

The Borough of Mountain Lakes 2021 Year-End Report

By Bob Schindler
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December 7th, 2021

SÖLITUDE
LAKE MANAGEMENT

Restoring Balance. Enhancing Beauty.

2021 Year-End Report

Borough of
Mountain Lakes
2021 Year-End Report

2021 Climate and Precipitation Data Individual Lake Descriptions

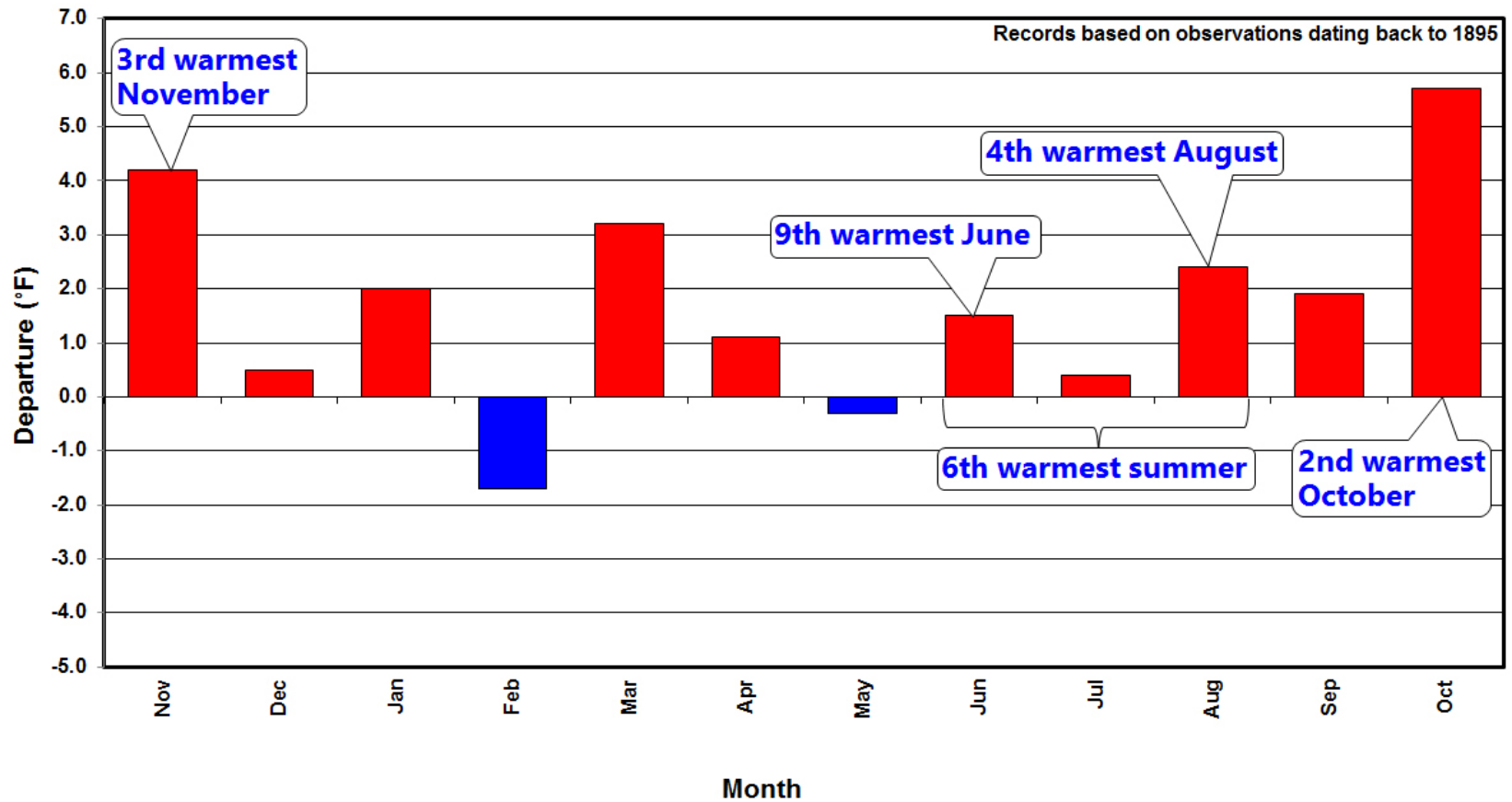
- 2021 Aquatic Plant and Algae Control
- 2007-2021 Historical Plant and Algae Control
- 2021 Water Quality and Phytoplankton Results

Additional Lake Management Projects

- Small Basin DO
- TPO4 at All Nine Lakes
- Birchwood and Mountain Lake Fecal Coliform Testing
- 2021 Lakes Cleaning Project
- Mountain Lakes Aquatic Plant Guide

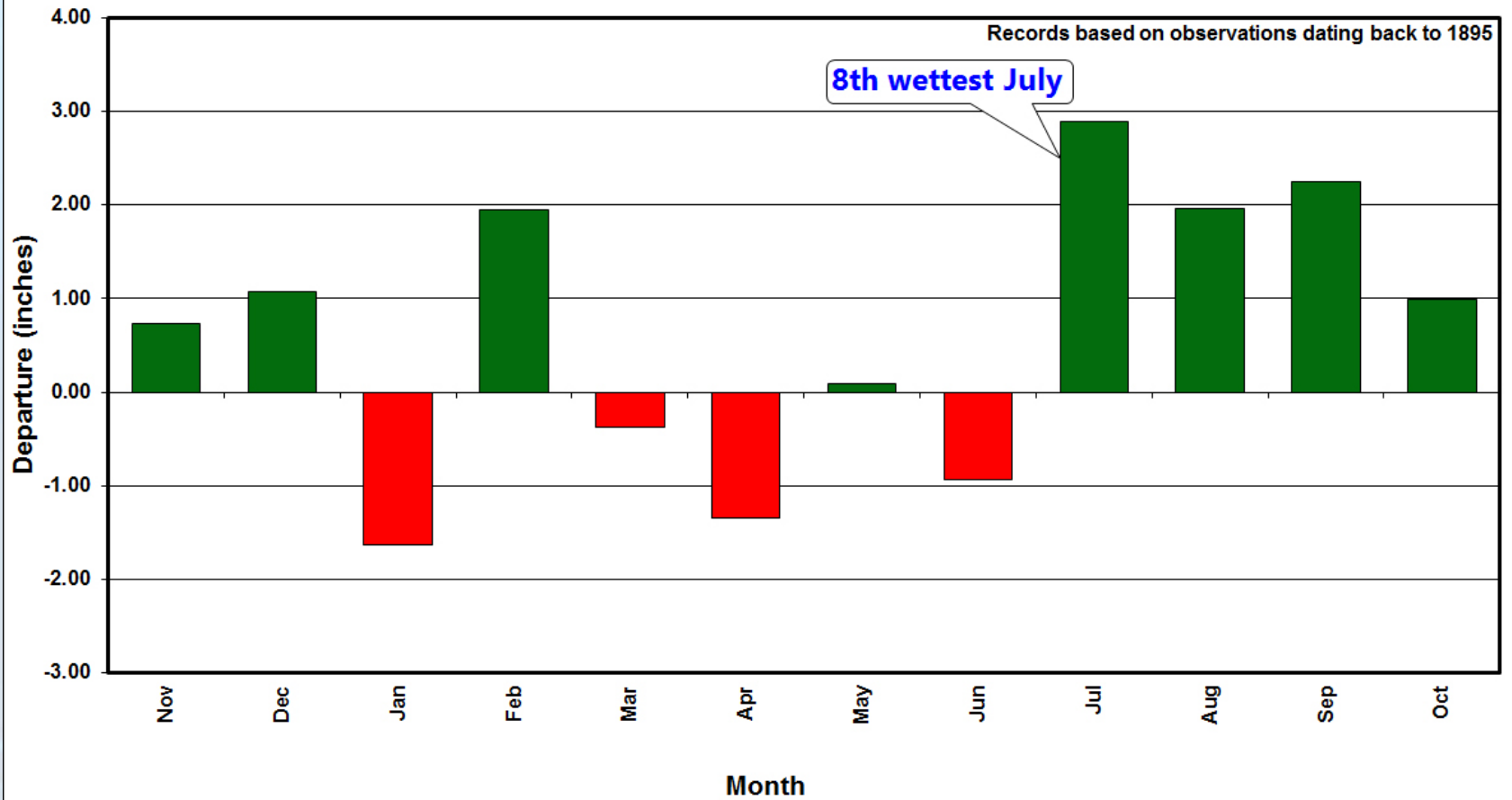
NJ Monthly Temperature Departures (November 2020 – October 2021)

Departures calculated from differences between observed monthly temperatures and 1991–2020 monthly averages

