

## **Landslides in North Dakota: A Complete Dataset and Mapping into the Future**

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### **Abstract**

The North Dakota Geological Survey (NDGS) has mapped over 55,000 landslides at the 1:24,000 scale; an inventory of slumps, earth flows, and soil creep which can have a substantial impact on statewide infrastructure. Historically, the NDGS has mapped landslides using aerial photographs from the 1950s and 1960s (viewed in stereopair) and early satellite imagery (Phase 1). Since 2017 it has been updating all its maps using LiDAR (Light-Detection and Ranging) data (Phase 2), and landslide mapping has been completed at the 1:24,000 scale at the Phase 2 level for the entirety of North Dakota. This scale provides great geologic context to engineering firms, construction companies, and land developers as they strive to mitigate landslide risk. While these maps are useful, there was no temporal data associated with landslides and no sense of susceptibility was conveyed. North Dakota has statewide LiDAR data available at approximately 1 to 2 meter horizontal spacing and now is getting repeat coverage, which is managed by the North Dakota Department of Water Resources. The timespan between coverages is approximately 8-10 years on average. Comparing the elevations of the two datasets allows NDGS geologists to observe any changes that occurred to the land surface over that time interval. The NDGS is now applying this vertical displacement method where multiple LiDAR datasets are available (which currently is the eastern and central portions of the state) to identify areas of landslides that have recently been “active”. This supplement of temporal data is now Phase 3 of the NDGS landslide mapping program.