

Landslide Overview

Types, frequency, and risk factors of landslides in Southeast Alaska



Satellite photo of the Mt. Perouse landslide last February. Mt. Perouse is just south of Mt. Fairweather. Photo courtesy of Earth Observatory.

The Motivation: The rip-roaring power of landslides is an inspiring and sometimes terrifying fact of life in Southeast Alaska. With our steep, glacially-scoured valleys, our near-constant rainfall, our wild storms, and our poorly bonded soil, we live in a landslide paradise. But while they are almost inevitable here on thousand-year timescales, they're infrequent enough in our lifetimes to be surrounded by mystery, awe, and surprise when they do occur. With the Redoubt Lake and Starrigavan valley slides coming almost back to back and threatening lives and property, it's natural to think, "Where will the next one hit? Should I be worried?" Your direct landslide risk will be dependent on exactly where you live, but here's a brief overview of landslide types and frequencies across Southeast. Read on!



Aerial view of the Redoubt Lake slide. Surprisingly, this slide was initiated by rockfall! Photo from alaskapublic.org.

The Jargon: Types of Landslides

- 1) **Debris flow/avalanche:** fluid soil, debris, and water. Often start in highly saturated soil. The Starrigavan slide was a debris flow.
- 2) **Debris torrents:** a debris flow that has become concentrated into a tight notch or gully, increasing its local destructive power.
- 3) **Rockfall-initiated slides:** caused either by rocks falling from above an unstable slope or by blocks of bedrock pulling out of the slope. The Redoubt Lake slide was rockfall-initiated.
- 4) **Rotational slumps:** slow movement of a large block of soil, often only centimeters/year, along a slippery surface. Common slippery surfaces include smooth bedrock or ash layers.



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The Risks: Which Areas Are Most Prone to Landslides?

- 1) **Over steepened slopes.** Landslides are most common on slopes of 34 or more degrees, but they are not unheard of on slopes as low as 26 degrees.
- 2) **Southern facing slopes.** According to a 1991 report, 86% of landslides occur on southern aspects. The main Starrigavan slide faced south.
- 3) **Thick ash layers.** Much of Southeast Alaska was blanketed in 2-6 feet of ash during volcanic eruptions between 9,000 and 12,000 years ago. Thicker ash layers make excellent slippery surfaces for landslides to start.
- 4) **Strongly glaciated bedrock.** Most of Southeast Alaska has been scoured and smoothed by glaciers. That bedrock can be hard to find in the forest, but a stroll down the road to Medvejie Hatchery passes some excellent examples of glacially-smoothed bedrock.
- 5) **High rain potential.** Southeast Alaska is used to getting wet, but debris avalanches are typically sparked by an anomalously wet period or storm. "Microbursts" are often implicated in landslides, as is heavy rain over a recent snowfall.
- 6) **Water-collecting terrain.** Small depressions on a slope that focus water are often the starting points for debris avalanches. Soil channels are also common contributors to slope instability.



Logjam caused by the Starrigavan landslide

The Numbers:

13% of landslides are "debris torrents" overall. Debris torrents are more common in harvested timber.

2% of landslides are rockfall initiated.

79% of landslides start at elevations between 100 meters and 500 meters.

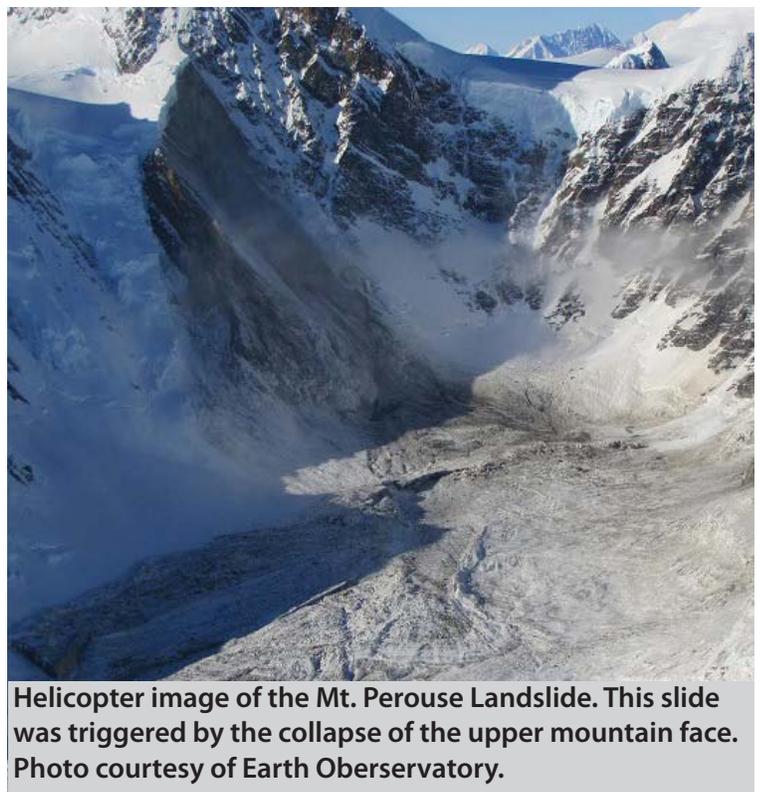
3.5x: the number of landslides on previously logged areas vs. unlogged areas.

3 acres (~220 meters long) : the average size of a landslide in unharvested timber.

0.5 acres (~40 meters long): the average size of a landslide in harvested timber.

75 million tons: the estimated size of the February 16, 2014 Mt. Perouse landslide. This slide was the largest natural slide in the world since 2010.

7.4 kilometers: the distance travelled by Mr. Perouse debris.



Helicopter image of the Mt. Perouse Landslide. This slide was triggered by the collapse of the upper mountain face. Photo courtesy of Earth Observatory.