Table S1. Biological bands/ecological categories for interpreting Average Score per Taxa (ASPT) from TARISS.

Ecological Band	**Water Category**	**Range of ASPT**	**Description**
A	Very good (Natural)	Greater than 7	No or negligible modification (relatively little human impact)
B	Good	6–6.9	Biodiversity and integrity largely intact (some human-related disturbance but ecosystems essentially in good state)
C	Fair	5.0–5.9	Sensitive species may be lost, with tolerant or opportunistic species dominating (Moderately modified)
D	Poor	4.0–4.9	Mostly only tolerant species present; alien species invasion; disrupted population dynamics; species are often diseased (Largely modified)
E	Very poor	less than 3.9	River has undergone critical modification; almost complete loss of natural habitat and indigenous species with severe alien invasion(seriously modified)

Modified from Kaaya [47] and Dallas and Day [46].

The physical-chemical water parameter varied between sampling sites across the streams (Table S2 and Table S3). Mean dissolved oxygen (DO) was lower at Sululu (4.37 ± 0.20 mg/L), and higher for other streams. Mean EC and turbidity were higher at Sululu (44.65 ± 0.60 μS/cm, 37.32 ± 4.60 NTU) while lower turbidity was found at Mkula (12.32 ± 1.84 NTU). Nutrients analysis revealed low concentrations of NH_4^+–N and NO_3^-–N at all streams, with highest concentrations of NH_4^+–N and NO_3^-–N at Sululu.

Across sites (Table S3), higher DO was found at the sampling sites upstream irrigation schemes (7.27 ± 0.31 mg/L for Site 1 and 7.17 ± 0.36 mg/L for Site 2) relative to sites downstream irrigation schemes (6.50 ± 0.34 mg/L at Site 4 and 6.42 ± 037 mg/L at Site 5). Electrical conductivity and turbidity were higher at the downstream irrigation sampling Site 4 and Site 5. Higher mean concentration of NH_4^+–N, and NO_3^-–N were found downstream irrigation; however, there was no difference of PO_4^{3-}–P among sampling.

Table S2. Physical-chemical water quality parameters between sampling sites and among streams their interactions in Kilombero Valley, Tanzania.

Factor	Dependent Variable	df	Mean square	F	P value
Stream	pH	4	0.446	12.640	0.000
	DO	4	30.777	1282.864	0.000
	EC	4	98.483	6.220	0.000
	Turbidity	4	3670.102	728.253	0.000
	Temp	4	19.915	1033.032	0.000
	NH_4^+–N	4	4.553	54.859	0.000
	NO_3^-–N	4	0.430	34.187	0.000
	PO_4^{3}–P	4	7.580E-06	0.791	0.537ns
Site	pH	4	0.220	6.241	0.000
	DO	4	2.176	90.716	0.000
	EC	4	157.465	9.945	0.000
	Turbidity	4	641.298	127.252	0.000
	Temp	4	12.636	655.425	0.000
	NH_4^+–N	4	0.951	11.458	0.000
	NO_3^-–N	4	0.094	7.446	0.000
	PO_4^{3}–P	4	3.013E-06	0.314	0.867ns
Stream * Site	pH	16	0.253	7.163	0.000
	DO	16	0.222	9.261	0.000
	EC	16	35.901	2.267	0.014
	Turbidity	16	265.513	52.685	0.000
	Temp	16	11.887	616.569	0.000
	NH_4^+–N	16	0.236	2.843	0.002
	NO_3^-–N	16	0.032	2.527	0.006
	PO_4^{3}–P	16	5.630E-06	0.587	0.879ns

Table S3. Physical-chemical parameters (mean ±SE); dissolved oxygen (DO), pH, electrical conductivity (EC), turbidity, temperature, ammonium-N, nitrate-N, and phosphate-water quality parameters of different streams and sampling sites in Kilombero Valley: MS—Msolwa, MK—Mkula, NJ—Njage, SL—Sululu, KT—Kidete stream (least impacted).

