



2023 Data Report for Lake Ellen, Iron County

Site ID: 360050

46.1725°N, 88.1519°W

The CLMP is brought to you by:



EGLE MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

**MICHIGAN STATE
UNIVERSITY**



About this report:

This report is a summary of the data that have been collected through the Cooperative Lakes Monitoring Program. The contents have been customized for your lake. The first page is a summary of the Trophic Status Indicators of your lake (Secchi Disk Transparency, Chlorophyll-a, Spring Total Phosphorus, and Summer Total Phosphorus). Where data are available, they have been summarized for the most recent field season, five years prior to the most recent field season, and since the first year your lake has been enrolled in the program.

If you did not take 8 or more Secchi disk measurements or 4 or more chlorophyll measurements, there will not be summary data calculated for these parameters. These numbers of measurements are required to ensure that the results are indicative of overall summer conditions.

If you enrolled in Dissolved Oxygen/Temperature, the summary page will have a graph of one of the profiles taken during the late summer (typically August or September). If your lake stratifies, we will use a graph showing the earliest time of stratification, because identifying the timing of this condition and the depth at which it occurs is typically the most important use of dissolved oxygen measurements.

The back of the summary page will be an explanation of the Trophic Status Index and where your lake fits on that scale.

The rest of the report will be aquatic plant summaries, Score the Shore results, and larger graphs, including all Dissolved Oxygen/Temperature Profiles that you recorded. For Secchi Disk, Chlorophyll, and Phosphorus parameters, you need to have two years of data for a graph to make logical sense. Therefore if this is the first year you have enrolled in the CLMP, you will not receive a graph for these parameters.

Remember that some lakes see a lot of fluctuation in these parameters from year to year. Until you have eight years worth of data, consider all trends to be preliminary.

To learn more about the CLMP monitoring parameters or get definitions to unknown terms, check out the CLMP Manual, found at: https://micorps.net/wp-content/uploads/2021/03/CLMP-Manual-2019update2_2021.pdf

Thank you!

The CLMP leadership team would like to thank you for all of your efforts over the past year. The CLMP would not exist without dedicated and hardworking volunteers!

The CLMP Leadership Team is made of: Jo Latimore, Erick Elgin, Jean Roth, Tamara Lipsey, Mike Gallagher, Melissa DeSimone, and Paul Steen

Questions?

If you have questions on this report or believe that the tabulated data for your lake in this report are in error please contact:

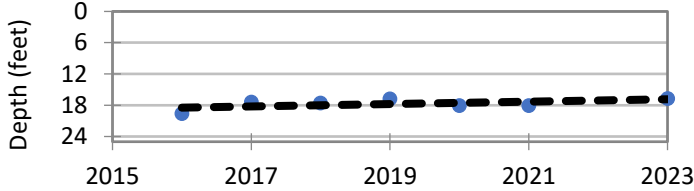
Paul Steen (psteen@hrwc.org), CLMP Data Analyst

Lake Ellen, Iron County 2023 CLMP Results



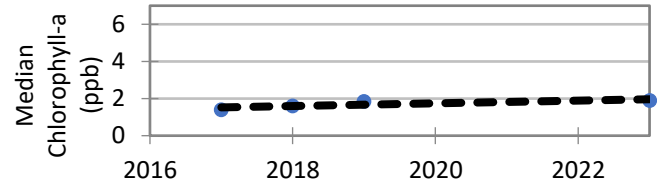
Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Average	Std. Dev	Carlson TSI
2023	14	11.5	25.5	16.7	5.2	37
2018-2022	52	11.0	24.0	17.6	2.8	36
2016-2017	22	13.0	26.0	18.5	3.4	35
2023 All CLMP Lakes	2825	0.5	51.0	12.2	2.7	43



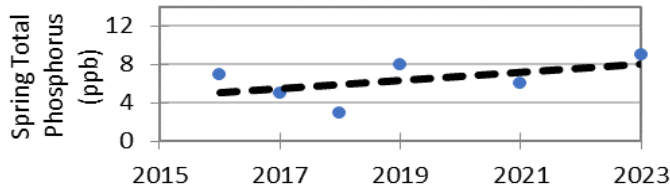
Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Median	Std. Dev	Carlson TSI
2023	5	<1.0	3.2	1.9	1.0	37
2018-2022	11	<1.0	3.1	1.7	0.8	36
2017	5	<1.0	1.7	1.7	0.5	34
2023 All CLMP Lakes	687	< 1.0	43.0	3.7	5.3	43



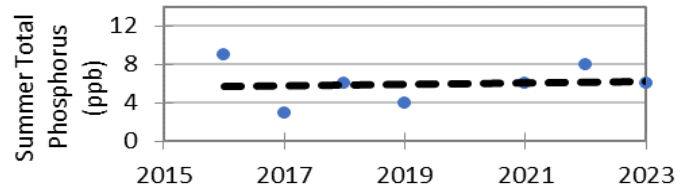
Spring Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev	Carlson TSI
2023	1	9.0	9.0	9.0	NA	NA
2018-2022	3	<=3 W	8.0	5.7	2.5	30
2016-2017	2	5.0	7.0	6.0	1.4	31
2023 All CLMP Lakes	220	<5	220.0	20.7	21.3	45

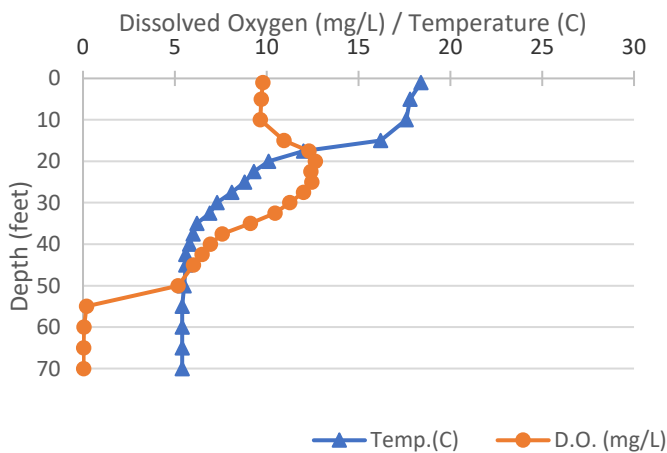


Summer Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev	Carlson TSI
2023	1	6.0	6.0	6.0	NA	30
2018-2022	4	<5 T	8.0	6.0	1.6	30
2016-2017	2	<=3 W	9.0	6.0	4.2	31
2023 All CLMP Lakes	234	<= 3	150.0	17.4	15.3	45



Dissolved Oxygen and Temperature Profile 6/14/23



Summary

Average TSI	2023	2018-2022	2016-2017
Lake Ellen	34	34	33
All CLMP Lakes	44	41	39

With an average TSI score of 34 based on 2023 Secchi transparency, chlorophyll-a, and summer total phosphorus data, this lake is rated as oligotrophic.

Monitoring data indicates that this lake is devoid of oxygen in the bottom waters by early summer and that the lakes remain stratified through early fall. More data is required to establish the point at which stratification begins during the monitoring season.

There is too little data to assess long term trends. CLMP recommends eight years of consistent monitoring in order to develop a strong data baseline.

