

Supplementary Material

Figures

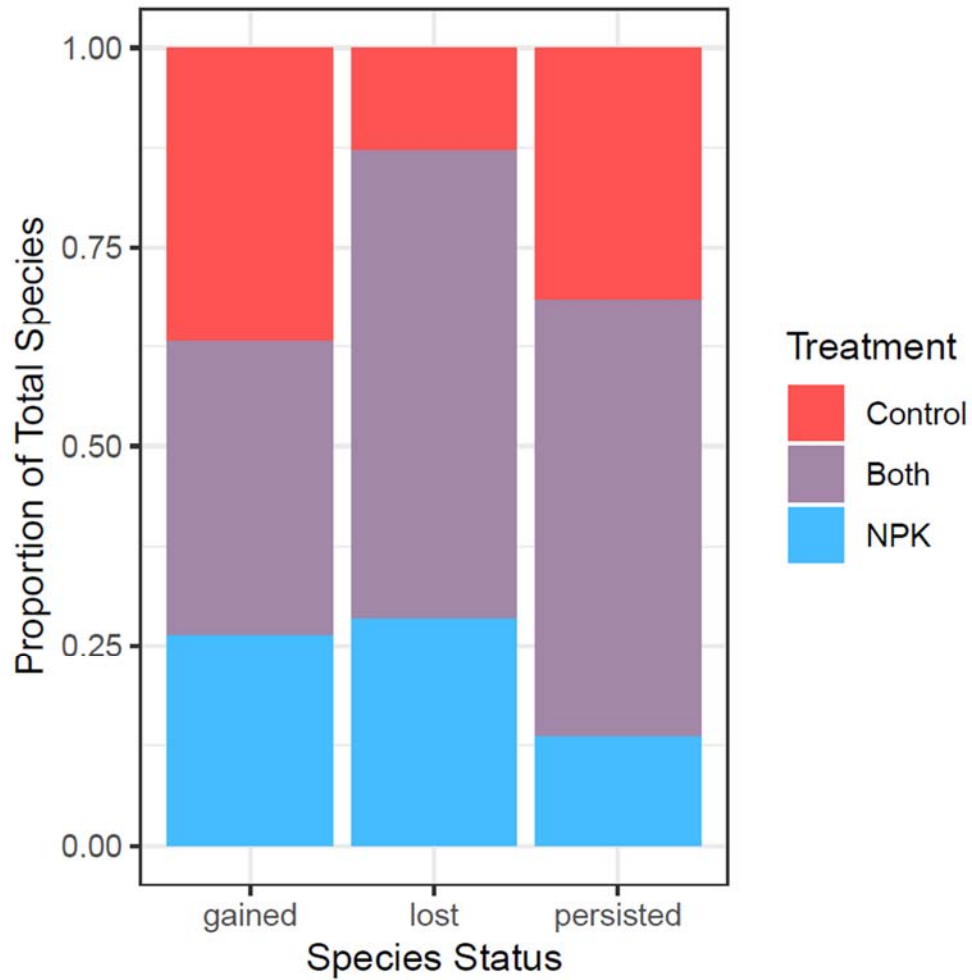
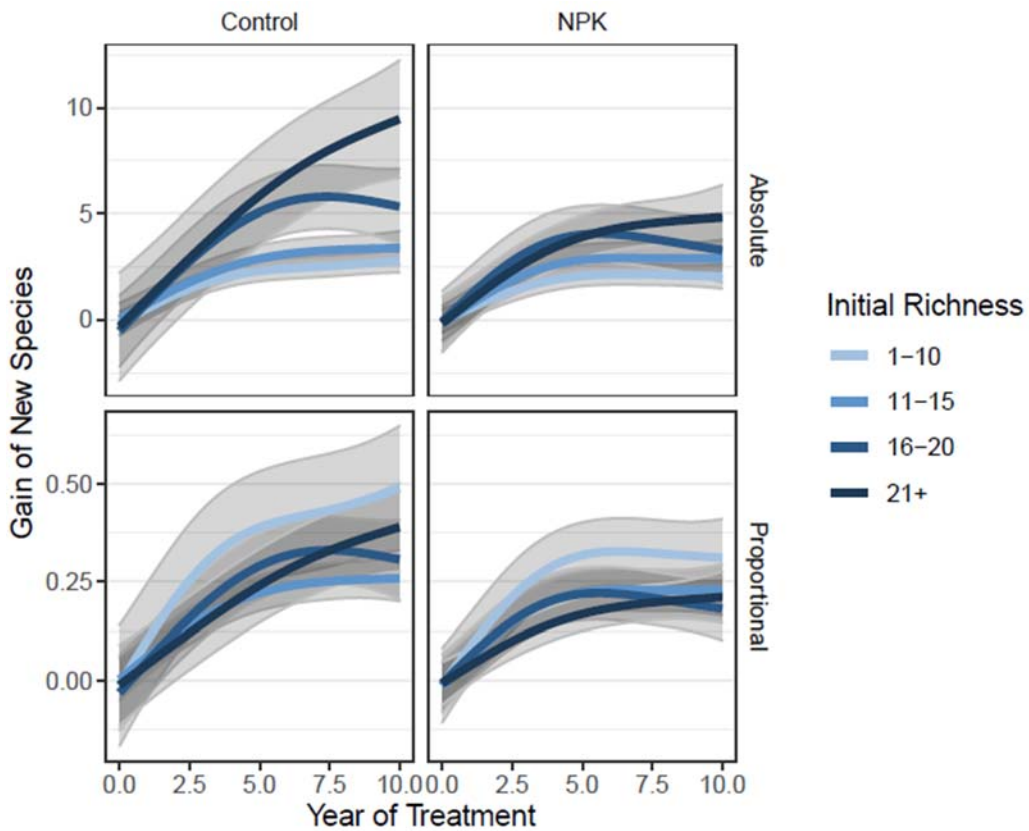
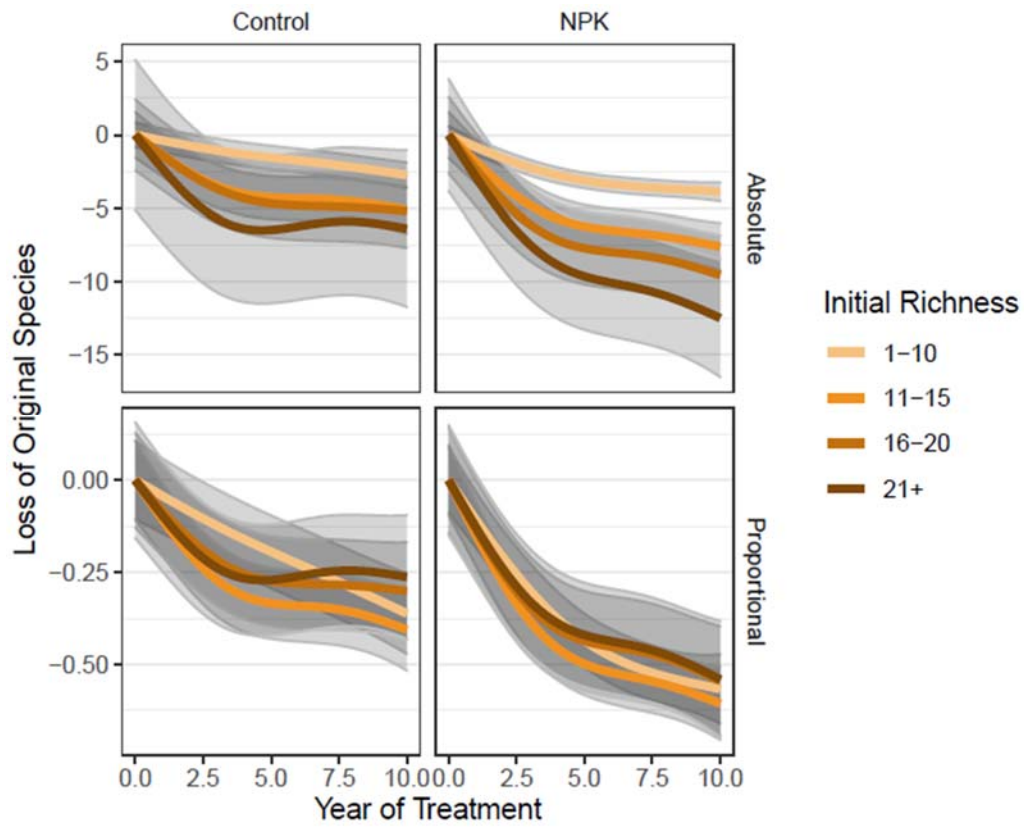


Figure S1. The proportion of total species gained, lost, or persisted (sum to 1 within each category) that were shared between treatments (both; purple) or unique to either Control (red) or NPK treatments (blue).



