Cooperative Lakes Monitoring Program

Michigan Lakes– Ours to Protect

2019 Data Report for Eagle Lake, Cass County

Site ID: 140057

41.8047°N, 86.0306°W

The CLMP is brought to you by:

Michigan Clean Water Corps

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

MICHIGAN STATE UNIVERSITY

Huron River Watershed Council

Great Lakes Commission des Grands Lacs

Michigan Lakes and Streams Association

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/sites/63/2019/06/CLMP-Manual-2019update.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: Marcy Knoll Wilmes, Jean Roth, Jo Latimore, Paul Steen, Mike Gallagher, Laura Kaminski, and Erick Elgin

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), MiCorps Program Manager

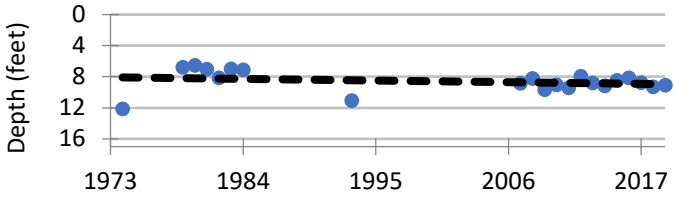
Site ID: 140057

Eagle Lake, Cass County
2019 CLMP Results

Cooperative Lakes Monitoring Program

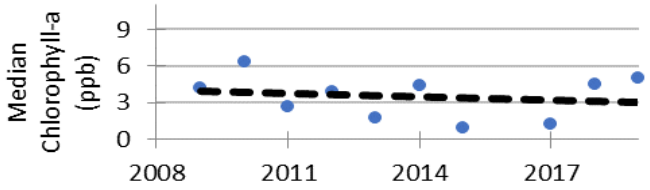
Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Average	Std. Dev	Carlson TSI
2019	18	5.5	12.0	9.1	1.8	45
2014-2018	76	4.0	22.5	9.1	4.0	46
1974-2013	255	3.0	28.0	8.5	3.9	46
2019 All CLMP Lakes	3392	1.5	50.0	12.8	5.8	42



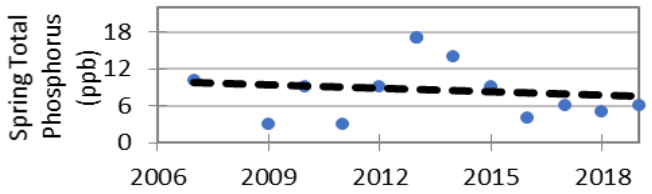
Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Median	Std. Dev	Carlson TSI
2019	5	4.0	5.8	5.0	0.8	46
2014-2018	22	<1.0	7.6	2.9	2.1	39
2009-2013	25	<1.0	9.9	2.9	2.7	44
2019 All CLMP Lakes	635	< 1.0	42.0	2.2	3.4	39



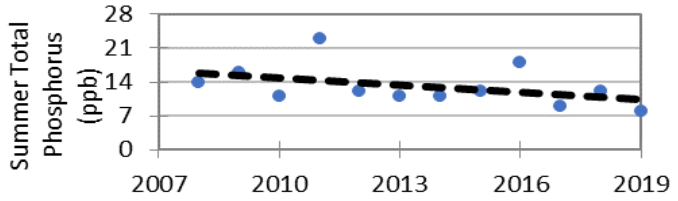
Spring Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev
2019	1	6.0	6.0	6.0	NA
2014-2018	5	<5 T	14.0	7.6	4.0
2007-2013	7	<=3 W	17.0	9.7	5.7
2019 All CLMP Lakes	220	<= 3	100.0	14.9	11.0



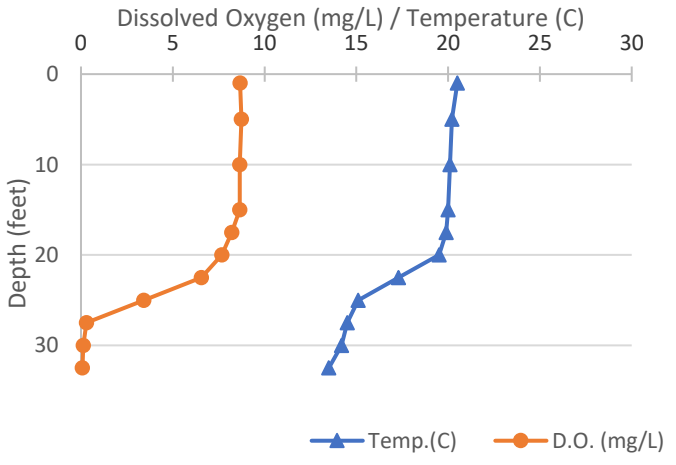
Summer Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev	Carlson TSI
2019	1	8.0	8.0	8.0	NA	34
2014-2018	5	9.0	18.0	12.4	3.4	40
2008-2013	6	11.0	23.0	14.5	4.6	42
2019 All CLMP Lakes	281	<= 3	65.0	12.8	9.3	38



Dissolved Oxygen and Temperature Profile

6/16/2019



Summary

Average TSI	2019	2014-2018	1974-2013
Eagle Lake	42	42	44
All CLMP Lakes	40	40	43

With an average TSI score of 42 based on 2019 Secchi transparency, chlorophyll-a, and summer total phosphorus data, this lake is rated as a mesotrophic lake.