* = Minimum # samples not met for average/median/TSI value

<1.0 = Chlorophyll-a: Sample value is less than limit of quantification (<1 ppb).

W = Value is less than the detection limit (<3 ppb) T = Value reported is less than the reporting limit (5 ppb)

Trophic Status Index Explained

In 1977, limnologist Dr. Robert Carlson developed a numerical scale (0-100) where the numbers indicate the level of nutrient enrichment. Using the proper equations, we can convert results from Summer Total Phosphorus, Secchi Depth, and Chlorophyll-a to this Trophic Status Index (TSI). The TSI numbers are furthermore grouped into general categories (oligotrophic, mesotrophic, eutrophic, and hypereutrophic), to quickly give us a way to understand the general nutrient level of any lake.

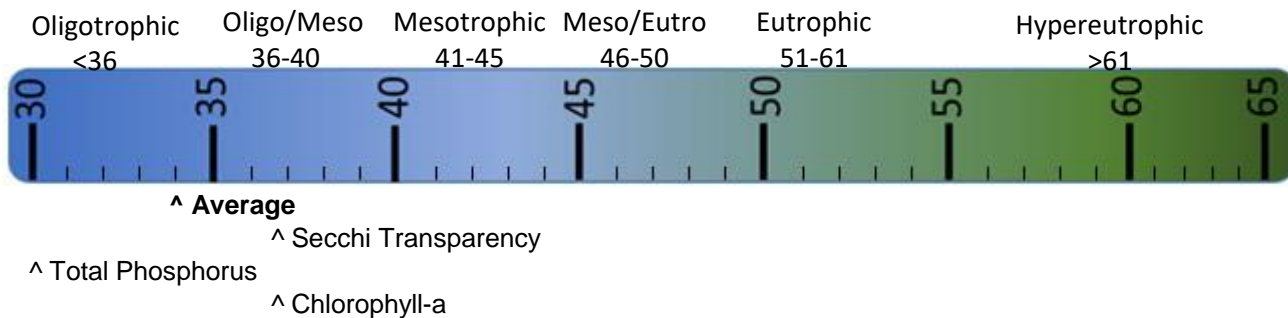
The tables below give the results-to-TSI conversions for the water quality data ranges normally seen in the CLMP. The formulas for this conversion can be found in the CLMP manual (link is on page 2 of this report).

Phosphorus (ppb)	TSI Value
<5	<27
6	30
8	34
10	37
12	40
15	43
18	46
21	48
24	50
32	54
36	56
42	58
48	60
>50	>61

Secchi Depth (ft)	TSI Value
>30	<28
25	31
20	34
15	38
12	42
10	44
7.5	48
6	52
4	57
<3	>61

Chlorophyll-a (ppb)	TSI Value
<1	<31
2	37
3	41
4	44
6	48
8	51
12	55
16	58
22	61
>22	>61

TSI for Lake Ellen in 2023	
Average	34
Secchi Disk	37
Summer TP	30
Chlorophyll-a	37



Oligotrophic: Generally deep and clear lakes with little aquatic plant or algae growth. These lakes maintain sufficient dissolved oxygen in the cool, deep-bottom waters during late summer to support cold water fish, such as trout and whitefish.

Mesotrophic: Lakes that fall between oligotrophic and eutrophic. Mid-ranged amounts of nutrients.

Eutrophic: Highly productive eutrophic lakes are generally shallow, turbid, and support abundant aquatic plant growth. In deep eutrophic lakes, the cool bottom waters usually contain little or no dissolved oxygen. Therefore, these lakes can only support warm water fish, such as bass and pike.

Hypereutrophic: A specialized category of eutrophic lakes. These lakes exhibit extremely high productivity, such as nuisance algae and weed growth.

Lake Ellen, Iron County

2023 Exotic Aquatic Plant Watch Results



The Exotic Aquatic Plant Watch was conducted on Lake Ellen in 2023.

This survey involves sampling at multiple locations around the lake to detect new invaders, and document the extent of known invaders. While notes on other plant species may be recorded during the survey, the effort focuses on five highly invasive species: Eurasian watermilfoil (*Myriophyllum spicatum*), starry stonewort (*Nitellopsis obtusa*), curly-leaf pondweed (*Potamogeton crispus*), European Frogbit (*Hydrocharis morsus-ranae*), and Hydrilla (*Hydrilla verticillata*).

The table below summarizes the results of the 2023 Exotic Aquatic Plant Watch on Lake Ellen.

Lake Ellen, Iron County		
2023 Exotic Aquatic Plant Watch Results		
Survey Date(s): July 28		
<u>Species</u>	<u>Status</u>	<u>Comments</u>
Eurasian watermilfoil	not found	20-30 plants were found and hand-pulled by contractor; none found during this survey.
Starry stonewort	not found	
Curly-leaf pondweed	not found	
European Frogbit	not found	
Hydrilla	not found	

Visit the MiCorps Data Exchange (<https://micorps.net>) or contact the lead volunteer on your lake for more details on the survey, including sampling locations, maps, and abundance information, and for information on past surveys.

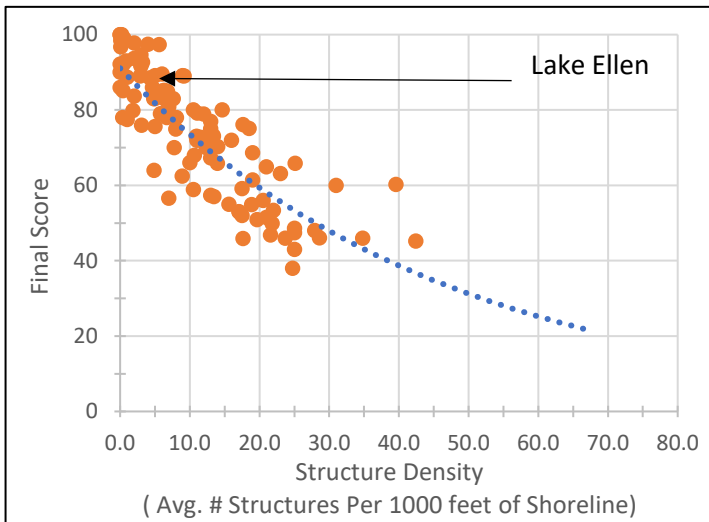
Lake Ellen, Iron County 2023 Score the Shore Results



The Score the Shore Habitat Assessment was conducted on Lake Ellen Lake in 2023.

This assessment involves rating 1000 foot sections of shoreline for aquatic vegetation, shoreline vegetation, erosion, and erosion control practices (like sea walls). Each shoreline section is given three scores ranging from 0-100 for the categories of Littoral, Riparian, and Erosion Management. The three scores are averaged to produce a average section score. Then a total score is given to the entire lake by averaging all of the average section scores. A score of 0 indicates a shoreline that has been extremely disturbed by human impacts and no natural shoreline remains. A score of 100 indicates a shoreline that is pristine.

How does your lake compare to others in the program?



