

Human Impacts on Ecosystems



Figure 1.11 How do you think the changes shown in these photographs might have affected the plants and animals that live in this ecosystem?

When you look out the window, are you looking at the same scene that you might have seen 100 years ago? Probably not. As Canada's population increased, land was cleared for homes and farms and eventually some of these settlements grew into the cities and towns we know today. Trees were cut for fuel and buildings, roads were built and eventually paved, and native prairie was ploughed under to create farmland. Humans affect the environment around them as they meet their needs. What types of changes to the environment can you see in the two pictures in Figure 1.11?

People are animals too, and we are part of nature. To meet our basic needs we rely on the ecosystem around us, just as all living things do. People use **natural resources** — the materials and products that are found in nature — to meet our basic needs. Trees, water, oil, and minerals are examples of natural resources that we use. Many human technologies depend on natural resources. For example, one way that electricity is generated is by tapping the energy of rivers. Large dams, such as the one in Figure 1.12, are built and water is trapped behind the dam. Instead of the river flowing freely as it once did, the water flow is controlled by the people who operate the dam.



Figure 1.12 Dams such as this one have a major effect on surrounding ecosystems.

Skill FOCUS

For more information on Societal Decision Making, turn to Skill Focus 8.

Recall from Topic 1 how beaver dams affect river ecosystems. Human-built dams affect ecosystems as well since large areas behind the dam are flooded. Human impacts can be large or small. When one person cleared a plot of land to build a house 100 years ago, the impact to the ecosystem was minimal. However, as more people move to an area, more land is cleared and there is a greater demand for natural resources. If one person drives a car, the impact on the environment is not great. In reality, of course, millions of people drive cars and the number of people *and* cars in the world is rising every day. With cars come roads, parking lots, sprawling cities, and air pollution.

As the human population increases, more and more humans have needs that must be met. As their numbers grow, people have a greater impact on the ecosystems around them. Humans have the same habitat needs as other living things, but, unfortunately, our needs often conflict with the needs of other living things.

DidYouKnow?

Human impacts on living things are not always easy to predict. Did you know that leaving the lights on in Toronto highrise buildings results in the deaths of thousands of songbirds? The birds are attracted to the lights of the buildings and crash into the glass. Concerned citizens and biologists educated building tenants about this problem and now some building owners voluntarily turn off the lights when there are high concentrations of birds in the area, such as when birds are migrating through to their breeding grounds.

People and Nature — A Changing Relationship

The ways that people interact with the environment have changed over time. Before the widespread use of engines and machines, people had a relatively low impact on the environment. They used available plants and animals for food and clothing and lived in simple shelters. If they travelled, they did so on foot, on horseback, or perhaps using canoes. Everything people needed, they found in the environment around them. The Aboriginal person in Figure 1.13 lived on the west coast of Canada. The clothing in the photograph was woven from the bark of the red cedar tree. The shelters in Figure 1.14 were made from long poles cut from trees, covered with the skin of buffalo.



Figure 1.13 The Nuu-cha-nulth (Nootka) were able to weave cedar bark to make clothing.



Figure 1.14 This shelter, called a tipi, consisted of long poles cut from trees and covered with buffalo skins.

Now, of course, our clothes and food come from different parts of the world, we live in fairly large homes or apartments that have electricity and heat, and we often travel in cars, trains, or airplanes. We drink more than just water, eat more than just the plants and animals in our ecosystem, and buy all sorts of items that we enjoy using but do not need. Such lifestyle changes have increased our impact on the ecosystems in which we live.

Gathering Food in Alberta: Then and Now



A These are the skulls of buffalo killed at Head-Smashed-In Buffalo Jump. Aboriginal people living on the plains of Alberta used this site at Porcupine Hills to hunt buffalo by driving them over a cliff. Buffalo that were not killed by the fall were killed with spears and arrows. The carcasses of the buffalo were then dragged to nearby camps to be processed into meat, hides, tools, and other necessary items. All parts of the buffalo were used, and there was very little waste. The technology needed for this type of hunting was minimal, and therefore had little environmental impact.



