



2021 Data Report for Pearl Lake, Benzie County

Site ID: 100271

44.76185°N, 85.9176°W

The CLMP is brought to you by:



EGLE MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY



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

Pearl Lake, Benzie County 2021 CLMP Results



Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Avg	Std. Dev	Carlson TSI
2021	16	6.0	21.0	13.2	5.0	40
2021 All CLMP Lakes	2817	1.0	50.0	12.7	2.9	42

No graph: Not enough data

Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Med	Std. Dev	Carlson TSI
2021	5	<1.0	10.0	<1.0	4.2	<31
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	10.0	10.0	10.0	NA
2021 All CLMP Lakes	220	<= 3	100.0	14.9	11.0

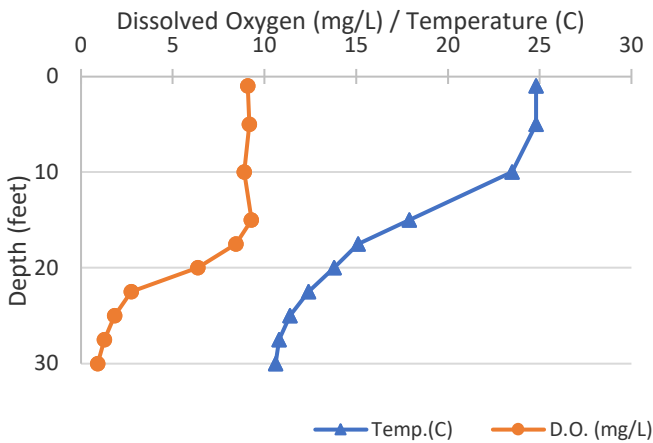
No graph: Not enough data

Summer Phosphorus (parts per billion)

Year	# Samples	Min	Max	Avg	Std. Dev	Carlson TSI
2021	1	6.0	6.0	6.0	NA	30
2021 All CLMP Lakes	281	<= 3	65.0	12.8	9.3	38

No graph: Not enough data

Dissolved Oxygen and Temperature Profile 7/20/2021



Summary

Average TSI	2021	2016-2020	1974-2015
Pearl Lake	34	NA	NA
All CLMP Lakes	42	40	43

With an average TSI score of 34 based on 2021 Secchi transparency, chlorophyll-a, and summer total phosphorus data, this lake is rated as an oligotrophic lake.

Due to its low depth and low nutrients, 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.

Welcome to the CLMP! The longer you stay in the program and the more parameters you monitor, the more interesting this report will become. Once you have eight years of data there will be enough history to analyze the long-term trend.

* = 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.

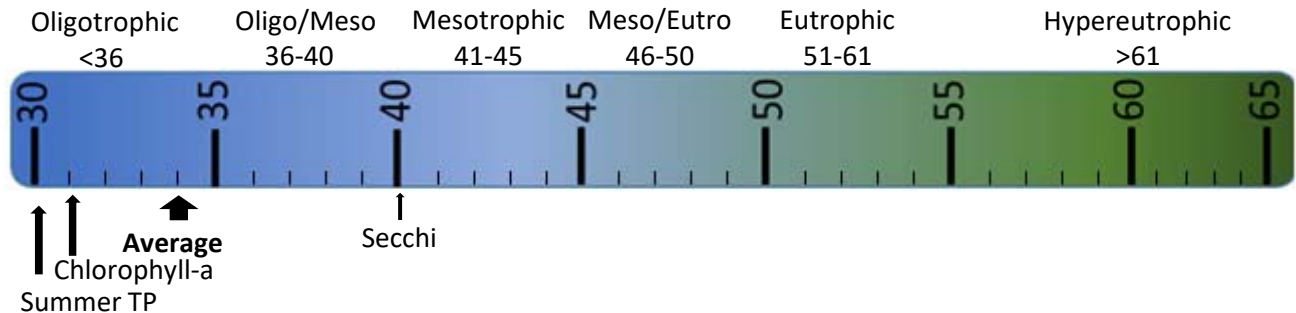
The tables below give the results-to-TSI conversions for the water quality data ranges normally seen in the CLMP. The formulas for this conversion can be found in the CLMP manual (link is on page 2 of this report).

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 Pearl Lake in 2021	
Average	34
Secchi Disk	40
Summer TP	30
Chlorophyll-a	<31



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.

Pearl Lake, Benzie County 2021 CLMP Aquatic Plant Results



The Aquatic Plant Identification and Mapping survey was conducted on Pearl Lake in 2021.

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 57 locations (19 transects) in Pearl Lake in 2021. Below is a list of species reported in order of relative abundance.

Pearl Lake, Benzie County 2021 Aquatic Plant Identification and Mapping: Species Reported		
Common Name	Latin name	Average Density*
Chara/stonewort	<i>Chara</i> sp.	3.0
Variable pondweed	<i>Potamogeton gramineus</i>	1.6
White water lily	<i>Nymphaea odorata</i>	0.9
Slender naiad	<i>Najas flexilis</i>	0.8
Floating leaf pondweed	<i>Potamogeton natans</i>	0.8
Water smartweed	<i>Persicaria amphibium</i>	0.6
Watershield	<i>Brasenia scherberi</i>	0.5
Largeleaf pondweed	<i>Potamogeton amplifolius</i>	0.5
Water celery	<i>Vallisneria americana</i>	0.3
Bladderwort	<i>Utricularia</i> sp.	0.3
Bulrush	<i>Scirpus</i> sp.	0.3
Waterweed	<i>Elodea canadensis</i>	0.3
Illinois pondweed	<i>Potamogeton illinoensis</i>	<0.1
Watermilfoil (native)	<i>Myriophyllum</i> sp.	<0.1
Sago pondweed	<i>Stuckenia pectinata</i>	<0.1
Arrowhead	<i>Sagittaria</i> sp.	<0.1
Yellow water lily	<i>Nuphar</i> sp.	<0.1
Flatstem pondweed	<i>Potamogeton zosteriformis</i>	<0.1
Longleaf/American pondweed	<i>Potamogeton nodosus</i>	<0.1
Fries' pondweed	<i>Potamogeton friesii</i>	<0.1
Northern naiad	<i>Najas gracillima</i>	<0.1
Small pondweed	<i>Potamogeton pusillus</i>	<0.1

*Lakewide. Scale: 0 (absent) - 5 (dense)

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.

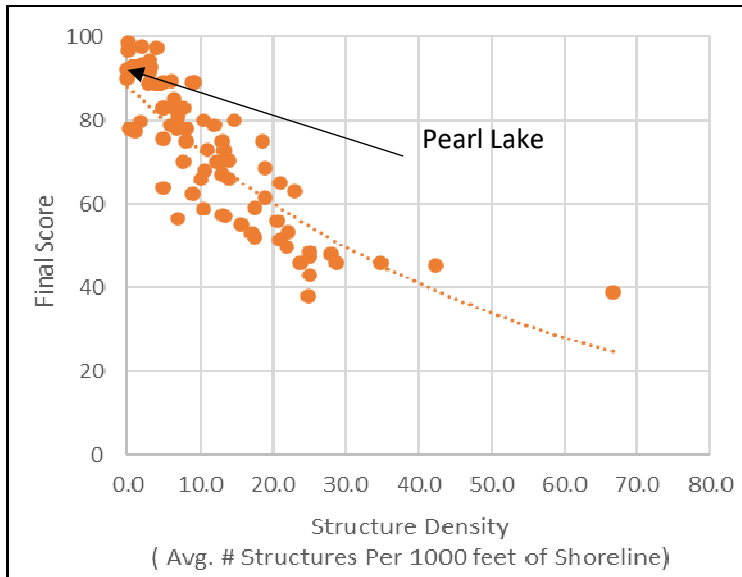
Pearl Lake, Benzie County 2021 Score the Shore Results



The Score the Shore Habitat Assessment was conducted on Pearl Lake in 2021.

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?



