



A GIS and fuzzy rules based framework for risk assessment of groundwater controlled wetlands in the UK and Ireland

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Most wetlands in the UK and Ireland are groundwater controlled. These wetlands are significant for floodplain water balance, important habitats for species of conservation importance and often provide refugial biotopes for endangered species and plant communities. Although land management practices have changed significantly within the last century, groundwater controlled wetlands are still under a variety of different pressures. The European Water Framework Directive (WFD) demands that regulatory bodies evaluate and, if necessary, improve the surface and groundwater quality of water bodies. Therefore the current status of water bodies, as well as pressures on them, the risks and potential strategies for improvement need to be characterised by national authorities. Additionally for England and Wales, the Environmental Agency has to deal with a change in the legislation for abstractions in 2006. In order to fulfil the demands of the WFD and to verify the risks related to abstractions and pollution, a complex framework has been developed to evaluate the risks related to particular management activities on the wetlands hydrology. The analysis of potential risks requires the identification and localisation of potentially groundwater controlled wetlands, with the characterisation of the intensity of the control. Based on this, the potential risks and needs can be identified and evaluated. The framework presented consists in a GIS based identification of potentially groundwater controlled wetlands in a first step. These spatial analyses are based on hydro-geomorphic and geological information available for the entire UK and Ireland. The selection of sites from the spatial analyses is verified by comparison of the chosen wetland sites with local expert knowledge at special sites. In a second step pathways and intensities of groundwater controls are characterised and a set of conceptual models is created. Each specified site is assigned

to an wetland model type based on the processes controlling the wetland. A risk matrix based on local expert knowledge will be created in order to represent potential risks for each of the characterised types of groundwater controlled wetland. Based on the GIS approach, the actual risks for each site are analysed and evaluated using a set of fuzzy decision rules in order to gain an objective assessment of site specific pressures. This final evaluation represents a suitable method for local authorities to realise site specific assessments of management practices and the implementation of abstraction legislation.