Supporting Information 1

Trace elements in peat bog porewaters: indicators of dissolution of atmospheric dusts and aerosols from anthropogenic and natural sources

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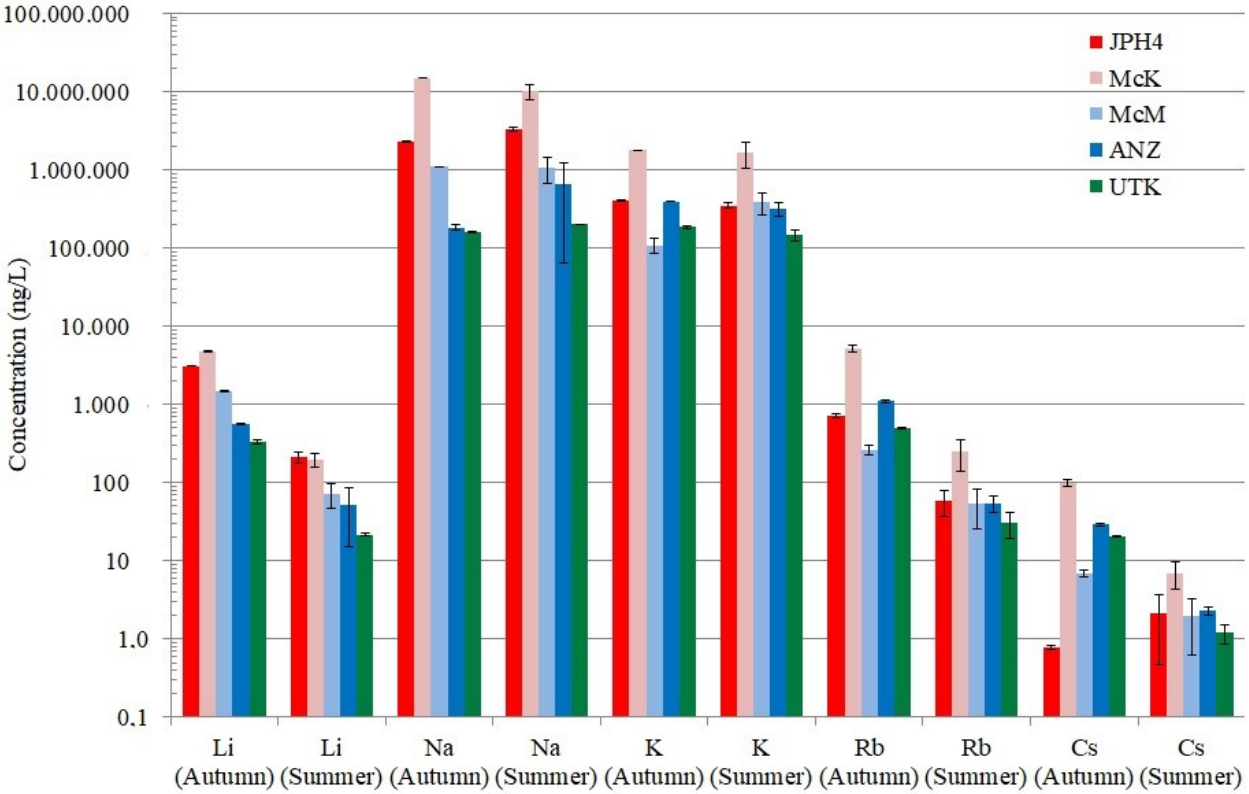

Figure S1. Concentrations of alkali metals (Li, Na, K, Rb, Cs) in peat bog porewater for both summer and autumn.

