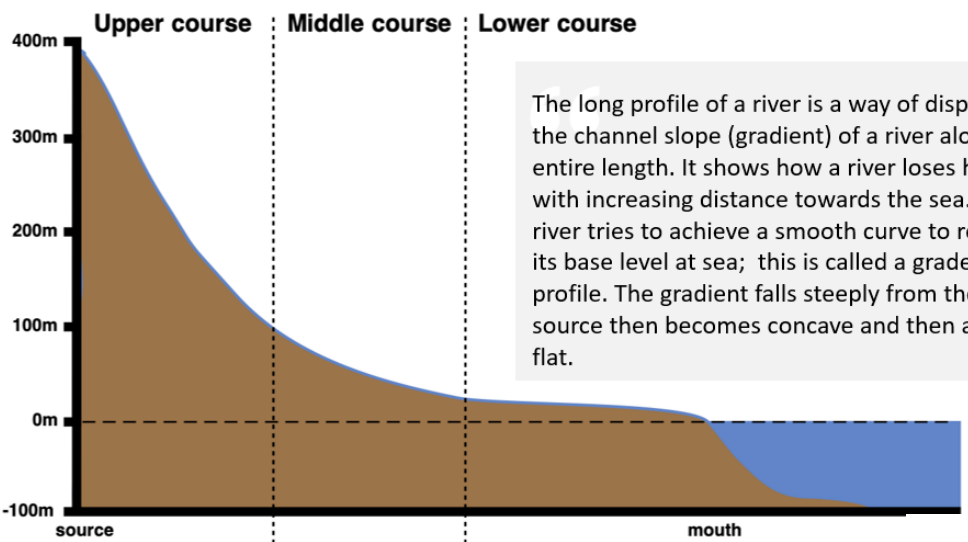


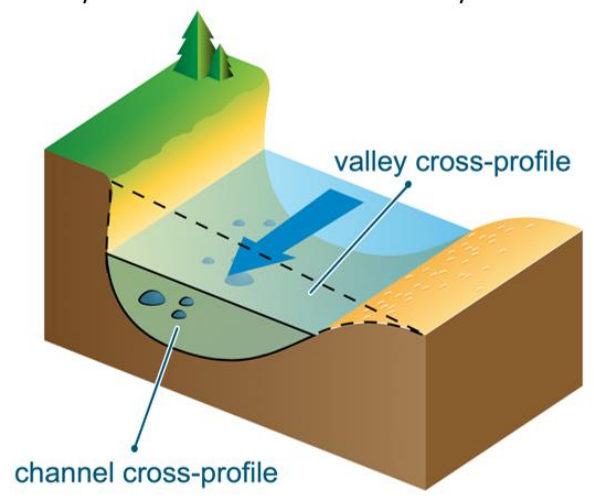
Year 8 - Topic 1 - How do rivers change as they go downstream?

Cross Profile



The long profile of a river is a way of displaying the channel slope (gradient) of a river along its entire length. It shows how a river loses height with increasing distance towards the sea. A river tries to achieve a smooth curve to reach its base level at sea; this is called a graded long profile. The gradient falls steeply from the source then becomes concave and then almost flat.

River cross profiles are a cross-section, taken sideways, of a river's channel and/or valley at certain points in the river's course. A **channel cross-profile** only includes the river whereas a **valley cross-profile** includes the channel, the valley floor and the sides of the valley.

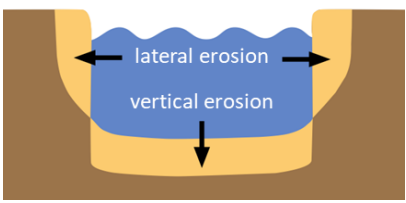


- V-shaped valley
- Narrow valley floor
- Vertical erosion
- Valley widens
- Lateral erosion
- Wide valley
- Lateral erosion

