

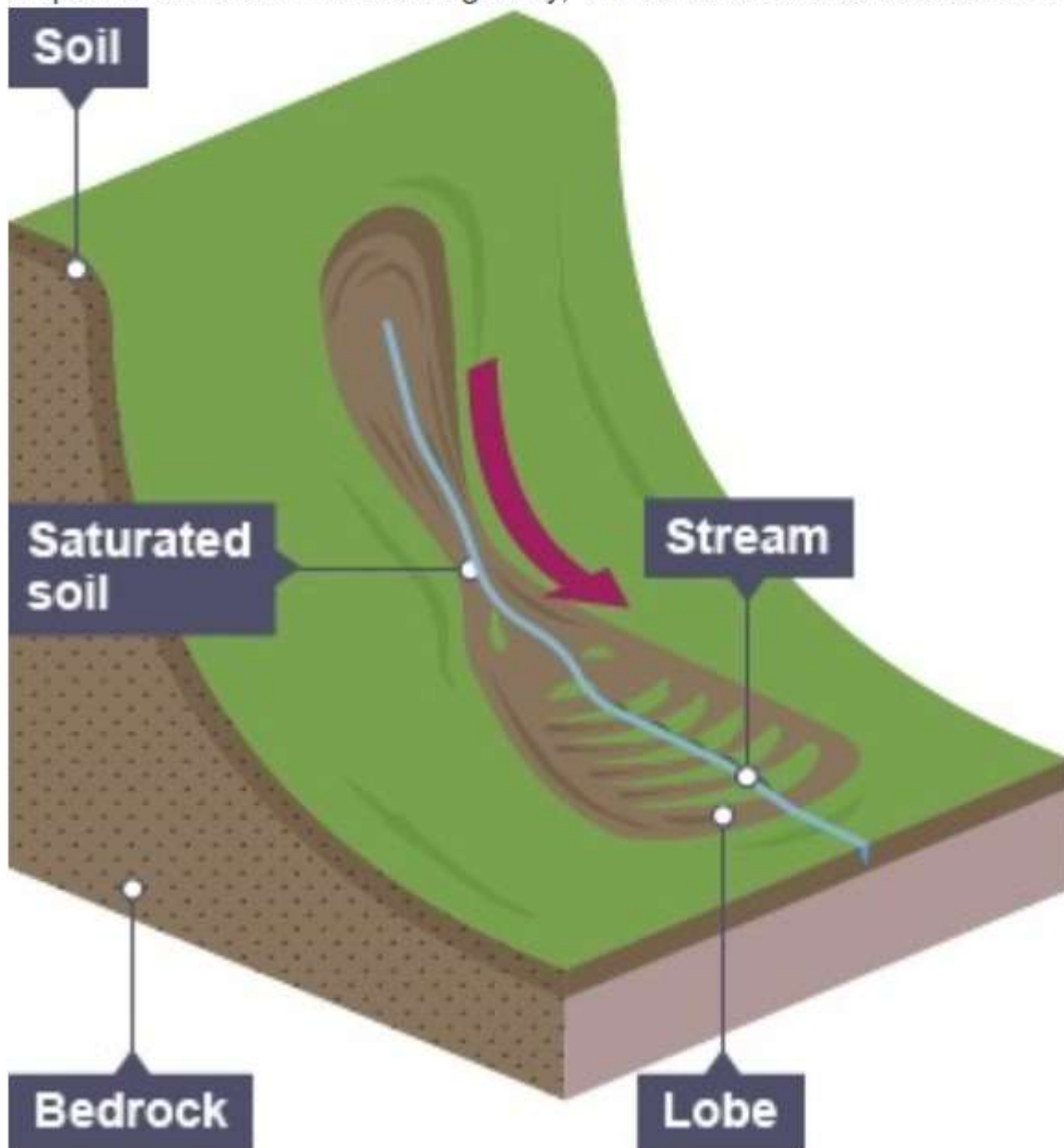
Geography Class 17

REVISION OF THE PREVIOUS CLASS (9:12 AM):

- Tsunami is a series of large waves of extremely long wavelengths and periods usually generated by a violent, impulsive undersea disturbance.
- The immediate reason is the vertical upliftment of the water column.
- The stages of the tsunami are:
 - I. Generation- can be caused by underwater earthquakes, volcanic eruptions, landslides, nuclear explosions, meteorite impacts, etc.
 - II. Propagation in deep water.
 - III. Propagation in shallow water.
 - IV. Landfall.
- Until the tsunami waves move in deep water, the speed is very high and the amplitude is very low.
- As the waves enter shallow waters, speed decreases and amplitude increases, which gives them a large height.
- This is called **Shoaling Effect**.
- After this, landfall occurs and coastal areas get submerged.
- **Weathering** is the **in-situ** breakdown of rocks wherever they are located.
- Agents of weathering include temperature, water, slope aspect, rock type, etc.
- Types of weathering- Physical, Chemical & Biological.
- **Erosion** is an **ex-situ** process.
- Types of erosion- abrasion, attrition, cavitation, corrosion, deflation, hydraulic action. and Plucking

Mass Movements:

- Mass movement involves the movement of weathered material along downhill slopes under the influence of gravity, with or without the assistance of water.



- A **landslide** is a type of mass movement.

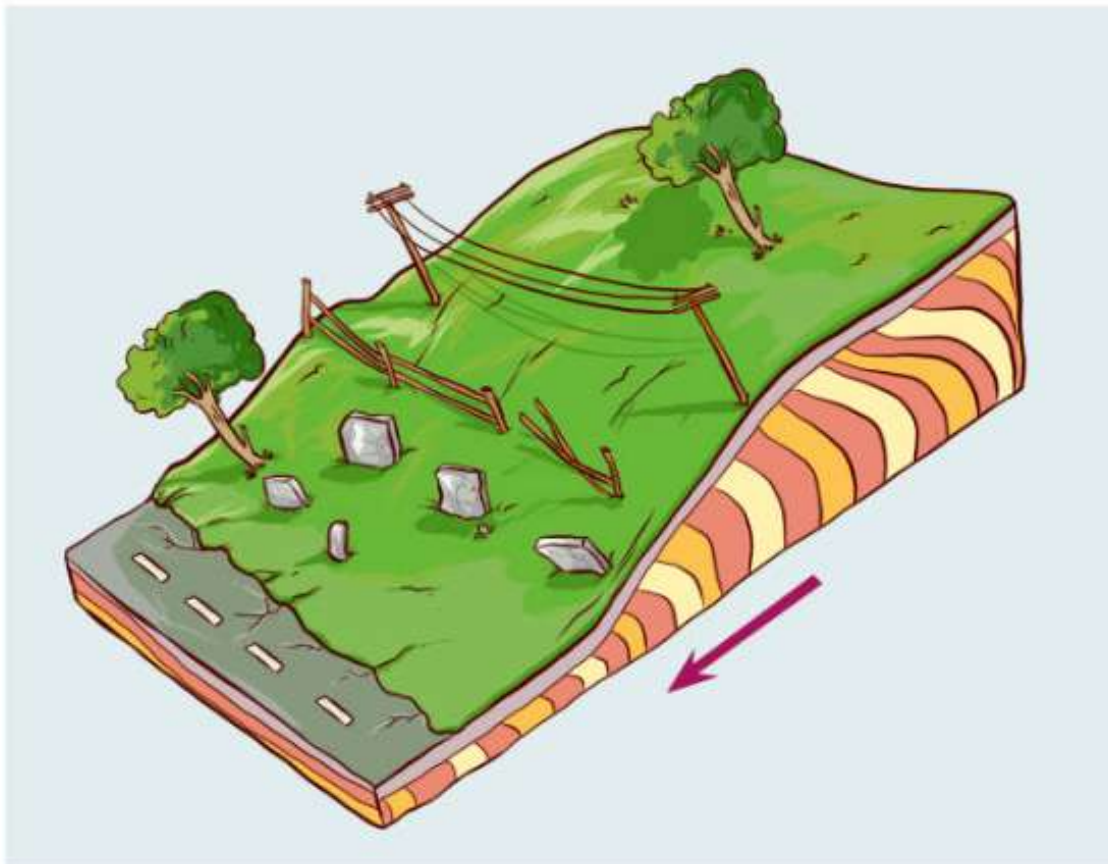
Classification of Mass Movements:

Slow Mass Movements	Rapid Mass Movements
<ul style="list-style-type: none">◦ Creep/Soil creep◦ Solifluction	<ul style="list-style-type: none">◦ Landslide◦ Earthflow◦ Mudflow◦ Rockslide/Rockfall

SOIL CREEP (9:30 AM):

- It is the slow downhill movement of the soil and the weathered mantle(lower rock layers, and not the earth's interior) occurring along the slopes.
- It is a continuous movement, but it is difficult to notice.

