UNIT 1 LANDFORMS AND LANDSCAPES

TOPIC 6
Rainforest landscapes

6.1 Overview
Numerous videos and interactivities are embedded just where you need them, at the point of learning, in your learnON title at www.jacplus.com.au. They will help you to learn the content and concepts covered in this topic.

6.1.1 Introduction
What do you know about rainforest landscapes? Did you know that rainforests have the greatest biodiversity of any forest environment? They contain complex layers that support thousands of species of plants and animals. The rainforest has supplied resources to all people, including indigenous communities. People are concerned that clearing large areas of this landscape is creating negative impacts that are unsustainable.

Aerial view of the Amazon rainforest in Peru, South America
Starter questions

1. Create a mind map of all the words that come to your mind when you hear the word rainforest. Place these words into specific categories such as animals, plants, colours or structure.
2. Using magazines, newspapers, the internet and other resources, create a collage that represents a rainforest landscape to you. What emotions does this image make you feel?
3. Refer to the image on these pages. Why do we call rainforests a ‘green landscape’?
4. Try to list the things in your home that might originally have come from a rainforest. Have they changed from their original form? How do you think they got here?
5. Think of your favourite place, the place you most like visiting. How would you feel if that place was destroyed and you could not visit or use it in ways you used to? What could you do about this?

INQUIRY SEQUENCE

6.2 What are the characteristics of a rainforest?

6.2.1 Rainforests

Forests that grow in constantly wet conditions are defined as rainforest landscapes. A rainforest is an example of a biome (a community of plants and animals spread over a large natural area). Rainforests are located wherever the annual rainfall is more than 1300 millimetres and is evenly spread throughout the year. While tropical rainforests are the best known of these landscapes, there are also other types.

6.2.2 Tropical rainforests and their processes

Tropical rainforest landscapes are found where there are both high temperatures and high precipitation. The sun’s rays that reach the Earth near the equator have a smaller area of the Earth and atmosphere to heat than rays reaching the Earth at higher latitudes. Therefore, it is hotter at the equator than at higher latitudes. Rainforests are also generally warmer at night, because the cloud cover and high humidity help to keep the heat in. Tropical rainforests have a hot climate right throughout the year with no summer or winter. High precipitation around the equator is mainly due to convectional rainfall and is often associated with thunderstorms. Convectional rainfall occurs when warm, moist air is heated when it moves over a hot surface on Earth. As the air is heated it expands and becomes lighter than the surrounding air. This causes it to rise. If the air continues to rise, condensation and precipitation occur. This combination of high temperatures and high precipitation influences the global distribution of the tropical rainforest landscape. Plants flourish in these rainforests, which support a huge number of plants and animals — perhaps as many as 90 per cent of all known species. Poison-dart frogs, birds of paradise, piranha, tarantulas, anacondas, Komodo dragons and vampire bats are all found in tropical rainforests.
Tropical rainforests that occur in the mountains, 1000 metres or more above sea level, are called montane rainforests. Other tropical rainforests are known as lowland rainforests (see figure 1).

**Lowland tropical rainforest**

Lowland tropical rainforests form the majority of the world’s tropical rainforests. They grow at elevations generally below 1000 metres. Trees in lowland forests are usually taller than those in montane forest and include a greater diversity of fruiting trees. These attract animals and birds adapted to feed on their fruits. These rainforests are far more threatened than montane forests because of their accessibility, soils that are more suitable for agriculture and more valuable hardwoods for timber. Lowland forests occur in a belt around the equator, with the largest areas in the Amazon Basin of South America, the Congo Basin of central Africa, Indonesia and New Guinea.

![Map of World Rainforest Types](source: MAPgraphics Pty Ltd, Brisbane)

*(a) Montane rainforest, (b) Temperate rainforest and (c) Lowland rainforest*
Temperate rainforests

The large area of the globe between the tropics and the polar regions (areas within the Arctic and Antarctic circles) is called the temperate zone, and rainforests can grow there too. Temperate rainforests occur in North America, Tasmania, New Zealand and China. Giant pandas, Tasmanian devils, brown bears, cougars and wolves all call temperate rainforests home.

6.2.3 Physical processes of a rainforest

Rainforest landscapes are the result of the interaction between the Earth’s four main systems or spheres. For example, the trees in a tropical rainforest (biosphere) rely on high levels of precipitation (hydrosphere), warm temperatures (atmosphere) and stability provided by soil (lithosphere) to thrive. Energy from the sun is stored by plants (biosphere). When humans or animals (biosphere) eat the plants, they acquire the energy originally captured by the plants.

6.2 Activities

To answer questions online and to receive immediate feedback and sample responses for every question, go to your learnON title at www.jacplus.com.au. Note: Question numbers may vary slightly.

