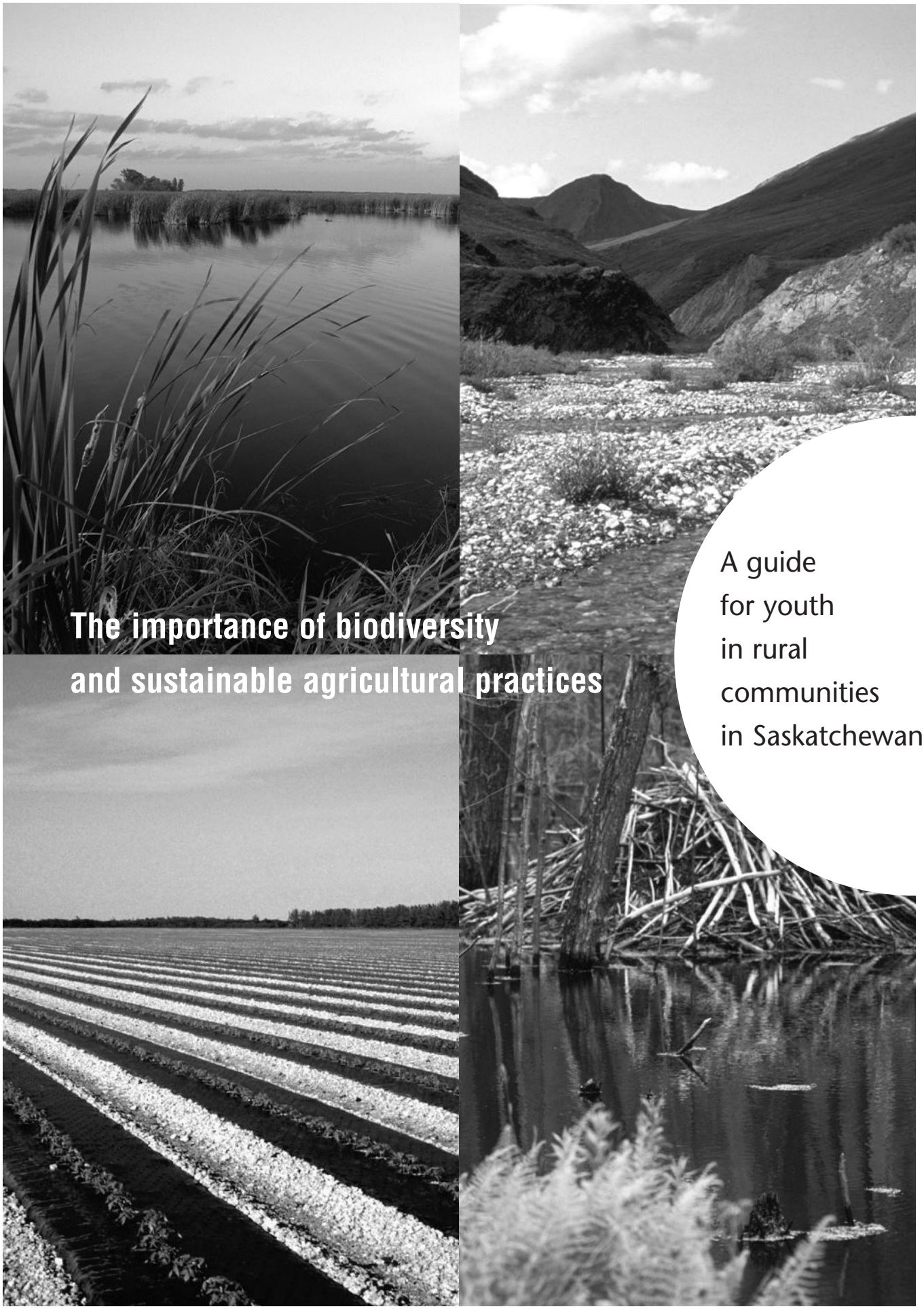

The importance of biodiversity and sustainable agricultural practices

A guide
for youth
in rural
communities
in Saskatchewan

Nature Canada works to protect and conserve wildlife and habitats in Canada by engaging people and advocating on behalf of nature. To help protect Canada's nature or learn more about it, please call 1-800-267-4088 or visit www.naturecanada.ca today! 75 Albert Street, Suite 300, Ottawa, ON, K1E 5E7

Nature Saskatchewan promotes the appreciation and understanding of our natural environment through education, conservation and research. Nature Saskatchewan has been observing, documenting and protecting the province's biological diversity since 1949. Nature Saskatchewan provides the cultural link by which people are inspired, gain knowledge of and ultimately enjoy and protect the natural world around them. Be involved! Please call 1-800-667-4668 (SK only) or 306-780-9273, or visit www.naturesask.ca. Room 206, 1860 Lorne Street, Regina, SK S4P 2L7

Nature Canada works with partners across Canada to promote sustainable agricultural practices that benefit people and biodiversity.

This booklet is one component of a project partnership with Agriculture and Agri-Food Canada to strengthen the role of the voluntary sector in the development of agricultural policies that benefit biodiversity. It was produced in conjunction with Nature Saskatchewan for 4-H clubs, schools and other youth groups. This guide is designed to educate youth in farming communities about the importance of biodiversity and promote sustainable agricultural practices and farmland management that benefit conservation. The project was funded through the Government of Canada's Voluntary Sector Initiative.

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

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On the Cover: Clockwise from top left — Ryan Hagerty/USFWS, U.S. Fish and Wildlife Service, Hans Stuart/USFWS, Gary M Stolz/USFWS

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Fact sheet

Our environment is the natural world around us—living and non-living. Within our environment there are many ecosystems. An ecosystem consists of living and non-living parts that are dependent upon each other and upon their related processes and interactions. For example, in a meadow ecosystem a flower depends on a bird to distribute its seeds, the bird depends on the flower for food, and the seed depends on the soil to grow. An ecosystem can include plants, animals and micro-organisms. Some examples of ecosystems are lakes, ponds, and forests. A farm is also an ecosystem and is referred to as an agro-ecosystem.

Ecosystems come in all sizes. They can be as small as the ecosystem within a rotting log with all associated interactions, such as bacteria and insects breaking down the rotting log, or they can be as large as the earth, and include all interactions within all ecosystems. Healthy ecosystems depend on the diversity of life within them as you'll learn while working through this guide.

Organisms within an ecosystem—plants, animals and humans—each have a habitat, which is where they live, breed, eat, sleep and so on. In other words, a habitat is a home. All organisms require specific habitats to survive and these habitat requirements may also depend on circumstances such as the time of year. For example, during the summer white-tailed deer are more solitary and eat plants, but in the winter they gather in herds and eat twigs, therefore their habitat is different depending on the season.

Each species within a habitat has a niche, which is what they do within the habitat—kind of like their job. For example, a woodchuck and a fox may both live in a field and share the same habitat, but they have two different niches. The woodchuck is active during the day and eats only vegetation, such as dandelions and clover, while the fox is more active when it's dark and eats things like grasshoppers and mice.

Taking care of our environment

Stewardship refers to the voluntary actions individuals undertake to care for and responsibly manage our natural world. Good stewards realize that land, water and wildlife are entrusted to our care and that we must look after what we have and try to restore what we have lost.

Some examples of stewardship include the following:

- recycling
- composting
- using less water
- preventing erosion
- reducing chemical use
- keeping streams and waterways free of pollution
- turning off lights and appliances when they are not being used
- not littering

As stewards we make changes that ensure the Earth and the land we manage remain diverse and healthy for future generations. It is up to us to assess our homes and the land around them to see what changes we can make to help support wildlife and promote biological diversity, or biodiversity. Our actions can help encourage others to be stewards of their land.

