Figure

Table

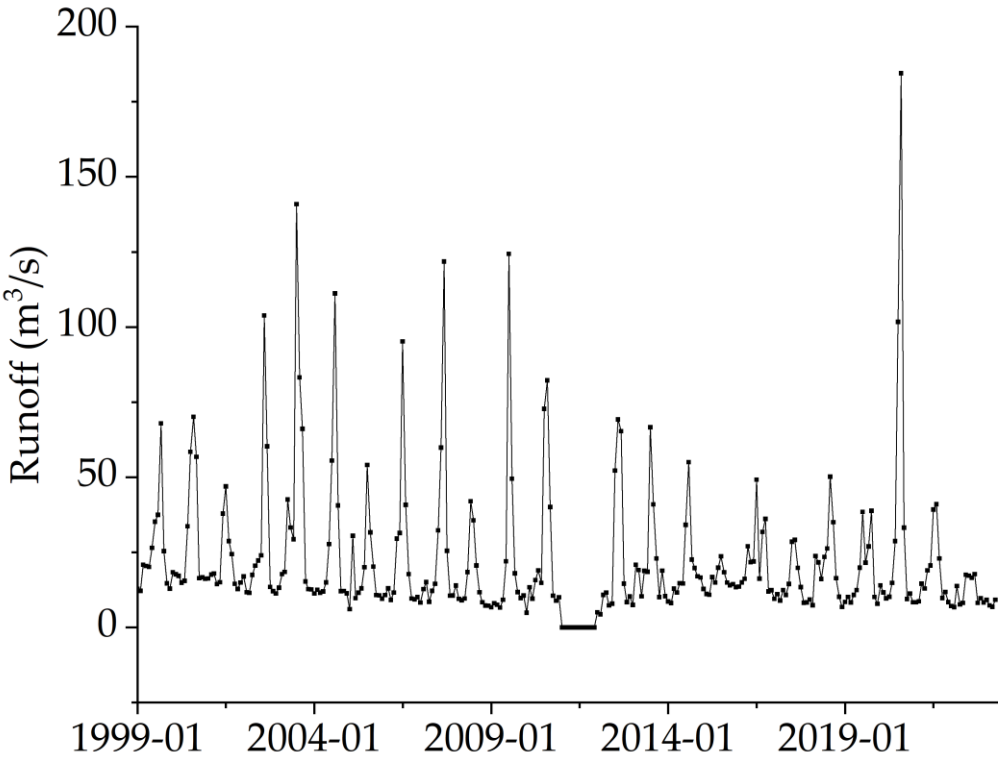
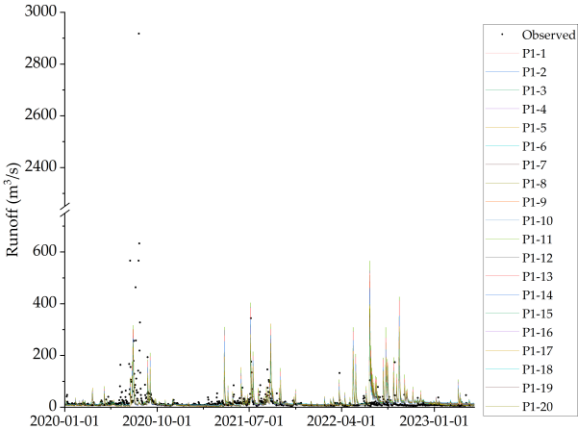
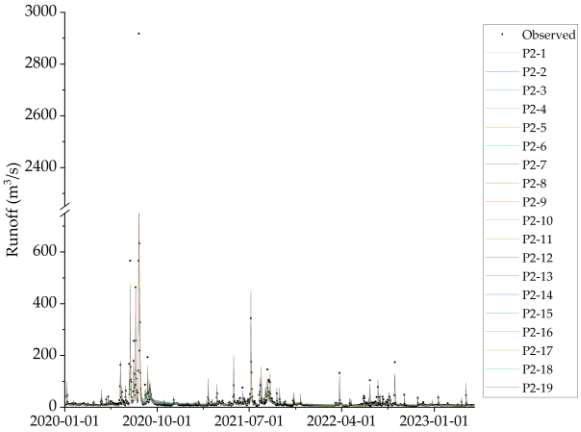


