

## RIVER ACTION

A river is a mass of water flowing over the land surface from its source to its mouth in a defined direction.

### **(1) River source**

This is a place from which a river begins to flow e.g. a lake, spring, melting glaciers, swamps or a region of steady rainfall e.g. R. Congo.

### **(2) Rivers mouth**

This is a place where the river ends e.g. Lake, ocean

### **(3) River's catchment area / long profile of a river.**

This refers to all the areas drained by a river and its tributaries from its source to its mouth. **OR;**

The long distance covered by a river from its source to the mouth which is divided into 3 stages namely, youthful, maturity and old stage.

### **(4) Cross profile of a river**

Refers to the vertical section through the river valley from one bank to the other.

### **(5) Divide / water shade**

This is a highland area separating one river system from another.

### **(6) River regime**

Refers to seasonal variations in the volume of water in a river valley. The volume is high during the rainy season and the volume is low in dry season.

A river course / profile is divided into 3 stages namely youthful, middle and old stage. In each of these stages a river does certain activities and therefore characterized by different features.

## **WORK OF A RIVER**

Rivers are major agents of land sculpture or moulding of land. A river is therefore both a constructive and destructive agent of the earth's surface. As a river flows, it erodes thus destroying, transports and deposits materials thus constructing the earth's surface.

The materials transported by a river are known as its load.

### **16.2 RIVER EROSIONAL PROCESSES**

A river erodes its channel through several processes e.g.:-

#### **(1) Hydraulic Action**

Erosion caused by the pounding force of moving water. Through this action, loose material is removed by the force of water alone. This type of erosion tends to make river banks curve.

#### **(2) Abrasion / Corrasion**

Mechanical wearing away of the river channel by the impact of the grinding action of materials carried by the river at the river floor.

#### **(3) Solution / corrosion**

Process where river dissolves soluble rocks like rock salt.

#### **(4) Attrition**

Erosion of materials or load that is being carried by the river which rub against each other thus reducing in size and the softer the rock, the easier it's eroded by attrition.

### **16.3 JUVENILE / YOUTHFUL STAGE / TORRENT / UPPER COUSE**

**Characteristics of a river in the youthful stage and its valley / Torrent state / upper course / juvenile**

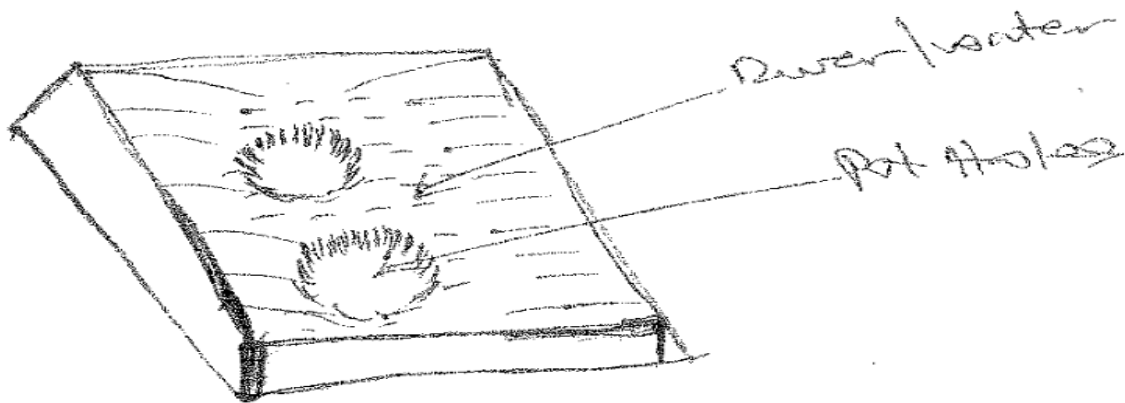
- A river flows very swiftly / high velocity due to the steep gradient.
- A river flows onto a steep gradient because of the steep slopes.
- Vertical erosion is very pronounced due to the rolling stones (abrasion).

- Lateral erosion is absent / very minimal because the river concentrates all its energy to vertical erosion.
- The river valley is V-shaped and narrow due to vertical erosion and minimal lateral erosion.
- The river flows in a winding manner avoiding any resistant rock out crops on the way resulting into interlocking spurs.
- Water falls, plunge pools, e.t.c. occur when the bend of the river becomes stiff.

## FEATURES FORMED IN THE YOUTHFUL STAGE

### (1) Potholes

These are circular depressions on the river bed formed when water of a fast flowing river swirls if the bed is un even and the stonescarried by the moving river cut circular depression on the river bed. These gradually deepen and are called potholes.

