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Soil Research

Supplementary Material

Do admixed conifers change soil nutrient conditions of European beech stands?

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Supplementary material

Table S1. Site characteristic from each stand studied. The forestry site data are given in an abbreviated and categorized form. Detailed specifications can be downloaded via GPS coordinates from the Lower Saxony NIBIS® KARTENSERVEN (www.nibis.lbeg.de/cardomap3).

Site	Plot	Latitude ¹	Longitude ¹	Substrate ²	Soil type (BK50) ³	WB ⁴	NS ⁵	Site index ⁶
Dassel	D	51.742203	9.692000	I	Medium podzolated Cambisol	1	A	9.4.2.3
	DB	51.721825	9.711016	II	Medium Cambisol	1	A	23.4.3.5
	Be	51.722836	9.707340	II	Medium Cambisol	1	A	19.4.3.5
	SB	51.722485	9.705923	II	Medium Cambisol	1	A	19.4.3.5
	S	51.722114	9.704072	II	Medium Cambisol	1	A	19.4.3.5
Winnefeld	D	51.677461	9.554547	I	Medium Cambisol	1	A	23.4.2.3
	DB	51.658589	9.578645	I	Medium Cambisol	1	A	19.4.2.3
	Be	51.658746	9.578127	I	Medium Cambisol	1	A	19.4.2.3
	SB	51.656866	9.583366	I	Medium Cambisol	1	A	19.4.2.3
	S	51.672081	9.563271	I	Deep Cambisol	1	B	19.3.2.2
Nienover	D	51.703371	9.526272	I	Medium Cambisol	1	A	9.4.2.3
	DB	51.690572	9.530188	I	Medium Luvisol	1	A	23.4.2.3
	Be	51.695162	9.522161	I	Medium Cambisol	1	A	23.4.2.3
	SB	51.699850	9.544065	I	Medium Cambisol	1	A	23.4.2.3
	S	51.702873	9.526989	I	Medium Cambisol	1	A	23.4.2.3
Nienburg	D	52.606199	9.264464		Medium podzolated Pseudogley-			
				III	Cambisol	2	B	42.3.5.5
	DB	52.609242	9.271672	III	Very deep Podzol-Regosol	2	B	42.3.5.5
	Be	52.642538	9.299441	IV	Shallow Pseudogley-Podzol	2	B	42.3.3.1
	SB	52.639817	9.298319	V	Shallow Pseudogley-Podzol	2	B	42.3.3.6
	S	52.605111	9.270793	VI	Deep Gley	3	B	33.3.2.6
Unterlüß	D	52.834063	10.345646	IV	Shallow Cambisol-Podzol	2	B	42.3.3.1

	DB	52.836679	10.340976	V	Shallow Cambisol-Podzol	1	A	41.4.3.7
	Be	52.836395	10.342229	V	Shallow Cambisol-Podzol	2	B	42.3.3.3
	SB	52.829141	10.315585	V	Shallow Cambisol-Podzol	2	B	42.3.3.3
	S	52.847644	10.309016	IV	Shallow Cambisol-Podzol	2	B	42.3.3.1
Göhrde II	D	53.131140	10.797078	IV	Shallow Cambisol-Podzol	2	B	42.3.3.1
	DB	53.130952	10.797593	IV	Shallow Cambisol-Podzol	2	B	42.3.3.1
	Be	53.136214	10.799709	VI	Shallow Cambisol-Podzol	2	C	43.2.2.2
	SB	53.116941	10.837505	IV	Medium Pseudogley-Cambisol	2	B	42.3.3.6
	S	53.115688	10.837152	V	Medium Pseudogley-Cambisol	2	B	42.3.3.6
Göhrde I	D	53.200487	10.799715	V	Medium Pseudogley-Cambisol	1	A	41.5.8.3
	DB	53.199677	10.797655	V	Medium Pseudogley-Cambisol	1	A	41.4.8.3
	Be	53.203667	10.800592	V	Shallow Cambisol-Podzol	2	B	42.3.3.6
	SB	53.201647	10.804566	V	Shallow Cambisol-Podzol	2	A	42.4.8.1
	S	53.200092	10.802351	VII	Medium Pseudogley-Cambisol	1	A	41.4.8.5

¹ GPS coordinates (WGS 84)

² Substrate

I = Base-poor silicate rocks, strongly influenced by periglacial solifluction soils (Fließerden)

