

Figure S1: Overarching schematic of study design

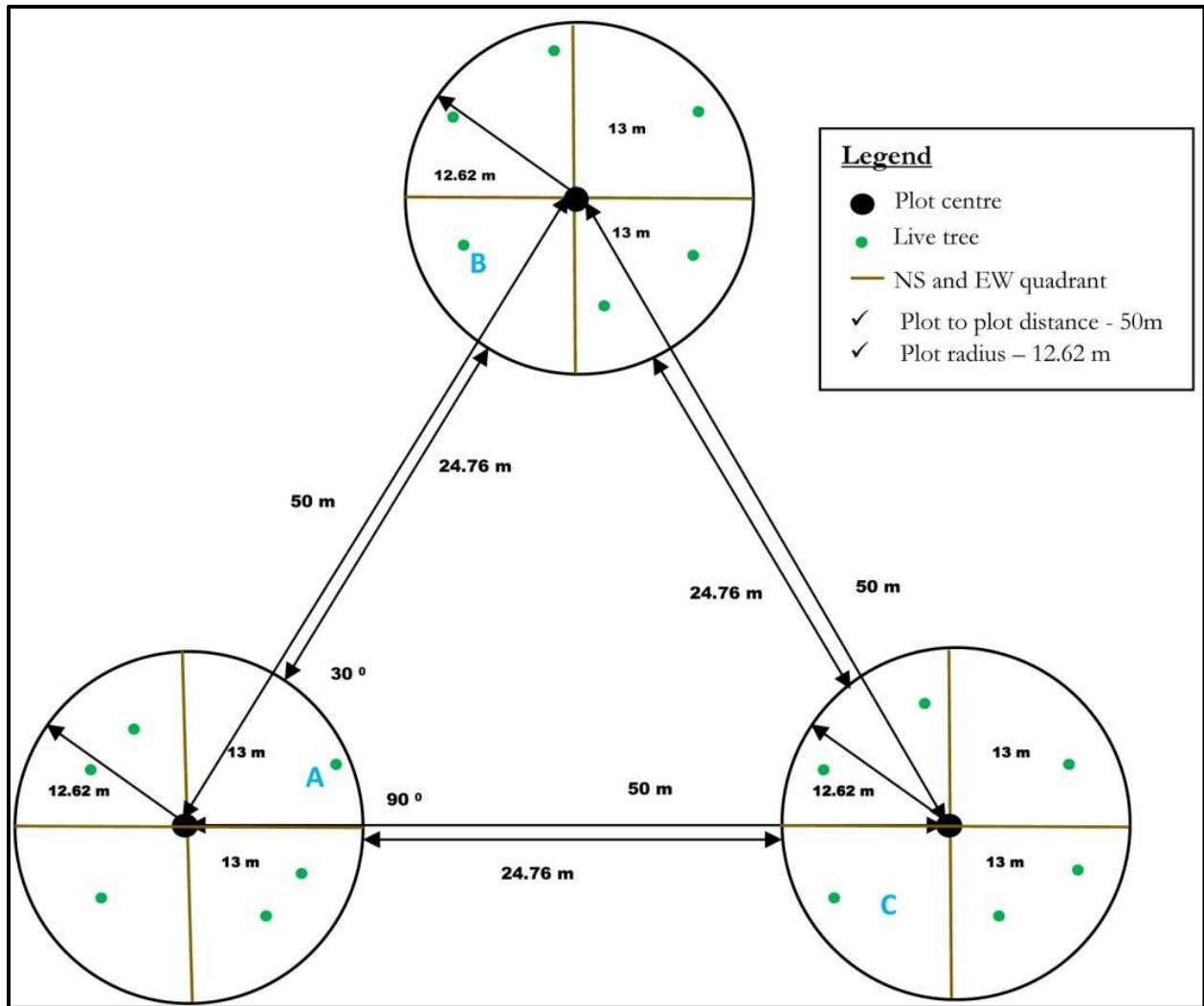


Figure S2: Sample plot layout for field-based assessments illustrating the arrangement of three plots per site (minimum distance of 50 m between the plot centres, orientated at 30 and 90 degrees from the centre of plot 'A').

