

TEACHER ACTIVITY GUIDE



Grassland Ecosystems & *Black-footed Ferrets*



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Ferret Facts

Black-footed Ferret

Scientific name: *Mustela nigripes*
Class: Mammalia
Order: Carnivora
Family: Mustelidae
Genus: Mustela

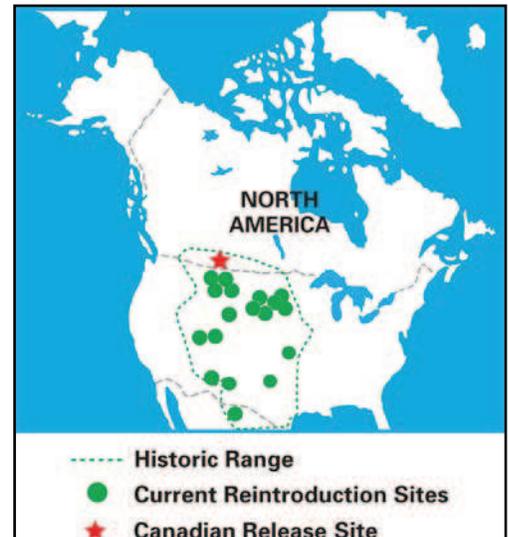


Distribution:

The black-footed ferret lived throughout North America's Great Plains before European settlement. In Canada they were historically found in southern Saskatchewan and Alberta. Thought to be globally extinct, a small population of 18 ferrets was discovered in Wyoming, USA in 1981. Today, because of ongoing international collaborations, ferrets have been reintroduced to the wild to 17 sites in the United States, one in Mexico and one in Canada. The first Canadian release of black-footed ferrets occurred in Grasslands National Park, Saskatchewan on October 2, 2009.

Status:

The black-footed ferret is listed as *extirpated* in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This means that they are extinct in the wild. This status will likely change once wildlife managers monitor the stability of the black-footed ferret population after subsequent releases in Canada. The black-footed ferret is classified as *endangered* by the International Union for the Conservation of Nature (IUCN) Red List.





Habitat:

- The black-footed ferret inhabits temperate grasslands where they eat prairie dogs and use their burrows and tunnels to sleep and raise their young. They once lived throughout North America's Great Plains across the United States, Mexico, and Canada. Today they only exist in one spot in Canada – Grasslands National Park, Saskatchewan.

Description:

- Native to North America, black-footed ferrets have long bodies and short black legs, a black tipped tail, and a black mask. Their coat is yellow-buff in colour with a paler underside.
- Adults have an average height of 15 cm and length of about 45 cm to 60 cm. They weigh on average 680g to 1130g. The black-footed ferret typically live up to 3-4 years in the wild or 8-9 years in captivity.
- They have short black legs with long claws on the front paws, suitable for digging
- They have large ears which gives them a strong sense of hearing.



Reproduction and Development:

- Breeding takes place from late January until early June. After a gestation period of 42-45 days, one to seven young are born in an enlarged prairie dog burrow.
- Baby ferrets, called kits, emerge from the burrow in early July and separate from the mother in September or early October by which time they are fully-grown.
- Both males and females are mature and able to reproduce at the age of one year.



Behaviour:

- Black-footed ferrets are nocturnal; most are active during the night, especially around dusk. They have occasionally been spotted in the very early hours of dawn.
- They can stay underground in a burrow up to a week during the winter months when they reduce their activity.



- Black-footed ferrets are solitary except during the breeding season. The males are territorial and will defend their territories against other males.
- Black-footed ferrets are agile and curious animals. They have a keen sense of smell, sight and hearing, and are skillful climbers. If threatened, ferrets use their sharp, non-retractable claws and powerful jaws to defend themselves.

Food:

- Black-footed ferrets are carnivorous and have a very specific diet. They are specialist predators of prairie dogs, which make up 90% of the ferret's diet. They are well adapted for hunting prairie dogs with their sharp teeth and strong jaws. Since prairie dogs are often larger than the ferret itself, ferrets often hunt prairie dogs while they're sleeping.
- On rare occasions ferrets will eat ground squirrels, other small rodents, cottontail rabbits, and birds.



Threats:

- Prairie dogs are considered pests by many and were previously hunted or poisoned. Their populations also decreased due to the loss of native prairie habitat through cultivation. By the early 1900s, the population of prairie dogs had decreased to small isolated populations. The prairie dog range in North America has declined by 98%. Prairie dogs are often mistaken for the much more abundant ground squirrel.
- Because black-footed ferrets rely so heavily on prairie dogs for food, they were thought to be extinct in the wild by the 1970s, due to loss of habitat and not enough food to eat.
- Diseases such as sylvatic plague, canine distemper, and human influenza have depleted black-footed ferret populations.
- Urban and sub-urban development is also threatening black-footed ferret habitat.

Recovery (how humans are helping the black-footed ferret):

- In the early 1980s a small population of black-footed ferrets was found in the wild. They were captured and brought into captivity to protect them and start a captive breeding program.



- The captive breeding program will supply ferrets for release into the wild, into their original range where enough prairie dogs exist to sustain ferret populations.

Facts:

- They are the only ferret native to North America.
- They originally evolved from ferrets found in Siberia 30,000 - 45,000 years ago when they crossed the Bering Strait.
- Ferrets belong to the Mustelid family which also includes weasels, mink, badgers, wolverines, and otters.
- Black-footed ferrets have very strong jaws which they use for hunting.
- They can be very vocal and communicate by hissing, barking, chatter-barking, and shrieking.
- Their long bodies are extremely flexible and can even turn around in a small tunnel.
- Black-footed ferrets have anal glands that can emit a strong foul odour (called musk) when threatened. They also use these scent glands to mark territories and food stores, and attract mates.





The Plight of the Black Footed Ferret

A Brief Background on Ferrets

The black-footed ferret (*Mustela nigripes*) is the only ferret species native to North America. Historically, they inhabited the Great Plains of the United States, Canada, and Mexico. They are highly dependent on the black-tailed prairie dog for food and for the use of their burrows, in which the ferrets rest and raise their young. Before European settlement, prairie dog colonies occupied **20%** of the entire western rangeland, providing ample habitat for the black-footed ferret.

What Happened to all the Ferrets?

With human settlement of the prairie ecosystem came the conversion of prairie-dog towns to agricultural fields. Prairie dogs were nearly driven to extinction as the population declined by **98%**. In addition to losing their primary food supply, ferrets were hit hard by diseases including canine distemper virus and sylvatic plague. These factors combined to make the black-footed ferret one of the most endangered animals on the planet.

Black-footed ferret numbers dropped steadily throughout the 20th century and by 1974 the species was thought to be globally extinct. In 1981, a family dog brought home a ferret to a farm in the state of Wyoming, USA. Authorities found another 18 ferrets in the area, captured them and used them as the founding members of a captive breeding and recovery program.



Captive Breeding and Release

Several zoos and facilities in North America formed the Black-footed Ferret Recovery Implementation Team. Ferrets are bred in captivity and those destined for release are brought to an outdoor, pre-conditioning facility where they learn to hunt prairie dogs and live like wild ferrets. Since reintroductions began in 1991, black-footed ferrets have been released at 17 sites in the United States, one site in Mexico and one site in Canada.

Released black-footed ferrets are monitored using microchips that have been implanted under their skin. Field crews conduct spotlight surveys at night and identify ferrets by their distinctive green eye shine. Once an inhabited ferret burrow is discovered, a microchip reader is placed over the burrow entrance and identifies the ferret as it passes through. Monitoring ferret populations in this way has allowed scientists to estimate the current wild population to be near **1,000** individuals.

A Cooperative Approach to Success

The **Black-footed Ferret/Black-tailed Prairie Dog Recovery Team** is working to establish stable prairie dog populations in the areas where the ferrets are reintroduced. Another important step in re-establishing black-footed ferrets is restoring prairie ecosystems as a whole. The long-term survival of the black-footed ferret will be dependent on their ability, in addition to the ability of prairie dogs, to produce self-sustaining populations.



Curriculum Links

Grade 1: Needs and Characteristics of Living Things

Overall Expectations

- Assess the role of humans in maintaining a healthy environment
- Investigate needs and characteristics of plants and animals, including humans
- Demonstrate an understanding of the basic needs and characteristics of plants and animals, including humans

Relating Science and Technology to Society and the Environment

- Describe changes or problems that could result from the loss of some kinds of living things that are part of everyday life

Black-footed ferrets are predators in a grassland ecosystem. They prey primarily on prairie dogs but also eat ground squirrels, other rodents, cottontail rabbits, and birds. With the decreasing populations of prairie dogs resulting from agriculture and human interactions, the population of black-footed ferrets was directly impacted.

Developing Investigation and Communication Skills

- Investigate and compare the basic needs of humans and other living things, including the need for air, water, food, warmth, and space, using a variety of methods and resources

Black-footed ferrets need:

- ✓ Prairie dogs as a main source of food
- ✓ Prairie grassland with pre-existing tunnels (dug by prairie dogs and other rodents) to raise young and stay throughout the year

Agriculture and urban development of the prairies have impacted the viability of the black-footed ferret by reducing food sources as well as habitat.

- Investigate and compare the physical characteristics of a variety of plants and animals, including humans



- Investigate characteristics of parts of the human body, including the five sensory organs, and explain how their characteristics help humans meet their needs and explore the world around them.

Understanding Basic Concepts

- Identify environment as the area in which something or someone exists or lives
Black-footed ferrets live in burrows or tunnels underground in grassland prairies. Underground, the ferrets are protected from predators, keep warm during the cold weather and winters, and safely raise their young.
- Identify the physical characteristics of a variety of plants and animals
- Identify what living things provide for other living things

Grade 2: Growth and Change in Animals

Overall Expectation

- Assess ways in which animals have an impact on society and the environment, and ways in which humans have an impact upon animals and the places where they live;
- Investigate similarities and differences in the characteristics of various animals;
- Demonstrate an understanding that animals grow and change and have distinct characteristics.

Relating Science and Technology to Society and the Environment

- Identify positive and negative impacts that different kinds of human activity have on animals and where they live

Through the partnership of Parks Canada, Toronto Zoo and others, the black-footed ferrets were reintroduced into the Grasslands National Park on October 2, 2009. The black-footed ferrets were extirpated from Canada in the 1930s due to human activities impacting prairie dog populations and reduction of habitat.

Developing Investigation and Communication Skills

- Observe and compare the physical characteristics and the behavioural characteristics of a variety of animals, including insects



Black-footed ferrets are mammals that have brown-yellowish fur to help them camouflage in their grassland habitat. Their long slender body is the perfect shape for living in underground burrows.

They are a nocturnal animal that hunts primarily in the dusk hours.

- Investigate the ways in which a variety of animals adapt to their environment, using various methods

Understanding Basic Concepts

- Identify and describe major physical characteristics of different types of animals
- Describe an adaptation as a characteristic body part, shape, or behaviour that helps a plant or animal survive in its environment

The long slender body shape and colouration of the black-footed ferret are adaptations for survival in the grassland habitat. The ability to burrow underground provides shelter from nocturnal predators such as owls and coyotes, which hunt when ferrets are most active

Grade 4: Habitats and Communities

Overall Expectations

- Analyze the effects of human activities on habitats and communities
- Investigate the interdependence of plants and animals within specific habitats and communities
- Demonstrate an understanding of habitats and communities and the relationships among the plants and animals that live in them

Relating Science and Technology to Society and the Environment

- Identify reasons for the depletion or extinction of a plant or animal species

As the prairies became settled, populations of prairie dogs declined due to their eradication by humans and their habitat being altered by development and agricultural practices. The declining food source contributed to the extirpation of the black-footed ferret in Canada.

