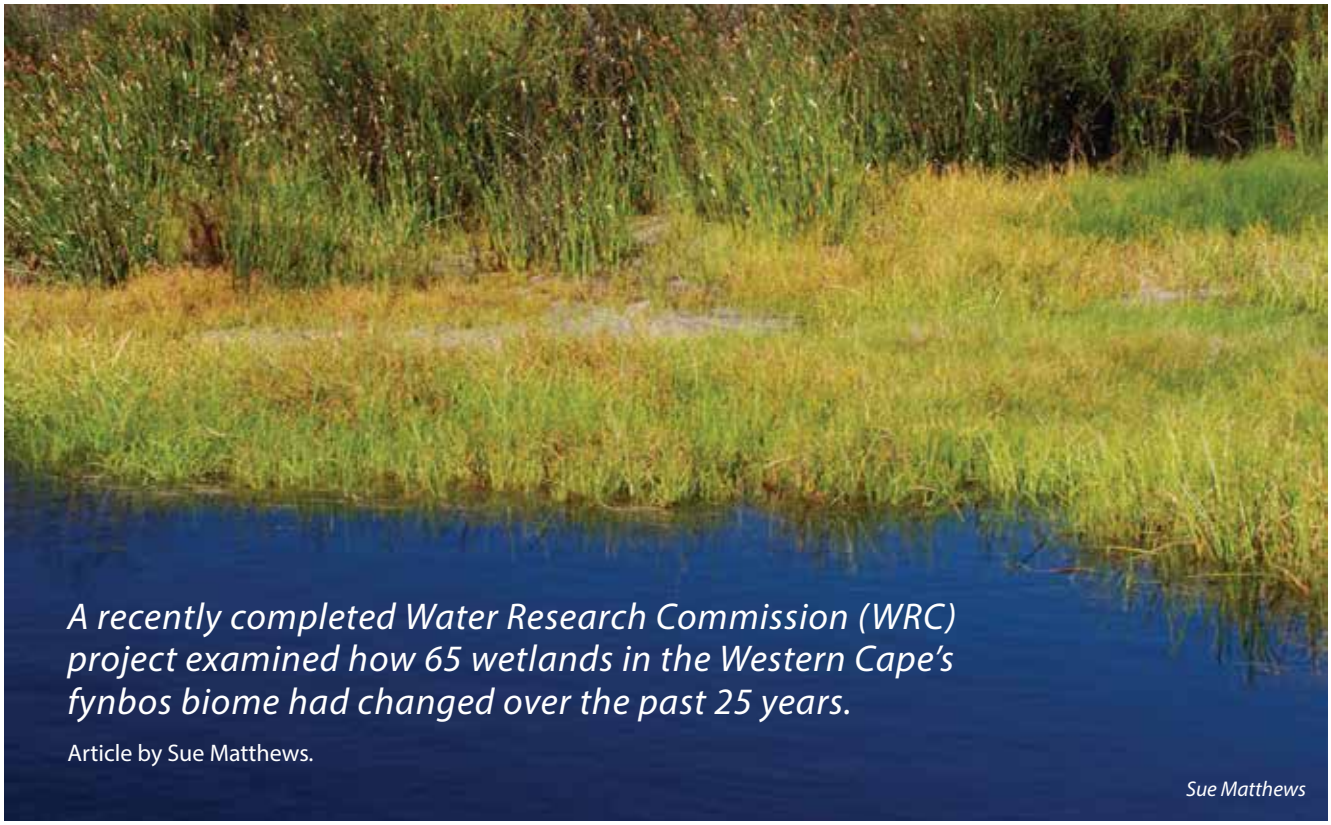
Wetlands

The Cape's fynbos wetlands – then and now



A recently completed Water Research Commission (WRC) project examined how 65 wetlands in the Western Cape's fynbos biome had changed over the past 25 years.

Article by Sue Matthews.

Sue Matthews

"We were chatting one day about the wetlands work that Mike Silberbauer and Jackie King [both formerly of the University of Cape Town (UCT)] had done in the late 1980s, and we thought 'wouldn't it be interesting to see what's happened to those wetlands?' " says project leader, Dr Heather Malan. "Once we knew that our project proposal to the WRC had been approved, the first task was to get hold of all that original material, which meant trawling in the depths of the building that I didn't know existed!"

