

Assessment of Groundwater Quality and Vulnerability in the Nakivale Sub-catchment of the Transboundary Lake Victoria Basin, Uganda

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Supplementary materials

Table S1. Calculated Irrigation groundwater quality indices each groundwater sample

Sample ID	EC (µs/cm)	KR	MAR (%)	SAR	SP (%)	RSC (meq/L)
RAF7021-1	960	0.5	40	1.6	33	-2.9
RAF7021-2	370	1.2	46	2.0	55	-0.9
RAF7021-3	1538	0.6	36	2.7	39	-3.6
RAF7021-6	1304	0.2	35	1.1	21	-4.1
RAF7021-8	442	7.0	26	7.3	88	1.7
RAF7021-9	827	0.5	41	1.5	32	-4.5
RAF7021-10	396	2.0	0	4.0	67	1.3
RAF7021-11	393	0.4	42	1.4	29	-5.8
RAF7021-13	961	0.3	43	1.3	23	-2.7
RAF7021-14	1223	0.4	36	1.7	33	-5.5
RAF7021-15	1084	0.6	60	1.4	38	-2.6
RAF7021-17	550	1.2	43	2.6	56	-0.8
RAF7021-18	610	0.5	32	1.5	34	-4.7
RAF7021-21	780	0.2	35	0.4	21	-1.2
RAF7021-22	297	0.5	37	1.1	34	-1.7
RAF7021-23	468	0.4	42	1.5	27	-7.6
RAF7021-24	523	0.9	57	2.0	49	-0.1

Sample ID	EC ($\mu\text{S}/\text{cm}$)	KR	MAR (%)	SAR	SP (%)	RSC (meq/L)
RAF7021-25	1023	0.4	42	1.5	31	-3.6
RAF7021-26	441	0.5	27	1.1	35	-1.0
Mean	747	1.0	38	2.0	39	-2.7
STDEV.	366	1.5	12	1.5	17	2.4
Max.	1538	7.0	60	7.3	88	1.7
Min.	297	0.2	0	0.4	21	-7.6

Table S2. Computed groundwater quality sub-index for each hydrochemical parameter and overall groundwater quality index (GWQI) for each sample.

Sample_ID	Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺	Cl ⁻	SO ₄ ²⁻	HCO ₃ ⁻	pH	TDS	NO ₃ ⁻	Fe	GWQI
RAF7021-1	1.6	4.2	7.7	4.6	2.5	6.1	6.1	9.7	0.2	4.4	17.1	64.2
RAF7021-2	1.0	1.3	1.6	1.3	1.9	1.6	1.0	8.8	0.2	3.0	3.3	25.0
RAF7021-3	3.4	6.5	12.7	6.4	3.7	13.2	11.3	9.6	0.2	0.3	208.5	276.0
RAF7021-6	1.5	6.2	14.8	7.1	2.3	8.8	13.0	10.2	0.2	10.6	13.2	87.9
RAF7021-8	2.2	2.0	0.7	0.3	0.8	2.4	4.2	10.4	0.2	0.6	23.8	47.8
RAF7021-9	1.4	1.4	6.3	4.1	2.2	8.2	1.4	8.9	0.2	2.2	1.6	38.0
RAF7021-10	2.4	1.2	0.1	0.02	0.7	1.0	6.2	8.8	0.2	0.7	0.8	22.1
RAF7021-11	1.5	2.5	8.3	5.3	2.0	12.1	1.9	12.7	0.3	1.3	50.4	98.3
RAF7021-13	1.7	3.7	11.6	7.9	2.9	8.0	13.5	9.1	0.2	1.1	17.0	76.8
RAF7021-14	1.9	4.6	9.5	4.8	2.2	11.6	3.2	9.9	0.2	2.1	30.1	80.1
RAF7021-15	0.9	1.6	2.3	3.2	1.1	5.0	0.3	9.2	0.2	8.5	5.9	38.2
RAF7021-17	1.7	1.8	2.6	1.8	3.9	0.9	2.7	5.1	0.1	8.1	1.2	30.0
RAF7021-18	1.4	2.1	6.8	2.9	1.6	8.2	0.3	6.6	0.2	11.8	3.6	45.8
RAF7021-21	0.2	2.1	2.6	1.3	0.7	1.6	1.5	5.4	0.1	4.8	4.9	25.2
RAF7021-22	0.7	1.7	3.3	1.7	1.4	2.8	1.5	12.2	0.2	5.5	22.1	53.0
RAF7021-23	1.8	1.6	9.9	6.5	1.9	15.9	1.2	9.7	0.2	4.8	14.2	67.5
RAF7021-24	1.4	2.8	2.3	2.7	1.3	3.0	4.6	12.8	0.2	1.2	10.0	42.3
RAF7021-25	1.7	4.4	8.0	5.2	3.9	7.2	5.7	5.8	0.2	1.6	218.9	262.6
RAF7021-26	0.8	1.5	3.9	1.3	0.9	1.9	3.0	7.2	0.2	7.9	6.1	34.7

