



2019 Data Report for Fremont Lake, Newaygo County

Site ID: 620029

43.4506°N, 85.9647°W

The CLMP is brought to you by:



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:

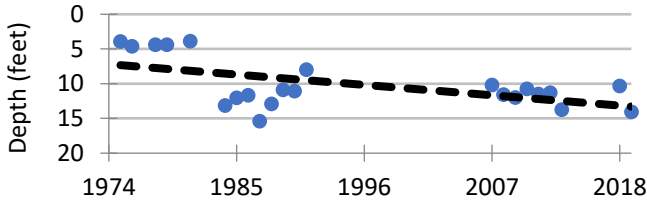
Paul Steen (psteen@hrwc.org), MiCorps Program Manager

Fremont Lake, Newaygo County 2019 CLMP Results



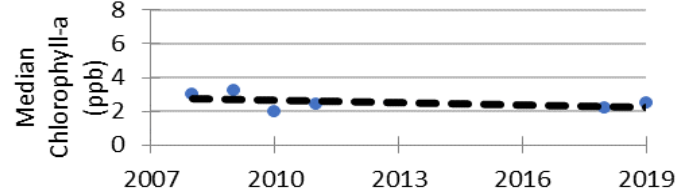
Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Average	Std. Dev	Carlson TSI
2019	8	7.5	21.5	14.1	5.4	39
2014-2018	21	5.0	18.5	14.1	4.3	43
1975-2013	319	2.0	30.0	9.9	4.1	45
2019 All CLMP Lakes	3392	1.5	50.0	12.8	5.8	42



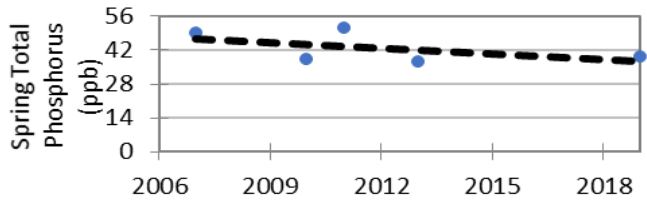
Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Median	Std. Dev	Carlson TSI
2019	4	1.0	4.4	2.5	1.5	40
2014-2018	4	<1.0	2.5	2.2	0.9	38
2008-2013	20	<1.0	7.6	2.2	2.2	40
2019 All CLMP Lakes	635	< 1.0	42.0	2.2	3.4	39



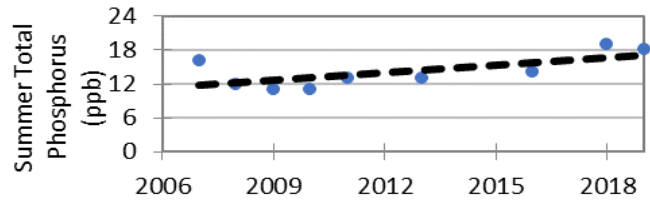
Spring Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev
2019	1	39.0	39.0	39.0	NA
2014-2018	4	37.0	51.0	43.8	7.3
2019 All CLMP Lakes	220	<= 3	100.0	14.9	11.0



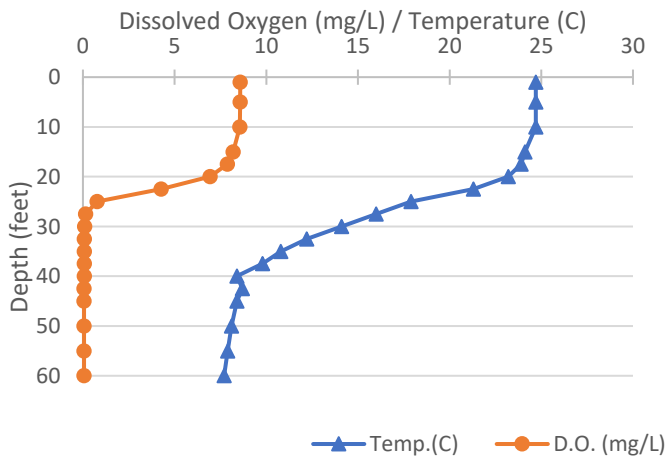
Summer Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev	Carlson TSI
2019	1	18.0	18.0	18.0	NA	46
2014-2018	2	14.0	19.0	16.5	3.5	44
2019 All CLMP Lakes	281	<= 3	65.0	12.8	9.3	38



Dissolved Oxygen and Temperature Profile

8/20/2019



Summary

Average TSI	2019	2014-2018	1975-2013
Fremont Lake	42	42	42
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 early summer, but by early summer the lake has stratified and the bottom water is devoid of oxygen.

While the trends for individual parameters are mixed and transparency has increased significantly, the overall nutrient levels in the lake are largely unchanged since monitoring began.

* = 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.

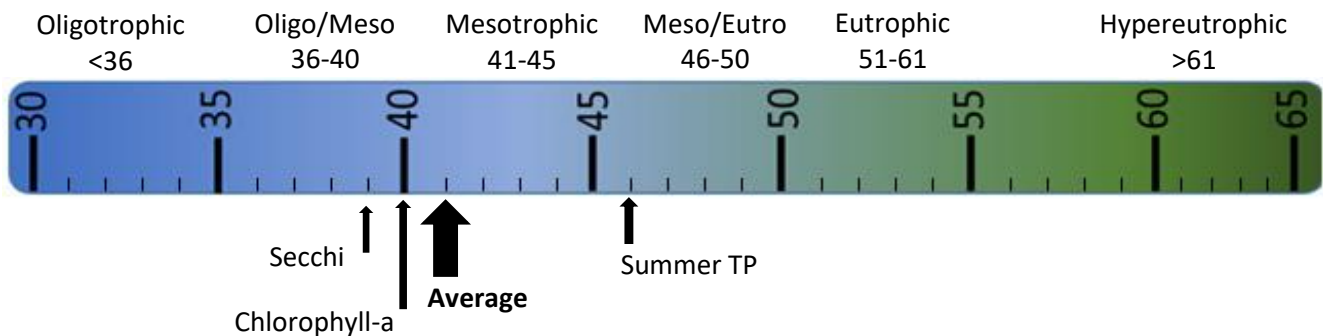
The tables below give the results-to-TSI conversions for the water quality data ranges normally seen in the CLMP. The formulas for this conversion can be found in the CLMP manual: <https://micorps.net/wp-content/uploads/sites/63/2019/06/CLMP-Manual-2019update.pdf>

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 Fremont Lake in 2019	
Average	41
Secchi Disk	39
Summer TP	46
Chlorophyll-a	40



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.

