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Interactive comment on "Quantifying soil and critical zone variability in a forested catchment through digital soil mapping" *by* M. Holleran et al.

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We thank Dr. Libohova for the constructive review and comments. Here we respond to the points highlighted.

Regarding the length of explanation of soil variables, we reviewed these sections and attempted to reduce discussion where possible; however, these are key data that provide the context for the digital soil mapping application and results. The paper was meant not to be just a DSM paper, but an attempt to use DSM to make informed interpretation of soil formation processes and patterns of soil data. As such, we incorporated presentation and discussion of data and processes beyond just the application of DSM.

We agree with the reviewer that the use of the iPCA and cLHS works well for larger spatial areas with greater diversity in soil forming factors. As stated in the introduction, this work was in part a test of the efficacy of applying these same techniques over a small catchment. A direct test of the problem posed by the reviewer would be to apply various sampling techniques to this catchment and determine which design provided the best predictive power. This was beyond the scope of work that could be completed with limited time and money. However, we feel it was appropriate to apply these methods in order to minimize the number of layers used in prediction and to ensure that sample locations captured the range of variability in each of those layers. The work does demonstrate that application of these techniques to a small catchment provides a robust approach to predicting soil properties.

We agree that a true validation set of independently measured soil data would be the most appropriate test of the effectiveness of the prediction models developed in this study. Unfortunately, this area is unmapped by soil survey and without other sources of independently measured data that would allow for true validation of model predictions; hence the LOOCV was the best attempt we could provide at testing model predictions. A full sampling of a validation dataset was beyond the time and money constraints of this project and we agree that a validation sample set beyond the small catchment modeled here would allow for testing and upscaling of predicted results to a greater area. We have added statements to the methods and summary addressing this issue.

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