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Supplementary Material

Improved logistic models of crown fire probability in Canadian conifer forests

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Canadian experimental burn sites: Estimates of live crown base height, foliar moisture content, and other details

This document contains additional background information on the Canadian experimental burning experiments and data used to calculate or estimate live crown base height (LCBH), foliar moisture content (FMC), and other variables for crown fire modelling purposes. Experimental fires were carried out in natural stands of black spruce (*Picea mariana* (Mill.) B.S.P.) and jack pine (*Pinus banksiana* Lamb.), and to a lesser extent red pine (*Pinus resinosa* Ait.)–white pine (*Pinus strobus* L.) and lodgepole pine (*Pinus contorta* var. *latifolia* Engelm. Dougl. ex Loud.), as well as red pine plantations.

Sampling intensity and transparency of LCBH values increased over time in the various fire experiments comprising our database. At the earliest sites, little information was available and crown ratio (CR) modelling based on overall stand metrics appeared to be the only option for estimating LCBH. Starting in the mid-1970's, some measure of variation between plots was typically available, with either individual plot mean LCBH values (mostly previously published), or measures from a small sample (e.g. 10-30 trees) of biomass trees of different sizes produced for estimating diameter at breast height (DBH)–height and CR relationships; these relationships could then be applied to experimental plots. Later experimental burning projects typically featured more detailed fuel sampling (e.g. at the International Crown Fire Modelling Experiment, ICFME; Alexander *et al*. 2004), though not in all cases.

The sites described here with previously-unpublished LCBH estimates are from Sharpsand Creek (immature and thinned plots), Kenshoe Lake (pine stratum and spruce-pine fuel strata gap (FSG_{SP}) only), and the Petawawa National Forest Institute (PNFI: jack pine and red/white pine) in Ontario; and Darwin Lake, Big Fish Lake, and Pelican Mountain sites in

Alberta. Additionally, values at ICFME were calculated differently than in past analyses. At the remaining sites, LCBH values were unchanged from values reported in the original sources.

At the Sharpsand Creek site, raw cruise data were available for immature (SC-IM) and thinning treatment (SC-TH) plots based on earlier sampling (Walker and Stocks 1975), allowing for a fresh analysis of crown fuel structure. Analysis of plot density values revealed one clear outlier among the SC-TH plots, with much higher live (8380 ha^{-1}) and dead (6875 ha^{-1}) density compared with other thinned plots; these values were in the range of the SC-IM plots (live density: 6424–13 928 ha^{-1}; dead density: 5032–13 164 ha^{-1}). This plot (number 16) was therefore suspected to have been only partially or incompletely thinned and was assigned to the SC-IM treatment for analysis purposes. Overall, immature plots had mean values of 9213 and 9971 live and dead stems ha^{-1}, respectively, while the comparable values for SC-TH plots were 4725 live and 1175 dead stems ha^{-1}; both differences were highly significant between treatments (Welch's t-test, $p < 0.001$ for both live and dead stems). The biomass trees from the same study (Walker and Stocks 1975) were also reanalyzed to examine CR values. CR varied slightly by DBH, and was modelled as a linear function as follows:

$$CR = 0.3705 + 0.009196 \cdot DBH \qquad \text{(S1)},$$

and deemed marginally significant (p=0.0747); this gave estimated CR values of 0.39-0.48 for trees with DBH values from 2-12 cm.

We then calibrated an Ontario-based mixed-effects model (Sharma and Parton 2007) for describing tree heights and CR for jack pine based on density and basal area, with a random effect for site quality. We used this model to produce new height estimates for live and dead cohorts and LCBH for live SC-IM trees. Together with the estimated CR values, this produced the DBH-LCBH model shown in Figure S1. This was used together with the cruise data to estimate plot-level LCBH estimates for the SC-IM plots.

Unfortunately, raw plot-level data from the SC-SM plots could not be found; consequently, all SC-SM plots were assumed to have the an LCBH value of 5.3 m (McRae *et al.* 2017).