Fremont Lake, Newaygo County 2016 Exotic Aquatic Plant Watch Results



The Exotic Aquatic Plant Watch was conducted on Fremont Lake in 2016.

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*), and Hydrilla (*Hydrilla verticillata*).

The table below summarizes the results of the 2016 Exotic Aquatic Plant Watch on Fremont Lake.

Fremont Lake, Newaygo County		
2016 Exotic Aquatic Plant Watch Results		
Survey Date: May 16, 2016		
<u>Species</u>	<u>Status</u>	<u>Comments</u>
Eurasian watermilfoil	FOUND	Lakewide density = 2.1 (scale 0-5; at 19 of 77 surveyed sites); 3rd most common plant in lake
Starry stonewort	not found	
Curly-leaf pondweed	FOUND	Lakewide density = 1.6; relatively uncommon. Found 8 of 77 surveyed sites.
Hydrilla	not found	

Visit the MiCorps Data Exchange (www.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.

Fremont Lake, Newaygo County 2016 CLMP Aquatic Plant Results



The Aquatic Plant Identification and Mapping survey was conducted on Fremont in 2016.

This survey involves intensive sampling at multiple locations and depths around the lake produce a complete map of all aquatic plants present in a lake. A great deal of effort is involved both on the lake and back on shore to identify plants, compile data, and develop a detailed plant map, but the result is an extremely valuable record of the plant community of the lake.

Aquatic plants were sampled from a total of 77 locations in Fremont Lake in 2016. Below is a list of species reported [in order of relative abundance, if the volunteer calculated that like they are supposed to].

Fremont Lake, Newaygo County		
2016 Aquatic Plant Identification and Mapping: Species Reported		
<u>Common Name</u>	<u>Latin Name</u>	<u>Relative Density Rating</u>
Filamentous algae	--	2.9
Coontail	<i>Ceratophyllum demersum</i>	2.5
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	2.1
Waterweed	<i>Elodea canadensis</i>	1.8
Milfoil	<i>Myriophyllum</i> spp.	1.8
Muskgrass	<i>Chara</i> spp.	1.8
Northern watermilfoil	<i>Myriophyllum sibiricum</i>	1.6
Curly-leaf pondweed	<i>Potamogeton crispus</i>	1.6
Bushy pondweed	<i>Najas</i> spp.	1.4
Sago pondweed	<i>Stuckenia pectinata</i>	1.1
Pondweed species	<i>Potamogeton</i> spp.	1.0
Water stargrass	<i>Heteranthera (Zosterella) dubia</i>	1.0

Visit the MiCorps Data Exchange (www.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.

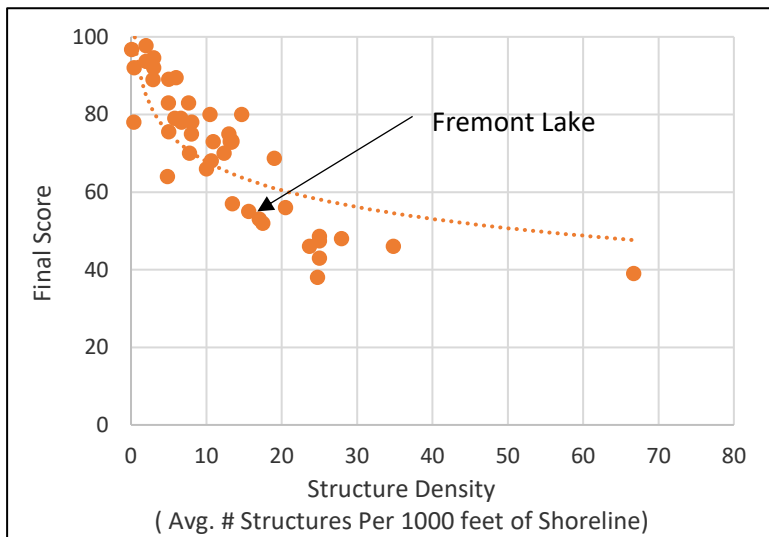
Fremont Lake, Newaygo County 2016 Score the Shore Results



The Score the Shore Habitat Assessment was conducted on Fremont Lake in 2016.

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?



Fremont Lake:	
Number of Sections:	25
Number of Structures:	424
Structure Density:	17
Final Score:	53

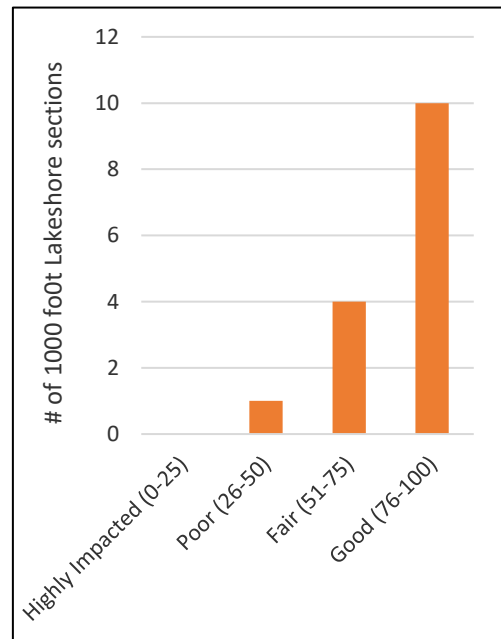
All 42 Participating Lakes from 2015-2018:	
Avg. Number of Sections:	16.3
Avg. Number of Structures:	248.5
Avg. Structure Density:	15.2
Avg. Final Score:	70.5

Analysis specific to Fremont Lake:

Overall, the lakeshore habitat of Fremont Lake is below average when compared to the other lakes in the program. 50% percent of the lake sections score poor or worse (1 highly impacted, 12 poor, 5 fair, 7 good).

