



2021 Data Report for Lake Independence, Marquette County

Site ID: 520149

46.808337°N, 87.711393°W

The CLMP is brought to you by:



Michigan Clean
Water Corps

EGL

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

**MICHIGAN STATE
UNIVERSITY**



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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:

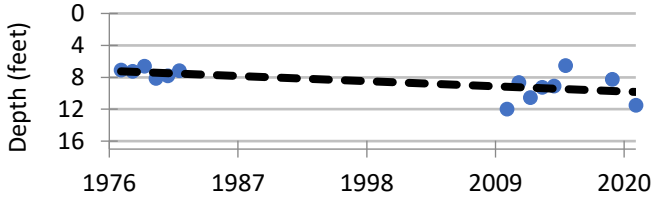
Paul Steen (psteen@hrwc.org), CLMP Data Analyst

Lake Independence, Marquette County 2021 CLMP Results



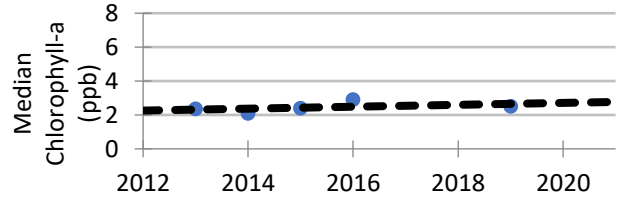
Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Avg	Std. Dev	Carlson TSI
2021	9	8.0	14.5	11.5	2.3	42
2019	30	5.0	13.5	11.5	0.7	47
1977-2015	164	3.0	15.0	8.4	1.7	47
2021 All CLMP Lakes	2817	1.0	50.0	12.7	2.9	42



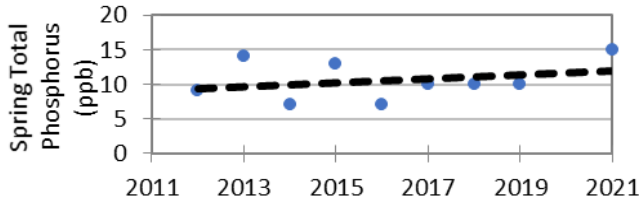
Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Med	Std. Dev	Carlson TSI
2021	3	1.2	2.0			
2016-2019	13	<1.0	6.8	2.7	0.9	40
2012-2015	17	<1.0	4.3	2.7	1.0	39
2021 All CLMP Lakes	635	< 1.0	42.0	2.2	3.4	39



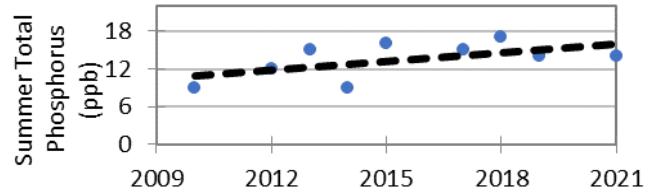
Spring Phosphorus (parts per billion)

Year	# Samples	Min	Max	Avg	Std. Dev
2021	1	15.0	15.0	15.0	NA
2016-2019	4	7.0	10.0	9.3	1.5
2012-2015	4	7.0	14.0	10.8	3.3
2021 All CLMP Lakes	220	<= 3	100.0	14.9	11.0



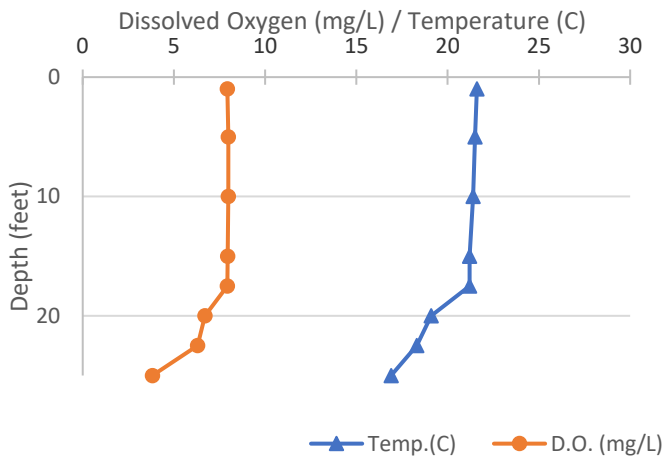
Summer Phosphorus (parts per billion)

Year	# Samples	Min	Max	Avg	Std. Dev	Carlson TSI
2021	1	14.0	14.0	14.0	NA	42
2016-2019	3	14.0	17.0	15.3	1.5	43
2010-2015	5	9.0	16.0	12.2	3.3	40
2021 All CLMP Lakes	281	<= 3	65.0	12.8	9.3	38



Dissolved Oxygen and Temperature Profile

6/14/2021



Summary

Average TSI	2021	2016-2019	1977-2015
Lake Independence	42	43	42
All CLMP Lakes	42	40	43

With an average TSI score of 42 based on 2021 Secchi transparency and summer total phosphorus data, this lake is rated as a mesotrophic lake.

Due to its low depth, the lake is able to maintain dissolved oxygen throughout the water column for the entire summer, though there are days when dissolved oxygen gets low or anoxic on the bottom waters.

While the trends for individual parameters are mixed, 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.

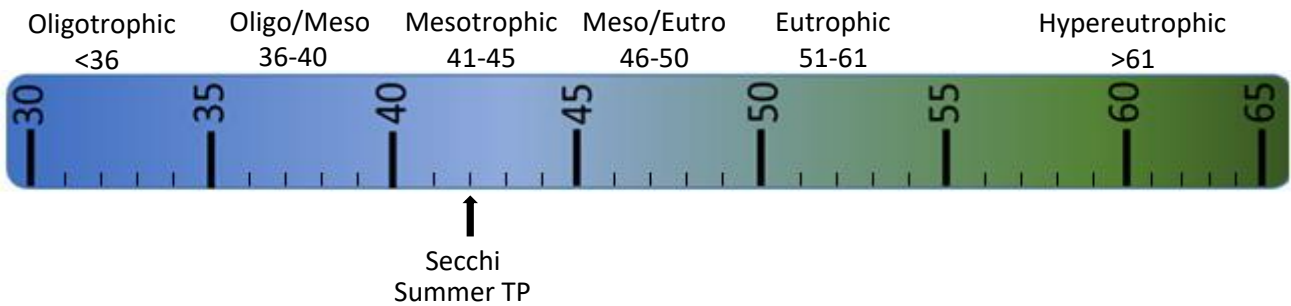
The tables below give the results-to-TSI conversions for the water quality data ranges normally seen in the CLMP. The formulas for this conversion can be found in the CLMP manual (link is on page 2 of this report).

