

Ecosphere

Fate of N additions in a multiple resource-limited Mediterranean oak-savanna

Appendix S1

Kendalynn A. Morris\*, Richard Nair, Gerardo Moreno, Marion Schrumpf, Mirco Migliavacca

\*Corresponding author: [kmorris@bgc-jena.mpg.de](mailto:kmorris@bgc-jena.mpg.de)

**Table S1.** Summary of microbial  $^{15}\text{N}$  label recovery data across nutrient addition treatments, spatial location, and sampling campaign.  $N$  represents the number of replicates for which final values were obtained, max  $N = 6$ .

Treatment	Habitat	Sampling Campaign	$N_{\text{microbial}}$	$N_{\text{totalE}}$
N added	Open Pasture	March '17	6	6
		May '17	5	5
		October '17	5	5
		March '18	3	3
	Under Canopy	March '17	5	5
		May '17	6	6
		October '17	6	6
		March '18	5	6
N + P added	Open Pasture	March '17	6	6
		May '17	6	6
		October '17	6	6
		March '18	4	4
	Under Canopy	March '17	6	6
		May '17	6	6
		October '17	5	5
		March '18	4	6

**Table S2.**

Dependent Variable:	soil N			foliar N			root N			extractable N			microbial N		
	df	<i>F</i>	<i>p</i>	df	<i>F</i>	<i>p</i>	df	<i>F</i>	<i>p</i>	df	<i>F</i>	<i>p</i>	df	<i>F</i>	<i>p</i>
habitat	1,24	170.90	2.08E-12	1,24.7	41.99	9.22E-07	1,95	27.62	9.06E-07	1,23.7	25.47	3.81E-05	1,23.9	160.95	4.20E-12
trt	1,24	1.21	0.28204	1,24.7	4.24	0.05014	1,95	4.72	0.03223	1,23.7	0.01	0.908835	1,23.9	0.51	0.48055
campaign	3,72	9.71	1.85E-05	3,68.0	53.73	<2.20E-16	3,95	11.65	1.43E-06	3,71.1	15.08	1.08E-07	3,71.3	3.10	3.22E-02
habt. x trt.	1,24	0.03	0.85666	1,24.7	0.00	0.98362	1,95	0.68	0.41013	1,23.7	0.09	0.761318	1,23.9	0.88	0.35881
habt. x camp.	3,72	1.74	0.16738	3,68.0	2.78	0.04737	3,95	1.53	0.21093	3,71.1	5.09	0.002987	3,71.3	1.84	0.14704
trt x camp.	3,72	5.39	0.00211	3,68.0	0.04	0.98857	3,95	0.12	0.94741	3,71.1	1.25	0.298154	3,71.3	3.11	0.03155
habt. X trt x camp.	3,72	0.54	0.65522	3,68.0	0.56	0.646	3,95	2.29	0.08372	3,71.1	0.73	0.540002	3,71.3	0.34	0.7994

