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THE EFFECTS OF FOREST MANAGEMENT PRACTICES ON INFILTRATION CAPACITY OF SANDY SOILS

N. A. Wahl (1), O. Bens (2) and R. F. Hüttl (2)

(1) Aalborg University, Department of Civil Engineering, Physical Geography Section, P.O. Box 159, DK-9100 Aalborg (Email i5wahl@civil.auc.dk), (2) Brandenburg University of Technology Cottbus, Chair of Soil Protection and Recultivation, P.O. Box 101344, D-03013 Cottbus

For soils under both agricultural and forest use, management and tillage practice have significant influence on hydraulic properties. It is therefore supposed, that management practices are capable of altering surface runoff, water retention and flooding risk of 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.

Investigations were carried out on several study plots in the German Northeastern Lowlands, located approx. 50 km NE of Berlin. The predominant soil in the study area is a weakly podsolic Cambisol from glacifluvial deposits with a distinct texture in the range of medium sized sand. The four stands investigated represent different stages of forest transformation, in a sense of a "false" chronosequence and are dominated by different proportions of Pinus sylvestris and Fagus sylvatica.

Infiltration was determined with a tension infiltrometer (hood infiltrometer) and a single ring infiltrometer at the soil surface. Water repellency was quantified with the water drop penetration time (WDPT) test (persistency of water repellency), and the ethanol percentage (EP) test (severity/degree of water repellency). Soil samples from the study plots at different soil depths (0-160 cm) were utilized for the experiments.

During the different stages of forest transformation, the types, forms, and quantities of soil organic matter and humus present, are changed. Consequently, the production and supply of water repellent substances vary according to the stand structure of the different study plots. The results indicate that for the studied sandy forest soils, the overall infiltration capacity of the plots is low due to the textural composition. The inter-variability of the plots is mainly caused by changes in the effects of water repellency that varies both in time and space. For all plots a significant proportion of severely and extremely hydrophobic samples in the upper 20 cm of the soil profile were revealed, whereas the persistence of repellency decreases with increasing soil depth. The EP exhibits for all plots a shallower depth distribution than the WDPT.

The obtained results will be incorporated in a hydrologic catchment model in order to evaluate the possible impact on 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 flooding events in forested catchments.