ACTIVITY 1
What does your habitat include?

Remember, habitat is where you spend your time. Think about where you live and play and what you eat and drink. In the table below write a description for the components of your habitat. There are no wrong answers.

Habitat component	Description
Shelter Describe where you live, what it is made of and what it looks like.	
Space Describe the other places where you spend time and what you do there.	
Food What foods do you eat? Where does your food come from (e.g., from your garden, local producers, grocery store)?	
Water Describe the things you use water for during the day. Do you know where your water comes from?	

ACTIVITY 2
Match the niche with the species

Read through the lists below. When you have selected which niche goes with which species place the appropriate number in the circle next to the species. Remember, a niche is like job.

Species list

- ◯ moose
- ◯ monarch butterfly
- ◯ raccoon
- ◯ red squirrel
- ◯ river otter
- ◯ cedar waxwing

Niche list

1. Pollinates flowers; adults eat nectar from flowers.
2. Gathers and stores seeds and nuts; eats bark, nuts and seeds.
3. Eats fish, clams and frogs; spends a lot of time in the water.
4. Disperses seeds; eats fruits and berries.
5. Climbs trees and eats bird eggs; also eats berries and crayfish.
6. Eats aquatic vegetation as well as twigs and trees.

Answers are provided on page 39.

ACTIVITY 3
Stewardship and you

In the fact sheet we learned about being stewards of our land. List five things you can do in the next week that will help take care of the environment.

	Action you will take	How it will help the environment
1.		
2.		
3.		
4.		
5.		

Some sample answers are provided on page 39.

Agricultural lands include a variety of habitat types, such as wetlands, forests and meadows. In this section we look at management practices for some of the more commonly found types of habitat. For simplicity we have divided agricultural lands into four categories: farmlands, woodlands, riparian areas, and aquatic areas.

Farmlands

The most abundant type of habitat is farmlands, which includes pastures, croplands, windbreaks and hedgerows, as well as any abandoned croplands or ruins. These areas provide valuable habitat for a number of species, such as deer, badgers, coyotes, kestrels and short-eared owls.

Photo by Gary M Stolz/USFWS

Best management practices for farmlands

- Allow unproductive lands, such as rocky areas, to fill in with vegetation to provide important habitat for wildlife.
- Try to delay grazing and haying until mid-July to allow nesting birds time to raise their young and leave their nests.
- Plant windbreaks and hedgerows to prevent soil erosion and to provide wildlife with cover and corridors (areas wildlife use for travel and migration). Use native plants to further increase biodiversity on your land.
- Reduce chemical use to minimize the amount of toxins entering the environment.
- Use practices that will reduce erosion, such as crop rotation, conservation tillage and planting cover crops.
- Avoid overgrazing to maintain optimal vegetation and soil health.

Woodlands

Land areas on a farm that are predominantly covered with forest and vegetation are called woodlands and include both naturally occurring forests as well as plantations. In Saskatchewan, natural forests tend to consist of aspen, oak bluff and mixed forest (deciduous and coniferous trees). Woodlands are home to species such as snowshoe hares, red foxes, Franklin's ground squirrels, great horned owls and Tennessee warblers. Woodlands provide important wildlife habitat, prevent soil erosion, capture snow that will provide needed water in the spring, and provide firewood and other wood products.

Best management practices for woodlands

- Thin trees in dense plantations to allow for new growth, provide more diverse habitats, and to allow easier movement for wildlife.
- Leave some dead trees as well as the tops of harvested trees in place to provide homes for many species.
- Avoid allowing livestock to graze in woodlands as this can harm habitat. Cattle sometimes graze on seedlings or young trees which would otherwise become forests.

Riparian areas

Riparian areas are transitional zones where the land meets water. A healthy riparian area is often well-vegetated and provides useful habitat for many species. Riparian areas are important because they reduce erosion, prevent sediment from entering the water, trap moisture from snow, and provide habitat and corridors for terrestrial and aquatic wildlife.

Best management practices for riparian areas

- Keep livestock away from riparian areas to prevent water contamination, transmission of disease amongst livestock, trampling of vegetation, and bank erosion. In situations where

livestock have access to only a section of a water body, fence off the area to keep livestock away. Instead of fencing your entire riparian area, which can be costly and impede the movement of wildlife, try enticing livestock away with an alternate water source, such as a trough.
- Refrain from using chemicals, fertilizers and feed in the immediate area to avoid polluting the water.
- Refrain from altering the path of the water body as it will alter the ecosystem.
- Leave a buffer zone of vegetation along the water body to reduce erosion, catch snow, filter contaminants, and provide habitat.
- Add logs to streams and ponds to create habitat.

It is important to remember that riparian areas often provide fish habitat. Alterations to fish habitat and activities pertaining to fish habitat need to receive permission by the Department of Fisheries and Oceans Canada (DFO). For more information contact the DFO office in your area or check their Web site at www.dfo-mpo.gc.ca.

Aquatic areas

Areas associated with water, such as streams, ponds or wetlands, are called aquatic areas. These areas contain some of the most diverse and productive habitats and are home to insects, fish, reptiles, amphibians, birds and mammals.

Best management practices for aquatic areas

- Do not drain wetlands because they provide important habitat, improve water quality by acting as filters, help reduce flooding by acting like sponges to capture rain and runoff, and they maintain groundwater levels that are essential for properly running wells. Groundwater is a source of water that is found in the ground, it is where well water comes from.

Photo by Ryan Hagerty/USFWS

- Remove invasive exotic plant species, such as purple loosestrife, and replace them with native species.
- Do not use chemicals near water sources to avoid contamination.
- Maintain a buffer of vegetation around water sources to provide shelter for wildlife, trap moisture, and help prevent contaminants from reaching the water.
- Erect nesting boxes for birds.
- Leave fallen trees for habitat.
- Limit livestock's access to water to avoid water contamination and habitat destruction.
- Thin dense vegetation in the water and on the shoreline to allow wildlife to move more freely.
- Clean up garbage and debris.

Landscape management

Roads are a major threat to wildlife. It is important to leave areas free from ATV use, snowmobile trails and roads because vehicles (and livestock) can scare wildlife, disrupt their routines, and physically destroy their habitat. When planning access routes, ensure they are as far as possible from undisturbed areas. If a water crossing is absolutely necessary use a bridge to prevent trampling the habitat of the streambed. If possible avoid or remove barriers that could inhibit wildlife movement through corridors (areas wildlife use for travel and migration).

HABITATS

ACTIVITY 1

Get to know the wildlife who share your habitat

Create a wildlife sightings chart documenting every non-domestic living thing that you see in your backyard or on your property. You can either record wildlife that you have seen in the past, or you can observe for a week and note the animals you see. If you don't know an animal's proper name, just describe it as best you can.

Wildlife name or description	Where did you see it? (e.g., in the grass, in the pasture, by the marsh etc.)	Why do you think it was there? (e.g., to get water, to eat, its den or nest is near by, etc.)

If you run out of space, use a blank piece of paper.

ACTIVITY 2
Creating habitat on your property

Create habitat on your property by building piles of natural materials, such as stones and dead trees. The piles you create could provide habitat for snakes, birds and small mammals.

Tips for creating piles

- Use the largest material for the base and leave openings as you create the pile.
- Place the pile near other cover.
- Use natural materials whenever possible.
- Don't use dangerous materials, such as tires, glass, wire or treated woods.
- Make your piles no more than a couple feet high.
- Contact your local government office and inquire about permits before creating stone or brush piles in or alongside water bodies.

