When the Landscape Moved

Five landslide disasters and one revealing comparison | 2012-2018



Landsat 7 natural-color view on May 6, 2012, roughly one day after the avalanche. Diagonal stripes are missing data. Credit: NASA Earth Observatory / Jesse Allen and Robert Simmon; Landsat data: USGS.

Historical evidence. Better questions. Useful records.

A hillside can move for years before collapsing, or it can fail in minutes. These six case studies connect satellite views, field observations and measured impacts to show why location, timing and the path of moving material matter as much as size.

Prepared November 11, 2026 | A collection by Dattle

What the records reveal

SCOPE AND METHOD

This is a selected case-study collection, not a ranking or a complete inventory. Five records describe failures; Paul's Slide is a comparison that did not fail catastrophically during the study period. Published estimates retain their units and dates. Satellite acquisition dates differ from event dates. Historical evidence is not a current hazard assessment.

A COMPARISON WORTH MAKING

The most useful comparison is a sequence: prior movement, water or slope conditions, acceleration, runout and consequences. Mud Creek and Paul's Slide experienced similar weather but different outcomes. The contrast illustrates why rainfall totals alone cannot identify which slope will collapse.

IMAGES AND UNCERTAINTY

Photographs and satellite views are historical agency imagery. Charts are drawn from cited observations or estimates, with units and dates preserved. A picture shows a place and moment; it does not prove an entire event boundary, impact or cause. This is a historical reference, not a live warning service.

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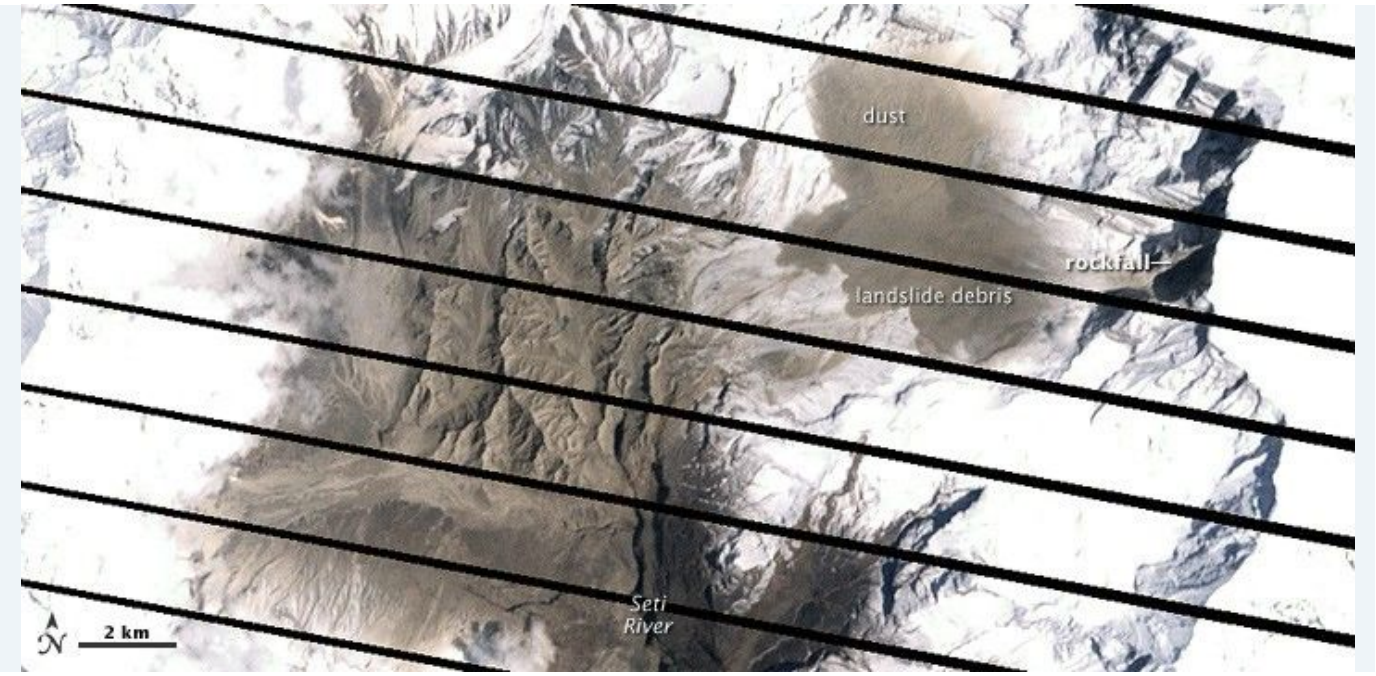
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Annapurna-Seti: tracing a cascading disaster

May 5, 2012 | Annapurna IV and the Seti River, Nepal



Landsat 7 natural-color view on May 6, 2012, roughly one day after the avalanche. Diagonal stripes are missing data. Credit: NASA Earth Observatory / Jesse Allen and Robert Simmon; Landsat data: USGS.

