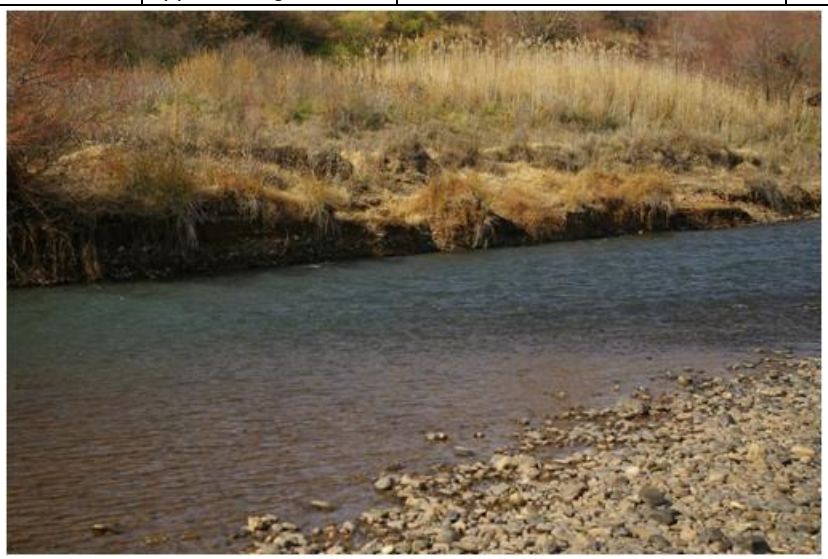
1 JBS31 (EFR K7: LOWER KRAAI)

The information is summarised from WFA (2010a;b).

1.1 SITE DESCRIPTION

The Kraai River is a tributary of the Orange River which flows near Barkley East in the Eastern Cape. The river originates to the south of Lesotho and flows westward, where it joins the Orange near Aliwal North. Agricultural intensity in the area has declined since the 1980's, with many of the slopes previously cultivated now being abandoned to pasture or grassland. For the purposes of the EFR study, the Kraai River was delineated into three MRUs. EFR K7 is situated in the lower reaches of the Kraai River in MRU C approximately 42 km from the Orange River confluence. The landuse in this reach is dominated by irrigation and dry land agriculture and aquaculture. The site is approximately 30 m wide, and riffles are cobble/gravel bed dominated. Grazing and trampling pressure is high on the LB. Flow sensitive habitats for fish (FS and FD) are very well represented at the site and overall habitat diversity at site very good with all flow-depth categories well represented although overhanging vegetation and undercut banks are absent in FS and FD habitats. Macroinvertebrate habitat is very good although aquatic vegetation and mud habitats are limited.

Location	EFR K7 Lower Kraai	**Altitude**	1327 m
Longitude	26.92055	**Latitude**	-30.83055
EcoRegion	Nama Karoo 26	**Quaternary catchment**	D31M
Water Management Area	Upper Orange	**Geomorphological zone**	Lowland Foothills



EFR K7, Lower Kraai River. Cobble/gravel bed dominated riffle.

1.2 PRESENT ECOLOGICAL STATE (PES)

Geom	The PES is close to reference condition and is only slightly modified from natural. Although base flows are slightly reduced the small farm dams and weirs upstream, and extensive agriculture in the catchment, have not had a measurable impact on the geomorphology at the site. High flows and floods are relatively unimpacted by the changes in the catchment, and the geomorphology at this site – dominated by larger cobble/gravel bed elements – is

