Topic 1.1

What are ecosystems, and why do we care about them?

Key Concepts

- Ecosystems are about connections.
- Ecosystems are made up of biotic (alive) and abiotic (not alive) parts that interact.
- Interactions between terrestrial (land) ecosystems and aquatic (water) ecosystems keep all ecosystems healthy.

Key Skills

Inquiry
Literacy

Key Terms

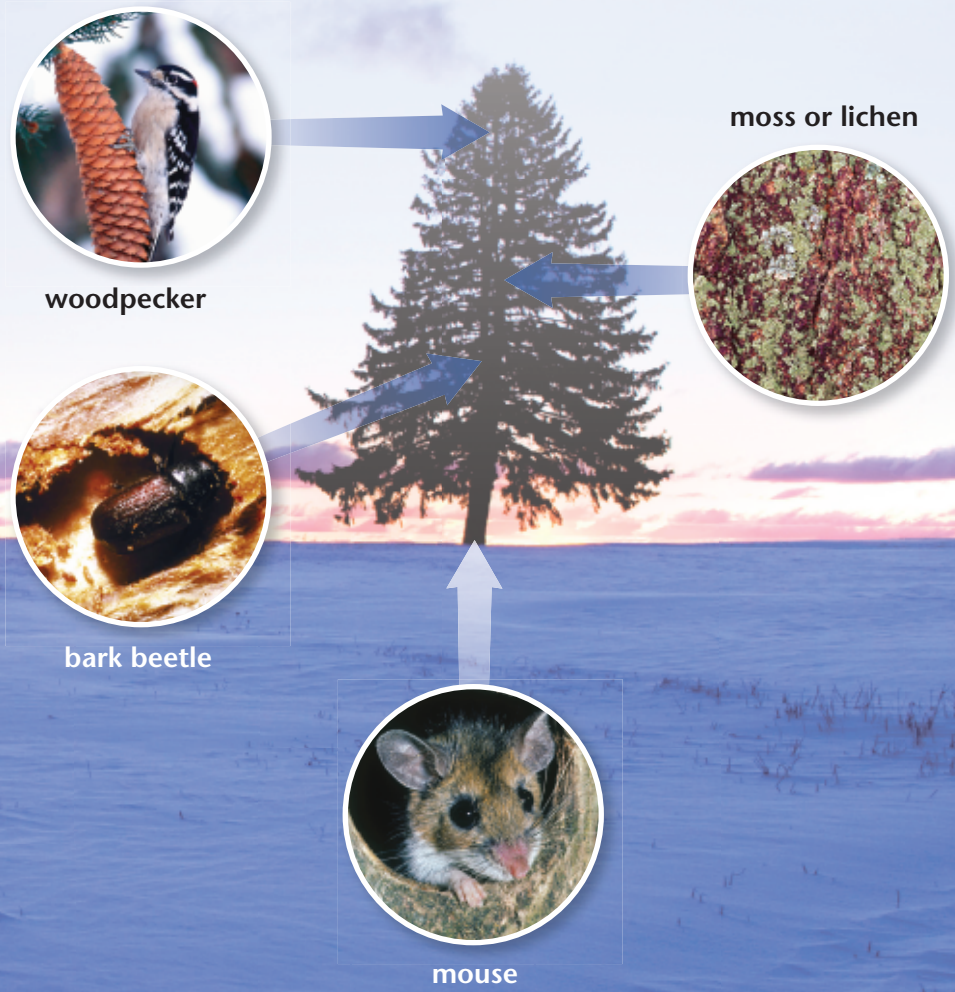
ecology
biotic
abiotic
ecosystem
terrestrial ecosystem
aquatic ecosystem

Everywhere in the world around you, living things are scurrying across the ground, burrowing through the soil, floating in the water, and soaring through the air. Each and every living thing makes its home somewhere. Even your armpit is an attractive home for many forms of life! In fact, dozens of kinds of microscopic organisms live on and inside your body.

Why do some organisms inhabit your body, while others make their home in spruce trees? It all comes down to basic needs. Living things make their homes in the places they do, because these places provide them with what they need to survive.

Starting Point Activity

1. How many ecosystems can you see on these two pages? (Hint: First discuss what the word "ecosystem" means.)
2. Name at least three things that people, trees, and other living things need to survive.
3. State three reasons why a woodpecker can make its home on a spruce tree but not on a human being.



Ecosystems are about connections.