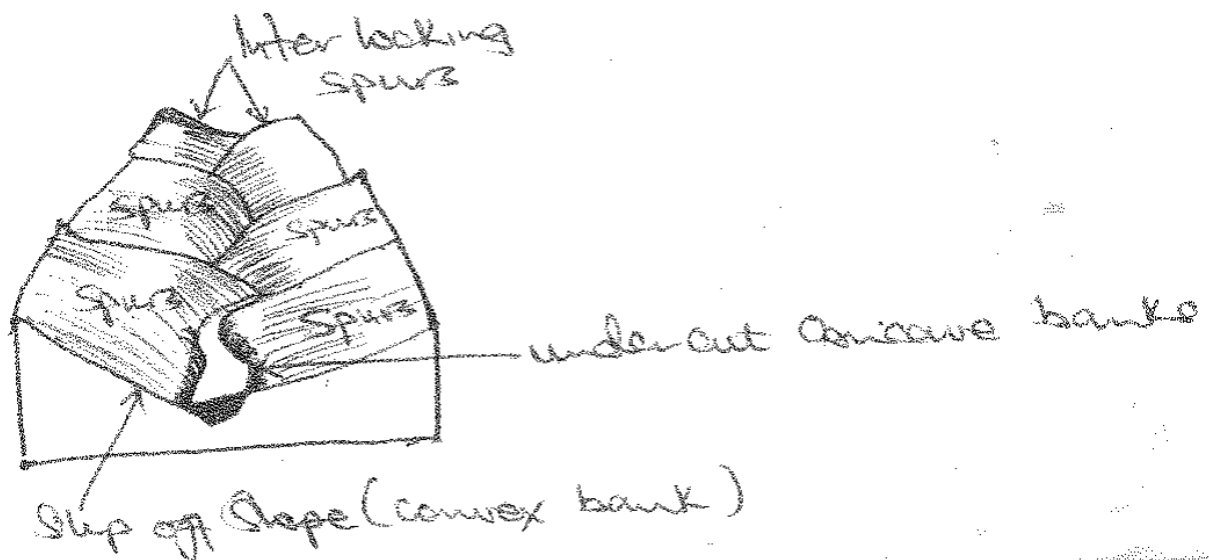


### 2. Interlocking spurs

River features in a highland area where a river flows through a series of highlands, twists and turns around to avoid resistant rock obstacles. It's formed as a result of a river's vertical erosion through hydraulic and abrasion action rapidly deepening the river

and the river twists and turns around obstacles of hard rocks. Erosion is more pronounced on the concave banks of the river which form interlocking spurs to interlock. Eroded materials from the concave banks are deposited on the convex banks where there is no or little erosion this makes the convex banks form gentle slopes of slip off-slopes.

**Diagram:**



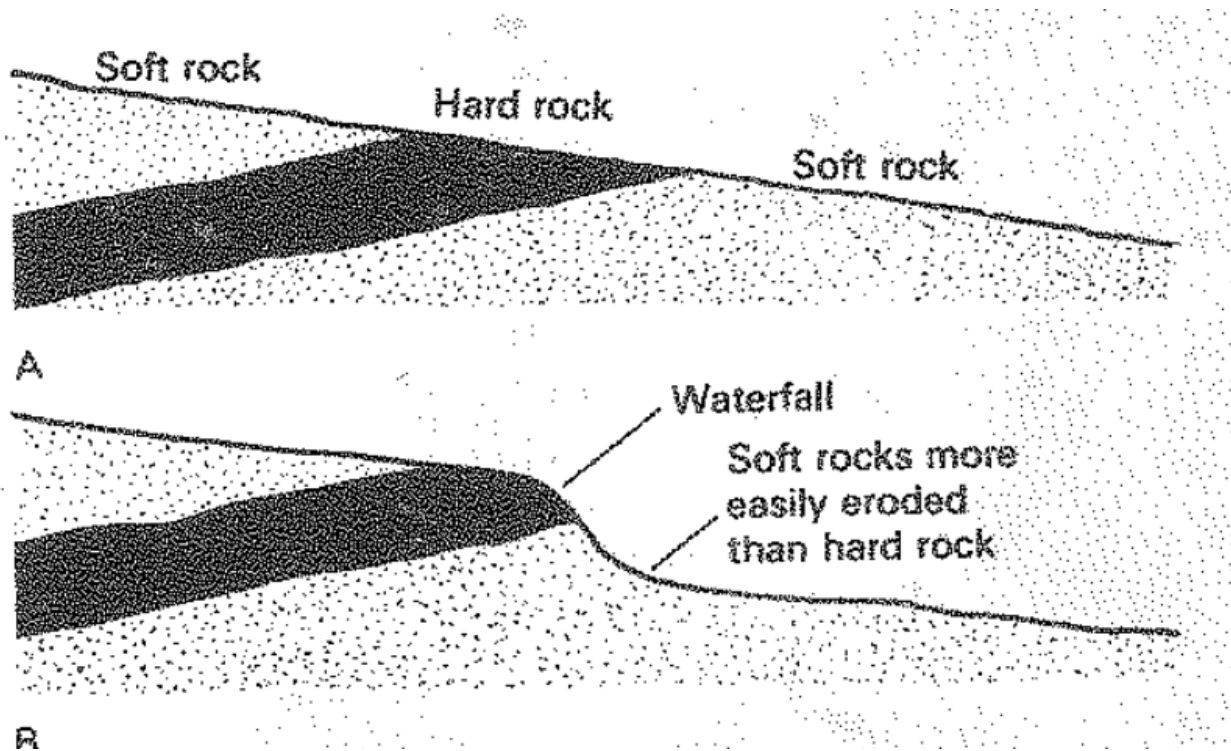
### **(3) Water fall**

This is a sharp change in the gradient of the slope over which a river flows i.e. from a high elevation to a sudden low elevation.

Waterfalls are of two types i.e. those caused by rock differentials in hardness into which the river is cutting and those caused by an uplift and faulting, larva flows and landslides.

#### **(a) Waterfalls due to rock differentials.**

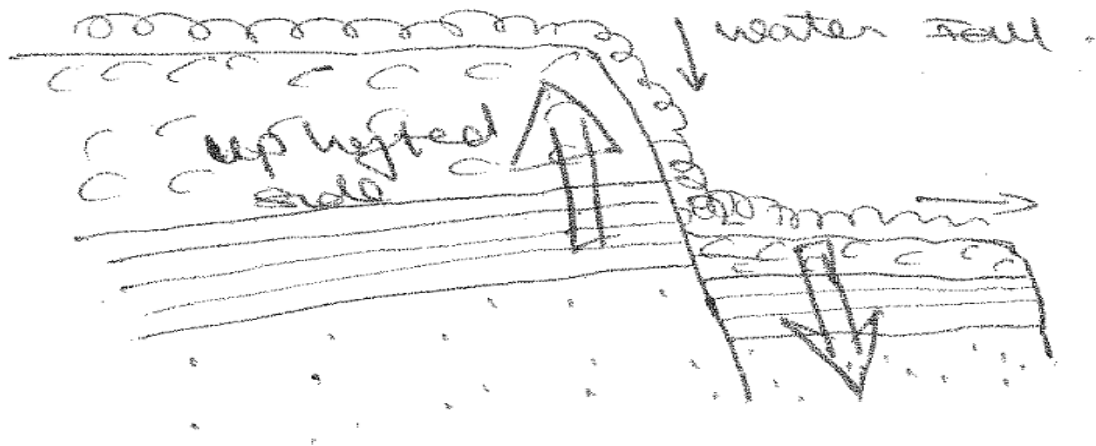
When a layer of hard rock lies across a river's course, the soft rocks on the downstream side are more quickly eroded by abrasion and hydraulic action than the hard rock. The river bed is thus steepened when it crosses the hard rock and a waterfall develops e.g. Bujagali, Owen falls, Ssezibwa falls, Sippi falls.



