Anthropogenic disturbances shape soil capillary and saturated water retention indirectly via functional traits and soil organic carbon in temperate forests

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Table S1. The descriptive summary of the studied sites and plots.

Site	Site size (ha) (dimension, m)	No. of subplots	Latitude longitude	Elevation (m)[a]	Species richness	DBH (cm)[a]	Dominant species
Plots of low-disturbance level							
L1	1 (100*100)	25	127.98N; 42.35E	877.5 (875.1; 879.7)	25	8.68 (1.0, 115.2)	*Pinus koraiensis, Tilia amurensis, Acer pictum*
L2	1 (100*100)	25	126.23N; 43.18 E	727.5 (724.2; 731.1)	35	8.98 (1.0, 152)	*Pinus koraiensis, Acer pictum, Tilia amurensis*
L3	1 (100*100)	25	127.91N; 42.21E	1107.2 (1105.6; 1108.3)	21	8.64 (1.0, 96)	*Larix gmelinii, Abies nephrolepis, Tilia amurensis*
Plots of medium-disturbance level							
M1	1 (100*100)	25	127.86N; 42.48E	1010.9 (1016.3; 1023.1)	34	7.83 (1.0, 96.5)	*Pinus koraiensis, Picea jezoensis, Acer pseudosieboldianum*
M2	1 (100*100)	25	127.94N; 44.01E	721.6 (698.4;743.7)	41	8.98 (1.0, 75.0)	*Acer pictum, Acer mandshuricum, Ulmus laciniata*
M3	0.8 (80*100)	20	124.79N; 40.91E	834.1 (817.0; 851.0)	40	7.22 (1.0, 60.9)	*Betula costata, Acer pseudosieboldianum, Acer pictum*
Plots of high-disturbance level							
H1	1 (100*100)	25	126.48N; 42.36E	758.6 (749.6; 764.8)	47	3.4 (1.0, 75.0)	*Pinus koraiensis, Juglans mandshurica, Acer pictum*
H2	1 (100*100)	25	128.17N; 42.19E	652.9 (640.4; 666.2)	45	6.35 (1.0, 68.5)	*Abies holophylla, Carpinus cordata, Ulmus laciniata*
H3	0.6 (60*100)	15	124.90N; 41.33E	892.2 (873.1; 909.4)	43	7.15 (1.0, 53.8)	*Prunus maackii, Tilia amurensis, Ulmus laciniata*

[a] Mean value and range (min, max) of each 20*20m subplots. DBH, diameter at breast height. The dominant species are envaulted by the important value (the sum of the relative frequency, the relative density, and the relative dominance) of each species in each site.

Table S2. The descriptive statistical summary of soil functions and plant attributes

Soil functions and plant attributes		Mean	Min	Max	SE
Water retention	WC (t hm^{-2})	553	189	806	11
	WS (t hm^{-2})	796	684	948	4
	SOC (g kg^{-1})	147.9	16.4	416.8	7.1
Soil texture	Clay (%)	34.2	6.9	83.1	1.2
	Silt (%)	34.0	9.4	43.8	0.7
	Finesand (%)	28.4	3.5	69.2	1.1
	Sand (%)	3.3	0.0	15.8	0.2
Plant diversity	S	15	7	29	0.4
	H	2.2	1.3	2.8	0.02
	FDis	2.3	1.5	4.2	0.04
Functional trait composition	CWM.SLA (cm^2 g^{-1})	234.7	113.0	522.5	6.9
	CWM.LA (cm^2)	45.9	8.1	216.3	3.2
	CWM.H (m)	25.0	13.8	35.3	0.3
	CWM.LPC (‰)	1.7	1.4	2.0	0.01
	CWM.LNC (%)	2.0	1.6	2.5	0.02

Abbreviations: soil capillary water retention (WC), soil saturated water retention (WS), soil organic carbon content (SOC), tree species richness (S), tree Shannon diversity (H), tree functional dispersion diversity (FDis), community weighted mean of specific leaf area (CWM.SLA), community weighted mean of leaf area (CWM.LA), community weighted mean of leaf phosphorus content (CWM.LPC), community weighted mean of leaf nitrogen content (CWM.LNC), community weighted mean of maximum tree height (CWM.H).

Table S3. Soil nutrient content among different disturbance levels and their difference based on one-way ANOVA analysis.

Variable	Unit	Disturbance Levels	Mean	Max	Min	S.E.	Difference among disturbance levels (p<0.05)
Available soil nitrogen content	mg kg^{-1}	High	913.0	1262.1	495.4	22.2	a
		Medium	570.0	1568.7	165.1	32.3	b
		Low	430.0	908.2	148.6	20.4	c
Available soil phosphorus content	mg kg^{-1}	High	11.7	41.5	0.2	1.4	a
		Medium	3.4	15.3	0.0	0.3	b
		Low	4.9	11.0	2.0	0.3	b
Soil pH	Unitless	High	6.7	7.3	5.9	0.0	ab
		Medium	6.5	7.4	5.5	0.0	b
		Low	6.8	7.9	5.6	0.1	a
Soil organic carbon content	g kg^{-1}	High	246.0	416.8	92.1	10.4	a
		Medium	132.0	294.7	34.8	7.3	b
		Low	86.9	245.5	16.4	4.6	c
Total soil carbon	%	High	15.4	27.5	5.3	0.7	a
		Medium	8.1	17.1	2.1	0.4	b
		Low	5.2	10.5	1.1	0.2	c
Total soil nitrogen	%	High	1.01	1.60	0.40	1.01	a
		Medium	0.55	1.15	0.15	0.55	b
		Low	0.39	0.82	0.08	0.39	c
Total soil phosphorus	‰	High	0.12	0.17	0.06	0.12	a
		Medium	0.07	0.14	0.03	0.07	c
		Low	0.09	0.20	0.02	0.09	b

Table S4. The standardized loadings of CWM.pca1 on functional traits based on principal component analysis.

Variables	CWM.SLA	CWM.LA	CWM.LPC	CWM.LNC	CWM.H
Standardized loadings (CWM.pca1)	0.96	0.82	0.75	0.93	-0.86

Figure S1. Spearman's correlation relationship between soil water retention and community attributes. Red to blue color indicates negative to positive correlations, and the numbers inside the square represent correlation coefficient (r). Crosses inside the circles indicate insignificant (P > 0.05) correlations.