

Estuaries

St Lucia 2001 to 2012: A decade of drought

A new publication records the impacts of the 2001 to 2012 drought at St Lucia and the management interventions that were conducted.

Background

In 2001 rainfall in the catchments of Lake St Lucia was above average. The rivers entering the lake were flowing strongly, the St Lucia mouth was open and salinity in the system was low.

Then the situation changed. Below average rainfall was recorded most years for the period 2001 to 2012, and there was little flow in the rivers. The St Lucia mouth closed and the authorities decided against dredging it open.

This was a controversial management decision. The cumulative freshwater deficit manifested as lowered water levels and hypersalinity.

At the onset of the drought the accepted management philosophy of breaching the mouth to maintain connectivity



The confluence of the Msunduzi (bottom right) and the Mfolozi Rivers (centre) which then enter the sea as the Mfolozi Mouth.

between the lake and the sea was overturned, and the mouth was allowed to stay closed. However, it was soon after the start of the drought, during the Department of Water Affairs water reserve determination exercise, that the full implications of having the Mfolozi River separated from St Lucia were realised.

But it was still strongly embedded in the management philosophy that, if the Mfolozi River was reconnected to St Lucia, the quantity of sediments that would enter St Lucia would be of long-term detriment to the system, and it would be preferable to allow the system to be affected by short-term lowering of water levels.

Impacts of the drought

During the drought there were a number of physical changes. Large portions of the St Lucia lake bed dried. As the lake dried up salt concentrated in the remaining water reaching record heights of salinity.

It then dried up completely, leaving a crust of precipitated salt on the cracked mud. Wind shifted sediments within and out of the lake basin. Shoreline margins changed shape and hummocks of grass trapped mounds of sediment.

There have been many interesting biological responses over this past decade. These have included die-offs of estuarine fish and little opportunity for them to recruit from the sea.

In response, with the lack of competition, the Tilapia populations increased exponentially. So much so that thousands of Great White Pelicans were consuming an estimated 15 t of these fish each day during peak periods.

Groundwater seepage along at least 40 km of St Lucia's 400 km of shoreline supported a rich groundwater-



At the peak of the drought the whole of the North Lake dried up.

dependent vegetation, and in other areas there have been large 'fields' of succulent salt-march, new areas of reed beds line the Narrows and the mangroves are still healthy. In the northern part of the lake, where salinity was at its highest, the food chain was reduced to a simple form with only few species and characterised by a bloom of orange-coloured cyanobacteria.

Management interventions

In the past decade the management authorities implemented several management actions. Initially, the effort was focused on the maintenance of the sediment trap inland of the mouth and the preparation to breach the mouth when the time was right. Then effort went into separating and keeping the Mfolozi Mouth separate from St Lucia – in line with the management objective of not allowing the Mfolozi into St Lucia for fear of increased sediment accumulation.

More recently, since 2008, the managers experimented with small-scale linkages of the Mfolozi River via the Back Channel – a disused channel excavated in about 1970. This has proved to be a highly successful management intervention, albeit only at a small scale.

It has allowed backed-up, sediment-free freshwater from the Mfolozi to enter St Lucia whenever the Mfolozi Estuary mouth closed, but this backing-up caused some of the low-lying sugar farms to be flooded.

In addition, whenever the Mfolozi Mouth has been open, sea water has entered St Lucia via this Back Channel at high spring tides, allowing some recruitment of marine

organisms. This has been a unidirectional movement – from the sea into St Lucia but not in the other direction.

In 2010, to synthesise the knowledge necessary to implement a re-linkage of the Mfolozi to St Lucia, the WRC supported a very successful 'Indaba' to allow all the involved scientists to present their knowledge. The proceedings of this have been published as the WRC **Report No. KV 255/10**.

The issue of sediment inputs is still largely an unknown. Indications are that the quantities of sediment brought down by the Mfolozi River are less than thought – and that a lot of the sediment was, in fact, of marine origin. It was in 2011 that the decision was taken to re-connect the Mfolozi to St Lucia via a newly-excavated Beach Channel.

Cyclone events

Other events have also impacted on the system during this drought period. Two important ones were associated with cyclones.

In March 2007 extreme high seas, caused by the coincidence of very high tides, storm surges and the influence of Cyclone Gamede, breached the St Lucia Mouth. This stayed open for six months before closing naturally.

In this time a large quantity of seawater flowed into St Lucia, raising water levels and introducing salt. What was the long-term influence of this, and was the mouth breach affected by the dredging that had been conducted some time prior to the breaching event? This was a natural 'management experiment' which still needs to be described and from which there is the opportunity to learn and, if necessary, to adapt future management strategies.

In March 2012, Cyclone Irina brought a lot of rain to St Lucia, but not to the inland catchment areas. This was not adequate to open the mouth.

However, from early September 2012, heavy and consistent rains caused the rivers to flow and break the drought. The summer of 2012/13 turned out to be particularly wet, with well above average rains falling in the catchment area.

All the rivers entering St Lucia carried water most of this summer period and the Mfolozi River overtopped into the abandoned Link Canal bringing huge quantities of freshwater into St Lucia. The water level in St Lucia increased by more than a metre in the summer period and salinity levels dropped.

St Lucia still has a shortage of freshwater and controversy about management continues. At the time of writing, a Global Environment Facility funded project was underway to assess the situation, and to make recommendations of various long-term options to relieve the situation. It would then set the course to rectify the problems relating to the long-term management of St Lucia.

WRC report

The WRC report on the St Lucia drought has three components, namely a description of available literature on the drought; a timeline of events and management interventions; and a description of the ecological responses to the drought and the management interventions.

The document produced is a record that will inform future managers and researchers of the 2001 to 2012 drought, and how it affected St Lucia.

The interpretation of events and the management of St Lucia are based on personal value judgements formed through experience and exposure to specific places and events. Nobody can predict the duration or magnitude of a drought. It therefore must be realised that all decisions were taken with the best of intentions at a time when nobody could know that the drought could last for over a decade.

Recommendations for future research

The St Lucia estuarine system has catchments that are transformed by human activities. With time the degree of transformation will increase, and this will impact St Lucia.

The changes will be related to freshwater supply and to accelerated sedimentation. New threats are those of altered water quality and the impacts of alien invasive species. Future research should focus on all of these topics.

The scale of management should change to consider the full catchment and have a long-term view of future changes. Future research should be directed at ways to reduce catchment-level impacts. Management should not just be 'activated' during drought periods – but have a full wet-dry cycle level of consideration.

Further reading:

To order the report, *St Lucia 2001 to 2012: A decade of drought. Management interventions and what have learnt about the ecosystem* (Report No. TT 576/13) contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.