Developing Investigation and Communication Skills

- Build food chains consisting of different plants and animals, including humans



- Use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs.
- Use appropriate science and technology vocabulary, including habitat, population, community, adaptation and food chain, in oral and written communication.

Understanding Basic Concepts

- Identify factors that affect the ability of plants and animals to survive in a specific habitat
 - Black-footed ferrets depend primarily on prairie dogs for food (see food chain above) as well as a specific grassland habitat (which has pre-existing tunnels dug by burrowing rodents), which ferrets depend on for shelter and protection.
- Classify organisms, including humans, according to their role in the food chain
 - Black-footed ferrets are secondary consumers.
- Identify animals that are carnivores, herbivores, or omnivores
 - Black-footed ferrets are secondary consumers and carnivores, eating primarily prairie dogs but will occasionally eat other rodents, ground squirrels, and birds.
- Describe structural adaptations that allow plants and animals to survive in specific habitats
 - Black-footed ferrets have many physical adaptations that help it survive in the grassland habitat.
- Explain why changes in the environment have a greater impact on specialized species than on generalized species
 - The specialized diet of the black-footed ferret created a situation where its survivability was threatened with the decline of prairie dog populations. A carnivore that enjoys a more varied diet would potentially be able to withstand such changes to prey populations without such a drastic impact on its survival.

Grade 6: Biodiversity

Overall Expectations

- Assess human impacts on biodiversity, and identify ways of preserving biodiversity
- Investigate the characteristics of living things, and classify diverse organisms according to specific characteristics



- Demonstrate an understanding of biodiversity, its contributions to the stability of natural systems, and its benefit to humans

Relating Science and Technology to Society and the Environment

- Assess the benefits that human societies derive from biodiversity and the problems that occur when biodiversity is diminished

Developing Investigation and Communication Skills

- Use appropriate science and technology vocabulary, including *classification, biodiversity, natural community, interrelationships, vertebrate, invertebrate, stability, characteristics, and organism*, in oral and written communication

Understanding Basic Concepts

- Demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plant and animal, among species of plants and animals in communities, and among communities and the physical landscapes that support them
- Describe ways in which biodiversity within species is important for maintaining the resilience of those species
- Describe ways in which biodiversity within and among communities is important for maintaining the resilience of these communities
- Describe interrelationships within species, between species, and between species and their environment, and explain how these interrelationships sustain biodiversity



Ferret Lesson Plans

GRADE 2 LESSON #1

Where do Black-footed Ferrets Live?

MATERIALS

Copy of Where do Black-footed Ferrets Live?
Student response sheet

METHOD

Introduce to students that they will be learning about the black-footed ferret, an endangered animal that lives in the prairie grassland areas of the USA, Mexico, and western Canada. It would be helpful to show students pictures of the black-footed ferret and the grassland or prairie ecosystem. Please see the following websites; www.blackfootedferret.org; www.pc.gc.ca/eng/pn-np/sk/grasslands/edu/edu1/f.aspx

Read the story, Where Do Black-footed Ferrets Live? aloud to students or as a shared reading activity. You may give each student a copy of the text page, or you may wish to display it on chart paper and add it to a bulletin board.

Read instructions on the student response sheet aloud to students.

Question 1. Discuss with students that black-footed ferrets are a member of the mammal group. With this knowledge shared, discuss the stages of growth for the kit and elicit from students information about how kits live during each stage of life; for each stage ask students questions like where do they live and how or what do they eat?

Sample answers:

- Newborn kits - stay in the burrow close to mother
 - are fed on mother's milk
- Young kits - begin to leave burrow
 - explore area near burrow
 - fed mother's milk and begin to eat meat
- Older kits - begin to move farther from burrow
 - follow mother when hunting
 - eat animals caught by mother
- Young adults - move to new areas, find empty burrows for themselves
 - begin to hunt on their own



Question 2. Make it clear to students that the black-footed ferret lives in the prairies because this is where it finds all it needs to survive; food (prairie dogs), shelter (prairie dog burrows), and space (a place to raise its young).

Where Do Black-footed Ferrets Live?

Black-footed ferrets live in grassland areas where they hunt prairie dogs and use their burrows and tunnels to hide, sleep, and raise their babies. Grassland areas, or prairies, are large, flat areas that have very few trees and mostly grass species. The black-footed ferret is a type of weasel and is smaller and more slender than a cat. They have yellowish-brown fur, black feet, a black tail tip, and a black mask like a raccoon. Female ferrets have from one to seven babies in the spring. The babies, called kits, are born in a prairie dog burrow that the ferrets have taken over. Since ferrets are mammals, the kits are fed on their mother's milk for the first part of their lives. After several weeks the kits will come out of the burrow and begin to explore areas nearby. During the summer they learn to hunt and to escape danger from other animals by following and watching their mother. By October, most kits have grown to full size and are ready to live on their own.



Name: _____

Where Do Black-footed Ferrets Live?

1) Draw one of the stages in the life of a black-footed ferret in the space below.

2) In the space below explain why you think that the prairie is a good place for the black-footed ferret to live.



GRADE 2 LESSON #2

How are Black-footed Ferrets Adapted to Their Environment

MATERIALS

Copy of How are Black-footed Ferrets Adapted to Their Environment?
Student response sheet

METHOD

Review with students concepts covered in lesson 2.1, namely;

- black-footed ferrets are mammals that live in grassland areas that have few trees
- they hunt prairie dogs and use prairie dog burrows as their homes
- young are raised in the burrows and learn to survive by watching their mother

Tell students that in this lesson we will learn more about how black-footed ferrets live. Introduce the idea that every animal has ways that they live and behave that help them to survive in their own environment. The things that help the black-footed ferret survive in the prairie grasslands are called adaptations.

Read the student text How are Black-footed Ferrets Adapted to Their Environment together as a shared reading activity (make and distribute copies of the student text or copy it onto chart paper and retain for later reference). You may need to review vocabulary with students before hand; camouflage, predator, badger, keen, burrows.

Discuss the adaptations of the black-footed ferret to its environment. Go through the text again and guide students in identifying things that are part of the ferret's physical make-up, its appearance, or behaviour that help it survive. Guiding questions would be things like...

- Does this help the ferret to get food? How?
- Does this help the ferret to raise its young? How?
- Does this help the ferret avoid being caught by other animals that might hunt it? How?

As this discussion progresses note adaptations in chart form using a table. A completed table is included for reference. You may wish to complete a class chart or use the included student response page to have students complete their own chart.

In concluding the lesson, note that the black-footed ferret is well adapted to its environment and that this is what we see when we study any plant or animal in nature.



How are Black-footed Ferrets Adapted to Their Environment?

Black-footed ferrets have long, slender bodies with sharp claws. This helps them crawl in and out of burrows and tunnels where they live. Ferrets have adapted to hunt prairie dogs at night while the prairie dogs are sleeping. They have very good eyesight, hearing, and a keen sense of smell which helps them locate the prairie dogs in their tunnels in the dark. They use their sharp teeth and claws to catch their prey. Ferrets have yellowish-brown fur which acts as camouflage next to the dry grasses and soil around their burrows. Since ferrets are nocturnal, their main predators are species that are also most active at night, such as owls, badgers and coyotes. To protect themselves from these predators, they instinctively move from burrow to burrow for coverage. They also make sounds and signals to each other to warn of danger so that they can escape by going into their burrows.



Black-footed Ferret Adaptations

Completed Chart:

Body shape, appearance	Where it lives	Behaviour
<ul style="list-style-type: none"> - long, slim body is good for crawling in tunnels - sharp claws are good for digging and hunting - sharp teeth are good for hunting - good eyesight, smell, and hearing are good for hunting and escaping predators - yellowish-brown fur blends in with dirt and dry grass (camouflage) to help avoid being caught by predators 	<ul style="list-style-type: none"> - lives on the prairie where there are large numbers of prairie dogs - uses prairie dog tunnels and burrows for protection, shelter, and to raise young - wide open spaces make it easy to see predators 	<ul style="list-style-type: none"> - active at night so they can hunt prairie dogs. - when in danger, it hides in underground burrows



Name: _____

Black-footed Ferret Adaptations

Body shape, appearance	Where it lives	Behaviour



GRADE 2 LESSON #3

What is Extinction?**MATERIALS**Copy of What is Extinction?

Student Activities sheet

METHOD

Review with students that black-footed ferrets are adapted to life in the grassland ecosystem. This means that the way they are built (physical adaptations) and the way they behave (behavioural adaptations) allow them to find food, raise their babies, and live in safety in the prairie ecosystem.

Ask students what they think would happen if a black-footed ferret could no longer find food (prairie dogs)? Lead them to understand that the ferret's survival and its ability to raise young would be at risk if it could not find sufficient food.

Ask students what they think would happen if the black-footed ferret could no longer find burrows for hiding and raising its young? Lead them to understand that without tunnels as shelter the ferret and its young would be in danger from other animals such as owls, coyotes, and other predators.

Read the first section of *What is Extinction?* together as a shared reading activity (make and distribute copies of the student text or copy it onto chart paper and retain for later reference). Read the box on extinction.

Help students understand that humans should be concerned for all of the plants and animals in the world, and that the extinction of a species is a very sad thing – it means the balance of nature has been upset in a way that can never be repaired. As humans we should do all we can to try to prevent this from happening.

Read the remainder of the text. Discuss with students how ferrets might be reintroduced into the wild. How could zookeepers prepare young ferrets to live on their own?

As part of the preparation, young ferrets are put in pre-conditioning pens where they learn to hunt prairie dogs. They also learn to use burrows as shelter and as a way to escape danger.

- What would zookeepers look for when trying to find places to release the black-footed ferrets?

Zookeepers would want to find an area with a good population of prairie dogs. They would also want this area to be protected, meaning that people would not make farms or build houses in the area, leaving it in its natural state.

Have students complete one of the response activities listed on the following page.



What Is Extinction?

In Canada, much of the prairie grassland has been turned into farms. Farmers usually see burrowing rodents as pests because they dig holes in grazing areas, fields, and disturb crops. In the United States, farmers often try to get rid of prairie dogs and this means that there are fewer prairie dogs in many parts of the prairies. As prairie dogs disappeared the black-footed ferret had no food and also no tunnels or burrows to use as shelter. The black-footed ferret was thought to be extinct.

Extinction - When an animal becomes extinct there are no more of that animal on earth; it is gone forever.

A small population of black-footed ferrets was found in Wyoming, USA in 1981 and 18 individuals were brought into captivity to start a breeding program.

Since 1992, the Toronto Zoo has helped the black-footed ferret come back from near extinction. The Zoo has bred hundreds of ferrets and the babies from these ferrets have been released into prairie grassland areas where the ferret once lived. In this way the black-footed ferret can be returned to its natural place in the grassland ecosystem.



