

Figure S1: Overview of the study area and sites. (a) Geographical localisation of the study area and distribution of the study sites (Experimental Units). The study area is located in Quebec, Canada, at a latitude of 52°N and a longitude of 67-68°W. The right panel presents the sampling design as undertaken in each EU around the watershed lake with three transects and three sampled distances (plots) by transect. (b) Open black spruce-lichen woodland. (c) closed black spruce-moss forest.

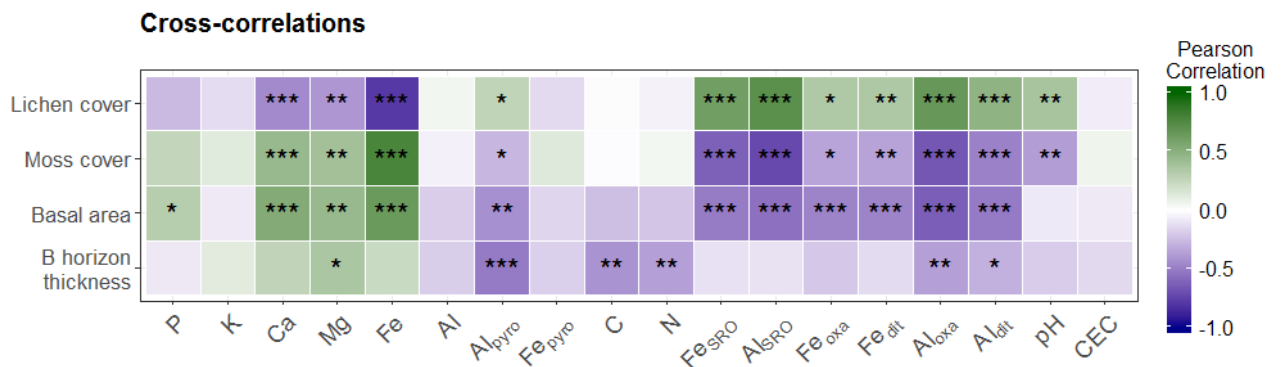


Figure S2: Cross-correlations heatmap between environment characteristics and chemical elements in B horizons. Correlations were computed on fully standardized variables using Pearson's coefficient method and tested by associated t-tests. Asterisks indicate statistical significance with *: p-value < 0.05, **: p-value < 0.01, ***: p-value < 0.001.

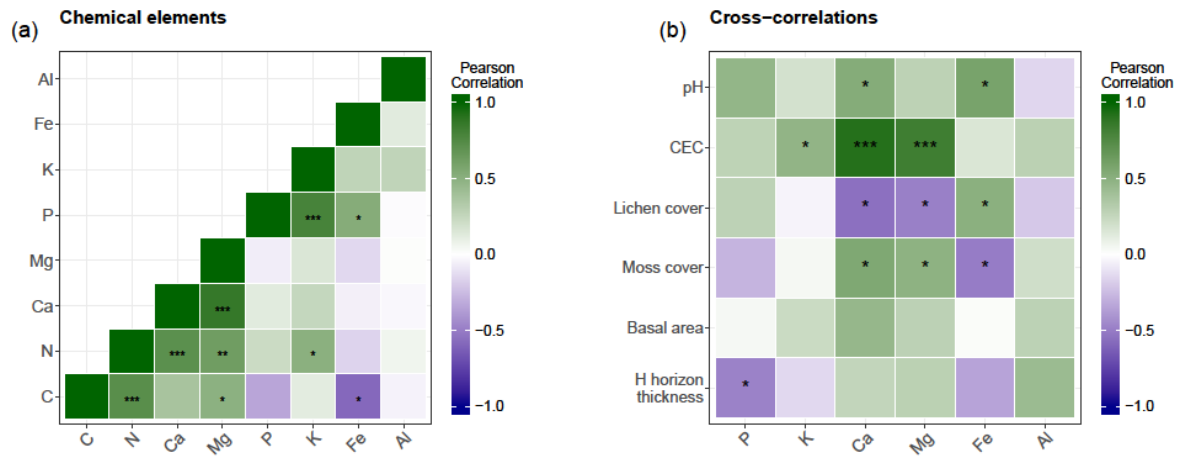


Figure S3: Correlation heatmap of (a) chemical elements in the FH organic horizons and (b) cross-correlation matrix with environment characteristics. Correlations were computed on fully standardized variables using Pearson's coefficient method and tested by associated t-tests. Asterisks indicate statistical significance with *: p-value<0.05, **: p-value<0.01, ***: p-value<0.001.