Fact sheet

Biodiversity is the variety or diversity of living things. Biodiversity includes diversity at three levels:

- Genetic level—for example, the difference between your genes and those of your friends.
- Species level—the difference between two species, such as a monarch butterfly and a goldenrod plant.
- Ecosystem level—the range of different habitats and ecosystems, such as farmlands and forests.

Diversity at all levels is important for a healthy and stable environment. For example, many different species can perform the same job, such as producing food energy, and since many species share this job, if one species is lost there are still many others to make sure the job gets done. There are also some species whose genes allow them to perform highly specialized jobs, such as some birds that have evolved beaks specially shaped to allow them to pollinate specific flowers.

It is important to preserve genetic diversity because all species depend on other species to survive and if one species is lost it could negatively impact other species. Using the example above, if the bird species with the specialized beak disappeared the flower would also disappear because pollination would not occur. Taking this one step further, any species that depend on this flower would then also be affected.

By increasing biodiversity and maintaining healthy, natural ecosystems our farms benefit environmentally, economically, and socially.

Environmental benefits of biodiversity

Biodiversity is vital to the health and survival of the Earth's overall ecosystem. Some environmental benefits include the following:

- Water purification—wetlands provide wildlife with habitat, help maintain stable water levels, control salinity, and act as filters against contaminants to improve water quality.
- Pollution absorption—plants and trees are a source of oxygen, and also absorb carbon dioxide and some pollutants.
- Erosion control—trees and other vegetation reduce soil erosion and provide wildlife habitat at the same time.
- Waste management—soils rich in organisms, such as fungi, bacteria and arthropods, are healthier because these organisms break down organic matter and minerals into parts that can be utilized by other organisms, such as food for plants.

These environmental benefits also overlap with social and economic benefits. For example, if the soil is not rich in biodiversity it will not be as productive, which means a reduced crop yield.

Economic benefits of biodiversity

A farm rich in biodiversity can translate into production gains on your farm. Some examples include the following:

- Free pollination—many insects and birds provide the valuable service of pollinating crop plants for free.
- Pest control—natural predators can act as controls for agricultural pests.

BIODIVERSITY

- Erosion control—soil erosion can be reduced by planting vegetation.
- Water purification—keeping water sources free from livestock reduces contamination of the water and helps improve herd heath.
- Stress resistance—healthy ecosystems have a greater resistance to stressors such as drought, diseases, overgrazing and fire.
- Genetic resources—wild plant and animal species are a source of genetic resources that may possess desirable traits for breeding programs.

Social benefits of biodiversity

An environment rich in biodiversity can improve our overall quality of life. Some examples include the following:

- Outdoor recreation—hiking, camping, bird-watching, canoeing, and other outdoor activities provide enjoyment for many people.
- Revenue from tourism—tourists who want to experience nature contribute revenue to the economy, which means jobs for many Canadians.
- Other benefits—biodiversity provides fulfillment to people simply because of its beauty as well as for spiritual reasons.

Photo by Elise Smith/USFWS

ACTIVITY 1
Who lives at the pond?

For this activity you can work individually or in a team.

Materials you will need

- small shallow containers
- magnifying lens
- pencil and the chart below
- tweezers (for picking up bugs)
- kitchen strainer

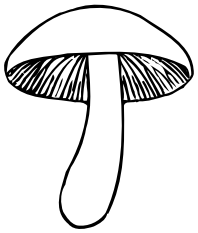
1. Make a list of the types and numbers of different animal species you think would live around a pond. See the chart below for different categories of animals.
2. Visit a shallow pond and count how many different species of animals you find around the pond. Don't forget to turn over rocks. Record your findings in the chart.
3. Look at what lives in the pond. Using a bucket or scoop collect samples of marsh water and mud from the bottom of the pond and examine them for organisms. Record your findings in the chart.
4. Sweep the strainer through the water just below the surface near the marsh plants. Pour the catch into a shallow container and count the species of insects you collected. Record your findings in the chart.
5. Compare your results with your estimates. Was your estimate higher or lower?

Animals	Estimated number of different species	Actual number of different species
birds		
mammals		
reptiles (turtles, snakes, lizards)		
amphibians (frogs, toads, salamanders)		
insects (everything else)		

The variety of species is an example of biodiversity. The way the species interact is an example of an ecosystem.

ACTIVITY 2
A look at biodiversity

For this activity you will work in groups of two.



Materials you will need

- container or basket
- pencil and the chart below

1. During the fall visit a wooded area near your home or your meeting location.
2. Estimate the total number of different species of mushrooms you think will be found by all the groups together.
3. With your partner spend 20-30 minutes collecting mushrooms. **VERY IMPORTANT:** Do not eat any mushrooms. Some are poisonous and can seriously harm you—some are even fatal! Wash your hands as soon as you are finished handling the mushrooms.
4. Count how many different species of mushrooms you find. You don't need to identify the types of mushrooms by name. You will be able to tell by their appearance if they are a different species. Compare your answers with those of the other groups. Was the actual number of different species higher than you guessed? This gives you an idea how much diversity exists in this ecosystem.

Estimated total number of different types of mushrooms found by all groups ◯	Number of different mushrooms your group found ◯	Total number of different mushrooms found by all groups ◯

ACTIVITY 3
How does biodiversity help you?

List three ways biodiversity helps you. You can review the fact sheet for ideas.

	How you benefit from biodiversity
1.	
2.	
3.	

Some sample answers are provided on page 39.

The biggest threat to biodiversity is our growing population. More that six billion people inhabit our planet and it is estimated the population increases by about 90 million people per year. This increase puts greater pressures on our ecosystem and consequently on the species that inhabit it.[1] Additional threats include habitat loss, pollution, climate change, invasive exotic species, and agricultural practices. At any time one or more of these threats can be occurring

Habitat loss

Large-scale commercial harvesting of forests is a prime example of habitat loss. In Canada forests are often clear-cut, which results in significant soil erosion, degraded fish habitat and loss of natural forests. Natural forests are important because they contain trees in different stages of growth that provide a variety of habitat for wildlife. Cleared areas are often reforested with plantations of trees that are all the same age and these do not support the same level of biodiversity.

Expanding cities and towns also contribute to habitat loss when land is cleared and wetlands are drained to accommodate growing populations.

Pollution

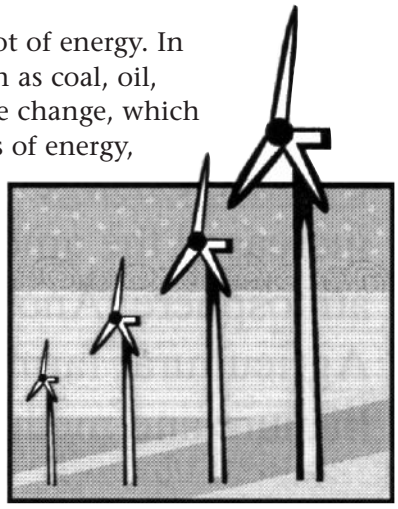
Sewage and industrial wastes are some of the pollutants that contaminate our waters and lands. Once released into the environment many pollutants persist and move though the food chain where they enter the tissue of living things. For example, DDT was used as an effective pesticide until people realized it created more problems than it solved. Although its use has been banned since 1972, it is still found in bird's eggs and at levels that are higher than 20-25 years ago. The past use of DDT demonstrates the long-term environmental impact of pollutants, many of which we do not know the effects of. Since winds and waters carry pollutants, not even remote places are safe from their effects.

