

Interactive comment on “Groundwater-dependent ecosystems: recent insights, new techniques and an ecosystem-scale threshold response” by D. Eamus et al.

A. O’Grady

anthony.ograde@csiro.au

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Eamus et al. present an interesting and timely review of the current state of knowledge and approaches for addressing issues in relation to GDE’s. The manuscript is clearly relevant to the readership of HESS. While one anonymous commenter on the review argues that the parts of the review cover pre-existing reviews (e.g. around remote sensing) I believe that there is still value in having a review that brings much of this previous work together under the umbrella of groundwater dependent ecosystems. Potentially the primer on remote sensing could be reduced, but I don’t see it as a serious issue

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The review didn't really cover traditional water balance approaches (eg the Doody and Benyon paper suggested by the other reviewer). In my mind these present a point of truth, against which the remote sensing techniques can be validated. Indeed many of the insights into the O'Grady et al 2011 paper cited throughout this manuscript were based on a review of existing albeit limited number of water balance studies that have quantified groundwater discharge.

I found the discussion on remote sensing pretty interesting, but in my experience I find the way that remote sensing is applied in practice somewhat frustrating, and so a discussion on the limitations of remote sensing in relation to identifying GDEs is I think really warranted. In itself that may be a separate review, but I think it would be good to recognise some of these limitation here. In reality remote is somewhat blunt instrument that often has very little validation, it is not unusual to have three GDE remote sensing products that give a different answer to the same problem. Further more remote sensing on its own can provide very little information on the source of the water in the signal, thus the "groundwater signal" may not accurately reflect the groundwater system the water manager is concerned about, e.g. a regional aquifer v a perched aquifer. I see remote sensing as a valuable way of focussing limited resources into areas of most concern or high risk, so that more detailed assessments can be preformed. The underlying assumption that systems with access to groundwater have an unlimited water supply (top paragraph of pg 4692, 'it is assumed that actual et rates are equivalent the et of a reference crop' is a flawed assumption. For example the salinity of groundwater may vary from fresh to saline, thus the plant available water is somewhat less.

With respect to the discussion on ecological response functions, I thought the approach to analysing the co-ordination of traits presented in figure 9 was really nice. There is remarkably close agreement in terms of thresholds identified to that identified by Kath et al 2014 Global Ecology and Conservation, 2, 148-160, which is a nice approach at coming at this problem using remote sensing. It may be worthwhile recognising those

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that these approaches are correlative in nature, in that they correlate state with state, but are not in themselves ecological response functions, rather a prediction of what that response function might look like.

This is a good review that should be published in HESS

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 4677, 2015.

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