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TECHNICAL BRIEF

Wetlands

Probabilistic modelling of wetland condition

A completed WRC-funded project introduces a new method to assess the ecosystem health of wetlands.

Motivation for study

Projections on growing water quantity and quality stress within South Africa are becoming more frequent. One approach in mitigating risks of water-supply failure is to safeguard wetlands with the corollary that degraded wetlands fail to provide ecosystem services, including baseflow recharge and maintenance.

Wetland assessments continue to be undertaken, although still at the scale of individual wetlands, and ultimately a regional assessment is required. Costs and logistics prevent conservation managers from assessing the condition of all known wetlands regionally or nationally.

The growing levels of catchment degradation occurring nationally necessitate a higher-level approach be taken to assess wetland conditions per wetland type, and to begin prioritisation conservation actions at a regional and national level.

Given constraints in regional data collection models which describe relationships between wetland conditions and remotely sensed land use become useful in achieving regional planning and evaluation of ecosystem health.

Such models with region-wide predictive ability are necessary to inform management, planning and policy decisions. The aim of this research was to develop models for statistically predicting the ecological status and probability of degradation per wetland type, based on landscape-scale drivers.

Methodology

Field and existing data for a total of 463 seep, floodplain and valley bottom (channelled and unchannelled) hydrogeomorphic (HGM) units was used to develop predictive models of HGM unit condition. Data on land cover, infrastructure and catchment physiography covering 21 potential explanatory variables, were linked to individual HGM units.

Multiple linear regression models were developed to estimate A-F Present Ecological Status scores, while multiple logistic regression models were developed to estimate the probability of degradation per HGM type. Models were developed at tertiary and quaternary catchment scales, and fine scale using a 1 000 m buffer radius around each HGM unit centroid.

Statistical models were successfully developed to estimate both condition and probability of degradation for all four HGM types. Different landscape predictors were linked to the condition status of the different HGM types.

Percent natural vegetation, road density, number and area of dams, and altitude, together with anthropogenic land use (cultivation and plantation area) were important predictors of wetland condition. Average wetland conditions per HGM type per quaternary catchment were successfully mapped to provide images on spatial patterns of degradation within KwaZulu-Natal.

Conclusion

The models show promise, and are useful at a regional planning level to identify priority catchments where field assessments of wetland condition would be required. Models are preliminary and should be refined using more data, and covering a wider area.

Development of such models is in line with current international wetland research. The models in no way make existing initiatives in South African wetland planning redundant, and rather complement these. There is potential to refine and extend the models for application at a national level.

Further reading:
To order the report, *Probabilistic modelling of wetland condition* (**Report No. KV 298/12)** contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.