Appendix S1.1 Site-specific description of field environmental characteristics of the AuCl experiment including various climate and soil variables.

	Auclair (QC, CAN)	**Cloquet** (MN, USA)
Coordinates	47.7º N, 68.6º W[a]	46.7º N, 92.5º W[a]
Altitude (m)	333[a]	383[a]
Former land use	Low-input abandoned pasture[a]	Forest[a]
Mean annual temperature (ºC)	3.4 ± 5.5[b]	4.3 ± 5.5[c]
Mean annual precipitations (mm/month)	88.5 ± 20.8[b]	35.2 ± 19.7[c]
Soil type	Loam[a]	Sandy-loam[a]
Mean litter layer height (cm)	2.0 ± 0.6[d]	1.8 ± 0.7[d]
Mean soil temperature (ºC)	NA	6.97 ± 4.19[e]
Mean soil moisture (% H_2O d.m.)	19.5 ± 3.4[d]	10.6 ± 2.8[d]
Mean soil microbial biomass (µg microbial-C g^{-1})	132.8 ± 22.6[d]	NA
Mean soil pH	4.56 ± 0.14[f]	5.58 ± 0.15[g]

[a] As described in Tobner *et al.* (2014) and TreeDivNet (2018)

[b] Calculated from average monthly data between 2005 to 2015 at Edmunston, NB, Canada (~ 44km from Auclair; Environment Canada)

[c] Calculated from average monthly data between 2005 to 2015 at Cloquet, MN, USA (Weather Underground)

[d] Method is explained in "Material and methods" section of the paper

[e] Calculated from average 2015 monthly data at Cloquet experimental site

[f] Measured with a water-based method on 12 samples taken across blocks in September 2017

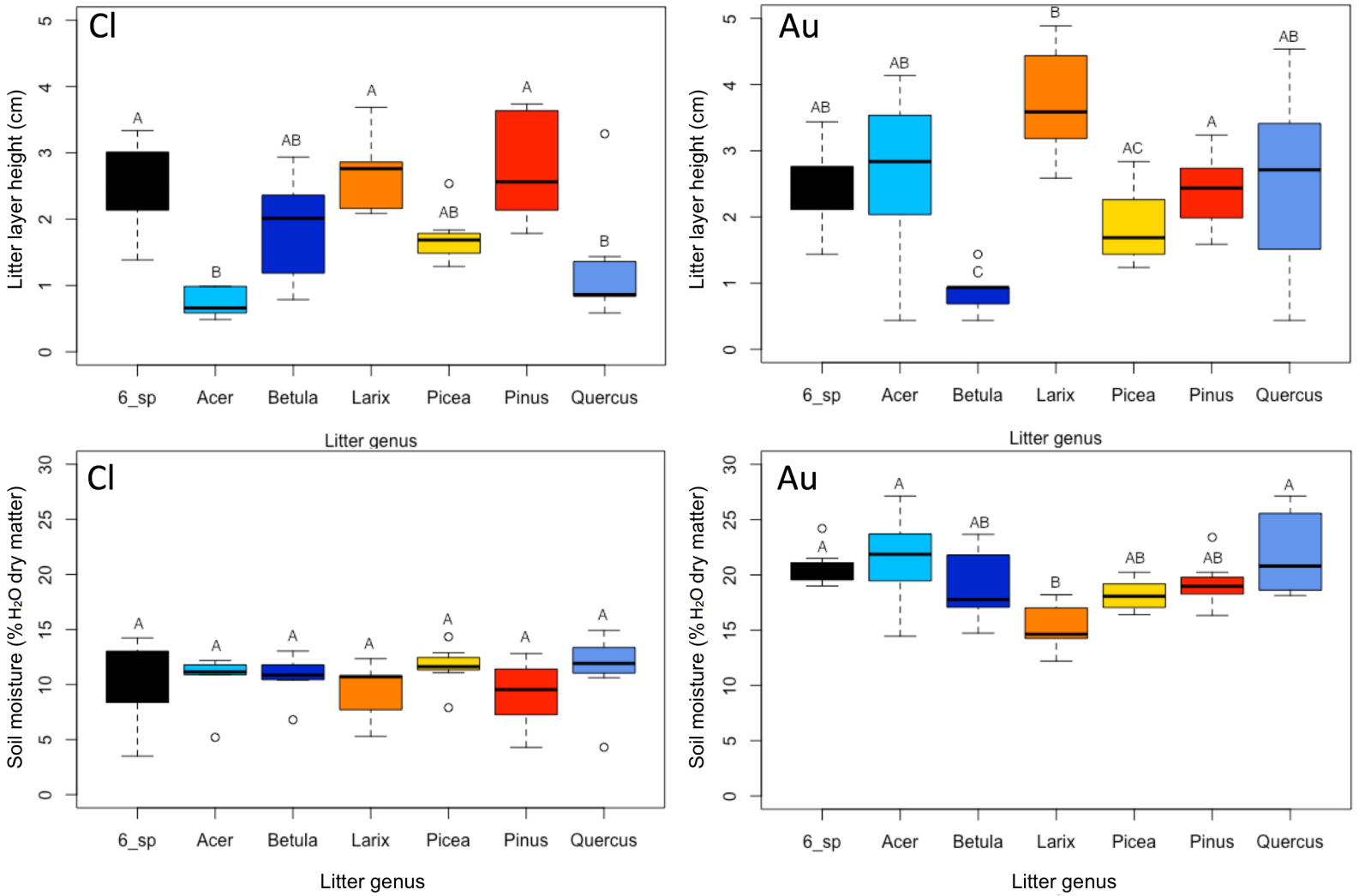
[g] Measured with a water-based method on 64 samples taken across blocks in October 2013