**(b) Water falls due to uplift / faulting.**

When faulting occurs across a river channel, this is followed by vertical displacement of rocks along the fault line where one block is uplifted and the other one sinks. A water fall is formed where a river flows from a suddenly high to a low elevation e.g. Murchison falls.

***Diagram:***



## A PLUNGE POOL

A narrow or broad depression formed at the base of a water fall, formed as a result of the enlargement of a pot hole at the base of a water fall due to the progressive drilling or grinding of the valley floor by the hydraulic and abrasion action of water.

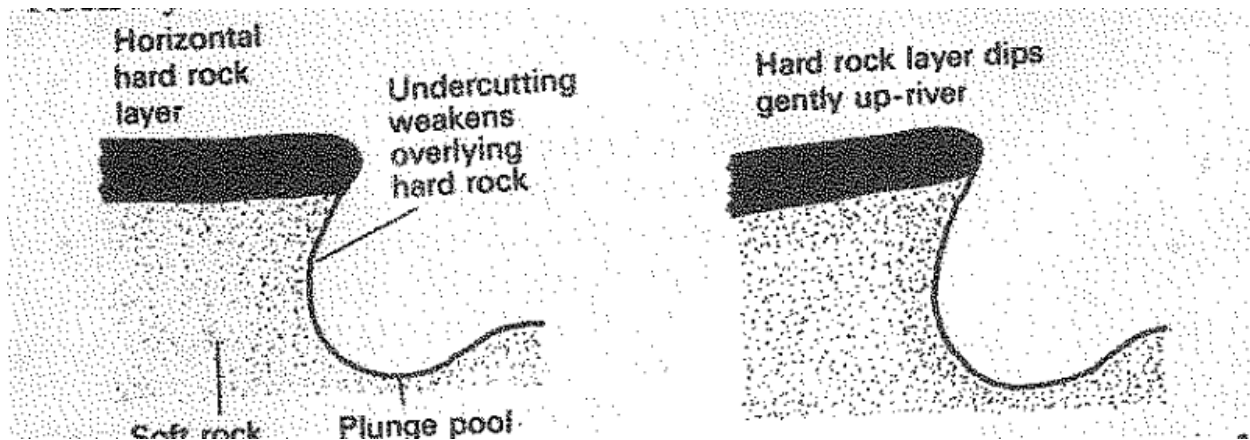
## CONDITIONS FOR THE FORMATION OF A PLUNGE POOL

- Large volumes of water which increases the rivers competence.
- Steep gradient resulting into high erosive power of a river due to velocity.
- Large amounts of abrasive materials like boulders to swirl and grind the bed.
- Difference in rock resistance in that the river flows from a hard rock to a soft rock.

Thus drilling and deepening the softer rock.

- Examples are found along R. Sezibwa at Sezibwa falls, Sipi falls, Kizizi falls and upper Tana River.

Illustration.



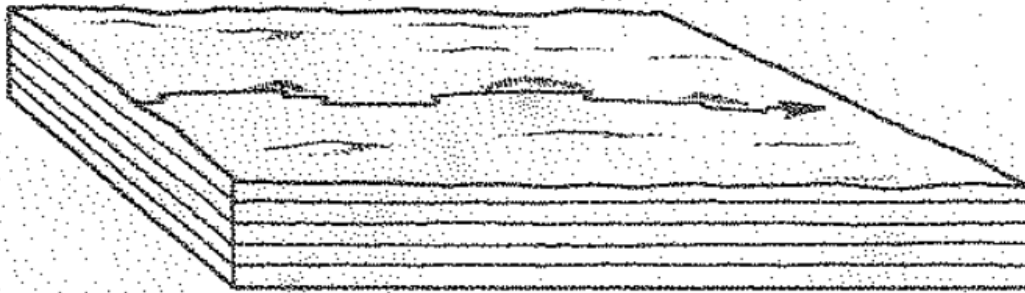
(b) A gorge may also be formed when a river maintains its course across a belt of land that has been uplifted due to the pronounced under cutting through hydraulic and abrasion action.