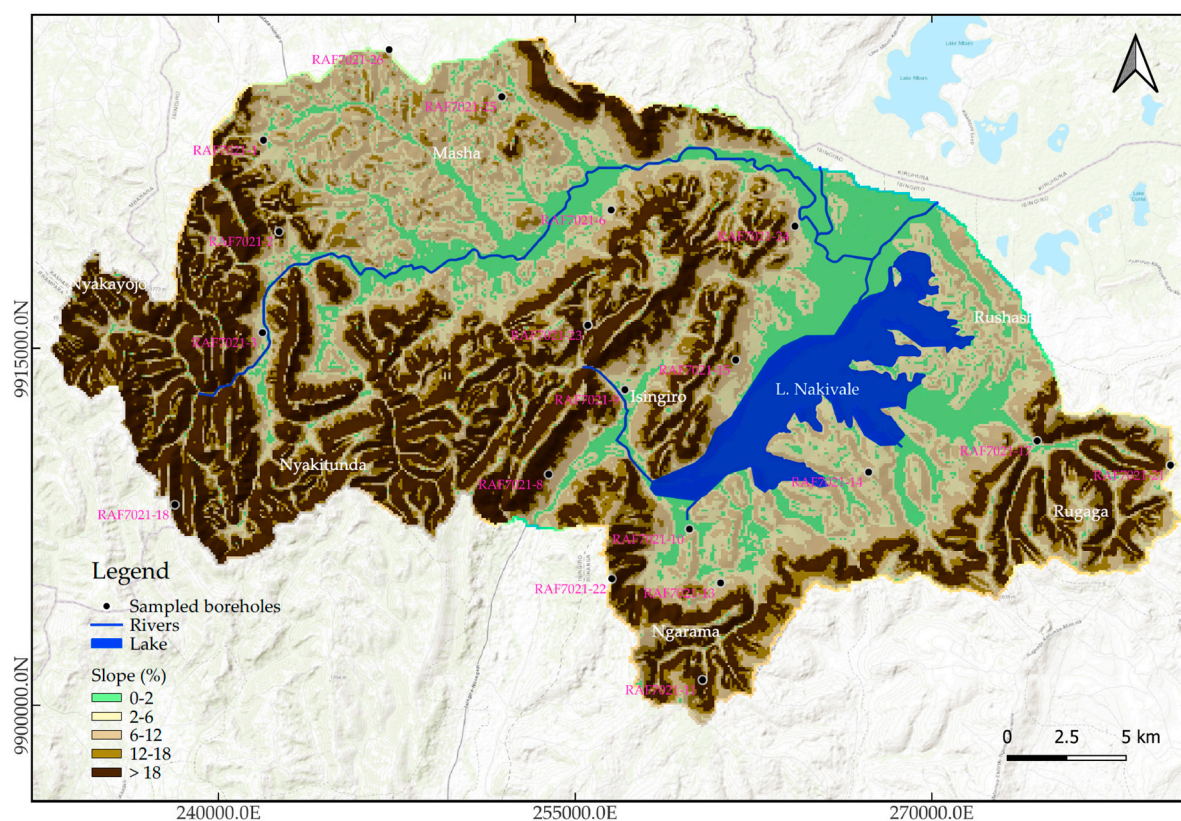


Figure S1. Spatial variation of topographical slope within Nakivale sub-catchment