II = Base-poor loess (70/80cm) with base-poor material over rock

III = Holocene water heels, redeposited sandy loess and loess blankets

IV = Boulder clay cover layers with sand underlayer

V = Boulder clay sands with loamy, silty sands

VI = Sands, partly weakly loamy or gravelly, weakly loamy subsoil

VII = Boulder clay over boulder clay marl without sand covers (<20cm)

³ Soil type (BK50); see:

<http://nibis.lbeg.de/cardomap3/public/ogc.ashx?NodeId=989&Service=WMS&Request=GetCapabilities&>

⁴ WB = Water balance

1 = fresh and fresh stocked locations of the plains, even stagnant slope sites

2 = moderately fresh sites

3 = ground moisture sites, average groundwater level 60-100cm, partly backwater (veg.time)

⁵ NS = Nutrient supply

A = pretty well supplied with nutrients

B = moderately supplied with nutrients

C = weakly supplied with nutrients

⁶ **Site index (terrain ecology estimation framework of the forest site mapping in Lower Saxony/Germany)**

Mountain area: <https://www.landesforsten.de/wp-content/uploads/2019/03/standortskartierung-bergland-rahmenschema01-2007.pdf>

Lowland: https://www.schleswig-holstein.de/DE/fachinhalte/W/wald/Downloads/Schaetzrahmen_Stoka_pdf.pdf?__blob=publicationFile&v=1

1. No. = terrain water budget; 2. No. = nutrient supply; 3. No. = substrate groups (texture; geological source substrates); 4. No. = soil type, stratification, thickness and bedding conditions of substrates

Table S2. Liming data for all plots collected from North-West German Forest Research Centre database.

	Site	Stand	Year	CaCO ₃ (Mg ha ⁻¹)	MgCO ₃ (Mg ha ⁻¹)	P ₂ O ₅ (Mg ha ⁻¹)	
Southern sites	Dassel	D	2010	1.65	1.05	0	
		DB	2010	1.65	1.05	0	
		S	1991	2.25	0.45	0	
	Winnefeld	D	2008	1.57	1.25	0	
		DB	2008	1.5	1.19	0	
		Be	2008	1.57	1.25	0	
		S	2008	1.57	1.25	0	
	Nienover	D	2008	1.57	1.25	0	
		DB	1995	1.5	1.2	0	
		Be	1993	1.65	1.05	0	
		Be	2008	1.57	1.25	0	
		SB	1993	1.65	1.05	0	
		SB	2008	1.57	1.25	0	
		S	1993	1.65	1.05	0	
		S	2008	0.62	0.49	0	
Northern sites	Nienburg	D	2001	1.8	0.9	0	
		DB	1990	1.5	1.2	0	
		DB	2001	1.8	0.9	0	
		S	1990	1.48	1.19	0	
		S	2001	1.8	0.9	0	
	Unterlüß	DB	1990	1.4	0.12	0.47	
		Be	1990	1.4	0.12	0.47	
		SB	1990	2.17	0.37	0.09	
	Göhrde II	No liming recorded in the last 30 years					
	Göhrde I	No liming recorded in the last 30 years					

Table S3– Soil pH (KCl), C and N concentration, exchangeable Al, Ca, Mg, K concentration (mmolc kg⁻¹), base saturation (BS; %), cations exchangeable capacity (CEC; mmol_c kg⁻¹), and C:N ratio in various depths of the mineral soil of pure stands of Douglas fir (D), Norway Spruce (S), European beech (Be) and mixed stands Douglas fir + Beech (DB) and Norway spruce + Beech (SB). Average values and standard deviation are presented by stand type and region, Southern sites (SL, n=12), and Northern sites (NS, n=16). Significant (p < 0.05; Kruskal-Wallis-H-test, followed by pairwise Mann-Whitney-U-test) differences between tree species for a given soil depth are marked by different letters: lowercase letters for individual soil depths inner sites and capitals between sites for the same species.

