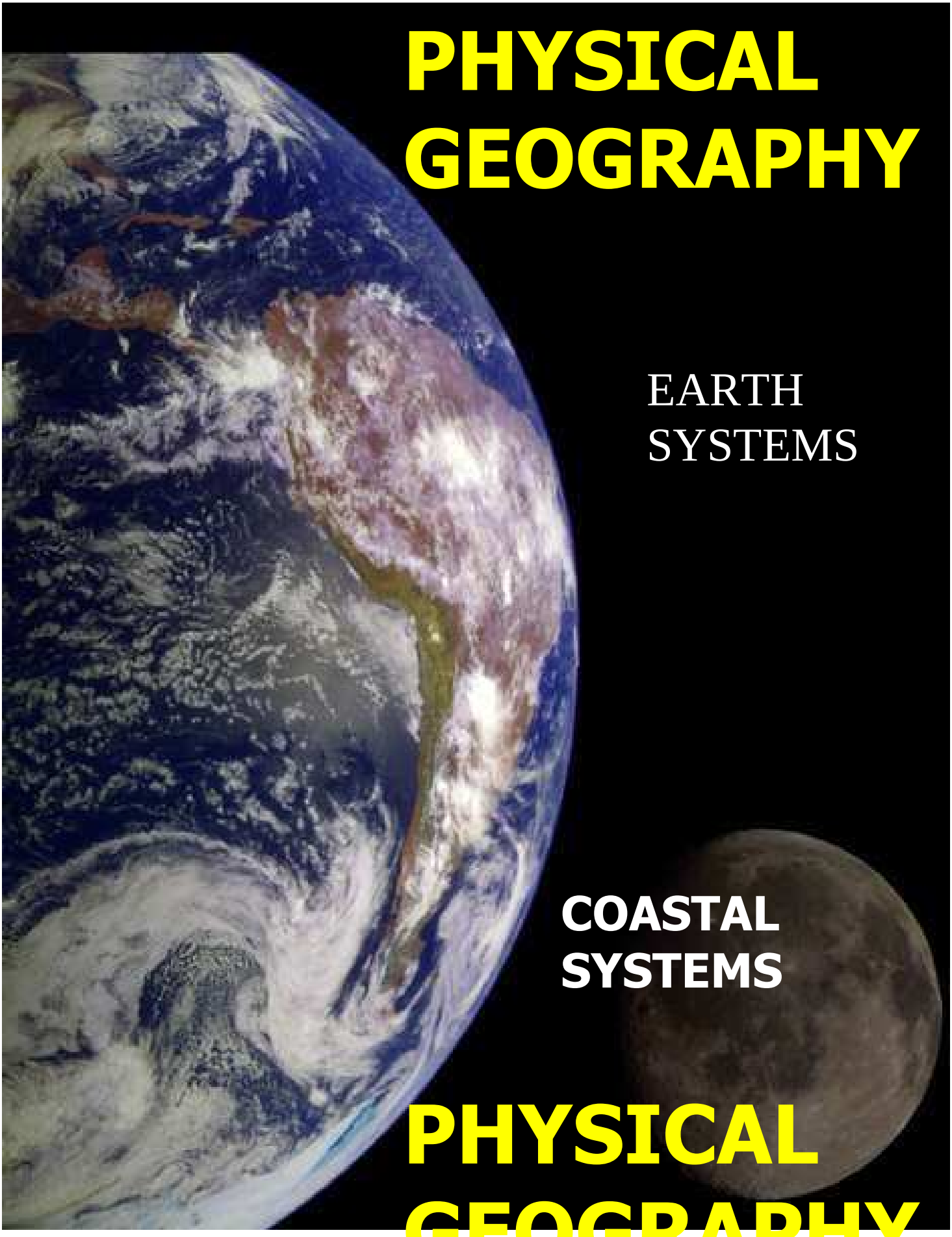
PHYSICAL GEOGRAPHY



EARTH SYSTEMS

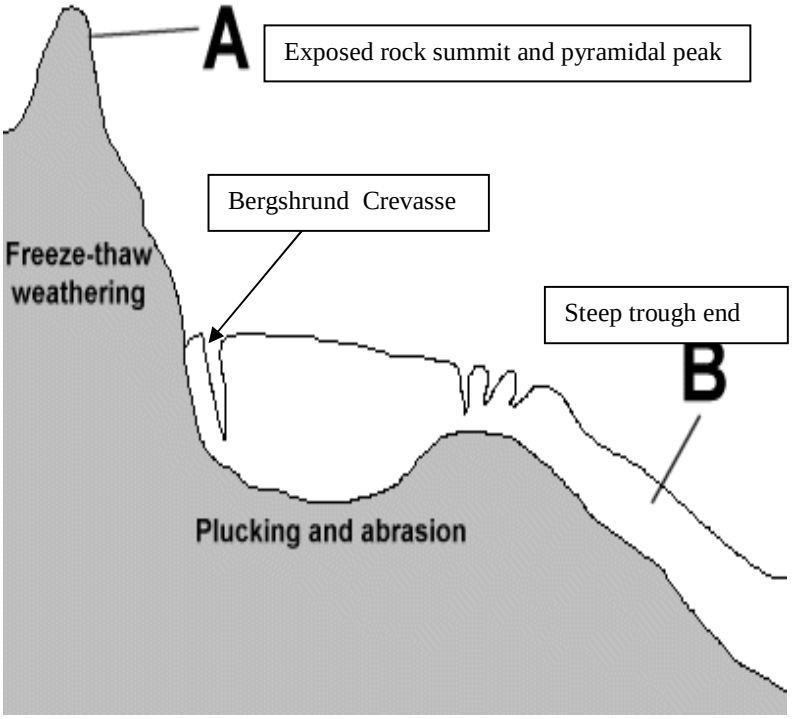
COASTAL SYSTEMS

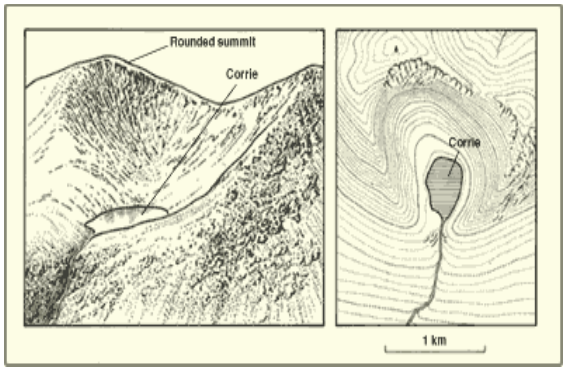
PHYSICAL GEOGRAPHY

GLACIAL SYSTEMS

CORRIES / CIRQUES

- A Corrie or Cirque is the armchair shaped hollow that was the birthplace of a glacier.
- It has steep, high and jagged back and side-walls, a round basin and an open front or lip.
- The basin may contain a small, deep circular lake called a Tarn.
- The backwall is eroded by Plucking and freeze-thaw processes in a crevasse called the Bergschrund.
- The basin is eroded by a process called Abrasion, where moving ice uses the debris it carries.
- The front of the Corrie is an open lip over which the ice flowed into the glacial valley.





