

Weathering: Big Ideas

- Humans cannot eliminate natural hazards but can engage in activities that reduce their impacts by identifying high-risk locations, improving construction methods, and developing warning systems.
- Water's unique physical and chemical properties are essential to the dynamics of all of Earth's systems
- Understanding geologic processes active in the modern world is crucial to interpreting Earth's past
- Earth's systems are dynamic; they continually react to changing influences from geological, hydrological, physical, chemical, and biological processes.

Mass Wasting

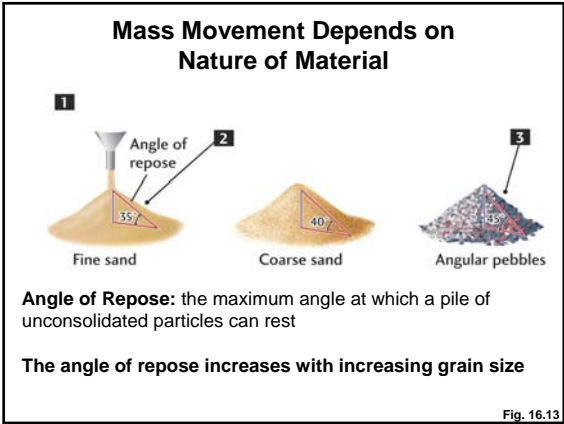
Process by which material moves downslope under the force of gravity

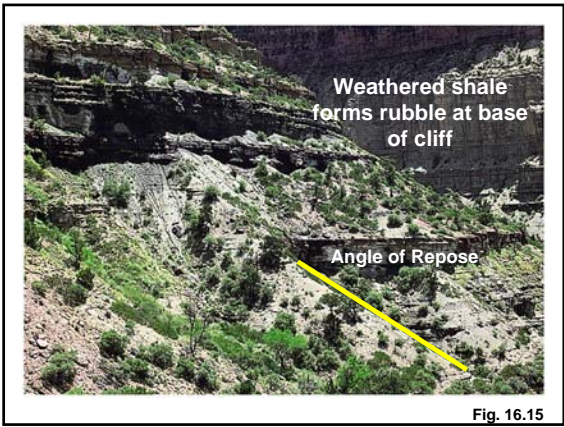


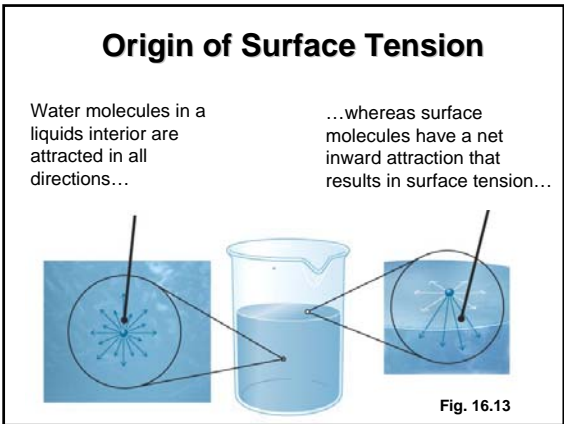
<http://www.youtube.com/watch?v=qEbYpts0Onw>

