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**Rotational grazing management achieves similar plant diversity outcomes to areas managed for conservation in a semi-arid rangeland**

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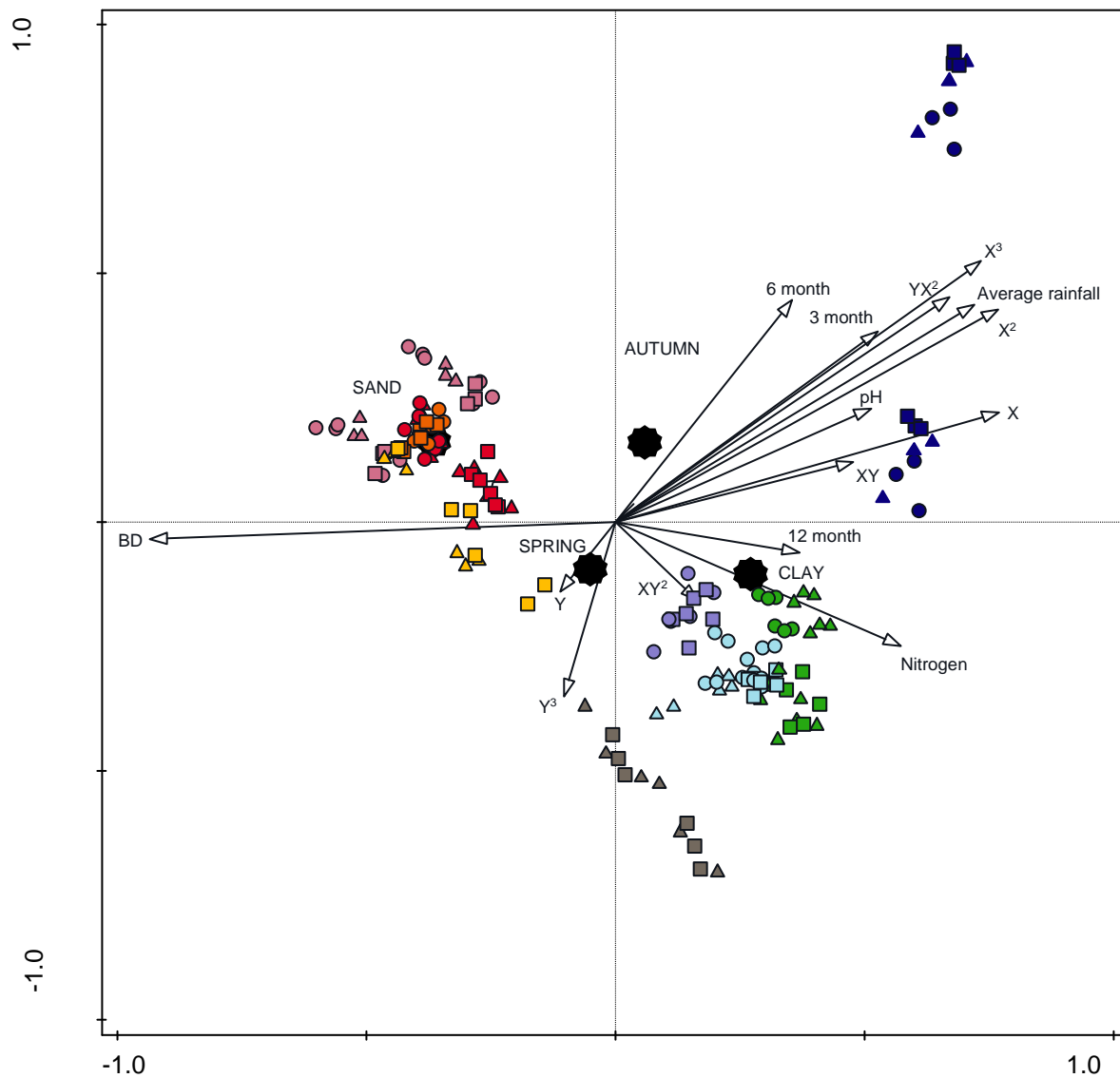
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## Supplementary Materials



**Figure SA.1.** Constrained ordination of species frequency for both spring and autumn. Dark blue = cluster 1 clay; light blue = cluster 2 clay; green = cluster 3 clay; red = cluster 3 sand; orange = cluster 4 sand; purple = cluster 4 clay; grey = cluster 5 clay; yellow = cluster 5 sand; pink = cluster 6 sand. ▲ = conservation, ● = rotational grazing, ■ = continuous grazing, ◆ = factors. 6 month = previous 6 month rainfall; 3 month = previous 3 month rainfall; 12 month = previous 12 month rainfall; Average rain = average annual rainfall per year; BD = bulk density; Nitrogen = soil total organic nitrogen; pH = soil pH; see Borcard et al. (1992) for information on spatial variables (X, XY, etc.). Significant variables explaining <1% of explained variation are not shown in this figure (i.e. EC, average stocking rate under grazing, average number of months rested per year, sheep/goat dung, macropod dung,  $Y^2$ ).

