



## Quantitative analysis of gully erosion under forest conditions versus a windfall area

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Along the eastern border of the Trier-Luxembourg basin, in the range of lower Saar River valley there are sandstone belonging to the middle and upper formations of Bunter Sandstein (Lower Triassic) form a cuesta scarp which is more than 100 m in height. The slope of the cuesta scarp is dissected by small valleys and up to ten meter deep gullies. It is assumed that these gullies are already developed in the 16th century by grinding wood and have deepened by the increased agricultural use. In the course of the reforestation in the 2nd half of the 19th century, they have stabilized again. In the winter of 2010/2011 a storm cut a path through the wooded area and laid bare the old gullies. After the event, the area has been arranged and cleared by Harvester. In the late summer of 2011, the reforestation with deciduous trees took place. Now the question arises whether the formerly stable gullies have become active? Observations show that sandstone slopes respond extraordinarily sensitive to human intervention and lead to relief changes.

The aim of this investigation is a quantitative analysis of sheet and gully erosion under forest conditions versus a windfall area in the German low mountain range.

Over two years, the surface runoff and soil erosion were measured on eight test plots with the application of sediment traps. For comparison, three sediment traps were applied under forest and five in the windthrow area. The sediment traps are located on the side slopes and at the head of each gully. The precipitation measurements were made with a totalisator with high-resolution electronic weighing system and integrated digital data collector.

The results clearly show a higher runoff and soil erosion on the windthrow areas in contrast to the forest areas. Furthermore, an increase of instability of the windfall areas after machining by Harvester can be observed. In the years 2011 and 2012 the erosion and the runoff are on the forest land approximately constant, while runoff, soil erosion and sediment concentration decreased significantly on the windthrow areas after 2011. Generally, the headcut of the gullies are more instable than their sides.

The maximum runoff value of the forest areas reached 6.49 L in 2011 and 6.50 L in 2012. The maximum soil loss value in 2011 amounts to 49.36 g, while in 2012 even a maximum value of 135.13 g was reached. The maximum sediment concentration for these areas is around  $252 \text{ gL}^{-1}$  in both years.

In contrast, the windfall areas show much higher maximum values. In 2011, a maximum of 1665 g soil loss, 23.65 L runoff and a sediment concentration of  $1426.98 \text{ gL}^{-1}$  were determined. In 2012 the highest soil loss value was only 441.30 g.