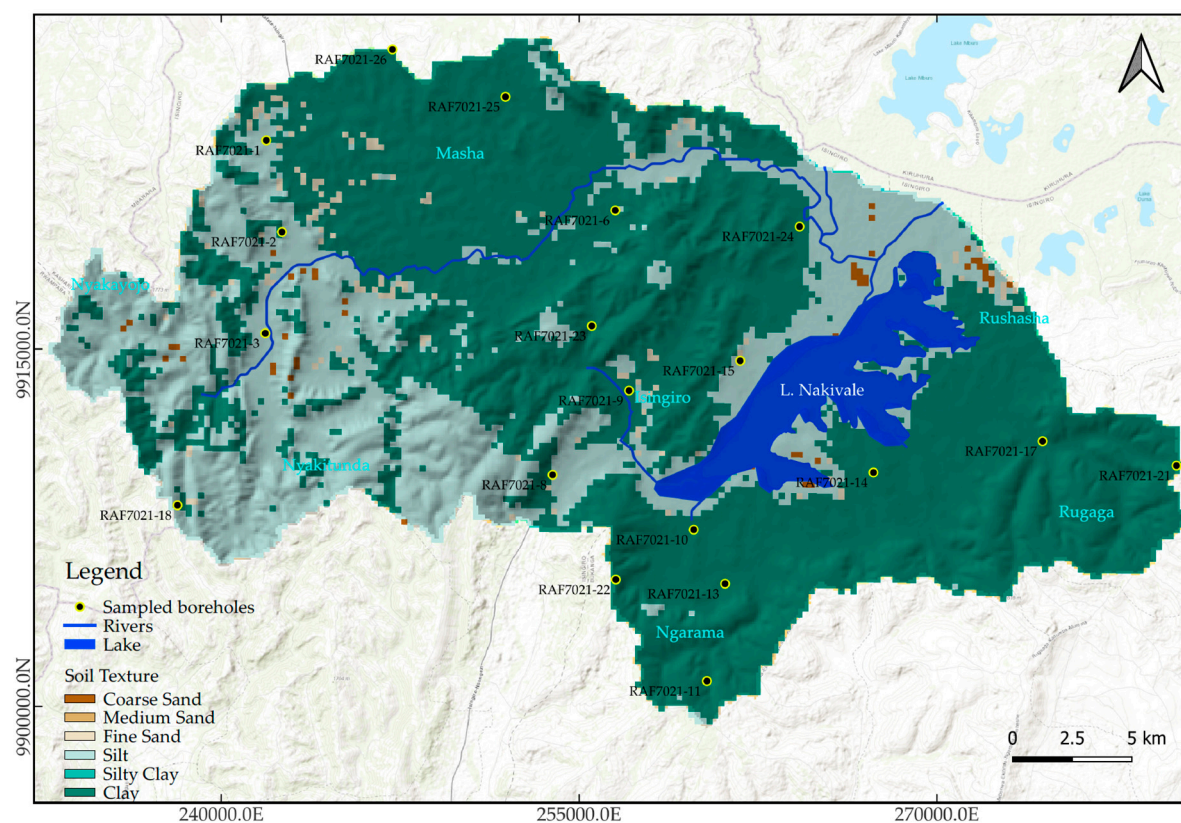


Figure S2. Soil texture within Nakivale sub-catchment, southwestern Uganda

Table S3. Assigned weights and ratings for each respective parameter within the applied DRASTIC aquifer vulnerability assessment model