Pearl Lake:	
Number of Sections:	39
Number of Structures:	125
Structure Density:	3.21
Final Score:	93

All 78 Participating Lakes from 2015-2021:	
Avg. Number of Sections:	16
Avg. Number of Structures:	214
Avg. Structure Density:	12.2
Avg. Final Score:	72

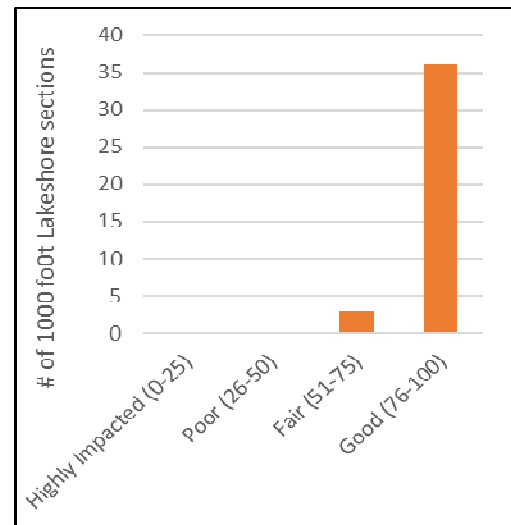
Note about graph to the left: The dotted line sets your average expectation of the score of your lake. If your lake is lower than the dotted line, then your shoreline health is lower than average compared to lakes with similar amount of shoreline development. And vice-versa in regards to a lake above the dotted line.

Analysis specific to Pearl Lake:

Overall, the lakeshore habitat of Pearl Lake is doing well and scored higher than average when compared to other lakes in the program. All of the 1000 foot sections scored either Fair or Good: 3 fair, and 36 good.

The overall lakeshore habitat is nearly pristine on Pearl Lake according to the scoring. All three categories average higher than 90 for the lake as a whole.

To make improvements, the primary thing to consider is how to improve the score of the three sections scored as "Fair". Each of these have lower scores in the Riparian category, so striving to increase this score would be the priority. 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. You can get plenty of ideas for improving shoreline health from the Michigan Natural Shoreline Partnership (<https://www.mishorelinepartnership.org/>).



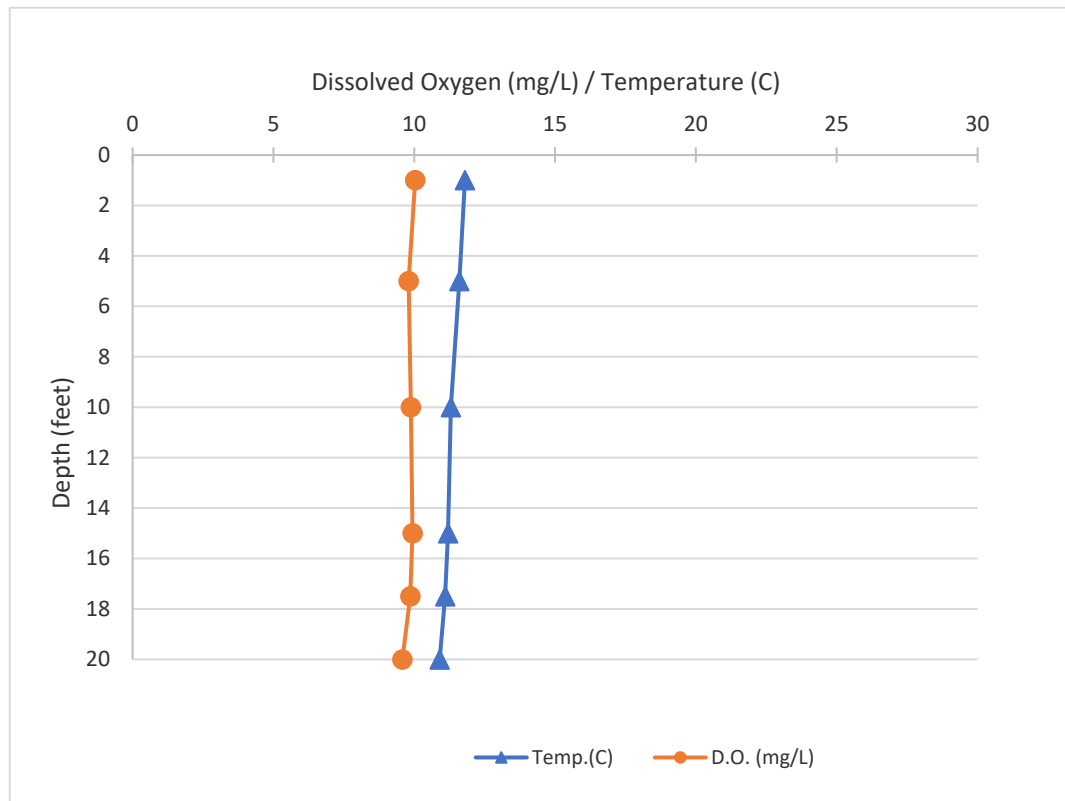
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 5/5/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	11.8	10.03
5	11.6	9.8
10	11.3	9.88
15	11.2	9.94
17.5	11.1	9.86
20	10.9	9.58

Lake: Pearl Lake (Benzie Co.)

5/5/2021



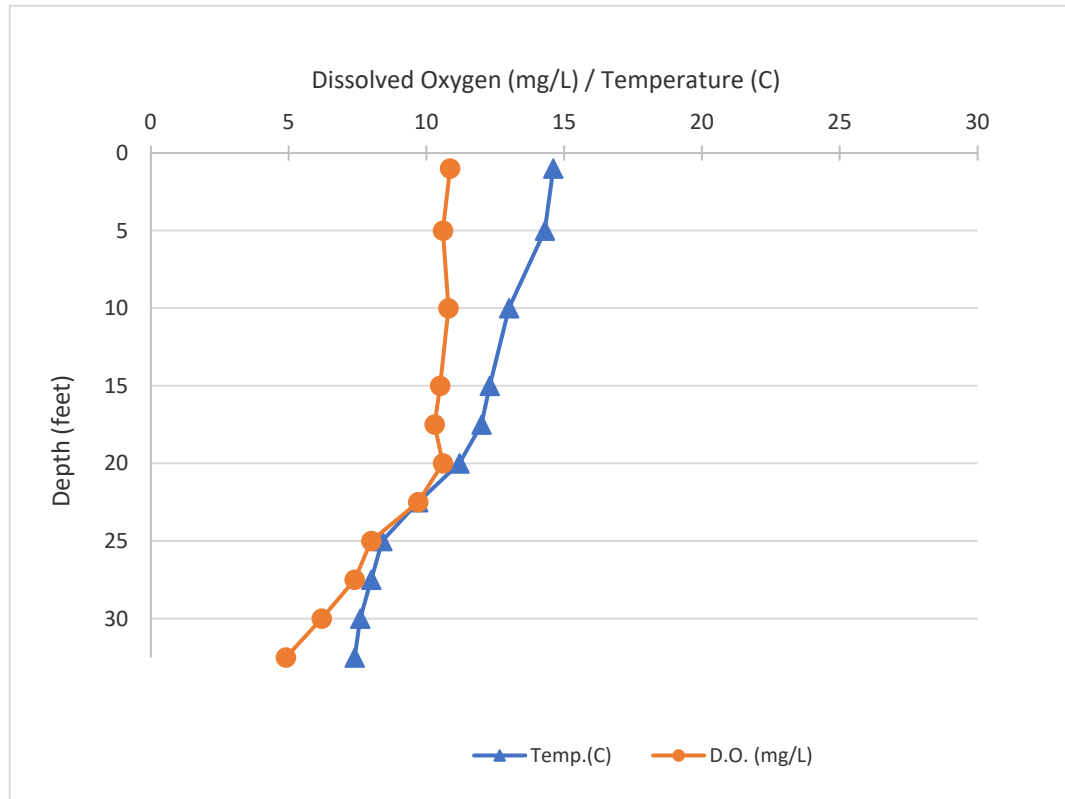
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 5/14/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	14.6	10.86
5	14.3	10.6
10	13	10.8
15	12.3	10.5
17.5	12	10.3
20	11.2	10.6
22.5	9.7	9.7
25	8.4	8
27.5	8	7.4
30	7.6	6.2
32.5	7.4	4.9

Lake: Pearl Lake (Benzie Co.)

