

Supporting information- Phosphorus transformations during decomposition of wetland macrophytes

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9 Pages including 3 Figures and 6 Tables

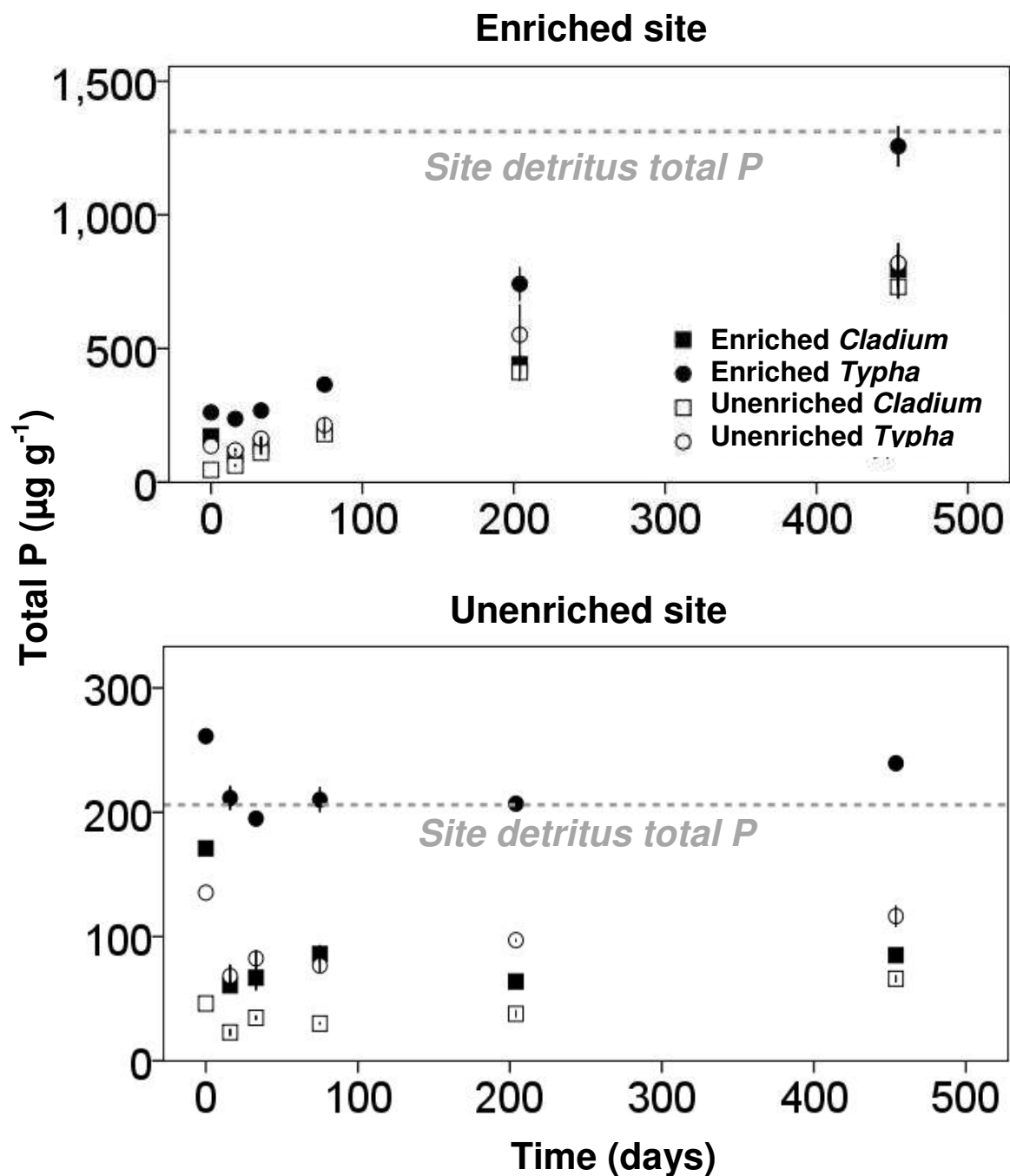


Figure S1. Changes in litter P concentration over time at enriched unenriched study sites. Symbols represent averages ($n=3$) with error bars showing one standard error.

