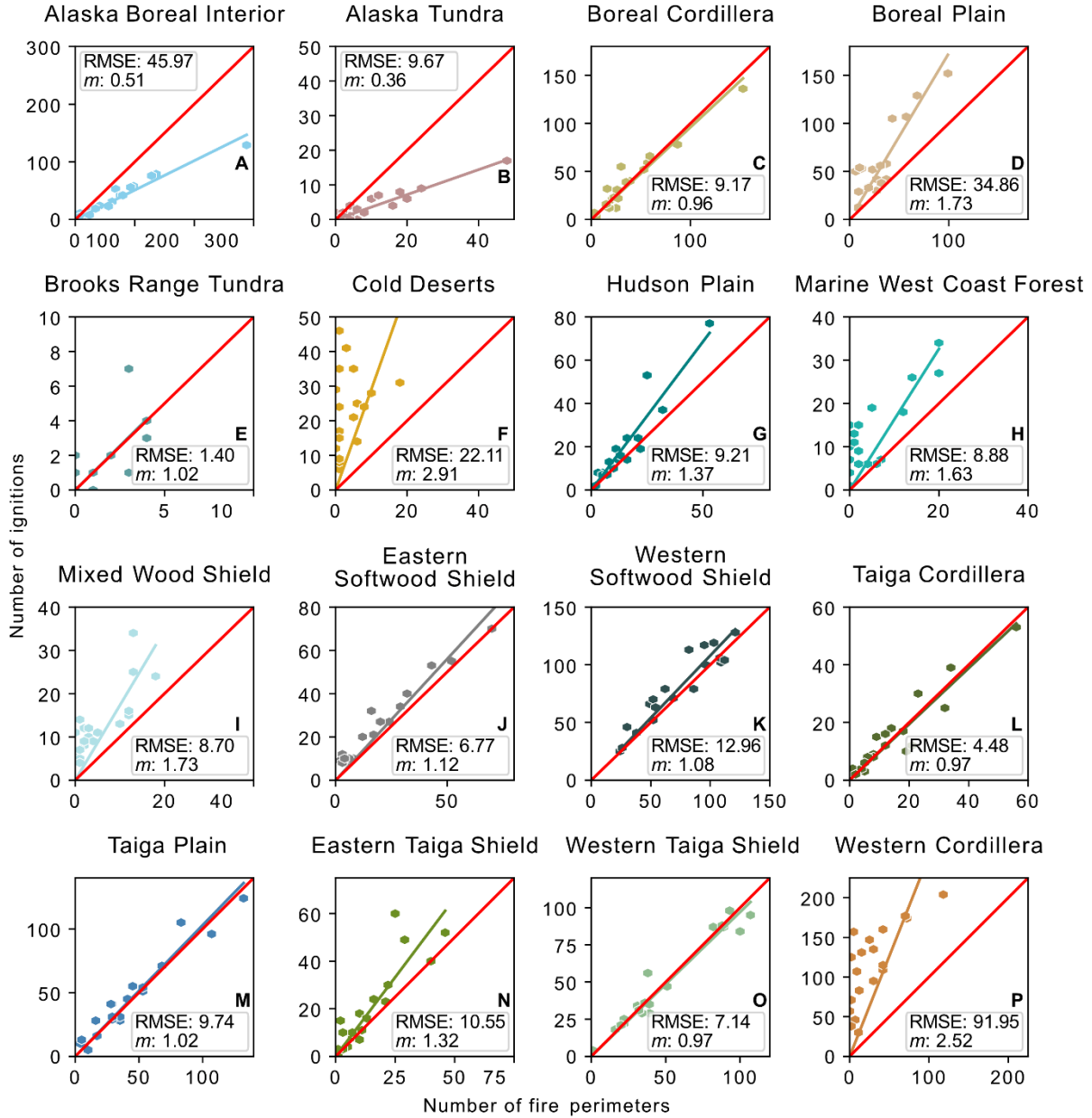
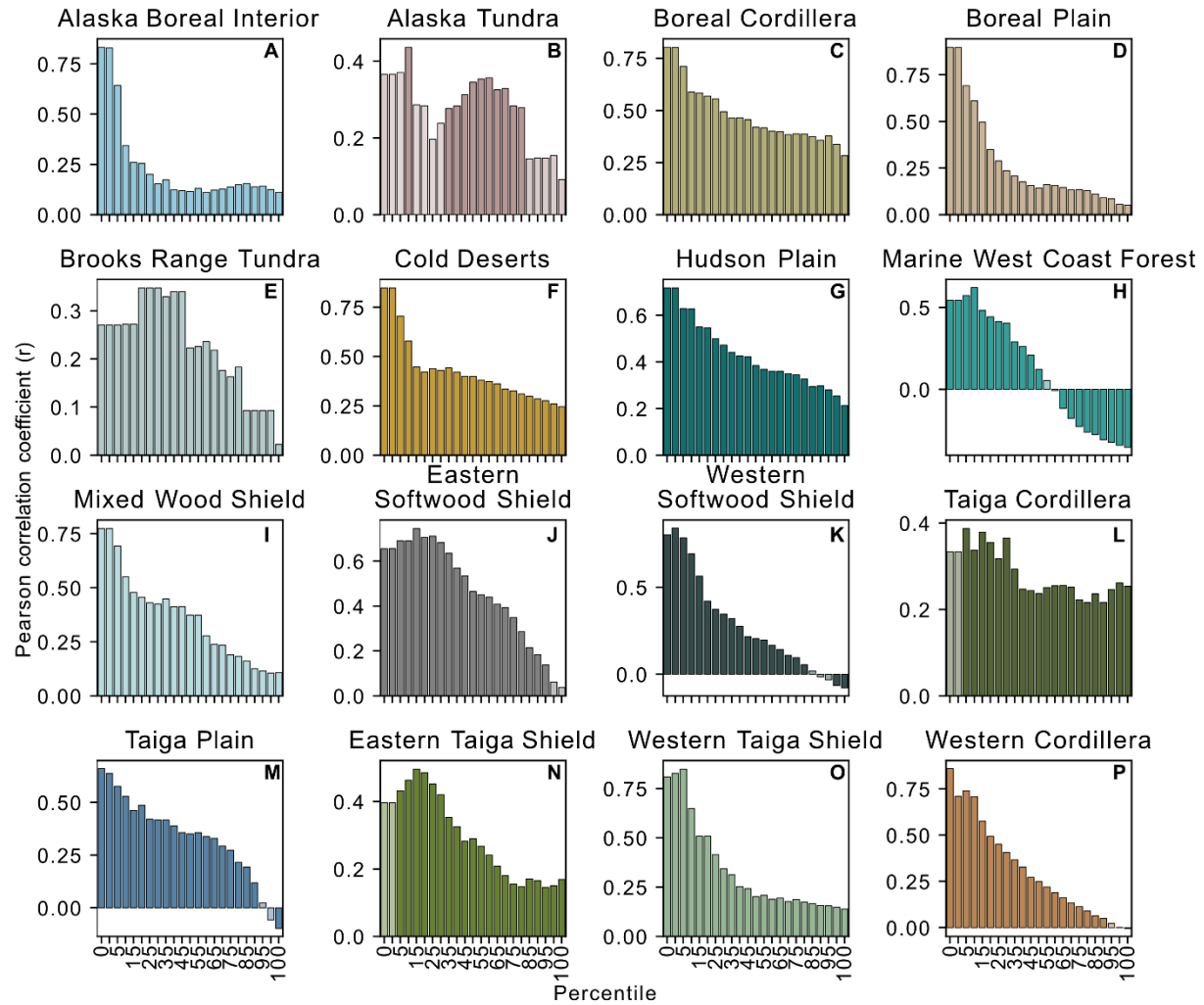


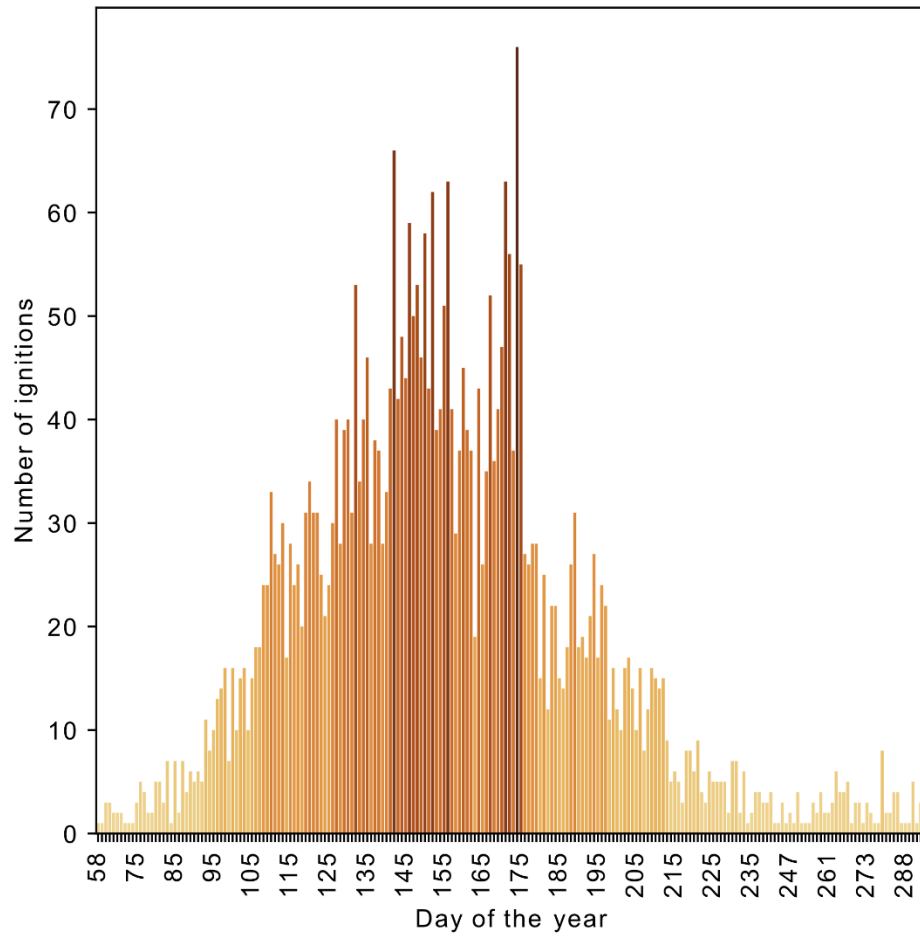
**Figure S1** The relationship between snowmelt timing from the Northern Hemisphere Equal-Area Scalable Earth Grid 2.0 version 4 weekly snow cover product (NSIDC) (1980-2019) and Moderate Resolution Imaging Spectroradiometer (MODIS) (2001-2019) for all ecoregions. The root mean square error (RMSE) and Pearson correlation coefficient (r) between the two snowmelt timing products are indicated for each ecoregion.



