

Supplementary Materials: Impacts of Climate Change and Anthropogenic Activities on the Ecological Restoration of Wetlands in the Arid Regions of China

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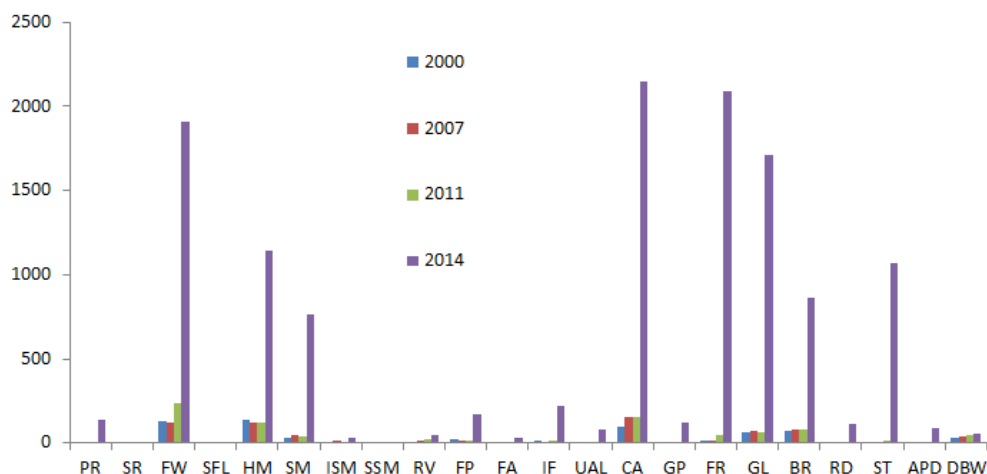


Figure S1. Patch numbers of landscapes in the HRB from 2000 to 2014.

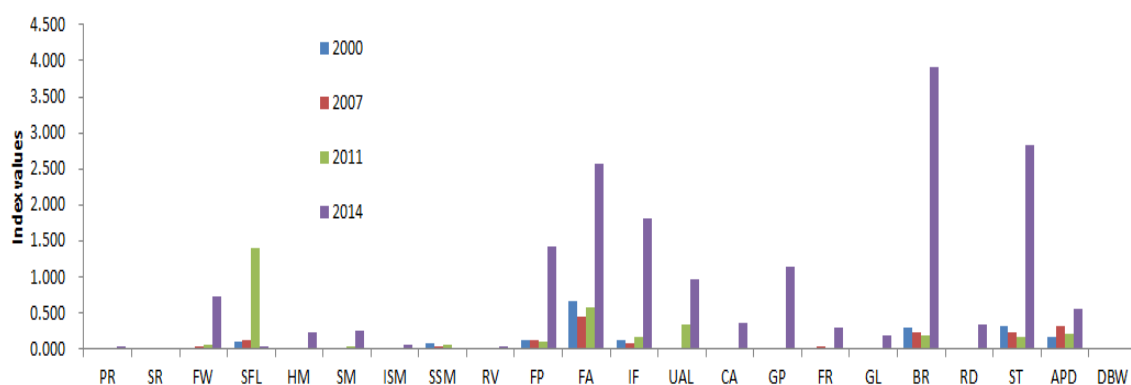


Figure S2. Patch densities of landscapes in the HRB from 2000 to 2014.

