Supplemental Materials

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

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Supplemental 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.

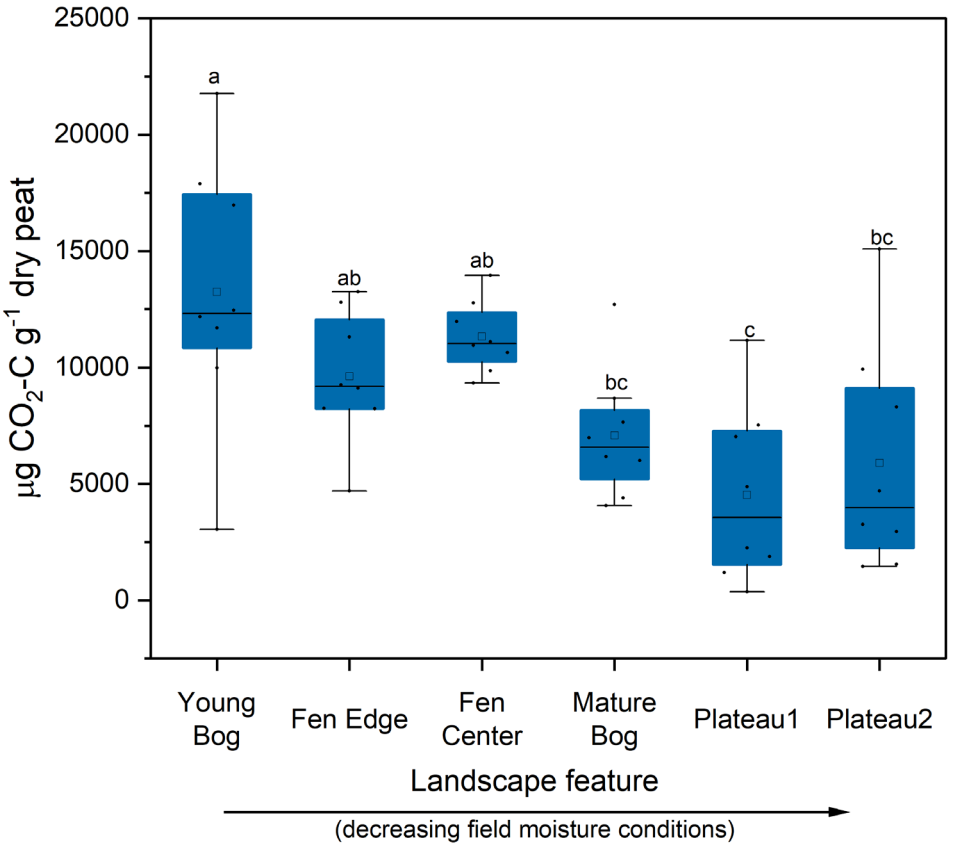
Supplemental Figure S1. Cumulative CO_2 production by landscape feature ordered from high to low *in situ* peat moisture and averaged across moisture treatments.

Supplemental Figure S2. Mean N_2O production between field moisture (wet) and gradual drying (dry) over time (h) for a two-week incubation period.

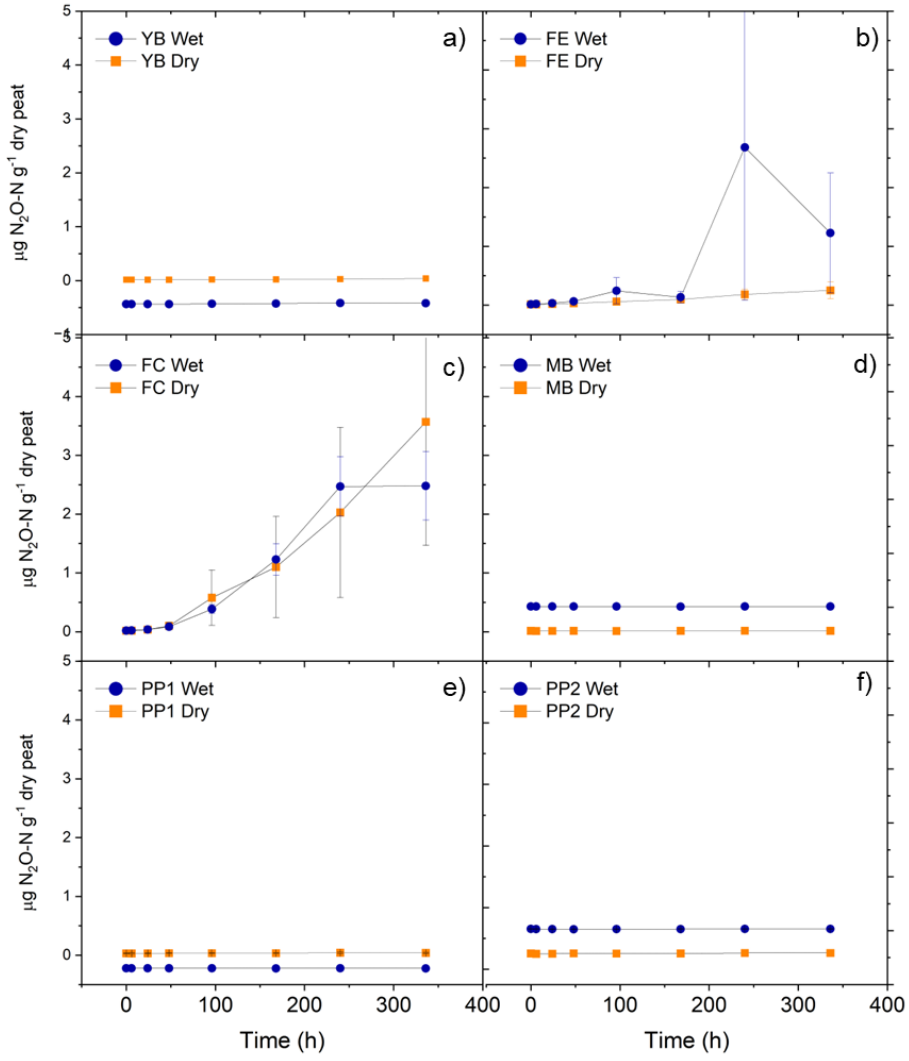
Supplemental Figure S3. Mean CO_2 production between field moisture (wet) and gradual drying (dry) over time (h) for a two-week incubation period.