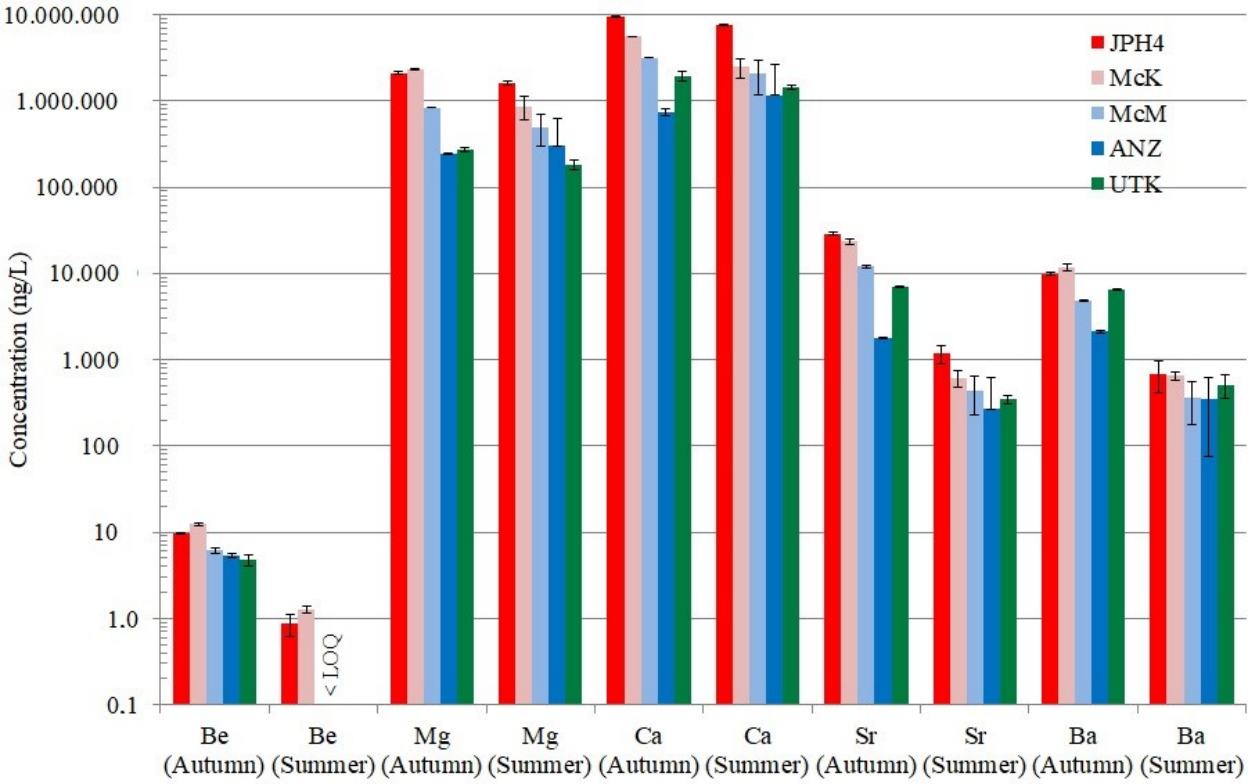

Figure S2. Concentrations of alkaline earth metals (Be, Mg, Ca, Sr, Ba) in peat bog porewater for both summer and autumn.

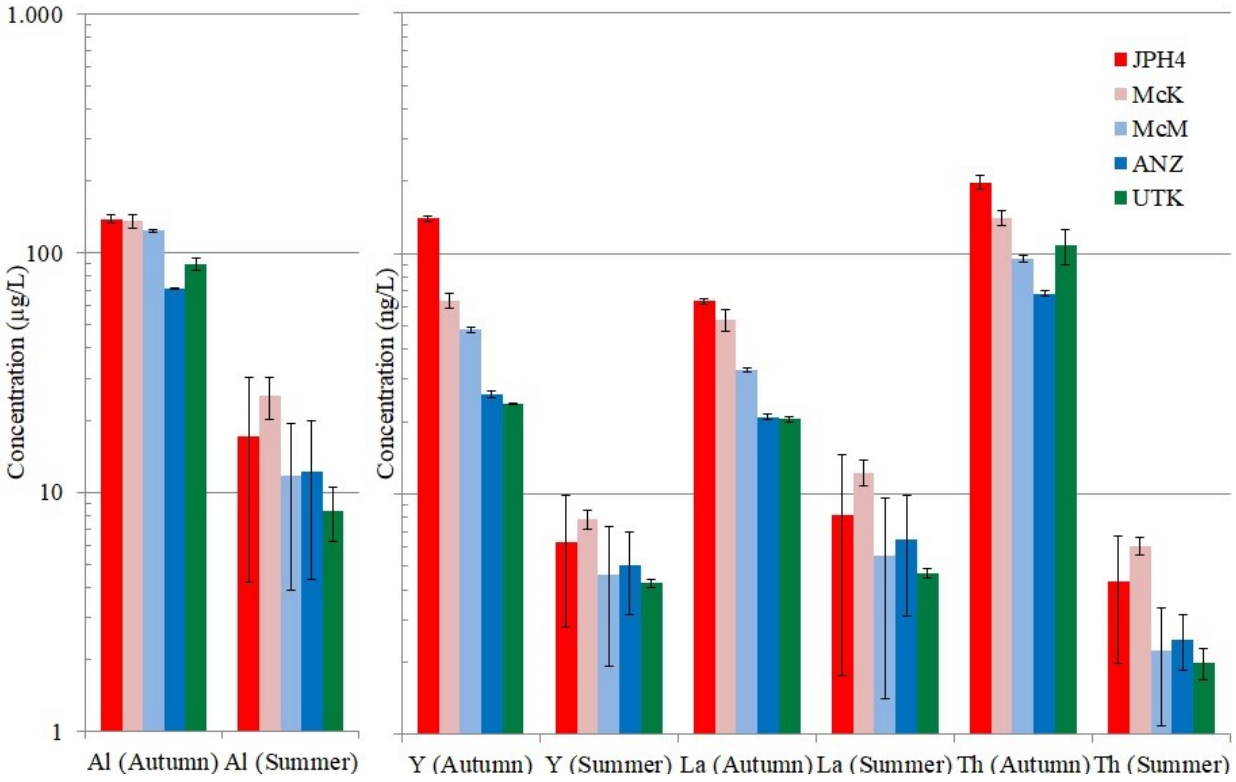

Figure S3. Concentrations of conservative, lithophile elements (Al, Y, La, Th) in peat bog porewater for both summer and autumn.

