1 Rivers, coasts and glaciation

Pupil Book pages 22–23

How does ice shape the land?

About this spread
This spread examines how glacial process can affect upland areas through the processes of erosion, deposition and transportation. It explains how plucking, abrasion and freeze–thaw weathering create pieces of rock, how these pieces are transported by the glacier and where they might be deposited. It also looks at the landforms that are left behind after these processes have occurred and the characteristic features of corries, arêtes and pyramidal peaks.

Learning outcomes
By the end of this spread pupils should be able to:
- identify where different processes occur in a glacial landscape
- annotate examples of glacial landscapes in the Alps.

Key vocabulary
- glaciers
- erosion
- transportation
- deposition
- moraine
- freeze–thaw weathering
- plucking
- abrasion
- corrie
- arête
- pyramidal peak

Learning objectives
On this spread pupils should learn:
- the types of erosion, transportation and deposition associated with a glacier
- to describe the landforms found in upland glacier areas.

Skills builder
Pupils often use diagrams and photos and it is an important skill to be able to interpret what is happening in both an idealised version of a situation and a similar real world example. Photos are useful because they can show what features or places are like, they can provide information, and help us to understand the processes that made places and things the way they are. Pupils have the opportunity to build their skills by linking key words, diagrams and photographs.

Further discussion suggestions
- Which areas of the world will we find these landforms in?
- When will freeze–thaw weathering be most effective?
- What is the role of gravity in the process?

Answers to activities

1
a A glacier is a slow moving river of ice.

b The force of gravity causes a glacier to move downhill.

c Moraine are the rocks and sediment carried and deposited by a glacier.

2
a and b

2 a and b

A glacier is a slow moving river of ice. The force of gravity causes a glacier to move downhill. Moraine are the rocks and sediment carried and deposited by a glacier.

2 c

Moraine on glacier

Moraine in glacier

Moraine under glacier

Moraine at rock lip

Glacier

Freeze–thaw: water sits in cracks in the rock, freezes, expands and puts pressure on the rock. The ice thaws, the crack refills with water and the whole process starts again. Eventually pieces of rock break off.

Plucking: ice freezes to the rock and pulls it away when the glacier moves.

Abrasion: rocks at the base of the glacier sandpaper the bottom of the corrie.

3
a Pupils make their own sketch of Photo D.

b

Pyramidal peak

Backwall

Arête

Corrie

Sidewall

Glaciers form on the side of the Matterhorn when ice does not melt. Freeze–thaw, plucking and abrasion create a number of armchair-shaped hollows called corries.

A knife-shaped ridge, called an arête, forms where two corries form back-to-back.

When several arêtes meet, a pyramidal peak forms, like that seen on the Matterhorn.
1 Rivers, coasts and glaciation

Pupil Book pages 24–25

What landforms result from glaciation?

About this spread
This spread continues the work on pages 22–23 and looks at how a glacier influences a more lowland landscape. It considers what the landscape may look like as a river valley before glaciation, when it is ice filled and when the ice has melted. By looking at these three time periods it allows the pupils to consider how landforms created by the river will be altered by a glacier. It also introduces pupils to landforms such as hanging valleys, ribbon lakes and truncated spurs.

Learning objectives
On this spread pupils should learn:
● about the landforms created in the lower part of a glacier.
● to compare the landforms formed by a glacier and a river.

Skills builder
The pupils have the opportunity to practise drawing sketches of landforms and to identify and label the key features. This is an important skill as it allows pupils to interpret the landscape that they are looking at. To help increase the level of complexity contained within the sketch, pupils could add annotations with connectives such as ‘because’, ‘this means’ or ‘so that’. The activities also provide an opportunity for pupils to practise the skill of explaining a process ensuring that they use the correct geographical terminology and the correct order in which processes occur.

Further discussion suggestions
● Which areas of the world would we find these landscapes in?
● Are there any examples of these features close to the school? Look at the reasons why there are or are not.
● What would these features look like on an Ordnance Survey map?

Learning outcomes
By the end of this spread pupils should be able to:
● identify glacial landforms
● explain how a glacier forms a glacial trough
● explain how river landforms are changed by glaciers.

Key vocabulary

<table>
<thead>
<tr>
<th>V-shaped valley</th>
<th>U-shaped valley</th>
<th>glacial trough</th>
<th>truncated spur</th>
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<tbody>
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<tr>
<td>hanging valley</td>
<td>ribbon lake</td>
<td>erratic</td>
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Answers to activities
1 A glacial trough is a flat-bottomed valley with steep sides that provides this feature's other name 'U-shaped valley'. A U-shaped valley forms when ice erodes a V-shaped river valley, making it deeper, wider and straighter. In a glacial trough there are no interlocking spurs as they are eroded away.
2 1 pyramidal peaks
   2 hanging valley
   3 arêtes
   4 erratics
   5 corries
   6 truncated spurs
   7 ribbon lake
   8 glacial trough
3 a A U-shaped valley forms when the glacier erodes a V-shaped valley, making it deeper, wider and straighter. Fragments of rock carried along the sides of the glacier cause abrasion, removing interlocking spurs and widening and straightening the valley. The weight of the ice causes abrasion along the base of the glacier which deepens the valley.
   b Interlocking spurs turn into truncated spurs when fragments of stone carried by the glacier erode the sides of the U-shaped valley and remove the point of the spur.
   c Glaciers in river tributaries contain less ice so they do not erode as deeply as the ice in the glacial trough. This feature is called a hanging valley. Where the two valleys meet (a confluence) there is now a steep wall. To get to the bottom of the glacial trough from the hanging valley, the water needs to pass over the steep wall as a waterfall.