Sites	Stand	depth cm	pH	C	N		Al ³⁺		Ca ²⁺		Mg ²⁺		K ⁺		BS	CEC		CN					
			KCl	(%)										(%)	(mmol _c kg ⁻¹)	-							
SL	Be	0-5	3.26 ± 0.4		6.14 ± 2.4	A	0.37 ± 0.1	A	43.94 ± 25.0	a A	22.39 ± 17.7	ab AB	13.34 ± 10.9	b B	2.16 ± 1.0	a	29.99 ± 24.4	102.88 ± 6.5	A	16.78 ± 0.8	bc B		
		5-10	3.28 ± 0.2	b B	2.50 ± 0.9	B	0.16 ± 0.1	B	55.05 ± 23.7	A	4.06 ± 2.8	B	4.24 ± 3.0	bc B	0.94 ± 0.4	bc A	14.03 ± 9.7	b	75.53 ± 7.3	A	15.86 ± 1.3	bc B	
		10-30	3.69 ± 0.2	b	1.31 ± 0.4	A	0.10 ± 0.0	a A	45.02 ± 19.2	A	1.62 ± 0.9		1.75 ± 1.6	A	0.80 ± 0.3	b A	8.13 ± 5.7		53.58 ± 5.9	A	12.98 ± 1.6	B	
	D	0-5	3.69 ± 0.8		4.66 ± 1.9	A	0.24 ± 0.1	A	20.86 ± 18.5	b B	41.24 ± 31.1	a A	25.18 ± 13.7	a A	1.16 ± 0.4	b	29.16 ± 7.6		104.08 ± 7.2		19.59 ± 2.4	a B	
		5-10	3.25 ± 0.4	b	2.18 ± 0.3	B	0.12 ± 0.0		41.19 ± 13.3		8.61 ± 12.4		7.52 ± 3.6	a A	0.67 ± 0.2	c A	19.59 ± 5.2	a A	72.53 ± 2.4	A	18.73 ± 3.4	a B	
		10-30	3.62 ± 0.3	b	0.99 ± 0.3	B	0.07 ± 0.0	b	38.14 ± 9.2	A	1.71 ± 2.2		1.88 ± 0.9	A	0.62 ± 0.2	b A	8.54 ± 4.0		47.32 ± 3.3		13.95 ± 3.7	B	
	S	0-5	3.35 ± 0.6	A	5.54 ± 1.8	B	0.29 ± 0.1	B	60.72 ± 32.4	a B	21.08 ± 27.0	b	16.69 ± 18.4	b A	1.59 ± 0.6	ab AB	21.66 ± 11.2	A	124.08 ± 4.6	A	18.72 ± 2.7	a B	
		5-10	3.56 ± 0.3	a A	2.81 ± 1.6	B	0.17 ± 0.1	B	56.79 ± 25.3	B	9.03 ± 15.3	B	8.36 ± 12.1	ab B	0.93 ± 0.4	b A	15.44 ± 11.6	ab	86.38 ± 7.7	A	16.46 ± 3.2	bc B	
		10-30	3.87 ± 0.2	a A	1.60 ± 1.2	A	0.11 ± 0.1	a A	39.90 ± 14.0	A	1.70 ± 1.7	A	1.94 ± 2.2	A	0.72 ± 0.2	b A	8.73 ± 5.3		48.63 ± 5.1	A	13.77 ± 3.7	B	
	DB	0-5	3.20 ± 0.3	AB	5.26 ± 1.8		0.32 ± 0.1	A	49.66 ± 22.2	a B	24.60 ± 21.1	ab	8.03 ± 6.2	b A	2.28 ± 0.8	a A	17.69 ± 6.5		109.16 ± 4.3	A	16.06 ± 1.4	c B	
		5-10	3.40 ± 0.2	ab A	2.31 ± 1.1	B	0.16 ± 0.1	B	56.31 ± 14.8	A	6.36 ± 4.9	B	3.45 ± 2.3	bc B	1.38 ± 0.5	a A	10.85 ± 3.7	b	77.84 ± 4.2	A	14.46 ± 1.5	c B	
		10-30	3.65 ± 0.2	b	1.24 ± 0.5		0.10 ± 0.0	a A	47.40 ± 17.6		1.90 ± 0.9		1.72 ± 0.9	A	1.19 ± 0.5	a A	8.64 ± 2.9		58.63 ± 6.4	A	11.97 ± 2.0	B	
	SB	0-5	3.15 ± 0.4	A	5.93 ± 2.2		0.33 ± 0.1	A	57.60 ± 24.7	a B	12.56 ± 9.9	b	8.86 ± 7.5	b B	1.78 ± 0.8	a AB	24.24 ± 19.4		104.31 ± 6.6	A	18.07 ± 1.7	ab B	
		5-10	3.42 ± 0.2	ab A	2.38 ± 0.7	B	0.14 ± 0.0	B	58.38 ± 18.3	B	2.69 ± 2.5	B	2.17 ± 1.5	c B	0.92 ± 0.3	b A	9.65 ± 4.3	b	73.05 ± 6.2	A	17.25 ± 3.0	ab B	
		10-30	3.87 ± 0.2	a A	1.02 ± 0.4	A	0.08 ± 0.0	b A	34.63 ± 10.7	A	0.97 ± 0.5		0.85 ± 0.5	A	0.70 ± 0.2	b A	7.21 ± 4.4		40.35 ± 3.3	A	12.69 ± 2.6	B	
