Supplemental Information

Chloride Sources and Losses in Two Tile-Drained Agricultural Watersheds

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Road Salt Estimate

To estimate recent annual road salt applications in each watershed we communicated with local officials in charge of city streets and local roads to obtain typical road salt use and km of roads that the salt was applied to. There were no long-term records available. We obtained the following estimates of salt applications during the past five years, which included winters with below average to above average snow: City of Champaign, 17.5 Mg km^{-1} yr^{-1} (Ernesto Salinas, personal communication, 2015), City of Urbana, 11.5 Mg km^{-1} yr^{-1} (William Gray, personal communication, 2015), Village of Savoy, 9.7 Mg km^{-1} yr^{-1} (Brent Maue, personal communication, 2015), Champaign County, 18.2 Mg km^{-1} yr^{-1} (Jeff Blue, personal communication, 2015); Piatt County 10.4 Mg km^{-1} yr^{-1} (Eric Seibring, personal communication, 2015). Road and street km in each watershed was determined using ArcMap 10.1. Highway GIS files were downloaded from the Illinois Technology Transfer Center within the Illinois Department of Transportation with the latest available data from 2013. These shape data files were clipped with the shape files of the two watersheds. The attribute tables of the clipped highway shape files were then sorted and summed to determine municipal, county, and state maintained roadway km within each watershed. The road km were then multiplied by the salt application rates listed above. For road categories where we didn't have a direct estimate, the average of the other estimates was used (13.5 Mg salt km^{-1} yr^{-1}).

Table S1. Results of linear regression analysis with annual flow weighted chloride concentrations (mg L^{-1}) as the dependent variable for the Embarras River.

Independent variable	Regression coefficient	*t*	*p* > [*t*]	R^2
Water yield (cm)	-0.15	-4.41	< 0.0001	
Lag† (potash fertilizer sales) (1000 metric tons yr^{-1} as Cl)	0.039	10.82	< 0.0001	0.73

†The lag of potash fertilizer sales refers to the average four year sales lagged two years (i.e., value for 1962 was the average sales for 1957-1960)

Table S2. Median sodium and chloride concentrations and molar ratios from water samples collected at various locations in the Embarras River watershed during 1994 through 1996.

Watershed location	n	Sodium	Chloride	Ratio
		------------- mg L^{-1} --------------		mol mol^{-1}
Champaign	113	33.3	63.6	0.79
Urbana	111	32.2	59.4	0.80
Curtis Road	121	24.5	47.1	0.81
300 N	123	12.9	27.8	0.72
Outlet at Camargo	121	10.3	25.7	0.72