Stream/ Site	pH	DO (mg/L)	EC (μS/cm)	Turbidity NTU	Temp (°C)	NH_4^+–N (mg/L)	NO_3^-–N (mg/L)	PO_4^{3-}–P (mg/L)
MS	7.29±0.14^{a}	6.84±0.30^{a}	40.04±2.42^{a}	47.33±8.82^{a}	20.09±0.14^{a}	3.21±0.14^{a}	0.77±0.04^{a}	0.082±0.001
MK	7.59±0.12^{bc}	7.61±0.13^{b}	42.83±2.07^{ab}	12.32±1.84^{b}	21.26±0.61^{b}	2.84±0.10^{b}	1.03±0.04^{bc}	0.082±0.001
NJ	7.18±0.07^{a}	7.46±0.14^{b}	42.32±2.68^{a}	22.22±2.04^{c}	19.79±0.19^{c}	2.77±0.10^{b}	0.78±0.03^{a}	0.083±0.001
SL	7.54±0.20^{c}	4.37±0.20^{c}	44.65±0.60^{b}	37.32±4.60^{d}	22.57±1.85^{d}	3.33±0.09^{a}	0.98±0.05^{c}	0.083±0.001
KT	7.32±0.40^{a}	7.91±0.19^{d}	38.07±3.18^{ac}	12.06±2.67^{b}	20.12±0.41^{e}	1.93±0.07^{c}	0.61±0.02^{d}	0.0812±0.001
Site1	7.35±0.05^{a}	7.27±0.31^{a}	37.14±1.55^{a}	19.74±1.84^{a}	19.70±0.095^{a}	2..50±0.15^{a}	0.71±0.05^{a}	0.082±0.0008
Site2	7.20±0.08a^{b}	7.17±0.36^{a}	40.21±1.43^{a}	20.21±3.06^{a}	20.01±0.08^{b}	2.64±0.16^{ac}	0.84±0.04^{b}	0.082±0.0006
Site3	7.41±0.08^{ac}	6.84±0.36^{b}	41.22±1.28^{a}	25.80±4.78^{b}	21.97±1.04^{c}	3.05±0.15^{bc}	0.82±0.03^{ab}	0.081±0.0008
Site4	7.44±0.09^{ac}	6.50±0.34^{c}	45.43±0.81^{b}	30.84±5.26^{c}	20.94±0.26^{d}	2.82±0.12^{c}	0.91±0.06^{b}	0.081±0.0008
Site5	7.52±0.10^{ac}	6.42±037^{c}	43.91±1.28^{b}	34.67±5.30^{d}	21.21±0.34^{e}	3.07±0.20^{c}	0.90±0.07^{b}	0.083±0.001

Table 4. List of macroinvertebrate taxa and their distribution for sites of different streams in Kilombero Valley, Tanzania.

