

DEBRIS FLOWS

Debris flows (a type of landslide) are a fast flowing mixture of mud, rocks, and trees

Triggered by heavy bursts of rain or rain-on-snow events



More likely to occur following local slope movements/distress and prolonged precipitation

Houses at the base of steep slopes with mountain creeks are at greatest risk



Begin in mountain creeks and grow in size as they travel down slope, usually in surges (pulses)

Can bury or tear down houses



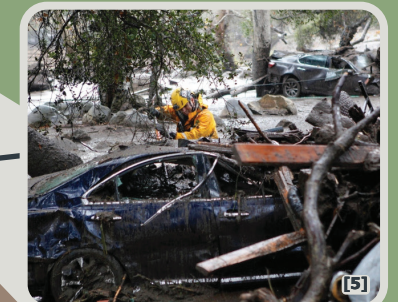
Can flow faster than a person can run

Can suddenly jump out of the channel

Can sweep away or crush cars



Can impact homes far from the channel



PROTECT YOURSELF FROM

DEBRIS FLOWS

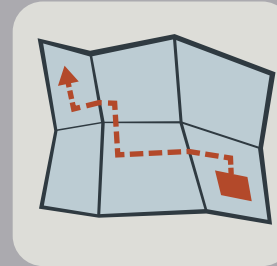
BEFORE

Stay informed



Keep updated with weather advisories, such as heavy rainfall warnings. Consult the Haines Borough to learn where the slope hazard zones are located.

Have a plan



Consult the Haines Borough about the best evacuation route and muster station. Know what rooms are safest if you have to shelter in place.

Know the signs



An abrupt increase or decrease in flow, unusually muddy water, shaking ground, and a loud roar (rumbling sounds like a train or helicopters) might indicate a debris flow is coming.

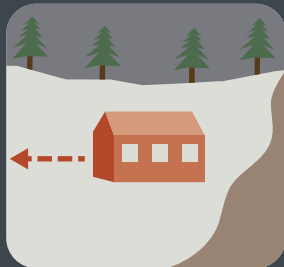
Safe home design



Put high occupancy rooms like bedrooms on the top floor and on the downhill side (away from slopes).

DURING

DECISION: evacuate



If you believe your life to be in imminent danger and you see a clear path to safety, evacuate. Go to higher ground. Take the evacuation route to the muster station.

DECISION: shelter



If it is unsafe to evacuate, shelter up and away. Climb to the top floor or on the roof. Shelter on the downhill side, away from the slope. Avoid basements.

Climb on top of furniture



Get on top of a bed or counter to avoid being swept away or buried. Do not hide behind or underneath heavy furniture - these can crush or pin you down.

Shelter in a closet



If you cannot escape vertically, small rooms like closets can offer additional protection from collapse if your home is buried.

DO NOT exit out of curiosity



Seek shelter upstairs instead of investigating the situation. Only go outside to evacuate.

DO NOT cross flood waters



Moving water and debris as little as 12 inches deep can quickly sweep you away. Do not attempt to drive or walk through.

AFTER

Assume more will come



Debris flows come in surges (pulses) and can continue for days. Following pulses may be more severe than the previous.

Make noise if buried



Shout or tap on something so search and rescue can locate you faster.

If safe, help neighbors



Help evacuate your neighbors when it's safe to do so, and offer assistance to search and rescue personnel.

Obey closures



Evacuation orders and road closures must be taken seriously. Only return to your house when local authorities declare it safe to do so.

NOTES

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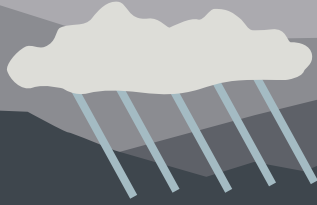
- [1] Photo provided by the Haines Avalanche Center.
- [2] Debris flow in Brienz, Switzerland. Available from: [https://www.bafu.admin.ch/bafu-fr/home/themes/dangers-naturels/dossiers/cruces-dix-ans/la-crue-de-tous-les-records-.html](https://www.bafu.admin.ch/bafu/fr/home/themes/dangers-naturels/dossiers/cruces-dix-ans/la-crue-de-tous-les-records-.html)
- [3] Damaged home in Montoceto, CA. Available from: <https://www.arcgis.com/apps/MapJournal/index.html?appid=541c23aa483b48978d1bc9904a6fb14d>
- [4] Debris flow at Cataline Creek, BC. Photo taken by BGC Engineering Inc.
- [5] Long Beach Search and Rescue photo by AP/Daniel Drefuss. Available from: <https://www.ctvnews.ca/world/death-toll-hits-17-in-california-mudslides-13-missing-1.3753070>

BGC Engineering Inc. prepared this infographic for Project No. 2263001. Artwork by Sophia Zubrycky.