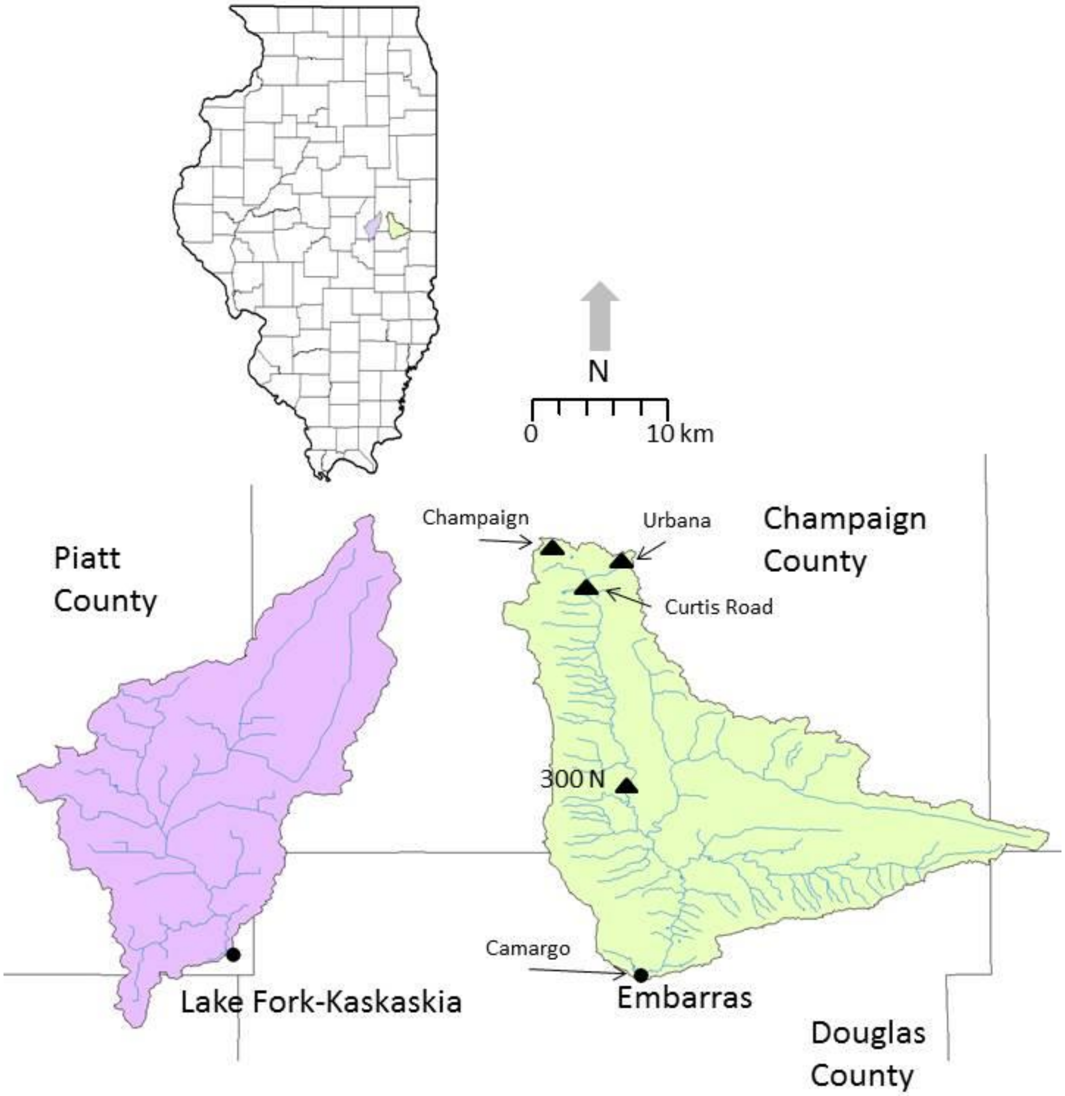

Figure S1. Map of Kaskaskia and Embarras River watersheds in east-central Illinois, showing watershed outlets that are gaged by the USGS (black dots), as well as other water quality sampling sites in the Embarras River watershed (triangles).

