MIDCOAST CONSERVANCY

Collaborative efforts to find answers to Damariscotta Lake's wicked cyanobacteria problems

Patricia Nease, Robin Sleith, &
Pete Countway

Bigelow LABORATORY

Road Map

- Quick Orientation
- Cyanobacteria Timeline
- Some Results
- Next Steps

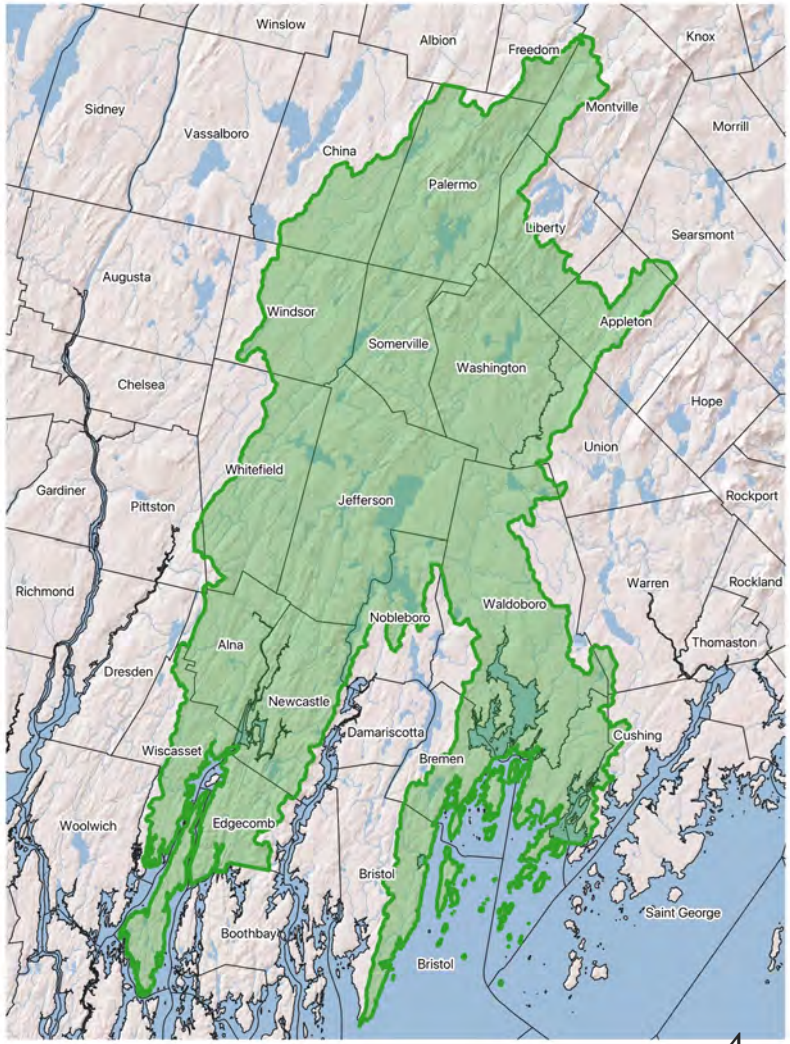
Mission

MIDCOAST CONSERVANCY

We protect and restore vital lands and waters on a scale that matters.

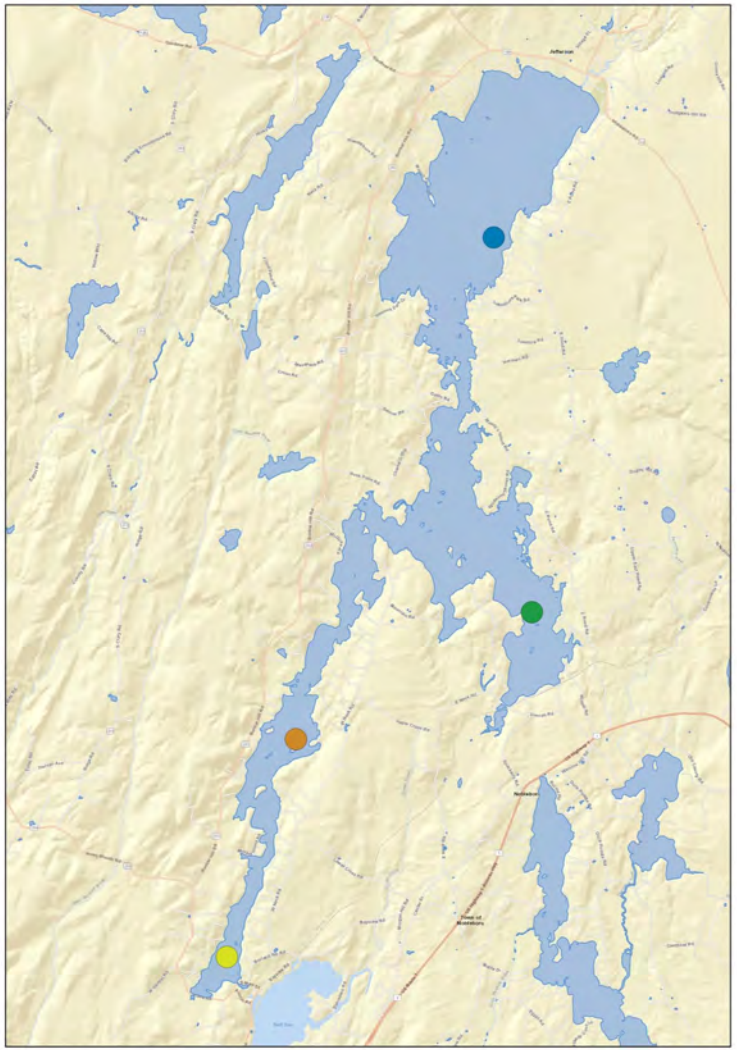
Midcoast Conservancy

- Roughly 500 square miles
- 14,589 acres conserved
- 3 watersheds
  - Sheepscot River
  - Damariscotta Lake
  - Medomak River

