Supplementary Information

to the paper Riesch et al. (2025) From here to there: free-ranging large herbivores redistribute nutrients from grassland to forest soil. Landscape Ecology. https://doi.org/10.1007/s10980-025-02116-x

Corresponding author: Friederike Riesch, friederike.riesch@agr.uni-goettingen.de

Contents

Table S1

Estimated marginal means of soil phosphorus (P) and potassium (K) concentration (mg kg^{-1}) for forest and grassland compared within red deer zones (1 – low, 2 – intermediate, 3 – high red deer habitat use). Tests were performed on the log scale with containment degrees-of-freedom approximation. Significant *p*-values (< 0.05) for the pairwise comparison between habitat types are marked in bold font

Response	Red deer zone	Habitat type	Emmean	SE	df	Lower CL	Upper CL	*p*-value
Soil P	1	Forest	10.61	2.40	29	6.68	16.83	0.429
	1	Grassland	9.27	2.06	29	5.88	14.61	
	2	Forest	10.64	2.86	29	6.14	18.43	0.162
	2	Grassland	8.22	2.14	29	4.83	14.01	
	3	Forest	28.81	4.60	29	20.79	39.93	**<0.001**
	3	Grassland	13.60	2.14	29	9.85	18.76	
Soil K	1	Forest	169.30	27.08	29	122.06	234.81	0.070
	1	Grassland	127.03	23.17	29	87.49	184.46	
	2	Forest	245.45	43.46	29	170.88	352.55	**<0.001**
	2	Grassland	104.58	19.66	29	71.20	153.61	
	3	Forest	369.80	40.32	29	295.88	462.20	**<0.001**
	3	Grassland	119.01	14.37	29	92.96	152.35	

Table S2

Contrasts of soil phosphorus (P) and potassium (K) concentration (mg kg^{-1}) between forest and grassland compared at different levels of red deer resting intensity (unit: SD from mean). Tests were performed on the log scale with containment degrees-of-freedom approximation. Significant *p*-values (<0.05) for the forest/grassland ratio are marked in bold font

Response	SD from mean resting intensity	Ratio	SE	df	t-ratio	*p*-value
Soil P	-1	1.28	0.15	160	2.10	**0.037**
	0	1.62	0.14	160	5.74	**<0.001**
	1	2.05	0.24	160	6.02	**<0.001**
	2	2.59	0.49	160	5.05	**<0.001**
Soil K	-1	1.78	0.18	160	5.69	**<0.001**
	0	2.36	0.17	160	11.98	**<0.001**
	1	3.14	0.32	160	11.26	**<0.001**
	2	4.16	0.67	160	8.89	**<0.001**

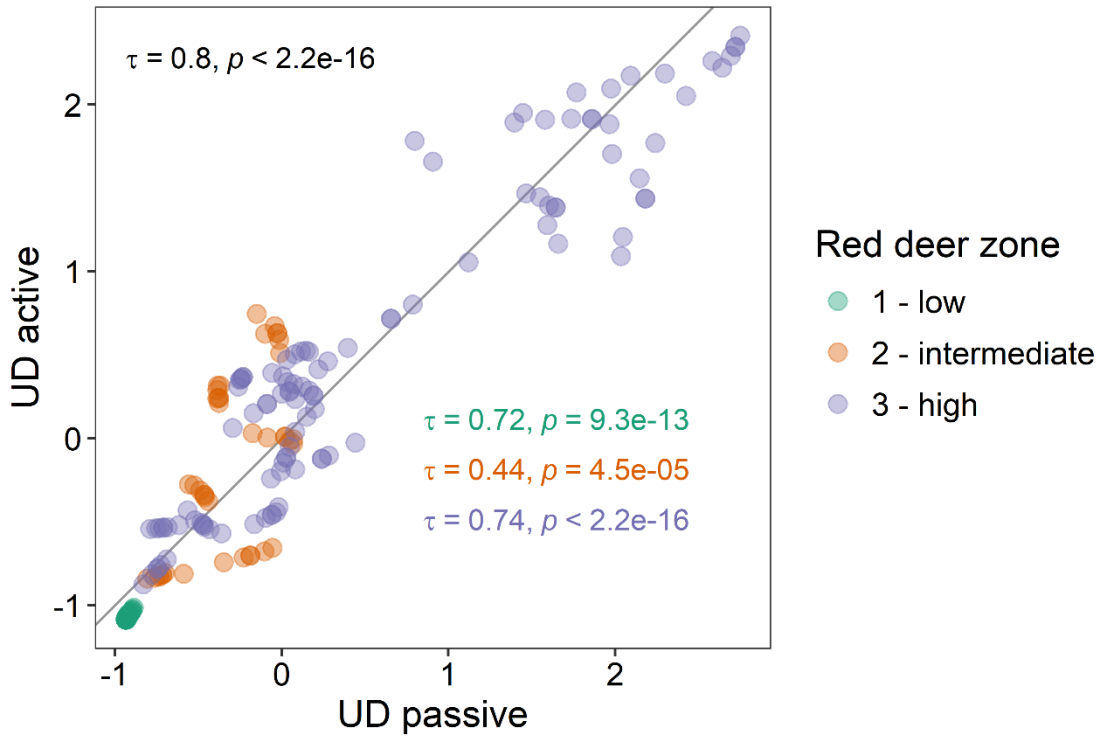

Fig. S1

Red deer utilisation density in the active behavioural state (UD active) derived for the soil sampling points in relation to the red deer utilisation density in the passive behavioural state (UD passive). For comparison, the grey line shows a direct proportional relationship with a slope of 1. Kendall's rank correlation coefficient tau (τ) was computed for all samples combined (black) and separately for the zones of 1 – low, 2 – intermediate, and 3 – high red deer habitat use