

LANDSCAPES AND LANDFORMS

SNAPSHOT 2:

Landscape diversity and change



Panorama from the prairies to the mountains in western Canada. L Chaffer

Lorraine Chaffer, Vice President GTANSW & ACT

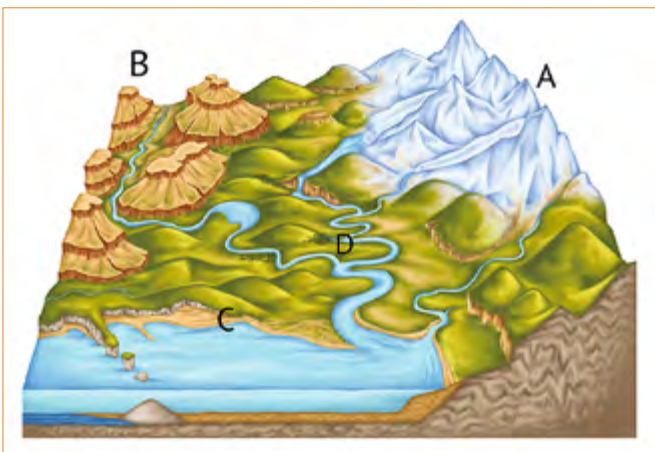
'Shaped and sculpted over millions of years, these stunning landscapes and rock formations hold invaluable clues to Earth's past and future'

<http://www.bbc.com/earth/story/20150205-the-15-most-amazing-landforms>

The geomorphic processes of weathering, erosion and deposition create a large variety of landscapes and landforms. The processes that form different landscapes and create their unique landforms are largely determined by climate and geology. In the future climate change could influence the geomorphic processes forming and transforming landscapes by changing river flow, melting glaciers and increasing extreme weather events. An understanding of the geomorphic processes that shape landscapes and landform help us to visualise how places looked in the past and predict how they may look in the future.

Topographic maps summarise the features of landscapes using symbols including contour lines to show the relief of the land. When used with satellite and other photographs, maps are powerful tools for investigating landscapes.

SOURCE A Landscape diversity



Shutterstock: GTANSW & ACT Account

SOURCE B: Satellite photo Uluru



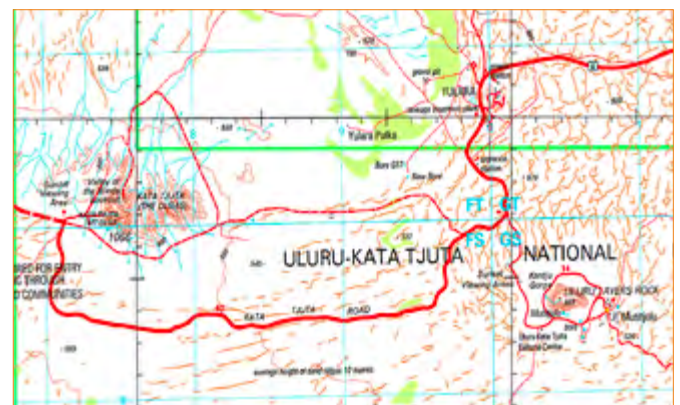
THINK

Imagine how this landscape looked in the past.

Predict what these landforms might look like in the future.

Explain one of your predictions.

SOURCE C: Topographic Map Uluru Kata Tjuta NP



Map: Data.Gov.au Source: <https://data.gov.au/dataset/ds-ga-a05f7892-e3e5-7506-e044-00144fdd4fa6/details?q=>

Aerial Photo (left): NASA Earth Observatory Source: https://eoimages.gsfc.nasa.gov/images/imagerecords/89000/89288/iss049e010638_lrg.jpg

DESERT LANDSCAPES

Deserts are dry landscapes with large daily (diurnal) ranges in temperature and very little vegetation. The processes of weathering, erosion and deposition shape desert landscapes.

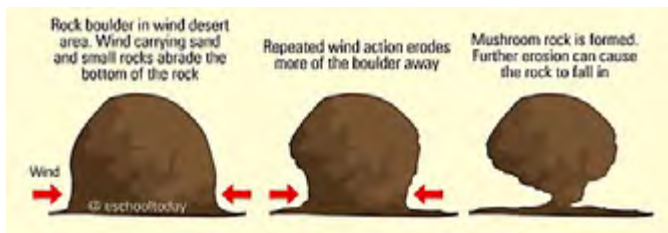
Weathering

Big differences between day and night temperatures cause physical weathering leaving large amounts of broken rock in the landscape. Water plays a role in shaping desert landscapes however wind is the main agent of erosion and deposition.

