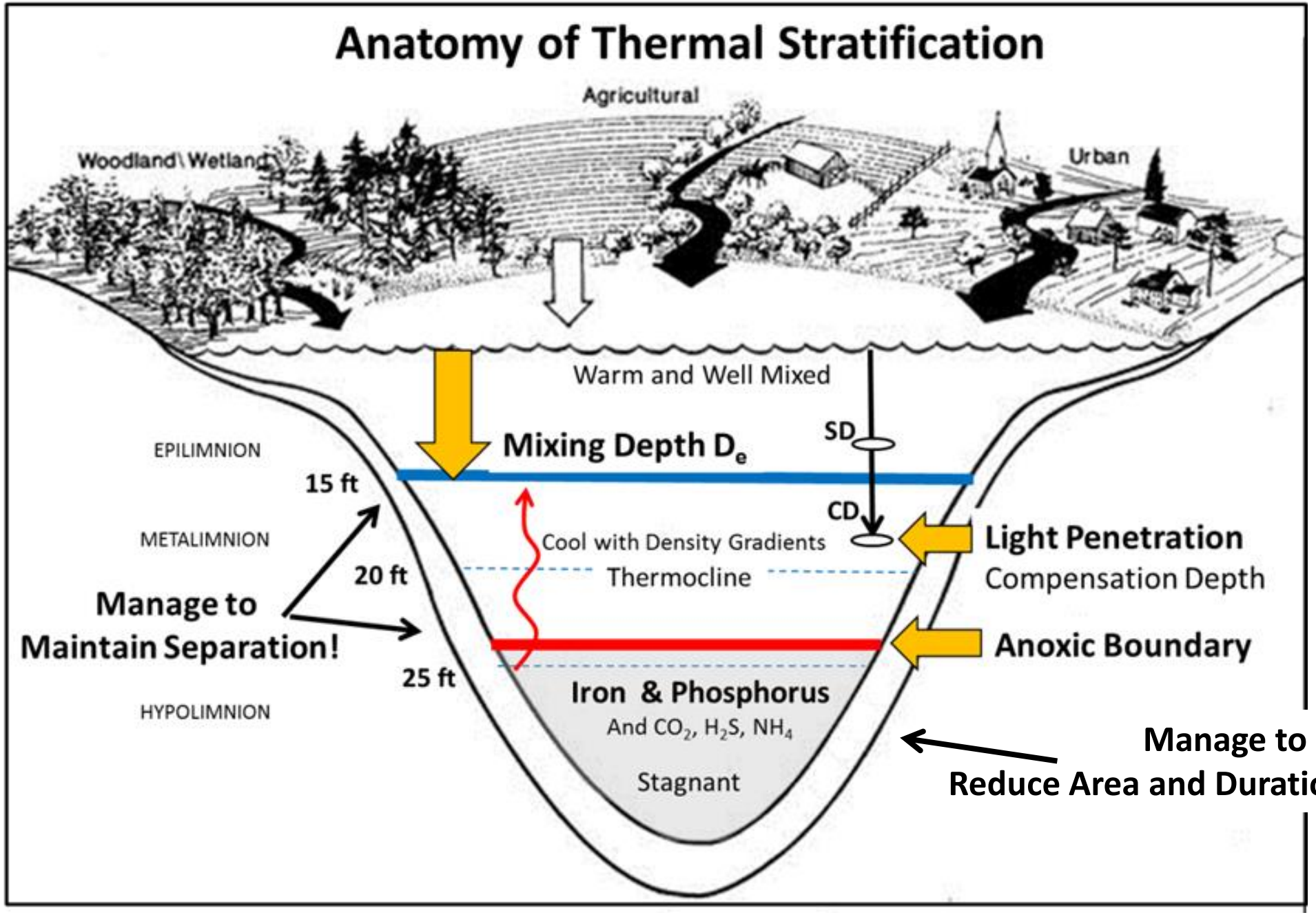



*Kortmann, 2020*

Known for excellence.
Built on trust.

