

Shifts in taxonomic and functional composition of trees along rainfall and phosphorus gradients in central Panama

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Table S1. Proportion of species with available trait data at each site for each trait. Site names are organized alphabetically. LMA – leaf mass per area, LA – leaf area, MH – maximum height. Information for wood density was not included in the table because we have data for all the species.

Site	LMA	LA	MH
Albrook-transecto	0.38	0.38	0.55
BCI	0.57	0.55	0.87
CaminoPlantacion-transecto	0.44	0.42	0.7
CampoChagres	0.57	0.53	0.64
Caritas	0.5	0.5	0.64
CasaRoubik	0.21	0.2	0.32
Cerrogalera	0.51	0.51	0.62
CerroJefe-transecto	0.14	0.14	0.3
CerroPatacon-p40	0.42	0.42	0.66
CerroPelado-Gamboa-p1ha	0.39	0.36	0.64
CerroPelado-Gamboa-p40	0.35	0.35	0.68
CerroPelado-Gamboa-transecto.1	0.43	0.41	0.66
CerroPelado-Gamboa-transecto.2	0.43	0.42	0.65
Chagres-Chilibre-p1ha	0.4	0.38	0.62
Chagres-Chilibre-transecto	0.38	0.36	0.56
Clayton-transecto	0.37	0.36	0.54
Coba1	0.33	0.31	0.49
Coba2	0.29	0.26	0.38
Elcharco	0.57	0.53	0.72
FuerteSanLorenzo-p40.1	0.44	0.42	0.71
FuerteSanLorenzo-p40.2	0.36	0.36	0.57
Gigante1	0.51	0.48	0.73
IslaGaleta-transecto	0.42	0.4	0.66
LP1	0.57	0.56	0.8
LP2	0.68	0.67	0.88
P01	0.52	0.5	0.76
P02	0.44	0.42	0.66
P03	0.53	0.5	0.75
P04	0.54	0.51	0.72
P05	0.54	0.53	0.81
P06	0.48	0.45	0.69
P07	0.5	0.47	0.69
P08	0.48	0.46	0.66
P09	0.45	0.43	0.6
P10	0.64	0.61	0.85
P11	0.62	0.59	0.87

Table S1. (Continuation)

Site	LMA	LA	MH
P12	0.6	0.6	0.83
P13	0.54	0.52	0.88
P14	0.68	0.66	0.91
P15	0.55	0.53	0.74
P16	0.55	0.53	0.73
P17	0.55	0.52	0.78
P18	0.6	0.58	0.86
P19	0.38	0.36	0.55
P20	0.39	0.38	0.62
P21	0.5	0.49	0.77
P22	0.53	0.52	0.77
P23	0.59	0.56	0.81
P24	0.54	0.52	0.75
P25	0.27	0.26	0.41
P26	0.31	0.3	0.45
P27	0.56	0.52	0.8
P28	0.49	0.48	0.71
Paraiso-CerroLuisa-p40.1	0.37	0.33	0.58
Paraiso-CerroLuisa-p40.2	0.42	0.41	0.59
ParqueMetropolitano-transecto.1	0.36	0.35	0.55
ParqueMetropolitano-transecto.2	0.37	0.37	0.6
Plot32	0.28	0.25	0.31
QuebradaLopez-transecto	0.27	0.26	0.48
SantaRita-p40	0.22	0.2	0.29
SantaRita-p40.1	0.19	0.18	0.28
SantaRita-p40.2	0.24	0.23	0.31
SantaRita-Sierra-transecto	0.16	0.16	0.23
SenderoElCharco-p1ha	0.53	0.51	0.78
SenderoElCharco-p40.1	0.53	0.51	0.82
SenderoElCharco-p40.2	0.43	0.43	0.71
SenderoElCharco-p40.3	0.43	0.41	0.72
SenderoElCharco-p40.4	0.51	0.48	0.84
SenderoElCharco-p40.5	0.37	0.34	0.73
Sherman	0.34	0.33	0.54
Sherman-CaminodePinas-p40.1	0.34	0.33	0.54
Sherman-CaminodePinas-p40.2	0.35	0.35	0.53
MEAN	0.67	0.65	0.76

Table S2. Pearson correlations between all pair of traits. All relationships were non-significant ($\alpha = 0.05$).

