UNIT 1
Biomes and food security

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1 Understanding ecosystems

Source 1.1 Bialowieza Forest, where abiotic parts of the Earth's surface and biotic organisms interact.

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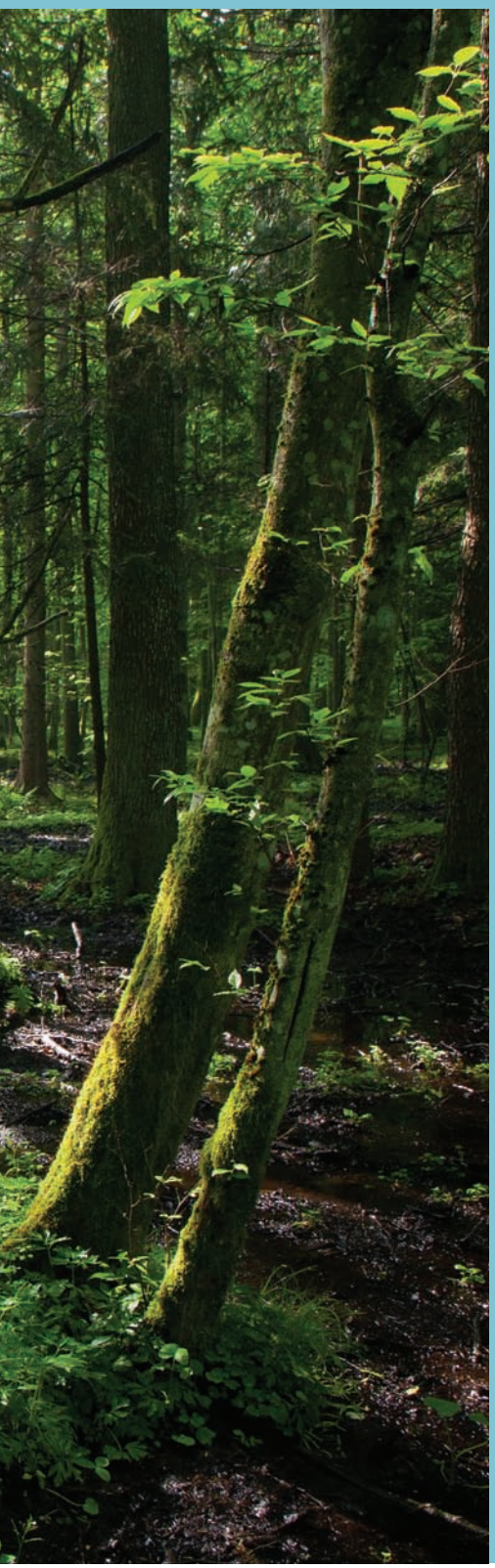

Before you start

Main focus

One way of looking at the Earth's natural environment is to look at the different ecosystems which form the basis of life on Earth.

Why it's relevant to us

Knowledge of the Earth's ecosystems is basic to understanding how the natural environment operates, how that environment can impact on people and the effects people may have on that environment.

Inquiry questions

- What is an ecosystem?
- What are the main characteristics of an ecosystem?
- How have natural forces combined to allow for the development of these ecosystems?
- How and why are ecosystems important to humans?

Key terms

- Climate
- Climax vegetation
- Decomposers
- Ecosystem
- Food chain
- Primary producer
- Weather

Let's begin

Geographers make sense of the world by dividing it into regions. The physical world around us – the plants, animals, soils, slopes and climate – can be divided into different-sized regions, depending on the scale of the study being undertaken. Even the study of a small part of the Earth's surface may divide that area up into different ecosystems.

An ecosystem is a natural region – a hill slope, a pond, a beach, a backyard. This natural region is based on a physical feature upon which a group of plants, animals and microorganisms have developed. Some geographers studying ecosystems take a large-scale approach to their studies. These geographers examine relationships between plants and animals, and natural and human features, in a small area. Geographers who take what is known as a small-scale approach examine regions covering a much larger area. These regions are known as biomes and are the subject of the next chapter.

It is sometimes difficult to map ecosystems and biomes because they are subject to change – which may be long term, such as in the changes caused by the uplifting of mountains, or rapid, as in change following a cyclone, flood or bushfire.

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1.1 Ecosystems

An **ecosystem** is an area where non-living (abiotic) parts of the Earth's surface and biotic (living) organisms interact. They interact in such a way that a small area may be identified as a region. Geographers may be interested in studying this ecosystem from a variety of viewpoints. They may be interested in what causes the ecosystem to function as a unit or in how the ecosystem is changing over time and what might be causing that change. They may also be interested in what changes might occur in the ecosystem if certain changes were made to it.

ecosystem an area of the Earth's surface where living organisms interact with non-living parts of the Earth

The key part of the word is 'system'. The various parts work together just as the parts of your body do or the parts of a car do. Ecosystems require 'inputs' to make them function – just as your body needs food and a car needs fuel of some sort. Ecosystems also have 'outputs' – waste material resulting from the processes required to keep the ecosystem functioning. Your body may sweat. It certainly emits various wastes as gases, liquids and solids. A car converts the fuel into the energy required to move it forward and emits various gases as a result of the energy transformation process.

The ecosystem, the body and the car all require inputs from the world around us. This world can be divided into two parts – the abiotic and the biotic.

Geographical fact

The hair on your head is an interesting ecosystem: thousands of microscopic creatures live in and on your hair. These creatures actually wage war on each other. For them, the entire universe is your head.

Abiotic components of an ecosystem

The abiotic part of an ecosystem is that part of the ecosystem which is non-living. There are many abiotic components of an ecosystem. All of these are essential parts of the ecosystem and contribute to the type of ecosystem that develops. Those components are as follows.

