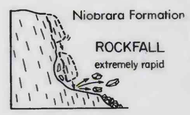
TYPE OF MOVEMENT

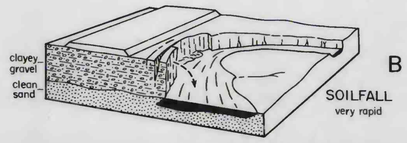
TYPE OF MATERIAL
*(BEFORE MOVEMENT)**

BEDROCK

SOILS
(CLASTIC MATERIAL, INCLUDING ROCK FRAGMENTS, SHEARED BEDROCK, ORGANIC MATTER, ETC.)

I. FALLS
Mass in motion travels most of the distance through the air. Includes free fall, movement by leaps and bounds, and rolling of rock and debris fragments without much interaction of one fragment with another.





Till, slow-draining alluvium, alluvium, colluvium, and loess unit, and loess

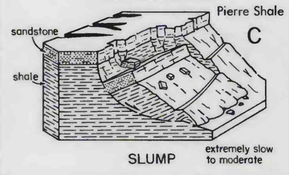
II. SLIDES
Movement caused by finite shear failure along one or several surfaces which are visible or whose presence may reasonably be inferred.

A. Material in motion not greatly deformed. Moving mass consists of one or a few units. Maximum dimension of units is greater than displacement between units. Movement may be controlled by surfaces of weakness such as faults, bedding planes or joints.

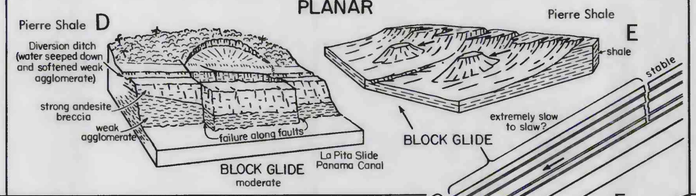
1) SLUMP: Movement only along internal slip surfaces, which are usually concave upward. Backward tilting of units is common. 2) BLOCK GLIDE: Movement of a single unit out and down along a more or less planar surface of weakness, generally a bedding plane. Block may glide far out on original ground surface.

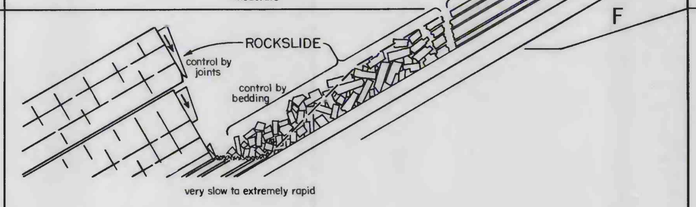
B. Material in motion is greatly deformed or consists of many semi-independent units. Movement frequently is structurally controlled by surfaces of weakness such as faults, joints, bedding planes, variations in shear strength between layers of bedded deposits, or by the contact between firm bedrock and overlying detritus. Maximum dimension of units is comparable to or less than displacement between units, and generally much smaller than displacement of center of gravity of the whole mass. Movement may progress beyond original slip surface so that parts of mass slide over the ground surface.

ROTATIONAL



PLANAR





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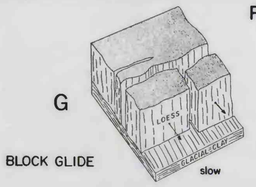
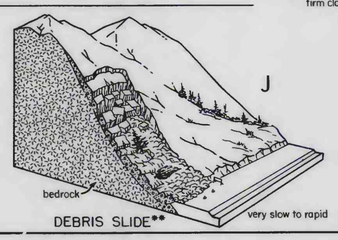
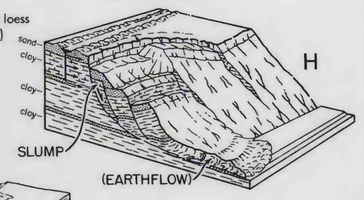
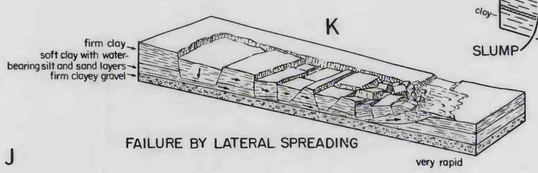




ROTATIONAL

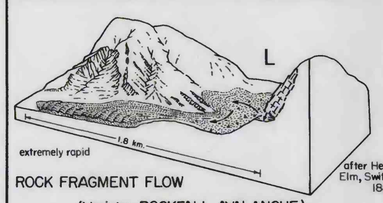




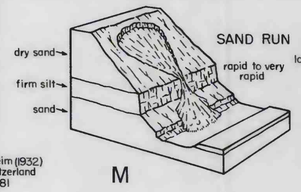
ALL UNCONSOLIDATED

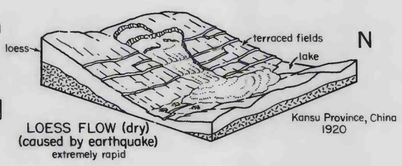
MOSTLY LARGE ROCK FRAGMENTS	NONPLASTIC OR SORTED SAND OR SENSITIVE SILT	MIXED ROCKS, SOIL, CLAY, ETC.	MOSTLY PLASTIC

DRY



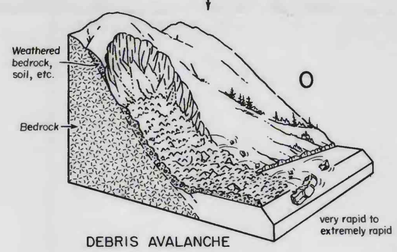
(Variety: ROCKFALL AVALANCHE)
This type of movement occurs only when large rockfalls and rockslides attain unusual velocity. Extremely rapid (more than 130 ft per sec at Elm.)