Remember
1. What conditions do rainforest environments thrive in?
2. What are the differences between montane and lowland rainforest environments? What causes these changes in rainforest type?
3. Describe the distribution of rainforests around the world. Think about in which continents and between which latitudes they are found, the size and scale of them, and whether they are continuous or scattered.

Explain
4. Why are lowland rainforest environments more threatened by human activity than montane rainforests?
5. Why are montane forests often called ‘cloud forests’?

Discover
6. Refer to figure 1.
   (a) Use an atlas to help you name six countries in the Asia-Pacific region that contain rainforests.
   (b) What type of rainforest environment is found:
      (i) in north-eastern Australia
      (ii) along the western coastline of Canada?

Think
7. Refer to figure 2. List Earth’s four spheres. Give several examples of features in each sphere.
8. List some Earth sphere interactions from your own daily activities.
9. Why are rainforest environments able to support a large range of animals and plants?
6.3 What is a rainforest ecosystem like?

6.3.1 Rainforest ecosystems

Rainforests are unique ecosystems consisting of four different layers — the emergent, canopy and understorey layers and the forest floor. Each layer can be identified by its distinct characteristics. Rainforests are actually a community of plants and animals working together to survive, linked in a food web (see figure 2).

Emergents

These are the tallest trees, ranging in height from 30 to 50 metres. They are so named because they rise up or emerge out of the forest canopy. Huge crowns of leaves and abundant animal life thrive on plenty of available sunlight.

Canopy

This describes the array of treetops that form a barrier between the sunlight and the underlying layers. Their height can vary from 20 to 45 metres. This layer contains a distinct microclimate and supports a variety of plants and animals. The taller trees host special vines called lianas that intertwine the branches. Other plants called epiphytes use the tree trunks and branches as anchors in order to capture water and sunlight.

Understorey

This layer contains a mixture of smaller trees and ferns that receive only about five per cent of the sun’s energy. Many animals move around in the darkness and humidity, using the vines as highways.

Forest floor

This bottom layer is dominated by a thick carpet of leaves, fallen trees and huge buttress roots that support the giant trees above. Rainforest soils give the impression of being fertile because they support an enormous number of trees and plants. However, this impression is wrong, as the soil in rainforests is generally poor. Leaves and other matter are recycled by the many organisms to create a living
compost. The roots of trees must ‘snatch’ these nutrients from the soil before heavy rains wash them away and they are lost through a process called leaching.

Larger animals also roam through this layer in search of food.

**FIGURE 2** An example of a typical food web in an Australian rainforest.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Height</th>
<th>Amount of light</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producers</td>
<td></td>
<td></td>
<td>Trees, and shrubs (leaves, seeds and fruit)</td>
</tr>
<tr>
<td>Insects and invertebrates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary consumers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary consumers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary consumers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decomposers and detritus feeders, such as bacteria, fungi, earthworm and some species of ferns, return nutrients to the soil.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green possum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amethystine 'scrub' python</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kookaburra</td>
<td></td>
<td></td>
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<tr>
<td>Striped possum</td>
<td></td>
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<tr>
<td>Native rat</td>
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<td></td>
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<tr>
<td>Cassowary</td>
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<td></td>
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<tr>
<td>Insects</td>
<td></td>
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</tr>
</tbody>
</table>

### 6.3 Activities

To answer questions online and to receive **immediate feedback** and **sample responses** for every question, go to your learnON title at www.jacplus.com.au. *Note:* Question numbers may vary slightly.

**Remember**

1. How many layers are there in a rainforest **environment**?
2. What are the tallest trees in the rainforest called?

**Explain**

3. Describe how conditions in the canopy layer differ from those on the forest floor.
4. Draw up and complete a table like the one below that summarises the features of a rainforest **environment**.
Discover
5. Many rainforest animals live their whole life in the trees. Using the internet to help you, give some examples of these animals and conduct research into the habits of one animal.
6. Use the Treehouse weblink in the Resources tab (click on the picture, then select the Jewels of the Earth activity) to explore the layers of the rainforest and the plants and animals that inhabit them.

Think
7. In a rainforest, the soil below the trees is often poor and shallow, and the trees create their own nutrients. In one sentence describe how this happens, and draw a labelled sketch to illustrate the process.
8. What change might you expect in the success of plant growth if the rainforest trees are removed and crops are planted instead? Why?
9. Imagine you are a raindrop. Recreate your journey through a rainforest, passing through each of the forest layers. Read or act out your descriptions to the rest of the class.
10. Identify key characteristics of a tropical rainforest.