Table S1: Numbers of individual trees assessed in the field ('candidate trees') and delineated in the lidar data by wildfire severity class

Severity class ^a	Number of sites	Number of plots	Live tree measurement			
			Field- measured candidate trees	Trees delineated in lidar		
				Candidate trees	Non- candidate trees ^b	Total
Unburnt	4	12	79	21	20	41
Low Severity	4	12	91	22	21	43
Moderate Severity	5	15	93	24	28	52
High Severity	4	12	79	23	37	60
Total	17	51	342	90	106	196

^a The 'Black Saturday' severity classes included five categories relevant to forests; our 'High' severity corresponded to classes 1 and 2, 'Moderate' severity to class 3, and 'Low' severity to classes 4 and 5a. The classes were: 1, 'crown burn', 70 – 100% crowns burned, understorey entirely consumed; 2, 'crown scorch', 60 – 100% crowns scorched, some crowns burned, intense understorey fire; 3, 'moderate crown scorch', 30 – 65% crowns scorched as a mosaic, variable understorey burn; 4, 'light crown scorch', 1 – 35% crowns scorched, mostly light ground fire; and 5a 'no crown scorch', <1% of crown scorched, <1% of understorey burnt or scorched, and/or low intensity ground fire (Department of Sustainability and Environment 2009)

^b Non-candidate trees were either only assessed for diameter and location in the field or were clearly distinguished in the lidar data just beyond the plot boundary (same forest type and fire severity)

22 LITERATURE CITED (Supplementary document 1: Table 1)

23 Department of Sustainability and Environment. 2009. Remote sensing guideline for assessing

24 landscape scale fire severity in Victoria's forest estate. Guideline – Reference manual for SOP No. 4:

25 Classification of remotely sensed imagery into fire severity maps. Department of Sustainability and

26 Environment, Melbourne, Victoria, Australia.

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Table S2: Summary of lidar acquisition and sensor specifications

Sensor type	Trimble AX60
Flight altitude (m asl)	800
Beam divergence (mrad)	≤ 0.25
Footprint (m)	0.22
Scan Rate (Hz)	134
Swath (side) Overlap (%)	50
Maximum scan angle ($^{\circ}$)	60 (FOV)
Average pulse spacing (m)	0.29
Average point density (m) [*]	24.34
Horizontal Accuracy (cm)	≤ 20
Vertical Accuracy (cm)	≤ 20
Stored Data Format	LAS v1.3
Tile size	1km \times 1km

30 ^{*} *Calculated from LAStools using average value of ten tiles of lidar data based on all returns.*

