



Wood logging and surface runoff generation under central European conditions (mechanisms, mitigation measures)

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The effect of logging on hydrological processes has become one of the most discussed environmental problems in Slovakia since November 2004 when more than 12000 ha (more than 3 millions of trees) of the spruce forest in High Tatra Mt. were completely cut down by bora wind. The field measurements and mathematical simulations revealed that good-state forest vegetation can intercept 3-times more precipitation water than grass or herbs during the vegetation season (about. 40% of seasonal precipitation) in wind affected area. The immediate effect of forest vegetation during a single storm event however is very small and only small positive effect on floods can be expected when compared to other types of vegetation (grass, shrubs, herbs).

The effects of wood logging in mountainous areas on water balance are similar to those of natural disasters (clear-cuts) or they can be further modified by building of forest roads, logging roads and other compacted surfaces. The irrigation experiments showed that majority (81%) of 100 mm artificial rain that fell on the logging road's surface during 3 hours did not infiltrate but flew downward the slope of the road. Moreover, logging roads accelerate and concentrate the surface runoff since they increase the drainage density of the basin (draining of upward slopes). Mathematical simulations on HYDRUS-2D model theoretically approved more than 50% contribution of logging roads to 400-year flood discharge in Píla village in June 7, 2011. Studies from the western part of USA report up to 30% contribution of forest roads to extreme flood discharges.

The irrigation experiments showed that this asset can be reduced to 0% when a recultivation of unused logging roads by the mechanical loosening of their compacted surface is done.