Use the information on this page to write an explanation of Corrie formation:

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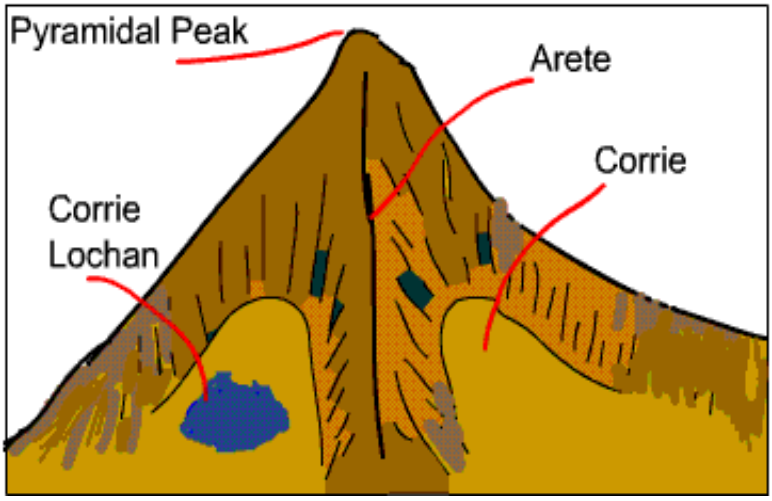
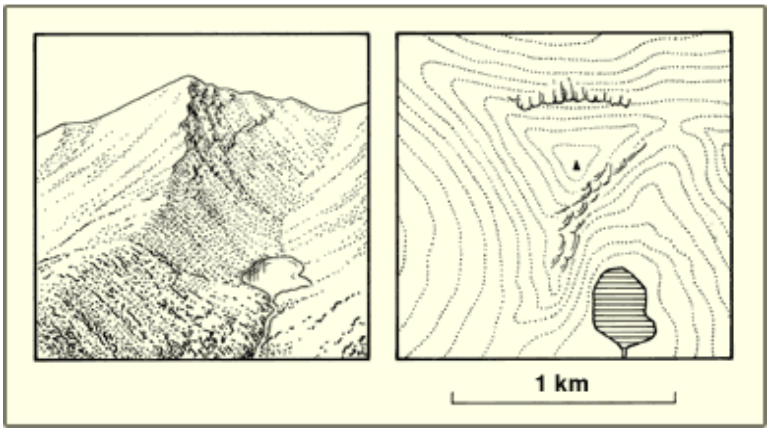
GLACIAL SYSTEMS

ARETES AND PYRAMIDAL PEAKS

- An arete is a thin knife-life ridge between two corries or two glacial valleys.
- A pyramidal peak is an isolated mountain summit or horn where three or more corries are forming.
- Both features are found in the upland summits of all glaciated mountain ranges.
- The features will be jagged and ice etched if the glaciers did not entirely cover the upland.
- Post-glacial frost shattering caused by freeze-thaw processes enhance their jagged, rugged look.
- In the Lake District Striding Edge and Helvellyn are two excellent examples.





Use the information on this page to explain:

Aretes

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Pyramidal peaks

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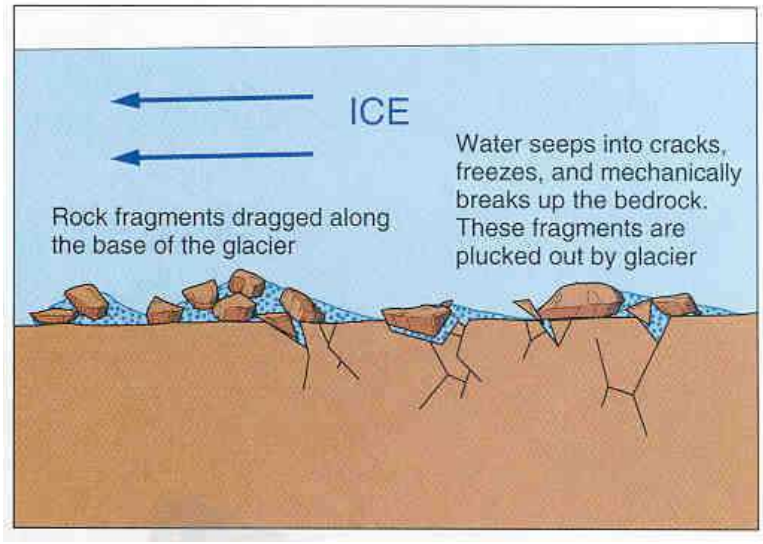
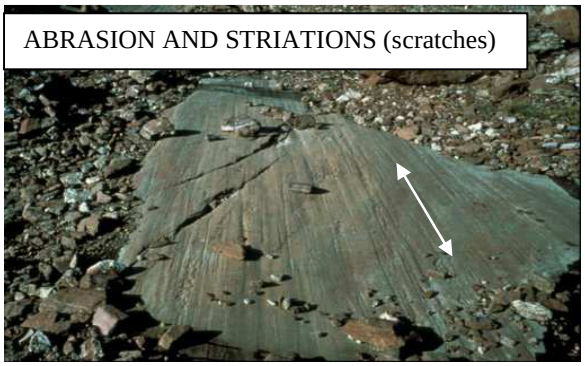
GLACIAL SYSTEMS