**Table S3.**

Dependent Variable:	total recovery			foliar recovery			root recovery		
	df	<i>F</i>	<i>p</i>	df	<i>F</i>	<i>p</i>	df	<i>F</i>	<i>p</i>
habitat	1,26.2	2.50	1.26E-01	1,26	7.11	1.30E-02	1,95	4.38	3.90E-02
trt	1,26.2	1.53	0.22752	1,26	0.03	0.85973	1,95	0.01	0.90994
campaign	3,69.1	8.97	4.28E-05	3,69.4	23.04	1.84E-10	3,95	12.24	7.56E-07
habt. x trt.	1,26.2	0.01	0.94091	1,26	0.10	0.75539	1,95	0.91	0.34279
habt. x camp.	3,69.1	5.95	0.00114	3,69.4	0.88	0.45457	3,95	8.89	2.95E-05
trt x camp.	3,69.1	2.21	0.09476	3,69.4	1.14	0.33859	3,95	1.44	0.2373
habt. X trt x camp.	3,69.1	1.90	0.13691	3,69.4	1.12	0.34575	3,95	0.51	0.67536
Dependent Variable:	soil recovery			extractable recovery			microbial recovery		
	df	<i>F</i>	<i>p</i>	df	<i>F</i>	<i>p</i>	df	<i>F</i>	<i>p</i>
habitat	1,24	0.03	8.71E-01	1,28.2	2.77	1.07E-01	1,20.5	0.00	9.59E-01
trt	1,24	0.93	0.345626	1,28.2	0.59	0.44883	1,20.5	2.93	0.10216
campaign	3,72	5.02	3.23E-03	3,64.1	44.43	1.19E-15	3,41.7	2.17	1.06E-01
habt. x trt.	1,24	0.24	0.62573	1,28.2	0.09	0.76483	1,20.5	6.36	0.02006
habt. x camp.	3,72	4.26	0.007894	3,64.1	3.42	0.02252	3,41.7	2.24	0.09725
trt x camp.	3,72	1.64	0.186849	3,64.1	0.90	0.44638	3,41.7	1.42	0.25148
habt. X trt x camp.	3,72	2.62	0.057033	3,64.1	0.28	0.8432	3,41.7	2.87	0.04781

