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Impacts of logging residue and stump removal on nitrogen export to stream - a modelling approach

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Utilisation of logging residues and stumps as a source of renewable energy can decrease the net carbon emissions to the atmosphere, but the harvesting of the residues and stumps may have adverse effects including changes in nutrient cycle and nutrient export to water bodies. The aim was to quantify the effects of logging residue and stump removal on the N export from clear-cut area to stream and on N fluxes in the clear-cut area. Hydrological processes and nitrogen export from a catchment subject to clear-cutting and different scenarios of biomass removal were simulated using a mathematical model FEMMA. The model describes a catchment as a hillslope that extends from a water divide to a stream and may include a buffer zone located between the clear-cut area and the stream. Four different residue and stump removal scenarios were compared to a conventional clear-cutting, where the logging residues were left on site. Logging residue recovery did not decrease the nitrogen export to the stream, because the microbial immobilisation decreased remarkably after removing the woody debris from the site. Therefore harvesting of logging residues in low atmospheric N-deposition areas could not be motivated with decreasing N loads to water bodies.