Climate change

The depletion of forests, the burning of fossil fuels, such as gas and oil, the release of nitrous oxide from fertilizers, and the release of methane produced during digestion in ruminant animals have significantly increased

Energy management

You may already be aware that operating a farm requires a lot of energy. In many cases this energy comes from burning fossil fuels, such as coal, oil, propane and natural gas. Burning fossil fuels leads to climate change, which threatens biodiversity. Fossil fuels are non-renewable sources of energy, which means we only have a limited amount. Many people are now looking at renewable sources of energy, such as solar (using the sun) and wind energy. These innovative technologies require a financial investment, but over the long term they pay off, for both your farm and the environment. This is something you can look into, but in the meantime it is important to try to reduce the amount of energy you use on a day-to-day basis. You can start by monitoring heating, lighting, refrigeration, crop drying, feed processing, crop inputs and equipment use.



the amount of greenhouse gases and ozone-depleting particles in our atmosphere. This increase in greenhouse gases is contributing to the warming of our planet's temperature—global warming. Scientists agree this change in global temperature will have an effect on our climate, which means more extreme weather conditions, such as storms, extreme heat, extreme cold, floods and droughts. It is estimated that climate change may also result in the loss of specialized habitat, such as Arctic areas, which will have serious impacts on species and biodiversity.

Climate change may also have a detrimental impact on agriculture. Problems may include crop damage, water shortages, changes in interactions among crops, pests, and weeds, and changes in production patterns.

Invasive exotic species

The introduction of exotic or non-native species into an ecosystem threatens biodiversity. Some exotic species thrive in the new environment and out compete the native species for nutrients, sunshine, and space. Leafy spurge and purple loosestrife are examples of invasive exotic species. Purple loosestrife, a popular garden perennial, was introduced to North America about 200 years ago. Since then it has invaded wetlands throughout Canada. It can grow densely and choke out native vegetation, which destroys wildlife habitat. Chemical inputs have proven ineffective over the long term, but the use of biological controls, such as the release of beetles that eat the plant, is showing some promise.

Agricultural practices

Agricultural practices, such as tillage, overgrazing, chemical and fertilizer applications, soil erosion and the draining of wetlands, have negatively impacted biodiversity. The agriculture industry, however, has a huge potential for maintaining or increasing natural biodiversity by making small changes to the management of resources. Many agricultural producers are already incorporating changes, such as adding hedgerows to prevent soil erosion and reducing chemical inputs. By learning about biodiversity we are taking the first step to positive change.

T H R E A T S

ACTIVITY 1
What's the threat to biodiversity?

Match the following actions with the threat to biodiversity. Place the appropriate number in the circle next to the action. Each threat may apply to one or more actions.

Actions

- ◯ Building a new shopping mall
- ◯ Leaving your car running
- ◯ Spilling gasoline while filling your lawn mower
- ◯ Wasting paper
- ◯ Planting leafy spurge in your garden
- ◯ Paving over a wetland for a parking lot
- ◯ Spraying pesticides near a pond with geese and fish

Threats to biodiversity

1. pollution
2. habitat loss
3. climate change
4. invasion of exotic species

Answers are provided on page 39.

ACTIVITY 2
How much energy can you save?

It is sometimes a challenge to reduce energy use. You might not run a farm yet, but try accounting for and then reducing the amount of non-renewable energy you use in your daily life. For one week write down how many hours of electricity you use, for example while watching TV or reading at night. Then pick a week and try to reduce the amount of energy that you use.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total hours for the week
Number of hours of electricity used during a regular week	◯	◯	◯	◯	◯	◯	◯	◯
Number of hours of electricity used during a reduction week	◯	◯	◯	◯	◯	◯	◯	◯

How many hours were you able to reduce your energy use by?

What percentage was this reduction?

How did your reduced energy consumption affect your lifestyle?

Fact sheet

The majestic cry of the loon and the sight of a moose foraging in the morning mist are things we associate with Canada. Wildlife is not only something Canadians love, but something we use to define ourselves and our country. People are just starting to recognize that we humans are part of a large ecosystem, Earth, and our health depends on the health of our environment, including our wildlife.

Wildlife is more than wild mammals, reptiles, amphibians and birds—it includes all life that is wild, including plants and even fungi and bacteria. Our survival as humans depends on the natural world, including wildlife.

Here are a few examples of how we depend on wildlife:

- Cotton used for clothing, such as jeans, comes from the tamed offspring of the wild cotton plant.
- Oil, which produces many of the synthetic materials we use today, comes from the remains of wildlife that died millions of years ago.
- Wood and paper originate from natural forest ecosystems.
- Many medicines we use are derived from wild plants, such as aspirin, originally derived from willow bark but now produced synthetically.
- All products harvested by commercial agriculture have wild ancestors, including potatoes, rice, corn, cattle and horses. Even now agriculture looks to wildlife to provide new genetic materials, new crops and new products. Having a healthy number of a wild variety of life means there are better options for future generations of producers.
- Wildlife plays an important role in the production of oxygen, pollination of plants, moderating climate, contributing to our water cycle, and much more.

In Canada we have thousands of different species of wildlife and new ones are being discovered all the time. Here are some examples of the number of species we have in Canada:

- 198 species of mammals
- 440 species of birds
- 1,141 species of fish
- 30,000 species of insects

Photo by Mike Lockhart/USFWS

All of these species live in a variety of ecosystems across Canada, including short- and long-grass prairies, rivers, tundra, swamps, bogs, temperate rainforests, boreal forests, streams, and your property, to name a few. Many of these ecosystems are changing and disappearing as a direct result of human development, which also has a direct negative impact on wildlife species. Some of these species may disappear before scientists have a chance to identify them. In Canada, the great auk, passenger pigeon and sea mink are a few examples of species that are extinct—many more are endangered.

Wildlife at work

We already mentioned that within ecosystems there are interactions going on between species. Every species plays an important role or job that keeps our global ecosystem healthy. There is a natural tendency for people to favour some wildlife over others—after all, who hasn't wished that mosquitoes would just go away? But the reality is that mosquitoes, like all other species, are a crucial component of the health of our planet.

Here are some examples of the jobs wildlife perform:

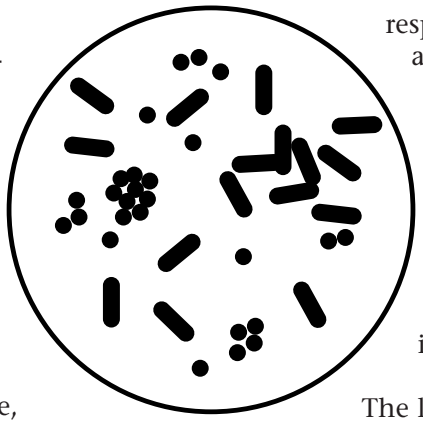
Insects are a great example of wildlife most of us think we could do without, but in reality they play at least two very important roles in healthy ecosystems. Insects are a food source for many animals and even some plants—they are one of the most significant sources of protein in the diet of animals. They also pollinate many flowering plants, which is a beneficial service to Canadian farmers and is estimated to be worth billions of dollars annually. So maybe bugs aren't so bad after all!