(i) Before uplifting

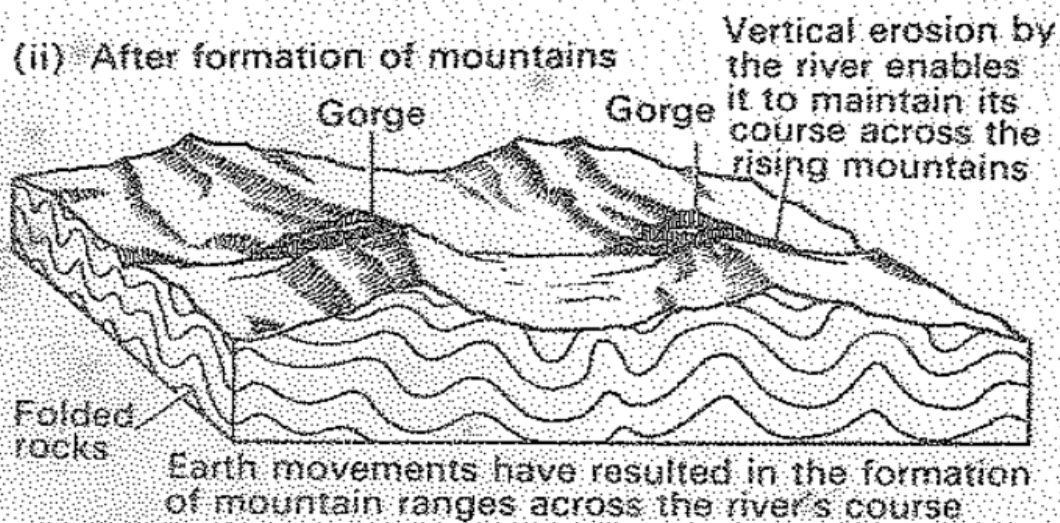
(ii) After uplifting

**Diagram:**

(i) Before formation of mountains



(ii) After formation of mountains



#### Examples of Gorges include:-

- The Great Ruaha Gorge on R. Ruaha in Tanzania.
- Murchison falls on R. Nile.
- Sabaloka and Batoka on R. Nile in Sudan.
- Rupata Gorge in Mozambique
- Manambolo Gorge in Madagasca

#### MAIN CAUSES OF GORGES

When a water fall retreats up stream as it erodes vertically it will create a Gorge. It's

common when retreatment is at a water fall e.g. Batoka Gorge and Victoria falls on R. Zambezi.

A gorge may be cut by fast flowing river especially when a rock on which it flows is very soft. It's common at a point where rejuvenation has taken place, increasing the erosive force e.g. in Sudan such gorge is super imposed at Sabaloka Gorge where R. Nile has excessively eroded a volcanic ash leaving behind a super imposed Gorge.

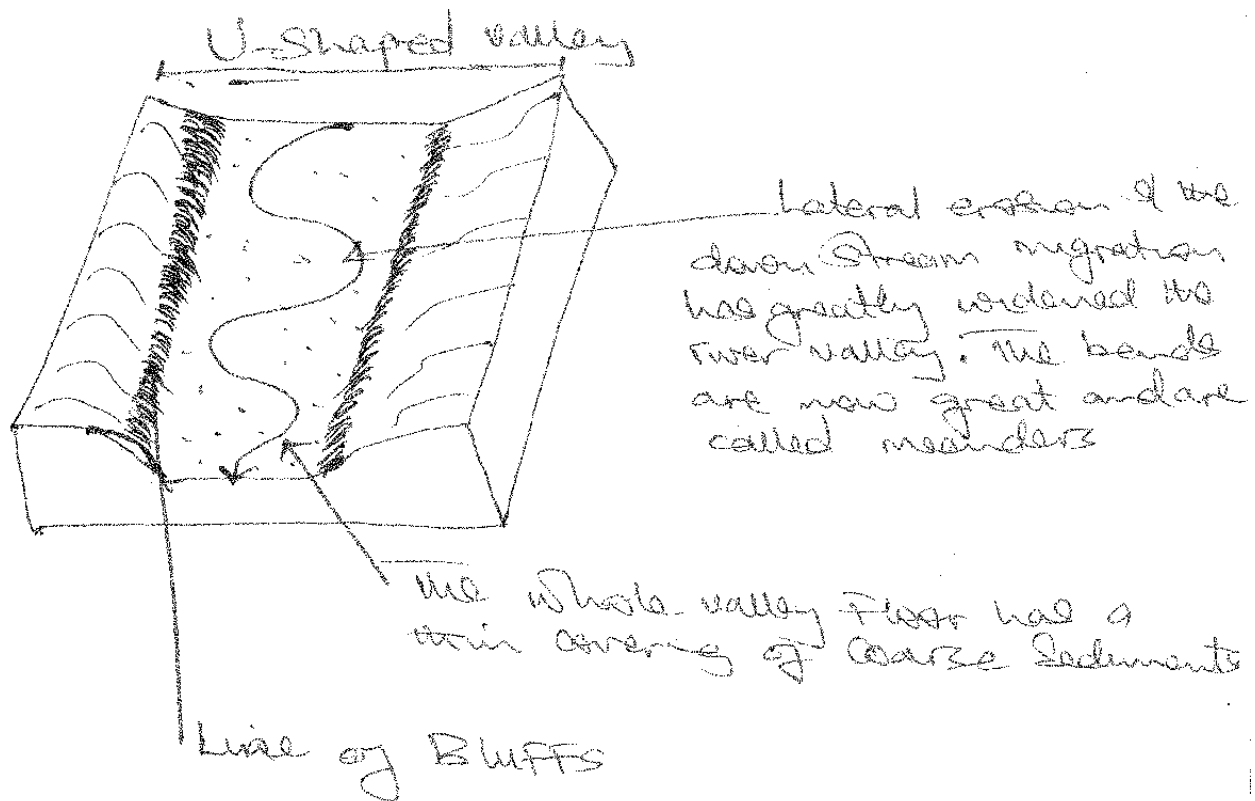
Sometimes there is continuous rise of landscape but a river continues to erode vertically at the previous rate. In this case, an antecedent Gorge will develop at point of uplift as illustrated above.

### **MIDDLE STAGE / MATURITY STAGE OF A RIVER.**

#### **Characteristics:-**

- A river flows on a reduced gradient due to the Gentle slope on which it flows.
- The velocity of the river is reduced i.e. it's not swift as in the youthful stage.
- Both vertical and lateral erosion are pronounced.
- The valley becomes U-shaped due to increased lateral erosion.
- The river valley floor is wide and by the time the river is nearing the old stage, the valley floor is covered by a layer of sediments.
- Spurs are removed by lateral erosion and their remains form a line of bluffs on each side of the valley floor.
- River bends are pronounced which form meanders.
- The concave banks of meanders stand as cliffs while the convex bank slopes gently as slip off slopes.