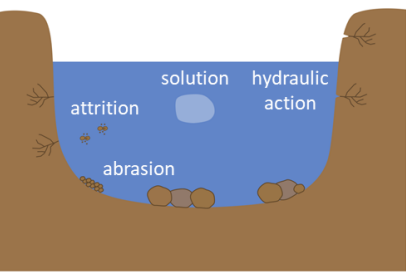
Long Profile

Cross Profile

Processes of River Erosion



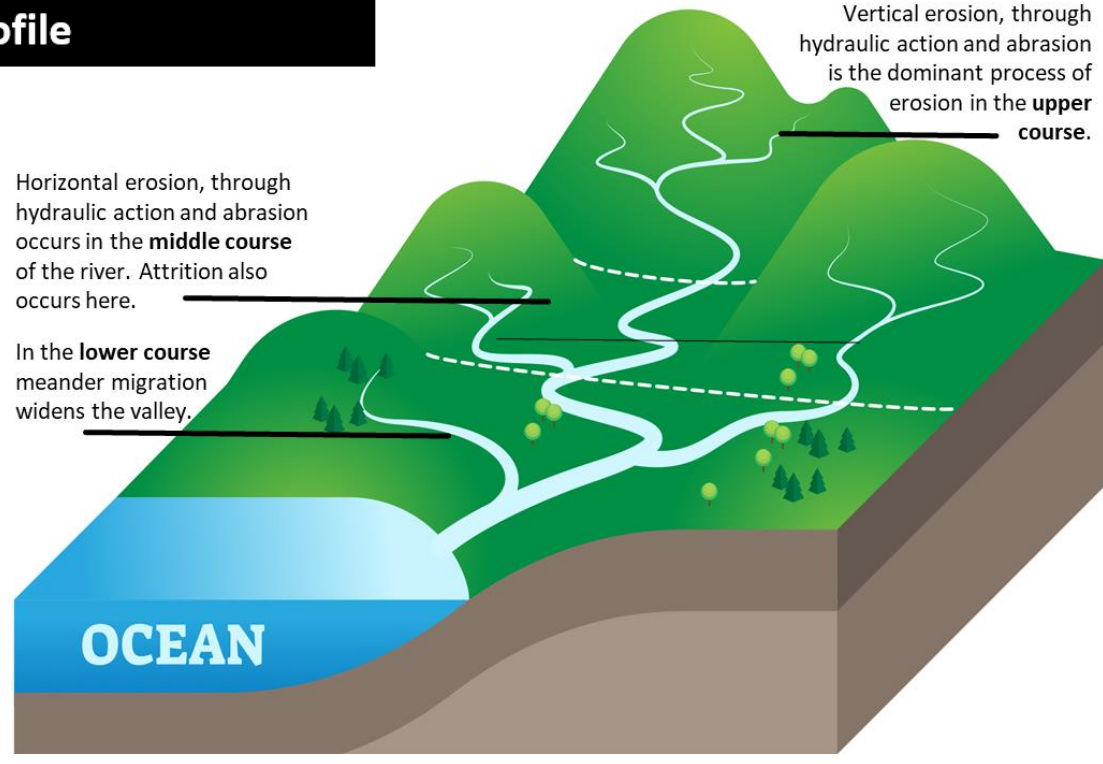
- Abrasion** – Rocks carried along by the river wear down the river bed and banks.
- Attrition** – Rocks transported by the river collide and become smaller and rounded.
- Erosion** – The wearing away of rock and soil found along the river bed and banks.
- Hydraulic Action** – The force of water compressing air in cracks, weakening river banks.
- Lateral erosion** – Sideways erosion by a river on the outside of a meander.
- Solution** – Soluble particles are dissolved into the river.
- Vertical erosion** – Downward erosion of a river bed.



Horizontal erosion, through hydraulic action and abrasion occurs in the **middle course** of the river. Attrition also occurs here.

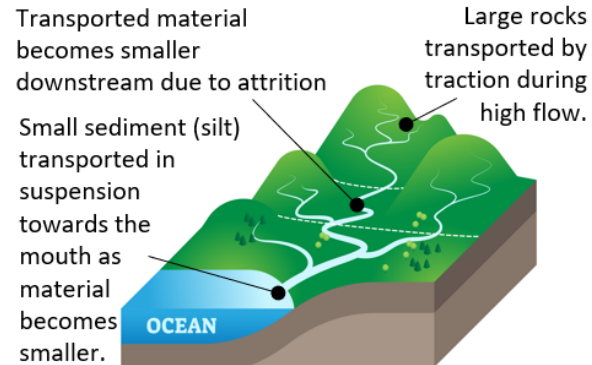
In the **lower course** meander migration widens the valley.

