The Landslide Reporter's Guide

Primer and Landslide Identification

Contents

This part of the guide is designed to give a brief introduction to landslides and how to identify them.

You will know a little more about:

- Why we study landslides
- Types of landslides
- Our landslide size table (for Landslide Reporter)

Landslides along a Sikkim road caused by the 2011 Himalayan earthquake in India. (Source: AGU/ Sacramento Bee)

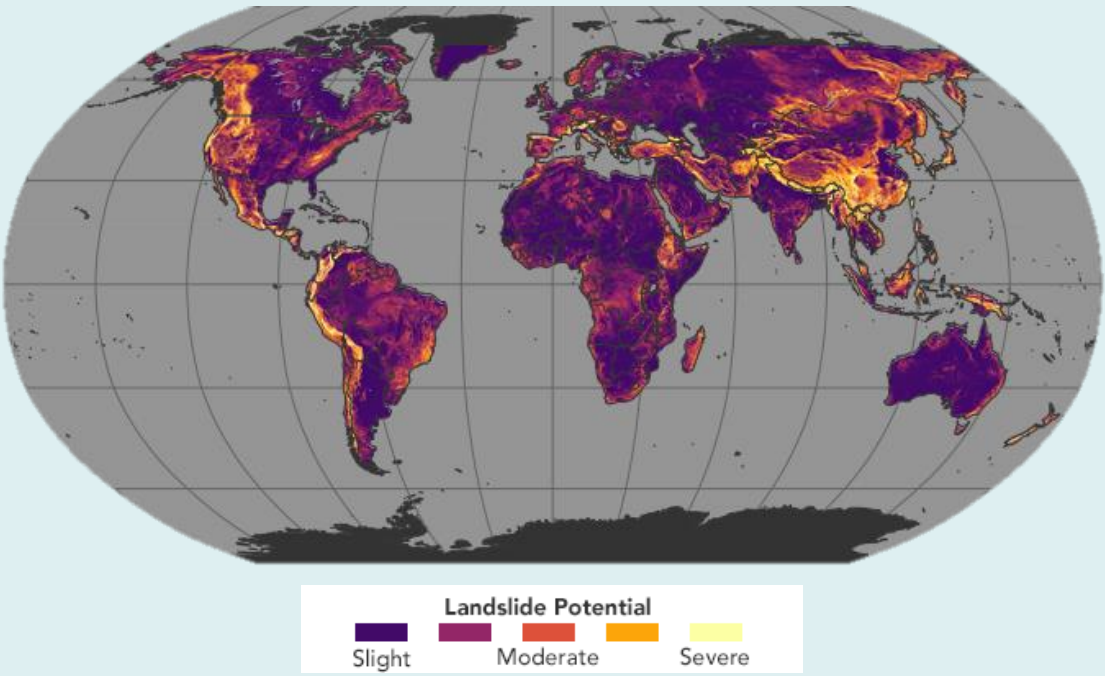
Definition of a Landslide

The United States Geological Survey defines a landslide as “a wide variety of processes that result in the **downward and outward movement of slope-forming materials** including rock, soil, artificial fill, or a combination of these. The materials may move by falling, toppling, sliding, spreading, or flowing”. Landslides can also be called “landslips” or “mass movements”.

Where can landslides happen?

Landslides occur in all environments and nearly every country.

They can be caused by natural processes like rain or earthquakes or by manmade processes like mining or pipe leaks.



This NASA landslide susceptibility map shows the global impact of landslides due to rainfall. (Source: NASA)

Why study landslides?

Worldwide, landslides cause billions of dollars in infrastructural damage and thousands of deaths every year.

Often, it's not exactly known when and where a landslide will occur, resulting in unexpected loss of life and destruction of roads, buildings, and property.

