Response to Interactive Comments from Anonymous Referee #1

We value the comments received from Anonymous Referee #1 and would like to thank this individual for taking the time to review our paper. Addressing these comments has greatly improved our 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

General Comments:

RC1: "*The Introduction needs further development. The last paragraph in particular needs development and more references to literature. Page 10777, lines 17-21 should be clearer. There is mention of trees being different in their ability to cycle base cations and may result in differences in soil base cation concentrations in forest stands (p. 10777 line 17-19). By 'forest stands,' you really mean soil under the trees (I think). Expand on this. This paragraph discusses relationships among acid intolerant species, specifically, looking at relationships among sugar maple basal area and stream and soil characteristics. It does not talk about predicted relationships concerning acid tolerant species, such as black cherry, with stream and soil characteristics. This should be included here since this is the focus of the manuscript. Why do we care about sugar maple and black cherry in particular? The mention of Grass Pong is sort of out of the blue. Might want to include a little text context about Grass Pond here (I know some is in the methods). Maybe talk about it in the context of the Adirondacks and it being a sensitive area to acid deposition.*"

AC1: In a revised version of this paper, the introduction has been further developed to include more details and clarification regarding Grass Pond within the context of the Adirondacks, soil characteristics within forest stands and acid tolerant species including a focus on black cherry. Essentially, Grass Pond was chosen as the research site for this project because it is located the southwest portion of the Adirondacks which receives a greater amount of acidic deposition than the remainder of the Adirondacks and sub-watersheds within Grass Pond were found to differentially neutralize acidic surface waters in a previous study (Ito et al, 2002 and Ito et al, 2007). There is considerable evidence that ecosystem acidification has been especially marked in the southwestern region of the Adirondack Mountains (Driscoll et al., 1991, 2003)

Driscoll, C.T., Newton, R.M., Gubala, C.P., Baker, J.P., Christensen, S., Adirondack Mountains, In: Charles, D.F. (Ed.), Acidic Deposition and Aquatic Ecosystems: Regional Case Studies, Springer-Verlag, New York, 133-202, 1991.

RC2: *"The two types of statistics in this manuscript seem redundant. A disclaimer that I am not a statistician. However, first a correlation analysis is done whereby relationships among basal area, and soil and water characteristics are assessed. Then a CCA is performed where the same information seems to be gleaned. Could the results of the CCA be presented both in the graphs (as already done) and in a table form, where specific correlations could be examined? Also it is not clear from the description of the CCA if environmental variables and basal area are more highly correlated if they are physically closer to each other?? For example, p. 10785 lines 5-8 claims that there is a strong positive association between sugar maple and stream water ANC, BCS and pH. The environmental parameters are physically far from sugar maple on the graph shown in Figure 5c. Does this matter?"*

AC2: Canonical correspondence analysis is based on the correlations between tree species basal areas to forest floor, mineral soil and stream chemistry, in which these correlations are transformed to two ordination axes, similar to the first two principal components, to display the relationships between the species and chemistry in a biplot. However, the re-computed relationships are on the relative basis. Thus, the relative locations and directions are important and interesting. For example, in Fig. 5c, sugar maple is on the same direction as ANC, BCS and pH and American beech is on the same direction as NO3, which indicated positive association or relationships (as also shown in Table 5). But the length of the arrows for the stream chemistry was relative to their correlations with the species. For example, the arrow length of DOC was longest because it had the largest (negative) correlation with sugar maple (thus opposite direction) in Table 5. On the other hand, the biplot was overlaid from the two ordinations systems (one for species and one for chemistry). The scaling of the two axes system may be different. Therefore, the relative directions of species vs. chemistry are more important than the relative locations of species vs. chemistry (e.g., how far away from each other).

RC3: "*Correlation between certain variables is highlighted throughout this manuscript that are not significant. Results and discussion of these correlations should be done cautiously and major conclusions should not be drawn from non-significant correlations. Specific instances of this are indicated in the detail below. Although the paragraph on page 10787 lines 5-15 highlights the limited statistical power, this needs to be more strongly stated in the abstract, results, and conclusions. See more detail below."*
AC3: See comments 3a-3r below.

