

**Table S1.** Carbon density per unit area of different land cover types in the YRD region, China (Unit: Mg/ha)

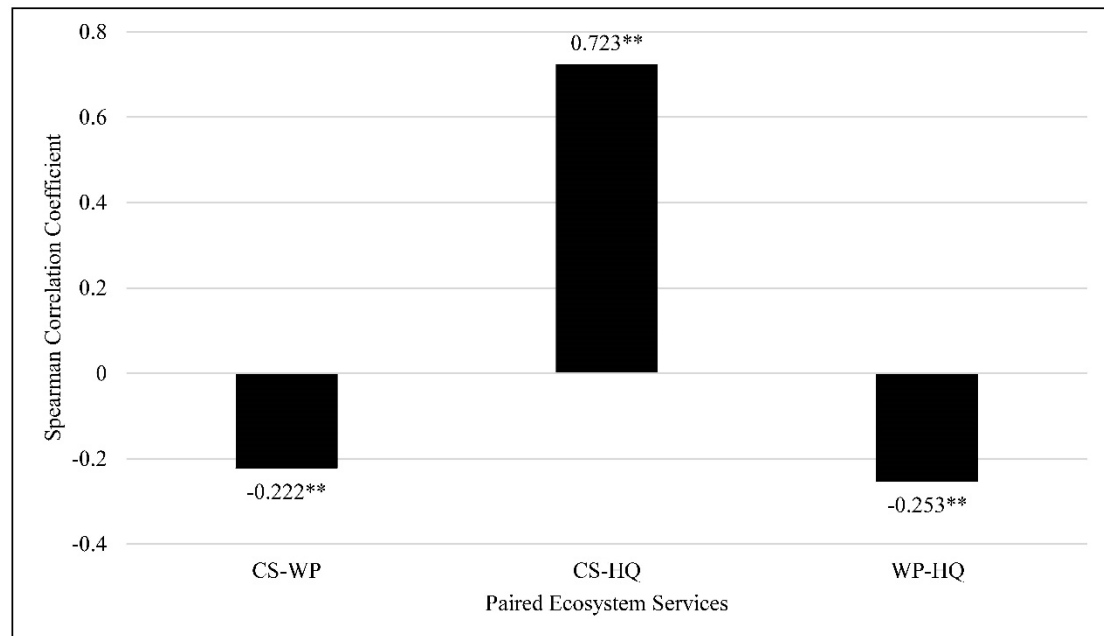
Land cover type	Aboveground	Belowground	Soil organic	Dead organic
Cropland	22.4	80.7	108.4	5
Forest	44.8	128.6	140.5	46.1
Grassland	35.3	86.5	99.9	2
Waterbody	0	0	119	0
Built-up land	1.9	50.2	94.2	0
Bareland	20.6	70.3	97.7	0

**Table S2.** Biophysical table in water purification module for the YRD region, China.

LULC type	Kc	root_depth	usle_c	usle_p	sedret_eff	load_n	eff_n	load_p	eff_p	LULC_veg	crit_ len_p	crit_ len_n	load_ subsurface_n	load_ subsurface_p	proportion_ subsurface_n
Crop land	0.65	2000	0.25	0.4	0.25	5.3	0.25	1.5	0.25	1	150	150	0.53	0.15	0.3
Forest	1	7000	0.003	0.2	0.6	1.8	0.8	0.011	0.8	1	150	150	0.18	0.0011	0
Grassland	0.65	1700	0.008	0.2	0.4	11	0.4	1.5	0.4	1	150	150	1.1	0.15	0
Waterbody	1	500	0.001	0.001	0.05	0.001	0.05	0.001	0.05	0	150	150	0.0001	0.0001	0
Built-up land	0.3	500	0.001	0.001	0.05	9	0.05	2.5	0.05	0	150	150	0.9	0.25	0
Bare land	0.2	10	0.25	0.01	0.2	4	0.05	0.001	0.05	0	150	150	0.4	0.0001	0

**Table S3.** Parameters for habitat quality in the YRD region, China

		Threats					
		Habitat	Crop	Built-up	National way	Highway	Provincial way
<b>The properties of threats</b>	Max_Distance	-	8	10	3	1	1
	Weight	-	0.7	1	1	0.7	0.7
	Decay	-	linear	exponential	linear	linear	linear
<b>Sensitivity of different land cover types</b>	Cropland	0.3	0.35	0.3	0.2	0.2	0.1
	Forest	0.5	0.55	0.5	0.4	0.4	0.3
	Grassland	0.3	0.35	0.3	0.2	0.2	0.1
	Waterbody	1	0.7	0.9	0.7	0.6	0.6
	Built-up	0	0	0	0	0	0
	Bareland	0	0	0	0	0	0



**Figure S1.** Coefficients of the Spearman correlations between paired ESs (\*\* p<0.01).