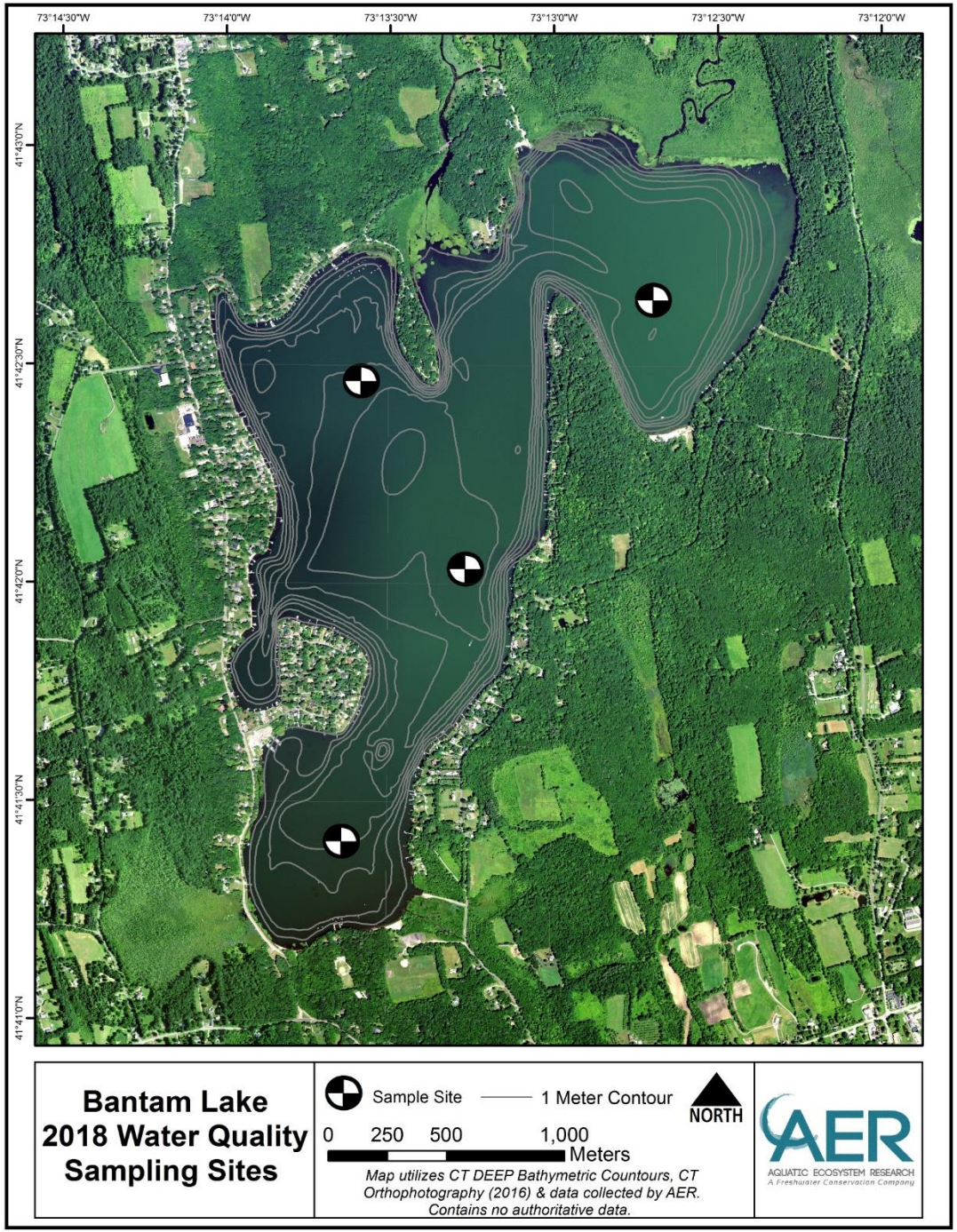
Bantam Lake

Water Quality and Cyanobacteria Monitoring 2018

Larry Marsicano
Aquatic Ecosystem Research

Bantam Lake Protective Association
Annual Meeting
June 8, 2019



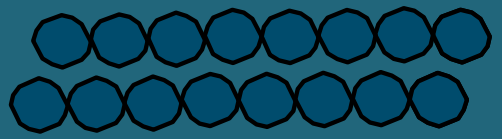
Hired to...

- Conduct 7-month water quality monitoring of Bantam Lake
- Provide a biweekly assessment of cyanobacteria
- Two sites
- April - October

Date	Profiles and Secchi[1]	Algae[2]	Nutrients & Alkalinity[3]	Iron & Manganese[4]	Chl-*a*, Cations, Chloride[5]
April 22nd	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
May 8th	NB, CL, FP, SB	NB, CL			
May 21st	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
June 1st *	NB, CL, FP				
June 4th	NB, CL, FP, SB	NB, CL			
June 18th	NB, CL	NB, CL	NB, CL	NB, CL	NB, CL
June 26th *	NB, CL, FP, SB				
July 2nd	NB, CL, FP, SB	NB, CL			
July 5th *	NB, CL, FP, SB				
July 6th	NB, CL, FP, SB				
July 11th *	NB, CL, FP, SB				
July 16th	NB, CL, FP, SB	NB, CL, SB	NB, CL	NB, CL	NB, CL
July 19th *	NB, CL, FP, SB				
July 30th	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
August 2nd *	NB, CL, FP, SB				
August 10th *	NB, CL, FP, SB				
August 16th	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
August 24th *	NB, CL, FP, SB				
August 27th	NB, CL, FP, SB	NB, CL, SB			
September 5th *	NB, CL, FP, SB				
September 11th	NB, CL, FP, SB	NB, CL, SB			
September 20th *	NB, CL, FP, SB				
September 24th	NB, CL, FP, SB	NB, CL, SB	NB, CL	NB, CL	NB, CL
October 4th *	NB, CL, FP, SB				
October 9th	NB, CL, FP, SB	NB, CL			
October 22nd	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
November 8th	NB, CL, FP, SB	NB, CL			

Table 1. Summary of data collections for Bantam Lake in 2018 used in this report. NB = North Bay Site, CL = Center Lake Site, FP = Folly Point Site, and SB = South Bay Site. Chl-*a* = chlorophyll-*a*.

* Data collections by James Fischer of the White Memorial Conservation Center. All others by AER.

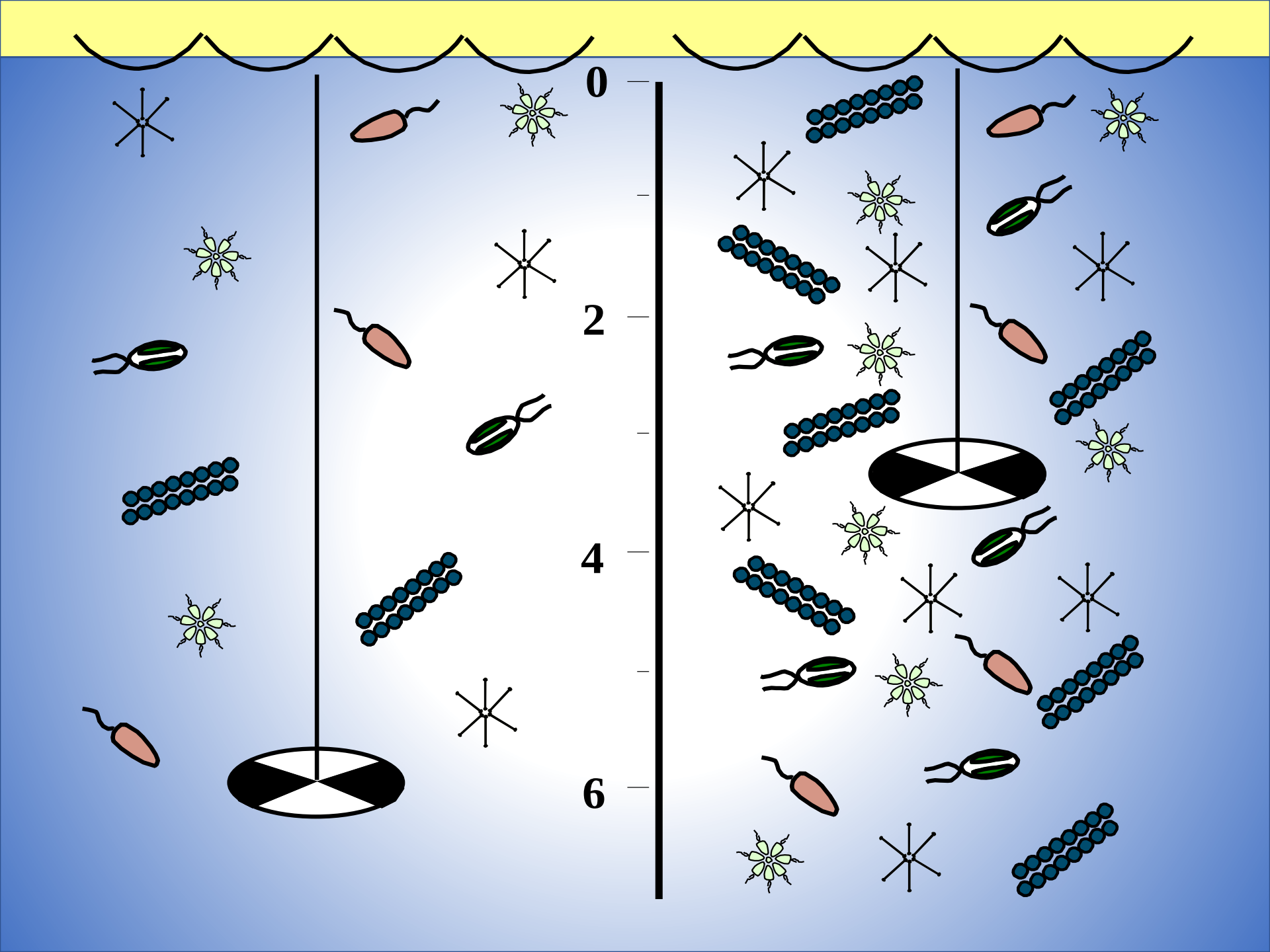


Water Quality – Cyanobacteria Connection

- Nutrient Dynamics
  - TN:TP
- Water Column Stratification and Mixing
  - Temperature and Dissolved Oxygen
- Availability of Carbon
- Secchi Transparency, Chlorophyll-*a*, Cell Counts