Figures S2 and S3. Plots were divided into four groups based on the starting richness (# of species in year 0; 1-10 species (n = 438), 11-15 species (n = 211), 16-20 species (n = 146), 21+ species (n = 76)). Models represent the gain or loss of species or proportional richness through time in Control and NPK plots. Lines are fit from generalized additive models with confidence intervals two standard errors from the estimate.

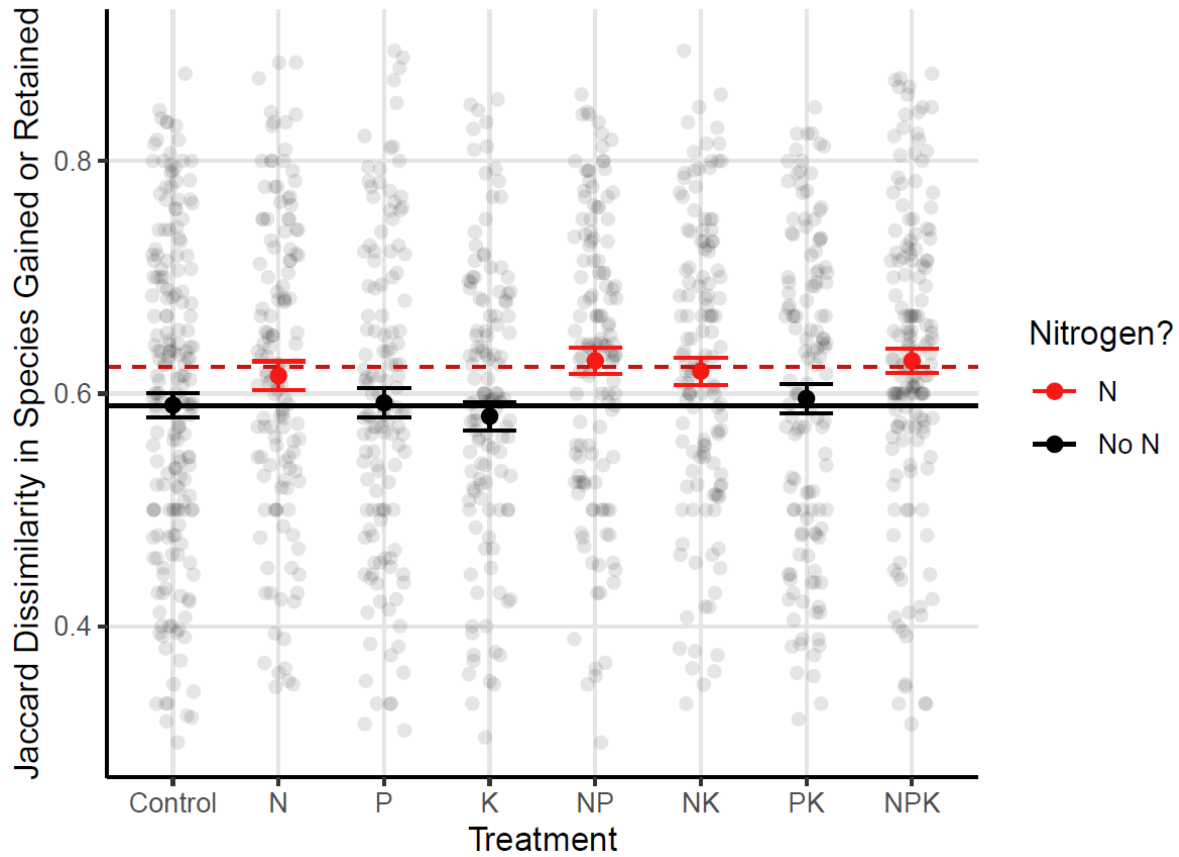


Figure S4. The Jaccard dissimilarity in the species gained or retained between plots of the same treatment over a decade treatment period. Dissimilarity indices were calculated on presence/absence community matrices for each site separately, and indices were then averaged across all 27 sites. Each point in the background represents the dissimilarity between two plots of the same treatment at the same site. Higher values indicate greater dissimilarity in species gain/retention. The dotted line is the average of all Nitrogen treatments, the solid line is all other treatments. Error bars are one standard error of the mean.