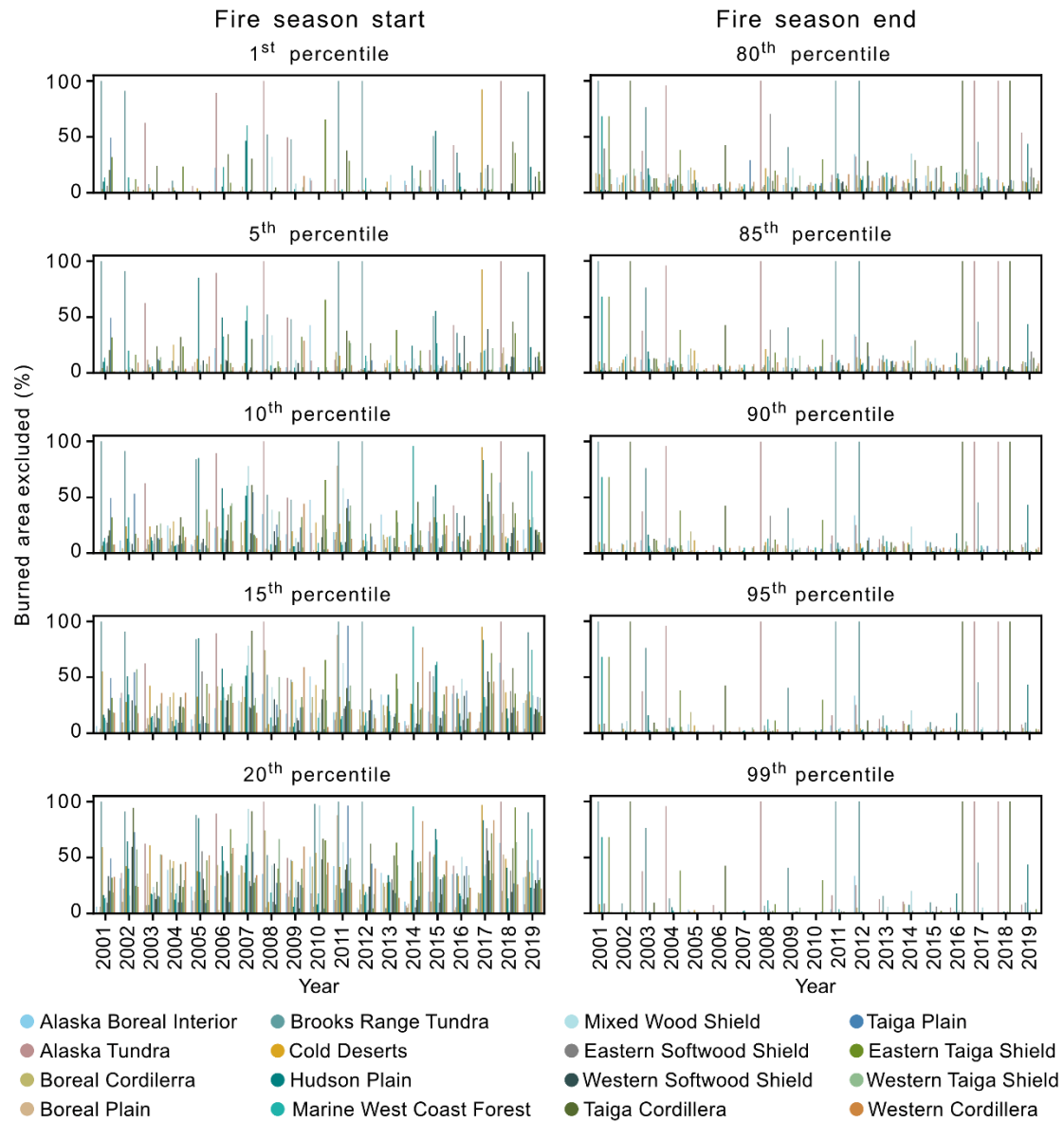
**Figure S2** The relationship between the number of fire perimeters from the Alaskan and Canadian large fire database and the number of ignitions retrieved from the Arctic-Boreal Vulnerability Experiment Fire Emission Database between the 2001 and 2019 per ecoregion. The root mean square error (RMSE) and the slope ( $m$ ) are indicated for each ecoregion. The slope is forced through the origin and used to extend the ignition count back to the year 1980.