	WD	MH	logLMA	logLA
WD	1			
MH	-0.22	1		
logLMA	0.095	0.33	1	
logLA	-0.21	-0.06	-0.15	1

Table S3. Soil resin P and dry season moisture index (D_m) effects on CM for wood density (WD, $g\ cm^{-3}$), maximum height (MH, m), leaf mass per area (LMA, $g\ m^{-2}$) and leaf area (LA, cm^2) for tree communities along the P and rainfall gradient in central Panama. CM refers to community mean trait values, and CWM refers to community weighted mean trait values.

Traits	Metric	Parameter	Estimate	Std. Error	t-value	P-value	Adjusted R^2
WD	CM	Intercept	0.5493	0.0299	18.348	<0.001	0.07
		D_m	-0.00004	0.0001	-0.729	0.47	
		Soil Resin P	-0.0115	0.0045	-2.534	0.01	
MH	CM	Intercept	0.1683	0.0356	4.728	<0.001	0.1
		D_m	0.0002	0.0001	2.835	0.006	
		Soil Resin P	0.0144	0.0054	2.683	0.0091	
LMA	CM	Intercept	2.054	0.0317	64.78	<0.001	0.57
		D_m	0.0002	0.0001	3.125	0.0026	
		Soil Resin P	-0.0288	0.0048	-6.022	<0.001	
LA	CM	Intercept	1.0601	0.111	9.546	<0.001	0.59
		D_m	-0.0017	0.0002	-8.26	<0.001	
		Soil Resin P	0.0068	0.0168	0.404	0.68	
WD	CWM	Intercept	0.601	0.084	7.143	<0.001	-0.02
		D_m	0.0001	0.0002	0.414	0.68	
		Soil Resin P	-0.009	0.012	-0.752	0.45	
MH	CWM	Intercept	1.375	0.094	14.705	<0.001	0.07
		D_m	0.00001	0.00001	0.599	0.55	
		Soil Resin P	0.03	0.014	2.211	0.03	
LMA	CWM	Intercept	2.035	0.045	45.004	<0.001	0.73
		D_m	0.0001	0.0001	1.307	0.199	
		Soil Resin P	-0.057	0.007	-8.706	<0.001	
LA	CWM	Intercept	0.869	0.227	3.837	<0.001	0.44
		D_m	-0.002	0.0001	-4.936	<0.001	
		Soil Resin P	0.011	0.033	0.334	0.74	

Table S4. Total fractions of explained variation for functional and taxonomic composition. D_m refers to dry season moisture index. Negative values should be interpreted as zero.

	Wood density	Leaf mass per area	Leaf area	Maximum height	Species
Soil Resin P	7.3	52.7	-1.4	0.9	9.4
D_m	-0.6	37.2	24.1	2.0	7.9
Spatial	3.3	22.8	17.6	8.4	20.1
All	11.0	56.1	41.2	14.1	27.1

Table S5. Soil resin P and dry season moisture index (D_m) effects on CM for leaf traits (LMA and LA), after removing plots for which trait data were available for less than 30% of species. A total of 10 sites were removed for models using LMA and 11 sites for LA.

Response variable		Estimate	Std. Error	t-value	P-value
CM LMA	(Intercept)	2.06	0.0413	49.74	<0.001
CM LMA	D_m	0.00019	0.0001	2.543	0.014
CM LMA	Soil Resin P	-0.025	0.0051	-4.979	<0.001
CM LA	(Intercept)	1.1279	0.1135	9.936	<0.001
CM LA	D_m	-0.0016	0.0002	-7.762	<0.001
CM LA	Soil Resin P	-0.0211	0.0145	-1.458	0.15