What is Extinction? Student Activities

1. Design a sign to be posted on a zoo exhibit that discusses how black-footed ferrets are being raised for reintroduction into the grassland ecosystem. The poster should include things like the name and a picture of the animal, how it lives, and should state that it is endangered. It should also mention where the animal lives and why it is endangered.
2. Design a sign to be posted in an area where the black-footed ferret is being reintroduced. The sign should explain a bit about the animal (its name, how it lives, and that it is endangered). It should also mention that the area must be left undisturbed so that the ferrets can get used to their new home.
3. Draw a picture of black-footed ferrets being released into the grassland ecosystem. Think about how the ferrets would be carried (in small covered cages), how they would be released (cages placed at release sites in the grasslands where prairie dog burrows are easy to find), and how might scientists check that newly released ferrets are surviving (nocturnal – **spotlighting** at night).

Spotlighting is when scientists go out at night and shine flashlights looking for the green eyeshine of the ferrets. They then watch and see what burrow the ferret goes in. They place a microchip reader around the hole so when the ferret pops his head out (ferrets have microchips placed under their skin before release), they can identify the individual ferret. In summer, scientists will also locate the kits and vaccinate them for potential diseases.



GRADE 4 LESSON #1

Ecosystem Producers and Consumers

MATERIALS

Copy of Ecosystem Producers and Consumers

Activity sheet, Apply Your Knowledge – The Prairie Grassland Ecosystem

Student copy of Grassland Species

Index cards, Bristol board, or half sheets of white paper

METHOD

This lesson covers material on producers and consumers with specific reference to the prairie grassland ecosystem and the endangered mammal, the black-footed ferret.

- 1) Copy student pages Ecosystem Producers and Consumers and prepare materials for species identification cards (Apply Your Knowledge – The Prairie Grassland Ecosystem, Activity 1).
- 2) Remind students that when we talk about **habitats** we mean places where a plant or animal lives. When we say **ecosystem** we mean a place where a number of different plant and animal species live (an ecosystem may contain a number of habitats). To familiarize students with the prairie grassland ecosystem it may help to look at photos and have students describe visible features (e.g. flat with rolling hills, few trees, vegetation is mostly grasses, climate is dry). Helpful images are located at www.blackfootedferret.org
- 3) Read student pages together or assign them as independent reading and discuss. Give students time to record food eaten yesterday. It may be helpful to post lesson vocabulary and definitions for future reference (chlorophyll, photosynthesis, producer, consumer, carnivore, herbivore, and omnivore). Guide students in selecting organisms to serve as examples for each; carnivores - wolves, foxes, ferrets, hawks; herbivores - deer, moose, grasshoppers; omnivores - bears, raccoons, mice.
- 4) To create species identification cards distribute the resource page provided (Grassland Species). It contains information and web resources on a number of grassland organisms. The goal of this activity is for each student to create a number of species cards that can later be organized into food chains. Each student should choose a couple of plant species and a couple of animal species (alternatively students can be paired up for this activity). Have students complete cards as directed in the activity instructions. Students can mix and match cards for activities in later lessons, but encourage students to pick different kinds of consumers when deciding which animal species to profile (don't choose all carnivores or all herbivores). Students should put their names on these and hand them in or keep them in a safe place for the next lesson on food chains.
- 5) For the consumer (What type of consumer are you?) question - students may need guidance in identifying foods as originating from plants or animals.



Ecosystem Producers and Consumers

Quick Check

Humans need energy for running, working, and even thinking. This energy comes from what we eat and drink. What did you eat and drink yesterday? Make a list in the space below.

All living things need energy to survive. Animals, like humans, get this energy from food. Plants are living things but most plants don't eat the way animals do. How do plants get energy?

Plant Energy

Green plants use energy from the sun to turn water and carbon dioxide into food they can use to live. They do this using a special chemical called **chlorophyll**. This process of trapping energy from the sun to produce simple sugars (plant food) is called **photosynthesis**. The sugars produced in photosynthesis are used by the plant for growth, tissue repair, and reproduction. Plants are called **producers** because they make (**produce**) **their own food**.

Animal Energy

All animals are called **consumers** because they get their energy by eating (consuming) other living things. There are 3 types of consumers;

1) Carnivores are meat eaters - they eat only other animals.

Examples:

2) Herbivores eat only plants.

Examples:

3) Omnivores eat both plants and animals

Examples:



Apply Your Knowledge - The Prairie Grassland Ecosystem

1) Use the student resource page provided (Grassland Species) to create species identification cards for plants and animals living in the prairie grassland ecosystem. Each card should contain the following;

- the name of the organism
- a colour drawing of the animal or plant
- point form notes on how it lives (e.g., appearance, size, colour, food)

Create cards for 2 or 3 plants and 2 or 3 animals (a herbivore, a carnivore, etc.)

2) On each card identify the organism as a producer or consumer (use block letters at the bottom of each card). Further identify consumers as herbivores, carnivores, or omnivores.

For example the black-footed ferret would have CONSUMER - CARNIVORE at the bottom of the card. Colour code your species cards (colour the border or background) as follows: producers (green), herbivores (yellow), omnivores (blue), carnivores (red).

3) What type of consumer are you? Look at the foods eaten yesterday that you listed in **Quick Check**. Decide if each one of them came from a plant or an animal. Use this information to explain what kind of consumer you are.



Grassland Species

<p><u>Spear Grass</u></p> <ul style="list-style-type: none"> - a slender grass with spiked seed pods - grows 30-70 cm tall - grows in dry areas and on hillsides <p>www.naturenorth.com/summer/mgp/Fmixgrss.html</p>	<p><u>Blue Grama</u></p> <ul style="list-style-type: none"> - medium height grass (20-50 cm tall), seed pod looks like the head of a toothbrush - grows well in dry areas and during periods of little rain <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>	<p><u>Ferruginous Hawk</u></p> <ul style="list-style-type: none"> - a large hawk (60 cm tall) - nests in isolated trees - eats prairie dogs as well as other small mammals, birds and reptiles <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>
<p><u>Black-footed Ferret</u></p> <ul style="list-style-type: none"> - slender weasel-like mammal up to 60 cm in length - lives in prairie dog burrows - eats mainly prairie dogs but may also catch other small mammals <p>Google images</p>	<p><u>Burrowing Owl</u></p> <ul style="list-style-type: none"> - small owl (25 cm tall) that nests below ground in abandoned prairie dog burrows - eats locusts, grasshoppers, other insects and small mammals <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>	<p><u>June Grass</u></p> <ul style="list-style-type: none"> - narrow-leaved grass up to 60 cm tall that grows in spring (dormant during hot, dry summer) - leaves are low on stem allowing it to survive grazing <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>
<p><u>Sagebrush</u></p> <ul style="list-style-type: none"> - drought-tolerant bush 30 cm-1 m tall - contains chemicals that make it taste bad to some animals (some animals have evolved an ability to eat it) <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>	<p><u>Loggerhead Shrike</u></p> <ul style="list-style-type: none"> - robin-sized bird that feeds on grasshoppers, other insects, and small mammals - will stick its prey on a spike or thorn while eating - nests in shrubs and trees <p>www.naturenorth.com/summer/mgp/Fmixgrss.html</p>	<p><u>Purple Prairie Clover</u></p> <ul style="list-style-type: none"> - grows in thick patches with low, spreading stems - adds nutrients to soil, improving it for other plants - up to 40 cm high and blooms in mid-July <p>www.naturenorth.com/summer/wildflwr/wldflr2.html</p>
<p><u>Black-tailed Prairie Dog</u></p> <ul style="list-style-type: none"> - social mammal up to 45 cm in length that lives in large groups, creating underground burrows - eats grasses, roots, leaves, and flowers <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>	<p><u>Prairie Crocus</u></p> <ul style="list-style-type: none"> - white flower with a yellow centre that blooms early in spring - up to 40 cm in height <p>naturenorth.com/spring/flora/crocus/Prairie_Crocus.html</p>	<p><u>Prairie (Western) Rattlesnake</u></p> <ul style="list-style-type: none"> - poisonous snake with a rattle tail used to warn larger animals - up to 115 cm long - it hunts at night using a heat sensor - eats small mammals <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>
<p><u>Pronghorn</u></p> <ul style="list-style-type: none"> - deer-sized, it is the fastest land animal in North America - eats grasses and sagebrush - adults have few predators but young are taken by hawks <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>	<p><u>Locust</u></p> <ul style="list-style-type: none"> - looks like a large grasshopper - feed on grasses - sometimes swarm, causing crop damage <p>Google images</p>	<p><u>Sagebrush Vole</u></p> <ul style="list-style-type: none"> - small mammal (12 cm long) with dull grey fur that lives in underground burrows - feeds on grasses and leaves in summer, sagebrush bark and twigs in winter <p>Google images</p>
<p><u>Prairie Deer Mouse</u></p> <ul style="list-style-type: none"> - small thumb-sized mammal with reddish-brown fur - active at night and feeds on seeds, fruit, mushrooms, insects and spiders - lives in underground burrows <p>Google images</p>	<p><u>Western Kingbird</u></p> <ul style="list-style-type: none"> - robin-sized bird that lives in dry, grassland areas - eats insects and berries - nests in trees <p>Google images</p>	<p><u>Darkling Beetle</u></p> <ul style="list-style-type: none"> - black beetle, 2 cm in length - lives in open, dry prairie areas - feeds on leaves, roots and stems of different prairie plants - when disturbed it gives off an unpleasant odour <p>www.royalsaskmuseum.ca/education/Kids_Domain</p>



GRADE 4 LESSON #2

Plant and Animal Connections

MATERIALS

Copy of Plant and Animal Connections

METHOD

This lesson deals with the concept of energy transfer within a food chain with specific reference to food chains found in the prairie grassland ecosystem.

- 1) Make copies of the student pages for Plant and Animal Connections for each student. Students will also use their species identification cards prepared in lesson 4.1.

- 2) Review with students that a **habitat** is the place where an animal or plant lives. Also review the meaning of **herbivore** (plant-eater), **carnivore** (meat-eater), and **omnivore** (animal that eats plants and animals). Assign quick check. Prompt students to think of visible plants (trees, shrubs, flowers, grass, weeds), and animals (bird species, insect life, animals that live on or under the surface of the soil like earthworms or snails). Help students to identify animals as herbivores, carnivores, or omnivores.

- 3) Read together (or assign as independent reading) the student pages. It may help to display important words (**community, predator, prey**) and definitions for reference.

- 4) Try creating a food chain with the class as a whole.

- 5) When discussing food chains be sure to emphasize that the arrows indicate the flow of energy; energy from the grasses becomes part of the locust when the grasses are consumed.

- 6) In the Apply Your Knowledge section have students complete the table for organisms found in each food chain.

prairie grasses → locust → burrowing owl

Organism	Producer or Consumer	Herbivore, Carnivore, or Omnivore
grasses	producer	
locust	consumer	Herbivore
burrowing owl	consumer	Carnivore



prairie grasses → black-tailed prairie dog → black footed ferret → hawk

Organism	Producer or Consumer	Herbivore, Carnivore, or Omnivore
grasses	producer	
prairie dog	consumer	Herbivore
black-footed ferret	consumer	Carnivore
hawk	consumer	Carnivore

7) In Applying your Knowledge question 2 students are asked to build food chains using species cards for grassland organisms prepared in lessons 4.1. As students create food chains monitor that they begin the chain with a producer, and that animals are in an order that makes sense (herbivores are eating plants, carnivores are eating animals, etc.). Food chains can be recorded in the space provided. As mentioned in question 3 you may also wish to display some of the food chains created by mounting species cards connected with arrows to show energy flow.