GLACIAL EROSION

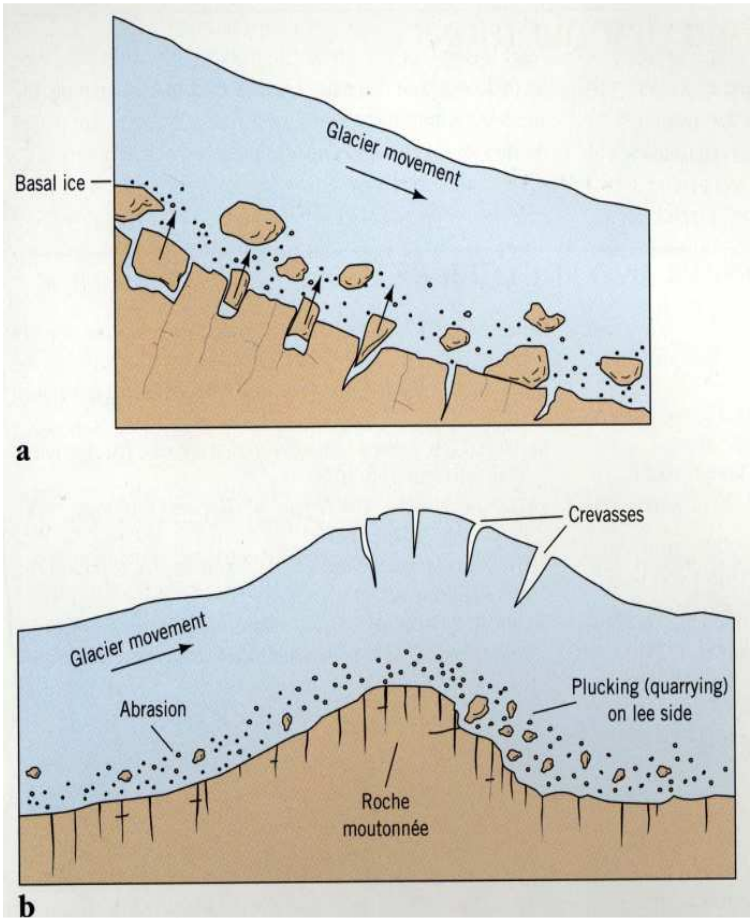
- Glacial erosion is most likely to occur in the mountains, but can be caused by ice sheets in lowlands.
- The speed of movement of the ice and the strength of the underlying rocks are the main factors.
- The main process is Abrasion, where the ice uses its load of moraine to eroded the underlying rocks.
- Plucking is a process where the ice pulls and levers out blocks of rocks frozen into the ice.
- Frost shattering is and important process in loosening rocks and preparing the way for erosion.
- A Roche Moutonnee illustrates the effects of both Abrasion and Plucking.



ABRASION AND STRIATIONS (scratches)



PLUCKING



Use the information on this page to write a description and explanation of glacial erosion:

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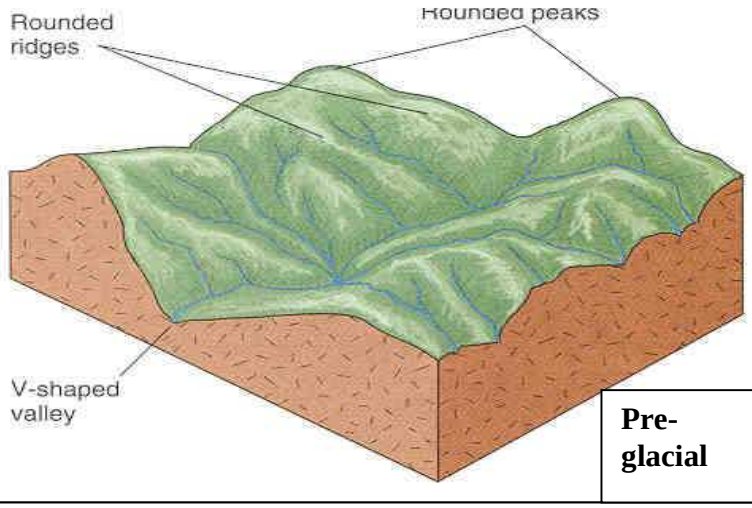
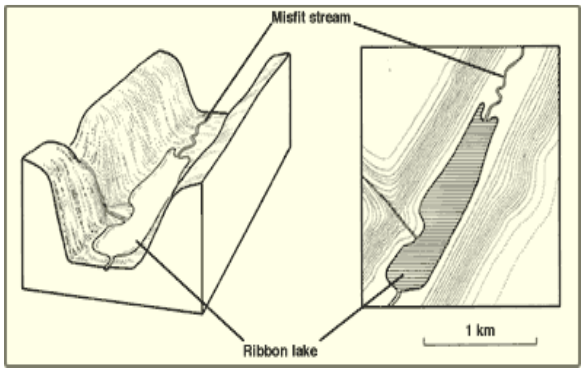
GLACIAL SYSTEMS

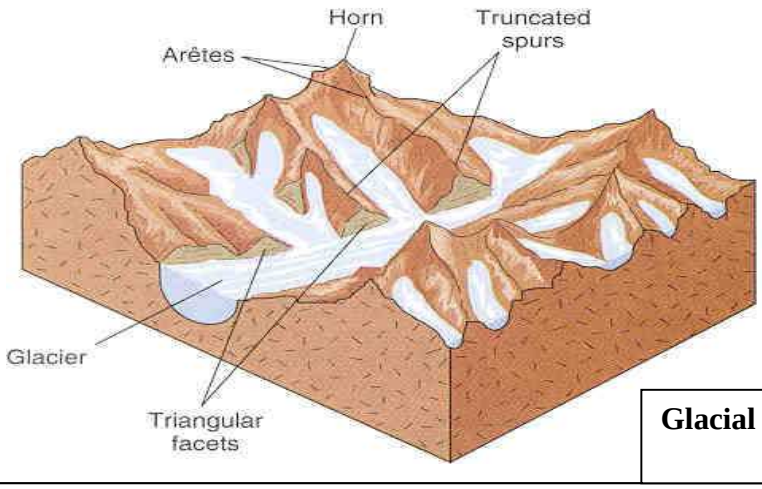
THE GLACIAL VALLEY : ROCK STEPS AND RIBBON LAKES

- The glacial valley is a U shaped trough with steep sides and a flat valley floor.
- The valley is deeper, wider and straighter than the pre-existing river valley followed by the glacier.
- More resistant bands of rock may form steeper sections called rock steps.
- Weak, more easily eroded rock may form rock basins occupied by long, narrow ribbon lakes.
- Post-glacially the valley may be affected by alluvial and lacustrine deposits on the valley floor.
- The post-glacial valley is occupied by a misfit stream, too small to have formed the deep tough.

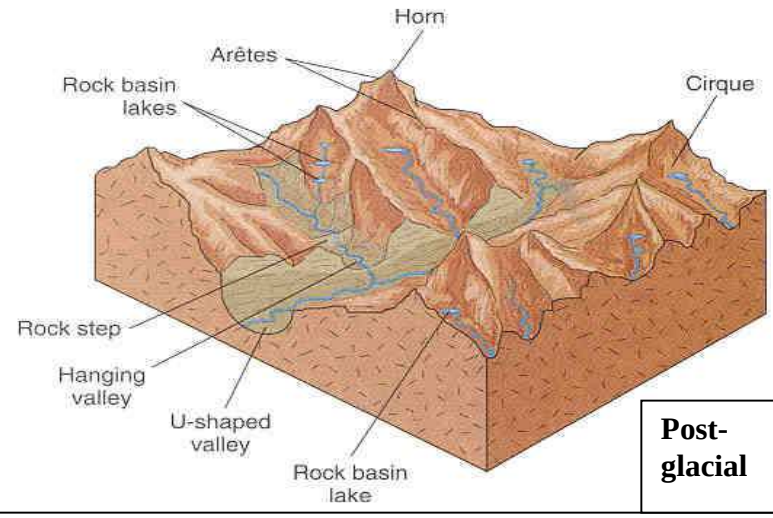


Pre-glacial





Glacial



Post-glacial

Use the information on this page to write a description and explanation of the features of a glacial valley:

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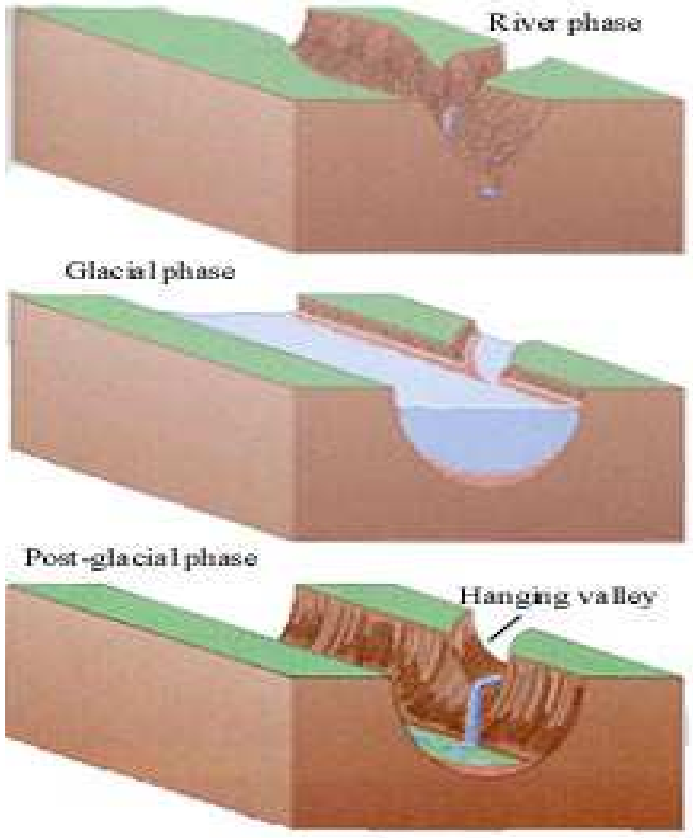
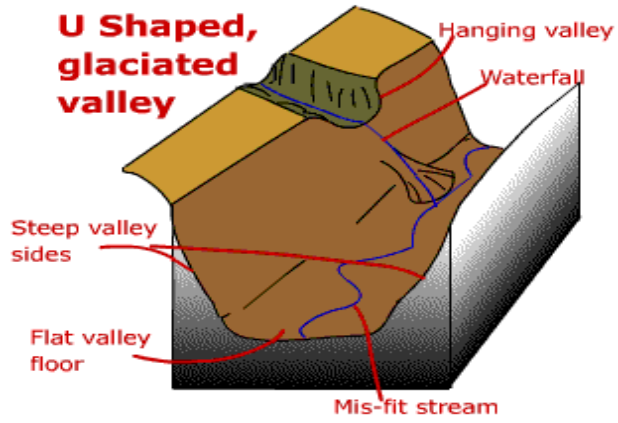
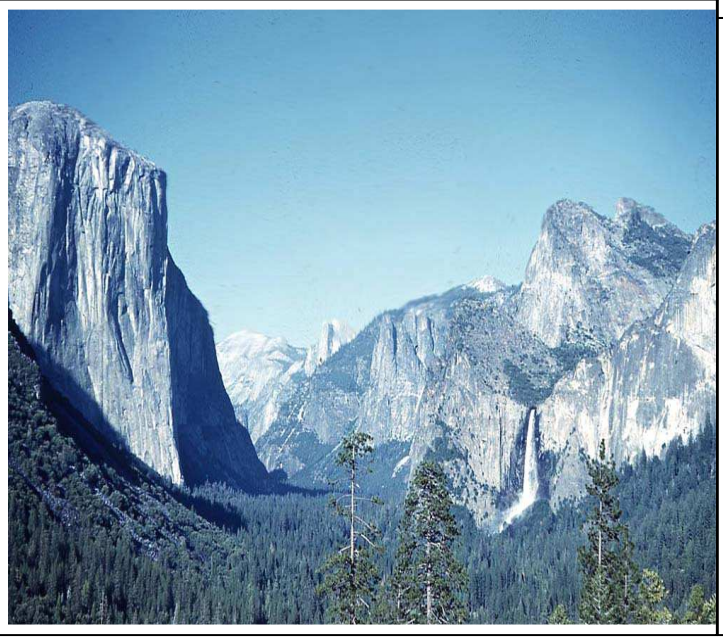
GLACIAL SYSTEMS

THE GLACIAL VALLEY : HANGING VALLEYS AND TRUNCATED SPURS

- The glacier takes a more direct route down slope and produces a straighter valley than a river.
- The glacial valley is also deeper than the pre-existing V shaped river valley.
- The main glacier erodes more deeply than tributary glaciers whose valleys are left Hanging.
- The hanging valley will be marked by a very steep-sided slope and a waterfall.
- The pre-existing river valley had interlocking spurs that are eroded by the more powerful glacier.
- These eroded spurs leave steep rocky slopes called Truncated spurs.







Label the photographs above and to the left with the following:

TRUNCATED SPUR

HANGING VALLEY

GLACIAL VALLEY

WATERFALL

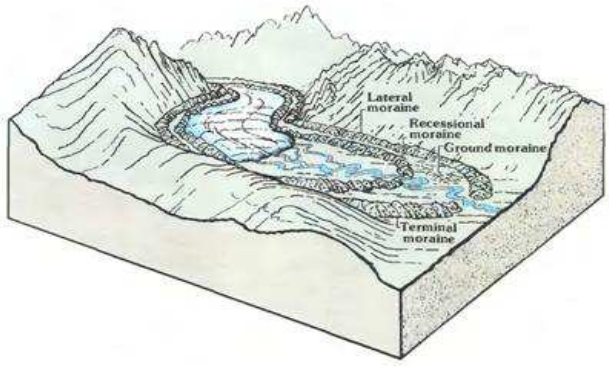
TRIBUTARY VALLEY

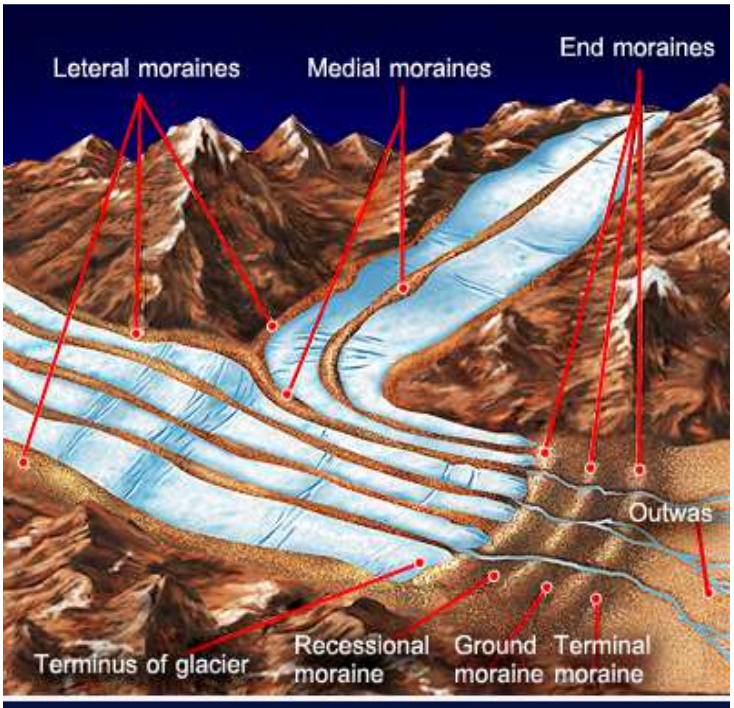
FROST WEATHERED SUMMITS

GLACIAL SYSTEMS

MORAINES

- Material transported by ice sheets and glaciers is called Moraine.
- Moraine is supplied to the ice by erosion and by weathering and mass movement on the valley sides.
- Moraine is unsorted and unstratified debris consisting of coarse angular boulders and finer clay/sand.
- Ground moraine is beneath the ice; lateral moraine at the side of the ice; medial where glaciers join.
- A terminal / end moraine is found at the snout/terminus of the glacier as ice deposits debris.
- Recessional moraines chart the retreat of the glacier in stages and Push moraines show a re-advance.





Types of Moraines

On the Photo above label:

LATERAL MORAINE

MEDIAL MORAINE

Describe the main characteristics of Moraine:

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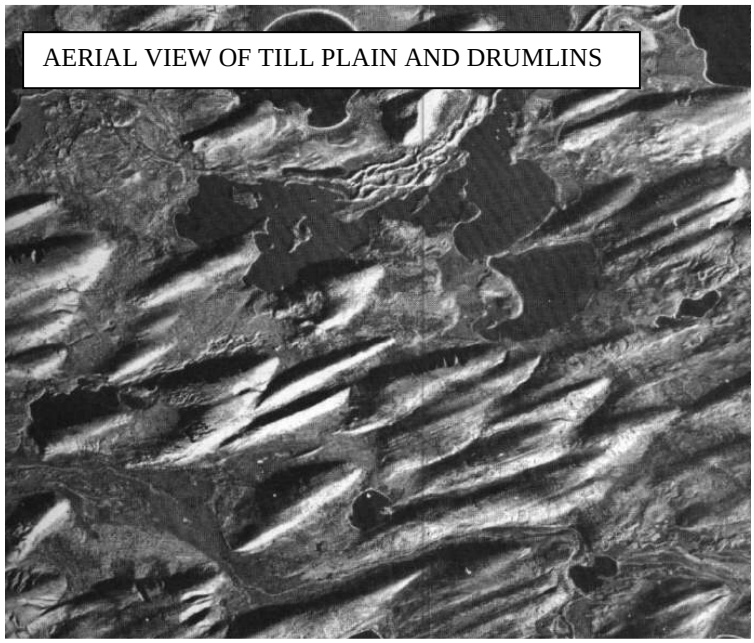
GLACIAL SYSTEMS

TILL PLAINS AND DRUMLINS

- Boulder Clay or Glacial Till is the morainic material deposited by ice sheets and glaciers.
- The deposition occurs in the lower valley or where an ice sheet loses energy during deglaciation.
- Glacial Till is a layer of unsorted, unstratified angular boulders in a clay matrix.
- The boulders within the Glacial Till may be called erratics if they are of recognisable origin.
- The Till forms an undulating Till Plain covered with hummocks called Drumlins.
- Drumlins form when moving ice deposits Till of varying thickness or erodes previous Tills.

AERIAL VIEW OF TILL PLAIN AND DRUMLINS



1. What does the photograph above tell you about boulder clay / glacial till?

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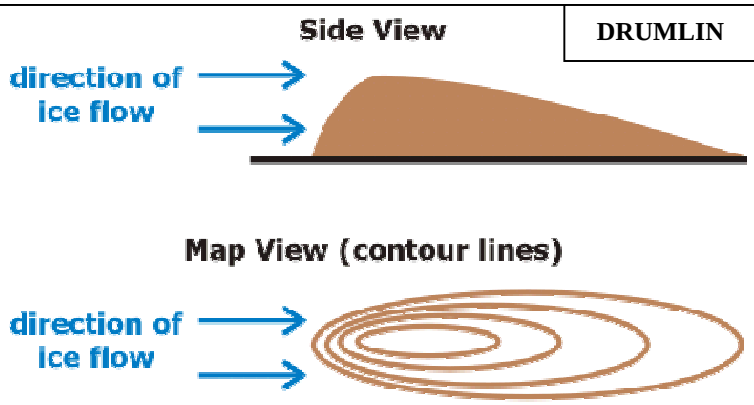
DRUMLIN

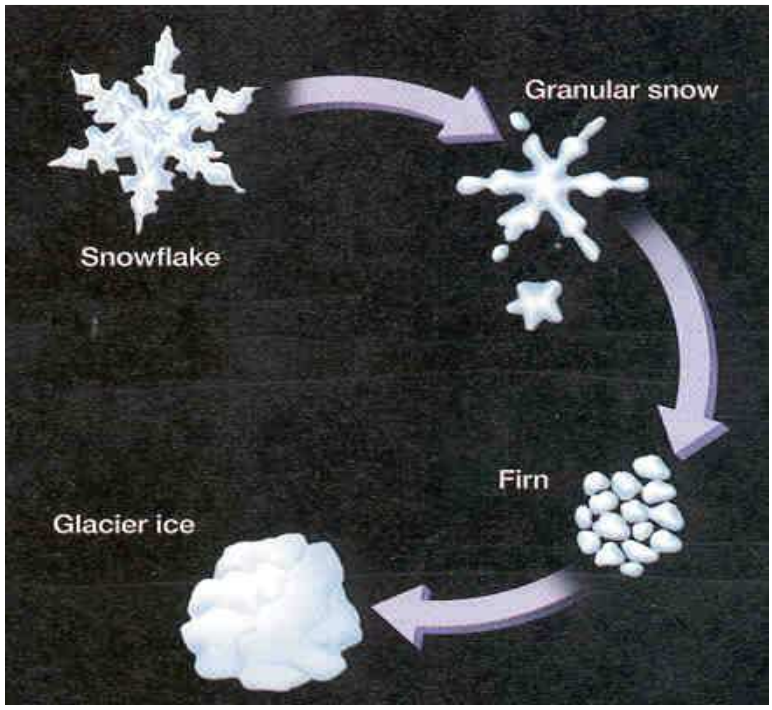


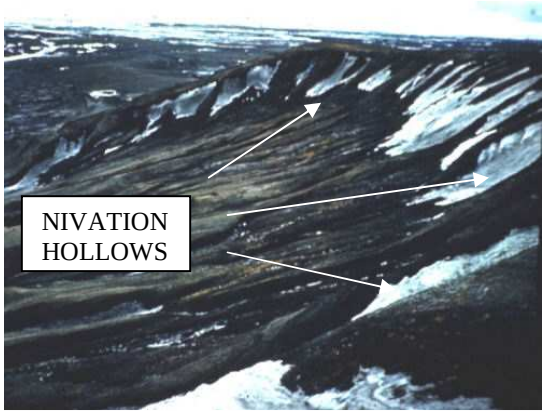
2. Draw an arrow on the photograph to the left to show the direction the ice sheet or glacier moved.