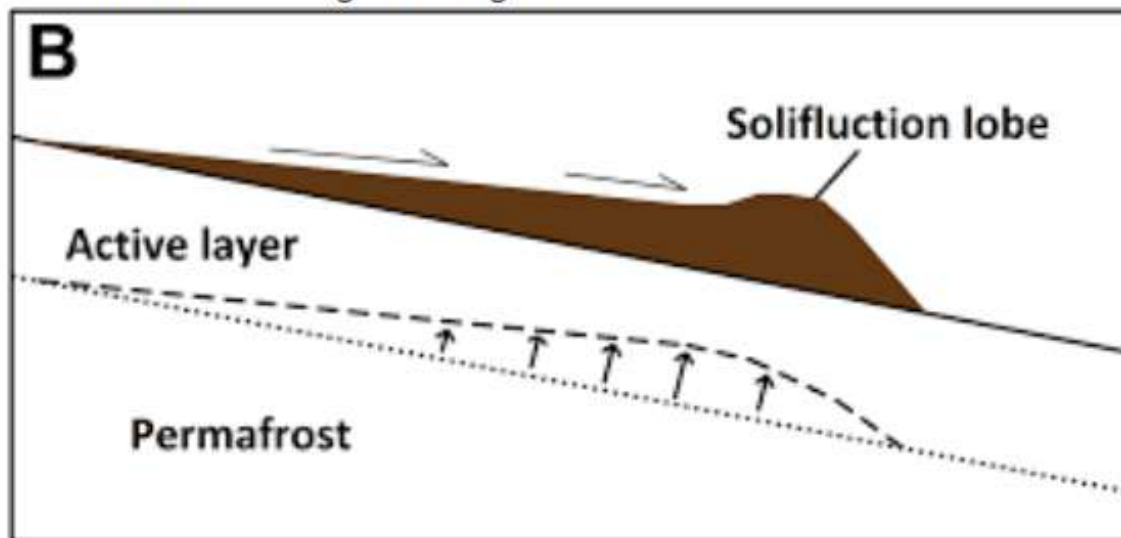
SOIL CREEP



- It must be monitored carefully because we can never tell when the speed of downhill movement will get suddenly accelerated.

Solifluction:

- It involves the slow movement of soil mixed with water as a viscous fluid.
- It is found near the glacial regions.



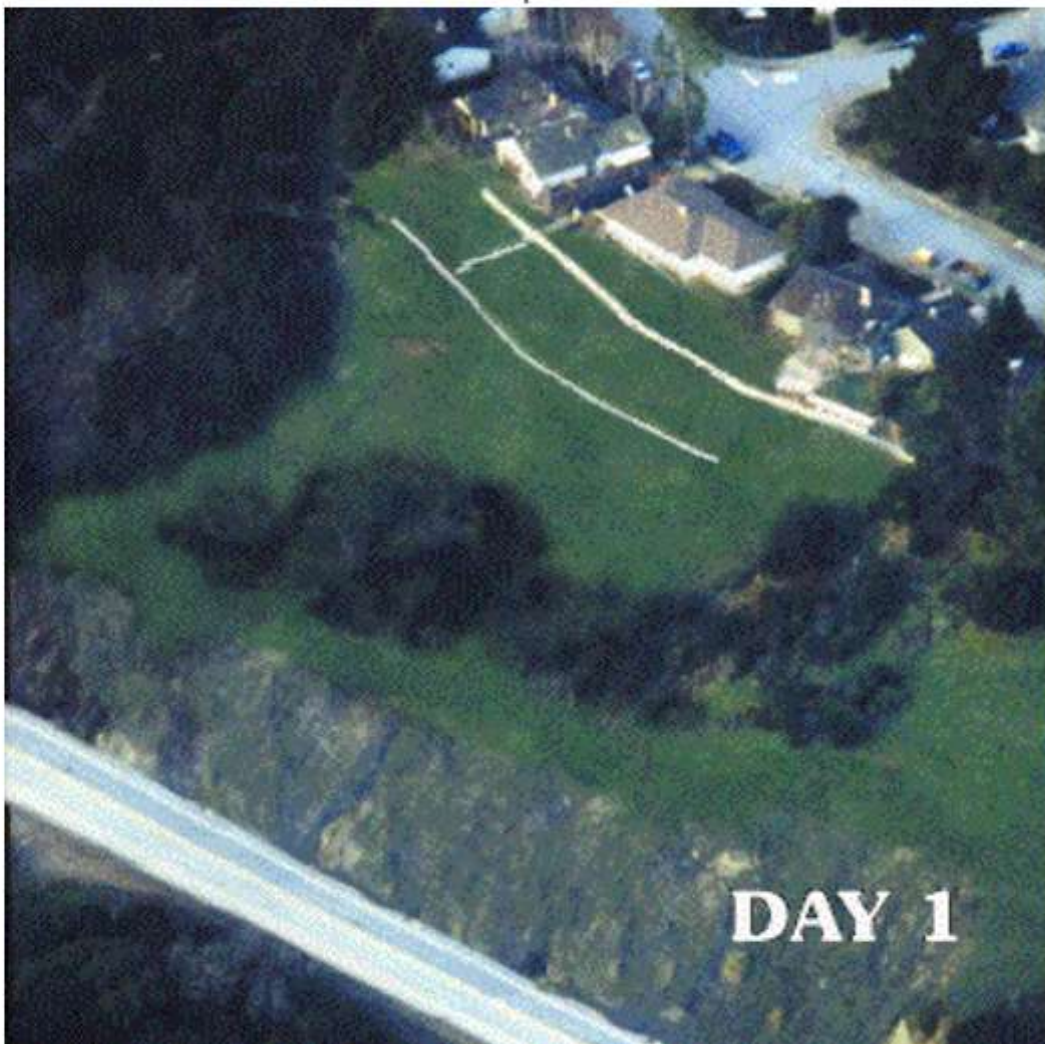
Landslide:

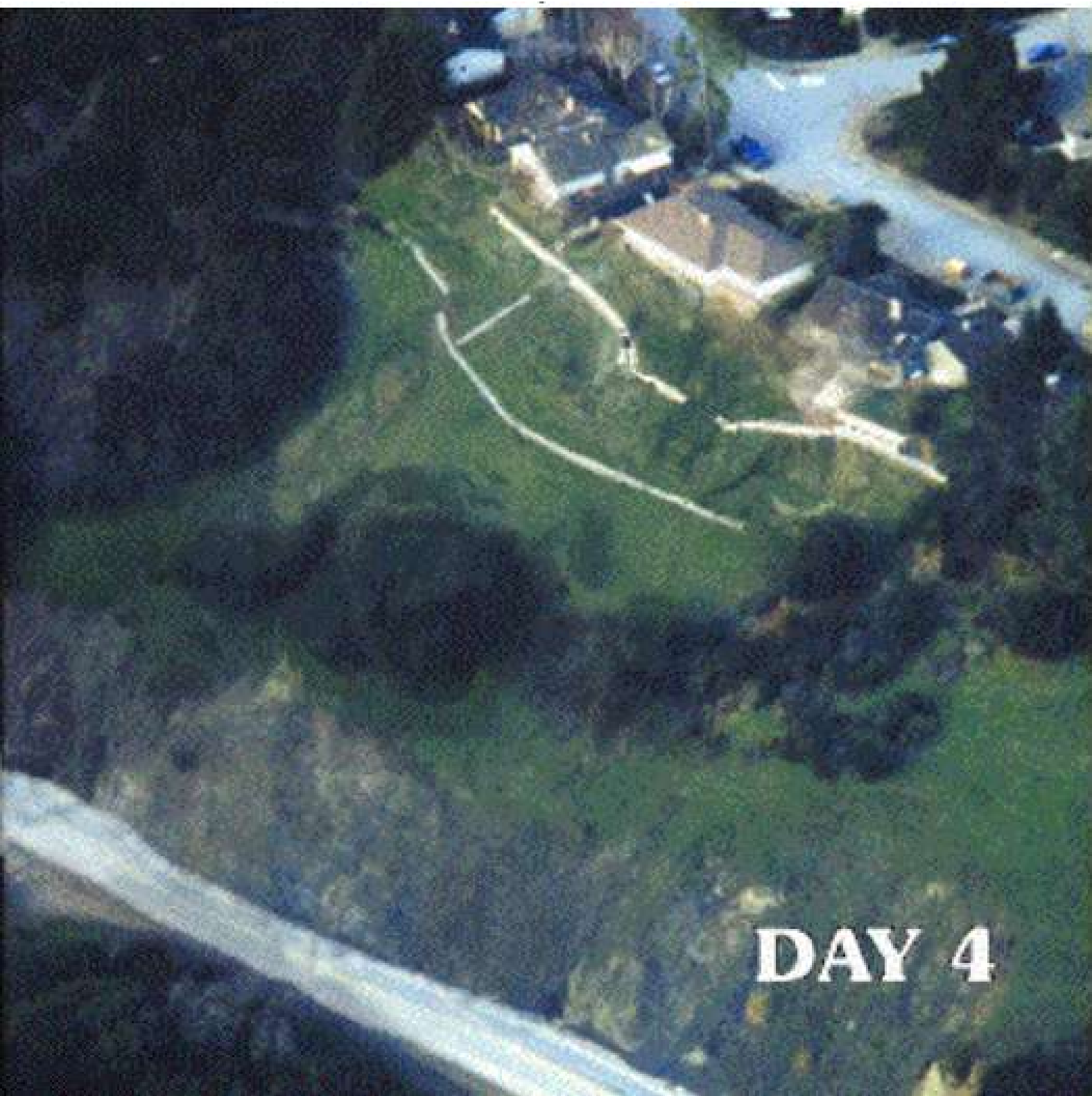
- It is the movement of the cross-section of the hill slope under the influence of gravity.
- The material maintains continuous contact with the surface as it moves.