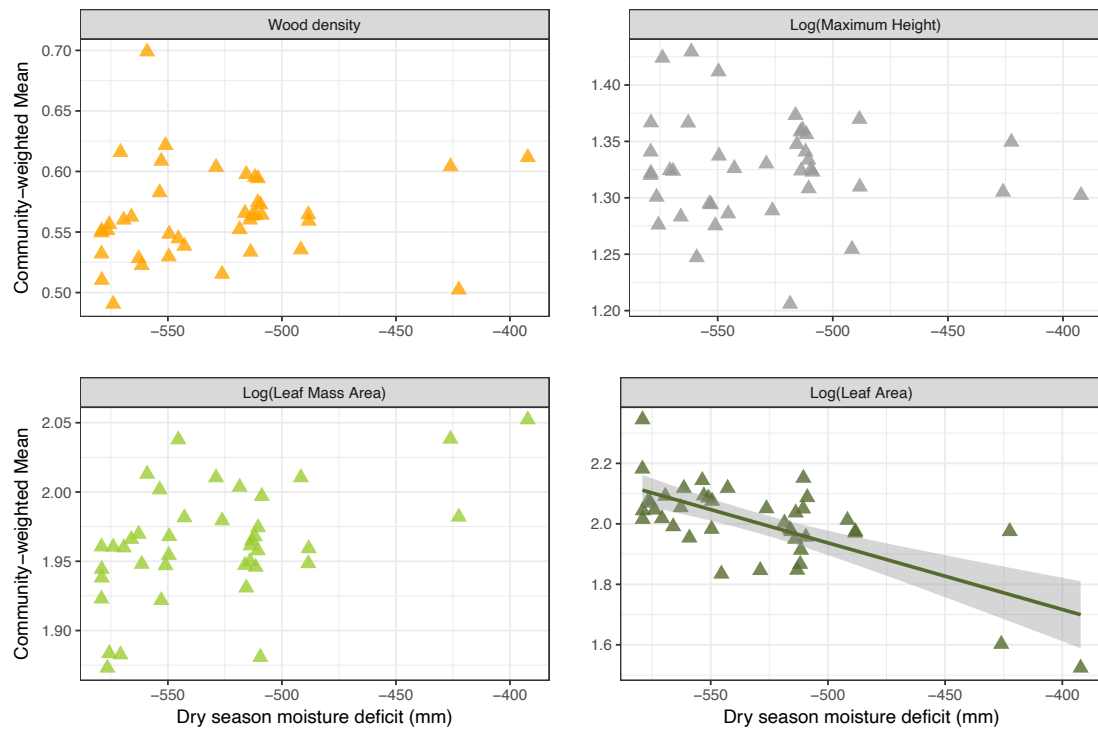


Figure S1. Relationship between community-weighted mean (CWM) trait values and dry season moisture deficit index (D_m). This analysis includes the subset of sites for which abundance information was available (40 out of 72 sites). Wood density was measured in g cm^{-3} , maximum height was measured in m, leaf mass per area was measured in g m^{-2} and leaf area was measured in cm^2 . Lines show significant relationships, and shaded area indicates 95% confidence intervals ($\alpha = 0.05$).

