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Recovery of soil carbon and nitrogen pools following forest fires in eastern Lapland, Finland.

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Forest fires have been the dominant disturbance regimes in boreal forests since the last Ice Age. Fire is the primary process which organizes the physical and biological attributes of the boreal biome and influences energy flows and biogeochemical cycles, particularly the carbon and nitrogen cycle. Forest fire activity is expected to increase significantly with changing climate, acting as a catalyst to a wide range of ecosystem processes controlling carbon storage in boreal forests.

We compared the initial recovery of carbon (C) and nitrogen (N) pools and dynamics following fire disturbance in Scots pine (*Pinus sylvesteris*) stands in the boreal forests of eastern Lapland (Värriö Strict Nature Reserve), Finland, by sampling soils and measuring soil respiration from sample plots established in a chronosequence of different forest sites with 4 age classes, ranging from 2 years to 150 years after fire disturbance (2, 40, 60, 150 years after fire). The sites are situated north of the Arctic Circle, near to the northern timberline at an average of 300 m altitude.

The overall/total C and N contents in the first 10 cm of the topsoil (all soil layers taken into consideration) were highest on old areas (fire 150 years ago) and lowest on new areas (fire 2-40 years ago). The highest C pools (1071 g m^{-2}) were measured on old areas from top soil horizons (consisting of decomposing litter). The total C pool was at the old site was 2329 g m^{-2}. The area where the fire was 2 years ago had the lowest total C pools, 1550 g m^{-2} respectively. The lowest C pools were measured from area where the fire was 60 years ago, and from B horizon, where the amount of C was 103 g m^{-2}.When we compared the total C pools, the newly burned areas (areas where the fire was 2 – 40 years ago) formed one group (had similar values of total C) and old areas (areas where the fire was 60-150 years ago) formed another group with similar values. Same tendencies occurred also in total N pools, where we had lowest values where the fire was recently and the highest values in old areas. These results are also correlating to the soil respiration measurements, where we had lowest values of soil respiration in areas where fire was 2 years ago (0,047 mg CO_2 s^{-1} m^{-2}) and highest values in old areas (0,144 mg CO_2 s^{-1} m^{-2}).

Our preliminary results show that forest fire has a substantial effect on the C and N pool in the litter layer decaying forest top soil layer, but not in the humus layer and in mineral soil layers. Soil respiration and biomass development showed similar chronological response to the time since the forest fire indicating that substantial proportion of the respiration was originating from the very top of the soil.