Supplementary Materials

Table S1. Distribution of irrigation and land use in Shell Creek.

Land Use	(%)	Irrigated	Dryland	Corn	Soybean
Irrigated Corn	24	x		x	
Irrigated Soybeans	14	x			x
Range, Pasture, Grass	18				
Dryland Corn	25		x	x	
Dryland Soybeans	13		x		x
Subtotal (%)	94	38	38	49	27

Table S2. Periods considered for trend analysis in summer (S) and winter (W) at precipitation stations near Shell Creek.

	Columbus	Elgin	Genoa	Madison	Oakdale	Schuyler	Elgin awdn	Monroe awdn
W	1910–2014	1912–2014	1910–2014	1910–2006	1910–2014	1910–2012	1988–2014	1997–2014
S	1910–2014	1912–2014	1910–2014	1910–2011	1910–2014	1910–2011	1988–2014	1996–2014

Table S3. Precipitation trend analysis in summer (S) and winter (W) at rain gage stations near Shell Creek.

	Variable	Columbus	Elgin	Genoa	Madison	Oakdale	Schuyler	Elgin awdn	Monroe awdn
W	H**	0	0	0	0	0	0	0	0
	p-value	0.627	0.064*	0.485	0.120	0.436	0.837	0.966	0.938
	slope	0.0016	−0.0062	0.0025	−0.006	−0.0023	−0.00053	0	−0.002
S	H**	0	0	0	0	0	0	0	0
	p-value	0.097*	0.096*	0.748	0.323	0.131	0.536	0.428	0.326
	slope	0.0059	0.0053	0.001	0.0034	0.005	0.0021	0.024	0.092

* Denote statistically significant trend at 10% significance level (90% confidence interval).** H=0 denotes no significant trend at 5% significance level.

Table S4. Performance of calibrated and validated models using rain gage and radar forcings.

	Calibration	Validation	Calibration	Validation
NSE	0.58	0.92	0.60	0.92
RSR	0.65	0.28	0.63	0.28
PBIAS	8.31	6.09	5.54	20.7

Table S5. Daily and monthly performances of the water quality model for Shell Creek.

SWAT Output Time-Step	Target Variable	Iteration#	No. parameters§	P ‡	R ‡	NSE† Flow	NSE Sediments	NSE Atrazine
Daily	Flow	S	31	0.94	0.79	0.29	-	-
		C	9	0.91	0.5	0.33	-	-
		V	-	-	-	0.19	-	-
	Sediments	S	9	0.37	0.01	0.36	0.02	-
		C	5	0.11	0.01	0.37	0.03	-
		V	-	-	-	0.43	0.01	-
	Atrazine	S	10	0.01	1365	0.37	0.03	0.23
		C	5	0.18	181.67	0.37	0.03	0.25
		V	-	-	-	0.43	0.01	−0.01
Monthly	Flow	S	31	0.94	1.91	0.63	-	-
		C	13	0.89	1.71	0.79	-	-
		V	-	-	-	0.65	-	-
	Sediments	S	9	0.33	1.21	0.77	0.69	-
		C	5	0.39	0.84	0.77	0.69	-
		V	-	-	-	0.69	0.47	-

Atrazine	S	10	0	117141	0.77	0.69	−0.09
	C	4	0.61	12.19	0.77	0.69	−0.08
	V	-	-	-	0.69	0.47	−0.05

[#] S: Sensitivity analysis and C: Calibration (1992-94) used a 2,000-runs iteration total, V: Validation (2008-09) used a 1-run with the best parameters from calibration. [†] Nash-Sutcliffe efficiency (NSE) coefficient. [§] Number of parameters allowed changing their values in a given iteration. [‡] P-factor: percentage of observations within 95PPU, and R-factor: mean thickness of 95PPU band divided by the standard deviation of observed data.

Table S6. SWAT parameter values for atrazine.