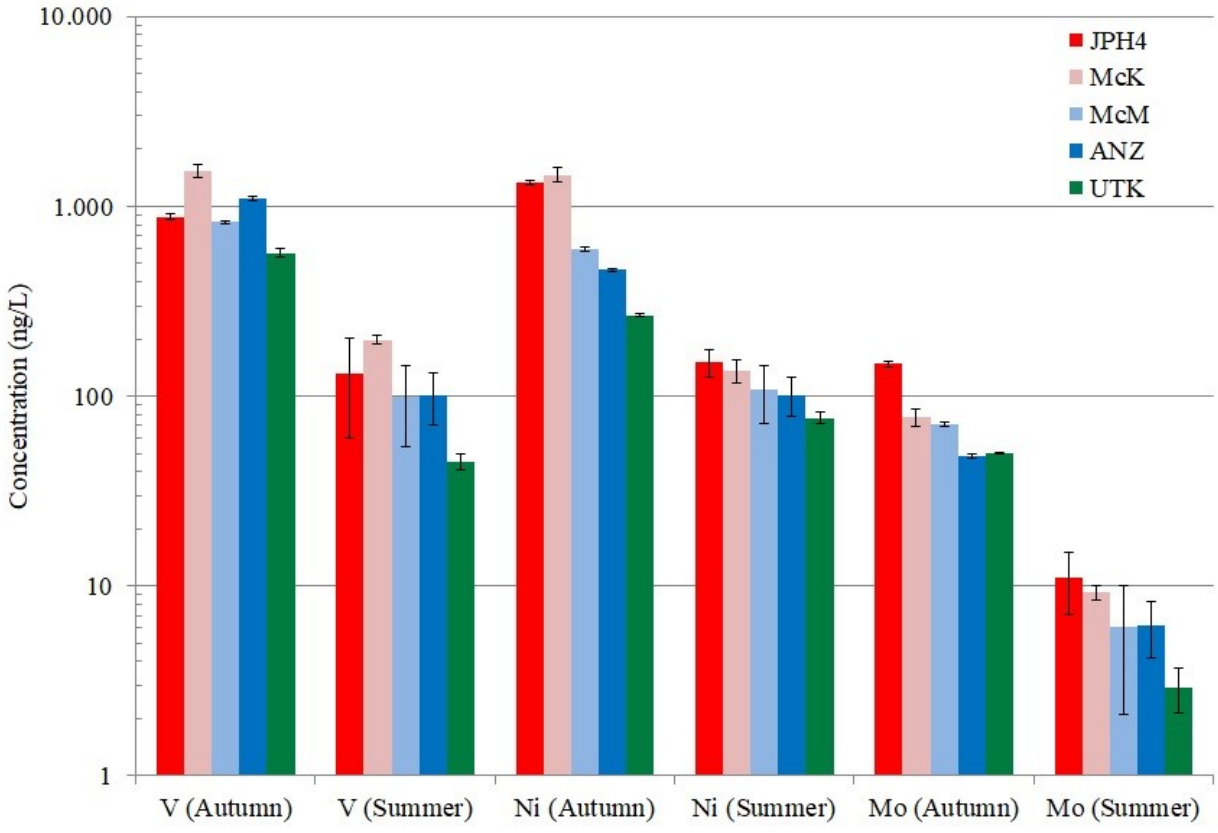

Figure S4. Concentrations of metals enriched in bitumen (V, Ni, Mo) in peat bog porewater for both summer and autumn.

