Microbial Population and Community Ecology

**Significant and persistent impact of timber harvesting on soil microbial communities in Northern coniferous forests**

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**Abstract**

Forest ecosystems have integral roles in climate stability, biodiversity and economic development. Soil stewardship is essential for sustainable forest management. Organic matter (OM) removal and soil compaction are key disturbances associated with forest harvesting, but their impacts on forest ecosystems are not well understood. Because microbiological processes regulate soil ecology and biogeochemistry, microbial community structure might serve as indicator of forest ecosystem status, revealing changes in nutrient and energy flow patterns before they have irreversible effects on long-term soil productivity. We applied massively parallel pyrosequencing of over 4.6 million ribosomal marker sequences to assess the impact of OM removal and soil compaction on bacterial and fungal communities in a field experiment replicated at six forest sites in British Columbia, Canada. More than a decade after harvesting, diversity and structure of soil bacterial and fungal communities remained significantly altered by harvesting disturbances, with individual taxonomic groups responding differentially to varied levels of the disturbances. Plant symbionts, like ectomycorrhizal fungi, and saprobic taxa, such as ascomycetes and actinomycetes, were among the most sensitive to harvesting disturbances. Given their significant ecological roles in forest development, the fate of these taxa might be critical for sustainability of forest ecosystems. Although abundant bacterial populations were ubiquitous, abundant fungal populations often revealed a patchy distribution, consistent with their higher sensitivity to the examined soil disturbances. These results establish a comprehensive inventory of bacterial and fungal community composition in northern coniferous forests and demonstrate the long-term response of their structure to key disturbances associated with forest harvesting.