

Dear Dr. Pantoja,

20 August 2019

We received three positive and constructive reviews of our manuscript, “Spatial changes in soils stable isotopic composition in response to carrion decomposition (BG-2018-498)”. Below we address the comments and recommendations provided by the reviewers (original comments in italics, responses beneath). We feel the revised manuscript is improved from the original version as a result of these valuable suggestions.

The primary changes to the MS include:

- Removing the three end-member model at the suggestion of Reviewer #2 (Fig. 7), which did not add to the main conclusions of the original manuscript;
- Adding details to the discussion, particularly emphasizing the broader ecological consequences of persistent carcass-enriched soil; and
- Framing the two end-member mixing model more clearly.

Other changes to the manuscript in response to specific comments are detailed below. Please feel free to contact me if there are any questions regarding this re-submission.

Thank you,

Sarah Keenan

Anonymous Referee #1 (Received and published: 23 January 2019)

Overall the manuscript, “Spatial changes in soil stable isotopic composition in response to carrion decomposition,” within minimal revision is a well written and a sound contribution towards understanding the spatial influence of pulsed organic nutrient inputs into terrestrial ecosystems from the deposition of carrion. Numerous studies have approached this subject but the geographic expanse and complexity of the resultant biogeochemical responses leaves ample room for investigation. This work helps to bridge the gap between previous studies through both the spatial layout of the observations and the utilization of isotope discrimination factors and $\delta^{15}N$ methodologies to tease apart the spatial extent of carrion influence within the soil profile.

Addressing the following concerns and comments will enhance the quality of this manuscript:

Specific comments:

1) Table 1: Insert note that defines N.M.

Response: Note inserted to table legend.

2) Perhaps note that control values do not have an error term due to being homogenized into a single sample.

Response: Note inserted to table legend.

3) The table caption or a note should include the statement about this data being from Keenan et al. 2018 except for the one year data. Also include a reprint permission statement in text (section 180) and with the table if required by either journal.

Response: A statement has been added to clarify that some of the data is derived from Keenan et al. (2018a), and clarifying that the bolded data are new.

4) *The caption states that the letters indicate differences between samples but it is not clear as to between which samples the letters are referring to from the caption or from what was readily found in the text.*

Response: We added text to clarify that by “between samples” we were referring to between samples within each measured dataset over time (i.e., comparing pH from each sampling timepoint). The text now reads: “Letters indicate hotspot soil samples within each measured dataset (i.e., pH) that were not significantly different based on One-way ANOVA ($p < 0.05$).”

5) *Figure 3. Again the caption states that the letters indicate differences between samples but it is not clear as to between which samples the letters are referring to from the caption or from what was readily found in the text.*

Response: Text was added to the caption to clarify that letters indicate the soil samples taken at discrete distances from the hotspot center that were not significantly different based on a one-way ANOVA with post-hoc testing.

6) *Figure 5. Similar comment to Figure 3. Clearly there are differences signified with depth but it is not readily apparent what the difference is between A, AB, B, etc.*

Response: As with Figure 3, the caption was revised to clarify what the letters were indicating.

Technical corrections:

7) *Section 110: The equations as written may prove confusing to readers unfamiliar with isotope ratio calculations due to the use of the backslash as the division symbol both within the numerator and denominator as well as between. Perhaps something like $^{13}\text{C}/^{12}\text{C}_{\text{sample}} \div ^{13}\text{C}/^{12}\text{C}_{\text{standard}}$ would be better.*

Response: The equation was modified as suggested.

8) *Section 175: The following sentences seem to be restating a similar conclusion, “The pulse of nutrient-rich fluids resulted in significant changes to surrounding soil physio- chemistry (Table 1, Table S1). Soils exhibited long-term changes to physiochemistry following fluid degradation by soil microbial communities.” Consider strengthening this paragraph by combining or differentiating these statements.*

Response: The two sentences were combined for clarity and to eliminate redundancy.

9) *Section 185: “. . . values around 80 cm of the hotspot” presumably should read “80cm from the hotspot”.*

Response: Text modified as suggested.

10) *Section 200: Finesse this sentence a little bit to clarify that the 60 cm extent was beyond the carcass decomposition island. I believe that is what you are trying to state.*

Response: The sentence was edited for clarity.

11) Section 235: *The flow and the strength of the second sentence could be enhanced by revising the inclusion of “, here at least one year,”. This is an important point that should specifically state that the results are for the given location, climate, soil, etc. and perhaps it would be better to give this its own subsequent sentence.*

Response: The text was modified to emphasize that these results are specific for this site, a point we raise further in the discussion.

12) *Typo - The third sentence, “The beaver carcasses used this study,” should be “used in this study”.*

Response: Typo fixed.

13) Section 315: *Typo - Sentence missing "a", “Based on the isotopic discrimination factor (D) for N in hotspot soils, a linear regression”*

Response: Typo fixed.