

Interactive comment on “River restoration: morphological, hydrological, biogeochemical and ecological changes and challenges” by M. Schirmer et al.

Anonymous Referee #3

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In the manuscript, “River restoration: morphological, hydrological, biogeochemical and ecological changes and challenges,” Schirmer et al. summarize the interdisciplinary findings of a large-scale study called RECORD that examined morphologic, hydrologic, biogeochemical, and ecological responses to restoration in a reach of the Thur River. The goals of the manuscript are to illustrate how detailed quantification of processes can answer a number of questions pertaining to restoration outcomes and facilitate knowledge transfer to other river systems (P 6). These goals are somewhat lofty for a particular study (results of particular sites do not always transfer to other sites), and the authors do not dedicate enough detail in text or figures to answering the questions on

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P 6. Similarly, the authors stress the importance of interdisciplinary science to address uncertainty in restoration outcomes, but they never clearly demonstrate how the interdisciplinary RECORD study is able to go beyond more narrowly focused studies. For example, key results on P 10-11 read like a bit of a laundry list: integration is somewhat lacking, and each of these points could have been surmised from a less comprehensive study than RECORD at another site. How are the results more insightful than what we would learn from a collective assortment of more traditional studies? This is an important question, since the funding mechanisms for earth science are moving towards larger, interdisciplinary platforms like SoilTrek and Critical Zone Observatories.

I believe the authors would have a more impactful manuscript if they focus on integrating the interdisciplinary results of RECORD and explicitly describe the advantages of an interdisciplinary study and opportunities for future research. There is a need for this kind of synthesis of large, multidisciplinary studies (for example, new work coming from Critical Zone Observatories), and the authors could recraft the text and figures to address this important need. One way to do this would be to change the scope of the introduction: at present, the manuscript begins like a review of the state of restoration science with ensuing support from a case study. Reviews of restoration science have been done before (for example, Wohl citation below). What may not have been done is a synthesis of the RECORD results. If the authors emphasize the need for these integrated studies and make a case for their superiority to more traditional studies with narrow disciplinary focus, I believe the manuscript would be more novel. The authors say that they attempt this (P 11 L 8), but the text could use more explicit descriptions of how the multidisciplinary approach excels. The authors could end with a discussion of grand challenges for restoration science that can only be addressed with these kinds of multidisciplinary studies. One example of a paper pertaining to Critical Zone Observatories that achieves a similar (but not the same) goal is by SL Brantley et al.: “Twelve testable hypotheses on the geobiology of weathering” (2011).

Line edits:

P 4 L 25: It's not apparent that legislative efforts aim to increase hyporheic exchange, particularly in the USA, where hyporheic exchange still seems to be relatively low on the radar of restorationists.

P 5 L 5: Suggest citing Wohl [2005]: Wohl, E., P. L. Angermeier, B. Bledsoe, G. M. Kondolf, L. MacDonnell, D. M. Merritt, M. A. Palmer, N. L. Poff, and D. Tarboton (2005), River restoration, *Water Resources Research*, 41(W10301), doi: 10.1029/2005WR003985.

P 15 L 20-25: Conclusions are not clearly illustrated or supported by any figures. The fact that the figures do not contribute substantially to illustrating these conclusions suggests to me that figures could do a better job synthesizing the findings of a multidisciplinary study.

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