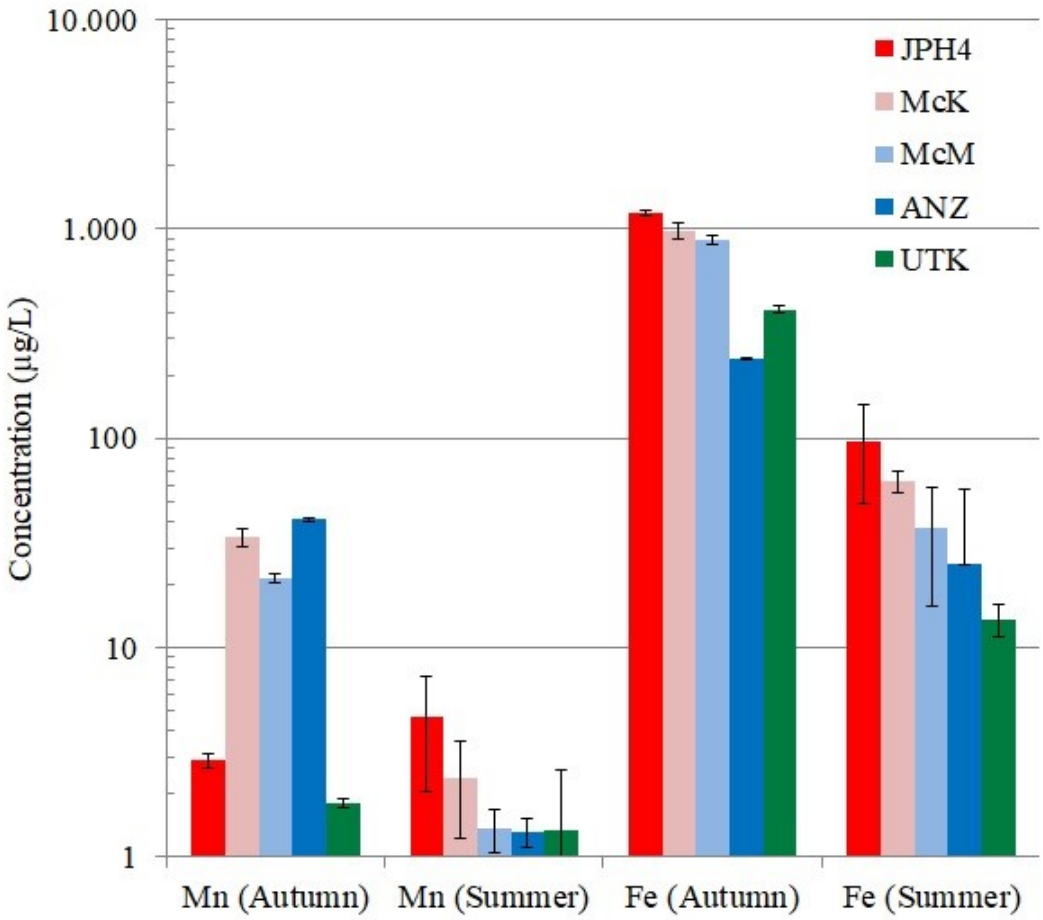

Figure S5. Concentrations of Mn and Fe which are sensitive to fluctuations in redox potentials, and therefore depth to water table, in peat bog porewater for both summer and autumn.