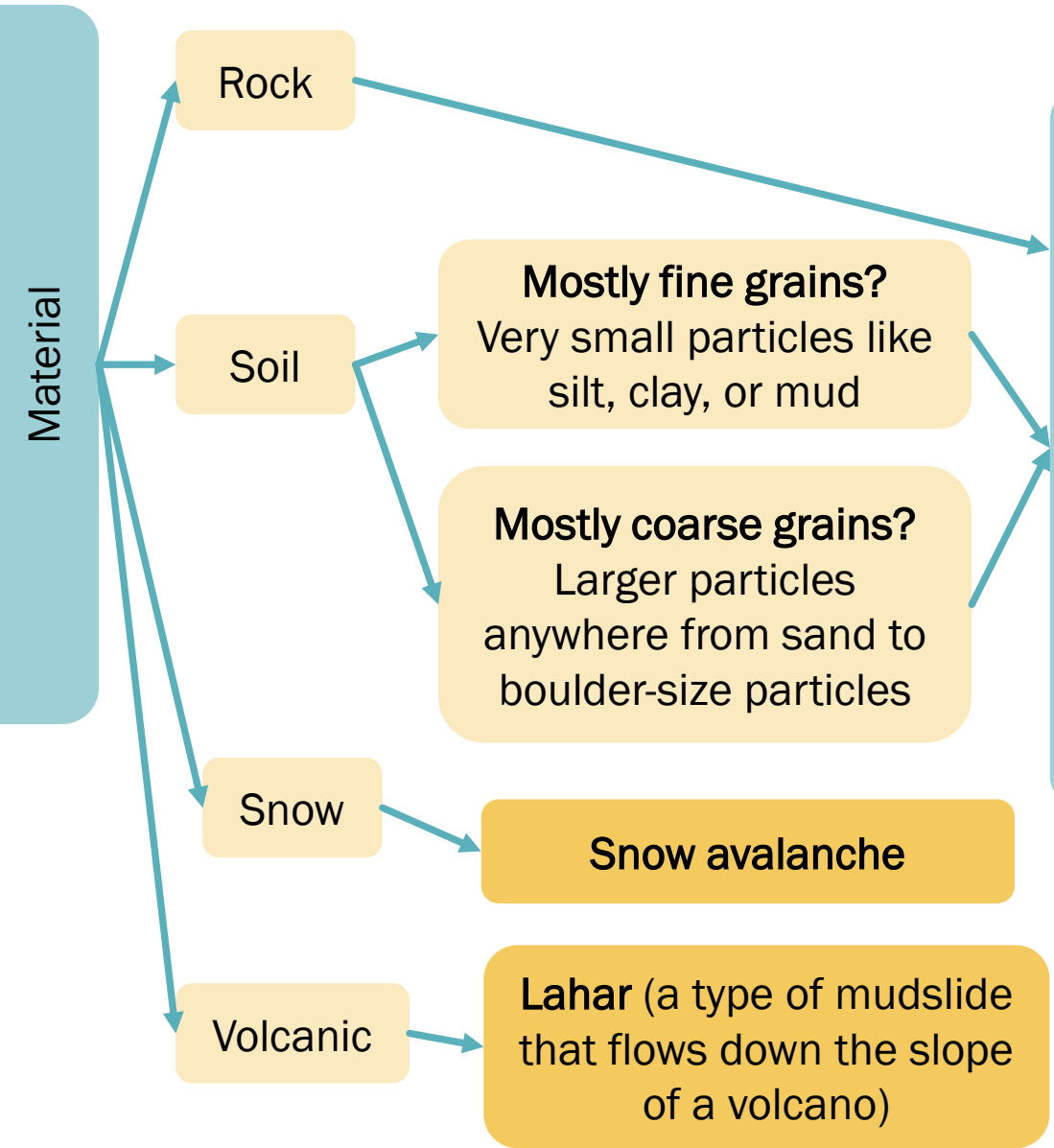
More data about past landslide events guides awareness and action to protect against landslide hazards and enables researchers to study their future impact.

Aerial photo of the 2014 Oso mudslide that killed 43 people in Oso, Washington, USA. (Source: AP)

Landslide Categories

In order to classify a landslide, we need to look at both the **material** and the **movement**.

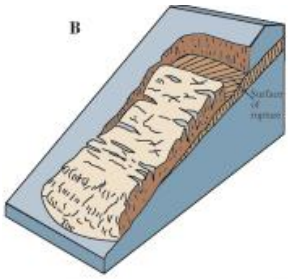
- First, think about material.