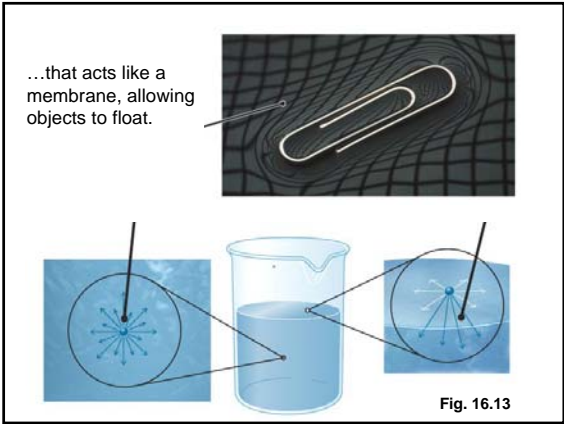
Factors Influencing Mass Movement

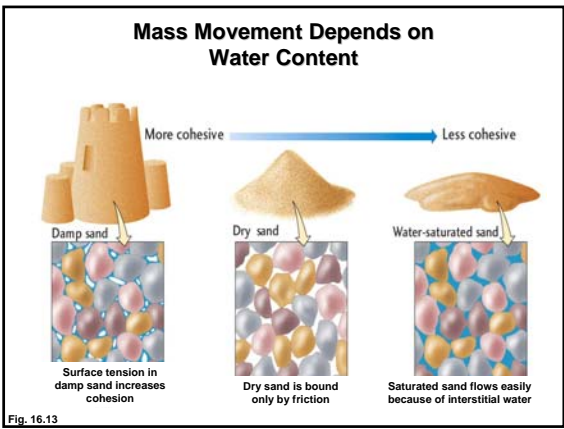
Nature of Slope Material	Steepness of Slope	Water Content	Slope Stability
UNCONSOLIDATED			
Loose sand or sandy silt	Angle of repose	Dry Wet	High Moderate
Unconsolidated mixture of sand, silt, soil, and rock fragments	Moderate	Dry Wet	High Low
	Steep	Dry Wet	High Low
CONSOLIDATED			
Rock, jointed and deformed	Moderate to steep	Dry or wet	Moderate
Rock, massive	Moderate	Dry or wet	High
	Steep	Dry or wet	Moderate

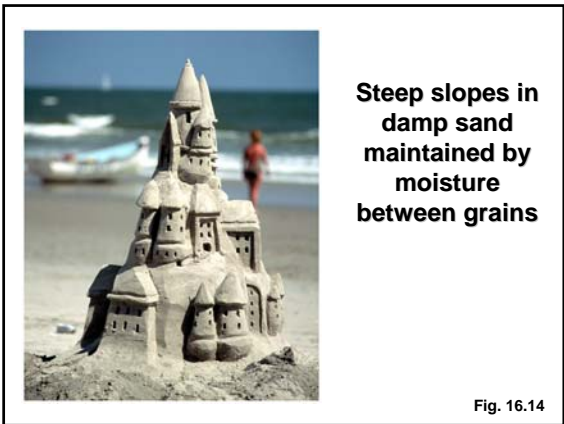










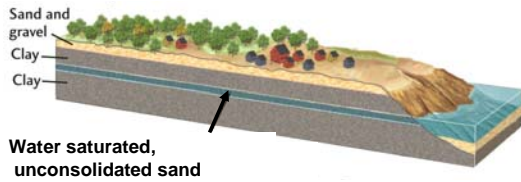




Yellowstone National Park

Loss of vegetation and root systems increases susceptibility of soils to erosion and mass movement

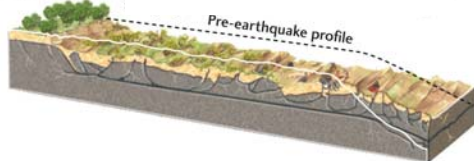
Before the 1964 Alaska Earthquake



Water saturated, unconsolidated sand

Fig. 16.6

After the 1964 Alaska Earthquake



Cyclic loading during the "Good Friday" Earthquake caused the sand beneath Turnagain Heights Subdivision to liquefy.

Fig. 16.6

Turnagain Heights Subdivision, Alaska



Fig. 16.6

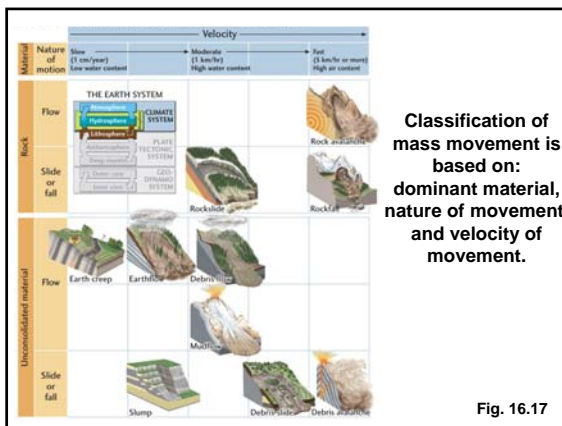
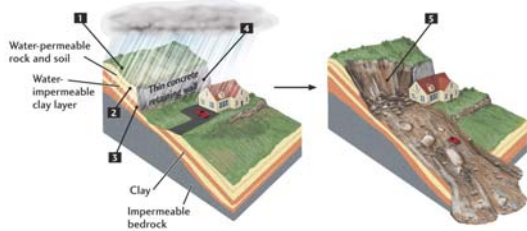


