

QUANTIFYING ORGANIC MATTER COMBUSTION DURING PEATLAND WILDFIRE

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ABSTRACT

Lightning-initiated forest fires are common to the western boreal forest and have important consequences for ecosystem carbon (C) storage in upland systems. Despite the importance of peat-accumulating lowlands to soil C stocks, little is known about contemporary fire frequencies in peatlands or the effects of wildfire on peatland C accumulation. Our objectives are 1) to describe a direct approach for the quantification of organic matter combustion during individual peatland fires, based upon ash concentrations in burned and unburned peat, and 2) to describe a novel use of the Canadian Large Fire Database in assessing recent potential fire frequencies in boreal lowlands. Our results suggest that 1,470 km² of peatland burned annually between 1980 and 1995 across Alberta, Manitoba, and Saskatchewan. We estimate that these fires released an average of 4.7 Tg C yr⁻¹ to the atmosphere through organic matter combustion. This annual C loss represents 53% of long-term net C accumulation as peat, suggesting that wildfires may substantially reduce ecosystem C storage in boreal lowlands.

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