## Climate Change in the Northeast 1980 to 2018

https://climatereanalyzer.org/
Burpee, 2021

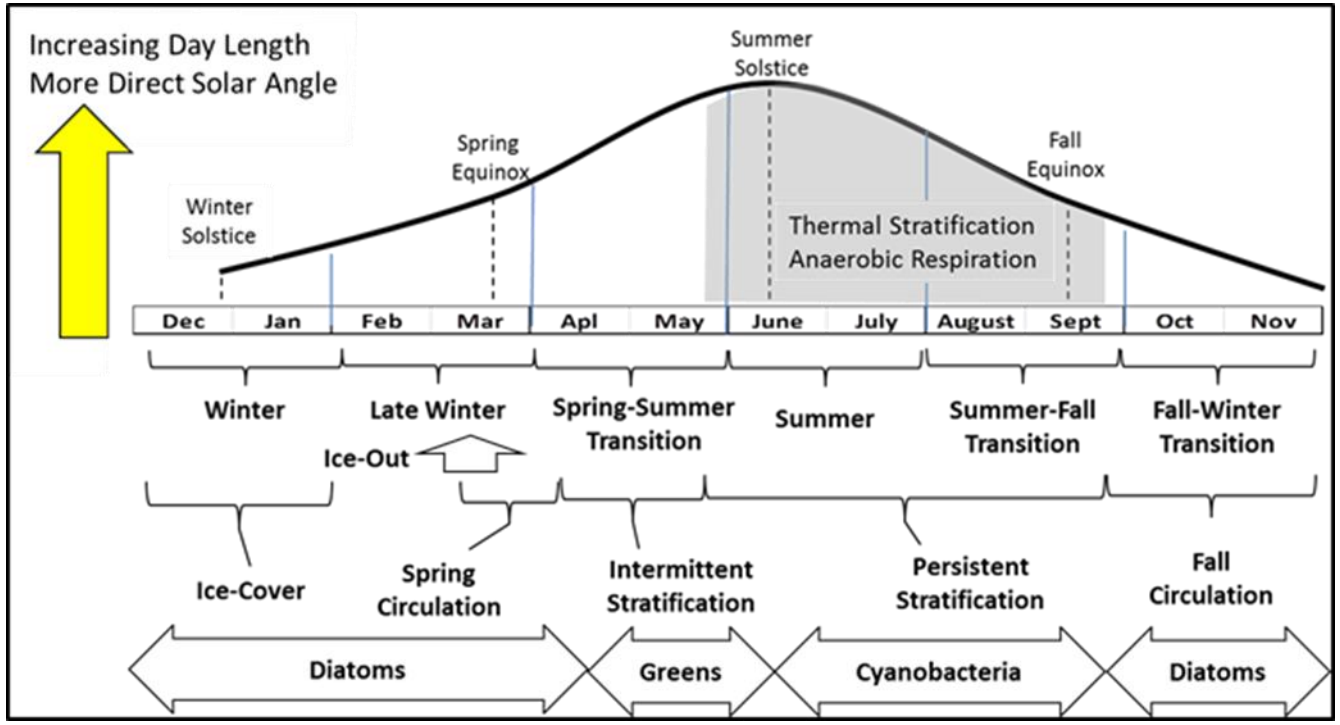
**1980 to 2018**

| | Average Annual | DJF Winter | MAM Spring | JJA Summer | SON Autumn |
|---|---|---|---|---|---|
| Average Increase Temperature deg. C | 1.5 | **2** | 0 | 1 | **2** |
| Precipitation cm | 4 | **5** | -3 | -1 | **3** |
| Wind Speed meters/second | -0.8 | -0.9 | -0.8 | -0.8 | -0.6 |

- Average Temperature is increasing most rapidly during Winter and Autumn
- Stratification and Growing Seasons are Beginning Earlier and Ending later
- Precipitation is also increasing most rapidly during Winter and Autumn
- Wind Speeds are Decreasing, with similar seasonal change
- Severe Storm Episodes and Mixing Events are becoming more frequent

*(Burpee, 2021. Army Corps of Engineers presentation)*

*Six seasons in the lake, and it is a year-to-year continuum.*




- Duration of Summer Stratification is increasing (on both ends)
  - Oxygen Loss is ascending higher and lasting longer
  - Internal Nutrient Loading from sediments is increasing
- Cyanobacteria is persisting through the mild winters in some years
- Seasonal Succession of different algae groups is being altered

