

Earthflows range from very small to the very big, involving hundreds of tons of material blocking or destroying roads, damming rivers and destroying houses.

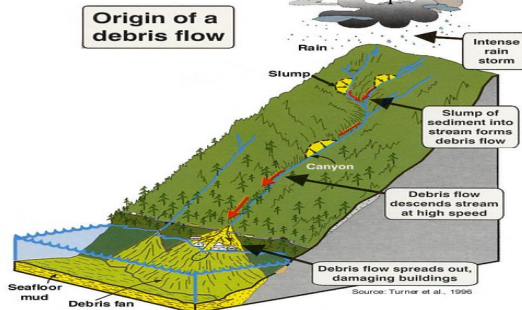
DEBRIS FLOW OR MUDFLOW

These two terms are used interchangeably and they refer to the rapid but viscous flow of mud and other surficial materials. Rotational slides usually end up as mudflows after travelling a few metres because the soil is saturated and vibrations caused by the movement induces the soil to liquefy and behave as a viscous fluid. The flow can travel along channels or flow paths for considerable distances until the slope decreases or the channel widens, at which point the flow fans out and its momentum abates.

Mud or debris flows commonly originate in steep terrain where vegetation and organic litter that help to stabilize the soil and retain rainfall and runoff have been removed by fire, grazing, logging or other processes. Intense and prolonged rainfall may then trigger the downslope movement of soil and other surface materials.

This type of landslide is potentially more dangerous than other types because it can form very quickly and more velocities up to 80km per hour. The greater density meant that it is more destructive than floodwaters, the mud does not recede after the storm.

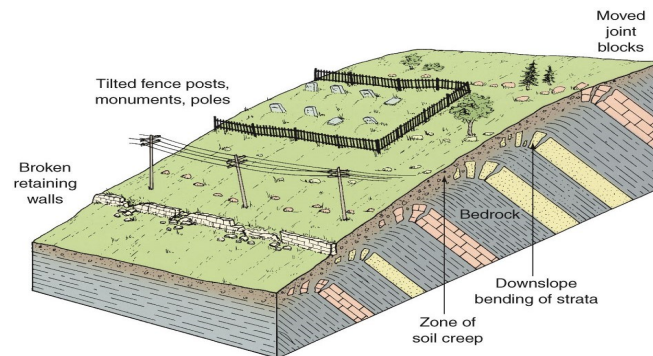
In the unlikely event of a volcanic eruption in Fiji mudflows can be generated on its flanks by rapid infusion of great volumes of water (from heavy rains associated with such eruptions) into poorly consolidated ash and other volcanic debris deposits.



CREEP

Creep occurs mainly in the soil mantle, that part of the soil from the surface to a few centimeters or metres below the surface. It involves the slow downslope movement or the gradual plastic deformation of the soil mantle and/or the fracturing of bedrock at imperceptible rates. There is no single surface along which slippage occurs. The rate of downhill movement or creep can vary from a few millimeters per year for slopes less than 10% to about 10mm per year in steeper terrains.

The downward movement involves minute displacement of individual particles that are moving at different rates. It is commonly caused by the expansion of the surface layer due to heating followed by contraction due to cooling. Creep may also be caused by the swelling of certain clays after seasonal rainfalls when their moisture content increases, followed by contraction when their moisture content drops during the dry period.



REFERENCE

Griggs, Gary B. and Gilchrist, John A., 1983. Geologic Hazards, Resources and Environmental Planning (second edition) Wadsworth Publishing Company, Belmont, California, USA.

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MINISTRY OF LANDS
AND
MINERAL RESOURCES

TYPES OF LANDSLIDES



MINERAL RESOURCES
DEPARTMENT

INTRODUCTION

This information sheet describes and illustrates the various types of landslide and how one can recognize them and their related features in the field.

Landslides are part of a more general erosion or surficial process known as mass wasting, which is simply the downslope movement of earth or surface materials due to gravity. They are classified into four main types: fall and toppling, slides (rotational and translational), flows and creep.