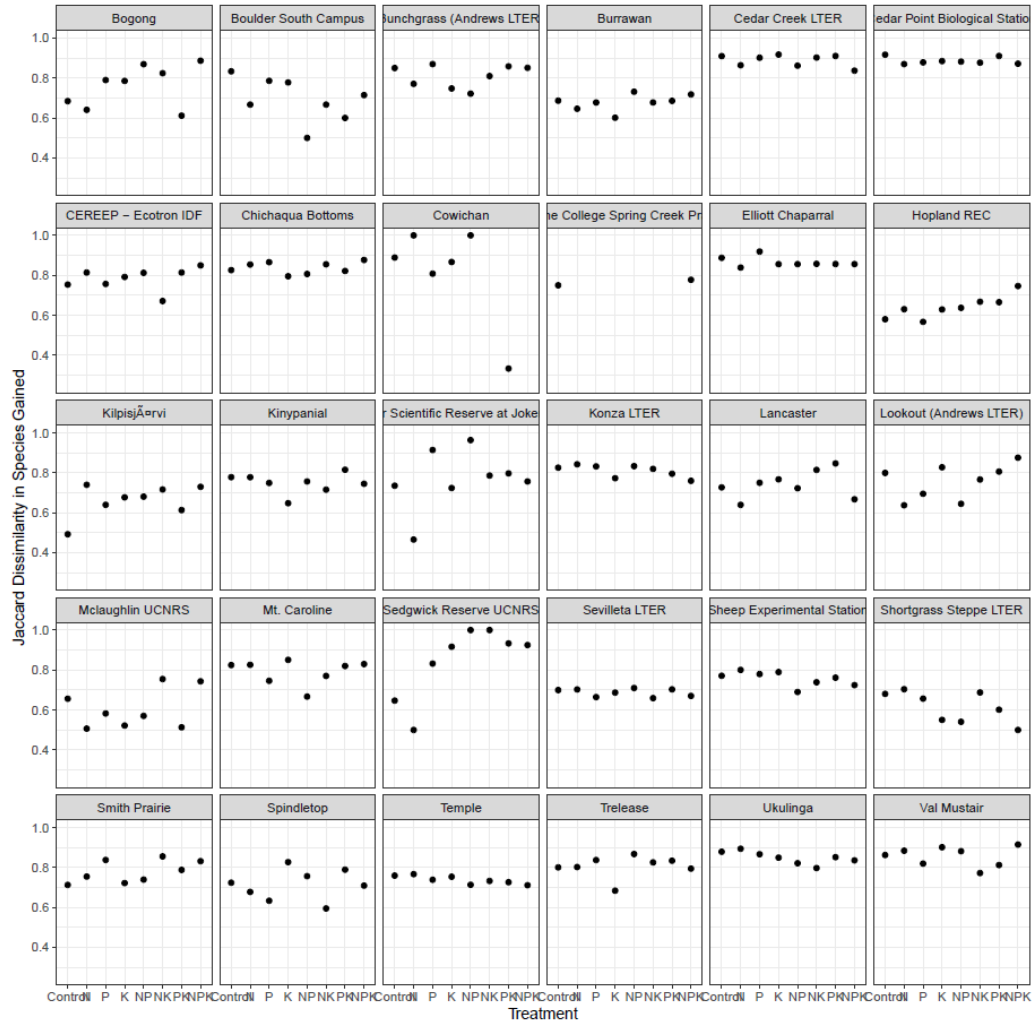


Figure S5. The Jaccard dissimilarity in the species gained between plots of the same treatment for each site.

