

# Soil Erosion

- It is the process of detachment, transportation and deposition of soil materials from one place to another by an erosive agent.
- Geologic erosion
- Accelerated erosion

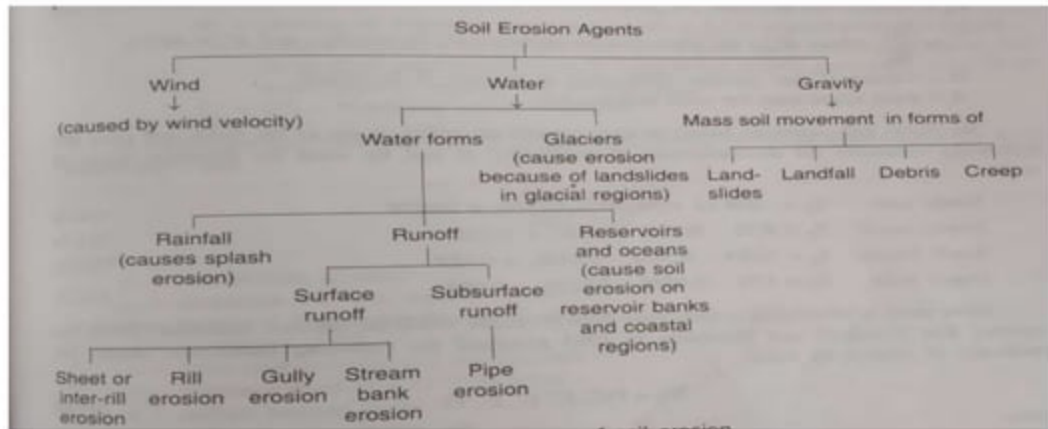
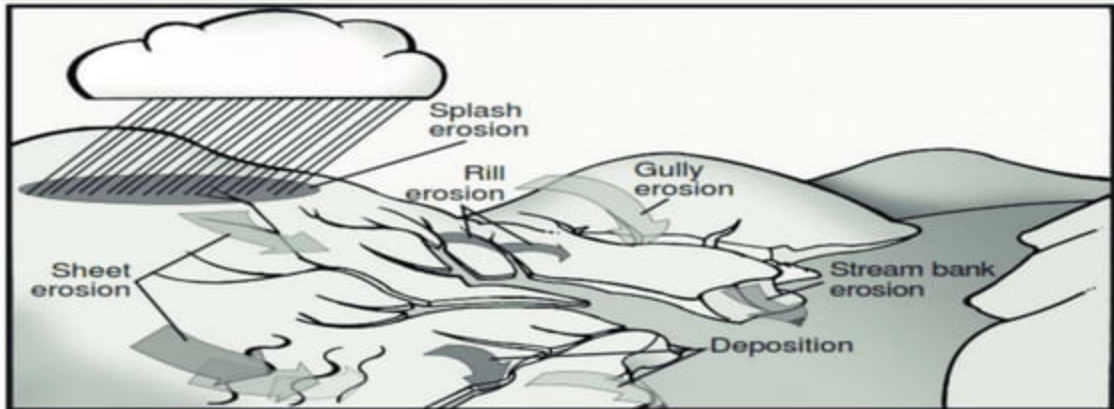


Fig:1 Types of soil erosion ( Das G, 2012)

# Water Erosion

- It is the detachment, transportation and deposition of soil particles from one place to another by the force of water
- Soil erosion by the water is the result of rain detaching and transporting of vulnerable soil, either directly by means of rain splash or indirectly by rill and gully erosion.



# Forms of water erosion

- **Rain splash erosion:**

- caused by the impact of water striking the surface of soil.

It take place in two steps:

1. As precipitation fill pore spaces, loosening and driving soil particles apart.
2. Impact of subsequent rain drop hitting the surface, transporting particles to other area.



## Sheet Erosion

- It is the removal of fairly uniform layer of soil from land surface by the action of rainfall and runoff water.
- Slopping land having shallow loose topsoil overlying a compact subsoil are most susceptible to sheet erosion.