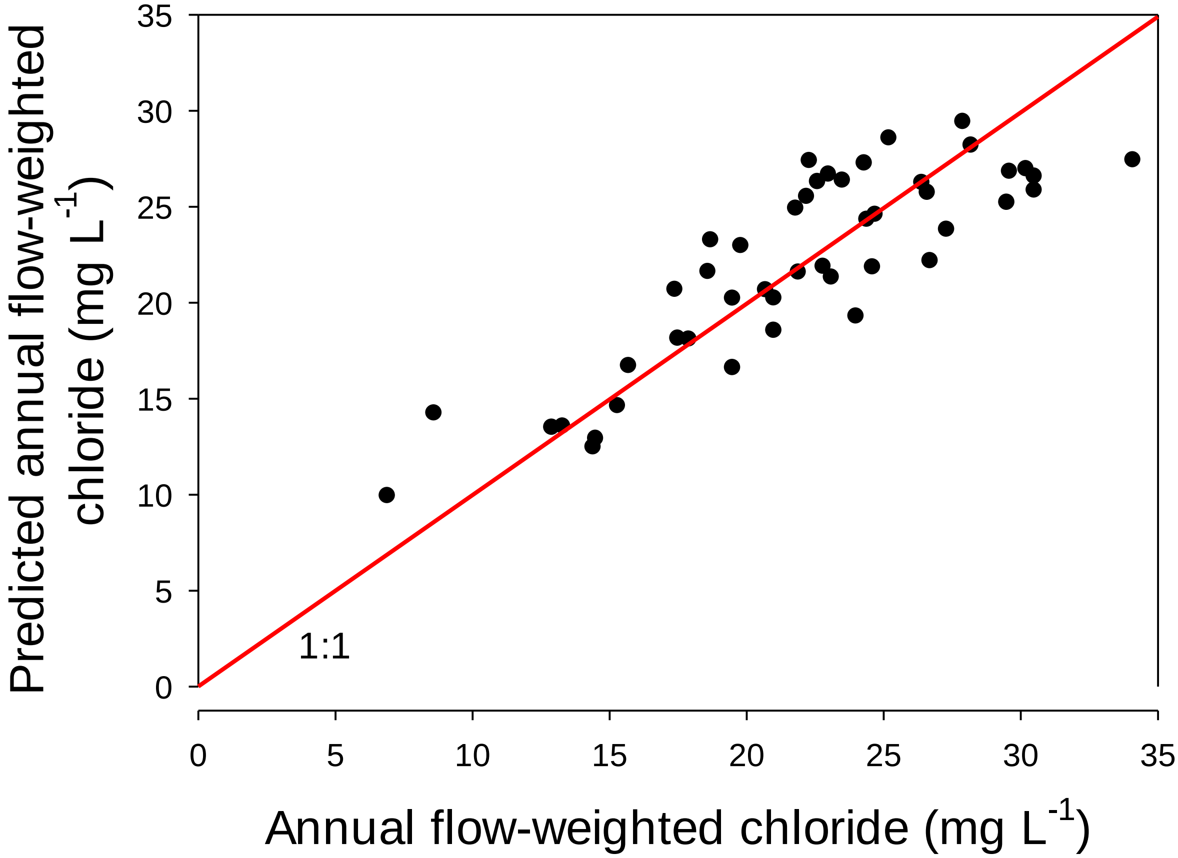

Figure S2. Annual flow-weighted chloride concentration for the Embarras River for the 1962-2014 water years versus multiple regression model predicted values. Also shown is a 1:1 line.

