

**Appendix S1.** Pearson's correlation coefficients ( $r$ ) between plot-level predictor variables used in our generalised mixed models. Block-level woodiness was converted to an ordered numeric (grassland = 1, intermediate = 2, shubland = 3)

	Woody species frequency	Indigenous structural dominance	Exotic grass frequency	North aspect	East aspect	Topographic shelter	Outcrop area
Indigenous structural dominance	0.53						
Exotic grass frequency	-0.14	-0.34					
North aspect	-0.01	-0.23	-0.07				
East aspect	-0.01	0.20	0.25	-0.07			
Topographic shelter	0.41	0.39	0.07	-0.31	0.08		
Outcrop area	0.09	0.18	-0.35	-0.09	-0.11	0.03	
Block-level woodiness	0.45	0.31	-0.05	-0.06	0.01	0.36	0.22

**Appendix S2.** Major vascular plant species in sites and blocks: frequency of each of the 48 most abundant vascular plant species at sampling points within plots and on transects in grassland (G), intermediate (I), and shrubland (S) blocks at our three sites. Species names follow the New Zealand Plant Names Database (<http://nzflora.landcareresearch.co.nz/>). \*Asterisks indicate exotic plants.

	Bendigo			Blackstone Hill			Cambrian		
	G	I	S	G	I	S	G	I	S
<b>Tree, shrub, liane or subshrub</b>									
<i>Kunzea ericoides</i>	-	132	659	-	-	-	-	4	-
<i>Olearia odorata</i>	12	5	-	-	-	-	-	-	2
<i>Corokia cotoneaster</i>	1	1	5	1	1	4	-	-	33
<i>Coprosma propinqua</i>	9	2	14	12	20	25	6	40	65
<i>Discaria toumatou</i>	29	13	7	32	80	66	59	77	125
<i>Meliccytus alpinus</i>	1	1	-	11	7	16	2	18	4
<i>Leptospermum scoparium</i>	-	-	-	-	-	-	25	-	13
<i>Rubus schmidelioides</i>	4	1	7	2	1	2	3	4	10
<i>Muehlenbeckia complexa</i>	-	-	2	7	7	11	7	29	18
<i>Parsonsia capsularis</i>	-	-	-	-	-	-	-	-	28
<i>Leucopogon fraseri</i>	<1	-	<1	2	3	2	30	1	14
* <i>Rosa rubiginosa</i>	37	75	3	14	26	87	-	1	1
<b>Dicot or monocot herb</b>									
<i>Bulbinella angustifolia</i>	-	-	-	1	9	1	10	18	9
<i>Helichrysum filicaule</i>	-	<1	-	<1	2	1	5	1	5
<i>Anisotome aromatica</i>	-	-	-	-	2	-	10	-	2
<i>Aciphylla aurea</i>	-	-	-	-	<1	-	20	1	4
* <i>Myosotis discolor</i>	15	26	19	1	1	<1	-	-	-
* <i>Veronica verna</i>	13	17	16	5	4	3	-	3	<1
* <i>Erodium cicutarium</i>	38	25	5	4	1	1	-	-	-
* <i>Trifolium arvense</i>	34	23	8	3	5	5	-	1	2
* <i>Arenaria serpyllifolia</i>	9	<1	4	2	2	2	-	2	-
* <i>Rumex acetosella</i>	6	8	3	13	11	9	<1	1	1
* <i>Trifolium striatum</i>	17	-	-	1	-	<1	-	1	<1
* <i>Crepis capillaris</i>	9	2	3	4	3	5	5	12	5
* <i>Trifolium dubium</i>	16	4	<1	11	14	8	-	10	<1
* <i>Trifolium glomeratum</i>	-	-	-	12	10	9	-	-	-
* <i>Trifolium repens</i>	8	2	<1	13	21	7	2	25	8
* <i>Galium aparine</i>	-	-	-	1	5	2	<1	27	1
* <i>Cerastium fontanum</i>	1	<1	-	1	1	1	3	23	7
* <i>Pilosella officinarum</i>	<1	-	<1	20	26	8	39	9	24
* <i>Hieracium lepidulum</i>	1	<1	1	<1	2	<1	37	11	58
<b>Grass</b>									
<i>Rytidosperma clavatum</i>	-	<1	2	2	4	15	-	-	-
<i>Poa cita</i>	8	6	-	7	7	2	1	3	11
<i>Festuca novae-zelandiae</i>	15	19	<1	17	29	6	19	4	12
<i>Poa colensoi</i>	14	2	1	5	15	7	28	4	28
<i>Chionochloa rigida</i>	-	-	-	-	13	-	211	22	49
* <i>Aira caryophyllea</i>	-	1	6	2	4	1	-	<1	-
* <i>Bromus tectorum</i>	17	3	1	8	5	9	-	3	-
* <i>Poa pratensis</i>	33	20	1	41	28	22	-	32	2
* <i>Bromus hordeaceus</i>	49	11	3	45	38	57	-	13	-