Imagine going back in time to the year 1966. Think about seeing the photo of Earth in **Figure 1.1**. This photo shocked the world because it showed for the first time what our home planet, our Earth, looks like from space.

When something is very large, as Earth is, it helps to take a step or two back so that we can see it and think about it in a new way. Photos of Earth from space helped people start to do just that. As we viewed Earth, as if with fresh eyes, a very different planet took shape in our minds. Saudi astronaut Sultan bin Salman bin Abdulaziz Al Saud put it this way, as the Space Shuttle *Discovery* carried him and six others away from Earth in 1985: "The first day or so we all pointed to our countries. The third or fourth day we were pointing to our continents. By the fifth day, we were aware of only one Earth."

Our journeys into space helped us start to see Earth in a way that First Nations and other Aboriginal people have seen it for a long time. We began to see an Earth where everything is connected.

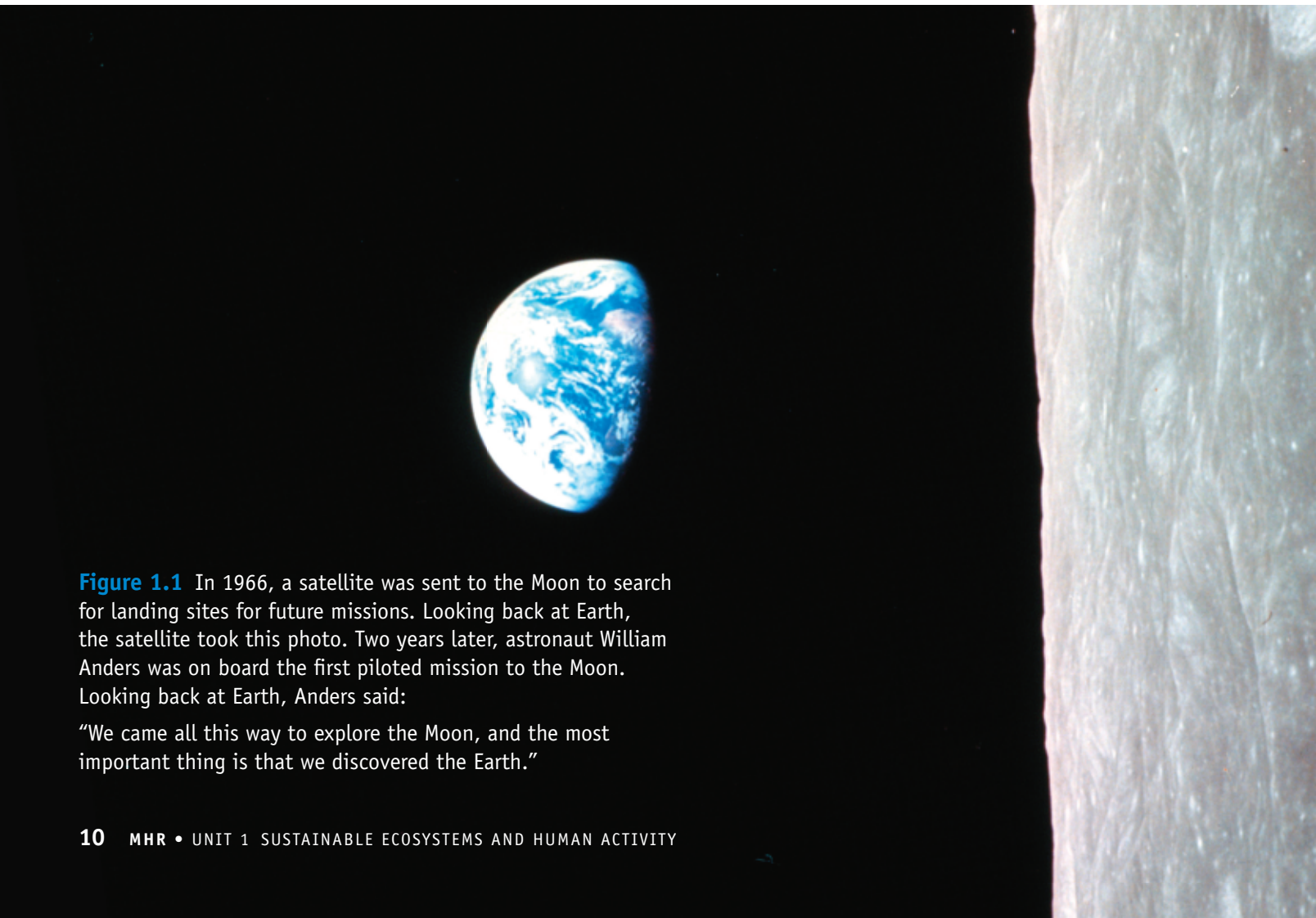


Figure 1.1 In 1966, a satellite was sent to the Moon to search for landing sites for future missions. Looking back at Earth, the satellite took this photo. Two years later, astronaut William Anders was on board the first piloted mission to the Moon. Looking back at Earth, Anders said:

"We came all this way to explore the Moon, and the most important thing is that we discovered the Earth."