ROCKFALLS & ROCKSLIDES

Rockfalls are pieces of rock falling, bouncing, or rolling down a slope

Rockslides are large masses of rock detaching, sliding, and breaking apart down a slope



Occur mostly during heavy rain, freeze/thaw cycles, or earthquakes

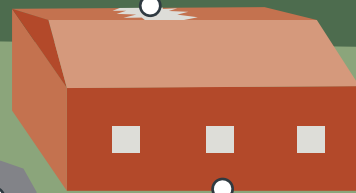


Rockfalls can easily break through walls and roofs

Smaller rockfalls often come before larger rockfalls and rockslides



Rockslides can easily destroy roads, cars, and buildings



Boulders might be evidence of past rockfalls and rockslides



Houses at the base of steep slopes are at greatest risk

Rocks can reach speeds faster than a car can travel

Rocks can bounce and roll long distances



Rocks can be bigger than a truck



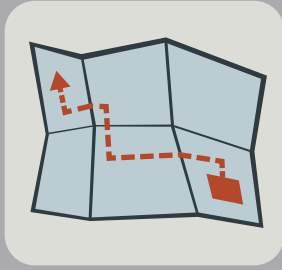
BEFORE

Stay informed



Keep updated with weather advisories, such as heavy rainfall warnings and repeated cycles of freeze/thaw.

Have a plan



Consult the Haines Borough about the best evacuation route and muster station. Know what rooms are safest if you have to shelter in place.

Know the signs



Signs include ground shaking (like an earthquake), loud cracking, and clouds of dust. Smaller rockfalls often come before larger ones.

Know the hazard zones



Consult the Haines Borough to learn where slope hazard zones are located.

Limit exposure



Limit time spent in slope hazard zones. Do not park beneath steep slopes or rock cuts.

Safe design



Put high occupancy rooms like bedrooms on the top floor and on the downhill side (away from slopes); add barriers between hillside and homes.

PROTECT YOURSELF FROM ROCKFALLS & ROCKSLIDES

DURING

DECISION: evacuate



If you believe your life to be in imminent danger and you see a clear path to safety, evacuate. Get away from the slope as fast as you can. Take the evacuation route to the muster station.

DECISION: shelter



If it is unsafe to evacuate, shelter in a room on the downhill side of your house, preferably on the top floor.

DO NOT cross a rock path



Crossing debris is very dangerous since more rocks will likely fall here. Take a route away from the slope and debris.

DO NOT stay to watch



Rocks can bounce irregularly and roll long distances. Get away from the slope instead of watching or filming.

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- [1] Christchurch earthquake rockfall photo by Julian Thomson. Available from: <https://outtherelearning.co.nz/2011/04/rockfall-impacts-from-the-christchurch-quake/>
- [2] Sea-to-Sky rockslide photo from SFU archives. Available from: <http://www.sfu.ca/geog/geog351spring09/group06/Landslide/2landslidegallery.htm>
- [3] Site of Utah rockfall tragedy. Available from: <https://blogs.agu.org/landslide-blog/2013/12/13/utah-rockfall-1/>
- [4] Semi-truck smashed by rockslide boulder photo by Matt Ruschinski. Available from: <https://www.cbc.ca/news/canada/british-columbia/trans-canada-highway-rock-slide-semi-boulder-1.4502567>

BGC Engineering Inc. prepared this infographic for Project No. 2263001. Artwork by Sophia Zubrycky.

AFTER

Assume more will fall



Rocks may continue to come down since the slope is unstable.

Notify authorities



Report any rockfalls and rockslides, big or small, to local authorities.

If safe, help neighbors



Help evacuate your neighbors when it's safe to do so, and offer assistance to search and rescue personnel.

Obey closures



Evacuation orders and road closures must be taken seriously. Only return to your house when local authorities declare it safe to do so.