Borehole ID	Weights							Rating							Calculated
	D	R	A	S	T	I	C	D	R	A	S	T	I	C	Drastic Index
RAF7021-1	5	4	3	2	1	5	3	5	5	7	5	5	2	3	100
RAF7021-2	5	4	3	2	1	5	3	4	5	5	5	5	2	3	89
RAF7021-3	5	4	3	2	1	5	3	4	5	5	5	4	2	3	88
RAF7021-6	5	4	3	2	1	5	3	5	6	7	5	6	2	4	108
RAF7021-8	5	4	3	2	1	5	3	4	5	5	3	6	2	3	86
RAF7021-9	5	4	3	2	1	5	3	5	6	5	5	7	2	3	100
RAF7021-10	5	4	3	2	1	5	3	4	5	6	3	5	2	3	90
RAF7021-11	5	4	3	2	1	5	3	5	5	7	3	3	2	4	97
RAF7021-13	5	4	3	2	1	5	3	5	5	5	3	5	2	3	90
RAF7021-14	5	4	3	2	1	5	3	6	6	5	3	4	2	3	100
RAF7021-15	5	4	3	2	1	5	3	6	6	5	5	7	2	3	105
RAF7021-17	5	4	3	2	1	5	3	6	6	5	5	7	2	3	105
RAF7021-18	5	4	3	2	1	5	3	5	5	5	3	3	2	3	88
RAF7021-21	5	4	3	2	1	5	3	6	6	5	3	4	2	3	98
RAF7021-22	5	4	3	2	1	5	3	6	5	5	3	3	2	3	93
RAF7021-23	5	4	3	2	1	5	3	5	5	5	3	5	2	3	90
RAF7021-24	5	4	3	2	1	5	3	5	5	5	5	7	2	3	96
RAF7021-25	5	4	3	2	1	5	3	5	5	5	5	7	2	3	96
RAF7021-26	5	4	3	2	1	5	3	6	6	5	3	9	2	3	103

