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Gradual drying of permafrost peat decreases carbon dioxide production in drier peat plateaus but not in wetter fens and bogs

Aelis Spiller et al.

Correspondence to: Cynthia M. Kallenbach (cynthia.kallenbach@mcgill.ca)

Table S1. Lutose, Alberta Canada site characteristics and peat properties for two transects across a thaw gradient where peat samples were collected for the experimental drying incubation. For the peat moisture, total carbon (TC), total nitrogen (TN), C:N, $\delta^{13}C$, $\delta^{15}N$, ammonium, and nitrate, the mean and standard error from initial peat samples are shown with their one-way ANOVA model p-values. Letters that are different indicate a significant difference among transect features, n=4.

	Transect 1			**Transect 2**			**p-value**
	Mature Bog	Young Bog	Peat Plateau 1	Fen Center	Fen Edge	Peat Plateau 2	
Vegetation	*Sphagnum fuscum, Chamaedaphne calyculata, Eriophorum vaginatum*	*Sphagnum riparium, Carex aquatilis*	*Cladonia lichens, Sphagnum fuscum, Rhododendron groenlandicum, Chamaedaphne calyculata*	Sedge dominated, *Comarum palustre, Menyanthes trifoliata*, Gallium species, cottongrass, Sphagnum, and brown mosses	Mostly sphagnum amongst the sedges	*Cladonia lichens, Picea mariana, Sphagnum fuscum, Rhododendron groenlandicum, Chamaedaphne calylculata*	
Peat pH	4.23	4.65	4.13	6.16	5.2	4.4	
Water table depth	20-35 cm	8-13 cm	no water table	1 cm	5-10 cm	no water table	
Peat moisture (%)	91.0^{a}	95.4^{a}	79.8^{b}	90.5^{a}	93.2^{a}	72.5^{b}	<0.0001
TC peat (%)	44.2±0.1^{b}	43.2± 0.5^{b}	45.5 ±0.9^{ab}	45.1 ±0.4^{ab}	43.1±0.8^{b}	48.9±2.0^{a}	<0.005
TN peat %	0.52±0.04^{d}	0.83±0.06 ^{c}	0.74±0.07^{cd}	2.44±0.07^{a}	1.80±0.09^{b}	1.00±0.07^{c}	<0.0001
C:N peat	88.7±6^{a}	53.5±3^{b}	65.5±6^{b}	18.6±0.6^{c}	24.3±1^{c}	51.4±5^{b}	<0.0001
$\delta^{13}C$ peat	-29.76±0.5 ^{ab}	-28.85±0.1^{a}	-27.90±0.4^{a}	-25.95±0.3^{d}	-26.08±0.1^{cd}	-26.88±0.2^{bc}	<0.0001
$\delta^{15}N$ peat	-3.98±0.6^{c}	-2.58±0.7^{bc}	-0.80±1.2^{ab}	0.53±0.5^{a}	-0.44±0.4^{ab}	-0.20±0.4^{ab}	<0.0001
Ammonium (μg g^{-} dry peat)	5.7± 1.3^{a}	11.2±4.1^{a}	3.3±0.8^{c}	3.8±0.5^{bc}	5.7±1.2^{a}	3.3±0.6^{c}	<0.0001
Nitrate (μg g^{-} dry peat)	5.9±0.6^{b}	7.8±0.8^{a}	3.9±0.8^{cd}	4.4±0.5^{c}	5.7±0.5^{b}	2.7±0.4^{d}	<0.0001

