

Supplementary Materials for

**Modelling historical variability of phosphorus and organic carbon fluxes to the Mackenzie River,
Canada**

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Table S1: Seasonal summary of the TP and DOC concentrations for the three river basins. The data for TP (DOC) correspond to the periods 1988-2012 (1988-2012), 1972-2012 (1979-2012) and 1979-2012 (1979-2012), respectively, for the Hay, Liard and Peel Rivers, respectively.

Basin	Summary index	TP (mg/l)				DOC (mg/l)			
		DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Hay	# samples	32	39	46	35	31	39	44	32
	Min.	0.02	0.01	0.01	0.03	2.86	3.00	5.20	18.87
	Median	0.05	0.14	0.10	0.06	29.30	23.80	25.23	30.00
	Max.	0.39	0.73	0.32	0.18	38.70	72.53	40.40	44.70
Liard	# samples	62	36	81	60	57	34	72	52
	Min.	<0.01	0.01	0.01	<0.01	0.70	1.20	0.10	2.00
	Median	0.01	0.24	0.18	0.03	2.60	9.28	4.92	3.69
	Max.	0.08	2.30	2.48	0.20	32.57	21.10	21.60	9.10
Peel	# samples	46	29	55	38	42	28	56	35
	Min.	<0.01	<0.01	0.04	<0.01	0.30	0.50	1.67	1.52
	Median	0.01	0.02	0.21	0.03	1.41	1.86	4.45	2.90
	Max.	0.20	0.90	1.88	1.07	13.47	16.00	24.60	8.60

Table S2. Annual (Ann.) and seasonal (December-January-February: DJF, March-April-May: MAM; June-July-August: JJA and September-October-November: SON) temperatures and trends for the Hay, Liard and Peel Rivers corresponding to the period of water quality records. The trends are expressed as °C change per decade and values in bold indicate statistically significant trends (at the 5% significance level).

Rivers	Years	Mean temperature [°C]					Temperature trend [°C change per decade]				
		Ann.	DJF	MAM	JJA	SON	Ann.	DJF	MAM	JJA	SON
Hay	1988-2012	-0.8	-17.7	0.1	14.6	-0.3	0.2	0.5	-0.6	0.2	0.7
Liard	1972-2012	-2.2	-16.2	-1.7	11.5	-2.4	0.4	1.0	0.1	0.2	0.4
Peel	1979-2012	-5.9	-21.1	-6.3	11.0	-7.3	0.5	1.1	0.1	0.2	0.5

Table S3: Selected “best” regression models with inputs and bias correction based on Method 3. The LOADEST equation numbers correspond to Runkel et al. (2004).

Constituent	River	Model
TP	Hay	LOADEST eq. (6)
	Liard	LOADEST eq. (9)
	Peel	LOADEST eq. (4)
DOC	Hay	Linear model
	Liard	LOADEST eq. (7)
	Peel	LOADEST eq. (4)