	NS	Be	0-5	3.14 ± 0.5	a	4.11 ± 2.6	B	0.21 ± 0.1	B	13.31 ± 9.5	c B	15.52 ± 15.6	B	3.51 ± 3.5	C	1.61 ± 1.6		33.60 ± 21.1		55.27 ± 9.1	b B	19.55 ± 2.3	b A
			5-10	3.18 ± 0.3	B	1.72 ± 0.7	b C	0.09 ± 0.0	bc C	14.45 ± 8.8	c B	4.60 ± 4.6	B	1.44 ± 2.2	C	0.43 ± 0.2	B	21.43 ± 20.0		30.56 ± 1.9	c B	19.84 ± 2.8	c A
			10-30	3.82 ± 0.3		1.01 ± 0.5	b B	0.06 ± 0.0	bc B	17.85 ± 6.2	d B	1.70 ± 1.8		0.57 ± 0.8	B	0.29 ± 0.2	b B	12.10 ± 12.1		23.27 ± 1.7	b B	17.17 ± 3.5	c A
D		0-5	2.95 ± 0.2	ab	6.61 ± 4.6	A	0.26 ± 0.2	A	30.94 ± 14.2	a A	16.38 ± 17.2	B	7.21 ± 11.4	B	1.17 ± 0.5		26.67 ± 17.8		83.97 ± 11.2	a	24.98 ± 3.5	a A	
		5-10	3.18 ± 0.3		3.65 ± 2.7	a A	0.15 ± 0.1	a	34.59 ± 19.0	a	5.79 ± 6.5		3.34 ± 6.6	B	0.48 ± 0.3	B	14.03 ± 11.7	B	60.14 ± 8.8	a B	24.36 ± 3.8	ab A	
		10-30	3.77 ± 0.4		1.79 ± 0.9	a A	0.07 ± 0.0	a	27.12 ± 7.5	ab	4.71 ± 11.8		1.67 ± 3.1	B	0.41 ± 0.3	ab B	12.34 ± 15.5		39.01 ± 4.5	a B	23.59 ± 4.2	a A	
S		0-5	2.89 ± 0.2	b B	4.52 ± 2.6	B	0.19 ± 0.1	C	18.89 ± 12.8	bc C	9.25 ± 12.1		2.83 ± 2.2	B	1.03 ± 0.5	B	23.33 ± 19.0	A	54.38 ± 6.0	b B	23.75 ± 3.7	a A	
		5-10	3.11 ± 0.2	B	1.71 ± 0.7	b C	0.08 ± 0.0	c C	20.69 ± 10.7	bc C	2.69 ± 4.3	C	1.09 ± 1.0	C	0.56 ± 0.3	B	13.05 ± 14.0		36.59 ± 3.0	bc B	22.21 ± 5.3	bc A	
		10-30	3.70 ± 0.2	B	0.94 ± 0.3	b B	0.05 ± 0.0	c B	22.79 ± 7.2	bc	0.82 ± 0.6	B	0.60 ± 0.6	B	0.45 ± 0.3	a B	7.24 ± 5.6		29.52 ± 2.3	b B	20.59 ± 3.3	ab A	
DB		0-5	2.91 ± 0.3	b B	6.16 ± 4.4		0.26 ± 0.2	A	23.56 ± 13.3	ab C	15.05 ± 18.3		5.25 ± 6.3	AB	1.31 ± 1.2	B	25.16 ± 17.2		72.99 ± 9.1	ab B	24.22 ± 7.8	a A	
		5-10	3.07 ± 0.4	B	3.32 ± 2.8	a B	0.12 ± 0.1	ab C	25.19 ± 14.0	b B	3.24 ± 2.3	B	2.07 ± 2.5	C	0.55 ± 0.3	B	13.42 ± 9.2		49.34 ± 7.7	ab B	26.07 ± 8.7	a A	
		10-30	3.58 ± 0.3		1.74 ± 1.3	a	0.07 ± 0.0	ab B	32.44 ± 15.3	a	1.30 ± 0.8		1.01 ± 1.1	B	0.45 ± 0.3	a B	7.71 ± 4.2		40.98 ± 4.7	a B	22.76 ± 8.7	a A	
SB		0-5	2.79 ± 0.1	b B	5.04 ± 4.0		0.21 ± 0.2	B	20.02 ± 11.5	ab C	9.63 ± 11.4		2.94 ± 3.0	C	1.03 ± 0.9	B	19.62 ± 12.8		59.03 ± 8.1	b B	23.45 ± 2.2	a A	
		5-10	3.05 ± 0.2	B	1.78 ± 0.4	b C	0.08 ± 0.0	bc C	19.83 ± 8.4	bc C	2.65 ± 2.8	B	0.82 ± 0.6	C	0.39 ± 0.2	B	10.79 ± 7.6		36.03 ± 2.4	bc B	22.15 ± 2.7	abc A	
		10-30	3.79 ± 0.3	B	0.94 ± 0.3	b A	0.05 ± 0.0	c B	19.30 ± 5.9	cd	0.91 ± 0.7		0.34 ± 0.2	B	0.26 ± 0.1	b B	6.52 ± 3.0		23.92 ± 1.8	b B	17.96 ± 2.5	bc A	