*(Kortmann, 2020. Journal New England Water Works Association)*

## Climate Change effects on Lakes and Reservoirs

*Cause* → *Effect*

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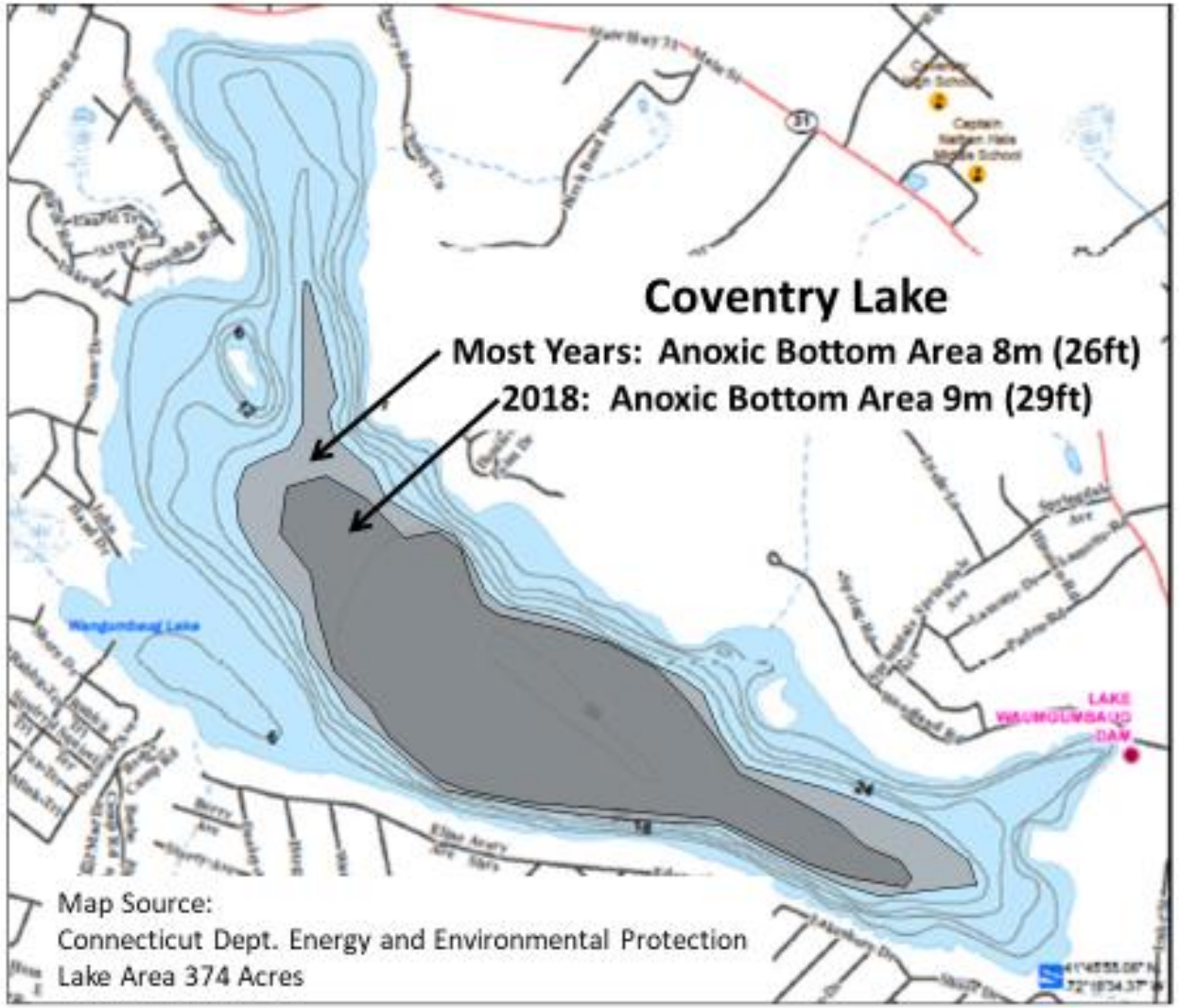


