahs were born and raised in captivity. Because of the continuous wild capture of the Asian species of cheetahs for royalty and their failure to breed in captivity, the Asiatic cheetahs were sharply reduced, and cheetahs had to be exported from Africa to supply hunting cheetahs at court. In India, the cheetah was considered a prerequisite for royalty - in 1952 it was declared extinct. The Asian cheetah, which was distributed widely throughout the continent in eleven countries, is now nearly extinct. Today only 100 cheetahs are found in Asia, in the country of Iran.

The number of cheetahs has decreased from 100,000 at end of the 19th century to approximately 10,000 today. The cheetah has suffered from inbreeding, high infant mortality, loss of habitat, a reduction in its prey base, conflicts with livestock farming, and a reduced ability to survive in parks and reserves due to the presence of larger predators. Despite all these problems, the cheetah is the oldest of the big cats, and has survived the longest. If we can provide a habitat and a rich prey-base for cheetahs on the livestock farmlands of southern Africa, the cheetah's race will be one of survival, not extinction.

"A Cheetah Ready for the Hunt"
For centuries, Southwest Asian royalty trained cheetahs to hunt. The cats (like falcons) were fitted with leather hoods en route to hunting to minimise distraction. The cloak was for warmth.

Discussing

CHEETAH SPEED

If a human and a cheetah were to run the 100 metre sprint in the Olympics, who would win?

The cheetah is the fastest land mammal on earth and can easily outrun the world's fastest human sprinter. It can reach speeds of up to 110 km/h in seconds; however, it can only maintain this speed for 400-500 metres before it must stop and rest for up to 30 minutes.

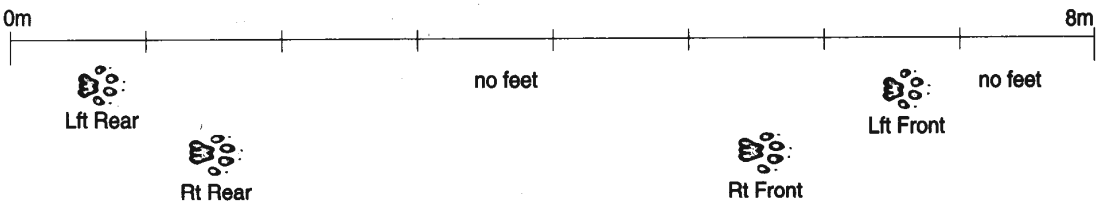
Without rest its body would overheat just like the engine of a car. While its speed is impressive, the cheetah's ability to accelerate is overwhelming. The cheetah can go from a complete standstill - or 0 km/h - to nearly 80 km/h in three seconds. It can actually outperform a sports car - a Ferrari needs four seconds to reach that speed!!

But how does the cheetah achieve this amazing speed?

The key to the cheetah's success is its increased stride length and stride frequency. A stride is one cycle of sequential footsteps, and the stride distance is measured between where one foot leaves the ground and the place where it touches the ground again. At top speed, the cheetah covers 7-8 metres in a single stride, and completes four strides per second.

The unique body structure -long legs, flexible spine, semi-retractable claws, and long tail- allows the cheetah to achieve this incredible speed. Its slender, long, light body creates less wind resistance when it runs. The cheetah's shoulder blades are not attached to its collar bone, allowing the shoulders to move freely and help increase the length of the stride. Its flexible spine allows for more extension and flexion during running. This helps the cheetah increase its stride length because its front and rear legs stretch farther apart when its body is fully extended, and its hips and shoulders move closer together when its feet are crossing. The cheetah's hip bones pivot during its stride for greater length. The tail helps the cheetah make sharp turns when running by stabilising its body and acting as a rudder. Its claws, which are semi-retractable, grip the ground for traction during chases.

Even the cheetah's heart, lungs, and liver have evolved for speed. Enlarged nostrils and sinuses increase the amount of air exchanged. The cheetah has large lungs to move oxygen into its system quickly and a big heart that increases its respiratory rate, enabling the blood to move from the lungs to the muscles rapidly so the cheetah does not get tired while running. During a chase, the cheetahs breathe at a rate of 60 to 150 breaths per minute.