Plant and Animal Connections

Quick Check

Many plants and animal species share habitats. Make a list of some plants and animals that live in and around your school yard. Are the animals mentioned herbivores, carnivores, or omnivores?

Communities and Food Chains

A group of plants and animals living in the same space is called a **community**. Within any community there are many food relationships. **Herbivores** eat plants to survive while other animals (**carnivores** and **omnivores**) hunt for their food. Animals that hunt for their food are known as **predators**, while those that are hunted are called **prey**.

When a plant or animal is eaten, the energy in that plant or animal becomes energy for the consumer (the animal that eats it). For example, in the grassland habitat, there are many plants capturing and storing energy from the sun, as they use it to make their own food. A locust is a herbivore that eats some of these plants, using the energy stored in the plant for its own survival needs. If a burrowing owl catches and eats the locust, the stored energy from the plant passes from the locust to the owl. This food relationship is called a food chain and can be shown in a diagram;

prairie grasses → locust → burrowing owl

Food chains link the producers and consumers in a community. Here is another example of a food chain found in the prairie grassland community

prairie grasses → black-tailed prairie dog → black footed ferret → owl



Apply Your Knowledge - Grassland Food Chains

1) Look at the sample food chains given. For each food chain identify the producers and consumers. Identify each consumer as a herbivore, carnivore, or omnivore.

prairie grasses → locust → burrowing owl

Organism	Producer or Consumer	Herbivore, Carnivore, or Omnivore

prairie grasses → black-tailed prairie dog → black footed ferret → owl

Organism	Producer or Consumer	Herbivore, Carnivore, or Omnivore

2) Work with a partner to build prairie grassland food chains. Examine your plant and animal species cards from lesson 4.1. Look for food relationships and use these to arrange cards into food chains. Record each food chain in the space provided. Be sure to show what eats what, and use arrows to show the flow of energy from producers to consumers.

Prairie Grassland Food Chains

3) Share your food chains with the class. Use a poster format or display them as part of a bulletin board display.



GRADE 4 LESSON #3

Gone Forever

MATERIALS

Copy of Gone Forever

Copy of Apply Your Knowledge

METHOD

This lesson deals with food chain changes that may have negative effects on the species involved. The black-footed ferret is studied as an example of an animal that becomes endangered through human influence. Efforts to restore and protect it are also studied.

1) Have students look at the food chain shown in Quick Check. Emphasize that nature operates in balance, and that if part of a food chain is changed, all members of the food chain may be affected. In considering the possible changes suggested, have students focus on immediate connections; if the prairie dog population was reduced or removed from this food chain, prairie grass consumption would go down. This may mean that other plants are squeezed out of the ecosystem (out-competed for space by the grasses). The prairie dog is the main prey of the black-footed ferret, so if prairie dog numbers are reduced, the ferret may not find enough prey to survive.

If grass populations were reduced or eliminated similar results would occur; prairie dogs would have trouble finding enough food so their populations would likely drop. Ferrets would have trouble locating enough prey, so they too would be in danger.

2) Have students fill in the blank spaces for each of the Food Chain Changes.

Emphasize that ecosystem changes are sometimes not predictable. Also emphasize that these changes can be difficult to stop or reverse.

1) The black-footed ferret is reduced or removed from the food chain.

Possible effects to the food chain include;

- a) fewer prairie dogs will be eaten, prairie dog populations will increase
- b) more prairie dogs will be eating prairie grasses, so grass populations may decrease

2) The black-tailed prairie dog is reduced or removed from the food chain.

Possible effects to the food chain include;

- a) fewer prairie dogs will be available as prey, ferret populations will decline
- b) fewer prairie dogs will be eating grasses, grass populations will increase

3) The population of prairie grasses is reduced.

Possible effects to the food chain include;

- a) with fewer grasses there will be less food for prairie dogs, so their numbers may decline
- b) if there are fewer prairie dogs there will be less prey for ferrets and other species, so ferret numbers may decline

3) Read over the section Human Effects on Food Chains with students or assign it as independent reading. Explain that once an animal becomes endangered it may not be reversible - i.e. even if the factors that caused it to become endangered are reversed the species may not recover. A case in point is the near extinction of the black-footed ferret. Efforts are being made to re-establish this predator in its prairie grassland range, but it will take years of monitoring to determine whether this is successful.



4) Assign Applying Your Knowledge. Recommended responses include;

1) Some plant and animal species become extinct because of habitat destruction, over hunting, or because of pollution.

2) prairie grasses → black-tailed prairie dog → black footed ferret → hawk

If the black-footed ferret became extinct there would be fewer prairie dogs being eaten by predators. This could mean an increase in prairie dog numbers. This could also mean that more prairie grasses are eaten, reducing the amount of grasses growing in prairie dog areas. Predators like birds of prey may also suffer as they will be unable to find ferrets for food, but birds of prey could switch to hunting prairie dogs and other prey.

Options

Assign question 3 or 4, or allow students a choice.

3) Research should reveal that the black-footed ferret became endangered because:

- prairie dog numbers were reduced (prairie dogs were seen as pests by farmers, who hunted, trapped, and poisoned them)
- introduction of diseases such as canine distemper and sylvatic plague
- As farms were developed there was also significant habitat loss for the black-footed ferret.

Resource: www.blackfootedferret.org

4) For ideas and endangered species information see:
www.naturecanada.ca/endangered_know_our_species.asp



Gone Forever

Quick Check

Look at the grassland food chain displayed below.

prairie grasses → black-tailed prairie dog → black footed ferret

What do you think would happen to the other living things in this food chain if one part of it was removed? For example, cover up the prairie dog. What would happen to populations of prairie grasses and black-footed ferrets? Or what would happen to the prairie dog and the ferret if prairie grasses in an area were removed?

Food Chain Changes

When one part of a food chain is reduced or removed, the other parts of the food chain will also be affected. Consider the following changes to the food chain shown above.

1) The black-footed ferret is reduced or removed from the food chain.

Possible effects to the food chain include;

a) _____

b) _____

2) The black-tailed prairie dog is reduced or removed from the food chain.

Possible effects to the food chain include;

a) _____

b) _____



3) The population of prairie grasses is reduced.

Possible effects to the food chain include;

a) _____

b) _____

Human Effects on Food Chains

Human actions have many different effects on food chains. Many of these effects are negative - that is they make it more difficult for the living things in the food chain to survive. Examples of negative human impacts on food chains include;

- 1) Habitat destruction
- 2) Over-hunting of some animals
- 3) Pollution

When there are very few of a particular species of plant or animal left in the world it is considered to be **endangered**. Once a species is declared endangered laws are sometimes passed to protect it. For example, the hunting of an endangered animal may be banned, but this can be hard to enforce and it does not always save the species. If an animal or plant disappears completely it is **extinct**.

The black-footed ferret is a grassland carnivore that feeds largely on prairie dogs. Its numbers declined in the last century to the point where only 18 animals were left in the world. In the 1980s the remaining population was taken into captivity in an effort to save the species from extinction. Since then several organizations, including the Toronto Zoo, have been working to rebuild black-footed ferret populations. In 2009 the Toronto Zoo, Parks Canada, and numerous partners were involved in the first Canadian release of black-footed ferrets in Grasslands National Park, Saskatchewan.



Apply Your Knowledge - Food Chain Changes

Respond on a separate paper.

1) Why do some species of plants and animals become extinct?

2) Review the following food chain.

prairie grasses → black-tailed prairie dog → black footed ferret → coyote

Consider how the living things in this food chain might be affected if the black-footed ferret were to become extinct. Explain your thinking.

Options

3) Research the black-footed ferret in more detail. Why/how did it become endangered? Explain how endangered populations of the black-footed ferret have been rebuilt.

4) Identify through research another prairie animal that is endangered. Use research to find possible reasons for it being endangered. Find out if anything is being done to protect this animal.



GRADE 7 LESSON #1

The Prairie Grassland Ecosystem

METHOD

Copy of The Prairie Grassland Ecosystem

Copy of Apply Your Knowledge

MATERIALS

This lesson introduces the concept of how populations, communities, and nonliving physical elements combine to create an ecosystem. These ideas are introduced by using the prairie grassland ecosystem as a specific example.

1) Make copies of student pages The Prairie Grassland Ecosystem for each student.

2) Introduce and explain the terms listed at the beginning of the student pages.

biotic - refers to parts of an ecosystem that are alive (e.g., bacteria and other microbes, and any plants and animals that are part of an ecosystem)

abiotic - refers to parts of an ecosystem that are not alive (e.g., rocks, soil nutrients, presence of water, availability of sunlight, fire events, etc.)

population - number of organisms of one species living in an area (e.g., all sugar maple trees in one forest, all small mouth bass in one lake).

community - all the organisms living in one ecosystem (e.g., the plant and animal species living around and in a lake; all the trees, grasses, shrubs, wildflowers, insects etc. that live in the specific area)

3) Read the introduction together, drawing students' attention to the terms defined above. Then read The Prairie Grassland Ecosystem or assign it as independent reading. You may wish to refer to the following websites for additional information and images; www.blackfootedferret.org www.prairiewildlife.org

4) Assign Apply Your Knowledge. Factors affecting populations may include

Organism	Biotic factors	Abiotic factors
soil microbes	- worms, insects (eat microbes)	- water - sunlight (warmth) - organic matter in soil
earthworms	- microbes (food source) - presence of predators (e.g., birds)	- same as above
locusts	- presence of food plants - predators (e.g., birds)	- same as above
wheatgrass	- presence of plant eating animals	- same as above
June grass	- worms, microbes add to soil nutrients	- fire events - space to grow



- | | | |
|---------------------------|---|---|
| black-tailed prairie dog- | availability of food plants | - water |
| | - presence of predators (e.g., ferret, hawk) | - sunlight (warmth) |
| | - population pressures (numbers in on area) | - suitable area for burrows |
| ferruginous hawk | - availability of prey species (food) | - water |
| black-footed ferret | - presence of predators, insect pests
(especially for young animals) | - sunlight (warmth) |
| | | - suitable habitat for burrows
or nest sites |

Students should note some common factors for different populations. All animal species need food (biotic factor), water, warmth, and space (abiotic factors). All plant species need sunlight, water, space, and soil nutrients (abiotic factors) but are often eaten by animals (biotic factors).

5) Points made above should also be seen in question 3) where students consider populations in a vacant lot near their school.



The Prairie Grassland Ecosystem

Terms: biotic abiotic population community

Introduction

Biologists describe an ecosystem as a community of living things that interact with each other and the physical world. An ecosystem is made up of living things (the different animal and plant species that live in a community) and nonliving things (physical features like rocks, soil, sunlight, temperature, or precipitation). The living things in an ecosystem are called the **biotic** elements of the ecosystem, while the non-living things are referred to as the **abiotic** elements of the ecosystem. Within an ecosystem the number of animals or plants of the same species are called **populations**. The population of all living things within an ecosystem is called a **community**. Let us explore these definitions relating to ecosystems by examining a specific ecosystem found in Canada, the **prairie grassland ecosystem**.

The Prairie Grassland Ecosystem

The most noticeable feature of the prairie grassland ecosystem in Canada is the lack of trees. Prairie grassland areas have a climate that includes hot, dry summers and very cold winters. The plant community is made up of different **populations** of grasses and sedges (e.g., wheatgrass, June grass, three-leaf sedge) and some small shrubs. Most prairie plants have extensive root systems that help them find water during periods of drought. Since grass fires are natural events on the prairie, many plants are adapted to survive fires and spread into soil areas after a fire. Some grasses are also adapted to survive and grow after being clipped by grazing animals. The grassland community also includes the microbes, worms, and insects that live in close contact with the soil. These **populations** break down dead plant and animal matter, returning it to the soil as nutrients that can be used by plants. Other grassland animals include populations of insects, birds, reptiles, amphibians, and mammals (e.g., locust, black-tailed prairie dog, black-footed ferret, ferruginous hawk). Each survives by eating grassland plants, grassland animals, or a combination of both.

All of the species that live in the grassland ecosystem form a **community**. The grassland ecosystem includes the **community** of organisms that live there, plus the non-living features of this environment that affect these living things.



Apply Your Knowledge - The Prairie Grassland Ecosystem

1) Explain the following terms in your own words or using a diagram; population, community, ecosystem.

2) Populations in the Prairie Grassland Community

soil microbes	wheat grass	ferruginous hawk
earthworms	June grass	black-footed ferret
locusts	black-tailed prairie dog	

a) Choose one population from the table above. Make a list of the biotic and abiotic factors that affect this population.

b) Do the same for a different population from the table.

c) Are any biotic or abiotic factors in both lists? Which ones?

3) Suppose there is a vacant lot beside your school. Some of its possible populations are listed below;

ants	crickets	dandelions	crabgrass
robins	mice	June beetles	

a) What other living things might be found in this community?

b) List the biotic and abiotic factors that might affect populations in this ecosystem?



GRADE 7 LESSON #2

Connections Within an Ecosystem

MATERIALS

Copy of Connections Within an Ecosystem

Copy of Apply Your Knowledge

METHOD

This lesson introduces the concept that matter is recycled within an ecosystem by producers, consumers, and decomposers. Students are also introduced to the food web as a way of understanding food relationships within an ecosystem. The prairie grassland ecosystem is used as an example.

- 1) Make copies of student pages Connections Within an Ecosystem for each student.
- 2) It may be helpful to introduce and define terms used in this section that may be new to students:

chlorophyll - chemical present in green plants that allows energy from the sun to be used in the creation of simple sugars which plants then use as food

photosynthesis - chemical process in which chlorophyll and energy from the sun is used to create simple sugars, which plants then use as food

producers - living things that create their own food

consumers - living things that get energy by eating other living things

decomposers - living things that reduce once-living matter into its basic components

herbivores - living things that eat only plants

carnivores - living things that eat only other animals

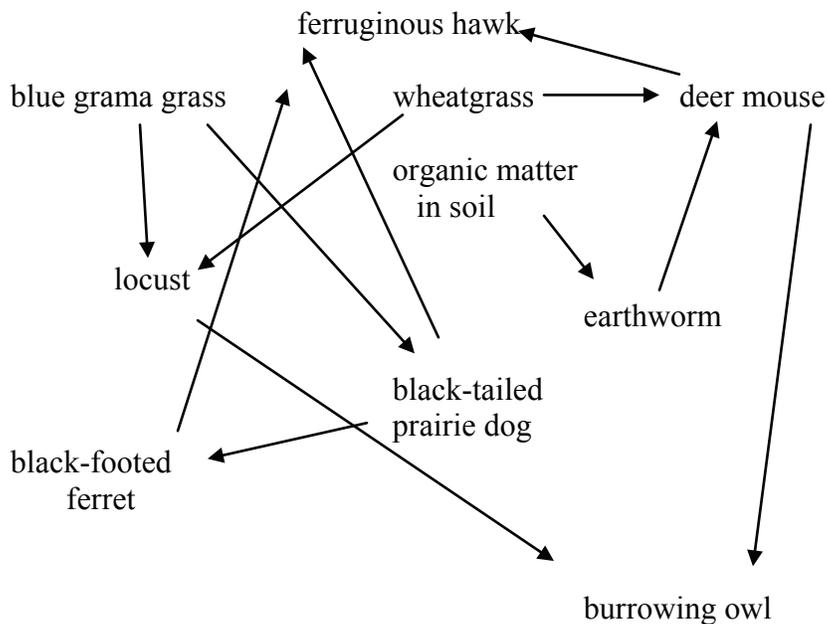
omnivores - living things that eat both plants and animals

- 3) Read the student pages Connections Within an Ecosystem together or assign them as independent reading. Emphasize that while food chains show food relationships within an ecosystem, food webs give a better idea of the complexity of relationships found in most ecosystems. The web shows that if one food source for an animal is absent, it may rely on other organisms in the ecosystem to get the energy it needs to survive.

- 4) Have students work on Apply Your Knowledge. You may wish to do question 1) together, working your way through each component of the web as the overall result contains many lines. The finished web is below.



Prairie Grassland Food Web



5) As students work on question 3 remind them that the black-footed ferret's prey species is the black-tailed prairie dog, which is a herbivore. Without an ecosystem filled with plants to support a prairie dog population the ferret will have no prey.

6) As students work on question 4 have them refer to the prairie grassland food web. If, for example, the deer mouse was removed from the food web, organisms that rely on it for food would end up eating more of the other things that they can use for food. This could change the balance in the web as a species like the ferruginous hawk eats more prairie dogs or ferrets.



Connections Within an Ecosystem

Terms: decomposition chlorophyll photosynthesis producers
 herbivores carnivores omnivores consumers
 decomposers

You Are Recycled Matter

Living things are mostly made up of atoms of carbon, oxygen, hydrogen, and nitrogen. These atoms have been part of the Earth and its atmosphere since the beginning of time. This means that the atoms in your body may have also been part of an ancient fern or even a dinosaur. As living things die they are broken down into basic nutrients in the process of **decomposition**. Living things use these nutrients (available in air, water, and soil) to build complex matter once again. Since matter in ecosystems is constantly recycled, organisms depend on each other.

The Cycle of Matter and Energy

The matter cycle begins with plants. Plants use energy from the sun to produce their own food. They do this using a green chemical called **chlorophyll** in a process called **photosynthesis**. Since plants with chlorophyll produce their own food they are referred to as the **producers** in an ecosystem.

Animals do not have chlorophyll so they cannot make their own food. They get food by eating plants or by eating other animals. Animals that eat plants are called **herbivores**. Those that eat other animals are called **carnivores**. Animals that eat both plants and animals are called **omnivores**. In each case, animals are actually capturing energy that originally came from the sun. Since these animals must eat to survive they are called **consumers**.

Once animals and plants die, their bodies are returned to the form of nutrients by living things like bacteria, moulds, and fungi. These organisms get their energy by breaking down dead material, which is then available in an ecosystem. These organisms are referred to as **decomposers** because they break down the final remains of living things and recycle the nutrients back into the food web.



Dependence in Ecosystems

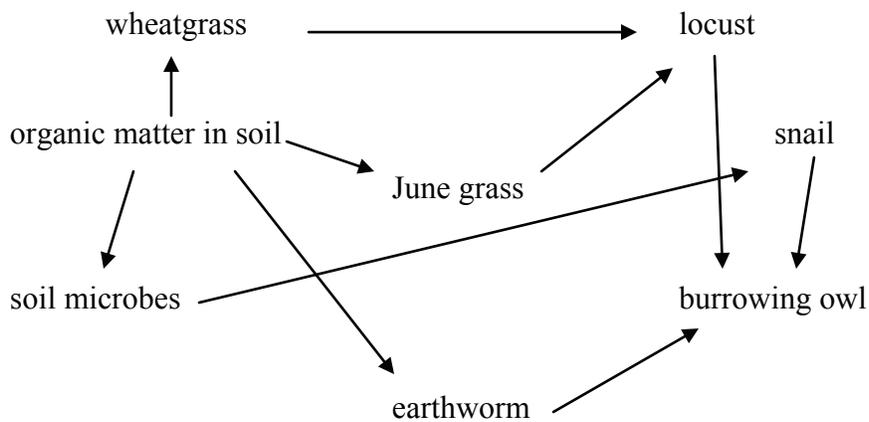
Food relationships in an ecosystem can be shown using a food chain;

June grass → locust → burrowing owl

In the food chain for a prairie grassland meadow the June grass is the producer, while the locust (herbivore) and the burrowing owl (carnivore) are the consumers. The arrows show the energy flow; energy in the grass becomes part of the locust, and energy in the locust becomes part of the burrowing owl.

In most ecosystems, consumers rely on more than one source of food (a locust will eat more than one type of plant, and a burrowing owl will eat more than just locusts). These more complex relationships could be shown in a **food web**, which is a better way of showing how living things interact within an ecosystem.

Simplified Prairie Grassland Food Web





Apply Your Knowledge - Prairie Grassland Food Web

1) Complete the prairie grassland food web shown below by drawing arrows to show food relationships. The arrow goes from one organism to the one that consumes it - this shows the flow of energy in the ecosystem.

Prairie Grassland Food Web



- 2) How is a food chain different from a food web? Why might you choose to represent an ecosystem using a food web rather than a food chain?
- 3) Explain why black-footed ferrets could not live in an ecosystem without plants even though they are not part of their food source.
- 4) What would happen to a consumer if one of its food sources was removed from the ecosystem? Could this change/affect other living things in the ecosystem? Explain using the prairie grassland food web as an example.



GRADE 7 LESSON #3

The Black-footed Ferret – An Endangered Animal

MATERIALS

Copy of The Black-footed Ferret – An Endangered Animal

METHOD

This lesson presents specific information on a grassland animal that was considered to be extinct a few decades ago. The return of populations of the black-footed ferret to some areas of its original range is the result of the efforts of many scientists and conservationists, as well as organizations like the Toronto Zoo. The Zoo has been a leader in establishing captive breeding programs and supervising the reintroduction of the black-footed ferret, which has brought this species back from the brink of extinction. The Toronto Zoo is also the only Canadian breeding facility for black-footed ferrets.

While it may seem like the black-footed ferret is a small part of the prairie grassland ecosystem it is important for students to understand two points. First, extinction is a permanent event; once a species is lost it is gone for good and represents a bit of creation that can never be seen, heard, appreciated or truly understood ever again. When this occurs due to human influence, it is a sad commentary on how we are handling our environment. Second, an ecosystem is a linked system of several parts that function as a whole. When one part of that system is removed, it is often difficult to predict how the entire system will be affected. It is better for all (humans included) if balance is preserved by protecting and maintaining all elements of an ecosystem whenever possible.

1) Copy and distribute the The Black-footed Ferret – An Endangered Animal to each student. Introduce the black-footed ferret by recalling the prairie grassland food web in Lesson #2.

2) Discuss the term extinction with students. Emphasize that

a) Extinction is permanent

b) Its effects on an ecosystem are sometimes impossible to predict.

*It is worth noting that humans are often the cause of extinctions. Humans can also help by trying to prevent extinctions, but human efforts are sometimes not enough. So far, the story of the recovery of the black-footed ferret has been one of good news.

