# Kruger Rivers Post-Flood Research Programme

**by Melissa Parsons**


*Photograph – Mark Rountree*

**Because of their size and social impact, the floods of February and March 2000 attracted the attention of the world. In Kruger National Park, flooding of the Sabie and Letaba Rivers caused significant damage to park infrastructure. Damage to bridges, buildings and roads has since been repaired, but what were the effects of the flood on river ecosystems?**

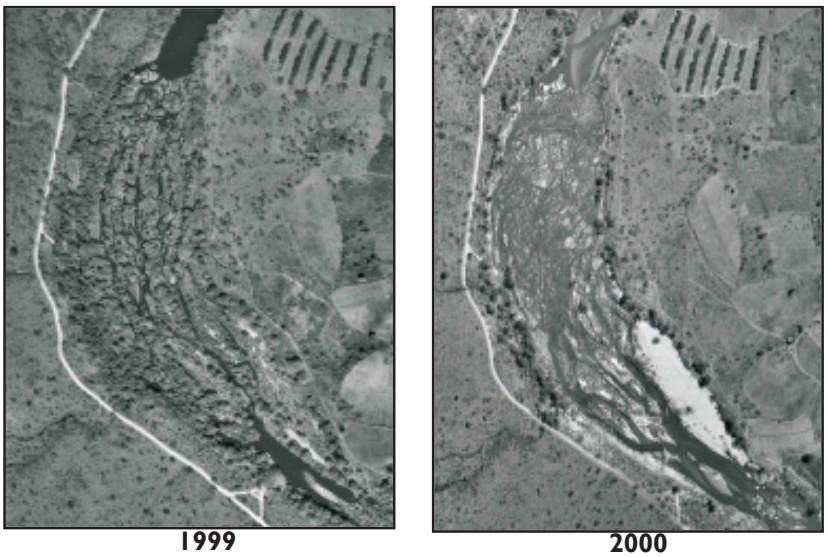
Floods of different sizes are an integral part of river ecosystems. Large, infrequently occurring floods, like the one in 2000, are important because they reorganize the physical environment by eroding and depositing sediment, removing riparian vegetation, and redistributing nutrients. Large floods may also alter instream faunal communities such as fish and macroinvertebrates.

But these large floods do not wipe the slate clean as we might think they do. Instead, floods leave a patchy biological and physical imprint because water velocity varies in different parts of the river channel and many riverine organisms are adapted to survive flooding. For example, many riparian plant species are able to withstand inundation by flood water, while others are able to regenerate from broken fragments.

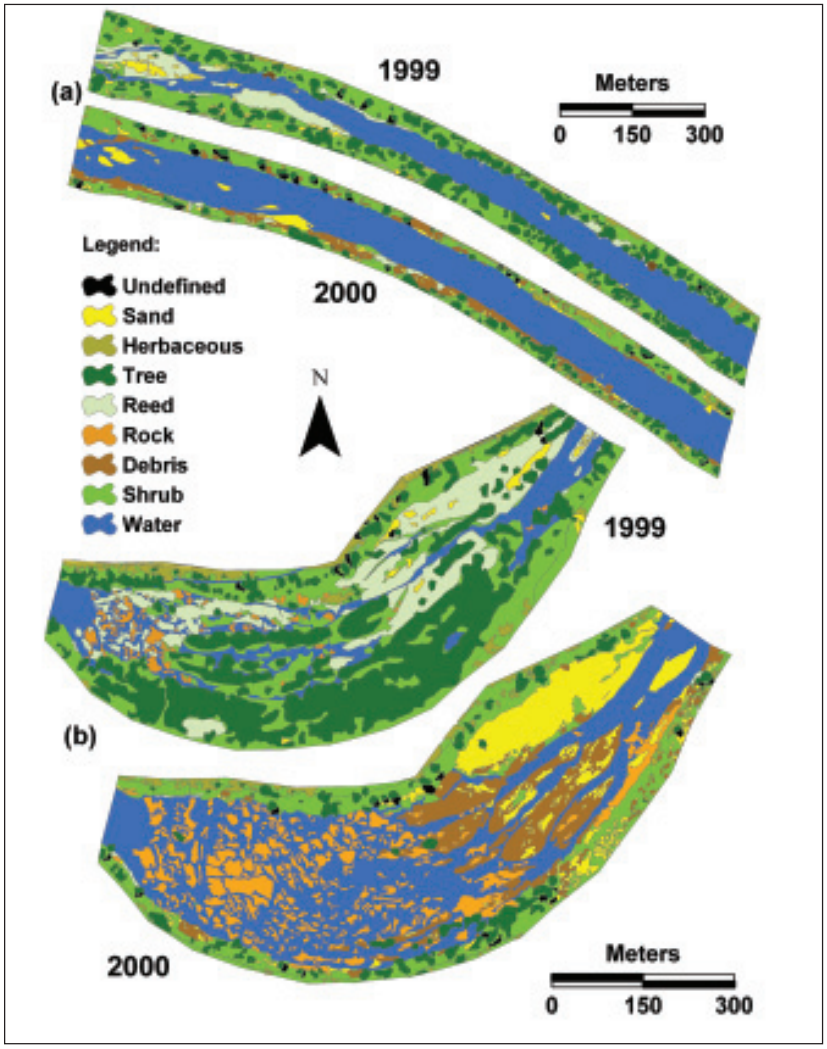
The parts of the physical environment and the organisms that survive a large flood have important implications for the subsequent response of a river, because they form the template upon which all future ecological processes take place. Thus, the 2000 flood has left an imprint that may influence river ecosystems in Kruger National Park for decades to come.