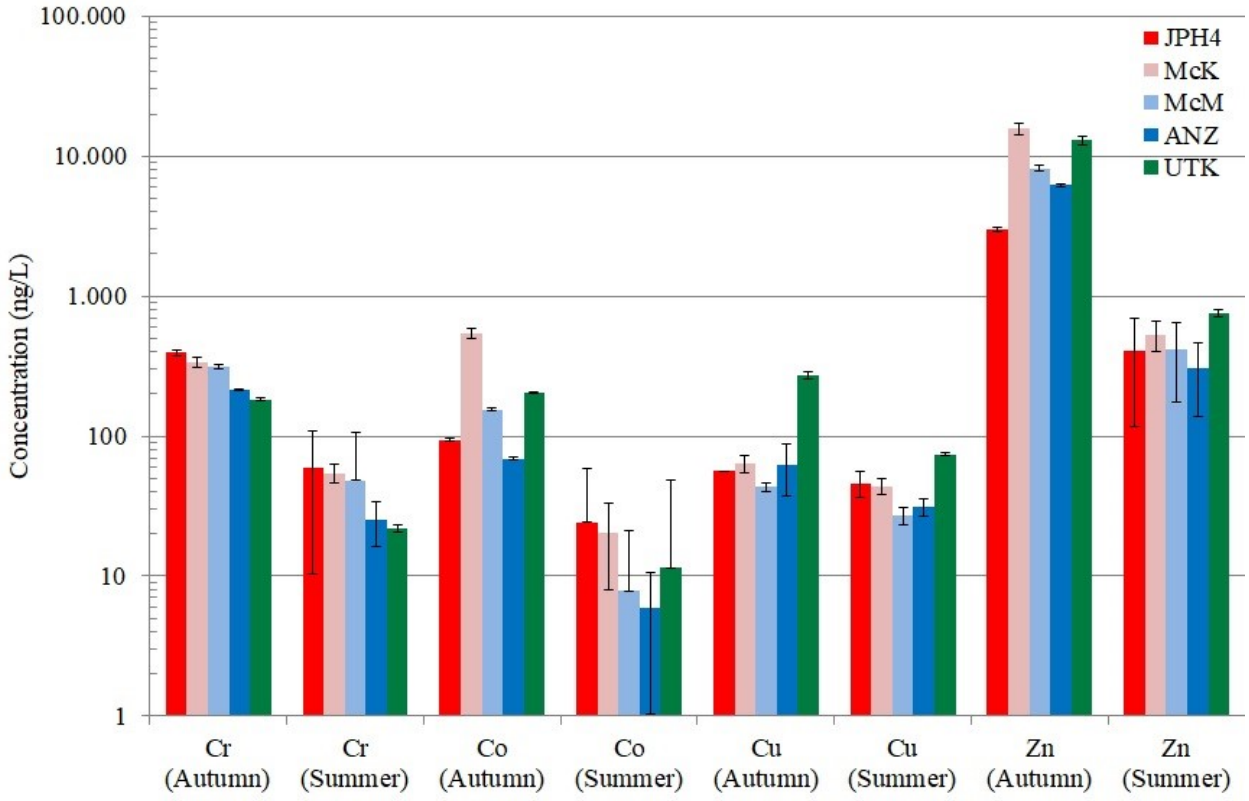

Figure S6. Concentrations of metals of the first transition series (Cr, Co, Cu, Zn) in peat bog porewater for both summer and autumn.

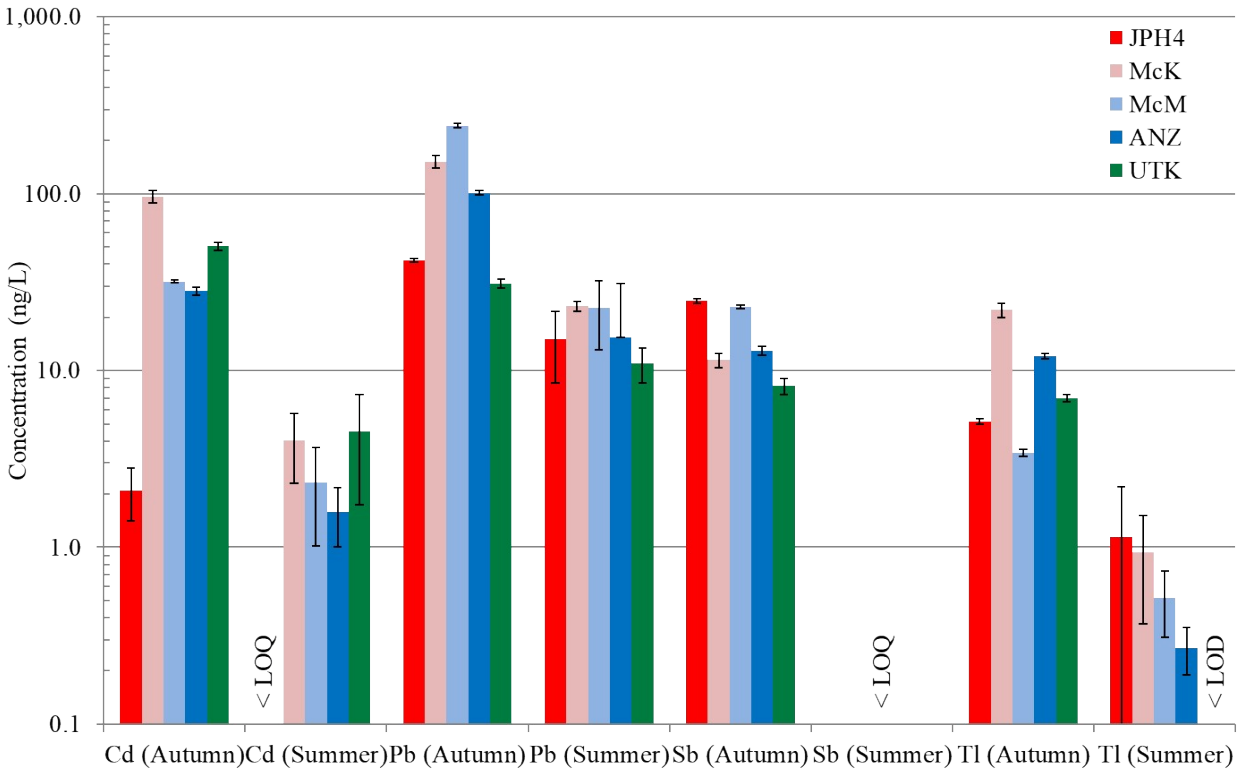

Figure S7. Concentrations of potentially toxic "heavy metals" (Cd, Pb, Sb, Tl) in peat bog porewater for both summer and autumn.

Note: Limit of quantification (LOQ) and limit of detection (LOD), for values see table S3.