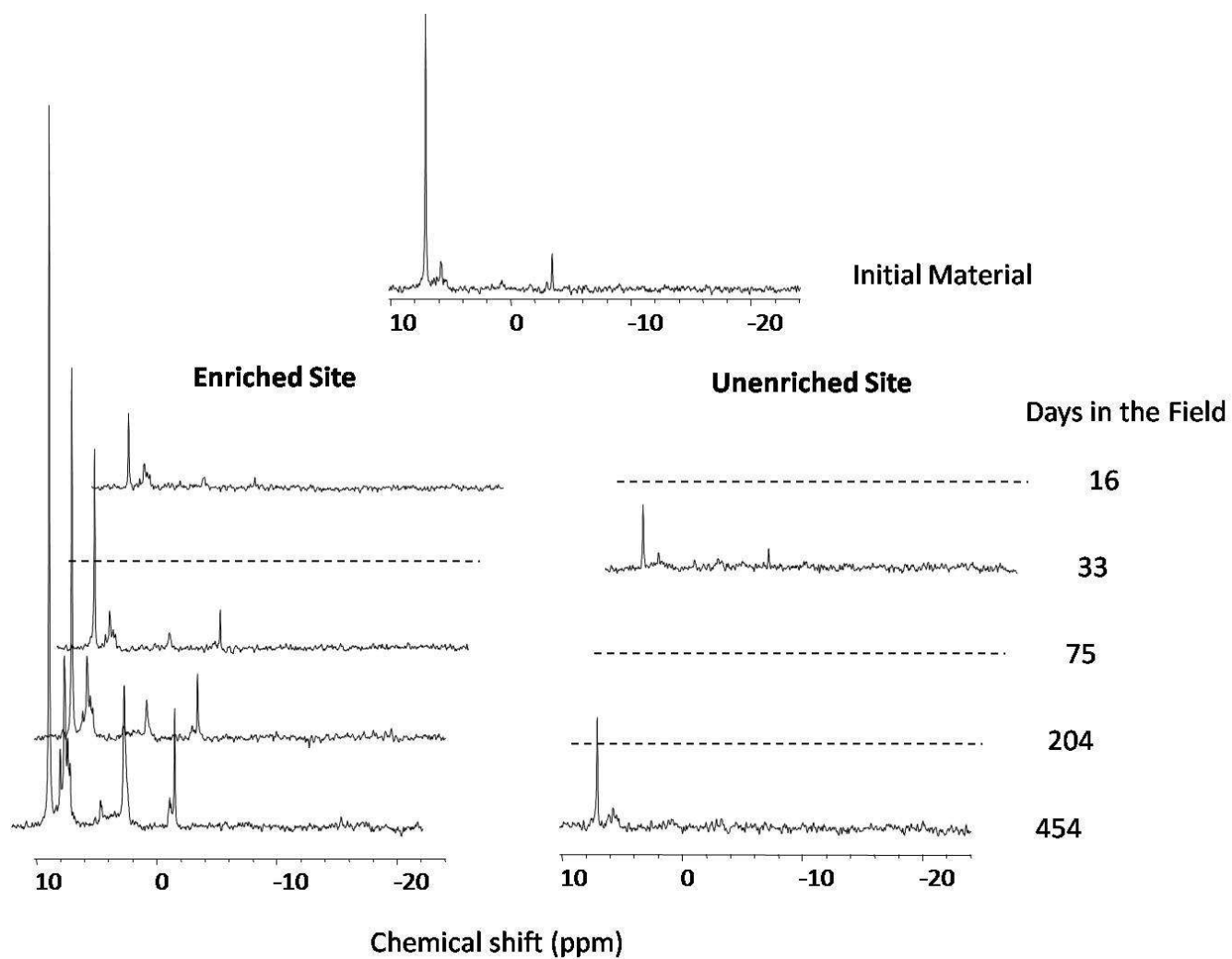


Figure S2. Solution ^{31}P NMR spectra showing changes in P composition of *Cladium* leaf litter, originally from the enriched site, during decomposition at both an unenriched and enriched site over 454 days in the field. Spectra plotted using 15 Hz line broadening and scaled to height of MDP.

