ABSTRACT


Title: Identification and Prediction of Debris Slides in the Hot Springs Basin, Cascade Range, Northwest Oregon.

A rain-on-snow event in February 1996 triggered thousands of debris slides in northwestern Oregon, USA. A 57 km² study area in the Hot Springs Basin of the Mt. Hood National Forest was chosen to evaluate several methods of debris slide identification and prediction. The results of these methods were compared to a field investigation that identified 142 debris slides.

An aerial photograph analysis identified 204 suspected landslide features, but only 28% were confirmed in the field to be debris slides. The photo analysis failed to identify 59% of the debris slides identified in the field, approximately 37% of the total debris slide area. The large percentage of false positives, features incorrectly identified as debris slides, combined with the large percentage of false negatives, field-investigated debris slides not identified, indicate that the photo analysis did not accurately identify the distribution of debris slides.

Using a Geographic Information System, GIS, the distribution of field-investigated debris slides was compared to the spatial variation of factors that affect slope stability, and maps of these factors were evaluated for their potential to predict the
distribution of debris slides in the future. A soils map performed the best and captured
more than 76% of the total debris slide area in less than 25% of the study area. The
analysis also identified several trends. The beds of Bull Creek, typically associated with
large deep-seated landslides, had the highest debris slide area density, 3362 m²/km², of
any geologic unit. However, the Rhododendron Formation, typically associated with
debris slides, had a low debris slide area density, 1188 m²/km², because it is only found
at high elevations in the study area, where a thick snow pack buffered the slopes from
the storm.

SINMAP, a GIS landslide hazard mapping tool, was run with 30 m and 10 m
Digital Elevation Models (DEM’s). The output was compared to the distribution of
field-investigated debris slides. SINMAP’s performance was adversely affected by
DEM resolution and debris slide inventory accuracy. SINMAP must be calibrated with a
more accurate map of debris slides to thoroughly evaluate its potential as a predictive
tool.