

1 JBS09 (EWR 9: SUIKERBOS US (SUIKERBOSRAND RIVER))

The information is summarised from DWA (2008a,b; 2009a; 2010a).

1.1 SITE DESCRIPTION

EWR 9 is situated in the upper reaches of the Suikerbosrand River, and falls within MRU Suiker A delineated as from the origin of river to the confluence with Blesbokspruit River. The site is in a bedrock rapid, and although the reach is generally characterised by long pools, there are a number of such rapids in the reach. Some morphological cues present in the upstream pool area - upper terrace is paired on opposite the bank and the lower bench is annually flooded. Some channel manipulation from the construction of bridge downstream was observed and there is 40% exotic species coverage. Fish habitat, flow-depth categories and cover is well represented at site and macroinvertebrate habitat is moderate.

Location	EWR 9	Altitude	1509 m
Longitude	28.38197	Latitude	-26.6467
EcoRegion	Highveld/Southern Central Kalahari 11.01	Quaternary catchment	C21C
Water Management Area	Upper Vaal	Geomorphological zone	Lower Foothills
			
EWR 9, Suikerbos US, August 2008			

1.2 PRESENT ECOLOGICAL STATE (PES)

Geom	There are large areas of relatively pristine sections of this river, and the Suikerbosrand River is often considered as a "reference state" system for the Highveld rivers (which are otherwise generally very highly impacted rivers). The site is a bedrock rapid, and although the reach is generally characterised by long pools, there are a number of such rapids in the reach. The upper terrace is paired on the opposite bank and the lower bench is annually flooded. Erosion in the catchment has increased the fines load of the river, so possibly the pools are infilling and channels are reducing in width due to sedimentation.
WQ	Data from C2H131Q01 (Colliery point on Suikerbosrand River) and Rand Water Data from C-S1 (2003 – 2008; n = 92) were used for the physico-chemical PES assessment. Agricultural runoff (nutrients and sediments) are impacting this site. Instream dams (Harhoff and Belfast) for agricultural water supply and farm dams in tributaries are causing higher

	water temperatures. There are some sand mining activities in the area and may be causing elevated salt concentrations and turbidity levels. Faecal coliforms have seasonal highs while the physico-chemical data indicates that sulphates are low.
Fish	Most of the expected fish species are still present at this site. It is expected that <i>A. sclateri</i> have been lost as a result of the flow modification (Balfour Dam and abstraction), and the FROC of <i>L. kimberleyensis</i> , <i>Labeobarbus aeneus</i> , and <i>Labeo capensis</i> have been reduced. Another prominent reduction in FROC is evident in the small species (<i>B. anoplus</i> , <i>B. pallidus</i> and <i>P. philander</i>), most probably related to the impact of the predatory alien <i>M. salmoides</i> .
Inverts	Aug 07: SASS5 score: 69 No of Taxa: 12 ASPT: 5.8 Apr 08: SASS5 score: 119 No of Taxa: 20 ASPT: 6.0 Composition of macroinvertebrates is variable, depending on releases from Balfour Dam. In August 2007 the flow comprised a trickle only, and various taxa needing higher flows disappeared (Heptageniidae; 3 spp Hydropsychidae; and Hydraenidae). The total SASS score was significantly lower (69) than expected (182), but the ASPT was not significantly different to natural. This suggests that flow changes were more important in determining the PES than any deterioration in water quality. In April 2008, when flows were moderate, the composition of invertebrates recovered significantly (C EC). Overall, the taxa missing or scarce were mainly those that prefer slow or standing water in gravel, sand and mud substrates (Corixidae, Caenidae, Sphaeriidae, Leptophlebiidae, and Ceratopogonidae). The reason for this is not clear.
Rip veg	This site occurs within the Soweto Highveld Grassland vegetation type, which has an endangered conservation status with 52.7% of the type remaining and only 0.2% protected. Moderate to high rates of alien infestation is present in the lower zone.
Diatoms	Four diatom samples were taken at this site (August and December 2007 and January and April 2008). The August 2007 diatom sample indicated that the biological water quality was good with moderate pollution levels, and that there slightly elevated levels of organically bound nitrogen in the water. The rest of the samples showed a gradual deterioration in biological water quality and the biological water quality is a C EC.

1.3 MAIN IMPACTS AT THE SITE

	PES	Causes	Sources	F/NF
WQ	C/D	Faecal coliforms seasonal highs.	WWTW upstream.	NF
		Increased sediment and turbidity.	Agricultural runoff, upstream dams (Balfour and Harhoff).	
		Increased N and P.	Agricultural runoff and cattle.	
		Elevated temperatures.	Sand mining activities, upstream dams (Balfour and Harhoff).	
Geom	B/C	Reduced transport capacity.	Upstream farm dams and Balfour and Harhoff Dams.	F
		Increased sediment supply.	Erosion of the upstream tributaries in the farming areas.	NF
		Slight reduction in connectivity.	Upstream farm dams and two moderately large dams.	F/NF
		Slight reduction in channel width.	Sedimentation and reduced floods.	
Rip veg	B/C	Higher than expected woody and non-woody cover.	Reduced or loss of dry season base flows.	F
		Reduced indigenous riparian species cover and proportions in lower and upper zones.	Moderate to high alien infestation in lower and upper zones respectively.	NF
Fish	D	Altered habitat diversity (fluctuation from natural composition) as a result of flow modification (especially low flow).	Balfour Dam and abstraction.	F

	PES	Causes	Sources	F/NF
		Decreased overhanging vegetation as cover for fish.	Increased bank erosion related to agricultural and livestock farming.	NF
		Increased sedimentation result in deterioration of substrate as habitat (clogging interstitial spaces, loss of important spawning habitats, etc.).	Bank erosion and vegetation removal (grazing) contribute to increased sedimentation.	
		Decreased species diversity and abundance (especially small species) as result of presence of aggressive alien predator (<i>M. salmoides</i>).	Presence of aggressive alien predatory species (<i>M. salmoides</i>) naturally spreading and introduced for recreation/angling.	
		Decreased bottom substrate quality.	Impact of bottom feeding alien <i>C. carpio</i> and siltation.	
		Decreased fish species abundance.	Poaching.	
		Presence of migration barriers reduces migration success (breeding, feeding and dispersal) of some species.	Dams and various weirs. Also farm dams in tributaries reduce refuge areas.	
Inverts	D	Increased periods of very low flow.	Upstream dam and abstractions.	F

1.4 RESULTS: PRESENT ECOLOGICAL STATE

Driver Components	PES	Trend
GEOMORPHOLOGY	B/C	Negative
WATER QUALITY	C/D	Negative
DIATOMS	C	
Response Components	PES	Trend
FISH	D	Stable
MACRO INVERTEBRATES	D	Stable
INSTREAM	D	
RIPARIAN VEGETATION	B/C	Negative
ECOSTATUS	C	

The C EcoStatus PES can be contributed to flow related impacts which include altered flow regime due to Balfour and Harhoff Dams and non-flow related impacts include deteriorated water quality due to WWTW and agriculture, erosion and alien species (fish and vegetation).

1.5 SUITABILITY AS FUTURE BIOMONITORING SITE

This portion of the Suikerbosrand River catchment is largely natural, there are no significant abstractions or discharges influencing the river flow. OSAEH 11.15 is at the same locality as

EWR 9 and considering that the lower reaches of the Suikerbosrand are impacted by mining and other industrial activities this site should be included in a monitoring programme.