The lake keeps some dissolved oxygen in the bottom waters through spring, but by mid-/late summer the lake has stratified and the bottom water is devoid of oxygen.

Long term monitoring shows slight downward slopes on the parameters, indicating a very slow movement toward lower nutrient levels in the lake.

** = No sample received W= Value is less than the detection limit (<3 ppb) T= Value reported is less than the reporting limit (5 ppb).*

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

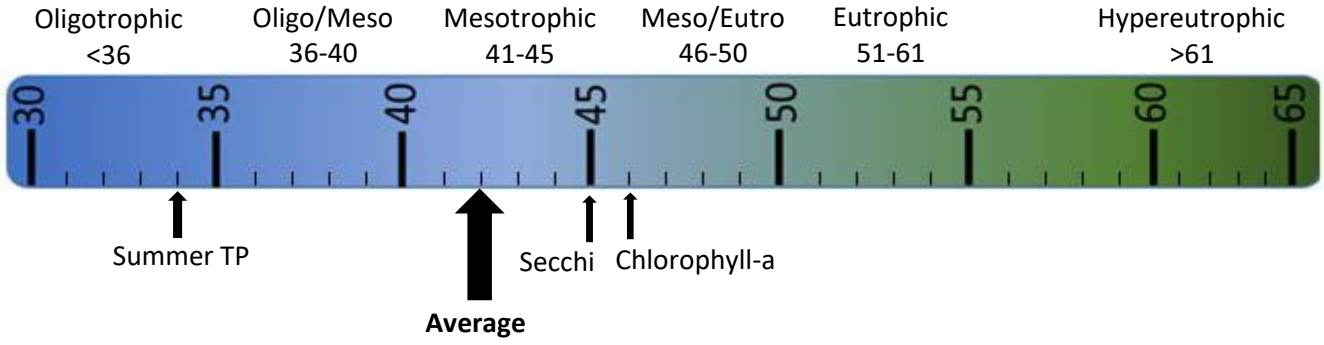
The tables below give the results-to-TSI conversions for the water quality data ranges normally seen in the CLMP. The formulas for this conversion can be found in the CLMP manual: **https://micorps.net/wp-content/uploads/sites/63/2019/06/CLMP-Manual-2019update.pdf**

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 Eagle Lake in 2019	
Average	42
Secchi Disk	45
Summer TP	34
Chlorophyll-a	46



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 euthrophic lakes. These lakes exhibit extremely high productivity, such as nuisance algae and weed growth.

Site ID: 140057

Eagle Lake, Cass County
2019 Exotic Aquatic Plant Watch Results

The Exotic Aquatic Plant Watch was conducted on Eagle Lake in 2019.

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 four 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 2019 Exotic Aquatic Plant Watch on Eagle Lake.

Eagle Lake, Cass County

2019 Exotic Aquatic Plant Watch Results

Survey Date(s): August 9, 13

Species	Status	Comments
Eurasian watermilfoil	FOUND	Found in 3 of 29 transects surveyed.
Starry stonewort	FOUND	Most that was found was described as dead.
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.

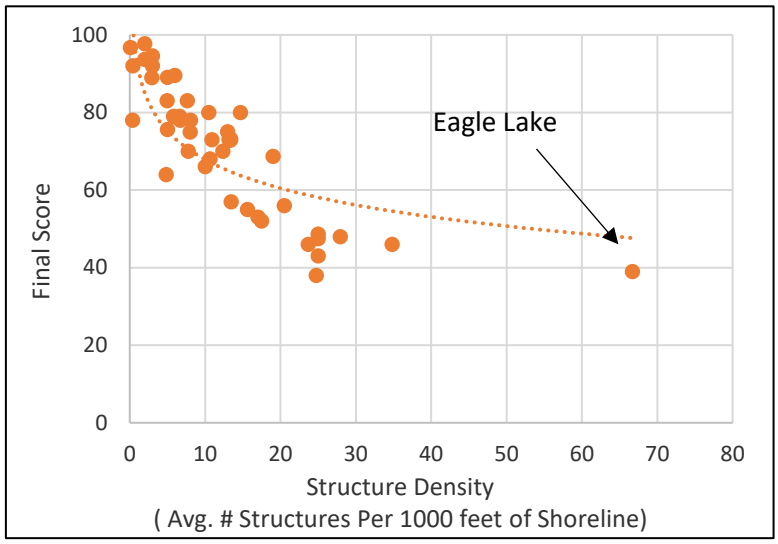
Site ID: 140057

Eagle Lake, Cass County
2015 Score the Shore Results

The Score the Shore Habitat Assessment was conducted on Eagle Lake in 2015.

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 nearly pristine.

How does your lake compare to others in the program?