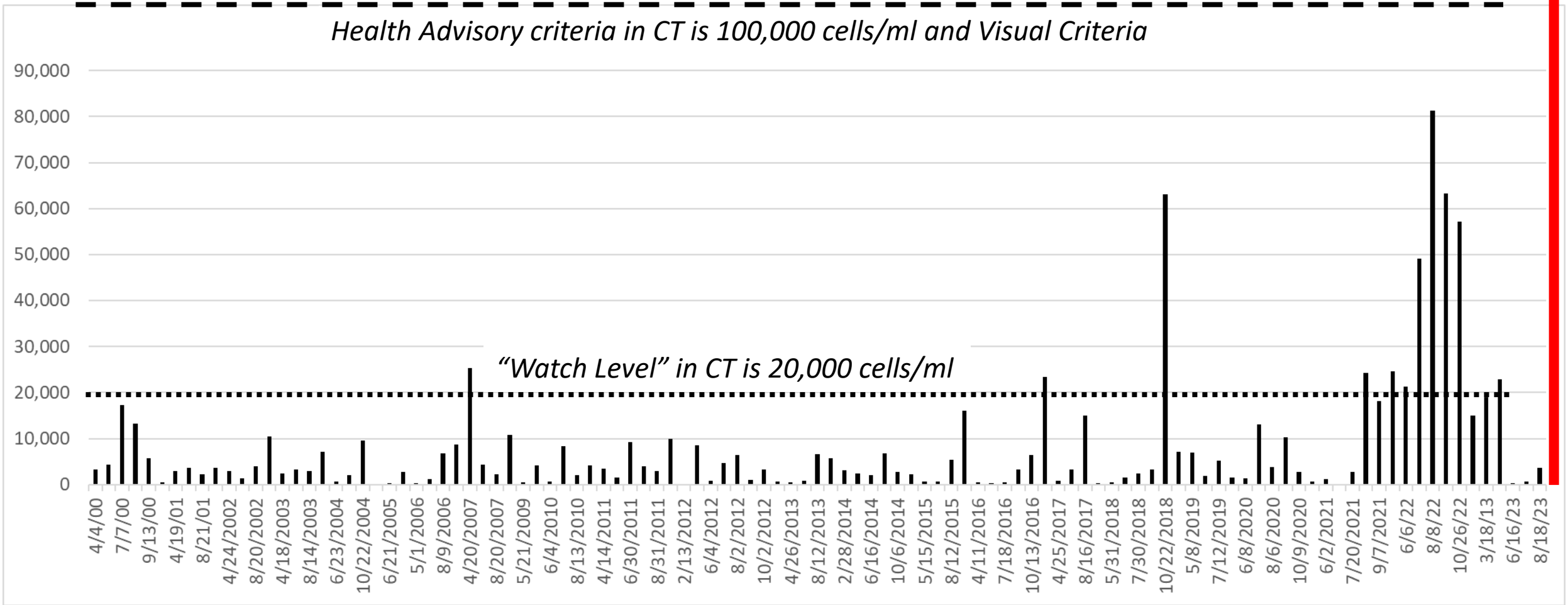

**Critical Natural Features for Nutrient Loading from Sediments:**

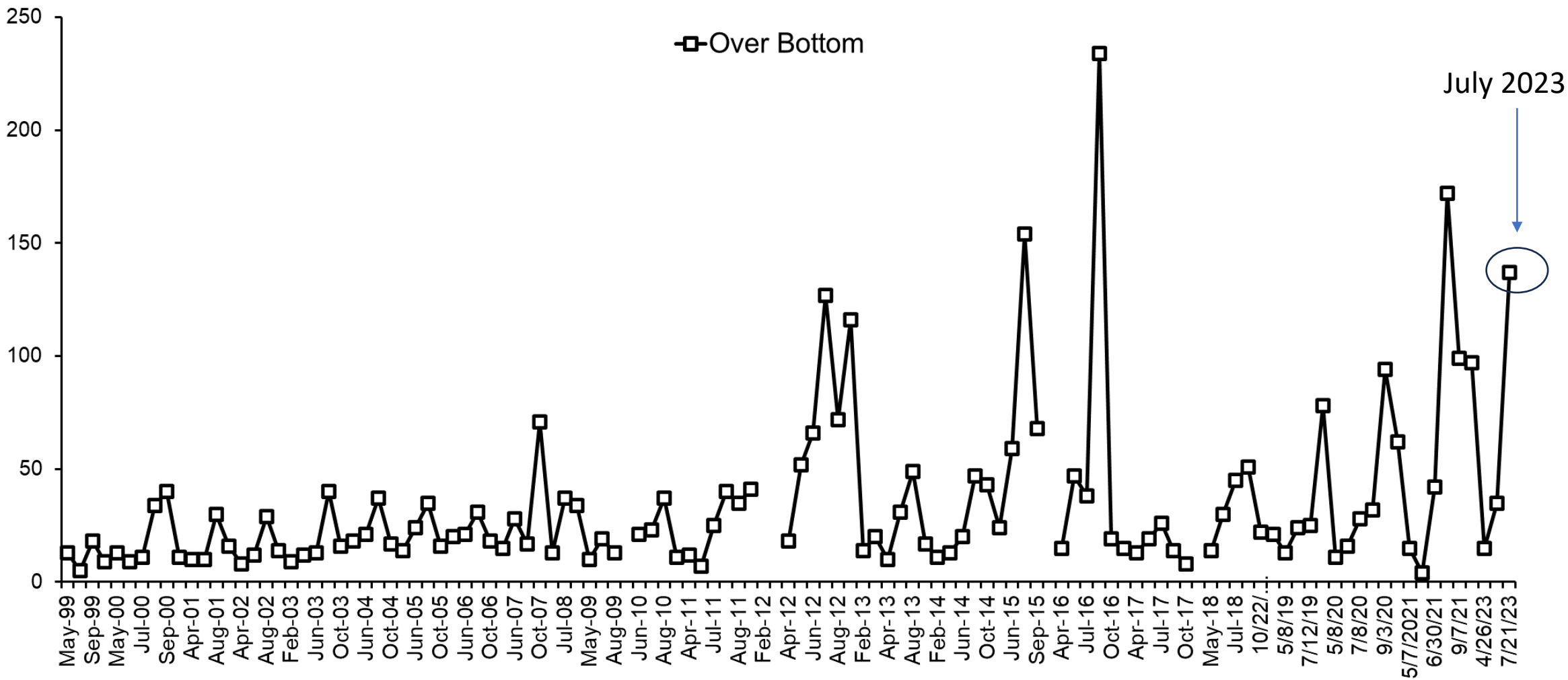
- Bottom Area that becomes devoid of oxygen
  - Duration of oxygen loss over-bottom
- Ascent of the Oxygen Loss Boundary up into the water column (approaching the surface water mixing depth)

