

ACTIVITIES 

IDENTIFY

- 1 List the factors that make landscapes different.

EXPLAIN

- 2 Why do you think people **change** landscapes?
- 3 The map in figure 1 shows the wide variety of landscapes found on the surface of the Earth. However, it does not show all locations for each landscape type. Investigate one of the featured landscapes and find out other **places** in which it is found. Show this information on a map. Annotate your map with characteristics of your landscape.

INVESTIGATE

- 4 Copy the following table into your workbook.
 - a Select one of the landscape types described in this section and complete the table.

Landscape characteristics	How people use it	Positive effects	Negative effects

- b Which list is larger — the positive impacts or negative impacts?
 - c Review the column of negative impacts. Select three of these impacts and suggest a way in which the **environment** could be used in a more **sustainable** way.
- 5 Describe how the **scale** of the following landscapes might differ around the world: deserts, polar regions, aquatic landscapes and islands.

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2.3 What types of landscapes and landforms are there in Australia?

2.3.1 What processes have shaped Australia's landscapes and landforms?

The tectonic forces of folding, faulting and volcanic activity have created many of Australia's major landforms. Other forces that work on the surface of Australia, and give our landforms their present appearance, are **weathering**, mass movement, **erosion** and **deposition**. These forces are examples of geomorphic processes.

Australia is an ancient landmass. The Earth is about 4600 million years old, and parts of the Australian continent are about 4300 million years old.

FIGURE 1 Many of Queensland's mountain peaks were formed by volcanic activity around 20 million years ago. The Glasshouse Mountains, north of Brisbane, are volcanic plugs. They are composed of volcanic rock that hardened in the vent of a volcano. Over millions of years, weathering and erosion have worn away the softer rock that surrounded the vent, leaving only the plugs.



weathering the breaking down of rock through the action of wind and water and the effects of climate, mainly by water freezing and cooling as a result of temperature change

erosion the wearing away and removal of soil and rock by natural elements, such as wind, waves, rivers or ice, and by human activity

deposition the laying down of material carried by rivers, wind, ice and ocean currents or waves

Over millions of years, Australia has undergone many changes. Mountain ranges and seas have come and gone. As mountain ranges eroded, sediments many kilometres thick were laid down over vast areas. These sedimentary rocks were then subjected to folding, faulting and uplifting. This means that the rocks that make up the Earth's crust have buckled and folded along areas of weakness, known as faults. Sometimes, fractures or breaks occur, and forces deep within the Earth cause sections to be raised, or uplifted. Over time the forces of weathering and erosion have worn these down again. Erosion acts more quickly on softer rocks, forming valleys and bays. Harder rocks remain as mountains, hills and coastal headlands.

Because it is located in the centre of a **tectonic plate**, rather than at the edge of one, Australia currently has no active volcanoes on its mainland, and has very little tectonic lift from below. This means its raised landforms such as mountains have been exposed to weathering forces for longer than mountains on other continents and are therefore more worn down.

About 33 million years ago, when Australia was drifting northwards after splitting from Antarctica, the continent passed over a large **hotspot**. Over the next 27 million years, about 30 volcanoes erupted while they were over the hotspot. The oldest eruption was 35 million years ago at Cape Hillsborough, in Queensland, and the most recent was at Macedon in Victoria around six million years ago. Over millions of years, these eruptions formed a chain of volcanoes in eastern and south-eastern Australia, that are known today as the Great Dividing Range. At present, the hotspot that caused the earlier eruptions is probably beneath Bass Strait (see figure 2).

The present topography of much of Australia results from erosion caused by ice. For example, about 290 million years ago a huge icecap covered parts of Australia. After the ice melted, parts of the continent subsided and were covered by sediment, forming sedimentary basins (a low area where sediments accumulate) such as the Great Artesian Basin. On a smaller scale, parts of the Australian Alps and Tasmania have also been eroded by glaciers during the last ice age.

Rivers and streams are another cause of erosion, having carved many of the valleys in Australia's higher regions.

When streams, glaciers and winds slow down, they deposit or drop the material they have been carrying. This is called deposition. Many broad coastal and low-lying inland valleys have been created by stream deposition. These areas are called floodplains.

