



2021 Data Report for Otter Lake, Oakland County

Site ID: 631193

42.629508°N, 83.347401°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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River
Watershed
Council

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:

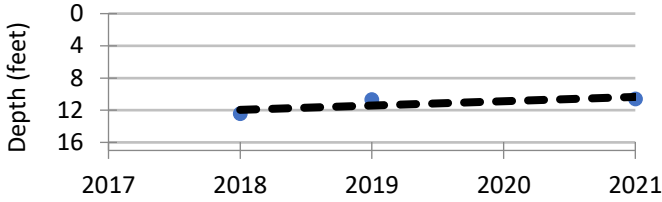
Paul Steen (psteen@hrwc.org), CLMP Data Analyst

Otter Lake, Oakland County 2021 CLMP Results



Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Avg	Std. Dev	Carlson TSI
2021	11	7.0	16.5	10.6	3.1	43
2018-2019	35	7.0	22.0	10.6	3.2	42
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
2019	5	<1.0	5.7	2.4	2.3	39
2021 All CLMP Lakes	635	<1.0	42.0	2.2	3.4	39

No graph: Not enough data

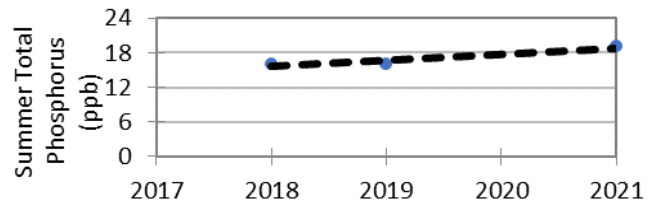
Spring Phosphorus (parts per billion)

Year	# Samples	Min	Max	Avg	Std. Dev
2021	1	26.0	26.0	26.0	NA
2019	1	17.0	17.0	17.0	NA
2021 All CLMP Lakes	220	<= 3	100.0	14.9	11.0

No graph: Not enough data

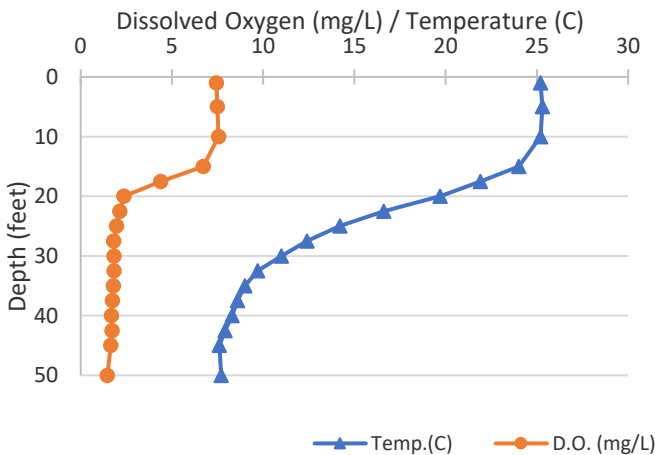
Summer Phosphorus (parts per billion)

Year	# Samples	Min	Max	Avg	Std. Dev	Carlson TSI
2021	1	19.0	19.0	19.0	NA	47
2018-2019	2	16.0	16.0	16.0	0.0	44
2021 All CLMP Lakes	281	<= 3	65.0	12.8	9.3	38



Dissolved Oxygen and Temperature Profile

8/23/2019



Summary

Average TSI	2021	2018-2019
Otter Lake	45	43
All CLMP Lakes	42	41

With an average TSI score of 45 based on 2021 Secchi transparency and summer total phosphorus data, this lake is rated as a mesotrophic lake.

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

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.

* = 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.

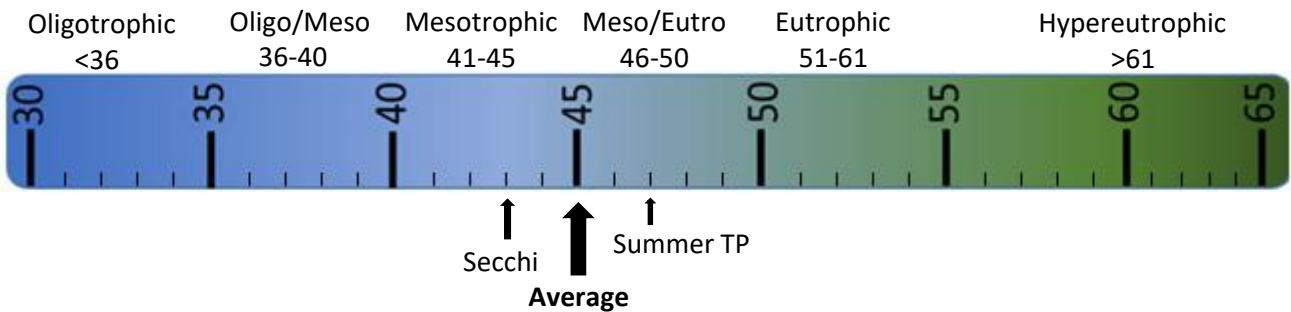
The tables below give the results-to-TSI conversions for the water quality data ranges normally seen in the CLMP. The formulas for this conversion can be found in the CLMP manual (link is on page 2 of this report).

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 Otter Lake in 2021	
Average	45
Secchi Disk	43
Summer TP	47
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.

Otter Lake, Oakland County 2018 Exotic Aquatic Plant Watch Results



The Exotic Aquatic Plant Watch was conducted on Otter Lake in 2018.

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 2018 Exotic Aquatic Plant Watch on Otter Lake.

Otter Lake, Oakland County		
2018 Exotic Aquatic Plant Watch Results		
Survey Date(s): August 1		
<u>Species</u>	<u>Status</u>	<u>Comments</u>
Eurasian watermilfoil	FOUND	Found at 4 of 11 transects surveyed.
Starry stonewort	FOUND	Found at 10 of 11 transects surveyed.
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.