Studying the Connections

Ecology is a science that tries to explain the connections between everything on Earth. An ecologist is a scientist who studies these connections. So ecologists study how living things interact with each other and with everything else in their environment. Ecologists focus their attention on ecosystems in order to organize their studies.

ecology: a branch of science that studies the relationships between living things and the environment

An ecosystem can be very large and very small. A rotting log is an ecosystem. So is a pond, a forest, a desert, an ocean, a spruce tree, a human body, and even the whole Earth. The size and shape of an ecosystem depend on the types and numbers of connections an ecologist wants to study.

LEARNING CHECK

1. What is ecology?
2. What do ecologists study?
3. Name two large ecosystems and two small ecosystems.
4. What do you think this quotation means: "By the fifth day, we were aware of only one Earth." Explain your reasoning.

Literacy Focus

Activity 1.1

INSPIRING CONNECTIONS

"On Earth, we are all connected." What does this statement mean to you? In this activity, you will explore your ideas about connections in the world around you.

What To Do

1. Work together in small groups. Take turns reading each quote.
2. Share your ideas about each quote. Do you agree with it? Do you disagree? Why? Record your group's opinions.
3. Work together to write your own quote about the statement, "On Earth, we are all connected." Record your group's quote on a sheet of paper.

What Did You Find Out?

1. What does "On Earth, we are all connected" mean to you, personally?

"Connected means our planet is the ultimate recycler. Everything is reused around the planet."

Gary, age 13, Timmins, ON

"I think living things are our neighbours. Their lives affect us and we affect them."

Mira, age 14, Sarnia, ON

"To me this means that we need to stop polluting because what we do to the environment connects back to us."

Yan, age 14, Cornwall, ON

Ecosystems are made up of biotic and abiotic parts that interact.

Literacy Focus

Activity 1.2

PONDERING PONDS

Study Figure 1.2. With a partner, present your answers to these questions as a concept map.

1. In what parts of Ontario do you find ponds?
2. What kinds of plants live in and around a pond? Name at least three types that you can see or imagine.
3. What kinds of animals live in and around a pond? Name at least three types that you can see or imagine.
4. What other living things (but not plants or animals) live in and around a pond?
5. What non-living things would you find in and around a pond?

biotic: living

abiotic: not living (non-living)

All the living things in an ecosystem such as the one in Figure 1.2 are **biotic** parts of the ecosystem. The biotic parts of ecosystems might eat each other, defend themselves from each other, and compete with each other for living space, mates, and food. These are some of the ways that the biotic parts of ecosystems interact.

Within the Western tradition of modern science, some parts of the pond ecosystem are considered to be not alive. For instance, the water, the muddy pond soil, the air, and the sunlight shining on the pond are non-living. All the non-living things in a pond ecosystem, or any other ecosystem, are **abiotic** parts of the ecosystem. The temperature of the pond water is affected by how much sunlight it gets and by the weather patterns for the season. The shape and amount of shoreline is affected by the motion of the water. These are some ways that abiotic parts of ecosystems interact.

Interacting Biotic and Abiotic Parts

To function and to stay healthy, the biotic parts of ecosystems interact with each other as well as with the abiotic parts of the ecosystem. For example, in a pond ecosystem, plants interact with soil and water. These abiotic parts help plants meet their basic needs for water and nutrients. Likewise, air provides plants with carbon dioxide and animals with oxygen they need to survive. The Sun supplies needed light and warmth.

▲ **Figure 1.2** Beaver dams are a common sight in many pond ecosystems of Ontario. Like all ecosystems, ponds have living (biotic) and non-living (abiotic) parts.

Defining the Term "Ecosystem"

To understand what an ecosystem is, you first have to know the words "biotic" and "abiotic." You also have to know that everything on Earth is connected. In other words, all the biotic and abiotic parts interact in ways that make the environment able to support and sustain life.

