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Supplementary material

2 **Dissolved phosphorous through dry-wet-dry transitions in a small-dammed**
3 **river basin: integrated understanding on transport patterns, export controls,**
4 **and fate**

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13 This document extends for 9 pages consists of 3 figures and 4 tables.



Rubber dam (Lower-reach)



Traditional agriculture (Middle-reach)



Sand trapping dam (Lower-reach)



Traditional agriculture (Middle-reach)

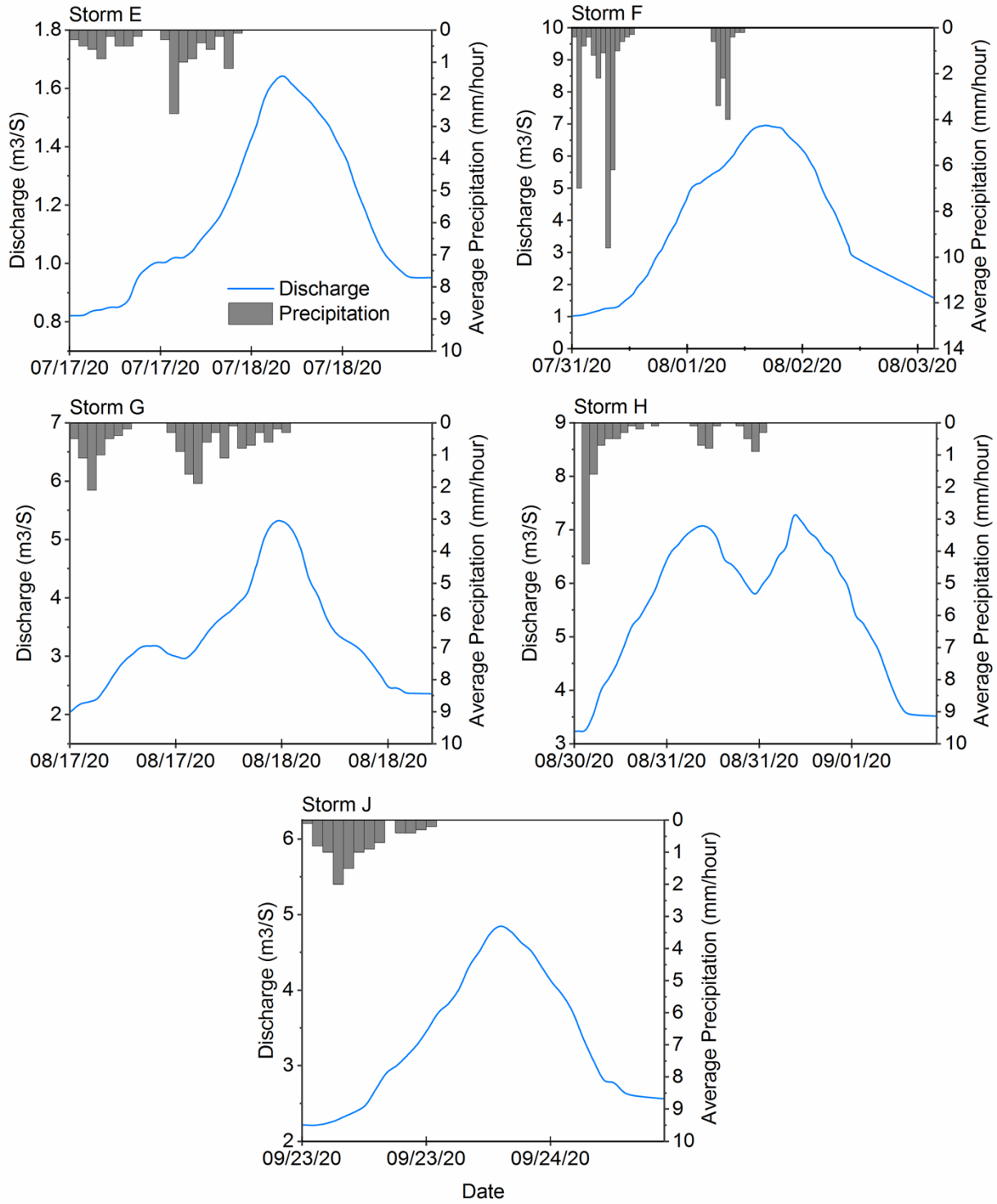


Concrete weirs (Donggou-reach)



Semi-intensive agriculture (Xigou-reach)

14 **Fig. S1** Images displaying human interactions with the Qingshuihe river system.