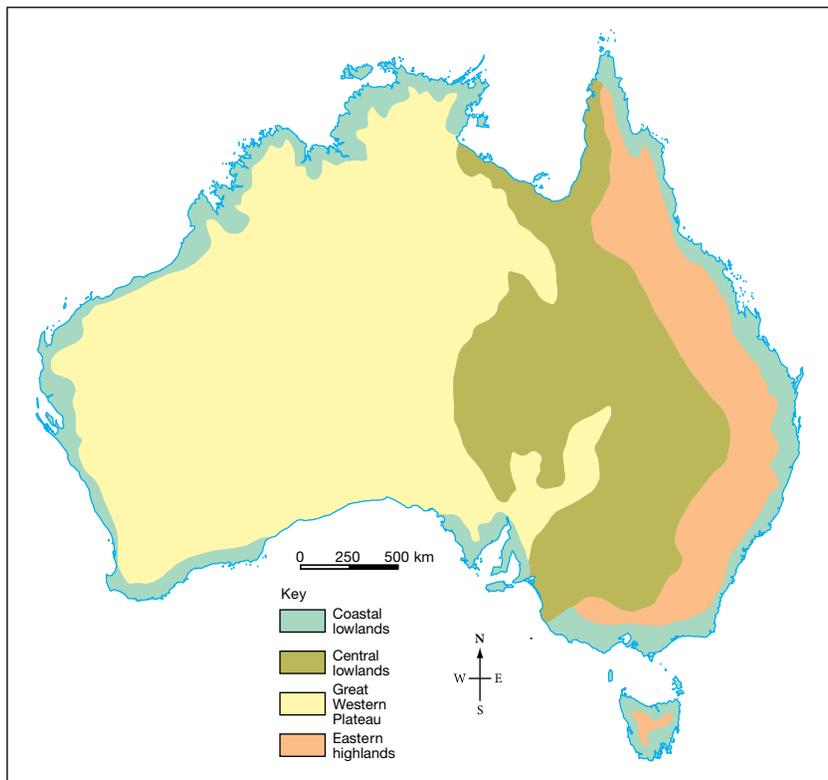
FIGURE 2 Relief map of Australia's east coast. The Great Dividing Range stretches from north of Cairns in Queensland to Mount Dandenong near Melbourne in the south.



tectonic plate one of the slow-moving plates that make up the Earth's crust. Volcanoes and earthquakes often occur at the edges of plates.

hotspot an area on the Earth's surface where the crust is quite thin, and volcanic activity can sometimes occur, even though it is not at a plate margin

FIGURE 3 Australia's four major landform regions



Source: MAPgraphics Pty Ltd Brisbane

What are Australia's landform regions?

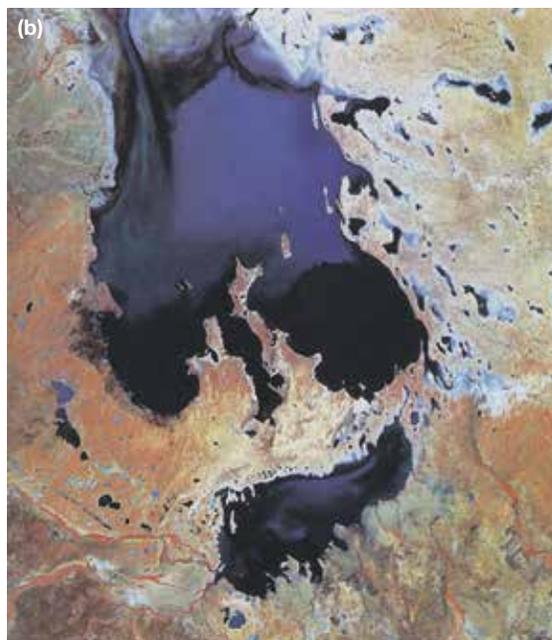
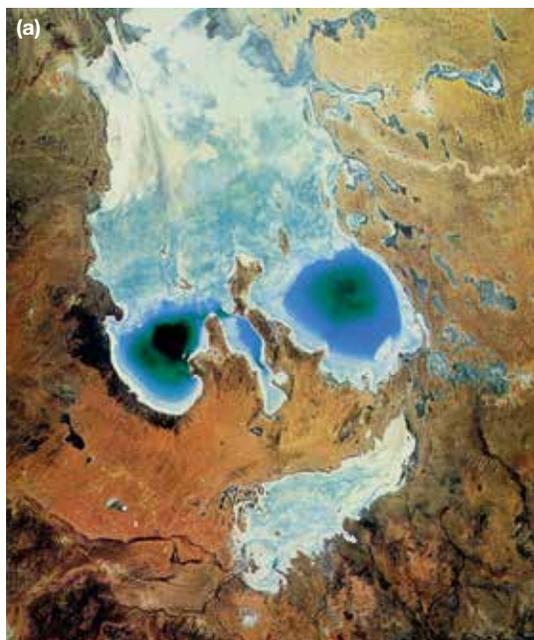
The topography of Australia can be divided into four major regions (see figure 3).