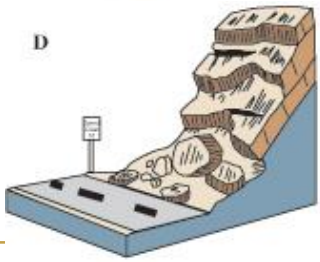


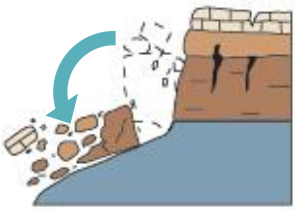
Landslide Categories

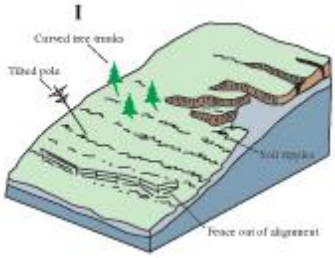
- Next, think about movement.

Slides	The mass breaks off from the underlying layer and slides downslope atop the underlying layer.
Falls	Masses of soil or rock dislodge from a steep slope and fall vertically downwards.
Topples	The mass breaks off and pivots forward around an axis below the displaced mass.
Flows	The mass is saturated with water and viscous enough to flow rapidly downslope.
Creep	The mass moves imperceptibly slow downwards as a result of shear stress, but does not break off completely.









Content adapted from USGS and the California Geological Survey

Landslide Categories

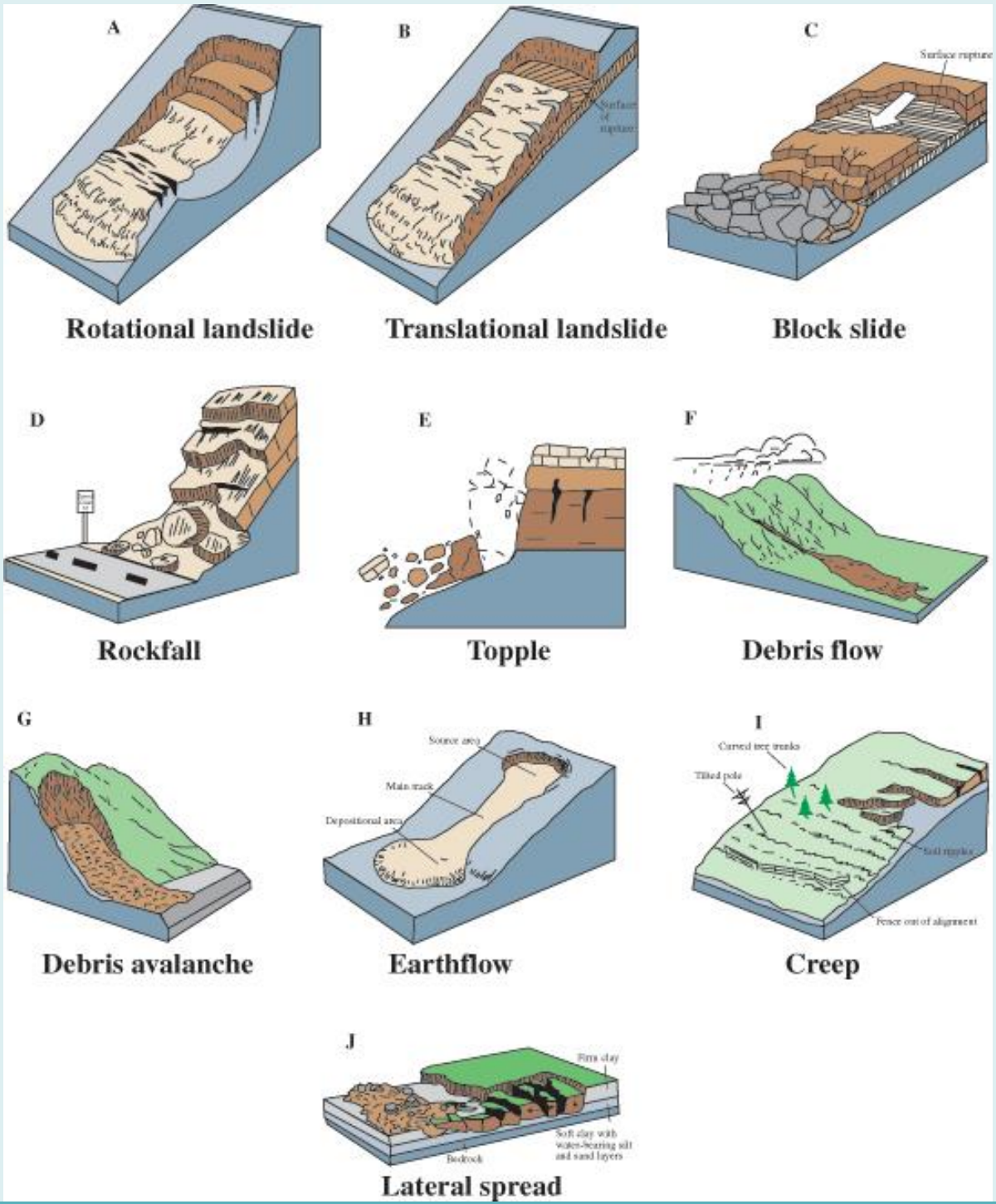
Once you have defined the landslide material and movement, use the tables and guides on the next pages to determine whether the landslide is one of the below categories.

