

Supplementary Materials

Appendix S1. Analysis of variance showing the effects of *Kunzea serotina* shrubs or grassland on soil fertility.

Source of variation	SS	DF	MS	F	P
Canopy cover and treatment	1.85	3	0.62	5.4	0.005
Error	3.18	28	0.11		
Total	5.02	31	0.16		

Appendix S2. Analysis of variance showing effects of *Kunzea serotina* shrub canopy on soil nitrogen content. Plot level examines the effect of shrub architecture. Sub-plot level examines the effects of canopy cover and soil depth and their interactions with the plot level. Significant probability (*P*) values are in **bold**. *P* values > 0.1 are not shown.

a) Plot

Source of variation	SS	DF	MS	F	P
Grazing	0.002	1	0.002	4.31	0.083
Shrub architecture	0.001	1	0.001	2.14	0.194
Grazing x shrub architecture	0.003	1	0.003	7.78	0.032
Error	0.003	6	0.000		
Total	0.008	9	0.001		

b) Sub-plot

Source of variation	SS	DF	MS	F	P
Canopy cover	0.001	1	0.001	11.81	0.003
Soil depth	0.000	1	0.000	1.56	0.228
Canopy cover x soil depth	0.000	1	0.000	0.25	0.626
Canopy cover x grazing	0.002	1	0.002	15.79	<0.001
Canopy cover x shrub architecture	0.000	1	0.000	0.20	0.657
Soil depth x grazing	0.000	1	0.000	0.28	0.605
Soil depth x shrub architecture	0.000	1	0.000	1.47	0.241
Canopy cover x soil depth x grazing	0.000	1	0.000	0.38	0.547
Canopy cover x soil depth x shrub architecture	0.000	1	0.000	0.14	0.716
Canopy cover x grazing x shrub architecture	0.000	1	0.000	1.33	0.264
Soil depth x grazing x shrub architecture	0.000	1	0.000	3.09	0.096
Canopy cover x soil depth x grazing x shrub architecture	0.000	1	0.000	3.92	0.063
Error	0.002	18	0.000		
Total	0.006	30	0.000		

Appendix S3. Analysis of variance showing effects of *Kunzea serotina* canopy on soil nitrate content (log-transformed). Plot level examines the effect of shrub architecture. Sub-plot level examines the effects of canopy cover and soil depth and their interactions with the plot level. Significant probability (*P*) values are in **bold**. *P* values > 0.1 are not shown.

a) Plot

Source of variation	SS	DF	MS	F	P
Grazing	6.88	1	6.88	6.17	0.048
Error	6.69	6	1.12		
Total	15.47	9	1.72		

b) Sub-plot

Source of variation	SS	DF	MS	F	P
Canopy cover	2.24	1	2.24	11.37	0.003
Soil depth	1.04	1	1.04	5.27	0.034
Soil depth x grazing	0.62	1	0.62	3.17	0.092
Canopy cover x soil depth x shrub architecture	0.73	1	0.73	3.72	0.069
Error	3.55	18	0.19		
Total	8.79	30	0.293		

Appendix S4. Analysis of variance showing effects of *Kunzea serotina* shrub canopy on Olsen available phosphorus (log-transformed). Plot level examines the effect of shrub architecture. Sub-plot level examines the effects of canopy cover and soil depth and their interactions with the plot level. Significant probability (*P*) values are in **bold**. *P* values > 0.1 are not shown.

b) Sub-plot

Source of variation	SS	DF	MS	F	P
Canopy cover	3.26	1	3.26	27.46	<0.001
Soil depth	0.69	1	0.69	5.83	0.027
Error	2.14	18	0.12		
Total	6.74	30	0.23		

Appendix S5. Analysis of variance for total nitrogen in *Discaria toumatou* plots. Plot level examines the effect of shrub architecture. Sub-plot level examines the effects of canopy cover and soil depth and their interactions with the plot level. Significant probability (*P*) values are in **bold**. *P* values > 0.1 are not shown.