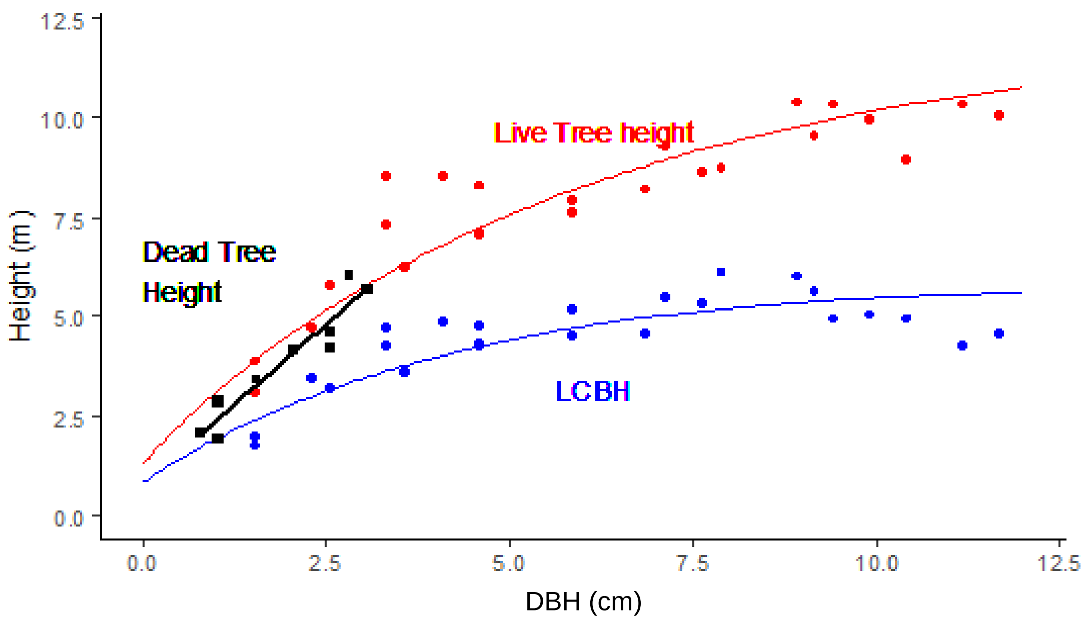

Figure S1. Biomass tree data and models from Sharpsand Creek jack pine: height-DBH data and model (red), LCBH data and model (blue); and dead tree data and linear fit (black). For estimating dead tree height, the linear model was used for DBH < 3 cm and the live tree height model was used for DBH ≥ 3 cm.

For the SC-TH plots, no cruise data (DBH) was located for two of the five plots. Furthermore, the DBH-height (and CR) relationship from the SC-IM biomass trees could not be assumed to hold. Pre-commercial thinning treatments in jack pine are known to cause radial growth compared to controls (Zhang *et al.* 2006) and can also alter crown recession rate and CR

(Morris *et al.* 1994). In the absence of a credible model for LCBH in thinning treatments, we used the mean SC-IM plot value (4.28 m) for SC-TH plots.

One additional adjustment was made to the Sharpsand Creek plot data based on time of burning. The SC-IM and SC-TH plots were burned between 1974-1976 and 1981, while SC-SM plots were burned from 1988-1991. Stand measurements occurred in 1974 (for IM and TH plots), and again in 1984 (for SC-SM). As noted by McRae *et al.* (2017), significant stand changes had occurred over the decade between measurements, with >50% reductions in live and dead stand density and a 1.0 m increase in LCBH (i.e. from 4.28 m to 5.3 m). Therefore, the latest SC-TH and SC-IM burns occurred halfway between measurements. To compensate for this, 0.5 m (half of the mean difference) was added to the estimated LCBH of the four plots burned in 1981 (i.e. 2 each of the SC-IM and SC-TH plots).

