Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Water-use dynamics of an alien invaded riparian forest within the summer rainfall zone of South Africa" *by* Bruce C. Scott-Shaw and Colin S. Everson

Bruce C. Scott-Shaw and Colin S. Everson

brucecharlesss@gmail.com

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RC1: 'Water-Use Dynamics of an Alien Invaded Riparian Forest Within the Summer Rainfall Zone of South Africa', Anonymous Referee #1, 2 July 2018

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Anonymous referee #1 (AR1) is thanked for their thorough review. The comments and suggestions provided were insightful and beneficial to the progress of this paper.

1. AR1 stated that the description of the sampling design and its rationale needs more detail in the text. Papers should be written to allow some level of replicability of the

method to other sites. The comments relating to up-scaling are itemised as follows:

âẮc How and why were sites, species, and particular trees chosen? âẮc This has been detailed in Chapter 2.2 which leads into the new Chapter 2.6.

âẮc How did sites differ topographically, distance from river, soil properties, etc? âẮc All sites were in close proximity to one another and the river. There were no variations in soils, climate and access to water. This has been mentioned in Chapter 2.2.

âẮc Why were different numbers of trees of different species chosen? âẮc This was due to availability of equipment and the associated budget constraints. Additionally, some trees which need to be in close proximity to the logger, do not provide good flow measurements. This limitation has been mentioned in Chapter 2.6.

âẮc What is the likely or known age range or age structure in the indigenous and the invasive trees at the sites? âẮc The growth stage of each tree has been included in Table 1.

âẮc Are the indigenous trees necessarily older? âẮc The growth stage of each tree has been included in Table 1. However, the authors were measuring the current state and therefore the water-use of the stand as it was during the measurement period. The selection of different size classes was more important than the age of each tree in this regard. Water-use does change with age but the size and LAI are more relevant to water-use. The state of the forest is addressed in the next comment.

âẮc How did the species and the size classes of the trees compare to that of mature indigenous Eastern Mistbelt forest? âẮc A description of the typical pristine composition and characteristics of Mistbelt forest has been provided in Chapter 2.1.

âẮc Are any early successional? âẮc The growth stage of each tree has been included in Table 1.

âẮc What is the typical composition of Eastern Mistbelt forest in terms of the proportion of trees that are deciduous? âẮc Provided in Chapter 2.1. The proportion of deciduous

species is variable in this forest type but the forest has been classified as Mistbelt forest.

âĂć Deciduousness effects the water use of the trees. Was this proportion mimicked in the selection of trees to monitor? âĂć Approximately 10% of species in the forest are deciduous, with the remainder being evergreen and semi-deciduous. The sampling design used this proportion in the selection of trees to monitor.

âĂć Were the Acacia and Eucalyptus trees near maturity? âĂć The growth stage of each tree has been included in Table 1.

2. Two of the three Acacia's and one of the two Eucalyptus trees measured had larger diameters than the indigenous trees, except for the L. sericea. Is statement on pg 7 ln 11 that "the introduced species used 2.4 times more water than the indigenous species" made by comparing individual trees of similar sizes or of similar ages? âĂć This was a general statement based on an average water-use of each species. The size differences are noted and the results represent the status quo of how much water the stand was using during the measurement period. The statement provides an indication of what the invasion is using in comparison to typical indigenous trees that it has replaced.

3. The description of how the scaling up from individual tree water use to stand scale water use also needs more detail. Was the water use from different indigenous trees measured and applied across all trees of all species and size classes across the stand? âĂć This reiteration of the previous comments has been addressed by Chapter 2.6 and links to the selection of trees and sampling design.

4. Were water use ïňĄgures of the individual measured trees applied to trees of the same species and/or functional group (e.g. deciduous or not, similar growth form or not, similar wood density) or similar size class? âĂć Yes, as described in the new Chapter 2.6, water-use was extrapolated per representative size class and species class identified in the density measurements.

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5. Wouldn't water use of mature trees be different to the young ones measured in this study? âĂć Yes, however the objective was to capture the age and size distribution of the stand and measure this as accurately as possible with the available equipment.

6. What was assumed to the be the size class distribution in the invaded and restored scenarios? The same as current or larger more mature trees assumed? âĂć The hypothetical scenarios used the existing size class distribution for each species class and extrapolated this based on an assumed invasion level.

7. These aspects need to be described in the methods and the effects of the assumptions made, and alternatives, discussed in the discussions. As such the ïňĄgures of species level and stand level water use should also have some estimates of likely uncertainty. âĂć Comment no. 6 was described in the text as per this recommendation in Chapter 3.4. Due to the number of trees measured in each species class, the statistical level of uncertainty was not practical to include.

Specific Comments

1. Pg 2, Ln 21-23: unnecessary to cite the paper twice in the sentence. âĂć Corrected.
2. Pg3, Ln 35-37: The statement "invasive species use 189% more water than indigenous dominated stands" needs more clariïňĄcation: this number is too speciïňĄc to apply to all three of the cited studies. Was this the highest or lowest value from these three studies? Perhaps give the range of values across multiple studies. Does this only refer riparian forests compared to invaded stands? âĂć This was made more clear in the text. This was a global literature review of published studies. It provided a baseline from which the findings of this paper are compared to. "At the ecosystem scale, a comprehensive review of numerous internationally published studies indicate that invasive species use up to 189 % more water than indigenous dominated stands, particularly in tropical moist forests (Nosetto et al., 2005; Yepez et al., 2005; Fritzsche et al., 2006). These findings, typically outside of South Africa are limited to mostly herbaceous species with very few recent studies focusing on measurement of introduced

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trees."

3. Pg4, Section 2.2 requires more details in the text as to the numbers of trees of different species and why they were chosen as well as how the scaling up calculations were done. âĂć A new chapter in the Methods (2.6) has been added to provide detail on the up-scaling approach.

4. Pg 7 Ln 43 There is no citation for Everson et al 2016 in the reference list. âĂć This has been added to the reference list.

5. Pg 8 ln 4 typo: "bcome". âĂć Corrected.

6. Pg 15 Table 1 – typo: "Eucalyptus nitenss". âĂć Corrected.

Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2018-227/hess-2018-227-AC3-supplement.pdf

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