Lake Ellen	
Number of Sections:	17
Number of Structures:	99
Structure Density:	6
Final Score:	85

All 106 Participating Lakes from 2015-2023:	
Avg. Number of Sections:	16
Avg. Number of Structures:	223
Avg. Structure Density:	12
Avg. Final Score:	73

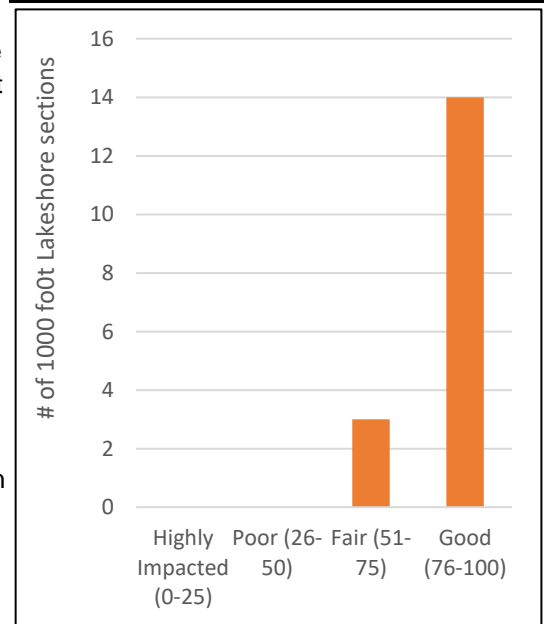
Note about graph to the left: The dotted line sets your average expectation of the score of your lake. If your lake is lower than the dotted line, then your shoreline health is lower than average compared to lakes with similar amount of shoreline development. And vice-versa in regards to a lake above the dotted line.

Analysis specific to Lake Ellen:

Overall, the lakeshore habitat of Lake Ellen is doing well and scored higher than average when compared to other lakes in the program with similar amount of development. All of the 1000 foot sections scored either Fair or Good: 3 fair, and 14 good.

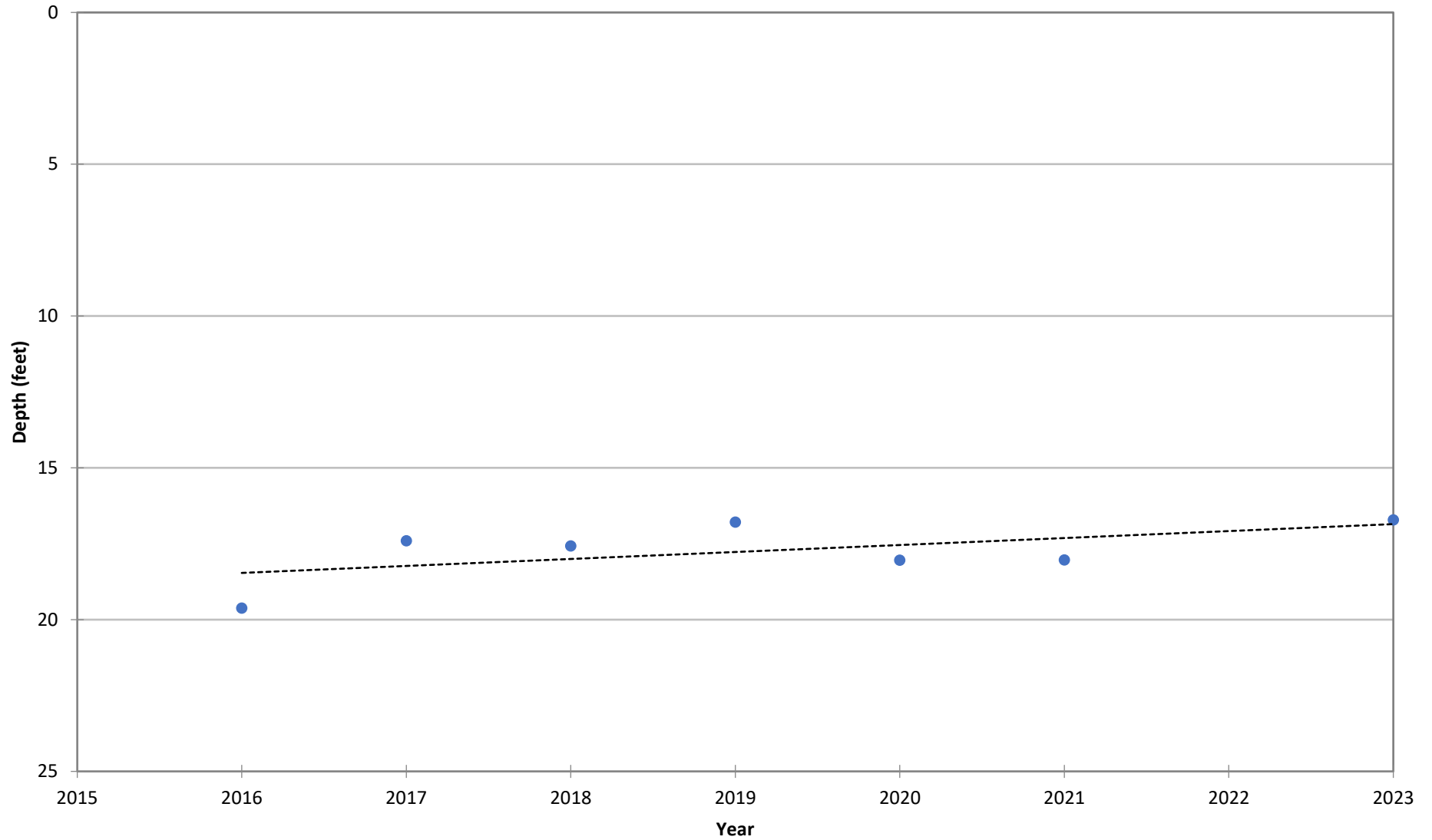
The lake sections scored highest for erosion control, with an average of 89, meaning that there are a low amount of sea walls, rock rip-rap, and other shoreline erosion structures, and no to few erosional areas of note.

The littoral zone was the weak point in Lake Ellen's habitat (scoring an average of 81). An average score of 81 is good, but there are two sections in particular that only score a 62 and 69 in Littoral. To improve the littoral zone score, leave woody debris in place, or introduce it specially, and allow native aquatic vegetation to grow in the shallow waters. You can get plenty of ideas for improving shoreline health from the Michigan Natural Shoreline Partnership. <https://www.shorelinepartnership.org/>



