Cooperative Lakes Monitoring Program

Michigan Lakes– Ours to Protect

2019 Data Report for Spider Lake, Grand Traverse County

Site ID: 280395

44.6760°N, 85.4994°W

The CLMP is brought to you by:

Michigan Clean Water Corps

EGLE Michigan Department of Environment, Great Lakes, and Energy

Michigan State University

Huron River Watershed Council

Great Lakes Commission des Grands Lacs

Michigan Lakes and Streams Association

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

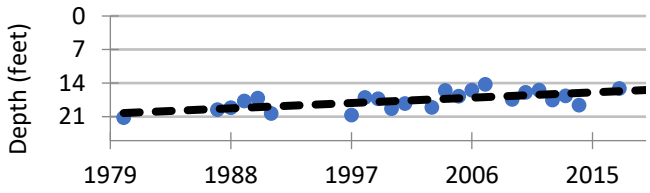
Questions?
If you have questions on this report or believe that the tabulated data for your lake in this report are in error please contact:
Paul Steen (psteen@hrwc.org), MiCorps Program Manager

Site ID: 280395

Spider Lake, Grand Traverse County
2019 CLMP Results

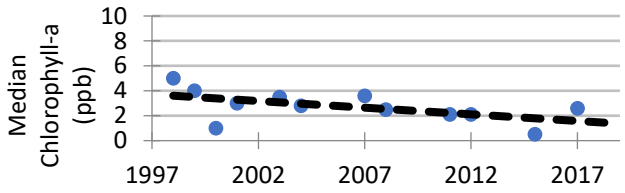
Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Average	Std. Dev	Carlson TSI
2019	4	9.5	20.5			
2014-2018	29	10.0	26.0	14.5	5.0	36
1980-2013	348	10.0	35.0	17.7	4.9	36
2019 All CLMP Lakes	3392	1.5	50.0	12.8	5.8	42



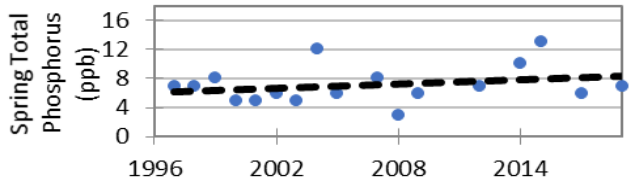
Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Median	Std. Dev	Carlson TSI
2019	3*	<1.0	3.2			
2014-2018	10	<1.0	32.0	1.6	7.1	32
1998-2013	63	<1.0	7.0	1.6	1.5	41
2019 All CLMP Lakes	635	< 1.0	42.0	2.2	3.4	39



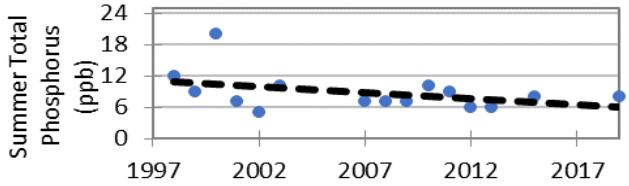
Spring Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev
2019	1	7.0	7.0	7.0	NA
2014-2018	3	6.0	13.0	9.7	3.5
1997-2013	13	<=3 W	12.0	6.5	2.1
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	8.0	8.0	8.0	NA	34
2014	1	8.0	8.0	8.0	NA	34
1998-2013	13	5.0	20.0	8.8	3.9	35
2019 All CLMP Lakes	281	<= 3	65.0	12.8	9.3	38



Dissolved Oxygen and Temperature Profile

This lake does not have recent (within 5 years) dissolved oxygen/water temperature data available. Consider enrolling in this parameter next year. Fish, insects, mollusks, and crustaceans need dissolved oxygen to live in water. By late summer, many lakes stratify, with cold anoxic water on the bottom and warm, oxygen rich water on the surface. Anoxic (oxygen-depleted) water occurring too close to the surface is a sign of nutrient enrichment. Understanding the pattern of dissolved oxygen and water temperature in a lake is important for assessing nutrient problems as well as the health of the biological community.

