



2023 Data Report for Lake Christiana, Cass County

Site ID: 140055

41.8053°N, 85.9972°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/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:

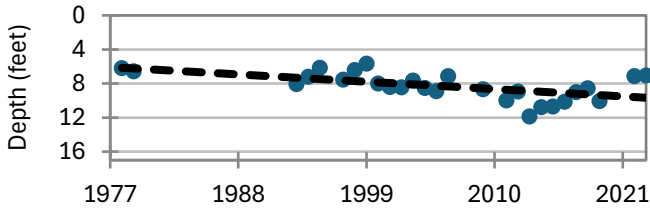
Paul Steen (psteen@hrwc.org), CLMP Data Analyst

Lake Christiana, Cass County 2023 CLMP Results



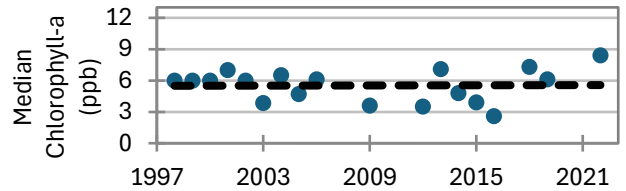
Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Average	Std. Dev	Carlson TSI
2023	9	6.0	8.0	7.1	0.5	49
2018-2022	35	5.0	16.0	8.6	2.0	46
1978-2017	348	3.5	19.0	8.3	2.2	47
2023 All CLMP Lakes	2825	0.5	51.0	12.2	2.7	43



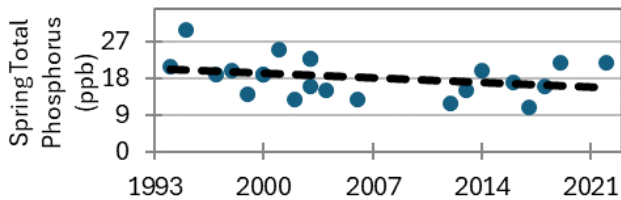
Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Med	Std. Dev	Carlson TSI
2022	5	3.2	9.8	8.4	2.7	51
2017-2021	5	3.4	11.0	7.3	2.7	50
1998-2016	74	<1.0	15.0	7.3	2.7	48
2023 All CLMP Lakes	687	< 1.0	43.0	3.7	5.3	43



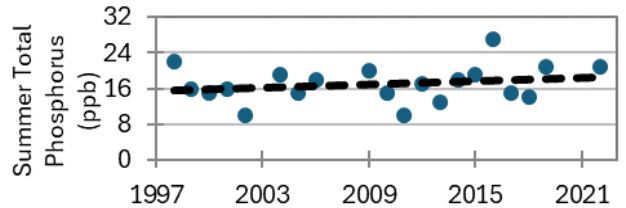
Spring Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev
2022	1	22.0	22.0	22.0	NA
2017-2021	3	11.0	22.0	16.3	5.5
1994-2016	18	12.0	30.0	18.6	4.7
2023 All CLMP Lakes	220	<5	220.0	20.7	21.3



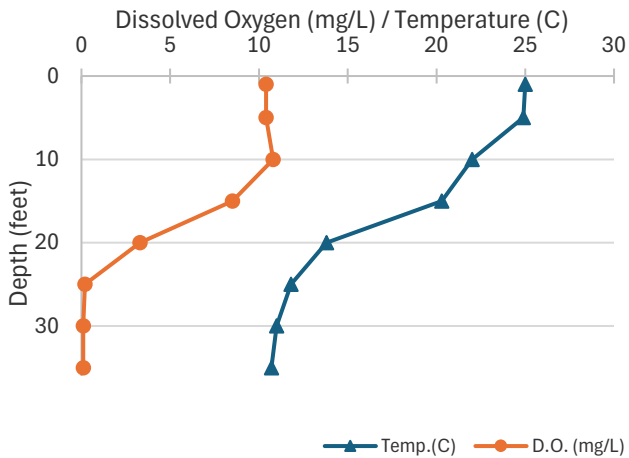
Summer Phosphorus (parts per billion)

Year	# Samples	Min	Max	Avg	Std. Dev	Carlson TSI
2022	1	21.0	21.0	21.0	NA	48
2017-2021	2	14.0	15.0	14.5	0.7	43
1998-2016	16	10.0	27.0	16.9	4.3	44
2023 All CLMP Lakes	234	<= 3	150.0	17.4	15.3	45



Dissolved Oxygen and Temperature Profile

6/13/2022



Summary

Average TSI	2023	2018-2022	1978-2017
Lake Christiana	49	47	46
All CLMP Lakes	44	41	42

With a TSI score of 49 based on 2023 Secchi disk transparency, this lake is rated between the mesotrophic and eutrophic classification. The lake leans slightly more eutrophic than mesotrophic.

Monitoring data indicates that this lake is stratified in early-summer, and the bottom water remains devoid of oxygen until early fall.

Long term monitoring shows slight upward slopes on summer phosphorus and chlorophyll-a, and a slight increase in average TSI scores over time. These results indicate a slow movement towards higher nutrient levels in this lake over time.

* = 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.

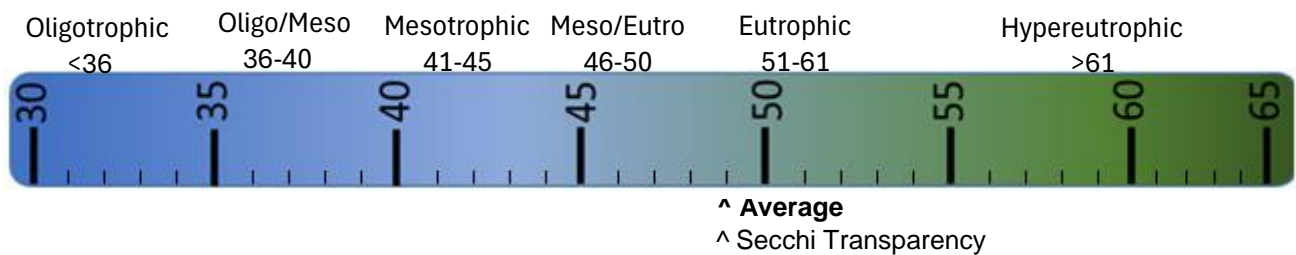
The tables below give the results-to-TSI conversions for the water quality data ranges normally seen in the CLMP. The formulas for this conversion can be found in the CLMP manual (link is on page 2 of this report).

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 Christiana in 2023	
Average	49
Secchi Disk	49
Summer TP	
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 Christiana, Cass County 2023 Exotic Aquatic Plant Watch Results



The Exotic Aquatic Plant Watch was conducted on Christiana Lake 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 Christiana Lake.

Christiana Lake, Cass County		
2023 Exotic Aquatic Plant Watch Results		
Survey Date(s): August 24		
<u>Species</u>	<u>Status</u>	<u>Comments</u>
Eurasian watermilfoil	FOUND	Found in one of 15 areas surveyed.
Starry stonewort	not found	
Curly-leaf pondweed	not found	Suspected, but photos revealed water celery (native plant).
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 Christiana, Cass County

2022 Exotic Aquatic Plant Watch Results



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The table below summarizes the results of the 2022 Exotic Aquatic Plant Watch on Christiana Lake.

