RAPID LANDSLIDE INVENTORIES FROM LIDAR: SIMPLIFYING THE INVENTORY PROCESS TO SHARE LANDSLIDE DATA QUICKLY

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Project Summary
In March 2016, the Washington Geological Survey’s Landslide Hazards Program (LHP) began a pilot project that involved landslide inventory, susceptibility, and vulnerability mapping in Pierce County, Washington. The LHP developed a streamlined landslide-mapping protocol (SLIP) to allow geologists to rapidly map landslide landforms from lidar, and tested this method in Pierce County. Using the simplification process is expected to rapidly map landslide deposits from high-quality lidar accurately and in the time-consuming process of recording tabular data. The SLIP approach allows geologists to quickly share a landslide inventory with counties, cities, state agencies, etc., to assist decision-makers in the prioritization of areas for future detailed landslide mapping. By implementing the SLIP method, the LHP and Pierce County were able to focus on critical areas for detailed landslide mapping. In areas where detailed mapping was unneeded, the SLIP landslide polygons will remain an effective tool for the county to identify mapped landslide hazards.

Why Simplify?
Eliminate previous false positives
- Washington’s landslide-study and reports contain thousands of unmapped and unmapped landslide.
- Previous, pre-lidar landslide-mapping efforts encountered geologists to remotely map unmapped or questionable landslides to ensure that a field visit will be triggered. This has contributed to the large population of false positives.
- Remapping these areas using high-quality lidar will reduce the number of unnecessary geological reports and landslide annotations.

Regulators don’t care about the landslide details
- In Washington, the burden of landslide proof is within the land management (property owner). Regulations typically require the landowner to understand the tabular data (landslide type, landslide material, age, geology, etc.).
- Washington’s existing landslide inventory, used by many regulators, has more than 58,000 landslide polygons and more than half have incomplete or blank tabular data.

Detailed landslide inventories are time-consuming
- An experienced landslide geologist can confidently digitize a landslide landform from high-quality lidar in less than a minute.
- Populating tabular data for such landslide may take several minutes or more and likely includes multiple searches and interpretations.

Methods
Each high-confidence landslide is mapped as an individual polygon that includes deposits, flanks, and scarp—the landslide-affected area.
- Lower-confidence landslides are identified as points and assigned an attribute of low or moderate confidence.
- No other attributes are recorded!

Benefits
- Allows geologists to quickly share landslide data with stakeholders and decision-makers.
- Assists decision-makers in prioritizing areas for future detailed landslide inventory and susceptibility mapping following landslide-mapping protocols developed by Oregon Department of Geology and Mineral Industries (Burns and Madin, 2006; Burns and others, 2012; and Burns and Metzinger, 2013).
- Produces a basic landslide-inventory map that is superior to all previous, remote landslide-mapping efforts.

Pierce County SLIP Landslide Inventory

Results
- 235 high-confidence landslide polygons
- 1.1% lower-certainty landslide points

Study Area: Pierce County, WA
- 283,400 people (2016)
- 2nd most populous county in Washington
- Land area 1,665 mi² (perimeter per sq. mi: 450)
- Elevations range from sea level to 14,416 ft
- Mountain range

Requirements
- High-quality lidar
- An experienced landslide geologist
- Acceptance that more data is better than less data

How did Pierce County use SLIP data?
- SLIP data was conveyed with county stakeholders to identify areas to be mapped and attributed to local following protocol outlined in DOGAMI SP-42 (Burns and Madin, 2006).
- Stakeholders chose to focus detailed mapping in population centers and along major highway corridors and water bodies, including portions of managed wildfires and federal lands.
- In the simplified mapping area, SLIP data points were converted to polygons and attributed with mapper confidence.

Reference:

Footnotes: