

Modeling the hydrologic influence of subsurface tile drainage using the National Water Model

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Introduction

In this supporting information, we provide two figures and three tables to support the manuscript. The spatial distributions of land use (i.e., croplands and tile drainage) in the Upper Mississippi River Basin and Ohio River Basin are presented in Figure S1. A graphical explanation for the high-flow and low-flow identification from the streamflow timeseries is presented in Figure S2. All the p-values from the statistical significance tests conducted for the manuscript are provided in Table S1 to S3.

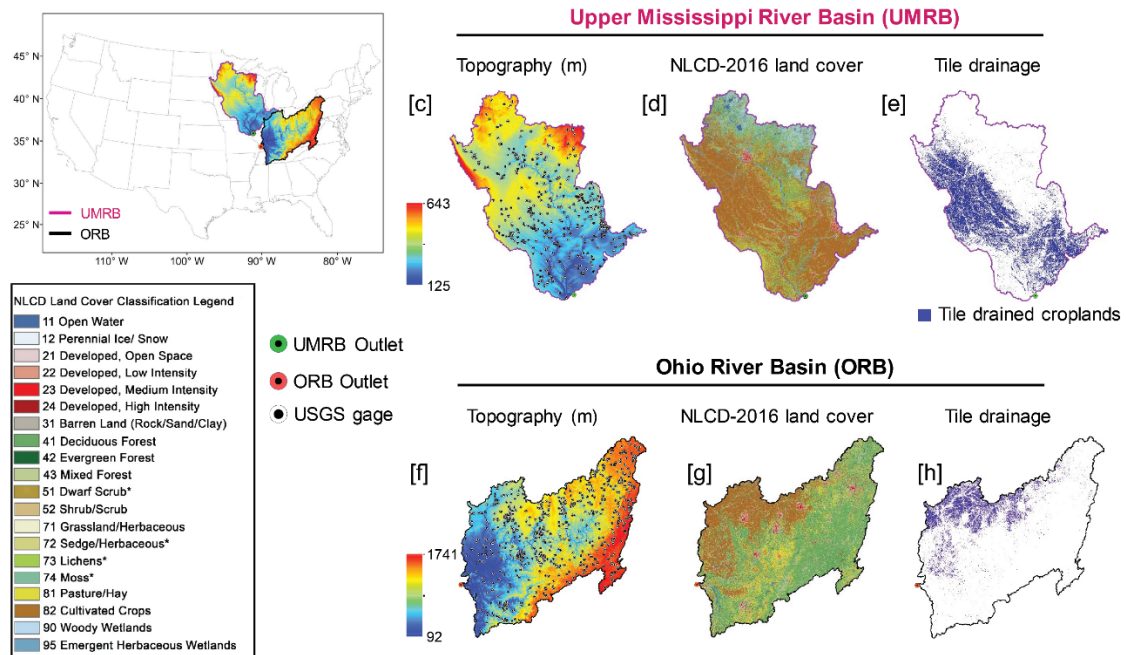


Figure S1. The spatial distributions of land use land cover in UMRB and ORB.

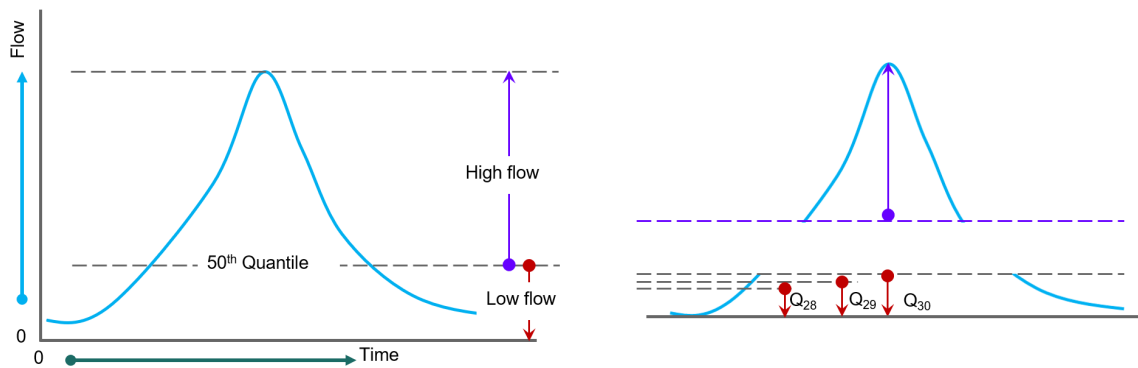


Figure S2. Schematic representation of high flow and low flow definitions used in this study.

Table S1. The statistical significance (p-value) of the NWM performance change between experiments estimated using Wilcoxon signed rank test for the calibration period. Red font indicates the changes are significant at 0.05 significance level.

Period	Season	Metric	Default [V2.0] and Default [V2.0+TD]	Default [V2.0] and Calibrated [V2.0]	Default [V2.0] and Calibrated [V2.0+TD]	Calibrated [V2.0] and Calibrated [V2.0+TD]
Calibration	DJF	COR	0.0721	0.0000	0.0000	0.4404
Calibration	DJF	RMSE	0.8375	0.3610	0.1896	0.6254
Calibration	DJF	PBIAS	0.8708	0.0000	0.0000	0.1306
Calibration	DJF	NSE	0.1039	0.0000	0.0000	0.0605
Calibration	DJF	NSEWT	0.4115	0.0000	0.0000	0.0557
Calibration	DJF	KGE	0.2201	0.0000	0.0000	0.0951
Calibration	MAM	COR	0.0006	0.0000	0.0000	0.0768
Calibration	MAM	RMSE	0.6055	0.1288	0.1438	0.6006
Calibration	MAM	PBIAS	0.5665	0.0000	0.0000	0.0221
Calibration	MAM	NSE	0.0010	0.0000	0.0000	0.0699
Calibration	MAM	NSEWT	0.0411	0.0000	0.0000	0.0557
Calibration	MAM	KGE	0.0018	0.0000	0.0000	0.2509
Calibration	JJA	COR	0.6105	0.0001	0.0000	0.0189
Calibration	JJA	RMSE	0.8430	0.3390	0.0909	0.3499
Calibration	JJA	PBIAS	0.7664	0.0000	0.0002	0.1101
Calibration	JJA	NSE	0.5618	0.0014	0.0000	0.0035
Calibration	JJA	NSEWT	0.7664	0.0018	0.0000	0.0059
Calibration	JJA	KGE	0.7718	0.0000	0.0000	0.1183
Calibration	SON	COR	0.7990	0.0000	0.0000	0.0994
Calibration	SON	RMSE	0.9831	0.1872	0.0243	0.2912
Calibration	SON	PBIAS	0.9099	0.0000	0.0000	0.0010
Calibration	SON	NSE	0.7881	0.0025	0.0000	0.0049
Calibration	SON	NSEWT	0.9436	0.0006	0.0000	0.0110
Calibration	SON	KGE	0.9492	0.0000	0.0000	0.0189

Table S2. The statistical significance (p-value) of the NWM performance change between experiments estimated using Wilcox signed rank test for the validation period. Red font indicates the changes are significant at 0.05 significance level.