6.4 SkillBuilder: Creating and describing complex overlay maps

WHAT IS A COMPLEX OVERLAY MAP?
A complex overlay map is created when one or more maps of the same area are laid over one another to show similarities and differences between the mapped information. Traditionally, the second map is on tracing paper that is attached to the original page.

Complex overlay maps show relationships between factors — the similarities and the differences in a pattern.

Go online to access:
• a clear step-by-step explanation to help you master the skill
• a model of what you are aiming for
• a checklist of key aspects of the skill
• a series of questions to help you apply the skill and to check your understanding.

FIGURE 1 An illustration of a completed complex overlay map showing Australia’s seasonal rainfall patterns (left), drainage catchments (centre) and average annual rainfall (right)

RESOURCES — ONLINE ONLY
Watch this eLesson: Watch this video to learn how to create and describe complex overlay maps.
Searchlight ID: eles-1656
Try out this interactivity: Use this interactivity to learn how to create and describe complex overlay maps.
Searchlight ID: int-3152
6.5 How have Australia’s rainforests changed?

6.5.1 Australian rainforests

Although hard to believe now, Australia was once mostly covered in rainforest! Even areas that today are deserts were once teeming with plant and animal life similar to those in the Amazon. This is because Australia was further north than it is today. Over the past 100 million years, however, a series of events has gradually reduced the area of Australia’s rainforests (see figure 1).

The gradual movement of Australia southwards as it separated from Gondwanaland and a series of ice ages have combined to make it a drier place (see figure 2). Rainforests have become confined mainly to the mountains and gorges of the Great Dividing Range and Tasmania. These areas have higher rainfall and fewer fires.

The farming practices of European immigrants have reduced much of the remaining rainforest — in the past 200 years, more than 70 per cent of these forests have been cleared.

Scientists have identified three major types of rainforest in Australia (see figure 3). There are examples of all three in Queensland. This diversity occurs nowhere else on Earth.

Much of Australia’s tropical rainforests are now World Heritage areas. This means they have been listed by UNESCO as being of global importance. The Wet Tropics of Queensland are a World Heritage area containing some of the oldest rainforests in the world. They have the world’s highest concentration of flowering plants, and have records that show Aboriginal communities are the world’s oldest indigenous rainforest culture.

The indigenous inhabitants of the Daintree Rainforest in North Queensland are the Kuku Yalanji Aboriginal people, believed to have lived in this area for more than 9000 years by European estimates. Their culture is uniquely adapted to the rainforest environment.
For the Kuku Yalanji, the natural world is often thought of in human terms and is closely linked to the people. Any changes to the environment are seen as changes to themselves. Because of the powerful properties attributed to most story places (sites with links to the Dreamings) of the Daintree, the Kuku Yalanji regard damage and destruction to the environment as unacceptable.

The Kuku Yalanji people gather their food and medicine and many of their implements, weapons, fibres and construction material from plants in their environment. The natural patterns and cycles of the rainforest give important information about the food that is available. The plants are their calendar, marking the seasons.
For example, when blue ginger (jun jun) is fruiting it is time to catch scrub turkey (diwan), and when mat grass (jilngan) is flowering it is time to collect the eggs of the scrub fowl (jarruka).

6.5 Activities
To answer questions online and to receive immediate feedback and sample responses for every question, go to your learnON title at www.jacplus.com.au. Note: Question numbers may vary slightly.

Remember
1. List the reasons given in this subtopic for the gradual disappearance of Australia’s rainforest environments.
2. What resources does the rainforest provide for the Kuku Yalanji people?

Explain
3. How has the scale of Australian rainforest environments changed over time?
4. Describe the location and distribution of Australia’s remaining rainforest environments. What factors have contributed to their survival here?
5. There are three major types of rainforest environments found in Australia. What makes Queensland’s rainforests unique? Why is this possible?
6. Refer to figure 3. Why are there no rainforest environments on the western side of Australia?
7. Why do the Kuku Yalanji people regard damage to the Daintree Rainforest as unacceptable?

Discover
8. Use the UNESCO Heritage weblink in the Resources tab to complete the following.
   (a) On a map of Australia, locate and label Australia’s World Heritage sites.
   (b) Which three sites have been added most recently?
   (c) Which two sites protect Australian rainforest?
   (d) The Wet Tropics of Queensland are particularly special because they border another World Heritage site. What is this other site?
   (e) What criteria does UNESCO use to determine whether a natural region should be placed on its list?

Think
9. Based on the history of Australia’s rainforests and the protection now in place for the remaining forests, what do you think the future holds for this important resource?
10. A hotel chain has applied to the Queensland government for permission to build a resort in the Daintree. Assess this proposal from the perspectives of the developers, government, local residents, environmentalists and Kuku Yalanji people. Try to make a decision as to whether this project should be approved. This could be completed in small groups or debated as a class.

