

CHAPTER 13: Unsafe Ground—Landslides and Other Mass Movements

MASS WASTING

- **GRAVITY** transports larger quantities of Earth material down slope

FACTORS That Influence MASS WASTING

- **Earth Material**
 - **SOLID ROCK**
 - **Deformation (faults/folds)**
 - **Mechanical/Chemical Weathering**
 - **Foliated Metamorphic Rocks**
 - **UNCONSOLIDATED MATERIAL**
 - **Angle of Repose**- max angle at which a slope of loose material will lie without cascading down
 - **Vegetation**- plants add support against erosion
- **Water Content**
 - Water fills pore spaces between sediments, add weight, and depending on the amount may reduce internal resistance.
 - **DRY PARTICLES**—bound by **SIZE AND FRICTION**
 - **UNSATURATED**—bound by **SURFACE TENSION OF WATER**
 - **SATURATED**—particles act as **LUBRICANT**
- **Slope**
 - Process that can create steeper slopes
 - **FAULTING, FOLDING, TILTING**
 - **QUARRYING, GROUND CUTS**

TYPES OF MASS WASTING

- **FALL**
 - Solid rocks **FALL RAPIDLY** from **STEEP** or **VERTICAL SLOPE**
 - **TALUS**- rocky accumulation at foot of steep cliff
- **ROCK AVALANCHE**
 - Flows by entraining **AIR** as its moves down **SLOPE**
- **SLIDE**
 - Single mass of rock is **RELEASED** and **MOVES RAPIDLY** along a **PLANE OF WEAKNESS**
- **CREEP**
 - Downhill movt. of soil or other deposits
 - **SLOWEST MASS WASTING PROCESS**—**mm/yr**

- **SLUMP**
 - RAPID SLIDE of soil or rock along a curved surface
 - "STAIRSTEPS"

- **FLAWS**
 - **HIGH WATER CONTENT**
 - **EARTHFLOW**- SOILS (RELATIVELY SLOW)
 - **DEBRIS FLOW**- more COARSE than SAND, can carry huge BOULDERS and moves RAPIDLY
 - **DEBRIS AVALANCE**- mountainous areas, moves RAPIDLY
 - **Mudflows/Lahars**

REMOVAL OF VEGETATION (DEFORESTATION) INCREASES MASS WASTING B/C OF LESS VEGETATION or STABILITY

TRIGGERS OF MASS WASTING

- HEAVY RAINFALL
- EARTHQUAKES
- VOLCANOES
- HUMAN ACTIVITY
 - Added mass of buildings on slopes
 - Removal of VEGETATION
 - Increased angles of slopes
 - Addition of water

CHAPTER 14: Running Water

Initial Runoff- "SHEET FLOW"—thin sheets of water depends on: **intensity/duration of rainfall, soil texture, moisture, hill slope, vegetation**

- small channel develops which feed streams

STREAM TRANSPORTATION (in solution, in suspension, bed load—bottom)

- **DISSOLVED LOAD**- CHEMICALS DISSOLVED IN THE WATER
- **SUSPENDED LOAD**- FINER PARTICLES THAT ARE SUSPENDED IN THE WATER COLUMN—CLEAR TO MUDDY
- **BED LOAD**- MATERIAL IN THE STREAM CARRIES ALONG THE BED BY SLIDING, ROLLING and SALTATION
 - Low velocities form ripples
 - High velocities form dunes

STREAM CHANNEL TYPES

- STRAIGHT
 - SINGLE channels
 - Forms on steep to low slopes
- BRAIDED
 - MULTIPLE channels
 - Channels split apart & rejoin
 - HIGH VOLUMES OF SEDIMENT
- MEANDERING
 - ONE MAIN channel that WINDS BACK & FORTH
 - Forms on LOW SLOPES
 - CUT BANK strongest currents on outside of curves, erosion occurs
 - POINT BAR- velocity slowest on inside of curves, deposition occurs

DRAINAGE PATTERNS

- DENDRITIC
 - FLAT LYING layers (similar rock type)—“tree”
- TRELLIS
 - FOLDED rock layers
- RECTANGULAR
 - Rock units cut by joints or faults—90 degree bends
- RADIAL
 - HIGH MOUNTAIN PEAKS (volcanoes)

FACTORS THAT INFLUENCE STREAM FLOW

- Velocity
 - Faster towards the center of stream
 - Distance water travels divided by time (ft/s or m/s)
- Gradient
 - Change in elevation divided by distance (rise/run)
 - Ft/mi—slope
- Discharge
 - Volume of water that passes a certain point adjacent to a bank
 - Area of stream x stream velocity
 - Feet Squared/second or Meter Squared/second

OTHER FEATURES OF STREAMS