Period	Season	Metric	Default [V2.0] and Default [V2.0+TD]	Default [V2.0] and Calibrated [V2.0]	Default [V2.0] and Calibrated [V2.0+TD]	Calibrated [V2.0] and Calibrated [V2.0+TD]
Validation	DJF	COR	0.0217	0.0000	0.0000	0.9718
Validation	DJF	RMSE	0.5908	0.0909	0.1644	1.0000
Validation	DJF	PBIAS	0.2509	0.0000	0.0000	0.3799
Validation	DJF	NSE	0.0124	0.0000	0.0000	0.9380
Validation	DJF	NSEWT	0.0135	0.0000	0.0000	0.4531
Validation	DJF	KGE	0.0021	0.0000	0.0001	0.9549
Validation	MAM	COR	0.0008	0.0000	0.0000	0.8763
Validation	MAM	RMSE	0.5859	0.1288	0.1824	0.8486
Validation	MAM	PBIAS	0.8597	0.0000	0.0000	0.2912
Validation	MAM	NSE	0.0031	0.0000	0.0000	0.6868
Validation	MAM	NSEWT	0.0496	0.0000	0.0000	0.3462
Validation	MAM	KGE	0.0005	0.0000	0.0000	0.7025
Validation	JJA	COR	0.3838	0.0000	0.0000	0.0152
Validation	JJA	RMSE	0.8375	0.3799	0.1518	0.5570
Validation	JJA	PBIAS	0.8320	0.0000	0.0000	0.0149
Validation	JJA	NSE	0.4531	0.0003	0.0000	0.0093
Validation	JJA	NSEWT	0.6558	0.0002	0.0000	0.0067
Validation	JJA	KGE	0.5288	0.0000	0.0000	0.5570
Validation	SON	COR	0.8375	0.0000	0.0000	0.1419
Validation	SON	RMSE	0.8875	0.6204	0.4573	0.5908
Validation	SON	PBIAS	0.9718	0.0000	0.0000	0.0332
Validation	SON	NSE	0.8100	0.1458	0.0003	0.0805
Validation	SON	NSEWT	0.8875	0.1039	0.0001	0.0073
Validation	SON	KGE	0.8154	0.0015	0.0000	0.0548

Table S3. The statistical significance (p-value) of the NWM performance change between experiments estimated using Wilcox signed rank test for the regional simulation. Red font indicate the changes are significant at 0.05 significance level.

Domain	Season	Metric	<i>Default and DefaultTD</i>	<i>Default and Calib</i>	<i>Default and CalibTD</i>	<i>Calib and CalibTD</i>
Regional	DJF	COR	0.0000	0.0000	0.0000	0.0000
Regional	DJF	RMSE	0.3787	0.0508	0.1708	0.8287
Regional	DJF	PBIAS	0.0266	0.0000	0.0000	0.0001
Regional	DJF	NSE	0.0000	0.0000	0.0000	0.1617
Regional	DJF	NSEWT	0.0000	0.0000	0.0000	0.0024
Regional	DJF	KGE	0.0000	0.0000	0.0000	0.0008
Regional	MAM	COR	0.0000	0.0000	0.0000	0.0000
Regional	MAM	RMSE	0.4326	0.2935	0.1369	0.2161
Regional	MAM	PBIAS	0.8638	0.0000	0.0000	0.5096
Regional	MAM	NSE	0.0000	0.0000	0.0000	0.0000
Regional	MAM	NSEWT	0.0000	0.0000	0.0000	0.0001
Regional	MAM	KGE	0.0000	0.0000	0.0000	0.0000
Regional	JJA	COR	0.0731	0.0005	0.0000	0.0000
Regional	JJA	RMSE	0.6772	0.8345	0.0641	0.0276
Regional	JJA	PBIAS	0.9227	0.0000	0.0000	0.0000
Regional	JJA	NSE	0.0409	0.0409	0.0000	0.0000
Regional	JJA	NSEWT	0.1897	0.1200	0.0000	0.0000
Regional	JJA	KGE	0.0339	0.0000	0.0000	0.0000
Regional	SON	COR	0.5707	0.0000	0.0000	0.0000
Regional	SON	RMSE	0.8369	0.9239	0.3731	0.2500
Regional	SON	PBIAS	0.8790	0.0000	0.0000	0.5231
Regional	SON	NSE	0.5348	0.5328	0.0006	0.0027
Regional	SON	NSEWT	0.6718	0.5840	0.0016	0.0003
Regional	SON	KGE	0.4136	0.0000	0.0000	0.0124