Vertical erosion, through hydraulic action and abrasion is the dominant process of erosion in the **upper course**.



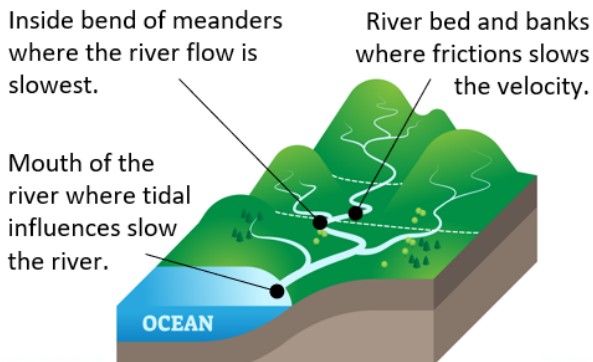
River Transportation

Transportation is affected by river velocity.



River Deposition

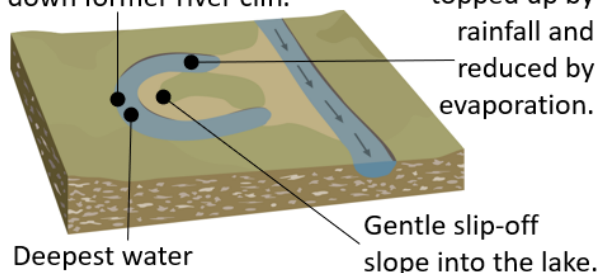
Deposition occurs when a river loses velocity.



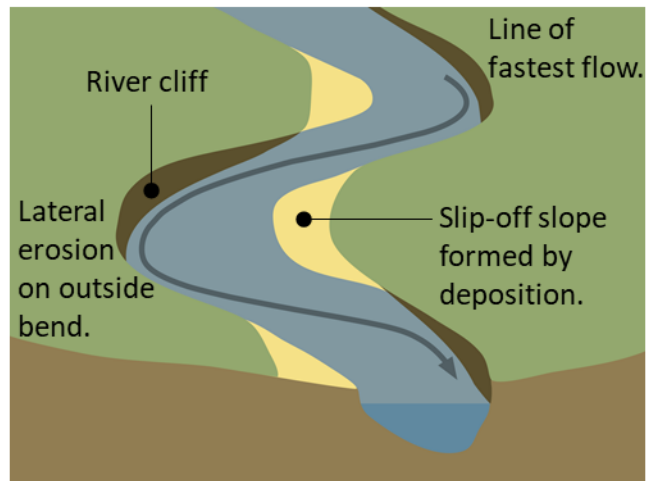
Oxbow lake characteristics

Steep drop to the lake down former river cliff.

Stagnant water, topped up by rainfall and reduced by evaporation.