Table S4. Estimated Change Balance Error (CBE) for each sample

Sample ID	Ca mg/L	Ca meq/L	Ca %	K mg/L	K meq/L	K %	Mg mg/L	Mg meq/L	Mg %	Na mg/L	Na meq/L	Na%	Na+K %	SUM CATION meq/L	Cl mg/L	Cl meq/L	Cl %	HCO3 mg/L	HCO3 meq/L	HCO3 %	SO4 mg/L	SO4 meq/L	SO4 %	SUM ANION meq/L	CBE %
RAF7021-1	75.1	3.7	40.5	9.8	0.3	2.7	30.1	2.5	26.8	63.7	2.8	30.0	32.7	9.2	61.7	1.7	19.1	198.9	3.3	35.7	198.2	4.1	45.2	9.1	0.6
RAF7021-2	15.3	0.8	23.6	3.1	0.1	2.4	8.2	0.7	20.9	39.4	1.7	53.1	55.5	3.2	45.5	1.3	43.5	34.2	0.6	19.0	53.2	1.1	37.6	3.0	4.5
RAF7021-3	124.1	6.2	39.0	15.1	0.4	2.4	41.9	3.4	21.7	134.7	5.9	36.9	39.3	15.9	90.8	2.6	14.6	367.3	6.0	34.3	430.5	9.0	51.1	17.5	-5.0
RAF7021-6	144.1	7.2	51.6	14.4	0.4	2.6	46.4	3.8	27.4	58.8	2.6	18.4	21.0	13.9	56.7	1.6	11.1	422.2	6.9	47.9	284.9	5.9	41.0	14.4	-1.8
RAF7021-8	7.2	0.4	8.1	4.8	0.1	2.8	1.7	0.1	3.2	87.4	3.8	85.9	88.7	4.4	19.8	0.6	12.6	135.4	2.2	50.0	79.7	1.7	37.4	4.4	-0.1
RAF7021-9	61.4	3.1	39.6	3.2	0.1	1.0	26.7	2.2	28.4	55.1	2.4	31.0	32.0	7.7	54.7	1.5	19.6	45.9	0.8	9.6	267.1	5.6	70.8	7.9	-0.7
RAF7021-10	0.7	0.0	0.8	2.8	0.1	1.7	0.0	0.0	0.1	92.5	4.0	97.4	99.1	4.1	16.4	0.5	10.5	201.3	3.3	74.6	31.7	0.7	14.9	4.4	-3.4
RAF7021-11	80.9	4.0	42.1	5.9	0.2	1.6	34.6	2.8	29.6	58.9	2.6	26.7	28.3	9.6	48.0	1.4	12.8	61.7	1.0	9.6	392.2	8.2	77.5	10.5	-4.6
RAF7021-13	113.5	5.7	43.7	8.7	0.2	1.7	51.6	4.2	32.8	64.8	2.8	21.8	23.5	12.9	70.0	2.0	13.5	439.3	7.2	49.3	260.0	5.4	37.1	14.6	-6.0
RAF7021-14	92.4	4.6	43.4	10.8	0.3	2.6	31.4	2.6	24.3	72.6	3.2	29.7	32.3	10.6	53.5	1.5	13.6	103.7	1.7	15.4	376.8	7.8	71.0	11.1	-2.0
RAF7021-15	22.4	1.1	24.9	3.7	0.1	2.1	20.5	1.7	37.4	36.8	1.6	35.6	37.7	4.5	26.2	0.7	17.3	10.3	0.2	3.9	161.9	3.4	78.8	4.3	2.5
RAF7021-17	25.9	1.3	24.7	4.1	0.1	2.0	12.0	1.0	18.9	65.2	2.8	54.3	56.4	5.2	95.4	2.7	56.6	87.9	1.4	30.3	29.9	0.6	13.1	4.8	4.7
RAF7021-18	66.8	3.3	44.7	5.0	0.1	1.7	19.1	1.6	21.0	56.0	2.4	32.6	34.3	7.5	39.2	1.1	16.1	10.0	0.2	2.4	268.2	5.6	81.5	6.9	4.3
RAF7021-21	25.3	1.3	51.4	5.0	0.1	5.2	8.4	0.7	28.1	8.7	0.4	15.3	20.5	2.5	16.0	0.5	19.0	50.0	0.8	34.6	52.9	1.1	46.4	2.4	1.7
RAF7021-22	31.9	1.6	42.2	4.1	0.1	2.8	11.2	0.9	24.5	26.5	1.2	30.6	33.3	3.8	34.4	1.0	26.4	47.6	0.8	21.2	92.3	1.9	52.3	3.7	1.3
RAF7021-23	96.4	4.8	42.4	3.8	0.1	0.9	42.0	3.5	30.4	68.8	3.0	26.4	27.2	11.4	47.3	1.3	10.5	38.1	0.6	4.9	515.6	10.7	84.6	12.7	-5.6
RAF7021-24	22.2	1.1	22.0	6.7	0.2	3.4	17.8	1.5	29.1	52.7	2.3	45.5	48.9	5.0	31.0	0.9	16.2	150.1	2.5	45.6	99.0	2.1	38.2	5.4	-3.4
RAF7021-25	78.0	3.9	39.8	10.2	0.3	2.7	33.7	2.8	28.4	65.5	2.8	29.1	31.8	9.8	96.1	2.7	25.5	186.7	3.1	28.7	234.1	4.9	45.8	10.6	-4.2
RAF7021-26	38.3	1.9	48.0	3.5	0.1	2.3	8.7	0.7	17.9	29.1	1.3	31.8	34.1	4.0	21.6	0.6	17.4	98.8	1.6	46.4	60.8	1.3	36.2	3.5	6.5