Supplementary information

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- **Table S2:** Summary of the multiple linear regressions (with standard errors) performed on log_{10} transformed (non-standardized) values for the entire dataset and for each type of system separately. The grey font indicates a non-significant regression model.

- **Fig S1.** Results of multiple linear regression analyses of pCH_4 as a function of measured variables, performed on the entire dataset, and split by system type (lakes, rivers, and small lentic systems represented by wetlands and ponds). Analyses are performed on log_{10} transformed data and standardized to a standard deviation of 1 to be able to compare regression coefficients (effect size). Circle size represents the effect size of each explanatory variable, and the green and red colors represent positive vs negative effects, respectively. The light to dark color gradient is scaled to a 0 to 1 confidence value around the effect size, computed as 1 – SE/Eff, with Eff the effect size and SE its standard error, with negative values (SE > Eff) considered as 0. All regressions have p-values << 0.01 except for lakes, and R^2_{adj} values are 0.34, 0.14, 0.76, and 0.22 for all systems, lakes, rivers, and small lentic systems, respectively.

- **Fig S2.** Marginal effect of salinity on pCH_4 derived from multiple linear regressions (in Fig. S1), when holding other factors constant at their average value in different system types. Shaded areas represent the 95% confidence interval around the slope.

- **Fig S3.** Salinity versus sulfate (SO_4^{2-}) concentration in the three types of sampled lentic systems. The linear regression has a p-value << 0.001 and a $R^2_{adj} = 0.56$.

- **Fig S4.** Map depicting long-term (1990-2020) trends (Sen slopes) in inland water sulfate concentration in monitored sites in the Canadian Prairies, based on publicly available data from the Saskatchewan Water Security Agency.

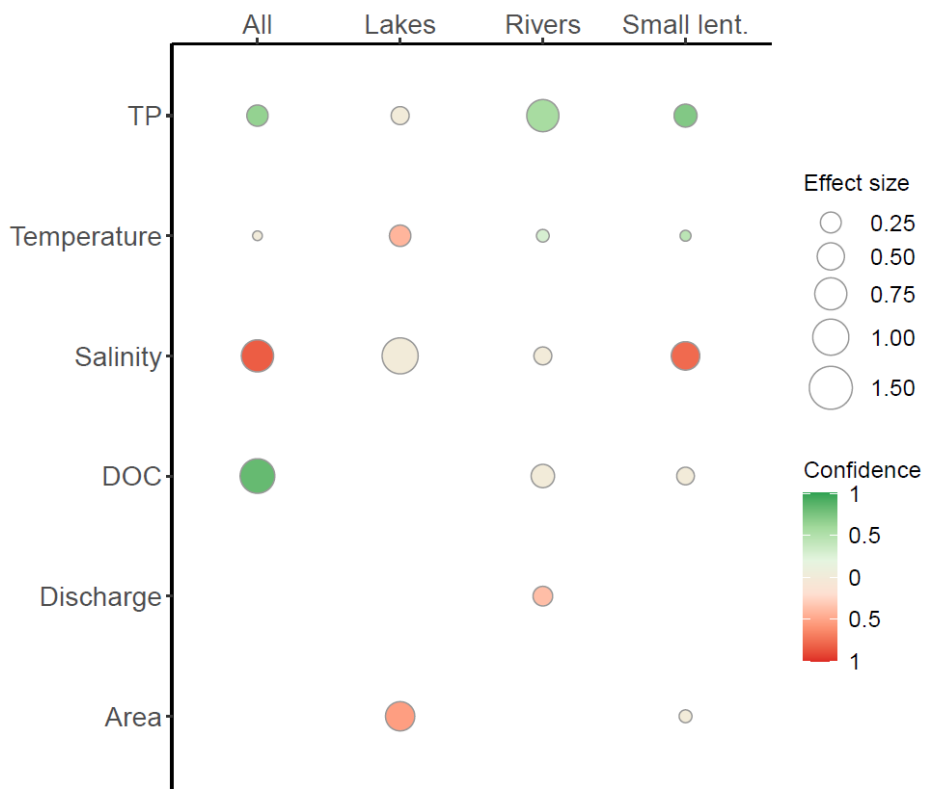
Table S1: Summary statistics, mean, median,standard deviation (SD), range (min and max), number of observations (n) of measured variables by system type.