Risk categories determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

Extinct	Extirpated	Endangered	Threatened	Special concern
A species that no longer exists anywhere	A species that no longer exists in the wild in Canada, but still exists elsewhere	A species that is threatened with imminent extirpation or extinction in Canada	A species that will likelybecome endangered in Canada if certain factors are not reversed	A species that has characteristics that make it particularly sensitive to human activities and natural events

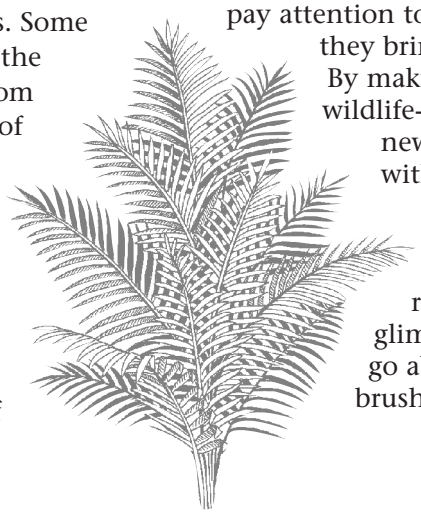
Status of at risk species in Canada[2]

Extinct	Extirpated	Endangered	Threatened	Special concern	TOTAL
12	21	160	108	140	441



Bacteria are another type of organism that have a bad reputation. Even though there are some very harmful types of bacteria, many are beneficial. For example, the bacteria that exist in our digestive system break down the food we eat into useable components, such as energy, and at sewage treatment plants bacteria break down human waste into carbon dioxide, water and nutrients. Through a process called decomposition bacteria break down dead materials into useful nutrients and carbon used by other organisms, such as plants. Some soil bacteria take nitrogen, one of the main components in fertilizers, from the air and convert it into a form of nitrogen that plants can use.

Green plants provide oxygen—a basic requirement of life for all animals. Through the process of photosynthesis plants convert carbon dioxide and water into oxygen and sugar with the help of the sun's energy. The process of respiration is preformed by animals and does the opposite—it converts oxygen into carbon dioxide. Plants help reduce global warming by absorbing carbon dioxide, which is one of the greenhouse gases that traps heat on our planet. Global warming occurs because the heat is prevented from escaping the Earth's atmosphere.



The landscapes of our farms and homes are part of an ecosystem that provides homes for many other living things—things that can grace our lives if we learn to pay attention to them and value the diversity they bring to our daily interactions. By making our homes and farms wildlife-friendly, we open a door to new relationships—relationships with the birds who stop to rest on their migrations, relationships with bats who swoop to prey on mosquitoes, and relationships formed by glimpses of wild predators as they go about their lives, sometimes brushing up against ours.

WILDLIFE

ACTIVITY 1
What is the wildlife connection?

Things that we humans use and depend on are listed below. Can you figure out how they are connected to wildlife?

Object	Connection to wildlife
aspirin	
nylon	
fur coat	
pencil	
cotton clothing	
penicillin (antibiotic)	
leather jacket	
notebook	
fish sticks	
gasoline for your car	

Answers are provided on page 39.

ACTIVITY 2
Wildlife at work

As we learned in the fact sheet, wildlife perform important jobs that benefit humans. See if you can match the job below with the appropriate wildlife. Place the corresponding number in the circle next to the wildlife.

Wildlife

- ◯ bacteria
- ◯ fungi
- ◯ bats
- ◯ algae
- ◯ butterflies
- ◯ sea otters
- ◯ robins
- ◯ trees

Jobs wildlife perform that benefit humans

1. Many species of fish need kelp beds (a type of seaweed) for their habitat. This wildlife eats sea urchins, which keeps them from eating and destroying all the kelp beds.
2. This wildlife eats tonnes of mosquitoes.
3. We can eat some types of this wildlife and it also helps break down dead trees into soil.
4. This wildlife eats seeds and berries and then disperses the seeds in other areas to grow.
5. This wildlife lives in our gut and helps us digest food, as well as providing us with medicine.
6. This wildlife pollinates flowers.
7. This wildlife provides shelter for other wildlife, it helps control soil erosion, and it provides us with building materials.
8. This wildlife provides much of the world's oxygen.

Answers are provided on page 39.

Fact sheet

Soil is the foundation of your farm. Much more than just dirt, soil is made up of many things. An average soil sample taken from most places in Saskatchewan consists of about 45% mineral matter, 25% air, 25% water and 1%–5% organic matter. Organic soils found in bogs and wetlands of northern Saskatchewan are composed of at least 20% organic matter.[3]

Mineral matter comes from small fragments of rocks. Plants need trace amounts of minerals found in soil, such as calcium, zinc and copper. Humans also need minerals so they are added to many items we consume, such as bottled water and vitamins.

Organic matter is made when plants and animals die. The nutrients contained within their remains decompose, usually with the help of bacteria, fungi, insects and earthworms, and are reabsorbed into the soil. Organic matter is also known as humus and is usually the top layer of soil.

The health of your farm is directly related to the heath and productivity of your soil—your crops and livestock depend on it.

Soil texture is determined by the size of the rock particles contained in the soil. Small particles result in clay, medium-sized particles are silt, and larger particles are sand. Soil texture determines moisture retention, air circulation, and how the soil deals with contaminants. For example, water passes quickly through sand and therefore allows contaminants to reach the groundwater. Clay soils, however, slow the movement of water and act as natural filters, which gives bacteria and other organisms the opportunity to break down contaminants before they can reach the groundwater.[4]

Fertilizers and soil management

Managing soil often involves adding commercial fertilizers. In Canada the nitrogen content of commercial fertilizers has been increasing steadily over the past three decades[5]. In some cases the nitrogen is not absorbed properly and as a result enters the water system.

Excess nitrogen in water bodies provides food for algae, which results in an algae bloom. Excessive algae growth prevents other organisms from getting the sunlight they need to survive. Nitrogen also affects air quality by causing air pollution, disrupts forest growth by creating an imbalance in nutrients that results in reduced growth, and nitrogen emissions are the major source of ground-level ozone (thought to be harmful to human health). Fertilizer application in agriculture is only one of many sources of excess nitrogen. Others sources include industry and vehicle emissions.

Best management practices for using commercial fertilizers

- Read and follow all instructions before applying fertilizers.
- Do not over apply fertilizers.
- Apply fertilizers when they can best be absorbed by plants and soil, for example when the forecast is not predicting rain.
- Whenever possible use organic fertilizers rich in nitrogen, potassium and phosphorous, such as coffee grounds, bone meal, manure, mushroom compost, ground bark or sawdust, peat moss, soybean meal, blood meal and compost.

Soil erosion and compaction

Soil erosion removes soil from areas where it's needed, such as croplands, and deposits it in areas where it can cause problems, such as in water bodies. Erosion is caused by overgrazing, wind and water action, drought, poor crop management and loss of organic matter.

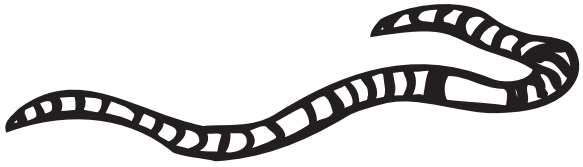
Impacts of soil erosion

- Eroded soil, including soil-bound contaminants, can end up in water bodies where it negatively alters aquatic ecosystems.
- Growing plants can be buried or injured by sandblasting.
- The land's capacity to grow crops can be depleted and cause crop yield variability.
- Air and water quality can be reduced.
- Costs can be incurred to replace eroded soil and to clean up eroded soil and other materials.

Soil compaction is caused by poorly timed tillage, heavy machinery, and trampling by livestock. Soil compaction increases the risk of erosion and makes re-vegetation difficult.

Best management practices to minimize erosion and compaction

- Plant trees or shrubs to prevent erosion caused by wind and water. This is especially important in sloped areas.
- Plant winter cover plants to keep soil in place.
- Practice conservation tillage (see Lesson 10 for a definition) and leave crop residue to minimize soil erosion.[6]
- Keep livestock and machinery off wet fields to avoid soil compaction.



S O I L

ACTIVITY 1
What is the texture of your soil?