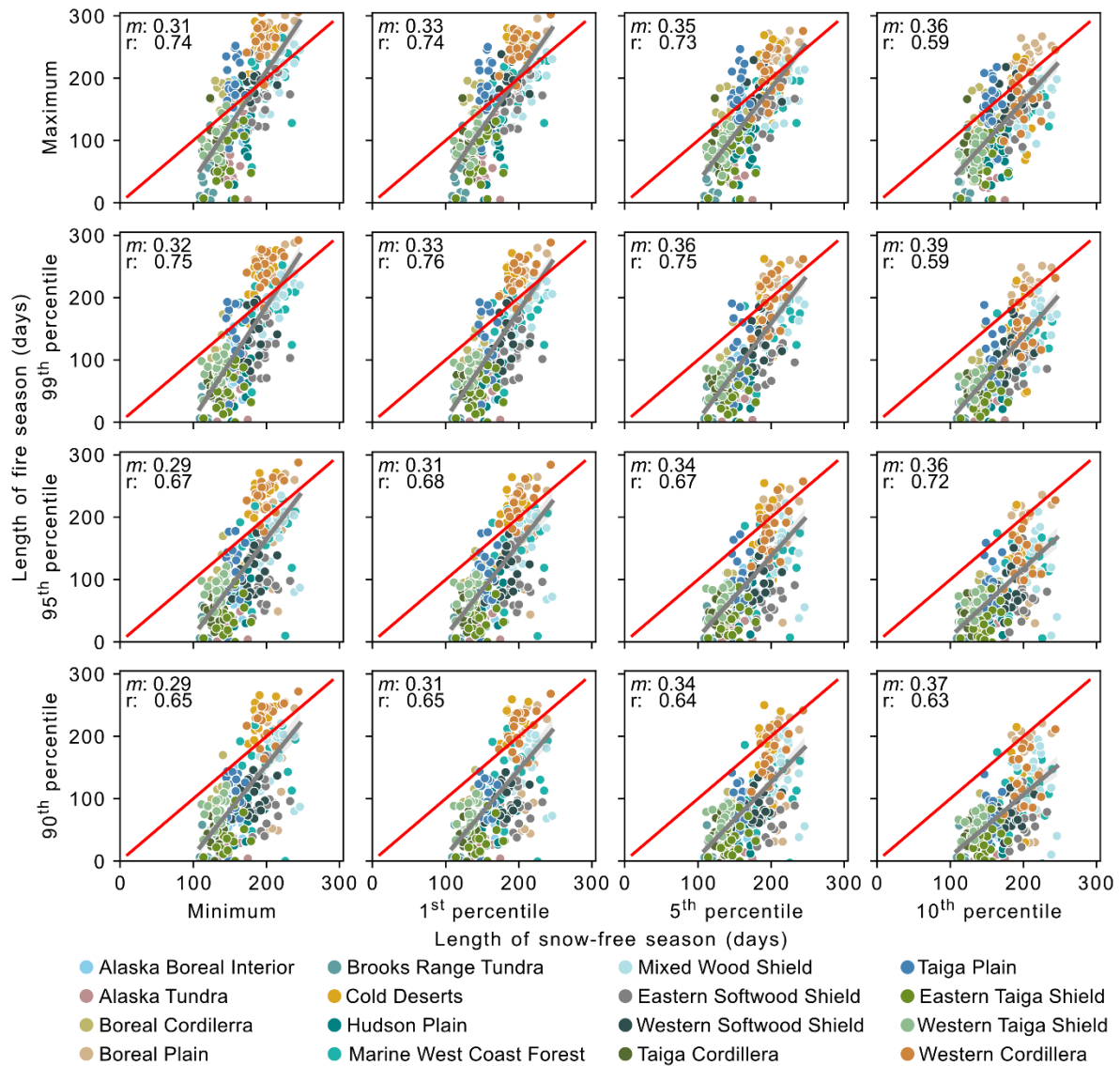
**Figure S3** The correlation between snowmelt and ignition for different percentiles of the ignition timing distribution. We included all ignitions within the 20<sup>th</sup> percentile of the ignition timing distribution for further analysis of the influence of snowmelt timing on ignition timing. All shaded bars showed no significant correlation between snowmelt and ignition timing. All combinations were insignificant for the Brooks Range Tundra ( $p > 0.05$ ).



