

## Supplementary Material

**Supplementary Table 1.** List of flora per sampling time and percent cover for all control and OTC plots. Photos of our species can be found here: <https://www.inaturalist.org/projects/pichincha-volcanic-complex-otc-experiments>.

Voucher	Species	Time	Percent Cover		Voucher	Species	Time	Percent Cover	
			Control	OTC				Control	OTC
Irazábal R.J. #286; Duchicela S. # 1547	<i>Aa cf. maderoi</i>	RM2	0.03	0.00		Grupo Apiaceae	RM3	0.05	0.04
	<i>Aa cf. maderoi</i>	RM3	0.00	0.00		Grupo Apiaceae	RM4	0.01	0.02
	<i>Aa cf. maderoi</i>	RM4	0.00	NA		Grupo Apiaceae	RM5	0.00	NA
	<i>Aa cf. maderoi</i>	RM5	0.00	NA		Grupo Calamagrostis	RM2	3.49	5.48
Duchicela S. # 1532, #1533, #1534, #1576, #1579	<i>Achyrocline alata</i>	RM3	0.00	NA		Grupo Calamagrostis	RM3	3.06	4.16
	<i>Antennaria linearifolia</i>	RM3	NA	0.00		Grupo Calamagrostis	RM4	3.33	3.88
	<i>Aphanactis jamesoniana</i>	RM2	0.01	0.05		Grupo Calamagrostis	RM5	3.58	1.58
	<i>Aphanactis jamesoniana</i>	RM3	0.00	NA	Duchicela S. # 1518	<i>Gynoxys acostae</i>	RM3	NA	0.00
S. Salgado # 1633	<i>Aphanactis jamesoniana</i>	RM4	0.01	0.00		<i>Halenia weddelliana</i>	RM2	0.01	0.07
	<i>Aphanactis jamesoniana</i>	RM5	0.00	0.00		<i>Halenia weddelliana</i>	RM3	0.01	0.03
	<i>Arenaria serpyllifolia</i>	RM2	0.02	0.05	Irazábal R.J. #288; Duchicela S. # 1531	<i>Halenia weddelliana</i>	RM4	0.01	0.01
	<i>Astragalus geminiflorus</i>	RM2	0.03	0.01		<i>Halenia weddelliana</i>	RM5	0.00	0.00
Irazábal R.J. #264; Duchicela S. # 1549	<i>Astragalus geminiflorus</i>	RM3	0.05	0.01		<i>Hieracium frigidum</i>	RM2	0.06	0.07
	<i>Astragalus geminiflorus</i>	RM4	0.06	NA	Irazábal R.J. #332; S. Salgado # 1625;	<i>Hieracium frigidum</i>	RM3	0.02	0.05
	<i>Astragalus geminiflorus</i>	RM5	0.04	NA	Duchicela S. # 1537; Duchicela S. # 1577;	<i>Hieracium frigidum</i>	RM4	0.02	0.04
	<i>Azorella aretioides</i>	RM2	0.05	0.05	Duchicela S. # 1580	<i>Hieracium frigidum</i>	RM5	0.02	0.01
Irazábal R.J. #298	<i>Azorella aretioides</i>	RM3	0.05	0.28		<i>Hypochaeris sessiliflora</i>	RM2	0.93	0.92
	<i>Azorella aretioides</i>	RM4	0.04	0.06		<i>Hypochaeris sessiliflora</i>	RM3	0.52	0.79
	<i>Azorella aretioides</i>	RM5	0.02	0.01	Irazábal R.J. #328	<i>Hypochaeris sessiliflora</i>	RM4	0.34	0.48
	<i>Azorella pedunculata</i>	RM2	1.10	1.01		<i>Hypochaeris sessiliflora</i>	RM5	0.19	0.02
Irazábal R.J. #364	<i>Azorella pedunculata</i>	RM3	1.15	0.50		<i>Lachemilla orbiculata</i>	RM2	0.72	0.68
	<i>Azorella pedunculata</i>	RM4	1.07	0.25		<i>Lachemilla orbiculata</i>	RM3	0.72	0.44
	<i>Azorella pedunculata</i>	RM5	0.94	0.01	Irazábal R.J. #327; Duchicela S. # 1507	<i>Lachemilla orbiculata</i>	RM4	0.62	0.37
	<i>Baccharis caespitosa</i>	RM2	0.35	0.16		<i>Lachemilla orbiculata</i>	RM5	0.63	0.30
Irazábal R.J. #333; Duchicela S. # 1527	<i>Baccharis caespitosa</i>	RM3	0.36	0.17		<i>Lachemilla vulcanica</i>	RM2	0.02	0.01
	<i>Baccharis caespitosa</i>	RM4	0.39	0.19		<i>Lachemilla vulcanica</i>	RM3	0.02	0.00
	<i>Baccharis caespitosa</i>	RM5	0.52	0.05	Irazábal R.J. #370; S. Salgado # 1622	<i>Lachemilla vulcanica</i>	RM4	0.04	0.00
	<i>Bartsia laticrenata</i>	RM5	NA	0.00		<i>Lachemilla vulcanica</i>	RM5	0.02	0.00
	<i>Bartsia stricta</i>	RM2	0.01	0.01		<i>Lasiocephalus ovatus</i>	RM2	0.10	0.16