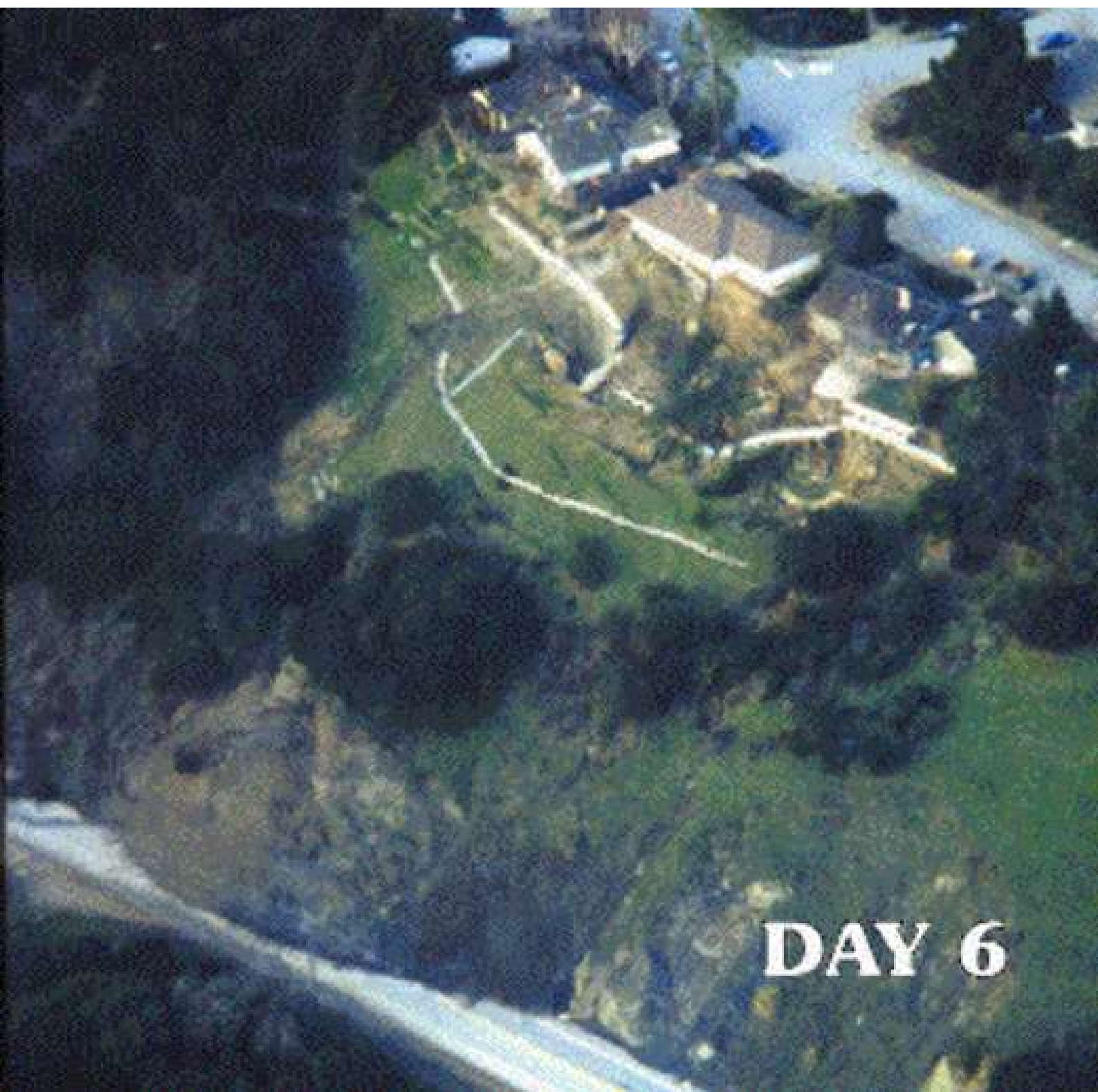
Earthflow:

- It is a movement of the terraces and hill sites due to the weakening of lower layers or its saturation with water.
- The entire upper layer will start to move.
- It is a faster version of soil creep.

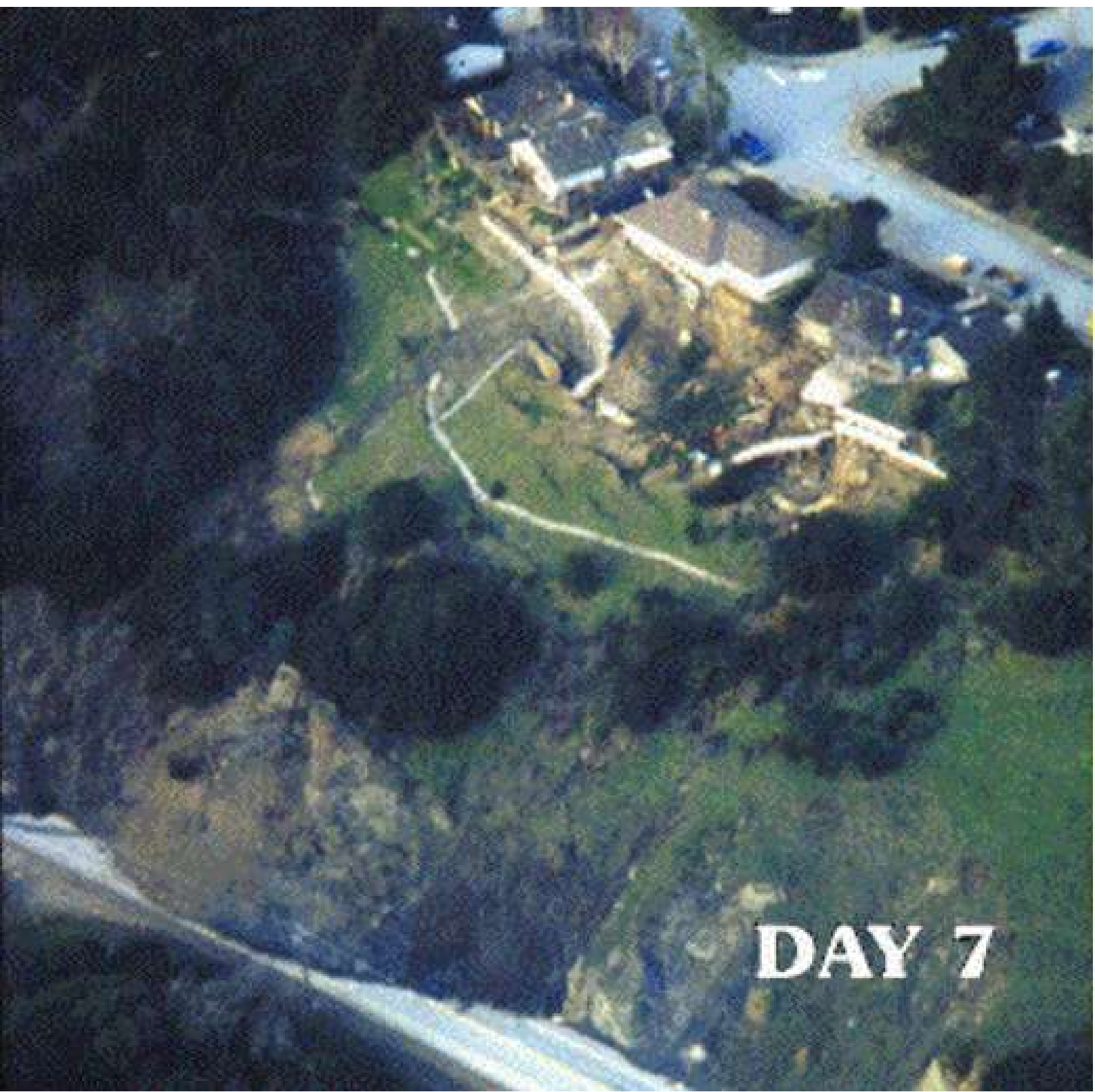




DAY 4



DAY 6



DAY 7

Mudflow:

- It is the rapid movement of masses of uncompacted soil saturated with water.

Rockslide & Rockfall:

- They involve the rapid movement of broken rock material along the hill slopes.
- Rockfall happens when the slope is too steep.



Landslide:

- **Natural causes:**

- Earthquakes(not in the Western Ghats)
- Sedimentary rock layers.
- Heavy rainfall & cloudbursts.
- Volcanic eruption.
- Floods.

Anthropogenic causes:

- Tunneling.
- Construction of roads, railways, dams, reservoirs, etc.
- Deforestation.
- Overgrazing.
- Disturbance of drainage pattern.
- Mining.
- Increased tourism activities.
- Increased soil erosion.

Reasons for mass movements in the Himalayas:

- Himalayas are tectonically active.
- They are mostly made up of sedimentary rocks and unconsolidated and semi-consolidated deposits.
- The slopes are very steep.

Some differences between the Himalayas and the Western Ghats:

- Western Ghats are relatively tectonically stable because their formation process stopped long back.
- Western Ghats are mostly made up of hard rocks.
- The region sees considerable mass movements like landslides, but less than the Himalayas.

Reasons for mass movements in the Western Ghats:

- Many slopes are steeper with almost vertical cliffs.
- Mechanical weathering due to mining and other human interventions.
- The region sees high rainfall in short periods.

LANDFORMS (10:10 AM):

- They are the results of exogenetic events that happen on the earth's surface.
- They happen due to either erosion or deposition.