Foliar moisture content (FMC) for all Sharpsand Creek plots was estimated using the FBP System equations based on calendar date, elevation and latitude/longitude (Forestry Canada Fire Danger Group 1992; hereafter FCFDG 1992).

Surface fuel consumption (SFC) values were missing for the SC-SM plot files, though total fuel consumption (TFC) and depth of burn values were reported (McRae *et al.* 2017). In order to estimate SFC in line with the remaining observations, we subtracted estimated crown fuel consumption (CFC) values from reported TFC (as per FCFDG 1992). Mean reported CFC values in the SC-IM and SC-TH plots were grouped by type of fire (Stocks 1987; unpublished data files). SC-SM TFC values were therefore reduced by 0.02, 0.39, and 1.14 kg m^{-2}, for surface, passive crown (or ‘torching’), and active crown fires, respectively. For the two observations with fire behaviour described as ‘some torching’, we estimated CFC as the mean of the first two categories (surface and passive crown) or in other words 0.20 kg m^{-2}. This gave overall SFC estimates of 1.4–3.6 kg m^{-2}.

At the Kenshoe Lake site, a similar process was used for LCBH on the jack pine data (used for the upper crowning analysis). The local biomass tree data was used once again to calibrate Sharma and Parton (2007)'s DBH-height model, with parameters and biomass data for black spruce and jack pine calculated separately. For the pine cohorts, CR values were not significantly different across size classes (p = 0.336), so a constant CR of 0.34 was assumed. With the DBH-height model and constant CR, new pine LCBH estimates were calculated, which ranged from 10.2-11.0 m. As noted in the main text, the LCBH for spruce layer was not measured, but estimated to be 2.0 m for all plots. Together with new spruce cohort mean height estimates of 5.4-7.8 m, this gave black spruce crown centroid heights estimates of 3.4-5.8 m and FSG_{SP} estimates of 4.8-6.5 m (see main text, Appendix II for additional information). FMC estimates at Kenshoe Lake were based on the FBP System equations (FCFDG 1992).

At the Big Fish Lake site, unpublished plot-level LCBH measurements were made available for 8 of the 9 experimental fires (M. E. Alexander, research coordinator for the experimental burning project). These were based on sampling of trees directly across from the fireguards surrounding each plot; this was done to avoid trampling the sensitive surface fuelbeds inside the plot perimeters. The resulting LCBH plot values ranged from 0.36–1.29 m, based on samples from 55–221 trees per plot. LCBH for the only unsampled plot was estimated as the mean value (i.e. 0.96 m) of the other eight plot averages. FMC estimates at Big Fish Lake were derived from the FBP System equations (FCFDG 1992). LCBH and FMC values at other associated black spruce experimental burning sites were provided or estimated from the original sources (Kiil 1975; Newstead and Alexander 1983).

At the Darwin Lake site, two distinct stand types were described, with similar basal area but differing stand height, age and density (Quintilio *et al.* 1977). Overstory data on tree heights and LCBH were sparse, with a biomass tree sample (later published in Alexander *et al.* 1991) lacking in data from larger trees. We estimated height and DBH values from three additional dominant trees based on photos presented in Alexander and de Groot (1988) to add to the biomass sample; we then fitted a simple log-model to these data to estimate an overall DBH-height relationship (Fig. S2). In the biomass sample, the slope of the DBH–CR relationship was not significantly different from zero ($p > 0.1$), suggesting a constant CR of about 0.54. Using this biomass model with the plot data resulted in new LCBH estimates from 4.75–6.21 m. FMC at Darwin Lake was estimated using the FBP System equations (FCFDG 1992).