Table S4 – Nutrient concentration in the various layer of the organic layer of pure stands of Douglas fir (D), Norway Spruce (S), European beech (Be), and mixed stands Douglas fir + Beech (DB) and Norway spruce + Beech (SB). Average values and standard deviation are presented by stand type and region, Solling (SR, $n=12$), and Northern (NR, $n=16$). Significant ($p < 0.05$; Kruskal-Wallis-H-test, followed by pairwise Mann-Whitney-U-test) differences between tree species for a given soil depth are marked by different letters: lowercase letters for individual soil depths inner sites and capitals between sites for the same species (Continued)

Region	Species / Layer	Al mg kg ⁻¹		Ca		K		Mg		Mn		P		S								
SR	Douglas-fir																					
	L	7.76	a***	A***	8.51	ab**	AB*	2.99	a***	AB*	2.05	a**	A**	2.25	ns	A***	0.89	ab***	ns	1.24	a**	ns
	F	17.40	a***	A***	4.86	ab***	ns	4.53	a***	A***	2.48	a**	A***	1.44	ab***	A***	0.60	b***	B*	0.66	b***	B**
	H	13.21	ns	B***	4.90	ns	AB*	3.36	ab*	AB***	1.99	ns	A***	0.78	ns	A***	0.60	b**	AB***	0.98	ns	ns
	Douglas-fir + European beech																					
	L	2.58	b***	B***	9.94	a**	ns	2.00	b	A***	1.65	ab**	AB***	2.98	ns	A**	0.89	ab***	A***	1.07	ab**	ns
	F	9.03	ab***	AB***	7.39	a***	ns	3.36	ab***	A***	1.80	abc**	ns	3.23	a***	A***	1.00	a***	ns	1.38	a***	ns
	H	16.38	ns	AB***	2.79	ns	ns	4.74	a*	A***	1.79	ns	AB***	0.45	ns	AB**	0.82	ab**	AB***	1.46	ns	ns
	European beech																					
	L	1.21	b***	B***	10.53	a**	ns	1.72	b	A**	1.83	ab**	AB**	1.82	ns	A***	0.95	a***	AB**	0.99	ab**	B**
	F	5.39	b***	AB***	9.59	a***	ns	2.23	b***	B***	2.14	ab**	A***	2.17	a***	ns	1.00	a***	ns	1.31	a***	ns
	H	15.54	ns	AB***	3.31	ns	ns	3.75	ab*	B***	1.89	ns	BC**	0.84	ns	ns	0.70	ab**	AB**	0.87	ns	ns
	Norway spruce + European beech																					
	L	0.53	c***	B***	8.63	b**	ns	1.52	c***	ns	1.39	b**	ns	1.83	ns	B**	0.64	b***	B**	0.85	b**	B**
	F	4.84	ab***	AB***	6.91	a***	ns	1.86	b***	AB***	1.37	bc**	A**	1.93	a***	AB**	0.94	a***	A*	1.40	a***	ns
	H	11.88	ns	B***	4.00	ns	ns	3.01	b*	A***	1.66	ns	A**	0.94	ns	ns	0.79	ab**	A***	1.14	ns	AB*
