Restore Carbon Dynamics

BERA Project Update

Impact of Seismic Lines on Carbon Cycling in Boreal Peatlands

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Project Theme Area
Soils and Hydrology

Project Code
BERA 1

Project Location
Peace River, Alberta

Working Group

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Please reach out to Percy if you are interested in joining this working group

Why is this study important?
Boreal peatlands serve as long-term carbon sinks as well as a significant source of methane (CH_4) to the atmosphere. Therefore, peatland management has been highlighted as an important nature-based climate solution. The cumulative impact of tree clearing and ground disturbance on peatland carbon cycling is not clearly understood. This study seeks to investigate the impact of seismic lines on microbial and vegetation community shifts, as well peat accumulation rates in boreal peatlands to establish a basis for predicting changes to carbon cycling.

How was it completed?
The field work for this study was completed across three peatlands associated with oil sands exploration/extraction near the town of Peace River. Four peatland subsites were selected based on the peatland type, type of seismic line disturbance and availability of data on vegetation and hydrology. During the summer months of 2018/2019/2020 data was collected on CO_2 and CH_4 fluxes from disturbed and adjacent undisturbed areas. Measurements related to water table levels, physicochemical parameters and climatic conditions were recorded alongside microbial, biomass and decomposition data.

What are the core management implications to date?
Seismic lines shift vegetation communities and alter microclimatic conditions in peatlands. These in turn alter carbon cycling and the overall function of boreal peatlands. Preliminary results of our work indicate that microbial communities are not significantly affected by seismic lines. However, peat accumulation rates and carbon turnover are altered. These findings suggest that the lack of trees on lines have little impact on the microbial community function, and that changes in plant community and microclimate are the main drivers of shifts in carbon exchange.

Attributes related to the plant community, microtopography, and wetness should hold promise for mapping changes in peatland carbon cycling in response to seismic line disturbance.

Achievements
Results from vegetation community changes were collaboratively published in the journal of Geophysical Research (Davidson et al. 2021). Findings from the microbial community studies were presented at the SER 2021world conference, while the manuscript is currently being prepared in conjunction with 3 additional papers on peat accumulation rates and CO_2 and Methane Flux dynamics.

Boreal Ecosystem Recovery & Assessment