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Irazábal R.J. #325; Duchicela S. # 1525	<i>Bartsia stricta</i>	RM3	0.00	0.00		<i>Lasiocephalus ovatus</i>	RM3	0.02	0.04
Duchicela S. # 1546	<i>Bartsia stricta</i>	RM4	0.00	0.00	Irazábal R.J. #354; Duchicela S. # 1519	<i>Lasiocephalus ovatus</i>	RM4	0.04	0.03
Duchicela S. # 1503	<i>Belloa</i> cf. 01 in ECPIC	RM3	0.00	NA		<i>Lasiocephalus ovatus</i>	RM5	0.04	0.01
	<i>Bidens andicola</i>	RM3	0.00	0.00		<i>Lupinus microphyllus</i>	RM2	0.25	0.30
	<i>Carex pygmaea</i>	RM2	0.08	0.11	Irazábal R.J. #367; Duchicela S. # 1510	<i>Lupinus microphyllus</i>	RM3	0.08	0.10
Irazábal R.J. #289; Duchicela S. # 1509	<i>Carex pygmaea</i>	RM3	0.11	0.08		<i>Lupinus microphyllus</i>	RM4	0.01	0.00
	<i>Carex pygmaea</i>	RM4	0.09	0.09		<i>Lupinus microphyllus</i>	RM5	0.00	0.00
	<i>Carex pygmaea</i>	RM5	0.06	0.04		<i>Lupinus pubescens</i>	RM2	0.02	0.10
	<i>Castilleja fissifolia</i>	RM2	0.08	0.17	Irazábal R.J. #271; Duchicela S. # 1521	<i>Lupinus pubescens</i>	RM3	0.01	0.02
Duchicela S. # 1526	<i>Castilleja fissifolia</i>	RM3	0.03	0.06		<i>Lupinus pubescens</i>	RM4	0.00	0.03
	<i>Castilleja fissifolia</i>	RM4	0.01	NA		<i>Lupinus pubescens</i>	RM5	0.00	0.00
	<i>Cerastium floccosum</i>	RM2	NA	0.00	Irazábal R.J. #273	<i>Luzula racemosa</i>	RM2	0.04	0.03
Irazábal R.J. #266; Duchicela S. # 1520	<i>Cerastium floccosum</i>	RM3	0.01	0.00	Duchicela S. # 1516, # 1541	<i>Monnina crassifolia</i>	RM3	0.00	NA
	<i>Cerastium floccosum</i>	RM4	0.00	0.00		<i>Monticalia peruviana</i>	RM2	0.01	0.00
	<i>Cerastium floccosum</i>	RM5	0.00	NA	Irazábal R.J. #350; Duchicela S. # 1542	<i>Monticalia peruviana</i>	RM3	0.00	0.01
Irazábal R.J. # 800	<i>Cerastium imbricatum</i>	RM2	0.03	0.02		<i>Monticalia peruviana</i>	RM4	NA	0.01
	<i>Cerastium imbricatum</i>	RM5	0.01	0.01		<i>Monticalia peruviana</i>	RM5	0.00	NA
	<i>Chuquiraga jussieui</i>	RM2	0.06	0.17		<i>Nototriche phyllanthos</i>	RM2	0.04	0.06
Irazábal R.J. #353; Duchicela S. # 1539	<i>Chuquiraga jussieui</i>	RM3	0.03	0.06	Irazábal R.J. #272; Duchicela S. # 1545	<i>Nototriche phyllanthos</i>	RM3	0.03	0.04
	<i>Chuquiraga jussieui</i>	RM4	0.04	0.06		<i>Nototriche phyllanthos</i>	RM4	0.05	0.03
	<i>Chuquiraga jussieui</i>	RM5	0.05	0.01		<i>Nototriche phyllanthos</i>	RM5	0.09	NA
Duchicela S. # 1515	<i>Clinopodium nubigenum</i>	RM3	0.00	NA		<i>Ourisia</i> sp.	RM5	0.00	NA
	<i>Draba aretioides</i>	RM2	0.00	NA		<i>Pernettya prostrata</i>	RM2	0.07	0.00
	<i>Erigeron ecuadoriensis</i>	RM2	0.01	NA	Irazábal R.J. #366; Duchicela S. # 1529	<i>Pernettya prostrata</i>	RM3	0.06	0.00
	<i>Erigeron ecuadoriensis</i>	RM4	0.00	NA		<i>Pernettya prostrata</i>	RM4	0.04	0.00
	<i>Erigeron ecuadoriensis</i>	RM5	0.00	NA		<i>Pernettya prostrata</i>	RM5	0.04	0.00
	<i>Galium pumilio</i>	RM2	0.02	0.01		<i>Phyllactis rigida</i>	RM2	0.01	NA
Duchicela S. # 1514	<i>Galium pumilio</i>	RM3	0.02	0.00	Irazábal R.J. #296	<i>Phyllactis rigida</i>	RM3	0.01	NA
	<i>Galium pumilio</i>	RM4	0.03	0.00		<i>Phyllactis rigida</i>	RM4	0.01	NA
	<i>Galium pumilio</i>	RM5	0.01	0.00		<i>Phyllactis rigida</i>	RM5	0.01	NA
	<i>Gentiana sedifolia</i>	RM2	0.03	0.04		<i>Plantago linearis</i>	RM2	0.02	0.01
Irazábal R.J. #336; Duchicela S. # 1523	<i>Gentiana sedifolia</i>	RM3	0.01	0.00	Irazábal R.J. #376; Duchicela S. # 1513	<i>Plantago linearis</i>	RM3	0.02	0.01
	<i>Gentiana sedifolia</i>	RM4	0.01	NA		<i>Plantago linearis</i>	RM4	0.00	0.01
	<i>Gentiana sedifolia</i>	RM5	0.00	NA		<i>Plantago sericea</i>	RM2	0.18	0.06
	<i>Gentianella foliosa</i>	RM2	0.03	0.03	Irazábal R.J. #331; Duchicela S. # 1511	<i>Plantago sericea</i>	RM3	0.06	0.01
S. Salgado # 1630; Duchicela S. # 1504	<i>Gentianella foliosa</i>	RM3	0.02	0.01		<i>Plantago sericea</i>	RM4	0.04	0.00
	<i>Gentianella foliosa</i>	RM4	0.01	0.05		<i>Plantago sericea</i>	RM5	0.01	NA
	<i>Gentianella foliosa</i>	RM5	0.05	0.05		<i>Rumex acetosella</i>	RM2	0.14	0.11
S. Salgado # 1656;	<i>Gentianella rapunculoides</i>	RM2	0.09	NA	Irazábal R.J. # 342; Duchicela S. # 1522	<i>Rumex acetosella</i>	RM3	0.12	0.12
	<i>Gentianella rapunculoides</i>	RM3	0.00	0.03		<i>Rumex acetosella</i>	RM4	0.16	0.06