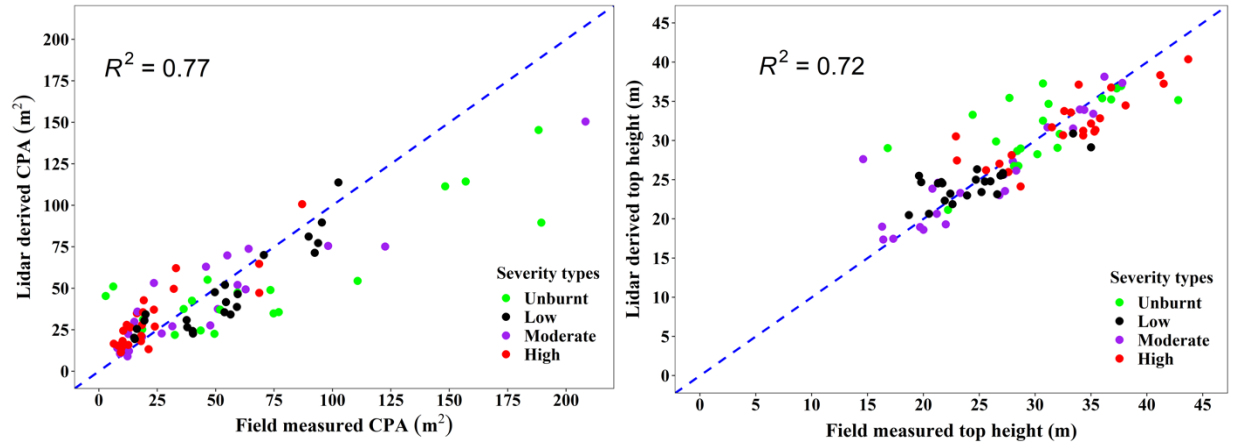
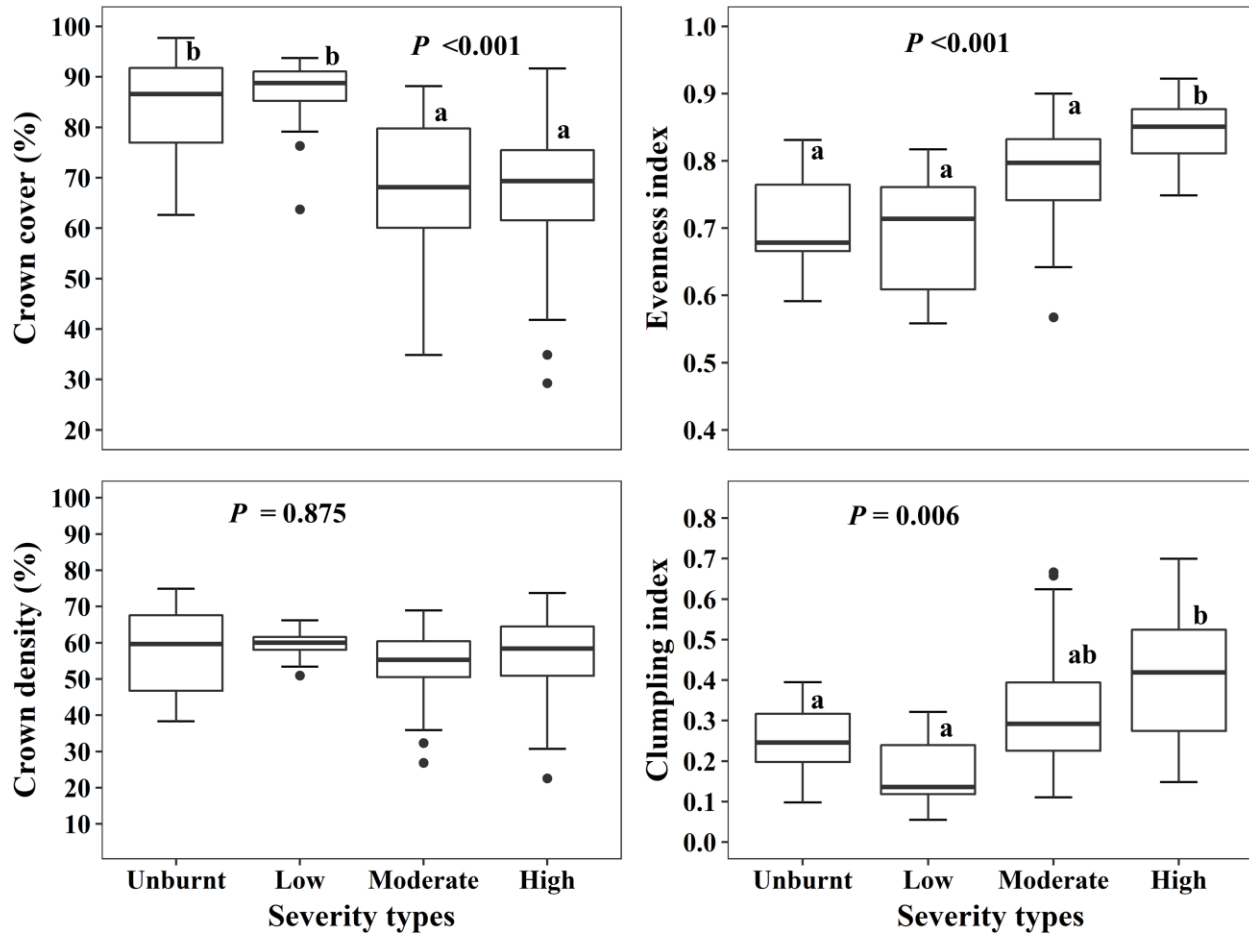


Figure S3: Comparison of lidar-derived and field-measured crown projection areas (CPA, left) and total tree height of candidate trees ($n = 90$) by fire-severity class. Dashed line is the 1 to 1 line.



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42 Figure S4: Comparison of lidar-derived crown metrics – crown cover, crown density, evenness index
 43 and clumping index – among fire-severity classes for field-based trees that were also delineated in the
 44 lidar data. Metrics were calculated within standardised CPAs that were estimated from relationships
 45 with DBHOB of unburnt trees, and are based on 11 to 24 trees per severity types (UB – 21, L - 22,
 46 M – 24, H – 23).

