Table S1. Macronutrient concentration of litter fall fractions. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Group	Fraction Litter Fall	N_t (%)	S (%)	Ca (%)	Mg (%)	K (%)	Notes/Reference
Plot-specific [1]	leaves (European beech)	1.02	0.07	0.81	0.12	0.26	GE 1, measurement (n=5)
		1.06	0.08	0.84	0.09	0.37	GE 2, measurement (n=5)
		0.99	0.08	0.91	0.12	0.36	GE 3, measurement (n=5)
		1.05	0.08	1.16	0.15	0.31	GE 4, measurement (n=5)
		0.84	0.07	1.32	0.19	0.21	GE 5, measurement (n=5)
		1.00	0.07	0.80	0.06	0.58	GE 6, measurement (n=5)
	needles (Scots pine and Norway spruce)	0.72	0.06	0.81	0.05	0.12	CS 1, measurement (n=5)
		0.87	0.06	0.82	0.06	0.10	CS 2, measurement (n=5)
		0.96	0.07	0.82	0.07	0.16	CS 3, measurement (n=5)
		1.12	0.07	1.00	0.08	0.22	CS 4, measurement (n=5)
		0.94	0.07	0.64	0.06	0.14	CS 5, measurement (n=5)
		0.66	0.05	0.73	0.03	0.13	CS 6, measurement (n=5)
Weighted [1,2]	reproductive parts (European beech)	1.26	0.17 [3]	0.28	0.10	0.35	GE 1, weighted, calculated from husks and beechnuts, see below
		1.00	0.15 [3]	0.23	0.07	0.28	GE 2, weighted, calculated from husks and beechnuts, see below
		0.99	0.14 [3]	0.24	0.07	0.26	GE 3, weighted, calculated from husks and beechnuts, see below
		0.89	0.17 [3]	0.22	0.06	0.25	GE 4, weighted, calculated from husks and beechnuts, see below
		1.69	0.18 [3]	0.35	0.12	0.39	GE 5, weighted, calculated from husks and beechnuts, see below
		1.56	0.17 [3]	0.31	0.09	0.43	GE 6, weighted, calculated from husks and beechnuts, see below
	husk (European beech)	0.24	NA	0.12	0.02	0.11	assumption: like twig European beech, Lyr et al. (1992) [4]
	beechnut (European beech)	2.88	0.17	0.53	0.23	0.74	GE 1, measurement (n=5)
		2.80	0.15	0.50	0.18	0.69	GE 2, measurement (n=5)
		2.82	0.14	0.54	0.20	0.63	GE 3, measurement (n=5)
		3.21	0.17	0.60	0.20	0.75	GE 4, measurement (n=5)
		3.46	0.18	0.64	0.23	0.73	GE 5, measurement (n=5)
		0.24	0.17	0.54	0.18	0.82	GE 6, measurement (n=5)
Literature	bark (European beech)	0.79	NA	0.85	0.04	0.14	branch bark (European beech), Lyr et al. (1992) [4]
	twig (European beech)	0.24	NA	0.12	0.02	0.11	dead twig material, diameter: 1 cm, Lyr et al. (1992) [4]
	cone (Norway spruce)	0.48	0.04	0.02	0.06	0.30	Hågvar (2016) [5]
	cone (Scots pine)	0.28	NA	0.01	0.01	0.12	Lim and Cousens (1986) [6]
	bark (Scots pine)	0.47	NA	0.80	0.09	0.26	fine bark (Scots pine), Lyr et al. (1992) [4]
	twig (Norway spruce)	0.73	NA	0.48	0.04	0.12	dead twig material, diameter: 1 cm, Lyr et al. (1992) [4]

twig (Scots pine)	0.29	NA	0.23	0.02	0.03	dead twig material, diameter: 1 cm, Lyr et al. (1992) [4]

[1] without GE ICP and CS ICP

[2] weighted mass of reproductive parts; mean proportion: beech husks (65.2%) and beechnuts (34.8%)

[3] only based on beechnuts

[4] Lyr, H.; Fiedler, H.J.; Tranquillini, W. Physiologie und Ökologie der Gehölze, 1st ed., Gustav Fischer Verlag Jena, Stuttgart, Germany, 1992; pp. 80-82

[5] Hågvar, S. From Litter to Humus in a Norwegian Spruce Forest: Long-Term Studies on the Decomposition of Needles and Cones. Forests 2016, 7, 186. doi:10.3390/f7090186

