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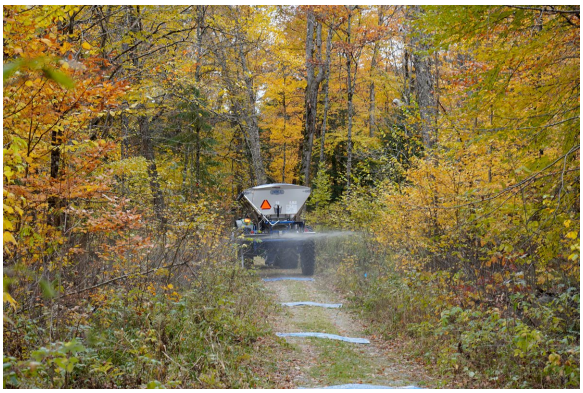

Enhanced weathering of wollastonite for sustainable managed forests

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Trail networks are used for selective harvesting in managed forests, which cover 10–69% of their areas[1] and provide an opportunity to expand enhanced rock weathering (ERW) while benefiting forest health. Wollastonite ($CaSiO_3$) is a fast-dissolving silicate with very low concentrations of heavy metals, making it a desirable ERW amendment. Applying wollastonite-rich rock powder (e.g., skarn) to acidic forest soils can further accelerate mineral weathering for carbon dioxide removal (CDR) while deacidifying and supplying base cations to soils that promote tree growth.[2] This ongoing study aims to accurately quantify CDR via wollastonite skarn weathering in acidic forest soils through laboratory and field experiments and assess the scalability of ERW in forests. The weathering rates of individual major minerals [wollastonite and diopside ($CaMgSi_2O_6$)] in the skarn are being assessed using laboratory column experiments to evaluate to what extent these minerals will contribute to CDR in the field. The wollastonite skarn used in this study has a maximum CDR potential of 377–427 kg CO_2/t, assuming solubility trapping of CO_2. In Haliburton Forest, Ontario, Canada, sixteen 12×12 m plots were set up and applied with varying dosages of pulverized wollastonite skarn (0, 5, 10, 20 t/ha × four replicates). Major cations (Ca, Mg, and Si) and dissolved inorganic carbon in near-surface soil water showed increased trends in the first 4 months after the application compared to the baseline and the control plots, representing CDR, which was positively correlated with dosages. An application test was conducted to assess the challenges of amending and monitoring forested land. The significant spatial heterogeneity in applied dosages shows that verifying amendment dosages and selecting appropriate monitoring sites are essential for accurately quantifying CDR in forest ERW applications. In relation to this study, we highlight three pitfalls that could lead to overestimating CDR rates: (1) initially fast dissolution rates, (2) weathering of accessory carbonates, and (3) quantifying cations rather than carbon.[3]

[1] Vantellingen & Thomas (2021) *Ecosystems*, 24: 1402-1421. [2] Taylor *et al.* (2021) *Biogeosciences*, 18: 169-188. [3] Power et al. (2025) *Front. Clim*. 6: 1510747.