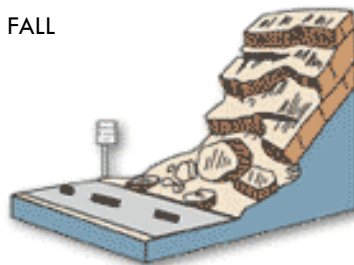
FALLS AND TOPPLING

A rock-fall is the abrupt free fall or downslope movement, (rolling or sliding) of loosened blocks or boulders of solid rock. It differs from a slide in that free fall is the main type of movement and no marked slide surface develops. This type of slope failure occur in caverns and along steep gorges, sea cliffs and steep road cuts through unstable bedrock. The bedding, jointing and fracturing of the bedrock are the important factors affecting slope stability. The effects of weathering, such as the freezing of water in joints (in cold countries), the pressure of water in fissures, and root pressures may initiate failure in the weak rocks.

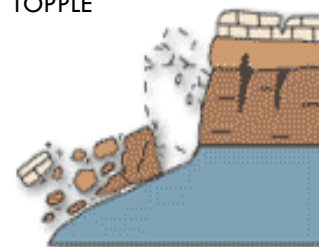
A rock fall, as in most landslides, is usually the result of a combination of factors. On a sea cliff it could be due to a combination of jointing patterns, percolation of surface water, wedging of tree roots and the impact of and undercutting by waves. Thus a lot of rock-falls along sea cliffs occur during storms when much rain percolates through cracks in the rock and the pressure pushes the blocks over or when heavy surfs strike the cliff causing vibrations and thus causing undercut cliff faces to topple over.

The magnitude and scale of rock-falls varies from the breaking off of isolated small rocks to the fall of enormous masses. Large-scale failures have been known to dam rivers, creating lakes and destroying parts of towns. On a small scale, the talus commonly found at the base of cliffs and also at the base of slopes in mountainous area is the accumulation of numerous rock-falls over many years.

FALL



TOPPLE



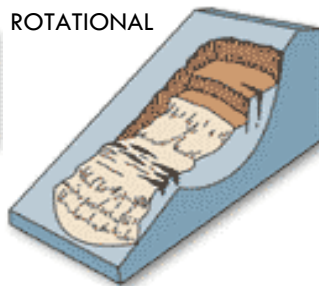
SLIDES

A slide, in the strictest sense, is characterized by failure of material at depth and then movement by sliding along a rupture or slip surface. If sliding is on a predominantly planar slip surface then the slide is called a block slide. If movement is on a curved slip surface then the slide is called a rotational slide. A lot of rotational slide end up as a mudflow leaving a gaping hole in the ground where the slide began. Debris from the slide is strewn down a torrent track along which the mudflow travelled to the base of the slope or where the flow path widens and dissipates. A rotational slide with one or more curved slip surfaces where the movement of material is incomplete, leaving individual slumped blocks, is referred to as a slump.

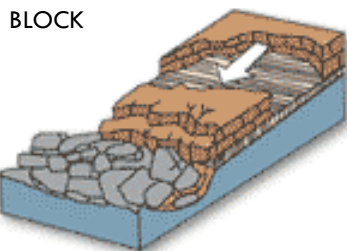
TRANSITIONAL



ROTATIONAL



BLOCK



LATERAL



Slides are probably the most common and overall possibly the most destructive type of landslide to hillside developments. Wherever steep mountains or hillside slopes occur or are altered, the possibility of large landslides and consequent disasters exist.

The rupture or slip surface can occur within the bedrock, at the contact between the bedrock and the overburden or soil (in which case all the surface materials move) or within the overburden which in some cases may be of artificial fill.

FLOWS

Flows involve the deformation of an entire soil mass that then flows downslope as a viscous or sticky fluid. Deformation may be due to a high soil water content or seismic shaking that leads to liquefaction and thus generates such a fluid flow. The slopes need not be very steep. Two types of flow can be recognized; if the downslope movement is very slow then is an earthflow, if it is very rapid it is a debris flow or as it is sometimes known, a mudflow.

EARTHFLOW

Earthflows occur in moderate to steep slopes where the topsoil or overburden seasonally becomes saturated by heavy rains. The material slumps away from the upper part of the slope leaving a scarp, and flows down to form a bulge at the toe.