*Kortmann, 2022*

***Total Cyanobacteria at 30 ft deep August 18, 2023 161,000 Cells/ml →***

# Coventry Lake
# Cyanobacteria Abundance over the past 23 Years




Coventry Lake Total Phosphorus (µg/L) 1999-2023
Over Bottom
July 2023
250
200
150
100
50
0
May-99
Sep-99
May-00
Jul-00
Sep-00
Apr-01
Aug-01
Apr-02
Aug-02
Feb-03
Jun-03
Oct-03
Jun-04
Oct-04
Jun-05
Oct-05
Jun-06
Oct-06
Jun-07
Oct-07
Jul-08
May-09
Aug-09
Jun-10
Aug-10
Apr-11
Jul-11
Aug-11
Feb-12
Apr-12
Jun-12
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Jun-14
Oct-14
Jun-15
Sep-15
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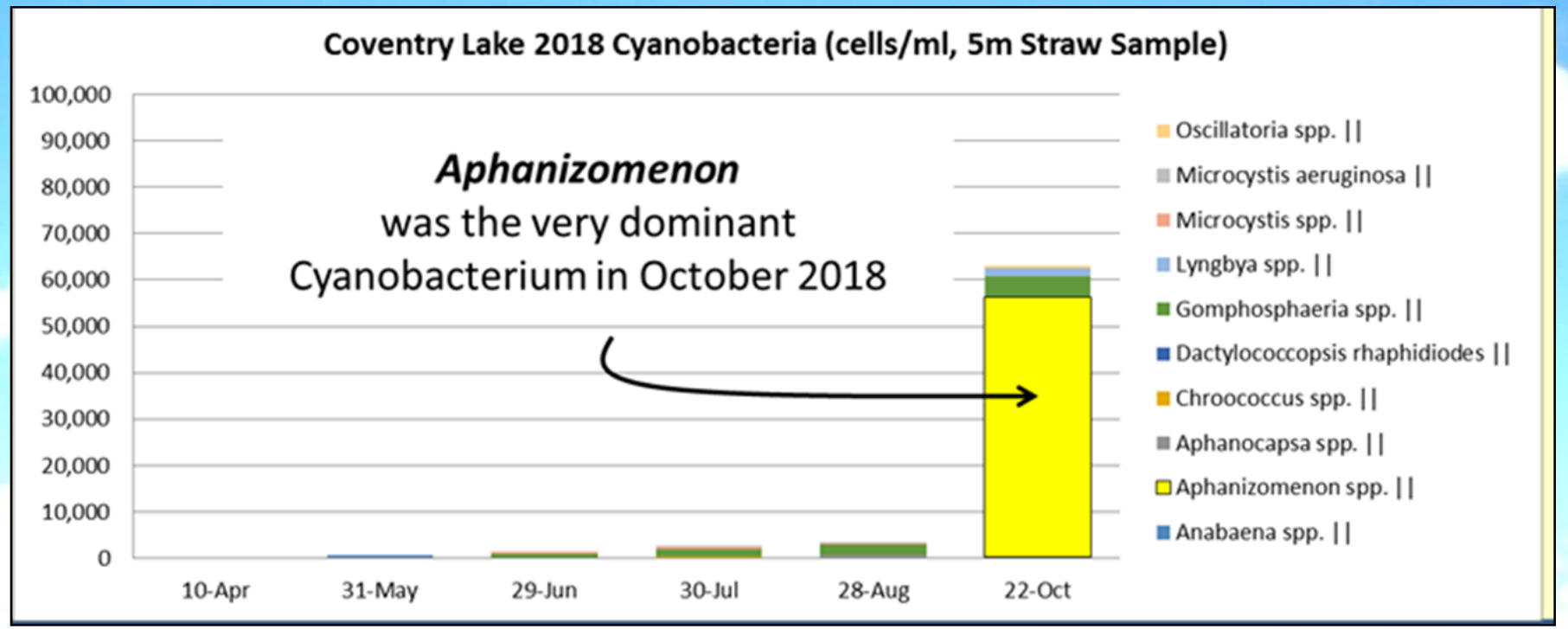
Jul-16
Oct-16
Apr-17
Jul-17
Oct-17
May-18
Jul-18
10/22/...
5/8/19
7/12/19
5/8/20
7/8/20
9/3/20
5/7/2021
6/30/21
9/7/21
4/26/23
7/21/23