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 Independence in 2021	
Average	42
Secchi Disk	42
Summer TP	42
Chlorophyll-a	



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 Independence, Marquette County 2015 Exotic Aquatic Plant Watch Results



The Exotic Aquatic Plant Watch was conducted on Independence Lake in 2015.

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 2015 Exotic Aquatic Plant Watch on Independence Lake.

Independence Lake, Marquette County
2015 Exotic Aquatic Plant Watch Results
Survey Date(s): August 10-14

<u>Species</u>	<u>Status</u>	<u>Comments</u>
Eurasian watermilfoil	Not found	
Starry stonewort	Not found	
Curly-leaf pondweed	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.

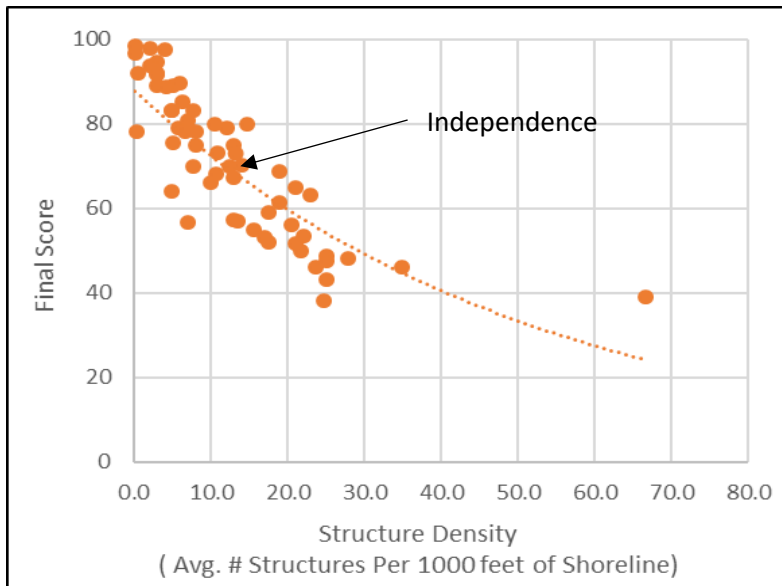
Lake Independence, Marquette County 2019 Score the Shore Results



The Score the Shore Habitat Assessment was conducted on Lake Independence in 2019.

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?



Lake Independence:	
Number of Sections:	34
Number of Structures:	470
Structure Density:	14
Final Score:	70

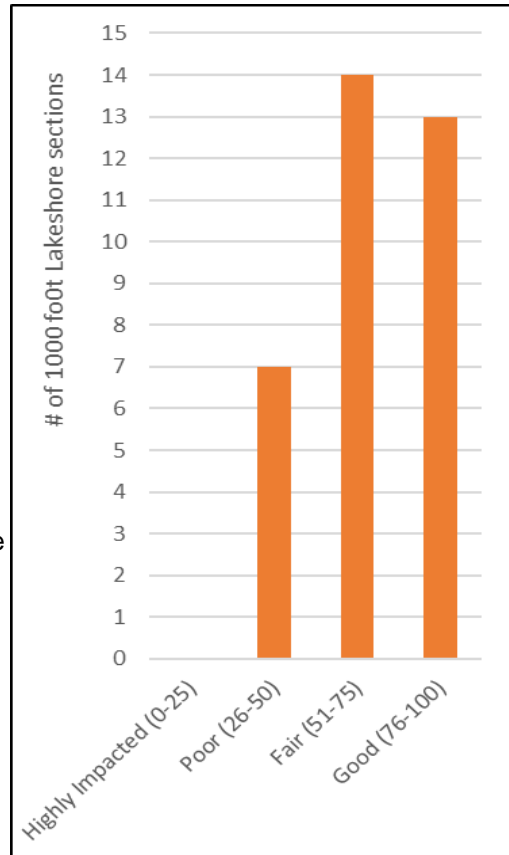
Participating Lakes from 2015-2019:	
Avg. Number of Sections:	16
Avg. Number of Structures:	228
Avg. Structure Density:	12.6
Avg. Final Score:	71

Analysis specific to Lake Independence:

Lake Independence scored best in erosion management with an average score of 89, meaning that there was a low amount of sea walls and other shoreline erosion structures.

