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Interactive comment on "Geomorphic regulation of floodplain soil organic carbon concentration in watersheds of the Rocky and Cascade Mountains, USA" *by* Daniel N. Scott and Ellen E. Wohl

Anonymous Referee #1

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Scott and Wohl present an analysis and interpretation of a dataset containing soil organic matter concentrations on floodplain soils. Due to the dynamic alluvial nature, these soils often have large carbon stores and function differently than soils on hill slopes. Scott and Wohl have made a valuable step in understanding the geomorphic factors controlling the distribution of organic matter in these profiles. This contribution will be important to the understanding of how carbon is mobilized and transported to long-term depositional areas. I thank the authors for a very well written manuscript and I have only a few editorial comments. I have a few moderately important suggestions that the authors should consider and respond to: 1. The redox condition of soils is hugely important in determining the fate of associated carbon (as noted by your dis-

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cussion on soil moisture and respiration). This has been recently been brought to the fore by Keiluweit, et al. (2018). Changing redox condition in these soil profiles may be really important for destabilizing mineral associated carbon. But probably most important was that much of the deposited carbon was probably fixed in an “oxic” upland location - so that the stabilizing minerals (Fe) could be destabilized in the floodplain. The redoximorphioc conditions of floodplain soils are complex since they it is more than just a simple function of depth and moisture since hyporheic flow can bring DO into portions of the profile and floodplain that may seem distal to the river. Soil morphological characterization including characterizing the mottling, gleying, and soil color could have helped with those hypotheses that moisture was important in destabilizing or preserving soil carbon (or that dryer sites have higher respiration). Where these sorts of observations made and recorded in a systematic way so that they could be included in the analysis? At any rate I think this emerging topic in soil carbon stabilization needs to be incorporated into the discussion. 2. How does the dominant precipitation type affect erosion and sedimentation in a watershed? The Snoqualimie River is likely more dominated by rain than the Big Sandy which is likely more dominated by snow. Will this have an impact on what is mobilized by the river network (i.e. source of POM)? If the authors think so, then I suggest these topics be discussed. 3. I would really like to see a figure summarizing the profile OC concentrations. I realize it could be complex. Something that shows means by depth (box plots? with actual data points in a lighter shade?). This would go a long way in illustrating that depth is the primary controller of OC concentrations in these profiles. 4. Soils in the Snoqualmie basin are dominated by Andisols and Spodosols which have a disproportionate ability to stabilize soil carbon (especially relative to the Big Sandy). Can you please discuss how the soil type might have affected the differences between the basins?

Other than those three comments: Page 11 Line 25: This took me a couple times to figure out. Deposition of POM on the surface of the soil would be included in the first mechanism of this paragraph. I think you’re trying to distinguish it from terrestrial processes (authoncthonous inputs) and/or include it at the same time in this paragraph.

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You might be able to clear this up by dealing with the river deposition of allocthonous POM as a sort of confounding factor later in the discussion (or not).

Page 12 Line 5 (and throughout): I have mainly seen that O-horizon (litter and duff) floats away when floodplains are flooded. This material tends to be trapped downstream (e.g. log jams) and maybe it's these areas that are buried and able to preserve litter.

References cited: Keiluweit M, Wanzek T, Kleber M, Nico P, Fendorf S. Anaerobic microsites have an unaccounted role in soil carbon stabilization. Nature communications. 2017 Nov 24;8(1):1771.

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