

Soils Team: Soil Disturbance on Seismic Lines Leads to Compaction, Wetter Conditions and Organic Matter Loss

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Project Summary

This project aimed to determine the impact of seismic line disturbance and restoration on soil characteristics across contrasting boreal ecosites (poor mesic site and treed fen site). The main objectives were: 1) to determine differences in soil physical and chemical characteristics between narrow and wide lines and the adjacent undisturbed area and 2) to document changes in soil physical and chemical characteristics following mounding compared to unmounded lines and adjacent undisturbed areas. Seismic line disturbances resulted in a significant increase in bulk density and soil moisture on the line at both ecosites. We found an almost 40% reduction in organic matter on the line compared to natural areas at the poor mesic site, implying changes to carbon cycling, increased mineralization rates and carbon loss from the system. There was also $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ enrichment and narrower C:N ratios on the line, indicating increased decomposition state. We also found evidence of increased decomposition state on the mounds created after restoration at the treed fen.

Management Implications and Lessons Learned

Overall, seismic line disturbances significantly impacted soil physical and chemical characteristics. The large reduction in organic matter found in poor mesic sites has major implications for carbon cycling across these sites, indicating increased rates of mineralization. The mounding technique used for restoration of these lines also causes some disturbance to soil properties through increased decomposition and higher bulk density. Although seismic lines only make up a relatively small part of the landscape, it has to be questioned whether mounding these lines is a trade-off between disturbing the landscape to encourage tree regeneration and enhancing organic matter decomposition leading to increased carbon losses from the system, at least in the short term. As mounding has been successfully used to improve tree regeneration in other ecosite types, future work should involve investigating alternative mounding techniques to ensure both tree recovery and minimal impact to the ground layer vegetation in wetland systems.

Publication(s)

Davidson, S.J., Goud, E.M., Franklin, C., Nielsen, S.E. and Strack, M. Seismic line disturbance alters soil physical and chemical properties across contrasting boreal soils. In Review: *Frontiers in Earth Science: Biogeosciences*