A systematic biomonitoring survey of the Mogol River Catchment, Limpopo Province.

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Introduction.

The Mogol River rises in the bushveld basin, approximately 25km to the west of Nylstroom and flows northwards for approximately 200 km before joining the Limpopo River. The lower catchment is dominated by game farming, while the upper catchment is dominated by irrigated agriculture.

Important, perennial tributaries to the Mogol include the Sterkstroom, Taaibosspruit, Frikkies se loop, Loubadspruit, Sand, Klein Sand, Rietspruit and Dwars Rivers.

Only one large dam, the Mokolo Dam occurs in the catchment. Flow below the Mokolo Dam is regulated and here the system experiences periodic pulses of flow throughout the year. Upstream of Mokolo Dam, the system is considered to be perennial, although in recent times the main river is becoming more seasonal in nature.

The Mogol River below the Mokolo Dam is heavily infested with the common reed, *Phragmites mauritianus*. The reed is thought to be impacting on releases of water from the Mokolo Dam and as a result, there have been numerous attempts by the Mokolo Irrigation Board, to eradicate the reeds through the aerial spraying of the herbicide Roundup. This activity gave rise to concerns in the Department of Environmental Affairs and as a result, the river was prioritized for an ecological assessment during the 2002 period.

Angliss *et al* (2003) conducted a systematic biomonitoring survey of perennial rivers of the Mogol Catchment. A total of 30 sites were surveyed using standard River Health Programme protocols, between May and September 2002. All sites were assessed for fish, invertebrates, riparian vegetation, and geomorphology. *In situ* water quality was recorded and diatoms were collected.

At the time of the survey, the river was not flowing in its lower reaches near the Limpopo confluence. A monitoring site (A4Mogo-monte) was identified in this region but could not be surveyed.

Mogol Catchment. From Midgely *et al* (1994)

Tertiary Catchment	A42
Gross Catchment Area	8395 km^2

Rainfall. From Midgely *et al* (1994)

MAP max/min mm	667 / 428

Geology. From Midgely *et al* (1994)
The Mogol River and its tributaries originate in a region of porous consolidated and unconsolidated sedimentary strata and then flow through a region of intercalated arenaceous and argillaceous strata before reaching the Limpopo River.

Ecoregions. Shapefiles provided by the Department of Water Affairs and Forestry. Kleynhans *et al* (2002)

