



# **1 Regional Landslide-Hazard Assessment for Seattle, Washington, USA**

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Landslides are a widespread, frequent, and costly hazard in Seattle and the Puget Sound area of Washington State, USA. Shallow earth slides triggered by intense rainfall are the most common type of landslide in the area; many transform to debris flows and cause significant property damage or disrupt transportation. Large rotational and translational slides, though less common, also cause serious property damage. The hundreds of landslides that occurred during the winters of 1995-96 and 1996-97 stimulated renewed interest by Puget Sound communities in identifying landslide-prone areas and in taking actions to reduce future landslide losses. Informal partnerships between the U.S. Geological Survey (USGS), the City of Seattle, and private consultants are addressing these interests by identifying and mapping areas of landslide hazard and by characterizing temporal aspects of the hazard. The USGS has developed GIS-based methods to map the probability of landslide occurrence and developed empirical rainfall thresholds and physically based methods to forecast times of landslide activity. Our methods for mapping landslide hazard zones begin with field studies and physically based models to assess relative slope stability that include the effects of material properties, seasonal groundwater levels, and rainfall infiltration. We then analyze the correlation between historic landslide occurrence and relative slope stability to map the degree of landslide hazard. Areas of low relative slope stability include sig-

nificantly more area than is affected by landslides from any given storm, but 90% of historical landslides have occurred within areas indicated by our models to have low relative slope stability. The city of Seattle is using results of these recent and ongoing USGS studies in storm preparedness planning for emergency access and response, planning for development or redevelopment of hillsides, and municipal facility planning and prioritization.