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Published in:
Geophysical Research Abstracts

Publication date:
2007

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Wahl, N. A., Bens, O., Schäfer, B., & Hüttl, R. F. (2007). Water Repellency, Infiltration and Water Retention Properties of Forest Soils under Different Management Practices: . *Geophysical Research Abstracts*, 4.

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WATER REPELLENCY, INFILTRATION AND WATER RETENTION PROPERTIES OF FOREST SOILS UNDER DIFFERENT MANAGEMENT PRACTICES

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For soils under both agricultural and forest use, management and tillage practice can have significant influence on the hydraulic properties. It is therefore supposed, that management practices are capable of altering surface runoff, water retention and flooding risk for river catchments. Soil water repellency (hydrophobicity) can adversely affect soil hydrological properties, e.g. reduce infiltration capacity and induce preferential flow, thus enhancing the overall risk of flooding in river catchment areas. Hydrophobic effects are especially pronounced in coniferous forest soils.

Investigations were carried out on several study plots in the German Northeastern Lowlands, located app. 50 km NE of Berlin in Brandenburg. Soils found in the area are mainly of glacialfluvial origin with a pronounced sandy texture (with medium sized sand dominating). The four stands investigated represent different stages of forest transformation, in a sense of a chronosequence and are made up of populations of *Pinus sylvestris* and *Fagus sylvatica* of different ages.

Infiltration was measured with hood infiltrometers, and single infiltration rings at soil surface. Water retention capacity and the influence of soil organic matter on water storage were evaluated with laboratory methods. Water repellency was quantified with the water drop penetration time (WDPT) test, for determining the persistence of water repellency, and the ethanol percentage (EP) test, for measuring the severity/degree of water repellency. Soil samples from the four forest plots and different soil depths (0–160 cm) were used for the measurements. Potential water repellencies were determined after 3-day oven-drying at 45 °C.

The results indicate that for sandy forest soils, the overall infiltration capacity of the plots is low due to the effects of water repellency. The inter-variability of the plots is mainly caused by changes in the textural composition of the soils. For all plots a significant proportion of severely and extremely hydrophobic samples in the upper 10 cm of the soil profile was revealed, whereas the persistence of repellency decreases with increasing soil depth. The EP exhibit for all plots a shallower depth distribution than the WDPT. During forest transformation, both humus type as well as humus distribution in the soil and the litter layers are altered. These changes influence above

all the water storage capacity of the soil which declines considerably during the first stage of forest transformation.

The obtained results will be incorporated in a hydrologic catchment model in order to evaluate the possible impact on the runoff characteristics. Simulated runoff data for selected mesoscale catchments (e.g. of the Rhine area) will serve to evaluate different soil management practices in terms of minimizing surface runoff and preventing flood events.