Supplemental 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.

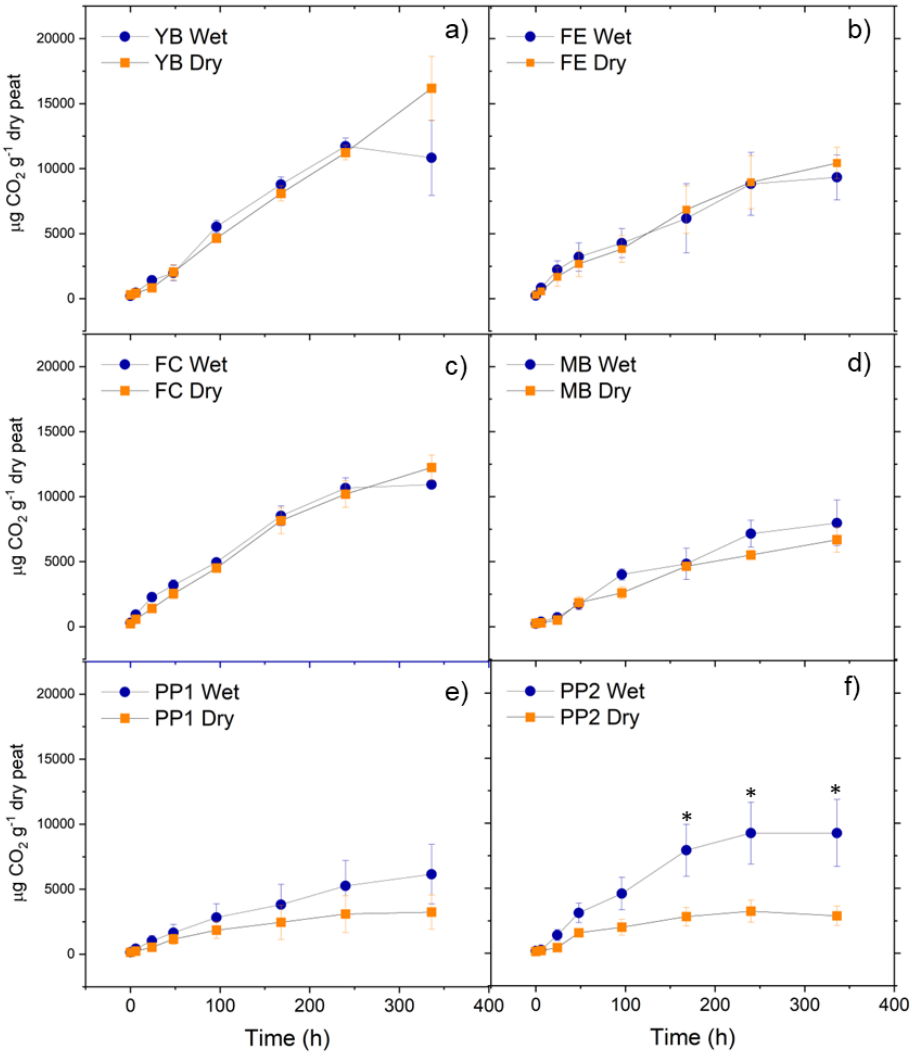
	Transect 1			Transect 2			
	Mature Bog	Young Bog	Peat Plateau 1	Fen Center	Fen Edge	Peat Plateau 2	
Peat pH	4.23	4.65	4.13	6.16	5.2	4.4	
Water table depth	20-35 cm	8-13 cm	no water table	1 cm	5-10 cm	no water table	
Vegetation	*Sphagnum fuscum*, *Chamaedaphne calyculata*, *Eriophorum vaginatum*	*Sphagnum 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*	
							p-value
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



Supplemental Figure S1. Cumulative CO_2 production by landscape feature 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) and boxes show the 25th and 75th percentiles. Means that do not share a same letter are significantly different.



Supplemental 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.



Supplemental Figure S3. 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.