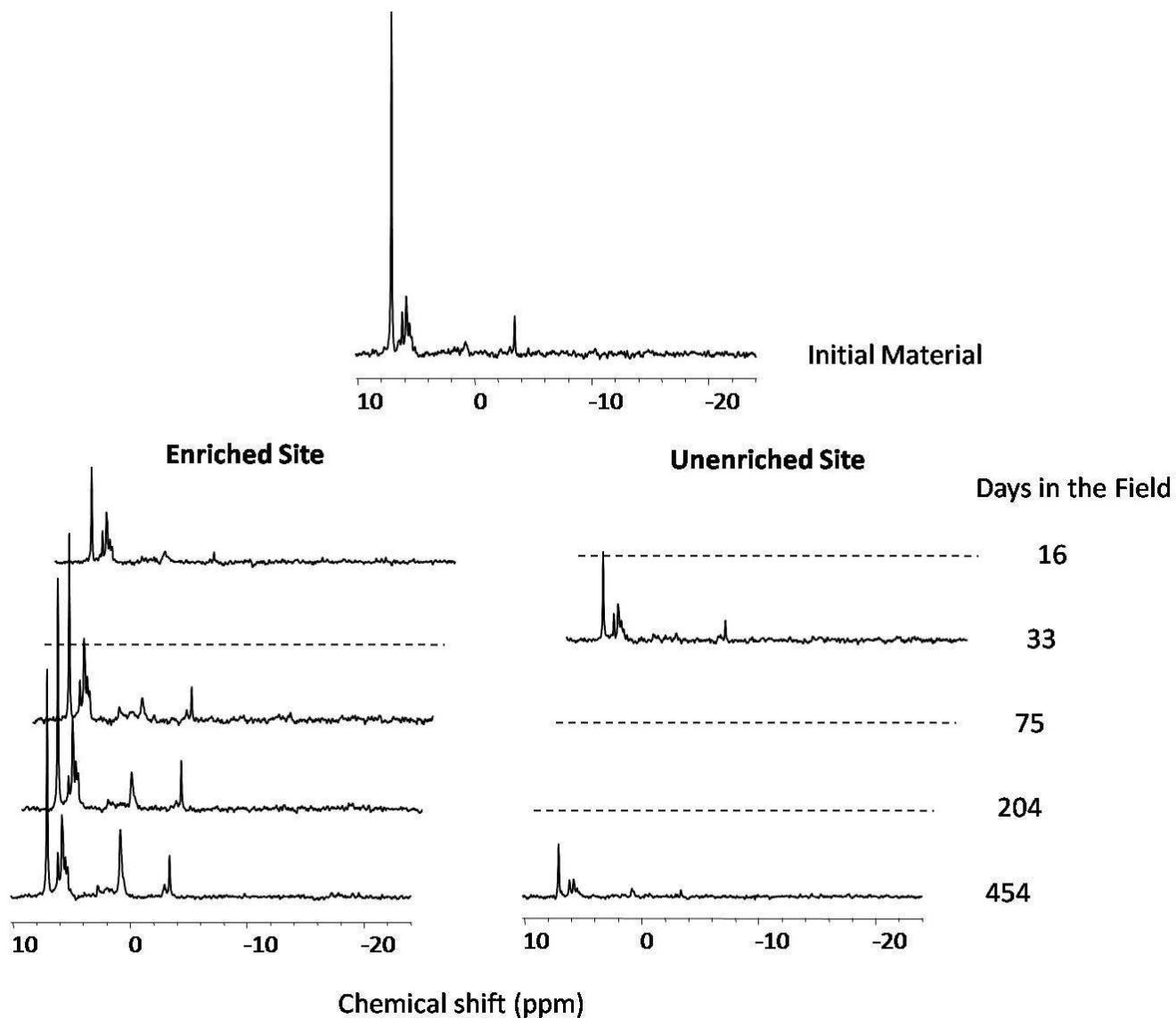


Figure S3. Solution ^{31}P NMR spectra showing changes in P composition of *Typha* leaf litter, originally from the enriched site, during decomposition at both an unenriched and enriched site over 454 days in the field. Spectra plotted using 15 Hz line broadening and scaled to height of MDP.

Table S1. Characterization of litter material used within the decomposition study, consisting of two species (*Cladium* and *Typha*) and collected from two locations (Unenriched (Un) and Enriched (En)).

	<i>Cladium</i>		<i>Typha</i>	
	Un	En	Un	En
Organic matter [†] (%)	91.8	93.7	95.6	95.6
Total C (mg g ⁻¹)	414	409	431	432
Total N (mg g ⁻¹)	4.1	3.8	4.5	5.4
Total P (µg g ⁻¹)	46.1	171.0	135.4	261.2
Molar C:P	23200	6179	8223	4273
Forage Analysis (Ankom A200)				
Neut. Det Extractable [‡] (%)	25	22	30	30
Hemi-cellulose (%)	29	33	23	25
Cellulose (%)	35	36	37	37
Lignin (%)	8.6	8.1	9.1	7.6

[†] Estimate from loss on ignition at 550° C for 4 h

[‡] Neutral-detergent extractable

Table S2. Four-way univariate ANOVA for mass remaining. Full factorial model adjusted $R^2 = 0.973$. Source and species of litter (litter quality) as well as site of decomposition and time in the field all shown to be highly significant ($P < 0.001$). With litter quality parameters and site showing significant interactions with time.