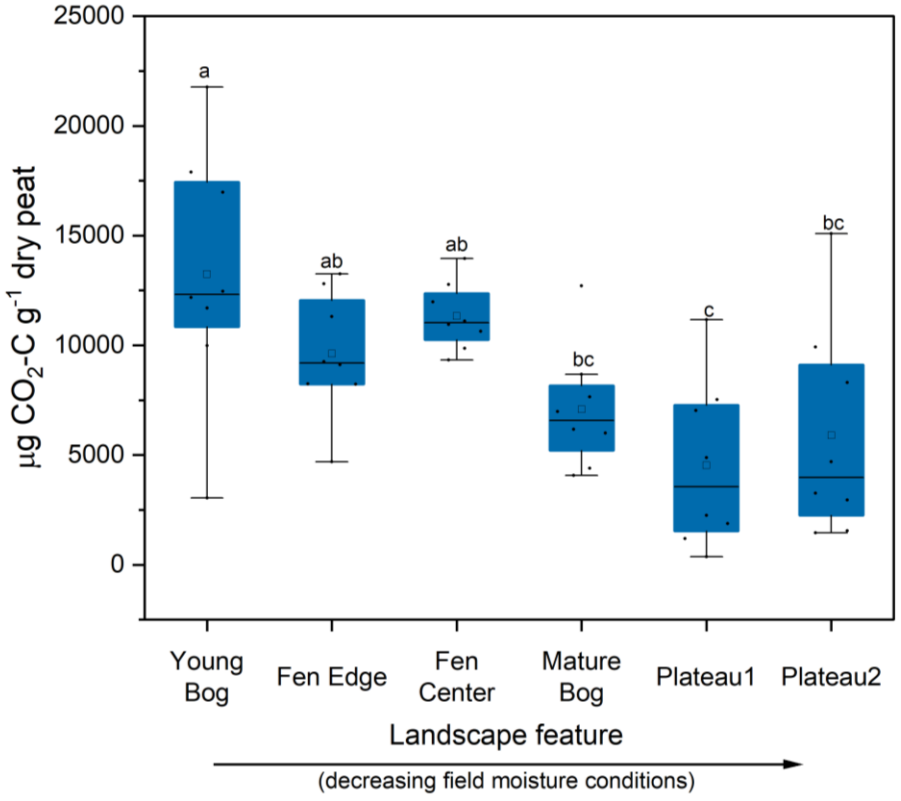

Figure S1. Cumulative CO_2 production by landscape feature after the two-week incubation ordered from high to low *in situ* peat moisture and averaged across moisture treatments. Wet treatments were incubated at field moisture conditions, and dry treatments were incubated under gradual drying. Horizontal lines show the median (n=8), open squares are the mean, and boxes show the 25th and 75th percentiles. Means that do not share a same letter are significantly different.

