CALIFORNIA FIRE SCIENCE CONSORTIUM

JOINT FIRE SCIENCE PROGRAM

Research Brief for Resource Managers

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Source of Sediment Hazards on Steep Slopes

DiBiase, R.A., and M.P. Lamb. 2013. Vegetation and wildfire controls on sediment yield in bedrock landscapes. Geophysical Research Letters 40:1093-1097.

Steep, rocky slopes between 30-45 degrees wouldn't have any soil at all if it weren't for soil storage behind "plant dams" like yuccas, shrub stems and tree trunks. In southern California these slopes are famous for producing high sediment yields following fires. DiBlase and Lamb showed that large volumes of sediment are released when the "dams" are burned in wildfires.

Sediment accumulation behind a yucca on an otherwise bare rock slope. Dashed line indicates the top profile of the sediment pile.

The Little Santa Anita Canyon of the San Gabriel Mountains has average slope angles of 30-45 degrees. One portion of the canyon that was last burned in 1954 was compared to another that was last burned in 2009. Sediment piles measured behind four types of vegetation (unburned *Pseudotsuga macrocarpa*, *Ceonothus* shrubs and yuccas, as well as burned yuccas) were consistent with a mathematical model to calculate the volume of stored soil. The hillslope sediment storage capacity was calculated over a 2.4 km^2 area and matched the records of postfire sediment yield from nearby retention basins.

On these types of slopes, sediment buildup is limited by bedrock-to-soil conversion rates and "more frequent fires may not result in increased sedimentation rates due to supply limitations."

Management Implications

- On steep slopes between 30-45 degrees, loose soil is stored behind plant "dams."
- After a fire, > 75% of stored sediment is rapidly released to the channel system by dry ravel (the rolling, bouncing, and sliding of individual particles).
- The postfire hazard from stored sediment can be calculated at the catchment scale if the size and distribution of vegetation cover are known.