- **Sunlight** is vital to life on Earth. The location of the sun in relation to the Earth's surface affects the length of time when there is daylight. It affects the temperatures that humans experience. It affects the amount of water in the atmosphere. Most importantly, it is essential for photosynthesis. This is the process by which plants turn the carbon dioxide breathed out by humans into oxygen.
- **Temperature** affects ecosystems daily, annually and over long periods of time. There are parts within an ecosystem that are affected by the sun, and thus by seasonal changes that are brought about by the Earth's revolving on its tilted axis around the sun over a year. Long-term changes in the world's **climate** zones also have an impact on ecosystems.

climate the long-term changes in temperature and rainfall experienced in an area

- **Wind** also affects ecosystems daily, annually and over long periods of time. The movement of air over the Earth's surface is influenced by other abiotic factors – the sun and related temperature changes. Wind affects the growth patterns of trees and the flight patterns of birds and insects and can significantly alter an ecosystem in a matter of hours.
- **Rainfall** is more correctly referred to as precipitation. This is any moisture that falls from the sky, and includes rain, hail, sleet and snow. This abiotic part of an ecosystem is also essential for the long-term survival of an ecosystem.
- **Rocks** are the basis of all ecosystems. There are many types of rocks, made of many different compounds. Rocks are not only the basis of life on Earth; they also form the largest part of the Universe we see at night around us.

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- **Soil** develops from rocks as a result of physical and chemical interactions between rocks and the atmosphere. It also has a link to the biotic part of an ecosystem, as the actions of plants, humans and animals can affect its development.
- **Gas** and dust combined some 4.6 billion years ago to form the planet on which we live, according to scientists. Today the interior of our planet is a swirling mass of chemicals. From time to time these chemicals produce gases which are forced out under pressure. Sometimes the pressure is extreme; sometimes it is just a slow, regular release through an outlet. These gases become part of the Earth's atmosphere and can impact on the ecosystems that evolve around them.

Biotic components of an ecosystem

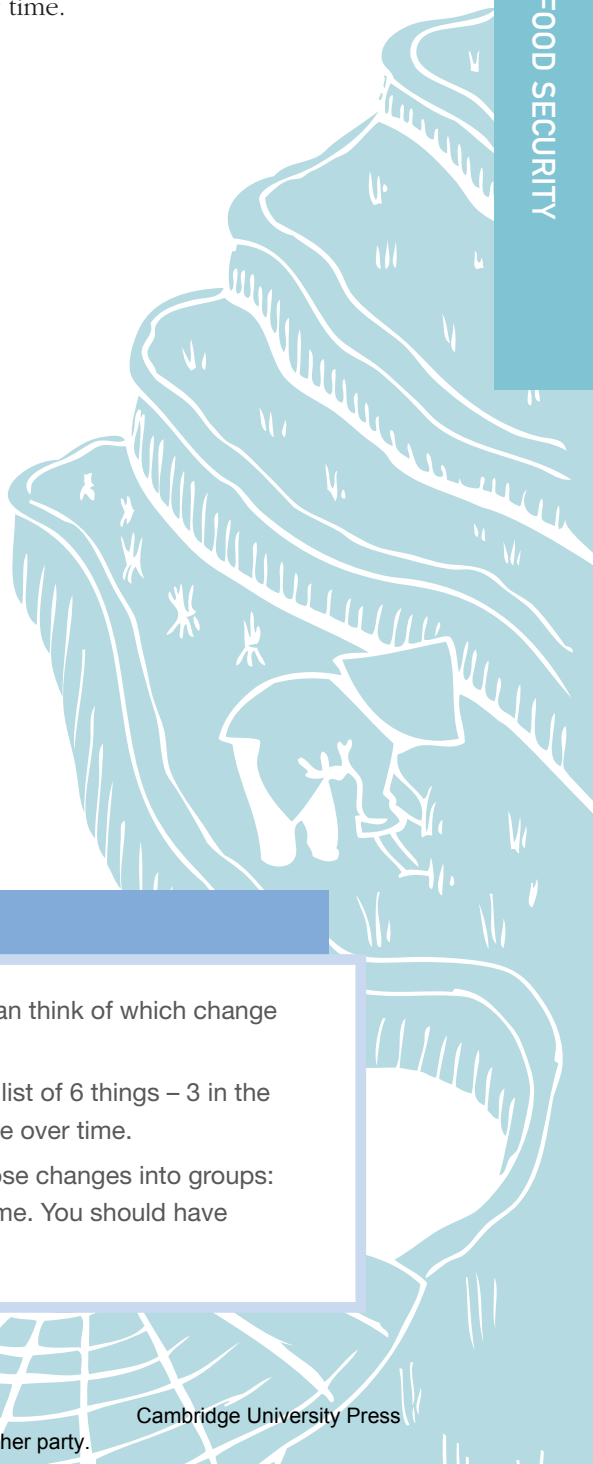
The biotic parts of an ecosystem are its living parts. These are closely related to the abiotic components of the ecosystem. The biotic parts of an ecosystem include the following.

- **Flora** is the plant life found in a region at a particular time. This includes trees, shrubs, ferns, grasses, cacti, bacterial organisms and algae.
- **Fauna** is the animal life found in a region at a particular time. This includes all levels, from herbivores, carnivores and omnivores to, very importantly, humans.
- **Fungi** look like plants but are in fact organisms (such as smuts, moulds, mushrooms and mildews) which can grow in low moisture. They do not contain **chlorophyll**, do not have roots or leaves, and cannot manufacture their own food; they obtain their food by decomposing dead plant material.

chlorophyll the green substance in plants that allows them to use the energy from the sun

How do ecosystems work?

Ecosystems are dynamic. The parts operate together just as the parts of a human body or a car work together. Ecosystems are subject to change. These changes may occur daily, annually or over a longer period of time.



ACTIVITY 1.1

- **Think:** On your own, in 2 minutes, make a list of 6 things you can think of which change over time.
- **Pair:** Choose a partner and, in 5 minutes, produce a combined list of 6 things – 3 in the abiotic and 3 in the biotic parts of an ecosystem – which change over time.
- **Share:** Share your lists with your class, and then categorise those changes into groups: those which occur daily, annually and over a longer period of time. You should have developed an interesting table.

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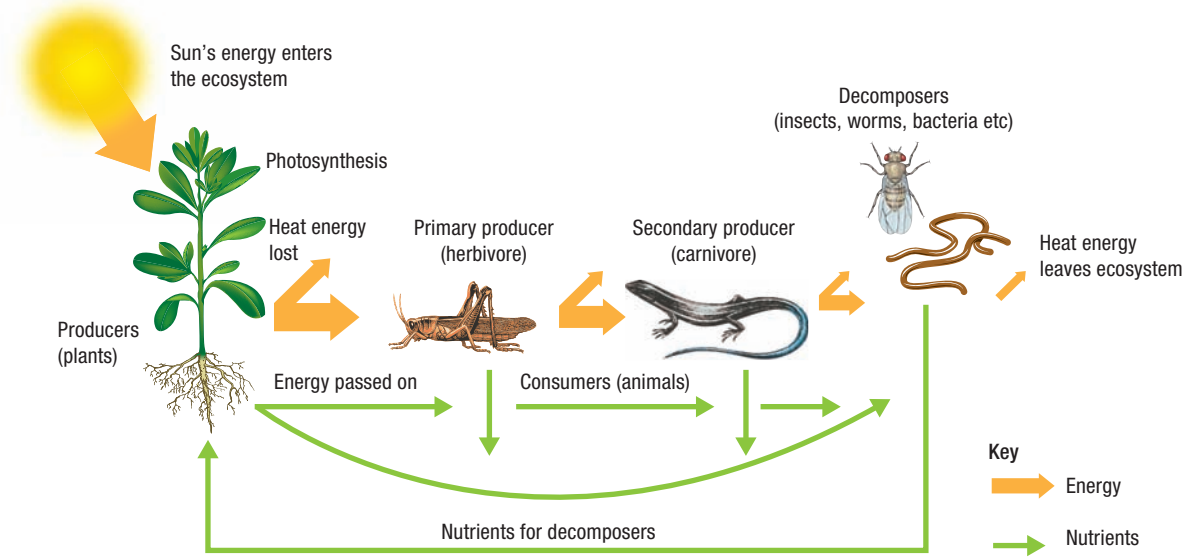
Ecosystems on Earth are driven by the power of the sun. Radiation from the sun provides the heat which is essential for life on Earth. Without the sun, Earth would be a frozen rock whirling through space. Approximately 30% of this radiation is reflected back into space by clouds, aerosols, ice and snow. The remaining radiation is absorbed by the land, the oceans, the atmosphere and human structures.

The amount of radiation directed to Earth by the sun varies. Sunspot activity increases the amount of radiation. There are also long-term cycles in the activity of the sun which affect the amount of radiation Earth receives (see Source 1.2, which shows the simple relationships within an ecosystem).

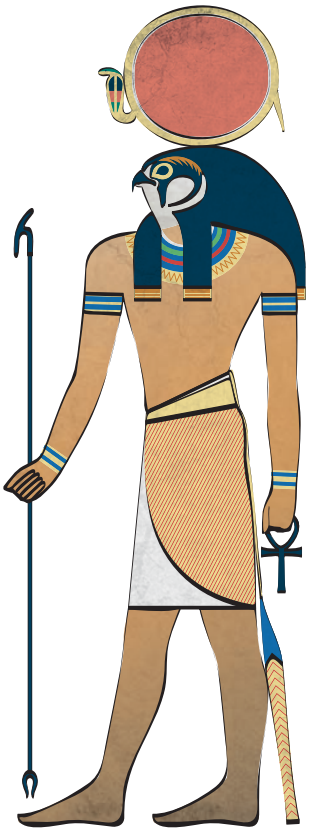


Source 1.2 Simple ecosystem diagram

The sun provides the Earth with light and heat. If you are a light sleeper, you will notice the arrival of the sun as the sky brightens and birds begin their daily activity. If your house has solar panels, you will notice that the output from the panels increases as the day progresses. The reverse occurs as the sun begins to set.

Humans today know much about the activity of the sun and its role in affecting life on Earth. This was not so in the past, so it is interesting to see how people regarded the sun then.

Early Egyptians worshipped many gods, but one of the most important was the god Ra (see Source 1.3). This god sailed across the world each day bringing light and warmth. At night, Ra sailed through the underworld, to return in the morning. One of the roles of the priests was to ensure the return of Ra each morning.



Source 1.3 Ra, the Egyptian Sun god

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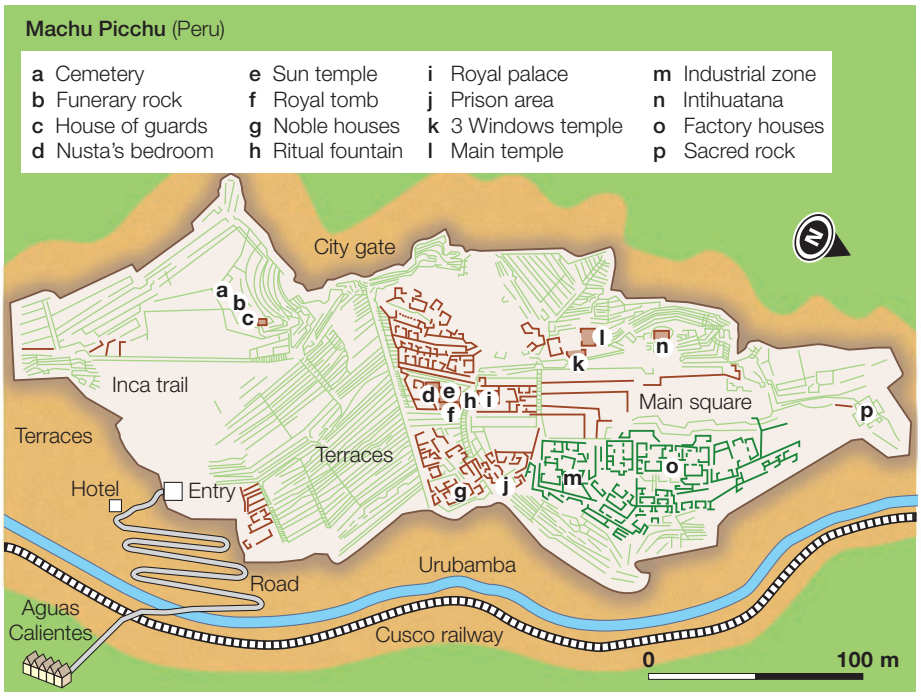
Machu Picchu, in Peru, is a favourite destination for international travellers. Machu Picchu was constructed by the Incas around the middle of the 15th century, but was abandoned by them when the Spanish invaded Peru. The city was reclaimed by the surrounding vegetation and was not shown to the world until 1911, when its location was revealed by US historian Hiram Bingham.

