Resource Quality Information Services

STATE OF RIVERS REPORT

River Ecostatus Monitoring Programme

2020-2021

WATER IS LIFE
SANITATION IS DIGNITY

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Ribbokspruit at Golden Gate National Park, Source – Hendrik Sithole, SANPARKS

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State of Rivers Report 2020-2021

Contents

ACRONYMS

ASPT	Average Score Per Taxon
BGCMA	Breede Gouritz Catchment Management Agency
CMA	Catchment Management Agencies
EC	Ecological Category
EWR	Ecological Water Requirements
FRAI	Fish Response Assessment Index
FROC	Frequency of Occurrence
FBIS	Freshwater Biodiversity Information System
GAI	Geomorphology Driver Assessment Index
GDARD	Gauteng Department of Agriculture and Rural Development
DPW	Department of Public Works
IHI	Index of Habitat Integrity
IUCMA	Inkomati-Usuthu Catchment Management Agency
KNP	Kruger National Park
MIRAI v2	Macroinvertebrate Response Assessment Index Version 2
MTPA	Mpumalanga Tourism and Parks Agency
NAEHMP	National Aquatic Ecosystem Health Monitoring Programme
NC/DENC	Northern Cape Department of Environment and Nature Conservation
PES	Present Ecological State
REMP	River Ecostatus Monitoring Programme
RHP	River Health Programme
RQIS	Resource Quality Information Services
RQO	Resource Quality Objectives
SASS5	South African Scoring System Version 5
SANBI	South African National Biodiversity Institute
SANPARKS	South African National Parks
SQR	Sub Quaternary Reach
VEGRAI	Vegetation Response Assessment Index
WMA	Water Management Area
WWTW	Wastewater Treatment Work

EXECUTIVE SUMMARY

Introduction

River systems are either approaching, or already in unsustainable conditions, not functioning as intended, becoming unbearable sites for flora and fauna (including humans. Urgent solutions are needed. The South African National Water Act (Act 36 of 1998) requires regulators to establish a sustainable equitable balance between the use and protection of water resources. This includes a range of resource monitoring and protection measures that must be implemented for the rivers in South Africa. The River Ecostatus Monitoring Programme (REMP) enables the monitoring of the ecological condition of river ecosystems in South Africa and provides information to support the management of rivers. River Ecostatus monitoring assists in identifying problems at an early stage so that prevention measures can be initiated timeously. In areas that are poor or unsustainable, intervention actions can be initiated to remedy problems and rehabilitate these vital water resources.

The objective of this report is to determine the ecological condition of South Africa's rivers based on mostly the rapid assessment of aquatic macroinvertebrates. This state of the rivers report presents the findings of the river Ecostatus monitoring that was undertaken during the 2020/21 hydrological year, comparing it to the results from previous assessments and Resource Quality Objectives (RQOs) where applicable.

Results

The number of sites per reporting year has increased from 207 in 2016/17 to 467 in 2020/21 (Figure S1). The decreased number of sites monitored in 2019/20 was due to the COVID-19 restrictions.

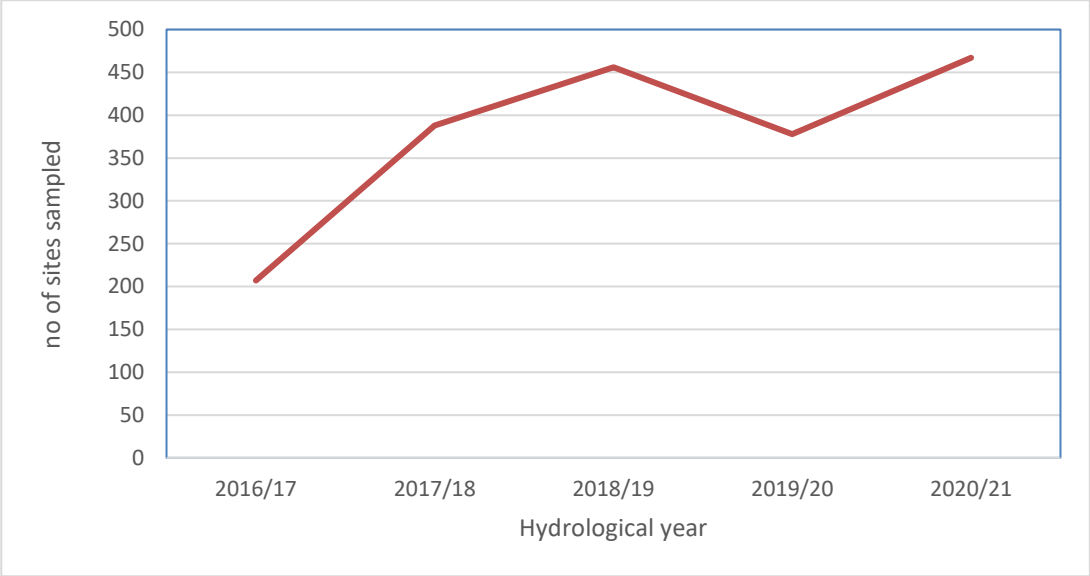

Figure S1: Number of sites sampled per hydrological year from 2016/17 to 2020/21.

The COVID-19 pandemic and associated lockdown measures also impacted the monitoring during this hydrological year. To reduce exposure to the virus only macroinvertebrates were monitored in most areas from October 2020 to March 2021. Figure S2 graphically represents the sites monitored during the 2020/21 hydrological year and indicates the reasons for not sampling where relevant. The riverine macroinvertebrates were assessed at 446 sites using the Macroinvertebrate Response Assessment Index (MIRAI) with the results

depicted in Figure S3. Other indices, additional to or instead of the MIRAI were also applied at some sites. The Riparian Vegetation Response Assessment Index (VEGRAI) was done at 65 sites, fish indices at 152 sites, the Index of Habitat Integrity (IHI) at 43 sites, and the Geomorphology Driver Assessment Index (GAI) at 16 sites. The sparsity of this data makes it challenging to combine the indices for an overall Ecostatus at this stage.

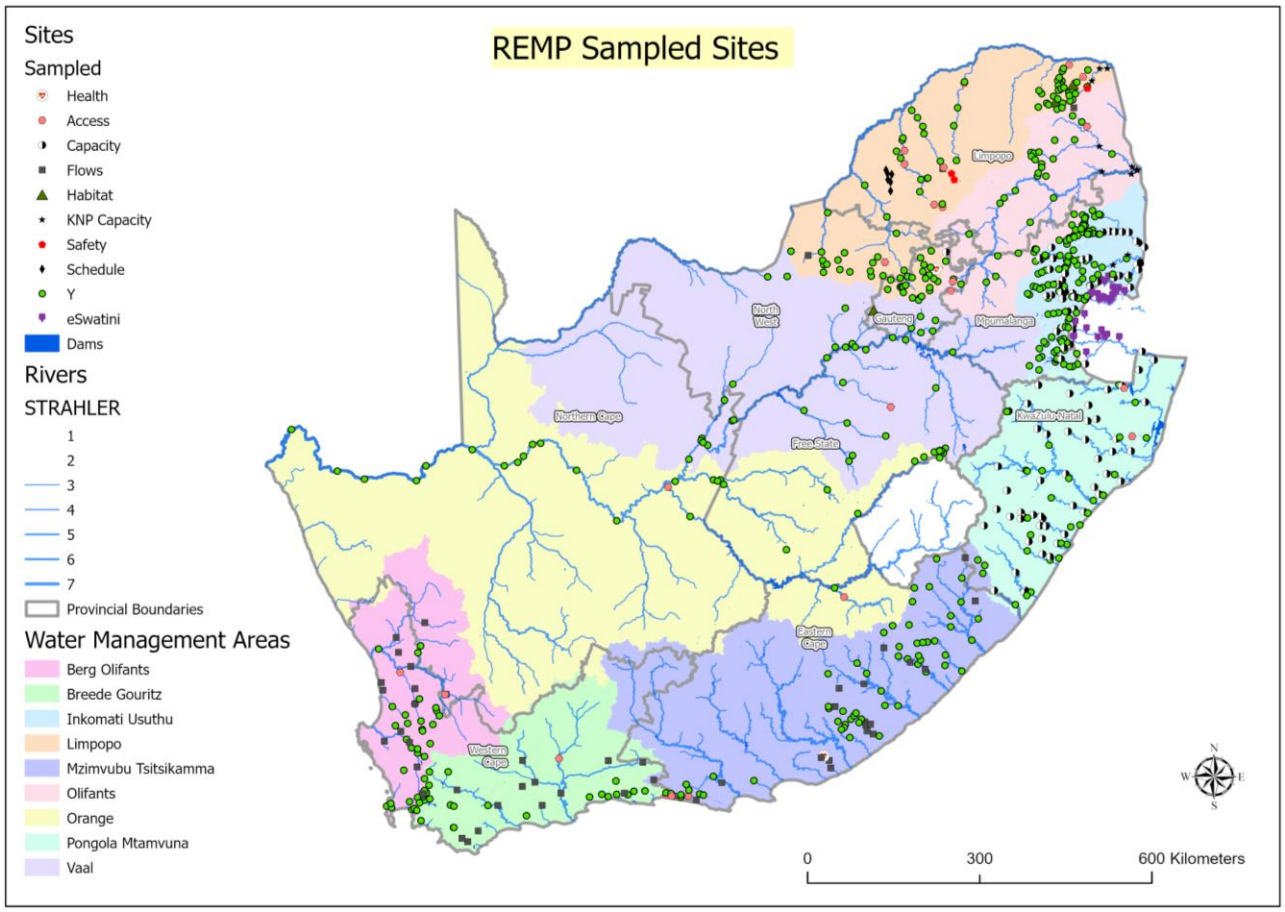

Figure S2: Map indicating the sites sampled during the 2020/21 Hydrological year in green. Sites not sampled with reasons for not sampling are presented with different markers as indicated in the legend. Reasons for not sampling include amongst others Access, Health and Safety, Capacity, Unsuitable Habitat, and flow conditions.

Figure S3a indicates the distribution of the sites where macroinvertebrates were monitored and their condition. Most (263) sites in the country, about 59%, were moderately modified (C). Moderately modified conditions were found to be the dominant condition in most river systems except the Crocodile West catchment which was mostly in a largely modified (D) condition. The upper portions of the Crocodile West catchment are located with the industrial and urban areas of Gauteng and is thus heavily impacted. The Jukskei River, Modderfonteinspruit, Crocodile River upstream of Hartbeespoort Dam, Hartbeesspruit just upstream of Roodeplaat Dam as well as the Apies and Hennops rivers were in very poor (D/E and E) condition.

As in previous years (DWS, 2019a; 2020a; 2021a), most of the modified (D category) to seriously modified (E) sites were in the Gauteng province (Figure S3b). That is, the upper Crocodile and upper Vaal sub-catchments, which are subjected to intensive urban and industrial development. The Sabie (18 sites), Komati (11 sites), Crocodile east (10 sites), Olifants (5 sites) and Usuthu (3 sites) stood out as catchments that had many sites that were in largely natural conditions (B and B/C categories), as presented in Figure S3c. The rest of the largely natural sites were either in the upper reaches closer to the source (Magalies, Debengeni, Berg and

Breede-Gouritz sites), protected areas (Eerste, Klerkspruit, Perskeboomspruit, Glen Reenenspruit, Ribbokspruit), or rural areas (sites the former Transkei area, Mkomazi, Mhlatuze and Pongola catchment).

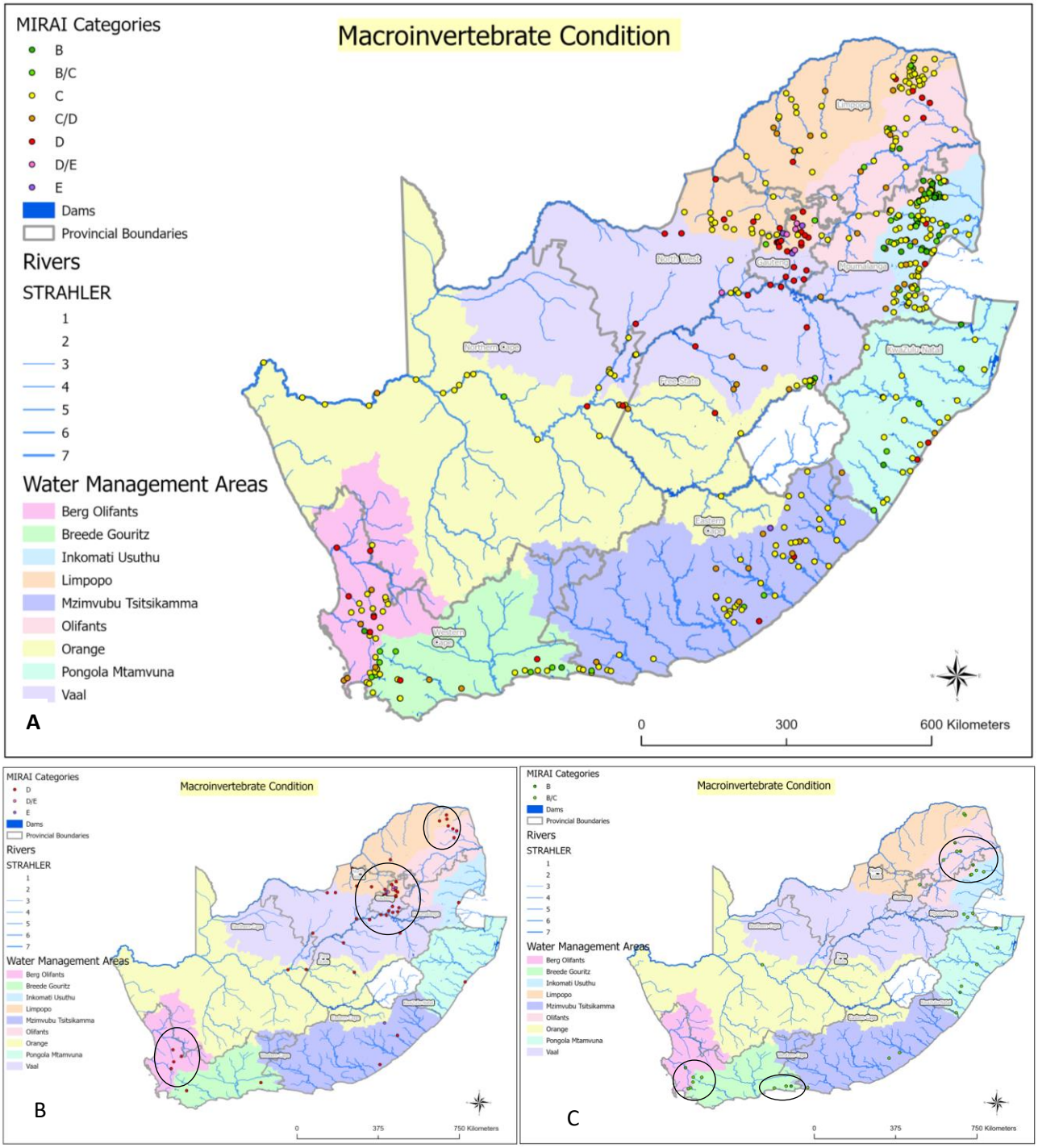

Figure S3: Summary of Ecological Categories reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B and B/C) while the red and purple reflect relatively poor conditions (D to E).

Although most (73%) of the sites monitored in this hydrological year were also monitored in the previous year, only 127 sites were monitored every year since the 2016/17 hydrological year (Annexure Y). This repetition rate helps with building of trends and having a better understanding of our river systems. It also shows that the programme seems to be finding stability, despite the challenges. These trends are depicted in Figure S4 below. Approximately 58% of sites remained in the same category as the previous reporting period; most of these were sites in the C category. Sites in this moderately modified condition (C category)

seem to be resilient and not easily responsive to changes, they can maintain basic ecosystem functions, provided the catchments around them are not subjected to severe disturbances. There was an improvement at 19% of the sites and a decline in ecological condition at 23%. It is however, concerning to notice that there seems to be an increasing proportion of sites deteriorating over the assessment period (from 11% between 2016/17-2017/18 to 23% in 2019/20-2020-21) at the cost of sites remaining unchanged or improving (Figure S4).

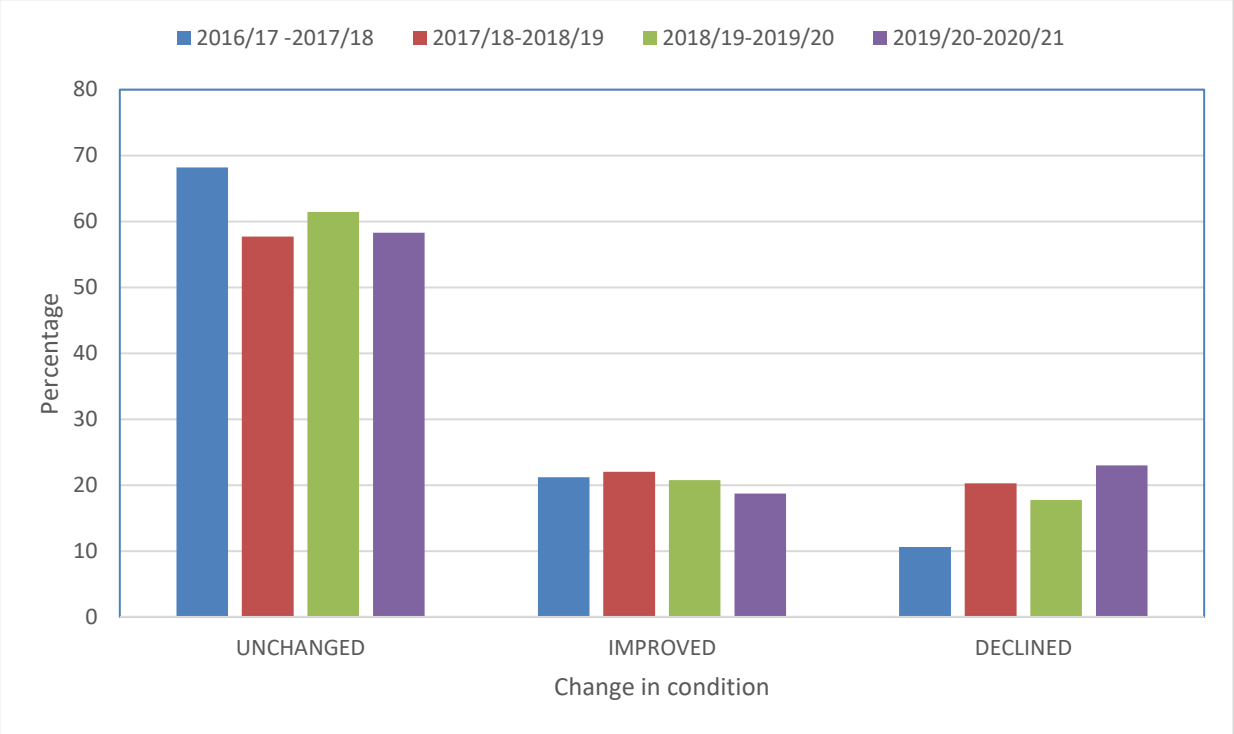

Figure S4: The percentage change in the macroinvertebrate ecological condition at sites that were monitored from the 2016/17 to 2020/21 hydrological years

Resource Quality Objectives

Invertebrates

Considering that the macroinvertebrates data was the most available, the below summary (Table S1) of compliance to Resource Quality Objectives (RQOs) was assessed only on this component. Two hundred and one (201) REMP sites were either EWR sites with RQOs or fall within a Resource Unit that has RQOs set for the macroinvertebrate condition. Annexure Z has all these sites and their coordinates. Table S1 only shows those that have been monitored since the 2016/17 hydrological year (169), with an indication of compliance. Sites with green cells complied with the RQO, while blue indicates better than the RQO and red non-compliance. There was RQO non-compliance at 60 sites, thus 45% of monitored sites. There was compliance at 47 sites, while 26 sites were in a better condition than the set RQOs. Approximately 22% of the sites are always non-compliant and approximately 38% are always compliant or in a better condition. Eleven percent of the sites are always in a better condition than the RQO.

Table S1: Comparison of macroinvertebrate condition to targeted RQOs

Site	River	Main River	2017	2018	2019	2020	2021	RQO	Site	River	Main River	2017	2018	2019	2020	2021	RQO
A2APIE-DEOND	Apies	Apies	D	D	E	D	D/E	C	C4VET-HOOPS	Vet	Vaal		D	D	C/D	D	C/D
A2APIE-PRETO	Apies	Apies	D/E	D/E	E	D/E	D/E	D	C6VALS-LINDL	Vals	Vaal	E	C	C/D	D		C/D
A2BLOU-KROMD	Bloubankspruit	Crocodile	D	D	D	D	D	D	C6VALS-PROKL	Vals	Vaal		C	D	D		C/D
A2BLOU-RIETF	Bloubankspruit	Crocodile	D	D	D/E	E	D	D	C8LIEB-MAFAH	Liebenbergsvlei	Wilge	E	D	C/D	C	D	B
A2BLOU-ZWART	Bloubankspruit	Crocodile	D	D	D	D	D	D	C9VAAL-DELPO	Vaal	Vaal	D	C/D	C/D	C	C	C
A2BRAA-PARKH	Braamfonteinspruit	Jukskei	D/E	D/E	E	D	D	D	C9VAAL-GONGG	Vaal	Vaal	D	C/D	C	C	C	C
A2CROC-BOBBE	Crocodile	Crocodile					E	D	C9VAAL-SCHMI	Vaal	Vaal	D	C/D	C	C	C	C
A2CROC-ELAND	Crocodile	Crocodile	D	D	C/D	C	D	D	C9VAAL-STCLA	Vaal	Vaal		C	D	D	D	C
A2CROC-KOEDO	Crocodile	Crocodile		C	C	D	C	D	C9VAAL-VAALB	Vaal	Vaal	D	C/D	C	C	C	C
A2CROC-MAKOP	Crocodile	Crocodile			C/D		C	C/D	C9VAAL-WARRE	Vaal	Vaal	D	C/D	C/D	C	C	D
A2CROC-MOUNT	Crocodile	Crocodile	D	D	D	D	D	D	C9VAAL-WVALE	Vaal	Vaal	C/D	D	C/D	C	C	D
A2EDEN-LEEUW	Edendalespruit	Pienaars	D	D	D	D		D	D4MOLO-WELTE	Molopo	Orange		D			D	D
A2ELAN-BESTE	Elands	Elands	C	C			C	C	G1BERG-BRBM1	Berg	Berg		C	C	C	B/C	B/C
A2ELAN-KLIPB	Elands	Elands	C	C	C	C	C	C	G1BERG-BRBM5	Berg	Berg		C	C	C	B	D
A2ELAN-NOOIT	Elands	Elands			D	D	D	C	G1BERG-BRBM6	Berg	Berg				C	C/D	B/C
A2HART-KAMEE	Hartbeesspruit	Pienaars	D	D/E	D	D	E	D	G1BERG-BRMB2	Berg	Berg		C	C/D	C/D	C	C
A2HENN-HENNO	Hennops	Hennops	E	E			D/E	D	G1BERG-JIMFO	Berg	Berg			C	C		C
A2HEXR-OLIFA	Hex	Elands		C	C/D		C	C	G1KROM-BEIT	Krom	Berg		C			C	B/C
A2HEXR-PAARD	Hex	Elands		E	E	D	D	D	G2DIEP-KALBA	Diep	Diep		D/E				E
A2HEXR-ROOIW	Hex	Elands	C	C/D	C	C	C	D	G2EERS-JONKE	Jonkershoek	Eerste		B/C	B	B	B/C	C
A2JUKS-EDENV	Jukskei	Jukskei	E	E	E	E	E	D	G2HOUT-ORANJ	Hout Bay	Hout Bay		C				D
A2JUKS-GULLU	Jukskei	Jukskei	E	E	E	E	E	D	G2HOUT-VICTO	Hout Bay	Hout Bay		D			C/D	D
A2KOST-NAAUW	Koster	Elands			D	D	C	C	G2LOUR-BROAD	Lourens	Lourens		C/D		C/D		D
A2MAGA-HARTE	Magalies	Magalies	C	C	C/D	C	C	C	G2LOUR-RADLO	Lourens	Lourens		C/D	C/D	C	C	D
A2MAGA-MALON	Magalies	Magalies		B	B/C	B/C	B/C	B	G2SILV-SUNBI	Silvermine	Silvermine		C/D				C
A2MODD-MODDE	Modderfonteinspruit	Jukskei		E	E	D	D/E	D	G4KLEI-GOUDI	Klein	Klein	C	C/D				C
A2MORE-FAIRY	Moreletaspruit	Pienaars	D	D	D	D	D	D	G4PALM-KOGEL	Palmiet	Palmiet	C	C	C/D		C	B
A2PIEN-BUFFE	Pienaars	Pienaars	C	C	C	D	C	C	G4PALM-NUWEB	Palmiet	Palmiet	C	C				B/C
A2PIEN-KLIPD	Pienaars	Pienaars		C	C		D	C	G5NUWE-BRAKP	Nuwejaars	Heuningnes		C	D	D		D
A2PLAT-KOMAN	Buffelspruit	Pienaars		B	B/C	C	C	C	H1BREE-SLANG	Breede	Breede		D	C	C	B/C	D
A2RIET-MERIN	Rietvlei	Hennops		D	D	D	D	C	H1BREE-WITBR	Breede	Breede		C				D
A2SKEE-SKEER	Skeerpoort	Magalies	B	B	B	C	C	B	H6BAVI-GENAD	Baviaans	Riviersonderend				C	C	A/B
A2STER-BUFFE	Sterkstroom	Crocodile		B/C	B/C	B/C	C	C	H6RIVI-GREYT	Riviersonderend	Riviersonderend			C	C	D	C/D
A2STER-MAMOG	Sterkstroom	Crocodile		C	C	C		D	H8DUIW-VERMA	Duiwenhoks	Duiwenhoks		C/D	C	C	C/D	E
A2SWAR-ELAND	Rietvlei	Hennops	E	D/E	D	D	D	C	J3KAMM-EWR10	Kammanassie	Olifants			D	D	D	C
A2SWAV-ZWAVE	Swavelpoortspruit	Pienaars	E	D	D	D	D	D	K2GROO-KLEIN	Groot Brak	Groot Brak		C	C	C	C	A
A2WATE-BAVIA	Waterkloofspruit	Elands		B	B	C	C	C	K3KAAI-GWEIR	Kaaimans	Kaaimans		C	B/C	B/C	B/C	A
A3GMAR-KOEDO	Groot Marico	Groot Marico	B/C	B	B	C	C	A/B	K4DIEP-DIEPR	Diep	Sedgefield		C	B/C	B	C	B
A3GMAR-LOTTE	Groot Marico	Groot Marico			C		D	C	K4HOMT-KNYSA	Homtini	Homtini		C	C	C	C	A
A3GMAR-RIEKE	Groot Marico	Groot Marico	C/D	C	C		C	C	K5KNYS-EWR01	Knysna	Knysna		C	B/C	B/C	B/C	B
A3GMAR-WONDE	Groot Marico	Groot Marico		B/C	C	C	C	B	K6KEUR-EWR06	Keurbooms	Keurbooms		C	B	B	B	B
A3KAAL-RIETS	Kaaloog se Loop	Groot Marico	C	B/C	C	C	C	A/B	T3MZIM-BHUJE	Kinira	Mzimvubu		C	C		C	C
A3POLK-TWYFE	Polkadraaispruit	Groot Marico		B/C	D	C	C	B/C	T3TINA-N2ROA	Thina	Mzimvubu			C		C	C

Site	River	Main River	2017	2018	2019	2020	2021	RQO	Site	River	Main River	2017	2018	2019	2020	2021	RQO
A4DWAR-JIMSE	Jim se loop	Mokolo	C	C	C	C	C	C	T3TSIT-LALEN	iTsitsa	Thina		C	C	C	C	C
A4DWAR-ZANDD	Dwars	Mokolo	C	C	C		C	C	T4MTAM-MADIK	Mtamvuna	Mtamvuna		C	B/C	B/C	B/C	B
A4MAMB-DIAMA	Mamba	Matlabas		C/D				C	U1MKOM-JOSEB	Mkomazi	Mkomazi				B	B	B
A4MATL-HOOPD	Matlabas	Matlabas		C	D	D		C	U1MKOM-SHOZI	Mkomazi	Mkomazi			C	C	C	B
A4MATL-WATER	Matlabas	Matlabas		C	C	C/D		C	U2MGEN-MZINY	uMgeni	uMgeni		C	B/C			C/D
A4MOKO-ALMAB	Sand	Mokolo			D	C	D	D	U2MGEN-USMWW	uMgeni	uMgeni			C	C	C	C
A4MOKO-MOKOL	Mokolo	Mokolo				C		C	U4MVOT-EWR12	uMvoti	uMvoti		B/C	B/C			B/C
A4MOKO-VAALW	Mokolo	Mokolo	C/D	C/D	C/D		C/D	C	V1TUKH-EWR02	Thukela	Thukela		D				C/D
A4MOKO-WWORK	Mokolo	Mokolo		D	D	D	C/D	C	V1TUKH-TUGEL	Thukela	Thukela			C	C	C	C
B1KOLI-MIDDE	Klein Olifants	Olifants	C	C	D	D	C/D	C	V3BUFF-RORKE	Buffalo	Thukela			C	C	C	C
B2WILG-BOSSE	Wilge	Olifants	C	C	C	C	C	C	V3NCND-LEYDN	Unspecified	Ncandu			C	C	C	B/C
B3ELAN-RHENO	Elands	Olifants	D	C	D	C	C	D	V3SLNG-NCHTW	Slang	Buffalo		B/C				B
B4STEE-PRETO	Steelpoort	Olifants			C		C	D	V5THUK-RAILB	Thukela	Thukela			C	C/D	C	C
B6BLYD-PILGU	Blyde	Olifants	C	C	C	C	C/D	B	V6THUK-TFERR	Thukela	Thukela			C	C	C	D
B7OLIF-BALUL	Olifants	Olifants	C	C	C			C	V7BUSH-MASHU	Bushmans	Thukela			C	C	C	C/D
B8GLET-APPEL	Groot Letaba	Groot Letaba	C	C	C	C	C/D	C	X1GLAD-VAALK	Gladdespruit	Komati		D				D
B8LETA-CONFL	Letaba	Letaba	C	D				C-C/D	X1KOMA-GEVON	Komati	Komati		B/C	B	B/C	C	B/C
B8LETA-KLIPK	Letaba	Letaba	C		D			C-C/D	X1KOMA-HOOGE	Komati	Komati		B/C	C	B/C	B/C	C
B8LETA-MAHLA	Letaba	Letaba	D	C	C			C-C/D	X1KOMA-TONGA	Komati	Komati		B/C	B/C	C	C	D
B8LETA-MBEWU	Letaba	Letaba	C/D	D	C	C	C	C-C/D	X1LOMA-KLEIN	Lomati	Komati		B				C
B8LETS-TANKB	Letsitele	Groot Letaba	D	D	D	C/D	C	C	X1TEEES-HEUNI	Teespruit	Komati			B	B	B/C	C
C1WATE-UPPER	Waterval	Vaal		D	D	D	C/D	D	X1TEES-TEESP	Teespruit	Komati		B/C				C
C2BLES-UPPER	Blesbokspruit	Suikerbosrant	E	E	E	D/E	D	D	X1TEES-WELVE	Teespruit	Komati			B/C	B/C		C
C2KLIP-ROTHD	Klip	Vaal		D	D	D	D	D	X2CROC-DONKE	Crocodile	Crocodile	B	B				B
C2MOOI-EWR02	Mooi	Vaal		D	D	D	C	D	X2CROC-GOEDE	Crocodile	Crocodile	B	B	B/C	C	C	B
C2MRLO-KHUTS	Moorivierloop	Mooi			D	C/D		D	X2CROC-MALEL	Crocodile	Crocodile	C	C	D			C
C2SKOO-GHOLF	Schoonspruit	Vaal			E		C	C/D	X2CROC-MONTR	Crocodile	Crocodile	BC	B/C			C	C
C2SKOO-URANI	Schoonspruit	Vaal		D/E	D	D	D/E	D	X2CROC-NKONG	Crocodile	Crocodile	C	C	D			C
C2SUIK-DEHOE	Suikerbosrant	Vaal	D	D	D	D	D	B/C	X2CROC-POPLA	Crocodile	Crocodile	BC	A/B	C	C	B/C	C
C2TAAI-SASOL	Taaibosspruit	Vaal	D	D	D	C/D	D	D	X2CROC-RIETV	Crocodile	Crocodile	BC	B/C	B/C	B/C	B/C	C
C2VAAL-EWR13	Vaal	Vaal		D	D			D	X2CROC-VALY1	Crocodile	Crocodile	AB	A/B	C	B/C	B/C	B
C2VAAL-SCAND	Vaal	Vaal		D	C/D	C	C	C	X2CROC-VERLO	Crocodile	Crocodile	AB	A/B	C	C	C	B
C2VAAL-SCHOE	Vaal	Vaal				C/D	D	C	X2CROC-VERL1	Crocodile	Crocodile				B	B/C	B
C2VAAL-VERMA	Vaal	Vaal		D	C/D		C	D	X2KAAP-HONEY	Kaap	Crocodile	C	C		C	C	B
C3HART-DELPO	Harts	Vaal	D	C	C	C	C	D	X3MACM-FALLS	Mac Mac	Sabie			B		B	A/B
C3HART-PAMPI	Harts	Vaal	D	C	C/D	C	C	D	X3MACM-PICNI	Mac Mac	Sabie			B/C		B/C	A/B
C3HART-TAUNG	Harts	Vaal	D	D	D	D	D	D	X3MACM-VENUS	Mac Mac	Sabie			B/C		B/C	A/B
C4GVET-VDRIE	Groot Vet	Vet		C	D	C/D	C/D	C	X3MUTL-NEWF1	Mutlumuvi	Sand			B/C		B/C	B/C
C4KVET-VVIER	Klein Vet	Vet		C/D	C	D	C/D	C	X3SABI-BRUG	Sabie	Sabie		C	C		C	B
C4SAND-R73BR	Sand	Vet	D	C	D	D	C/D	C	X3SABI-RIOOL	Sabie	Sabie		C			C	B
C4SAND-SENEK	Sand	Vet		C/D	D	D	C/D	C	X3SABI-SEKUR	Sabie	Sabie			C			B
									X3SAND-SKUKU	Sand	Sabie		D				B

Fish:

The limited fish sampling is reflected in Table S2 below which compares the fish condition against the targeted RQOS where available. Only 28 sites have both fish condition and gazetted RQOs for fish available. These sites are in the Mzimvubu and Inkomati catchments only. Sites with green cells complied with the RQO, while blue indicates better than the RQO and red non-compliance. Only the Komati River at Hooggenoeg (X1KOMA-HOOGE), of the 21 sites monitored in the 2020/21 hydrological year, was in a better condition than the gazetted RQO. Nine sites were in the same condition as the gazetted RQO, and 11 sites were non-compliant.

Table S2: Comparison of fish condition to targeted RQOs

Site	River	Main River	2017	2018	2019	2020	2021	RQO
T3MZIM-BHUJE	Kinira	Mzimvubu		C	C	C		C
T3TINA-N2ROA	Thina	Mzimvubu		B/C		B/C		B/C
T3TSIT-LALEN	iTsitsa	Thina		E/F	E	E	E	C
X1GLAD-VAALK	Gladdespruit	Komati		D				D
X1KOMA-GEVON	Komati	Komati		C			C	C
X1KOMA-HOOGE	Komati	Komati		B/C			B/C	C
X1KOMA-TONGA	Komati	Komati		C			C	C/D
X1LOMA-KLEIN	Lomati	Komati		C				C
X1TEEES-HEUNI	Teespruit	Komati					C	C
X1TEES-TEESP	Teespruit	Komati		C				C
X1TEES-WELVE	Teespruit	Komati					C	C
X2CROC-DONKE	Crocodile	Crocodile	B/C				C	B
X2CROC-GOEDE	Crocodile	Crocodile	B/C				C	B
X2CROC-MALEL	Crocodile	Crocodile	B/C					C
X2CROC-MONTR	Crocodile	Crocodile	B/C				C	B
X2CROC-NKONG	Crocodile	Crocodile	C/D					C
X2CROC-POPLA	Crocodile	Crocodile	B/C				B/C	B
X2CROC-RIETV	Crocodile	Crocodile	B/C				B/C	B
X2CROC-VALY1	Crocodile	Crocodile	B/C				B/C	A
X2CROC-VERLO	Crocodile	Crocodile	B/C				B/C	A
X2CROC-VERL1	Crocodile	Crocodile					C	B
X2KAAP-HONEY	Kaap	Crocodile	C				C	C
X3MACM-FALLS	Mac Mac	Sabie					B	B/C
X3MACM-PICNI	Mac Mac	Sabie					B	B/C
X3MACM-VENUS	Mac Mac	Sabie					B	B/C
X3MUTL-NEWF1	Mutlumuvi	Sand					C	C
X3SABI-BRUG	Sabie	Sabie					C	B
X3SABI-RIOOL	Sabie	Sabie					C	B

Riparian Vegetation:

The Riparian Vegetation was monitored at 38 sites with gazetted RQOS (Table S3). Six (40%) of the 15 sites monitored in the 2020/21 hydrological year were non-compliant and only two sites were in a better condition than the gazetted RQOs. Only four sites were monitored in all three years. Almost 40% of the sites never complied to the RQOs while another 40% always complied to the RQOs. Only 18% of the sites were always in a better condition than the gazetted RQOs.

Table S3: Comparison of riparian vegetation condition to targeted RQOs

Site	River	Main River	2019	2020	2021	RQO
A2BLOU-KROMD	Bloubankspruit	Crocodile		C		D
A2BLOU-ZWART	Bloubankspruit	Crocodile		C/D	D	D
A2CROC-MAKOP	Crocodile	Crocodile	D/E	D/E	D/E	C/D
A2CROC-MOUNT	Crocodile	Crocodile	D	D		C/D
A2ELAN-BESTE	Elands	Elands	C/D			C
A2ELAN-KLIPB	Elands	Elands	D			C
A2ELAN-NOOIT	Elands	Elands	C			C
A2HART-KAMEE	Hartbeesspruit	Pienaars			D	D
A2HENN-HENNO	Hennops	Hennops		E	D	D
A2HEXR-ROOIW	Hex	Elands	C/D	D		C
A2JUKS-GULLU	Jukskei	Jukskei		E		C
A2MAGA-HARTE	Magalies	Magalies	D	D	C/D	C/D
A2MODD-MODDE	Modderfonteinspruit	Jukskei		E	D	C
A2MORE-FAIRY	Moreletaspruit	Pienaars			D	D
A2PIEN-BUFFE	Pienaars	Pienaars	C/D	C/D	D	C
A2PIEN-KLIPD	Pienaars	Pienaars			C	C
A2STER-MAMOG	Sterkstroom	Crocodile	C	C		C
A2SWAR-ELAND	Rietvlei	Hennops			D	C
A2SWAV-ZWAVE	Swavelpoortspruit	Pienaars		C		D
A3GMAR-KOEDO	Groot Marico	Groot Marico	C			B
A3GMAR-LOTTE	Groot Marico	Groot Marico	D		C	C
A3GMAR-RIEKE	Groot Marico	Groot Marico			C	C/D
A3GMAR-WONDE	Groot Marico	Groot Marico	E		D	C
A3KAAL-RIETS	Kaaloog se Loop	Groot Marico			C	B
C2BLES-UPPER	Blesbokspruit	Suikerbosrant		E		D
C2SKOO-GHOLF	Schoonspruit	Vaal	B			C/D
C2SKOO-URANI	Schoonspruit	Vaal	C/D			C/D
C2SUIK-DEHOE	Suikerbosrant	Vaal		C		B/C
C2VAAL-EWR13	Vaal	Vaal	C			D
C2VAAL-VERMA	Vaal	Vaal	C			D
C4GVET-VDRIE	Groot Vet	Vet	C/D	C		C
C4KVET-VVIER	Klein Vet	Vet	B/C	C		C
C4SAND-R73BR	Sand	Vet	D	C/D		C
C4SAND-SENEK	Sand	Vet	C/D	C		C
C4VET-HOOPS	Vet	Vaal	D	C/D		C/D
C6VALS-LINDL	Vals	Vaal	C	C		C
C6VALS-PROKL	Vals	Vaal	D	C		C/D
D4MOLO-MODIM	Molopo	Orange	C	C	C	D

Habitat Integrity:

The Index of Habitat Integrity (IHI) was conducted at 40 sites with gazetted RQOS. The Instream IHI (Table S4) at half (13) and the Riparian IHI (Table S5) at 14 (54%) of the 26 sites monitored in the 2020/21 hydrological year were non-compliant. The Instream (13 sites) and riparian (14 sites) IHI at approximately one-third of the sites never complied to the RQOs while the Instream IHI at 21 sites (53%) and the Riparian IHI at 16 sites (40%) always complied to the RQOs. The Instream IHI at 14 sites (35%) and the Riparian IHI at 11 sites (28%) were always in a better condition than the gazetted RQOs

Table S4: Comparison of Instream Index of Habitat Integrity condition to targeted RQOs

Site	River	Main River	2018	2018	2020	2021	RQO
A2CROC-BOBBE	**Crocodile**	**Crocodile**	**D**	**D**	**D**	**D**	**D**
A2CROC-KOEDO	**Crocodile**	**Crocodile**		**C**	**C/D**	**D**	**D**
A2CROC-MAKOP	**Crocodile**	**Crocodile**			**D/E**	**E**	**C/D**
A2CROC-MOUNT	**Crocodile**	**Crocodile**	**E**	**E**	**E**		**C/D**
A2ELAN-BESTE	**Elands**	**Elands**		**C**			**C**
A2ELAN-KLIPB	**Elands**	**Elands**		**C**			**C**
A2HEXR-ROOIW	**Hex**	**Elands**		**D**			**D**
A2JUKS-GULLU	**Jukskei**	**Jukskei**		**C**			**D**
A2MAGA-HARTE	**Magalies**	**Magalies**		**E**	**D**	**C**	**C/D**
A2MAGA-MALON	**Magalies**	**Magalies**		**B**	**C**	**B**	**B**
A2MODD-MODDE	**Modderfonteinspruit**	**Jukskei**		**C**			**D**
A2PIEN-BUFFE	**Pienaars**	**Pienaars**			**C**	**D**	**C**
A2PLAT-KOMAN	**Buffelspruit**	**Pienaars**			**B**	**B/C**	**C/D**
A2RIET-MERIN	**Rietvlei**	**Hennops**		**D**	**D**	**D**	**C**
A2SKEE-SKEER	**Skeerpoort**	**Magalies**		**B**		**B**	**C/D**
A2STER-BUFFE	**Sterkstroom**	**Crocodile**		**C**			**B/C**
A2SWAV-ZWAVE	**Swavelpoortspruit**	**Pienaars**		**D**			**D**
A3GMAR-KOEDO	**Groot Marico**	**Groot Marico**		**B/C**	**C**	**C**	**B**
A3GMAR-LOTTE	**Groot Marico**	**Groot Marico**		**D/E**	**D/E**	**D**	**C**
A3GMAR-RIEKE	**Groot Marico**	**Groot Marico**			**E**	**E**	**C/D**
A3GMAR-WONDE	**Groot Marico**	**Groot Marico**		**D**	**D**	**C/D**	**C**
A3KAAL-RIETS	**Kaaloog se Loop**	**Groot Marico**			**A/B**	**A/B**	**B**
A3KMAR-KALKD	**Klein Marico**	**Groot Marico**			**E**	**E**	**C**
A3POLK-TWYFE	**Polkadraaispruit**	**Groot Marico**		**B/C**	**D**	**C**	**B**
A4MAMB-DIAMA	**Mamba**	**Matlabas**		**A**			**B/C**
A4MAMB-HOPEW	**Mamba**	**Matlabas**		A			**B/C**
A4MATL-WATER	**Matlabas**	**Matlabas**		**A**			**B/C**
C2SKOO-GHOLF	**Schoonspruit**	**Vaal**				**B**	**C/D**
C2SKOO-URANI	**Schoonspruit**	**Vaal**				**D**	**C/D**
C2VAAL-EWR13	**Vaal**	**Vaal**				**C**	**D**
C2VAAL-VERMA	**Vaal**	**Vaal**				**C**	**D**
C4GVET-VDRIE	**Groot Vet**	**Vet**				**B/C**	**C**
C4KVET-VVIER	**Klein Vet**	**Vet**				**B/C**	**C**
C4SAND-R73BR	**Sand**	**Vet**				**D**	**C**
C4VET-HOOPS	Vet	**Vaal**				**D**	**C/D**
C6VALS-PROKL	**Vals**	**Vaal**				**F**	**C/D**
D4MOLO-MODIM	Molopo	Orange		D/E	D/E	C	**D**
T3KINI-GWEIR	Kinira	Mzimvubu					C
T3MZIM-BHUJE	**Kinira**	**Mzimvubu**	**A**				**B/C**
T3TINA-N2ROA	**Thina**	**Mzimvubu**	**C**				**C**
T3TSIT-LALEN	**iTsitsa**	**Thina**	**C**				**B/C**

Table S5: Comparison of Riparian Index of Habitat Integrity condition to targeted RQOs

Site	River	Main River	2018	2019	2020	2021	RQO
A2CROC-BOBBE	Crocodile	Crocodile	D/E	D/E	D	B/C	D
A2CROC-KOEDO	Crocodile	Crocodile		D	D	E	D
A2CROC-MAKOP	Crocodile	Crocodile			D	E	C/D
A2CROC-MOUNT	Crocodile	Crocodile	F	D	E		C/D
A2ELAN-BESTE	Elands	Elands		C			C
A2ELAN-KLIPB	Elands	Elands		C			C
A2HEXR-ROOIW	Hex	Elands		C/D			C
A2JUKS-GULLU	Jukskei	Jukskei		E			C
A2MAGA-HARTE	Magalies	Magalies		F	E	C	C/D
A2MAGA-MALON	Magalies	Magalies		B	C	A/B	B
A2MODD-MODDE	Modderfonteinspruit	Jukskei		F			C
A2PIEN-BUFFE	Pienaars	Pienaars			C	D	C
A2PLAT-KOMAN	Buffelspruit	Pienaars			B	B	C/D
A2RIET-MERIN	Rietvlei	Hennops		D/E	D	C	C

Site	River	Main River	2018	2019	2020	2021	RQO
A2SKEE-SKEER	Skeerpoort	Magalies		C		C	C/D
A2STER-BUFFE	Sterkstroom	Crocodile		B			B/C
A2SWAV-ZWAVE	Swavelpoortspruit	Pienaars		F			D
A3GMAR-KOEDO	Groot Marico	Groot Marico		A/B	A/B	C	B
A3GMAR-LOTTE	Groot Marico	Groot Marico		D	D	D	C
A3GMAR-RIEKE	Groot Marico	Groot Marico			A/B	D	C/D
A3GMAR-WONDE	Groot Marico	Groot Marico		E	E	D	C
A3KAAL-RIETS	Kaaloog se Loop	Groot Marico			A/B	B	B
A3KMAR-KALKD	Klein Marico	Groot Marico			E	C	C
A3POLK-TWYFE	Polkadraaispruit	Groot Marico		D	D	D	B
A4MAMB-DIAMA	Mamba	Matlabas		A			B/C
A4MAMB-HOPEW	Mamba	Matlabas		A			B/C
A4MATL-WATER	Matlabas	Matlabas		A			C
C2SKOO-GHOLF	Schoonspruit	Vaal				B	C/D
C2SKOO-URANI	Schoonspruit	Vaal				C	C/D
C2VAAL-EWR13	Vaal	Vaal				B/C	D
C2VAAL-VERMA	Vaal	Vaal				B/C	D
C4GVET-VDRIE	Groot Vet	Vet				D	C
C4KVET-VVIER	Klein Vet	Vet				B/C	C
C4SAND-R73BR	Sand	Vet				D	C
C4VET-HOOPS	Vet	Vaal				D	C/D
C6VALS-PROKL	Vals	Vaal				E/F	C/D
D4MOLO-MODIM	Molopo	Orange		B	C	D/E	D
T3MZIM-BHUJE	Kinira	Mzimvubu	A/B				C
T3TINA-N2ROA	Thina	Mzimvubu	C				C
T3TSIT-LALEN	iTsitsa	Thina	C				C

Being the solution

The upper Crocodile West is one of the most polluted catchments in the country. It feeds into the hypertrophic Hartbeespoort dam. Communities and Non-Profit Organisations (NPOs) such as the Hennops Revival, Kanana Community and Adopt Tolwane, have been organising themselves to clean up parts of river stretches and other water bodies in this catchment. These groups have embarked on efforts to "heal" water resources from the scars of everyday bruising, by implementing innovative solutions to trap litter (at Hennops), citizen science (Tolwane River), and the good old "getting your hands dirty" (canal to Kaalspruit). For example, the pictures seen in Box 1, clockwise, show:

The youth of Embekweni, on the banks of the Berg River in the Paarl area, champion environmental education and awareness by aligning their activities and actions with the United Nations Sustainable Development Goals. They monitor aquatic invertebrates and riparian health as they implement various initiatives that contribute to a more ecologically sustainable Berg River. Some of which are a plastic-free Berg River initiative in Embekweni, equipping young members of the community as future water-warriors that will choose relevant careers and be part of future solutions, as well as planting indigenous plants.

Organisations like GroundTruth, triple P, and the Duzi-uMngeni Conservation Trust (DUCT) have put citizen science on the map in KwaZulu-Natal; benefiting rivers like Mngeni, Msunduzi, Mlazi, Mbokodweni, just to mention a few. Communities can confidently approach polluters, with the power of data and facts. It was proven that citizen science can be a proxy for monitoring compliance to Total Suspended Solids, through utilisation of a community friendly water clarity tube. Graham and Taylor (2018) demonstrated this in the development of the citizen science tools, where there was partnership with a community affected by discharges from a wastewater treatment facility around the informal settlement of Shiyabazali, on the banks of the uMngeni River.

What is missing?

Government needs to strengthen funding, training, Personal Protective Equipment (PPE), investing in resources, regulation (enforcement, strategies), service delivery, education, and empowerment. Businesses need to partner with the public and government, and employ environmentally sustainable business practices, including better management of wastewater, environmentally friendly farming methods and greener developments.

The improvement of storm water quality in urban areas needs to be prioritised by local authorities, as this is a major cause of water quality pollution in urban rivers and estuaries. More ecological infrastructure methods should be employed such as constructed wetlands to treat contaminated storm water. The impacts by agriculture, destruction of riparian habitat and ecological infrastructure such as wetlands also requires urgent attention, especially in urban areas. The clearance of invasive alien plants both terrestrial and aquatic also requires urgent attentions as these plants have a direct impact on the availability of water in the rivers. Funds to rehabilitate and maintain ecological infrastructure is required. Private sector and non-governmental organisations can play a significant role to find funds for ecological infrastructure projects.

INTRODUCTION

River systems are either approaching, or already in unsustainable conditions, not functioning as intended, becoming unbearable sites for flora and fauna (including humans). Urgent solutions are needed.

The South African National Water Act (Act 36 of 1998) requires regulators to establish a sustainable equitable balance between the use and protection of water resources. This includes a range of resource monitoring and protection measures that must be implemented for the rivers of South Africa. Notwithstanding this legislative requirement, there has been a demonstrable drop in the aquatic ecosystem health across the country and increased stress on water resources, leaving little buffering capacity for any coming changes and increasing water demand. Well-functioning ecosystems provide valuable services such as water quality improvement, streamflow regulation and flood attenuation, to people and can also buffer human settlements and built infrastructure against extreme events that are likely with climate change. Thus, playing a crucial and cost-effective role in disaster-risk reduction. The integrates protection of aquatic ecosystems ensures the complex and interconnected nature of catchments as socio-ecological systems are recognized and the aquatic ecosystem (water quantity and quality, habitat, and biota) are managed in an integrated way (DWS, 2013a). The National Aquatic Ecosystem Health Monitoring Programme (NAEHMP) is an initiative established by the Department of Water and Sanitation to develop and implement a range of monitoring programmes for various water resources in South Africa. The South African River Health Programme (RHP) was initiated in 1994 in response to the need for more detailed information on the condition of South Africa's river ecosystems. The RHP was initiated prior to the promulgation of the Water Act and as such did not align completely with the Act, so it was later replaced by the River Ecostatus Monitoring Programme (REMP). The REMP enables the monitoring of the ecological condition of river ecosystems in South Africa. It provides information regarding the ecological condition of river ecosystems to support the management of rivers and was designed to meet the following objectives:

- Measure, assess, and report the ecological status of river ecosystems;
- Detect and report spatial and temporal trends in the ecological status of river ecosystems;
- Identify and report emerging problems regarding river ecosystems;
- Ensure that all river ecosystem status reports provide scientifically relevant information for the management of these river ecosystems; and
- Create public capacity and environmental awareness.

One of the key objectives for the National Water Resources Strategy (NWRS2) is to ensure that water is protected, used, developed, conserved, managed, and controlled in an equitable and sustainable manner. One of the strategic themes in addressing these issues and respond to national priorities is water resource protection which aims to ensure that South Africa's aquatic ecosystems are protected effectively at different and appropriate levels, and that decision concerning levels of protection take transparent and just account of environmental, social, and economic well-being. Integrated protection of aquatic ecosystems in one of the principles under water protection of the strategy which can be achieved through River Ecostatus monitoring programme thereby evaluating indices such macroinvertebrates, Fish, riparian vegetation, habitat etc. River Ecostatus monitoring assists in identifying water-related problems at an early stage so that prevention measures can be initiated before the problem becomes severe. In areas where the status is poor or unsustainable, remedial actions can be initiated to rehabilitate the water resources.

OBJECTIVES OF THIS REPORT

The objective of this report is to report on the ecological condition of South Africa's rivers based on mostly the rapid assessment of aquatic macroinvertebrates. This state of the rivers report presents the findings of the river Ecostatus monitoring that was undertaken during the 2020/21 hydrological year, comparing it to the results from previous assessments and Resource Quality Objectives (RQOs) where applicable.

METHODS

The REMP makes use of a suite of ecological indicators that have specifically been selected for their ability to integrate the impact of multiple disturbances on the status of rivers. The integration of the ecological indicators then provides information on the overall condition of the river, known as the ecological status (Ecostatus). This totality of the features and characteristics of the river and its riparian areas manifests in its ability to support a natural array of species. This ability relates directly to the capacity of the system to provide a variety of ecosystem services (Kleynhans and Louw, 2008).

Macroinvertebrate assemblages are good, short-term, biotic indicators of integrated stressors on river resources (Dickens and Graham, 2002). Macroinvertebrate assemblage composition and abundance can be affected by flow alterations, habitat disturbance and water quality perturbations, or any combination of these stressors (Thirion, 2007). Macroinvertebrates possess various sensitivities to these 3 system drivers thereby giving an indication of the overall disturbance to the ecological integrity of a freshwater resource (Thirion, 2007; 2016); see Plate 1. Macroinvertebrates were monitored at 446 of the 461 sites sampled this hydrological year.

Sampling was conducted according to the South African Scoring System Version 5 (SASS5) method, which is a rapid biomonitoring tool that was developed for lotic (flowing water) systems only. This method assesses macroinvertebrate assemblages occupying different habitats and uses pre-determined sensitivity weightings assigned per taxon. Macroinvertebrates are identified mostly to family level. This method gives an indication of water quality impairment and overall river integrity/health. Details on this method can be obtained in Dickens and Graham (2002).

The Macroinvertebrate Response Assessment Index version 2 (MIRAI v2) was used to analyse the SASS5 data collected. Present-day and relevant historic data for sites was sourced. The MIRAI was developed to provide a habitat-based cause-and-effect foundation for interpreting the deviation of the macroinvertebrate assemblage from reference condition (Thirion, 2007; 2016).

The MIRAI generates an Ecological Category (EC) for macroinvertebrates by integrating the ecological requirements of an assemblage and relating this to modified flow, habitat, and water quality conditions. Reference conditions for this project were set by using historic data as well as the reference taxa generator functionality of MIRAI v2 and specialist judgement. Frequencies of Occurrence (FROCs) were set using the SASS5 data (Thirion, 2007; 2016) and specialist judgment based on the natural habitat and flow conditions of a particular site.

Table 1: Generic Ecological Categories (EC) for Ecological Integrity Categories (modified from Kleynhans 1996 & Kleynhans 1999).

ECOLOGICAL CATEGORY	GENERIC DESCRIPTION OF ECOLOGICAL CONDITIONS	ARBITRARY GUIDELINE SCORE (% OF MAXIMUM THEORETICAL TOTAL)
A	**Unmodified/natural.** Close to natural or close to predevelopment conditions within the natural variability of the system drivers: hydrology, physico-chemical and geomorphology. The habitat template and biological components can be considered close to natural or to pre-development conditions. The resilience of the system has not been compromised.	>92 - 100
A/B	The system and its components are in a close to natural condition most of the time. Conditions may rarely and temporarily decrease below the upper boundary of a B category.	>88 - ≤92
B	**Largely natural with few modifications**. A small change in the attributes of natural habitats and biota may have taken place in terms of frequencies of occurrence and abundance. Ecosystem functions and resilience are essentially unchanged.	>82 - ≤88
B/C	Close to largely natural most of the time. Conditions may rarely and temporarily decrease below the upper boundary of a C category.	>78 - ≤82
C	**Moderately modified.** Loss and change of natural habitat and biota have occurred in terms of frequencies of occurrence and abundance. Basic ecosystem functions are still predominantly unchanged. The resilience of the system to recover from human impacts has not been lost and it is ability to recover to a moderately modified condition following disturbance has been maintained.	>62 - ≤78
C/D	**The system is in a close to moderately modified condition most of the time.** Conditions may rarely and temporarily decrease below the upper boundary of a D category.	>58 - ≤62
D	**Largely modified.** A large change or loss of natural habitat, biota and basic ecosystem functions have occurred. The resilience of the system to sustain this category has not been compromised and the ability to deliver Ecosystem Services has been maintained.	>42 -≤58
D/E	**The system is in a close to largely modified condition most of the time.** Conditions may rarely and temporarily decrease below the upper boundary of an E category. The resilience of the system is often under severe stress and may be lost permanently if adverse impacts continue.	>38 - ≤42
E	**Seriously modified.** The change in the natural habitat template, biota and basic ecosystem functions are extensive. Only resilient biota may survive, and it is highly likely that invasive and problem (pest) species may dominate. The resilience of the system is severely compromised as is the capacity to provide Ecosystem Services. However, geomorphological conditions are largely intact but extensive restoration may be required to improve the system's hydrology and physico-chemical conditions.	20 - ≤38
F	**Critically / Extremely modified.** Modifications have reached a critical level and the system has been modified completely with an almost complete change of the natural habitat template, biota, and basic ecosystem functions. Ecosystem Services have largely been lost This is likely to include severe catchment changes as well as hydrological, physico-chemical, and geomorphological changes. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. Restoration of the system to a synthetic but sustainable condition acceptable for human purposes and to limit downstream impacts is the only option.	<20

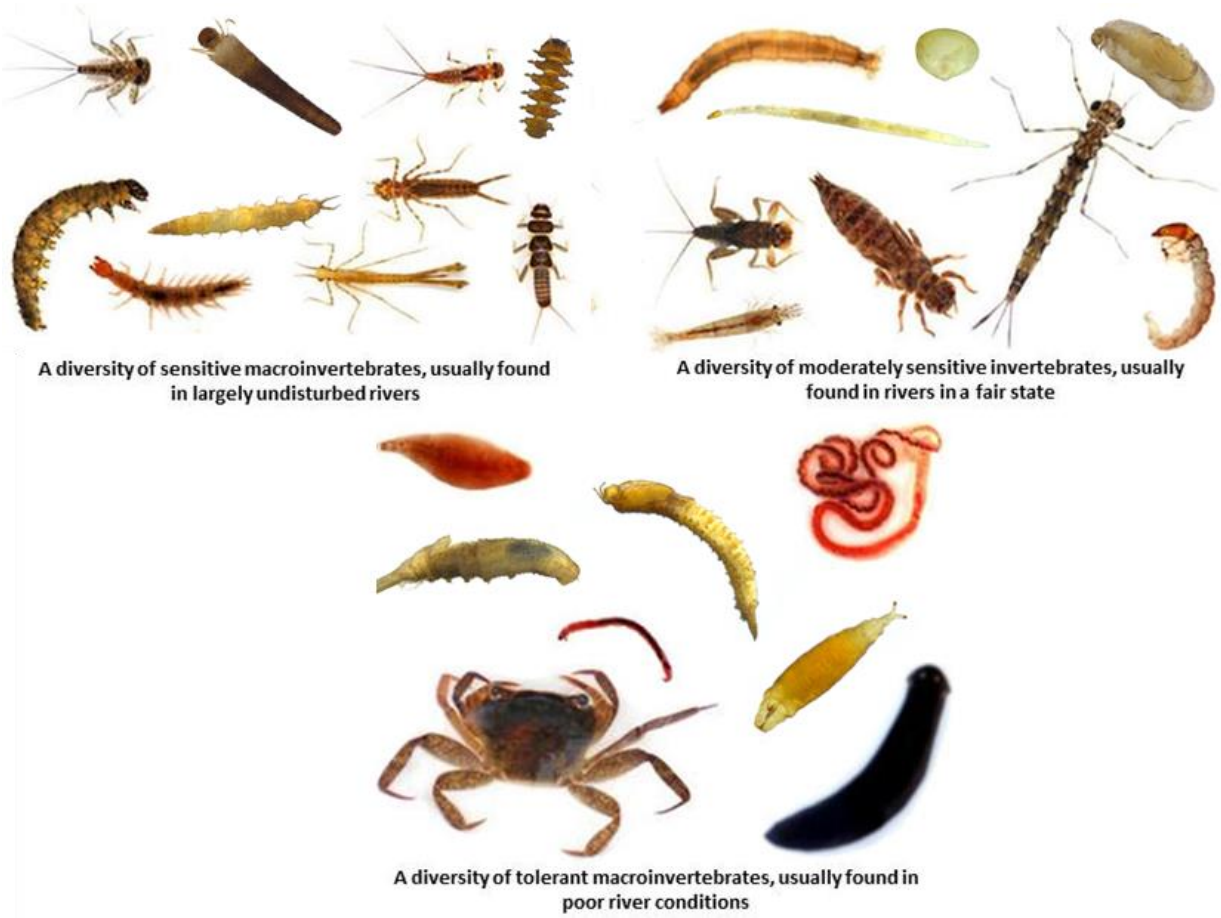

Plate 1: Examples of macroinvertebrate taxa with different levels of sensitivity.

Riparian vegetation was monitored at 65 sites, once during the spring to summer season. The sites were in the Northwest, Gauteng, Limpopo, Free State, and the Western Cape. In the field, the vegetation monitoring points were demarcated into the marginal and non-marginal zones. Species composition impacts of land use and exotic vegetation were recorded and assessed as stipulated in (Kleynhans *et al*., 2007). The data was analysed using the Vegetation Response Assessment Index (VEGRAI) to determine the riparian vegetation ecological category. The basis of the index is to compare the current condition against a perceived reference condition as with the other Ecostatus models (Kleynhans *et al*., 2007). The numerical score from the model is then converted into an ecological category as stipulated in Table 1.

The habitat integrity of a river refers to the maintenance of a balanced composition of physico-chemical and habitat characteristics on a temporal and spatial scale that are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996). Habitat integrity assessment is approached from an instream and riparian zone perspective and is seen as a surrogate for the assessment of biological responses to driver changes. It is also an integrated assessment of driver state (Kleynhans *et al.,* 2008). The Index of Habitat Integrity (IHI) considers the severity of impacts on the natural instream and riparian habitats. Rating of impacts of modifications on the instream habitat mainly looks at abstraction, flow changes, water quality issues, and modifications of the riverbed and water column. The riparian habitat modifications would then focus on invasion by exotic plants, removal of plants, impacts of erosion and channel modification, to name a few. The method focuses on rating the impacts on a scale of 0 to 25, with 0 meaning no impact and 25 meaning a very severe impact. The scores are also converted into an ecological category as for the other indices, using Table 1 for guidance. The IHI was conducted at 51 sites in the Limpopo (29 sites) and the Mzimvubu to Tsitsikamma (22 sites) water management areas.

Fish sampling was undertaken by catching fish using an electro-shocker (SAMUS - 725G; 650 watts of output power), as well as a small seine net (5m by 1.5m, mesh size of approximately 0.5cm). The fish species caught were then identified, counted, and categorized into alien and/or indigenous species. Indigenous species were released back into the water and alien species were eradicated for the purpose of protecting the indigenous species. The Fuzzy Fish Index (FFI) considers the maturity of fish species caught i.e., adults or juveniles, fish health condition (with or without infection) availability of biotopes i.e., deep, or shallow pools, slow or fast pools etc. and abundance of native and introduced species to categorize each site to condition categories. The generic ecological categories were applied as indicated in Table 1, to obtain the fish ecological condition. The Fuzzy Fish Index (FFI) was conducted at 12 sites in the Mzimvubu to Tsitsikamma Water Management Area.

Geomorphology assessments start with a desktop estimate of the catchment using Google Earth, Aerial photographs, 1:50 000 topographic maps and 1: 250 000 topo-cadastral maps. In the field, investigations of sediments in the riverbed (also known as bedload) and channel morphology were conducted. Additional field observations that were made include the description of riparian cover, erosion, and depositional features, as well as catchment processes associated with causing considerable impacts on the river systems. The above information was processed through the Geomorphology Driver Assessment Index (GAI) to obtain the geomorphological condition of a river at a predetermined reach (Rowntree *et al*., 2013). Table 1 was used to translate the results to ecological categories. Thirteen sites in the Eastern Cape were assessed for geomorphological condition.

ECOLOGICAL CONDITION OF SOUTH AFRICAN RIVERS

NATIONAL PERSPECTIVE

The number of sites per reporting year has increased from 207 in 2016/17 to 467 in 2020/21 (Figure 1). The decreased number of sites monitored in 2019/20 was due to the COVID-19 restrictions.

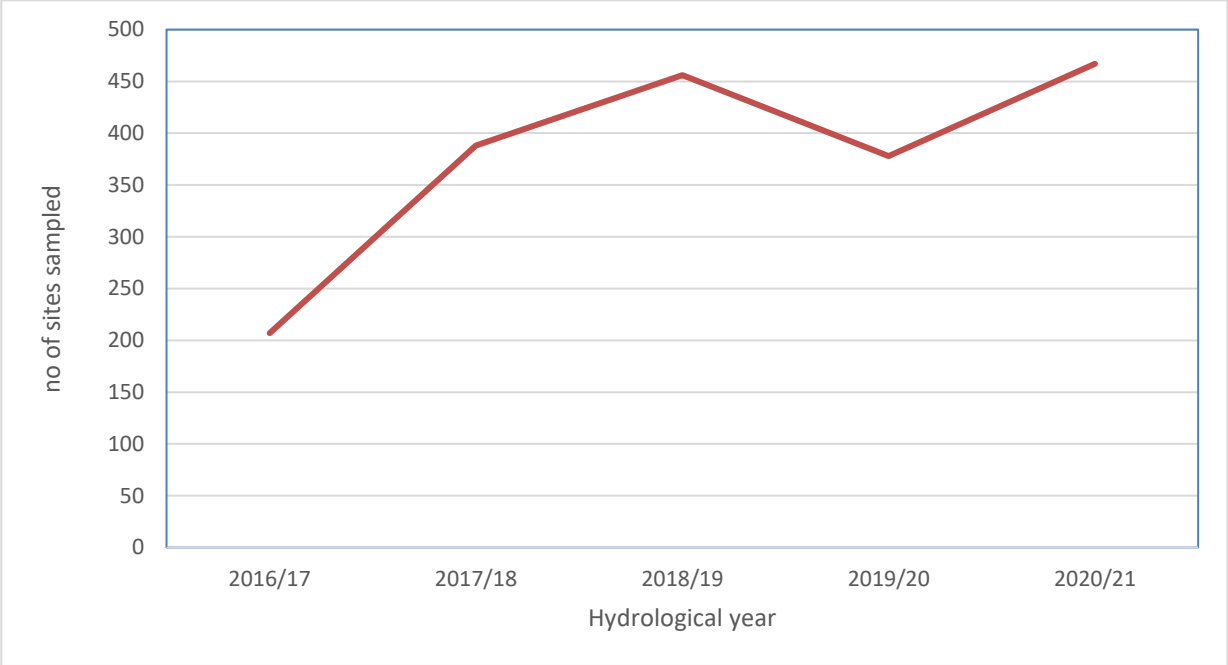

Figure 2: Number of sites sampled per hydrological year from 2016/17 to 2020/21.

The COVID-19 pandemic and associated lockdown measures impacted the monitoring during this hydrological year. To reduce exposure to the virus only macroinvertebrates were monitored in most areas from October 2020 to March 2021. Figure 2 graphically represents the sites monitored during the 2020/21 hydrological year and indicates the reasons for not sampling where relevant. Aquatic macroinvertebrates, riparian vegetation, habitat integrity, fish, and/or geomorphology were monitored at a total of 467 sites during the 2020/2021 hydrological year (Figure 2). The data for sites falling within the Mokala and Golden Gate National Parks was provided by the South African National Parks (SANPARKS) and data for sites in the Breede-Gouritz WMA was provided by the Breede-Gouritz Water Management Agency (BGCMA). The results are presented in Figure 3 to Figure 10 for the whole country. Figures 11 to 103 display the results for the Primary Drainage Regions A to X.

The riverine macroinvertebrates were assessed at most (446) of the monitored sites using the Macroinvertebrate Response Assessment Index (MIRAI) with the results depicted in Figure 3. Other indices were also applied at some sites, additional to or instead of MIRAI. The Riparian Vegetation Response Assessment Index (VEGRAI) was done at 65 sites (Figure 6), fish indices at 152 sites (Figure 7), the Index of Habitat Integrity (IHI) at 43 sites (Figure 8 and Figure 9), and the Geomorphology Driver Assessment Index (GAI) at 16 sites (Figure 10). The sparsity of this data makes it challenging to combine the indices for an overall Ecostatus at this stage.

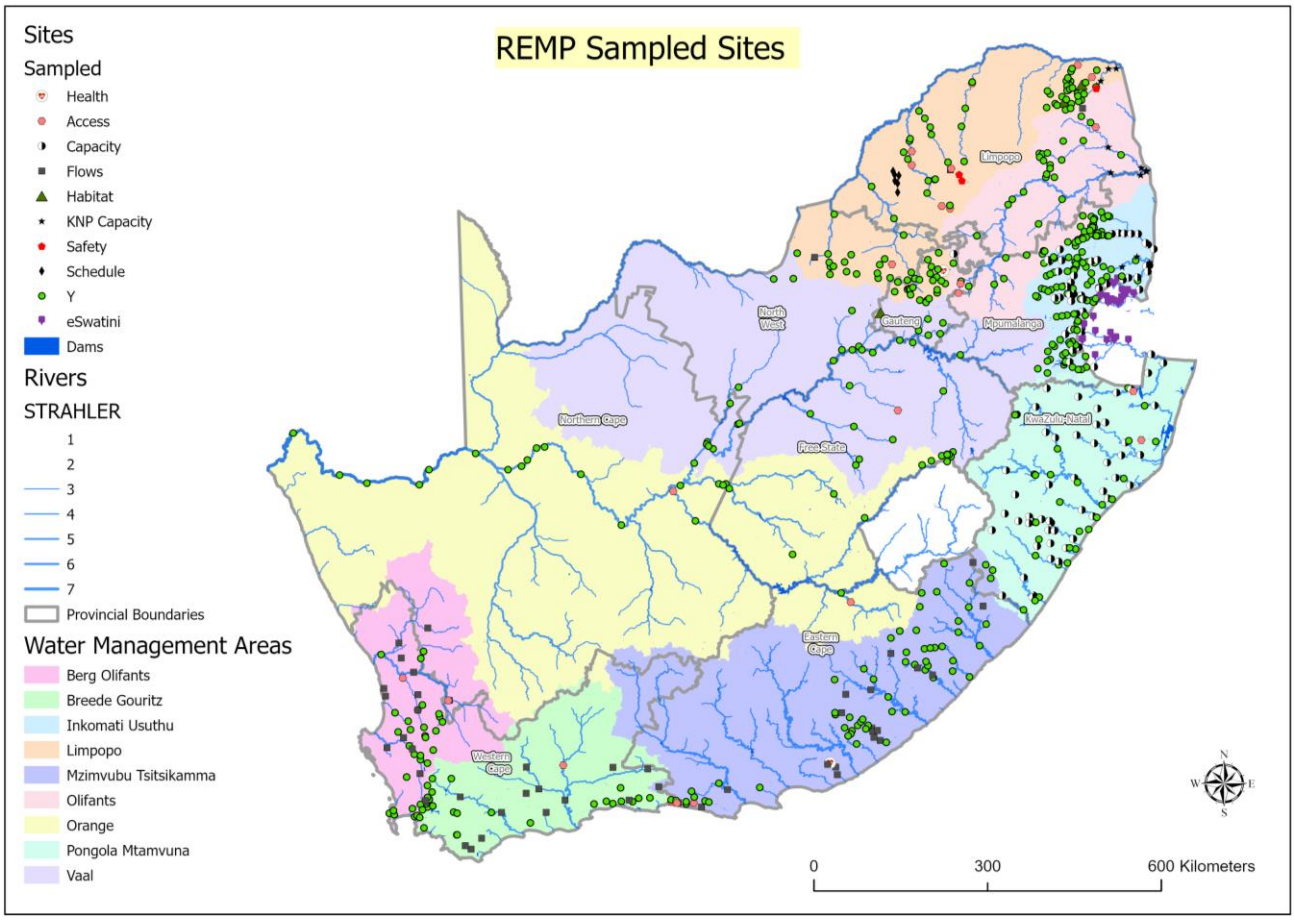

Figure 2: Map indicating the sites sampled during the 2020/21 Hydrological year in green. Sites not sampled with reasons for not sampling are presented with different markers as indicated in the legend. Reasons for not sampling include amongst others Access, Health and Safety, Capacity, Unsuitable Habitat, and flow conditions.

Invertebrates:

Figure 3a indicates the distribution of the sites where macroinvertebrates were monitored and their condition. Most sites in the country, about 59%, were moderately modified. Only 5% of the sites were in a largely natural (B) condition and 12% were in a largely modified (D) condition. Eleven sites (2%) of the sites were in an unsustainable (D/E and E) condition. Moderately modified conditions were found as the dominant condition on most rivers. The tributaries to the upper Vaal River were mostly in a largely modified (D) condition. The Sabie and many of its tributaries were mostly in a close to natural (B/C) condition. The Upper Vaal catchment is heavily impacted by industries and failing wastewater treatment works while the Sabie catchment has fewer impacts.

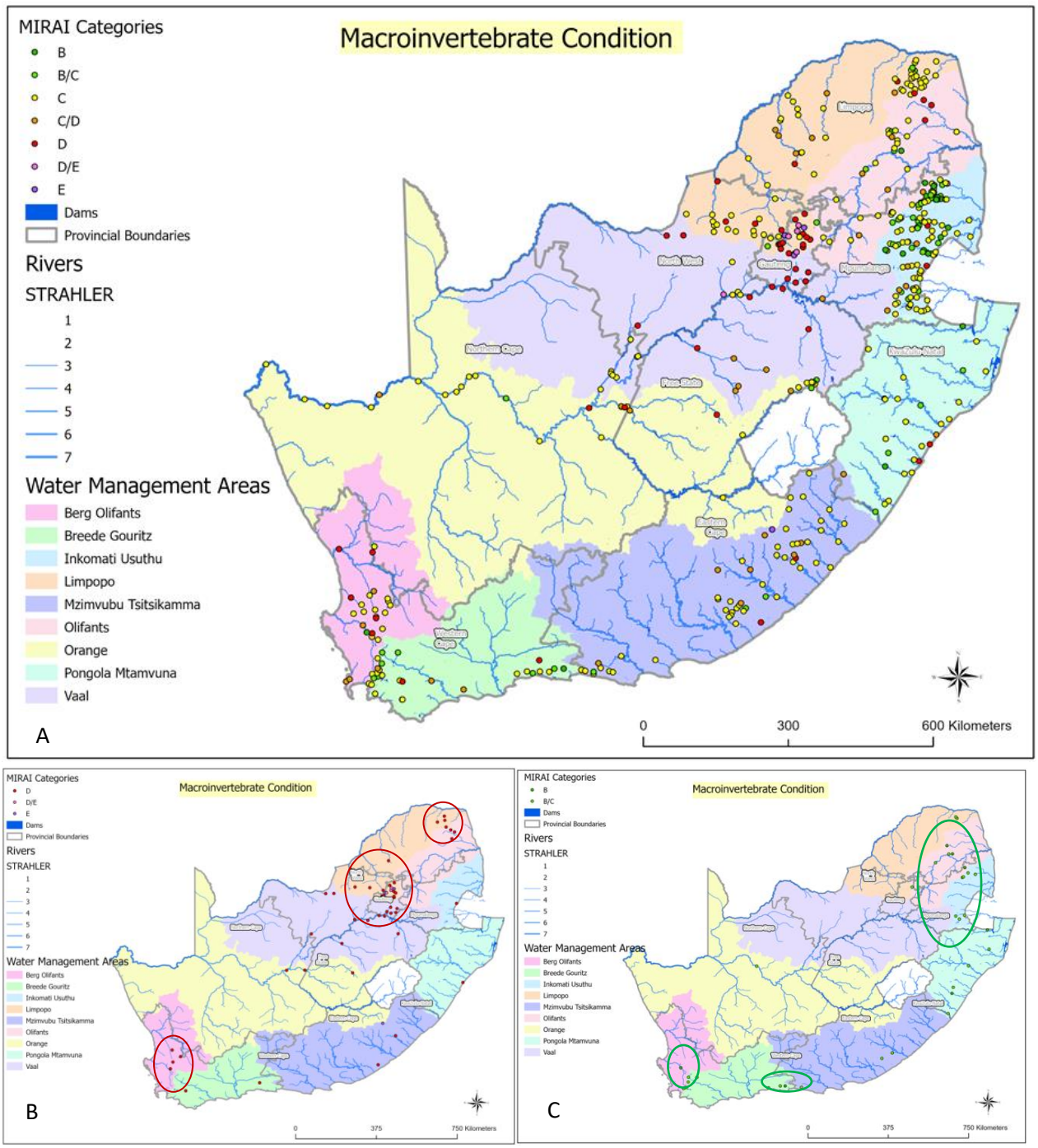

Figure 3: Summary Ecological Categories reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B and B/C) while the red and purple reflect relatively poor conditions (D to E).

As in previous years (DWS, 2019a; 2020a; 2021a), most of the modified (D category) to seriously modified (E) sites were in the Gauteng province (Figure 3b). That is, the upper Crocodile and upper Vaal sub-catchments, which are subjected to intensive urban and industrial development. The Sabie (18 sites), Komati (11 sites), Crocodile east (10 sites), Olifants (5 sites) and Usuthu (3 sites) stood out as catchments that had many sites that were in largely natural conditions (B and B/C categories), as presented in Figure 3c. The rest of the largely natural sites were either in the upper reaches closer to the source (Magalies, Debengeni, Berg and Breede-Gouritz sites), protected areas (Eerste, Klerkspruit, Perskeboomspruit, Glen Reenenspruit, Ribbokspruit), or rural areas (sites the former Transkei area, Mkomazi, Mhlatuze and Pongola catchment).

Although most (73%) of the sites monitored in this hydrological year were also monitored in the previous year, only 127 sites were monitored every year since the 2016/17 hydrological year (Annexure Y). This repetition rate helps with building of trends and having a better understanding of our river systems. It also shows that the programme seems to be finding stability, despite the challenges. These trends are depicted in Figure 4 below. Approximately 58% of sites remained in the same category as the previous reporting period; most of these were sites in the C category. Sites in this moderately modified condition (C category) seem to be resilient and not easily responsive to changes, they can maintain basic ecosystem functions, provided the catchments around them are not subjected to severe disturbances. There was an improvement at 19% of the sites and a decline in ecological condition at 23%. It is however, concerning to notice that there seems to be an increasing proportion of sites deteriorating over the assessment period (from 11% between 2016/17 -2017/18 to 23% in 2019/20 -2020/21) at the cost of sites remaining unchanged or improving (Figure 4).

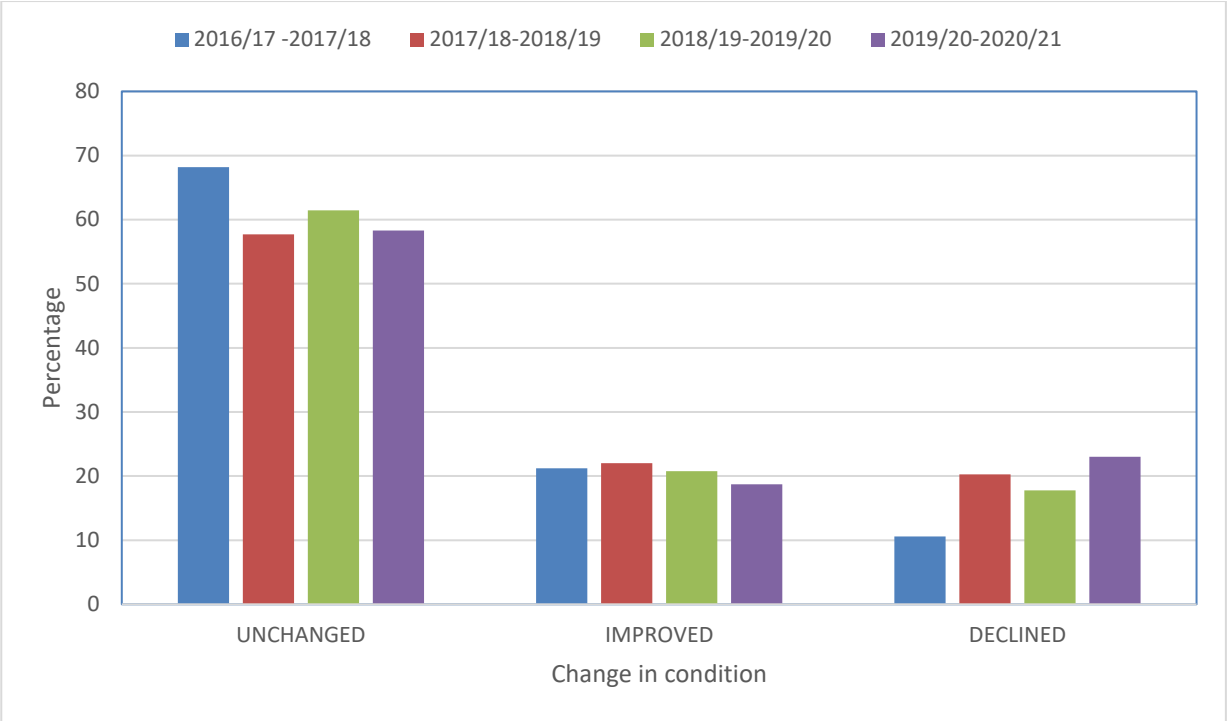

Figure 4: The percentage change in the macroinvertebrate ecological condition at sites that were monitored from the 2016/17 to 2020/21 hydrological years.

Compared to the 2019/20 hydrological year, the sites in a B category maintained their largely natural conditions during 2020/21 at 5% see Figure 5. The conditions of these sites are expected to remain stable as they are in areas with minimal anthropogenic influence (as discussed above); changes would be mostly driven by severe climatic conditions. At the other end of the scale, On the other end, one of the sites (A2BLOU-RIETF) that was in a seriously modified condition (E category) during the 2019/20 hydrological year improved to a D category in 2020/21 but two other sites deteriorated from a moderately modified (C) condition (S5TSOM-UPPER) and a largely modified (D) condition (A2HART-KAMEE) to a seriously modified (E) condition; increasing sites in this condition from 0.8% to 1.1% of the monitored sites. While 24 sites that were largely modified (D category) improved to moderately modified conditions (B/C, C and C/D). Thus, the proportion of sites in a largely modified (D) category sites decreased from 17.6% to 12.1%. Most of the sites that improved were in the Vaal (6) and Crocodile West (5) catchments. The reason for the improvement in sites in the Vaal River catchment should be investigated but it might be related to the remedial work conducted in the Emfuleni area. The proportion of sites in a C category increased (52.5 to 59%) while those in a C/D category increased marginally (9.5 to 9.6%), from the 2019/20 to the 2020/21 monitoring period.

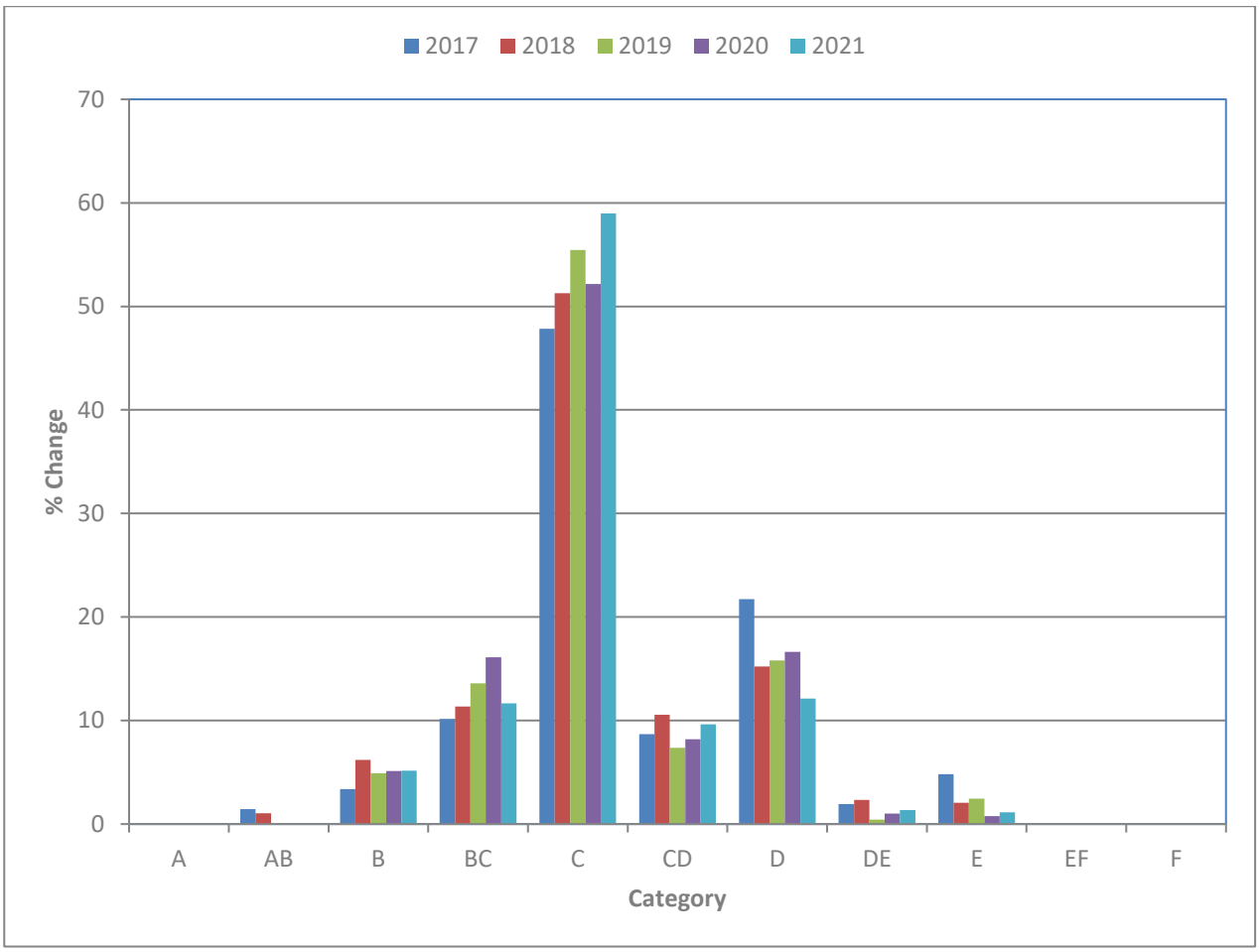

Figure 5: Comparison of percentage changes in the ecological categories of macroinvertebrates from the 2017/18 to the 2020/21 hydrological years.

Riparian Vegetation:

Riparian Vegetation was monitored in the Western Cape (Berg), Free State (Upper Orange), Gauteng and North West (Crocodile West Marico) and Limpopo (Nwanedi/Nzhelele & Luvuvhu) catchments (Figure 6). Most (46%) sites were in a largely modified (D) condition with approximately 28% in a moderately modified (C) condition. Approximately 11% of the sites were in a close to natural (A/B) to close to largely natural (B/C) condition and another approximately 11% of the sites in a close to largely modified (D/E) to seriously modified (E) condition. The least impacted sites were in the Berg and Mutale River catchments, while the most impacted sites were in the Berg, Crocodile West, and Mutale River catchments.

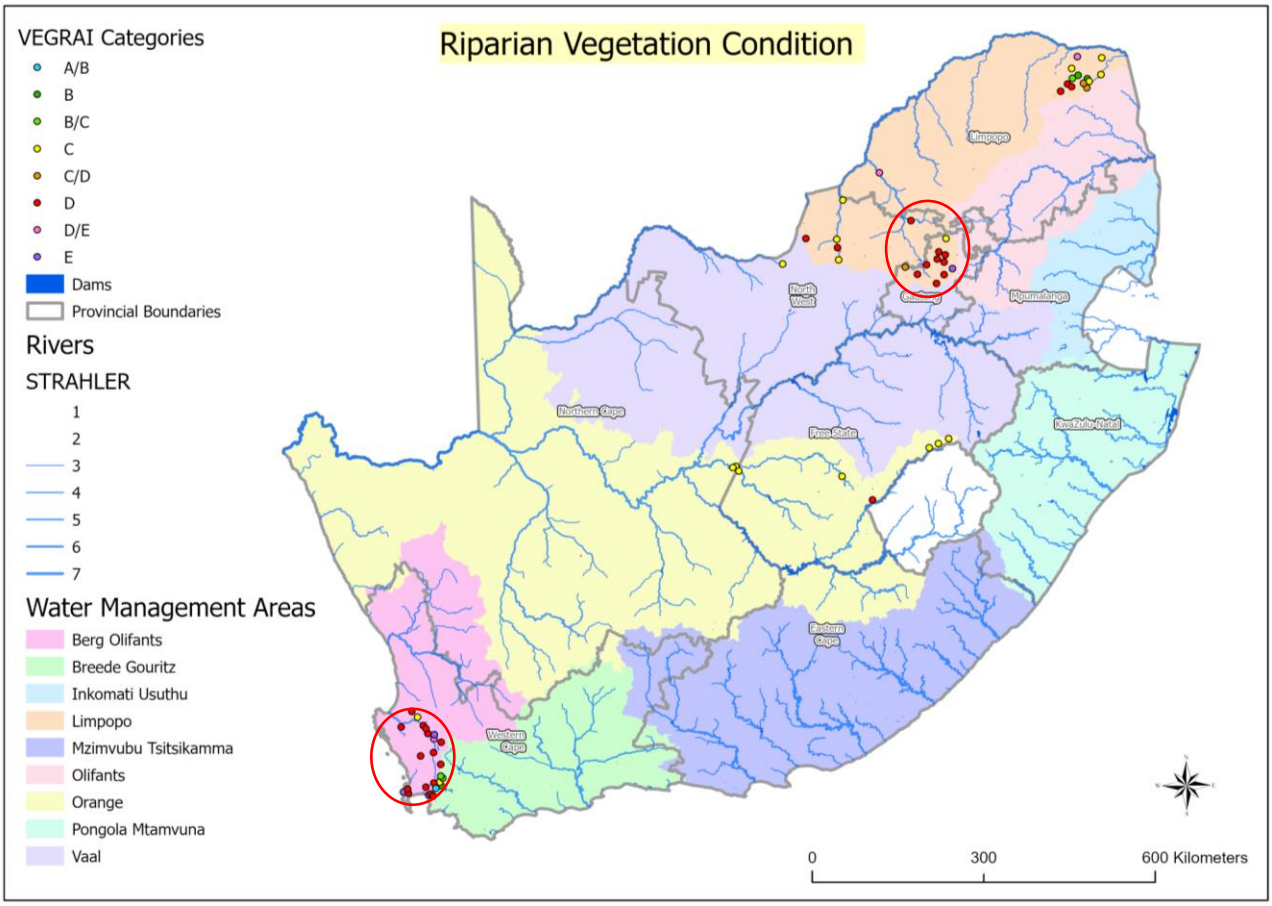

Figure 6: Summary Ecological Categories reflecting the riparian vegetation condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green (B and B/C) representing relatively good conditions while the red and purple reflect relatively poor conditions (D to E).

Fish:

Fish were sampled at 151 sites in the Eastern Cape and Inkomati-Usuthu areas (Figure 7). The fish at most sites (58%) were in a moderately modified (C) condition, with approximately 5% in a natural (A) to largely natural (B) condition and 16% in a largely to seriously modified (D-E) condition. The least impacted site (A) is in the upper Keiskamma River in the Eastern Cape. The other sites in reasonably good condition are in the Keiskamma and in the Sabie-Sand catchments. The sites in worst condition are in the Keiskamma, Great Kei, Mzimvubu and Inkomati catchments. One of the contributing factors to the decline in the Fish condition is the presence of exotic, often piscivorous, fish species such as black bass (*Micropterus salmoides*).

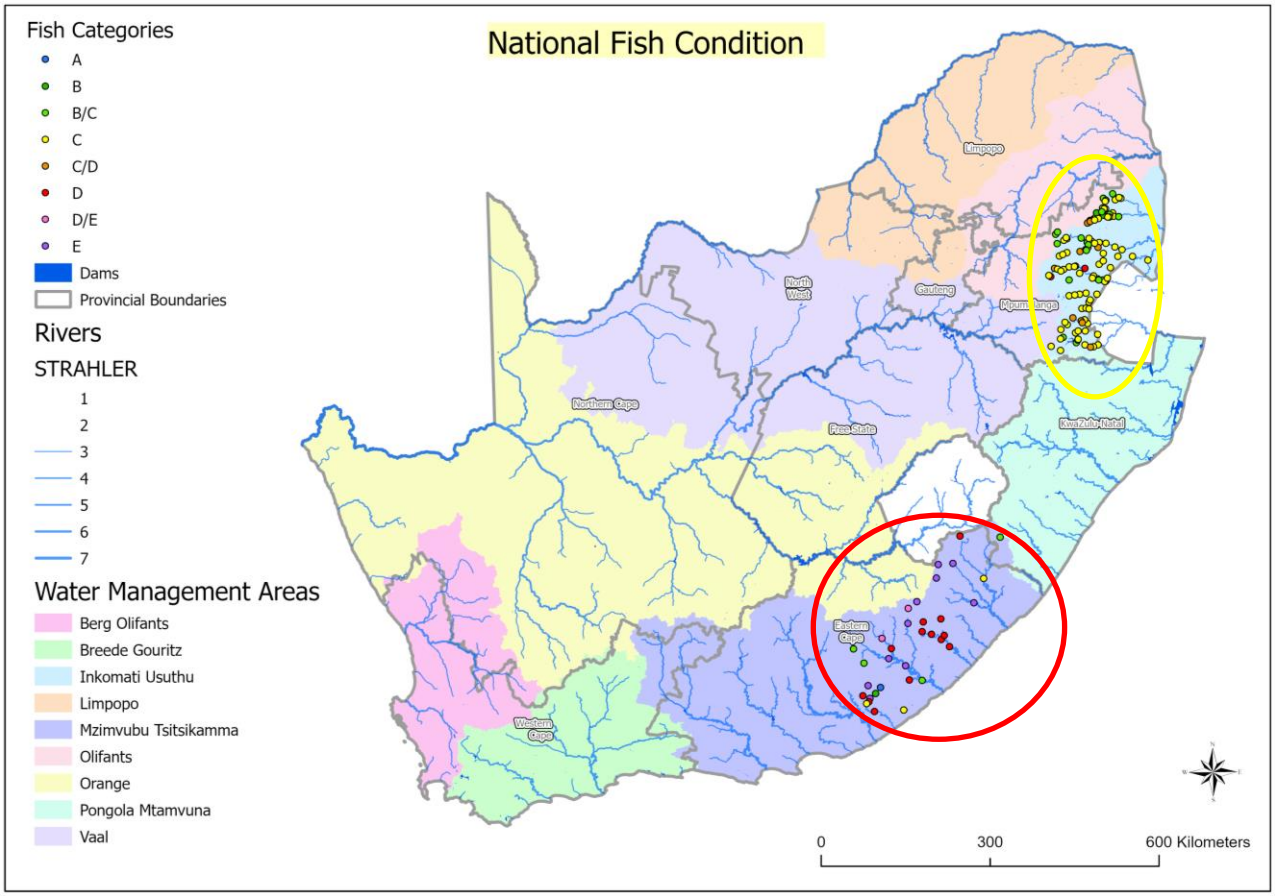

Figure 7: Summary Ecological Categories reflecting the Fish condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A to B/C) while the red and purple reflect relatively poor conditions (D to E/F).

Index of Habitat Integrity (IHI):

The IHI was determined at 40 sites in the Eastern Cape, Free State, Gauteng, and North West. The Instream and Riparian IHI results are presented in Figures 8 and 9. Approximately one-third (33%) of the sites had the instream IHI in a moderately modified (C) and riparian IHI in a largely modified (D) condition. The Instream habitat seems to be in a better condition than the riparian habitat. Approximately 15% of the sites had an instream IHI in a near natural to largely natural (A/B-B) condition while only 12% of the sites had a riparian IHI in a near natural to largely natural (A/B-B) condition. The generally poorer riparian habitat is also evident as the Instream habitat at 12.5% of the sites are in a seriously (E) to critically modified (F) condition while the riparian habitat at 15% of the sites are in a seriously (E) to critically (F) condition. There are four sites with both the Instream and Riparian IHI in good (A-B) condition. These sites are situated in the Crocodile West (A2MAGA-MALON), Marico (A3KAAL-RIETS), Vaal (A2SKOO-GHOLF) and upper Orange (D2LEEU-EWRO6) drainage regions. There are two sites in the Crocodile West (A2CROC-MAKOP) and the Vals (C6VALS-PROKL) River with both instream and riparian habitat in a poor (E-F) condition.

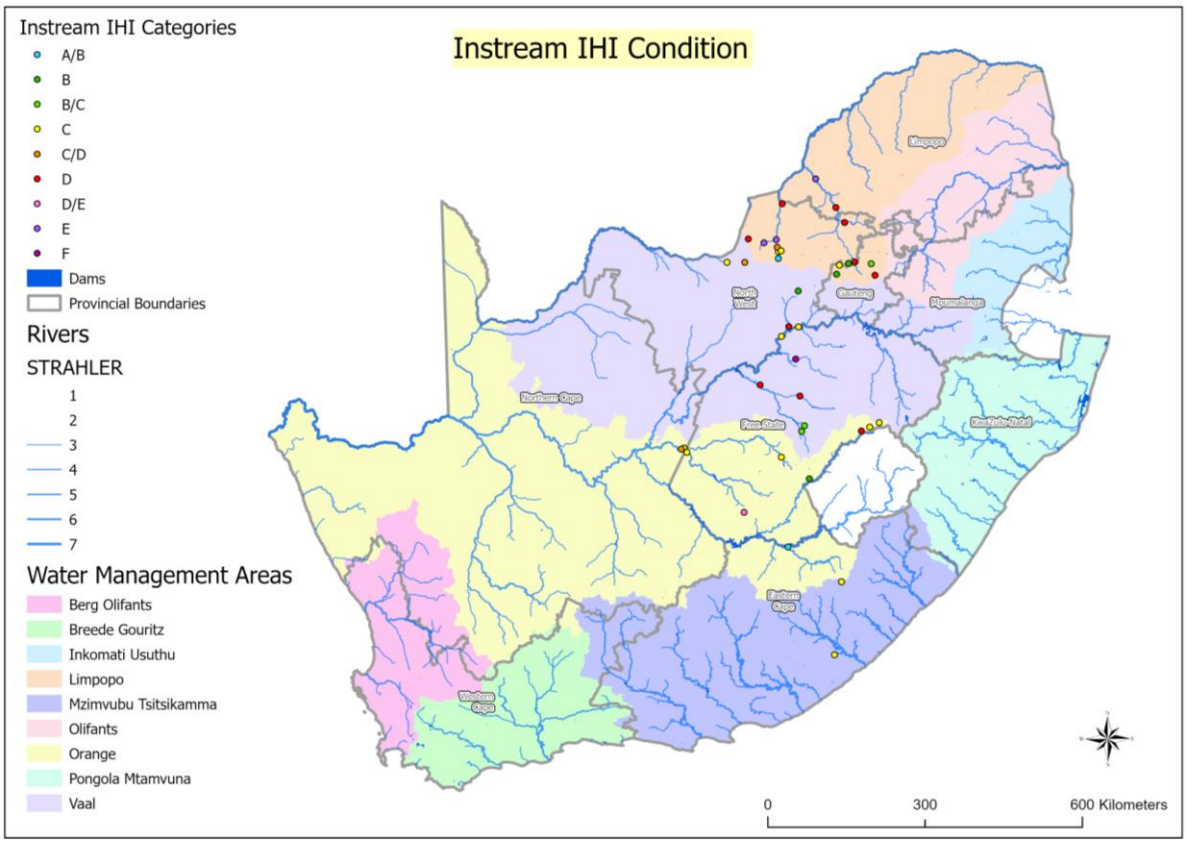

Figure 8: Summary Ecological Categories reflecting the instream habitat condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A to B/C) while the red and purple reflect relatively poor conditions (D to E).

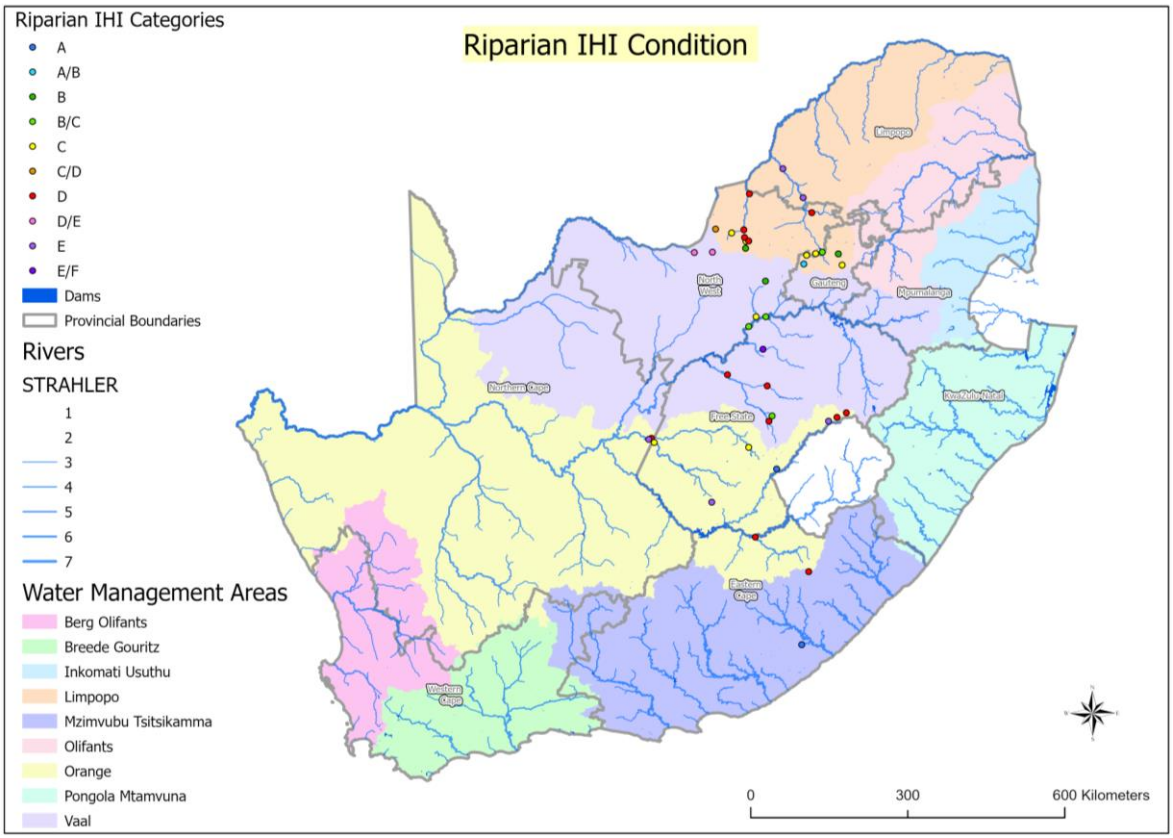

Figure 9: Summary Ecological Categories reflecting the riparian habitat condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A to B/C) while the red and purple reflect relatively poor conditions (D to E).

