

# No national system to track landslide hazards

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In this photo taken in October 2012, released by WSI, a Quantum Spatial Company, sensor operators Lennie Rummel left, and Drew Wendeborn, right, are shown inside a helicopter taking measurements with LIDAR, a high-tech laser system mounted on the aircraft, to build a detailed elevation map of the terrain above Omak, Wash. The maps can be used by planners and homeowners to begin to assess landslide risk. (AP Photo/ WSI, a Quantum Spatial Company)

People living in the path of a deadly Washington state landslide had virtually no warning before a wall of mud, trees and other debris thundered down the mountain. Some of the homeowners didn't even

know the hillside could give way at any time.

Unlike the warning systems and elaborate maps that help residents and officials prepare for natural disasters such as floods and hurricanes, there's no national system to monitor slide activity and no effort underway to produce detailed nationwide landslide hazard maps.

The U.S. Geological Survey doesn't track or inventory slide areas on a national scale, despite an ambitious plan to do so more than a decade ago when Congress directed it to come up with a national strategy to reduce landslide losses.

That's left states and communities to put together a patchwork of maps showing landslide hazards. In some cases, they are discovering that more buildings than previously thought are sitting on unstable ground. Even then, that information may not make its way to property owners.

Building a nationwide system is now possible with new technology, experts say, but would require spending tens of millions of dollars annually and could take more than a decade to complete with the help of states and cities. So far, however, there has been little public outcry for faster, concerted action.

"No one has pushed it, and it hasn't been a priority," said Scott Burns, a geology professor at Portland State University. "It's costly to monitor it, and we don't want to pay for it."

He added, "Now they're seeing these large disasters and saying this is important."

The challenge, experts say, is that many landslides are inactive or cause consistent low-level damage, while big, destructive landslides happen only sporadically and don't cause the type of spectacular devastation

hurricanes, earthquakes or tornadoes do—so they often don't get the same attention or resources.

Despite this, landslides have exacted a toll in all 50 states, causing 25 to 50 deaths a year and up to \$2 billion in losses annually. The last national map, which shows high landslide risk areas in the Appalachians, the Rockies and along the West Coast, was published in 1982, but it is outdated and lacks detail.

The lack of attention on landslides comes as experts say increasing numbers of people are moving farther out from cities and suburbs—or onto previously uninhabited slopes within them—and are more likely to come face to face not just with the views they sought but also with nature's destructive forces. Development on vulnerable land can disturb soil, put too much weight on slopes, or increase soil moisture, whether it is from runoff or a prolific sprinkler system.

Lynn Highland, a geographer with the USGS's National Landslide Information Center, said she and others have advocated for a national landslide inventory, but the agency's Landslide Hazards Program only has an annual budget of \$3.5 million and a staff of about 20.

"It's expensive and everybody seems to be satisfied with dealing with landslides when they come, except when we get a big one like this," she said, referring to the March 22 slide that killed at least 18 in Oso, about 55 miles northeast of Seattle, in what could be one of the worst natural disasters in the state's history.

Weary of landslides constantly threatening homes, power lines and underground pipes, some states aren't waiting for disasters to hit. Oregon, North Carolina, Kentucky and others have used high-tech lasers mounted on aircraft to begin to assess landslide risk and build maps that could be used by planners and homeowners.

The air-borne laser, known as LIDAR, fires rapid laser pulses at a surface and a sensor on the instrument measures the amount of time it takes for each pulse to bounce back—building a detailed elevation map, point by point.

These mapping efforts are turning up previously overlooked dangers: More homes and businesses than previously thought are sitting on hillsides, coastal bluffs and mountain areas that could give way at any time.

"We discovered that in most places we had only found a tenth to a quarter of existing landslides in previous mapping efforts," said Ian Madin, chief scientist for the Oregon Department of Geology and Mineral Industries.

While a national LIDAR mapping effort is planned to start in 2015, USGS scientists have worked in regions such as Washington state's Puget Sound to pinpoint landslide hazards. In Seattle, they developed a forecasting tool that acts as an early warning system to let city officials know when intense rainfall could likely cause rain-soaked hillsides to buckle.

Jim Lee, a senior engineer with Seattle Public Utilities, said when that rain threshold is reached, landslide response crews are put on standby so they are ready to clear downed power lines, mud-covered streets or check on water lines. The National Weather Service in Seattle also will issue statements about potential landslides once the threshold is reached.

Tracking landslides is difficult because all the action happens underground and slides vary from hillside to hillside depending on soil, hydrology and geologic conditions, experts say, so much so that damage is typically excluded from typical private property insurance.

The lack of private insurance for landslide damage results, in part, from the difficulty in estimating the likelihood that a landslide will occur at any particular location, a USGS study found. "We might be able to get a handle on insurance for landslide if we have an inventory," Highland said.

The USGS started a landslide inventory pilot project for states but ran out of money. A dozen states participated, including Oregon, Washington, California, Louisiana and Pennsylvania. But even if scientists can map all the existing landslides and are able to monitor those that are active, they still don't know how to narrow down to the most vulnerable locations where landslides can turn into a disaster, said Jonathan Stock, director of the USGS Innovation Center for Earth Sciences in California.

"Of the tens of thousands of similar landslides that are slowly moving around the nation, we still don't know which have the potential to be pathological," Stock said.

For now, the USGS runs a half dozen monitoring research projects to understand conditions in soil that precede landslides driven by big storms. In the San Francisco Bay area, where storms have caused hundreds to thousands of slides at a time in recent years, instruments measure such soil characteristics as moisture level and water pressure.

Some communities are working to develop regulations that would guide development on landslide-prone areas. In Oregon City, Oregon, where landslides have caused significant property damage in recent years, city code requires applicants to provide a report on the site's geology and prohibits construction of new subdivisions on steeper slopes.

"We're trying to do everything to reduce the risk or altogether avoid these areas," said Tony Konkol, the city's community development

director.

And even when landslide risks have been mapped using the new technology—as was the case with the slide area in Washington state—homeowners often don't have access to the maps or don't know how to interpret them. And some may choose not to heed the maps' warnings.

Robin Youngblood, whose house in the foothills of the scenic North Cascades was crushed in the landslide, said Snohomish County officials did not inform her about the dangers of the hillside.

"They knew that this mountain was unstable and they let people build there," she said. "This shouldn't have happened."

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