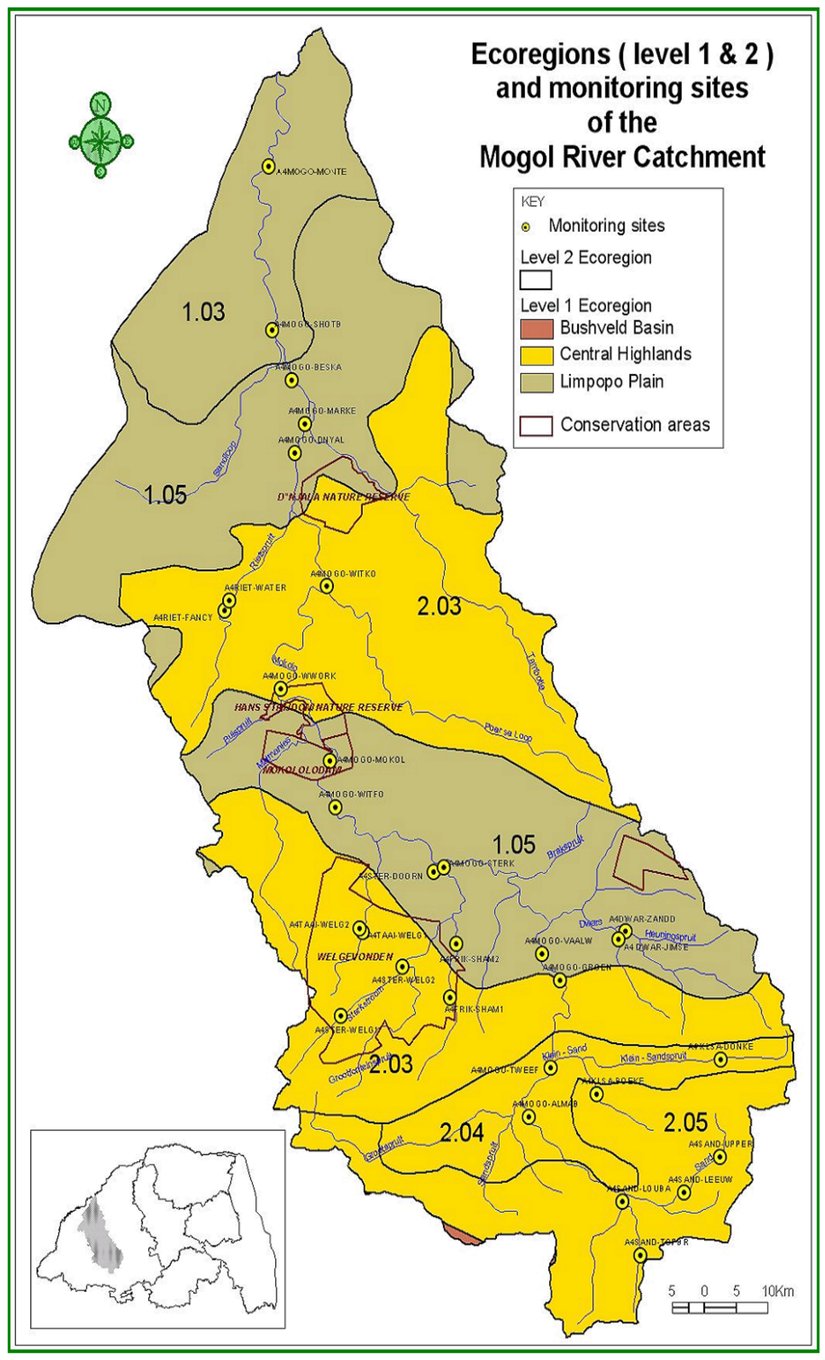
Vegetation. From Low and Rebelo (1996)
Savanna
12 Waterberg Moist Mountain Bushveld.
17 Sweet Bushveld.
18 Mixed Bushveld.

Sand mining has a serious impact on the riverine habitats. Access to the river for mining purposes destroys the natural riparian vegetation, opening this area up for the invasion of alien plants.

Deep pools in the lower river provide refuge for fish for both the Mogol and Limpopo rivers and habitat for hippos.

Nature reserves in the middle catchment afford the river protection from regional developments and contribute towards good instream habitat.

Although only ten alien plant species were identified in the catchment the extent of invasion by some of these species is a cause for concern. Three species involved are poplars (*Populus* sp), mulberry (*Morus alba*) and seringa (*Melia azedarach)*. At two sites (A4mogo-alma and A4sand-upper) the extent of invasion by poplars was rated as *very high.* At these sites the plant density ranged from 1 - 4 plants per square meter and in both cases more than 30 % of the area selected, contained poplars. The invasion by aliens could not be related to flooding, as is the case with reeds and terrestrial plants and seemed to be localized in certain sites.

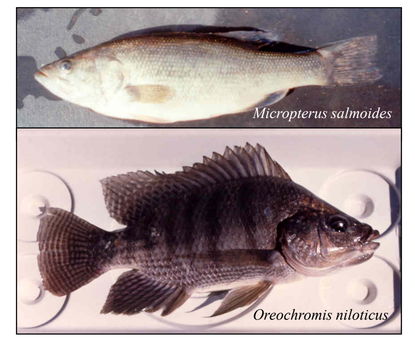


The influence of flow regulation and the absence of the normal flooding regime, caused by the Mokolo Dam, are clearly illustrated by the invasion of the riparian zone by reeds and terrestrial woody species.