[6] Lim, M. T.; Cousens, J. E. The Internal Transfer of Nutrients in a Scots Pine Stand 2. The Patterns of Transfer and the Effects of Nitrogen Availability. Forestry 1986, 59, 17-27. https://doi.org/10.1093/forestry/59.1.17

Table S2. Vegetation data used for the prediction of the herbaceous aboveground biomass and macronutrient stocks with the estimation model PhytoCalc 1.4 at GE and CS. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Plot [1]	Plant Species (Herbaceous Layer)	Growth Group [2] (WG, Morphological)	Element Group [2] (EG)	Cover (%)	n	Mean Shoot Length (cm)
GE 1	*Rubus fructicosus agg.*	KST	ST1	0.1	1	81.5
	Rubus idaeus	KST	ST1	0.1	1	89.2
	Dryopteris carthusiana	F	F2	0.5	9	42.1
	Dryopteris dilatata	F	F1	0.5	6	53.0
	Carex canescens	KG	G1	0.5	5	38.2
	Carex pilulifera	KG	G2	0.5	4	21.5
	Carex remota	KG	G1	3.0	15	51.6
	Juncus effusus	MG	G1	0.5	5	90.4
	Impatiens parviflora	GK	K3	0.5	4	19.1
	Oxalis acetosella	KK	K4	0.5	15	5.8
CS 1	*Rubus fructicosus agg.*	KST	ST1	15.0	15	108.7
	Rubus idaeus	KST	ST1	0.5	5	103.3
	Vaccinium myrtillus	ZST	ST2	3.0	15	27.3
	Dryopteris carthusiana	F	F2	3.0	15	43.4
	Dryopteris dilatata	F	F1	3.0	15	68.5
	Carex canescens	KG	G1	0.5	5	47.0
	Carex pilulifera	KG	G2	0.1	2	19.5
	Deschampsia flexuosa	KG	G2	0.5	15	43.2
	Juncus effusus	MG	G1	0.1	2	71.2
	Luzula pilosa	KG	G2	0.5	3	33.0
	Milium effusum	GG	G1	0.5	15	82.0
	Epilobium angustifolium	GK	K4	0.5	3	52.4
	Impatiens parviflora	GK	K3	0.5	5	21.0
	Moehringia trinervia	KK	K3	0.5	5	11.3
	Oxalis acetosella	KK	K4	0.5	15	5.2
CS 2	*Vaccinium myrtillus*	ZST	ST2	0.5	7	33.8
	Dryopteris dilatata	F	F1	0.5	5	69.6
	Carex pilulifera	KG	G2	0.5	5	21.1
	Juncus effusus	MG	G1	0.1	1	82.4
GE 3	*Impatiens parviflora*	GK	K3	0.5	4	16.9
CS 3	*Vaccinium myrtillus*	ZST	ST2	0.5	9	15.7
	Athyrium filix-femina	F	F1	0.5	3	35.4
	Dryopteris carthusiana	F	F2	0.5	7	41.0
	Dryopteris dilatata	F	F1	3.0	15	55.1
	Dryopteris filix-mas	F	F1	0.1	6	43.9
	Agrostis stolonifera	MG	G2	0.1	2	31.2
	Carex leporina	KG	G2	0.5	6	35.2
	Carex pilulifera	KG	G2	0.5	6	30.9
	Deschampsia flexuosa	KG	G2	3.0	15	33.3
	Holcus lanatus	MG	G1	0.5	10	94.3
	Juncus effusus	MG	G1	0.5	3	79.7
	Cardamine flexuosa	MK	K2	0.5	5	13.9
	Cerastium holosteoides	MK	K3	0.5	5	32.7
	Impatiens parviflora	GK	K3	3.0	15	27.1
	Maianthemum bifolium	MK	K4	0.5	11	8.4
	Moehringia trinervia	KK	K3	0.5	5	13.7
	Mycelis muralis	GK	K4	0.5	5	36.1
	Oxalis acetosella	KK	K4	0.5	15	5.7
	Scorzoneroides autumnalis	MK	K2	0.5	4	23.5
	Stellaria palustris	MK	K3	0.5	5	29.3

