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Interactive comment on “A meta-analysis on the impacts of partial cutting on forest structure and carbon storage” by D. Zhou et al.

D. Zhou et al.

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Received and published: 27 March 2013

Comments and our Responses to Dr. Eric Vance:

[Comment 1] This is a valuable and clearly written analysis of the effects of thinning on forest biomass (DBH, basal area), growth, and carbon storage (aboveground, understory, forest floor, mineral soil) across a wide range of forests. Thinning effects are logically separated into thinning intensity and time since thinning. Findings of the analysis should be useful in addressing a range of ecological and management questions. Table and figures are logically developed and clearly depict results of the analysis. [Response 1]: Thanks for your encouragement and comments.

[Comment 2] More objective language concerning the effects of thinning is needed.

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Interactive Discussion

Discussion Paper



Interactive
Comment

Reduced aboveground biomass or basal area can be positive or negative, depending on the particular system and values being considered. Thinning can provide significant ecological benefits related to forest health, biodiversity, and susceptibility to wildfire, for example. These benefits should be part of the discussion in the paper. Terms such as “adverse impacts” (p. 5, line 19) and “significant negative influences” (p. 14, line 12), should be avoided. [Response 2]: Nice comments and observation. We have made a thorough revision to make the language more objective following your suggestions: 1) We have added a new paragraph at the end of section 4.2 in Discussion to address the constructive comments of you (lines 456-472 on Pages 15-16 in the revision) as following: “It should be noted that the biomass C removed generally did not return immediately to the atmosphere but rather remained store in a durable status such as in wood products (Fahey et al., 2009), which (if long lived) can be considered a C sink (Pacala et al., 2007). The removed biomass was one major contributor to global energy supply (Berndes et al., 2003). Moreover, it’s widely accepted that partial cutting alters species composition and stand structure, which can provide many benefits, such as enhancement of wood products and reduction of fire risk (Kolb et al. 1998;Harvey et al., 2002; Frey et al., 2003; McDowell et al. 2006;Campbell et al. 2009). Thus, the immediate AGBC loss induced by partial cutting can be repaid in other terms of forest services and functions.” 2) Summary session was rephrased with more objective language (lines 525-531 and 540-542 on Pages 17-18 in the revision). 3) We changed “adverse impacts” (p. 3, line 19) into “opposite impacts” (p.4, line 88 in the revision), and “poses significant negative influences on AGBC” (p. 14, line 12) into “reduced the AGBC significantly” (p.17, line 526 the revision).

[Comment 3] Implications of the results for forest carbon storage should also be more objectively described. A true analysis of the carbon impacts of thinning would include the carbon implication for the biomass removed, which can continue to store carbon or be used as an energy source. An unthinned forest may also be more susceptible to wildfire, which can dramatically reduce carbon storage. [Response 3]: Agree. Please see our responses to your comment 2.

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[Comment 4] Abstract: Note the timeframe of the analysis in describing the results. [Response 4]: The timeframe “between 1973 and 2011” was added in Abstract (p. 3, line 40 in the revision).

[Comment 5] Page 5, line 9: Describe how data from different soil depths are treated. If data from 0-5 cm, 0-10 cm, or 0-20 cm is available from a study, can those data be used and, if so, how so for the 0-15 cm depth defined in the analysis? [Response 5]: Nice observation. We defined the depth of mineral soil as 0-15cm in this analysis because about 82% of the studies reported the soil C sampled in this layer. This description was added in the Section 2.1 in Method (p. 6, lines 142-146) in the revision as “We defined the depth of mineral soil as 0-15cm in this analysis because about 82% of the studies reported the soil C sampled in this layer. The other studies (i.e., Yang et al., 2001; Gundale et al., 2005) that provided soil C at the depth of 0-10cm were also utilized directly without further transformation in order to include observations as many as possible.”.

[Comment 6] 5, 26: Briefly described “unweighted.” [Response 6]: Described as “an unweighted meta-analysis was used in this paper, in which the response effects were not weighted by sample size” as suggested (p. 7, line 193 in the revision).

[Comment 7] 10, 17: “trees” [Response 7]: Modified.

[Comment 8] Section 4.2: Here and elsewhere, as appropriate, acknowledge that thinning effects carbon balance in ways other than on site storage (e.g., products and energy). [Response 8]: Agree. Please see our responses to your comment 2.

[Comment 9] 12, 17: It’s not clear how reduced autotrophic respiration might increase forest floor carbon. [Response 9]: The increase of NPP (i.e., GPP- Ra) might lead to the increase of annual litterfall and we assumed that the decrease of Ra can increase NPP. Obviously this depends on the situation of GPP as well. Therefore, we removed the sentence of “the lower autotrophic respiration rates induced by the reduced live root biomass (Ryu et al., 2009)” in the revision to avoid possible confusion.

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[Comment 10] 13, 7: “Sustainable” should mean more than the amount of forest biomass in most cases. The baseline assumption appears to be that more forest biomass is always better, regardless of implications for forest health and other values. [Response 10]: Agree. Discussion and summary sessions were rephrased with more objective language according to your comments. For details please our responses to your comment 2.

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Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/10/C538/2013/bgd-10-C538-2013-supplement.pdf>

Interactive comment on *Biogeosciences Discuss.*, 10, 787, 2013.

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10, C538–C542, 2013

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