River Research and Application

An eutrophication index for lowland sandy rivers in Mediterranean coastal climatic regions of Southern Africa

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Abstract

The eutrophication of waterways has become an endemic global problem. Nutrient enrichment from agriculture activities and waste water treatment plants are major drivers, but it remains unclear how lowland sandy rivers respond to eutrophication. The objective of this study was the development and verification of eutrophication index for sandy rivers (EISR) to prioritize nutrient enrichment river stretches caused by different land use activities that include point and nonpoint sources of nutrient enrich water. The Berg River drainage system in South Africa served as a case study area for this purpose during the dry seasons (December and January) of 2015 and 2016. In the initial EISR development phase, periphyton, benthic biomass (chl-a mg m-2), and macroinvertebrate families were employed as benthic bioindicators of river bedforms, whereas in the second phase, physicochemical and abiotic variables were used as target indicator. Using a weight of support approach, the site receiving sewage effluent was categorize as heavily polluted whereas sites impacted by agriculture land use activities were polluted. The EISR that focuses strongly on benthic bioindicators, which are close to the transfer of nutrients and energy in the food web, showed a distinct difference between river bedform impacted by sewage effluent and agriculture none point source. A maximum benthic algae biomass of 110 mg m-2 chl-a was recorded with higher sediment orthophosphate concentration at sewage-impacted sites. The outcome of the proposed EISR showed that it can be employed as a decision support tool for eutrophication management of sandy rivers.