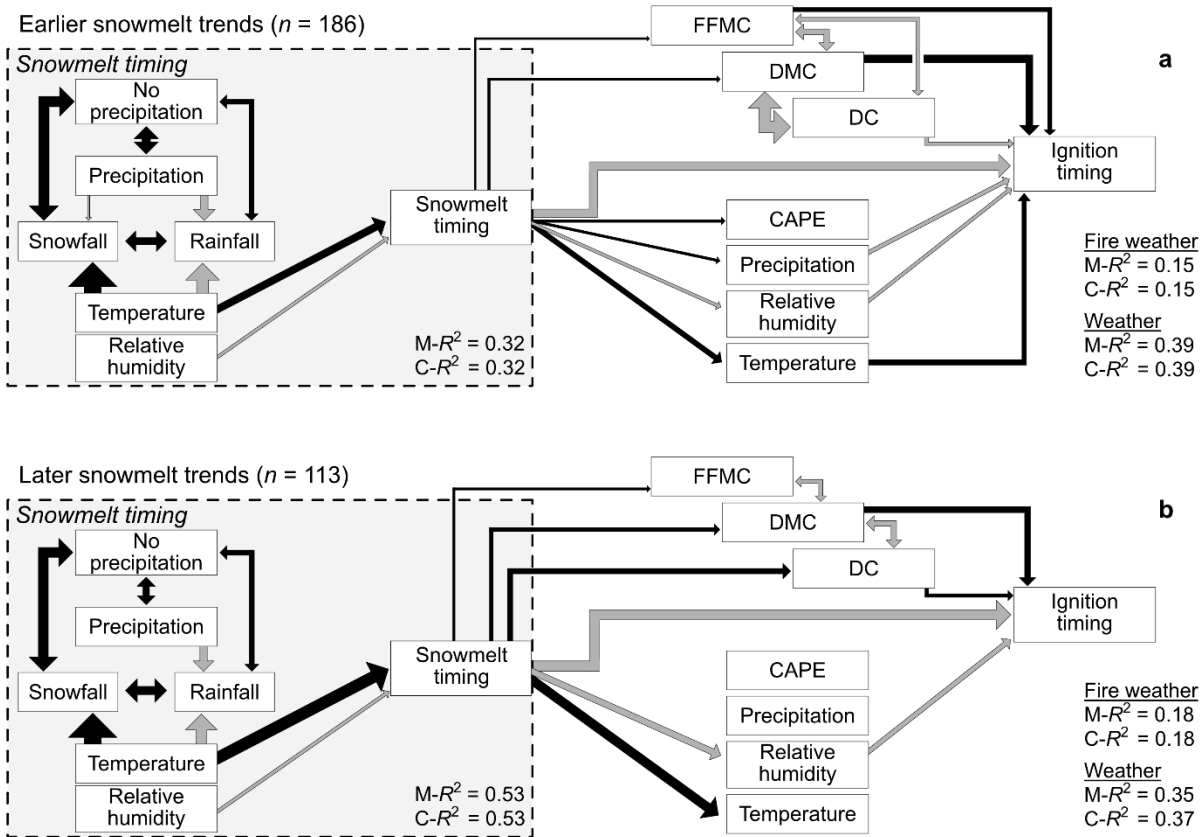
**Figure S4** The interannual number of ignitions per day of the year across the study domain for all ignitions that occurred on or before the 20<sup>th</sup> percentile day of ignition. The lighter colors represent few daily number of ignitions and darker colors vice versa.