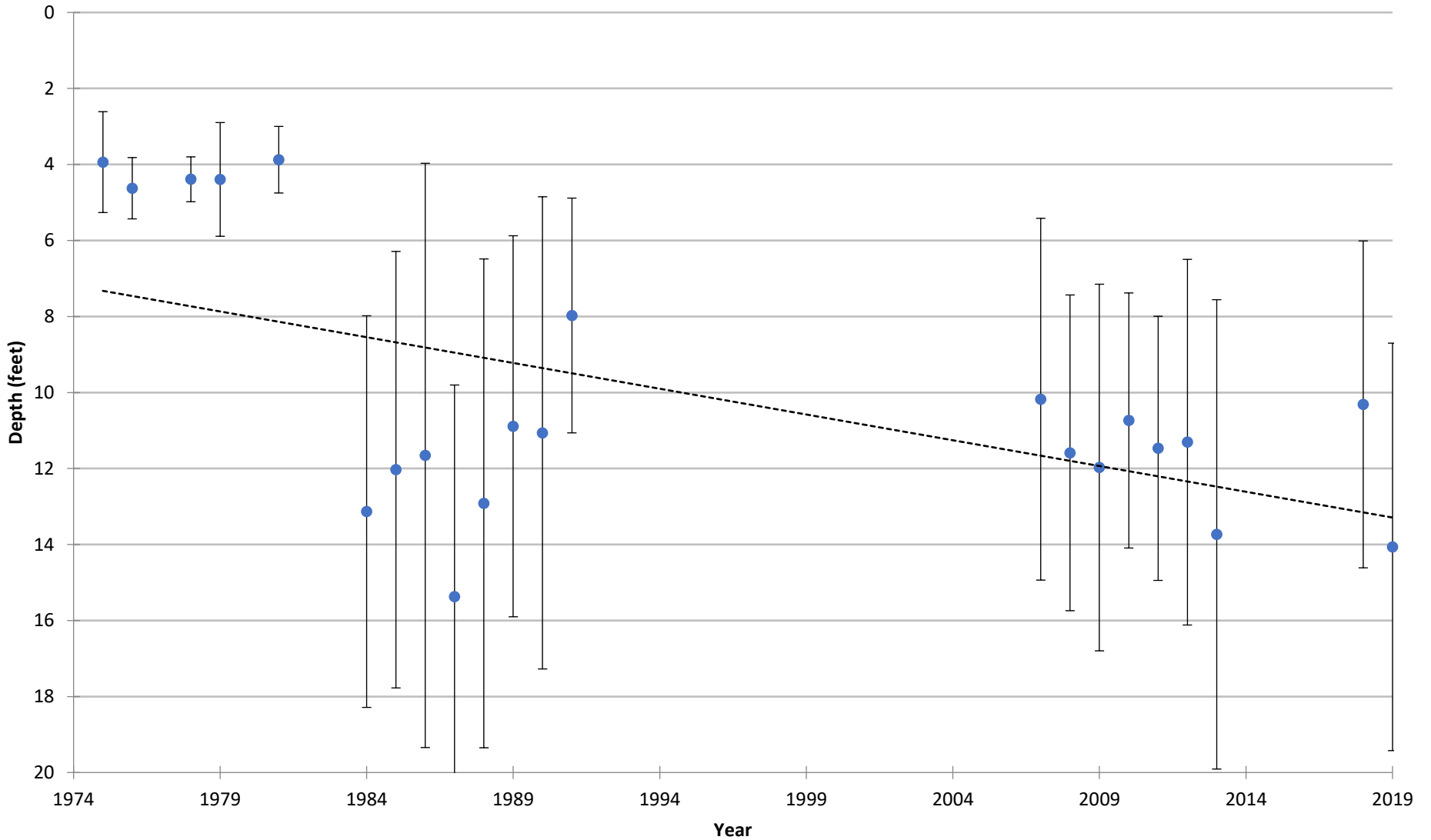
With an average score of 73.6, the lake sections scored highest in erosion control out of the 3 main categories, meaning that there only a moderate amount of sea walls and other shoreline erosion structures.

With an average score of 39.5, the poorest scoring category was the littoral zone. To improve the littoral zone score, leave woody debris in place and allow native aquatic vegetation to grow in the shallow waters. The worst scoring section of the lake was section 22, which scored badly in all three categories, but in particular scored a 0 in riparian zone, meaning that there was absolutely no unmowed vegetation on this section.



