

FACT SHEET: LANDSLIDE HAZARDS

WASHINGTON GEOLOGICAL SURVEY

SHALLOW LANDSLIDE HAZARD FORECAST SYSTEM

In cooperation with the National Weather Service and NOAA, we have developed a model based on recent and predicted rainfall data that may forecast hazards and may reduce losses from landslides. Visit the site at www.dnr.wa.gov/slhfm.

FREQUENTLY ASKED QUESTIONS

Where do landslides occur?

Landslides can occur on gentle to steep slopes but they are most common on steep slopes.

When do landslides occur?

Landslides occur when the strength of material on a slope becomes less than the force of gravity acting on the material.

Common landslide triggers include:

- **Rainfall**—Prolonged or intense rainfall and rain-on-snow events can saturate soils and trigger landslides
- **Earthquakes**—Intense shaking during earthquakes can cause the ground to fail
- **Water-level changes**—Rapid lowering of water levels can trigger landslides, especially along dams, coastlines, reservoirs, and rivers
- **Human activities**—Vegetation removal, mining, loading on a slope, excavation at the base of a slope, and leakage from pipes can all trigger landslides
- **Geology**—Easily weathered rock types and sandy or clay-rich soils are especially susceptible to landslides

REPORT LANDSLIDES

Report landslides to your county
Emergency Manager:
mil.wa.gov/other-links/emd-contact-us



WASHINGTON STATE DEPT OF
**NATURAL
RESOURCES**

Landslide Hazards in Washington State



Washington is one of the most landslide-prone states in the country, with hundreds to thousands of events each year. The direct cost of landslide damage includes the repair of roads and property. Indirect costs, such as loss of property value and tax revenue, and environmental effects, such as the degradation of water quality, can exceed direct costs.

This fact sheet is designed to provide general information about landslide hazards and possible warning signs. Individual landslides have many variables and are not predictable.

WARNING SIGNS OF AN IMPENDING LANDSLIDE

- Landslides are dangerous and unpredictable. Some landslides may provide clues that they are about to happen; others may happen suddenly without any warning signs.
- Rapidly growing cracks in the ground; downslope movement of rock, soil, or vegetation.
- Sudden changes in creek water levels, sometimes with increased sediment, especially during or right after large or protracted storm events
- Sounds of cracking wood, knocking boulders, groaning of the ground, or other unusual sounds, especially if the sound increases

IF YOU NOTICE THESE SIGNS OR OBSERVE A LANDSLIDE IN PROGRESS

Leave the area immediately if it is safe to do so! Landslides are dangerous, unpredictable, and can occur rapidly. A landslide can easily destroy or bury a car or house.
Report the problem immediately to your county Emergency Manager.

WARNING SIGNS OF A POTENTIAL LANDSLIDE

- A hillside that has increased spring and (or) seep activity, or newly saturated ground, especially if it was previously dry
- Formation of cracks or tilting of trees on a hillside
- New or developing cracks, mounds, or bulges in the ground
- Sagging or taut utility lines; leaning telephone poles, deformed fences, or bent trees
- Sticking windows or doors; new and (or) growing cracks in walls, ceilings, or foundations
- Broken or leaking utilities, such as water, septic, or sewer lines
- Separation of structures from their foundation; movement of soil away from foundations
- Changes in water well levels or water wells that suddenly run dry

WHAT TO DO IF YOU THINK A LANDSLIDE MAY OCCUR

Signs of a potential landslide should be reported to your county Emergency Manager so that the area can be properly evaluated (See *RESOURCES* on back page).



Courtesy Washington State
Department of Ecology

PERKINS LANE LANDSLIDE

REDUCE YOUR RISK

Most landslides and flows occur during or up to several days after a heavy rainfall or rapid snowmelt event. Earthquakes can also initiate landslides so be alert if you feel the ground shake and you are near sloping ground.

- Educate yourself about your landslide risk. Locations that experienced landslides in the past are more likely to have future landslides. The Washington Geologic Information Portal contains the most comprehensive listing of landslides available. However, because not all landslides are mapped, the absence of a landslide in the database does not indicate the absence of risk.
- Make a landslide emergency plan. Know what areas near your home or work are at risk. Know which areas are safe and how to reach them in an emergency.
- Consider evacuating prior to storm events which can cause sudden flooding and (or) landslides.
- Avoid living in locations that are hazardous. Areas above or below steep slopes, or in areas known to have frequent landslides, are more likely to experience landslides in the future.
- Consult a licensed geologist or licensed geotechnical engineer if you would like a site-specific evaluation.
- Control runoff from buildings and roads so it flows away from steep slopes and into natural drainages or storm drains.

DURING DANGEROUS WEATHER

- Seek out advisories and warnings during and after intense rainfall events. Check the NOAA Weather Radio, your local TV stations, and the Shallow Landslide Hazard Forecast website at <https://fortress.wa.gov/dnr/protection/landslidewarning>.
- Don't assume that highways are safe—watch for collapsed pavement, mud, fallen rock, or other debris on the roadway.
- Listen for loud or unusual sounds. These can be indicators of an imminent landslide. If you think there is danger, evacuate immediately.
- Keep away from landslide-prone areas.

LANDSLIDES AND THE WASHINGTON GEOLOGICAL SURVEY

Our mission is to collect, develop, use, distribute, and preserve geologic information to promote the safety, health, and welfare of the citizens, protect the environment, and support the economy of Washington. To this end, we conduct and maintain an assessment of landslide hazards in Washington. This assessment is not comprehensive. We also provide technical assistance to state and local government agencies on the interpretation and application of this assessment. Every year, we respond to and (or) record hundreds to thousands of landslides.

RESOURCES

City/County Emergency, Health, and Planning Departments

Emergency Management—mil.wa.gov/other-links/emd-contact-us

Counties—www.mrsc.org/byndmrsc/counties.aspx

Cities—www.mrsc.org/byndmrsc/cities.aspx

Washington Geological Survey

Geologic Information Portal—www.dnr.wa.gov/geologyportal

Shallow Landslide Hazard Forecast Map—<http://fortress.wa.gov/dnr/protection/landslidewarning>

Washington State Forest Practices Board Manual

Evaluating Unstable Slopes—http://www.dnr.wa.gov/Publications/fp_board_manual_section16.pdf

Washington State Department of Transportation

Road closures due to landslides—www.wsdot.wa.gov/

Federal Emergency Management Agency (FEMA)

Landslides—www.ready.gov/landslides-debris-flow

U.S. Geological Survey (USGS)

Landslide Hazards Program—<http://landslides.usgs.gov/>

Landslide Insurance

<http://insurance.wa.gov/your-insurance/home-insurance/landslides/>

Washington State Department of Licensing

Licensed Geologists—<http://www.dol.wa.gov/business/geologist/>

Washington State Department of Ecology

Puget Sound Landslides—www.ecy.wa.gov/programs/sea/landslides/index.html



Courtesy Wash. State
Dept. of Transportation