**Table SA.1. Grazing information for sites as communicated by landholders.**

DSE = Dry sheep equivalent when grazed (1 DSE = 0.2 animal units); Rest = number of months of rest per year; Length = duration of current management; K = kangaroo; S/G = sheep/goat; C = cattle. CON = conservation management, RRGM = rotational grazing management, CCGM = continuous grazing management

Property Cluster	Contrast	Treatment	Grazing pressure (DSE ha <sup>-1</sup> )	Rest (month s)	Livestock type	Length (years)	Dung (pellets or pats per m <sup>2</sup> )			Rotation frequency*
							K	S/G	C	
1	1	RGMRGM	30.00	11	Cattle	13	2.53	0.00	0.26	1-5 days, 8 month rest. Variable.
1	1	CON	0	12	NA	5.25	6.52	0.07	0.00	NA
1	1	CGM	0.82	3	Sheep	>50	0.50	9.61	0.25	Nil
2	2	CON	0	12	NA	5.25	6.00	2.29	0.00	NA
2	2	RGMRGM	0.40	4	Sheep	30	4.63	4.46	0.00	Depending on seasonal conditions
2	3	RGM	0.50	4	Sheep	30	4.45	11.13	0.00	Depending on seasonal conditions
2	3	CGM	0.84	2.6	Sheep & cattle	6	1.21	25.84	0.00	Nil
3	4	CON	0	12	NA	6.7	4.45	0.01	0.00	NA
3	4	CGM	0.20	3	Cattle	50	2.85	0.11	0.10	9 months to nil
3	5	CON	0	12	NA	6.7	0.13	0.14	0.02	NA
3	5	RGM	0.37	6	Sheep & Cattle	35	0.09	0.09	0.19	4 months
3	6	CON	0	12	NA	6.7	3.49	7.77	0.02	NA
3	6	CGM	0.20	3	Cattle	>50	2.68	6.83	0.15	9 months to nil
3	7	CON	0	12	NA	6.7	2.03	9.06	0.00	NA
3	7	RGM	0.82	6	Sheep & Cattle	35	2.43	16.55	0.00	4 months
4	8	RGM	0.25	8	Sheep & Cattle	5	1.81	6.89	0.03	2 weeks, 3 month rest
4	8	CGM	0.25	0	Sheep	>50	1.90	9.25	0.00	Nil
4	9	RGM	0.25	8	Sheep & Cattle	5	3.47	11.75	0.07	2 weeks, 3 month rest
4	9	CGM	0.20	0	Cattle	14.5	2.23	0.54	0.02	Nil
5	10	CON	0	12	NA	6.6	4.98	0.28	0.03	NA
5	10	CGM	1.19	4	Cattle	>50	2.71	1.14	0.15	Nil
5	11	CON	0	12	NA	6.6	3.73	7.98	0.01	NA
5	11	CGM	0.16	4	Cattle	>50	3.93	5.45	0.06	Nil
6	12	RGM	0.15	6	Goats & cattle	7	1.11	11.66	0.03	2 weeks to 3 months
6	12	CON	0	12	NA	35	4.52	0.89	0.00	NA
6	13	RGM	0.15	6	Goats & cattle	7	2.65	10.55	0.01	2 weeks to 3 months
6	13	CGM	0.30	3	Cattle	15	2.83	2.31	0.04	9 months to nil

\* Typical rotation strategies. These strategies were not strictly employed on properties, and depended on seasonal conditions, all RGM managed adaptively according to seasonal conditions. Rest was employed on CGM properties when feed and water availability became too low to support livestock.

**Table SA.2. Average rainfall (MAP), soil and vegetation characteristics of study clusters, and grazing contrasts compared within each cluster.**

CON = conservation management, RGM = rotational grazing management, CGM = continuous grazing management

Cluster	MAP (mm)	Soil type <sup>1</sup>	ASC soil type <sup>2</sup>	Land System <sup>3</sup>	Bioregion	Vegetation community (overstorey)	Gazing treatments compared		
							CON	RGM	CGM
Cluster 1 Contrast 1	400	Clay	Vertosol	Long Meadow	Darling Riverine Plains	<i>Chenopodium nitrariaceum</i>	✓	✓	✓
Cluster 2 Contrast 2	354	Clay	Vertosol	Long Meadow	Darling Riverine Plains	<i>Eucalyptus largiflorens, Eucalyptus coolabah, Acacia stenophylla, Eremophila bignoniiflora, Duma florulenta</i>	✓	✓	
Contrast 3		Clay	Vertosol						✓
Cluster 3 Contrast 4	310	Clay	Vertosol	Nelyambo	Darling Riverine Plains	<i>Eremophila bignoniiflora, Acacia stenophylla, Duma florulenta</i>	✓		✓
Contrast 5		Clay	Vertosol						✓
Contrast 6		Sand	Calcarosol	East Toorale		<i>Eucalyptus populnea, Grevillea striata, Atalaya hemiglauca, Acacia excelsa, Acacia cambagei, Alectryon oleifolius, Casuarina cristata, Eremophila sturtii, Eremophila mitchellii, Dodonaea viscosa</i>	✓		✓
Contrast 7		Sand	Calcarosol						✓
Cluster 4 Contrast 8	303	Sand	Kandosol	Goonery	Mulga Lands	<i>Eucalyptus. populnea, Acacia cambagei, Acacia aneura, Acacia excelsa, Atalaya hemiglauca, Flindersia maculosa, Alectryon oleifolius, Dodonaea viscosa, Eremophila sturtii</i>		✓	✓
Contrast 9		Clay	Vertosol	Walkdens					

Cluster	MAP (mm)	Soil type <sup>1</sup>	ASC soil type <sup>2</sup>	Land System <sup>3</sup>	Bioregion	Vegetation community (overstorey)	Gazing treatments compared		
							CON	RGM	CGM
Cluster 5 Contrast 10	275	Clay	Vertosol	Warrego	Mulga Lands	<i>Duma florulenta, Eragrostis australasica</i>	✓		✓
Contrast 11		Sand	Kandosol			<i>Atalaya hemiglauca, Acacia excelsa, Alectryon oleifolius, Acacia aneura, Eucalyptus populnea, Eremophila sturtii, Dodonaea viscosa, Casuarina cristata</i>	✓		✓
Cluster 6 Contrast 12	275	Sand	Calcarosol	Waverly	Mulga Lands	<i>Acacia aneura, Eucalyptus populnea, Acacia excelsa, Grevillea striata, Senna spp., Dodonaea viscosa, Eremophila longifolia, Eremophila sturtii,</i>	✓	✓	
Contrast 13		Sand	Calcarosol			<i>Acacia aneura, Eucalyptus populnea, Acacia excelsa, Grevillea striata, Senna spp., Dodonaea viscosa, Eremophila longifolia, Eremophila sturtii,</i>		✓	✓

<sup>1</sup> Grouped as sand or clay for analysis in this study

<sup>2</sup> Australian Soil Classification. Isbell, R. 2016. The Australian soil classification. CSIRO publishing, Clayton South, Australia.