Self Study:

- Ncert class 11, Chapter 7 will be enough.
 - G.C. Leong chapters 5-10 can be skipped.
- We can have different types of landforms/topographies:

Exogenic factor	Type of Landform
Running water	Fluvial/Riverine Landforms
Underground water	Karst
Sea waves	Marine landforms
Winds	Aeolian /Desert landforms
Ice Sheets	Glacial landforms

Riverine Topography:

- A river passes through three stages- Youth, Mature & Old.

Feature	Youth Stage	Mature Stage	Old Stage
Slope	High	Moderate	Very Low
Energy(Speed)	Very High	Moderate	Low
Erosion	Very High(Vertical)	Moderate(Lateral)	No
Deposition	No	Moderate	High
Meandering	No	Moderate	High

DIFFERENT LANDFORMS (10:40 AM):

Topography	Agent	Processes/Conditions	Erosional Features	Depositional Features
Riverine	Running Water	<ul style="list-style-type: none"> ◦ Corrasion ◦ Attrition ◦ Cavitation ◦ Corrosion ◦ Hydraulic Action 	<ul style="list-style-type: none"> ◦ V-Shaped Valleys ◦ Gorges, Canyons ◦ Rapids-Cataracts-Waterfalls ◦ Plunge pools ◦ Potholes ◦ River capture & wind gap ◦ River Cliff 	<ul style="list-style-type: none"> ◦ Slip-off slope ◦ Oxbow lake ◦ Alluvial fan ◦ Delta ◦ Estuary ◦ Floodplain ◦ Levees.
Karst	Groundwater	<ul style="list-style-type: none"> ◦ Presence of limestone & dolomite. ◦ Soft and permeable strata above hard strata. ◦ Moderate-High rains. ◦ Corrasion ◦ Attrition ◦ Corrosion ◦ No hydraulic action because water is not very fast flowing here. 	<ul style="list-style-type: none"> ◦ Sinkhole ◦ Doline ◦ Uvala ◦ Swallow hole ◦ Blind valley 	<ul style="list-style-type: none"> ◦ Stalactite. ◦ Stalagmite ◦ Cave Pillars

Youthful stage of the river:

- The river is at its highest erosive capacity.
- Long narrow V-shaped valleys initially have a slightly convex but steeper wall.



- These reliefs are called **gorges**.
- Gorges are found at specific places where there are hard rocks.



- **Canyons** are formed where there are horizontally bedded sedimentary arrangements.

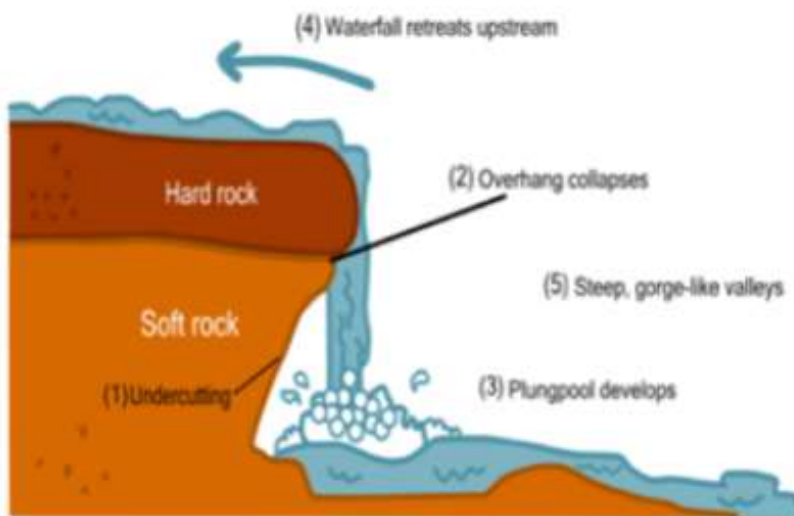
- **Canyons** are formed where there are horizontally bedded sedimentary arrangements.



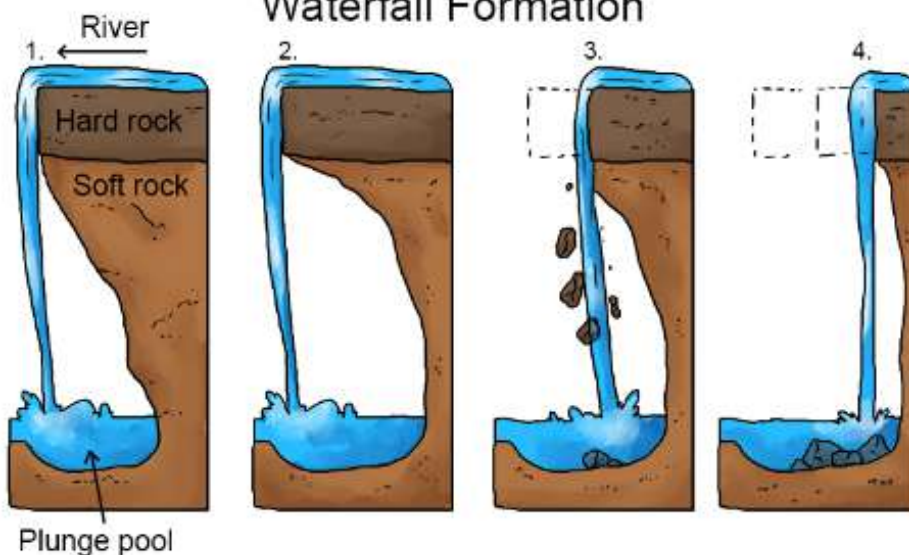
- Gorges have vertical walls.
- Even though the walls of canyons are vertical, the walls are gentle near the ground.
- We do not see V-shaped valleys in the Himalayas but not in peninsular India because the rivers are old and the rocks are harder

Waterfalls:

- Waterfalls often form in the upper stages of a river where it flows over different bands of rock.
- It erodes soft rock more quickly than hard rock and this may lead to the river seeing a very steep drop in its course, hence creating a waterfall.



Waterfall Formation



Cascades:

- They are steplike waterfalls.
- They are a series of small, continuous waterfalls.



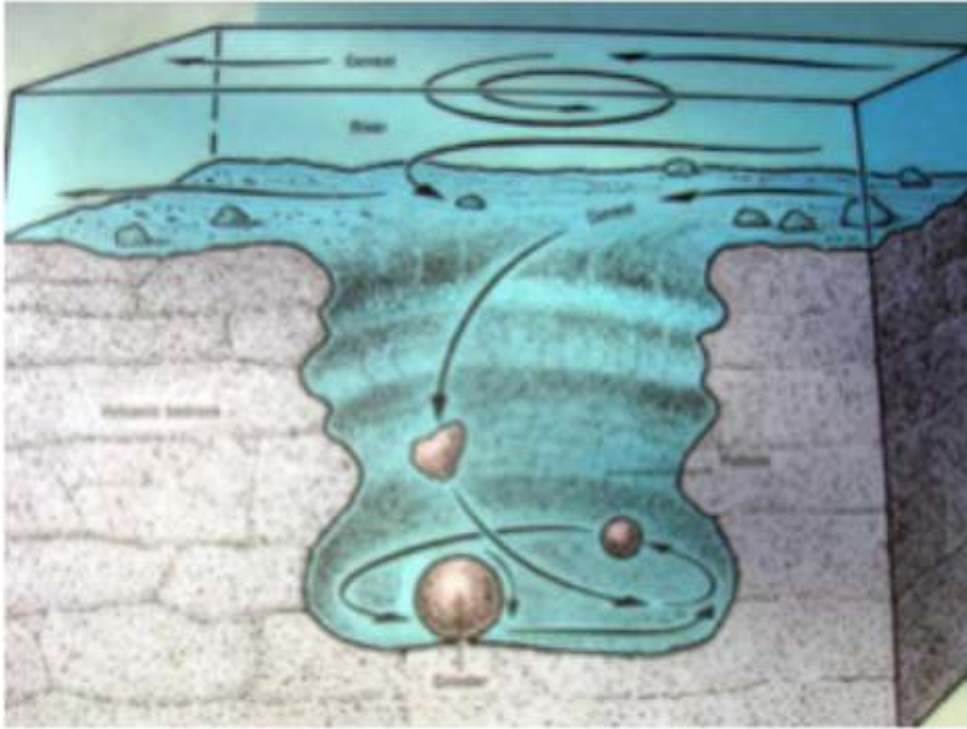
Rapids:

- They are the dangerous part of a river that flows very fast because it is steep and sometimes narrow.



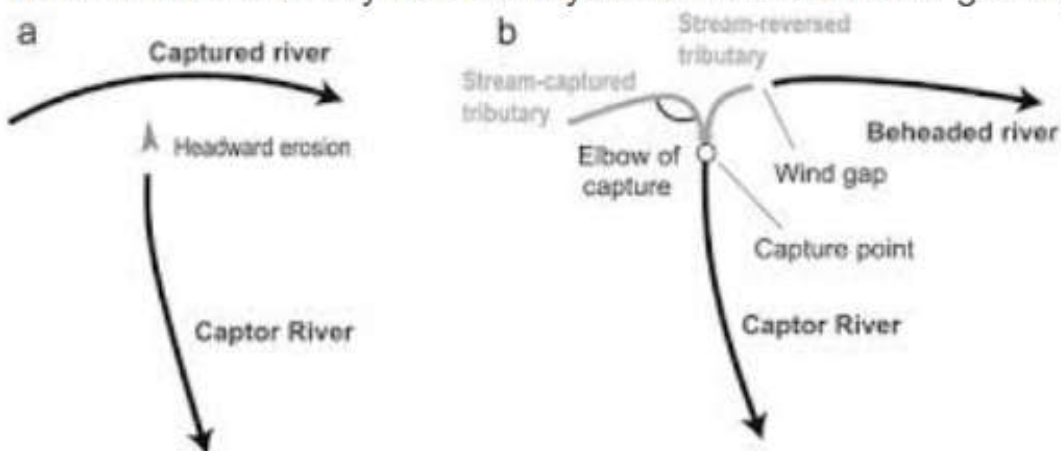
Potholes:

- They get developed due to the erosional actions of rocks due to the eddy currents of the water.



