

Supplementary Materials

Supplementary tables

Table S1. Hypothesis test results of generalized additive model fitting.

Smooth terms	Biodiversity			Carbon fixation			Soil conservation			Water conservation		
	Edf	F	P	Edf	F	P	Edf	F	P	Edf	F	P
s(Elevation)	9.23	9.17	<0.001***	5.87	8.25	<0.001***	1.97	157.48	<0.001***	1.00	147.08	<0.001***
s(Slope)	\	\	\	\	\	\	5.36	580.92	<0.001***	4.40	4.52	<0.001***
s(Aspect)	—	—	—	7.47	2.75	0.004**	3.84	6.99	<0.001***	3.05	2.95	0.028*
s(TRI)	—	—	—	5.26	3.82	0.001***	\	\	\	\	\	\
s(TPI)	—	—	—	1.93	17.96	<0.001***	2.94	1313.93	<0.001***	6.72	10.65	<0.001***
s(TNI)	3.40	4.04	0.002**	3.56	15.51	<0.001***	2.96	606.68	<0.001***	2.68	24.84	<0.001***
s(NDVI)	1.00	7.44	0.006**	1.00	8.28	0.004**	1.00	6.45	0.011*	4.76	70.80	<0.001***
s(NPP)	2.92	5.56	<0.001***	1.86	10.44	<0.001***	2.40	6.25	0.001***	3.63	11.00	<0.001***
s(Precipitation)	4.72	6.11	<0.001***	5.92	6.21	<0.001***	1.00	106.84	<0.001***	2.97	472.46	<0.001***
s(Soil organic)	2.87	4.82	0.004**	1.89	113.68	<0.001***	1.95	10.47	<0.001***	1.96	99.87	<0.001***
s(Dis_forestland)	2.94	17.05	<0.001***	2.89	23.54	<0.001***	2.15	3.15	0.022*	4.09	47.08	<0.001***
s(Dis_grassland)	—	—	—	1.94	22.57	<0.001***	—	—	—	4.66	9.23	<0.001***
s(Dis_cul)	6.99	12.51	<0.001***	4.93	22.23	<0.001***	—	—	—	4.66	7.39	<0.001***
s(Dis_waters)	3.86	2.43	0.032*	2.88	8.90	<0.001***	3.91	13.13	<0.001***	4.49	9.47	<0.001***
s(Dis_con)	2.94	8.53	<0.001***	1.92	19.85	<0.001***	2.83	6.09	<0.001***	1.00	49.01	<0.001***
s(POP)	2.26	2.78	0.049*	2.16	9.67	<0.001***	—	—	—	1.00	11.65	0.001***
s(GDP)	—	—	—	1.00	4.88	0.027*	—	—	—	2.99	71.61	<0.001***

The statistical significance levels were significant (*p<0.05), very significant (**p<0.01), and extremely significant (**p<0.001). \ : There were not incorporated into the models because of collinearity. — : There were not statistically significant. Edf: Estimated degrees of freedom, when edf>1, represents a nonlinear relationship, and when edf=1, represents a linear relationship; Dis_cul: Distance to cultivated land; Dis_con: Distance to construction land.

