

**Physical and chemical characteristics of 1300 lakes and ponds across the Canadian Arctic**

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**Key words:** limnology, water chemistry, nutrients, metals, geology, arctic lakes.

The ion balance check compares the sum of cations to the sum of anions (in  $\mu\text{molc L}^{-1}$ ), with differences (between cations and anions) of  $\leq 10\%$  assumed to be acceptable (ICP Waters, 2010).

Ion balance =  $\left( \frac{\text{sum of cations: } \sum([\text{Ca}] + [\text{Mg}] + [\text{K}] + [\text{Na}] + [\text{H}]) - \text{sum of anions: } \sum([\text{Cl}] + [\text{SO}_4] + [\text{NO}_3] + [\text{ALK}])}{\text{sum of cations}} \right) \times 100$

The concentration of protons [H] was calculated from pH, and where ALK (alkalinity) were not reported, values we estimated from the relationship between dissolved inorganic carbon (DIC) and ALK at 217 sites (see Supporting Material F1), and converted to  $\mu\text{molc L}^{-1}$  for the ion balance check.

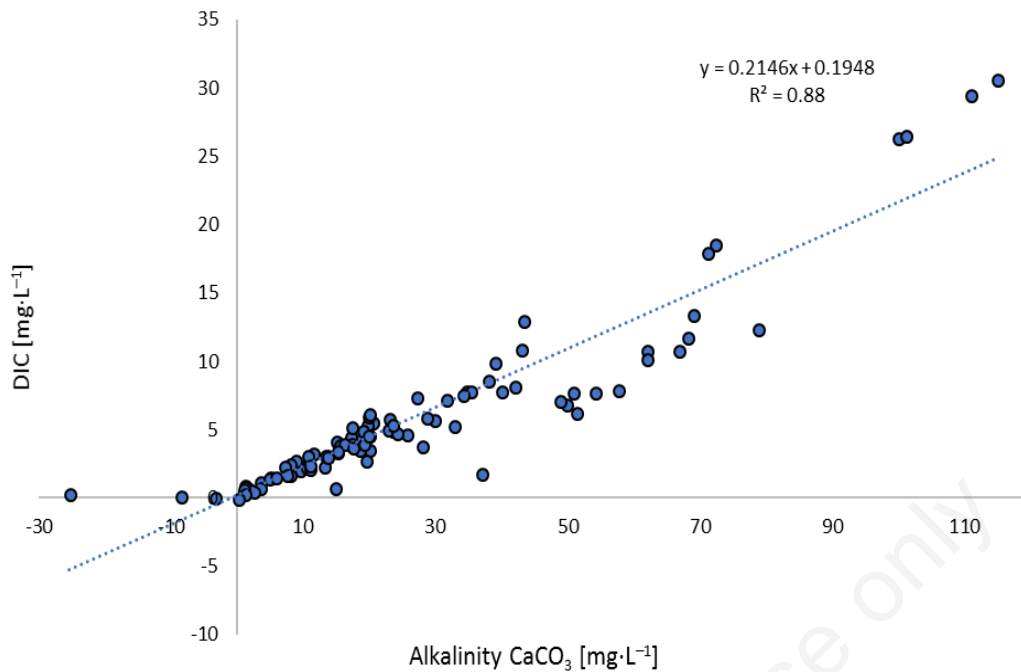
**Supporting Material T1.** Descriptive statistics of 59 parameters including count, mean, percent coefficient of variation (%CV), minimum, maximum, and percentile (5th and 9th) values.

