Supporting information S1: Physico-chemical characterisation of Volga in summer low water period 2021

Based on hydro-chemical data the shortened version of Kurlov's formula (Kurlov & Sobkevich 1921 [33]) was used to describe and compare the ionic composition of the water in the Volga headwaters in summer low water period 2021 (Table S1).

Table S1. Concentration (mg/l) of the main ions in the headwaters of the Volga in the summer low-flow period 2021. All nitrogen-compounds were recalculated to the ionic form, i.e. nitrate nitrogen (N-NO_3) was recalculated into the nitrate ion (NO_3), nitrite nitrogen (N-NO_2) was recalculated into the nitrite ion (NO_2) and ammonium nitrogen (N-NH_4) was recalculated into the ammonium ion (NH_4).

	anions					kations				
	HCO_3^-	SO_4^{2-}	Cl^-	NO_3^{2-}	NO_2^-	Ca^{2+}	Mg^{2+}	Na^+	K^+	NH_4^+
Kokovkino	78.3	2.12	0.55	0.111	0.003	19.8	3.18	1.60	0.79	0.009
Rzhev	112.3	5.57	3.57	0.54	0.007	34.9	6.26	3.71	0.88	0.069
Tver	158.4	5.48	4.05	0.013	0.003	39.6	9.95	4.43	1.38	0.161
Konakovo	165.1	6.29	6.13	0.30	0.023	34.9	9.96	5.42	1.73	0.054
Kimry	160.3	9.74	10.5	1.58	0.161	35.4	6.99	6.77	1.83	0.12
Kalyazin	153.0	9.70	7.60	0.084	0.063	34.3	8.66	5.15	1.56	0.01

The Kurlov formula is a method of visual representation of the chemical composition of natural water. The content of anions (in %-eq) is summarized above the line in descending order. and cations below the line. The formulae are used to analyse the correctness of chemical analyses. by

- the law of electroneutrality: $\sum$ anions $=\sum$ cations. mg-eq/l

and

- the calculation of conductivity (based on the additivity of the electrical conductivity of electro-lyte mixtures) and comparison with the measured values.