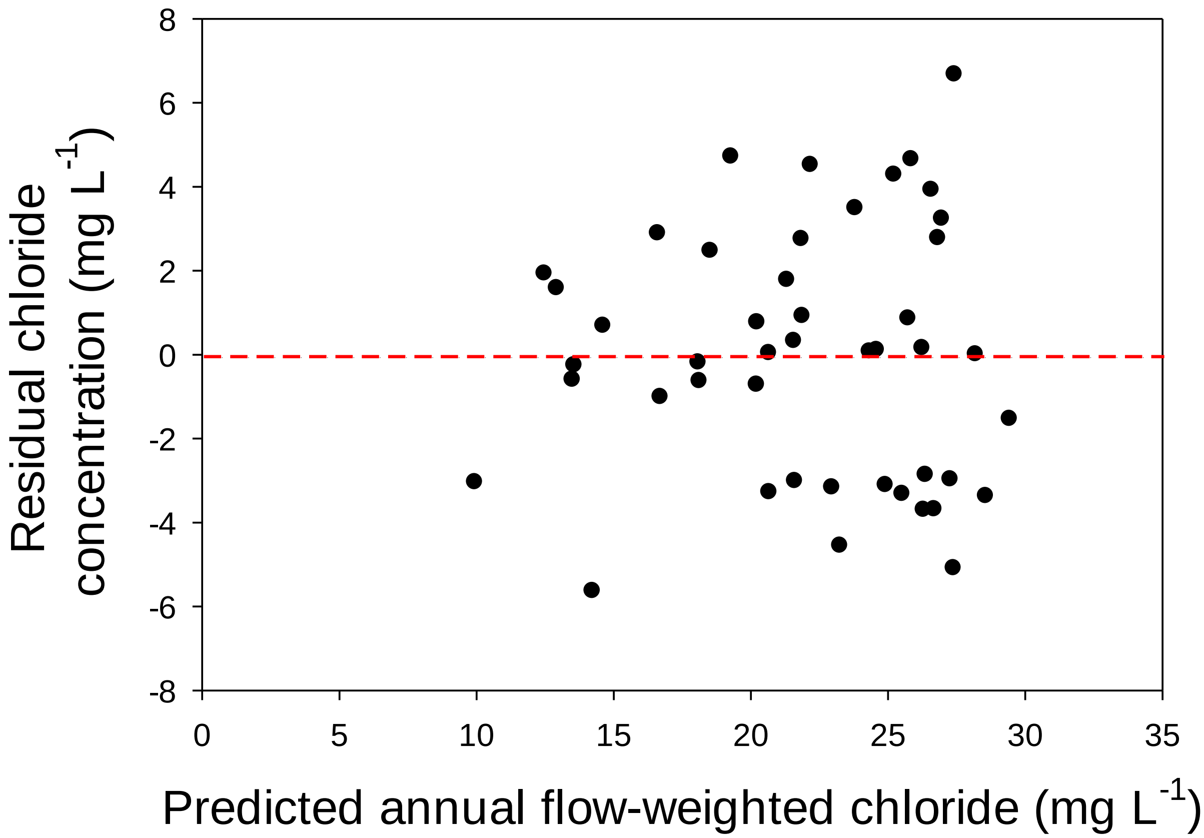

Figure S3. Plot of model residuals versus predicted multiple regression model annual flow-weighted chloride concentrations for the Embarras River for the 1962-2014 water years.

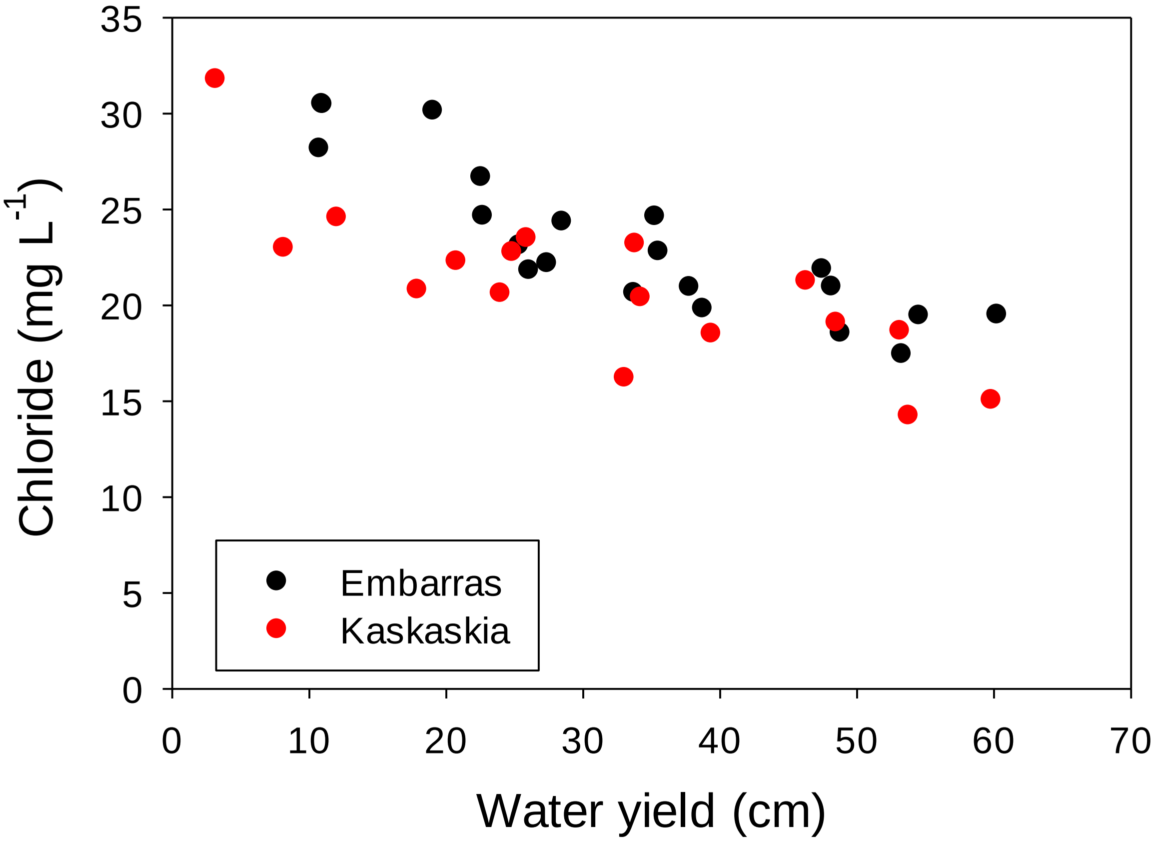

Figure S4. Flow weighted chloride concentrations and water yields for the Embarras River watershed at Camargo, IL and the Kaskaskia River at Atwood, IL.