- The coastal lowlands around Australia's edge are narrow and fragmented. The plains often take the form of river valleys, such as the Hunter River Valley near Newcastle.
- The eastern highlands region (which includes the Great Dividing Range) is mainly a series of tablelands and plateaus. Most of the area is very rugged, because rivers have cut deep valleys. It is the source of most of Australia's largest rivers, including the Fitzroy, Darling and Murray. The highest part is in the south-east, where a small alpine area is snow-covered for more than half the year.
- The central lowlands are a vast area of very flat, low-lying land that contains three large **drainage basins**: the Carpentaria Lowlands in the north, the Lake Eyre Basin in the centre (see figure 4) and the Murray–Darling Basin in the south.
- The Great Western Plateau is a huge area of tablelands, most of which are about 500 metres above sea level. It includes

drainage basin the entire area of land that contributes water to a river and its tributaries

areas of gibber (or stony) desert and sandy desert. There are several rugged upland areas, including the Kimberley and the McDonnell Ranges.

FIGURE 4 Lake Eyre, the lowest point on the Australian mainland, is part of the Great Artesian Basin. It is 15 metres below sea level. Once a freshwater lake, the region is now the world's largest salt pan. The evaporated salt crust shows white in the satellite image (a) below left. The lake fills with water only three or four times each century, transforming it into a haven for wildlife. Deep water is shown as black in image (b) below right.



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The Murray–Darling Basin

The Murray–Darling River covers about one million square kilometres, and more than 20 major rivers flow into it. It has a wide variety of landscapes, ranging from alpine areas in the south-east to plains in the west. The basin produces 43 per cent of Australia’s food and over 40 per cent of Australia’s total agricultural income.

The Murray–Darling Basin is the largest and most important drainage basin in Australia, covering one-seventh of the continent. However, the amount of water flowing through it in one year is about the same as the *daily* flow of the Amazon River. The basin is facing severe problems.

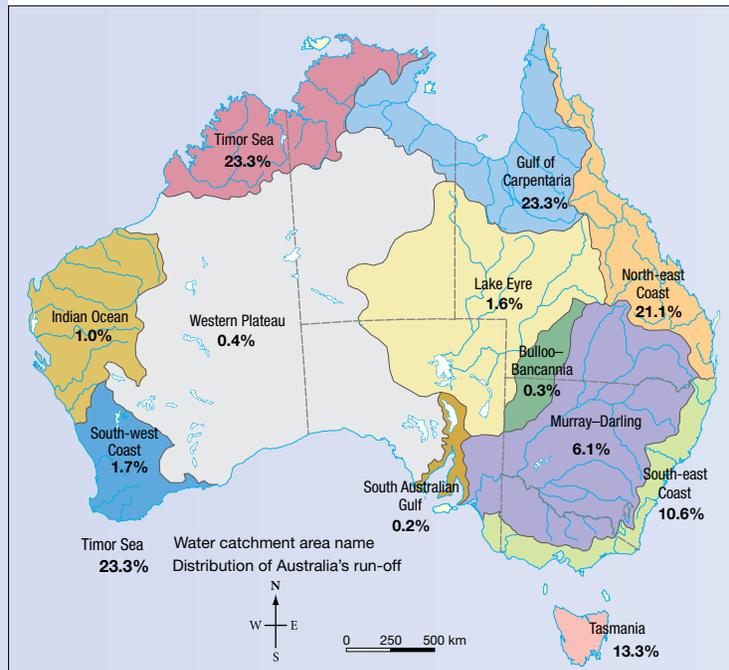
- Only about 20 per cent of the water flowing through the basin ever reaches the sea. The rest is diverted for agriculture, industry and domestic use.

