

Terrestrial laser scanning and pin meter measurements for erosion and roughness assessment in boreal peatland forest ditches

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Drainage and the maintenance of drainage ditches in peatland forests increase erosion and sediment load reducing water quality downstream. The understanding of the sediment source area processes requires reliable methods for topographical change detection in the peatland forest ditches. The objective of this study was to quantify erosion and changes in surface roughness with two different methods: terrestrial laser scanning (TLS) and manual pin meter measurements. Two newly cleaned boreal peatland forest ditches were studied, one peat ditch and one with exposed till soil under the thin peat layer. The topographies of a 4-meter-long section of the ditches were measured sequentially during the 11–20 months study period. In the ditch with thin peat layer, erosion estimates were quite similar with both methods. However, in the peat ditch the erosion measured with the pin meter considerably exceeded the results provided by TLS. Surface roughness indicated by the TLS data was greater than the surface roughness calculated from the pin meter data. According to both methods, surface roughness increased more at the ditch with thin peat layer. Both methods could be adopted to measure erosion and surface roughness in peatland forest conditions. However, the methods had difficulties to distinguish the bed of the peat ditch. TLS encountered problems to detect dark peat soil bed under shallow layer of humic ditch water resulting in no-data areas at the bed of the ditch. Pin meter device was able to measure under the water but the soft peat bed increased the uncertainty of the measurements.