Duchicela S. # 1500	<i>Gentianella rapunculoides</i>	RM4	0.01	0.01		<i>Rumex acetosella</i>	RM5	0.15	0.01
	<i>Gentianella rapunculoides</i>	RM5	0.01	NA		<i>Sibthorpia repens</i>	RM4	0.00	NA
Irazábal R.J. #372; Duchicela S. # 1550	<i>Geranium humboldtii</i>	RM2	0.46	0.14	Irazábal R.J. # 292	<i>Sibthorpia repens</i>	RM5	0.00	NA
	<i>Geranium humboldtii</i>	RM3	0.23	0.04		<i>Silene thysanodes</i>	RM5	0.00	NA
	<i>Geranium humboldtii</i>	RM4	0.30	0.06		<i>Sisyrinchium jamesonii</i>	RM2	NA	0.00
	<i>Geranium humboldtii</i>	RM5	0.44	0.04	Irazábal R.J. # 329; Duchicela S. # 1528	<i>Sisyrinchium jamesonii</i>	RM3	0.00	NA
	<i>Geranium reptans</i>	RM2	0.01	0.00		<i>Sisyrinchium jamesonii</i>	RM4	0.00	NA
Irazábal R.J. #330; Duchicela S. # 1530	<i>Geranium reptans</i>	RM3	0.04	0.02		<i>Sisyrinchium jamesonii</i>	RM5	0.00	NA
	<i>Geranium reptans</i>	RM4	0.04	0.01	Duchicela S. # 1506; Duchicela S. # 1548	<i>Stellaria recurvata</i>	RM3	0.02	0.03
	<i>Geranium reptans</i>	RM5	0.05	0.00		<i>Stellaria recurvata</i>	RM4	0.01	0.03
	Group Asteraceae	RM2	0.00	0.03		<i>Stellaria recurvata</i>	RM5	0.01	0.00
	Group Asteraceae	RM3	0.00	0.00	Irazábal R.J. #296	<i>Valeriana microphylla</i>	RM3	0.00	0.00
	Group Asteraceae	RM4	0.00	0.00		<i>Valeriana microphylla</i>	RM4	0.00	0.00
	Group Asteraceae	RM5	0.00	0.00		<i>Valeriana microphylla</i>	RM5	0.01	0.00
	Group Poaceae	RM2	1.38	0.65	Irazábal R.J. #363	<i>Werneria nubigena</i>	RM2	0.60	0.16
	Group Poaceae	RM3	0.49	0.30		<i>Werneria nubigena</i>	RM3	0.20	0.07
	Group Poaceae	RM4	0.37	0.08		<i>Werneria nubigena</i>	RM4	0.23	0.05
	Group Poaceae	RM5	0.03	0.01		<i>Werneria nubigena</i>	RM5	0.22	0.04
	Grupo Apiaceae	RM2	0.27	0.09		<i>Werneria pumila</i>	RM4	0.00	NA