RC3a: *"Title: 'between' should be replaces with 'among'."*
AC3a: We agree, the title has been revised to use the term "among" instead of "between"

RC3b: *"P. 10777 line 11: Change 'does' to 'grows'."*
AC3b: The authors agree, the word "does" has been changed to "grows".

RC3c: *"P. 10779 Section 2.3.1: An inset figure to Figure 1 would be helpful in describing Grass Pond and its subwatersheds. Use something like Figure 4 for the main figure and show Grass Pond in NY as an inset to Figure 1."*
AC3c: The authors agree that adding an inset of Grass Pond and its subwatersheds to Figure 1 would be helpful although not necessary since this has been provided in detail elsewhere (e.g., Ito, M., Mitchell, M. J., Driscoll, C. T., Newton, R. M., Johnson, C. E., and Roy, K. M.: Controls on surface water chemistry in two lake-watersheds in the Adirondack region of New York: differences in nitrogen solute sources and sinks, Hydrol. Process., 21, 1249–1264, 2007.)

RC3d: *"P. 10783 Section 3.1: Figure 3a and 3b should be switched since 3b is referred to first."*
AC3d: Yes, Fig. 3b is mentioned in the paper before Fig. 3a so this has been revised.

RC3e: "*P10783 Line 20-21: elaborate on the statement 'indicating elevated nitrogen levels'."*
AC3e: All stream sample sites had moderate to low nitrate levels (<40 μeql−1). Regional surveys of surface waters forested watersheds in the northeast United States have suggested that nitrate concentrations range from 0 to 60 ueq/L (Aber et al., 2003) and hence the nitrate values for the streams of the Grass Pond watershed were within the low to moderate range.

Aber, J.D., Goodale, C.L., Olllinger, S.V., Smith, M., Magill, A.H., Martin, M.E., Hallett, R.A., and Stoddard, J.L., Is nitrogen deposition altering the nitrogen status of northeastern forests? Bioscience, 53, 375-389, 2003.

RC3f: *P10783 "Lines 21-23: What constitutes high Al? Based on what reference?"*

AC3f: It has generally been established that monomeric Al concentrations in soil and surface waters >10 ueq/L are toxic (Driscoll et al., 2001). The concentrations of exchangeable Ca found in the Grass Pond watershed soils are within the range (<0.1 mg Ca/g soil) that has been attributed to surface water acidification throughout the Adirondacks. These relatively low Ca soil concentrations are also coupled with high Al soil concentrations in the Grass Pond watershed. (Sullivan et al., 2006).

Driscoll, C.T, Lawrence, G.B., Bulger, A.J., Butler, T.J., Cronan, C.S., Eagar, C., Lambert, K.F., Likens, G.E., Stoddard, J.L., and Weathers, K.C., Acidic deposition in the Northeastern United States: Sources and inputs, ecosystem effects and management strategies, Bioscience, 51, 181-198, 2001.

Sullivan, T.J., Fernandez, I.J., Herlihy, A.T., Driscoll, C.T., McDonnell, T.C., Nowicki, N.A., Snyder, K.U., and Sutherland, J.W., Acid-base characteristics of soils in the Adirondack Mountains, New York, Soil Science Society of America, 70, 141-152, 2006.

RC3g: P10783 *"Lines 25-28: Same thing. What is a low nitrate value and high DOC value? Based on what reference?"*

AC3g: Adirondack Lakes have been classified into high (>500 mol DOC/L) and low (<500 mol DOC/L) by Driscoll and Newton (1990). Hence all of the Grass Pond sub-watersheds would be classified as having low DOC.

Driscoll, C.T., and Newton, R.M., Chemical characteristics of Adirondack lakes, Environmental Science and Technology, 19, 1018-1024.

RC3h: *"P. 10784 Lines 5-6: BCS and pH are not significantly correlated with sugar maple. P is > 0.05!"*

AC3h: Correct, stream water BCS and pH are not significantly correlated with sugar maple. This sentence in the results section of the paper is meant to just state the results that the relationship was positively correlated with the respective r and p values. Significant relationships were stated as such in the paper. Lack of significant relationships were also discussed in the conclusion. The wording has been changed to more accurately reflect these results.

