

Supplementary Materials

# Sediment Nutrient Flux Rates in a Shallow, Turbid Lake Are More Dependent on Water Quality Than Lake Depth

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Table S1. Water quality parameters by month, depth, and site.

Month	Depth	Site	Depth (m)	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)	Secchi Depth (cm)	Ni-trate (µg/L)	SRP (µg/L)	Total Nitrogen (µg/L)	Total Phosphorus (µg/L)	Water Chlorophyll (µg/L)	Water AFDM (g/L)
April		1		21.65	180	6.49	7.46	166.3	7	1041.9	233.6	2456.4	676.1	29.3	0.100
		2		22.71	177	5.9	7.44	221.8	7.5	1623.1	191.3	2539.7	668.8	4.7	0.173
	Surface	3		22.3	178	6.48	7.34	242.8	7	1623.1	139.2	2539.7	544.5	8.9	0.200
		4		21.59	174	6.02	7.18	251.7	6	1623.1	101.1	2872.8	565.3	5	0.160
		5		20.75	171	5.33	7.4	280	7.5	1448.7	124.5	2539.7	673.4	3.9	0.180
	Mid	1		21.06	177	5.04	7.38	170.2	-	867.5	107.5	2664.6	714.8	16.8	0.117
		2		21.65	174	4.84	7.37	224.2	-	1390.6	138.9	2581.3	563.4	4.9	0.000
		3		21.41	174	4.98	7.11	247.8	-	1332.5	150.9	2706.2	565	6	0.143
		4		21.32	171	5.33	7.14	252.5	-	1739.3	187.9	2747.9	636.1	9.2	0.064
		5		20.71	168	5.22	7.34	282.1	-	1623.1	100	2872.8	552.8	5.9	0.220
	Bottom	1	1.0	20.23	177	3.7	7.31	174.2	-	693.2	304.5	2414.7	833.1	14.3	0.060
		2	1.4	19.82	170	2.9	7.31	227.8	-	1506.9	163	2664.6	819.5	4.6	0.253
		3	1.4	20.75	170	2.45	7.2	249.4	-	1565	148.3	2872.8	776.9	5	0.187
		4	1.4	20.57	171	4.6	7.12	255	-	1681.2	167.2	2456.4	811.6	4.5	0.182
		5	0.9	20.73	170	5.26	7.27	273.5	-	1681.2	116.2	2747.9	602.7	2.1	0.184
	Surface	1		22.19	102	5.47	7.51	181.4	6	1390.6	49.8	2498	542.9	5.4	0.340
		2		23.1	97	6.03	7.56	176	7.5	1739.3	70.9	2581.3	667.8	15.2	0.360
		3		22.84	98	6.23	7.6	178.4	6	1506.8	78.1	2738.8	622.3	11.4	0.360
		4		22.31	94	6.11	7.62	181.3	5	1623.1	81.1	2738.8	676.9	10.6	0.320
		5		21.41	96	5.95	7.84	150.2	3.5	1623.1	78.9	2920.7	624.2	16.2	0.320
Mid	1		21.85	102	5.14	7.45	180.7	-	1158.1	55.8	2414.7	671.5	2.8	0.380	
	2		22.29	96	5.4	7.5	176.6	-	1564.9	72.1	2498	671.5	8.7	0.360	
	May	3		22.38	96	5.53	7.52	180.7	-	1681.2	84.1	2920.7	670.1	8.1	0.340
		4		22.14	97	5.82	7.55	180.5	-	1681.2	81.9	2738.8	642.9	8.8	0.360
		5		21.42	94	5.82	7.65	142.6	-	1739.3	80	2693.3	663.4	18.5	0.340
Bottom	1	0.9	21.5	102	5	7.59	181.3	-	1158.1	65.7	2373.1	834.4	11.3	0.440	
	2	1.2	22.03	96	5.3	7.43	177	-	1506.8	92.4	3011.7	663	8.1	0.360	
	3	1.3	22.28	97	5.34	7.48	181.1	-	1739.3	85.7	2875.2	676.9	8.5	0.360	
	4	1.1	22.17	95	5.78	7.52	179.8	-	1681.2	82.6	2784.3	607	10.4	0.360	
	5	0.7	21.42	96	5.81	7.59	143.2	-	1797.4	84.9	2602.4	679.8	14.9	0.380	
	1		26	103	4.6	7.59	197.6	5	576.9	67.2	1829.1	500.1	5.2	0.180	
	2		26.76	105	4.69	7.96	177.7	6	693.2	74.7	2011.1	422.7	8.2	0.180	