Christiana Lake, Cass County		
2022 Exotic Aquatic Plant Watch Results		
Survey Date(s): September 6		
<u>Species</u>	<u>Status</u>	<u>Comments</u>
Eurasian watermilfoil	FOUND	Found at 3 of 15 sites. Identification confirmed by photographs.
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.

Score the Shore

Lake Christiana does not have Score the Shore results.

Why is the Score the Shore parameter important?

Healthy shorelines are an important and valuable component of the lake ecosystem. The shoreline area is a transition zone between water and land, and should be a very diverse environment that provides habitat for a great variety of fish, plants, birds, and other animals. A healthy shoreline area is also essential for maintaining water quality, slowing runoff, and limiting erosion.

However, Michigan's inland lake shorelines are threatened. Extensive development, often combined with poor shoreline management practices, can reduce or eliminate natural shoreline habitat and replace it with lawn and artificial erosion control such as sea walls and rock. As a result, shoreline vegetation is dramatically altered, habitat is lost, and water quality declines.

Therefore, in 2019 the MiCorps Cooperative Lakes Monitoring Program introduced a new monitoring program – Score the Shore – that enables volunteers to assess the quality of their lake's shoreline habitat.

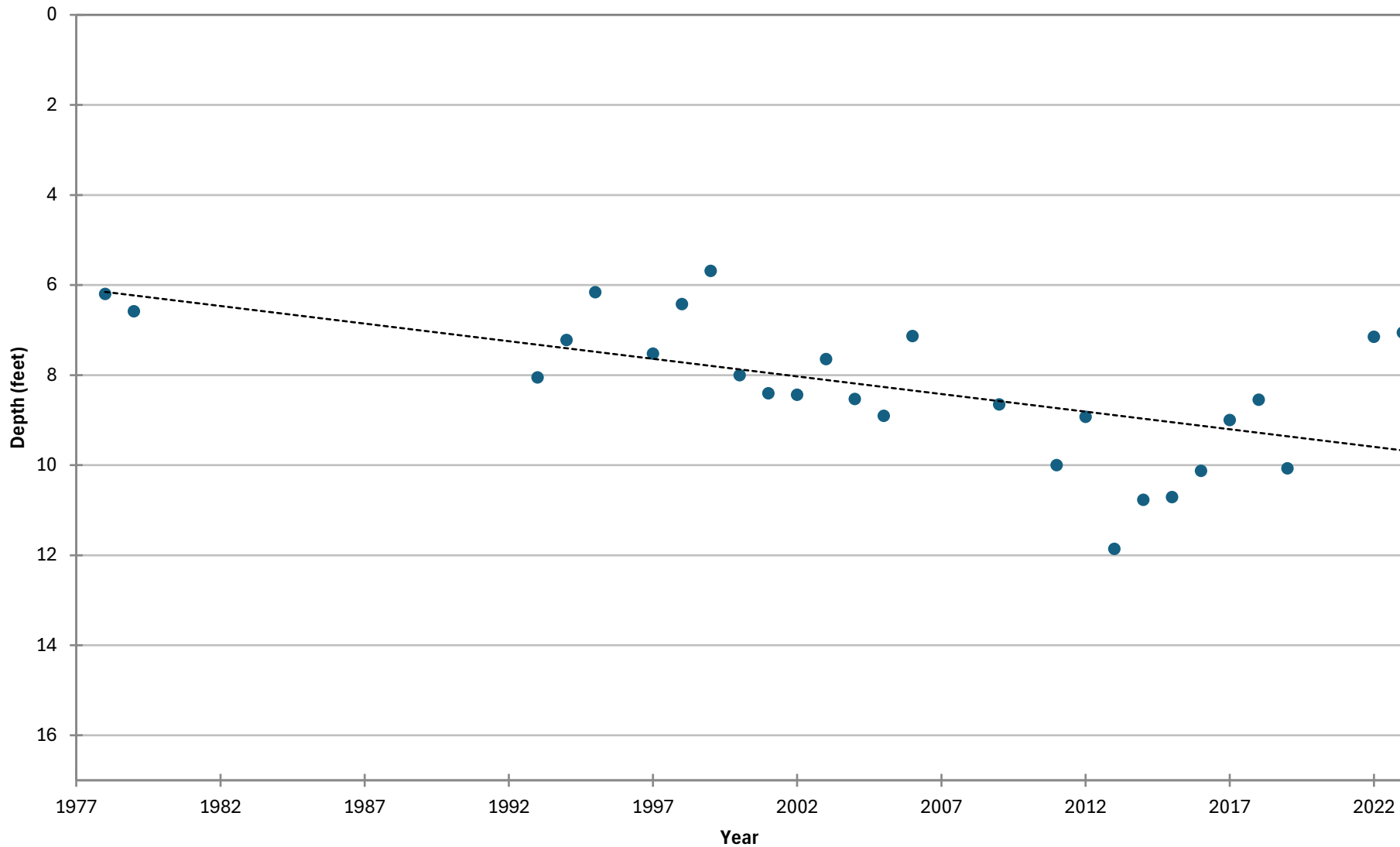
The information gathered during this assessment will allow lake communities to identify high-quality areas that can be protected, as well as opportunities for improvement. Score the Shore data, combined with educational resources describing the value of healthy shorelines and how to restore and maintain them, can be incorporated into lake management planning and used for educating lakefront property owners. The Michigan Natural Shoreline Partnership (MNSP) is a collaboration of agencies and professionals that promotes natural shoreline practices to protect Michigan's inland lakes. The MNSP website (www.mishorelinepartnership.org) includes materials and information that can be used in educational efforts. MNSP also offers training for professional educators and landscape contractors, and maintains a list of trained educators who may be available to speak to your community about natural shorelines.

Score the Shore data, just like all CLMP data, will also be available to any interested parties through the MiCorps Data Exchange (www.micorps.net). State agency staff and researchers regularly access CLMP data to better understand and manage Michigan's inland lakes.

Score the Shore is a descriptive process for assessing shoreline quality on Michigan's inland lakes. It is also a valuable educational tool. Score the Shore is not a regulatory program, nor is it intended to tell people what they can and cannot do on their property. The Michigan Department of Environmental Quality's Inland Lakes and Streams Program has responsibility for shoreline protection on public lakes. To learn about their shoreline protection program, including construction permitting and recommendations for shoreline management, visit www.mi.gov/deqinlandlakes.