5/14/2021



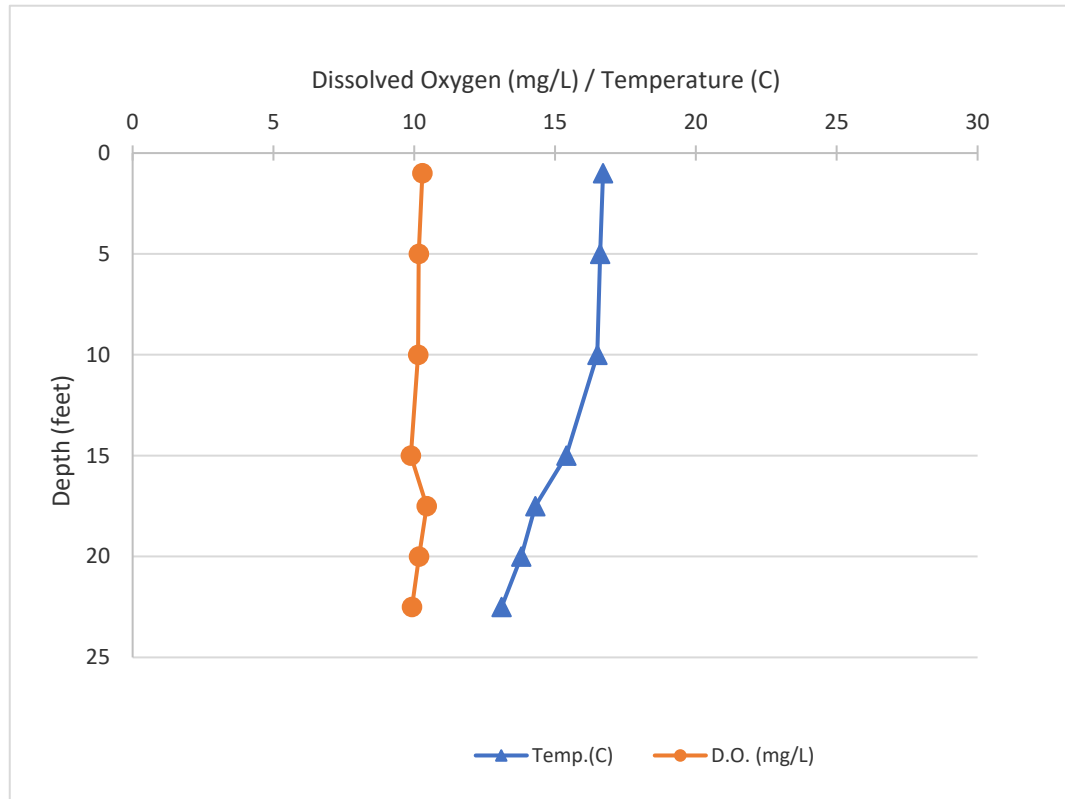
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 5/20/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	16.7	10.29
5	16.6	10.16
10	16.5	10.14
15	15.4	9.88
17.5	14.3	10.44
20	13.8	10.17
22.5	13.1	9.92

Lake: Pearl Lake (Benzie Co.)

5/20/2021



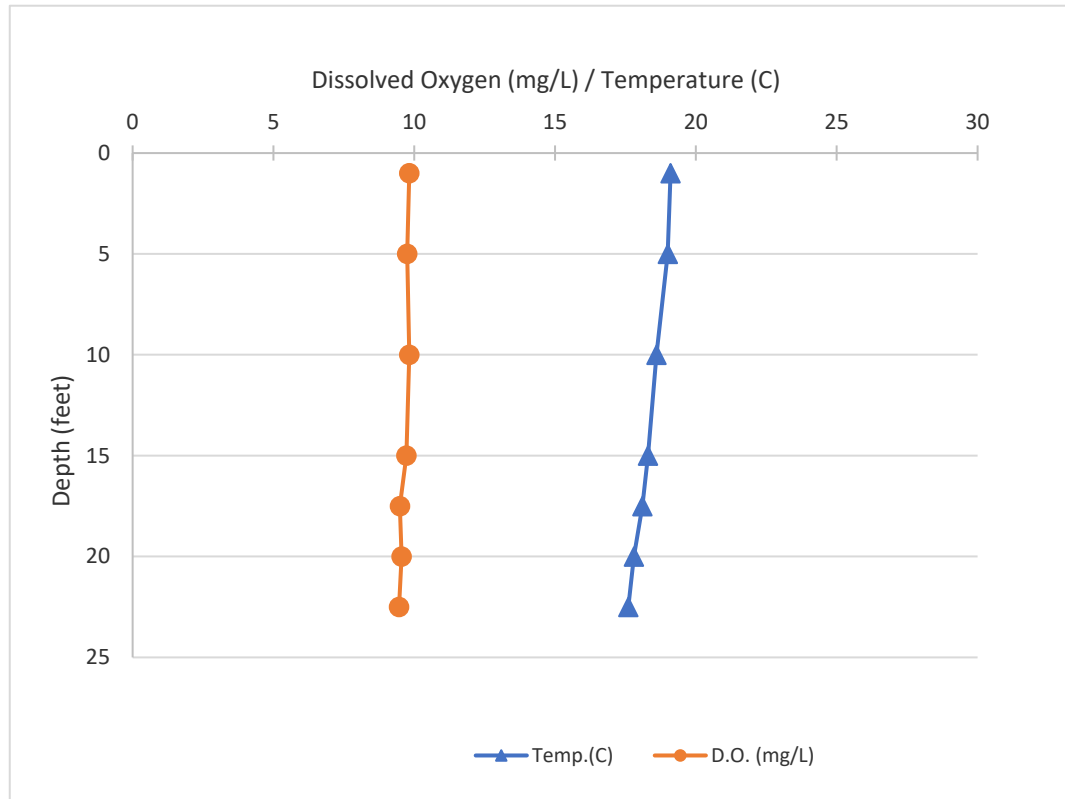
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 6/2/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	19.1	9.82
5	19	9.75
10	18.6	9.82
15	18.3	9.72
17.5	18.1	9.49
20	17.8	9.55
22.5	17.6	9.46

Lake: Pearl Lake (Benzie Co.)

6/2/2021



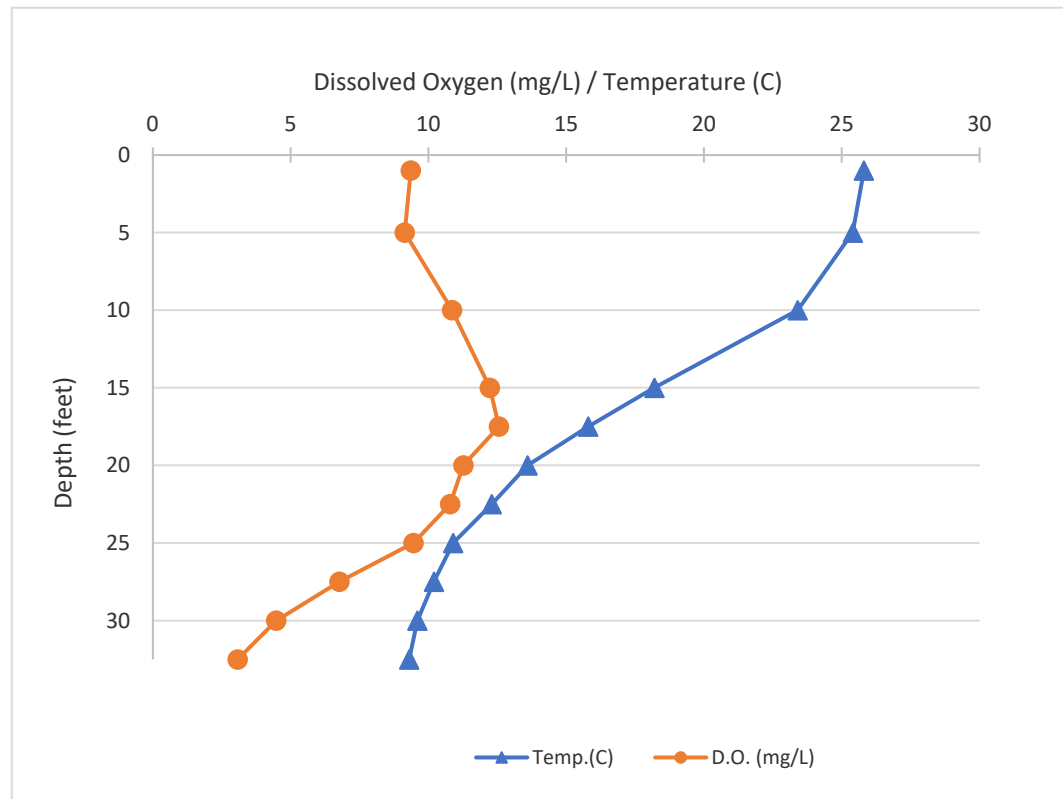
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 6/9/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25.8	9.36
5	25.4	9.14
10	23.4	10.86
15	18.2	12.23
17.5	15.8	12.56
20	13.6	11.27
22.5	12.3	10.79
25	10.9	9.46
27.5	10.2	6.77
30	9.6	4.48
32.5	9.3	3.08

Lake: Pearl Lake (Benzie Co.)