**Table S4.** Atom percent excess  $^{15}\text{N}$  content of measured ecosystem components, values represent means  $\pm$  standard error with combined nutrient treatments, n = 12, except for foliar samples for fall where only 7 and 11 samples had sufficient plant material for processing in open grassland and under canopy plots respectively. Root and soil samples are from 0 - 5 cm depth.

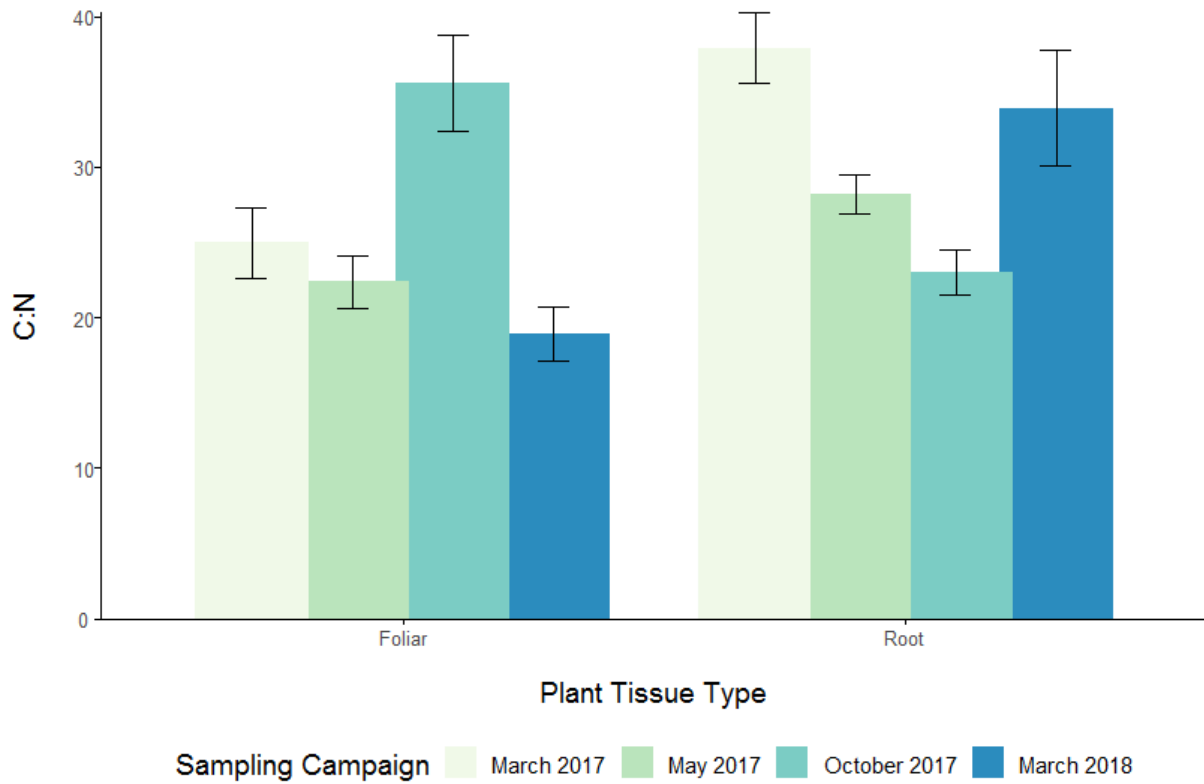
Habitat	Campaign	Foliar	Root	Soil	Total E	Microbial
Open Pasture	March '17	0.37 $\pm$ 0.05	0.11 $\pm$ 0.02	0.008 $\pm$ 0.001	0.08 $\pm$ 0.02	0.05 $\pm$ 0.01
	May '17*	0.20 $\pm$ 0.08	0.10 $\pm$ 0.03	0.008 $\pm$ 0.001	0.04 $\pm$ 0.01	0.03 $\pm$ 0.01
	October '17	0.13 $\pm$ 0.02	0.08 $\pm$ 0.01	0.013 $\pm$ 0.002	0.05 $\pm$ 0.01	0.04 $\pm$ 0.01
	March '18	0.05 $\pm$ 0.01	0.03 $\pm$ 0.01	0.008 $\pm$ 0.001	0.01 $\pm$ 0.01	0.02 $\pm$ 0.003
Under Canopy	March '17	0.20 $\pm$ 0.03	0.05 $\pm$ 0.01	0.005 $\pm$ 0.001	0.08 $\pm$ 0.01	0.05 $\pm$ 0.01
	May '17*	0.10 $\pm$ 0.01	0.03 $\pm$ 0.01	0.003 $\pm$ 0.0003	0.03 $\pm$ 0.01	0.03 $\pm$ 0.01
	October '17	0.04 $\pm$ 0.01	0.02 $\pm$ 0.003	0.004 $\pm$ 0.001	0.04 $\pm$ 0.02	0.02 $\pm$ 0.002
	March '18	0.05 $\pm$ 0.01	0.04 $\pm$ 0.01	0.005 $\pm$ 0.001	0.02 $\pm$ 0.004	0.01 $\pm$ 0.003

