



Recovery of soil physical properties and microbiology in foresty drained peatlands from the impact of forest machinery

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Forestry-drained peatlands occupy approximately 5.7 million ha and represent almost one fourth of the total forest surface in Finland. They are subjected to the same silvicultural harvesting operations as upland forests. However, although the potential of timber harvesting to cause detrimental effects on soil is well documented in upland forests, the knowledge on environmental impact of harvesting machinery on peat soils is still lacking.

To assess the impact of harvesting machines on peat physical properties and biology we collected soil samples from six peatland forests that were harvested by commonly employed Harvester and Forwarder. Samples were taken from trails formed by harvesting machinery (treatment plots) and outside of trails (control plots unaffected by machinery traffic) to a depth of 15 cm. To address the recovery of soil properties after disturbance we sampled sites that form a chronosequence in respect to time since harvesting: 1 month (class I), 3-4 years (class II) and 14-15 years (class III). The physical and microbiological properties of soil samples were analyzed in laboratory.

Harvesting operations with heavy machinery appeared to significantly increase the bulk density of peat in the machines' trails at recently harvested sites in comparison to control plots. Following change in bulk density there was change of pore size distribution with decreasing macrospores quantity. This led to slight decrease of total porosity and decrease of air filled porosity. Water retention capacity increased with increasing bulk density. CO₂ evolution increased in the trails of class I site with where dissolved organic carbon concurrently decreased. While there was not impact of harvesting on microbial biomass or carbon, PLFA analysis indicated that machinery traffic caused a shift in microbial community structure. Results of class II and class III sites showed a recovery of physical properties within 16 years: treatment plots and control plots started to resemble each other in their soil properties. The results imply that peat soil have high recovery potential.