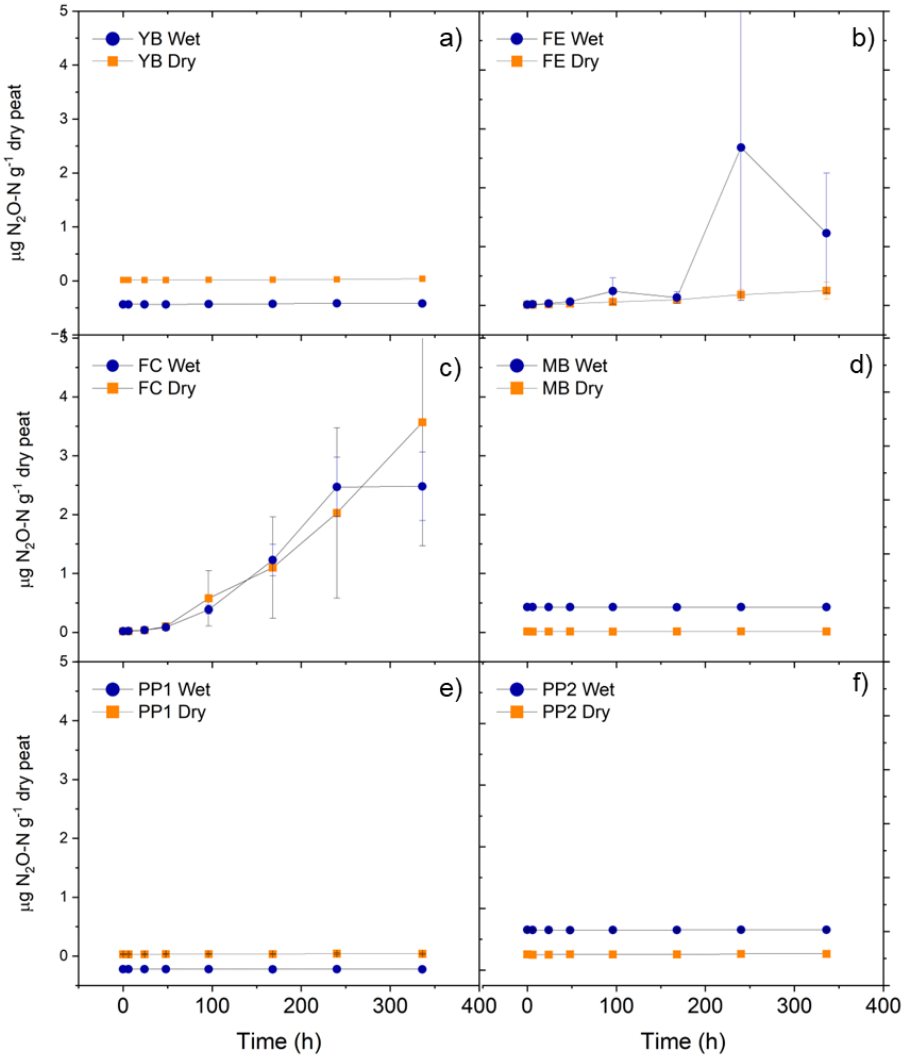

Figure S2. Mean N_2O production between field moisture (wet) and gradual drying (dry) over time (h) for a two-week incubation period. Panels a-f are ordered from wettest to driest field moisture conditions: (a) young bog (YB), (b) fen edge (FE), (c) fen center (FC), (d) mature bog (MB), (e) peat plateau 1 (PP1), and (f) peat plateau 2 (PP2). Error bars are standard error, n= 4.

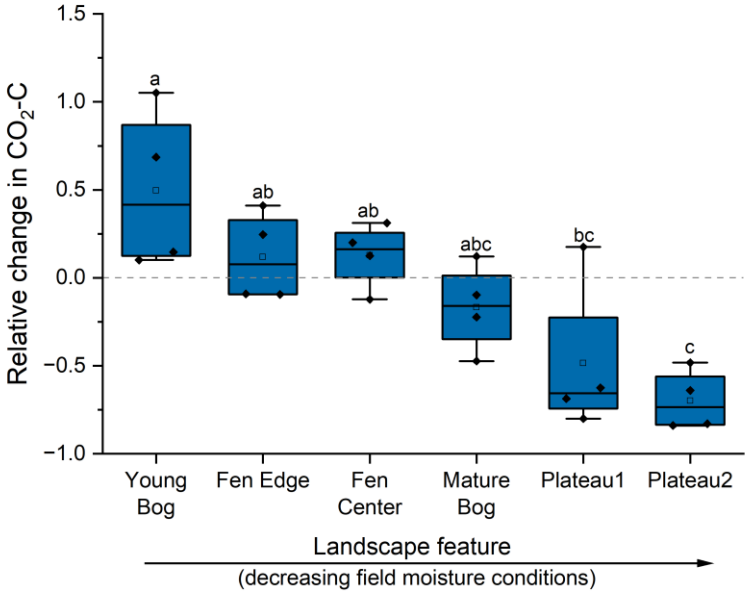

Figure S3. Relative change in CO_2 production by landscape feature after the two-week incubation ordered from high to low *in situ* peat moisture. Wet treatments were incubated at field moisture conditions, and dry treatments were incubated under gradual drying. For a given landscape feature, the change was calculated as the difference between the total CO_2-C production of the dried peat samples and those that were held at field moisture (control) conditions, relative to total CO_2-C production of the wet control sample after two weeks: (CO_2 *dried* − CO_2 *wet*)/CO_2 *wet*. Horizontal lines show the median (n=8), open squares are the mean, and boxes show the 25th and 75th percentiles. The dashed horizontal line is the reference zero line indicating no change. Means that do not share a same letter are significantly different.