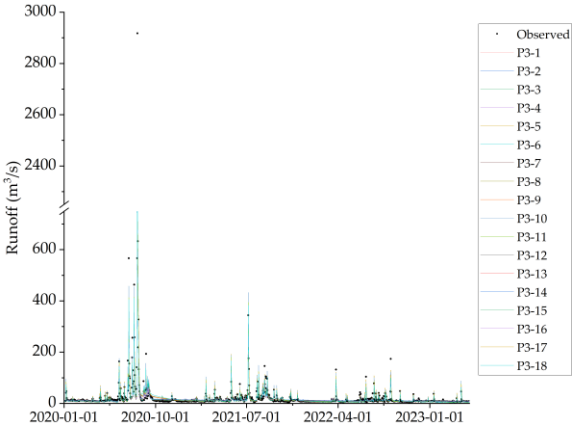
Figure S1. Monthly runoff in the Yeongsan river basin during historical periods.



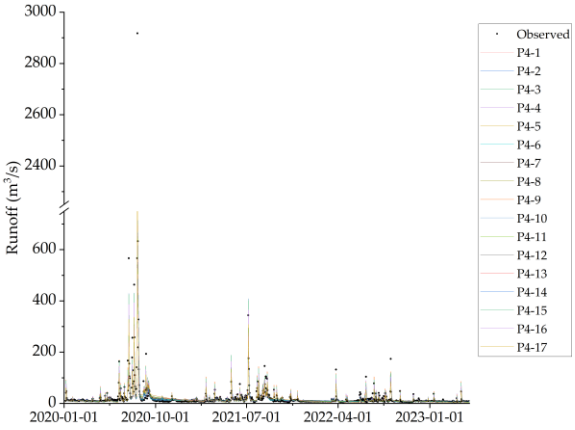
(**a**) P1



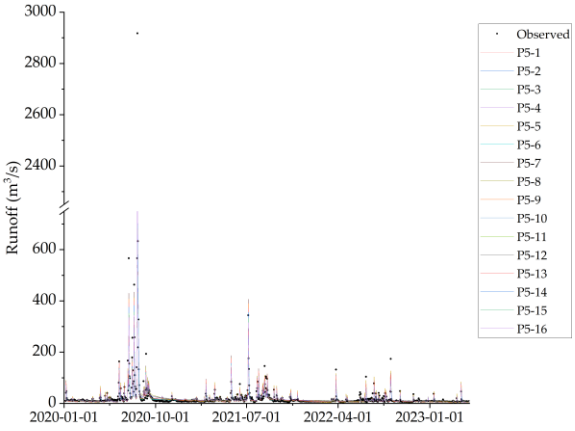
(**b**) P2



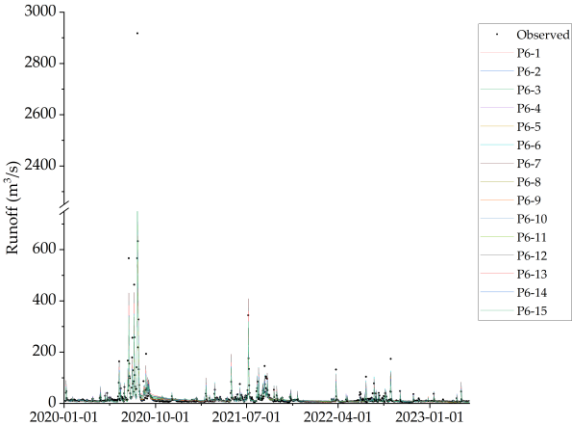
(**c**) P3



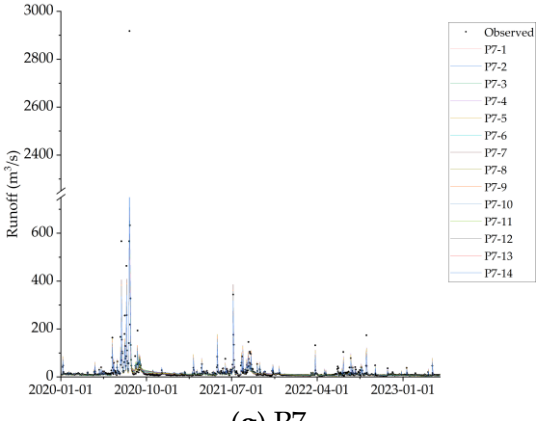