Parameter	Symbol	Units	Count	Mean	%CV	Min	Max	Median	Percentile	
									5th	95th
Depth	Depth	m	680	5.54	3.84E+39	0.03	49.00	4.00	0.50	16.81
Transparency	Transp	m	137	3.56	7.32E+07	0.50	11.50	3.00	1.00	8.52
Surface Water Temperature	Temp	°C	894	9.21	1.20E+29	-0.40	25.00	8.02	2.07	18.14
Dissolve Oxygen	DO	mg·L <sup>-1</sup>	216	11.72	7.57E+08	1.10	20.00	12.56	7.88	13.95
Alkalinity	Alkalinity	mg·L <sup>-1</sup>	217	47.83	N/A	-25.43	350.00	19.74	0.98	191.20
Soluble Reactive Silicate	SRSi	mg·L <sup>-1</sup>	16	0.64	1.63E+02	0.20	1.86	0.48	0.24	1.69
Total Suspended Solids	TSS	mg·L <sup>-1</sup>	20	25.62	N/A	0.11	384.00	1.00	0.23	92.35
Particulate Organic Nitrogen	PON	mg·L <sup>-1</sup>	465	0.16	1.02E+07	0.00	45.00	0.04	0.01	0.19
Nitrite	NO <sub>2</sub> *	µg·L <sup>-1</sup>	480	4.70	N/A	0.01	630.00	1.47	0.26	7.00
Nitrate Nitrite	NO <sub>3</sub> +NO <sub>2</sub> *	µg·L <sup>-1</sup>	458	17.10	N/A	0.08	888.00	7.09	0.60	62.17
Particulate Phosphorous	PP*	µg·L <sup>-1</sup>	205	8.03	N/A	0.10	146.00	3.50	0.53	29.96
Particulate Nitrogen	PN*	µg·L <sup>-1</sup>	306	57.62	N/A	2.00	524.00	46.00	7.20	128.75
Total Dissolved Nitrogen	TDN*	µg·L <sup>-1</sup>	123	397.59	N/A	30.00	1990.00	236.00	57.25	1425.00
Total Dissolved Phosphorous	TDP*	µg·L <sup>-1</sup>	22	2.70	1.50E+12	0.14	13.00	2.00	1.00	8.56
Suspended Nitrogen	SN	µg·L <sup>-1</sup>	9	36.22	N/A	16.00	78.00	30.00	16.40	65.20
Suspended Carbon	SC	µg·L <sup>-1</sup>	9	303.33	N/A	200.00	570.00	250.00	204.00	530.00
Dissolved Inorganic Nitrogen	DIN	µg·L <sup>-1</sup>	2	61.00	N/A	22.00	100.00	61.00	25.90	96.10
Dissolved Organic Nitrogen	DON	µg·L <sup>-1</sup>	2	134.00	N/A	117.00	151.00	134.00	118.70	149.30
Soluble Reactive Phosphorus	SRP	µg·L <sup>-1</sup>	675	154.85	N/A	0.00	4800.00	1.00	0.16	1100.00
Chlorophyll-A	Chla.a	µg·L <sup>-1</sup>	684	180.52	N/A	0.00	6900.00	1.09	0.05	1200.00
Chlorophyll-A Uncorrected	Chla.u	µg·L <sup>-1</sup>	496	0.98	3.50E+04	0.01	20.40	0.70	0.05	2.62
Silver	Ag	µg·L <sup>-1</sup>	190	0.41	2.70E+02	0.00	3.00	0.05	0.00	2.00
Arsenic	As	µg·L <sup>-1</sup>	224	0.45	9.48E+03	0.00	17.10	0.22	0.03	1.41
Boron	B	µg·L <sup>-1</sup>	253	5.67	1.78E+122	0.05	113.30	2.50	0.35	20.16
Beryllium	Be	µg·L <sup>-1</sup>	198	0.06	1.91E+01	0.00	0.40	0.02	0.00	0.20
Bismuth	Bi	µg·L <sup>-1</sup>	57	0.71	3.09E+05	0.00	7.79	0.00	0.00	4.59
Cadmium	Cd	µg·L <sup>-1</sup>	264	0.62	5.01E+03	0.00	11.00	0.16	0.00	3.63
Cerium	Ce	µg·L <sup>-1</sup>	28	0.13	2.99E+01	0.01	0.54	0.11	0.01	0.39
Cobalt	Co	µg·L <sup>-1</sup>	271	0.93	3.74E+10	0.00	26.00	0.24	0.01	3.72
Chromium	Cr	µg·L <sup>-1</sup>	242	0.70	1.26E+03	0.00	5.00	0.38	0.01	2.97
Cesium	Cs	µg·L <sup>-1</sup>	2	0.01	1.63E-01	0.01	0.01	0.01	0.01	0.01

