

Supplementary table 3. Downstream ecological maxima: Huayuankou GPP (9303 gC/m²/yr) and FVC (0.877) exceed upper-basin peaks (Tangnaihai 3010 gC/m²/yr, 0.482) by 3.1× and 1.8×.

Hydrological Station	Ecological variable	Year																							
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Tangnaihai	GPP (g C/m ² /y)	2152	2333	2427	2522	3010	2670	2043	2369	2474	2265	2033	1819	2296	1673	1789	1752	1937	2450	2031	2116	1998	1733	1711	2354
	FVC	0.397	0.323	0.364	0.359	0.482	0.436	0.197	0.228	0.263	0.283	0.190	0.169	0.308	0.097	0.106	0.162	0.149	0.199	0.193	0.283	0.264	0.271	0.052	0.206
Lanzhou	GPP (g C/m ² /y)	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534	65534
	FVC	0.208	0.122	0.000	0.000	0.000	0.098	0.041	0.000	0.000	0.000	0.021	0.077	0.000	0.051	0.095	0.108	0.105	0.138	0.074	0.092	0.117	0.153	0.115	0.179
Toudaoguai	GPP (g C/m ² /y)	2374	1862	3296	3712	3613	3351	3423	2884	3545	3446	3357	3115	3924	4451	4120	4157	5041	4717	4795	5112	4157	4459	4548	4546
	FVC	0.304	0.340	0.543	0.473	0.615	0.593	0.596	0.556	0.586	0.558	0.432	0.443	0.531	0.626	0.538	0.624	0.702	0.639	0.632	0.664	0.551	0.598	0.648	0.609
Longmen	GPP (g C/m ² /y)	5631	5067	5272	4933	5046	5304	5137	5973	5982	5881	3728	2218	2297	3704	3110	4019	4160	4694	5444	4590	4928	5001	5779	6045
	FVC	0.785	0.775	0.679	0.671	0.797	0.697	0.793	0.839	0.779	0.741	0.439	0.384	0.073	0.468	0.630	0.431	0.461	0.601	0.589	0.525	0.567	0.447	0.442	0.593
Tongguan	GPP (g C/m ² /y)	5285	4334	5269	6423	6516	6277	6912	6698	6322	7148	7416	6779	7848	6613	6957	8029	7023	7571	7579	5740	8396	7836	9303	8937
	FVC	0.603	0.361	0.344	0.621	0.614	0.721	0.531	0.609	0.537	0.803	0.808	0.582	0.609	0.764	0.678	0.666	0.560	0.615	0.555	0.499	0.767	0.629	0.692	0.707
Huayuankou	GPP (g C/m ² /y)	4416	5405	4873	5295	4689	4059	3752	3651	3514	3630	4617	1707	2211	2434	2450	3123	4370	4915	3863	3088	1279	1288	883	2089
	FVC	0.574	0.877	0.698	0.598	0.313	0.698	0.640	0.699	0.697	0.608	0.450	0.227	0.269	0.221	0.032	0.422	0.515	0.597	0.431	0.271	0.000	0.000	0.029	0.182
Gaocun	GPP (g C/m ² /y)	5753	5944	5594	5972	6442	6370	4687	5944	7169	5201	6411	6735	6778	6135	8121	7811	7553	8147	7753	7311	8530	7575	8383	7878
	FVC	0.781	0.963	0.830	0.676	0.846	0.822	0.795	0.791	0.866	0.884	0.762	0.799	0.695	0.844	0.823	0.878	0.742	0.914	0.804	0.934	0.945	0.941	0.945	0.872
Aishan	GPP (g C/m ² /y)	4728	4683	4236	5364	5747	5053	5508	5550	6594	5120	5048	5695	6368	5399	4734	6758	6298	5425	6699	5289	6922	6864	6804	6112
	FVC	0.611	0.691	0.326	0.746	0.484	0.907	0.740	0.722	0.703	0.670	0.488	0.722	0.652	0.690	0.719	0.786	0.638	0.617	0.599	0.582	0.488	0.754	0.716	0.504
Lijin	GPP (g C/m ² /y)	4764	4758	5209	5220	5883	5197	5481	5180	5189	4879	4763	5261	5539	5534	5665	5688	6596	6593	6933	6457	6967	6929	6871	6550
	FVC	0.652	0.693	0.628	0.810	0.767	0.621	0.678	0.677	0.683	0.676	0.665	0.962	0.611	0.655	0.771	0.712	0.649	0.779	0.775	0.580	0.762	0.834	0.760	0.701

The bolded numbers in the table represent the maximum values over the years, while the underlined data represents the minimum values over the years.

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Formatted: Indent: First line: 0 ch