



Lesson 1: What was the British Isles like 20,000 years ago, during the last Ice Age?



The British Isles and the Ice Age

This map shows how much of the **British Isles** were covered during the last glacial extent.

Ice ages are extremely cold periods, in which glaciers and ice sheets covered the majority of the land in the northern and southern hemispheres.

- Around 110,000 years ago Earth got colder and a new Ice Age began.
- An ice sheet spread over much of northern Europe and most of the British Isles.
- In areas the ice sheet didn't cover the ground was still frozen and only melted in the summer.
- The Ice Age ended around 10,000 years ago

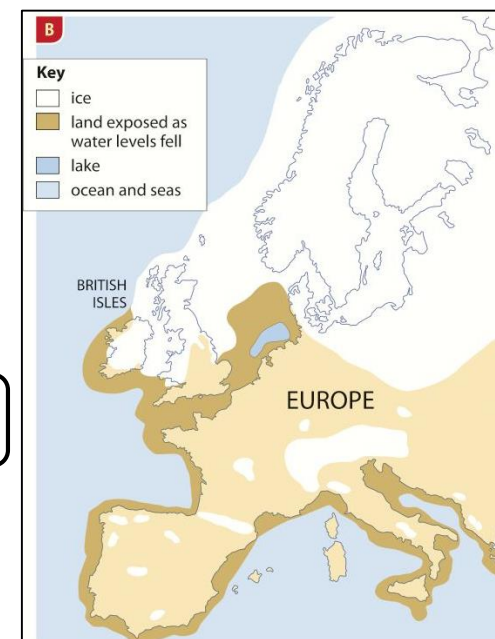
The British Isles would have been a very tough place to live at the time for the wildlife. The animals and plants adapted by having thick skins and fur, living in sheltered areas and staying in groups.

The map on the right, below shows how the British Isles and Europe looked around 10,000 years ago, at the end of the last Ice Age.

Since the sea level was lower than the present day, due to ice being stored as snow and ice in ice sheets, the British Isles was connected to the land mass of Europe. This 'land bridge' is responsible for plant and animal species migrating and living in the tundra region on southern Britain.

Therefore, Woolly Mammoths could migrate and live in the frozen land area and the English Channel did not exist.

Upon the melting of the land based ice sheets, sea levels rose and Britain became detached from Europe, creating the English Channel.



Lesson 2: How do Glaciers Form and What Processes are Responsible for Shaping the Landscape?



Glacial Landforms

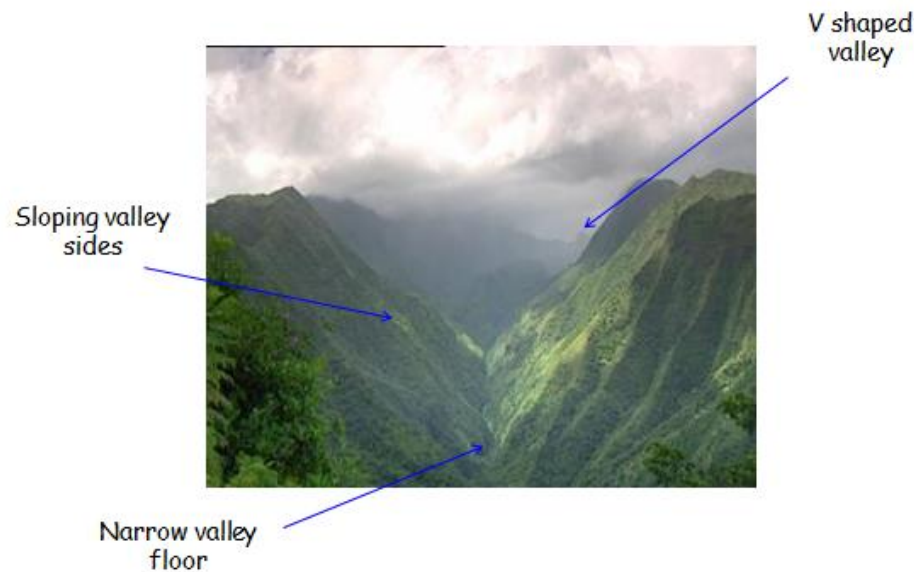
U-shaped valleys (Glacial troughs) were formerly **V-shaped valleys**, however, since a glacier has travelled through the valley, the erosion during the movement of the glacier has caused the valley to change shape.