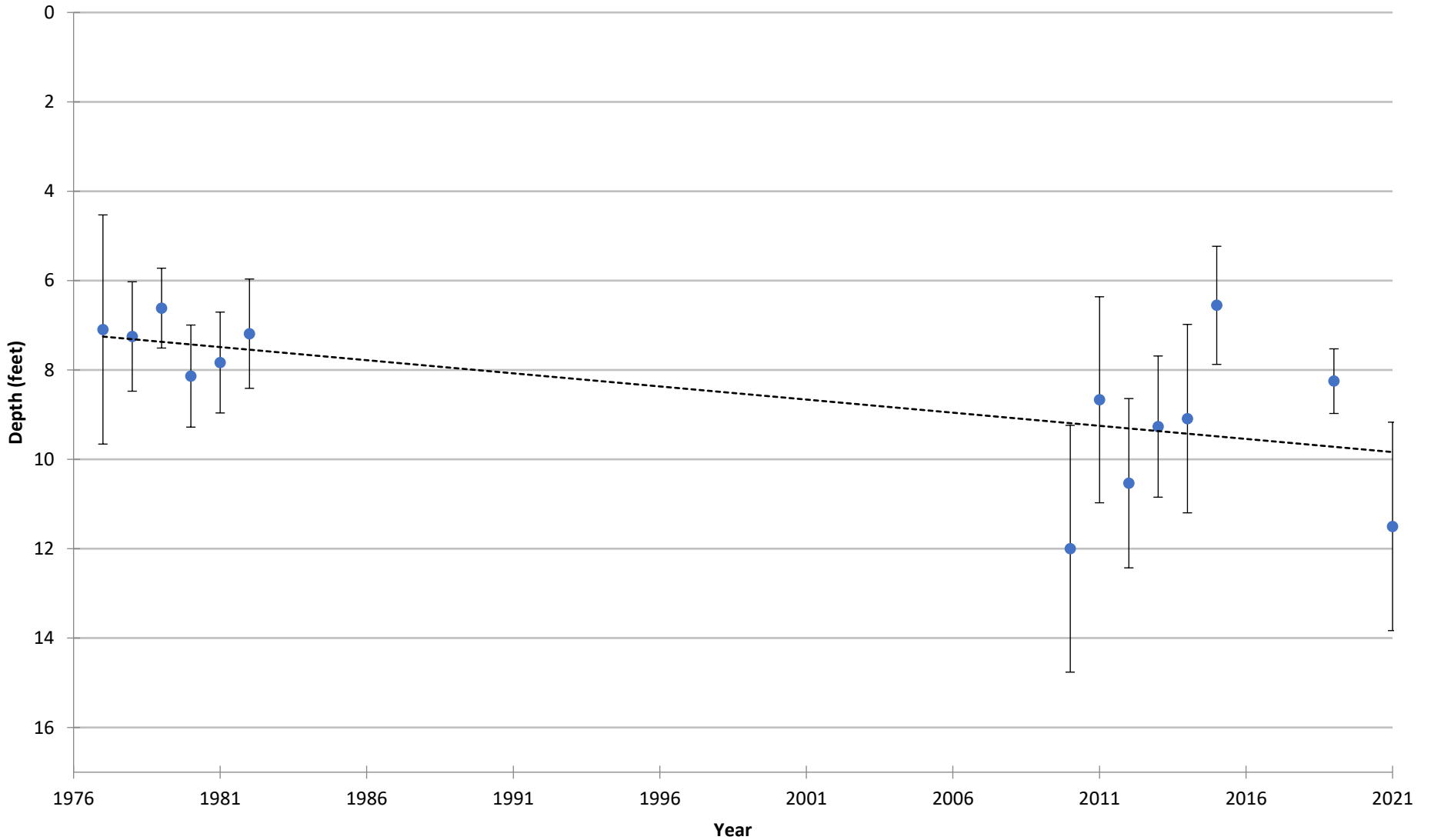
The weakest point of the Lake Independence assessment was the littoral zone (shallow water near the shore). Increasing aquatic vegetation, allowing fallen trees to remain in the water, and reducing shoreline erosion would be the primary way to boost this score. A score of 60 for the littoral zone is not bad, but if residents in Lake Independence want to improve the overall shoreline quality, this is the component to concentrate on.

There were seven 1000 foot sections (sections 23-28, 31) that were particularly problematic in Lake Independence, scoring equal or less than a 50 which is classified as a "Poor" section. Each of these has its particular issues, which are best seen by going back to the raw data. Most of the sections scored a Fair or Good, though with 27 out of 34 sections in these categories.



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEAN TRANSPARENCY

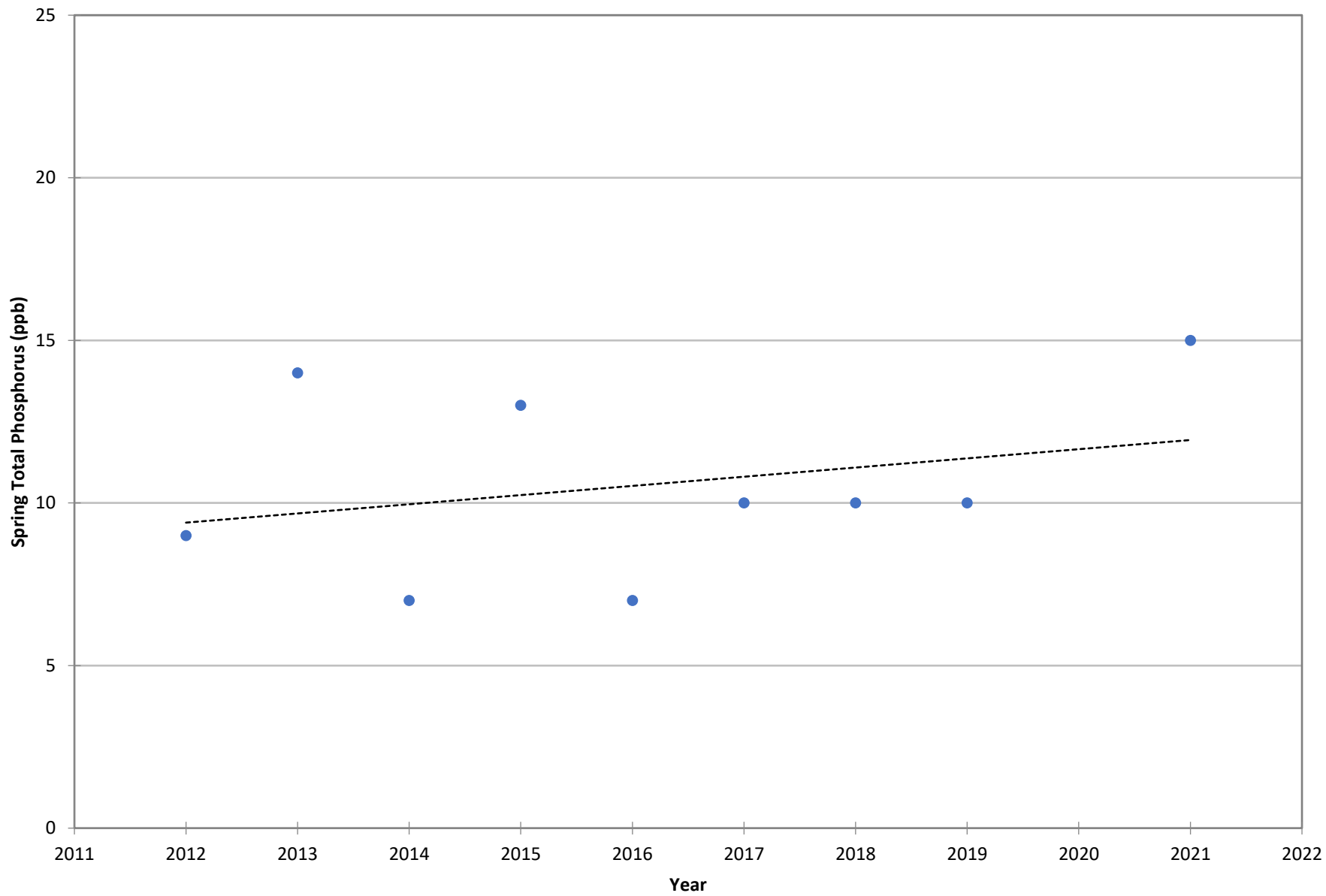
Lake Independence (Marquette Co.), 520149