Table S1: Characteristics of C horizons in mf and lw plots. lw plots = plots covered by lichen woodlands, mf plots = plots covered by moss forests. Values are given as means \pm standard deviations. Asterisks indicate statistical significance of mean comparison tests with *: p-value<0.05, **: p-value<0.01, ***: p-value<0.001.

	Horizon C			Metal species	Horizon C		
	lw	mf	p-values		lw	mf	p-values
%C	0.16 \pm 0.13	0.35 \pm 0.16	0.001***	Al pyro	1.31 \pm 0.57	1.52 \pm 0.69	0.262
%N	0.01 \pm 0	0.01 \pm 0	0.083	Al oxa	2.53 \pm 1.57	2.23 \pm 1.09	0.430
C:N	22.69 \pm 8.63	43.46 \pm 16.09	0.004**	Al dit	1.93 \pm 1.26	2.04 \pm 1	0.921
CEC	4.17 \pm 3.63	8.64 \pm 6.91	0.032*	Al SRO	1.23 \pm 1.02	0.71 \pm 0.71	0.077
Base saturation	0.11 \pm 0.06	0.1 \pm 0.08	0.926	Fe pyro	0.38 \pm 0.36	0.77 \pm 0.47	0.104
P	53.34 \pm 33.69	21.75 \pm 12.14	0.000***	Fe oxa	2.61 \pm 0.96	2.4 \pm 0.95	0.751
pH	5.61 \pm 0.15	5.41 \pm 0.12	0.000***	Fe dit	2.53 \pm 1.36	3.34 \pm 1.68	0.323
				Fe SRO	2.22 \pm 1.05	1.63 \pm 0.9	0.464
				Fe CRI	-0.05 \pm 1.34	0.94 \pm 1.13	0.123

Table S2: Crystallinity index of mineral soil horizons in MF and LW sites. CI (Fe) accounts for iron crystallinity index of iron ($Fe_{dit}:Fe_{oxa}$). CI (Al) accounts for aluminium index ($Al_{dit}:Al_{oxa}$). Site mean comparisons were achieved by Mann-Whitney tests. Values are given as means \pm standard deviations.

Site	type	CI (Fe)	
		B horizon	C horizon
Lake Adele	LW	1.29 \pm 0.16	1.48 \pm 0.30
Lake Prisca	LW	1.09 \pm 0.11	0.65 \pm 0.21
Lake Mundi	LW	1.13 \pm 0.17	1.09 \pm 0.32
Lac des trotteurs	MF	1.09 \pm 0.11	1.05 \pm 0.26
Lake Arthur	MF	1.12 \pm 0.12	1.47 \pm 0.33
Lake Freeze	MF	1.16 \pm 0.24	1.88 \pm 0.63

Table S3: Results of the permutation test for homogeneity of multivariate dispersions of individual plot values around the centroids (MF vs LW).

Response: Distances	df	MS	F	p-value	Number of perm.
Groups	1	0.398	0.0203	0.895	999
Residuals	52	19.606			

Table S4: Stocks of Fe and Al species contained in the B horizon. Values are given as means \pm standard deviations.

Total stock at the site scale (t.ha⁻¹)		
Metal species	LW sites	MF sites
Fe _{pyro}	14.06 \pm 5.02	18.74 \pm 4.57
Fe _{oxa}	33.13 \pm 6.08	29.09 \pm 13.25
Fe _{dit}	39.12 \pm 9.79	31.83 \pm 13.60
Fe _{SRO}	19.07 \pm 4.87	10.36 \pm 8.75
Al _{pyro}	27.51 \pm 3.86	22.60 \pm 5.46
Al _{oxa}	57.93 \pm 14.51	28.18 \pm 8.45
Al _{dit}	41.95 \pm 11.55	29.63 \pm 8.32
Al _{SRO}	30.42 \pm 16.46	5.57 \pm 4.96