Supplementary figures

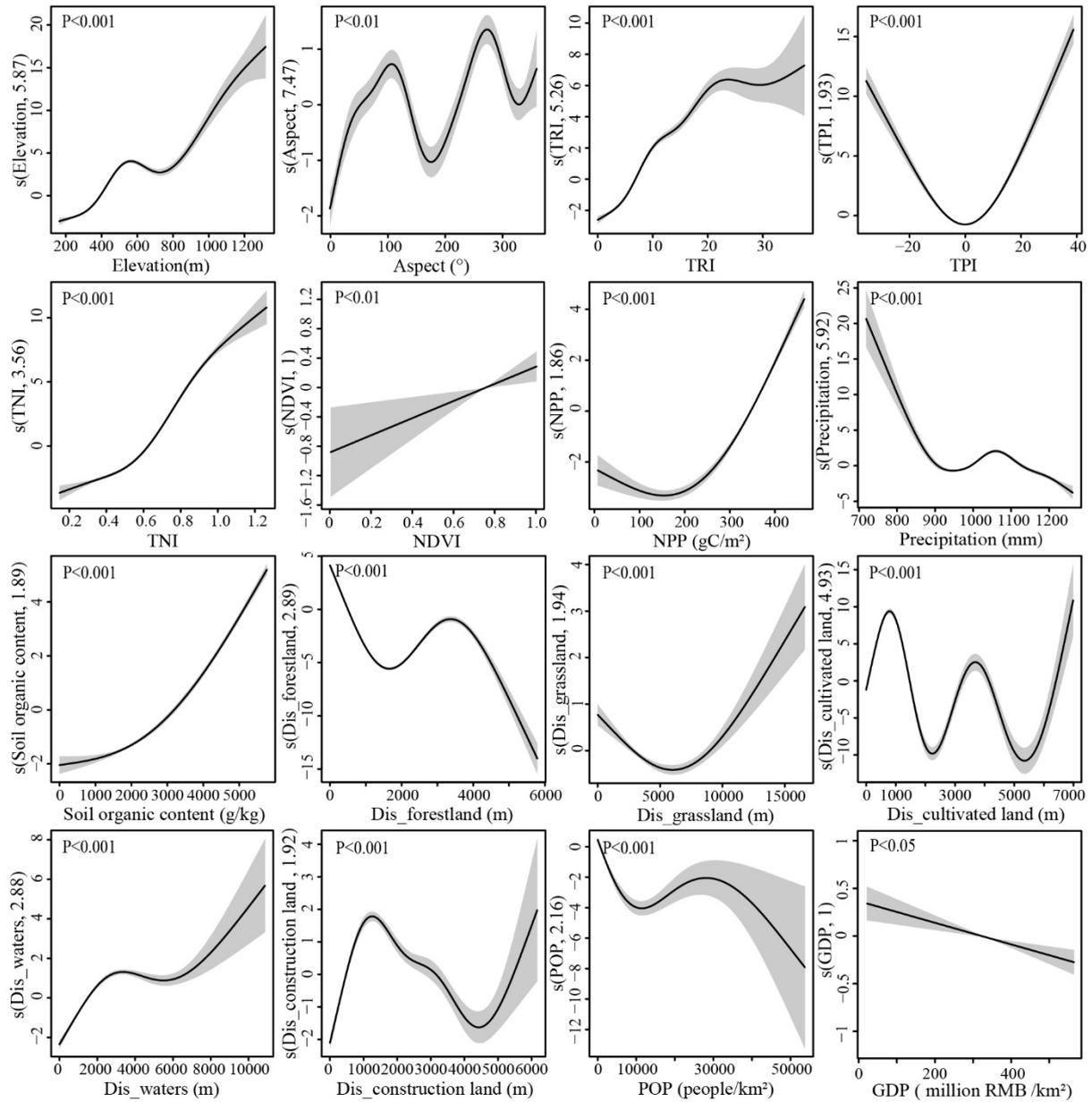


Figure S1. Smoothing functions of the covariate terms for carbon fixation GAM showing the effect of driving factors. Smoothers describe carbon fixation as a function of the respective predictor (lines) along with their 95% confidence intervals (grey shading) and partial residuals. Y axis represents partial residuals and the number in the y-axis label is estimated degrees of freedom of the smoothers function. X axis represents driving variables.