Wind erosion and deposition

A lack of vegetation allows wind to pick up sand and carry it away, leaving behind rocks that form a reg or rocky desert. This process is called deflation. Wind-blown sand causes further erosion through abrasion or sand blasting creating landforms such as pedestal rocks and arches. Sand is deposited by the wind in another location to form sand dunes in a sandy desert known as an erg.

SOURCE E: Pedestal rock formation

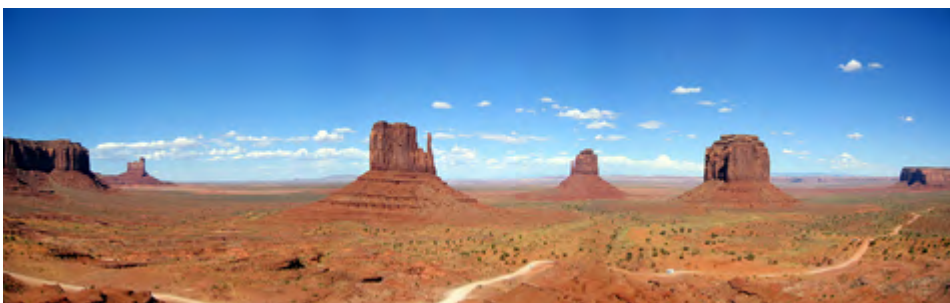


Source: <http://www.eschooltoday.com/landforms/erosion-and-landforms.html>



Pedestal rock, Arizona, USA

SOURCE F: Monument Valley, USA

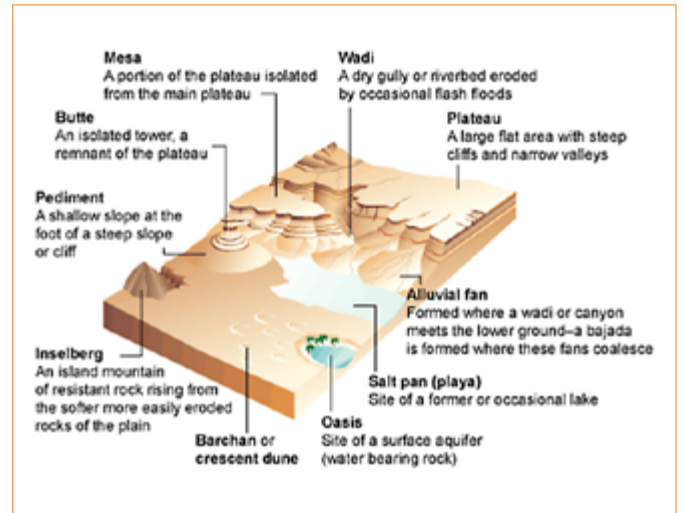


Source: Moritz Zimmermann, <https://commons.wikimedia.org/w/index.php?curid=166401>

Water erosion and deposition

Water erodes plateaus during flash floods, dissecting the landscape with canyons that lead to the formation of mesas and buttes. The eroded rock is deposited as alluvial fans where watercourses leave a plateau. Salt pans (playa lakes) are dry lakes formed when water from floods evaporated and wadis are dry watercourses.

SOURCE D Desert landforms



Source: <http://thebritishgeographer.weebly.com/the-physical-characteristics-of-extreme-environments.html>

Monument Valley

Monument Valley is a cluster of sandstone buttes reaching up to 300 m above the valley floor on the Arizona–Utah border in the USA in the Navajo Nation Reservation. A large proportion of Monument Valley Navajo Tribal Park (equivalent to a national park) lies within the valley. The buttes show the layers of deposition that created the sedimentary rock and the colour comes from the chemical weathering of the minerals through oxidation. Along with a cultural value to the First Nations people, Monument Valley is an important tourist destination and inspirational landscape.

THINK

Imagine how this landscape looked in the past.

Predict what these landforms might look like in the future.

