Soil succession in relation to vegetation on a subalpine forest fire site in the Northern Limestone Alps

Judith Schaufler

Institute of Forest Ecology, University of Natural Resources and Life Sciences, Vienna

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Summary

The study investigates secondary soil succession on a steep subalpine site in the Northern Limestone Alps of Austria after substantial vegetational and soil losses induced by a stand replacing forest fire in 1950. The main objectives were (1) to estimate the extent of soil development in relation to different kinds of vegetation, (2) to quantify macroscopically visible charcoal in these soils and (3) to test the potential of FTIR-analysis to identify the vegetational litter sources of the humus layers for subsequent identification of typical patterns of succession. The field survey, which took place in 2013, included the firesite and an undisturbed reference site. Sampling design was stratified by vegetation (grasses, heather, larch, spruce, mountain pine) and included morphological soil profile descriptions as well as volumetric soil samples. Total belowground organic carbon and nitrogen stocks were estimated including litter/soil, deadwood, charcoal and roots. According to the results, with an average total of 3.7 kg C m^{-2} and 0.1 kg N m^{-2} the soils of recolonized patches at the firesite so far have recovered by around 40 % as compared to typical site potentials (reference site: 8.4 kg C m^{-2} and 0.30 kg N m^{-2}). Soil layer analysis reveals that largest regeneration discrepancies occur in the soil/litter stocks of the Oh-horizons with a regeneration of soil C < 25 %. Total sequestration varies considerably depending on the kind of vegetation with hitherto heather showing the highest regeneration potential comprising a total of 5.8 kg C m^{-2} belowground, compared to 3.5 kg C m^{-2} for grasses as well as for spruce, 2.8 kg C m^{-2} for mountain pine and 1.8 kg C m^{-2} for larch. The comparatively high C stocks for heather are characterised by remarkably high stocks comprised in dense root layers (~2 kg C m^{-2}). The amount of charcoal in the soils of the firesite is low with an average of 60 g m^{-2}, probably due to heavy erosion. The intended FTIR approach for identifying the vegetational source material of the humus layers proved to be too complex in the course of this study, however potentials for further research were highlighted.

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References

SCHAUFLER J. 2014. Bodensukzession in Abhängigkeit von der Vegetation auf einer subalpinen Waldbrandfläche im Nationalpark Kalkalpen. Masterarbeit, Institut für Waldökologie, Universität für Bodenkultur, Wien, 82 p.

Contact

Judith Schaufler
judith_schaufler@gmx.at