References :

Tobner CM, Paquette A, Reich PB, Gravel D & Messier C. 2014 Advancing biodiversity–ecosystem functioning science using high-density tree-based experiments over functional diversity gradients. *Oecologia* **174**, 609-621.

TreeDivNet (2018). IDENT (Canada, USA, Germany, Italy). See http://www.treedivnet.ugent.be/ExpIDENT.html (accessed 21 February 2018).

Appendix S1.2 Soil moisture (% H_2O dry matter) and litter layer height (cm) by tree genus and site (Au = Auclair, Cl = Cloquet). Letters represent post-hoc Tukey results ($p < 0.05$).



Appendix S2.1 Functional trait measurement methods of leaf litter per tree species per site.

Trait (units)	Replication	Instrument and/or protocols
C and N concentration (% dry-leaf mass)	3	At least 5 leaves were pooled together to grind to a fine powder with a ball mill (Retsch). A replicate was a subset of this mixture. C and N concentrations were measured with an elementary analyzer EA1108 (Thermo Scientific).
Hemicellulose, cellulose and lignin concentration (% organic matter)	1 to 3	At least 5 leaves were pooled together to grind with a 1 mm cutter mill (Wiley). A replicate was a subset of this mixture. Hemicellulose, cellulose and lignin concentrations were obtained after a series of chemical digestions (NDF, ADF, ADL) with a Fiber Analyzer 2000 (Ankom). Organic matter was determined after ashing at 550°C during 5 hrs. More details in Van Soest *et al.* (1991). Number of replicates depended on available litter for analyses.
Water saturation capacity (% H_2O dry-leaf mass)	≥ 10	Based on this formula: (W – D) / (D) * 100 Where: D = Dried leaf mass after 48 hrs in oven at 65°C W = Wet leaf mass after 48 hrs immersion in distilled water. Adapted from the LDMC measurement protocol in Pérez-Harguindeguy *et al.* (2013).
Leaf thickness (mm)	≥ 15	Sub-replicates (3-5) were taken per leaf and at least 15 leaves were analyzed. Measured with a QuantuMike 293-180 digital micrometer (Mitotuyo). More details in Pérez-Harguindeguy *et al.* 2013.
Leaf toughness or "resistance to fracture" (g $mm^{2\ -1}$)	≥ 15	Sub-replicates (3-5) were taken per leaf and at least 15 leaves were analyzed. Measured with a Medio-Line 403000 pressure dynanometer (Pesola). More details in Pérez-Harguindeguy *et al*. (2013).
Microbial basal respiration (µg CO2-C g^{-1} h^{-1})	2 to 24	Moisture content was adjusted at 45 % of water holding capacity after grinding (coffee mill) and sieving of all litter material (1 mm Retsch test sieve). To limit size heterogeneity, only litter pieces ≥ 0.6 mm were used (second sieving). Preincubation lasted 7 days at 25 °C. More details see Campbell *et al.* (2003). Number of replicates depended on available litter for analyses.