B Early settlers on the Prairies often kept small mixed farms where they raised crops and livestock. Instead of moving around to different locations from season to season following food sources, early settlers developed the technology to raise their own food on their own farms and they became self-supporting. This lifestyle had a larger impact on the environment than hunting buffalo because the farmland had to be modified to support the crops and the livestock.



C A feedlot contains a large number of cattle penned together and raised for meat. The cattle are fed a special diet to increase the amount of meat produced. Once the beef is processed, it is shipped out to consumers all over the country. This technology allows us to produce lots of food and transport it to many locations. The impact this has on the environment is very significant, however. For example, wastes from cattle go directly into the soil where they become concentrated. This changes the condition of the soil, and affects all of the organisms living in that environment.

Off the Wall

Is it possible to make your own artificial ecosystem? The man shown here tried to. The years preceding the year 2000 were filled with rumours about how the world as we knew it would end at the stroke of midnight, December 31, 1999. The Y2K bug, as it was known, was based on the idea that computers would mistakenly recognize the year 2000 as the year 1900, so all of our technology would fail. Many people believed that “disasters” would happen (everything from failing computers, to overloaded hospitals, to loss of water, natural gas, and electricity). The man shown here buried 42 school buses under concrete, connected them to make an emergency shelter, and prepared to live inside the buses when the Y2K bug affected the world.



When Is a Need a Want?

For the most part, Canadians do not have an ongoing challenge of finding food and shelter, so they have been able to turn their attention to their “wants” — things that make their lives more enjoyable.

For many of us, the line between “want” and “need” has become blurred. “I *need* new shoes, I *need* that new computer game, I *need* to call my friend.” Meeting our needs and wants usually uses natural resources in some way. Each time we satisfy a need or a want that requires natural resources or energy, we are making a choice and having an impact on our environment. For example, take a look at the fruits and vegetables that you can find in your local grocery store year-round. Many of these foods are grown elsewhere and are shipped to local stores. Land was cleared, fuel was used, and air pollution was created to bring that food to you. Our impact would be quite different if we ate only locally grown food. Food is a basic need, but having food from distant locations available year-round is a luxury.

Alberta Grown

Find Out **ACTIVITY**

What would happen if you did not have access to grocery stores? What would you eat? What foods did the Aboriginal people who lived in Alberta eat?

Materials

plant guide books suitable for your region

Procedure Performing and Recording

1. Consult a plant book and find five edible plants (or plants that were used as medicine) that grow in Alberta. (Also see the Internet Connect below.) Sketch the plant and describe the parts that are edible (roots, berries, leaves, bark, etc.). If possible, note how you would prepare the food.
2. Create a meal plan using only plants and animals from Alberta.

INTERNET **CONNECT**

www.school.mcgrawhill.ca/resources/

To learn more about how Aboriginal people from Alberta used the plants in their ecosystem, visit the Internet site for the Native People’s Garden at the Devonian Botanic Garden. Go to **Science Resources**, then to **SCIENCEFOCUS 7** to find out where to go next. In your Science Log, note five plants Aboriginal people used, and how they used them.

Our demand for more consumer products often conflicts with the health of ecosystems and the plants or animals living there. Look at the photographs in Figure 1.15. How do these pictures show that we live beyond our basic needs? Of course most of us do not want to turn back the clock and give up all of the things we enjoy. We can however, make responsible choices. Today, many people are starting to question whether we need so much “stuff.”



Figure 1.15 As North Americans we are lucky to have relatively comfortable lives. However, we consume far more than our share of the world’s natural resources. We also create more than our share of pollution and impact on the land.

In our haste to satisfy our wants, we often forget the basic needs of plants and animals. For example, many people love to visit parks in the Rocky Mountains in order to camp and hike, but towns, campgrounds, and parking lots are at the bottom of the valley, which is the most important wildlife habitat for animals such as elk (Figure 1.16).