A set of historical field notes was even found hidden behind some water pipes while clearing out the laboratory of the Freshwater Research Unit! Having been based in UCT's Zoology Department since its inception in 1984, the Freshwater Research Unit closed in 2012, but some of its staff and former students regrouped off-campus as the independent Freshwater Research Centre.

The project, entitled *'Trajectories of change in wetlands of the Fynbos Biome'* was therefore conducted under the auspices of the Freshwater Research Centre, but also involved researchers and students from UCT, North West University and UNISA.

By finding out how wetlands had changed – and why – the project team aimed to improve understanding of the factors leading to wetland degradation, and in so doing facilitate their conservation.

Locating the wetlands previously surveyed by Silberbauer and King was not always a simple task though.

"That was before the days of GIS and Google Earth, so they had recorded the geographical coordinates from 1:50 000 maps, which wasn't very accurate. We had to do a bit of detective work to figure out where some of the wetlands were, and pin-pointing the exact sampling site was often impossible," notes Dr Malan.

Annotated orthophotographs used in the original project were of great help, as were the old field sheets, which often included a description of how to get to a site, valuable insights into the flora and fauna, comments by landowners or other aspects noted during sampling. And thanks to the foresight and diligence of Mike Silberbauer, most of the results – mainly in the form of water chemistry measurements and species lists

of plants and invertebrates – had been collated in an electronic database that was fortunately still accessible.

A sampling programme was drawn up that ensured wetlands were generally visited in the same month of the year as the original project, unless they had been recorded as dry at that time, or where logistics made this impractical. In each case, *in situ* measurements were taken and water samples collected to assess water quality. In addition, diatoms, plants and invertebrates were sampled, and a rapid habitat assessment conducted.

Land use in the surrounding area was noted during field trips and checked using aerial photographs to infer changes in wetland plant species composition since the 1980s. The overall importance of the wetland, in terms of its ecological importance and sensitivity, direct human benefits and ecosystem services, was also scored. All of this information was used to determine each wetland's Present Ecological State, which could be compared to its likely condition at the time of the original survey, although Heather stresses that the historical state was "very much an educated guess, based on what we had in the way of old photos and reports".

Surprisingly, 29% of wetlands were found to be in a better condition – their scores pushing them into a higher ecological health category – than they were 25 years ago, and 24% were in much the same condition. By contrast, 23% of wetlands had deteriorated significantly, and 8% showed a slight deterioration. For the remaining 16% of wetlands, the change in ecological health either could not be determined or the wetland no longer exists. But even if all of those wetlands had deteriorated to some degree, the total percentage of wetlands in an improved or similar condition would still be in the majority.

The research showed that the main reason for improved ecological health is the protection of wetlands within new conservation areas, including the Table Mountain and Agulhas national parks, municipal reserves such as Kenilworth Racecourse Conservation Area and Witzands Aquifer Nature Reserve, and even private landowner initiatives like the Nuwejaars Special Wetland Management Area. Indeed, 51% of the wetlands have a better conservation status than they did in the late 1980s.

City of Cape Town

Khayelitsha Pool

The Khayelitsha Pool may originally have been a depression that filled as the water table rose in winter, but it was probably deepened at some stage to accommodate flow from the Kuils River, which was diverted south of the N2 road. The once seasonal river is now a perennial system as it receives a high volume of stormwater runoff and treated sewage effluent from the extensively developed catchment. Not surprisingly, perhaps, the Khayelitsha Pool was found to have the highest phosphate levels of all the wetlands surveyed in the project, and the second highest ammonium levels. Nevertheless, since the original survey it has become the centrepiece of the Khayelitsha Wetlands Park, an urban green space and recreational area managed by the the City of Cape Town's parks department. The pool, its reed beds and the surrounding wetlands provide habitat for a variety of birds, while the landscaped area includes a playground, skate park, picnic sites and footpaths. The site is also important for flood control and nutrient attenuation.