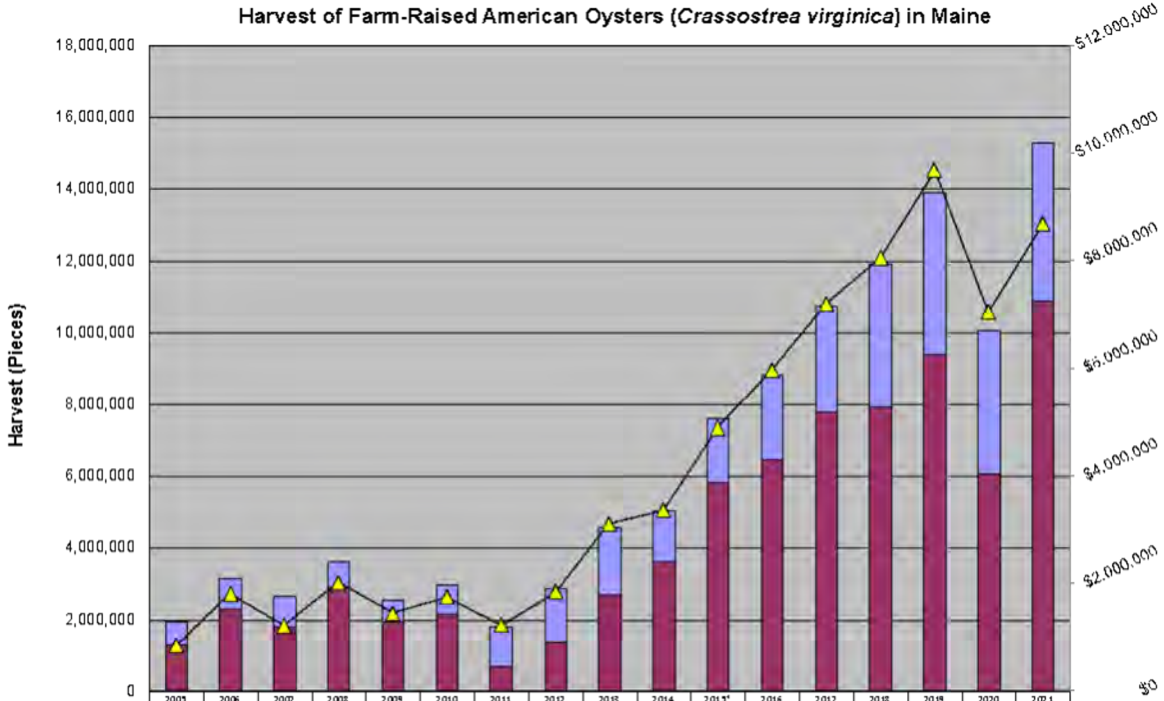


Damariscotta Lake

- 4,600 acres
- Three distinct basins
- State park and 2 public boat launches
- Large alewife run



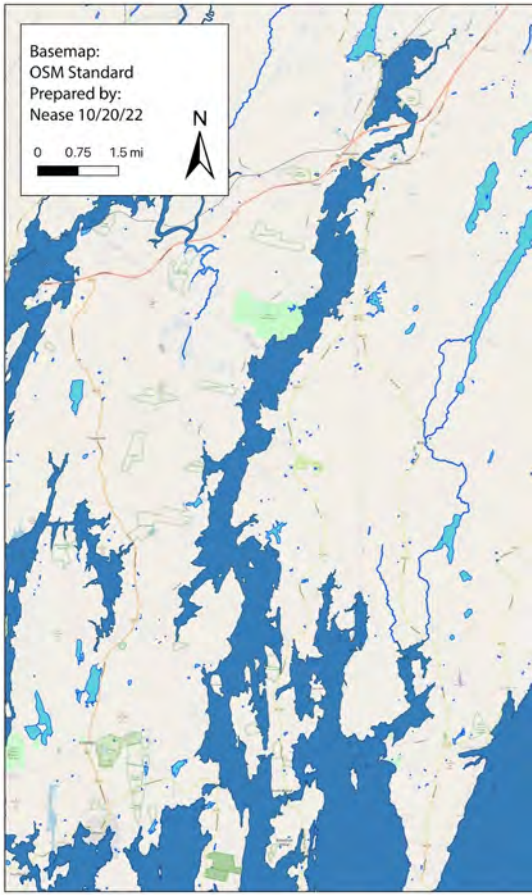
Damariscotta River Estuary



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015*	2016	2017	2018	2019	2020	2021
Other Location	650,044	837,488	875,067	728,078	653,894	820,047	1,103,901	1,522,652	1,900,640	1,404,261	1,788,625	2,236,755	2,941,792	3,892,948	4,507,768	3,990,144	4,293,261
Damariscotta River	1,291,484	2,206,290	1,777,792	2,896,716	1,823,700	2,140,279	687,500	1,352,162	2,681,897	3,618,569	5,811,629	6,447,636	7,774,405	7,898,517	9,381,531	6,070,775	10,286,636
Total Harvest	1,941,528	3,148,428	2,652,865	3,624,787	2,359,594	2,960,326	1,791,401	2,875,814	4,582,537	5,022,830	7,600,254	8,684,391	10,716,197	11,791,465	13,889,299	10,060,919	14,282,497
Total Value ($)	$848,338	$1,812,677	$1,220,531	$2,024,373	$1,447,378	$1,794,744	$1,225,472	$1,851,331	$2,113,775	$3,259,665	$4,898,154	$5,964,214	$7,193,923	$8,054,957	$9,670,100	$7,041,070	$8,676,238

* DMR began collecting LPA harvest data in 2015.