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEAN TRANSPARENCY

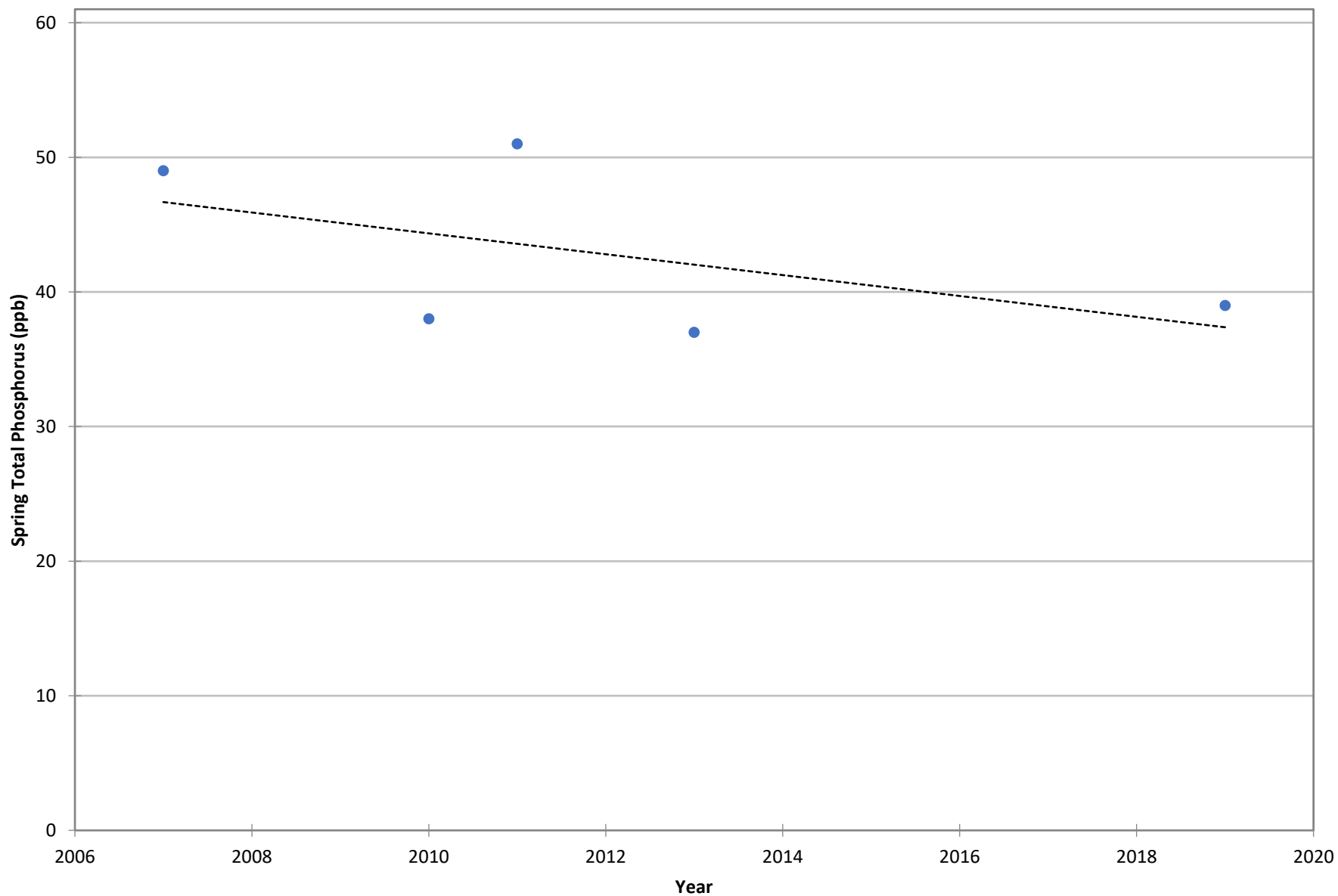
Fremont Lake (Newaygo Co.), 620029



Vertical bars indicate standard deviation

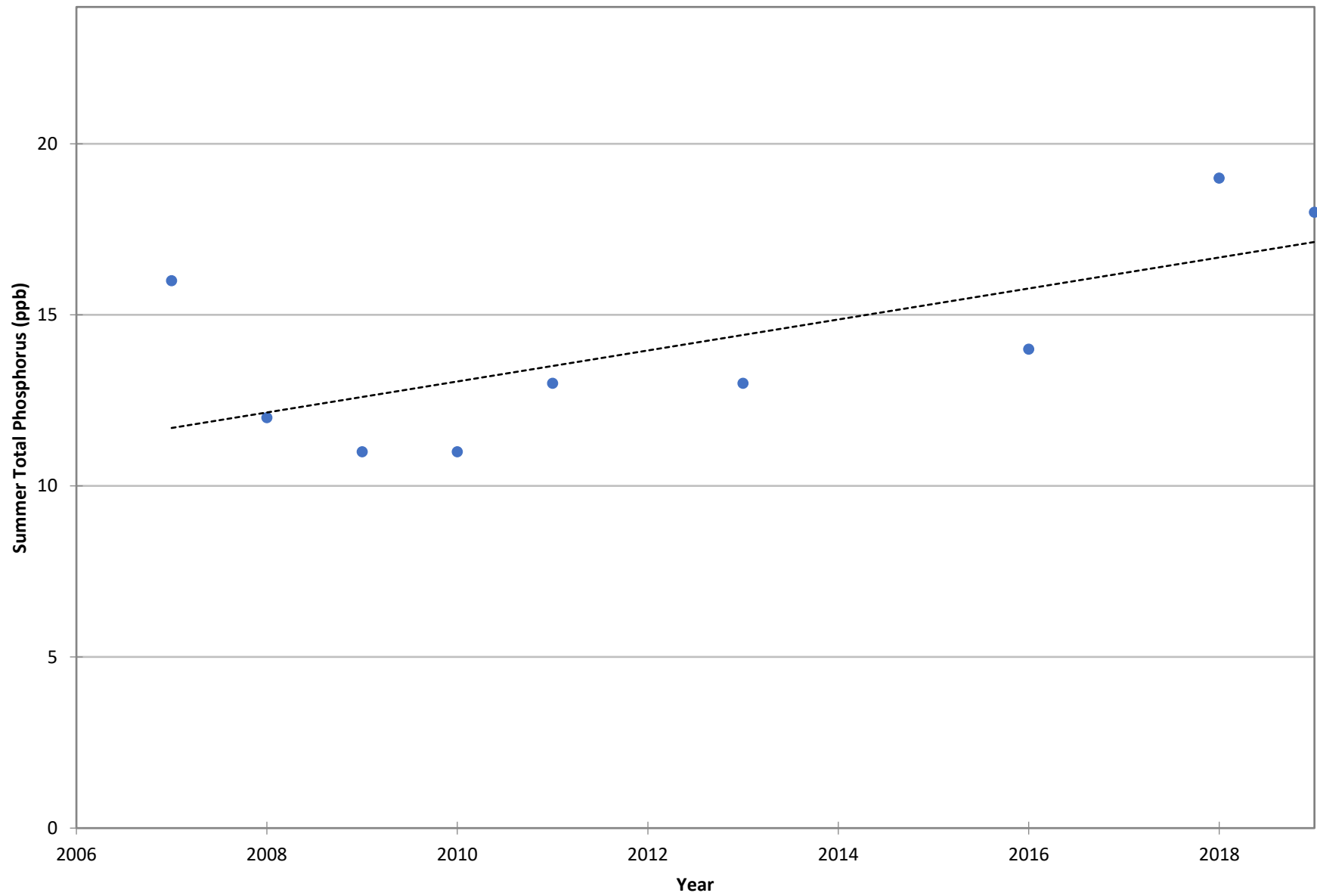
COOPERATIVE LAKES MONITORING PROGRAM
SPRING TOTAL PHOSPHORUS

Fremont Lake (Newaygo Co.), 620029



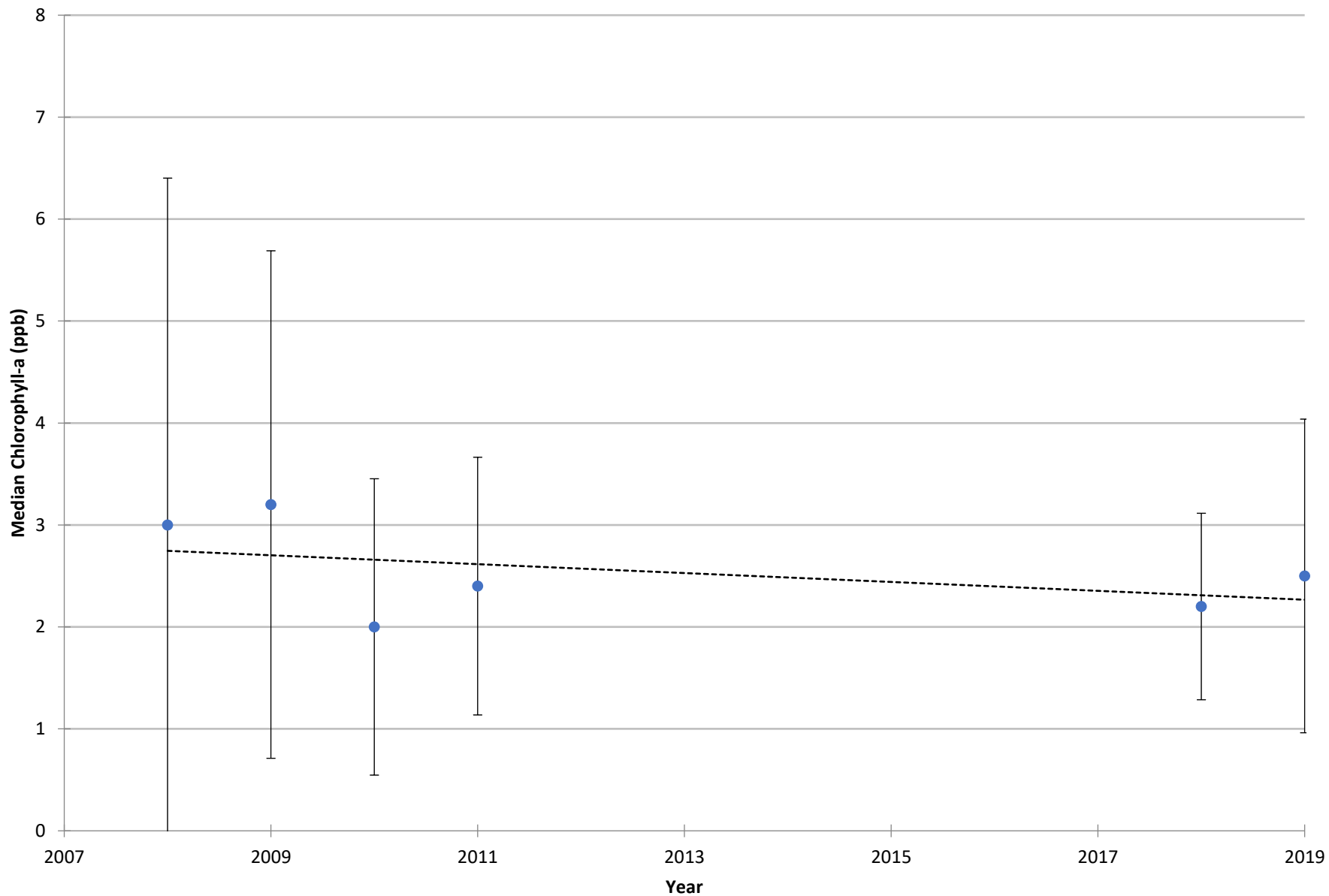
COOPERATIVE LAKES MONITORING PROGRAM
SUMMER TOTAL PHOSPHORUS

Fremont Lake (Newaygo Co.), 620029



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEDIAN CHLOROPHYLL-A

