RC2 comment I agree with the other reviewer that CBI is perhaps described too in-depth since it is not used, but I think that on lines 162-163, some clarifications could be added to "In this framework we do not use the CBI aggregated metric itself to infer biomass consumption, but rather compilations of burn severity ground plot measurements that include all the individual biomass pool measurements." A sentence or two could be added to explain the individual components of the burn severity ground plot measurements that inform the biomass pool measurements as it is currently a little unclear as is.

RC2 reply from authors: thank you for that helpful comment, we have revised the text in that section to:

" Field measurements of fire effects on individual ecosystem components (e.g. tree mortality, crown consumption, unburned surface litter area, etc) taken as part of CBI plot measurements were used, and aggregated to the plot level severity class as determined by CBI. For instance, plot level data on tree mortality percentage was available across numerous plots within Canada's Boreal Plains ecozone; arithmetic mean values of tree mortality per severity class (Low, Moderate, High) were computed based the plot overall severity score as determined by CBI in order to compute ecozone-specific values"

RC1 Comment Line 84-86: This is a vey important sentence , however, it is a bit hard to follow. What is meant by "we outline the evidence-based fire DM" Do you mean that you are defining a new fire DM or new aspect to the fire DM? I think it is just a wording problem. It needs clarification or re-phrasing.

Comment 1 Reply: Thank you for that feedback. We have clarified this statement to read:" In this document, we outline a new scheme for computing fire DM based on field observations aggregated up to a three severity class paradigm (low, moderate, and high severity). These fire carbon flux models are built from a blend of aggregated field data linked to remotely sensed severity, as well as insights from fire physics and experimental fires."

Comment 2: Table 2: Where are these EF's from? Cite the source in the caption.

Reply 2: Caption now reads: "Emissions factors for flaming and smouldering used in this model, which are derived from Canada's operational air quality model [@chen2019]."

Comment 3: Sec 2.1.5: Line 153: This section should start with a very short, cited explanation of how severity it mapped from remote sensing. The opening sentence assumes readers are well-versed in this. All it needs is an opening sentence.

Reply 3: We have revised this section to provide a better overview of the approach at methods, as suggested:

“Remotely sensed fire severity metrics (i.e. dNBR and related indices) are capable of determining if a specific location falls within a low, moderate, or high severity fire area [@hall2008] by utilizing the change in the red and shortwave infrared band ratios after a fire [@key2006]. These remotely sensed fire severity classes can not alone inform estimates of fuel consumption down to specific biomass pools. Instead, this approach uses the change in biomass pools as measured at ground plots at varying satellite burn severity classes, using detailed and semi-standardized methods of burn severity ground plots with unburned controls [e.g. @cockeComparisonBurnSeverity2005; @hall2008]. Burn severity ground plot measurements are often aggregated into a single "Composite Burn Index" (CBI) with a weighting scheme originating in southwestern U.S. forests [@keyLandscapeAssessment2006; @parksGivingEcologicalMeaning2019], which are classed into low, moderate, and high severity categories. Plot level measurements of individual forest biomass pools (e.g. conifer overstory mortality or canopy consumption) are recorded as part of the CBI methodology.”

Comment 4: Sec 2.1.5: Too much review of CBI is included, and then CBI is not used. I think the section can simply mention CBI, rather than defending why it was not used. Instead simply state the work uses plot-level metrics grounded in standard field data collection protocols by strata.

Reply 4: See our response to the other reviewer’s comment and also Reply #3 above, which clarifies how CBI is used (severity class) but CBI as a continuous variable does not itself drive any combustion estimates.

Comment 5:- Sec 2.1.5, Line 177: The most important sentence of the section is this last sentence. Maybe it should be brought to the top?

Reply 5: good point, that sentence that briefly describes the methods is now at the start of the second last paragraph of 2.1.5:

“Individual burn severity plots were assigned a severity class based on ground observations, and an ecozone-level median biomass pool consumption fraction was computed for each severity class for each biomass pool.”

Comment 6:- Line 276: Weather-driven fuel moisture is used in many approaches; it may be good to cite this. You could cite CanFire here and the Consume model. GFED also uses weather metrics, although not as explicitly for duff moisture.

Reply 6: thank you for that excellent suggestion. We have revised the end of that paragraph as: “Given this lack of direct observability of forest floor consumption, this model uses fire weather and fuel loading as inputs to the forest floor consumption model, without consideration of the remotely sensed fire severity observations used in canopy consumption modelling. This approach mirrors many established and widely-used approaches in Canada such as CanFire (e.g. [@smyth2026]) as well as Consume [@ottmar1993] in the United States.”