Summary

Average TSI	2019	2014-2018	1980-2013
Spider Lake	34	34	37
All CLMP Lakes	40	40	42

With an average TSI score of 34 based on 2019 summer total phosphorus data, this lake is rated as an oligotrophic lake.

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

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.

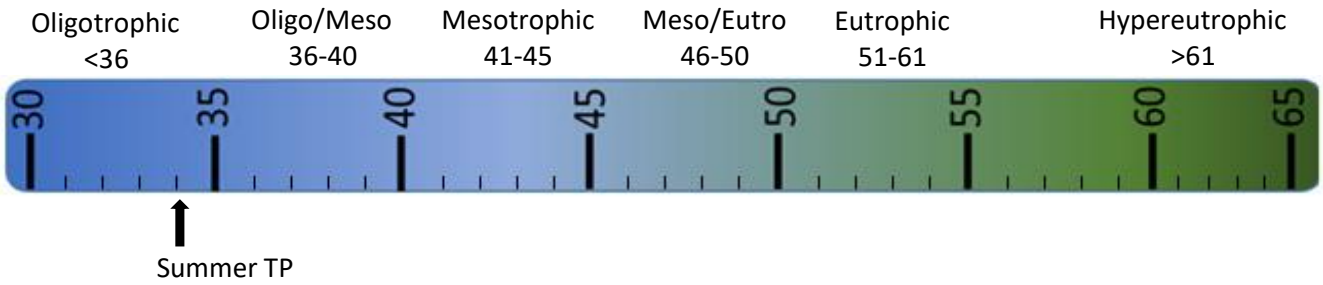
The tables below give the results-to-TSI conversions for the water quality data ranges normally seen in the CLMP. The formulas for this conversion can be found in the CLMP manual: **https://micorps.net/wp-content/uploads/sites/63/2019/06/CLMP-Manual-2019update.pdf**

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 Spider Lake in 2019	
Average	
Secchi Disk	
Summer TP	34
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 euthrophic lakes. These lakes exhibit extremely high productivity, such as nuisance algae and weed growth.

Site ID: 280395

Spider Lake, Grand Traverse County
2019 Exotic Aquatic Plant Watch Results

Spider Lake was enrolled in the Exotic Aquatic Plant Watch, but no survey results were reported in 2019.

Why is monitoring aquatic plants important?

A major component of the plant community in lakes is the large, leafy, rooted plants. Compared to the microscopic algae the rooted plants are large. Sometimes they are collectively called the "macrophytes" ("macro" meaning large and "phyte" meaning plant). These macrophytes are the plants that people sometimes complain about and refer to as lake weeds.

Far from being weeds, macrophytes or rooted aquatic plants are a natural and essential part of the lake, just as grasses, shrubs and trees are a natural part of the land. Their roots are a fabric for holding sediments in place, reducing erosion and maintaining bottom stability. They provide habitat for fish, including structure for food organisms, nursery areas, foraging and predator avoidance. Waterfowl, shore birds and aquatic mammals use plants to forage on and within, and as nesting materials and cover.

Though plants are important to the lake, overabundant plants can negatively affect fish populations, fishing and other recreational activities. Rooted plant populations increase in abundance as nutrient concentrations increase in the lake. As lakes become more eutrophic rooted plant populations increase. They are rarely a problem in oligotrophic lakes, only occasionally a problem in mesotrophic lakes, sometimes a problem in eutrophic lakes, and often a problem in hypereutrophic lakes.

However, sometimes a lake is invaded by an aquatic plant species that is not native to Michigan. In these cases, even nutrient poor oligotrophic lakes can be threatened. Some of these exotic plants, like Curly-leaf Pondweed, Eurasian Milfoil, Starry Stonewort, and Hydrilla can be extremely disruptive to the lake's ecosystem and recreational activities.

