March 26, 2020

To: HESS Editor

From: Chas Jones

Subject: Reconciliation of manuscript by Jones et al. (hess-2019-638)

Thank you for offering us the opportunity to respond to the reviewers' comments and feedback on our manuscript titled "Using hydrologic landscape classification and climatic time series to assess hydrologic vulnerability of the Western U.S. to climate". The manuscript was reviewed by two reviewers that recommended acceptance with minor edits. We have addressed the specific concerns in the attached revision that improves the manuscript and makes it worthy of publication in HESS. Both rounds of reviewer feedback were insightful and benefitted the manuscript. Attached you will find a copy of our response to the two reviewer comments.

Reviewer #2

1) General Comment

The authors here should be commended for a marked improvement in this revised paper. The revised organization and structure help guide the reader through the study better with a clearer sense of overall purpose and direction. I appreciate the thoughtful response to comments and the commitment made to addressing previous comments and concerns I had. I recommend acceptance of this paper with a few minor points that the authors may want to consider.

Response) *Thank you.*

2) I'd recommend the authors re-read this paper a final time for grammar and sentence structure and minor edits. Overall, the paper reads well, but there are a few places where a word seems missing. For example:

L49: I think the authors mean to add a "to" so it reads "and is related TO the threats of increased flooding.

Response) *Thank you. This has been addressed.*

L460: the sentence here ends with the verb "are". I'd revise so it doesn't end that way.

Response) *Thank you. This has been addressed.*

3) L60-82. This paragraph reads a bit like a cascade of a literature review. Maybe edit this paragraph to highlight common trends or take-home messages rather than Researcher X found this and Researcher Y found that. It provides good information but could be synthesized better.

Response) *Modified to provide better synthesis and added a summary sentence.*

4) Section 2.2.1 and by relation 2.2.2. For all the other HL indices you include the relevant dataset used to characterize that variable whereas we don't find out about the climate datasets till later in section 2.3. Maybe at least reference that the datasets used to develop those indices will be discussed in a follow-on section?

Response) *In line 206, we reference Section 2.3 as the location that we will describe the climate datasets, which I believe is what the reviewer is requesting. Thus, we didn't make any edits in response to this comment.*

5) L272-275. Was there a comparison done as to the degree of match between the climate normals and the historical climate analyses for overlapping years? The addition of L266-271 adds valuable context, but there any comparison done to how the downscaled 4k resolution dataset ended up matching (or not matching) the 400m high resolution one?

   Response) *Good question. For the overlapping timeframe of 1971-2000, both the 4k and 400m data were used in the downscaling process so that the error for the rescaled data was essentially non-existent. We did not have the high resolution 400m resolution data available for any individual month and year between 1971 to 2000, as we only had the monthly 30 year normal available at 400m. Therefore, there is insufficient information to present for a comparison.*

6) L314-320. I appreciated the additional language and consistent reference to your vulnerability evaluation not being indicative of a direction of change but rather a 2 SD threshold in either direction. It makes it much clearer. Based on Fig 5, it appears that precipitation and S' are particularly sensitive to going in either direction. Was there any evaluation done to discern those instances when it could go either direction? That seems as if it could point to less certainty in the results although it fits into your construct of a marked change of +/- 2 SD. Perhaps add a sentence or two as to implications of going in either direction?

   Response) *"Uncertainty" doesn't feel like the proper term given that these projections in vulnerability were defined by specific criteria. Analyzing "variability" in modeled projections seems more appropriate than uncertainty in this context. The Reviewer references Figure 5 as providing sufficient information to indicate more 'uncertainty' in two parameters, but Fig. 5 only provides 3 case study examples and may not be appropriate for drawing general conclusions. Figure A2 illustrates a broader view of the same information than Figure 5, but even then, Figure A2 depicts only 42 specific locations. The authors believe that it is more appropriate to examine the spatial uniformity of our vulnerability assessment presented in Figures 4 and S6, which provides the same information in a spatial context that provides more information about how consistent various geographies are to the analysis. Those figures combined with our comparison of various EPA Level 2 ecoregions was an attempt to see if the variability in HL vulnerabilities were correlated with specific geographic or ecological characteristics. In our analysis, we discussed the similarities in geographic response that correlates with various ecoregions in regards to precipitation (lines 369-373), S' (lines 378-380), and FMI (lines380-384), all of which were found to have more spatial or climatological variability relative to the other hydrologic parameters.*

7) L394. Maybe add (SWE) after snow accumulation so it's clear what the text is referring to in Table 4.

   Response) *Thank you. This has been addressed.*

8) L422. Maybe put S' at the end of this list so it's parallel with how the variables are shown in the Figure.

   Response) *Thank you. This has been addressed.*

9) Table 2. You might consider making this an appendix or supplemental table. Maybe it'll take up less space in a published version, but in my print-out it currently covers three complete pages.

   Response) *Thank you. We think that this table will be formatted to take up less space in the edited journal. We would prefer to keep it within the manuscript rather than as an appendix but will reconsider if the formatting does not work out.*

10) Table 4. Again, likely just a formatting issue, but the percentages for 3 of the 5 indices are shown across two lines. This should be on a single line as the subsurface permeability column shows. For instance, climate column and temperature row says 70 (next line) %, should just be 70%.

Response) *The standards for this journal request that there be a "space" between the number and the % symbol. I assume that the copy editors will format the table appropriately, but if there are any issues, we will address them in the formatting stage with the editors. Thanks!*

11) Figure 2. Panels B and C and the legend for Panel E is illegible in the printed-out version. Again, may be improved in a published version, but I'd increase font sizes so they can be seen. I don't think anything below the font size shown for the labels in Panel A will work. Maybe make the figure landscape to give yourself more space?

Response) *We are happy to work with the editors as needed to ensure that our graphics are legible in the printed journal. We are also flexible on whether the graphic is presented in a landscape or vertical orientation.*

Reviewer #3

1) The paper presents an interesting and simple methodology to assess "vulnerability" of landscapes to climate change. The contribution is technically correct, I just would have liked to see more discussion on the lessons learned from developing and applying the model. A couple of lines on the authors' thoughts about how to analyze the results for the case of other industries (similar to the analysis of the two grape varieties in the example) would be great.

Response) *Great idea. We have added a couple of sentences to the Summary and Conclusions section (lines 545-559).*