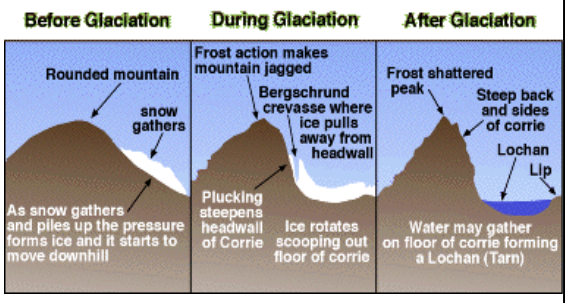
GLACIAL SYSTEMS

THE FORMATION OF GLACIERS

- Glacier ice forms from snow falls building up layer upon layer; most is air spaces at this stage.
- Firn is snow at the half way stage to true glacier ice, half ice and half air space.
- Further melting and refreezing and compaction by layers of snow and firn above produces ice.
- This tends to occur in a North and East facing hollow in the mountains, called a Nivation hollow.
- The Nivation hollow grows by frost shattering and glacial erosion to form a Corrie/Cirque.
- The Corrie/Cirque is the birthplace of the glacier, ice spills out from here into the glacial valley.







Use the information on this page to write an explanation of the formation of glacier ice:

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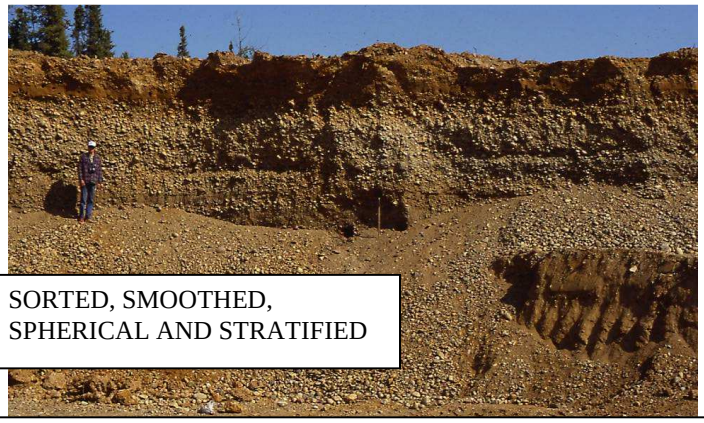
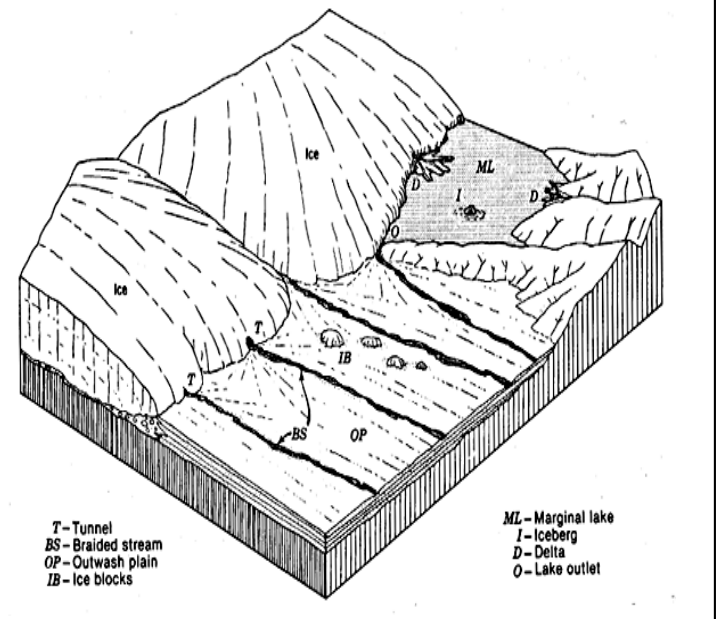
GLACIAL SYSTEMS

FLUVIO-GLACIAL DEPOSITS

- Fluvio-glacial deposits are laid down by meltwater streams in the later stages of deglaciation.
- Meltwater streams also flow beyond the snout/terminus of the glacier into the Pro-glacial zone.
- These streams are often braided and produce a gently sloping outwash plain or Sandur.
- Dead ice masses can allow outwash to build up around them, leaving Kettle holes when they melt.
- Meltwater deposits are smoothed due to attrition and are stratified and sorted to a degree.
- The meltwater streams deposit the coarsest material first, but clay is carried further in suspension.



SORTED, SMOOTHED, SPHERICAL AND STRATIFIED



Use the information on this page to explain what Fluvio-glacial deposits are:

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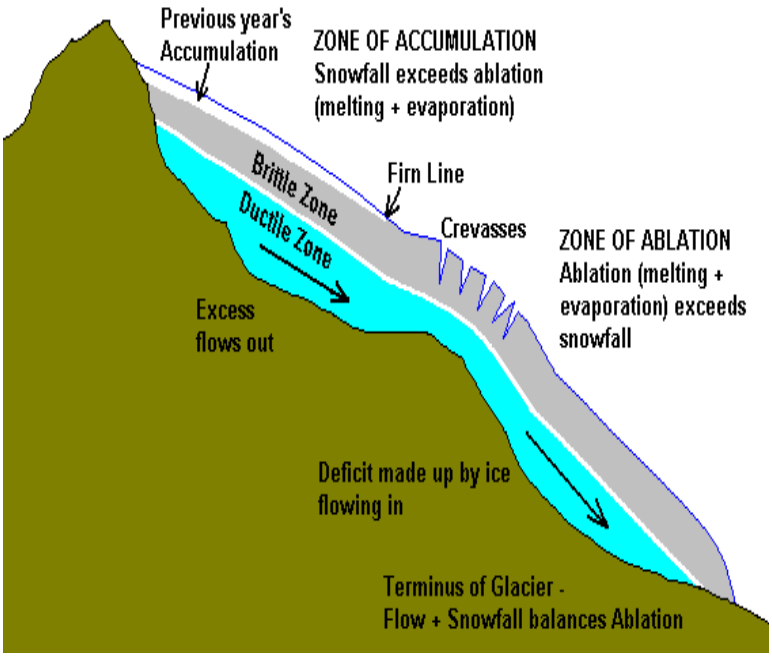
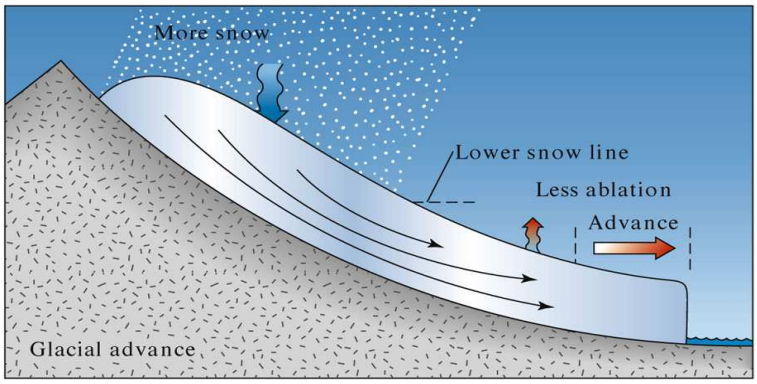
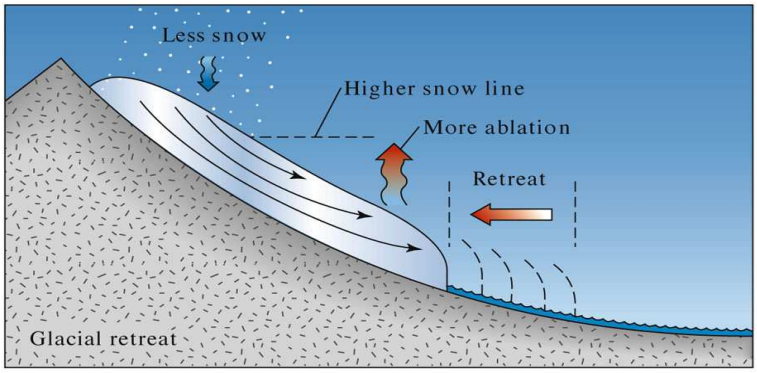
GLACIAL SYSTEMS

THE GLACIER MASS BALANCE

- Mass balance is the balance between accumulation in the upper glacier and melting lower down.
- Accumulation occurs where there is a net surplus of snow, layers build up and firn and ice form.
- Ablation or melting is a net loss of ice in the lower valley and may include loss by sublimation.
- The Equilibrium/Firn line is between the 2 zones and the glacier transports ice between the 2 zones
- A net surplus of ice formation over ablation causes the glacier to advance lower down.
- Net ablation causes the glacial snout to retreat, the ice, however, is still moving down slope.







Use the information on this page to write a description and explanation of the glacier mass balance:

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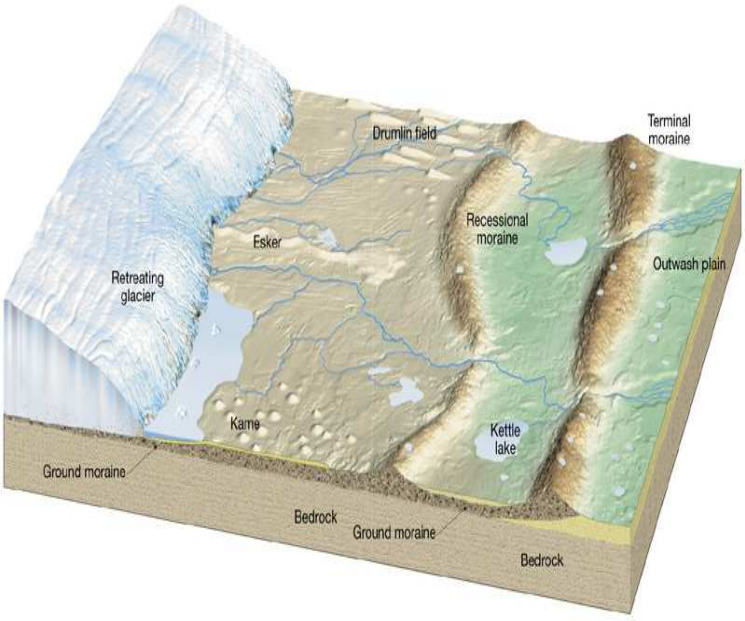
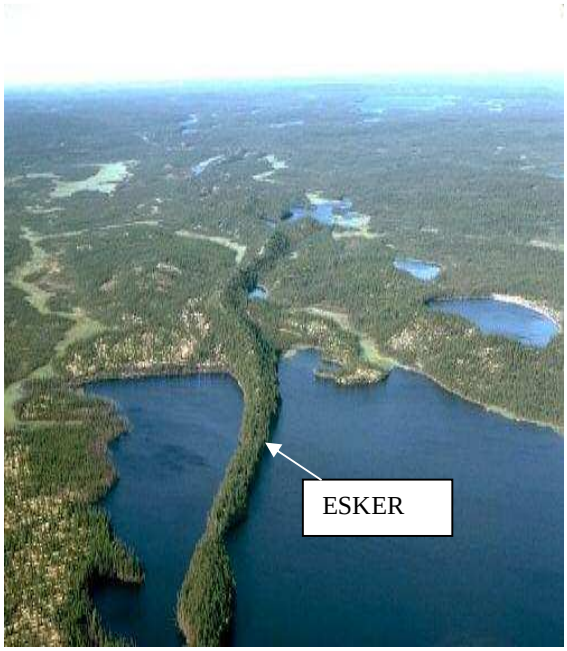
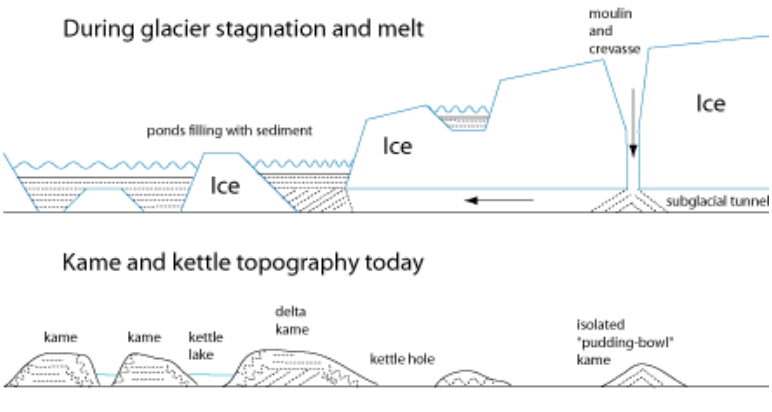
GLACIAL SYSTEMS

ESKERS AND KAMES

- Eskers and kames are features formed by fluvio-glacial deposition by meltwater streams.
- The material deposited is not as well sorted or stratified as true fluvio-glacial outwash.
- This ice contact fluvio-glacial material is only sorted, stratified and smoothed to some extent by attrition.
- Eskers are long sinuous ridges caused by deposition of debris by subglacial or en-glacial meltwater.
- Kames or delta Kames form when meltwater streams deposit debris into a pro-glacial lake.
- A lateral meltwater stream between the ice and the valley side deposits a Kame terrace.