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEAN TRANSPARENCY

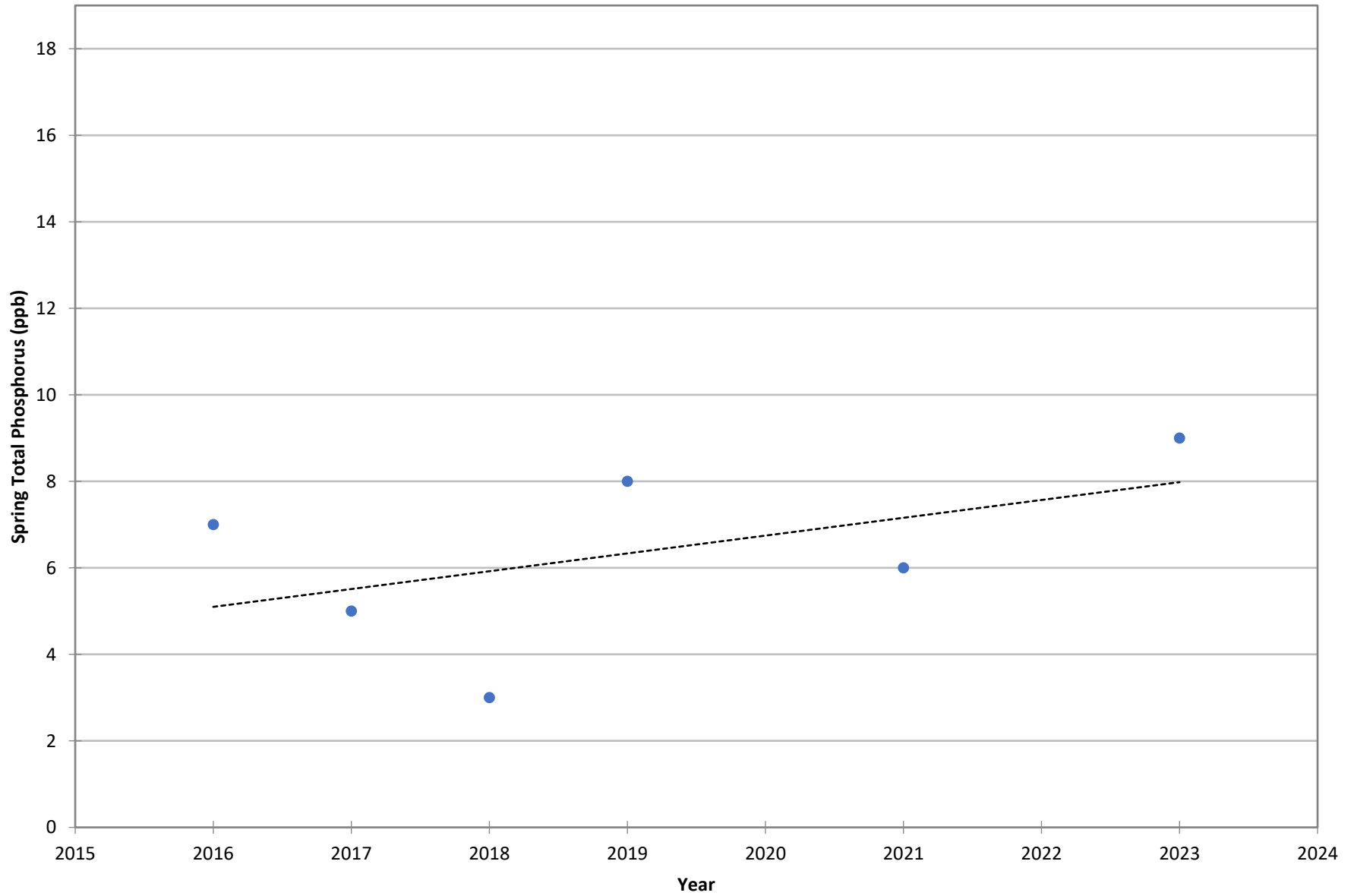
Lake Ellen (Iron Co.), 360050



Vertical bars indicate standard deviation

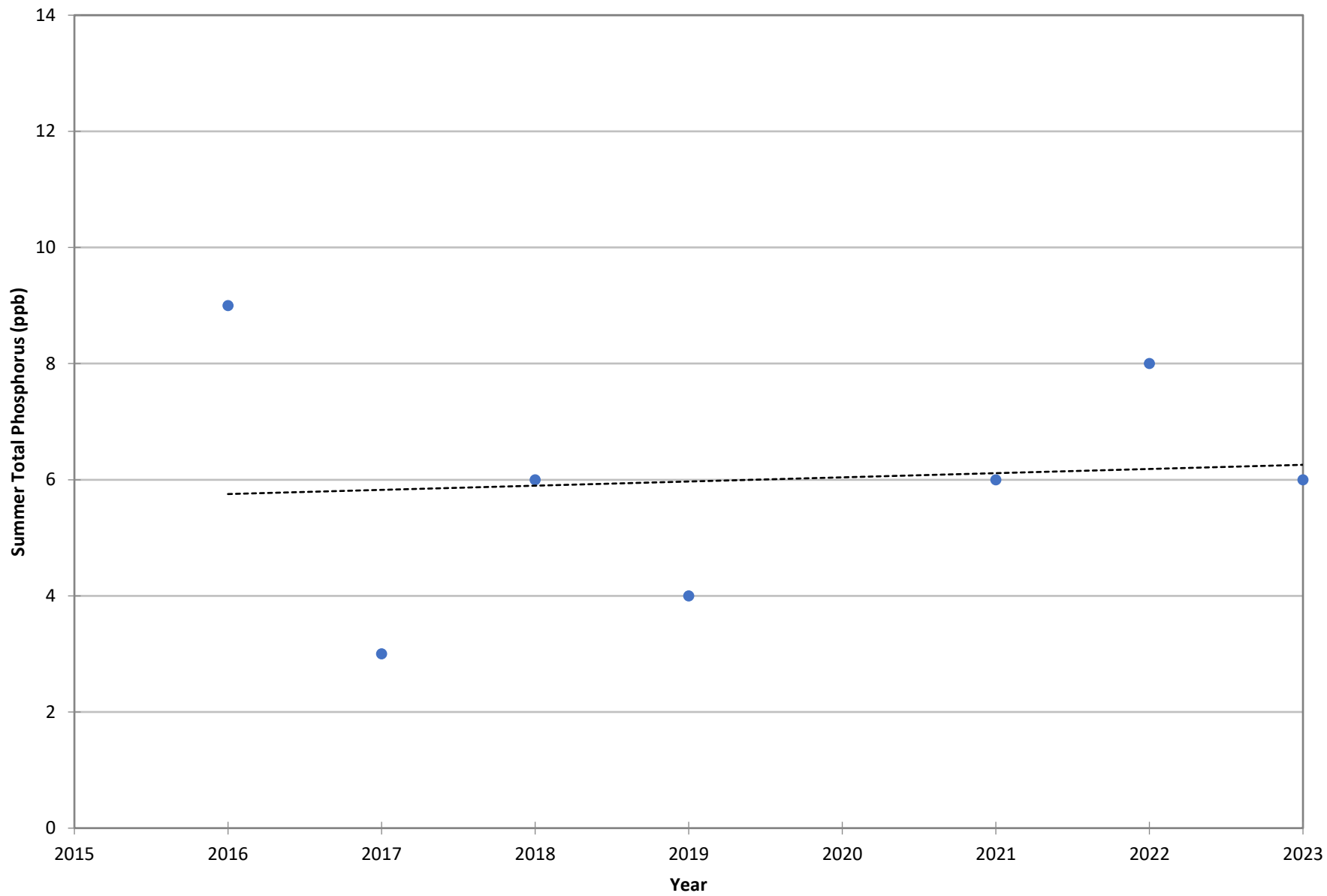
COOPERATIVE LAKES MONITORING PROGRAM
SPRING TOTAL PHOSPHORUS

Lake Ellen (Iron Co.), 360050



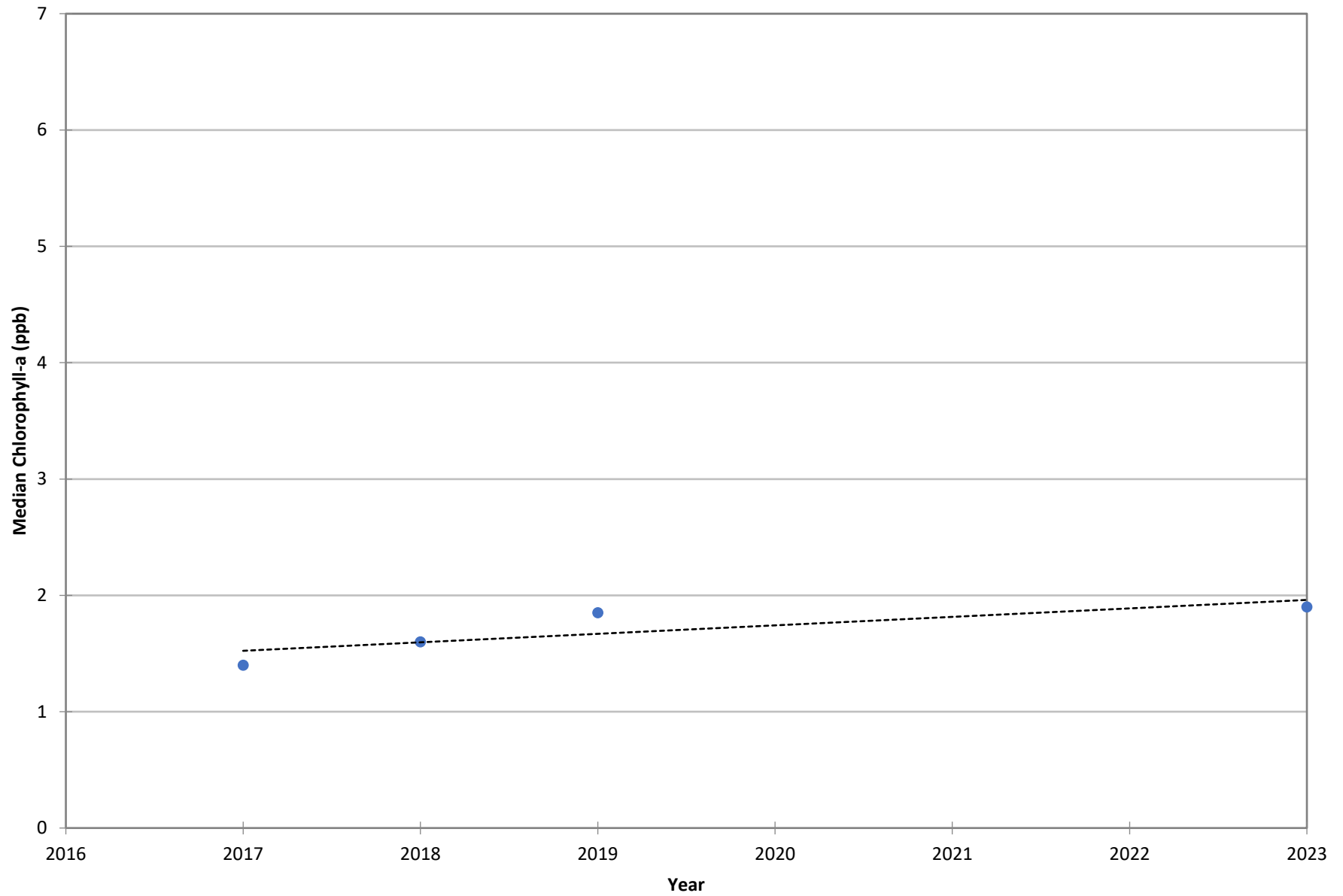
COOPERATIVE LAKES MONITORING PROGRAM
SUMMER TOTAL PHOSPHORUS

Lake Ellen (Iron Co.), 360050



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEDIAN CHLOROPHYLL-A