6/9/2021



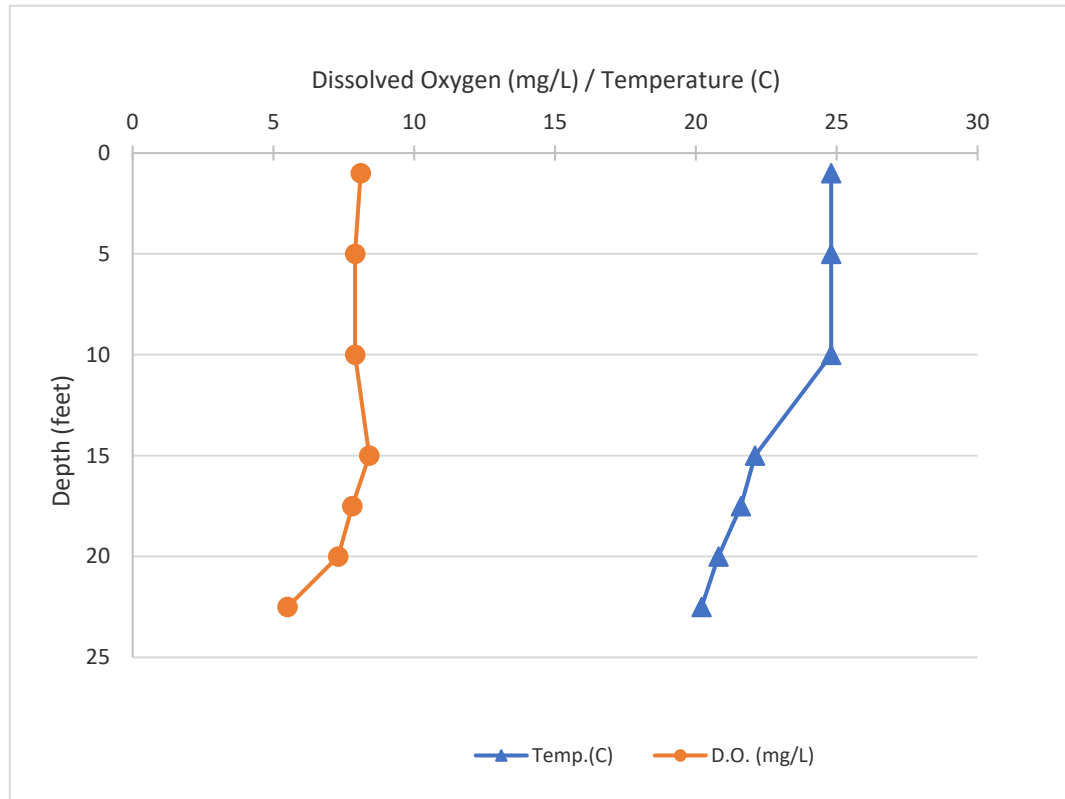
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 6/15/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.8	8.1
5	24.8	7.9
10	24.8	7.9
15	22.1	8.4
17.5	21.6	7.8
20	20.8	7.3
22.5	20.2	5.5

Lake: Pearl Lake (Benzie Co.)

6/15/2021



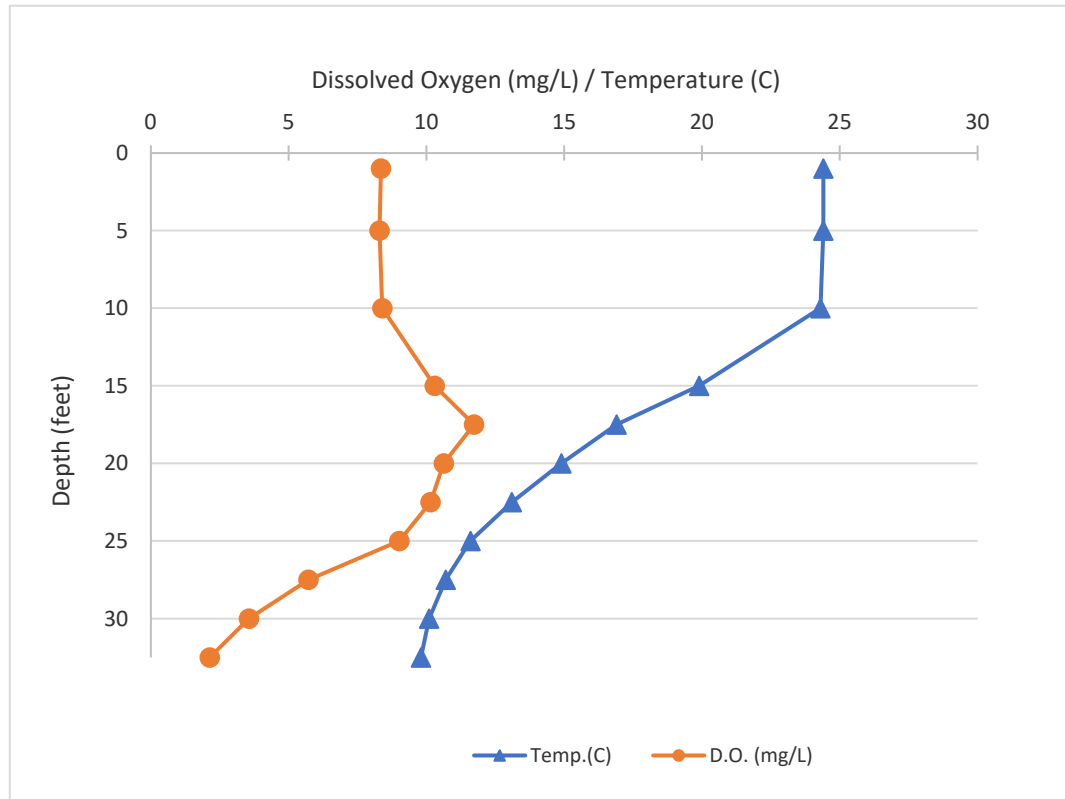
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 6/17/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.4	8.35
5	24.4	8.3
10	24.3	8.4
15	19.9	10.3
17.5	16.9	11.73
20	14.9	10.63
22.5	13.1	10.15
25	11.6	9.02
27.5	10.7	5.72
30	10.1	3.56
32.5	9.8	2.14

Lake: Pearl Lake (Benzie Co.)

6/17/2021



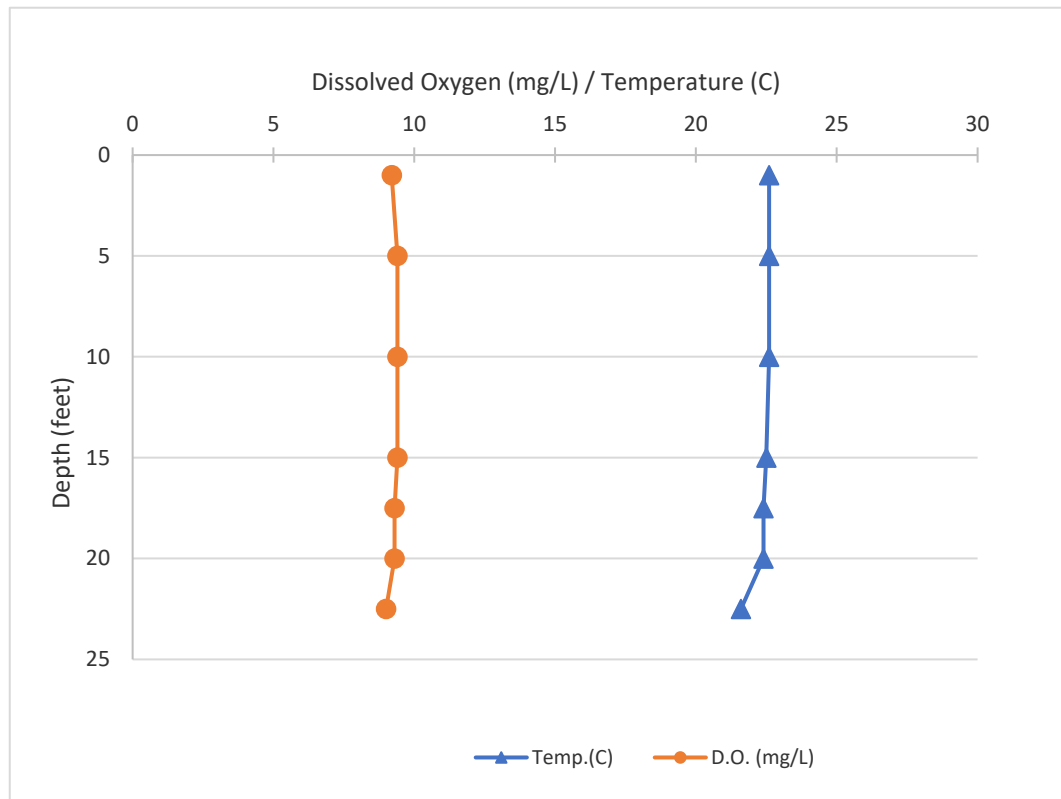
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 7/1/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	22.6	9.2
5	22.6	9.4
10	22.6	9.4
15	22.5	9.4
17.5	22.4	9.3
20	22.4	9.3
22.5	21.6	9

Lake: Pearl Lake (Benzie Co.)

