

Table S3: Upstream boundary conditions for nutrients and phytoplankton. W, Sp, Su, F correspond to winter, spring, summer and fall, respectively.

System name	long degrees	lat degree	Season	Phy ($\mu\text{M C}$)	Si ($\mu\text{M Si}$)	NO ₃ ($\mu\text{M N}$)	NH ₄ ($\mu\text{M N}$)	PO ₄ ($\mu\text{M P}$)	O ₂ ($\mu\text{M O}$)
NAR									
-	-67.25	44.75	W	6.21	130.8	43.2	18.5	0.5	441.3
	-67.25	44.75	Sp	9.58	130.8	43.2	18.5	0.5	420.8
	-67.25	44.75	Su	10.29	130.8	43.2	18.5	0.5	261.8
	-67.25	44.75	F	7	130.8	43.2	18.5	0.5	336.3
-	-67.25	45.25	W	6.21	148	50.5	21.7	0.6	441.3
	-67.25	45.25	Sp	9.58	148	50.5	21.7	0.6	420.8
	-67.25	45.25	Su	10.29	148	50.5	21.7	0.6	261.8
	-67.25	45.25	F	7	148	50.5	21.7	0.6	336.3
-	-67.25	45.25	W	6.21	125.5	55.6	23.8	0.5	441.3
	-67.25	45.25	Sp	9.58	125.5	55.6	23.8	0.5	420.8
	-67.25	45.25	Su	10.29	125.5	55.6	23.8	0.5	261.8
	-67.25	45.25	F	7	125.5	55.6	23.8	0.5	336.3
-	-67.75	44.75	W	6.21	149.5	58.5	25.1	0.5	441.3
	-67.75	44.75	Sp	9.58	149.5	58.5	25.1	0.5	420.8
	-67.75	44.75	Su	10.29	149.5	58.5	25.1	0.5	261.8
	-67.75	44.75	F	7	149.5	58.5	25.1	0.5	336.3
Penobscot	-68.25	44.75	W	6.21	155.7	109	46.7	0.4	441.3
	-68.25	44.75	Sp	9.58	155.7	109	46.7	0.4	420.8
	-68.25	44.75	Su	10.29	155.7	109	46.7	0.4	261.8
	-68.25	44.75	F	7	155.7	109	46.7	0.4	336.3
Kennebec	-68.75	44.75	W	6.21	142.5	52	22.3	0.5	441.3
	-68.75	44.75	Sp	9.58	142.5	52	22.3	0.5	420.8
	-68.75	44.75	Su	10.29	142.5	52	22.3	0.5	261.8
	-68.75	44.75	F	7	142.5	52	22.3	0.5	336.3
-	-69.75	44.25	W	6.21	133.1	67.1	28.8	3.7	441.3
	-69.75	44.25	Sp	9.58	133.1	67.1	28.8	3.7	420.8
	-69.75	44.25	Su	10.29	133.1	67.1	28.8	3.7	261.8
	-69.75	44.25	F	7	133.1	67.1	28.8	3.7	336.3
-	-70.25	43.75	W	21.83	70.4	76.3	32.7	5.1	359
	-70.25	43.75	Sp	8	70.4	76.3	32.7	5.1	312.15
	-70.25	43.75	Su	19.25	70.4	76.3	32.7	5.1	265.6
	-70.25	43.75	F	8.92	70.4	76.3	32.7	5.1	321.87
-	-70.75	41.75	W	6.21	93.5	94.8	40.6	12.6	441.3
	-70.75	41.75	Sp	9.58	93.5	94.8	40.6	12.6	420.8
	-70.75	41.75	Su	10.29	93.5	94.8	40.6	12.6	261.8
	-70.75	41.75	F	7	93.5	94.8	40.6	12.6	336.3
-	-70.75	42.25	W	6.21	106.9	64.3	27.5	3.4	441.3
	-70.75	42.25	Sp	9.58	106.9	64.3	27.5	3.4	420.8
