Exploring the Future of Fuel Loads in Tasmania, Australia: Shifts in Vegetation in Response to Changing Fire Weather, Productivity, and Fire Frequency †

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Supplementary Material

Figure S2.1: The distribution of vegetation across Tasmania belonging to the flammability categories in TASVEG 3.0;

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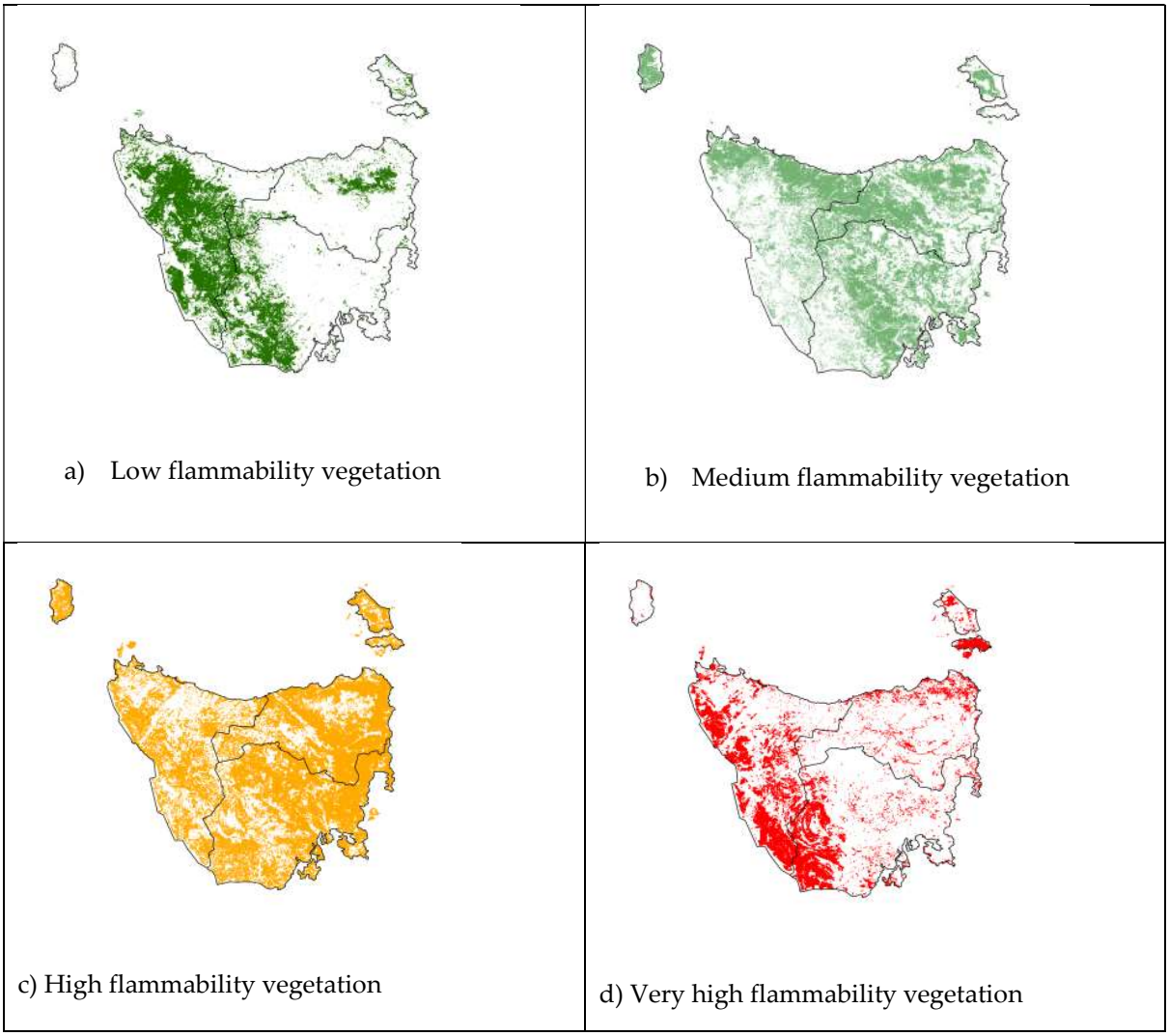
S2.1. Flammability of vegetation across Tasmania



a) Low flammability vegetation

b) Medium flammability vegetation

c) High flammability vegetation

d) Very high flammability vegetation

Figure S2.1: The distribution of vegetation across Tasmania belonging to the flammability categories in TASVEG 3.0

