

Minkkinen Kari: University of Helsinki, Department of Forest Ecology  
Laine, Jukka: University of Helsinki, Department of Forest Ecology  
Mäkiranta, Päivi: Finnish Forest Research Institute, Kannus Research Unit  
Penttilä, Timo: Finnish Forest Research Institute, Vantaa Research Unit

## Effects of forest management on GHG fluxes on peatlands

Forestry drainage has been the most extensive land use applied to peatlands in Finland. Approximately 60%, i.e. 6 million hectares, of peatlands and paludified forests in Finland have been drained for forestry. According to present knowledge, emissions of CH<sub>4</sub> decrease after drainage whereas those of N<sub>2</sub>O may increase in fertile sites. Soil CO<sub>2</sub> effluxes that originate from heterotrophic respiration always increase after drainage, although the net change in soil (peat) C stores have been reported to either decrease or increase in the long-term following drainage. The impact of forestry operations, such as fellings and following soil preparation for regeneration has been unknown.

The aim of the project was to study the dynamics in GHG fluxes following tree stand fellings in typical drained peatland forests in southern and northern Finland. Two study sites with clear-fell and thinning treatments were established in 2000–2001, one in southern Finland (Vesijako, 61°22' N, 25°07' E) and the other in northern Finland (Kivalo, 66°20' N, 26°40' E). Soil respiration (=CO<sub>2</sub> efflux) originating from 1) living roots, 2) decomposition of peat and 3) decomposition of litter was measured weekly-biweekly by a portable closed chamber system. In addition, CH<sub>4</sub> and N<sub>2</sub>O fluxes, and in Vesijako clear-fell site the net CO<sub>2</sub> exchange (NEE, including ground vegetation) and CO<sub>2</sub> efflux originating from decoposing slash were measured biweekly using closed chambers.

Two seasons after the fellings, soil respiration (total CO<sub>2</sub> efflux) had decreased approximately by the amount of root respiration i.e. 20–40%. Heterotrophic respiration (decomposition of old OM) did not significantly change, even though the soil surface temperature increased a little. The impact of increased temperature may have been counteracted by the increased droughts in clear-felled sites during summer months. Both sites were still small CH<sub>4</sub> sinks and small N<sub>2</sub>O sources. The net CH<sub>4</sub> consumption may have decreased a little but no clear changes in these gas fluxes after fellings were observed. However, at the clear-felled site in Vesijako the slash piles had significantly higher emissions of CO<sub>2</sub> than the plots without slash, and NEE was clearly negative due to poor photosynthetic capacity of the suffered ground vegetation. Thus, it is concluded that clear felling may cause at least a short term increase in the net GHG effluxes from forestry-drained peatlands.

Corresponding author: Kari Minkkinen, email: [kari.minkkinen@helsinki.fi](mailto:kari.minkkinen@helsinki.fi)