



Mass Wasting

Mass wasting is a general term used to describe the downslope movement of soil, rock, and organic materials as a result of the pull of gravity. A more common term is “landslide,” but this is only one of the many processes of mass wasting (Figure 2.5.8).

Some slopes are more susceptible to mass wasting than others. Many factors contribute to the instability of slopes, but the major factors related to mass wasting are the characteristics of the bedrock and soil, the steepness and geometry of the slope, and friction.

Three distinct physical events occur during mass wasting: the initial failure of the slope, the transportation of the slide materials, and the final deposition of these materials. In addition to weathering, mass wasting can be triggered by the following conditions:

- undercutting of a slope by stream erosion, wave action, glaciers, or human activity, such as mining;
- intense or prolonged rainfall, rapid melting of snow and ice, or large fluctuations in groundwater levels;
- vibrations caused by earthquakes or construction activity; and
- the weight of the materials sitting on the upper slopes.

Once a slide is triggered, materials fall or flow downslope.

Wasting typically appears along weak areas parallel to the slope. Weaknesses are likely to occur where soils consist of silt and clay, which are much softer than the surrounding rock.

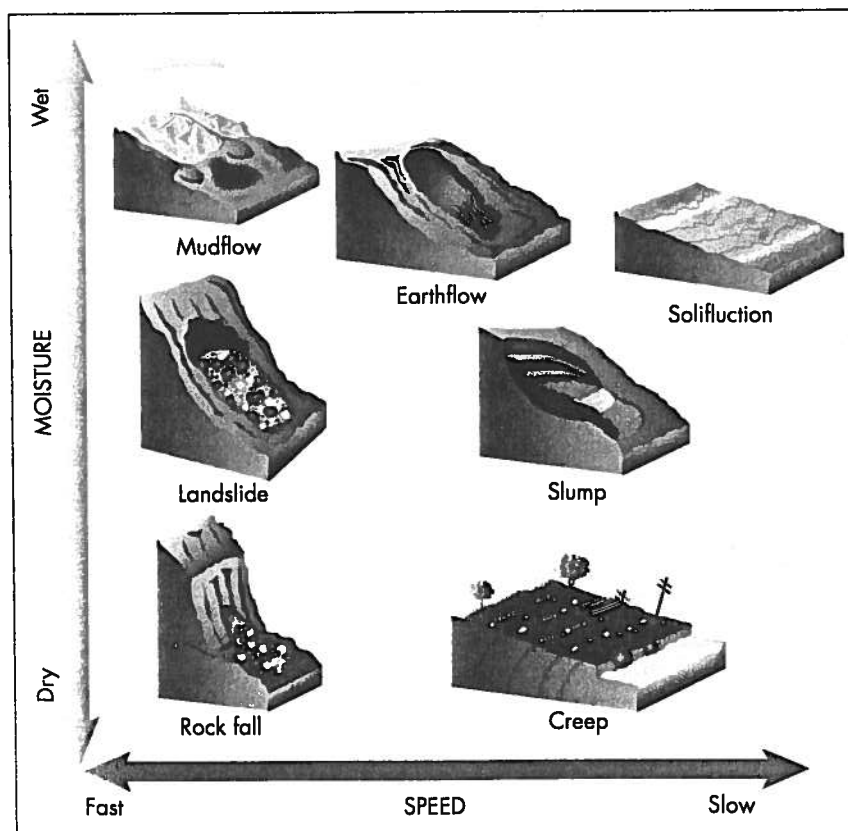


Figure 2.5.8
Mass wasting

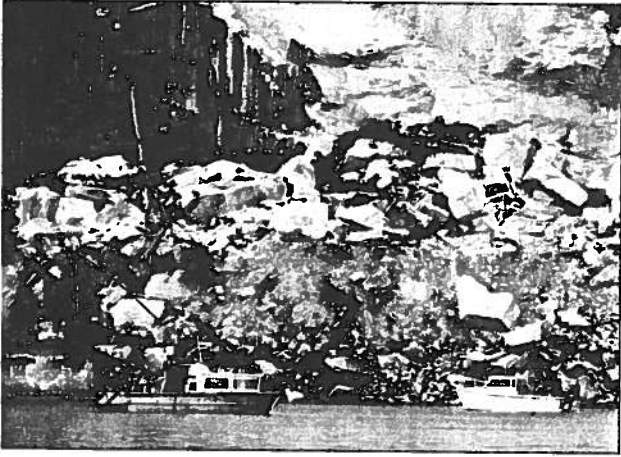


Figure 2.5.9 A massive rockslide in 2008 blocked the Sea-to-Sky Highway near Porteau Cove, British Columbia for several days, severing the only direct route between Vancouver and Whistler. The highway will be the main corridor for visitors from around the world during the 2010 Olympic Games.

Effects of Human Activity

Mass wasting may result either directly or indirectly from human activities. Mining or road construction can trigger slope failures where these activities undercut or overload unstable slopes, or redirect the flow of surface water or groundwater over weak slopes.

Clear-cutting of forests may increase the rate of surface runoff or infiltration by groundwater. Inefficient irrigation or sewage disposal can increase groundwater pressure, which in turn may reduce the stability of the rock and sediment on a slope.

How Does Mass Wasting Affect People?

Mass wasting can cause property damage, injury, and death, and deplete many important resources. For example, a mass wasting event can damage water supplies, sewage disposal systems, dams, forests, and highways for many years.

The harmful economic effects of mass wasting include the cost to repair structures, disruption of transportation routes, loss of property value, medical costs to treat injuries, and indirect costs such as the loss of fish stocks or timber reserves. Mass wasting events can also reduce water availability, quantity, and quality. In addition, geological studies and engineering projects to assess and stabilize potentially dangerous sites can be expensive.

Minimizing the Effects of Mass Wasting

Surveying and environmental assessments that lead to improved community bylaws and zoning can reduce the risk of mass wasting. Geological mapping, detection of slope hazards, and determining the likelihood of mass wasting events can help engineers, developers, planners, and building inspectors avoid construction in high-risk areas. Structures such as homes, schools, hospitals, power lines, fire stations, and roads can thus be safely located away from areas of potential risk.

REVIEW AND REFLECT

1. Gravity is a force that pulls objects downward. Friction is a force that resists the sliding motion of one surface against another. Explain how these forces affect rocks and soil on a slope.
2. Identify at least four examples of mechanical weathering and chemical weathering in your local community. Specify what type of physical or chemical weathering has taken place, and explain how you know this.
3. Mass wasting events lie somewhere between weathering and erosion: they are not caused by one or the other. Explain.
4. List four factors that can trigger mass wasting. With a partner, create an experiment or model to demonstrate how one of these factors contributes to mass wasting.
5. Describe some ways that human activities can have an impact on the processes of both weathering and mass wasting.