

Interactive comment on “A Synthesis of Three Decades of Eco-Hydrological Research at Scotty Creek, NWT, Canada” by William Quinton et al.

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Page 2 Line 18: The reference to Figure 2 here is odd, since the figure does not indicate anything about expanding precipitation and stream gauging networks

â€” Agreed. Reference to Figure 2 has been removed.

P2L31: I believe that there is a more current NWWG that could be referred to here (1997).

â€” Agreed. The reference has been updated to “(NWWG, 1997)”.

P4L32: Do any of the numerous Scotty papers document/support this chemically dilute water additions with other indicators (EC, major ions etc.)?

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“Electrical conductance was found to increase with increasing distance from the edge of plateaus. This EC data was not published, but this observation will be noted in the paper with reference to “unpublished data”.

Paragraph starting on P6L31: Indeed, the authors have contributed some important findings on peat properties. However, this paragraph seems to be much more about understanding peat physical and hydrological properties than anything specific about Scotty Creek. Although this is fine, the literature discussed is limited to only the work that the authors have done. As the significance of the findings are related to peat properties in general, and the work was largely completed in the lab, it seems prudent to expand beyond exclusively self-citations and include other papers and key findings related to peat properties in general, since this section is not necessarily about Scotty specifically?

Agreed. This paragraph will be expanded to include other papers and key findings related to peat physical and hydraulic properties.

P8L34 – P9L7: It is unclear to me the relevance of including this lab-based study on mulching?

The sentence starting on line 34 (“Further climate chamber. . .”) and the remaining sentences of that paragraph have been separated from the text above. This new paragraph will focus on the development and testing of thaw mitigation strategies at Scotty Creek. This will include new text on novel new thermosiphon designs and applications, mulching, snow detectors, and other techniques and devices developed and tested at Scotty Creek.

P9L9-18: Indeed, here the authors mention the applicability of the findings from Scotty to a large number of other landscapes. This is, in my opinion, a missed opportunity to provide a more comprehensive synthesis of exactly how the decades of research at Scotty are explicitly applicable elsewhere. Expanding on this section could be a valuable opportunity to integrate the Scotty findings into other landscapes more definitively.

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A well-crafted paragraph here would strengthen this paper and increase the usefulness and applicability beyond Scotty.

â€” This section will be moved to the Summary and Conclusions section where it will be expanded upon.

P11L24: There is not a fig.8a in this paper, so remove this? If it was referring to a specific Fig in the Quinton paper, it seems odd and is a bit misleading to this reader.

â€” This reference was intended to guide the reader not just to a specific paper, but to a specific figure in that paper. We have re-expressed this reference to read: “(Fig. 8a in Quinton et al., 2009a)”. However, if the reviewer and/or the Editor does not like this reference style, we are happy to just refer the paper only and not also to a specific part of it.

P12L20-25: Has water fluxes through the talik subsurface flowpaths been quantified? How much (mm/y) is this water loss estimated to be? As the authors demonstrate, the saturated hydraulic conductivity of peat decreases rapidly with depth, so perhaps the K of talik peat is low, and limits these water fluxes? More information / quantifying this would be useful here.

â€” This is the subject of a current PhD student (E. Devoie). Some preliminary results are available based on the use of passive flux metres during the summer of 2018 that followed the initial submission of this manuscript. We plan to describe some of these initial findings in the revised draft of the present manuscript.

Summary/Conclusions section: I found the last few sections of the paper to be a bit laborious to read through. I think that a guiding conceptual figure would be useful to help keep the reader focussed and engaged, and to help someone not as familiar with the wealth of research from Scotty to more easily grasp the big picture and key findings. I do not know what this would look like, but some type of image that provides an overview / demonstrates the key changes to the landscape and their impact on the

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hydrological function of this region over the 3 decades of study. I think this would be very useful for potential readers.

â€” We are preparing a conceptual model that depicts 1) the accumulated understanding of the hydrological functioning of the major land-cover types that predominate the Scotty Creek basin and surrounding region, and 2) the trajectory of the permafrost thaw-induced land cover and hydrological change.

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