COASTAL LANDSCAPES

Coastal landscapes form where the land meets the sea and is subjected to physical and chemical weathering, erosion and deposition by wind and water. Salt spray, wind, waves, plants and animals weaken coastal rocks making them more easily eroded. The underlying geology of a coast will influence the landforms that develop with areas of resistant rock forming headlands and areas of weaker rock becoming bays. When headlands are weathered and eroded rocky features such as cliffs, platforms, caves, arches and stacks are left behind.

Rock eroded from headlands and transported by wind, waves and currents is dropped to form depositional features such as beaches, dunes and sand spits. Rivers also provide sand that is deposited on beaches. Dunes form at the back of beaches by wind blowing sand away from the shoreline. Sometimes sand spits and beaches grow across bays and create coastal lagoons such as Terrigal Lagoon and Tuggerah Lakes on the Central Coast of NSW.

SOURCE I: Port Campbell coast



Source: Shutterstock

THINK

Imagine how the coastal landscape at Port Campbell looked in the past.

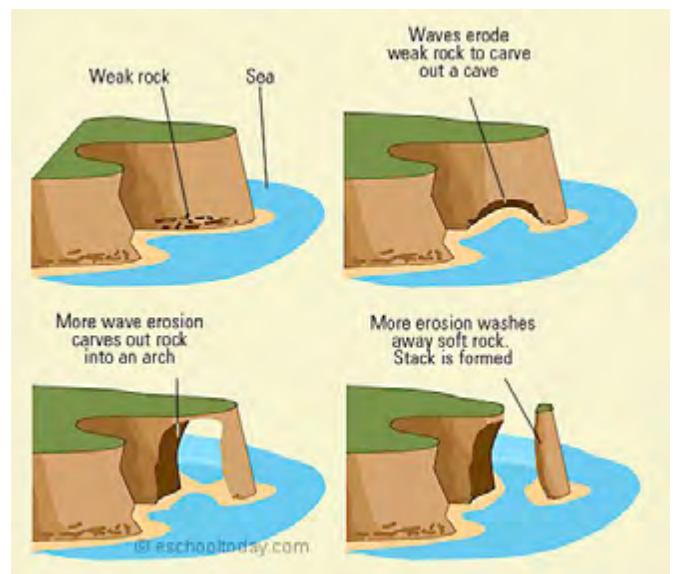
Describe and explain what the landscape might look like in the future.

SOURCE G: Coastal landforms



Shutterstock: GTANSW & ACT Account

SOURCE H: Caves, arches and stacks



Source: <http://www.eschooltoday.com/landforms/erosion-and-landforms.html>

The Twelve Apostles

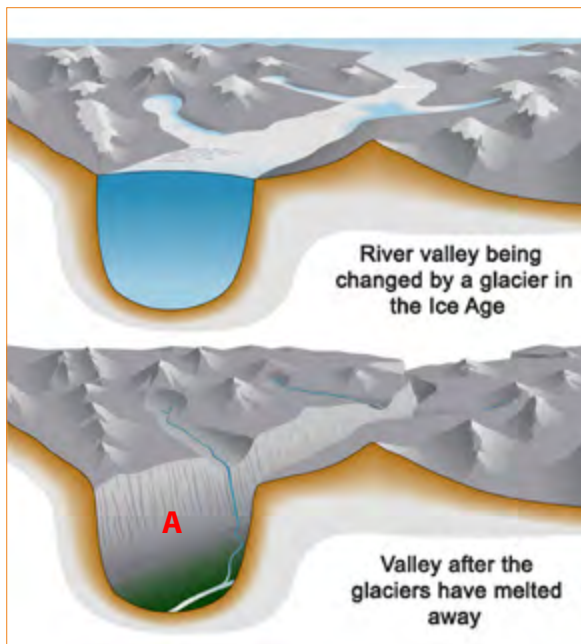
The Twelve Apostles are limestone stacks on the coastline along the Great Ocean Road in Victoria.

These rock formations are the result of weathering and erosion over thousands of years. The soft limestone cliffs easily eroded to form caves, which became arches when caves eroded through a headland. The arches were weakened by continual weathering and erosion until they collapsed leaving stacks behind. The largest remaining stacks measure up to 45 meters in height, although less than eight that remain today. It is estimated that it takes about 600 years for an arch to form in a headland and then a stack before finally collapsing into the sea.