To satisfy people’s desire for juicy, red tomatoes year-round, large greenhouses are being built on prime farmland just outside of Vancouver. This land is a very important habitat for thousands of shorebirds. Shorebirds rest here after flying hundreds, or even thousands, of kilometres enroute between their southern wintering grounds and their northern breeding grounds. Now, because so much of the land is being taken up by greenhouses, the shorebirds are left with very little habitat. These are just two examples of how the *wants* of people conflict with the *needs* of wildlife.



Figure 1.16 Sometimes, when we want to “go back to nature,” our wants conflict with the needs of wildlife.



Figure 1.17 These “monster” greenhouses provide juicy, red tomatoes year round, but at what cost?

Learning from Our Mistakes



Figure 1.18 While letting wild fires rage through heavily used areas would not be practical, wardens now light and carefully control fires in certain areas to ensure there is adequate food for grazing animals.

You have heard about the terrible destruction caused by forest fires. Would it surprise you to learn that park wardens in Banff National Park deliberately set the fire shown in Figure 1.18? For years people have seen fire as having a devastating effect on the environment. Park wardens, along with the ecologists and biologists who work with them, however, found that naturally occurring fires can benefit the ecosystem. Periodic fires clear areas of small trees and leaves, needles, and other forest debris that gather on the ground. After a fire, new grasses and other plants sprout up and provide valuable food for elk, deer, and other animals that routinely graze in the valley bottoms.

Learning the benefits of fire is just one way to use scientific understanding in order to try to reduce human impact on the environment. Ecologists continue to study natural areas and natural systems to reduce our impact. For example, the peregrine chicks shown in Figure 1.19 have been helped by the actions of humans. Peregrine falcons were close to extinction in eastern Canada in the mid-1900s following the common use of the pesticide, DDT. Why? The use of this pesticide had some unfortunate side effects. One negative effect was that it caused the eggshells of many birds to become so thin and fragile that their chicks did not survive. DDT is no longer used in Canada. The ban on the use of DDT, and the programs such as the one shown here to help peregrine falcons achieve nesting success, are increasing the numbers of this majestic bird. Originally, peregrine falcons nested on cliffsides. Now they also use tall buildings for their nests — a human-made substitute.



Figure 1.19 Peregrine falcon chicks are being placed in a nest of a pair of peregrine falcons that have not been able to produce their own young.



Figure 1.20 The crates on the back of this horse-drawn carriage carry wolves that are being relocated to Yellowstone National Park in the United States, to replace wolves that had almost entirely disappeared from that environment.

Recall that part of the reason that swift foxes almost disappeared in Alberta was because they were accidentally poisoned. For years, natural predators such as wolves, coyotes, and cougars were seen as “bad” and unnecessary animals. They were thought to be dangerous and aggressive animals and were often shot on sight. As well, many of these animals were often poisoned. Unfortunately, when poisons were set out, they also resulted in the death of many other “innocent” birds and animals, including the swift fox. Now — again because people became concerned and learned more about the role of these animals in natural systems — these animals are regarded as an important part of ecosystems. Predators keep the numbers of deer, mice, rabbits, and other small animals in check. Without this sort of natural control, the population of these animals would increase to such an extent that vegetation would be threatened by overgrazing.

INTERNET CONNECT

www.school.mcgrawhill.ca/resources/

Take a peek at a peregrine nest by visiting the site of the Canadian Peregrine Foundation (CPN). The CPN has live cameras focused on peregrines nesting on buildings in Etobicoke, Hamilton, and Ottawa. To view peregrines, visit the above web site. Go to **Science Resources**, then to **SCIENCEFOCUS 7** to find out where to go next.

Monitor the site for a few days and note the activity on the nest during that time in your Science Log.

DECISION-MAKING

INVESTIGATION 1-B

Wetland Wonders

Think About It

Wetlands are areas where the soil is wet for all or most of the year. Wetland areas drain slowly and are important parts of ecosystems, not only as wildlife habitat, but also because they capture, store, and slowly release water to surrounding areas. When wetlands are filled in, the flow of water can change, causing flooding in some areas and drought in others. As well, the critical wetland habitat is lost. Wetlands are one of the most endangered habitats in Canada. A developer wants to put a road through the middle of a wetland that is home to a variety of plants and animals. Can you come up with a solution that will help preserve the wetland habitat?