	Norway spruce																					
	L	5.99	a***	A***	5.41	c**	B*	2.45	ab*	B***	1.36	b**	A**	1.63	ns	A**	0.95	a***	A***	1.24	a**	ns
F	7.61	ab***	A***	3.10	b***	B***	1.90	b***	AB***	1.05	c**	AB**	0.73	b***	AB***	0.91	a***	A***	1.57	a***	ns	
H	14.08	ns	B***	3.10	ns	B**	3.01	ab*	B***	1.74	ns	AB***	0.56	ns	A**	0.89	a**	A***	1.18	ns	ns	
NR	Douglas-fir																					
	L	0.90	a***	B***	8.16	ab*	B*	2.21	a**	AB*	1.12	a**	AB**	0.50	b**	B***	0.93	a***	ns	1.39	a***	ns
	F	2.21	a*	B***	5.03	bc**	ns	0.91	b**	B***	0.74	ab**	B***	0.23	c***	B***	0.81	ns	AB*	1.67	ns	A**
	H	3.83	ns	D***	2.99	ns	B*	0.77	ns	C***	0.70	ns	B***	0.07	b***	B***	0.52	ns	B***	1.37	ab**	ns
	Douglas-fir + European beech																					
	L	0.55	b***	C***	9.20	ab*	ns	1.01	ab**	AB***	1.17	a**	B***	1.06	b**	B**	0.63	b***	B***	1.12	ab***	ns
	F	1.25	b*	BC***	7.88	ab**	ns	1.06	ab**	B***	1.04	a**	ns	0.97	ab***	B***	0.83	ns	ns	1.45	ns	ns
	H	3.07	ns	BC***	3.54	ns	ns	0.84	ns	C***	0.95	ns	B***	0.15	ab***	B**	0.56	ns	B***	1.52	a**	ns
	European beech																					
	L	0.35	b***	BC***	11.24	a*	ns	1.29	ab**	B**	1.27	a**	BC**	1.93	a**	A***	0.70	ab***	B**	0.97	b***	B**
	F	1.74	ab*	B***	9.41	a**	ns	1.22	a**	C***	0.91	ab**	B***	2.07	a***	ns	0.83	ns	ns	1.32	ns	ns
	H	3.41	ns	C***	3.15	ns	ns	0.94	ns	C***	0.55	ns	C**	0.54	a***	ns	0.51	ns	B**	1.03	b**	ns
	Norway spruce + European beech																					
	L	0.32	b***	B***	8.25	ab*	ns	1.22	ab**	ns	1.07	ab**	ns	2.52	a**	A**	0.61	b***	B**	1.08	ab***	A**
	F	1.11	ab*	C***	5.74	abc**	ns	1.11	ab**	B***	0.64	ab**	B**	2.37	a***	A**	0.77	ns	AB*	1.41	ns	ns
	H	3.31	ns	C***	2.27	ns	ns	0.80	ns	B***	0.48	ns	B**	0.33	a***	ns	0.51	ns	AB***	1.49	a**	A*
	Norway spruce																					
	L	1.40	a***	B***	6.50	bc*	AB*	1.05	b**	C***	0.66	b**	B**	0.74	b**	B**	0.66	b***	B***	1.36	a***	ns
F	2.07	ab*	B***	4.04	c**	AB***	0.91	b**	C***	0.53	b**	C**	0.46	bc***	B***	0.63	ns	B***	1.47	ns	ns	
H	3.25	ns	C***	2.99	ns	B**	0.75	ns	D***	0.66	ns	C***	0.18	ab***	AB**	0.52	ns	AB***	1.50	ab**	ns	