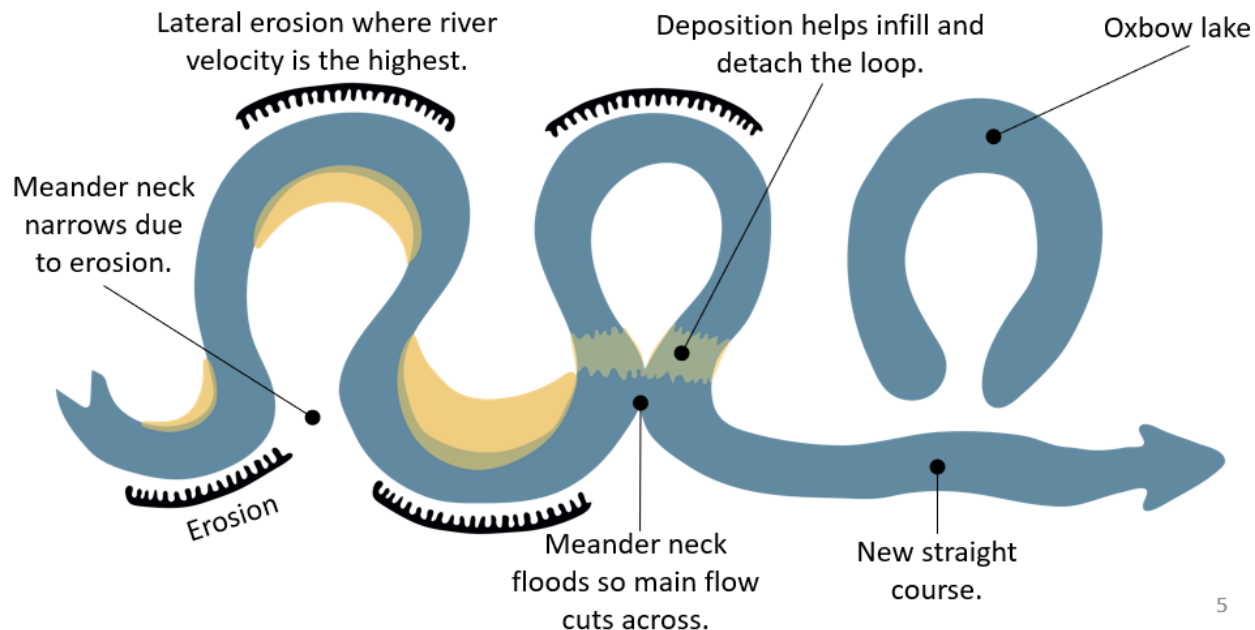


Mender characteristics

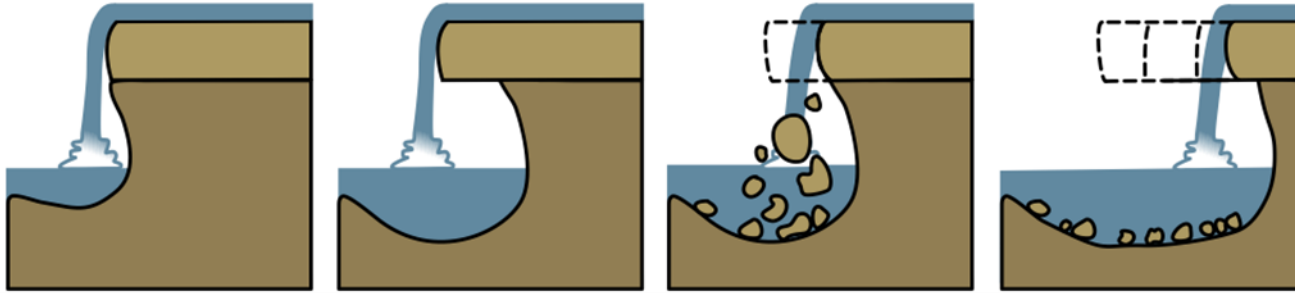


-  **Helicoidal flow** – The cork-screw-like flow of water in a meander.
-  **Meander** – One of a series of bends in a river.
-  **Oxbow lake** – A curved lake formed when a river cuts off a meander.
-  **Pools** – Areas of deep water and greater erosion in a river.
-  **Riffles** – Areas of shallow water created by the deposition of coarse sediment.
-  **River cliff** – Cliff formed by lateral erosion on the outside bend of a meander.
-  **Slip-off slope** – A gently sloping river beach formed on the inside of a meander.

The formation of an oxbow lake



Waterfall



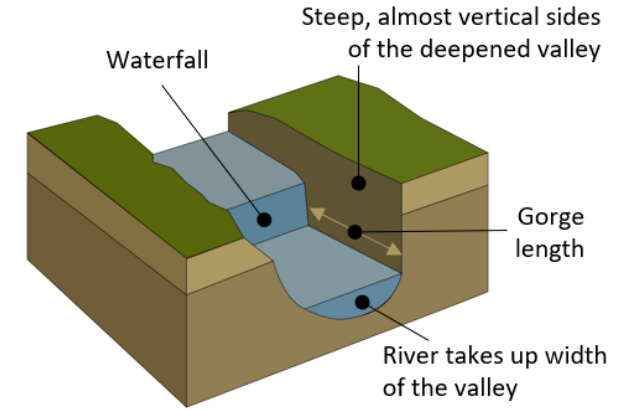
1. Waterfalls occur in the upper stage of a river where a band of hard rock overlies a softer rock. Falling water and rock particles erode the soft rock below the waterfall, creating a plunge pool.

2. The soft rock is undercut by erosional processes e.g. hydraulic action and abrasion creating a plunge pool where water and debris swirl around eroding the rock creating an overhang.