A glacier is a slowly moving river of ice formed by the accumulation and compaction of snow on mountains or near the poles. Glaciers take hundreds to thousands of years to form.

Keywords: ice age ice sheet tundra glacier abrasion plucking freeze-thaw weathering
Roche Moutonnee striations moraine corrie/cwm tarn



Before Glaciation - Non-glacial valley: V shaped



After Glaciation - Glacial valley: U shaped



Changes to the Landscape Over Thousands of Years

The action of glaciers on the land over thousands of years changes the shape from a V shaped valley, to a U shaped valley. Before glaciation, the action of rivers erodes the valleys deeper and wider, but after glaciation, the valleys become wider with a flat valley floor. The river which flows in the bottom of a U shaped valley is called a misfit stream, as it is too narrow to have eroded such a wide valley.



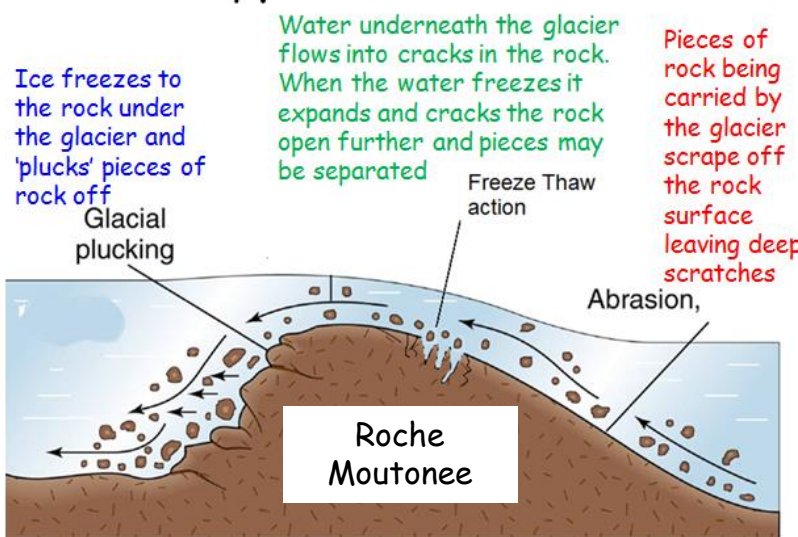
How do Glaciers Form and Change the Landscape?

1. **Snow accumulates** in the mountains. The valleys have been carved out by rivers and are V shaped.
2. The **snow compacts over many years** and turns into **ice**. This river of ice is called a **glacier**.
3. The **glacier begins to move** down the valley under the force of **gravity**. They scrape across the ground surface and can 'slide' along on melt water beneath them.
4. As the glacier moves downhill it **erodes** (wears away) the ground surface. There are 2 types of erosion called **plucking** and **abrasion**. Also **weathering** through **Freeze Thaw** breaks down the rock.
5. The ground surface is eventually moulded by the ice to form a **flat bottomed and steep sided valley**.
6. When temperatures warm up the glacier melts leaving behind it a clear U shaped valley.

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Types of Erosion



Glacial erosion

The image to the left describes and explains to two processes of erosion (abrasion and plucking) and weathering (freeze thaw).

Weathering is the process of **weakening and breaking up rocks**. It is the physical and chemical breakdown of rocks and minerals at or near the Earth's surface (this process happens in one place, there is no movement of material).

