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Interactive comment on "Waning habitats due to climate change: effects of streamflow and temperature changes at the rear edge of the distribution of a cold-water fish" *by* José M. Santiago et al.

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Thank you for your revision. We have read your comments carefully and proceeded to make the necessary changes. We have reviewing the manuscript to do the reading more fluid and to avoid redundancies, especially between text and figures/tables. We agree that abbreviations and terminology may make it complex to easily follow the text, however we strongly believe that they are essential for accuracy of the exposition. Nevertheless, we have reviewed the wording in order to make understanding easier. We are not native English speakers, therefore, we got the manuscript edited for proper

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English language, grammar, punctuation, spelling, and overall style by native specialists. Please, see the attached certificate. However, we have given another “turn of the screw” to the whole manuscript.

Detailed comments: - Comment: “Please provide more specified objectives.” Response: Done. We have included this paragraph to address this comment: Specifically, in this paper: (i) we assess both the streamflow and geology effects on stream temperature; (ii) we predict the changes in streamflow and stream temperature in the IPCC5 climate change scenarios; and (iii) we assess the expected effects of these changes on trout habitat aptitude.

- Comment: “There has been newer IPCC climate scenarios (IPCC6). Please let readers know how this reflects to your results.” Response: As far as we can see today, we don’t know any published results on IPCC6. CMIP6 initiative is in progress and experiments defined: âĂć CMIP6 experimental design finalized âĂć Forcing datasets for DECK and CMIP6 historical simulations finalized Thus, it is not possible for us to interpret how the new experimental designs affect our results. (Eyring, V., Bony, S., Meehl, G. A., Senior, C. A., Stevens, B., Stouffer, R. J., and Taylor, K. E.: Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization, Geosci. Model Dev., 9, 1937-1958, doi: 10.5194/gmd-9-1937-2016, 2016.)

- Comment: “Study sites: Please specify which kind of forest and geology sites contains.” Response: We have taken into account this comment. Forest are mainly composed by coniferous belonging to genus Pinus (P. sylvestris, P. nigra, P. pinea, P. pinaster). This is specified in the new version. Sites geology is described in the main text and Table 1 (see also Figure 2) and in p 4 line7. Our concern on geology relies on its hydrological response. In the Iberian Peninsula are distinguished four main lithological classes: igneous, carbonated, detrital and volcanic. These main classes are used because resume very well their different behaviour relating to the water cycle.

- Comment: “Data collection: what are time periods for temperature data collection? How logger was installed? Was discharge measured from all sites?” Response: We have incorporated in the text additional information on these matters. Regarding time periods, they are specified in Table 1 (total recording days at each site). Loggers were kept recording all throughout the year. Also, loggers were tested for malfunction before being deployed, and they were placed avoiding direct sunshine (as specified in the response to the Referee 1). Discharge was obtained from 10 gauging stations of the official network (p 5 line 9, and Table 2). These 10 stations were used to model running flows.

- Comment: “Hydrological modelling: Whole section is confusing, please clarify and make in more compact. Did authors calibrate M5 models with measured discharge from all sites? Was model validation done?” Response: Done. Sites in which discharge was measured were the gauging station sites. Five-fold cross validation was done in each case.

- Comment: “Stream temperature modelling: Please re-write whole section.” Response: Done. We agree that this section can be particularly complex but this complexity is somewhat inherent to the matter we address and we cannot see how it can be further simplified.

- Comment: “Page 9, lines 10-14: Correct place for geology part? What geology classes where used?” Response: We think this is a suitable place because geology is used to analyse particularities of the temperature models. As said above, geology (lithology) classes were described in page 4 line 7 (and following) and Table 1 (see also Figure 2).

- Comment: “Page 10, lines 2-6: Please tell in more details how DEM was used to study stream continuum. Was this information mentioned in Results?” Response: We have explained it better. An altitudinal interpolation of the parameters of the stream temperature models was performed and a digital elevation model (DEM, at a 5-m resolution,

obtained from LIDAR, IGN [National Geographic Institute of the Spanish Government]) was used to determine the geographic coordinates and the altitude (x, y, z) of the points at which the established threshold will be transgressed in the simulations of the effects of climate change. This results will make possible to determine the altitude and the percentage of the length of stream in which the suitable thermal conditions for the trout will be lost. The results of it are reflected in the cited usable length reductions (p 17 line 30 . . .56%, 11%, 66%...). This information has been also completed with altitudinal data.

- Comment: “Results: Tell first main results (in beginning of the paragraph). Please re-write results, now they are difficult to follow.” Response: Done. The whole section has been rewritten.

- Comment: “Figure 6: Not sure is this figure needed. At least need more explanation from main points.” Response: We think this is important for understanding the hydrological and thermal response at a glance. We have improved and simplified the explanation.

- Comment: “Figure 7: please tell geological classes already in methods.” Response: It was done. Please, see page 4 line 7 (and following) and Table 1 (see also Figure 2).

- Comment: “Page 17: is all numerical results necessary to include to the text? Especially section 3.3.4 is challenging to read.” Response: We completely agree. The section was too wordy. This have been mended by removing unnecessary descriptions of the results.

- Comment: “Discussion: Please re-formulate and re-write. No detailed comments provided.” Response: Done.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/hess-2016-606/hess-2016-606-AC2-supplement.pdf

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