



Evaluation of the intensity and dynamics of soil erosion processes on the surface of forest skid trail using terrestrial laser scanning

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It is common opinion that forest areas protect soils, including the reduction of water erosion processes intensity, however cultivation and maintenance of forest enforces using the forest roads and skid trails. These activities influence on changing the hydrological conditions and contribute to the intensification of erosion processes. In the terms of guaranteed forest soil protection function and the limitations of these functions resulting from forest works, the aim of the research was to determine the intensity and spatial range of soil erosion processes. Results of the study indicate that it is possible and efficient to use terrestrial laser scanning data for the monitoring of the erosion phenomena, as well as a qualitative assessment, spatial extent and intensity of the process even in difficult, highly relief, forest area.

Terrestrial laser scanning as the remote sensing technique was used in the research of erosion processes occurring in the mountain forest, the Western Sudetas, Poland, on the surface of the inactive skid trails. The measurements were performed with few millimetres laser scanning resolution. Obtained the dense points cloud has been interpolated to GRID of digital terrain model with a resolution of 1 cm, which allowed evaluating the erosion phenomena using the method of differential models in the period of 2011–2013. In the study it was analysed the part of the skid trail with an area of ca. 200 m² and average longitudinal slope of ca. 10% with mounted anti-erosion barriers.

The aim of the study was to determine the volume of material erosion formed on the surface of the skid trail and the effectiveness of the anti-erosion treatments. In the study it was determined that during the entire period of research the amount of soil erosion material was ca. 6.22 m³, which gives ca. 88 kg•m⁻². Erosion index on different sections of the analysed skid trail was ranged from 3.7 to 52.3 dm³•m⁻² in different research periods. The erosion processes occurred mainly in the form of sheet erosion. The erosion processes in the form of sheet erosion occurred ca. 50% of trail area.

In the research it was showed the highly effective of anti-erosion barriers in the accumulation of soil material and reducing runoff. Results of the study indicate that it is efficient to use TLS for the monitoring of the erosion phenomena, qualitative and spatial range assessment, also in difficult, highly relief, forest area. At the same time, it has been proven that intensive water erosion processes can also occur in forests.