

## Response to 2<sup>nd</sup> review

### Report #1

No comments

### Report #2

Line 65: The authors mean that higher lignin:N ration has lower decomposition, right?

This wording has been changed: " Litter composed of more complex C compounds and/or higher lignin:N ratios can have lower decomposition rates and, therefore, lower rates of C loss and relative N retention."

Line 195: It seems that it would be appropriate to mention the stand age of the black spruce, which would also indicate the time since stand replacing fire.

The fire return interval of our black spruce forest, based on literature values, is likely between 25 – 150 years\*. However, stand age has no influence on and is much younger than the age of ecosystem initiation, which is what is needed to determine long-term accumulation rates. Therefore, we did not measure this value.

\*Fryer, Janet L. 2014. Fire regimes of Alaskan black spruce communities. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: [http://www.fs.fed.us/database/feis/fire\\_regimes/AK\\_black\\_spruce/all.html](http://www.fs.fed.us/database/feis/fire_regimes/AK_black_spruce/all.html) [2016, July 13].

Line 320: Was there any charcoal evidence indicating fires that could help corroborate this? A lack of any charcoal in the core descriptions from the rich fen would show this clearly.

We addressed the issue of charcoal evidence by adding the following text: "An examination of the soil horizon descriptions for these sites only found one incidence of charcoal being observed (Manies et al., 2016; shrub ecosystem, 12-17 cm). However, a macrofossil analysis of these or future cores could further support this hypothesis."

Line 335: remove "are"

Removed extra word.

Line 337: "...This variability is likely due [to] microsite variability"

Add the word 'to'.

Figure 1: Perhaps this would depict the comparison better as an xy plot (Pb vs. C) with correlation coefficients.

We adjusted this figure to be a xy plot and found it to be confusing, especially because each date has an upper and a lower range, which is difficult to interpret in the xy format. We would like to keep this figure as it is. To make the figure clearer we added some vertical lines to make it easier to delineate which samples should be compared.