



Slip Sliding Away



n March 22, a deluge of wet mud covered most of a town in Washington, killing 41 people, injuring many more, and engulfing everything in its path. The steep slopes above the Steelhead Haven development just east of Oso held massive amounts of water from rain, and the additional weight helped gravity to expedite a landslide that might otherwise have been delayed years or occurred more gradually.

Landslides are not uncommon in the United States; just after this major disaster a smaller and drier event took place in Jackson, Wyoming. There the slopes relatively crept downward over a period of several weeks from the outskirts towards the tourist town, cracking homes and roads ahead of it but giving notice to those in its path to get out of the way.

The causes of landslides are as varied as the types. The US Geological Survey publishes both a short four-page fact sheet and a comprehensive 147-page landslide handbook (Circular 1325) explaining slides, falls, topples, flows, and lateral spreads. Both the Oso and Jackson events come under the category of “flow”, although different subsets of that broad description.

Oso experienced debris flow, the rapid movement of loose materials massed together as a slurry 9 to 21 feet deep. The weight of soil, rock, organic material, and extraordinary amount of water from heavy spring rains roaring downhill gave residents little opportunity to escape – this time. The slope area, known as the Hazel Landslide, has experienced lesser events due to instability documented back to 1937, most recently in 2006. A possible buyout of homes below it was tabled in 2004, and a



An aerial view of the Stillaguamish River and State Route 530 after the Oso landslide on March 22. The landslide resulted in the damming of the Stillaguamish River in Snohomish County. Mud covering the area, including SR 530, is a mile wide.

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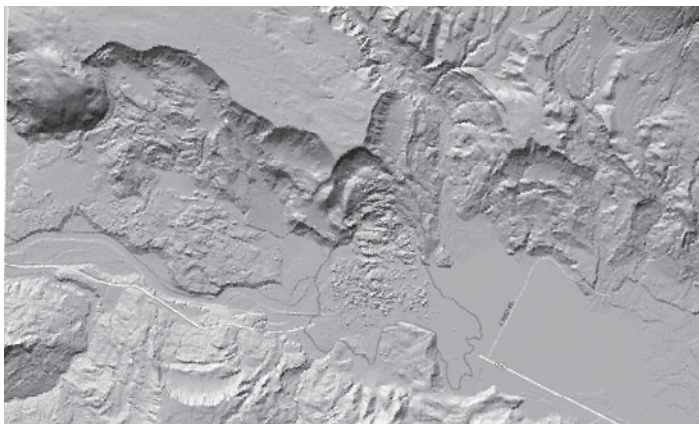
study commissioned by the county in 2010 identified the slope as one of the county's most dangerous.

Jackson had more of a creeping type of slow earthflow. Investigators are still unclear as to whether excavation and grading at the base of the slope or the wet winter initiated the slide. Geologists there want to drill deep into the hillside for core samples they hope will reveal soil and rock composition, water levels, and depth and contour of the moving layer.

Both situations point out additional care needed in planning and siting development when slopes are nearby, particularly when directly above us: geology matters. While I haven't seen such designations, there is allowance for mapping of mudflows on

the Flood Insurance Rate Maps, identified as Zone M to represent areas “most likely to be subject to severe mudslides (i.e., mudflows).” Mudslides and mudflows are defined in 44 *CFR* 59.1(a)3 as “a condition where there is a river, flow or inundation of liquid mud down a hillside usually as a result of a dual condition of loss of brush cover, and the subsequent accumulation of water on the ground preceded by a period of unusually heavy or sustained rain.” This section further includes in its definition of “flood” or “flooding” those mudslides and mudflows “which are proximately caused by flooding as defined in paragraph (a)(2) of this definition and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is

Lidar image showing the upper parts of the landslide that occurred in northwest Washington on March 22, 2014.



carried by a current of water and deposited along the path of the current.”

NFIP regulations tell us that a mudslide/mudflow can happen while a landslide is in progress, and that when the mud’s movement rather than the landslide is the “proximate cause of damage” then the mudslide/mudflow will be recognized as a flooding event. Those harmed by such incidents are therefore eligible for flood insurance payouts (if they had flood insurance policies).

But should we be counting on flood insurance to resuscitate us from these disasters? Circular 1325 includes along with its explanation of each type of landslide a description of the general velocity of travel, triggering mechanisms, direct and indirect effects, predictability, and mitigation measures that can be taken to protect against that particular category of event. We know that “mitigation” is a big focus in floodplain management, and that the term generally means taking action to reduce the serious-

ness of something, whether emotional pain or physical circumstances. In every case, the best means of mitigation is avoidance of a risk in the first place—and Circular 1325 underscores this for every type of landslide. Failing this, try to minimize impacts when risks and hazards can’t be avoided.

We should be more aware of the landscape uphill of our built communities. Circular 1325 notes that generally debris flows can’t be prevented, and the recommended mitigation is to avoid building homes in steep walled areas that have a history of flows or are “otherwise susceptible due to wildfires, soil type, or other related factors.” (Fires glaze and seal soils through high heat while destroying stabilizing vegetation.) Deflection structures and debris-flow basins may buy some time, but warning and evacuation systems may be inadequate. ■

Wendy Lathrop is licensed as a Professional Land Surveyor in NJ, PA, DE, and MD, and has been involved since 1974 in surveying projects ranging from construction to boundary to environmental land use disputes. She is a Professional Planner in NJ, and a Certified Floodplain Manager through ASFP.



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