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Supplementary Material

Short-term impacts of operational fuel treatments on modelled fire behaviour and effects in seasonally dry forests of British Columbia, Canada

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Supplementary material A

Table S1. Methodologies used by the Fire and Fuels Extension to the Forest Vegetation Simulator.

Model metric	Citations
Canopy base height and canopy bulk density	Scott and Reinhardt (2001)
Surface fire behavior (rate of spread, flame length, fireline intensity)	Rothermel (1972), Albini (1976)
Crown fire initiation and propagation criteria	van Wagner (1977, 1993)
Probability of torching	Rebain et al. (2010)
Crowning index	Scott and Reinhardt (2001), linking Rothermel (1991) and van Wagner (1977)
Tree mortality	Reinhardt et al. (1997)

Supplementary material B

For each response variable (probability of torching (P-Torch), crowning index, and tree mortality), we first selected the best random-effects structure (Tables S1, S3, and S5). Proceeding with the selected random-effects structure, we then selected the best fixed-effects structure (Tables S2, S4, and S6).

P-Torch

Table S1. Akaike Information Criterion (AIC) for P-Torch models with different random-effects structures. The selected model is highlighted in bold font. REML, restricted likelihood.

Fixed effects	Random effect	Method	AIC
none	**none**	**REML**	**432.40**
none	forest & treatment unit within forest	REML	436.20
none	forest	REML	434.20
none	treatment unit	REML	434.40

Table S2. Akaike Information Criterion (AIC) for P-Torch models with different fixed effects structures. The final model is highlighted in bold font. TRT, fuel treatment type (1-5); HT, average tree height; ML, full likelihood.

Fixed effects	Random effect	Method	AIC
TRT	none	ML	442.56
TRT, HT	**none**	**ML**	**435.53**
TRT, HT, TRT*HT	none	ML	439.72

Crowning index

Table S3. Akaike Information Criterion (AIC) for crowning index models with different random effects structures. The selected model is highlighted in bold. REML, restricted likelihood.

Fixed effects	Random effect	Method	AIC
none	none	REML	333.05
none	forest & treatment unit within forest	REML	321.51
none	forest	REML	333.87
none	**treatment unit**	**REML**	**319.51**

Table S4. Akaike Information Criterion (AIC) for crowning index models with different fixed effects structures. The final model is highlighted in bold. TRT, fuel treatment type (1-5); DEN, density of live trees; ML, full likelihood.

Fixed effects	Random effect	Method	AIC
TRT	treatment unit	ML	320.19
TRT, DEN	**treatment unit**	**ML**	**305.19**
TRT, DEN, TRT*DEN	treatment unit	ML	305.38

Tree mortality

Table S5. Akaike Information Criterion (AIC) for tree mortality models with different random effects structures. The selected model is highlighted in bold. REML, restricted likelihood.

Fixed effects	Random effect	Method	AIC
none	**none**	**REML**	**384.51**
none	forest & treatment unit within forest	REML	386.31
none	forest	REML	386.44
none	treatment unit	REML	384.31

Table S6. Akaike Information Criterion (AIC) for tree mortality models with different fixed effects structures. The final model is highlighted in bold. TRT, fuel treatment type (1-5); RD, Curtis Relative Density; ML, full likelihood.

Fixed effects	Random effect	Method	AIC
TRT	none	ML	384.93
TRT, RD	**none**	**ML**	**379.13**
TRT, RD, TRT*RD	none	ML	382.82

Supplementary material C

For models where the random treatment unit and forest effects were not significant, goodness-of-fit was assessed with Pseudo R^2 and root mean square error (RMSE, which is reported in the unit of the response variable; Rawlings et al. 1998). For models where the random treatment unit and/or forest effect was significant, goodness-of-fit was assessed with RMSE, marginal R^2 (the proportion of variance explained by the fixed component of the model), and conditional R^2 (the proportion of variance explained by the fixed and random components of the model; Nakagawa and Schielzeth 2013). The marginal and conditional R^2 were computed using the piecewiseSEM package in R (Lefcheck 2016).

For probability of torching (P-Torch; in %), the final meta-model had fuel treatment type and average tree height as fixed effects. The RMSE was 32.5% and the Pseudo R^2 was 0.25 for the fitted model. The final meta-model for crowning index (in km h^{-1}) had a random treatment unit effect as well as fuel treatment type and density of live trees as fixed effects. The RMSE was 6.3 km h^{-1}, the marginal R^2 was 0.57, and the conditional R^2 was 0.64 for the fitted model. The final meta-model for tree mortality (in %) had fuel treatment type and Curtis RD as fixed effects. The RMSE was 18.7% and the Pseudo R^2 was 0.38 for the fitted model.

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