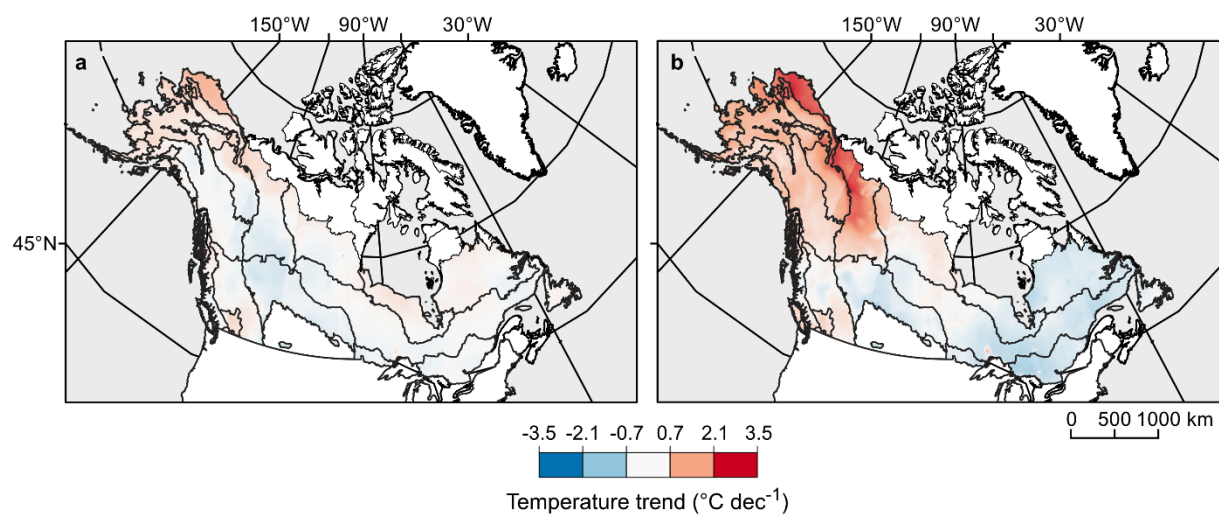
**Figure S5** The annual percentage of the total burned area excluded from the analysis for different fire season start and fire season end thresholds for each ecoregion. The percentile thresholds were calculated per year and ecoregion.



**Figure S6** The relationship between the annual snow-free season length and fire season length for four different threshold for the fire season start (first day of ignition and 1<sup>st</sup>, 5<sup>th</sup>, and 10<sup>th</sup> percentile day of ignition) and four different cut-off thresholds for the fire season end (the last 90<sup>th</sup>, 95<sup>th</sup>, 99<sup>th</sup> percentile day of burning, and last day of burning). The relationship between the snow-free season and fire season is represented by the Pearson correlation coefficient (r). The x axis shows the length of the snow free periods (days) and y axis the fire season length (days) per ecoregion. The colors correspond to the colors on the inset map of Figure 1.

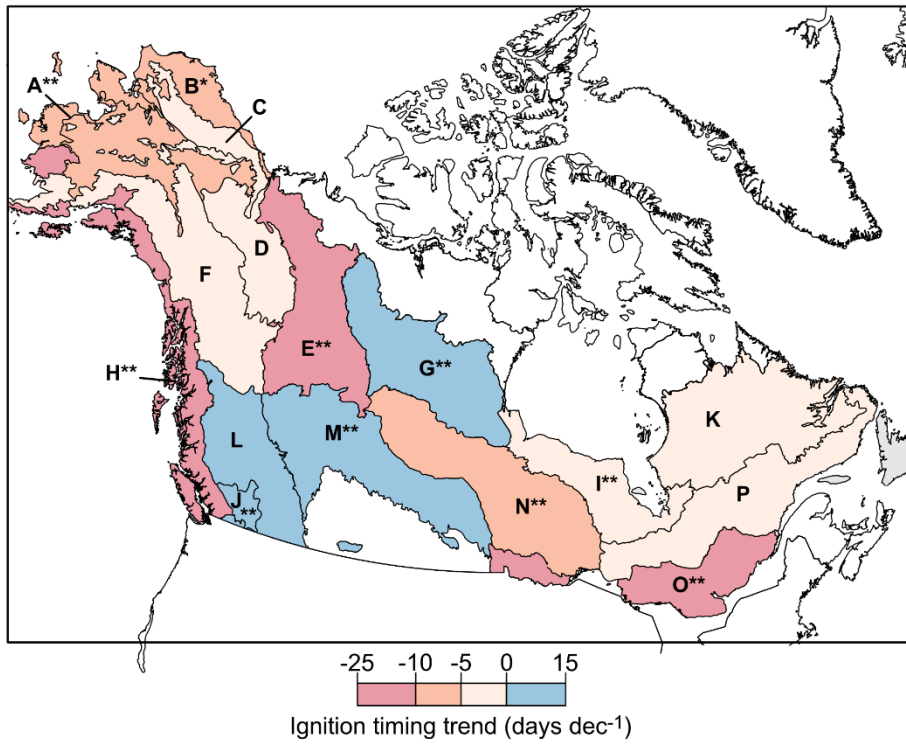


**Figure S7** Results from the piecewise structural equation model (pSEM) for ecoregions with earlier snowmelt timing (a), later snowmelt timing (b) (Table S1). The gray arrows represent positive effects and black arrows indicate negative effects. The single-headed arrows show significant direction of causal relationships, while double-headed arrows represent significant non-causal relationships ( $p < 0.01$ ). All arrows are scaled to their respective effect size (Table S11-S12). Marginal  $R^2$  ( $M-R^2$ ) indicates the variation solely explained by the fixed effects and the conditional  $R^2$  ( $C-R^2$ ) shows the variation explained by both the fixed and random effects combined.