Surface	3		26.68	97	5.15	7.79	188.8	7	751.3	69.8	1965.6	497.5	3.9	0.180
	4		26.76	102	5.6	7.81	205.6	7	635.1	64.1	1915.1	509.2	5.1	0.160
	5		26.74	107	5.17	7.84	189.9	6	809.4	70.6	2081.6	512.8	13.3	0.040
	1		25.53	103	4.39	7.54	192.8	-	809.4	61.1	2102.1	442.2	12.6	0.200
Mid	2		26.06	104	4.98	7.82	182.7	-	576.9	72.8	2011.1	441	9.2	0.180
June	3		26.22	99	4.97	7.67	190.1	-	809.4	62.6	2056.5	490.7	7.3	0.160
	4		26.74	102	5.45	7.7	205.2	-	693.2	64.1	1965.6	428.7	7.9	0.180
	5		26.59	106	5.16	7.74	190.6	-	809.4	55.5	2123.2	503.2	12.6	0.180
	1	0.9	25.2	102	3.9	7.47	188.9	-	576.9	58.1	1920.1	513.5	8.9	0.200
	2	1.2	25.88	103	4.6	7.69	187.1	-	635.1	49.4	1874.6	593.5	7.3	0.160
Bottom	3	1.2	26.15	99	4.82	7.59	192	-	693.2	54.7	1920.1	427.2	7	0.180
	4	1.1	26.58	100	5.26	7.64	203.7	-	635.1	67.2	1998.3	448.3	8.8	0.160
	5	0.8	26.51	107	5.08	7.68	190.1	-	635.1	66	2414.7	441.4	3.2	0.160

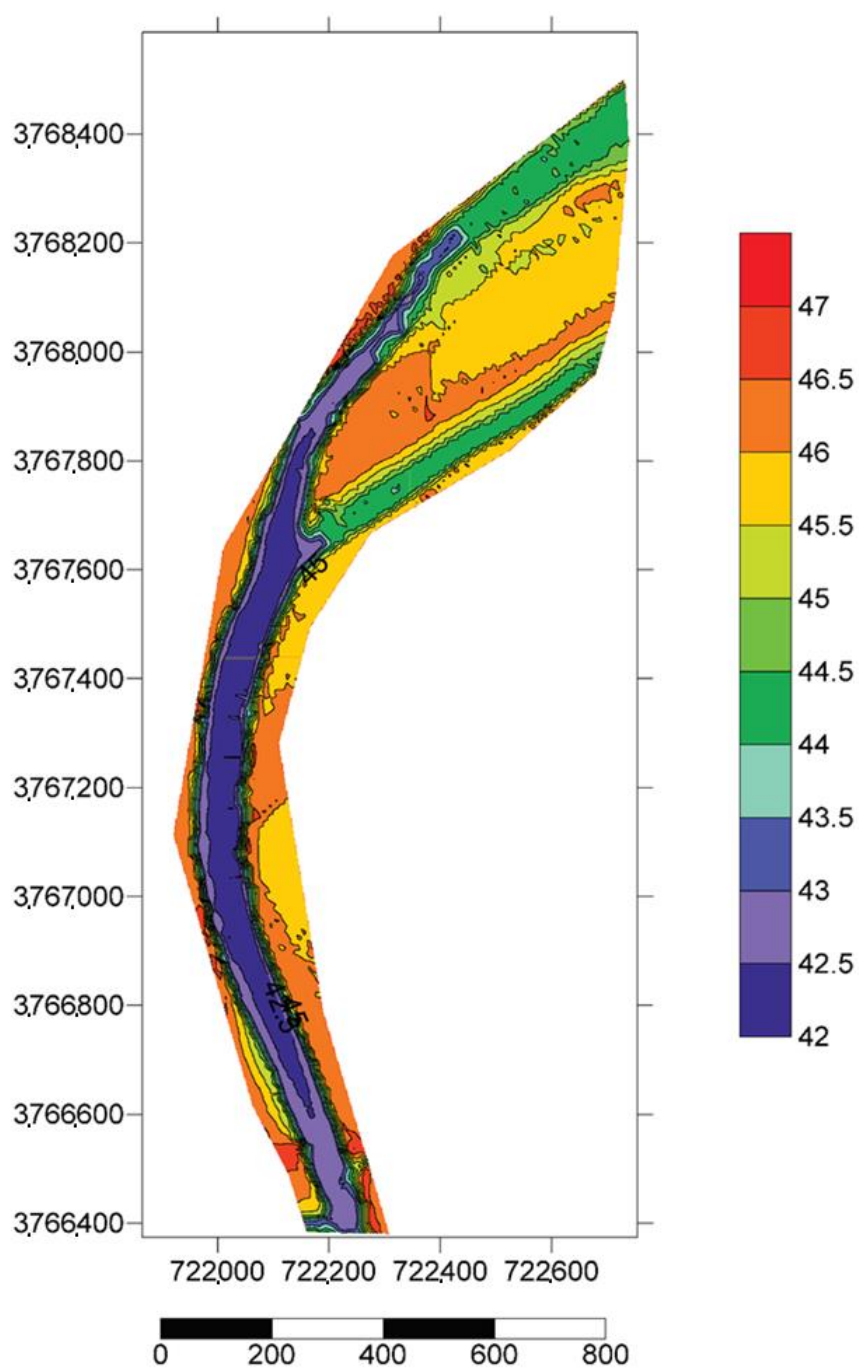
Table S2. Nutrient and gas flux rates for the field collected cores.