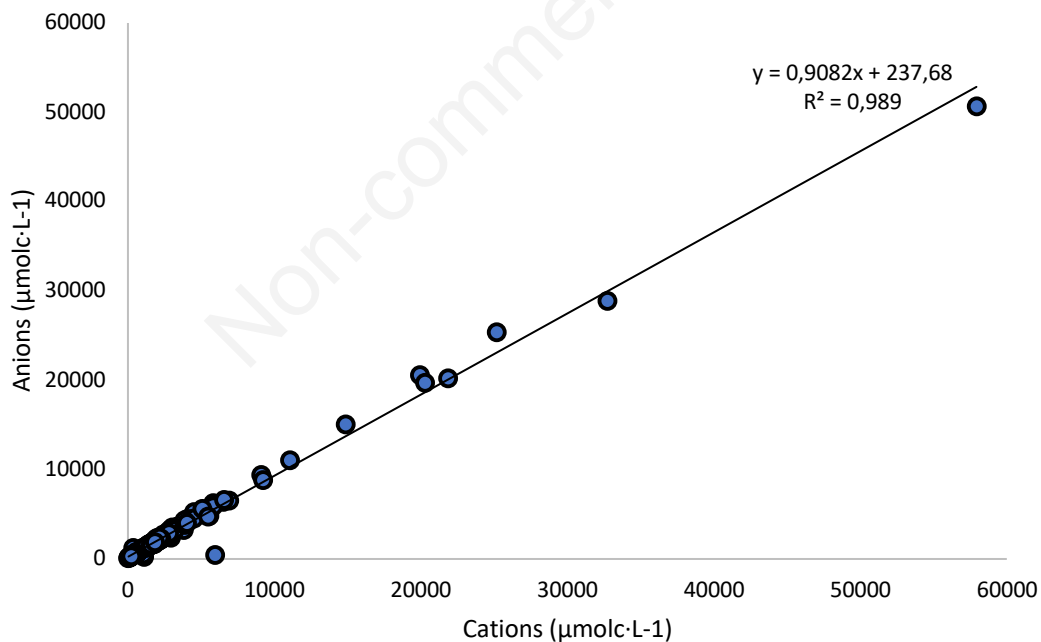
Copper	Cu	$\mu\text{g}\cdot\text{L}^{-1}$	592	2.45	3.30E+12	0.02	29.20	1.47	0.22	8.00
Fluoride	F	$\mu\text{g}\cdot\text{L}^{-1}$	89	26.63	N/A	1.67	244.15	17.56	5.09	68.78
Gallium	Ga	$\mu\text{g}\cdot\text{L}^{-1}$	89	0.01	2.87E+00	0.00	0.06	0.01	0.00	0.04
Lanthanum	La	$\mu\text{g}\cdot\text{L}^{-1}$	89	0.19	3.46E+02	0.00	4.91	0.03	0.00	0.49
Lithium	Li	$\mu\text{g}\cdot\text{L}^{-1}$	548	4.79	N/A	0.00	341.00	1.30	0.05	13.65
Molybdenum	Mo	$\mu\text{g}\cdot\text{L}^{-1}$	364	4.57	N/A	0.00	1190.00	0.40	0.01	3.66
Neodymium	Nb	$\mu\text{g}\cdot\text{L}^{-1}$	2	0.00	1.63E-01	0.00	0.00	0.00	0.00	0.00
Nickel	Ni	$\mu\text{g}\cdot\text{L}^{-1}$	424	13.94	N/A	0.02	1350.00	0.69	0.11	9.00
Phosphorus	P	$\mu\text{g}\cdot\text{L}^{-1}$	5	61.26	N/A	2.00	240.00	24.30	4.56	197.04
Lead	Pb	$\mu\text{g}\cdot\text{L}^{-1}$	366	1.25	4.70E+13	0.01	52.00	0.17	0.02	5.00
Platinum	Pt	$\mu\text{g}\cdot\text{L}^{-1}$	2	0.00	3.91E-02	0.00	0.00	0.00	0.00	0.00
Rubidium	Rb	$\mu\text{g}\cdot\text{L}^{-1}$	246	1.42	1.22E+08	0.04	17.26	0.55	0.13	7.16
Sulfur	S	$\mu\text{g}\cdot\text{L}^{-1}$	92	1807.14	N/A	246.86	13600.00	1354.58	367.57	5625.00
Antimony	Sb	$\mu\text{g}\cdot\text{L}^{-1}$	147	0.20	8.95E+02	0.00	8.00	0.02	0.00	0.53
Scandium	Sc	$\mu\text{g}\cdot\text{L}^{-1}$	2	0.19	4.43E+01	0.06	0.32	0.19	0.07	0.31
Selenium	Se	$\mu\text{g}\cdot\text{L}^{-1}$	80	1.36	2.15E+33	0.00	29.00	0.03	0.01	18.00
Silicon	Si	$\mu\text{g}\cdot\text{L}^{-1}$	134	1766.28	N/A	24.00	21500.00	1361.54	114.21	4670.00
Tin	Sn	$\mu\text{g}\cdot\text{L}^{-1}$	60	0.39	4.28E+04	0.00	11.00	0.02	0.00	1.97
Thorium	Th	$\mu\text{g}\cdot\text{L}^{-1}$	41	0.01	2.15E+00	0.00	0.05	0.00	0.00	0.02
Titanium	Ti	$\mu\text{g}\cdot\text{L}^{-1}$	79	4.58	N/A	0.01	319.00	0.15	0.03	3.02
Thallium	Tl	$\mu\text{g}\cdot\text{L}^{-1}$	140	0.13	2.34E+02	0.00	4.66	0.02	0.00	0.13
Uranium	U	$\mu\text{g}\cdot\text{L}^{-1}$	219	0.16	1.28E+02	0.00	4.36	0.05	0.01	0.53
Vanadium	V	$\mu\text{g}\cdot\text{L}^{-1}$	287	0.75	2.81E+04	0.00	20.00	0.33	0.02	2.97
Tungsten	W	$\mu\text{g}\cdot\text{L}^{-1}$	2	0.04	4.89E+00	0.02	0.05	0.04	0.02	0.05
Yttrium	Y	$\mu\text{g}\cdot\text{L}^{-1}$	2	0.05	2.28E+00	0.04	0.05	0.05	0.04	0.05
Zinc	Zn	$\mu\text{g}\cdot\text{L}^{-1}$	696	2.79	1.37E+53	0.00	129.00	1.00	0.05	10.00
Zirconium	Zr	$\mu\text{g}\cdot\text{L}^{-1}$	58	0.13	4.54E+01	0.00	0.75	0.02	0.00	0.55
Nitrogen Isotope 15	d15N	%	31	3.80	N/A	-28.55	23.84	7.40	-22.77	18.90