\*Half of the samples (distributed evenly across treatments) were collected on the 21<sup>st</sup>, the second half on the 22<sup>nd</sup> of May 2017.

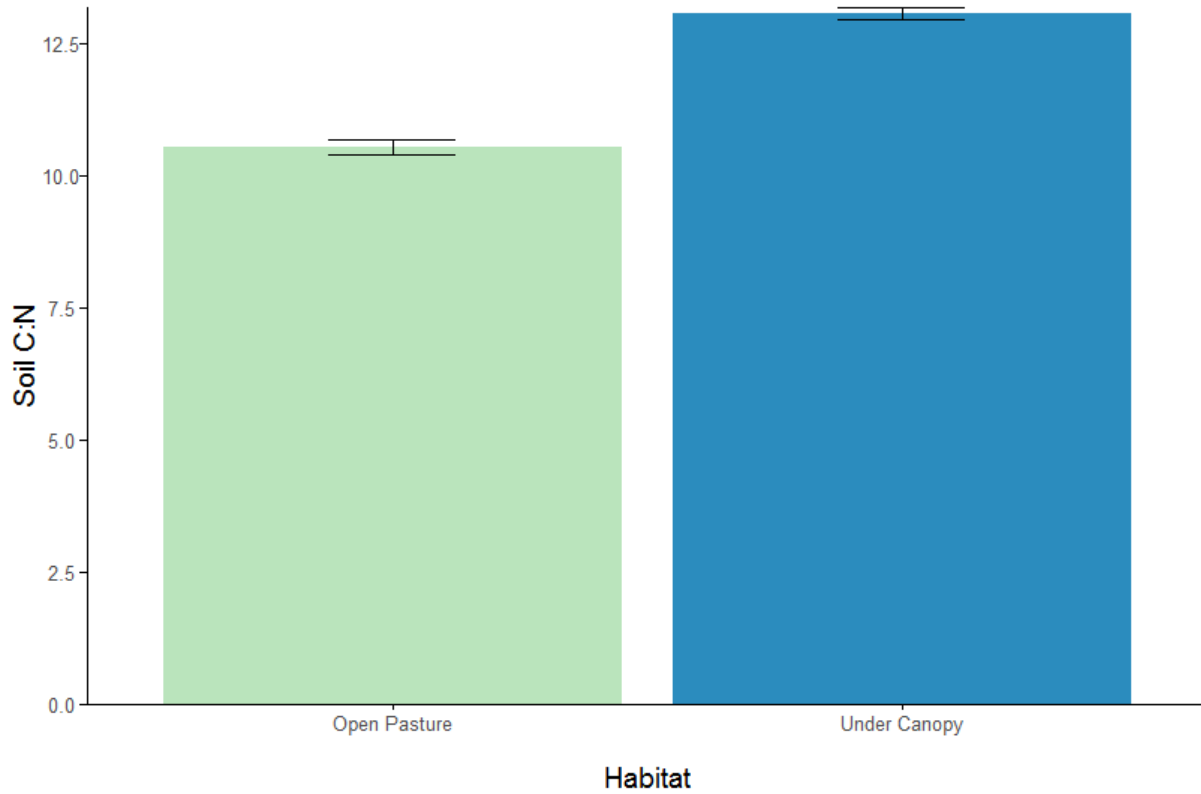
**Table S5.** Nitrogen content per unit area of measured ecosystem components, values represent means  $\pm$  standard error with combined nutrient treatments, n = 12, except for foliar samples for fall where only 7 and 11 samples had sufficient plant material for processing in open grassland and under canopy plots respectively. Root and soil samples are from 0 - 5 cm depth.

Habitat	Campaign	Foliar g N m <sup>-2</sup>	Root g N m <sup>-2</sup>	Soil g N m <sup>-2</sup>	Total Extractable g N m <sup>-2</sup>	Microbial g N m <sup>-2</sup>
Open Pasture	March '17	0.95 $\pm$ 0.08	2.06 $\pm$ 0.13	91 $\pm$ 7	3.2 $\pm$ 0.7	3.8 $\pm$ 0.4
	May '17*	1.07 $\pm$ 0.14	1.75 $\pm$ 0.12	79 $\pm$ 5	1.1 $\pm$ 0.1	3.1 $\pm$ 0.2
	October '17	0.47 $\pm$ 0.13	1.24 $\pm$ 0.16	96 $\pm$ 12	2.5 $\pm$ 0.3	4.0 $\pm$ 0.3
	March '18	2.22 $\pm$ 0.18	1.46 $\pm$ 0.18	63 $\pm$ 6	1.0 $\pm$ 0.1	2.8 $\pm$ 0.1
Under Canopy	March '17	1.15 $\pm$ 0.11	2.78 $\pm$ 0.17	196 $\pm$ 12	7.4 $\pm$ 1.6	6.7 $\pm$ 0.8
	May '17*	0.91 $\pm$ 0.04	2.15 $\pm$ 0.19	207 $\pm$ 28	3.2 $\pm$ 0.6	6.5 $\pm$ 1.0
	October '17	0.70 $\pm$ 0.04	1.99 $\pm$ 0.16	174 $\pm$ 16	2.2 $\pm$ 0.3	6.3 $\pm$ 0.6
	March '18	1.69 $\pm$ 0.12	2.41 $\pm$ 0.13	147 $\pm$ 12	1.4 $\pm$ 0.2	6.2 $\pm$ 0.6