Geomorphology:

The geomorphology was only assessed at 16 sites in the Great Kei and Mthatha catchments in the Eastern Cape province (Figure 10). The geomorphology at the sites monitored in the 2020/21 hydrological year was mostly in a reasonably good condition. The GAI was in a moderately modified (C) condition at half of the sites and another 44% in a natural to largely natural (A-B) condition. There were no sites in a poorer than moderately modified condition.

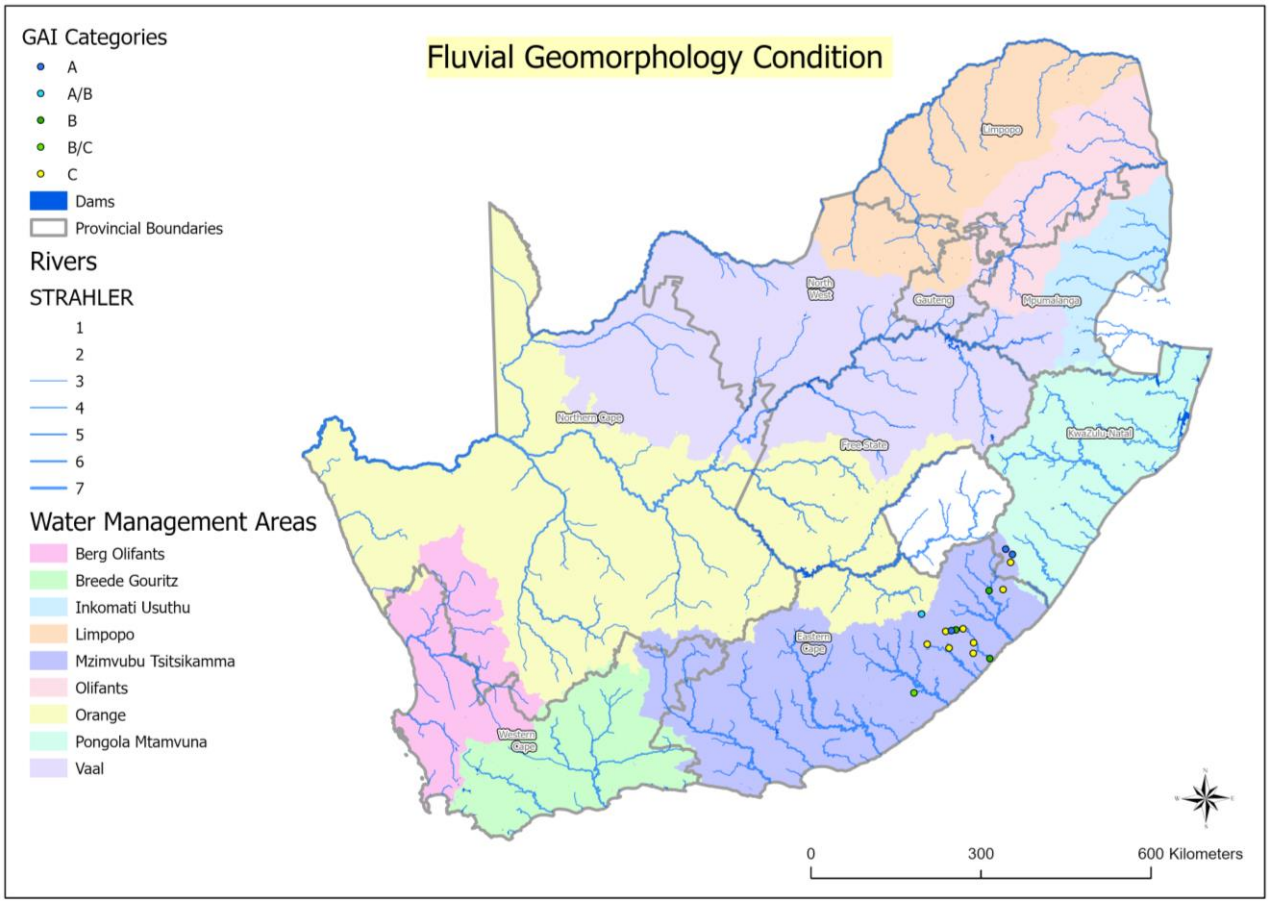

Figure 10: Summary Ecological Categories reflecting the fluvial geomorphology condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A to B/C) while the yellow reflect relatively moderate conditions (C).

COMPLIANCE TO RESOURCE QUALITY OBJECTIVES

Resource Quality Objectives (RQOs) should be measurable management goals that give direction to water resource managers on how the water resources should be managed (DWA, 2011a). They give effect to the Management Class and set Reserve and assist in tracking the balance between sustainable use of water resources, to boost development, and protection. The condition of water resources should be measured against these RQOs, through monitoring systems, such as the REMP. Once monitoring indicates a possible negative trend, management interventions should be implemented.

The RQOs are also discussed further under each drainage region, where applicable.

Invertebrates:

Considering that the macroinvertebrates data was the most available, the below summary (Table 2) of compliance to Resource Quality Objectives (RQOs) was assessed only on this component. Two hundred and one (201) REMP sites were either EWR sites with RQOs or fall within a Resource Unit that has RQOs set for the macroinvertebrate condition. Annexure Z has all these sites and their coordinates. Table 2 only shows those that have been monitored since the 2016/17 hydrological year (169), with an indication of compliance. Sites with green cells complied with the RQO, while blue indicates better than the RQO and red non-compliance. There was RQO non-compliance at 60 sites, thus 45% of monitored sites. There was compliance at 47 sites, while 26 sites were in a better condition than the set RQOs. Approximately 22% of the sites are always non-compliant and approximately 38% are always compliant or in a better condition. Eleven percent of the sites are always in a better condition than the RQO.

Table 2: Comparison of macroinvertebrate condition to targeted RQOs

Site	River	Main River	2017	2018	2019	2020	2021	RQO	Site	River	Main River	2017	2018	2019	2020	2021	RQO
A2APIE-DEOND	Apies	Apies	D	D	E	D	D/E	C	C4VET-HOOPS	Vet	Vaal		D	D	C/D	D	C/D
A2APIE-PRETO	Apies	Apies	D/E	D/E	E	D/E	D/E	D	C6VALS-LINDL	Vals	Vaal	E	C	C/D	D		C/D
A2BLOU-KROMD	Bloubankspruit	Crocodile	D	D	D	D	D	D	C6VALS-PROKL	Vals	Vaal		C	D	D		C/D
A2BLOU-RIETF	Bloubankspruit	Crocodile	D	D	D/E	E	D	D	C8LIEB-MAFAH	Liebenbergsvlei	Wilge	E	D	C/D	C	D	B
A2BLOU-ZWART	Bloubankspruit	Crocodile	D	D	D	D	D	D	C9VAAL-DELPO	Vaal	Vaal	D	C/D	C/D	C	C	C
A2BRAA-PARKH	Braamfonteinspruit	Jukskei	D/E	D/E	E	D	D	D	C9VAAL-GONGG	Vaal	Vaal	D	C/D	C	C	C	C
A2CROC-BOBBE	Crocodile	Crocodile					E	D	C9VAAL-SCHMI	Vaal	Vaal	D	C/D	C	C	C	C
A2CROC-ELAND	Crocodile	Crocodile	D	D	C/D	C	D	D	C9VAAL-STCLA	Vaal	Vaal		C	D	D	D	C
A2CROC-KOEDO	Crocodile	Crocodile		C	C	D	C	D	C9VAAL-VAALB	Vaal	Vaal	D	C/D	C	C	C	C
A2CROC-MAKOP	Crocodile	Crocodile			C/D		C	C/D	C9VAAL-WARRE	Vaal	Vaal	D	C/D	C/D	C	C	D
A2CROC-MOUNT	Crocodile	Crocodile	D	D	D	D	D	D	C9VAAL-WVALE	Vaal	Vaal	C/D	D	C/D	C	C	D
A2EDEN-LEEUW	Edendalespruit	Pienaars	D	D	D	D		D	D4MOLO-WELTE	Molopo	Orange		D			D	D
A2ELAN-BESTE	Elands	Elands	C	C			C	C	G1BERG-BRBM1	Berg	Berg		C	C	C	B/C	B/C
A2ELAN-KLIPB	Elands	Elands	C	C	C	C	C	C	G1BERG-BRBM5	Berg	Berg		C	C	C	B	D
A2ELAN-NOOIT	Elands	Elands			D	D	D	C	G1BERG-BRBM6	Berg	Berg				C	C/D	B/C
A2HART-KAMEE	Hartbeesspruit	Pienaars	D	D/E	D	D	E	D	G1BERG-BRMB2	Berg	Berg		C	C/D	C/D	C	C
A2HENN-HENNO	Hennops	Hennops	E	E			D/E	D	G1BERG-JIMFO	Berg	Berg			C	C		C
A2HEXR-OLIFA	Hex	Elands		C	C/D		C	C	G1KROM-BEIT	Krom	Berg		C			C	B/C
A2HEXR-PAARD	Hex	Elands		E	E	D	D	D	G2DIEP-KALBA	Diep	Diep		D/E				E
A2HEXR-ROOIW	Hex	Elands	C	C/D	C	C	C	D	G2EERS-JONKE	Jonkershoek	Eerste		B/C	B	B	B/C	C
A2JUKS-EDENV	Jukskei	Jukskei	E	E	E	E	E	D	G2HOUT-ORANJ	Hout Bay	Hout Bay		C				D
A2JUKS-GULLU	Jukskei	Jukskei	E	E	E	E	E	D	G2HOUT-VICTO	Hout Bay	Hout Bay		D			C/D	D
A2KOST-NAAUW	Koster	Elands			D	D	C	C	G2LOUR-BROAD	Lourens	Lourens		C/D		C/D		D
A2MAGA-HARTE	Magalies	Magalies	C	C	C/D	C	C	C	G2LOUR-RADLO	Lourens	Lourens		C/D	C/D	C	C	D
A2MAGA-MALON	Magalies	Magalies		B	B/C	B/C	B/C	B	G2SILV-SUNBI	Silvermine	Silvermine		C/D				C
A2MODD-MODDE	Modderfonteinspruit	Jukskei		E	E	D	D/E	D	G4KLEI-GOUDI	Klein	Klein	C	C/D				C
A2MORE-FAIRY	Moreletaspruit	Pienaars	D	D	D	D	D	D	G4PALM-KOGEL	Palmiet	Palmiet	C	C	C/D		C	B
A2PIEN-BUFFE	Pienaars	Pienaars	C	C	C	D	C	C	G4PALM-NUWEB	Palmiet	Palmiet	C	C				B/C
A2PIEN-KLIPD	Pienaars	Pienaars		C	C		D	C	G5NUWE-BRAKP	Nuwejaars	Heuningnes		C	D	D		D
A2PLAT-KOMAN	Buffelspruit	Pienaars		B	B/C	C	C	C	H1BREE-SLANG	Breede	Breede		D	C	C	B/C	D
A2RIET-MERIN	Rietvlei	Hennops		D	D	D	D	C	H1BREE-WITBR	Breede	Breede		C				D
A2SKEE-SKEER	Skeerpoort	Magalies	B	B	B	C	C	B	H6BAVI-GENAD	Baviaans	Riviersonderend				C	C	A/B
A2STER-BUFFE	Sterkstroom	Crocodile		B/C	B/C	B/C	C	C	H6RIVI-GREYT	Riviersonderend	Riviersonderend			C	C	D	C/D
A2STER-MAMOG	Sterkstroom	Crocodile		C	C	C		D	H8DUIW-VERMA	Duiwenhoks	Duiwenhoks		C/D	C	C	C/D	E
A2SWAR-ELAND	Rietvlei	Hennops	E	D/E	D	D	D	C	J3KAMM-EWR10	Kammanassie	Olifants			D	D	D	C
A2SWAV-ZWAVE	Swavelpoortspruit	Pienaars	E	D	D	D	D	D	K2GROO-KLEIN	Groot Brak	Groot Brak		C	C	C	C	A
A2WATE-BAVIA	Waterkloofspruit	Elands		B	B	C	C	C	K3KAAI-GWEIR	Kaaimans	Kaaimans		C	B/C	B/C	B/C	A
A3GMAR-KOEDO	Groot Marico	Groot Marico	B/C	B	B	C	C	A/B	K4DIEP-DIEPR	Diep	Sedgefield		C	B/C	B	C	B
A3GMAR-LOTTE	Groot Marico	Groot Marico			C		D	C	K4HOMT-KNYSA	Homtini	Homtini		C	C	C	C	A
A3GMAR-RIEKE	Groot Marico	Groot Marico	C/D	C	C		C	C	K5KNYS-EWR01	Knysna	Knysna		C	B/C	B/C	B/C	B
A3GMAR-WONDE	Groot Marico	Groot Marico		B/C	C	C	C	B	K6KEUR-EWR06	Keurbooms	Keurbooms		C	B	B	B	B
A3KAAL-RIETS	Kaaloog se Loop	Groot Marico	C	B/C	C	C	C	A/B	T3MZIM-BHUJE	Kinira	Mzimvubu		C	C		C	C
A3POLK-TWYFE	Polkadraaispruit	Groot Marico		B/C	D	C	C	B/C	T3TINA-N2ROA	Thina	Mzimvubu			C		C	C

Site	River	Main River	2017	2018	2019	2020	2021	RQO	Site	River	Main River	2017	2018	2019	2020	2021	RQO
A4DWAR-JIMSE	Jim se loop	Mokolo	C	C	C	C	C	C	T3TSIT-LALEN	iTsitsa	Thina		C	C	C	C	C
A4DWAR-ZANDD	Dwars	Mokolo	C	C	C		C	C	T4MTAM-MADIK	Mtamvuna	Mtamvuna		C	B/C	B/C	B/C	B
A4MAMB-DIAMA	Mamba	Matlabas		C/D				C	U1MKOM-JOSEB	Mkomazi	Mkomazi				B	B	B
A4MATL-HOOPD	Matlabas	Matlabas		C	D	D		C	U1MKOM-SHOZI	Mkomazi	Mkomazi			C	C	C	B
A4MATL-WATER	Matlabas	Matlabas		C	C	C/D		C	U2MGEN-MZINY	uMgeni	uMgeni		C	B/C			C/D
A4MOKO-ALMAB	Sand	Mokolo			D	C	D	D	U2MGEN-USMWW	uMgeni	uMgeni			C	C	C	C
A4MOKO-MOKOL	Mokolo	Mokolo				C		C	U4MVOT-EWR12	uMvoti	uMvoti		B/C	B/C			B/C
A4MOKO-VAALW	Mokolo	Mokolo	C/D	C/D	C/D		C/D	C	V1TUKH-EWR02	Thukela	Thukela		D				C/D
A4MOKO-WWORK	Mokolo	Mokolo		D	D	D	C/D	C	V1TUKH-TUGEL	Thukela	Thukela			C	C	C	C
B1KOLI-MIDDE	Klein Olifants	Olifants	C	C	D	D	C/D	C	V3BUFF-RORKE	Buffalo	Thukela			C	C	C	C
B2WILG-BOSSE	Wilge	Olifants	C	C	C	C	C	C	V3NCND-LEYDN	Unspecified	Ncandu			C	C	C	B/C
B3ELAN-RHENO	Elands	Olifants	D	C	D	C	C	D	V3SLNG-NCHTW	Slang	Buffalo		B/C				B
B4STEE-PRETO	Steelpoort	Olifants			C		C	D	V5THUK-RAILB	Thukela	Thukela			C	C/D	C	C
B6BLYD-PILGU	Blyde	Olifants	C	C	C	C	C/D	B	V6THUK-TFERR	Thukela	Thukela			C	C	C	D
B7OLIF-BALUL	Olifants	Olifants	C	C	C			C	V7BUSH-MASHU	Bushmans	Thukela			C	C	C	C/D
B8GLET-APPEL	Groot Letaba	Groot Letaba	C	C	C	C	C/D	C	X1GLAD-VAALK	Gladdespruit	Komati		D				D
B8LETA-CONFL	Letaba	Letaba	C	D				C-C/D	X1KOMA-GEVON	Komati	Komati		B/C	B	B/C	C	B/C
B8LETA-KLIPK	Letaba	Letaba	C		D			C-C/D	X1KOMA-HOOGE	Komati	Komati		B/C	C	B/C	B/C	C
B8LETA-MAHLA	Letaba	Letaba	D	C	C			C-C/D	X1KOMA-TONGA	Komati	Komati		B/C	B/C	C	C	D
B8LETA-MBEWU	Letaba	Letaba	C/D	D	C	C	C	C-C/D	X1LOMA-KLEIN	Lomati	Komati		B				C
B8LETS-TANKB	Letsitele	Groot Letaba	D	D	D	C/D	C	C	X1TEEES-HEUNI	Teespruit	Komati			B	B	B/C	C
C1WATE-UPPER	Waterval	Vaal		D	D	D	C/D	D	X1TEES-TEESP	Teespruit	Komati		B/C				C
C2BLES-UPPER	Blesbokspruit	Suikerbosrant	E	E	E	D/E	D	D	X1TEES-WELVE	Teespruit	Komati			B/C	B/C		C
C2KLIP-ROTHD	Klip	Vaal		D	D	D	D	D	X2CROC-DONKE	Crocodile	Crocodile	B	B				B
C2MOOI-EWR02	Mooi	Vaal		D	D	D	C	D	X2CROC-GOEDE	Crocodile	Crocodile	B	B	B/C	C	C	B
C2MRLO-KHUTS	Moorivierloop	Mooi			D	C/D		D	X2CROC-MALEL	Crocodile	Crocodile	C	C	D			C
C2SKOO-GHOLF	Schoonspruit	Vaal			E		C	C/D	X2CROC-MONTR	Crocodile	Crocodile	BC	B/C			C	C
C2SKOO-URANI	Schoonspruit	Vaal		D/E	D	D	D/E	D	X2CROC-NKONG	Crocodile	Crocodile	C	C	D			C
C2SUIK-DEHOE	Suikerbosrant	Vaal	D	D	D	D	D	B/C	X2CROC-POPLA	Crocodile	Crocodile	BC	A/B	C	C	B/C	C
C2TAAI-SASOL	Taaibosspruit	Vaal	D	D	D	C/D	D	D	X2CROC-RIETV	Crocodile	Crocodile	BC	B/C	B/C	B/C	B/C	C
C2VAAL-EWR13	Vaal	Vaal		D	D			D	X2CROC-VALY1	Crocodile	Crocodile	AB	A/B	C	B/C	B/C	B
C2VAAL-SCAND	Vaal	Vaal		D	C/D	C	C	C	X2CROC-VERLO	Crocodile	Crocodile	AB	A/B	C	C	C	B
C2VAAL-SCHOE	Vaal	Vaal				C/D	D	C	X2CROC-VERL1	Crocodile	Crocodile				B	B/C	B
C2VAAL-VERMA	Vaal	Vaal		D	C/D		C	D	X2KAAP-HONEY	Kaap	Crocodile	C	C		C	C	B
C3HART-DELPO	Harts	Vaal	D	C	C	C	C	D	X3MACM-FALLS	Mac Mac	Sabie			B		B	A/B
C3HART-PAMPI	Harts	Vaal	D	C	C/D	C	C	D	X3MACM-PICNI	Mac Mac	Sabie			B/C		B/C	A/B
C3HART-TAUNG	Harts	Vaal	D	D	D	D	D	D	X3MACM-VENUS	Mac Mac	Sabie			B/C		B/C	A/B
C4GVET-VDRIE	Groot Vet	Vet		C	D	C/D	C/D	C	X3MUTL-NEWF1	Mutlumuvi	Sand			B/C		B/C	B/C
C4KVET-VVIER	Klein Vet	Vet		C/D	C	D	C/D	C	X3SABI-BRUG	Sabie	Sabie		C	C		C	B
C4SAND-R73BR	Sand	Vet	D	C	D	D	C/D	C	X3SABI-RIOOL	Sabie	Sabie		C			C	B
C4SAND-SENEK	Sand	Vet		C/D	D	D	C/D	C	X3SABI-SEKUR	Sabie	Sabie			C			B
									X3SAND-SKUKU	Sand	Sabie		D				B

Fish:

The limited fish sampling is reflected in Table 3 below which compares the Fish condition against the targeted RQOS where available. Only 28 sites have both fish condition and gazetted RQOs for fish available. These sites are in the Mzimvubu and Inkomati catchments only. Sites with green cells complied with the RQO, while blue indicates better than the RQO and red non-compliance. Of the 21 sites monitored in the 2020/21 hydrological year, only the Komati River at Hooggenoeg (X1KOMA-HOOGE) was in a better condition than the gazetted RQO. Nine sites were in the same condition as the gazetted RQO, and 11 sites were non-compliant.

Table 3: Comparison of fish condition to targeted RQOs

Site	River	Main River	2017	2018	2019	2020	2021	RQO
T3MZIM-BHUJE	Kinira	Mzimvubu		C	C	C		C
T3TINA-N2ROA	Thina	Mzimvubu		B/C		B/C		B/C
T3TSIT-LALEN	iTsitsa	Thina		E/F	E	E	E	C
X1GLAD-VAALK	Gladdespruit	Komati		D				D
X1KOMA-GEVON	Komati	Komati		C			C	C
X1KOMA-HOOGE	Komati	Komati		B/C			B/C	C
X1KOMA-TONGA	Komati	Komati		C			C	C/D
X1LOMA-KLEIN	Lomati	Komati		C				C
X1TEEES-HEUNI	Teespruit	Komati					C	C
X1TEES-TEESP	Teespruit	Komati		C				C
X1TEES-WELVE	Teespruit	Komati					C	C
X2CROC-DONKE	Crocodile	Crocodile	B/C				C	B
X2CROC-GOEDE	Crocodile	Crocodile	B/C				C	B
X2CROC-MALEL	Crocodile	Crocodile	B/C					C
X2CROC-MONTR	Crocodile	Crocodile	B/C				C	B
X2CROC-NKONG	Crocodile	Crocodile	C/D					C
X2CROC-POPLA	Crocodile	Crocodile	B/C				B/C	B
X2CROC-RIETV	Crocodile	Crocodile	B/C				B/C	B
X2CROC-VALY1	Crocodile	Crocodile	B/C				B/C	A
X2CROC-VERLO	Crocodile	Crocodile	B/C				B/C	A
X2CROC-VERL1	Crocodile	Crocodile					C	B
X2KAAP-HONEY	Kaap	Crocodile	C				C	C
X3MACM-FALLS	Mac Mac	Sabie					B	B/C
X3MACM-PICNI	Mac Mac	Sabie					B	B/C
X3MACM-VENUS	Mac Mac	Sabie					B	B/C
X3MUTL-NEWF1	Mutlumuvi	Sand					C	C
X3SABI-BRUG	Sabie	Sabie					C	B
X3SABI-RIOOL	Sabie	Sabie					C	B

Riparian Vegetation:

The Riparian Vegetation was monitored at 38 sites with gazetted RQOS. Six (40%) of the 15 sites monitored in the 2020/21 hydrological year were non-compliant and only two sites were in a better condition than the gazetted RQOs (Table 4). Only four sites were monitored in all three years. Almost 40% of the sites never complied to the RQOs while another 40% always complied to the RQOs. Only 18% of the sites were always in a better condition than the gazetted RQOs

Table 4: Comparison of riparian vegetation condition to targeted RQOs

Site	River	Main River	2019	2020	2021	RQO
A2BLOU-KROMD	Bloubankspruit	Crocodile		C		D
A2BLOU-ZWART	Bloubankspruit	Crocodile		C/D	D	D
A2CROC-MAKOP	Crocodile	Crocodile	D/E	D/E	D/E	C/D
A2CROC-MOUNT	Crocodile	Crocodile	D	D		C/D
A2ELAN-BESTE	Elands	Elands	C/D			C
A2ELAN-KLIPB	Elands	Elands	D			C
A2ELAN-NOOIT	Elands	Elands	C			C
A2HART-KAMEE	Hartbeesspruit	Pienaars			D	D
A2HENN-HENNO	Hennops	Hennops		E	D	D
A2HEXR-ROOIW	Hex	Elands	C/D	D		C
A2JUKS-GULLU	Jukskei	Jukskei		E		C
A2MAGA-HARTE	Magalies	Magalies	D	D	C/D	C/D
A2MODD-MODDE	Modderfonteinspruit	Jukskei		E	D	C
A2MORE-FAIRY	Moreletaspruit	Pienaars			D	D
A2PIEN-BUFFE	Pienaars	Pienaars	C/D	C/D	D	C
A2PIEN-KLIPD	Pienaars	Pienaars			C	C
A2STER-MAMOG	Sterkstroom	Crocodile	C	C		C
A2SWAR-ELAND	Rietvlei	Hennops			D	C
A2SWAV-ZWAVE	Swavelpoortspruit	Pienaars		C		D
A3GMAR-KOEDO	Groot Marico	Groot Marico	C			B
A3GMAR-LOTTE	Groot Marico	Groot Marico	D		C	C
A3GMAR-RIEKE	Groot Marico	Groot Marico			C	C/D
A3GMAR-WONDE	Groot Marico	Groot Marico	E		D	C
A3KAAL-RIETS	Kaaloog se Loop	Groot Marico			C	B
C2BLES-UPPER	Blesbokspruit	Suikerbosrant		E		D
C2SKOO-GHOLF	Schoonspruit	Vaal	B			C/D
C2SKOO-URANI	Schoonspruit	Vaal	C/D			C/D
C2SUIK-DEHOE	Suikerbosrant	Vaal		C		B/C
C2VAAL-EWR13	Vaal	Vaal	C			D
C2VAAL-VERMA	Vaal	Vaal	C			D
C4GVET-VDRIE	Groot Vet	Vet	C/D	C		C
C4KVET-VVIER	Klein Vet	Vet	B/C	C		C
C4SAND-R73BR	Sand	Vet	D	C/D		C
C4SAND-SENEK	Sand	Vet	C/D	C		C
C4VET-HOOPS	Vet	Vaal	D	C/D		C/D
C6VALS-LINDL	Vals	Vaal	C	C		C
C6VALS-PROKL	Vals	Vaal	D	C		C/D
D4MOLO-MODIM	Molopo	Orange	C	C	C	D

Habitat Integrity:

The Index of Habitat Integrity (IHI) was conducted at 40 sites with gazetted RQOs. The Instream IHI (Table 5) at half (13) and the Riparian IHI (Table 6) at 14 (54%) of the 26 sites monitored in the 2020/21 hydrological year were non-compliant. The Instream (13 sites) and riparian (14 sites) IHI at approximately one-third of the sites never complied to the RQOs while the Instream IHI at 21 sites (53%) and the Riparian IHI at 16 sites (40%) always complied to the RQOs. The Instream IHI at 14 sites (35%) and the Riparian IHI at 11 sites (28%) were always in a better condition than the gazetted RQOs.

Table 5: Comparison of Instream Index of Habitat Integrity to targeted RQOs

Site	River	Main River	2018	2018	2020	2021	RQO
A2CROC-BOBBE	**Crocodile**	**Crocodile**	**D**	**D**	**D**	**D**	**D**
A2CROC-KOEDO	**Crocodile**	**Crocodile**		**C**	**C/D**	**D**	**D**
A2CROC-MAKOP	**Crocodile**	**Crocodile**			**D/E**	**E**	**C/D**
A2CROC-MOUNT	**Crocodile**	**Crocodile**	**E**	**E**	**E**		**C/D**
A2ELAN-BESTE	**Elands**	**Elands**		**C**			**C**
A2ELAN-KLIPB	**Elands**	**Elands**		**C**			**C**
A2HEXR-ROOIW	**Hex**	**Elands**		**D**			**D**
A2JUKS-GULLU	**Jukskei**	**Jukskei**		**C**			**D**
A2MAGA-HARTE	**Magalies**	**Magalies**		**E**	**D**	**C**	**C/D**
A2MAGA-MALON	**Magalies**	**Magalies**		**B**	**C**	**B**	**B**
A2MODD-MODDE	**Modderfonteinspruit**	**Jukskei**		**C**			**D**
A2PIEN-BUFFE	**Pienaars**	**Pienaars**			**C**	**D**	**C**
A2PLAT-KOMAN	**Buffelspruit**	**Pienaars**			**B**	**B/C**	**C/D**
A2RIET-MERIN	**Rietvlei**	**Hennops**		**D**	**D**	**D**	**C**
A2SKEE-SKEER	**Skeerpoort**	**Magalies**		**B**		**B**	**C/D**
A2STER-BUFFE	**Sterkstroom**	**Crocodile**		**C**			**B/C**
A2SWAV-ZWAVE	**Swavelpoortspruit**	**Pienaars**		**D**			**D**
A3GMAR-KOEDO	**Groot Marico**	**Groot Marico**		**B/C**	**C**	**C**	**B**
A3GMAR-LOTTE	**Groot Marico**	**Groot Marico**		**D/E**	**D/E**	**D**	**C**
A3GMAR-RIEKE	**Groot Marico**	**Groot Marico**			**E**	**E**	**C/D**
A3GMAR-WONDE	**Groot Marico**	**Groot Marico**		**D**	**D**	**C/D**	**C**
A3KAAL-RIETS	**Kaaloog se Loop**	**Groot Marico**			**A/B**	**A/B**	**B**
A3KMAR-KALKD	**Klein Marico**	**Groot Marico**			**E**	**E**	**C**
A3POLK-TWYFE	**Polkadraaispruit**	**Groot Marico**		**B/C**	**D**	**C**	**B**
A4MAMB-DIAMA	**Mamba**	**Matlabas**		**A**			**B/C**
A4MAMB-HOPEW	**Mamba**	**Matlabas**		A			**B/C**
A4MATL-WATER	**Matlabas**	**Matlabas**		**A**			**B/C**
C2SKOO-GHOLF	**Schoonspruit**	**Vaal**				**B**	**C/D**
C2SKOO-URANI	**Schoonspruit**	**Vaal**				**D**	**C/D**
C2VAAL-EWR13	**Vaal**	**Vaal**				**C**	**D**
C2VAAL-VERMA	**Vaal**	**Vaal**				**C**	**D**
C4GVET-VDRIE	**Groot Vet**	**Vet**				**B/C**	**C**
C4KVET-VVIER	**Klein Vet**	**Vet**				**B/C**	**C**
C4SAND-R73BR	**Sand**	**Vet**				**D**	**C**
C4VET-HOOPS	Vet	**Vaal**				**D**	**C/D**
C6VALS-PROKL	**Vals**	**Vaal**				**F**	**C/D**
D4MOLO-MODIM	Molopo	Orange		D/E	D/E	C	**D**
T3KINI-GWEIR	Kinira	Mzimvubu					C
T3MZIM-BHUJE	**Kinira**	**Mzimvubu**	**A**				**B/C**
T3TINA-N2ROA	**Thina**	**Mzimvubu**	**C**				**C**
T3TSIT-LALEN	**iTsitsa**	**Thina**	**C**				**B/C**

Table 6: Comparison of Riparian Index of Habitat Integrity to targeted RQOs

Site	River	Main River	2018	2019	2020	2021	RQO
A2CROC-BOBBE	Crocodile	Crocodile	D/E	D/E	D	B/C	D
A2CROC-KOEDO	Crocodile	Crocodile		D	D	E	D
A2CROC-MAKOP	Crocodile	Crocodile			D	E	C/D
A2CROC-MOUNT	Crocodile	Crocodile	F	D	E		C/D
A2ELAN-BESTE	Elands	Elands		C			C
A2ELAN-KLIPB	Elands	Elands		C			C
A2HEXR-ROOIW	Hex	Elands		C/D			C
A2JUKS-GULLU	Jukskei	Jukskei		E			C
A2MAGA-HARTE	Magalies	Magalies		F	E	C	C/D
A2MAGA-MALON	Magalies	Magalies		B	C	A/B	B
A2MODD-MODDE	Modderfonteinspruit	Jukskei		F			C
A2PIEN-BUFFE	Pienaars	Pienaars			C	D	C
A2PLAT-KOMAN	Buffelspruit	Pienaars			B	B	C/D
A2RIET-MERIN	Rietvlei	Hennops		D/E	D	C	C

Site	River	Main River	2018	2019	2020	2021	RQO
A2SKEE-SKEER	Skeerpoort	Magalies		C		C	C/D
A2STER-BUFFE	Sterkstroom	Crocodile		B			B/C
A2SWAV-ZWAVE	Swavelpoortspruit	Pienaars		F			D
A3GMAR-KOEDO	Groot Marico	Groot Marico		A/B	A/B	C	B
A3GMAR-LOTTE	Groot Marico	Groot Marico		D	D	D	C
A3GMAR-RIEKE	Groot Marico	Groot Marico			A/B	D	C/D
A3GMAR-WONDE	Groot Marico	Groot Marico		E	E	D	C
A3KAAL-RIETS	Kaaloog se Loop	Groot Marico			A/B	B	B
A3KMAR-KALKD	Klein Marico	Groot Marico			E	C	C
A3POLK-TWYFE	Polkadraaispruit	Groot Marico		D	D	D	B
A4MAMB-DIAMA	Mamba	Matlabas		A			B/C
A4MAMB-HOPEW	Mamba	Matlabas		A			B/C
A4MATL-WATER	Matlabas	Matlabas		A			C
C2SKOO-GHOLF	Schoonspruit	Vaal				B	C/D
C2SKOO-URANI	Schoonspruit	Vaal				C	C/D
C2VAAL-EWR13	Vaal	Vaal				B/C	D
C2VAAL-VERMA	Vaal	Vaal				B/C	D
C4GVET-VDRIE	Groot Vet	Vet				D	C
C4KVET-VVIER	Klein Vet	Vet				B/C	C
C4SAND-R73BR	Sand	Vet				D	C
C4VET-HOOPS	Vet	Vaal				D	C/D
C6VALS-PROKL	Vals	Vaal				E/F	C/D
D4MOLO-MODIM	Molopo	Orange		B	C	D/E	D
T3MZIM-BHUJE	Kinira	Mzimvubu	A/B				C
T3TINA-N2ROA	Thina	Mzimvubu	C				C
T3TSIT-LALEN	iTsitsa	Thina	C				C

REGIONAL PERSPECTIVE

The maps of results for each primary drainage region (Figure 11 to Figure 109) give an indication of the status of the monitored sites per Water Management Area (WMA) in the 2020/21 reporting period. A summary of the sites which could not be sampled along with the reasons for not monitoring are provided in Annexures A to X.

DRAINAGE REGION A (LIMPOPO WATER MANAGEMENT AREA)

The primary drainage region A falls completely within the Limpopo Water Management Area. Secondary drainage regions within the A drainage region are sampled quarterly by the Northwest (A1-A3) and the Limpopo (A4-A9) regional offices. The section of the Luvuvhu catchment that falls within the Kruger National Park (KNP) used to be sampled annually by Mr Hendrik Sithole of South African National Parks (SANPARKS). Since 2020 only one site per river has been sampled in the KNP and no results were available for this hydrological year. There are nine secondary drainage regions:

- A1: Ngotwane
- A2: Crocodile West
- A3: Marico
- A4: Mokolo/ Matlabas
- A5: Lephalale
- A6: Mogalakwena
- A7: Sand (not sampled as it is a seasonal system)
- A8: Nzhelele/ Nwanedi
- A9: Luvuvhu

The condition of each of the rivers in primary drainage region A is provided in Figure 11 to Figure 14 below. There are 121 active REMP monitoring sites in this drainage region. Five sites in secondary drainage region A4 and one in secondary drainage region A5 were discontinued due to safety reasons. One site in secondary drainage region A9 was discontinued, and another site was moved to a different location in the vicinity of the original site. Scheduled monitoring is difficult at 24 sites mostly due to unfavourable flow conditions; see Annexure A for the reasons.

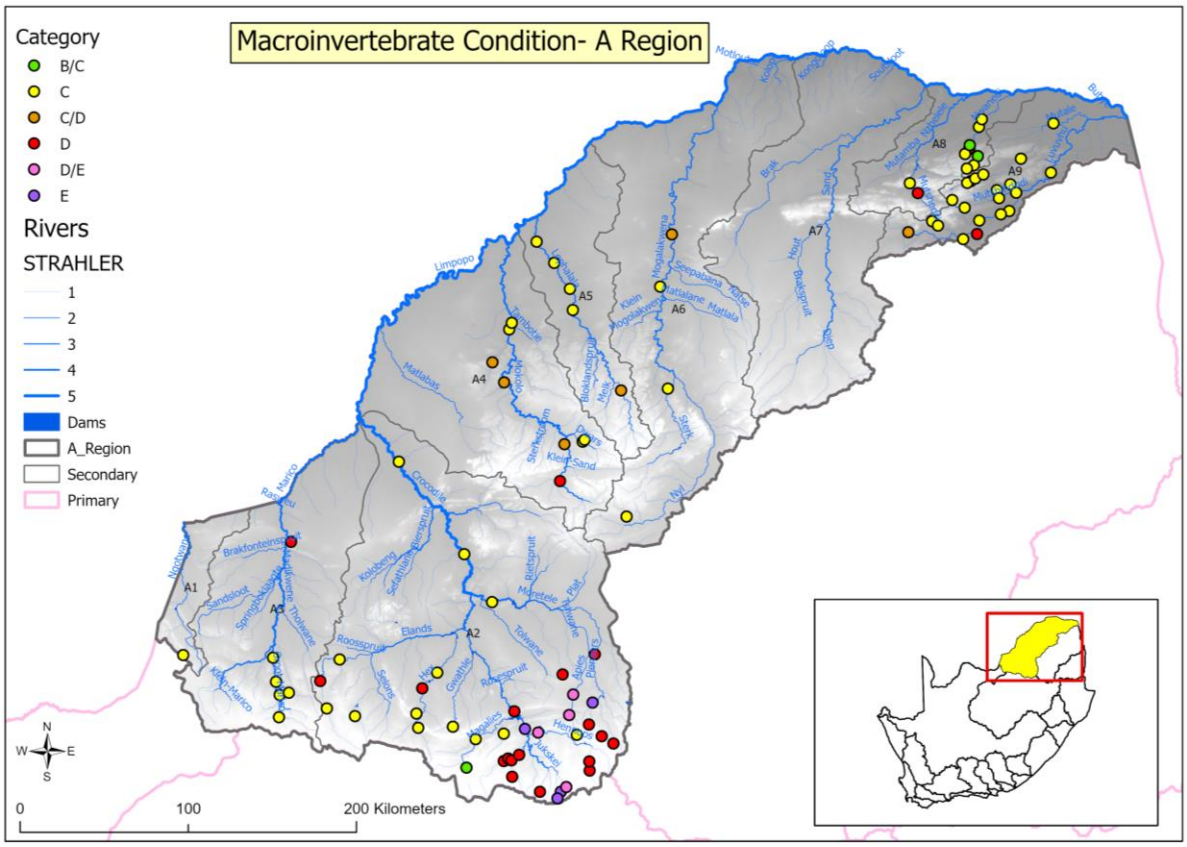

Figure 11: Summary Ecological Categories in primary drainage region A (Limpopo) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) while the red and purple reflect relatively poor conditions (D to E).

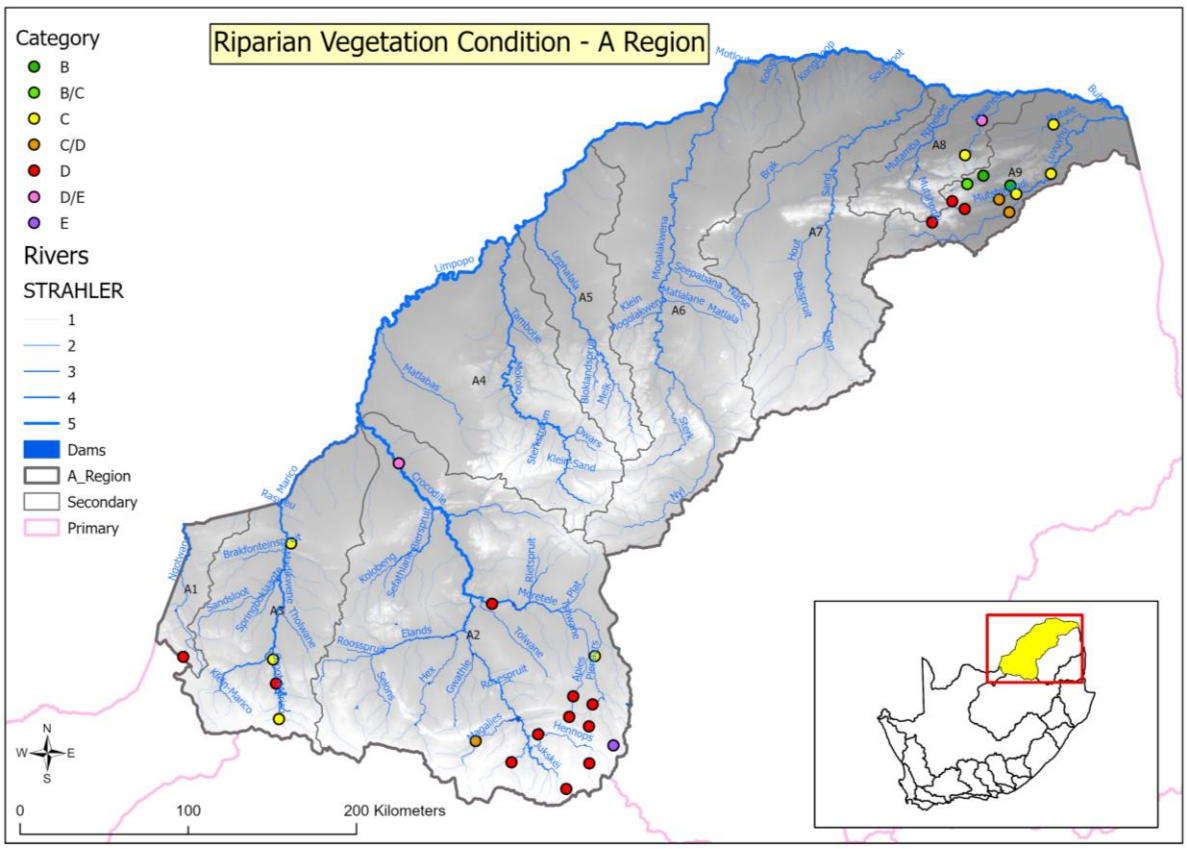

Figure 12: Summary Ecological Categories in primary drainage region A (Limpopo) reflecting the riparian vegetation condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B and B/C) while the red and purple reflect relatively poor conditions (D to E).

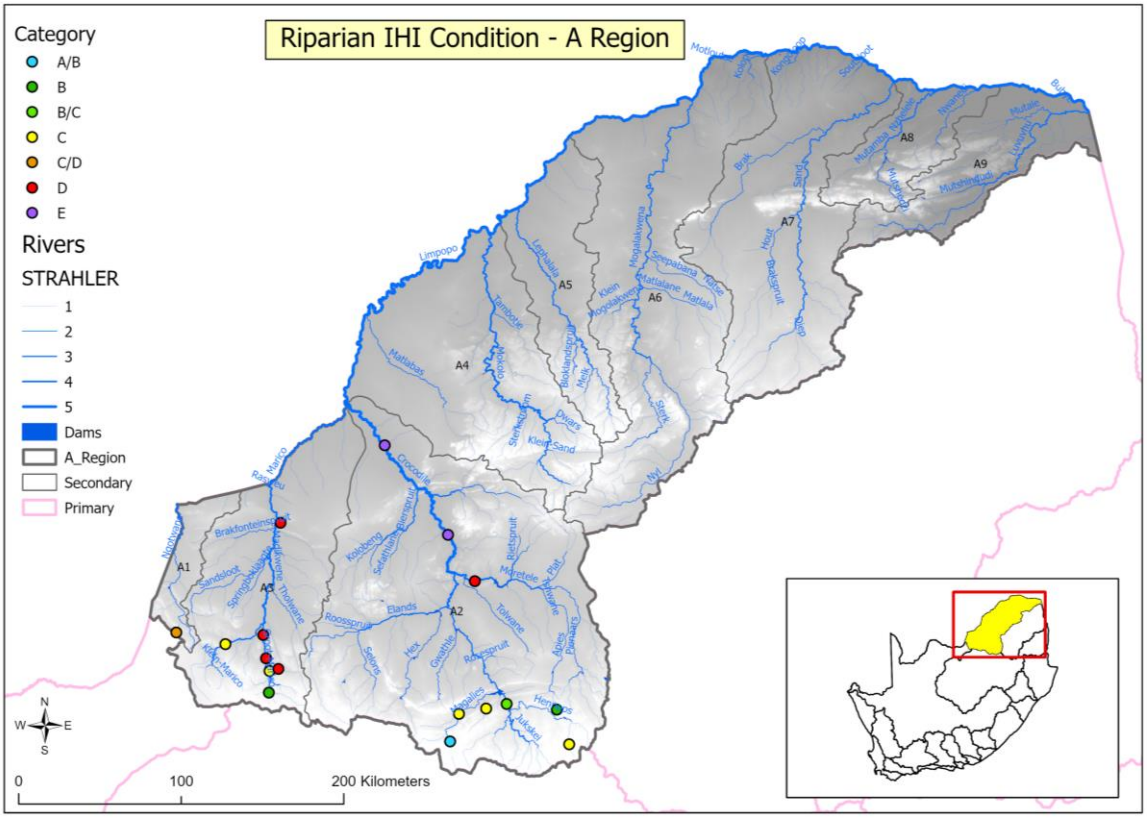

Figure 13: Summary Ecological Categories in primary drainage region A (Limpopo) reflecting the riparian habitat condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A to B/C) while the red and purple reflect relatively poor conditions (D to E).

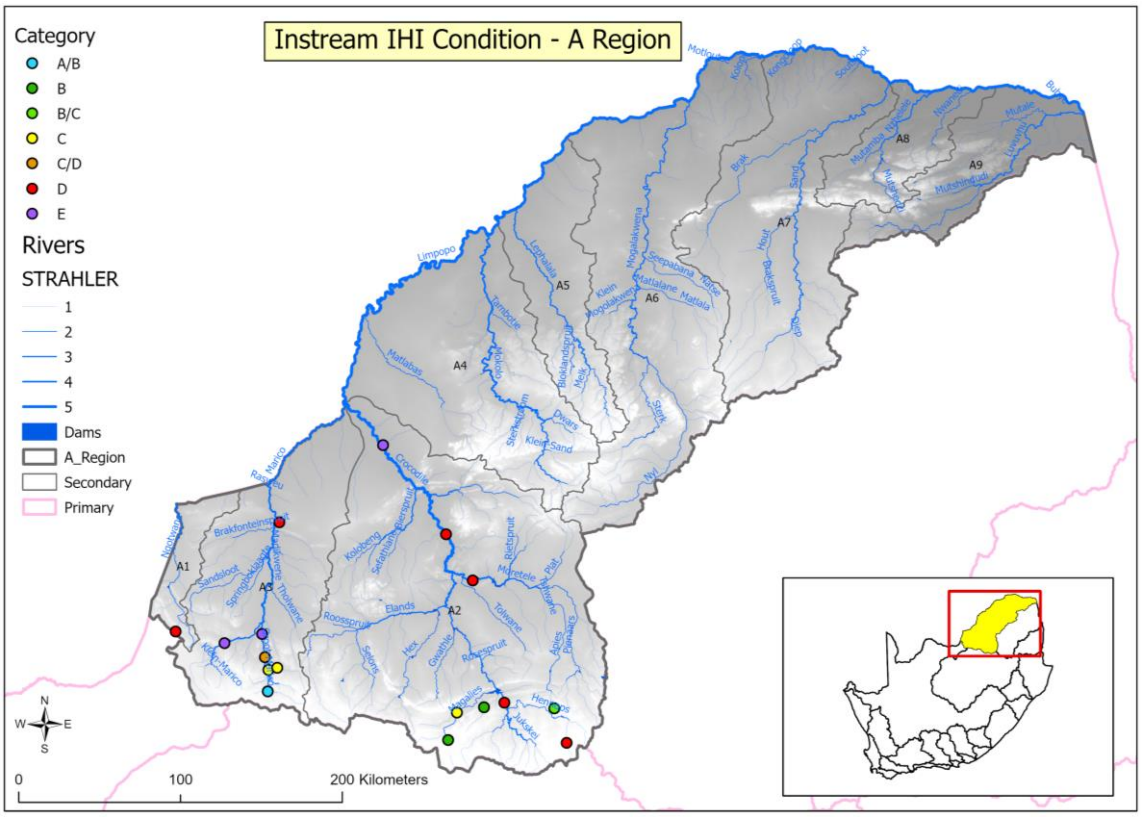

Figure 14: Summary Ecological Categories in primary drainage region A (Limpopo) reflecting the instream habitat condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A to B/C) while the red and purple reflect relatively poor conditions (D to E).

A1: Ngotwane

There is only one active REMP site (A1NGOT-DINOK) in the Ngotwane catchment. The site is located approximately 1 km from the source of the Ngotwane River at Dinokana Springs which is the source of domestic water supply to the surrounding villages. There are no gazetted Resource Quality Objectives (RQOs) for the Ngotwane secondary drainage region.

Macroinvertebrates:

The invertebrates were mostly found to be in a moderately modified (C) condition except for the 2019/2020 hydrological years where the condition changes to close to moderately modified (C/D) condition. Alterations to the flow have been a contributing factor.

Riparian Vegetation:

The Riparian Vegetation was found to be in a close to moderately modified (C/D) condition in 2018/19 but declined to a largely modified (D) condition in 2020/21. This is due to overgrazing, vegetation removal, and infestation by invasive plants.

Habitat Integrity:

The Index of Habitat Integrity (IHI) was assessed during 2018/19 and 2020/21 hydrological years. In 2018/19 the instream IHI was largely modified (D) while the riparian IHI was moderately modified (C). The instream IHI remained in a largely modified (D) condition in 2020/21 but the riparian deteriorated to a close to moderately modified (C/D) condition. The instream IHI is mostly affected by over abstraction of water for domestic use while the riparian condition is affected by bank erosion and vegetation clearing.

A2: Crocodile West

The A2 drainage region can be divided into four sub-catchments:

- Upper Crocodile: From the source to the confluence with the Elands River including the major tributaries such as the Sterkstroom, Magalies, Bloubankspruit, Jukskei and Hennops rivers.
- Lower Crocodile: From the Elands River confluence to the confluence with the Marico
- Elands
- Apies/Pienaars.

The source of the Crocodile River is in the Witwatersrand Mountain range at a height of 1 700 m.a.s.l. This sub-catchment is densely populated and includes the northern suburbs of Johannesburg, as well as parts of Kempton Park and Krugersdorp. The Hartbeespoort and Roodekopjes Dams are in this sub-catchment. Main tributaries include the Hennops, Jukskei, Magalies, Skeerpoort and Sterkstroom (DWS, 2015).

The Lower Crocodile sub-catchment stretches from the Confluence of the Elands River to its confluence with the Marico River to form the Limpopo River. The Sand River and the Bierspruit are the two main tributaries to the lower Crocodile. Irrigated agriculture is the main water use in this area. There are also substantial transfers to the Medupi Power station in the Mokolo River catchment (DWS, 2015).

The Elands River and its main tributaries (Hex, Koster, Selons, Watervals) drains large tribal areas with platinum mining the dominant land use in the area. Rustenburg is the only major town in this area. The Bospoort Dam on the Hex River and the Vaalkop Dam on the Elands are the main dams in the area (DWS, 2015).

The Apies and Pienaars rivers are the main rivers in the Apies/Pienaars sub-catchment that also includes several smaller tributaries such as the Moretele, Edendalespruit, Hartbeesspruit and the Plat River. The Apies River starts at the Fountains in Pretoria and drains the Pretoria CBD, sections of the central-eastern suburbs and most of the industrial and urban areas in the western part of Pretoria. Increased surface runoff is channeled into the Apies River which flows into the highly eutrophic Bon Accord Dam. Effluent from four big wastewater treatment works (Daspoort, Rooiwal, Themba and Babelegi) is discharged into the Apies River. The Pienaars River drains the area from the east of Pretoria northwards before joining the Crocodile River downstream of the Elands River confluence. Roodeplaat and Klipvoor Dams are the main dams on the Pienaars River. The upper and middle reaches of the Pienaars River are densely populated. The main rivers in this sub-catchment are perennial and the flows are increased by treated domestic and industrial effluent as well as water imported from the Vaal Catchment used primarily for domestic and industrial use (DWS, 2015).

There are 40 active sites in this secondary drainage region which have been sampled since the 2016/17 hydrological year. The main rivers sampled include the Crocodile, Jukskei, Magalies, Apies, Pienaars, Hennops, and Elands rivers including several tributaries.

BOX1: SOME OF THE SOLUTIONS IN THE UPPER CROCODILE RIVER CATCHMENT

The upper Crocodile is one of the most polluted catchments in the country, feeding into the hypertrophic Hartbeespoort Dam. Communities have been organising themselves to clean up parts of river stretches and other water bodies in this catchment. These groups have embarked on efforts to “heal” water resources from the scars of everyday bruising, by implementing innovative solutions to trap litter, citizen science, and the good old “getting your hands dirty”. For example, the below pictures, clockwise, show: Hennops Revival’s litter trap across the Hennops River; Kanana community cleaning up a canal that contributes tonnes of waste to the Kaalspruit (one of the tributaries of the Hennops); and passionate Winter veldt participants that are always keen to monitor and keep track of the biota in a beautiful wetland and tributary of the Tolwane River.

Macroinvertebrates:

Almost all sites were sampled on a regular basis through all hydrological years except for A2CROC-BOBBE which was only sampled during the 2020/21 hydrological year due to unfavourable flow conditions. The macroinvertebrates were sampled at 38 of the sites. Most (22) sites remained in the same condition as the previous year but five sites (A2APIE-DEOND, A2CROC-ELAND, A2HART-KAMEE, A2MODD-MODDE, A2STER-BUFFE) deteriorated and another five sites (A2BLOU-RIETF, A2CROC-KOEDO, A2KOST-NAAUW, A2PIEN-BUFFE, A2SOUT-RIETG) Improved from the previous hydrological year.

The upper Magalies River at Maloney's Eye (A2MAGA-MALON) was in the best condition(B/C) in this drainage region. Most (16) sites were in a largely modified (D) condition with 13 sites in a largely modified C condition and four sites each in a close to largely modified (D) and seriously modified (D/E) condition. Seven sites (A2PLAT-K0MAN, A2SKEE-SKEER, A2STER-BUFFE, A2WATE-BAVIA, A2PIEN-KLIPD, A2APIE-DEOND, A2HART-KAMEE) have steadily deteriorated since the 2016/17 hydrological year while only eight (A2CROC-MAKOP, A2KOST-NAAUW, A2BRAA-PARKH, A2HEXR-PAARD, A2PIEN-TIEGE, A2SWAV-ZWAVE, A2HENN-HONNO, A2MODD-MODDE) have improved.

The Jukskei, Apies, Pienaars, Hennops and Crocodile rivers are the most impacted water resources in this drainage regions. These rivers flow through cities and highly developed areas. Discharges from wastewater treatment works, manhole overflows, return flows from agricultural activities and industrial effluent are among contributing factors to the deterioration of ecological condition of water resources. The main impacts in the Crocodile West catchment were related to mining, partially treated sewage effluent, manhole overflows, removal of riparian vegetation, over abstraction and flow alteration, industry, agricultural practices, and solid waste dumping from mushrooming informal settlements. Most of the sites specifically those located in urban areas display continuous deterioration in the ecological state. Few sites are on the same category with the RQOs (see Box 1).

There are gazetted RQOs at 37 of the monitoring sites in this region, 35 of which were sampled this hydrological year. Most (60%) of these sites met the gazetted RQOs with only three sites (A2CROC-KOEDO. A2CROC-MAKOP, A2HEXR-ROOIW) were in a better condition than the gazetted RQOs. Most of the sites that did not meet the gazetted RQOs are in the highly urbanised and industrialised upper part of the Crocodile catchment. There were 15 sites which always complied with the gazetted RQOs and eight sites that never complied.

Riparian Vegetation:

The Riparian Vegetation assessment was not conducted during the 2016/17 and 2017/18 hydrological years due to lack of human resources. The VEGRAI was conducted at nine sites in 2018/19 at 14 sites in 2019/20 and at 13 sites during the current hydrological year. The riparian vegetation in the region was mostly in a poor condition with nine sites (69%) in a largely modified (D) condition. The condition at most (5) of the even sites sampled in both 2019/20 and 2020/21 improved while the condition at A2PIEN-BUFFE deteriorated from a close to moderately modified (C/D) condition to a largely modified (D) condition and the riparian vegetation remained in a close to largely modified (D/E) condition in the lower Crocodile River at A2CROC-MAKOP. The Riparian Vegetation is generally in a poor condition and is impacted by territorialisation (A2CROC-MAKOP), flow regulation (A2CROC-MAKOP), overgrazing (A2CROC-MAKOP, A2ELAN-NOOIT), vegetation clearing (A2CROC-MOUNT), pollution (A2CROC-MOUNT, A2HENN-HENNO), alien invasive species (A2CROC-MOUNT, A2ELAN-NOOIT, A2HENN-HENNO), urban developments (A2CROC-MOUNT), channelization (A2CROC-MAKOP), bank disturbances (A2HENN-HENNO), erosion (A2HENN-HENNO) and other anthropogenic impacts (A2CROC-MAKOP).

There are gazetted riparian vegetation RQOs at 19 of the active sites in the A2 drainage region, 10 of which were sampled during this reporting period. The riparian vegetation condition at four sites did not comply with the gazetted RQOs in 2020/21. The riparian condition at nine sites never complied with the gazetted RQOs while seven sites always complied with the gazetted RQOs. The poor condition of the riparian vegetation in this secondary drainage area is of major concern.

Habitat Integrity:

The Index of Habitat Integrity (IHI) were assessed at 18 sites between the 2017/18 -2020/21 hydrological years but only nine sites were monitored in 2020/21. In 2017 the HI was not conducted due to lack of capacity. Eight sites were sampled in both 2019/20 and 2020/21. The instream IHI at 44% of the sites (4) was in a largely modified (D) two sites (A2MAGA-MALON, A2SKEE-SKEER) in the upper reaches were in a largely natural (B) and only the most downstream site in the Crocodile River (A2CROC-MAKOP) in a seriously modified (E) condition. The instream IHI at four of the eight sites sampled in both 2019/20 and 2020/21 deteriorated, while two sites (A2CROC-BOBBE, A2RIET-MERIN) remained in the same condition and two sites in the Magalies River (A2MAGA-MALON, A2MAGA-HARTE) improved. Several factors contributing to the deterioration of instream habitat include weirs and dams which decrease the amount of flow downstream as well as sedimentation due to erosion. The riparian IHI ranged from a close to natural (A/B) in the upper Magalies River (A2MAGA-MALON) and a largely natural (B) condition in the Plat river tributary (A2PLAT-KOMAN) to a seriously modified (E) condition in the lower Crocodile River (A2CROC-KOEDO, A2CROC-MAKOP). The riparian IHI improved at 4 sites and deteriorated at another three sites with only the Plat river tributary (A2PLAT-KOMAN) remaining in a largely natural condition. The riparian IHI was most impacted by vegetation removal and encroachment of exotic vegetation.

There are gazetted IHI RQOs at 35 of the 40 active sites but only 17 of these were monitored during 2017/18-2020/21 hydrological years. The instream IHI at three of the nine sites with gazetted RQOs monitored in 2020/21 were non-compliant and three sites were in a better condition than the gazetted RQOs. The Instream IHI at four sites remained non-compliant from 2017/18 onwards and 10 sites were always compliant. The riparian IHI at three of the nine sites with gazetted RQOs monitored in 2020/21 were non-compliant and five sites were in a better condition than the gazetted RQOs. The instream IHI at six sites remained non-compliant from 2017/18 onwards and only 3 sites were always compliant.

A3: Marico

The Marico River is fed by several eyes within the Groot Marico dolomitic aquifer compartment including the Groot Marico Eye which is the source of Kaaloog-se-loop. The Groot Marico River proper starts after the confluence of the Kaaloog se loop, Bokkraal se loop and Ribbokfontein se loop. The main tributary is the Klein Marico which joins the Groot Marico downstream of the Marico Bosveld Dam to become the Marico River. The upper reaches of this secondary catchment are sparsely populated with Zeerust, the only major town. The Klein Maricopoort, Marico Bosveld and Molatedi dams are the main dams in the catchment. These dams have a major impact on the natural flow pattern of the Marico River (DWS, 2015). Monitoring was conducted from 2016/17-2020/21. The secondary catchment consists of seven active REMP sites.

Macroinvertebrates:

Macroinvertebrates were sampled at six of the seven sites. The Klein Marico River (A3KMAR-KALKD) were not monitored due mostly to very low flows and overgrown access. The sites generally maintained a moderately modified (C) condition with only the most downstream site (A3GMAR-LOTTE) downstream of Molatedi Dam in a largely modified (D) condition. The Polkadraaispruit (A2POLK-TWYFE) and the upper Groot Marico River (A3GMAR-KOEDO, A3KAAL-RIETS) deteriorated from 2016/17 2020/21 due mostly to sedimentation because of slate mining (A3KAAL-RIETS) and agricultural activities. The sites downstream of the Marico Bosveld (A3GMAR-RIEKE) and Molatedi (A3GMAR-LOTTE) dams are affected by an altered flow regime as no-to-minimal releases into the river are made from these dams. The site at the N4 (A3GMAR-WONDE) was impacted by construction work done to repair the bridge but has shown some improvement since the construction work was completed.

There are gazetted RQOs at all seven sites. It is of major concern that only the Groot Marico downstream of the Marico Bosveld Dam (A3GMAR-WONDE) complied with the gazetted RQOs in 2020/21. Kaaloog-se-loop (A3KAAL-RIETS), and the Groot Marico upstream of the Marico Bosveld Dam never complied to the gazetted RQOs.

Vegetation:

The vegetation component was only monitored during three sites in 2018/19 and at four sites in 2020/21. The sites at A3GMAR-KOEDO and A3KAAL-RIETS remained in a moderately modified (C) condition during due to minimal anthropogenic activities. Site A3GMAR-LOTTE downstream of Molatedi Dam improved from a largely modified (D) and site A3GMAR-WONDE at the N4 downstream of Groot Marico town from a seriously modified (E) category in 2018/19 to a moderately modified (C) condition in 2020/21. The improvement at A3GMAR-WONDE can largely be attributed to recolonisation of the riparian zone after the construction work on the bridge was completed.

There are gazetted RQOs at all seven monitoring sites but only five sites have been monitored. None of the sites complied with the gazetted RQOs in 2018/19 but the two sites downstream of the dams (A3GMAR-RIEKE, A3GMAR-LOTTE) complied with the gazetted RQOs in 2020/21. The Groot Marico River downstream of the Marico Bosveld Dam (A3GMAR-RIEKE) was in a better condition than the gazetted RQO.

Habitat Integrity:

The Index of Habitat Integrity (IHI) was not monitored during the 2016/17 and 2017/18 hydrological years due to lack of capacity. The IHI was conducted at all seven sites. The instream IHI ranged from a close to natural (A/B) condition in Kaaloog-se-loop to a seriously modified (E) condition in the Klein Marico downstream of the Klein Maricopoort Dam and the Groot Marico downstream of the Marico Bosveld Dam. The Instream IHI remained in the same condition at four sites and improved at three sites. The riparian IHI ranged from a near natural (B) condition in the Kaaloog-se-loop (A3KAAL-RIETS) to a largely modified (D) condition at the Polkadraaispruit (A3POLK-TWYFE) and the lower Groot Marico and Marico (A3GMAR-WONDE, A3GMAR-RIEKE, A3GMAR-LOTTE). The riparian IHI deteriorated at three sites, remained in the same condition at two sites and improved at two sites.

There are gazetted RQOs at all seven sites. In 2020/21 the instream IHI was non-compliant at six sites and in a better than required condition at the Kaaloog se loop. The instream IHI remained non-compliant at six sites and compliant at one site. The riparian IHI was non-compliant at four sites and compliant at three sites in

2020/21. The riparian IHI remained non-compliant at three sites while only the Kaaloog-se-loop (A3KAAL-RIETS) and the upper Groot Marico (A3GMAR-RIEKE) remained compliant throughout the monitoring period.

A4: Mokolo/Matlabas

The Matlabas River rises in the Waterberg within the Marekele National Park flowing north-westwards until it reaches the Limpopo River. The Mamba River is its only significant tributary. There are no major towns or dams in the catchment. The upper catchment falls mostly within the Marakele National Park while the lower catchment is characterised by agriculture and game farming (RHP, 2008). The Mokolo River proper starts near the town of Alma at the confluence of the Grootspruit and the Sand River. It flows north-westwards to enter the Limpopo River near Woudend. The main towns in the catchment are Vaalwater and Lephalale. The Mokolo River has numerous small tributaries including the Sterkstroom, Rietspruit and Tambotie rivers. The main land use is agriculture with private game lodges also spread throughout the catchment. The Mokolo Dam is the only major dam in the catchment (DWA, 2012). The Mokolo and Matlabas rivers are non-perennial.

There are currently 16 active sites in this secondary catchment. Five sites that were sampled previously, mostly within the Welgevonden Nature Reserve, were discontinued due to safety concerns relating to wild animals. The Matlabas catchment was not sampled in this hydrological year due to constant low flows. It will be sampled again from the 2023/24 financial year.

Macroinvertebrates:

Eight of the active REMP sites were sampled in 2020/21. Two of the sites in the Mokolo River (A2MOKO-MOKOL in the Kaingo private game reserve, A4MOKO-WITK) could not be accessed. Most (4) of the sites were in a moderately modified (C) condition with three sites in a close to moderately modified (C/D) condition and the Sand River at Alma (A4MOKO-ALMAB) in a largely modified (D) condition. Only one (A4MOKO-ALMAB) of the five sites which were also sampled the previous year deteriorated while two sites (A4DWAR-JIMSE, A4MOKO-MARKE) remained in the same condition and another two sites (A4MOKO-DNYAL, A4MOKO-WWORK) improved. Three sites (A4DWAR-JIMSE, A4DWAR-ZANDD, A4MOKO-MARKE) remained in a moderately modified (C) condition and the Mokolo River at Vaalwater (A4MOKO-VAALW) remained in a close to moderately modified (C/D) condition since 2016/17. The Mokolo River just downstream of Mokolo Dam (A4MOKO-WWORK) steadily improved from a largely modified (D) condition in 2017/18 to a close to moderately modified (C/D) condition in 2020/21 while the site at the R33 just upstream of Lephalale (A4MOKO-DNYAL) improved from largely modified (D) condition in 2016/16 to a moderately modified (C) condition in 2020/21. The Rietspruit deteriorated from a moderately modified (C) condition in 2017/18 to a close to moderately modified (C/D) condition in 2020/21. The Mamba River (A4MAMB-DIAMA) was in a close to moderately modified (C/D) condition in 2017/18. The Matlabas River deteriorated from a moderately modified (C) condition in 2017/18 to a close to moderately modified (C/D) condition at A4MATL-WATER and a largely modified (D) condition at A4MATL-HOOPD in 2019/20.

There are gazetted RQOs at 12 sites within this secondary catchment but only nine of these sites were monitored since 2016/17. The macroinvertebrate condition at only two (A4DWAR-JIMSE, A4DWAR-ZANDD) of the five sites monitored in 2020/21 complied with the gazetted RQOs. The Mokolo River was non-compliant. The Dwars River and its tributary Jim-se-loop (A4DWAR-ZANDD, A4DWAR-JIMSE) and site

A4MOKO-MOKOL always complied with the gazetted RQOs while the Mamba (A4MAMB-DIAMA) and Mokolo River at Vaalwater (A4MOKO-VAALW) and just downstream of the Mokolo Dam (A4MOKO-WWORK) never complied with the gazetted RQOs. The Sand River at Alma (A4MOKO-ALMAB) complied with the RQO in 2019/20 but was non-compliant in 2018/18 and in 2020/21. The Matlabas River complied with the RQOs in 2017/18 but did not comply when it was last sampled in 2019/20.

Habitat Integrity:

There are gazetted RQOs for fifteen sites in this drainage region but none of these sites were monitored this hydrological year. The IHI was inly conducted at three sites (A4MAMB-DIAMA, A4MAMB-HOPEW and A4MATL-WATER) in the Matlabas catchment during 2018/19 hydrological year and they were found in a natural(A) condition for both instream and riparian habitat. The main impacts in this catchment were related to reduced flow and agricultural activities. The low flows due to the drought conditions were exacerbated by abstraction for agricultural activities.

A5: Lephalale

The Lephalale River rises in the Waterberg in a distinct mountain catchment area dominated by grasslands and extensive wetlands. It flows in a northerly direction through the Lephalale Wilderness Area and joins the Limpopo River on the Botswana border (RHP, 2008). The Lephalale catchment has limited water resources, but a high demand dominated by irrigation. The upper reaches of the Lephalale River catchment form part of the Waterberg Biosphere Reserve, however there are still several rural villages in the lower section that use water directly from the river for domestic purposes (RHP, 2007a). There are seven active REMP monitoring sites on the main Lephalale River and one on the Rietbokvleispruit which was discontinued in 2020. Another site on the Lephalale River at the Lephalale Wilderness Area boundary has been discontinued due to safety reasons. The RQOs have not yet been determined for the Lephalale catchment.

Macroinvertebrates:

Macroinvertebrates at four of the five sites in 2020/21 were in a moderately modified (C) condition with only the site near Melkrivier (A5LEPH-MELKR) in a close to moderately modified (C/D) condition. The site at Melkrivier is mostly in a moderately modified (C) condition but improved to a close to largely natural (B/C) condition in 2018/19 but deteriorated to a close to moderately modified (C/D) condition in 2020/21. The site on the Rietbokvleispruit (A5RIET-MAKOU) was mostly in a largely modified (D) condition but improved to a close to moderately modified (C/D) condition in 2017/18. The rest of the sites showed steady improvement in condition since 2016/17. The main impacts in this catchment are related to habitat changes due largely to erosion.

Habitat Integrity:

The IHI was only conducted at seven sites in 2018/19. The instream IHI ranged from a natural (A) condition in the upper reaches (A5RIET-MAKOU, A5LEPH-WITWA) to largely modified (D) further downstream at A5LEPH-KROON. While the riparian IHI ranged from a natural (A) condition in the upper Lephalale River (A5LEPH-WITWA) to a seriously modified (E) condition further downstream a A5LEPH-KROON. The riparian

habitat was more impacted than the instream habitat. The instream IHI at 43% of the sites were in a natural to near natural (A -A/B) condition while the riparian IHI was in a natural to near natural condition at only 28% of the sites.

A6: Mogalakwena

The Mogalakwena River originates as the Great Nyl River near the towns of Bela-Bela and Modimolle in the Waterberg. It flows north-eastwards towards Mokopane where its name changes to Mogalakwena. The Mogalakwena then flows north-westwards to join the Limpopo River near Tokio. There are eight dams in the catchment, the most important of which are the Glen Alpine (Mogalakwena), Doorndraai (Sterk), Combrinck (Dorps) and Donkerpoort (Klein Nyl) dams. The main tributaries are the Klein Nyl, Sterk, Dorps, Mothlakole and Matlalane. The main land use in the catchment is agriculture and private game farms (DWS, 2020b). Bela-Bela, Modimolle, Mookgophong and Mokopane are the main towns in the catchment.

The Mogalakwena catchment has limited surface water resources. There are 10 active sites in this drainage region, but four sites are difficult to access and are only sampled sporadically. Three of the four sites were sampled in the 2020/21 hydrological year were in a moderately modified (C) condition with only the site downstream of Glen Alpine Dam (A6MOGA-BGLEN) in a close to moderately modified (C/D) condition. This site downstream of Glen Alpine Dam has deteriorated from a moderately modified (C) condition in 2017/18. The Mogalakwena at Steilloop (A6MOGA-STEIL) improved from a close to moderately modified (C/D) condition in 2017/18 to a moderately modified (C) condition in 2020/21 while the Mogalakwena River downstream of Glen Alpine (A6MOGA-BGLEN) deteriorated from a moderately modified (C) condition in 2017/18 to a close to moderately modified (C/D) condition in 2020/21. The dams in the catchment supply water for domestic use and irrigation. The main impacts are related to flow regulation as well as poorly functioning wastewater treatment works.

A8: Nzhelele/ Nwanedi

The Nzhelele River rises on the northern slopes of the Soutpansberg and flows north to the Limpopo River. The main tributaries are the Mutshedzi, Mufugudi, Mutambu and Tshishiru rivers. Irrigation, mostly from the Mutshedzi and Nzhelele dams, is the dominant water use in this catchment. There is a significant amount of afforestation in the high rainfall regions of the Soutpansberg and a small industrial area, Makhado Centre, which obtains water from the Mutshedzi Dam Regional Water Supply Scheme (DWS, 2019b).

The Nwanedi River rises in the upper Soutpansberg, then flows northwards before joining the Limpopo River at Popalin Ranch. The Luphephe River is the only major tributary. The Nwanedi and Luphephe dams, built for irrigation, are the two major dams in the catchment. There are no major towns in the study area, but numerous informal settlements are present. The main land uses are extensive agriculture and game farming (REMP, 2019b). The upper part of the catchment is dominated by plantations while the lower section is utilised for irrigation, so the main impacts on the river are flow modification and habitat alteration. The upper sections of the Nwanedi catchment are perennial whereas the lower sections are more seasonal and often dry up completely during drought conditions. The upper part of the catchment falls within a more natural area but there are numerous informal settlements and agricultural activities in the lower section.

There are 12 active sites in this drainage region but the Nwanedi River near Feskraal (A8NWAN-ADELA) could not be accessed this hydrological year.

Macroinvertebrates:

Most (7) sites were in a moderately modified (C) condition with two sites each in a close to largely natural (B/C) and largely modified (D) condition. Although five sites remained in the same condition as the previous year, the macroinvertebrate condition improved at three sites and deteriorated at another three sites. The macroinvertebrate condition at two sites on the Nwanedi River improved from a largely modified (D) condition in 2016/17 to a close to moderately modified (C/D) condition in 2017/18 (A8NWAN-ADELA) and a moderately modified (C) condition (A8NWAN-CROSS) since 2017/18. The Nzhelele River downstream of the Mutshedzi River deteriorated from a moderately modified (C) condition in 2016/17 to a largely modified (D) condition since 2018/19.

Vegetation:

The riparian vegetation was assessed at two sites on the Nwanedi River (A8NWAN-FALLS, A8NWAN-FOLOR) and at one site (A8NZHE-PLANT) on the Nzhelele River. The riparian vegetation at the upper Nwanedi River (A8NWAN-FALLS) was in a moderately modified (C) condition while the site further downstream (A8NWAN-FOLOR) was in a much worse close to largely modified (D/E) condition due to impacts from agricultural activities. The site at Nzhelele River (A8NZHE-PLANT) maintained a largely modified (D) condition due to bank erosion and invasive plant competition.

Habitat Integrity:

The IHI was conducted at 11 of the monitoring sites in 2020/21. Only the instream IHI was conducted at the same sites in 2018/19. The instream IHI ranged from a natural (A) condition in the upper Luphephe (A8LUPH-TSHIT) and upper Nwanedi (A8NWAN-FALLS, A8NWAN-GORGE) rivers to a moderately modified (C) condition at four sites. There were two sites (A8LUPH-GUMEL, A8NZHE-PLANT) in a largely natural (B) condition and another two sites (A8NWAM-CONFL, A8NWAN-CROSS) in a close to largely natural (B/C) condition. The instream IHI remained in the same condition at seven sites and improved at four sites. The riparian IHI was mostly in a moderately modified (C) condition, with only the upper Luphephe River (A8LIPH-TSHIT) in a natural condition. The upper Nwanedi River (A8NWAN-FALLS, A8NWAN-GORGE) was in a close to natural (A/B) condition and the lower Luphephe (A8LUPH-GUMEL) in a largely natural (B) condition. The riparian IHI was more impacted than the instream IHI as evidenced by lower riparian IHI condition at five sites.

A9: Luvuvhu

The Luvuvhu River and some of its tributaries rise in the Soutpansberg, it then flows north-eastwards for about 200 km before joining the Limpopo River near Pafuri in the Kruger National Park. The main tributaries are the Latonyanda, Dzindi, Mutale and Mutshindudi rivers. There are seven major dams in the catchment, the largest of which are the Albasini and Nandoni dams in the Luvuvhu River. The Luvuvhu catchment falls mostly within an agricultural and rural area with the lower section forming part of the Kruger National Park. Thohoyandou is the main town in the catchment.

There are 28 active sites in this secondary catchment but only 20 were sampled in the 2020/21 hydrological year. The four sites located within Kruger National Park (A9LUVU-BOBOM, A9LUVU-DONGA, A9LUVU-SHIDZ and A9MUTA-MBEND) have not been sampled since 2019.

Macroinvertebrates:

Most (20) sites were in a moderately modified (C) with only the upper Luvuvhu (A9LUVU-BEJAB) in a close to moderately modified (C/D) condition and two sites on the Luvuvhu (A9LUVU0HASAN) and Mutale (A9MUTA-ROADS) rivers in a largely modified (D) condition. Twenty of the sites monitored in 2020/21 were also sampled the previous year. Most (9) sites remained in the same condition while the condition at eight sites deteriorated and improved at three sites. Six sites remained in the same condition since 2016/17 and the condition at another six sites improved. The only site which showed a steady deterioration is the upper Mukhase River at the Mphaphuli Nature Reserve (A9MUKH-CYCAD) which deteriorated from a close to largely natural (B/C) condition in 2016/17 to 2018/19 to a moderately modified (C) condition since 2019/20. The main impacts in this catchment are related to altered flow regimes and changes in habitat due mostly to erosion and sedimentation.

Riparian Vegetation:

The riparian vegetation was only monitored at 11 sites during the 2019/20 hydrological year. The riparian vegetation condition ranged from a largely natural (B) category in the upper sections of the Mukhase (A9MUKH-CYCAD) and Tshiombedi rivers (A9TBDI-BRIDG) to a largely modified (D) condition in the Latonyanda River at Entabeni (A9LATO-ENTAB) and the Mutshindudi upstream of Phiphidi Falls (A9MUTS-BRIDG).

Habitat Integrity:

The IHI was conducted at 15 sites during 2018/19 hydrological year. The instream IHI in this catchment was generally high with two sites (A9MUKH-CYCAD, A9MUTS-SCHOO) in a natural (A) condition, one (A9LATO-FORES) in a close to natural (A/B) condition, two sites (A9DZIN-CROCV, A9MUTS-GWEIR) in a largely natural (B) condition, four sites in a close to largely natural (B/C) condition and three sites in a moderately modified (C) condition. The riparian habitat was generally in a poorer condition as reflected by 9 sites (60%) with a moderately modified (C) riparian IHI. The riparian IHI at the Mukhase River (A9MUKH-CYCAD) was in a natural (A) condition while the Mutshindudi at A9MUTS-SCHOO was in a largely natural (B) condition. Two sites (A9LUVU-LAMBA, A9MBWE-BRIDG) were in a close to largely natural (B/C) condition. The upper Luvuvhu (A9LUVU-BEJAB) was in a close to moderately modified (C/D) and the lower Luvuvhu at Mhinga (A9LUVU-MHING) was in a close to largely modified (D/E) condition.

Summary:

Macroinvertebrates:

Most sites in the primary drainage region A are in a moderately modified (C) condition (Figures 15 and 16). There are no sites in a natural or close to natural (A, A/B) condition and only about 5% in a largely natural (B) condition. Almost 10% of the sites are in an unsustainable (D/E, E) condition. Overall, it seems as if the invertebrate condition is in a relatively stable condition.

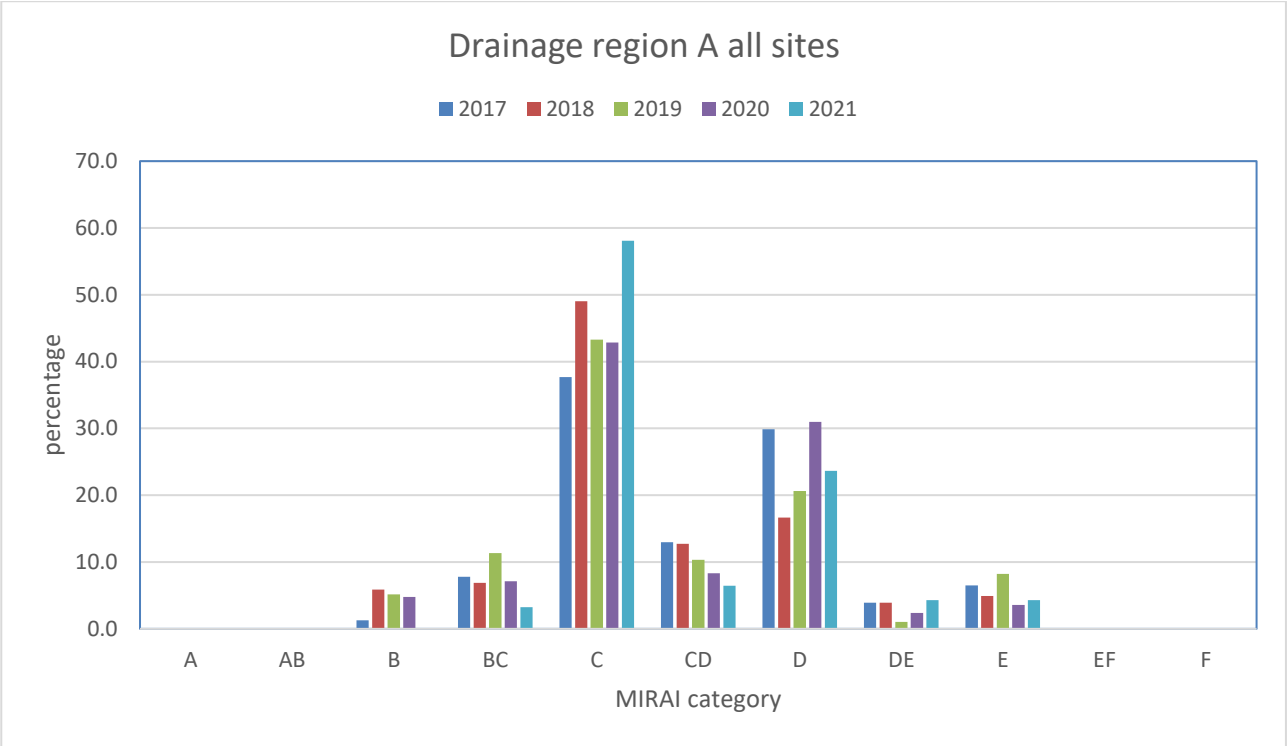

Figure 15: The percentage of sites in each ecological category in primary drainage region A (Limpopo) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2020/21.

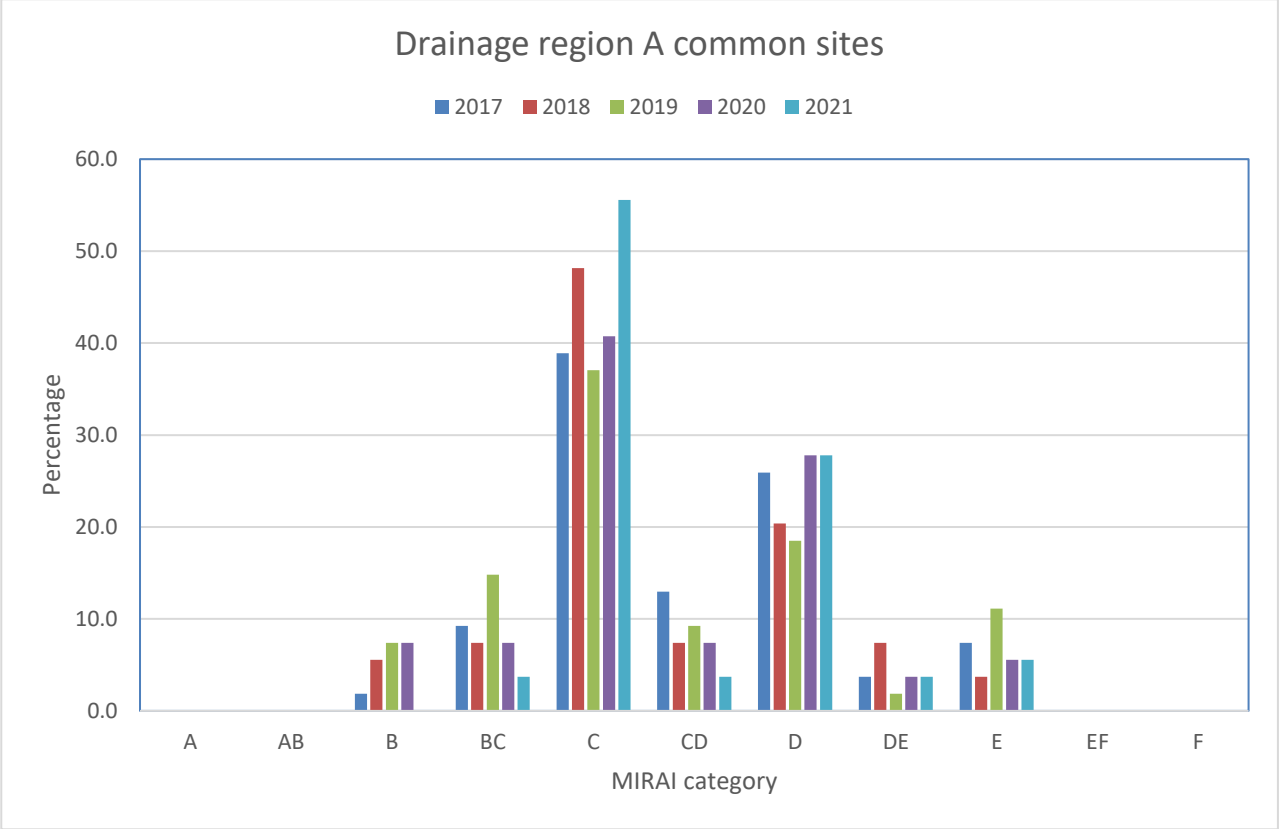

Figure 16: The percentage of sites in each ecological category in primary drainage region A (Limpopo) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2020/21.

Riparian Vegetation:

The riparian vegetation seems to have been impacted more than the macroinvertebrates with most sites in a close to large modified (C/D) and largely modified (D) condition (Figures 17 and 18). There seems to be a negative trend in the riparian vegetation condition when comparing only those sites monitored in both 2018/2019 and 2019/2020, with fewer sites in a moderately to largely modified (C/D) condition and more sites in a largely modified (D) condition (Figure 18).

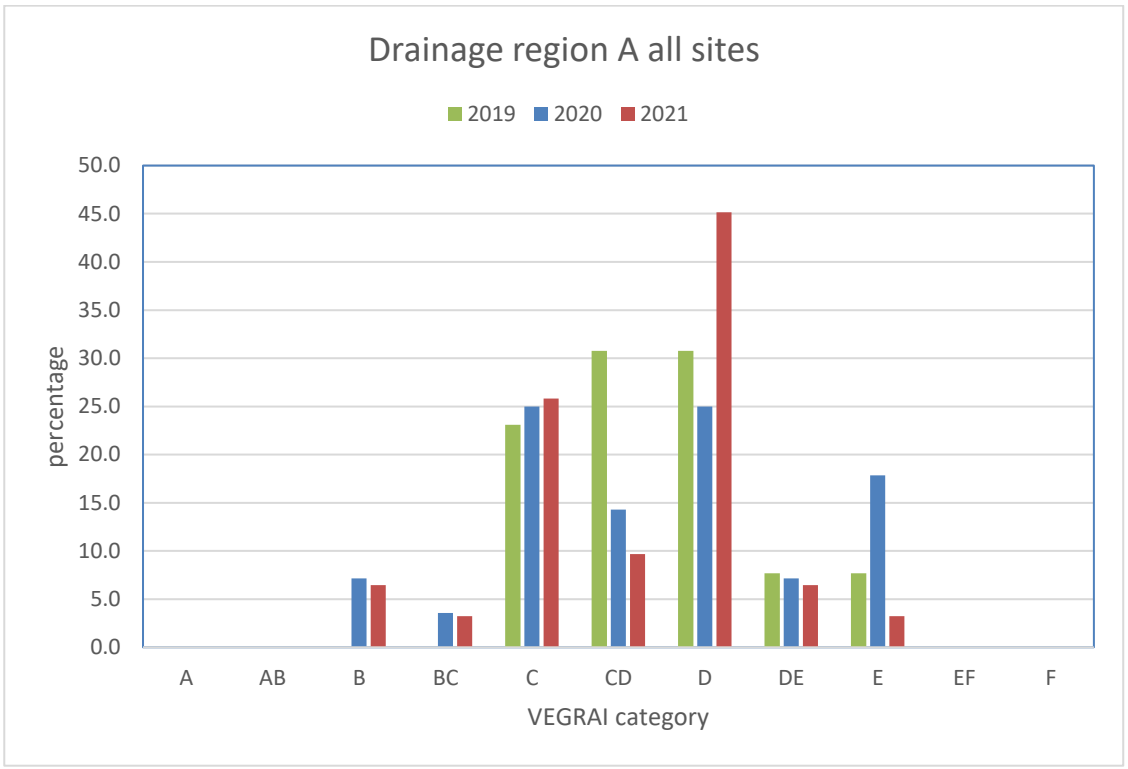

Figure 17: The percentage of sites in each ecological category in primary drainage region A (Limpopo) per hydrological year for riparian vegetation at all sites monitored from 2018/19 to 2020/21.

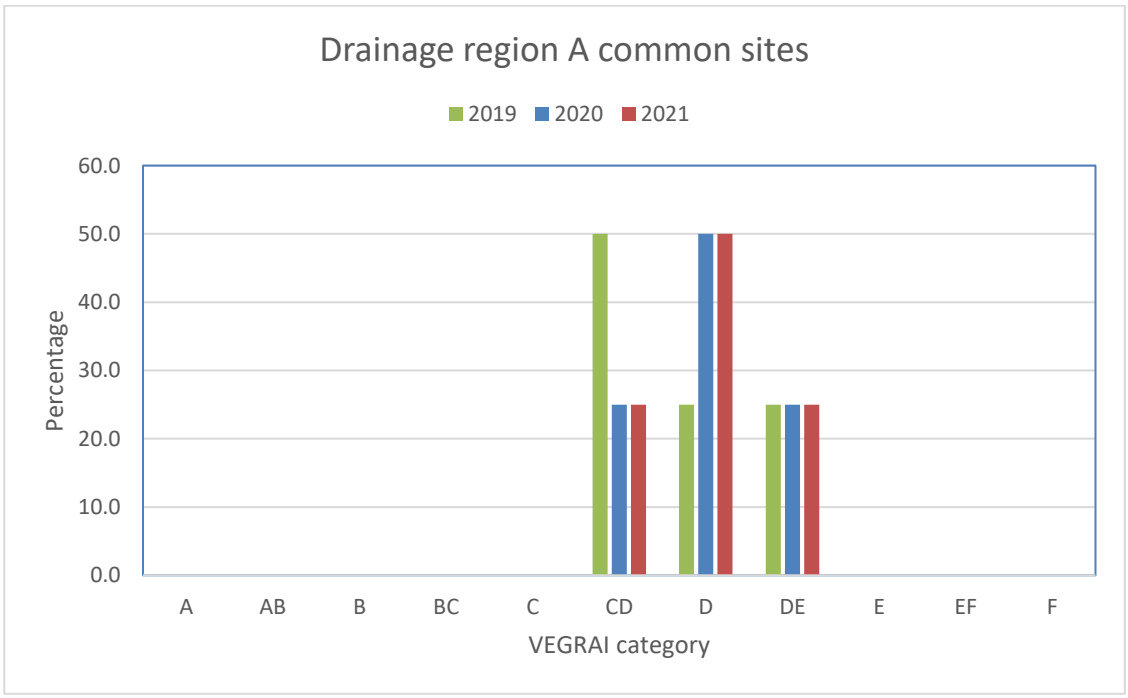

Figure 18: The percentage of sites in each ecological category in primary drainage region A (Limpopo) per hydrological year for riparian vegetation at those sites monitored every year from 2018/19 to 2020/21.

Habitat Integrity:

The instream habitat Integrity ranged from a natural (A) condition in the upper Nwanedi and Luphephe rivers to a seriously modified (E) condition at the sites downstream of Hartbeespoort (A2CROC-MOUNT), Marico Bosveld (A3GMAR-RIEKE) and Klein Maricopoort (A3KMAR-KDAM) dams in 2019/2020 (Figures 19 and 20). These results clearly show the negative impacts that dams have on the instream habitat. As was also evident from the riparian vegetation results, the riparian habitat integrity is also in a worse condition than the instream habitat with the condition ranging from a natural (A) condition in 2019/20 in the upper Groot Marico (A3GMAR-KOEDO) to a critically modified (F) condition in the lower Magalies River (A2MAGA-HARTE) in 2018/2019 (Figure 19). When comparing only those sites sampled in both 2018/19 and 2019/20 (Figure 20), there seems to be a deterioration in the habitat condition in this drainage region with more sites in a largely modified (D) condition in 2019/2020 and no sites in a better that moderately modified (C) condition.

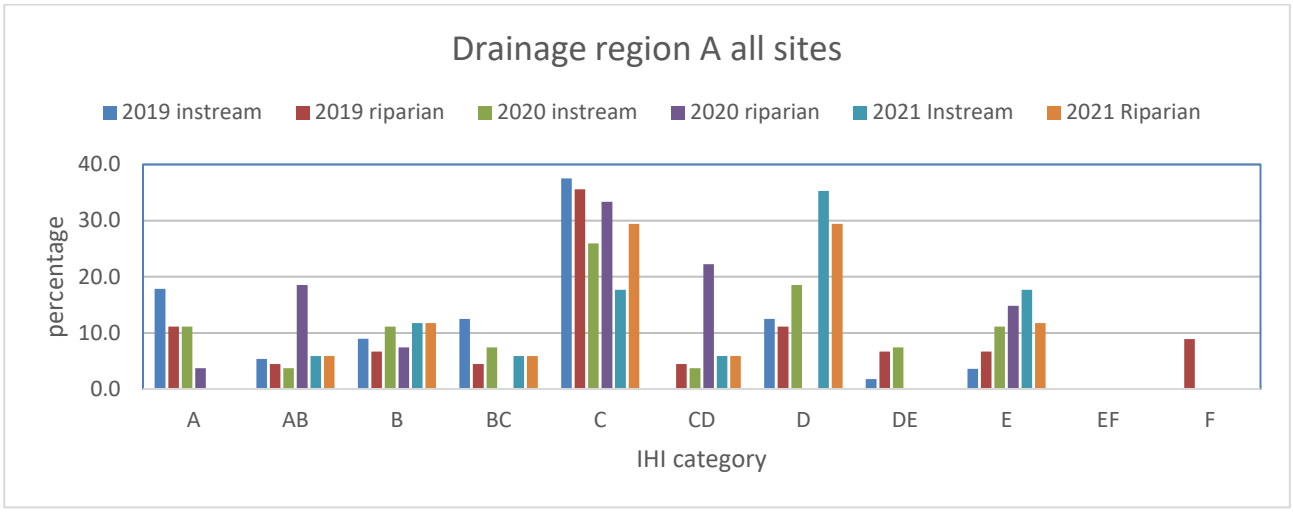

Figure 19: The percentage of sites in each ecological category in primary drainage region A (Limpopo) per hydrological year for habitat integrity at all sites monitored from 2018/19 to 2020/21.

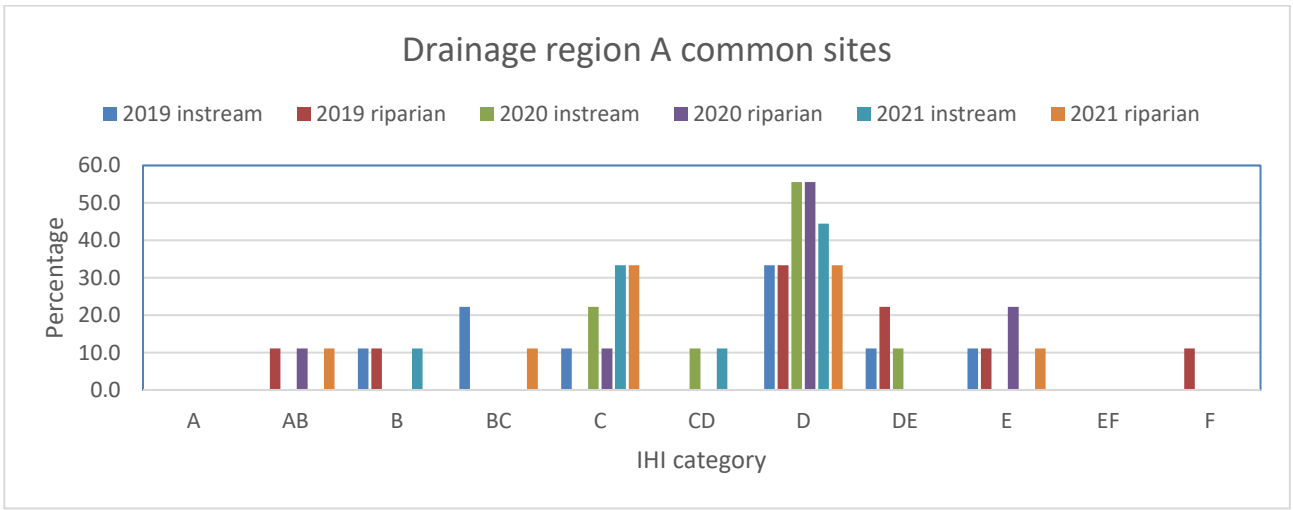

Figure 20: The percentage of sites in each ecological category in primary drainage region A (Limpopo) per hydrological year for habitat integrity at those sites monitored every year from 2018/19 to 2020/21.

DRAINAGE REGION B (OLIFANTS WATER MANAGEMENT AREA)

The condition of the rivers in primary drainage region B is provided in Figure 21. There are currently 43 active REMP monitoring sites in this drainage region. Many sites frequently experience challenges such as accessibility and unfavourable flows to conduct scheduled monitoring (Annexure B). The sections of the drainage region that falls within the Kruger National Park (KNP) used to be sampled annually by Mr Hendrik Sithole of South African National Parks (SANPARKS). Since 2020 only one site per river has been sampled in the KNP and no results were available for this hydrological year. Primary Drainage B is subdivided into the Olifants River (B1 to B7), Letaba River (B8) and Shingwidzi (B9) sub-catchments.

The Olifants River originates at Trichardt to the east of Johannesburg and initially flows northwards before gently curving in a generally eastward direction through the Kruger National Park and into Mozambique, where it joins the Limpopo River before discharging into the Indian Ocean. The Olifants River catchment falls within 3 provinces; it originates in the western part of Gauteng, after which most of it drains Mpumalanga. The last portion is in the Limpopo Province. The main tributaries are the Wilge, Elands and Ga-Selati rivers on the left bank and the Klein Olifants, Steelpoort, Blyde, Klaserie and Timbavati rivers on the right bank (DWS, 2016; 2019d). Nineteen of 25 active REMP sites in the Olifants River catchment were monitored during the 2020/21 hydrological year. The Olifants River catchment covers an area of approximately 54 570 km^2 and is subdivided into 7 secondary catchments (B1 to B7) (DWS, 2019b).

The Groot Letaba, Politsi, Debengeni, Thabina and Letsitele rivers rise in the Northern Drakensberg Mountains and cascade down the steep slopes in a north-easterly direction. The Little Letaba joins the Groot Letaba in the Kruger National Park (KNP) to form the Letaba River, which flows eastwards across the KNP until it joins the Olifants River a short distance upstream of the Mozambique border. The Letaba catchment falls entirely within the B8 secondary catchment and within the Limpopo Province.

The Shingwedzi River rises in the Soutpansberg near Thoyandou and Malalulele. It flows eastwards across the lowveld and through the Kruger National Park into Mozambique before joining the Olifants River approximately 12lm downstream of Massingit Dam. The Shingwidzi is non-perennial river which rarely has surface flow and was not sampled.

- B1: Olifants and Klein Olifants
- B2: Wilge/ Bronkhorstspruit
- B3: Elands/ Olifants
- B4: Steelpoort
- B5: Olifants
- B6: Blyde
- B7: Olifants
- B8: Letaba
- B9: Shingwidzi (not sampled)

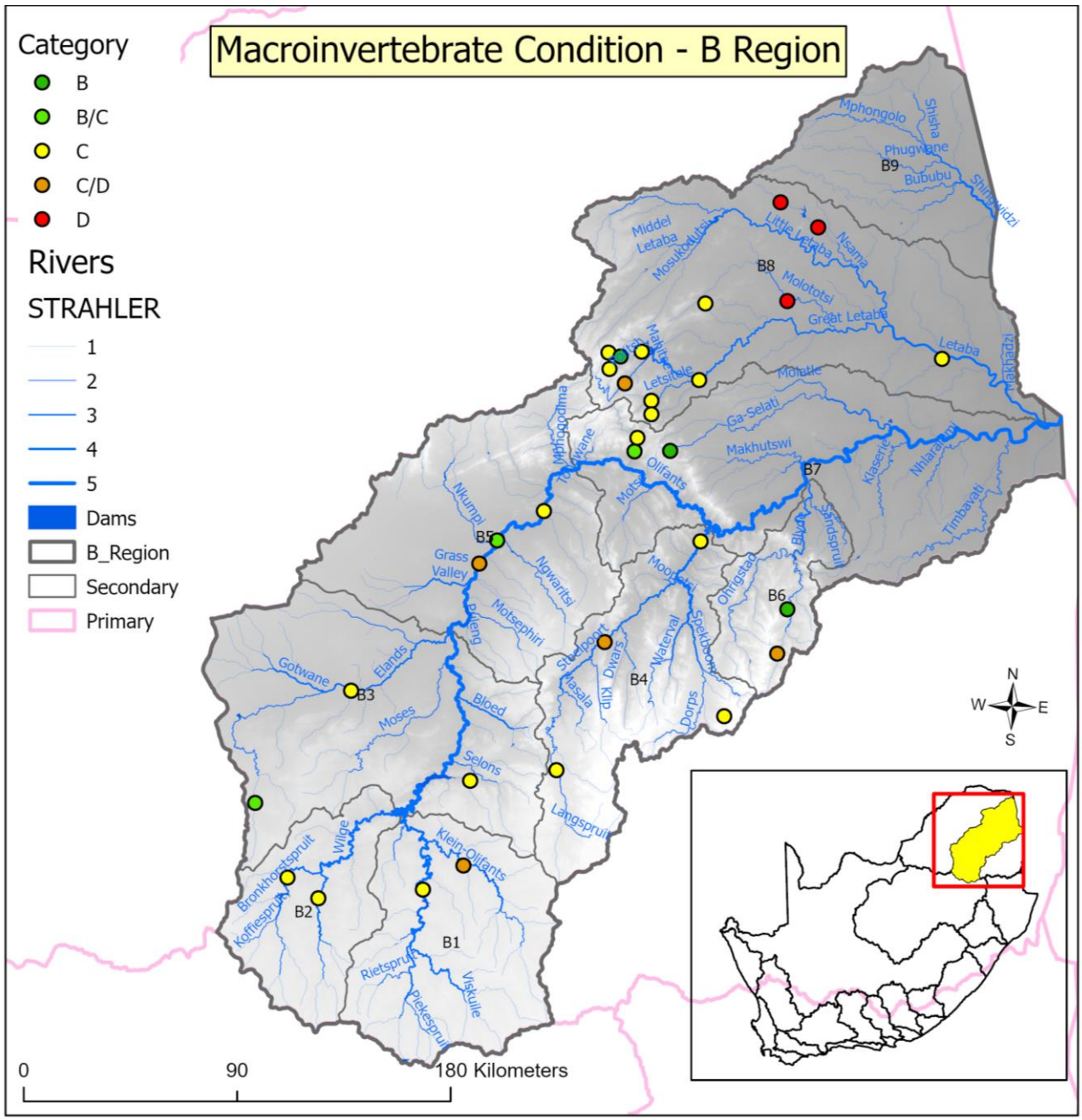

Figure 21: Summary Ecological Categories in primary drainage region B (Olifants-Letaba) reflecting the macroinvertebrate condition for selected sites monitored during 2019/2020 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B and B/C) while the red reflects relatively poor conditions (D).

B1: Olifants and Klein Olifants

Two sites (B1KOLI-MIDDE and B1OLIF-DOORN) were monitored within the B1 secondary drainage region. The two sites were only assessed for macroinvertebrates. The Olifants River (B1OLIF-DOORN) was in a moderately modified (C) condition while the Klein Olifants River (B1KOLI-MIDDE) was in a close to moderately modified (C/D) condition. The macroinvertebrate condition in the Klein Olifants River deteriorated from a moderately modified (C) condition in 2016/17 and 2017/18 to a largely modified (D) condition in 2018/19 and 2019/20 but improved slight to the close to moderately modified (C/D) condition in 2020/21. It remains to be seen if this is the beginning of a positive trend or within the normal fluctuation at the site.

Aerial imagery indicates that most of this part of the Olifants has been subjected to extensive coal mining and cultivation. The Klein Olifants River did not comply with the gazetted RQO of a moderately modified (C) since 2018/19, but it complied with the gazetted RQO in 2016/17 and 2017/18.

B2: Wilge/Bronkhorstspruit

Only two of the four active sites in this secondary catchment were monitored in this year. The macroinvertebrates at the lower Bronkhorstspruit (B2BRON-KLIPE) and the Wilge River upstream of the confluence with the Bronkhorstspruit (B2WILG-BOSSE) were both in a moderately modified (C) condition in this hydrological year. The Wilge River has been in a moderately modified condition since the 2016/17 hydrological year while the Bronkhorstspruit has deteriorated from a moderately modified (C) condition in 2016/17 to a close to moderately modified (C/D) condition in 2017/18 before improving again to a moderately modified (C) condition from 2018/19 onwards. The upper Bronkhorstspruit (B2BRON-WAAIK) was only sampled in 2016/17 and 2017/18 when it was in a seriously modified (E) condition. The other site on the Bronkhorstspruit (B2BRON-VLAKF), downstream of the Bronkhorstspruit Dam, remained in a moderately modified (C) condition from 2016/17 to 2019/20. The Wilge River (B2WILG-BOSSE) always complied with the gazetted RQO of C (moderately modified). This catchment is largely affected by agriculture, coal mining and the towns of Delmas and Bronkhorstspruit.

B3: Elands and Olifants

here are five active REMP sites in this secondary drainage region. The Olifants River is not monitored in this drainage region due to accessibility issues and the threat of dangerous wildlife. The major tributaries are the Elands, Kranspoort, and Selons rivers. Although there are no REMP results for the main Olifants River in this secondary catchment, there have been records of microalgal blooms on the Loskop Dam (DWS, 2011b) and invasive aquatic plants (water hyacinth). Major impacts are Acid Mine Drainage (AMD) and sewage effluent (Dabrowski *et al*., 2013).

Only three sites, two on the Elands River (B3ELAN-DETWE, B3ELAN-RHENO) and one on the Kranspoortspuit (B3KRAN-ZEEKO) were sampled in 2020/21. The macroinvertebrates in the upper Elands River at de Tweedespruit (B3ELAN-DETWE) were in a close to largely natural (B/C) condition and the other two sites in a moderately modified (C) condition. The upper Elands River at the 513-road bridge (B3ELAN-DOORB) was in a moderately modified (C) condition when it was sampled in 206/17 and 2018/19. The Elands River near Moloto (B3ELAN-SPRIN) was only sampled in 2016/17 when it was in a moderately modified (C) condition. The Elands River at de Tweedespruit improved from a moderately modified (C) condition to a close to largely natural (B/C) condition in 2020/21. This apparent improvement is most likely due to improved flows in the river. The Elands River downstream of Rhenosterkop Dam fluctuated between a moderately modified (C) and a largely modified (D) condition. This site thus always complied with the gazetted RQO of D (largely modified. The Kranspoortspruit was mostly in a moderately modified (C) condition but was in a close to moderately modified (C/D) condition in 2019/20. Agriculture is the major land use in this catchment, followed by urban and rural settlements and mining.

B4: Steelpoort

All four active sites in the Steelpoort sub-catchment were sampled in 2020/21. Assessments only considered macroinvertebrates due to lack of capacity. This drainage region was mostly in a moderately modified (C) condition with only the Steelpoort River downstream of De Hoop Dam (B4STEE-STEEL) in a close to moderately modified (C/D) condition. The main Steelpoort River is mostly in a moderately modified (C) condition with the two more upstream sites (B4STEE-STOFF, B4STEE-STEEL) sporadically deteriorating to a close to moderately modified (C/D) condition. The upper Sterkspruit in the Sterkspruit Nature Reserve deteriorated from a close to largely natural (B/C) condition in 2016/17 to a moderately modified (C) conditionfrom2017/18 onwards. The lower Steelpoort River (B4STEE-PRETO) is always in better condition than the largely modified (D) gazetted RQO. Salinity, eutrophication, toxicity, and sedimentation have been cited as major problems, due to irrigation return flows, mining impacts, and sewage treatment plant discharges (DWS, 2011b).

B5: Olifants

All three active REMP sites were sampled in 2020/21 and were in a better condition than the previous year. These three sites have been steadily improving from the 2016/17 hydrological year onwards. The middle reaches of the Olifants River are sandy in nature; thus, this part of the catchment usually experiences low taxon diversity. Additionally, these sites, especially site B5OLIF-POWER, are affected by continuous disturbance from vehicles crossing directly through the river and foot paths, use of the river to wash cars, and water abstraction (DWS, 2019e). Other impacts include intensive citrus agriculture, game farming, informal settlements, and erosion (DWS, 2011b).

There are only Targeted Ecological Categories (TECs) in this part of the Olifants River catchment; the detailed RQOs per indicator were not set. The TEC for B5 Resource Units is a D category. Only macroinvertebrates monitoring results are available, and thus not sufficient to indicate compliance to the TEC.

B6: Blyde

The Blyde River catchment is characterised by commercial forestry, extensive orchards, croplands, and nature reserves. Macroinvertebrate RQOs of a largely natural condition (B category) were gazetted for the Blyde River in the vicinity of Pilgrim's Rest. Data from B6BLYD-PILGU, representative of this section of the Blyde River, has continuously had a moderately modified condition (C category) for four hydrological years in a row until the 2020/21 hydrological year when it deteriorated to a close to moderately modified (C/D) condition. Thus, there has been continuous non-compliance to the RQOs. Even though large parts of this upper section of the catchment are within Mount Sheba Nature Reserve, some afforestation and development around Pilgrims Rest town may contribute some impacts. The site just upstream of the Blyde River Canyon (B6BLYD-VAALH) maintained a moderately modified condition during 2017/18 hydrological years, could not be monitored during 19/20 due to a change in the habitat structure that was affecting the macroinvertebrate biotopes. During 2021 hydrological year the site showed considerable improvement to a largely natural (B) condition.

B7: Olifants

Most of this secondary catchment is in the Kruger National Park (KNP) or other nature reserves, i.e., the Ga-Selati River site is within the Lekgalameetse Nature Reserve and more than half of the Mohlapitse goes through the Lekgalameetse and Wolkberg Nature Reserves.

There are six active sites in this secondary catchment but the three sites on the mainstem Olifants, located within the Kruger National Park (KNP) have not been sampled since 2018/19. The upper Ga-Selati River in the Lekgalameetse Nature Reserve was in a largely natural (B) condition, while the Mohlapitse River deteriorates from a close to largely natural (B/C) condition in the upper reaches (B7MOHL-GEMIN) to a moderately modified (C) condition further downstream (B7MOHL-VALLI). The upper Ga-Selati River has improved from a close to largely natural (B/C) condition in 2016/17 and 2017/18 to a largely natural condition from 2018/19 onwards. The upper Mohlapitse site (B7MOHL-GEMIN) fluctuates between a close to largely natural (B/C) and a moderately modified (C) condition while the lower Mohlapitse River (B7MOHL-VALLI) remained in a moderately modified (C) condition. The macroinvertebrate condition in the Olifants River deteriorated from a moderately modified (C) condition when it enters the KNP (B7OLIF-MAMBA) to a close to moderately modified (C/D) condition at the confluence with the Letaba River (B7OLIF-CONFL). This deterioration within the KNP is concerning as the condition would be expected to either improve or remain the same without added impacts.

RQOs were only gazetted for the main river in this secondary catchment. The Olifants River within the KNP, in the vicinity of the Balule Satellite Camp complied with the gazetted RQO of C (moderately modified) from 2016/17 to 2018/19. As there is no information available since 2019, the current situation is unclear. This site could be experiencing cumulative impacts from upstream land use. Ashton and Dabrowski (2011) detail how the water quality at this portion of the Olifants River is likely impaired by the mining and industries in Phalaborwa, as well as agricultural return flows and domestic effluent.

B8: Letaba River

Thirteen of the 17 active sites in the Letaba catchment were sampled in 2020/21. Three of the four sites in the KNP have not been sampled since 2018/19 and the lower Nsama River (B8NSAM-YOUTH) could not be accessed.

The macroinvertebrate condition in the Letaba catchment ranged from a largely natural (B) condition at the upper Debengeni River (B8DEBE-WATER) to a largely modified (D) condition at three sites in the Molototsi and Nsama rivers with eight sites (62%) in a moderately modified (C) condition. Most of the sites remained in the same condition as the previous year with only the lower Letsitele River (B8LETS-TANKB) improving from a close to moderately modified (C/D) to a moderately modified (C) condition while the Politsi River (B8POLI-AVOFA) deteriorated from a close to largely natural (B/C) to a moderately modified (C) condition and the Groot Letaba at Appel (B8GLET-APPEL) deteriorated from a moderately modified (C) to a close to moderately modified (C/D) condition. As was the case with the Olifants River the condition of the Letaba River within the KNP deteriorates from a moderately modified (C) condition at the two most upstream sites to a largely modified (D) condition at the two downstream sites. This situation needs to be investigated, but it can only be done if the sites are monitored. Only one of the EWR sites (B8LETA-MBEWU) is currently monitored and it has been improving from a largely modified (D) condition in 2017/18 to a moderately modified (C) condition since 2018/19. The site at the border of KNP improved from a largely modified (D)

condition in 2016/17 to a moderately modified (C) condition in 2017/18 and 2018/19 while the condition at the two downstream sites (B8LETA-KLIPK, B8LETA-CONFL) deteriorated from a moderately modified (C) condition in 2016/17 to a largely modified (D) condition in 2017/18 and 2018/19.

There are gazetted RQOs for six sites in this drainage region. Only three of these sites were sampled in the 202/21 hydrological year with the other three sites in the KNP last sampled in2018/19. The Groot Letaba at Appel (B8GLET-APPEL) did not comply with the gazetted RQO in 2020/21 but was still compliant up to 2019/20. The two lower sites in the KNP (B8LETA-KLIPK, B8LETA-CONFL) only complied with the gazetted RQO in 2016/17. The Letaba River at the entrance to KNP did not comply with the RQO in 2016/17 but complied in 2017/18 and 2018/19 while the EWR site (B8LETA-MBEWU) complied with the RQO except for 2017/18. The lower Letsitele River (B8LETS-TANKB) only complied with the RQO in 2020/21.

Summary:

Figure 22 indicates a general increase in sites in a moderately modified condition (C category) in the B drainage region, while the largely natural and largely modified sites decrease. Therefore, a deterioration of some sites and an improvement of others has taken place. The C category is usually a dominant status in areas where there is moderate utilisation of water resources whilst basic ecosystem functions are still largely intact. This is evident in large parts of the B drainage region (Figure 23), where the upper Olifants River sites are subjected to mining, industrial and urban development, changing to mostly agriculture and rural communities in the middle and lower Olifants, as well as afforestation in the Letaba.

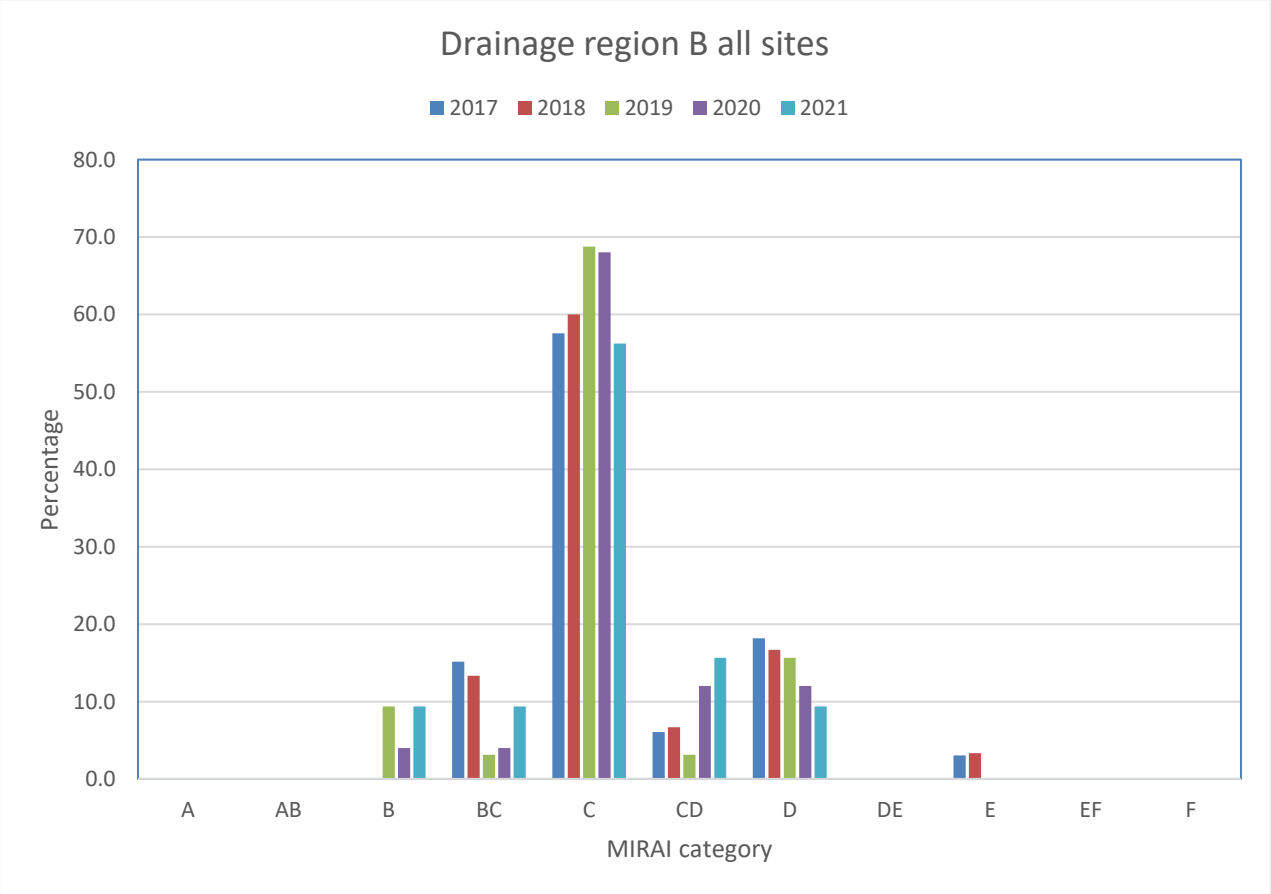

Figure 22: The percentage of sites in each ecological category in primary drainage region B (Olifants-Letaba) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2020/21.

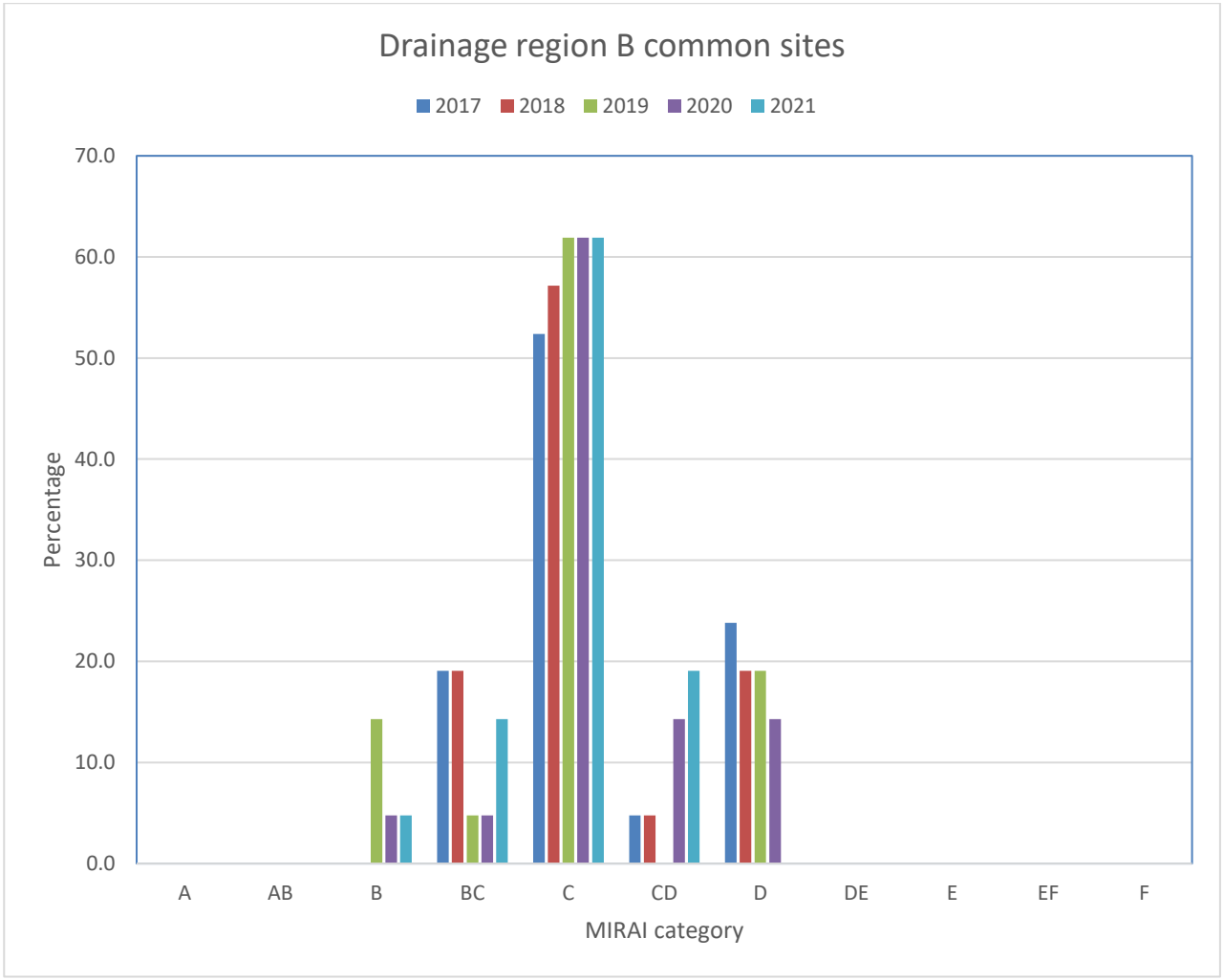

Figure 23: The percentage of sites in each ecological category in primary drainage region B (Olifants-Letaba) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2020/21.

DRAINAGE REGION C (VAAL AND ORANGE WATER MANAGEMENT AREAS)

The C primary drainage (See Annexure C) region falls mostly within the Vaal WMA but the Modder-Riet catchment (C5) forms part of the Orange River WMA. This drainage region is sampled quarterly by the Gauteng (Upper Vaal), Free State (Middle Vaal and Modder-Riet) and the Northern Cape (Lower Vaal) regions. The section of the Riet River that falls within the Mokala National Park as well as the Klerkspruit and Perskeboomspruit within the Golden Gate National Park are sampled annually by Mr Hendrik Sithole of SANPARKS. The Gauteng regional office is assisted by staff of the Gauteng Department of Agriculture and Rural Development (GDARD) regarding monitoring. The condition of the rivers in primary drainage region C is provided in Figure 24. There are 43 active REMP monitoring sites in this drainage region. Thirty-eight sites were monitored for macroinvertebrates. VEGRAI monitoring was only done at four of the 43 active sites (Figure 25) and 14 sites were assessed for habitat integrity in 2020/21. Due to access problems monitoring in the Renoster River catchment (C7) has been discontinued. There are nine secondary drainage regions:

- C1: Vaal
- C2: Vaal
- C3: Harts
- C4: Sand/ Vet
- C5: Modder/Riet
- C6: Vals
- C7: Renoster (could not gain access)
- C8: Wilge
- C9: Vaal

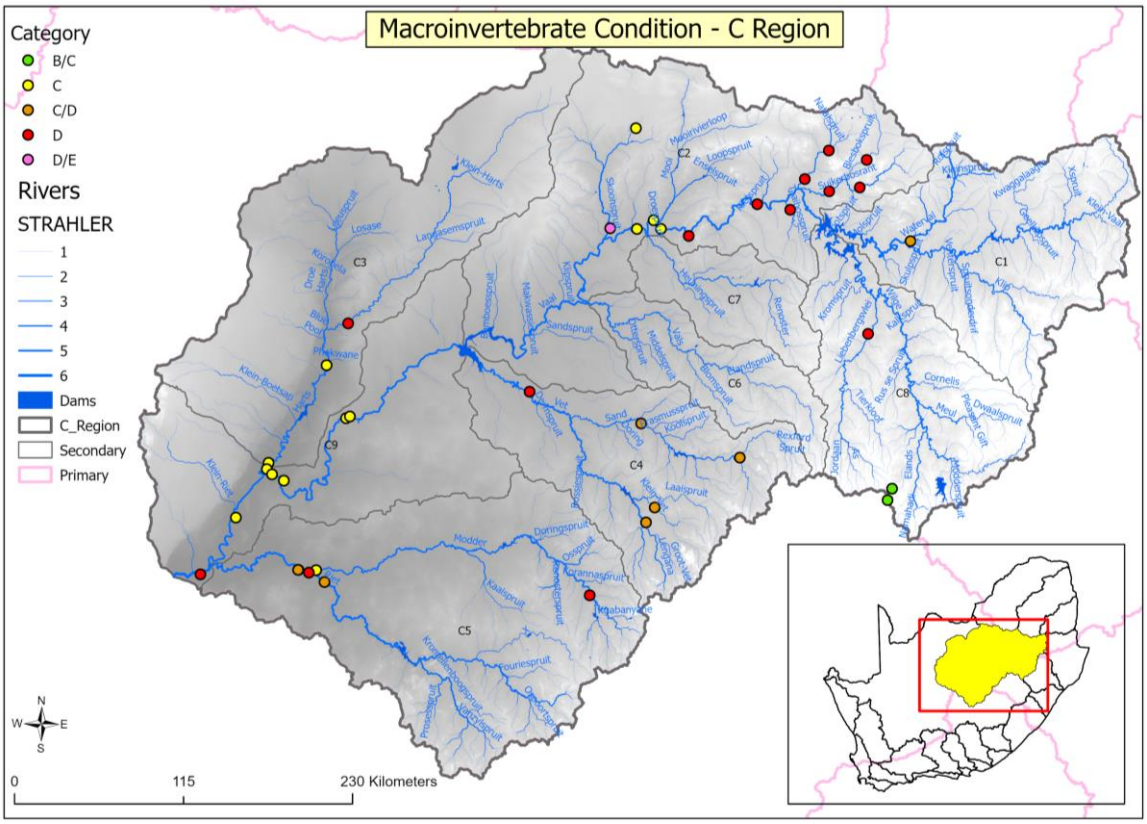

Figure 24: Summary Ecological Categories in drainage region C (Vaal) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) while the red and purple reflect relatively poor conditions (D to D/E).

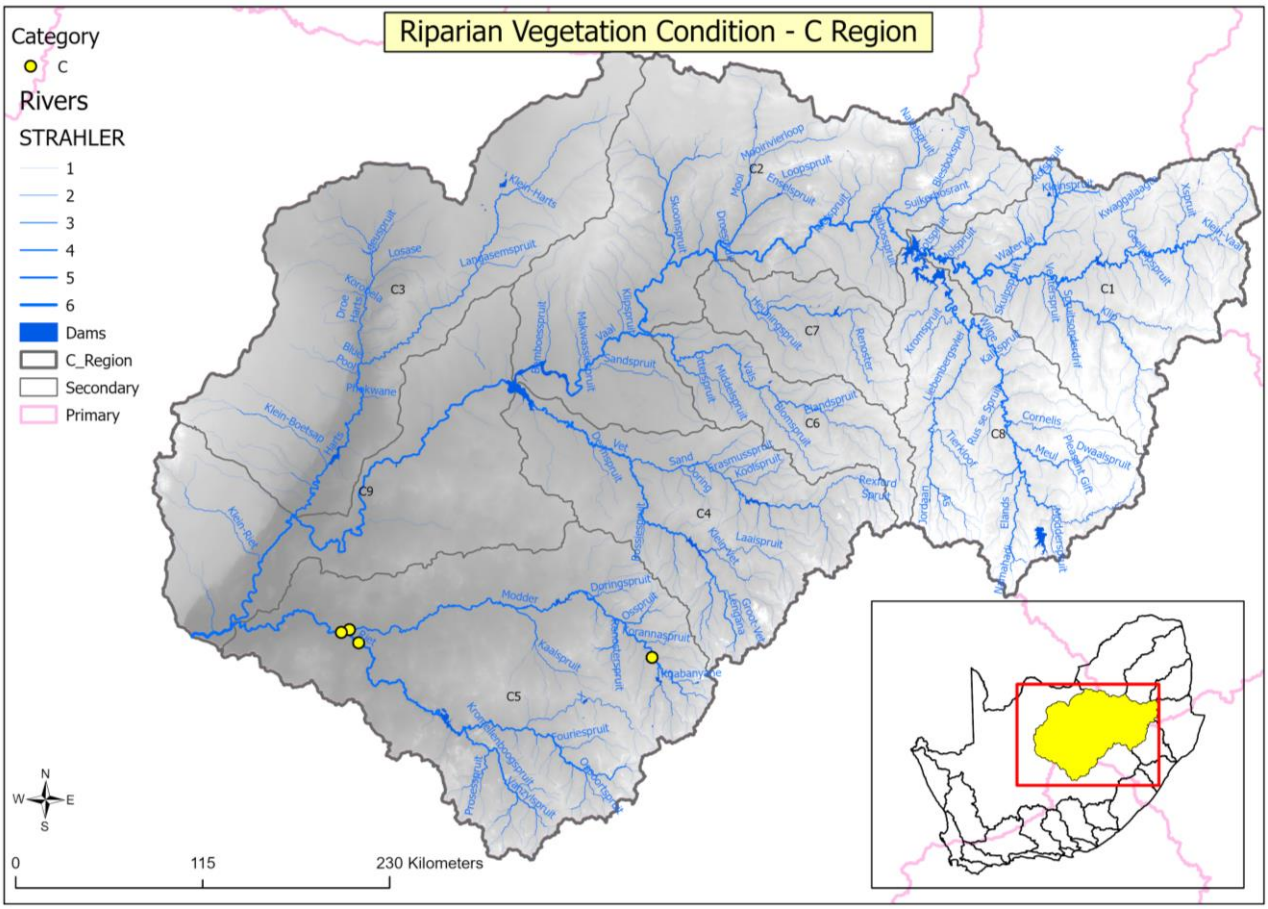

Figure 25: Summary Ecological Categories in drainage region C (Vaal) reflecting the riparian vegetation condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with yellow representing relatively fair conditions (C).

C1: Vaal River

This secondary catchment comprises the Vaal River and its tributaries upstream of Vaal Dam. The Vaal River starts near Breyton on the Mpumalanga Highveld and flows south-westwards to the Vaal Dam near Villiers. The main tributaries in this catchment are the Klein Vaal, Klip and Watervals rivers. The two main dams in the catchment are the Grootdraai Dam near Standerton and the Vaal Dam at the lower end of the catchment. The main towns in the catchment are Ermelo, Standerton, Secunda, and Villiers. The only active site in this secondary catchment is on the Watervals River. The Vaal River and its other tributaries have not yet been sampled due to limited resources. The macroinvertebrates in the Watervals River showed slight improvement from a largely modified (D) condition to a close to a moderately modified (C/D) condition in 2020/21 which is above the gazetted Resource Quality Objective (RQO) of D. The upper part of the catchment is highly modified due to coal mining activities. The Grootdraai Dam also impacts on the natural flow pattern.

C2: Vaal River

This secondary catchment comprises the Vaal River and its tributaries (Suikerbosrant, Blesbokspruit, Klip, Leeuspruit, Taaibosspruit, Natalspruit, Skoonspruit and Mooi rivers) from the Vaal Dam to the Bloemhof Dam. The main cities in this catchment are Johannesburg and Soweto along with larger towns such as

Vereeniging, Vanderbijlpark, Klerksdorp, Potchefstroom, and numerous smaller towns and settlements. This part of the Vaal catchment is heavily utilised as is evident from the generally poor condition. The main impacts are related to mining, industry as well as partial or non-functioning wastewater treatment works. There are 15 active REMP sites in this secondary catchment.

Macroinvertebrates:

The invertebrates were sampled at 13 of the 15 sites in 2020/21. The EWR site at Regina Bridge (C2VAAL-EWR13) could not be accessed and there was now suitable habitat at the Mooirivierloop near Khutsong (C2MRLO-KHUTS). The macroinvertebrates in this area are mostly in a largely modified (D) condition (8sites) with four sites in a moderately modified (C) condition and the lower Skoonspruit (C2SKOO-URANI) in a close to largely modified (D/E) condition. The macroinvertebrate condition mostly remained in the same condition as the previous year with only two sites (C2BLES-UPPER, C2MOOI-EWR02) improving and three sites deteriorating. The macroinvertebrate condition in this secondary drainage region has showed considerable improvement with condition at eight sites improving since the 2016/17 hydrological year. Three of these sites (C2VAAL-BARRA, C2VAAL-SCAND, C2VAAL-VERMA) are in the mainstem Vaal River between the Vaal Barrage and the Bloemhof Dam. four sites (C2KLIP-ROTHD, C2SUIL-DEHOE, C2SUIK-GOEDV, C2VAAL-EWR13) remained in the same category from 2016/17 onwards and the Vaal River at Schoemansdrif deteriorated.

There are gazetted RQOs at 12 of the REMP sites in this drainage region. Three of the sites (C2SKOO-URANI, C2SUIK-DEHOE, C2VAAL-SCHOE) did not comply with the gazetted RQOs in 2020/21, and three sites (C2MOOI-EWR02, C2SKOO-GHOLF, C2VAAL-VERMA) were in a better condition than the gazetted RQOs. The Vaal River at Schoemansdrif (C2VAAL-SCHOE) and the Suikerbosrant at de Hoek (C2SUIK-DEHOE) never complied with the gazetted RQOs while there were eight sites which always complied with the gazetted RQOS.

Riparian Vegetation

The VEGRAI was only conducted in 2018/19 and 2019/20. Four sites were monitored in 2018/19 and another four sites in 2019/20. The riparian vegetation condition ranged from largely natural (B) at the upper Skoonspruit (C2SKOO-GHOLF) to seriously modified (E) at the upper Blesbokspruit (C2BLES-UPPER), with most sites in a moderately modified (C) to close to moderately modified (C/D) condition.

Only six of the 12 sites with gazetted RQOs for riparian vegetation were monitored. The upper Blesbokspruit (C2BLES-UPPER) and the Suikerbosrant at de Hoek (C2SUIK-DEHOE) did not comply with the gazetted RQO while three sites (C2SKOO-GHOLF, C2VAAL-EWR13, C2VAAL-VERMA) were in a better condition than the gazetted RQO.

Habitat integrity:

The IHI was monitored at four sites only in 2020/21. The instream IHI was in a moderately modified (C) condition in the Vaal River (C2VAAL-EWR13, C2VAAL-VERMA) and in a largely natural (B) condition in the upper Skoonspruit (C2SKOO-GHOLF) but deteriorated to a largely modified (D) condition in the lower Skoonspruit (C2SKOO-URANI). The riparian habitat condition was generally in a better condition than the instream habitat with riparian IHI at the two sites in the Vaal River in a close to largely natural (B/C) condition while the lower Skoonspruit was in a moderately modified (C) and the upper Skoonspruit in a largely natural (B) condition.

There are gazetted RQOS at all four monitored sites. The riparian habitat at all four sites were in a betted condition than the gazetted RQOs and the instream habitat was better than the gazetted RQOS at three of the sites. Only the lower Skoonspruit (C2SKOO-URANI) did not comply with the gazetted RQOs.

C3: Harts River

The Harts River originates near Lichtenburg in the Northwest province and flows southwards before joining the Vaal River at Delportshoop. The Harts River is the main river in this catchment. It is characterised by highly intermittent runoff that is regulated by dams (Wentzel, Taung and Spitskop). The main dam on the Harts River is the Spitskop Dam. The lower section of the Harts River forms part of the Vaal-Harts water scheme. There are three active sites on the Harts River as the tributaries (Klein Harts and Droë Harts are very seasonal). There are three active sites in the Harts River catchment.

Only macroinvertebrates were monitored. The Harts River is generally in a poor condition with the condition ranging from a largely modified (D) at Taung to moderately (C) modified condition at Pampierstad and Delportshoop. The Harts River at Taung has remained in a largely modified (D) condition, whereas the condition at Delportshoop has improved from a largely modified (D) condition in 2016/17 to a moderately modified (C) condition since 2017/18. The middle site at Pampierstad has fluctuated between a largely modified (D), close to moderately modified (C/D) and moderately modified (C) condition. All three sites have been complying with the gazettes RQO of D (largely modified). The main impacts in the catchment are from towns and settlements such as Schweizer Reneke, Taung, Pampierstad as well as irrigation from the Vaal-Harts Scheme in the lower part of the catchment. The condition of the Harts River at Taung is of particular concern as sand mining is continuing to degrade the river (M. Ntoi, personal communication, 16 Aug 2022).

C4: Sand/ Vet

This secondary catchment is characterised by agricultural activities, mostly in the southern part of the catchment, and gold mining in the Welkom/ Virginia area. The rivers in this area are mostly seasonal with only the Sand and Vet rivers perennial. The Sand River starts in the mountainous area to the south of Paul Roux and flows westwards through the Allemanskraal Dam to join the Vet River near Welkom. The Vet River starts within the Erfenis Dam after the confluence of the Groot Vet and the Klein Vet. The Vet River then continues westwards and joins the Vaal River in the Bloemhof Dam. The catchment is characterised by five active sites.

Macroinvertebrates

Macroinvertebrates were sampled at all five active sites in this catchment. The macroinvertebrate condition at most sites were in a close to moderately modified (C/D) condition, with only the Vet River near Hoopstad (C4VETR-HOOPS) in a largely modified (D) condition in 2020/21. The macroinvertebrate condition at the Vet (C4VETR-HOOPS) and upper Sand (C4SAND-SENEK) rivers fluctuates between a close to moderately modified (C/D) and largely modified (D) condition and between moderately modified (C) and largely modified (D) conditions at the other sites. None of the sites complied with the gazetted RQOs in 2020/21. The Upper Sand

River (C4SAND-SENEK) has been non-compliant since 2016/17 while the other sites only occasionally complied with the gazetted RQOs.

Riparian Vegetation:

Vegetation was only monitored during 2018/19 and 2019/20. The riparian vegetation condition ranged from close to largely natural (B/C) at the Klein Vet to largely modified (D) at the Vet River in 2018/19 and from moderately modified (C) to close to moderately modified (C/D) in 2019/20. The riparian vegetation condition improved at most sites in 2019/20 expect for the Klein Vet River which deteriorated from a close to largely natural (B/C) condition to a moderately modified (C) condition in 2019/20. Only the lower Sand River (C4SAND-R73BR) did not comply with the gazetted RQO in 2019/20, but only the Klein Vet River complied with the gazetted RQOs in 2018/19.

Habitat Integrity:

Index of habitat integrity was at four of the five sites, only conducted in 2020/21. The IHI was not conducted for the upper Sand River (C4SAND-SENEK). The instream habitat at the Klein Vet and Groot Vet rivers was in a close to largely natural (B/C) condition while the Lower Sand (C4SAND-R73BR) and the Vet (C4VETR-HOOPS) were in a largely modified (D) condition. The riparian habitat was in a largely modified (D) condition at the lower Sand (C4SAND-R73BR), Groot Vet (C4GVET-VDRIE) and Vet (C4VETR-HOOPS) rivers while the Klein Vet River (C4KVET-VVIER) was in a close to largely natural (B/C) condition. The instream IHI at the Klein Vet and Groot Vet rivers complied with the gazetted RQOs but was non-compliant at the lower Sand and Vet Rivers. The riparian IHI complied with the gazetted RQOs only at the Klein Vet River, with the other three sites all non-compliant.

C5: Modder/Riet

Although the Riet River is a tributary of the Vaal River, this secondary catchment forms part of the Orange River WMA. The Modder River starts in the Eastern Free State near the Lesotho border and enters the Riet River at the town of Ritchie upstream of the Mokala National Park. The Riet River originates near Donkerhoek in the Eastern Free State and joins the Vaal River upstream of the Douglas Weir. The main dams are the Rustfontein and Krugersdrift dams in the Modder River and the Kalkfontein Dam in the Riet River. Bloemfontein is the only city in this catchment. This secondary catchment is characterised by seven active sites. This area is mostly impacted by agriculture. However, the Modder River is also affected by the Bloemfontein and Botshabelo, presumably through increased stormwater and pollution which are a result of the dense settlements and partially functioning Wastewater Treatment Works. The Riet River is also affected by mining activities in the vicinity of Koffiefontein. The catchment flow regime is modified by the Orange-Riet Inter Basin Transfer Scheme (ORASECOM, 2013). Because this drainage region forms part of the Orange River WMA, no RQOS have been gazetted.

Macroinvertebrates:

Most sites were found at a largely modified (D) condition. Only six of the seven active sites were sampled in 2020/21. The Vanzylspruit tributary of the Riet River could not be sampled this year due to low flows. The

macroinvertebrate condition ranged from moderately modified (C) in the Riet (C5RIET-DEKRA) in Mokala National park and the lower Modder (C5MODD-MODDE) rivers to largely modified at the Riet River near Richie (C5RIET-RICHI). The Riet River at De Kranse in the Mokala National park has remained in a moderately modified (C) condition since 2016/17 while the Riet River at Richie and the Modder River at Sannaspos remained in a largely modified (D) condition. The lower Modder River (C5MODD-MODDE) improved from a largely modified (D) condition to a moderately modified (C) condition in 2020/21. The Vanzylspruit deteriorated from a moderate modified (C) in 2017/18 to a largely modified (D) condition in 2018/19 and could not be monitored since then.

Riparian Vegetation:

The riparian vegetation was monitored at the five sites outside of the Mokala National Park. Vegetation was monitored from 2018/19 to 2020/21. All four sites monitored in 2020/21 were in a moderately modified (C) condition. The Vanzylspruit was in a close to largely natural (B/C) condition when it was monitored in 2018/19. The Riet River at Ritchie (C5RIET-RITCH) deteriorated from a largely natural (B) condition in2018/19 to a moderately modified (C) condition in 2020/21. The riparian vegetation condition at the other 3 sites fluctuated between moderately (C) and largely (modified) conditions.

Habitat Integrity:

IHI was only conducted in 2020/21. The instream habitat ranged from moderately modified (C) in Modder River and the Riet River at Jacobsdal to close to largely modified (D/E) in the Vanzylspruit, With the Riet River at Richie in a close to moderately modified (C/D) condition. The riparian habitat was generally in a poorer condition than the instream habitat and ranged from moderately modified (C) at the Riet River at Jacobsdal (C5RIET-JACOB) and the Modder River at Sannaspos (C5MODD-SANNA) to seriously modified (E) in the Riet River at Ritchie and the Vanzylspruit (C5RIET-RITCH, C5VANZ-DWNWR).

C6: Vals

The Vals River originates in the Eastern Free State near the town of Bethlehem and flows through a mostly agricultural area before joining the Vaal River near Bothaville. It is mostly impacted by agricultural activities but also by urban runoff from towns as well as more industrial impacts at Kroonstad. It is a major water source for Sedibeng Water in Bothaville. There are only two active sites in this catchment.

Invertebrates:

The invertebrates could not be sampled in 2020/21. The upper Vals River near Lindley (C6VALS-LINDL) could not be accessed due to a weir being constructed at the sites while the lower Vals River at Proklameersdrift (C6VALS-PROKL) was too polluted. The macroinvertebrate condition at the upper Vals River has improved from a seriously modified (E) in 2016/17 to a largely modified (C) condition in 2017/18 after which it deteriorated to a close to moderately modified (C/D) condition in 2018/19 and a largely modified (D) condition in 2019/20. Both sites on the Vals River is mostly non-compliant to the gazetted RQOs. Both sites complied with the gazetted RQOs in 2018/19 and the upper Vals River also complied with the gazetted RQO in 2019/20.

Riparian Vegetation:

The riparian vegetation was only assessed in 2018/19 and 2019/20. The riparian vegetation in the upper Vals River near Lindley remained in a moderately modified (C) condition while the lower Vals near Proklameersdrift improved from largely modified (D) in 2018/19 to moderately modified (C) in 2019/20. The Upper Vals River complied with the gazetted RQO in both years while the lower Vals River was non-compliant in 2019/20.

C7: Renoster

The Renoster River flows mostly through agricultural areas before entering the Vaal River upstream of Orkney. There is only one site in the Renoster River which could not be sampled due to unfavourable flows. This site is also located on private property and could not be accessed. Sampling at this site has therefore been discontinued for the time being.

C8: Wilge

The Wilge and Liebenbergsvlei rivers are the main rivers in this catchment. The Wilge River starts in the Eastern Free State near the KwaZulu-Natal border. It is joined by the Liebenbergsvlei at Frankfort and then joins the Vaal River within the Vaal Dam. The Liebenbergsvlei also rises in the Eastern Free State near Kestell. Its main tributary is the As River which joins the Liebenbergsvlei in the Sol Plaatjie (previously known as Saulspoort) Dam at Bethlehem. Water from the Katse Dam in Lesotho is transferred into the upper reaches of the As River via a gravity-fed tunnel at a maximum transfer rate of $18m^3/s$. This water is then fed into the Vaal Dam via the Liebenbergsvlei and Wilge Rivers. The Wilge River is also impacted by the Tugela Vaal transfer scheme. Water from the Tugela catchment is transferred from the Sterkfontein Dam via the Nuwejaarspruit and Wilge River to the Vaal dam. These transfer schemes have resulted extensive flow alteration in the catchment affecting the habitat and biological indicators. The Wilge River is also negatively impacted by the increase of dysfunctional Wastewater Treatment Works which affect the water quality. The site in the Wilge River has been discontinued due to altered habitat making the site unsuitable for monitoring.

There are three active REMP sites in this drainage region. The Klerkspruit and the Perskeboomspruit, in the Golden Gate National Park has only been sampled from 2020/21. The two sites in Golden Gate National Park were in a close to largely natural (B/C) condition while the Liebenbergsvlei was in a largely modified (D) condition. The Liebenbergsvlei which is impacted by the Lesotho Highlands Transfer scheme steadily improved from a seriously modified (E) condition in 2016/17 to moderately modified (C) in 2019/20 before deteriorating to a largely modified (D) condition in 2020/21. Since 2016/17 the Liebenbergsvlei never complied to the gazetted RQO of largely natural (B).

C9: Vaal

This lower section of the Vaal River is generally in moderately modified (C) condition with only the most downstream site downstream of the Douglas Weir at St Clair in a largely modified (D) condition. The Vaal River at St Clair (C8VAAL-STCLA) deteriorated from a moderately modified (C) condition in 2017/18 to a largely modified (D) condition from 2018/19 onwards. This deterioration is mostly due to flow regulation from the Douglas Weir resulting in very low water levels and the river even drying up sometimes. The Vaal River at Warrenvale (C9VAAL-WVALE) deteriorated from a close to moderately modified (C/D) condition in 2016/17 to largely modified (D) in 2017/18 after which it improved to a close to moderately modified (C/D) condition in 2018/19 and a moderately modified (C) condition from 2019/20 onwards. The other sites all showed steady improvement from largely modified (D) in 2016/17 to the current moderately modified (C) condition.

The Vaal River at St Clair did not comply to the gazetted RQO since 2016/17, while the sites at Warrenton and Warrenvale (C9VAAL-WARRE, C9VAAL-WVALE) always complied to the gazetted RQOs. The site at Delportshoop (C9VAAL-DELPO) has been compliant since 2019/20 and the other sites since 2018/19. Most of the sites in this area are affected by alluvial diamond mining.

Summary

Macroinvertebrates:

Figure 26 indicates that the macroinvertebrates at most sites in all five assessment periods are in a largely modified (D) condition. However, when comparing the results for the 19 sites monitored in all five years (Figure 27), there seems to be an increase in the sites in a moderately modified (C) and close to largely modified (D/E) condition and a decrease in the sites in a moderately modified (C) and close to modified (C/D). About 37% of the sites did not meet the gazetted macroinvertebrate RQOs.

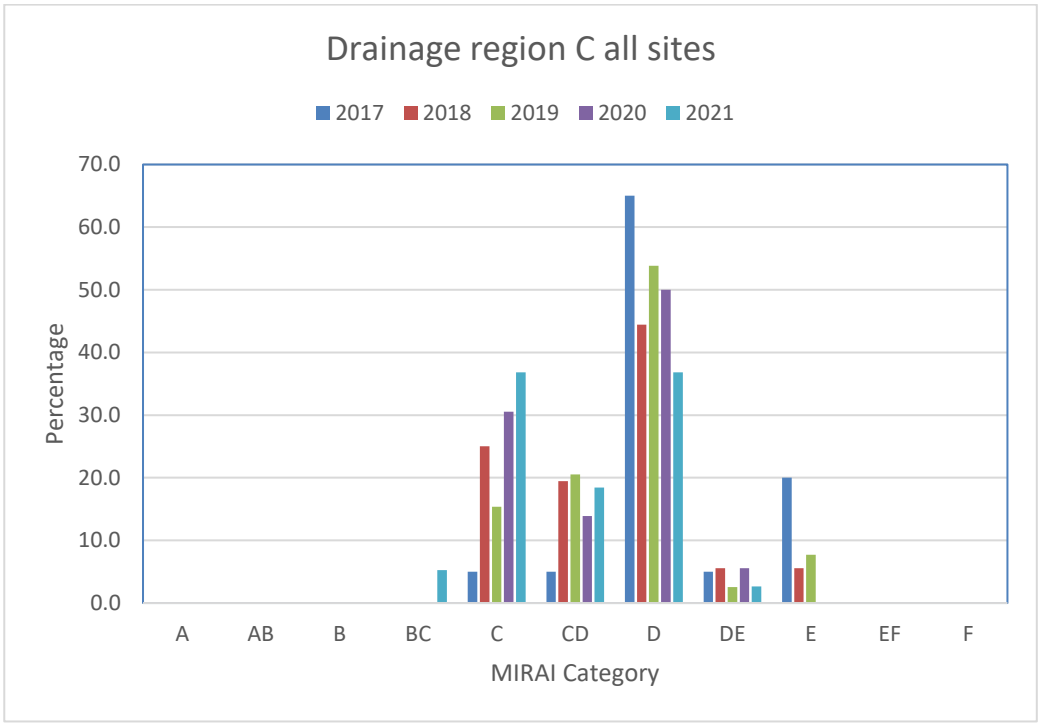

Figure 26: The percentage of sites in each ecological category in primary drainage region C (Vaal) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2020/21.

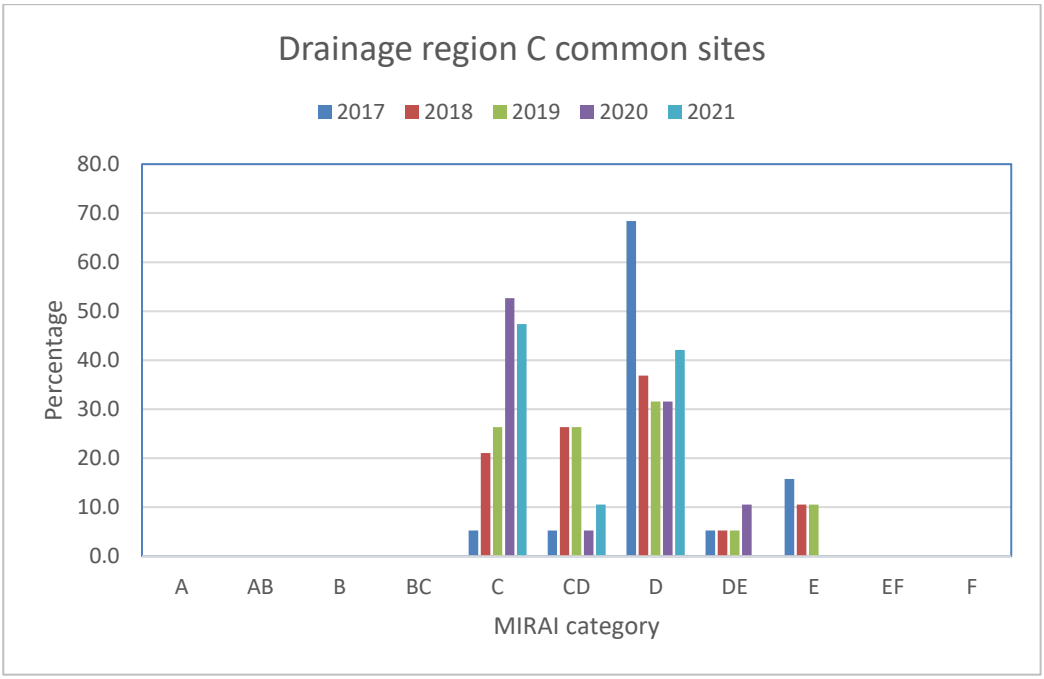

Figure 27: The percentage of sites in each ecological category in primary drainage region C (Vaal) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2020/21.

Riparian Vegetation:

VEGRAI was only conducted from 2018/19. The riparian vegetation in this drainage region seems to have deteriorated from the previous year (Figure 28). However, when comparing the 11 sites that were sampled every year from 2018/19 to 2020/21 hydrological years (Figure 29) it is obvious that there was a shift in riparian vegetation condition to the moderately modified (C) condition, with no sites in a B/C (close to largely natural). Most of the sites sampled during 2019/2020 were not sampled during 2020/21. Approximately 40% of the sites did not meet the gazetted riparian Vegetation RQOs.

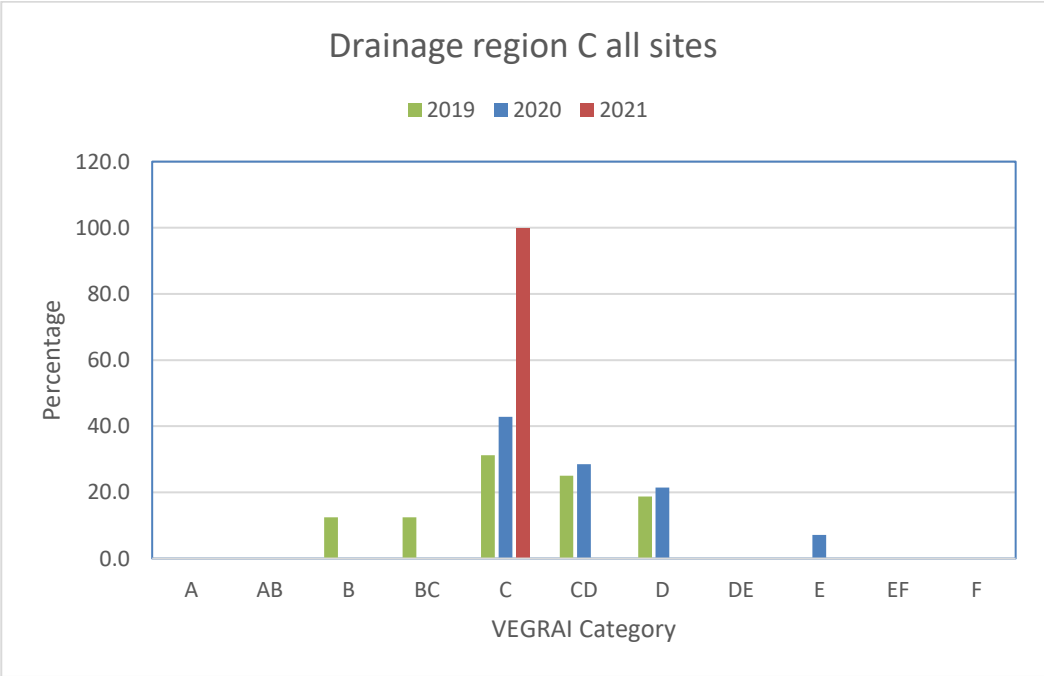

Figure 28: The percentage of sites in each ecological category in primary drainage region C (Vaal) per hydrological year for riparian vegetation at all sites monitored from 2018/19 to 2020/21.

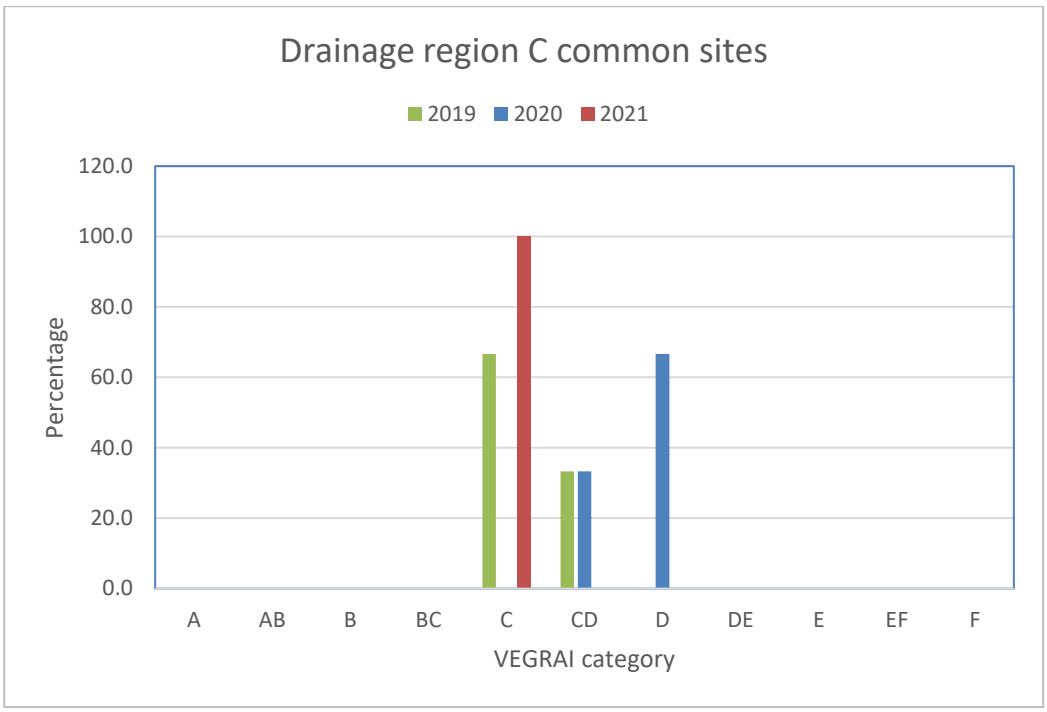

Figure 29: The percentage of sites in each ecological category in primary drainage region C (Vaal) per hydrological year for riparian vegetation at those sites monitored every year from 2018/19 to 2020/21.

DRAINAGE REGION D (ORANGE AND LIMPOPO WATER MANAGEMENT AREAS)

The D primary drainage region falls mostly within the Orange River WMA, but the Molopo catchment (D4) forms part of the Vaal WMA. The RQOs for the Orange River WMA has not yet been set. This drainage region is sampled quarterly by the Northwest (Molopo), Free State (Upper Orange) and the Northern Cape (Lower Orange) regions. The condition of the rivers in primary drainage region D is provided in Figures 30 to 33. Twenty-seven of the 29 active monitoring sites were sampled in this drainage region. The macroinvertebrates could not be sampled at one site due to unfavourable flows (D1KRAA-ROODE) (see Annexure D). The upper Kraai River could not be monitored due to access problems (Figure 30). The Index of Habitat Integrity (Figures 32 and 33) was done at the upper Molopo (D4MOLO-WELTE). The riparian vegetation (VEGRAI) and Index of Habitat Integrity (IHI) were only done in the Molopo River (D4). There are eight secondary drainage regions:

- D1: Orange
- D2: Caledon
- D3: Orange
- D4: Molopo
- D5: Hartbees (Ephemeral not sampled)
- D6: Brak (Ephemeral not sampled).
- D7: Orange
- D8: Orange

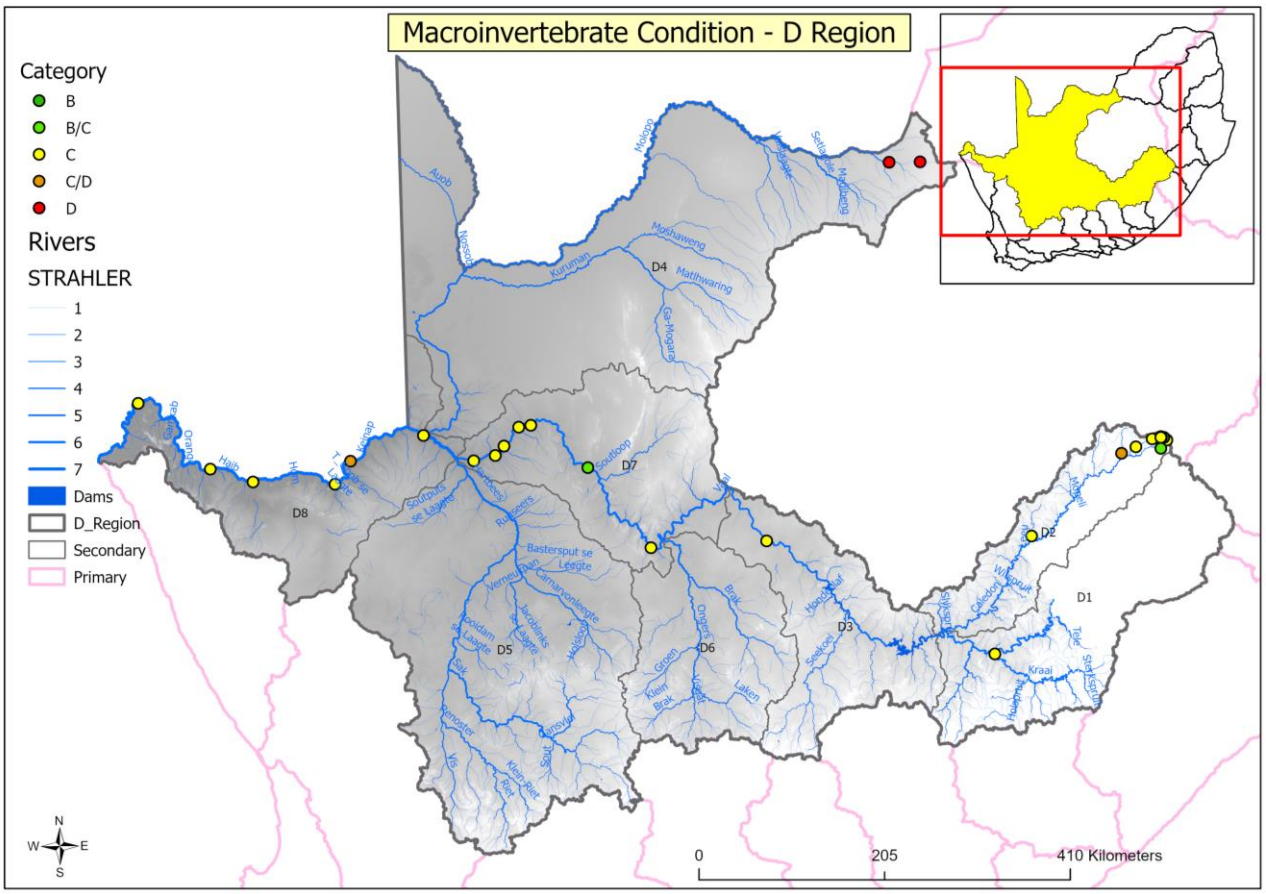

Figure 30: Summary Ecological Categories in drainage region D (Orange) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) while the red reflects relatively poor conditions (D).

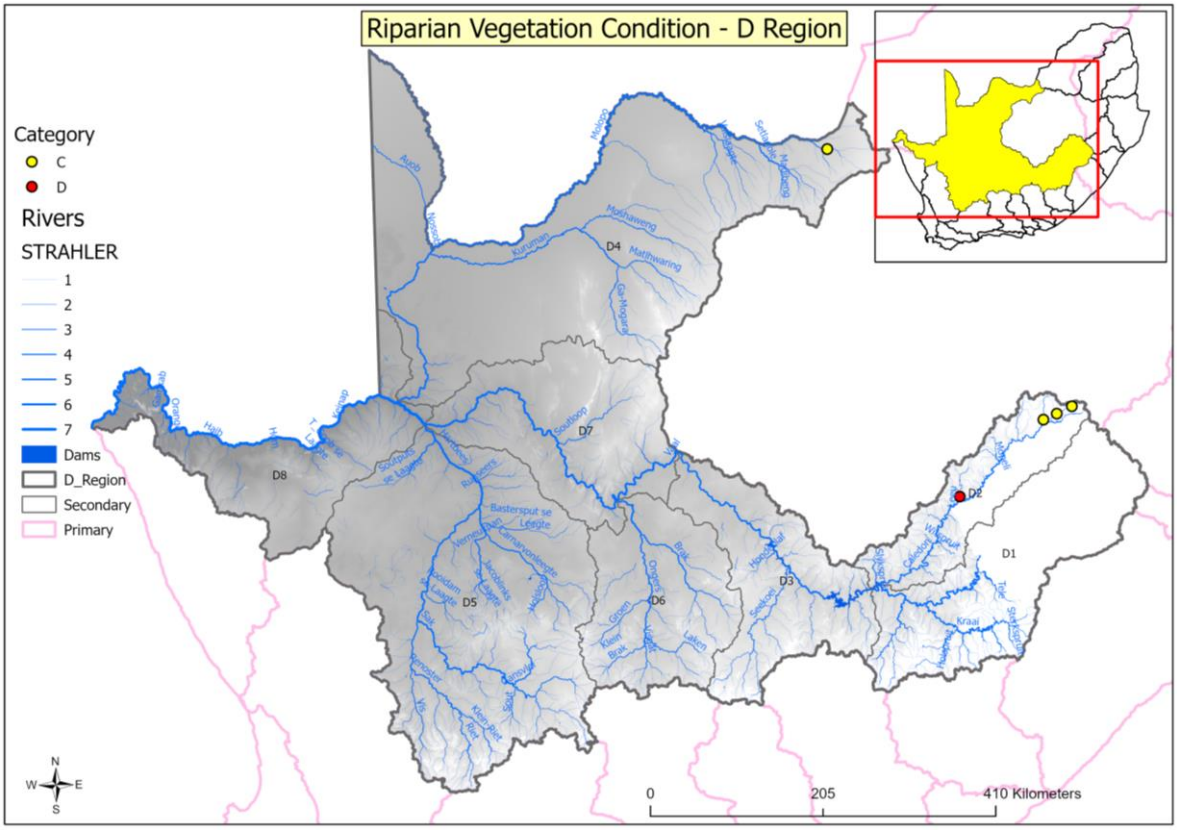

Figure 31: Summary Ecological Categories in drainage region D (Orange)reflecting the riparian vegetation condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with yellow representing relatively fair conditions (C) while the red reflects relatively poor conditions (D).

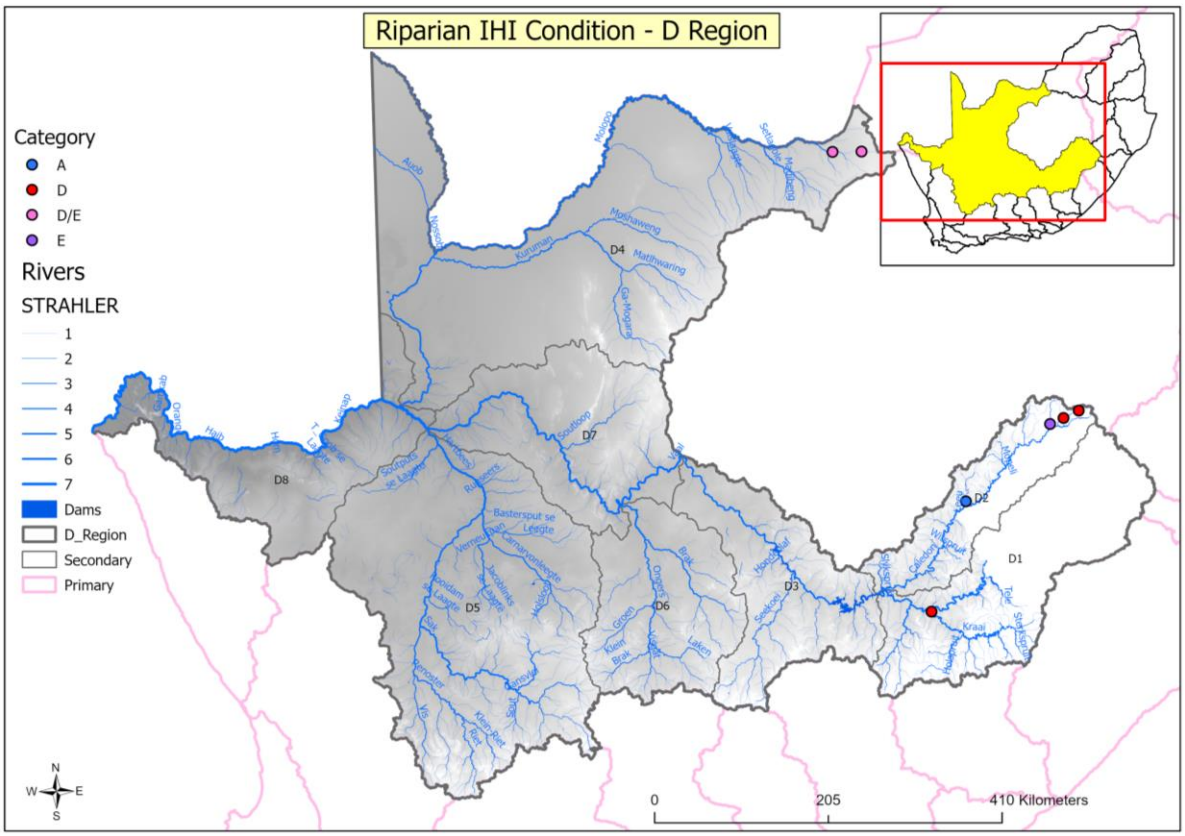

Figure 32: Summary Ecological Categories in drainage region D (Orange) reflecting the riparian habitat condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue representing natural conditions (A) while the red to purple reflects relatively poor conditions (D-E).

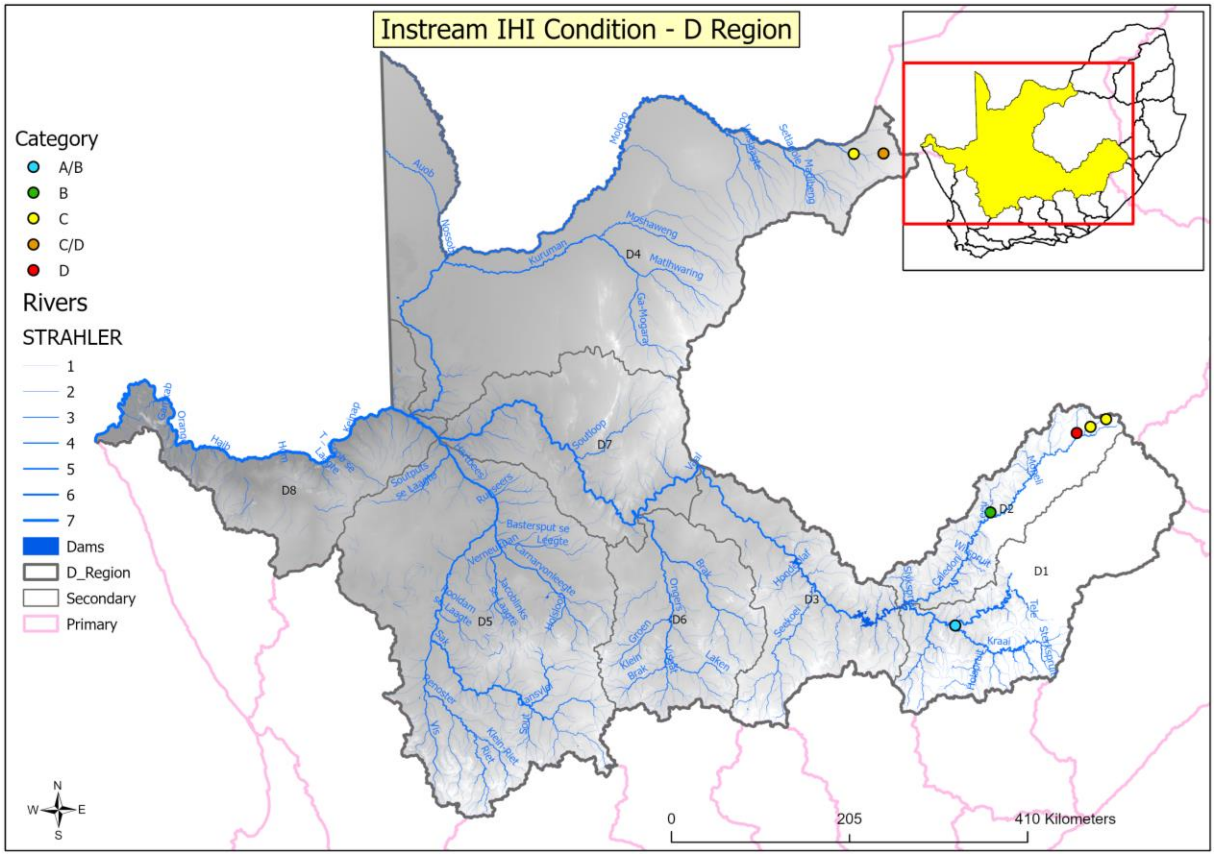

Figure 33: Summary Ecological Categories in drainage region D (Orange) reflecting the instream habitat condition for selected sites monitored during 2018/2019 hydrological year. The colour of the circles indicates the Ecological Condition with yellow representing relatively fair conditions (C) while the red reflects relatively poor conditions (D/E).

D1: Orange

Most of this secondary catchment falls within Lesotho and is not included in this assessment. There are only two active REMP sites within South Africa. The Kraai River is the only river in this secondary included as part of REMP. Assessment was based on macroinvertebrates and vegetation. The upper site on the Kraai River (D1KRAA-ROODE) could not be accessed for monitoring.

Macroinvertebrates

Invertebrates were monitored in the lower Kraai River (D1KRAA-ALIWA) near Maletswai (previously Aliwal North) with the invertebrate condition improving from a largely modified (D) condition to a moderately modified (C) condition in 2020/21. The site at D1KRAA-ROODE could not be sampled due to unfavourable flow conditions.

Riparian Vegetation:

The riparian vegetation was only assessed at the lower Kraai River (D1KRAA-ALIWA) near Maletswai where it deteriorated from a close to moderately modified (C/D) in 2018/19 to a largely modified (D) condition in 2019/20.

Habitat Integrity

The instream IHI at the lower Kraai River was in a close to natural (A/B) condition while the riparian IHI was in a largely modified (D) condition.

D2: Caledon

The Caledon River rises in the north-eastern part of Lesotho and forms the border between South Africa and Lesotho for most of its length before joining the Orange River in the Gariep Dam. The Little Caledon rises in the Golden Gate Highlands National Park and joins the Caledon at the Caledonspoort Border Post. The Groot River (Brandwater) rises in the mountains west of Clarens in the Eastern Free State and joins the Caledon approximately 24 km downstream of the Little Caledon. The Leeuw River rises near the Oldenburg Lodge and Game Park in the eastern Free State and joins the Caledon near Hobhouse. There are no major towns or dams (except the Gariep Dam at the lower part) in this catchment and the main stem Caledon River is not included as part of REMP due to its naturally sandy habitat as well as safety issues. There are nine active REMP sites in the D2 drainage region. Four of which are small tributaries located in the Golden Gate National Park.

Macroinvertebrates:
The macroinvertebrates were sampled at all nine sites in this catchment. Most (6) sites were in a moderately modified (C) condition with only the Glen Reenen River in a largely natural (B) condition and the upper Ribbokspruit (D2RIBB-RIBBO) in a close to largely natural (B/C) condition and the Brandwaterspruit (D2GROO-FARM1) in a largely modified (D) condition. The five sites in the Golden Gate National Park were only sampled in 2020/21. The Brandwaterspruit and Leeuw River both improved from a largely modified (D) condition in 2018/19. The Brandwaterspruit to a close to moderately modified (C/F) and the Leeuw River to a moderately modified (C) condition. The Little Caledon River remained mostly in a moderately modified (C) condition although D2LCAL-EWR01 near Clarens briefly improved to a close to largely natural (B/C) condition in 2019/20.

Riparian Vegetation:
The riparian vegetation was assessed at annually at four sites from 2018/19 to 2020/21. Three of the four sites were in a moderately modified (C) condition in 2020/21 with only the Leeuw River (D2LEEU-EWR06) in a largely modified (D) condition. The Leeuw River remained in a largely modified (D) condition and the lower site on the Little Caledon (D2LCAL-EWR02) near Fouriesburg in a moderately modified (C) condition. The Little Caledon near Clarens (D2LCAL-EWR01) improved from a close to moderately modified (C/D) condition to a moderately modified (C) condition in 2020/21. The Brandwaterspruit fluctuated between a moderately modified (C) and largely modified (D) condition.

D3: Orange

This secondary catchment comprises the Orange River from the confluence with the Caledon (at Gariep Dam) to the confluence with the Vaal River downstream of Douglas. The seasonal Seekoei River is the main tributary in this catchment and joins the Orange River in Vanderkloof Dam. This section of the Orange River is largely impacted by hydroelectricity generation at Gariep and Vanderkloof dams. The nature of this

electricity generation results in regular and extreme fluctuations in flows close to the dams, which becomes less extreme further downstream. Other impacts in this region are related to agricultural activities. Only macroinvertebrates were considered. Only one (D3ORAN-HOPET) of the two active sites in this catchment were sampled in 2020/21 as the site at Marks drift (C3ORAN-MARKS) could not be accessed. Both sites remained in a moderately modified (C) condition from 2016/17 to 2020/21.

D4: Molopo

The Molopo system is mostly ephemeral and forms part of the Vaal WMA. The only monitoring sites in the Molopo are near its source in the Northwest Province. These sites are often dry and can only be sampled irregularly when there is flow. The Molopo Eye in the Molopo Eye Private Game Reserve is the source of the Molopo River. It flows through the Northwest and Northern Cape provinces to join the Orange River downstream of Augrabies Falls. Invertebrates, Riparian Vegetation and Habitat Integrity were done in this catchment.

Macroinvertebrates:

The macroinvertebrates at both sites (D4MOLO-WELTE, D4MOLO-MODIM) remained in a largely modified (D) condition from 2016/17 onwards, due to deteriorating water quality as well as reduced flow conditions.

Riparian Vegetation:

The riparian vegetation at the lower site (D4MOLO-MODIM) downstream of Setumo Dam outside of Mahikeng, remained in moderately modified (C) condition. The Riparian Vegetation condition as reflected by the VEGRAI at the lower Molopo site complies with the Gazetted RQO of D. Although no VEGRAI has been conducted, the riparian zone at the upstream site (D4MOLO-WELTE) has been severely modified by exotic vegetation. Farming activities affect the upper section of the Molopo while urban and rural activities modify it closer to Mahikeng. Several dams (Cooke's lake, Letlamoneng, Setumo and Disaneng) downstream of Mahikeng add to the irregular flows in the Molopo system.

Habitat Integrity:

In 2020/21 the instream IHI at the upper site (D4MOLO-WELTE) deteriorated from a moderately modified (C) condition to a close to moderately modified (C/D) while the site downstream of the Setumo Dam (D4MOLO-MODIM) improved from a close to largely modified (D/E) condition to a moderately modified (C) condition. The improvement at the lower site is related to higher flows. The riparian IHI at the upper sites remained in a close to largely modified (D/E) condition, reflecting the effect of the farming activities as well as the prevalence of exotic Poplar (*Populus spp*.) trees. The riparian IHI at the lower sites has been steadily declining from a near natural (B) condition in 2018/19 to a close to largely natural (D/E) condition in 2020/21. The difference between the instream and riparian condition could be attributed to the water quality being impacted due to poorly managed wastewater treatment works in Mahikeng as well as the severe flow modification by the Setumo Dam. Farming activities affect the upper section of the Molopo while urban and rural activities modify it closer to Mahikeng. Several dams add to the irregular flows in the Molopo system. The instream IHI complied with the gazetted IHI at D4MOLO-MODIM only in 2020/21, while the riparian IHI

complied with the gazetted IHI in 2018/19 and 2019/20 but not in 2020/21. The reason for the decline in riparian habitat should be investigated.

D7: Orange

This secondary catchment stretches from the Vaal River confluence near Douglas to the confluence with the Hartbees River at Kakamas. All seven sites in this secondary catchment were monitored for macroinvertebrates and were found to be generally in the moderately modified (C) category. In 2020/21 only the site downstream of Boegoeberg Dam (D7ORAN-GROBL) was not in a moderately modified (C) condition but it improved to a close to largely natural (B/C) condition. The site downstream of the Neusberg Berg near Kakamas (D7ORAN-NEUSB) improved from a close to moderately modified (C/D) in 2016/17 and 2017/18 to a moderately modified (C) condition from 2018/19 onwards. The main impacts in this section of the Orange River are related to agriculture, mostly irrigated vineyards along the river. The site at Kakamas is situated downstream of the Neusberg Weir and is also exposed to the effects of the Neusberg Hydro-Electrical Scheme further impacting this site.

D8: Orange

This is the lowest section of the Orange River stretching from the confluence of the Hartbees River at Kakamas to the Orange River Estuary at Alexander Bay. All six sites were monitored for macroinvertebrates and found to be mostly in a moderately modified (C) condition with only the site at Onseepkans (D8ORAN-ONSEE) in a close to moderately modified (C/D) condition. The future of this site is also in question as the access to the site was via the irrigation board road. Since the installation of a pipeline to replace the canal, the road is not maintained anymore. The exotic *Prosopis* (Mesquite) is also invading the riparian zone. Most sites have remained in a moderately modified (C) condition from 2016/17 onwards. The site at Onseepkans deteriorated from moderately modified (C) to largely modified (D) in 2019/20 but has improved slightly to a close to moderately modified (C/D) condition in 2020/21. The most downstream site in the Richtersveld National Park (D8ORAN-RICHT) improved from moderately modified (C) to close to largely natural (B/C) in 2017/18 but has been in a moderately modified (C) condition again since 2018/19. A contributing factor to the apparent deterioration at this site is that the river meander changes from time to time, and it has now moved more towards the Namibian side which makes the monitoring more difficult. It is, however, important to ensure that it does not deteriorate to the lower end of a C category. This site is more than 100 km from the river mouth at Alexander Bay but there are no suitable sites downstream of the Richtersveld.

Summary:

Invertebrates:

The condition in this primary drainage region seems to have remained relatively stable in a moderately modified (C) condition with only a few sites in a B/C, C/D and D condition (and 35). The Glen Reenen stream in the Golden Gate National Park is the only site in a largely natural (B) condition.

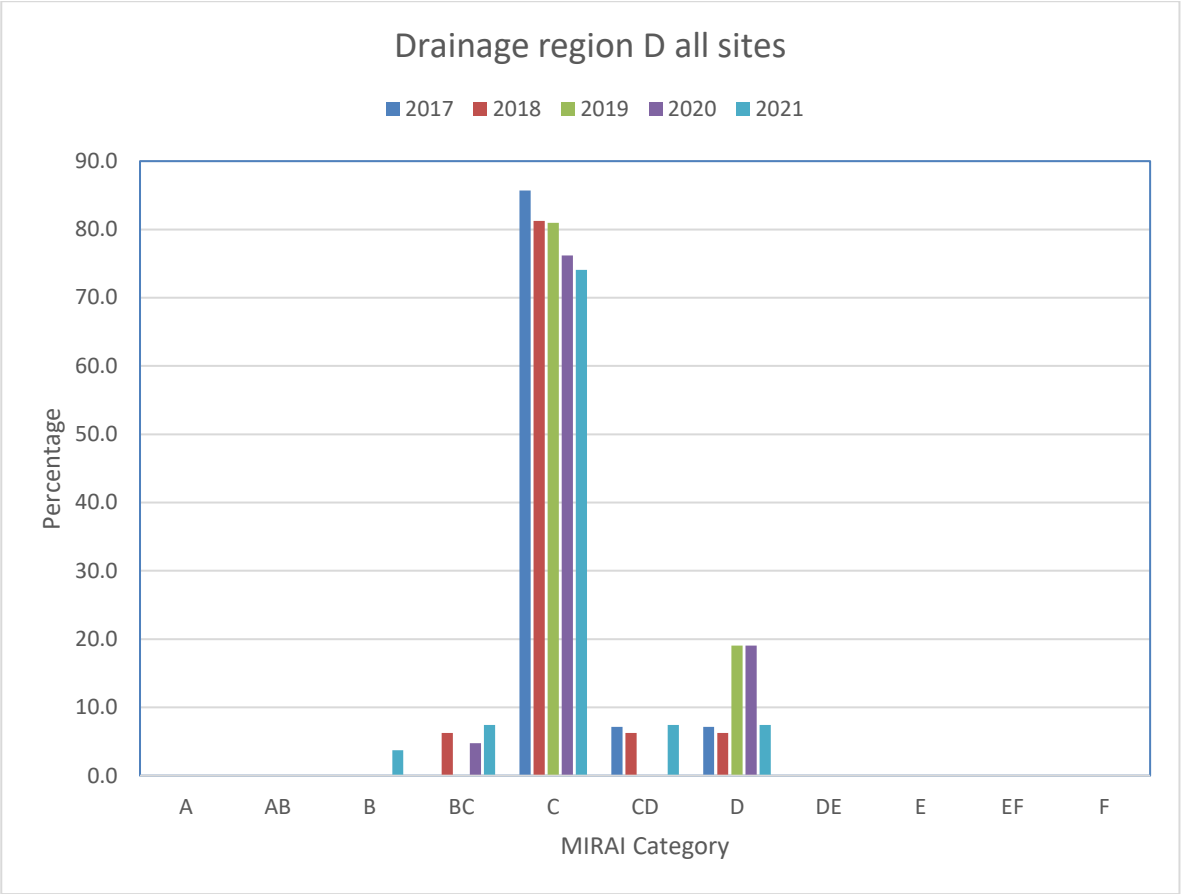

Figure 34: The percentage of sites in each ecological category in primary drainage region D (Orange) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2020/21.

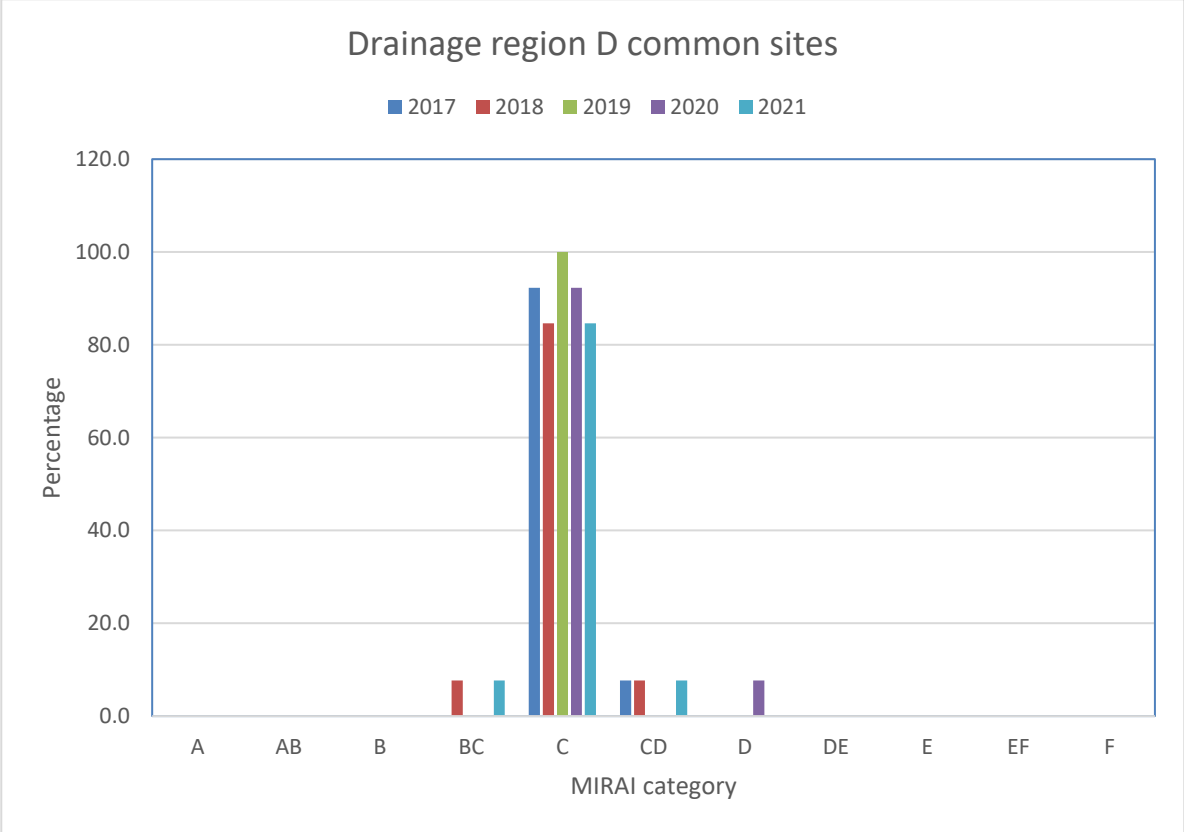

Figure 35: The percentage of sites in each ecological category in primary drainage region D (Orange) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2020/21.

Riparian Vegetation:

The Riparian Vegetation is mostly in a moderately modified (C) condition with some sites in poorer (C/D & D) condition (Figure 36 and 37).

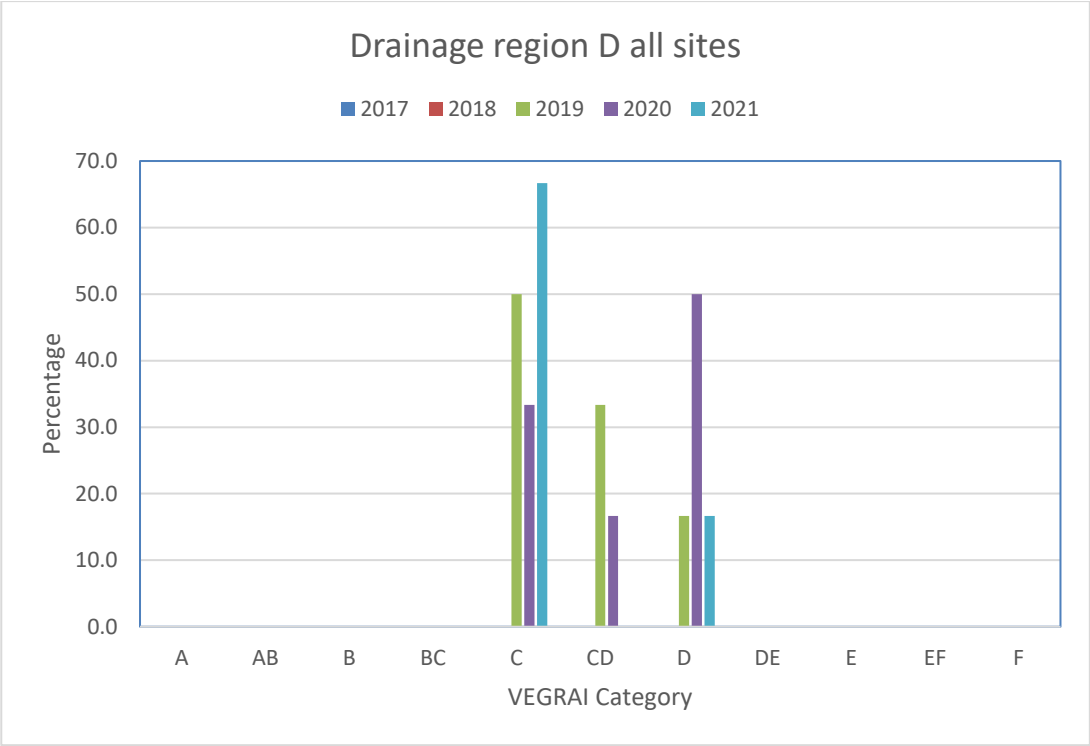

Figure 36: The percentage of sites in each ecological category in primary drainage region D (Orange) per hydrological year for riparian vegetation at all sites monitored from 2016/17 to 2020/21.

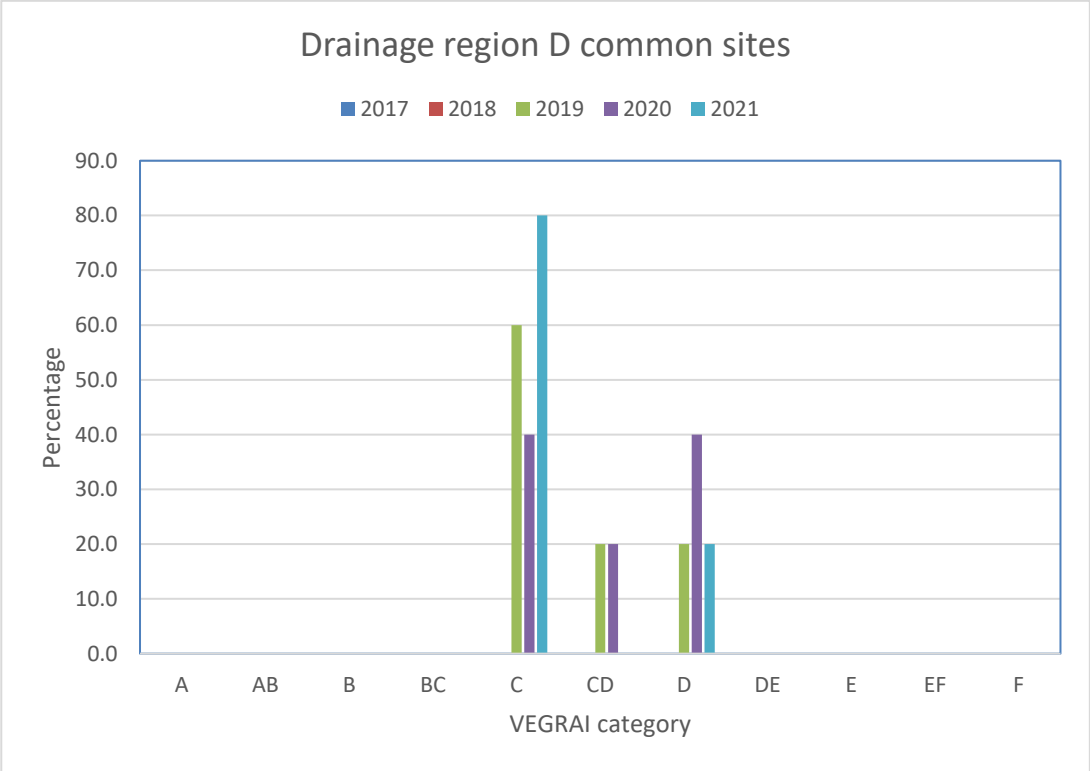

Figure 37: The percentage of sites in each ecological category in primary drainage region D (Orange)per hydrological year for riparian vegetation at those sites monitored each year from 2018/19 to 2020/21.

Habitat Integrity:

The instream IHI is mostly in a moderately modified (C) condition (Figures 38 and 39), while the riparian IHI was mostly in a poorer condition (D & D/E). Only two sites were sampled in both 2018/19 and 2020/21.

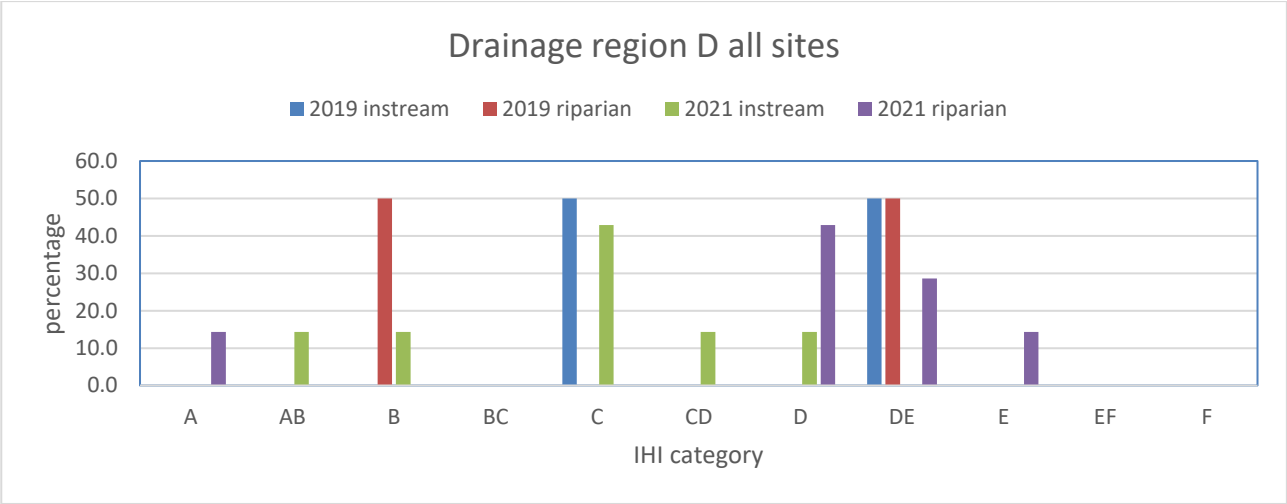

Figure 38: The percentage of sites in each ecological category in primary drainage region D (Orange) per hydrological year for Habitat Integrity at all sites monitored from 2016/17 to 2020/21.

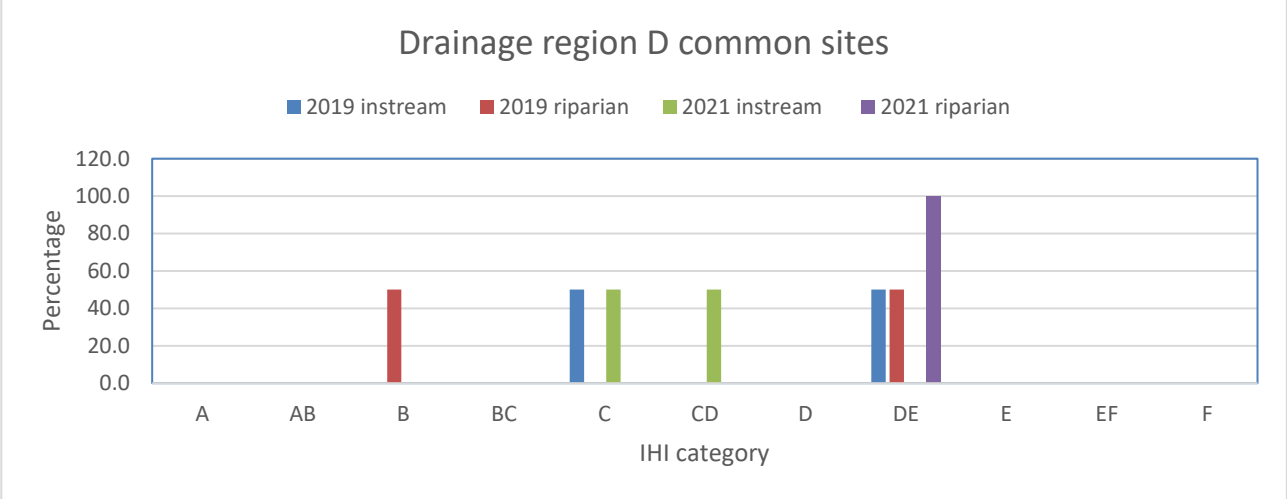

Figure 39: The percentage of sites in each ecological category in primary drainage region D (Orange) per hydrological year for habitat integrity at those sites monitored each year from 2018/19 to 2020/21.

DRAINAGE REGION E (BERG-OLIFANTS WATER MANAGEMENT AREA)

The E primary drainage region only consists of the Olifants-Doring River catchment (Annexure E). The south-western portion of the catchment falls within the Western Cape Province and the arid north-eastern portion is in the Northern Cape Province (Basson and Rossouw, 2003). The main river is the Olifants, with the Doring River being a major tributary. The other tributary is the Hol River (Basson and Rossouw, 2003). There is currently a Reserve study underway for the G30 and F60 quaternary catchments in this area, which was not included in the previous reserve study.

The Olifants-Doring catchment has 22 active REMP sites (Figure 40). During the 2017-2021 hydrological years, monitoring was ultimately conducted on 16 sites, mostly due to unfavourable flow condition and difficulties accessing some of the sites. Only 13 sites were monitored in the 2020/21 hydrological year. There are four secondary catchments in this primary drainage Region:

- E1: Olifants
- E2: Doring
- E3: Lower Olifants
- E4: Oorlogskloof/Koebee

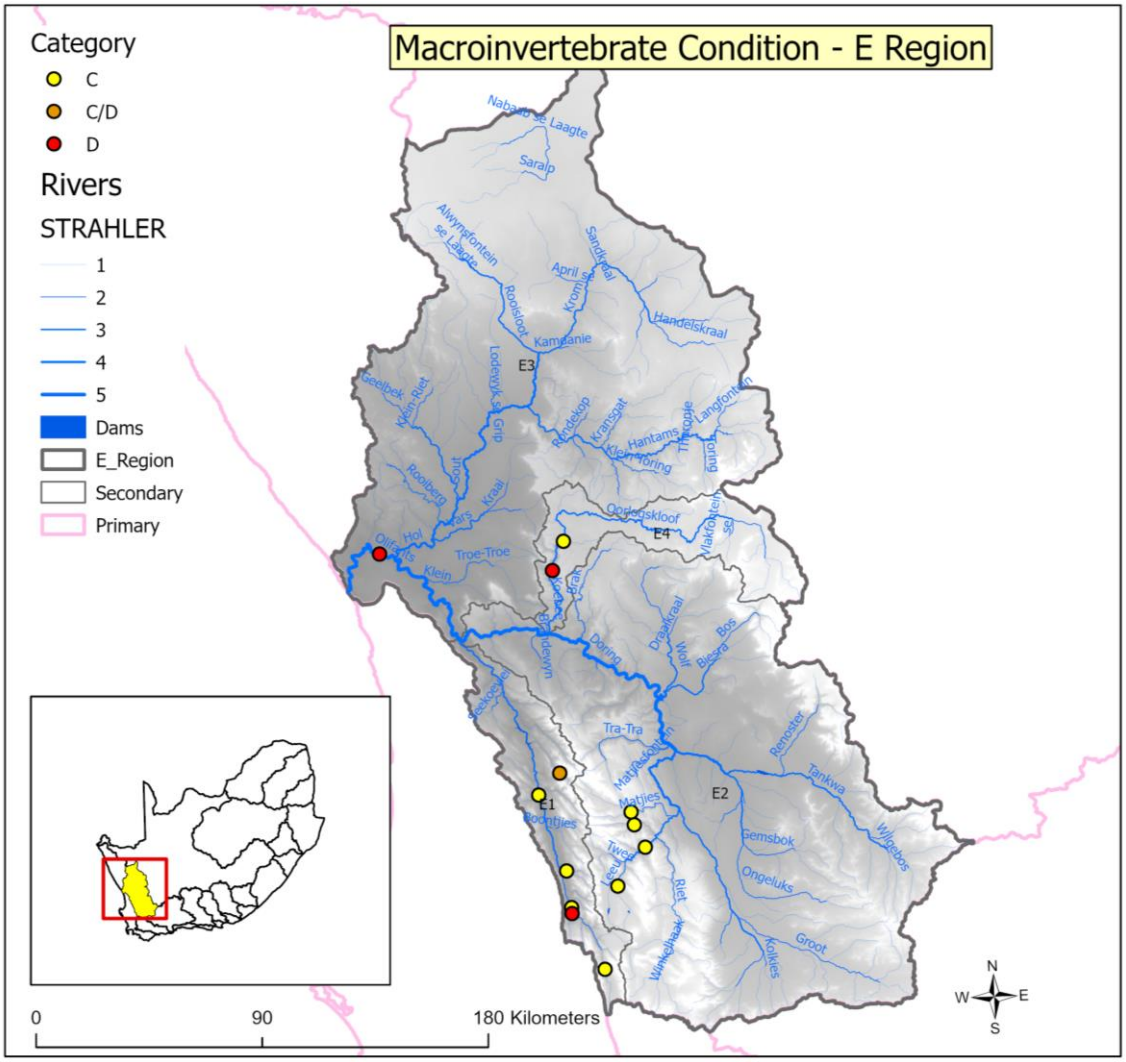

Figure 40: Summary Ecological Categories in drainage region E (Olifants-Doring) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with yellow representing relatively fair conditions (C) while the red reflects relatively poor conditions (D).

The RQOs that were set for the Olifants-Doring catchment were not usable at this scale of reporting. There were no target categories for the various indices, but rather information on targeted taxa.

E1: Olifants

This secondary catchment comprises the upper and middle sections of the Olifants River upstream of the Doring River confluence. Most of the habitat in the Olifants River catchment has been destroyed by agricultural activities in the riparian zones. The Olifants River is transformed by cultivated areas as it emerges in the Agter Witzenberg Mountains, north of Ceres. The upper reaches are characterised by commercial agriculture (deciduous fruit, vegetables, and citrus), changing to wine, rooibos tea, vegetables, and livestock farming in the middle and lower reaches (RHP, 2006). Six of the nine active REMP sites were sampled in 2020/21. Only the Rondegat and Ratel rivers were not in a moderately modified condition as the natural habitat has been transformed in most parts. The Rondegat River (E1ROND-EWR03) deteriorated from moderately modified (C) to close to moderately modified (C/D) in 2020/201 and the Ratel River (E1RATE-BEAVE) from moderately modified (C) to largely modified (D). The Olifants River at Algeria (E1OLIF-ALGER) improved from a close to largely modified (C/D) condition in 2018/19 to moderately modified (C) in 2020/21 and the Olifants downstream of Bulshoek Dam (E1OLIF-ZYPHE) improved from close to moderately modified (C/D) condition in 2018/19 to a close to largely natural (B/C) condition in 2019/20.

E2: Doring

The Doring River is the main tributary of the Olifants River. Only four of the seven active REMP sites could be sampled in 2020/21. The Doring River itself could not be sampled due to unfavourable flow conditions. as the Doring River is a seasonal river. It was either dry during the low flow period or flooding in the high rainfall period as observed by the Western Cape regional office. The lower sections of the Doring River and tributaries cease to flow in summer for periods lasting longer than would have occurred naturally due to abstractions (RHP, 2006). The Doring Tributaries were mostly in a moderately modified (C) condition with only the Leeu River (E2LEEU-GAUGE) improving from a close to moderately modified (C/D) condition in 2019/20 to a moderately modified (C) condition in 2020/21. Much of the upper portion of the Groot catchment is undeveloped and falls within the Cederberg Wilderness Reserve (RHP, 2006). However, all these sites are subjected to extensive cultivation of deciduous fruit and vegetables.

E3: Lower Olifants

The Lower Olifants secondary catchment (E3) comprises of the Olifants River downstream of the Doring River confluence with Klein and Hol rivers as major tributaries. Only the OlifantsRiver at Lutzville (E3OLIF-LUTTZ) was sampled with its condition has fluctuated between a largely modified (D) and close to moderately modified (C/D) condition. This can be attributed to the surrounding agricultural impacts on the habitat, flow, and water quality. This site is also downstream of major dams (like the Clanwilliam and Bulshoek). None of the tributaries could be sampled due to unfavourable flow conditions.

E4: Oorlogskloof/Koebee

Both active REMP sites in this drainage region were sampled in 2020/21. The Koebee River (E4KOEB-DEHOO) was in a largely modified (D) condition while the Oorlogskloof River (E4OORL-OORLO) improved from a largely modified (D) condition in 2018/19 to a moderately modified (C) condition in 2020/21. The monitored on the Oorlogskloof/Koebee secondary catchment (E4) did not have suitable flow conditions to conduct monitoring during the 2019-20 hydrological year, thus there was no data. As mentioned in a River Health Programme report (RHP, 2006), many of the Doring River tributaries are subjected to large scale abstraction, including the Oorlogskloof/Koebee, thus flow would be heavily affected.

Summary:

As the national trend has already highlighted, most sites were in a moderately modified (C) condition in the Olifants-Doring catchment (Figures 41 and 42). There seems to be a negative trend in the invertebrate condition with more sites declining to a largely modified (D) condition compared to previous years.

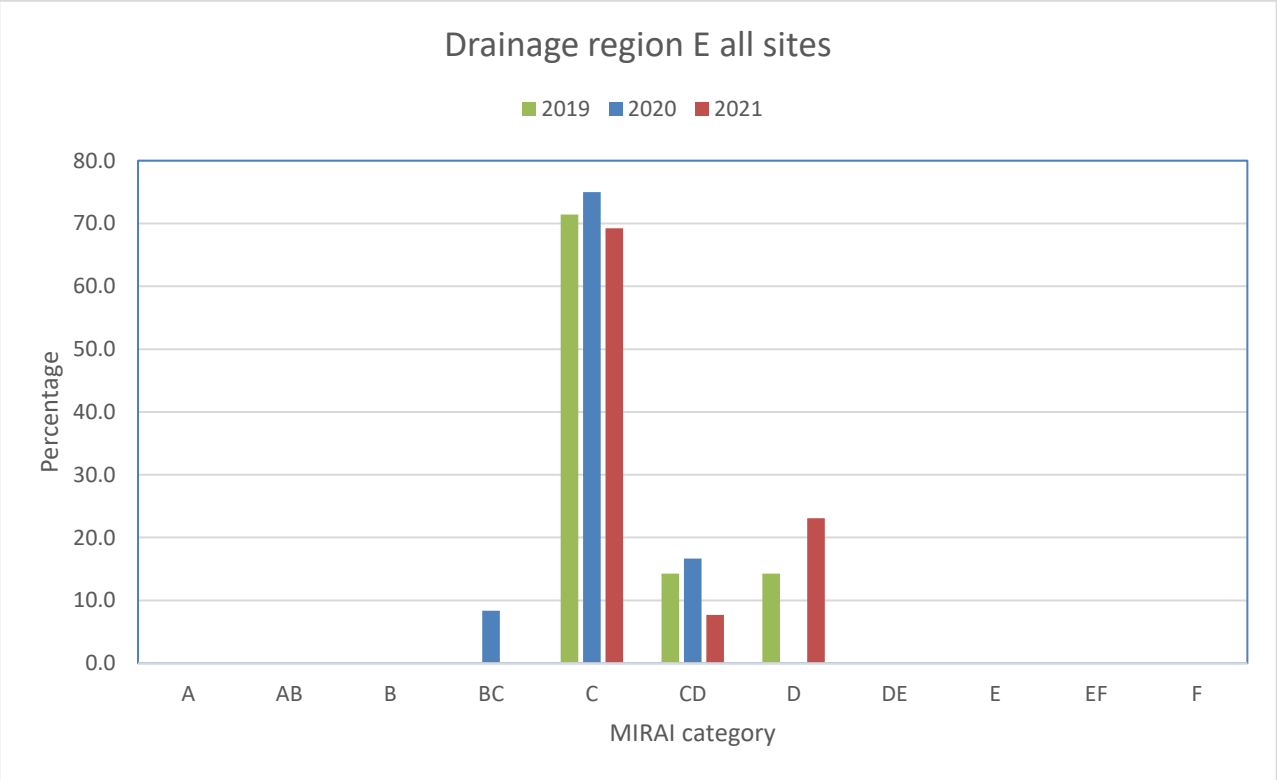

Figure 41: The percentage of sites in each ecological category in primary drainage region E (Olifants-Doring) per hydrological year for macroinvertebrates at all sites monitored from 2018/19 to 2020/21.

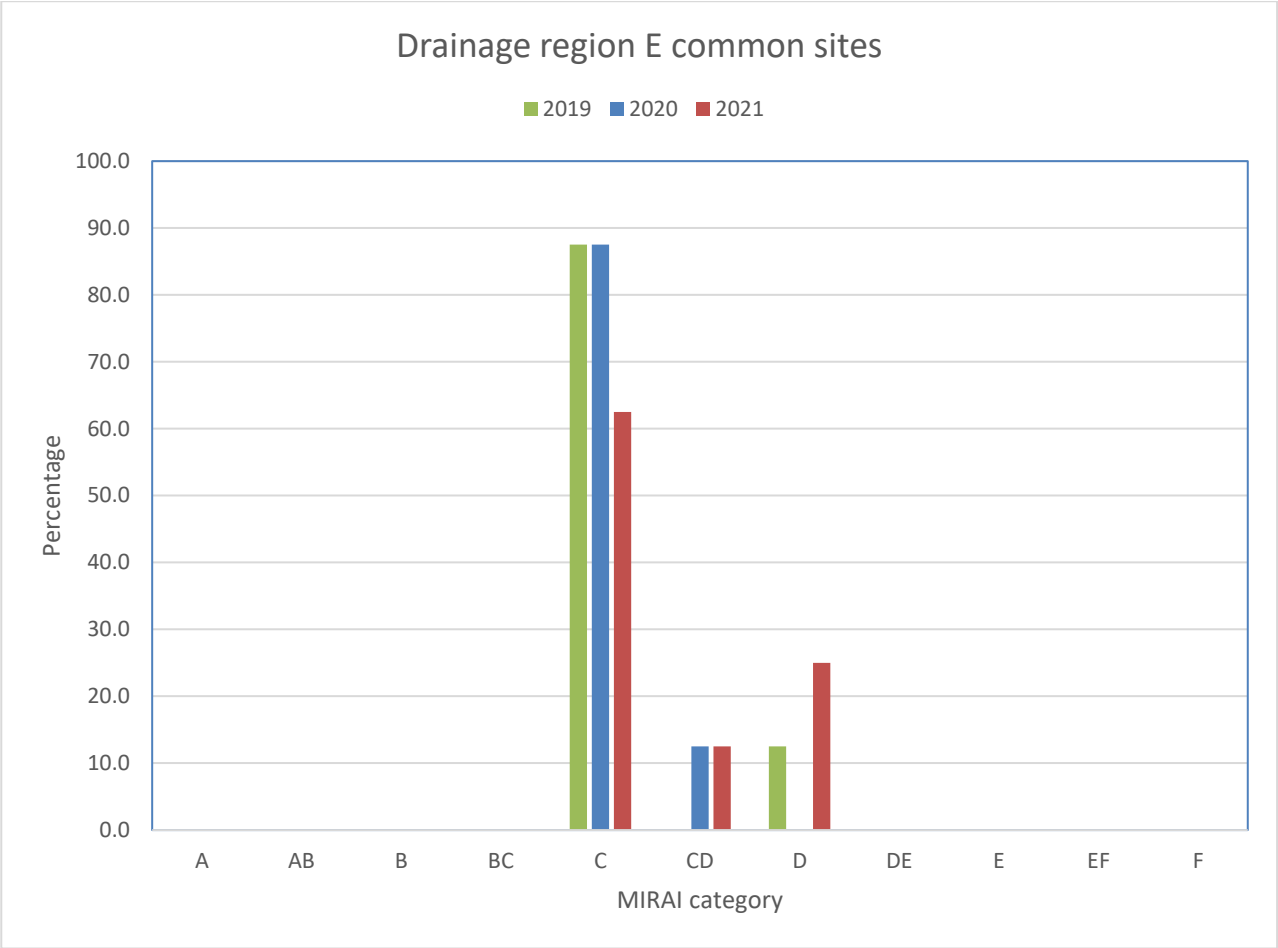

Figure 42: The percentage of sites in each ecological category in primary drainage region E (Olifants-Doring) per hydrological year for macroinvertebrates at those sites monitored every year from 2018/19 and 2020/21.

DRAINAGE REGION G (BERG-OLIFANTS AND BREEDE-GOURITZ WATER MANAGEMENT AREAS)

The G primary drainage region mostly consists of the old Berg River WMA (G1 and G2), a small portion of the Olifants-Doring WMA (G3), and the south-western parts of the old Breede WMA (G4 and G5). Only 27 of the 38 active sites were sampled this hydrological year. Annexure G has more detailed tables of the sites and Figure 43 and Figure 44 provide a spatial view of the ecological conditions. There are five secondary catchments in this primary drainage regions.

- G1: Berg
- G2: Eerste River, etc.
- G3: Verlorenvlei to Jakkalsvlei
- G4: Palmiet to Uilkraal
- G5: Nuwejaars to Sout

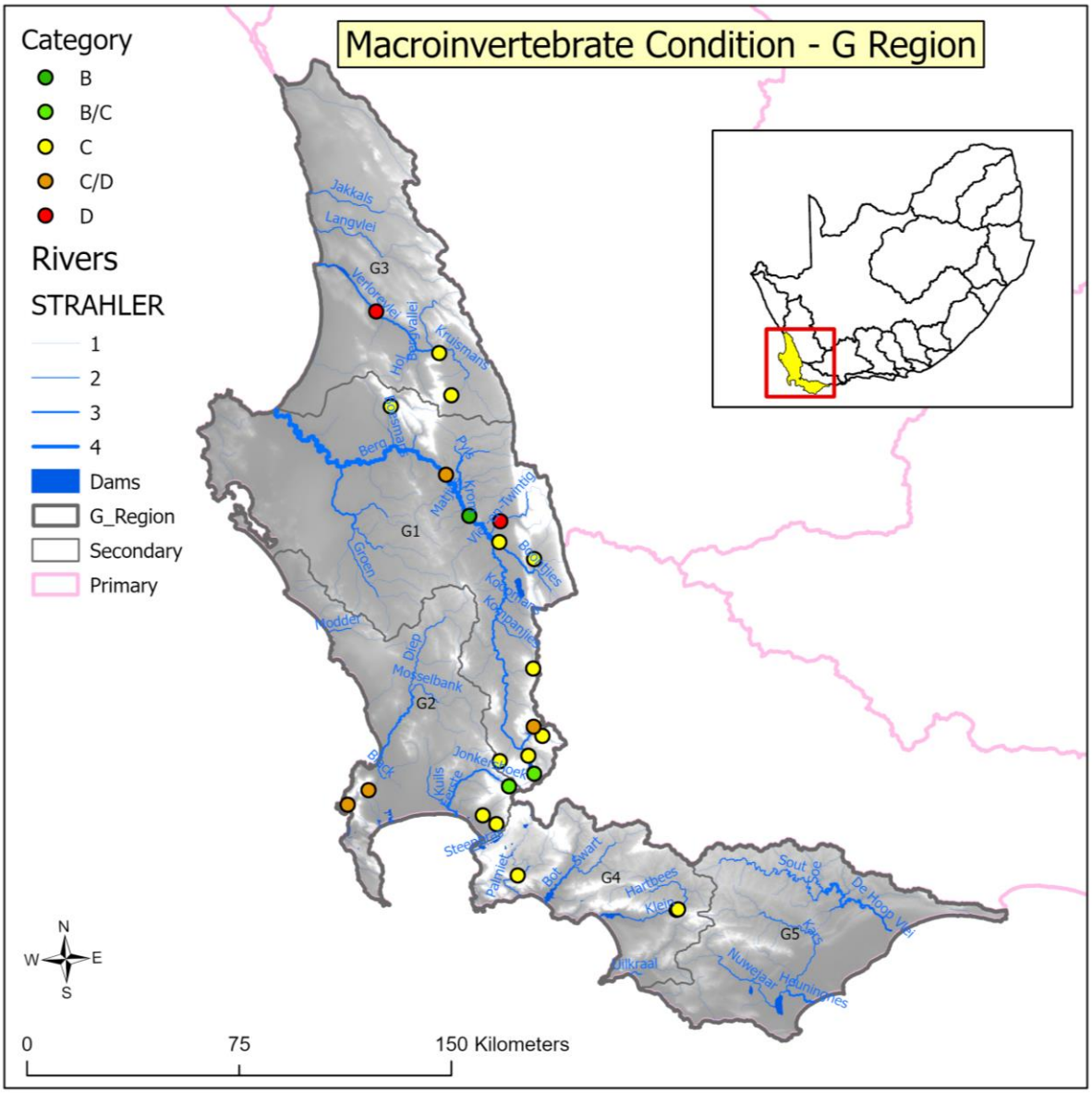

Figure 43: Summary Ecological Categories in primary drainage region G (Berg- Breede) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B, B/C) while the red reflect relatively poor conditions (D).

It is worth noting that the gazetted RQOs for the G2 secondary catchment need to be reviewed. Several them have been set for the unsustainable E and F categories. Setting targets that allow for water resources to be completely transformed is detrimental for the water resource, society, and the economy.

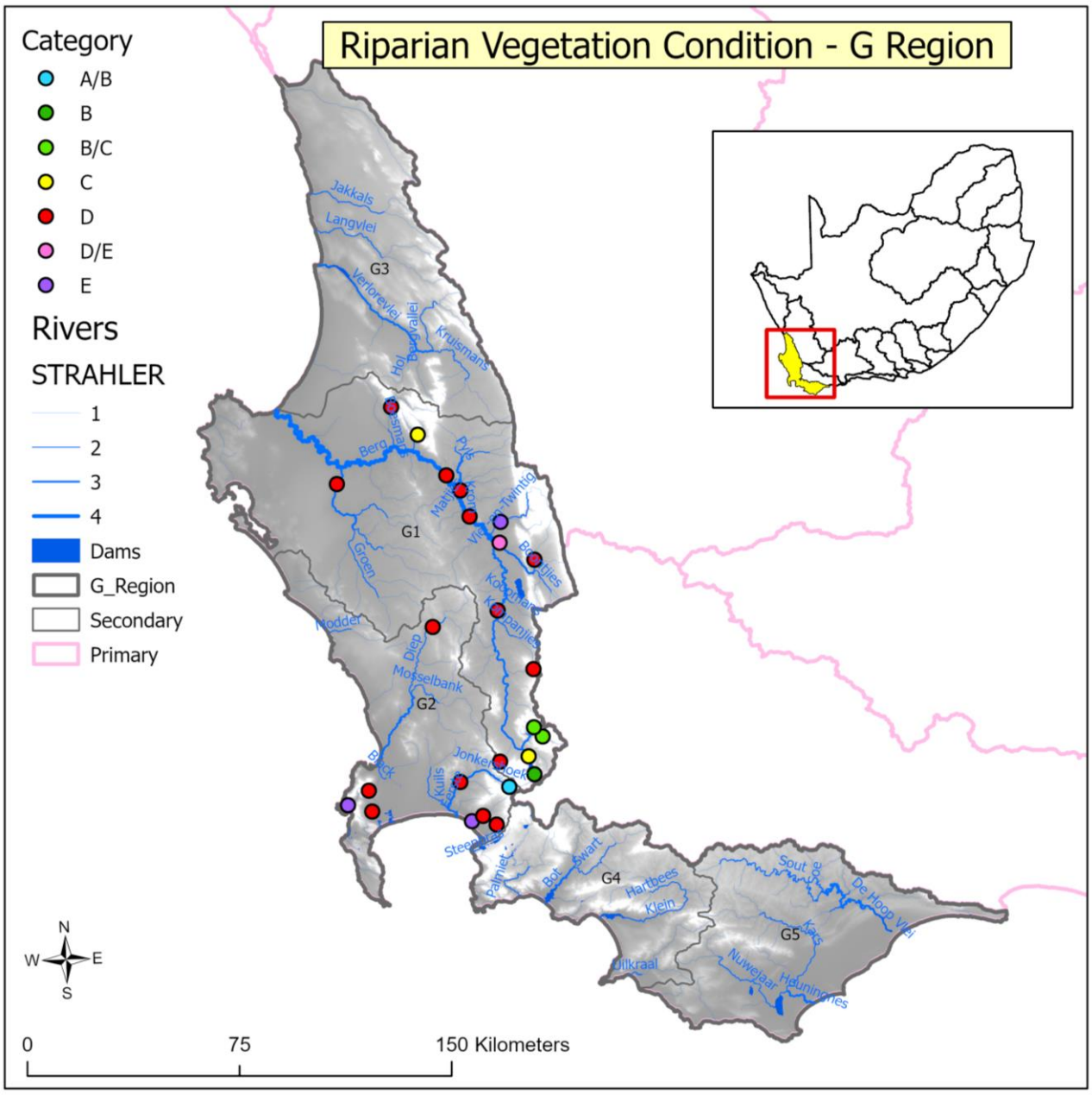

Figure 44: Summary Ecological Categories in primary drainage region G (Berg-Breede) reflecting the riparian vegetation condition for selected sites monitored during 2020/2021hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A/B to B/C) while the red and purple reflect relatively poor conditions (D to E).

G1: Berg

Secondary catchment G1 has 12 active monitoring sites on the main Berg River and some tributaries, (Wemmershoek, Vier-en-Twintig, Krom and Platkloof rivers). Immediately downstream of its source, the Berg River flows through Franschhoek and proceeds north-westwards through Paarl, Wellington and Velddrif at the coast before entering the Atlantic Ocean through the Berg River Estuary. Aerial images indicate that cultivation intrudes onto the riverbanks in some areas. About 65% of the Berg River is under agriculture, mostly grapes and deciduous fruit, with some dryland grain farming and sheep farming north of Wellington (RHP, 2004a).

Macroinvertebrates:

Due to the highly developed nature of the catchment, most of the Berg River catchment, including the tributaries, were in a moderately modified (C) condition. The Berg River upstream of Theewaterskloof Dam (G1BERG-BRBM1) was in a close to largely natural (B/C) condition and another site (G1BERG-DRIEH) further downstream in a largely natural (B) condition. The Berg River (G1BERG-BRBM6) upstream of Piketberg and the Drakenstein River upstream of Wemmershoek Dam were in a close to moderately modified (C/D) condition. The Vier-en-Twintig River (G1TWEN-HALMA) was in a largely modified (D) condition. Most (7) sites deteriorated steadily since 2018/19 with only three sites (G1BERG-BRBM1, G1OLIF-ABRID, G1DRAK-WEMME) upstream of the Berg River and Wemmershoek Dams improving. These sites, in the upper reaches are probably benefitting from improved flow conditions following the severe drought and should be monitored closely to see if they will continue improving.

There are gazetted RQOs for the Krom River as well as five sites on the Berg River. Two of the Berg River sites (G1BERG-DEWAD, G1BERG-DRIEH) complied with the gazetted RQOS, while the Krom River (G1KROM-BEIT) and the other two Berg River sites (G1BERG-BRBM1, G1BERG-BRBM6) were non-compliant in 2020/21. Three sites (G1KROM-BEIT, G1BERG-BRBM1, G1BERG-BRBM6) never complied with the gazetted RQOs from 2017/18 to 2020/21, while another two Berg River sites (G1BERG-DRIEH, G1BERG-JIMFO) always complied with the gazetted RQOs. The Berg River at downstream of the Berg River Dam (G1BERG-DEWAD) complied in 2017/18 and 2020/21 but was non-compliant in 2018/19 and 2019/20.

Riparian Vegetation:

The VEGRAI was conducted at 16 sites in 2020/21. The riparian vegetation was mostly (9 sites) in a largely modified (D) condition. Only the Berg River upstream of the Berg River Dam (G1BERG-BRBM1) had riparian vegetation in a largely natura; (B) condition, while the riparian vegetation at the Drakenstein and Olifants rivers upstream of the Wemmershoek Dam was in a close to largely natural (B/C) condition. The riparian vegetation at the lower Klein Berg (G1KLEI-R44RB) and the Vier-en-Twintig (G1TWEN-HALMA) rivers were in the worst condition at close to largely modified (D/E) and seriously modified (E) respectively. There is community involvement in some areas along the Berg River, like in Paarl (see Box 2) which could hopefully result in improved riparian zones. However, the bigger water users, municipality, farmers, also need to contribute to these efforts. There are gazetted RQOs for seven sites but only five of these sites were monitored in 2020/21. All five sites complied with the gazetted RQOs.

G2: Eerste River etc.

There are 9 active REMP sites (Figure 43) within the G2 secondary drainage region. It is mostly within the Cape Town Metropolitan municipality and made up of a combination of numerous small catchments. Such as, Steenbras, Sir Lowry's Pass, Lourens, Eerste/ Kuils, Silvermine, Hout Bay, Salt, Diep, Sout, Modder and Dwars rivers. These rivers rise in the Hottentots Holland Mountains in the east and Table Mountain and Cape Peninsula mountains in the southwest (RHP, 2005). The Eerste River significantly deteriorates from its origins in the Jonkershoek Nature Reserve to the lower reaches, by the Spier Wine Farm. The ecological condition of the river deteriorates rapidly once it exits the nature reserve, as it flows downstream passing major towns and cities (Stellenbosch and Cape Town), before discharging through the estuary (M. Lintnaar-Strauss, personal communication, 26 August 2020).

BOX 2: YOUTH OF EMBEKWENI ECO CLUB

The youth of Embekweni, on the banks of the Berg River in the Paarl area, champion environmental education and awareness by aligning their activities and actions with the United Nations Sustainable Development Goals. Focusing on the following goals: Goal 4 – Inclusive and Equitable Quality Education; 6 – Clean Water and Sanitation; 12 – Responsible Consumption and Production; 13 – Climate Action; 17 – Partnerships for Goals. They monitor aquatic invertebrates and riparian health as they implement various initiatives that contribute to a more ecologically sustainable Berg River. Some of which are a plastic-free Berg River initiative in Embekweni, equipping young members of the community as future water warriors that will choose relevant careers and be part of future solutions, as well as planting indigenous plants.

Macroinvertebrates:

The macroinvertebrates were sampled at five sites in 2020/21. The macroinvertebrate condition ranged from close to largely natural (B/C) in the upper reaches of the Eerste River (G2EERS-JONKE) in Jonkershoek to close to moderately modified (C/D) in the Liesbeek (G2LIES-WINCH) and Hout Bay (G2HOUT-VICTO) rivers. The macroinvertebrate condition in the Hout Bay (G2HOUT-VICTO), Sir Lowrys Pass (G2SIRL-WEDDE) and upper Lourens (G2LOUR-RADLO) rivers improved from 2017/18 to 2020/21 while it remained the same in the Keysers (G2KEYS-LISMO) and the lower Lourens (G2LOUR-BROAD) rivers. The macroinvertebrate condition in the upper Eerste River at Jonkershoek improved from a close to largely natural (B/C) condition in 2017/18

to largely natural in 2018/19 and 2019/20 but deteriorated back to a close to largely natural (B/C) condition in 2020/21.

The macroinvertebrate RQO for the Diep River was gazetted as a seriously modified (E) condition and it was therefore not compared to the RQO. The macroinvertebrate condition at the Silvermine (G2SILV-SUNBI) River did not comply with the gazetted RQOs in 2017/18. The other sites always complied with the gazetted RQOs.

Riparian Vegetation:

VEGRAI was only conducted during the 2020/21 hydrological year. The riparian vegetation at the upper Eerste River in the Jonkershoek Nature reserve (G2EERS-JONKE) was in a close to natural (A/B) condition. The riparian vegetation at most (6) sites were in a largely modified (D) condition while the Hout Bay and lower Lourens rivers were seriously modified (E) due to anthropogenic activities.

The RQOs for the Diep, Hout Bay and Keysers rivers are gazetted for conditions worse than largely modified (E and D/E) and are therefore not assessed. The riparian vegetation at the Eerste and upper Lourens rivers complied with the gazetted RQOs but the lower Lourens River did not comply with the gazetted RQOs).

G3: Verlorenvlei to Jakkalsvlei

This secondary catchment falls within the old Olifants-Doring Water Management Area boundaries. It comprises the seasonal Verlorenvlei, Langvlei and Jakkals rivers, which flow westwards to the Atlantic Ocean (RHP, 2006). The catchment is mostly rural, with extensive agriculture in the form of irrigated potato cultivation. The coastal areas support fishing and tourism development. Only three of the five active monitoring sites in the G3 secondary catchment were sampled in 2020/21 as indicated in Figure 43. The Jakkalskloof and Langvlei rivers could not be sampled due to unsuitable flow conditions.

The Kruismans River tributary of the Verlorenvlei River was in a moderately modified (C) condition while the Verlorenvlei River at Redelinghuis (G3VELO-REDEL) was in a largely modified (D) condition. The lower site on the Kruismans River (G3KRUIS-R365B) improved from a largely modified (D) condition in 2018/19 to a moderately modified (C) condition in 2020/21. The upper Kruismans River (G3KRUIS-PIKET) fluctuated between a largely modified (D) condition in 2019/20 and a moderately modified (C) condition in 2018/19 and 2020/21.

G4: Palmiet to Uilkraal

The G4 secondary catchment forms the western part of the old Breede WMA. It is mainly drained by short, coastal, fast flowing rivers like the Palmiet, Bot, Onrus, Klein, and Uilkraals rivers. The main land use is irrigated agriculture in the form of orchards and vineyards, afforestation, and livestock farming (RHP, 2011). Due to human capacity constraints, monitoring was reduced to Resource Quality Objectives (RQO) sites in the Breede-Gouritz WMA. There are currently only two active REMP sites (G4KLEI-RAKA, G4PALM-KOGEL) in this catchment. The Klein River (G4KLEI-RAKA) remained in a moderately modified (C) condition while the Palmiet River (G4PALM-KOGEL) in the Kogelberg Nature Reserve is mostly in a moderately modified (C)

condition but deteriorates to a close to moderately modified (C/D) condition in 2018/19. The Palmiet River did not comply with the largely natural (B) gazetted RQO.

G5: Nuwejaars to Sout

This secondary catchment consists of slower flowing, more turbid and saline rivers that are associated with several inland water bodies and wetlands (RHP, 2011). For instance, the second largest freshwater lake in South Africa, the Soetendalsvlei, is found in this drainage region. There are two (G5NUWE-BRAKP, G5KARS-SOUTK) active monitoring sites, but none were sampled during 2020/21 due to unsuitable flow conditions. The site at G5KARS-SOUTK was in a moderately modified (C) condition when it was last sampled in 2017/18 and G5NUWE-BRAKP declined from a moderately modified (C) condition in 2017/18 to a largely modified (D) condition in 2018/19 and 2019/20. The Nuwejaarspruit thus complied to the gazetted macroinvertebrate RQO of moderately modified (D) category. This site mostly experiences impact of habitat loss due to agricultural activities on the riparian zones.

Summary:

The moderately modified condition (C category) dominated in this drainage region (Figure 45), like the overall trend for the country. The C/D and D category sites decreased in 2017-2021 hydrological years while there was a sharp increase in the C category (moderately modified) sites (Figure 46). Thus, indicating an overall improvement in the condition of the largely modified sites.

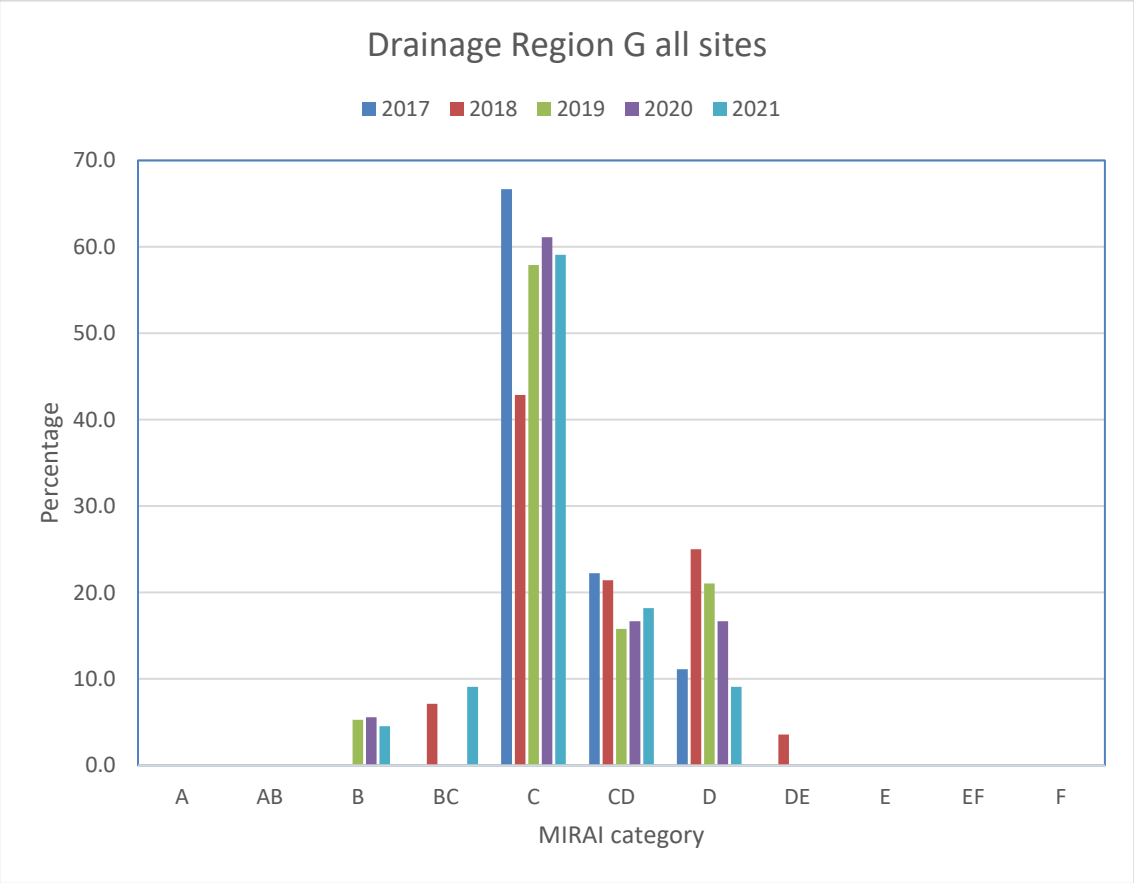

Figure 45: The percentage of sites in each ecological category in primary drainage region G (Berg-Breede) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2020/2021.

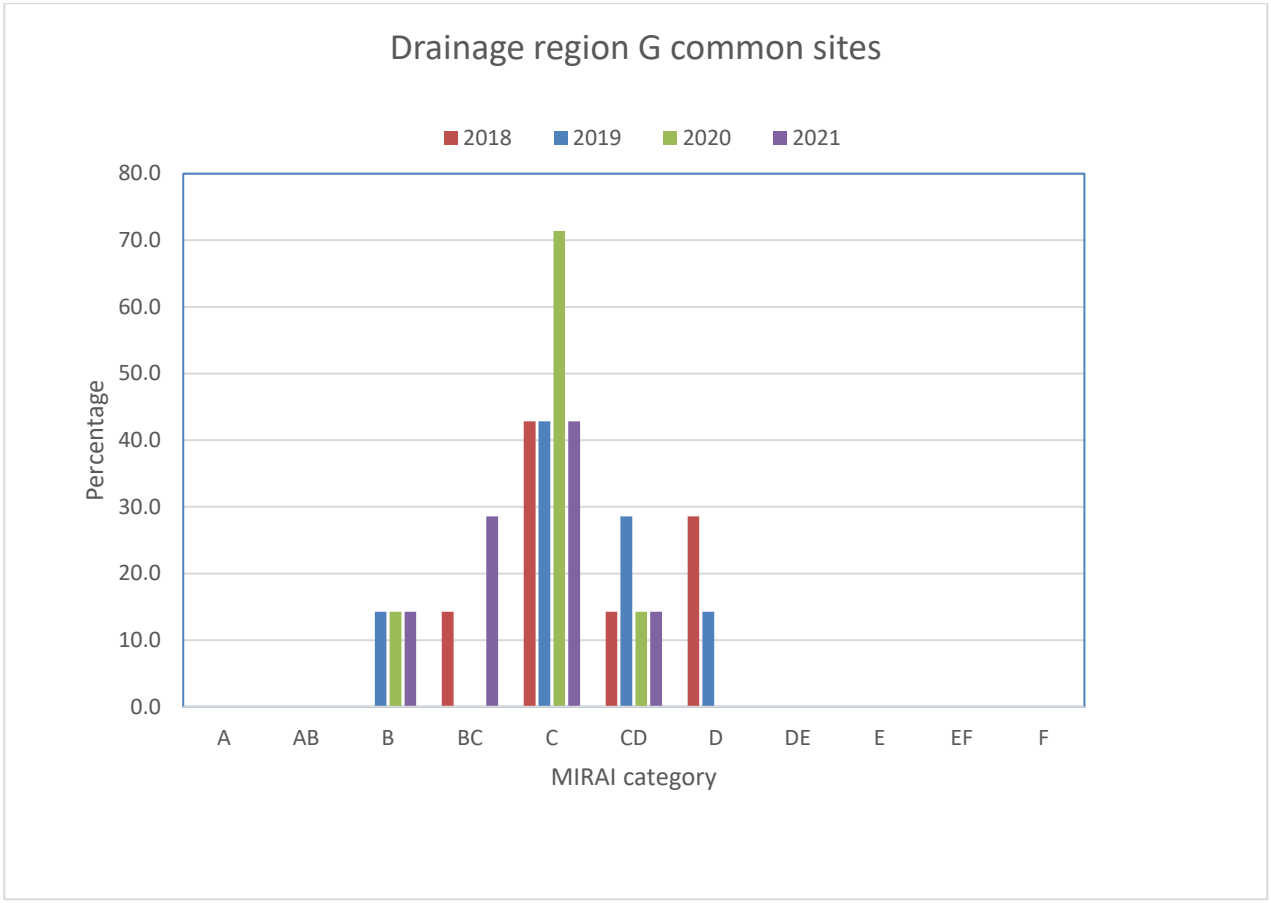

Figure 46: The percentage of sites in each ecological category in primary drainage region G (Berg-Breede) per hydrological year for macroinvertebrates at those sites monitored each year from 2017/18 to 2020/21.

DRAINAGE REGION H (BREEDE-GOURITZ WATER MANAGEMENT AREA)

The H drainage region falls entirely within the current Breede-Gouritz WMA demarcation. A large portion of the H catchment (H1 to H7) forms part of the previous Breede WMA, while H8 and H9 are the Duiwenhoks and Goukou parts of the previous Gouritz WMA. There are 57 active REMP sites in this drainage region (Figure 47). Annexure H has more detailed tables of the sites.

- H1: Breede
- H2: Hex
- H3: Kogmanskloof
- H4: Breede
- H5: Breede
- H6: Riviersonderend
- H7: Breede
- H8: Duiwenhoks
- H9: Goukou

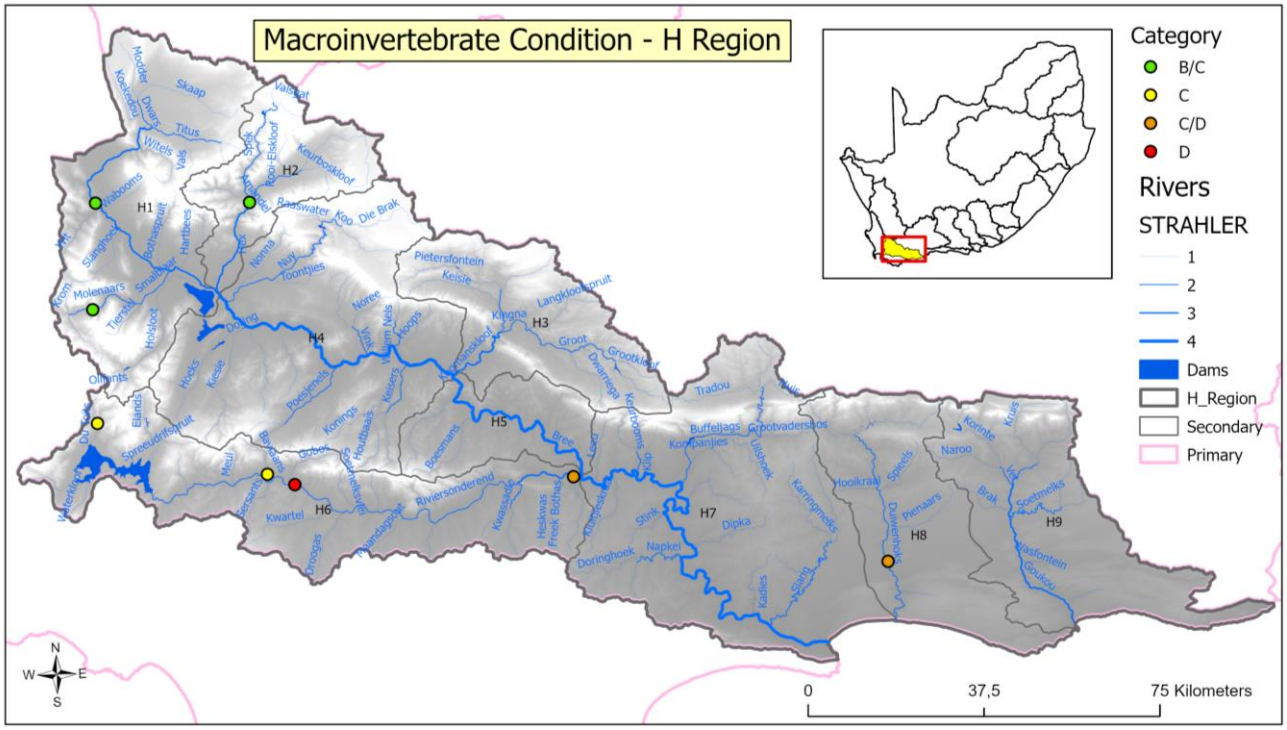

Figure 47: Summary Ecological Categories in primary drainage region H (Breede-Gouritz) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) while the red reflect relatively poor conditions (D).

H1: Breede

The Breede River originates in the H1 secondary drainage region, near Ceres, through the confluence of Koekedouw, Dwars, and Titus rivers. The other tributaries in this secondary catchment are Witels, Wabooms, Bothaspruit, and Hartbees on the left and Wit, Slanghoek, and Smallblaar on the right-hand side of the Breede River. Irrigated crops and pastures and some dryland crops are the prevalent land uses on this part of the

catchment (RHP, 2011). Major towns are Ceres, Wolseley, Worcester, and Rawsonville. The upper reaches of this river system originate within urban development, have riparian areas that have been cleared for agricultural activities, or have other extensive habitat alterations. There are currently only two (H1BREE-MOOIP, H1MOLE-GWEIR) active REMP sites in this area, but another six sites were still sampled in 2017/18. The main challenges relate to lack of capacity and unstable climatic condition that affects flow conditions.

Both monitoring sites were in a close to largely natural (B/C) condition in2020/21. The Breede River at Mooiplaas steadily improved from a largely modified (D) condition in 2017/18 to a moderately modified (C) condition in 2018/19 and 2019/20 hydrological year further to an improved close to a largely natural (B/C) condition in 2020/21. The Molenaars River improved from a moderately modified (C) condition in 2017/18 to close to largely natural (B/C) in 2018/19 and largely natural in 2019/20 before deteriorating to a close to largely natural (B/C) condition again in 2020/21. In 2017/18 the Koekedou and Titus rivers were in a largely modified (D) condition, while the Witels River and the Breede river near Wolesley (H1BREE-WITBR) were in a moderately modified (C) condition and the Wit Rivers was in a largely natural (B) condition. The Breede River has been complying with the gazetted RQO for the macroinvertebrates since 2017/18.

H2: Hex

The Hex River, the major river in this secondary catchment, rises from several mountain streams draining the southern slopes of the Bonteberg in the north eastern portion of the Upper Breede area and joins the Breede River north of the Brandvlei Dam (RHP, 2011). There is currently only one active REMP site in this catchment. The Hex River at H2HEXR-AMAND has improved from a moderately modified (C) condition (2017/18 to 2019/20) to a close to largely natural (B/C) condition in 2020/21. This site is downstream of De Doorns, a town that is the centre of the grape cultivation region. The orchards and vineyards extending into the riparian zone could be main drivers in the site condition. There are no gazetted RQOs for this site.

H3: Kogmanskloof

The main river in this secondary catchment is the Kogmanskloof, which joins the Breede River in the middle reaches. There are no active REMP sites in this secondary catchment.

H4: Breede

This secondary catchment forms part of the Central Breede River region. It stretches from the confluence with the Hex River at Brandvlei Dam to the confluence with the Kogmanskloof River near Ashton. The main tributaries in this area are the Keisers, Doring and Hoeks rivers. There is only one active REMP site (H4BREE-LECHA) in this secondary catchment, but another three sites on the Nuy (H4NUY-ABDAM, H4NUY-LOWER) and Hoeks (H4HOEK-MODDE) rivers were sampled in 2017/18. No sampling at the Breede River was possible since 2016/17. This site is located downstream of Le Chasseur Weir and was too deep to sample. In 2017/18

the Nuy River upstream of the Keerom Dam was in a moderately modified (C) condition while the lower Nuy and Hoeks rivers were in a largely modified (D) condition.

H5: Breede

The H5 secondary catchment also forms part of the Central Breede River area and stretches from the confluence with the Kogmanskloof near Ashton to the confluence of the Breede River with the Riviersonderend River upstream of Swellendam. The small tributaries, Poesjenels, Groot and Boesmans rivers, have become seasonal due to abstraction for the intensive agriculture in the area (RHP, 2011). There are no active REMP sites in this drainage Region.

H6: Riviersonderend

The H6 secondary catchment comprises the Riviersonderend sub-catchment The Riviersonderend has its source in the Groot Drakenstein and Franschhoek Mountains and flows eastwards to its confluence with the Breede River west of Swellendam. The 2011 State of Rivers report (RHP, 2011) established that Theewaterskloof Dam has seriously modified the natural flow regime of the downstream reaches of the Riviersonderend while agricultural practices in the catchment led to moderate modifications to the river channels and contributed to further flow modifications.

The macroinvertebrates were sampled at all four active REMP sites in 2020/21. The Baviaans and Du Toits rivers were in a moderately modified (C) condition. The Riviersonderend near Greyton (H6RIVI-GREYT) was in a largely modified (D) condition while the lower Riviersonderend (H6RIVI-KAMBA) was in a close to moderately modified (C/D) condition. The macroinvertebrate condition at the Dutoits and upper Riviersondend sites deteriorated respectively from a close to largely natural (B/C) and moderately modified (C) condition in 2018/18 and 2019/20 to a moderately modified (C) and close to moderately modified (C/D) condition in 2020/21). The Baviaans River remained in a moderately modified (C) condition, while the lower Riviersonderend fluctuated between moderately modified (C) and close to moderately modified (C/D) conditions.

The Baviaans and upper Riviersonderend were non-compliant with the gazetted RQOs in 2020/21 but the upper Riviersonderend still complied with the gazetted RQO in 2018/19 and 2019/20. The gazetted RQO for the Baviaans is a close to natural A/B condition. The RQO was determined using information from site upstream of Genadendal but the monitoring point is downstream of the town (T. Bushula, personal communication, 16 Aug 2022). This would probably be a challenge to attain due to impacts arising from Genadendal town and agriculture. The site is also quite low in the Baviaans River catchment, thus various impacts from upstream would have accumulated at this point.

H7: Breede

This secondary catchment comprises the lower reaches of the Breede River from the confluence with the Riviersonderend near Swellendam to the Breede River Estuary at Witsand where it enters the Indian Ocean.

The land use in this part of the Breede River changes from vineyards and orchards to wheat fields. Removal of riparian vegetation and thus habitat disturbance from intensive farming, coupled with water quality alteration from upstream towns (i.e., Swellendam), may have large impacts on the Breede River. There is only one active REMP site (H7BREE-BONTE) in this drainage region and it could not be sampled. Another site on the Breede River (H7BREE-FELIX) was in a moderately modified (C) condition when it was sampled in 2018/19. This site is in a very deep section of the river and it is always challenging to sample invertebrates. The invertebrates target is a D category.

H8: Duiwenhoks

The Duiwenhoks River drains the Langeberg Mountains, flows south to the coast, and enters the Indian Ocean adjacent to the Duiwenhoksriviermond Private Nature Reserve, through the Duiwenhoks Estuary. The secondary drainage comprises of one active REMP site. The Duiwenhoks River fluctuates between a moderately modified (C) and a close to moderately modified (C/D) condition. It was in a close to moderately modified (C/D) condition in 2020/21. This site is in the vicinity of agricultural activities; dryland and irrigated agriculture (vineyards, Lucerne, and pasture) are a major land use in this secondary catchment (RHP 2007).

H9: Goukou

The Goukou River rises in the Langeberg northeast of Riversdale in the Western Cape. It flows southwards before entering the Indian Ocean at Stilbaai. There is only one active REMP site in this catchment. The main land use in the Goukou secondary catchment is dryland and irrigated agriculture (vineyards, fruit, vegetables, Lucerne, and pasture), livestock, and commercial forestry. According to RHP (2007), the middle reaches are affected by black wattle (*Acacia mearnsii*) infestation, while reduced flow conditions are prevalent in the lower reaches. This could be the reason behind the lack of sufficient flow to conduct monitoring in this catchment. Thus, there was no data for the Goukou River.

Summary

Most sites in this drainage region remained in a moderately modified (C) condition (Figures 48 and 49). There seems to be a steady improvement from 2017/18 onwards in the invertebrate condition is this drainage region with a shift towards minimally modified (B and B/C) from a largely modified (C/D and D) as is evident from Figure 48. The improvement in invertebrate condition is most likely due to improved flows.

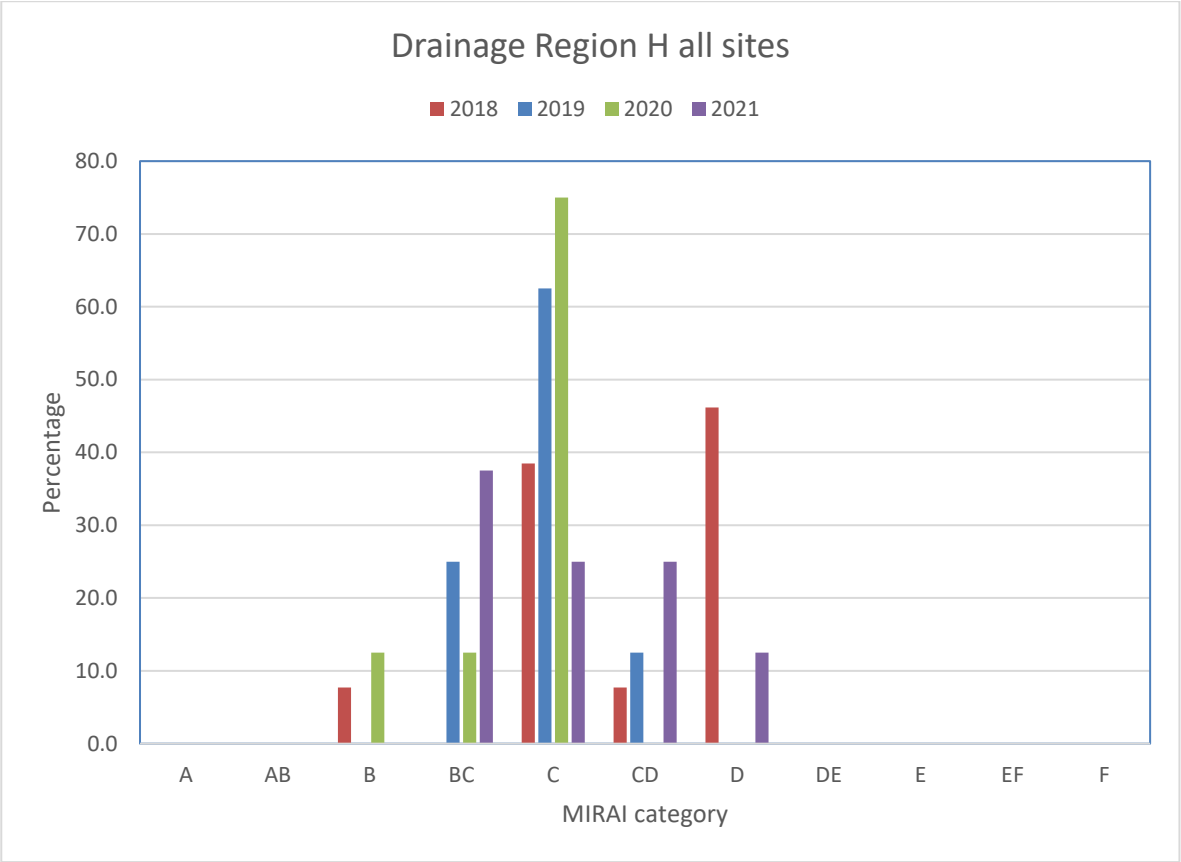

Figure 48: The percentage of sites in each ecological category in primary drainage region H (Breede-Gouritz) per hydrological year for macroinvertebrates at all sites monitored from 2017/18 to 2020/21.

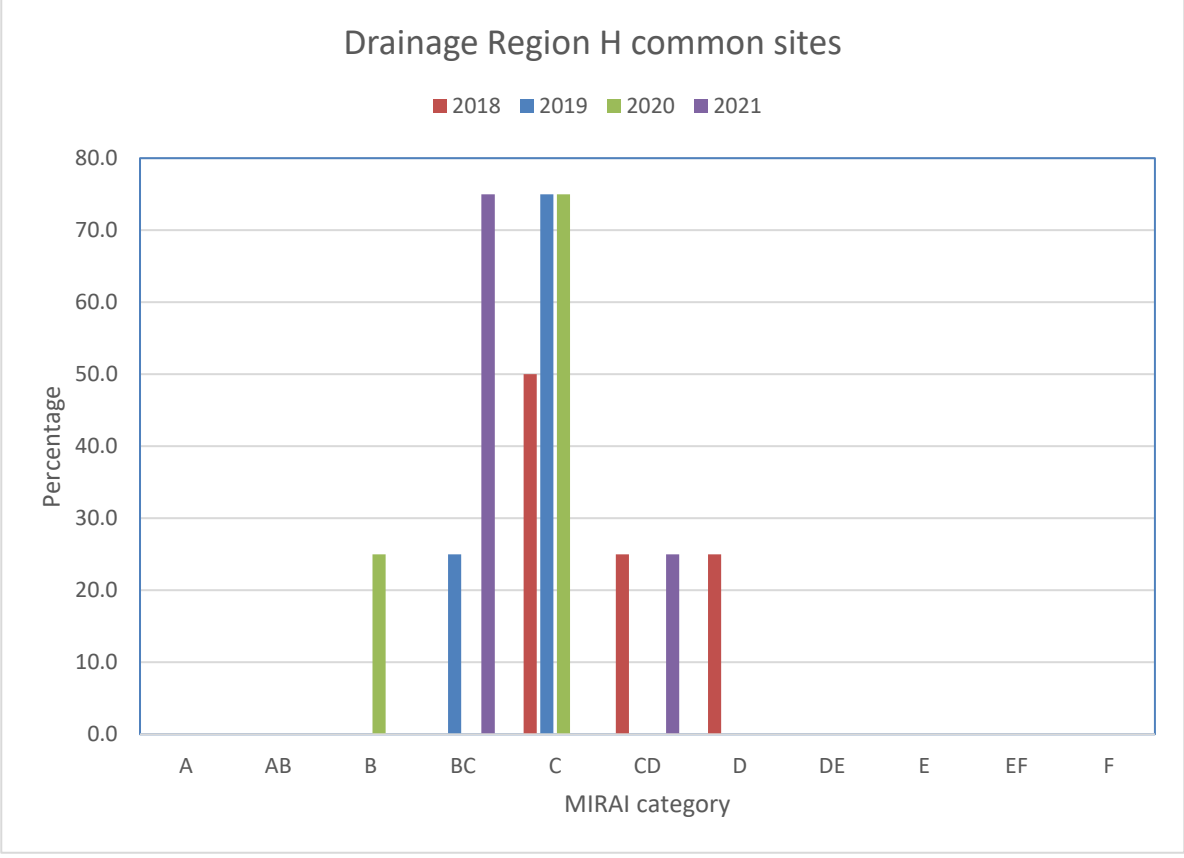

Figure 49: The percentage of sites in each ecological category in primary drainage region H (Breede-Gouritz) per hydrological year for macroinvertebrates at those sites monitored each year from 2017/18 to 2020/21.

DRAINAGE REGION J (BREEDE-GOURITZ WATER MANAGEMENT AREA)

The J primary drainage region consists of the Gouritz River system. The mainstem Gouritz River, flows from the confluence of the Gamka and Olifants rivers and is joined by the Groot River, before flowing through the Langeberg Mountains and coastal plain and eventually draining into the Indian Ocean near Gouritzmond (RHP, 2007). Dryland and irrigated agriculture (Lucerne and pasture), and livestock (cattle and sheep) are the major land uses in the primary catchment. Because most of the rivers within this catchment are dry, only one out of the eight active sites were monitored (Annexure J) in 2020/21.

There are 4 secondary catchments in this primary drainage region (Figure 50):

- J1: Groot
- J2: Gamka
- J3: Olifants
- J4: Gouritz

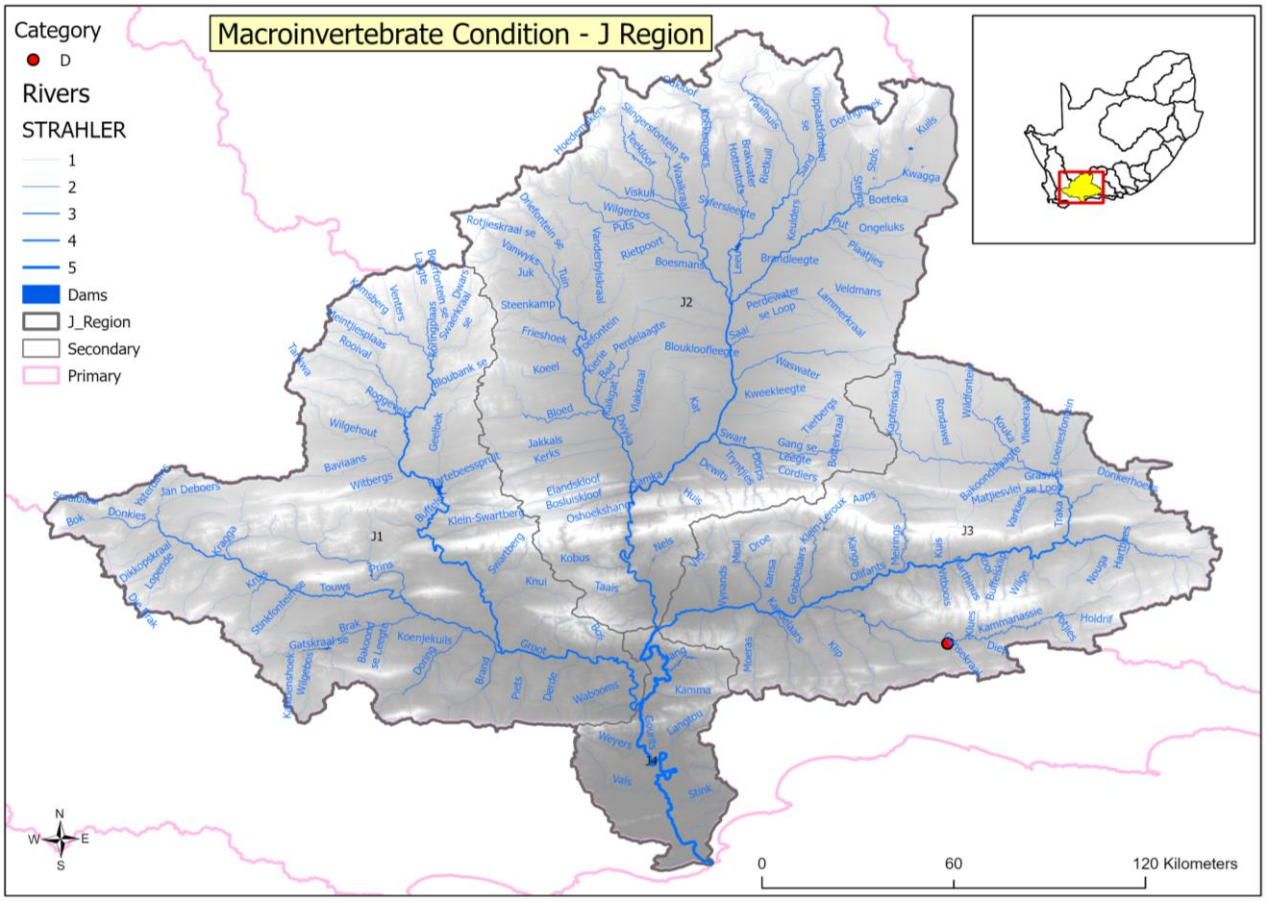

Figure 50: Summary Ecological Categories in primary drainage region J (Gouritz) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with red reflecting relatively poor conditions (D).

J1: Groot

The Groot River starts as the Buffels River as it rises in the Great Karoo, flowing through Laingsburg and the Klein Swartberg Mountains into the Little Karoo. The name changes to Groot 50 km before its confluence

with the Touws, a major tributary in the J1 secondary catchment. Livestock and domestic water use mostly depends on groundwater in this secondary catchment, due to the high salinity of surface water (RHP, 2007). Rivers in this secondary drainage area are episodic in nature and only flow during heavy rainfall events. There are three active REMP sites in this area in the flowing rivers: Doring, Touws, Buffels but these sites have been dry for years now and could therefore not be sampled.

J2: Gamka

The J2 catchment starts in the Great Karoo where a few rivers, e.g., Dwyka, Koekemoers and Leeuw rivers, join to form the Gamka River (RHP, 2007). The only active REMP site in this catchment, just downstream of the Gamkaspoort Dam, was too deep to sample. The J2 catchment ends before the Olifants joins the Gamka River.

J3: Olifants

There are three active REMP sites in this drainage region. Olifants River, Diep and Grobbelaars are the main rivers in secondary catchment J3. Only the Kammanassie River (J3KAMM-EWR10) was sampled in 2020/21, while the Meirings (J3GROO-MEIRI) and Klein le Roux (J3KLEI-EWR05) rivers were also sampled in 2018/19. The Kammanassie River has been in a largely modified (D) condition from 2018/19 onwards, while the Meirings and Klein le Roux rivers were in moderately modified (C) condition in 2018/19. Water quality, habitat destruction, extensive alien vegetation infestation, and flow reduction from ostrich farming and other agricultural activities are some of the major impacts in this catchment (RHP, 2007). The Kammanassie remained in a largely modified (D) condition.

J4: Gouritz

The Gouritz River flows from the confluence of the Gamka and Olifants rivers and is joined by the Groot River, before flowing through the Langeberg Mountains and coastal plain, eventually draining to the Indian Ocean through the Gouritz River Estuary at Gouritsmond. The only site in this secondary catchment could not be sampled due to unfavourable flow conditions.

Summary:

The dry nature of this drainage region is reflected in the sparsity of macroinvertebrate results (Figure 51). Only three sites in J3 could be sampled. The macroinvertebrate conditions in this drainage region ranges from moderately (C) to largely (D) modified.

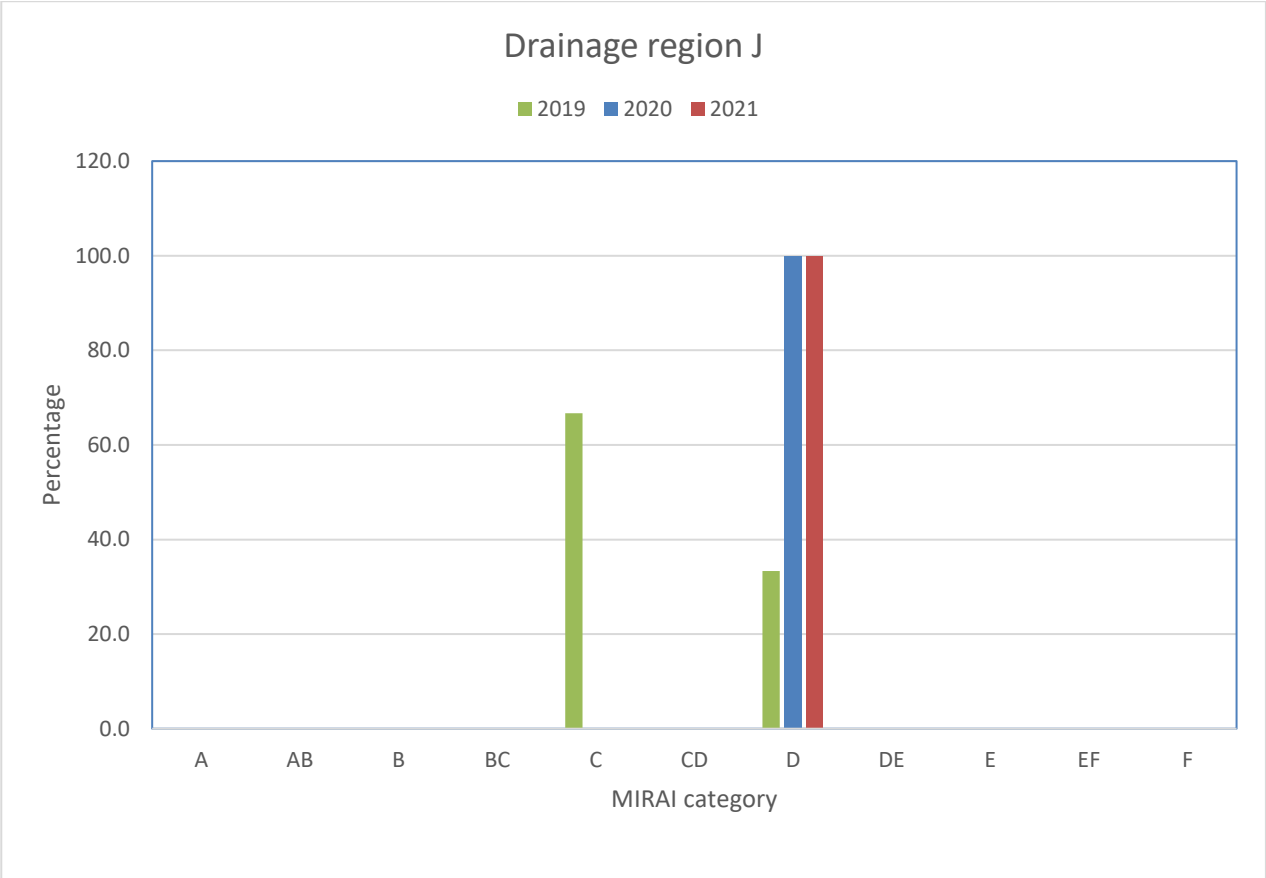

Figure 51: The percentage of sites in each ecological category in primary drainage region J (Gouritz) per hydrological year for macroinvertebrates at all sites monitored from 2018/18 to 2020/21.

DRAINAGE REGION K (BREEDE-GOURITZ AND MZIMVUBU-TSITSIKAMMA WATER MANAGEMENT AREAS)

The K primary drainage region falls within the Breede-Gouritz and Mzimvubu-Tsitsikamma WMAs. The Breede-Gouritz part of the catchment is sampled quarterly by the Breede-Gouritz Catchment Management Agency (BGCMA), and the rivers in the Mzimvubu-Tsitsikamma WMA are sampled by the Eastern Cape Regional officials in Port Elizabeth. Only 14 of the 20 active REMP monitoring sites in this drainage region were sampled in 2020/21 due to human capacity constraints and access to monitoring sites (Annexure K). Only macroinvertebrates and Habitat Integrity were monitored. The condition of the rivers in primary drainage region K is provided in Figures 52 to 54. There are nine secondary drainage regions:

- K1: Klein Brak
- K2: Groot Brak
- K3: Kaaimans
- K4: Sedgefield
- K5: Knysna
- K6: Keurbooms
- K7: Bloukrans
- K8: Tsitsikamma
- K9: Kromme/ Seekoei

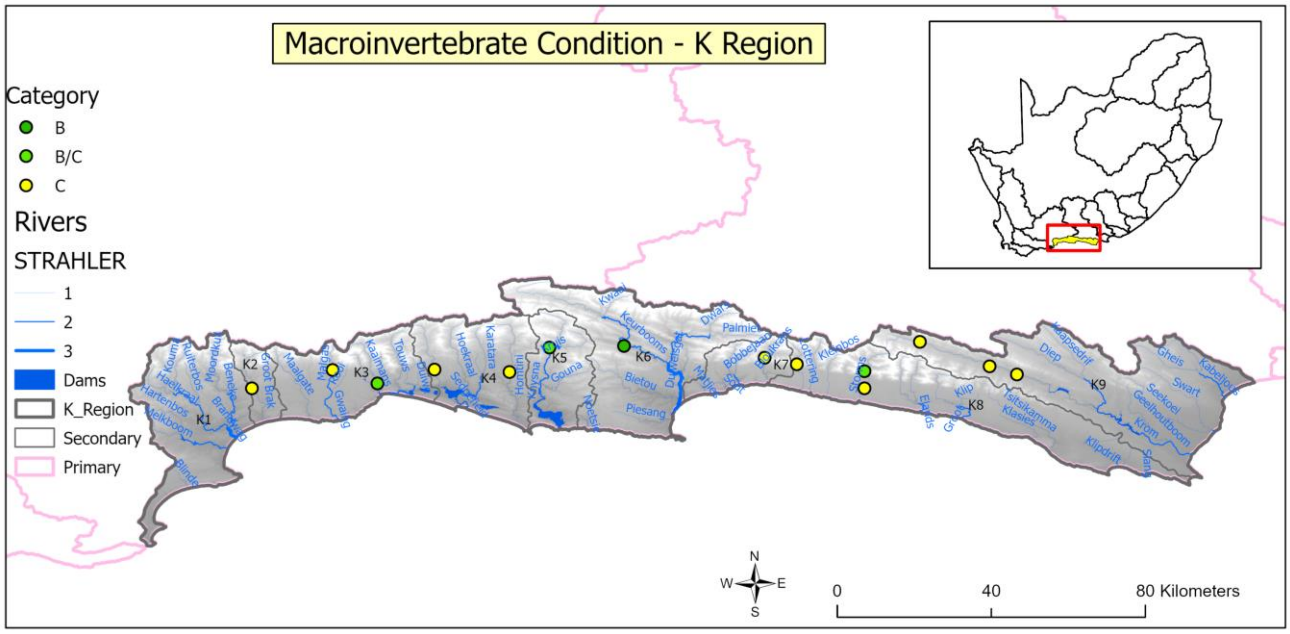

Figure 52: Summary Ecological Categories in primary drainage region K (Breede-Gouritz & Mzimvubu-Tsitsikamma) reflecting the macroinvertebrate condition for selected sites monitored during 2019/2020 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B and B/C) while the yellow reflects relatively fair conditions (C).

K1: Klein Brak

There are no active REMP sites in this catchment. The macroinvertebrates in the Moordkuil river were in a close to moderately modified (C/D) condition when they were monitored in 2017/18.

K2: Groot Brak

There is only one active REMP site in this drainage region, the Groot Brak River (K2GROO-KLEIN) upstream of Wolwedans Dam (Figure 52). The Varing River tributary of the Groot Brak was also sampled in 2017/18. Both rivers remained in a moderately modified (C) condition and does not meet the gazetted RQO of natural (A). The main impacts in this area are related to agriculture (abstraction and irrigation), alien vegetation and forestry, while the lower reaches of the Groot Brak River also experience alteration in flow from the Wolwedans Dam (DWS, 2014a).

K3: Kaaimans

The main impacts in the K3 secondary catchment are related to forestry and agriculture with the lower reaches of some rivers also impacted by the coastal towns, such as George and Wilderness (DWS, 2014b). There are several smaller rivers (Gwaing, Kaaimans, Maalgate, Silver, Swart, and Touws) in this region. There only two active monitoring sites on the Kaaimans and Malgas rivers in this region (Annexure K). The Silver and Touws rivers were also sampled in 2017/18 when they were both in a moderately modified (C) condition. The Kaaimans River (K3KAAI-GWEIR) improved from a moderately modified (C) condition in 2017/18 to a close to largely natural (B/C) condition from 2018/19 onwards. The Malgas River (K3MALG-OUTEN) was mostly in a moderately modified (C) condition but briefly improved to a close to largely natural (B/C) condition in 2018/19. These sites are surrounded by nature reserves, with some afforestation close to the Malgas site. The Kaaimans River did not comply with the gazetted RQO.

K4: Sedgefield etc.

There are several smaller rivers (Diep/Wolwe, Homtini, Sedgefield and tributaries) in this secondary catchment. Monitoring was conducted at two of the three active sites in this drainage region. The Homtini River (K4HOMT-KNYSN) has remained in a moderately modified (C) condition and does not comply with the gazetted RQO of A (natural). The Diep River (K4DIEP-DIEPR) improved from a moderately modified (C) condition in 2017/18 to a close to largely natural to moderately modified (B/C) condition in 2018/19 and to a largely natural condition (B) condition in 2019/20 but the deteriorated to a moderately modified (C) condition in 2020/21. This site only complied with the gazetted RQO of B in 2019/20. The Diep River (K4WOLW-BARND) was also sampled in 2017/18 when it was in a largely modified (D) condition. The main impacts in this area are related to indigenous forestry activities (DWS, 2014c). Minor infestation by alien vegetation, mainly black wattle (*Acacia mearnsii*) is evident in this area. Water abstraction and habitat destruction by an abstraction weir also impact the site. There is a pump station in the riparian zone of the Homtini River for the Knysna Municipality.

K5: Knysna

The Knysna River catchment is characterised by forestry in the upper reaches and tourism and light industry in the lower reaches. There is only one active REMP site on the Knysna River. The Knysna River (K5KNYS-EWR01) improved from a largely modified (C) condition in 2017/18 to a close to largely natural (B/C) condition from 2018/19 onwards but does not comply with the gazetted RQO of a B (largely natural). The Knysna site is in the upper reaches, within SANPARKS property. Thus, upstream afforestation related impacts are countered by being in a protected area and part of an alien clearing programme. The Gouna River is inundated by an abstraction weir for water abstraction by the Knysna Municipality. There is also a slight infestation by black wattle (*Acacia mearnsii*). The Gouna River does not have suitable biotopes anymore, it is too deep, and has thus been discontinued.

K6: Keurbooms

There is only one active REMP site (K6KEUR-EWR06) in this secondary catchment. The Bietou River (K6BITO-WITTE) was only sampled during 2017/18 when it was in a moderately modified (C) condition. The Keurbooms (K6KEUR-EWR06) improved from a moderately modified (C) condition in 2017/18 to a largely natural (B) condition and thus complied with the gazetted RQO objective of B from 2018/19 onwards. The site is within a largely undeveloped part of the catchment; however, the catchment does have a heavy infestation of invasive alien vegetation, mainly black wattle (T. Bushula, personal communication, 14 August 2020).

K7: Bloukrans

Of the two main rivers (Groot and Bloukrans) in this secondary catchment only a tributary of the Bloukrans River was sampled. The lower site on the Bloukrans River (K7BLOU-LOWER) could not be accessed due to repairs on the R102 road (Annexure K). The macroinvertebrate condition in the upper section of the Bloukrans River catchment (K7BLOU-UPPER) has remained moderately modified (C) condition. In contrast the instream and riparian habitat at this site were in a natural (A) condition (2019/20). This is a mostly natural area with some forestry in the upper reaches and mostly tourism in the lower reaches. The modification in the invertebrate condition at the upper site may have been exacerbated by the continuing drought.

K8: Tsitsikamma etc.

There are several smaller rivers (Elands, Elandsbos, Kleinbos, Lotterings, Storms, Groot, Klasies, Tsitsikamma and Klipdrift) in this secondary catchment. There are seven active REMP sites in this catchment. Only three sites could be sampled in 2020/21 (Annexure K). Large areas in this secondary catchment are under protection, in the form of the Formosa Nature Reserve and Tsitsikamma National Park while the other sites are surrounded by agricultural activities (DWS, 2014d).

Macroinvertebrates:

The macroinvertebrates could only be sampled in the Storms and upper Lotterings rivers in 2020/21. The Groot River (K8GROO-LOWER) remained in a moderately modified (C) condition. The upper Storms River (K8STOR-UPPER) gradually improved over the years from a close to moderately modified (C/D) condition in 2017/18 to a close to largely natural (B/C) condition from 2019/20 onwards, while the Elandsbos River (K8ELAN-UPPER) improved from a close to largely natural (B/C) to a largely natural (B) condition from 2018/19 onwards. The lower Lotterings River (K8LOTT-LOWER) improved from a moderately modified (C) condition to a close to largely natural (B/C) condition in 2019/20 but the upper Lotterings (K8LOTT-UPPER) and lower Storms (K8STOR-LOWER) rivers fluctuated between a close to largely natural(B/C) and a moderately modified (C) condition.

Habitat Integrity:

The habitat condition was monitored at five sites in 2019/20. The instream habitat condition ranged from a natural (A) condition at the upper Storms River (K8STOR-UPPER) to a largely modified (D) condition at the Groot River (K8GROO-LOWER) while the other three sites were in a largely natural (B) and close to largely natural (B/C) condition. The riparian habitat condition at the Groot River (K8GROO-LOWER) was also in a largely modified (D) condition while that of the upper Storms River (K8STOR-UPPER) was in a close to natural (A/B) condition. The riparian habitat at the other three sites were also in a largely natural (B/C) and close to moderately modified (B/C) condition.

K9: Kromme/ Seekoei

The secondary drainage comprised of three active REMP active sites. Only the Kromme River was sampled in this secondary catchment. The macroinvertebrates and fluvial geomorphology (GAI) were monitored at all three sites while the habitat integrity was only monitored at two of the sites. These sites are affected by agricultural activities in the Langkloof, flow regulation from Churchill and Mpofu dams as well as impacts from the town of Kareedouw (DWS, 2014e; 2019f).

Macroinvertebrates:

The macroinvertebrate condition at all three sites were moderately modified (C) in 2020/21. The upper site in (K9KROM-BOJAN) remained in a moderately modified (C) condition. The macroinvertebrate at the two sites further downstream (K9KROM-MELKH, K9KROM-DEWIL) fluctuated between moderately (C) and largely modified (D).

Habitat Integrity:

The IHI was only conducted once in 2019/20. The instream and riparian Habitat condition at the lower site in the Kromme River (K9KROM-DEWIL) were in a moderately modified (C) condition whereas the habitat at the upper Kromme River (K9KROM-BOJAN) were in a poorer condition with the instream habitat in a largely modified (D) condition and the riparian habitat in a seriously modified (E) condition.

Geomorphology:

The Geomorphology was only assessed once in 2018/19 and all three sites were in a moderately modified (C) condition.

Summary:

The invertebrate condition in this drainage region ranges from a largely natural (B) to a largely modified (D) condition but most sites are in moderately modified (C) condition (Figure 53). When comparing only those sites that were sampled in each year from 2016/17 to 2020/21 (Figure 54) the invertebrate condition seems to be improving with more sites in a better condition (B & B/C) and fewer sites in a poorer (C & C/D) condition.

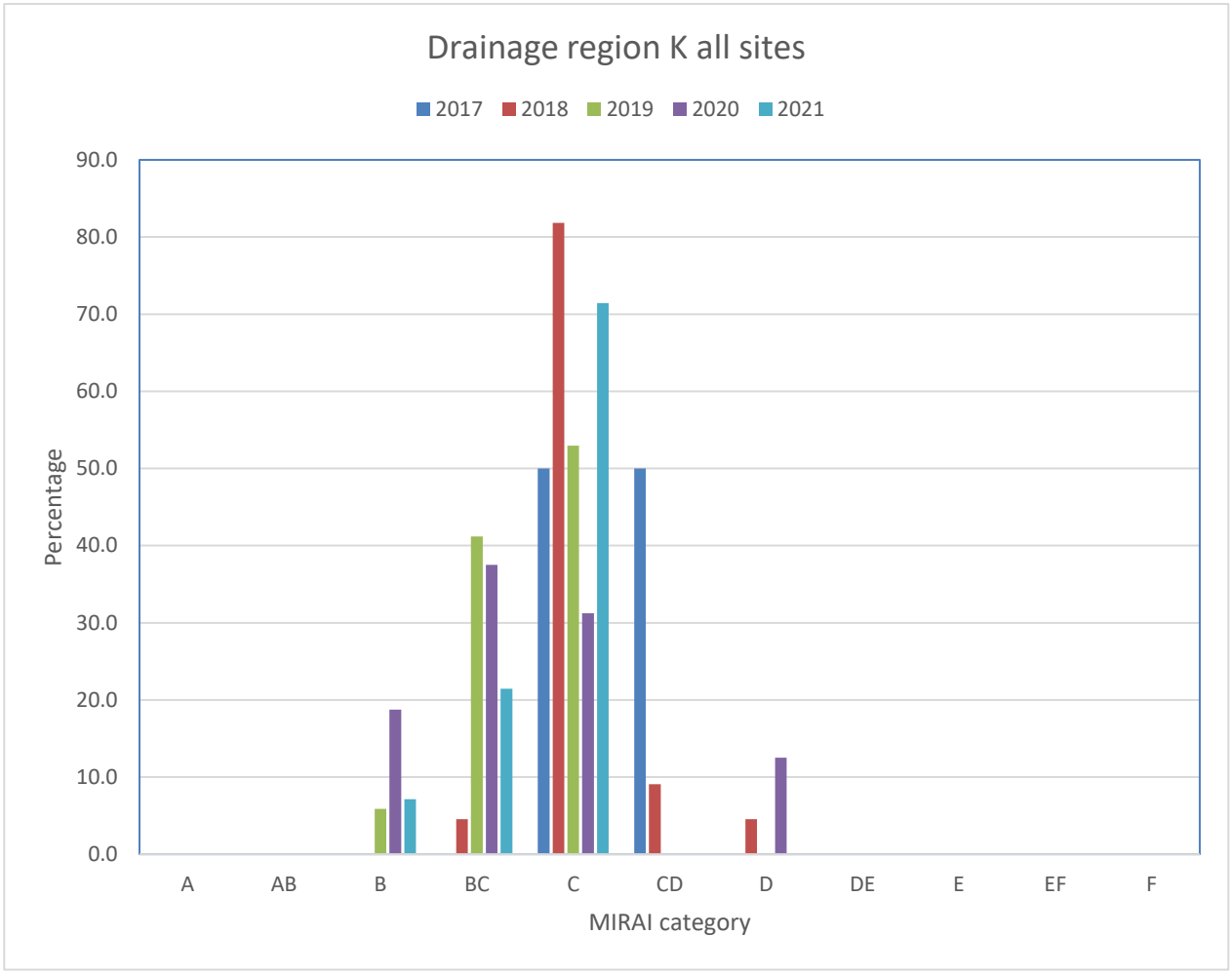

Figure 53: The percentage of sites in each ecological category in primary drainage region K (Breede-Gouritz & Mzimvubu-Tsitsikamma) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2020/21.

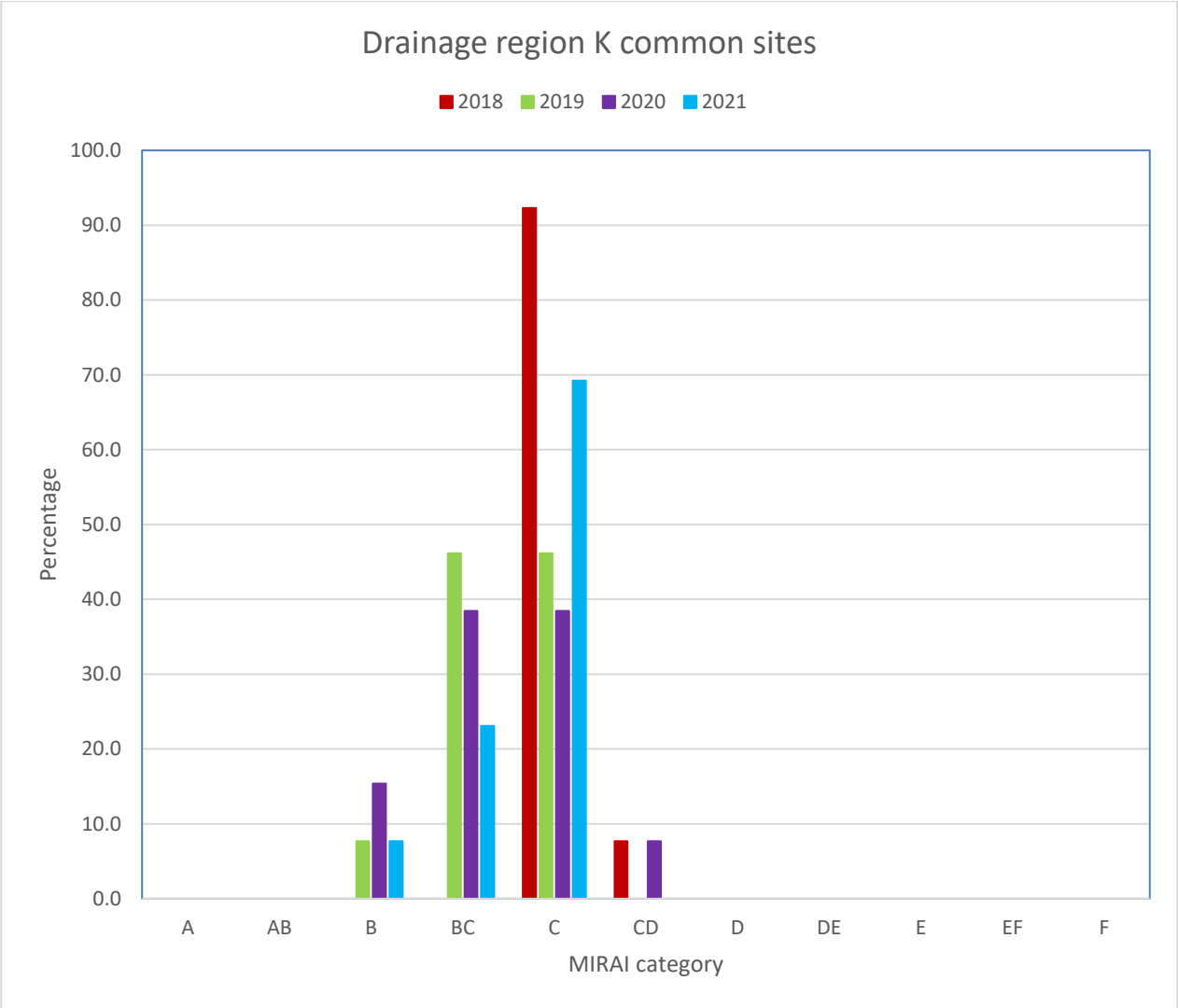

Figure 54: The percentage of sites in each ecological category in primary drainage region K (Breede-Gouritz & Mzimvubu-Tsitsikamma) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2020/21.

DRAINAGE REGION L (MZIMVUBU-TSITSIKAMMA WATER MANAGEMENT AREA)

The L primary drainage region falls within the Mzimvubu-Tsitsikamma WMA. This drainage region was sampled by the Eastern Cape Regional Office staff in Port Elizabeth. This primary catchment is generally dry with limited rainfall (DWS, 2018a). There are four active REMP monitoring sites in this drainage region. Monitoring at four other sites was discontinued due to concerns of wild animals in the Baviaanskloof, mining of the riverbed in one of the Groot River sites, and access issues at Nabooms River (Annexure L). Only two of the four active sites could be monitored in this hydrological year due to unsuitable flow conditions. There are 9 secondary drainage regions but only three (L7-L9) were sampled. The secondary catchments that were not sampled are mostly ephemeral in nature and thus not suitable for the SASS protocol.

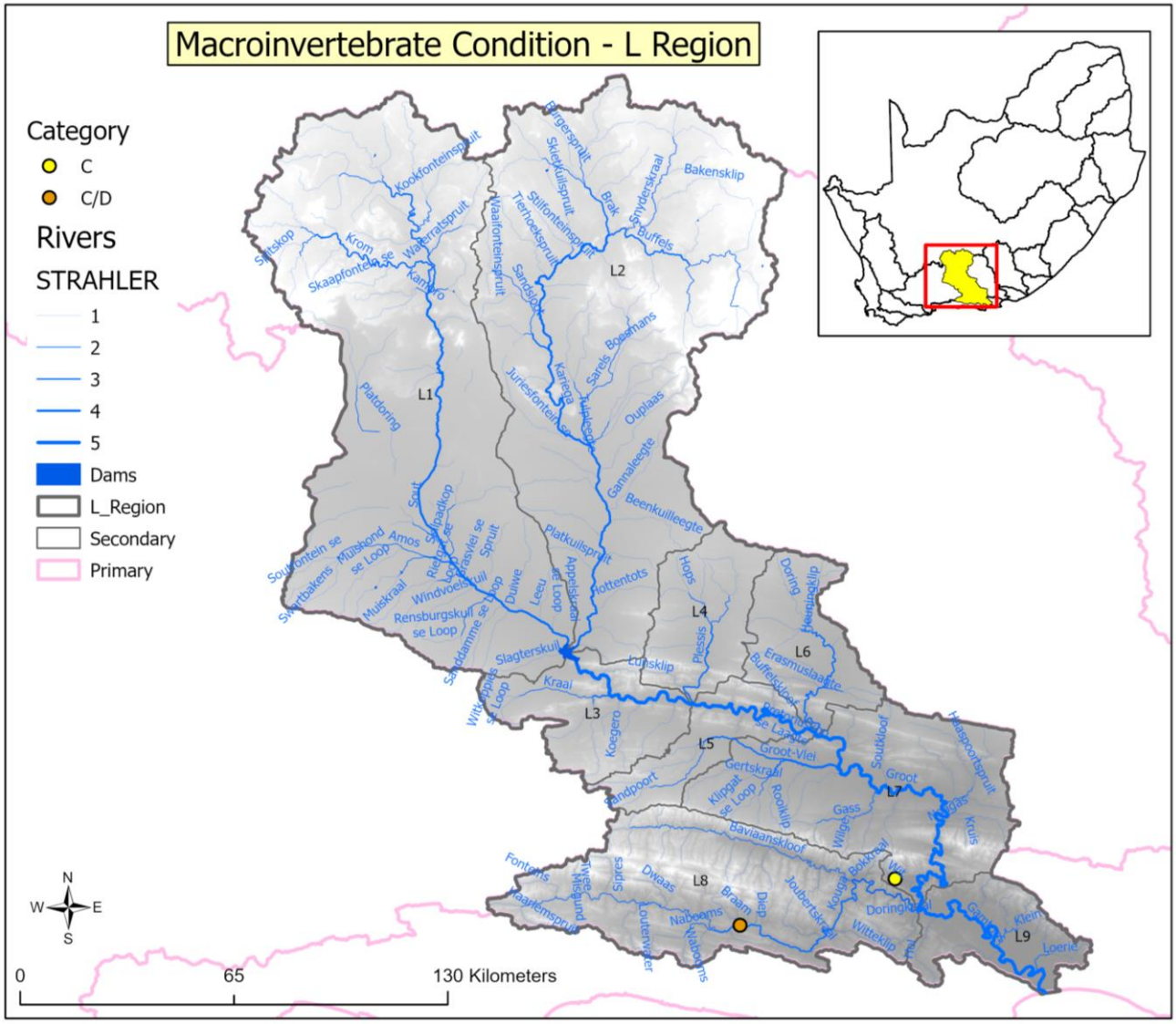

Figure 55: Summary Ecological Categories in primary drainage region L (Kouga-Gamtoos) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with yellow reflects relatively fair conditions (C).

- L1: Sout (ephemeral)
- L2: Kariega (ephemeral)
- L3: Groot (ephemeral)
- L4: Plessis (ephemeral)
- L5: Groot (ephemeral)
- L6: Heuningklip (ephemeral)
- L7: Groot
- L8: Kouga
- L9: Gamtoos

L7: Groot

There is only one site in this secondary catchment on the Wit River. The site on the Groot River was discontinued as the riverbed is mined and could not be sampled. The invertebrates at the site on the Wit River (L7WITR-GROOT), located in the Baviaanskloof Mega Reserve, deteriorated from a close to largely natural (B/C) condition to a moderately modified (C) condition. This deterioration evident in the macroinvertebrate assemblage is most likely a response to decreased flow conditions. The riparian vegetation was in a largely natural (B) condition while the instream and riparian habitat Integrity were in a close to largely natural (B/C) condition. These results reflect the generally good condition in the upper part of the catchment with minimal impacts.

L8: Kouga

There are two sites in this secondary catchment but only one of the sites was sampled. The Groot River (L8KOUG-BOKOU) site could not be sampled in 2020/21 due to insufficient flows but the macroinvertebrates remained in a moderately modified (C) condition from 2016/17 to 2019/20. The macroinvertebrate assemblage in the Kouga River (L8KOUG-OPKOM) deteriorated from a moderately modified (C) condition to a moderate-largely modified (C/D) condition. This deterioration evident in the macroinvertebrate assemblage is most likely a response to decreased flow conditions. The riparian vegetation at the Kouga River was in a largely modified (D) condition while the instream habitat was in a close to critically modified (E/F) condition and the riparian habitat in a seriously modified (E) condition.

L9: Gamtoos

The Gamtoos River at Patensie could not be sampled in 2019/20 and 2020/21 due to insufficient flows in the river. The macroinvertebrate condition deteriorated from moderately modified (C) in 2016/17 to a largely modified (D) in 2017/18 and 2018/19. This site is in an area of irrigated agriculture (citrus and vegetables) downstream of the Kouga River dam. Flow at the site is modified by the dam and return flows from agriculture (DWS, 2018a). This drainage region is experiencing a very severe drought with the Kouga Dam at just under 10% of capacity.

Summary:

Invertebrates:

The macroinvertebrates in this drainage region have remained in mostly a moderately modified (C) condition (Figures 56 and 57) with the Kouga River alternating between a moderately modified (C) and a close to largely natural (B/C) condition and the Gamtoos River between a moderately modified (C) and a largely modified (C/D) condition. The biggest impact in this drainage region is related to insufficient flows.

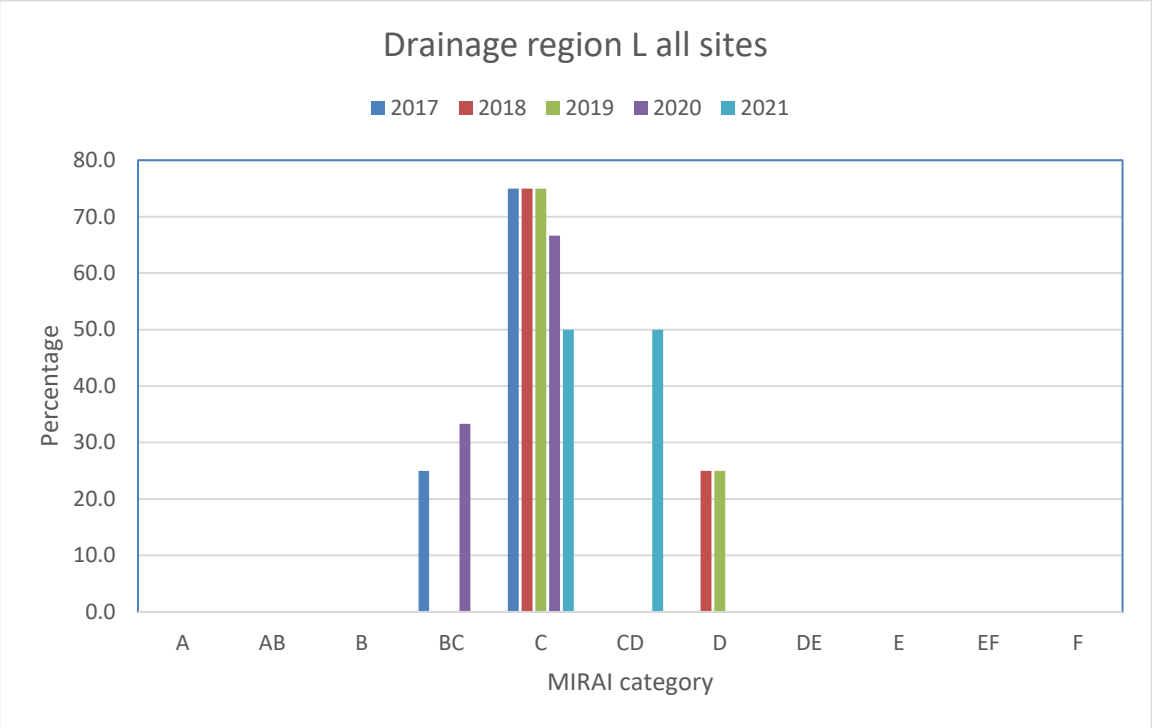

Figure 56: The percentage of sites in each ecological category in primary drainage region L (Kouga-Gamtoos) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2020/21.

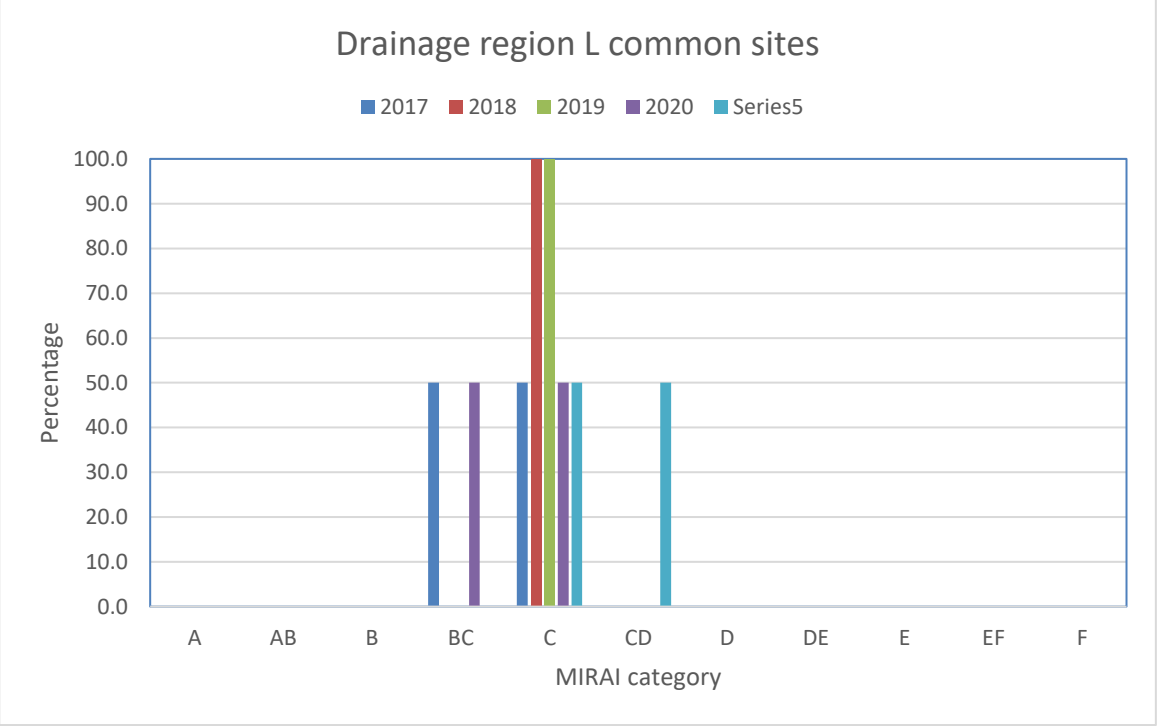

Figure 57: The percentage of sites in each ecological category in primary drainage region L (Kouga-Gamtoos) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2020/21.

DRAINAGE REGION M (MZIMVUBU-TSITSIKAMMA WATER MANAGEMENT AREA)

The M primary drainage region falls within the Mzimvubu-Tsitsikamma WMA. This drainage region was sampled by the Eastern Cape Regional officials in Port Elizabeth. There is only one active REMP monitoring site in this drainage region (Annexure M). There are three secondary drainage regions but only the Swartkops (M1) was sampled.

- M1: Swartkops
- M2: van Stadens etc. (not sampled)
- M3: Coega (not sampled)

The KwaZungu (Swartkops) River downstream of the Groendal Dam was the only section of the Swartkops River that was sampled. The sites lower down in the Swartkops River are so polluted by sewerage that sampling is a health risk. Sand mining is taking place in the Brak River. The KwaZungu River remained in a moderately modified (C) condition (Figure 58). Flow is modified by the Groendal Dam (DWS, 2019g).

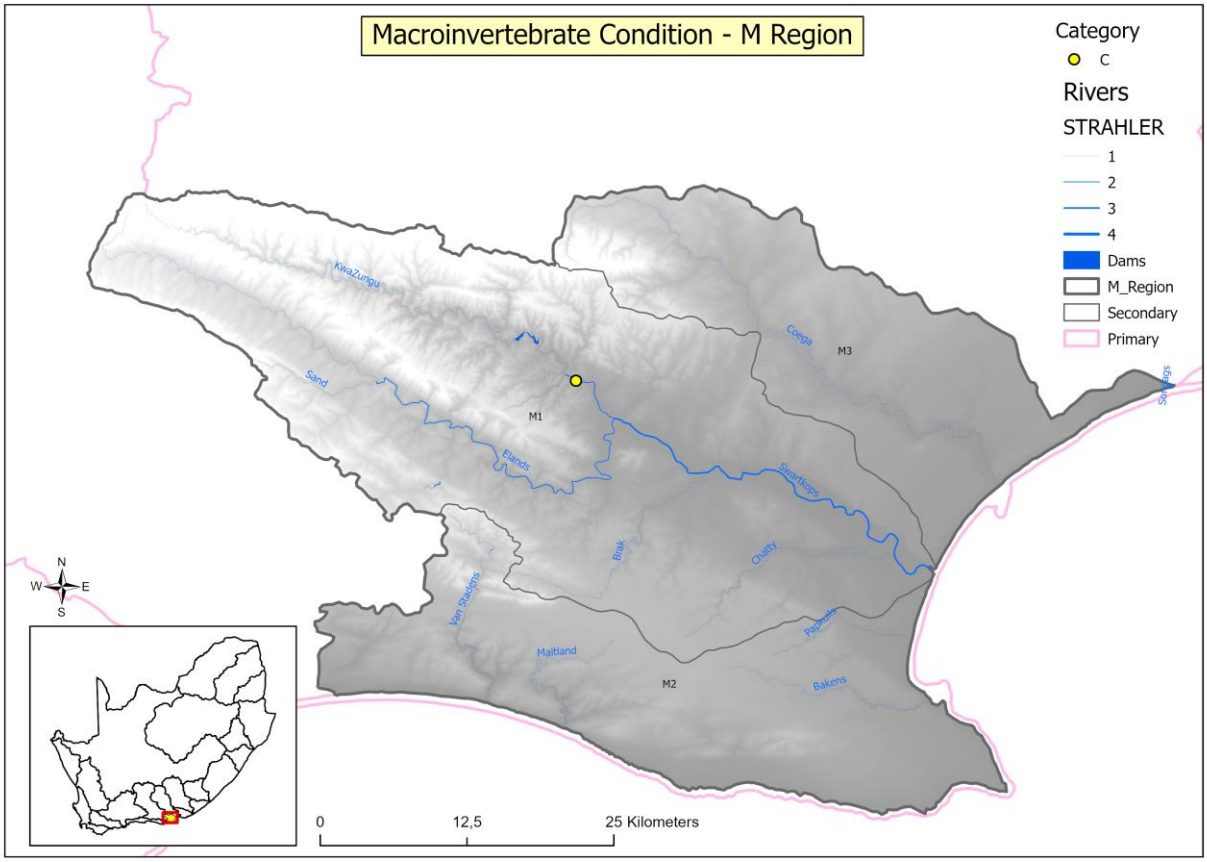

Figure 58: Summary Ecological Categories in primary drainage region M (Swartkops) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circle indicates the Ecological Condition with yellow representing relatively fair conditions (C).

DRAINAGE REGION P (MZIMVUBU-TSITSIKAMMA WATER MANAGEMENT AREA)

The P primary drainage region falls within the Mzimvubu-Tsitsikamma WMA. This drainage region was sampled by the Eastern Cape Regional staff in Port Elizabeth. There are four secondary drainage regions but only the Kowie (P4) is sampled. No sites were sampled during this hydrological year due to severe pollution at P4BLOU-RAILW and unsuitable flow conditions at the other sites (Annexure P).

- P1: Boesmans
- P2: Boknes etc.
- P3: Kariega
- P4: Kowie

Summary

Based on previous years' data the macroinvertebrates in this drainage region are mostly in a moderately modified (C) condition (Figures 59 and 60) although there seems to be a declining trend in the upper sections of both the Bloukrans and the Kowie rivers. The upper Bloukrans River (P4BLOU-RAILW) in Makhanda declined from a largely modified (D) in 2016/17 to a close to largely modified (D/E) condition in 2017/18. Since then, the site has become so polluted that it became a health risk to conduct instream monitoring.

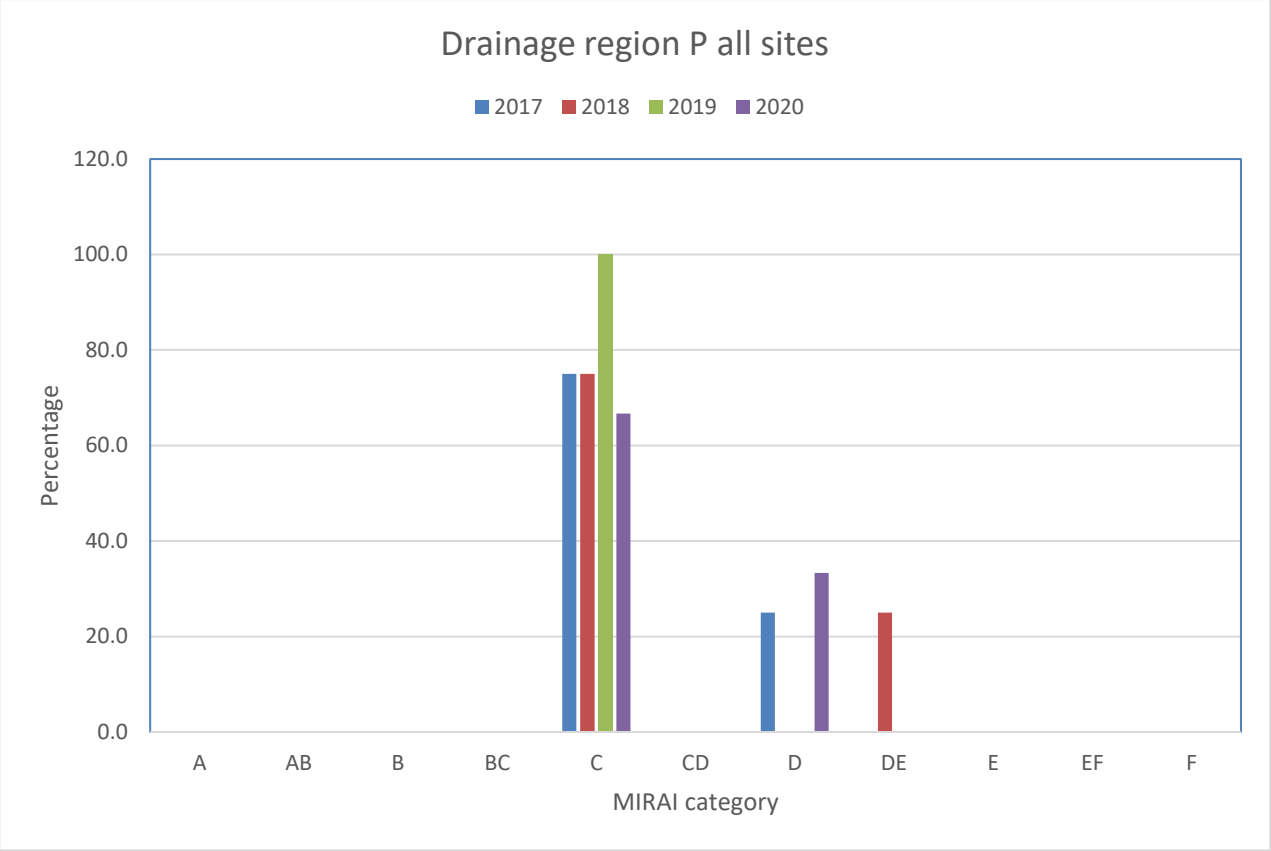

Figure 59: The percentage of sites in each ecological category in primary drainage region P (Kowie) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2019/20.

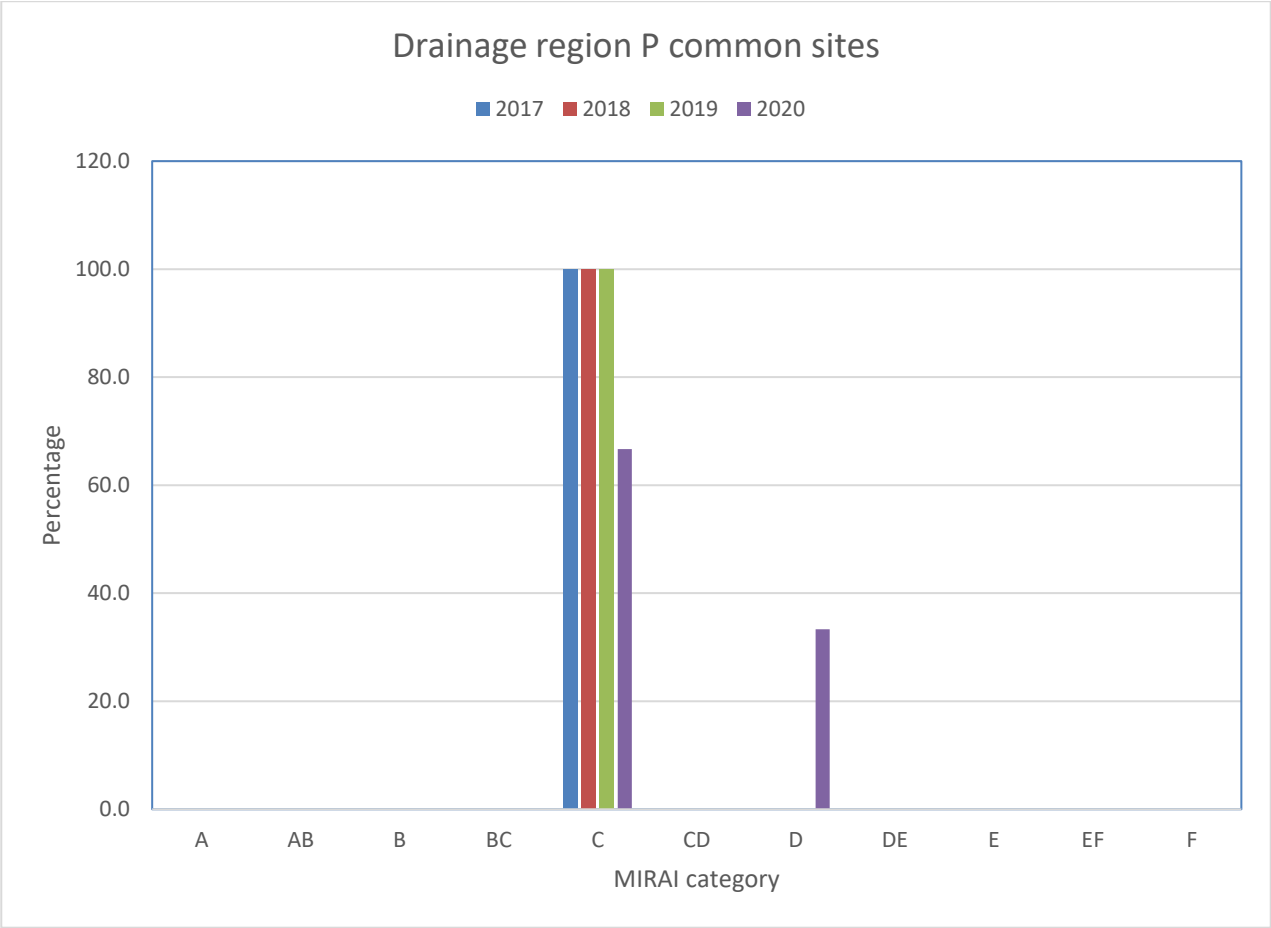

Figure 60: The percentage of sites in each ecological category in primary drainage region P (Kowie) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2019/20.

DRAINAGE REGION Q (MZIMVUBU-TSITSIKAMMA WATER MANAGEMENT AREA)

The Q primary drainage region (Great Fish River) falls within the Mzimvubu-Tsitsikamma WMA. This drainage region was sampled quarterly by the Eastern Cape Regional staff in East London. There are three active REMP monitoring sites in this drainage region. The IHI were monitored at all three sites, but the macroinvertebrates were only sampled at two of the sites (Q9KATR-BRIDG and Q9BALF-SODOM). There are nine secondary drainage regions but only Q9 was sampled. A list of the monitoring sites including reasons for not sampling is provided in Annexure Q**.**

- Q1: Great Fish
- Q2: Great Fish.
- Q3: Great Fish
- Q4: Tarka
- Q5: Great Fish
- Q6: Baviaans.
- Q7: Great Fish
- Q8: Little Fish
- Q9: Great Fish

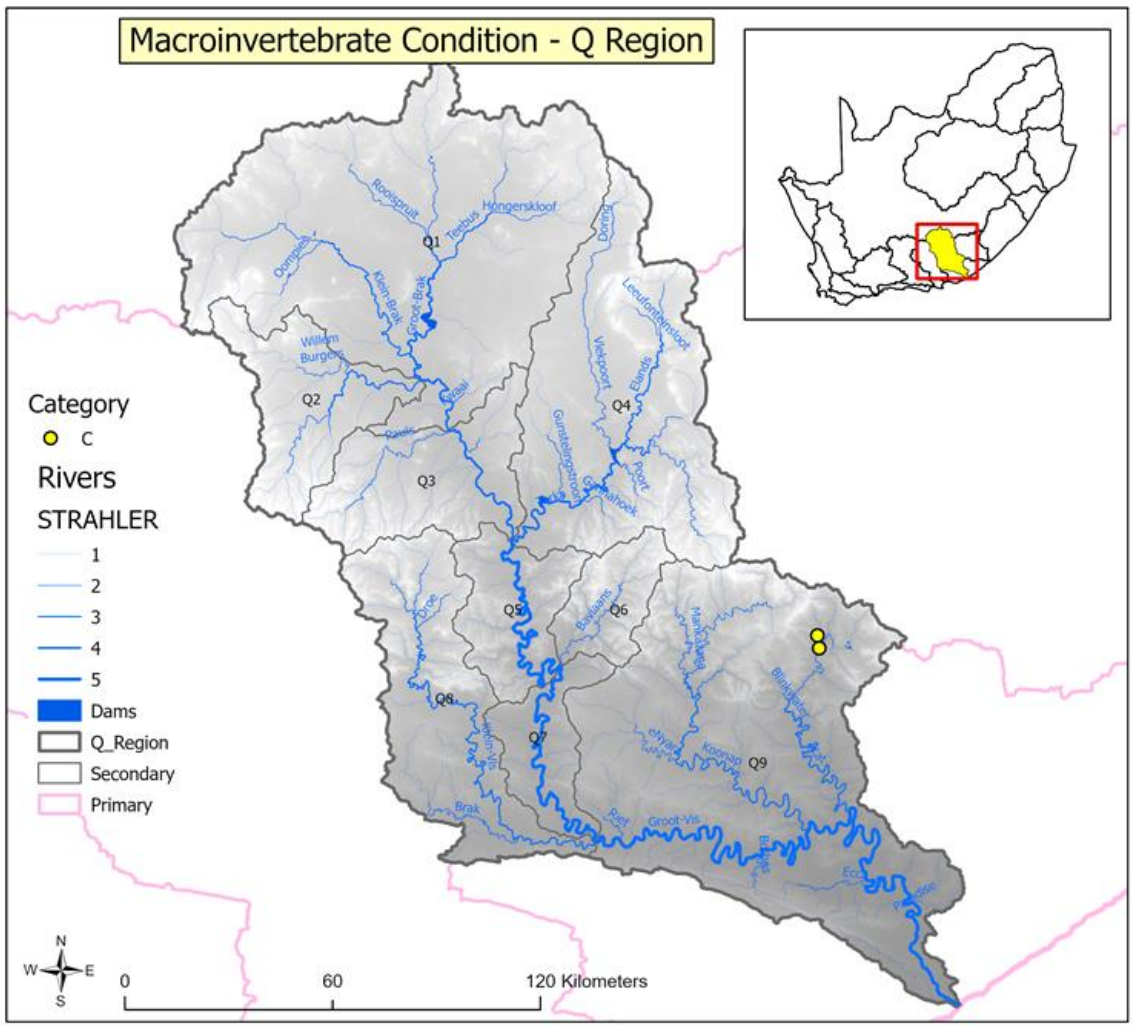

Figure 61: Summary Ecological Categories in primary drainage region Q (Great Fish) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good (B) conditions and yellow representing relatively fair conditions (C).

The Great Fish River is naturally quite dry, but currently experiences high flow due to the Orange-Fish Inter Basin Transfer (IBT) Scheme. Water is diverted from the Orange River to the Great Fish River via the Orange-Fish Tunnel and the Teebusspruit. A portion of this water is also diverted to the Sundays River Catchment via the Little Fish River and the Skoenmakers Canal. This transfer scheme has resulted in higher flows in a large part of the catchment making sampling impractical. As such it was decided to focus only on the Kat River part of the Q9 secondary catchment as it is not affected by the IBT scheme.

The Kat River macroinvertebrate condition was mostly moderately modified (C) but briefly improved to a largely natural (B) condition in 2019/20. The Balfour River (a tributary of the Kat) remained in a moderately modified (C) condition (Figure 61). The IHI was only conducted in 2019/20. The instream habitat at both sites were in a moderately modified (C) condition while the riparian habitat in the Kat River was also in a moderately modified (C) condition the riparian habitat in the Balfour river was in a poorer largely modified (D) condition.

Summary

The macroinvertebrates in this drainage region have remained in mostly a moderately modified (C) condition (Figure 62) with the Kat River alternating between a moderately modified (C) and a close to largely natural (B) condition and Balfour River remaining at a moderately modified (C) condition. This reasonably good condition in the macroinvertebrate assemblage is to be expected as these sites are in the upper part of the catchment without major impacts.

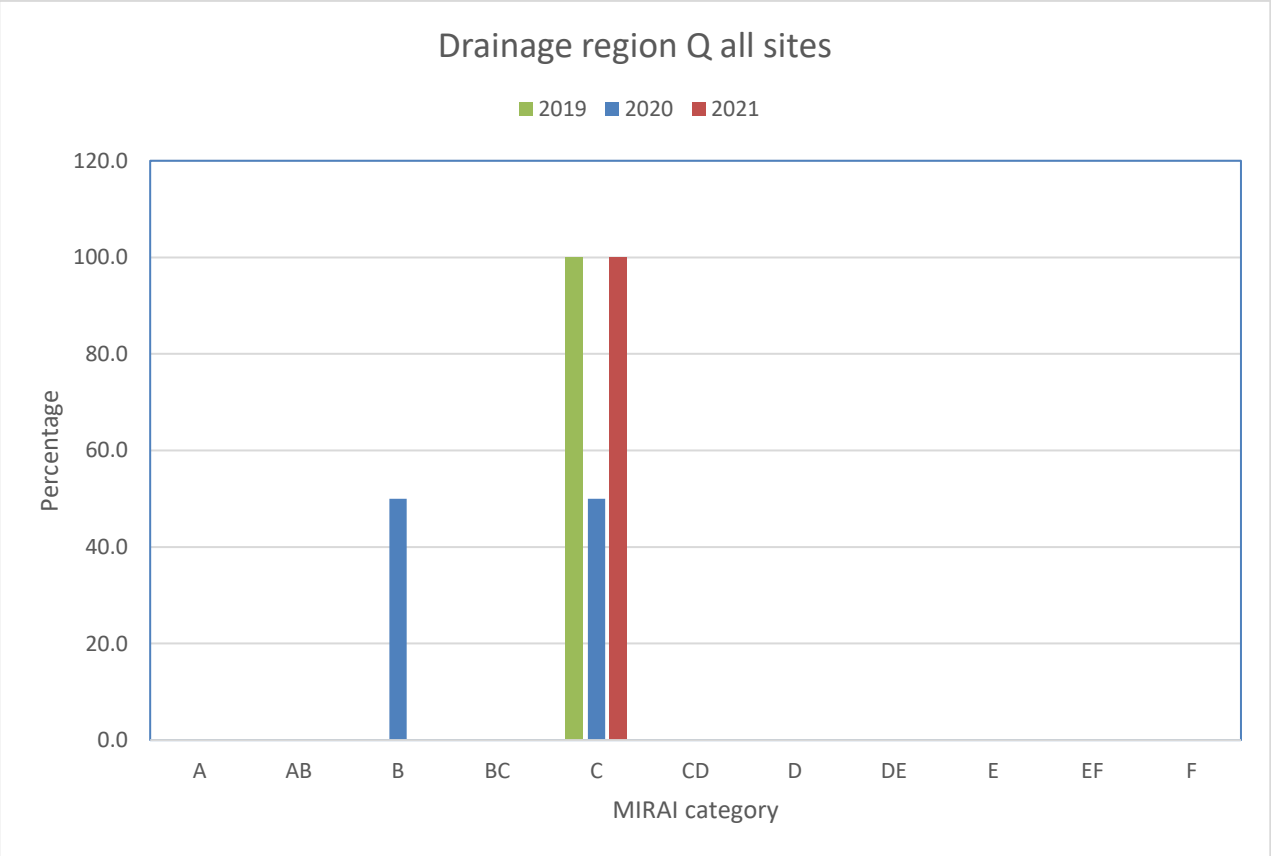

Figure 62: The percentage of sites in each ecological category in primary drainage region Q (Great Fish) per hydrological year for macroinvertebrates at all sites monitored from 2018/19 to 2019/20.

DRAINAGE REGION R (MZIMVUBU-TSITSIKAMMA WATER MANAGEMENT AREA)

The R region is formed by the secondary catchments around the East London area; there are 17 active monitoring sites in five secondary drainage regions (Figure 63 and 64) but only the Keiskamma (R1) and Buffalo (R2) were sampled. Annexure R has more detailed tables of the sites. Land use ranges from urban development, nature reserves closer to the coast to more rural and farming inland. Various water transfer schemes augment the areas with high water demand, for example Keiskamma River to Birha River and Wriggleswade Dam to Buffalo and Nahoon rivers (ISP, 2004).

- R1: Keiskamma
- R2: Buffalo
- R3: Nahoon (not sampled)
- R4: Tyolomnqa (not sampled)
- R5: Mpekweni, Mtati, Mgwalana, Birha (not sampled)

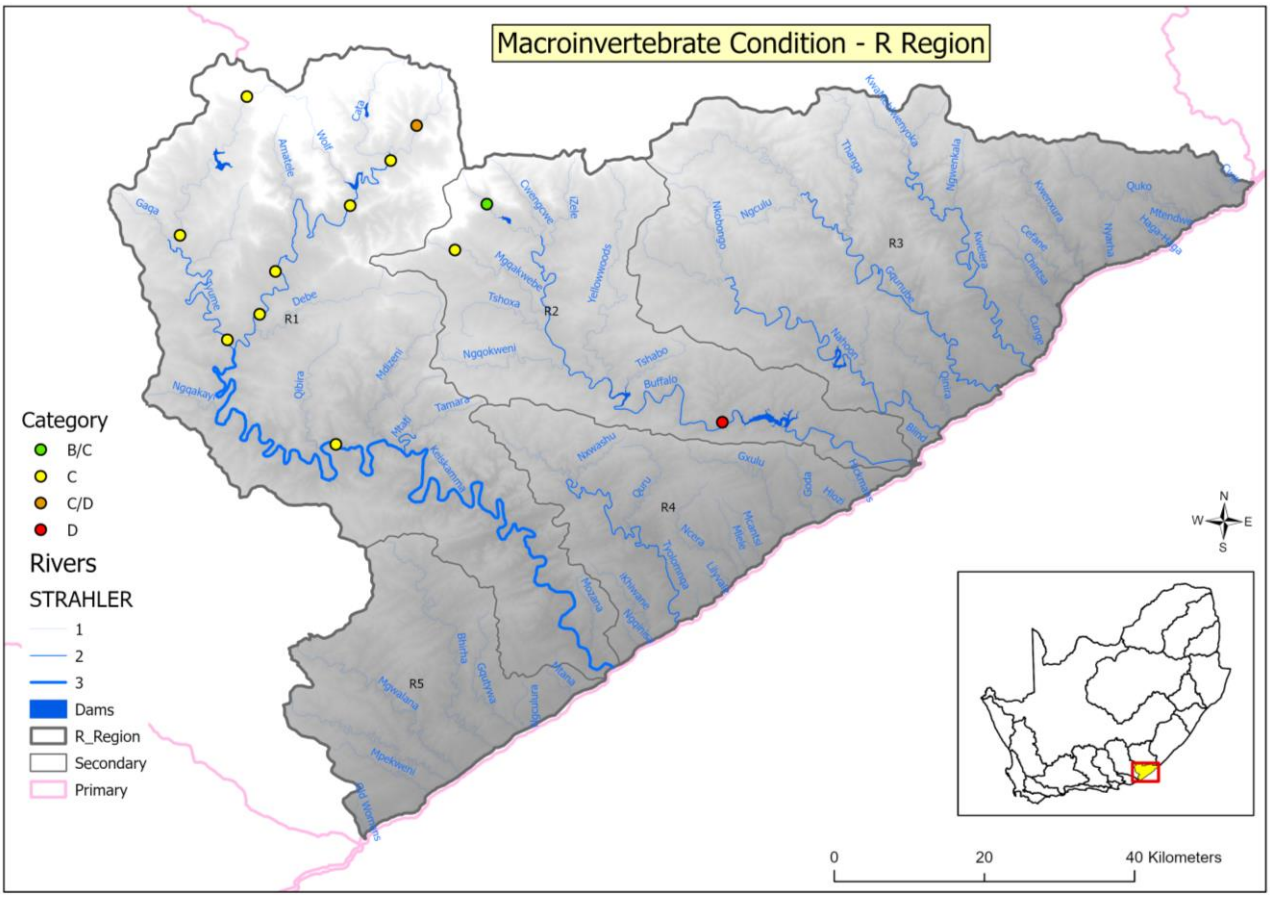

Figure 63: Summary Ecological Categories in primary drainage region R (Keiskamma & Buffalo) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B to B/C) while the red reflects relatively poor conditions (D).

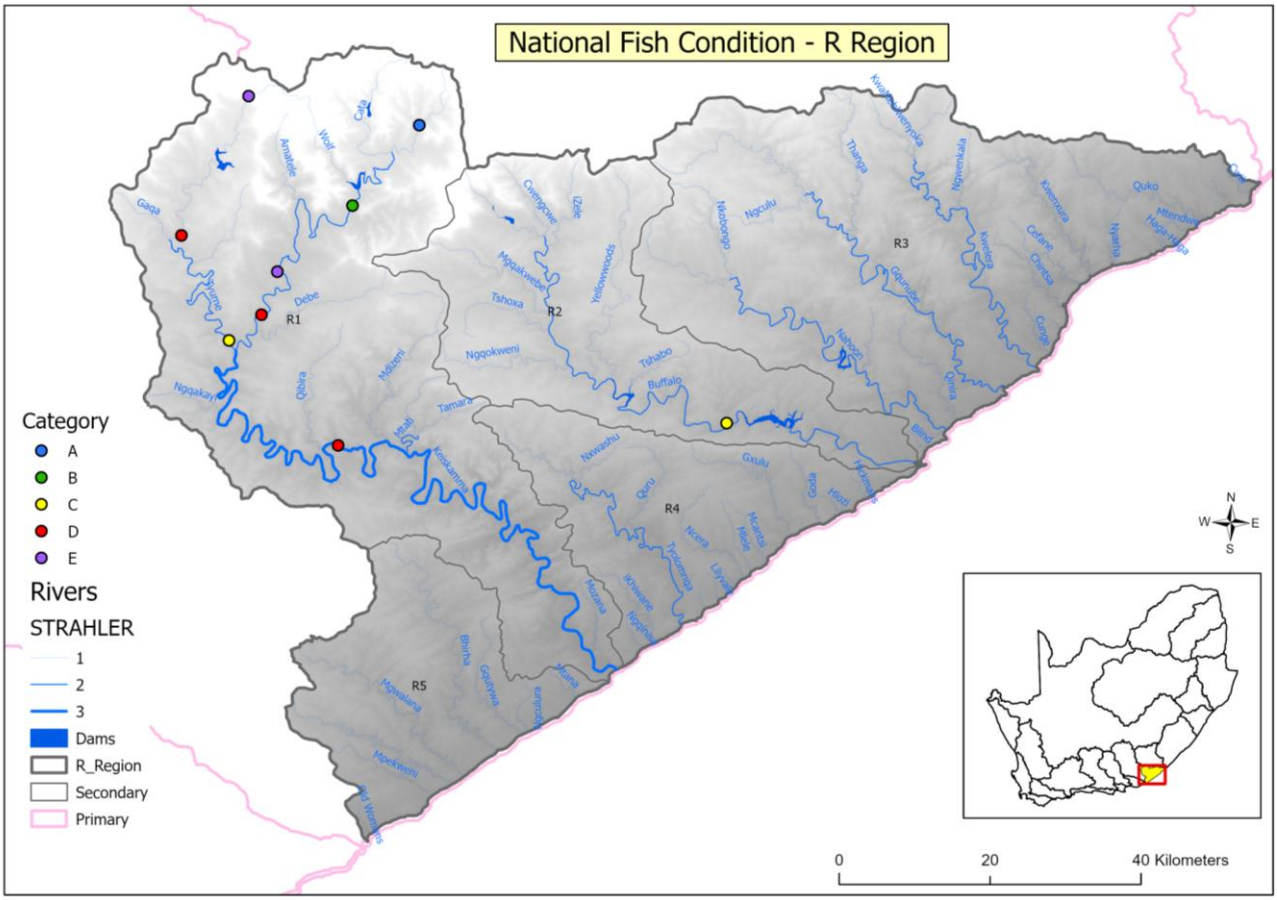

Figure 64: Summary Ecological Categories in primary drainage region R (Keiskamma & Buffalo) reflecting the fish condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A-B) while the red and purple reflects relatively poor conditions (D-E).

R1: Keiskamma

The major river in this secondary catchment is the Keiskamma. The source of the river is at the Amatola escarpment and flows into the Indian Ocean through the Keiskamma Estuary, within the Hamburg Nature Reserve. There are numerous tributaries that drain into the Keiskamma, namely the Gqubushe, Wolf, Amatole, Debe, Nxalawe, Tyume, Qibira, Zalara, Mtati, Mgwanggqa, Nquntsi, Mtombe, KwaDube, Tyityaba, Mkalane, Wawana, Wawa, Tuwa, Nyulutsi and Mozana streams. The catchment is relatively undeveloped with most land being communal and used predominantly for stock grazing or dry land cultivation. Commercial forestry (less than 1000ha) is present in the upper reaches of the Keiskamma and Tyume rivers. The main formal towns are Alice, Middeldrift and Keiskammahoek in the upper catchment and Hamburg at the mouth of the Keiskamma River (DWS, 2018c).

Invertebrates:

Monitoring was conducted at nine sites spanning the Keiskamma and Tyume Rivers. Overall, most of these sites were in moderately modified (C) conditions (eight out of nine). Five of these sites maintained the same category they were in the previous hydrological year, the Keiskamma River downstream of the Qibira River confluence (R1KEIS-GCINI) deteriorated from a largely natural condition (B/C) to a moderately modified (C) condition. The area is mostly undeveloped with some low-density rural settlements. The Tyume River at

Hogsback, near its source (R1TYUM-HOGSB) deteriorated from a largely natural condition (B) to a moderately modified (C) condition. R1KEIS-SMBRI deteriorated from a moderately modified (C) condition to a close to a largely modified (C/D) condition. This deterioration of the macroinvertebrate assemblage could be due to low flow conditions. Only one site on the Keiskamma River (R1KEIS-BSMA) near Keiskammahoek improved steadily from a largely modified (D) in 2017/18 to moderately modified (C) in 2020/21. Three sites (R1KEIS-BESAN, R1KEIS-SMBRI, R1TYUM-BECON) deteriorated steadily from 2017/18 onwards while another 3 sites (R1KEIS-BEXEB, R1KEIS-EWRO1, R1TYUM-FORTH) remained in the same condition. The Keiskamma River at Qamdobowa (R1KEIS-GCINI) fluctuated between moderately modified (C) and close to largely natural (B/C) conditions and the upper Tyume River at Hogsback between a largely natural (B) and moderately modified (C) conditions.

Fish:

The fish was sampled at eight sites in 2017/18 and in 2020/21. The fish condition in 2020/21 ranged from natural (A) in the upper Keiskamma River (R1KEIS-SMBRI, R1KEIS-BESAN) to seriously modified (E) in the upper reaches of the Tyume River at Hogsback (R1TYUM-HOGSB) and the Keiskamma at Middeldrift (R1KEIS-BEXEB). The fish condition at Hogsback is severely impacted by the presence of exotic rainbow trout (Oncorhynchus mykiss) while the habitat in the Keiskamma River at Middeldrift was affected by sedimentation, solid waste dumping and eutrophication. Most of the sites were in a largely modified (D) condition in 2020/21. The fish condition at four sites deteriorated from the previous survey in 2017/18 with two sites (R1KEIS-SMBRI, R1TYUM-BECON) remaining in the same condition and only the Keiskamma River downstream of Sandile Dam (R1KEIS-BESAN) improving.

Riparian Vegetation:

The riparian vegetation was only assessed at five sites in 2018/19. The riparian vegetation was mostly in a moderately modified (C) condition. The riparian vegetation in the Tyume River improved from a moderately modified (C) condition at Hogsback and Fort Hare to a close to largely natural (B/C) just upstream of its confluence with the Keiskamma River. The riparian vegetation in the Keiskamma River improved from a close to moderately modified (C/D) condition at Keiskammahoek (R1KEIS-BSMBRI) to a moderately modified (C) condition downstream of Sandile Dam (R1KEIS-BESAN).

Geomorphology:

The GAI was conducted at nine sites in 2017/18 and at seven sites in 2018/19. The geomorphological condition in this catchment was generally in a good condition ranging from natural (A) in the upper and lower Tyume River (R1TYUM-HOGSB, R1TYUM-BECON) to moderately modified (C) in the Keiskamma River downstream of Sandile Dam (R1KEIS-BESAN) and at the EWR site downstream of Middeldrift (R1KEIS-EWR01). The geomorphology remained mostly in the same condition but improved at the middle Tyume River (R1TYUM-FORTH) and the Keiskamma River at Middeldrift (R1KEIS-BEXEB) from moderately modified (C) to largely natural (B) and at the Keiskamma River downstream of Sandile Dam (R1KEIS-BESAN) from a close to moderately modified (C/D) to a largely modified (D) condition.

Habitat Integrity:

The IHI was only conducted in 2017/18. The instream and riparian habitat were mostly in a moderately modified (C) condition. The instream habitat ranged from natural (A) at two sites in the Tyume River (R1TYUM-HOGSB, R1TYUM-BECON) to largely modified (D) at the Keiskamma at Qamdobowa (R1KEIS-GCINI). The Riparian habitat ranged from natural (A) at two sites in the Tyume River (R1TYUM-FORTH, R1TYUM-BECON) and the Keiskamma River downstream of Sandile Dam (R1KEIS-BESAN) to close to moderately

modified (C/D) in the middle reaches of the Tyume River (R1TYUM-FORTH). In contrast to the natural trend the riparian habitat in this catchment is generally in a better condition than the instream habitat.

R2: Buffalo

The R2 secondary catchment is densely populated, putting strain on the Buffalo River, which is the main river system that drains this catchment. Four dams supply the main urban areas of King William's Town, Zwelitsha, Mdantsane and East London. These dams have no mechanisms for releasing environmental flows to support ecosystem functions and health. The Mgqakwebe, Ngqokweni, Yellowwoods and KwaNxamkwane tributaries supplement the low flow in the Buffalo River. Other notable challenges are overloaded sewage treatment systems, industrial effluent, and impacts of cultivation, livestock farming and plantations (RHP, 2004b).

Invertebrates:

As a result of low flow to dry conditions as well as challenges with accessing sites, only three of the eight active REMP sites could be monitored in 2020/21. R2BUFF-MADEN improved from a largely modified (C/D) condition in 2018/19 to a largely natural condition (B/C). This site was not sampled in 2020 due to insufficient flows. R2MGQA-PIRIE improved from a largely modified (C/D) condition to a moderately modified (C) condition while R2NXAM-POTSD deteriorated from a largely modified (C/D) condition to a largely modified (D) condition.

Fish:

The fish condition in the KwaNxamkwane River (R2NXAM-POTSD) deteriorated from close to largely natural (A/B) in 2018/19 to moderately modified (C) in 2020/21.

Geomorphology:

The fluvial geomorphology was assessed at two sites in 2017/18 and at four sites in 2018/19. The KwaNxamkwane River (R2NXAM-POTSD) remained in a largely natural (B) condition and the Buffalo River at Zwelitsha (R2BUFF-ZWELI) in a seriously modified (E) condition. The upper reaches of the Buffalo River upstream of Maden Dam (R2BUFF-MADEN) was in a seriously modified (E) and in a moderately modified (C) condition further downstream at horseshoe bend (R2BUFF-HORSE) upstream of Qonce (King Williamstown).

Habitat Integrity:

The IHI was conducted at six sites in 2017/18. The instream and riparian habitat ranged from natural (A) in the Mgqakwebe River at Pirie Mission Station (R2MGQA-PIRIE) to critically modified (F) in the Buffalo River at Zwelitsha (R2BUFF-ZWELI). The riparian condition at the other four sites were worse the instream condition. The instream IHI at the two EWR sites (R2BUFF-EWR01, R2BUFF-EWR02) was largely modified while the riparian IHI was seriously (E) modified and close to largely modified respectively. The Instream IHI at the Yellowwoods River (R2YELL-LONSD) was in a close to largely natural (B/C) while the riparian IHI was in a largely modified (D) condition. The instream habitat at the KwaNxamkwane River (R2NXAM-POTSD) was largely natural (B) but the riparian habitat was moderately modified (C).

R3: Nahoon

Reduced flows have made it difficult to monitor the aquatic condition of the rivers in the R3 secondary catchment. The major river systems in this drainage region are the Nahoon, Gqunube, and Kwelera. Due to the unsuitable flows in the Nahoon River coupled with human and financial resources, sampling in this secondary catchment is suspended.

Summary:

Macroinvertebrates

Figures 65 and 66 indicate that the macroinvertebrate assemblage ranges from a largely natural condition (B/C) to a moderately modified (C) to a largely modified (D) condition with most sites in a moderately modified (C) condition. This is despite the number of sites in this category decreasing in 2019/20 due to an increase in sites with a C/D category.

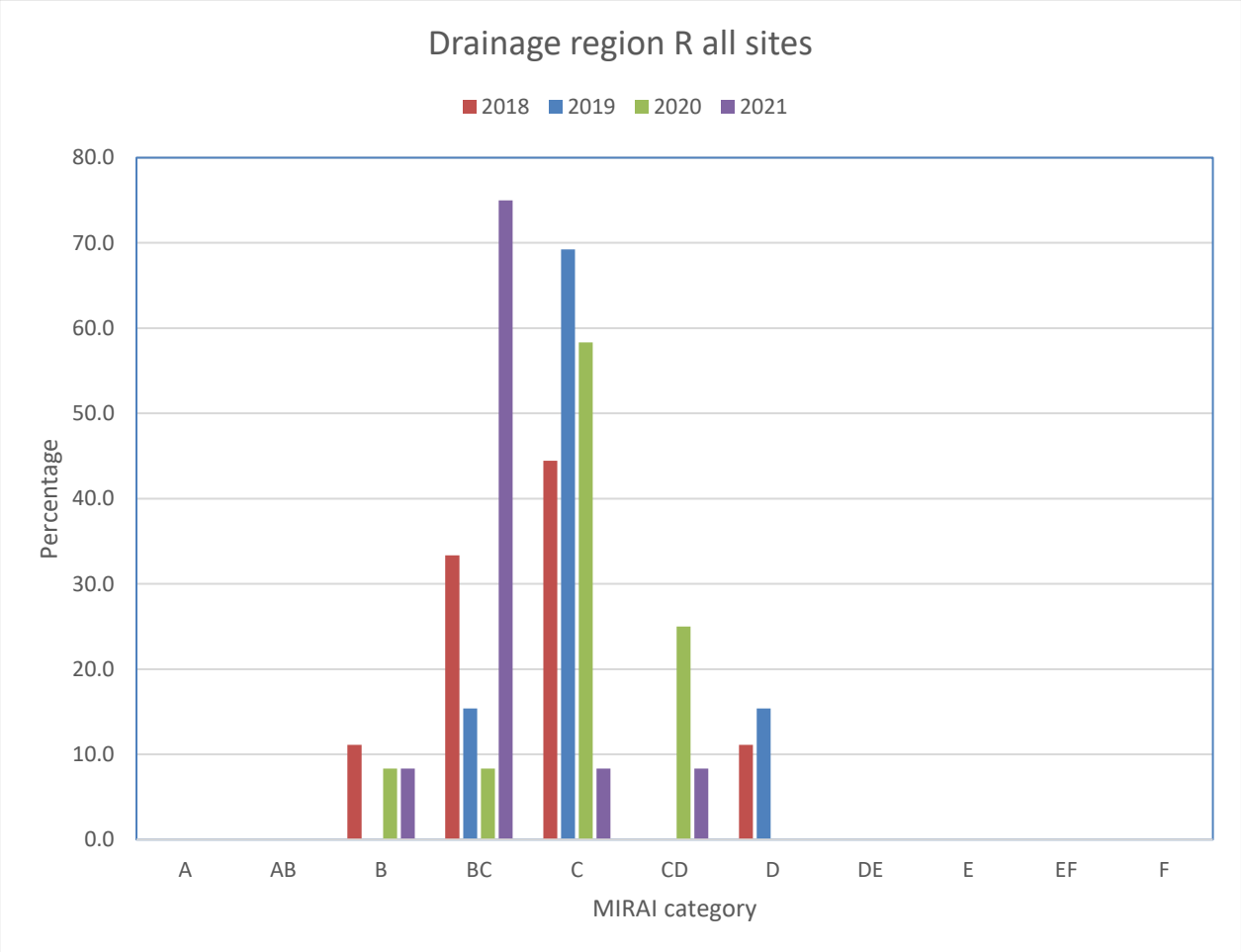

Figure 65: The percentage of sites in each ecological category in primary drainage region R (Keiskamma & Buffalo) per hydrological year for macroinvertebrates at all sites monitored from 2017/18 to 2020/21.

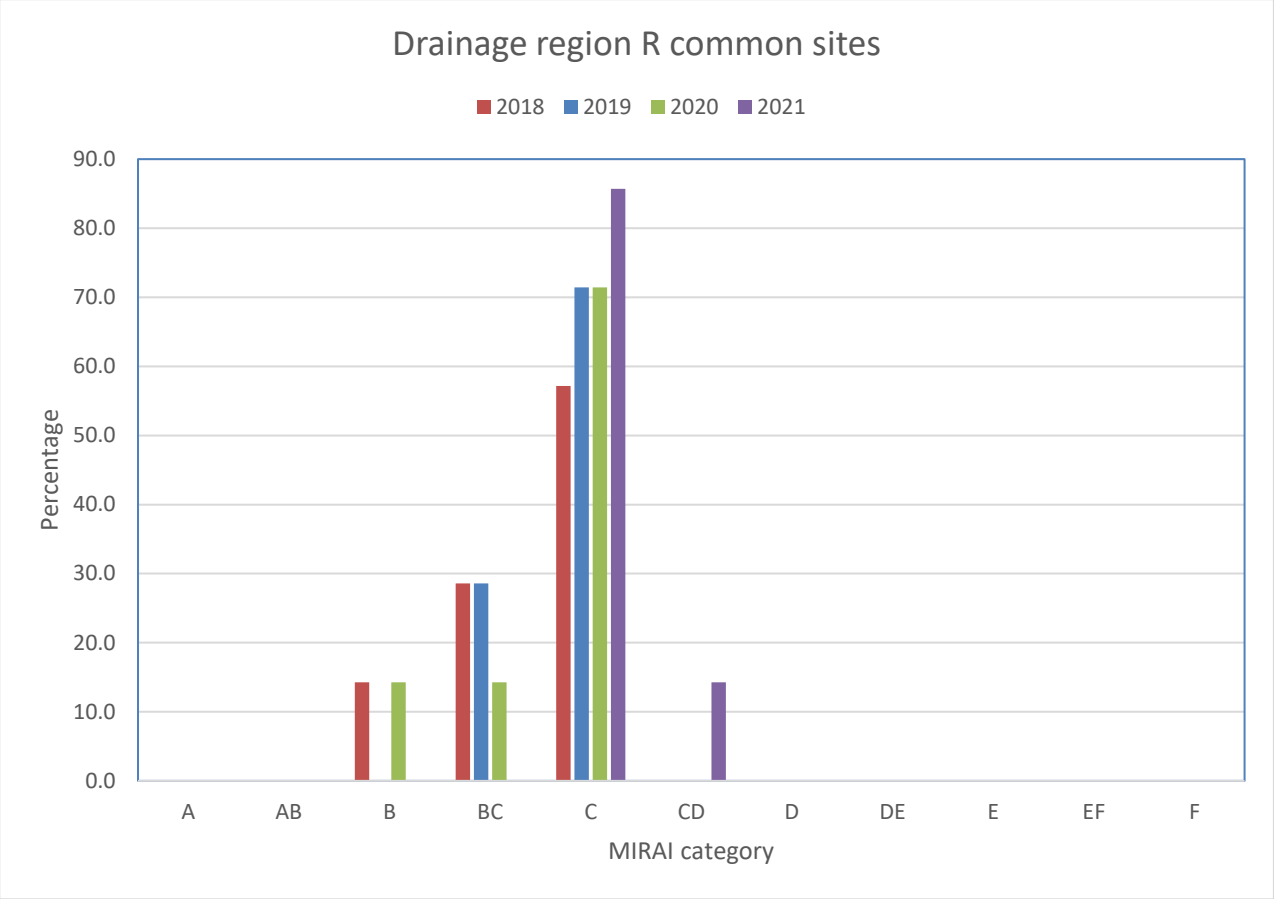

Figure 66: The percentage of sites in each ecological category in primary drainage region R (Keiskamma & Buffalo) per hydrological year for macroinvertebrates at those sites monitored each year from 2017/18 to 2020/21.

Fish:

The fish condition in this drainage region has deteriorated in the last few years with more sites in largely (D) and seriously (E) modified conditions in the current hydrological year compared to previous years (Figures 67 and 68)

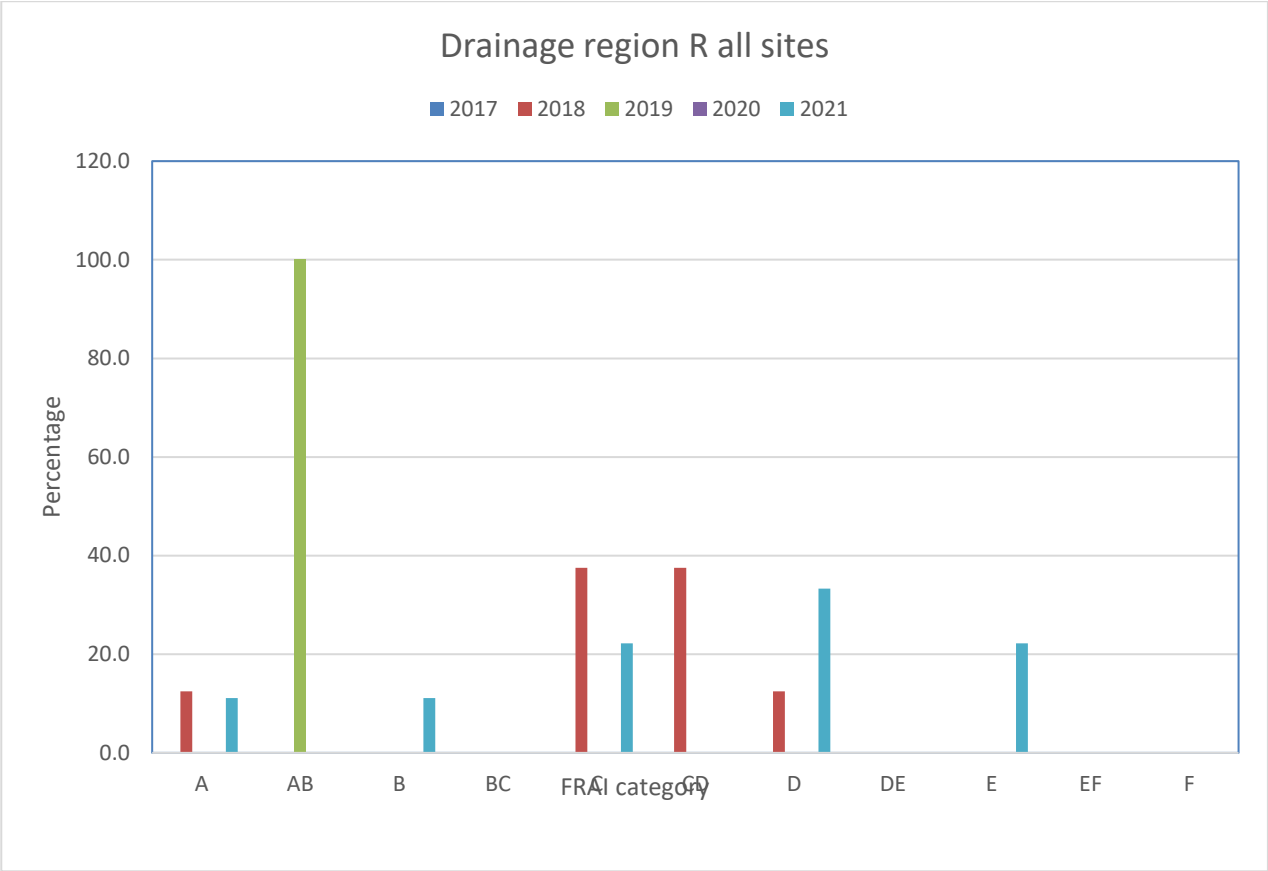

Figure 67: The percentage of sites in each ecological category in primary drainage region R (Keiskamma & Buffalo) per hydrological year for fish at all sites monitored from 2017/18 to 2020/21.

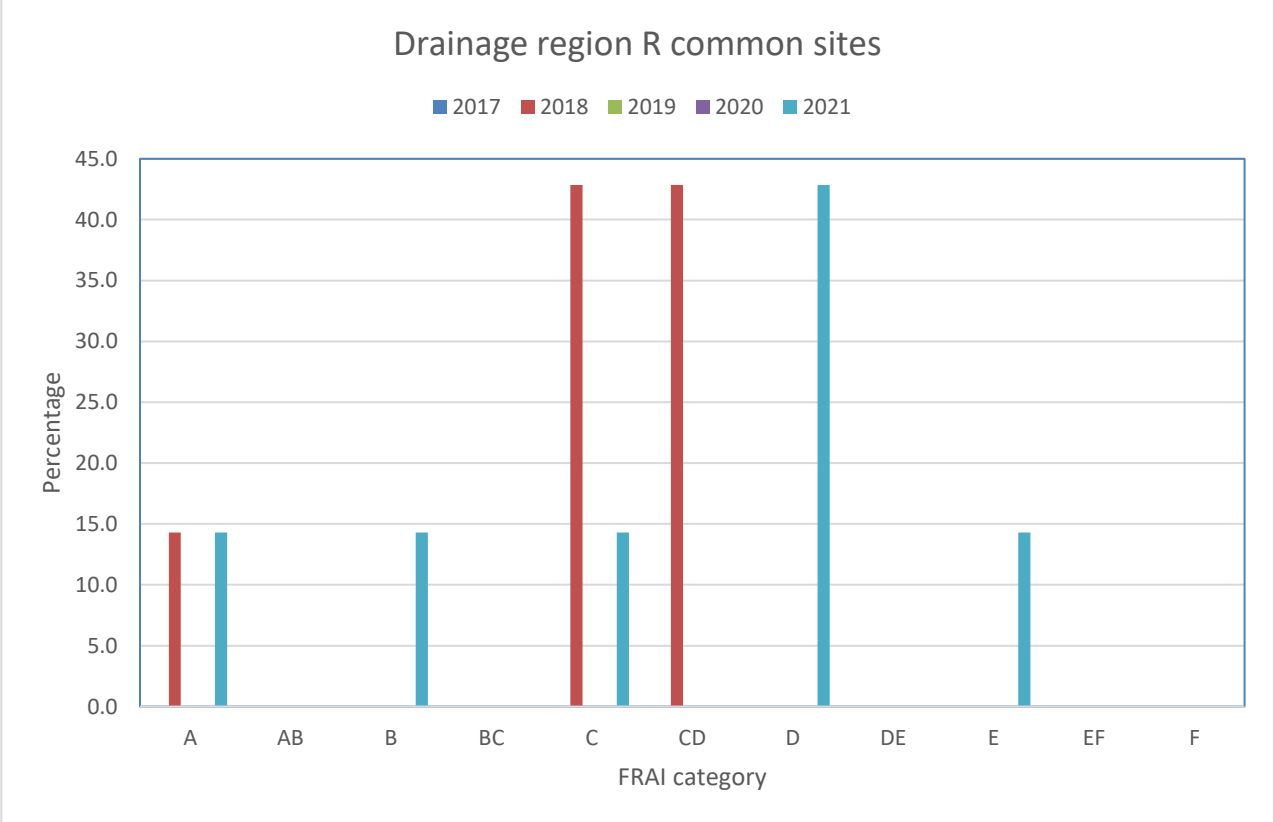

Figure 68: The percentage of sites in each ecological category in primary drainage region R (Keiskamma & Buffalo) per hydrological year for fish at those sites monitored each year from 2017/18 to 2020/21.

Geomorphology:

The Geomorphology was only assessed on 2017/18 and 2018/19. The geomorphological condition in this drainage region improved from 2017/18 to 2018/19 with fewer sites in a moderately modified (C) condition and more sites in a largely natural (B) condition (Figures 69 and 70).

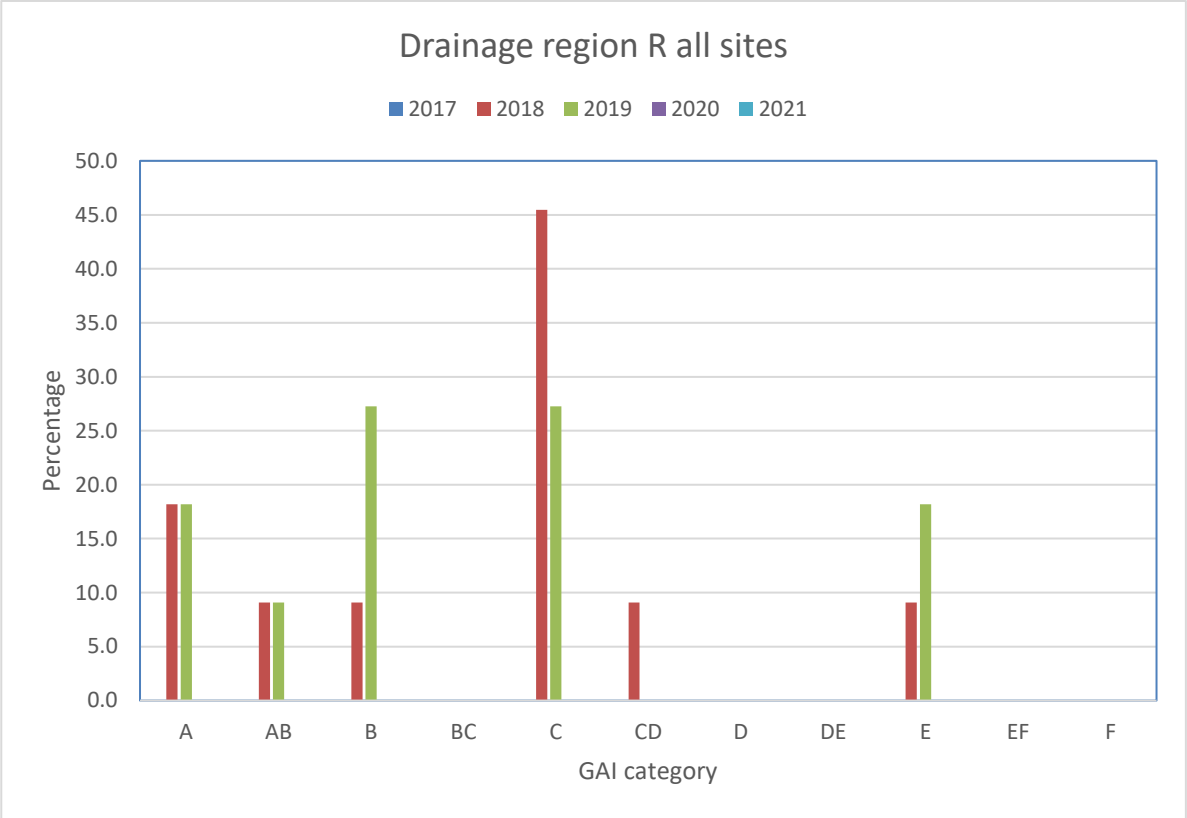

Figure 69: The percentage of sites in each ecological category in primary drainage region R (Keiskamma & Buffalo) per hydrological year for geomorphology at all sites monitored from 2017/18 to 2020/21.

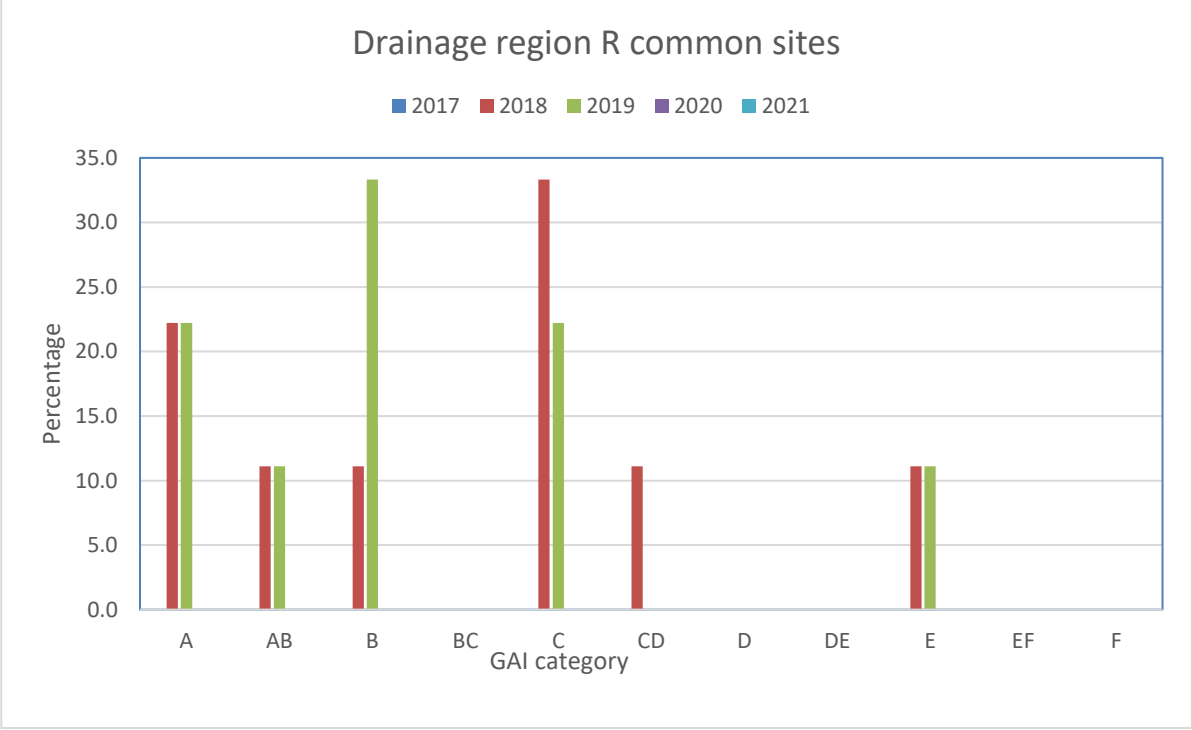

Figure 70: The percentage of sites in each ecological category in primary drainage region R (Keiskamma & Buffalo) per hydrological year for geomorphology at those sites monitored each year from 2017/18 to 2020/21.

DRAINAGE REGION S (MZIMVUBU-TSITSIKAMMA WATER MANAGEMENT AREA)

The Great Kei River catchment takes up the entire S primary drainage region (Figure 71 to 73). The main river forms north-east of Cathcart from the confluence of the Black Kei and White Kei rivers. It meanders in a south-easterly direction for 320 km till it flows into the Indian Ocean through the Great Kei Estuary (DWS, 2018). There are 11 active REMP monitoring sites in this drainage region. Mainly due to COVID hindering monitoring in two quarters (Annexure S), as well as other challenges with flow and capacity only 8 sites were sampled in 2020/21. There are 7 secondary catchments, namely:

- S1 – White Kei;
- S2 – Indwe (not sampled);
- S3 – Black Kei;
- S4 – Great Kei;
- S5 – Tsomo;
- S6 – Kubusi; and
- S7 – Great Kei

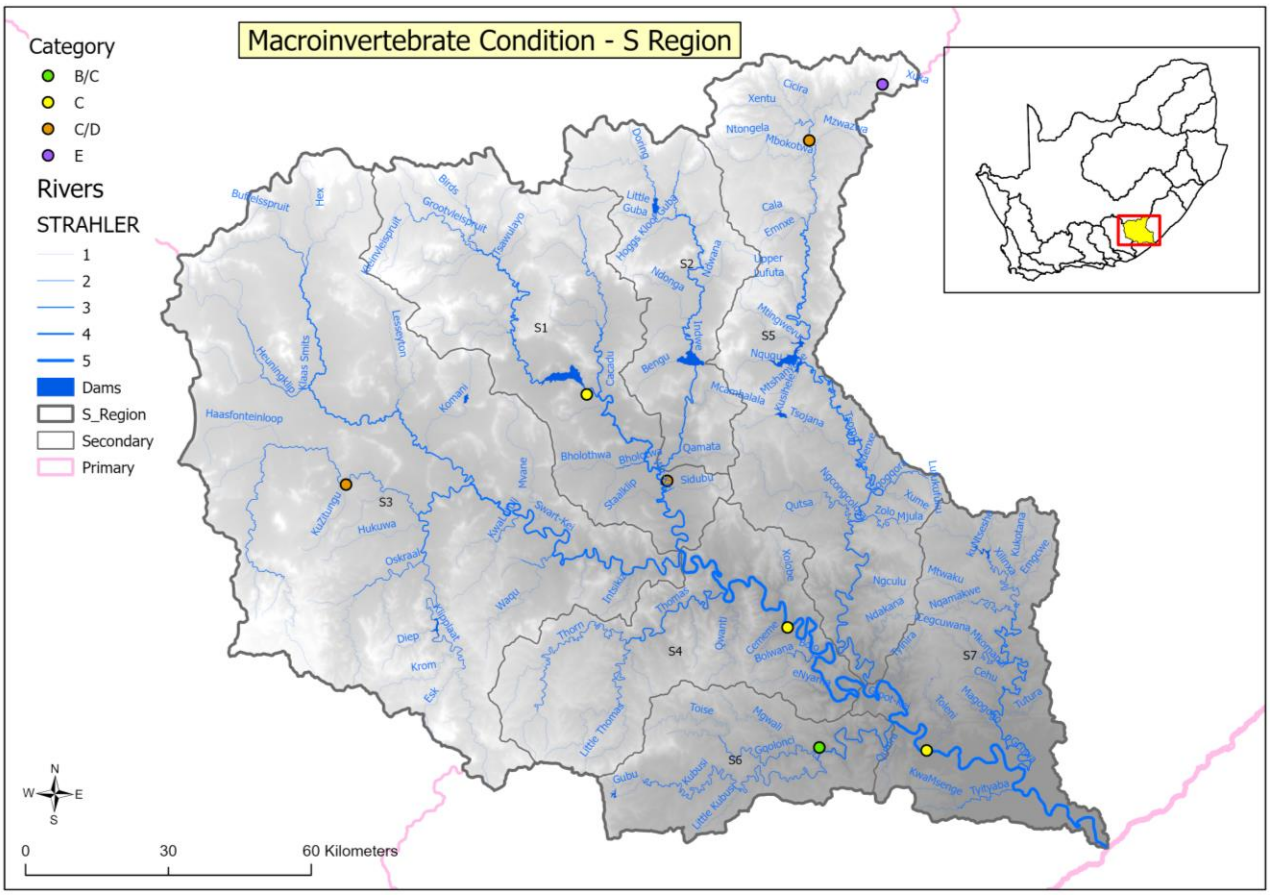

Figure 71: Summary Ecological Categories in primary drainage region S (Great Kei) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) while the purple reflects relatively poor conditions (E).

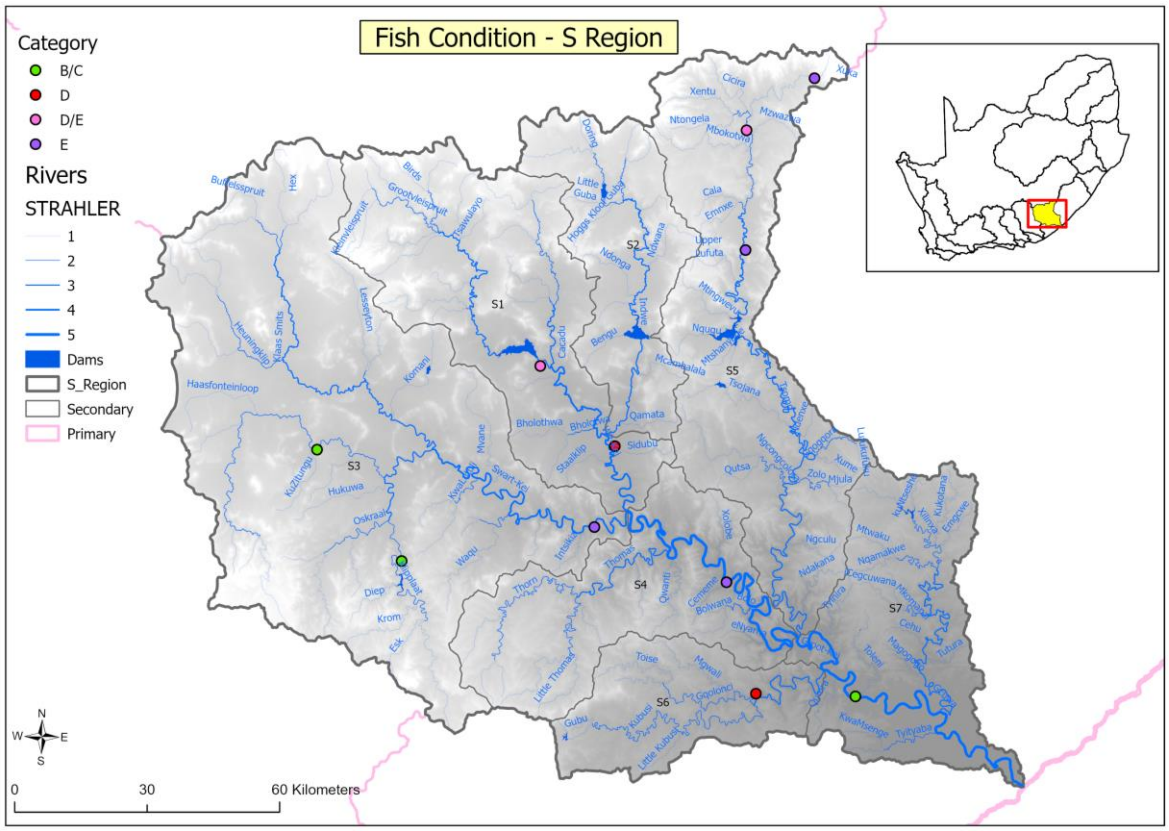

Figure 72: Summary Ecological Categories in primary drainage region S (Great Kei) reflecting the fish condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) while the red to purple reflects relatively poor conditions (D to E).

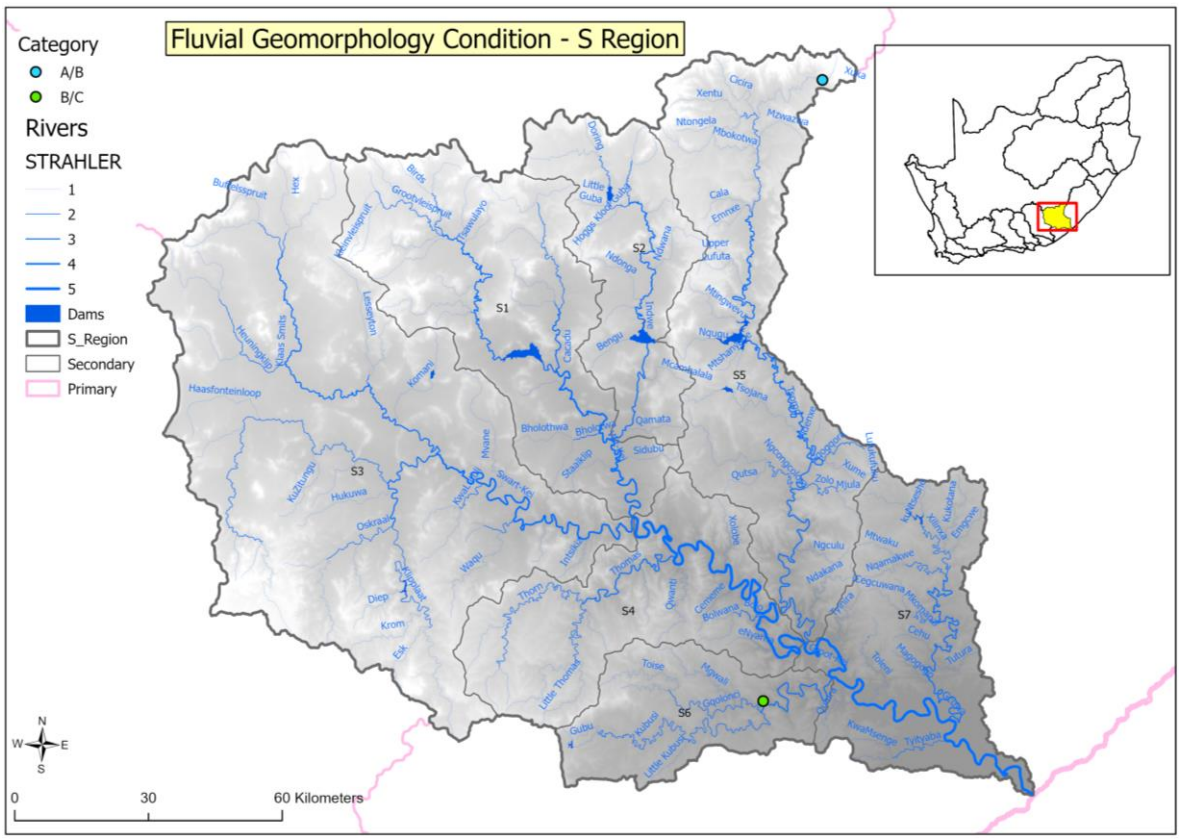

Figure 73: Summary Ecological Categories in primary drainage region S (Great Kei) reflecting the geomorphological condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A/B -B/C).

S1 – White Kei

The S1 secondary catchment comprises of the White Kei River and its smaller tributaries, ending before it joins the Black Kei, and excluding the Indwe River (its largest tributary, which falls under S2 and was not monitored). There are two sites on the White Kei River in the S1 secondary catchment: downstream of Xonxa Dam and at St Marks.

Invertebrates:

The macroinvertebrate assemblage for the site downstream of Xonxa Dam (S1WKEI-BXOND) was in a moderately modified (C) condition. The macroinvertebrates data indicates that the White Kei at St Marks deteriorated from a moderately modified (C) to a largely modified (C/D) condition. This site could be affected by livestock grazing and trampling.

Fish:

The Fish was surveyed in 2018/19 at St Marks (S1WKEI-STMAR) in 2018/19 and 20120/21 while it was only surveyed in 2020/21 downstream of Xonxa Dam (S1WKEI-BXOND). The fish data indicate that the White Kei downstream of Xonxa Dam was in a close to largely natural (D/E) condition while the site at St Marks remained in a largely modified (D) condition in 2018/19 and 2020/21.

Habitat Integrity:

The IHI was only conducted at one site (S1WKEI-STMAR) in 2017/18 when the instream habitat was in close to moderately modified (C/D) and the riparian habitat in a largely modified (D) condition.

S3 – Black Kei

Invertebrates:

Only S3BKEI-BULLH could be sampled in 20120/21 as S3BKEI-TURNS and S3KLIP-PLAAT had issues with flow. The macroinvertebrate data indicates that this site is in a largely modified (C/D) condition. The lower Black Kei River at Turn stream was only sampled in 2018/19 when it was in a moderately modified (C) condition. The Klipplaat River improved from a moderately modified (C) condition in 2018/19 to a close to largely natural (B/C) in 2019/20. The site in the Klipplaat River could be affected by habitat destruction from clearance of riparian vegetation, water quality and quantity impacts related to agricultural activities in the vicinity of the site and upstream. It is also downstream of Waterdown Dam, which supplies Queenstown with drinking water (Wikipedia, 2020).

Fish:

Fish surveys were conducted in 2018/19 and 2020/21. The lower Black Kei River (S3BKEI-TURNS) remained in a seriously modified (E) condition while the Klipplaat River improved from a moderately modified (C)

condition in 2018/19 to a close to natural (B/C) condition in 2020/21. The upper Black Kei (S3BKEI-BULLH) which was only sampled in 2020/21 was also in a close to largely natural (B/C) condition.

Habitat Integrity:

The IHI was only conducted in 2017/18. The instream IHI at the Klipplaat River was in a moderately modified (C) condition while the close to natural (A/B) riparian habitat was in a considerably better condition. The largely natural (B) instream habitat at the upper Black Kei River was in a better condition than the moderately modified (C) riparian habitat while both instream and riparian habitat at the lower Black Kei river were in a close to natural (A/B) condition.

S4 – Great Kei

The S4 secondary drainage forms the middle reaches of the Great Kei catchment, downstream of the confluence of the White and the Black Kei, until before confluences with Tsomo on the left and Kubusi on the right. There is only one site in this part of the catchment, and the macroinvertebrates data indicates that it improved from a largely modified (D) in 2018/19 to a moderately modified (C) condition in 2020/21, while the fish was in a seriously modified (E) condition. The IHI was only conducted in 2017/18 when the instream habitat was in a largely natural (B) and the riparian habitat in a close to natural (A/B) condition.

S5 – Tsomo

Invertebrates:

For the macroinvertebrates, the Tsomo River in the upper reaches (site S5TSOM-UPPER) deteriorated from a close to largely natural (B/C) in 2018/19 to a seriously modified (E) condition in 2020/21. S5TSOM-R56BR was in a largely modified (C/D) condition in 2017/18 and 2020/21 but was in a largely modified (D) condition in 2018/19. S5TSOM-KOMKH could not be sampled in 2020/21 but was in a moderately modified (C) condition in 2018/19.

Fish:

The fish condition in the upper Tsomo River near Elliot remained in a seriously modified (E) condition in 2019/20 and 2020/21, while the other two sites deteriorated. The fish condition in the middle reaches of the Tsomo River (S5TSOM-R56BR) deteriorated from a largely modifies (D) condition in 2018/19 to a close to largely modified (D/E) condition in 2020/21, while the lower reaches of the Tsomo (S5TSOM-KOMHK) deteriorated even more from a close to moderately modified (C/D) condition in 2018/19 to a seriously modified (E) condition in 2020/21.

Geomorphology:

The geomorphology at the upper Tsomo River improved from a moderately modified (C) condition in 2018/19 to a close to natural (A/B) condition in 2019/20 and 2020/21.

Habitat Integrity:

The instream IHI in the upper Tsomo River remained in a moderately modified (C) condition from 2017/18 onwards while the riparian IHI decreased from a close to moderately modified (C/D) condition in 2017/18 to a largely modified (D) condition in 2019/20 and 2020/21. The instream IHI in the middle Tsomo River (S5TSOM-R56BR) was close to largely natural (B/C) while the riparian IHI was close to moderately modified. The instream IHI in the lower Tsomo River (S5TSOM-KOMKH) was moderately modified and the riparian IHI largely modified (D).

The riverine ecosystem has largely been altered due to invasion by alien plants (*Acacia* spp) on riverbanks, channel deepening, erosion of riverbed alluvium on steep gradients.

S6 – Kubusi

The Kubusi River originates near, and flows through, the town of Stutterheim. It starts off in forestry plantations, flowing through urban development and various forms of agriculture, passing through the Wriggleswade Dam before joining the Great Kei River. The monitoring site in this secondary catchment is downstream of all these land uses; despite this the macroinvertebrates have improved from a moderately modified (C) to a largely natural condition (B/C) in 2020/21. The fish deteriorated from a moderately modified (C) condition in 2019/20 to a largely modified (D) condition in 2020/21. The geomorphology remained in a close to largely natural (B/C) condition while the instream habitat deteriorated form a close to largely natural (B/C) condition in 2017/18 to a moderately modified (C) condition in 2019/20 and 2020/21. The riparian habitat improved from a largely natural (B) condition in 2017/18 to a natural (A) condition in 2019/20 and 2020/21.

S7 – Lower Great Kei

The lower reaches of the Great Kei River are affected by siltation due to sand mining and commercial agriculture; as a result, the water is mostly turbid (DWS, 2018d). The macroinvertebrate condition improved from a largely modified (D) condition in 2018/19 to moderately modified (C) in 2019/20 and 2020/21. The fish condition also improved from largely modified (D) in 2018/19 to moderately modified (C) in 2020/21. The condition of the fish could have been in a better condition at this site due to the proximity to the Great Kei Estuary, which is popular for its variety of fish species (Colloty *et al*., 2002). The fluvial geomorphology was in a moderately modified (C) condition in 2018/19 as was the instream and riparian habitat integrity in 2017/18.

Summary:

Invertebrates:

Figures 74 and 75 indicate that the macroinvertebrate assemblage was mostly in the moderately modified (C) and largely modified (C/D) categories. However, there was one site (S5TSOMO-UPPER) that was in a seriously modified (E) category.

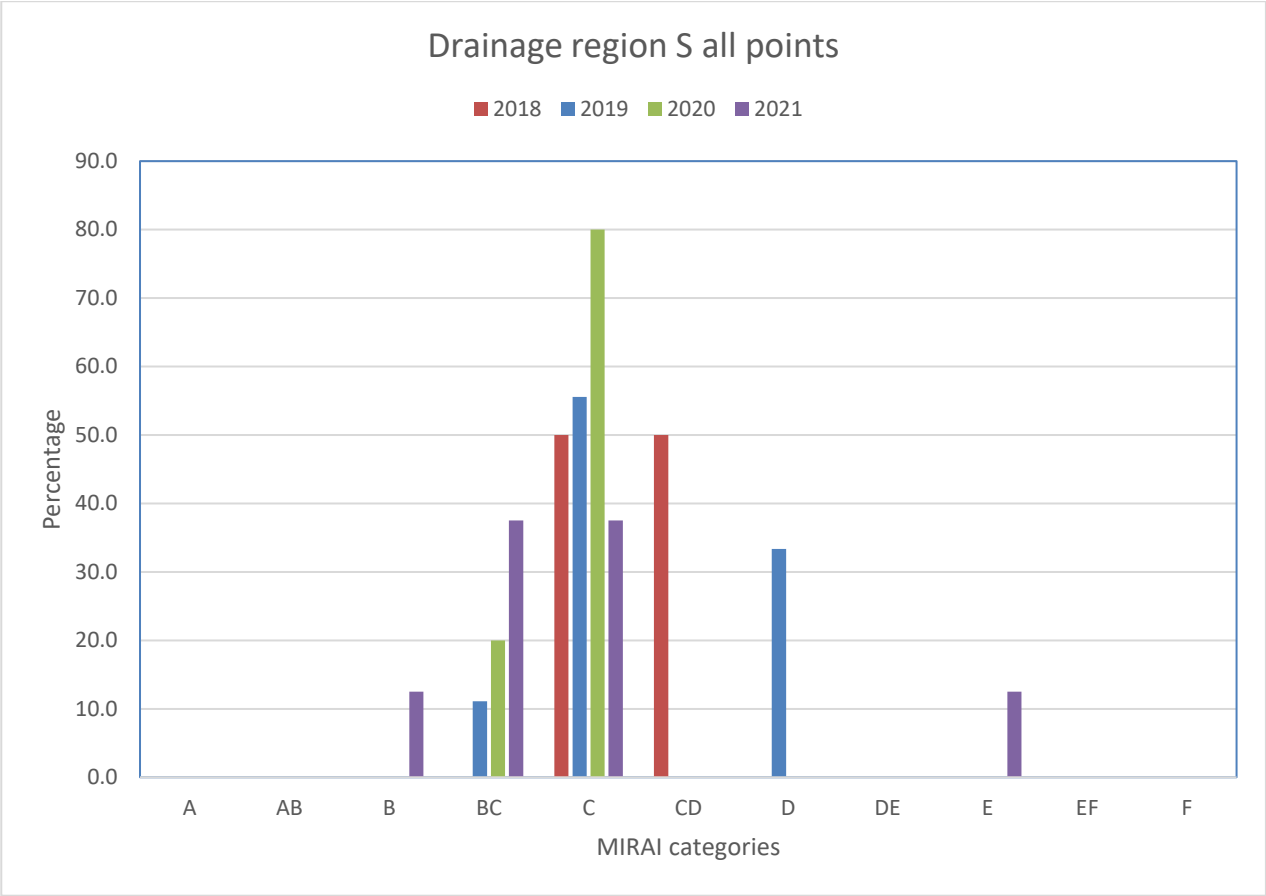

Figure 74: The percentage of sites in each ecological category in primary drainage region S (Great Kei) per hydrological year for macroinvertebrates at all sites monitored from 2017/18 to 2020/21.

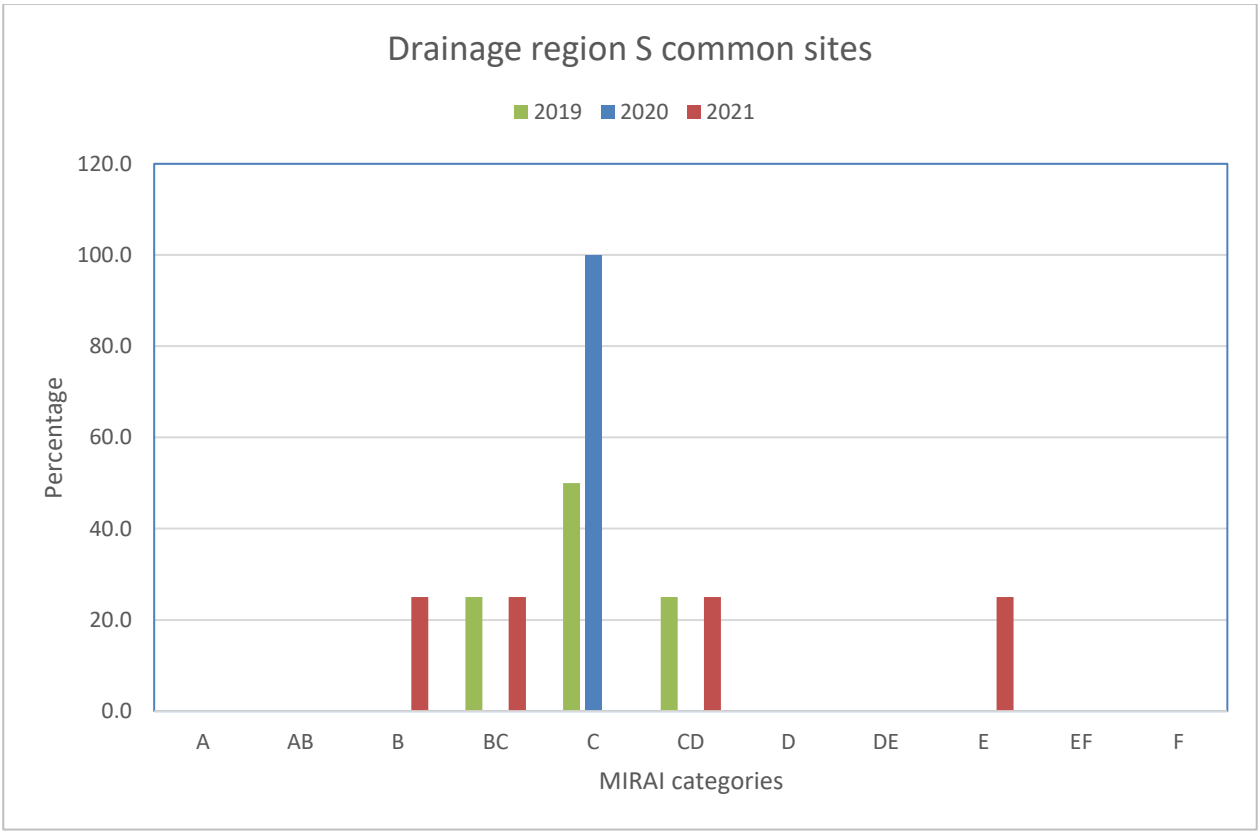

Figure 75: The percentage of sites in each ecological category in primary drainage region S (Great Kei) per hydrological year for macroinvertebrates at those sites monitored in both 2018/19 and 2019/20.

Fish:

The number of sites that could be monitored for fish decreased, and those that were sampled were not the same sites as the previous hydrological years. As per Figure 76, moderately modified conditions prevailed in 2018/19 while only one of the two sites that were sampled in 2019/20 was moderately modified. The other site was seriously modified (E). The situation improved somewhat in 2020/21 with some sites in a close to largely natural (B/C) condition and fewer sites in a seriously modified (E) condition.

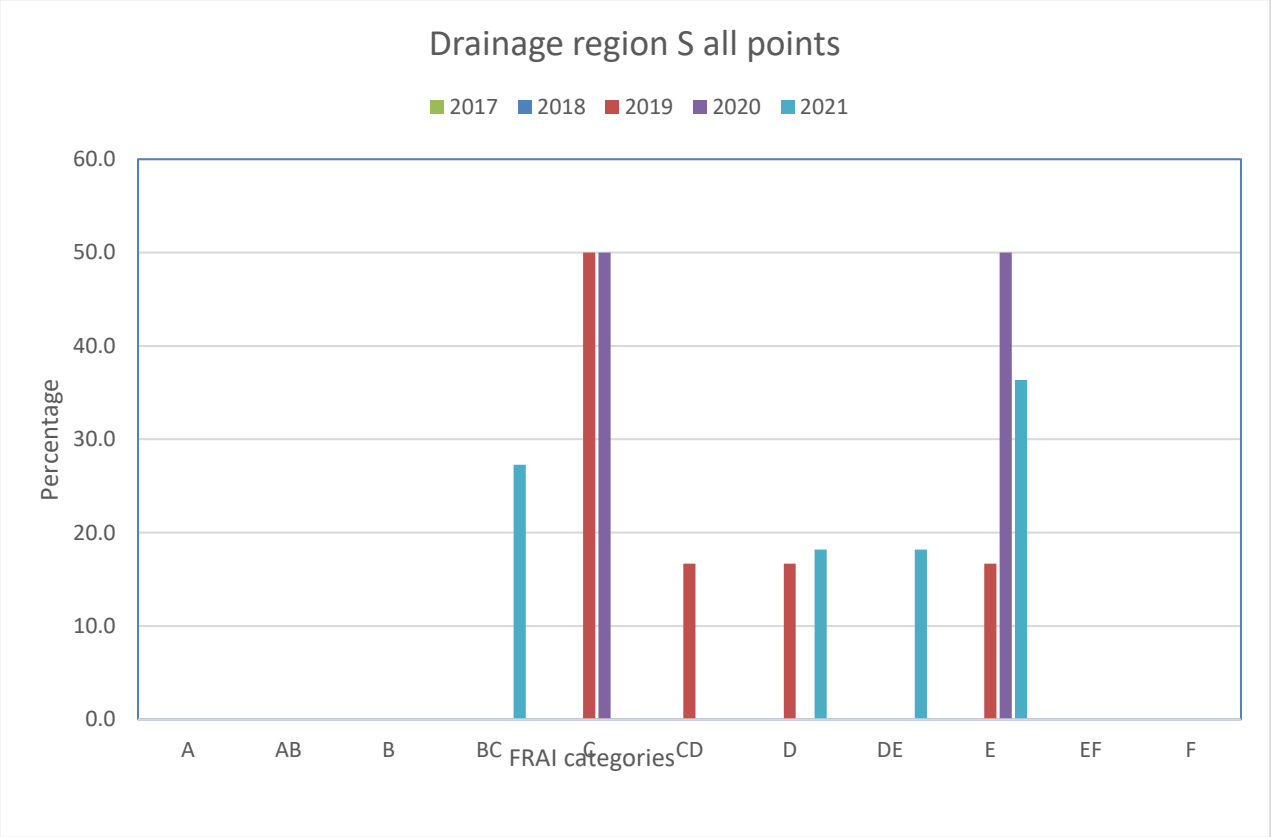

Figure 76: The percentage of sites in each ecological category in primary drainage region S (Great Kei) per hydrological year for fish at all sites monitored from 2018/19 to 2020/21.

Geomorphology:

The geomorphology was also not monitored at the same sites in the different years. The sites that were monitored under the reporting period were mostly in a close to natural condition and close to largely natural condition in 2019/20 and 2020/11and mostly moderately modified (Figure 77) in 2018/19.

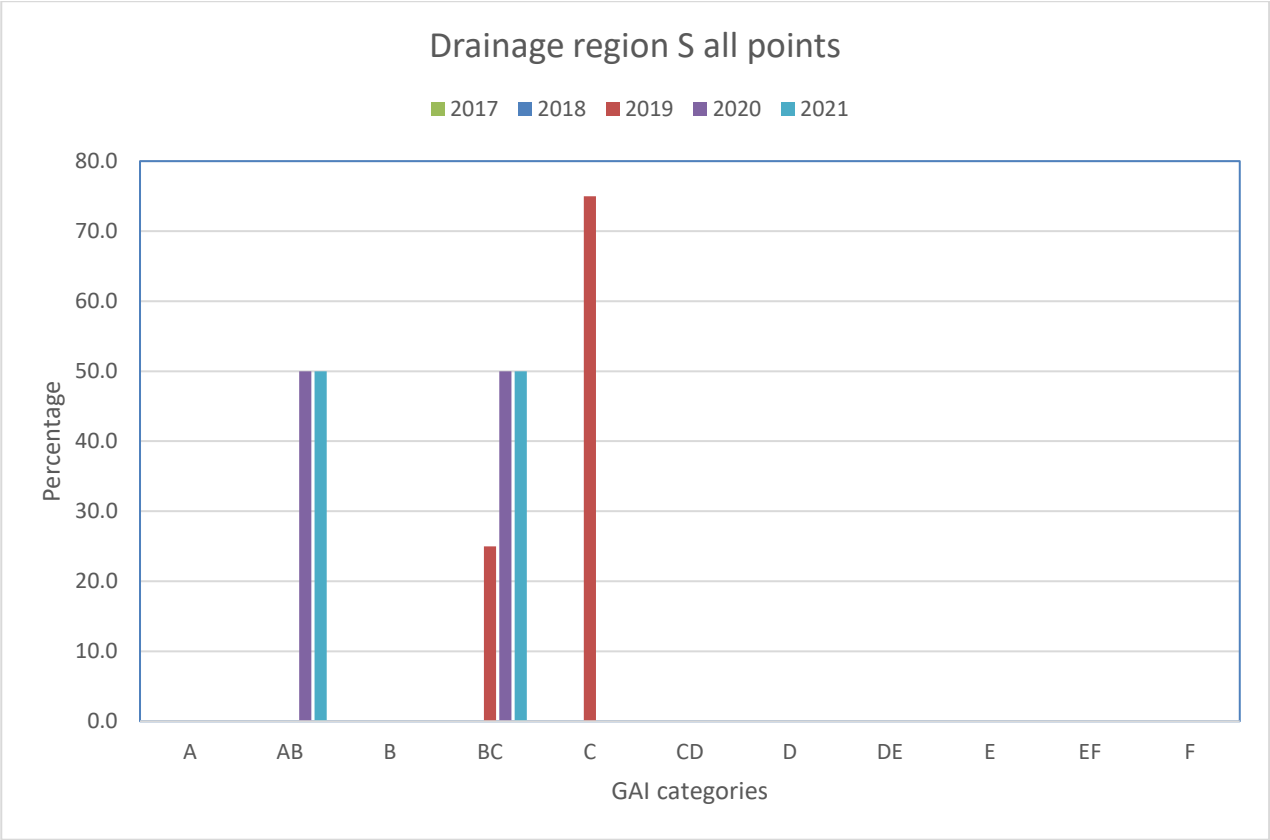

Figure 77: The percentage of sites in each ecological category in primary drainage region S (Great Kei) per hydrological year for geomorphology at all sites monitored from 2018/19 to 2019/20.

Habitat Integrity:

Figure 78 indicates that the habitat integrity was mostly in the moderately modified (C) category. However, there were some natural (A) sites and some sites in a largely modified (D) condition.

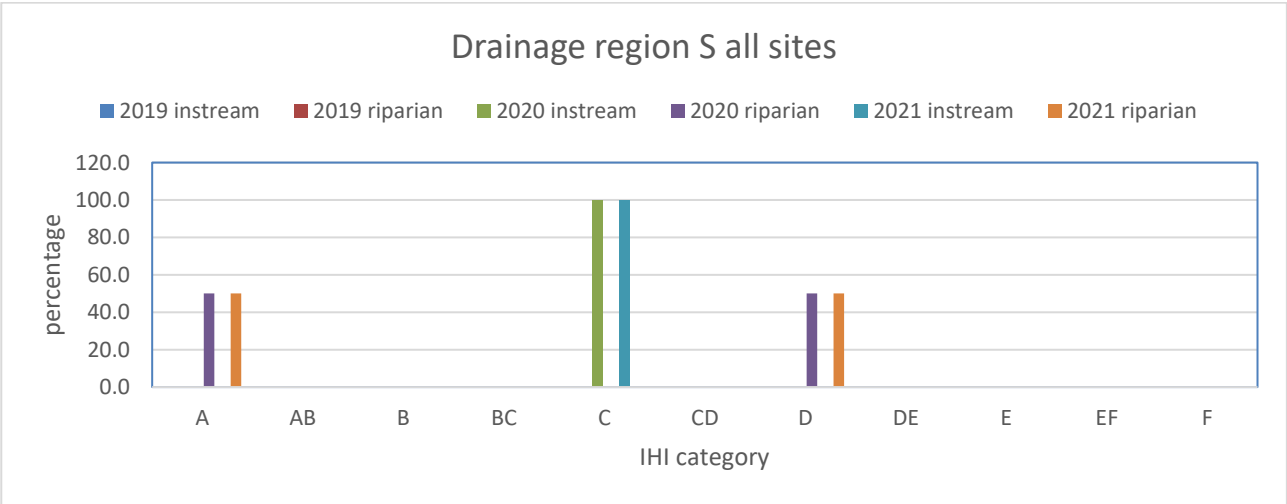

Figure 78: The percentage of sites in each ecological category in primary drainage region S (Great Kei) per hydrological year for Habitat Integrity at all sites monitored from 2019/20 to 2020/21.

DRAINAGE REGION T (MZIMVUBU-TSITSIKAMMA AND PONGOLA–MTAMVUNA WATER MANAGEMENT AREAS)

The largest part of this drainage region forms part of the Mzimvubu to Tsitsikamma WMA with only two (T4 and T5) secondary catchments forming part of the Pongola to Mtamvuna WMA (Figures 79 to 81). The East London office is responsible for sampling the sites in the Mzimvubu to Tsitsikamma WMA, while the KwaZulu-Natal regional office is responsible for monitoring the Mtamvuna (T4) and Mzimkhulu (T5) catchments. There are 37 active sites within this primary catchment but 15 of these sites could not be sampled due to human capacity constraints and a continuous lack of sufficient flows (Annexure T). Results for 25 sites are discussed below. There are no sites in the T8 secondary catchment. The nine secondary catchments in this drainage region are:

- T1: Mbhashe
- T2: Mthatha
- T3: Mzimvubu
- T4: Mtamvuna
- T5: Mzimkhulu
- T6: MNtafufu to Mzamba (not sampled)
- T7: Mdumbi to Mngazi (not sampled)
- T8: Xora to Coffee Bay (not sampled)
- T9: Qolora to Nqabarha (not sampled)

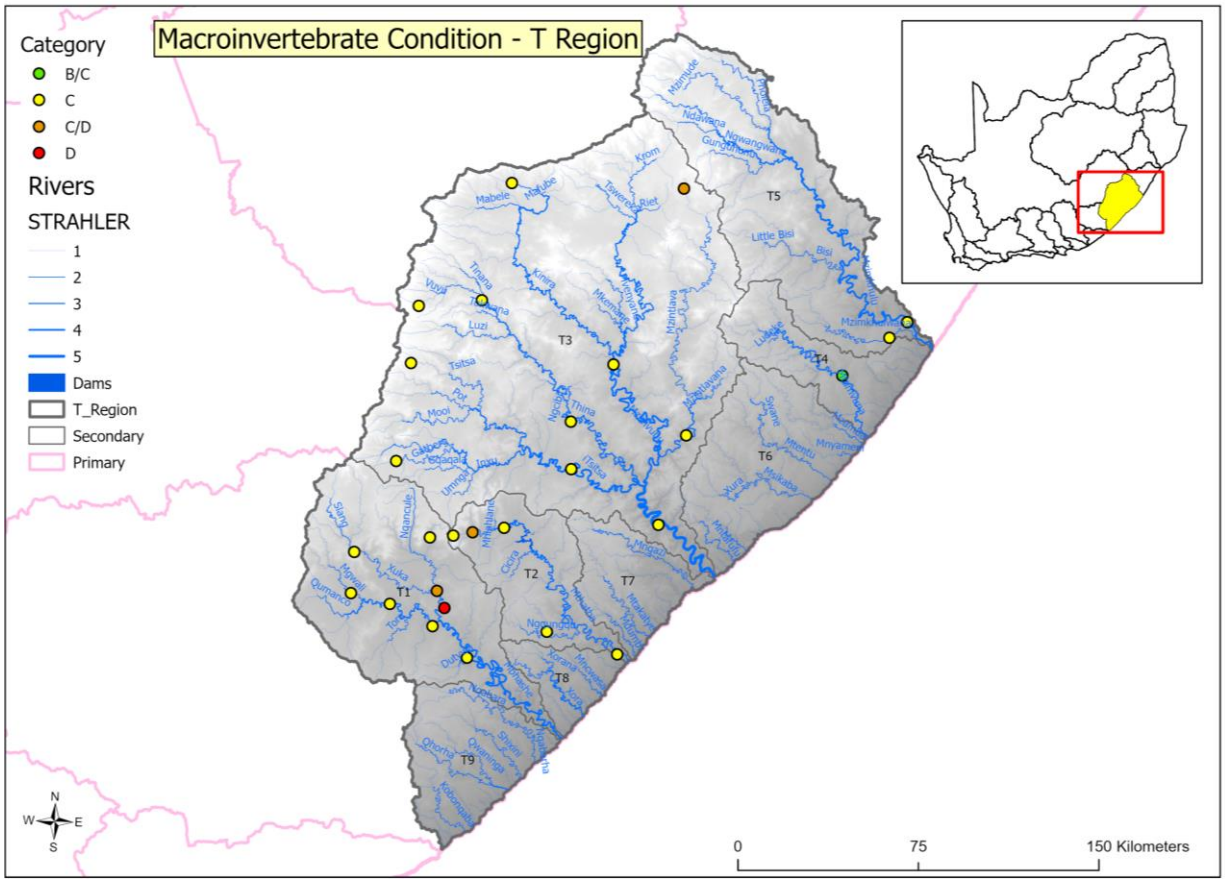

Figure 79: Summary Ecological Categories in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) while the red reflects relatively poor conditions (D).

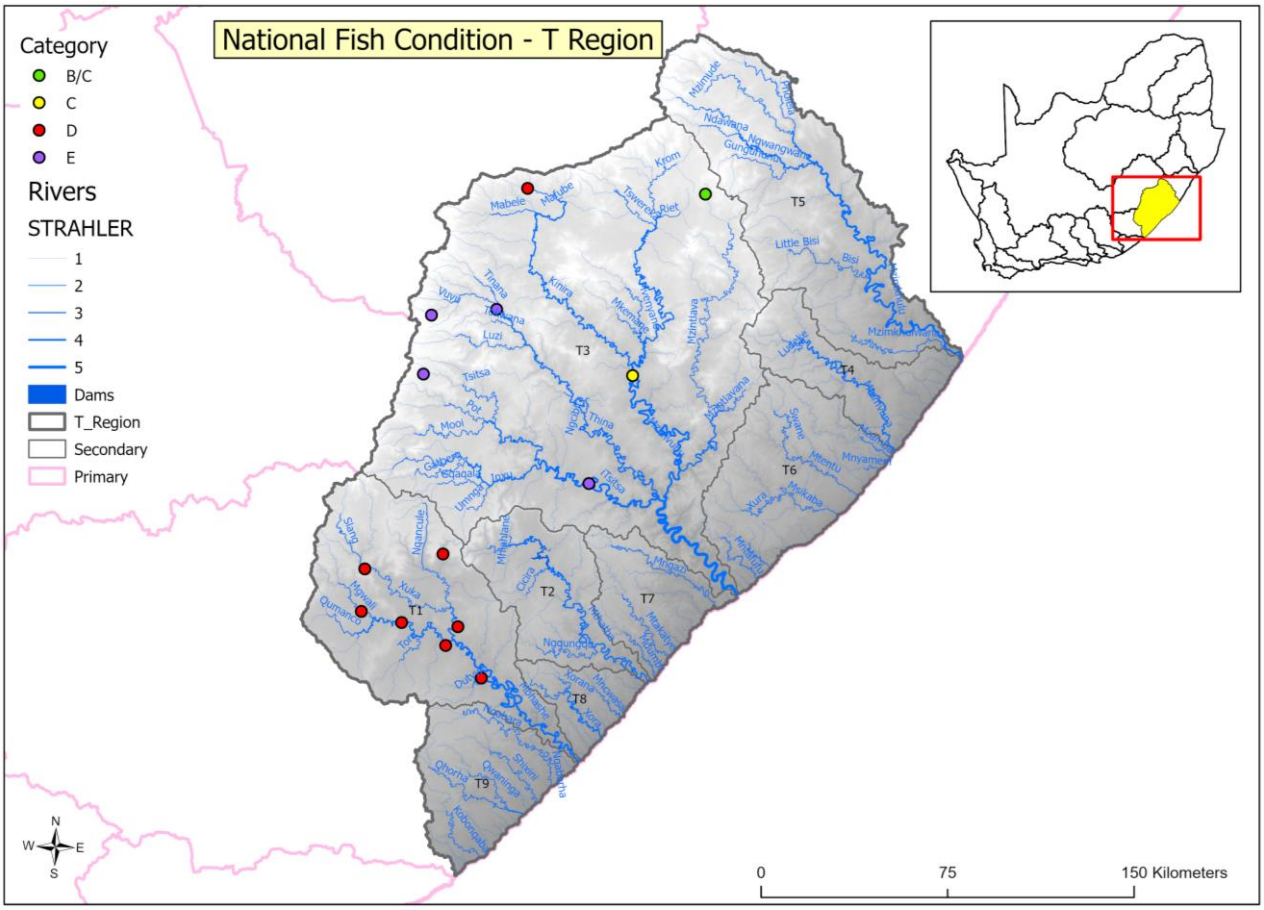

Figure 80: Summary Ecological Categories in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) reflecting the fish condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with yellow representing relatively fair conditions (C) while the red and purple reflects relatively poor conditions (D to E).

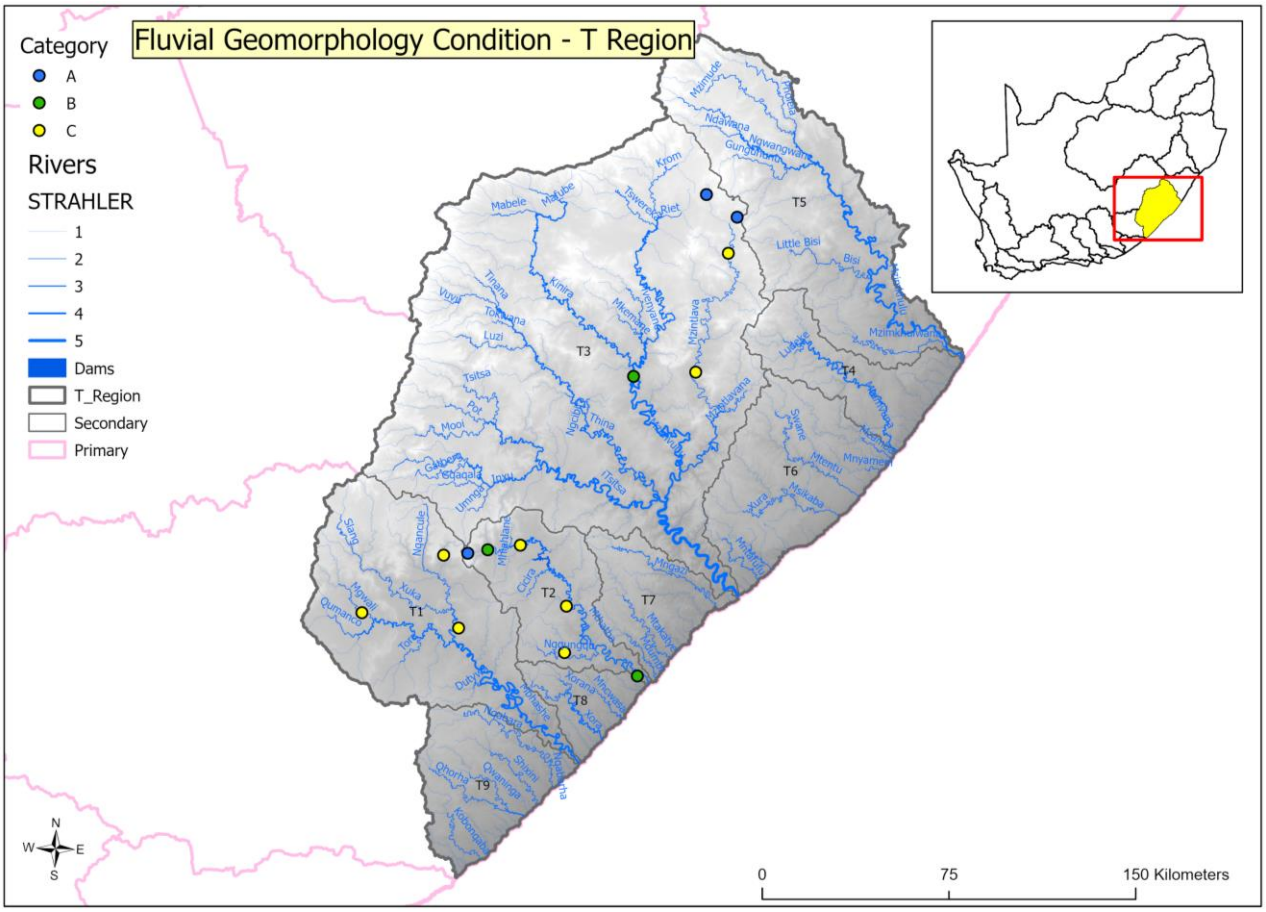

Figure 81: Summary Ecological Categories in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) reflecting the fluvial geomorphological condition for selected sites monitored during 2019/2020 hydrological year. The colour of the circles indicates the Ecological Condition with blue and green representing relatively good conditions (A to B/C) while the yellow reflects relatively fair conditions (C).

T1: Mbhashe

The Mbhashe River system begins in the Drakensberg Mountain range and passes through Elliot, Engcobo, and Idutywa towns, finally discharging into the Indian Ocean through the Mbhashe Estuary. The major tributaries of the system are Mnyolo, Mgwali and Xuka. Most of the catchment is degraded, mainly due to overgrazing. The soils are naturally erodible and severe erosion has occurred. Due to the rural nature of the area, land use is mostly in the form of subsistence farming and cattle grazing. Commercial dryland agriculture occurs in the upper reaches of the catchment around Elliot, along with some small-scale commercial forestry (DWA, 2010). There are 10 active monitoring sites in this drainage region. All indices except for the riparian vegetation were monitored in this reporting period.

Macroinvertebrates:

Macroinvertebrates were monitored at eight of the ten active monitoring sites in this drainage region (Figure 79). The monitoring results indicate a river system that is mostly in a moderately modified condition, as six of the eight monitored sites were in a moderately modified (C) category, mostly due to erosion. T1NTSU-UPPER deteriorated from a moderately modified (C) condition to a largely modified (D) condition. The lowest

site in the Xuka River catchment (T1XUKA-CONFL) deteriorated from a close to largely natural condition (B/C) to a close to moderately modified (C/D) condition.

Fish:

The fish results (Figure 80) showed a fish community in a seriously modified condition (E) at all three sites sampled this year. This may be due to habitat loss and turbidity resulting from sedimentation and erosion as well as prevalence of the invasive *Labeobarbus aeneus* (DWS, 2020d). The fish assemblage condition at the Mnyolo River (T1MNYO-BRIDG) decreased by 11.4% from a largely modified (D) category to a seriously modified (E) category.

Geomorphology:

The geomorphology condition at all three sites monitored this year were a moderately modified (C) condition (Figure 81). While the upper Mgwali (T1MGWA-R61BR) remained in a moderately modified (C) condition, the Mnyolo River (T1MNYO-BRIDG) improved from a close to moderately modified (C/D) to a moderately modified (C) condition and the Upper Ntsu River (T1NTSU-UPPER) deteriorated from a close to largely natural (B/C) to a moderately modified (C) condition.