GLACIAL LANDSCAPES AND LANDFORMS

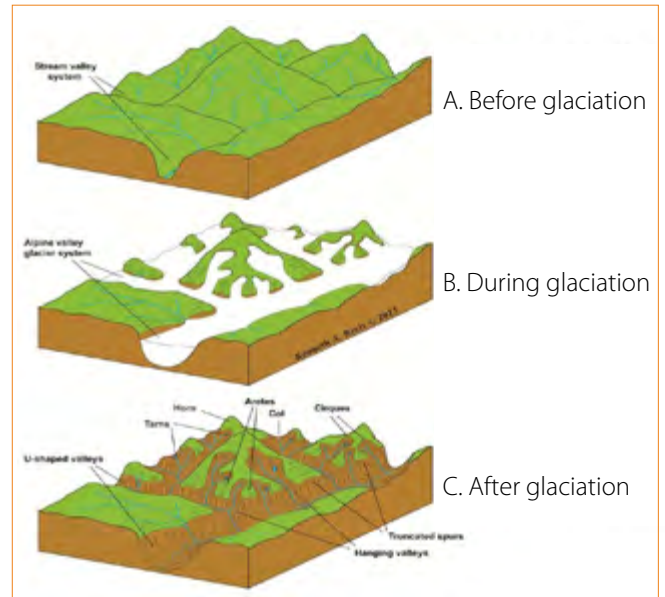
In very cold climates such as Iceland and Canada, snow is the main form of precipitation in winter. The snow accumulates over time to form ice sheets and glaciers which flow slowly downhill, eroding the land. Large continental ice sheets and valley glaciers create distinctive landform features including sharp mountain peaks (horn), narrow ridges (arete), deep u-shaped valleys, hanging valleys and mountain lakes (tarn). Most of these landform features are only visible after a glacier has melted or retreated. Many of the world's glaciers are retreating due to the influence of climate change. The rock eroded by glaciers (moraine) is transported by a glacier within, beside and in front of a moving glacier. When a glacier melts and shrinks back up a valley, the moraine is left behind. Lagoons are created where the moraine traps the melting ice water.

SOURCE K: Glacial U-shaped valley



Athabasca Glacier, Canada. Photo L Chaffer.

SOURCE J: Glacial landscapes



THINK

Predict what the glacial landscapes of Canada and Iceland might look like in the future as the glaciers melt and retreat

SOURCE L: Glacial landscapes in Iceland & Canada



Glaciers and a glacial lagoon in Iceland. Photo L Chaffer.

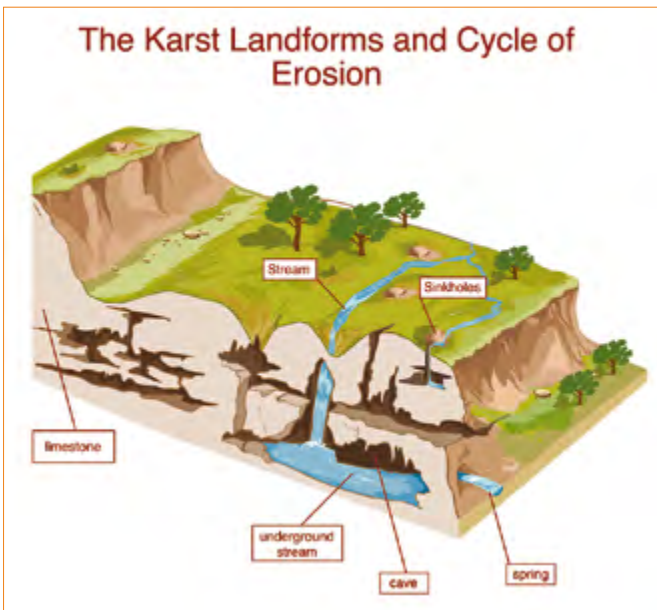


Icefields Parkway in Canada. Photo L Chaffer.

