

Effect of peat characteristics on P, N and DOC mobilization from re-wetted peat soils - a laboratory column study for the impacts of restoration on forestry-drained peatlands

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Peatlands are an integral part of the hydrological cycle in the boreal and temperate zones, providing ecosystem services such as water filtering. From the mid to late 1900's, over 15 ha of peatlands and wetlands were drained for forestry in the temperate and boreal zones, causing deterioration of biodiversity and loss of ecosystem services. They are now being restored in order to reverse this development.

Restoration of peatlands has been found to cause leaching of DOC and nutrients after water level rise and expansion of reducing conditions in the peat. A molar ratio between redox-sensitive Fe and P in the peat of < 10 has been previously suggested as a limit value indicating risk of high P export. The ratio, however, does not predict the level of P release well when the value is < 10 .

It has also been suggested that redox-sensitive Fe is involved in the export of DOC via consumption of protons during reduction reactions of Fe, which reduces the soil positive charge and makes the DOC molecules more electronegative, which makes them repel each other.

An incubation experiment was conducted to study factors affecting P, N and DOC release from inundated peat from forestry-drained peatlands of several fertility classes. It was discovered that in addition to Fe, a high ratio of Al to P in the peat reduces P export under reducing conditions. High peat Fe content was also found to predict high DOC export, suggesting that minerotrophic sites are susceptible to post-restoration DOC leaching due to the Fe in their peat. Microbial biomass and mineralization potential of the peat were not found to be important for the export of DOC or P. High NO_3 content in the peat predicted high export of NH_4 under reducing conditions.