Long Term Forest Soil Productivity: effects related to organic matter removal and compaction on soil nutrient pool & microbial activity

Speaker: Jordy Kersey, PhD Soil Science Student
Supervisor: Sean Smukler
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Abstract:

Forest soils control many ecosystem services that enable and support primary forest productivity. Therefore, maintaining the health of the soil is critical to sustainable forest management. The long-term soil productivity (LTSP) experiment was initiated to track forest soil health over the long-term, and in growing our understanding of how the soil responds to pulse harvest disturbance. The purpose of this study was to investigate the effect of organic matter (OM) removal and compaction manipulations on soil health indicators at six long-term LTSP sites (study durations 15-25 years) in the Pacific Northwest and Northern California, USA. We hypothesized that only the most severe organic matter removal treatment would exhibit decreased soil nutrient pools and microbial activity-related processes; compaction would have less detrimental impact on soil properties than organic matter removal treatments; and site differences may preclude universal response of harvesting treatments and cause differentiated response to organic matter removal and compaction in some soil measurements. We collected mineral soil samples at six LTSP sites and measured soil properties related to nutrient pools (total soil carbon (C) and nitrogen (N), active C) and microbial activity indicators (C and N mineralization and enzymatic potential activity). Our results indicate that the effects of organic matter removal treatments are more long lasting than those effects of compaction treatments and that microbial activity indicators may be more susceptible to the influence of inherent site properties which obscure observation of treatment effects, compared to measures of nutrient pool status. Despite variation in inherent site properties, we did find consistent evidence that removing the forest floor, following timber harvest, is detrimental to most soil nutrient pool and microbial activity measurements, even after 15-25 years. These results highlight the importance of the forest floor in maintaining ecosystem services and are important in understanding the recovery trajectory of forest soils following harvest disturbance.

Bio:

Jordy is originally from Iowa, US and completed her BSc in Environmental Science and Biology at Iowa State University. During her time at ISU, she was a research assistant on a project investigating the impact of extended rotations on soil carbon and nitrogen dynamics in conventional agriculture systems. Following undergrad, she pursued a MSc in soil science at Oregon State University studying forest soil microbiology. Working in forest soils, she found herself longing for the days of sampling corn fields. Soon rediscovering her love for agriculture and interest in improving food systems, she moved to Vancouver to pursue a PhD in the Sustainable Agricultural Landscapes (SAL) lab under the supervision of Sean Smukler.