# ECO-HYDROLOGICAL MODELLING OF GROUNDWATER DEPENDENT ECOSYSTEMS: A REVIEW OF EXISTING ECOLOGICAL AND HYDROLOGICAL MODELS AND SUGGESTIONS FOR INTEGRATION

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Groundwater dependent ecosystems are important habitats for many species and thus have high biodiversity. During the last decades however, extent and biodiversity of these ecosystems have strongly declined due to human impacts such as groundwater extraction and drainage for agricultural purposes. This has led to disappearance of groundwater seepage sites and fragmentation of the remaining ones. As a consequence species of groundwater dependent ecosystems have disappeared on a large scale and the remaining subpopulations of these species occur isolated, resulting in a decrease in viability of the metapopulations.

In wetland ecosystems both hydrological processes as well as vegegation dynamics and their interaction are highly complicated, making unravelling the influence of human impact a difficult task. This makes adequate conservation of groundwater dependent ecosystems a challenge.

In order to take effective measures to conserve these complex ecosystems, comprehensive knowledge about the underlying causes of deterioration of groundwater dependent ecosystems is indispensable. To disentangle the intricately interacting processes, a number of hydrological and ecological models have been developed. Modelling methods have great potential, especially when one aims at predicting the effect of human-induced disturbances on the ecosystem, as these disturbances are often temporally and spatially irregular and hence difficult to analyse. Recently, there have been some attempts to integrate both model types. These integrated models are expected to contribute to a deeper understanding of the systems and an efficient conservation of groundwater dependent ecosystems.

During this presentation a review of existing models is presented, with focus on the possibilities to integrate hydrological and ecological models. The features compared among models include input and output type, model paradigm (top-down, bottom-up, expert-based, empirical statistical, mechanistic, simulation, mathematical, etc), temporal and spatial scale, model applicability to different landscapes and ecosystems and predictive ability. Subsequently, this presentation is concluded with suggestions for spatially and temporally explicit model integration. The applicability of the various approaches to a decision support system for restoration of fragmented groundwater dependent ecosystems will be discussed.