**Supporting Material T2.** List of PCA variables and their loadings for the five principal components with eigenvalues above 1.

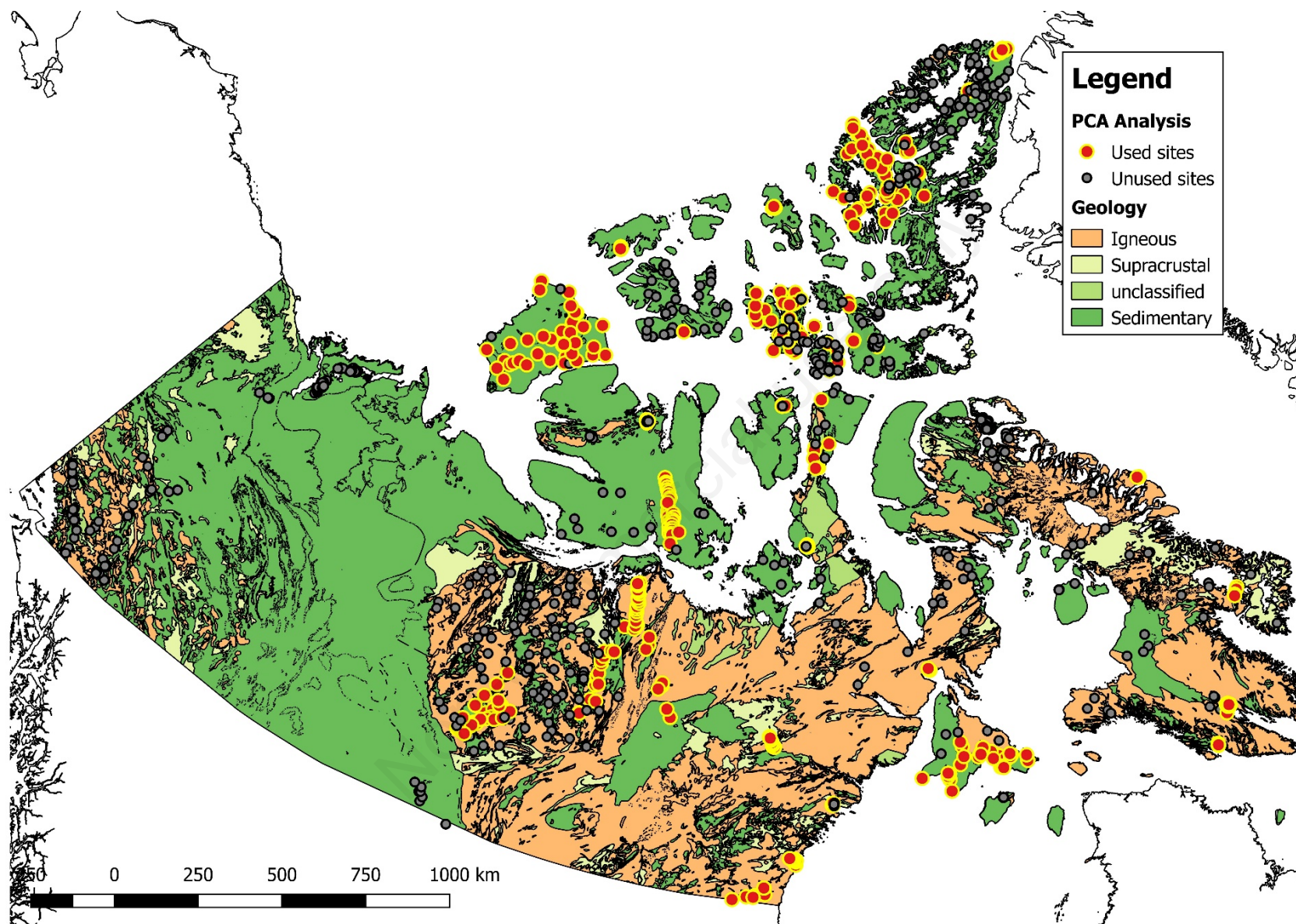
<b>Variables</b>	<b>PC1</b>	<b>PC2</b>	<b>PC3</b>	<b>PC4</b>	<b>PC5</b>
Eigenvalues	6.445	2.576	1.080	1.406	1.154
Latitude	-0.152	-0.149	-0.246	-0.130	0.610
Elev	0.169	-0.231	0.355	0.312	0.327
Distance	0.123	-0.062	0.539	0.217	0.042
pH	-0.181	-0.257	0.111	-0.524	0.022
Cond	-0.352	-0.153	-0.065	0.180	-0.018
Ca	-0.313	-0.273	-0.056	0.128	0.133
K	-0.295	0.157	0.113	0.257	-0.113
Mg	-0.346	-0.147	0.022	0.145	0.099
Na	-0.335	0.164	-0.107	0.033	-0.241
Cl	-0.313	0.165	-0.106	-0.125	-0.270
DOC	-0.185	0.127	0.502	-0.040	-0.117
DIC	-0.280	-0.338	0.102	-0.174	0.087
TN	-0.258	0.107	0.387	-0.235	0.083
TP	-0.128	0.385	0.147	-0.042	0.059
Al	-0.046	0.435	-0.121	0.140	0.362
Fe	-0.076	0.421	0.070	-0.207	0.427
SO4	-0.243	0.008	-0.113	0.511	0.049