Secchi Disk Transparency

Fr. Angelo Secchi
1865


0
2
4
6

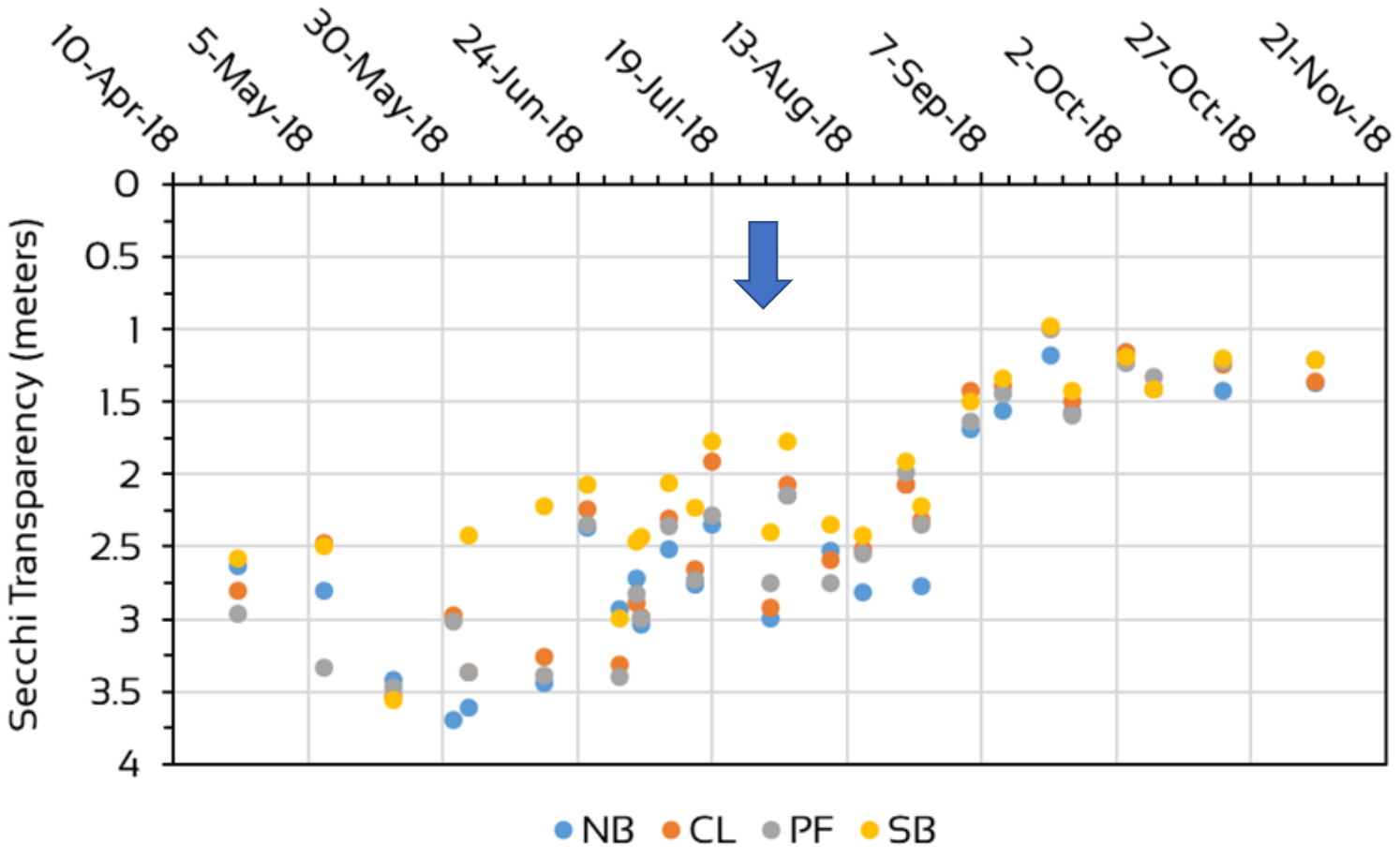


Figure 5. Measurement of Secchi transparency taken at the North Bay (NB), Center Lake (CL), Point Folly (PF), and South Bay (SB) sites between April 22nd and November 8th of 2018.

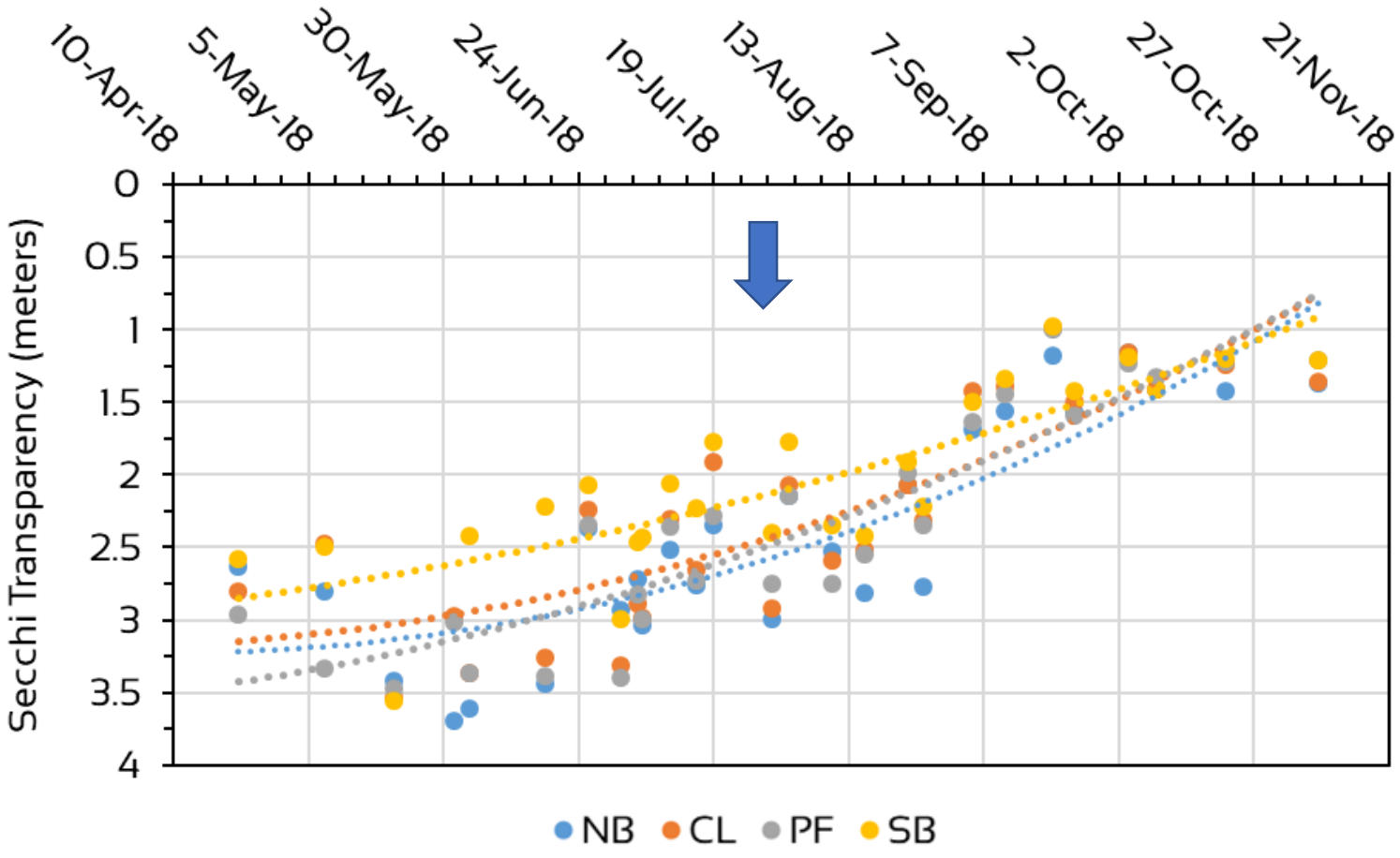


Figure 5. Measurement of Secchi transparency taken at the North Bay (NB), Center Lake (CL), Point Folly (PF), and South Bay (SB) sites between April 22nd and November 8th of 2018.

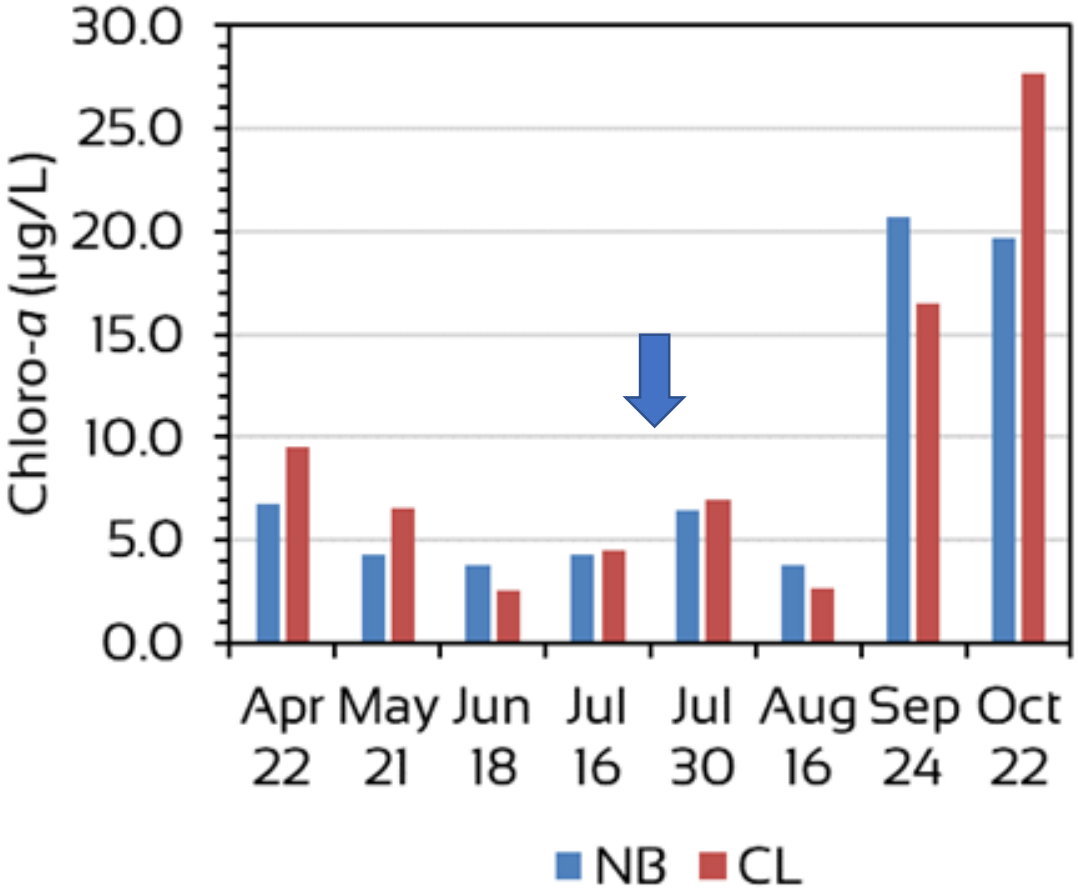


Figure 6. Chlorophyll-a concentrations measured at the North Bay (NB) and Center Lake (CL) sites during the 2018 sampling season.