**Supplementary Table 2.** Mixed effects models for temperature—including yearly temperatures, dry season temperatures and nightly temperatures.

<i>Predictors</i>	<b>Yearly Temperature</b>				<b>Dry Season Temperature</b>				<b>Night Temperature</b>			
	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
Intercept	6.64	5.30 – 7.98	9.74	<b>&lt;0.001</b>	7.56	5.96 – 9.15	9.29	<b>&lt;0.001</b>	2.81	2.17 – 3.44	8.70	<b>&lt;0.001</b>
Treatment (OTC)	0.17	0.14 – 0.20	10.14	<b>&lt;0.001</b>	-0.28	-0.35 – -0.22	-8.21	<b>&lt;0.001</b>	-0.02	-0.04 – 0.01	-1.48	0.139
Logger Placement (Soil)	0.94	0.88 – 0.99	33.69	<b>&lt;0.001</b>	0.55	0.44 – 0.66	10.01	<b>&lt;0.001</b>	4.52	4.48 – 4.56	226.38	<b>&lt;0.001</b>
Treatment * Logger Position	-0.51	-0.57 – -0.45	-16.87	<b>&lt;0.001</b>	-0.57	-0.69 – -0.45	-9.03	<b>&lt;0.001</b>	-0.72	-0.76 – -0.68	-33.28	<b>&lt;0.001</b>
<b>Random Effects</b>												
$\sigma^2$	15.13				20.76				4.14			
$\tau_{00}$	0.29	Logger			0.57	Logger			0.45	Logger		
	11.05	hour			15.62	hour			1.26	hour		
ICC	0.43				0.44				0.29			
N	24	hour			62	Logger			62	Logger		
	62	Logger			24	hour			13	hour		
Observations	1166066				397435				631927			
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.005 / 0.431				0.003 / 0.440				0.433 / 0.599			

**Supplementary Table 3.** Summary statistics for freezing events in control and OTC plots recorded by air and soil loggers.