Materials you will need

- 1-cup measure
- 1-litre jar (a tall skinny jar works best)
- water

1. Take one cup of soil and place it into the jar.
2. Fill the rest of the jar with tap water, cover it with the lid or your hand, and shake it until the soil and water are completely mixed.
3. Let the jar sit for 24 hours. You will begin to see the soil settle. When the water at the top is almost clear you should see that the soil has separated into layers. Sand will settle at the bottom, the middle layer will be silt, and clay will settle on top of that. The organic matter will float on top of or in the water.

Is your soil mostly clay, silt or sand?

How will water flow through your soil?

ACTIVITY 2
Start a compost pile

Materials you will need

- wood or welded wire mesh
- nails
- screws
- hammer
- fasteners
- measuring tape
- cutting tool
- hinges
- pencil

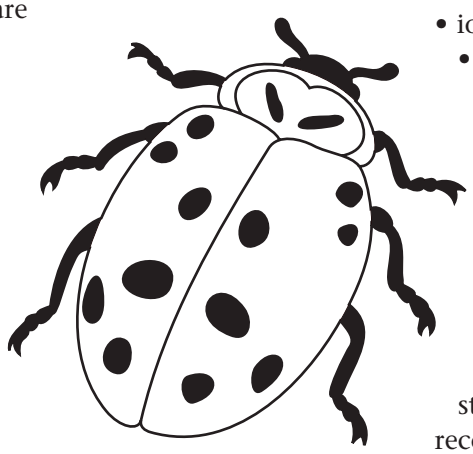
1. Build a compost container to suit your needs. It can be any size but should have a bottom, four sides, and a cover that can be secured to prevent wildlife from entering and materials from blowing away.
2. Once completed add materials such as leaves, vegetable scraps, coffee grounds and grass clippings. Stir the contents each time you add new materials to ensure air circulation for decomposition. If there is an odour coming from the container this usually means there is not adequate air circulation.

You will know the decomposition process is complete when the material is brown and breaks apart easily. At that point you can apply it.

For more information check out the City of Regina Web site at www.cityregina.ca/content/info_services/environmental/compost.shtml. They have a brochure about composting for Saskatchewan climates.

Traditional agricultural practices rely on the use of pesticides to control weeds, diseases and harmful insects. Pesticides, however, contaminate our ecosystem and create chemical resistance in insects. Also, even though pesticides are intended to only control a specific pest, they inevitably reach our air, water, soil and other living organisms where they can cause harm, such as water pollution.

Chemical resistance in both insect and weed populations is increasing. According to the National Research Council of Canada, more than 440 insect and mite species and 70 fungal species are known to be resistant to some pesticides. It has been shown that those populations of pests that are resistant to one or more pesticides are likely to develop resistance to other chemicals more rapidly.[7] This demonstrates the need to develop methods of pest control that do not depend on chemicals.



A new trend is emerging, however, as farmers look for ways to reduce practices that are chemically dependent. Recently, more environmentally friendly techniques have been developed. These range from being entirely chemical free to using integrated pest management to reduce reliance on pesticides.

Organic farming

The principle goal of organic farming is to develop economically and environmentally sustainable enterprises. Markets have shown that once a farm is certified organic, its produce can usually qualify for prices higher than non-organic products. Organic produce currently comprises 2% of the total produce sold in Canada and is the fastest growing sector of Canadian agriculture. The number of organic farms in Canada is growing by approximately 20% per year.

To be certified as organic in Canada, livestock must be raised on 100% organic feed and the following items are prohibited on your farm for at least three years prior to harvest:

- highly soluble or synthetically compounded mineral fertilizers
- synthetically compounded pesticides
- growth regulators
- antibiotics
- hormones
- ionizing radiation
- recombinant genetic manipulation of plants or animals (GMOs)

Integrated pest management

Integrated pest management (IPM) uses a combination of techniques to reduce the reliance on chemicals while still controlling pests. IPM recognizes that eliminating all types of pests or entire populations is not cost-effective, good for the environment, or necessary. To successfully use IPM farmers should closely monitor the pest problem and utilize the least toxic method to combat the pest population. Reducing the use of chemicals benefits farmers' health and the health of the environment. It can also reduce pest-management costs and the likelihood of pests developing chemical resistance.

Not all bugs are bad!
Some insects even help—they act as a natural pest control and therefore reduce the need for chemical pesticides. To encourage these helpful bugs it's important to learn how to recognize the good ones from the bad ones, avoid the use of pesticides that target a wide variety of insects, and try to maintain the habitat used by these beneficial insects.

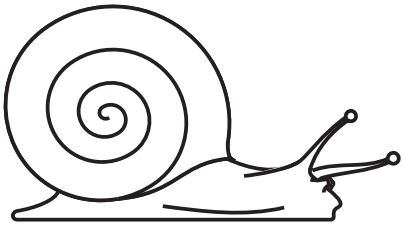
IPM involves the following methods to control pests:

- Planting—rotating crops to deter crop-specific pests and using companion planting.
- Non-chemical pest control—targeting pests using sticky traps and even vacuums, and using screens to protect crops.
- Biological control—using natural predator insects to reduce pests.
- Chemical control—still used in some extreme situations.

If you need to use pesticides keep the following in mind:

- Use a product with high absorption, low solubility, which reduces the amount of chemicals that will dissolve into water bodies, and one that breaks down fast, so its chances of entering the environment are reduced.
- Use a product with low toxicity.
- Read and follow all instructions and get any required training before use.
- Store them away from water sources.
- Do not spray on windy days.
- Do not spray within 10 metres of water bodies.

It is also important to remember that pesticide containers, even if empty, should be handled carefully. Containers should be cleaned and discarded according to regulations. Mark or puncture containers so they will not be reused and be sure never to burn the containers.



MANAGEMENT

Activity

ACTIVITY 1

A look at organically grown produce

Visit your local grocery store and record the price of five organically grown fruits and vegetables and organically produced meat, then record the price of the non-organic equivalent. If stores in your area do not carry organic products refer to the answer section on page 39 for sample organic product prices.

Products	Organic price	Non-organic price	Which has a higher price and by what percentage?

Is there a price difference?

What percentage is the price difference?

How do you explain the increase in demand for organic products by consumers?

General answers are provided on page 39.

Environmental farming involves making some changes to our practices and to our thinking as well. Many people traditionally viewed wildlife as a problem. But as we learned in Lesson 1, all things are connected and diversity is essential to a healthy farm and a healthy ecosystem.

In many situations an attraction, such as suitable habitat for denning or a food source, draws the wildlife to your property. This means that even if you get rid of the animal that is creating the problem, others will be attracted and simply take its place. For this reason you need to target the attraction whenever possible. A dog is also a good way to deter wildlife.

This fact sheet looks at the benefits of certain wildlife and what can be done to minimize conflict with them.

Beavers

Beavers are amazing builders and are able to significantly alter their habitat, which is why they come into conflict with humans. Beavers taking down trees and building dams are part of the natural cycle of a wetland ecosystem. Their dams reduce downstream floods by providing a more consistent water flow, they reduce bank instability, they create habitat for many species, such as fish and waterfowl, and beaver ponds trap sediment, which improves water quality.

Photo by Hans Stuart/USFWS

Tips for managing beavers

- Think, before you destroy a beaver dam—it will most likely be rebuilt and result in even more trees being removed.
- Remember, live trapping and relocating a beaver is not a solution. If the habitat is suitable for beavers, then another one will move in and take its place. Additionally, you might just transfer your problem to your neighbour. In some provinces it is illegal to relocate wildlife outside of a close proximity.
- Protect trees on your property by wrapping them in hardware cloth (also called welded wire mesh). It is more expensive than chicken wire, but beavers can't chew through it. If you have too many trees to protect them all, focus on trees you really want to protect.
- Install a beaver baffle to alleviate flooding by running a plastic pipe from the point of high water through the dam to low water. This allows water levels to balance. (Remember, if beavers hear running water they will continue to dam.)
- Form a welded wire mesh fence around culverts to protect them from being blocked.