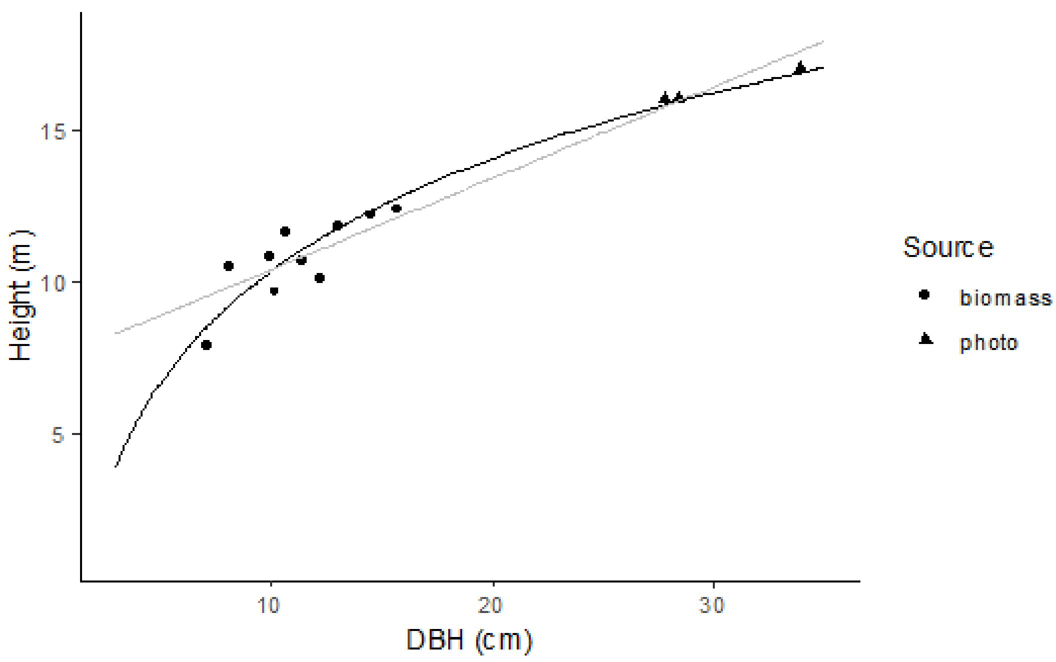

Figure S2. Fitted DBH-height relationship for overstory jack pine trees at Darwin Lake, Alberta, showing observations from the published biomass trees along with three additions based on scaling from photographs. The log-model performed slightly better (black; R^2=0.931) and was believed to be more realistic than a linear model (gray; R^2=0.917) for representing the DBH-height relationship; consequently the log-model was used to estimate tree heights in experimental fire plots.

The PNFI establishment (formerly the Petawawa Forest Experiment Station), west of Ottawa, Ontario, was the site of the earliest field experiments on fire behaviour in pine stands (e.g., Van Wagner 1963; 1965). The 1960's era jack pine experimental fires conducted by C. E. Van Wagner were later documented by Hummel (1979) and Weber *et al.* (1987) in a related fire effects study. We used Hummel's (1979) stand data and reconstructions with McAlpine and Hobbs' (1994) locally-calibrated model to estimate plot-level LCBH values based on stand density and basal area. This resulted in five new LCBH estimates for PNFI jack pine plots, ranging from 7.33–9.12 m.

For the PNFI red and white pine stands, no previous LCBH measures were ever formally published, though the FBP System documentation suggested a fixed LCBH value of 18 m for the C-5 fuel type (FCFDG 1992). Stand data was published for the various experimental blocks along with the results from earlier experimental fires (Van Wagner 1963). We used Holdaway's (1988) models from Wisconsin, USA to calculate CR values for these stands, providing for admittedly crude estimates. Together with published stand height values (14.6–25.0 m), this resulted in new LCBH estimates for the PNFI red and white pine stands of 7.4 m–13.3 m. FMC values for all PNFI red and white pine stands were interpolated from local species-specific seasonal curves (Van Wagner 1967).

