

Interactive comment on “Training hydrologists to be ecohydrologists and play a leading role in environmental problem solving” by M. E. McClain et al.

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We thank Dr. Meixner for his careful review of the manuscript and constructive comments. We respond to each below.

[comment] First, in defining ecohydrology in the abstract and introduction the authors need to better state the particular domain of knowledge that ecohydrology occupies. It is of course a broad category of study but the authors current definition “: : : examining mutual interactions of the hydrological cycle and ecosystems” is not defined enough. This definition needs to be refined in some way because as it currently stands it almost

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encompasses all of hydrology itself. The essential note of ecohydrology would seem to me to be the specific ways in which the biological processes of life influence hydrologic processes. I agree that is reasonable to perhaps include the inverse as well – that ecohydrology includes the ways in which hydrologic processes control biological processes. I do think restructuring here to state that ecohydrologists study the intersection of hydrologic processes with the biological processes operating in ecosystems. This comment at some level does amount to some level of word smithing.

[response] Defining interdisciplinary fields of science is exceptionally difficult and commonly polemic. Honestly, we tried to avoid definitions in this manuscript and instead refer the reader to a couple of papers presenting the past and present debates (lines 10-12 of page 1485). Our approach is to describe the content of ecohydrology from the perspectives of those recognized as pioneers in the field. We acknowledge that our own perspective is aligned with that of the UNESCO-IHP Ecohydrology Program, which was strongly influenced by the work of Prof. Maciej Zalewski. We also acknowledge and incorporate the perspectives of Professors Ignacio Rodríguez-Iturbe and Malin Falkenmark, who represent large proportions of the ecohydrology communities in the US and Europe, respectively. As the text transitions into the description of the different spheres of ecohydrology we acknowledge the perspectives and work of many other scientists in the field. In each of these areas we took care to include highly cited papers of the 90s and 00s. We hope that our approach has been sufficiently broad and detailed to encompass most scientists who consider themselves to be ecohydrologists.

Personally we agree with the narrower and more ‘definitive’ definition of Ecohydrology that Dr. Meixner seeks, but by insisting on this we would exclude the perspectives of many colleagues. Moreover, we would exclude much of the content that is taught in already established ecohydrology programs. We believe that ecohydrology is still in a process of formation, and the rush by many to embrace it has pushed the boundaries of the science beyond its core and founding concepts. We anticipate that ecohydrology will continue to evolve over the coming years and boundaries with other disciplines

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will hopefully become more distinct, but for the moment ecohydrology means different things to different people. We have tried to accommodate these diverse perspectives and save our more pointed message for the sections of the paper presenting professional and personal competencies we believe should be included in the training of ecohydrologists.

[comment] Second, the authors need to tone down the reference to the 3 spheres of ecohydrology. These are certainly areas of research investigation and are in fact the current primary areas of research in ecohydrology. However if we are developing a curriculum for educating Ecohydrologists these three areas should be couched as examples rather than specific domains as it is currently stated. As an example of another area that could have been listed catchment biogeochemistry is arguably both an influence on and a domain of ecohydrology.

[response] We struggled somewhat with the identification of the three spheres in the manuscript for some of the reasons indicated by Dr. Meixner. We felt, however, that it was important to provide some structure to a science that, as described in the previous response, is still quite amorphous to many. We chose these spheres because they reflect how we believe most ecohydrologists distinguish themselves, and distinct literatures exist in each sphere. The spheres mainly delineate the spatial configuration of the science and the systems considered in it rather than the disciplinary boundaries. We consider each sphere to include physical, biological, chemical and indeed biogeochemical interactions. We do not, however, want these spheres to become a distraction to readers and will attempt to tone down the importance of them as Dr. Meixner suggests.

[comment] Third, if we are expecting to train ecohydrologists who are out in the real world making decisions and advising policy makers the current curriculum as described comes up short. Table 1 includes some policy and management courses. The text however comes up short in this regard. Ecohydrologists will not be political scientists nor will they be policy experts but there is some core of knowledge about how policy

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influences decision making and constrains decision making about the environment that would be valuable for students to know.

[response] Thank you for this suggestion. We will strengthen the importance of policy influences in the revised text.

[comment] Fourth- The opening of the Conclusions section with the statement about Darwinian versus Newtonian “opposing” world views I find puzzling. Little intro on this opposition of these two world views is offered earlier in the text. Additionally I find little in opposition about these two views in my own view and my own work I find the two views more complementary than in opposition.

[response] The historical basis of considering Darwinian and Newtonian world views to be opposing is described in the cited article by Professor John Harte, and the message of that article (and our own) is aligned with Dr. Meixner’s perspective that there is value in synthesizing the two. We agree that the statement comes a bit out-of-nowhere, and we intended it to be mildly provocative in order to punctuate the beginning of the conclusions. We would be happy if other readers also experience the moment of reflection (whether positive or negative) described by Dr. Meixner. Interestingly Reviewer #1 also singled out this statement, writing “I like the Harte reference in the beginning of the conclusions!”

[comment] Minor comments- On page 1488 Using Nemani, R.R., C.D. Keeling, H. Hashimoto, W.M. Jolly, S.C. Piper, C.J. Tucker, R.B. Myneni, S.W. Running. (2003) Climate-Driven Increases in Global Terrestrial Net Primary Production from 1982 to 1999. *Science* 300 (5625):1560-1563. Might help make case for water limited systems importance to ecohydrology since most (~75%) of the world’s ecosystems are water limited at some point during the growing season.

[response] Thank you for this suggestion. We will add this reference to the revised paper.

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