Habitat Integrity:

The Habitat integrity was not monitored this hydrological year. In the previous year the instream habitat was in a better condition than the riparian habitat with two of the sites (T1MGWA-R61BR and T1NYOL-BRIDG) in a moderately modified (C) condition and the third site (T1NTSU-UPPER) in a close to largely natural (B/C) condition. In contrast, the riparian condition at two of the sites (T1MGWA-R61BR and T1NYOL-BRIDG) was in a seriously modified (E) condition and the third (T1NTSU-UPPER) site in a moderately modified (C) condition. The habitat integrity at the upper Mgwali River (T1MGWA-R61BR) remained the same as the previous year, but the instream habitat condition at the Nyolo River (T1NYOL-BRIDGE) deteriorated from a largely natural (B) to a moderately modified (C) and the riparian habitat condition from close to largely modified (D/E) to a seriously modified (E) condition. In contrast the instream habitat at the upper Ntsu tributary (T1NTSU-UPPER) deteriorated from a natural (A) condition to a close to largely natural (B/C) condition while the riparian habitat improved from a largely modified (D) to a moderately modified (C) condition.

T2: Mthatha

The main river in this secondary catchment, Mthatha River, originates approximately 5 km below the Drakensberg Mountains. It meanders towards the Indian Ocean with major tributaries being Cicira, Tabase, Mpafane, Ncambele, Corana, Cumngce and Ngqungqu rivers. Land use activities include pine (*Pinus spp*.) and blue gum (*Eucalyptus sp.)* tree plantations, subsistence agriculture (animal husbandry and crop production, mainly livestock and maize respectively), commercial agriculture, especially the areas along the Mthatha Dam (where extensive irrigation occurs), and settlements (mainly rural and some urban around Mthatha town) (DWS, 2019h). There are six active REMP sites in the Mthatha catchments, five sites on the Mthatha River and one on the Ngqungqu tributary. All indices except for Riparian Vegetation were monitored in the Mthatha catchment.

Macroinvertebrates:

Five of the six active monitoring sites were sampled (Figure 79). The lower site on the Mthatha (T2MTHA-TAKAT) could not be sampled due to unsuitable flow conditions (see Annexure T). The monitoring results indicate a river system that is mostly in a moderately modified condition, as four of the five monitored sites were in a moderately modified (C) category. The lower Mthatha River (T2MTHA-MDUMB) deteriorated from a largely natural condition (B/C) to a moderately modified (C) condition. Only T2MTHA-ASAWM fell below a moderately modified condition, deteriorating from a moderately modified (C) category to a close to moderately modified (C/D) category.

Fish:

Fish was only sampled at three sites (Figure 80). The fish condition on the Mthatha River upstream of the Langeni Sawmill (T2MTHA-ASAWM) remained in a seriously modified (E) condition, most likely due to reduced fish diversity and the presence of alien species. The fish condition at T1MTHA-TAKAT improved from a close to seriously modified (E/F) condition to a moderately modified (C) condition, while the lower Ngqungqu (T2NGQU-LOWER) only improved slightly from a largely modified (D) to a close to moderately modified (C/D) condition.

Geomorphology:

There has also been a noticeable modification in the geomorphology of the catchment with two of the three sites monitored in a close to moderately modified (B/C) condition and one site in a moderately modified (C) condition (Figure 81). The Mthatha River upstream of the Langeni sawmill (T2MTHA-ASAWM) and the Lower Ngqungqu (T2NGQU-LOWER) improved from a moderately modified (C) condition to a close to largely natural (B/C) condition while the condition at site T2MTHA-TAKAT remained in a moderately modified (C) condition.

Habitat Integrity:

The Habitat Integrity was not monitored this hydrological year. During the 2019/20 hydrological year, the instream habitat integrity at the Mthatha upstream of the Langeni sawmill (T2MTHA-ASAWM) was still in a largely natural (B) condition while the lower Ngqungqu (T2NGQU-LOWER) and the Mthatha (T2MTHA-TAKAT) were in a moderately modified (C) condition. The riparian habitat was generally in a poorer condition than the instream habitat with the riparian habitat at the upper Mthatha (T2MTHA-ASAWM) in a moderately modified (C) condition and the Mthatha River at Ntsaka (T2MTHA-TAKAT) downstream of Mthatha Town in a largely modified (D) condition. However, the riparian habitat at the lower Ngqungqu was in a largely natural (B) condition compared to the moderately modified (C) instream habitat.

T3: Mzimvubu

The T3 secondary catchment is the largest in this primary drainage region. It comprises of the Mzimvubu River and its four major tributaries: Tsitsa, Tina, Kinira, and Mzintlava Rivers. The origins of the Mzimvubu catchment are at the Drakensberg escarpment, then flowing through deep and steep river valleys incised

into the coastal belt, before discharging into the Indian Ocean at Port St Johns (DWS, 2019i). Land uses are commercial agriculture with farm dams, irrigation schemes, crop production and animal husbandry as well as subsistence agriculture. There are pine and blue gum plantations as well as urban and rural settlements. Major developments (see Box 3) are on the pipeline for the Mzimvubu catchment, especially on the Tsitsa River side (Le Roux, et al., 2015; Huchzermeyer, et al., 2018). Only 10 of the 17 active REMP sites were monitored. Macroinvertebrates (Figure 79), Fish (Figure 80) and Geomorphology (Figure 81) were monitored during this hydrological year.

Macroinvertebrates:

The monitoring results indicate a river system that is mostly in a moderately modified condition, as ten of the eleven monitored sites were in a moderately modified (C) category (Figure 79). T3MZIN-KUPOY and T3TSIT-TVALL deteriorated from a largely natural condition (B/C) to a moderately modified (C) condition. Only T3MZIN-EWR fell below a moderately modified condition, deteriorating from a moderately modified (C) category to a close to moderately modified (C/D) category. Poor management of land use activities was constantly observed as evidenced by habitat destruction via crossings, cattle trampling, overgrazing and sand mining, alien plant invasions adding to erosion and sedimentation, and water abstraction and farm dams leading to reduced or no flows in some parts of the catchment. Three of the sites (T3MZIM-BHUJE, T3TINA-N2ROA, T3TSITS-LALEN) in this area complied with the gazetted RQOs.

Fish:

The fish was only monitored at four of the 10 active REMP sites (Figure 80). The fish were generally in a poor condition ranging from largely modified (D) in the Mzimvubu at the N2Bridge (T3MZIM-N2BRI) to seriously modified (E) at the other three sites (T3MZIN-KUPOY, T3TSIT-LALEN, T3TSIT-TVALL). The fish is mostly impacted by the presence of exotic fish species. The fish condition in the Tsitsa River (T3TSIT-LALEN) did not comply with the gazetted RQO, while the Tina (T3TINA-N2ROA) and Mzimvubu (T3MZIM-BHUJE) complied with the gazetted RQOs.

BOX 3: GREY INFRASTRUCTURE WITHOUT THE GREEN?

The Mzimvubu River catchment proves to be a complex system to implement water security and economical projects without society and intact green infrastructure. Even though there are several proposed water dependant projects, there first need to be interventions to improve the ecological infrastructure before the hard infrastructure (dams) can be built. Projects like the rehabilitation of the Tsitsa River catchment, driven by the Department of Forestry, Fisheries, and the Environment and Rhodes University, and financial injections by the Global Environment Facility replenishment 7 rely on riparian communities assisting in implementing rehabilitation of the environment in this area, such as reducing sedimentation through replanting bare lands, and control of alien invasive species, before the gains of the built infrastructure can be realised.

Geomorphology:

The geomorphology was only monitored at five of the 10 active sites (Figure 81). As with the other catchments in the former Transkei region, landscapes are still largely untransformed, thus the geomorphology of the catchment ranged from natural (A) at the EWR site in the Mzintlava (T3MZIN-EWR) and lower Mzintlava (T3MZIN-RDM) to moderately modified (C) in the Mzintlava at Franklin Vlei (T3MZIN-

FRANK) and Ntshakeni (T3MZIN-NTSHA). The Mzimvubu at the N2 Bridge (T3MZIM-N2BRI) remained in a largely natural (B) condition.

T4: Mtamvuna

The Mtamvuna River forms the border between the Eastern Cape and KwaZulu-Natal with mostly rural low-density settlements covering the catchment. There is extensive forestry in the upper reaches, the middle reaches have a gorge that makes the river difficult to access, and cultivation occurs in the more accessible lower reaches (DWA, 2013b). The Mtamvuna River at Madikazini village maintained a close to largely natural condition (B/C) in 2020/21 but did not comply with the gazetted RQO. This site has undergone many changes, due mainly to natural processes such as floods and normal heavy rains. This was in an area with cultivation along the riverbanks surrounded by rural communities.

T5: Mzimkhulu

Challenges of human capacity in the KwaZulu-Natal office and access to some of the sites have led to difficulty with monitoring the Mzimkhulu River system, thus only two sites were monitored during 2020/21 hydrological year. This river originates in a World Heritage Site, at Ukhahlamba Drakensberg Park, and winds down south-easterly, joined by the Ngwangwane, Bisi, Mzimkhulwana and other tributaries, before discharging into the Indian Ocean (DWS, 2011c). Both the Mzimkhulwana site in Oribi Gorge Nature Reserve (T5MZKH-ORIBI) and the main Mzimkhulu River (T5MZIM-NPCQS) maintained a moderately modified (C) condition. There is limited habitat available at these sites which are characterised by mainly bedrock and limited GSM (particularly the Mzimkhulwana) and no or very little vegetation.

T6: Mntafufu to Mzamba to T9: Qolora to Nqabarha

Lack of human capacity in the East London regional office of the Department has led to these secondary catchments being left out, in terms of biomonitoring, except for the Shixini River (T9), where monitoring has been terminated due to prevailing low flow conditions. These catchments are in largely rural areas or nature reserves, which mean they would probably exhibit natural ecological conditions. The importance of monitoring these rivers is recognised and monitoring will be re-instated as soon as the human capacity limitations have been resolved.

Summary

Invertebrates:

Most sites are in the moderately modified (C) condition, with a few in the largely natural condition (B/C) (Figure 82). Sites in the D category have decreased and sites in the C/D category have increased. A similar trend was noticed with the common sites (Figure 83), it is thus not new sites, but possibly sites are improving in some areas.

Only four of the monitored sites have gazetted RQOs. Three sites (75%) complied to the gazetted RQOs for macroinvertebrates.

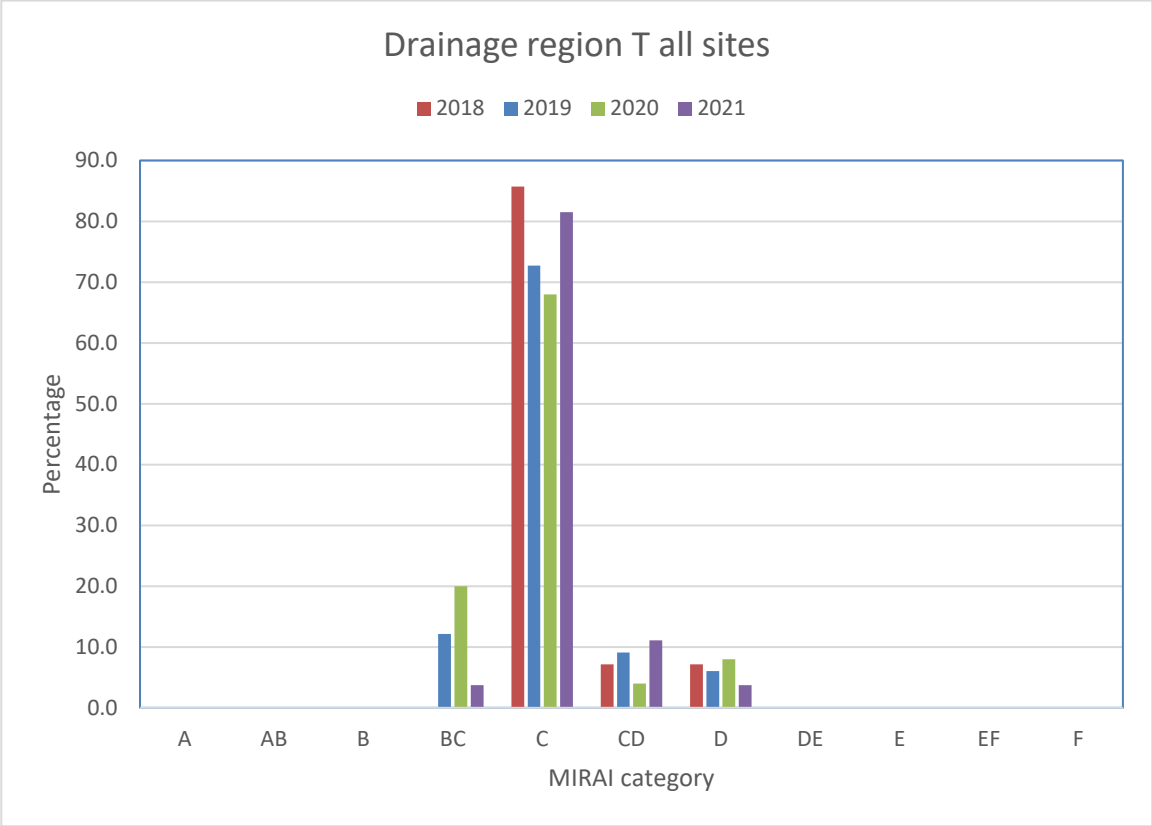

Figure 82: The percentage of sites in each ecological category in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) per hydrological year for macroinvertebrates at all sites monitored from 2017/18 to 2020/21.

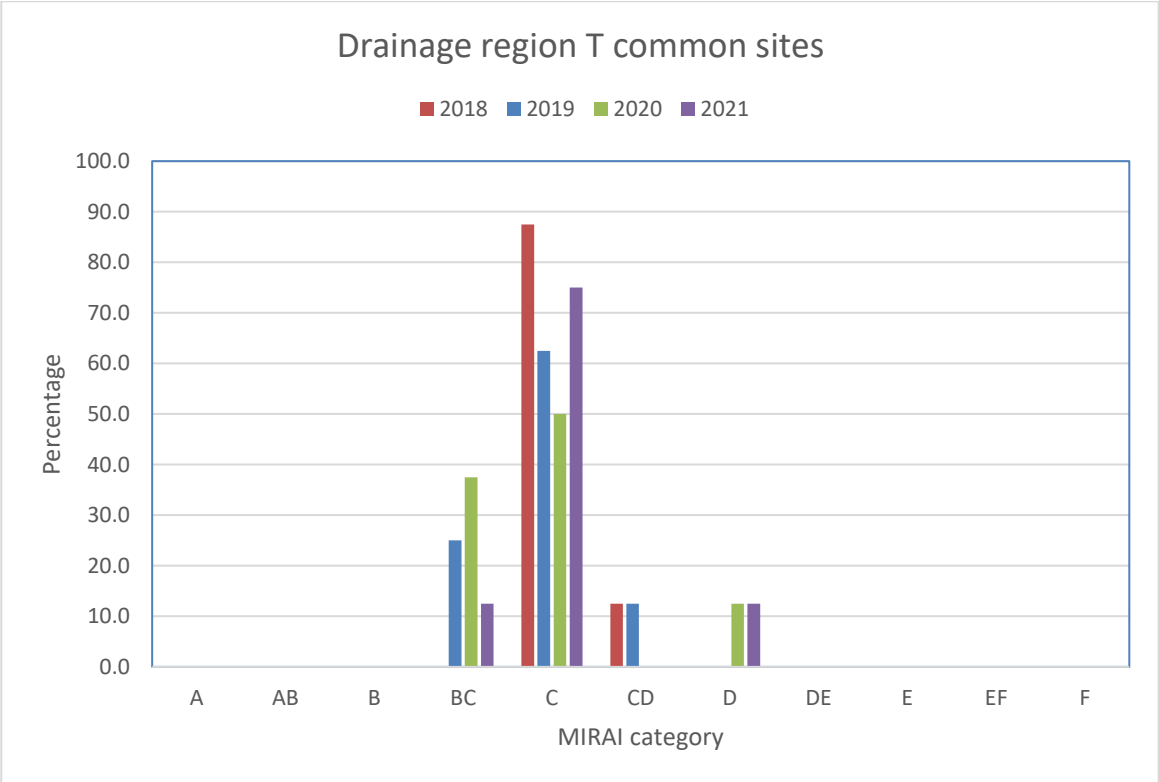

Figure 83: The percentage of sites in each ecological category in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) per hydrological year for macroinvertebrates at those sites monitored each year from 2017/18 to 2020/21.

Fish:

The deteriorating status of fish (Figure 84 and 85) in this drainage region is concerning. The presence of exotic fish has been identified as a major issue. Three of the monitored sites have gazetted RQOs for fish. Two of these sites (67%) complied with the gazetted RQOs.

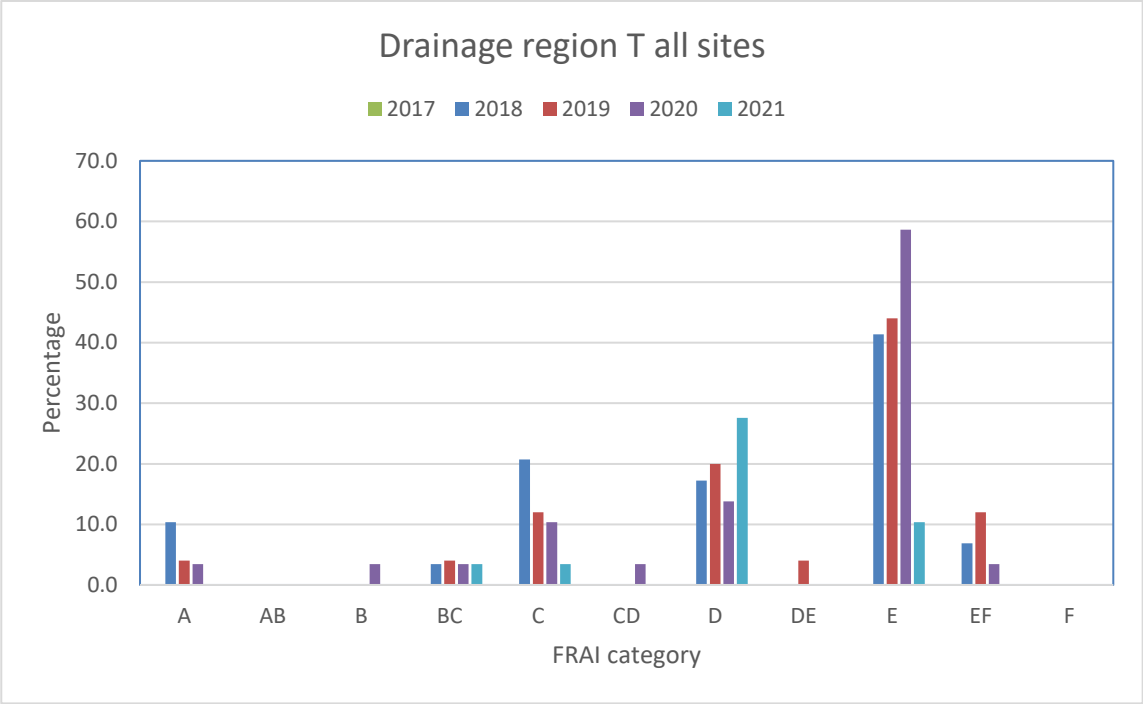

Figure 84: The percentage of sites in each ecological category in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) per hydrological year for fish at all sites monitored from 2018/19 to 2020/21.

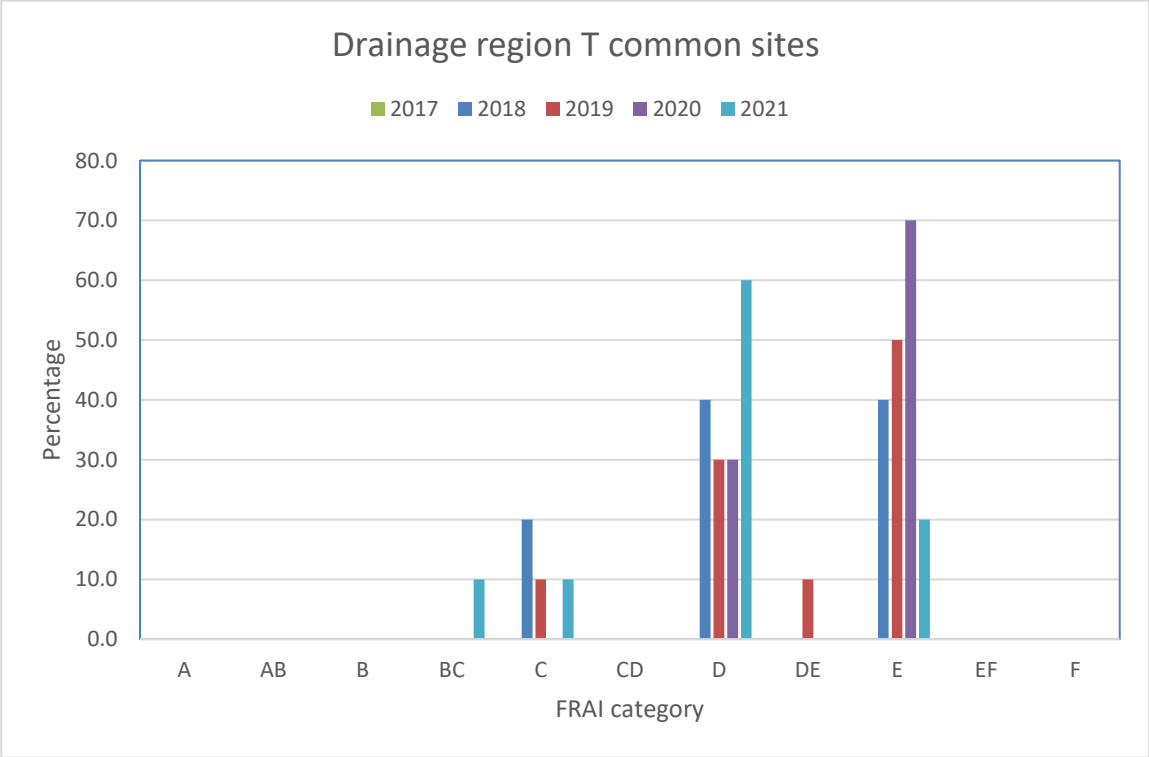

Figure 85: The percentage of sites in each ecological category in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) per hydrological year for fish at those sites monitored in both 2018/19 and 2020/21.

Geomorphology:

The erodible nature of the soils in the Mzimvubu and Mbhashe catchments do not provide a good habitat template. As a result, erosion, sedimentation, gully formation is exacerbated and thus affecting the geomorphology of these catchments. The geomorphology of many sites was in a moderately modified condition, even though these are rural areas, and it seems this state is becoming more prevalent (Figure 86 and 87).

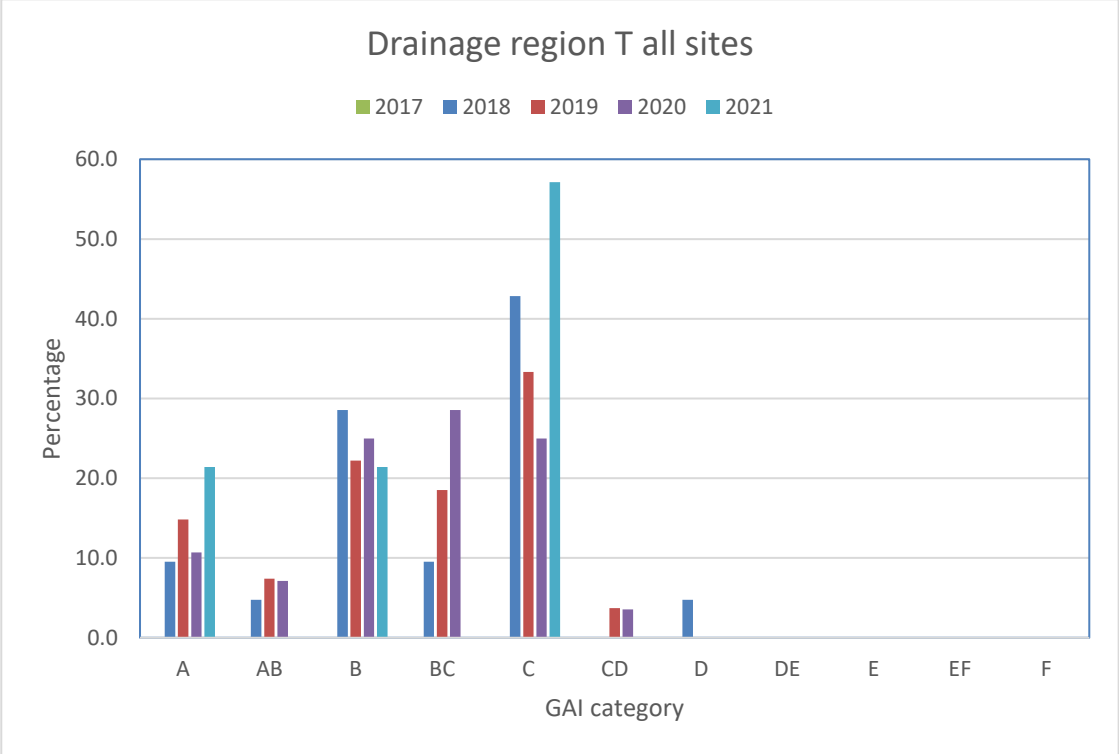

Figure 86: The percentage of sites in each ecological category in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) per hydrological year for geomorphology at all sites monitored from 2018/19 to 2019/20.

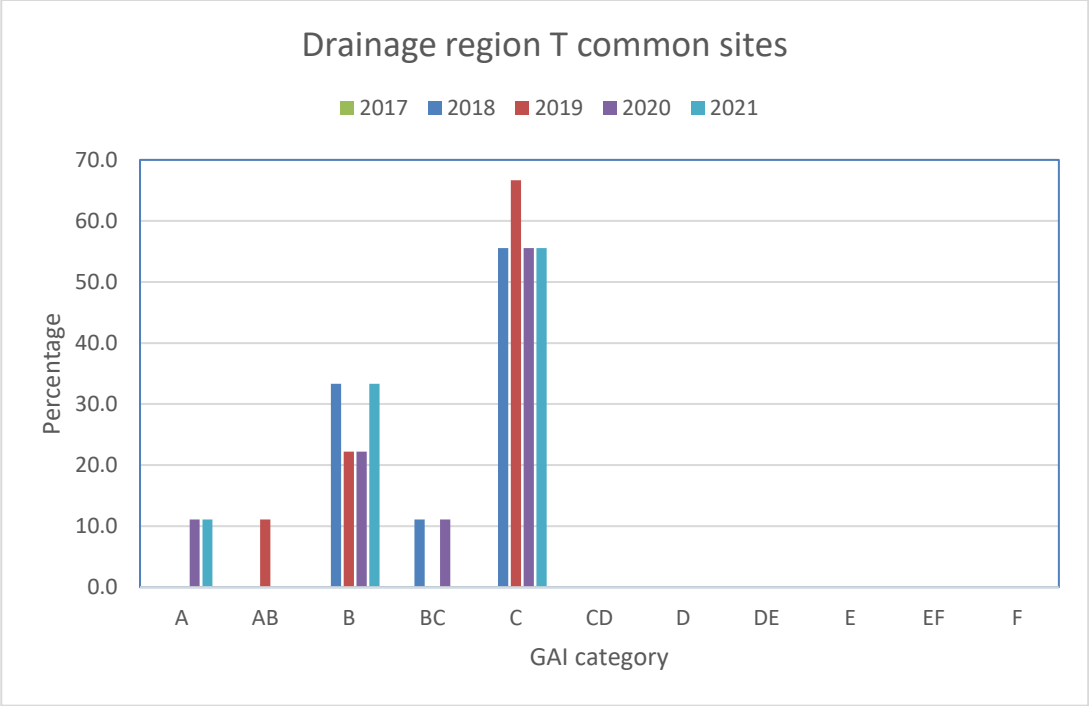

Figure 87: The percentage of sites in each ecological category in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) per hydrological year for geomorphology at those sites monitored in both 2018/19 and 2020/21.

Habitat Integrity:

The instream habitat integrity is generally better than the riparian habitat integrity (Figures 88 and 89). When comparing only the sites monitored in both 2019 and 2020 (Figure 89) there was deterioration in both the instream and riparian habitat. There were no sites with a relative natural (A/B and B) condition in 2020. The riparian habitat integrity at most (66%) sites were in a seriously modified (E) condition in 2020 as opposed to only 33% of the sites in 2019.

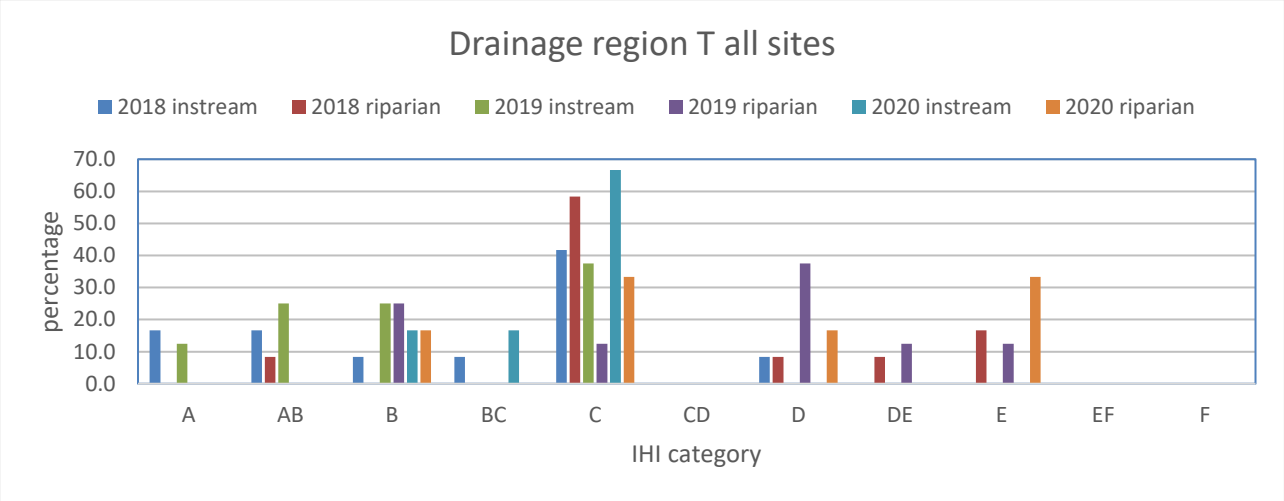

Figure 88: The percentage of sites in each ecological category in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) per hydrological year for habitat integrity at all sites monitored from 2018/19 to 2019/20.

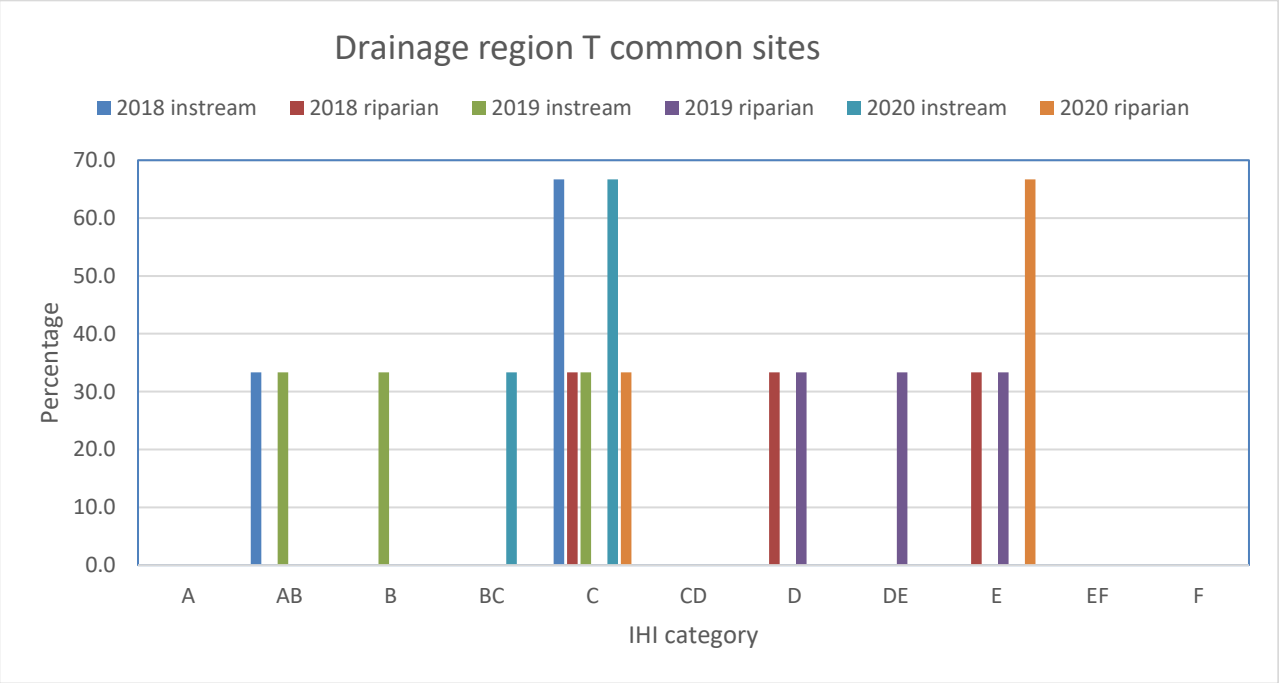

Figure 89: The percentage of sites in each ecological category in primary drainage region T (Mbhashe, Mthatha, Mzimvubu, Mtamvuna, Mzimkhulu) per hydrological year for habitat integrity at those sites monitored in both 2018/19 and 2019/20.

DRAINAGE REGION U (PONGOLA-MTAMVUNA WATER MANAGEMENT AREA)

The U primary drainage region falls within the Pongola-Mtamvuna WMA (Figure 90). The KwaZulu-Natal regional office is responsible for monitoring this management area. Up to November 2017 an implementing agent was used to do the monitoring. Since terminating the services of the implementing agent, only a limited number of sites have been monitored due to limited human and financial capacity. The condition of the rivers in primary drainage region U is provided in Figure 90. There are 29 monitoring sites in this drainage region but only 11 were monitored in this hydrological year due to limited capacity. Nine of these sites were also monitored in the previous year. There are eight secondary drainage regions. There are no sites in secondary regions U5 (Nonoti) and U8 (Mzumbe etc.). A list of the monitoring sites including reasons for not sampling is provided in Annexure U.

- U1: Mkomazi
- U2: Mngeni.
- U3: Mdloti, Tongati etc.
- U4: Mvoti
- U5: Nonoti (not done)
- U6: uMlazi etc.
- U7: Lovu
- U8: Mzumbe etc (not done)

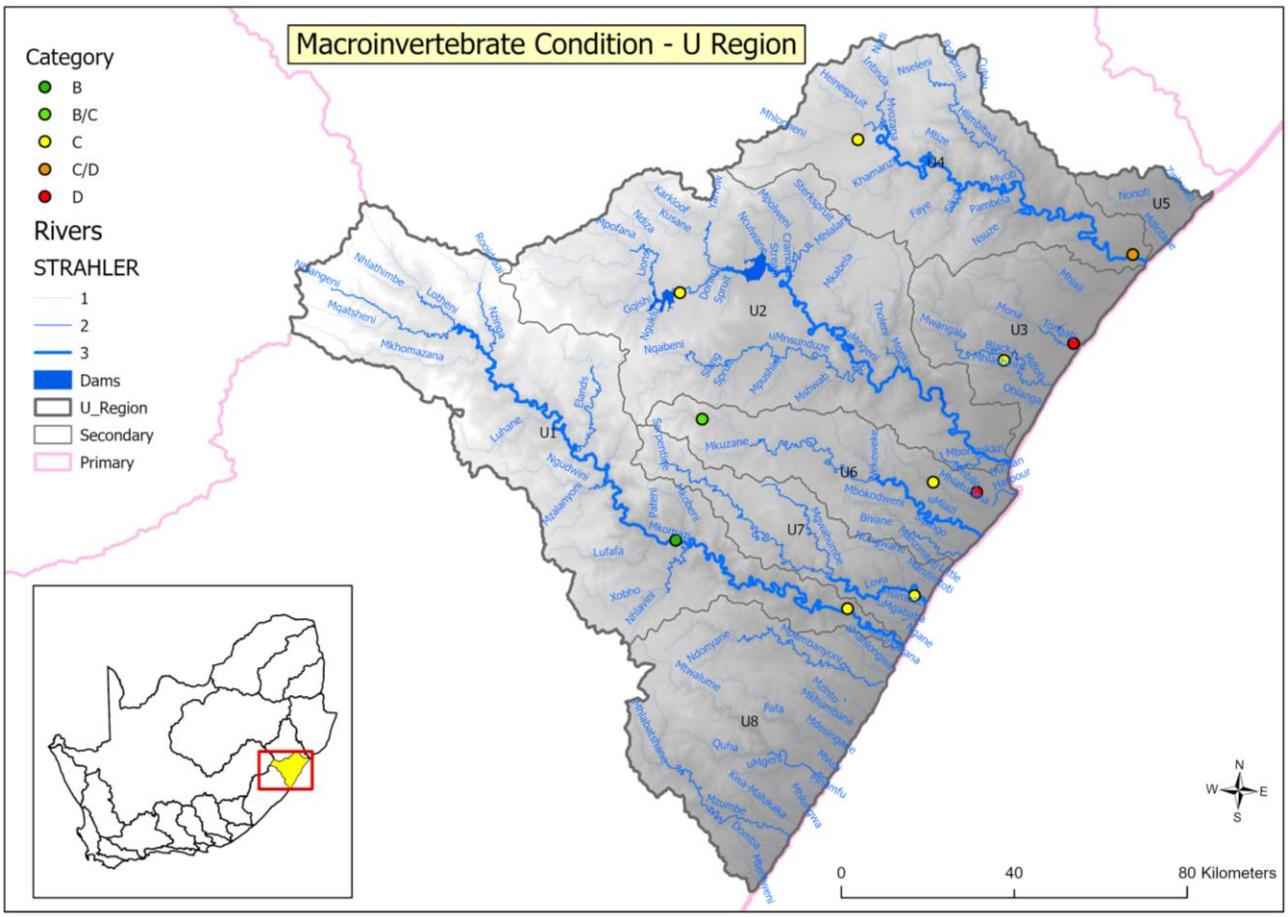

Figure 90: Summary Ecological Categories in primary drainage region U (Pongola-Mtamvuna WMA) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B, B/C) while the red reflect relatively poor conditions (D).

U1: Mkomazi

The Mkomazi River rises in the Eastern Drakensberg near Thabana Ntlenyana on the Lesotho border. It flows south-eastwards before entering the Indian Ocean at Umkomaas approximately 40 km south of Durban. The main tributaries are the Mkomazana, Elands and Lotheni rivers. There are no major dams or cities in the catchment only several smaller towns such as Bulwer, Impendle, Ixopo and Boston. The main land use activities in the catchment are afforestation, irrigation as well as the paper industry (SAPPI) near the river mouth. Only two of the three sites in this secondary catchment were sampled during the hydrological year. The upper Mkomazi near Josephine's Bridge was in a near natural (B) condition while the lower Mkomazi River near uMgababa remained in a moderately modified (C) condition. The Mkomazi has limited GSM and vegetation habitat. The Mkomazana River near the Sani Pass could not be sampled due to limited capacity (Annexure U). The upper Mkomazi River (U1MKOM-JOSEB) complied with the gazetted RQO of B but the lower Mkomazi did not comply with the gazetted RQO of B.

U2: Mngeni

The uMngeni River rises in the uMngeni Vlei area, near Dargle, at the western edge of the catchment 1 760m above sea level. From its source, the Mngeni River flows eastwards for about 230 km before entering the Indian Ocean north of Durban at the Blue Lagoon. It is the main water source for large parts of KwaZulu-Natal including Pietermaritzburg and Durban. The main tributaries are the Lions, Karkloof, uMnsunduze and Palmiet rivers. Three of the four major dams in this catchment (Midmar, Nagle and Inanda) were built mostly for industrial and domestic water supply while the Albert Falls Dam supplies irrigation water. There are 11 sites in this secondary catchment, seven on the Mngeni River, two on the Duzi River and one each on the Lions and Karkloof rivers. Only one site on the Mngeni River itself was monitored due to limited human capacity. The Mngeni River downstream of Midmar Dam remained in a moderately modified (C) condition and met the gazetted RQO. The main impacts in the Mngeni catchment apart from flow regulation were related to poor water quality (DWS, 2017). According to the 2017 State of the Rivers of KwaZulu-Natal report, the Umngeni River had acceptable water quality but with periodic increases in microbial contamination as well as increased concentrations of salts and nutrients in the lower reaches. See Box 4 for some solutions.

BOX 4: COMMUNITIES, NPOS, PRIVATE COMPANIES

Organisations like GroundTruth, triple P, DUCT have put citizen science on the map in KwaZulu Natal; benefiting rivers like uMngeni, Msunduzi, Mlazi, Mbokodweni, just to mention a few. Communities can confidently approach polluters, with the power of data and facts. It was proven that citizen science can be a proxy for monitoring compliance to Total Suspended Solids, through utilisation of a community friendly water clarity tube. Graham and Taylor (2018) demonstrated this in the development of the citizen science tools, where there was partnership with a community affected by discharges from a wastewater treatment facility around the informal settlement of Shiyabazali, on the banks of the uMngeni River. Community member Zongile Ngubane is pictured below conducting the monitoring.

U3: Mdloti, Tongati

The Mdloti River rises in the rural hilly area near the village of Etsheni passing through increasingly dense settlements and the densely populated town of Verulam before flowing into the Indian Ocean near the coastal towns of Umdloti and La Mercy. The Mwangala and Black Mashini rivers are the main tributaries and Hazelmere Dam upstream of Verulam is the only dam in the river. The Tongati also rises in rural hilly areas and flows through more densely populated areas before reaching the Indian Ocean at the Zimbali Coastal Estate near Ballito. The Mona River is the Tongati's main tributary. There are only two sites in this secondary catchment, one each on the Mdloti and the Tongati rivers. The site on the Mdloti is in the backup of the Hazelmere Dam and can only be sampled when the water levels in the Hazelmere Dam is low enough to prevent flooding of the site. This site remained in a moderately modified (C) condition, but the condition has been steadily improving from 67% in 2018/2019 to 77.9% in 2020/2021. The Mdloti River, downstream of the Hazelmere Dam is highly impacted by poorly functioning and overloaded wastewater treatment works. Even though sand mining has been noted to be an issue on the Mdloti River, over recent years, this has become very extensive (S. Buthelezi, personal communication, 18 August 2022). The Tongati River remained in a largely modified (D) condition but the condition has decreased from 55.5% in 2019/2020 to only 47.4% in 2020/2021. According to the 2017 State of KZN Rivers report (DWS, 2017), this site may be affected by faecal pollution and fertilizers. This area is impacted by agricultural activities as well as run-off from industrial, urban, and peri-urban areas (DWS, 2017).

U4: Mvoti:

The Mvoti River rises in a forested area near Hilton. It flows through the Mvoti Vlei Nature Reserve and rural villages before entering the Indian Ocean at Blythedale Beach near Kwa Dukuza and Stanger. The main tributaries of the Mvoti are: Heinespruit, Mvozana, Khamanzi, Mtize, Sikoto, Hlimbitwa and Nsuze. Only two of the four sites in the Mvoti catchment were monitored. The upper site on the Mvoti River near Greytown (U4MVTI-SHANK) decreased from a largely natural (B) condition back to a moderately modified (C) condition, while the lower site at the N2 bridge remained in a close to moderately modified (C/D) condition. The EWR site on the Mvoti River (U2MVTI-EWR12) was in a largely natural to moderately modified (B/C) condition when it was last sampled in 2017/2018 and in 2018/2019. The main impacts in this area are from low-density rural settlements and the accompanying overgrazing by livestock (DWS, 2014f). The lower Mvoti catchment is also impacted by the pulp industry, sometimes having strips of suspended material in the river (S. Buthelezi, personal communication, 19 August 2022).

U6: uMlazi etc.

The uMlazi River rises near Byrne west of Pietermaritzburg. The upper part of the river is in a sparsely populated forested area while the lower reaches are in the densely populated Mpumalanga region. The lower section before flowing into the Indian Ocean near the old Durban Airport is canalised. The main tributaries are the Mkuzane and Sterkspruit. The Hopewell and Shongweni dams in the Mlazi River are used for domestic water supply. There are five sites in this drainage region three sites on the Mlazi River and one each on the Umbilo and Mhlatuzana rivers. Only the uppermost of the three sites in the Mlazi River were

sampled. The site, upstream of the Baynesfield Farm Estate near Richmond, improved by almost 3% from a moderately modified (C) condition to a close to largely natural (B/C) condition in the current hydrological year. The condition at this site has been varying between a C to a B/C condition in the last few years. This site is mostly impacted by agriculture and there were indications of erosion and sedimentation as well as possible faecal pollution and nitrogen-based fertilisers (DWS, 2017). The Umbilo in a largely modified (D) condition and Mhlatuzana in a moderately modified (C) condition were not monitored prior to this hydrological year. These two rivers are mostly impacted by urban runoff and sewage pollution from the greater Durban area.

U7: Lovu

There are four sites within this secondary catchment but only the lower site near the estuary could be sampled during this hydrological year due to a lack of human capacity. This site remained in a moderately modified (C) condition. This site has been impacted by vehicles crossing the river but since that has stopped the site has shown improvement (information from SASS sheets). However, the condition at the site has deteriorated slightly compared to the previous year. This site is now impacted by sand-mining activities (information from SASS sheets), which also seriously affect the water quality with respect to suspended solids.

Summary

Most sites in this primary drainage region are in a moderately modified (C) condition (Figure 91 and 92) but there seems to have been a slight improvement in the macroinvertebrate condition in this catchment (Figure 91), with no sites in an unsustainable (E) condition since the 2017/2018 hydrological year and sites in a largely natural (B) condition since 2019/2020. This improving trend is less obvious when only considering the sites that were sampled in every year since 2018/19 (Figure 92), but it is still evident in the presence fewer sites in a largely modified (D) condition and more sites in a largely natural (B) or largely natural to moderately modified (B/C) condition.

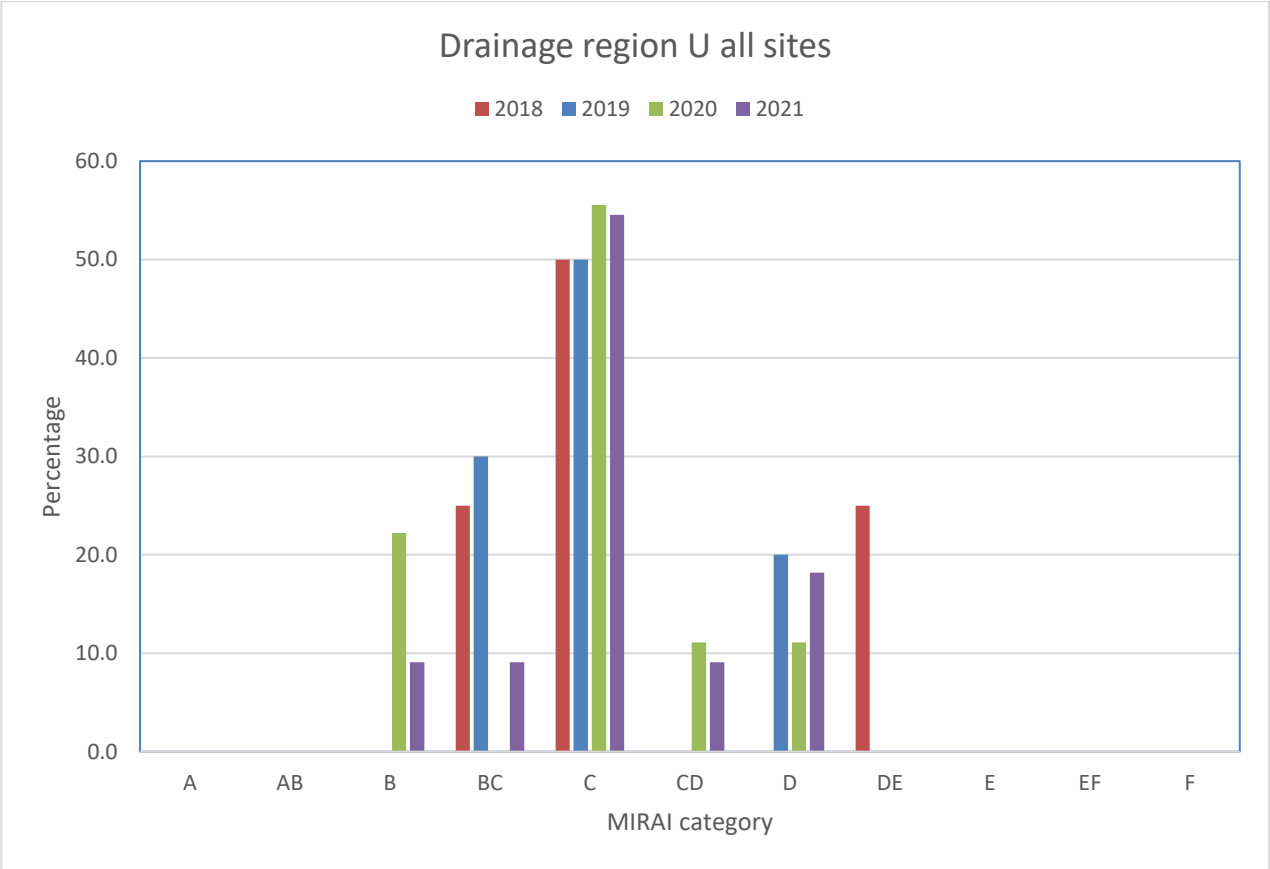

Figure 91: The percentage of sites in each ecological category in primary drainage region U (Pongola-Mtamvuna WMA) per hydrological year for macroinvertebrates at all sites monitored from 2017/18 to 2020/21.

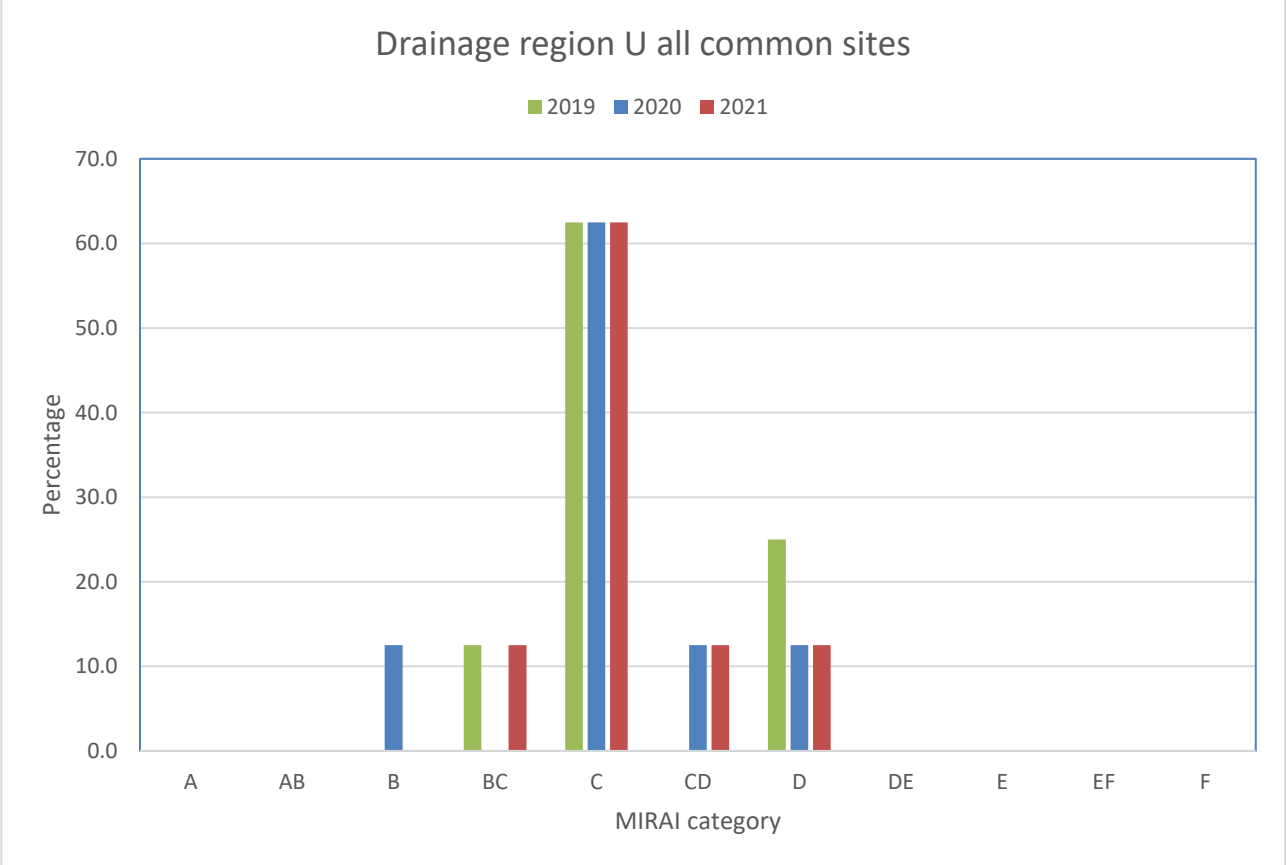

Figure 92: The percentage of sites in each ecological category in primary drainage region U (Pongola-Mtamvuna WMA) per hydrological year for macroinvertebrates at those sites monitored every year since 2018/19.

DRAINAGE REGION V (PONGOLA-MTAMVUNA WATER MANAGEMENT AREA)

The V (Thukela) primary drainage region falls within the Pongola-Mtamvuna WMA. It is the largest river in KwaZulu-Natal with a catchment area of 29100 km^2. The KwaZulu-Natal regional office is responsible for monitoring this management area. Up to November 2017 an implementing agent was used to do the monitoring. Since terminating the services of the implementing agent, only a limited number of sites have been monitored due to limited human and financial capacity. The condition of the rivers in primary drainage region V is provided in Figure 93. There are 17 active REMP monitoring sites in this drainage region but only seven were sampled during this hydrological year. Six of these sites were also sampled in the previous year. Five of these sites remained in the same condition as the previous year and one improved by half a category. There are seven secondary drainage regions. A list of the monitoring sites including reasons for not sampling is provided in Annexure V. A study to classify the Thukela River and determine the Resource Quality Objectives is nearing completion. The RQOs have been determined but has not yet been gazetted as it still must be subjected to comments from the public. The macroinvertebrate condition for this drainage region is compared to these draft RQOs.

- V1: Thukela
- V2: Mooi
- V3: Buffalo
- V4: Thukela
- V5: Thukela
- V6: Thukela Sundays
- V7: Bushmans

V1: Thukela:

This drainage region represents the Little Tugela and the upper sections of Thukela up to the Bushmans River confluence. The Thukela River rises at Mont-Aux-Sources on the Lesotho Border plunging almost 950m down the Tugela Falls before meandering through the KwaZulu-Natal Midlands. The Woodstock and Spioenkop dams are the main dams in this part of the catchment. The main towns in this area are Bergville, Winterton and Colenso. The Little Tugela, Bloukrans and Klip rivers are the main tributaries in this secondary catchment. Water is transferred from the Driel Barrage (downstream of Woodstock Dam) to the Kilburn Dam in the Majaneni River from where it is pumped to the Driekloof Dam (connected to the Sterkfontein Dam) as part of the Thukela Vaal transfer scheme. The water is then released to the Vaal Dam from Sterkfontein Dam via the Nuwejaarspruit and the Wilge River. Eskom uses the Kilburn and Driekloof Dams (Drakensberg pumped storage scheme) to generate electricity (ORASECOM 2013). Only one of the two sites in the upper reaches of the Thukela River could be sampled. The Thukela River, just upstream of the Bloukrans River confluence, remained in a moderately modified (C) condition and complied with the draft RQO. The main impacts in this reach apart from flow regulation are related to agricultural activities including irrigation and cattle farming (DWS, 2017).

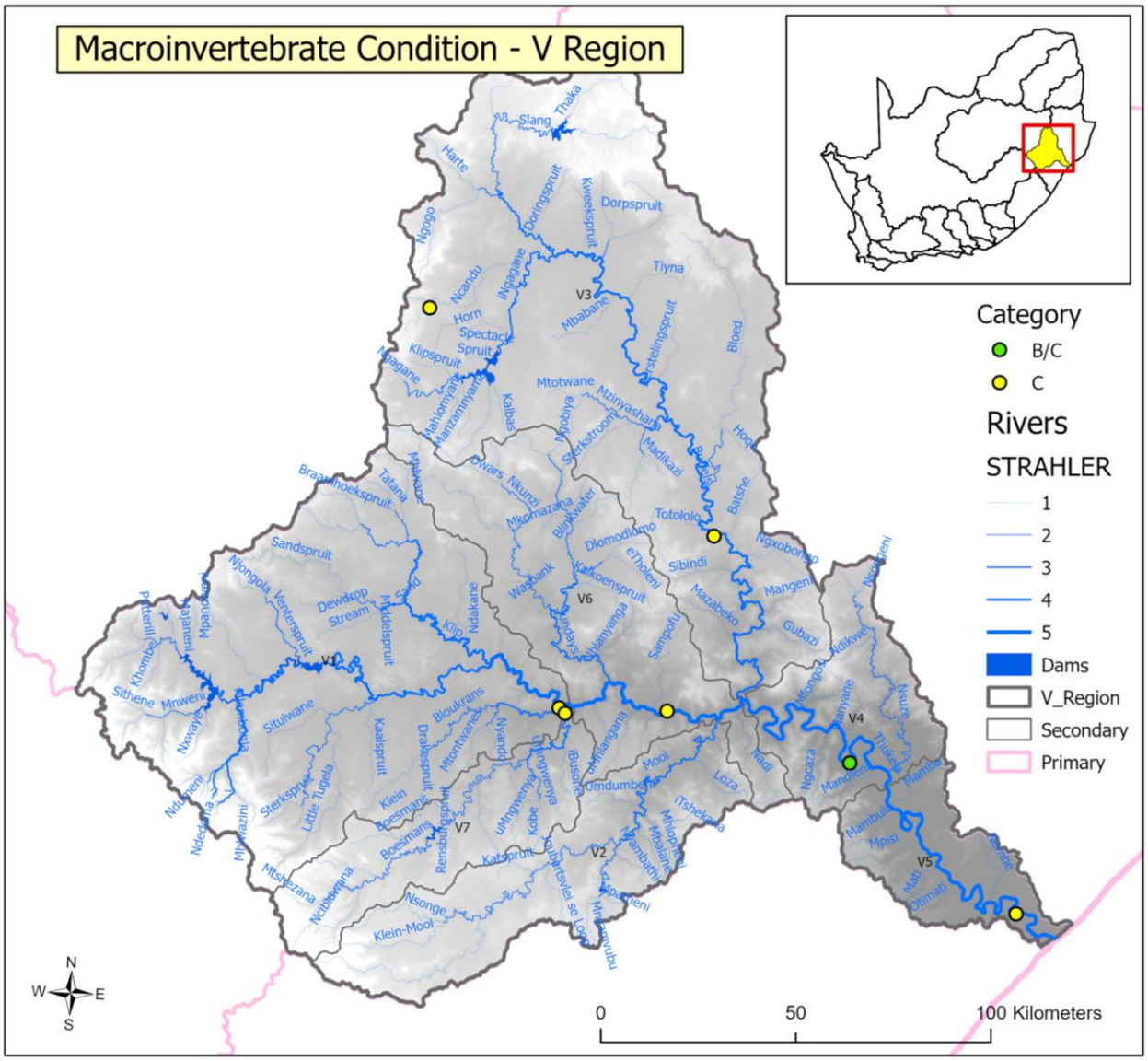

Figure 93: Summary Ecological Categories in primary region V (Thukela) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) and yellow relatively fair conditions (C).

V2: Mooi:

The Mooi River as well as the Klein Mooi River rises in the Kamberg-Highmoor area of the UKhahlamba Drakensberg World Heritage site. The Springrove Dam and the Cragie Burn Dam (in the Mnyamvubu tributary) are the main dams in the catchment. Rosetta, Mooi River and Müden are the main towns. The Mooi River Catchment could not be monitored due to capacity constraints. Water is transferred from the Springrove Dam to Midmar Dam on the Mngeni via the Mooi-Mpofana transfer scheme. There are two sites in this secondary catchment, one in a tributary of the Mooi River and the other an Ecological Water Requirement (EWR) site near the town of Mooiriver. These two sites have not been sampled for the last four years due to human capacity constraints. In the 2016/2017 hydrological year the Kamberg site in the Ukhahlamba Drakensberg Park was in a close to natural (A/B) condition (DWS, 2017). This site is mostly impacted by the sedimentation and erosion related to a weir constructed for the old trout hatchery near the site (DWS, 2017).

V3: Buffalo:

The Buffalo River, the largest tributary of the Thukela River, rises at Majuba Hill northeast of Volksrust. It flows through the coal-mining area at Newcastle and joins the Thukela River at Ngubevu near Nkandla. The main tributaries are the Slang, iNgangane, Wasbankspruit, Sandspruit and the Blood River. The Zaaihoek Dam on the Slang River is the largest instream dam in this catchment. The main economy in the upper and middle part of the catchment involves coal mining around Newcastle, Dundee, and Utrecht. Two of the seven sites in the Buffalo catchment were sampled. Both the Buffalo River at Rorkes Drift and an unnamed tributary of the Ncandu River remained in a moderately modified (C) condition. The Buffalo River (V3BUFF-RORKE) complied with the draft RQO of a C while the Ncandu River tributary (V3NCND-LEYDN) did not comply with the gazetted RQO of a B/C. The only impacts at the Ncandu tributary are related to the local farming activities; mainly erosion and sedimentation due to some trampling in the riparian zone (DWS, 2017), whereas the physico-chemical conditions at the lower Buffalo River will also be impacted by the coal mining activities in the Newcastle area (iNgagane River).

V4: Thukela:

This secondary drainage region comprises the Thukela River from the confluence of the Buffalo River up to the Middledrift area just upstream of the Washi confluence. It is a mostly rural area with no main towns or dams. Only one of the two sites in this secondary catchment was monitored due to human capacity constraints. The Thukela River near Kranspoort (V4THUK-KRANS) was in a close to largely natural (B/C) condition.

V5: Thukela:

This secondary drainage region comprises the Thukela River from the Washi confluence up to the Thukela River mouth near Mandini. The only site in this catchment (V5THUK-RAILWB) is at the railway bridge near Mandini, upstream of the Thukela River mouth. This site increased to a moderately modified (C) condition in 2020/21 from a close to moderately modified (C/D) condition in 2019/2020 and complied with the draft RQO of a C category. The limited habitat availability (only bedrock and GSM) constraints the diversity of macroinvertebrates at this site. Water for the Lower Thukela bulk water supply scheme is abstracted from a weir approximately 1500m upstream of the site. The SAPPI Tugela Mill also has an impact on the site.

V6: Thukela Sundays:

This secondary drainage region comprises the Thukela River from the Bloukrans River confluence up to the confluence with the Buffalo River. The Sundays River is the main tributary in this catchment. The Wasbank River tributary of the Sundays River is impacted by coal mining in the Glencoe area near Dundee. The only site in this catchment is the Thukela River at Tugela Ferry (V6THUK-TFERR) downstream of the Sundays River

confluence. This site remained in a moderately modified (C) condition and complies with the RQO of a D category.

V7: Bushmans:

This secondary drainage region comprises the Bushmans River and its tributaries. The Bushmans River rises at Giants Castle in the Drakensberg. The main towns in the catchment are Estcourt near the Wagendrift Dam and Weenen at the lower end of the catchment. Only one of the two sites on the Bushmans River was monitored. This site (V7BUSH-MASHU) approximately 2.5 km from the confluence with the Thukela River at Tugela Estates remained in a moderately modified (C) condition and complied with the draft RQO of a C/D category.

Summary

The condition in the Thukela catchment has changed from 2017/2018 to 2020/2021 with one site in a close to largely natural (B/C) condition, more (6) sites in the moderately modified (C) condition and no sites in the largely modified (D) condition (Figure 94). However, if one only considers those sites sampled in 2018/2019, 2019/2020 and 2020/2021 (Figure 95) it seems as if the condition has remained mostly stable with most sites in a moderately modified (C) condition. There is only one site (V5THUK-RAILWB) which changed from a moderately modified (C) condition in 2018/19 to a close to moderately modified (C/D) condition in 2019/2020 but it improved back to a C condition in 2020/2021. This site is impacted by abstractions for the lower Thukela Bulk water scheme as well as the SAPPI Thukela mill and changes to either of these impacts. One would need information for a longer period to determine if there is a decreasing trend over the medium term.

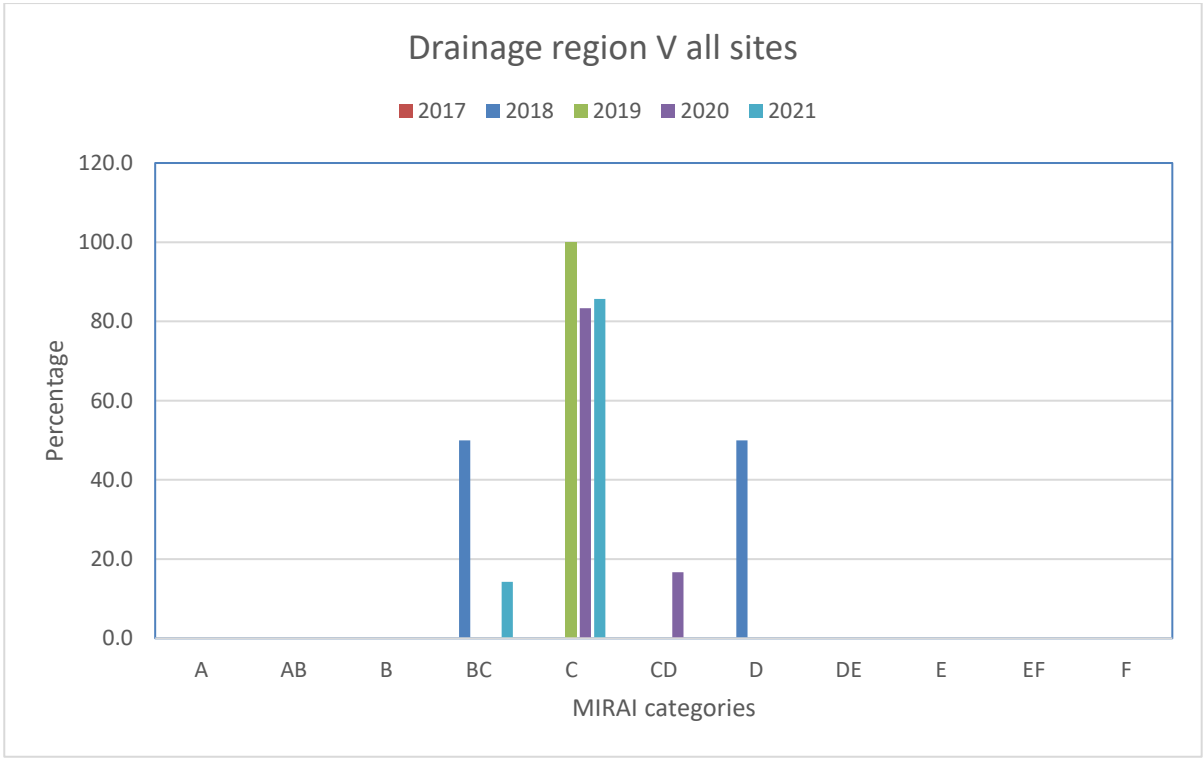

Figure 94: The percentage of sites in each ecological category in primary drainage region V (Thukela)) per hydrological year for macroinvertebrates at all sites monitored from 2017/18 to 2019/21.

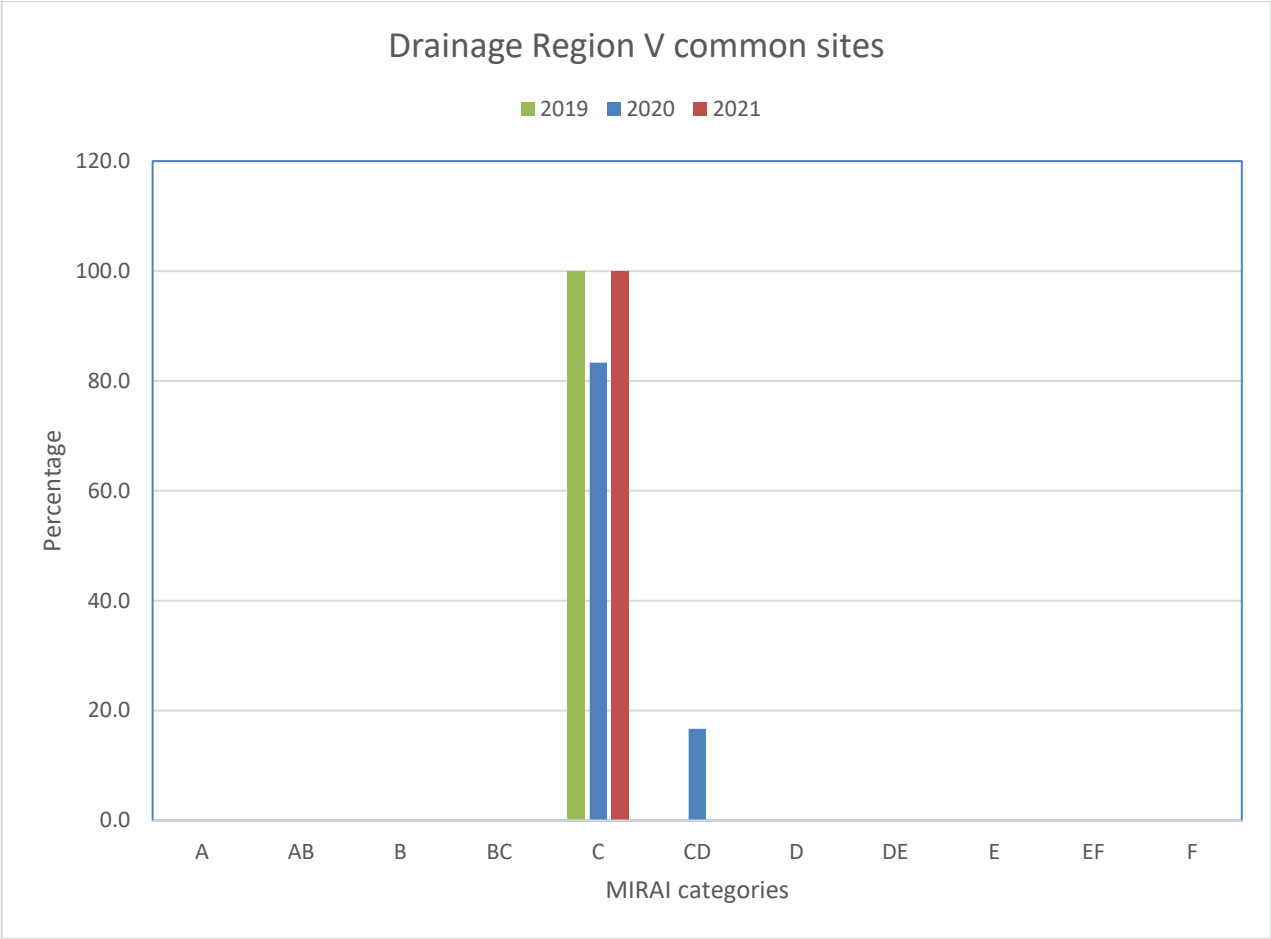

Figure 95: The percentage of sites in each ecological category in primary drainage region V (Thukela) per hydrological year for macroinvertebrates at those sites monitored every year from 2018/19 to 2020/21.

DRAINAGE REGION W (PONGOLA-MTAMVUNA AND INKOMATI USUTHU WATER MANAGEMENT AREAS)

The W primary drainage region falls within the Pongola-Mtamvuna and the Inkomati-Usuthu WMAs. The KwaZulu-Natal regional office is responsible for monitoring the Pongola-Mtamvuna WMA and the Inkomati Usuthu Catchment Management Agency (IUCMA) for the Usuthu (W5) drainage region. The IUCMA uses an implementing agent to do detailed biomonitoring in the Usuthu catchment every five years. The IUCMA monitors a limited number of sites annually. A detailed survey of the Usuthu was done in 2019. Until November 2017, DWS used an implementing agent to do the monitoring. Since terminating the services of the implementing agent, only a limited number of sites have been monitored due to limited human and financial capacity. The condition of the rivers in primary drainage region W is provided in Figures 96 and 97. There are 83 REMP monitoring sites in this drainage region 13 of these are in eSwatini. Monitoring was done at 40 sites in 2020/21. Thirty-six of these sites were also monitored in the previous year. The condition at 21 (52.5%) of the sites remained the same while five (12.5%) improved and 10 (25%) decreased. There are seven secondary drainage regions, but W6 and W7 are not monitored. W6 falls within eSwatini and Mozambique, whereas W7 comprises the Kosi Lakes system where no suitable river habitat is available. A list of the monitoring sites including reasons for not sampling is provided in Annexure W**.**

- W1: Mhlatuze
- W2: Mfolozi
- W3: Mkuze
- W4: Pongola
- W5: Usuthu
- W6: Mbuluzi (not sampled)
- W7: Kosi Lakes (not sampled)

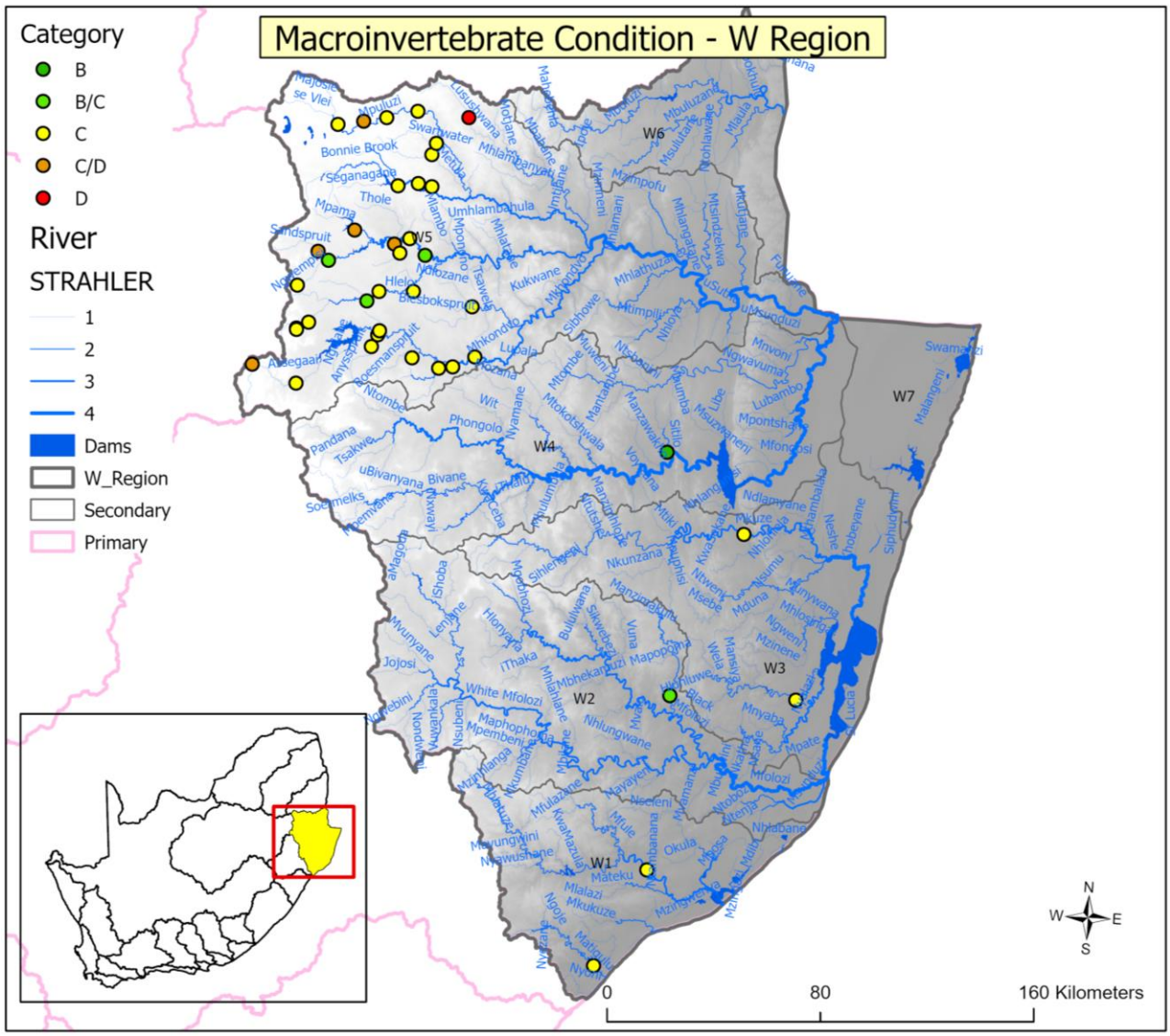

Figure 96: Summary Ecological Categories in primary drainage region W (Usuthu-Mhlatuze, Pongola) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B & B/C) while the red reflect relatively poor (D) conditions.

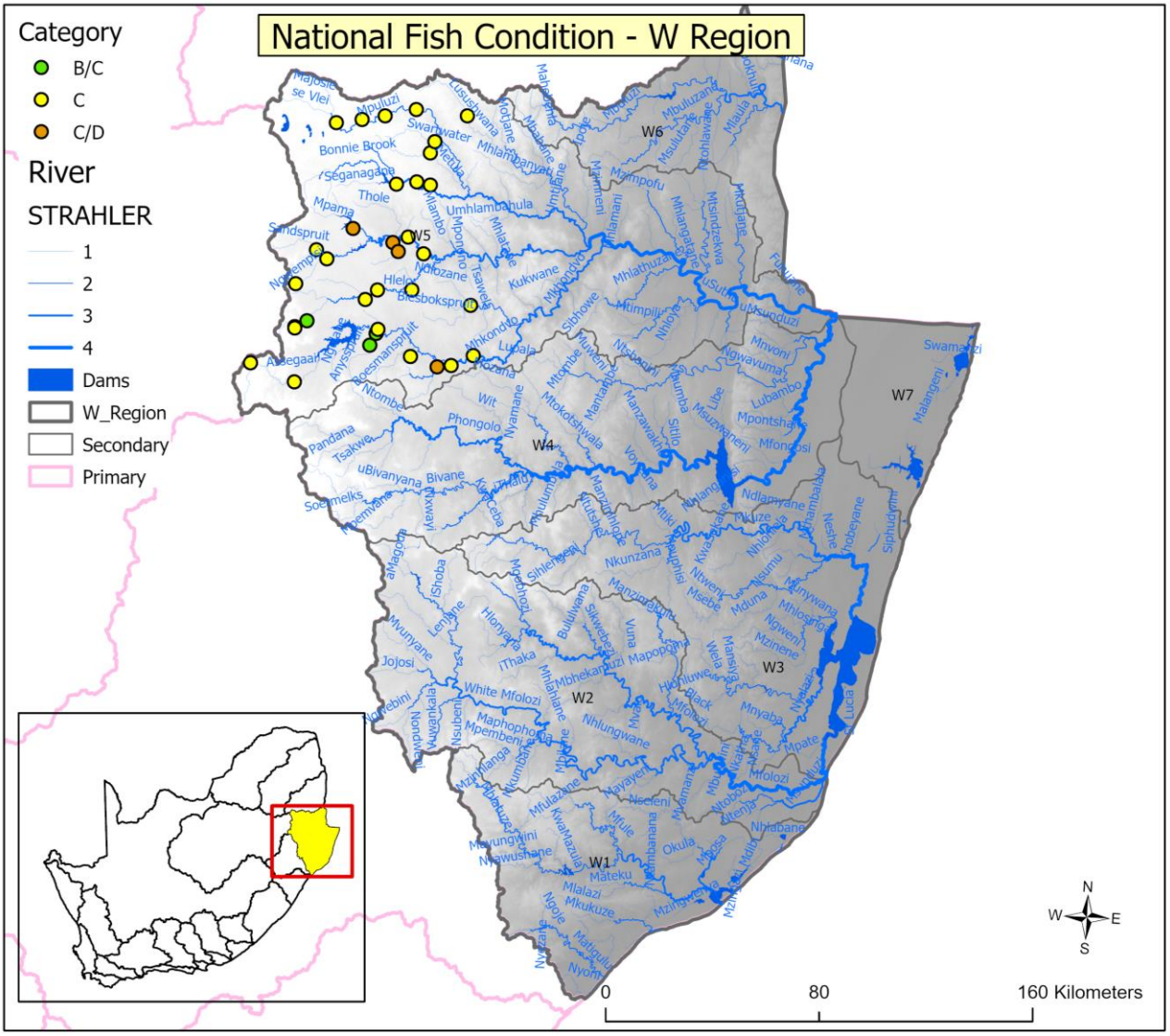

Figure 97: Summary Ecological Categories in primary drainage region W (Usuthu-Mhlatuze, Pongola) reflecting fish condition for selected sites monitored during 2020/2021 hydrological year. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B/C) while the orang reflect relatively poor (C/D) conditions.

W1: Mhlatuze:

The Mhlatuze catchment comprises the Mhlatuze River as well as the Matigulu, Mlalazi and Nhlabane rivers. The Mhlatuze River rises in the Babanango Hills and flows into the Indian Ocean at Richards Bay. The upper part of the catchment is in a rural area with forestry but changes to more agriculture dominated land use downstream of the Goedertrouw Dam. The lower parts of the river are more densely populated and include the Richards Bay Industrial Complex. The Goedertrouw Dam was built to provide water for the Richards Bay Industrial Complex but also supplies water for domestic use and irrigation. The main towns in the catchment are Melmoth, Eshowe, Empangeni and Richards Bay. Only two of the seven sites in this drainage region were sampled. Both sites (W1MATI-NYEZA and W1MHLA-GWEIR) remained in a moderately modified (C) condition. The lower Matigulu (W1MATI-NYEZA) is modified, not only by sand mining and livestock grazing and trampling, but also by the local community driving through the channel as there is no formal river crossing in the vicinity (DWS, 2017). The upper site on the Mhlatuze (W1MHLA-GWEIR) is at a weir

approximately 28 km upstream of the R102 crossing (at the P230 Road Bridge) and is mainly impacted by agricultural activities.

W2: Mfolozi:

This drainage region comprises the Mfolozi River as well as its two main tributaries the Black Mfolozi and the White Mfolozi. The Mfolozi is formed by the confluence of the Black- and White Mfolozi rivers at the border of the Hluhluwe-Imfolozi Game Reserve. The White Mfolozi rises near Vryheid while the Black Mfolozi rises near Bloemendal. The Klipfontein Dam on the White Mfolozi near Vryheid is the main dam in the catchment. The main land use in the upper parts of the Black and the White Mfolozi rivers is Forestry. Just downstream of the confluence of the Black and the White Mfolozi the Mfolozi River flows past the Somkhele Coal Mine. Only one of the eight sites in this drainage region could be monitored. The Mona River near Hlabisa improved considerably from a largely modified (D) condition to a close to largely natural (B/C) condition. This improvement is most likely due to improved flow conditions. The Mona River is also affected by sand mining.

W3: Mkuze:

This drainage region comprises the Mkuze and Hluhluwe rivers. The Mkuze River rises in a forested area near Hlobane and forms the north-eastern border of the Mkuze Game Reserve and flows into Lake St. Lucia. The lower part of the catchment is characterised by an extensive wetland system including several floodplain pans. The Hluhluwe River rises near Bazaneni and flows into Lake St Lucia. A large portion of the upper catchment forms part of the Hluhluwe-Imfolozi Game Reserve. The Hluhluwe Dam, just downstream of the Hluhluwe-Imfolozi Game Reserve supplies water for irrigation and domestic water supply. Mkuze and Hluhluwe are the main towns in this catchment. Only two of the five sites in this drainage region were sampled. The site in the Mkuze River near Mkuze town remained in a moderately modified (C) condition. The main impacts in the upper reaches of the Mkuze River are linked to commercial forestry, road crossings, coal mines and agricultural activities (DWS, 2014g). Sand mining is increasingly becoming a serious issue in the Mkuze River (S. Buthelezi, personal communication, 19 August 2022). The Hluhluwe River downstream of the dam has improved from a largely modified (D) condition in 2018/2019 and a slightly better C/D (close to moderately modified) condition in 2019/2020 to a moderately modified (C) condition in this hydrological year. This site is impacted by flow regulation from the dam as well as formal agriculture. The upper site on the Hluhluwe River within the Game Reserve is often dry and access to the site needs to be arranged ahead of time.

W4: Pongola:

This secondary drainage region comprises the Pongola River and its tributaries. The Pongola catchment is shared with eSwatini and Mozambique. The Pongola rises near Utrecht in northern KwaZulu-Natal, flows east through Pongola then it flows north before joining the Maputo River in Mozambique. The Bivane and Mozana rivers in South Africa, as well as the Ngwavuma in eSwatini are the main tributaries. The lower part of the catchment between Pongolapoort Dam and the confluence with the Usuthu River on the Mozambique

border forms an extensive floodplain wetland characterized by floodplain pans. Only one of the seven sites in this drainage region was sampled. The Pongola River downstream of Pongola between the confluences of the Rietspruit and Sitilo rivers has improved from a close to largely natural (B/C) condition in 2018/19 and 2019/20 to a largely natural (B) condition in 2020/21. Water for irrigation is diverted from the Grootdraai weir. South Africa is obligated to make releases to Mozambique from the Pongolapoort Dam. In addition, there are operating rules in place that specify the frequency and magnitude of flood releases for ecological and social requirements to the floodplain downstream of the dam. The main land use in the Pongola catchment is large scale commercial forestry in the upper part of the catchment and extensive irrigated sugarcane in the lower reaches of the catchment.

W5: Usuthu:

The source of the Usuthu is in the Mpumalanga Highveld near the town of Amsterdam. It flows through the Kingdom of eSwatini and into Mozambique (Diedericks *et al*., 2017). This secondary catchment can be subdivided into seven sub-catchments (Usuthu, Assegai, Hlelo, Ngwempisi, Mpuluzi, Lusushwane and Lusutfu). The main impacts in this drainage region are due to Forestry, Mining, agricultural activities as well as municipal Wastewater Treatment Works. Another large impact is related to Inter basin transfers to the Vaal and Olifants catchments mostly to provide cooling water to ESKOM power stations (Diedericks *et al*., 2016). Four dams were built in the Assegai, Ngwempisi and Usuthu rivers to support these transfers. Water is transferred from the Heyshope dam on the Assegai River to the Grootdraai Dam in the Vaal catchment as well as to the Morgenstond Dam on the Ngwempisi. Water is then transferred to the Jericho Dam on the Mpama River and from there to the Olifants River catchment. In addition, water is also transferred from the Bonnie Brook River to the Jericho Dam via the Westoe Dam on the Usuthu (Roux *et al.*, 2020). The IUCMA is responsible for monitoring the Usuthu catchment. The Mpumalanga Tourism and Parks Agency (MTPA) monitored 40 of the 56 sites in the Usuthu catchment during spring 2019 on behalf of the IUCMA (Roux *et al*., 2020). During the current hydrological year, the IUCMA monitored invertebrates at 34 and Fish at 35 of the sites in South Africa only. Thirty-one of these sites were also sampled in the previous year.

Invertebrates:

Only three of the 35 sites were in a close to largely natural (B/C) condition. Almost three quarters of the sites (25) were in a moderately modified (C) condition while another five were in a close to moderately modified (C/D) condition and one site in a largely modified (D) condition. When compared to the results obtained in 2019/20, most (60%) of the sites remained in the same category. Only two sites improved and 10 of the sites deteriorated when compared to the 2019/20 results. The presence of the exotic red claw crayfish (*Cherax quadricarinatus*) and the quilted Melania snail (*Tarebia granifera*) is of major concern (Roux *et al*., 2020).

Fish:

The fish were mostly in a moderately modified (C) condition with only four sites in a close to largely natural (B/C) condition and another four in a close to moderately modified (C/D) condition. Twenty-one of the 35 sites monitored in this hydrological year were also monitored in 2018/2019. Most (13) of these sites remained in the same condition with two sites improving and six sites deteriorating.

Summary:

Invertebrates:

The invertebrates mostly remained in a moderately modified (C) condition since 2017 (Figures 98 and 99). The slight improvement in condition with more sites in a better than moderately modified condition and fewer sites in a worse than moderately modified condition (Figures 98 and 99) observed in the previous hydrological year was not evident this year.

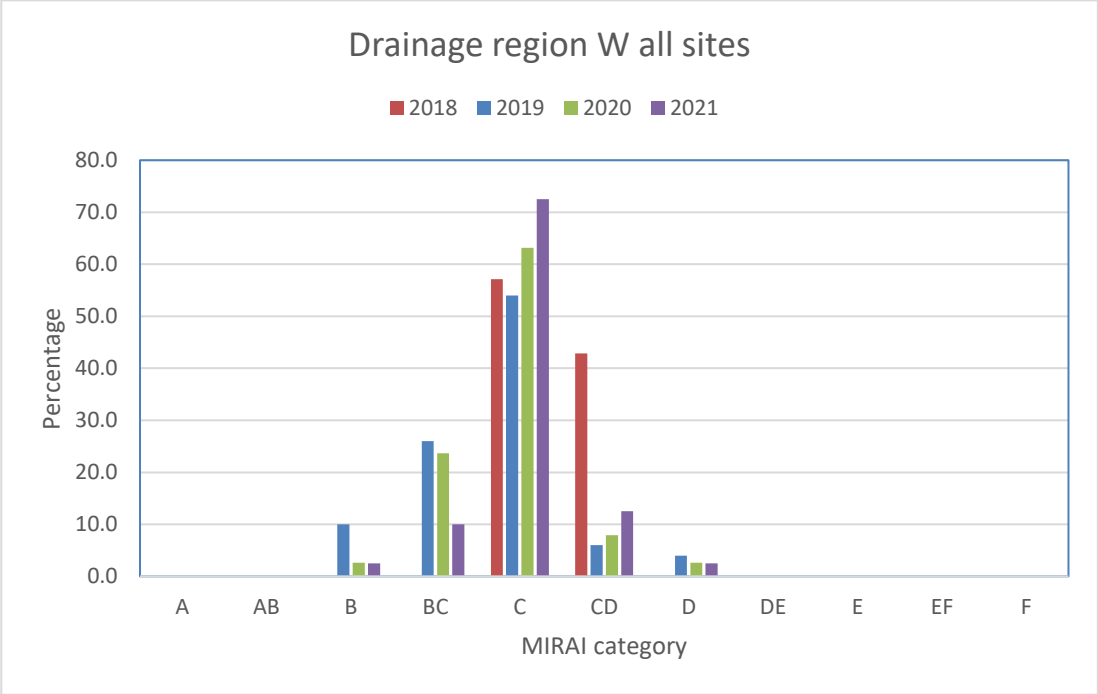

Figure 98: The percentage of sites in each ecological category in primary drainage region W (Usuthu-Mhlatuze, Pongola) per hydrological year for macroinvertebrates at all sites monitored from 2017/18 to 2020/21.

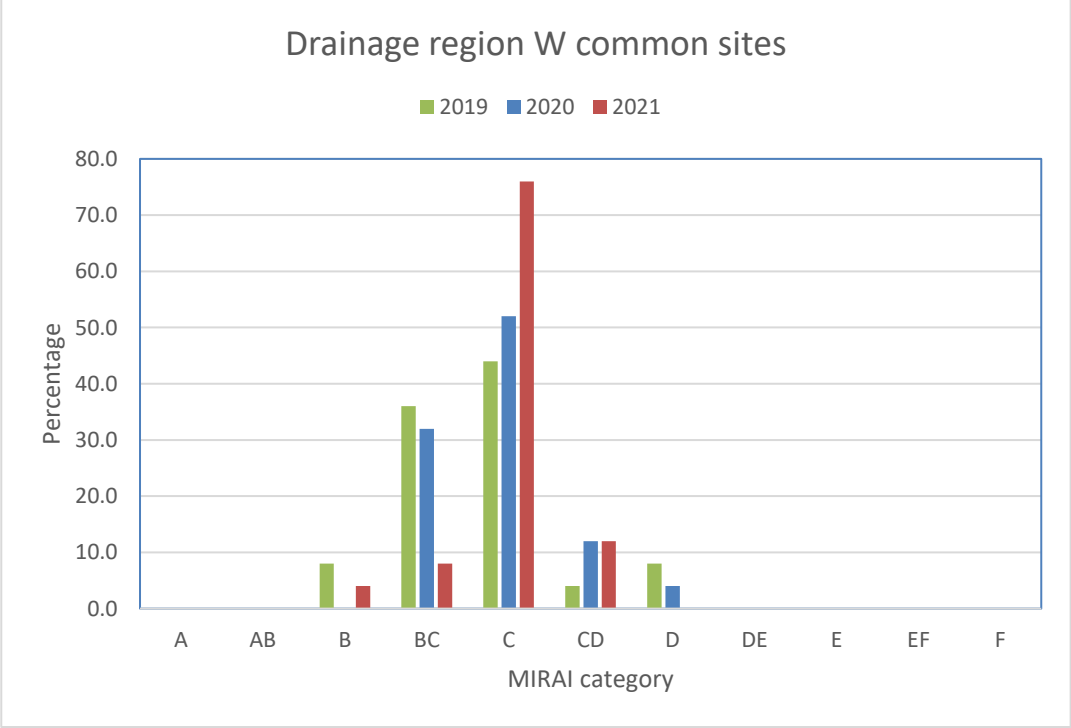

Figure 99: The percentage of sites in each ecological category in primary drainage region W (Usuthu-Mhlatuze, Pongola) per hydrological year for macroinvertebrates at those sites monitored every year from 2018/19 to 2020/21.

Fish:

Fish were only sampled in 2018/2019 and in 2020/2021. There seems to have been a slight deterioration in fish condition in the current year (Figure 100) compared to 2018/2019 with more sites in a worse than moderately modified condition and fewer sites in a better than moderately modified condition. This phenomenon is even clearer when only considering those sites sampled during both sampling periods (Figure 101).

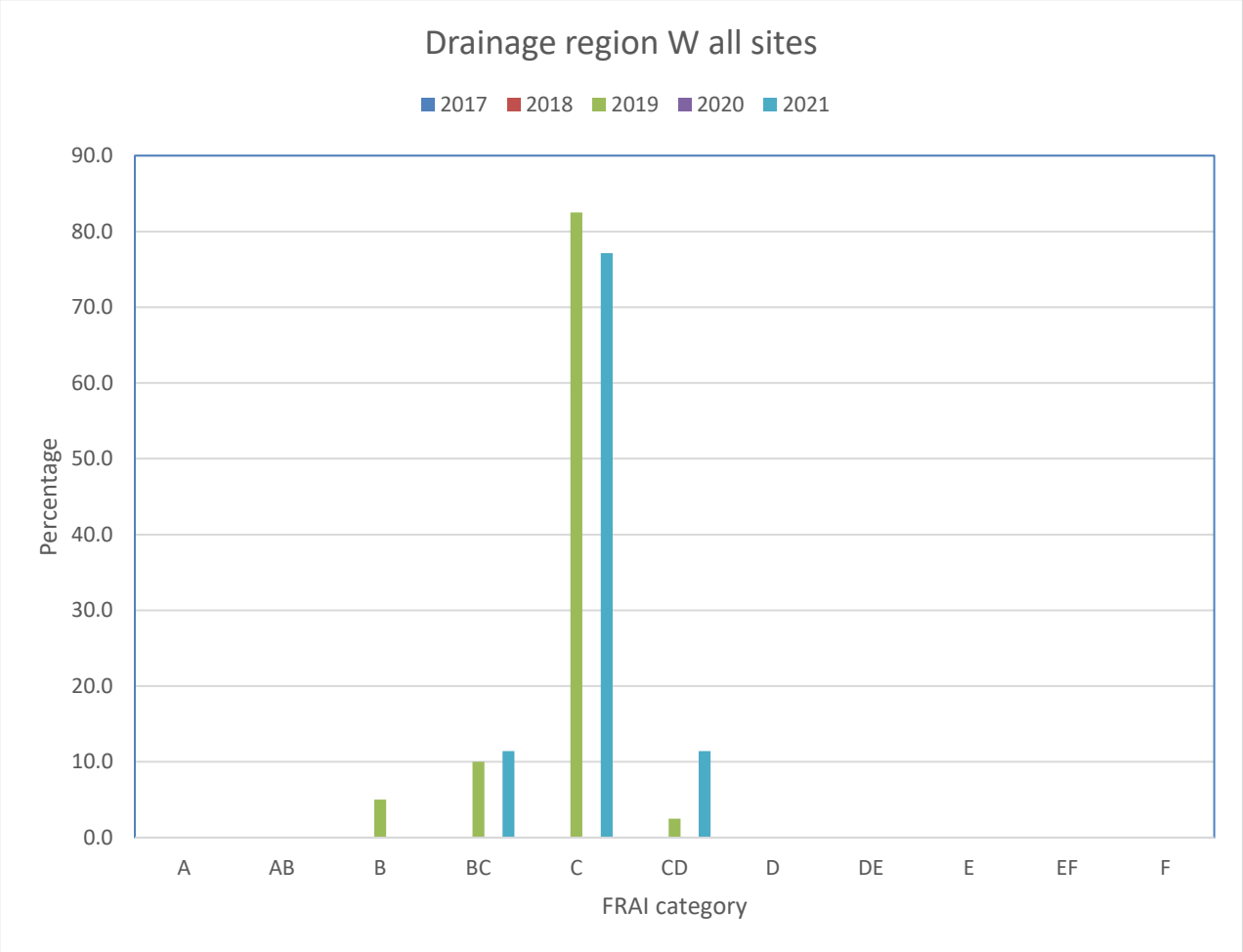

Figure 100: The percentage of sites in each ecological category in primary drainage region W (Usuthu-Mhlatuze, Pongola) per hydrological year for fish at all sites monitored from 2017/18 to 2020/21.

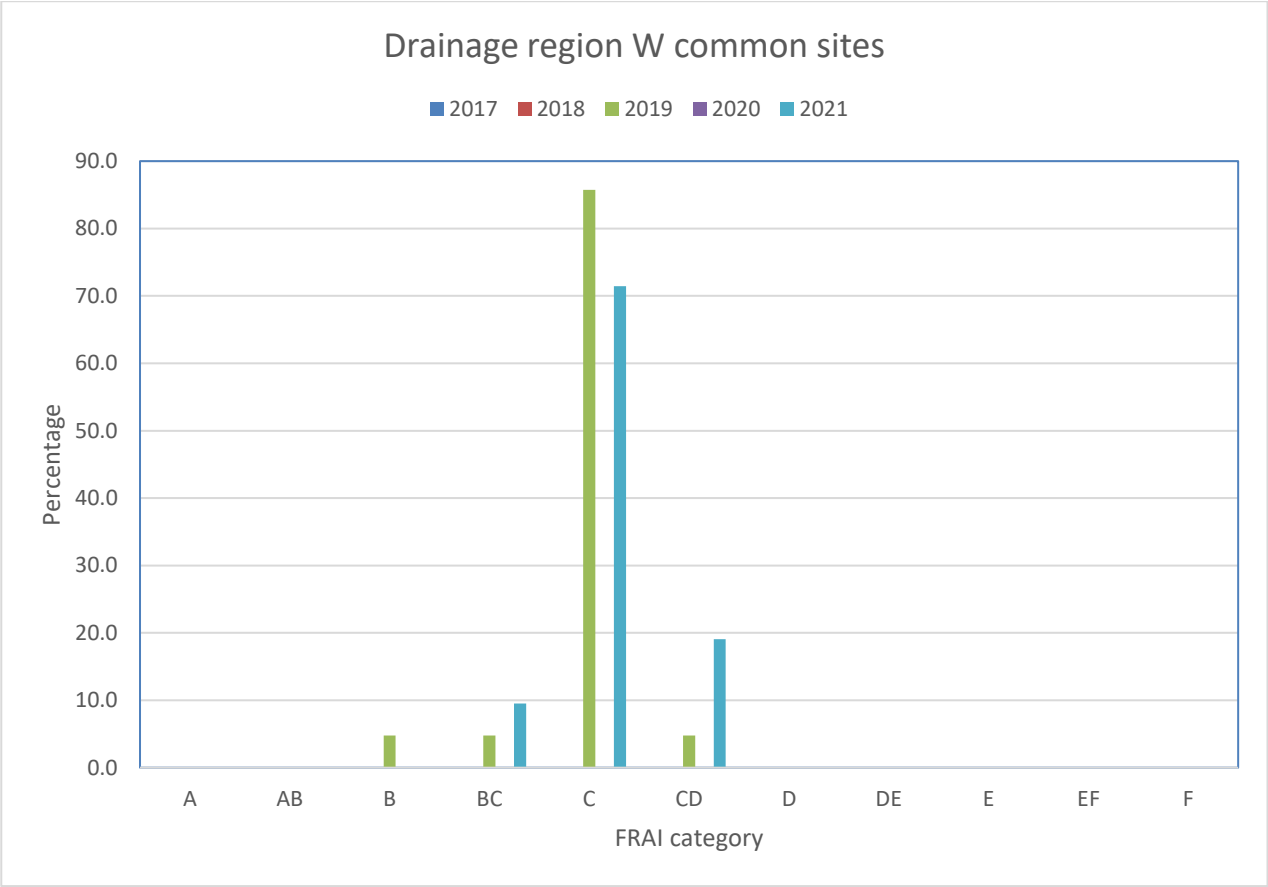

Figure 101: The percentage of sites in each ecological category in primary drainage region W (Usuthu-Mhlatuze, Pongola) per hydrological year for fish at those sites monitored in both 2018/19 and 2020/21.

