

Interactive comment on “Plant controls on post-fire nitrogen availability in a pine savanna” by Cari D. Ficken and Justin P. Wright

Anonymous Referee #2

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General Comments: The main objective of this research was to assess potential mechanisms responsible for post-fire variations in nitrogen (N) availability and pools in a longleaf pine savanna. The manuscript provides weekly measurements of N over a 9-week period (several weeks pre- and post-fire) during the growing season at five sites at Ft Bragg, NC. This allowed detection of rapid but ephemeral pulses in N availability post-fire. The subject matter appears appropriate for Biogeosciences. The paper is relatively well-written and thought out. However, background information provided in Introduction needs additional citation (e.g., Pg 3 lines 17-18, 21-22; Pg 4 lines 1-2, 6, 7-9, 9-11), and there is a lack of detail in the Methodology (see specific comments below). As written, the sampling design appears a bit weak, and the choice of sites and inclusion of the wildfire site and exclusion an outlier control site need more justification. The use of the Bayesian model to account for pre-fire heterogeneity of N

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values appear to be a useful technique. The authors claim that decreased vegetation cover post-fire could be a major factor driving increases in NH_4^+ availability, but no vegetation data are provided, although these data apparently exist (cited in Discussion as 'unpublished data'). Inclusion of vegetation data (at least in some form) would substantially strengthen the paper.

Specific comments. Pg 2, Line 24: This phrase is confusing and needs clarification: "localized studies with ecosystem-specific temporal data resolution" Pg 5, line 6: Please provide examples of the Ericaceous species Pg 5, lines 10-15: It would be useful to know more about the burn regime of the study sites, especially since one of the fires was a wildfire. When are prescribed fires normally set? At the same time as the wildfire? Was the wildfire similar in severity and timing as the prescribed fires? Pg 5, lines 15-19: It's unclear what is meant by "historical burn characteristics." The information in parentheses makes it seem like this means that all the sites burned under similar conditions, but the last part of the sentence makes it seem like only the return interval was the same. Pg 5, line 20: The grouping of the wildfire with other fire sites needs more justification. The authors go to great length to explain in previous sentences why the three 'burned' sites were chosen based on their similarities and then seem to gloss over the grouping of this wildfire with other fire sites despite the fact that it burned at a totally different burn interval and likely under very different conditions. Pg 5, line 22-24: The removal of the third control site from further analyses is questionable. Were these differences among control sites unknown prior to sampling, or were they only discovered after sampling? Is there nothing that can be gleaned from information on this site? How representative of the area is this site? Pg 5, line 23: Five sites is pretty small sample size, especially since the wildfire site might not represent the prescribed fire sites. If the sites are not considered replicates, and instead the cores within a site are the replicates, this should be clarified. Pg 5, line 26: How big was the sampling area? Pg 5, line 27-28: The description of sampling above the 'ecotone' needs clarification. Was this just to avoid being in the 'extremes' of either upland or lowland? Pg 6, lines 1-2: The vegetation sampling needs to be described in more detail. Exactly how was

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this done? Given that the vegetation link to N availability is a big part of this study's conclusion, why aren't these data included or at least described in more detail? Pg 6, line 3: This sentence should be moved to where the fire regimes are being described. Pg 6, lines 4-7: What temperatures were recorded? Where in the burns were these pyrometers installed? How far apart from each other? How high off the ground? Pg 6, lines 6-7: Are there other surrogates of fire intensity that could be used to assess this wildfire site? Canopy mortality? Depth of residual organic layer? Char cover? Pg 6, line 13: How far apart were cores? "Adjacent to each other" is vague. Pg 6, line 19: "throughout the growing season" makes it seem like samples were collected over a much longer period. Longleaf probably grow for many weeks (much more than 9 weeks) in North Carolina. Pg 6, line 21: "until they were analyzed" is vague. How long were soils typically stored frozen before analysis? Pg 7, line 21: What is the date referring to? Pg 8, line 24: What is SOM? Soil organic matter? From the description in previous sections, no organic layer develops in this system. Please clarify. Pg 10, line 11-12: The vegetation description should be expanded to show how the communities varied across sites. What functional types are the three species listed? Grasses, forbs, shrubs? Pg 10, line 17-18: This sentence seems out of place since no description of fuel load or moisture across the sites is given in this manuscript. Pg 14, line 16-17: The link to plant communities would be strengthened if there were more detailed plant data included in the study. As written, there's no way to assess whether N availability co-varied with plant abundance. Apparently these data exist (Pg 15, lines 18 and 21), so why aren't they included? Pg 17, this paragraph on 15N is way too long and hard to follow. Please simplify and condense, or break into a couple of paragraphs. Pg 18, lines 25-28: Inclusion of the vegetation data would substantially strengthen this statement. Figure 1 is a bit confusing. The text description could use more detail for clarification.

Technical Corrections: Throughout: "Southeastern" is sometimes one word and sometimes two words.

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