7/1/2021



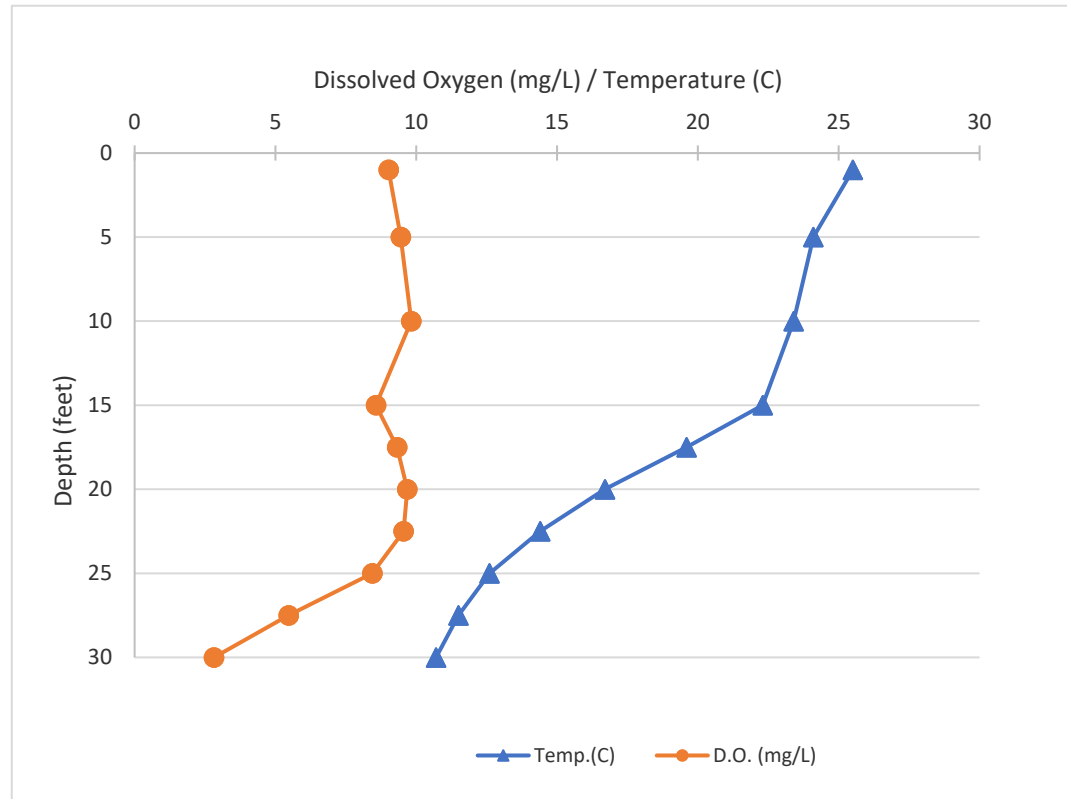
Name: Pearl Lake
 County: Benzie
 Site ID: 100271
 Date: 7/4/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	25.5	9.02
1	25.5	9.02
5	24.1	9.45
5	24.1	9.45
10	23.4	9.82
10	23.4	9.82
15	22.3	8.57
15	22.3	8.57
17.5	19.6	9.32
17.5	19.6	9.32
20	16.7	9.68
20	16.7	9.68
22.5	14.4	9.55
22.5	14.4	9.55
25	12.6	8.44
25	12.6	8.44
27.5	11.5	5.47
27.5	11.5	5.47
30	10.7	2.82
30	10.7	2.82

Lake: Pearl Lake (Benzie Co.)

7/4/2021



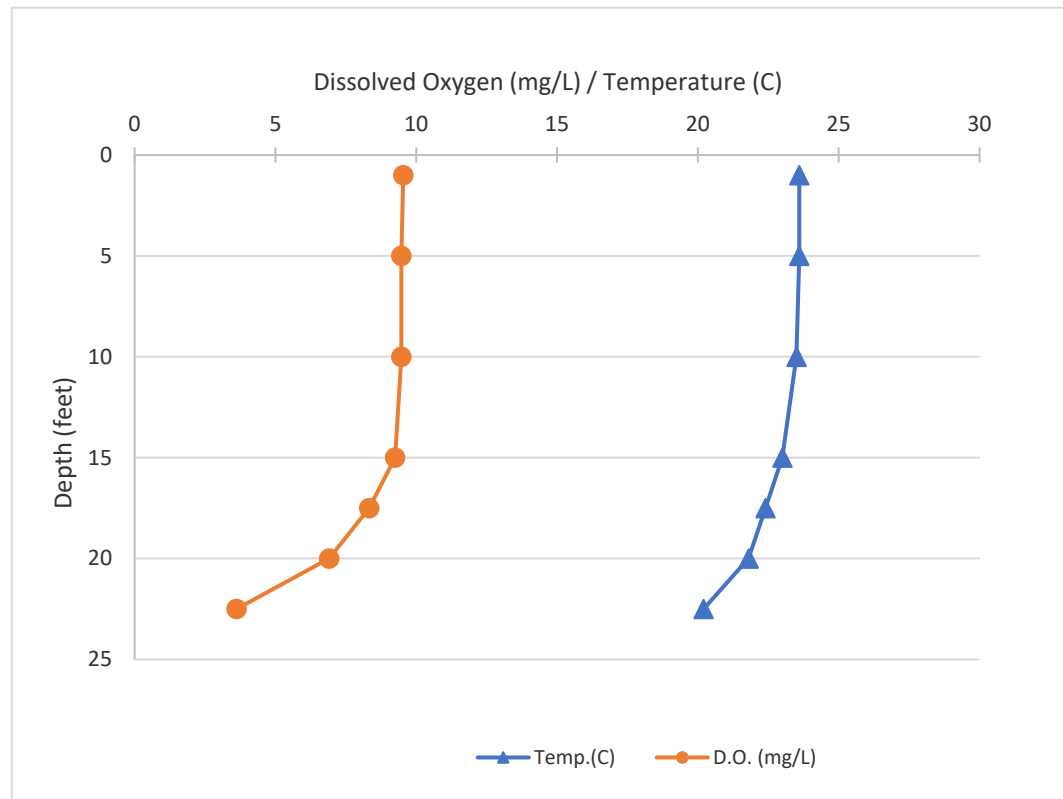
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 7/13/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	23.6	9.54
5	23.6	9.47
10	23.5	9.47
15	23	9.25
17.5	22.4	8.33
20	21.8	6.91
22.5	20.2	3.62

Lake: Pearl Lake (Benzie Co.)