The Cheetah's Stride at Top Speed

Conflicts with humans

CHEETAHS & FARMERS

Cheetahs are considered "top predators" - relatively large animals that are strictly meat eaters and are usually not preyed on by other animals. Cheetahs need a lot of room to find food and mates and to raise their young. In Namibia, a male cheetah's range is 800 km^2 to 1,500 km^2 and a female's 1,500 km^2 to 3,000 km^2. Because they need so much space, many predators are having trouble surviving as land is converted for human use.

With the development of agricultural farms in southern Africa, most of the large predators were eradicated. Today, of the large carnivores, only cheetahs and leopards are found on many livestock farmlands, and some farmers are still waging a war against these species because of their fear and misconceptions. Ninety-five percent of Namibia's, South Africa's, Botswana's and Zimbabwe's cheetahs live on commercial farmlands. The species' adaptation to farmland is due to the absence of other large predators and the increased water availability, which attracts wild prey populations. However, the cheetah's attraction to livestock and agricultural land poses a direct threat to the species' survival. Local declines in the cheetah population continue as farmers indiscriminately capture and remove cheetahs as vermin or "livestock killing" animals.

Loss of livestock and wild game to cheetahs is an emotional issue. Farmers perceive cheetahs as having an excessive economic impact on their livestock and wild game; however, research indicates that less livestock is taken by cheetahs than is thought. Farmers who employ effective livestock management practices and/or own farms with abundant wild game suffer minimal or no livestock loss to cheetahs. Unfortunately, a majority of the farmers have done little to reduce their predator problems in a non-lethal manner.

Cheetahs prefer wild game to livestock, but if cheetahs are unable to find or catch wild game they may take livestock. When the cheetah's natural prey populations decline, due to loss of habitat and/or increased livestock on lands, it may turn to catching goats, sheep, and calves. Livestock are easier prey than are wild animals because the domestic animals are much slower and not as capable of escaping a predator's attack.

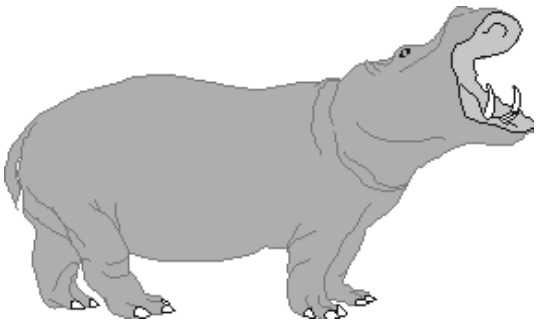
Indiscriminate capture by farmers may force some cheetahs to prey on domesticated animals because the cheetahs' ability to capture wild prey has been reduced. For example, juvenile cheetahs are poor hunters, and they rely on their mother to teach them to capture wild game. If they are separated from their mother (when farmers indiscriminately capture cheetahs, a mother may be separated from the juveniles), the young cheetahs may not be able to hunt wild prey and could turn to livestock as a food source.

Cheetahs are territorial animals. Male cheetahs will fight, sometimes to the death, to protect their territories. If a farmer has a cheetah on his/her property that does not kill livestock, it is better to keep the animal on the farmland. By removing cheetahs, farmers create vacuums in an area causing other cheetahs to fight for possession of the territory. Where previously only one cheetah had lived, two or three may now come to fill its place. Furthermore, a "problem" animal may replace the one that was trapped.

Social groupings among male cheetahs are also important to hunting behaviour. Male cheetahs from the same litter live in coalitions for their whole life, which increases breeding and hunting success. If any are live-trapped and removed from the coalition, those remaining may begin to hunt livestock because of the reduction in their coalition number.

A dilemma:

WHY DO SPECIES BECOME ENDANGERED?