Vertical bars indicate standard deviation

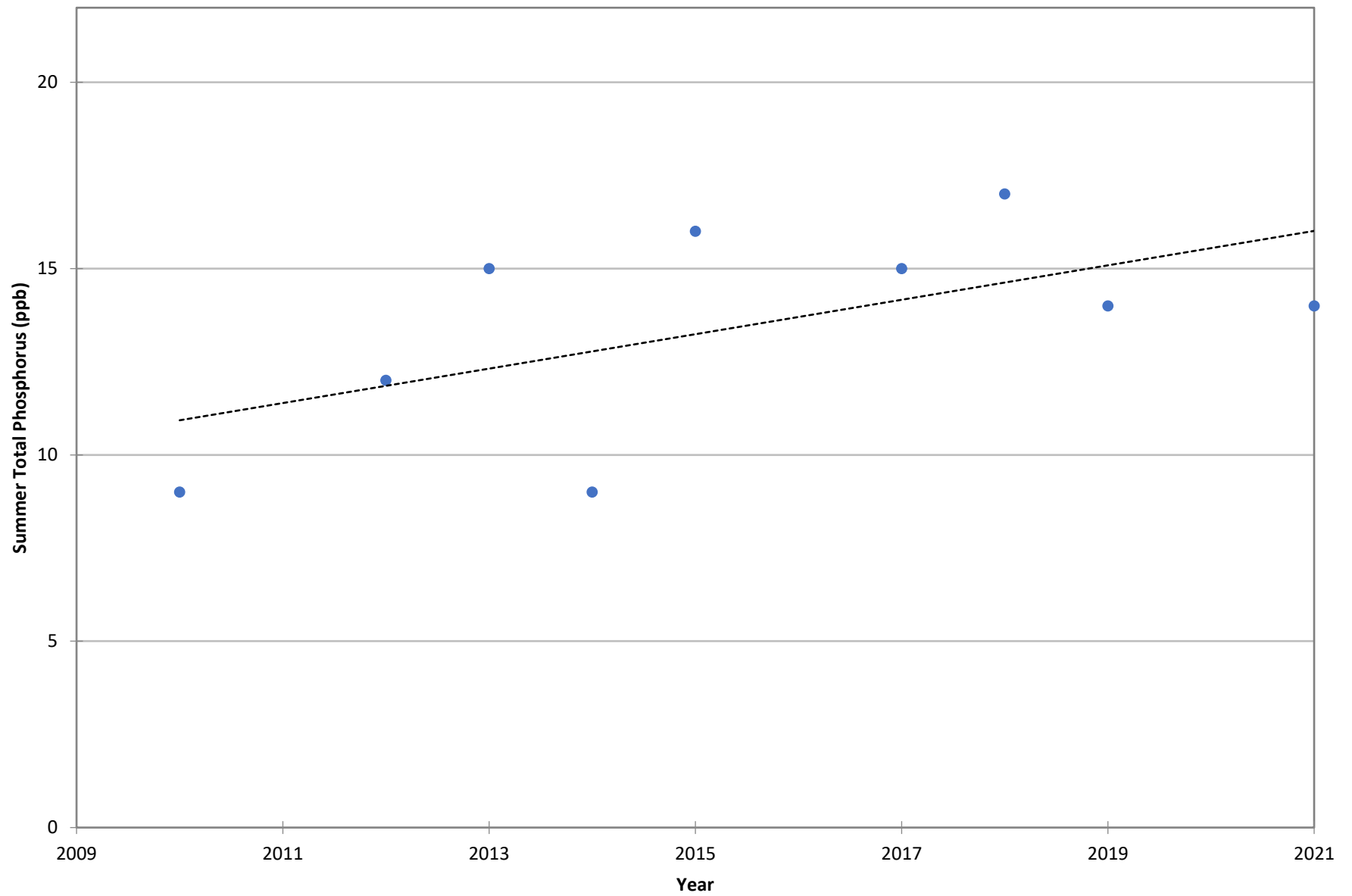
COOPERATIVE LAKES MONITORING PROGRAM
SPRING TOTAL PHOSPHORUS

Lake Independence (Marquette Co.), 520149



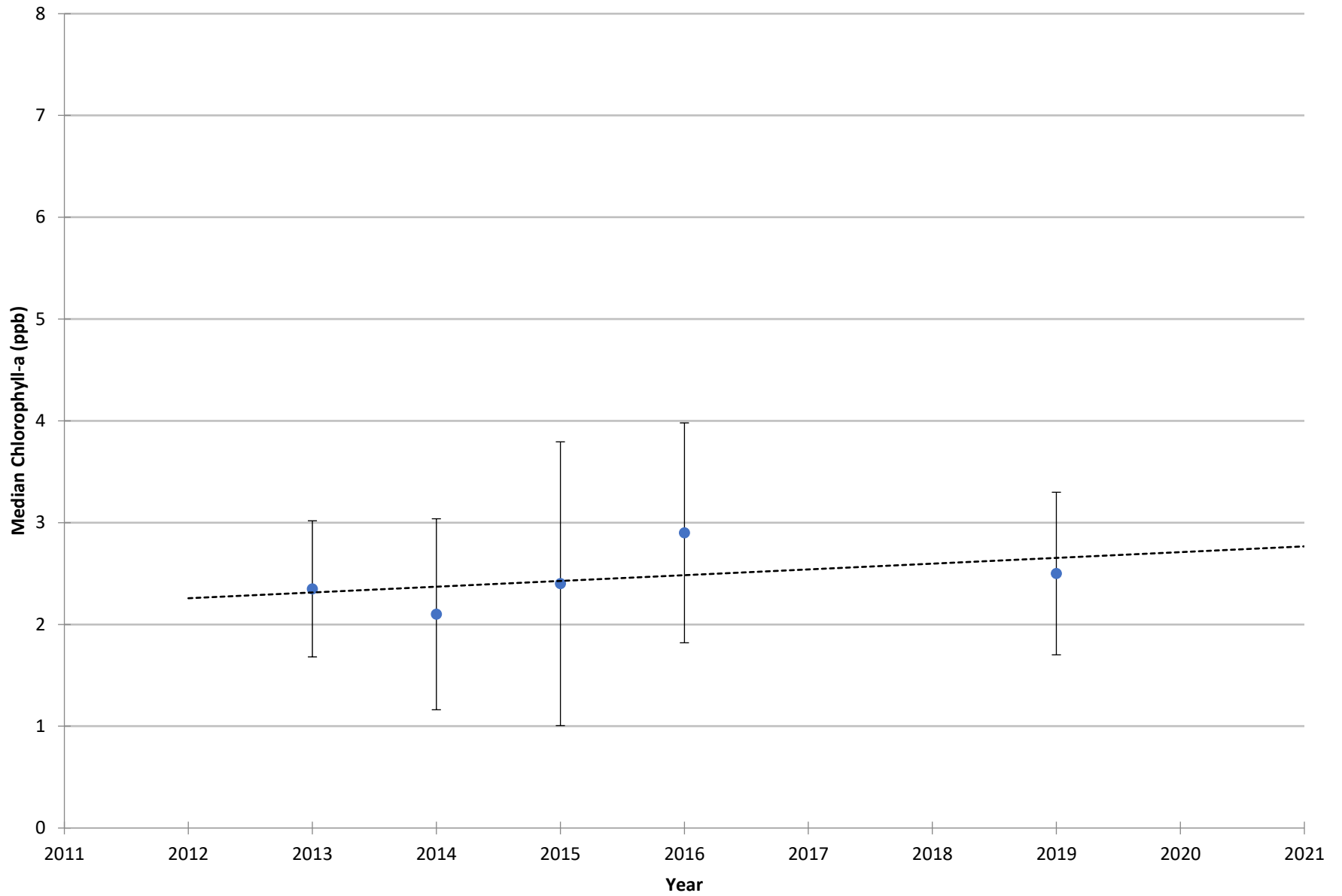
COOPERATIVE LAKES MONITORING PROGRAM
SUMMER TOTAL PHOSPHORUS

Lake Independence (Marquette Co.), 520149



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEDIAN CHLOROPHYLL-A