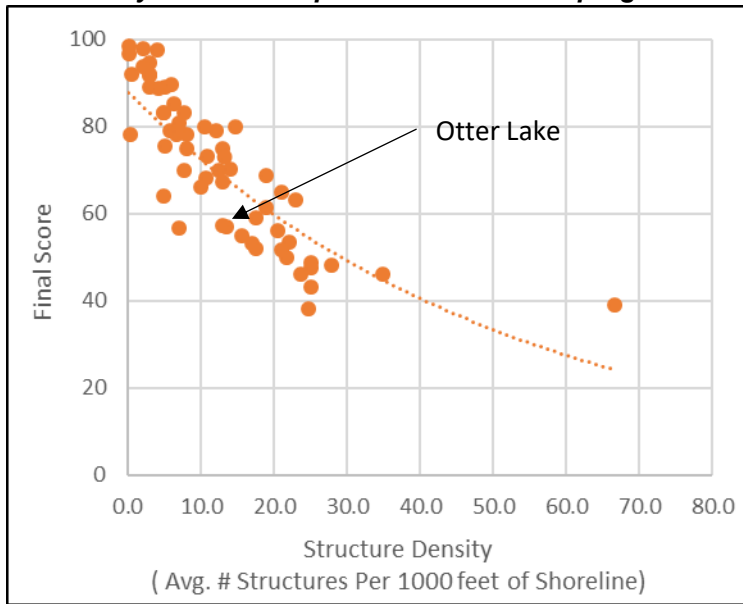
Otter Lake, Oakland County 2019 Score the Shore Results



The Score the Shore Habitat Assessment was conducted on Otter Lake 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 an 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?



Otter Lake:	
Number of Sections:	26
Number of Structures:	57
Structure Density:	13
Final Score:	57

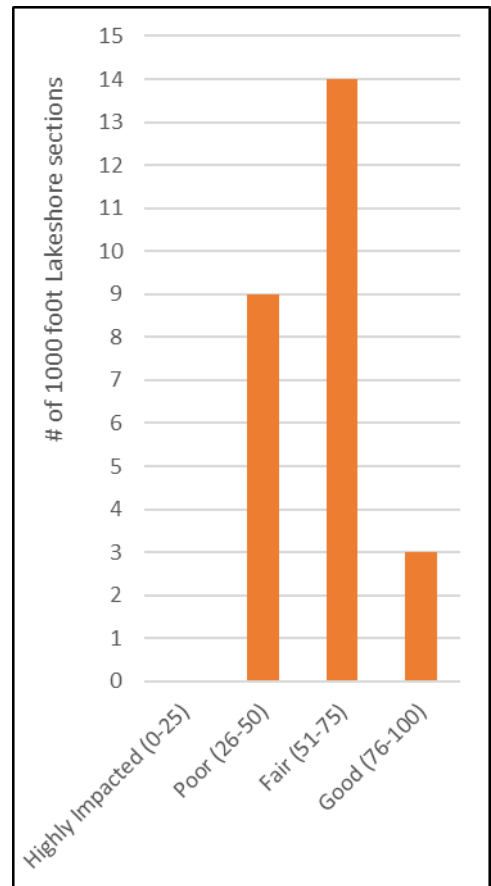
All 62 Participating Lakes from 2015-2019:	
Avg. Number of Sections:	16
Avg. Number of Structures:	228
Avg. Structure Density:	12.6
Avg. Final Score:	71

Analysis specific to Otter Lake:

Overall, the lakeshore habitat of Otter Lake is below average when compared to the other lakes in the program. About 1/3 of the lake sections score poor (9 poor, 14 fair, 3 good).

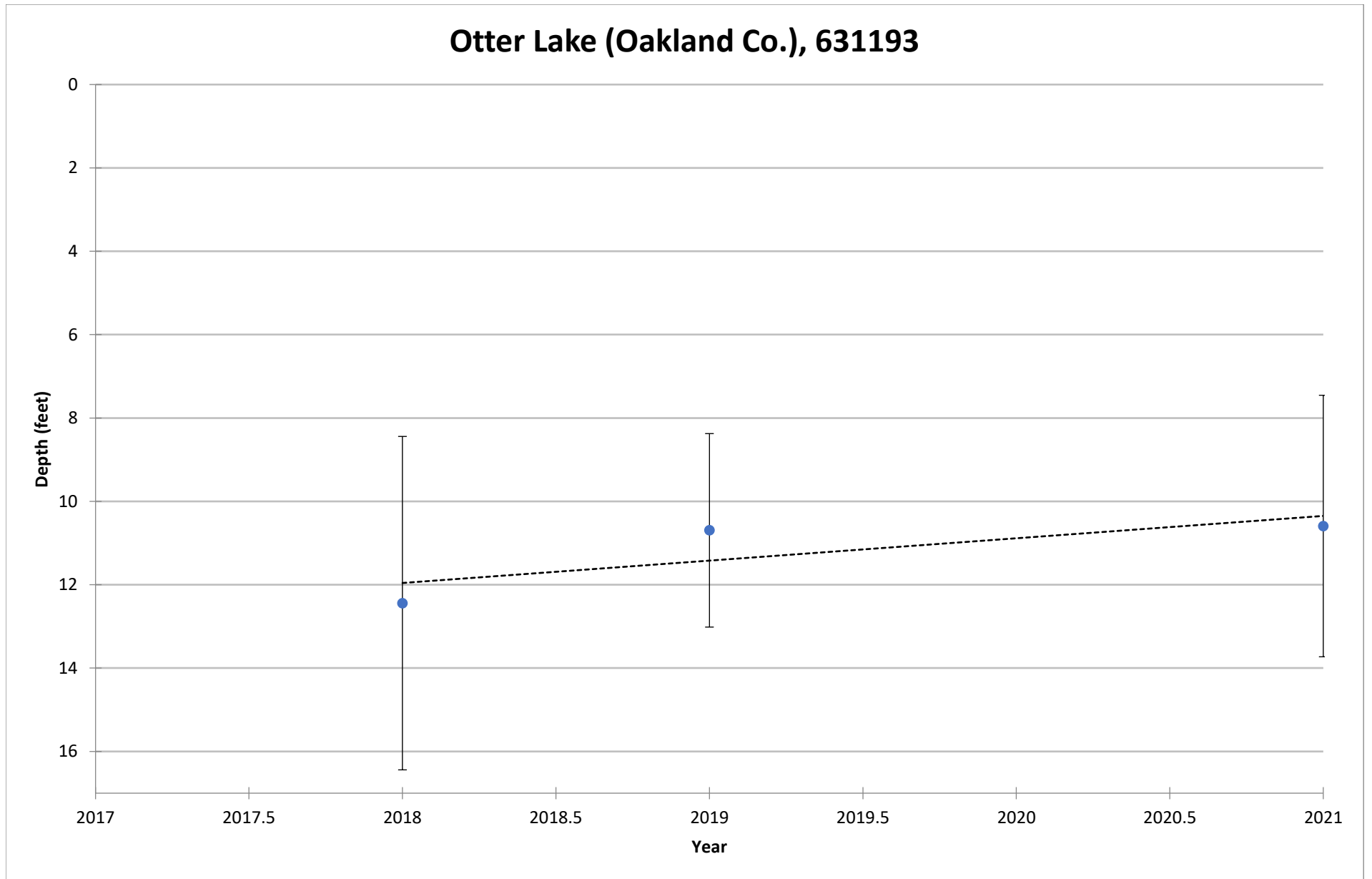
The lake sections scored highest for erosion control, with an average of 74, meaning that there are a low to moderate amount of sea walls, rock rip-rap, and other shoreline erosion structures.