(a) Plot

Source of variation	SS	DF	MS	F	P
Shrub architecture	0.01	3	0.002	129.27	<0.001
Error	0.000	6	0.000		
Total	0.01	9	0.001		

Appendix S6. Analysis of variance for soil organic matter content under *Coprosma propinqua*. Plot level examines the effect of shrub size. Sub-plot level examines the effects of canopy cover its interactions with the plot level. Significant probability (*P*) values are in **bold**. *P* values > 0.1 are not shown.

(a) Plot

Source of variation	SS	DF	MS	F	P
Shrub size	26.59	1	26.59	7.47	0.027
Error	28.46	8	3.56		
Total	55.05	9	6.12		

(b) Sub-plot

Source of variation	SS	DF	MS	F	P
Canopy cover	5.24	1	5.24	12.37	0.008
Error	3.39	8	0.42		
Total	8.94	10	0.89		

Appendix S7. Analysis of variance for soil nitrate under *Coprosma propinqua*. Plot level examines the effect of shrub size. Sub-plot level examines the effects of canopy cover its interactions with the plot level. Significant probability (*P*) values are in **bold**. *P* values > 0.1 are not shown.

(b) Sub-plot

Source of variation	SS	DF	MS	F	P
Canopy cover	0.02	1	0.02	5.37	0.049
Canopy cover x shrub size	0.02	1	0.02	3.93	0.083
Error	0.04	8	0.004		
Total	0.08	10	0.01		

Appendix S8. Analysis of variance for total nitrogen under *Coprosma propinqua*. Plot level examines the effect of shrub size. Sub-plot level examines the effects of canopy cover its interactions with the plot level. Significant probability (*P*) values are in **bold**. *P* values > 0.1 are not shown.

(a) Plot

Source of variation	SS	DF	MS	F	P
Shrub size	0.09	1	0.09	10.26	0.013
Error	0.07	8	0.01		
Total	0.17	9	0.02		

Appendix S9. Review of ‘fertile islands’ along the rainfall gradient. Positive values represent higher concentration of the soil nutrient in soils under woody plants and negative values, higher concentration in soils in the adjacent open grassland. Values from the current study are in bold type.