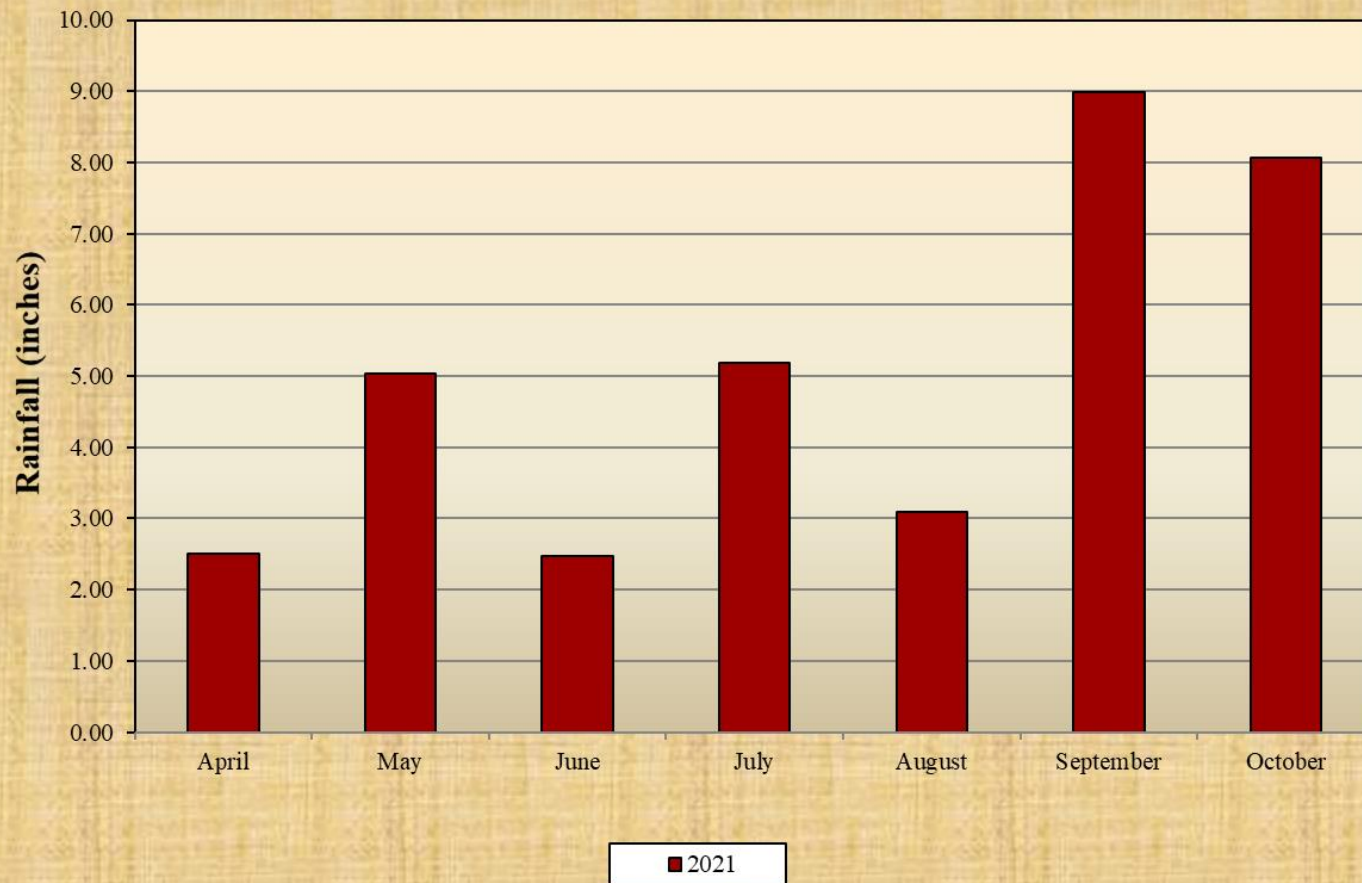


NJ Monthly Precipitation Departures (November 2020 – October 2021)

Departures calculated from differences between observed monthly precipitation and 1991–2020 monthly averages



2021 Monthly Rainfall Mountain Lakes, NJ

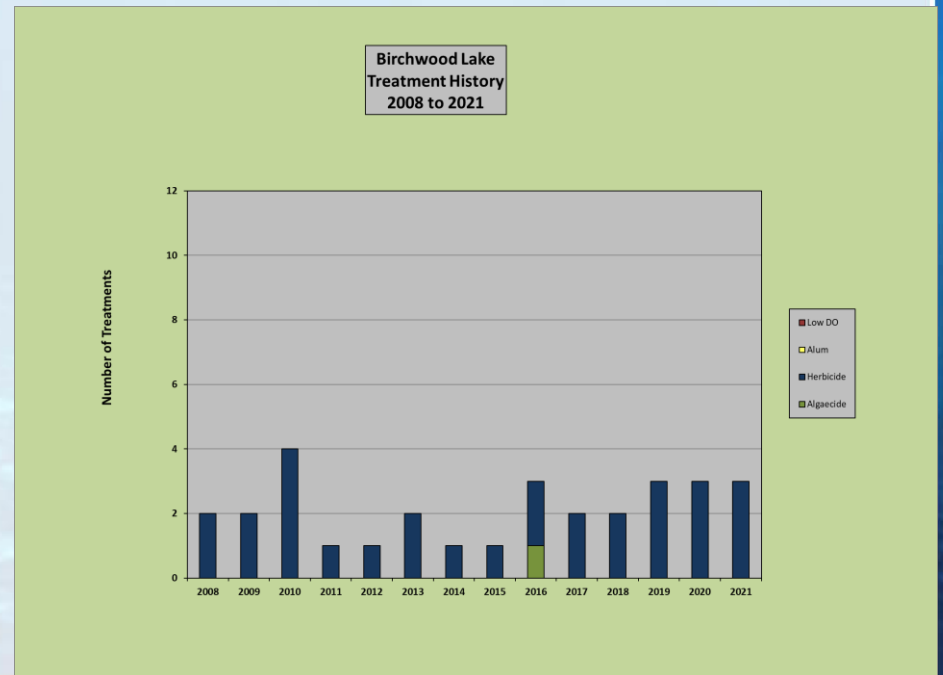


Birchwood Lake

Birchwood Lake			
Date	Product Applied	Acres Treated	Target Species
4/29/2021	Flumioxazin	1	Curly-leaf pondweed/ Low Water milfoil
6/28/2021	Flumioxazin	0.25	Low Water milfoil
8/25/2021	AquaNeat	5	Water Lilies
9/13/2021	AquaNeat	5	Water Lilies

Birchwood Lake Control Notes

- No Algaecide Applications
- Four Herbicide Applications
 - Pondweed/milfoil in swim lanes
 - Water Lilies
- Dam Vegetation Spray



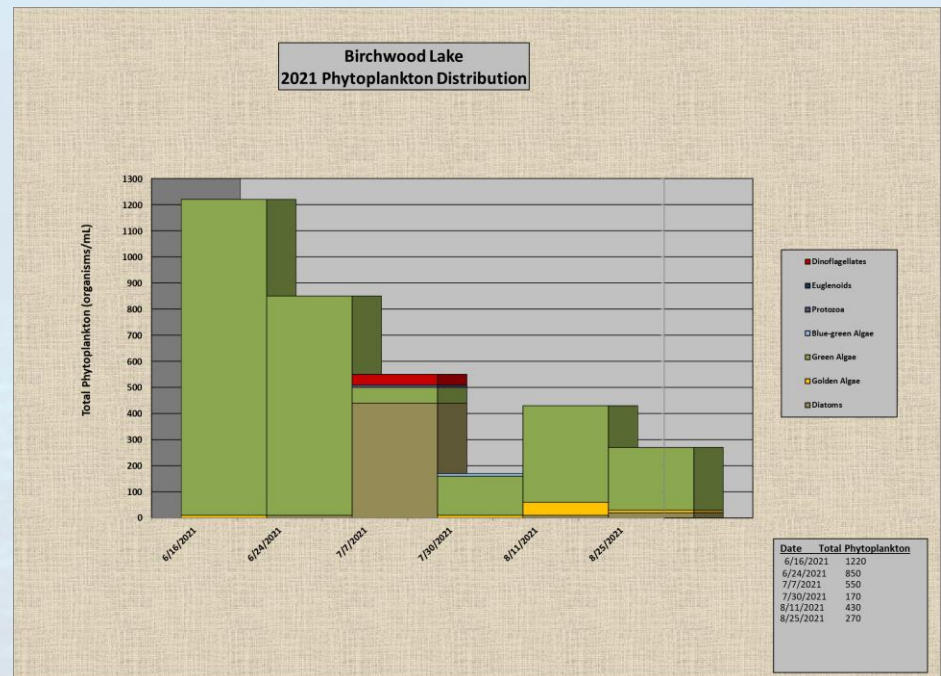
Birchwood Lake-Water Quality

Birchwood Lake	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	22.40	25.8	25.1
Dissolved Oxygen	mg/L	4.93	4.41	3.32
Alkalinity	mg/L	80	60	44
pH	SU	6.50	6.5	6.5
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.023	0.022	ND
Turbidity	NTU	1.8	2.0	1.0
Water Clarity	feet	6	7.5	8

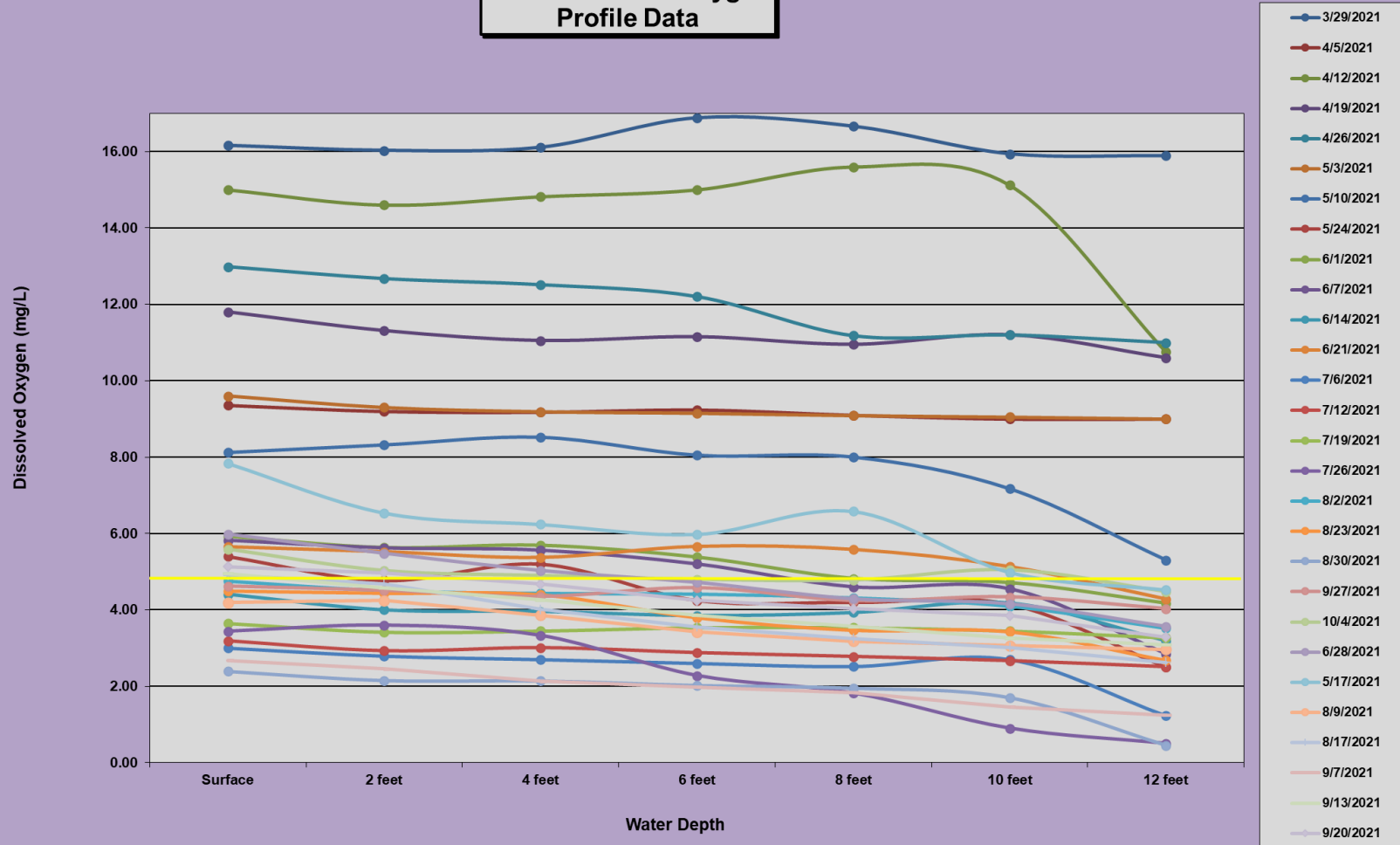
Birchwood Lake WQ Notes

- Dissolved Oxygen
- pH consistent all dates
- TPO4 favorable all dates
- Phytoplankton