Month	Site	Depth Habitat	Distance To Shore	Lake Depth	NO <sub>3</sub> Flux (mg/m <sup>2</sup> /h)	SRP Flux (mg/m <sup>2</sup> /h)
April	1	Mid Lake	30	1	19.127	-3.474
April	1	Tree	17	0.9	19.127	1.672
April	1	Shore	3	0.6	15.306	-2.649
April	2	Mid Lake	43	1.4	3.821	3.300
April	2	Tree	17	1.2	5.102	-0.803
April	2	Shore	2	0.5	2.540	-2.497
April	3	Mid Lake	45	1.4	-25.510	0.304
April	3	Tree	16	1.1	-10.204	0.651
April	3	Shore	2	0.6	-8.923	1.368
April	4	Mid Lake	49	1.4	2.540	-1.042
April	4	Tree	10	0.85	0.000	0.065
April	4	Shore	1	0.5	-5.102	1.672
April	5	Mid Lake	38	0.85	22.948	1.824
April	5	Mid Lake	38	0.85	2.540	2.128
April	5	Tree	12	0.7	22.948	2.171
April	5	Shore	4	0.6	19.127	2.497
May	1	Mid Lake	30	0.9	0.000	-0.022
May	1	Tree	17	0.7	8.663	-0.695
May	1	Shore	10	0.5	0.000	-0.434
May	2	Mid Lake	49	1.2	1.238	-3.213
May	2	Tree	17	1.1	-3.713	-3.213
May	2	Shore	1	0.6	2.475	-3.517
May	3	Mid Lake	48	1.3	-3.713	1.151
May	3	Tree	17	1	4.950	0.304
May	3	Shore	10	0.6	0.000	0.217
May	4	Mid Lake	38	1.1	8.663	1.303
May	4	Tree	17	1	-1.238	0.999
May	4	Shore	1	0.6	1.238	0.087
May	5	Mid Lake	35	0.7	-3.713	0.304
May	5	Tree	16	0.6	8.663	-1.411
May	5	Shore	4	0.3	0.000	0.087
June	1	Mid Lake	30	0.85	-1.259	-1.780
June	1	Tree	19	0.7	-1.259	-1.889
June	1	Shore	4	0.3	-7.555	-1.020
June	2	Mid Lake	42	1.2	-3.778	-0.282

June	2	Tree	20	1.1	-3.778	0.608
June	2	Shore	10	0.8	2.540	0.934
June	3	Mid Lake	40	1.2	-2.540	-1.216
June	3	Tree	18	1.1	5.037	-1.563
June	3	Shore	10	0.7	-5.059	-0.868
June	4	Mid Lake	46	1.1	-3.778	-4.711
June	4	Tree	26	1.1	2.540	-3.517
June	4	Shore	4	0.5	-3.778	-3.278
June	5	Mid Lake	30	0.8	0.000	1.389
June	5	Tree	22	0.7	1.259	-0.847
June	5	Shore	4	0.3	-6.318	-0.391
June	6	Mid Lake	1	0.6	6.318	1.433
June	6	Tree	1	0.6	3.778	1.455
June	6	Shore	1	0.6	10.095	1.585

Table S3. Nutrient and gas flux rates for the laboratory temperature experiment.

