Hydrology and Earth System Science – HESS – 2023-211

Manuscript title: Multi-decadal Floodplain Classification and Trend Analysis in the Upper Columbia River Valley, British Columbia

Authors: Italo Sampaio Rodrigues, Christopher Hopkinson, Laura Chasmer, Ryan J. MacDonald, Suzanne E. Bayley, Brian Brisco

RESPONSE TO REVIEWER #2 AND EDITOR

Dear Dra. Patrica Saco,

Editor of the Hydrology and Earth System Science,

Thank you for considering our manuscript entitled “Multi-decadal Floodplain Classification and Trend Analysis in the Upper Columbia River Valley, British Columbia” as suitable for publication in the Hydrology and Earth System Science after minor revisions.

We revised our work according to the suggestions from the reviewer, to whom we are very grateful for the valuable comments. Please find as follows our replies to each of the queries, as well as the attached new version of the manuscript with all changes colour-highlighted (in yellow).

With our kind regards,

Italo Rodrigues
Christopher Hopkinson
Laura Chasmer
Ryan J. MacDonald
Suzanne E. Bayley
Brian Brisco

Reviewer #2: The authors present a detailed analysis of the evolving landscape of the Upper Columbia River Wetlands (UCRW) in British Columbia, Canada. Through the application of a Random Forest algorithm to Landsat image archives from 1984 to 2022, this paper methodically examines the impact of changing hydro-climatological variables, including air temperature, river discharge, and water levels, on the wetland's landcover. The study's findings are significant, revealing pronounced changes in regional hydrology and vegetation communities, primarily attributed to climate change. This research provides critical insights into the consequences of climate change on wetland ecosystems and underscores the importance of implementing effective management strategies for their preservation. The study concludes by highlighting the increased vulnerability of these wetland habitats to future climatic and hydrological shifts, which may further diminish their extent.

Authors: Dear Reviewer #02, we would like to thank you very much for the positive feedback and recommendations, as well as all the time spent on our manuscript. Please find a point-by-point answer.

The authors have applied appropriate methods and their approach is grounded in a comprehensive and well-documented review of the relevant literature. The explanation of the methods is detailed and clear. The figures are clear and well-produced. The manuscript is well-written with very minor typos that I was able to catch e.g., whether in line 431.

Authors: Thank you very much for the positive comment. As suggested, we corrected the minor errors over the manuscript, as well as the one you pointed in Line 431 (now in Line 436).

A lot of important information is included in the supplemental materials regarding the RF model evaluation. If possible including more information about the performance of the model and the effect of the different sample sizes on the performance would be great instead of needing to review the supplemental materials.

Authors: We thank the reviewer for this useful comment. Regarding the average performance of the RF model, we showed that in Lines 252 to 254, then, in Line 255 we presented the average performance for the whole year.

Regarding the sample sizes, the years with more high-resolution image availability for training samples (Aerial photographs – 1984 to 1991, 2005, 2007, and 2009; Sentinel 2 – 2016 to 2022; Airborne LiDAR – 2018; UAV LiDAR and geotagged photos – 2022) were the ones where RF performed better (Kappa ≥ 0.8). This illustrates the importance of the sample size in the classification process. We have added a sentence to the Discussion, section 4.1, highlighting this aspect of the classification process.

> *Lines 372 – 374: "Furthermore, the years with supplementary available imagery (1984 to 1991, 2005, 2007, 2009, 2016, 2018, 2022) for additional training and validation were those where RF performed better (average Kappa of 0.84). This illustrates how the increase in high quality training/validation sites improves the land cover classification."*

If the authors can document and release their GEE notebook and data that would be greatly appreciated.

Authors: The GEE notebook and the land cover data that support the findings of this study are actively being used and refined for other related studies. These can be made available from the corresponding author upon request.

Yours sincerely,
Italo Rodrigues, Christopher Hopkinson, Laura Chasmer, Ryan J. MacDonald, Suzanne E. Bayley, Brian Brisco