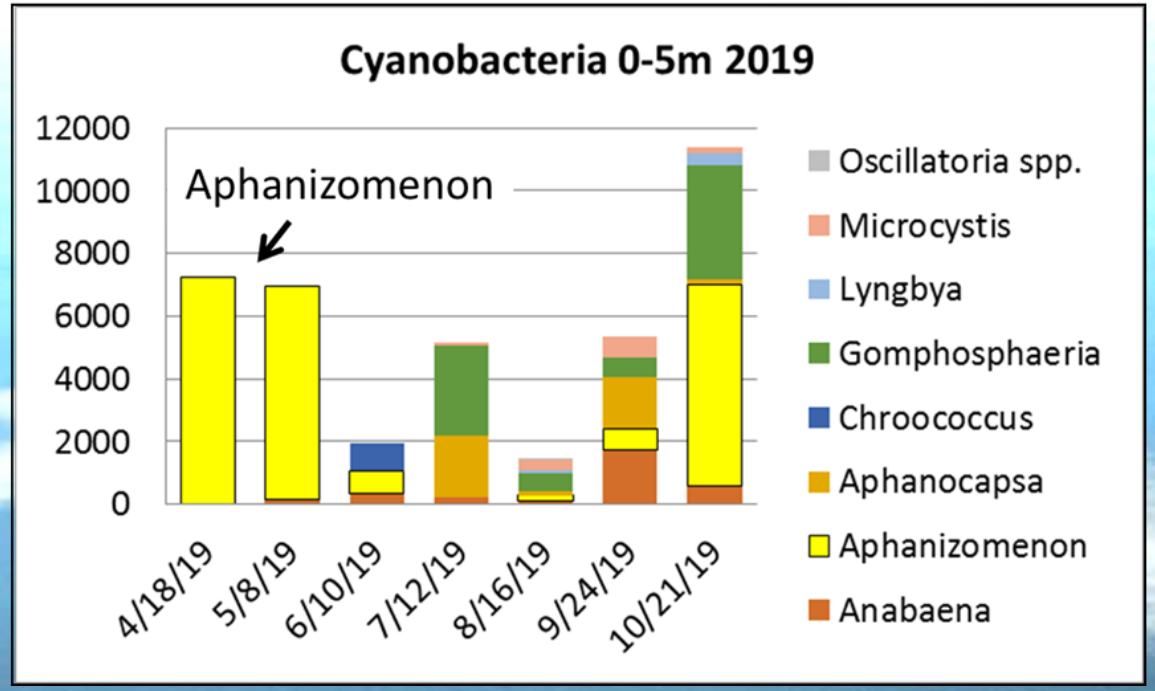
GZA Known for excellence. Built on trust.




Very Low Cyanobacteria Density in Surface 5m during Summer,

Highest Fall Cyanobacteria Density since 1974 in 2018,

Cyanobacteria Persisted Through Winter to Spring 2019.



Aphanizomenon persisted through the winter

Cyanobacteria in deep waters

## Coventry Lake 2023 Cyanobacteria

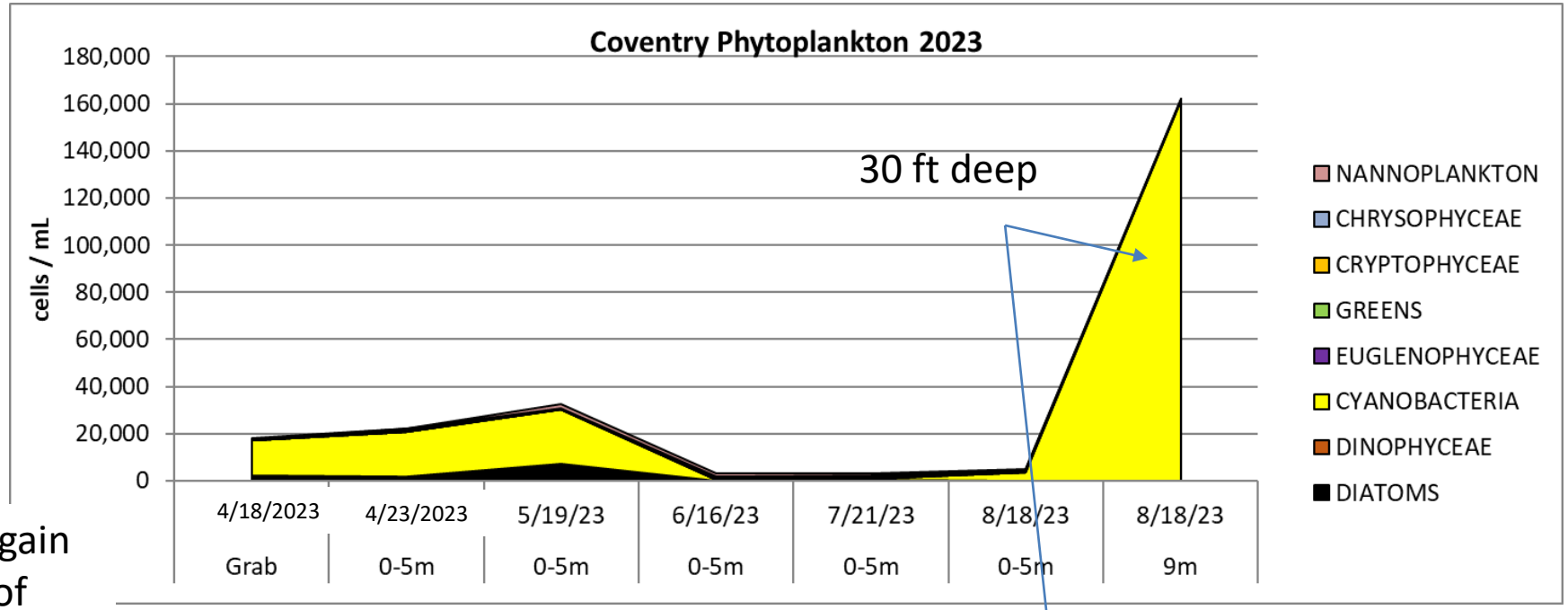
### Cells/ml TOP 5M (Surface to 16 ft deep)

