

Key Points:

- Factors that affect the stability of a slope
- Factors that affect the velocities of streams
- Darcy's Law

Mass Wasting:

- 1) **Mass wasting**- the down slope (hill) movement of rock, soil, or sediment under the influence of gravity.
 - a) Occurs depending on → materials involved (rock, soil, earth, mud, or debris) AND the motion involved (fall, slide, flow)
- 2) **Landslide**-all falls, slides, and flows that occur at a *fast or moderately fast rate*.

Types of motion:

- **Falls:** landslides that involve collapsing material from steep slopes.
 - o Typically involve free-falling, bouncing, or rolling sediments that deposit at base of slope
- **Slides:** downslope movement of soil/rock that occurs primarily on the surface of rupture or on thin areas of great shear strain
- **Flows:** Turbulent motion of sediments downhill

Types of Falls:

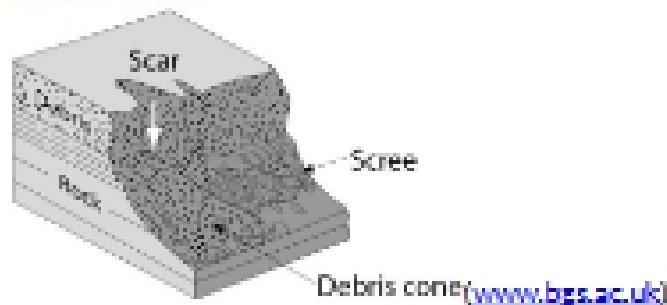
1) **Rock Fall**



2) **Earth Fall**



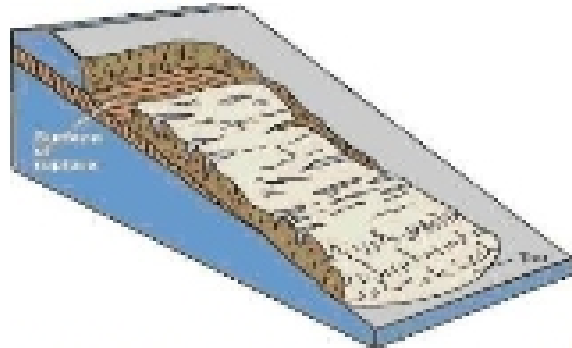
3) **Debris Fall**



- *Falls occur with the detachment of soil/rock from steep slope.
- ***Secondary Falls** involve rocks already detached from cliff, just lodged upon the cliff.

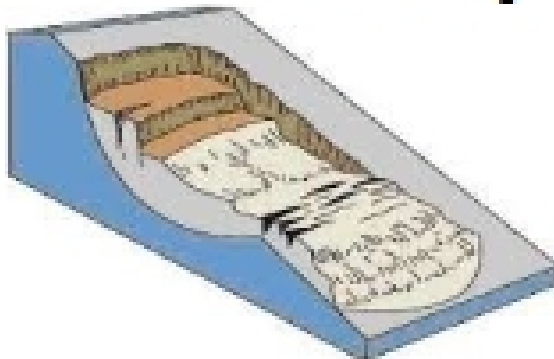
Types of Slides:

- 1) **Translational slide** → mass displaces along a wavy surface of rupture, sliding out over original surface



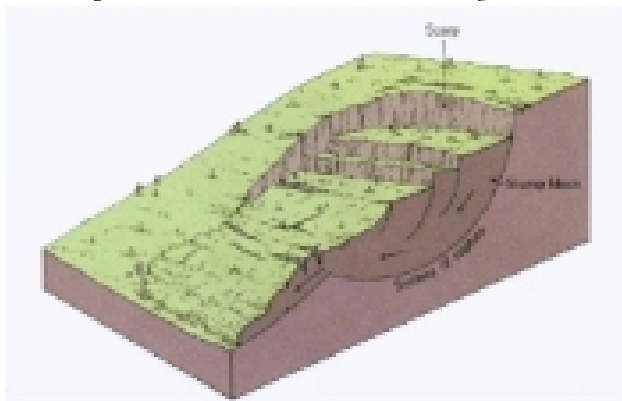
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- 2) **Rotational Slide** → move along surface of rupture that is curved/concave



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- 3) **Slump** → breaks off of a steep surface. Material moves as coherent mass along curved surfaces.



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Types of Flows:

- 1) **Debris Flow** → turbulent flow of debris (cars, scrap, trees, etc.)
 - a. Fast-moving, destroy objects in their paths, strike without warning.
 - b. Materials vary greatly in size
 - c. Often triggered by heavy rains on steep slopes
 - d. Famous debris flows: Venezuela, December, 1999 & Mt. Mayuyama, Japan 1992
 - e. Includes Debris Avalanche
- 2) **Creep Flow** → slow flow (downhill) grain by grain through freeze-thaw cycles (freezing/melting) between grains of rock. Slowly "creep" 1 cm/year or less.
 - a. Biological agents also important in creep process (insects, small animals, and plants move soil around)
 - b. Oddly enough, results in most damage costs per year among landslides
- 3) **Mud Flow** → very rapid flow of saturated plastic debris in a channel.
 - a. Caused by high intensity rainfall
 - b. Contains a great water content
- 4) **Earth Flow** → very thick soil that accumulates and creates a flow (slow to rapid)

a. *Type of earth flow: Colorado Landslide*

5) **Rock Flow** → extremely slow movements of bedrock

**Factors that influence Mass Wasting/the stability of slopes:

-Materials involved (rocks, soil, sediment, etc.)

-Steepness of slope

-Water

-Vegetation

-Heights

-Climate (freeze-thaw cycles)

-Presence and orientation of planes of weakness

a. example: *a dipping/diagonal foliation can result in landslides and damage to buildings built upon the zones of weakness of a slope*

-Human Activities

Streams

- **Stream**- water that flows in channels
 - o Carries water and sediments
 - o Ability to erode/pick up sediments
 - Erosion depends on **VELOCITY**
- Difference between capacity of stream and competency of stream:
 - o Capacity of stream: **amount** of particles stream can carry
 - Depends on: **discharge** (amount of water flowing past a certain point of stream per unit time).
 - o Competency of stream: **largest** particle it can carry
 - Depends on: velocity
- ***Factors that affect velocities of stream: (very important)
 - o Gradient of stream: $\frac{\text{elevation distance}}{\text{horizontal distance}}$ or slope of surface over which it flows
 - Steeper the slope of stream, faster the water flows