16 **Fig. S2** Plots showing discharge and average hourly precipitation behaviors of the five storm
 17 events.

18 **Table S1** TP, PP, and TSS concentration-discharge relationships

Item	Storm event	HI_m	Hysteresis pattern	Actual loop size (mg/L)
TP	E	-0.210	Counter-clockwise	-0.066
	F	0.359	Clockwise	0.764
	G	0.146	Clockwise	0.044
	H	NA ^a	Complex	NA
	J	0.140	Clockwise	0.031
PP	E	-0.224	Counter-clockwise	-0.075
	F	0.341	Clockwise	0.703
	G	0.083	Clockwise	0.023
	H	NA	Complex	NA
	J	0.236	Clockwise	0.044
TSS	E	-0.278	Counter-clockwise	-53.395
	F	0.243	Clockwise	434.037
	G	0.079	Clockwise	11.864
	H	NA	Clockwise	NA
	J	0.105	Clockwise	21.966

19 “NA”: Two discharge peaks and relatively complex concentration behavior in storm H hindered the
 20 index calculation

21 HI_m values of clockwise PP responses were greater than the corresponding values of TSS in
 22 each comparison and the trend was reversed when comparing HI_m values of the counter-
 23 clockwise patterns of PP and TSS, indicating concentrated PP delivery in rising sedigraph
 24 limbs compared to falling sedigraph limbs leading to expand the clockwise PP loops and shrink
 25 counter-clockwise loops compared to TSS.

26 **Table S2** Dry period before the wet season ($\text{dry}_{(\text{before})}$) baseflow data (B1)

27	River reach	Sub-catchment	TP (mg/L)	TDP (mg/L)	PP (mg/L)	PO4 (mg/L)	DOP (mg/L)	PP/TP	PO4/TP	DOP/TP
28	Lower-reach	W2	0.45	0.14	0.31	0.14	0.01	0.68	0.30	0.01
29		W1	0.54	0.16	0.38	0.15	0.01	0.70	0.28	0.02
30	Xigou-reach	X6	0.09	0.05	0.04	0.02	0.02	0.49	0.26	0.25
31		X5	0.11	0.04	0.07	0.02	0.01	0.67	0.22	0.11
32		X4	0.08	0.03	0.04	0.02	0.01	0.58	0.26	0.16
33		X3	0.06	0.03	0.03	0.02	<0.01	0.53	0.42	0.05
34		X2	0.16	0.04	0.12	0.01	0.03	0.74	0.07	0.19
35		X1	0.06	0.02	0.03	0.02	0.01	0.61	0.28	0.11
36	Middle-reach	Y4	0.40	0.14	0.26	0.14	0.01	0.64	0.34	0.01
37		Y3	0.66	0.16	0.50	0.16	0.01	0.75	0.24	0.01
38		Y2	0.70	0.22	0.47	0.21	0.01	0.68	0.30	0.01
39		Y1	1.20	0.35	0.85	0.34	0.01	0.71	0.28	0.01
40	Zhenggou-reach	Z3	0.02	0.02	<0.01	0.02	<0.01	0.05	0.91	0.04
41		Z2	0.01	0.01	<0.01	<0.01	<0.01	0.42	0.27	0.31
42		Z1	0.05	0.03	0.02	0.02	0.01	0.38	0.46	0.15
43	Donggou-reach	D7	0.95	0.21	0.74	0.21	<0.01	0.78	0.22	0.00
44		D6	0.76	0.16	0.60	0.15	<0.01	0.79	0.20	0.01
45		D5	1.75	0.44	1.31	0.43	0.01	0.75	0.25	0.01
46		D4	0.08	0.02	0.06	0.02	0.01	0.73	0.19	0.08

