



## **Linkage between root system development of three pioneer plant species and soil nitrogen during the initial phase of ecosystem development of the artificial watershed Hühnerwasser**

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In 2005, a 7-ha artificial watershed (Hühnerwasser) was built on a post-mined landscape in Lusatia, Germany from sandy substrates of Pleistocene origin, commonly used in reclamation. The watershed was developed to investigate the initial phase of soil and ecosystem development under natural conditions. At this early stage, nutrients in young sandy soils are limited and pioneer plants become key components of natural succession. Local abundant pioneering legumes *Lotus corniculatus* and *Trifolium arvense* and one pioneer grass species *Calamagrostis epigeios* were investigated 5 years after watershed construction. In the present study, we investigated the influence of spatial root distribution of these species on soil nitrogen accumulation and on nutrient redistribution.

Soil, including roots, was sampled from field monoliths covered with the aforementioned plant species. Root systems of both legumes were mainly restricted to the upper 20 cm of soil, whereas roots of *C. epigeios* also developed strongly at greater depths. A positive relationship was found, with higher plant densities associated with higher root densities, which were related with higher nodule densities for legumes and which were all associated with significantly higher soil nitrogen concentration relative to non-vegetated areas.

This research provides rare information on the role root systems of pioneer legumes play in soil nitrogen input and development of nutrient patterns in the early stage of soil and ecosystem development during revegetation by natural succession.