- Landslide
- Mudslide
- Debris flow
- Rock fall
- Translational slide
- Rotational slide
- Complex
- Topple
- Riverbank collapse
- Lahar
- Earth flow
- Snow avalanche
- Creep

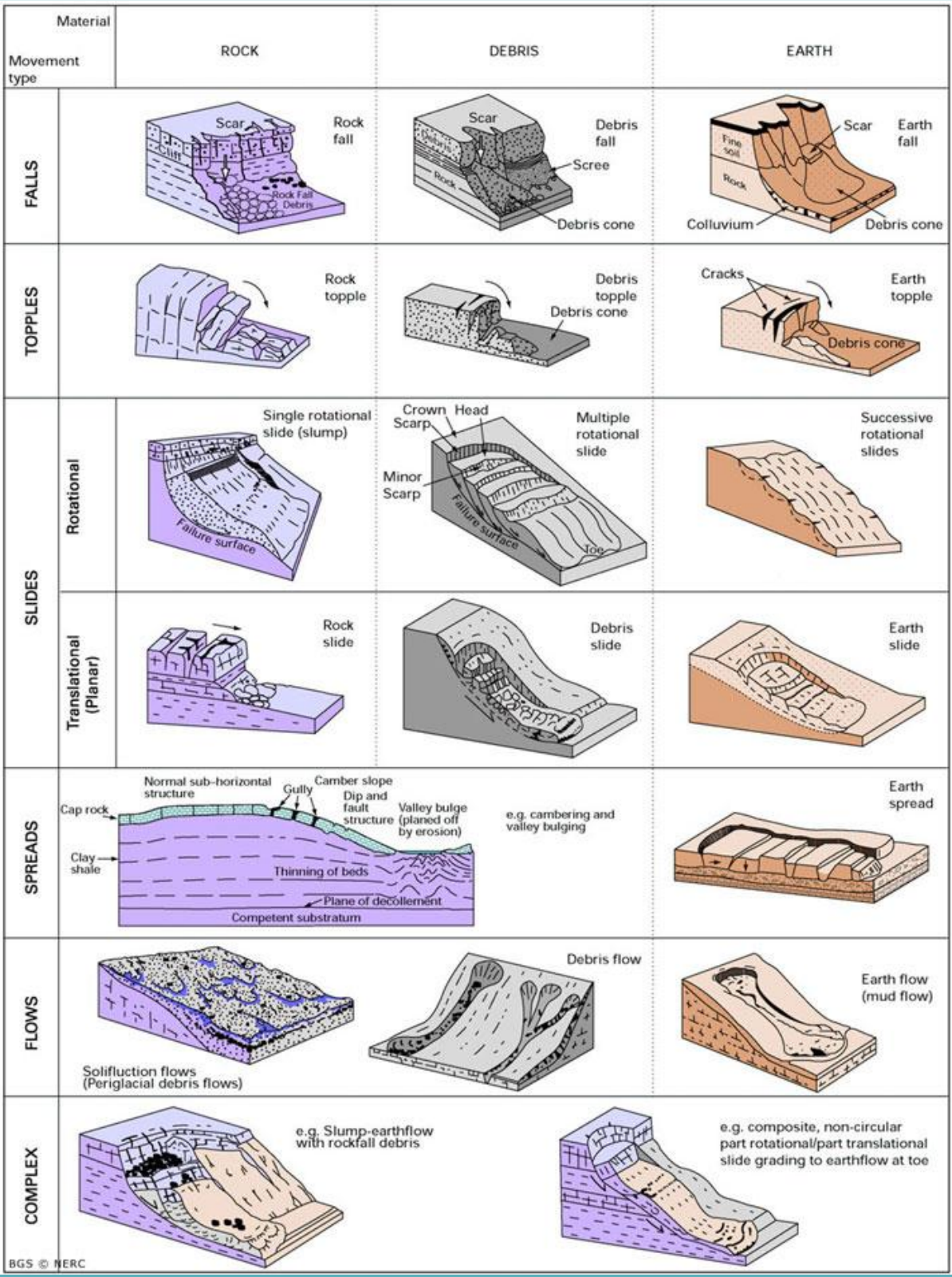
Adapted from an abbreviated version of Varnes' (1978) landslide classification. White boxes are options in Landslide Reporter. (Source: USGS)