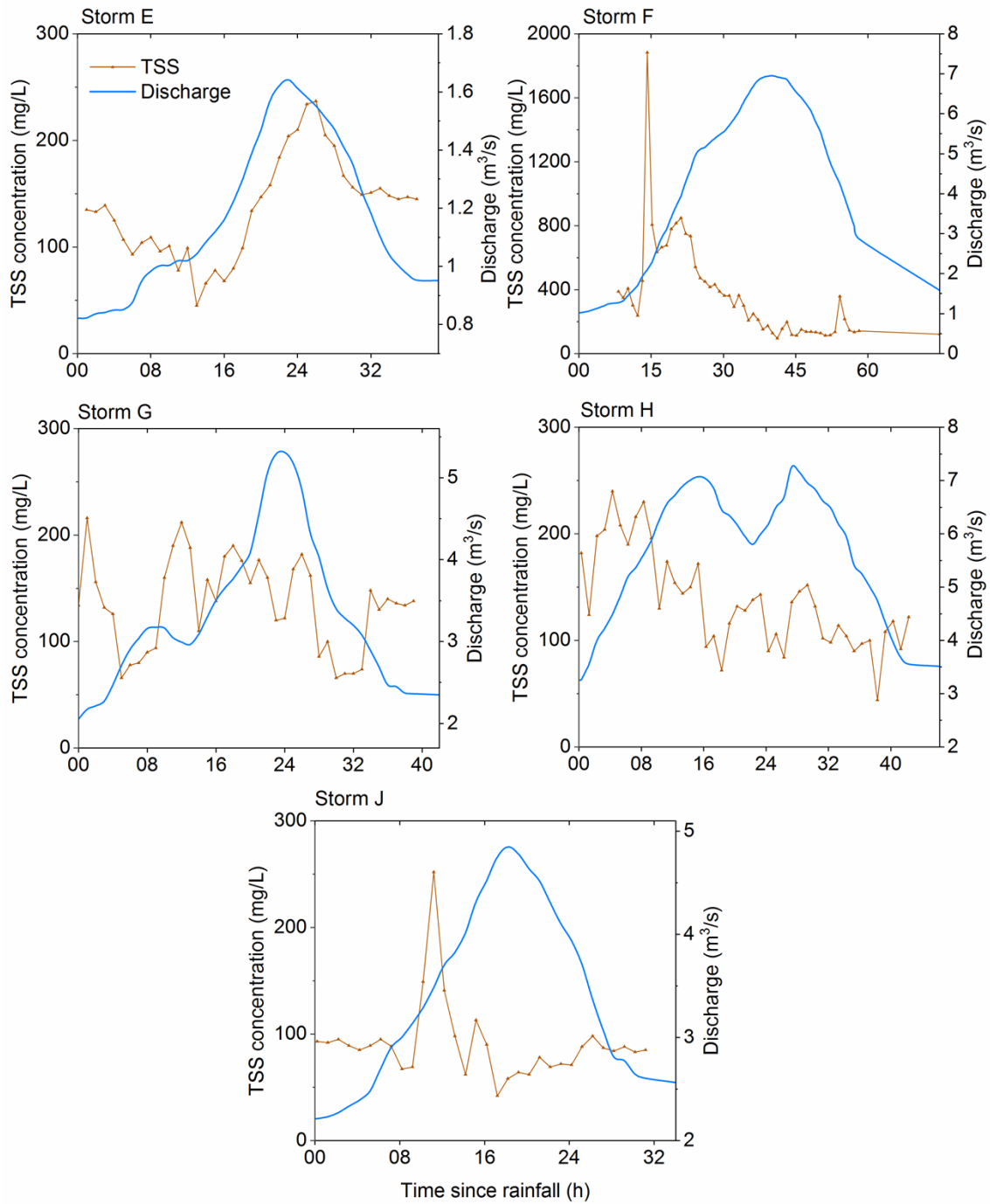
39 **Table S3** Dry period after the wet season (dry_(after)) baseflow data (B2)