FIGURE 5 Aerial view of the Murray River, where it enters the Coorong and Lake Alexandrina in South Australia



- The Murray supplies about 40 per cent of Adelaide’s drinking water. The quality of the water continues to decline, mainly because of salinity levels.
- Approximately 50 to 80 per cent of the wetlands in the basin have been severely damaged or destroyed, and more than a third of the native fish species are threatened with extinction.
- In 2008, inflows into the river system were at their lowest levels since records began 117 years earlier.
- An estimate of weather trends shows that the flow to the Murray River mouth may be reduced by a further 25 per cent by 2030. However, with the added problem of climate change, it is predicted that precipitation in the Murray–Darling catchment will decrease, so that the reduction in flow to the mouth could be as high as 70 per cent.

FIGURE 6 Australia’s drainage basins



Source: MAPgraphics Pty Ltd Brisbane

FIGURE 7 Lake Eyre and surrounding drainage systems



Source: Spatial Vision

How does water flow across the land?

Permanent rivers and streams flow in only a small proportion of the Australian continent. Australia is in fact the driest of all the world's inhabited continents. It has:

- the least amount of run-off
- the lowest percentage of rainfall as run-off
- the least amount of water in rivers
- the smallest area of permanent wetlands
- the most variable rainfall and stream flow.

Australia has many lakes, but they hold little water compared with those found on other continents. The largest lakes are Lake Eyre (see figure 4) and Lake Torrens in South Australia. During the dry seasons, these become beds of salt and mud. Yet an inland sea did once exist in this area. It covered about 100 000 square kilometres around present-day Lake Eyre and Lake Frome. South Australia is Australia's driest state, and has very few permanent rivers and streams.

GEOskills TOOLBOX

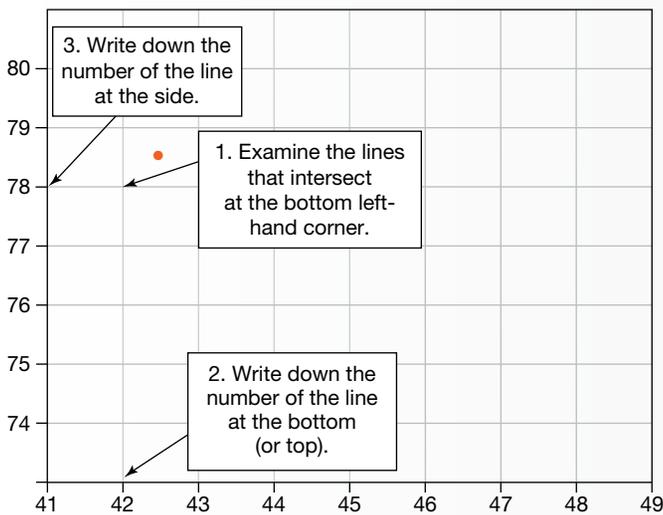
Area and grid references

Topographic maps usually have grids with numerical references. The lines that are horizontal are called northings. The lines that are vertical are called eastings.

- Area references have 4 digits, for example AR4278.
- Grid references have 6 digits, for example GR425786.

To work out area references, go to the bottom left-hand corner of the square. Examine the lines which are intersecting. Write down the number of the line at the bottom (or top) first and then write down the number of the line at the side.

FIGURE 8 Steps to determine the area reference of a location



To work out a grid reference you need to imagine that the square has been divided into tenths along both the northing and the easting.

- The area reference of this square is AR4276.
- The grid reference of this point is GR424766.
 - 1 Determine the area references for points 1–10.
 - 2 Determine the grid references for points 1–10.