The riparian zone was the weak point in Otter Lake's score (scoring an average of 33). 33 is quite poor compared to many lakes in the program. Reduce the amount of mowed grass and increase the amount of unmowed native vegetation along the lakeshore to boost this aspect of the shoreline habitat.



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEAN TRANSPARENCY

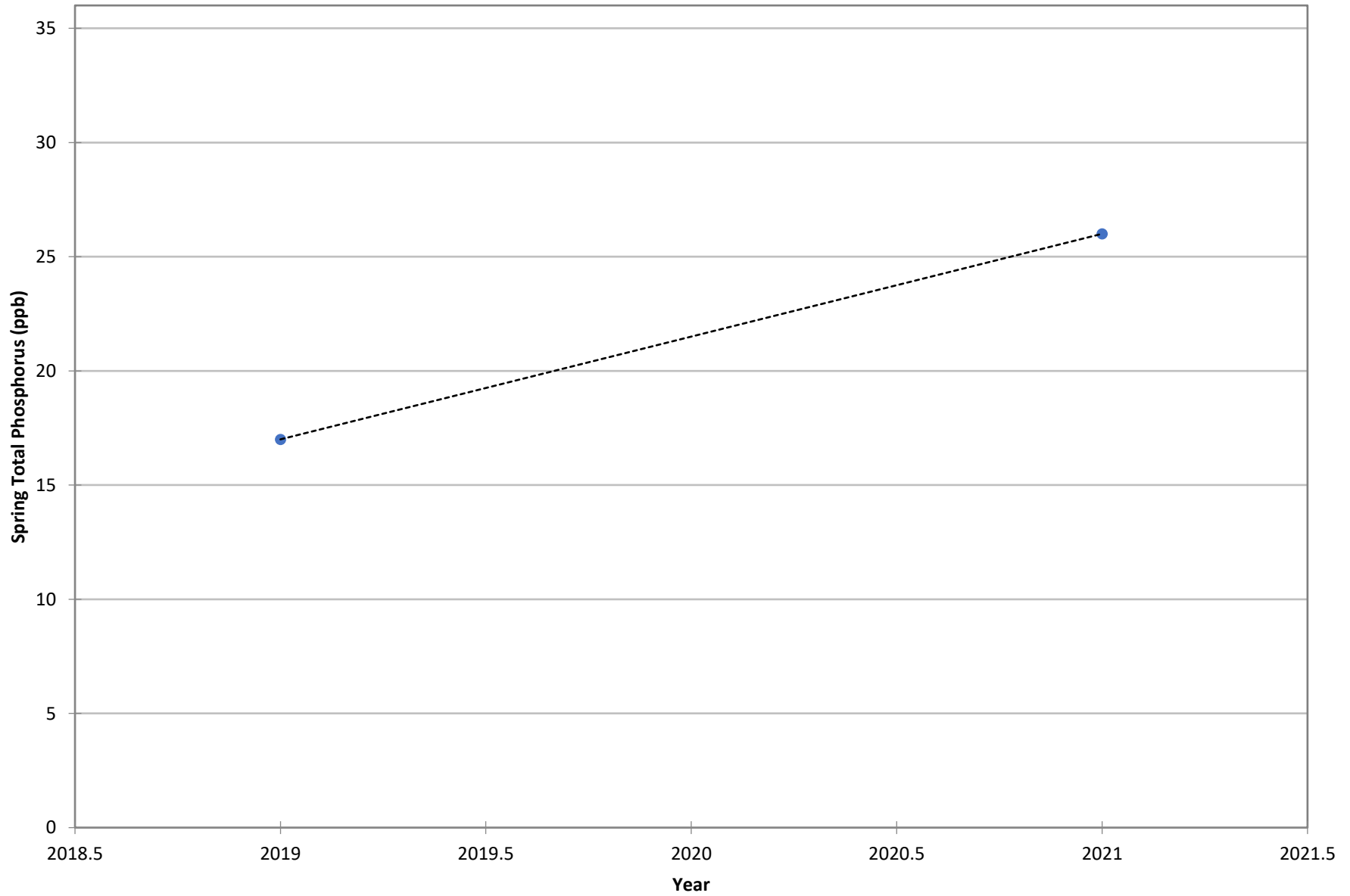
Otter Lake (Oakland Co.), 631193



Vertical bars indicate standard deviation

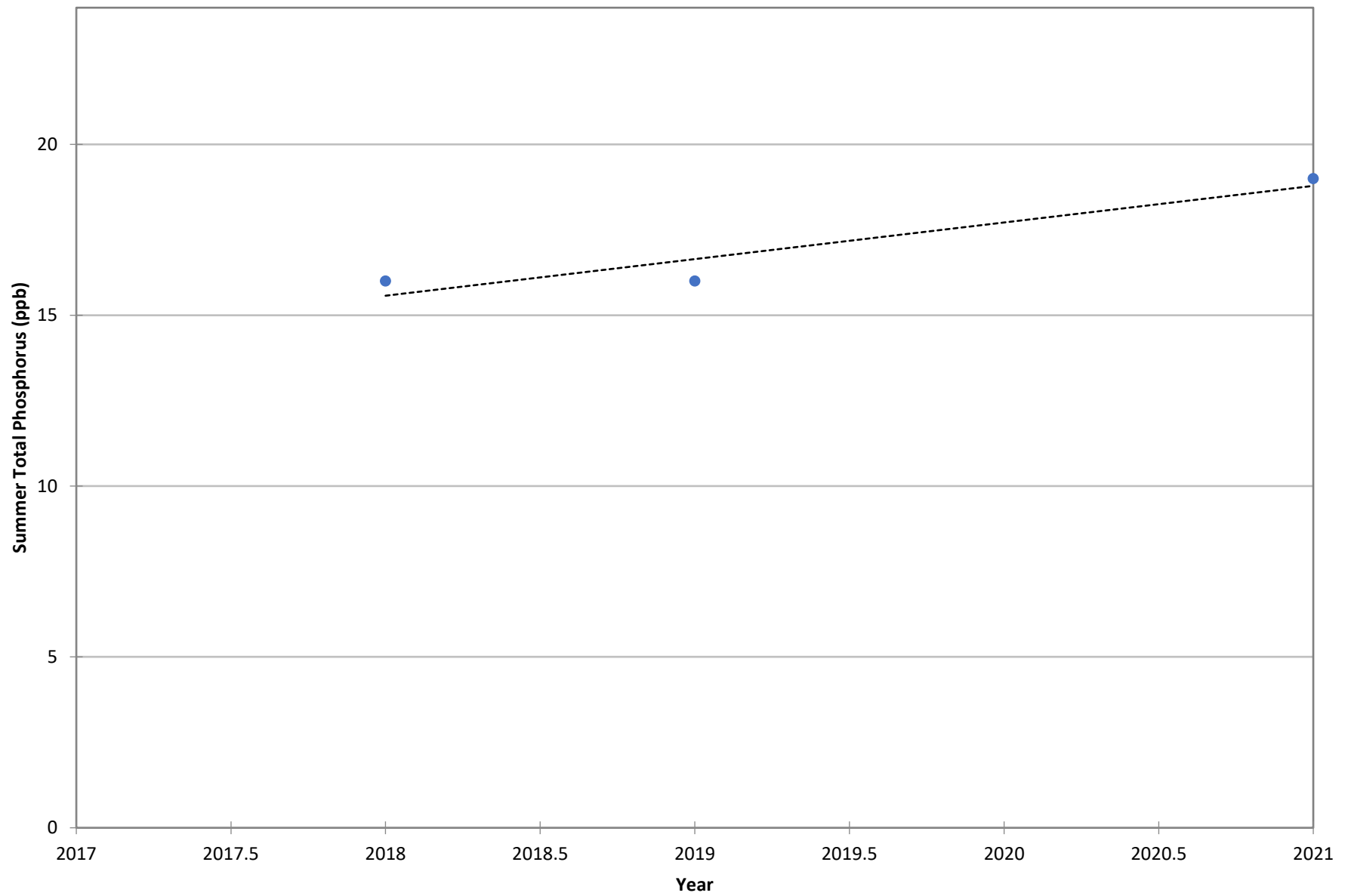
COOPERATIVE LAKES MONITORING PROGRAM