<sup>3</sup> Walker, P. J. 1991. Land System of Western NSW, Technical Report No. 25. Soil Conservation Service of NSW, Sydney.

**Table SA.3. Species frequency of occurrence and functional characteristics of understorey species recorded within quadrats.**

O = origin, N = native, E = exotic, LH = life history, A = annual, P = perennial, FG =functional group, AF = annual forb, PF = perennial forb, AG = annual grass, PG = perennial grass, Height = height at maturity, SL = seed length, LA = leaf area index, RI = rarity index, P = palatability, L = low palatability, M = moderate palatability, H = highly palatable

Species	Quadrat frequency - Spring		Quadrat frequency - Autumn		Functional traits							
	Sand	Clay	Sand	Clay	O	LH	FG	Height (cm)	SL (mm)	LA (mm <sup>2</sup> )	RI	P
<i>Abutilon otocarpum</i>	0.189	0	0.169	<0.001	N	P	PF	0.6	3	4800	67.9	L
<i>Actinobole uliginosum</i>	0.042	0	0.041	0	N	A	AF	0.05	0.7	65	85.8	L
<i>Alternanthera angustifolia</i>	0.024	0.089	0.016	0.006	N	A	AF	0.05	1.5	60	84.57	H
<i>Amaranthus mitchellii</i>	0	0.228	0	0.005	N	A	AF	0.4	2.5	1250	85.19	H
<i>Amphipogon caricinus v. caricinus</i>	0.001	0	0.009	0	N	P	PG	0.5	3	450	98.15	L
<i>Aristida anthoxanthoides</i>	0	0.009	0	0	N	A	AG	0.5	6	135	98.77	H
<i>Aristida contorta</i>	0.477	0	0.210	0	N	A	AG	0.5	4	100	62.35	M
<i>Aristida jerichoensis v. jerichoensis</i>	0.069	0	0.003	0	N	P	PG	0.9	4.5	3450	90.74	L
<i>Asperula conferta</i>	0	<0.001	0	0	N	P	PF	0.2	1.5	8	99.38	M
<i>Astrebla elymoides</i>	0	0.004	0	0	N	P	PG	1	7	1375	98.77	H
<i>Astrebla lappacea</i>	0	0.169	0	0.288	N	P	PG	0.9	5	2100	79.01	H
<i>Astrebla pectinata</i>	0	0.020	0	0	N	A	AG	1.2	5	1500	98.15	H
<i>Atriplex eardleyae</i>	0	0.010	0	0.004	N	P	PF	0.3	–	180	96.91	–
<i>Atriplex holocarpa</i>	0	0.034	0	0	N	A	AF	0.4	–	1400	95.68	L
<i>Atriplex leptocarpa</i>	0	<0.001	0	0	N	P	PF	0.3	–	240	99.38	L
<i>Atriplex limbata</i>	0	0	0.002	0	N	P	PF	0.4	–	540	98.77	M
<i>Atriplex muelleri</i>	0	0.004	0	0	N	A	AF	0.4	–	1250	98.77	L
<i>Atriplex stipitata</i>	0.020	0	0.017	0	N	P	PF	1	–	300	94.44	L
<i>Austrostipa scabra</i>	0.021	0	0.019	0	N	P	PG	0.6	2	500	91.36	M
<i>Boerhavia dominii</i>	0.193	0.050	0.282	0.091	N	P	PF	0.05	4.5	800	37.04	H
<i>Brachyscome ciliaris v. lanuginosa</i>	0.010	<0.001	0.007	0	N	P	PF	0.45	2	1200	93.21	M
<i>Brachyscome curvicarpa</i>	0	0.002	0	0	N	A	AF	0.4	–	900	98.77	H
<i>Brachyscome lineariloba</i>	0.003	<0.001	0	0	N	A	AF	0.15	2.5	800	98.15	H
<i>Brachyscome whitei</i>	0.010	0	0	0	N	A	AF	0.15	–	1120	98.15	–