	Veronica montana	MK	K2	0.5	4	14.3
GE 4	*Rubus fructicosus agg.*	KST	ST1	0.1	1	78.7
	Impatiens parviflora	GK	K3	0.5	5	16.9
CS 4	*Rubus fructicosus agg.*	KST	ST1	0.5	5	127.0
	Rubus idaeus	KST	ST1	15.0	15	93.2
	Dryopteris carthusiana	F	F2	0.1	4	56.3
	Dryopteris dilatata	F	F1	0.5	8	60.1
	Dryopteris filix-mas	F	F1	0.5	7	60.8
	Deschampsia flexuosa	KG	G2	0.5	15	55.2
	Festuca gigantea	GG	G1	0.5	4	99.5
	Holcus lanatus	MG	G1	0.1	3	58.0
	Juncus effusus	MG	G1	0.1	1	80.7
	Milium effusum	GG	G1	0.5	3	69.0
	Poa nemoralis	MG	G1	0.5	5	54.4
	Poa trivialis	MG	G1	0.5	3	54.1
	Alliaria petiolata	GK	K2	0.5	2	24.7
	Cardamine flexuosa	MK	K2	0.5	5	37.0
	Epilobium angustifolium	GK	K4	0.5	5	70.6
	Galium aparine	MK	K2	0.5	4	69.9
	Galium rotundifolium	MK	K2	0.5	5	22.1
	Geranium robertianum	MK	K2	3.0	15	23.9
	Geum urbanum	GK	K2	0.1	1	47.9
	Impatiens parviflora	GK	K3	15.0	15	20.1
	Lathyrus linifolius	MK	K4	0.5	3	23.8
	Moehringia trinervia	KK	K3	3.0	15	12.7
	Mycelis muralis	GK	K4	0.5	7	33.8
	Oxalis acetosella	KK	K4	3.0	15	6.3
	Senecio hercynicus	GK	K2	0.1	1	57.8
	Taraxacum sect. Ruderalia	MK	K4	0.5	4	21.5
	Urtica dioica	GK	K1	0.5	6	79.7
GE 5	*Epipactis atrorubens*	MK	K1	0.1	1	25.9
CS 5	*Vaccinium myrtillus*	ZST	ST2	0.5	10	50.9
	Dryopteris dilatata	F	F1	0.5	7	62.3
	Pteridium aquilinum	GF	F2	0.5	9	93.7
CS 6	*Calluna vulgaris*	ZST	ST2	0.1	5	22.6
	Vaccinium myrtillus	ZST	ST2	0.5	15	35.1
	Dryopteris carthusiana	F	F2	0.5	7	43.9
	Dryopteris dilatata	F	F1	0.5	6	55.0
	Deschampsia flexuosa	KG	G2	0.5	12	41.7
	Luzula pilosa	KG	G2	0.1	1	32.1
	Digitalis purpurea	GK	K4	0.1	3	98.9
	Stellaria alsine	MK	K3	0.1	1	16.9

[1] without GE ICP and CS ICP; herb layer absent at GE 2 and GE 6

[2] Bolte, A. Biomasse- und Elementvorräte der Bodenvegetation auf Flächen des Forstlichen Umweltmonitorings in Rheinland-Pfalz (BZE, Level II). Berichte des Forschungszentrums Waldökosysteme Reihe B 72, 2006, 81.

