Response to Interactive Comments from J.D. Moore:

We value the comments received from Dr. Moore and would like to thank him for taking the time to review our paper. Addressing these comments has greatly improved the article. Below we have responded to each comment and the number of the answer corresponds to the number of the comment provided.

RC=Reviewer's comments
AC=Authors' comments

RC General: *"This is an interesting paper. The authors present the correlations between basal area of some tree species of the northern hardwood forest and soil and surface water characteristics in the Adirondack Mountains. Although the topic should be of interest to forest managers dealing with that kind of ecosystems (with some minor changes in the introduction to explain why the focus was on sugar maple and black cherry), there are however important weaknesses that could harm the acceptance of this paper by the HESS. One of my main concerns is the low "n" value used in the Pearson correlation for the Watershed stream chemistry (Table 5) making hazardous the interpretation of results, particularly in absence of graphics. Moreover, the interpretation of some correlations with P > 0.20 (and up to 0.48) as significant (although the authors choose 0.05 as the significant level – P.10782, L.18), makes also hazardous such interpretation. In this context the conclusions should be wrong or biased."*

AC General: We have added more in the introduction to explain why sugar maple and black cherry were the focus of this paper. Essentially, sugar maple and black cherry were the main focus of this research project because the remainder of the tree species were widespread throughout the entire Grass Pond watershed while sugar maple and black cherry trees were primarily found in distinct groves within separate sub-watershed. Furthermore, sugar maple has major economic importance and its decline has been noted in a number of regions including the Adirondacks. Some of these details are provided in the paper as well in the cited works by: Burns and Honkala, 1990; Van Breemen et al., 1997. Recent studies have suggested the importance of black cherry especially in sites with low base status. For more details see: Aguilar and Arnold, 1985; Godefroid et al., 2005; Lorenz et al., 2004 that are cited in our manuscript. We realized the available sample size for watershed stream chemistry was small (n = 7). Thus, this correlation analysis had low power for testing the null hypothesis that Pearson correlation equals zero and the p-value for the test may not be reliable or meaningful. This is because the t-test is strongly affected by the sample size: $\mathrm{t} = \frac{\hat{\rho} - 0}{\sqrt{\frac{(1-\hat{\rho}^2)}{\mathrm{n}-2}}}$. For example, for a moderate correlation: $\hat{\rho} = 0.5$, the sample size must be larger than 14 in order to get the t > 2 ($\mathrm{n} = \frac{\mathrm{t}^2(1-\hat{\rho}^2)}{\hat{\rho}^2} + 2$). Therefore, the non-significant tests for the Pearson correlation coefficients in Table 5 were partially due to the small sample size. Instead of focusing on the significance of the Pearson correlation we would interpret the Pearson correlation coefficients based on the common guideline such that low (0.1 – 0.3), moderate (0.4 – 0.6) and high (0.7 - 0.9). The statement "Within our study, all statistical analysis were assessed at a significance level of p = 0.05" has been removed and additional explanation added to provide further clarification in the manuscript.

Specific Comments:

Abstract

RC1: *"L16: put a coma after NH4."*

AC1: The authors agree and in a revised version we have put a comma after NH4.

Introduction

RC1: *"P10777, L3: Liming could also be a countering force. Otherwise, add "natural" after Countering."*

AC1: The authors agree and in a revised version we have added "natural" after Countering.

RC2: *"P10777, L6: I suggest to add "it is generally recognized that …"forests" ."*

AC2: The authors agree and in a revised version of the article we have added "it is generally recognized that…"

Results

RC1: *"Section 3.3: What about black cherry positive basal area correlation with forest floor Ca (r = 0.25, p = 0.071; Table 4)?"*

AC1: We believe Dr. Moore's comment refers to the positive correlation between black cherry basal area and *mineral* soil Ca (r=0.25, p=0.071; Table 4). We believe that providing this relationship is insightful even recognizing that the p value is 0.071. This result, however, does not provide a substantive addition to the discussion and conclusion section and if it is felt by the editor that it should be added this could be done.

RC2: *"P10785, L4 and 5: The authors stated that: "a strong negative association between black cherry and pH (Table 4, Fig. 5a, b)" but in Table 4, r = -0.079 and p = 0.55 for the forest floor pH and r = -0.18 and p = 0.20 for the mineral soil pH. Its seems that the association is not so strong!"*

AC2: The complete sentence of the paper referenced in this comment states "The relative location of black cherry in the CCA biplot indicated a strong positive association with forest floor NH4 (Table 4 and Fig. 5a)". The authors agree with the comment that this association in Table 4 is not strong. This statement refers solely to the association in the CCA analysis depicted in Fig. 5a and hence the wording has been changed to clarify that this result is not inferred for other statistical analyses.