To avoid a takeover by exotic plants, it is necessary to use Integrated Pest Management (IPM) strategies: monitoring, early detection, rapid response, maintenance control, and preventive management. For more information on these strategies, check out Integrated Pest Management for Nuisance Exotics in Michigan Inland Lakes (MSU Extension Water Quality Publication WQ-56, available at https://micorps.net/lake-monitoring/clmp-documents/)

The CLMP offers two parameters on aquatic plants. In the Exotic Aquatic Plant Watch, volunteers concentrate on monitoring and early detection of exotic invasive plants only. In Aquatic Plant Identification and Mapping, volunteers identify all native and non-native plants. In both parameters, volunteers create lake maps or use digital tools to georeference where the plants are found.

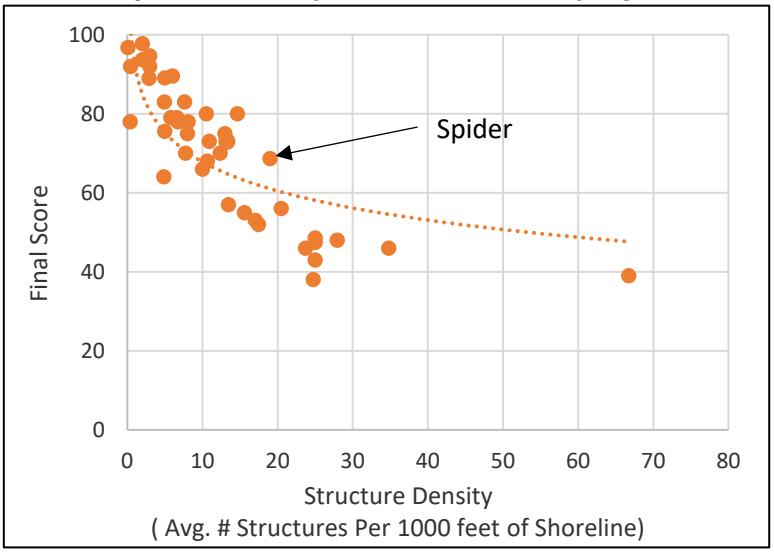
Site ID: 280395

Spider Lake, Grand Traverse County
2017 Score the Shore Results

The Score the Shore Habitat Assessment was conducted on Spider Lake in 2017.

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?



Spider Lake:	
Number of Sections:	58
Number of Structures:	1117
Structure Density:	19.3
Final Score:	69

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

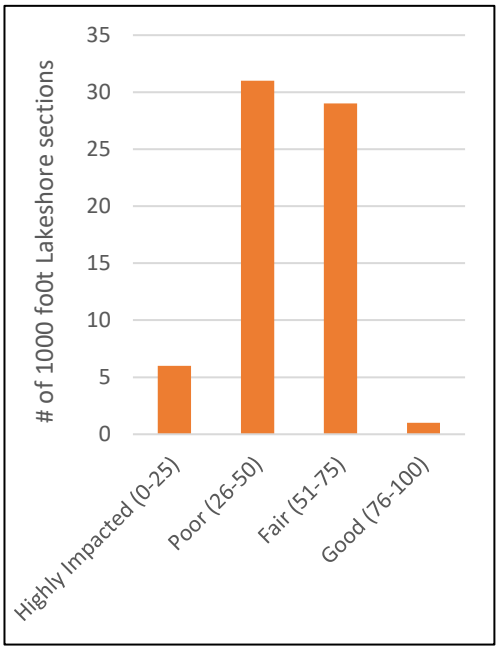
There is a very tight relationship between Final Score and Structure Density. It will be interesting to see if and how this changes as more lakes go through this scoring process.