Fremont Lake (Newaygo Co.), 620029



Vertical bars indicate standard deviation

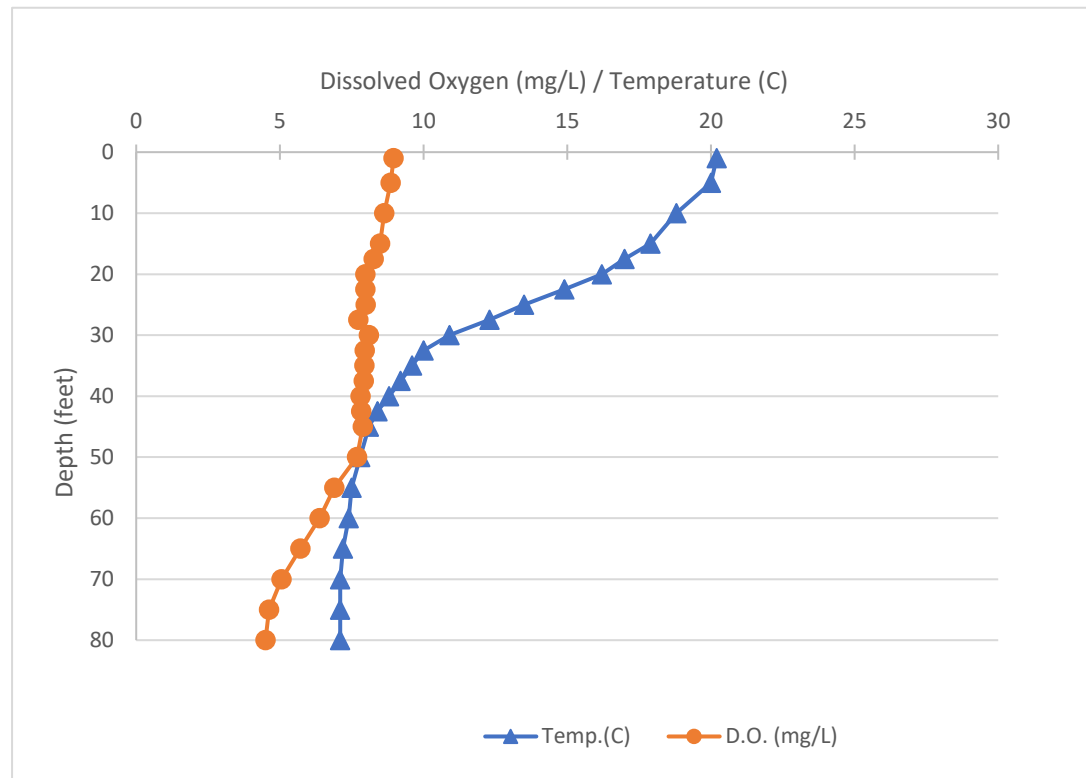
Name: Fremont Lake
 County: Newaygo
 Site ID: 620029
 Date: 6/7/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	20.2	8.96
5	20	8.85
10	18.8	8.63
15	17.9	8.49
17.5	17	8.27
20	16.2	7.97
22.5	14.9	7.98
25	13.5	7.99
27.5	12.3	7.73
30	10.9	8.1
32.5	10	7.95
35	9.6	7.94
37.5	9.2	7.92
40	8.8	7.81
42.5	8.4	7.83
45	8.1	7.89
50	7.8	7.69
55	7.5	6.9
60	7.4	6.38
65	7.2	5.71
70	7.1	5.06
75	7.1	4.62
80	7.1	4.5

Lake: Fremont Lake (Newaygo Co.)