* 2021 data are preliminary and will be finalized when 2022 data are posted.



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Cyanobacteria Timeline

Anecdotal reports of cyanobacteria outbreaks

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August 2020: *Planktothrix* outbreak in South Arm

Cyanoba

Anecdotal reports of cyanobacteria outbreaks

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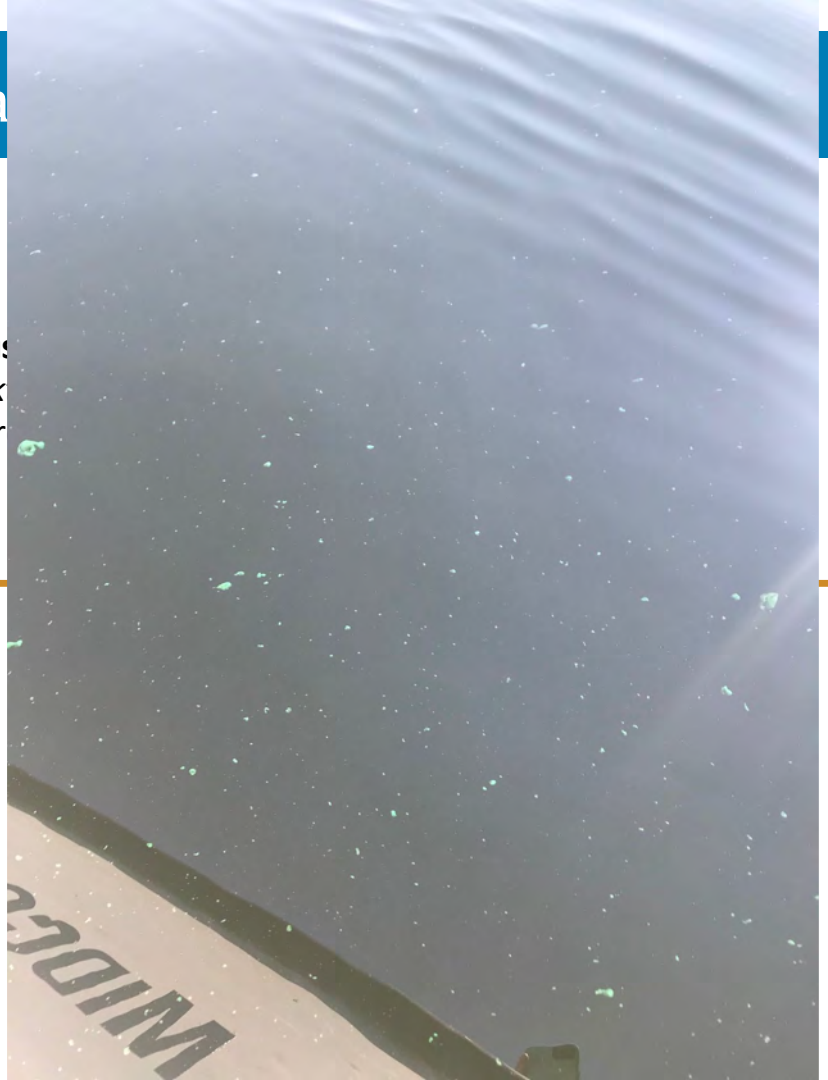
August 2020: *Planktothrix* outbreak in South Arm



Cyanobacteria Timeline

Anecdotal reports of cyanobacteria outbreaks

August 2020: *Planktothrix* outbreak in South Arm

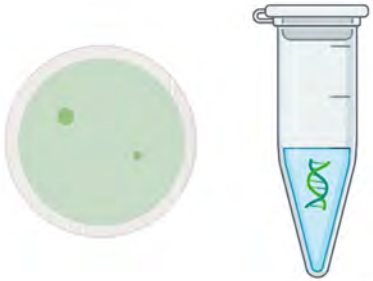
August 2021: *Planktothrix* outbreak in South Arm