Taxonomic Group	Sensitivity Score	MS1	MS2	MS3	MS4	MS5	MK1	MK2	MK3	MK4	MK5	NJ1	NJ2	NJ3	NJ4	NJ5	SL1	SL2	SL3	SL4	SL5	KT1	KT2	KT3	KT4	KT5	Abundance (%)
Annelida																											**1**
Hirudinea	1	0	0	0	0	✓	0	0	✓	0	✓	0	0	✓	✓	0	✓	✓	✓	✓	✓	0	0	0	0	0	1
Crustacea																											**8**
Potamonautiae	3	✓	✓	0	0	0	✓	✓	✓	0	0	✓	0	0	✓	0	0	0	0	✓	0	✓	✓	✓	✓	0	3
Atyidae	8	0	0	0	0	0	✓	0	0	0	0	✓	✓	0	0	0	✓	✓	0	0	0	0	0	0	✓	✓	5
Ephemeroptera (mayflies)																											**13**
Baetidae >2 sp	12	✓	0	✓	✓	0	✓	✓	0	0	0	✓	0	0	0	✓	0	0	0	0	0	✓	✓	✓	✓	✓	4
Caenidae	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0	0	✓	0	0	✓	0	0	1
Ephemerythidae	9	✓	0	✓	✓	✓	✓	✓	✓	✓	0	✓	0	0	0	✓	0	0	0	0	1	0	✓	0	0	0	3
Heptageniidae	13	✓	✓	0	0	0	✓	✓	0	0	0	0	0	0	✓	0	0	0	0	✓	0	✓	✓	0	0	0	2
Tricorythidae	9	0	✓	0	0	0	0	0	0	0	0	✓	0	0	0	0	0	0	0	0	0	0	✓	6	0	0	1
Oligoneuridae	15	0	0	0	0	0	0	0	0	0	0	✓	0	0	0	0	0	0	0	0	0	✓	✓	0	0	0	1
Leptophlebiidae	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓	✓	✓	0	0	1
Odonata (dragonflies & damselflies)																											**18**
Coenagrionidae	4	0	0	✓	✓	0	✓	0	✓	✓	0	0	0	0	✓	✓	0	0	0	0	0	0	0	0	0	0	2
Chlorocyphidae	10	0	✓	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0	0	1	0	0	✓	✓	0	0	1
Gomphidae	6	✓	0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	✓	✓	✓	✓	0	✓	✓	✓	✓	✓	✓	9
Cordulidae	8	0	0	0	0	0	0	0	0	0	0	0	0	✓	✓	✓	0	0	✓	✓	✓	0	0	0	✓	✓	2
Libellulidae	4	0	0	✓	✓	0	0	0	0	✓	✓	0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	5
Hemiptera (bugs)																											**24**
Nepidae	3	0	0	0	0	0	0	0	0	✓	0	0	0	✓	0	0	0	0	✓	0	0	0	0	0	0	✓	1
Pleidae	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naucoridae	7	0	0	0	✓	0	0	0	✓	✓	0	0	0	✓	0	✓	0	0	✓	0	✓	✓	0	0	0	0	1
Veliidae	5	✓	✓	✓	✓	✓	✓	✓	0	✓	✓	✓	✓	0	✓	✓	0	✓	0	✓	✓	✓	✓	✓	✓	✓	12
Hydrometridae	6	0	0	✓	0	0	0	0	✓	0	0	0	✓	0	0	0	0	✓	0	0	0	0	0	0	0	0	1
Gerridae	5	0	0	0	0	✓	0	0	0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	0	✓	✓	10
Belostomatidae	3	0	0	0	0	✓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera																											**10**
Philopotamidae	10	✓	✓	0	0	0	✓	✓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Leptoceridae	6	0	0	✓	0	✓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓	1
Hydropsychidae	12	✓	✓	✓	0	✓	✓	✓	0	0	0	0	0	✓	0	0	0	0	0	0	0	✓	✓	0	0	0	7

Coleoptera (beetles)																											**10**
Gyrinidae	5	0	✓	0	0	✓	✓	0	0	✓	✓	✓	✓	0	0	0	✓	✓	0	0	0	✓	0	0	0	0	6
Dytscidae	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0
Psephenidae	10	✓	✓	✓	0	0	✓	✓	✓	0	0	0	0	0	0	0	0	0	0	0	0	✓	✓	✓	0	0	2
Hydrophilidae	5	0	0	0	✓	0	0	0	0	0	0	0	✓	0	0	0	0	0	0	0	0	0	0	✓	0	0	0
Elmidae	8	0	0	0	0	0	✓	0	0	✓	0	0	0	✓	✓	0	0	0	0	✓	0	✓	✓	0	0	0	1
Scirtidae	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0	1
Haliplidae	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0	0	✓	0	0	0	0	0	0
Diptera (flies)																											**4**
Simuliidae	5	0	0	✓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0
Chironomidae	2	0	0	0	0	✓	0	0	✓	0	✓	0	0	✓	✓	0	0	0	✓	✓	✓	0	✓	0	0	✓	2
Tipulidae	5	0	0	0	0	0	✓	✓	0	0	0	0	0	✓	0	0	0	0	0	0	0	0	✓	0	0	0	1
Muscidae	1	0	0	0	0	0	✓	0	0	0	0	0	0	0	0	0	0	0	✓	✓	✓	0	0	0	0	0	0
Tabanidae	5	0	0	0	0	0	✓	✓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Athericidae	10	0	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0	0	0	0	0	0	0	0	0	0	1
Gastropoda (snails)																											**10**
Planorbidae	3	0	0	0	0	✓	0	0	0	✓	✓	0	0	✓	✓	0	✓	✓	✓	✓	0	0	0	0	✓	✓	9
Thiaridae	3	0	0	✓	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0	0	✓	0	0	✓	✓	0	1
Plecoptera (stone flies)																											**2**
Perlidae	12	✓	✓	✓	0	0	✓	✓	0	0	0	0	0	0	0	0	0	0	0	0	0	✓	0	0	0	0	2