6/7/2019



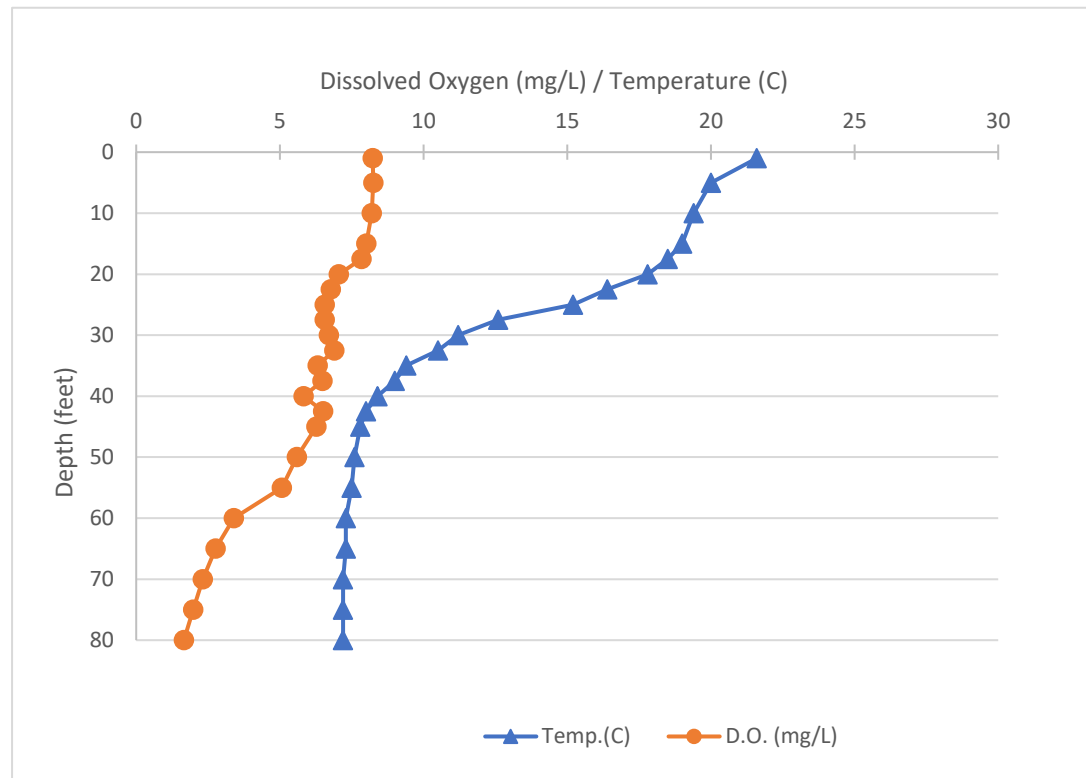
Name: Fremont Lake
 County: Newaygo
 Site ID: 620029
 Date: 6/21/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.6	8.23
5	20	8.25
10	19.4	8.2
15	19	8.01
17.5	18.5	7.84
20	17.8	7.05
22.5	16.4	6.77
25	15.2	6.56
27.5	12.6	6.56
30	11.2	6.71
32.5	10.5	6.89
35	9.4	6.32
37.5	9	6.48
40	8.4	5.83
42.5	8	6.5
45	7.8	6.27
50	7.6	5.59
55	7.5	5.07
60	7.3	3.4
65	7.3	2.76
70	7.2	2.32
75	7.2	1.98
80	7.2	1.66

Lake: Fremont Lake (Newaygo Co.)

6/21/2019



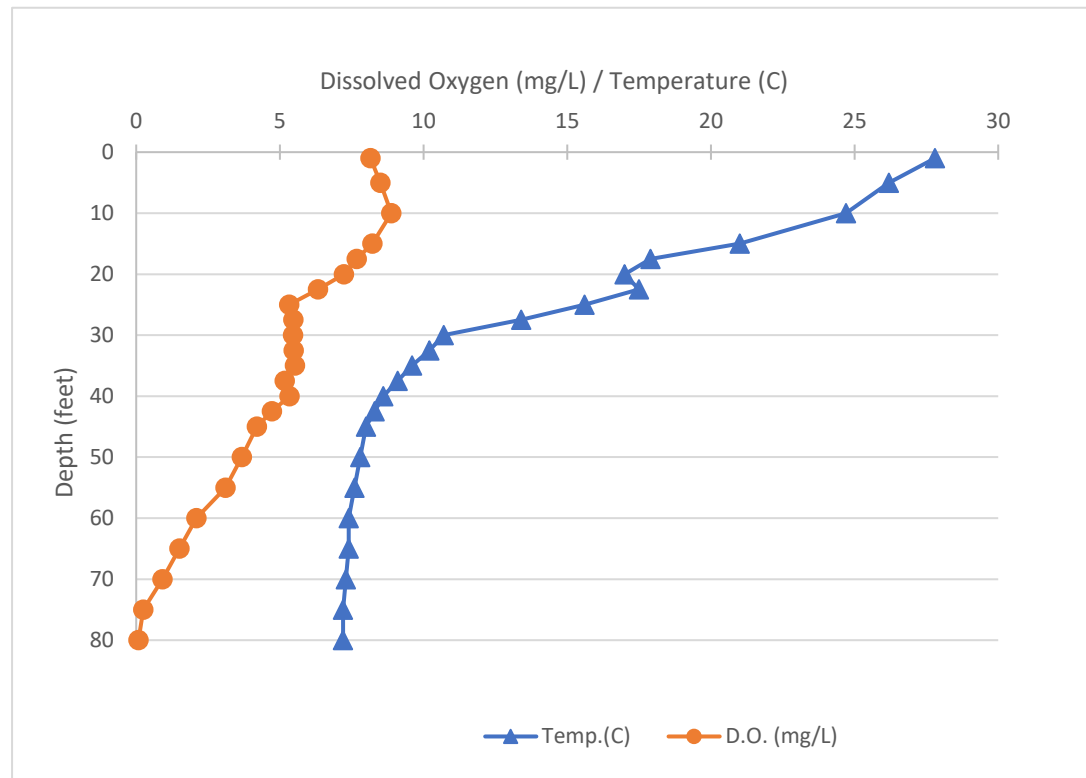
Name: Fremont Lake
 County: Newaygo
 Site ID: 620029
 Date: 7/3/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	27.8	8.15
5	26.2	8.5
10	24.7	8.88
15	21	8.22
17.5	17.9	7.68
20	17	7.23
22.5	17.5	6.33
25	15.6	5.32
27.5	13.4	5.47
30	10.7	5.46
32.5	10.2	5.48
35	9.6	5.52
37.5	9.1	5.17
40	8.6	5.34
42.5	8.3	4.72
45	8	4.2
50	7.8	3.68
55	7.6	3.11
60	7.4	2.09
65	7.4	1.51
70	7.3	0.92
75	7.2	0.25
80	7.2	0.08