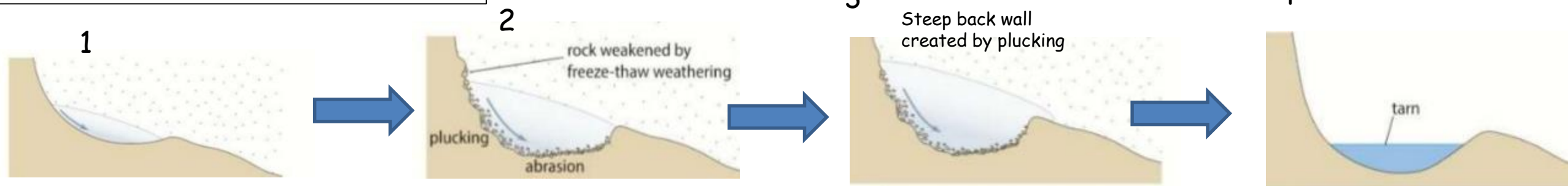
Erosion is the wearing away of the land by water, ice or wind. Material can be worn away through the action of ice and the sediment within glaciers (movement is required for this process).

As the glaciers passes over the Earth's surface it will leave 'scratches', these scratches are called **striations** will be created due to the ice and the sediment carried within the glacier scratching on the Earth's surface.

Corrie formation

A corrie begins as a sheltered hollow, where snow builds up year after year.

1. The snow **compacts** to ice. When the ice is thick enough, it starts to **flow downhill** due to gravity. It is now a glacier! First it flows into the hollow
2. Through **plucking and abrasion** the hollow grows deeper and the walls steeper. Freeze-thaw weathering helps.
3. Eventually the glacier is big enough to flow over the edge of the corrie. It's off on its journey down the mountain.
4. Once the glacier melts, the corrie is revealed. It may have a lake within, these lakes are called **tarns**.



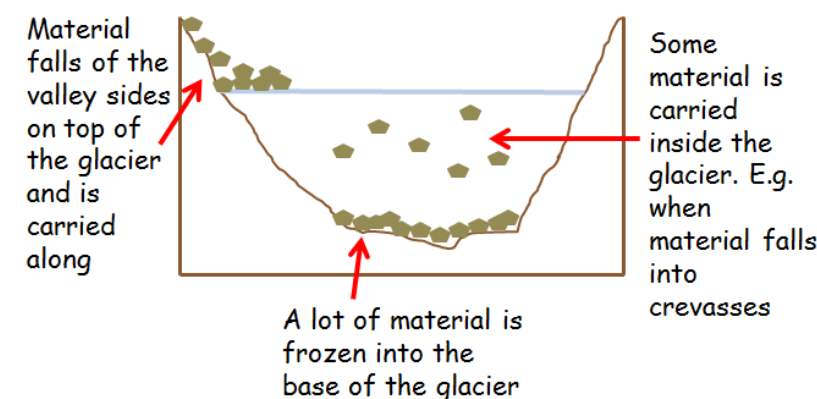
Glacial transport

The image to the right shows the different ways in which material can be transported. Material that has been carried and deposited by the glacier is called **moraine**

Different types of moraine

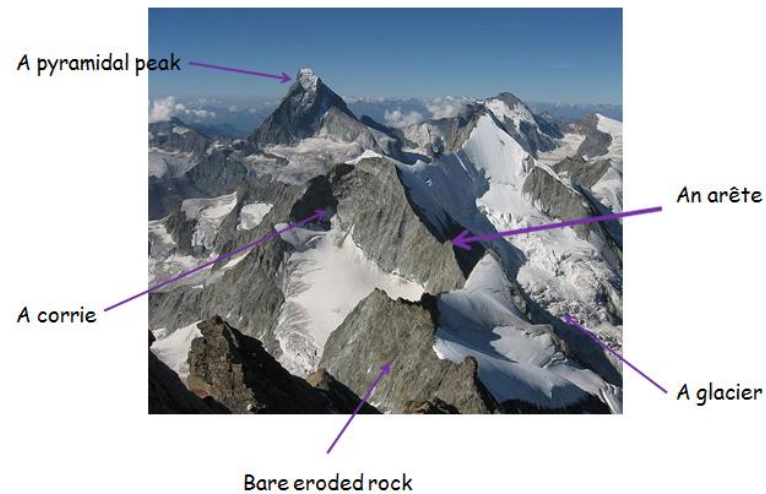
- **Terminal moraines** are found at the terminus or the furthest (end) point reached by a glacier.
- **Lateral moraines** are found deposited along the sides of the glacier.
- **Medial moraines** are found at the junction between two glaciers.
- **Ground moraines** are disorganised piles of rocks of various shapes, sizes and of differing rock types.