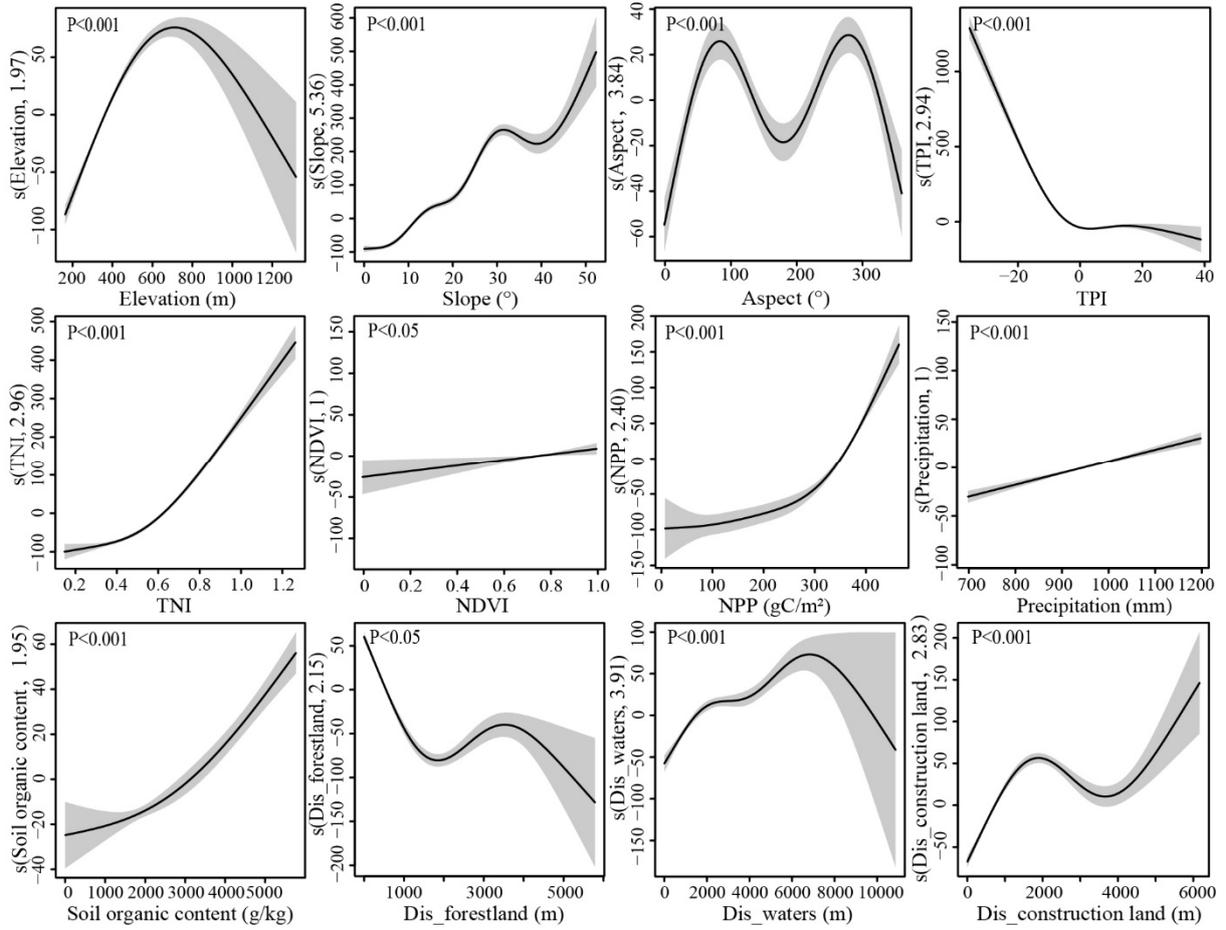


Figure S2. Smoothing functions of the covariate terms for soil conservation GAM showing the effect of driving factors. Smoothers describe soil conservation as a function of the respective predictor (lines) along with their 95% confidence intervals (grey shading) and partial residuals. Y axis represents partial residuals and the number in the y-axis label is estimated degrees of freedom of the smoothers function. X axis represents driving variables.

