Response of soil organisms to varying sizes of aggregated green-tree retention

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Variable retention of living trees is increasingly being favored as an alternative to clear-cutting in forest management. Soil organisms have a vital role in nutrient cycling, so preservation of a functioning soil community is essential for ecosystem function. Currently, only retention of woody debris and limitation of soil scalping are recommended to protect soil organisms after harvest. However, a more suitable management treatment may be preservation of living trees on harvested sites, providing soil organisms with sources of energy from tree roots and litter. The aim of this project is to assess the potential of green tree retention (GTR) as a management tool to maintain soil function after harvesting. This project brings together multi-disciplinary researchers, applying a range of novel techniques to quantify changes in soil microbial and faunal diversity and function in response to harvesting. The project is using STEMS installation near Elk Bay, Vancouver Island. STEMS is a multi-disciplinary field experiment that compares the ecological and socio-economic effects of 7 silvicultural systems (clear-cut, uncut, group selection, patch cuts, dispersed retention, aggregated retention). This experiment has allowed us to examine the same soils pre- and post-harvest. Our investigations are determining how soil communities change, whether key species are lost, and if GTR of different aggregate sizes and density ameliorate modifications of these communities. Changes in rates of soil processes are being measured concurrently to determine if the observed alterations in soil communities have serious consequences for soil functioning. Analyses of our pre-harvest samples have shown that 95% of the soil faunal populations were found in the forest floor. The forest floor harbored a distinct microbial community from the mineral soil in both composition, measured using PCR-DGGE, and function as measured using enzymatic and catabolic profiles. These results indicate that the forest floor is a critical reservoir for soil organisms in this forest. One of the benefits, therefore, of GTR may be retention of undisturbed forest

floors in the retention patches, which could serve as refugia for colonization of disturbed areas following harvest. This is confirmed by the analyses of post-harvest samples which have shown that populations of most of the soil macrofauna and Collembola are influenced more by the amount of disturbance of the forest floor, than by the influence of living trees.

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