RC3i: *"Lines 11-14: Again black cherry is not significantly inversely correlated with BCS, pH, NO3, and ANC nor is stream water DOC significantly correlated with black cherry basal area."*

AC3i: Correct, stream water BCS, pH, NO3, ANC and DOC are not significantly correlated with black cherry. This sentence in the results section of the paper is meant to just state the results that the relationship was positively correlated with the respective r and p values. Significant relationships were stated as such in the paper. Lack of significant relationships were also discussed in the conclusion. The wording has been changed to more accurately reflect these results.

RC3j: *"Page 10785 lines4-8: Is there a strong association between sugar maple and pH in the forest floor? And is there a strong association between black cherry and pH in the mineral soil?"*

AC3j: As included in Table 4, there is not a strong association between forest floor pH and sugar maple (r=0.13 and p=0.32) and there is not a strong association between mineral soil pH and black cherry (r=-0.18 and p=0.20).

RC3k: P10785 *"Lines 26-27. Again, these relationships are not significant and conclusions are being drawn here."*

AC3k: Stream water DOC and sugar maple are significantly inversely correlated. We also describe some other notable relationships recognizing that the statistical relationships are not strong. However, some of these results link to other studies that have also described these relationships.

RC3l: *"Page 10786 Line 6: Citation needed after this sentence."*

AC3l: A number of studies including some in the Adirondacks have indicated hydrogeolocial factors as a major influence on surface water chemistry (Chen et al., 1984; Mitchell et al., 2013; Peters and Driscoll, 1987).

Chen, C.W., Gherini, S.A., Peters, N.E., Murdoch, P.S., Newton, R.M., and Goldstein, R.A. Hydrological analysis of acidic and alkaline lakes, Water Resources Research, 20, 1875-1882, 1984.

Mitchell, M.J., Driscoll, C.T., McHale, P.J., Roy, K.M., and Dong Z., Lake-watershed sulfur budgets and their response to decreases in atmospheric sulfur deposition: Watershed and climate controls, Hydrological processes , 2013 (in press).

Driscoll, C.T. and Peters, N.E., Hydrogeological controls on surface water chemistry in the Adirondack region of New York State, Biogeochemistry, 3, 163-180, 1987.

RC3m: P10786 *"Line 9: Citation needed after this paragraph."*

AC3m: A number of studies including some in the Adirondacks related to the nutrient demands of sugar maple trees (Burns and Honkala, 1990; Van Breemen et al., 1997).

RC3n: P10786 *"Line 25: add 'associated' before C:N."*

AC3n: The authors agree, in the revised version we have added "associated" before C:N.

RC3o: *"Page 10787 Lines 5-16: Develop this paragraph more. Line 8: Aren't you looking for variation in Ca among plots as related to species composition? Also change 'between' to 'among'. Line 8-9: Why would lack of soil development results in low statistical power? Lines 12-13: Very few significant correlations have been identified in this study!"*

AC3o: In this paragraph we have done major substantial revisions and discussed how our statistical results in some of our analyses were affected by low statistical power due to small sample sizes.

RC3p: *"Table 1 and 2 could be combined"*

AC3p: Tables 1 and 2 have been combined in the current manuscript.

RC3q: *"Figure 4: In my version, the legend is unreadable. The circles are not very distinguishable from the small to large sizes. Caption should not be discussing correlations. Rather, describe the figure pictured."*

AC3q: The authors agree and this figure has been revised accordingly.

RC3r: *"Figure 5: Make axes the same range. Font size is too small."*

AC3r: Font size has been increased in a revised version. The ordination axes in these figures are on a relative basis, therefore, the relative locations and directions are what is important and not the numerical values on the axes.

RC3s: *"Figure 6: Why is hydrology mentioned here? Remove."*

AC3s: The authors agree, "hydrology" has been removed in a revised version of this paper.