Winter 2021-2022: Developed quantitative eDNA methods for *Planktothrix*

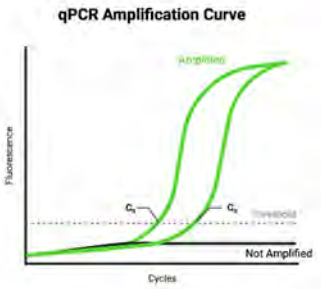
Quick qPCR Workflow

Step 1: Collect a water sample

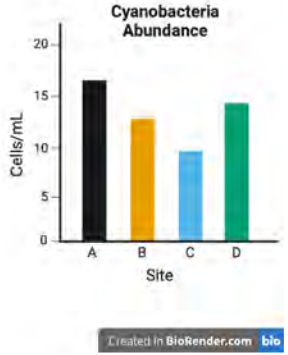
Step 2: Filter the water sample



Step 3: Extract DNA from filter



Step 4: Run qPCR



Step 5: Convert output to abundance

Cyanobacteria Timeline

Anecdotal reports of cyanobacteria outbreaks

August 20
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outbreak i
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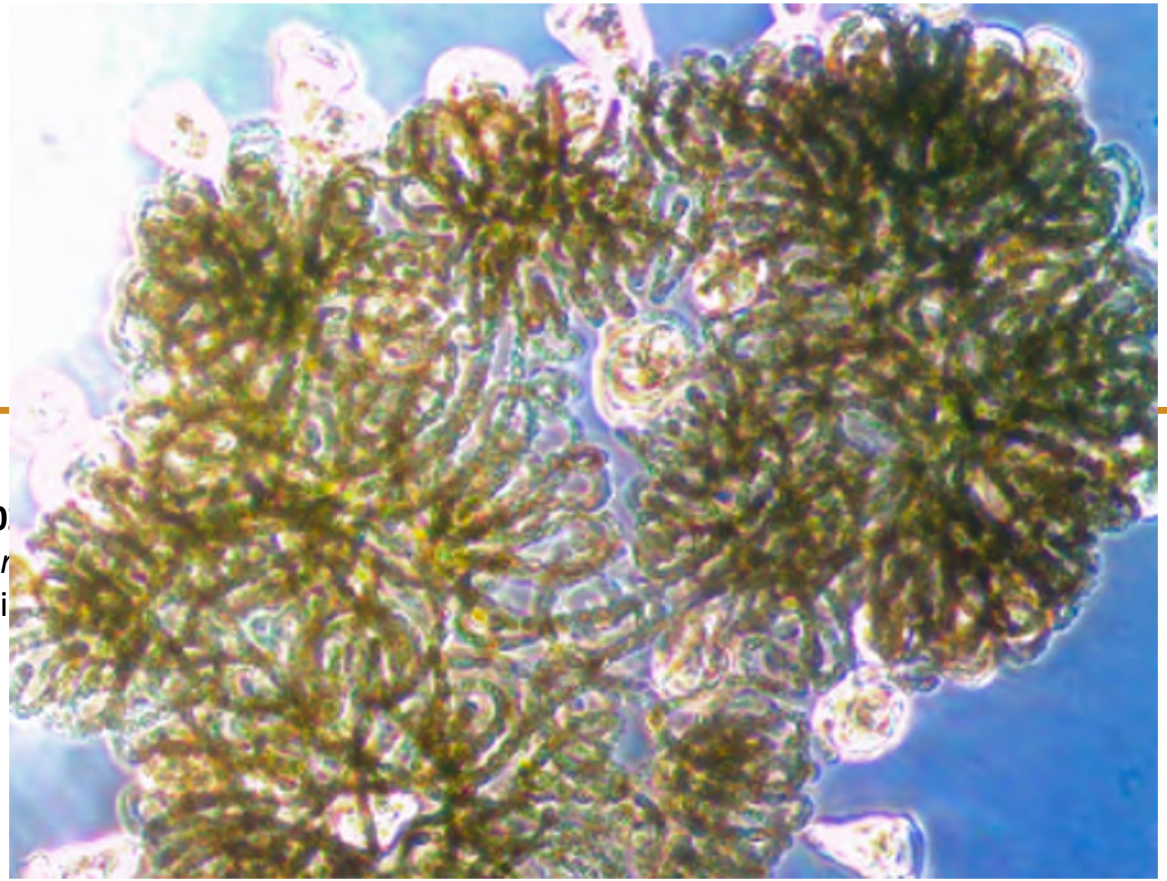

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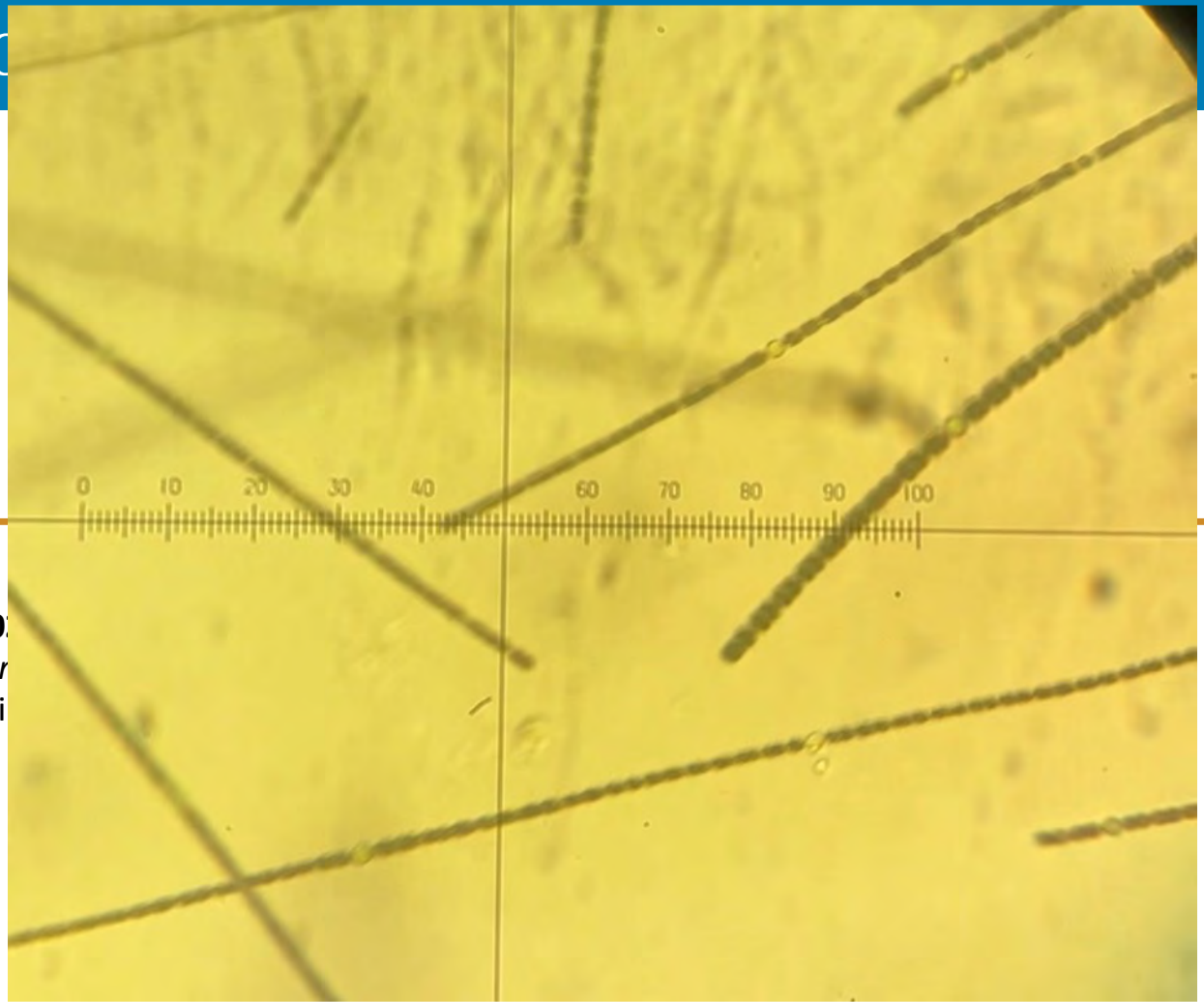

