

Carbon and nitrogen pools and mineralization rates in boreal forest soil after stump harvesting

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The use of forest-derived biomass has steadily increased in the Finland and Sweden during the past decades. Thus, more intensive forest management practices are becoming more common in the region, such as whole-tree harvesting, both above- and belowground. Stump harvesting causes a direct removal of carbon (C) in the form of biomass from the stand and can cause extensive soil disturbance, which in turn can result in increased C mineralization.

In this study, the effects of stump harvesting on soil C and nitrogen (N) mineralization, and soil surface disturbance were studied at two different clear-felled Norway spruce (*Picea abies*) stands in Central Finland. The treatments were conventional stem-only harvesting combined with mounding (WTH) and stump harvesting (i.e. complete tree harvesting) combined with mounding (WTH+S). Logging residues were removed from all study sites. Soil samples down to a depth of 20 cm were systematically collected from the different soil disturbance surfaces (undisturbed soil, the mounds and the pits) 12–13 years after final harvest. Soil samples were incubated in the laboratory to determine the C and N mineralization rates. In addition, total C and N pools were estimated for each disturbance class and soil layer.

Soil C and N pools were lower following stump harvesting, however, no statistically significant treatment effect was detected. Instead, C mineralization responses to treatment intensity was site-specific. C/N-ratio and organic matter content were significantly affected by harvest intensity. The observed changes in C and N pools appear to be related to the intrinsic variation of the surface disturbance and soil characteristics, and harvesting per se, rather than treatment intensity. Long-term studies are however needed to draw long-term conclusions whether stump harvesting significantly changes soil C and nutrient dynamics.