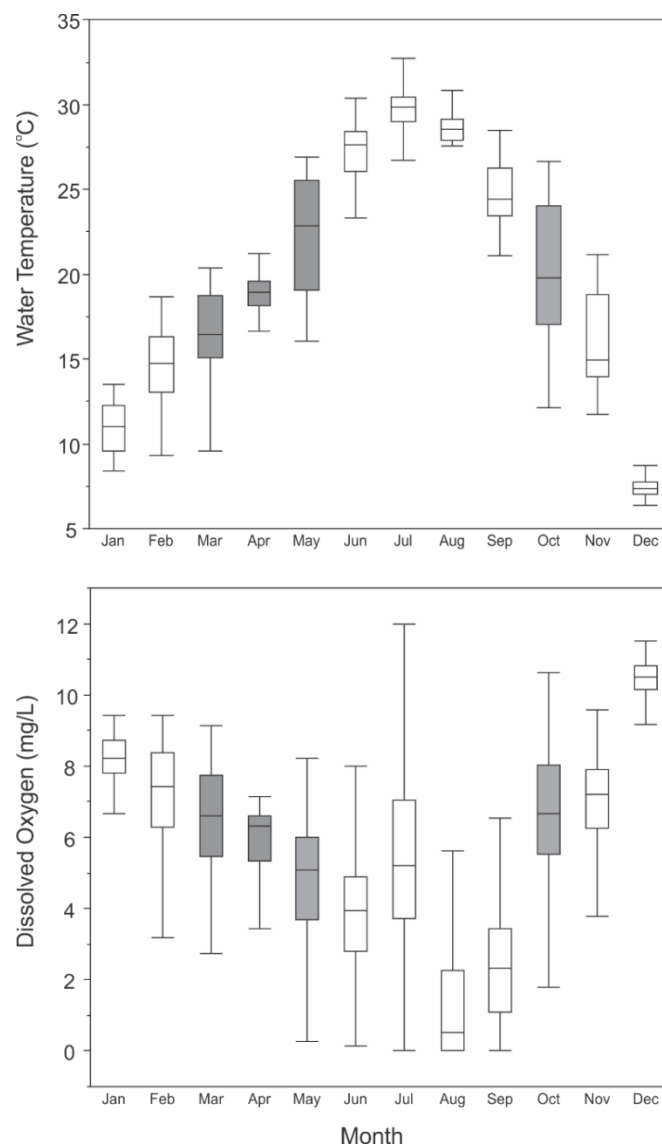
Temperature Treatment	NO <sub>3</sub> Flux (mg/m <sup>2</sup> /h)	SRP Flux (mg/m <sup>2</sup> /h)	Denitrification (mg N <sub>2</sub> /m <sup>2</sup> /h)	Sediment Oxygen Demand (mg O <sub>2</sub> /m <sup>2</sup> /h)
10	-32.42	-1.90	1.46	-64.65
10	-29.38	-0.99	1.85	-56.92
10	-30.39	-1.86	1.39	-71.28
10	-31.41	-2.19	2.05	-61.15
10	-30.39	-2.23	1.94	-67.23
10	-31.41	-2.03	1.14	-42.00
10	-33.43	-1.60	1.06	-44.02
10	-32.42	-1.46	1.58	-68.89
10	-31.41	-1.90	1.61	-40.34
20	1.74	-0.57	3.00	-106.89
20	1.74	-0.57	3.00	-106.89
20	1.74	-0.47	1.60	-94.25
20	3.47	-0.25	3.19	-111.31
20	1.74	-0.22		-106.89
20	0.87	-0.17	0.10	-46.10
20	3.47	-0.11	1.50	-92.36
20	25.18	4.07	-0.07	-44.68
20	1.74	-0.06	3.71	-114.46
20	2.60	0.58	0.82	-41.68
30	0.00	1.52	-0.95	-89.02
30	0.00	0.76	0.10	-97.29
30	0.00	1.72	4.80	-91.70
30	7.38	0.89	0.32	-50.10
30	1.23	0.09	4.55	-117.42
30	-1.23	0.76	2.11	-38.92
30	0.00	0.81	2.58	-55.92
30	2.46	0.67	4.90	-116.98
30	-2.46	0.83	3.44	-101.32



**Figure S1.** Bathymetry of Roundaway Lake: x-axis is west longitude and y-axis is north latitude; color legend depicts watershed elevation in meters above mean sea level; and black and white legend depicts distance in meters.



**Figure S2.** Flow-through sediment core incubation setup used in this study. Cores and source water were maintained at ambient lake temperature using controlled-temperature water bath tanks.



**Figure S3.** Monthly water temperature and dissolved oxygen at the bottom of water column) for Roundaway Lake at site 3. Gray boxes denote months samples were collected. Boxes show median values, with 25% and 75% percentiles. Whiskers are 5% and 95% percentiles. Data taken at site 3, Roundaway Lake in 2017 from USDA ARS long-term monitoring; R. Lizotte, unpublished data.