	Control				OTC				Significance	
	Event	SE	conf.low	conf.high	Event	SE	conf.low	conf.high	p.value	p.signif
<b>Air Loggers</b>										
<b>Dry Season</b>										
max	1.59	0.09	1.42	1.77	1.29	0.11	1.08	1.50	0.00	****
mean	0.32	0.03	0.27	0.37	0.23	0.02	0.19	0.27	0.00	****
min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
<b>Dry Season Night</b>										
max	0.91	0.03	0.85	0.96	0.91	0.03	0.85	0.96	0.99	ns
mean	0.02	0.00	0.02	0.03	0.02	0.00	0.01	0.02	0.09	ns
min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
<b>Daily</b>										
max	4.33	0.11	4.10	4.54	4.80	0.17	4.48	5.12	0.45	ns
mean	2.72	0.07	2.58	2.86	2.72	0.07	2.57	2.87	0.52	ns
min	0.92	0.04	0.84	1.01	0.73	0.03	0.66	0.79	0.03	*
<b>Night</b>										
max	0.92	0.01	0.90	0.95	0.89	0.02	0.85	0.92	0.15	ns
mean	0.02	0.00	0.02	0.02	0.02	0.00	0.01	0.02	0.00	**
min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
<b>Soil Loggers</b>										
<b>Dry Season</b>										
max	0.14	0.03	0.09	0.21	0.00	0.00	0.00	0.00	0.00	****
mean	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	****
min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
<b>Dry Season Night</b>										
max	0.27	0.04	0.19	0.35	0.00	0.00	0.00	0.00	0.00	****
mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
<b>Daily</b>										
mean	3.69	0.35	3.03	4.39	2.04	0.26	1.58	2.58	0.08	ns
<b>Night</b>										
max	0.22	0.02	0.18	0.26	0.06	0.01	0.04	0.09	0.00	****
mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA

**Supplementary Table 4.** Summary statistics for freezing event lengths (intensity) in control and OTC plots recorded by air and soil loggers.

	Control			OTC			Significance	
	Lengths	SD	SE	Lengths	SD	SE	p.value	p.signif
<b>Air Loggers</b>								
<b>Dry Season</b>								
max	11.00	1.08	0.04	10.00	1.09	0.04	0.00	****
mean	0.12	0.25	0.01	0.10	0.27	0.01	0.00	****
min	0.00	0.00	0.00	0.00	0.09	0.00	0.05	*
<b>Dry Season Night</b>								
max	11.00	1.06	0.04	10.00	1.06	0.04	0.00	****
mean	0.21	0.41	0.01	0.16	0.41	0.01	0.00	****
min	0.00	0.03	0.00	0.00	0.15	0.01	0.03	*
<b>Daily</b>								
max	11.00	1.09	0.02	10.00	1.03	0.02	0.00	****
mean	0.20	0.45	0.01	0.16	0.41	0.01	0.00	****
min	0.00	0.05	0.00	0.00	0.10	0.00	0.13	ns
<b>Night</b>								
max	11.00	1.09	0.02	10.00	1.03	0.02	0.00	****
mean	0.20	0.45	0.01	0.16	0.41	0.01	0.00	****
min	0.00	0.05	0.00	0.00	0.10	0.00	0.13	ns
<b>Soil Loggers</b>								
<b>Dry Season</b>								
max	1.00	0.21	0.01	0.00	0.00	0.00	0.00	****
mean	0.01	0.05	0.00	0.00	0.00	0.00	0.00	****
min	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
<b>Dry Season Night</b>								
max	1.00	0.21	0.01	0.00	0.00	0.00	0.00	****
mean	0.02	0.09	0.00	0.00	0.00	0.00	0.00	****
min	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
<b>Daily</b>								
max	2.00	0.19	0.00	2.00	0.15	0.00	0.00	****
mean	0.01	0.08	0.00	0.00	0.03	0.00	0.00	****
min	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
<b>Night</b>								
max	2.00	0.19	0.00	2.00	0.15	0.00	0.00	****
mean	0.01	0.08	0.00	0.00	0.03	0.00	0.00	****
min	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA

**Supplementary Table 5.** Summary statistics and percent difference for biomass in control and OTC plots for the time periods two through five.