	Bendigo			Blackstone Hill			Cambrian		
	G	I	S	G	I	S	G	I	S
* <i>Vulpia bromoides</i>	1	<1	1	5	5	24	-	1	-
* <i>Festuca rubra</i>	18	9	5	3	3	6	21	16	43
* <i>Elymus rectisetus</i>	2	-	-	12	4	32	-	<1	-
* <i>Agrostis capillaris</i>	11	23	3	10	26	13	57	44	39
* <i>Lolium perenne</i>	-	-	-	4	5	7	-	13	-
* <i>Holcus lanatus</i>	1	-	1	5	11	2	1	21	3
* <i>Dactylis glomerata</i>	1	6	1	10	22	4	9	56	17
* <i>Anthoxanthum odoratum</i>	17	15	4	46	52	38	105	138	110
<b>Fern</b>									
<i>Polystichum vestitum</i>	-	-	-	-	-	-	6	2	8

**Appendix S3.** Numbers of plant species observed in blocks, and average ( $\pm$  SE) plot-scale species densities (i.e. the number of plant species per plot) observed in grassland, intermediate and shrubland levels across three sites (All) and in each study site (Bendigo, Blackstone Hill and Cambrian). Blocks sums represent species observed at 950 sampling points in plots and transects. Each block contained 10 plots, each with 65 sampling points.

	Grassland		Intermediate		Shrubland	
	Block	Plots	Block	Plots	Block	Plots
<i>Number of indigenous plants</i>						
All	92	9.6 $\pm$ 1.4	80	7.4 $\pm$ 0.7	110	11.4 $\pm$ 1.2
Bendigo	22	4.4 $\pm$ 0.8	34	4.6 $\pm$ 0.5	43	6.6 $\pm$ 0.9
Blackstone Hill	30	5.9 $\pm$ 0.8	49	10.6 $\pm$ 1.4	32	8.5 $\pm$ 0.8
Cambrian	72	18.5 $\pm$ 2.3	44	7.0 $\pm$ 0.8	79	19.0 $\pm$ 1.6
<i>Number of exotic plants</i>						
All	63	10.4 $\pm$ 0.6	73	11.9 $\pm$ 0.6	63	9.8 $\pm$ 0.7
Bendigo	42	12.5 $\pm$ 0.5	37	10.5 $\pm$ 1.2	43	9.4 $\pm$ 0.9
Blackstone Hill	41	11.7 $\pm$ 0.9	44	12.2 $\pm$ 0.9	41	12.3 $\pm$ 1.1
Cambrian	25	7.1 $\pm$ 0.5	49	13.0 $\pm$ 1.1	33	7.7 $\pm$ 0.9
<i>Indigenous compositional dominance (% plant species indigenous)</i>						
All	59.4	43.0 $\pm$ 4.2	52.3	37.1 $\pm$ 2.2	63.6	51.0 $\pm$ 3.2
Bendigo	34.4	24.8 $\pm$ 3.8	47.9	31.1 $\pm$ 2.9	50.0	40.8 $\pm$ 4.2
Blackstone Hill	42.3	33.3 $\pm$ 4.0	52.7	45.2 $\pm$ 4.0	43.8	41.2 $\pm$ 3.1
Cambrian	74.2	70.9 $\pm$ 2.6	47.3	35.0 $\pm$ 3.1	70.5	70.8 $\pm$ 2.9
<i>Plot-level indigenous structural dominance (% of total summed frequency indigenous)</i>						
All		33.5 $\pm$ 4.5		29.0 $\pm$ 3.8		52.6 $\pm$ 4.7
Bendigo		24.0 $\pm$ 7.1		29.6 $\pm$ 8.8		77.2 $\pm$ 6.3
Blackstone Hill		18.4 $\pm$ 3.4		33.4 $\pm$ 5.2		28.9 $\pm$ 4.3
Cambrian		58.2 $\pm$ 5.4		23.9 $\pm$ 5.5		51.7 $\pm$ 5.2
<i>Plot-level woodiness (summed frequency of indigenous and exotic woody species)</i>						
All		0.89 $\pm$ 0.20		1.77 $\pm$ 0.41		3.90 $\pm$ 1.03
Bendigo		1.03 $\pm$ 0.52		2.42 $\pm$ 1.00		7.43 $\pm$ 2.70
Blackstone Hill		0.46 $\pm$ 0.14		1.18 $\pm$ 0.30		1.91 $\pm$ 0.54
Cambrian		1.18 $\pm$ 0.30		1.73 $\pm$ 0.66		2.36 $\pm$ 0.84