Lake Ellen (Iron Co.), 360050



Vertical bars indicate standard deviation

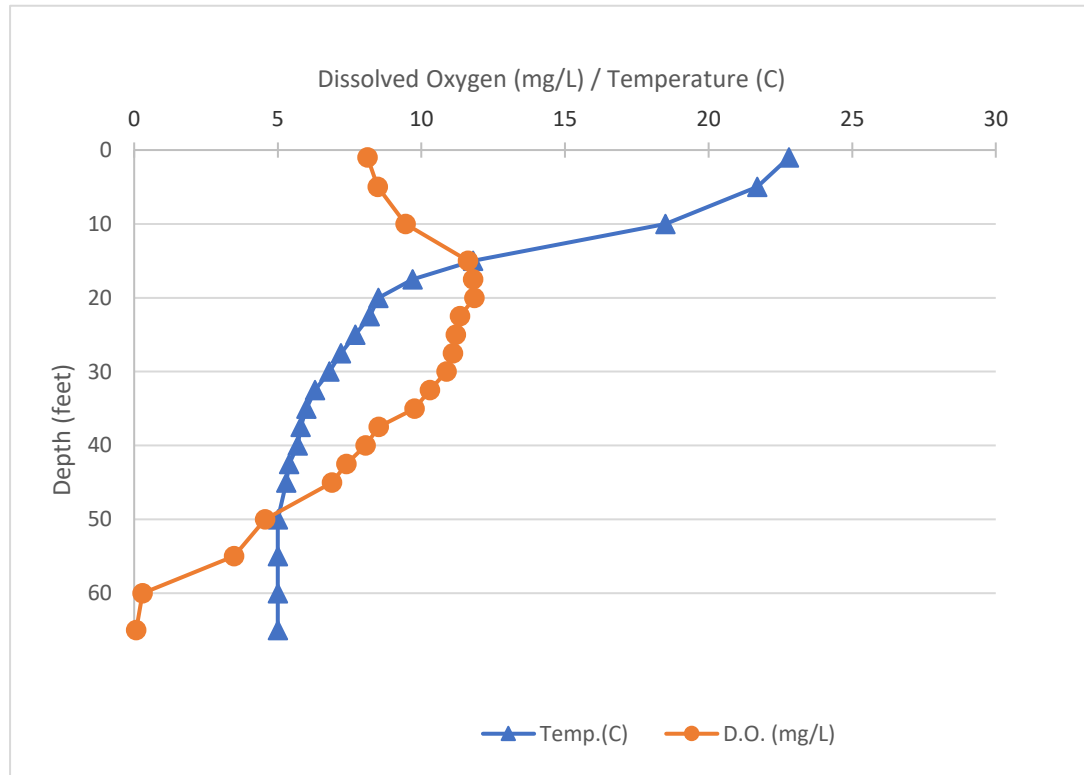
Name: Lake Ellen
 County: Iron
 Site ID: 360050
 Date: 6/3/2023

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	22.8	8.13
5	21.7	8.48
10	18.5	9.45
15	11.8	11.62
17.5	9.7	11.8
20	8.5	11.85
22.5	8.2	11.35
25	7.7	11.2
27.5	7.2	11.1
30	6.8	10.88
32.5	6.3	10.3
35	6	9.76
37.5	5.8	8.52
40	5.7	8.06
42.5	5.4	7.39
45	5.3	6.89
50	5	4.56
55	5	3.48
60	5	0.29
65	5	0.07

Lake: Lake Ellen (Iron Co.)