6.6 How is the Amazon rainforest changing?
6.6.1 The Amazon rainforest
The world’s largest remaining rainforest is in the Amazon Basin in South America. This truly remarkable forest is under increasing threat from forestry, mining and farming. The loss may cause severe problems worldwide. Most of us use rainforest products every day. More importantly, however, rainforests help control the world’s climate and our oxygen supply. So the next time you eat chocolate, treat your asthma, play a guitar or even take a deep breath, you should thank the Amazon rainforest.
• The Amazon forest is home to more than 400,000 species of plants, 1,300 bird species, 430 different mammals and 2.5 million different insects.

• Approximately 1.3 million tons of sediment is transported by the Amazon River to the sea daily.

• No bridges cross the main trunk of the Amazon River, which locals call the Ocean River.

• Since 2000, the Amazon rainforest has been facing deforestation at an average rate of 50 football fields per minute.

• The Amazon is the second longest river in the world, but it carries more water than the next six largest rivers combined.

• The Amazon River and those rivers that feed into it (tributaries) contain one-fifth of the world’s fresh water, and more than 2000 species of fish — more than in the Atlantic and Pacific oceans combined.

• The mouth of the Amazon River is approximately 325 kilometres wide and contains an island the size of Switzerland!

A The Amazon forest is home to more than 400,000 species of plants, 1,300 bird species, 430 different mammals and 2.5 million different insects.

B The mouth of the Amazon River is approximately 325 kilometres wide and contains an island the size of Switzerland!

• Approximately 1.3 million tons of sediment is transported by the Amazon River to the sea daily.
• No bridges cross the main trunk of the Amazon River, which locals call the Ocean River.
• Since 2000, the Amazon rainforest has been facing deforestation at an average rate of 50 football fields per minute.
• The Amazon is the second longest river in the world, but it carries more water than the next six largest rivers combined.
• The Amazon River drains nearly 40 per cent of South America.
• There are official plans for 412 dams to be in operation in the Amazon River and its headwaters.
• Since 1900, more than 90 indigenous groups have disappeared in Brazil alone.
FIGURE 2  The brown waters of the Amazon show that it is carrying a lot of sediment.

FIGURE 3  Area cleared for ranching in the Amazon rainforest.

FIGURE 4  Development is clearly visible within the green carpet of the Amazon rainforest between 1975 (left) and 2012 (right).

Source: NASA/Landsat
6.6.2 Amazing rainforests

- More than 7000 modern medicines are made from rainforest plants. They can be used to treat problems from headaches to killer diseases like malaria. They are used by people who suffer from multiple sclerosis, Parkinson’s disease, leukaemia, asthma, acne, arthritis, diabetes, dysentery and heart disease among many others.
- Even animals can be used to cure human diseases. Tree frogs from Australia give off a chemical that can heal sores, and a similar chemical from a South American frog is used as a powerful painkiller.
- The poisonous venom from an Amazonian snake is used to treat high blood pressure.
- Only one per cent of the known plants and animals of the rainforest have been properly analysed for their medicinal potential. Perhaps the greatest benefits to medicine and our own health, however, are yet to come.
- Rainforests are home to the greatest profusion of life on the planet: at least half of all known plants and animals live in rainforests.
- At least 50 million indigenous peoples live in rainforests worldwide. From the Kuna people of Panama and the Yanomami of Brazil to the Baka people of Cameroon and the Penan of Borneo (Indonesia), these people have traditionally lived a way of life that has little impact on their forest home.
• The people who live in or near the rainforests gain much of their food from the forest. But rainforests also supply the supermarkets of the world with their bounty. Most of these fruits and nuts are now grown by farmers rather than harvested directly from the forest, but it was in the rainforests that they originated.

• Chocolate first came from cacao trees native to the Amazon rainforest. Today the cocoa in the chocolate you eat is most likely to have come from huge cacao plantations in West Africa. Similarly, brazil and cashew nuts, cinnamon, ginger, pepper, vanilla, bananas, pineapples, coconuts, paw-paws, mangoes and avocados were all originally rainforest plants. Even the gum used in chewing gum comes from a rainforest plant, as does the tree that produces rubber.

• Rainforest trees are generally hardwood trees, making them resistant to decay and attractive for building. Well-known rainforest timbers are mahogany, teak, ebony, balsa and rosewood. Rosewood is particularly interesting, as it is considered the best timber in the world for guitar making. In many tropical countries, people also collect timber as fuel for s or heating.

6.6 Activities
To answer questions online and to receive immediate feedback and sample responses for every question, go to your learnON title at www.jacplus.com.au. Note: Question numbers may vary slightly.