Species	Quadrat frequency - Spring		Quadrat frequency - Autumn		Functional traits							
	Sand	Clay	Sand	Clay	O	LH	FG	Height (cm)	SL (mm)	LA (mm <sup>2</sup> )	RI	P
<i>Bromus diandrus</i>	0	0.008	0	0	N	A	AG	1	–	3300	97.53	M
<i>Brunonia australis</i>	0.002	0	0	0	N	P	PF	0.3	3	1800	99.38	M
<i>Bulbine semibarbata</i>	0.022	0.021	0.041	0.028	N	A	AF	0.5	3	1350	70.99	H
<i>Calandrinia eremaea</i>	0.092	<0.001	0.050	0	N	A	AF	0.05	0.5	440	72.84	H
<i>Calandrinia ptychosperma</i>	0.006	0	0	0	N	A	AF	0.01	0.5	210	98.15	H
<i>Calostemma purpureum</i>	0	0.002	0	0	N	P	PF	0.5	–	10800	98.77	L
<i>Calotis ancyrocarpa</i>	0	0.010	0	0	N	A	AF	0.22	3	240	98.77	H
<i>Calotis hispidula</i>	0.168	0.089	0	0	N	A	AF	0.1	3	140	72.22	M
<i>Calotis scabiosifolia</i>	0	0	0	0.004	N	P	PF	0.45	2	7200	98.77	M
<i>Cenchrus ciliaris</i>	0.003	0	0.003	0	E	P	PG	1.5	1.3	2960	98.15	H
<i>Centipeda thespidioides</i>	0.014	0.002	0.007	0	N	P	PF	0.2	2.5	175	94.44	H
<i>Cheilanthes sieberi</i>	0	0	0.010	0	N	P	PF	0.4	0.1	12250	96.91	L
<i>Chenopodium auricomum</i>	0	0.058	0	0.046	N	P	PF	2	1.5	1800	93.83	L
<i>Chenopodium carinatum</i>	0.001	0	0	0	N	A	AF	0.3	0.5	600	99.38	–
<i>Chenopodium curvispicatum</i>	0.027	0	0.009	0	N	P	PF	1	1.5	225	96.3	L
<i>Chenopodium desertorum</i>	0.009	0.005	0.012	0.002	N	P	PF	0.3	1.5	200	90.12	M
<i>Chenopodium melanocarpum</i>	0.220	0.008	0	0	N	A	AF	0.05	0.5	900	79.63	L
<i>Chloris truncata</i>	0.017	0.145	0.007	0.074	N	P	PG	0.5	2.2	700	78.4	H
<i>Convolvulus erubescens</i>	0.092	0.267	0.060	0.132	N	P	PF	0.05	4	2400	55.56	H
<i>Crassula colorata v. acuminata</i>	0.031	0	0	0	N	A	AF	0.15	0.5	15	93.21	H
<i>Cullen graveolens</i>	0	0.016	0	0	N	A	AF	0.8	3	700	98.77	H
<i>Cullen tenax</i>	0	0.007	0	0	N	P	PF	0.15	3	300	97.53	H
<i>Cuphonotus andraeanus</i>	0.020	0	0	0	N	A	AF	0.25	1.5	150	97.53	–
<i>Cymbonotus maidenii</i>	0	0.005	0	0.002	N	A	AF	0.4	–	24000	96.91	L
<i>Cyperus bifax</i>	0	<0.001	0	0	N	P	PF	0.9	1.5	2720	99.38	L
<i>Cyperus gilesii</i>	0	<0.001	0	0	N	A	AF	0.35	5	15750	99.38	L
<i>Dactyloctenium radulans</i>	0.029	0.029	0.001	0	N	A	AG	0.2	2.5	720	87.04	H
<i>Daucus glochidiatus</i>	0.029	0.068	0.012	0.130	N	A	AF	0.6	–	1500	70.37	H
<i>Dichanthium sericeum</i>	0.003	0.303	0	0.149	N	P	PG	1.2	3	600	74.07	H



Species	Quadrat frequency - Spring		Quadrat frequency - Autumn		Functional traits							
	Sand	Clay	Sand	Clay	O	LH	FG	Height (cm)	SL (mm)	LA (mm <sup>2</sup> )	RI	P
<i>Digitaria ammophila</i>	0.009	0.003	0	<0.001	N	P	PG	0.8	3	1000	95.68	M
<i>Digitaria coenicola</i>	0.007	0	0	0	N	P	PG	0.8	3.5	900	98.77	H
<i>Dissocarpus paradoxus</i>	0	0	0.010	0	N	P	PF	0.5	–	45	98.15	L
<i>Duma florulenta</i>	0	<0.001	0	0.003	N	P	PF	3	4	700	97.53	L
<i>Einadia nutans</i>	0.009	0	0.009	<0.001	N	P	PF	0.2	1	600	91.36	H
<i>Einadia polygonoides</i>	0	<0.001	0	<0.001	N	A	AF	0.2	1	100	98.77	H
<i>Enchylaena tomentosa</i>	0.002	0.006	0.003	0	N	P	PF	1	–	30	95.06	L
<i>Enneapogon avenaceus</i>	0.463	0.123	0.458	0.096	N	A	AG	0.5	1.6	480	45.68	H
<i>Enteropogon acicularis</i>	0.083	0.004	0.069	0	N	P	PG	0.4	–	800	83.95	M
<i>Eragrostis australasica</i>	0	0.006	0	0	N	P	PG	3	1	600	98.15	L
<i>Eragrostis cilianensis</i>	0.001	0.003	0	0	E	A	AG	0.6	0.5	1400	98.15	L
<i>Eragrostis dielsii</i>	0.044	0.003	0.002	0	N	A	AG	0.4	2	160	90.12	H
<i>Eragrostis eriopoda</i>	0.204	0	0.214	0	N	P	PG	0.5	0.75	10	75.31	M
<i>Eragrostis lacunaria</i>	0	0.003	0	0	N	P	PG	0.5	0.5	140	98.15	H
<i>Eragrostis microcarpa</i>	0	<0.001	0	0	N	P	PG	0.6	0.4	200	99.38	L
<i>Eragrostis setifolia</i>	0.171	0.196	0.131	0.201	N	P	PG	0.6	0.4	260	31.48	H
<i>Eremophila latrobei</i>	0.019	0	0.004	0	N	P	PF	2	–	450	96.91	H
<i>Eriochlamys squamata</i>	0.002	0	0	0	N	A	AF	–	–	42	98.77	–
<i>Eriochloa crebra</i>	0	0.183	0	0.047	N	P	PG	1	6	1500	79.01	H
<i>Erodium crinitum</i>	0.061	0.274	0.193	0.057	N	A	AF	0.5	10	1200	66.67	H
<i>Euphorbia Drummondii</i>	0.220	0.068	0.034	0.015	N	P	PF	0.05	–	50	61.11	L
<i>Euphorbia planiticola</i>	0	0	0	0.051	N	A	AF	0.5	–	250	95.06	H
<i>Euphorbia tannensis</i>	0	0	0.001	0	N	P	PF	1	3	490	99.38	L
<i>Evolvulus alsinoides. v. villosicalyx</i>	0	0	0.010	0	N	P	PF	0.4	1.5	150	95.68	M
<i>Frankenia gracilis</i>	0	0.002	0	0	N	P	PF	0.5	–	8.4	98.77	–
<i>Geranium solanderi v. solanderi</i>	0	<0.001	0	0	N	P	PF	0.2	–	1500	99.38	M
<i>Glossocardia bidens</i>	0.004	0	0.001	0	N	P	PF	0.3	10	2700	96.91	L
<i>Gnephosis tenuissima</i>	0.004	0	0.001	0	N	A	AF	0.1	0.4	40	98.77	–
<i>Goodenia cycloptera</i>	0.038	0	0.062	0	N	P	PF	0.3	6	1500	81.48	M