Estimated initial rock volume

About 22 million m³

Source mountain summit

7,525 m elevation

Satellite comparison

April 20 and May 6, 2012

WHAT HAPPENED

A rock avalanche below Annapurna IV coincided with a destructive flood along the Seti River. Researchers combined seismic signals, Landsat imagery and aerial observations to reconstruct a possible connection. Their early estimate put the initial rockfall near 22 million cubic meters. The satellite scene shows debris spread across the high valley after the event.

WHAT THE DATA REVEALS

Track the whole cascade: a slope failure upstream can become a river disaster downstream. The most informative entry links the slope, channel and impact observations, with a time for each.

READ WITH CARE

NASA's May 2012 account describes an evolving interpretation, not a settled reconstruction of the flood mechanism. The estimated volume is not a surveyed flood volume. Diagonal stripes in the image are Landsat data gaps, not landscape features.

Source 1 >

Visual / data >

Mount La Perouse: a remote avalanche found from afar

February 16, 2014 | Mount La Perouse, southeastern Alaska, USA



Landsat 8 view from February 23, 2014. Brown debris contrasts with surrounding snow and ice. Credit: NASA Earth Observatory / Jesse Allen and Robert Simmon; Landsat data: USGS.

Preliminary estimated mass

68 million metric tons

Mapped debris extent

7.4 km

Satellite image

February 23, 2014

WHAT HAPPENED

A mountain-face collapse sent rock, snow and ice southeast across the glacier below Mount La Perouse. The event was first suspected from its seismic signature. Scientists narrowed the location, helicopter pilot Drake Olson photographed the debris, and Landsat supplied a further view. NASA's contemporary account reported a preliminary mass estimate of 68 million metric tons.

WHAT THE DATA REVEALS

Different instruments answer different questions: seismic data constrain timing and dynamics, while imagery establishes where the material traveled. An observation record becomes more useful when these complementary lines of evidence are linked.

READ WITH CARE

The mass estimate was preliminary; it is not interchangeable with volume. The 7.4-kilometer debris extent does not measure speed. This case's remote setting also makes its human consequences unlike an occupied river valley.

Source 1 >

Visual / data >

Oso: when runout crossed a river and a community

March 22, 2014 | Steelhead Haven near Oso, Washington, USA



Landsat 8 image acquired March 23, 2014, showing the debris and temporary barrier lake. Credit: NASA Earth Observatory; Landsat 8 data: USGS.

Fatalities

43

Homes and other structures covered

About 40

Area overrun

About 0.5 square mile

WHAT HAPPENED

The Oso landslide crossed the North Fork Stillaguamish River and devastated Steelhead Haven. USGS reported 43 deaths and about 40 homes and other structures covered by debris. The slide also blocked the river, creating a temporary lake. A Landsat view acquired the following day records both the debris footprint and the water impounded upstream.

WHAT THE DATA REVEALS

The path beyond the initial slope is central to understanding impacts. Record the runout, occupied land, river blockage and subsequent drainage as separate observations rather than reducing the event to a single landslide size.

READ WITH CARE

The area figure is approximate. A satellite footprint cannot reveal every buried structure or reconstruct individual movements. The source's historical account should not be used to infer that nearby slopes are safe today.

Source 1 > **Source 2 >** **Visual / data >**

Mud Creek: a second acceleration before collapse

May 20, 2017 | Big Sur coast, California, USA



USGS aerial view of the May 2017 Mud Creek collapse and the buried Highway 1 corridor. Credit: USGS; reproduced by NASA Earth Observatory.

Estimated rock and debris volume

About 5 million m³

Stable movement documented

At least 8 years

Road repair reported by NASA

More than 1 year; $54 million

WHAT HAPPENED

Mud Creek collapsed across California Highway 1 after years of slow movement. The debris volume was estimated at roughly five million cubic meters. Radar analysis revealed a seasonal acceleration that initially eased, followed by renewed acceleration before the May 2017 failure. The road had already been closed after smaller slides were observed.