With these understandings, you can now understand how ecologists describe ecosystems. An **ecosystem** is all the biotic parts of a certain place, as well as all the ways that they interact with other biotic parts and with the abiotic parts of that place.

ecosystem: a system that is made up of all the interacting biotic and abiotic parts of a certain place

LEARNING CHECK

1. Use **Figure 1.2** to name two ways that biotic parts and two ways that abiotic parts of an ecosystem interact.
2. Explain how an ecosystem is like the Internet.
3. Use a graphic organizer to show the interactions you have with the abiotic and biotic parts of a neighbourhood ecosystem.

ACTIVITY LINK
Activity 1.4, on page 16

Interactions between terrestrial and aquatic ecosystems keep all ecosystems healthy.

terrestrial ecosystem: an ecosystem that is based mostly or totally on land

aquatic ecosystem: an ecosystem that is based mostly or totally in water

Some ecosystems are based on land. A forest, a desert, an ant colony, and a city are examples of land-based ecosystems. A land-based ecosystem is called a **terrestrial ecosystem**. (*Terra* means land or earth.)

Other ecosystems are based on water. A pond, a lake, a river, and an ocean are examples of water-based ecosystems. A water-based ecosystem is called an **aquatic ecosystem**. (*Aqua* means water.)

Inquiry Focus

Activity 1.3

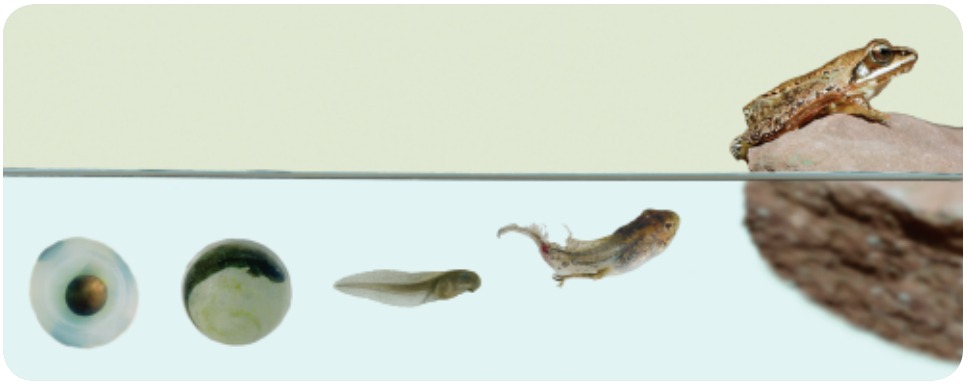
INTERACTION I.D.

The picture shows an ecosystem that includes a land ecosystem and a water ecosystem. Identify (I.D.) three interactions in the land ecosystem. Then I.D. three interactions in the water ecosystem. Finally, I.D. three interactions that involve both the land and the water ecosystems.

Interactions within Ecosystems and between Ecosystems Sustain Life

Terrestrial and aquatic ecosystems are closely linked. **Figure 1.3** shows a few examples of ways that they are linked. Throughout this unit, you will observe and think about other ways that terrestrial and aquatic ecosystems are linked. These interactions keep biotic and abiotic parts of all ecosystems balanced. As a result, all ecosystems stay healthy.

In this unit, you also will look at ways that human activities can upset this balance. For instance, by cutting down a forest near a stream, tree roots that once trapped soil wither and die. Soil and nutrients wash into the stream, and this can harm or kill fish and other living things. This is just one way that the balance in ecosystems can be upset.



▲ **Figure 1.3A** Some organisms live in aquatic ecosystems for part of their lives and in terrestrial ecosystems for other parts of their lives. Frogs are an example.

◀ **Figure 1.3B** Animals that live in terrestrial ecosystems drink from ponds, rivers, and other bodies of water. A fox is one example.

▲ **Figure 1.3C** Many animals that live on land eat plants and animals that grow and live in aquatic ecosystems. *You* are an example.

LEARNING CHECK

1. Use a t-chart to brainstorm examples of five different aquatic ecosystems and five different terrestrial ecosystems. Compare your examples with a partner's.
2. What are some similarities and differences between an aquatic ecosystem and a terrestrial ecosystem?

Inquiry Focus

Activity 1.4

ECOSYSTEMS WHERE YOU LIVE

Complete this mapping activity to assess your knowledge of terrestrial and aquatic ecosystems near your home.