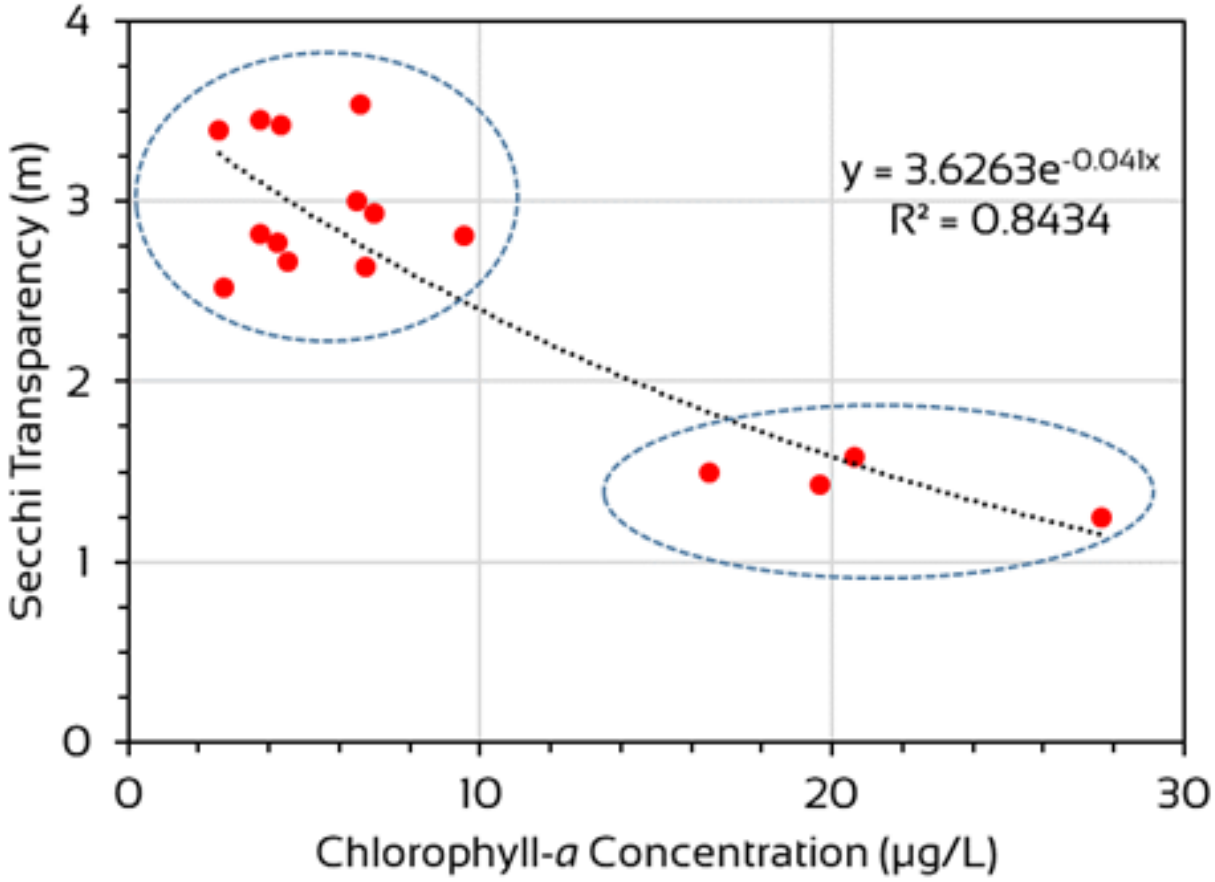


Figure 7. Regression analysis of paired Secchi transparency and chlorophyll-*a* data collected at the North Bay and Center Lake sites during the 2018 sampling season. Each point represents both a Secchi transparency and chlorophyll-*a* concentration for one of the two sites on one of eight sampling dates.

Date	Profiles and Secchi[1]	Algae[2]	Nutrients & Alkalinity[3]	Iron & Manganese[4]	Chl-*a*, Cations, Chloride[5]
April 22nd	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
May 8th	NB, CL, FP, SB	NB, CL			
May 21st	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
June 1st *	NB, CL, FP				
June 4th	NB, CL, FP, SB	NB, CL			
June 18th	NB, CL	NB, CL	NB, CL	NB, CL	NB, CL
June 26th *	NB, CL, FP, SB				
July 2nd	NB, CL, FP, SB	NB, CL			
July 5th *	NB, CL, FP, SB				
July 6th	NB, CL, FP, SB				
July 11th *	NB, CL, FP, SB				
July 16th	NB, CL, FP, SB	NB, CL, SB	NB, CL	NB, CL	NB, CL
July 19th *	NB, CL, FP, SB				
July 30th	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
August 2nd *	NB, CL, FP, SB				
August 10th *	NB, CL, FP, SB				
August 16th	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
August 24th *	NB, CL, FP, SB				
August 27th	NB, CL, FP, SB	NB, CL, SB			
September 5th *	NB, CL, FP, SB				
September 11th	NB, CL, FP, SB	NB, CL, SB			
September 20th *	NB, CL, FP, SB				
September 24th	NB, CL, FP, SB	NB, CL, SB	NB, CL	NB, CL	NB, CL
October 4th *	NB, CL, FP, SB				
October 9th	NB, CL, FP, SB	NB, CL			
October 22nd	NB, CL, FP, SB	NB, CL	NB, CL	NB, CL	NB, CL
November 8th	NB, CL, FP, SB	NB, CL			