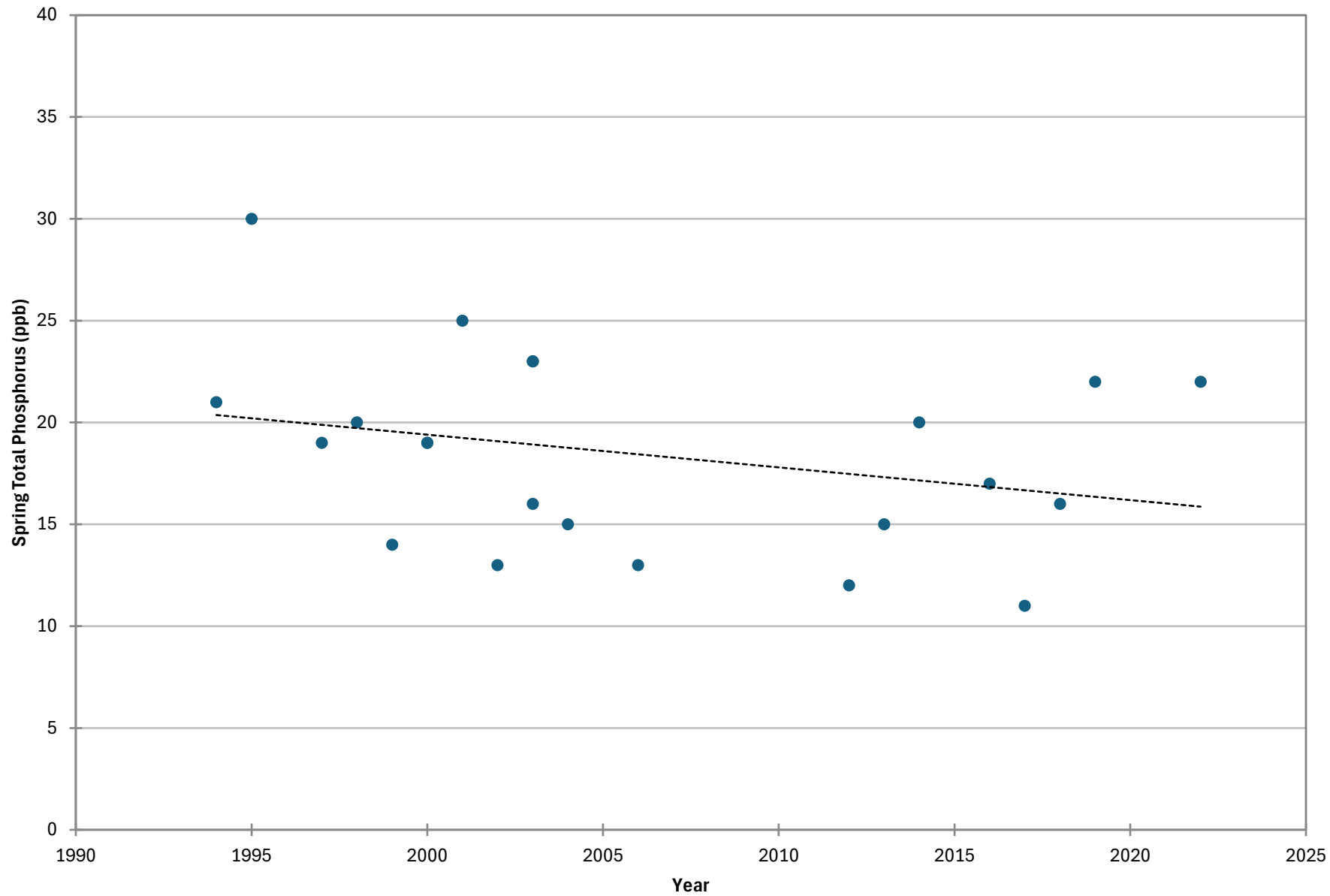
COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEAN TRANSPARENCY

