STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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Partial Landslide Inventory of the Western Portion of Coos County, Oregon

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by William J. Burns, Ian P. Madin, Katherine A. Mickelson, and Kendra J. Williams

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IMPORTANT NOTICE
This map depicts an inventory of existing landslides based on published and unpublished reports and interpretation of topography derived from lidar data and air photos. This map cannot serve as a substitute for site-specific investigations by qualified practitioners. Site-specific data may give results that differ from those shown on this map.

KEY

Landslide Deposit

Fan

Study Area Boundary
The study area was chosen to cover major settlement areas and transportation networks in western Coos County.

ABOUT THIS STUDY

In 2009-2010, the Oregon Department of Geology and Mineral Industries (DOGAMI) was funded by the Federal Emergency Management Agency (FEMA) to prepare a multi-hazard study of Coos County, Oregon. The hazards included riverine and coastal flooding, river channel migration, tsunami inundation, earthquake hazards, and landslide hazards. This report describes the methods used to map the landslide deposits and includes a digital database of mapped landslide deposits.

During the severe storms of 1996-1997, roughly 270 landslides were recorded in Coos County, indicating a significant hazard (Hofmeister, 2000). For this study we identified and mapped existing landslides to provide a preliminary understanding of the general landslide hazard in this area. This study provides a partial landslide inventory: it is limited spatially to the western half of the county (Figure 1), and it includes only mapped landslide deposits, not the full set of landslide features that are part of a complete inventory (Burns and Madin, 2009).

In the past, most accurate, higher-certainty landslide maps were created using a combination of aerial photography and extensive field survey. In 2007 DOGAMI collected high-resolution, high-accuracy lidar data to produce detailed digital elevation models (DEMs). These new data give us a much better image of surface geomorphology, allowing identification of features associated with landslides, such as concave slope depressions, vertical or steep scarps, shear zones located along landslide flanks, and shortening features of landslides such as toes, transverse ridges, and snouts (Burns, 2007). Such features can be used to identify landslides with a high level of certainty and map them accurately. The use of lidar-derived bare-earth DEMs is the key to the landslide mapping performed in this study (Figure 1).

Slopes that have failed in the past often remain in a weakened state, and many landslide areas tend to fail repeatedly over time. In some cases, areas that have previously failed assume rather subtle geometries, and these areas may or may not be obvious on hazard maps that emphasize slope. Previously failed areas are nonetheless particularly important to identify, as they may pose a substantial hazard for future instability. They are also one of the key inputs for creating susceptibility maps or maps that show areas of relative low to high potential for future landslides.

To create this landslide inventory layer, we extracted existing landslide polygons from the Statewide Landslide Information Database for Oregon (SLIDO release 1) (Burns and others, 2008). This Geographic Information Systems (GIS) compilation of landslide areas (landslide inventory) was derived from published geologic reports and existing geologic hazard studies. We then used lidar-derived imagery to correct this database in three main ways: 1) remove incorrectly mapped slides, 2) redraw extents of previously mapped slides, and 3) add previously unidentified or unmapped landslides. Due to time constraints, we performed this new mapping at a maximum scale of 1:10,000. The scale limitation restricted our mapping to mainly the relatively large, deep-seated landslides in this area. Therefore, some landslides, especially small shallow slides and debris flow fans, are missing from the database. The GIS database included in this publication is in Esri's shapefile format.

We followed DOGAMI Special Paper 42, Protocol for Inventory Mapping of Landslide Deposits from Light Detection and Ranging (Lidar) Imagery (Burns and Madin, 2009) to create this landslide inventory of the western portion of Coos County. Due to time constraints we did not follow the complete protocol, which would have resulted in several other spatial components and attribution of the landslide deposit polygons.

Previous mapping (SLIDO release 1, 2008) identified roughly 331 landslides in the study area. Results of the new mapping include the identification of 948 landslide deposits and 50 fans within the study limits. These 998 landslide areas cover roughly 41 square miles, or 5% of the study area. Although we did not have time to complete the landslide inventory protocol, the preliminary map provides a fairly complete depiction of the existing landslide locations in the study area. It is very likely that completion of the protocol would identify many more landslides in the study area and result in a more complete database.

The western portion of Coos County has a moderate landslide hazard, with roughly 5% of the study area underlain by landslides. The map and GIS database contain useful information to guide site-specific investigations for future development, to assist in regional planning and development, to mitigate existing landslides and slopes, and to prepare for emergency situations, such as storm events and earthquakes. This information is not appropriate for site-specific evaluations, but it is valuable for regional screening for landslides and selection of appropriate areas on which to focus site-specific studies.

We recommend the completion of this database following DOGAMI Special Paper 42 at some point in the future.

REFERENCES

Burns, W. J., 2007, Comparison of remote sensing datasets for the establishment of a landslide mapping protocol in Oregon, *in* Schaefer, V. R., Schuster, R. L., and Turner, A. K., eds., 1st North American Landslide Conference, Vail, Colo., June 3–8, 2007, Proceedings: AEG Special Publication No. 23, p. 335–345.

Burns, W. J., and Madin, I. P., 2009, Landslide protocol for inventory mapping of landslide deposits from light detection and ranging (lidar) imagery: Oregon Department of Geology and Mineral Industries Special Paper 42, 30 p.

Burns, W. J., Madin, I. P., and Ma, L., 2008, Statewide landslide information database for Oregon (SLIDO), release 1: Oregon Department of Geology and Mineral Industries, 26 p., digital data, map plate scale 1:500,000. [Web: http://www.oregongeology.org/sub/slido/]

Hofmeister, R. J., 2000, Slope failures in Oregon: GIS inventory for three 1996/97 storm events: Oregon Department of Geology and Mineral Industries Special Paper 34, 20 p.

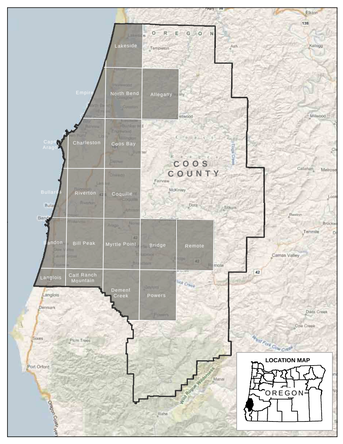

Figure 1. Map of study extent (779 square miles), western Coos County, Oregon. U.S. Geological Survey 7.5-minute quadrangles are shown in white.

Data Sources
Base map: Esri ArcGIS Data Appliance v. 3.1 map service "World Street Map" [http://help.arcgis.com/en/data-appliance/3.1/help/basemap/index_Left.htm#CSHID=world_street_map.htm%23|StartTopic=content%2Fworld_street_map.htm%23|SkinName=agda} (Sources: ESRI, DeLorme, AND, Tele Atlas, First American, ESRI Japan, UNEP-WCMC, USGS, METI, ESRI Hong Kong, ESRI Thailand, Procalculo Prosis), and U.S. Geological Survey 10-m DEM hillshade.
Landslide layer: Oregon Department of Geology and Mineral Industries.

Projection: North American Datum 1983, UTM zone 10 north.

SCALE 1:100,000

0 1.25 2.5 5 7.5 10 Miles
0 1.5 3 6 9 12 Kilometers

APPROXIMATE MEAN DECLINATION, 2006

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