#### ***Illustration:***



## MEANDERS

This is a pronounced bend of a river or acute bend of a river.

### CAUSES OF RIVER MEANDERS

#### (1) Coriolis force

Rivers meander following the rotation of the earth. As the earth rotates, coriolis force forces rivers to lose their normal trend. This greatly affects rivers at the poles.

#### (2) Obstacles across river channels

The presence of obstacles of resistant rock out crops across a river channel may force a river to meander as it manoeuvres its way down valley avoiding the resistant out crop of rocks.

Obstacles along river valleys may force rivers to meander in their youthful stage, forcing them to develop interlocking spurs along river profiles.

#### (3) River deposition

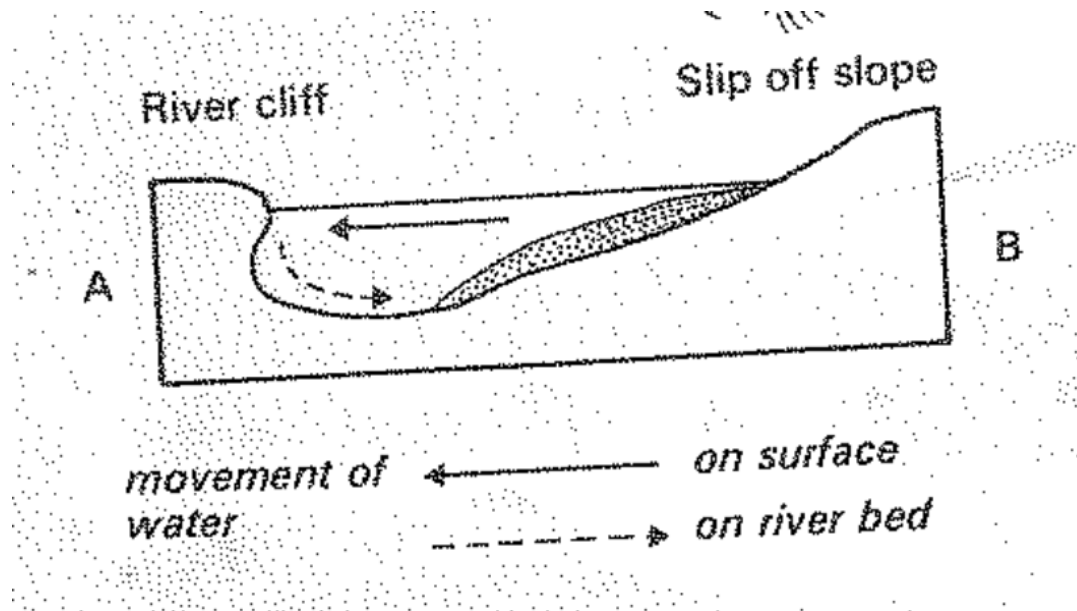
When the angle of the slope reduces from the steep surface to an undulating landscape, the speed of the water in the river valley is greatly reduced and the river may be forced to meander in the 2<sup>nd</sup> and 3<sup>rd</sup> stages of the river.

### TYPES OF MEANDERS

#### (1) In-grown incised meanders.

These are under cut meanders composed of alternating steep sides with undercut slopes facing gentle sides of slip-off slopes.

They often develop on rocks of uniform resistance to erosion where the base level falls gradually. As a result in-grown incised meanders are of asymmetrical profile. (not uniform)  
e.g R.Mwachi North West of Mombasa and R.Umzimukulu and R.Ruizi.



## (2) Entrenched incised meanders

These are steep sided with symmetrical cross profile.

It develops on weak rocks where the base level falls quickly as a result of rapid vertical incision eg R.Mangeni, R.Mtavuna, R.Mkomazi and R.Mpanga have entrenched meanders. Entrenched meander (diagram).



## OLD STAGE/ SENILE/LOWER COURSE PLAIN COURSE

### Characteristics

- The valley is U-shaped which gained its shape from the middle stage.
- The gradient is totally reduced. Hence the river is flowing sluggishly/slowly.
- The river is braided.
- River bends are very pronounced and in fact, the river is characterized by numerous meanders eg on R.Ruizi in Mbarara.
- The valley floor is totally covered with a layer of sediments.

## 16.7 FEATURES FORMED.

### 1. Flood plain.

Is a low lying swampy plain covered with alluvial deposits of sands, silts, gravel and muds.