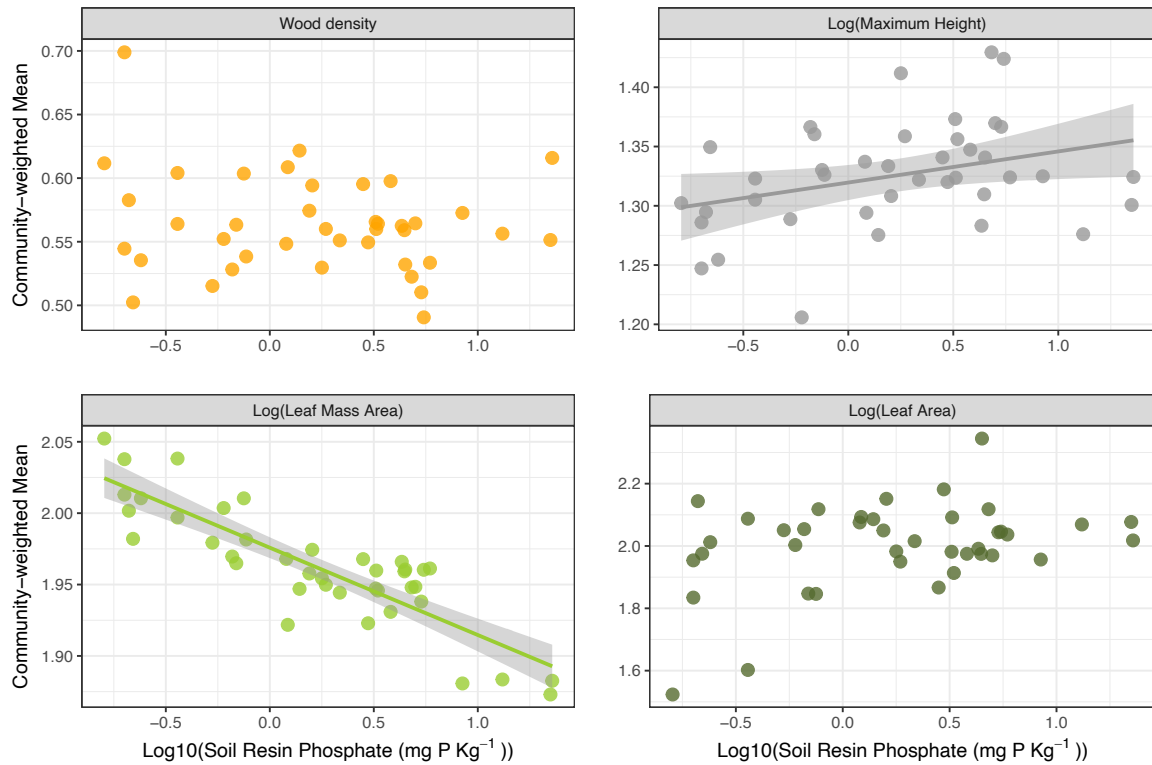


Figure S2. Relationship between community-weighted mean (CWM) trait values and soil resin P. This analysis includes the subset of sites for which abundance information was available (40 out of 72 sites). Units for traits are the same as in Figure S1. For the leaf mass per area plot, the sites represented by four dots in the bottom right corner are dominated by *Gustavia superba* (Lecythidaceae). Lines show significant relationships and shaded area indicates 95% confidence intervals ($\alpha = 0.05$).

