

ASSESSING SPATIAL VARIATION IN ORGANIC MATTER LOST DUE TO FIRE WITHIN AND BETWEEN CONTINENTAL PEATLANDS OF WESTERN CANADA

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ABSTRACT

Fire in peatlands directly releases carbon to the atmosphere through combustion of biomass. Assuming that 1,470 km² of peatland burns annually in boreal, continental, western Canada (Alberta, Saskatchewan, and Manitoba), projected carbon losses of 2.2 to 4.4 kg m⁻² would result in a direct loss of 3.2 to 6.6 Gg C yr⁻¹ in affected peatlands. However, variation in burning between peatland types and within peatlands have been inadequately documented, making it difficult to assess errors in estimates of carbon loss based on areal extent alone. Site conditions, such as microtopography and hydrology, and fire characteristics, such as intensity, duration, and type (surface or crown), result in a differential degree of burning. A recent 114,043-ha fire during May–June 2001 near Chisolm, Alberta, reflects such variation between and within peatland landforms. Bog landforms seemed to burn more than open or treed fens, with the greatest amount of burning observed in the lower hollows compared to the raised hummocks of the bogs. To characterize variation, randomized transects in two bog, open fen, and treed fen landforms, respectively, were established. In each of 10 plots along each transect, 20-cm long, 10-cm diameter cores were collected at each corner of a 1-m² plot, with 1 additional core per corner collected if microtopographic variation was present. From each core, the upper burned portion was collected, along with 5 cm of the underlying unburned section. Each sample was dried at 70 °C for 48 h, weighed, and homogenized, followed by sub-sampling to determine ash concentration by loss on ignition at 450 °C for 4 h. Assuming uniform distribution of ash throughout the peat column before fire, the amount of ash in the burned portions should be significantly greater than in the underlying unburned portions because the relative concentration is increased by the loss of biomass. Within sites, greater ash concentrations should be observed in the hollows than the hummocks, as these areas appear to have burned more extensively. Between-site variation should reflect the fire characteristics, with areas subjected to more intense surface and crown fires (i.e., bogs) showing greater ash concentrations compared with areas with less intense, fast-moving, surface fires (i.e., open fens). Results of this study will be essential for assessing the effects of fire at the site level, allowing for a quantitative evaluation of small-scale and between-site variation in carbon lost through post-fire peat sampling.

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