S2.2 The vegetation pathways followed in the model

Table S2.2. The vegetation pathways followed in the model. The order of the vegetation types reflects the pathway followed in the model. The associated TASVEG 3.0 VEGCODEs represent the original vegetation types used to develop the pathway

Broad Vegetation Type	**Pathway**	**Tas Veg 3.0 VEGCODE**
Buttongrass	Buttongrass moorland woodland shrubby or heathy understorey; Buttongrass moorland; Buttongrass moorland bare ground	MBE; MBP; MBR; MBS; MBU; MBW; MRR; MSW
Generic	Generic forest; Generic dry scrub; Generic woodland shrubby or heathy understorey; Generic woodland grassy understorey; Generic grassland; Generic bare ground; Generic heathland; Generic heathland grassland; Generic heathland bare ground;	NBA; SAL; SCA; SED; SLS; SMP; SSC; SKA; GCL; GHC; GPH; GPL; GRP; GTL; SCH; SHW; SLG; SRH; SSZ; SCL; DBA; DGW; DMW; DVG; DOW; DKW; DPD; DPO
Eucalypt	Eucalypt wet sclerophyll forest with rainforest understorey; Eucalypt wet sclerophyll forest broadleaf tree understorey; Eucalypt wet sclerophyll forest with shrubby or heathy understorey; Eucalypt dry sclerophyll forest shrubby understorey; Eucalypt dry sclerophyll forest shrubby or heathy or broadleaf understorey; Eucalypt dry sclerophyll forest shrubby or heathy or buttongrass understorey; Eucalypt dry sclerophyll forest shrubby or heathy or grassy understorey; Eucalypt dry sclerophyll forest shrubby or heathy understorey; Eucalypt dry sclerophyll forest shrubby or grassy understorey; Eucalypt dry sclerophyll forest heathy understorey; Eucalypt dry sclerophyll forest grassy understorey; Eucalypt woodland shrubby or heathy understorey; Eucalypt woodland grassy understorey; Eucalypt grassland; Eucalypt bare ground	DGL; DTO; DAC; DNI; DAM; DSG; DSO; DTD; DTG; DDE; DOV; DPU; DRI; DRO; DAS; DOB; DVC; DSC; DNF; DAD; WDB; WOB; WVI; WDA; WDL; WNL; WOL; WRE; WSU; WDU; WOU; WNU; WBR; WDR; WGK; WNR; WOR
Non-Eucalypt	Non-eucalypt wet forest broadleaf understorey; Non-eucalypt wet forest shrubby or broadleaf understorey; Non-eucalypt wet forest shrubby understorey; Non-eucalypt wet forest heathy understorey; Non-eucalypt wet forest sedgey understorey; Non-eucalypt wet scrub shrubby understorey; Non-eucalypt wet scrub heathy understorey; Non-eucalypt wet scrub sedgey understorey; Non-eucalypt dry forest; Non-eucalypt dry scrub; Non-eucalypt heathland; Non-eucalypt grassland; Non-eucalypt bare ground	NRL; NRV; NCR; NRR; NRD; NLM; NRF; NME; NBS; NLA; SBM; NLE; SSK; SWR; SBR; SRE; SLL; SLW; SMM; SMR; SWW
Sphagnum	Sphagnum; Sphagnum sedgeland; Sphagnum bare ground	GSL; MSP
Rainforest	Rainforest with conifers or deciduous beech; Rainforest without conifers or deciduous beech; Rainforest wet scrub shrubby understorey; Rainforest wet scrub heathy understorey; Rainforest wet scrub sedgey understorey; Rainforest heathland; Rainforest sedgeland; Rainforest grassland; Rainforest bare ground	RHP; RKF; RKP; RKX; RMU; RMT; RCO; RFE; RML; RMS; RSH; SRF

