

Supplementary Material

Physical and chemical drivers of vegetation in groundwater-source pools on the Bogong High Plains, Victoria

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Summary of the Supporting information

- Number of pages: 10 (including this page)
- Number of figures: 10
- Number of tables: 3

Supporting Information contains:

Figure S1. Location photograph of the top of the Whiterock Creek (WR) catchment.

Figure S2. Photograph of part of the Watchbed Creek (HS) catchment.

Figure S3. Photograph of part of the Cope Creek (cc) catchment near the Pretty Valley Pondage.

Figure S4. Photograph of *Blindia robusta* (dark green aquatic moss) with *Bartramia bogongia* (lime green semi-aquatic moss) in a typical groundwater source pool at Heathy Spur (HS) catchment.

Figure S5. A typical groundwater source pool found in the Whiterock Creek (WR) catchment. This pool had species commonly found in wetland areas in the Bogong High Plains.

Figure S6. A typical groundwater source pool found in the Cope Creek (CC) catchment. The groundwater source pools usually consisted of very fine sediment and little to no vegetation.

Figure S7 MDS ordination of Heathy Spur (HS), Whiterock Creek(WR) and Cope Creek (CC) catchments. Two dimensional configuration based on (%) cover data

Figure S8. MDS ordination of Heathy Spur, Whiterock Creek and Cope Creek catchments. Two dimensional configuration based on presence/absence data (Minimum stress = 0.01).

Figure S9. Principal component analysis (PCA) for anion and cation levels in the groundwater source water comparing all catchments. This figure shows that all catchments are almost the same.

Figure S10. Principal component analysis (PCA) for chloride ,nitrate and bicarbonate levels in the groundwater source pools comparing Heathy Spur (HS), Whiterock Creek (WR) and Cope Creek (CC) catchments.

Table S1. Depths for the permanent groundwater-source pools at Heathy Spur, Whiterock Creek and Cope Creek. HS= Heathy Spur; WR= Whiterock Creek; CC= Cope Creek.

Table S2. Site descriptions for the groundwater sources at Heathy Spur, Whiterock Creek and Cope Creek. HS= Heathy Spur; WR= Whiterock Creek; CC= Cope Creek.

Table S3. Mean cover (%) of vegetation species present in groundwater source pools in three catchments across the Bogong High Plains.

Table S4. Mean and +/- 2 Standard Deviation results for anions and cations in the groundwater sources at Heathy Spur, Whiterock Creek and Cope Creek. HS= Heathy Spur; WR= Whiterock Creek; CC= Cope Creek.



Figure S1. Photograph of the top of Whiterock Creek (WR) catchment.



Figure S2. Photograph of part of the Watchbed Creek (HS) catchment.



Figure S3. Photograph of part of the Cope Creek (CC) catchment near Pretty Valley pondage.



Figure S4. Photograph of *Blindia robusta* (dark green aquatic moss) with *Bartramia bogongia* (lime green semi-aquatic moss) in a typical groundwater source pool at Heathy Spur (HS) catchment.



Figure S5. A typical groundwater source pool found in the Whiterock Creek (WR) catchment. This pool had *Blindia robusta* and *Bartramia bogongia* present in the pool. *Empodisma minus*, *Richea continentis*, *Poa costiniana* and *Baeckea gunniana* are shown in this photograph. All of these species are commonly found in wetland areas in the Bogong High Plains.



Figure S6. A typical groundwater source pool found in the Cope Creek (CC) catchment. The groundwater source pools usually consisted of very fine sediment and little to no vegetation.

