UNIVERSITY TRANSPORTATION CENTER

RESEARCH BRIEF

Post-Wildfire Stability and Improvement of Hillslopes Near PNW Transportation Infrastructure to Increase Mobility

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Background

An increased incidence of wildfires followed by a wet season along the Pacific Northwest has resulted in an increase in post-wildfire erosion and shallow landslides. When eroded hillslope material moves into stream channels, culverts are blocked and highways are washed out, which can lead to long-term road closures and therefore to significantly reduced system mobility. If a wetting-induced shallow landslide occurs on a highway embankment or on a natural hillslope near Pacific Northwest infrastructure, in addition to human life and property loss, there are significant economic consequences when the hillslope material blocks the highway, damages the transportation infrastructure, and therefore reduces mobility. Identifying slopes susceptible to wetting-induced shallow landslides and stabilizing critical slopes that could damage infrastructure, block corridors, and reduce mobility are crucial to maintaining transportation system performance. Especially after a natural hazard such as a wildfire, keeping corridors open is critical to maintaining access to the hazard area.

Research Project

We will use a distributed physically-based probabilistic model to identify slopes susceptible to wetting-induced shallow landslides. The model will be an updated version of level-one stability analysis, LISA, developed by the researchers at the Rocky Mountain Research Station, Moscow ID. The model will use Monte Carlo simulation to calculate wetting-induced shallow landslide probability using a suction stress based infinite slope stability analysis.

We will also investigate environmentally-friendly alternatives for surficial stabilization of wildfire-burnt slopes. Different polymers and biopolymers will be sprinkled on the surface of wildfire-burnt soil compacted in rainfall tanks. Rainfall will be applied under controlled laboratory conditions using a sprinkler system. Soil will be dried after each wetting cycle using a light source. Erosion reduction and shear strength increase after multiple wet-dry cycles will be measured and used to evaluate the effectiveness of surficial application of the environmentally-friendly stabilizers.

ABOUT THE AUTHORS

The research team consisted of Idil Akin of Washington State University.

ABOUT THE FUNDERS

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EXPECTED DATE OF COMPLETION

August 2021

FOR MORE INFORMATION

http://depts.washington.edu/pactrans/research/projects/post-wildfire-stability-and-improvement-of-hillslopes-near-pnw-transportation-infrastructure-to-increase-mobility/