3) Read the student pages together. You may wish to refer to additional material (Zoo pamphlet on the black-footed ferret) or the following websites for added information and images;

www.blackfootedferret.org

www.prairiewildlife.org

www.torontozoo.com/conservation/captive-breeding.asp?pg=bff

www.pc.gc.ca/eng/pn-np/sk/grasslands/edu/edu1/f.aspx

4) Assign questions. As an option instead of question 3 hold a class discussion on the idea of avoiding extinction and helping species recover. The issue in question could be dealt with in other ways.



Options include:

Debate – assign groups to argue for and against the preservation of the black-footed ferret. (Have students consider both sides of the conservation argument; those for the saving of the species can use the points presented in the introductory paragraph above; those arguing against preservation efforts might use issues like the cost of recovery programs and the barriers to development that are needed in the habitat of a protected species as arguments for their case).

Ad campaign – design a print, radio or TV ad to convince others of the importance of saving species that are on the brink of extinction.

Research other Canadian species that are in danger - report on what caused the species to become endangered and what (if anything) is being done about it.



The Black-footed Ferret – An Endangered Animal

One animal that is part of the prairie grassland ecosystem and is currently endangered is the black-footed ferret. What follows is a description of this animal and how it lives, as well as some information on how it became endangered and what is being done about it.

Description

Ferrets belong to the same family, known as mustelids, as weasels, mink, badgers, wolverines, and otters. Black-footed ferrets live in prairie grassland areas where they use prairie dog burrows as shelters and to raise their young. Adult ferrets are 45-60 cm long and weigh about 1 kg. They have a long, slender body with short legs. They are equipped with long claws for digging, and sensitive ears. The ferret's coat is a yellow-buff colour, with a black mask, feet, and tail tip. Black-footed ferrets live 3-4 years in the wild or 8-9 years in captivity. In the spring, adult female ferrets give birth to a litter of up to 7 kits (average litter size 3-4) in a prairie dog burrow. Kits emerge from the burrow in July and are fully mature after one year.

Behaviour

Black-footed ferrets are nocturnal, so they are most active at dusk and during the night. They are agile, curious animals with keen senses of smell, sight, and hearing. Black-footed ferrets are solitary, which means that they live alone for most of the year, except during the breeding season when they mate and mothers raise their young. When in danger, they retreat to the safety of an abandoned prairie dog burrow. They may also defend themselves with their sharp claws and powerful jaws. Black-footed ferrets are less active during the winter and may stay underground in a burrow for up to a week at a time.

Food

Black-footed ferrets have a very specific diet. Prairie dogs make up over 90% of a ferret's diet. Their sharp teeth and strong jaws are adapted for hunting prairie dogs that are often twice the size of the ferret itself. Ferrets have therefore adapted to hunting prairie dogs at night when they are sleeping. The black-footed ferret will sometimes eat ground squirrels, mice, voles, rabbits, and birds.



Threats

Black-footed ferrets once lived throughout the North American prairies in parts of Canada, the United States, and Mexico. As these areas were settled, prairie dog habitat was reduced. Farmers also hunted, trapped, and poisoned the remaining prairie dogs as they were seen as pests. By the early 1900s the prairie dog's range had been reduced by 98% in North America. The prairie dog population has always been limited in Canada and is now a protected species. Since prairie dog numbers were so low, there was little prey available for the black-footed ferret. In addition, a number of diseases (including canine distemper, sylvatic plague and human influenza) also reduced ferret populations. Urban development also continues to threaten black-footed ferret habitat. By the 1970s the ferret was thought to be extinct.

Recovery

In the 1980s a small population of black-footed ferrets was found in the wild. They were captured and used to start a captive breeding program. This is where scientists supervise the breeding and raising of ferrets in a controlled environment. These ferrets are then released into areas where ferrets once existed, if these areas now have stable prairie dog populations. The Toronto Zoo has been a participant in the recovery of the black-footed ferret. Hundreds of kits have been born at the Zoo and released into the wild. In 2009 the Toronto Zoo, Parks Canada, and numerous partners were involved in the first Canadian release of black-footed ferrets in Grasslands National Park, Saskatchewan.



Apply Your Knowledge – The Black-Footed Ferret

1) Describe the process that led to the decline and near extinction of the black-footed ferret.

Include the following in your description;

- where and how the black-footed ferret lived
- what happened to their habitat and food supply
- other factors that led to their decline

2) Explain how the black-footed ferret was saved from extinction.

3) Efforts continue to reintroduce the black-footed ferret into its former range. This takes a lot of time and effort, and considerable financial resources. Do you think that it is worthwhile to make sure that this species survives? Explain.



Ferret Activities



Primary Activity #1

The Story of Noir, the Black-footed Ferret

Description:

Students will learn about the habitat and life of a black-footed ferret as they read the story of Noir, the black-footed ferret. Questions, a maze, and the “What’s for Dinner?” exercises will underscore the facts discussed in the story.

Procedure:

1. As a class, read the story “The Story of Noir, the Black-footed Ferret”.
2. Hand out the story and corresponding questions (found on page 53-54) to each student.
Students will answer the questions to reinforce the key facts about ferret life, their predators, their food and how they use their senses to stay safe.
3. As a supplemental activity, distribute copies of the maze (page 55) and the “What’s for Dinner?” worksheet (page 56) to each student.
4. The teacher will review with the class the responses to all activities, reinforcing the way ferrets use their senses to stay safe from predators and to find their main food source, prairie dogs.



Student Page

The Story of Noir, the Black-footed Ferret

It is early spring and the moon is shining brightly in the Saskatchewan night sky. The wind gently blows the tall grasses. A little head with big ears pops out of a hole in the ground. It's Noir, the black-footed ferret. She has brownish-yellow fur with black around her eyes, black feet and black at the tip of her tail. As her long thin body emerges from the hole, Noir uses her big ears and strong sense of hearing to *listen* for predators. She uses her strong sense of *smell* to test the air for predators and she uses her strong eyesight to *look* for predators. When she knows it is safe, she runs through the grasslands in search of her dinner. Noir and other black-footed ferrets like to eat prairie dogs. Sometimes if Noir can't find a prairie dog, she will eat small animals like birds and squirrels. But tonight Noir is in luck, she has spotted a burrow where a prairie dog family lives. She slinks down the burrow and snatches a sleeping prairie dog. After she finishes her dinner, Noir feels tired and she bounds back to her home. Her home helps keep her safe from predators like hawks, badgers, and coyotes. Noir's home is like that of all black-footed ferrets, it is an underground tunnel called a burrow, which is the perfect shape for her long slinky body. Noir crawls into her burrow and falls fast asleep.

As the sun starts to set in the sky and many other animals are going to sleep, Noir is just waking up. Noir is enjoying the cool evening in the grasslands when she sees another black-footed ferret. He looks friendly so Noir approaches him. They dance around with each other before they mate. Noir doesn't get to see her new friend again, but six weeks later Noir is in her burrow with four baby black-footed ferret kits. Noir now spends all her time caring for her babies.

On a warm summer's evening the kits emerge from the burrow for the first time. They are scared at first but their mom encourages them to leave the burrow and soon they are playing in the grass with Noir watching over them.



The Story of Noir, the Black-footed Ferret

Questions:

1. What does Noir look like?

Noir has _____ coloured fur on her feet, tail and around her eyes.

The rest of her fur is _____ coloured.

She is _____ (**tall** or small) and she has a _____

(l o n g or ~~short~~) body.



2. What senses does Noir use when checking for predators?

Noir uses her sense of _____ to listen, her sense of _____ to sniff the air and she uses her sense of _____ to look for predators.

3. What do Noir and other black-footed ferrets like to eat?

4. What do you call baby black-footed ferrets?



5. When do the black-footed ferrets like to go out and play?





Help Noir, the Black-footed ferret find her way home!

Draw a line through the maze to get the Black-footed ferret to its home.

Make sure you go to the right *home!*





What's For Dinner?

Noir, the Black-footed ferret is very hungry. Draw lines from the black-footed ferret to the food items that it would eat in the wild.



An animal that eats meat is called a _____



Primary Activity #2

Art Project: Create a Black-footed Ferret Mask

Description:

Black-footed ferrets have distinctive colouration to help them camouflage in their grassland habitat. They are brownish-yellow with black fur around their eyes, black feet and black fur on the tip of their tail. Students will colour and create a mask so they can pretend to be black-footed ferrets, out in the grasslands.

Materials:

- Scissors
- Coloured pencil crayons, crayons or markers
- String
- Mask template
- White pipe cleaners
- Glue stick

Procedure:

1. Hand out one mask template (page 58) to each student.
2. Have the students colour the template with the brown, yellow, white and black to correspond to the ferret's colouration.
3. Cut out the template along the dashed lines outlining the face and eyes.
4. Punch a hole along the sides and thread string through the holes.
5. Use small pieces of pipe cleaner to make the whiskers. Glue onto the mask.



You too can become a Black-footed ferret!

Use the picture below to trace out the face of a black-footed ferret. Colour the face and remember to use black around the eyes! Cut out the face and eyes by cutting along the outline. Punch the white circles and thread string through the holes to create the mask. Add some whiskers!





Primary Activity #3

Math Project: The Grassland Community

Description:

Black-footed ferrets live in a grassland community with other species of animals such as the prairie dog (their prey) and owls which are the ferret's predator. In the scenario provided, Noir is out with her kits and observes these two animals in the area. Students will graphically represent the number of animals observed on the grasslands during Noir's time out of her burrow.

Materials:

- Coloured pencil crayons, crayons, or markers
- Math activity sheet

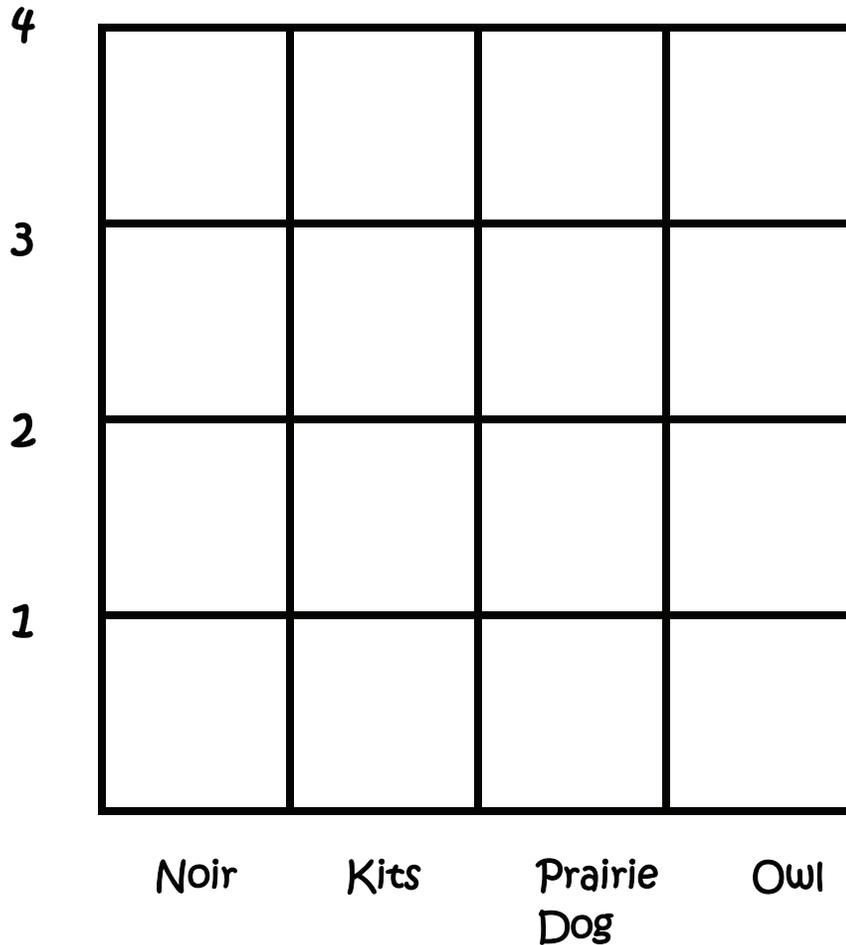
Procedure:

1. Distribute the math activity sheet entitled "The Grassland Community!" (page 60) to each student.
2. Have each student complete the exercise.