Experimental fires in red pine plantations at PNFI were also conducted and documented by Van Wagner (1968, 1977), with additional insights documented in later reports (e.g. Van Wagner 1986). Field-scale experimental fires carried out between 1962 and 1967 were conducted in late spring through summer conditions. Mean stand attributes, including LCBH values, were provided in these reports, though no sampling details were provided. The described ranges suggest that some stand-wide sampling was conducted. Stem and canopy fuel densities were high in these stands (FCFDG 1992). FMC values were estimated from locally-derived seasonal FMC curves (Van Wagner 1967).

At the Pelican Mountain experimental burning site, most of the necessary inputs involved in crown fire modelling were documented and reported on by Thompson *et al.* (2020), with the exception of LCBH. Mean overstory (black spruce) LCBH values were obtained for the control (2.08 m) and thinned (4.15 m) plots from G. A. Marshall (personal communication, April 2022). FMC was estimated and reported in the study (Thompson *et al.* 2020) using the FBP System equations (FCFDG 1992).

At the ICFME site, detailed fuel structure surveys were previously published in various tables (Alexander *et al.* 2004). The only difference from previous analyses was the change from using the 'combined' black spruce-jack pine LCBH value to using individual values for overstory spruce and pine cohorts (Alexander *et al.* 2004, Table 12).[1] The overstory spruce had LCBH values of 0.7–2.4 m, while pine cohorts (used for estimating upper canopy crowning) had LCBH values of 3.6–8.2 m. Combined with spruce crown depth plot measurements, this gave spruce crown centroid estimates of 2.7–4.3 m and spruce-pine fuel strata gap (FSG_{SP}) estimates of 2.5–5.8 m. Two of the ICFME plots (numbers 3 and 4) had no overstory spruce and were therefore excluded from the dual strata calculations. FMC was measured at the plot level as part of the ICFME burning project (Stocks *et al.* 2004).

At the Porter Lake site, plot-level LCBH as well as FMC values were published in the original primary source report (Alexander *et al.* 1991) and remain unchanged for our analysis.

[1] Note that Table 12 in Alexander *et al.* (2004) contains a previously unreported error in the black spruce overstory LCBH. The value for Plot 5 should be 0.7 m (not 10.0 m as shown); the mean spruce LCBH for all 7 plots with this stratum was 1.49 m and not 2.7 m as shown.

At the Prince George (Summit Lake) site, the LCBH from the two distinct stand types (i.e. ‘Dry pine south’ and ‘Dry pine north’) were published in the original source report (Lawson 1972) and remain unchanged for our analysis. The FMC values were estimated using the FBP System equations (FCFDG 1992).

Use of MC_{SA} model – suggestions and caution at high FFMC levels

With the present published version of Wotton and Beverly’s (2007) stand-adjusted litter moisture content (MC_{SA}) model, it is straightforward, if somewhat uncertain, to apply the five stand parameters to generate MC_{SA} estimates. Applying FFMC, DMC, and stand type inputs follows the application of standard hourly or diurnal Canadian Forest Fire Weather Index (FWI) System components (Van Wagner 1987) and stand survey information. Use of calendar dates for assigning season, as we did in the present study, is a coarse but sometimes necessary simplification. Future users will likely have better success using local greenup dates to define the end of the spring season, as intended by Wotton and Beverly (2007). While not originally part of their model, the ‘spring-summer transition’ season (i.e. June 1-15, or as defined locally) likely remains useful and is simply calculated as the mean value from the two seasons. The density factor can be applied as we did, using estimated canopy closure classes (e.g. from hemispherical photographs; Chianucci and Cutini 2012) roughly as follows: ‘light’ (20-45%), ‘moderate’ (46-60%) and ‘dense’ (>61%). In a physical sense, we expect the crown closure influence to be tied to in-stand solar radiation and potential evapotranspiration (Vezina and Péch 1964; van der Kamp *et al.* 2017); additional testing and validation of this effect are clearly required.

