

Geology Test 3 study guide

Section 1: Mass Wasting

Mass wasting: The downward slope movements of rock, soil, or sediment by gravity

Materials involved: rock, soil or Earth, mud, debris

Motions involved:

fall: free falling of detached material from a steep slope

slide: movement of rock/debris down an incline

flow: moves as viscous fluid with sediment, water, and sometimes air.

Examples of mass wasting: Landslides, mudslides, avalanches

Landslide: term for all slides, flows, and falls that occur at a fast or moderately fast rate.

Understand all the factors that effect mass wasting (i.e. what factors influence the stabilities of slopes) and how they effect it. Such factors include:

- nature of materials: consolidated vs. unconsolidated materials- consolidated materials are generally more stable resisting movement, while the slope for unconsolidated materials can only be so steep before they start slipping down.
angle of repose: maximum angle at which unconsolidated material is stable
- Steepness of slope: gravity provides energy to move materials. The steeper the slope the more likely for movement. Rapid mass wasting occurs on steep slopes and slow mass wasting occurs on gentle slopes
- Water: Reduces friction between bedding layers, lubricating them. However, to a point, the addition of water created adhesion of material, adds weight which is instability.
- Vegetation: Holds unconsolidated materials together which reduces the likelihood of mass movement. Removes water from the ground.
- Presence and orientation of planes of weakness: bedding, joints/cracks, and metamorphic foliations assist in mass movement
- Climate: Precipitation can saturate a surface and reduce adhesion, causing mudflows, a type of mass movement. Freezing and Thawing cycles can also cause "grain by grain" movement. As water between grains crystallizes to ice

and expands, a grain is pushed away from the surface of the ground. On thawing, gravity pushes the grain further downslope.

Think about some ways in which human activity can influence these factors and what the results of such activity might be.

- highway cuts/excavations: rock and soil material from a hill or mountain is cut to make way for a road. This causes artificial over steepening making the material unstable and move downslope
- Stripping of vegetation: Because plants hold on to loose sediments, stripping vegetation would increase the likelihood of material movement

Natural processes that oversteepen slopes include:

- stream erosion
- wave erosion
- tectonic uplift
- volcanic activity

Mass wasting events are manifested in different ways and at different rates depending on the types of materials involved (such as rock, earth, mud, debris) and the type of motion involved (such as fall, slide, flow). To what do the terms creep, slump, and avalanche refer; what about the rates at which they occur?

Creep: Materials involved are soil/Earth. Occurs at the slowest rate of mass wasting processes, 1cm or less a year. Creep is a grain by grain process. It is the most damaging because it destroys foundations of buildings and such.

Slump: material moves as a coherent mass along curved surfaces. Slumps can be both slow moving and fast moving. Fast moving ex: La Concita, slow moving ex: Slumguillion earthflow.

Avalanche: loose material moves rapidly down a slope in a chaotic or "incoherent" fashion

Be familiar with the details of creep and the structure, geometry, and behavior of slumps.

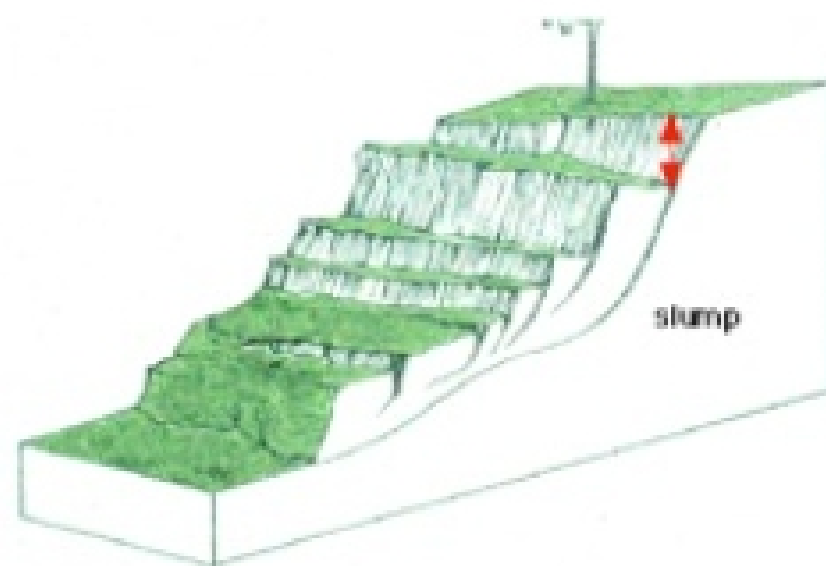
In slumps, material moves as coherent mass along curved surfaces. This motion results in a slightly backward rotation of blocks. Note that the ground surfaces on the intermediate blocks dip slightly toward the master sole of the slump.

The distal end (toe) of the slump moves along a less steep surface. Often the toe of slumps move more as flows than as slides.

How can you recognize evidence of past mass wasting events?

The evidence of mass wasting can be observed on aerial photographs. Scarps, open fissures, displaced/tilted objects, a hummocky surface, and sudden changes in vegetation are features indicating former landslides. Effects of erosion, weathering, and vegetation may however obscure evidence of past mass wasting events.

What (if to lessen such mass events prevented, engineers to damage Because



anything) can be done the possibility of future events in areas prone to wasting?

most mass wasting usually cannot be geologists and can use various methods minimize danger and resulting from them. water plays such an

important role in many landslides, one of the most effective and inexpensive ways to reduce to potential for slope failure or to increase existing slope stability is surface and subsurface drainage of a hillside. It reduces the weight of the material likely to slide and increases the shear strength of the slope material by lowering pore pressure.

Section 2: Streams