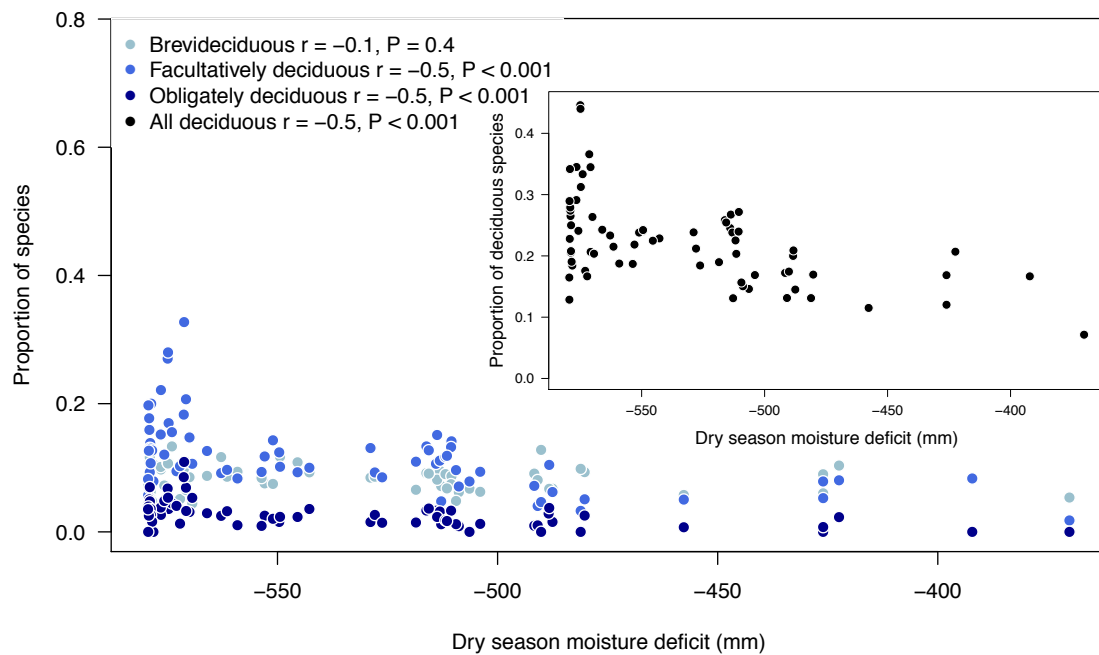


Figure S3. Proportion of deciduous species along the moisture gradient. Brevideciduous refers to species that drop their leaves for just a few weeks (i.e., *Anacardium excelsum*, *Jacaranda copaia*), facultatively deciduous refers to species that drop their leaves as the dry season intensifies, and obligately deciduous refers to species that drop their leaves at the beginning of the dry season and are deciduous throughout the dry season. The inset plot shows relationship between moisture and the proportion of deciduous species for all the deciduousness categories combined. The Pearson correlation coefficients (r) and p -values (P) are shown in the left corner of the figure. Deciduousness information is missing for two species: *Clidemia dentata* and *Pavonia dasypetala*.

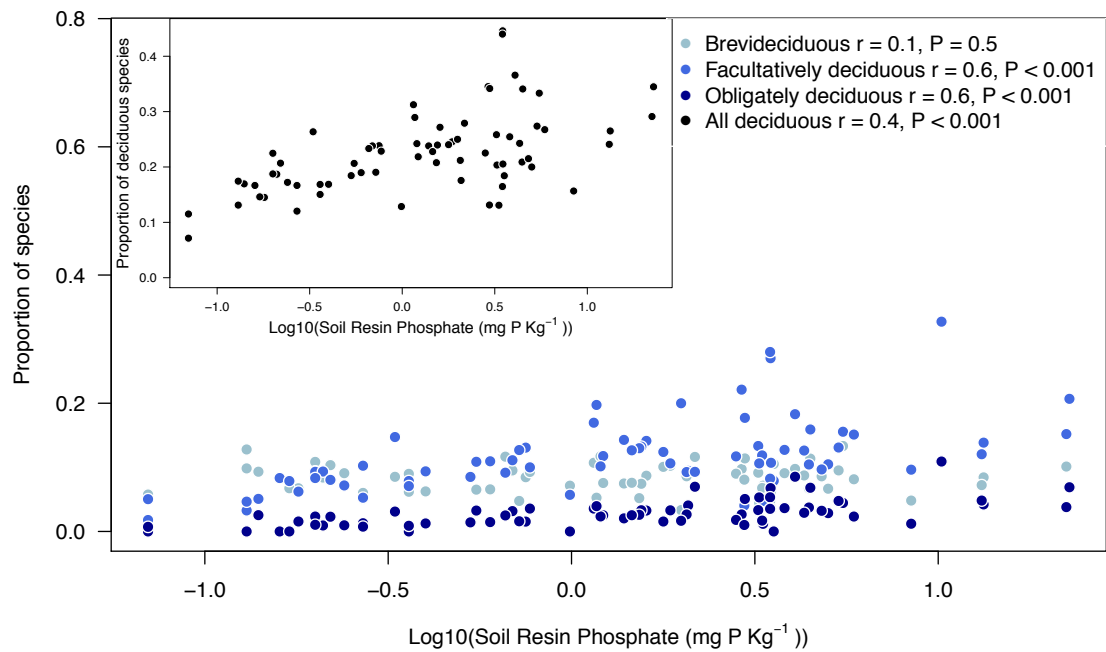


Figure S4. Proportion of deciduous species along the soil resin P gradient. Categories for deciduousness are the same as in Figure S3. The inset plot shows relationship between soil resin P and the proportion of deciduous species for all deciduousness categories combined. The Pearson correlation coefficients (r) and p-values (P) are shown in the right corner of the figure. Deciduousness information is missing for two species: *Clidemia dentata* and *Pavonia dasypetala*.