Lake: Fremont Lake (Newaygo Co.)

7/3/2019



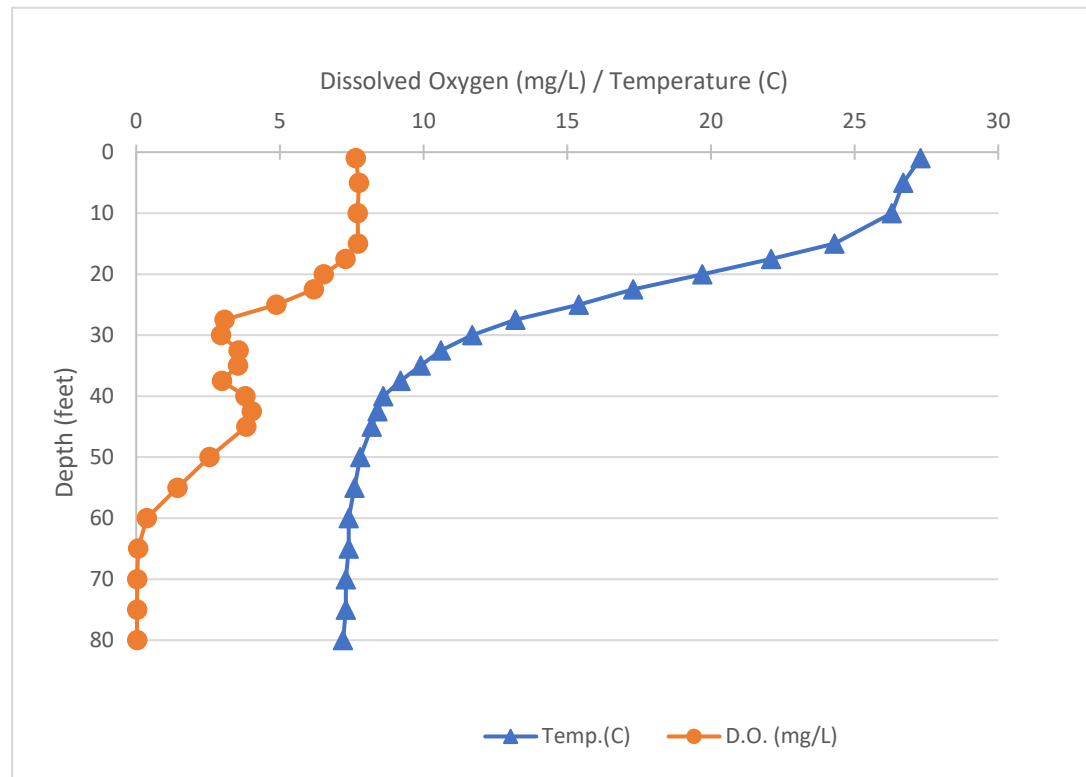
Name: Fremont Lake
 County: Newaygo
 Site ID: 620029
 Date: 7/17/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	27.3	7.64
5	26.7	7.75
10	26.3	7.71
15	24.3	7.72
17.5	22.1	7.28
20	19.7	6.53
22.5	17.3	6.18
25	15.4	4.88
27.5	13.2	3.07
30	11.7	2.95
32.5	10.6	3.57
35	9.9	3.54
37.5	9.2	2.99
40	8.6	3.8
42.5	8.4	4.02
45	8.2	3.83
50	7.8	2.55
55	7.6	1.44
60	7.4	0.37
65	7.4	0.07
70	7.3	0.04
75	7.3	0.03
80	7.2	0.03

Lake: Fremont Lake (Newaygo Co.)