Users should take heed of some illogical behaviour in the MC_{SA} model of Wotton and Beverly (2007) at high FFMC levels, likely caused by limited sampling and statistical interaction terms. Stands classified as 'dense' begin to show a reverse density influence on litter moisture content (MC) above an FFMC of approximately 92.93, such that 'dense' stands are predicted to have slightly lower MC values than 'moderate' stands; similarly illogical differences between 'light' and 'moderate' categories exist above an FFMC of approximately 96.15, where 'light' density stands begin to have higher predicted MC than 'moderate' density stands. Below these thresholds, the density classes behave as expected. A similar reversal exists with the season factor: below FFMC 95.16, 'spring' produces lower estimated MC than 'summer'; above that threshold, 'summer' MC value is slightly higher than 'spring'. In this latter instance, however, it is not clear if this is a model error since the cause of the seasonal difference was unknown (Wotton and Beverly 2007). In our analyses, we adjusted the density classes of five high FFMC (> 92.9) fire observations, from 'dense' to 'moderate', where the FFMC-density combinations were producing illogical behaviour; the maximum change in MC due to this adjustment was 0.37% for FFMC values up to 94.2. For cases with higher FFMC values, differences could be more pronounced. In a practical sense, these differences are small but suggest the need for additional studies or refinements to the MC_{SA} model.

Fitted coefficients for all described models

Table S1. Coefficients for all models tested in the main study, fitted to full database (n=113). Models 7-11 are duplicated here for simplicity (see Table 3 in main text). All coefficients in Models A, B and 1–6 are significant at the α=0.05 level. See main text, Appendix I for abbreviations.

Model	Intercept	WS_{10}	FSG	MC	SFC	SFC.CLS2	SFC.CLS3	Accuracy	AIC	Predictors	FSG
A	-1.1933	0.3250	-0.519	-	-	-	-	0.8142	94.3	WS_{10} + FSG	Base

B	6.3281	0.4292	-0.853	-0.688	-	-	-	0.8407	73.9	WS_{10} + FSG + MC_{FFMC}	Base
1	4.3777	0.4923	-1.081	-0.6928	1.4377	-	-	0.8761	65.9	WS_{10} + FSG + SFC + MC_{FFMC}	Base
2	3.7926	0.4586	-1.047	-0.5466	1.1419	-	-	0.8673	71.2	WS_{10} + FSG + SFC + MC_{SA}	Base
3	2.4339	0.5171	-0.345	-0.6579	1.4751	-	-	0.885	64.7	WS_{10} + $FSG^{1.5}$ + SFC + MC_{FFMC}	Base
4	2.1617	0.4983	-0.343	-0.5452	1.1888	-	-	0.8761	68.5	WS_{10} + $FSG^{1.5}$ + SFC + MC_{SA}	Base
5	-4.8496	1.2658	-0.397	-0.0662	1.7128	-	-	0.9027	61	WS_{10} + $FSG^{1.5}$ + SFC + MC_{FFMC} x WS_{10}	Base
6	-3.8869	1.0597	-0.38	-0.0493	1.3516	-	-	0.8761	65.5	WS_{10} + $FSG^{1.5}$ + SFC + MC_{SA} x WS_{10}	Base
7	-3.0923	1.2611	-0.395	-0.0659	2.8324	-	-	0.9027	60.1	WS_{10}+ $FSG^{1.5}$ + ln(SFC) + MC_{FFMC} x WS_{10}	Base
8	-2.4341	1.0449	-0.376	-0.0487	2.1943	-	-	0.8761	65	WS_{10} + $FSG^{1.5}$ + ln(SFC) + MC_{SA} x WS_{10}	Base
9	-4.6830	1.3156	-0.415	-0.0663	-	1.6792	3.2814	0.8761	61.6	WS_{10} + $FSG^{1.5}$ + SFC.CLS + MC_{FFMC} x WS_{10}	FSG Adj.
10	-4.0204	1.3514	-0.434	-0.0688	2.8906	-	-	0.9115	56.3	WS_{10} + $FSG^{1.5}$ + ln(SFC) + MC_{FFMC} x WS_{10}	FSG Adj.
11	-3.5550	1.4407	-0.532	-0.0702	2.4897	-	-	0.9204	55.2	WS_{10} + $FSG^{1.5}$ + ln(SFC) + MC_{SA} x WS_{10}	FSG Adj.
12	-3.2882	1.0441	-0.125	-0.0476	2.0661	-	-	0.8938	64.9	WS_{10} + FSG^2 + ln(SFC) + MC_{SA} x WS_{10}	FSG Adj.

