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Dynamics of N_2O as Indicator of the Function of Peatland Buffers

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Forest harvesting and soil amelioration, especially in forested peatlands, increases the release of nutrients, solids and dissolved organic matter from the catchment. For the protection of the receiving watercourses, flooded buffer zones are established between the forest management area and the watercourse. The raising water level and increasing nutrient load in the flooded buffers may affect both primary producers and decomposers of organic matter in the buffer ecosystems, and thereby the production or consumption of decomposition gases, such as nitrous oxide (N_2O). Nitrogen may be substantially released in gaseous form from the peatland buffers, e.g. NO_3^--nitrogen entering a buffer can be released as N_2O through denitrification. In addition, plant biomass and N-reserves in soil may change. N_2O fluxes depend much on the water table. Denitrification potentials at different depths of the peat profile and spatially show great variability. Our overall aim is to find new means to monitor the capability of peatland buffers to bind nutrients. Specifically, we follow the changes in the nutrient dynamics, quantity and quality of dissolved organic carbon (DOC) and water table in peatland buffers, and relate these changes with those in the composition of ground vegetation. Gas exchange studies were applied in order to link the changes in nutrient retention and activity of soil micro-organisms. DOC contributes to the carbon cycle of peatland buffer as a source of carbon for micro-organisms. We hypothesize that visible vegetation changes in connection with the biogeochemical changes evolve with age in the buffer. Using these indications we try to find better concepts for buffer construction in order to reduce the nutrient load from and greenhouse gas emissions from sites

of peatland forestry.