Investigating the Relationship Between Tree Height and Landslide Occurrence in the Ikawa Catchment, Central Japan

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The occurrence of landslides in forested terrain can have large impacts on the future productivity of soil and the quality of water that drains from a catchment, as well as damaging a valuable asset in the forest itself. The relationship between tree height and landslide occurrence in the Ikawa catchment, Northern Shizuoka prefecture, is investigated to gain a better insight into the distribution of landslides. Root depth profile, measured for trees of various height via trenches, is used in conjunction with tree height when assessing the distribution of landslides. Root tensile strength for unit areas of soil is calculated from individual root diameters to better understand the effect of the root network on slope stability. Landslide ratios in the Ikawa catchment show that landslides occur more frequently in shorter forests, with occurrence decreasing as tree height increases. This is likely due to stabilizing features of trees being accentuated as they grow, which is supported by both total root area and total root tensile strength data showing a significant increase between that of the 6.5m Kumashide, 8m Momi, and 12m Kumashide. The random distribution of results when comparing landslide depth to tree height suggests that while tree height, and hence total root tensile strength, has an impact upon whether a landslide is to occur or not, the depth of the landslides that do occur are independent of the height of trees. This suggests that slope stability increases alongside tree height and that landslide depth is not controlled by tree height so is therefore controlled by other factors. While there is no relationship between tree height and landslide depth, both Kumashide trees surveyed show decreases in total root tensile strength around the average depth of landslides in the Ikawa catchment of 0.46m.

Keywords: Landslide depth, Tree height, Root tensile strength, LiDAR