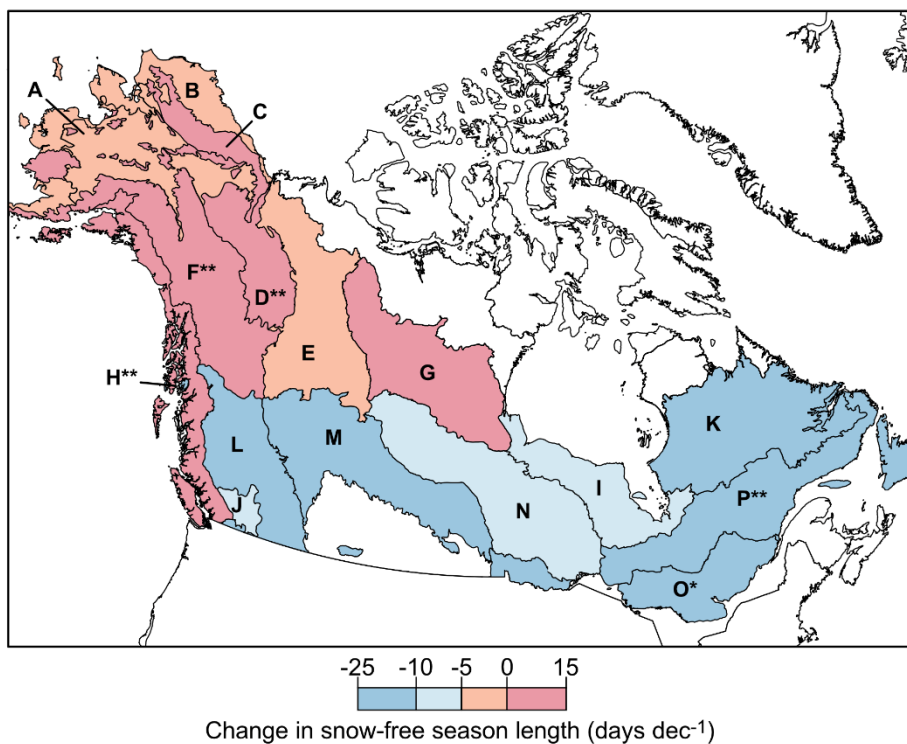


**Figure S8** (a) The temperature trend for February-April between 1980 and 2019 and (b) between 2001 and 2019 derived from the fifth generation of the European Centre for Medium-Range Weather Forecast's (ECMWF) reanalysis for the climate and weather (ERA5 reanalysis) at  $0.25^{\circ}$  resolution (Hersbach et al., 2020) for the study domain overlaid by second-level ecoregions (US EPA, 2015).





**Figure S9** The magnitude and direction of the average ignition timing (days decade<sup>-1</sup>) for all ignitions per ecoregions (A-P) from 2001 to 2019. The slope is given for all ecoregions in table S1 and its significance level is indicated by \* ( $p < 0.1$ ) or \*\* ( $p < 0.05$ ). Letters correspond to the respective ecoregion names (Fig. 2).



**Figure S10** Changes the snow-free season length (days decade<sup>-1</sup>) for all ecoregions (A-P) between 1980 to 2019 (Table S1). Letters correspond to the respective ecoregion names (Fig. 2) and significant relationships are indicated by \* ( $p < 0.1$ ) and \*\* ( $p < 0.05$ ).