Matthew Buckland

Lake Michelle

Today Lake Michelle is a permanently inundated freshwater body, but it was once a seasonal saline wetland known as the Noordhoek Salt Pan. Although it has been completely transformed from its natural state, its condition is arguably better than it was 25 years ago. The pan was mined for salt until the 1920s, and in the 1930s it was used as a motor-racing track. During the 1970s it was excavated for a marina development that was never built, and subsequently used for the storage of treated sewage effluent. By the late 1980s, the land was heavily infested with alien acacias, but much of this was cleared when construction of the current residential development began in 2000. The eastern shore is now fringed with exotic garden plants, but the western and southern shores form part of an eco-estate, where restios and other indigenous species have been planted as a protective buffer, and the use of pesticides and fertilisers is strongly discouraged. Artificial wetlands have been created to 'cleanse' polluted stormwater runoff from the surrounding catchment, and water quality monitoring shows nutrient levels to be in the acceptable range. Regular sightings of otters on the estate are considered indicative of the good water quality and ecological condition. Lake Michelle therefore forms an effective buffer protecting the downstream Noordhoek Wetlands, which lie within the Table Mountain National Park, from water quality impacts arising in the catchment.

Wetland deterioration was usually caused by invasion by alien plants – chiefly acacias, pines and eucalypts – and urban or agricultural development. It manifested as poor water quality, with high nitrogen and/or phosphorus levels, and a proliferation of reeds such as *Phragmites australis* or *Typha capensis* in response to this nutrient enrichment, sedimentation and more constant water levels.

"We found that the condition of the wetland can be predicted fairly well from the land use in the area," says Dr Malan, "so looking at changes in land use via remote-sensing methods, for example, is a good broad-based way of monitoring wetlands."

These are the kind of practical considerations that can inform the National Wetlands Monitoring Programme, to be developed under a recently initiated WRC-funded project.

"Doing fieldwork is very expensive, although of course there is information you can only get when you go out into the field," she explains. "In fact, the results from this project show that diatoms have quite a lot of potential as water quality indicators for wetlands."

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This finding warrants further exploration, especially since other studies have recently demonstrated that aquatic invertebrates are less reliable for inferring water quality in wetlands, unlike in rivers, where the macroinvertebrate assemblage is the basis for the rapid biomonitoring tool, SASS – the South African Scoring System.

"If you think of invertebrates living in a seasonal pan, they have to be very tough to exist in a system that changes from fresh when the wetland is inundated during winter, to quite saline when much of the water evaporates in summer. They tend to be generalists, able to tolerate a wide range of conditions, while SASS works for rivers because those invertebrates have a narrow tolerance range."

For the National Wetlands Monitoring Programme, the project team believe that it would be best for each wetland to be subject to an initial in-depth assessment to prepare baseline information and to identify any issues or threats specific to that wetland,

after which a tailor-made monitoring strategy should be prepared. This would include sampling for selected water quality parameters and monitoring basic aspects like land-use change, as well as any specific issues – such as reed encroachment or pollution inputs – relevant for that particular wetland and likely to pose a threat to its future ecological health.

One realisation brought home to the project team, however, was that even highly degraded wetlands can have important benefits for people. This was well illustrated by Khayelitsha Pool on the Cape Flats, which is heavily impacted by development upstream and surrounded by low-cost housing. On the other hand, residential development does not necessarily mean that a wetland will be in poor condition, as demonstrated by Lake Michelle on the South Peninsula. At the opposite extreme, the wetland at the inflow of the Silvermine Dam is protected from development as it lies within the Table Mountain National Park.

While these three wetlands all fall within the Greater Cape Town Area, in rural areas further afield the condition of a wetland may by entirely dependent on the actions of just one or two of the surrounding landowners.

"As an academic researcher, realising how essential it is to work with the landowners was quite an eye opener for me," says Dr Malan. "We need to do more to incentivise people to protect wetlands, whether it's through education or tools such as tax breaks, because you can't conserve everything in a national park!"

To order the report, *Trajectories of change in wetlands of the Fynbos Biome from the late 1980s to 2014* (**Report No. 2183/1/14**) contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; or Email: orders@wrc.org.za.

Silvermine Dam Inflow

The Silvermine River rises in the Constantiaberg on the Peninsula mountain chain and flows into the sea at Fish Hoek, about 12 km downstream. A dam was built close to its source in 1898, but has not been used as a municipal water supply for some decades. The area formed part of the local authority Silvermine Nature Reserve until it was incorporated into the Table Mountain National Park in 1998. Since then, pine trees and other invasive alien vegetation in the catchment have been removed, and paths and a gravel road crossing the river upstream of the dam have been closed to restore natural habitat and prevent erosion. The environmental condition of the wetland at the dam's inflow is therefore likely to have improved since 1988, and it is in a near-pristine condition, with the low nutrients levels and pH typical of fynbos streams.

Sue Matthews