Green algae bloom in June
Trace B-G on one dates



Birchwood Lake 2021 Dissolved Oxygen Profile Data

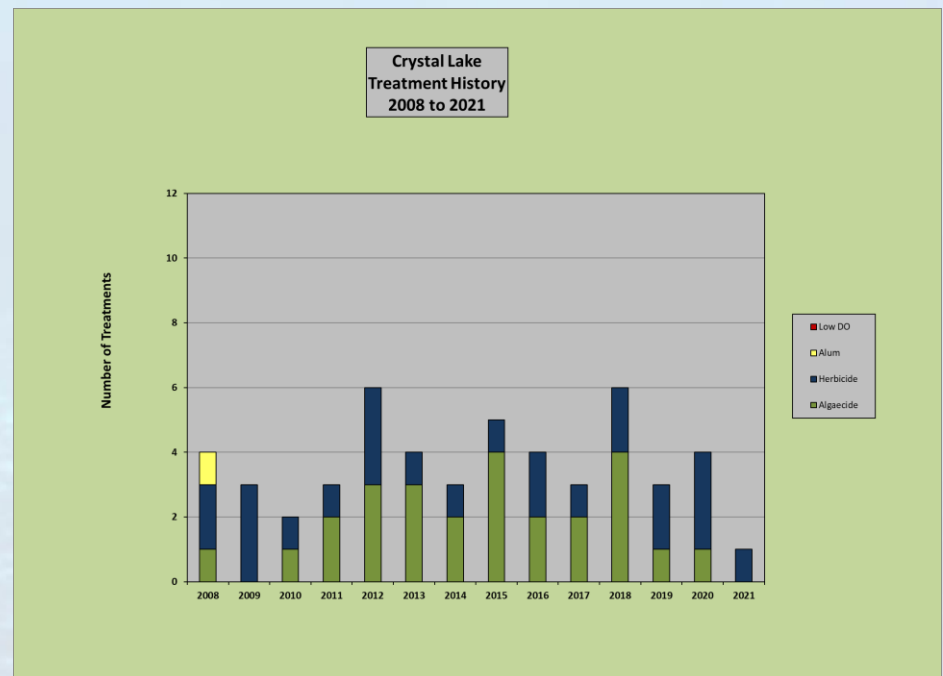


Crystal Lake

Crystal Lake			
Date	Product Applied	Acres Treated	Target Species
7/30/2021	Flumioxazin	3	Filamentous algae

Crystal Lake Control Notes

- **One Algaecide Applications**
 - Trace filamentous algae
 - Green algae bloom August
 - Dissipated quickly
- **No Herbicide Applications**
 - Curly-leaf early season
 - Bassweed in June
- **Dam Treatment**

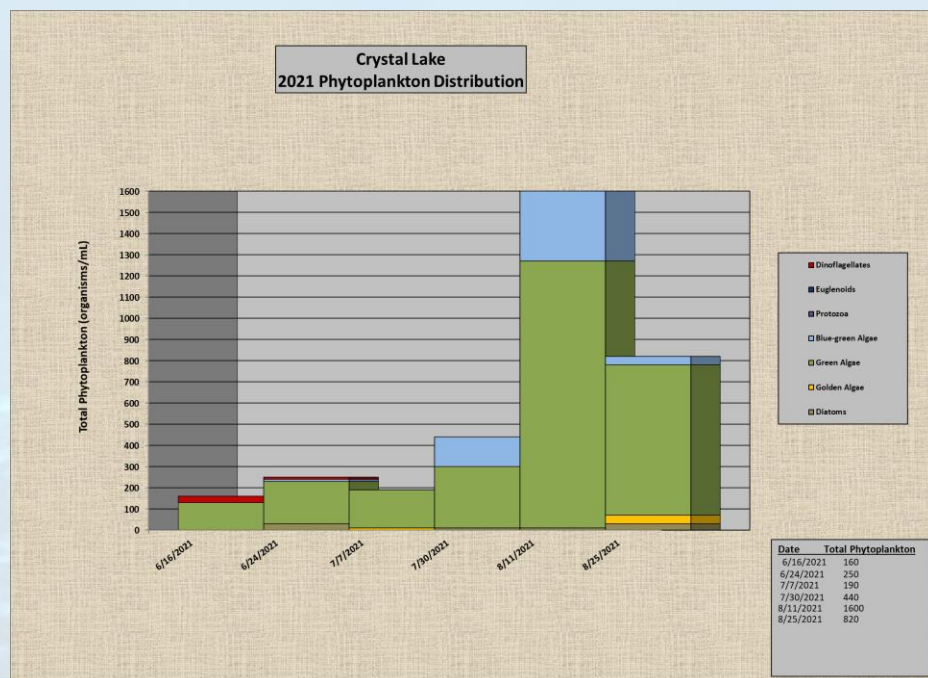


Crystal Lake-Water Quality

Crystal Lake	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	22.8	25.9	27.1
Dissolved Oxygen	mg/L	8.66	5.15	6.10
Alkalinity	mg/L	60	60	44
pH	SU	7.0	6.75	8.0
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.016	0.011	0.01
Turbidity	NTU	2.2	1.8	2.6
Water Clarity	feet	3	6	3

Crystal Lake WQ Notes

- TPO4 suitable all season
- Good Clarity all season
- Phytoplankton
 - August Green algae bloom
 - Blue green algae (BGA)
 - Typically, green algae growth

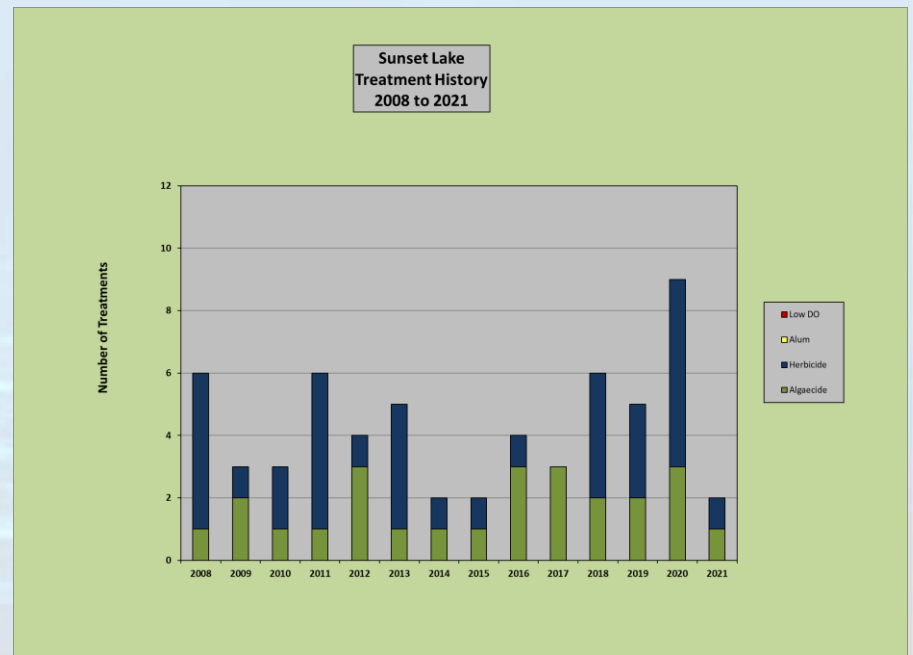


Sunset Lake

Sunset Lake			
Date	Product Applied	Acres Treated	Target Species
5/13/2021	Copper Sulfate	6.5	Filamentous Algae
7/26/2021	Aquasrike	3	Bassweed
	Flumioxazin	3	Water lilies

Sunset Lake Control Notes

- **One Algaecide Application**
 - Target: Filamentous Algae
 - Limited Acreage (~6.5 ac)
- **Two Herbicide Applications**
 - Target: bassweed once 3 acres
 - water lily control on one date

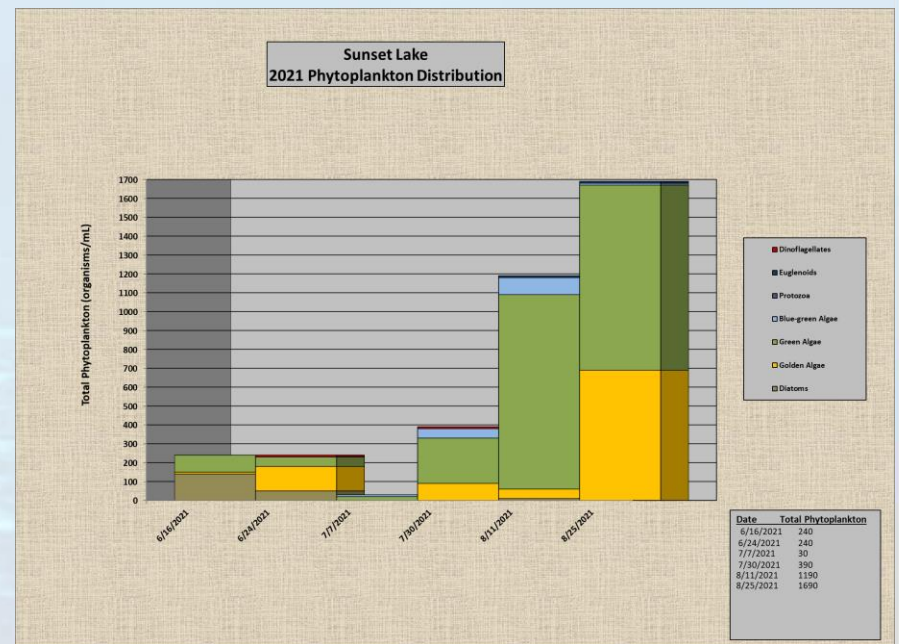


Sunset Lake-Water Quality

Sunset Lake	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	22.40	29.5	26.9
Dissolved Oxygen	mg/L	6.44	6.68	3.54
Alkalinity	mg/L	60	40	60
pH	SU	7	7.0	7.0
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.024	0.020	0.014
Turbidity	NTU	2.4	5.9	2.5
Water Clarity	feet	3	6.25	4