Anecdotal reports of cyanobacter outbreaks

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Cyanobacteria Timeline

Anecdotal reports of cyanobacteria outbreaks

August 2020: *Planktothrix* outbreak in South Arm

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Winter 2021-2022: Developed quantitative eDNA methods for *Planktothrix*

June 2022: *Dolichospermum* (curly morph) outbreak in whole lake

July 2022: *Dolichospermum* (straight morph) outbreak in South Arm

August 2022: *Planktothrix* outbreak in South Arm

Summer-Fall 2022: Developed quantitative eDNA methods for both *Dolichospermum* strains

Quick ddPCR Workflow

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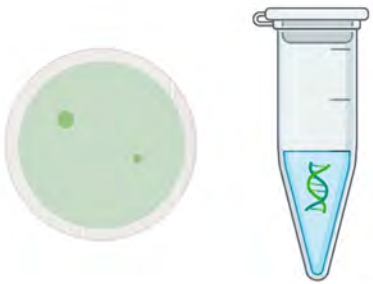
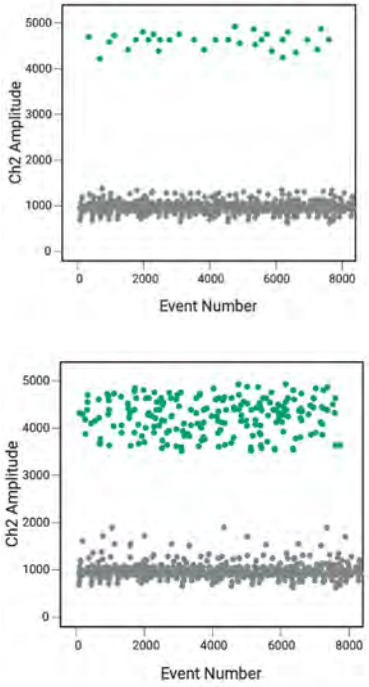
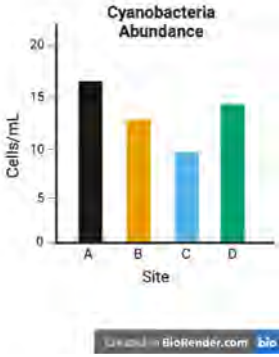
Step 2: Filter the water sample



Step 3: Extract DNA from filter



Step 4: Run ddPCR



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Summer-Fall 2022: Developed quantitative eDNA methods for both *Dolichospermum* strains