Lake Christiana (Cass Co.), 140055



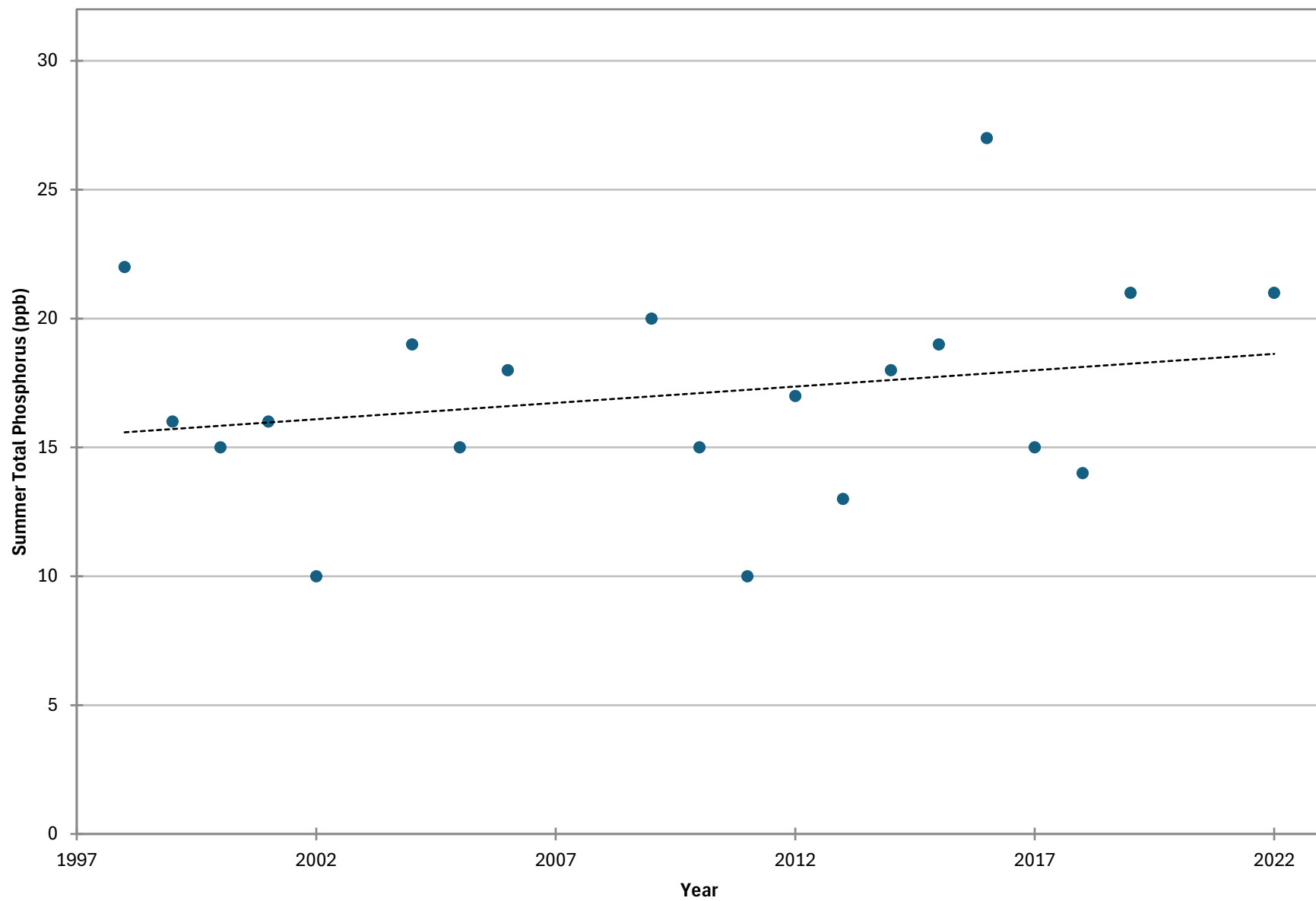
COOPERATIVE LAKES MONITORING PROGRAM
SPRING TOTAL PHOSPHORUS

Lake Christiana (Cass Co.), 140055



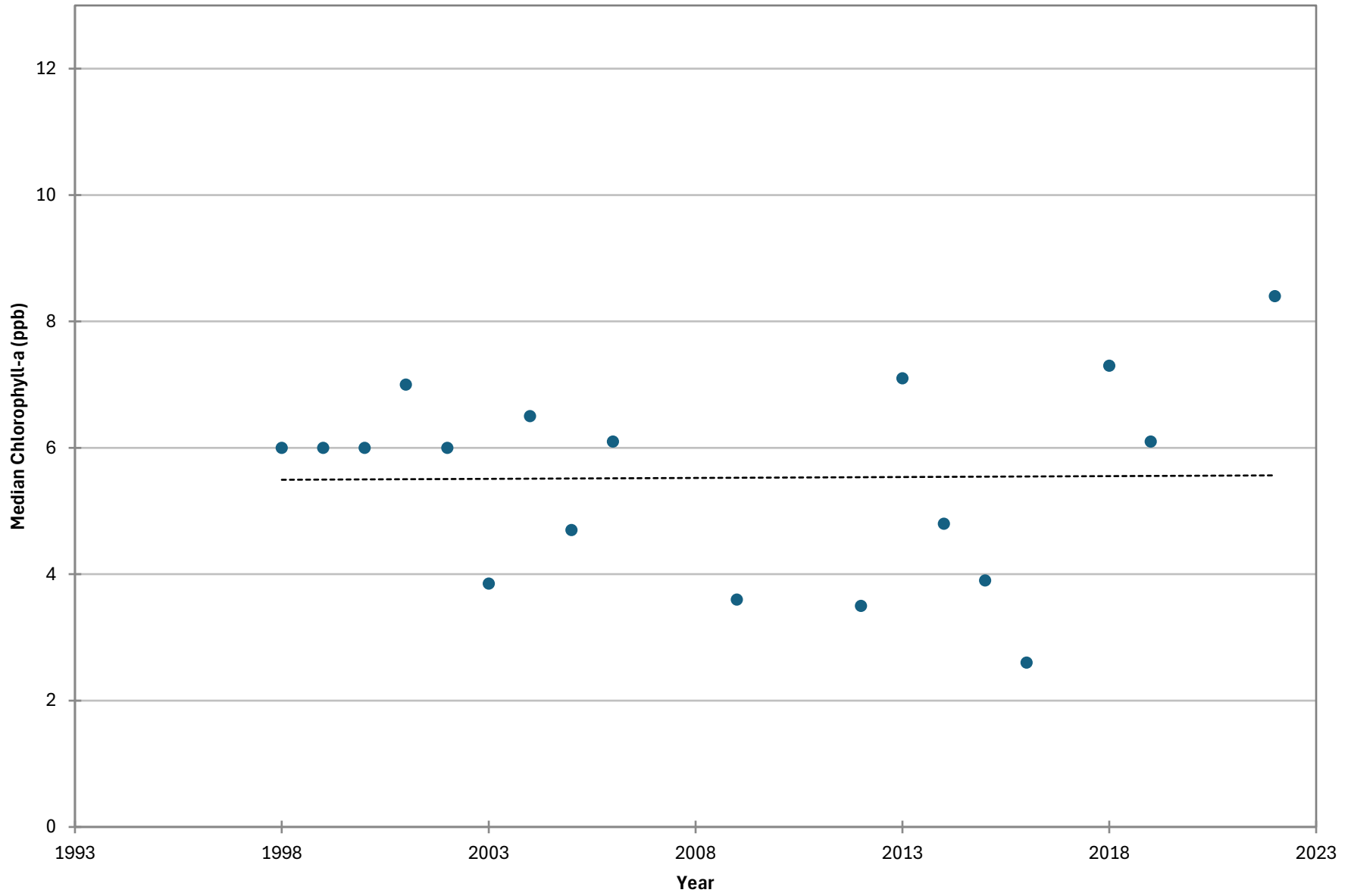
COOPERATIVE LAKES MONITORING PROGRAM
SUMMER TOTAL PHOSPHORUS

Lake Christiana (Cass Co.), 140055



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEDIAN CHLOROPHYLL-A

Lake Christiana (Cass Co.), 140055



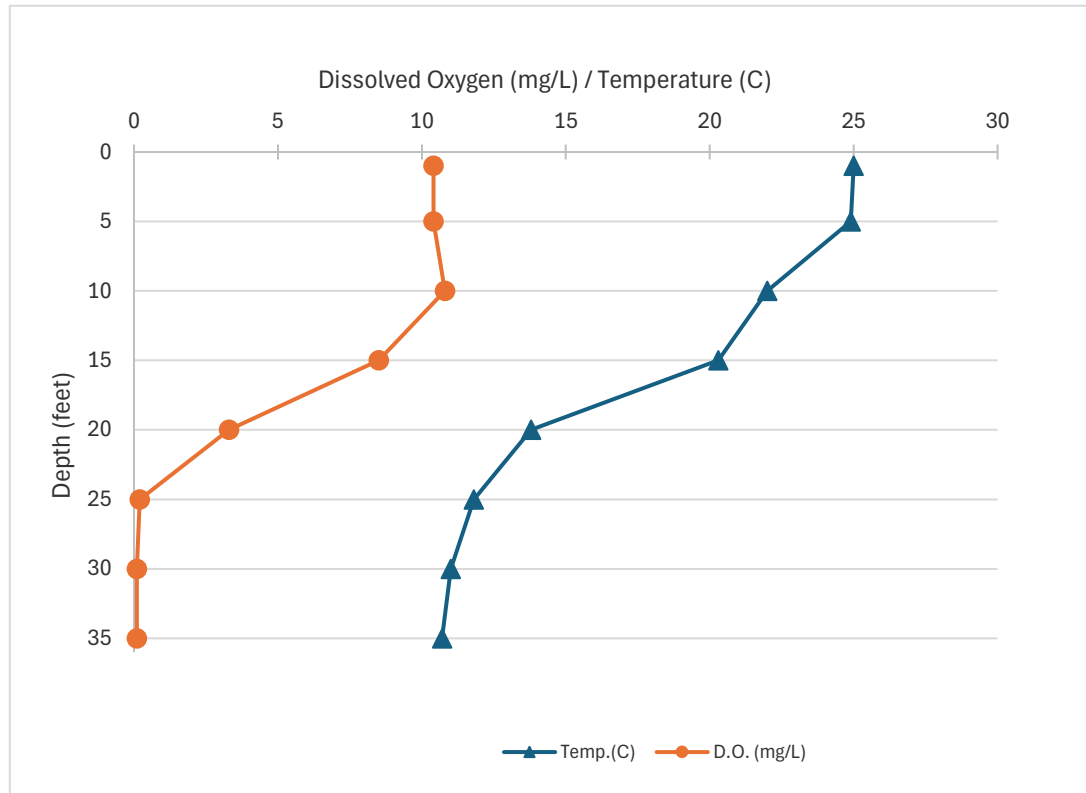
Name: Lake Christiana
County: Cass
Site ID: 140055
Date: 6/13/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25	10.4
5	24.9	10.4
10	22	10.8
15	20.3	8.5
20	13.8	3.3
25	11.8	0.2
30	11	0.1
35	10.7	0.1

Lake: Lake Christiana (Cass Co.)

