

Model-based assessment of water protection methods in a drained peatland forest catchment

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Elevated suspended sediment loads released from peatland forest after ditch network maintenance (DNM) and the resulting negative effect on the ecological status of the receiving water bodies have been widely recognized. Understanding the processes controlling erosion and sediment transport within the ditch network forms a prerequisite for adequate water protection. While numerous experimental studies have been reported in this field, model based assessments are rare. We developed a modelling approach to investigate sediment transport in a peatland ditch network after DNM. The sediment transport model describes bed erosion, rain-induced bank erosion, floc deposition, and consolidation of the bed. Coupled to a distributed hydrological model, sediment transport was simulated in a 5.2 ha forestry-drained peatland catchment for two years after ditch cleaning and evaluated against a wide range of field measurements.

The model is being further extended to evaluate the efficiency of water protection structures, which could have been implemented alongside DNM in the study catchment. Water protection methods applied within ditch networks in practice include sediment ponds, silt traps, peak runoff control dams, breaks in cleaning, and submerged weirs. Scientific evidence on the efficiency of these methods is limited mainly to sedimentation ponds and the processes controlling their efficiency is poorly understood. Modelling provides a unique possibility to evaluate alternative scenarios without the concerns of varying meteorological conditions and site characteristics present in experimental approaches. This presentation will elaborate on the setup of the planned scenario-based modelling study and showcase some preliminary results of a set of scenarios.