Subalpine	Subalpine rainforest; Subalpine scrub; Subalpine woodland; Subalpine heathland; Subalpine sedgeland; Subalpine grassland; Subalpine bare ground	DCO; RKS; SHS; RPF; RPP; SSW; DDP; NLN; RPW
Alpine	Alpine heathland with conifers; Alpine heathland without conifers; Alpine rushland or sedgeland; Alpine bare ground	HUE; HCH; RFS; HCM; HHE; HHW; HSE; HSW; MDS; MGH

S2.3. Accumulation curves

The fuel load was calculated for each broad vegetation type at each time step, using Olson's model of fuel accumulation [28]:

Biomass (of fuel) = L*(1-exp(-k*A))

Where L represents the carrying capacity (or maximum fuel load), k iss the growth rate (or decomposition rate), and A is age (or time since fire)

Values for carrying capacity and growth rate in Tasmanian vegetation types were decided on after consultation with the literature and fire ecologists (Jon Marsden-Smedley, Dave Taylor, pers. comm.), and resulted in the accumulation curves shown in Figure S3.1. The value for the TASVEG type that made up the greatest area of each Broad Vegetation Type was used.

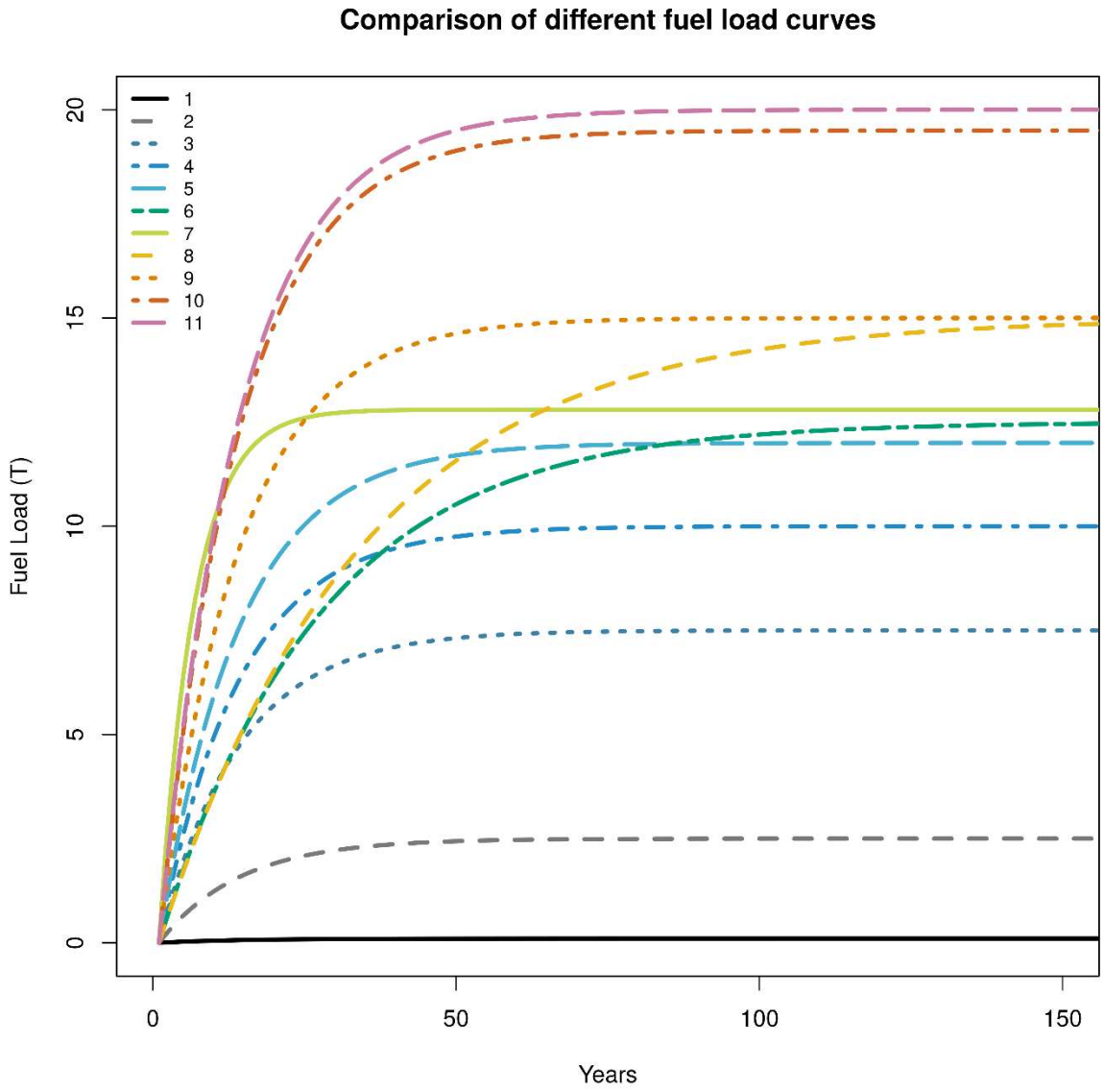


Figure S2.3: Fuel load versus time since fire in the broad vegetation types. The vegetation types associated with each curve are shown in Table S2.3.

Table S2.3: The vegetation types in the model associated with each fuel accumulation curve. Note that each type represents the different transition pathways that the current vegetation can follow, rather than an existing vegetation type.

1. “Bare ground”
2. Subalpine woodland
3. Eucalypt dry sclerophyll forest shrubby/ heathy/ grassy understorey
4. Alpine heathland with conifers
5. Alpine rushland/sedgeland; Buttongrass moorland woodland shrubby or heathy understorey, Buttongrass moorland, Eucalypt woodland shrubby or heathy understorey, Eucalypt woodland grassy understorey, Eucalypt grassland, Generic heathland grassland, Generic woodland shrubby or heathy understorey, Generic woodland grassy understorey, Generic grassland, Non-eucalypt grassland, Rainforest sedgeland, Rainforest grassland, Sphagnum sedgeland, Subalpine sedgeland, Subalpine grassland
