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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Riparian forest as a management tool for moderating future thermal conditions of lowland temperate streams" *by* P. B. Kristensen et al.

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Dear anonymous referee #1 On behalf of the author team I would like to thank you for the comments on the manuscript "Riparian forest as a management tool for moderating future thermal conditions of lowland temperate streams", where you recommend moderate revision. We have revised the manuscript addressing your comments and questions and believe that the revised manuscript now is significantly improved relative to the initial submission. Below is an itemized response to your comments and questions.

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Anonymous referee #1:

2.1 The sentence “Availability of incoming solar energy in summer under clear-skyconditions may be more than 90% in an unshaded stream” (p.6084) is not clear. What does availability of incoming solar energy refer to?

Author reply: The text has been clarified to avoid misunderstanding. Availability of incoming solar energy is given as a percentage of potential direct energy from solar radiation reaching the stream surface. Part of the solar radiation is reflected from the atmosphere and part is scattered as diffuse radiation, leaving only a percentage radiation available for heating of the stream water.

Anonymous referee #1:

2.2 Authors should reconsider or better justify the resolution they have considered for water temperature sensors. In their specification of the water temperature sensors, the manufacturer specifies a resolution of 0.14 âĄřC. Authors need to better justify their 0.14 âĄřC (2 x 0.07 âĄřC) criteria in determining significant between-logger temperature differences. As such, bias was only evaluated for a subset of sensors and certain sensors could have a bias closer to that estimated by the manufacturer. Authors reported an average between-logger difference of $\pm$0.07 âĄřC, but what was the maximum between-logger difference observed? Given the importance of the bias estimation in the interpretation of results, authors should provide a better justification for using a smaller bias than the one defined by the manufacturer.

Author reply: First of all, we agree of the importance of the bias estimation in the interpretation of the results. This is also why we tested the loggers in the most relevant temperature interval of our study, between 10-20 âĄřC. This reduced the uncertainty of the loggers markedly, as this is greatest at the extremes at each end of the scale. Thus, when we evaluated the uncertainties of the used loggers we found the average logger-to-logger bias to be lower than specified by the manufacture. We found the bias to be 0.14 (+/- 0.07) degrees which is much lower than the 0.5 reported by the manufacture.

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In addition, we found that the between logger bias of 0.14 only was exceeded in 6 % of the 1738 number of measurements we performed in the test. Also, the maximum bias was found to be 0.287 âĄřC between two neighboring loggers. Combined this indicates that the bias of the subsample of loggers we tested was low. However, even if a couple of the loggers not tested for uncertainty should have been biased, this does not change the trend in the illustrated patterns. Overall, we are confident that this is a sound and reasonable methodology, although we in the clear hindsight of course would have liked to test all loggers.

Anonymous referee #1:

Furthermore, were water temperature sensors protected from direct solar radiation when deployed in streams? PVC tubes or neoprene flaps have typically been used to avoid solar radiation warming up the sensor itself. This aspect should also be considered when assessing the between-logger bias.

Author reply: Yes, logger sites were thoroughly picked such that loggers could be deployed in well mixed water without being exposed to warming from direct solar radiation. This has been clarified in the text.

Anonymous referee #1:

2.3 Discharge and width-to-depth are treated as variables relatively constant throughout the study period. While this assumption holds for other physical characteristics studied, discharge, and as such water depth, tend to vary through time. Readers (such as me) are not necessarily familiar with the flow regime in Danish streams. Authors refer to a “relatively stable flow regime” (p.6085), does that mean that discharge was relatively constant from July to September? Only mean discharge values were provided but hydrographs for the study period would help evaluate variation in discharge during the study period. If important variation in discharge occurred during the study period (e.g. due to precip-itation events), than more information on water depth measurements is required. a)If point measurements of water depth were made, then authors

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should consider if water depth measurements were made under flow conditions representative of the summer. Differences in width-to-depth ratio from one site to another could also be due to differences in flow conditions at the time of measurements. For example, if measurements were taken at base flow vs. in the rising or descending limb of the hydrograph, the width-to-depth ratio will not necessarily be comparable between different streams.

Author reply: Width-depth and discharge measurements of the paired forest/open reaches were conducted within two days and always at baseflow representing conditions during the study period. This has been described in the methods.

Anonymous referee #1:

b)When performing the linear regression between July water temperature change in forest and width-to-depth ratio (Figure 2), authors should specify if only July water depth measurements were considered.

Author reply: Width-depth ratios represent conditions of July at baseflow. Text has been clarified.

Anonymous referee #1:

2.4 Results from the multiple linear regression should be included in the Results section. Results should at least include regression coefficients although a 2D graph could help visualize how canopy closure and width-to-depth ratio interact and influence water temperature. A measure of the proportion of variance explained by the regression should also be included. A similar measure (R2) should also be added to linear regressions presented in Figure 2.

Author reply: The results section has been revised accordingly and R-squared added.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 6081, 2013.