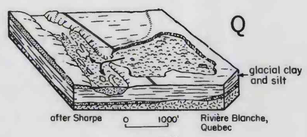




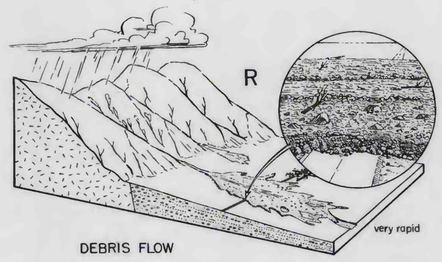
gradational series

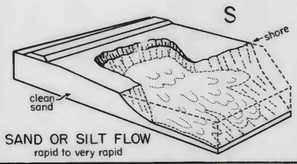
GRADATIONAL WATER CONTENT



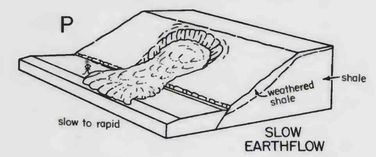


MUDFLOW





Weathered Pierre Shale, till, and colluvium

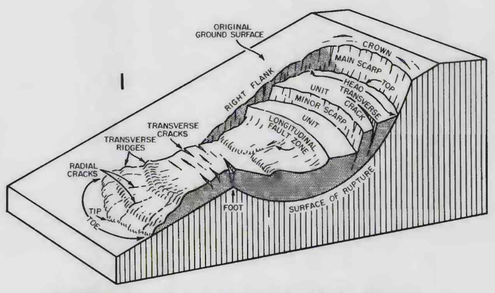


MUDFLOW

WET

III. FLOWS
Movement within displaced mass such that the form taken by moving material or the apparent distribution of velocities and displacements resemble those of viscous fluids. Slip surfaces within moving material are usually not visible or are short-lived. Boundary between moving mass and material in place may be sharp or a zone of distributed shear.

IV. COMPLEX LANDSLIDES
Movement is by a combination of one or more of the three principal types of movement described above. Many landslides are complex, although, as illustrated in Pls. 1-k and 1-l, one type of movement generally dominates over the others at certain areas within a slide or at a particular time in the evolution of a slide.



Nomenclature of the parts of a landslide
(see drawing at right)

MAIN SCARP– A steep surface on the undisturbed ground around the periphery of the slide, caused by movement of slide material away from the undisturbed ground. The projection of the scarp surface under the disturbed material becomes the surface of rupture.

MINOR SCARP– A steep surface on the disturbed material produced by differential movements within the sliding mass.

HEAD– The upper parts of the slide material along the contact between the disturbed material and the main scarp.

TOP– The highest point of contact between the disturbed material and the main scarp.

FOOT– The line of intersection (sometimes buried) between the lower part of the surface of rupture and the original ground surface.

TOE– The margin of disturbed material most distant from the main scarp.

TIP– The point on the toe most distant from the top of the slide.

FLANK– The side of the landslide.

CROWN– The material that is still in place, practically undisturbed, and adjacent to the highest parts of the main scarp.

ORIGINAL GROUND SURFACE– The slope that existed before the movement which is being considered took place. If this is the surface of an older landslide, that fact should be stated.

LEFT AND RIGHT– Compass directions are preferable in describing a slide, but if right and left are used they refer to the slide as viewed from the crown.

The following definition of a landslide has been adopted for use in this book:

Landslide– The term "landslide" denotes downward and outward movement of slope-forming materials composed of natural rock, soils, artificial fills, or combinations thereof.

Landslides move along surfaces of separation by falling, sliding, and by flowing. Parts of a landslide may move upward while other parts move downward. The lower limit of the rate of movement of landslide material is restricted in this book by the economic aspect to that actual or potential rate of movement which provokes correction or maintenance.

**The type of material involved is classified according to its state prior to initial movement or, if the type of movement changes, according to its state at the time of the change in movement. Thus, the Elm slide (Pl. 1-I) began as a rock slide and rock fall in bedrock, but at the time a flowing type of movement started the material was an "unconsolidated" mass of extremely rapidly moving rock fragments.*

***By debris is meant natural soil and rock detritus.*

Approximate ranges of rates of movement are according to the scale below

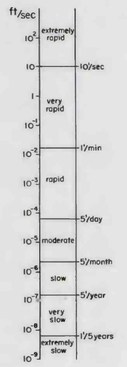


CHART SHOWING CLASSIFICATION OF LANDSLIDES

Reprinted from Varnes (1958, pl. 1) with certain additions for this report

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