WHAT THE DATA REVEALS

A change in the pattern of movement can be more revealing than the presence of movement alone. Comparing successive measurements helps separate familiar seasonal behavior from an unusual sequence.

READ WITH CARE

Surface radar measurements and a hydrological model supported the proposed mechanism; they did not directly measure conditions at the buried slip surface. One documented transition does not establish a universal failure threshold. The repair figure is a reported project cost, not total economic loss.

Source 1 > **Source 2 >** **Visual / data >**

Paul’s Slide: the comparison that did not collapse

2015-2017 study period | Big Sur coast, California, USA



Qualitative synthesis of the 2015-2017 study; not a measured velocity graph. Credit: Dattle graphic from the cited source data.

Comparison with Mud Creek
About 21 km to the north

Outcome during study
No catastrophic failure

Observation method
Satellite radar interferometry

WHAT HAPPENED

Paul’s Slide was a slow-moving comparison site in the study of Mud Creek. It experienced similar wet-season conditions in 2017 but did not undergo catastrophic collapse during the analyzed period. Its movement accelerated with seasonal rain and then stabilized, while Mud Creek showed a later acceleration before failure.

WHAT THE DATA REVEALS

Record non-failures alongside disasters. Otherwise, a collection of failures alone can make a common condition - such as heavy rain - look sufficient to predict collapse. A comparison site helps test an explanation rather than merely illustrate it.

READ WITH CARE

“No catastrophic failure” refers to this study period, not permanent stability or an absence of road disruption. The small comparison sample supports a research question, not an operational warning rule. The graphic summarizes observed outcomes, not measured displacement.

Source 1 > Source 2 > Visual / data >

Montecito: intense rain on a recent burn scar

January 9, 2018 | Montecito and the Thomas Fire burn area, California, USA



Landsat 8 image on January 10, 2018: burn scars and debris paths are brown; unburned vegetation is green. Credit: NASA Earth Observatory / Joshua Stevens; Landsat data: USGS.

Reported local rainfall burst

13 mm in 5 minutes

Nearby Carpinteria rainfall

22 mm in 15 minutes

Satellite comparison

November 23, 2017 / January 10, 2018

WHAT HAPPENED

Debris flows carried mud, rock and burned vegetation from slopes affected by the Thomas Fire into Montecito. NASA's imagery contrasts the landscape before the fire with conditions after the January flows. Its account emphasizes short, intense rain bursts: about 13 millimeters in five minutes at Montecito, rather than an exceptional storm-total rainfall alone.

WHAT THE DATA REVEALS

Combine rainfall intensity with the prior condition of the catchment. A before-and-after image becomes more meaningful when the record also includes the fire date, rain duration and downstream route.

READ WITH CARE

The two rainfall measurements are from different locations and durations, not competing totals for one gauge. NASA's early report contained evolving damage counts; those counts are omitted here. Historical rainfall examples are not a local evacuation threshold.

Source 1 > Source 2 > Visual / data >

From examples to observations

A USEFUL RECORD KEEPS ITS EVIDENCE

Keep the time, place, measurement method, unit, source and uncertainty with every observation. Separate what you saw from an estimate or interpretation. Repeat observations consistently, and retain the original evidence when updating a record.

SUGGESTED DATTLE FIELDS

- Observation date and time, with time zone
- Named slope, watershed and approximate location
- Event type and whether failure was observed or inferred
- Rainfall amount, duration and observation source
- Previous fire, erosion or movement history
- Displacement or runout, with method and units
- Road, river, building and ecological impacts
- Photograph date, view direction and source credit
- Evidence status, source URL and next follow-up

AI AS AN ACCELERATOR

Use this prompt to draft a collection structure, then review it. AI can organize the questions and fields; it cannot supply missing observations or replace source verification.

> Create a Dattle for documented landslides and debris flows. Include date, location, event type, trigger evidence, previous movement, rainfall with duration and units, measured or estimated runout and volume, effects on roads and rivers, source-linked photos, observation methods, uncertainty and follow-up. Keep observations separate from interpretations. Include comparison sites that did not fail and label them clearly. Do not invent missing measurements or treat the collection as a warning system.

Explore Dattle at dattle.com. Availability, features and plan limits are described on the website.

Sources and image credits

Primary references checked November 11, 2026. Records and estimates can be revised. Every case page links to its evidence; full addresses are retained here for reuse.

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