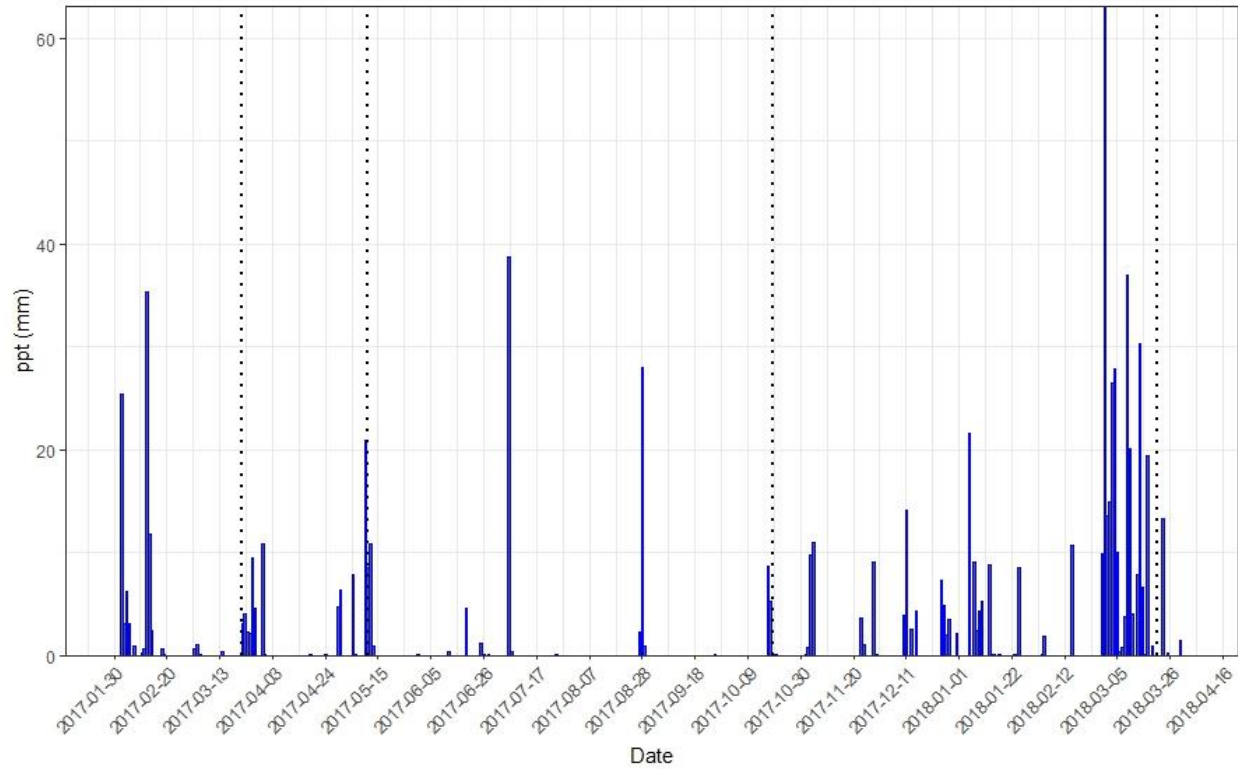
\*Half of the samples (distributed evenly across treatments) were collected on the 21<sup>st</sup>, the second half on the 22<sup>nd</sup>.



**Figure S1.** C to N ratio of plant foliage and roots over four sampling campaigns. There is an interaction between tissue type and time. Letters represent Tukey post-hoc groupings within a single material type. Data are means  $\pm$  se averaged over nutrient addition treatments and sampling campaigns, n = 6.



**Figure S2.** C to N ratio of 0-5 cm depth soil from open pasture and under canopy habitats of a dehesa. Under canopy soil has a significantly higher C:N than open pasture soil. Data are means  $\pm$  se averaged over nutrient addition treatments and sampling campaigns,  $n = 24$ .



**Figure S3.** Precipitation events over the course of the experiment, averaged from two gauges each approximately 0.5 km from the experimental plots. Dashed lines represent sampling campaigns.