Species	Quadrat frequency - Spring		Quadrat frequency - Autumn		Functional traits							
	Sand	Clay	Sand	Clay	O	LH	FG	Height (cm)	SL (mm)	LA (mm <sup>2</sup> )	RI	P
<i>Goodenia fascicularis</i>	0.090	0.041	0.194	0.223	N	P	PF	0.2	5	3500	55.56	H
<i>Goodenia glauca</i>	0	0.004	0	0.024	N	P	PF	0.3	4	800	95.06	H
<i>Haloragis glauca</i>	0	0.004	0	0	N	P	PF	0.4	–	360	98.15	H
<i>Harmsiodoxa blenmodioides</i>	0.004	0	0	0	N	A	AF	0.3	2.2	2000	97.53	H
<i>Hibiscus brachysiphonius</i>	0.004	0.085	0	0.004	N	P	PF	0.5	3	2500	90.12	H
<i>Hordeum leporinum</i>	0	0.002	0	0	E	A	AG	0.2	–	1540	99.38	H
<i>Iseilema membranaceum</i>	0	0.028	0	0.005	N	A	AG	0.8	2.2	1000	95.06	H
<i>Isoetopsis graminifolia</i>	0.017	0	0	0	N	A	AF	0.05	2	100	95.68	H
<i>Leiocarpa brevicompta</i>	0	0.012	0	0.003	N	A	AF	0.6	2	175	96.91	M
<i>Leiocarpa tomentosa</i>	0	0.010	0	0.002	N	P	PF	0.7	5	120	96.3	M
<i>Lepidium bonariense</i>	0	0.008	0	0	E	A	AF	0.5	1.5	160	98.15	M
<i>Lepidium oxytrichum</i>	0.057	<0.001	0	0	N	A	AF	0.3	2	300	89.51	M
<i>Lepidium papillosum</i>	0	<0.001	0	0	N	A	AF	0.3	2	2000	99.38	L
<i>Lepidium pseudohyssopifolium</i>	0	0.002	0	0	N	P	PF	0.6	1.5	1350	99.38	–
<i>Leptorhynchus squamatus</i>	0	0.003	0	0	N	P	PF	0.4	3	140	99.38	L
<i>Lotus cruentus</i>	0.003	0.036	0	0	N	P	PF	0.15	1.5	105	92.59	–
<i>Maireana aphylla</i>	0	0.084	0	0.029	N	P	PF	1.5	–	8	91.98	L
<i>Maireana coronata</i>	0	0.103	0	0.106	N	P	PF	0.15	–	20	88.27	M
<i>Maireana decalvans</i>	0	0	0	0.004	N	P	PF	0.5	–	10	98.77	L
<i>Maireana pyramidata</i>	0.040	0	0.033	0	N	P	PF	1.5	1.5	5	92.59	L
<i>Maireana villosa</i>	0.066	0	0	0	N	P	PF	0.5	–	15	93.21	L
<i>Malacocera tricornis</i>	0	0.036	0	0.039	N	P	PF	0.8	2	20	93.83	M
<i>Malvastrum americanum</i>	0.002	0.124	0	0.054	E	P	PF	0.6	–	2100	76.54	L
<i>Marsilea drummondii</i>	0	0.050	0	0.020	N	P	PF	0.3	–	900	82.72	L
<i>Medicago laciniata</i>	0.006	0	0	0	E	A	AF	0.35	3	66	98.77	H
<i>Medicago minima</i>	0	0.038	0	0.089	E	A	AF	0.2	2	112	87.65	H
<i>Medicago polymorpha</i>	0	0.041	0	0.137	E	A	AF	0.2	4	540	90.12	H
<i>Menkea australis</i>	0	<0.001	0	0	N	A	AF	0.05	0.6	210	99.38	–
<i>Monachather paradoxus</i>	0.038	0	0.008	0	N	P	PG	0.6	1	800	95.06	H