	Control		OTC				Significance	
	Biomass	sd	Biomass	sd	Difference	Percent difference	p.value	p.signif
<b>TIME 2 - 2014</b>								
max	4.23	0.91	2.10	0.61	-2.13	-33.70	0.54	ns
min	0.22	0.11	1.74	0.71	1.52	77.95	0.47	ns
mean	1.59	0.38	1.92	0.42	0.32	9.14	0.59	ns
<b>TIME 3 - 2015</b>								
max	1.65	0.91	3.40	0.61	1.75	34.53	0.01	**
min	0.33	0.11	0.26	0.71	-0.07	-11.22	0.58	ns
mean	0.77	0.38	1.07	0.42	0.30	16.59	0.01	*
<b>TIME 4 - 2017</b>								
max	2.86	0.91	3.26	0.61	0.40	6.55	0.02	*
min	0.07	0.11	0.29	0.71	0.22	60.56	0.00	**
mean	0.67	0.38	1.18	0.42	0.51	27.50	0.00	**
<b>TIME 5 - 2019</b>								
max	1.90	0.91	2.54	0.61	0.64	14.37	0.04	*
min	0.08	0.11	0.38	0.71	0.31	65.97	0.00	***
mean	0.56	0.38	1.00	0.42	0.44	27.85	0.01	**

**Supplementary Table 6.** Mixed effects models for biomass—including comparing between exclusion and control plots, exclusion and OTC plots, and OTC and control plots.

<i>Predictors</i>	Exclusion-Control (Biomass)				Exclusion-OTC (Biomass)				Biomass			
	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
Intercept	0.01	-0.08 – 0.09	0.21	0.836	0.12	-0.10 – 0.33	1.07	0.284	0.01	-0.08 – 0.10	0.27	0.789
Treatment (Exclusion)	0.13	-0.01 – 0.26	1.88	0.061								
Time (1)	0.00	-0.10 – 0.10	0.00	1.000	-0.00	-0.30 – 0.30	-0.00	1.000	-0.00	-0.11 – 0.11	-0.00	1.000
Time (2)	0.12	0.02 – 0.22	2.26	<b>0.024</b>	0.14	-0.14 – 0.42	0.96	0.336	0.11	-0.00 – 0.23	1.92	0.055
Time (3)	-0.16	-0.26 – -0.06	-3.12	<b>0.002</b>	-0.22	-0.47 – 0.03	-1.75	0.079	-0.21	-0.32 – -0.11	-4.08	<b>&lt;0.001</b>
Time (4)	-0.27	-0.36 – -0.18	-6.03	<b>&lt;0.001</b>	-0.22	-0.46 – 0.02	-1.77	0.076	-0.27	-0.36 – -0.17	-5.52	<b>&lt;0.001</b>
Time (5)	-0.35	-0.45 – -0.24	-6.63	<b>&lt;0.001</b>	-0.28	-0.53 – -0.03	-2.17	<b>0.030</b>	-0.32	-0.43 – -0.22	-5.99	<b>&lt;0.001</b>
Treatment (OTC)					0.07	-0.04 – 0.19	1.26	0.208	0.20	0.12 – 0.28	4.70	<b>&lt;0.001</b>
<b>Random Effects</b>												
$\sigma^2$	0.05				0.07				0.06			
$\tau_{00}$	0.01 <sub>Plot</sub>				0.00 <sub>Plot</sub>				0.01 <sub>Plot</sub>			
ICC	0.13								0.12			
N	23 <sub>Plot</sub>				24 <sub>Plot</sub>				40 <sub>Plot</sub>			
Observations	279				136				331			
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.312 / 0.398				0.118 / NA				0.241 / 0.329			



**Supplementary Table 7.** Summary statistics for evenness, Hill Diversity Index and Species Richness in control and OTC plots for the time periods two through five.

Index	Control		OTC		Significance	
	mean	sd	mean	sd	p.value	p.signif
<b>TIME 2 - 2014</b>						
Evenness	0.69	0.10	0.59	0.12	0.01	*
N1-Diversity	5.82	1.92	4.70	1.93	0.09	ns
Richness	12.11	2.49	12.11	3.65	1.00	ns
<b>TIME 3 - 2015</b>						
Evenness	0.52	0.15	0.48	0.15	0.61	ns
N1-Diversity	4.66	2.04	4.00	1.94	0.36	ns
Richness	16.00	3.11	14.25	3.16	0.07	ns
<b>TIME 4 - 2017</b>						
Evenness	0.50	0.15	0.38	0.16	0.03	*
N1-Diversity	4.13	1.55	3.06	1.75	0.02	*
Richness	14.70	3.03	12.88	2.89	0.05	ns
<b>TIME 5 - 2019</b>						
Evenness	0.48	0.16	0.32	0.13	0.01	**
N1-Diversity	3.68	1.72	2.17	0.65	0.00	**
Richness	12.19	2.68	9.64	2.38	0.01	*

**Supplementary Table 8.** Mixed effects models for biodiversity—comparisons between OTC and control plots for evenness, Hill Diversity Index, and Species Richness.