## MELLON FOUNDATION

Funded by the Andrew W. Mellon Foundation, the Centre for Water in the Environment and Kruger National Park have embarked on a research programme examining the response of Kruger Rivers to the 2000 flood. One of the first steps




*Aerial photographs of a section of river before (1999) and after (2000) the flood.*




*Landscape state change between 1999 (pre-flood) and 2000 (post-flood) in the a) braided and b) pool-rapid geomorphologies of the Sabie River.*

*Sycamore Fig (*Ficus sycomorus*) seedling.*

*Photograph – Melissa Parsons*

*Jackal-berry (*Diospyros mespiliformis*) seedling.*

*Photograph – Melissa Parsons*

*Tamboti (*Breonadia salicina*) seedlings usually establish in bedrock crevices.*

*Photograph – Melissa Parsons*

Photograph – Mark Rountree

*The flood damaged or removed many riparian plants.*

Photograph – Melissa Parsons

*Ongoing research will examine the importance of residual vegetation, such as this surviving adult Sycamore Fig.*

in the Post-Flood Research Programme was to document the initial imprint of the flood in the Sabie River.

Using GIS technology, we examined the effect of the flood on the mosaic of tree, shrub, reed, herbaceous vegetation, bedrock, sand, water and debris patches that occur within the river (see diagram).

## FLOOD MOSAICS

Differences between the pre- and post-flood mosaics showed that the flood stripped large amounts of trees, shrubs and reeds to expose the underlying physical template of bedrock, water and sand. Thus, the flood changed the river mosaic from a vegetated to an unvegetated state.

However, the flood did not remove all the vegetation patches along the river. Rather, the pattern and amount of residual vegetation patches varied in river sections with different geomorphology. For example, in the steeper pool-rapid sections vegetation stripping was severe, and few patches remained after the flood. But, in the lower-gradient braided sections, stripping was less severe, leaving a higher amount of residual shrub and tree vegetation patches.

Photograph – Melissa Parsons

*Expansion of a surviving reed patch (*Phragmites mauritianus*) into sand deposited by the flood.*

## RIPARIAN PLANTS

The flood also had a variable effect on individual riparian plant species. Densities of commonly occurring species such as Potato-bush, Matumi, Red Spikethorn, Bushveld Waterberry and Tamboti were significantly reduced because of destruction by floodwaters.

In contrast, densities of species

Photograph – Melissa Parsons.

*River Bushwillow (*Combretum erythrophyllum*) regenerating from the broken parent plant.*

Photograph – Melissa Parsons.

*The flood introduced a large number of woody debris piles, which offer favourable conditions for seedling recruitment.*

such as Cucumber Bush, Pigeonwood, Magic Guarri and Flame Climbing Bushwillow increased significantly after the flood because of recruitment from seed or regeneration from broken parts of the parent plant.

The imprint left by the flood provides a baseline for future research on the response of the river. A major part of the research will focus on post-flood vegetation response, and the factors that may influence the types of vegetation communities that develop, such as:

- the type, amount and location of residual species
- levels of herbivory on seedlings
- presence of alien weeds
- environmental influences such as drought, river flow and elevation within the channel.

## ECOLOGICAL RESERVE

The effects of the flood on the biophysical character of the Sabie River also raise questions about the Ecological Reserve. Instream Flow Requirements (IFRs) were proposed to maintain the pre-flood state, but marked changes in the biophysical character of the river may warrant a post-flood re-evaluation of IFRs. The Kruger Rivers Post-Flood Research Programme provides an excellent opportunity to test the post-flood applicability of IFRs, particularly because operation of the Injaka Dam, on a tributary of the Sabie River, will allow proper implementation of the Reserve in this very important river.

Studies on ecosystem response to catastrophic events such as the 1980 Mt St Helens volcanic eruption and the 1988 fires in Yellowstone National Park indicate that these ecosystems are shaping up to be similar to their pre-disturbance state. The Post Flood Research Programme will examine whether a similar trend emerges in the Sabie River.

**For further information on the Post-Flood Research Programme, including research opportunities within the Programme, please contact Dr. Melissa Parsons, at the Centre for Water in the Environment, (011) 717 6430.**