River capture:

- The process of headward erosion, especially in the youthful stage can result in completely taking over parallel-flowing rivers
- There is also a theory that the mythical Saraswati river got captured by Ganga.



DEPOSITIONAL FEATURES OF THE RIVER (11:15 AM):

Meanders:

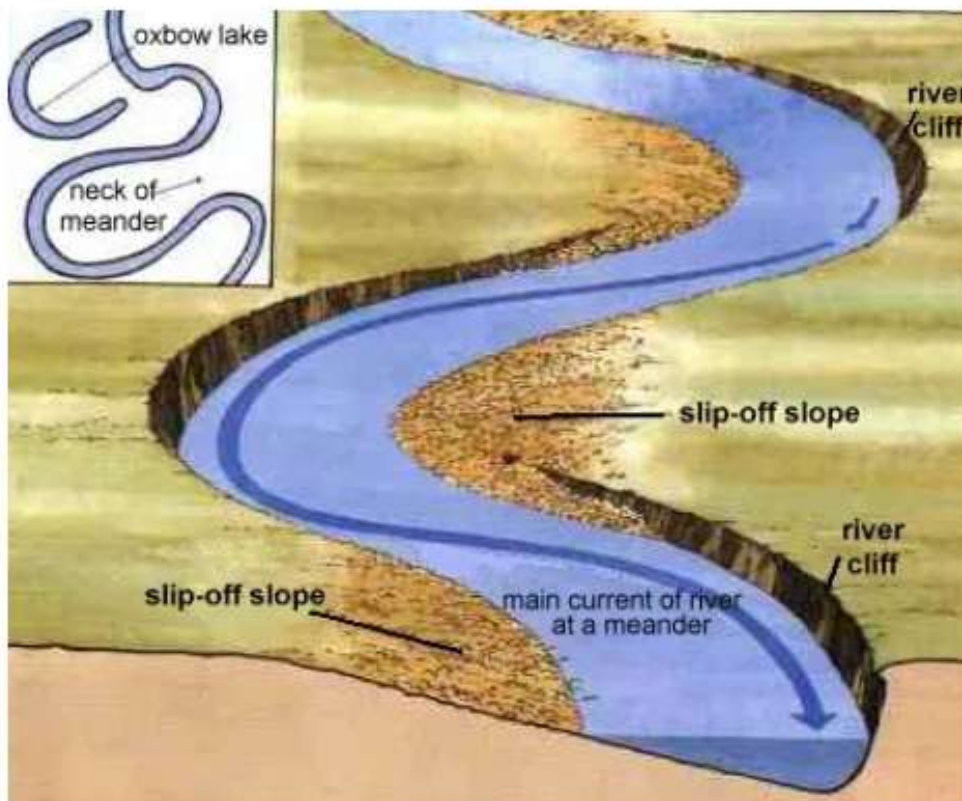
- A meandering stream has a single channel that flows snakelike through its valley.



- As water flows around these curves, the outer edge of the water is moving faster than the inner edge.

Oxbow lake:

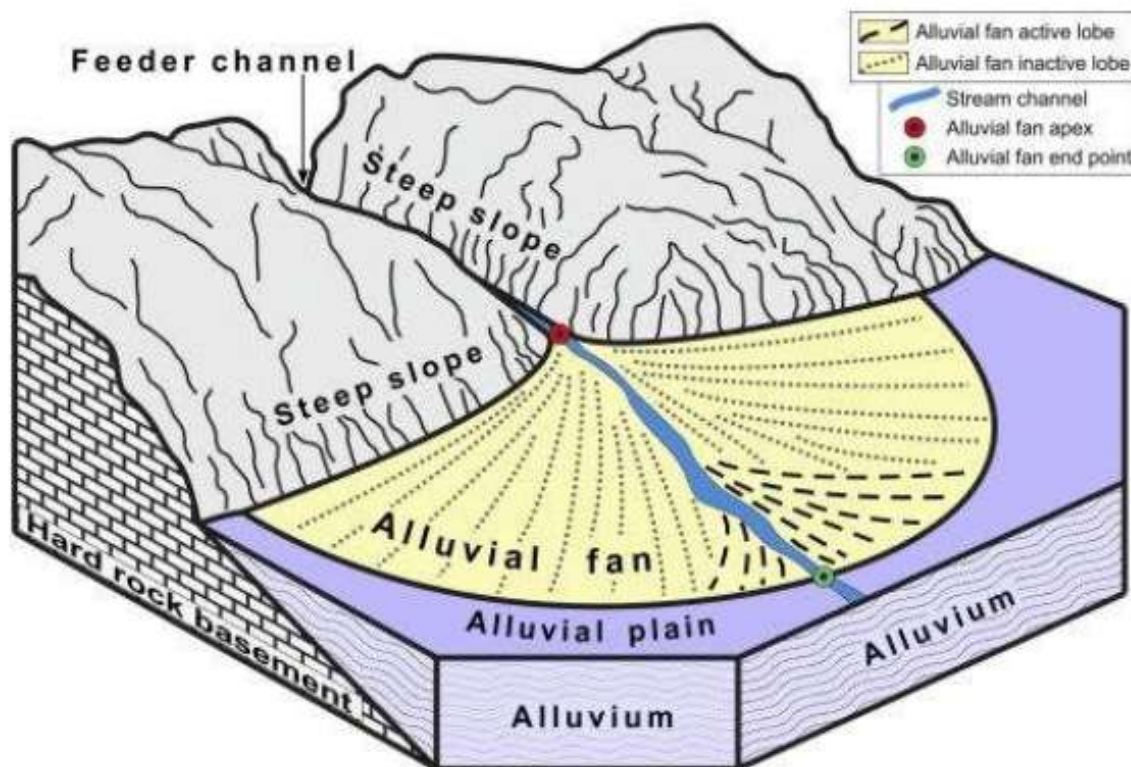
- These form when the action of the River cliff and slip-off slope cuts the river creating a free-standing body of water called **Oxbow Lake**.
- River cliff is an erosional feature while slip-off slopes are depositional features.
-



- Even tectonic or seismic activities can form oxbow lakes.

Alluvial fan:

- It is a triangular deposit of gravel, sand, silt, etc. which is seen when the river meets a region with a flat gradient like feet of mountain or canyon.
- Alluvial fans are formed in the youth stage of the river and they have large size sediments.
- Delta is formed in the old stage of the river and it has smaller sediments.
-



Delta:

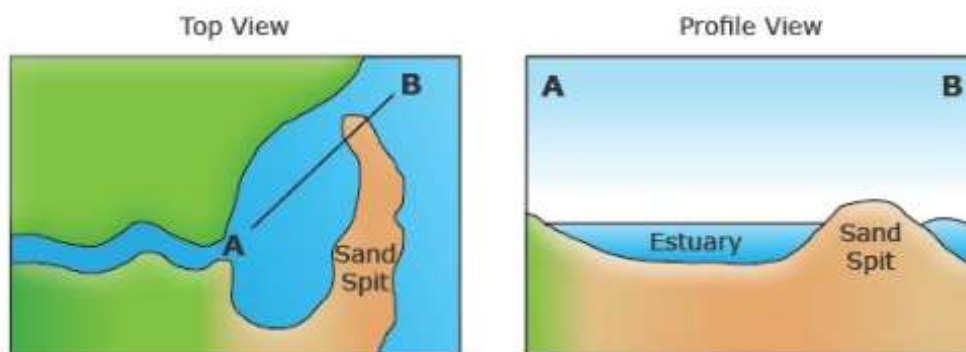
- This is a depositional landform that is formed at the mouth of the river.
- The Sundarbans delta of the Ganga and Brahmaputra rivers is the largest delta in the world.



Bhagirathi from Gangotri glacier in Uttarkashi district of Uttarakhand meets with Alaknanda in Devprayag and goes forms Uttarakhand, Uttarpradesh, Bihar, Jharkhand and divides into two tributaries in West Bengal among them one flows in West Bengal whose name is Hoogli and one which flows in Bangladesh is named as Padma which then merge with Bhramaputra river and forms river Meghna which then forms world's largest delta known as Sundarban Delta. This Delta is listed in world heritage site in 1987.