Variable	System type	Mean	Median	SD	Min	Max	n
Area (km^2)	All	7.085	0.0015	47.4831	0.0001	500	169
	Rivers						0
	Lakes	70.099	8.6	137.7732	0.5	500	17
	Wetlands	0.1229	0.0056	0.7454	0.0001	5.01	45
	Ponds	0.0014	0.001	0.0018	0.0002	0.0139	107
Max depth (m)	All	2.83	2.1	3.41	0.12	27.7	148
	Rivers						0
	Lakes	9.46	9	6.4	2.8	27.7	17
	Wetlands	1.08	0.7	2.01	0.12	10	23
	Ponds	2.15	2.1	0.97	0.18	5.1	108
Temperature (°C)	All	20.1	20.2	2.6	13	29.5	193
	Rivers	19	18.5	3	13	23.9	23
	Lakes	20.3	20.5	1.4	17.6	22.3	17
	Wetlands	20.7	20.4	3	15.6	26.8	45
	Ponds	20.1	20	2.5	15.7	29.5	108
pH	All	8.6	8.62	0.71	6.76	10.5	193
	Rivers	8.33	8.35	0.36	7.3	9.34	23
	Lakes	8.82	8.8	0.21	8.49	9.14	17
	Wetlands	8.29	8.29	0.94	6.76	9.9	45
	Ponds	8.75	8.72	0.65	6.95	10.5	108
Salinity (ppt)	All	0.95	0.45	1.55	0.07	13.27	193
	Rivers	0.28	0.16	0.26	0.1	0.92	23
	Lakes	1.48	0.79	1.86	0.12	5.93	17
	Wetlands	1.33	0.53	2.39	0.08	13.27	45
	Ponds	0.84	0.45	1.12	0.07	8.57	108
Sp. Conductivity ($\mu S\ cm^{-1}$)	All	1656	838	2446	136	18974	193
	Rivers	520	345	421	201	1549	23
	Lakes	2749	1579	3263	263	10494	17
	Wetlands	2226	995	3555	162	18974	45
	Ponds	1489	810	1811	136	13489	108
SO_4 ($mg\ L^{-1}$)	All	1037.9	558.45	1454.74	0.72	9489.78	118
	Rivers						0
	Lakes	1273.54	533.3	1823.34	78.55	6304.24	14
	Wetlands	804.92	293.76	1274.02	0.72	6686.67	42
	Ponds	1142.51	703.81	1482.69	0.99	9489.78	62
DOC ($mg\ L^{-1}$)	All	28.2	25.5	20.1	0.4	126.9	190
	Rivers	5.8	2.3	7.5	0.4	25.6	23
	Lakes	18	17.3	10.4	4.4	43.6	17
	Wetlands	36.5	31.2	26.2	3.1	126.9	45
	Ponds	31.3	29.1	15.7	4.6	90.4	105
TP ($\mu g\ L^{-1}$)	All	267	80	621	1	6480	189
	Rivers	154	20	519	1	2508	23