Eagle Lake:	
Number of Sections:	7
Number of Structures:	467
Structure Density:	66.7
Final Score:	39

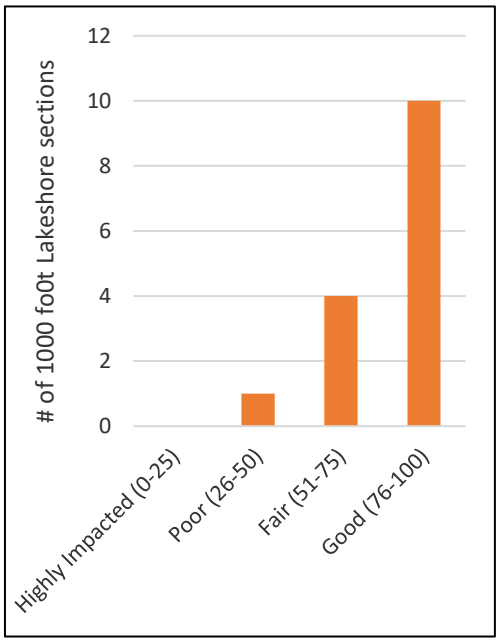
All 42 Participating Lakes from 2015-2018:	
Avg. Number of Sections:	16.3
Avg. Number of Structures:	248.5
Avg. Structure Density:	15.2
Avg. Final Score:	70.5

There is a very tight relationship between Final Score and Structure Density. It will be interesting to see if and how this changes as more lakes go through this scoring process.

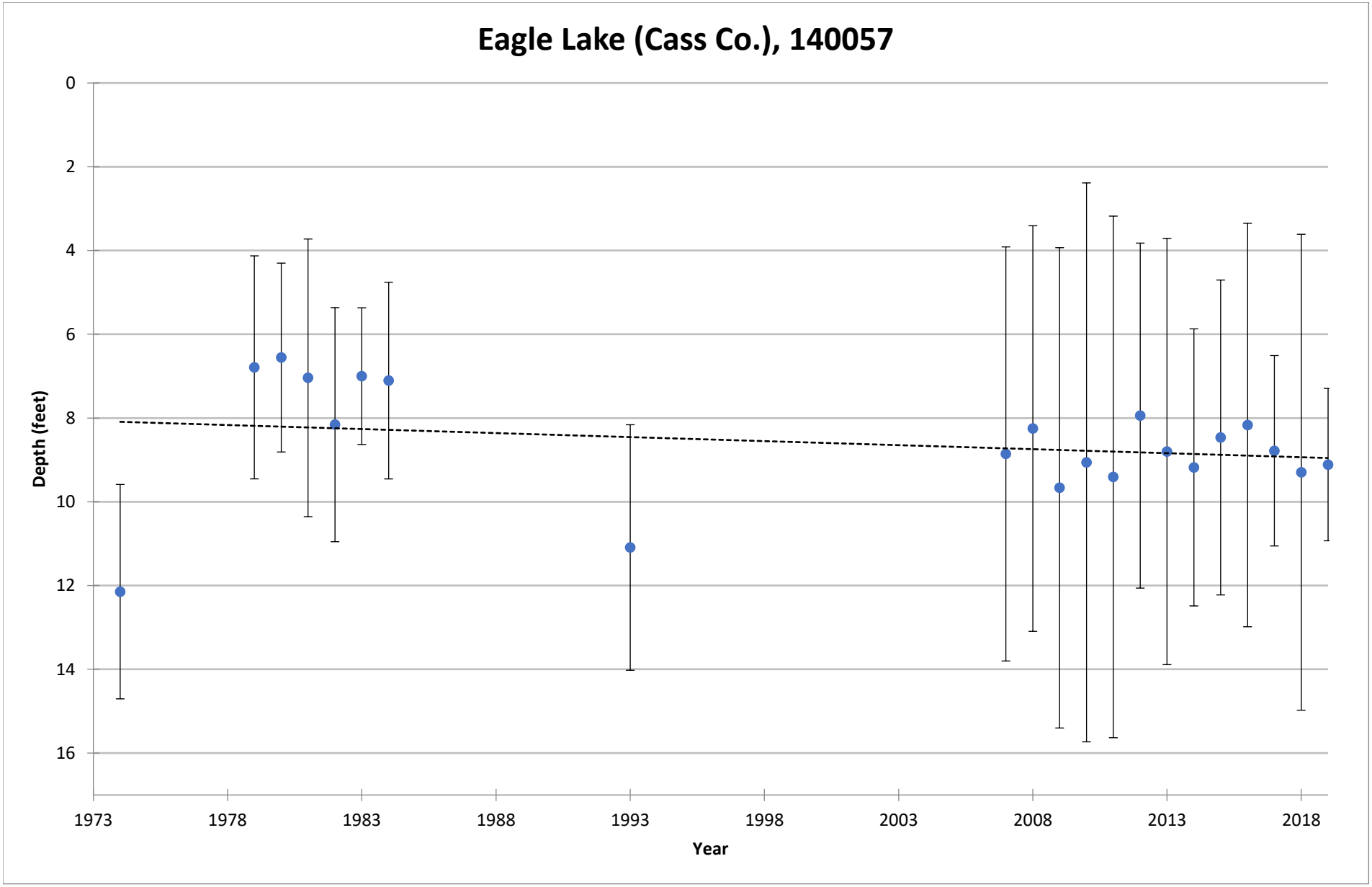
Analysis specific to Eagle Lake:

With a very high density of houses and docks on Eagle Lake, it logically follows that the overall lakeshore health is poor. The lake is characterized by sea walls, few unmowed areas, and very little aquatic vegetation.