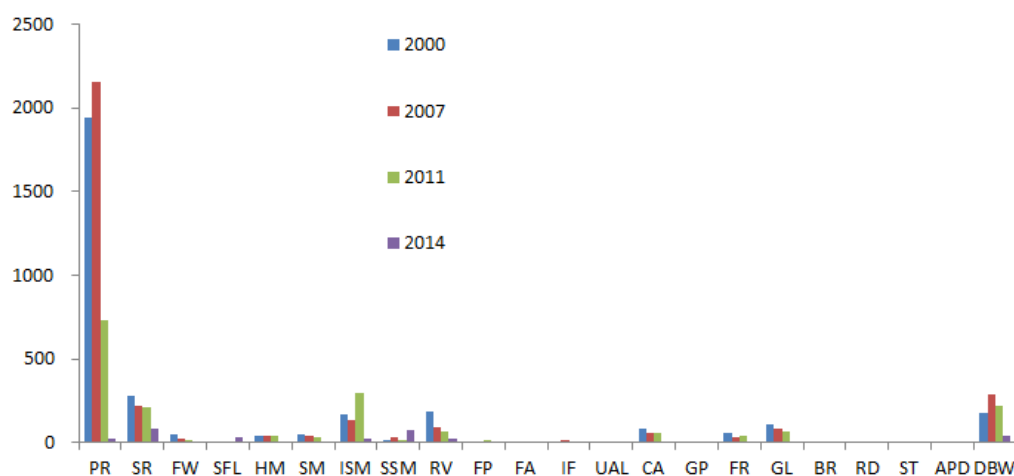


Figure S3. Mean patch sizes of landscapes in the HRB from 2000 to 2014.



Figure S4. A diagram of the effects of constructing channels on the shrinkage of seasonal river.

Table S1. The selected landscape index implication and its ecology significance.

Landscape Index Name	Abbreviation	Application Scale	Implication	Ecological Significance
Patch number	NumP	patch type	Refers to the total number of patch types or landscape level	Important indicator of landscape fragmentation
Mean patch size	MPS	patch type	The ratio of total area and number of each patch	Indications of landscape fragmentation
Patch density	PD	patch type	The ratio of patch number and landscape total area	Reflect the complexity of landscape structure and fragmentation
Mean shape index	MSI	patch type	Deviation degree of patch shape and square	Reflect the complexity of patch shape
Area-weighted Mean Patch Fractal Dimension	AWMPFD	patch type	The complexity of patch shape, description of the patch geometry shape	Reflect the influence and interference intensity of human activities on landscape pattern
Species diversity index	SDI	landscape level	The abundance and heterogeneity of landscape type	Reflect the number of landscape factors and change of proportion of various landscape factors
Dominance Index	DI	landscape level	The deviation of landscape diversity and maximum diversity	Reflect the dominate degree of a certain landscape to the whole landscape types
Species evenness index	SEI	landscape level	The ratio of diversity index and its maximum value	Reflect uneven distribution of shape and area for each patch in the landscape

Table S2. Transfer matrix of wetland landscapes during 2000–2007 in the reserve.

The Transfer Matrix of Wetland Landscape in 2000–2007	River Wetland	Lake Wetland	Marsh Wetland	Artificial Wetland	Non-Wetland
Permanent River	3492.37	0.00	174.85	25.05	192.61
Seasonal River	245.39	0.00	2.35	0	34.90
Floodplain Wetland	1534.84	0.02	536.38	18.31	3779.68
Seasonal freshwater lake	0	42.83	15.83	0	24.35
Herbal marsh	934.04	6.43	2982.82	44.94	1216.98
shrub marsh	126.9	0.00	1251.85	24.25	188.49
Inland salt marsh	20.84	0.00	893.26	0	80.15
Seasonal salt water marsh	0	0.00	50.72	0	3.15
Reservoir	13.89	0.00	19.01	946.37	127.97
Farm pond	0	0.00	51.77	80	64.44
Freshwater aquafarm	0.36	0.00	1.47	2.47	0.20
Irrigated land	38.53	0.00	32.79	23.75	20.03
Urban artificial wetland landscape and recreational water surface	0	0.00	0	0	0.00
Non wetland	694.26	7.44	1795.57	114.58	45266.64

Table S3. Transfer matrix of wetland landscapes during 2007–2011 in the reserve.

The Transfer Matrix of Wetland Landscape in 2007–2011	River Wetland	Lake Wetland	Marsh Wetland	Artificial Wetland	Non-Wetland
Permanent River	3857.63	0.00	241.99	11.76	181.37
Seasonal River	214.13	0.00	0.03	0	2.97
Floodplain Wetland	848.86	0.00	482.44	16.82	1220.63
Seasonal freshwater lake	0	0.61	19.31	27.44	9.37
Herbal marsh	542.5	31.36	2681.72	162.55	969.93
shrub marsh	172.9	0.00	891.52	5.34	900.43
Inland salt marsh	0.04	0.00	1146.56	0.01	233.38
Seasonal salt water marsh	0	0.00	68.51	0	1.86
Reservoir	0.81	0.01	122.87	943.69	15.28
Farm pond	10.91	0.02	28.45	56.55	20.18
Freshwater aquafarm	0	0.00	1.08	1.13	0.00
Irrigated land	2.89	0.00	8.15	28.05	39.65
Urban artificial wetland landscape and recreational water surface	0	0.00	0	0	0.00
Non wetland	857.36	0.79	1984.57	207.81	8258.41

Table S4. Transfer matrix of wetland landscapes during 2011–2014 in the reserve.