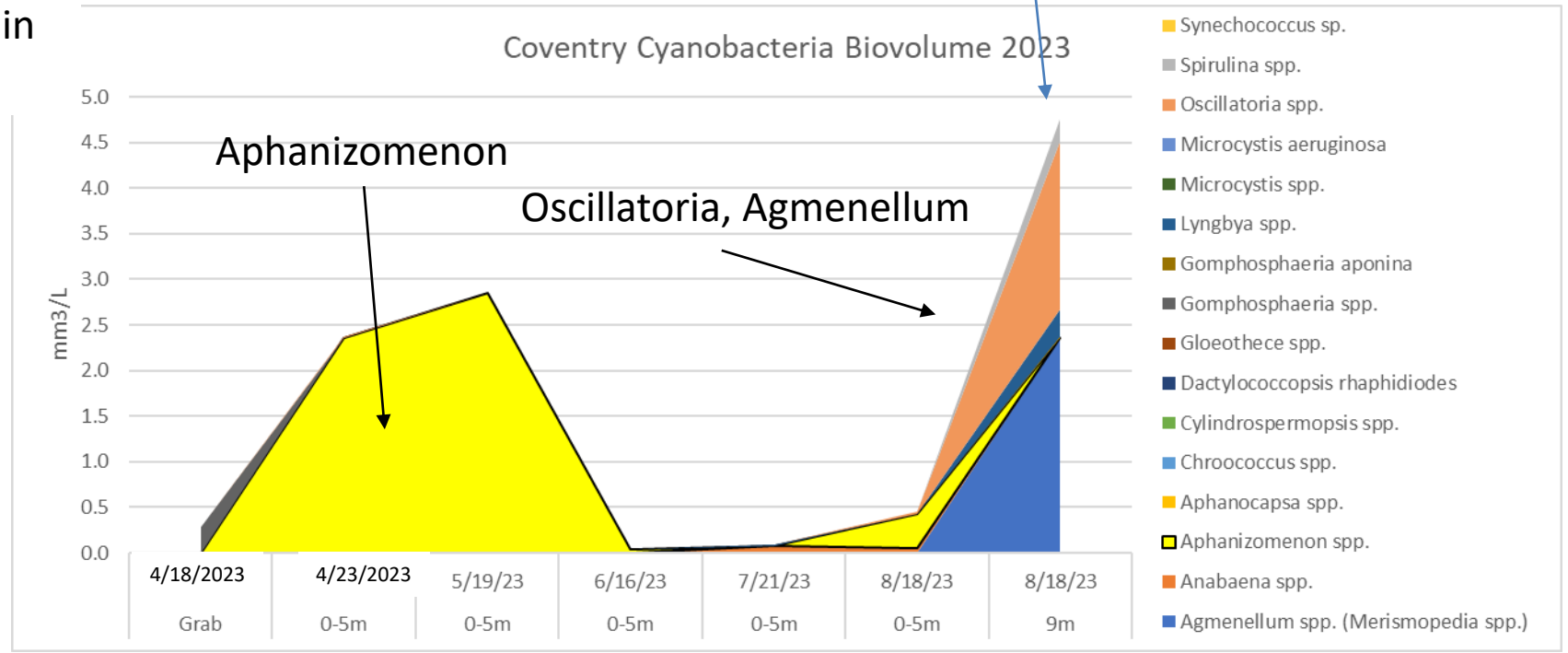
| | 4/23/2023 | 4/18/2023 | 5/19/2023 | 6/16/2023 | 7/21/2023 | 8/18/2023 | | 30 ft deep 8/18/2023 |
|---|---|---|---|---|---|---|---|---|
| Agmenellum spp. (Merismo | 0 | 0 | 0 | 0 | 0 | 0 | | 87445 |
| **Anabaena spp.** | 0 | 0 | 0 | 0 | 359 | 229 | | 0 |
| **Aphanizomenon spp.** | 18904 | 0 | 22837 | 271 | 0 | 2956 | | 0 |
| Aphanocapsa spp. | 0 | 0 | 0 | 0 | 0 | 0 | | 895 |
| Gomphosphaeria spp. | 0 | 15093 | 0 | 0 | 0 | 106 | | 0 |
| **Lyngbya spp.** | 0 | 0 | 0 | 0 | 316 | 190 | | 16099 |
| **Oscillatoria spp.** | 94 | 0 | 0 | 0 | 0 | 231 | | 14757 |
| Spirulina spp. | 0 | 0 | 0 | 0 | 0 | 0 | | 42564 |
| TOTAL | 18998 | 15093 | 22837 | 271 | 675 | 3712 | | 161761 |