The weakest point of Eagle Lake was the riparian zone (land adjacent to the water), scoring only a 27 out of 100. Reducing the amount of mowed grass and increasing the amount of unmowed vegetation would be the primary way to boost the overall score of Eagle Lake. Residents should be encourage to plant 20 foot wide strips of native plants along the lakeshore.

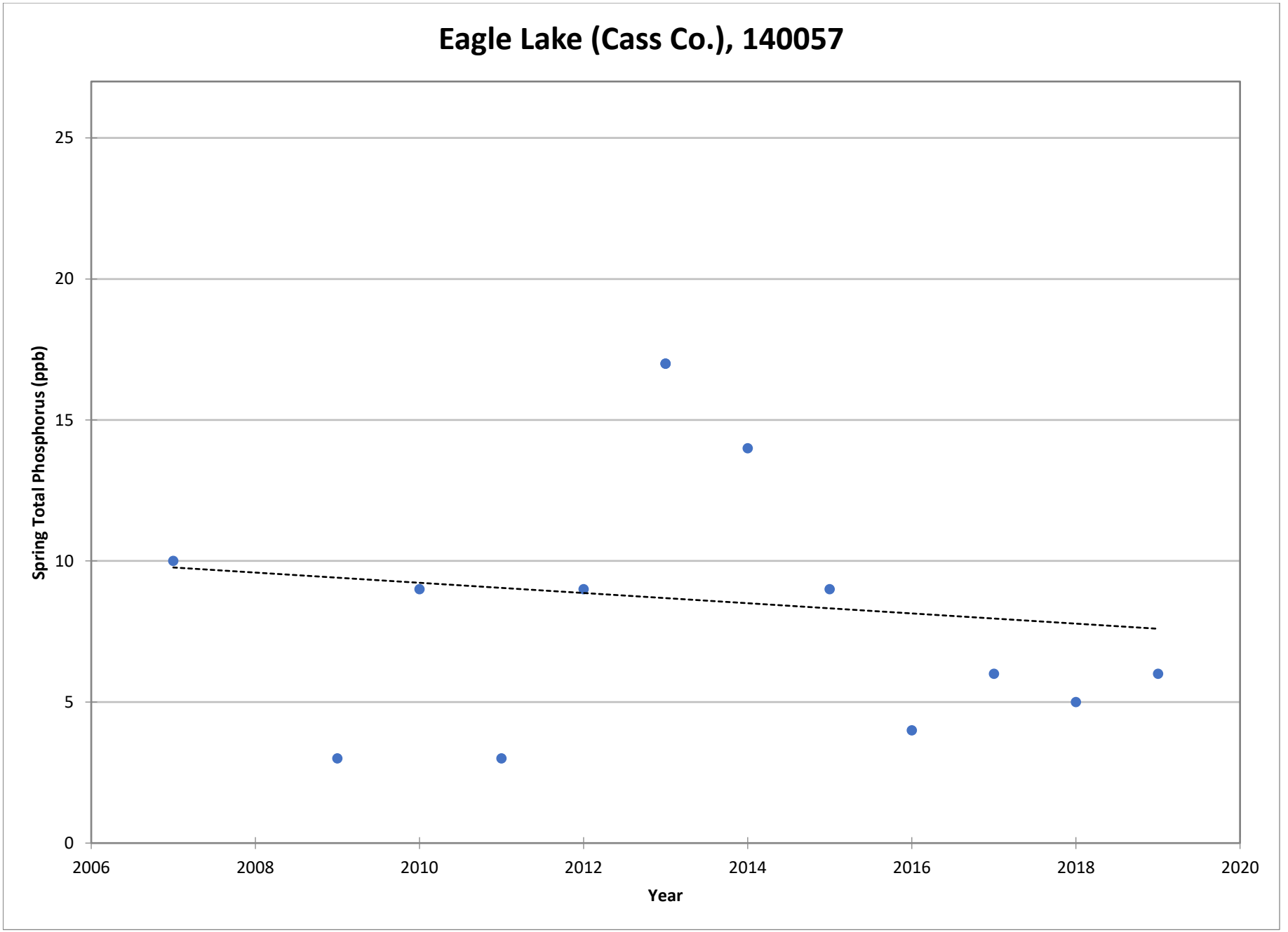


COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEAN TRANSPARENCY

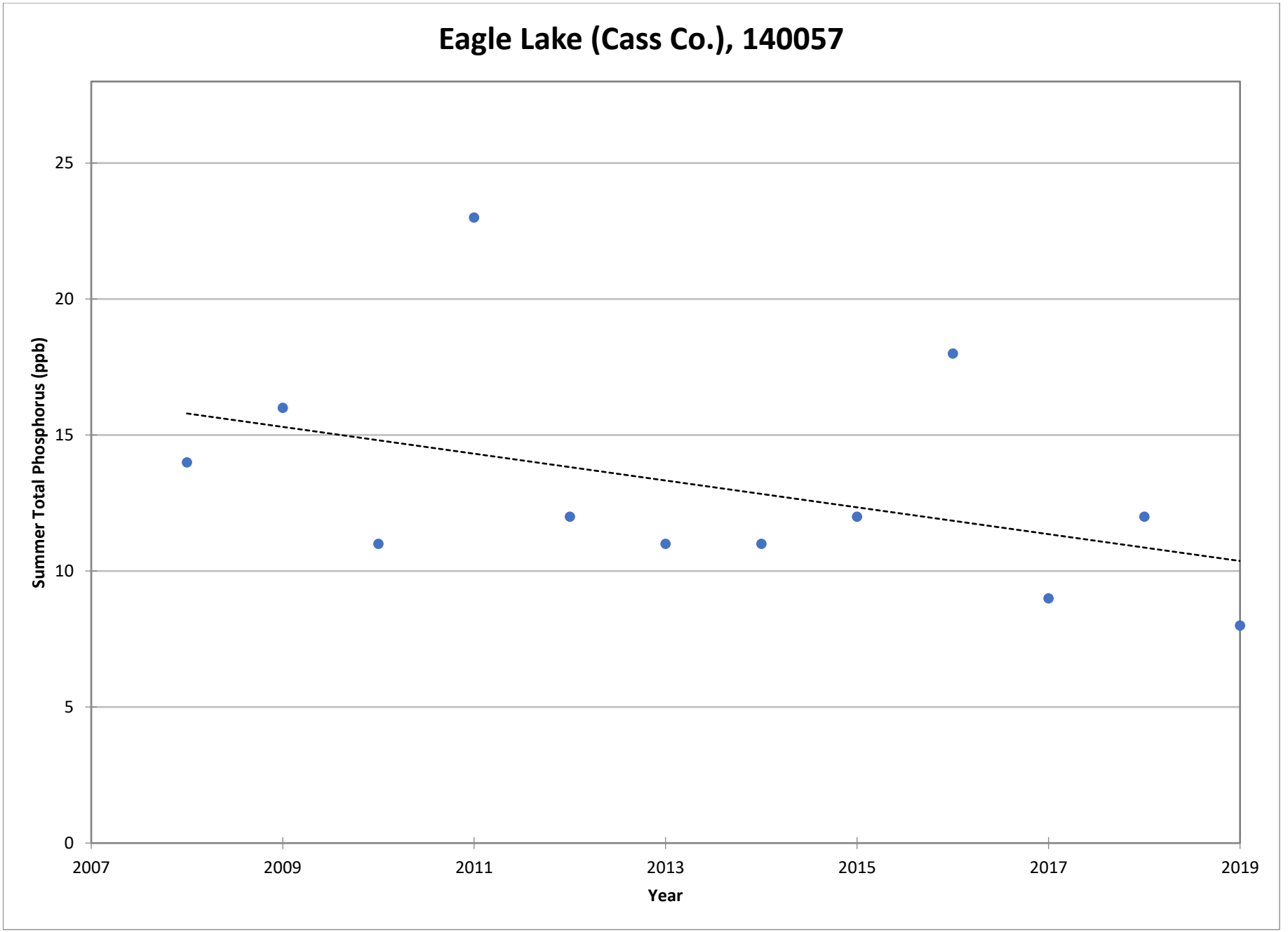


Vertical bars indicate standard deviation

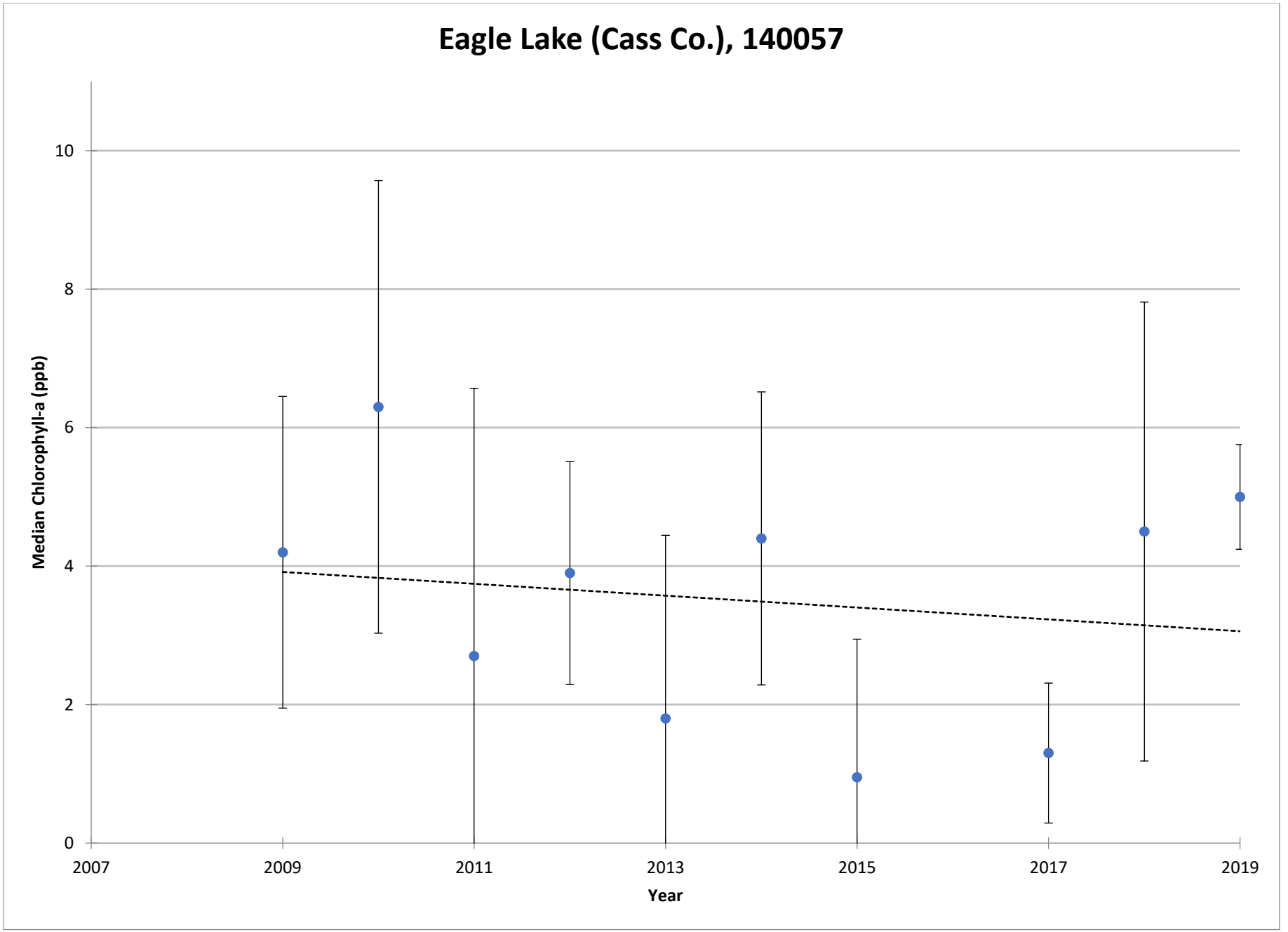