Species	Quadrat frequency - Spring		Quadrat frequency - Autumn		Functional traits							
	Sand	Clay	Sand	Clay	O	LH	FG	Height (cm)	SL (mm)	LA (mm <sup>2</sup> )	RI	P
<i>Neobassia proceriflora</i>	0	0.044	0	0.020	N	P	PF	0.4	–	20	91.36	H
<i>Neptunia gracilis</i>	0.003	0	0	0	N	P	PF	–	–	250	99.38	H
<i>Nicotiana megalosiphon v. megalosiphon</i>	0.001	0	0	0	N	P	PF	0.9	–	13600	99.38	–
<i>Omphalolappula concava</i>	0.002	0	0.002	0	N	A	AF	0.35	10	240	97.53	–
<i>Ophioglossum lusitanicum</i>	0	0	0.009	0	N	A	AF	0.15	–	500	96.3	L
<i>Osteocarpum acropterum v. deminuta</i>	0.001	0.011	0	0.005	N	P	PF	0.2	–	6	95.68	M
<i>Oxalis perennans</i>	0.008	0.007	0.002	0.004	N	P	PF	0.1	–	60	88.89	–
<i>Panicum decompositum</i>	0	0.355	0.001	0.371	N	P	PG	1	1.5	6000	64.2	H
<i>Panicum effusum</i>	0.038	0	0.006	0	N	P	PG	0.7	2	1500	91.98	H
<i>Panicum queenslandicum</i>	0	0.470	0	0.126	N	P	PG	0.8	–	12250	80.86	M
<i>Parsonsia eucalyptophylla</i>	0.002	0	0	0	N	P	PF	–	–	4800	98.77	M
<i>Paspalidium constrictum</i>	0.106	0	0.006	0	N	P	PG	0.6	–	450	94.44	H
<i>Perotis rara</i>	0.006	0	0	0	N	A	AG	0.4	–	200	97.53	M
<i>Phlegmatospermum cochlearinum</i>	0.004	0.013	0	0	N	A	AF	0.35	2	1800	95.68	L
<i>Phyllanthus lacunarius</i>	0	0.004	0	0	N	A	AF	0.25	1.5	140	98.77	L
<i>Phyllanthus maderaspatensis</i>	0	0.006	0	0.003	N	P	PF	0.5	1.5	200	96.91	L
<i>Phyllanthus virgatus</i>	0	0.002	0	0	N	P	PF	0.5	1.5	1400	99.38	L
<i>Pimelea penicillaris</i>	0.017	<0.001	0.017	0	N	P	PF	2	4	114	93.83	L
<i>Pimelea simplex v. continua</i>	0	0	0	0.003	N	A	AF	0.5	3.5	60	98.77	L
<i>Pimelea trichostachya</i>	0.087	0.003	0.010	0	N	P	PF	0.75	3.5	45	87.04	L
<i>Plagiobothrys plurisepaleus</i>	0	<0.001	0	0	N	A	AF	0.05	1.5	135	99.38	H
<i>Plantago cunninghamii</i>	0	<0.001	0	0	N	A	AF	0.15	3	1500	99.38	H
<i>Plantago turrifera</i>	0.023	0.093	0	0.002	N	A	AF	0.1	3	2500	85.8	H
<i>Pluchea dentex</i>	0	0.003	0	0	N	P	PF	0.6	1.5	360	98.15	–
<i>Podolepis jaceoides</i>	0	0.012	0	0	N	P	PF	0.7	3	4000	98.77	L
<i>Podolepis muelleri</i>	0.013	0	0	0	N	A	AF	0.22	1.5	600	97.53	L
<i>Polycarpaea corymbosa</i>	0.007	0	0	0.002	N	A	AF	0.3	–	6	97.53	L
<i>Portulaca oleracea</i>	0.460	0.199	0.149	0.034	N	A	AF	0.05	1	375	34.57	H
<i>Pseudognaphalium luteoalbum</i>	0	0.003	0	0	N	A	AF	0.45	–	250	98.77	L

Species	Quadrat frequency - Spring		Quadrat frequency - Autumn		Functional traits							
	Sand	Clay	Sand	Clay	O	LH	FG	Height (cm)	SL (mm)	LA (mm <sup>2</sup> )	RI	P
<i>Ptilotus gaudichaudii</i> v. <i>parviflorus</i>	0.017	0.004	0	0	N	A	AF	0.5	1.5	520	95.06	L
<i>Ptilotus leucocoma</i>	0.006	0	0	0	N	P	PF	0.25	–	210	98.77	L
<i>Ptilotus nobilis</i> v. <i>nobilis</i>	0	<0.001	0	0.005	N	P	PF	1	2	15000	97.53	H
<i>Ptilotus nobilis</i> v. <i>semilanatus</i>	0.001	0	0	0	N	P	PF	0.3	3	1200	99.38	H
<i>Ptilotus polystachyus</i>	0.062	0	0.003	0	N	P	PF	1	2	7560	89.51	H
<i>Ptilotus sessilifolius</i> v. <i>sessilifolius</i>	0.038	0	0.034	0	N	P	PF	1	–	2000	91.36	M
<i>Pycnosorus chrysanthes</i>	0	0.002	0	0	N	A	AF	0.6	2	700	98.77	L
<i>Ranunculus pentandrus</i> v. <i>platycarpus</i>	0	0.002	0	0	N	A	AF	0.3	2	500	99.38	L
<i>Rapistrum rugosum</i>	0	0.018	0	0	E	A	AF	0.6	2	12500	98.77	M
<i>Rhagodia spinescens</i>	0.008	0	0	0	N	P	PF	3	1.5	300	96.91	M
<i>Rhodanthe floribunda</i>	0.053	0.065	0	0	N	A	AF	0.3	5	40	85.8	L
<i>Rhodanthe uniflora</i>	0	0.033	0	0	N	A	AF	0.07	3.5	5	98.15	L
<i>Salsola australis</i>	0.069	0.057	0.028	0.030	N	A	AF	1	–	90	69.14	M
<i>Salvia verbenaca</i>	0	0.006	0	0	E	P	PF	0.7	3	8000	98.77	L
<i>Sauropus trachyspermus</i>	0.049	<0.001	0.068	0.007	N	P	PF	0.2	5	60	75.93	–
<i>Schoenia ramosissima</i>	0.042	0	0	0	N	A	AF	0.15	2.5	40	96.3	L
<i>Sclerolaena parallelicuspis</i>	0	0	0.006	0	N	P	PF	0.3	–	25	99.38	M
<i>Scleroblitum atriplicinum</i>	0	0.024	0	0	N	A	AF	0.15	1	1500	97.53	H
<i>Sclerolaena articulata</i>	0.006	<0.001	0	0	N	P	PF	0.4	–	15	98.77	L
<i>Sclerolaena bicornis</i> v. <i>bicornis</i>	0.191	0.096	0.102	0.074	N	P	PF	0.8	–	25	63.58	M
<i>Sclerolaena brachyptera</i>	0	0.030	0	0.030	N	P	PF	0.2	–	15	95.06	H
<i>Sclerolaena calcarata</i>	0	0.145	0	0.113	N	P	PF	0.3	–	15	82.1	M
<i>Sclerolaena convexula</i>	0.116	0	0.213	0	N	P	PF	0.4	–	10	75.93	L
<i>Sclerolaena decurrens</i>	0.002	0	0.007	0	N	P	PF	0.3	–	15	95.68	L
<i>Sclerolaena divaricata</i>	0.012	0.103	0.028	0.077	N	P	PF	0.75	–	12	78.4	L
<i>Sclerolaena intricata</i>	0.007	0	0	0	N	P	PF	0.7	–	50	98.77	L
<i>Sclerolaena lanicuspis</i>	0.037	0.036	0.049	0	N	P	PF	0.4	–	15	87.04	H
<i>Sclerolaena muricata</i> v. <i>villosa</i>	0.026	0.063	0.002	0.016	N	P	PF	1.5	–	40	79.01	L
<i>Sclerolaena muricata</i> v. <i>semiglabra</i>	0.027	0	0.033	<0.001	N	P	PF	1.5	–	60	88.89	L