Habitat loss

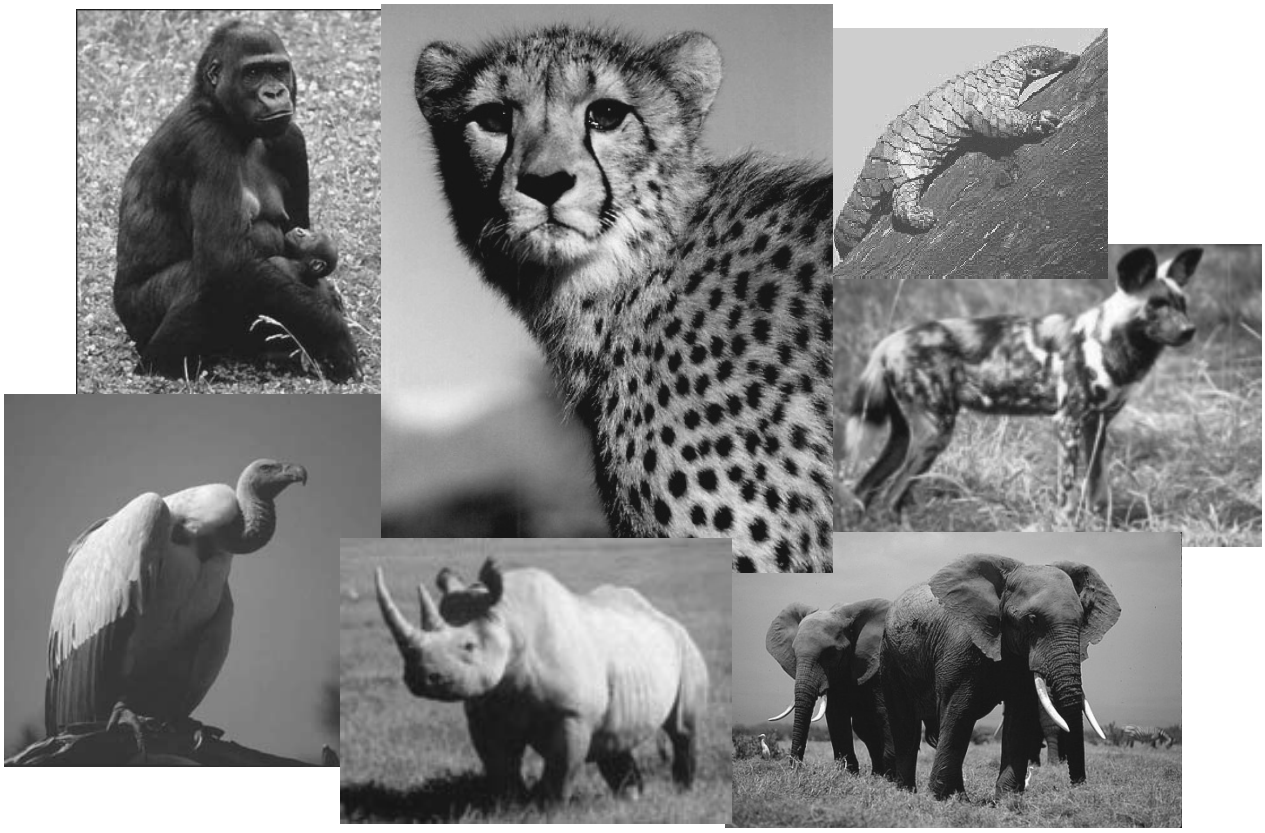
Introduced species

Pollution

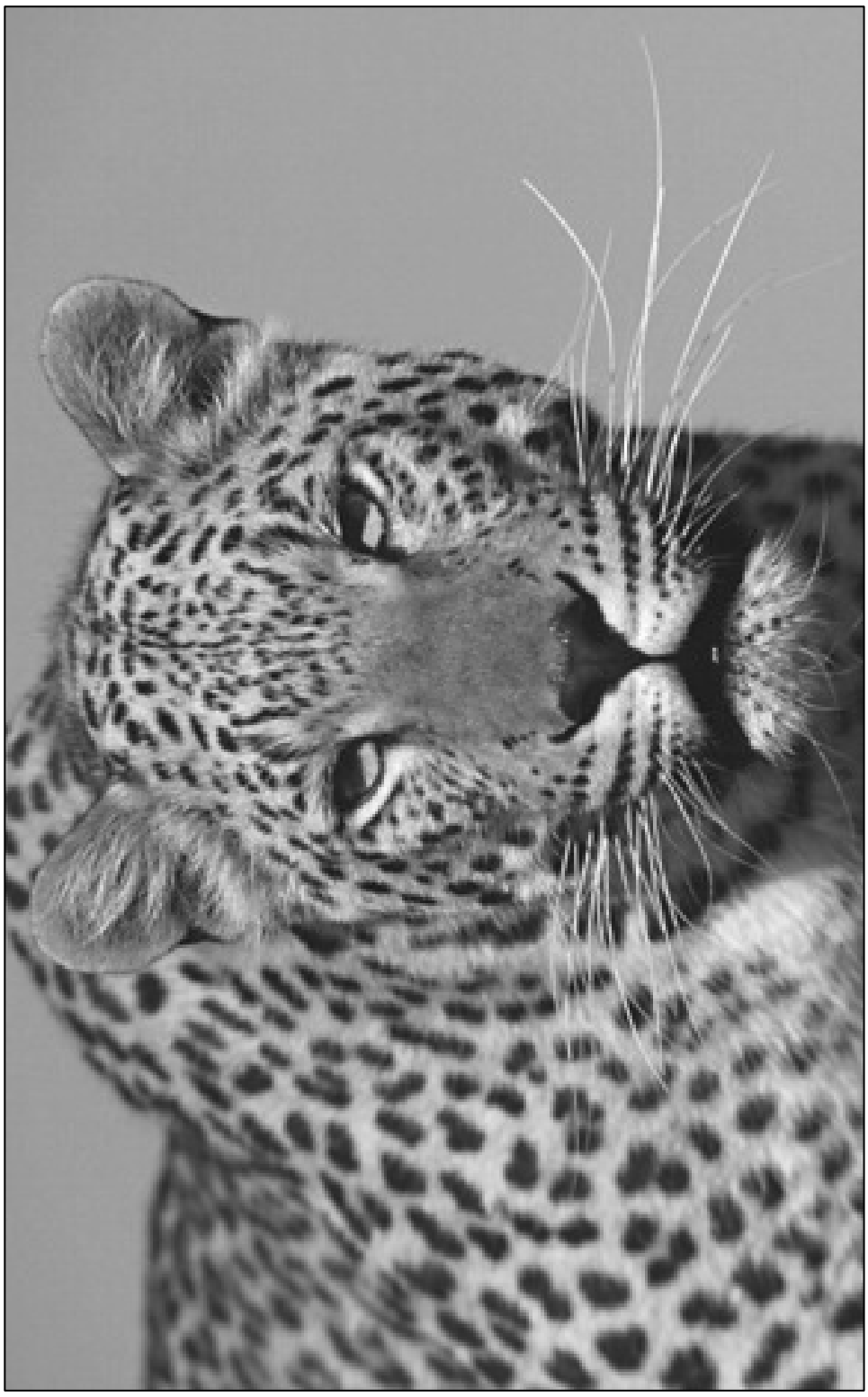
Population growth

Over-consumption

Some examples of endangered animals...



PHOTOGRAPHS



CONSERVATION ACTIVITIES

Learning Outcomes

Learners will go beyond simply 'knowing' about the cheetah and instead will take ACTION to help save the cheetah and its habitat for future generations.

Ideas for conservation activities:

1) Start an environmental club at your school. Meet weekly to discuss and plan environmental and conservation activities for your school and community.

2) Collect newspaper articles about wildlife conservation issues in your community and host a community discussion of problems and definite solutions.

3) Write letters to students at other schools or to students in other countries asking them about the wildlife in their area. Ask about what their government has done to help protect wild species. Share with the learners your favourite animals and why you think protecting them is important.

4) Host an essay contest at your school (using a conservation issue as the topic) and give prizes for the best essay.

5) Host a cheetah and/or wildlife art contest and give prizes for the winners.

6) Write letters to government officials or non-governmental organisations (like the Cheetah Conservation Fund) telling them about your concerns and perspectives on conservation. Ask what you can do to help.

7) Organise a Conservation Fair and create projects, songs and artwork to educate others about conservation issues around the world. Present the problems facing wildlife and their habitats and come up with your own solutions to the problems.

8) Read conservation/wildlife/environmental facts every morning at your school's morning assembly to better educate the learners at your school.

9) Prepare songs and have them ready to perform for any school event (awards ceremonies, sports activities, farewell parties, etc.)