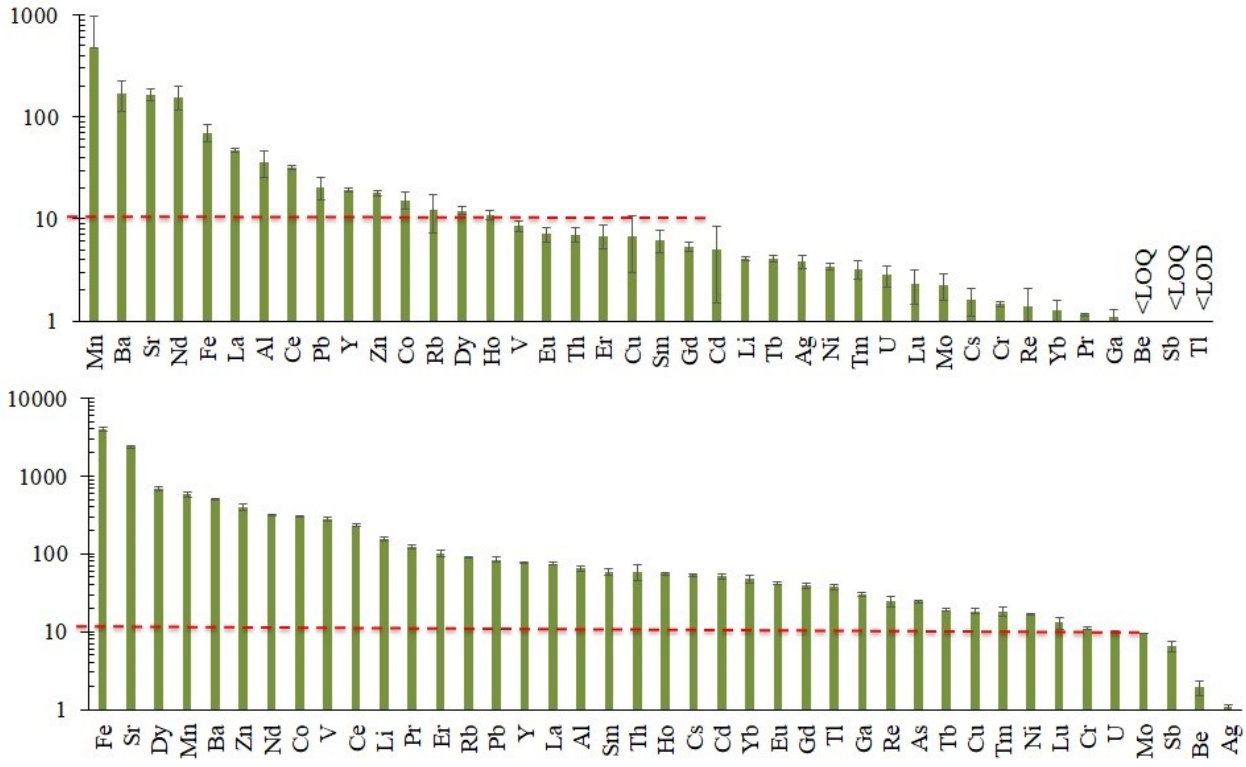

Figure S8. Ratio of trace element concentrations in bog waters from UTK to the LOQ obtained using ICP-MS for samples collected in summer (upper panel) and autumn (lower panel).

Note: Limit of quantification (LOQ) and limit of detection (LOD), for values see table S3.

232 **Table S1.** GPS coordinates of peat bog sites in Alberta and Ontario
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Province	Bog site	GPS coordinates
Alberta (AB)	JPH4	57° 6'44.10" N 111° 25'24.42" W
	McKay (McK)	57° 13'42.4" N 111° 42'00.8" W
	McMurray (McM)	56° 37'40.4" N 111° 11'39.1" W
	Anzac (ANZ)	56° 28'19.08" N 111° 2'33.66" W
	Utikuma (UTK)	56° 04'34.6" N 115° 28'31.2" W
Ontario (ON)	Spruce	45° 35'47.23" N 78° 22'14.78" W
	Mer Bleue	45° 24'35.91" N 75° 31'1.22" W
	Luther	43° 54'31.56" N 80° 24'31.02" W

Table S2. ICP-MS limit of detection (LOD), limit of quantification (LOQ), and water standard reference materials (SRM) recoveries for autumn 2019 samples.

			NIST 1640a - Elements in Natural Surface Water			SPS-SW2 - Elements in Surface Water		
	LOD	LOQ	Certified Value	Measured Value (Mean, n = 6)	Recovery	Certified Value	Measured Value (Mean, n = 6)	Recovery
	ng/L	ng/L	µg/L	µg/L	%	µg/L	µg/L	%
Ag	0.2	1.6	8.08	5.70	71			
Al	86.0	1372.5	53.00	66.07	125	250	252	101
As	2.3	12.1	8.08	8.69	108	50.0	50.7	101
Ba	2.1	13.3	151.80	160.05	105	250	243	97
Be	0.5	2.5	3.03	3.26	108			
Cd	0.3	1.0	3.99	4.25	106	2.50	2.52	101
Ce	0.1	0.2				2.50	2.65	106
Co	0.1	0.7	20.20	21.36	106	10.0	9.99	100
Cr	1.3	16.5	40.50	42.20	104	10.0	9.56	96
Cs	0.1	0.4				10.0		
Cu	1.2	14.8	86.00	86.07	100	100	94.8	95
Dy	0.0	0.0				2.50	2.68	107
Er	0.0	0.0				2.50	2.72	109
Eu	0.0	0.0				2.50	2.76	110
Fe	16.3	102.6	36.80	40.93	111	100	102	103
Ga	0.2	1.0						
Gd	0.0	0.2				2.50	2.68	107
Ho	0.0	0.0				2.50	2.65	106
La	0.1	0.3				2.50	2.66	106
Li	0.2	2.1	0.41	0.45	111			

Note: LOD = 3σ blanks; LOQ = average blank + 10σ blanks.