WILDLIFE

Waterfowl

Waterfowl will stop to feed on farmers' fields if the fields are along their migration path. Some farmers budget for these losses and consider it a payment for the benefits wildlife bring to the farm, such as free pollination. For the most part, there is little that can prevent the birds from eating your crops, but you can minimize the impacts.

Tips for managing waterfowl

- Use scare devices, such as propane-run noise-makers, scare-eye balloons and scarecrows, to frighten away birds before they land.
- Encourage natural predators, such as raptors, to frequent the area by installing nest boxes and creating high perches.
- Plant some crops specifically for the birds to eat to help protect other fields.
- Rotate crops that waterfowl are not as fond of, such as rapeseed, flax, potatoes and sugar beets, with other crops in areas of heavy damage.

Ground squirrels

Several species of ground squirrels are found in Saskatchewan. These social animals live in burrows and forage on vegetation. Ground squirrels play an important role in the prairie ecosystem because they provide food for birds of prey, such as ferruginous hawks, a species of special concern, and they provide burrows for many animals, including endangered burrowing owls. The extermination of ground squirrels has a negative effect on the ecosystem and the chemicals used to destroy them harms other species. It is therefore better to use non-lethal methods to manage this species.

Tips for managing ground squirrels

- Keep grass growth heavy since they seem to prefer foraging in shorter grass.
- Encourage natural predators, such as owls and hawks, to frequent the area by creating perching areas, such as trees or posts, and installing nest boxes.

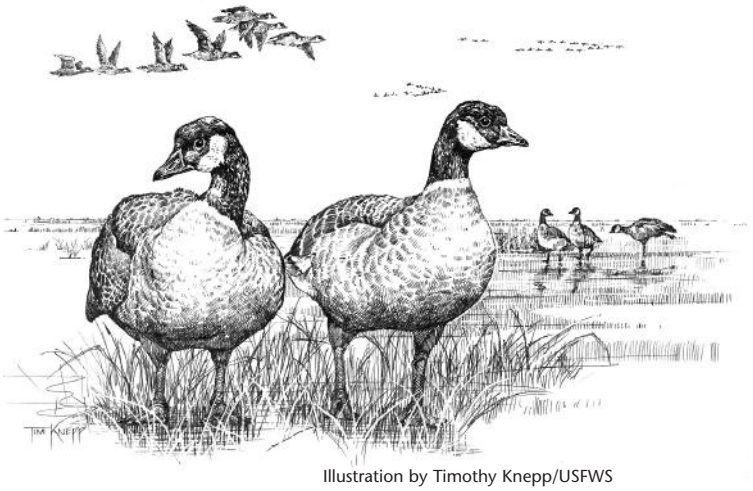


Illustration by Timothy Knepp/USFWS

Other wildlife

For other wildlife problems, confirm which species is causing the problem and then honestly assess the damage they create versus the benefits of the species. If you feel the problem needs to be addressed, do research into non-toxic solutions.

If wild animals have moved into sheds or barns, find the point of entry and cover it. Welded wire mesh (hardware cloth) is a good material to use. However, during their birthing season many animals move into sheds or barns for a safe place to have their babies. In these situations it is often best to leave them for a few weeks until the young are ready to emerge with their mother, otherwise you risk trapping the babies inside where they will die and smell. Additionally, the mother will likely cause a great deal of damage trying to get back inside to her young. When you are sure the mother and babies are coming out together, wait until you are certain they are out and then secure the access area. Also remember that different species have their babies at different times, so be sure to research what this is for your area.

It is also important to secure areas where animals like chickens are kept. Welded wire mesh should be used since chicken wire is often not strong enough. Remember that foxes and raccoons are good diggers, so be sure to secure the bottom as well. Always remove sources of food, such as garbage, pet food, and feed, whenever possible.

Activity

ACTIVITY 1
What wildlife use for denning sites

We learned that sometimes wildlife den close to people. This activity looks at what materials wildlife use to make their dens. For this activity you will work in groups of two.

Materials you will need

- pencil and the chart below
- bucket or bag to carry small items found

At your schoolyard or meeting place spend 30 minutes walking around to find things wildlife use to make their home or use as a shelter. Observe larger items where they are and if you want bring smaller items back for discussion with the other groups. In the chart below list all the items you find, what species use them, and how.

Item	Species that uses item	How item is used

Sample answers are provided on page 39.

Fact sheet

Grazing is an important part of a healthy grassland ecosystem. By grazing, livestock help turn over the soil through their trampling, and their waste—broken down plant matter they consume—returns nutrients to the soil. These tasks were previously performed by grazing wildlife, such as bison, deer and antelope. But there is an important difference between livestock and wildlife grazing: livestock are confined to a specific area, which increases the risk of overgrazing. When overgrazing occurs the area is not allowed time to recover, which leads to poor plant and soil health.

Best management practices for grazing

- Livestock waste can contaminate water bodies. In situations where livestock have access to only a section of a water body, fence off the area to keep livestock away. In situations where livestock have access to an entire water body, fencing off the entire water body may not be feasible as it will be costly and it will impede wildlife movement.
- Time grazing with plant life cycles to allow the plants time to complete their period of fastest growth, which is usually between late May and mid-June.
- Practice rotational grazing to limit access by livestock and reduce overgrazing. Divide your land with fences and when the forage in one fenced-in area is grazed to about 5cm, move the livestock to another area.
- Do not allow overgrazing, especially prior to the first frost, as this is when plants are preparing for the winter.
- Leave carry over or some ground cover to reduce erosion, trap snow that will provide moisture, and provide critical habitat for wildlife.
- Designate an area free from grazing for a season to allow the soil and vegetation time to recuperate.
- Provide sufficient feed to discourage foraging and overgrazing when livestock are kept in a specific area for a long period of time.

Waste management

Although livestock waste can provide a source of nutrients, it can also contaminate nearby water sources, including lakes, ponds and even your well, with nitrogen, phosphorus, ammonia, bacteria and other harmful organisms. It is therefore extremely important to store manure in leak proof containers and well away from water sources (a minimum of 30m from domestic water sources and at least 15m from other water sources).

Feed management

Animal feed contains nutrients and other organic matter. As we learned in Lesson 6, these materials can pose serious problems if they find their way into water sources. Feed should be confined and stored away from water sources.

LIVESTOCK

Activity

ACTIVITY 1
A look at compaction caused by grazing

This activity looks at the impact heavy grazing has on the soil.

Material you will need
- shovel

Select an area that has recently been grazed. Use a shovel to dig out a sample patch of pasture. Take another sample from an area that has not been recently grazed.

What is the difference in the level of soil compaction?

What is the difference in the amount of grass roots?

What is the difference in the length of grass roots?

Answers are provided on page 39.

The crops you select to grow and the agricultural practices you use affect your crop yield as well as the natural environment. In this section we discuss the benefits of techniques that enhance biological diversity.

Many farmers leave summer fields fallow (bare). It is best to avoid this practice because summer fallowing encourages soil loss through erosion and does not save significant amounts of water.

Best management practices for crops
- no-till farming
- conservation tillage
- cover crops
- relay cropping
- crop rotation
- companion planting

No-till farming leaves the crop residue on the fields to protect the soil from erosion. As we learned in Lesson 6, soil is more than just dirt. It is home to millions of micro-organisms and acts as a storage place for carbon. Plowing a field releases carbon into the atmosphere and contributes to climate change, especially at the industrial level. Nitrogen is found in soil and is important for crop development, but nitrogen is lost through plowing, which releases nitrogen from the soil and into the environment.