6/13/2022



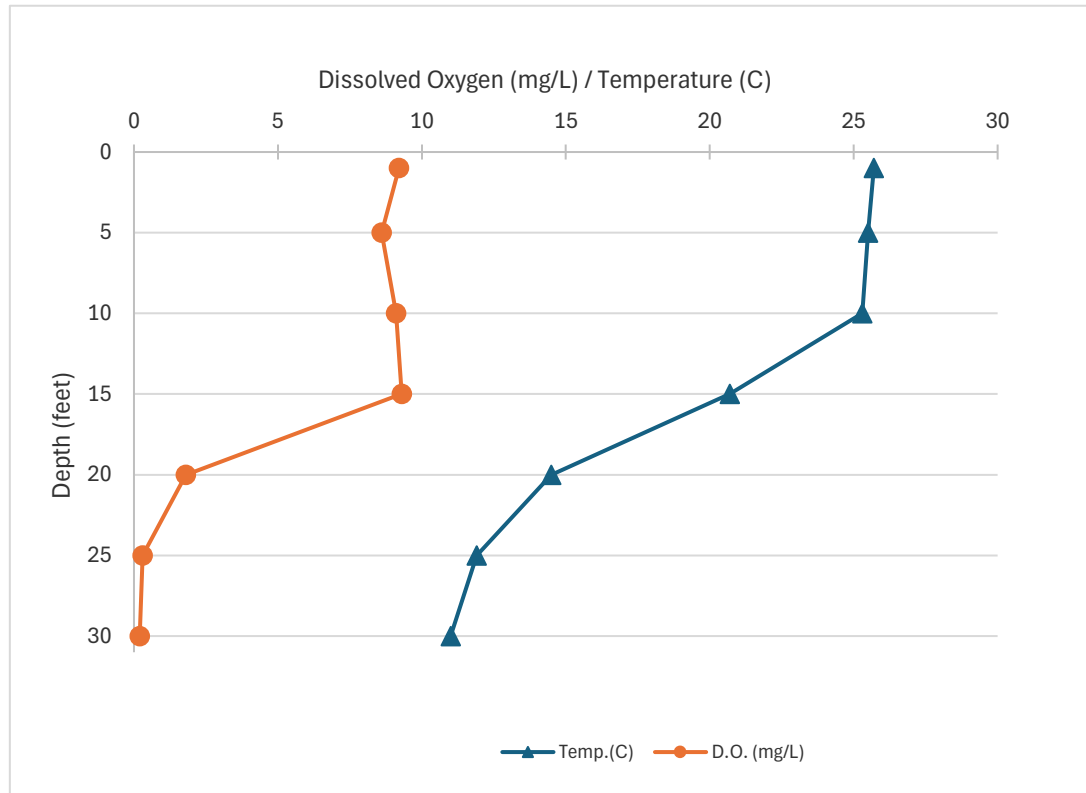
Name: Lake Christiana
County: Cass
Site ID: 140055
Date: 6/20/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25.7	9.2
5	25.5	8.6
10	25.3	9.1
15	20.7	9.3
20	14.5	1.8
25	11.9	0.3
30	11	0.2

Lake: Lake Christiana (Cass Co.)

6/20/2022



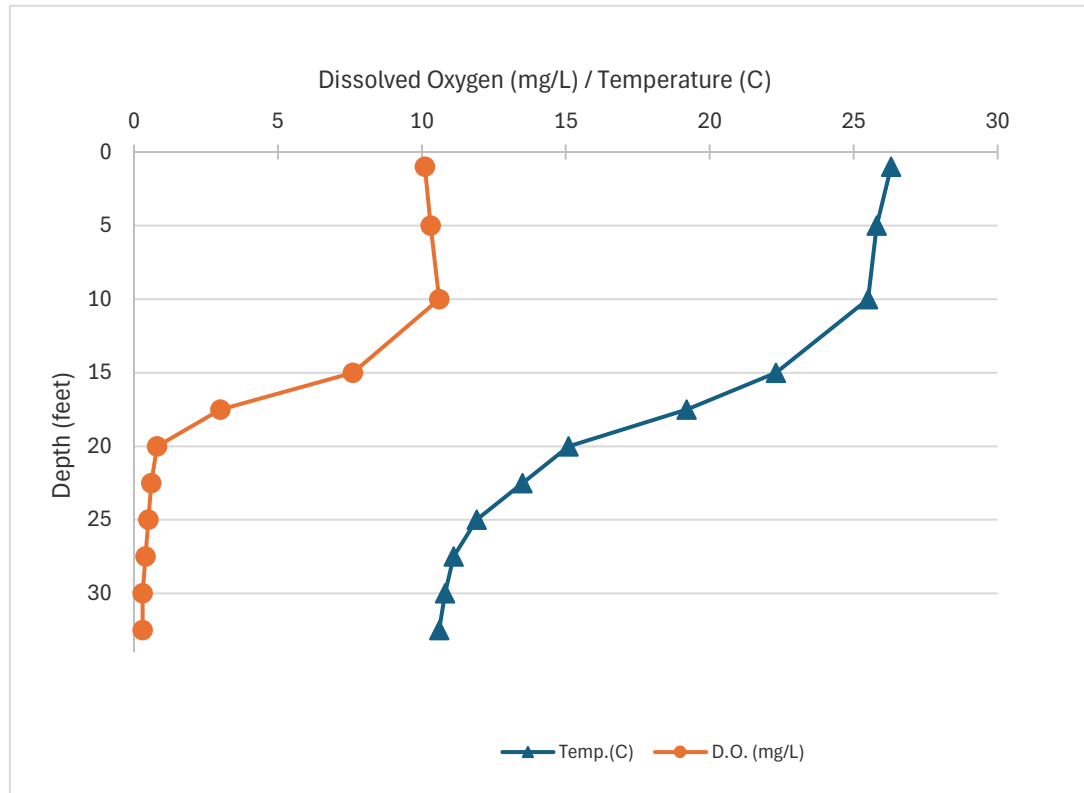
Name: Lake Christiana
County: Cass
Site ID: 140055
Date: 7/2/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26.3	10.1
5	25.8	10.3
10	25.5	10.6
15	22.3	7.6
17.5	19.2	3
20	15.1	0.8
22.5	13.5	0.6
25	11.9	0.5
27.5	11.1	0.4
30	10.8	0.3
32.5	10.6	0.3

Lake: Lake Christiana (Cass Co.)