How Can Science Help?

Scientists who study water flow understand how changing or draining wetlands can harm them. As well, biologists have a good understanding of the needs of the plants and animals that live in wetland ecosystems. Together, these scientists can explain the problems that can occur if wetlands are drained, and they can make suggestions to reduce the impacts of development. To learn about wetlands, scientists carefully observe wetland areas and set up models of such areas in which they can test and monitor various conditions.

Safety Precautions



Wipe up all spills immediately.

Materials

water coloured with
food colouring
plastic Ziplock™ bags

Apparatus

2 rectangular aluminum
foil baking pans
scissors
modelling clay
bucket
500 mL beaker
stopwatch or watch
with a second hand
graduated cylinder
3–5 small sponges

Procedure

- 1 Use the scissors to carefully cut a series of holes about the size of a dime at the bottom near one end of one of the baking pans.
- 2 Raise the end of the baking pan without the holes about 2 cm high using two balls of modelling clay under the pan. Put the end of the baking pan with the holes just over the edge of the table. Put the other baking pan on a chair under the holes so that it will catch any water draining from the first pan.

- 3 Pour 250 mL of water at one end of the pan and time how long it takes for the water to flow through the pan and drain into the second baking pan. Copy the data table below into your notebook, and record this number in the data table.

Number of sponges	Time to drain through (s)	Amount of water collected (mL)

- 4 Put one sponge in the pan with the holes and pour 250 mL of water into the pan. (The sponge is your wetland.) Time how long it takes for the water to flow through the first pan and drain into the second pan. Use the graduated cylinder to measure the amount of water that flowed through the pan. Record the time and the amount of water collected. Squeeze the water in the sponge back into the beaker.



- 5 Repeat step 4, adding one more sponge with every trial.



- 6 When you have the pan filled with sponges, create a “road” of modelling clay across the middle of the baking pan. Pour 250 mL of water in the baking pan and observe what happens.

Analyze

1. Describe how wetlands are like a sponge.
2. What happens when wetlands are paved over?
3. Describe what happened to your wetland when a road was put through the middle of it.
4. Could you think of an alternative to a road that would allow the developer to get through the wetland, but would still protect the wetland habitat?

What's the Count?

Linda Söber is an environmental biologist who helps governments and developers use their land in a way that preserves the existing wildlife. "I count each type of plant and animal I see. Once I know what's there, I can suggest ways to protect the natural environment." When studying an area, Linda does not look for just the animals themselves. She looks for tracks, droppings, nests or bedding sites, and fish eggs on plants along the water's edge or in a swamp. She also listens for identifying sounds of certain bird calls.



Developers often want to fill in wetland areas on their land to make solid ground on which they can build. Unfortunately, this destroys the wetlands and almost everything that lives there. According to Linda, wetlands have more wildlife than either fields or forests.

Do some research at the library or on the Internet, talk to somebody at a wetland reserve if there is one in your area, or contact a wildlife organization, such as Ducks Unlimited. Identify ten animals and plants that live in wetlands (also called swamps, bogs, or marshes). For each animal or plant, write a sentence about how filling in the wetland will affect it. Will filling in the wetland remove its food supply or breeding ground? What are some other ways that wetland animals could be affected?

TOPIC 2 Review

1. What are natural resources? Give two examples of natural resources and explain how humans use them to meet their needs.
2. Complete the following chart.

Activity	Impact on the environment	Positive or negative impact	Alternative action to lessen negative impact
Using plastic bags in your lunch			
Mowing your lawn and putting the grass clippings in the garbage			
			Riding your bicycle

3. Think of two activities you perform in a typical day, and describe two impacts that each activity has on your environment. Are these activities wants or needs?
4. Describe two native plants that grow in Alberta.
5. Describe the habitat needs of one Alberta animal.
6. How has the relationship between humans and their environment changed in Alberta since the time the first settlers arrived here?