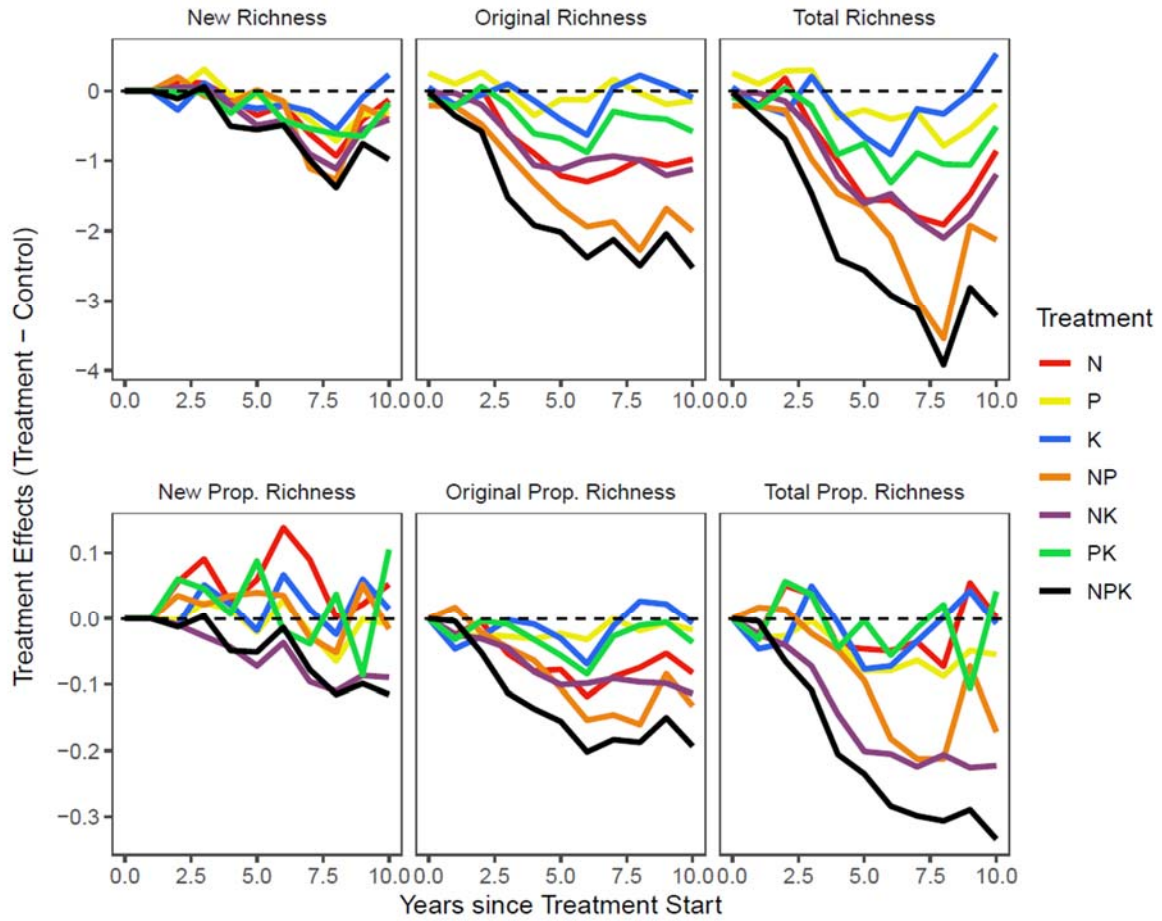


Figure S6: The change in absolute or proportional richness in each nutrient treatment relative to the control (dotted line) during the first 10 years of treatment.

Analyses and Models

Table S1: AIC and GCV scores for three hierarchical models: *site* as a random effect, *site + site/block*, and *site + site/block + site/block/plot*. Random effects are abbreviated as “s” (site), “b” (block) and “p” (plot). These models were crossed with Restricted Maximum Likelihood (REML) selected smoothing parameters at 3, 4 or 5 spline knots. More than 5 spline knots were deemed to overfit based on visual assessment.