FIGURE 9 Steps to determine the grid reference of a location

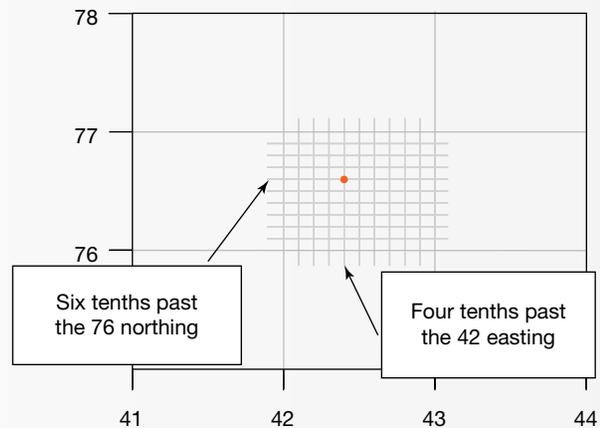
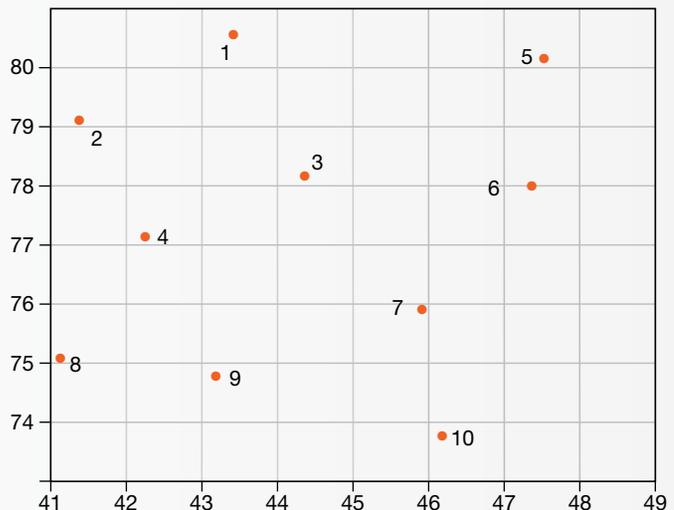


FIGURE 10 A basic grid is an important feature of a topographic map.



IDENTIFY

- 1 In your own words, explain what is meant by the terms *folding*, *faulting* and *uplift*.
- 2 Describe some of the physical **changes** Australia's landmass has undergone.
- 3 Describe the major characteristics of Australia's four main landform regions.

EXPLAIN

- 4 Explain why Australia is so low in altitude compared with other continents.

INVESTIGATE

- 5 Use an atlas to complete the table below, listing the highest mountains in each Australian state and territory. Describe the location of each.

State/ Territory	Highest mountain	Elevation (metres)	Absolute location	Relative location
New South Wales				
Victoria				
Queensland				
Tasmania				
Western Australia				
South Australia				
Northern Territory				
Australian Capital Territory				

- 6 Use Google Earth to view any part of the Murray–Darling Basin. Describe the landscape.
- 7 Divide your class into four groups. Assign each group one of Australia's landform regions to investigate. Collectively compile a list of landforms that are found in each region. Then have each member of the group

investigate a different landform and prepare a series of PowerPoint slides that show the following:

- a the landform
- b where it is located
- c how it was formed
- d whether people might want to visit this landform, including the reasons why it is or is not a popular landform.

Put the individual presentations together for viewing by the rest of the class.

Refer to the information on page 28 to complete this question.

- 8 Use your atlas to find the Cape Hillsborough and Macedon volcanoes, or refer to figure 2.
 - a Calculate the distance between them.
 - b Use the information in this section to work out the rate at which the Australian landmass is moving.
 - c How far has Australia moved over the Bass Strait hotspot? Now calculate where under Bass Strait this hotspot might now lie.
 - d Use the information in this section to explain why this hotspot has **changed** its location over time.
- 9 It is said that the amount of water that flows down the Amazon River in a day is more than flows down the Murray in a year.
 - a What does that tell you about how dry Australia's climate is?
 - b How might this affect the way the **environment** around the Murray River is affected?

APPLY

- 10 Australia is an ancient landmass and has undergone many **changes** over millions of years. In groups, brainstorm and compile lists under the following headings.
 - Physical **changes** that have taken place on the Australian landmass
 - Tectonic processes that have contributed to these **changes**
 - **Changes** caused by processes such as weathering and erosion
 - Within your group, write a series of paragraphs that explain the **interconnection** between these factors.