	-70.75	42.25	Su	10.29	106.9	64.3	27.5	3.4	261.8
	-70.75	42.25	F	7	106.9	64.3	27.5	3.4	336.3
Merrimack	-70.75	42.75	W	6.21	106.9	64.3	27.5	3.4	441.3
	-70.75	42.75	Sp	9.58	106.9	64.3	27.5	3.4	420.8
	-70.75	42.75	Su	10.29	106.9	64.3	27.5	3.4	261.8
	-70.75	42.75	F	7	106.9	64.3	27.5	3.4	336.3
MAR									
-	-70.75	43.25	W	6.21	130.2	60.2	25.8	1.3	441.3
	-70.75	43.25	Sp	9.58	130.2	60.2	25.8	1.3	420.8
	-70.75	43.25	Su	10.29	130.2	60.2	25.8	1.3	261.8
	-70.75	43.25	F	7	130.2	60.2	25.8	1.3	336.3
-	-71.25	41.75	W	21.83	78.7	122.4	52.4	14.6	359
	-71.25	41.75	Sp	8	78.7	122.4	52.4	14.6	312.15
	-71.25	41.75	Su	19.25	78.7	122.4	52.4	14.6	265.6
	-71.25	41.75	F	8.92	78.7	122.4	52.4	14.6	321.87
-	-71.75	41.25	W	21.83	104.3	70.1	30.1	2.5	359

	-71.75	41.25	Sp	8	104.3	70.1	30.1	2.5	312.15
	-71.75	41.25	Su	19.25	104.3	70.1	30.1	2.5	265.6
	-71.75	41.25	F	8.92	104.3	70.1	30.1	2.5	321.87
-	-72.75	40.75	W	21.83	91	89.3	38.3	6.1	359
	-72.75	40.75	Sp	8	91	89.3	38.3	6.1	312.15
	-72.75	40.75	Su	19.25	91	89.3	38.3	6.1	265.6
	-72.75	40.75	F	8.92	91	89.3	38.3	6.1	321.87
-	-72.75	41.25	W	21.83	90.5	79.3	34	5.6	359
	-72.75	41.25	Sp	8	90.5	79.3	34	5.6	312.15
	-72.75	41.25	Su	19.25	90.5	79.3	34	5.6	265.6
	-72.75	41.25	F	8.92	90.5	79.3	34	5.6	321.87
Connecticut	-72.75	41.75	W	21.83	105.9	46.2	19.8	1.5	359
	-72.75	41.75	Sp	8	105.9	46.2	19.8	1.5	312.15
	-72.75	41.75	Su	19.25	105.9	46.2	19.8	1.5	265.6
	-72.75	41.75	F	8.92	105.9	46.2	19.8	1.5	321.87
-	-73.25	40.75	W	21.83	105.9	46.2	19.8	1.5	359
	-73.25	40.75	Sp	8	105.9	46.2	19.8	1.5	312.15
	-73.25	40.75	Su	19.25	105.9	46.2	19.8	1.5	265.6
	-73.25	40.75	F	8.92	105.9	46.2	19.8	1.5	321.87
Hudson	-74.25	40.75	W	21.83	84.6	82.7	35.4	9.9	359
	-74.25	40.75	Sp	8	84.6	82.7	35.4	9.9	312.15
	-74.25	40.75	Su	19.25	84.6	82.7	35.4	9.9	265.6
	-74.25	40.75	F	8.92	84.6	82.7	35.4	9.9	321.87
-	-75.25	37.75	W	21.83	72.9	66.1	28.3	1.5	359
	-75.25	37.75	Sp	8	72.9	66.1	28.3	1.5	312.15
	-75.25	37.75	Su	19.25	72.9	66.1	28.3	1.5	265.6
	-75.25	37.75	F	8.92	72.9	66.1	28.3	1.5	321.87
-	-75.25	38.75	W	21.83	104.7	105.5	45.2	2.2	359
	-75.25	38.75	Sp	8	104.7	105.5	45.2	2.2	312.15