Table S4 (Continued).

Region	Species / Layer	C		N		CN				
		%					-			
SR	Douglas-fir									
	L	32.43	c**	BC**	1.53	ns	ns	21.13	d***	B***
	F	15.15	b**	B***	0.88	b**	B***	17.19	b**	B***
	H	19.49	ab*	B**	1.06	ab**	B*	18.12	ab**	B**
	Douglas-fir + European beech									
	L	44.73	ab**	ns	1.56	ns	AB*	28.84	bc***	AB**
	F	34.44	a**	B***	1.74	a**	ns	19.80	ab**	B***
	H	27.73	a*	AB*	1.53	a**	ns	18.16	ab**	AB***
	European beech									
	L	46.54	ab**	ns	1.52	ns	AB**	31.40	ab***	AB**
	F	37.61	a**	ns	1.78	a**	ns	21.48	a**	ns
	H	15.12	b*	B*	0.97	b**	ns	15.26	b**	B***
	Norway spruce + European beech									
	L	48.90	a**	ns	1.29	ns	B***	38.53	a***	A**
	F	40.09	a**	ns	1.87	a**	ns	21.49	a**	B**
	H	25.39	a*	ns	1.38	a**	ns	18.11	ab**	B***
	Norway spruce									
	L	37.70	bc**	ns	1.59	ns	ns	23.80	cd***	B**
	F	36.76	a**	ns	1.65	a**	ns	22.06	a**	AB**
	H	22.78	a*	B*	1.20	ab*	ns	18.72	a**	B***
	NR	Douglas-fir								
L		46.62	ns	A**	1.77	a***	ns	26.32	b***	A***
F		42.16	ns	A***	1.76	ns	A***	24.23	ns	A***
H		32.13	ab*	A**	1.40	ns	A*	22.96	ab**	A**
Douglas-fir + European beech										
L		47.81	ns	ns	1.49	ab***	B*	32.51	ab***	A**
F		44.70	ns	A***	1.91	ns	ns	23.53	ns	A***
H		35.09	a*	A*	1.51	ns	ns	23.13	ab**	A***
European beech										
L		47.13	ns	ns	1.37	b***	B**	34.94	a***	A**
F		38.25	ns	ns	1.72	ns	ns	22.44	ns	ns
H		23.97	c*	A*	1.14	ns	ns	20.78	b**	A***
Norway spruce + European beech										
L		47.97	ns	ns	1.49	ab**	AB***	32.86	ab***	AB**
F		43.19	ns	ns	1.77	ns	ns	24.66	ns	A**
H		32.82	ab*	ns	1.43	ns	ns	23.09	ab**	A***
Norway spruce										
L		44.83	ns	ns	1.62	ab***	ns	27.95	b***	A**
F		39.16	ns	ns	1.57	ns	ns	25.10	ns	A**
H		35.00	a*	A*	1.39	ns	ns	25.15	a**	A***

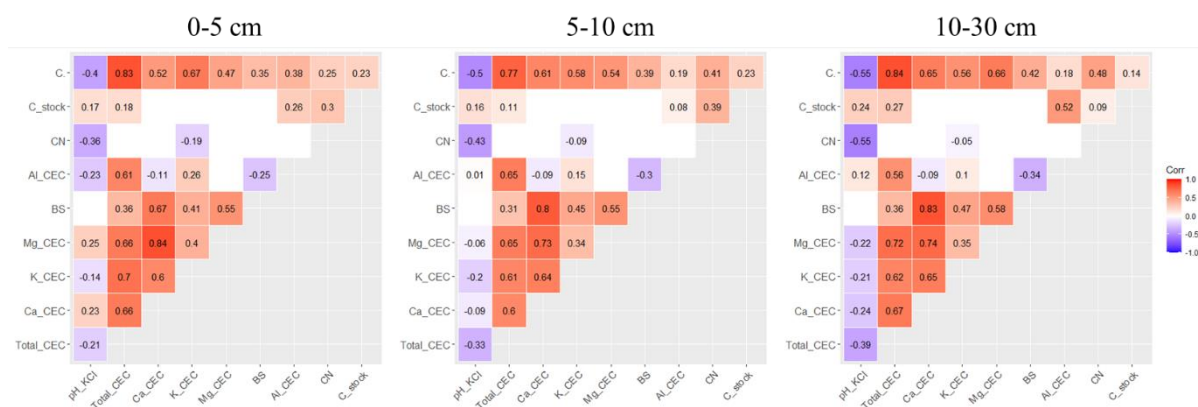


Figure S1. Spearman correlation among mineral soil variables, C content, C stocks, C:N ratio, exchangeable Al³⁺, Mg²⁺, K⁺, Ca²⁺ and CEC for each mineral soil depth (cm). Significant correlations are marked in bold (p<0.05).