Table S3. Summary statistics and ANOVA results of the linear mixed-effects models. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Dependent Variable	Forest Type GE		Intercept		Observations	Akaike Inf. Crit.	Log Likelihood	R^2c	R^2m
	Value (SE)	F-Value (numDF; denDF)	Value (SE)	F-Value (numDF; denDF)					
LMM Forest floor (∑ Oi, Oe, Oa) [1]									
log10(DM) (kg ha^{-1})	−0.307 (0.026) ***	132.88 (1; 77)	5.017 (0.059) ***	7015.25 (1; 77)	84	−30.09	24.05	0.39	0.22
log10(N_t) (kg ha^{-1})	−0.326 (0.029) ***	120.52 (1; 77)	3.133 (0.060) ***	2599.45 (1; 77)	84	−18.16	18.08	0.43	0.26
log10(S) (kg ha^{-1})	−0.441 (0.034) ***	167.75 (1; 65)	2.195 (0.064) ***	1038.58 (1; 65)	72	−6.91	12.45	0.64	0.46
log10(Ca) (kg ha^{-1})	−0.341 (0.032) ***	110.75 (1; 77)	2.648 (0.039) ***	4813.41 (1; 77)	84	−5.05	11.53	0.35	0.31
log10(Mg) (kg ha^{-1})	−0.297 (0.034) ***	77.87 (1; 77)	1.978 (0.056) ***	1187.88 (1; 77)	84	13.21	2.39	0.29	0.19
log10(K) (kg ha^{-1})	−0.163 (0.031) ***	26.91 (1; 77)	2.151 (0.257) ***	1430.68 (1; 77)	84	−24.75	21.37	0.24	0.07
LMM Mineral soil (∑ 0–10 cm, 10–20 cm, 20–40 cm) [1]									
log10(N_t) (kg ha^{-1})	0.015 (0.031)	0.25 (1; 77)	3.205 (0.033) ***	11,887.88 (1; 77)	84	−41.40	29.70	0.04	0.01
log10(S) (kg ha^{-1})	−0.037 (0.020)	3.57 (1; 65)	2.969 (0.025) ***	14,924.19 (1; 65)	72	−102.43	60.22	0.32	0.04
log10(Ca) (kg ha^{-1})	−0.024 (0.019)	1.70 (1; 77)	3.733 (0.082) ***	2080.33 (1; 77)	84	−69.02	43.51	0.94	0.01
log10(Mg) (kg ha^{-1})	0.008 (0.027)	0.09 (1; 77)	3.636 (0.164) ***	495.98 (1; 77)	84	−33.94	25.97	0.96	0.01
log10(K) (kg ha^{-1})	0.004 (0.024)	0.02 (1; 77)	3.960 (0.116) ***	1006.13 (1; 77)	72	−63.79	40.89	0.93	0.01
LMM Annual litter fall [1]									
log10(DM) (kg ha^{-1}year^{-1})	0.311 (0.022) ***	197.38 (1; 53)	3.426 (0.022) ***	362.03 (1; 53)	60	−70.06	45.03	0.70	0.64
log10(N_t) (kg ha^{-1}year^{-1})	0.651 (0.025) ***	498.90 (1; 53)	1.228 (0.035) ***	2147.72 (1; 53)	60	−46.50	33.25	0.88	0.81
log10(S) (kg ha^{-1}year^{-1})	0.808 (0.027) ***	916.90 (1; 53)	−0.016 (0.045) ***	80.14 (1; 53)	60	−35.36	27.68	0.92	0.86
log10(Ca) (kg ha^{-1}year^{-1})	0.304 (0.021) ***	208.80 (1; 53)	1.247 (0.045) ***	1002.29 (1; 53)	60	−72.34	46.17	0.89	0.57
log10(Mg) (kg ha^{-1}year^{-1})	0.571 (0.026) ***	490.40 (1; 53)	0.161 (0.062) ***	54.96 (1; 53)	60	−48.33	34.16	0.85	0.67
log10(K) (kg ha^{-1}year^{-1})	0.708 (0.027) ***	658.68 (1; 53)	0.555 (0.036) ***	736.20 (1; 53)	60	−44.74	32.37	0.94	0.88
LMM Fractional annual loss (turnover rate; k) [1, 2]									
log10(DM) (year^{-1})	0.545 (0.057) **	92.88 (1; 5)	−1.593 (0.078) ***	324.47 (1; 5)	12	5.03	2.49	0.98	0.68
log10(N_t) (year^{-1})	0.773 (0.055) ***	200.22 (1; 5)	−1.874 (0.089) ***	305.25 (1; 5)	12	6.17	1.92	0.99	0.77
log10(S) (year^{-1})	1.156 (0.088) ***	174.30 (1; 5)	−2.128 (0.099) ***	304.74 (1; 5)	12	11.31	−0.66	0.99	0.86
log10(Ca) (year^{-1})	0.388 (0.086) **	20.48 (1; 5)	−1.320 (0.061) ***	687.53 (1; 5)	12	3.84	3.08	0.99	0.65
log10(Mg) (year^{-1})	0.663 (0.118) **	31.63 (1; 5)	−1.767 (0.083) ***	592.24 (1; 5)	12	10.20	−0.10	0.99	0.74
log10(K) (year^{-1})	0.698 (0.076) **	84.93 (1; 5)	−1.561 (0.094) ***	200.90 (1; 5)	12	9.49	0.26	0.98	0.72