The Grassland Community

Noir, the black-footed ferret is out of her burrow with her four kits. She sees that there are two prairie dogs eating grasses and seeds. Flying high in the sky over them is one owl looking for food. Colour in the bar graph below to show how many of each animal can be found on Noir's habitat.





Primary Activity #4

Gym Activity: Dusk

Description:

Black-footed ferrets predate primarily on prairie dogs as their food source. They are nocturnal animals that are most active around dusk. Through this simulation predator-prey game, students will understand the link between the two species.

Procedure:

1. Select two students to be the black-footed ferrets. The remaining students are prairie dogs.
2. Line the prairie dogs up in a straight line, along a wall if played in a gymnasium.
3. The two black-footed ferrets stand in the centre of the room.
4. When the black-footed ferrets yell out “**Dusk**”, the prairie dogs must run across the room towards safety and avoid being tagged by the ferrets.
5. When a prairie dog is tagged, they become a ferret
6. The game ends when there is only one prairie dog left.

Discussion:

After the game, discuss with the students the relationship between predators (ferret) and prey (prairie dog). Discuss if the simulation would be true to what happens in the wild, i.e. eating all the prairie dogs. Discuss how in nature there is a balance and these animals are part of a bigger, more complex web.



Junior/Intermediate Activity #1

The Maze of Life

Description:

Black-footed ferrets have many physical and behavioural adaptations to help them survive in the temperate grasslands habitat. Students will use their knowledge from reading the background information to assist them in the maze activity.

Procedure:

1. Distribute a copy of the black-footed ferret information (found on pages 3-6) to each student.
2. Hand out a copy of the questions (page 63) and the *Maze of Life* activity to each student.
3. Students will answer the questions to reinforce the key facts about ferret life, their predators, their food, and how they use their senses to stay safe.



Student Page

Answer the following questions about the Black-footed ferret to guide you in the maze!

1. Black-footed ferrets are the only ferrets native to North America. They evolved from *where* 30,000 - 45,000 years ago.

- A. Europe
- B. Africa
- C. Siberia



2. One of the reasons the black-footed ferret became extinct in the wild was because...

- A. Hunting
- B. Lack of food & habitat
- C. They moved back to Siberia

3. Black-footed ferrets are being reintroduced in which National Park?

- A. Grasslands National Park, Canada
- B. Prince Albert National Park, Canada
- C. Wood Buffalo National Park, Canada



4. The black-footed ferrets are part of the Mustelid family that includes weasels, mink, badgers, otters, and...

- A. Prairie Dogs
- B. Wolverines
- C. Squirrels

5. Black-footed ferrets have evolved to hunt with their...

- A. Sharp claws
- B. Strong jaw
- C. Strong tail

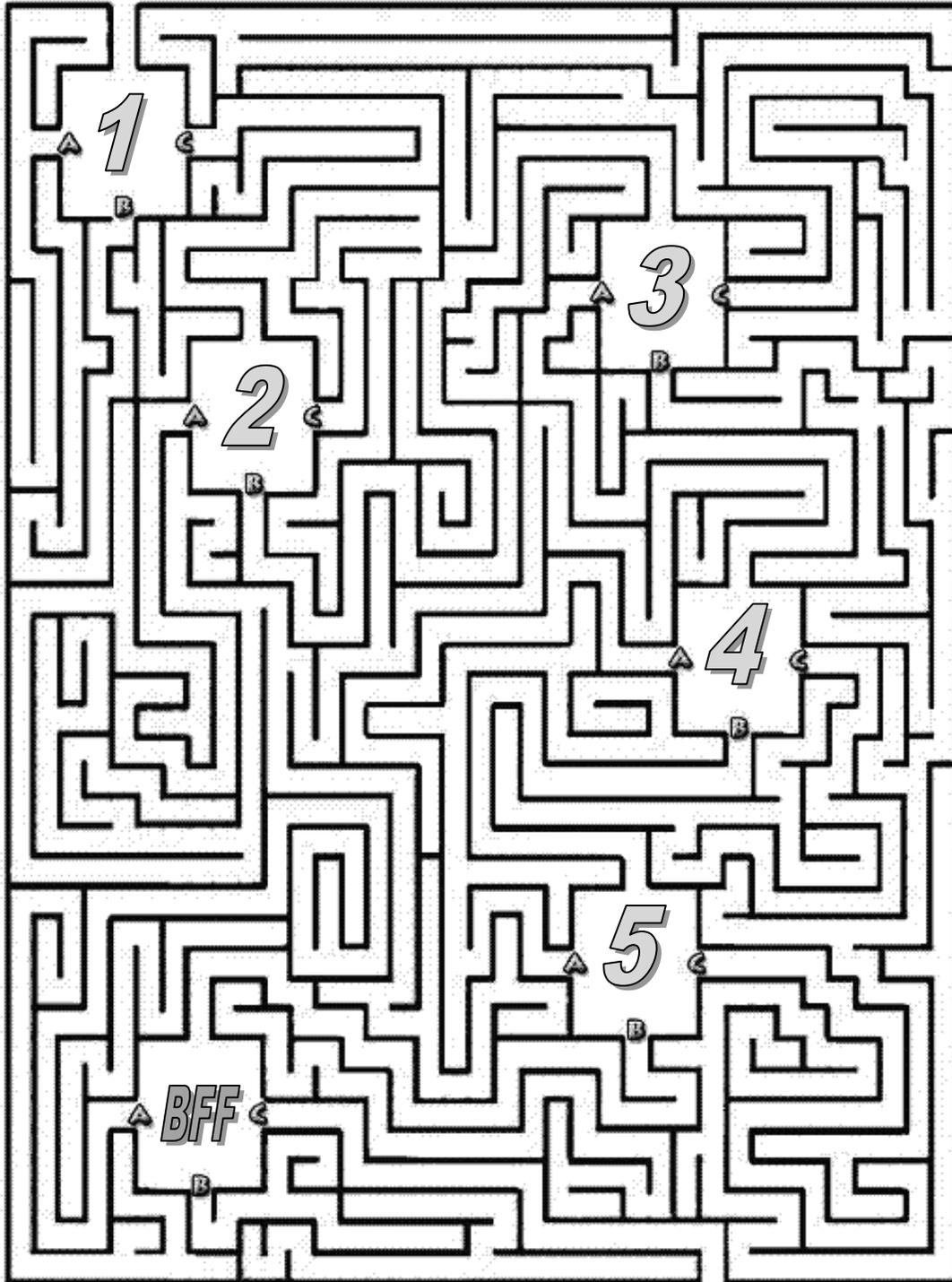




The Maze of Life

Use the clues to find your way to the finish line.

Start



Finish



Junior/Intermediate Activity #2

Grassland Habitat: Home for the Black-footed Ferret

Description:

Grasslands National Park in Saskatchewan is the site of the reintroduction of black-footed ferrets into Canada. Students will use the vocabulary provided in the following two exercises to write a paragraph about the black-footed ferret.

Procedure:

1. Distribute the worksheets found on pages 26 and 27 to each student.
2. Distribute a copy of the *Return of the Black-footed Ferret to Grasslands National Park - Fall 2009* (page 39) to each student.
3. Have the students read the information sheet and use the materials covered to complete the exercises.

Next Steps:

Discuss with the students what the reintroduction program is. Ask what steps are being done to ensure success? What is “boot camp”? Why is it important? Why is this reintroduction important for the grasslands ecosystem?



Grassland Habitat: Home for the Black-footed Ferret

Match each word with its meaning.

	adaptation	a	the total number of a kind of animal living in an area or habitat
	agile	b	a series of organisms in which each uses the next usually lower member of the series as a food source
	biodiversity	c	land covered with herbs rather than shrubs and trees also the name of a national park in Canada
	community	d	variation in an environment as shown by numbers of different species of plants and animals
	curious	e	to return animals to the wild
	extirpated	f	a class of the same kind of plant or animal divided into groups by their characteristics
	food chain	g	a change in an organism that fits it better for the conditions of its environment.
	grasslands	h	active at night
	habitat	i	extinct in the wild
	kits	j	a group of living things that belong to one or more species, interact ecologically, and are located in one place
	nocturnal	k	the place where a plant or animal naturally or normally lives or grows
	population	l	able to move quickly and easily
	reintroduce	m	baby ferrets, short for kittens
	species	n	an active desire to learn or to know

What four things are needed in every habitat?