	-75.25	38.75	Su	19.25	104.7	105.5	45.2	2.2	265.6
	-75.25	38.75	F	8.92	104.7	105.5	45.2	2.2	321.87
Delaware	-75.25	39.75	W	21.83	89.8	101.6	43.5	7.7	359
	-75.25	39.75	Sp	8	89.8	101.6	43.5	7.7	312.15
	-75.25	39.75	Su	19.25	89.8	101.6	43.5	7.7	265.6
	-75.25	39.75	F	8.92	89.8	101.6	43.5	7.7	321.87
-	-75.75	39.25	W	21.83	83.2	196.9	84.4	5.1	359
	-75.75	39.25	Sp	8	83.2	196.9	84.4	5.1	312.15
	-75.75	39.25	Su	19.25	83.2	196.9	84.4	5.1	265.6
	-75.75	39.25	F	8.92	83.2	196.9	84.4	5.1	321.87
Susquehann	-76.25	39.25	W	21.83	118.3	41.1	50	2.2	359
	-76.25	39.25	Sp	8	118.3	41.1	50	2.2	312.15
	-76.25	39.25	Su	19.25	118.3	41.1	50	2.2	265.6
	-76.25	39.25	F	8.92	118.3	41.1	50	2.2	321.87
Potomac	-76.75	38.75	W	21.83	174.1	62.5	26.8	3.9	359
	-76.75	38.75	Sp	8	174.1	62.5	26.8	3.9	312.15
	-76.75	38.75	Su	19.25	174.1	62.5	26.8	3.9	265.6
	-76.75	38.75	F	8.92	174.1	62.5	26.8	3.9	321.87
-	-76.75	37.75	W	21.83	86.3	82.8	35.5	3.9	359
	-76.75	37.75	Sp	8	86.3	82.8	35.5	3.9	312.15
	-76.75	37.75	Su	19.25	86.3	82.8	35.5	3.9	265.6
	-76.75	37.75	F	8.92	86.3	82.8	35.5	3.9	321.87
-	-76.75	39.25	W	21.83	120.2	252.5	108.2	22.4	359
	-76.75	39.25	Sp	8	120.2	252.5	108.2	22.4	312.15
	-76.75	39.25	Su	19.25	120.2	252.5	108.2	22.4	265.6
	-76.75	39.25	F	8.92	120.2	252.5	108.2	22.4	321.87
-	-77.25	38.25	W	21.83	157.5	76.1	32.6	0.3	359
	-77.25	38.25	Sp	8	157.5	76.1	32.6	0.3	312.15
	-77.25	38.25	Su	19.25	157.5	76.1	32.6	0.3	265.6
	-77.25	38.25	F	8.92	157.5	76.1	32.6	0.3	321.87
James River	-77.75	37.25	W	21.83	160.3	79.9	34.3	3.8	359
	-77.75	37.25	Sp	8	160.3	79.9	34.3	3.8	312.15

	-77.75	37.25	Su	19.25	160.3	79.9	34.3	3.8	265.6
	-77.75	37.25	F	8.92	160.3	79.9	34.3	3.8	321.87
SAB									
-	-78.25	34.25	W	21.83	202.2	121.7	52.1	5.6	359
	-78.25	34.25	Sp	8	202.2	121.7	52.1	5.6	312.15
	-78.25	34.25	Su	19.25	202.2	121.7	52.1	5.6	265.6
	-78.25	34.25	F	8.92	202.2	121.7	52.1	5.6	321.87
-	-79.25	33.25	W	26.67	153.1	98.9	42.4	1.4	226.87
	-79.25	33.25	Sp	32.75	153.1	98.9	42.4	1.4	197.8
	-79.25	33.25	Su	37.21	153.1	98.9	42.4	1.4	155.6
	-79.25	33.25	F	20.75	153.1	98.9	42.4	1.4	172.5
Pee Dee	-79.25	33.75	W	26.67	161	40.5	17.3	1.6	226.87