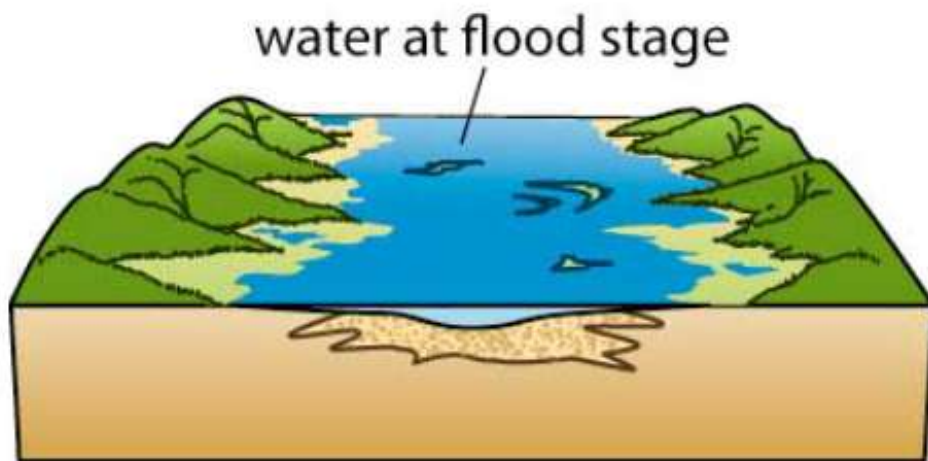
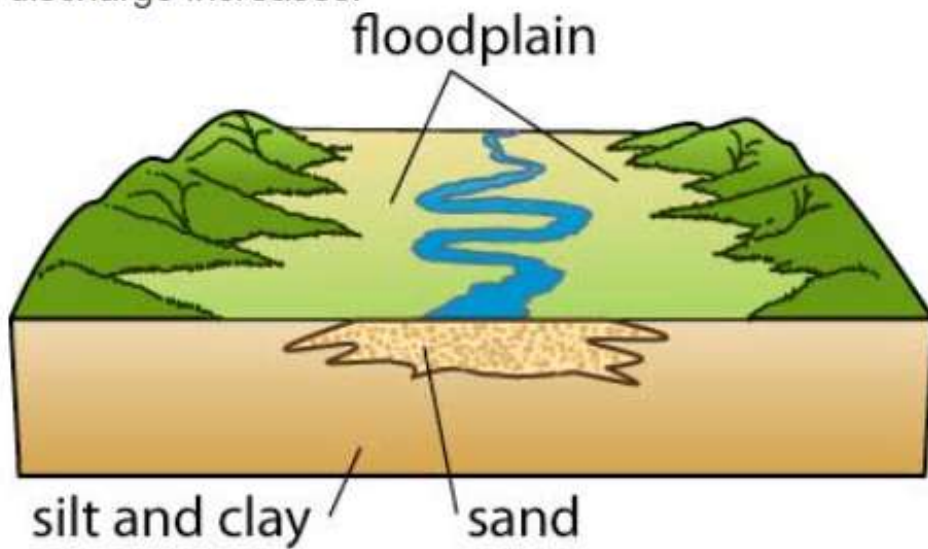
Estuary:

- In some cases, there can be no deposition by the river.
- **For example-** Amazon has huge sediments but no delta because of the large amount of water that it carries.
- Estuary is simply the region where freshwater from the rivers without significant sediment load meets the seawater.
- Most of the west-flowing rivers make estuaries like Narmada, Tapi, etc.



Floodplain:

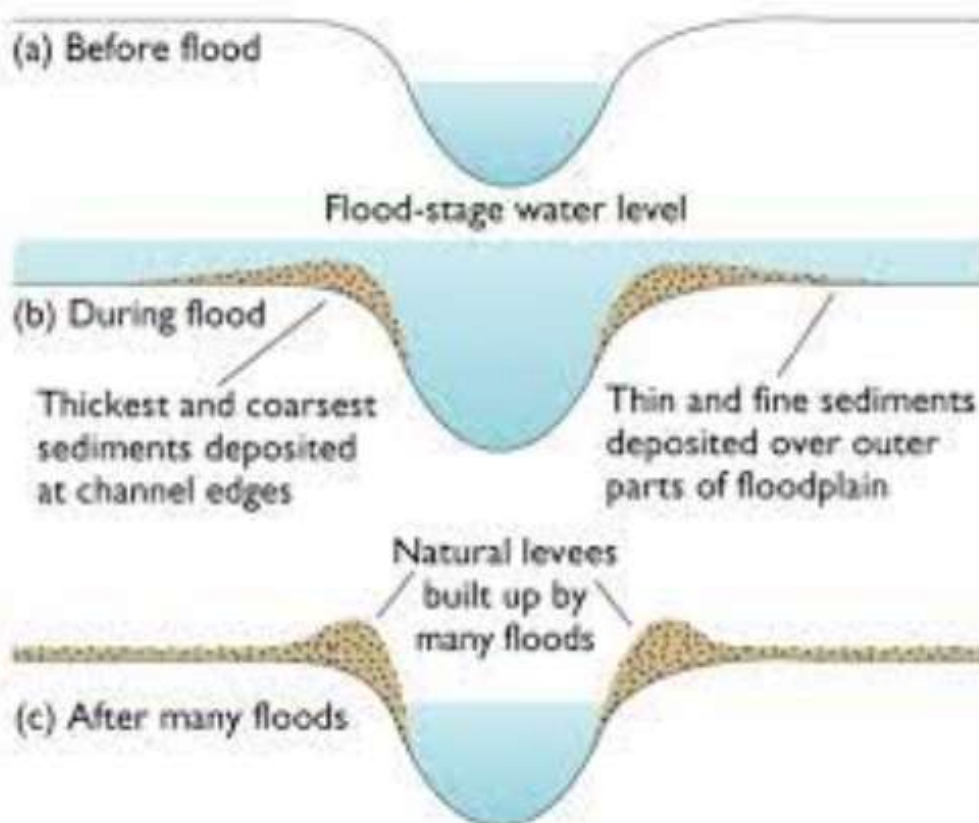
- A floodplain is an adjacent land of the river that can experience flooding if the river discharge increases.



Elizabeth Morales

Leaves:

- As the river returns to its original channel surrounding the banks, natural deposition happens along the raised section of the river bank closer to the river.
- It is known as **natural levees**.



KARST TOPOGRAPHY (10:40 AM):

- It is named after the Karst region of erstwhile Yugoslavia.
- It is seen as a result of groundwater action in regions rich in limestone and dolomite.
- Yugoslavia split in 1992 into **Balkan** states (hence the term balkanization).

SOCIALIST FEDERAL REPUBLIC OF YUGOSLAVIA AS OF JANUARI 1991



Sink Hole:

- It is found where the rock below the land surface is limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by groundwater circulating through them.
- Sinkholes can be seen anywhere but are most commonly used for karst.

Doline:

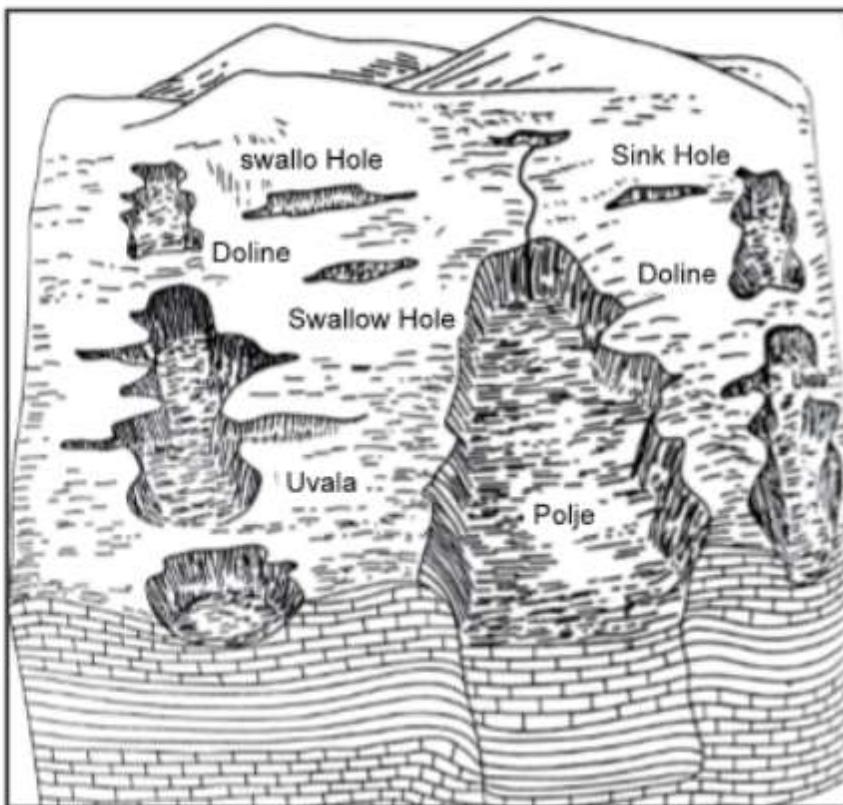
- They can be understood as sinkholes of large sizes.

Uvala:

- Uvala is caused due to coming up of multiple dolines together.

Polje

- It is a large basin of the flat floor that is formed by the coalescence of several sinkholes.
- It can occupy very large areas.



Blind Valley:

- It is formed due to the complete disappearance of water as all water seeps into the ground.
- This seeped-in water can cause erosion making caves.
- The longest and largest caves in the world are limestone caves.
- Such caves are found in Thailand, Malaysia, Cambodia, Eastern Europe, Italy, France, Mexico Yucatan peninsula, etc.
- They are also found in some northeastern states like Meghalaya.



DEPOSITIONAL KARST LANDFORMS (11:30 AM):

Stalactites:

- They are the elongated calcium carbonate depositions that appear like icicles.
- An icicle is a pendant mass of ice formed by the freezing of the dripping water.

Stalagmites:

- These appear like inverted stalactites that rise from the floor of the Karst cave.
- They give very vital information- as one deposited layer takes around 100 years to form, time analysis of different layers can point to droughts for specific time periods.
- It might also help in discovering if long droughts had wiped out civilizations.
- It also helps in ascertaining the different geological time scales - stalagmite analysis in 2017 from Mawmluh caves gave us information about what is now known as the **Meghalayan age**.