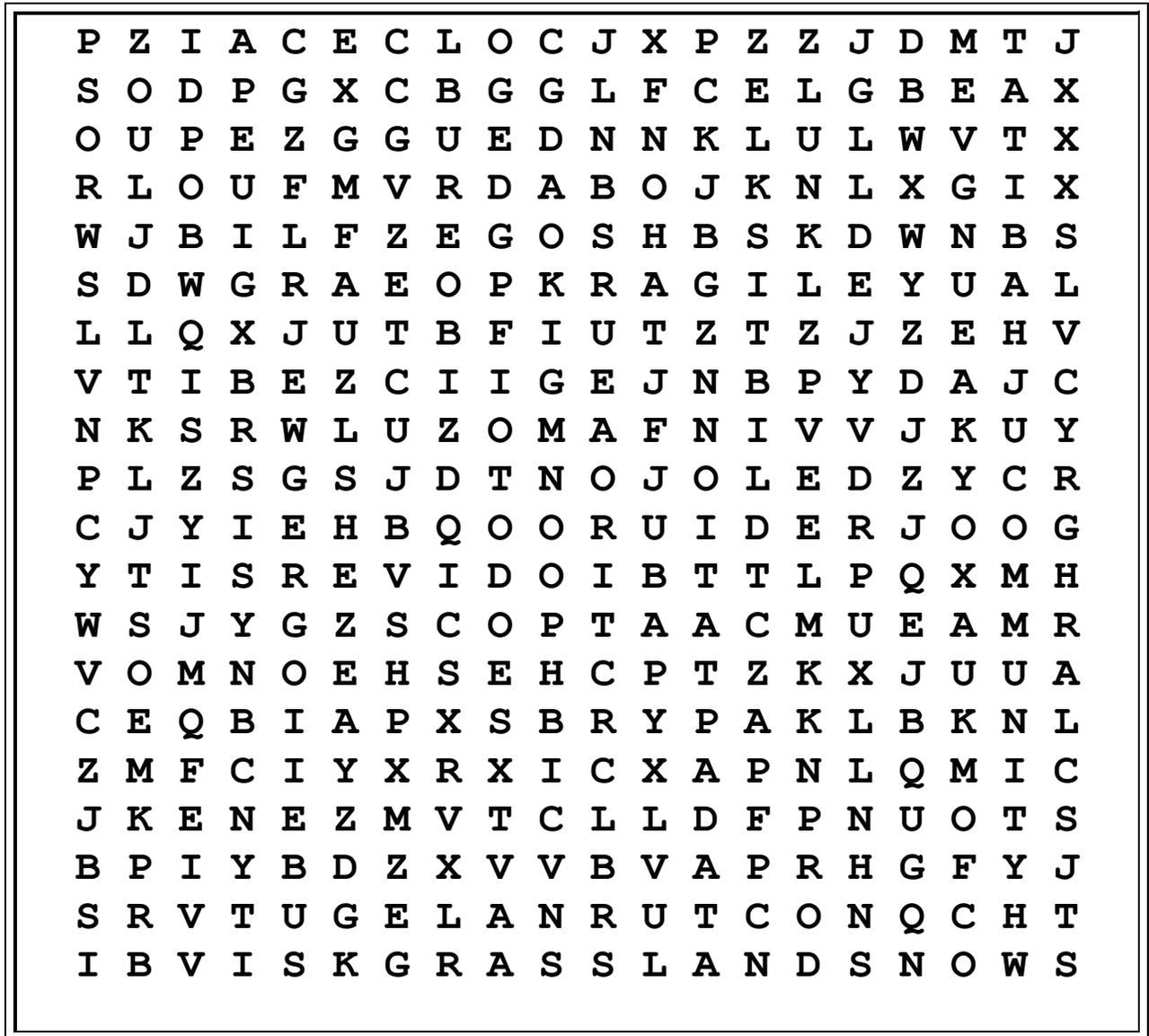
- a. _____ b. _____ c. _____ d. _____

Write a paragraph about black-footed ferrets using 4 of the above words from the matching activity.



Word Search

Find the words from the list below in the word search puzzle.



ADAPTATION

AGILE

BIODIVERSITY

COMMUNITY

CURIOUS

EXTIRPATED

FOODCHAIN

GRASSLANDS

HABITAT

KITS

NOCTURNAL

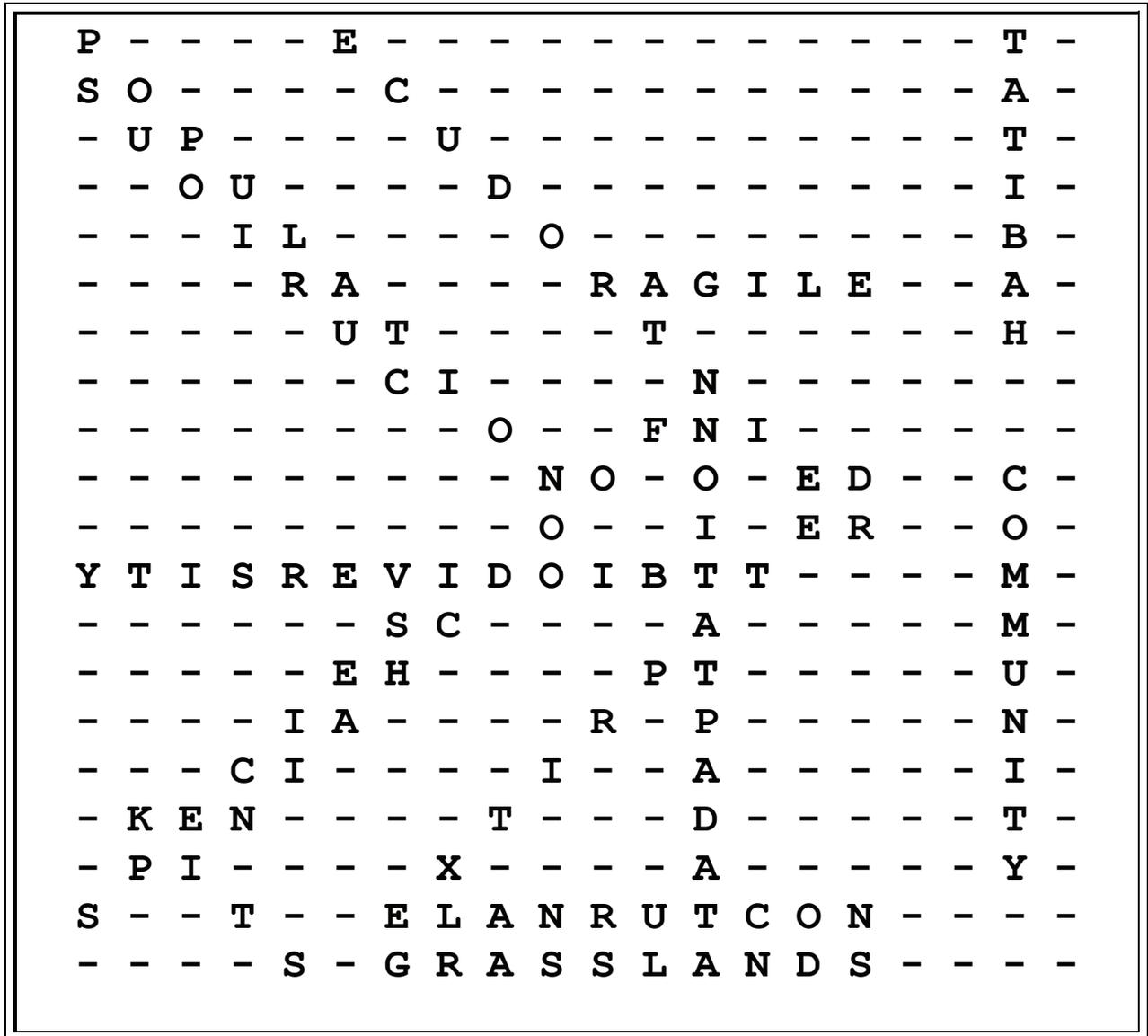
POPULATION

REINTRODUCE

SPECIES



Word Search – Solution



(Over,Down,Direction)

ADAPTATION (13,3,N)

COMMUNITY (19,10,S)

FOODCHAIN (12,9,SW)

KITS (2,17,SE)

REINTRODUCE (16,11,NW)

AGILE (12,6, E)

CURIOUS (7,8,NW)

GRASSLANDS (7,20,E)

NOCTURNAL (16,19, W)

SPECIES (1,19,NE)

BIODIVERSITY (12,12, W)

EXTIRPATED (7,19,NE)

HABITAT (19,7, N)

POPULATION (1,10,SE)



Junior/Intermediate Activity #3

Gym Activity: Black-footed ferrets, Prairie dogs, and Great-horned owls

Description:

Students through this simulation game will understand the role of predators, prey, consumers, and decomposers in a food chain found in the grasslands habitat. In this game, the food chain is as follows:



Materials:

- Gymnasium or playing field
- Paper to record data from each round of play

Procedure:

This game is similar to “Rock, Paper, Scissors” and “Giants, Wizards, Trolls”.

1. Divide the students into two teams. Direct each team to go to opposite ends of the gymnasium.
2. Students decide what animal their team will be in the first round. They can be black-footed ferrets, prairie dogs, or great-horned owls. The entire team is the same animal.
3. Once each team has decided what animal they are, have the two teams line up, facing the opposing team, in the middle of the gymnasium (or playing field).
4. Everyone together then yells out “Ferret! Prairie dog! Owl!” followed by what creature the team is. For example, Team one might yell “Ferret, prairie dog, owl, owl” as they chose to be owls in the first round of play. The other team may yell “Ferret, prairie dog, owl, ferret” as they chose to be ferrets. In this example, owls prey on ferrets and thus the owl team “wins”.
5. The winner of the round is determined as:



- Great-horned owls wins over ferrets (predator-prey)
 - Black-footed ferrets win over prairie dogs (predator-prey)
 - Prairie dogs win over Great horned owls (decomposers convert owls to nutrients that provide nourishment to the grasses that the prairie dogs eat)
6. The winning team then chases the losing team back to their side of the gymnasium.
 7. Any student on the losing team tagged before reaching their side of the gymnasium now belongs to the other team.
 8. In the situation where both teams end up being the same creature, consider it a tie and start over.
 9. Continue playing rounds until the majority of students are on one team.

Next steps:

After each round is played, record the numbers of students on each team and what animal they are. Using this data, have the students graphically represent the changes in population between the rounds. Discuss how animal populations change with changes in predation patterns. What may contribute to these changes?

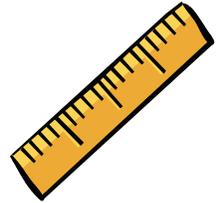


Junior/Intermediate Activity #4

Math Project: Ferret Statistics

Grade 4:

1. An adult male black-footed ferret can grow to a length of 61 cm, including a 15 cm tail. Without the tail, how long is the body of the black-footed ferret?



2. The black-footed ferret searches for food at night, often covering a distance of 6 kilometres in a single evening. How far would a black-footed ferret travel in one week? How far would the ferret travel in the month of June?

Grade 6:

1. An adult male black-footed ferret has a mass of about 900 grams. A fully grown female is about 10% lighter. What is the mass of an adult female black-footed ferret?



2. An adult male black-footed ferret can grow to a length of 61 cm, including a 15 cm tail. Convert these measurements to mm (millimetres) and m (metres).

Full body length is 61 cm which is _____ mm or _____ m

Tail length is 15 cm which is _____ mm or _____ m



3. Prairie dogs make up 90 percent of the diet of the black-footed ferret. They also catch a variety of small animals: rabbits, ground squirrels, insects, and small birds. Create a graph to display this information.



Junior Activity #1

Investigating the Black-footed Ferret

Using online and library resources, answer the following question:

Why is the black-footed ferret endangered?

My Hypothesis:

I think the black-footed ferret is endangered because _____

Research:

- Description of the black-footed ferret

- Shelter requirements (Habitat)

- Food requirements

- Problems the black-footed ferret has in its environment

Conclusion:

The black-footed ferret is endangered because _____



Draw a picture of the black-footed ferret in its habitat with its food.





Intermediate Activity #1

Investigating the Black-footed Ferret

1. Why is it important to save the black-footed ferret and other species which are endangered or on the verge of extinction?
2. Through much effort, the black-footed ferret has been re-introduced into the Canadian wilderness. This type of work takes a lot of time and effort, and considerable financial resources. Is it worth while to make sure that this species survives? Why?
3. Describe the process which led to the decline and near extinction of the black-footed ferret. Include the following:
 - a. Where they lived? (range, habitat);
 - b. What happened to the land?
 - c. What happened to their food supply?
4. What is sylvatic plague and how does it affect the survival of the black-footed ferret?
5. Find out how the black-footed ferret was saved from extinction.

Useful websites

www.blackfootedferret.org

www.prairiewildlife.org

www.torontozoo.com/conservation/captive-breeding.asp?pg=bff

www.nwhc.usgs.gov/disease_information/sylvatic_plague

www.pc.gc.ca/eng/nature/eep-sar/itm3/eep-sar3j/3.aspx