6/3/2023



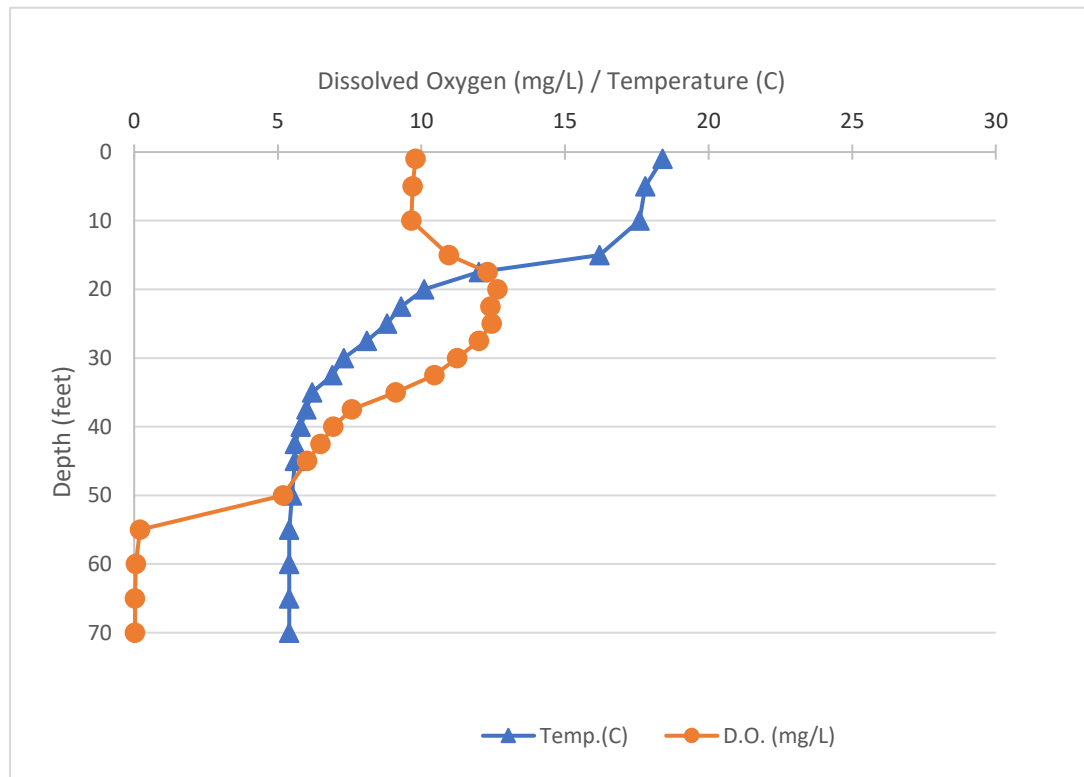
Name: Lake Ellen
 County: Iron
 Site ID: 360050
 Date: 6/14/2023

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	18.4	9.8
5	17.8	9.7
10	17.6	9.65
15	16.2	10.95
17.5	12	12.3
20	10.1	12.65
22.5	9.3	12.4
25	8.8	12.45
27.5	8.1	12
30	7.3	11.25
32.5	6.9	10.45
35	6.2	9.11
37.5	6	7.58
40	5.8	6.93
42.5	5.6	6.49
45	5.6	6.02
50	5.5	5.18
55	5.4	0.2
60	5.4	0.06
65	5.4	0.03
70	5.4	0.03

Lake: Lake Ellen (Iron Co.)

6/14/2023



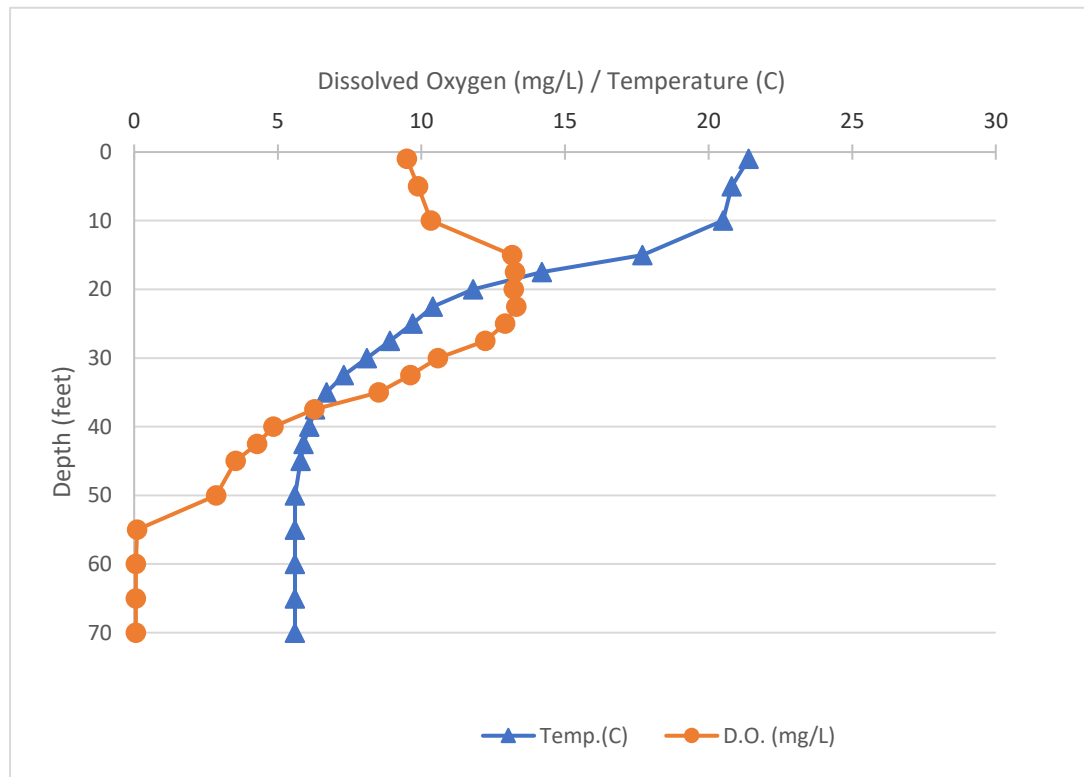
Name: Lake Ellen
 County: Iron
 Site ID: 360050
 Date: 6/29/2023

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.4	9.5
5	20.8	9.89
10	20.5	10.33
15	17.7	13.16
17.5	14.2	13.26
20	11.8	13.22
22.5	10.4	13.31
25	9.7	12.92
27.5	8.9	12.23
30	8.1	10.58
32.5	7.3	9.62
35	6.7	8.52
37.5	6.3	6.27
40	6.1	4.85
42.5	5.9	4.28
45	5.8	3.53
50	5.6	2.86
55	5.6	0.1
60	5.6	0.06
65	5.6	0.06
70	5.6	0.06

Lake: Lake Ellen (Iron Co.)