Campbell CD, Chapman SJ, Cameron CM, Davidson MS & Potts JM. 2003 A rapid microtiter plate method to measure carbon dioxide evolved from carbon substrate amendments so as to determine the physiological profiles of soil microbial communities by using whole soil. *Appl. Environ. Microbiol.* **69**, 3593-3599

Pérez-Harguindeguy N, Díaz S, Garnier E, Lavorel S, Poorter H, Jaureguiberry P *et al.* 2013. New handbook for standardised measurement of plant functional traits worldwide. *Aust. J. Bot*. **61**, 167-234

Van Soest PV, Robertson JB & Lewis BA. 1991 Methods for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in relation to animal nutrition. *J. Dairy Sci.* **74**, 3583-3597.

Appendix S2.2 Mean litter trait values and standard deviation for the 12 tree species of Auclair (Au) and Cloquet (Cl). NA= North American origin (native), EU = European species (non-native), o.m. = organic matter and d.m. = dry matter. See Appendix 2 for number of replicates and methodology associated.

Species	Origin	Site	Thickness mm	Resistance g $mm^{2\ -1}$	WSC % H_2O d.m.	N % d.m.	C/N	Cellulose % o.m.	Hemicellulose % o.m.	Lignin % o.m.	Lignin/N	MR µg CO2-C g^{-1} h^{-1}
A. saccharum	NA	Au	0.095 ± 0.01	4 ± 1	377.651 ± 33.606	0.98 ± 0.01	45.53 ± 0.09	33.1 ± 0.53	3.75 ± 0.27	12.47 ± 0.47	12.72	21.029 ± 5.946
A. platanoides	EU	Au	0.077 ± 0.009	3 ± 1	383.51 ± 19.926	0.92 ± 0.02	48.68 ± 1.01	39.3 ± 1.72	15.94 ± 1.18	9.99 ± 0.29	10.86	28.769 ± 2.563
A. saccharum	NA	Cl	0.135 ± 0.007	5 ± 1	232.783 ± 17.067	0.91 ± 0.03	49.18 ± 1.3	26.54 ± 0.44	4.38 ± 0.1	12.12 ± 0.27	13.32	55.024 ± 9.747
A. platanoides	EU	Cl	0.115 ± 0.01	4 ± 1	237.533 ± 21.114	1.62 ± 0.02	27.5 ± 0.26	31.65 ± 1.23	7.48 ± 1.81	14.64 ± 0.47	9.04	86.328 ± 15.096
B. papyrifera	NA	Au	0.117 ± 0.012	3 ± 1	367.94 ± 27.023	1.38 ± 0.01	33.76 ± 0.08	31.32 ± 0.65	4.81 ± 1.02	16.7 ± 2.56	12.1	53.394 ± 1.396
B. pendula	EU	Au	0.13 ± 0.009	2 ± 1	384.723 ± 36.062	0.93 ± 0.01	49.98 ± 0.45	33.39 ± 0.1	12.38 ± 1.67	12.45 ± 1.1	13.39	34.69 ± 0.817
B. papyrifera	NA	Cl	0.152 ± 0.015	3 ± 3	352.124 ± 30.811	1.07 ± 0.01	44.09 ± 0.26	25.11 ± 0.43	7.8 ± 0.84	14.75 ± 0.5	13.79	69.054 ± 15.836
B. pendula	EU	Cl	0.138 ± 0.012	2 ± 1	398.826 ± 20.641	0.73 ± 0.02	64.59 ± 1.47	33.27 ± 1.03	5.13 ± 0.27	13.98 ± 0.58	19.15	56.422 ± 18.98
Q. rubra	NA	Au	0.12 ± 0.007	7 ± 1	289.602 ± 38.462	0.92 ± 0.01	51.41 ± 0.16	42.64 ± 0.62	10.46 ± 0.61	16.17 ± 0.66	17.58	38.669 ± 10.649
