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Reply to Harrington et al.'s Comment on "Drawdown 'Triggers': A Misguided Strategy for Protecting Groundwater-Fed Streams and Springs," by Matthew J. Currell, 2016, v. 54, no. 5: 619–622.

**Comment** by Matthew J. Currell

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I thank Harrington et al. (2017) for their letter in response to my recent technical commentary (Currell 2016). It is pleasing that the article has stimulated debate about how best to manage groundwater dependent ecosystems (GDEs) that are vulnerable to groundwater extraction. Their comments are thoughtful, well-argued, and clearly based on considerable experience managing such issues. I believe the original piece and their letter stand as two different yet largely complementary perspectives on this important topic.

Harrington et al.'s five-step method generally appears to be a robust system for monitoring and managing GDEs. I can see no major issue with using drawdown triggers as a management tool within such a strategy, provided (as they indicate):

- 1 Clear water level baselines can be established at each monitoring point to measure drawdown against.
- 2 Any important water level and/or flux thresholds required to meet management objectives are determined and considered when setting trigger levels.
- 3 Triggers are used in conjunction with a sound model that accounts for the capture and depletion

caused by groundwater extraction, including transient effects.

Importantly, a trigger-based management strategy should not (as discussed in Currell 2016) be adopted without careful analysis of the water balance implications of groundwater abstraction. The relationships between drawdown at a particular monitoring point and fluxes to a discharge feature may not be straightforward or easily determined in practice. This, along with uncertainties in model parameters, may result in difficulty determining appropriate trigger levels that adequately warn against changes in flux. Some conservatism and a careful, adaptive approach based on collection of sound field data (as Harrington et al. advocate, and as described in the case study they refer to), are therefore warranted when adopting this strategy.

The major impetus for writing the original article was in response to an observation that in some cases, drawdown triggers are being used or proposed as a management strategy without the important complementary steps outlined by Harrington et al., and consideration of the issues discussed in Currell (2016). This creates a serious risk that the environmental objectives they are designed to achieve may fail.

## References

- Currell, M.J. 2016. Drawdown "triggers": a misguided strategy for protecting groundwater-fed streams and springs. *Groundwater* 54, no. 5: 619–622.
- Harrington, R., K. Rainville, and T.N. Blandford. 2017. Comment on "Drawdown 'triggers': a misguided strategy for protecting groundwater-fed streams and springs," by Matthew J. Currell, 2016.