(**d**) P4



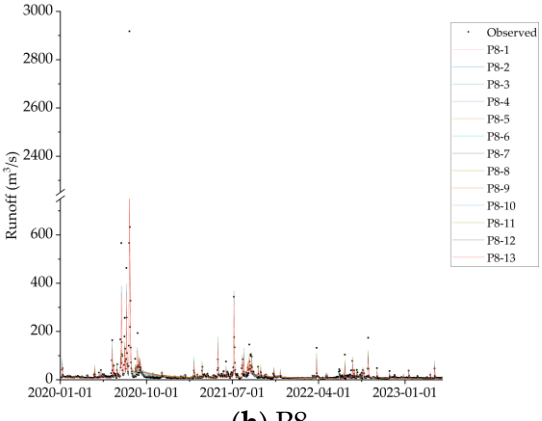
(**e**) P5



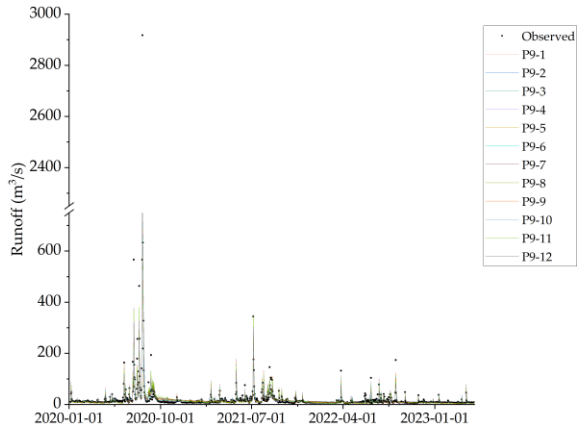
(**f**) P6



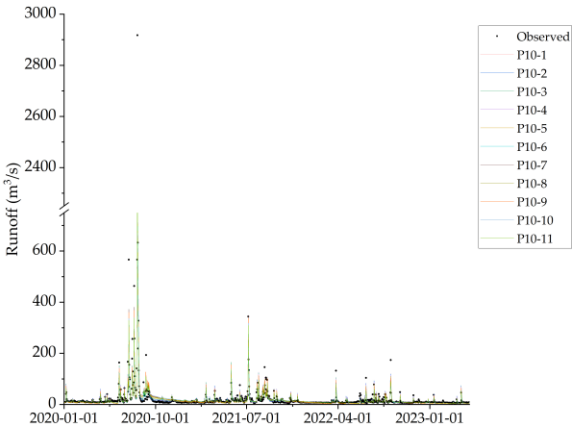
(**g**) P7



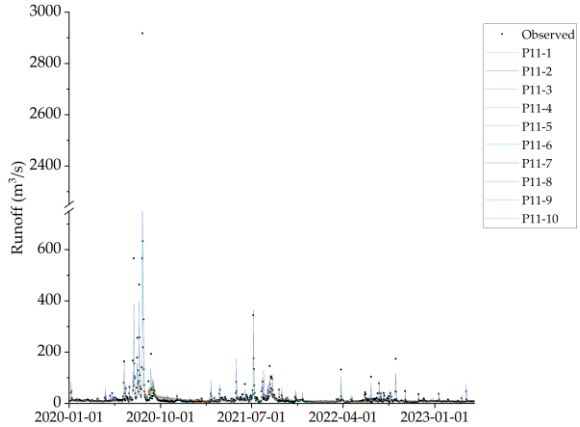
(**h**) P8



(**i**) P9



(**j**) P10



(**k**) P11

Figure S2. Hydrographs over the validation period.

