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.

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_____

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
- 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	- 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	- 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

Spear Grass - a slender grass with spiked seed pods - grows 30-70 cm tall - grows in dry areas and on hillsides www.naturenorth.com/summer/mgp/Fmixgrss.html	**Blue Grama** - 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 www.royalsaskmuseum.ca/education/Kids_Domain	**Ferruginous Hawk** - a large hawk (60 cm tall) - nests in isolated trees - eats prairie dogs as well as other small mammals, birds and reptiles www.royalsaskmuseum.ca/education/Kids_Domain
Black-footed Ferret - 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 Google images	**Burrowing Owl** - small owl (25 cm tall) that nests below ground in abandoned prairie dog burrows - eats locusts, grasshoppers, other insects and small mammals www.royalsaskmuseum.ca/education/Kids_Domain	**June Grass** - 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 www.royalsaskmuseum.ca/education/Kids_Domain
Sagebrush - 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) www.royalsaskmuseum.ca/education/Kids_Domain	**Loggerhead Shrike** - 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 www.naturenorth.com/summer/mgp/Fmixgrss.html	**Purple Prairie Clover** - 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 www.naturenorth.com/summer/wildflwr/wldflF2.html
Black-tailed Prairie Dog - social mammal up to 45 cm in length that lives in large groups, creating underground burrows - eats grasses, roots, leaves, and flowers www.royalsaskmuseum.ca/education/Kids_Domain	**Prairie Crocus** - white flower with a yellow centre that blooms early in spring - up to 40 cm in height naturenorth.com/spring/flora/crocus/Prairie_Crocus.html	**Prairie (Western) Rattlesnake** - 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 www.royalsaskmuseum.ca/education/Kids_Domain
Pronghorn - 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 www.royalsaskmuseum.ca/education/Kids_Domain	**Locust** - looks like a large grasshopper - feed on grasses - sometimes swarm, causing crop damage Google images	**Sagebrush Vole** - 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 Google images
Prairie Deer Mouse - small thumb-sized mammal with reddish-brown fur - active at night and feeds on seeds, fruit, mushrooms, insects and spiders - lives in underground burrows Google images	**Western Kingbird** - robin-sized bird that lives in dry, grassland areas - eats insects and berries - nests in trees Google images	**Darkling Beetle** - 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 www.royalsaskmuseum.ca/education/Kids_Domain

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 June grass	- presence of plant eating animals - worms, microbes add to soil nutrients	- same as above - fire events - space to grow

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

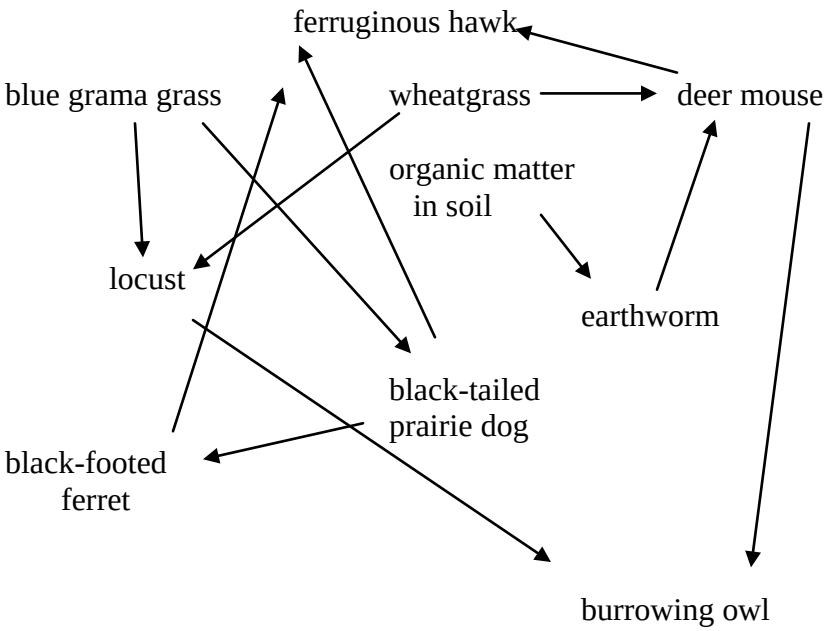
carnivores - living things that eat only other animals

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

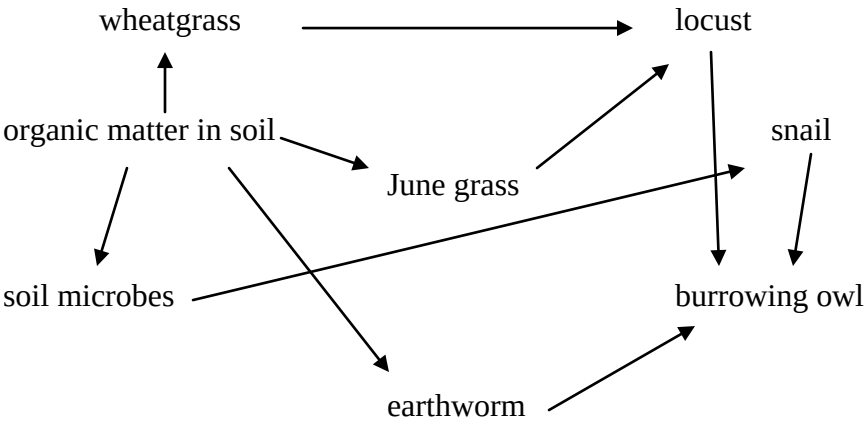
Food relationships in an ecosystem can be shown using a food chain;

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

ferruginous hawk

blue grama grass | wheatgrass | deer mouse

organic matter in soil

locust | earthworm

black-tailed prairie dog

black-footed ferret | burrowing owl

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.