

## ***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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It would also be useful to have a map illustrating the location of instrumentation listed in Table 1, possibly as an additional panel(s) to Figure 1.

— A map showing the location of the infrastructure referred to in the Table has been prepared. It will be included as Figure 1c.

My other main suggestion would be a careful consideration of the use of terminology. In the early sections, the authors refer to collapse scars and later I think these are referred to as flat bogs. Maybe these are not the same thing, but in any case, I wasn't sure, so a clear and consistent use of terminology will help this. A few additional comments are below.

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“We thank the reviewer for pointing this out. “Flat bog” is a term we used in earlier publications. However, its use was problematic because, strictly speaking, the peat plateaus are also bogs since they receive water from precipitation only, and as such are similar to the well-described “domed bogs” found at lower latitudes. We have revised the present manuscript to remove the term “flat bogs” (except to explain that it was used in earlier papers) and have replaced it with “collapse scar bogs” or simply “collapse scars”.

Page 3, line 15: Are you able to provide an estimate of how much of the subarctic this type of land cover accounts for?

An estimate of the extent of Scotty-like terrain is possible in the southern Taiga Plains, such as in the area captured in Fig. 1a. We will include such an estimate in the revised draft.

Page 5, lines 15-16: And what is the main difference between these subarctic peatlands and those further south? Further south peatland can act as water sources, transmitters or sinks. Can you be more specific here?

The main difference is that the peat plateaus are relatively impermeable to infiltrating water owing to the presence of saturated permafrost close to the ground surface. Raised bogs at lower latitudes are without permafrost and are therefore more permeable. As such they have a greater capacity to store water and therefore shed less runoff than peat plateaus. The presence of permafrost below the peat plateaus also decouples the overlying active layer from interacting with groundwater. Also, the juxtaposition of permafrost and permafrost-free terrains in the study region results in greater contrast in the hydrological functions of adjacent terrain types (e.g. peat plateau and adjacent collapse scar) at the study site compared to peatland terrains at lower latitudes. This explanation will be added to lines 15-16 of page 5 in the revised manuscript.

Page 8, line 11: I suggest a hyphen between regions and adapted to make the term clearer – so “cold regions-adapted”

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â€” Agreed. Done.

Page 11, lines 4-9: This paragraph doesn't report on the findings, but what was done. Either remove it, or edit to tell the reader the main finding from each study.

â€” The purpose of this paragraph was to show that new knowledge on water flux and storage processes was not an end in itself, but has been used to inform hydrological model development so that hydrological predictions can be made more confidently. For example, such models are important tools for evaluating hydrological impacts for different scenarios of permafrost thaw-induced land-cover change. We will also add text explaining how the CRHM model (informed by process studies at Scotty Creek) runs in the Stone et al. shed light on the nature of hydrological interactions among the major land cover types.

Page 12, line 2: When the authors refer to bogs in this sentence, is this the same feature described as a collapse scar in the early sections? If so, please use the same terminology here. See also others instances of the term bogs throughout this section.

â€” Yes, this is the same feature. The text has been revised so that "flat bog" and "bog" are replaced by "collapse scar bog" or simply "collapse scar".

Page 14, line 5: Here the authors define "bog-capture", but it has already been used on several occasions in the preceding paragraphs. Consider moving this definition forward to the first instance of the term bog-capture.

â€” The definition has been moved so that it accompanies the first instance of its use in the paper.

Page 16, line 20: Do you know the density of the linear disturbance in the catchment? Or the total length? That would be a useful addition here if known.

â€” The density of linear disturbance at Scotty Creek is approximately 1 km of disturbance per 1 km<sup>2</sup>. This is approximately 7 times the density of the drainage network of channel fens and open channels. This information will be added to the revised

manuscript.

Page 17, summary and conclusions: This section does a good job of illustrating the importance of the research at Scotty Creek to the broader hydrological community, but could also be used to set the stage for what is to come. What are the most important remaining knowledge gaps? What should the next 5 years of research priorities look like? Many of the sections of the paper introduce needs for future research, but this section can really highlight what still needs to be done.

â€” This point was also raised by the other reviewers. 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. This will help to set the stage for what is to come – i.e. present research gaps and research needs for the future.

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