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Author(s): Jacob S. Diamond et al.
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Responses to Referees

Anonymous Referee #3:

We thank Referee #3 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:

Introduction:

RC1: When talking about primary production and distance from WT, it's a bit odd not to mention drainage of peatlands for forestry which has been thoroughly studied

AC1: We will include some references to these works in our revisions.

RC2: As the Diamond (referred to at times as "Diamont") et al. in review is a discussion paper, it can of course be referred to, but a link to the paper should be found in the references!

AC2: We sincerely apologize for the numerous issues associated with citations throughout our manuscript; this was noticed by the other Referees as well. We have fixed all citation issues and note them here in our response, and note that Diamond et al. [in Review] (accidentally referred to Diamont et al. at one point) is published now as:

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.

Methods:

RC3: 2.1 Site descriptions How were the measurement plots placed in the sites? How far from each other were they? The area variation in the sites is large; is there some correlation between site type and area? These things should be explained in the text at least briefly even if they are available in another article.

AC3: We will include more detailed information on site characteristics and plot locations in our revisions. The measurement plots were randomly placed throughout the sites (by means of a pre-field random placement algorithm), typically less than 50 meters from one another.

RC4: 2.2 Field measurements The WTL monitoring setup should be described in detail already in the methods section-now the fact that WTL was measured in only one location per site(?) only comes up in the Discussion. If indeed WTL was only measured at one location in a site of over 15 hectares, this is quite a problematic approach. The water retention characteristics of peat can vary by a lot based on how decomposed it is and what it is composed of. Also, the water in a peatland system is never at a steady state; it is always on the move and therefore there are always differences in the pressure head inside the ecosystem. This hampers the tests on species richness and basal area, a fact which should be noted in the text. The fact that the TLS measurements were only conducted on six of the sites should be mentioned already here.

AC4: We will be more detailed here, as it is clearly confusing as written. The note that site areas were 0.5–15.6 ha is misleading and we will remove it. Those site areas were estimated from earlier survey approaches and are not representative of our actual study areas. The actual study areas within sites only varied between 0.07 and 0.12 ha, as we did not sample the entire previously estimated site area. Hence, we believe that measured water tables are quite representative of our small study areas. We measured water table every 15-minutes at our sites for 3 years and so we believe have a good general understanding of overall water table behavior and dynamics at our sites. Overall, the goal was to sample areas that we could also measure with our TLS approach, which was indeed measured at all 10 sites. Still, we point to limitations of this approach in the Methods and will increase focus on these limitations in the Discussion text.

RC5: 2.2.1 For the species richness, the importance of each microform to landscape level biodiversity would be interesting; even though areas higher from the WTL host more species than those closer to the WTL, their species composition might be closer to that of the surrounding upland forests. This could be discussed.

AC5: We agree that this is a very interesting perspective and will include a brief discussion of the potential for this future work in the Discussion. However, we are unable to assess this importance with our current datasets.

RC6: 2.2.2 These two paragraphs are really hard to understand. How were the stand-level metrics for the first data source measured? Is there some reference available?

AC6: We agree that this is the most confusing part of our methods, and will do our best to clarify. The stand-level metrics were measured with standard forestry methods. There is no direct reference available for these data, but we will provide them as part of open access in this journal.

Essentially, the first, forestry/stand-based data source is useful for site-level understanding, but the second, TLS data source is useful for microform-level understanding. With the TLS data source we can tie a specific tree to a specific microform.

RC7: 2.2.3 Why would you air-dry the samples? Bringing moist peat samples to warm conditions is sure to alter their composition, with high microbial activity breaking down organic matter, and nitrification-denitrification processes running wild. This casts doubt on the whole soil chemistry part of the manuscript and should at least be discussed. The different times it takes for the peat samples with different pore size distribution to dry and thus the different amounts of microbial activity that has gone on in the samples will cause the carbon and available phosphate content and nitrogen fractions to differ between the samples.

AC7: To the best of our knowledge, air-drying wetland soil is a common method used across many wetland systems and recommended by Reddy and DeLaune, Biogeochemistry of Wetlands: Science and Applications. We will further note that soils were air-dried to constant weight, and were extremely friable when we ground them. We will include a discussion of possible artifacts of this method in the Discussion.

RC8: 2.3 The three-level approach to the dataset is good and the applied statistical methods seem appropriate for each sub-analysis

AC8: Thank you.

<u>Methods:</u>

RC9: 3.2 If you take the p-value approach to significance of effects, you should use the wording "no statistically significant relationship".

AC9: We will make this change.

RC10: 3.3 The problems with sample processing should be addressed. Bulk density and other physical characteristics representing the state of decomposition of the peat in each location would be useful and potentially another explanation for some of the chemical differences observed.

AC10: We will include a discussion of potential artifacts of the approach in the Discussion.

Discussion:

RC11: The various problems of sampling and sample processing mentioned above and their effects on the observed results should be discussed here.

AC11: We will include a brief discussion of potential artifacts from sample processing here.