What You Need

large sheet of paper

coloured markers

What To Do

1. Mark and label a dot at the centre of your paper. This represents your home.
2. Add details about local ecosystems to your map by completing the tasks that follow. Label each ecosystem you draw with a different colour. Details do not need to be drawn to scale. You may not be able to do all the tasks at this point.
   - **a)** Indicate north, south, east, and west on your map.
   - **b)** Show any prominent landforms near your home, such as hills, rivers, and lakes. Write the name beside each landform.
   - **c)** Draw and label two terrestrial ecosystems found near your home. These may be natural areas (for example, a forest or field) or human-made areas (for example, a school field or park).
   - **d)** Draw and label two aquatic ecosystems found near your home. These may be natural areas (for example, a bog or stream) or human-made areas (for example, a human-made pond or lake).
   - **e)** Draw one very small ecosystem and one very large ecosystem near your home.
   - **f)** At the side of your map, sketch three biotic parts of ecosystems that are naturally found near your home. Include at least one that is found in a terrestrial ecosystem and one found in an aquatic ecosystem.
   - **g)** At the side of your map, name three abiotic parts of ecosystems near your home.
   - **h)** Show an ecosystem that has been altered or is in the process of being altered by human activity.
   - **i)** Show an ecosystem that is conserved or protected from development.
   - **j)** Find the name(s) of the Aboriginal people who live in your area, or who lived there in the past. Determine if any local ecosystems are especially important to these Aboriginal people. Mark these ecosystems on your map.
3. Share your map with other students in your class. Discuss tasks a) to j) in step 2. If your classmates were able to complete any tasks that you had trouble with, you can use their information to complete your map. If you are still missing some information, use library or computer resources to complete further research. Add your research findings to your map.

What Did You Find Out?

1. One of the ecosystems you included on your map is being or has recently been changed by human activity. Describe how and why this ecosystem has changed.
2. Ecosystems consist of both biotic and abiotic parts. For an ecosystem you identified on your map, describe an interaction that might occur between
   - **a)** two biotic parts
   - **b)** two abiotic parts
   - **c)** a biotic part and an abiotic part
3. Ecosystems are about connections. Describe one way that your daily activities are connected to the ecosystems around your home.

Topic 1.1 Review

Key Concepts Summary

- Ecosystems are about connections.
- Ecosystems are made up of biotic (alive) and abiotic (not alive) parts that interact.
- Interactions between terrestrial ecosystems and aquatic ecosystems help keep all ecosystems healthy.

Review the Key Concepts

1. K/U Answer the question that is the title of this topic. Copy and complete the graphic organizer below in your notebook. Fill in four examples from the topic using key terms as well as your own words.

2. A Ecosystems are about connections. Thinking about the ecosystem in which you live, what are some of those essential connections?

3. K/U Refer to **Figure 1.2** to answer these questions.

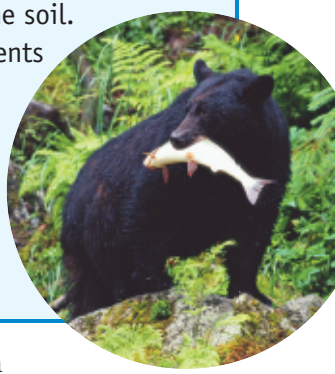
a) List three interactions that might occur between the biotic parts of this ecosystem.

b) List three interactions that might occur between the biotic and abiotic parts of the ecosystem.

4. C Choose an ecosystem that is familiar to you (or one that is shown on the previous pages). Create a concept map showing how the abiotic parts are connected to the biotic parts of the ecosystem.

5. K/U As you read the paragraph below, complete a t-chart to list all the biotic and abiotic parts of ecosystems that are mentioned.

In a stream along the coast of British Columbia, a female salmon hatches. It eats microscopic living things in the stream and, as it grows, it swims out into the Pacific Ocean. Here, as it matures, it stores nutrients such as calcium, nitrogen, and phosphorus in its body tissues. After a few years, it starts the long swim back to the coastal stream where it began its life. Along the way, it dodges seals, sea lions, and other predators. Finally, it arrives at its stream. After it lays its eggs, it is caught and eaten by a grizzly bear. Later, the bear defecates. Decomposers release nutrients from the bear's feces (droppings) into the soil. Decomposers also release nutrients from the remains of the salmon carcass into the forest soil. Trees and other forest plants absorb these nutrients. In turn, the plants provide food for the forest-dwelling animals.



6. A Reread the paragraph in question 5. Explain how the interactions between terrestrial and aquatic ecosystems keep the forest ecosystem healthy.