6/29/2023



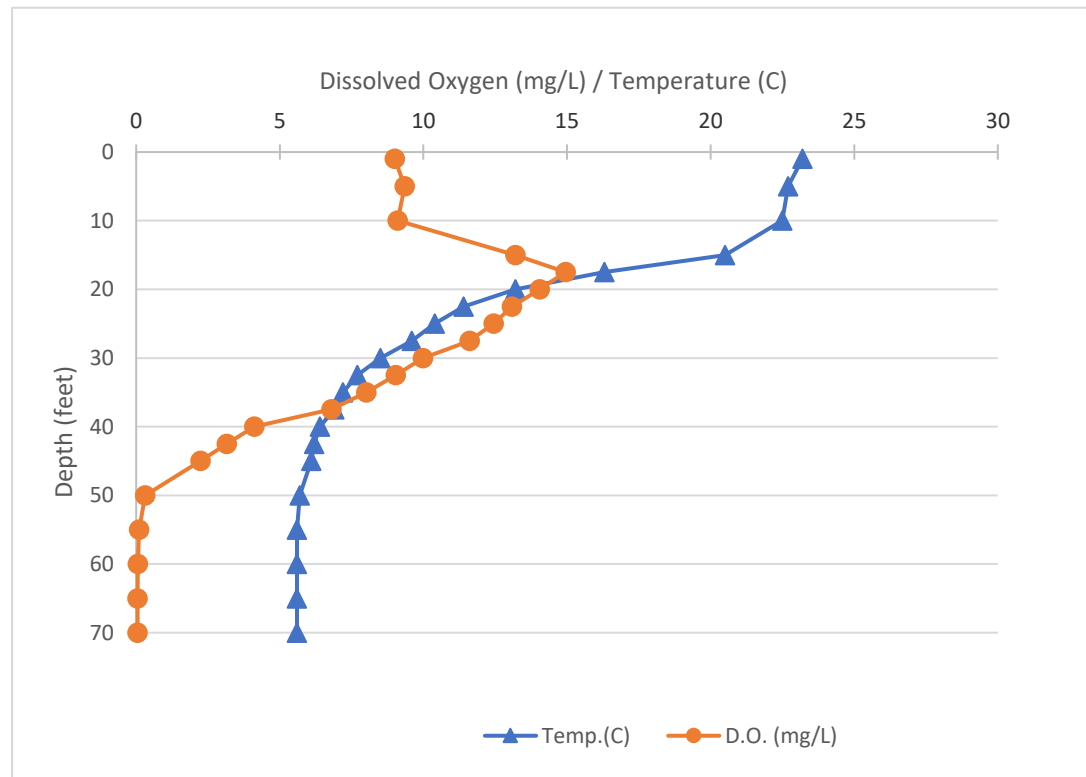
Name: Lake Ellen
 County: Iron
 Site ID: 360050
 Date: 7/13/2023

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	23.2	9
5	22.7	9.35
10	22.5	9.11
15	20.5	13.2
17.5	16.3	14.95
20	13.2	14.05
22.5	11.4	13.08
25	10.4	12.45
27.5	9.6	11.61
30	8.5	9.99
32.5	7.7	9.04
35	7.2	8.01
37.5	6.9	6.8
40	6.4	4.11
42.5	6.2	3.16
45	6.1	2.24
50	5.7	0.31
55	5.6	0.1
60	5.6	0.06
65	5.6	0.05
70	5.6	0.05

Lake: Lake Ellen (Iron Co.)

7/13/2023



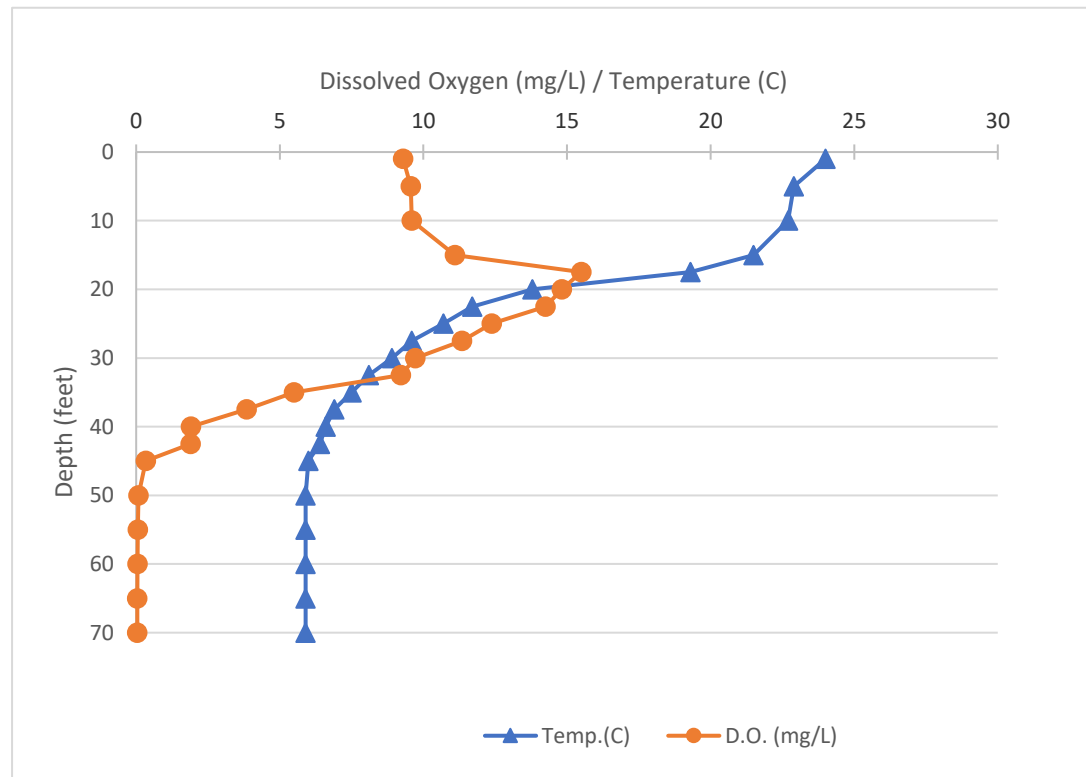
Name: Lake Ellen
 County: Iron
 Site ID: 360050
 Date: 7/25/2023

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24	9.3
5	22.9	9.56
10	22.7	9.6
15	21.5	11.1
17.5	19.3	15.5
20	13.8	14.82
22.5	11.7	14.25
25	10.7	12.38
27.5	9.6	11.35
30	8.9	9.72
32.5	8.1	9.22
35	7.5	5.5
37.5	6.9	3.85
40	6.6	1.91
42.5	6.4	1.9
45	6	0.34
50	5.9	0.08
55	5.9	0.06
60	5.9	0.05
65	5.9	0.04
70	5.9	0.04

Lake: Lake Ellen (Iron Co.)