Calcite Pillars:

- They are formed as a result of the stalactites and the stalagmites coming in contact.

The topics for the next class are factors for delta formation, marine, glacial and desert topographies.

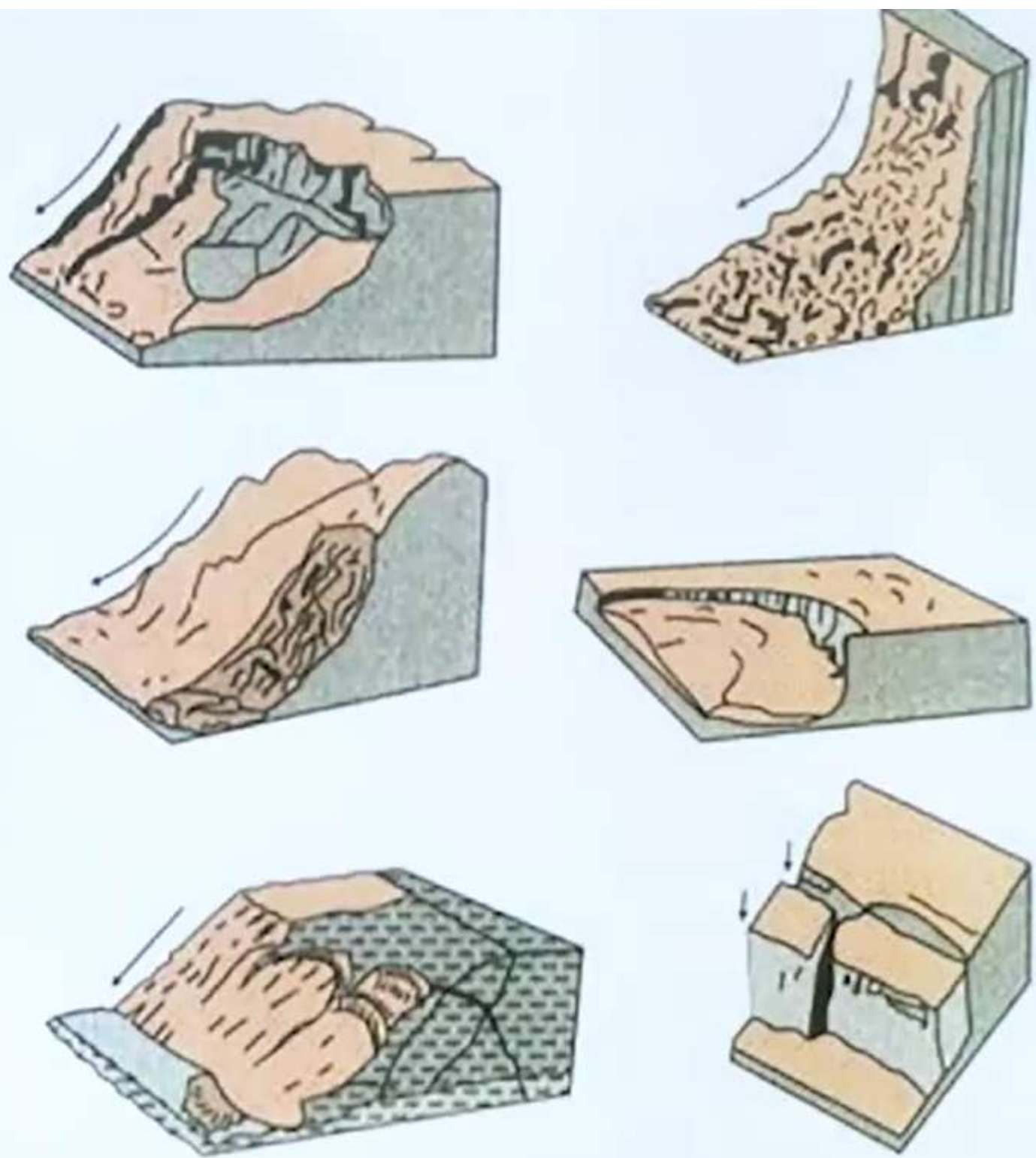


Fig.11.5. Slopes and movement of soil

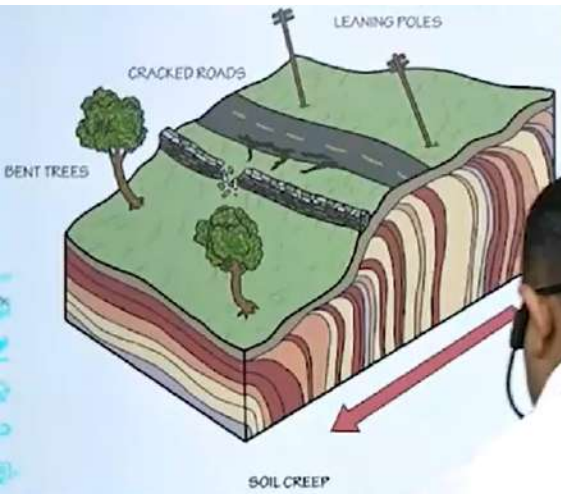


Earth flow



Mud flow





Solifluction



The Daily Item
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ABC4 Utah
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The Denver Post
Highway 50 remains closed after ...



KTOO
Rock slides close the North Douglas Hig...



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Types of Wasting: Slump, Rockslide & Debris Flow –
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Rock Fall | Napa County, CA



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Figure 7.2 : An entrenched meander loop of river Colorado in USA showing step-like side slopes of its valley typical of a canyon

Landforms



Landforms

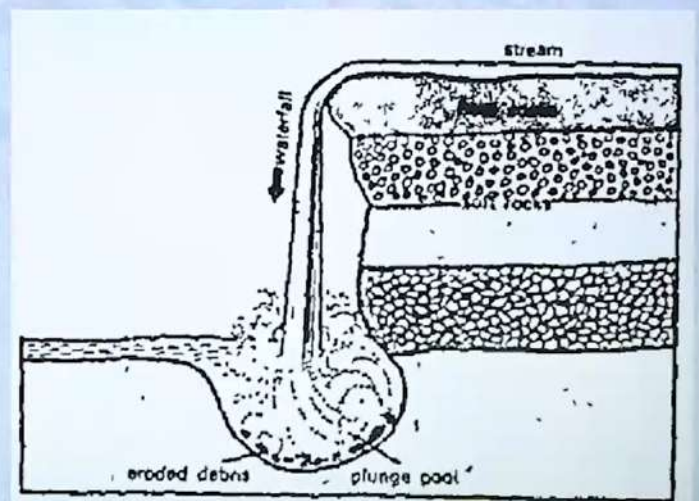
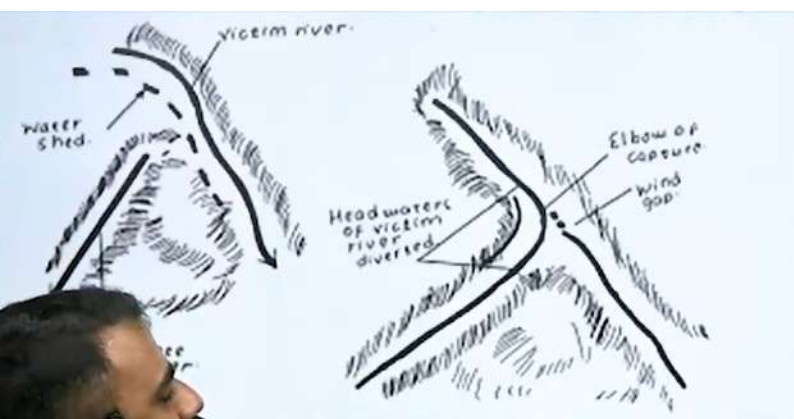