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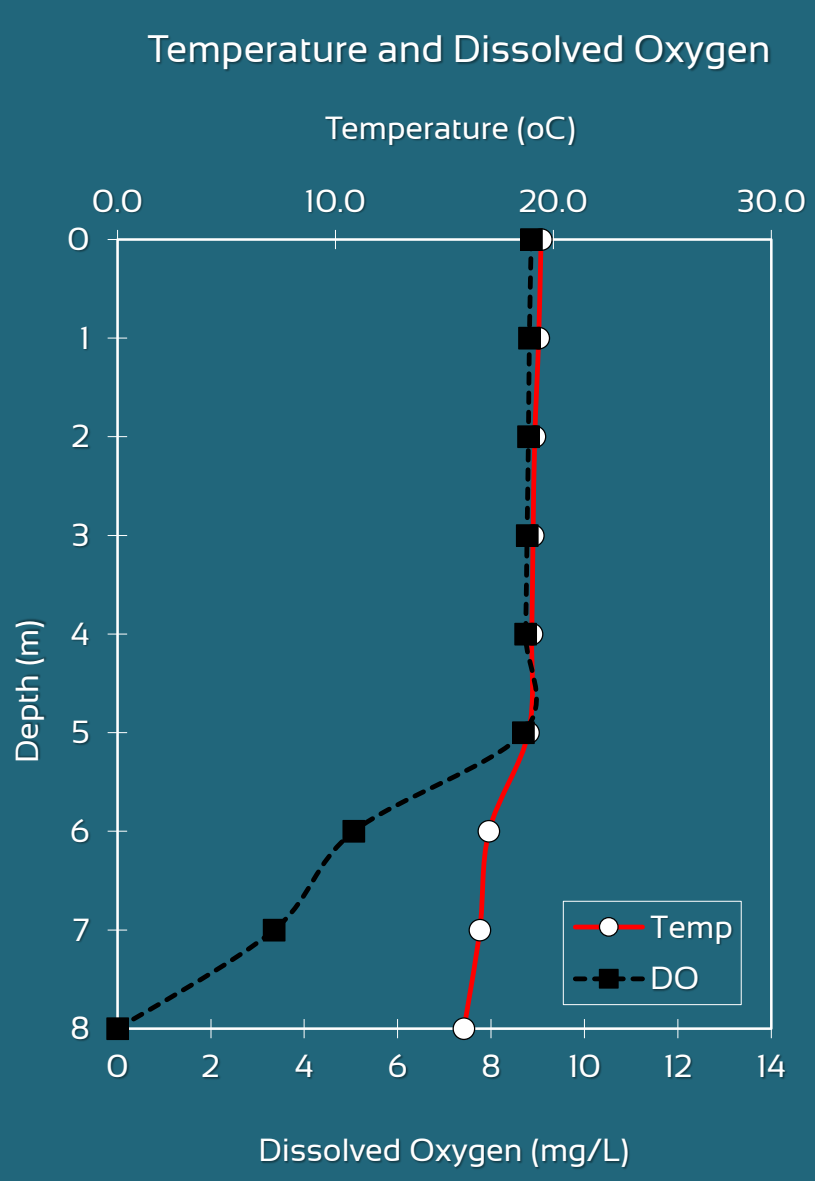
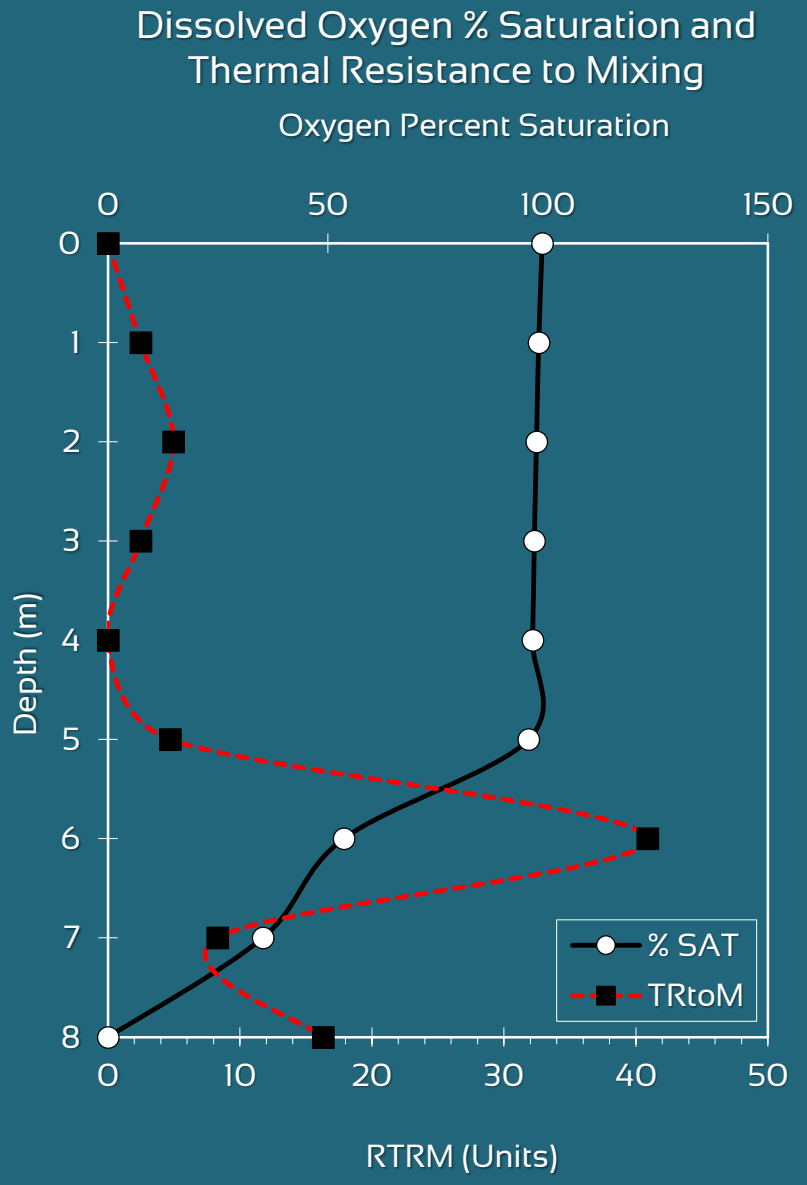
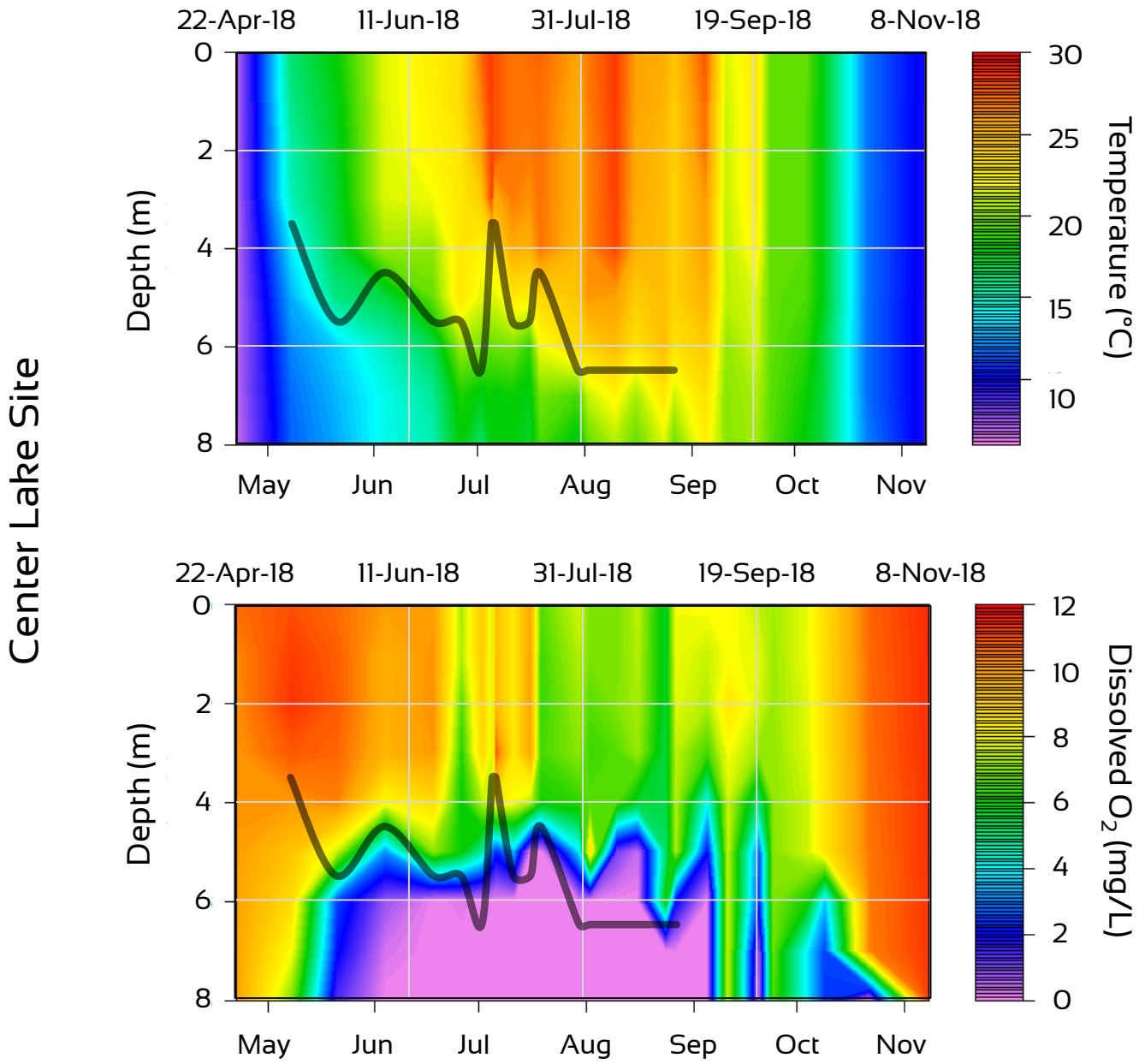




Center Lake Site – June 4, 2019


Center Lake Site
22-Apr-18
11-Jun-18
31-Jul-18
19-Sep-18
8-Nov-18
Depth (m)
0
2
4
6
8
May
Jun
Jul
Aug
Sep
Oct
Nov
30
25
20
15
10
Temperature (°C)
12
10
8
6
4
2
0
Dissolved O2 (mg/L)

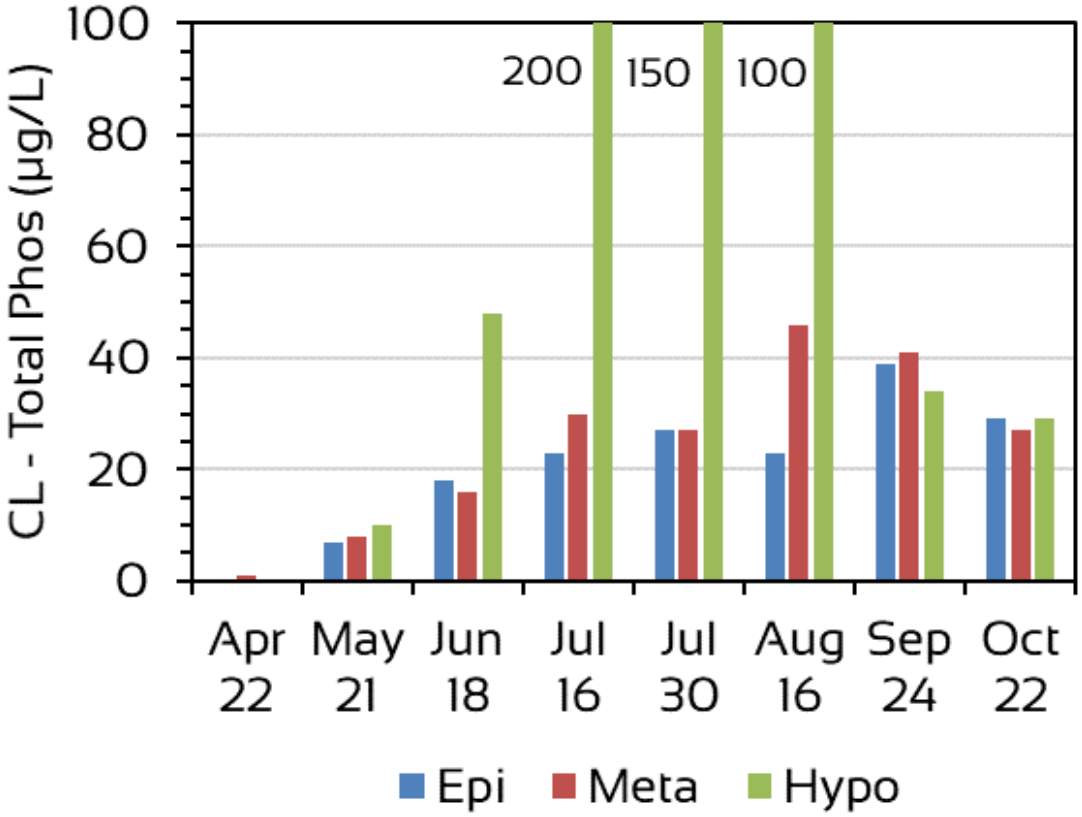


Figure 13. Total phosphorus concentration measured in samples from the epilimnion (Epi), metalimnion (Met) or middle depths, and hypolimnion (Hypo) or near bottom depths at the CL site in 2018.

