

1 JBS28 (EFR C5: UPPER CALEDON)

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

1.1 SITE DESCRIPTION

For the purposes of the EFR study, the Caledon River was delineated into four MRUs. EFR C5 is situated in the upper reaches of the Caledon River on the border of MRU A and B which is just upstream of the Klein Caledon River confluence. The site is approximately 10 m wide, and alluvial, although some bedrock is exposed on the lower bank with rapids being boulder/cobble/bedrock dominated. Grazing and trampling pressure is high on both banks and high levels of erosion were present. Flow sensitive habitats for fish (FS and FD) are very well represented at the site and although habitat diversity is good there is potentially some loss of deep areas due to sedimentation. Macroinvertebrate habitat is moderate with limited stones-out-of-current, marginal vegetation in current and aquatic vegetation habitats.

The sediment production in the catchment is very high as much of the catchment has been cleared for cultivation, and grazing pressures are high. The steep slopes, poor vegetation cover and intense rainfall events promote erosion. Dongas across the catchment are widespread. Exotic vegetation is, in places, play some role in stabilising sections of eroding banks and dongas. This high sediment load is reflected in the instream condition of the river. The original bed of the river was probably gravels and cobbles with some sands. These larger bed elements have been smothered by the high sands and fine loads from the eroding lands in the catchment. Some cut banks near the EFR site indicate up to 2 metres of fine sediment having been deposited over the original cobble beds over only a few flow events.

Location	EFR C5 Upper Caledon	Altitude	1640 m
Longitude	28.3875	Latitude	-28.65078
EcoRegion	Eastern Escarpment Mountains 15	Quaternary catchment	D21A
Water Management Area	Upper Orange	Geomorphological zone	Lowland Foothills



EFR C5, Caledon River. The site under different flow conditions.

1.2 PRESENT ECOLOGICAL STATE (PES)

Geom	This is primarily attributed to the high sediment loads (sands and fines) being introduced from the eroding upstream hill slopes and associated drainage lines, and destabilisation of the banks along the channel. These impacts have caused large changes to the condition of the instream habitats through reduction in cobble and gravel in-channel habitats, and loss of marginal vegetation.
WQ	Salinity levels are naturally elevated. Suspected toxics and suspended solids from upstream farming activities dominate the water quality assessment.
Fish	Two of the expected fish species (<i>A. sclateri</i> and <i>L. capensis</i>) have disappeared from this river reach, primarily as a result of habitat deterioration. Both these species have a preference for fast habitats over rocky substrates, which have been extensively altered by sedimentation in this reach. The FROC of the two fish species presently occurring within this reach have been reduced. <i>Labeobarbus aeneus</i> is also thought to have been primarily impacted by the deterioration of bottom substrates by siltation, while the impact on overhanging vegetation as cover (trampling, overgrazing, bank erosion) probably have the biggest impact on the FROC of <i>Barbus anoplus</i> . The presence of predatory alien fish species (<i>Oncorhynchus mykiss</i> and <i>Salmo trutta</i>) is thought to be another primary impact on the fish assemblage of this reach.
Inverts	2010 SASS5 score: 97 No of Taxa: 17 ASPT: 5.7 Key taxa expected but not observed included Perlidae, Heptageniidae, Dytiscidae, Caenidae, Hydracarina, Dixidae, Ecnomidae, and Lymnaeidae. Only two species of Baetidae were recorded, and only one species of hydropsychid caddisflies was recorded. The fauna was dominated by baetid mayflies (mainly <i>Baetis harrisoni</i>), and blackflies (mainly <i>Simulium nigritarse</i> and <i>S. medusaeforme</i>). These species are highly tolerant of water quality deterioration.
Rip veg	Marginal Zone: Patchy, open boulder/cobble with <i>G. virgatum</i> and <i>S. mucronata</i> as woody indigenous riparian obligates. Alluvial deposits with cobble areas dominated by sedges, especially <i>C. marginatus</i> . Composition is close to reference, but cover has been reduced by high grazing and trampling pressure. Reduced base flows would favour sedge establishment, but this is marginally evident due to the overriding effect of domestic stock (grazing and trampling). Because grasses are more palatable than sedges, the latter has increased at the expense of the former under the current grazing regime. Increased sediment loads do not appear to have resulted in changes to riparian vegetation as an impact on its own, but together with grazing, has favoured the establishment of <i>C. marginatus</i> . Lower Zone: Portions of the lower zone are dominated by low density sedges (<i>C. marginatus</i>) and mixed with hydrophilic grasses. Grassed terraces have a high degree of trampling which has caused bank slumping and accelerated erosion. Exotic woody species occur in the zone (20% cover). Increased sediment loads do not appear to have resulted in changes to the riparian vegetation. Upper Zone: Grassland dominated, with grasses that indicate overutilization common. High cover (% aerial) by <i>Artemisia affra</i> also supports the overgrazed landuse. Woody exotic cover is high (20% aerial cover), especially where banks have been destabilized by overgrazing and trampling.
Diatoms	Diatom results are based on samples taken during 2010 at various sites situated in MRU A/B. There are indications of elevated nutrient levels as well as elevated turbidity and calcium-based salinity although water quality data indicated that salinity and nutrient levels are naturally elevated. Pollution levels are elevated at this site and organic pollution may be problematic. The biological water quality however seemed in a good condition as the reach upstream of the site is situated in the Golden Gate Nature Reserve. The Ecological Category (EC) for this reach is a B.

