

Interactive comment on “Dam tailwaters compound the effects of reservoirs on the longitudinal transport of organic carbon in an arid river” by A. J. Ulseth and R. O. Hall Jr.

Anonymous Referee #2

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Review of Dam tailwaters compound the effects of reservoirs on the longitudinal transport of organic carbon in an arid river By Ulseth and Hall

This manuscript describes a study regarding carbon dynamics along a dam-impacted river with a focus on ascertaining the impact of dam tailwaters. The methods of the study are sound and the sampling scheme was well designed – temporally and spatially. The results are interesting as they clearly show the reduction in quantity and quality of organic carbon immediately downstream of the reservoirs compared to what entered them. The tailwaters were then locations set a few more kilometers downstream of the reservoir and in these locations there tended to be new carbon added to the systems, which the authors describe as an additive impact of the reservoir system

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on carbon dynamics. I believe that this point needs to be addressed more clearly (as described below) before the paper is ready for publication; however, I feel the data is of interest to the community and that upon minor revisions that this paper should be fully published.

General comments: A main discussion point that was not discussed but I believe should be in the paper is why the authors believe that the tailwater locations and their impact on carbon should be an additive effect of the impact of reservoirs without knowing what pre-dam conditions were like. It seems that the reservoirs do impact the flow of carbon, but further downstream the river begins to reset itself by adding more carbon. How do you know that this carbon would not have been added in this location had the reservoir not been upstream? I think this is a major issue with the interpretation of the data that needs to be addressed prior to publication.

Specific comments: 1. P6082, L4-5- Something sounds strange here with the ‘processing than reservoirs alone’ – I guess you are trying to make the distinction between the effect of only reservoirs and tailwaters plus reservoirs but words are missing somewhere. 2. P6082, L20 – I don’t think there is enough detail in the abstract for the reader to know how important ‘THE simultaneous transformation and production of OC’ is and how ‘upstream and downstream of reservoirs and their tailwaters do NOT represent’ this. I would reformulate this last sentence or divided into two to give more detail and make your point more clearly. 3. P6083, L14 – ‘Reservoirs may increase, decrease, or not alter Doc concentrations. . .’ – I believe you should give a leading sentence prior to this stating how different studies have produced varying results when it comes to the impact reservoir may have on DOC concentrations. You actually go into detail of the refs in the following sentences so you could just replace that sentence with the more generalized one I suggested. 4. P6083, L25-26 – So you think that these other studies took a more large-scale approach, while yours is smaller scale? I don’t see enough information from the description of those studies to tell that really. It seems that the Ontario did look at upstream and downstream of reservoirs. And you state that

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these studies don't capture OC dynamics in the river reaches below dams but then in the next paragraph you start discussing what is known about carbon dynamics in tailwaters. 5. P6084, L2 – 'confer' doesn't seem needed here 6. P6084, L14-15 – You may want to reformulate the introduction slightly so you start with this sentence so the reader knows where you are going with this study. It seems there has been quite a bit of work done on the subject, but perhaps only in pieces. You should really define what is unique about your study and describe that and then build up to it with the rest of the introduction. 7. Introduction – You didn't really discuss bioavailability or autochthonous carbon and the importance of such things in your introduction. This would help direct the reader as well. You are not only describing quantity of the carbon but also the quality. 8. P6085, L14-21 – Use the labels A-G from Figure 1 in your text when describing sampling sites 9. Figures 2, 3 and 4 – also label the panels (Fig. 2, 3) and boxplots (Fig. 4) and Tables 1-3 with A-G accordingly (keep the long name too but adding the letters help a bit more) 10. Figure 3 and 4 should be switched – you discuss Figure 4 (bioavailability) before Figure 3 (Sr and SUVA) 11. P6092, L24 – 'by magnifying the transformation of both POC and DOC, as will be discussed further.' — you need to either give the reasons for this now or say that you will discuss it now. This left the reader hanging. 12. P6093, L11 – add 'however' in the sentence to contrast with previous finding 13. P6093, L11-12 – maybe expand a bit your explanation here 14. P6094, L2 – do you know anything about production in the system? 15. P6094, L5 and L19 – Based on the last sentence of this paragraph, I believe you don't mean 'type' of reservoir but rather 'reservoir scheme' – you state in the parentheses 'many small vs few large'... and along those same lines, in the methods section you state that the Colorado River has 7 large dams and then here you may this distinction between many small and few large reservoir schemes. I am confused now. Please clarify somehow here and in the methods. 16. P6094, L20 – delete 'and not just total water storage capacity of the basin' 17. P6094, L22-23 – change the order of the sentence to start not with the negative: 'Residence time likely drove, at least in part, the longitudinal DOC concentration and flux patterns we observed in relation to the reservoirs, although we

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do not have the appropriate data to adequately budget OC for either of the reservoirs.' 18. P6095, L1-3 – where were these lakes and reservoirs? Be a bit more explicit with these examples. 19. P6095, L25 – do you mean 'autochthonous' instead of 'microbially produced' DOC? 20. P6096, L14 – delete 'of' 21. P6097, L27-28 – how was this 6-14% calculated? Give a little bit more description here. And why are you determining the OC reduction as low? What are you basing that on? 22. P6098, L1-3 – 'The effect of impounding rivers on OC fluxes is potentially underestimated...' Do you mean your study results or in general? 23. General – shouldn't it be 'impounded rivers' instead of 'impounding rivers'? 24. P6098, L7-12 – You say that that the tailwaters increased the export of autochthonous OC downstream and that this was an additive effect to the impact that reservoirs/dams have on carbon cycling in rivers, but how do you know that this additional autochthonous OC wouldn't have been produced had there been no reservoir? The most obvious affect I see is that the reservoirs almost reset the carbon balance of the mainstream river by reducing flow of OC. Then it was restored in the tailwaters eventually, but that doesn't mean that had the reservoir not been there that the same amount wouldn't have been added in that particular stretch of the river. 25. P6098, L1-16 - For this last paragraph to act more like a conclusion, I would suggest summarizing the specific main points of your study.

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