SPRING TOTAL PHOSPHORUS

Otter Lake (Oakland Co.), 631193



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER TOTAL PHOSPHORUS

Otter Lake (Oakland Co.), 631193



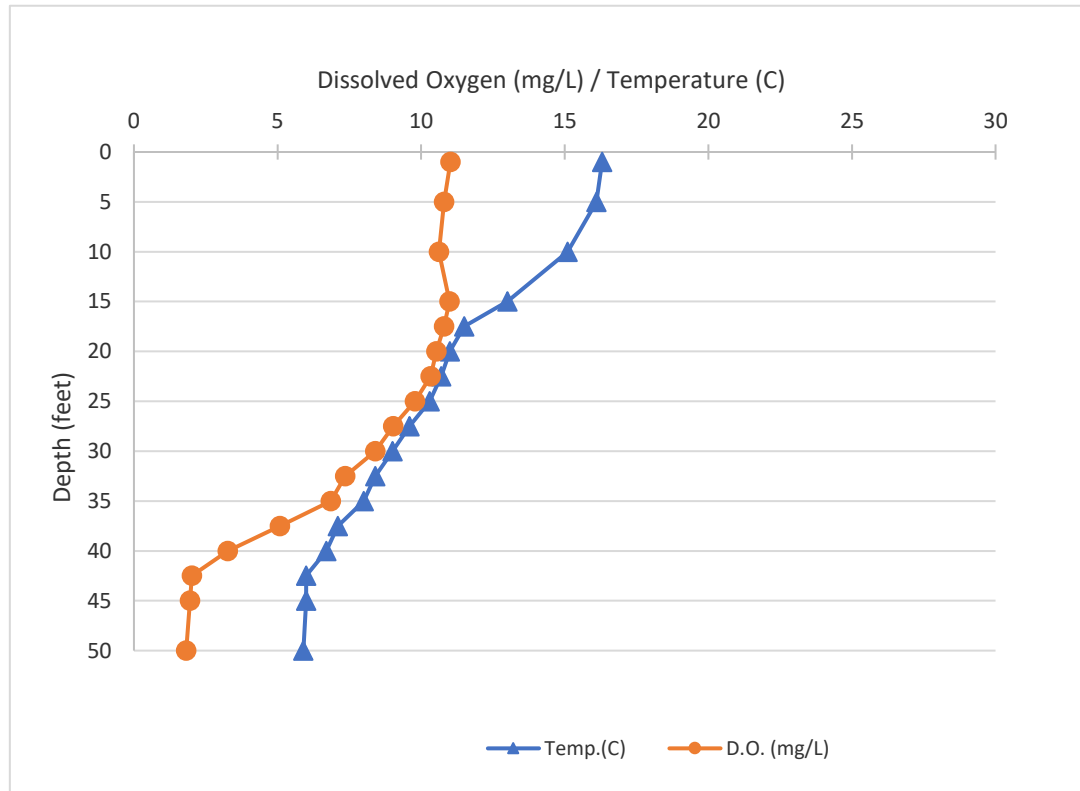
Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 5/17/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	16.3	11.02
5	16.1	10.8
10	15.1	10.62
15	13	10.99
17.5	11.5	10.8
20	11	10.53
22.5	10.7	10.33
25	10.3	9.78
27.5	9.6	9.03
30	9	8.4
32.5	8.4	7.36
35	8	6.85
37.5	7.1	5.08
40	6.7	3.27
42.5	6	2.02
45	6	1.95
50	5.9	1.82

Lake: Otter Lake (Oakland Co.)