<i>Predictors</i>	<b>Evenness (J)</b>				<b>Hill's Diversity Index (N1)</b>				<b>Species Richness</b>			
	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	<i>Incidence Rate Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
Intercept	0.66	0.61 – 0.71	25.81	<b>&lt;0.001</b>	5.48	4.87 – 6.09	17.53	<b>&lt;0.001</b>	12.66	11.35 – 14.12	45.61	<b>&lt;0.001</b>
Treatment (Exclusion)	0.11	- 0.04 – 0.26	1.44	0.150	1.63	- 0.23 – 3.49	1.71	0.087	1.17	0.96 – 1.42	1.52	0.128
Treatment (OTC)	-0.05	-0.10 – - 0.01	-2.19	<b>0.028</b>	-0.53	- 1.08 – 0.03	-1.85	0.065	0.90	0.81 – 1.00	-1.95	0.052
Time (3)	-0.13	-0.16 – - 0.10	-8.23	<b>&lt;0.001</b>	-0.88	-1.26 – - 0.50	-4.54	<b>&lt;0.001</b>	1.25	1.11 – 1.41	3.77	<b>&lt;0.001</b>
Time (4)	-0.19	-0.22 – - 0.15	- 11.41	<b>&lt;0.001</b>	-1.61	-1.99 – - 1.23	-8.23	<b>&lt;0.001</b>	1.14	1.01 – 1.29	2.16	<b>0.031</b>
Time (5)	-0.20	-0.24 – - 0.17	- 12.23	<b>&lt;0.001</b>	-2.12	-2.52 – - 1.72	- 10.49	<b>&lt;0.001</b>	0.92	0.81 – 1.05	-1.22	0.224
<b>Random Effects</b>												
$\sigma^2$	0.01				0.75				0.07			
$\tau_{00}$	0.01 <sub>Plot</sub>				2.28 <sub>Plot</sub>				0.01 <sub>Plot</sub>			
ICC	0.74				0.75				0.13			
N	42 <sub>Plot</sub>				42 <sub>Plot</sub>				42 <sub>Plot</sub>			
Observations	161				161				161			
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.280 / 0.814				0.226 / 0.808				0.177 / 0.283			

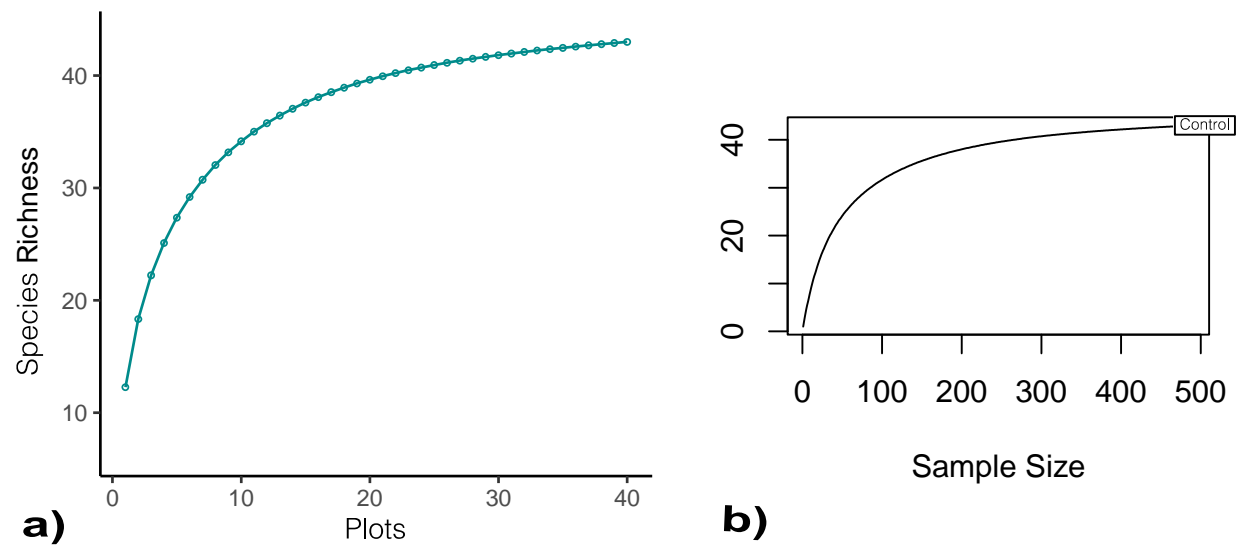
**Supplementary Table 9.** Mixed effects models for growth form indices—comparisons between OTC and control plots for growth form evenness and Hill Diversity Index.