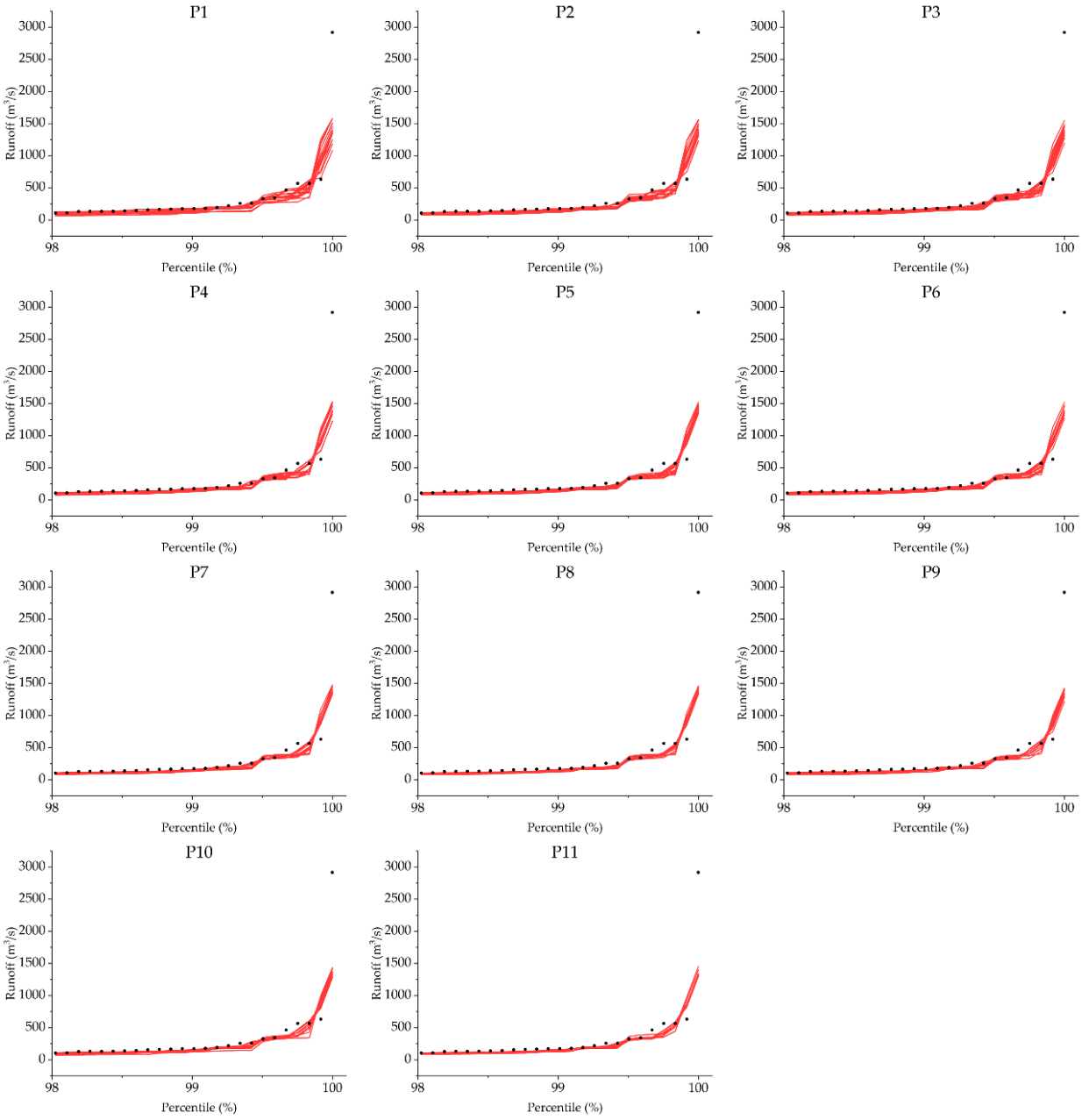


Figure S3. Comparison of observed and simulated extreme runoff of above 98th percentile (Red line is simulated runoff data and black dot is observed runoff data).

Table S1. SWAT parameters and their ranges selected for calibration.