10) Coordinate and plan activities for your entire school on Arbour Day and Earth Day. Plan in advance and raise funds, if necessary.

11) Plant trees on a regular basis

12) Become involved in your school's sciences and agriculture classes and hold regular discussions and forums on conservation issues.

GLOSSARY

ACCELERATION – the act of increasing speed.

ADAPTATION - changes in a structure, behaviour, body form or function, which help an animal or plant exist or survive in its environment. For example, the cheetah's claws do not fully retract so that they have better traction while running. The cheetah is the only cat species whose claws do not fully retract.

BEHAVIOUR – the manner of behaving (to act, react, function, perform) in a particular way.

BIOLOGICAL DIVERSITY (BIODIVERSITY) - the full variety of life on earth and all the processes and interactions that sustain it.

BINOCULAR VISION - eyes both looking forward. Aids in judging distances and depth perception.

BOTTLENECK - a severe population reduction, often resulting in inbreeding of the remaining animals.

BREED – (v) to produce offspring, to give birth

BUSH ENCROACHMENT - thick scrub growth that takes over areas of land, making them unsuitable for farming or grazing; caused by poor land-use practices.

CAMOUFLAGE - the colour or patterns of an animal's coat, its smell, or a noise that help it blend into or hide in the natural surroundings from predators or prey.

CAPTIVITY – the state or period of being confined or restrained.

CAPTIVE ANIMAL - any wild animal that lives inside a zoo or animal park or is kept as a pet.

CARNIVORE - a meat-eating animal.

CARRYING CAPACITY - a wildlife management term for the amount of living matter that can be supported by an area. It is usually expressed as a number indicating the population of any organism a designated area can support. The carrying capacity of an area can vary throughout the year and from year to year depending on conditions within the species habitat, such as food sources or climate.

CHEETAH - a long-legged, swift-running, slender, spotted African wild cat.

CHEETAH CONSERVATION FUND (CCF) - a registered Namibian Trust established in 1990 to conduct conservation research and education programs on the cheetah throughout its range. CCF strives to: (1) identify important components of farmland ecosystems that are necessary to sustain healthy cheetah populations; (2) develop conservation management plans that are beneficial to both cheetahs and farmers, thereby ensuring the species' survival on livestock farms; and (3) promote farm management practices that reduce livestock losses from predators.

C.I.T.E.S. - Convention on International Trade in Endangered Species of Wild Fauna and Flora. A treaty that monitors international trade in animals and plants. Over 175 countries have signed the treaty. Namibia, Botswana, Zimbabwe and South Africa are member nations, or "parties," to C.I.T.E.S.

CONFLICT – a battle, struggle, clash or disagreement

CONSERVATION - the act of protecting and preserving the environment and wild species.

CONSERVE - to make use of natural resources wisely and well, so as not to overuse them.

CONSUMPTIVE USE - any use of a plant or animal that involves an activity resulting in the loss of an individual organism. Examples include hunting, fishing, and trapping as well as indirect impacts such as habitat loss.

CUB – the name of some young carnivorous animals such as cheetahs, leopards and lions.

CULTIVATE – to promote the growth of, to improve and repair

DEPLETABLE RESOURCE - a natural resource, such as rainforests and soil, that takes thousands of years to be renewed.

DEPREDATION - in relation to wildlife damage, the act of destroying people's crops or domesticated animals.

DESERT – a dry region rendered barren due especially to low rainfall.

DISTRIBUTION – to divide and dispense out in portions

DIURNAL - animal that is active during the day.

DIVERSITY – the way in which things are different

DNA - Deoxyribonucleic Acid. A chemical found in the chromosomes of every cell. DNA is organised into genes, which form the genetic code. An individual receives half of his or her DNA from the mother through her egg and half from the father's sperm.

ECOLOGY - the study of the relationships between animals, plants, and the environment.

ECOSYSTEM - a system of plants, animals, and other organisms together with the nonliving components of their environment.

ENDANGERED SPECIES - a group of animals or plants in immediate danger of disappearing (becoming extinct) from the earth due to changes in their environment, loss of habitat, commercial trade and/or inability to adapt. Protective measures must be taken immediately or the species will become extinct. The cheetah is an endangered species.