Lake Independence (Marquette Co.), 520149



Vertical bars indicate standard deviation

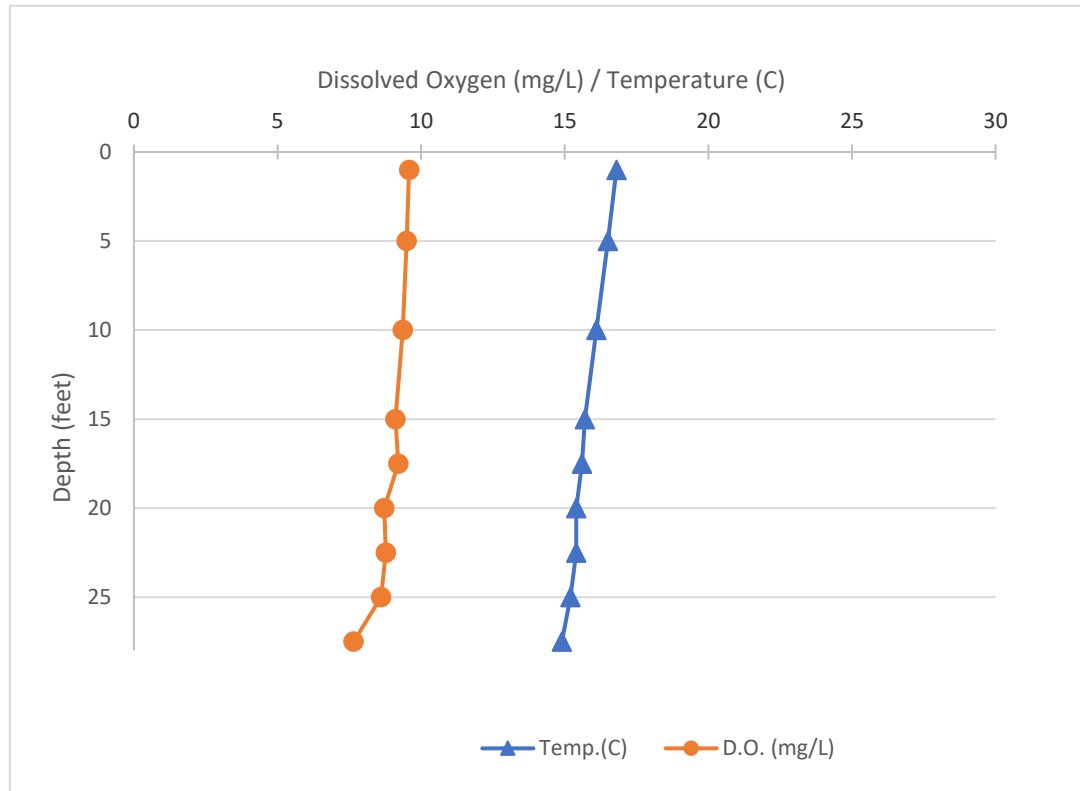
Name: Lake Independence
County: Marquette
Site ID: 520149
Date: 5/31/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	16.8	9.58
5	16.5	9.49
10	16.1	9.36
15	15.7	9.11
17.5	15.6	9.2
20	15.4	8.71
22.5	15.4	8.77
25	15.2	8.6
27.5	14.9	7.65

Lake: Lake Independence (Marquette Co.)