3. The layer of hard rock overhang above the plunge pool collapses as its weight is no longer supported.

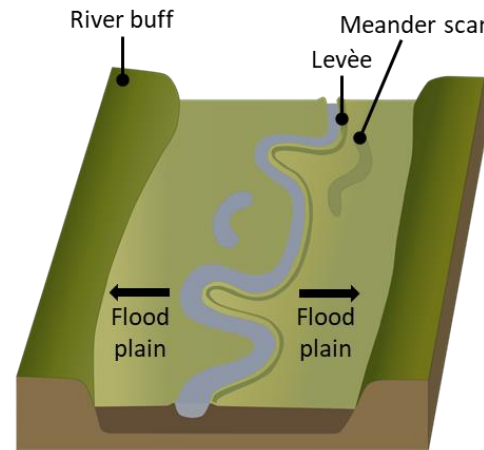
4. Erosion continues and the waterfall retreats upstream leaving behind a gorge.

Gorge

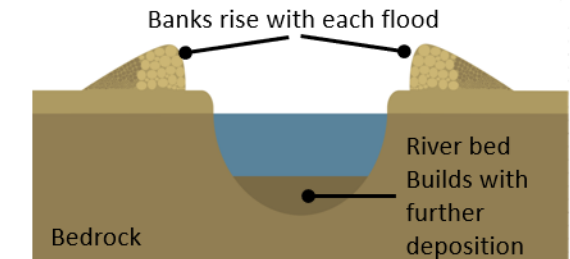
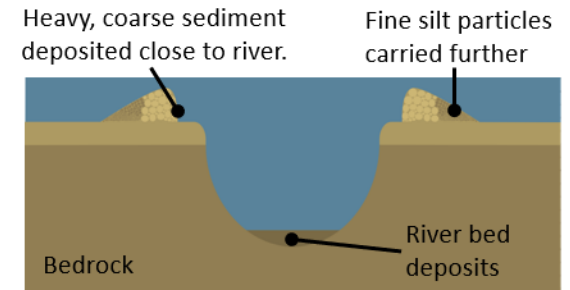
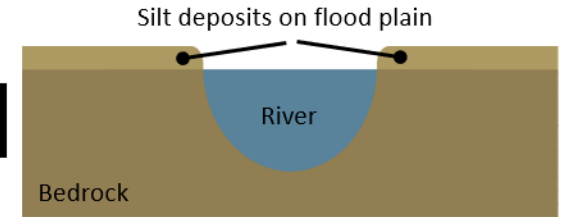


Levée Formation

Flood Plain Characteristics



Flood plain widens due to meander migration.



River Transportation

Suspension - fine material such as clay and sediment is carried by the river.

Solution - dissolved minerals are carried by the river.

Traction - large boulders and pebbles are rolled along the river bed.

Saltation - small stones, pebble and silt bounces along the river bed.

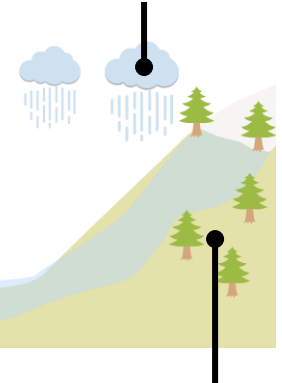
River bed

Physical causes of flooding

Heavy rainfall – water arrives too quickly to infiltrate the soil increasing surface run-off. Water rapidly reaches river channel.