**Supporting Material F1.** Water dissolved inorganic carbon (DIC) concentrations ( $\text{mg}\cdot\text{L}^{-1}$ ) as a function of alkalinity ( $\text{mg}\cdot\text{L}^{-1}$ ) in arctic lakes and ponds ( $n = 98$ ) in the Canadian Arctic.



**Supporting Material F2.** Ion balance of the major cations and anions for 224 lakes in the Canadian Arctic.



**Supporting Material F3.** Locations of sites used (red) and not used (grey) for the principal component analysis (PCA).

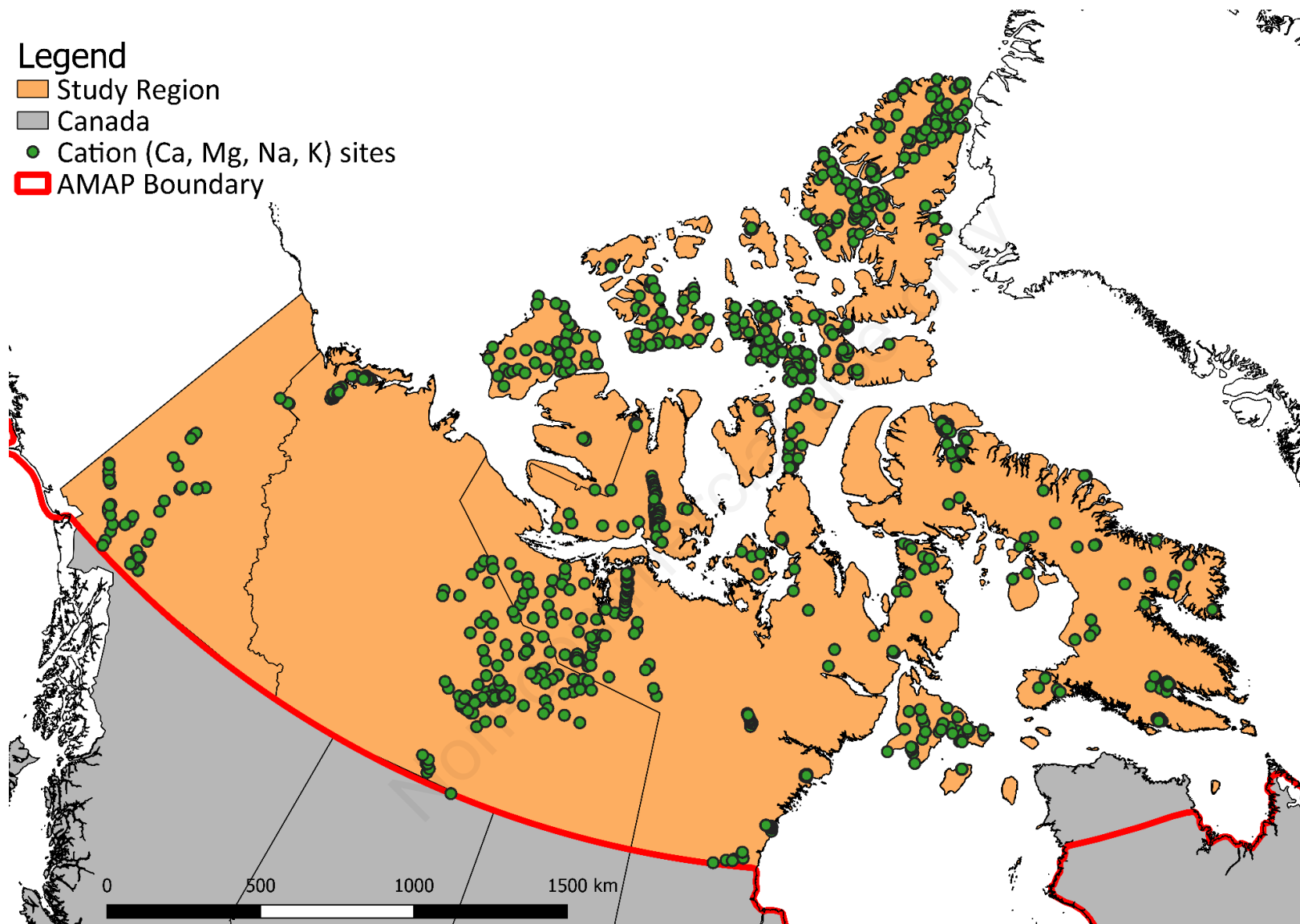
## Legend

Study Region

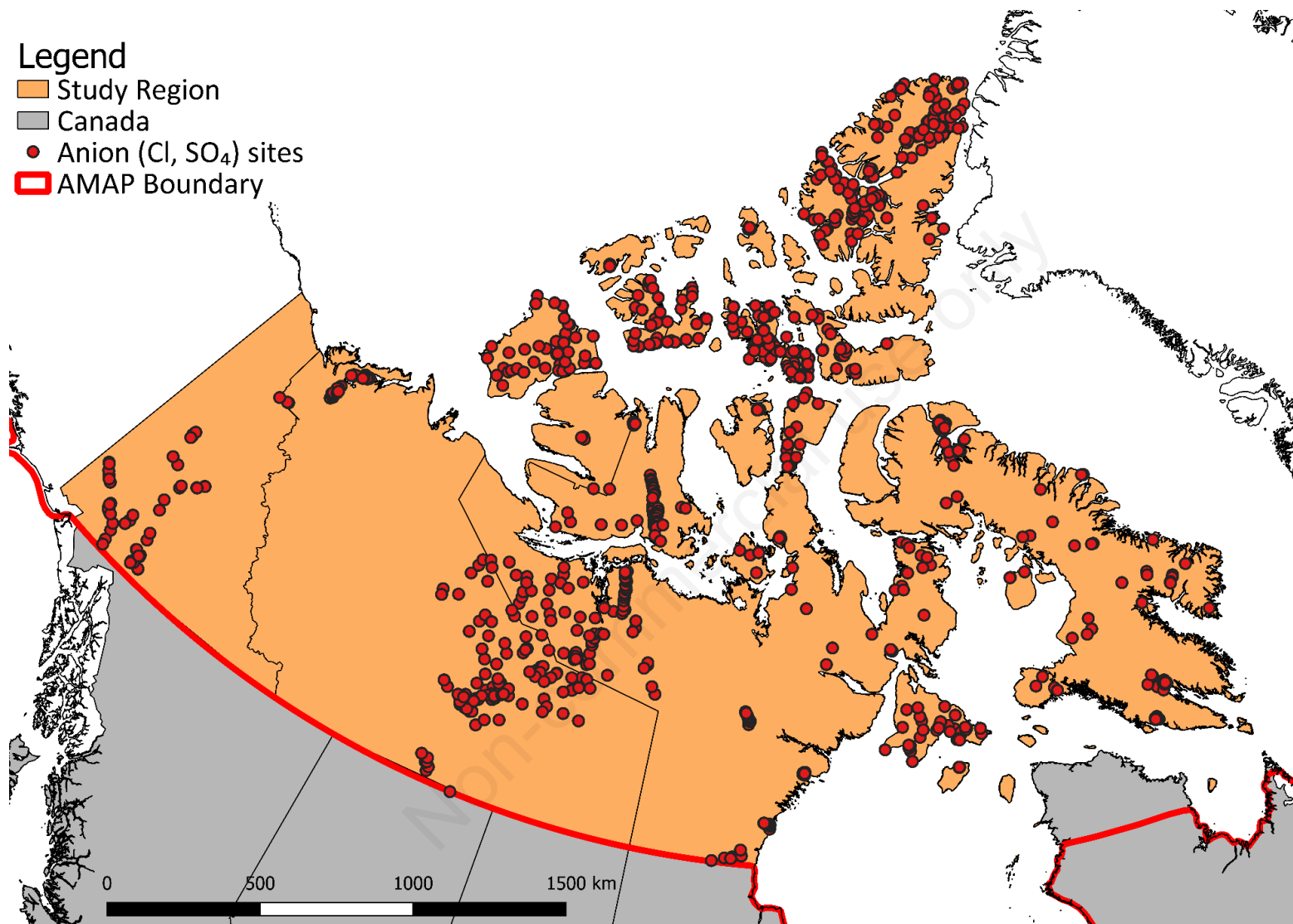
Canada

Cation (Ca, Mg, Na, K) sites

AMAP Boundary



