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Approaches to modelling hydrology and ecosystem interactions

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As the pressures of industry, agriculture and mining on groundwater resources increase there is a burgeoning un-met need to be able to capture these multiple, direct and indirect stresses in a formal framework that will enable better assessment of impact scenarios. While there are many catchment hydrological models and there are some models that represent ecological states and change (e.g. FLAMES, Liedloff and Cook, 2007), these have not been linked in any deterministic or substantive way. Without such coupled eco-hydrological models quantitative assessments of impacts from water use intensification on water dependent ecosystems under changing climate are difficult, if not impossible.

The concept would include facility for direct and indirect water related stresses that may develop around mining and well operations, climate stresses, such as rainfall and temperature, biological stresses, such as diseases and invasive species, and competition such as encroachment from other competing land uses. Indirect water impacts could be, for example, a change in groundwater conditions has an impact on stream flow regime, and hence aquatic ecosystems.

This paper reviews previous work examining models combining ecology and hydrology with a view to developing a conceptual framework linking a biophysically defensable model that combines ecosystem function with hydrology. The objective is to develop a model capable of representing the cumulative impact of multiple stresses on water resources and associated ecosystem function.