Machu Picchu has a layout that excites modern geographers and town planners, with clear areas set aside as a main square, an area for the upper classes or nobles, an industrial area and an area for workers' housing. Surrounding the city centre, and separated from it by a wall, was an agricultural area. Perhaps the most significant feature of the town was its orientation in relation to the sun.



Source 1.4 Machu Picchu town plan

solstices the two times of the year when the sun is at its greatest distance from the celestial equator. The summer solstice is the longest day of the year and the winter solstice is the shortest.

The sun temple is designed so that the rays of the sun on the winter **solstice** shine into it. Some distance away is the Sun Gate. This is the point through which the sun's rays first light up Machu Picchu each day.

Source 1.5 Machu Picchu, high in the Andes Mountains, was carefully oriented in relation to the sun.

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RESEARCH 1.1

There are other sites around the world where structures have been built to allow people to worship the sun.

Carry out an internet search to locate these, then produce a world map showing where they are and when they were built. What are they used for today?

Many Australians worship the sun, but in a far different way from these ancestors and with far different results. Source 1.6 shows the effects of sun damage on the author of this chapter.

Source 1.6 Skin cancer kills many young people each year. The author was lucky his sister was a doctor and spotted a basal cell carcinoma on him in its early stages. The author has been having regular surgery since then (late 1980s) to halt the progress of this disease. Even now it is still recognised as having the ability to cause the author's death simply because the body will become worn out fighting the disease.

1.2 The sun and the abiotic environment: weather

The sun has a major impact on the abiotic environment. Let's start by examining the impact of the sun on **weather**. Weather refers to the day-to-day changes in the Earth's atmosphere in terms of:

- **precipitation**
- temperature
- humidity
- wind speed and direction
- air pressure.

weather the state of the atmosphere at a given time

precipitation water, in forms such as rain, snow, sleet or hail, that condenses in the air, becomes too dense to remain suspended, and falls to the Earth's surface

How does the sun affect these variables?

The main variable it affects is temperature. The sun heats up the land and water surfaces of the Earth. The heating up of water bodies, whether they are oceans, seas, lakes or ponds, leads to the evaporation of water. Water can exist as a liquid, solid or gas.

This evaporation drives one of the major cycles on Earth – the water cycle. Humidity is a reflection of this evaporation: it is a measure of the amount of water the atmosphere is capable of holding, recorded as a percentage of the total amount of water vapour the air can hold. If the humidity is high (80%, say), there is a large amount of water in the atmosphere and rainfall is possible. If the humidity is low (20%, say), there is room in the atmosphere for more water, and evaporation is still possible.

Because land is a solid and water is a liquid, their surfaces heat up at different rates and lose heat at different rates. Land heats up quickly and loses heat quickly. Water will distribute heat more effectively, and so heats up slowly and loses heat slowly. These differences between the heating rates of land and water generate movement within the atmosphere too.

As air is warmed, it expands, and the pressure it exerts on the Earth's surface decreases (because

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there are fewer molecules per cubic metre). This warming creates regions of low pressure. In cold areas the air contracts, which means more molecules per cubic metre; this creates an area of higher pressure. The Earth's atmosphere works to equalise air pressure across the Earth's surface – wind is the movement of air from an area of high pressure to an area of low pressure. The movement of the wind affects ecosystems.

ACTIVITY 1.2

Answer the following questions and explain your responses using terms from the above paragraph.

1. What happens when you blow up a balloon?
2. What happens if you blow the balloon up too much?
3. What happens if you let the balloon go when you have blown it up?

The balloon exercise shows that air moves from areas of high pressure to areas of low pressure. This movement between areas of low pressure and high pressure generates wind, cyclones, typhoons and thunderstorms. Short-term atmospheric events such as these will affect ecosystems. Flooding, erosion and loss of habitat can also occur as a result of these events.

How is the movement of wind measured? One of the earliest measures of wind speed was based on the impact wind had on parts of an ecosystem. The Beaufort Scale, devised by Francis Beaufort in 1805, is still used by people on land or sea to estimate wind speed. It was based on observable changes in the environment – both natural and human – caused by the movement of air from one place to another.

Source 1.7 Giant Red Cedar felled by Cyclone Larry

Source 1.8 The collapse of this tree immediately changed the ecosystem around it.