KARST LANDSCAPES

Karst landscapes are places with a network of caves, sinkholes and rivers below the ground formed by the action of water dissolving limestone rock. Weathering and erosion in these landscapes are influenced by the climate, geology (rock type and jointing) and moving water. After moderate to heavy precipitation, slightly acidic water infiltrates joints in the limestone dissolving the calcium carbonate and joining the groundwater flow. Systems of underground streams, caves, sinkholes and cenotes attract cavers and tourists. Cenotes form at sinkholes where the limestone rock on the surface collapses exposing the groundwater below. In some places, such as the Stone Forest near Guilin in China and Halong Bay in Vietnam, joints in the rocks are gradually widened and deepened creating a jagged landscape of peaks or islands on the land surface.

SOURCE M: Karst landforms



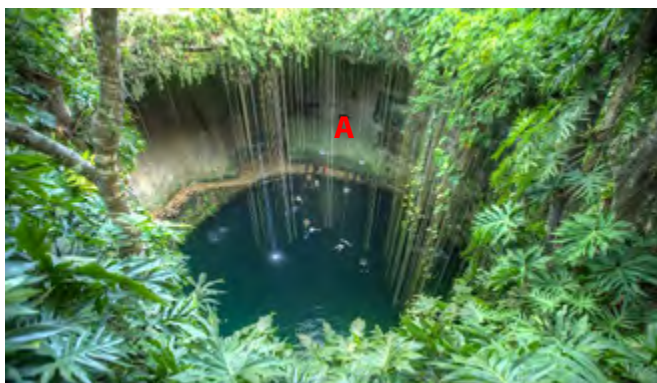
Source: Shutterstock

Jenolan Caves

The Jenolan Caves is a complex cave system in the Blue Mountains, NSW. The caves are filled with underground rivers, natural archways, stalactites, stalagmites, columns and straws. Stalactites grow downwards from the ceiling of a cave and stalagmites grow upwards from the ground, both created by drops of water containing dissolved limestone.

According to a Dreamtime story of the Gundungurra people the area was formed by a tussle between two ancestral creator spirits, a giant eel known as Gurangatch and a large native cat known as Mirrigan. Today the caves remain a significant part of Indigenous culture. In the past, the Gundungurra people used the subterranean water, believed have curative powers, to bathe their sick.

SOURCE N: Examples of Karst landscapes



A cenote (sinkhole) in Mexico.

Source: <https://www.journeymexico.com/blog/cenotes-in-mexico>



Left: Halong Bay, Vietnam

THINK

Imagine how these landscapes looked in the past.

Predict what one these karst landscapes and its landforms might look like in the future.



Jenolan Caves, NSW, Australia. Source: <https://www.jenolancaves.org.au/the-caves/show-cave-tours~1/river-cave/>

LANDSCAPES AND LANDFORMS: SNAPSHOT 2

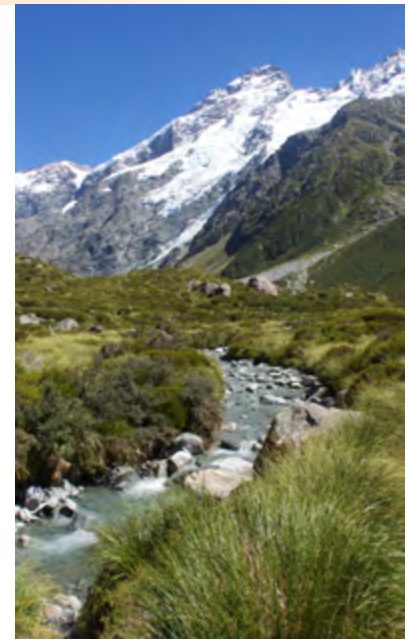
RIVER (FLUVIAL) LANDSCAPES AND LANDFORMS

In regions of high rainfall or spring snow melt, water runoff forms into rivers that flow downhill and transform the land into distinct landscapes and landforms. Landscapes shaped by water are also called fluvial landscapes.

River landscapes transform from source to mouth as rivers change from eroding deep valleys in the mountains to winding across wide valleys and depositing sediment on floodplains and deltas. On floodplains deposition creates floodplains and levee banks while areas of erosion and deposition within a river channel creates meanders and oxbow lakes. Braiding, breaking into multiple channels, occurs where large amounts of sediment fill the river channel where the gradient flattens.