Comparison between crown fire occurrence probability models

Table S2. Table of crown fire occurrence probabilities comparing inputs and different model outputs.

Models 9–10 shown are from the present study. Model 11_{d1} and Model 11_{d2} indicate model 11 with low and moderate stand density, respectively, and LOGIT1 and LOGIT2 represent the models of Cruz *et al*. (2003). Required inputs for various models are as indicated. $MC_{SA\text{-}d1}$ and $MC_{SA\text{-}d2}$ refer to stand-adjusted moisture content estimates using light (d1) and moderate (d2) stand density categories, respectively, assuming a pine stand and summer season (Wotton and Beverly 2007). Green text and background indicate predicted surface fire behaviour ($p < 0.5$) while red text and background indicate predicted crown fire behaviour ($p \geq 0.5$). Same fire type (FT) is true (T) when Model 9, Model 10, Model 11_{d2} and LOGIT1 and LOGIT2 models all predict the same fire type (surface or crown) or false (F) when at least one is different from the others. Drought Code (DC) associated with selected Duff Moisture Code (DMC) values are mean values calculated from British Columbia fire weather database statistics (1970-2016) for DMC 36-45, excluding anomalously high values (i.e. DC < 400, for DMC 40; n = 104,651) and DMC 86-95 (DC < 500, for DMC 90; n = 15,310). Initial Spread Index (ISI) is calculated from indicated wind speed (WS) and Fine Fuel Moisture Code (FFMC) values, and Buildup (BUI) is calculated from the indicated DMC and DC values as per the Canadian Forest Fire Weather Index System (Van Wagner 1987). SFC for Models 10 and 11, and SFC class for Model 9, were calculated from the FBP System C-3/C-4 fuel type SFC model based on the BUI (FCFDG 1992, Eqn. 11). This gave values of 1.6 kg m^{-2} (SFC class 2) and 3.4 kg m^{-2} (SFC class 3) for BUI 57 and 111, respectively. Refer to Appendix 1 in the main text for abbreviations and units.

FFMC	DMC	$MC_{SA\text{-}d1}$	$MC_{SA\text{-}d2}$	WS_{10}	DC	ISI	BUI	FSG	Model 9 WS_{10}, FFMC, FSG, SFC.CLS	Model 10 WS_{10}, FFMC, FSG, SFC	Model 11_{d2} WS_{10}, MC_{SA}, FSG, SFC	LOGIT1 WS_{10}, FFMC, LCBH, DC	LOGIT2 ISI, LCBH, DC	Same FT?	Model 11_{d1} WS_{10}, MC_{SA}, FSG, SFC
88	40	10.91	13.31	7	241	4.58	57	3	0.122	0.163	0.175	0.096	0.242	T	0.409
91	40	8.91	10.3	7	241	7.04	57	3	0.38	0.475	0.483	0.444	0.625	F	0.649
94	40	6.8	7.31	7	241	10.73	57	3	0.718	0.798	0.802	0.857	0.952	T	0.839