DRAINAGE REGION X (INKOMATI USUTHU WATER MANAGEMENT AREA)

The X primary drainage (Inkomati) region falls within the Inkomati Usuthu WMA. The Inkomati Usuthu Catchment Management Agency (IUCMA) is responsible for monitoring this drainage region, while the sites that fall within the Kruger National Park (KNP) used to be monitored annually by Mr Hendrik Sithole of SANPARKS. Since 2020 SANPARKS have only been sampling one site per river system. In the current hydrological year only one site on the Sabie River was sampled while the Crocodile and Komati rivers were not sampled. The IUCMA uses an implementing agent to do detailed biomonitoring in the Inkomati Usuthu catchment. This detailed monitoring focusses on one river per year. The IUCMA staff monitors a limited number of sites annually. The Sabie Sand catchment (X3) was supposed to be done in 2020 and the Crocodile catchment (X2) in 2021 but an implementing agent could not be appointed in time. The condition of the rivers in primary drainage region X is provided in Figures 102 and 103. There are 149 active REMP monitoring sites in this drainage region 19 of which falls within eSwatini. Only 90 sites were sampled, and the remaining sites were not sampled due to the reasons provided in Annexure X**.** There are four secondary drainage regions but region X4 comprising seasonal systems within the Kruger National Park is not monitored. A list of the monitoring sites including reasons for not sampling is provided in Annexure X**.**

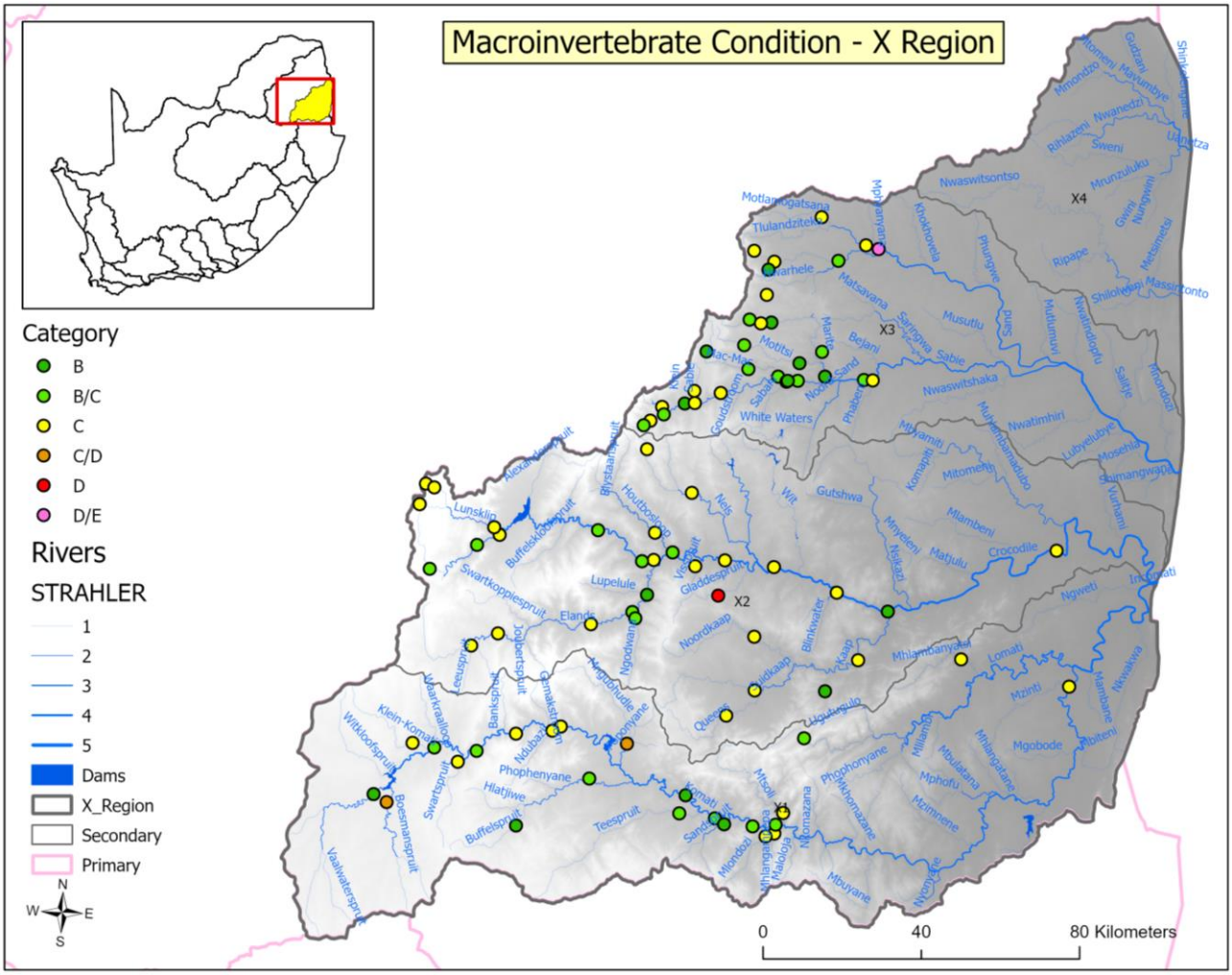

Figure 102: Summary Ecological Categories in primary drainage region X (Inkomati) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B & B/C) while the red and orange reflect relatively poor conditions (D & D/E).

- X1: Komati
- X2: Crocodile (East)
- X3: Sabie
- X4: Nwaswitsontso, Nwanedzi, Sweni (Seasonal systems in KNP not sampled).

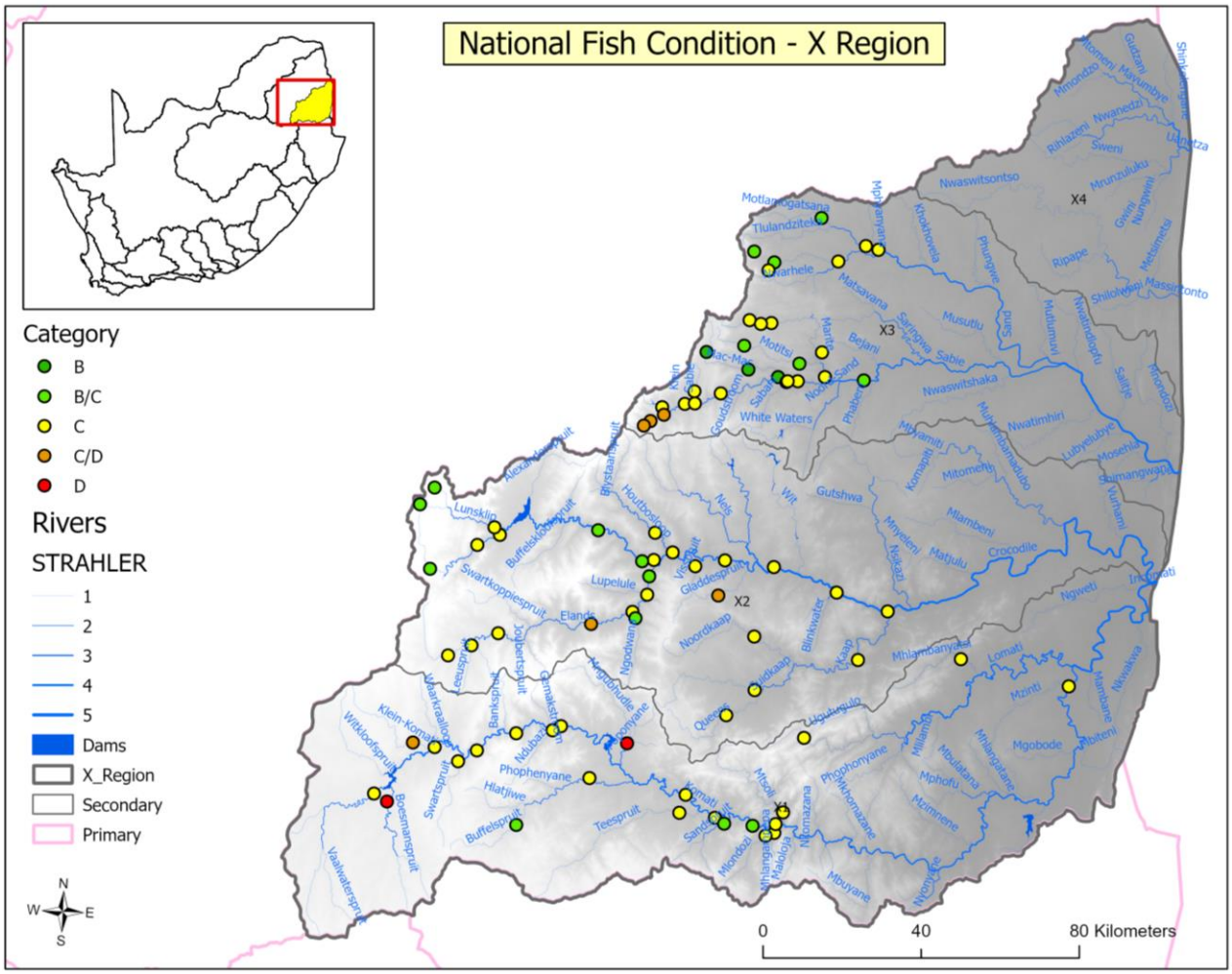

Figure 103: Summary Ecological Categories in primary drainage region X (Inkomati) reflecting the macroinvertebrate condition for selected sites monitored during 2020/2021. The colour of the circles indicates the Ecological Condition with green representing relatively good conditions (B & B/C) while the red reflects relatively poor conditions (D).

X1: Komati

The source of the Komati River is near Breyton in Mpumalanga, the middle reaches of the river flow through eSwatini before entering South Africa again. The Komati River flows into Mozambique at Komatipoort. The IUCMA only monitored a limited number of sites, and the previous detailed survey of the Komati River was done during the low flow season of 2018 (Roux *et al.*, 2019). There are 64 sites in the Komati catchment (19 of which are in eSwatini). Only 24 sites were sampled during the assessment period. The ecological condition based on the macroinvertebrates in the drainage region ranged from largely natural (B) in the upper part of the catchment to close to moderately modified (C/D) in the Gladdespruit and Boesmanspruit (Figure 106). Approximately 42% of the sites (10) were in a moderately modified (C) condition, 17% (4) in a largely natural (B) condition, 33% (8) in a close to largely natural (B/C) condition and only two sites (8%) in a close to moderately modified (C/D) condition. All 24 sites were also sampled in the previous hydrological year. Most (19) sites remained in the same category while the condition of two sites improved and the condition of three

sites deteriorated. There are gazetted RQOs for five of the sites in the Komati catchment. Only two of the four sites with gazetted RQOs for invertebrates complied to the RQOs while the fish condition at all five sites complied with the gazetted RQOs. The catchment is highly stressed due to water demands, with ESKOM and agriculture (mainly irrigation in the lower reaches) being the major water users (Roux *et al*., 2019). The numerous weirs and dams in the system alter the natural flow regime and impede fish migration (Roux *et al*., 2019).

X2: Crocodile

This drainage region comprises the Crocodile River (east) and its tributaries (Elands, Kaap, etc.). Only 45 of the 71 REMP sites in the X2 drainage region are active. The majority have been abandoned for various reasons such as habitat change and problems with access. The IUCMA sampled 34 sites in this drainage region (Figure 102 and 103) because it was not scheduled for a detailed survey. The previous detailed survey of the Crocodile Catchment was undertaken from June to September 2017 (Roux *et al*., 2018).

Invertebrates:

The Macroinvertebrate condition in this drainage region ranged from largely natural (B) and close to largely natural (B/C) in the upper parts of the catchment to largely modified (D) in the Gladdespruit tributary of the Crocodile River (Figure 105). The majority (66%) of the sites (21) were in a moderately modified (C) condition with another seven sites (22%) in a close to largely natural (B/C) condition. The Gladdespruit (D) was the only site in a worse than moderately modified (C) condition. Nineteen sites were sampled in both 2019/20 and 2020/21. The majority (11) of the sites sampled in both years (58%) remained in the same condition, four sites (21%) deteriorated, and another four sites (21%) improved compared to the previous year. There are gazetted RQOs for 10 sites in the X2 drainage region. Only eight of the 10 sites with gazetted RQOs were monitored this year. It is of major concern that the four of the five sites (X2CROC-VERLO, X2CROC-VERL1, EWR1:X2CROC-VALY1 & EWR2: X2CROC-GOEDE) that did not comply with the gazetted RQOs for the macroinvertebrates are in the Crocodile River upstream of Kwena Dam. One of the main reasons for the decrease in invertebrate condition at the two EWR sites is the poor marginal vegetation. The reason for this apparent deterioration in the marginal vegetation should be investigated. The Crocodile River downstream of Kwena Dam is largely modified by unseasonal releases from the dam for irrigation. The Crocodile River catchment is impacted by commercial forestry, agricultural activities, including large scale irrigation of fruit orchards (mainly citrus and banana), vegetables and sugar cane as well as rural and urban settlements (Roux *et al*., 2018).

Fish:

The Fish condition was monitored at 30 sites in this hydrological year. It ranged from close to largely natural (B/C) in the upper part of the catchment to a close to moderately modified condition (C/D) in the Gladdespruit tributary and the Elands River at Hemlock (Figure 107 to 109). The majority (70%) of the sites (21) were in a moderately modified (C) condition with another seven sites (23%) in a close to largely natural (B/C) condition. Only two sites (X2GLAD-HERMA & X2ELAN-HEMLO) were in a worse than moderately modified (C) condition. Twenty-seven sites were sampled in both 2016/2017 and 2020/2021. Most (20) of these sites (74%) remained in the same condition with six sites (22%) deteriorating and only the Crocodile

River at Kaapmuiden (X2CROC-KAAPM) improving. Nine of the 10 sites with gazetted RQOs were monitored this year. It is of major concern that only the Kaap River (X2KAAP-HONEY) complied with the gazetted RQO.

X3: Sabie Sand

This drainage region comprises the Sabie and Sand Rivers and their tributaries. The last detailed IUCMA survey in this catchment took place in 2016 (Roux *et al*., 2017). Although this drainage region was targeted for a detailed survey in 2020, it did not take place. There are 40 active REMP sites in this drainage region but only 32 were sampled in 2020/21. The Sabie River itself is not impounded but the Da Gama Dam on the White Waters and the Injaka Dam on the Marite rivers still modifies the flow conditions of the lower reaches of the Sabie River. The Sabie catchment is affected by a variety of land uses including commercial forestry and agriculture, as well as rural and urban impacts.

Invertebrates:

The macroinvertebrate condition in this catchment ranged from a moderately modified (B) condition in the upper parts of the Sabie River, Mac, Marite and Ngwaritsana tributaries to a close to largely modified (D/E) condition in the Sand River upstream of the greater Kruger National Park Region. Most (41%) sites (13) were in a moderately modified (C) condition, with 31% (10) sites in a close to largely natural (B/C) condition, 25% (8) sites in a largely natural condition and only 1 site (X3SAND-ROLLE) in a close to largely modified (D/E) condition. The Sabie was not sampled in the previous hydrological year but 16 of the sites were also sampled in the 2018/2019 hydrological year. Most (11) of these sites remained in the same condition with 4 sites improving and only one site (X3NGWA-WILGE) deteriorating from a largely natural (B) condition to a close to largely natural (B/C) condition. There are gazetted RQOS for eight of the sites but only six were monitored. The other two sites are within the Kruger National Park and is not currently monitored. Only the Mutlumuvi River (X3MUTL-NEWF1) at New Forest complied with the gazetted RQOS. It is very concerning that none of the sites in the Mac Mac or main stem Sabie River met the gazetted RQOs. The reason for this non-compliance should be investigated.

Fish:

The Fish were monitored at 28 sites in this drainage region. The fish condition ranged from a largely natural (B) condition in the Mac Mac to a close to moderately modified (C/D) condition in the upper parts of the Sabie. According to IUCMA/MTPA (2012) and Roux *et al.* (2017) this relatively poor condition (C/D) in the upper Sabie catchment is likely related to excessive sedimentation and the presence of high numbers of the exotic predatory rainbow trout (*Oncorhynchus mykiss*). Most (18) sites were in a moderately modified (C) condition (64%), with four sites (14%) in a close to largely natural (B/C) condition and three (11%) sites each in a largely natural (B) and close to moderately modified (C/D) condition. Fish were sampled at six of the sites with gazetted RQOs but none of them complied with the RQOs.

Summary

Invertebrates

Although this catchment is still mostly in a good condition, when comparing the sites which have been sampled annually since 2017 (Figures 104 to 106), it is concerning to note that since 2017/2018 there are now no sites in a close to natural (A/B) condition and that there are sites in a largely modified (D) condition. Only the Crocodile River catchment (X2) have been sampled every year since 2016/2017. When comparing only those sites in the X2 drainage region which were sampled every year since 2016/17 (Figure 105), there seems to be a shift in site condition towards the moderately modified (C) condition. When comparing only those sites in the X1 and X2 drainage regions which were sampled every year since 2017/208 (Figure 106), it becomes even more evident that there is a shift form the more natural (A, A/B) condition towards the more modified (C, C/D & D) condition. It thus seems as if there is a steady deterioration in this primary drainage region. This decreasing trend should be investigated and halted if possible.

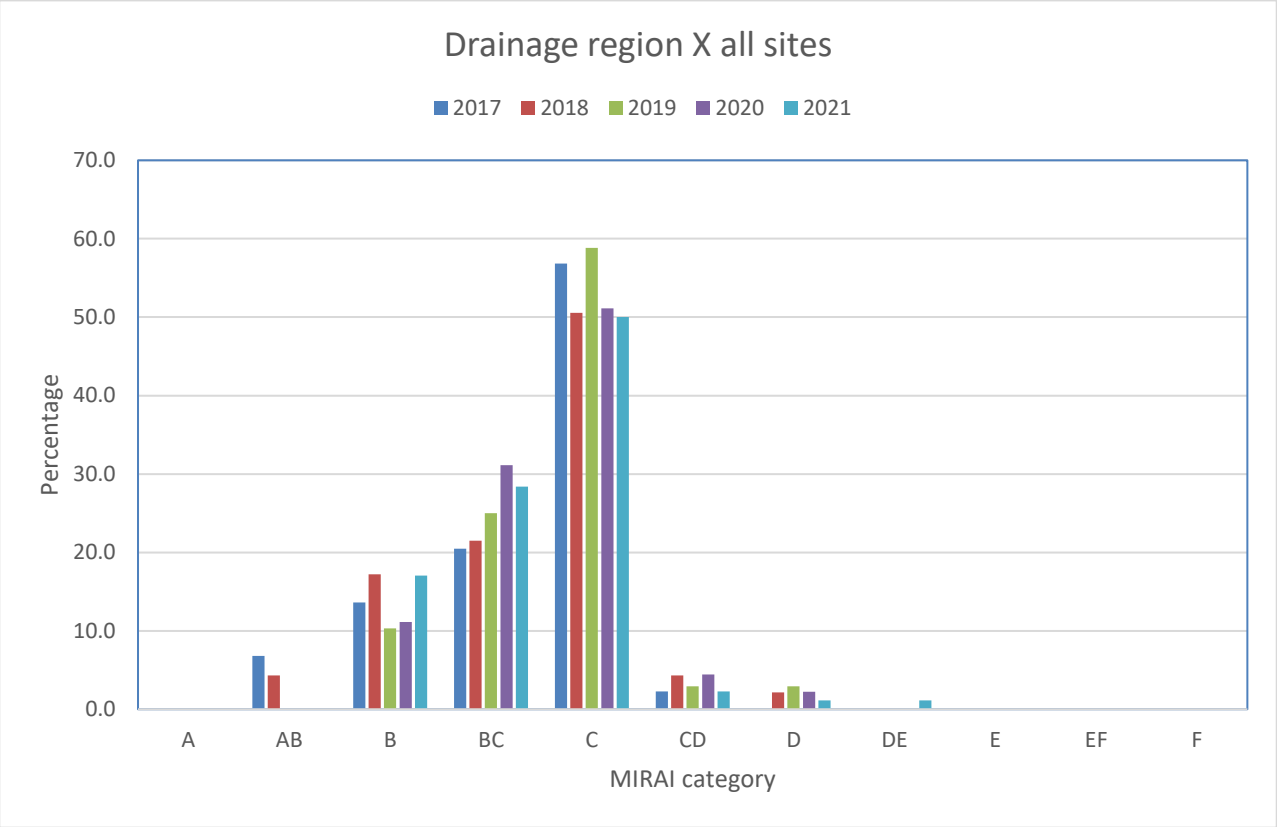

Figure 104: The percentage of sites in each ecological category in primary drainage region X (Inkomati) per hydrological year for macroinvertebrates at all sites monitored from 2016/17 to 2020/21.

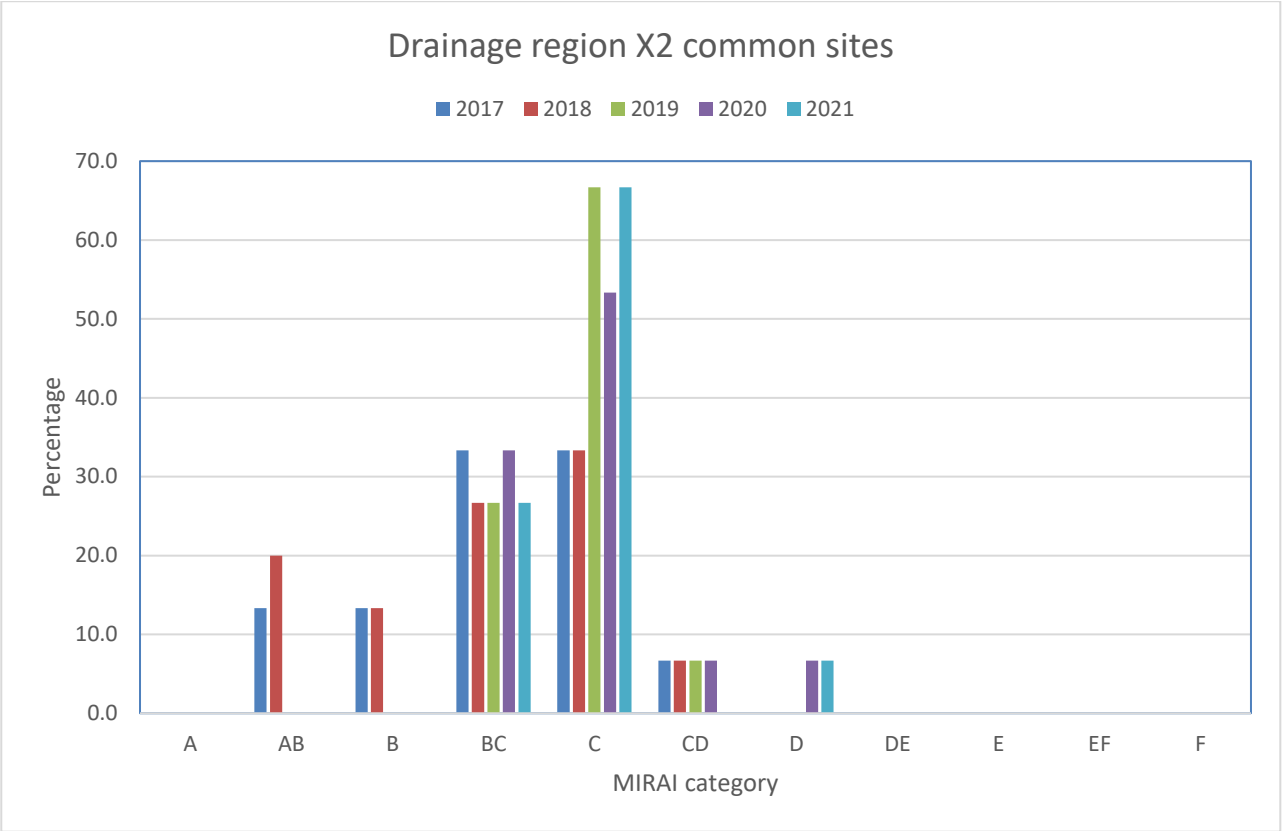

Figure 105: The percentage of sites in each ecological category in primary drainage region X2 (crocodile) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2020/21.

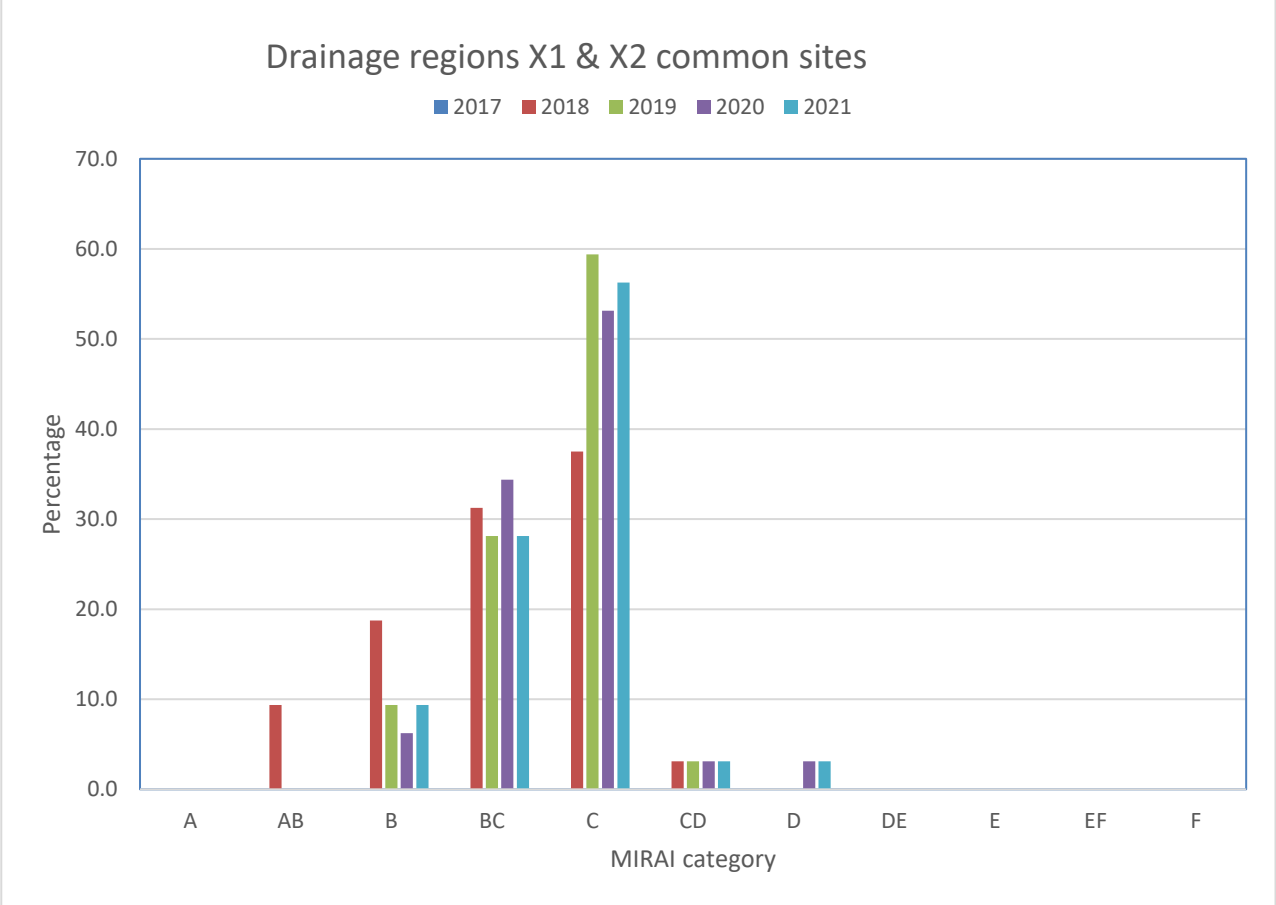

Figure 106: The percentage of sites in each ecological category in primary drainage region X1 & X2 (Komati & Crocodile) per hydrological year for macroinvertebrates at those sites monitored each year from 2016/17 to 2020/21.

Fish:

No fish sampling took place in 2019 and 2020. The Crocodile River was sampled in 2016/2017 and in 2020/2021 while the Komati was sampled in 2017/2018 and in 2020/2021. The Sabie River was only sampled in 2020/2021 so it is not possible to look at trends in fish condition for the Sabie River catchment. When comparing the results for all sites (Figure 107), there seems to be a shift in fish condition away from the more natural (B & B/C) condition toward the more modified (C, C/D & D) conditions. This same shift away from more natural to poorer conditions are also evident when comparing the sites sampled during both surveys for the Komati River (Figure 108) and the Crocodile River catchments (Figure 109).

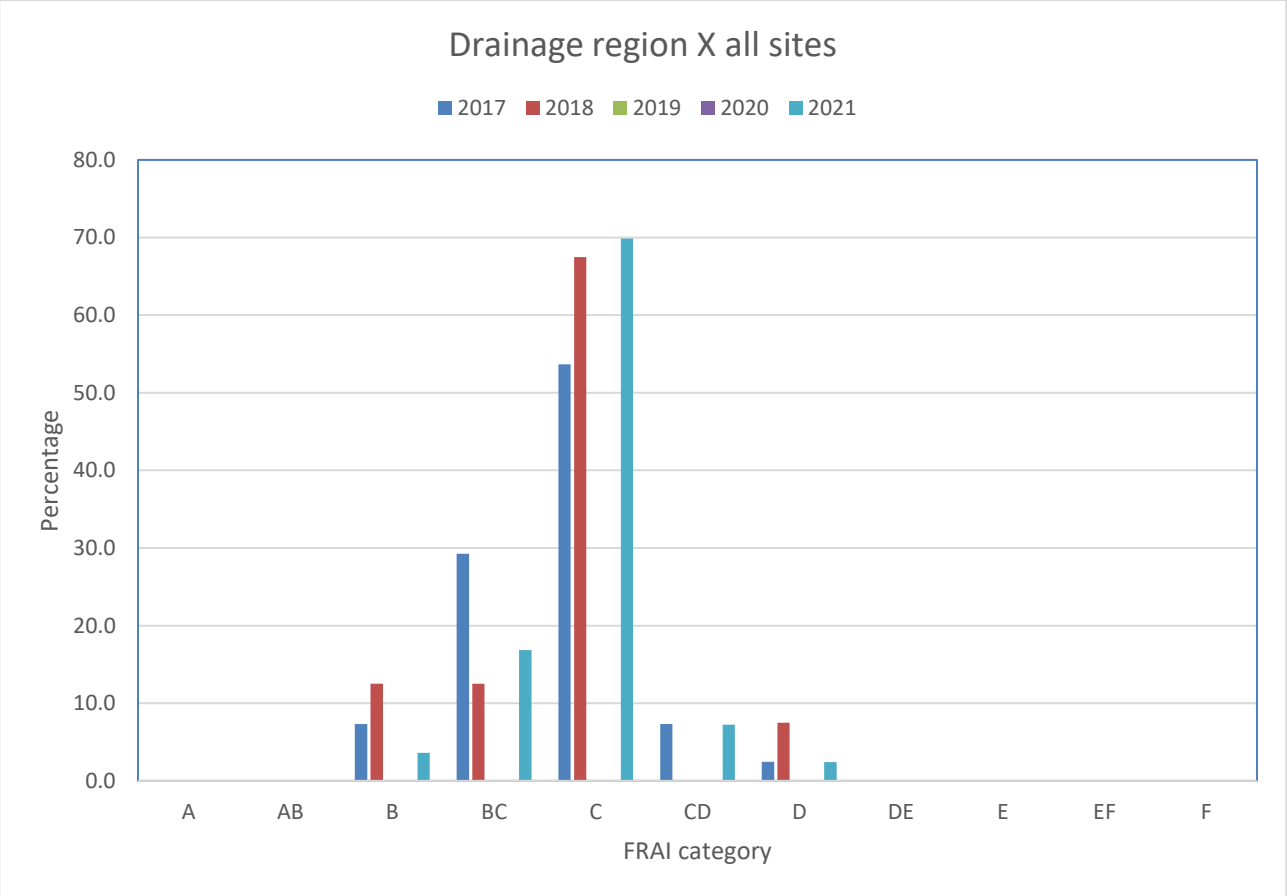

Figure 107: The percentage of sites in each ecological category in primary drainage region X (Inkomati) per hydrological year for fish at all sites monitored from 2016/17 to 2020/21.

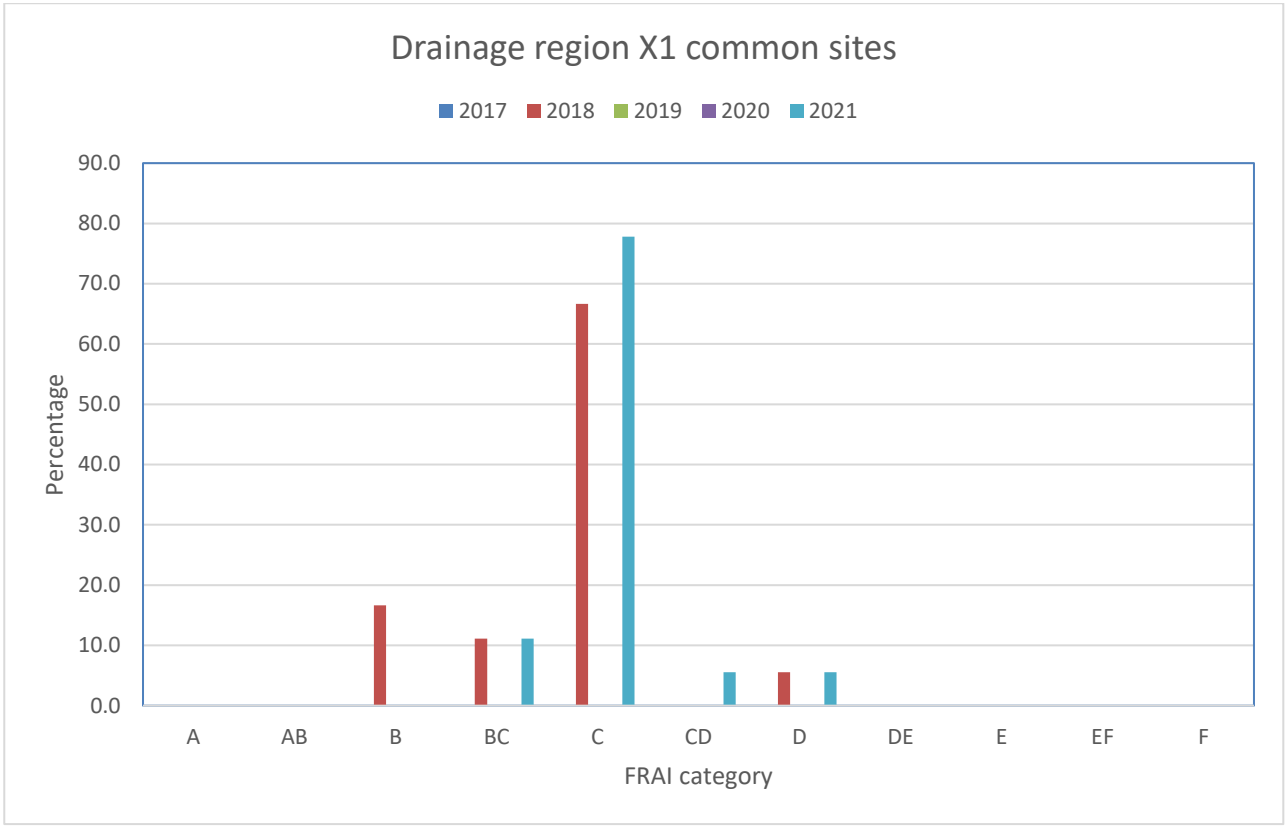

Figure 108: The percentage of sites in each ecological category in primary drainage region X1 (Komati) per hydrological year for fish at those sites monitored in both 2017/18 and 2020/21.

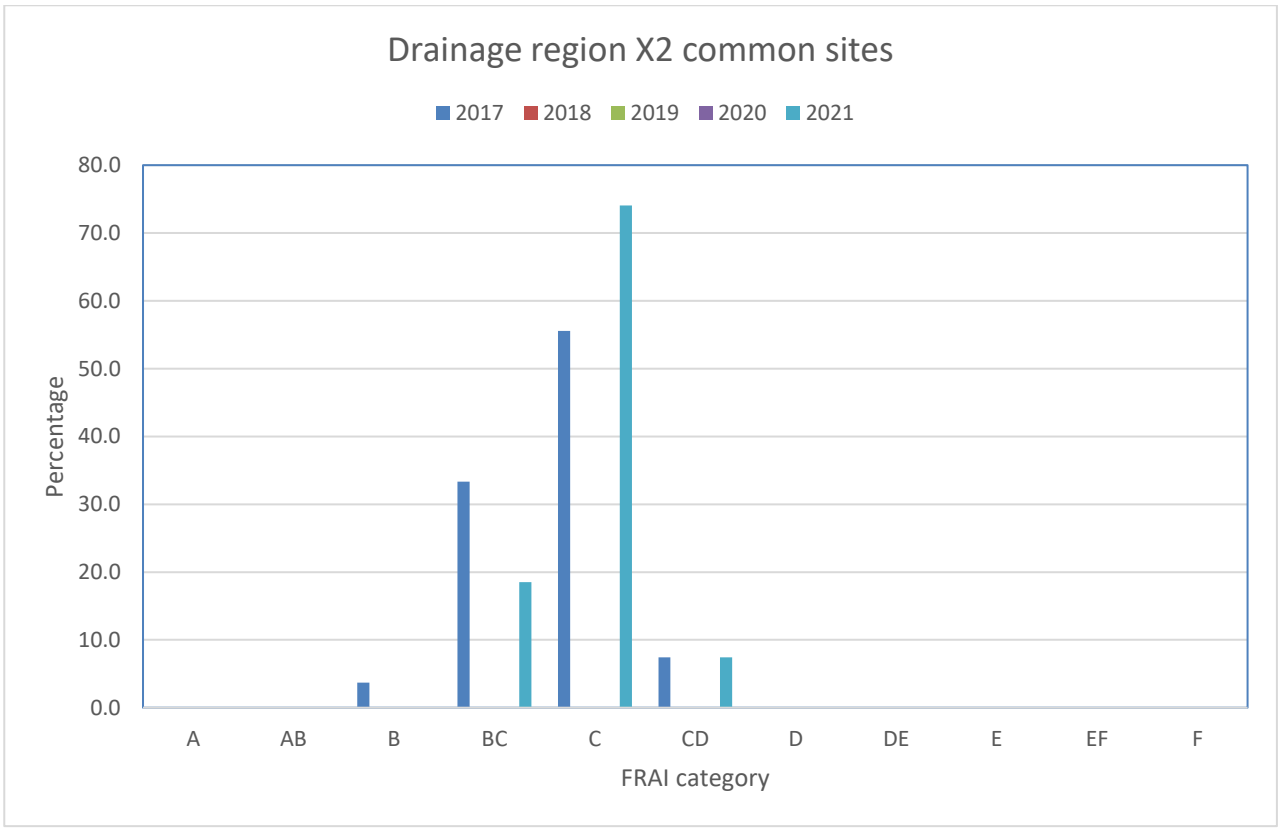

Figure 109: The percentage of sites in each ecological category in primary drainage region X2 (Crocodile) per hydrological year for fish at those sites monitored in both 2016/17 and 2020/21.

IMPLEMENTATION CHALLENGES

Many sites were not sampled (see Annexure A to Annexure X). A major portion of the sites are inactive due to either access problems or unsuitable flow conditions, or pollution. The sites that could not be accessed are normally on private land where the permission of landowners is required. The implementers were provided with letters seeking permission to access these sites, as per Section 125(2) of the National Water Act. However, the COVID-19 pandemic might have had more impact on monitoring.

A lack of human capacity remains a major challenge with implementing the REMP (Table 7). It is important to note that the capacity indicated includes Graduate Trainees and that the officials also perform other functions. From April 2022 there is no officials in the Pongola-Mzimkhulu WMA responsible for REMP monitoring. At this stage only the macroinvertebrates are monitored on a regular basis in all the WMAs. Even though all the regions are monitoring the macroinvertebrates there are still some regions with no or only one accredited SASS practitioner. There are external SASS5 training courses available but at a cost. In addition to the formal SASS5 courses the staff can also receive internal SASS5 training to gain the necessary experience. This method has proven to be successful in the Gauteng, North West as well as the Northern Cape. Apart from receiving the SASS training there seems to be reluctance in certain instances for individuals to undergo the SASS accreditation process.

There is improvement in the processing of the EcoStatus models by implementers. The systematic training process under way to provide the necessary training as well as continuous mentoring seems to be bearing fruits. Training in riparian vegetation assessments and plant identification has been implemented. Additional training in fish identification is also currently being investigated.

Prior to 2014 the fish and macroinvertebrate data collected through the REMP was archived in the Rivers Database. This database was specifically developed for the River Health Programme (precursor to the REMP) became non-functional in 2014. The Rivers Database used Windows XP as an operating system and funds were not available for upgrading it. Since then, the Freshwater Research Centre in Cape Town received donor funding to develop the Freshwater Biodiversity Information System (FBIS), initially for the Cape Floristic Kingdom, but later expanded to the whole of South Africa. The data captured on the Rivers Database has since been imported into the FBIS. Version 2 of FBIS became available in July 2019 (FBIS, 2019). At this stage, the FBIS can only store invertebrate and fish information. The FBIS is hosted on a web server and data can only be captured online, requiring a stable internet connection.

A Department-funded and maintained database should be a priority, as it will cater for all the data storage needs for the REMP as well as other National Aquatic Ecosystem Health Monitoring Programmes. As currently experienced with FBIS, there might be an issue of capacity to capture the data; the National Office would have to step in and find ways to close gaps.

Table 7. A summary of capacity in the regional offices and Catchment Management Agencies. The number of officials include Graduate Trainees.

Region	Number of officials	Indicators	Comments
Tsitsikamma Mzimvubu (West)	6	Invertebrates Habitat Integrity Geomorphology	
Tsitsikamma Mzimvubu (East)	6	Invertebrates Habitat Integrity Geomorphology Fish	
Upper Vaal (Gauteng)	4	Invertebrates Riparian Vegetation	
Middle Vaal and Upper Orange (Free State)	3	Invertebrates Riparian Vegetation Habitat Integrity	Includes 2 Graduate Trainees who need training
Lower Vaal (Northern Cape	3	Invertebrates	Officials require training
Lower Orange (Northern Cape)	6	Invertebrates	
Berg Olifants (Western Cape)	6	Invertabrates Habitat Integrity Riparian Vegetation Geomorphology	Want to start with Fish
North West	13	Invertebrates Habitat Integrity Riparian Vegetation	
North West (Gauteng)	3	Invertebrates Habitat Integrity Riparian Vegetation	
Limpopo		Invertebrates Habitat Integrity Riparian Vegetation	
Olifants	5	Invertebrates Habitat Intewgrity Riparian Vegetation	
Pongola-Mzimkhulu	0		Currently no capacity
IUCMA	4	Invertebrates Fish Riparian Vegetation	
BGCMA	2	Invertebrates	Require training for other indices

RECOMMENDATIONS

The main recommendation is to "be part of the solution". Actions taken up by communities have been displayed within the main text above. More of these interventions are needed, and there is a potential for everyone and every organisation (public or private) to contribute and make a bigger impact. The Department Water and Sanitation should prioritize filling vacant posts within the directorates responsible for this programme to ensure the continuous collection of data.

Government needs to champion these initiatives and reach out to the public, ring-fence funding for citizen science and initiatives like the Adopt-a-River (AaR) programme and continue with rehabilitation initiatives like the "Working for Wetlands". This is an investment for a secure water future. When it comes to the REMP and AaR, the programmes need to be well resourced to cover the operational costs, in terms of travelling, provision of proper PPE, sampling and working equipment and attendance of training to up-skill implementers. This will ensure more indicators can be sampled through REMP or communities can close gaps, where capacity is a constraint, through citizen science. These challenges pose a huge risk of resulting in information gaps, preventing a robust understanding of our river systems.

Regulators need to strengthen their regulation role, keep land users in-check, and enforce the National Water Act to prosecute illegal use and pollution. Some of the solutions could be strengthening the monitoring of compliance to set Reserves, RQOs, and licence conditions, firming up the anti-pollution task team, as well as developing strategies that mitigate point and non-point sources of pollution (e.g., the Eutrophication Strategy; DWS, 2021b). The decline in functionality and very poor condition of the country's Wastewater Treatment plants is highlighted in the recently publish Green Drop Report (DWS, 2022). The proportion on wastewater systems in critical condition has increased considerably since the 2013 survey with 39% of municipal systems and 89% of DPW systems in critical state (DWS, 2022). The poor operation and maintenance of WWTWs is a major issue in South Africa and should receive urgent attention. Poor land use exacerbates the impacts of climate change. At the recently held Ministerial Indaba the Minister of Water and Sanitation announced a target to reduce pollution in rivers by 60% over 36 months. Should this target be met, the ecological condition of our rivers will also improve.

RQO compliance monitoring should be implemented. Table 8 provides a summary of all the non-compliant indicators and possible reasons for this non-compliance. It is not the function of the REMP to monitor and assess compliance to the gazetted RQOs specifically. However, REMP monitoring can provide the information needed to assess RQO compliance and implement remedial actions where possible. As is very clear from Table 8, the main reasons for non-compliance are frequently related to water quality (often due to non-functioning WWTWs) and flow regulation.

Formal and informal developments, mining and farming activities have caused severe deterioration of riparian zones and instream habitats. Intact river habitats are beneficial to the environment and humans. They support a high biodiversity of aquatic fauna and flora and can provide goods and services beneficial to surrounding communities. Riparian plants can buffer impacts of temperature increases due to climate change on instream habitats and reduce erosion. Everyone needs to contribute to sustainable solutions in this space. Municipalities need better and greener town planning and improve service delivery to densely populated areas. Mining companies need to be held accountable where there has been improper management of mining activities. Compliance and enforcement measures need to be tightened, for example on the illegal sand and alluvial diamond mining prevalent in Eastern Cape and Northern Cape.

Sustainable agricultural practices are encouraged, where preserving of biodiversity and protection of the environment are practised with reduced use of fertilisers and water. Other environmentally friendly farming methods include drip irrigation, no or low tillage to reduce erosion and water use, and crop and livestock rotation to improve water quality and increase carbon sequestration.

Alien vegetation clearing programmes need to be encouraged and resourced in many regions of the country.

Table 8: A summary of non-compliant biological and habitat indicators at REMP monitoring sites during the 2020/21 hydrological year:

Site	Main River	INVERTEBRATES	FISH	VEGETATION	INSTREAM HABITAT	RIPARIAN HABITAT	POSSIBLE REASONS
A2APIE-DEOND	Apies						WQ
A2APIE-PRETO	Apies						WQ
A2CROC-BOBBE	Crocodile						WQ, FLOW
A2CROC-KOEDO	Crocodile						FLOW, VEGETATION CLEARING
A2CROC-MAKOP	Crocodile						FLOW, VEGETATION CLEARING
A2ELAN-NOOIT	Elands						WQ, FLOW
A2HART-KAMEE	Pienaars						WQ
A2HENN-HENNO	Hennops						WQ, FLOW
A2JUKS-EDENV	Jukskei						WQ, FLOW
A2JUKS-GULLU	Jukskei						WQ, FLOW
A2MAGA-MALON	Magalies						UNKNOWN,
A2MAGA-HARTE	Magalies						FLOWS, ALIEN INVASIVE PLANTS
A2MODD-MODDE	Jukskei						WQ, FLOW
A2PIEN-BUFFE	Pienaars						FLOW, VEGETATION CLEARING
A2PIEN-KLIPD	Pienaars						WQ, FLOW
A2RIET-MERIN	Hennops						WQ, FLOW
A2SKEE-SKEER	Magalies						UNKNOWN POSSIBLY WQ
A2SWAR-ELAND	Hennops						WQ, ALIEN INVASIVE PLANTS
A3GMAR-KOEDO	Groot Marico						LAND USE (POSSIBLY SEDIMENTATION), ALIEN PLANTS
A3GMAR-LOTTE	Groot Marico						FLOW, VEGETATION CLEARING
A3GMAR-RIEKE	Groot Marico						FLOW, VEGETATION CLEARING
A3GMAR-WONDE	Groot Marico						WQ, HABITAT, VEGETATION CLEARING
A3KAAL-RIETS	Groot Marico						LAND USE (SEDIMENTATION), ALIEN PLANTS
A3KMAR-KALKD	Groot Marico						FLOWS
A3POLK-TWYFE	Groot Marico						FLOW, SEDIMENTATION, ALIEN PLANTS
A4MOKO-VAALW	Mokolo						WQ, LAND USE
A4MOKO-WWORK	Mokolo						FLOW REGULATION
B1KOLI-MIDDE	Olifants						WQ

Site	Main River	INVERTEBRATES	FISH	VEGETATION	INSTREAM HABITAT	RIPARIAN HABITAT	POSSIBLE REASONS
B6BLYD-PILGU	Olifants						WQ
B8GLET-APPEL	Groot Letaba						LAND USE (SEDIMENTATION)
C2SKOO-URANI	Vaal						WQ
C2SUIK-DEHOE	Vaal						POSSIBLY UPSTREAM IMPACTS
C2VAAL-SCHOE	Vaal						WQ, FLOWS
C4GVET-VDRIE	Vet						LAND USE, VEGETATION CLEARING, ALIEN PLANTS
C4KVET-VVIER	Vet						LAND USE
C4SAND-R73BR	Vet						WQ, FLOWS, VEGETATION CLEARING
C4SAND-SENEK	Vet						WQ, LAND USE
C4VET-HOOPS	Vaal						WQ, FLOWS
C6VALS-PROKL	Vaal						WQ, FLOWS, VEGETATION CLEARING
C8LIEB-MAFAH	Wilge						FLOWS (IBT)
C9VAAL-STCLA	Vaal						WQ, FLOWS
D2MOLO-MODIM	Molopo						FLOWS, GRAZING AND TRAMPLING
G1BERG-BRBM6	Berg						WQ, FLOWS
G1KROM-BEIT	Berg						FLOWS (IBT), LAND USE
G4PALM-KOGEL	Palmiet						WQ, FLOWS
H6BAVI-GENAD	Riviersonderend						WQ
H6RIVI-GREYT	Riviersonderend						WQ, FLOWS
J3KAMM-EWR10	Diep						WQ, FLOWS
K2GROO-KLEIN	Groot Brak						LAND USE
K3KAAI-GWEIR	Kaaimans						LAND USE
K4DIEP-DIEPR	Sedgefield						LAND USE
K4HOMT-KNYSA	Homtini						LAND USE
K5KNYS-EWR01	Knysna						LAND USE
T3TSIT-LALEN	Thina						EXOTIC FISH
T4MTAM-MADIK	Mtamvuna						HABITAT,
U1MKOM-SHOZI	Mkomazi						HABITAT,
V3NCND-LEYDN	Ncandu						LAND USE
X2CROC-DONKE	Crocodile						EXOTIC FISH, FLOWS, HABITAT (SEDIMENTATION, VEGETATION CLEARING)

Site	Main River	INVERTEBRATES	FISH	VEGETATION	INSTREAM HABITAT	RIPARIAN HABITAT	POSSIBLE REASONS
X2CROC-GOEDE	Crocodile						EXOTIC FISH, FLOWS, HABITAT (SEDIMENTATION, VEGETATION CLEARING)
FLOW	Crocodile						FLOWS, EXOTIC VEGETATION
X2CROC-POPLA	Crocodile						FLOWS, EXOTIC VEGETATION
X2CROC-RIETV	Crocodile						FLOWS, EXOTIC VEGETATION
X2CROC-VALY1	Crocodile						EXOTIC FISH, FLOWS, HABITAT (SEDIMENTATION, VEGETATION CLEARING)
X2CROC-VERLO	Crocodile						EXOTIC FISH, FLOWS, HABITAT (SEDIMENTATION, VEGETATION CLEARING)
X2CROC-VERL1	Crocodile						EXOTIC FISH, FLOWS, HABITAT (SEDIMENTATION, VEGETATION CLEARING)
X2KAAP-HONEY	Crocodile						WQ. INVASIVE PLANTS, HABITAT
X3MACM-FALLS	Sabie						SEDIMENTATION
X3MACM-PICNI	Sabie						SEDIMENTATION
X3MACM-VENUS	Sabie						SEDIMENTATION
X3SABI-BRUG	Sabie						WQ, SEDIMENTATION
X3SABI-RIOOL	Sabie						WQ

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ANNEXURES

ANNEXURE A: MONITORING SITES IN PRIMARY DRAINAGE REGION A

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
A1NGOT-DINOK	-25,45528	25,85377	Ngotwane	Ngotwane	Limpopo	C/D	D				D	A10A-00915	
A2APIE-DEOND	-25,61681	28,19158	Apies	Apies	Limpopo	D					E	A23F-00827	
A2APIE-PRETO	-25,72692	28,17192	Apies	Apies	Limpopo	D/E	E				F	A23E-01071	
A2BLOU-KROMD	-25,98139	27,78806	Bloubankspruit	Crocodile	Limpopo	D	C				D	A21D-01185	
A2BLOU-RIETF	-25,967972	27,814278	Bloubankspruit	Crocodile	Limpopo	E					D	A21D-01185	
A2BLOU-ZWART	-25,97722	27,83389	Bloubankspruit	Crocodile	Limpopo	D	C/D				D	A21D-01185	
A2BRAA-PARKH	-26,1383	28,01072	Braamfonteinspruit	Jukskei	Limpopo	D					E	A21C-01262	
A2CROC-BOBBE	-25,80794	27,909828	Crocodile	Crocodile	Limpopo				D	D	D	A21H-01107	FLOWS
A2CROC-ELAND	-25,946389	27,878781	Crocodile	Crocodile	Limpopo	C					E	A21E-01162	
A2CROC-KOEDO	-24,889437	27,517378	Crocodile	Crocodile	Limpopo	D			C/D	D	D	A24C-00596	
A2CROC-MAKOP	-24,40653	27,115155	Crocodile	Crocodile	Limpopo		D/E		D/E	D	D	A24J-00438	FLOWS
A2CROC-MOUNT	-25,7168	27,8421	Crocodile	Crocodile	Limpopo	D	D		E	E	E	A21J-01053	
A2CROC-ROODE	-26,0635	27,8416	Muldersdrif se loop	Crocodile	Limpopo	D	E				N/A	A21C	
A2EDEN-LEEUW	-25,678	28,4017	Edendalespruit	Pienaars	Limpopo	D					D	A23A-01045	
A2ELAN-BESTE	-25,46392	26,78925	Elands	Elands	Limpopo						D	A22E-00940	FLOWS
A2ELAN-KLIPB	-25,72656	26,72044	Elands	Elands	Limpopo	C					C	A22A01001	
A2ELAN-NOOIT	-25,581884	26,677901	Elands	Elands	Limpopo	D					C	A22A01001	
A2HART-KAMEE	-25,65645	28,30846	Hartbeesspruit	Pienaars	Limpopo	D					D	A23A-01049	
A2HENN-HENNO	-25,8256	27,98944	Hennops	Hennops	Limpopo		E				E	A21B-01135	FLOWS
A2HEXR-OLIFA	-25,818423	27,270733	Hex	Elands	Limpopo						C	A22G-01131	FLOWS
A2HEXR-PAARD	-25,60828	27,28897	Hex	Elands	Limpopo	D					E	A22J-00878	
A2HEXR-ROOIW	-25,52136	27,37528	Hex	Elands	Limpopo	C	D				E	A22J-00878	
A2JUKS-EDENV	-26,1357	28,1351	Jukskei	Jukskei	Limpopo	E					N/A	A21C	
A2JUKS-GULLU	-26,17147	28,118067	Jukskei	Jukskei	Limpopo	E	E				E	A21C-01269	
A2KOST-NAAUW	-25,76268	26,8901	Koster	Elands	Limpopo	D					C	A22B-01014	
A2MAGA-HARTE	-25,87	27,615	Magalies	Magalies	Limpopo	C	D		D	E	D	A21F-01116	
A2MAGA-MALON	-26,0217	27,56472	Magalies	Magalies	Limpopo	B/C			C	C	C	A21F-01208	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
A2MODD-MODDE	-26,109497	28,16897	Modderfonteinspruit	Jukskei	Limpopo	D	E				E	A21C-01268	
A2MORE-FAIRY	-25,77369	28,29178	Moreletaspruit	Pienaars	Limpopo	D					E	A23A-01074	
A2PIEN-BUFFE	-25,13958	27,69114	Pienaars	Pienaars	Limpopo	D	C/D		C	C	C	A23L-00706	
A2PIEN-KLIPD	-25,40084	28,31269	Pienaars	Pienaars	Limpopo	C					C	A23B-00896	
A2PLAT-KOMAN	-24,82934	28,222499	Buffelspruit	Pienaars	Limpopo	C			B	B	N/A	A23G	
A2RIET-MERIN	-26,0189	28,30442	Rietvlei	Hennops	Limpopo	D			D	D	D	A21A-01178	
A2SKEE-SKEER	-25,836238	27,784352	Skeerpoort	Magalies	Limpopo	C					C	A21G-01126	
A2SOUT-RIETG	-25,51175	28,1255	Kutswane	Pienaars	Limpopo	D/E					D	A23J-00782	
A2STER-BUFFE	-25,8074	27,47814	Sterkstroom	Crocodile	Limpopo	B/C					C	A21K-01124	
A2STER-MAMOG	-25,59839	27,50575	Sterkstroom	Crocodile	Limpopo	C	C				C	A21K-00959	
A2SWAR-ELAND	-25,96917	28,30111	Rietvlei	Hennops	Limpopo	D					D	A21A-01178	
A2SWAV-ZWAVE	-25,834386	28,370056	Swavelpoortspruit	Pienaars	Limpopo	D	C				N/A	A23A	
A2WATE-BAVIA	-25,7414	27,2568	Waterkloofspruit	Elands	Limpopo	C					B	A22H-01070	
A3GMAR-KOEDO	-25,6587	26,436	Groot Marico	Groot Marico	Limpopo	C			C	A/B	C	A31B-01039	
A3GMAR-LOTTE	-24,84439	26,486	Groot Marico	Groot Marico	Limpopo				D/E	D	C	A32D-00539	FLOWS
A3GMAR-RIEKE	-25,46119	26,39189	Groot Marico	Groot Marico	Limpopo				E	A/B	D	A31B-00923B	FLOWS
A3GMAR-WONDE	-25,58932	26,412153	Groot Marico	Groot Marico	Limpopo	C			D	E	D	A32B-00923A	
A3KAAL-RIETS	-25,777	26,43339	Kaaloog se Loop	Groot Marico	Limpopo	C			A/B	A/B	B	A31A-0400/Kaaloog se Loop	
A3KMAR-KALKD	-25,5163	26,15861	Klein Marico	Groot Marico	Limpopo				E	E	D	A31E-00926	FLOWS
A3POLK-TWYFE	-25,64697	26,48928	Polkadraaispruit	Groot Marico	Limpopo	C			D	D	C	A31B-01009	
A4DWAR-JIMSE	-24,271833	28,1997	Jim se loop	Mokolo	Limpopo	C					C	A42E-00398	
A4DWAR-ZANDD	-24,262933	28,2103	Dwars	Mokolo	Limpopo						C	A42E-00384	FLOWS
A4MAMB-DIAMA	-24,2247	27,5816	Mamba	Matlabas	Limpopo						C	A41B-00334	FLOWS
A4MAMB-HOPEW	-24,21271	27,50718	Mamba	Matlabas	Limpopo						C	A41B-00334	FLOWS
A4MATL-HAARL	-24,160167	27,479572	Matlabas	Matlabas	Limpopo						D	A41C-00279	FLOWS
A4MATL-HOOPD	-24,30814	27,51618	Matlabas	Matlabas	Limpopo	D					C	A41A-00340	
A4MATL-WATER	-24,345514	27,563726	Matlabas	Matlabas	Limpopo	C/D					C	A41A-00340	
A4MATL-ZWART	-24,4843	27,5689	Matlabas	Matlabas	Limpopo						N/A	A41A	FLOWS
A4MOKO-ALMAB	-24,485917	28,0737	Sand	Mokolo	Limpopo	C					C	A42A-00499	
A4MOKO-DNYAL	-23,68747	27,74557	Mokolo	Mokolo	Limpopo	C/D					D	A42H-00194	
A4MOKO-MARKE	-23,65215	27,75973	Mokolo	Mokolo	Limpopo	C					D	A42H-00194	
A4MOKO-MOKOL	-24,058	27,7984	Mokolo	Mokolo	Limpopo	C					C	A42F-00285	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
A4MOKO-VAALW	-24,28937	28,0924	Mokolo	Mokolo	Limpopo						C	A42C-00392	FLOWS
A4MOKO-WITKO	-23,8477	27,79033	Mokolo	Mokolo	Limpopo						C	A42G-00225	FLOWS
A4MOKO-WWORK	-23,97067	27,72595	Mokolo	Mokolo	Limpopo	D					C	A42G-00241	
A4RIET-WATER	-23,86486	27,653033	Rietspruit	Mokolo	Limpopo						C	A42G-00226	FLOWS
A5LEPH-ABBOT	-23,4624	28,0956	Lephalale	Lephalale	Limpopo						D	A50H-00110	FLOWS
A5LEPH-BEAUT	-23,2181	27,8918	Lephalale	Lephalale	Limpopo						D	A50H-00110	FLOWS
A5LEPH-GEORG	-24,1143	28,4638	Lephalale	Lephalale	Limpopo						B	A50B-00298	FLOWS
A5LEPH-KROON	-23,5756	28,115899	Lephalale	Lephalale	Limpopo						D	A50H-00110	FLOWS
A5LEPH-MELKR	-23,9941	28,4156	Lephalale	Lephalale	Limpopo	C					C	A50B-00262	
A5LEPH-WITPO	-23,328	27,9978	Lephalale	Lephalale	Limpopo						D	A50H-00110	FLOWS
A5LEPH-WITWA	-24,0927	28,4767	Lephalale	Lephalale	Limpopo	C					B	A50B-00298	
A5RIET-MAKOU	-24,2693	28,4324	Rietbokvleispruit	Lephalale	Limpopo	D					N/A	N/A	
A6KLEI-ENTAB	-24,17472	28,616471	Klein Sterk	Mogalakwena	Limpopo						C	A61J-00306	FLOWS
A6KNYL-DONKE	-24,6778	28,3355	Klein Nyl	Mogalakwena	Limpopo						D	A61A-00520	FLOWS
A6MMAD-ENTAB	-24,269318	28,66709	Mmadikiri	Mogalakwena	Limpopo						D	A61J-00359	FLOWS
A6MOGA-ASHTO	-22,7658	28,778	Mogalakwena	Mogalakwena	Limpopo						D	A63B-00046	ACCESS
A6MOGA-BGLEN	-23,154778	28,682205	Mogalakwena	Mogalakwena	Limpopo						D	A63A-00071	FLOWS
A6MOGA-CANTE	-22,742989	28,78543	Mogalakwena	Mogalakwena	Limpopo						D	A63B-00046	FLOWS
A6MOGA-STEIL	-23,435021	28,624901	Mogalakwena	Mogalakwena	Limpopo						C	A62J-00142	FLOWS
A6OLIF-JASPE	-24,70984	28,47965	Nyl	Mogalakwena	Limpopo						C	A61B-00552	FLOWS
A6OLIF-RIETS	-24,663	28,475	Nyl	Mogalakwena	Limpopo						C	A61B-00489	FLOWS
A6STER-APPIN	-23,97639	28,6911	Sterk	Mogalakwena	Limpopo	C/D					C	A61J-00267	
A8LUPH-GUMEL	-22,668858	30,449513	Luphephe	Nwanedi	Limpopo	C			B	B	C	A80H-00060	
A8LUPH-TSHIT	-22,719473	30,429766	Luphephe	Nwanedi	Limpopo	D			A	A	C	A80H-00060	
A8NWAN-ADELA	-22,4093	30,5549	Nwanedi	Nwanedi	Limpopo						D	A80J-00028	ACCESS
A8NWAN-CONFL	-22,6298	30,3999	Nwanedi	Nwanedi	Limpopo	C			B/C	C	D	A80J-00028	
A8NWAN-CROSS	-22,5141	30,4477	Nwanedi	Nwanedi	Limpopo	C			B/C	C	D	A80J-00028	
A8NWAN-FALLS	-22,6613	30,3749	Nwanedi	Nwanedi	Limpopo	C	C		A	A/B	B	A80H-00064	
A8NWAN-FOLOR	-22,471	30,4633	Nwanedi	Nwanedi	Limpopo	C	D/E		C	C	D	A80J-00028	
A8NWAN-GORGE	-22,6138	30,3999	Nwanedi	Nwanedi	Limpopo	B			A	A/B	D	A80J-00028	
A8NWAN-TSHAM	-22,739139	30,389597	Nwanedi	Nwanedi	Limpopo	C			C	C	B	A80H-00064	
A8NZHE-FUNYU	-22,88051	30,11058	Nzhelele	Nzhelele	Limpopo	D			C	C	D	A80B-00069	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
A8NZHE-MUSEK	-22,83115	30,06091	Nzhelele	Nzhelele	Limpopo	C/D			C	C	D	A80B-00069	
A8NZHE-PLANT	-22,90999	30,31472	Nzhelele	Nzhelele	Limpopo	B	D		B	C	E	A80A-00089	
A9DZIN-CROCV	-23,0107	30,47753	Dzindi	Luvuvhu	Limpopo	C					D	A91E-00103	
A9DZIN-VHAVE	-22,988266	30,350642	Dzindi	Luvuvhu	Limpopo						D	A91E-00103	FLOWS
A9LATO-ENTAB	-23,02616	30,20227	Latonyanda	Luvuvhu	Limpopo	B/C	D				D	A91D-00108	
A9LATO-FORES	-23,048973	30,23767	Latonyanda	Luvuvhu	Limpopo	B					D	A91D-00108	
A9LUVU-BEJAB	-23,091822	30,065608	Luvuvhu	Luvuvhu	Limpopo	D					C	A91A-00105	
A9LUVU-BOBOM	-22,42773	31,20942	Luvuvhu	Luvuvhu	Limpopo						B	A91K-00035	Capacity (KNP)
A9LUVU-DONGA	-22,70976	30,88843	Luvuvhu	Luvuvhu	Limpopo						C	A91H-00045	Capacity (KNP)
A9LUVU-GWEIR	-23,113997	30,389673	Luvuvhu	Luvuvhu	Limpopo	C					C	A91F-00111	
A9LUVU-HASAN	-23,084	30,46933	Luvuvhu	Luvuvhu	Limpopo	C/D					C	A91F-00111	
A9LUVU-LAMBA	-22,7365	30,88217	Luvuvhu	Luvuvhu	Limpopo	B/C	C				C	A91H-00045	
A9LUVU-MALAM	-22,9525	30,649	Luvuvhu	Luvuvhu	Limpopo	B	C/D				D	A91F-00093	
A9LUVU-MHING	-22,753	30,88917	Luvuvhu	Luvuvhu	Limpopo	C					C	A91H-00045	
A9LUVU-NAND0	-22,9715	30,60167	Luvuvhu	Luvuvhu	Limpopo	B/C					D	A91F-00093	
A9LUVU-SHIDZ	-22,63492	30,95915	Luvuvhu	Luvuvhu	Limpopo						C	A91H-00045	Capacity (KNP)
A9MBWE-BRIDG	-22,84534	30,572226	Mbwedi	Mutshindudi	Limpopo	D					D	A91G-00079	
A9MUKH-CYCAD	-22,81033	30,64783	Mukhase	Mutshindudi	Limpopo	C	B				B	A91G-00078	
A9MUTA-GUYUN	-22,586	30,80533	Mutale	Mutale	Limpopo						C	A92B-00051	ACCESS
A9MUTA-MBEND	-22,43768	31,07745	Mutale	Mutale	Limpopo						C	A92D-00030	Capacity (KNP)
A9MUTA-MUTAL	-22,474	30,8805	Mutale	Mutale	Limpopo	C	C				C	A92D-00030	
A9MUTA-ROADS	-22,80417	30,41667	Mutale	Mutale	Limpopo	C/D					C	A92B-00051	
A9MUTA-SAMBA	-22,70067	30,639	Mutale	Mutale	Limpopo	C					C	A92B-00051	
A9MUTA-TSHIK	-22,67133	30,7015	Mutale	Mutale	Limpopo	C					C	A92B-00051	
A9MUTA-TSHIR	-22,814128	30,39539	Mutale	Mutale	Limpopo	B/C	B/C				C	A92B-00051	
A9MUTA-WHBON	-22,789	30,44267	Mutale	Mutale	Limpopo	D					C	A92B-00051	
A9MUTS-BRIDG	-22,94713	30,38934	Mutshindudi	Mutshindudi	Limpopo	C	D				D	A91G-00098	
A9MUTS-GWEIR	-22,85333	30,6855	Mutshindudi	Mutshindudi	Limpopo	C	C				C	A91G-00086	
A9MUTS-SCHOO	-22,88617	30,58683	Mutshindudi	Mutshindudi	Limpopo	C	C/D				C	A91G-00091	
A9TBDI-BRIDG	-22,7647	30,4869	Tshiombedi	Mutale	Limpopo	C	B				N/A	N/A	

ANNEXURE B: MONITORING SITES IN PRIMARY DRAINAGE REGION B

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
B1KOLI-MIDDE	-25,75752	29,46143	Klein Olifants	Olifants	Olifants	C/D					D	B12D-01118	
B1OLIF-DOORN	-25,854207	29,293483	Olifants	Olifants	Olifants	C					D	B11J-01155	
B2BRON-KLIPE	-25,828	28,717	Bronkhorstspruit	Wilge	Olifants	C					C	B20D-01146	
B2BRON-VLAKF	-25,864	28,708	Bronkhorstspruit	Wilge	Olifants						C	B20D-01146	ACCESS
B2BRON-WAAIK	-26,01	28,677	Bronkhorstspruit	Wilge	Olifants						D	B20A-01245	ACCESS
B2WILG-BOSSE	-25,902072	28,851375	Wilge	Olifants	Olifants	C					C	B20F-01150	
B3ELAN-DETWE	-25,551	28,568	Elands	Olifants	Olifants	B/C					C	B31A-00963	
B3ELAN-DOORB	-25,6107	28,5612	Elands	Olifants	Olifants						C	B31A-00963	FLOWS
B3ELAN-RHENO	-25,115511	28,957101	Elands	Olifants	Olifants	C					D	B31F-00654	
B3ELAN-SPRIN	-25,408	28,569	Elands	Olifants	Olifants						C	B31C-00770	FLOWS
B3KRAN-ZEEK	-25,4376	29,4758	Kranspoortspruit	Olifants	Olifants	C					C	B32A-00950	
B4STEE-PRETO	-24,495	30,4	Steelpoort	Olifants	Olifants	C					D	B41K-00487	
B4STEE-STEEL	-24,893	30,017	Steelpoort	Olifants	Olifants	C/D					D	B41H-00601	
B4STEE-STOFF	-25,38311	29,83837	Steelpoort	Olifants	Olifants	C					D	B41B-00912	
B4STER-LYDEN	-25,14933	30,53652	Sterkspruit	Steelpoort	Olifants	C					N/A	N/A	
B5OLIF-ADRIA	-24,527778	29,545833	Olifants	Olifants	Olifants	B/C					D	B51G-00482	
B5OLIF-MOHLAP	-24,408611	29,736111	Olifants	Olifants	Olifants	C					D	B52E-00439	
B5OLIF-POWER	-24,6175	29,475	Olifants	Olifants	Olifants	C/D					D	B51C-00411	
B6BLYD-PILGU	-24,9028	30,74658	Blyde	Olifants	Olifants	C/D					C	B60A-00653	
B6BLYD-VAALH	-24,73478	30,77825	Blyde	Olifants	Olifants	B					B	B60B-00566	
B7GASE-MIDDL	-24,161	30,254	GaSelati	Olifants	Olifants	B					B	B72F-00367	
B7MOHL-GEMIN	-24,16826	30,10561	Mohlapitse	Olifants	Olifants	B/C					B	B71C-00292	
B7MOHL-VALLI	-24,117225	30,114096	Mohlapitse	Olifants	Olifants	C					B	B71C-00292	
B7OLIF-BALUL	-24,0529	31,72998	Olifants	Olifants	Olifants						C	B73H-00311	Capacity (KNP)
B7OLIF-CONFL	-23,99173	31,82709	Olifants	Olifants	Olifants						C	B73H-00311	Capacity (KNP)
B7OLIF-MAMBA	-24,04244	31,21503	Olifants	Olifants	Olifants						D	B73C-00318	Capacity (KNP)
B8BROE-BRIDG	-23,8007	29,97741	Broederstroom	Groot Letaba	Olifants	C					C	B81A-00242	
B8DEBE-WATER	-23,8139	30,029	Debengeni	Politsi	Olifants	B					N/A	N/A	
B8HELP-WATER	-23,8625	29,984	Helpmekaarspruit		Olifants	C					N/A	N/A	
B8GLET-APPEL	-23,9149	30,05218	Groot Letaba	Groot Letaba	Olifants	C/D					C	B81B-00264	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
B8KLET-BRIDG	-23,598	30,37073	Klein Letaba	Groot Letaba	Olifants	C					C	B82F-00128	
B8LETA-CONFL	-23,9816	31,81423	Letaba	Letaba	Olifants						C	B83E-00265	Capacity (KNP)
B8LETA-KLIPK	-23,94338	31,73133	Letaba	Letaba	Olifants						C	B83E-00265	Capacity (KNP)
B8LETA-MAHLA	-23,65046	31,14842	Letaba	Letaba	Olifants						B	B83A-00220	Capacity (KNP)
B8LETA-MBEWU	-23,759563	31,37062	Letaba	Letaba	Olifants	C					C	B83A-00235	
B8LETS-CRAIGH	-23,9742	30,1658	Letsitele	Groot Letaba	Olifants	C					D	B81D-00272	
B8LETS-TANKB	-23,8888	30,36193	Letsitele	Groot Letaba	Olifants	C					D	B81D-00271	
B8MOLOT-BRIDG	-23,5734	30,71258	Molototsi	Groot Letaba	Olifants	D					D	B81H-00171	
B8NSAM-BANAN	-23,2893	30,8242	Nsama	Klein Letaba	Olifants	D					C	B82H-00127	
B8NSAM-BRIDG	-23,2026	30,66332	Nsama	Klein Letaba	Olifants	D					C	B82H-00127	
B8NSAM-YOUTH	-23,3556	30,9151	Nsama	Klein Letaba	Olifants						B	B82H-00157	FLOWS
B8POLI-MAGOE	-23,7959	30,0997	Politsi	Groot Letaba	Olifants	C					C	B81B-00240	
B8THAB-RAMOD	-24,0255	30,16917	Thabina	Groot Letaba	Olifants	C					D	B81D-00277	
B9SHIN-BRIDG	-23,0736	30,6735	Shingwedzi	Shingwedzi	Olifants						C	B90F-00114	FLOWS

ANNEXURE C: MONITORING SITES IN PRIMARY DRAINAGE REGION C

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
C1WATE-UPPER	-26,960189	28,745795	Waterval	Vaal	Vaal	C/D					D	C12G-01963	
C2BLES-UPPER	-26,47883	28,42505	Blesbokspruit	Suikerbosrant	Vaal	D					C	C21F-01447	
C2KLIP-ROTHD	-26,60788	28,00181	Klip	Vaal	Vaal	D					E	C22E-01520	
C2MOOI-EWR02	-26,88044	26,96417	Mooi	Vaal	Vaal	C					D	C23L-01827	
C2MRLO-KHUTS	-26,340686	27,32816	Moorivierloop	Mooi	Vaal						D	C23E-01378	HABITAT
C2RIET-RIETS	-26,429175	28,160603	Natalspruit	Klip	Vaal	D					E	C22B-01437	
C2SKOO-GHOLF	-26,32595	26,828869	Schoonspruit	Vaal	Vaal	C			B	B	D	C24E-01164	
C2SKOO-URANI	-26,93449	26,66427	Schoonspruit	Vaal	Vaal	D/E			D	C	D	C24H-01860	
C2SUIK-DEHOE	-26,64672	28,38197	Suikerbosrant	Vaal	Vaal	D					C	C21C-01675	
C2SUIK-GOEDV	-26,675517	28,173291	Suikerbosrant	Vaal	Vaal	D					C	C21G-01627	
C2TAAI-SASOL	-26,79472	27,90708	Taaibosspruit	Vaal	Vaal	D					N/A	C22K	
C2VAAL-BARRA	-26,76861	27,67806	Vaal	Vaal	Vaal	D					D	C23B-01731	
C2VAAL-EWR13	-27,104105	26,521939	Vaal	Vaal	Vaal				C	B/C	C	C24J-02016	ACCESS
C2VAAL-SCAND	-26,93156	27,01672	Vaal	Vaal	Vaal	C					D	C23L-01792	
C2VAAL-SCHOE	-26,970756	27,20975	Vaal	Vaal	Vaal	D						C23L-01792	
C2VAAL-VERMA	-26,936415	26,850367	Vaal	Vaal	Vaal	C			C	B/C	C	C24B-01817	
C3HART-DELPO	-28,37931	24,30192	Harts	Vaal	Vaal	C					D	C33C-02836	
C3HART-PAMPI	-27,7867	24,70485	Harts	Vaal	Vaal	C					D	C33A-02470	
C3HART-TAUNG	-27,5333	24,85443	Harts	Vaal	Vaal	D					D	C31F-02140	
C4GVET-VDRIE	-28,712389	26,95911	Groot Vet	Vet	Vaal	C/D			B/C	D	B	C41C-03248	
C4KVET-VVIER	-28,6188	27,016427	Klein Vet	Vet	Vaal	C/D			B/C	B/C	B	C41B-03157	
C4SAND-R73BR	-28,113249	26,908007	Sand	Vet	Vaal	C/D			D	D	D	C42J-02716	
C4SAND-SENEK	-28,305516	27,606749	Sand	Vet	Vaal	C/D					C	C42B-02841	
C4VET-HOOPS	-27,93489	26,125728	Vet	Vaal	Vaal	D			D	D	C	C43A-02561	
C5MODD-MODDE	-29,028882	24,638277	Modder	Riet	Orange	C	C		C	D	D	C52K-03183	
C5MODD-SANNA	-29,16111	26,57194	Modder	Riet	Orange	D	C		C	C	D	C52B-03819	
C5RIET-DEKRA	-29,02778	24,51306	Riet	Vaal	Orange	C					D	C51M-03519	
C5RIET-LILYD	-29,02696	24,51292	Riet	Vaal	Orange	C/D					D	C51M-03519	
C5RIET-JACOB	-29,09972	24,69889	Riet	Vaal	Orange	C/D	C		C	C	D	C51K-03878	
C5RIET-RICHI	-29,044898	24,587063	Riet	Vaal	Orange	D	C		C/D	E	D	C51M-03519	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
C5VANZ-DWNWR	-30,110831	25,849719	VanZylspruit	Riet	Orange				D/E	E	C	C51G-04759	FLOWS
C6VALS-LINDL	-27,849392	27,67833	Vals	Vaal	Vaal						C	C60C-02552	ACCESS
C6VALS-PROKL	-27,486831	26,81305	Vals	Vaal	Vaal				F	E/F	C	C60J-02262	POLLUTION
C7RENO-R501B	-27,041	26,99639	Renoster	Vaal	Vaal						C	C70J-01955	ACCESS
C8KLER-MPEER	-28,53427	28,652061	Klerkspruit	Caledon	Orange	B/C					B	C81G-02882	
C8LIEB-MAFAH	-27,53111	28,47556	Liebenbergsvlei	Wilge	Vaal	D					C	C83H-02392	
C8PERS-SETHU	-28,462723	28,681275	Perskeboomspruit	Perskeboomspruit		B/C							
C9VAAL-DELPO	-28,41847	24,29047	Vaal	Vaal	Vaal	C					D	C91E-02969	
C9VAAL-GONGG	-28,48797	24,40919	Vaal	Vaal	Vaal	C					D	C91E-02969	
C9VAAL-SCHMI	-28,71169	24,07258	Vaal	Vaal	Vaal	C					D	C92B-02903	
C9VAAL-STCLA	-29,0549	23,8213	Vaal	Vaal	Vaal	D					D	C92B-03590	
C9VAAL-VAALB	-28,45019	24,32617	Vaal	Vaal	Vaal	C					D	C91E-02969	
C9VAAL-WARRE	-28,10756	24,84256	Vaal	Vaal	Vaal	C					D	C91D-02644	
C9VAAL-WVALE	-28,09578	24,86975	Vaal	Vaal	Vaal	C					D	C91D-02644	

ANNEXURE D: MONITORING SITES IN PRIMARY DRAINAGE REGION D

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
D1KRAA-ALIWA	-30,69007	26,74157	Kraai	Orange	Orange	C			A/B	D	C	D13M-05442	
D1KRAA-ROODE	-30,8306	26,92056	Kraai	Orange	Orange						C	D13M-05565	ACCESS
D2GROO-FARM1	-28,68056	28,13972	Brandwater	Caledon	Orange	C/D	C		D	E	C	D21G-03101	
D2KLER-MPEER	-28,53427	28,652061	Klerkspruit	Caledon	Orange	C							
D2LCAL-WILGE	-28,50154	28,58132	Little Caledon	Caledon	Orange	C					C	D21D-03094	
D2LCAL-EWR01	-28,52694	28,48306	Little Caledon	Caledon	Orange	C	C		C	D	C	D21D-03094	
D2LCAL-EWR02	-28,611389	28,30194	Little Caledon	Caledon	Orange	C	C		C	D	C	D21E-03142	
D2LEEU-EWR06	-29,52167	27,13583	Leeuw	Caledon	Orange	C	D		B	A	C	D23E-04213	
D2GLEN-GELNR	-28,50758	28,61612	Glen Reenen	Caledon	Orange	B							
D2RIBB-RIBBO	-28,618083	28,583678	Ribbok Spruit	Caledon	Orange	B/C							
D2RIBB-UWWTW	-28,50952	28,58344	Ribbok Spruit	Caledon	Orange	C							
D2RIBB-DWWTW	28,50853	28,58273	Ribbok Spruit	Caledon	Orange	C							
D3ORAN-HOPET	-29,6	24,08778	Orange	Orange	Orange	C					C	D33G-04051	
D3ORAN-MARKS	-29,141709	23,692039	Orange	Orange	Orange						C	D33K-03723	ACCESS
D4MOLO-MODIM	-25,85936	25,44972	Molopo	Orange	Vaal	D	C		C	D/E	E	D41A-01055	
D4MOLO-WELTE	-25,85175	25,79552	Molopo	Orange	Vaal	D			C/D	D/E	E	D41A-01055	
D7ORAN-GIFKL	-28,43722	21,400969	Orange	Orange	Orange	C					D	D73E-02957	
D7ORAN-GROBL	-28,86658	22,04244	Orange	Orange	Orange	B/C					D	D73D-03267	
D7ORAN-KANON	-28,63594	21,09061	Orange	Orange	Orange	C					D	D73F-03193	
D7ORAN-KEIMO	-28,72806	20,98547	Orange	Orange	Orange	C					D	D73F-03193	
D7ORAN-NEUSB	-28,77686	20,73969	Orange	Orange	Orange	C					D	D73F-03393	
D7ORAN-PRIES	-29,66117	22,75564	Orange	Orange	Orange	C					C	D72B-04273	
D7ORAN-UPING	-28,45256	21,25992	Orange	Orange	Orange	C					D	D73E-03072	
D8ORAN-BLOUP	-28,51061	20,172	Orange	Orange	Orange	C					C	D81B-03140	
D8ORAN-GOODH	-28,90742	18,20825	Orange	Orange	Orange	C					C	D82D-03653	
D8ORAN-ONSEE	-28,74072	19,3305	Orange	Orange	Orange	C/D					C	D81E-03349	
D8ORAN-PELLA	-28,96411	19,14531	Orange	Orange	Orange	C					B	D81F-03445	
D8ORAN-RICHT	-28,0777	16,9442	Orange	Orange	Orange	C					C	D82J-02886	
D8ORAN-VIOOL	-28,76211	17,72633	Orange	Orange	Orange	C					C	D82F-03531	

ANNEXURE E: MONITORING SITES IN PRIMARY DRAINAGE REGION E

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
E1JAND-BOSKL	-32,20881	18,9752	Jan Dissel	Olifants	Berg-Olifants						D	E10H-07331	
E1NOOR-OFFTA	-32,72032	19,06633	Noordhoek	Olifants	Berg-Olifants	C					N/A	E10D	
E1OLIF-ALGER	-32,3653	18,95278	Olifants	Olifants	Berg-Olifants	C					D	E10G-07443	
E1OLIF-EWR01	-32,44583	18,96067	Olifants	Olifants	Berg-Olifants						D	E10F-07630	FLOWS
E1OLIF-EWR02	-31,94055	18,71	Olifants	Olifants	Berg-Olifants						C	E10K-06999	ACCESS
E1OLIF-KEERO	-32,85125	19,08223	Olifants	Olifants	Berg-Olifants	C					C	E10C-08121	
E1OLIF-VISGA	-33,07694	19,21639	Olifants	Olifants	Berg-Olifants	C					C	E10A-08299	
E1RATE-BEAVE	-32,87361	19,08333	Ratels	Olifants	Berg-Olifants	D					B	E10C-08136	
E1ROND-EWR03	-32,37033	19,05361	Rondegat	Olifants	Berg-Olifants	C/D					D	E10G-07406	
E2BRAN-VOGEL	-32,565	19,3625	Brandkraal	Doring	Berg-Olifants	C					B	E21J-07721	
E2DORI-BIEDO	-32,9706	19,22153	Doring	Olifants	Berg-Olifants						A	E24H-07135	CAPACITY
E2DORI-KRUIT	-32,3139	19,55008	Doring	Olifants	Berg-Olifants						C	E22G-07463	ACCESS
E2DORI-OUDRI	-31,8569	18,91317	Doring	Olifants	Berg-Olifants						B	E24M-06892	FLOWS
E2GROO-EWR06	-32,64569	19,40694	Groot	Doring	Berg-Olifants	C					B	E21J-07804	
E2LEEU-GAUGE	-32,7805	19,28341	Leeuw	Doring	Berg-Olifants	C					B	E21H-07937	
E2MATJ-BRIDG	-32,51862	19,35055	Matjies	Doring	Berg-Olifants	C					B	E21K-07583	
E2TANK-ELAND	-32,3142	19,53	Tankwa	Doring	Berg-Olifants						B	E23K-7401	ACCESS
E3HANT-R27RO	-31,1824	19,20101	Grasberg	Hantam	Berg-Olifants						B	E32E-06238	FLOWS
E3OLIF-KLAWE	-31,7694	18,61111	Olifants	Olifants	Berg-Olifants						D	E33G-06752	FLOWS
E3OLIF-LUTZV	-31,5648	18,32743	Olifants	Olifants	Berg-Olifants	D					N/A	E33H-06563	
E3SOUT-N7BRI	-31,3968	18,66383	Sout	Olifants	Berg-Olifants						D	E33E-06438	FLOWS
E3TROE-VANRY	-31,6297	18,69472	Troe	Olifants	Berg-Olifants						D	E33F-06648	FLOWS
E4KOEB-DEHOO	-31,64786	19,05497	Koebee	Doring	Koebee	D					B	E40D-06644	
E4OORL-OORLO	-31,46462	19,08095	Oorlogskloof	Doring	Berg-Olifants						C	E40C-06492	FLOWS
E4OORL-OORLO	-31,545	19,10624	Oorlogskloof	Doring	Berg-Olifants	C					B	E40D-06588	

ANNEXURE G: MONITORING SITES IN PRIMARY DRAINAGE REGION G

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
G1BERG-BRBM1	-33,9562	19,0726	Berg	Berg	Berg-Olifants	B/C	B				A	G10A-09199	
G1BERG-BRBM4	-33,4333	18,95556	Berg	Berg	Berg-Olifants		D				D	G10F-08726	FLOWS
G1BERG-BRBM5	-33,1306	18,86298	Berg	Berg	Berg-Olifants	B	D				D	G10J-08414	
G1BERG-BRBM6	-32,998	18,78042	Berg	Berg	Berg-Olifants	C/D	D				D	G10K-08197	
G1BERG-BRMB2	-33,8997	19,05284	Berg	Berg	Berg-Olifants	C	C				B	G10A-09172	
G1BERG-JIMFO	-33,877255	19,033363	Berg	Berg	Berg-Olifants						D	G10A-09160	FLOWS
G1BOES-KAPTE	-32,7743	18,58187	Boesmans	Berg	Berg-Olifants	C	D				D	G10K-07983	
G1DWAR-KYLEM	-33,91242	18,94392	Dwars	Berg	Berg-Olifants	C	D				C	G10C-09145	
G1KLEI-R44RB	-33,21857	18,97433	Klein Berg	Berg	Berg-Olifants	C	D/E				C	G10F-08505	
G1KLEI-TWEEJ	-33,275258	19,104522	Klein Berg	Berg	Berg-Olifants	C	D				D	G10E-08618	
G1MAAT-GWEIR	-33,04722	18,83194	Matjies	Berg	Berg-Olifants		D						DRY
G1OLIF-ABRID	-33,83762	19,1108361	Olifants	Wemmershoek	Berg-Olifants	C	B/C				A	G10B-09101	
G1KROM-BEIT	-33,6224	19,08483	Krom	Berg	Berg-Olifants	C	D				D	G10D-08928	
G1PLAT-GOEDV	-32,8647	18,67928	Platkloof	Berg	Berg-Olifants		C				C	G10K-08061	FLOWS
G1TWEN-HALMA	-33,1516	18,98019	Vier-en-Twintig	Berg	Berg-Olifants	D	E				D	G10J-08463	
G1DRAK-WEMME	-33,80775	19,077	Drakenstein	Wemmershoek	Berg-Olifants	C/D	B/C				A	G10B-09074	
G1SOUT-HAZEK	-33,010892	18,36332	Sout	Berg	Berg-Olifants		D				D	G10L-08287	FLOWS
G1WEMM-WEMME	-33,8535	19,04055	Wemmershoek	Berg	Berg-Olifants						D	G10B-09136	FLOWS
G2DIEP-KALBA	-33,4773	18,70683	Diep	Diep	Berg-Olifants		D				D	G21D-08761	DRY
G2EERS-JONKE	-33,9939	18,9751	Jonkershoek	Eerste	Berg-Olifants	B/C	A/B				A	G22F-09247	
G2EERS-SPIER	-33,972634	18,786979	Eerste	Eerste	Berg-Olifants		D					G22H-09189	ACCESS
G2HOUT-VICTO	-34,0307	18,35355	Hout Bay	Hout Bay	Berg-Olifants	C/D	E				D	G22B-09261	
G2KEYS-LISMO	-34,0542	18,4453	Keysers	Diep	Berg-Olifants		D				D	G22D-09294	FLOWS
G2LIES-WINCH	-33,98833	18,43639	Liesbeek	Soutvlei	Berg-Olifants	C/D	D				E	G22C-09219	
G2LOUR-BROAD	-34,098	18,82722	Lourens	Lourens	Berg-Olifants		E				D	G22J-09266	FLOWS
G2LOUR-RADLO	-34,0831	18,86938	Lourens	Lourens	Berg-Olifants	C	D				D	G22J-09266	
G2SIRL-WEDDE	-34,1115	18,92006	Sir Lowry's Pass	Sir Lowry's Pass	Berg-Olifants	C	D				E	G22K-09315	
G3JAKK-KOOKF	-32,0894	18,35241	Jakkalsvlei	Jakkalsvlei	Berg-Olifants						D	G30G-07159	FLOWS
G3KRUI-PIKET	-32,7462	18,81433	Kruismans	Verlorenvlei	Berg-Olifants	C					D	G30B-07953	
G3KRUI-R365B	-32,6114	18,77444	Kruismans	Verlorenvlei	Berg-Olifants	C					D	G30B-07783	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
G3LANG-REDEL	-32,2105	18,37833	Langvlei	Langvlei	Berg-Olifants						C	G30F-07350	FLOWS
G3VELO-REDEL	-32,4719	18,54148	Verlorenvlei	Verlorenvlei	Berg-Olifants	D					D	G30E-07487	
G4BATH-CALE1	-34,2281	19,46556	Bath	Swart	Breede-Gouritz						N/A	N/A	FLOWS
G4BATH-CALE2	-34,2281	19,46083	Bath	Swart	Breede-Gouritz						N/A	N/A	FLOWS
G4BATH-CALE3	-34,2283	19,44417	Bath	Swart	Breede-Gouritz						N/A	N/A	FLOWS
G4BOTR-DORIN	-34,452	19,60453	Bot	Uilkraal	Breede-Gouritz						C	G40M-09414	FLOWS
G4BOTR-KANAA	-34,1166	19,235	Bot	Bot	Breede-Gouritz						D	G40E-09299	FLOWS
G4BOTR-WILDE	-34,2409	19,21808	Bot	Bot	Breede-Gouritz						D	G40E-09360	FLOWS
G4HERM-SAFCOL	-34,294	19,11781	Hermanus	Bot	Breede-Gouritz						N/A	N/A	FLOWS
G4KLEI-BLUEG	-34,4167	19,53972	Klein	Klein	Breede-Gouritz						D	G40L-09411	FLOWS
G4KLEI-GOUDI	-34,314703	19,589392	Klein	Klein	Breede-Gouritz						D	G40K-09354	FLOWS
G4KLEI-RAKAW	-34,40613	19,60147	Klein	Klein	Breede-Gouritz	C					D	G40L-09411	
G4KLEI-WABOO	-34,4046	19,60658	Klein	Klein	Breede-Gouritz						D	G40L-09411	FLOWS
G4ONRU-BRIDG	-34,41067	19,193	Onrus	Onrus	Breede-Gouritz						D	G40H-09398	FLOWS
G4ONRU-HAYGR	-34,3519	19,26836	Onrus	Onrus	Breede-Gouritz						D	G40H-09398	FLOWS
G4ONRU-VOLMO	-34,3784	19,23261	Onrus	Onrus	Breede-Gouritz						D	G40H-09398	FLOWS
G4PALM-ARIES	-34,244	18,99443	Palmiet	Palmiet	Breede-Gouritz						D	G40C-09305	FLOWS
G4PALM-ELGIN	-34,1636	19,02056	Palmiet	Palmiet	Breede-Gouritz						D	G40C-09305	FLOWS
G4PALM-GRABO	-34,1517	19,02468	Palmiet	Palmiet	Breede-Gouritz						D	G40C-09305	FLOWS
G4PALM-KODAM	-34,225	18,99167	Palmiet	Palmiet	Breede-Gouritz						D	G40C-09305	FLOWS
G4PALM-KOGEL	-34,278744	18,9949	Palmiet	Palmiet	Breede-Gouritz	C					B	G40D-09369	
G4PALM-KOGFR	-34,3194	18,96957	Palmiet	Palmiet	Breede-Gouritz						B	G40D-09369	FLOWS
G4PALM-NUWEB	-34,059426	19,045865	Palmiet	Palmiet	Breede-Gouritz						D	G40C-09305	FLOWS
G4PALM-R45BR	-34,094	19,054	Palmiet	Palmiet	Breede-Gouritz						D	G40C-09305	FLOWS
G4SWAR-CONFL	-34,2596	19,22483	Swart	Bot	Breede-Gouritz						E	G40F-09365	FLOWS
G4UILK-BAARD	-34,58	19,481	Uilkraal	Uilkraal	Breede-Gouritz						C	G40M-09414	FLOWS
G4UILK-GOEDV	-34,5271	19,53919	Uilkraal	Uilkraal	Breede-Gouritz						C	G40M-09414	FLOWS
G4UILK-PAARDE	-34,465228	19,596302	Uilkraal	Uilkraal	Breede-Gouritz						C	G40M-09414	FLOWS
G4UILK-SALMO	-34,4402	19,61956	Uilkraal	Uilkraal	Breede-Gouritz						N/A	N/A	FLOWS
G5HEUN-RIVER	-34,6886	20,03361	Heuningnes	Heuningnes	Breede-Gouritz						N/A	G50F-09424	FLOWS
G5HOTN-CONFL	-34,2872	20,02417	Hotnotskraal	Sout	Breede-Gouritz						D	G50H-09340	FLOWS
G5KARS-KARS	-34,4133	19,82058	Kars	Heuningnes	Breede-Gouritz						E	G50D-09393	FLOWS

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
G5KARS-ROOID	-34,4297	19,9153	Kars	Heuningnes	Breede-Gouritz						E	G50D-09393	FLOWS
G5KARS-SOUTK	-34,46902	20,06844	Kars	Heuningnes	Breede-Gouritz						E	G50E-09404	FLOWS
G5KLEI-BOSKL	-34,5473	19,80733	Klein Pietersielie	Pietersielie	Breede-Gouritz						N/A	N/A	FLOWS
G5KLIP-KLIPPE	-34,4517	19,90119	Klipdrift	Kars	Breede-Gouritz						N/A	N/A	FLOWS
G5NUWE-BRAKP	-34,634	19,865	Nuwejaars	Heuningnes	Breede-Gouritz						C	G50B-09418	FLOWS
G5NUWE-KERS	-34,5786	19,70792	Nuwejaars	Heuningnes	Breede-Gouritz						N/A	N/A	FLOWS
G5PIET-BOSKL	-34,5423	19,81867	Pietersielie	Nuwejaars	Breede-Gouritz						N/A	N/A	FLOWS
G5RATE-DIRKU	-34,7127	19,69803	Ratel	Ratel	Breede-Gouritz						D	G50A-09428	FLOWS
G5SOES-SOESR	-34,3434	20,15356	Soe	Sout	Breede-Gouritz						C	G50H-09390	FLOWS
G5SOUT-BRAKF	-34,3686	20,23775	Sout	De Hoop Vlei	Breede-Gouritz						C	G50H-09387	FLOWS
G5SOUT-DWAFW	-34,292	20,02336	Sout	De Hoop Vlei	Breede-Gouritz						D	G50G-09352	FLOWS
G5SOUT-KLIPD	-34,306283	19,962492	Sout	De Hoop Vlei	Breede-Gouritz						D	G50G-09352	FLOWS
G5SOUT-SOUTK	-34,2693	19,87472	Sout	De Hoop Vlei	Breede-Gouritz						E	G50G-09373	FLOWS
G5SOUT-WYDGE	-34,3964	20,2905	Sout	De Hoop Vlei	Breede-Gouritz						C	G50H-09400	FLOWS

ANNEXURE H: MONITORING SITES IN PRIMARY DRAINAGE REGION H

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
H1BREE-SLANG	-33,520233	19,18519	Breede	Breede	Breede-Gouritz	B/C					C	H10F-08730	
H1BREE-R101B	-33,6507	19,33482	Breede	Breede	Breede-Gouritz						D	H10G-08844	CAPACITY
H1BREE-WITBR	-33,422808	19,257982	Breede	Breede	Breede-Gouritz						C	H10F-08730	CAPACITY
H1DWAR-EIKEN	-33,3419	19,30417	Dwars	Breede	Breede-Gouritz						C	H10C-08644	CAPACITY
H1ELAN-TUNNE	-33,7333	19,115	Elandspad	Molenaars	Breede-Gouritz						B	H10J-09038	CAPACITY
H1HOLS-RAWSO	-33,6932	19,32585	Holsoot	Breede	Breede-Gouritz						C	H10K-08972	CAPACITY
H1HOLS-STETT	-33,8369	19,2575	Holsoot	Breede	Breede-Gouritz						C	H10K-08972	CAPACITY
H1JAND-ELSKL	-33,5556	19,34333	Bothaspruit	Breede	Breede-Gouritz							H10H-08826	CAPACITY
H1KOEK-BRDG4	-33,3631	19,27638	Koekedouw	Dwars	Breede-Gouritz						D	H10C-08560	CAPACITY
H1KOEK-DCDAM	-33,363348	19,276934	Koekedouw	Dwars	Breede-Gouritz						D	H10C-08560	CAPACITY
H1KOEK-UCDAM	-33,3386	19,26611	Koekedouw	Dwars	Breede-Gouritz						D	H10C-08560	CAPACITY
H1MOLE-GWEIR	-33,723613	19,169725	Molenaars	Smalblaar	Breede-Gouritz	B/C					C	H10J-08990	
H1SMAL-RAWSO	-33,6886	19,31905	Smalblaar	Breede	Breede-Gouritz						E	H10L-08968	CAPACITY
H1TITU-ACHTE	-33,393367	19,372384	Titus	Breede	Breede-Gouritz						C	H10B-08700	CAPACITY
H1WITE-MITCH	-33,41691	19,290958	Witels	Breede	Breede-Gouritz						A	H10D-08755	CAPACITY
H1WITT-TWEED	-33,570051	19,139314	Wit	Breede	Breede-Gouritz						A	H10E-8836	CAPACITY
H2AMAN-KLIPH	-33,5122	19,49972	Amandel	Hex	Breede-Gouritz						B	H20E-08786	CAPACITY
H2HEXR-AMAND	-33,529065	19,540292	Hex	Breede	Breede-Gouritz	B/C					D	H20H-08839	
H2SAND-ROODE	-33,5087	19,53	Sanddriftskloof	Amandel	Breede-Gouritz						B	H20D-08627	CAPACITY
H3KEIS-BERGR	-33,7822	20,11472	Keisie	Kogmanskloof	Breede-Gouritz						D	H30D-09015	CAPACITY
H3KEIS-PIETE	-33,7092	20,05881	Keisie	Kogmanskloof	Breede-Gouritz						D	H30D-08966	CAPACITY
H3KING-ABRIK	-33,8264	20,23972	Groot	Kingna	Breede-Gouritz						D	H30B-09048	CAPACITY
H3KING-LEGOL	-33,8142	20,09	Kogmanskloof	Kogmanskloof	Breede-Gouritz						D	H30E-09032	CAPACITY
H3KING-MONTA	-33,788176	20,132711	Kingna	Kogmanskloof	Breede-Gouritz						D	H30B-08978	CAPACITY
H4BREE-LECHA	-33,8167	19,69167	Breede	Breede	Breede-Gouritz						B	H40F-09026	CAPACITY
H4DORI-HIGHL	-33,9128	19,42639	Doring	Breede	Breede-Gouritz						N/A	N/A	CAPACITY
H4HOEK-MODDE	-33,85469	19,408489	Hoeks	Breede	Breede-Gouritz						D	H40E-09059	CAPACITY
H4KEIS-MCGRE	-33,939757	19,84055	Keisers	Breede	Breede-Gouritz						D	H40K-09150	CAPACITY
H4NUY-ABDAM	-33,570088	19,702592	Nuy	Breede	Breede-Gouritz						C	H40B-08847	CAPACITY
H4NUY-GLENO	-33,6486	19,63917	Nuy	Breede	Breede-Gouritz						D	H40B-08880	CAPACITY

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
H4NUY-LOWER	-33,716855	19,491638	Nuy	Breede	Breede-Gouritz						E	H40C-08999	CAPACITY
H4POEJ-SEVEN	-33,9561	19,58944	Poesjenels	Breede	Breede-Gouritz						B	H40G-09195	CAPACITY
H5GROO-STEEN	-33,9869	19,89	Groot	Breede	Breede-Gouritz						D	H50A-09161	CAPACITY
H6BAVI-GENAD	-34,0505	19,55996	Baviaans	Riviersonderend	Breede-Gouritz	C					C	H60E-09217	
H6DUTO-WEIR2	-33,9417	19,17083	Du Toits	Riviersonderend	Breede-Gouritz	C					B	H60B-09162	
H6ELAN-HIGHN	-33,9542	19,28111	Elands	Riviersonderend	Breede-Gouritz						D	H60C-09164	CAPACITY
H6FREE-N2ROA	-34,1058	20,27972	Freek Bothas	Riviersonderend	Breede-Gouritz						D	H60L-09291	CAPACITY
H6GOBO-GREYT	-34,0414	19,61917	Gobos	Riviersonderend	Breede-Gouritz						C	H60F-09248	CAPACITY
H6RIVI-ELAND	-34,0636	19,4633	Riviersonderend	Riviersonderend	Breede-Gouritz							H60D-09239	FLOWS
H6RIVI-GREYT	-34,0722	19,62222	Riviersonderend	Riviersonderend	Breede-Gouritz	D					D	H60F-09277	
H6RIVI-KAMBA	-34,07398	20,26818	Riviersonderend	Riviersonderend	Breede-Gouritz	C/D					D	H60L-09269	
H6RIVI-HELDE	-34,085	19,37913	Riviersonderend	Riviersonderend	Breede-Gouritz						D	H60D-09271	CAPACITY
H6RIVI-STORM	-34,0819	20,09556	Riviersonderend	Riviersonderend	Breede-Gouritz						D	H60K-09263	CAPACITY
H7BREE-BONTE	-34,0764	20,45444	Breede	Breede	Breede-Gouritz						C	H70B-09251	CAPACITY
H7BREE-FELIX	-34,1447	20,47861	Breede	Breede	Breede-Gouritz						C	H70G-09308	CAPACITY
H7BUFF-ABN2R	-34,0456	20,535	Buffeljags	Breede	Breede-Gouritz						D	H70E-09184	CAPACITY
H7BUFF-SUURB	-34,0042	20,65833	Buffeljags	Breede	Breede-Gouritz						E	H70D-09183	CAPACITY
H7GLEN-SWELLE	-34,0125	20,45028	Glen	Breede	Breede-Gouritz						N/A	N/A	CAPACITY
H7HUIS-BARRY	-33,9158	20,74639	Huis	Tradou	Breede-Gouritz						C	H70C-09131	CAPACITY
H7KOOR-SWELL	-34,0239	20,44361	Koornlands	Breede	Breede-Gouritz						N/A	N/A	CAPACITY
H7LEEU-SWELL	-34,0028	20,33167	Leeu	Breede	Breede-Gouritz						E	H70A-09186	CAPACITY
H7MELK-INFAN	-34,3869	20,68639	Melk Hout	Breede	Breede-Gouritz						N/A	N/A	CAPACITY
H7TRAD-BARRY	-33,9281	20,70861	Tradou	Buffeljags	Breede-Gouritz						B	H70D-09157	CAPACITY
H7TRAD-SANDR	-33,9258	20,60556	Tradou	Buffeljags	Breede-Gouritz						D	H70C-09066	CAPACITY
H8DUIW-VERMA	-34,2516	20,99183	Duiwenhoks	Duiwenhoks	Breede-Gouritz	C/D					D	H80E-09314	
H9GOUK-GWEIR	-34,0926	21,29366	Goukou	Goukou	Breede-Gouritz						D	H90C-09229	FLOWS
H9GOUK-KLPFN	-34,2714	21,29833	Goukou	Goukou	Breede-Gouritz						C	H90E-09343	CAPACITY