[1] p-value: * <0.05, ** <0.01, *** <0.001

[2] residence time is the inverse of the FAL

Table S4. Soil data used for the prediction of the annual base cation release (Ca^{2+}, Mg^{2+}, K^{+}; kg ha^{-1}) from weathering processes in the main rooting zone of the soil matrix at GE and CS according to the soil type-texture approximation for non-calcareous soil profiles given in CLRTAP (2017). GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Plot [1]	Texture Class [2]	Parent Material Class [2]	Weathering Rate Class [2]	Main Rooting Zone (m)	MAT (°C)
GE 1	2	acidic	3	0.44	7.8
CS 1	2	acidic	3	0.36	7.8
GE 2	2	acidic	3	0.90	7.8
CS 2	2	acidic	3	0.80	7.8
GE 3	2	intermediate	4	0.82	7.8
CS 3	2	intermediate	4	0.25	7.8
GE 4	2	intermediate	4	0.64	7.8
CS 4	2	intermediate	4	0.70	7.8
GE 5	2	acidic	3	0.67	7.8
CS 5	2	acidic	3	0.72	7.8
GE 6	2	acidic	3	0.87	7.8
CS 6	2	acidic	3	0.70	7.8

[1] without GE ICP and CS ICP

[2] CLRTAP. Latest update of Guidance on mapping concentrations levels and deposition levels - Manual on methodologies and criteria for modelling and mapping critical loads and levels and air pollution effects, risks and trends. UNECE Convention on Long-range Transboundary Air Pollution, 2017. www.icpmapping.org

Table S5. Litter fractions and their share in the macronutrient return within the analysed litter at GE and CS. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Litter Fraction	N_t (%)	S (%)	Ca (%)	Mg (%)	K (%)
			GE [1]		
leaves (European beech)	52.9	38.3	82.5	67.9	59.1
reproductive parts [2]	45.7	61.7	15.8	31.1	39.3
bark	0.6	NA	1.0	0.3	0.3
twigs (European beech)	0.9	NA	0.7	0.7	1.3
			CS [1]		
needles	79.0	99.6	78.7	71.8	65.5
reproductive parts[2]	3.7	NA	0.1	3.5	9.0
bark	6.4	NA	12.2	15.8	17.7
twigs (Norway spruce)	5.6	NA	4.2	3.9	4.6
twigs (Scots pine)	5.0	NA	4.4	4.6	2.8

[1] without GE ICP and CS ICP

[2] based on weighted mass of reproductive parts

(forest type-specific: beechnuts, beech husks or cones)

Table S6. Macronutrient stocks (in above-ground-tree-biomass, herbaceous ground vegetation, forest floor and mineral soil) for Green Eyes and coniferous sites. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Plot	OM (Mg ha^{-1})	N_t (kg ha^{-1})	S (kg ha^{-1})	∑ Ca, Mg, K (kg ha^{-1})	Ca (kg ha^{-1})	Mg (kg ha^{-1})	K (kg ha^{-1})
			Predicted macronutrient stock in above-ground-tree-biomass (dominant tree species, whole-tree) [1]				
GE 1	NA	428	36	656	298	67	290
CS 1	NA	220	25	367	210	38	119
GE 2	NA	557	46	821	375	85	361
CS 2	NA	422	46	676	380	65	231
GE 3	NA	1026	85	1571	714	162	695
CS 3	NA	530	54	863	481	70	311
GE 4	NA	1190	100	1878	852	192	835
CS 4	NA	558	55	865	472	72	321
GE 5	NA	561	46	827	378	86	364
CS 5	NA	314	32	458	250	44	165
GE 6	NA	520	42	724	332	76	316
CS 6	NA	214	25	358	208	40	110
GE median [2]	*NA*	*559 (286)*	*46 (24)*	*824 (468)*	*376 (212)*	*85 (48)*	*362 (209)*
CS median [2]	*NA*	*368 (137)*	*39 (12)*	*567 (215)*	*315 (116)*	*54 (15)*	*198 (85)*
			Predicted macronutrient stock in herbaceous ground vegetation [3]				
GE 1	NA	2.54	0.225	3.18	0.29	0.158	2.73
CS 1	NA	13.51	0.997	14.41	4.61	1.823	7.98
GE 2	NA	NA	NA	NA	NA	NA	NA
CS 2	NA	0.60	0.076	0.68	0.22	0.066	0.39
GE 3	NA	0.04	0.004	0.07	0.01	0.004	0.06
CS 3	NA	3.92	0.371	5.32	0.80	0.311	4.20
GE 4	NA	0.09	0.007	0.12	0.03	0.011	0.08
CS 4	NA	15.27	1.130	18.26	4.72	1.791	11.75
GE 5	NA	0.03	0.004	0.06	0.02	0.004	0.03
CS 5	NA	0.66	0.090	0.73	0.30	0.086	0.34
GE 6	NA	NA	NA	NA	NA	NA	NA
CS 6	NA	0.73	0.093	0.83	0.28	0.083	0.47
GE median [2]	*NA*	*0.1*	*0.01*	*0.1*	*0.03*	*0.01*	*0.07*
CS median [2]	*NA*	*2.3*	*0.23*	*3.1*	*0.55*	*0.20*	*2.34*
			Forest floor (∑ Oi, Oe, Oa)				
GE 1	90	810	41	517	226	87	203
CS 1	122	1731	155	653	394	90	170
GE 2	70	889	72	362	180	50	132
CS 2	135	1825	183	767	474	109	183
GE 3	44	538	41	421	242	61	118
CS 3	106	1128	112	638	308	108	223
GE 4	25	287	20	340	235	43	62
CS 4	81	1288	137	1171	818	226	127
GE 5	56	748	69	922	678	161	83
CS 5	97	1334	138	335	213	39	84
GE 6	87	1142	83	449	280	42	126
CS 6	128	1694	181	468	303	43	123
GE mean [2]	*51 (7) ****	*641 (89) ****	*57 (8) ****	*348 (37)*	*203 (18) ****	*48 (6) ****	*97 (13) ****
CS mean [2]	*104 (14) ****	*1358 (188) ****	*157 (23) ****	*680 (71)*	*444 (40) ****	*95 (12) ****	*141 (19) ****
			Mineral soil (∑ 0–10 cm, 10–20 cm, 20–40 cm)				
GE 1	NA	1690	781	24,360	6908	6323	11,129
CS 1	NA	1973	808	20,357	6408	5220	8729
GE 2	NA	1968	834	17,745	5198	4702	7845

