



On the Influence of Biological Soil Crusts on Soil Erosion under Forest

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The impact of soil erosion on ecosystems and human development is tremendous. In this regard it negatively affects e.g. soil fertility as well as nutrient cycling, reduces soil organic matter or can change the water-holding capacity of soils. Thereby, soil erosion is not exclusively occurring in agricultural landscapes, but has also been observed in forest ecosystems. Especially, zones of vegetation disturbance in forests such as skid trails are prone to soil losses. The most important manner to counteract these negative impacts on the upper soil layer is a quick restoration of soil surface covers by vegetation. Biological soil crusts (biocrusts) are known for their positive effect on soil erodibility and soil structure stability, so that they play an important role in the protection of soil surfaces against wind and water erosion. As the very most studies on the impact of biocrusts on soil erosion have been conducted in arid and semi-arid regions, their influence in other climates is widely unknown. Previous studies in subtropical China verified an erosion-reducing effect of particularly bryophyte-dominated biocrusts in early-stage forest plantations. However, further studies on biocrust development in different disturbed forest ecosystems appear to be of high interest.

This study focuses on the influence of biocrusts on soil erosion after vegetation disturbances by skid trails in a temperate European forest ecosystem and takes place in the Schönbuch Nature Park in the State of Baden-Württemberg, South Germany. To investigate the effect of biocrust covers on soil and nutrient losses after vegetation disturbances and the role of species composition and different underlying substrates, several experiments will be conducted in situ. They will explore soil losses in entire skid trails, thus including the effect of preferential flows and rilling processes and make use of a terrestrial laser scanner. Furthermore, they consider particular impacts of the forest floor vegetation and will be carried out with micro-scale runoff plots (ROPs) with 0.4 x 0.4 m size under simulated rainfall. In a further rainfall simulation bryophyte species in suspension from in vitro culture will be applied with spraying-up technique within a newly created skid trail to test for soil loss from covered soils under controlled conditions. A third experiment will be conducted in the laboratory to investigate how biocrusts affect soil losses by altering soil aggregation and soil organic matter.

The results of this study will help to attain a better comprehension of the role of biocrusts for soil erosion control and will clarify their influence on soil losses on different substrates in forests. First outcomes of the study will be presented at the EGU 2019.