COOPERATIVE LAKES MONITORING PROGRAM
SPRING TOTAL PHOSPHORUS



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER TOTAL PHOSPHORUS



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEDIAN CHLOROPHYLL-A



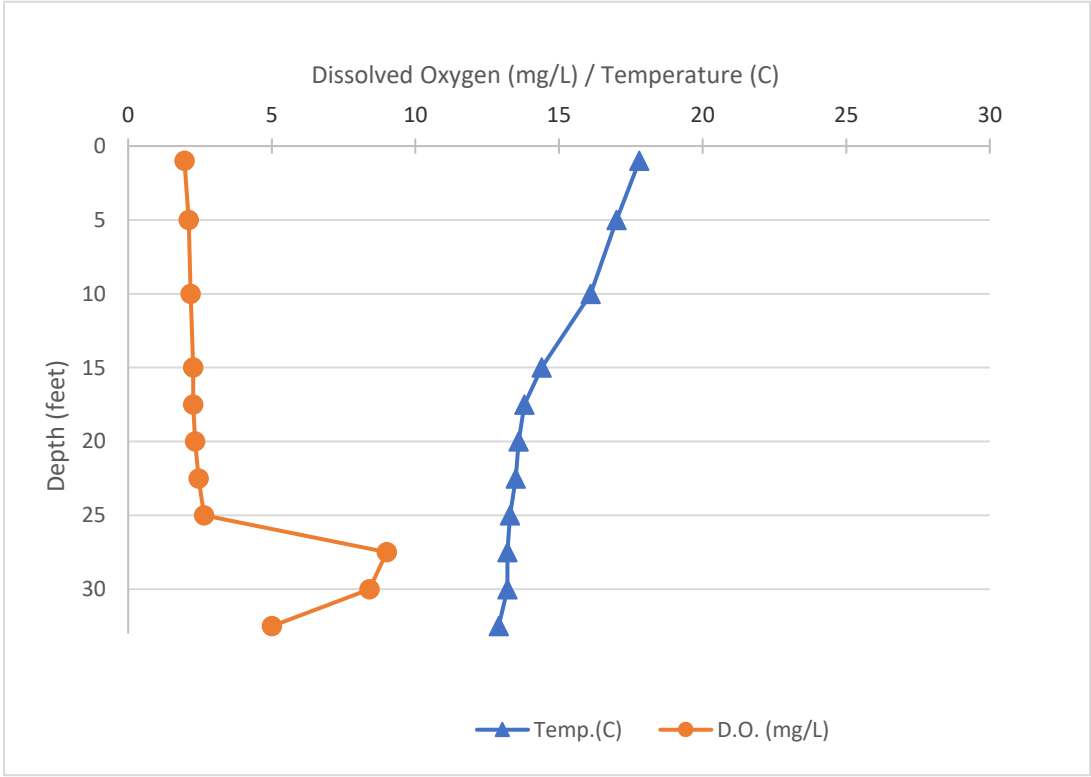
Vertical bars indicate standard deviation