Fig. 16.17

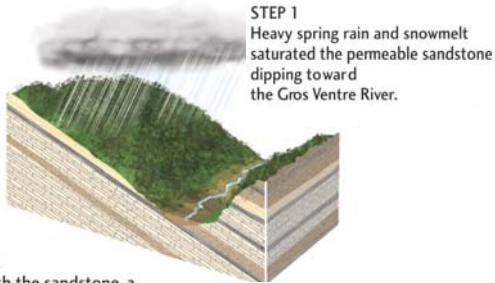
Possible Triggers for Mass Movement

- over-steepened slope:
 - erosion / lateral erosion
 - volcanic ash
 - excavation (manmade)
- increased water content:
 - intense rainfall
 - rising water table (e.g. behind dam)
- cyclic loading:
 - earthquakes
 - storms

Landslide Caused by Undercutting Inclined Strata



1925 Gros Ventre Slide, Wyoming

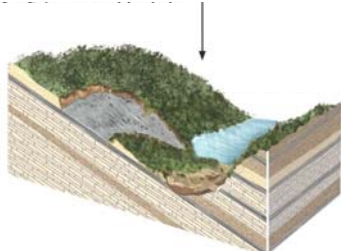


STEP 1
Heavy spring rain and snowmelt saturated the permeable sandstone dipping toward the Gros Ventre River.

STEP 2
Beneath the sandstone, a layer of soft, impermeable shale became slippery when wet.

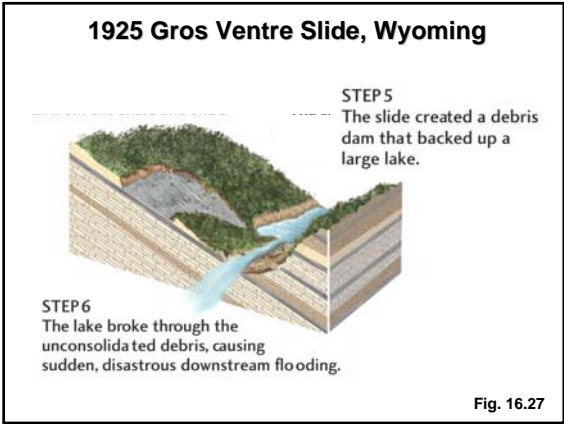
Fig. 16.27

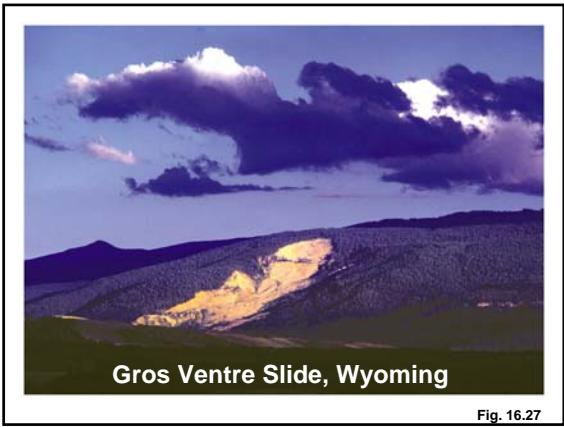
1925 Gros Ventre Slide, Wyoming

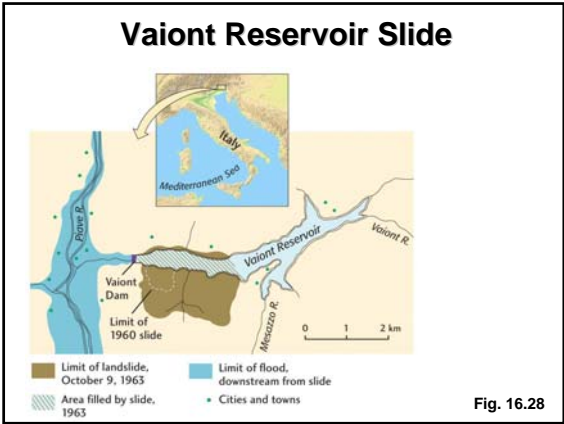


STEP 3
The sandstone layer—eroded by the river—was unsupported at its lower edge.

STEP 4
Less friction between the sandstone and slippery shale and over-steepening of the bank caused by the erosion, caused the sandstone to detach from the shale and slide.







Ways to Reduce Losses Due to Landslides Include:

- avoid construction in areas prone to mass movement
- build in a way that does not make naturally stable slope unstable
- engineer water drainage to prevent strata to become water saturated and prone to fail

Types of Rock Mass Movement

- rock fall
- rock slide
- rock avalanche

