



# GRADE 4 LESSON #1 Ecosystem Producers and Consumers

#### **MATERIALS**

Copy of <u>Ecosystem Producers and Consumers</u>
Activity sheet, <u>Apply Your Knowledge – The Prairie Grassland Ecosystem</u>
Student copy of <u>Grassland Species</u>
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 <u>Ecosystem Producers and Consumers</u> and prepare materials for species identification cards (<u>Apply Your Knowledge The Prairie Grassland Ecosystem</u>, 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 <a href="https://www.blackfootedferret.org">www.blackfootedferret.org</a>
- 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 (<u>Grassland Species</u>). 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 <u>Plant and Animal Connections</u> 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 <u>Apply Your Knowledge</u> section have students complete the table for organisms found in each food chain.

prairie grasses  $\rightarrow$  locust  $\rightarrow$  burrowing owl

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





#### prairie grasses $\rightarrow$ black-tailed prairie dog $\rightarrow$ black footed ferret $\rightarrow$ 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 <u>Applying your Knowledge</u> 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;

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  $\rightarrow$  black-tailed prairie dog  $\rightarrow$  black footed ferret  $\rightarrow$  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 $\rightarrow$ locust $\rightarrow$ burrowing owl

Organism	Producer or Consumer	Herbivore, Carnivore, or Omnivore	

### prairie grasses $\rightarrow$ black-tailed prairie dog $\rightarrow$ black footed ferret $\rightarrow$ 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 <u>Gone Forever</u> Copy of <u>Apply Your Knowledge</u>

#### **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 blackfooted 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 <u>Food Chain Changes</u>. 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 <u>Human Effects on Food Chains</u> 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  $\rightarrow$  black-tailed prairie dog  $\rightarrow$  black footed ferret  $\rightarrow$  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 blackfooted 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  $\rightarrow$  black-tailed prairie dog  $\rightarrow$  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 inc	lude;	
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  $\rightarrow$  black-tailed prairie dog  $\rightarrow$  black footed ferret  $\rightarrow$  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.