7/25/2023



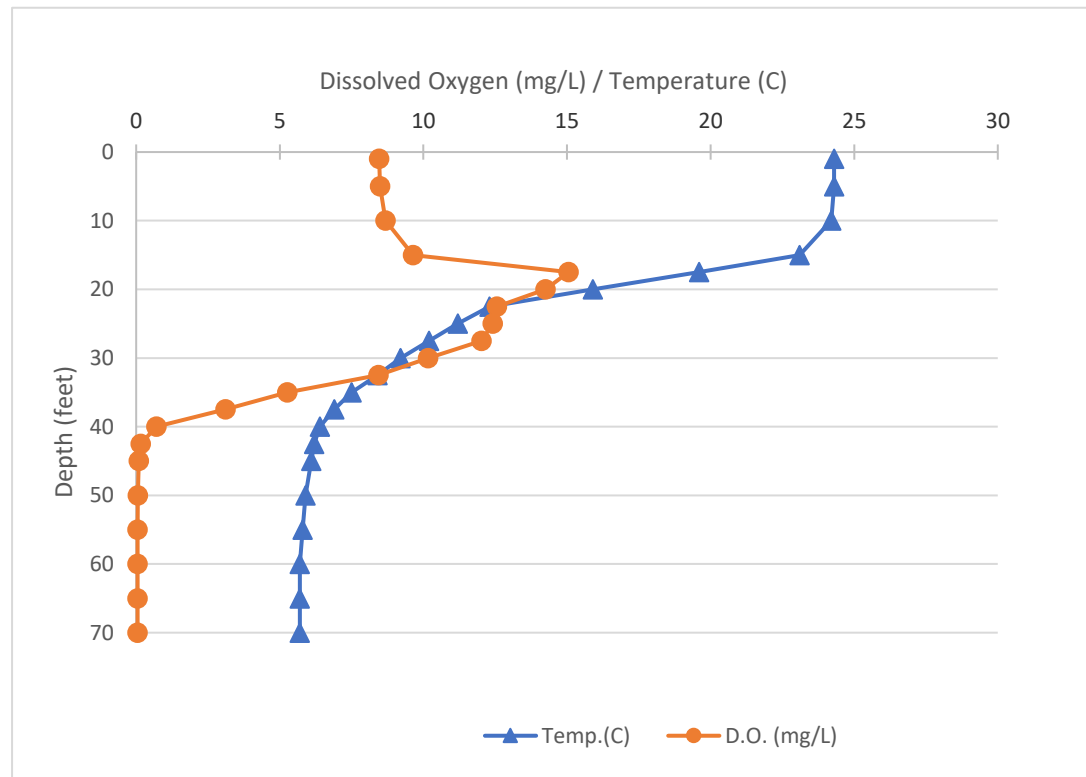
Name: Lake Ellen
 County: Iron
 Site ID: 360050
 Date: 8/4/2023

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.3	8.46
5	24.3	8.49
10	24.2	8.68
15	23.1	9.64
17.5	19.6	15.06
20	15.9	14.25
22.5	12.3	12.56
25	11.2	12.42
27.5	10.2	12.03
30	9.2	10.16
32.5	8.4	8.44
35	7.5	5.26
37.5	6.9	3.11
40	6.4	0.7
42.5	6.2	0.16
45	6.1	0.09
50	5.9	0.06
55	5.8	0.05
60	5.7	0.05
65	5.7	0.05
70	5.7	0.05

Lake: Lake Ellen (Iron Co.)

8/4/2023



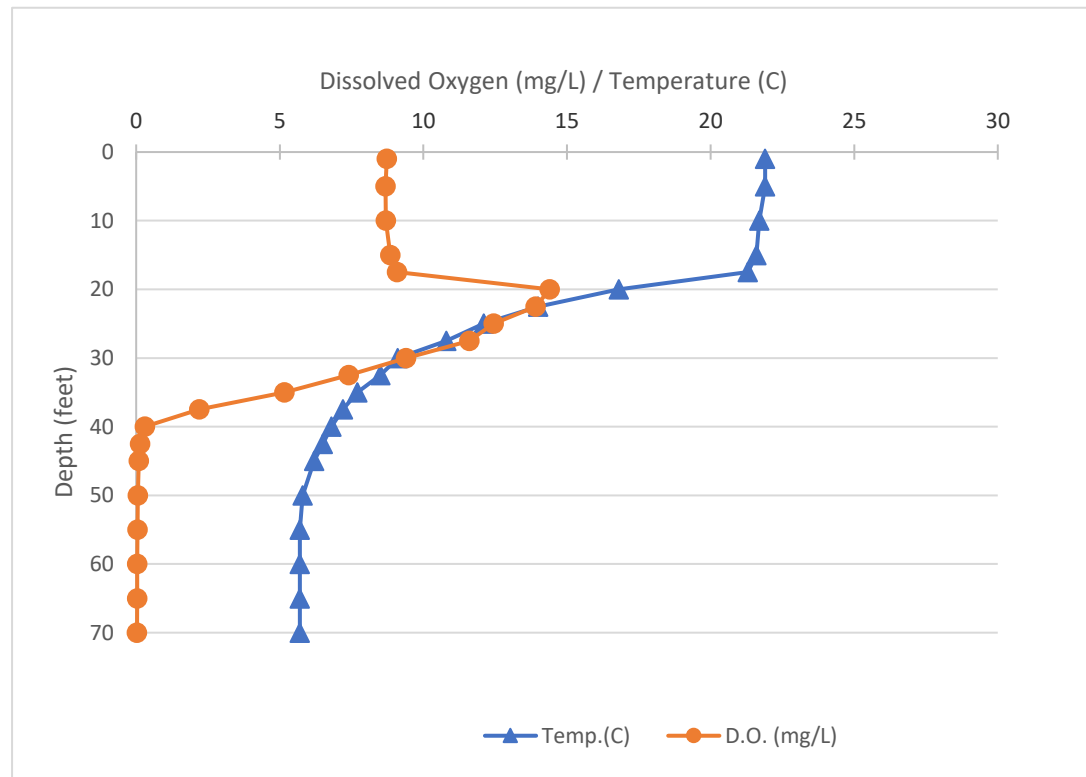
Name: Lake Ellen
 County: Iron
 Site ID: 360050
 Date: 8/19/2023

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.9	8.73
5	21.9	8.68
10	21.7	8.69
15	21.6	8.85
17.5	21.3	9.08
20	16.8	14.4
22.5	14	13.91
25	12.1	12.45
27.5	10.8	11.6
30	9.1	9.4
32.5	8.5	7.4
35	7.7	5.16
37.5	7.2	2.2
40	6.8	0.3
42.5	6.5	0.14
45	6.2	0.09
50	5.8	0.06
55	5.7	0.05
60	5.7	0.04
65	5.7	0.04
70	5.7	0.03

Lake: Lake Ellen (Iron Co.)

8/19/2023



Name: Lake Ellen
 County: Iron
 Site ID: 360050
 Date: 8/24/2023

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.7	8.4
5	21.5	8.55
10	21.5	8.79
15	21.4	8.9
17.5	21	9.4
20	18.2	13.42
22.5	14.2	13.89
25	12.2	12.1
27.5	10.6	12.07
30	9.4	10.01
32.5	8.4	6.92
35	7.7	4.24
37.5	7.1	1.13
40	6.8	0.17
42.5	6.5	0.09
45	6.2	0.06
50	5.9	0.04
55	5.7	0.03
60	5.7	0.03
65	5.7	0.02
70	5.7	0.02

Lake: Lake Ellen (Iron Co.)

8/24/2023