5/17/2019



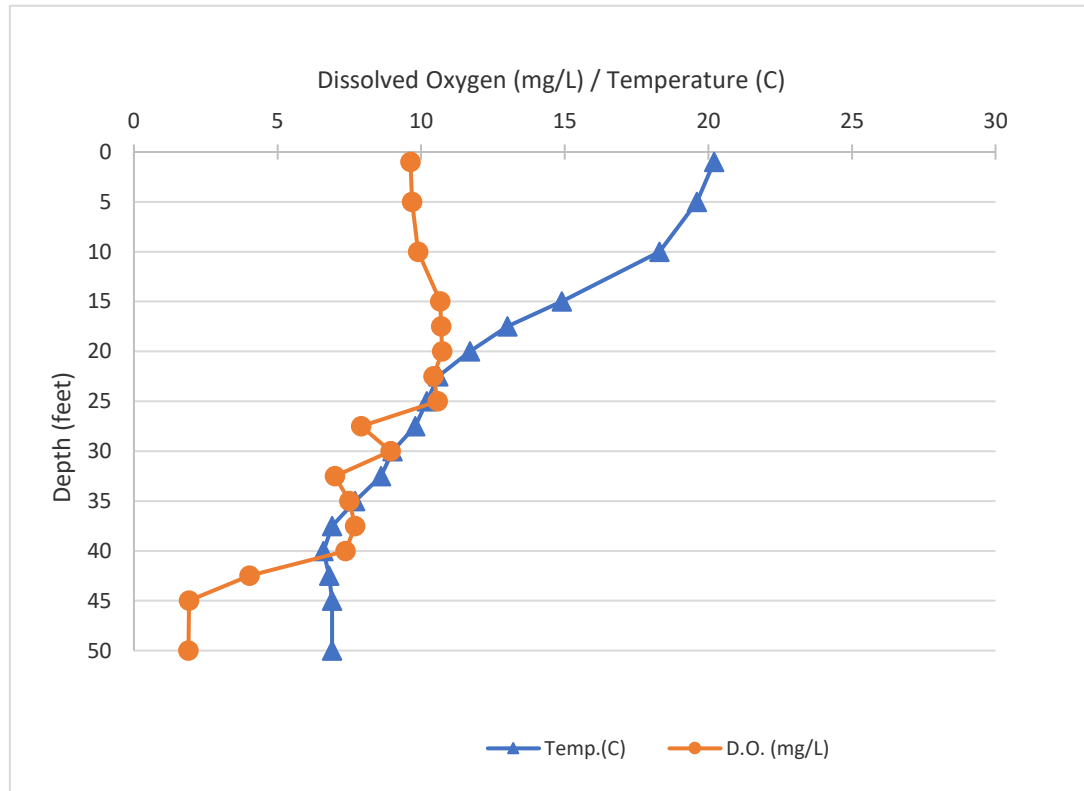
Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 5/31/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	20.2	9.63
5	19.6	9.69
10	18.3	9.9
15	14.9	10.67
17.5	13	10.7
20	11.7	10.73
22.5	10.6	10.43
25	10.2	10.58
27.5	9.8	7.91
30	9	8.94
32.5	8.6	7
35	7.7	7.5
37.5	6.9	7.7
40	6.6	7.37
42.5	6.8	4.02
45	6.9	1.92
50	6.9	1.9

Lake: Otter Lake (Oakland Co.)

5/31/2019



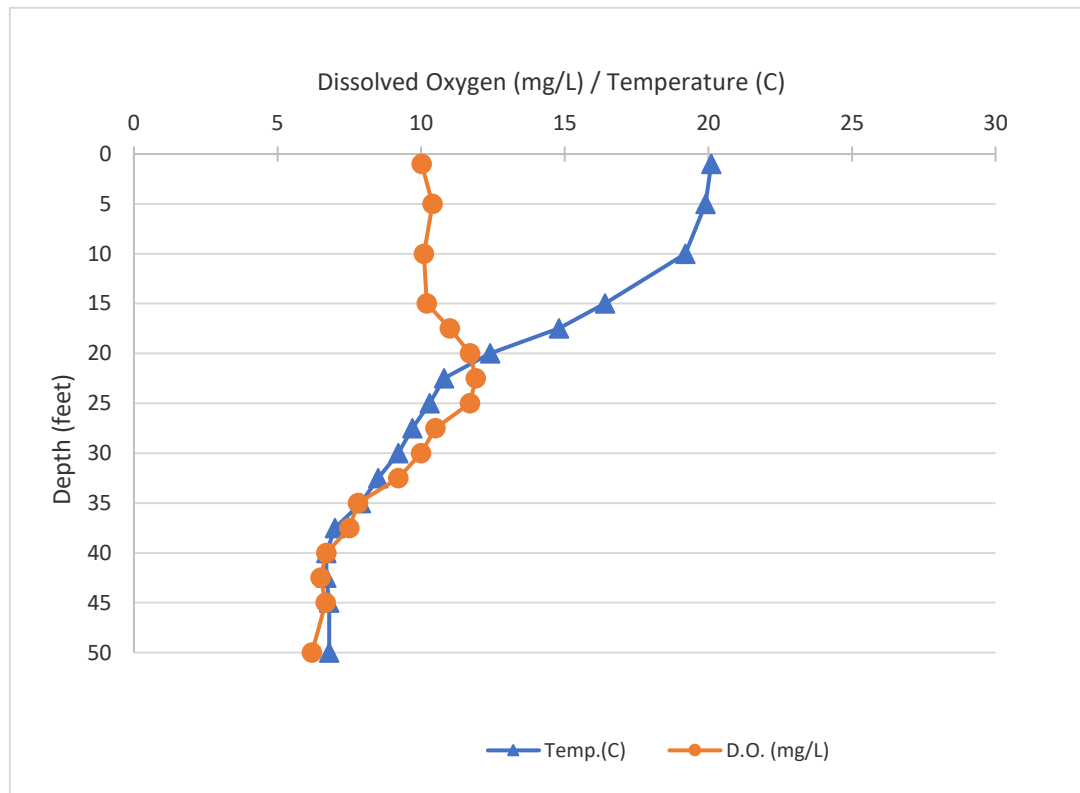
Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 6/11/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	20.1	10.02
5	19.9	10.4
10	19.2	10.1
15	16.4	10.2
17.5	14.8	11
20	12.4	11.7
22.5	10.8	11.9
25	10.3	11.7
27.5	9.7	10.5
30	9.2	10
32.5	8.5	9.2
35	7.9	7.8
37.5	7	7.5
40	6.7	6.7
42.5	6.7	6.5
45	6.8	6.68
50	6.8	6.2

Lake: Otter Lake (Oakland Co.)