Table S2. ICP-MS limit of detection (LOD), limit of quantification (LOQ), and water standard reference materials (SRM) recoveries for autumn 2019 samples (continued).

			NIST 1640a - Elements in Natural Surface Water			SPS-SW2 - Elements in Surface Water		
	LOD	LOQ	Certified Value	Measured Value (Mean, n = 6)	Recovery	Certified Value	Measured Value (Mean, n = 6)	Recovery
	ng/L	ng/L	µg/L	µg/L	%	µg/L	µg/L	%
Lu	0.0	0.0				2.50	2.79	112
Mn	0.3	3.1	40.40	44.44	110	50.0	51.8	104
Ni	1.4	16.2	25.30	26.82	106	50.0	50.2	100
Pb	0.0	0.4	12.10	13.20	109	25.0	25.2	101
Pr	0.0	0.1				2.50	2.8	112
Rb	1.3	5.6	1.19	1.29	109	50.0	49.7	100
Re	0.0	0.0						
Sb	0.2	1.3	5.11	5.48	107			
Sm	0.0	0.1				2.50	2.75	110
Sr	0.6	2.9	126.00	138.52	110	250	260	104
Tb	0.0	0.0				2.50	2.71	109
Th	0.1	1.8				2.50	2.69	108
Tl	0.0	0.2	1.619	1.70	105	2.50	2.49	100
Tm	0.0	0.0				2.50	2.70	108
U	0.0	0.2	25.35	27.21	107	2.50	2.56	102
V	0.4	2.0	15.10	16.17	107	50.0	49.7	99
Y	0.1	0.3				2.50	2.70	108
Yb	0.0	0.0				2.50	2.65	106
Zn	2.65	32.7	55.60	60.72	109	100	101	101

Note: LOD = 3σ blanks; LOQ = average blank + 10σ blanks.

Table S3. ICP-MS limit of detection (LOD), limit of quantification (LOQ), and water standard reference materials (SRM) recoveries for summer 2019 samples.

			NIST 1640a - Elements in Natural Surface Water			SPS-SW2 - Elements in Surface Water		
	LOD	LOQ	Certified Value	Measured Value (Mean, n = 6)	Recovery	Certified Value	Measured Value (Mean, n = 6)	Recovery
	ng/L	ng/L	µg/L	µg/L	%	µg/L	µg/L	%
Ag	0.1	0.4	8.08	8.1	100		< LOD	
Al	35.6	235.3	53.00	57.4	108	250	262	105
As			8.08	ND		50.0	ND	
Ba	0.4	3.0	151.80	146.2	96	250	249	100
Be	0.1	0.9	3.03	2.8	92			
Cd	0.3	0.9	3.99	3.9	98	2.50	2.55	102
Ce	0.1	0.3				2.50	2.40	96
Co	0.2	0.7	20.20	19.1	95	10.0	9.8	98
Cr	1.0	14.9	40.50	38.7	96	10.0	10.2	102
Cs	0.2	0.8				10.0	10.0	100
Cu	1.4	10.9	86.00	92.5	108	100	11.2	112
Dy	0.0	0.1				2.50	2.47	99
Er	0.0	0.1				2.50	2.52	101
Eu	0.0	0.0				2.50	2.33	93
Fe	35.5	196.0	36.80	39.9	107	100	109	109
Ga	0.8	2.8						
Gd	0.0	0.1				2.50	2.33	93
Ho	0.0	0.0				2.50	2.47	99
La	0.0	0.1				2.50	2.45	98
Li	0.1	5.3	0.41	0.40	100			

Note: LOD = 3σ blanks; LOQ = average blank + 10σ blanks; ND = not determined.

Table S3. ICP-MS limit of detection (LOD), limit of quantification (LOQ), and water standard reference materials (SRM) recoveries for summer 2019 samples (continued).