	-79.25	33.75	Sp	32.75	161	40.5	17.3	1.6	197.8
	-79.25	33.75	Su	37.21	161	40.5	17.3	1.6	155.6
	-79.25	33.75	F	20.75	161	40.5	17.3	1.6	172.5
-	-79.75	33.25	W	26.67	180.2	61.8	26.5	0.5	226.87
	-79.75	33.25	Sp	32.75	180.2	61.8	26.5	0.5	197.8
	-79.75	33.25	Su	37.21	180.2	61.8	26.5	0.5	155.6
	-79.75	33.25	F	20.75	180.2	61.8	26.5	0.5	172.5
-	-80.25	32.75	W	26.67	225.1	73.3	31.4	3.3	226.87
	-80.25	32.75	Sp	32.75	225.1	73.3	31.4	3.3	197.8
	-80.25	32.75	Su	37.21	225.1	73.3	31.4	3.3	155.6
	-80.25	32.75	F	20.75	225.1	73.3	31.4	3.3	172.5
Santee	-80.25	33.25	W	26.67	320.9	188.7	80.9	4.9	226.87
	-80.25	33.25	Sp	32.75	320.9	188.7	80.9	4.9	197.8
	-80.25	33.25	Su	37.21	320.9	188.7	80.9	4.9	155.6
	-80.25	33.25	F	20.75	320.9	188.7	80.9	4.9	172.5
Roanoke	-80.75	32.25	W	26.67	204.4	44.6	19.1	0.3	226.87
	-80.75	32.25	Sp	32.75	204.4	44.6	19.1	0.3	197.8
	-80.75	32.25	Su	37.21	204.4	44.6	19.1	0.3	155.6
	-80.75	32.25	F	20.75	204.4	44.6	19.1	0.3	172.5
-	-80.75	32.75	W	26.67	207.7	99.3	42.6	1.9	226.87
	-80.75	32.75	Sp	32.75	207.7	99.3	42.6	1.9	197.8
	-80.75	32.75	Su	37.21	207.7	99.3	42.6	1.9	155.6
	-80.75	32.75	F	20.75	207.7	99.3	42.6	1.9	172.5
-	-81.25	31.75	W	26.67	222.4	74.1	31.7	0.9	226.87
	-81.25	31.75	Sp	32.75	222.4	74.1	31.7	0.9	197.8
	-81.25	31.75	Su	37.21	222.4	74.1	31.7	0.9	155.6
	-81.25	31.75	F	20.75	222.4	74.1	31.7	0.9	172.5
Savannah	-81.25	32.25	W	26.67	21.4	36.4	15.6	0.2	226.87
	-81.25	32.25	Sp	32.75	21.4	36.4	15.6	0.2	197.8
	-81.25	32.25	Su	37.21	21.4	36.4	15.6	0.2	155.6
	-81.25	32.25	F	20.75	21.4	36.4	15.6	0.2	172.5
-	-81.75	30.75	W	26.67	224.6	65.1	27.9	0.2	226.87
	-81.75	30.75	Sp	32.75	224.6	65.1	27.9	0.2	197.8
	-81.75	30.75	Su	37.21	224.6	65.1	27.9	0.2	155.6
	-81.75	30.75	F	20.75	224.6	65.1	27.9	0.2	172.5
-	-81.75	31.25	W	26.67	186.7	67.6	29	0.2	226.87
	-81.75	31.25	Sp	32.75	186.7	67.6	29	0.2	197.8
	-81.75	31.25	Su	37.21	186.7	67.6	29	0.2	155.6
	-81.75	31.25	F	20.75	186.7	67.6	29	0.2	172.5
Althamaha	-81.75	31.75	W	26.67	171.5	53.7	23	1.4	226.87
	-81.75	31.75	Sp	32.75	171.5	53.7	23	1.4	197.8
	-81.75	31.75	Su	37.21	171.5	53.7	23	1.4	155.6
	-81.75	31.75	F	20.75	171.5	53.7	23	1.4	172.5