Explain
1. Which of the present uses of the rainforest do you think is the most sustainable for the forest’s future? Explain your answer.
2. Refer to figure 4. Why does the clearing and change in the Amazon appear to occur in straight lines?
3. Looking at figures 2, 3 and 4 for interconnections, what do you think could be contributing to the high levels of sediment in the Amazon River? Why?
4. Refer to figure 5.
   (a) Explain the role of the rainforest environment in relation to the climate.
   (b) Why are rainforests sometimes called ‘the lungs of the Earth’?
Discover

5. Look carefully at figure 1.
   (a) List the countries of South America into which the Amazon rainforest extends.
   (b) Which country contains most of the Amazon rainforest?
   (c) Why do you think there are so few large cities in the rainforest?
   (d) Estimate the percentage of the rainforest that can be considered:
      (i) under low or no threat
      (ii) under threat
      (iii) disturbed.
   Describe in your own words what each of these terms means.

6. Using a piece of tracing paper, trace the Amazon River and its tributaries. Draw a single line that joins
   the source of each of the tributaries. Shade the area within this line using a light blue pencil: this area
   is known as the catchment, or basin, of the river. Overlay your completed diagram on the map of the
   forest and comment on the interconnection between the river and the forest.

7. This subtopic lists only a few of the products we use from rainforests. List the value of these and other
   rainforest products under the following headings.
   (a) Valued by different cultures
   (b) Valued economically
   (c) Valued for its aesthetic value (beauty)
   (d) Other

8. Use the Treehouse weblink in the Resources tab (click on the picture then choose the Track it back activity)
   to learn how the food you eat comes from the rainforest.

9. Use the Amazon tour weblink in the Resources tab to take a tour through an Amazon rainforest slideshow.

Think

10. If development in the Amazon Basin continues as seen in figures 3 and 4, what could be the consequences
    in terms of the processes shown in figure 5?

11. Make a list of things in your home that may come from the rainforest environment. Remember to look in
    the medicine cupboard and the pantry as well as at the furniture. Perhaps you could bring some examples
    to school and your class could set up a display.

6.7 SkillBuilder: Drawing a précis map

WHAT IS A PRÉCIS MAP?

A précis map is a simplified map — the cartographer has decided which details to leave in and which to leave out. It
is different from a sketch map, which includes all the main features.

Go online to access:
- a clear step-by-step explanation to help you master the skill
- a model of what you are aiming for
- a checklist of key aspects of the skill
- a series of questions to help you apply the skill and to check your understanding.
6.8 How do indigenous peoples use rainforests?

Access this subtopic at www.jacplus.com.au

6.9 Why are rainforests disappearing?

6.9.1 Factors causing rainforest deforestation

Rainforests have the potential to provide a wide variety of useful resources. The temptation to use these pristine areas is often too difficult for people to resist, especially if they live in poverty. As a result, all around the world, rainforests are being destroyed for economic gain. The main reasons for rainforests being cleared are described below.
Commercial logging

There are two main types of logging: **clearfelling** and **selective logging**. When a forest is clearfelled, all trees are removed either by chainsaw or with heavy machinery such as bulldozers. In selective logging, only the best and most valuable trees are cut down. But in clearing forest to reach those trees, it is estimated that a hectare (10000 square metres) of forest is destroyed for each log removed.

Farming

Rainforests grow in many developing countries. These countries struggle to provide the basic necessities of life for their people, and their populations are often rapidly increasing in size. In these countries, the land on which the forest grows is seen as more valuable than the forest itself.

Highways create access to these areas, opening up parts of the rainforest once almost impossible to reach. Soon after the roads are built, settlers (called homesteaders) arrive. Claiming a piece of the forest that borders the road, the homesteaders chop down a few trees as timber for fencing or a house, and then sets fire to the rest.

Once the initial ‘land rush’ is over and all the land beside the roads has been claimed, tracks and roads leading from the highways will push deeper and deeper into the forest. Soon an area of 50 kilometres either side of the highway will have been destroyed and replaced by small farms or large-scale commercial farms that raise beef or crops for export to the richer countries of the world.
Mining

Many rainforests are growing on land that also contains large energy and mineral deposits such as oil, gold, silver, bauxite, iron ore, copper and zinc. Mineral companies build roads to the deposits and set up large-scale mining and processing plants. These plants require large amounts of electricity, and this is often supplied by burning trees to create charcoal or by constructing vast hydroelectric dams.

Deep in the Brazilian rainforest, a 2000-square-kilometre dam has been constructed to provide electricity for aluminium smelters. The dam flooded the entire tribal lands of two native peoples, and is so large that it has altered the climate in the area, making it drier.

Another problem created by mining is the pollution of nearby rivers and streams from chemicals used in the processing plants. Rivers downstream from a vast goldmine in Papua New Guinea have been found to contain four times the safe limit of cyanide in the water. Cyanide is used to extract gold from rock.