Species	Quadrat frequency - Spring		Quadrat frequency - Autumn		Functional traits							
	Sand	Clay	Sand	Clay	O	LH	FG	Height (cm)	SL (mm)	LA (mm <sup>2</sup> )	RI	P
<i>Sclerolaena patenticuspis</i>	0.001	0	0	0	N	P	PF	0.3	–	10	99.38	M
<i>Sclerolaena stelligera</i>	0.001	0.077	0	<0.001	N	P	PF	0.3	–	15	95.68	H
<i>Sclerolaena tricuspis</i>	0	0.003	0	0	N	P	PF	0.75	–	15	99.38	L
<i>Senecio diaschides</i>	0	0.002	0	0	N	P	PF	1	–	3000	98.77	–
<i>Sida trichopoda</i>	0	0.193	0	0.102	N	P	PF	0.4	4	240	74.07	H
<i>Sisymbrium erysimoides</i>	0.001	0	0	0	E	A	AF	0.8	–	6000	99.38	L
<i>Solanum ellipticum</i>	0.018	0	0.030	0	N	P	PF	1	3	2400	85.8	–
<i>Solanum esuriale</i>	0.119	0.059	0.089	0.106	N	P	PF	0.3	3	1200	59.88	L
<i>Solanum parvifolium</i>	0	0	0.001	0	N	P	PF	1	2.5	600	99.38	–
<i>Sonchus oleraceus</i>	0.003	0.14	0	0.035	E	A	AF	1.1	3	42000	86.42	H
<i>Sporobolus actinocladius</i>	0	0.06	0.016	0.018	N	P	PG	0.8	0.8	450	91.36	H
<i>Sporobolus caroli</i>	0.021	0.217	0.021	0.074	N	P	PG	0.6	0.7	680	62.35	H
<i>Sporobolus mitchellii</i>	0	0.005	0	0	N	P	PG	1	1	200	98.15	M
<i>Stemodia glabella</i>	0	0.004	0	0	N	P	PF	0.4	0.5	250	96.91	L
<i>Stenopetalum lineare</i>	0	0.008	0	0	N	A	AF	0.5	1.2	700	98.77	H
<i>Swainsona greyana</i>	0	0.006	0	0.046	N	P	PF	1.5	4	9000	95.06	H
<i>Swainsona microphylla</i>	0.016	0.003	0.026	0	N	P	PF	0.6	1.5	1500	90.74	L
<i>Tephrosia sphaerospora</i>	0.010	0	0.007	0.002	N	P	PF	0.3	2.5	630	94.44	–
<i>Tetragonia tetragonioides</i>	0.049	0.004	0.057	0.152	N	A	AF	0.05	3	5000	72.84	H
<i>Teucrium racemosum</i>	0.001	0.020	0	0.028	N	P	PF	0.4	2	120	87.04	H
<i>Thyridolepis mitchelliana</i>	0.090	0	0.070	0	N	P	PG	0.5	4	270	88.27	H
<i>Tragus australianus</i>	0.072	0.013	0.001	0	N	A	AG	0.4	2.1	360	82.72	M
<i>Trianthema triquetra</i>	0	0.037	0.007	0.035	N	A	AF	0.05	1.2	120	87.65	–
<i>Tribulus terrestris</i>	0.040	0.006	0.036	0.071	E	P	PF	0.05	–	48	69.75	L
<i>Triglochin calcitrapa</i>	0	0.012	0	0	N	A	AF	0.12	1	880	98.77	M
<i>Trigonella suavissima</i>	0	0.002	0	0	N	A	AF	0.5	1	300	98.77	H
<i>Tripogon loliiformis</i>	0.028	0.067	0.233	0.052	N	P	PG	0.4	2.2	19.5	70.99	H
<i>Triraphis mollis</i>	0.182	0	0.013	0	N	P	PG	0.8	2.5	2000	84.57	L
<i>Verbena officinalis</i>	0	<0.001	0	0	E	P	PF	1	–	2100	99.38	L



**Table SA.4. Predicted (weighted) means for species frequency in sites, and functional diversity indices at the site scale.**

CON = conservation management, RGM = rotational grazing management, CGM = continuous grazing management, FRic = functional richness, FEve = functional evenness, FDis = functional dispersion, RaoQ = functional diversity (Rao's quadratic entropy)