RC3: *"P10785, L7: Add "DOC" after pH? See Table 5."*

AC3: Again, this sentence in the paper refers solely to the associations in the CCA analysis depicted in Fig. 5 as noted in the comment above.

Discussion and Conclusion

RC1: *"P10785, L22 and 23: But in your study, the correlations of these species and the attributes mentioned in L25 to 27 are not demonstrated for all of these species."*

AC1: We have changed this statement to address the concerns of the reviewer and clarify our major points: In Grass Pond watershed, forest composition was dominated by red maple and American beech with black cherry and sugar maple comprising 4% and 9% relative basal area, respectively. However, at Grass Pond watershed, sugar maple basal area was associated with those locations in the watershed with the neutralization of atmospheric acidic inputs, including high stream water ANCc, BCS, pH and Ca:Al, low stream water DOC and high soil pH. These locations were in contrast to those in which black cherry was found that showed more acidic attributes (Fig. 6).

RC2: *"P10786, L9: A reference would be suitable at the end of the sentence*."- In general, sites with thick soil layers with relatively high soil pH and Ca concentrations are more likely to be colonized by sugar maple trees than other less suitable more acidic sites because of the relatively high nutrient demands of this tree species.

AC2: We have added the following references to page 10786 line 9: Bailey et al., 2004, Christopher et al., 2006, Van Breemen et al., 1997; and:

Hallett, R.A., Bailey, S.W, Horsley, S.B., and Long R.P., Influence of nutrition and stress on sugar maple at a regionally scale, Canadian Journal of Forest Research, 36(9), 2235-2246, 2006.

Horsley, S.B., Bailey, S.W., and Hallett, R.A.: Linking environmental gradients, species composition, and vegetation indicators of sugar maple health in the northeastern United States, Canadian Journal of Forest Research, 38, 1761-1774, 2008.

Juice, S.M., Fahey, T.J., Siccama, T.G., Driscoll, C.T., Denny, E.G., Eagar, C., Cleavitt, N.L, Minocha, R., Richardson, A.D., Response of sugar maple to calcium addition to northern hardwood forest, Ecology, 87, 1267-1280.

Long, R.P., Horsley, S.B., Hallett, R.A., and Bailey, S.W.: Sugar maple growth in relation to nutrition and stress in the northeastern United States, Ecological Applications, 19(6), 1454-1466, 2009.

Long, R.P., Horsley, S.B., and Hall, T.J., Long-term impact of liming on growth and vigor of northern hardwoods, Canadian Journal of Forest Research, 41(6), 1295-1307, 2011.

Page, B.D., Bullen, T.D., and Mitchell, M.J., Influences of calcium availability and tree species on the cycling of Ca isotopes in soil, vegetation, and stream water, Biogeochemistry, 88, 1-13, 2008.

Schaberg, P.G., Tilley, J.W., Gary, J., DeHayes, D.H., and Bailey, S.W., Associations of calcium and aluminum with the growth and health of sugar maple trees in Vermont, Forest Ecology and Management, 223, 159-169, 2006.

RC3: *"P10787: Remove L4 and 5. In table 1, standard deviation is relatively high for NH4 and it seems to have no difference between NH4 values in subwatersheds. So, this hypothesis is highly speculative."*

AC3: The authors believe this comment refers to P10787, L3 and 4. We have removed the statement "It is also possible that the bear scat located at these sites may have contributed to high forest floor NH4+".

RC4: *"Given my general comments and the paragraph (L5 to 16) in P10787, the conclusion in P10787 and 10788 seems to overinterpret the results."*

AC4: In our discussion and conclusion we have been more careful in the interpretation of the results.

Other

RC5: *See Long et al. (2009) and Moore et al. (2012) to improve the text about nutrient requirements of sugar maple, black cherry and American beech.*

Moore, J.-D., R. Ouimet et L. Duchesne. 2012. Soil and sugar maple response 15 years after dolomitic lime application. For. Ecol. Manage. 281 : 130-139.

Long, R.P., Horsley, S.B., Hallett, R.A., Bailey, S.W., 2009. Sugar maple growth in relation to nutrition and stress in the northeastern United States. Ecol. Appl. 19, 1454–1466.

AC5: The authors agree that these additional references are very appropriate for use in this paper and have been added.