Q. robur	EU	Au	0.117 ± 0.007	6 ± 1	286.161 ± 24.788	0.93 ± 0.01	49.56 ± 0.14	43.14 ± 0.35	2.23 ± 0.41	16.03 ± 1.89	17.24	24.076 ± 1.064
Q. rubra	NA	Cl	0.141 ± 0.01	5 ± 1	244.33 ± 21.924	0.87 ± 0.02	51.6 ± 1.28	39.93 ± 0.39	8.63 ± 0.96	17.1 ± 0.13	19.66	82.512 ± 14.596
Q. robur	EU	Cl	0.154 ± 0.01	4 ± 1	282.001 ± 24.14	1.04 ± 0.01	42.29 ± 0.31	39.67 ± 0.39	1.88 ± 0.1	14.72 ± 0.3	14.15	67.918 ± 12.707
L. laricina	NA	Au	0.071 ± 0.18	2 ± 1	192.642 ± 16.773	1.85 ± 0.01	26.72 ± 0.13	42.19 ± 0.44	2.44 ± 0.09	24.77 ± 0.07	13.39	26.085 ± 2.21
L. decidua	EU	Au	0.088 ± 0.021	2 ± 1	218.937 ± 25.81	2.46 ± 0	19.81 ± 0.02	36.6	0	34.62	14.07	25.362 ± 5.717
L. laricina	NA	Cl	0.137 ± 0.017	3 ± 1	251.538 ± 51.215	0.92 ± 0.05	48.17 ± 2.45	35.78 ± 0.35	3.6 ± 0.68	26.71 ± 0.25	29.03	60.376 ± 15.654
L. decidua	EU	Cl	0.128 ± 0.012	2 ± 1	255.903 ± 35.845	0.48 ± 0.02	99.74 ± 2.98	39.05 ± 0.61	0.45 ± 0.31	26.65 ± 0.27	55.52	77.549 ± 20.763
P. glauca	NA	Au	0.273 ± 0.46	16 ± 5	148.521 ± 7.605	1 ± 0.01	47.42 ± 0.17	38.86 ± 1.21	2.91 ± 0.17	22.85 ± 1.38	22.85	22.478 ± 2.558
P. abies	EU	Au	0.201 ± 0.031	17 ± 5	138.212 ± 7.301	1.2 ± 0.01	39.17 ± 0.02	44.9 ± 0.80	4.17 ± 0.29	22.61 ± 0.44	18.84	20.329 ± 0.787
P. glauca	NA	Cl	0.284 ± 0.05	17 ± 6	164.594 ± 27.208	0.6 ± 0.01	77.96 ± 0.88	35.39 ± 0.32	4.53 ± 0.42	20.65 ± 0.16	34.42	55.815 ± 20.055
P. abies	EU	Cl	0.239 ± 0.02	10 ± 2	200.053 ± 28.256	0.64 ± 0.01	73.35 ± 0.46	39.75 ± 1.36	1.86 ± 1.15	22.23 ± 0.23	34.73	41.164 ± 6.73
P. strobus	NA	Au	0.232 ± 0.034	17 ± 5	115.494 ± 12.491	1.41 ± 0.01	34.69 ± 0.13	35.63 ± 0.47	2.62 ± 0.45	25.94 ± 0.18	18.4	18.983 ± 2.474
P. sylvestris	EU	Au	0.477 ± 0.078	43 ± 15	85.399 ± 9.752	0.97 ± 0.01	50.05 ± 0.18	47.96 ± 0.84	2.59 ± 0.3	21.6 ± 0.73	22.27	15.308 ± 2.322
P. strobus	NA	Cl	0.223 ± 0.04	11 ± 3	113.201 ± 10.447	0.38 ± 0.02	131.75 ± 6.95	37.51 ± 0.59	0.93 ± 0.39	26.26 ± 0.18	69.11	42.054 ± 7.835
P. sylvestris	EU	Cl	0.497 ± 0.056	50 ± 17	166.069 ± 17.693	0.55 ± 0.03	88.6 ± 4.45	42.8 ± 0.08	1.73 ± 0.27	19.77 ± 0.11	35.95	40.885 ± 8.294

Appendix S3 List of 57 springtail species sampled by study site in AuCl experiment. Individuals not matching with any species described in the available taxonomic keys were classed in "morpho-species" based on morphologic characteristics (e.g. *Arrhopalites* sp. 1) *Excluded from analyses.

