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Examination of sediment sources in a small forested catchment of Sopron Hills

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Sediment load of small streams generally has a strong temporal and spatial fluctuation referring to several factors influencing the sediment transport. Sediment concentration of densely forested and undisturbed catchment is relatively permanent and low among periods with high flows, while short flood events increase the magnitude and scatter of sediment load. Stochastic events like landslides, bank collapses, depletion of sediment traps, breakage of log jams, forestry activities (e.g. road building, harvesting) create a more varying sediment distribution in small forest streams.

The Farkas Creek in Sopron Hills also shows great deviation not only between sediment transport of base flow and flood events but also between sediment transport of separated flood waves, indeed during one flood events according to the hysteresis analysis of sediment rating curve. Inhomogeneous hydrological characteristics and mainly changing sediment availability are responsible for this fluctuation in sediment load. This preliminary study has examined the potential sediment supply in the Farkas Creek with especial regard to surface erosion and depletion of a sediment deposit in order to thoroughly know sediment dynamics of the stream. Siltation rate of a reservoir on lower altitude and by erosion endangered zones of the forested headwater catchment can also be predicted knowing sediment transport of the tributary. Proportion of sediment sources have been evaluated comparing to the total annual sediment load in 2009 hydrologic year.

Surface soil loss and erosion threatened zones have been predicted with the USLE model for the period from October 2008 till October 2009. Total surface erosion amounted 30.04 ton i.e. 0.54 ton ha^{-1} yr^{-1} proving the good soil protection function of the forest vegetation. Total sediment yield of the tributary has been computed by bedload measurements and suspended sediment model. Bedload has been calculated by volumetric approach, while regression equation considering discharge, 20-day antecedent precipitation index and rainfall erosivity and mean values have been applied for estimating suspended sediment load. The stream of the Farkas Creek transported 95.68 ton sediment load according to the provisional estimations. With sediment delivery ratio (50 %) reduced surface soil loss and total sediment yield have been compared to each other resulting that contribution of surface erosion to sediment transport was 16 % (15.02 ton). It revealed that surface erosion was not the major sediment supply in the Farkas Creek during the study time period and other erosion phenomenon support sediment load of the stream. Therefore channel erosion, mass erosion and linear erosion of unpaved forest roads should be monitored in the future which processes represent the most significant forms of the erosion in forested headwater catchments.

The moving sediment trap had 17 % proportion (15.80 ton) during the same period according to previous examinations. Mean monthly bedload increased to 0.55 t m^{-3} during the depletion of monitored sediment trap which value is 4.5 times higher than before the supplement effect between March 2006 and October 2008.

Keywords: sediment fluctuation, sediment trap, small forest stream, surface erosion, total sediment yield