Supplementary Information for

Periphyton phosphorus uptake in response to dynamic concentrations in streams: Assimilation and changes to intracellular speciation

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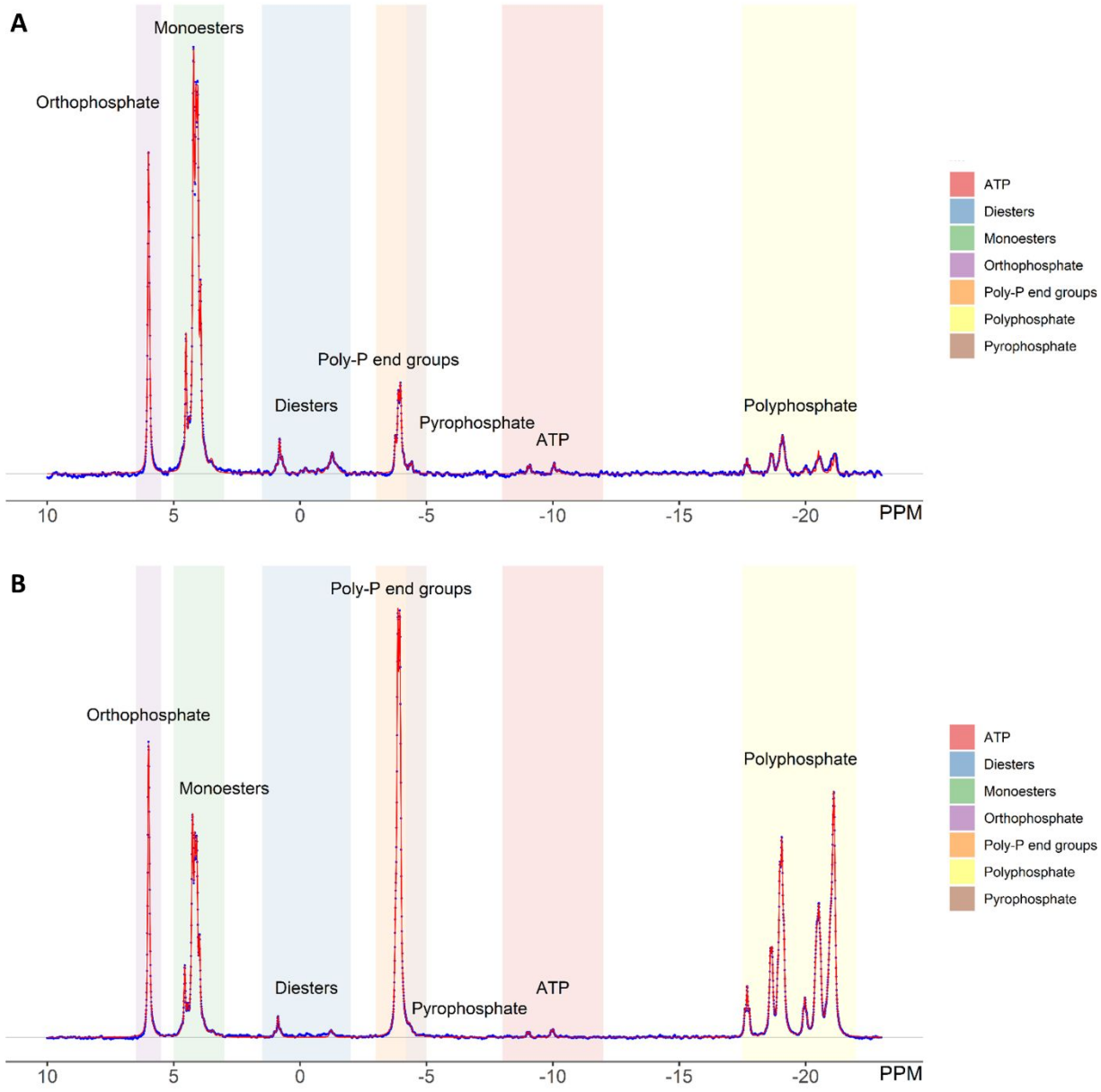

Figure S1.

Examples of ^{31}P NMR spectra obtained from periphyton sampled 1-day after receiving 48 hour experimental P pulses. "A" was obtained from periphyton that received a pulse of 25 µg L^{-1} SRP, "B" was obtained from periphyton that received a pulse of 700 µg L^{-1} SRP. P compound assignments are shown with colored panels. Raw data are shown with blue circles, the sum of fitted peaks is shown with a solid red line.