Sunset Lake WQ Notes

- TPO4 suitable all season
- Phytoplankton
 - Suitable counts on most dates
 - Moderate Overall August
 - green and golden algae
 - Trace BGA – 8/10 and 8/24 only

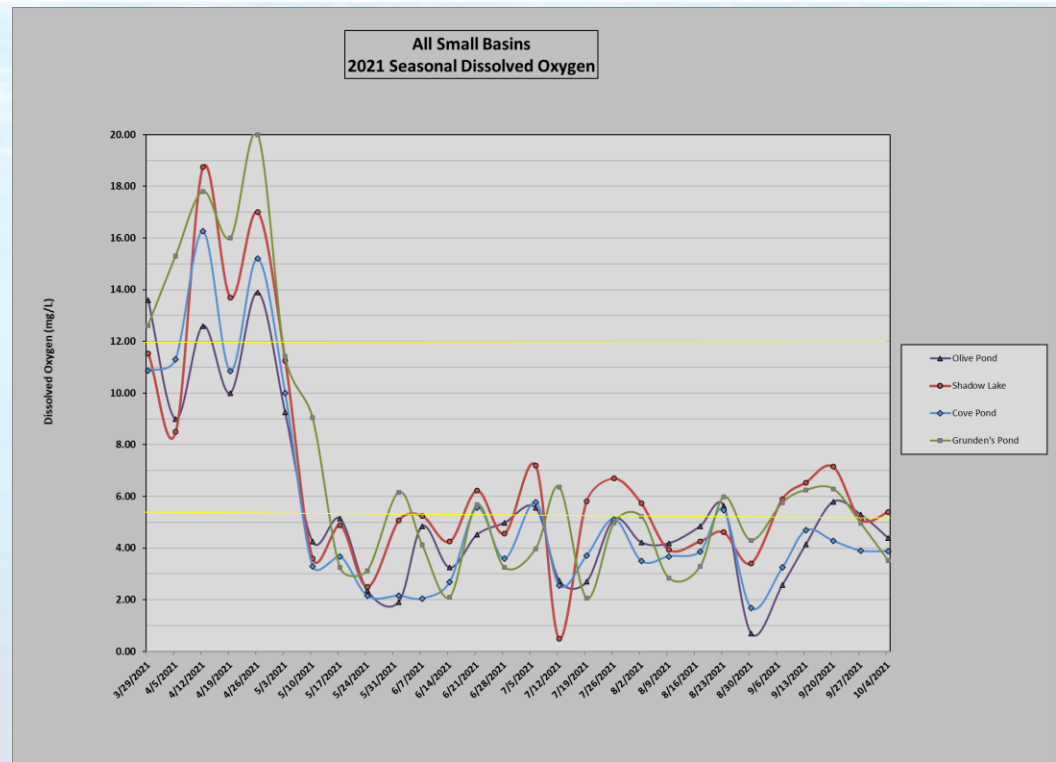


Small Basin Dissolved Oxygen

Stressful to Aquatic Biota:
< 5.0 mg/L
Preventing Control Work:
< 4.0 mg/L

Dissolved Oxygen

- Measured Weekly
- Basin Summary (< 4.0 mg/L / 4.0-5.0 mg/L)
 - Olive Pond: 7 dates (1 in 2020) / 1 dates Shadow Lake: 4 dates
 - Cove Pond: 14 dates
 - Grunden's Pond: 6 dates
 - **Overall, basins reduced dissolved oxygen compared to recent seasons**

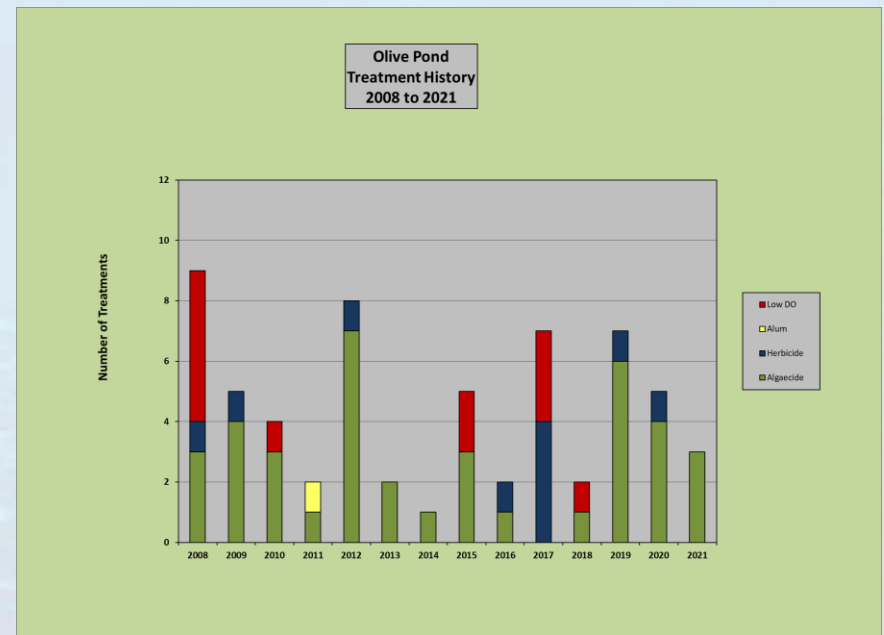


Olive Pond

Olive Lake			
Date	Product Applied	Acres Treated	Target Species
5/20/2021	Earthtec	0.5	Unicellular Algae
6/28/2021	Captain XTR	0.5	Filamentous Algae
8/25/2021	Earthtec	0.5	Unicellular Algae

Olive Pond Control Notes

- **Three Algaecide Application**
 - Earthtec – preventative applications
 - Shadow Lake impact
 - Minimal Filamentous Algae
- **No Herbicide Application**
 - Water meal not observed

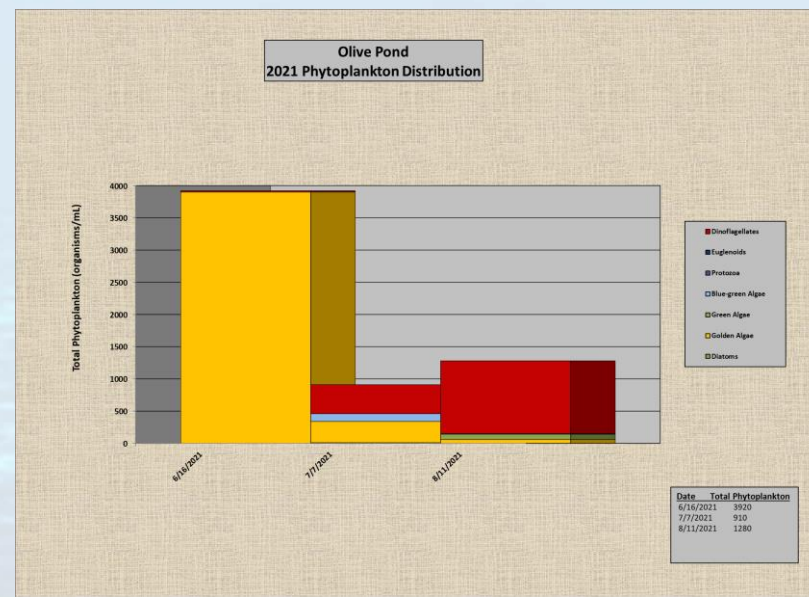


Olive Pond-Water Quality

Olive Lake	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	21.3	29.5	27.0
Dissolved Oxygen	mg/L	4.50	4.32	3.51
Alkalinity	mg/L	130	82	88
pH	SU	7	7.5	7.5
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.072	0.082	0.095
Turbidity	NTU	4.6	4.0	5.2
Water Clarity	feet	3	3.5	1.5

Olive Pond WQ Notes

- **Oxygen depressed on many dates**
 - No disruption of service
- **High TPO4 all dates**
 - Typical in recent years
 - Need to actively manage
- **Phytoplankton**
 - Only trace blue-green in July
- **Clarity poor in August – *Ceratium***

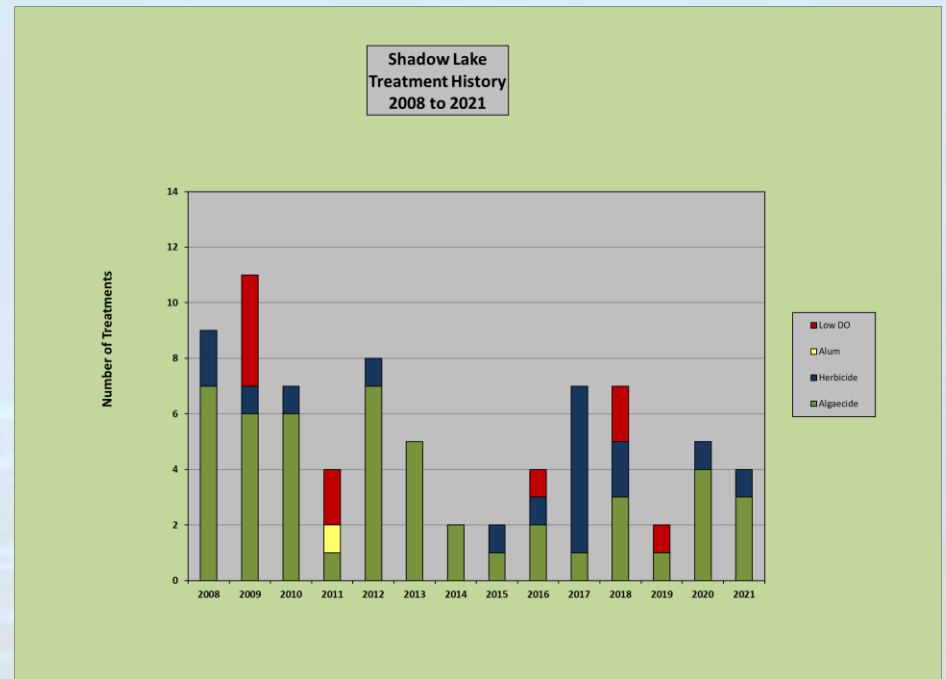


Shadow Lake

Shadow Lake			
Date	Product Applied	Acres Treated	Target Species
4/12/2021	Citrine Plus	0.8	Filamentous algae
4/29/2021	Citrine Plus	0.8	Filamentous algae
	Flumioxazin	0.8	Curly-leaf Pondweed
6/16/2021	Captain XTR	0.8	Filamentous Algae