Winter 2022-2023: Finding funding & planning for expanded sampling

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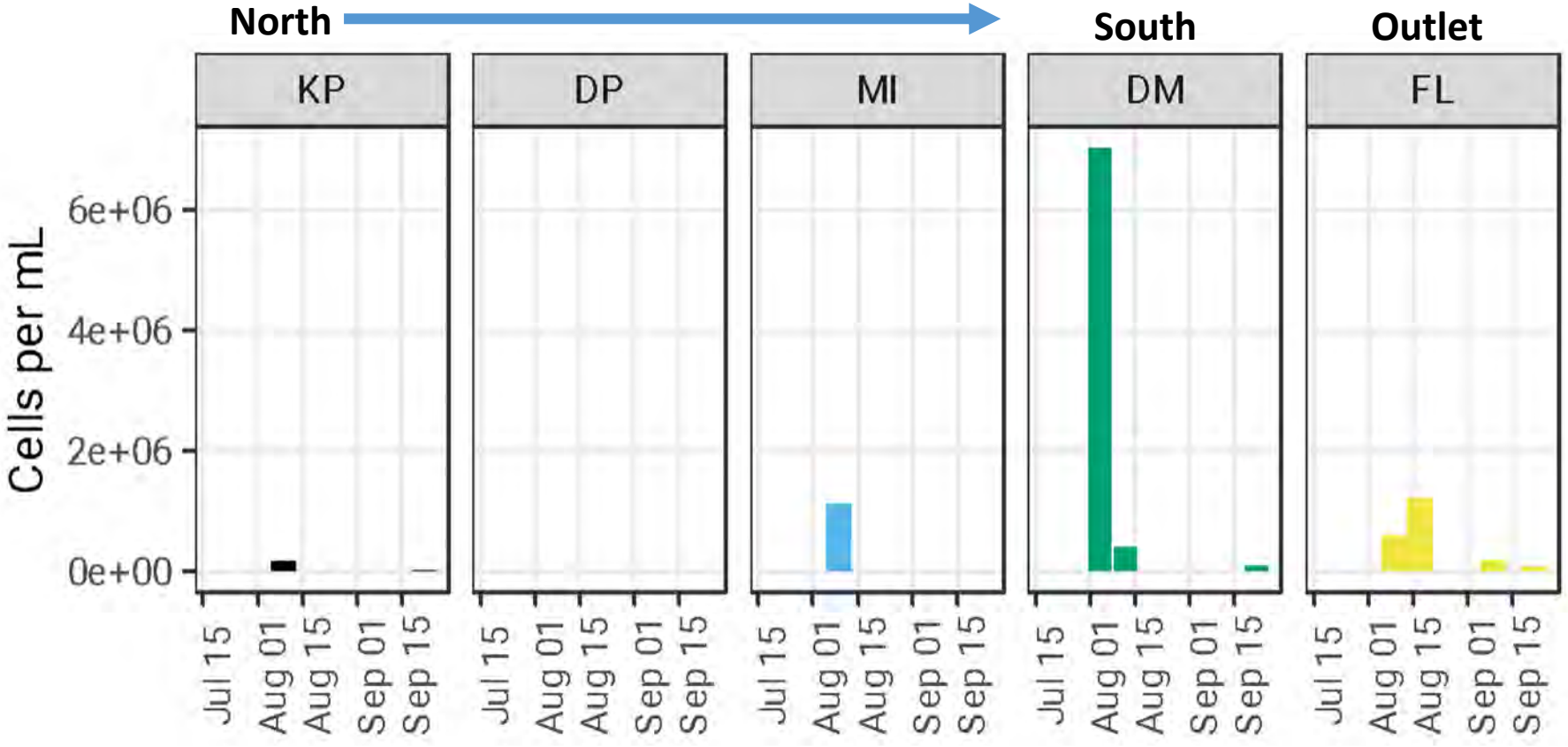
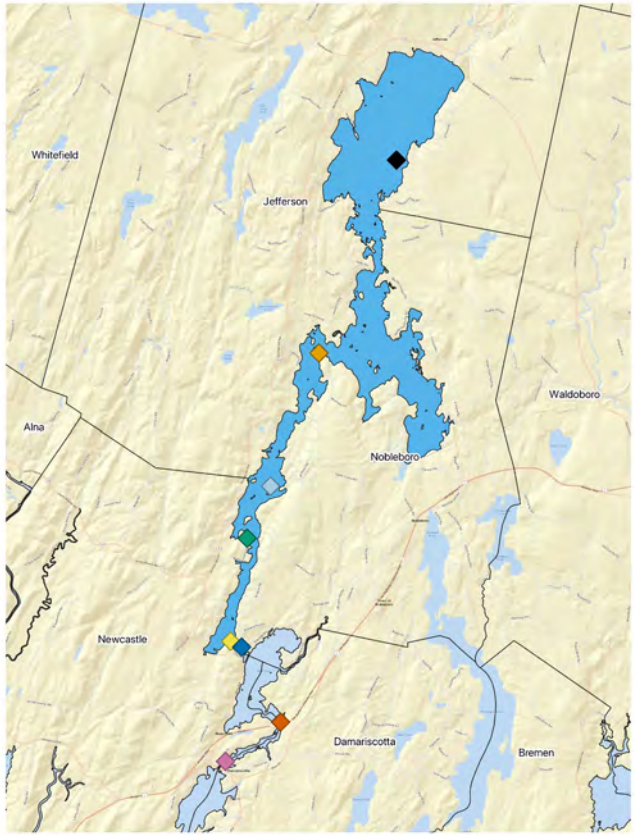
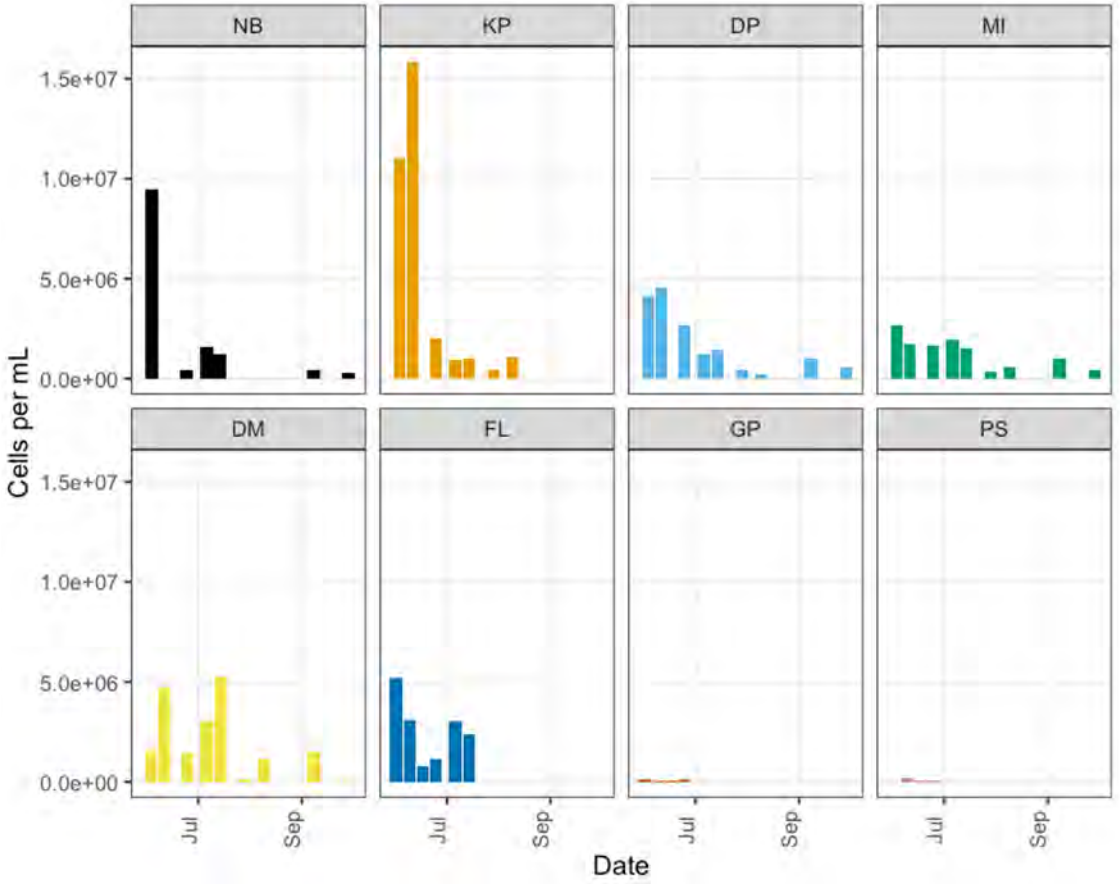
2021 *Planktothrix* Results



