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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

TECHNICAL BRIEF

Wetlands

Ephemeral wetlands of Nelson Mandela Bay

A completed Water Research Commission (WRC) project studied the classification, biodiversity and management implications of the ephemeral wetlands of the Port Elizabeth area.

Background

Wetlands provide a variety of ecosystem services, from flood attenuation and water filtration to cultural benefits. More focus has been placed on wetland research in recent years in response to anthropogenic pressures on these aquatic ecosystems. Many tools and methods have been developed to identify and delineate wetlands in order to better manage them.

In the Eastern Cape there is a general paucity of research attention and general spatial data for wetlands. This WRC project therefore used existing tools to better understand the wetlands of the Nelson Mandela Bay Metropolitan Area (NMBMA), particularly the area's ephemeral wetlands, as these systems potentially have a high biodiversity as compared to other more permanent systems.

The main aims of this project, therefore, were to locate, demarcate and classify (type) wetlands in the NMBMA and to gather baseline data on abiotic variables and biotic parameters in a broad range of ephemeral wetland types.

It is believed that this study made great strides in the wetlands knowledge base, especially the issue of being able to predict and describe the functioning of ephemeral wetland systems based on key physical and biological factors.

Methodology

A range of desktop, field and laboratory methods were used that applied multiple spatial and temporal scales. GIS techniques were used to display spatial and temporal patterns and further statistical analyses were used to explain the relationship of the different wetland types to the surrounding environment.

The wetlands were mapped as a desktop study at a scale of 1: 25 000. Wetlands were then ground-truthed to confirm, modify and add information to the maps and give additional detail to the classification of selected sites.

A sub-set of field sites were then chosen across the NMBMA to represent the range of rainfall distribution and terrestrial vegetation across the metro, including the spatial distribution of wetlands. A group of 46 sites were each sampled once, between 2012 and 2013, and were classified to Level 6 of the CS.

A number of parameters were measured in the field, and soil and water samples were taken to the laboratory for further analyses. Several different types of biological data were collected: vegetation, algae, aquatic invertebrates and tadpoles. Of those 46 sites, six sites were chosen to return to for monitoring at either weekly, monthly or quarterly intervals to investigate changes in abiotic variables and biotic communities linked to changes in inundation level.

Key findings

Assessing the use of the Classification System (CS) for wetlands in the NMBMA

The desktop demarcation and typing results from this study had a high degree of accuracy. This approach and use of the current method and tools can be transferred to other regions of the country if there is capacity and local knowledge.

The CS is easy to follow and thorough, especially the higher levels of the classification, which are largely desktop based. It is more difficult to synthesise the lower levels as they lend themselves to site description rather than multi-site analysis.

The use of the CS can provide a good foundation or template for use in an area or region to inventory wetlands. Other assessments, such as wetland health and ecosystem services provision can then be made on targeted systems. Having this template would also allow for more accurate and relevant management decisions to be made.

Classified wetlands in the NMBMA

In this project the study team was able to identify and classify 1 712 wetlands. This was a greater number than the team expected to find, especially given the semi-arid climate. The original SANBI map of wetlands for this area numbered 596, which were dominated by larger, perennial and artificial or modified systems. This is a 65% increase in wetland numbers.

The full range of wetland types from the CS were identified throughout the municipal area, however, the majority of these systems are small (less than a hectare). More than likely the majority of the wetlands can be considered to be ephemeral (seasonal and intermittent) wetlands.

The dominant wetland types, in terms of numbers and depressions (519), seeps (471) and wetland flats (387), with 70% of the wetlands in near-natural or natural areas. However, a significant proportion of wetlands do occur on land classified as agriculture and could be potentially threatened.

General physical and chemical characteristics

Soils were found to be good indicators of the presence of a wetland at 60% of the sites sampled. Where soil indicators were absent this was mostly due to underlying geological conditions, such as the presence of Aeolian sand.

Physico-chemical properties were linked to more geographical location and underlying geology than by the type of wetland. With the exception of the coastal dune depressions and one salt pan, the majority of the sites were fresh to slightly brackish with predominantly neutral pH.

Nutrient levels were highly variable, ranging from below detection levels to the higher end of the range for wetland nutrient levels. The majority of wetlands sampled were oligotrophic at the time of sampling.

It is also important to note that sites were chosen for their relative undisturbed nature, therefore there was little differentiation among the sites beyond natural variance from landscape inputs, such as underlying geology and surrounding vegetation.

Biodiversity and distribution of flora and fauna

There were over 300 plant taxa identified from the 46 wetland sites. Of those 148 were considered dominant in terms of cover. All sites had at least facultative wetland species present as a dominant, even when no water was present.

There were no differences between wetland types in terms of overall plant diversity. Wetland plant communities tended to be unique from site to site, with no strong groupings by either wetland type or geographical position. One confirmed red data species was recorded at three wetlands, namely *Crinum campanulatum*.

Phytoplankton and microphytobenthos were found to be fairly numerous and diverse, with 147 and 298 taxa identified respectively. The phytoplankton were dominated by chlorophytes, cyanophytes and cryptophytes and occurred in depressions and wetland flats.

Diatoms were analysed both as a part of the total benthic algal community and on their own. Around 180 species were identified, but with very low abundances. Of those, 76 species were also recorded as part of the overall benthic algal community.

There were 144 taxa of aquatic macroinvertebrate identified and unlike the floral component, there were differences in diversity between wetland types. Insect taxa were the most diverse in terms of the different number of species identified, across all wetlands.

There was one red data invertebrate recorded, an obligate ephemeral wetland species of fairy shrimp, *Streptocephalus dendyi*.

There was a healthy presence of amphibians utilising the ephemeral wetlands as important breeding habitat. Ten species of tadpoles were recorded, most only using the wetland for breeding and early life stage development.

Management implications

An extensive wetland database now exists for the NMBMA. The database includes information on where and what type of wetlands there are, and the associated attribute data which can be used to update landcover data, re-assess conservation and biodiversity priority areas and determine areas for potential rehabilitation projects.

There is now site-specific data recorded, along with more detailed hydrological and ecosystem characteristics on a subset of sites as well as the species and species distribution across a wide area of the municipality,

The data from this study can be used in the decision-making process for developments (e.g. housing projects). Many of these wetland systems were not identified previously and are not easily identifiable during a dry climatic cycle.

Any development that occurs on a wetland during this dry cycle would be at risk of flooding. This happened in many areas of Port Elizabeth during the floods in 2012. Subsequently, any development occurring during this time would benefit from having an extensive wetland layer.

Further reading:
To order the report, ***Ephemeral wetlands of the Nelson Mandela Bay Metropolitan area: Classification, biodiversity and management implications*** (**Report No. 2181/1/15**) contact Publications at
Tel: (012) 330-0340, Email: orders@wrc.org.za or
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