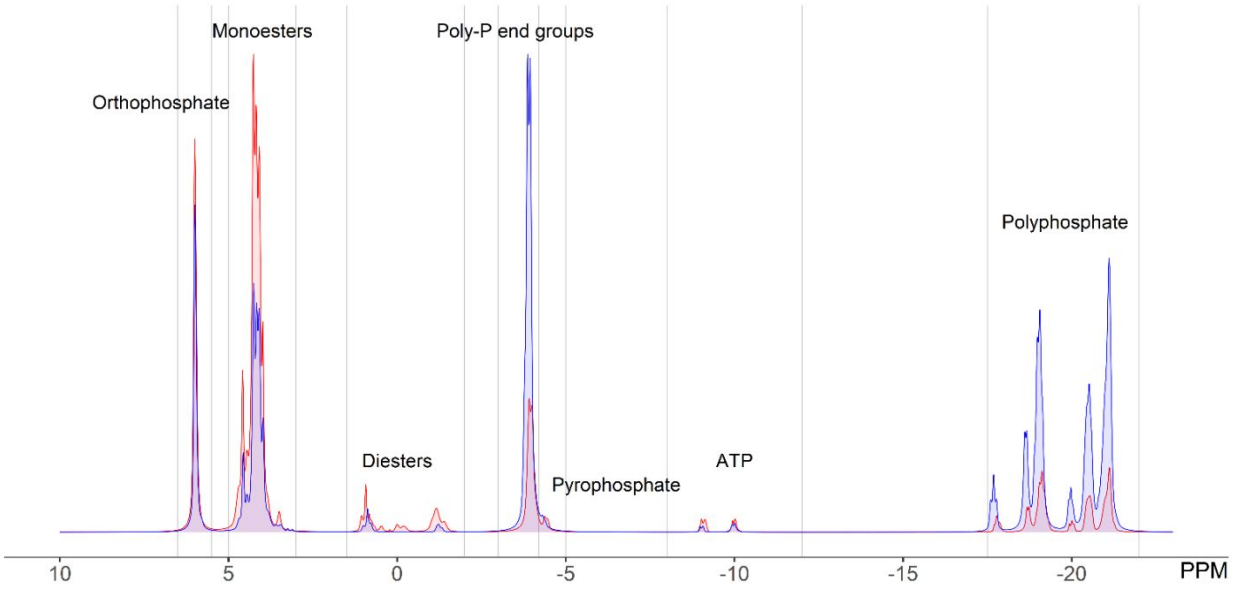

Figure S2.

Comparison of ^{31}P NMR spectra, normalized by total P concentration, obtained 1 and 10 days after a 48-hour experimental pulse of 700 µg L^{-1} SRP (blue and red, respectively).