ANNEXURE J: MONITORING SITES IN PRIMARY DRAINAGE REGION J

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
J1BUFF-EWR05	-33,38452	20,94169	Buffels	Groot	Breede-Gouritz						C	J11H-08557	FLOWS/DRY
J1DORI-EWR07	-33,79137	20,92699	Doring	Touws	Breede-Gouritz						D	J12L-08985	FLOWS/DRY
J1TOUW-EWR03	-33,72707	21,16507	Touws	Groot	Breede-Gouritz						D	J12M-08904	FLOWS/DRY
J2GAMK-EWR04	-33,36472	21,63051	Gamka	Olifants	Breede-Gouritz						C	J25A-08567	ACCESS
J3GROO-MEIRI	-33,409118	22,556551	Meirings	Olifants	Breede-Gouritz						C	J33D-08571	FLOWS
J3KAMM-EWR10	-33,73286	22,6974	Kammanassie	Diep	Breede-Gouritz	D					B	J34C-08869	
J3KLEI-EWR05	-33,423187	22,257484	Klein Le Roux	Grobbelaars	Breede-Gouritz						C	J35A-08551	FLOWS
J3OLIF-EWR01	-33,570671	22,42054	Olifants	Olifants	Breede-Gouritz						D	J33F-08772	HEALTH
J3OLIF-EWR09	-33,43813	23,20587	Olifants	Olifants	Breede-Gouritz						C	J31D-08592	FLOWS
J4GOUR-EWR06	-33,90982	21,65233	Gouritz	Gouritz	Breede-Gouritz						C	J40B-09106	FLOWS/DRY

ANNEXURE K: MONITORING SITES IN PRIMARY DRAINAGE REGION K

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
K1MOOR-PRIVA	-34,012206	22,139353	Moordkuil	Klein Brak	Breede-Gouritz						D	K10F-09139	FLOWS
K2GROO-KLEIN	-33,9783	22,19333	Groot Brak	Groot Brak	Breede-Gouritz	C					C	K20A-09083	
K2VARI-KLEIN	-33,959772	22,241429	Varing	Groot Brak	Breede-Gouritz						N/A	N/A	CAPACITY
K3GWAI-USN2R	-34,0066	22,40084	Gwaing	Gwaing	Breede-Gouritz						D	K30B-09151	CAPACITY
K3KAAI-GWEIR	-33,9711	22,54776	Kaaimans	Kaaimans	Breede-Gouritz	B/C					B	K30C-09065	
K3MAAL-GWEIR	-34,006583	22,350017	Maalgate	Maalgate	Breede-Gouritz						D	K30A-09087	CAPACITY
K3MALG-OUTEN	-33,9378	22,42194	Malgas	Gwaing	Breede-Gouritz	C					B	K30B-09082	
K3SILW-BRIDG	-33,965	22,5617	Silver	Kaaimans	Breede-Gouritz						N/A	N/A	CAPACITY
K3SWAR-KNYSN	-33,9675	22,52112	Swart	Kaaimans	Breede-Gouritz						D	K30C-09093	CAPACITY
K3TOUW-BOSPL	-33,9469	22,61292	Touws	Touws	Breede-Gouritz						B	K30D-09042	CAPACITY
K4DIEP-DIEPR	-33,9398	22,70805	Diep	Sedgefield	Breede-Gouritz	C					C	K40A-09027	
K4HOMT-KNYSA	-33,9474	22,91933	Homtini	Homtini	Breede-Gouritz	C					C	K40E-09016	
K4KARA-KNYSN	-33,9219	22,85329	Karatara	Sedgefield	Breede-Gouritz						C	K40C-09036	ACCESS
K4WOLW-BARND	-33,9785	22,71915	Wolwe	Sedgefield	Breede-Gouritz						C	K40A-09027	CAPACITY
K5KNYS-EWR01	-33,8911	23,03253	Knysna	Knysna	Breede-Gouritz	B/C					A	K50A-09069	
K6BITO-WITTE	-33,9996	23,34128	Bitou	Keurbooms	Breede-Gouritz						C	K60F-09092	CAPACITY
K6KEUR-EWR06	-33,8882	23,2421	Keurbooms	Keurbooms	Breede-Gouritz	B					C	K60C-08992	
K7BLOU-LOWER	-33,9558	23,63877	Bloukrans	Bloukrans	Breede-Gouritz						B	K70B-09055	ACCESS
K7BLOU-UPPER	-33,9176	23,63881	unnamed	Bloukrans	Breede-Gouritz	C					N/A	N/A	
K8ELAN-LOWER	-33,9668	23,77482	Elandsbos	Elandsbos	Mzimvubu-Tsitsikamma						C	K80A-09053	
K8ELAN-UPPER	-33,9713	24,06408	unnamed	Elands	Mzimvubu-Tsitsikamma						N/A	N/A	ACCESS
K8GROO-LOWER	-34,035	24,20761	Groot	Groot	Mzimvubu-Tsitsikamma						C	K80D-09182	FLOW
K8GROO-UPPER	-33,9728	24,12125	Groot	Groot	Mzimvubu-Tsitsikamma						B	K80D-09124	ACCESS
K8LOTT-UPPER	-33,933	23,72953	Lotterings	Lotterings	Mzimvubu-Tsitsikamma	C					N/A	N/A	
K8LOTT-LOWER	-33,97286	23,747156	Lotterings	Lotterings	Mzimvubu-Tsitsikamma						N/A	N/A	FLOWS
K8STOR-LOWER	-33,9886	23,91925	Storms	Storms	Mzimvubu-Tsitsikamma	C					B	K80B-09071	
K8STOR-UPPER	-33,9492	23,91953	Storms	Storms	Mzimvubu-Tsitsikamma	B/C					N/A	N/A	
K9KROM-BOJAN	-33,88083	24,07528	Kromme	Kromme	Mzimvubu-Tsitsikamma	C					D	K90A-09040	
K9KROM-MELKH	-33,93728	24,27208	Kromme	Kromme	Mzimvubu-Tsitsikamma	C					D	K90A-09040	
K9KROM-DEWIL	-33,95582	24,34909	Kromme	Kromme	Mzimvubu-Tsitsikamma	C					D	K90A-09040	

ANNEXURE L: MONITORING SITES IN PRIMARY DRAINAGE REGION L

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
L7WITR-GROOT	-33,66031	24,53501	Wit	Groot	Mzimvubu-Tsitsikamma	C					B	L70G-08818	
L8KOUG-BOKOU	-33,71656	23,41128	Groot	Kouga	Mzimvubu-Tsitsikamma						C	L82A-08911	FLOWS
L8KOUG-OPKOM	-33,7884	24,02531	Kouga	Gamtoos	Mzimvubu-Tsitsikamma	C/D					B	L82D-08977	
L9GAMT-PATEN	-33,76089	24,69356	Gamtoos	Gamtoos	Mzimvubu-Tsitsikamma						C	L90A-08877	FLOWS

ANNEXURE M: MONITORING SITES IN PRIMARY DRAINAGE REGION M

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
M1KWAZ-VYEBO	-33,72206	25,30069	Kwazungu	Swartkops	Mzimvubu-Tsitsikamma	C					D	M10C-08897	

ANNEXURE P: MONITORING SITES IN PRIMARY DRAINAGE REGION P

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
P4BLOU-BRIDG	-33,3905	26,70707	Bloukrans	Kowie	Mzimvubu-Tsitsikamma						C	P40A-08472	FLOWS
P4BLOU-RAILW	-33,32366	26,60003	Bloukrans	Kowie	Mzimvubu-Tsitsikamma						C	P40A-08472	SAFETY
P4KOWI-UPPER	-33,34928	26,56006	Kowie	Kowie	Mzimvubu-Tsitsikamma						C	P40A-08535	FLOWS
P4KOWI-BARTH	-33,50692	26,74464	Kowie	Kowie	Mzimvubu-Tsitsikamma						B	P40C-08731	FLOWS

ANNEXURE Q: MONITORING SITES IN PRIMARY DRAINAGE REGION Q

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
Q9KATR-BRIDG	-32,578283	26,679467	Kat	Kat	Mzimvubu-Tsitsikamma	C			C	C	C	Q94D-07647	
Q9BALF-SODOM	-32,545	26,67275	Balfour	Kat	Mzimvubu-Tsitsikamma	C			C	D	C	Q94C-07530	
Q9ELAN-SEYMO	-32,545555	26,798333	Elands	Kat	Mzimvubu-Tsitsikamma				E	E	N/A	N/A	FLOWS

ANNEXURE R: MONITORING SITES IN PRIMARY DRAINAGE REGION R

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
R1KEIS-BESAN R1KEIS-BESAD	-32,738317	27,09856	Keiskamma	Keiskamma	Mzimvubu-Tsitsikamma	C		B			D	R10D-07807	
R1KEIS-BESMA	-32,68322	27,154905	Keiskamma	Keiskamm	Mzimvubu-Tsitsikamma	C					D	R10B-07769	
R1KEIS-BEXEB	-32,81861	26,99417	Keiskamma	Keiskamm	Mzimvubu-Tsitsikamma	C		E			D	R10E-07844	
R1KEIS-EWR01	-32,870143	26,973135	Keiskamma	Keiskamm	Mzimvubu-Tsitsikamma	C		D			D	R10E-07844	
R1KEIS-GCINI	-33,023628	27,086267	Keiskamma	Keiskamm	Mzimvubu-Tsitsikamma	C		D			C	R10K-08150	
R1KEIS-SMBRI	-32,640472	27,19061	Keiskamma	Keiskamm	Mzimvubu-Tsitsikamma	C/D		A			C	R10A-07658	
R1TYUM-BECON	-32,901722	26,927778	Tyume	Keiskamm	Mzimvubu-Tsitsikamma	C		C			C	R10H-07938	
R1TYUM-FORTH	-32,778225	26,856328	Tyume	Keiskamm	Mzimvubu-Tsitsikamma	C		D			D	R10G-07651	
R1TYUM-HOGSB	-32,61111	26,94778	Tyume	Keiskamm	Mzimvubu-Tsitsikamma	C		E			D	R10G-07651	
R2BUFF-EWR01	-32,769342	27,362966	Buffalo	Buffalo	Mzimvubu-Tsitsikamma						D	R20A-07788	FLOWS
R2BUFF-EWR02	-32,958265	27,525713	Buffalo	Buffalo	Mzimvubu-Tsitsikamma						D	R20F-08045	FLOWS
R2BUFF-HORSE	-32,8225	27,380279	Buffalo	Buffalo	Mzimvubu-Tsitsikamma						C	R20B-07903	FLOWS
R2BUFF-MADEN	-32,732187	27,29368	Buffalo	Buffalo	Mzimvubu-Tsitsikamma	B/C					D	R20A-07788	
R2BUFF-ZWELI	-32,913639	27,410278	Buffalo	Buffalo	Mzimvubu-Tsitsikamma						C	R20D-08018	ACCESS
R2MGQA-PIRIE	-32,788056	27,249722	Mgqakwebe	Buffalo	Mzimvubu-Tsitsikamma	C					C	R20C-07878	FLOWS
R2NXAM-POTSD	-32,985194	27,63875	KwaNxamkwane	Buffalo	Mzimvubu-Tsitsikamma	D		C			N/A	N/A	
R2YELL-LONSD	-32,807918	27,46989	Yellowwoods	Buffalo	Mzimvubu-Tsitsikamma						D	R20E-07775	FLOWS

ANNEXURE S: MONITORING SITES IN PRIMARY DRAINAGE REGION S

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
S1WKEI-BXOND	-31,85525	27,189583	White Kei	Great Kei	Mzimvubu-Tstitsikamma	C		D/E			E	S10E-06699	
S1WKEI-STMAR	-32,013778	27,374222	White Kei	Great Kei	Mzimvubu-Tstitsikamma	C/D		D			C	S10J-06985	
S3BKEI-BULLH	-32,034528	26,655833	Black Kei	Great Kei	Mzimvubu-Tstitsikamma	C/D		B/C			C	S32C-06908	
S3BKEI-TURNS	-32,178611	27,330361	Black Kei	Great Kei	Mzimvubu-Tstitsikamma			E			C	S32M-07137	FLOWS
S3KLIP-PLAAT	-32,2568	26,86582	Klipplaat	Black Kei	Mzimvubu-Tstitsikamma			B/C			D	S32G-07224	FLOWS
S4GKEI-GUIKA	-32,283278	27,652528	Great Kei	Great Kei	Mzimvubu-Tstitsikamma	C		E			C	S40F-07265	
S5TSOM-KOMKH	-31,60925	27,6765	Tsomo	Great Kei	Mzimvubu-Tstitsikamma			E			C	S50D-06475	FLOWS
S5TSOM-R56BR	-31,367278	27,670722	Tsomo	Great Kei	Mzimvubu-Tstitsikamma	C/D		D/E			B	S50C-06248	
S5TSOM-UPPER	-31,257958	27,830014	Tsomo	Great Kei	Mzimvubu-Tstitsikamma	E		E	C	D	B	S50A-06076	
S6KUBU-BRIDG	-32,507306	27,731556	Kubusi	Great Kei	Mzimvubu-Tstitsikamma	B/C		D	C	A	C	S60E-07531	
S7GKEI-GLENK	-32,54475	28,193861	Great Kei	Great Kei	Mzimvubu-Tstitsikamma						C	S70F-07621	HABITAT
S7GKEI-KEIBR	-32,507222	27,97315	Great Kei	Great Kei	Mzimvubu-Tstitsikamma	C		B/C			C	S70A-07524	

ANNEXURE T: MONITORING SITES IN PRIMARY DRAINAGE REGION T

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
T1MBHA-MVEZO	-31,9587	28,4727	Mbhashe	Mbhashe	Mzimvubu-Tsitsikamma	C		D			B	T13C-06941	
T1MBHA-N2BRI	-31,922583	28,454194	Mbhashe	Mbhashe	Mzimvubu-Tsitsikamma						C	T13B-06866	FLOWS
T1MGWA-MAKHO	-31,846722	28,314306	Mgwali	Mbhashe	Mzimvubu-Tsitsikamma	C		D			C	T12G-06769	
T1MGWA-NGCAC	-31,769333	28,122778	Mgwali	Mbhashe	Mzimvubu-Tsitsikamma	C		D			D	T12F-06661	
T1MGWA-R61BR	-31,733	27,94925	Mgwali	Mbhashe	Mzimvubu-Tsitsikamma	C		D			C	T12B-06523	
T1MGWA-TORHA	-31,820717	28,176917	Mgwali	Mbhashe	Mzimvubu-Tsitsikamma						D	T12F-06661	FISH SITE
T1MNYO-BRIDG	-31,517222	28,290472	Mnyolo	Mbhashe	Mzimvubu-Tsitsikamma	C		D			C	T11F-06372	
T1NTSU-UPPER	-31,7775	28,36444	Unknown	Mbhashe	Mzimvubu-Tsitsikamma	D		D			N/A	N/A	
T1XUKA-CONFL	-31,714268	28,328791	Xuka	Mbhashe	Mzimvubu-Tsitsikamma	C/D					C	T11C-06457	
T1XUKA-SLIND	-31,579528	27,959583	Xuka	Mbhashe	Mzimvubu-Tsitsikamma	C		D			C	T11C-06457	
T2MTHA-ASAWM	-31,493056	28,477	Mthatha	Mthatha	Mzimvubu-Tsitsikamma	C/D					C	T20A-06409	
T2MTHA-EYE	-31,506944	28,393472	Mthatha	Mthatha	Mzimvubu-Tsitsikamma	C					C	T20A-06409	
T2MTHA-KAMBI	-31,471333	28,615056	Mthatha	Mthatha	Mzimvubu-Tsitsikamma	C					E	T20B-06274	
T2MTHA-MDUMB	-31,925944	29,136222	Mthatha	Mthatha	Mzimvubu-Tsitsikamma	C					C	T20G-06794	
T2MTHA-TAKAT	-31,685583	28,820583	Mthatha	Mthatha	Mzimvubu-Tsitsikamma						D	T20D-06659	FLOWS
T2NGQU-LOWER	-31,852056	28,820083	Ngqungqu	Mthatha	Mzimvubu-Tsitsikamma	C					C	T20F-06796	
T3GATB-FORES	-31,2378	28,1319	Gatberg	Mzimvubu	Mzimvubu-Tsitsikamma	C					C	T35G-06118	
T3KINI-MABUA	-30,191733	28,596833	Kinira	Mzimvubu	Mzimvubu-Tsitsikamma	C		D			B	T33A-04892	
T3MZIM-BHUJE	-31,438972	29,294332	Kinira	Mzimvubu	Mzimvubu-Tsitsikamma	C					C	T36A-06354	
T3MZIM-JONES	-30,157917	29,114167	Mzimvubu	Mzimvubu	Mzimvubu-Tsitsikamma						B	T31D-04926	FLOWS
T3MZIM-N2BRI	-30,850762	29,0697	Mzimvubu	Mzimvubu	Mzimvubu-Tsitsikamma	C		C			C	T33H-05680	
T3MZIM-SPRIN	-30,477217	29,065767	Mzimvubu	Mzimvubu	Mzimvubu-Tsitsikamma						B	T31G-05071	FLOWS
T3MZIN-EWR	-30,1869	29,34629	Mzintlanga	Mzintlava	Mzimvubu-Tsitsikamma	C/D		B/C			C	T32A-04907	
T3MZIN-FRANK	-30,394133	29,448467	Mzintlava	Mzimvubu	Mzimvubu-Tsitsikamma						B	T32B-05103	FLOWS
T3MZIN-KUPOY	-31,102149	29,399821	Mzintlava	Mzimvubu	Mzimvubu-Tsitsikamma	C					C	T32H-05842	
T3MZIN-NTSHA	-30,826825	29,331393	Mzintlava	Mzimvubu	Mzimvubu-Tsitsikamma						C	T32F-05464	FLOWS
T3MZIN-RDM	-30,2647	29,47835	Mzintlava	Mzimvubu	Mzimvubu-Tsitsikamma						B	T32A-04965	ACCESS
T3THIN-HEADW	-30,6409	28,20696	Thina	Mzimvubu	Mzimvubu-Tsitsikamma						B	T34A-05415	FLOWS
T3TINA-N2ROA	-31,069151	28,892677	Thina	Mzimvubu	Mzimvubu-Tsitsikamma	C					B	T34K-05835	
T3TINA-R316R	-30,659267	28,208833	Thina	Mzimvubu	Mzimvubu-Tsitsikamma	C		E			N/A	T34A	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
T3TINA-TSOLO	-30,630217	28,482417	Thina	Mzimvubu	Mzimvubu-Tsitsikamma	C		E			B	T34B-05351	
T3TSIT-LALEN	-31,245109	28,901664	iTsitsa	Thina	Mzimvubu-Tsitsikamma	C		E			B	T35L-05976	
T3TSIT-TVALL	-30,87194	28,18167	Tigervalleyspruit	iTsitsa	Mzimvubu-Tsitsikamma	C		E			N/A	T35A	
T4MTAM-MADIK	-30,855278	30,073333	Mtamvuna	Mtamvuna	Mzimvubu-Tsitsikamma	B/C					B	T40E-05601	
T5MZIM-EWR05	-30,35651	30,048161	Mzimkhulu	Mzimkhulu	Pongola-Mtamvuna						B	T52D-05155	CAPACITY
T5MZIM-NPCQS	-30,645665	30,345533	Mzimkhulu	Mzimkhulu	Pongola-Mtamvuna	C					B	T52J-05276	
T5MZKH-ORIBI	-30,70715	30,27062	Mzimkulwana	Mzimkhulu	Pongola-Mtamvuna	C					B	T52K-05467	

ANNEXURE U: MONITORING SITES IN PRIMARY DRAINAGE REGION U

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
U1MKMZ-SANIG	-29,647865	29,434046	Mkhomazana	Mkomazi	Pongola-Mtamvuna						B	U10C-0437	CAPACITY
U1MKOM-JOSEB	-30,0082	30,239028	Mkomazi	Mkomazi	Pongola-Mtamvuna	B					B	U10J-04799	
U1MKOM-SHOZI	-30,1316	30,66251	Mkomazi	Mkomazi	Pongola-Mtamvuna	C					B	U10M-04746	
U2DUZI-MOTOX	-29,607	30,4508	uMsunduzi	uMgeni	Pongola-Mtamvuna						E	U20J-04364	CAPACITY
U2DUZI-NKANY	-29,611	30,5578	uMsunduzi	uMgeni	Pongola-Mtamvuna						B	U20J-04391	CAPACITY
U2KARK-USMGN	-29,443797	30,319403	Karkloof	uMgeni	Pongola-Mtamvuna						B	U20E-04170	CAPACITY
U2MGEN-DRGLE	-29,488805	29,903036	uMgeni	uMgeni	Pongola-Mtamvuna						B	U20A-04253	CAPACITY
U2MGEN-FOUNT	-29,491252	30,492632	uMgeni	uMgeni	Pongola-Mtamvuna						B	U20G-04259	CAPACITY
U2MGEN-LIONS	-29,414572	30,094444	Lions	uMgeni	Pongola-Mtamvuna						C	U20B-04173	CAPACITY
U2MGEN-MIDMA	-29,488134	30,156002	uMgeni	uMgeni	Pongola-Mtamvuna						B	U20C-04275	CAPACITY
U2MGEN-MPOLW	-29,46458	30,46197	uMgeni	uMgeni	Pongola-Mtamvuna						B	U20G-04259	CAPACITY
U2MGEN-MZINY	-29,720839	30,904321	uMgeni	uMgeni	Pongola-Mtamvuna						E	U20M-04396	CAPACITY
U2MGEN-PETRU	-29,512469	30,094401	uMgeni	uMgeni	Pongola-Mtamvuna						B	U20A-04253	CAPACITY
U2MGEN-USMWW	-29,49676	30,22094	uMgeni	uMgeni	Pongola-Mtamvuna	C					C	U20E-04243	
U3MDLO-HAZEL	-29,602083	31,009018	Mdloti	Mdloti	Pongola-Mtamvuna	C					D	U30A-04360	
U3TONG-ROADB	-29,559913	31,174085	Tongati	Tongati	Pongola-Mtamvuna	D					C	U30D-04315	
U4MVOT-EWR12	-29,268696	31,031965	uMvoti	uMvoti	Pongola-Mtamvuna						B	U40H-04064	CAPACITY
U4MVOT-WELVE	-29,35611	31,2341	uMvoti	uMvoti	Pongola-Mtamvuna						C	U40J-03998	CAPACITY
U4MVTI-N2BRI	-29,370004	31,304341	uMvoti	uMvoti	Pongola-Mtamvuna	C/D					C	U40J-03998	
U4MVTI-SHANK2	-29,16334	30,62992	uMvoti	uMvoti	Pongola-Mtamvuna	C					C	U40A-03869	
U6MLAZ-KWAND	-29,869	30,7812	uMlazi	uMlazi	Pongola-Mtamvuna						C	U60D-04661	CAPACITY
U6MLAZ-P0502	-29,809722	30,5	uMlazi	uMlazi	Pongola-Mtamvuna						C	U60C-04555	CAPACITY
U6MLAZ-USBAY	-29,756	30,289	uMlazi	uMlazi	Pongola-Mtamvuna	B/C					C	U60A-04533	
U6UMBI-BELLA	-29,877546	30,960228	uMbilo	uMbilo	Pongola-Mtamvuna	D					D	U60F-04632	
U6MHLA-MKHIZ	-29,861451	30,853648	Mhlatuzana	Mhlatuzana	Pongola-Mtamvuna	C					D	U60F-04597	
U7LOVU-KAMPU	-30,083372	30,661645	Lovu	Lovu	Pongola-Mtamvuna						B	U70C-04859	CAPACITY
U7LOVU-MIDIL	-30,046426	30,520684	Lovu	Lovu	Pongola-Mtamvuna						D	U70B-04655	CAPACITY
U7LOVU-RICHM	-29,861446	30,261955	Lovu	Lovu	Pongola-Mtamvuna						C	U70A-04609	CAPACITY
U7LOVU-ILLOV	-30,09756	30,82321	Lovu	Lovu	Pongola-Mtamvuna						D	U70D-04905	CAPACITY

ANNEXURE V: MONITORING SITES IN PRIMARY DRAINAGE REGION V

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
V1TUKH-EWR02	-28,715431	29,642047	Thukela	Thukela	Pongola-Mtamvuna						C	V11M-03280	CAPACITY
V1TUKH-TUGEL	-28,75633	30,15038	Thukela	Thukela	Pongola-Mtamvuna	C					A	V14E-03233	
V2MOOI-EWR12	-28,904211	30,418753	Mooi	Thukela	Pongola-Mtamvuna						C	V20H-03500	CAPACITY
V2UNSP-KMBRG	-29,38435	29,65298	Unspecified	Mooi	Pongola-Mtamvuna						N/A	N/A	CAPACITY
V3BUFF-CONFL	-27,71562	30,11863	Buffalo	Thukela	Pongola-Mtamvuna						B	V32B-02457	CAPACITY
V3BUFF-RORKE	-28,345892	30,53862	Buffalo	Thukela	Pongola-Mtamvuna	C					C	V33A-03017	
V3NCND-EWR05	-27,846333	29,790194	Ncandu	Buffalo	Pongola-Mtamvuna						D	V31J-02487	CAPACITY
V3NCND-LEYDN	-27,85514	29,76054	Unspecified	Ncandu	Pongola-Mtamvuna	C						N/A	
V3SAND-COTSW	-28,09882	30,31853	Mzinyashana	Buffalo	Pongola-Mtamvuna						C	V32E-02769	CAPACITY
V3SLNG-NCHTW	-27,42067	30,29681	Slang	Buffalo	Pongola-Mtamvuna						B	V31A-02319	CAPACITY
V4THUK-EWR15	-28,779683	30,8675	Thukela	Thukela	Pongola-Mtamvuna						B	V40B-03429	CAPACITY
V4THUK-KRANS	-28,848519	30,92902	Thukela	Thukela	Pongola-Mtamvuna	B/C					B	V40E-03457	
V5THUK-RAILB	-29,172622	31,391921	Thukela	Thukela	Pongola-Mtamvuna	C					C	V50D-03903	
V6THUK-TFERR	-28,751235	30,437118	Thukela	Thukela	Pongola-Mtamvuna	C					C	V60J-03395	
V7BUSH-MASHU	-28,768412	30,167902	Bushmans	Thukela	Pongola-Mtamvuna	C					B	V70G-03440	
V7BUSH-MOORP	-29,08337	29,825037	Bushmans	Thukela	Pongola-Mtamvuna						C	V70C-03745	CAPACITY

ANNEXURE W: MONITORING SITES IN PRIMARY DRAINAGE REGION W

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
W1EVTH-GINNE	-29,06745	31,48596	Evutha	Amatikulu	Pongola-Mtamvuna						N/A	N/A	CAPACITY
W1MATI-NYEZA	-29,076547	31,563093	Amatikulu	Amatikulu	Pongola-Mtamvuna	C					N/A	W11C-03893	
W1MFLE-ELIZB	-28,51589	31,43614	Mfule	Amatikulu	Pongola-Mtamvuna						C	W12C-03189	CAPACITY
W1MHLA-EWR03	-28,845833	31,868056	Mhlatuze	Mhlatuze	Pongola-Mtamvuna						E	W12F-03494	CAPACITY
W1MHLA-GOEDE	-28,743056	31,605833	Mhlatuze	Mhlatuze	Pongola-Mtamvuna						D	W12D-03388	CAPACITY
W1MHLA-GWEIR	-28,74695	31,74745	Mhlatuze	Mhlatuze	Pongola-Mtamvuna	C					D	W12E-03475	
W1NWKU-MTGLU	-28,961894	31,396405	Mhlatuze	Mhlatuze	Pongola-Mtamvuna						C	W11A-03612	CAPACITY
W2BMFO-CHRIS	-27,9389	31,2103	Black Mfolozi	Mfolozi	Pongola-Mtamvuna						B	W22A-02610	CAPACITY
W2BMFO-NGOLO	-28,191223	31,737514	Black Mfolozi	Mfolozi	Pongola-Mtamvuna						B	W22J-02817	CAPACITY
W2MFOL-CONFL	-28,368467	32,017153	Mfolozi	Mfolozi	Pongola-Mtamvuna						B	W23A-03083	CAPACITY
W2MVNY-P0016	-28,118986	30,866828	Mvunyana	Mfolozi	Pongola-Mtamvuna						C	W21D-02815	CAPACITY
W2SKWB-GRTGL	-27,90033	31,36522		Mfolozi	Pongola-Mtamvuna						C	W22E-02605	CAPACITY
W2MONA-HLABI	-28,15913	31,79572	MONA	Mfolozi	Pongola-Mtamvuna	B/C					B	W22K-02783	
W2WMFO-DINDI	-28,393483	31,683031	White Mfolozi	Mfolozi	Pongola-Mtamvuna						B	W21K-03059	CAPACITY
W2WMFO-LANGV	-28,23146	31,1883	White Mfolozi	Mfolozi	Pongola-Mtamvuna						B	W21H-02897	CAPACITY
W3HLHW-HLWGR	-28,13856	32,01995	Hlhluwe	Hluhluwe	Pongola-Mtamvuna						B	W32E-02865	CAPACITY
W3HLHW-N2ROA	-28,1489	32,2818	Hlhluwe	Hluhluwe	Pongola-Mtamvuna	C					D	W32F-02835	
W3MKZE-D0230	-27,69256	31,21129	Mkuze	Mkuze	Pongola-Mtamvuna						B	W31A-02534	CAPACITY
W3MKZE-EBUHL	-27,60584	32,0433	Mkuze	Mkuze	Pongola-Mtamvuna	C					C	W31G-02425	
W3MKZE-DNYDR	-27,59227	32,21795	Mkuze	Mkuze	Pongola-Mtamvuna						C	W31J-02480	CAPACITY
W4BIVN-NTLSP	-27,52637	30,86144	Bivane	Pongola	Pongola-Mtamvuna						C	W41E-02359	CAPACITY
W4NGWV-D1840	-27,097892	32,068882	Ngwavuma	Pongola	Pongola-Mtamvuna						C	W43F-02099	CAPACITY
W4PONG-GROOT	-27,43145	31,532389	Pongola	Pongola	Pongola-Mtamvuna						C	W44A-02332	CAPACITY
W4PONG-NOOIT	-27,34653	31,72983	Pongola	Pongola	Pongola-Mtamvuna	B					C	W44C-02338	
W4PONG-MHLAT	-27,363611	31,783333	Pongola	Pongola	Pongola-Mtamvuna						C	W44D-02304	CAPACITY
W4PONG-N2PON	-27,39519	31,82661	Pongola	Pongola	Pongola-Mtamvuna						C	W44D-02304	CAPACITY
W4PONG-NDUMO	-26,929964	32,324218	Pongola	Pongola	Pongola-Mtamvuna						C	W45B-02029	CAPACITY
W5ANYS-ANYSS	-27,04762	30,57788	Anysspruit	Usuthu	Inkomati-Usuthu	C		B/C			C	W51C-02074	
W5ANYS-KLOPP	-27,00776	30,59989	Anysspruit	Usuthu	Inkomati-Usuthu	C		B/C			C	W51C-02074	
W5ASSE-KLIPS	-26,99312	30,60575	Assegai	Usuthu	Inkomati-Usuthu	C		C			D	W51C-02022	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
W5ASSE-NAAUW	-27,12678	30,12516	Assegai	Usuthu	Inkomati-Usuthu	C/D		C			C	W51A-02082	
W5ASSE-PLATJ	-27,18344	30,29556	Assegai	Usuthu	Inkomati-Usuthu	C		C			C	W51A-02082	
W5ASSE-WITK1	-26,99655	30,67699	Assegai	Usuthu	Inkomati-Usuthu			C			C	W51C-01981	CAPACITY
W5ASSE-ZANDB	-27,06465	30,97461	Assegai	Usuthu	Inkomati-Usuthu	C		C			B	W51E-02049	
W5ASSE-ZWART	-27,10162	30,89205	Assegai	Usuthu	Inkomati-Usuthu	C		C			B	W51E-02049	
W5BLES-WEEHO	-26,89837	30,95267	Blesbokspruit	Usuthu	Inkomati-Usuthu	C		C			C	W51F-01986	
W5BOES-ANHAL	-27,07833	30,7346	Boesmanspruit	Usuthu	Inkomati-Usuthu	C		C			B	W51C-02109	
W5BONN-BROAD	-26,50559	30,64736	Bonnie Brook	Usuthu	Inkomati-Usuthu	C		C			C	W54C-01556	
W5HLEL-HOLDE	-26,85632	30,72652	Hlelo	Usuthu	Inkomati-Usuthu	C		C			B	W52C-01867	
W5HLEL-SWAZI	-26,76133	30,82307	Hlelo	Usuthu	Inkomati-Usuthu						B	W52D-01862	CAPACITY
W5HLEL-THOEK	-26,99887	30,28728	Hlelo	Usuthu	Inkomati-Usuthu	C		B/C			B	W52A-01983	
W5HLEL-TWYFE	-26,89647	30,55205	Hlelo	Usuthu	Inkomati-Usuthu	B/C		C			C	W52B-01964	
W5HLEL-WATER	-26,86321	30,5967	Hlelo	Usuthu	Inkomati-Usuthu	C		C			B	W52C-01867	
W5HLEL-WITBA	-26,97702	30,33379	Hlelo	Usuthu	Inkomati-Usuthu	C		B/C			B	W52A-01983	
W5LUSU-FORES	-26,36328	31,05485	Lusushwana	Usuthu	Inkomati-Usuthu						eSwatini	W56C-01514	CAPACITY
W5LUSU-IFRS1	-26,20865	30,86326	Lusushwana	Usuthu	Inkomati-Usuthu						D	W56A-01372	CAPACITY
W5LUSU-KUHLE	-26,80776	32,10175	Usuthu	Usuthu	Inkomati-Usuthu						B	W57J-01923	CAPACITY
W5LUSU-LIBET	-26,66424	31,47224	Usuthu	Usuthu	Inkomati-Usuthu						eSwatini	W57A-01803	CAPACITY
W5LUSU-MABUZ	-26,58243	31,10297	Usuthu	Usuthu	Inkomati-Usuthu						eSwatini	W54F-01729	CAPACITY
W5LUSU-MALUN	-26,59915	31,36973	Lusushwana	Usuthu	Inkomati-Usuthu						eSwatini	W56F-01762	CAPACITY
W5LUSU-MANGC	-26,54346	30,85552	Usuthu	Usuthu	Inkomati-Usuthu						B	W54D-01593	CAPACITY
W5LUSU-ROBIN	-26,26558	30,90338	Lusushwana	Usuthu	Inkomati-Usuthu	D		C			D	W56A-01372	
W5LUSU-SIPHO	-26,68981	31,68981	Usuthu	Usuthu	Inkomati-Usuthu						eSwatini	W57E-01810	CAPACITY
W5METU-FERNI	-26,39529	30,77071	Metula	Usuthu	Inkomati-Usuthu	C		C			C	W55D-01506	
W5METU-SWAZI	-26,46191	30,85806	Metula	Usuthu	Inkomati-Usuthu						C	W55D-01506	CAPACITY
W5MKHO-NHLAN	-27,05378	31,11166	Mhkondvo	Usuthu	Inkomati-Usuthu						B	W51E-02049	CAPACITY
W5MKHO-SWAZI	-26,69709	31,43789	Mhkondvo	Usuthu	Inkomati-Usuthu						eSwatini	W51H-01808	CAPACITY
W5MPAM-GLENE	-26,66113	30,49137	Mpama	Usuthu	Inkomati-Usuthu	C/D		C/D			B	W53D-01764	
W5MPON-SWAZI	-26,71907	30,89173	Mlambo	Usuthu	Inkomati-Usuthu						eSwatini	W53E-01785	CAPACITY
W5MPUL-ARDE1	-26,24958	30,75242	Mpuluzi	Usuthu	Inkomati-Usuthu						B	W55C-01395	CAPACITY
W5MPUL-BORDE	-26,25341	30,70833	Mpuluzi	Usuthu	Inkomati-Usuthu	C		C			B	W55C-01395	
W5MPUL-BUSBY	-26,28034	30,5914	Mpuluzi	Usuthu	Inkomati-Usuthu	C		C			B	W55C-01395	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
W5MPUL-HAMIL	-26,31093	30,40725	Mpuluzi	Usuthu	Inkomati-Usuthu	C		C			B	W55C-01395	
W5MPUL-MIDDE	-26,29665	30,50474	Mpuluzi	Usuthu	Inkomati-Usuthu	C/D		C			B	W55C-01395	
W5MPUL-VELAB	-26,48943	30,89898	Mpuluzi	Usuthu	Inkomati-Usuthu						eSwatini	W55E-01651	CAPACITY
W5NDHL-SWAZI	-26,95675	31,12299	Ndlozane	Usuthu	Inkomati-Usuthu						eSwatini	W51F-01973	CAPACITY
W5NGWE-INHLO	-26,73396	30,76361	Ngwempisi	Usuthu	Inkomati-Usuthu	B/C		C			C	W53E-01790	
W5NGWE-LEIDE	-26,8544	30,28388	Ngwempisi	Usuthu	Inkomati-Usuthu	C		C			D	W53A-01853	
W5NGWE-MPONO	-26,72707	30,87921	Ngwempisi	Usuthu	Inkomati-Usuthu						eSwatini	W53E-01841	CAPACITY
W5NGWE-MZIMN	-26,71303	31,31287	Ngwempisi	Usuthu	Inkomati-Usuthu						eSwatini	W53G-01788	CAPACITY
W5NGWE-POMPO	-26,76743	30,39716	Ngwempisi	Usuthu	Inkomati-Usuthu	B/C		C			D	W53A-01853	
W5NGWE-SKURW	-26,68126	30,70271	Ngwempisi	Usuthu	Inkomati-Usuthu	C		C			C	W53E-01790	
W5NGWE-STERK	-26,70081	30,64582	Ngwempisi	Usuthu	Inkomati-Usuthu	C/D		C/D			C	W53D-01773	
W5OHLE-TWYFE	-27,00292	30,28759	Ohlelo	Usuthu	Inkomati-Usuthu	C		C			N/A	N/A	
W5SAND-ZANDS	-26,73906	30,35637	Sandspruit	Usuthu	Inkomati-Usuthu	C/D		C			B	W53A-01757	
W5SWAR-IZIND	-26,35762	30,78534	Swartwaterspruit	Usuthu	Inkomati-Usuthu	C		C			B	W55C-01489	
W5SWAR-WOLVE	-26,73056	30,66792	Swartwaterspruit	Usuthu	Inkomati-Usuthu	C		C/D			B	W53D-01814	
W5SWAR-ZWART	-27,10922	30,83852	Swartwaterspruit	Usuthu	Inkomati-Usuthu	C		C/D			B	W51D-02151	
W5THOL-ATHOL	-26,57401	30,57522	Thole	Usuthu	Inkomati-Usuthu						C	W53C-01679	CAPACITY
W5TWEE-MONDI	-26,81641	30,71804	Tweelingspruit	Usuthu	Inkomati-Usuthu						B	W52C-01888	CAPACITY
W5USUT-DEEPG	-26,49576	30,67991	Usuthu	Usuthu	Inkomati-Usuthu						B	W54D-01593	
W5USUT-DINGL	-26,4954	30,72383	Usuthu	Usuthu	Inkomati-Usuthu	C		C			B	W54D-01593	
W5USUT-STAFF	-26,50336	30,77666	Usuthu	Usuthu	Inkomati-Usuthu	C		C			B	W54D-01593	CAPACITY

ANNEXURE X: MONITORING SITES IN PRIMARY DRAINAGE REGION X

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
X1BLIN-KRANS	-26,04997	31,05354	Mhlangampepa	Komati	Inkomati-Usuthu	C		C			B	X12K-01332	
X1BOES-ROODE	-26,02357	30,06092	Boesmanspruit	Komati	Inkomati-Usuthu	C/D		D			C	X11B-01272	
X1BUFF-DOORN	-26,06264	30,39378	Buffelspruit	Seekoeispruit	Inkomati-Usuthu	B		B/C			C	X12A-01305	
X1BUFF-ZILVE	-26,01092	30,45119	Buffelspruit	Seekoeispruit	Inkomati-Usuthu						B	X12C-01271	CAPACITY
X1GLAD-VAALK	-25,77165	30,62716	Gladdespruit	Komati	Inkomati-Usuthu						D	X11J-01106	CAPACITY
X1GLAD-VYGEB	-25,86514	30,66661	Gladdespruit	Komati	Inkomati-Usuthu	C/D		D			C	X11K-01194	
X1HLAT-RIETF	-26,02361	30,36111	Hlatjiwe	Buffelspruit	Inkomati-Usuthu						C	X12B-01246	CAPACITY
X1KKOM-WELGE	-25,88793	30,12033	Klein Komati	Komati	Inkomati-Usuthu	C		C/D			C	X11D-01129	
X1KOMA-BHALE	-26,0998	31,51587	Komati	Komati	Inkomati-Usuthu						C	X13E-01346	CAPACITY
X1KOMA-GEVON	-25,85512	30,38235	Komati	Komati	Inkomati-Usuthu	C		C			C	X11G-01142	
X1KOMA-GROOT	-25,85494	30,57146	Komati	Komati	Inkomati-Usuthu						C	X11H-01140	CAPACITY
X1KOMA-HILLC	-26,02966	31,0555	Komati	Komati	Inkomati-Usuthu	B/C		C			D	X12K-01316	
X1KOMA-HOOGE	-26,03632	30,99806	Komati	Komati	Inkomati-Usuthu	B/C		B/C			C	X12H-01258	
X1KOMA-IFR03	-25,99827	31,58609	Komati	Komati	Inkomati-Usuthu						D	X13G-01282	CAPACITY
X1KOMA-KOMAT	-26,02341	30,90073	Komati	Komati	Inkomati-Usuthu	B/C		C			C	X12H-01296	
X1KOMA-KPOOR	-25,44667	31,95603	Komati	Komati	Inkomati-Usuthu						D	X13L-00995	CAPACITY
X1KOMA-LEBOM	-25,43901	31,97341	Komati	Komati	Inkomati-Usuthu						D	X13L-00996	CAPACITY
X1KOMA-LEKKE	-25,83429	30,49537	Komati	Komati	Inkomati-Usuthu	C		C			C	X11H-01140	
X1KOMA-MALOL	-26,05399	31,14151	Komati	Komati	Inkomati-Usuthu						C	X13A-01324	CAPACITY
X1KOMA-MELET	-26,08214	31,35515	Komati	Komati	Inkomati-Usuthu						C	X13D-01323	CAPACITY
X1KOMA-MOEDI	-25,89598	30,17625	Komati	Komati	Inkomati-Usuthu	B/C		C			C	X11D-01196	
X1KOMA-NYATS	-26,09908	31,39903	Komati	Komati	Inkomati-Usuthu						C	X13D-01323	CAPACITY
X1KOMA-SILIN	-25,82188	31,82616	Komati	Komati	Inkomati-Usuthu						E	X13J-01210	CAPACITY
X1KOMA-TJAKA	-25,97453	30,82221	Komati	Komati	Inkomati-Usuthu	B		C			C	X12G-01200	
X1KOMA-TONGA	-25,68168	31,78295	Komati	Komati	Inkomati-Usuthu	C		C			E	X13J-01130	
X1KOMA-VYGEB	-25,94631	30,68474	Komati	Komati	Inkomati-Usuthu						C	X11K-01227	CAPACITY
X1KOMA-WATER	-25,89828	30,2845	Komati	Komati	Inkomati-Usuthu	B/C		C			B	X11F-01163	
X1LEKKE-VERGE	-25,97977	30,654	Lekkerloop	Seekoeispruit	Inkomati-Usuthu						N/A	N/A	CAPACITY
X1LOMA-HIGHL	-25,83233	31,11699	Lomati	Komati	Inkomati-Usuthu	B/C		C			C	X14A-01173	
X1LOMA-HLELE	-25,81894	31,31144	Lomati	Komati	Inkomati-Usuthu						D	X14D-01174	CAPACITY

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
X1LOMA-KLEIN	-25,64993	31,62219	Lomati	Komati	Inkomati-Usuthu						D	X14H-01066	CAPACITY
X1LOMA-LEKKE	-25,63518	31,77914	Lomati	Komati	Inkomati-Usuthu						D	X14H-01066	CAPACITY
X1LOMA-MBONG	-25,75736	31,43655	Lomati	Komati	Inkomati-Usuthu						D	X14E-01151	CAPACITY
X1LOMA-SCHOE	-25,68629	31,52879	Lomati	Komati	Inkomati-Usuthu						E	X14G-01128	CAPACITY
X1LOMA-TWELLL	-25,84178	31,12153	Lomati	Komati	Inkomati-Usuthu						C	X14A-01173	CAPACITY
X1MALO-MALOL	-26,08253	31,10888	Malolotja	Komati	Inkomati-Usuthu						A	X13A-01337	CAPACITY
X1MAWE-TJAKA	-25,96386	30,8203	Mawelawela	Komati	Inkomati-Usuthu						N/A	N/A	CAPACITY
X1MBUL-MPOFU	-25,92469	31,52623	Mbulatana	Komati	Inkomati-Usuthu						D	X13G-01216	CAPACITY
X1MBUY-MKHOM	-26,1221	31,29693	Mbuyane	Komati	Inkomati-Usuthu						D	X13C-01364	CAPACITY
X1MELE-MELET	-26,08883	31,33933	Meleta	Komati	Inkomati-Usuthu						N/A	N/A	CAPACITY
X1MHLA-GROOT	-25,83626	30,56834	Mhlambanyatsi	Komati	Inkomati-Usuthu						N/A	N/A	CAPACITY
X1MHLA-MPOFU	-25,92661	31,62852	Mhlangatane	Komati	Inkomati-Usuthu						C	X13H-01197	CAPACITY
X1MHLA-RUSOO	-25,63447	31,50451	Mhlambanyatsi	Lomati	Inkomati-Usuthu	C		C			C	X14F-01085	
X1MKHO-MAGUG	-26,03989	31,26615	Mkhomazane	Komati	Inkomati-Usuthu						C	X13B-01276	CAPACITY
X1MLON-KRANS	-26,05772	31,03248	Mlondozi	Komati	Inkomati-Usuthu	C		C			C	X12K-01333	
X1MPOF-MPOFU	-25,93154	31,5815	Mphofu	Komati	Inkomati-Usuthu						D	X13G-01259	CAPACITY
X1MTSO-DIEPG	-26,00281	31,07402	Mtsoli	Komati	Inkomati-Usuthu	C		C			B	X12J-01202	
X1MZIM-MANSE	-26,04071	31,52635	Mzimnene	Komati	Inkomati-Usuthu						C	X13F-01252	CAPACITY
X1NDUB-SAPPI	-25,8447	30,47466	Ndubazi	Komati	Inkomati-Usuthu	C		C			C	X11G-01188	
X1NGWE-KOMAT	-25,45656	31,91683	Ngweti	Komati	Inkomati-Usuthu						D	X13L-01000	CAPACITY
X1NKOM-MALOL	-26,02851	31,16358	Nkomazana	Komati	Inkomati-Usuthu						C	X13A-01255	CAPACITY
X1NKWA-COOPE	-25,53515	31,95017	Nkwakwa	Komati	Inkomati-Usuthu						D	X13K-01068	CAPACITY
X1NYON-NYONY	-26,13236	31,48093	Nyonyane	Komati	Inkomati-Usuthu						C	X13E-01389	CAPACITY
X1PHOP-MAGUT	-25,83217	31,3692	Phophonyane	Komati	Inkomati-Usuthu						D	X14C-01203	CAPACITY
X1SAND-KORTB	-26,0351	30,92432	Sandspruit	Komati	Inkomati-Usuthu	B		B/C			C	X12H-01318	
X1SAND-TSHAN	-25,96858	31,73546	Sand	Komati	Inkomati-Usuthu						D	X13H-01299	CAPACITY
X1SEEK-DOORN	-25,94773	30,57494	Seekoeispruit	Komati	Inkomati-Usuthu	B/C		C			C	X12D-01235	
X1SEEK-WINKE	-25,96139	30,61846	Seekoeispruit	Komati	Inkomati-Usuthu						C	X12D-01235	CAPACITY
X1SWAR-HEBRO	-25,92519	30,23756	Swartspruit	Komati	Inkomati-Usuthu	C		C			C	X11E-01267	
X1TEEES-HEUNI	-26,01573	30,80877	Teespruit	Komati	Inkomati-Usuthu	B/C		C			C	X12E-01287	
X1TEES-TEESP	-26,01939	30,85179	Teespruit	Komati	Inkomati-Usuthu						C	X12E-01287	CAPACITY
X1TEES-WELVE	-26,05785	30,65012	Teespruit	Komati	Inkomati-Usuthu			C			C	X12E-01287	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
X1UGUT-ZEIST	-25,76308	31,24633	Ugutugulo	Lomati	Inkomati-Usuthu						C	X14B-01166	CAPACITY
X1VAAL-BOESM	-26,00713	30,02756	Vaalwaterspruit	Komati	Inkomati-Usuthu	B		C			C	X11A-01248	
X2ALEX-RIETF	-25,269056	30,408583	Alexanderspruit	Crocodile	Inkomati-Usuthu						C	X21C-00859	CAPACITY
X2BUFF-SOMER	-25,438139	30,447917	Buffelskloofspruit	Crocodile	Inkomati-Usuthu						C	X21D-00957	CAPACITY
X2CROC-DONKE	-25,46713	30,22966	Crocodile	Crocodile	Inkomati-Usuthu			C			C	X21B-00962	CAPACITY
X2CROC-GOEDE	-25,40961	30,31608	Crocodile	Crocodile	Inkomati-Usuthu	C		C			C	X21B-00962	
X2CROC-KAAPM	-25,536667	31,311528	Crocodile	Crocodile	Inkomati-Usuthu	B		C			D	X24C-01033	
X2CROC-KAMAG	-25,451028	31,016694	Crocodile	Crocodile	Inkomati-Usuthu	C		C			C	X22J-00958	
X2CROC-MALEL	-25,485972	31,502	Crocodile	Crocodile	Inkomati-Usuthu						D	X24D-00994	Capacity (KNP)
X2CROC-MAROE	-25,378	31,731	Crocodile	Crocodile	Inkomati-Usuthu	C					D	X24F-00953	
X2CROC-MONTR	-25,44869	30,71016	Crocodile	Crocodile	Inkomati-Usuthu	C		C			C	X21E-00943	
X2CROC-MYAMB	-25,315833	31,748333	Crocodile	Crocodile	Inkomati-Usuthu						D	X24F-00953	Capacity (KNP)
X2CROC-N4ROA	-25,5005	31,178694	Crocodile	Crocodile	Inkomati-Usuthu	C		C			C	X22K-01018	
X2CROC-NKONG	-25,3913	31,97427	Crocodile	Crocodile	Inkomati-Usuthu						D	X24H-00934	Capacity (KNP)
X2CROC-POPLA	-25,45275	30,68099	Crocodile	Crocodile	Inkomati-Usuthu	B/C		B/C			C	X21E-00943	
X2CROC-RIETV	-25,38813	30,56569	Crocodile	Crocodile	Inkomati-Usuthu	B/C		B/C			C	X21E-00943	
X2CROC-RIVUL	-25,43016	30,75744	Crocodile	Crocodile	Inkomati-Usuthu	B/C		C			C	X22B-00888	
X2CROC-STRKS	-25,44127	30,89102	Crocodile	Crocodile	Inkomati-Usuthu	C		C			C	X22C-00946	
X2CROC-VALY1	-25,494083	30,143556	Crocodile	Crocodile	Inkomati-Usuthu	B/C		B/C			C	X21A-00930	
X2CROC-VERLO	-25,34972	30,10994	Crocodile	Crocodile	Inkomati-Usuthu	C		B/C			C	X21A-00930	
X2CROC-VERL1	-25,43494	30,26047	Crocodile	Crocodile	Inkomati-Usuthu	B/C		C			C	X21B-00962	
X2ELAN-DEGOE	-25,6872	30,19924	Elands	Crocodile	Inkomati-Usuthu			C			C	X21F-01046	CAPACITY
X2ELAN-DOORN	-25,631694	30,324444	Elands	Crocodile	Inkomati-Usuthu	C		C			D	X21G-01037	
X2ELAN-GOEDG	-25,528444	30,698306	Elands	Crocodile	Inkomati-Usuthu	B		C			D	X21K-01035	
X2ELAN-HEMLO	-25,60042	30,55969	Elands	Crocodile	Inkomati-Usuthu	C		C/D			C	X21J-01013	
X2ELAN-LINDE	-25,486	30,701	Elands	Crocodile	Inkomati-Usuthu			B/C			C	X21K-00997	
X2ELAN-EHOEK			Elands	Crocodile	Inkomati-Usuthu								
X2ELAN-ROODE	-25,56853	30,66269	Elands	Crocodile	Inkomati-Usuthu	B/C		C			D	X21K-01035	
X2FIGT-COVIN	-25,723389	31,163222	Fig Tree Creek	Kaap	Inkomati-Usuthu	B					N/A	N/A	
X2GLAD-HERMA	-25,52147	30,87853	Gladdespruit	Crocodile	Inkomati-Usuthu	D		C/D			C	X22C-01004	
X2HOUT-SUDWA	-25,3875	30,71061	Houtbosloop	Crocodile	Inkomati-Usuthu	C		C			C	X22A-00913	
X2KAAP-HONEY	-25,64947	31,24286	Kaap	Crocodile	Inkomati-Usuthu	C		C			D	X23G-01057	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
X2KARE-GOLFC	-25,44106	30,21203	Kareespruit	Crocodile	Inkomati-Usuthu						N/A	N/A	CAPACITY
X2LEEU-GELUK	-25,661722	30,257917	Leeuspruit	Elands	Inkomati-Usuthu	C		C			C	X21F-01100	
X2LUNS-UITWA	-25,393556	30,301639	Lunsklip	Crocodile	Inkomati-Usuthu	C		C			C	X21B-00925	
X2LUNS-UVERL	-25,303056	30,123222	Lunsklip	Crocodile	Inkomati-Usuthu	C					N/A	N/A	
X2LUNS-VERLO	-25,31041	30,14558	Lunsklip	Crocodile	Inkomati-Usuthu	C		B/C			D	X21B-00898	
X2NELS-SPITZ	-25,293667	30,79808	Nels	Crocodile	Inkomati-Usuthu	C					C	X22F-00842	
X2NELS-RHENO	-25,200389	30,67867	Nels	Crocodile	Inkomati-Usuthu	C					C	X22D-00843	
X2NELS-R40RB	-25,42728	30,96444	Nels	Crocodile	Inkomati-Usuthu						D	X22F-00977	
X2NGOD-GROOT	-25,58194	30,67144	Ngodwana	Elands	Inkomati-Usuthu	B/C		B/C			C	X21H-01060	
X2NGOD-NOOIT	-25,66244	30,67236	Ngodwana	Elands	Inkomati-Usuthu						C	X21H-01060	CAPACITY
X2NOOR-RIVER	-25,61009	30,97639	Noord Kaap	Kaap	Inkomati-Usuthu	C		C			D	X23B-01052	
X2QUEE-HILVE	-25,79068	30,91542	Queens	Kaap	Inkomati-Usuthu	C		C			C	X23E-01154	
X2SUID-DAISY	-25,73033	30,98429	Suid Kaap	Kaap	Inkomati-Usuthu	C		C			D	X23C-01098	
X2SWAR-KINDE	-25,610389	30,401139	Swartkoppiespruit	Elands	Inkomati-Usuthu						C	X21G-01016	CAPACITY
X2VISS-ALKMA	-25,45813	30,81628	Visspruit	Crocodile	Inkomati-Usuthu	C		C			C	X22C-00990	
X2WITR-VALLE	-25,40214	31,06811	Wit	Crocodile	Inkomati-Usuthu						E	X22H-00836	CAPACITY
X3KSAB-KLEIN	-25,06355	30,79122	Klein Sabie	Sabie	Inkomati-Usuthu	C		C			C	X31A-00741	
X3KSAN-ROOIB	-24,658	31,089	Klein Sand	Sand	Inkomati-Usuthu	C		B/C			C	X32B-00551	
X3LONE-CREEK	-25,10316	30,71144	Lone Creek	Sabie	Inkomati-Usuthu	C		C			C	X31A-00783	
X3MACM-BRAND	-25,03	31,026	Mac Mac	Sabie	Inkomati-Usuthu	B					C	X31C-00683	
X3MACM-FALLS	-24,97389	30,81685	Mac Mac	Sabie	Inkomati-Usuthu	B		B			C	X31C-00683	
X3MACM-PICNI	-25,02197	31,00064	Mac Mac	Sabie	Inkomati-Usuthu	B/C		B			C	X31C-00683	
X3MACM-VENUS	-25,00858	30,92501	Mac Mac	Sabie	Inkomati-Usuthu	B/C		B			C	X31C-00683	
X3MARI-MARIT	-24,96082	31,10838	Marite	Sabie	Inkomati-Usuthu	B/C		C			D	X31E-00647	
X3MARI-SANDF	-25,0159	31,11907	Marite	Sabie	Inkomati-Usuthu	B		C			D	X31G-00728	
X3MARI-VERSA	-24,8389	30,96116	Maritsane	Marite	Inkomati-Usuthu	C					N/A	N/A	
X3MOHL-WELGE	-24,74091	30,92343	Mohlomobe	Sand	Inkomati-Usuthu	C		C			N/A	N/A	
X3MOHL-ZOEKN	-24,7636	30,97547	Mohlomobe	Sabie	Inkomati-Usuthu	C		C			N/A	N/A	
X3MOTI-DIEPD	-24,98841	31,05294	Motitsi	Marite	Inkomati-Usuthu	B		B/C			C	X31F-00695	
X3MUTL-NEWF1	-24,75355	31,13763	Mutlumuvi	Sand	Inkomati-Usuthu	B/C		C			D	X32F-00597	
X3NGWA-WILGE	-24,89695	30,92171	Ngwaritsana	Marite	Inkomati-Usuthu	B/C		C			D	X31E-00647	
X3NGWA-DOORN	-24,90117	30,97625	Ngwaritsana	Marite	Inkomati-Usuthu	B		C			D	X31E-00647	

Site	Latitude	Longitude	River	Main River	WMA	MIRAI	VEGRAI	FISH	INS IHI	RIP IHI	SQR PES	SQR	reason
X3NGWA-VERSA	-24,9036	30,95053	Ngwaritsana	Marite	Inkomati-Usuthu	C					D	X31E-00647	
X3SABA-BRAND	-25,0322	31,02255	Sabaan	Sabie	Inkomati-Usuthu	C		C			D	X31D-00773	
X3SABI-AANDE	-25,0286	31,05172	Sabie	Sabie	Inkomati-Usuthu	B/C		C			C	X31D-00755	
X3SABI-ANTHO	-24,96495	31,74455	Sabie	Sabie	Inkomati-Usuthu						B	X33A-00731	Capacity (KNP)
X3SABI-BORDE	-25,1847	32,0308	Sabie	Sabie	Inkomati-Usuthu						N/A (B)	N/A	Capacity (KNP)
X3SABI-BRAND	-25,0303	31,02602	Sabie	Sabie	Inkomati-Usuthu	B		C			C	X31D-00755	
X3SABI-BRUG	-25,06565	30,85817	Sabie	Sabie	Inkomati-Usuthu	C		C			C	X31B-00757	
X3SABI-CASTL	-25,09328	30,76893	Sabie	Sabie	Inkomati-Usuthu	B		C			C	X31A-00778	
X3SABI-HFALL	-25,13611	30,68396	Sabie	Sabie	Inkomati-Usuthu	C		C/D			C	X31A-00799	
X3SABI-HOXAN	-25,019	31,218	Sabie	Sabie	Inkomati-Usuthu	B/C		B/C			C	X31K-00752	
X3SABI-LONGT	-25,147	30,668	Sabie	Sabie	Inkomati-Usuthu	B/C		C/D			C	X31A-00799	
X3SABI-LOWER	-25,12141	31,92519	Sabie	Sabie	Inkomati-Usuthu						C	X33B-00804	Capacity (KNP)
X3SABI-LUBEY	-25,099	31,886	Sabie	Sabie	Inkomati-Usuthu						C	X33B-00804	Capacity (KNP)
X3SABI-NWATI	-24,97	31,4039	Sabie	Sabie	Inkomati-Usuthu						C	X31M-00681	Capacity (KNP)
X3SABI-OLIFA	-25,12066	30,71732	Sabie	Sabie	Inkomati-Usuthu	B/C		C/D			C	X31A-00799	
X3SABI-RIOOL	-25,09128	30,79376	Sabie	Sabie	Inkomati-Usuthu	C		C			C	X31B-00757	
X3SABI-SEKUR	-24,98814	31,29248	Sabie	Sabie	Inkomati-Usuthu						C	X31K-00715	Capacity (KNP)
X3SABI-TINGA	-24,97067	31,50496	Sabie	Sabie	Inkomati-Usuthu						C	X31M-00681	Capacity (KNP)
X3SABI-CAL01	-25,0184	31,24088	Sabie	Sabie	Inkomati-Usuthu	C					C	X31K-00752	
X3SAND-ROLLE	-24,722	31,237	Sand	Sabie	Inkomati-Usuthu	D/E		C			C	X32G-00565	
X3SAND-SKUKU	-24,96759	31,62552	Sand	Sabie	Inkomati-Usuthu						B	X32J-00602	Capacity (KNP)
X3SAND-THULA	-24,715	31,205	Sand	Sabie	Inkomati-Usuthu	C		C			C	X32C-00558	
X3WATE-WATER	-24,9549	30,91065	Waterhoutboom	Marite	Inkomati-Usuthu	B/C		B/C			C	X31F-00695	
X3TSWA-ONVER	-24,78246	30,9617	Tswafeng	Sand	Inkomati-Usuthu	B		C				X33D-00605	

ANNEXURE Y: MIRAI RESULTS FOR SITES MONITORED EVERY YEAR SINCE 2016/2017

Site	Latitude	Longitude	River	Main River	Ecoregion	Geozone	Altitude	2017	2018	2019	2020	2021
A1NGOT-DINOK	-25.4553	25.85377	Ngotwane	Ngotwane	11.09	B	1340	C	C	C/D	C/D	C
A2APIE-DEOND	-25.6168	28.19158	Apies	Apies	8.05	D	1198	D	D	E	D	D/E
A2APIE-PRETO	-25.7269	28.17192	Apies	Apies	7.05	D	1275	D/E	D/E	E	D/E	D/E
A2BLOU-KROMD	-25.9814	27.78806	Bloubankspruit	Crocodile	7.06	E	1409	D	D	D	D	D
A2BLOU-RIETF	-25.968	27.81428	Bloubankspruit	Crocodile	7.06	D	1390	D	D	D/E	E	D
A2BLOU-ZWART	-25.9772	27.83389	Bloubankspruit	Crocodile	7.06	D	1387	D	D	D	D	D
A2BRAA-PARKH	-26.1383	28.01072	Braamfonteinspruit	Jukskei	11.01	D	1566	D/E	D/E	E	D	D
A2CROC-ELAND	-25.9464	27.87878	Crocodile	Crocodile	11.01	D	1316	D	D	C/D	C	D
A2CROC-MOUNT	-25.7168	27.8421	Crocodile	Crocodile	7.05	E	1134	D	D	D	D	D
A2CROC-ROODE	-26.0635	27.8416	Muldersdrif se loop	Crocodile	11.01	C	1460	D	D	D	D	D
A2ELAN-KLIPB	-25.7266	26.72044	Elands	Elands	7.04	E	1307	C	C	C	C	C
A2HART-KAMEE	-25.6565	28.30846	Hartbeesspruit	Pienaars	9.03	E	1247	D	D/E	D	D	E
A2HEXR-ROOIW	-25.5214	27.37528	Hex	Elands	8.05	E	1035	C	C/D	C	C	C
A2JUKS-EDENV	-26.1357	28.1351	Jukskei	Jukskei	11.01	D	1572	E	E	E	E	E
A2JUKS-GULLU	-26.1715	28.11807	Jukskei	Jukskei	11.01	D	1612	E	E	E	E	E
A2MAGA-HARTE	-25.87	27.615	Magalies	Magalies	7.05	D	1258	C	C	C/D	C	C
A2MORE-FAIRY	-25.7737	28.29178	Moreletaspruit	Pienaars	7.05	D	1358	D	D	D	D	D
A2PIEN-BUFFE	-25.1396	27.69114	Pienaars	Pienaars	8.05	F	965	C	C	C	D	C
A2SKEE-SKEER	-25.8362	27.78435	Skeerpoort	Magalies	7.05	D	1253	B	B	B	C	C
A2SOUT-RIETG	-25.5118	28.1255	Kutswane	Pienaars	9.03	D	1246	D	D	E	D/E	D
A2SWAR-ELAND	-25.9692	28.30111	Rietvlei	Hennops	11.01	E	1531	E	D/E	D	D	D
A2SWAV-ZWAVE	-25.8344	28.37006	Swavelpoortspruit	Pienaars	11.03	D	1406	E	D	D	D	D
A3GMAR-KOEDO	-25.6587	26.436	Groot Marico	Groot Marico	7.04	E	1208	B/C	B	B	C	C
A3KAAL-RIETS	-25.777	26.43339	Kaaloog se Loop	Groot Marico	11.09	C	1327	C	B/C	C	C	C
A4DWAR-JIMSE	-24.2718	28.1997	Jim se loop	Mokolo	6.02	D	1207	C	C	C	C	C
A5LEPH-MELKR	-23.9941	28.4156	Lephalale	Lephalale	6.01	D	1172	C	C	B/C	C	C/D
A8LUPH-GUMEL	-22.6689	30.44951	Luphephe	Nwanedi	2.04	B	611	B/C	B/C	C	C	B/C
A8NWAN-CONFL	-22.6298	30.3999	Nwanedi	Nwanedi	2.04	D	532	D	C	C	C	D

Site	Latitude	Longitude	River	Main River	Ecoregion	Geozone	Altitude	2017	2018	2019	2020	2021
A8NWAN-CROSS	-22.5141	30.4477	Nwanedi	Nwanedi	2.02	E	480	D	C	C	C	C
A8NWAN-FALLS	-22.6613	30.3749	Nwanedi	Nwanedi	2.04	C	601	C	C	B/C	C	C
A8NWAN-FOLOR	-22.471	30.4633	Nwanedi	Nwanedi	2.02	E	460	D	C	D	C	C
A8NWAN-GORGE	-22.6138	30.3999	Nwanedi	Nwanedi	2.03	D	523	C	C	B/C	B	B/C
A8NZHE-FUNYU	-22.8805	30.11058	Nzhelele	Nzhelele	2.03	E	738	C	C/D	D	D	D
A8NZHE-MUSEK	-22.8312	30.06091	Nzhelele	Nzhelele	2.03	D	683	C	C/D	C	C/D	C
A8NZHE-PLANT	-22.91	30.31472	Nzhelele	Nzhelele	2.04	D	1010	B/C	B	B	B	C
A9DZIN-CROCV	-23.0107	30.47753	Dzindi	Luvuvhu	3.01	E	526	C/D	C	B	C	C
A9LATO-ENTAB	-23.0262	30.20227	Latonyanda	Luvuvhu	3.01	D	797	B/C	C	B/C	B/C	C
A9LATO-FORES	-23.049	30.23767	Latonyanda	Luvuvhu	3.01	D	709	C	C	B/C	B	C
A9LUVU-BEJAB	-23.0918	30.06561	Luvuvhu	Luvuvhu	3.01	D	769	C	C/D	C/D	D	C/D
A9LUVU-GWEIR	-23.114	30.38967	Luvuvhu	Luvuvhu	3.01	E	578	D	D	C	C	C
A9LUVU-HASAN	-23.084	30.46933	Luvuvhu	Luvuvhu	3.01	D	550	C/D	C	C	C/D	D
A9LUVU-LAMBA	-22.7365	30.88217	Luvuvhu	Luvuvhu	3.03	E	427	C	C	C	B/C	C
A9LUVU-MALAM	-22.9525	30.649	Luvuvhu	Luvuvhu	3.02	E	476	C	C	C	B	C
A9LUVU-NAND0	-22.9715	30.60167	Luvuvhu	Luvuvhu	3.02	E	484	C	C	B/C	B/C	C
A9MBWE-BRIDG	-22.8453	30.57223	Mbwedi	Mutshindudi	2.04	E	543	C/D	C	C/D	D	C
A9MUKH-CYCAD	-22.8103	30.64783	Mukhase	Mutshindudi	3.03	C	563	B/C	B/C	B/C	C	C
A9MUTA-MUTAL	-22.474	30.8805	Mutale	Mutale	2.02	E	334	C/D	C	C	C	C
A9MUTA-ROADS	-22.8042	30.41667	Mutale	Mutale	2.04	D	664	C	C	C	C/D	D
A9MUTA-TSHIK	-22.6713	30.7015	Mutale	Mutale	2.04	E	551	C/D	C	C	C	C
A9MUTA-TSHIR	-22.8141	30.39539	Mutale	Mutale	2.04	D	689	C	B/C	C	B/C	C
A9MUTA-WHBON	-22.789	30.44267	Mutale	Mutale	2.04	D	628	C/D	C	C	D	C
A9MUTS-BRIDG	-22.9471	30.38934	Mutshindudi	Mutshindudi	3.01	D	785	C/D	C	C	C	C
A9MUTS-SCHOO	-22.8862	30.58683	Mutshindudi	Mutshindudi	2.04	E	509	C	C	B/C	C	C
A9TBDI-BRIDG	-22.7647	30.4869	Tshiombedi	Mutale	3.03	D	641	C	C	C	C	C
B1KOLI-MIDDE	-25.7575	29.46143	Klein Olifants	Olifants	9.06	E	1441	C	C	D	D	C/D
B2BRON-KLIPE	-25.828	28.717	Bronkhorstspruit	Wilge	7.05	E	1397	C	C/D	C	C	C
B2WILG-BOSSE	-25.9021	28.85138	Wilge	Olifants	11.03	E	1400	C	C	C	C	C

Site	Latitude	Longitude	River	Main River	Ecoregion	Geozone	Altitude	2017	2018	2019	2020	2021
B3ELAN-DETWE	-25.551	28.568	Elands	Olifants	9.03	D	1242	C	C	C	C	B/C
B3ELAN-RHENO	-25.1155	28.9571	Elands	Olifants	8.04	E	922	D	C	D	C	C
B3KRAN-ZEEK	-25.4376	29.4758	Kranspoortspruit	Olifants	9.06	D	1065	C	C	C	C/D	C
B4STEE-STOFF	-25.3831	29.83837	Steelpoort	Olifants	9.03	E	1444	C	C	C	C/D	C
B4STER-LYDEN	-25.1493	30.53652	Sterkspruit	Steelpoort	10.01	C	1596	B/C	C	C	C	C
B5OLIF-ADRIA	-24.5278	29.54583	Olifants	Olifants	8.03	F	774	D	C	C	C	B/C
B5OLIF-MOHLAP	-24.4086	29.73611	Olifants	Olifants	8.01	F	744	D	D	C	D	C
B5OLIF-POWER	-24.6175	29.475	Olifants	Olifants	8.03	F	784	D	D	D	D	C/D
B6BLYD-PILGU	-24.9028	30.74658	Blyde	Olifants	10.01	D	1243	C	C	C	C	C/D
B7GASE-MIDDL	-24.161	30.254	GaSelati	Olifants	10.01	C	937	B/C	B/C	B	B	B
B7MOHL-GEMIN	-24.1683	30.10561	Mohlapitse	Olifants	9.02	D	745	C	C	B/C	C	B/C
B8BROE-BRIDG	-23.8007	29.97741	Broederstroom	Groot Letaba	9.02	D	1565	C	C	C	C	C
B8GLET-APPEL	-23.9149	30.05218	Groot Letaba	Groot Letaba	9.02	D	830	C	C	C	C	C/D
B8LETA-MBEWU	-23.7596	31.37062	Letaba	Letaba	3.03	E	269	C/D	D	C	C	C
B8LETS-CRAIGH	-23.9742	30.1658	Letsitele	Groot Letaba	3.01	E	648	C	B/C	B	C	C
B8LETS-TANKB	-23.8888	30.36193	Letsitele	Groot Letaba	3.01	E	507	D	D	D	C/D	C
B8POLI-AVOFA	-23.7923	30.11532	Politsi	Groot Letaba	4.02	D	756	B/C	B/C	B	B/C	C
B8THAB-RAMOD	-24.0255	30.16917	Thabina	Groot Letaba	10.01	C	783	B/C	B/C	C	C	C
C2BLES-UPPER	-26.4788	28.42505	Blesbokspruit	Suikerbosrant	11.03	E	1531	E	E	E	D/E	D
C2RIET-RIETS	-26.4292	28.1606	Natalspruit	Klip	11.01	F	1498	E	E	D	D	D
C2SUIK-DEHOE	-26.6467	28.38197	Suikerbosrant	Vaal	11.01	E	1509	D	D	D	D	D
C2SUIK-GOEDV	-26.6755	28.17329	Suikerbosrant	Vaal	11.01	F	1453	D	D	D	D	D
C2TAAI-SASOL	-26.7947	27.90708	Taaibosspruit	Vaal	11.03	E	1430	D	D	D	C/D	D
C2VAAL-BARRA	-26.7686	27.67806	Vaal	Vaal	11.03	F	1425	D/E	D/E	D/E	D	D
C3HART-DELPO	-28.3793	24.30192	Harts	Vaal	29.02	F	1009	D	C	C	C	C
C3HART-PAMPI	-27.7867	24.70485	Harts	Vaal	29.02	F	1065	D	C	C/D	C	C
C3HART-TAUNG	-27.5333	24.85443	Harts	Vaal	29.02	E	1130	D	D	D	D	D
C4SAND-R73BR	-28.1132	26.90801	Sand	Vet	11.08	F	1304	D	C	D	D	C/D
C5RIET-DEKRA	-29.0278	24.51306	Riet	Vaal	29.02	E	1067	C	C	C	C	C

Site	Latitude	Longitude	River	Main River	Ecoregion	Geozone	Altitude	2017	2018	2019	2020	2021
C5RIET-JACOB	-29.0997	24.69889	Riet	Vaal	29.02	F	1126	D	D	E	D/E	C/D
C6VALS-LINDL	-27.8494	27.67833	Vals	Vaal	11.03	E	1444	E	C	C/D	D	
C8LIEB-MAFAH	-27.5311	28.47556	Liebenbergsvlei	Wilge	11.03	F	1522	E	D	C/D	C	D
C9VAAL-DELPO	-28.4185	24.29047	Vaal	Vaal	29.02	F	1014	D	C/D	C/D	C	C
C9VAAL-GONGG	-28.488	24.40919	Vaal	Vaal	29.02	E	1033	D	C/D	C	C	C
C9VAAL-SCHMI	-28.7117	24.07258	Vaal	Vaal	29.02	F	1004	D	C/D	C	C	C
C9VAAL-VAALB	-28.4502	24.32617	Vaal	Vaal	29.02	E	1020	D	C/D	C	C	C
C9VAAL-WARRE	-28.1076	24.84256	Vaal	Vaal	29.02	F	1078	D	C/D	C/D	C	C
C9VAAL-WVALE	-28.0958	24.86975	Vaal	Vaal	29.02	F	1182	C/D	D	C/D	C	C
D3ORAN-HOPET	-29.6	24.08778	Orange	Orange	26.01	F	1054	C	C	C	C	C
D7ORAN-GROBL	-28.8666	22.04244	Orange	Orange	26.05	F	861	C	C	C	C	B/C
D7ORAN-KANON	-28.6359	21.09061	Orange	Orange	26.05	F	764	C	C	C	C	C
D7ORAN-KEIMO	-28.7281	20.98547	Orange	Orange	26.05	E	725	C	C	C	C	C
D7ORAN-NEUSB	-28.7769	20.73969	Orange	Orange	26.05	E	664	C/D	C/D	C	C	C
D7ORAN-PRIES	-29.6612	22.75564	Orange	Orange	26.05	F	925	C	C	C	C	C
D7ORAN-UPING	-28.4526	21.25992	Orange	Orange	26.05	F	790	C	C	C	C	C
D8ORAN-BLOUP	-28.5106	20.172	Orange	Orange	28.01	F	440	C	C	C	C	C
D8ORAN-GOODH	-28.9074	18.20825	Orange	Orange	28.01	F	201	C	C	C	C	C
D8ORAN-ONSEE	-28.7407	19.3305	Orange	Orange	28.01	E	367	C	C	C	D	C/D
D8ORAN-PELLA	-28.9641	19.14531	Orange	Orange	28.01	F	312	C	C	C	C	C
D8ORAN-RICHT	-28.0777	16.9442	Orange	Orange	28.01	F	39	C	B/C	C	C	C
D8ORAN-VIOOL	-28.7621	17.72633	Orange	Orange	28.01	F	169	C	C	C	C	C
K9KROM-BOJAN	-33.8808	24.07528	Kromme	Kromme	20.02	D	348	C	C	C	C	C
K9KROM-DEWIL	-33.9558	24.34909	Kromme	Kromme	20.02	E	198	C/D	C	C	D	C
L7WITR-GROOT	-33.6603	24.53501	Wit	Groot	19.02	C	215	B/C	C	C	B/C	C
L8KOUG-OPKOM	-33.7884	24.02531	Kouga	Gamtoos	19.02	E	332	C	C	C	C/D	C/D
X2CROC-GOEDE	-25.4096	30.31608	Crocodile	Crocodile	9.04	D	1215	B	B	B/C	C	C
X2CROC-POPLA	-25.4528	30.68099	Crocodile	Crocodile	10.02	E	830	B/C	A/B	C	C	B/C
X2CROC-RIETV	-25.3881	30.56569	Crocodile	Crocodile	10.02	D	929	B/C	B/C	B/C	B/C	B/C

Site	Latitude	Longitude	River	Main River	Ecoregion	Geozone	Altitude	2017	2018	2019	2020	2021
X2CROC-RIVUL	-25.4302	30.75744	Crocodile	Crocodile	4.04	E	740	C	C	C	B/C	B/C
X2CROC-VALY1	-25.4941	30.14356	Crocodile	Crocodile	9.02	D	1854	A/B	A/B	C	B/C	B/C
X2CROC-VERLO	-25.3497	30.10994	Crocodile	Crocodile	9.02	C	2098	A/B	A/B	C	C	C
X2ELAN-DOORN	-25.6317	30.32444	Elands	Crocodile	10.03	D	1397	C	C	C	C	C
X2ELAN-HEMLO	-25.6004	30.55969	Elands	Crocodile	10.02	D	991	C	C	C	C	C
X2GLAD-HERMA	-25.5215	30.87853	Gladdespruit	Crocodile	4.04	D	906	C/D	C/D	C/D	C/D	D
X2LEEU-GELUK	-25.6617	30.25792	Leeuspruit	Elands	9.02	D	1528	C	C	C	C	C
X2LUNS-UITWA	-25.3936	30.30164	Lunsklip	Crocodile	9.04	D	1238	B/C	B/C	B/C	C	C
X2LUNS-VERLO	-25.3104	30.14558	Lunsklip	Crocodile	9.02	C	2086	B/C	B/C	C	B/C	C
X2NOOR-RIVER	-25.6101	30.97639	Noord Kaap	Kaap	4.04	D	675	B/C	B/C	B/C	B/C	C
X2QUEE-HILVE	-25.7907	30.91542	Queens	Kaap	4.04	C	752	C	C	C	C	C
X2VISS-ALKMA	-25.4581	30.81628	Visspruit	Crocodile	4.04	C	757	B	B	C	D	C

ANNEXURE Z: RESOURCE QUALITY OBJECTIVES

Site	Latitude	Longitude	River	2017	2018	2019	2020	2021	RQO	SQR PES	SQR
A2APIE-DEOND	-25.6168	28.19158	Apies	D	D	E	D	D/E	C	E	A23F-00827
A2APIE-PRETO	-25.7269	28.17192	Apies	D/E	D/E	E	D/E	D/E	D	F	A23E-01071
A2BLOU-KROMD	-25.9814	27.78806	Bloubankspruit	D	D	D	D	D	D	D	A21D-01185
A2BLOU-RIETF	-25.968	27.81428	Bloubankspruit	D	D	D/E	E	D	D	D	A21D-01185
A2BLOU-ZWART	-25.9772	27.83389	Bloubankspruit	D	D	D	D	D	D	D	A21D-01185
A2BRAA-PARKH	-26.1383	28.01072	Braamfonteinspruit	D/E	D/E	E	D	D	D	E	A21C-01262
A2CROC-BOBBE	-25.8079	27.90983	Crocodile					E	D	D	A21H-01107
A2CROC-ELAND	-25.9464	27.87878	Crocodile	D	D	C/D	C	D	D	E	A21E-01162
A2CROC-KOEDO	-24.8894	27.51738	Crocodile		C	C	D	C	D	D	A24C-00596
A2CROC-MAKOP	-24.4065	27.11516	Crocodile			C/D		C	C/D	D	A24J-00438
A2CROC-MOUNT	-25.7168	27.8421	Crocodile	D	D	D	D	D	D	E	A21J-01053
A2EDEN-LEEUW	-25.678	28.4017	Edendalespruit	D	D	D	D		D	D	A23A-01045
A2ELAN-BESTE	-25.4639	26.78925	Elands	C	C			C	C	D	A22E-00940
A2ELAN-KLIPB	-25.7266	26.72044	Elands	C	C	C	C	C	C	C	A22A01001
A2ELAN-NOOIT	-25.5819	26.6779	Elands			D	D	D	C	C	A22A01001
A2HART-KAMEE	-25.6565	28.30846	Hartbeesspruit	D	D/E	D	D	E	D	D	A23A-01049
A2HENN-HENNO	-25.8256	27.98944	Hennops	E	E			D/E	D	E	A21B-01135
A2HEXR-OLIFA	-25.8184	27.27073	Hex		C	C/D		C	C	C	A22G-01131
A2HEXR-PAARD	-25.6083	27.28897	Hex		E	E	D	D	D	E	A22J-00878
A2HEXR-ROOIW	-25.5214	27.37528	Hex	C	C/D	C	C	C	D	E	A22J-00878
A2JUKS-EDENV	-26.1357	28.1351	Jukskei	E	E	E	E	E	D	N/A	A21C
A2JUKS-GULLU	-26.1715	28.11807	Jukskei	E	E	E	E	E	D	E	A21C-01269
A2KOST-NAAUW	-25.7627	26.8901	Koster			D	D	C	C	C	A22B-01014
A2MAGA-HARTE	-25.87	27.615	Magalies	C	C	C/D	C	C	C	D	A21F-01116
A2MAGA-MALON	-26.0217	27.56472	Magalies		B	B/C	B/C	B/C	B	C	A21F-01208
A2MODD-MODDE	-26.1095	28.16897	Modderfonteinspruit		E	E	D	D/E	D	E	A21C-01268
A2MORE-FAIRY	-25.7737	28.29178	Moreletaspruit	D	D	D	D	D	D	E	A23A-01074
A2PIEN-BUFFE	-25.1396	27.69114	Pienaars	C	C	C	D	C	C	C	A23L-00706

Site	Latitude	Longitude	River	2017	2018	2019	2020	2021	RQO	SQR PES	SQR
A2PIEN-KLIPD	-25.4008	28.31269	Pienaars		C	C		D	C	C	A23B-00896
A2PLAT-KOMAN	-25.8293	28.2225	Buffelspruit		B	B/C	C	C	C	N/A	A23G
A2RIET-MERIN	-26.0189	28.30442	Rietvlei		D	D	D	D	C	D	A21A-01178
A2SKEE-SKEER	-25.8362	27.78435	Skeerpoort	B	B	B	C	C	B	C	A21G-01126
A2STER-BUFFE	-25.8074	27.47814	Sterkstroom		B/C	B/C	B/C	C	C	C	A21K-01124
A2STER-MAMOG	-25.5984	27.50575	Sterkstroom		C	C	C		D	C	A21K-00959
A2SWAR-ELAND	-25.9692	28.30111	Rietvlei	E	D/E	D	D	D	C	D	A21A-01178
A2SWAV-ZWAVE	-25.8344	28.37006	Swavelpoortspruit	E	D	D	D	D	D	N/A	A23A
A2WATE-BAVIA	-25.7414	27.2568	Waterkloofspruit		B	B	C	C	C	B	A22H-01070
A3GMAR-KOEDO	-25.6587	26.436	Groot Marico	B/C	B	B	C	C	A/B	C	A31B-01039
A3GMAR-LOTTE	-24.8444	26.486	Groot Marico			C		D	C	C	A32D-00539
A3GMAR-RIEKE	-25.4612	26.39189	Groot Marico	C/D	C	C		C	C	D	A31B-00923B
A3GMAR-WONDE	-25.5893	26.41215	Groot Marico		B/C	C	C	C	B	D	A32B-00923A
A3KAAL-RIETS	-25.777	26.43339	Kaaloog se Loop	C	B/C	C	C	C	A/B	B	A31A-0400/Kaaloog se Loop
A3KMAR-KALKD	-25.5163	26.15861	Klein Marico						C	D	A31E-00926
A3POLK-TWYFE	-25.647	26.48928	Polkadraaispruit		B/C	D	C	C	B/C	C	A31B-01009
A4DWAR-JIMSE	-24.2718	28.1997	Jim se loop	C	C	C	C	C	C	C	A42E-00398
A4DWAR-ZANDD	-24.2629	28.2103	Dwars	C	C	C		C	C	C	A42E-00384
A4MAMB-DIAMA	-24.2247	27.5816	Mamba		C/D				C	C	A41B-00334
A4MAMB-HOPEW	-24.2127	27.50718	Mamba						C	C	A41B-00334
A4MATL-HAARL	-24.1602	27.47957	Matlabas						C	D	A41C-00279
A4MATL-HOOPD	-24.3081	27.51618	Matlabas		C	D	D		C	C	A41A-00340
A4MATL-WATER	-24.3455	27.56373	Matlabas		C	C	C/D		C	C	A41A-00340
A4MOKO-ALMAB	-24.4859	28.0737	Sand			D	C	D	D	C	A42A-00499
A4MOKO-MOKOL	-24.058	27.7984	Mokolo				C		C	C	A42F-00285
A4MOKO-VAALW	-24.2894	28.0924	Mokolo	C/D	C/D	C/D		C/D	C	C	A42C-00392
A4MOKO-WITKO	-23.8477	27.79033	Mokolo						C	C	A42G-00225
A4MOKO-WWORK	-23.9707	27.72595	Mokolo		D	D	D	C/D	C	C	A42G-00241
B1KOLI-MIDDE	-25.7575	29.46143	Klein Olifants	C	C	D	D	C/D	C	D	B12D-01118
B2WILG-BOSSE	-25.9021	28.85138	Wilge	C	C	C	C	C	C	C	B20F-01150

Site	Latitude	Longitude	River	2017	2018	2019	2020	2021	RQO	SQR PES	SQR
B3ELAN-RHENO	-25.1155	28.9571	Elands	D	C	D	C	C	D	D	B31F-00654
B4STEE-PRETO	-24.495	30.4	Steelpoort			C		C	D	D	B41K-00487
B6BLYD-PILGU	-24.9028	30.74658	Blyde	C	C	C	C	C/D	B	C	B60A-00653
B7OLIF-BALUL	-24.0529	31.72998	Olifants	C	C	C			C	C	B73H-00311
B8GLET-APPEL	-23.9149	30.05218	Groot Letaba	C	C	C	C	C/D	C	C	B81B-00264
B8LETA-CONFL	-23.9816	31.81423	Letaba	C	D				C-C/D	C	B83E-00265
B8LETA-KLIPK	-23.9434	31.73133	Letaba	C		D			C-C/D	C	B83E-00265
B8LETA-MAHLA	-23.6505	31.14842	Letaba	D	C	C			C-C/D	B	B83A-00220
B8LETA-MBEWU	-23.7596	31.37062	Letaba	C/D	D	C	C	C	C-C/D	C	B83A-00235
B8LETS-TANKB	-23.8888	30.36193	Letsitele	D	D	D	C/D	C	C	D	B81D-00271
C1WATE-UPPER	-26.9602	28.7458	Waterval		D	D	D	C/D	D	D	C12G-01963
C2BLES-UPPER	-26.4788	28.42505	Blesbokspruit	E	E	E	D/E	D	D	C	C21F-01447
C2KLIP-ROTHD	-26.6079	28.00181	Klip		D	D	D	D	D	E	C22E-01520
C2MOOI-EWR02	-26.8804	26.96417	Mooi		D	D	D	C	D	D	C23L-01827
C2MRLO-KHUTS	-26.3407	27.32816	Moorivierloop			D	C/D		D	D	C23E-01378
C2SKOO-GHOLF	-26.326	26.82887	Schoonspruit			E		C	C/D	D	C24E-01164
C2SKOO-URANI	-26.9345	26.66427	Schoonspruit		D/E	D	D	D/E	D	D	C24H-01860
C2SUIK-DEHOE	-26.6467	28.38197	Suikerbosrant	D	D	D	D	D	B/C	C	C21C-01675
C2TAAI-SASOL	-26.7947	27.90708	Taaibosspruit	D	D	D	C/D	D	D	N/A	C22K
C2VAAL-EWR13	-27.1041	26.52194	Vaal		D	D			D	C	C24J-02016
C2VAAL-SCAND	-26.9316	27.01672	Vaal		D	C/D	C	C	C	D	C23L-01792
C2VAAL-SCHOE	-26.9708	27.20975	Vaal				C/D	D	C		C23L-01792
C2VAAL-VERMA	-26.9364	26.85037	Vaal		D	C/D		C	D	C	C24B-01817
C3HART-DELPO	-28.3793	24.30192	Harts	D	C	C	C	C	D	D	C33C-02836
C3HART-PAMPI	-27.7867	24.70485	Harts	D	C	C/D	C	C	D	D	C33A-02470
C3HART-TAUNG	-27.5333	24.85443	Harts	D	D	D	D	D	D	D	C31F-02140
C4GVET-VDRIE	-28.7124	26.95911	Groot Vet		C	D	C/D	C/D	C	B	C41C-03248
C4KVET-VVIER	-28.6188	27.01643	Klein Vet		C/D	C	D	C/D	C	B	C41B-03157
C4SAND-R73BR	-28.1132	26.90801	Sand	D	C	D	D	C/D	C	D	C42J-02716
C4SAND-SENEK	-28.3055	27.60675	Sand		C/D	D	D	C/D	C	C	C42B-02841

Site	Latitude	Longitude	River	2017	2018	2019	2020	2021	RQO	SQR PES	SQR
C4VET-HOOPS	-27.9349	26.12573	Vet		D	D	C/D	D	C/D	C	C43A-02561
C6VALS-LINDL	-27.8494	27.67833	Vals	E	C	C/D	D		C/D	C	C60C-02552
C6VALS-PROKL	-27.4868	26.81305	Vals		C	D	D		C/D	C	C60J-02262
C7RENO-R501B	-27.041	26.99639	Renoster						C	C	C70J-01955
C8LIEB-MAFAH	-27.5311	28.47556	Liebenbergsvlei	E	D	C/D	C	D	B	C	C83H-02392
C9VAAL-DELPO	-28.4185	24.29047	Vaal	D	C/D	C/D	C	C	C	D	C91E-02969
C9VAAL-GONGG	-28.488	24.40919	Vaal	D	C/D	C	C	C	C	D	C91E-02969
C9VAAL-SCHMI	-28.7117	24.07258	Vaal	D	C/D	C	C	C	C	D	C92B-02903
C9VAAL-STCLA	-29.0549	23.8213	Vaal		C	D	D	D	C	D	C92B-03590
C9VAAL-VAALB	-28.4502	24.32617	Vaal	D	C/D	C	C	C	C	D	C91E-02969
C9VAAL-WARRE	-28.1076	24.84256	Vaal	D	C/D	C/D	C	C	D	D	C91D-02644
C9VAAL-WVALE	-28.0958	24.86975	Vaal	C/D	D	C/D	C	C	D	D	C91D-02644
D4MOLO-WELTE	-25.8518	25.79552	Molopo		D			D	D	E	D41A-01055
G1BERG-BRBM1	-33.9562	19.0726	Berg		C	C	C	B/C	B/C	A	G10A-09199
G1BERG-BRBM5	-33.1306	18.86298	Berg		C	C	C	B	D	D	G10J-08414
G1BERG-BRBM6	-32.998	18.78042	Berg				C	C/D	B/C	D	G10K-08197
G1BERG-BRMB2	-33.8997	19.05284	Berg		C	C/D	C/D	C	C	B	G10A-09172
G1BERG-JIMFO	-33.8773	19.03336	Berg			C	C		C	D	G10A-09160
G1KROM-BEIT	-33.6224	19.08483	Krom		C			C	B/C	D	G10D-08928
G2DIEP-KALBA	-33.4773	18.70683	Diep		D/E				E?	D	G21D-08761
G2EERS-JONKE	-33.9939	18.9751	Jonkershoek		B/C	B	B	B/C	C	A	G22F-09247
G2HOUT-ORANJ	-34.0052	18.39044	Hout Bay		C				D	D	G22B-09261
G2HOUT-VICTO	-34.0307	18.35355	Hout Bay		D			C/D	D	D	G22B-09261
G2LOUR-BROAD	-34.098	18.82722	Lourens		C/D		C/D		D	D	G22J-09266
G2LOUR-RADLO	-34.0831	18.86938	Lourens		C/D	C/D	C	C	D	D	G22J-09266
G2SILV-SUNBI	-34.1148	18.41085	Silvermine		C/D				C	C	G22A-09324
G4KLEI-GOUDI	-34.3147	19.58939	Klein	C	C/D				C	D	G40K-09354
G4PALM-ARIES	-34.244	18.99443	Palmiet						B/C	D	G40C-09305
G4PALM-KODAM	-34.225	18.99167	Palmiet						B/C	D	G40C-09305
G4PALM-KOGEL	-34.2787	18.9949	Palmiet	C	C	C/D		C	B	B	G40D-09369

Site	Latitude	Longitude	River	2017	2018	2019	2020	2021	RQO	SQR PES	SQR
G4PALM-KOGFR	-34.3194	18.96957	Palmiet						B	B	G40D-09369
G4PALM-NUWEB	-34.0594	19.04587	Palmiet	C	C				B/C	D	G40C-09305
G4PALM-R45BR	-34.094	19.054	Palmiet						B/C	D	G40C-09305
G5KARS-KARS	-34.4133	19.82058	Kars						B	E	G50D-09393
G5KARS-ROOID	-34.4297	19.9153	Kars						B	E	G50D-09393
G5NUWE-BRAKP	-34.634	19.865	Nuwejaars						D	C	G50B-09418
G5NUWE-UNSPE	-34.5787	19.75787	Nuwejaars		C	D	D		D	C	G50B-09418
H1BREE-MOOIP	-33.5202	19.18519	Breede		D	C	C	B/C	D	C	H10F-08730
H1BREE-WITBR	-33.4228	19.25798	Breede		C				D	C	H10F-08730
H4BREE-LECHA	-33.8167	19.69167	Breede						D	B	H40F-09026
H6BAVI-GENAD	-34.0505	19.55996	Baviaans				C	C	A/B	C	H60E-09217
H6RIVI-GREYT	-34.0722	19.62222	Riviersonderend			C	C	D	C/D	D	H60F-09277
H7BREE-FELIX	-34.1447	20.47861	Breede			C			D	C	H70G-09308
H8DUIW-VERMA	-34.2516	20.99183	Duiwenhoks		C/D	C	C	C/D	E	D	H80E-09314
J1BUFF-EWR05	-33.3845	20.94169	Buffels						C	C	J11H-08557
J1DORI-EWR07	-33.7914	20.92699	Doring						D	D	J12L-08985
J1TOUW-EWR03	-33.7271	21.16507	Touws						B/C	D	J12M-08904
J2GAMK-EWR04	-33.3647	21.63051	Gamka						B/C	C	J25A-08567
J3KAMM-EWR10	-33.7329	22.6974	Kammanassie			D	D	D	C	B	J34C-08869
J3OLIF-EWR09	-33.4381	23.20587	Olifants						C	C	J31D-08592
K2GROO-KLEIN	-33.9783	22.19333	Groot Brak		C	C	C	C	A	C	K20A-09083
K3GWAI-USN2R	-34.0066	22.40084	Gwaing						A	D	K30B-09151
K3KAAI-GWEIR	-33.9711	22.54776	Kaaimans		C	B/C	B/C	B/C	A	B	K30C-09065
K4DIEP-DIEPR	-33.9398	22.70805	Diep		C	B/C	B	C	B	C	K40A-09027
K4HOMT-KNYSA	-33.9474	22.91933	Homtini		C	C	C	C	A	C	K40E-09016
K4KARA-KNYSN	-33.9219	22.85329	Karatara						A	C	K40C-09036
K5KNYS-EWR01	-33.8911	23.03253	Knysna		C	B/C	B/C	B/C	B	A	K50A-09069
K6KEUR-EWR06	-33.8882	23.2421	Keurbooms		C	B	B	B	B	C	K60C-08992
T3KINI-GWEIR	-30.4816	28.62225	Kinira						C	C	T33E-05213
T3MZIM-BHUJE	-31.439	29.29433	Kinira		C	C		C	C	C	T36A-06354

Site	Latitude	Longitude	River	2017	2018	2019	2020	2021	RQO	SQR PES	SQR
T3TINA-N2ROA	-31.0692	28.89268	Thina			C		C	C	B	T34K-05835
T3TSIT-LALEN	-31.2451	28.90166	iTsitsa		C	C	C	C	C	B	T35L-05976
T4MTAM-MADIK	-30.8553	30.07333	Mtamvuna		C	B/C	B/C	B/C	B	B	T40E-05601
U1MKOM-JOSEB	-30.0082	30.23903	Mkomazi				B	B	B	B	U10J-04799
U1MKOM-SHOZI	-30.1316	30.66251	Mkomazi			C	C	C	B	B	U10M-04746
U2KARK-USMGN	-29.4438	30.3194	Karkloof						B	B	U20E-04170
U2MGEN-DRGLE	-29.4888	29.90304	uMgeni						C	B	U20A-04253
U2MGEN-MIDMA	-29.4881	30.156	uMgeni						C	B	U20C-04275
U2MGEN-MZINY	-29.7208	30.90432	uMgeni		C	B/C			C/D	E	U20M-04396
U2MGEN-PETRU	-29.5125	30.0944	uMgeni						C	B	U20A-04253
U2MGEN-USMWW	-29.4968	30.22094	uMgeni			C	C	C	C	C	U20E-04243
U4MVOT-EWR12	-29.2687	31.03197	uMvoti		B/C	B/C			B/C	B	U40H-04064
U7LOVU-KAMPU	-30.0834	30.66165	Lovu						B/C	B	U70C-04859
V1TUKH-EWR02	-28.7154	29.64205	Thukela		D				C/D	C	V11M-03280
V1TUKH-TUGEL	-28.7563	30.15038	Thukela			C	C	C	C	A	V14E-03233
V2MOOI-EWR12	-28.9042	30.41875	Mooi						C	C	V20H-03500
V3BUFF-CONFL	-27.7156	30.11863	Buffalo						C/D	B	V32B-02457
V3BUFF-RORKE	-28.3459	30.53862	Buffalo			C	C	C	C	C	V33A-03017
V3BUFF-EWR13	-28.177	30.49042	Buffalo						C/D	B	V32F-02707
V3NCND-EWR05	-27.8463	29.79019	Ncandu						B/C	D	V31J-02487
V3NCND-LEYDN	-27.8551	29.76054	Unspecified			C	C	C	B/C	N/A	N/A
V3SLNG-NCHTW	-27.4207	30.29681	Slang		B/C				B	B	V31A-02319
V4THUK-EWR15	-28.7797	30.8675	Thukela						C	B	V40B-03429
V5THUK-RAILB	-29.1726	31.39192	Thukela			C	C/D	C	C	C	V50D-03903
V6THUK-TFERR	-28.7512	30.43712	Thukela			C	C	C	D	C	V60J-03395
V7BUSH-MASHU	-28.7684	30.1679	Bushmans			C	C	C	C/D	B	V70G-03440
X1GLAD-VAALK	-25.7717	30.62716	Gladdespruit		D				D	D	X11J-01106
X1KOMA-GEVON	-25.8551	30.38235	Komati		B/C	B	B/C	C	B/C	C	X11G-01142
X1KOMA-HOOGE	-26.0363	30.99806	Komati		B/C	C	B/C	B/C	C	C	X12H-01258
X1KOMA-TONGA	-25.6817	31.78295	Komati		B/C	B/C	C	C	D	E	X13J-01130

Site	Latitude	Longitude	River	2017	2018	2019	2020	2021	RQO	SQR PES	SQR
X1LOMA-KLEIN	-25.6499	31.62219	Lomati		B				C	D	X14H-01066
X1TEEES-HEUNI	-26.0157	30.80877	Teespruit			B	B	B/C	C	C	X12E-01287
X1TEES-TEESP	-26.0194	30.85179	Teespruit		B/C				C	C	X12E-01287
X1TEES-WELVE	-26.0579	30.65012	Teespruit			B/C	B/C		C	C	X12E-01287
X2CROC-DONKE	-25.4671	30.22966	Crocodile	B	B				B	C	X21B-00962
X2CROC-GOEDE	-25.4096	30.31608	Crocodile	B	B	B/C	C	C	B	C	X21B-00962
X2CROC-MALEL	-25.486	31.502	Crocodile	C	C	D			C	D	X24D-00994
X2CROC-MONTR	-25.4487	30.71016	Crocodile	BC	B/C			C	C	C	X21E-00943
X2CROC-NKONG	-25.3913	31.97427	Crocodile	C	C	D			C	D	X24H-00934
X2CROC-POPLA	-25.4528	30.68099	Crocodile	BC	A/B	C	C	B/C	C	C	X21E-00943
X2CROC-RIETV	-25.3881	30.56569	Crocodile	BC	B/C	B/C	B/C	B/C	C	C	X21E-00943
X2CROC-VALY1	-25.4941	30.14356	Crocodile	AB	A/B	C	B/C	B/C	B	C	X21A-00930
X2CROC-VERLO	-25.3497	30.10994	Crocodile	AB	A/B	C	C	C	B	C	X21A-00930
X2CROC-VERL1	-25.4349	30.26047	Crocodile				B	B/C	B	C	X21B-00962
X2KAAP-HONEY	-25.6495	31.24286	Kaap	C	C		C	C	B	D	X23G-01057
X3MACM-FALLS	-24.9739	30.81685	Mac Mac			B		B	A/B	C	X31C-00683
X3MACM-PICNI	-25.022	31.00064	Mac Mac			B/C		B/C	A/B	C	X31C-00683
X3MACM-VENUS	-25.0086	30.92501	Mac Mac			B/C		B/C	A/B	C	X31C-00683
X3MUTL-NEWF1	-24.7536	31.13763	Mutlumuvi			B/C		B/C	B/C	D	X32F-00597
X3SABI-BRUG	-25.0657	30.85817	Sabie		C	C		C	B	C	X31B-00757
X3SABI-RIOOL	-25.0913	30.79376	Sabie		C			C	B	C	X31B-00757
X3SABI-SEKUR	-24.9881	31.29248	Sabie			C			B	C	X31K-00715
X3SAND-SKUKU	-24.9676	31.62552	Sand		D				B	B	X32J-00602