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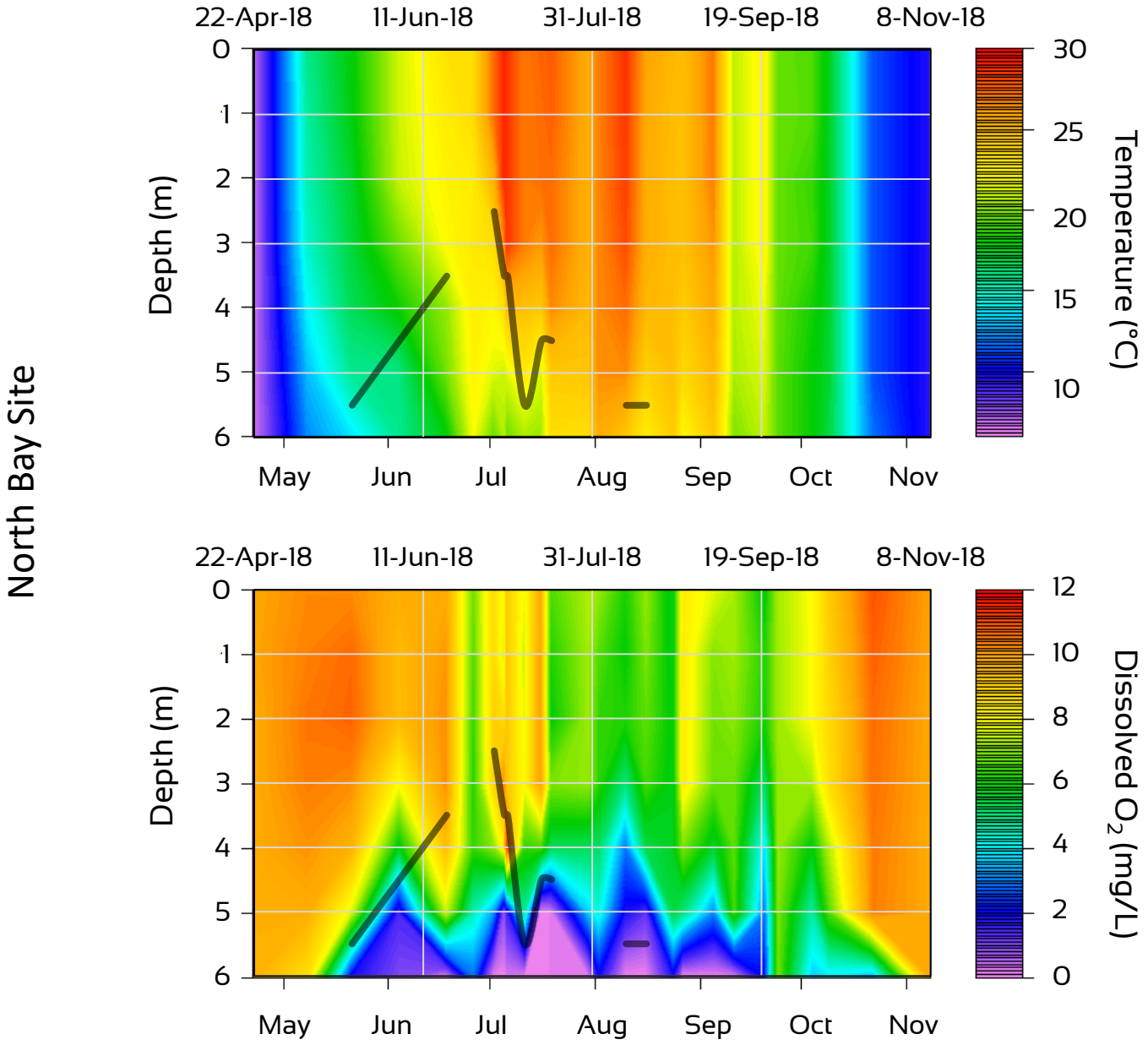
North Bay Site
22-Apr-18
11-Jun-18
31-Jul-18
19-Sep-18
8-Nov-18
Depth (m)
0
1
2
3
4
5
6
May
Jun
Jul
Aug
Sep
Oct
Nov
30
25
20
15
10
Temperature (°C)
22-Apr-18
11-Jun-18
31-Jul-18
19-Sep-18
8-Nov-18
Depth (m)
0
1
2
3
4
5
6
May
Jun
Jul
Aug
Sep
Oct
Nov
12
10
8
6
4
2
0
Dissolved O2 (mg/L)

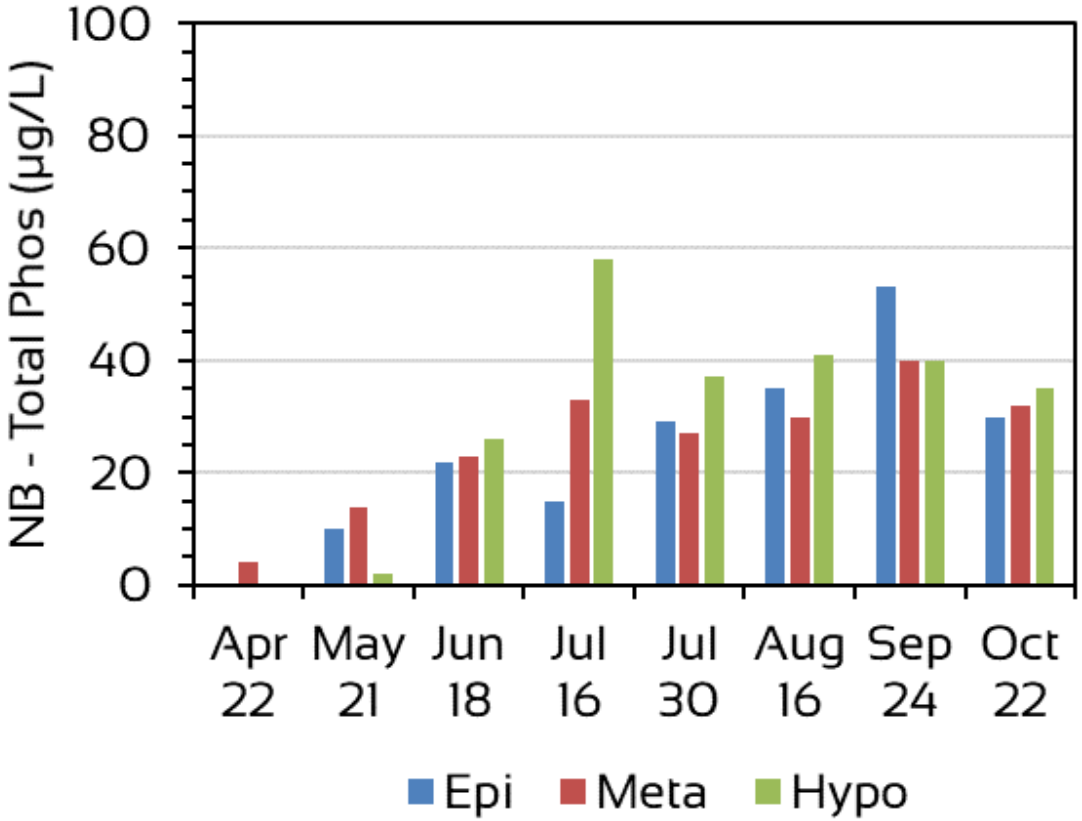

Figure 13. Total phosphorus concentration measured in samples from the epilimnion (Epi), metalimnion (Met) or middle depths, and hypolimnion (Hypo) or near bottom depths at the NB site in 2018.

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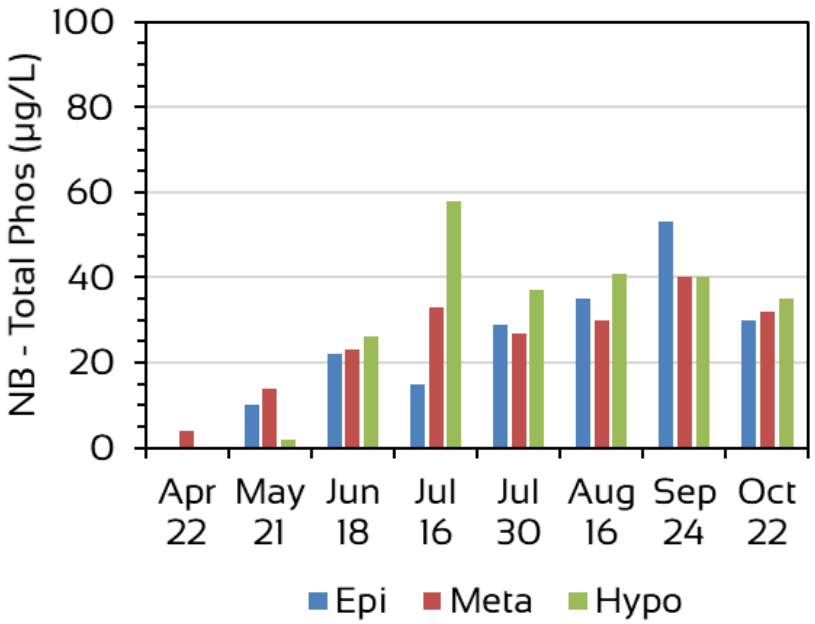

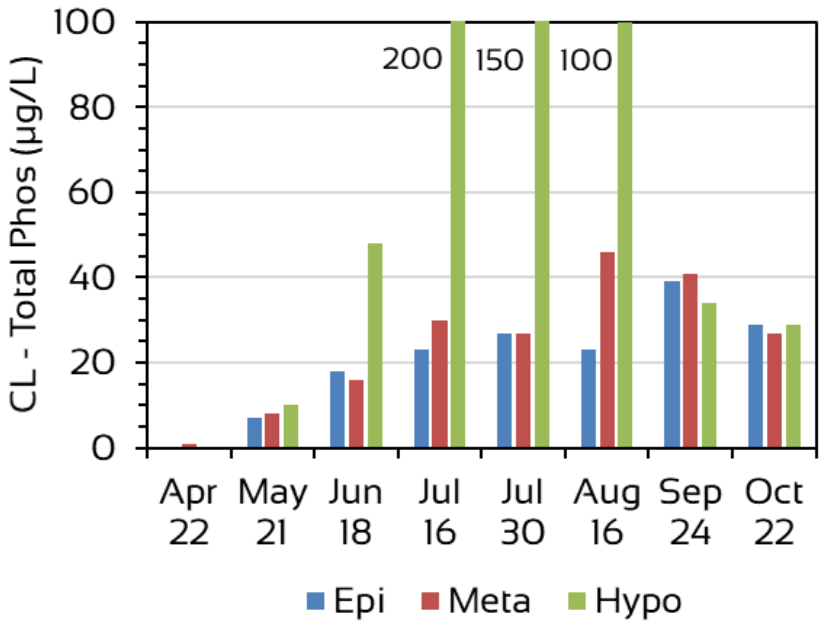

Figure 13. Total phosphorus concentration measured in samples from the epilimnion (Epi), metalimnion (Met) or middle depths, and hypolimnion (Hypo) or near bottom depths at the NB (left) and CL (right) sites in 2018.