88	90	9.21	11.23	7	366	4.58	111	3	0.409	0.61	0.781	0.503	0.648	F	0.906
91	90	7.52	8.69	7	366	7.04	111	3	0.753	0.879	0.925	0.883	0.906	T	0.957
94	90	5.74	6.17	7	366	10.73	111	3	0.927	0.97	0.977	0.983	0.991	T	0.981
88	40	10.91	13.31	13	241	6.2	57	3	0.681	0.753	0.816	0.763	0.487	F	0.975
91	40	8.91	10.3	13	241	9.52	57	3	0.971	0.981	0.986	0.96	0.899	T	0.996
94	40	6.8	7.31	13	241	14.52	57	3	0.998	0.999	0.999	0.994	0.996	T	0.999
88	90	9.21	11.23	13	366	6.2	111	3	0.914	0.961	0.994	0.968	0.845	T	0.999
91	90	7.52	8.69	13	366	9.52	111	3	0.994	0.998	0.999	0.996	0.981	T	>0.999
94	90	5.74	6.17	13	366	14.52	111	3	>0.999	>0.999	>0.999	0.999	0.999	T	>0.999
88	40	10.91	13.31	19	241	8.38	57	3	0.97	0.979	0.989	0.99	0.805	T	>0.999
91	40	8.91	10.3	19	241	12.88	57	3	0.999	>0.999	>0.999	0.999	0.988	T	>0.999
94	40	6.8	7.31	19	241	19.65	57	3	>0.999	>0.999	>0.999	>0.999	>0.999	T	>0.999
88	90	9.21	11.23	19	366	8.38	111	3	0.994	0.997	>0.999	0.999	0.96	T	>0.999
91	90	7.52	8.69	19	366	12.88	111	3	>0.999	>0.999	>0.999	>0.999	0.998	T	>0.999
94	90	5.74	6.17	19	366	19.65	111	3	>0.999	>0.999	>0.999	>0.999	>0.999	T	>0.999
88	40	10.91	13.31	7	241	4.58	57	8	<0.001	<0.001	<0.001	0.001	0.004	T	<0.001
91	40	8.91	10.3	7	241	7.04	57	8	<0.001	<0.001	<0.001	0.006	0.022	T	<0.001
94	40	6.8	7.31	7	241	10.73	57	8	0.002	0.002	<0.001	0.04	0.212	T	<0.001
88	90	9.21	11.23	7	366	4.58	111	8	0.001	0.001	<0.001	0.007	0.024	T	0.001
91	90	7.52	8.69	7	366	7.04	111	8	0.002	0.004	0.001	0.05	0.114	T	0.002
94	90	5.74	6.17	7	366	10.73	111	8	0.009	0.016	0.004	0.284	0.607	F	0.005
88	40	10.91	13.31	13	241	6.2	57	8	0.002	0.002	<0.001	0.022	0.013	T	0.004
91	40	8.91	10.3	13	241	9.52	57	8	0.024	0.027	0.006	0.144	0.106	T	0.023
94	40	6.8	7.31	13	241	14.52	57	8	0.256	0.301	0.09	0.558	0.774	F	0.137
88	90	9.21	11.23	13	366	6.2	111	8	0.008	0.013	0.016	0.176	0.068	T	0.096
91	90	7.52	8.69	13	366	9.52	111	8	0.108	0.182	0.145	0.615	0.407	F	0.331
94	90	5.74	6.17	13	366	14.52	111	8	0.631	0.776	0.629	0.923	0.952	T	0.715
88	40	10.91	13.31	19	241	8.38	57	8	0.023	0.024	0.009	0.405	0.052	T	0.176
91	40	8.91	10.3	19	241	12.88	57	8	0.572	0.618	0.325	0.836	0.533	F	0.754
94	40	6.8	7.31	19	241	19.65	57	8	0.985	0.989	0.963	0.974	0.991	T	0.981
88	90	9.21	11.23	19	366	8.38	111	8	0.106	0.167	0.456	0.866	0.242	F	0.925
91	90	7.52	8.69	19	366	12.88	111	8	0.869	0.929	0.961	0.98	0.868	T	0.992
94	90	5.74	6.17	19	366	19.65	111	8	0.997	0.999	0.999	0.997	0.998	T	0.999

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