Type of movement ↓		Type of material → Bedrock	Engineering soils: Mostly fine	Engineering soils: Mostly coarse
Falls		Rock fall	Earth fall	Debris fall
Topples		Rock topple	Earth topple	Debris topple
Slides	Rotational	Rock slide	Debris slide (Landslide)	Earth slide (Landslide)
	Translational			
Lateral spreads		Rock spread	Earth spread	Debris spread
Flows		Rock flow	Earth flow (Mudslide)	Debris flow
		Rock avalanche		Debris avalanche
		Deep creep	Soil creep	
Complex and compound		Combination in time and/or space of two or more principal types of movement		

Ilustrated Examples 1: Landslide diagrams as classified by the United States Geological Survey (Source: USGS)



Illustrated Examples 2: Landslides as classified by the British Geological Survey (Source: BGS)



Estimated Size

The relative size of the landslide. Use the table below to approximate the size of a landslide event.

	Descriptors	Volumes
Small	Small landslide affecting one hillslope or small area. Minimal impacts to infrastructure and roads. One road is blocked, cleaned in a few hours; one dump truck needed to clear the dirt; usually no fatalities	<10 cubic meters
Medium	Moderately sized landslide that could be either a single event or multiple landslides within an area, and involves a large amount of material. Road is blocked for multiple days; multiple roads blocked; multiple houses damaged; multiple dump trucks needed to clear the dirt; sometimes at least one fatality	10 to <1000 cubic meters

(table is continued on next page)

Estimated Size

The relative size of the landslide. Use the table below to approximate the size of a landslide event.

	Descriptors	Volumes
Large	Large landslide or series of landslides that occur in one general area but cover a wide area. Substantial impacts to infrastructure and roads, likely moderate to high number of fatalities. Tens to hundreds of people displaced.	1000 to <100,000 cubic meters
Very Large	Very large landslide or multiple events that affect an entire region (often encompassing an entire village). Thousands of people may be displaced, may be high numbers of fatalities.	100,000 to <1 million cubic meters
Catastrophic	Catastrophic impacts to infrastructure and roads. Multiple villages, neighborhoods, towns buried. Tens of thousands of people may be displaced. May be hundreds to thousands of fatalities.	≥1 million cubic meters

Finish

Congratulations,
you learned the basics of landslide reporting for COOLR!

Thank you for reading through this landslide primer. Use this guide to help you identify landslides for your reports, and keep it handy when you complete the Landslide Identification Training chapter of this guide.

Landslide Reporter

LANDSLIDES @ NASA

landslides.nasa.gov