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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assessing the Impacts of Hydrologic and Land Use Alterations on Water Temperature in the Farmington River Basin in Connecticut" *by* J. R. Yearsley et al.

Anonymous Referee #2

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General comments

The manuscript documents the extension of the coupled hydrologic and stream temperature models DHSVM-RBM to include the simulation of the effect of stratified and "run-of-river" reservoirs on stream temperature. The riparian vegetation model was also modified to account for changes in riparian vegetation in time and space, although it seems this modification was not evaluated in this study. Simplifying assumptions were acknowledged (e.g., constant water elevation in reservoirs, no water diversions, no river exchange with groundwater or bed heat exchange) and potential for further improvement of the model was recognized. In general, the authors describe the further

development of the DHSVM-RBM modeling system and demonstrate its capabilities using readily available data for the Farmington River basin. In particular, the model evaluation (error statistics and graphical presentations) is well done and highlights what the model did relatively well (e.g., high river flows) and what it did not (e.g., low flows, stream temperature at headwater locations). Some statement might be needed to explain the potential effect of low flow prediction errors on temperature.

The manuscript appears to assume that the reader is already familiar with the complexities of stream temperature modeling and the potential effects of reservoirs on downstream temperature. For example, there is no mention of the potential difference in effects of surface vs deep reservoir outlets, although the main effect described is downstream cooling due to "storing and releasing water from the hypolimnion" (line Discussion p. 12, line 27). The need for time and space varying riparian vegetation in the model was also not explained and there is not much discussion of the effects of riparian loss on water temperatures.

I believe the manuscript would benefit from at least a brief section on stream temperature modeling with an emphasis on riparian shade effects and the potential effects of various types of reservoirs on downstream temperatures. Some discussion of the effect of riparian loss on temperature results

Specific comments

p. 6, line 5: Recommend including the location of the outlet for each reservoir in Table 1 or Table 1

p. 6, line 8: Niemeyer et al. (2018) does not appear in references

p. 9, line 4: Moriasi et al. (2007) does not appear in references

p. 10, line 16, 5.1 Hydrology: From these two paragraphs it appears that this version of DHSVM does not account for transient storage or water diversions, which was implied earlier by stating that all reservoir inflows were equal to outflows. I wasn't until p.

11, line 2 that I understood that the flow model evaluation was based on long-term naturalized flows. It might help the reader to make this point in 3.3 Model Evaluation section. It was also confusing that the flow calibration figures and text refer to observed rather than naturalized flows. I'm assuming they are the latter.

p. 11, line 26: I'm not sure I understand the purpose of this paragraph. I thought the temperature data were collected by a Connecticut government agency. Furthermore, the application was a demonstration so would naturally rely on available data. Furthermore, in practical applications, I think it is rare for modelers to design the data collection systems to support model development – for flow networks in particular.

p. 12, line 30: The inability of the model to simulate the delayed warming effect of deep reservoir releases seems like a significant weakness in the model. It might be useful to suggest how the model might be improved to better simulate this feature.

p. 13, line 9: The general influences on water temperature might be a good starting point for material in the introduction describing basic stream temperature modeling and the role riparian vegetation and reservoirs modify temperature.

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