7/13/2021



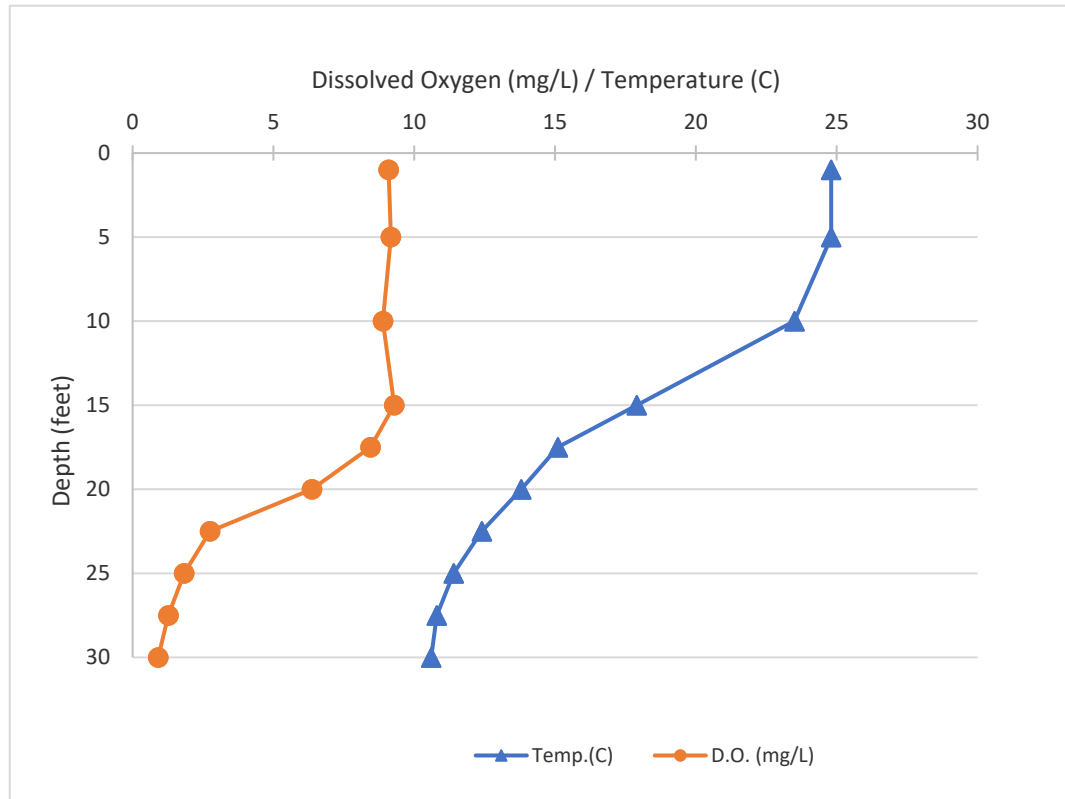
Name: Pearl Lake
 County: Benzie
 Site ID: 100271
 Date: 7/20/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.8	9.09
1	24.8	9.09
5	24.8	9.17
5	24.8	9.17
10	23.5	8.89
10	23.5	8.89
15	17.9	9.29
15	17.9	9.29
17.5	15.1	8.45
17.5	15.1	8.45
20	13.8	6.37
20	13.8	6.37
22.5	12.4	2.75
22.5	12.4	2.75
25	11.4	1.83
25	11.4	1.83
27.5	10.8	1.27
27.5	10.8	1.27
30	10.6	0.91
30	10.6	0.91

Lake: Pearl Lake (Benzie Co.)

7/20/2021



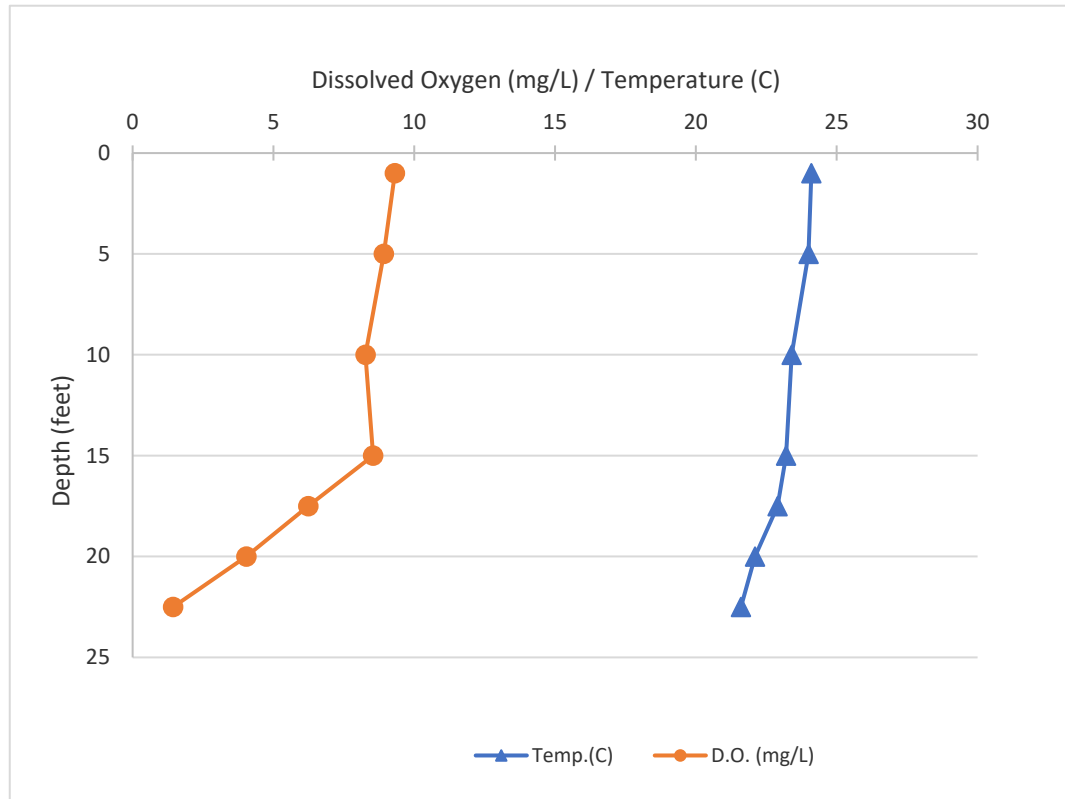
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 8/5/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.1	9.31
5	24	8.92
10	23.4	8.27
15	23.2	8.54
17.5	22.9	6.24
20	22.1	4.04
22.5	21.6	1.44

Lake: Pearl Lake (Benzie Co.)

8/5/2021



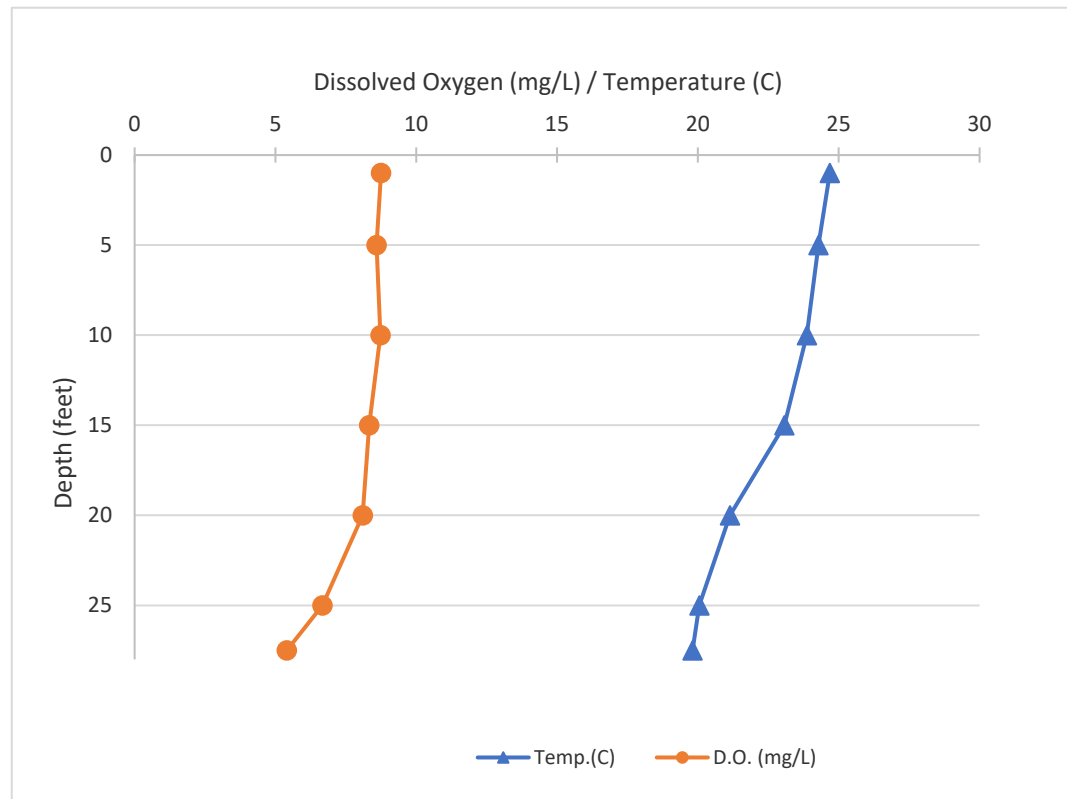
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 8/10/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.68	8.75
5	24.28	8.59
10	23.87	8.73
15	23.07	8.33
20	21.14	8.1
25	20.05	6.67
27.5	19.81	5.4

Lake: Pearl Lake (Benzie Co.)