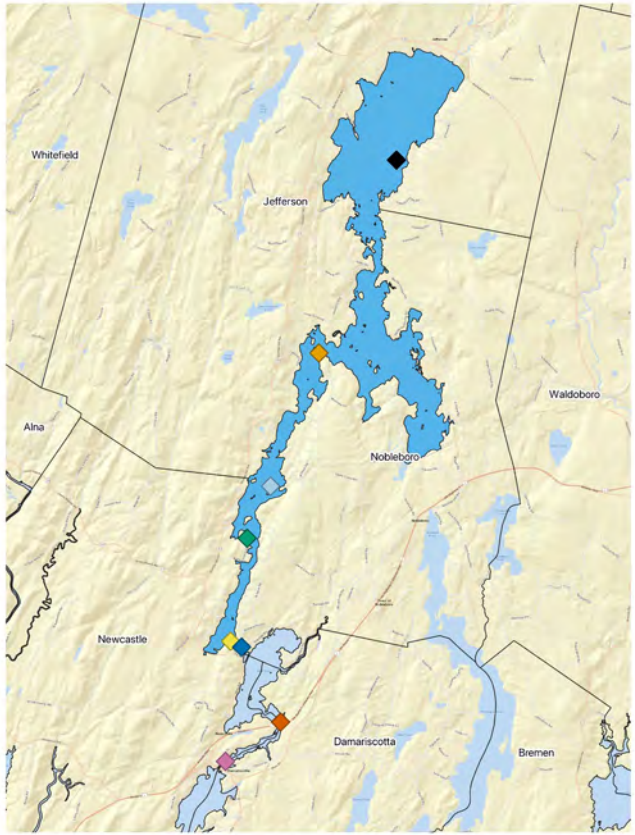
No Microcystin Biosynthesis Pathway

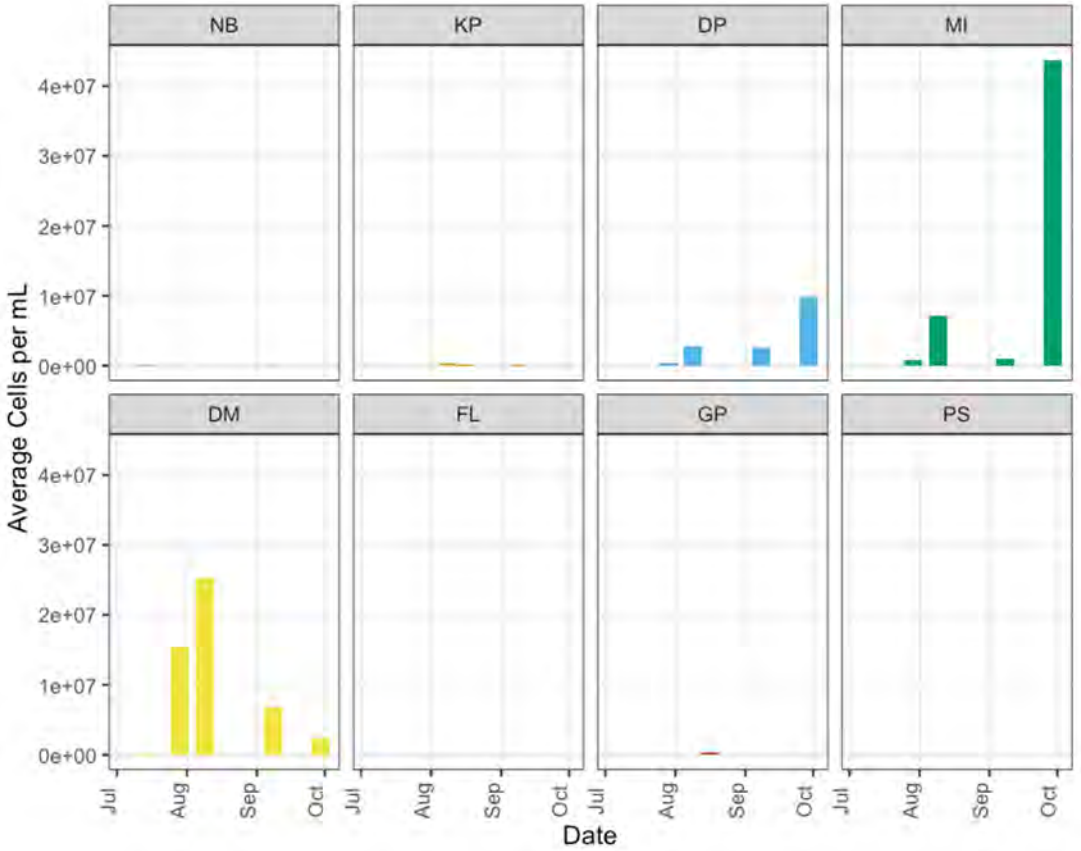
June *Dolichospermum* Results





July *Dolichospermum* Results





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Next Steps

- Consistent sampling May-October
- Adding more environmental sampling coincident with cyanobacteria sampling

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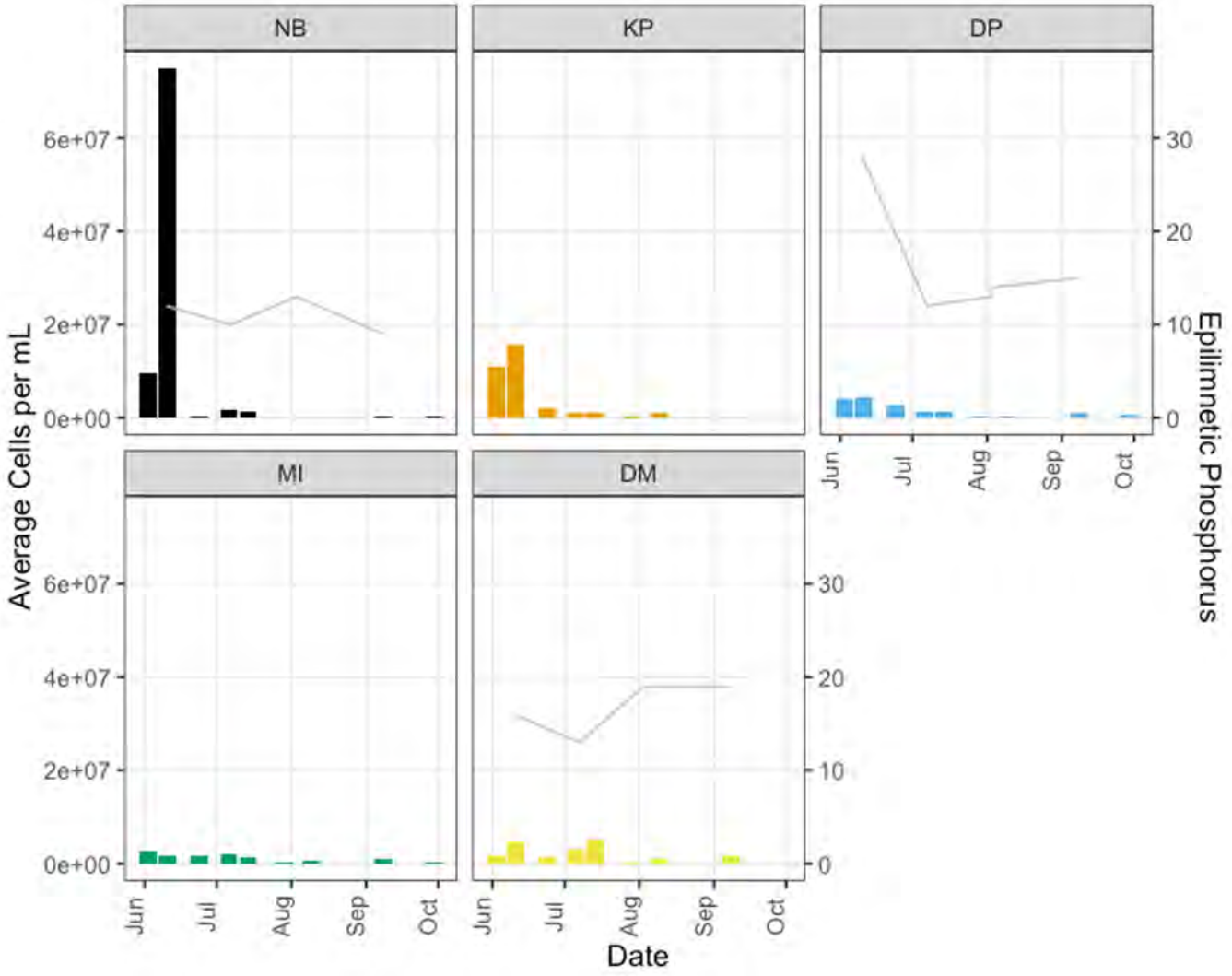
NB
KP
DP
MI
DM
Average Cells per mL
0e+00
2e+07
4e+07
6e+07
Epilimnetic Phosphorus
0
10
20
30
Jun
Jul
Aug
Sep
Oct
Date

Next Steps

- Consistent sampling May-October
- Adding more environmental sampling coincident with cyanobacteria sampling
- Develop models
- We have a workflow now for new strains

Maine Cyanobacteria Group

- Semi-regular meetings to discuss cyanobacteria
- Collective purchasing of cyanotoxin test strips
  - Standardized sampling, testing & data management

Email Patricia@midcoastconservancy.org if you want to join!

Thanks!

Hannah Braslau

Maddie Rapelyea

Supported by the National Science Foundation under Grant No. 11A-1849227

Thank you!

MIDCOAST CONSERVANCY

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WWW.MIDCOASTCONSERVANCY.ORG