<i>Predictors</i>	<b>Evenness (Growth Form)</b>				<b>Hill Diversity Index (Growth Form)</b>			
	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	<i>Estimates</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
Intercept	0.76	0.70 – 0.82	24.45	<b>&lt;0.001</b>	2.97	2.73 – 3.21	24.59	<b>&lt;0.001</b>
Treatment (OTC)	-0.06	-0.12 – 0.00	-1.95	0.051	-0.22	-0.44 – -0.00	-1.98	<b>0.047</b>
Time (3)	-0.09	-0.13 – -0.04	-3.78	<b>&lt;0.001</b>	-0.16	-0.32 – -0.01	-2.08	<b>0.038</b>
Time (4)	-0.16	-0.21 – -0.12	-7.03	<b>&lt;0.001</b>	-0.44	-0.59 – -0.28	-5.51	<b>&lt;0.001</b>
Time (5)	-0.22	-0.27 – -0.17	-9.17	<b>&lt;0.001</b>	-0.68	-0.84 – -0.52	-8.32	<b>&lt;0.001</b>
<b>Random Effects</b>								
$\sigma^2$	0.01				0.11			
$\tau_{00}$	0.02 <sub>Plot</sub>				0.33 <sub>Plot</sub>			
ICC	0.64				0.74			
N	39 <sub>Plot</sub>				39 <sub>Plot</sub>			
Observations	149				149			
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.201 / 0.716				0.137 / 0.779			

**Supplementary Table 10.** Summary statistics for growth form—including the Cushion, Herb, Rosette, Shrub and Tussock growth forms—for control and OTC plots for the time periods two through five.

Time	Growth Form	Control		OTC		Significance	
		mean	sd	mean	sd	p.value	p.signif
TIME 2 - 2014							
	Cushion	15.00	14.18	16.16	18.89	0.69	ns
	Herb	21.60	13.67	19.73	13.80	0.62	ns
	Rosette	17.00	9.91	11.29	7.91	0.04	*
	Shrub	4.07	2.74	3.86	3.69	0.60	ns
	Tussock	48.53	19.89	57.34	18.96	0.17	ns
TIME 3 - 2015							
	Cushion	23.59	21.05	14.96	16.92	0.47	ns
	Herb	19.26	12.65	14.65	13.50	0.20	ns
	Rosette	9.09	4.96	10.89	9.02	0.97	ns
	Shrub	4.02	7.70	3.29	4.15	0.49	ns
	Tussock	51.71	24.99	60.94	21.70	0.33	ns
TIME 4 - 2017							
	Cushion	25.41	22.91	8.76	13.80	0.04	*
	Herb	19.01	12.65	13.55	19.07	0.05	*
	Rosette	6.91	4.42	8.39	11.29	0.22	ns
	Shrub	4.44	7.50	3.90	5.59	0.85	ns
	Tussock	52.74	25.45	68.24	25.96	0.06	ns
TIME 5 - 2019							
	Cushion	27.65	25.82	3.89	8.65	0.02	*
	Herb	22.71	18.68	18.27	25.48	0.30	ns
	Rosette	4.85	3.58	2.59	1.95	0.03	*
	Shrub	5.74	9.73	2.17	1.96	0.57	ns
	Tussock	51.01	30.32	75.95	25.12	0.02	*

**Supplementary Figure 1.** (a) Species accumulation curve, (b) rarefaction curve, and (c) Chao-2 estimator for Sampling Time 2 (start of sampling period).



	Species	chao	chao.se	boot	boot.se	n
Time2	43	46.90000	5.168655	44.99797	1.263348	40
Time5CON	42	44.48276	2.733631	45.27730	1.722065	29
Time5OTC	28	35.36364	6.504417	31.76481	1.888497	11

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