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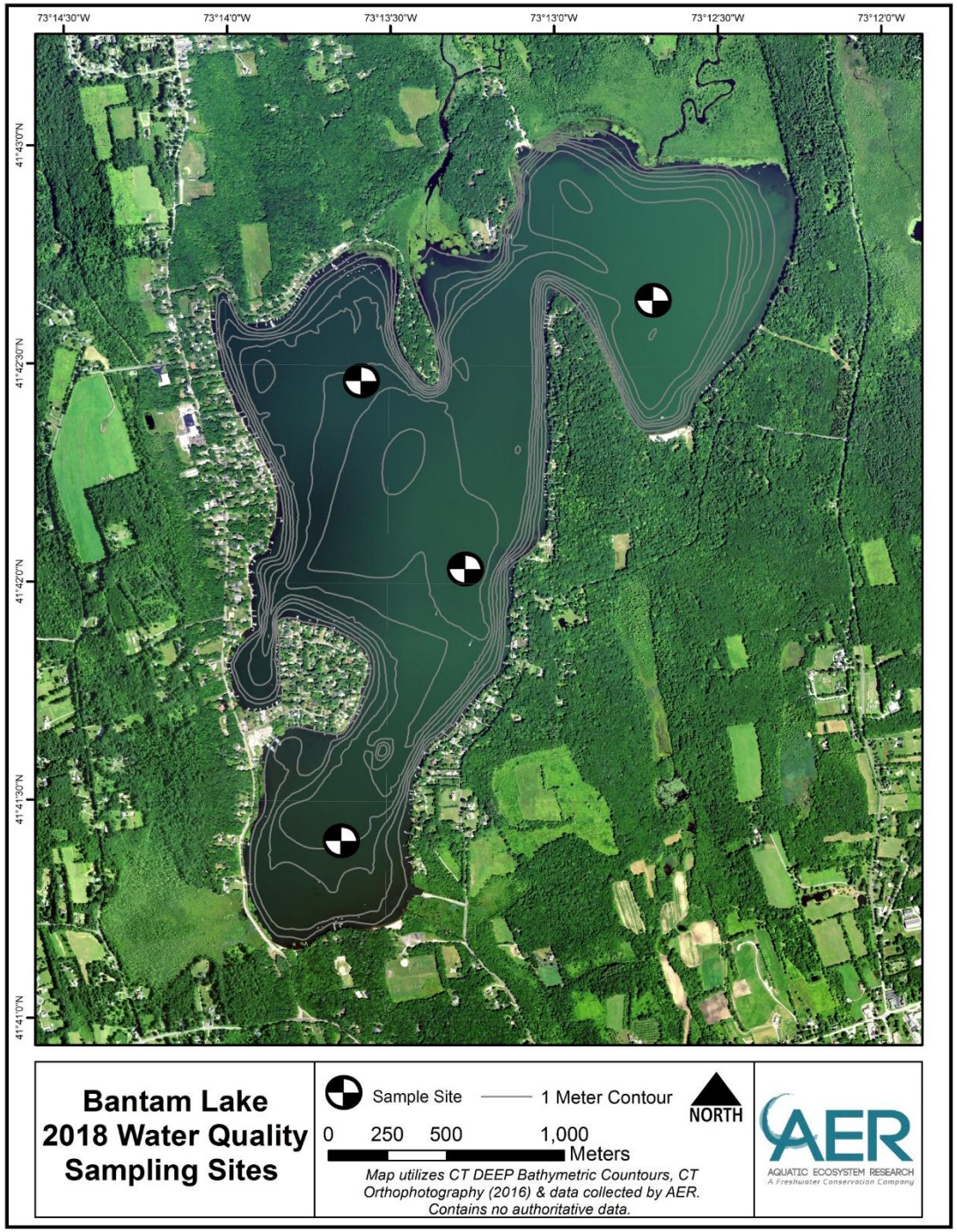

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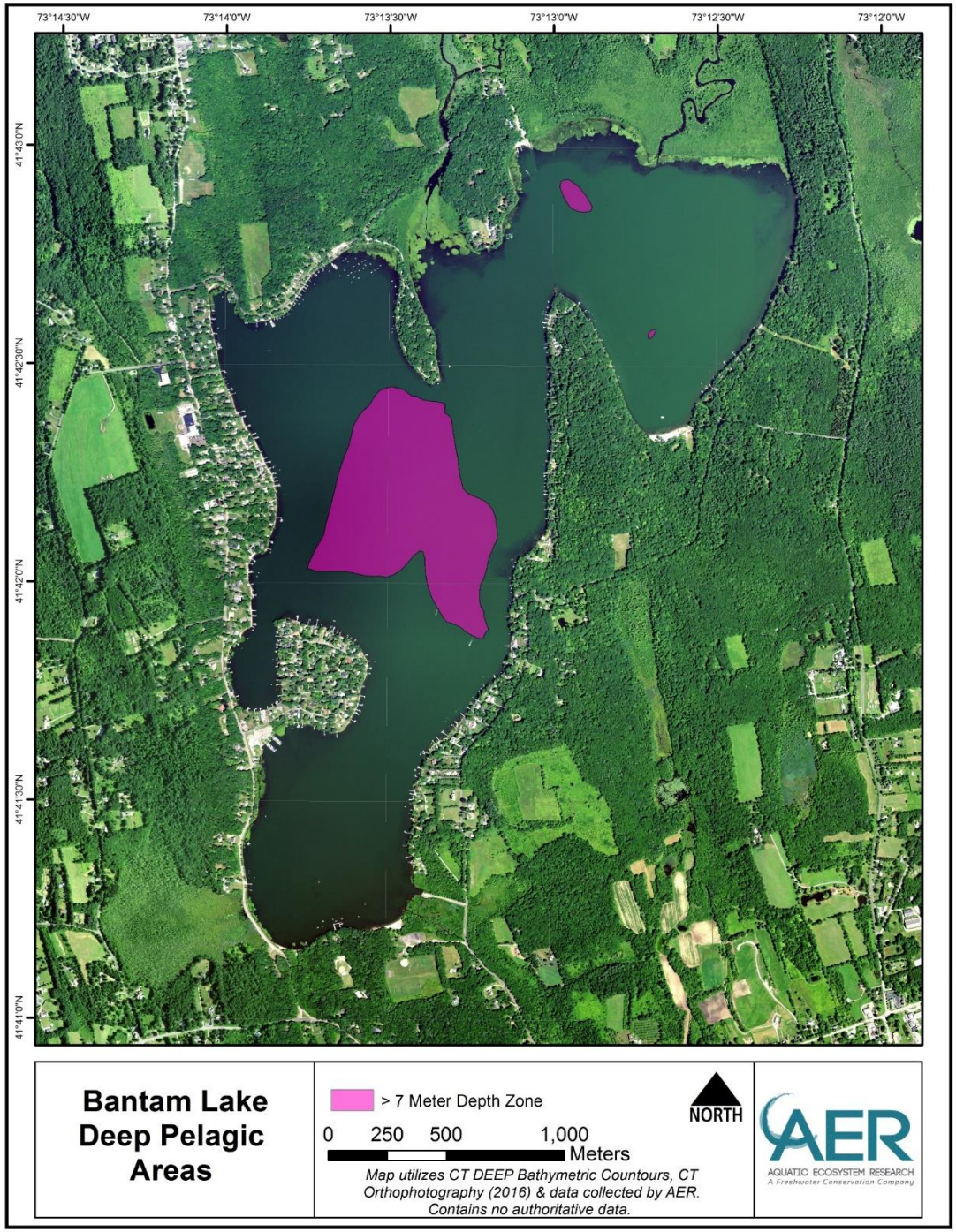

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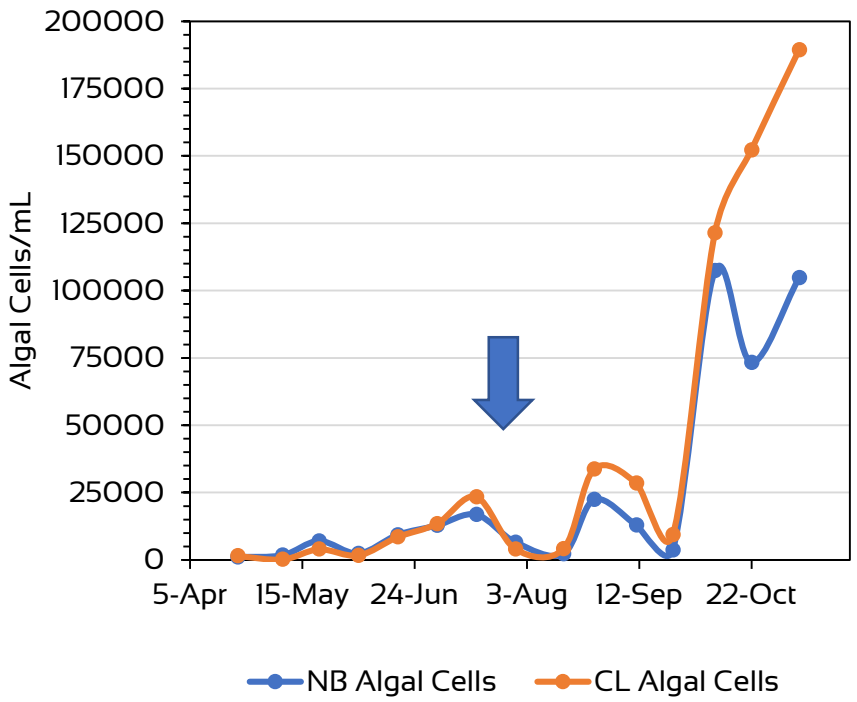
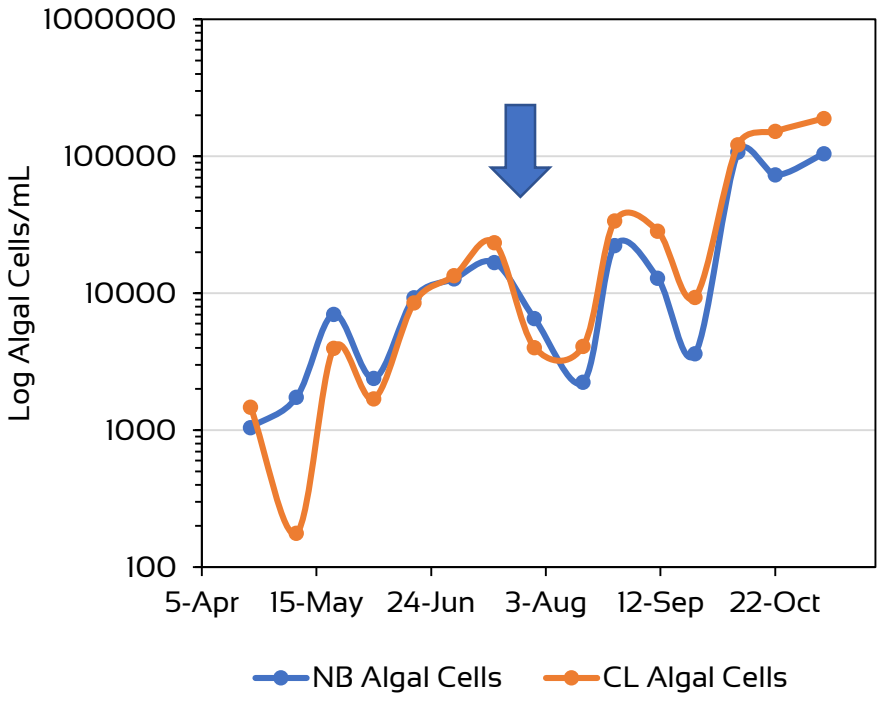
Cyanobacteria Cell Concentration