			NIST 1640a - Elements in Natural Surface Water			SPS-SW2 - Elements in Surface Water		
	LOD	LOQ	Certified Value	Measured Value (Mean, n = 6)	Recovery	Certified Value	Measured Value (Mean, n = 6)	Recovery
	ng/L	ng/L	µg/L	µg/L	%	µg/L	µg/L	%
Lu	0.0	0.0				2.50	2.37	95
Mn	0.2	2.8	40.40	40.5	100	50.0	52.5	105
Mo	0.3	1.3	45.60	48.3	106	50.0	54.5	109
Nd	0.0	0.0				2.50	2.30	92
Ni	2.7	22.3	25.30	24.2	95	50.0	50.5	101
Pb	0.1	0.5	12.10	11.8	97	25.0	24.7	99
Pr	0.2	0.9				2.50	2.43	97
Rb	0.6	2.5	1.19	1.20	104	50.0	51.5	103
Re	0.0	0.0						
Sb	0.6	2.9	5.11	4.9	96			
Sm	0.0	0.1				2.50	2.3	92
Sr	0.4	2.1	126.00	126.5	100	250	263	105
Tb	0.0	0.0				2.50	2.53	101
Th	0.0	0.3				2.50	2.25	90
Tl	0.1	0.5	1.619	1.5	94	2.50	2.45	98
Tm	0.0	0.0				2.50	2.47	99
U	0.0	0.2	25.35	23.1	91	2.50	2.45	98
V	0.8	5.3	15.10	15.1	100	50.0	51.5	103
Y	0.0	0.2				2.50	2.57	103
Yb	0.0	0.2				2.50	2.45	98
Zn	4.92	42.0	55.60	58.1	105	100	108	108

Note: LOD = 3σ blanks; LOQ = average blank + 10σ blanks; ND = not determined.

Table S4. ICP-MS limit of detection (LOD), limit of quantification (LOQ), and water standard reference materials (SRM) recoveries for autumn 2021 samples.

			NIST 1643f - Elements in Fresh Water			SPS-SW2 - Elements in Surface Water		
	LOD	LOQ	Certified Value	Measured Value (Mean, n = 6)	Recovery	Certified Value	Measured Value (Mean, n = 6)	Recovery
	ng/L	ng/L	µg/L	µg/L	%	µg/L	µg/L	%
Pb (AB)	0.2	0.9	18.49	17.5	95	25.0	23.6	95
Pb (ON)	0.1	0.4	18.49	19.4	105	25.0	26.0	104
Y (AB)	0.1	0.4				2.50	2.37	95
Y (ON)	0.1	0.3				2.50	2.47	99

Note: AB = Alberta samples, ON = Ontario samples

Table S5. Values of external reference standards, limit of detection (LOD) and limit of quantification (LOQ) for major ions for autumn 2019 samples

Lab ID	Na* mg/L	K* mg/L	Mg* mg/L	Ca* mg/L	Lab ID	Cl** mg/L
QC4	0.93	9.79	1.04	1.01	Cl_CCV	20.40
QC4	0.94	9.79	1.04	1.01	Cl_CCV	20.57
QC4	0.95	9.56	1.02	1	Cl_CCV	20.47
QC4	0.94	9.84	1.05	1.03	Cl_CCV	20.50
QC4	0.98	10.05	1.07	1.05	Cl_CCV	20.50
QC4 (expected value)	1	10.04	1	1.01	Cl_CCV (expected value)	20.00
LOD	0.02	0.06	0.02	0.08	LOD	0.11
LOQ	0.08	0.16	0.08	0.14	LOQ	0.38

Note: multi-element certified standard solutions from SCP Scientific were used for calibration, and separate certified multi-element solutions were used as external reference standards.

* Measured using ICP-OES

** Measured colorimetrically (U.S. EPA method 325.2)

Table S6. Limit of detection (LOD), limit of quantification (LOQ), and water standard reference material (SRM) recoveries for summer 2019 samples.

			SANGAMON-3 A natural river water from Illinois		
	LOD	LOQ	Certified Value	Measured Value (Mean, n = 3)	Recovery
	mg/L	mg/L	mg/L	mg/L	%
Na*	0.02	0.07	4.90	4.41	90
K*	0.01	0.03	3.80	3.58	94
Mg*	0.01	0.03	16.00	14.80	93
Ca*	0.01	0.03	40.30	39.54	98
Cl**	0.03	0.10	16.60	16.71	101

* Measured using ICP-OES

** Measured using ion chromatography

238 **1.1 Bog porewater collection:**

239 In the summer of 2019, three sampling pits were excavated at each bog in the ABS
240 region, yielding a total of 15 porewater samples for the five sites. The autumn porewater
241 samples were collected in triplicate from one of the pits that were excavated in the
242 summer at each bog. Wearing PE gloves, large pieces of solid organic matter were
243 removed from the pits using an acid-cleaned nylon strainer. Using an acid-cleaned bottle,
244 the pits were bailed of any water that was in the pit to avoid contamination introduced
245 by the knife. Once the pit recharged itself with porewater in about an hour, water was
246 collected into a clean 120 ml transfer bottle: from where water was sieved using the
247 strainer. The porewater was then filtered using acid-cleaned PP syringes and 0.45 μm
248 acid-cleaned PTFE filters into acid-cleaned bottles containing nitric acid to bring the pH
249 <2. Up to 5 filters were used for each subsample, enough to collect approximately 20 mL
250 of sample. These samples were transported to the University of Alberta in coolers and
251 stored at 4 °C until trace elements and major cations could be determined using ICP-MS
252 and ICP-OES, respectively.