ENDOSKELETON – an internal supportive skeleton; characteristic of vertebrates

ENVIRONMENT - all the physical, chemical, and biological factors that affect or make up an organism's surroundings.

EVOLVE – to be part or subject to a natural process of change and evolution

EXOSKELETON – an external, protective skeleton or supportive structure; characteristic of invertebrates such as insects.

EXTINCT - no longer found on the earth, no longer living, gone forever.

FACTOR – an item, thing or part that actively contributes to a result

FELIDAE - the scientific name for the family of animals that includes all cats.

FOOD CHAIN - the relationship between species where one species relies on another for its food. Herbivores are at the bottom of the chain and are preyed upon by animals called predators.

GAME ANIMAL -legal designation for animals that may be hunted under regulation.

GENE - a unit of DNA responsible for determining a specific heritable trait (for example, brown hair). Mammalian DNA contains about 100,000 genes.

GENERATION – the single stage of descent/ancestry; offspring having common parents

GENETIC DIVERSITY - the variety of genes in an organism or in a population.

GEOGRAPHICAL RANGE (also called RANGE) - the area where an individual species of plant or animal population lives.

HABITAT - the place where a species lives, the environment where a plant or animal naturally occurs.

HABITAT DESTRUCTION - changing an animal's natural habitat so that it can no longer survive there.

HERBIVORE - an animal that eats only plants.

HOME RANGE - the area where an animal roams during its normal activities; different than an animal's territory.

HUNT – to search through an area, as for game or prey

INBREEDING - occurs when close relatives (father and daughter, or brothers and sisters) mate. After several generations of inbreeding, animals may exhibit poor reproductive traits, ill health, and short life spans.

INTERSPECIFIC COMPETITION - competition between two different species for habitat, food, and other resources shared in common.

INSTINCT – the innate part of behaviour that is not learned

LEOPARD – a large feline mammal that lives in Africa and Asia. An aggressive, large cat that has spots that are brown in the middle with black spots surrounding it.

LIFE CYCLE - the continuous sequence of changes undergone by an organism from one primary form to the development of the same form again.

LION – a large carnivorous feline mammal of Africa that has tawny colour and males have a heavy mane.

LITTER - all the offspring of an animal produced at one birth.

LIVESTOCK – domestic animals such as cattle, goats, horses or sheep that are raised for home use or for profit.

MAMMAL - an animal that has hair on its body and is warm-blooded; most species bear live young instead of laying eggs. The young get milk from their mother's body until they are old enough to eat other food on their own.

MIGRATE – to move from countries or regions to settle in another

NOCTURNAL - an animal that is active at night.

NONCONSUMPTIVE USE - any use that does not directly kill an individual plant or animal, such as hiking or photographing.

NONGAME - all wildlife species that are not commonly hunted, killed, or consumed.

NUTRITION – the process of nourishing or being nourished; a living organism assimilates food and uses it for growth.

OFFSPRING – the progeny (children) of a person, animal or plant

OMNIVORE - an animal that eats plant material as well as meat.

ORGANISM - any life form, plant or animal, made of mutually dependent parts that maintain vital biological processes.

OVERGRAZE - grazing too much or allowing too many animals to graze on one area, thus damaging the soil and the future growth of plants and animals.

OVERSTOCK - putting too many animals in an area; exceeding the area's carrying capacity.

POACHING - the illegal catching or killing of animals, or the illegal collecting of plants.

POPULATION - the total number of individuals of a species that share the same geographic area.

PREDATION - the act of hunting and killing other animals for food.

PREDATOR - an animal that hunts and kills other animals for food.

PREFER – to select in preference of another; to value more highly; to like better

PREHISTORIC – belonging to the era before recorded history

PREY - an animal hunted by another for food; food for a predator.

PROTECT – to keep from harm, attack or injury; to guard

RAINFOREST – a dense evergreen forest in a tropical region with an annual rainfall of at least 100 inches.

RARE - a species not currently in danger of extinction, but of concern because of its low numbers.

REGION – a large and undefined portion of the earth's surface

RESERVE - an area of land set aside to conserve and protect animals and plants.

SAVANNAH - grassland with scattered trees or groups of trees.