Shadow Lake Control Notes

- **Three Algaecide Applications**
 - Filamentous Algae
- **One Herbicide Application**
 - Early curly-leaf pondweed
 - No watermeal / duckweed

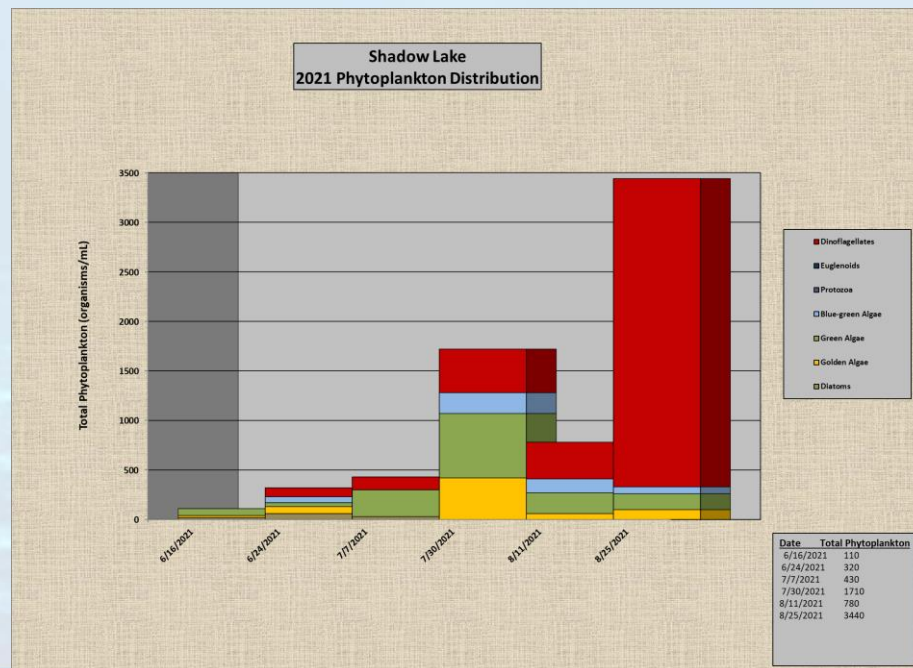


Shadow Lake-Water Quality

Shadow Lake	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	19.70	26.7	25.6
Dissolved Oxygen	mg/L	6.12	6.65	6.57
Alkalinity	mg/L	80	80	88
pH	SU	7.0	7.0	7.5
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.232	0.105	0.066
Turbidity	NTU	28	7.5	3.7
Water Clarity	feet	3	3.75	2.75

Shadow Lake WQ Notes

- **Elevated TPO4 all dates**
 - Typical in recent years
 - Needs active management
- **Phytoplankton**
 - Trace blue-green
 - Ceratium most abundant
 - Oxygen impact
- **Turbidity High in June**

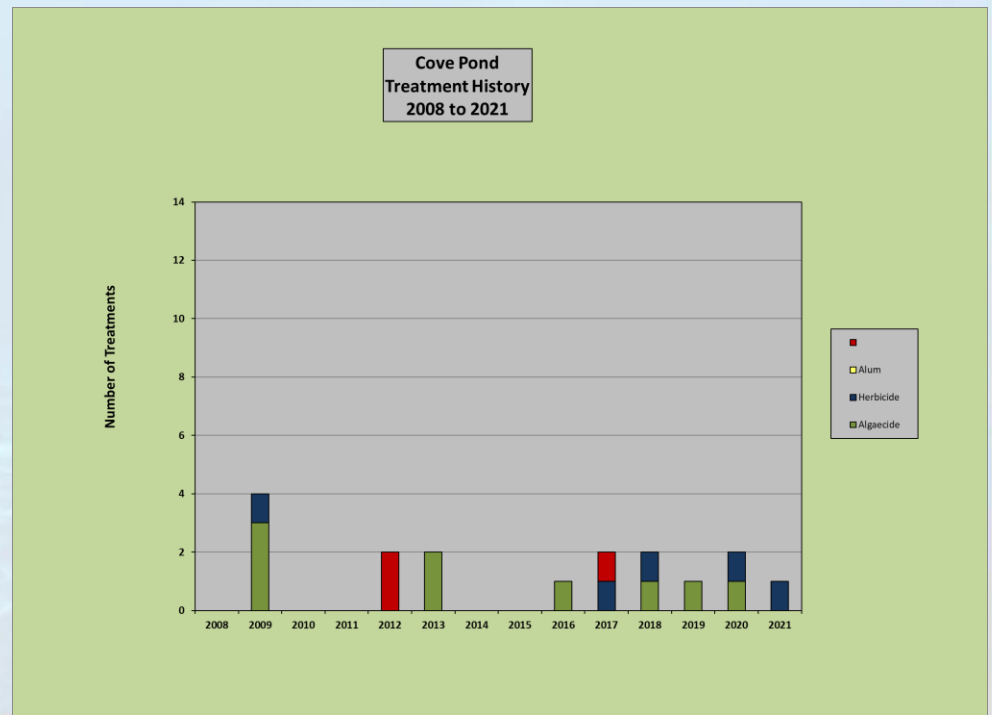


Cove Pond

Cove Pond			
Date	Product Applied	Acres Treated	Target Species
5/3/2021	Flumioxazin (RE)	0.35	Curly-leaf Pondweed

Cove Pond Control Notes

- Typically, minimal Control Needed at this Site
- One herbicide application - Curly-leaf pondweed

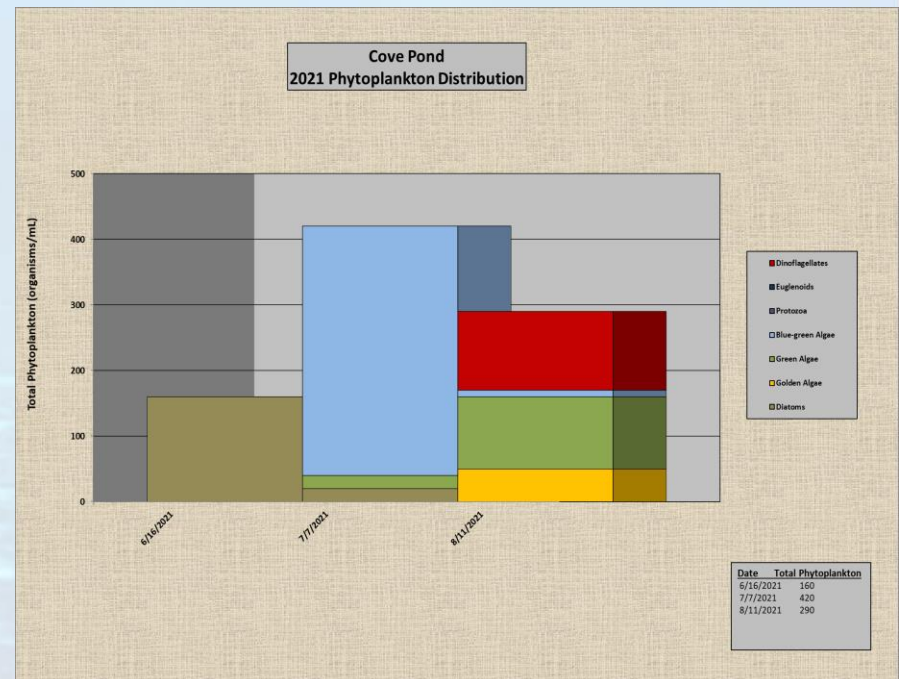


Cove Pond-Water Quality

Cove Pond	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	20.50	25.8	24.4
Dissolved Oxygen	mg/L	5.54	6.45	4.51
Alkalinity	mg/L	60	82	84
pH	SU	7.0	7.0	7.0
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.039	0.077	0.041
Turbidity	NTU	2.8	6.5	3.1
Water Clarity	feet	3	2.75	1.5

Cove Pond WQ Notes

- Water Clarity
 - Consistent early, poor in August
- TPO4 Elevated on all Dates
- Phytoplankton
 - Diatoms (June)
 - Moderate BGA bloom July
 - Short duration
 - Light density *Ceratium* August

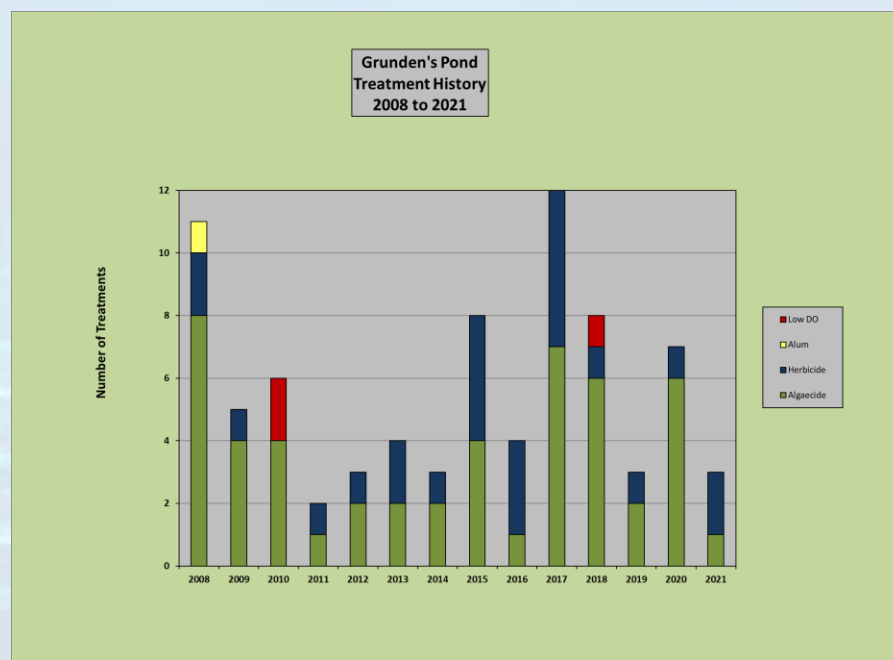


Grunden's Pond

Grunden's Pond			
Date	Product Applied	Acres Treated	Target Species
5/3/2021	Flumioxazin (RE)	1.25	Curly-leaf pondweed
7/1/2021	Captain	1.0	Filamentous algae
7/30/2021	Flumioxazin (RE)	1.25	Water meal

Grunden's Pond Control Notes

- **One Algaecide Application**
 - Target: Filamentous Algae
 - Lower abundance than normal
 - Seasonal low water level
- **Two Herbicide Applications**
 - Early: curly-leaf pondweed
 - Only traces of water meal