In most of the tributaries and the main stream of the Mogol River above the dam the extent of invasion, for both reeds and terrestrials, range from very low to low. Below the dam this situation however changes and the extent of invasion, by both components, is higher at all the sites ranging from medium to high.

Although chemical spraying of the reeds had reportedly been undertaken, no marked effect of the exercise was visible at the sites that were monitored.

The Mokolo Dam is used as a reservoir to supply water to irrigation farmers in the Ellisras area. Pulsed releases have a large impact on the downstream aquatic biota and do not reflect the natural seasonality of the river.



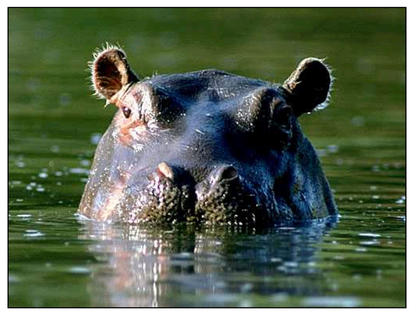
Alien fish are largely predatory and are responsible for destroying fish populations as well as their insect food base. Black bass (*Micropterus salmoides*) were found at two river monitoring sites in the middle catchment. Nile Tilapia (*Oreochromis niloticus*) have been collected in the Limpopo River and pose a threat to the Blue Kurper (*Oreochromis mossambicus*) in that they can cross breed and pollute the gene pool of the indigenous fish.

Alien aquatic plants, and in particular, *Myriophyllum aquaticum* are invading standing water habitats. Currently the problem is not regarded as serious, but the situation requires vigilance and frequent monitoring.

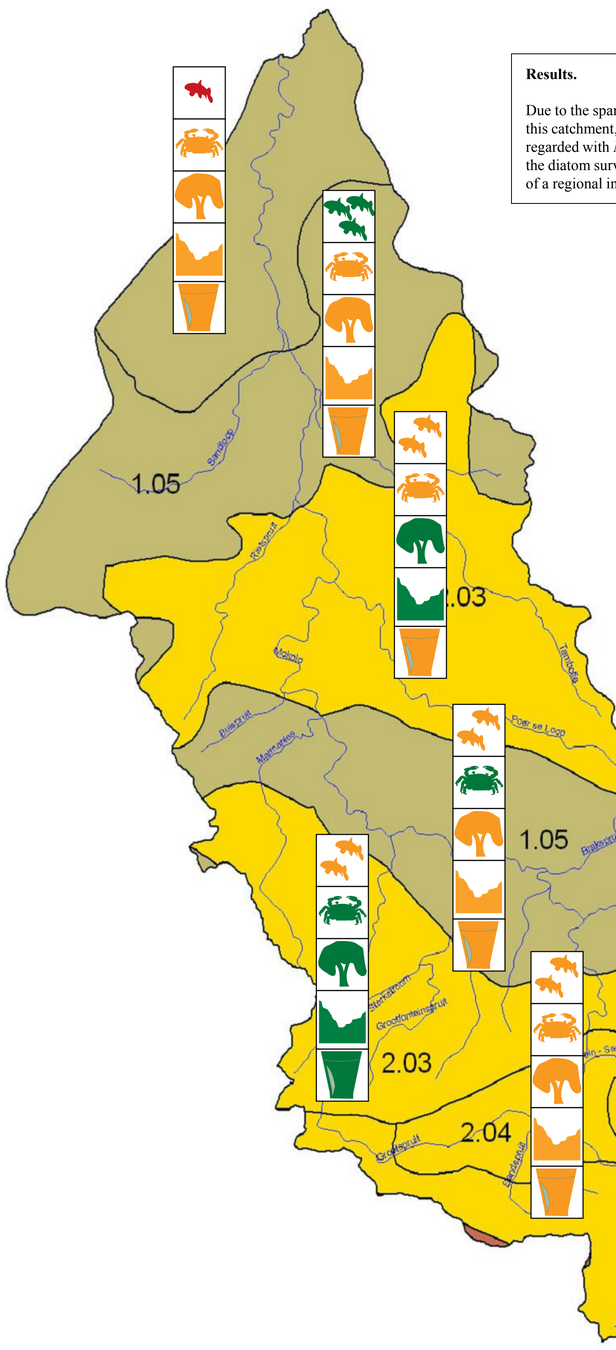
Table 1: Alien plant species recorded in the riparian zone of The Mogol River Catchment.