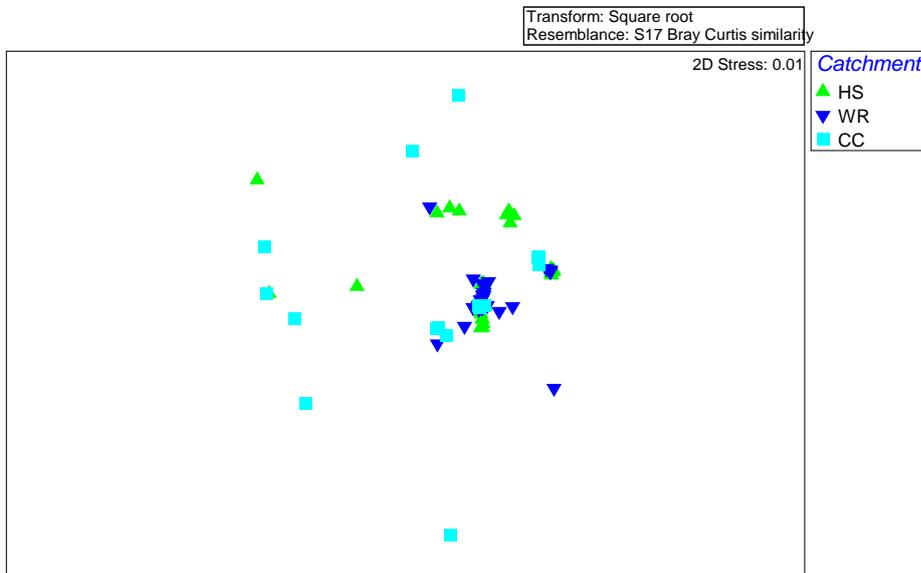


Figure S7. MDS ordination of Heathy Spur (HS), Whiterock Creek (WR) and Cope Creek (CC) catchments. Two dimensional configuration based on (%) cover data (Minimum stress = 0.01)

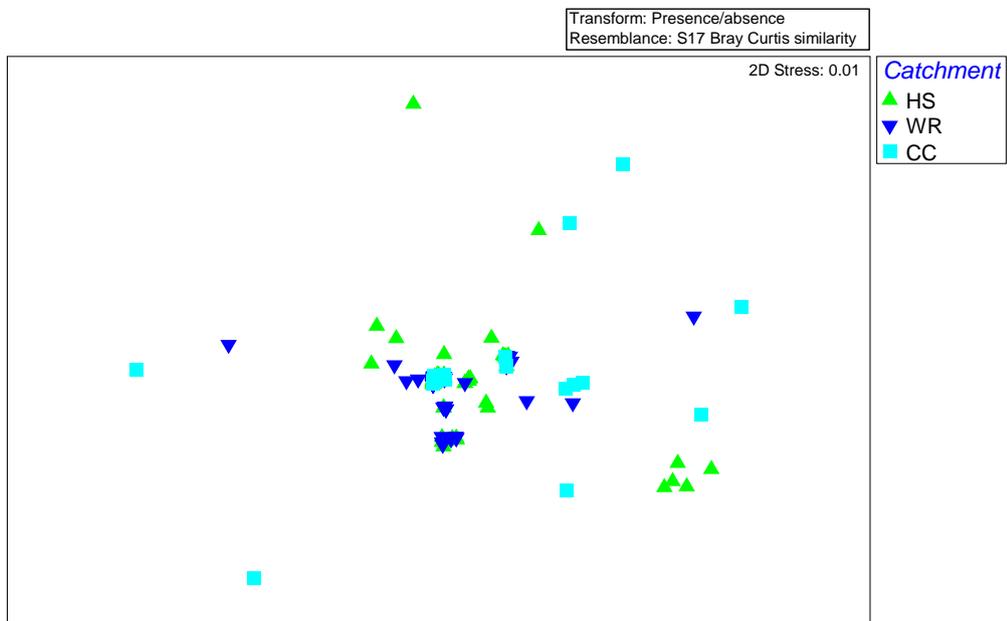


Figure S8. MDS ordination of Heathy Spur, Whiterock Creek and Cope Creek catchments. Two dimensional configuration based on presence/absence data (Minimum stress = 0.01).