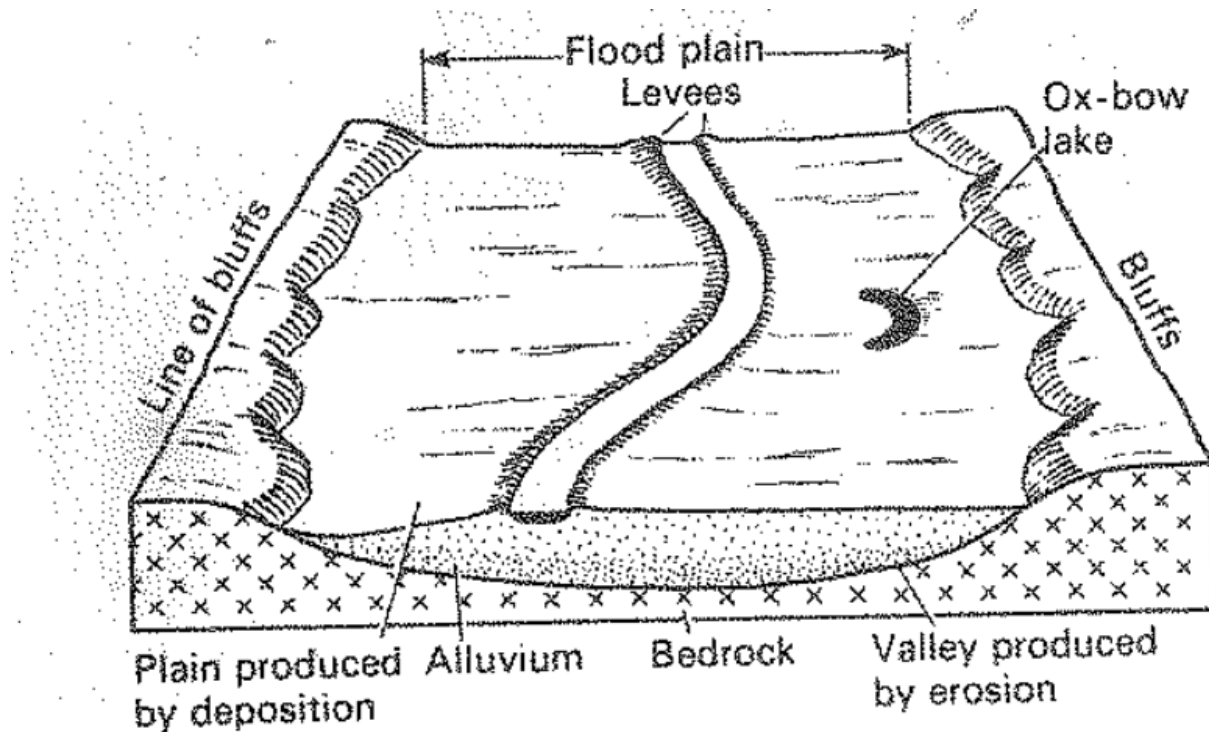
### Formation

Its formation begins during the maturity stage. The whole valley floor is ultimately widened by lateral erosion which is affected by meanders migrating down stream.

Active deposition begins to take place during maturity and the whole valley floor is ultimately affected as meanders wander across it.

When the age of maturity is reached, the river begins to over flow its banks and it deposits fine silts and muds on the valley floor. This is the final stage in the formation of a flood plain.

### Diagram



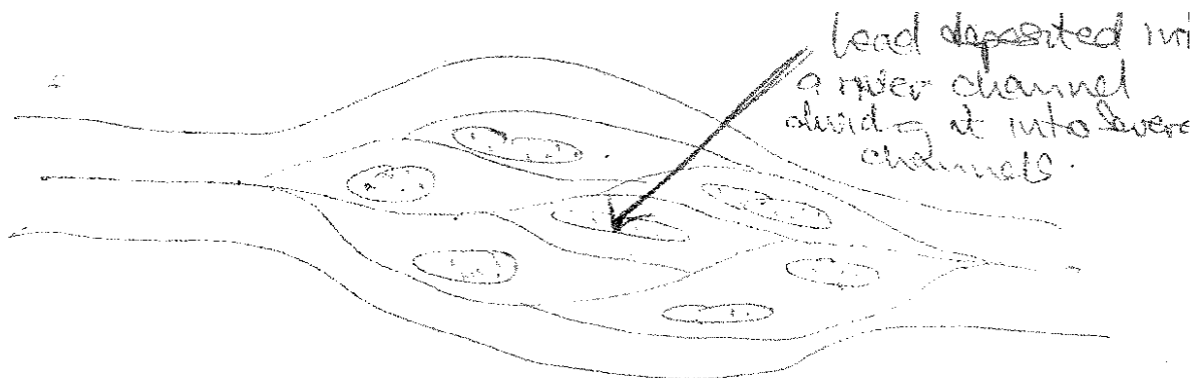
Examples of flood plains are seen on R. Ruizi, Semuliki, Nzoia and Nile in Egypt and Sudan.

### Characteristic features of flood plain

#### 1. River Braids

The river carries a heavy load some of which is deposited on its bed. This may produce mounds which divide the river channel into several channels. When this happens, the river is said to be braided.

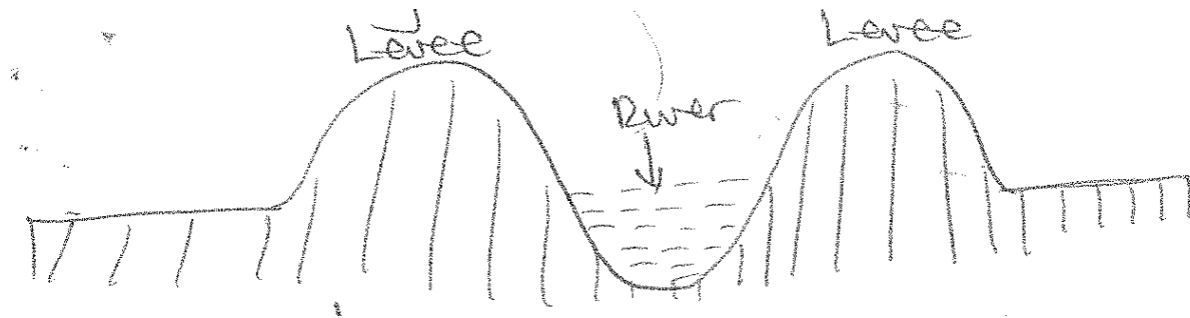
### Diagram



## 2. Levees

These refer to the pronounced banks of a river which develop onto a flood plain. They are formed as a result of a river building up its banks by depositing alluvium along side it.