**Supporting Material F4.** Locations of sites (green) used for the analysis of cations (Ca, Mg, Na, K). Sites were included if one or more ion was observed.

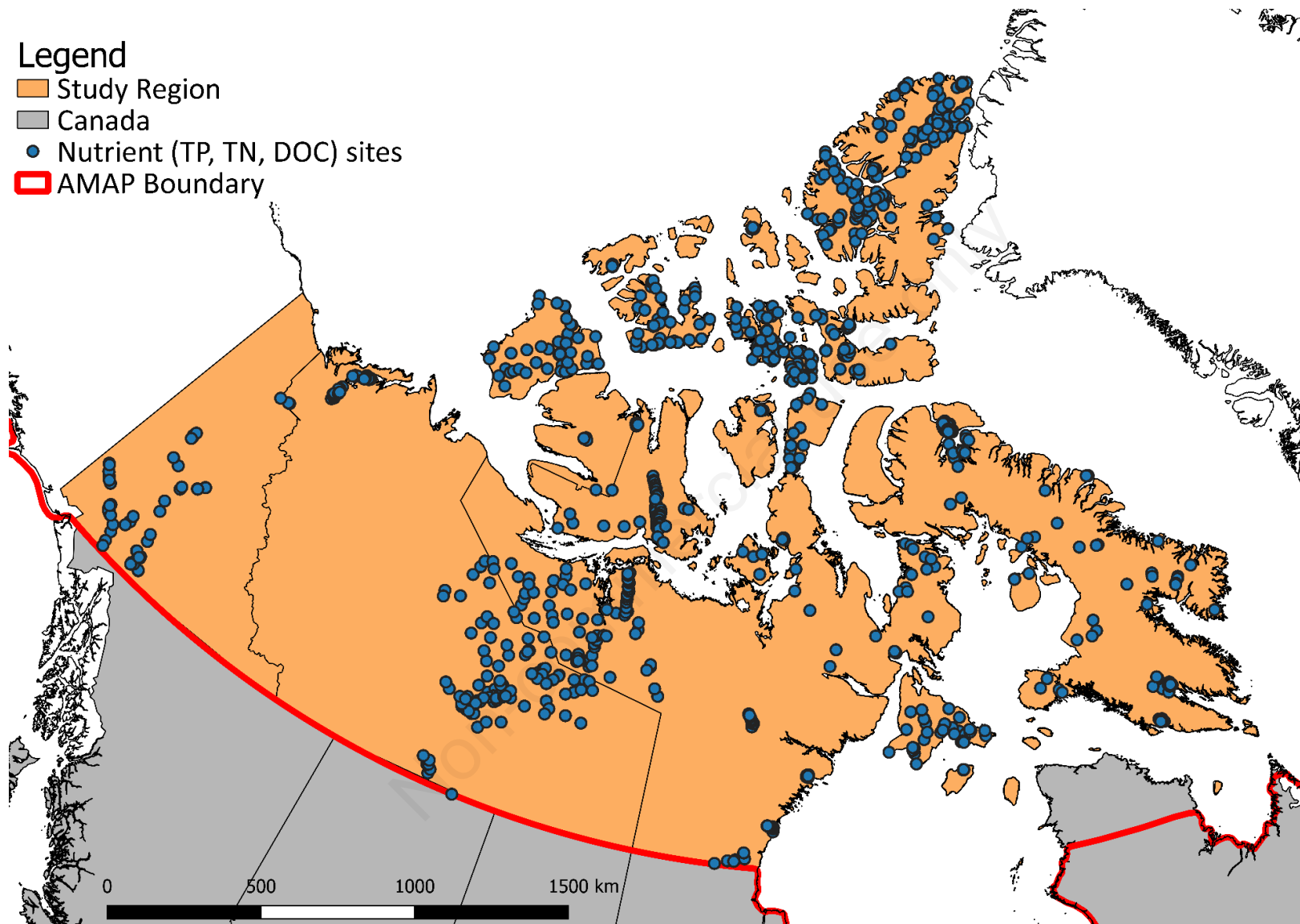


**Supporting Material F5.** Locations of sites (red) used for the analysis of anions (Cl, SO<sub>4</sub>). Sites were included if one or more ion was observed.