Name: Eagle Lake
County: Cass
Site ID: 140057
Date: 5/17/2019

Dissolved Oxygen and Temperature Profile

Lake: Eagle Lake (Cass Co.) **5/17/2019**

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	17.8	1.96
5	17	2.11
10	16.1	2.18
15	14.4	2.26
17.5	13.8	2.26
20	13.6	2.33
22.5	13.5	2.45
25	13.3	2.64
27.5	13.2	9
30	13.2	8.4
32.5	12.9	5

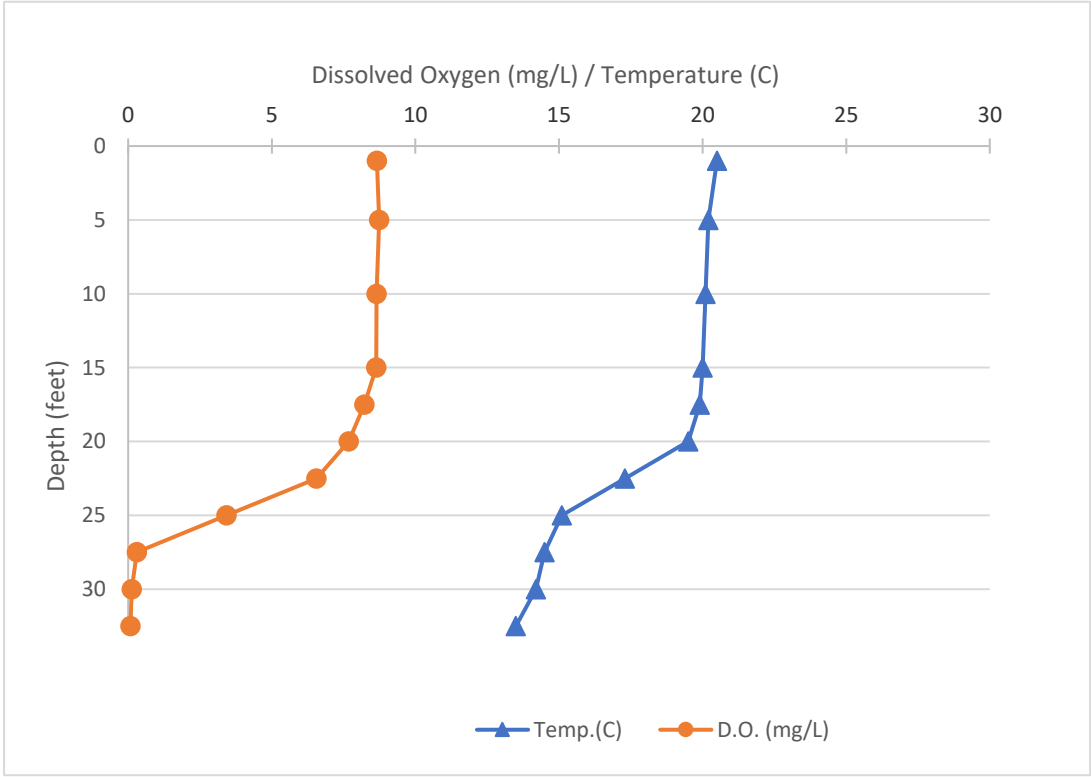


Name: Eagle Lake
County: Cass
Site ID: 140057
Date: 6/16/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	20.5	8.66
5	20.2	8.74
10	20.1	8.65
15	20	8.64
17.5	19.9	8.22
20	19.5	7.68
22.5	17.3	6.55
25	15.1	3.42
27.5	14.5	0.3
30	14.2	0.13
32.5	13.5	0.08