*Diagram*



## 3. Deffered/post poned junction

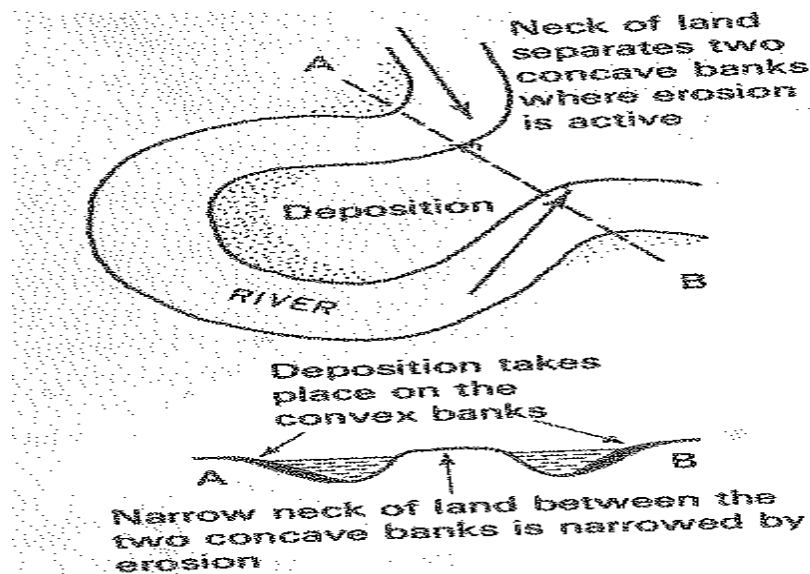
This occurs when the tributary is unable to join the main river because of the levees so that the junction is postponed eg R.Yazoo, a tributary of R. Mississippi flows for a long distance parallels to the Mississippi river before it is able to join it.

## 4. Ox-Bow Lakes

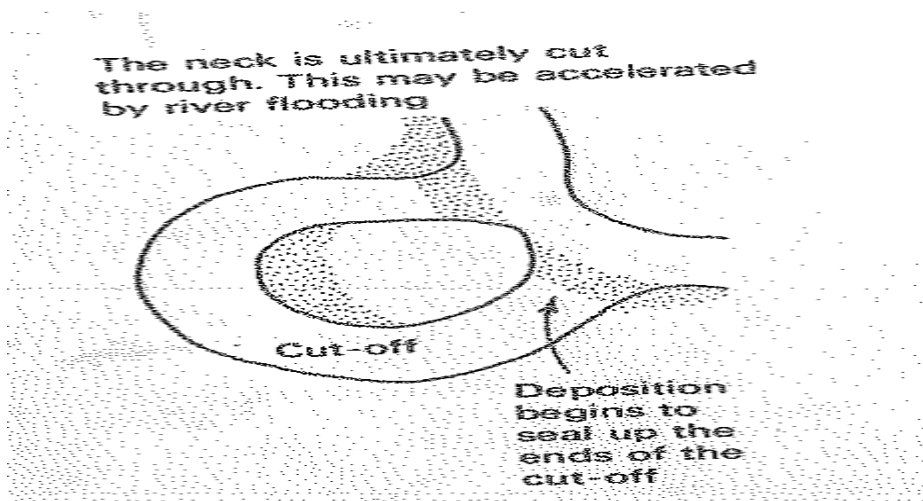
These lakes are formed where there is an acute meander with a narrow neck of land separating two concave banks which are being undercut.

The neck is ultimately cut through. This is always accelerated by river flooding. Deposition begins to seal up the ends of the cut-off to form ox-bow lakes.

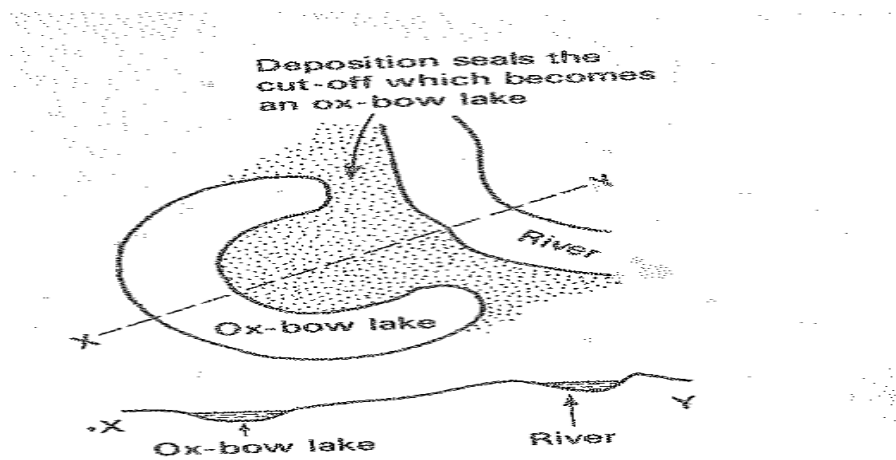
*Stage 1 diagram*



*Stage 2 diagram*



### *Stage 3 diagram*



### **Note**

Deposition along the convex banks increases after the formation of the ox-bow lake, the river bed and banks are steadily raised by the deposition and ultimately the river lies above the level of the ox-bow lake.

### **DELTAS**

A delta is a large flat low lying swampy plain characterized by the presence of deposited material, distributaries, small lakes and lagoons and vegetation.

A delta usually has a triangular shape formed at the mouth of a river as it enters a sea or lake or ocean.

### **CONDITIONS FOR THE FORMATION OF DELTAS.**

*Before a delta is formed, the following conditions must be met:-*

1. Active vertical and lateral erosion in the upper course of a river to provide extensive sediments to be deposited and form deltas.
2. The coast should be sheltered preferably tideless, allowing the deposited materials to stay and pile up.
3. The sea adjoining the delta should be shallow, or else the load disappears in deep waters.
4. **There should be no large lake in the river's course to filter off the sediments.**
5. There should be no strong currents running at right angles to the river's mouth, washing away the sediments.
6. **The velocity of the river must be too low as to allow deposition in the river's mouth.**
7. Rivers load must be deposited faster than can be removed by the action of tides and currents.

#### **FORMATION OF DELTAS**

- ✓ A large load and because of low river velocity, is deposited near the river's mouth.

There is coagulation of fine materials mixing with salty sea water.