Response variable	CON	RGM	CGM	<i>P</i> -value
Total annual	0.35	0.31	0.29	0.418
Annual forb	0.24	0.21	0.19	0.592
Annual grass	0.08	0.06	0.06	0.097
Total perennial	0.65	0.69	0.71	0.418
Perennial forb	0.36	0.39	0.36	0.585
Perennial grass	0.27	0.28	0.33	0.398
Native	0.95	0.95	0.96	0.489
Exotic	0.91	0.90	0.93	0.359
Unpalatable	0.20	0.20	0.18	0.450
Moderately palatable	0.25	0.23	0.22	0.789
Palatable	0.56	0.57	0.60	0.546
Height	0.54	0.52	0.54	0.759
Leaf area index	1599	1488	1761	0.505
Seed length	2.79	2.67	2.80	0.676
FRic				0.023
Spring	25.08	19.88	16.74	
Autumn	16.87	19.97	24.35	
FEve	0.65	0.61	0.60	0.068
FDis	0.29	0.30	0.29	0.838
RaoQ	0.11	0.12	0.12	0.844

**Table SA.5. Predicted (weighted) means for species frequency in plots and functional diversity indices at the plot scale.**

CON = conservation management, RGM = rotational grazing management, CGM = continuous grazing management, FRic = functional richness, FEve = functional evenness, FDis = functional dispersion, RaoQ = functional diversity (Rao's quadratic entropy)

Response variable	CON	RGM	CGM	<i>P</i> -value
Total annual	0.33	0.31	0.27	0.122
Annual forb	0.22	0.21	0.18	0.264
Annual grass	0.07	0.05	0.05	0.075
Total perennial	0.67	0.69	0.73	0.122
Perennial forb	0.35	0.37	0.35	0.372
Perennial grass	0.32	0.32	0.39	0.125
Native	0.97	0.97	0.98	0.352
Exotic	0.02	0.02	0.2	0.387
Unpalatable	0.20	0.20	0.17	0.130
Moderately palatable	0.20	0.19	0.19	0.887
Palatable	0.59	0.61	0.64	0.264
Height	0.55	0.52	0.54	0.408
Leaf area index	1659	1550	1804	0.265
Seed length				0.007
Sand	2.47	2.58	2.28	
Clay	3.05	2.84	3.24	
FRic				0.007
Spring	9.70	9.65	8.46	
Autumn	8.57	9.45	10.75	
FEve	0.70	0.66	0.67	0.11
FDis	0.28	0.28	0.28	0.952
RaoQ	0.10	0.10	0.11	0.687



**Table SA.6. Pearson's correlations for clay soils.**

\* = significant at  $P \leq 0.05$ .

		Spring				Autumn			
		Richness	Evenness	Diversity	Turnover	Richness	Evenness	Diversity	Turnover
Rainfall	Average rainfall	-0.485*	-0.502*	-0.538*	0.657*	-0.017	0.055	0.098	-0.269
	Three month	-0.162	-0.095	-0.178	0.229	0.448*	0.394*	0.558*	-0.353*
	Six month	0.348*	0.039	0.192	0.104	0.422*	0.454*	0.568*	-0.388*
	Twelve month	0.419*	0.188	0.348*	-0.267	0.444*	0.394*	0.558*	-0.354*
Spatial	Longitude	-0.498*	-0.491*	-0.544*	0.632*	0.022	0.088	0.159	-0.246
	Latitude	0.298*	0.169	0.239	-0.085	0.213	0.228	0.317*	-0.114
Soil	pH	-	-	-	-	-0.08	0.151	-0.031	-0.324
	EC	-	-	-	-	0.137	0.015	0.149	0.207
	Organic nitrogen	-	-	-	-	0.022*	0.088	0.159*	-0.246*
	Organic carbon	-	-	-	-	0.213*	0.228	0.317*	-0.114*
	Bulk density	-	-	-	-	0.049	-0.141	-0.01	0.409*
Grazing	Average DSE	-0.172	-0.109	-0.173	0.234	0.011	0.141	0.118	-0.221
	Ave rest	0.235	0.14	0.193	0.124	-0.027	0.321*	0.071	-0.279
	Kangaroo dung	0.119	-0.022	0.081	0.22	0.232	0.017	0.236	0.184
	Sheep/goat dung	-0.011	-0.091	-0.058	0.064	0.06	-0.254	-0.028	0.178
	Cattle dung	-0.109	-0.011	-0.071	0.026	0.126	0.203	0.19	-0.295*

**Table SA.7. Pearson's correlations for sand soils.**

\* = significant at  $P \leq 0.05$ .

Diversity measure		Spring				Autumn			
		Richness	Evenness	Diversity	Turnover	Richness	Evenness	Diversity	Turnover
Rainfall	Average rainfall	0.618*	0.131	0.586*	-0.674*	0.071	-0.536*	-0.103	-0.17
	Three month	0.248	0.138	0.244	-0.504*	0.181	0.356*	0.262	0.018
	Six month	-0.122	-0.119	-0.139	-0.235	-0.072	0.329*	0.033	0.285
	Twelve month	-0.075	-0.153	-0.102	-0.27	-0.218	-0.312	-0.294	0.397*
Spatial	Longitude	0.387*	0.177	0.376*	-0.551*	-0.221	-0.537*	-0.357*	0.224
	Latitude	-0.726*	-0.12	-0.687*	0.545*	-0.293	0.287	-0.175	0.490*
Soil	pH					0.209	-0.345	0.058	-0.169
	EC					0.086	0.158*	0.175	-0.013
	Organic nitrogen					0.242	0.214	0.272	0.035
	Organic carbon					0.245	0.341*	0.336*	-0.024
	Bulk density					0.003	-0.325	-0.1	-0.299
Grazing	Average DSE	0.085	-0.068	0.041	-0.378*	0.016	-0.385*	-0.112	-0.159
	Ave rest	0.238	0.114	0.24	0.122	-0.311	-0.059	-0.258	0.221
	Kangaroo dung	-0.089	0.255	0.011	-0.06	-0.232	-0.112	-0.235	-0.117
	Sheep/goat dung	0.407*	0.055	0.379*	-0.195	-0.133	-0.189	-0.145	0.102
	Cattle dung	0.18	0.172	0.182	-0.092	0.137	0.001	0.098	-0.03