6/11/2019



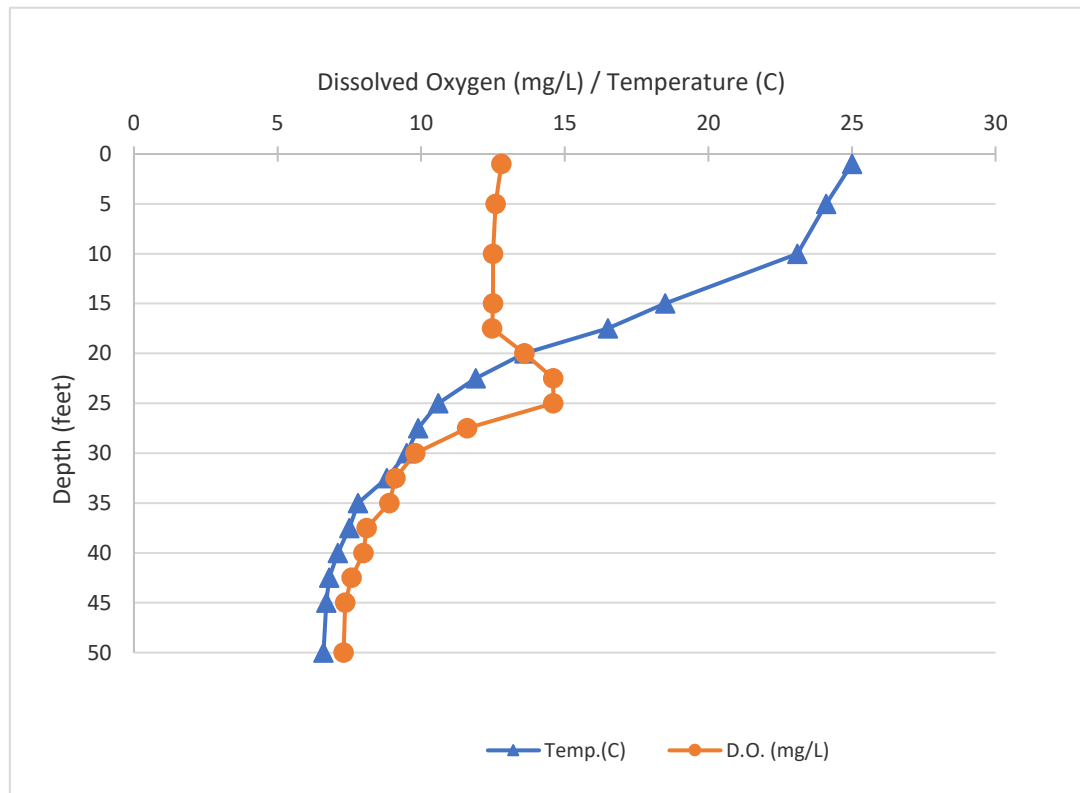
Name: Otter Lake
County: Oakland
Site ID: 631193
Date: 6/27/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25	12.79
5	24.1	12.59
10	23.1	12.5
15	18.5	12.5
17.5	16.5	12.47
20	13.6	13.6
22.5	11.9	14.6
25	10.6	14.6
27.5	9.9	11.6
30	9.5	9.8
32.5	8.8	9.1
35	7.8	8.89
37.5	7.5	8.1
40	7.1	7.99
42.5	6.8	7.58
45	6.7	7.36
50	6.6	7.3

Lake: Otter Lake (Oakland Co.)

6/27/2019



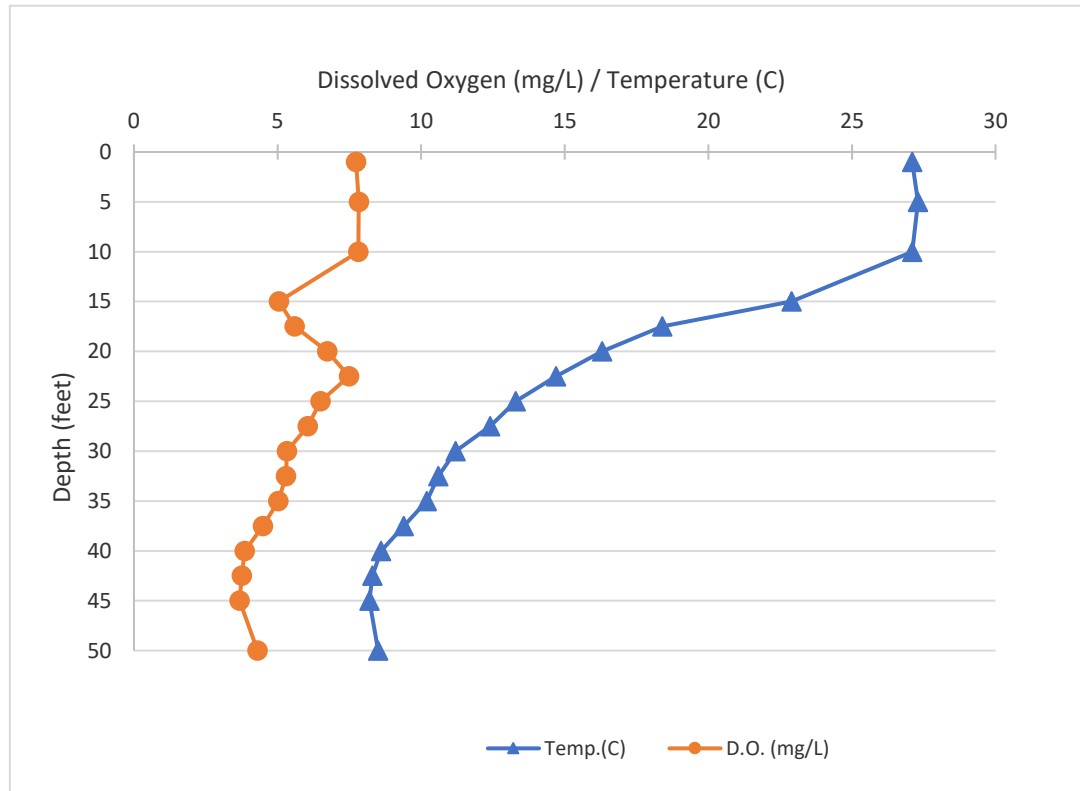
Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 7/12/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	27.1	7.73
5	27.3	7.83
10	27.1	7.81
15	22.9	5.05
17.5	18.4	5.6
20	16.3	6.73
22.5	14.7	7.49
25	13.3	6.5
27.5	12.4	6.05
30	11.2	5.33
32.5	10.6	5.29
35	10.2	5.03
37.5	9.4	4.49
40	8.6	3.86
42.5	8.3	3.76
45	8.2	3.68
50	8.5	4.3

Lake: Otter Lake (Oakland Co.)