The Beaufort Scale

Beaufort scale number	Descriptive term	Units in km/h	Units in knots (1 knot = 1.852 km/h	Description on land	Description at sea
0	Calm	0	0	Smoke rises vertically.	Sea like a mirror.
1–3	Light winds	19 or less	10 or less	Wind felt on face; leaves rustle; ordinary vanes moved by wind.	Small wavelets, ripples formed but do not break; a glassy appearance maintained.
4	Moderate winds	20–29	11–16	Raises dust and loose paper; small branches are moved.	Small waves – becoming longer; fairly frequent white horses.
5	Fresh winds	30–39	17–21	Small trees in leaf begin to sway; crested wavelets form on inland waters	Moderate waves, taking a more pronounced long form; many white horses are formed – a chance of some spray.
6	Strong winds	40–50	22–27	Large branches in motion; whistling heard in telephone wires; umbrellas used with difficulty.	Large waves begin to form; the white foam crests are more extensive with probably some spray.
7	Near gale	51–62	28–33	Whole trees in motion; inconvenience felt when walking against wind.	Sea heaps up and white foam from breaking waves begins to be blown in streaks along direction of wind.
8	Gale	63–75	34–40	Twigs break off trees; progress generally impeded.	Moderately high waves of greater length; edges of crests begin to break into spindrift; foam is blown in well-marked streaks along the direction of the wind.
9	Strong gale	76–87	41–47	Slight structural damage occurs – roofing dislodged; larger branches break off.	High waves; dense streaks of foam; crests of waves begin to topple, tumble and roll over; spray may affect visibility.
10	Storm	88–102	48–55	Seldom experienced inland; trees uprooted; considerable structural damage.	Very high waves with long overhanging crests; the resulting foam in great patches is blown in dense white streaks; the surface of the sea takes on a white appearance; the tumbling of the sea becomes heavy, with visibility affected.
11	Violent storm	10–117	56–63	Very rarely experienced – widespread damage.	Exceptionally high waves; small and medium-sized ships occasionally lost from view behind waves; the sea is completely covered with long white patches of foam; the edges of wave crests are blown into froth.
12+	Hurricane	118 or more	64 or more		The air is filled with foam and spray; the sea is completely white with driving spray; visibility very seriously affected.

Source 1.9 The Beaufort Wind Scale

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The scale used elements of the natural environment – smoke, dust and vegetation – to indicate what was happening as air moved over the surface of the Earth.

Geographical fact

Smoke was used as an indicator in 1805 but is unlikely to be used today. Why was smoke used then but isn't used now?

1.3 The sun and the abiotic environment: rocks and soil

Temperature changes associated with the heat of the sun are a major cause of mechanical or physical weathering, which is the breakdown of rocks **in situ** as a result of different components of rocks heating up and expanding at different rates or water in cracks and crevices in the rocks freezing during the cooler hours of the night and the rock being broken apart by the expanding ice.

in situ in the original position; not having been moved

Granular disintegration is directly caused by the sun. Dark-coloured compounds in rocks will heat up more quickly than lighter compounds. The dark compounds expand more quickly and can cause small grains of rock to break off the parent rock. This is most evident in a volcanic rock known as granite; the results are grains of sand which may eventually find their way to beaches. The breakdown of granite results in white sand beaches. The breakdown of basalt, a black rock, results in black sand beaches such as those found on the Big Island of Hawaii.

1.4 The sun and the biotic environment: flora and fauna

Sunlight generates the process of **photosynthesis** in plants. This process is essential for much of life on Earth. Photosynthesis is a complex chemical process, involving chlorophyll, carbon dioxide, water and sunlight, and produces the carbon and sugar compounds necessary for plant growth and the release of oxygen so necessary for animal life (read human life) on the planet.

photosynthesis the process of plants converting sunlight to energy

Source 1.10 Black sand beach in Hawaii formed by the erosion of basalt.

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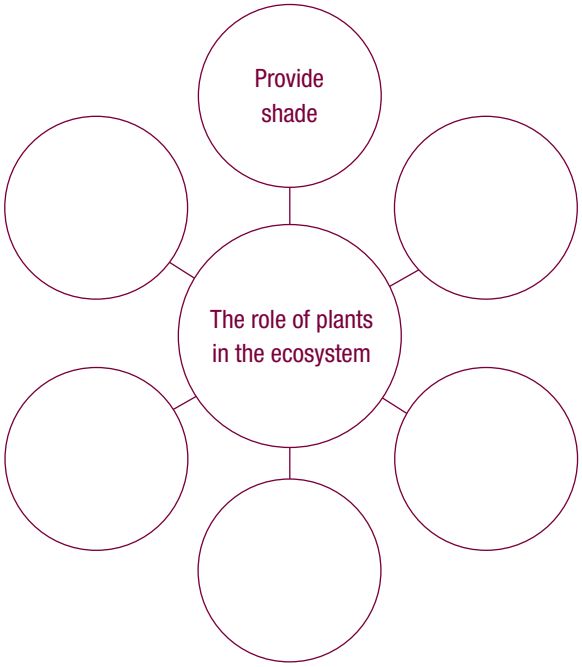
Plants have a number of roles in ecosystems. Some plants provide shade in which other plants will grow. Some plants are hosts for other plants; climbers and epiphytes, for example, need host plants. Many plants have special adaptations which allow them to grow in specific areas (mangroves and cacti, for example). All plants die, and in death they decompose and provide food for other plants.

Around the world there are some very difficult areas for plants to colonise. The growth of plants in these areas requires colonising plants with very special adaptations. These plants stabilise the environment and allow other plants, plants that are not adapted to the initial conditions, to eventually move into an area.

