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MITIGATION OF PHOSPHORUS, NITROGEN AND ORGANIC CARBON EXPORTS BY CONTINUOUS COVER FORESTRY ON DRAINED PEATLANDS

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In peatland forestry, ditch network maintenance (DNM) and clear-cuttings are the most adverse measures inducing detrimental impacts on water quality. From this perspective continuous cover forestry (CCF) has been suggested as a feasible alternative to traditional even-aged management as clear-cuts will be avoided and the continuously maintained tree stand with significant evapotranspiration capacity would decrease the need for DNM. However, the positive impacts of CCF are still based on theoretical conjecture. This study elucidates the effects of CCF (release of undergrowth) on the exports of total nitrogen (TN), total phosphorus (TP) and total organic carbon (TOC) during three growing seasons in a nutrient-rich drained peatland forest in southern Finland. The stand supported a mature Scots pine (Pinus sylvestris L.) stand with total volume of ca 278 m^3/ha an abundant undergrowth of Norway spruce (*Picea abies* L. Karst.) and downy birch (*Betula pubescens* Ehrh.). In March 2016, three parallel sites were established: a CCF harvest area removing overstory pines resulting in a removal of 74% of the pre-harvesting stand volume (14 ha), a clear-cut area mounded and planted with spruce seedlings in 2017 (1.8 ha), and a non-managed control (3 ha). Water quality was monitored during 2015-2018. Continuous runoff estimates were based on manual and automatic monitoring, and hydrological modelling. During the three post-treatment years, the average annual element exports (kg/ha) were higher from the CCF-treatment (TN: 5.2, TP: 0.3, DOC: 197.3) than the control (TN: 3.6; TP: 0.12; DOC: 138.3). However, TOC, TN, and TP exports from the clear-cut were 63%, 140%, and 340% higher than from the CCF-treatment, respectively. The treatment effect was the largest during the second post-treatment year. Even though CCF increased element exports compared to the uncut forest, it was a significantly better option from water quality perspective than clear-cutting at least in the short term.