Journal: BG
Title: Microtopography is a fundamental organizing structure in black ash wetlands
Author(s): Jacob S. Diamond et al.
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Responses to Referees

Anonymous Referee #1:

We thank Referee #1 for their detailed review of our manuscript. We have broken out your individual comments (RC) and responded to each accordingly (AC). We hope that our comments address and clarify any issues or concerns that they may have.

Detailed comments:

Title/Abstract:

RC1: …organizing structure of WHAT?

AC1: Our intent was that "organizing structure" refer to the structural backbone of ecosystem function in black ash wetlands, as is often mentioned in the ecological literature (i.e., "structure and function of ecosystems"). We understand that this may be ambiguous to some and we will amend the title to "Microtopography is a fundamental organizing structure of vegetation and soil chemistry in black ash wetlands".

RC2: By the definition wetlands are also coastal areas and shallow water bodies up to the depth of 6 m. This paper is about peatlands or mires. Please change through the text!

AC2: We respectfully disagree with the Referee comment on the necessity of changing the word "wetland" for two reasons. First, we are specific in our usage of the term "black ash wetlands", as opposed to simply "wetlands", and this term is in common usage in the literature. Second, we appreciate the reviewer's attention to word choice, but we further note that our study systems are not peatlands or mires; the similarity among our study sites is that they are dominated by black ash trees, not that they are peatlands (which the majority are not). We recognize this is not entirely clear and will add more detail in our site description section to address this oversight.

RC3: Are [wetland ecosystems] "controlled" or influenced, ruled or governed?

AC3: We are comfortable with our use of the word "controlled" in this context.

RC4: What was the resolution for [TLS] scanning?

AC4: The ranging error for the TLS used in this study is on the order of 5 mm, but we did not feel that including this information in the abstract was important or relevant, at least not nearly as important as describing the resolution of the surface model, which we note as 1-cm previously in the sentence.

RC5: Or something is causing the formation of microtopography and only then it will influence peat chemistry, vegetation etc?

AC5: We agree, and make this same argument in the previous sentence. Our perspective, which is well-supported in the literature, is that microtopography is created and maintained through feedbacks between biota and hydrology.

Introduction:

RC6: It is so in peatlands only up to the certain height above WT, whereas in wet lawns productivity can be higher than on dry hummocks.

AC6: We do not dispute this, and we provide direct references to support our statements, and state that "in many wetlands" this is true, not in all wetlands.

RC7: [Strack et al. 2006; Sullivan et al. 2008] Both missing from References! For citations missing from References it is shown here only once.

AC7: We sincerely apologize for the multiple issues with references. We will fix this in the revisions.

Strack, M., Waddington, J.M., Rochefort, L. and Tuittila, E.S., 2006. Response of vegetation and net ecosystem carbon dioxide exchange at different peatland microforms following water table drawdown. Journal of Geophysical Research: Biogeosciences, 111(G2).

Sullivan, P.F., Arens, S.J., Chimner, R.A. and Welker, J.M., 2008. Temperature and microtopography interact to control carbon cycling in a high arctic fen. Ecosystems, 11(1), pp.61-76.

RC8: [Rietkerk et al. 2004] Missing from References!

AC8: We sincerely apologize for the multiple issues with references. We will fix this in the revisions.

Rietkerk, M., Dekker, S.C., Wassen, M.J., Verkroost, A.W.M. and Bierkens, M.F.P., 2004. A putative mechanism for bog patterning. The American Naturalist, 163(5), pp.699-708.

RC9: [Heffernan et al. 2013] Missing from References!

AC9: We sincerely apologize for the multiple issues with references. We will fix this in the revisions.

Heffernan, J.B., Watts, D.L. and Cohen, M.J., 2013. Discharge competence and pattern formation in peatlands: a meta-ecosystem model of the Everglades ridge-slough landscape. PloS one, 8(5), p.e64174.

RC10: [Casey et al. 2016] Missing from References!

AC10: We sincerely apologize for the multiple issues with references. We will fix this in the revisions.

Casey, S.T., Cohen, M.J., Acharya, S., Kaplan, D.A. and Jawitz, J.W., 2016. Hydrologic controls on aperiodic spatial organization of the ridge–slough patterned landscape. Hydrology and Earth System Sciences, 20(11), pp.4457-4467.

RC11: Mostly evapotranspiration from hollows is greater than from hummocks!

AC11: We provide four references that support our statement that ET is higher on hummocks relative to hollows. If the Referee has a reference for the opposite, we would be happy to include it as an in-text parenthetical exception.

RC12: What is Paper I?

AC12: Apologies, Paper I is:

Diamond, J.S., McLaughlin, D.M., Slesak, R.A., and Stovall, A. Pattern and structure of microtopography implies autogenic origins in forested wetlands. Hydrology and Earth System Sciences, in Press.

<u>Methods:</u>

RC13: If this paper is not published yet then it can not cited for Methods. Please give details here.

AC13: The paper is now published, and can be found at:

Diamond, J.S., McLaughlin, D.M., Slesak, R.A., and Stovall, A. Pattern and structure of microtopography implies autogenic origins in forested wetlands. Hydrology and Earth System Sciences, in Press.

RC14: Please give peat depth, peat type, vegetation etc on studied sites-

AC14: We will include this summary information in our revisions, and we hope it also will clarify previous concerns the Referee had with our use of the word "black ash wetlands".

RC15: [Stovall et al. 2019] Missing from References!

AC15: We sincerely apologize for the multiple issues with references. We will fix this in the revisions.