River reach	Sub-catchment	TP (mg/L)	TDP (mg/L)	PP (mg/L)	PO4 (mg/L)	DOP (mg/L)	PP/TP	PO4/TP	DOP/TP
Lower-reach	W2	0.38	0.18	0.20	0.13	0.04	0.53	0.35	0.12
	W1	0.39	0.15	0.24	0.12	0.03	0.62	0.30	0.08
Xigou-reach	X6	0.06	0.05	<0.01	0.02	0.03	0.09	0.38	0.53
	X5	0.07	0.06	0.01	0.03	0.03	0.10	0.38	0.52
	X4	0.10	0.06	0.05	0.01	0.04	0.47	0.12	0.41
	X3	0.11	0.06	0.05	0.02	0.04	0.45	0.20	0.36
	X2	0.07	0.06	0.01	0.03	0.03	0.14	0.36	0.50
	X1	0.07	0.07	<0.01	0.02	0.05	0.07	0.24	0.69
Middle-reach	Y4	0.53	0.19	0.34	0.17	0.02	0.64	0.33	0.03
	Y3	0.99	0.22	0.78	0.18	0.03	0.78	0.18	0.03
	Y2	0.40	0.24	0.16	0.17	0.06	0.41	0.44	0.15
	Y1	0.44	0.22	0.22	0.15	0.08	0.50	0.33	0.17
Zhenggou-reach	Z3	0.09	0.08	0.01	0.02	0.06	0.16	0.19	0.65
	Z2	0.07	0.06	0.01	0.01	0.05	0.19	0.17	0.63
	Z1	0.09	0.05	0.04	0.03	0.03	0.43	0.28	0.28
Donggou-reach	D7	0.48	0.21	0.27	0.15	0.07	0.56	0.30	0.14
	D6	0.91	0.23	0.68	0.20	0.02	0.75	0.23	0.02
	D5	0.88	0.36	0.52	0.24	0.12	0.59	0.27	0.13
	D4	0.08	0.07	0.01	0.01	0.06	0.17	0.10	0.72
	D3	0.09	0.07	0.01	0.03	0.05	0.13	0.30	0.58
	D2	0.10	0.09	0.01	0.02	0.07	0.10	0.17	0.73
	D1	0.12	0.07	0.04	0.02	0.06	0.37	0.14	0.49

41 **Table S4** Summary of baseflow P concentration and composition variations between river
 42 reaches and events

Baseflow event	River reach	Feature	TP	PP	PO4-P	DOP
B1	Lower-reach	Max-con.	0.536	0.377	0.151	0.008
		Min-con.	0.453	0.310	0.138	0.005
		Average-con.	0.494	0.343	0.144	0.007
		Averaged fraction of TP		69%	29%	1%
	Xigou-reach	Max-con.	0.159	0.117	0.024	0.030
		Min-con.	0.056	0.029	0.011	0.003
		Average-con.	0.091	0.057	0.020	0.014
		Averaged fraction of TP		60%	25%	14%
	Middle-reach	Max-con.	1.197	0.847	0.339	0.011
		Min-con.	0.403	0.259	0.138	0.005
		Average-con.	0.740	0.520	0.212	0.008
		Averaged fraction of TP		70%	29%	1%
	Zhenggou-reach	Max-con.	0.051	0.020	0.024	0.008
		Min-con.	0.012	0.001	0.003	0.001
		Average-con.	0.027	0.008	0.014	0.004
		Averaged fraction of TP		28%	55%	17%
	Donggou-reach	Max-con.	1.750	1.307	0.433	0.010
		Min-con.	0.080	0.059	0.016	0.004
		Average-con.	0.886	0.677	0.203	0.006
		Averaged fraction of TP		76%	22%	2%
B2	Lower-reach	Max-con.	0.386	0.238	0.133	0.044
		Min-con.	0.376	0.199	0.116	0.032
		Average-con.	0.381	0.219	0.124	0.038
		Averaged fraction of TP		57%	33%	10%
	Xigou-reach	Max-con.	0.109	0.049	0.025	0.048
		Min-con.	0.055	0.005	0.013	0.029
		Average-con.	0.079	0.021	0.021	0.038
		Averaged fraction of TP		22%	28%	50%
	Middle-reach	Max-con.	0.993	0.778	0.182	0.076
		Min-con.	0.396	0.160	0.145	0.017
		Average-con.	0.590	0.374	0.169	0.047
		Averaged fraction of TP		58%	32%	10%
	Zhenggou-reach	Max-con.	0.090	0.039	0.025	0.058
		Min-con.	0.075	0.014	0.013	0.025
		Average-con.	0.085	0.023	0.018	0.044
		Averaged fraction of TP		26%	22%	52%
	Donggou-reach	Max-con.	0.906	0.679	0.240	0.117
		Min-con.	0.085	0.010	0.009	0.023
		Average-con.	0.378	0.221	0.094	0.064

Averaged fraction of TP	38%	22%	40%
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43 **Fig. S3** The figure shows the concentration behavior of TSS during the five storm events.