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The development of an ecological integrity index for quaternary catchments in South Africa

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Abstract

A multifactor ecological integrity index, focusing on freshwater ecosystems on a quaternary catchment scale, can be of great benefit to conservation planning. No ecological integrity index has previously been developed for South African quaternary catchments. In this study an index was developed based on three environmental surrogates: land cover, river integrity and fish species conservation status, with the intention of identifying quaternary catchments of highest conservation concern. By developing such an index, the aim was to provide a general indication of the degree to which catchments have been transformed from a natural environment to a human altered environment, thereby identifying catchments most in need of conservation.

For the three available datasets, indices were developed using a five category point-scoring system. A score of one indicates a completely degraded environment and a score of five indicates a pristine environment. The original land cover data consisted of 49 different land cover types which were reduced to five land cover transformation scores. Available river integrity data already existed in five categories and a numerical score of one to five was applied to each category. Fish species conservation status was scored according to the IUCN red data list classifications on a similar basis.

Subsequently, a weighted mean score expressed as a percentage was calculated for the three indices for each quaternary catchment. These indices indicate the degree of change/transformation from a natural system (100%) to a largely degraded system (20%).

Ultimately, an ecological integrity index was calculated as a mean value of the three related but independent indices. However, the results of the developed ecological integrity index were not representative of real world conditions. This is largely attributed to the lack of complete data found in two out of the three datasets used in the study. Some of the main limitations encountered were the lack of river segment definitions within each catchment and the incomplete and un-systematic collected fish species data records. The land cover data, on the contrary, was of high definition and high standard. It is recommended that in the

interim, the developed land transformation index, based on a detailed analysis of land cover, be used as an indicator index of ecological integrity of catchments.