Source of variation	DF	F	<i>P</i> -value	Partial η^2
Site (S)	1	57.9	<0.001	0.420
Time (T)	4	931.8	<0.001	0.979
Source (So)	1	74.3	<0.001	0.482
Species (Sp)	1	129.0	<0.001	0.617
T x S	4	34.2	<0.001	0.631
T x So	4	5.4	0.01	0.213
T x Sp.	4	23.3	<0.001	0.538
So x Sp	1	7.1	0.009	0.082

Table S3. Simple exponential decay rate constant ($x = 100e^{-kt}$) and leaf litter half life calculated from material recovered over the course of 15 months within WCA-2A (n=15).

Site	Litter type		k	R ²	T _{1/2} (days)
Enriched	<i>Cladium</i>	Enriched	0.00172	0.965	403
		Unenriched	0.00148	0.924	468
	<i>Typha</i>	Enriched	0.00275	0.943	253
		Unenriched	0.00202	0.918	343
Unenriched	<i>Cladium</i>	Enriched	0.00118	0.896	587
		Unenriched	0.00093	0.904	745
	<i>Typha</i>	Enriched	0.00207	0.960	335
		Unenriched	0.00136	0.954	510

Table S4. Four way Univariate ANOVA of P concentration in leaf litter. Model adjusted $R^2 = 0.947$. Source and species of litter (litter quality) as well as site of decomposition and time in the field all shown to be highly significant.

Source of variation	df	F	<i>p</i> value	Partial eta ²
Site (S)	1	2169.4	<0.001	0.966
Time (T)	4	302.4	<0.001	0.940
Source (So)	1	438.8	<0.001	0.851
Species (Sp)	1	759.2	<0.001	0.908
S x T	4	130.4	<0.001	0.871
S x So	1	77.0	<0.001	0.500
S x Sp	1	86.0	<0.001	0.527
T x So	4	11.0	<0.001	0.363
T x Sp	4	5.6	<0.001	0.226
So x Sp	1	22.3	<0.001	0.225

Table S5. Linear regression ($y = Bx + c$) of changes in mass of P within litterbags held in the field for between 33 and 454 days.

Site	Litter type		B ($\mu\text{g P g}^{-1} \text{ day}^{-1}$)	R ²	p value
Enriched	<i>Cladium</i>	Enriched	0.637	0.873	0.000
		Unenriched	0.685	0.950	0.000
	<i>Typha</i>	Enriched	0.447	0.795	0.000
		Unenriched	0.566	0.770	0.000
Unenriched	<i>Cladium</i>	Enriched	-0.036	0.201	0.143
		Unenriched	0.037	0.726	0.001
	<i>Typha</i>	Enriched	-0.175	0.851	0.000
		Unenriched	-0.014	0.050	0.248

Table S6. Phosphorus forms as determined by solution ^{31}P NMR spectroscopy of two species (*Typha* and *Cladium*) of litter material collected from the enriched site and tracked over the course of 454 days of decomposition at both an enriched and unenriched site within WCA-2A.

Site	Species	Time (days)	Total P ($\mu\text{g P g}^{-1}$)	Phosphonate	Orthophosphate	Phosphomonoesters	DNA	Other Phosphodiester	Pyrophosphate	Polyphosphate	Residual
% Total P											
Enriched	<i>Cladium</i>	0	171		35	13	3	1	3		46
		16	104		27	26	2	2	1		42
		75	187		24	17	4	2	5		49
		204	441		19	14	4	3	4		57
		454	795		20	16	10	5	4		45
	<i>Typha</i>	0	261	0.3	39	23	5	4	6		25
		16	237		18	33	2	12	1	2.4	35
		75	365		15	22	5	5	3		50
		204	742		11	13	4	3	3		67
		454	1257		12	15	8	4	4		57
Unenriched	<i>Cladium</i>	0	171		35	13	3	1	3		46
		33	67		33	15	1	9	14		28
		454	85		29	29	7	5	0		29
	<i>Typha</i>	0	261		39	23	5	4	6		25
		33	195		19	30	1	5	4		41
		454	239		16	18	4	1	2		59