6.9 Activities

To answer questions online and to receive immediate feedback and sample responses for every question, go to your learnON title at www.jacplus.com.au. Note: Question numbers may vary slightly.

Remember

1. What is the difference between clearfelling and selective logging?
2. List four changes/problems caused by mining operations in rainforests.

Explain

3. ‘Many homesteaders are unable to make a good living from the poor tropical soils.’ Explain the reasoning behind this statement. You may like to revisit subtopic 6.3 to help you with your response.
6.10 How does deforestation affect the environment and people?

6.10.1 Impacts of rainforest deforestation

Deforestation of rainforests around the world is the major cause of problems in this ecosystem. The loss of unique habitats is the primary reason species are becoming endangered. Clearing creates smaller islands of vegetation, making it more difficult for animals to communicate and breed. People are also affected by the removal of the rainforest. While indigenous peoples may feel the effects first, others also experience negative consequences.

- About one hectare of rainforest is destroyed every second: this is about twice the size of a soccer pitch.
- Scientists estimate that 137 plants and animals are made extinct daily: that's 50,000 each year. Some haven't even been discovered yet!
- It is believed that in the year 1500 up to nine million indigenous peoples lived in the Amazon rainforest. The number is now lower than 200,000.
- The world loses about two per cent of its rainforest each year, but rates differ between countries.

6.10.2 Impacts on plants and animals

Islands in the forest

Many forests are cleared using fire. These fires will release millions of tonnes of carbon dioxide into the air, increasing the threat of global warming. At the same time, destroying the trees robs the planet of the natural system that helps regulate the amount of carbon dioxide in the air.

In many areas where forests are cleared, it has become a practice to leave behind ‘islands’ of rainforest. This is meant to assist in the natural regeneration of the forest and also to leave sufficient areas of the natural habitats of plants and animals that live in the rainforest. But is this working?
The islands that are left are often not big enough to ensure the survival of the large numbers of species that live there. For example, the endangered Queen Alexandra’s Birdwing (the world’s largest butterfly) is facing extinction as its distribution is being condensed into seven isolated blocks of rainforest measuring approximately 1–2 square kilometres in northern Papua New Guinea. These remaining refuges are threatened by surrounding palm oil plantations.

And there are other problems. When the forest is cleared, the exposed earth can quickly erode as the tree roots no longer hold the soil together, making the regrowth of vegetation slow. On steep slopes this can increase the risk of landslides, and sediments can flow into rivers.

During drought, the bare ground can become hot and barren. With the removal of the forest cover there is little moisture stored in the ground and a much lower rate of evapotranspiration. This in turn affects the water cycle, reducing the amount of rain that falls on the remaining islands of rainforest, and they quickly dry out.

6.10.3 Indonesia

CASE STUDY

Deforestation in Indonesia and the orangutan

Nearly 10 per cent of the world’s rainforests and 40 per cent of all Asian rainforests are found in Indonesia. Less than half of Indonesia’s original rainforest area remains. Much of this is in Kalimantan, on the island of Borneo. Forests have been cleared for timber, for plantation crops such as palm oil trees, and to make way for Indonesia’s growing population, which is now more than 200 million. Fires lit to clear land in 1982 and 1997 resulted in wildfires that severely damaged large areas of rainforest in Kalimantan. Orangutans, Sumatran tigers and Javan hawk-eagles may disappear from Indonesia as their natural habitats disappear.

Orangutans are the largest tree-living mammals and the only great ape that lives in Asia. They survive only on the islands of Borneo and Sumatra. Current estimates are that orangutans have lost 80 per cent of their habitat in the last 20 years. In 1997–98, wildfires burned through nearly two million hectares of land in Indonesia, killing up to 8000 orangutans.

It is estimated that orangutan numbers have declined by more than 50 per cent in the last 60 years. The current orangutan population is believed to range between 45 000 and 69 000.
6.10.4 Impacts on people

Indigenous peoples

As forests are cleared and new occupiers move into the region, the indigenous peoples of the area are often displaced and their cultures may disappear. The homesteaders bring new diseases to which indigenous peoples have no natural immunity. One group, the Nambiquara of Brazil, lost half its population to illness when a road was placed through their tribal land. Indigenous peoples aren’t often given a choice about ‘progress’ coming to their section of the rainforest. As a result, tension can be created between these indigenous communities and the government. In 1999, the Bakun Dam Project began in Malaysia, resulting in the eviction of approximately 10,000 indigenous people from their ancestral homeland. While they were resettled as compensation, the land provided was too small to support their traditional forms of hunting and agriculture and many failed to adapt to their new lifestyles.
Landslides

A landslide, the downward movement of earth and rocks on a slope, occurs in the lithosphere (see subtopic 6.2). It can be caused by natural physical processes such as rainfall and earthquakes, or by man-made activities such as deforestation and road building. Usually, the roots of rainforest plants keep the soil together and add stability to mountainous areas. This is especially important during times of heavier rainfall. However, sometimes the ground becomes so waterlogged that the roots can’t keep the soil in place and it slips downhill, creating a landslide. The risk of this increases if deforestation has taken place on the hillside, as there are no tree roots to provide added stability.