Stovall, A.E., Diamond, J.S., Slesak, R.A., McLaughlin, D.L. and Shugart, H., 2019. Quantifying wetland microtopography with terrestrial laser scanning. Remote Sensing of Environment, 232, p.111271.

RC16: Size of plots?

AC16: We refer to the size of the plots in the previous section 2.2 on line 106; …"within three, 300 m^2 circular plots", but we will add a reference to their size again in the parentheses after this comment.

RC17: Sampling depth and area?

AC17: We will add that the area of sample was a circle 5 cm in diameter, but describe the remaining information already in the same paragraph as this comment: at least 13 points per site, 10 cm depth.

RC18: Samples were nor dried to constant weight to get concentration of chemicals per gram?

AC18: The samples were dried to constant weight. We will add this information in our revisions.

RC19: … water table depth? Or where there other parameters studied?

AC19: Water table depth was our state variable, but several simple statistical metrics were calculated from it. We will be more specific in our language in our revisions, and note that median and mean water table were the most predictive of our independent variables.

RC20: [De Caceres and Legendre 2009] Missing from References!

AC20: We sincerely apologize for the multiple issues with references. We will fix this in the revisions. This is already currently in the references as:

Cáceres, M.D. and Legendre, P., 2009. Associations between species and groups of sites: indices and statistical inference. Ecology, 90(12), pp.3566-3574.

RC21: [Caceres 2013] Missing from References!

AC21: We sincerely apologize for the multiple issues with references. We will fix this in the revisions. This is already currently in the references as:

De Cáceres, M., 2013. How to use the indicspecies package (ver. 1.7. 1). R Proj, 29.

Discussion:

RC22: [Duberstein and Connor 2009] Missing from References!

AC22: We sincerely apologize for the multiple issues with references. We will fix this in the revisions.

Duberstein, J.A. and Conner, W.H., 2009. Use of hummocks and hollows by trees in tidal freshwater forested wetlands along the Savannah River. Forest Ecology and Management, 258(7), pp.1613-1618.

RC23: But what is causing higher species diversity on hummocks?

AC23: As we discuss throughout the manuscript, and in particular in the previous paragraphs (lines 302–341), the preponderance of literature evidence suggests that hummocks provide hydrologic stress relief for vegetation allowing for both obligate and facultative species to grow. We also suggest that there is a productivity-elevation feedback that as hummocks increase in height, they increase local productivity/nutrient cycling on the hummock, further relaxing constraints on plant growth.

RC24: Can there be several "water tables" or still in each site only one?

AC24: In this case we referring to "water tables" in the broad, across-site sense. We will rephrase to improve clarity.

RC25: [Kirchner 2000] Missing from References!

AC25: We sincerely apologize for the multiple issues with references. We will fix this in the revisions. This should actually be "Kirchner et al. 2000" in text.

RC26: [In northern bog wetlands] This is the total mess of terms!

AC26: We will rephrase to "northern bogs".

RC27: There are opposite results published as well. See Limpens et al, 2014.

AC27: Without a specific reference from the referee, we can only assume that they are referring to:

Limpens, J., Holmgren, M., Jacobs, C.M., Van der Zee, S.E., Karofeld, E. and Berendse, F., 2014. How does tree density affect water loss of peatlands? A mesocosm experiment. PloS one, 9(3), p.e91748.

If this is true, the results from this study are not in opposition to our statement (which we support with citations from two studies). Limpens et al. 2014 show that compared to a control mesocosm, a treatment of low-density trees (analogous to tree encroachment in a bog) can produce lower water levels at the end of a growing season. They conclude that low-densities of trees produce a drying effect, but that if there are many trees and the canopy closes, this effect may be offset in the future.

RC28: [Cantelmo and Ehrenfeld 1999] Missing from References!

AC28: We sincerely apologize for the multiple issues with references. We will fix this in the revisions.

Cantelmo Jr, A.J. and Ehrenfeld, J.G., 1999. Effects of microtopography on mycorrhizal infection in Atlantic white cedar (Chamaecyparis thyoides (L.) Mills.). Mycorrhiza, 8(4), pp.175-180.

RC29: [Jones et al. 1996] Missing from References!

AC29: We sincerely apologize for the multiple issues with references. We will fix this in the revisions.

Jones, R.H., Lockaby, B.G. and Somers, G.L., 1996. Effects of microtopography and disturbance on fine-root dynamics in wetland forests of low-order stream floodplains. American Midland Naturalist, pp.57-71.

RC30: There is too much of repetition of results in Discussion.

AC30: In our revisions, we will reduce repetition of Results in the Discussion.

RC31: Is there any measurements to approve it?

AC31: Apart from our field observations, we do not have any publishable results to confirm that water tables are indeed flat across the study areas. We will add more attention to this limitation here.

Conclusions:

RC32: But vegetation "occupied" hollows as well?

AC32: Yes, vegetation occupies hollows as well. We will refine our language here to be less ambiguous.

References:

RC33: [Cohen et al 2016] Citation missing from the text

AC33: Thank you for finding this omission. We will remove this citation.

RC34: Are these two the same person or not? If not then put Caceres .. in right place in alphabetical order.

AC34: Yes, they are same person. We will fix this error.

RC35: [Huenneke and Sharitz 1986] Citation missing from the text

AC35: Thank you for finding this omission. We will remove this citation

RC36: [Iremonger and Kelly 1988] Citation missing from the text

AC36: Thank you for finding this omission. We will remove this citation

RC37: [Wilson and Agnew 1992] Citation missing from the text

AC37: Thank you for finding this omission. We will remove this citation

Figures:

RC38: [Figure 4] "..richness" or "species number?

AC38: Species richness is equivalent to the number of different species.