8/10/2021



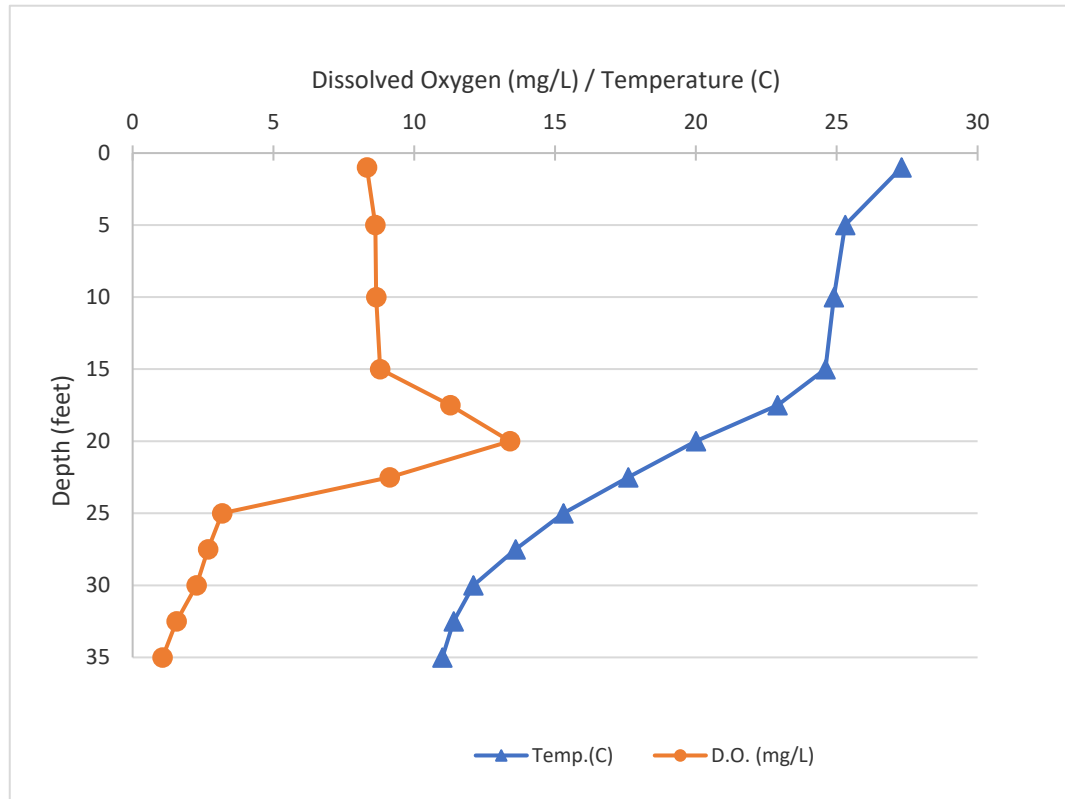
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 8/18/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	27.3	8.32
5	25.3	8.62
10	24.9	8.65
15	24.6	8.79
17.5	22.9	11.28
20	20	13.4
22.5	17.6	9.13
25	15.3	3.18
27.5	13.6	2.68
30	12.1	2.27
32.5	11.4	1.56
35	11	1.06

Lake: Pearl Lake (Benzie Co.)

8/18/2021



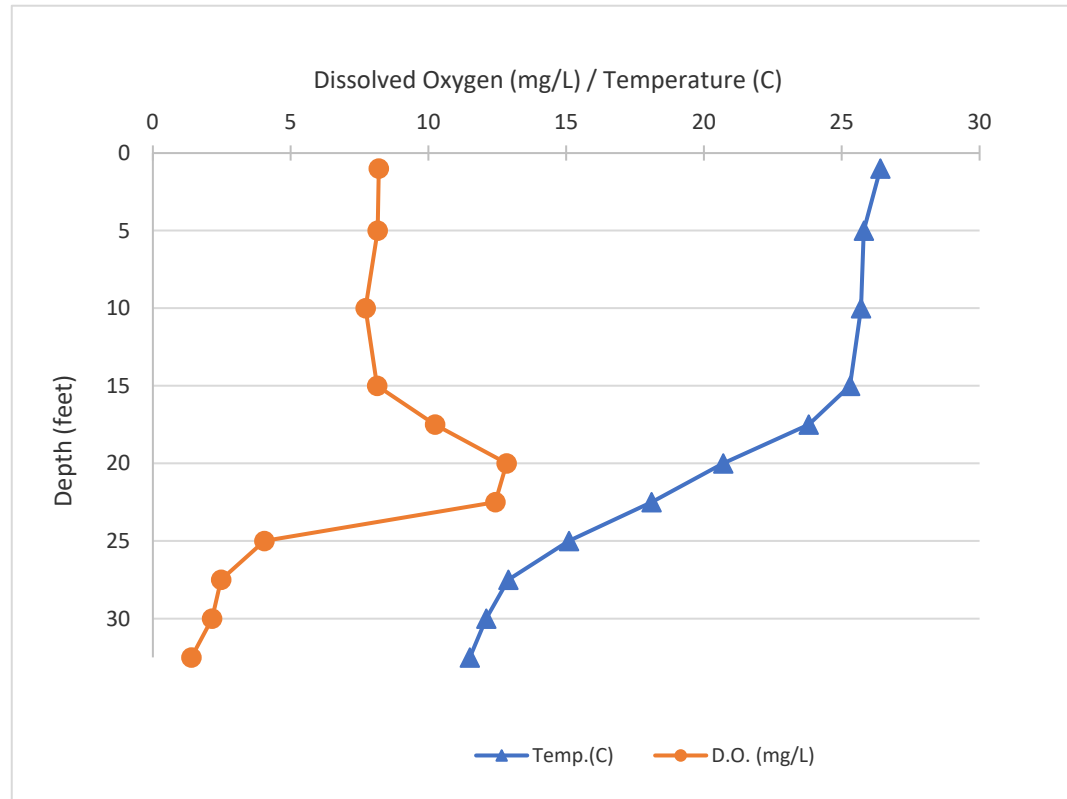
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 8/24/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26.4	8.2
5	25.8	8.16
10	25.7	7.72
15	25.3	8.14
17.5	23.8	10.24
20	20.7	12.84
22.5	18.1	12.43
25	15.1	4.05
27.5	12.9	2.48
30	12.1	2.15
32.5	11.5	1.4

Lake: Pearl Lake (Benzie Co.)

8/24/2021



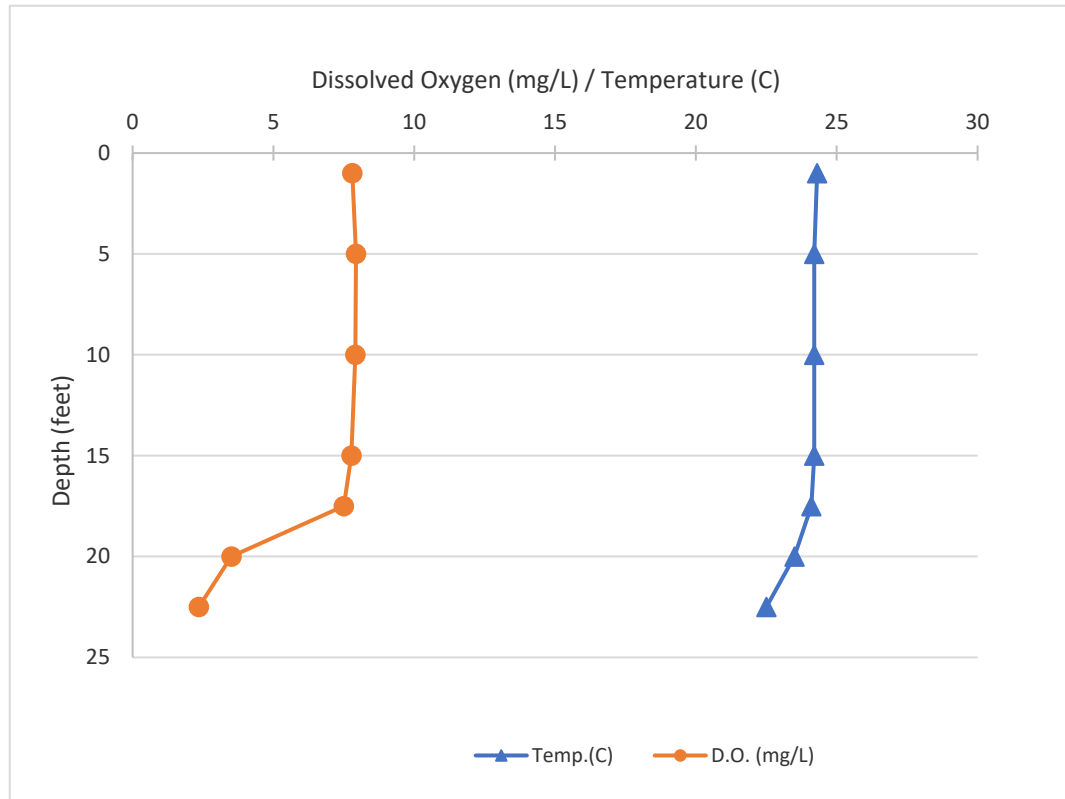
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 9/1/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	24.3	7.8
5	24.2	7.93
10	24.2	7.91
15	24.2	7.77
17.5	24.1	7.5
20	23.5	3.51
22.5	22.5	2.35