Family	Study site Auclair (n=37)	Cloquet (n=34)	Shared species (n=14)
Arrhopalitidae	*Arrhopalites* sp.1		
Bourletiellidae	*Bourletiella hortensis*	*Bourletiella hortensis*	*Bourletiella hortensis*
Dicyrtomidae		*Dicyrtoma fusca*	
Entomobryidae	*Corynothrix borealis*	*Entomobrya* sp.2	*Entomobrya* sp.2
	Entomobrya sp.1	*Entomobrya comparata*	*Entomobrya nivalis*
	Entomobrya sp.2	*Entomobrya nivalis*	*Lepidocyrtus cyaneus*
	Entomobrya sp.3	*Heteromurus nitidus*	*Lepidocyrtus fernandi*
	Entomobrya sp.4	*Lepidocyrtus cyaneus*	
	Entomobrya nivalis	*Lepidocyrtus fernandi*	
	Lepidocyrtus beaucatcheri	*Lepidocyrtus paradoxus*	
	Lepidocyrtus cyaneus	*Lepidocyrtus violaceus*	
	Lepidocyrtus fernandi	*Lepidocyrtus* sp.1	
	Pseudosinella alba	*Pseudosinella rolfsi*	
	Sinella sp.1		
Isotomidae	*Desoria flora*	*Desoria* sp.1	*Desoria flora*
	Desoria trispinata	*Desoria flora*	*Isotoma subviridis*
	Folsomina sp.1	*Folsomia bisetosa*	*Isotoma viridis*
	Folsomia stella	*Folsomia fimetaria*	*Isotomiella minor*
	Isotoma subviridis	*Isotoma subviridis*	*Parisotoma notabilis*
	Isotoma viridis	*Isotoma viridis*	
	Isotomiella minor	*Isotomiella minor*	
	Parisotoma notabilis	*Parisotoma notabilis*	
		Pseudanurophorus arcticus	
Hypogastruridae	*Schaeffaria duodecimocellata*	*Choreutinula americana*	
	Willemia intermedia	*Hypogastrura* sp.1	
		Willemia duodecimocellata	
Katiannidae	*Sminthurinus conchyliatus*	*Polykatianna intermedia*	
Neanuridae	*Friesea mirabilis*	Mic*ranurida pygmaea*	*Neanura muscorum*
	Neanura muscorum	*Neanura muscorum*	
Neelidae	*Megalothorax minimus**		
Onychiuridae	*Hymenaphorura similis*	*Hymenaphorura similis*	*Hymenaphorura similis*
	Onychiurus sp.1	*Oligaphorura pingicola*	
	Proisotoma immersa	*Thalassophorura parvicornis*	
	Proisotoma minima		
	Protaphorura armata		
	Protaphorura paucisetosa		
Sminthurididae		*Sminthurides lepus*	
Sminthuridae	*Sminthurus* sp.1		
Tomoceridae		*Pogonognathellus flavescens*	
Tullbergiidae	*Ameritulla clavata*	*Mesaphorura macrochaeta*	*Mesaphorura macrochaeta*
	Mesaphorura macrochaeta	*Mesaphorura silvicola*	*Mesaphorura silvicola*
	Mesaphorura silvicola		
	Mesaphorura simplex		

Appendix S4 Procrustes correlation between springtail species (blue) and litter traits (red) of Cloquet single-species treatments (0.4, $p < 0.01$). Permutations = 9999. Prior to analyses, species abundances were Hellinger-transformed and litter traits were standardized. Auclair is not represented as no significant correlation was observed (0.3, $p > 0.05$), thus graphical representation meaningless for this study site.