Fig. 20 A waterfall with plunge pool



Landforms

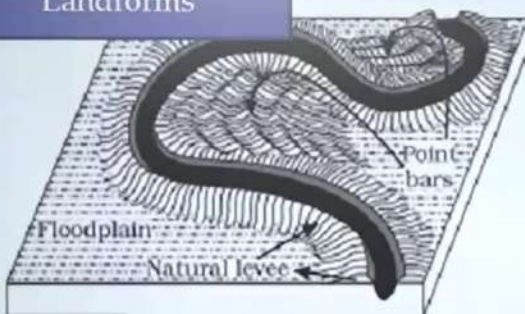


Figure 7.6 : Natural levee and point bars

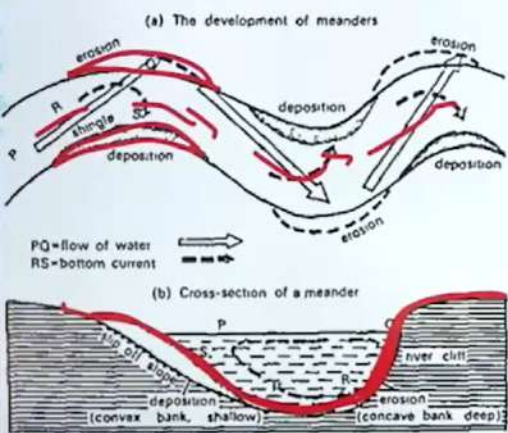


Fig 41 Meanders



Figure 7.8 : Meander growth and cut-off loops and slip-off and undercut banks



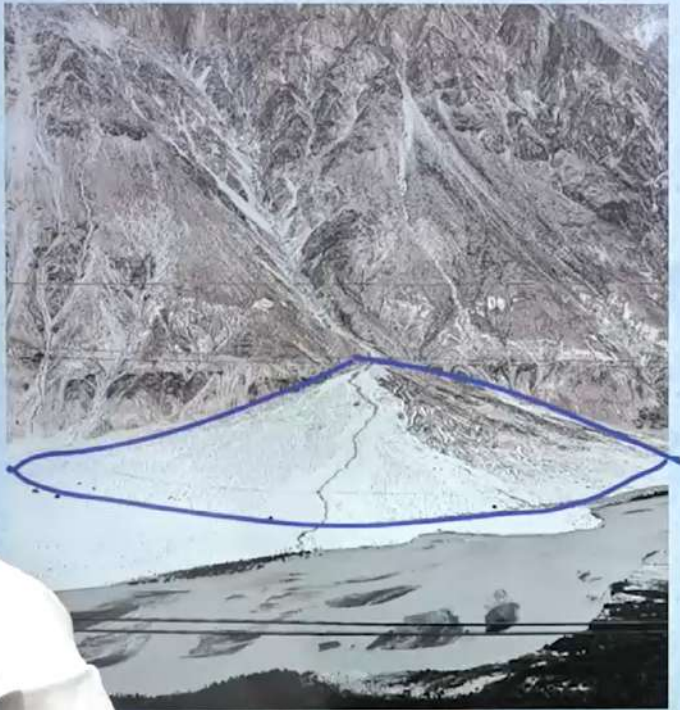
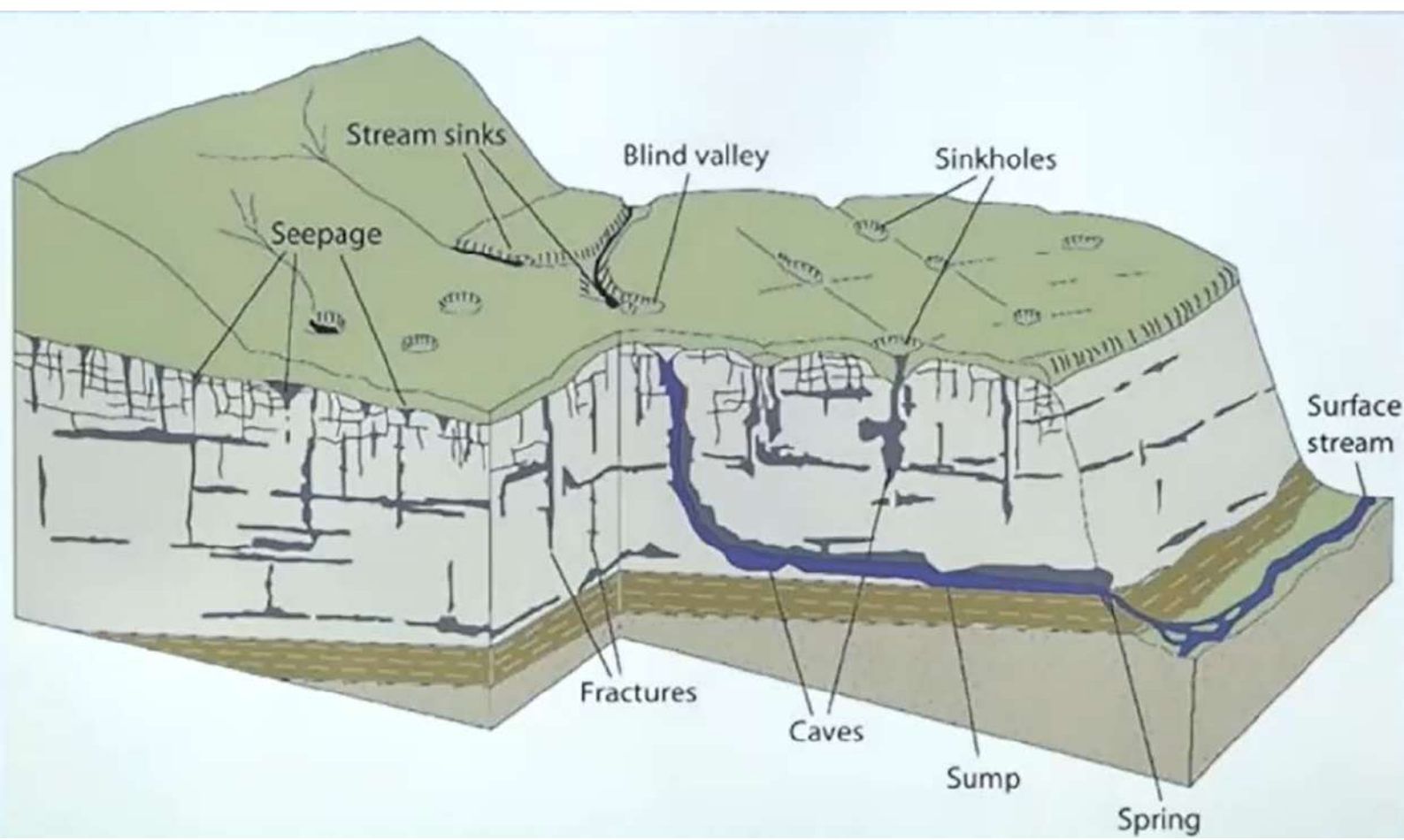


Figure 7.5 : A satellite view of part of Krishna river delta, Andhra Pradesh



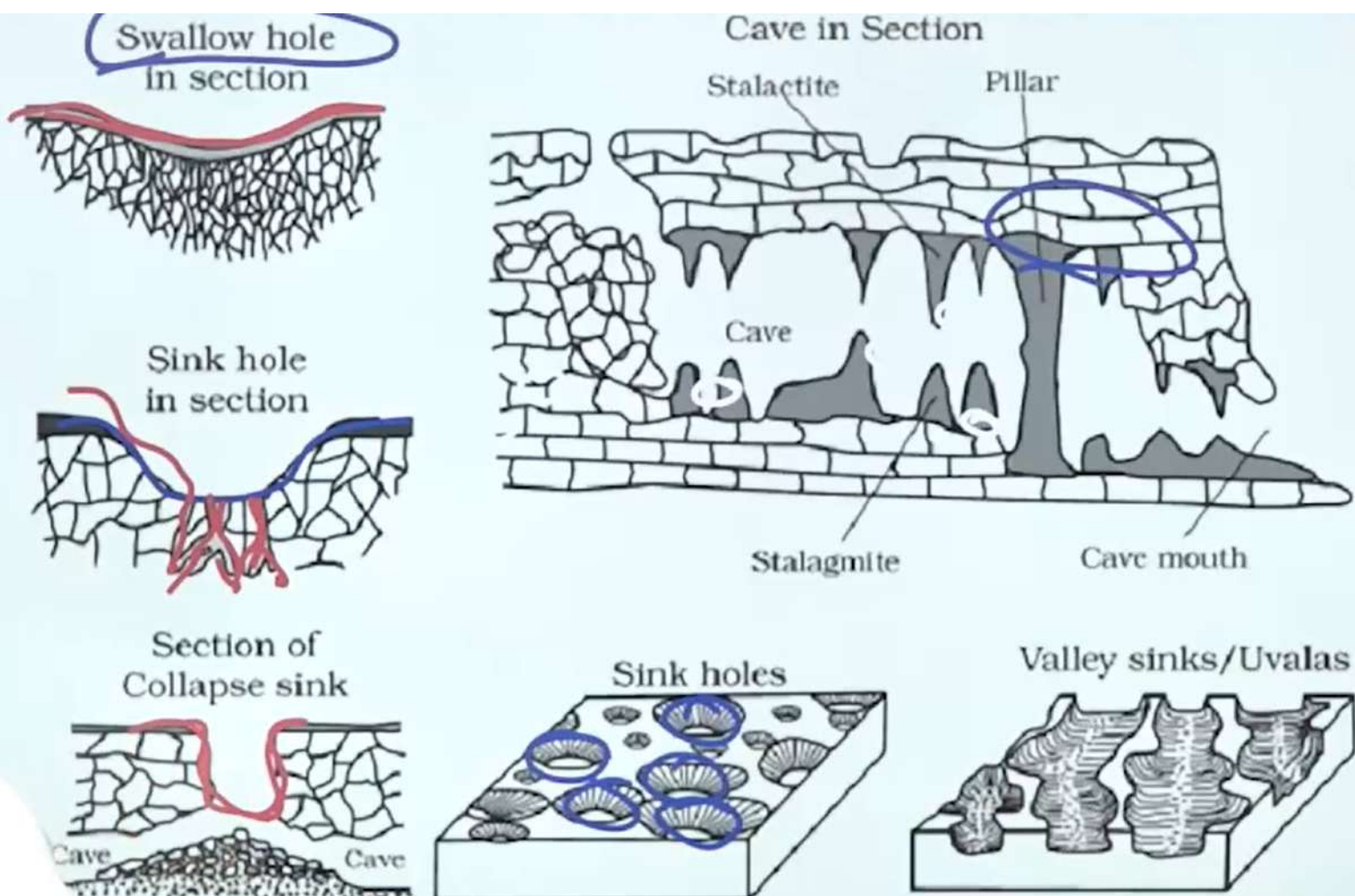


Figure 7.10 : Various karst features