6. Rainforest with conifers or deciduous beech; Rainforest without conifers or deciduous beech
7. Eucalypt dry sclerophyll forest shrubby or heathy understorey
8. Non-eucalypt wet scrub shrubby/heathy/sedgey understorey; Non-eucalypt wet scrub understorey, Rainforest wet scrub shrubby/ heathy/ sedgey understorey
9. Alpine heathland without conifers; Eucalypt dry sclerophyll forest shrubby/heathy/broadleaf/ grassy understorey; Generic forest; Non-eucalypt dry forest; Non-eucalypt dry scrub; Subalpine scrub; Subalpine heathland
10. Eucalypt wet sclerophyll forest with rainforest/ broadleaf/ shrubby/ heathy understorey; Non-eucalypt wet forest broadleaf/ shrubby/ heathy/ sedgey understorey; Subalpine rainforest
11. Generic heathland, Generic dry scrub, Non-eucalypt heathland, Rainforest heathland

S2.4. Flammability of vegetation types at different Soil Dryness Index levels

Table S2.4: Flammability at different levels of Soil Dryness Index (SDI), from Marsden-Smedley (2009).

Soil Dryness Index	**Broad Vegetation Type**	**Flammability**
≤10	Buttongrass moorland	High
	Wet scrub, dry eucalypt forest	Very low
	All other types	Non-flammable
11-15	Buttongrass moorland	Very high
	Wet scrub, dry eucalypt forest	Low
	Wet eucalypt forest	Very low
	Rainforest	Non-flammable
16-25	Buttongrass moorland	Very high
	Wet scrub	High
	Dry eucalypt forest, Wet eucalypt forest	Moderate
	Rainforest	Non-flammable
26-50	Buttongrass moorland	Very high
	Wet scrub, Dry eucalypt forest	High
	Wet eucalypt forest	Moderate
	Rainforest	Low
	Buttongrass moorland, Wet scrub, Dry eucalypt forest	Very high
>50	Wet eucalypt forest	High
	Rainforest	Moderate

S2.5. Impact of fire frequency on Potential Future Fire Activity (PFFA)

Changes to the Potential Fire Activity (PFFA) over the coming decades can be generated for any region, and will reflect the different vegetation types within the region of interest. We illustrate it here using the Tasmanian forecast districts of the Bureau of Meteorology.