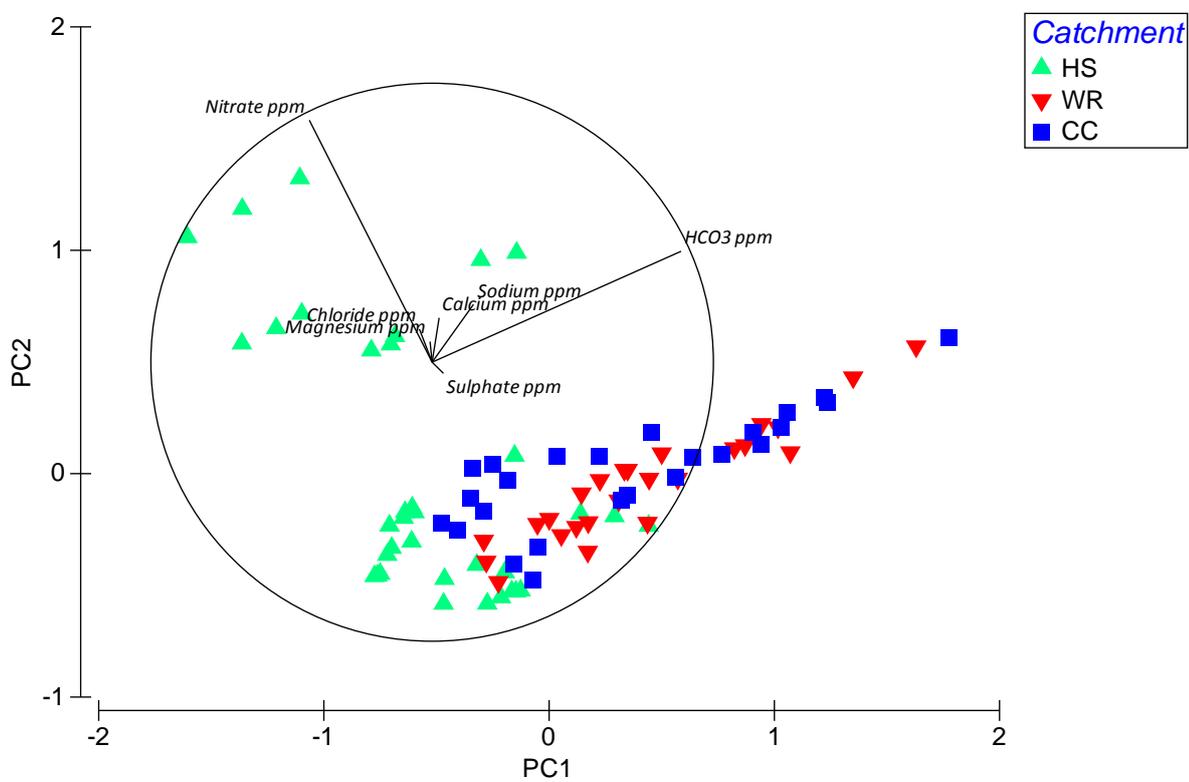


Figure S9. Principal component analysis (PCA) for anion and cation levels in the groundwater source water comparing all catchments. This figure shows that all catchments are almost the same.