Transport



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Glacial landforms

Arêtes - An arête is a sharp mountain ridge that is formed when two corries erode the mountain back to back.

Pyramidal peaks - A pyramidal peak is an angular, sharply pointed mountain peak which is formed when three or more corries are eroding backwards into a mountain at the same time.

Living with glaciers

Glaciers can be both **hazardous** to people who live near them, as well as a **vital resource** they need to survive.

Hazards	Benefits
Temperatures can drop to around -60°C making living there difficult	Glacial melt water provides vital drinking water.
Deep crevasses (cracks) form in glaciers and people may fall to their death.	Glacial melt water can be used to irrigate farmers' crops.
Glacial movement (sudden and steady) can trigger avalanches.	The lakes and landforms around glaciers attract many tourists and income.
Some glacial areas receive no sunlight for long periods of the year e.g. Alert Bay NE Canada is in darkness for 50 days a year.	Damming glacial melt water can generate electricity.



Impacts of avalanches

- Buildings can be completely destroyed
- Severe avalanches can lead to many deaths
- Roads and railways can be completely blocked
- Large avalanches can clear large areas of forest
- Ski resorts may lose business if they are isolated by an avalanche
- Mountain livestock (usually sheep or goats can be killed - affecting farmers livelihoods).

Avalanches

An **avalanche** is a rapid downhill **movement of a mass of snow**, ice and rocks usually in a mountainous environment. It can lead to injury and death if people are too close.

Powder Avalanches: Loose snow avalanches begin from a single point and expand as they descend. The slide path looks like an upside down V.

Slab Avalanches: Slab avalanches are the greatest threat to skiers. A slab is a thick layer of snow that has not stuck well to the layer below. It is under stress and a number of triggers can cause it to break. The trigger may be a storm, a change in temperature or the weight of a person.

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Ice on the Land Topic Glossary

Keyword	Definition
Ice age	A time period when ice advances from the north and south poles towards the equator, with global sea levels at a low due to water locked up as land based ice. Ice ages last for hundreds of thousands of years.
Ice sheet	A large, expansive body of ice, 1-2 miles thick which covers a land surface, covering continental areas.
Tundra	Permanently frozen bedrock and soil, found at the fringes of the glacial areas. Today, Alaska, Canada and Siberia are tundra covered areas.
Glacier	A frozen land based river like feature, flowing from the upland areas down towards the low-lying coastal areas. Formed through the accumulation of snow turning into ice over hundreds of thousands of years.
Abrasion	A type of glacial erosion, when the ice wears away the bedrock using the rock and pebbles being carried in the base of the glacier. It is often referred to as the sandpaper effect.
Plucking	A type of glacial erosion. When the base of glaciers freezes onto bedrock and pulls up large pieces of bedrock as it flows over the land surface.
Freeze-thaw weathering	The action of water flowing into cracks, freezing as ice (when temperatures drop or an ice age sets in), and widening the cracks so much that rock breaks apart. It is also known as frost-shattering and slowly breaks the rock apart.
Roche Moutonnee	An erosional feature. A large mass of bedrock which is eroded and shattered on the downward side and streamlined on the up flow side. The mass of rock often has scratch marks (striations), showing the direction of flow.
Striations	Scratch marks formed when the glacier uses pieces of moraine to scrape across the bedrock over which it flows. They can also be visible on large erratics which have been deposited by glaciers. The orientation of the striations can help to infer the direction of glacier/ice flow.
Moraine	Rocks, soil and sediment which is deposited by glaciers as a produce of the erosive action of the glaciers on the landscape. Types include: medial, recessional, lateral, and terminal.
Corrie/cwm	A large circular hollow, bowl or natural amphitheatre landform formed as a result of glacial erosion in a hollow on the side of a mountain. Most corries (called cwms in Wales) have a lake in the bottom of the bowl, referred to as a tarn. An example of a corrie which we visit for our field work is Cwm Idwal in the Ogwen valley in Snowdonia, North Wales.
Tarn	A post-glacial lake found in the bottom of a corrie. They are called tarns in England and Llynys in Wales.