- ✓ The deposited materials / sediments block the existing river channels causing new distributaries to form and with the growth of vegetation, distributaries are encouraged to form.

- ✓ Spits and bars together with lagoons are formed.

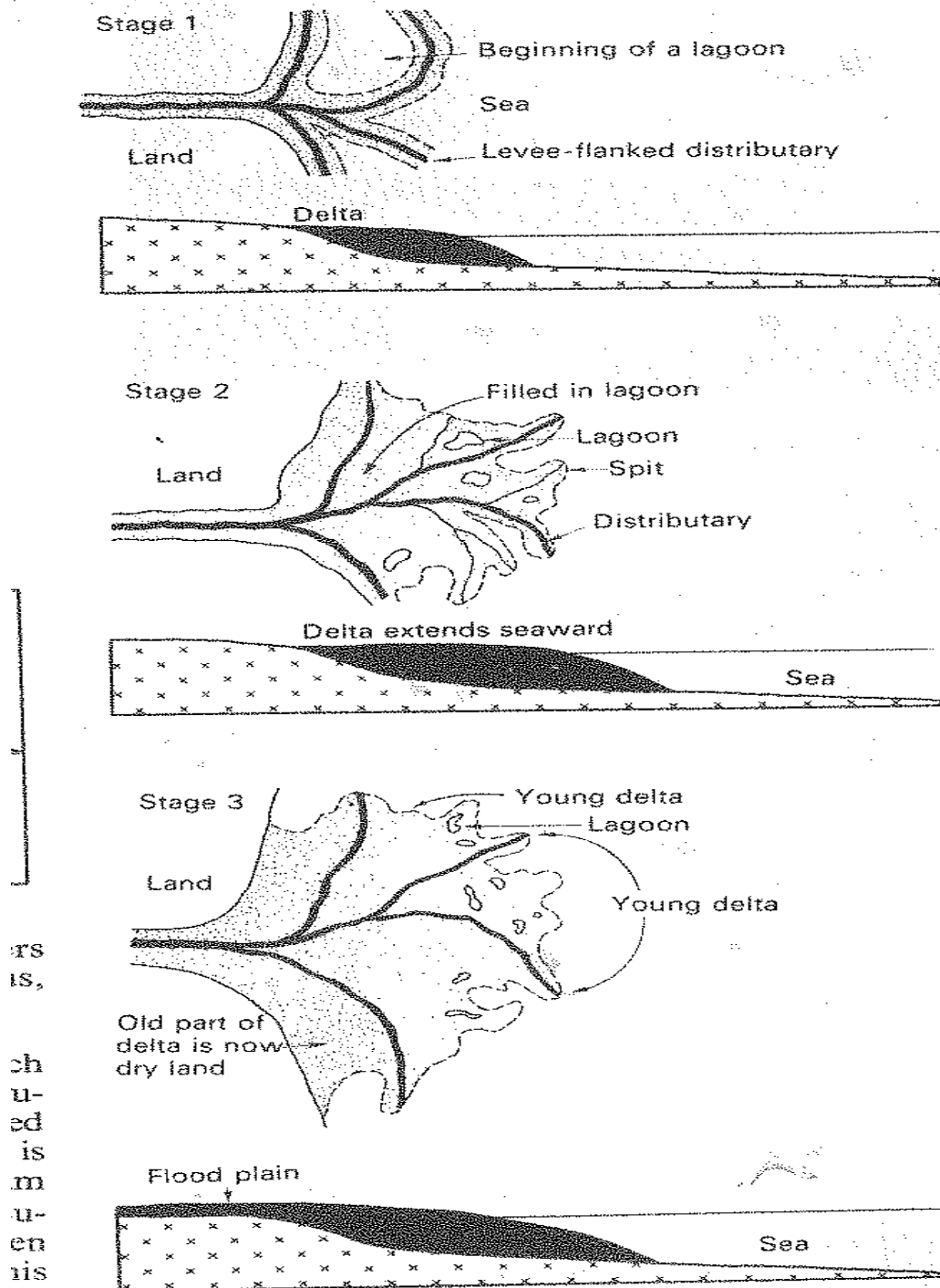
- ✓ Lagoons get filled with sediments and become swampy.

- ✓ Deltas thus take a solid appearance.

- ✓ Plants colonise the older/upper delta and its height eventually raised swamps disappear leaving a dry delta.

- ✓ Older parts of the delta eventually become part of the flood plain.

## Diagrams illustrating formation of deltas



## TYPES OF DELTAS

### 1. Arcuate deltas

These are formed of coarse and fine sediments such as gravel and sand. They are

triangular in shape or they have a shape of an inverted cone and many distributerries eg. R.Niger and Nile deltas.

## **2. Estuarine Deltas**

These are built by rivers depositing material in a submerged river mouth. Sand banks are formed with several distributerries winding around them.

They take the shape of an estuary eg R. Congo between Boma and Banana ports before it reaches the ocean.

## **3. Bird's foot digitate deltas**

These are formed by rivers carrying very fine materials/silts into the water where wave energy is too low to remove it.

There are a few long distributerries boarded by levees eg. R. Omo in Ethiopia as it enters Lake Turkana.

## **IMPORTANCE OF DELTAS**

✓

### **Disadvantages**

✓ They may hinder the development of ports and harbours as well as inland transport because rivers channels across them are very shallow due to continuous silting.

✓ Deltas often lead to flooding of the land scape adjacent to them. As a result, they may interfere with settlement, construction of roads and railways and may encourage the spread of bilharzia and other water born diseases.

### ***Question***

***(a) Distinguish between deltas and estuaries.***

***(b) Account for the formation of deltas.***

## **16.9 RIVER CAPTURE.**

Is the process where by one river course is diverted into a system of an adjoscent powerful river which is able to erode into the valley more rapidly than its weaker neighbor.