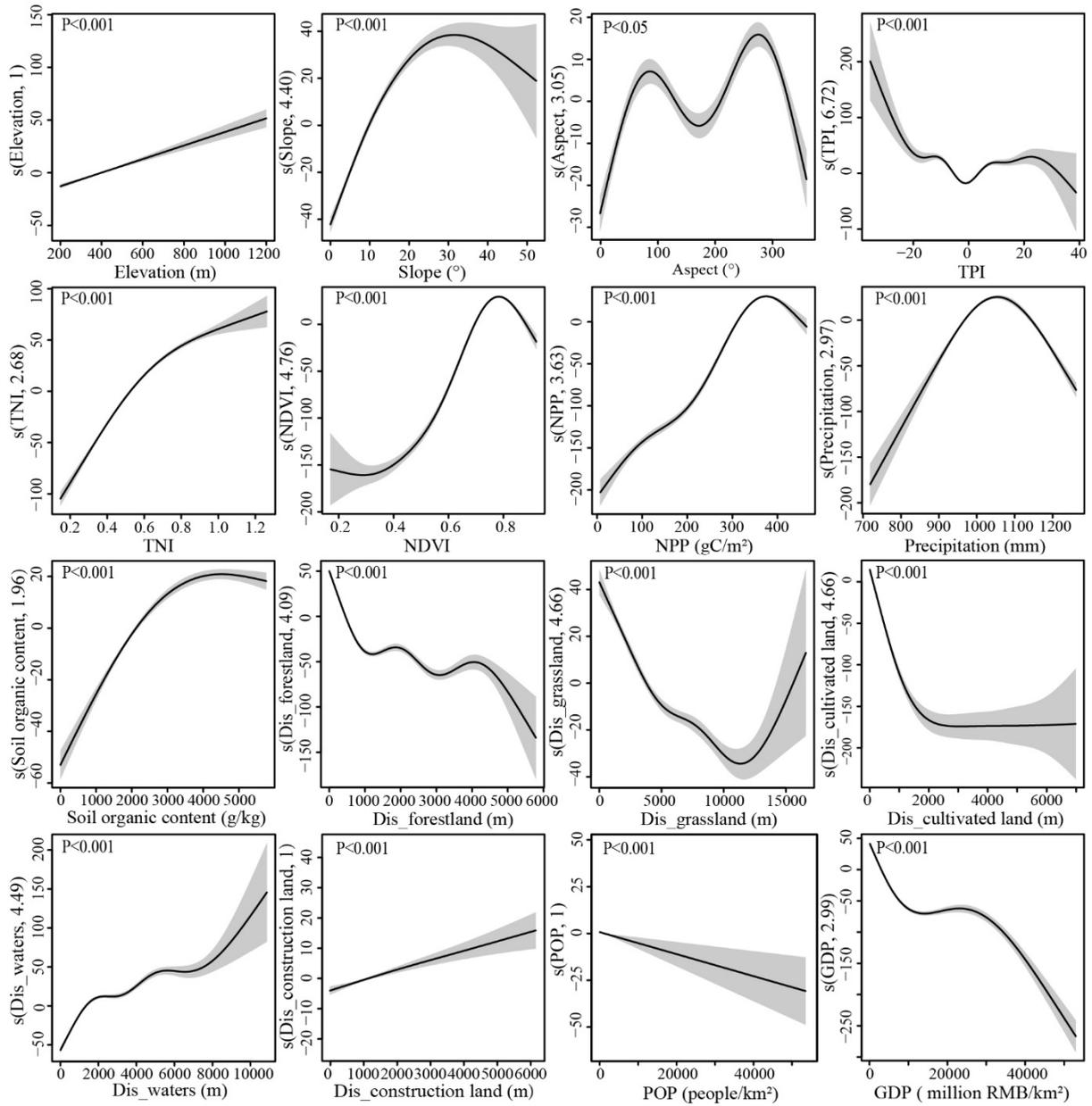


Figure S3. Smoothing functions of the covariate terms for water conservation GAM showing the effect of driving factors. Smoothers describe water conservation as a function of the respective predictor (lines) along with their 95% confidence intervals (grey shading) and partial residuals. Y axis represents partial residuals and the number in the y-axis label is estimated degrees of freedom of the smoothers function. X axis represents driving variables.

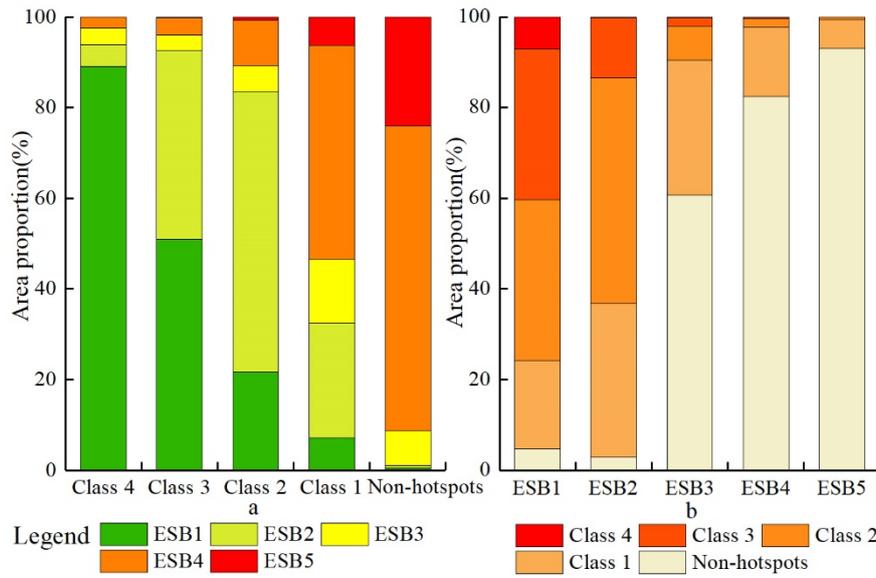


Figure S4. Area proportion of ecosystem services bundles (ESBs) in different ESs hotspots (a) and area proportion of multiple ES hotspots in different ESBs (b) in 2018.