	Parameter	Description	Range		Method
			Min	Max	
Ground water	ALPHA_BF	Baseflow alpha factor	0.01	0.4	Replace
	GW_DELAY	Groundwater delay time	50	450	Absolute
Hydrologic response unit	ESCO	Soil evaporation compensation factor	0.5	0.99	Replace
	SURLAG	Surface runoff lag coefficient	0.1	10	Replace
Soil	SOL_K	Saturated hydraulic conductivity	−0.25	0.25	Relative
Channel routing	CH_K2	Effective hydraulic conductivity in main channel alluvium	0	0.5	Replace

Management	CN2	Initial SCS runoff curve number for moisture condition Ⅱ	−0.25	0.25	Relative
Basin	SURLAG	Surface runoff lag coefficient	3	6	Replace

Table S2. Validation statistics of evaluation metrics of calibration periods.

Evaluation Metrics	Criteria	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
NSE	Avg.	0.72	0.73	0.73	0.73	0.74	0.74	0.74	0.74	0.73	0.72	0.73
	Median	0.73	0.73	0.74	0.73	0.74	0.74	0.74	0.74	0.74	0.72	0.72
	25%	0.70	0.72	0.72	0.73	0.73	0.73	0.73	0.73	0.72	0.71	0.72
	75%	0.75	0.74	0.75	0.75	0.75	0.75	0.74	0.75	0.74	0.74	0.73
	IQR	0.05	0.02	0.03	0.02	0.02	0.02	0.01	0.02	0.02	0.03	0.01
KGE	Avg.	0.60	0.60	0.61	0.61	0.61	0.61	0.61	0.60	0.59	0.59	0.59
	Median	0.59	0.60	0.62	0.60	0.61	0.61	0.61	0.60	0.60	0.59	0.59
	25%	0.56	0.57	0.58	0.58	0.59	0.58	0.60	0.59	0.58	0.57	0.57
	75%	0.65	0.63	0.63	0.63	0.63	0.62	0.63	0.62	0.61	0.61	0.60
	IQR	0.09	0.06	0.05	0.05	0.04	0.04	0.03	0.04	0.03	0.04	0.03
Pbias	Avg.	2.85	2.91	2.78	3.18	3.30	2.84	3.17	4.36	3.40	4.27	3.74
	Median	−2.75	−2.90	−2.95	−3.10	−3.20	−2.70	−3.35	−4.80	−3.50	−4.70	-4.25
	25%	−4.23	−3.70	−3.53	−4.25	−4.68	−4.20	−4.43	−5.80	−4.98	−6.00	-4.80
	75%	−0.20	−1.70	−0.98	−2.25	−1.63	−0.70	−1.53	−2.95	−1.23	−2.60	-2.50
	IQR	4.03	2.00	2.55	2.00	3.05	3.50	2.90	2.85	3.75	3.40	2.30
NRMSE	Avg.	52.52	52.05	51.55	51.62	51.08	51.37	51.16	51.32	52.17	52.35	52.33
	Median	51.90	52.10	51.15	51.80	51.05	51.30	50.90	51.30	51.30	52.70	52.80
	25%	50.43	50.70	50.00	50.00	50.28	50.30	50.53	50.35	51.13	50.90	51.45
	75%	54.15	53.10	52.80	52.30	51.68	52.10	52.10	52.35	53.20	53.50	53.13
	IQR	3.73	2.40	2.80	2.30	1.40	1.80	1.58	2.00	2.08	2.60	1.68

Table S3. Differences in extreme values between simulated and observed runoff using JS-D.

Criteria	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
Avg.	0.0143	0.0138	0.0139	0.0139	0.0135	0.0136	0.0131	0.0137	0.0140	0.0139	0.0138
Median	0.0138	0.0145	0.0136	0.0138	0.0137	0.0132	0.0132	0.0136	0.0135	0.0133	0.0135
25%	0.0130	0.0119	0.0125	0.0124	0.0125	0.0127	0.0125	0.0126	0.0128	0.0127	0.0120
75%	0.0156	0.0153	0.0157	0.0149	0.0144	0.0148	0.0137	0.0149	0.0153	0.0156	0.0156
IQR	0.0026	0.0033	0.0032	0.0025	0.0019	0.0021	0.0012	0.0023	0.0025	0.0028	0.0035