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Comment

Interactive comment on “Spatio-temporal analysis of nitrogen cycling in a mixed coniferous forest of the northern United States” by I. Howard and K. K. McLauchlan

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Each of the three reviewers expressed high interest in the wood $\delta^{15}\text{N}$ dataset reported in the manuscript, and found that the study design and analyses had been conducted well. Among all reviewers, a main revision needing to be addressed is a refinement of the interpretations of our findings about the ultimate cause of the declining patterns of $\delta^{15}\text{N}$ in wood. Because of the temporal synchrony of the declines among individual trees, the timing of the onset of the declines, and the known effects of fire suppression on nitrogen cycling from other forested systems, we posit that the decline is more than likely related to fire suppression in the state park beginning in 1920. However, as

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the reviews suggest, alternative and more complicated hypotheses for the decline are possible, and it is difficult to test these hypotheses fully without additional theoretical background and incorporation of additional data (such as the precise fire history of the watershed or additional datasets about temporal $\delta^{15}\text{N}$ patterns in pine species). We have followed the reviewer's suggestions and we now have more deeply examined the possibility that the decline is related to an anthropogenic change in disturbance regime. We have posted our response to the specific concerns addressed by each referee in their respective interactive comment section.

Summary of major changes: 1. Incorporated more detailed description of the statistical tests employed and the reasoning for choosing the tests. 2. Incorporated more discussion related to the role of fire within the Deming Lake watershed, using results found from the Clark (1990) study. 3. Changed Figure 2 from a map demonstrating the slope within the watershed to a contoured map to better demonstrate the sampling sites and the age distribution of the trees in the watershed. 4. Added more discussion related to alternative explanations and the ultimate implications of the results.

Cited references:

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Clark, J.S.: Fire and climate change during the last 750 yr in northwestern Minnesota, *Ecol. Monogr.*, 60, 135-159, <http://dx.doi.org/10.2307/1943042>, 1990a.

Doucet A., Savard, M.M., Bégin, C., and Smirnov, A.: Is pre-treatment essential for tree-ring nitrogen concentration and isotope analysis?, *Rapid Commun. Mass Spec.*, 25, 469-475, doi: 10.1002/rcm.4876, 2011.

McLauchlan, K.K., and Craine, J.M.: Species-specific trajectories of nitrogen isotopes

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National Atmospheric Deposition Program. 2013 Annual Summary. <http://nadp.sws.uiuc.edu/lib/data/2013as.pdf>, 2013.

Smithwick, E.A.H., Turner, M.G., Mack, M.C., and Chapin, F.S.: Postfire Soil N Cycling in Northern Conifer Forests Affected by Severe, Stand-Replacing Wildfires. Ecosystems 8, 163-181, 2005.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/12/C2362/2015/bgd-12-C2362-2015-supplement.pdf>

Interactive comment on Biogeosciences Discuss., 12, 3617, 2015.

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12, C2362–C2365, 2015

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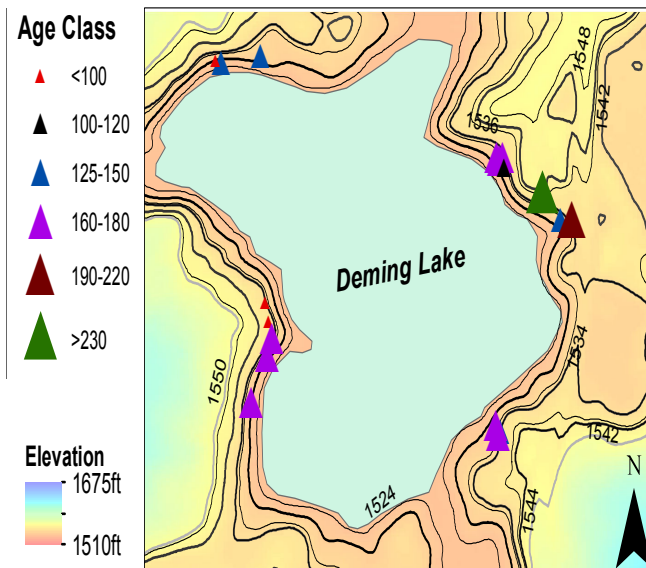
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100 Meters
Revision of figure two

Fig. 1.

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