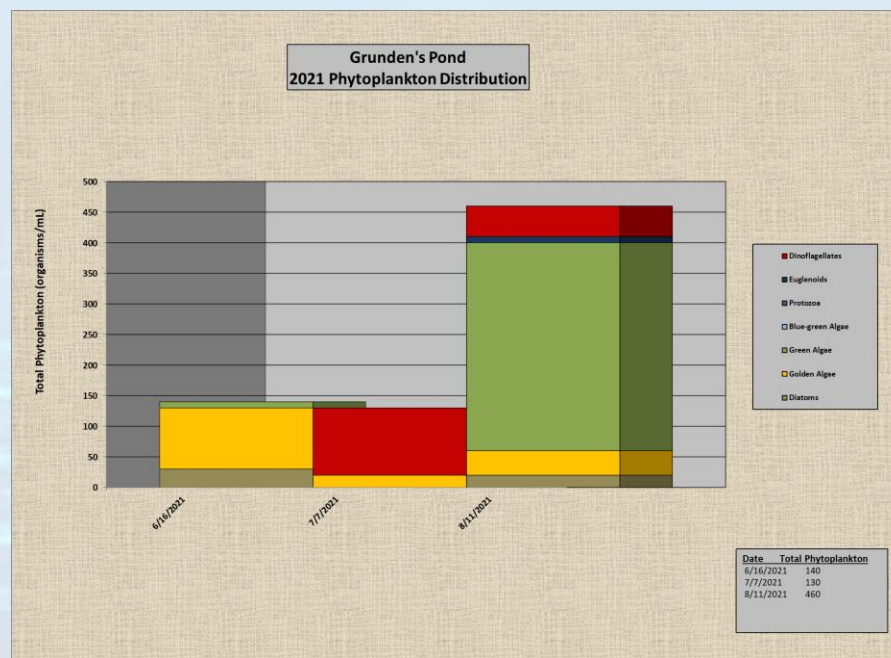


Grunden's Pond-Water Quality

Grunden's Pond	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	22.20	28.8	26.7
Dissolved Oxygen	mg/L	8.06	8.72	3.49
Alkalinity	mg/L	64	80	100
pH	SU	7.50	7.5	7.5
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.047	0.059	0.037
Turbidity	NTU	5.1	5.9	4.2
Water Clarity	feet	3	4.5	3

Grunden's Pond WQ Notes

- **TPO4 elevated all three dates**
 - Requires active management
- **Phytoplankton**
 - Moderate density August
 - Green algae
 - Trace density June/July
 - August - high green bloom
- **Favorable water clarity**

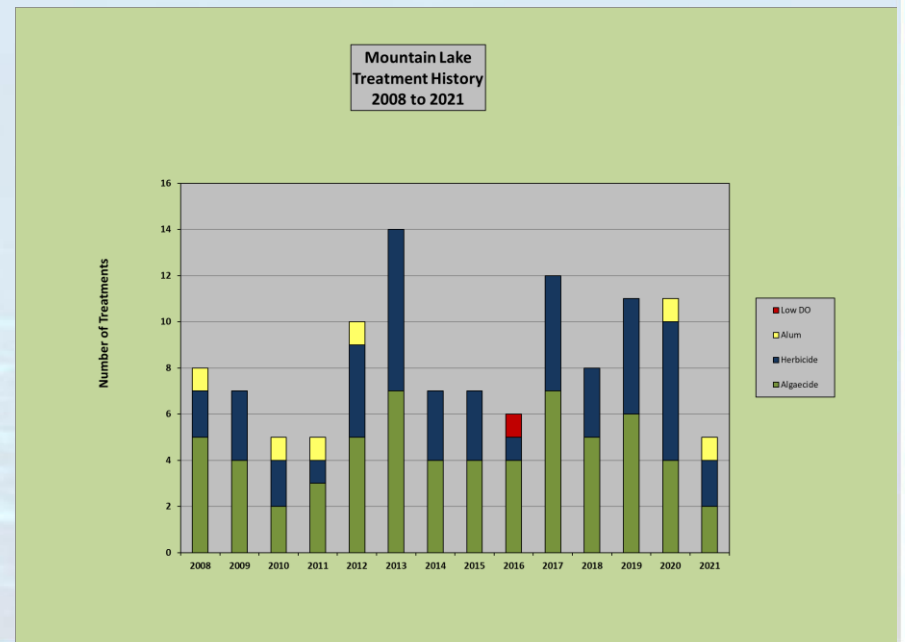


Mountain Lake

Mountain Lake			
Date	Product Applied	Acres Treated	Target Species
4/28/2021	Copper Sulfate	4.9	Filamentous algae
5/6/2021	Aluminum Sulfate	76.6	Nutrients
5/19/2021	Copper Sulfate	12.8	Filamentous algae
	Aquastrike	2.5	Bassweed
	Tribune	10	Curly-leaf pondweed
6/8/2021	Aquastrike	8	Bassweed
	Copper Sulfate	12.8	Filamentous algae
10/4/2021	Rodeo	0.2	Water primrose

Mountain Lake Control Notes

- **Three Herbicide Applications**
 - Shoreline Bassweed
 - Curly-leaf pondweed
 - Shoreline water primrose
- **Three Algaecide Applications**
 - Filamentous Algae – (~30 acres)
 - Lower abundance
- **Alum treatment in May**
- **Late Season green algae bloom**

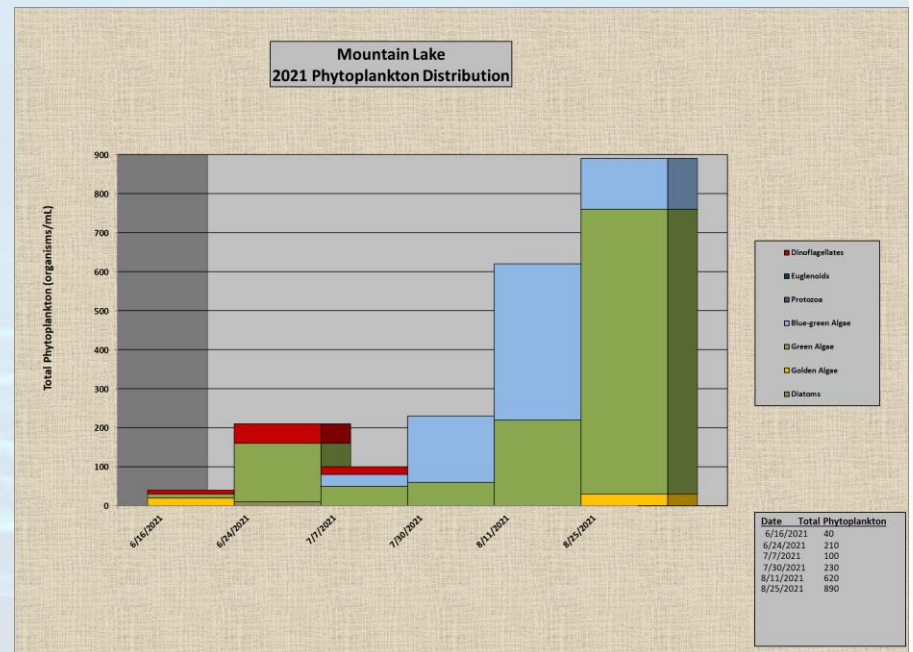


Mountain Lake-Water Quality

Mountain Lake	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	23.7	29.2	27.2
Dissolved Oxygen	mg/L	7.60	8.72	5.79
Alkalinity	mg/L	50	80	48
pH	SU	8.0	7.5	8.0
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.014	ND	ND
Turbidity	NTU	2.0	0.82	1.1
Water Clarity	feet	8	7	10

Mountain Lake WQ Notes

- Water Clarity mostly favorable
- TPO4 low all season
- Oxygen levels stable
- Phytoplankton
 - Counts low June and July
 - Moderate BGA bloom in September