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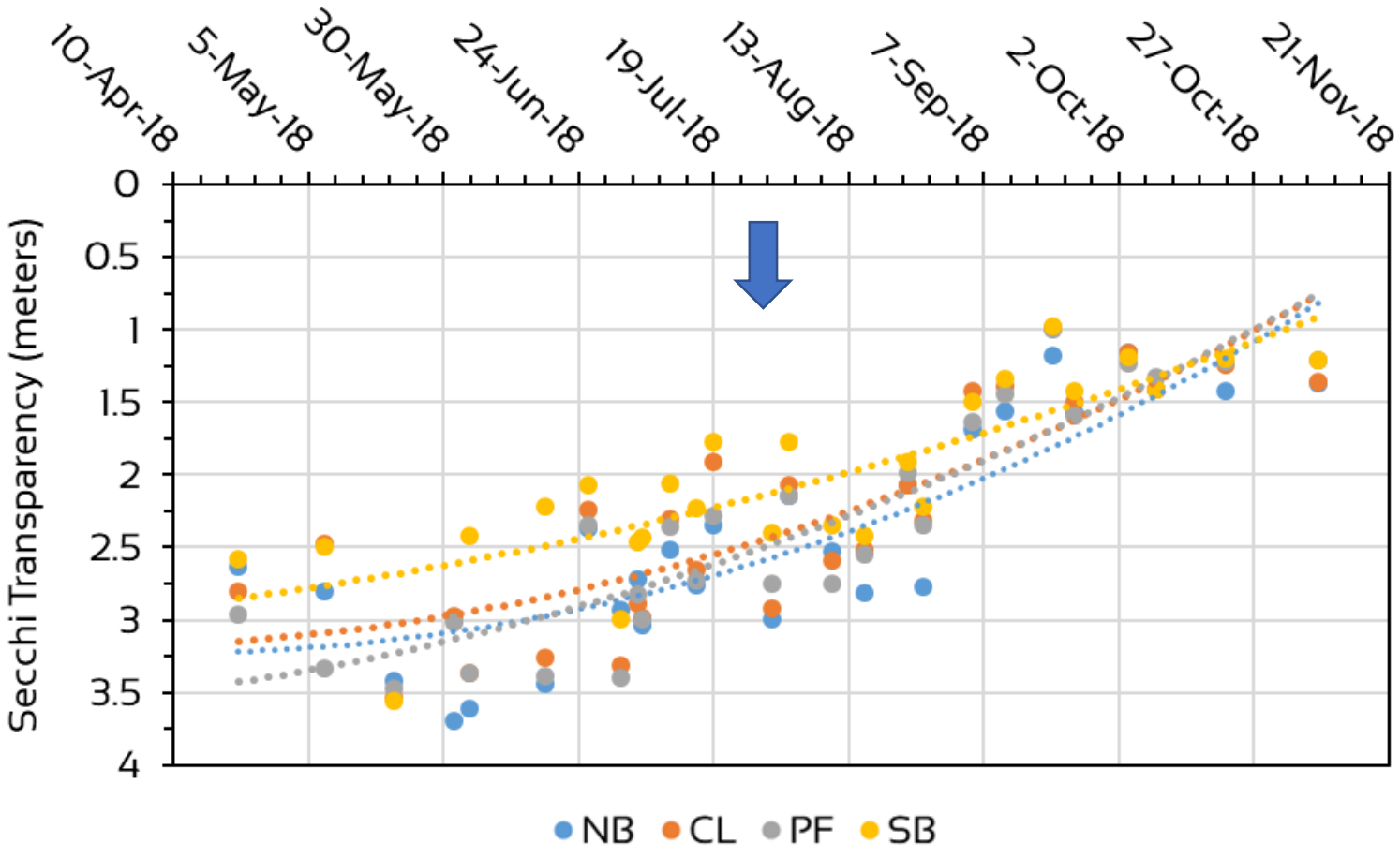

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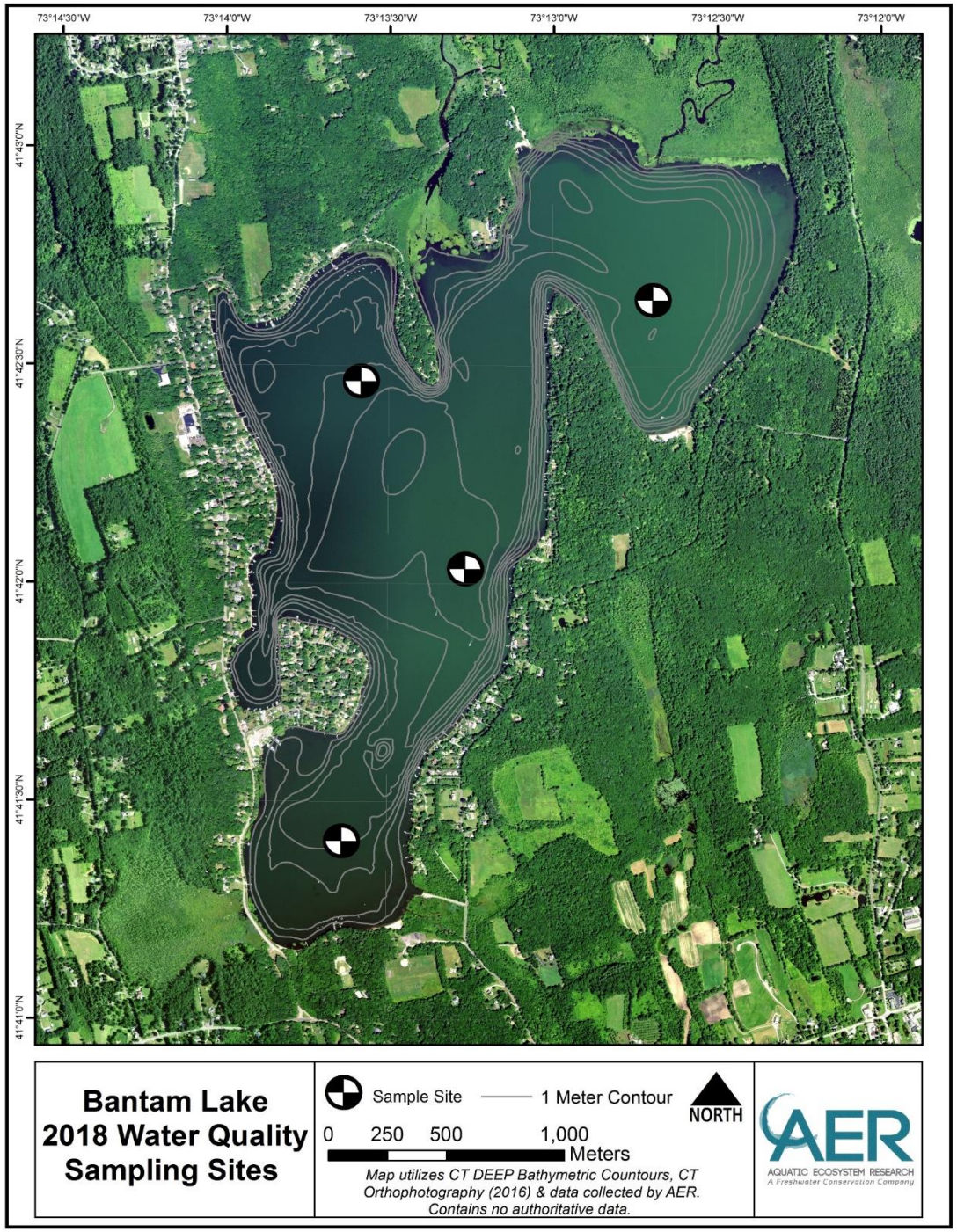