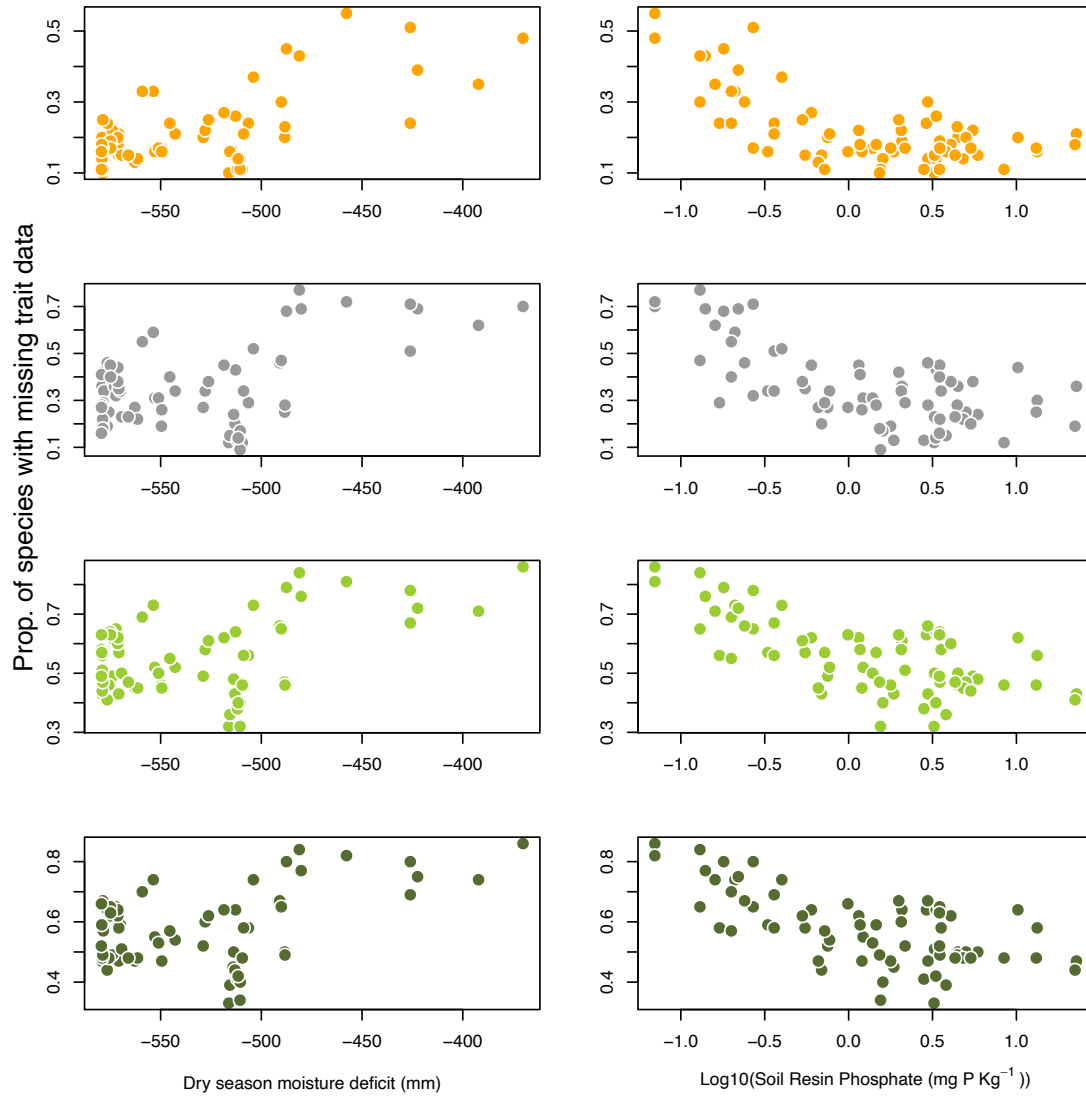


Figure S5. Relationships between proportion of species with missing trait data and rainfall and soil resin P. All relationships are significant ($\alpha = 0.05$).