NOTE THIS DOWN

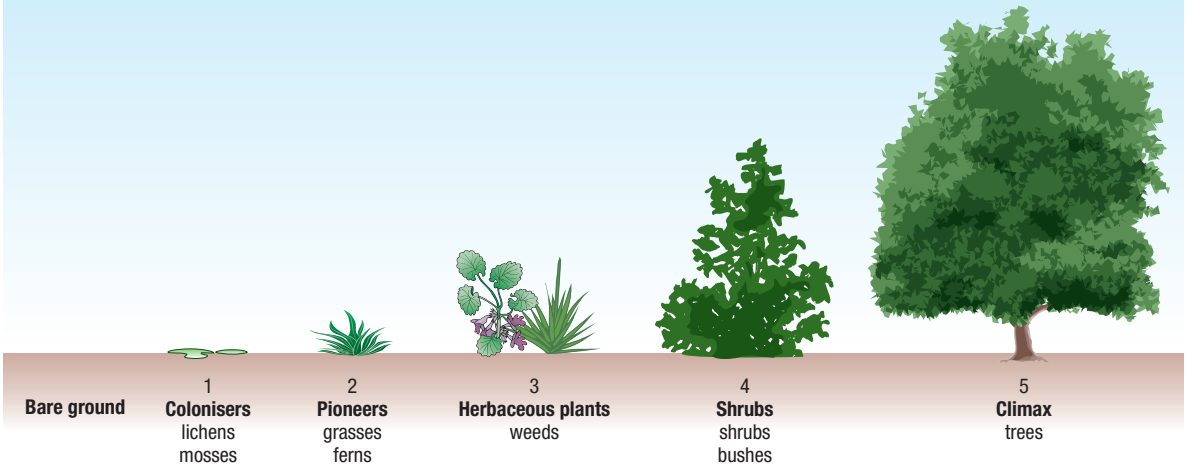
Copy the graphic organiser below and explore the different uses of plants.



RESEARCH 1.2

Sandy beaches and muddy estuaries support two entirely different ecosystems. Compare these two ecosystems and explain their difference and what factors affect them. Present your findings in a poster.

Source 1.11 shows how plant communities change over time: the character of an ecosystem changes as a result of its earlier plant communities.



Source 1.11 Transition from bare ground to a forest cover

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colonisers the first plants to inhabit an area

climax vegetation the most dominant form of vegetation in an area

The first plants to inhabit an area are known as the **colonisers**. The role of the colonisers is to establish an environment which will allow other plants to grow. The colonisers help break down the rock into soil and when they die they provide plant nutrients for a later group of plants. Eventually the environment is changed significantly by different groups of plants. A soil layer is developed and larger plants then provide protection for seedlings of still larger plants. The most dominant form of vegetation in an area is known as the **climax vegetation**. Climax vegetation is the major plant community that will develop in an area given the existing climatic conditions. For a large part of eastern Australia, the climax vegetation is eucalypt forest. Don't lose sight of the fact that it is the sun that is driving this vegetation development.

The animal kingdom is affected by sunlight in two ways. The time of day can have a significant effect on when animals are active. Some are **diurnal**. These animals are active during the day: giraffes and wildebeest, for example, are diurnal. Some are **nocturnal**. These are active at night: owls and flying foxes, for example, are nocturnal. Some are **crepuscular**. These are active in the twilight hours of early morning and early evening: many birds, for instance, use these hours to visit water sources. Deer too are most active in the twilight hours.

diurnal active during the day

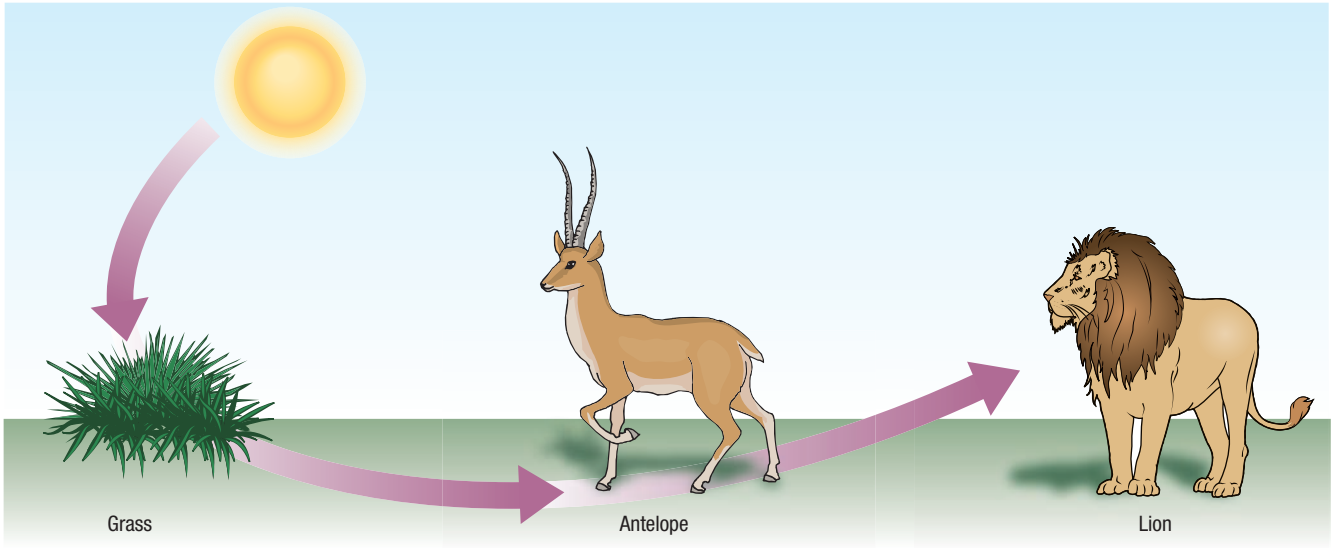
nocturnal active at night

crepuscular active at dawn or in the early evening

The other way sunlight affects the animal kingdom is through its effect on vegetation. There are animals which only eat plant material. These are the **primary producers** in an ecosystem. Primary producers are as small as caterpillars and as large as giraffes. They convert plant material into the food needed for their survival. They also produce waste products, in the form of gases, solids and liquids, which assist in the breakdown of plant material. On a more important level, many primary producer animals are the food of the next level of animals in the **food chain** – the carnivores. These animals eat other animals.

primary producer an animal that eats only plant matter

food chain the sequence of feeding arrangements in an ecosystem in which each member may be food for the next highest member of the chain



Source 1.12 Simple food chain in a small ecosystem

Source 1.12 is a simple version of what happens in many parts of the world. The sun provides the necessities for plant growth. A herbivore grazes on the plants and a carnivore consumes the herbivore.