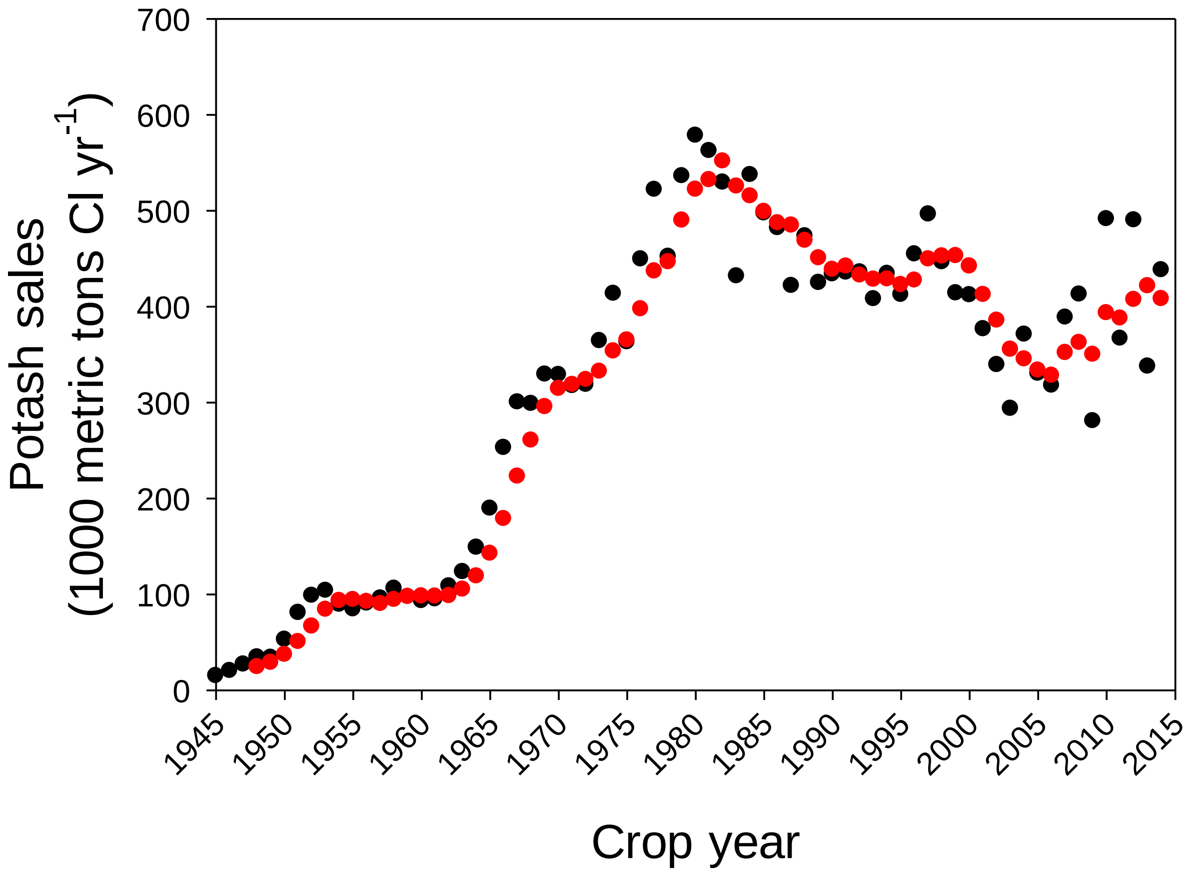

Figure S5. Annual Illinois fertilizer sales of potash (shown as input of chloride) by crop year (July – June). Four year moving average shown in red.