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SIMULATION OF EROSION AND RUNOFF ON FOREST ROADS USING A SMALL SCALE RAINFALL SIMULATOR

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The study examines the influence of unpaved forest roads and skid trails on sediment delivery and runoff generation in a forested catchment area. A small scale rainfall simulator with a plot size of 0,64 m^2 was used to measure sediment- and runoff-delivery for rainfall events with an intensity of 45 mm h^{-1}, a kinetic energy of 4,60 J m^{-2} mm^{-1} and a duration of 90 min.

Both sediment yield and runoff were collected with a temporal resolution of one minute. Therefore, it was possible to generate precise datasets of erodibility and hydrological characteristics of the surfaces over a rainfall event.

The results show that even semi-persistent skid trails tend to a much earlier generation of runoff than nearby undisturbed forest topsoils. This effect is even more distinct on unpaved road surfaces. The relative sum of infiltrated rainfall underlines these results, while forest topsoils infiltrate rainfall up to 99,1%, skid trails only infiltrate Ø 53,6% and unpaved roads Ø 16,2%.

The sediment delivery shows, that in contrast to the divergent hydrological characteristics, skid trails have an erodibility more comparable to undisturbed topsoils than to unpaved roads. While skid trails yielded Ø 10,8 g in 90 min, undisturbed topsoils produced a total of Ø 1,3 g. Unpaved roads on the other hand yielded Ø 181,3 g. Latter equates to a sediment delivery of 188,9 g m^{-2} min^{-1} with simultaneously higher sediment concentrations in the overland flow of about 6,4 g l^{-1} or 9,9 g mm^{-1} respectively.

These findings lead to the conclusion, that compacted surfaces of forest roads not only affect the hydrological response of small scale catchments, but also generate an increase of sediment delivery and soil erosion. Besides the direct consequences of structural damage to the road surface, serious ecological off-site damage can derive from the yielded sediment when it reaches adjacent stream systems.