	Lakes	143	71	171	12	539	17
	Wetlands	330	117	543	30	2540	45
	Ponds	285	80	713	9	6480	104
TN (mg L^{-1})	All	2.48	1.95	2.07	0.05	14.28	189
	Rivers	0.54	0.27	0.66	0.05	3.05	23
	Lakes	1.44	1.43	0.68	0.48	3.25	17
	Wetlands	2.65	1.96	1.69	0.99	9.54	45
	Ponds	3	2.3	2.26	0.42	14.28	104
DOC / salinity (mg L^{-1} ppt^{-1})	All	59.7	43.8	60.8	2.4	410.3	190
	Rivers	17.7	14.4	16.9	2.4	78.3	23
	Lakes	21.9	19.5	12.4	5.4	46.9	17
	Wetlands	75	53	88	5.2	410.3	45
	Ponds	68.5	56.5	50.6	8	276.9	105
pCH_4 (ppm)	All	2653	933	4904	2	40882	191
	Rivers	481	160	685	5	2750	23
	Lakes	412	163	778	2	3225	16
	Wetlands	4038	1742	6028	52	30244	45
	Ponds	2873	1324	5020	34	40882	107
CH_4 diffusion (mmol m^{-2} d^{-1})	All	6.12	2.76	10.6	0.11	91.47	139
	Rivers						0
	Lakes						0
	Wetlands	3.42	1.75	4.13	0.13	14.11	20
	Ponds	6.58	2.9	11.28	0.11	91.47	119
CH_4 ebullition (mmol m^{-2} d^{-1})	All	0.89	0.03	1.65	0	4.66	10
	Rivers						0
	Lakes						0
	Wetlands	1.12	0.01	2.02	2×10^{-6}	4.66	5
	Ponds	0.67	0.05	1.38	3×10^{-4}	3.13	5

Table S2: Summary of the multiple linear regressions (with standard errors) performed on log_{10} transformed (non-standardized) values for the entire dataset and for each type of system separately. The grey font indicates a non-significant regression model.

Systems	Equation	p-value	R^2_{adj}
All	Log_{10} pCH_4 = 0.62 (±0.39) + 0.90 (±0.15) log_{10} DOC – 0.76 (±0.12) log_{10} Salinity + 0.27 (±0.09) log_{10} TP + 0.02 (±0.02) Temperature	<< 0.001	0.34
River	Log_{10} pCH_4 = 0.18 (±0.67) + 0.34 (0.42) log_{10} DOC + 0.16 (±0.61) log_{10} Salinity + 0.76 (±0.33) log_{10} TP + 0.05 (0.04) Temperature	<< 0.001	0.76
Lake	Log_{10} pCH_4 = 10.4 (±4.2) – 1.6 (±1.8) log_{10} DOC + 1.0 (±1.07) log_{10} Salinity - 0.17 (±0.46) log_{10} TP – 0.27 (±0.16) Temperature	0.28	0.14
Pond	Log_{10} pCH_4 = 0.47 (±0.65) + 0.57 (±0.31) log_{10} DOC – 0.60 (±0.14) log_{10} Salinity + 0.28 (±0.10) log_{10} TP + 0.01 (±0.02) Temperature	<< 0.001	0.27
Wetland	Log_{10} pCH_4 = 3.5 (±1.02) – 0.50 (±0.34) log_{10} DOC – 0.82 (±0.23) log_{10} Salinity + 0.04 (±0.22) log_{10} TP + 0.02 (±0.03) Temperature	0.001	0.31



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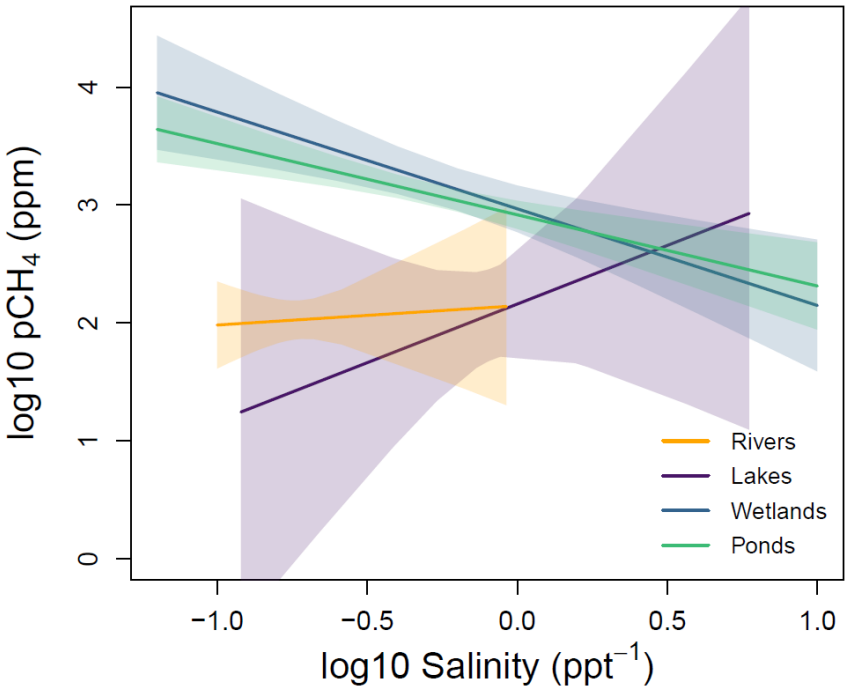