The actual situation is not that simple. The study of biomes in the next chapter will investigate the relationships between plants, animals and the environment in more detail.

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The interesting thing about human beings is that they have an increased ability to survive because they consume all levels of the food chain, from the plants at the base (carrots, tomatoes, peas) to the herbivores (cows, antelopes, kangaroos) to the carnivores (sharks, crocodiles).

The role of the sun's energy in relation to plant and animal life on Earth is not over even when plants and animals die. Many of the wastes remaining when a plant or animal dies go through further processing to return their nutrients to the environment. This is where the **decomposers** come in. They break down the decaying life form into nutrients which can be used again in the ecosystem. Scavengers form part of this group. Crows, Tasmanian devils and hyenas are scavengers. (Hyenas also hunt.) Fungi and bacteria are other life forms that assist in the decomposition of plant and animal remains.

decomposers animals, fungi and bacteria that break down or 'clean up' waste matter

ACTIVITY 1.3

1. Describe the role of the colonisers.
2. Predict the impact on the ecosystem if the decomposers were eliminated.
3. Create your own food chain based on your own diet.

1.5 Introducing another variable: humans

Up to this point, the investigation of ecosystems and their dynamics has concentrated on the natural world and how interactions, often related to the activity of the sun, occur. The interactions and interconnections are far more complex than have been shown so far, but the general idea should be clear.

For some considerable time humans have had a major impact on ecosystems on the Earth's surface and that impact is increasing. The impact can be small, such as using insecticide on an ants' nest (though that is certainly not a small event for the ant colony), or so large as to completely destroy ecosystems. Using an insecticide on an ants' nest is a deliberate attempt to destroy an ecosystem, but other actions may work to save an ecosystem.

Humans have not always had the degree of control over ecosystems that they have today. Humans were originally very much an integral part of the ecosystem: they lived in caves, gathered roots and berries and hunted wild animals during the day. Humans were hunted by those wild animals themselves.

Fire became an important tool for humans. It provided warmth and protection. Australia's first inhabitants used fire to modify the environment for their own use. Fire was used to remove undergrowth and encourage the growth of new shoots, which would attract animals. It has only recently been recognised that there was often a pattern to the burning. This pattern left a mosaic of sections of undergrowth at different stages of development. Some of this undergrowth provided protection for the animals the people hunted. The important thing was that catastrophic bushfires were prevented, as different parts of the land were in different stages of recovery from deliberate fires.

In time, humans learned which plants could be grown in certain areas and which animals could be brought under control. This knowledge resulted in the **domestication** of plants and animals and is the basis of agriculture in the modern world.

domestication the process of taming animals or cultivating plants for uses that benefit humans

Over time humans have become established at the top of the ecosystem. Humans can save, protect, destroy or modify an ecosystem. The sequence should probably be:

Modify → Save → Protect

In reality, the sequence in many places has probably been:

Destroy … → and where do we go from here?

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Case study 1.1
The Tasmanian Tiger

The thylacine, better known as the Tasmanian Tiger, was native to Australia and primarily found in Tasmania and some regions of Victoria. It was the country's largest carnivorous marsupial and had existed for over 4 million years.

The introduction of humans and dogs to the environment brought disease and predators to the ecosystem of the thylacine, and numbers declined drastically. Thylacines were kept in zoos, but suffered in captivity. They were also hunted by farmers who assumed the thylacine had been killing their sheep.

The last thylacine died in captivity in 1936, and although sightings have been reported and extensive searches carried out, there is no conclusive evidence of the creature being still in existence.

Currently, scientists are making attempts to clone thylacines from preserved specimens.

1 What were the possible impacts of the extinction of the thylacine in Tasmania?
2 Discuss how ecosystems in Tasmania would be affected if the thylacine was cloned and returned to its natural ecosystem.
3 Describe the steps taken by modern conservationists to help prevent more species becoming extinct.
4 Research and list plants and animals that have been rediscovered since they were declared extinct.

Humans have been altering ecosystems for thousands of years. Increasing populations required more food than could be provided by hunting and gathering. Providing more food required clearing land of its vegetation cover. In many parts of the world the flow of water had to be altered to provide water for larger and larger areas of crops and for the increasing number of livestock being raised. The flow of water also had to be altered to provide for increasing numbers of people living in settlements. The Industrial Revolution placed even more pressure on ecosystems as trees were cut and burned, and later coal and oil were extracted from the ground. Cities were built and spread across the countryside and communication networks of road and rail were constructed to connect them.

In the desire for this kind of progress, ecosystems for a long time took second place in humans' thinking. In parts of the world where development is still seen as the primary goal, or in places where disputes cannot be settled without conflict, ecosystems still take second place.

Fortunately, in other places the need to save and protect ecosystems is regarded as important. As a result, an international network of botanical gardens and zoos seeks to protect and enhance the future of plant and animal species that are under threat. There is also a network of reserves, state forests and, more importantly, national parks – both on land and on the water – which seek to preserve ecosystems. There are no guarantees that the efforts will be successful, but the efforts must be made.

The world's first national park – Yellowstone, in the United States – was opened on 1 March 1872. Australia's first national park was the National Park, south of Sydney. It was opened on 26 April 1879. It was the world's second national park. It was renamed the Royal National Park after a visit by Queen Elizabeth II in 1955.

In 1972, the United Nations recognised that parts of the world needed to be set aside as having special cultural or physical significance. By 2012, 962 sites had been recognised by the UN Educational, Scientific, and Cultural Organization (UNESCO) as World Heritage listed sites.

While world governments realise that parts of the Earth's surface need to be protected, it is not always easy, or possible, to do so. The fight to save the Cooloola area of Queensland was a classic example of the will of the people clashing with the government of the day and a mining company. Many clashes like this have occurred in the past 50 years, and many are under way around the world today.