7/17/2019



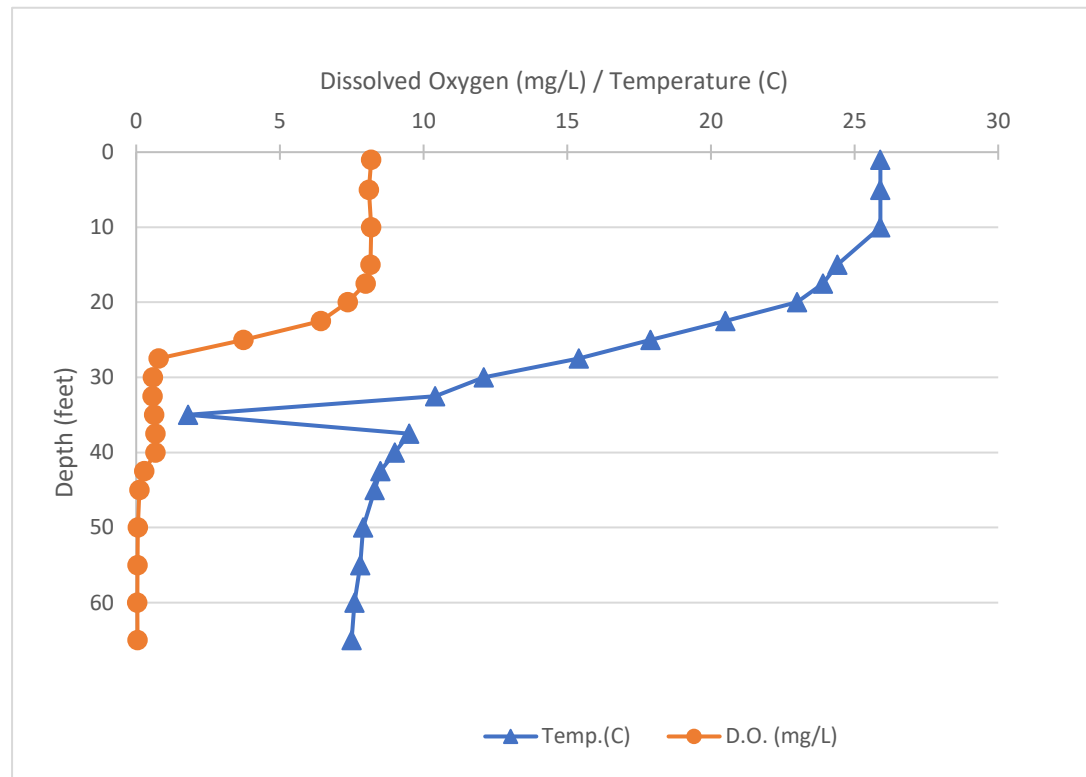
Name: Fremont Lake
 County: Newaygo
 Site ID: 620029
 Date: 8/8/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25.9	8.18
5	25.9	8.1
10	25.9	8.18
15	24.4	8.15
17.5	23.9	7.99
20	23	7.36
22.5	20.5	6.43
25	17.9	3.73
27.5	15.4	0.78
30	12.1	0.58
32.5	10.4	0.57
35	1.8	0.63
37.5	9.5	0.67
40	9	0.67
42.5	8.5	0.28
45	8.3	0.11
50	7.9	0.06
55	7.8	0.05
60	7.6	0.04
65	7.5	0.05

Lake: Fremont Lake (Newaygo Co.)

8/8/2019



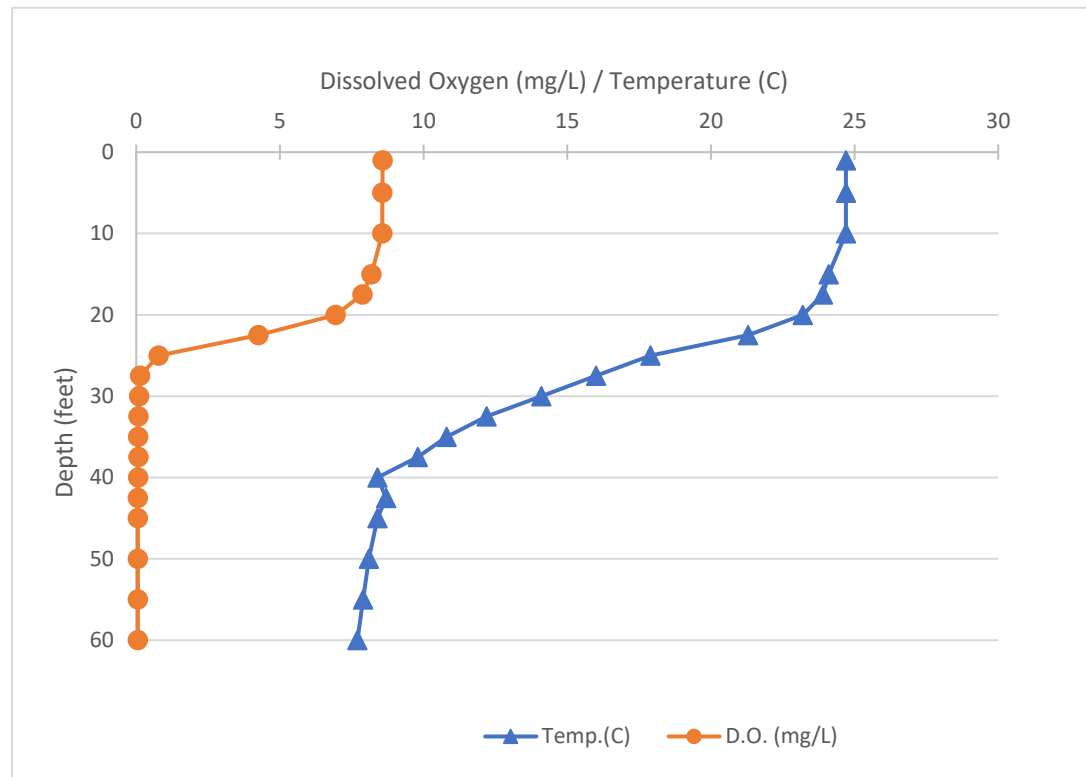
Name: Fremont Lake
 County: Newaygo
 Site ID: 620029
 Date: 8/20/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.7	8.58
5	24.7	8.57
10	24.7	8.56
15	24.1	8.19
17.5	23.9	7.87
20	23.2	6.94
22.5	21.3	4.26
25	17.9	0.78
27.5	16	0.14
30	14.1	0.1
32.5	12.2	0.08
35	10.8	0.07
37.5	9.8	0.08
40	8.4	0.07
42.5	8.7	0.06
45	8.4	0.06
50	8.1	0.06
55	7.9	0.06
60	7.7	0.06

Lake: Fremont Lake (Newaygo Co.)

8/20/2019



Name: Fremont Lake
 County: Newaygo
 Site ID: 620029
 Date: 9/16/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.9	9.54
5	20.3	9.73
10	20.1	9.61
15	19.9	9.38
17.5	19.8	9.2
20	19.8	8.84
22.5	19.6	8.4
25	19.5	8.22
27.5	18.9	7.4
30	17.9	5.53
32.5	15.3	0.37
35	11.4	0.26
37.5	10.5	0.2
40	9.8	0.17
42.5	9	0.12
45	8.6	0.1
50	8.1	0.08
55	7.8	0.08

Lake: Fremont Lake (Newaygo Co.)

9/16/2019