7/12/2019



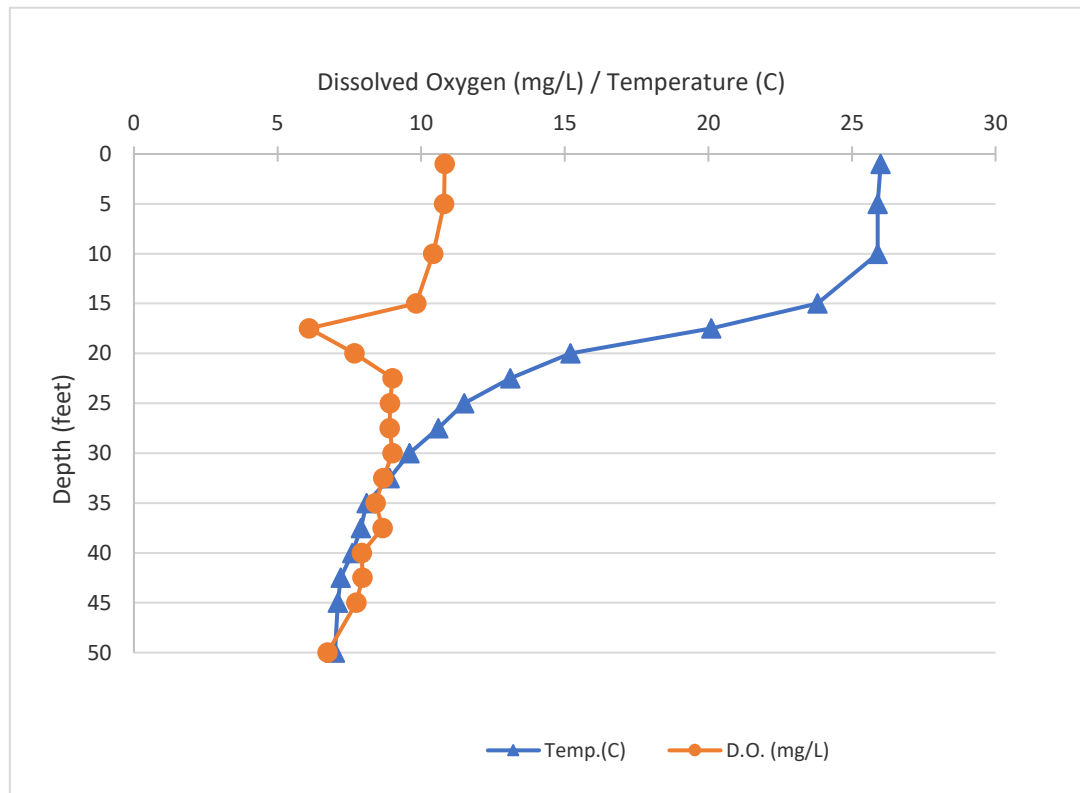
Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 7/27/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26	10.82
5	25.9	10.8
10	25.9	10.42
15	23.8	9.83
17.5	20.1	6.1
20	15.2	7.68
22.5	13.1	9
25	11.5	8.92
27.5	10.6	8.9
30	9.6	9
32.5	8.9	8.68
35	8.1	8.41
37.5	7.9	8.66
40	7.6	7.93
42.5	7.2	7.96
45	7.1	7.75
50	7	6.74

Lake: Otter Lake (Oakland Co.)

7/27/2019



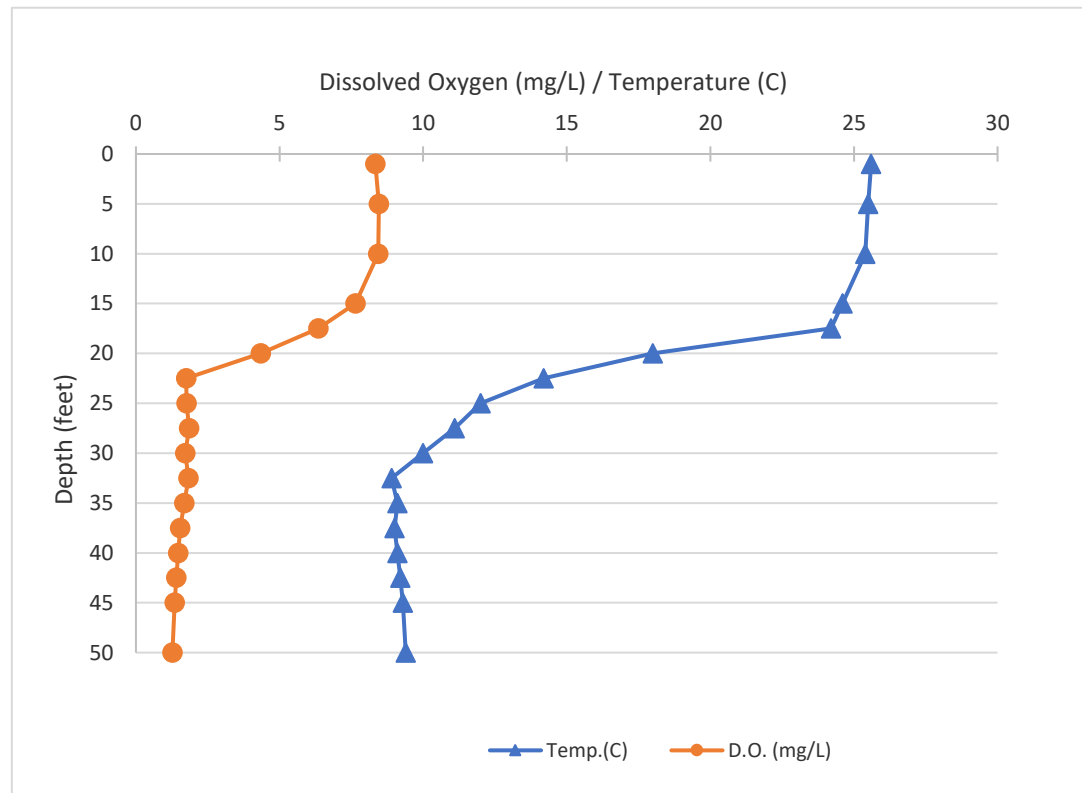
Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 8/10/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25.6	8.34
5	25.5	8.46
10	25.4	8.44
15	24.6	7.65
17.5	24.2	6.35
20	18	4.35
22.5	14.2	1.75
25	12	1.76
27.5	11.1	1.85
30	10	1.72
32.5	8.9	1.83
35	9.1	1.68
37.5	9	1.54
40	9.1	1.47
42.5	9.2	1.41
45	9.3	1.35
50	9.4	1.27

Lake: Otter Lake (Oakland Co.)