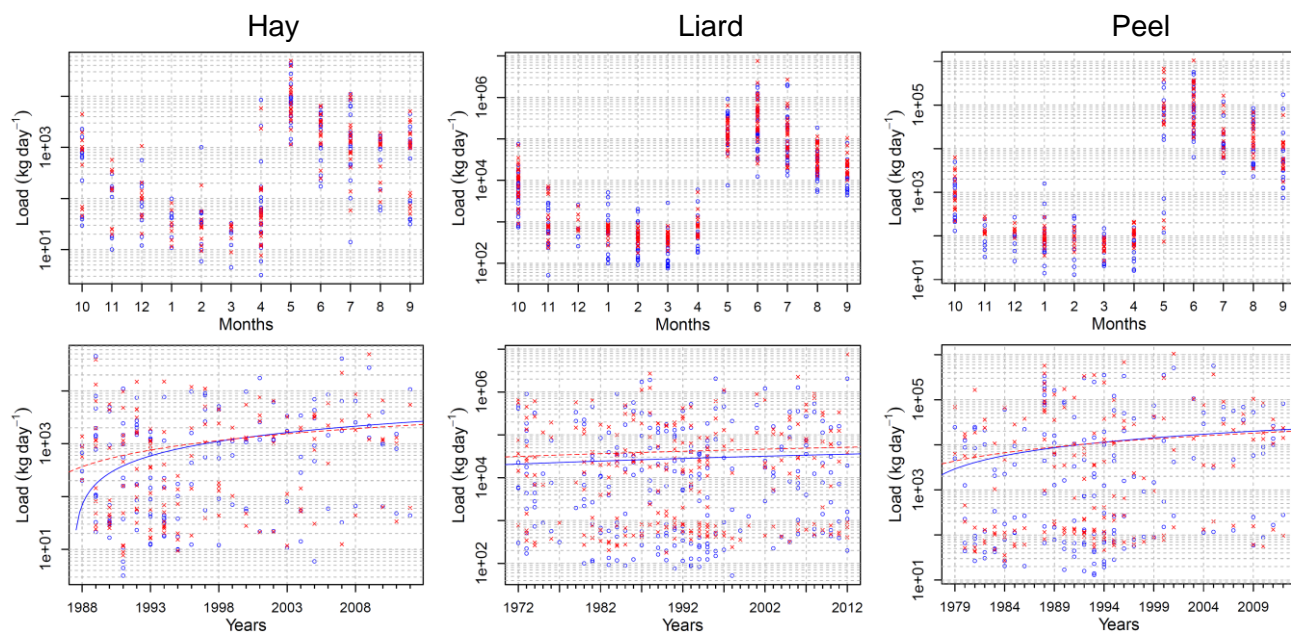


Figure S1: Observed (blue points) and simulated (red points) TP fluxes for the Hay, Liard and Peel Basins. Discharge and decimal time as explanatory variables and the delta method for bias correction were used. The observed and simulated values are plotted for the dates when the observed data are available. The blue and red lines indicate trends of the annual medians of observed and simulated data points, respectively. The trend lines are drawn for the sole purpose of model evaluation and do not represent historical trends.

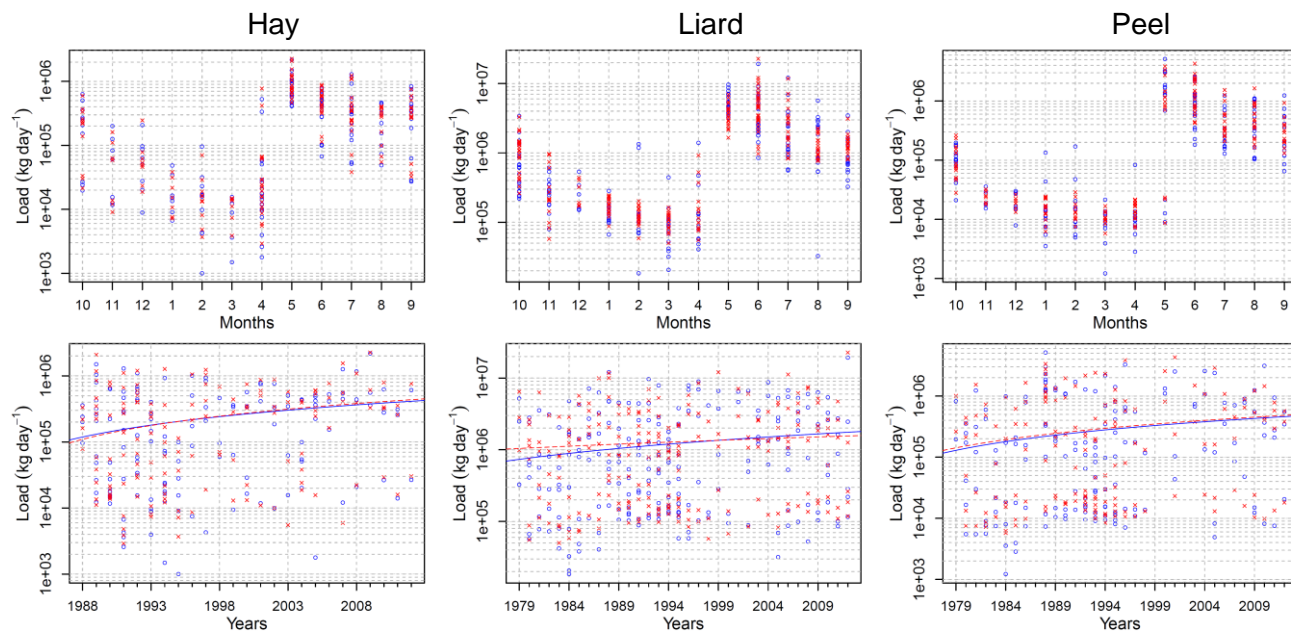


Figure S2: Same as Figure S1, but for DOC.