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Long-term effects of clear cutting and intensive biomass harvesting on the nitrogen leaching to groundwater in the boreal forest environment

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Clear-cutting and site preparation cause the greatest changes in site conditions and to the environment. The oldest research carried out within the boreal coniferous forest zone on the leaching of nutrients into watercourses was conducted in Sweden in the early 1970s. Also in Finland, the effect of clear-cutting and site preparation on the quality of surface runoff has been monitored since 1974 and into the groundwater, after waste wood harvesting, since 1986.

Recently intensive biomass harvest has been rapidly increasing and nowadays about seven percent of the total consumption of energy in Finland comes from forest energy. The consumption derived from wood-based fuels is as much as 23 per cent of the total energy. Thus study and understanding forest ecosystems function is nowadays facing new challenges, especially when harvested forest energy, especially stumps, course disturbances and more water penetrating into the soil and groundwater in addition to other ecosystem changes.

According the long term-monitoring results nitrate nitrogen seems to be the foremost nutrient leached into the groundwater as a consequence of forestry operations. The effects of clear-cutting on nitrate nitrogen leaching and concentrations in surface water have been shown to last only a few years, but the long-term property of increasing groundwater concentrations, have persisted 25 years which has not reported earlier from other sites. Clear-cutting increases the input of precipitation, but in northern areas this cannot be the main reason for the higher values. The greater part of the increased concentrations is due to the decomposition of cutting waste and humus. This is interesting in relation to intensive biomass harvesting.
The availability and the quality of water are strongly influenced by forests. The relationship between forests and water is therefore a critical issue that must be accorded high priority also when developing forest biomass harvesting for energy. To develop best forest management practices to protect water quality is becoming more and more important. Forests are stabilizing soils and protecting watersheds.

In the conference the long-term effects of different regeneration cuttings and biomass harvesting to the ground water will be discussed with special attention to the needs of understanding the great value of catchment base monitoring.