IAHS2017-322
IAHS Scientific Assembly 2017

Determining the hydrological functioning of the endemic Palmiet wetlands in the Eastern Cape of South Africa

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Wetlands provide a range of supporting, regulating and provisioning ecosystem services, including hydrological benefits such as flood attenuation and sustaining base flows. Despite their value, wetlands are one of the most threatened ecosystems in South Africa, with almost 50% of wetland types regarded as critically endangered. Palmiet wetlands are particularly threatened, with serious consequences for water security in many towns in their catchments, including cities such as Port Elizabeth. Prionium serratum (Palmiet) is a robust perennial plant that is endemic to wetlands in the sandstones and quartzites of the Table Mountain Group (TMG) in the Eastern and Western Cape provinces of South Africa. Wetlands dominated by the Palmiet plant are collapsing across the distributional range of this species, largely as a consequence of gully erosion that may or may not have been initiated by human activities. Degradation of these wetlands also means that they are now producers of large quantities of sediment, which is generally deposited in artificial impoundments downstream, thus significantly shortening the lifespan of dams.

Despite large investments by the State in wetland restoration, serious knowledge gaps in our understanding of Palmiet wetland structure and function remain, particularly in respect of the hydrological functioning of these systems. Similarly, the ability of Palmiet to modify water flows, or impact the catchment hydrological response, requires further investigation. Two projects funded by the state are investigating the geomorphology and hydrology behind these wetland systems and this presentation focuses on the investigation into the catchment and wetland hydrology. The projects have set up an instrumented study site within a relatively pristine Palmiet wetland located on the upper Krom River catchment within the Eastern Cape. While the project is still underway, indications are that these endemic wetlands are closely linked with the typical alluvial fan geomorphology/geology associated with the TMG sediments of the Cape Fold Belt. The wetlands seem to be sustained by subsurface (both groundwater and interflow) water moving through preferential flow paths in the alluvial fans which are in turn sustained by groundwater discharge from the surrounding sandstone and quartzite geology of the TMG sediments. The integrated hydrological model MIKE-SHE is currently being set up to test this hypothesis.

A key feature of Palmiet wetlands is that they generally have high slopes for their discharges, and therefore are vulnerable to collapse. Demonstration that collapse may be a result of natural processes (early results of geomorphological investigation) departs radically from the widely held perception that wetland degradation is due to anthropogenic influences alone. This requires an understanding of catchment hydrological response and the way wetlands are impacted by this response, particularly during extreme events. Key linkages between this geomorphological hypothesis and the understanding of catchment hydrological processes are being explored using the HECRAS hydraulic model. The evidence supporting these hypotheses together with the outcome of the modelling investigations will be presented.