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<u>Spatial heterogeneity in ecosystem processes after severe fire in a black spruce (*P.mariana*) forest, Alaska (USA)</u>

Soil heterogeneity is recognized as a critical unknown for evaluating ecosystem processes. Post-fire nitrogen (N) cycling may respond to fine-scale variation in ash, soil moisture, and vegetation, factors which affect microbial substrates and abiotic conditions for mineralization. In this study, we use geostatistics to evaluate and explain spatial patterns of net nitrogen (N) mineralization 1 year after severe fire in central Alaska. We expected spatial patterns in net N mineralization to reflect patterns in vegetation regrowth, legacy organic material, and microbial community composition. Net N mineralization averaged 62 ± 7 mg kg^{-1} yr^{-1} (1 SE, CV=103%) and was autocorrelated at distances < 6.6 m. Semivariograms of net N mineralization rates were compared to semivariograms of vegetative cover, soil moisture, pH, potential C and N mineralization rates, dissolved organic C, total C, total N, and microbial abundance (phospho-lipid fatty acids). pH and potential C mineralization demonstrated spatial gradients across the plot, while soil moisture was relatively homogenous (range = 22 m). Variables representing percent cover of vegetation showed no spatial dependence and were very heterogeneous (range <2 m, the minimum lag distance). Based on microbial community ordination, a majority of soil samples had similar microbial composition, although approximately 15% of samples were outliers containing lower levels of common fungal lipids. Lipid abundance averaged 0.45 ± 0.04 _g g $soil^{-1}$ (CV=76%). We conclude that spatial patterns in net N mineralization do not result from spatial patterns in aboveground vegetation, which may indicate a decoupling of above-ground variables and belowground N cycling 1 year after fire, and may indicate a strong role for legacy organic matter and microbial communities surviving fire.