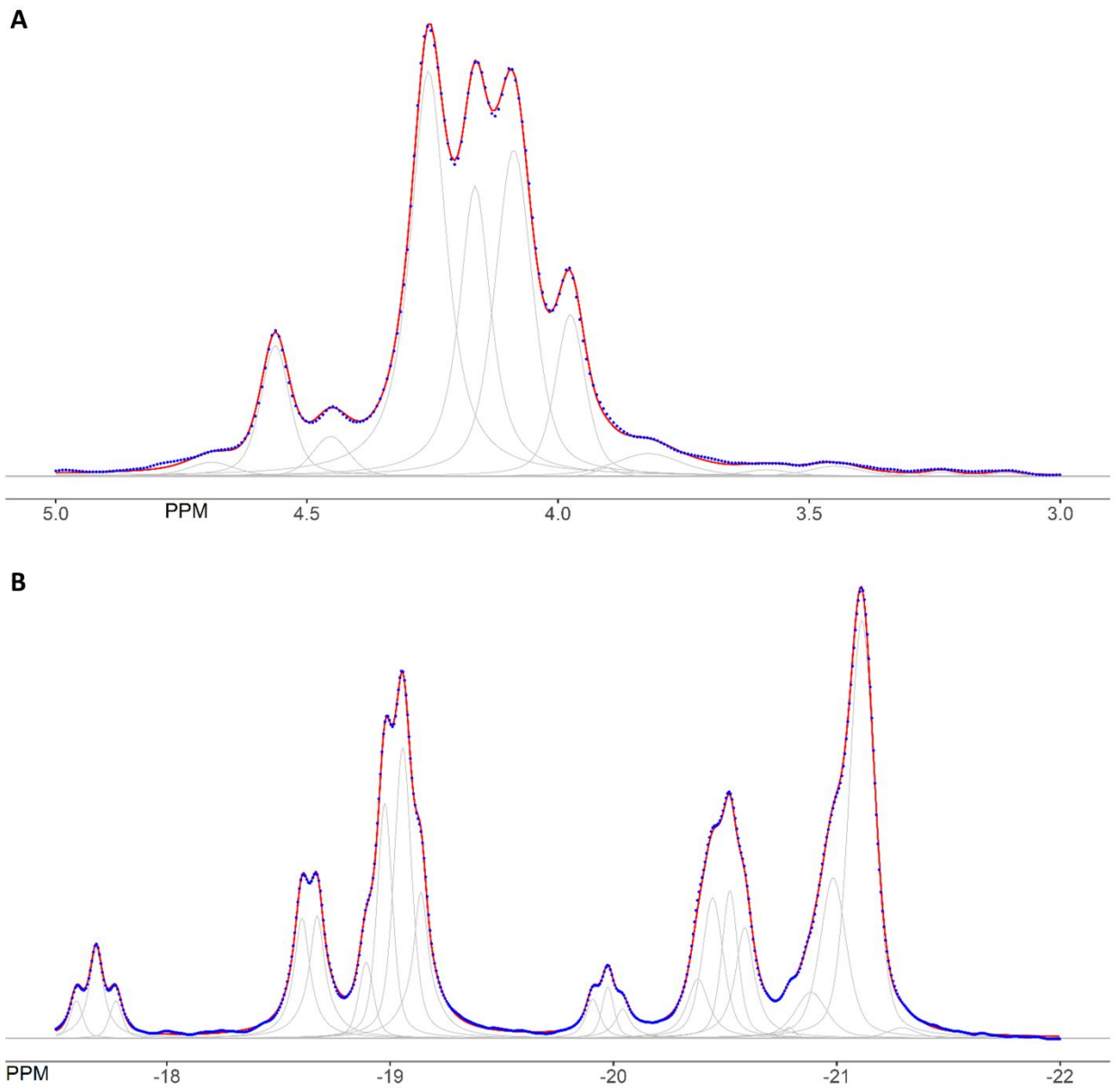

Figure S3.

Examples of fitting for regions of ^{31}P NMR spectra obtained 1-day after a 48-hour experimental pulse of 700 µg L^{-1} SRP. "A" corresponds to the monoester-P region, "B" corresponds to the polyphosphate region. Raw data are shown with blue circles, the sum of fitted peaks is shown with a solid red line.

Table S1.

Location, total phosphorus (TP), and total nitrogen (TN) status of streams used to inoculate artificial streams. Values represent average concentrations based on available data from the Ontario Provincial Water Quality Monitoring Network.

Stream Name	Location	Strahler Order	TP (mg L^{-1})	TN (mg L^{-1})
Medway Creek	43.013107, -81.280427	5	0.020	3.33
Waubuno Creek	42.994523, -81.116698	4	0.025	4.39
Reynolds Creek	42.969076, -80.949771	4	0.191	3.10
Middle Thames	43.031385, -80.998540	6	0.046	4.17
South Thames	43.018638, -80.92706	5	0.122	4.99
South Thames	43.126534, -80.779388	5	0.158	5.38

Table S2.

Strength of periphyton phosphorus content regression models for samples collected 1-day before (Before), 1-day after (After), and 10-days after (End) experimental P additions. Second order Akaike's information criteria values (AICc), AICc differences relative to the best model (ΔAICc), AICc weights (AICw), log-likelihood values (LL), number of estimated parameters (k), and residual deviance (Residual Dev.) are shown for each model. Bolded text represents the most plausible model.