Use the information on this page to write a description and explanation of eskers and kames:

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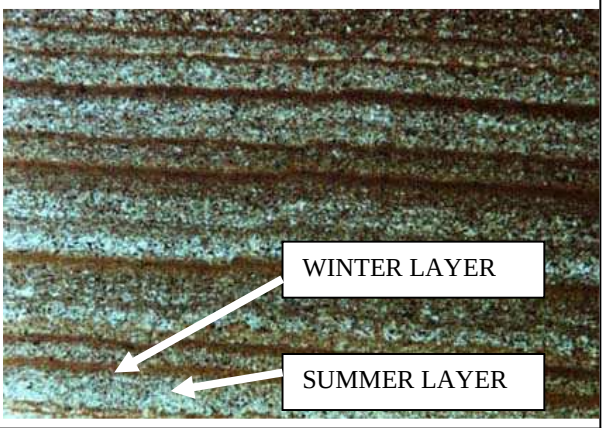
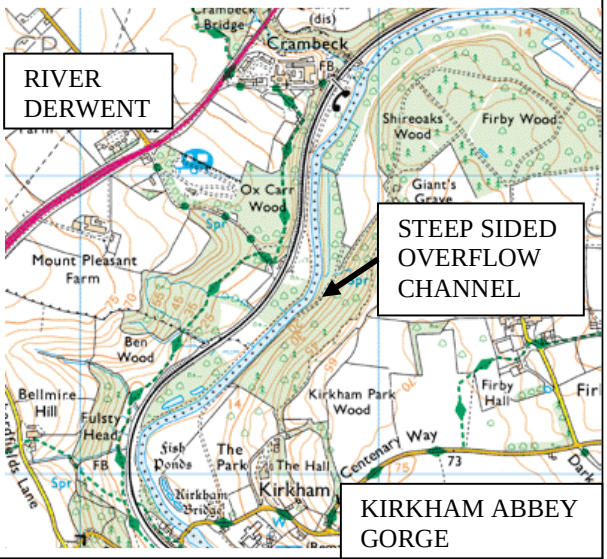
GLACIAL SYSTEMS

PRO-GLACIAL LAKES AND OVERFLOW CHANNELS

- Pro-glacial lakes form beyond ice sheets and glaciers especially during the later stages of de-glaciation.
- These lakes may be trapped between the ice and uplands or dammed by moraines.
- Meltwater streams carry sediment into the lakes which forms lacustrine deposits.
- These lake deposits may be Varves, seasonally deposited layers of sand and clay.
- Overflow of pro-glacial lakes can cut overflow channels, typically straight sided and flat-bottomed.
- Post-glacial drainage may be altered and diverted by the erosion of overflow channels.





ADD THE FOLLOWING LABELS TO THE CORRECT PHOTOS:

VARVE CLAY

PROGLACIAL LAKE

MELTWATER

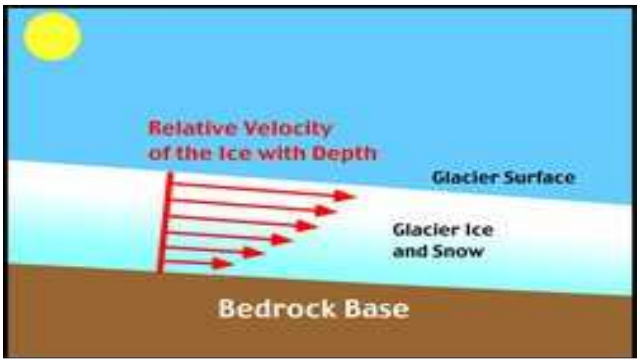
OVERFLOW CHANNEL

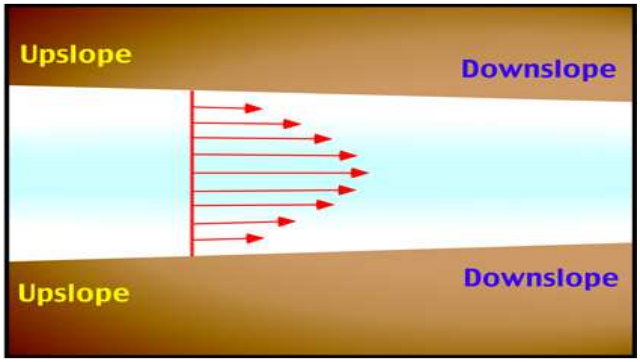
DIVERTED RIVER

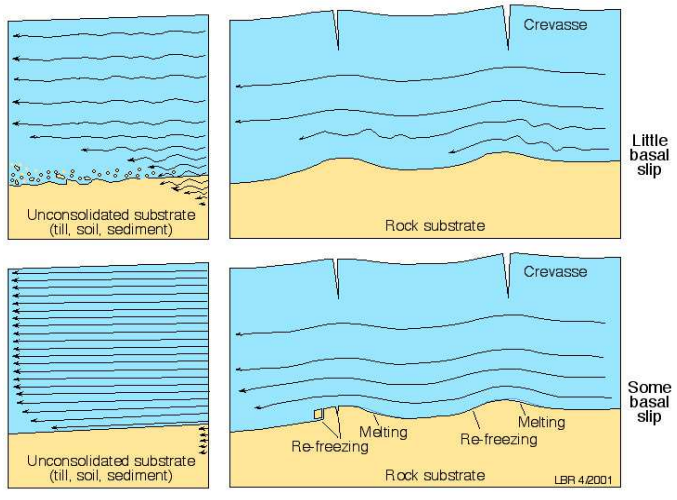
GLACIAL SYSTEMS

ICE MOVEMENT

- Glacier ice moves away from uplands and source areas, driven by ice accumulation and gravity.
- Surface ice moves faster as it is not affected by friction, moving by brittle fracture and crevassing.
- Basal ice moves by basal slippage and Regelation; pressure melting and refreezing.
- The weight of thick ice, more than 20m, causes it to flow by internal plastic deformation.
- Warm, Temperate glaciers move faster than cold, Arctic ones as they have more basal melting of ice.
- The speed of movement depends on temperature, gradient, ice thickness and bed roughness.







Use the information on this page to describe and explain how glaciers move:

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