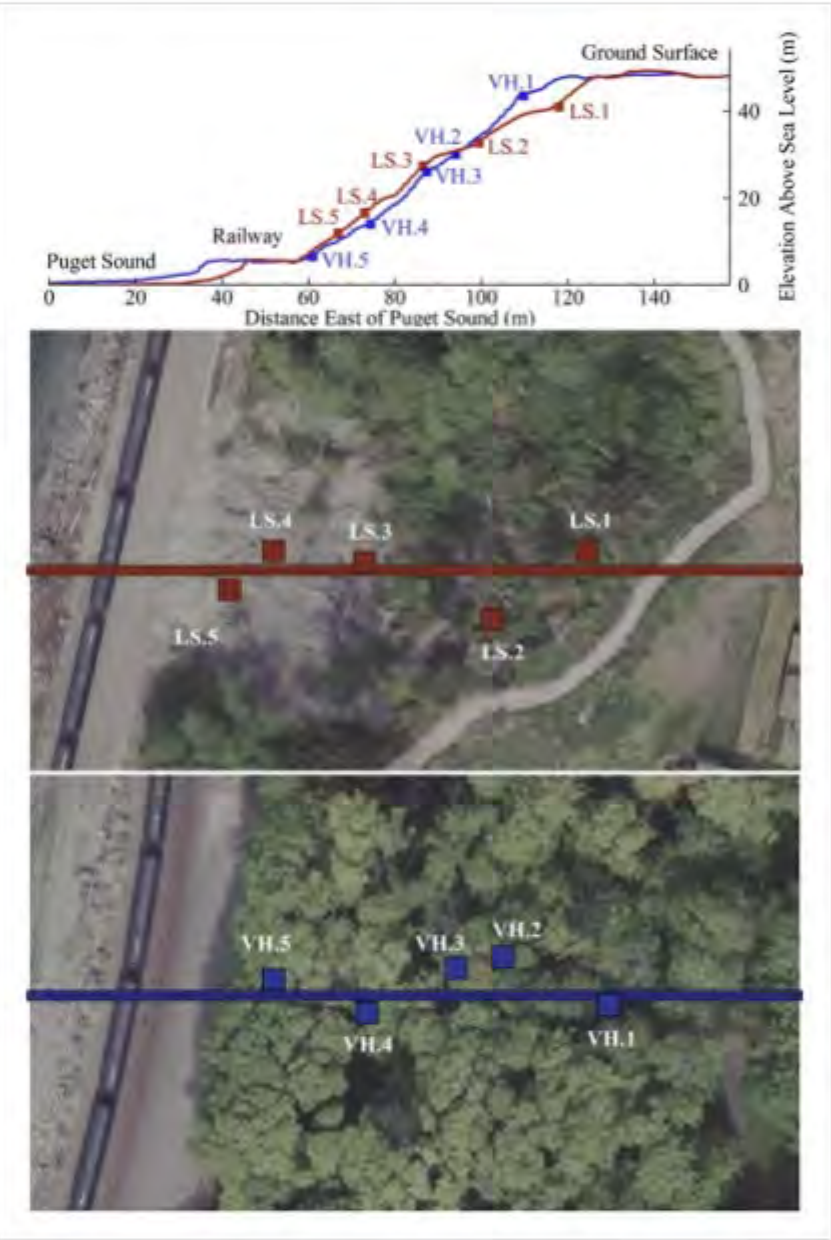


Landslides Can Cause More Landslides

One might think that if there was already a landslide in a particular location that there'd be nothing left to make another landslide in the future. Regrettably that is not always the case. Indeed, in some geologic settings evidence of a preexisting landslide plays a role in the mapping of future landslide hazards. The deadliest individual landslides in the U.S. recently were in places where there had previously been a landslide. In the small beach community of La Conchita, CA, just south of Santa Barbara along Highway 101, a landslide occurred in 1995 followed by a debris flow in 2005, killing 10 people and damaging 36 homes. In Oso, WA situated next to the North Fork of the Stillaguamish River about 50 miles SW of Seattle, a 2006 landslide was reactivated in 2014 as a debris-avalanche flow that killed 43 people and damaged private property and local highways. A few months later a large rock avalanche near the remote town of Collbran, Colorado occurred from the location of a preexisting rockslide, resulting in the deaths of 3 people. These are just a few examples of many repeat landslides that have been observed.



Map of Puget Sound Washington, showing location of the field site in Mukilteo. The gray hillshade inset shows a digital elevation map with the location of the two hillslope monitoring sites, labeled LS and VH.



Topography and aerial imagery of the two slopes LS and VH with locations of the monitoring instrumentation. The top slope, LS, is the one with a previous landslide, and the bottom slope, VH, is the one without a landslide.

USGS landslide scientists Ben Mirus, Joel Smith, and Rex Baum have been studying the coastal bluffs of Puget Sound, WA near Mukilteo where landslides often interrupt railway service. They instrumented two contrasting hillslopes: a steep but stable slope with dense vegetation, and another nearby slope that had experienced a recent landslide. They installed various sensors at 5 locations down the two slopes and waited for rain. They monitored the slopes and collected data for one year and then analyzed what they had. They were curious whether their data might show why landslides were happening in the same place they had before, instead of on nearby slopes that appeared to be just as likely, if not more likely, to slide.

From their measurements they were able to tell that there were a couple of reasons why the no-landslide location remained stable compared to the preexisting landslide location that remained unstable. Not only did the non-landslide slope have roots from vegetation that stabilized the soil, but also the vegetated slope drained better after rainstorms, shedding the water that would otherwise make the slope more unstable and landslide-prone. The preexisting landslide slope, on the other hand, with less vegetation and roots, had more unstable soil made even more so by the moisture that stayed in the soil after a rainfall, rather than draining away. Repeated rainfalls added more and more moisture to the slope, increasing the instability and potential for a landslide during the wet season.

For More Information

- Mirus, Benjamin B., Smith, Joel B., and Baum, Rex L. [Hydrologic Impacts of Landslide Disturbances: Implications for Remobilization and Hazard Persistence](#), Water Resources Research, v53, 10, 2017.

The Scientists Behind the Science



Ben Mirus.

[Ben Mirus](#)

started his career with the USGS in 2005, then served as an assistant professor at

UNC Chapel Hill, and was excited to return to the USGS in 2015 to study landslide hazards. In his free time Ben enjoys snowboarding, playing board games, and walking the family dogs.



Rex Baum.

[Rex Baum](#) has been a geologist with the USGS for more than three decades, where he studies landslide

processes, hazards, and warning. Rex enjoys the outdoors along with many other interests.



Joel Smith.

Joel Smith has been a civil engineer with the USGS since 2011, where he develops and applies monitoring

techniques to study landslide processes. When not working in the field, he enjoys playing guitar, luthiery, and woodworking.