5/31/2021



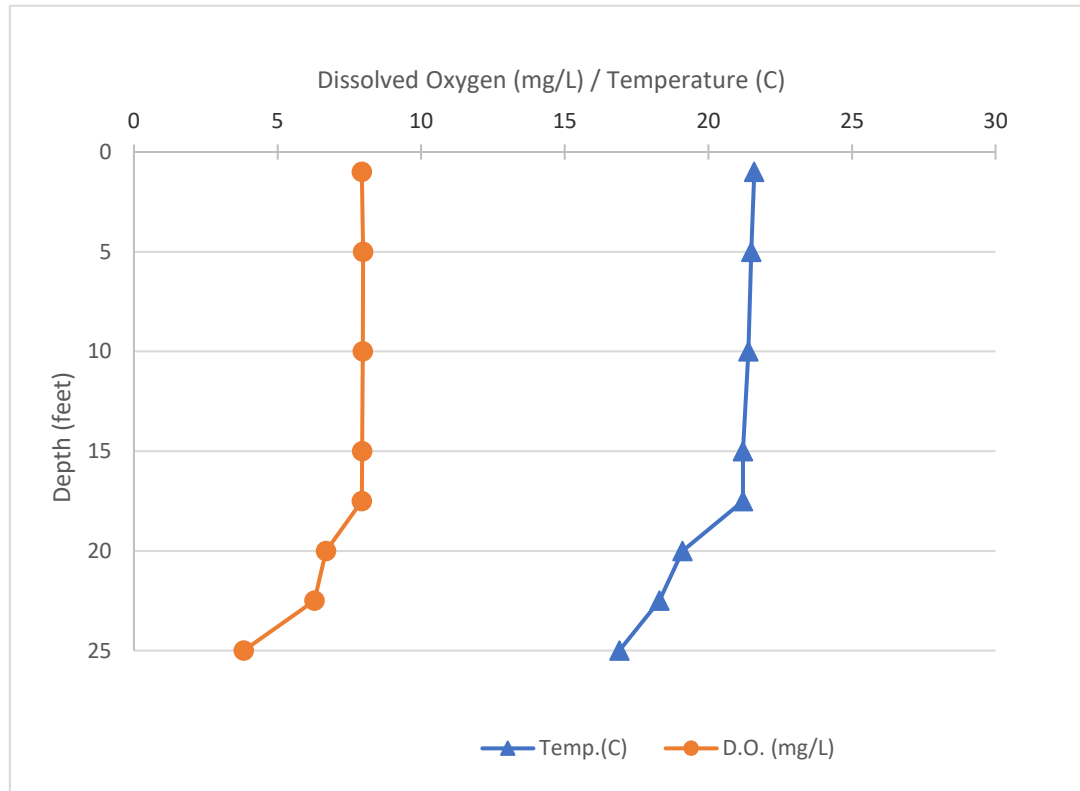
Name: Lake Independence
County: Marquette
Site ID: 520149
Date: 6/14/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.6	7.93
5	21.5	7.98
10	21.4	7.97
15	21.2	7.95
17.5	21.2	7.93
20	19.1	6.69
22.5	18.3	6.29
25	16.9	3.82

Lake: Lake Independence (Marquette Co.)

6/14/2021



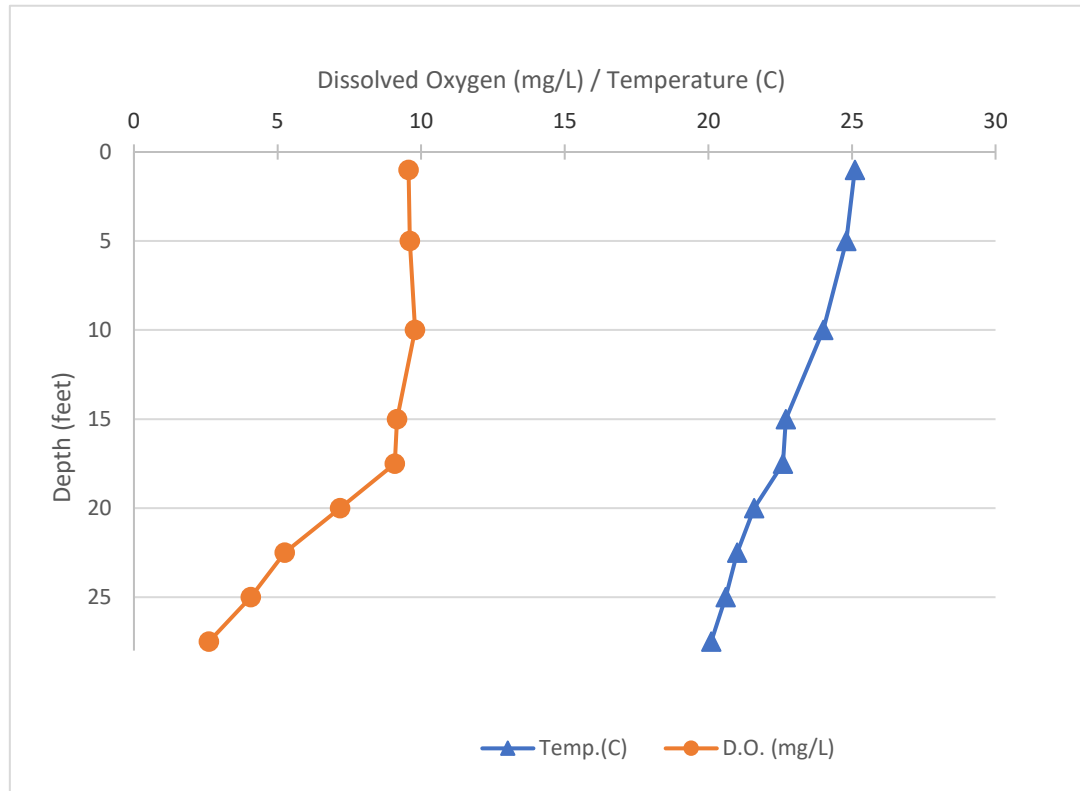
Name: Lake Independence
County: Marquette
Site ID: 520149
Date: 7/3/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25.1	9.56
5	24.8	9.61
10	24	9.79
15	22.7	9.16
17.5	22.6	9.08
20	21.6	7.18
22.5	21	5.25
25	20.6	4.07
27.5	20.1	2.61

Lake: Lake Independence (Marquette Co.)