7/2/2022



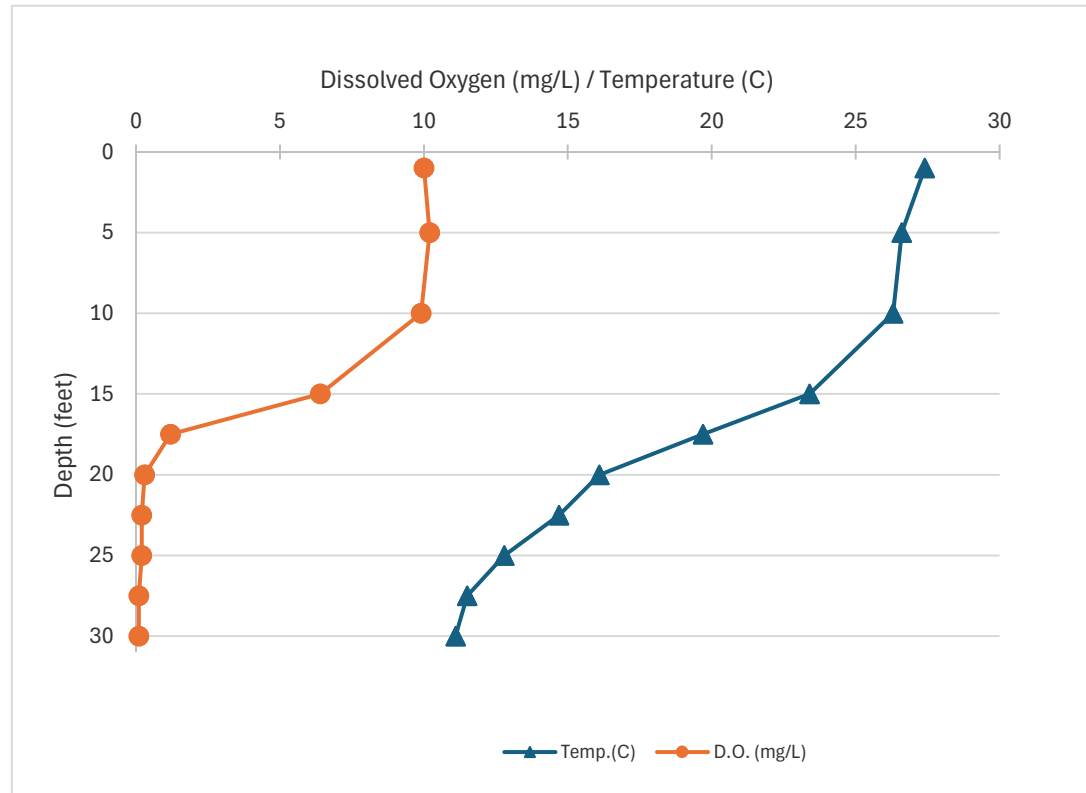
Name: Lake Christiana
 County: Cass
 Site ID: 140055
 Date: 7/7/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	27.4	10
1	27.4	10
5	26.6	10.2
5	26.6	10.2
10	26.3	9.9
10	26.3	9.9
15	23.4	6.4
15	23.4	6.4
17.5	19.7	1.2
17.5	19.7	1.2
20	16.1	0.3
20	16.1	0.3
22.5	14.7	0.2
22.5	14.7	0.2
25	12.8	0.2
25	12.8	0.2
27.5	11.5	0.1
27.5	11.5	0.1
30	11.1	0.1
30	11.1	0.1

Lake: Lake Christiana (Cass Co.)

7/7/2022



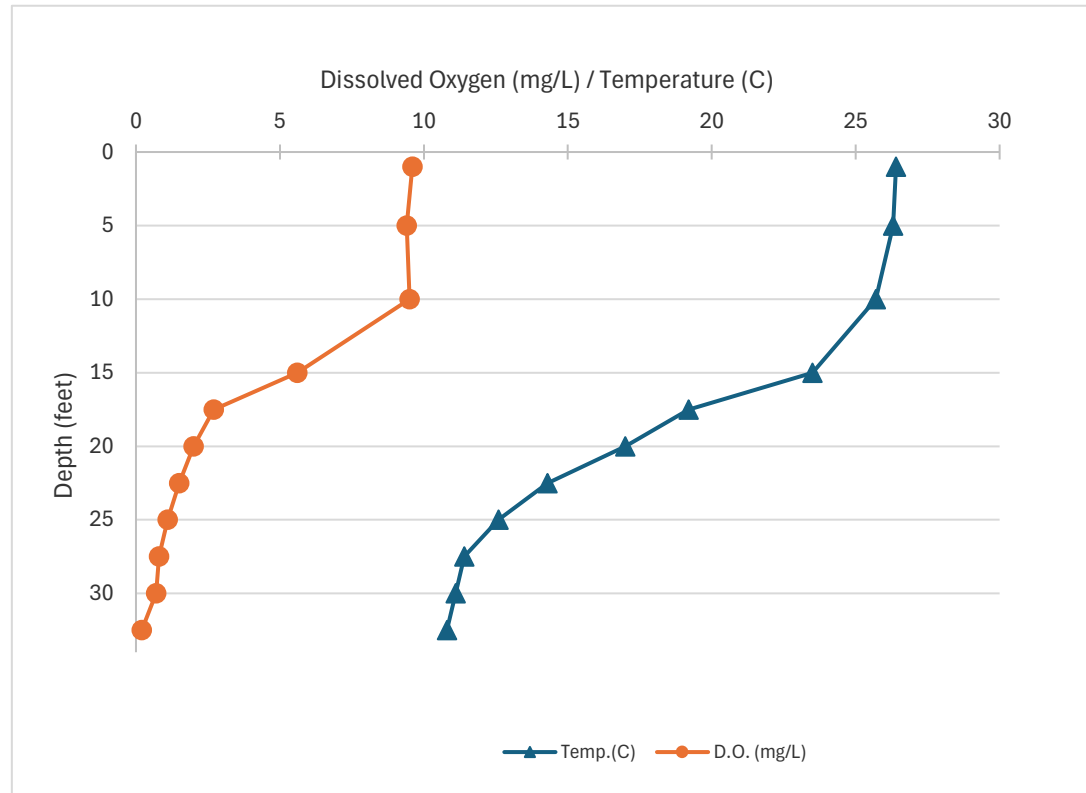
Name: Lake Christiana
County: Cass
Site ID: 140055
Date: 7/16/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26.4	9.6
5	26.3	9.4
10	25.7	9.5
15	23.5	5.6
17.5	19.2	2.7
20	17	2
22.5	14.3	1.5
25	12.6	1.1
27.5	11.4	0.8
30	11.1	0.7
32.5	10.8	0.2

Lake: Lake Christiana (Cass Co.)