Lake: Eagle Lake (Cass Co.) **6/16/2019**

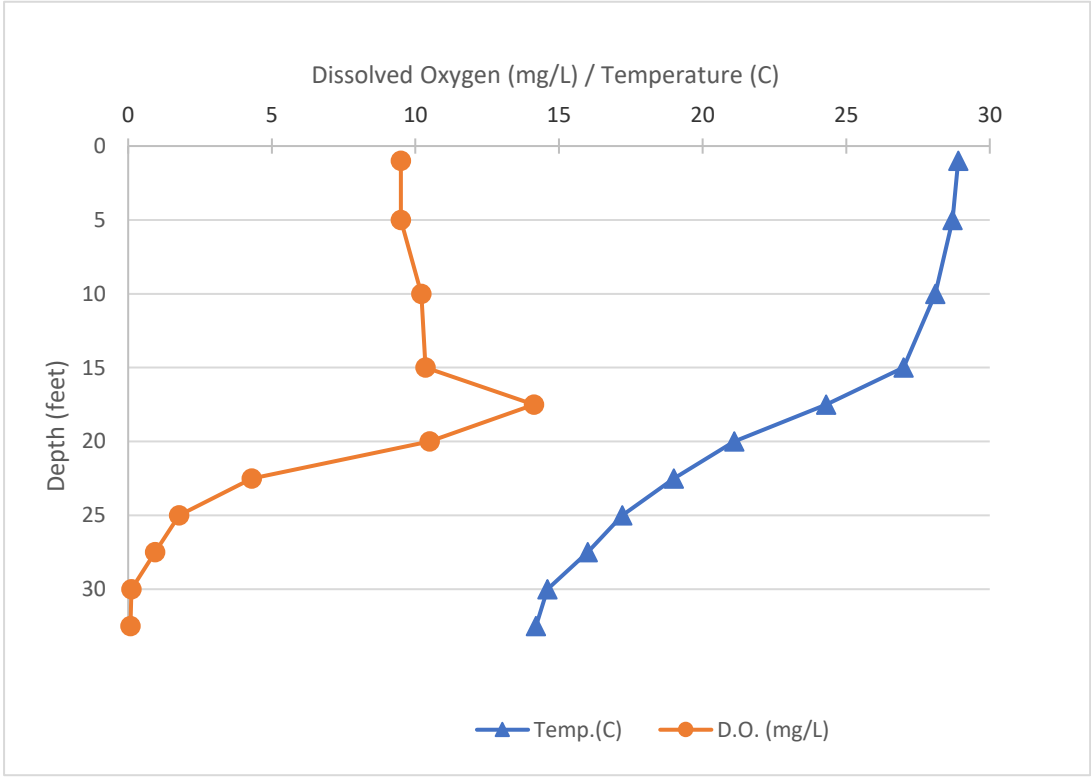


Name: Eagle Lake
County: Cass
Site ID: 140057
Date: 7/15/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	28.9	9.5
5	28.7	9.5
10	28.1	10.21
15	27	10.35
17.5	24.3	14.13
20	21.1	10.5
22.5	19	4.3
25	17.2	1.77
27.5	16	0.94
30	14.6	0.11
32.5	14.2	0.08

Lake: Eagle Lake (Cass Co.) **7/15/2019**

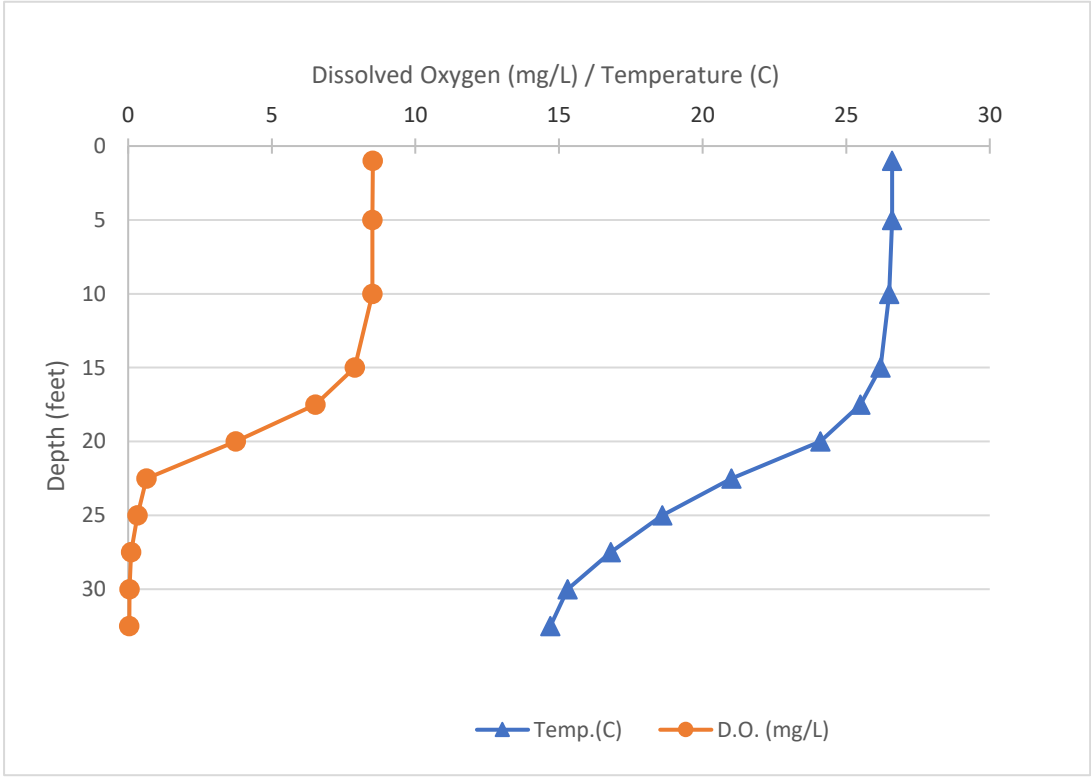


Name: Eagle Lake
County: Cass
Site ID: 140057
Date: 8/15/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26.6	8.52
5	26.6	8.5
10	26.5	8.5
15	26.2	7.89
17.5	25.5	6.52
20	24.1	3.75
22.5	21	0.64
25	18.6	0.32
27.5	16.8	0.1
30	15.3	0.05
32.5	14.7	0.04

Lake: Eagle Lake (Cass Co.) **8/15/2019**



Name: Eagle Lake
County: Cass
Site ID: 140057
Date: 9/19/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	23.5	8.95
5	23.3	9.06
10	23.1	8.97
15	22.9	8.91
17.5	22.4	8.52
20	22	8.3
22.5	21.3	4.46
25	20.7	1.11
27.5	19.3	0.18
30	17.6	0.13
32.5	15.8	0.1

Lake: Eagle Lake (Cass Co.) **9/19/2019**