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Geographical fact

It is interesting that the majority of sites identified are of cultural significance – the pyramids and the Mayan temples, for example. Only 188 sites are considered to be of significance because of their physical environmental characteristics.

At the end of 2012, Australia had 19 sites listed and 2 sites awaiting approval.

ACTIVITY 1.4

1 List the impacts that humans have had on the environment.
2 Suggest other types of creatures that have had a negative impact on an ecosystem.
3 Describe how humans can have a positive impact on the environment.
4 Evaluate the methods used to determine whether or not to preserve an area or site. Are some sites more significant than others? Explain why.

Source 1.13 Australia's World Heritage listed sites

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FIELDWORK 1.1 EXPLORING THE MANGROVES OF AN INLET

Aim

To examine a section of mangroves, such as Hays Inlet mangroves, to identify human impact on this ecosystem and the response of the mangrove community to this impact.

Method

A selected area of the mangroves, such as between Duffield Road and the sewage outfall pipe by Hays Inlet, will be examined.

Preparations

Use Google Earth, or an available map of the inlet, to prepare a base map of the area to be studied. Identify the various ecosystems you are likely to encounter. You will also need to take a camera, a GPS, old shoes in a plastic bag, insect repellent, a hat, sunscreen, a clipboard with the base map and the data collection sheet, and a pen.

Data collection

The suggested path for this trip is along the high-water line or lines of the mangroves. Use the GPS to record your route and to locate any significant evidence of human impact on the mangroves. Record data about the items you find along the high-water mark as well as any other evidence of human impact in the area.

List all the ways in which the mangroves appear to be being used. Take photos of these activities. Mark the location of these spots on your blank map. Provide a key to display your data collection. Are these activities active or passive? How often would the mangroves be used for these activities? How many boats did you see or hear during your time on the Inlet?

1 Explain the extent to which location along the inlet influences the type of activities evident in the mangroves.

2 Describe the positive and negative and short-term and long-term impacts of these activities on the mangroves. Sketch two examples of the ways in which the use of the area has affected the environment. Annotate your sketch with as much information as possible about the use and its impact.

3 Observe the features surrounding the mangroves that humans have created. Describe these. How do you think the mangroves have influenced these developments?

4 List some of the management strategies that you observe. Determine if you think the strategy is working or not and explain your reasoning. Suggest a new strategy for one of the impacts you identified in Item 2.

Fieldwork presentation layout

Front page	Title and name
Contents page	Do this last, once you have numbered the pages
Page 1	Aims and methods
Page 2	Location map – Hays Inlet area, for example
Page 3	Introduction – brief description of the study sites
Pages 4–5	Description of uses (and photos)
Page 6	Table of usage: effects of use (positive or negative, short-term and/or long-term)
Pages 7–8	Description of effects of use (and sketches and/or photos)
Page 9	Association between use and effects of use
Page 10	Table or written description of management strategies
Page 11	Photos or sketches of management strategies
Page 12	Evaluation of these strategies
Page 13	Appendix, bibliography, glossary

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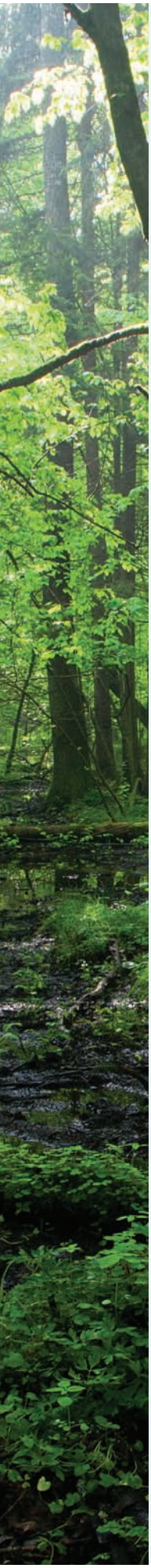

Chapter summary

- Ecosystems have both living and non-living components. All these parts work together, with 'inputs' to make them function and 'outputs' – waste material resulting from the processes required to keep the ecosystem functioning.
- Ecosystems are dynamic, responding and adapting to changes made by humans, the weather and animals (for example).
- Ecosystems exist at all types of scales, wherever abiotic parts of the Earth's surface and biotic organisms interact.
- Ecosystems are important for the continued existence of life on Earth. Humans can have significant and damaging impacts on ecosystems by introducing waste and pollution, and even destroying ecosystems.
- The need to save and protect ecosystems is regarded as important in some areas of the world.

End-of-chapter questions

Multiple choice

1 Which of the following is not a living part of an ecosystem?

A A rock
B A worm
C A butterfly
D An eagle

2 Which of the following is not a non-living part of an ecosystem?

A A rock
B A cloud
C Water
D A worm

3 Which of the following has the greatest long-term impact on ecosystems?

A Rocks
B Rainfall
C Wind
D The sun

4 What is the difference between an ecosystem and a biome?

A Size
B Variety of plant species
C Variety of wildlife
D All of the above

5 Which organisation works to protect ecosystems?

A WHO
B UN
C UNESCO
D QTQ

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Short answer

1 Describe how the sun affects an ecosystem on a daily basis.

2 Describe how the sun affects an ecosystem on an annual basis.

3 Define 'food chain'.

4 Explain the relationships between the non-living and the living parts of an ecosystem.

5 Discuss how humans can have an impact on an ecosystem.

Extended response

Pildappa Rock is near Minnipa in South Australia. It is one of a number of 'wave rocks' in Australia.

Examine the pictures below. Your task is to tell the story of the ecosystems here without using any other information source. What information is provided by the four images? What evidence of the information presented in this chapter is shown in them? Present your findings in a short report.

Source 1.14 Pildappa rock showing its wave rock shape

Source 1.15 Summit of Pildappa Rock showing the uneven nature of this granite formation

Source 1.16 An ecosystem on the summit of Pildappa Rock

Source 1.17 The hollow in this rock is also an ecosystem.

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