7/16/2022



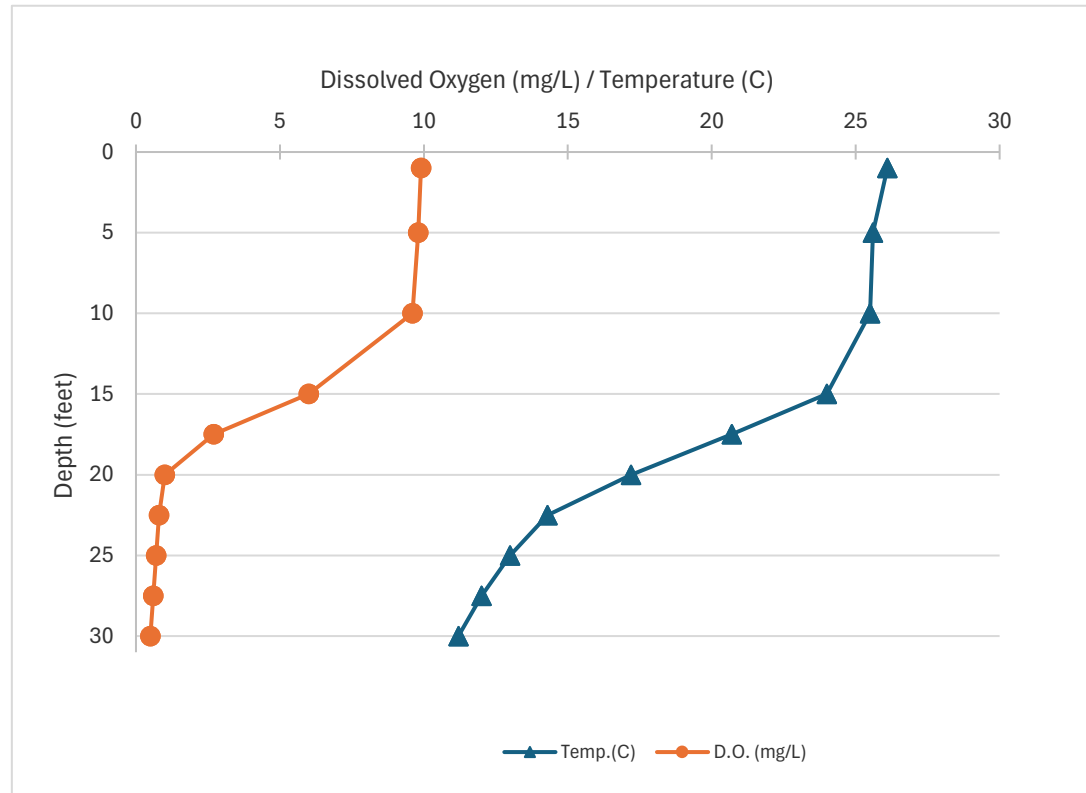
Name: Lake Christiana
 County: Cass
 Site ID: 140055
 Date: 7/18/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26.1	9.9
1	26.1	9.9
5	25.6	9.8
5	25.6	9.8
10	25.5	9.6
10	25.5	9.6
15	24	6
15	24	6
17.5	20.7	2.7
17.5	20.7	2.7
20	17.2	1
20	17.2	1
22.5	14.3	0.8
22.5	14.3	0.8
25	13	0.7
25	13	0.7
27.5	12	0.6
27.5	12	0.6
30	11.2	0.5
30	11.2	0.5

Lake: Lake Christiana (Cass Co.)

7/18/2022



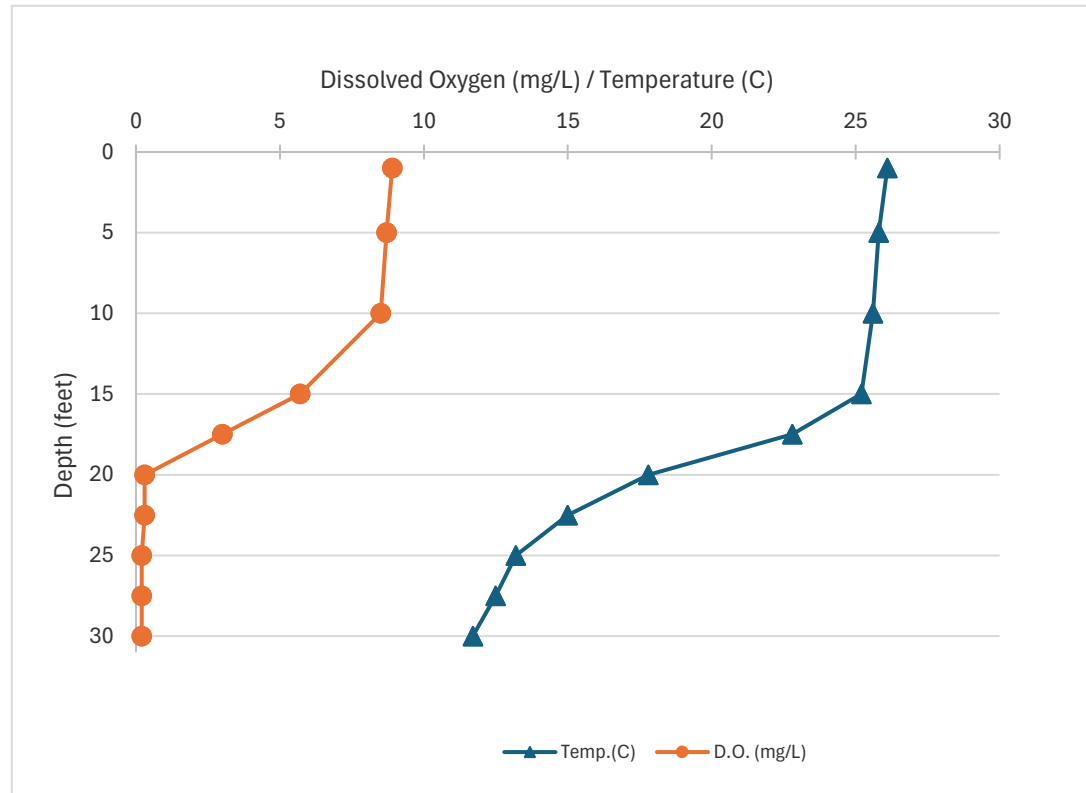
Name: Lake Christiana
 County: Cass
 Site ID: 140055
 Date: 7/30/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26.1	8.9
1	26.1	8.9
5	25.8	8.7
5	25.8	8.7
10	25.6	8.5
10	25.6	8.5
15	25.2	5.7
15	25.2	5.7
17.5	22.8	3
17.5	22.8	3
20	17.8	0.3
20	17.8	0.3
22.5	15	0.3
22.5	15	0.3
25	13.2	0.2
25	13.2	0.2
27.5	12.5	0.2
27.5	12.5	0.2
30	11.7	0.2
30	11.7	0.2

Lake: Lake Christiana (Cass Co.)