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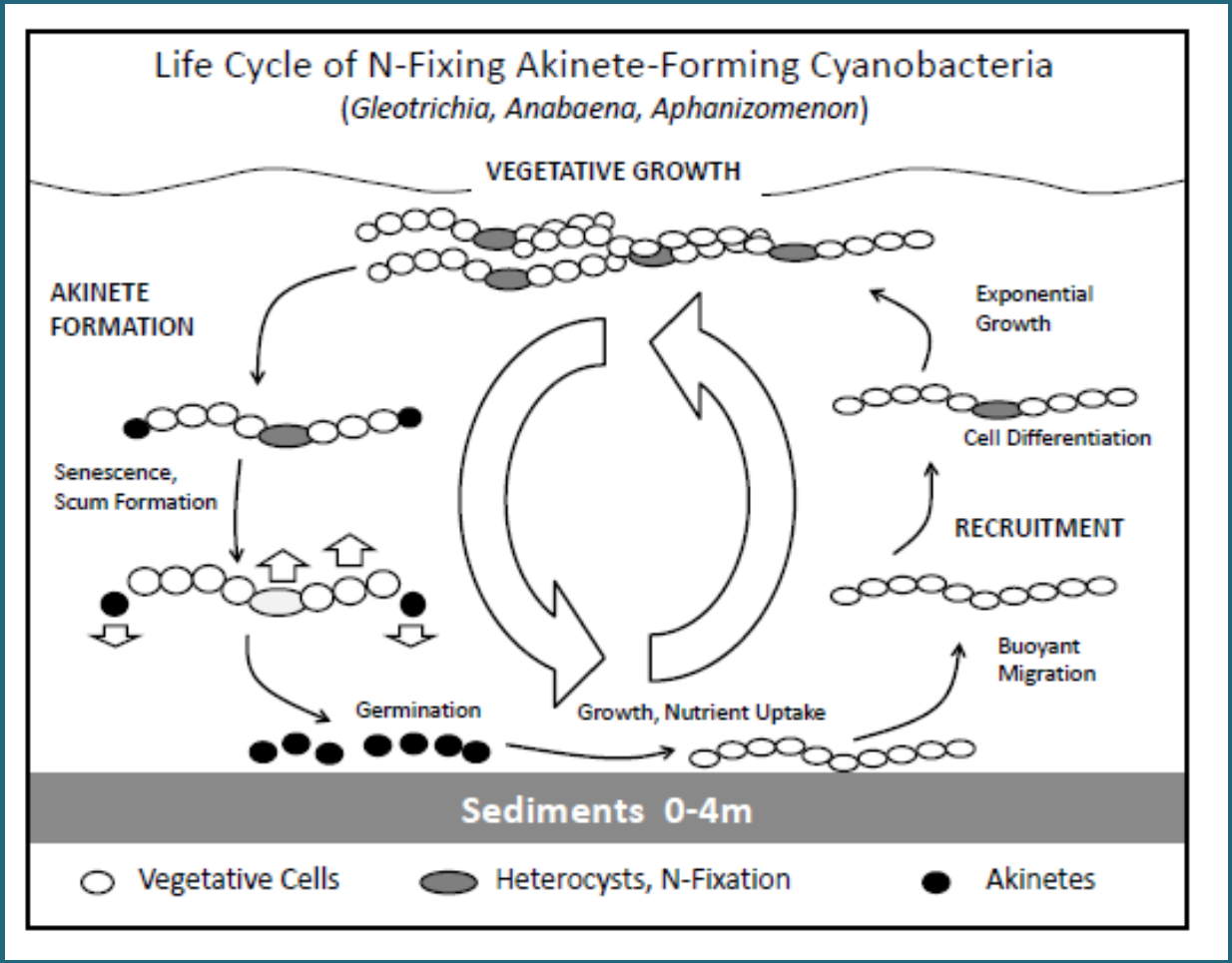
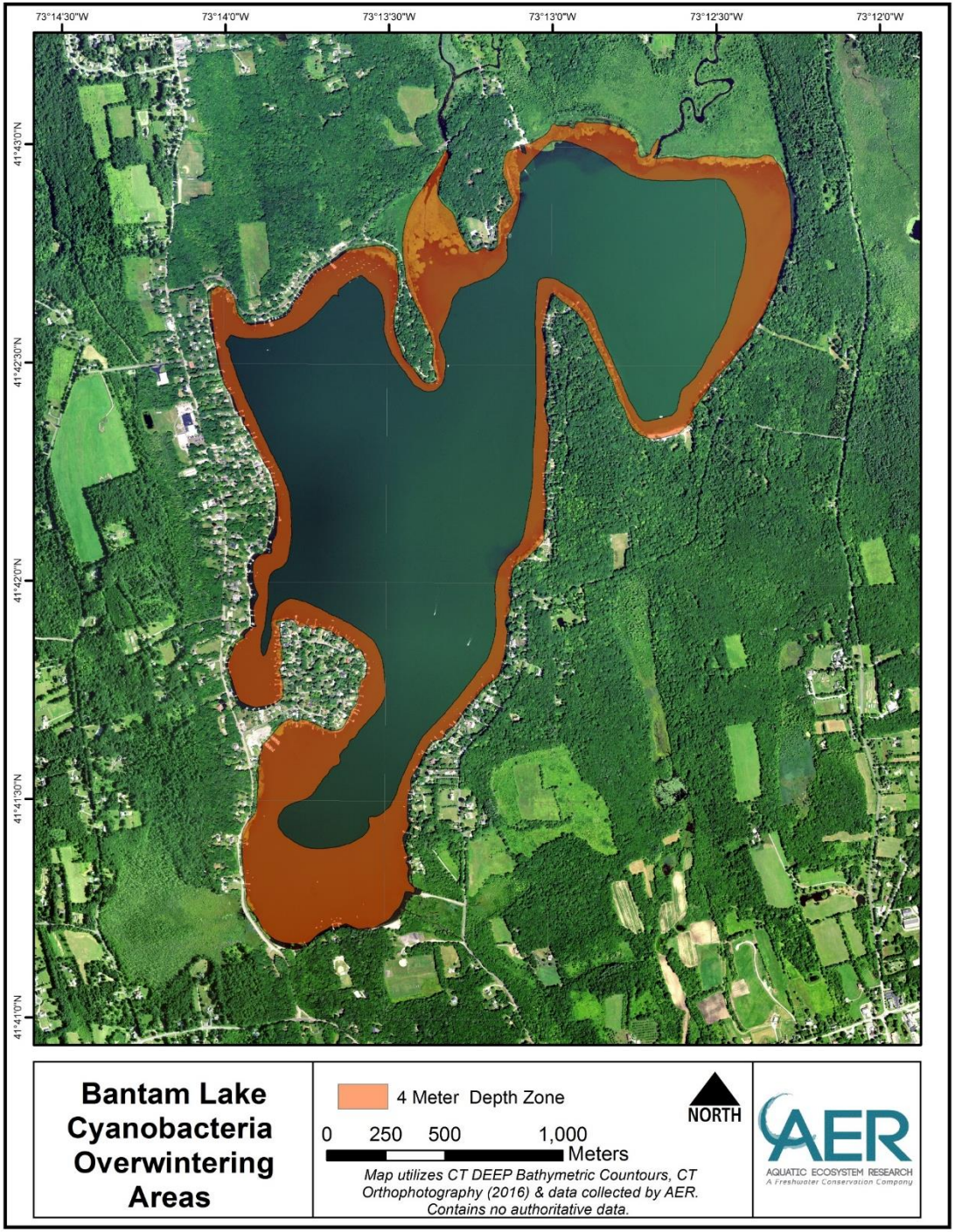


Figure No. 2. Generalized life cycle of *Anabaena spp.*, *Aphanizomenon spp.*, and similar Cyanobacteria genera. (Modified after Elfgren, 2003)

Cyanobacteria in Reservoirs: Causes, Consequences, Controls By Robert W. Kortmann, Ph.D. in NEWWA, 2015


73°14'30"W
73°14'0"W
73°13'30"W
73°13'0"W
73°12'30"W
73°12'0"W
41°43'0"N
41°42'30"N
41°42'0"N
41°41'30"N
41°41'0"N
Bantam Lake Cyanobacteria Overwintering Areas
4 Meter Depth Zone
NORTH
0 250 500 1,000
Meters
Map utilizes CT DEEP Bathymetric Countours, CT Orthophotography (2016) & data collected by AER. Contains no authoritative data.
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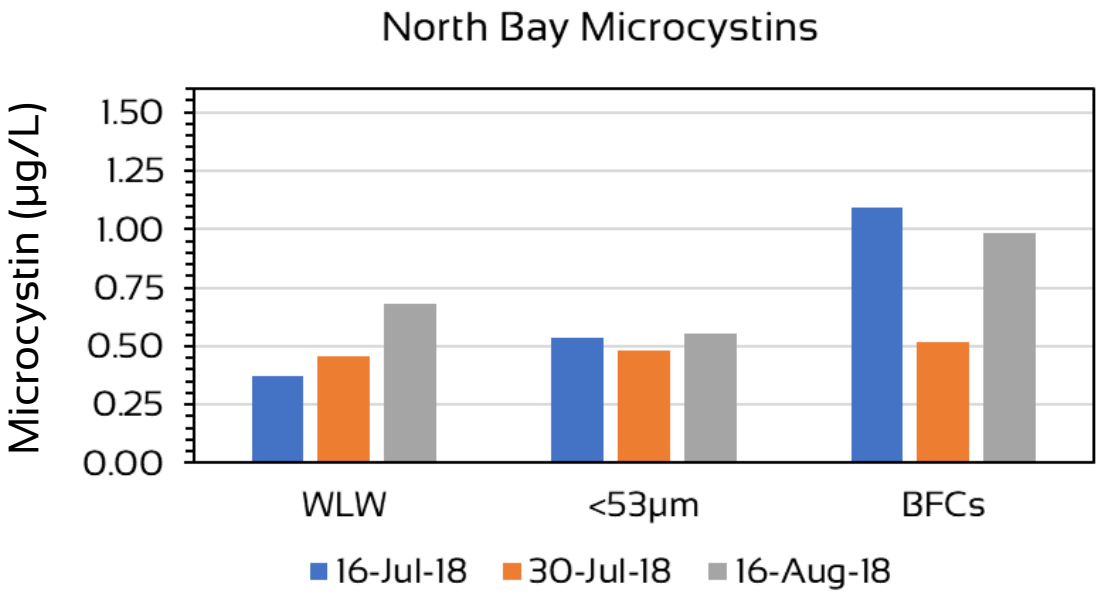
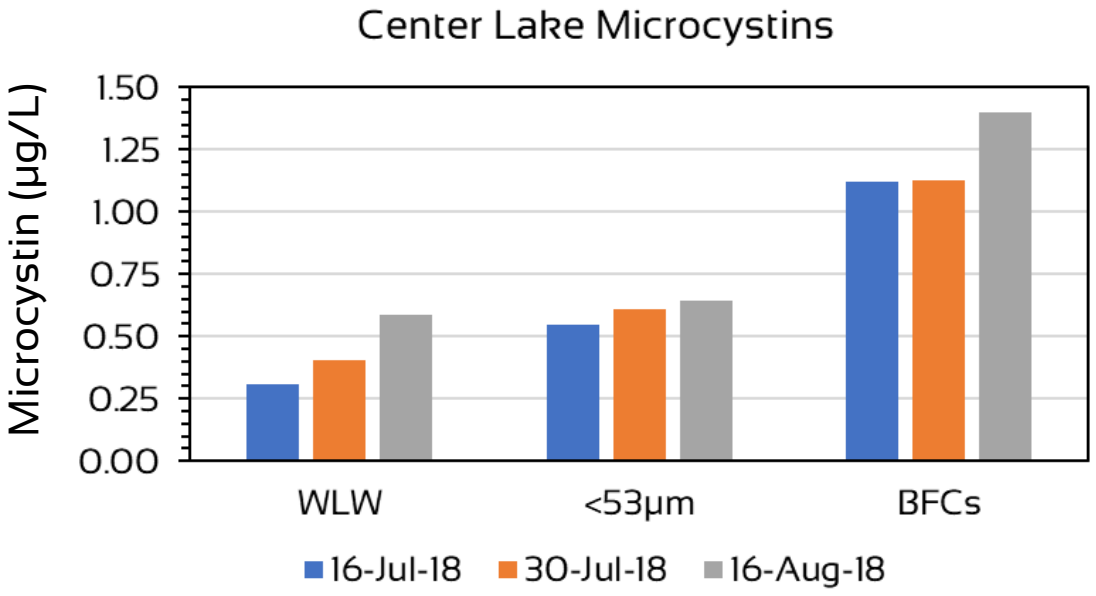
Microcystin levels in three size fractions of cyanobacteria from samples collected from the NB and CL sites. CTDPH uses a threshold of <4µg/L for recreational waters. WLW = whole lake water sample; <53µm = cyanobacteria that pass through a mesh of 53µm; BFCs = bloom forming cyanobacteria.





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Thank you!

Questions?

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