In no-till farming new crops are planted without a machine turning over the soil. Although there are initial start-up costs, this practice reduces costs in the long run due to reduced labour needs. This method is generally good for the environment, but there is a drawback: no-till farming tends to rely on pesticides to control the insects attracted by the crop residue.

A variation is partial-till farming, which uses a special plow that keeps soil disturbance to a minimum.

Conservation tillage only disturbs soil to a minimum and leaves some plant matter on the fields as a source of nutrients for future crops. As mentioned in Lesson 6, when plants die, organisms in the soil break the plant material down into nutrients, which are returned to the soil and used by other living things. But when we grow plants and remove them, the land loses the nutrients these plants provide as they break down. When using conservation tillage new crops are planted in the remaining plant matter.

Photo by U.S. Fish and Wildlife Service

Cover crops is the practice of planting crops to improve soil health and reduce erosion. These crops are not intended for harvest. Cover crops also provide food and shelter for wildlife.

> In 2001, Saskatchewan farmers used conventional tillage on 30% of the province's cropland, some sort of minimum till systems on another 30% of croplands, and directly seeded 40% of croplands (i.e., used a machine that places the seeds in the soil without first tilling the soil). This adoption rate of no-till farming is the highest in Canada.

Relay cropping involves planting a second crop amongst a first crop once it has become established. By the time the first crop is harvested the remaining crop has had a chance to grow. The second crop can be either ploughed to return nutrients to the soil or it can be left as cover to prevent erosion and provide habitat.

Crop rotation involves planting the same field with different crops at different times. Each crop interacts uniquely with the surrounding environment, including insects, pests, and soil. Crop rotation reinforces the benefits of diversity by improving soil quality, and making disease and pest control easier, all of which in turn increases crop yield.

Companion planting is a long-practiced technique that involves planting crops that compliment each other. It can be used as a method of natural pest control, such as planting tobacco with tomatoes to draw tobacco worms away from the tomatoes. This practice can also reduce the need to add nitrogen inputs by incorporating nitrogen-fixing plants, such as clover, beans and peas, into plantings. Companion planting is also a way to increase diversity of crops on your farm.

Used as a method of natural pest control, companion planting either deters pests or attracts helpful insects that prey on pests.[8]

Plants that repel ants:
- tansy
- onions
- mint family

Plants that repel aphids:
- chives
- garlic
- marigolds

Plants that attract useful ladybugs:
- alfalfa
- morning glory
- yarrow

Plants that attract useful yellow jacket wasps:
- ivy
- white sweet clover
- carrot

The management practices in this section underlie the basic principles of this guide: strive to impact the earth as little as possible, mimic natural cycles within practical means, and plan for biodiversity!

We hope this guide has been helpful in explaining the important role biodiversity plays in your life and particularly its importance to agriculture, and that you will be able to use some of the ideas and guidelines to improve biodiversity on your farm or property. While you may not be in a position to implement some of these changes, we hope you have gained an appreciation for your natural world and a desire to become stewards of your land.

C R O P S

ACTIVITY 1
Farmlands in your area

Investigate the farmlands in your area to find a farmer practicing one of the types of crop management discussed in the fact sheet. Interview the farmer so you can gain greater insight and learn first hand about the practice. Here are some questions to ask:

Why did you switch to your current crop management practice?

How long ago did you switch?

What was the cost to switch?

How have your new practices affected productivity?

What did you learn from the new practice?

ACTIVITY 2
Farm planning

Now you can practice what you learned throughout the guide. For this activity you can either create an imaginary farm or use your family farm as a starting point.

Design a farm and its surrounding landscape for use with livestock, crop production, or both, and include water bodies, trees, shrubs, buildings and crops and cattle. Be sure to incorporate some of the best management practices detailed in this manual. For instance, ask yourself the follwing questions.

Where are the best places for roads?

What type of crop management will I use?

How will I provide water for my cattle?

Can I incorporate alternate sources of energy?

How do I plan to protect riparian areas?

What methods of pest management will I use?

What are the habitat types on my farm?

Lesson 1: Getting to know our environment

Activity 2

moose 6; raccoon 5; river otter 3; monarch butterfly 1; red squirrel 2; cedar waxwing 4

Activity 3

Some examples of actions you can take to help the environment are

1. walking to school instead of driving (no pollution)
2. picking up litter (keeps the environment clean)
3. turn water off while you are brushing your teeth (conserves water)

Lesson 3: A look at biodiversity and why it's important

Some examples of how biodiversity helps you include the following:

1. it allows you to enjoy hiking, fishing or hunting
2. trees, hedgerows and vegetation reduce erosion
3. it keeps the air fresh for you to breath
4. it may provide the genetic resource for the steak you had for dinner

Lesson 4: Factors that threaten biodiversity

Activity 1

shopping mall 2; car running 3; spilling gas 1; wasting paper 2; leafy spurge 4; paving wetland 2; pesticides near pond 1

Lesson 5: Getting to know Canada's wildlife

Activity 1

- Aspirin originally came from derivatives of the wild willow tree.
- Nylon comes from oil products (long dead organisms).
- Fur coats come from wild fur-bearing mammals.
- Pencils are usually made with wood from wild trees.
- Cotton clothing comes from cotton plants that were once wild.
- Penicillin originally came from fungi/molds.
- Leather jackets come from cattle or deer that were once wild.
- Paper comes from (usually wild) trees.
- Fish sticks usually come from wild fish.
- Gasoline comes from oil products (long dead organisms).

Activity 2

bacteria 5; fungi 3; bats 2; algae 8; butterflies 6; sea otters 1; robins 4; trees 7

Lesson 7: Pest management

Activity 1

This activity is designed to demonstrate that even though in many cases organic products are more expensive, it is still a growing market because people feel strongly about selecting products they feel are healthier and are produced using more environmentally friendly agricultural practices.

Sample prices

Product	Organic price
bananas	$0.79/lb
whole chicken	$22.00/lb
3 lbs of white potatoes	$1.99
head of broccoli	$2.99
2 litres of milk	$4.50

Lesson 8: Wildlife management

Activity 1

Sample answers

- Dirt is used by foxes or other burrowing animals to make a den in the ground.
- Twigs are used by birds to build nests.
- Pine branches are used by deer for shelter against rain and snow.
- Rock piles provide dens for snakes.
- Tree cavities provide dens for many animals, such as bats and raccoons.

Lesson 9: Livestock and grazing management

Activity 2

The soil sample from a recently grazed area should have fewer roots and the roots that do exist should be shorter. The soil should also be more compacted.

END NOTES

[1] David Suzuki Foundation, www.davidsuzuki.org.

[2] *Canadian Species at Risk, November 2003*. Committee on the Status of Endangered Wildlife in Canada, 2003.

[3] http://interactive.usask.ca/ski/agriculture/soils/soilwht/soilwht_comp.html, October 2003.

[4] *Ontario Environmental Farm Plan*, Second Edition, Ontario Farm Environment Coalition, 1996.

[5] *North America's Environment*, EPA, 1998, p. 72.

[6] *Prairie Agricultural Landscapes: A Land Resource Review,* Prairie Farm Rehabilitation Administration, Regina, SK, 2000.

[7] *Pesticide resistance: Strategies and tactics for management,* Committee in Strategies for the Management of Pesticide Resistant Pest Populations. National Research Council, 1986.

[8] http://www.winnipeg.ca/cms/bugline/companion/default.stm, November 24, 2003.

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