Natural Resources Canada
Ressources naturelles Canada

Research Connections: Cumulative Effects

Targeting forest reclamation practices and developing indicators designed to protect and restore water resources and maximize carbon capture in a cumulative effects landscape

Note 6

Lead Researcher: Erik Emilson (GLFC) **Project Type:** Cumulative Effects **Project Status:** Active (2021–2022)

Need/Drivers

Canada's forested ecosystems are a globally significant source of freshwater resources and an important part of the global carbon cycle. Canada's forests fluctuate between being carbon sources and carbon sinks. Thus, there is a need to understand how management decisions can increase the potential for carbon storage. Due to the global importance of Canada's forests for carbon storage and freshwater resources, it is important to take into consideration the restoration and maintenance of these key ecosystem functions and services. This can be challenging, since current reclamation and forest management practices tend to focus on forest biomass without necessarily considering the effects on water or carbon sequestration. This project will provide the science to support both the responsible management of forest harvest operations and afforestation/reclamation projects. In addition, it will develop novel ecosystem indicators of carbon in freshwater ecosystems (i.e., indicators of conditions favouring carbon sequestration versus emission).

Approach

This project will develop novel forest reclamation and management strategies aimed to maximize carbon sequestration into soils, water and sediments. At the end of the project, partners will use data and model predictions generated through this work to modify their land reclamation protocols on private lands over the next decades. They will influence government regulations for public land management to include carbon storage management, along with other biodiversity, water, and soil quality criteria. Novel technologies will also be translated to the forest sector for future use in other environments. In addition, this project is concurrently developing a novel indicator of water resource function in managed forests. This indicator is a necessity for work within a cumulative effects paradigm, especially with a growing need for remote sensing and community-based monitoring. The key deliverables of this work are submissions of multiple manuscripts and presentations with industry partners and other stakeholders.

Anticipated Impacts

Targeted afforestation efforts can have huge benefits to Canadians. It is estimated that the carbon storage potential in reclaimed forests is 5Mt (~$500 million in value) in Sudbury alone, and this projection does not include freshwater carbon dynamics or the value of other associated ecosystem services. Functioning water resources offer diverse ecosystem services to Canadians that vary by region and community needs and dependencies. These services include clean drinking water, the support of fish productivity and even carbon storage. By providing science that will help maximize carbon capture and developing indicators designed to protect and restore water resources, this project aims to reduce global carbon emissions and enable our forests to continue providing benefits for Canadians. This project will develop novel ecosystem indicators that will be tailored to integrate into cumulative effects impact assessments, which are beginning to consider carbon budgets and sequestration. This work will be of benefit to industry (e.g., mining and forestry), the public and researchers.

Mike Thompson, VP of Boniferro Mill Works, visits sites with University of Cambridge students near the Turkey Lakes Watershed to help in planning a CFS-led experimental harvesting of watersheds to develop indicators of effects on aquatic ecosystems.

Project Location

Sudbury, Ontario and in the Turkey Lakes Watershed – a long-term study site run by the CFS and located north of Sault Ste. Marie, ON

CFS Team Members

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Collaborators

A. Tanentzap (U of Cambridge), N. Basiliko (Laurentian U), J. Gunn (Laurentian U), B. Edwards (Ontario Ministry of the Environment, Conservation, and Parks), M. Thompson (Boniferro Mill Works), J. McLellan (Clergue Forest Management)

Publications

Lescord G. L., Emilson E. J. S., Johnston T. A., Branfireun B. A., Gunn J. M. 2018. Optical Properties of Dissolved Organic Matter and Their Relation to Mercury Concentrations in Water and Biota Across a Remote Freshwater Drainage Basin. *Environmental Science and Technology* 52, 3344–3353.

Yakimovich, K.M., Orland, C., Emilson, E. J. S., Tanentzap, A.J., Basiliko, N., Mykytczuk, N.C.S. 2020. Lake characteristics influence how methanogens in littoral sediments respond to terrestrial litter inputs. *The ISME Journal* 14, 2153–2163.

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