7/3/2021



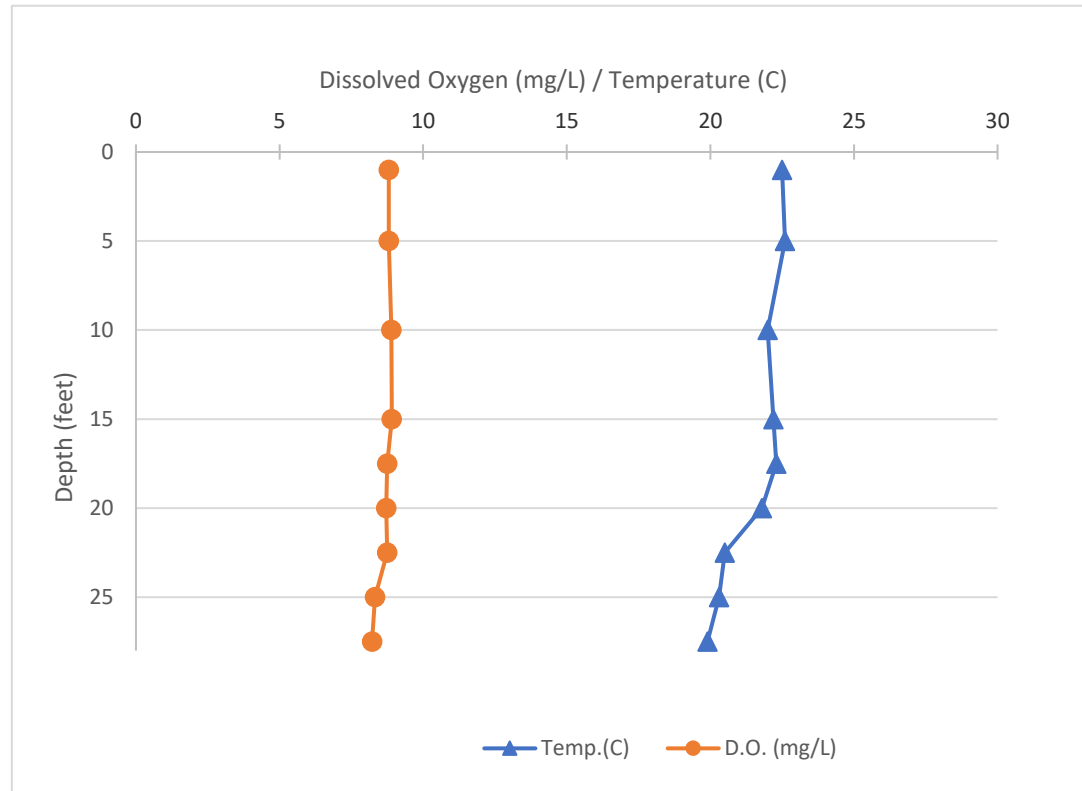
Name: Lake Independence
County: Marquette
Site ID: 520149
Date: 7/13/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	22.5	8.81
5	22.6	8.8
10	22	8.89
15	22.2	8.91
17.5	22.3	8.75
20	21.8	8.72
22.5	20.5	8.75
25	20.3	8.32
27.5	19.9	8.22

Lake: Lake Independence (Marquette Co.)

7/13/2021



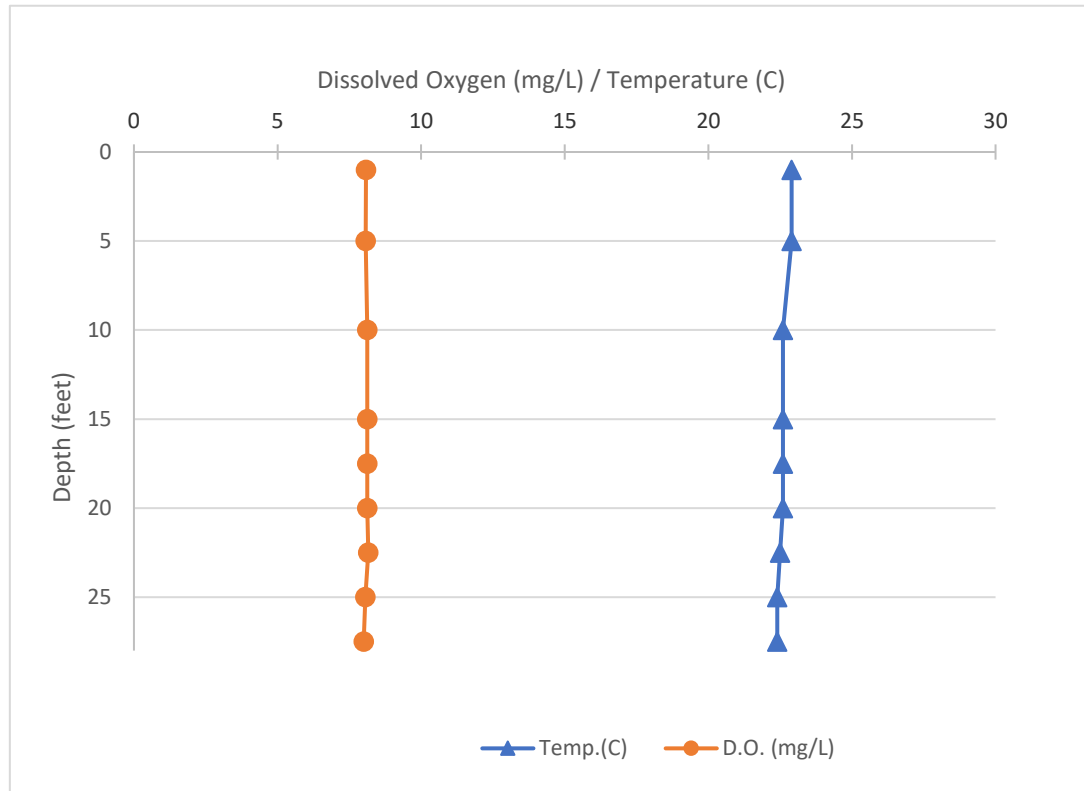
Name: Lake Independence
County: Marquette
Site ID: 520149
Date: 7/31/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	22.9	8.08
5	22.9	8.07
10	22.6	8.12
15	22.6	8.13
17.5	22.6	8.13
20	22.6	8.13
22.5	22.5	8.16
25	22.4	8.06
27.5	22.4	8

Lake: Lake Independence (Marquette Co.)