CS 2	NA	1610	871	23,749	6277	5799	11,673
GE 3	NA	2108	700	32,968	6870	11,247	14,851
CS 3	NA	2309	864	30,233	8129	9286	12,818
GE 4	NA	2027	814	39,113	8511	13,092	17,510
CS 4	NA	1702	857	38,102	8175	12,756	17,171
GE 5	NA	1240	1140	11,630	5826	1953	3851
CS 5	NA	1371	726	9048	3239	1888	3921
GE 6	NA	1701	595	7167	2703	1248	3217
CS 6	NA	1637	665	7130	2815	1328	2987
GE mean [2]	*NA*	*1661 (127)*	*855 (51)*	*18,716 (5289)*	*5114 (967)*	*4413 (1667)*	*9189 (2655)*
CS mean [2]	*NA*	*1604 (123)*	*932 (56)*	*18,858 (5293)*	*5407 (1022)*	*4331 (1636)*	*9120 (2635)*

[1] predicted macronutrient stock in above-ground-tree-biomass (whole-tree, basal-area-weighted and calculated after Block et al. (2016))

[2] without GE ICP and CS ICP; standard deviation (SD) or standard error (SE) in brackets, forest floor and mineral soil: LMM estimates, forest type effect (GE, CS) p-value: * <0.05, ** <0.01, *** <0.001

[3] predicted macronutrient stock of herbaceous ground vegetation (calculated with PhytoCalc 1.4 after Bolte (2006))

Table S7. Macronutrient stocks in mineral soil (∑ 0-10 cm, 10-20 cm, 20-40 cm) and divided into single depth increments for Green Eyes and coniferous sites. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Plot	Depth Increment (cm)	∑ Ca, Mg, K (kg ha^{-1})	Ca (kg ha^{-1})	Mg (kg ha^{-1})	K (kg ha^{-1})
		Mineral soil (∑ 0–10 cm, 10–20 cm, 20–40 cm)			
GE [1]	mineral soil	4605	1614	1020	2351
CS [1]	mineral soil	4632	1505	1127	2223
		Mineral soil depth increment			
GE [1]	0–10 cm	2714	843	509	1286
CS [1]	0–10 cm	2427	1007	535	1152
GE [1]	10–20 cm	4080	1172	1065	1810
CS [1]	10–20 cm	4545	1340	1074	2183
GE [1]	20–40 cm	9372	2990	3095	6043
CS [1]	20–40 cm	13,925	3480	3417	7100