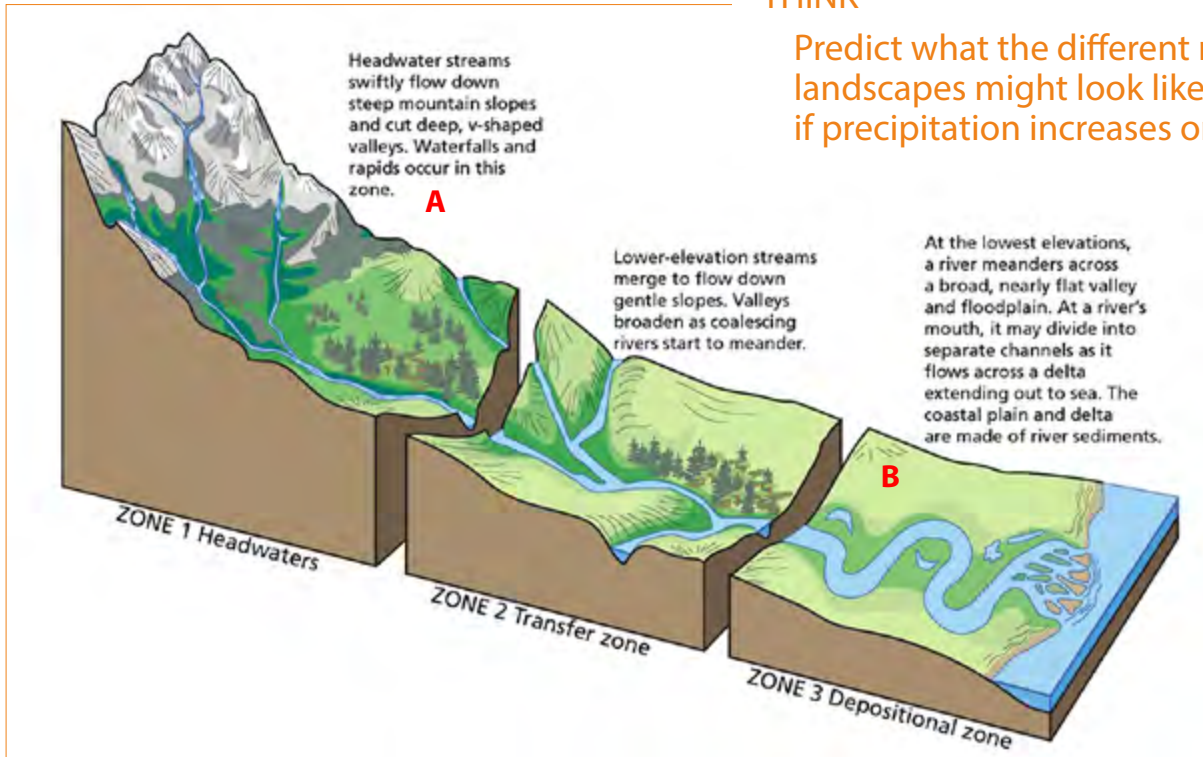
Rivers are often studied in sections which have different landform features:

- Upper Section
- Middle section
- Lower section



River headwaters near Mt Cook, NZ L Chaffer

SOURCE O: A diversity of river landscapes



Source: <https://www.nps.gov/subjects/geology/fluvial-landforms.htm>

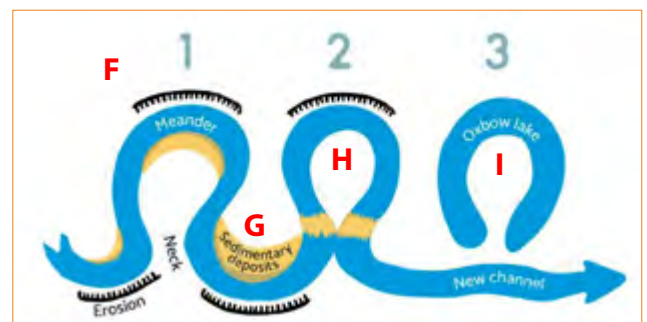
THINK

Predict what the different river landscapes might look like in the future if precipitation increases or decreases.

SOURCE P: Floodplain landform – Meandering stream



SOURCE Q: Ox-bow lake formation



Left and above: Shutterstock