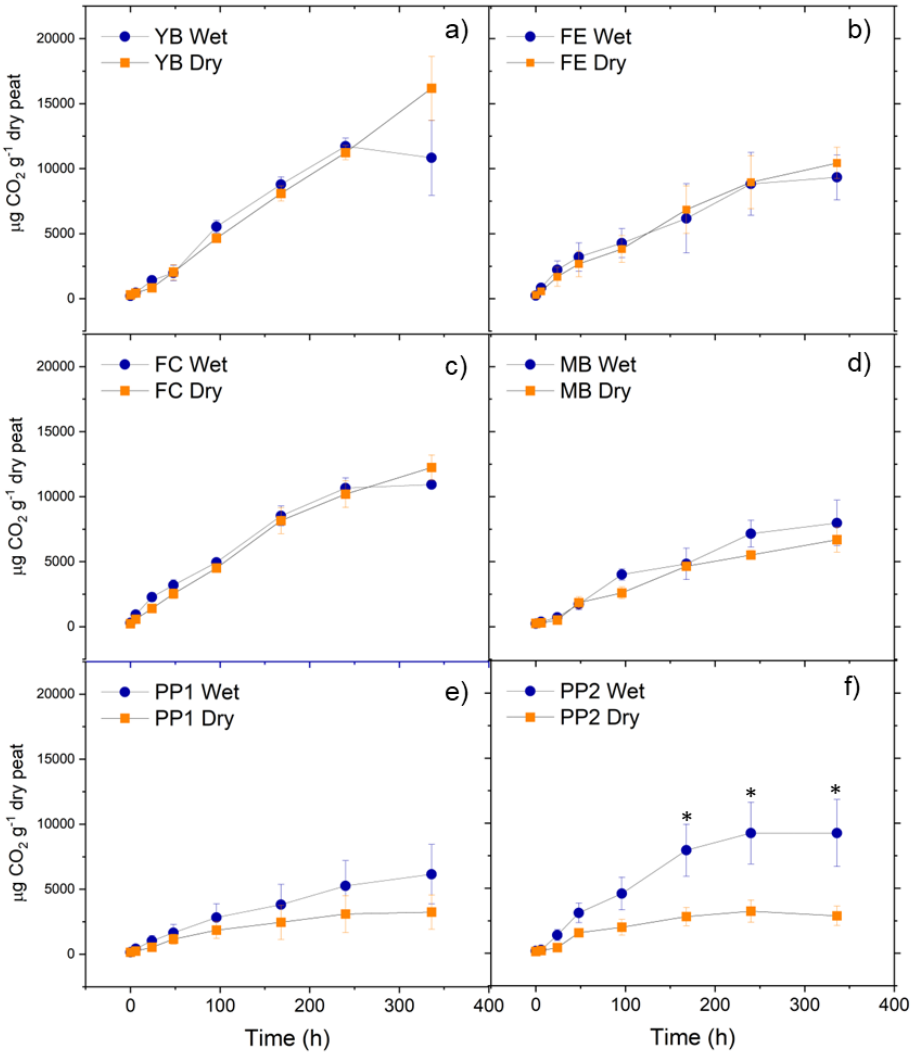

Figure S4. Mean CO_2 production between field moisture (wet) and gradual drying (dry) over time (h) for a two-week incubation period. Panels a-f are ordered from wettest to driest field moisture conditions: (a) young bog (YB), (b) fen edge (FE), (c) fen center (FC), (d) mature bog (MB), (e) peat plateau 1 (PP1), and (f) peat plateau 2 (PP2). Asterisks indicate significant differences between moisture treatments within a time point. Error bars are standard error, n= 4.