1.3 MAIN IMPACTS AT THE SITE

	PES	Causes	Sources	F/NF
WQ	B/C	Although this system is naturally turbid, elevated sediment levels are present due to land-use activities, particularly from the Lesotho Lowlands area. These activities also result in elevated nutrients and potential toxicant loads due to fertilizer and pesticide use.	Agriculture - Some toxicant and nutrient loading expected.	NF
Geom	C	Increased sediment yields from catchment.	Clearing of catchment for cultivation; high grazing pressure.	NF

	PES	Causes	Sources	F/NF
		Bank destabilization.	Grazing/trampling, tree removal, high fine loads deposited over more stable original cobble beds due to increased sediment yields.	
Rip vegn	C	Reduced vegetation cover and abundance.	Grazing and trampling.	NF
		Species compositional changes.	Perennial (15% average) and annual (5% average) exotic species.	
Fish	D	Decreased overhanging vegetation as cover for fish.	Agriculture – bank erosion.	NF
		Deterioration of substrate as habitat (clogging interstitial spaces, loss of important spawning habitats, etc.).	Bank erosion and extensive overgrazing.	
		Decreased substrate quality related to increased benthic growth.	Agriculture: increased nutrients and organics.	
		Impact on species with requirement for high water quality.	Over grazing, human settlements and agriculture.	
		Decreased species diversity and abundance (especially small species).	Presence of aggressive alien predatory species.	
		Increased turbidity and disturbed bottom substrates.	Erosion (agriculture).	
		Presence of migration barriers reduces migration success (breeding, feeding and dispersal) of some species.	Small barriers in tributaries and larger weirs downstream of site in Caledon River.	
Inverts	C	Increased sedimentation.	Farming activities (crops).	NF
		Increased nutrient loads.	Livestock.	

1.4 RESULTS: PRESENT ECOLOGICAL STATE

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

The main reasons for the PES are grazing and trampling, bank erosion, sedimentation, exotic vegetation and fish species. Geomorphology has a negative trend and this is due to erosion that will still increase with resulting increased sedimentation. Riparian vegetation is largely stable because grazing prevents exotic vegetation from increasing.

1.5 SUITABILITY AS FUTURE BIOMONITORING SITE

The site is adequate for biotic monitoring. The site is situated in the upper Caledon River bordering the Golden Gate National Park. Most of the river reach has Lesotho on the left bank (LB) with associated sedimentation problems due to land-use activities. Considerable irrigation development opportunity has been planned for small farmers in the Lesotho Lowlands area, which might exacerbate existing erosion problems depending on land management practices.