Lake: Pearl Lake (Benzie Co.)

9/1/2021



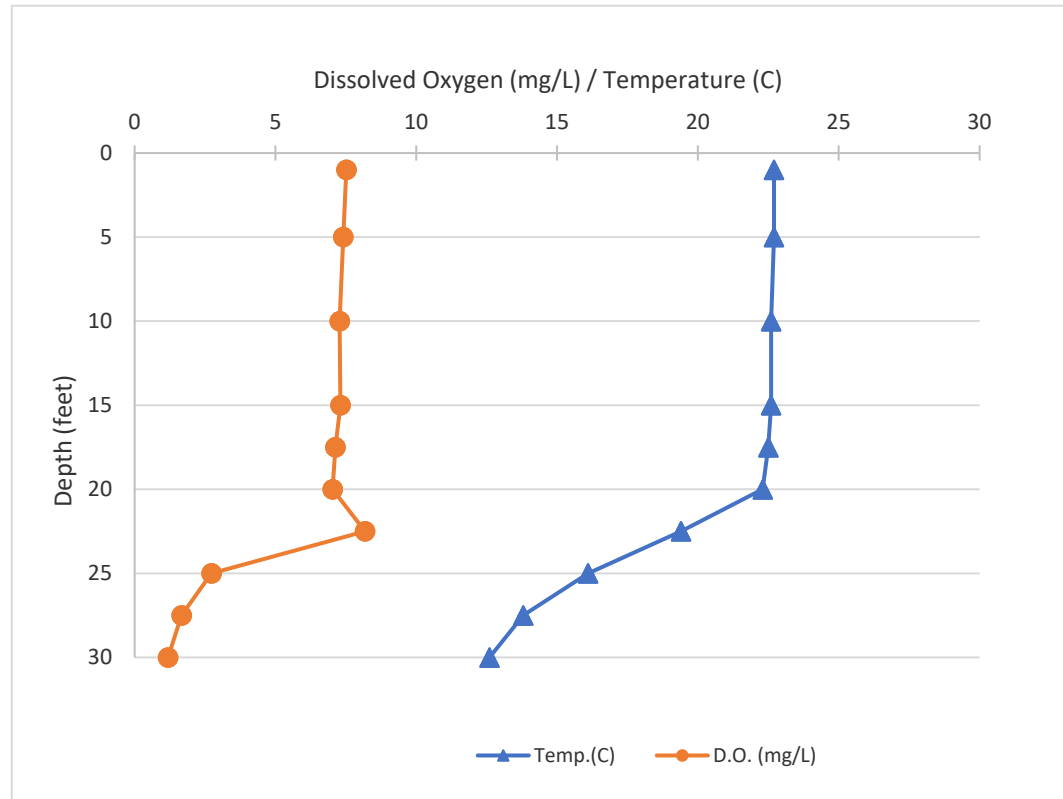
Name: Pearl Lake
 County: Benzie
 Site ID: 100271
 Date: 9/6/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	22.7	7.52
1	22.7	7.52
5	22.7	7.41
5	22.7	7.41
10	22.6	7.28
10	22.6	7.28
15	22.6	7.31
15	22.6	7.31
17.5	22.5	7.13
17.5	22.5	7.13
20	22.3	7.03
20	22.3	7.03
22.5	19.4	8.18
22.5	19.4	8.18
25	16.1	2.73
25	16.1	2.73
27.5	13.8	1.67
27.5	13.8	1.67
30	12.6	1.19
30	12.6	1.19

Lake: Pearl Lake (Benzie Co.)

9/6/2021



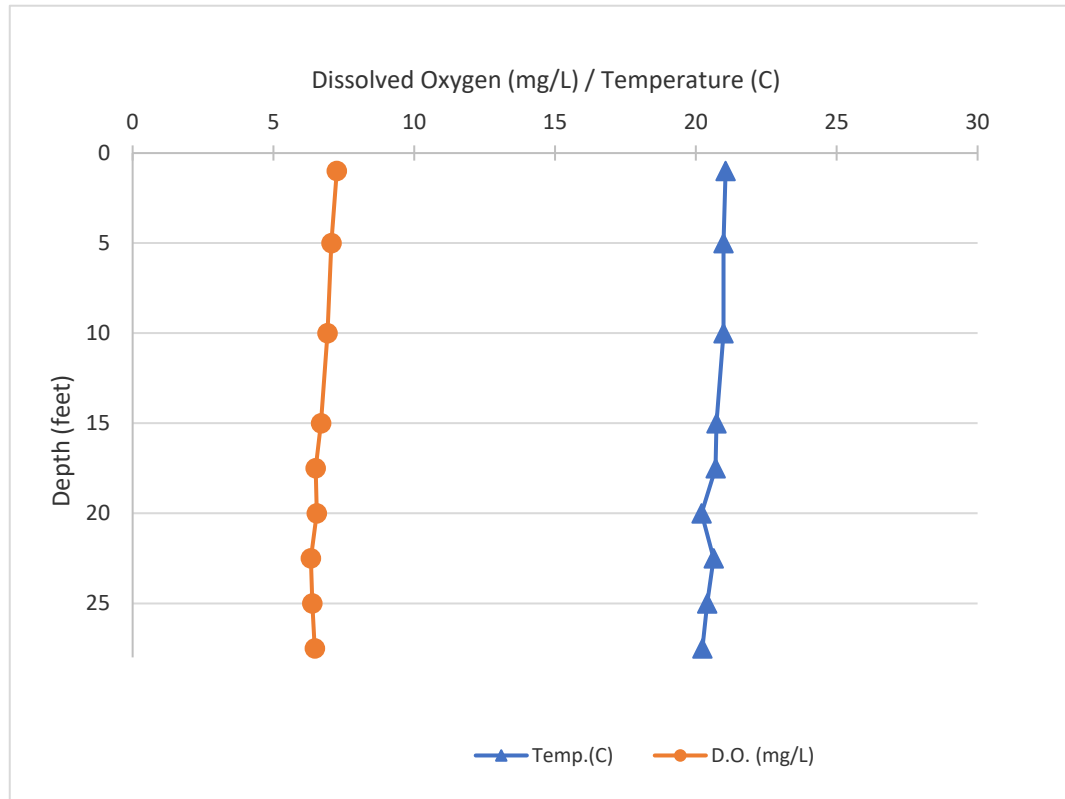
Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 9/9/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21.05	7.25
5	20.98	7.06
10	20.98	6.92
15	20.73	6.69
17.5	20.7	6.5
20	20.2	6.54
22.5	20.63	6.33
25	20.4	6.38
27.5	20.23	6.47

Lake: Pearl Lake (Benzie Co.)

9/9/2021



Name: Pearl Lake
County: Benzie
Site ID: 100271
Date: 9/13/2021

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	21	7.79
5	21.1	7.74
10	21.1	7.47
15	21	7.15
17.5	21	7.21
20	20.8	7.28
22.5	20.2	6.04
25	17.3	1.53
27.5	14.8	1.18
30	12.6	1.36
32.5	11.8	0.46

Lake: Pearl Lake (Benzie Co.)

9/13/2021

