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Soil biogeochemistry and microbiology research at Lakehead University, Thunder Bay, Canada

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Abstract

Canada contains nearly 10% of forests and the second largest northern peatland area globally. In particular, ecosystems in the sub-boreal to sub-arctic climate zones contain vast amounts of soil carbon that plays important biosphere - climate change feedback. These ecosystems are also facing multiple anthropogenic stressors from forestry, mining, invasive pests, and land conversion to agriculture, climate change, among others. Microbial communities play important roles in the formation and transformation of soil organic matter and the associated production of greenhouse gases. Knowledge of the diversity and roles of soil microorganisms and soil biogeochemistry has been notoriously constrained by technical limitations and challenges. However, progress in the biogeochemistry and environmental microbiology «toolkits» is advancing rapidly. This presentation will introduce the main ongoing research programs and projects on soil biogeochemistry and environmental microbiology across forest, wetland, and agricultural ecosystems at Lakehead University. In particular this will include: 1) the use of pulp and paper mill residuals as soil amendments in forestry, agriculture, and land reclamation, 2) carbon cycling and sequestration potential following smelter emissions reductions and land reclamation in a major metal mining region, 3) ecological trade-offs of intensified harvests for enhancing bioenergy feedstock production in temperate and boreal forests, and 4) feedbacks to permafrost thaw in peatlands. The important roles of student, researchers and local to international partnerships will be highlighted. Additionally, context will be given about new national-scale interests in characterizing soil health, and on initiatives for understanding and enhancing the state of soil science education in Canada. The presented is a former president of the Canadian Society of Soil Science, and the important roles of this organization in these initiatives and others will be presented.

Keywords: Agriculture, Carbon, Climate change, Forests, Peatlands