Average Water Clarity

2006: 7.54 feet

2007: 5.24 feet

2008: 6.50 feet

2009: 9.08 feet

2010: 6.51 feet

2011: 5.33 feet

2012: 7.33 feet

2013: 8.71 feet

2014: 10.03 feet

2015: 9.94 feet

2016: 6.18 feet

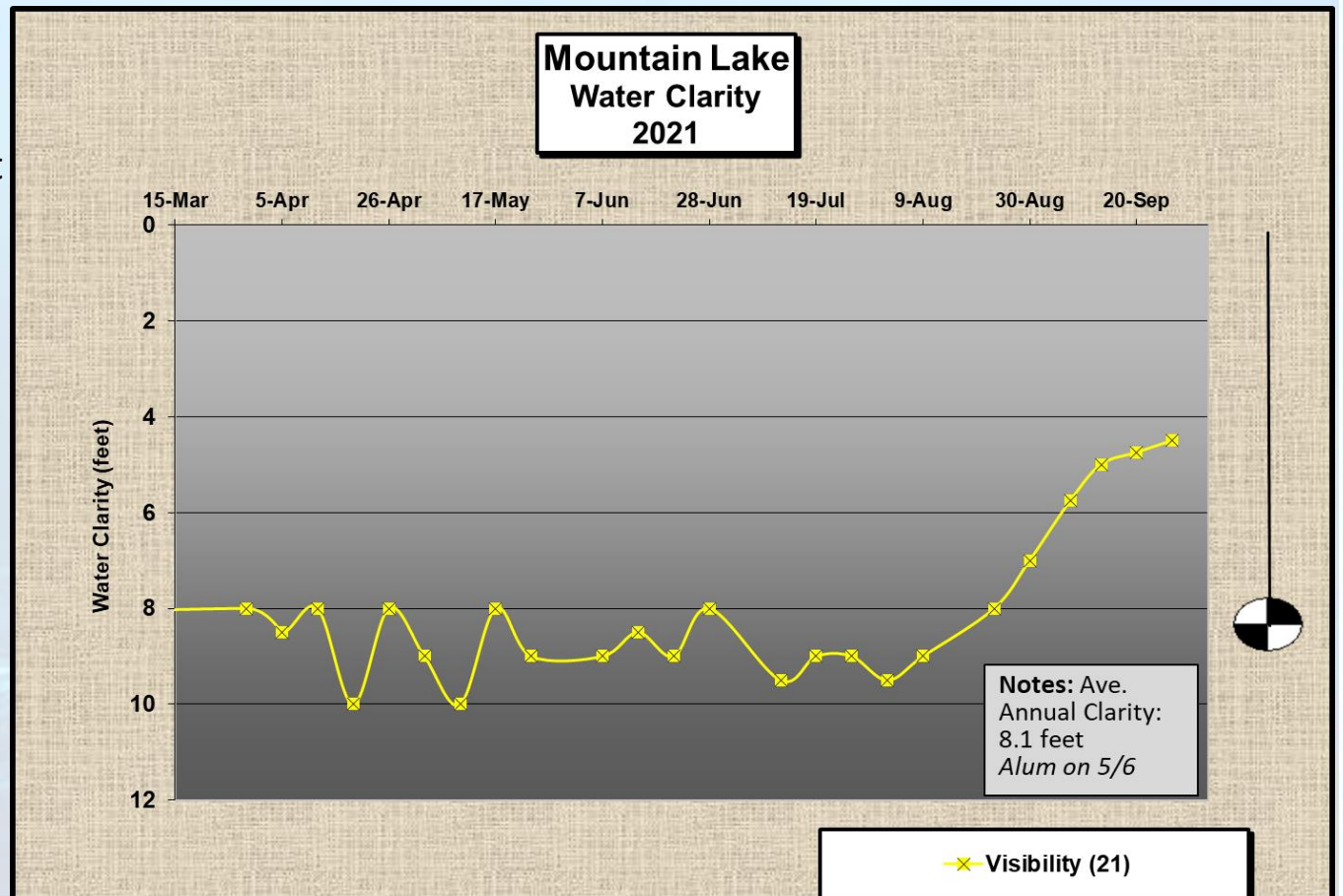
2018: 8.34 feet

2019: 6.32 feet

2020: 8.14 feet

2021*: 8.1 feet

*8.77 feet through
August

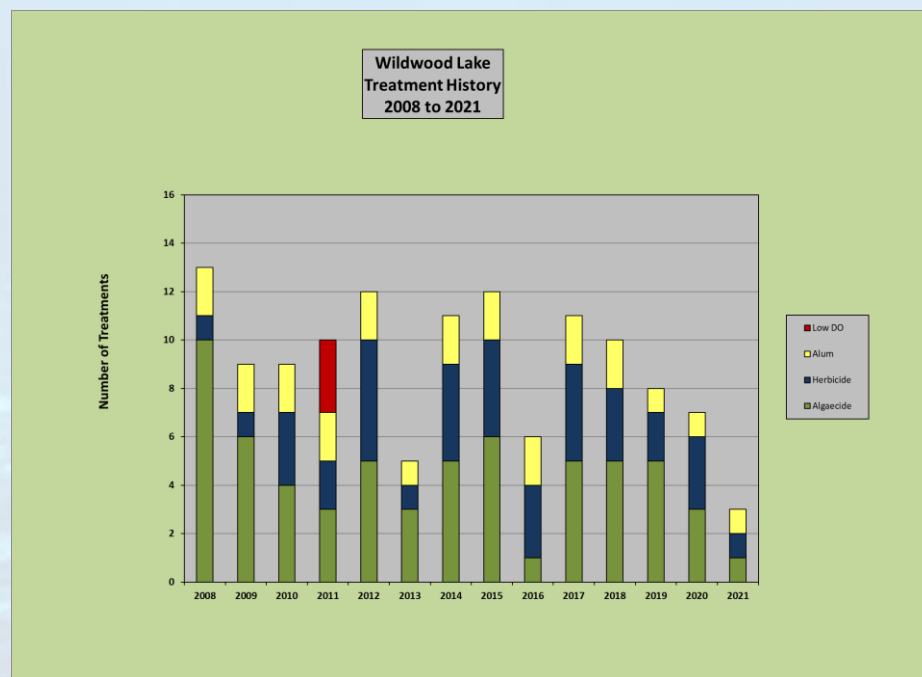


Wildwood Lake

Wildwood Lake			
Date	Product Applied	Acres Treated	Target Species
5/6/2021	Aluminum Sulfate	19	Nutrients
5/13/2021	Aquastrike	7.5	Eurasian watermilfoil
5/18/2021	Copper Sulfate	6.4	Filamentous algae
10/4/2021	Rodeo	0.3	Water primrose

Wildwood Lake Control Notes

- **Two Herbicide Applications**
 - Early curly-leaf pondweed / Eurasian watermilfoil
 - Shoreline water primrose
- **One Algaecide Application**
 - Filamentous algae
 - Average Year: 4
- **Alum Use (1x)**
 - Reduced from 2 - comparisons
 - Early May – fish kill???

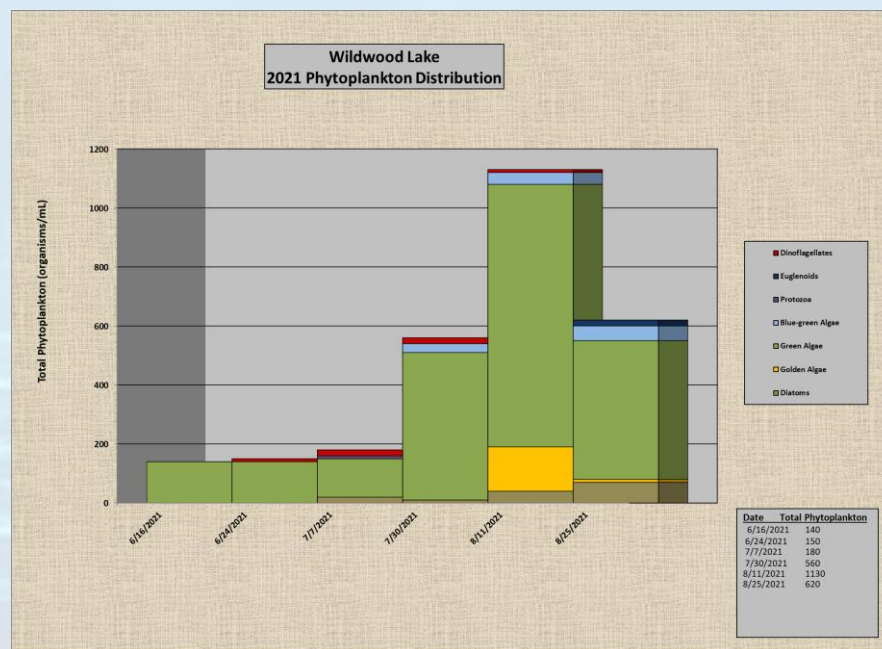


Wildwood Lake-Water Quality

Wildwood Lake	units	6/16/2021	7/7/2021	8/11/2021
Temperature	°C	23.9	29.8	27.4
Dissolved Oxygen	mg/L	9.67	8.28	5.20
Alkalinity	mg/L	65	82	68
pH	SU	8.0	8.0	7.5
Nitrate	mg/L	ND	ND	ND
Total Phosphorus	mg/L	0.019	0.029	0.02
Turbidity	NTU	1.7	3.7	3.4
Water Clarity	feet	3	6.75	3

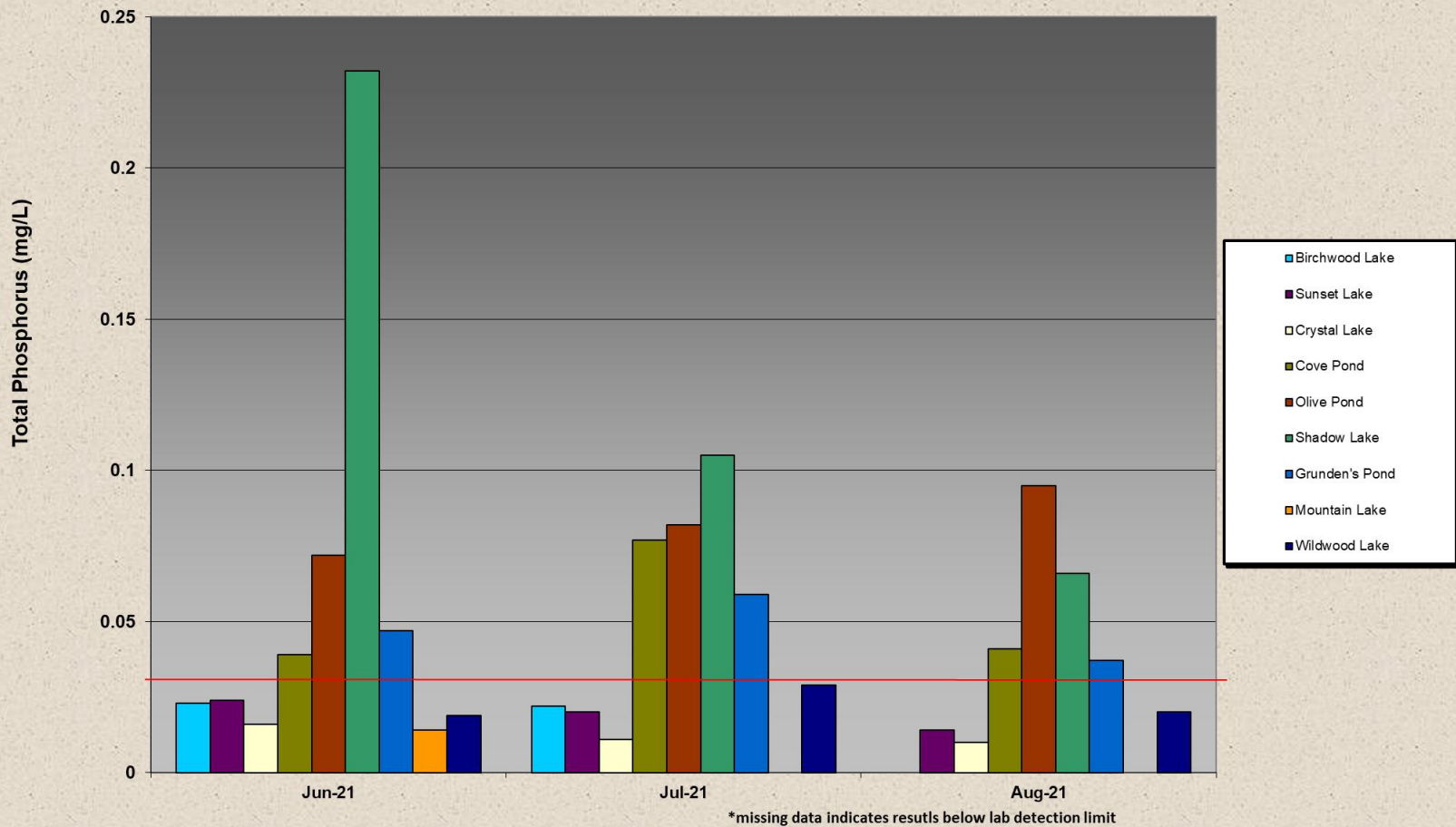
Wildwood Lake WQ Notes

- TPO4 reduced all season
 - Slightly elevated in July
 - Alum Use / plant growth
- Phytoplankton
 - Light and favorable all season
 - Trace BGA late July/August
 - No unicellular treatments
 - Green algae bloom late Sept.