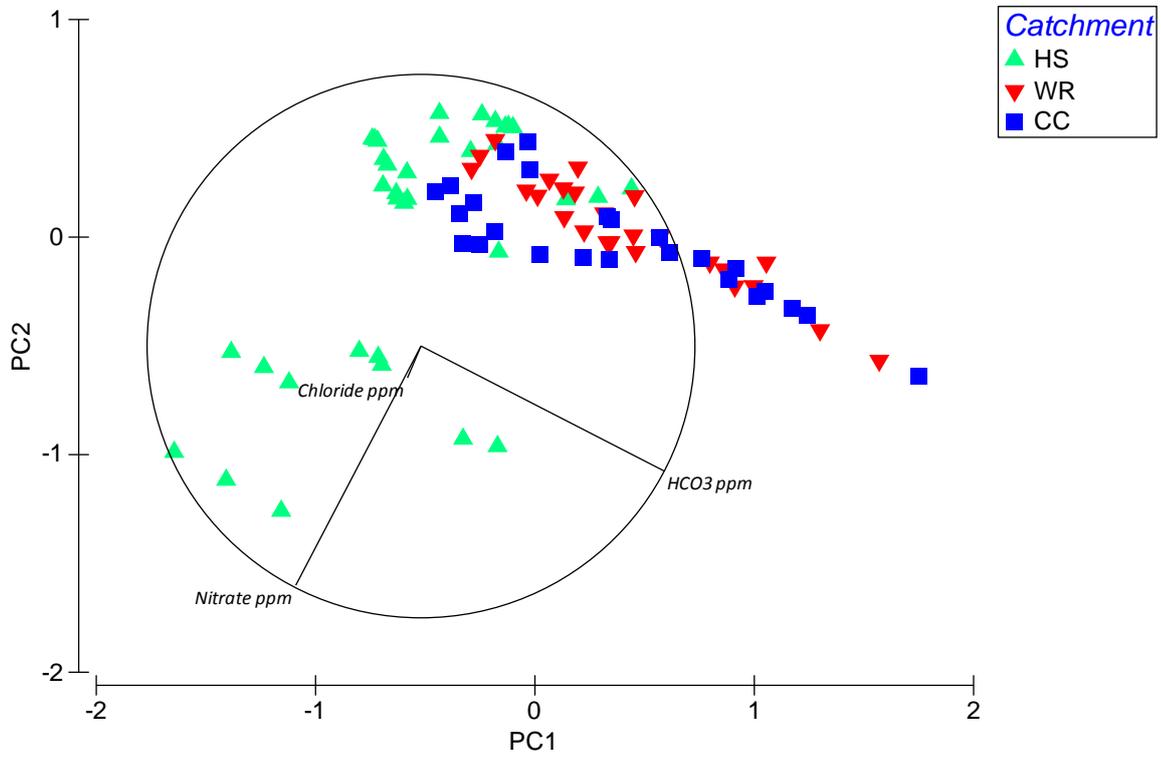


Figure S10. Principal component analysis (PCA) for chloride ,nitrate and bicarbonate levels in the groundwater source pools comparing Heathy Spur (HS), Whiterock Creek (WR) and Cope Creek (CC) catchments.

Table S1. Depths for the permanent groundwater-source pools at Heathy Spur, Whiterock Creek and Cope Creek. HS= Heathy Spur; WR= Whiterock Creek; CC= Cope Creek.

Site	Depth-cm
HSGW-1	27
HSGW-2	20
HSGW-3	8
HSGW-4	18
HSGW-5	14
HSGW-6	3
HSGW-7	24
HSGW-8	16
HSGW-11	26
WRGW-1	23
WRGW-3	18
WRGW-4	12
WRGW-5	13
WRGW-6	19
WRGW-7	23
WRGW-8	23
WRGW-9	20
WRGW-10	43
CCGW-3	29
CCGW-4	12
CCGW-7	4
CCGW-8	4

Table S2. Site descriptions for the groundwater sources at Heathy Spur, Whiterock Creek and Cope Creek.
 HS= Heathy Spur; WR= Whiterock Creek; CC= Cope Creek.

Site	Length m	Width m	Alt	Aspect	Depth cm	Catchment
HSGW-1	1.5	1.8	1737	South	27	HS
HSGW-2	3.5	2.3	1759	South	20	HS
HSGW-3	7.3	4.2	1761	South	8	HS
HSGW-4	6.9	6.3	1743	East	18	HS
HSGW-5	2.1	2	1737	West	14	HS
HSGW-6	10.8	6.8	1748	WSW	3	HS
HSGW-7	2.5	2.2	1760	WSW	24	HS
HSGW-8	9.3	2.5	1747	SW	16	HS
HSGW-10	8.2	4.2	1763	South	25	HS
HSGW-11	1.7	1	1737	SW	26	HS
WRGW-1	5.1	4.5	1790	North	23	WR
WRGW-2	0.9	1.3	1758	North	5	WR
WRGW-3	0.4	0.4	1792	North	18	WR
WRGW-4	1.2	1.5	1803	North	12	WR
WRGW-5	1.7	2	1775	North	13	WR
WRGW-6	16	12	1787	North	19	WR
WRGW-7	1.4	2.2	1798	North	23	WR
WRGW-8	5.5	1.8	1854	NW	23	WR
WRGW-9	4.3	2.1	1847	NW	20	WR
WRGW-10	6.9	3.2	1780	North	43	WR
CCGW-1	1.7	0.6	1722	South	12	CC
CCGW-2	4.1	1.8	1720	SE	8	CC
CCGW-3	2.2	1.1	1737	SE	29	CC
CCGW-4	2.9	7.2	1667	SE	12	CC
CCGW-5	0.6	0.5	1680	SE	6	CC
CCGW-6	2	0.7	1691	SE	16	CC
CCGW-7	0.98	0.6	1680	SE	4	CC
CCGW-8	2	0.9	1758	North	4	CC
CCGW-9	0.33	0.24	1767	East	15	CC
CCGW-10	1.1	0.7	1733	SE	10	CC
CCGW-11	0.46	0.3	1736	SE	8	CC

Table S3. Mean cover (%) of vegetation species present in groundwater source pools in three catchments across the Bogong High Plains.

