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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Quantifying Small-scale Temperature Variability using Distributed Temperature Sensing and Thermal Infrared Imaging to Inform River Restoration" *by* Jessica R. Dzara et al.

Anonymous Referee #1

Received and published: 17 October 2018

General Comments:

The paper addresses relevant scientific questions focusing on the importance of spatial and temporal fine scale variations in thermal habitat for Pacific salmon. The introduction could focus more on setting up the problem of warming waters for Pacific salmon in the southern extent of their range and on the importance of small scale variability in temperature for fish survival. Examining more recent papers that reference Sutton et al 2007 could help in this effort. Combining DTS, TIR, and one-dimensional temperature modeling in an effort to better manage and restore river systems is unique.

The methods were outlined reasonably well; however there were some points of confusion. It is possible that a cartoon schematic of the deployment of the DTS could be beneficial. The DTS itself had "two channels"and at times the wording became confusing because the DTS was deployed in a river channel. Results largely consisted of summary statistics of the temperature data and modeled temperature. It would be instructive to do more analysis that relates to the Pacific salmon of interest and its 28 degrees C threshold. Additional investigation might be done to research the following questions: 1)What percentage of the deployment was 28 degrees C exceeded at the mainstem site? 2) When the temperature was exceeded, did the model over or underestimate the actual value and by what percentage? 3) Is there anyway to go beyond the summary statistics of the dataset? The conclusions reached are clear; however, they seem fairly straightforward in that a one-dimensional model would certainly miss fine scale variation that occurs in a real river channel. I think it could be shown more clearly and in further detail the times when the one-dimensional model succeeds or fails for the Pacific salmon. How certain is that the results presented would not be different for a deployment time later in the summer? How might the results and discussion change for a period later in the summer? Key numerical results could be added to the abstract. At times the writing does not appear to have a singular voice.

Specific Questions:

pg. 3, Line 30: In what way do the diversions and return flows influence the temperature? It could be beneficial to explicitly state they warm the waters.

pg. 4, Line 10: What percentage of the deployment period did temperatures exceed 28 degrees C? Is this a common problem in the watershed (are there locations where it is always greater than 28 degrees C) or does the problem occur only during discrete heatwave events?

pg. 4, Line 30: Is it necessary to describe how DTS works in this level of detail?

pg. 8, Line 28: How were key features added to the model output?

pg. 9, Line 29: It would be useful to show that there was not a large warming even that occurred between the two deployments at the two sites. Weather conditions should be ruled out as a factor of influence on the two deployments.

Specific Notes: pg. 2, Line 3: Therefore, assessing stream temperatures...

pg. 2, Line 9: Stream temperature models are a useful tool for river management because they help...

pg. 2, Line 23: ...spatially-continuous stream surface temperatures. However, it... What does “it” refer to?

pg. 3, Line 31: Interactions between... “between” compares two things while “among” compares more than two things

pg. 4, Line 12: Low instream flows from surface water diversions have also caused the Walker Lake level to decline

pg. 5, Line 25: Verb tense was changed to present tense.

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