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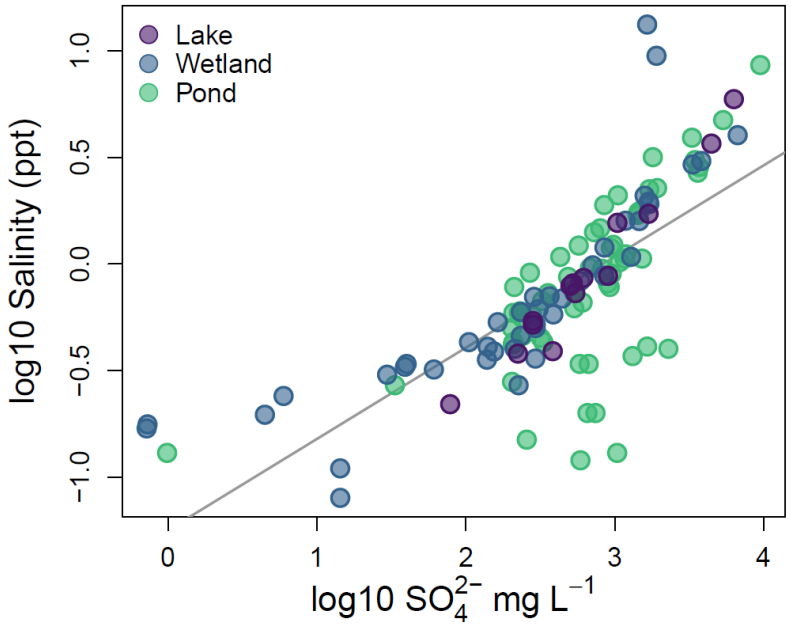

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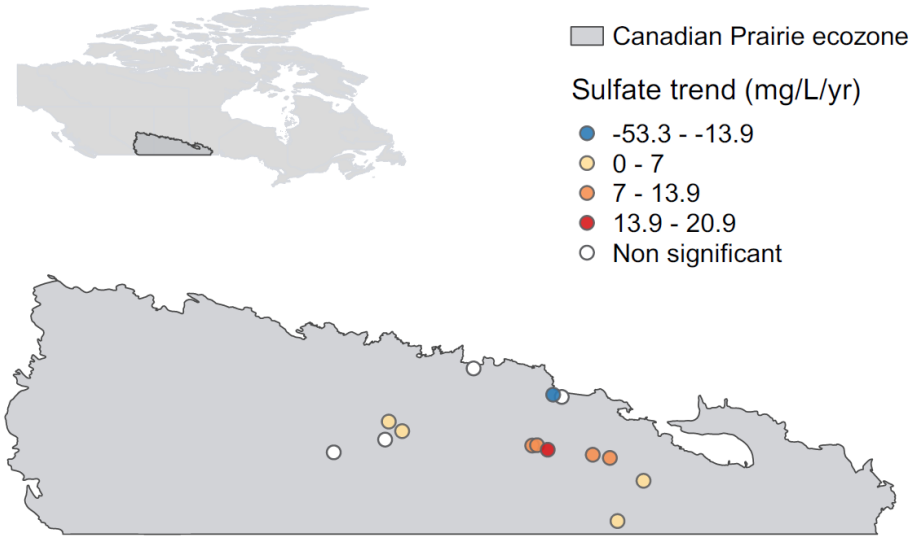

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