Species	Average %
<i>Blindia robusta</i>	53.00
<i>Polytrichum commune</i>	8.90
<i>Warnstorfia fluitans</i>	4.20
<i>Bartramia bogongia</i>	3.60
<i>Pyrrhobryum mnioides</i>	3.00
<i>Schoenus calyptratus</i>	3.00
<i>Poa costiniana</i>	1.30
<i>Isolepis crassiuscula</i>	1.00
<i>Richea continentis</i>	1.00
<i>Jungermannia orbiculata</i>	0.90
<i>Empodisma minus</i>	0.70
<i>Riccardia ssp.</i>	0.50
<i>Carex gaudichaudiana</i>	0.50
<i>Craspedia ssp.</i>	0.40
<i>Pratia surrepens</i>	0.40
<i>Acaena ssp.</i>	0.20
<i>Isotachis montana</i>	0.10
<i>Viola betonicifolia</i>	0.08
<i>Breutelia affinis</i>	0.04
<i>Sphagnum cristatum</i>	0.01

Table S4. Mean and ± 2 Standard Deviation results for anions and cations in the groundwater sources at Heathy Spur, Whiterock Creek and Cope Creek. HS= Heathy Spur; WR= Whiterock Creek; CC= Cope Creek.

Anion and cation analyses for groundwater at Heathy Spur, Whiterock Creek and Cope Creek

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Chloride ppm	HS	35	.541	.095	.016	.508	.573	.449	.735
	WR	25	.488	.073	.015	.457	.518	.332	.679
	CC	25	.477	.097	.019	.437	.517	.323	.756
	All sites	85	.510	.093	.010	.486	.526	.323	.756
Nitrate ppm	HS	35	.789	.645	.109	.567	1.011	.108	2.138
	WR	25	.274	.070	.014	.245	.303	.132	.373
	CC	25	.369	.162	.032	.302	.436	.153	.691
	All sites	85	.514	.482	.052	.410	.618	.108	2.138
Sulphate ppm	HS	35	.201	.043	.007	.187	.216	.127	.265
	WR	25	.257	.036	.007	.242	.272	.178	.338
	CC	25	.253	.133	.027	.198	.308	.144	.846
	All sites	85	.233	.083	.009	.215	.251	.127	.846
Sodium ppm	HS	35	.550	.099	.017	.516	.584	.410	.735
	WR	25	.687	.161	.032	.620	.753	.396	1.076
	CC	25	.685	.194	.039	.605	.765	.436	1.266
	All sites	85	.630	.163	.018	.595	.665	.396	1.266
Calcium ppm	HS	35	.266	.109	.019	.229	.304	.169	.534
	WR	25	.259	.047	.009	.240	.278	.165	.335
	CC	25	.254	.084	.017	.219	.288	.162	.468
	All sites	85	.260	.087	.009	.242	.279	.162	.534

Table S4 (Cont.). Mean and ± 2 Standard Deviation results for anions and cations in the groundwater sources at Heathy Spur, Whiterock Creek and Cope Creek. HS= Heathy Spur; WR= Whiterock Creek; CC= Cope Creek continued.

Anion and cation analyses for groundwater at Heathy Spur, Whiterock Creek and Cope Creek

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Magnesium ppm	HS	35	.126	.052	.009	.108	.144	.070	.269
	WR	25	.119	.013	.003	.113	.124	.098	.143
	CC	25	.130	.020	.004	.122	.138	.089	.163
	All sites	85	.125	.036	.004	.117	.133	.070	.269
HCO ₃ ⁻ ppm	HS	35	.939	.368	.062	.813	1.066	.407	1.832
	WR	25	1.770	.536	.107	1.548	1.991	1.010	3.067
	CC	25	1.738	.642	.128	1.473	2.003	.918	3.261
	All sites	85	1.418	.646	.070	1.279	1.558	.407	3.261