7/30/2022



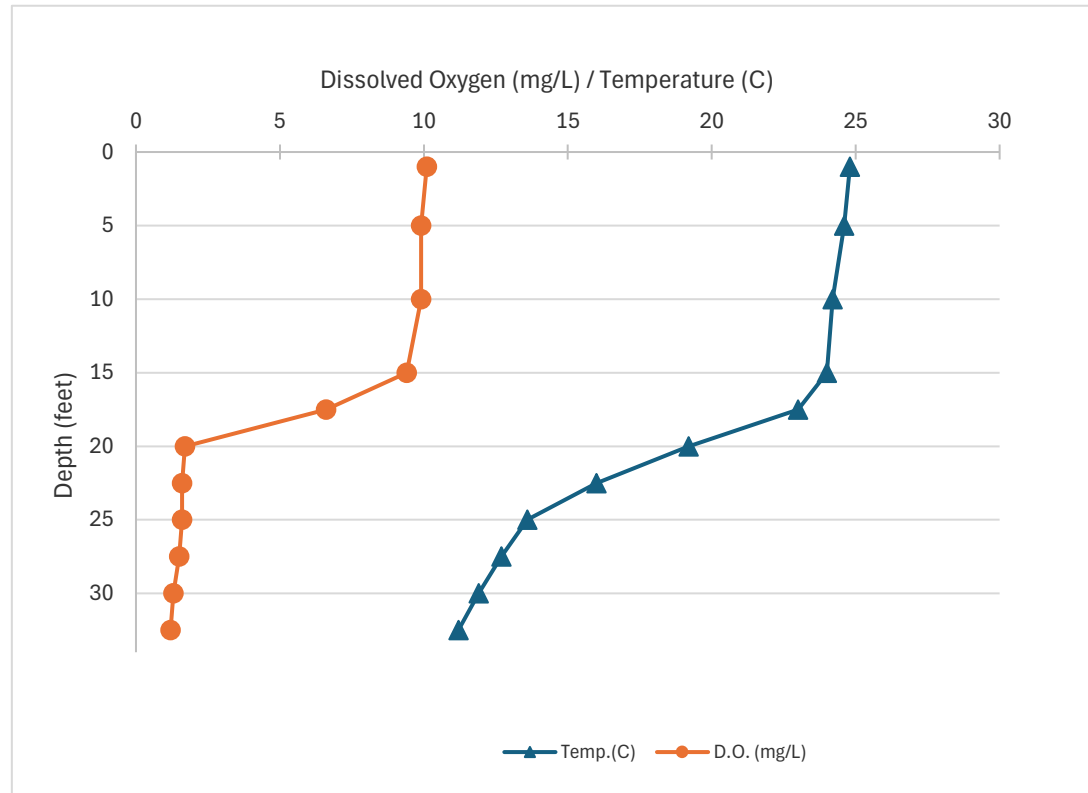
Name: Lake Christiana
County: Cass
Site ID: 140055
Date: 8/16/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.8	10.1
5	24.6	9.9
10	24.2	9.9
15	24	9.4
17.5	23	6.6
20	19.2	1.7
22.5	16	1.6
25	13.6	1.6
27.5	12.7	1.5
30	11.9	1.3
32.5	11.2	1.2

Lake: Lake Christiana (Cass Co.)

8/16/2022



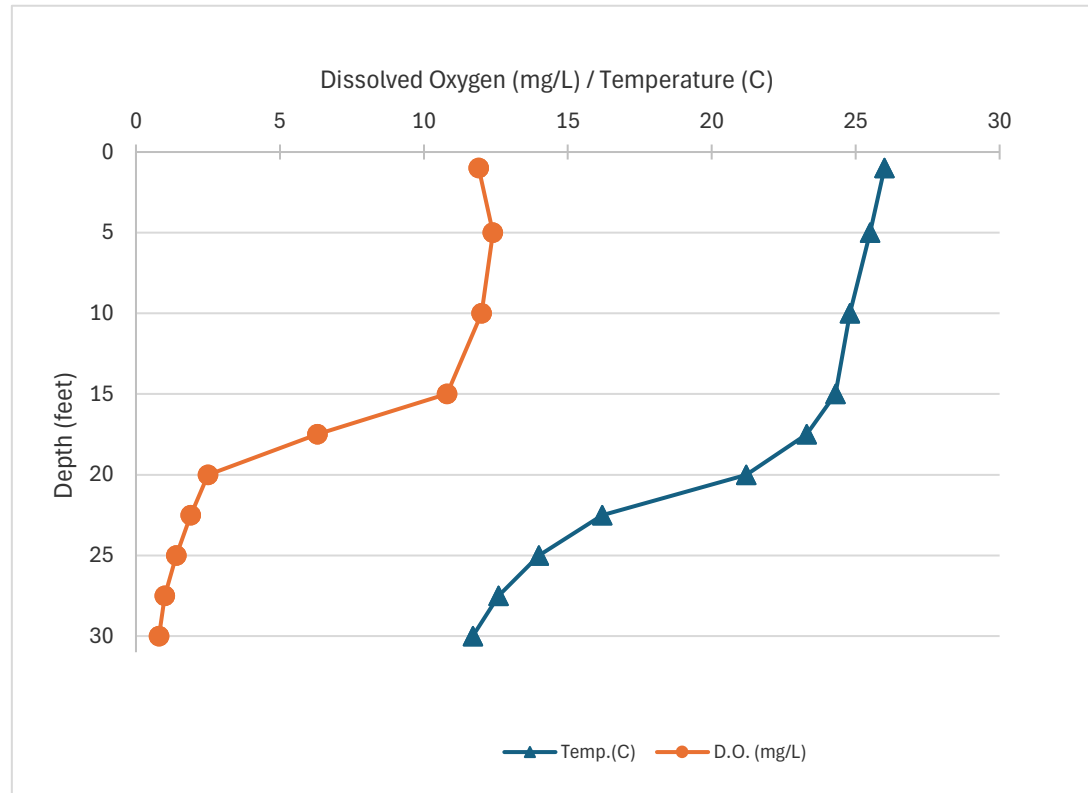
Name: Lake Christiana
 County: Cass
 Site ID: 140055
 Date: 9/3/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26	11.9
1	26	11.9
5	25.5	12.4
5	25.5	12.4
10	24.8	12
10	24.8	12
15	24.3	10.8
15	24.3	10.8
17.5	23.3	6.3
17.5	23.3	6.3
20	21.2	2.5
20	21.2	2.5
22.5	16.2	1.9
22.5	16.2	1.9
25	14	1.4
25	14	1.4
27.5	12.6	1
27.5	12.6	1
30	11.7	0.8
30	11.7	0.8

Lake: Lake Christiana (Cass Co.)

9/3/2022



Name: Lake Christiana
 County: Cass
 Site ID: 140055
 Date: 9/24/2022

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	20.7	7.8
1	20.7	7.8
5	20.7	7.8
5	20.7	7.8
10	20.7	7.8
10	20.7	7.8
15	20.6	8
15	20.6	8
17.5	20.6	8.3
17.5	20.6	8.3
20	20.6	8.4
20	20.6	8.4
22.5	18	1.8
22.5	18	1.8
25	15.1	1.6
25	15.1	1.6
27.5	12.9	1.5
27.5	12.9	1.5
30	11.9	0.9
30	11.9	0.9

Lake: Lake Christiana (Cass Co.)

9/24/2022