[1] median, without GE ICP and CS ICP

Table S8. Fractional annual loss (turnover rate) and residence time in years of the forest floor organic matter (OM) and of macronutrients stored in forest floor (∑ Oi, Oe, Oa) for Green Eyes and coniferous sites. A steady state condition was assumed. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Plot	OM	N_t	S	Ca	Mg	K
			Fractional annual loss (year^{-1}; turnover rate; k) [1]			
GE 1	0.06	0.07	0.13	0.11	0.06	0.07
CS 1	0.02	0.01	0.004	0.04	0.01	0.02
GE 2	0.08	0.06	0.08	0.15	0.09	0.13
CS 2	0.02	0.01	0.01	0.03	0.01	0.02
GE 3	0.12	0.09	0.12	0.12	0.08	0.13
CS 3	0.02	0.02	0.01	0.06	0.01	0.02
GE 4	0.19	0.17	0.26	0.16	0.13	0.21
CS 4	0.05	0.03	0.01	0.04	0.01	0.06
GE 5	0.10	0.08	0.08	0.08	0.06	0.16
CS 5	0.04	0.02	0.01	0.10	0.05	0.06
GE 6	0.05	0.05	0.06	0.10	0.07	0.17
CS 6	0.02	0.01	0.004	0.05	0.02	0.03
GE mean [2]	*0.09 (0.016)* **	*0.08 (0.016)* ***	*0.11 (0.024)* ***	*0.12 (0.016)* **	*0.08 (0.015)* **	*0.14 (0.030)* **
CS mean [2]	*0.03 (0.005)* **	*0.01 (0.003)* ***	*0.01 (0.002)* ***	*0.05 (0.007)* **	*0.02 (0.004)* **	*0.03 (0.006)* **

	Residence time (year)					
GE 1	18	15	8	9	16	14
CS 1	55	140	224	28	92	64
GE 2	13	16	12	7	12	8
CS 2	57	109	192	29	84	66
GE 3	9	11	8	8	12	8
CS 3	43	51	82	17	69	59
GE 4	5	6	4	6	7	5
CS 4	23	37	70	28	85	17
GE 5	10	13	13	12	17	6
CS 5	25	50	91	10	20	17
GE 6	18	21	18	10	14	6
CS 6	47	124	264	21	43	31
GE mean [2]	*11 (2)* **	*13 (3)* ***	*9 (2)* ***	*9 (1)* **	*13 (2)* **	*7 (2)* **
CS mean [2]	*39 (7)* **	*75 (15)* ***	*134 (31)* ***	*21 (3)* **	*59 (11)* **	*36 (8)* **

[1] calculated for continuous litter fall (CS) as: k_1= L / F and for discrete litter fall in autumn (GE) as: k_2= L / (L+F); F is the dry mass of total forest floor material (∑ Oi, Oe, Oa) (kg ha^{-1} year^{-1}), the residence time is the inverse of the FAL; fractional annual losses of macronutrients were calculated referred to the calculation of k_1 and k_2; the analysed litter fractions cover 79.8% of annual total litter fall at GE and 76.1% at CS
[2] without GE ICP and CS ICP; standard deviation (SD) or standard error (SE) in brackets, LMM estimates,
forest type effect (GE, CS) p-value: * <0.05, ** <0.01, *** <0.001

Table S9. Forest floor organic matter (OM) stocks (dry matter) at Green Eyes and coniferous sites. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Plot	**OM (Mg ha^{-1})**		
	Oi	**Oe**	**Oa**
GE 1	7.5	19.0	63.4
GE 2	6.3	21.1	42.6
GE 3	8.6	19.1	37.3
GE 4	7.1	18.2	NA
GE 5	5.6	26.5	24.0
GE 6	7.9	34.3	44.9
CS 1	6.6	55.1	60.6
CS 2	9.6	68.7	56.6
CS 3	9.0	46.3	51.2
CS 4	5.9	30.2	44.8
CS 5	7.5	64.6	25.1
CS 6	7.2	62.7	58.4
GE mean [1]	*7.2 (1.0)*	*23.0 (5.8)*	*42.4 (12.8)*
CS mean [1]	*7.6 (1.3)*	*54.6 (13.1)*	*49.4 (12.0)*

[1] without GE ICP and CS ICP; standard deviation (SD) in brackets

Table S10. Macronutrient fluxes (deposition, litter fall, predicted weathering in soil matrix) and predicted macronutrient budgets for Green Eyes and coniferous sites. GE: Groups of European beech within stands of Norway spruce and Scots pine (CS) near Hummelshain (Thuringia, Central Germany).