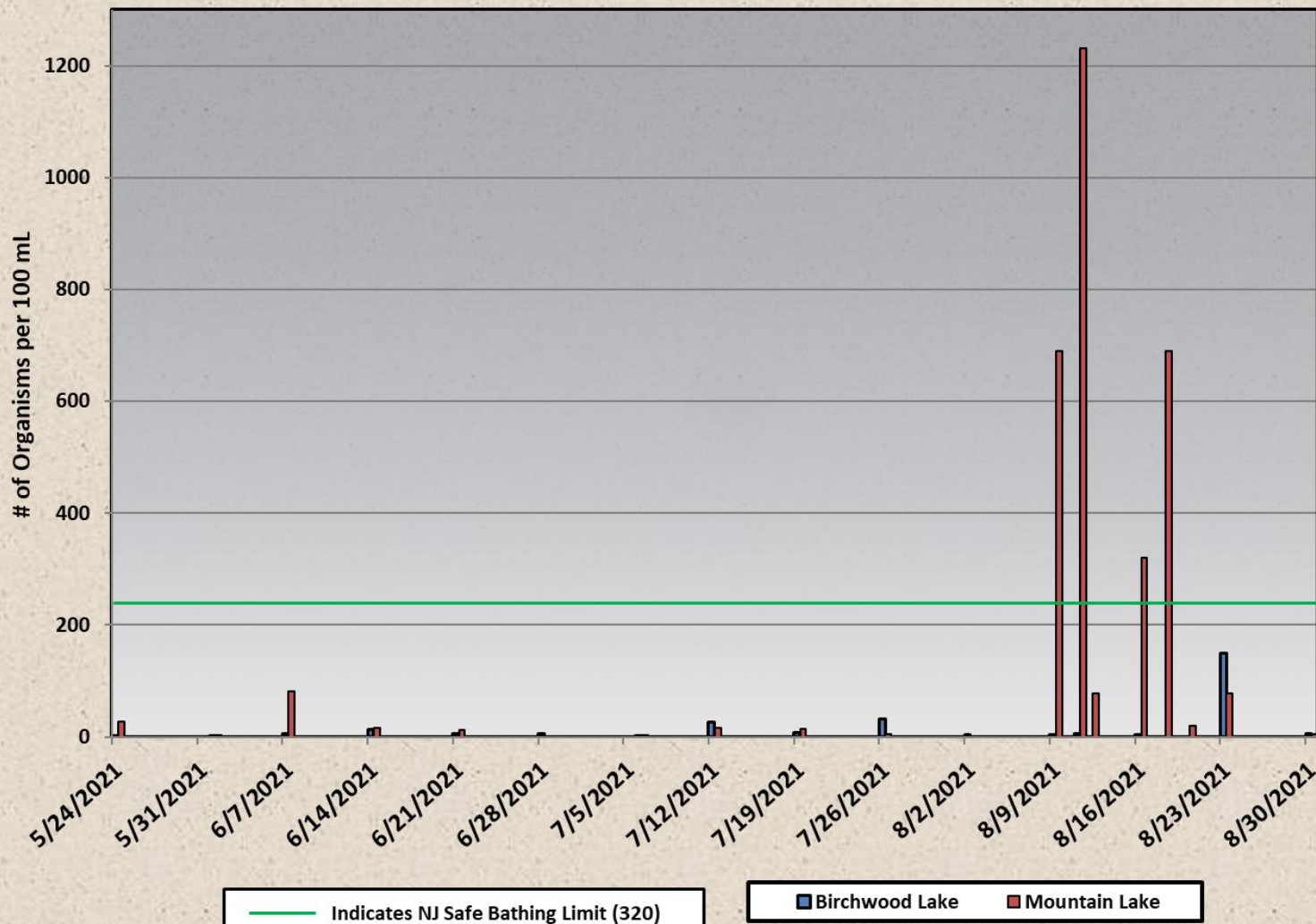


Mountain Lakes 2021 Total Phosphorus

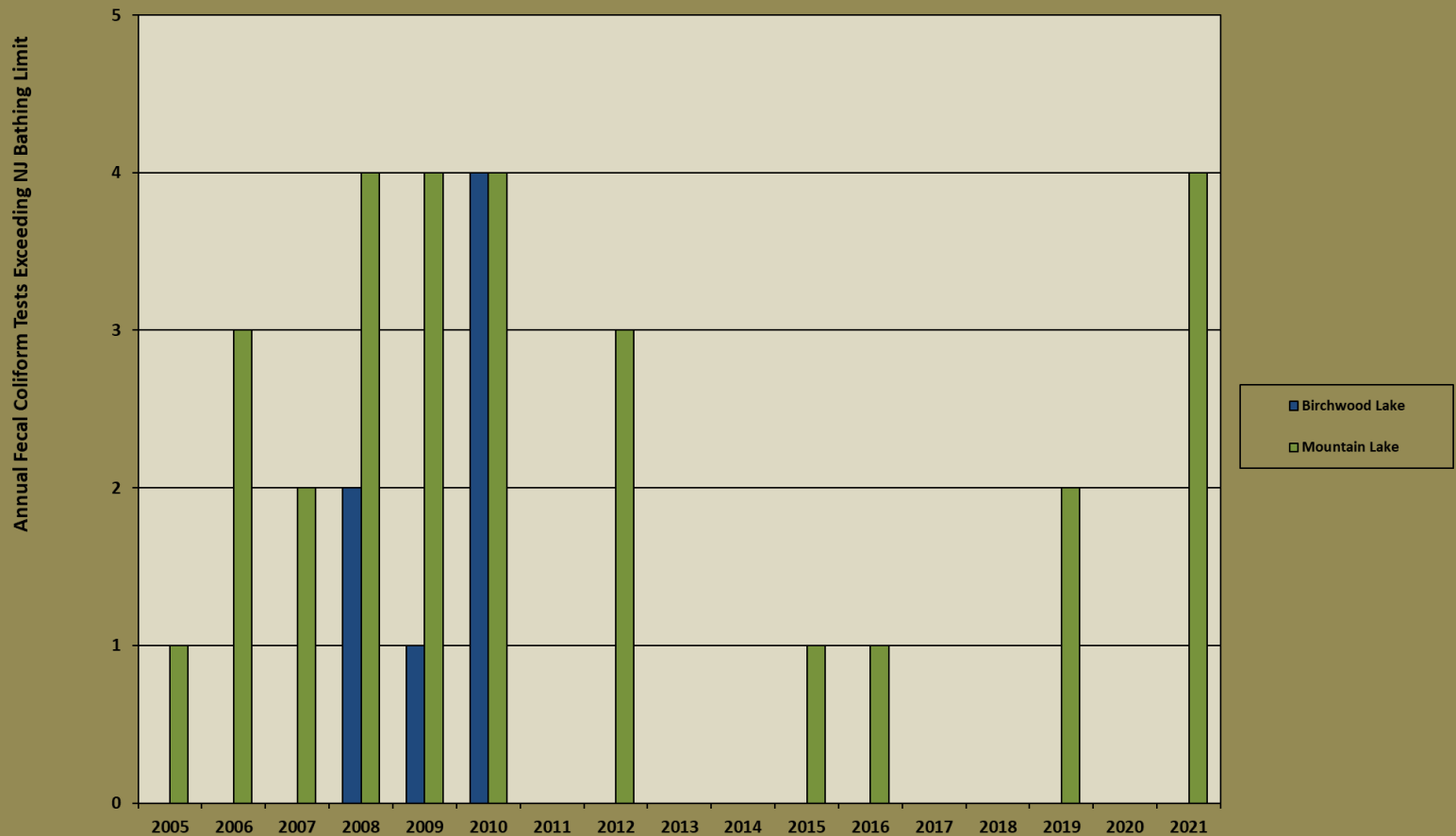
TPO4 Threshold



Mountain Lakes 2021 Escherichia coli Data



Annual Escherichia coli Test Failures
2005 to 2021



Lakes Cleaning-2021

**Spring 2021 – Completion of Year 3 of project
Two weeks with two barges**

**Fall 2021 – Completion of Year 4 of project
One week with two barges**



Fall 2022 – Completion of Five-Year Plan with one week with two barges

Possible for increased budget of additional \$18k to focus on cove area adjacent to beach, and north end “muck” removal??

Budget/Plan for additional lake raking program??

Fanwort: Early Detection/Rapid Response (EDRR)

Discovered during Canal Survey

- **August 22, 2016 (Monday)**
 - Routine Biological Monthly Survey
 - Increased plant growth following dredging
 - Creeping Water Primrose (invasive)
- **Treatment: August 25, 2016 (Thursday)**
 - Needed to amend the permit
 - Clipper (high dose)
 - Installed Erosion Barriers
 - Reduce Water Flow
 - Restrict Resident Movement
- **2018 – no Fanwort observed**
- **2019 – no Fanwort observed**
- **2020 – no Fanwort observed**
- **2021 – no fanwort observed**



2017/2018 Procedures

Increased Canal Surveys
Inc. Mountain/Wildwood Surveys
Aggressive herbicide Use (Wildw.)
Educational Outreach

- Mt. Lakes Plant Guide

2022 Recommended Lake Management

- **Continue WQ Program**
 - Weekly Surveys
- **Birchwood Lake Limited Herbicide Use**
 - Add'l Lily Control Lakewide
 - Maintain suitable recreational areas
 - Bacterial Enhancement?
- **Crystal Lake Herbicide Use as needed**
 - Generally reactive management – lilies / bassweed
- **Sunset Lake**
 - Whole Basin Water Lily Control
 - Aggressive bassweed management
 - Loosestrife Management
- **Olive, Shadow, Cove, Grunden's Pond**
 - Chelated copper algaecide / Earthtec
 - Bacterial Enhancement
 - Early season sodium aluminate treatments



2022 Recommended Lake Management (con't)

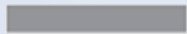
- **Mountain Lake**
 - Early Season Low Dose Alum Use
 - Reactive plant management
 - Bacterial Enhancement test site
 - Water primrose management
- **Wildwood Lake**
 - Milfoil observed across southern lake in 2021
 - Sonar in 2022
 - Alum: 1x
 - Water primrose management
- **Canal**
 - Monthly (at least) surveys
 - Treat as needed
 - Water primrose management
- **Sediment Depth Probing Survey (Outfalls)**
- **Mt. Lakes Plant Guide (March)**



Thank you! Questions?

By Bob Schindler

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April 20, 2023