The Transfer Matrix of Wetland Landscape in 2011–2014	River Wetland	Lake Wetland	Marsh Wetland	Artificial Wetland	Non-Wetland
Permanent River	2414.48	0.00	354.47	6.06	136.60
Seasonal River	140.64	0.00	39.12	0.04	31.94
Floodplain Wetland	1385.28	0.00	872.35	10.96	1106.51
Seasonal freshwater lake	0	0.00	0.65	0.02	0.76
Herbal marsh	610.79	39.42	3020.26	131.78	920.11
shrub marsh	109.37	2.75	1020.01	19.56	282.88
Inland salt marsh	5.53	0.00	305.38	0	1173.17
Seasonal salt water marsh	0	0.00	27.33	0.09	7.76
Reservoir	16.4	10.65	67.18	977.58	124.81
Farm pond	8.82	31.41	80.09	41.1	8.58
Freshwater aquafarm	0	0.00	1.81	5.22	1.62
Irrigated land	25.35	0.00	27.4	3.15	19.69
Urban artificial wetland landscape and recreational water surface	0	0.00	2.17	9.17	0.51
Non wetland	1127.99	45.82	3204.47	152.95	21476.62

Table S5. Status of various types of landscape pattern indices in the HRB in 2014.

Wetland Type ¹	Patch Area CA	Patch Number NumP	Patch Density PD	Mean Patch Size MPS	Mean Shape Index MSI	Area-Weighted Mean Patch Fractal Dimension AWPFD
PR	3101.25	140.00	0.05	22.15	3.67	1.57
SR	160.50	2.00	0.01	80.25	7.62	1.54
FW	2611.41	1911.00	0.73	1.37	2.31	1.43
SFL	130.04	4.00	0.03	32.51	2.95	1.34
HM	5023.74	1145.00	0.23	4.39	2.43	1.41
SM	3018.93	762.00	0.25	3.96	2.38	1.41
ISM	619.08	32.00	0.05	19.35	2.74	1.41
SSM	372.16	5.00	0.01	74.43	2.70	1.27
RV	1037.67	44.00	0.04	23.58	2.67	1.28
FP	117.34	167.00	1.42	0.70	2.18	1.42
FA	12.03	31.00	2.58	0.39	1.38	1.37
IF	120.67	219.00	1.81	0.55	3.83	1.50
UAL	82.38	80.00	0.97	1.03	5.11	1.58
CA	5889.60	2144.00	0.36	2.75	1.76	1.36
GP	106.51	122.00	1.15	0.87	1.37	1.32
FR	6795.32	2093.00	0.31	3.25	2.53	1.37
GL	9231.92	1710.00	0.19	5.40	2.56	1.33
BR	220.22	863.00	3.92	0.26	1.50	1.41
RD	343.19	114.00	0.33	3.01	7.89	1.79
ST	375.97	1066.00	2.84	0.35	2.08	1.47
APD	155.68	87.00	0.56	1.79	2.28	1.37
DBW	2179.11	56.00	0.03	38.91	2.91	1.43

¹ The abbreviation of the wetland types: permanent river (PR); seasonal river (SR); flooding wetland (FW); seasonal freshwater lake (SFL); herbaceous marsh (HM); shrub marsh (SM); inland salt marsh (ISM); seasonal salt water marsh (SSM); reservoir (RV); farm pond (FP); freshwater aquaculture (FA); irrigation field (IF); urban artificial landscape and recreational wetland (UAL); cultivated area (CA); garden plot (GP); forest (FR); grassland (GL); building region (BR); road (RD); structures (ST); artificial pile digging (APD); desert and bare land (DBW).