Therefore, when these hills are cleared and settled by communities, the danger of property damage, and even death, increases. November 2011 saw 35 people killed in a landslide in the Colombian city of Manizales. Fourteen houses were destroyed, displacing up to 159 people. This mountainous, coffee-growing region used to be rainforest before it was cleared and settled.

Haiti is at a high risk of landslides because its people cut down trees to use as fuel. As a result, most of Haiti’s natural forest has been destroyed. In 2004, Hurricane Jean hit the island; many of the 3000 people who died were caught in landslides.

Disease

The arrival of new tropical diseases is a less obvious result of deforestation. As animal hosts disappear and new human settlers move into previously inaccessible areas, ‘new’ disease-causing microorganisms are transferred into the human population. The frequency of mosquito-borne diseases such as malaria has increased due to the creation of more water puddles, for example in ditches and tyre treads, that are an excellent breeding ground for the mosquito. It is
estimated that malaria is responsible for the deaths of 20 per cent of the Yanomami people in Brazil and Venezuela. Today, more than 99 per cent of malaria cases in Brazil occur in the Amazon Basin region, even though the mosquitoes that carry the disease are found across 80 per cent of the country.

The outbreak of such diseases doesn’t affect only the local area but the impact can also spread into other countries via people who visit these areas, unknowingly contract an illness and then travel home, spreading the disease along the way.

6.10 Activities
To answer questions online and to receive immediate feedback and sample responses for every question, go to your learnON title at www.jacplus.com.au. Note: Question numbers may vary slightly.

Remember
1. Name some species threatened by deforestation in Indonesia.
2. List the main threats to orangutans.
3. What is the interconnection between deforestation and the impact of disease on indigenous peoples?

Explain
4. How does deforestation affect the lithosphere, atmosphere and biosphere? (Refer to subtopic 6.2 to refresh your memory.)
5. Why does having separate small islands of vegetation make it more difficult for animals to communicate and breed?

Discover
6. Refer to figures 4 and 5. Describe the interconnection between the two sets of data.
7. Refer to figure 6. Write a paragraph that explains how deforestation results in the consequences and changes illustrated in the diagram.
8. Research and create a list of 10 other animal species threatened by deforestation around the world. Choose one of these animals and report back to the class on its current location, the remaining population level and the main causes of deforestation. Present your report as a poster, PowerPoint presentation, movie (documentary), poem, song or drama performance.
9. Using the internet, investigate two different management strategies/policies/laws that have been implemented around the world to try to conserve the rainforest environment. Note the positive and negative aspects of these strategies. Comment on their ability to support the sustainable use of rainforests. Discuss your results as a class. Create a summary on the board to evaluate all the options that are shared.
6.11 How can rainforests be conserved?

6.11.1 Options for conserving rainforests

As people begin to realise the importance of rainforests, many have started to work towards preserving these valuable ‘green dinosaurs’. Some methods of conservation are relevant only to governments and large companies, but some are relevant to you and the choices you make.

6.11.2 Rescue package 1: protect the remaining rainforests

While only six per cent of the world’s rainforests are in a national park or reserve, there are many large areas of rainforest under protection. The number and size of these national parks are slowly increasing. The Korup National Park in Cameroon holds 126,000 hectares of Africa’s richest untouched rainforest; the Khao Yai National Park in Thailand has 200,000 hectares, where the habitats of tigers, elephants and gibbons are protected; Costa Rica’s rainforests are the most protected of all, with national parks and reserves covering almost one-third of that country.

6.11.3 Rescue package 2: use the forest without destroying it

This is called sustainable development. It means that resources are taken from the rainforests but the forest remains largely intact. It has been estimated that a forest used this way is worth $12,000 a hectare, while it is worth only $300 a hectare if it is cleared for farming.

Timber users can now purchase timber from forests that are properly managed. A company in Mexico — the Forest Stewardship Council (FSC) — assesses forests around the world. If the

Predict
10. Indonesia recently granted a licence to a pulp paper producer to clear 50,000 hectares of forest near an orangutan sanctuary in Sumatra. What impact do you consider this might have on the orangutan population?