# Knots	Random effects	df	Δ AIC	GCV
3	s	30.79435	+104.044	3220.837
3	s + s b	54.68749	+25.299	3189.726
3	s + s b + s b p	59.19688	+18.319	3188.542
4	s	31.18044	+104.609	3220.835
4	s + s b	54.6245	+25	3189.72
4	s + s b + s b p	60.52179	0	3186.366
5	s	31.14476	+104.587	3220.837
5	s + s b	54.62694	+25.163	3189.725
5	s + s b + s b p	60.98517	+1.298	3187.038

Site data

Table S2: Site name, code, habitat, location, mean annual precipitation (mm) and elevation (m) for each site included in the study.

Site Name	Site Code	continent	country	habitat	latitude	longitude	Annual mean precip. (mm)	Elevation (m)
Bogong	bogong.au	Australia	AU	alpine grassland	-36.874	147.254	1080.1	1760
Boulder South Campus	bldr.us	North America	US	shortgrass prairie	39.97202	-105.234	448.5732	1633
Bunchgrass (Andrews LTER)	bnch.us	North America	US	montane grassland	44.27669	-121.968	864.1927	1318.083
Burrawan	burrawan.au	Australia	AU	pasture	-27.7349	151.1395	632.3195	425
Cedar Creek LTER	cdcr.us	North America	US	tallgrass prairie	45.425	-93.2115	765.4171	270
Cedar Point Biological Station	cdpt.us	North America	US	shortgrass prairie	41.2	-101.63	462.9317	965
CEREEP - Ecotron IDF	cereep.fr	Europe	FR	old field	48.28	2.66	633.1537	83
Chichaqua Bottoms	cbgb.us	North America	US	tallgrass prairie	41.78507	-93.3854	888.5049	275
Cowichan	cowi.ca	North America	CA	old field	48.8088	-123.63	2215.951	50
Doane College Spring Creek Prairie	doane.us	North America	US	tallgrass prairie	40.6954	-96.8541	730.5756	418.19
Elliott Chaparral	elliott.us	North America	US	annual grassland	32.875	-117.052	287.9732	200
Hopland REC	hopl.us	North America	US	annual grassland	39.01275	-123.06	1073.766	598.302
Kilpisjärvi	kilp.fi	Europe	FI	tundra grassland	69.0567	20.8747	775.7537	700
Kinypanial	kiny.au	Australia	AU	semiarid grassland	-36.2	143.75	408.4073	90
Koffler Scientific Reserve at Joker's Hill	koffler.ca	North America	CA	pasture	44.02405	-79.5359	872.0024	301
Konza LTER	konz.us	North America	US	tallgrass prairie	39.07086	-96.5828	871.9561	440
Lancaster	lancaster.uk	Europe	UK	mesic grassland	53.98562	-2.62842	1188.91	180

Lookout (Andrews LTER)	look.us	North America	US	montane grassland	44.20518	-122.128	1183.605	1500.492
Mclaughlin UCNRS	mcla.us	North America	US	annual grassland	38.86427	-122.406	824.4415	641.801
Mt. Caroline	mtca.au	Australia	AU	savanna	-31.7821	117.6109	306.5732	285
Sedgwick Reserve UCNRS	sedg.us	North America	US	annual grassland	34.7	-120.017	432.9951	550
Sevilleta LTER	sevi.us	North America	US	desert grassland	34.3592	-106.691	346.061	1600
Sheep Experimental Station	shps.us	North America	US	shrub steppe	44.24299	-112.198	414.3756	910
Shortgrass Steppe LTER	sgs.us	North America	US	shortgrass prairie	40.81667	-104.767	397.6561	1650
Smith Prairie	smith.us	North America	US	mesic grassland	48.20658	-122.625	1995.878	62
Spindletop	spin.us	North America	US	pasture	38.13222	-84.5028	1156.18	271.3
Temple	temple.us	North America	US	tallgrass prairie	31.044	-97.349	883.9195	184
Trelease	trel.us	North America	US	tallgrass prairie	40.075	-88.829	988.8976	200
Ukulinga	ukul.za	Africa	ZA	mesic grassland	-29.67	30.4	868.5951	842.5
Val Mustair	valm.ch	Europe	CH	alpine grassland	46.63135	10.37225	2195.876	2320