Botanical names	Common names
Eucalyptus sp	Bluegums
Morus alba	Mulberry
Melia azedarach	Seringa
Opuntia	Prickly pear
Lantana camara	lantana
Persicum sp	Peach
Populus sp	Poplar
Ligustrum sp	Privet sp
Ricinus communis	Castor oil
Salix babylonica	Willow
Sesbania punicea	
Sesbania sesban	

Mountain tributaries provide habitat diversity and refuge for a wide variety of aquatic biota.



Hippo's and crocodiles occur in areas within the catchment where some form of protection and adequate grazing occur. Hippos living in the lower section of the river migrate to the Limpopo as the river dries up. This is a problem as the water levels in the Limpopo also drop quite low during the dry seasons and grazing is virtually non-existent at these times. These animals then have to be fed at great cost and water has to be pumped for them. Crocodiles have only been found in dams in this system.



Results.

Due to the sparsity of ecological base line data for this catchment, results of this survey should be regarded with *Moderate Confidence*. Results from the diatom survey are being used for the development of a regional index.

Indicators of river health and what they measure	
Fish populations	Fish (number of species, sensitivity, size and condition) are good indicators of the longer-term influences on a river reach and the general habitat conditions.
Aquatic invertebrates	A variety of invertebrate organisms (insect larvae, snails, crabs, worms) require specific aquatic habitat types and water quality for at least part of their life cycle.
Riparian vegetation	Healthy riverbanks maintain the form of the river channel, provide habitat for species (aquatic and terrestrial) and filter sediment, minerals and light.
Geomorphology	Describes the streambed characteristics that have an effect on water flow.
Water quality	The chemical and physical properties of water determine its suitability for use

River health categories	
Category	Meaning
Natural	No or negligible modification of aquatic habitats and biota
Good	Some human-related impact; biodiversity largely intact
Fair	Significant pressure from development and land-use; sensitive species may be lost
Poor	Extensive use of river ecosystem; natural functioning disrupted

Conclusions.

The Mogol River Catchment is considered to be in a fair – good condition with most good condition reaches flowing through protected nature reserves. Flow regulation from both the Mokolo Dam and from the myriad of farm dams, which occur in the catchment, appears to be the most significant impact observed. The reduction of flow in the lower catchment has contributed towards significant channel modification, with reed and terrestrial plant encroachment. Initial suspicions that the aerial spraying of reeds has caused serious impact within the lower river appear to be overshadowed by the impacts of regulated flow. The abundance of alien plant species in the middle and upper catchment is of concern.

The results of this study will shortly be published as a State of the Rivers Report for the Mogol Catchment. Information from this report will be made available to relevant role players in the catchment.

Core Management Recommendations.

1. An ecological reserve should be defined and implemented in the catchment.
2. Releases from Mokolo Dam should be coordinated, to more effectively address the ecological requirements of the downstream river.
3. Negotiations should be entered into with landowners, for the purposes of affording both long term protection and long term access to prioritized biomonitoring sites.
4. Repeat biomonitoring surveys should be scheduled, so as to collect representative seasonal data in the catchment.
5. There should be a review of sand mining activities in the catchment.
6. A strategic plan for the eradication of alien invasive plants from the catchment should be coordinated with the Working for Water programme and areas of activity prioritized.

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Acknowledgements.

Mogol Irrigation Board
Welgevonden Nature Reserve
Shambala Nature Reserve
Mokolo Ranch
University of Venda
Rhodes University