Parameters description	Units	Atrazine
Pesticide percolation coefficient		0.5
Application efficiency	fraction	0.99
Degradation half-life on the foliage	days	5
Degradation half-life in the soil	days	61
Soil adsorption coefficient normalized for soil organic carbon content	(mg/kg)/(mg/L)	171
Wash-off fraction	fraction	0.45
Solubility of the chemical in water	mg/L	33
Amount of pesticide applied to HRU	kg/ha	1
Depth of pesticide incorporation in the soil	mm	0

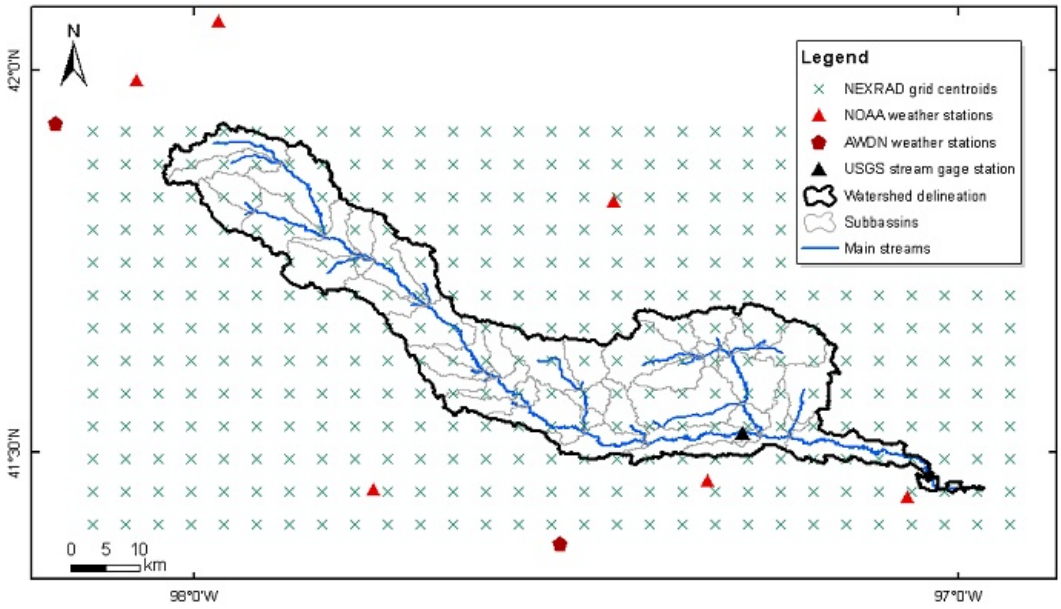

Figure S1. Rain gage stations and radar grid centroids used as forcings of the Shell Creek. model in SWAT

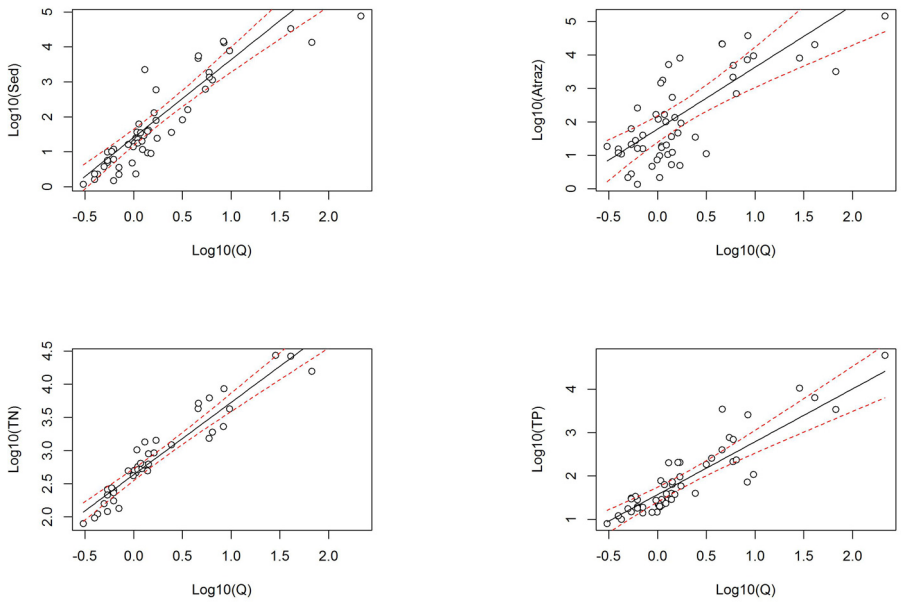

Figure S2. Logarithmic regression between sediments, nutrients, and atrazine, and streamflow in Shell Creek. The black line is the fitted regression. Red dashed lines display the 95% confidence band. Sed: sediments; Atraz: atrazine; TN: total nitrogen; TP: total phosphorus; Q: streamflow.