11. What could be some of the consequences if the rainforest environment continues disappearing at its current rate?

Think
12. Produce an A4-sized poster designed to publicise the rate and consequences of rainforest destruction. Your poster must include a colourful diagram and a short slogan based on the facts and figures presented in this subtopic.

13. Why is it important to save species from extinction?
forests comply with regulations, the timber is given the FSC stamp. People who purchase this timber know that the forest it came from is being responsibly managed.

6.11.4 Rescue package 3: use alternative timber

One further step is not to use rainforest timber at all. Many rainforest trees are now grown in plantations, and alternatives such as using steel beams in houses and recycled paper in cardboard help take the strain off the rainforests.

One alternative that has been developed is the processing of old coconut palms to create hardwood. The company that is developing this resource, Tangaloa, claims that there are enough non-productive coconut palms to produce timber equivalent to one million rainforest trees. If this concept proves popular, plantations of coconut palms could be grown specifically for this purpose.

6.11.5 Rescue package 4: act now!

While most of us do not have rainforests growing in our backyards, the choices we make each day can and do make a difference to the way resources are used around the world. There are many organisations that aim to conserve the world’s remaining rainforests. Some of their suggestions are:

- use less wood and paper
- write to businesses that destroy the rainforest
- educate yourself about the importance of rainforests
- look for alternatives to rainforest products
- be an ecotourist — visit rainforests where your tourist dollars go towards education and conservation.

<table>
<thead>
<tr>
<th>Country</th>
<th>Area of certified forest (hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1245 429</td>
</tr>
<tr>
<td>Belarus</td>
<td>7 757 520</td>
</tr>
<tr>
<td>Brazil</td>
<td>6 176 497</td>
</tr>
<tr>
<td>Canada</td>
<td>52 247 475</td>
</tr>
<tr>
<td>Chile</td>
<td>2 353 839</td>
</tr>
<tr>
<td>China</td>
<td>1 142 911</td>
</tr>
<tr>
<td>Congo, The Republic of</td>
<td>2 766 336</td>
</tr>
<tr>
<td>Germany</td>
<td>1053 684</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2 186 470</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1 257 931</td>
</tr>
<tr>
<td>Poland</td>
<td>6 933 317</td>
</tr>
<tr>
<td>Romania</td>
<td>2 523 283</td>
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<tr>
<td>Russia</td>
<td>4 075 232</td>
</tr>
<tr>
<td>South Africa</td>
<td>1 445 868</td>
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<tr>
<td>Sweden</td>
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<tr>
<td>Ukraine</td>
<td>2 603 965</td>
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<td>United Kingdom</td>
<td>1 587 999</td>
</tr>
<tr>
<td>United States</td>
<td>13 876 106</td>
</tr>
</tbody>
</table>

TABLE 1 Countries with FSC-certified forests totalling more than one million hectares (2016)
6.11 Activities
To answer questions online and to receive immediate feedback and sample responses for every question, go to your learnON title at www.jacplus.com.au. Note: Question numbers may vary slightly.

Remember
1. What percentage of the world’s rainforests are in national parks or reserves?
2. Which country has the most protected rainforests?
3. How are rainforest environments in Costa Rica protected?
4. Explain in your own words what the FSC does to help protect the rainforest environment.

Explain
5. List two advantages and two disadvantages of each rescue package. Which of the four packages do you think offers the most hope for rainforest conservation and sustainability? Explain why.
6. Why is it good to have a variety of action options?

Discover
7. On a countries outline map of the world, shade in those countries with FSC-certified forests of over one million hectares. Use lighter shades of one colour for countries with smaller areas of certified forest (such as 1 000 000 – 2 499 999 and 2 500 000 – 4 999 999 hectares), and darker shades of the same colour for countries with larger areas (5 000 000 – 7 499 999; 7 500 000 – 9 999 999; >10 000 000 hectares). This type of map is called a choropleth map.
8. Other methods to help conserve the world’s rainforests include:
   • breeding endangered rainforest animals in captivity, and then releasing them
   • providing websites where sponsors can give money to buy some rainforest and put it into a reserve
   • employing indigenous people to pick nuts and berries or even to breed butterflies for collectors.
   Use the internet to find an example of each of these methods and list any others that you find while completing this research. Document your findings.
9. Design your own website encouraging people to donate money to save the rainforest environment.

Try out this interactivity: Protecting or plundering rainforests Use this interactivity to decide whether or not various strategies protect rainforests.
Searchlight ID: int-3114

6.12 Review

6.12.1 Review
The Review section contains a range of different questions and activities to help you revise and recall what you have learned, especially prior to a topic test.

6.12.2 Reflect
The Reflect section provides you with an opportunity to apply and extend your learning.
Access this subtopic at www.jacplus.com.au