Biogeosciences Discussions

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Comment on bg-2021-200

Anonymous Referee #1

Referee comment on "Climate and topography: the two essential ingredients in predicting wetland permanence" by Jody Daniel et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-200-RC1, 2021

Overall, the paper "Climate and topography: the two essential ingredients in predicting

wetland permanence" is written very clearly and represents a needed analysis of the individual and combined effects of climate, land use, and topography on the permanence of wetlands in the Prairie Pothole Region. The authors looked at several variables in each category and region and predicted the permanence classes of wetlands. They found that terrain was a nearly as important to predicting permanence class as climate in two regions. This works stresses the importance of including terrain in modeling the effects of climate change on wetlands in the PPR.

General comments:

Many relevant results/methods are relegated to the appendices. Specifically, the variables used and their definitions (especially the topographic variables where the name of the variables doesn't make it obvious how it was calculated) should be in the main text. There are also analyses, the PCA analysis specifically, that are mentioned in the methods but not discussed in the results and only have a figure in an Appendix. Even if the analyses don't warrant an actual figure in the main text, the results should be mentioned in the main text.

Several potentially correlated variables are used in the analyses and could present issues when interpreting the variable importance. For instance, including % of land cover types as independent variables in the same model is potentially problematic, i.e. a wetland with more % cropland will automatically have less of the other land cover types. While correlation itself is not an issue with gradient boosting models, it could affect the inference of the importance of these variables. The variable importance could be split among % cropland and % natural because the two are likely negatively correlated but if you remove one, the other could have a higher variable importance. Had you considered limiting the correlated variables % cropland or % natural veg vs. including both?

It seems like one of the largest factors in determining the permanence class of a wetland would be wetland depth/volume and wetland size I can't see how/where you are getting at either of those. You might be getting to a proxy of depth this with some of the terrain

variables but if I understand correctly, those are only calculated in the wetland buffer?? Also knowing the average size of the wetland will help determine how effective a DEM of 25 meters is. Is a wetland generally about 1 cell or several cells? You discuss not including soils in the models in the discussion but including other variables that are likely to make a difference in permanence class will be helpful.

Specific comments:

Line 10/line 29 – I am not sure that wetlands that hold water year-round are *most* sensitive to climate change. Wouldn't temporarily ponded wetlands that have a decrease in hydroperiod and disappear completely also be pretty sensitive to clime change? The reference provided state they are the most rare so justify why they are most sensitive

Line 30 – this citation refers to potential -20% or +205 changes in precipitation that included with warming may decrease hydroperiod but doesn't specify a 20% decline in hydroperiod definitively

Line 83-84 – providing average and sd of wetland size in each region would be helpful

Line 97 – why only one year of climate data? Some studies have suggested that longer time frames of climate data explain water levels better. A justification for this is needed. Also, is this time frame in any way related to when the permanence classes for the wetlands were determined for the wetland inventories?

Line 100 – Appendix B - I think moving these variables into the main part of the paper would be helpful. Knowing the specifics of how each of these were calculated, especially the topographic variables which aren't as obvious.

Line 113-115 - Does this mean that it is only using data from the buffer and not the wetland itself? DEMs don't tend to get below surface water unless the data is collected in a particularly dry time. Thus, the DEM is not likely able to get at depth of a wetland although that may be an important factor in wetland permanence. But depending on how big these wetlands themselves are and when the DEM data was collected, you might be better to include the wetland itself as well

Line 119-120 – How did you use the PCA analysis and was it used to reduce the number of variables? Does Appendix B represent the reduced set of variables or was it further refined? Providing some additional information about why/how you did this and used the results of the PCA will be helpful. Many permanence classes appear to overlap here a lot so how did you use the PCA to visualize if wetlands could be partitioned?

Line 134 – remove parentheses

Line 142 – you mention the high error rates here but have again moved this information to an Appendix so it gets lost and might be better if discussed further

Line 153-167 and throughout – please check the Figure numbers in this section and throughout because a few appear to be referring to the wrong figure. An Appendix I is

referred to but there is no Appendix I. It is also difficult to tell if you are referring to Figures 5 & 6 with "(Figure 5-6)" or Figure 5-VI. Using letters instead of roman numerals in those figures might also be helpful

Line 215 – add space before citation

Line 238 – while you account for elevation, it could be better accounted for with a higher resolution DEM and including a more direct proxy for wetland depth/volume could also help improve the models

Line 247 – add space before citation