P Content	Model	k	LL	AICc	ΔAICc	AICw	Residual Dev.
Before	**Null**	**2**	**25.81**	**-45.62**	**0.00**	**0.73**	**1.70×10^{-3}**
	Linear	3	27.17	-43.55	2.07	0.26	1.26×10^{-3}
	Asymptotic	4	27.25	-36.50	9.12	< 0.01	1.24×10^{-3}
	Logistic	4	27.26	-36.52	9.10	< 0.01	1.23×10^{-3}
After	Null	2	2.23	1.55	26.02	< 0.01	3.21×10^{-1}
	Linear	3	13.58	-16.36	8.12	0.02	2.58×10^{-2}
	Asymptotic	4	17.24	-16.49	7.99	0.02	1.14×10^{-2}
	Logistic	**4**	**21.24**	**-24.48**	**0.00**	**0.97**	**4.70×10^{-3}**
End	Null	2	9.81	-13.62	25.30	< 0.01	5.96×10^{-2}
	Linear	**3**	**24.86**	**-38.92**	**0.00**	**0.73**	**2.10×10^{-3}**
	Asymptotic	4	27.18	-36.36	2.56	0.20	1.25×10^{-3}
	Logistic	4	26.01	-34.02	4.90	0.06	1.63×10^{-3}
P Uptake							
After – Before	Null	2	-0.50	7.00	14.95	< 0.01	5.89×10^{-1}
	Linear	3	9.08	-7.36	0.59	0.36	7.00×10^{-2}
	Asymptotic	4	11.81	-5.62	2.33	0.15	3.82×10^{-2}
	Logistic	**4**	**12.98**	**-7.95**	**0.00**	**0.49**	**2.95×10^{-2}**
End – After	**Null**	**2**	**20.62**	**-35.23**	**0.00**	**0.89**	5.40×10^{-3}
	Linear	3	20.89	-30.99	4.25	0.11	5.07×10^{-3}
	Asymptotic	4	20.48	-22.96	12.27	< 0.01	5.56×10^{-3}
	Logistic	4	19.07	-20.15	15.09	< 0.01	7.61×10^{-3}

Table S3.

Strength of periphyton phosphorus species regression models for samples collected 1-day after (After), and 10-days after (End) experimental P additions. Second order Akaike's information criteria values (AICc), AICc differences relative to the best model (ΔAICc), AICc weights (AICw), log-likelihood values (LL), number of estimated parameters (k), and residual deviance (Residual Dev.) are shown for each model. Bolded text represents the most plausible model.

Poly-P	Model	k	LL	AICc	ΔAICc	AICw	Residual Dev.
After	Null	2	4.05	-2.10	27.70	< 0.01	2.14×10^{-1}
	Linear	3	18.98	-27.16	2.63	0.13	7.76×10^{-3}
	Asymptotic	4	23.72	-29.43	0.36	0.40	2.71×10^{-3}
	Logistic	**4**	**23.90**	**-29.79**	**0.00**	**0.48**	**2.60×10^{-3}**
End	Null	2	19.14	-32.28	36.80	< 0.01	7.49×10^{-3}
	Linear	**3**	**39.94**	**-69.08**	**0.00**	**0.91**	**7.36×10^{-5}**
	Asymptotic	4	39.63	-61.26	7.82	0.02	7.89×10^{-5}
	Logistic	4	41.06	-64.12	4.96	0.08	5.74×10^{-5}
Ortho-P							
After	Null	2	25.43	-44.86	8.52	< 0.01	1.85×10^{-3}
	Linear	**3**	**32.09**	**-53.38**	**0.00**	**0.65**	**4.21×10^{-4}**
	Asymptotic	4	33.79	-49.57	3.81	0.10	2.89×10^{-4}
	Logistic	4	34.69	-51.39	1.99	0.24	2.23×10^{-4}
End	Null	2	27.33	-48.66	14.07	< 0.01	1.21×10^{-3}
	Linear	**3**	**36.76**	**-62.72**	**0.00**	**0.94**	**1.49×10^{-4}**
	Asymptotic	4	36.85	-55.70	7.02	0.03	1.46×10^{-4}
	Logistic	4	36.91	-55.82	6.90	0.03	1.44×10^{-1}
Diesters							
After	**Null**	**2**	**41.79**	**-77.79**	**0.00**	**0.91**	**4.88×10^{-5}**
	Linear	3	41.83	-72.88	4.71	0.09	4.83×10^{-5}
	Asymptotic	4	42.15	-66.29	11.30	< 0.01	4.51×10^{-5}
	Logistic	4	42.36	-66.72	10.86	< 0.01	4.30×10^{-5}
End	Null	2	33.51	-61.01	1.54	0.14	3.08×10^{-4}
	Linear	**3**	**36.68**	**-62.56**	**0.00**	**0.31**	**1.52×10^{-4}**
	Asymptotic	4	40.12	-62.25	0.31	0.27	7.07×10^{-5}
	Logistic	4	40.19	-62.37	0.19	0.28	6.97×10^{-5}
Monoesters							
After	**Null**	**2**	**19.74**	**-33.49**	**0.00**	**0.53**	**6.55×10^{-3}**
	Linear	3	21.93	-33.06	0.43	0.43	4.03×10^{-3}
	Asymptotic	4	19.66	-21.31	12.18	< 0.01	6.68×10^{-3}
	Logistic	4	22.98	-27.97	5.52	0.03	3.19×10^{-3}
End	Null	2	16.92	-27.84	17.50	< 0.01	1.23×10^{-2}
	Linear	**3**	**28.07**	**-45.34**	**0.00**	**0.60**	**1.03×10^{-3}**
	Asymptotic	4	30.92	-43.83	1.51	0.28	5.47×10^{-4}
	Logistic	4	30.07	-42.14	3.20	0.12	6.60×10^{-4}

