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The impact of dense willow stands (Salix purpurea L.) on the hydrology of heavily compacted soils

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Willows are often used in soil bioengineering praxis for stabilizing heavily compacted soils (e.g. levees, embankments, landfills, etc.). Beyond reinforcing and anchoring effects by their root matrix, plants enhance soil stability by decreasing pore water pressure due to evapotranspiration. In the common praxis of soil bioengineering, it is taken for granted that willow stands have higher evapotranspiration rates than grass-herb (turf) vegetation. But the positive effect of dense willow stands on pore water pressure from the soil bioengineering point of view is insufficiently studied and therefore difficult to quantify. Within the framework of a research project dealing with the effects of woody vegetation on levees this study investigates the effects of willow stands on soil water dynamics. This is done by determining the components of soil water balance.

The weighable lysimeters are composed of two planted barrels (one with a dense willow stand grown from brush mattresses; one with grass-herb vegetation) and one unplanted barrel. The fill material used is a mineral silt-sand-gravel classified as silty sand compacted to a dry density [D] of 1.83 g/cm^3. Each barrel is equipped with two soil moisture sensors, four tensiometers and a seepage measurement device. Furthermore the relevant meteorological parameters as precipitation, air temperature, air moisture, wind speed and radiation are measured. Plant parameters such as biomass, leaf area index and root growth are observed in 17 additional barrels.

The talk is going to deal with the results of the lysimeter investigations over a period of two years. During the first growing season, evapotranspiration rates of the willow stands were significantly higher than those found with grass-herb vegetation, whereas seepage was significantly lower. In the second growing period both vegetation types showed more or less the same evapotranspiration rates and hardly any seepage.