Site	Woody plant species	Annual precipitation (mm)	Total nitrogen concentration (g kg ⁻¹)	Available phosphorus concentration (mg kg ⁻¹)	Reference
Mojave desert, Nevada, USA	<i>Larrea tridentata</i> <i>Ambrosia dumosa</i>	69	+ 0.001	not measured	Thompson et al. (2005)
Sangtong River, China	<i>Tamarix</i> spp. <i>Haloxylon ammodendron</i>	150	+ 0.5 + 0.3 (ns)	not measured	Li et al. (2007)
West-central Nevada, USA	<i>Artemisia tridentata</i> <i>Pinus monophylla</i> <i>Juniperus osteosperma</i>	162–508	+ 1.1	+19.5	Chambers (2001)
Middleback Field Centre, South Australia	<i>Acacia papyrocarpa</i>	230	+ 1.25	+37.5	Facelli and Brock (2000)
Chihuahuan desert, Southwest, New Mexico, USA	<i>Larrea tridentata</i>	240	not measured	+ 5.9	Perkins et al. (2006)
Almeria Province, Spain	<i>Athrocnemum macrostachyum</i>	242	+ 1.31	+ 47	Pugnaire et al. (2004)
Northeast Colorado, USA	<i>Bontelona gracilis</i>	321	+ 0.911 g m ⁻²	not measured	Kelly and Burke (1997)
Province of Mendoza, Argentina	<i>Prosopis flexuosa</i> <i>Larrea divaricata</i>	329	0.00 (ns) + 0.40 (ns)	not measured	Abril et al. (2009)
Semi-arid SW Niger	One shrub and five tree species	350–650	+ 0.063	+ 0.74	Wezel et al. (2000)
Inner Mongolia, north China	<i>Salix gordejewii</i> <i>Artemisia halodendron</i> <i>Caragana microphylla</i> <i>Artemisia frigida</i>	362	+ 0.106	+ 32.0	Su et al (2004)
Tsavo National Park, Kenya	<i>Adansonia digitata</i> <i>Acacia tortilis</i>	400–500	0.02	+ 7.5	Belsky et al. (1989)
Central Otago, New Zealand	<i>Kunzea serotina</i> <i>Coprosma propinqua</i> <i>Discaria toumatou</i> <i>Rosa rubiginosa</i>	550	+ 1.1 + 0.28 (ns) + 0.03 (ns) + 0.181 (ns)	+4.46 - 1.600 (ns) + 1.325 (ns) + 1.125 (ns)	Current study, Camara (2009)
Gregory Rift Valley, northwestern Kenya	<i>Acacia tortilis</i>	500	+ 0.45	not measured	Weltzin and Coughenour (1990)
Mona Vale, Kyearuba Valley, NSW, Australia	<i>Eucalyptus melliodora</i>	548	+ 2.5	+ 70	Eldridge et al (2005)
Sierra Nevada, SE Spain	<i>Santolina canescens</i> <i>Ulex parviflorus</i>	548	+ 0.1 + 0.2	-0.40 -0.40	Gomez-Aparicio et al. (2005a)
Southern highveld, Zimbabwe	<i>Colophospermum mopane</i>	600	+ 1.5	+ 3.80	Mlambo et al (2005)
Adamvatta, Sweden	<i>Juniperus communis</i>	650	+ 0.06	+ 5	Deluca and Zackrinsson (2007)
Tsavo National Park, Kenya	<i>Adansonia digitata</i> <i>Acacia tortilis</i>	750	+ 0.611 + 0.631	+ 0.4	Belsky et al. (1993)
Northern Tablelands, NSW, Australia	<i>Eucalyptus blakelyi</i>	790	+ 1.1	+ 3	Wilson et al. (2007)
Northern Tablelands, NSW, Australia	<i>Eucalyptus melliodora</i> <i>Eucalyptus viminalis</i> <i>Eucalyptus calliginosa</i>	790	not measured	+ 12.5	Graham et al (2004)

Appendix S9. continued

Site	Woody plant species	Annual precipitation (mm)	Total nitrogen concentration (g kg ⁻¹)	Available phosphorus concentration (mg kg ⁻¹)	Reference
Sierra Nevada, SE Spain	<i>Salvia lavandulifolia</i> ssp. <i>vellerea</i>	846	+ 0.2 (ns)	+ 2.00 (ns)	Gomez-Aparicio et al. (2005 site 1)
Sierra Nevada, SE Spain	<i>Salvia lavandulifolia</i> <i>Genista versicolor</i> <i>Prunus ramburii</i>	846.5	0.000 (ns) 0.000 (ns) 0.000 (ns)	+ 2.00 + 4.46 + 4.20	Gomez-Aparicio et al. (2005 site 2)
Drummond Station, New Zealand	<i>Pinus radiata</i>	850	+ 0.3 (ns)	not measured	Alfredsson et al (1998)
Kainji Lake Basin, Nigeria	Different tree species	1000–1200	+ 0.15 (ns)	+ 0.79 (ns)	Isichei and Muoghalu (1992)
Zaria, north-west Nigeria	<i>Acacia albida</i> <i>Parkia biglobosa</i> <i>Eucalyptus camaldulensis</i>	1100	+ 0.7 + 0.2 –0.3 (ns)	not measured	Jaiyeoba (1995)
Manawatu Region, New Zealand	<i>Pinus radiata</i>	1263	–0.73	–23	Giddens et al. (1997)
North and South Island, New Zealand	<i>Pinus radiata</i>	1355	–0.5 (ns)	–0.2	Davis (1994)
Craigieburn Station, New Zealand	<i>Pseudotsuga menzielli</i>	1440	–2.2	not measured	Alfredsson et al (1998)
Craigieburn Research Area, New Zealand	<i>Pinus ponderosa</i> <i>Pinus nigra</i>	1440	–0.1	+2 (ns)	Chen et al. (2000)

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