8/10/2019



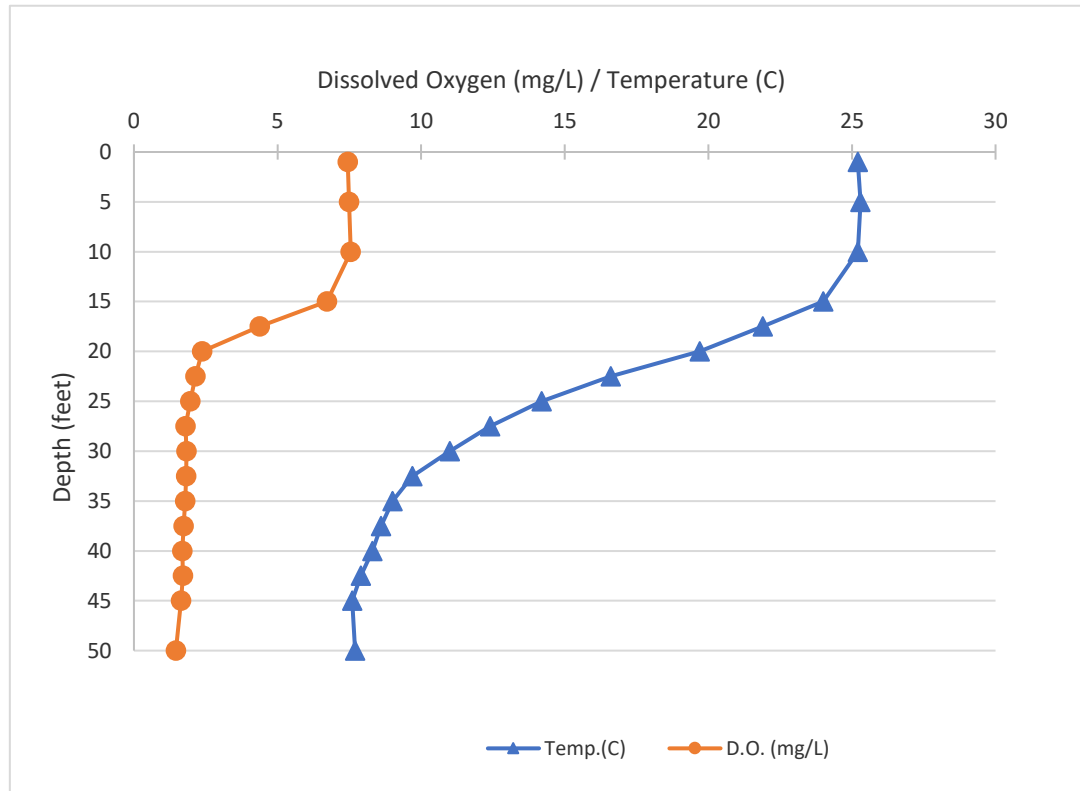
Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 8/23/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25.2	7.44
5	25.3	7.49
10	25.2	7.55
15	24	6.72
17.5	21.9	4.38
20	19.7	2.37
22.5	16.6	2.14
25	14.2	1.96
27.5	12.4	1.8
30	11	1.83
32.5	9.7	1.82
35	9	1.78
37.5	8.6	1.73
40	8.3	1.69
42.5	7.9	1.71
45	7.6	1.64
50	7.7	1.46

Lake: Otter Lake (Oakland Co.)

8/23/2019



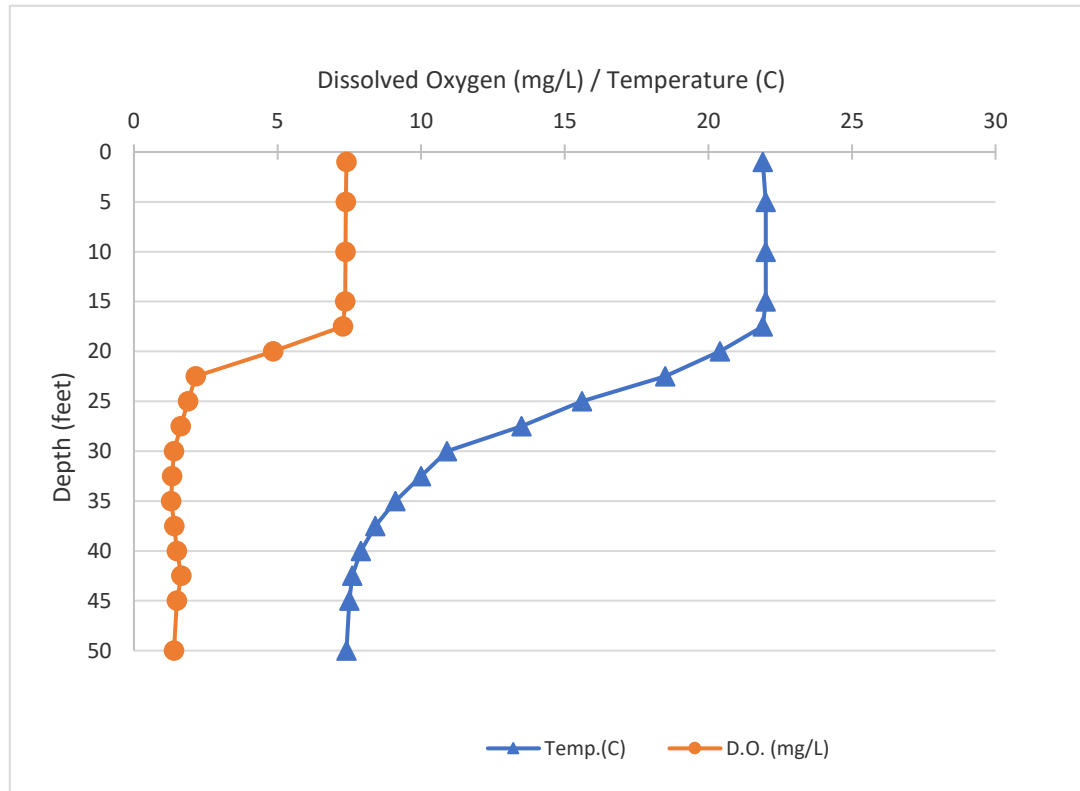
Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 9/4/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.9	7.4
5	22	7.38
10	22	7.37
15	22	7.36
17.5	21.9	7.28
20	20.4	4.85
22.5	18.5	2.15
25	15.6	1.89
27.5	13.5	1.63
30	10.9	1.39
32.5	10	1.33
35	9.1	1.3
37.5	8.4	1.41
40	7.9	1.49
42.5	7.6	1.65
45	7.5	1.5
50	7.4	1.39

Lake: Otter Lake (Oakland Co.)

9/4/2019



Name: Otter Lake
 County: Oakland
 Site ID: 631193
 Date: 9/16/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.8	8.19
5	21.7	8.1
10	21.7	8.05
15	21.1	7.78
17.5	20.6	7.42
20	19.6	6.23
22.5	18.3	3.79
25	15.8	2.1
27.5	13.4	1.45
30	11.4	1.64
32.5	10	1.77
35	9.2	1.86
37.5	8.7	1.83
40	8.3	1.85
42.5	8.1	1.84
45	8	1.75
50	7.9	1.71

Lake: Otter Lake (Oakland Co.)

9/16/2019