### Biovolume mm3 /L TOP 5M (Surface to 16 ft deep)

| | 4/23/2023 | 4/18/2023 | 5/19/2023 | 6/16/2023 | 7/21/2023 | 8/18/2023 | | 30 ft deep 8/18/2023 |
|---|---|---|---|---|---|---|---|---|
| Agmenellum spp. (Merismo | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | 2.361 |
| **Anabaena spp.** | 0.000 | 0.000 | 0.000 | 0.000 | 0.083 | 0.053 | | 0.000 |
| **Aphanizomenon spp.** | 2.360 | 0.000 | 2.851 | 0.034 | 0.000 | 0.369 | | 0.000 |
| Aphanocapsa spp. | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | 0.005 |
| Gomphosphaeria spp. | 0.000 | 0.284 | 0.000 | 0.000 | 0.000 | 0.002 | | 0.000 |
| **Lyngbya spp.** | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 0.004 | | 0.303 |
| **Oscillatoria spp.** | 0.012 | 0.000 | 0.000 | 0.000 | 0.000 | 0.029 | | 1.845 |
| Spirulina spp. | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | 0.244 |
| TOTAL | 2.371 | 0.284 | 2.851 | 0.034 | 0.089 | 0.456 | | 4.758 |

Cyanobacteria (Aphanizomenon) again persisted through the mild winter of 2022-23 and out-competed Diatoms in the Spring.



# Cooperative Monitoring Program Data – Collected by Coventry Volunteers

| | June 14, 2023 | June 19, 2023 | July 7, 2023 | July 9, 2023 | July 23, 2023 | July 31, 2023 | August 6, 2023 | August 14, 2023 | August 20, 2023 | August 31, 2023 | Sept 10, 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Time** | 3:40 pm | 3:00 pm | 4:00 pm | 3:00 pm | 2:30 pm | 4:50 pm | 3:45 pm | 5:20 pm | 3:50 pm | 5:45 pm | 1:00 pm |
| **Cloud Cover %** | 90-100% | 90-100% | 0-5% | 90-100% | 0-5% | 50-69% | 0-5% | 50-69% | 0-5% | 0-5% | 90-100% |
| **Light Conditions** | Overcast | Cloudy-bright | Bright | Overcast | Bright | Cloudy-bright | Bright | Cloudy-bright | Bright | Bright | Overcast |
| **Precipitation** | None | None | None | None | None | None | None | None | None | None | Rain |
| **Wind Conditions** | Breezy | Light | Light | Light | Light | Light to Breezy | Light | Light to Breezy | Light | Light | Light |
| **Water Surface** | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets | Smooth or rippled to small wavelets |
| **Air Temp** | 70F<br>21C | 76F<br>25C | 84F<br>29C | 80F<br>26.7C | 82F<br>27.8C | 80F<br>26.7C | 81F<br>27.2C | 80F<br>26.7C | 80F<br>26.7C | 70F<br>21C | 76F<br>25C |
| **Surface Water Temp** | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown |
| **Sampling Platform** | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) | Boat/Canoe (Kayak) |
| **Side of Boat** | "Shady" (Total cloud cover) | (Not Relevant) | (Not Relevant) | "Shady" (Total cloud cover) | (Not Relevant) | (Not Relevant) | (Not Relevant) | (Not Relevant) | (Not Relevant) | (Not Relevant) | "Shady" (Total cloud cover) |
| **Water Depth** | 30 FT 6 IN<br>9.3 M | 29 FT<br>8.8 M | 30 FT<br>9.1 M | 29 FT<br>8.8 M | 28 FT 6 IN<br>8.68 M | 28 FT<br>8.5 M | 29 FT 6 IN<br>9 M | 30 FT<br>9.1 M | 30 FT 6 IN<br>9.3 M | 29 FT<br>8.8 M | 30 FT<br>9.1 M |
| **Secchi Disk Reading #1** | 2.16 M<br>85 IN (7.08FT) | 2.8 M<br>110 IN | 3 M<br>118 IN | 2.6 M<br>102 IN | 2.7 M<br>106 IN | 2.8 M<br>110 IN | 3.1 M<br>122 IN | 3.4 M<br>134 IN | 3.4 M<br>134 IN | 3.5 M<br>138 IN | **3.6 M<br>142 IN** |
| **Secchi Disk Reading #2** | 2.26 M<br>89 IN (7.42FT) | 2.6 M<br>103 IN | 2.9 M<br>114 IN | 2.5 M<br>98 IN | 2.8 M<br>110 IN | 2.7 M<br>106 IN | 3.3 M<br>130 IN | 3.2 M<br>126 IN | 3.5 M<br>138 IN | 3.6 M<br>142 IN | **3.7 M<br>146 IN** |