	not sensitive to the small changes in base flows.
WQ	Salt levels as slightly elevated naturally. Some impacts from toxicants are expected due to farming-related pesticides and fertilizer use. Aluminium levels are high. The source of the aluminium shown in the Kraai data is unclear and the likely source of aluminium in the surface water is due to alum or aluminium sulphate used in most water treatment processes as a flocculating agent for suspended solids.
Fish	All the expected fish species are still present in this river reach albeit in a slightly reduced FROC. The primary changes responsible for deterioration in the fish assemblage include the loss of some FS and FD habitat as a result of flow modification, possibly slight deterioration in bottom substrate habitats related to some sedimentation and benthic algal growth, water quality deterioration (especially toxins and possibly nutrients). Some loss of marginal zone overhanging vegetation furthermore reducing cover for especially *B. anoplus*. The presence of the bottom feeding alien *C. carpio* contributes to bottom substrate disturbance while the potential presence of predatory alien species may further impact on indigenous fish. Presence of small migration barriers has a further contribution to the PES.
Inverts	2010 SASS5 score: 81 No of Taxa: 13 ASPT: 6.2 Key taxa expected but not observed included Heptageniidae, Dytiscidae, Hydracarina, Corixidae, Coenagrionidae, Oligochaeta and Ancylidae. Only two species of Baetidae were recorded, and only one species of hydropsychid caddisflies was recorded. The fauna was dominated by Chironomidae, which were very abundant (D abundance). Baetid mayflies were dominated by the highly tolerant *Baetis harrisoni,* and blackflies were dominated by the pest blackfly *Simulium damnosume)*. Sensitive taxa recorded included stoneflies (Perlidae) and Leptophlebiidae. The high abundance of Chironomidae indicates organic enrichment.
Rip veg	**Marginal zone:** Mostly open cobble/boulder and some alluvial deposits*. G. virgatum, S. mucronata* and *C. marginatus* are dominant species. **Lower zone:** Also mostly an open cobble bed, with low vegetation cover. Dominant species are the same as the marginal zone, together with *C. dactylon* and *Sporobolis spp.* **Upper zone:** Alluvial terraces and banks are dominated by woody vegetation, mainly *Salix (*both indigenous and exotic*), Lycium hirsutum (*endemic) and *P. australis.* Alien vegetation is present in all the zones – especially the upper zone.
Diatoms	Diatom results are based on samples taken during 2008 - 2010 at various sites situated in MRU C. From the range of samples assessed it is evident that organic pollution and elevated nutrient levels are problematic in this reach. Calcium-based salinity is present and it seems that the river is very turbid at times. The overall EC of this reach in terms of biological water quality is a C.

1.3 MAIN IMPACTS AT THE SITE

	PES	Causes	Sources	F/NF
WQ	B/C	Elevated nutrients and potential toxicant loads. Elevations in turbidity levels.	Agricultural activities.	NF
Geom	A/B	Slight increased sediment yields from catchment.	Cultivation has cleared some slopes. Change in flow.	F/NF
Rip Veg	C	Reduced indigenous cover on marginal and lower zone.	Reduced base flows.	F
		Reduced indigenous cover, abundance& species composition.	Exotic species.	NF
		Reduced recruitment.	Grazing and trampling pressure (right bank) and competition with exotic species.	
Fish	C	Decrease in FROC and abundance fish species with preference for fast habitats.	Slight decreased base flows.	F
		Deterioration of substrate habitat .	Bank erosion and some catchment erosion (sedimentation).	F/NF

	PES	Causes	Sources	F/NF
		Decreased substrate quality related to increased benthic growth.	Increased nutrients and organics.	NF
		Decreased water quality.	High nutrients, organics and possibly toxins (aluminum) – agriculture.	
		Decreased species diversity and abundance (especially small species).	Presence of aggressive alien predatory species.	
		Increased turbidity and disturbed bottom substrates.	Presence of alien *C. carpio*.	
		Decreased overhanging vegetation as cover.	Increased bank erosion and alien vegetation.	
		reduced migration success (breeding, feeding and dispersal) of some species.	Barriers: Some small dams/weirs.	
Inverts	C	Zero flows.	Abstraction.	F
		Organic enrichment.	Irrigated agriculture.	NF

1.4 RESULTS: PRESENT ECOLOGICAL STATE

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

Agricultural practices in the catchment seem to be the main impact in this reach leading to small driver changes which include decreased flows, zero flows, and increased nutrient levels. Alien fish and riparian vegetation species also impact on the site. Riparian vegetation has a negative trend due to increased growth of alien vegetation.

1.5 SUITABILITY AS FUTURE BIOMONITORING SITE

Habitat at the site is good for biotic monitoring. The presence of rare and unique riparian vegetation as well as the sensitivity of the habitat associated with a small and steep (gradient) river in the upper reaches, increases the ecological importance of this system.

The river is also widely used for recreational activities such as river rafting and fly-fishing in the Rhodes area.