7/31/2021



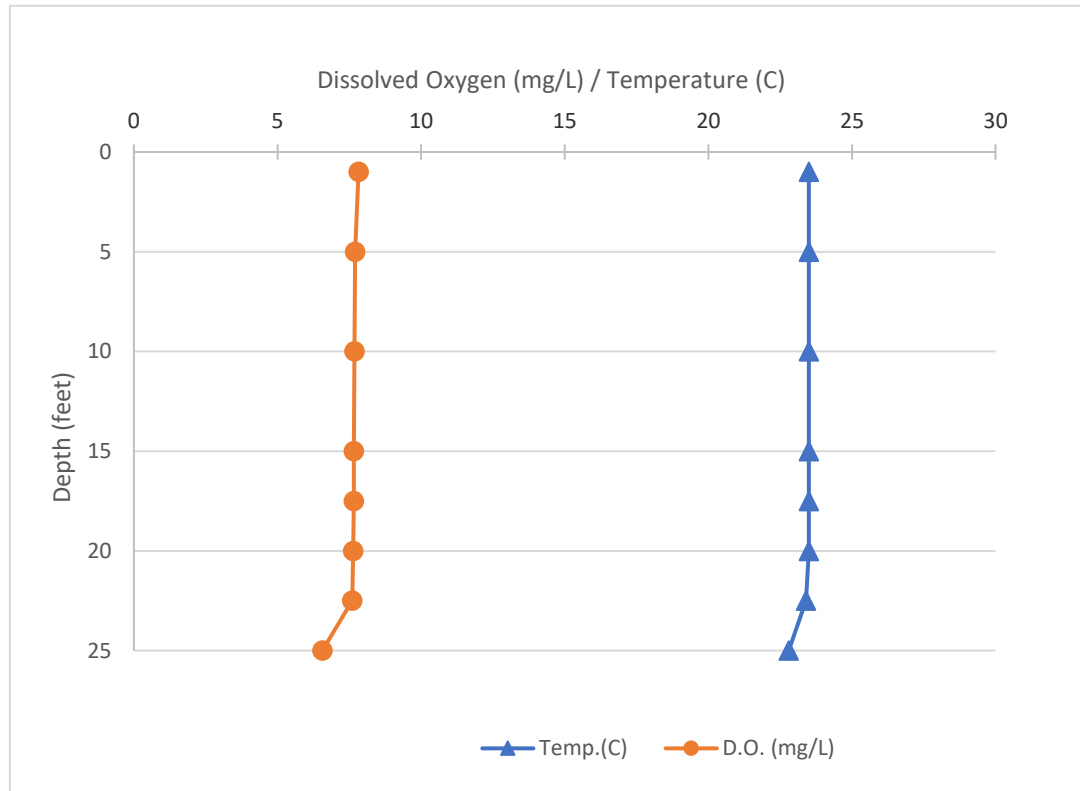
Name: Lake Independence
County: Marquette
Site ID: 520149
Date: 8/19/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	23.5	7.82
5	23.5	7.7
10	23.5	7.68
15	23.5	7.66
17.5	23.5	7.66
20	23.5	7.63
22.5	23.4	7.6
25	22.8	6.56

Lake: Lake Independence (Marquette Co.)

8/19/2021



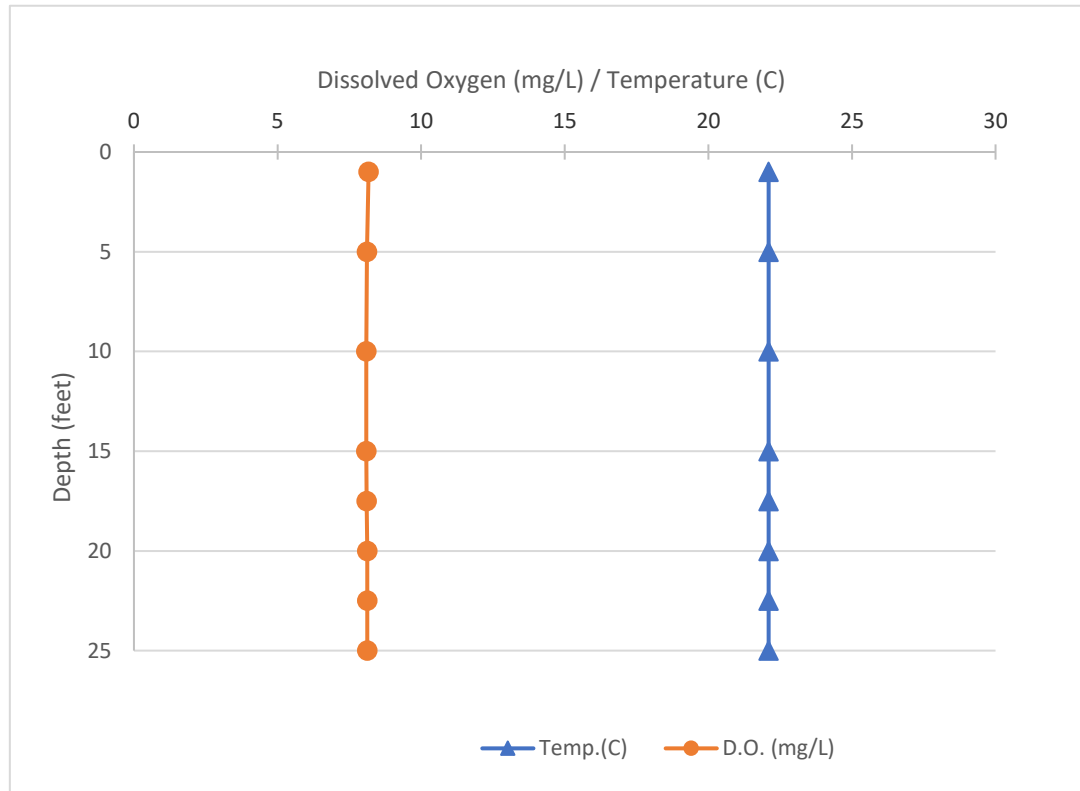
Name: Lake Independence
County: Marquette
Site ID: 520149
Date: 8/28/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	22.1	8.17
5	22.1	8.11
10	22.1	8.09
15	22.1	8.09
17.5	22.1	8.1
20	22.1	8.12
22.5	22.1	8.12
25	22.1	8.12

Lake: Lake Independence (Marquette Co.)

8/28/2021



Name: Lake Independence
County: Marquette
Site ID: 520149
Date: 9/7/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	20.7	8.85
5	20.6	8.73
10	20.5	8.66
15	20.5	8.55
17.5	20.2	8.36
20	19.9	7.98
22.5	18.8	7.65
25	18.8	7.52

Lake: Lake Independence (Marquette Co.)

9/7/2021