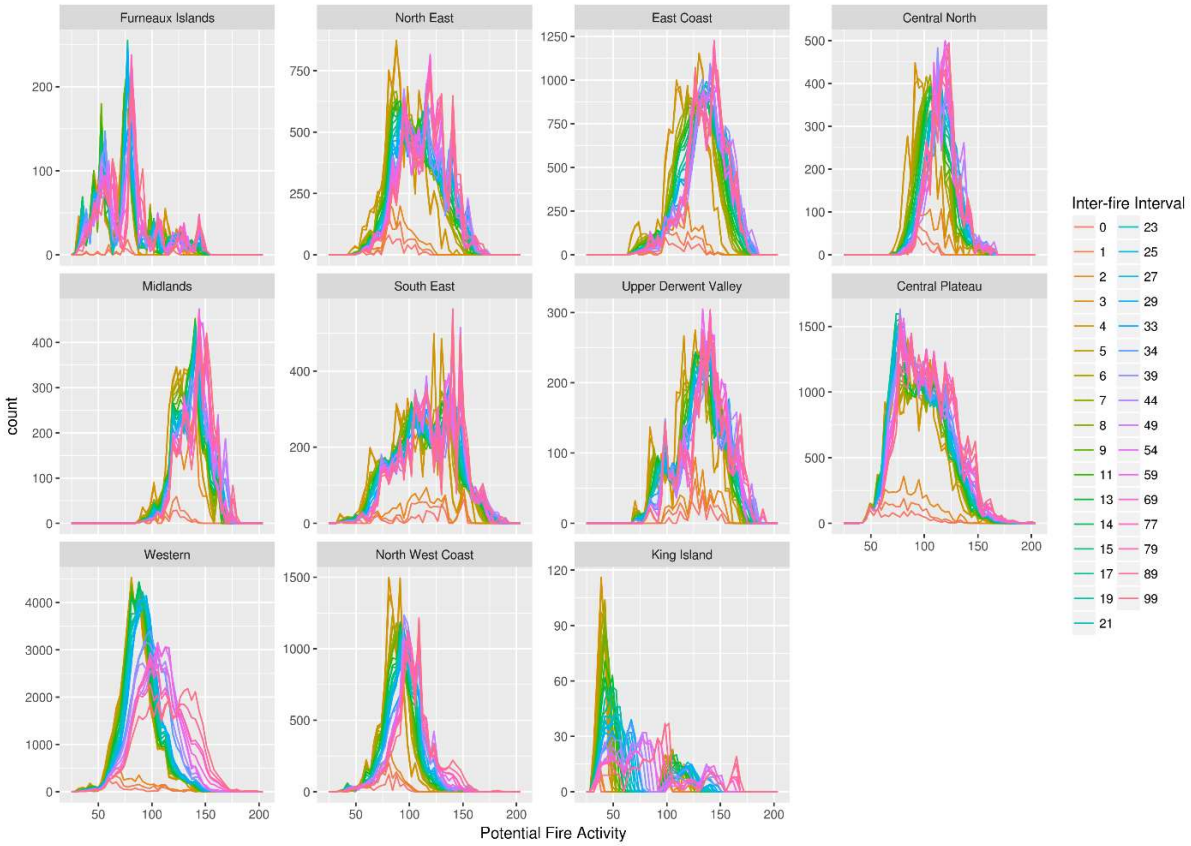


Figure S2.5: Impact of fire interval on Potential Future Fire Activity in the Bureau of Meteorology forecast districts.