Plot	N_t [1] (kg ha^{-1} year^{-1})	S (kg ha^{-1} year^{-1})	∑ Ca, Mg, K (eq ha^{-1} year^{-1})	∑ Ca, Mg, K (kg ha^{-1} year^{-1})	Ca (kg ha^{-1} year^{-1})	Mg (kg ha^{-1} year^{-1})	K (kg ha^{-1} year^{-1})
Mean annual deposition of macronutrients (∑ throughfall and stemflow; 2001-2018)							
GE ICP	14 (3)	5 (1)	NA	30 (5)	8 (1)	2 (1)	20 (5)
CS ICP	18 (2)	5 (1)	NA	24 (4)	6 (1)	2 (1)	16 (3)
Mean annual macronutrient return (litter fall) [2]							
GE 1	58	6	NA	49	28	6	16
CS 1	12	1	NA	17	14	1	3
GE 2	60	6	NA	55	31	5	19
CS 2	17	1	NA	20	16	1	3
GE 3	54	6	NA	57	34	5	17
CS 3	22	1	NA	24	19	2	4
GE 4	59	7	NA	68	45	7	17
CS 4	35	2	NA	40	29	3	8
GE 5	64	6	NA	85	60	10	16
CS 5	27	2	NA	27	21	2	5
GE 6	57	5	NA	60	31	3	25
CS 6	14	1	NA	19	14	1	4
GE mean[3]	*62 (5) ****	*6 (0.6) ****	*NA*	*59 (6)*	*36 (4) ****	*5 (0.2) ****	*18 (2) ****
CS mean[3]	*17 (1) ****	*1 (0.1) ****	*NA*	*24 (3)*	*18 (2) ****	*2 (0.8) ****	*4 (0.3) ****
Predicted annual macronutrient release during weathering in soil matrix [4]							
GE 1	NA	NA	377	10	2	1	7
CS 1	NA	NA	308	8	2	1	6
GE 2	NA	NA	771	22	5	2	15
CS 2	NA	NA	685	20	3	2	15
GE 3	NA	NA	984	27	3	4	20
CS 3	NA	NA	300	8	2	1	6
GE 4	NA	NA	768	21	3	3	15
CS 4	NA	NA	840	23	3	3	17
GE 5	NA	NA	574	16	5	1	10
CS 5	NA	NA	617	17	4	1	11
GE 6	NA	NA	745	21	5	1	14
CS 6	NA	NA	600	16	4	1	11
GE median[3]	*NA*	*NA*	*757 (188)*	*21 (5)*	*4 (1)*	*2 (1)*	*15 (4)*
CS median[3]	*NA*	*NA*	*608 (196)*	*17 (6)*	*3 (1)*	*1 (1)*	*11 (4)*
Predicted annual macronutrient uptake into tree coarse wood (diameter > 7 cm) and bark							
GE ICP	6.9 [5]	NA	659	16	8	1	6
CS ICP	3.4 [5]	NA	282	6	3	1	2
Predicted macronutrient budget (deposition - predicted tree uptake) [6]							
GE	7.4	NA	NA	14.6	-0.2	0.9	13.8
CS	15.0	NA	NA	17.9	3.0	1.2	13.6
Predicted macronutrient budget (litter fall - predicted tree uptake) [7]							
GE	55.1	NA	NA	43.0	28.0	4.0	12.0
CS	13.6	NA	NA	18.0	15.0	0.8	2.0
Predicted macronutrient budget (predicted weathering - predicted tree uptake) [8]							
GE	NA	NA	98	5	-4	0.5	8
CS	NA	NA	327	11	-0.2	0.6	9

[1] solution data with N_t = ∑ NO_3-N, NH_4-, N_{org}

[2] mean annual amount of total litter fall (dry matter) at GE and CS (without GE/CS ICP): 5467 ± 275 kg ha^{-1} year^{-1} (GE), 2671 ± 134 kg ha^{-1} year^{-1} (CS)

[3] without GE ICP and CS ICP; standard deviation (SD) or standard error (SE) in brackets, litter fall: LMM estimates, forest type effect (GE, CS) p-value: * <0.05, ** <0.01, *** <0.001

[4] calculated based on soil texture, parent material and the rooting zone of European beech, Scots pine and Norway spruce (CLRTAP 2017)

[5] Schlutow and Ritter (2018)

[6] calculated based on mean deposition (period 2001-2018) in GE ICP (∑ throughfall, stemflow) and CS ICP (throughfall)

[7] calculated based on mean litter fall (period 2016-2017) at GE and CS

[8] calculated based on median from weathering rates of GE and CS