## Rill Erosion

- Prolonged occurrence of soil erosion through inter rills, leads to widening of the inter rills and formation of small channels, called rills.
- Carry both the overland flow from inter rill area and direct flow.
- Small in size, can be destroyed by tillage operations



## Gully erosion

- When rills get larger in size and shape due to prolonged occurrence of flow through them.
- Can't be removed by tillage operations.
- Generally four stages involved in development of gully:
  1. Formation stage
  2. Development stage
  3. Healing stage
  4. Stabilization stage



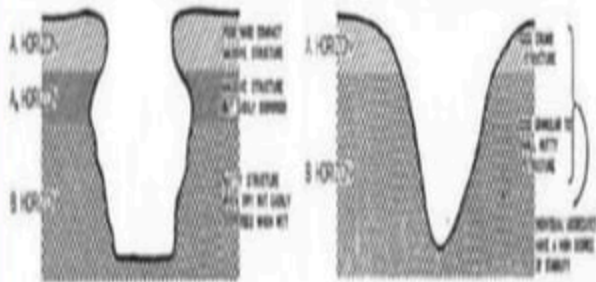
## On the basis of shape:

### 1. U-shaped gullies:

- Formed in areas where surface and subsurface soils are weak and susceptible to erosion
- Flatter in shape
- Formed on Levelled lands
- Flow velocity less thus give u shape

### 2. V-shaped gullies:

- Subsoil more resistant to erosion
- Occurs in hilly areas with steep faces
- Flow is low, but velocity is very high due to steep slope



## B. On the basis of the nature of gully flow:

1. Active gullies
2. Inactive gullies

## C. On the basis of size:

Type	Symbol	Specifications		Slide slopes
		Depth (m)	Width (m)	
Very small	G1	$\leq 3$	$\geq 18$	vary
Small	G2	$\leq 3$	$\geq 18$	8-15%
Medium	G3	3-9	$\geq 18$	8-15%
Deep	G4	$> 9$	vary	Steep slope



# Stream erosion

- The tractive force of water in a drainage channel scours the bed and cuts the soil from its sides.

Occurs in three stages:

1. **Suspension:** Major part of the total load remain in suspended state with the flowing water
2. **Saltation:** Skipping or bouncing of soil particles on the bed of the channel
3. **Surface creep (bed load):** Sediment move continuous contact with the bed of the stream



## Mass soil movement and landslides

- Sudden movement of soil mass, along with the weathered rock, due to the weight of the moisture present in the soil mass and the downward pull of gravity.
- Soil mass flows out with runoff – mudflow



# Pipe erosion

- By occurrence of interflows in the solid medium
- Removes and transport soft soil particles
- Initiated by cracks and burrows, developed by seepage of water.

## Factors affecting water erosion

Climate

Topography

Vegetation

Soil

Biological factors

## 1. Climate

- Rainfall
- Temperature
- Humidity
- Wind

## 2. Topography

- Degree of slope: velocity of the flow increases in proportion to the square root of the slope.
- Length of slope: kinetic energy of the flow is proportional to the square root of the length of the slope

## 3. Vegetation

- Increases infiltration rate
- Reduces surface runoff

- Reduces force of impact on soil surface
- Retards surface velocity of runoff water hence transportation capacity reduces
- Root system reduces detachability of the soil particles
- Add organic matter in the soil, biological activity increases

#### **4. SOIL**

- Texture
- Structure
- Bulk density
- Organic matter content
- Moisture content

#### **5. Biological factors**

Activities of man and animal

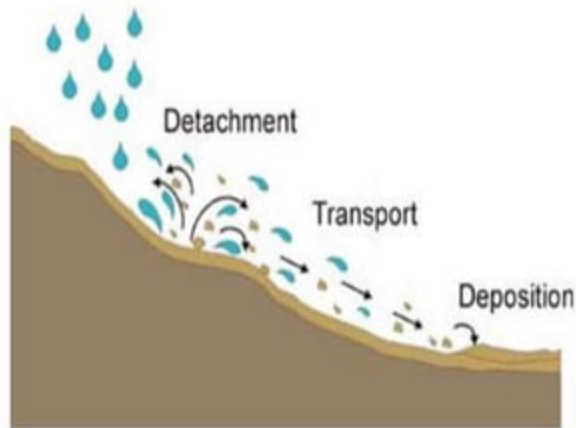
# Mechanism of Water Erosion

There are three steps for soil erosion by water:

i) **Detachment:** caused by flowing water, freezing and thawing of the top soil, and/or the impact of falling raindrops

a) **Hydraulic action:**

- Water compresses the soil
- Air voids exert pressure on soil particles & cause soil detachment



**b) Abrasion:**

- soil particles mixed in running water and create abrasion power.
- Capacity of flowing water to scour the soil particles increases.

**c) Attrition:** mechanical breakdown of the soil loads running along the running water due to collision of particles with each other.

**d) Solution:** associated with chemical action between running water and soil rocks.

**ii) Transportation:** soil particles mixed with running water are carried away from one place to another

**iii) Deposition:** transported particles settled at some places of lower elevation