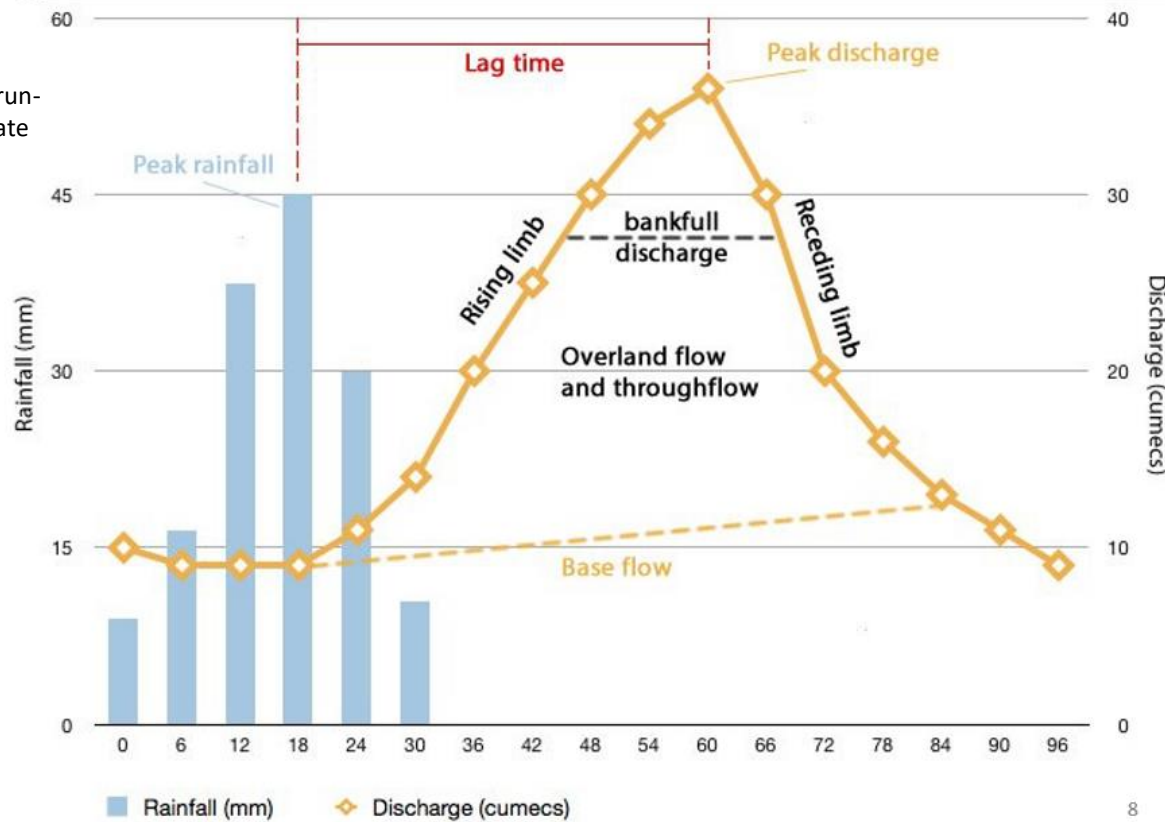
Prolonged rainfall - Soil becomes saturated. This increases surface run-off as rainfall can no longer infiltrate the soil. Flood risk increases.



Geology - Impermeable surfaces e.g. clay and granite reduce infiltration leading to greater surface run-off. The risk of flooding increases as water reaches the river channel quickly, increasing discharge and the risk of flooding.

Relief - The steeper the slope the more rapid the flow of water into a river channel, increasing the risk of flooding.

Characteristics of a Flood Hydrograph



Human Causes of Flooding

Disappearing gardens
The growth in the use of impermeable surfaces increases run off e.g. installing new drives and paving gardens.

New infrastructure
Urbanisation leads to new roads, houses, and other developments. This increases surface run off.

Agriculture
Field sizes have increased, loss of hedges means there is less interception increasing the risk of flooding.

Disappearing fields
Large scale farming leads to fields being replaced by huge sheds.

Forestry
Deforestation reduces interception and roots no longer take water from the soil.



Flashy vs Flat Hydrograph

- Baseflow** – The normal flow of a river when sustained by groundwater flow.
- Bankfull discharge** – Level of discharge above which a flood will occur.
- Falling limb** – The reduced discharge following the peak discharge.
- Hydrograph** – A graph showing river discharge, related to rainfall, over time.
- Lag time** – The time difference between peak rainfall and peak discharge.
- Peak discharge** – The highest recorded discharge following a rainfall event.
- Peak rainfall** – The highest amount of rainfall per time unit (highest bar).

- Flashy** – rapid response hydrograph posing a high flood risk.
 - Steep slopes
 - Impermeable rock
 - Heavy/prolonged rainfall
 - Urbanisation
 - Deforestation
- Flat** – slow response hydrograph posing a low flood risk.
 - Gentle slopes
 - Permeable rocks
 - Drizzle
 - Deep, dry soils
 - Afforestation