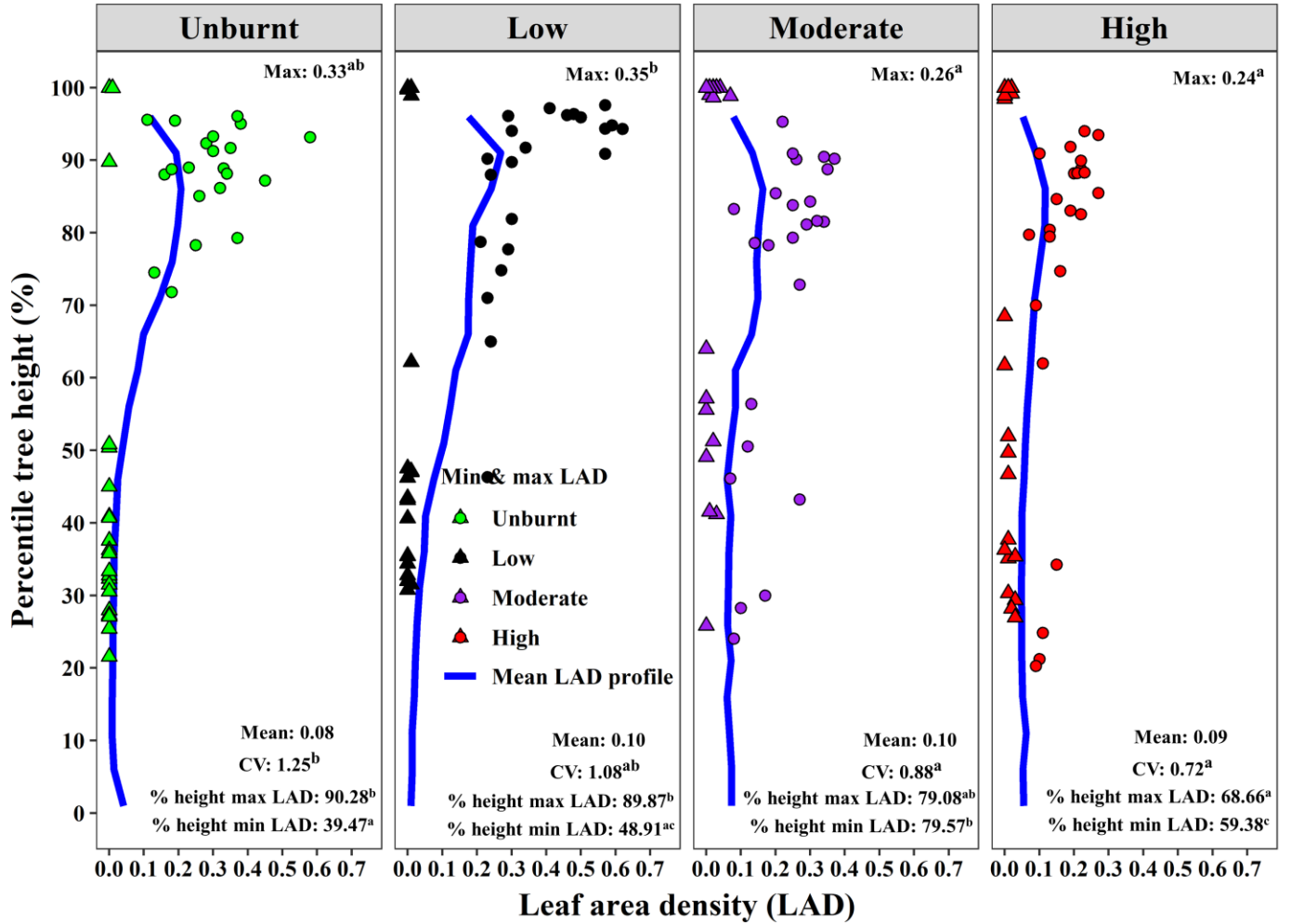


Figure S5: Comparison of lidar-derived metrics extracted from Leaf area density (LAD) profiles – maximum LAD (LADmax), mean LAD (LADmean), coefficient of variation of LAD (LADcv), percentile height of maximum LAD (HtmaxLAD) and percentile height of minimum LAD (HtminLAD) – among fire-severity classes for field-based trees that were also delineated in the lidar data. Metrics were calculated within standardised CPAs that were estimated from relationships with DBHOB of unburnt trees. Mean LAD profile (blue line), percentile height of the minimum LAD (triangles), and percentile height of the maximum LAD are based on 41 to 60 trees per severity class (UB - 41, L - 43, M - 52, H - 60). In-figure values are the mean metrics and superscript letters indicate pairwise comparison at $p < 0.027$ (LADmax), $p = 0.01$ (LADcv), $p = 0.557$ (LADmean), $p = 0.137$

57 (HtmaxLAD), and $p < 0.001$ (HtminLAD). P-values are calculated from LME models, and different
58 letters indicate significant differences between fire-severity classes as indicated by posthoc tests
59 (Fisher's LSD test).