## Legend

- Study Region
- Canada
- Nutrient (TP, TN, DOC) sites
- AMAP Boundary



**Supporting Material F6.** Locations of sites (blue) used for the analysis of nutrients (TP, TN, DOC). Sites were included if one or more nutrient species was observed.

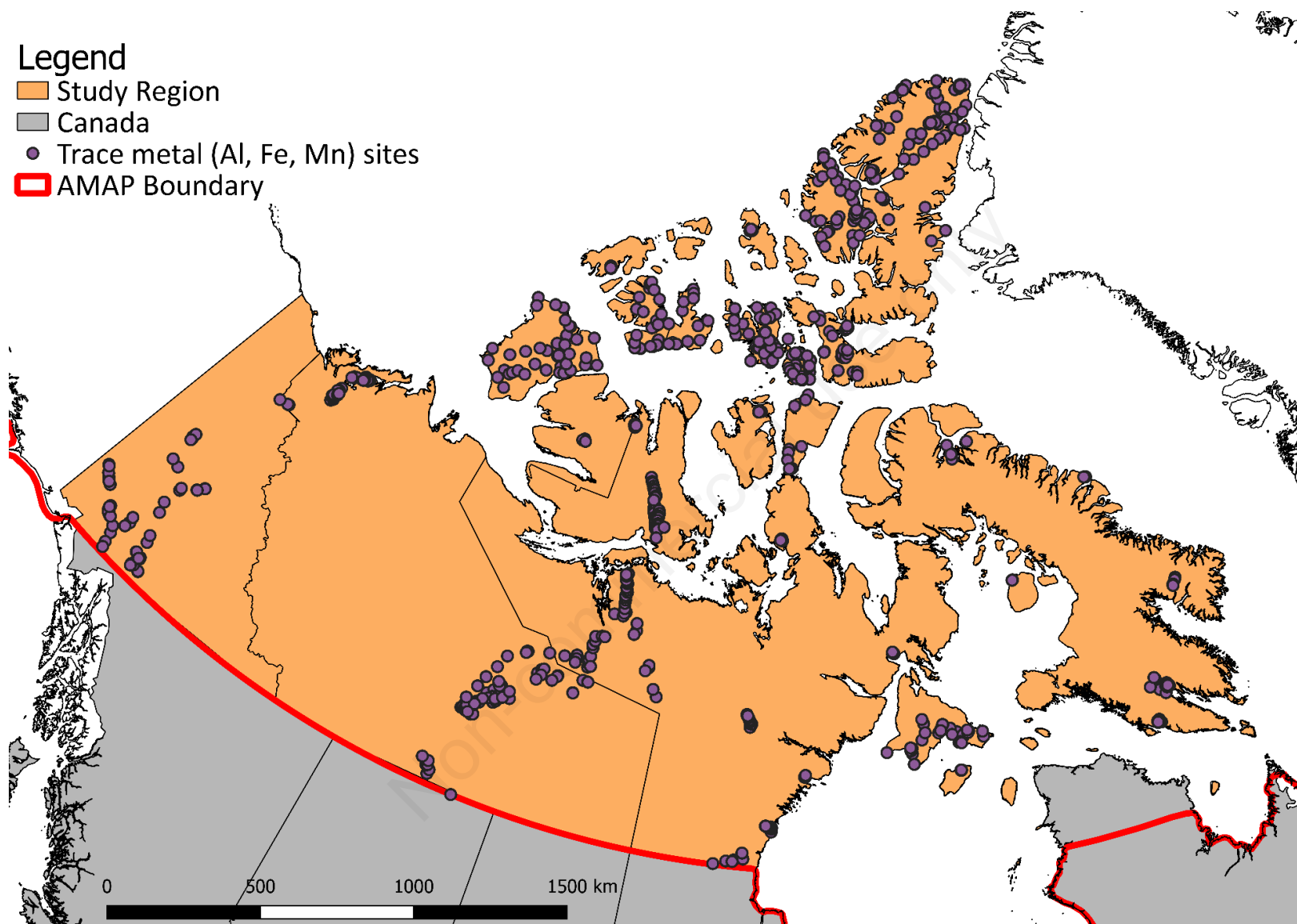
## Legend

Study Region

Canada

Trace metal (Al, Fe, Mn) sites

AMAP Boundary



**Supporting Material F7.** Locations of sites (purple) used for the analysis of trace metals (Al, Fe, Mn). Sites were included if one or more trace metal species was observed.