

Responses to comments from the Editor and reviewers

Editor

Comments:

Your manuscript received two substantially positive reviews, although corrections suggested by the referees may further improve its quality, please address them all.

Response:

Thank you for your positive feedback on our revision. Below you will see our complete responses to the comments and suggestions from two reviewers to further improve our manuscript during our second round of revisions.

Reviewer #1 Report #2

Comments:

For final publications, the manuscript should be accepted as is. Were a revised manuscript to be sent for another round of reviews I would be willing to review the revised manuscript.

Response:

Thank you for your time and dedication to the publication of this manuscript. Your efforts are greatly appreciated.

Reviewer #2, Report #1

Comments:

For final publications, the manuscript should be accepted subject to minor revisions. Were a revised manuscript to be sent for another round of reviews I would be willing to review the revised manuscript.

I have now reviewed the revised version of the manuscript of Ellis et al. and acknowledge the significant improvements made by the authors. However, I believe there are still some minor points that should be addressed before publication.

Response:

Thank you for your diligent review and willingness to continue working on the revision process. Below are our response to your comments and suggestions.

Line 183: What does n = 3333 reflect? Maybe not related to this study?

Response:

In line 183, n = 3333 referred to the total number of samples (branches, soil, streams, and groundwater) collected over our sampling period. In response to your comment, we decided that it did not effectively contribute to the methods section and was misplaced in that sentence. Rather, Table 1 reflected a better overview of our sampling scheme for the summer of 2021. Because of this, we removed “(n=3333)” from our revised manuscript submission.

Line 236-238: Please clarify the definition of d2h “biases” and explain why these d2h biases are similar to those reported by Allen & Kirchner (2022).

Response:

We rephrased this sentence to address systematic biases as described by Allen & Kirchner that may occur during cryogenic vacuum distillation and broke up our leading sentence to provide more clarity on when bias occurs (see expert from lines 234-236 below).

As reviewed by Allen & Kirchner (2022), the cryogenic vacuum distillation of water from plant tissues and soils can cause systematic biases in the measurements of $\delta^2\text{H}$. The degree of extraction bias varies depending on species and soil type (Allen & Kirchner, 2022).

Additionally, we added to the sentence connecting the findings of extraction bias by Allen & Kirchner (2022) to our results explaining the similar extraction methods and how any potential bias was smaller than the mean values of any potential sources (Lines 239-242).

Line 489-491: Please rephrase to clarify that this statement is based on isotope analysis.

Response:

Thanks. Following your suggestion, we now added “the results of our isotopic analysis” in Line 489-492 to clarify how we determined that there was more evaporative enrichment in the shallow soils of the heavily thinned stands and specified that this results was present when compared to the moderately thinned and control stands.

Line 495: Change "enrichment of d18O" to "enrichment in 18O."

Response:

Thank you for catching this. The correction has been made.

Line 461-466: The logic in this sentence is not entirely clear. I believe the authors intend to explain that Scenario 6 is the most realistic and statistically sound scenario. However, the text seems to "jump" between Scenarios 1, 2, and 6, as well as between Scenarios 4 and 6, without clear transitions. Additionally, Scenarios 3 and 5 are not mentioned, leaving gaps in the explanation. Could you please clarify the reasoning and ensure all relevant scenarios are addressed in a logical sequence?

Response:

Thank you for the comment. The objective of this paragraph is to describe the Gelman-Rubin diagnostic results of each of the scenarios and elaborate on why scenarios 4 and 6 were judged to be the most representative of different potential sources. In this revision (please see Lines 456-466), we broke up and reorganized this section to provide further clarity. Scenarios 1, 2, and 6 had the smallest Gelman-Rubin diagnostic results, indicating that they were the closest to converging. Additionally, we reiterated the variables considered for scenarios 4 and 6 to support why we identified these two scenarios as ones to rerun with a longer runtime.

Line 618-621: The current statement is not entirely clear. If thinning (or a decrease in stem density) increases soil water use below 35 cm during prolonged drought periods, then soil water below 35 cm becomes more relevant as the occurrence and duration of drought spells increase in the future (assuming this holds true for UPC). Therefore, lodgepole pine dependency on deep soil or groundwater would increase, not decrease as currently stated. Is this correct?

Response:

Lines 625-627: Great catch, thank you. The final sentence of that concluding statement has been revised to more clearly reflect the results of our study, which are that lodgepole pines are less dependent on summer precipitation events and more so on deep soil water and groundwater fed by winter snowpack/ spring snow melt rather than summer precipitation events under prolonged drought conditions.

Figures/Tables in general: Please explain the meaning of the lines in point plots as well as the boxes, whiskers, and symbols in boxplots. Additionally, provide more details on the location, species, and other relevant context. Ensure that all abbreviations are clearly defined. In general, each figure and table should be understandable on its own, without requiring the reader to refer to the entire manuscript.

Response:

We expanded the figure captions for figures 5, 6, 7, 8, and 9 to further explain the significance of boxplots and points in each figure as well as some of the results when appropriate to make the figures more comprehensive to individuals who have not read the entire manuscript.

Figure 9: The authors also collected isotope data from mature trees, but the rationale for including these data is not clearly expressed in the manuscript. I assume the mature trees are intended as a control to clarify the representativeness of the young tree water uptake patterns, correct? Additionally, I suggest adding the statistical results mentioned in Lines 453 and 455 to Figure 9 to make these key findings more explicit. Currently, these important results are somewhat "hidden" in the text, and highlighting them in the figure would enhance their visibility and impact.

Response:

Part of our expansion of the figure 9 caption is in response to the previously addressed comment, but we also included an explanation as to why the mature stand is only mentioned here and one of our key findings on changes in the isotopic signature of each of the stands between each sampling period. We also addressed some of the statistical findings and shift to a higher concentration of heavier isotopes in October when the values are the most positive in hopes of highlighting these results.

Figure 10: This is one of the most important figures in the paper. Could the authors please add more details to ensure the figure can be fully understood without needing to refer to the main

text? In particular, providing detailed information about Scenario 6 is crucial. Although the d2h biases are now mentioned in the Methods and Results sections, it remains unclear how these biases are considered in the MixSIAR model results. Please clarify how this bias is accounted for and its impact on the interpretation of the data.

Response:

We expanded our figure caption for this to include what sources and signatures were considered (in addition to reiterating it in the text) as well as the runtime parameters that were set in the MixSIAR model. We also described the more nuanced difference in the timing of changing proportions of depth to water uptake (more explicitly that the thinning treatments were able to maintain a larger proportion of shallow soil water uptake whereas the control stand shifted sources early in the study period).

The discussion of d2H bias was added to the main text (lines 498-501) to more explicitly state that it was not considered in our models.

Table S1: This table is not cited in the main text, or I may have missed the reference.

Response:

This supplemental table was not referenced in our previous submission but is now referenced in section 2.2. Climate and soil moisture monitoring (see line 177).