middle:end Poly-P							
After	Null	2	0.36	5.29	3.53	0.10	7.93×10^{-1}
	Linear	**3**	**4.52**	**1.76**	**0.00**	**0.61**	**1.19×10^{-1}**
	Asymptotic	4	6.70	4.60	2.84	0.15	1.12×10^{-1}
	Logistic	4	6.65	4.70	2.94	0.14	1.20×10^{-1}
End	Null	2	-1.84	9.68	8.14	< 0.01	4.87×10^{-1}
	Linear	3	3.70	3.39	1.85	0.19	2.31×10^{-1}
	Asymptotic	**4**	**8.23**	**1.54**	**0.00**	**0.48**	**8.46×10^{-2}**
	Logistic	4	7.85	2.29	0.75	0.33	9.12×10^{-2}

Table S4.

Strength of periphyton biomass regression models measured as chlorophyll-a (Chl a), ash-free dry-mass (AFDM), and autotrophic index (AI) for samples collected 1-day before (Before), 1-day after (After), and 10-days after (End) experimental P additions. Second order Akaike's information criteria values (AICc), AICc differences relative to the best model (ΔAICc), AICc weights (AICw), log-likelihood values (LL), number of estimated parameters (k), and residual deviance (Residual Dev.) are shown for each model. Bolded text represents the most plausible model.

Chl *a*	Model	k	LL	AICc	ΔAICc	AICw	Residual Dev.
Before	**Null**	**2**	**-10.06**	**26.13**	**0.00**	**0.90**	**4.93**
	Linear	3	-9.90	30.61	4.48	0.10	4.76
	Asymptotic	4	-11.06	40.12	13.99	< 0.01	4.87
	Logistic	4	-9.98	37.95	11.82	< 0.01	4.80
After	**Null**	**2**	**-9.55**	**25.11**	**0.00**	**0.87**	**4.40**
	Linear	3	-9.08	28.96	3.85	0.13	3.96
	Asymptotic	4	-9.58	37.15	12.05	< 0.01	4.43
	Logistic	4	-9.24	36.48	11.37	< 0.01	4.11
End	Null	2	-19.49	44.98	8.87	< 0.01	40.08
	Linear	**3**	**-12.66**	**36.11**	**0.00**	**0.77**	**8.78**
	Asymptotic	4	-11.03	40.06	3.94	0.11	6.11
	Logistic	4	-11.00	40.00	3.88	0.11	6.07
AFDM							
Before	**Null**	**2**	**10.52**	**-15.05**	**0.00**	**0.81**	**5.08 x10^{-2}**
	Linear	3	11.45	-12.10	2.95	0.19	4.14 x10^{-2}
	Asymptotic	4	10.85	-3.70	11.35	< 0.01	4.73 x10^{-2}
	Logistic	4	10.25	-2.50	12.55	< 0.01	5.40 x10^{-2}
After	**Null**	**2**	**4.12**	**-2.25**	**0.00**	**0.90**	**2.11 x10^{-1}**
	Linear	3	4.27	2.25	4.50	0.09	2.04 x10^{-1}
	Asymptotic	4	4.19	9.63	11.88	< 0.01	2.08 x10^{-1}
	Logistic	4	3.76	10.47	12.72	< 0.01	2.28 x10^{-1}
End	Null	2	-2.28	10.56	0.54	0.42	8.75 x10^{-1}
	Linear	**3**	**0.39**	**10.02**	**0.00**	**0.55**	**4.83 x10^{-1}**
	Asymptotic	4	0.64	16.71	6.69	0.02	4.57 x10^{-1}
	Logistic	4	0.66	16.67	6.65	0.02	4.55 x10^{-1}