SOIL INVERTEBRATE INDICATORS OF RECLAMATION SUCCESS

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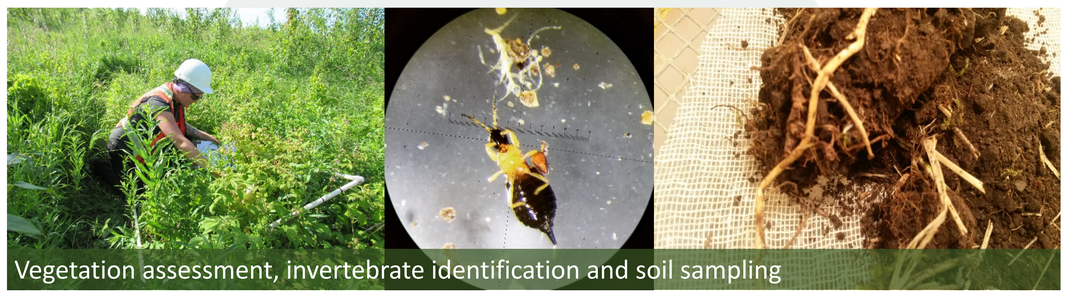
BACKGROUND

Reclamation success or failure is based on regulatory criteria. Current reclamation criteria for disturbed lands mainly focus on soil physical and chemical properties and vegetation cover. Global recognition of the need for conservation and restoration of ecosystems that are sustainable and high in biodiversity has focused reclamation success of some disturbances on a more complex and integrated system that will support diverse organisms at various trophic levels. Current common biophysical indicators of reclamation success may not provide a detailed picture of recovery after disturbance for these more complex ecosystems.

Soil invertebrates affect numerous soil properties and influence availability of resources for plants and microorganisms. The diversity and composition of soil invertebrates are directly linked to ecosystem health, biodiversity, function and stability. While rarely considered in reclamation, they may be an effective indicator of reclamation success.

AIMS AND OBJECTIVES

This research is part of a program to identify the most effective biophysical indicators of ecosystem biodiversity and resiliency and ultimately reclamation success. This research will enhance the understanding of relationships between soil physical and chemical properties, vegetation and soil invertebrates and the temporal and spatial dynamics of soil invertebrates in reclaimed ecosystems. This knowledge will help determine whether soil invertebrates should be considered a reclamation success indicator.



Vegetation assessment, invertebrate identification and soil sampling

PRELIMINARY RESULTS

Soil pit

Pitfall trap for invertebrates

Natural forest site

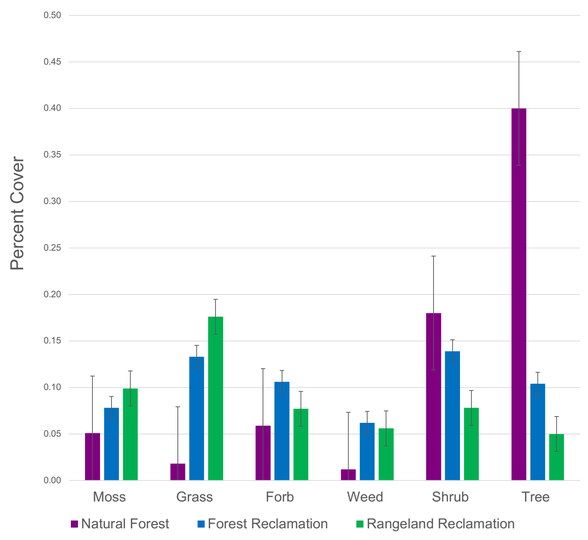
Soil Properties

Plot	Total Nitrogen (%)	Cation Exchange Capacity (meq/100g)	Electrical Conductivity (dS/m)	Total Organic Carbon (%)	Total Inorganic Carbon (%)
Rangeland Reclamation	0.35 (0.02)	35.2 (0.8)	0.9 (0.0)	5.2 (0.2)	0.2 (0.0)
Forest Reclamation	0.36 (0.02)	33.5 (1.3)	0.1 (0.0)	5.5 (0.4)	0.2 (0.0)
Natural Forest	0.52 (0.03)	51.2 (11.3)	0.6 (0.1)	7.8 (0.5)	0.1 (0.0)

Natural forest had higher total nitrogen, total organic carbon and cation exchange capacity than reclamation sites.

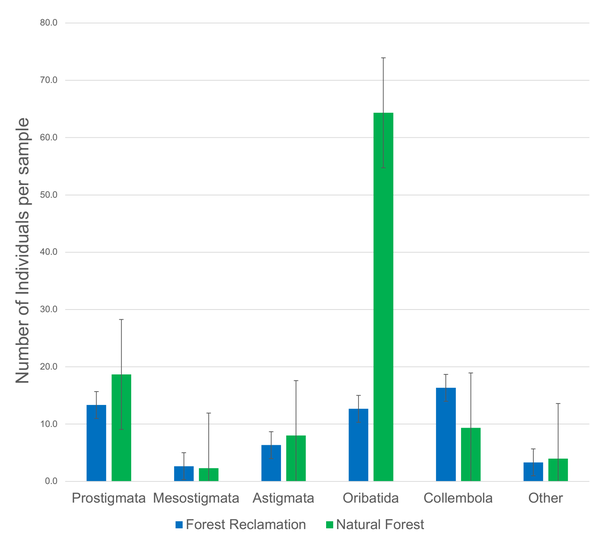
Forest reclamation site

Vegetation Cover



Moss, grass, forb and weed cover were higher in reclamation sites and shrub and tree cover were higher in natural forest.

Soil Invertebrates



Number of oribatid mites was highest in the natural forest site and number of collembola was higher in the reclamation site.

FUTURE DIRECTIONS

Research Plan

- Assessment of temporal effects on soil invertebrates with continued detailed invertebrate sample collection at Genesee Coal Mine and addition of a grasslands reference site.
- Application of success indicator assessment methods to other reclaimed sites in the energy industry including oil sands and pipelines.

Research Outcomes

- A reclamation assessment system that supports or improves current criteria and can be applied to reclamation of legacy, current and future energy systems.
- Development of ecologically and economically effective methods for soil invertebrate collection and identification in reclaimed sites.
- Development of future research directions to continue to build land and water reclamation criteria that are scientifically based.

PARTNERS

LAND RECLAMATION INTERNATIONAL GRADUATE SCHOOL

ROYAL ALBERTA MUSEUM

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NSERC CRSNG

FES PROJECT OVERVIEW

Resilient Reclaimed Land and Water Systems: Environmental issues associated with energy development, management and supply must be addressed for all energy systems. Regardless of the type, source or transport mode of energy, land and water will be affected. Hence, land and water will be integral components of all future, current and legacy energy systems, addressing land and water use, management, conservation and reclamation. After disturbance from energy focused activities, land and water require reclamation to resilient systems that support desired end land uses. Reclamation success can be achieved if metrics to determine trajectories and final outcomes are robust and science based, with good communication among stakeholders and practitioners. Our theme projects address a systemic approach to energy production and delivery and cross theme benefits.

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