SCAVENGER - an animal that feeds on dead animal flesh or other decaying organic matter.

SEMI-RETRACTABLE CLAWS - claws that can only be partially drawn back into sheaths.

SHELTER – something that provides cover of protection from the weather.

SLENDER – having little width in proportion to the height or length; thin

SPECIES - a group of animals or plants of the same kind that reproduce young like themselves. All organisms of the same kind. The leopard and cheetah are two different species of cats.

SPEED – the rate or a measure of the rate of motion.

SPOOR - the track or scent of an animal.

SPRINT – a short race at top speed.

STEWARDSHIP - the concept of responsible caretaking of the environment; based on the premise that we do not own resources, but are managers of resources and are responsible to future generations for their condition.

STRIDE – a 'step'; a single movement of the four legs of an animal completed when the legs return to their original position.

SURVIVAL – something that survives, endures or lives**.**

SUSCEPTIBLE – especially sensitive, highly impressionable.

SUSTAINABLE USE - the use of a plant, animal, or other life form in a way and at a rate that does not lead to the long-term decline of biological diversity, therefore maintaining the species' potential to meet the needs of present and future generations.

TERRITORY - the area of land in which an animal lives and defends as its home. Animals may have fierce fights over territorial land.

THREAT – an intention to inflict pain, injury, evil or harm on a person or thing.

THREATENED SPECIES - a species decreasing in numbers and range. Such animals and plants face serious problems and may become endangered if we do not help.

TIGER – a large carnivorous animal, cat, of Asia; has a tawny orange coat with black stripes.

UNIQUE – being the only one of its kind; something special.

VEGETATION – the plants of an area or region.

VULNERABLE SPECIES - a species that is limited in numbers or area but is not yet threatened or endangered.

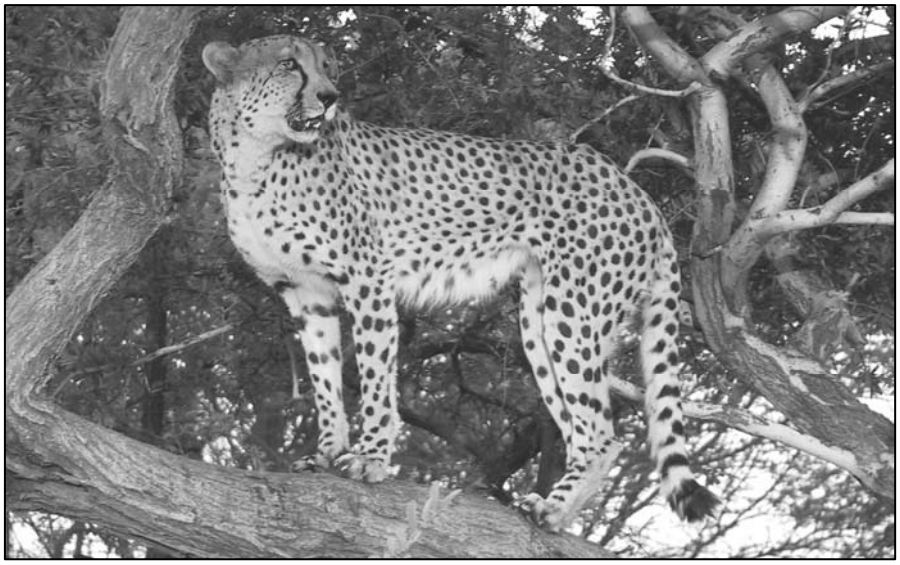
WARM-BLOODED - animal whose body temperature remains relatively constant. Animal that derives the heat energy it needs from the food it eats.

WETLAND – a lowland area such as a marsh or swamp that is saturated by moisture; especially thought of as a natural habitat of some wildlife.

WILDLIFE - the natural fauna and flora of an area. Animals that are not tamed or domesticated.

WILDLIFE CONSERVATION - the wise use of our world's natural resources, including minerals, plants, and animals, to prevent destruction of these resources and species extinction.

WILDLIFE MANAGEMENT - the application of scientific knowledge and technical skills to protect, conserve, limit, enhance, or extend the value of wildlife and its habitat.



Cheetah
CONSERVATION FUND

FNB

First National Bank

how can we help you?