Analysis specific to Spider Lake:

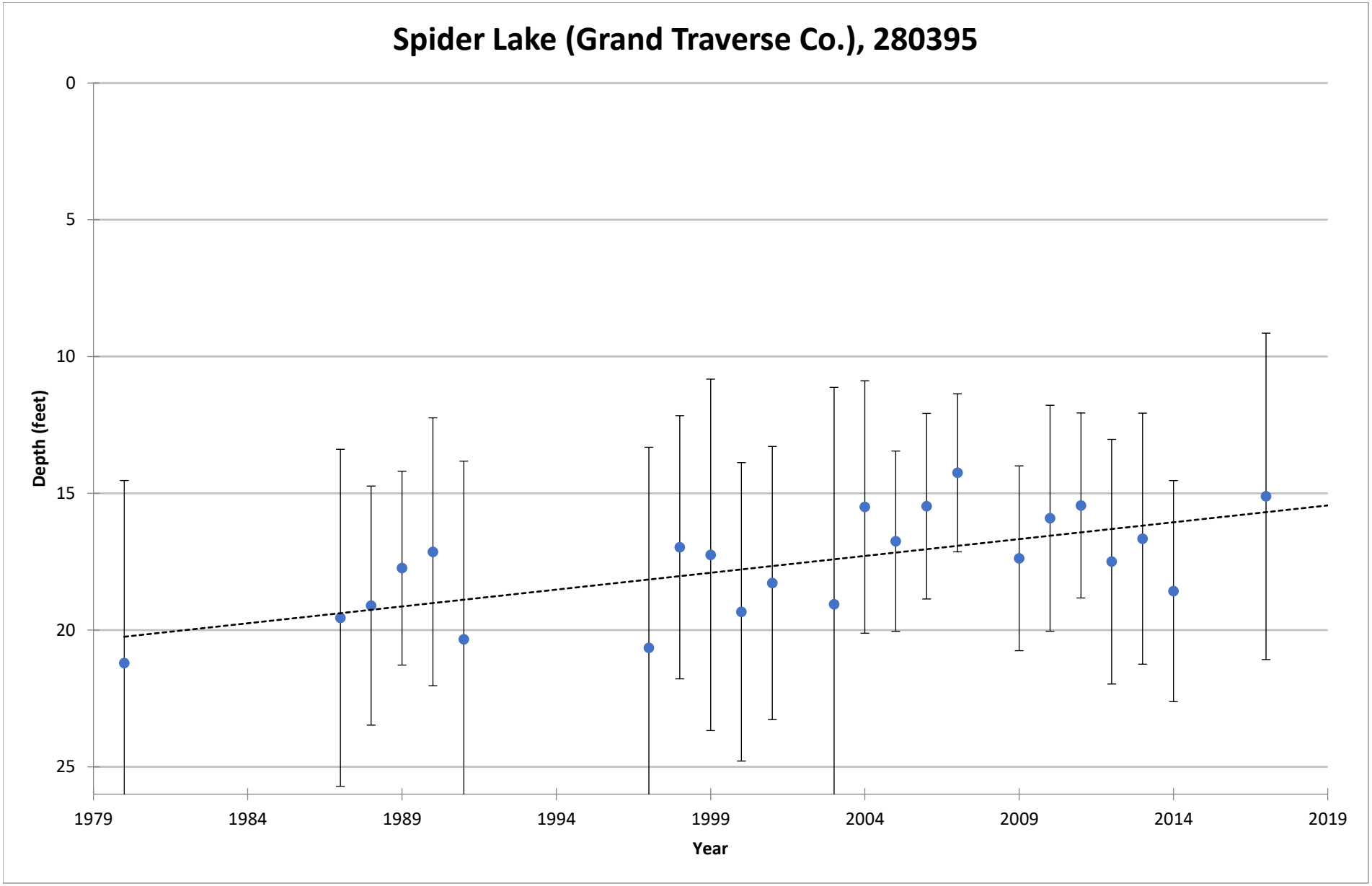
Overall, the lakeshore habitat of Spider Lake is doing well and close to the average when compared to other lakes in the program. The vast majority of the lake sections got a score of either fair or good.

All three of the scoring categories came out approximately the same on Spider Lake (Average scores: Littoral 62, Riparian 70, Erosion Control 74) This means that there is no particular strength or weakness to the habitat on Spider Lake.

To improve scores, residents should work on all three categories. Keep native plants in the shallows, allow unvegetated areas to grow on the shoreline, and remove sea wall whenever possible.

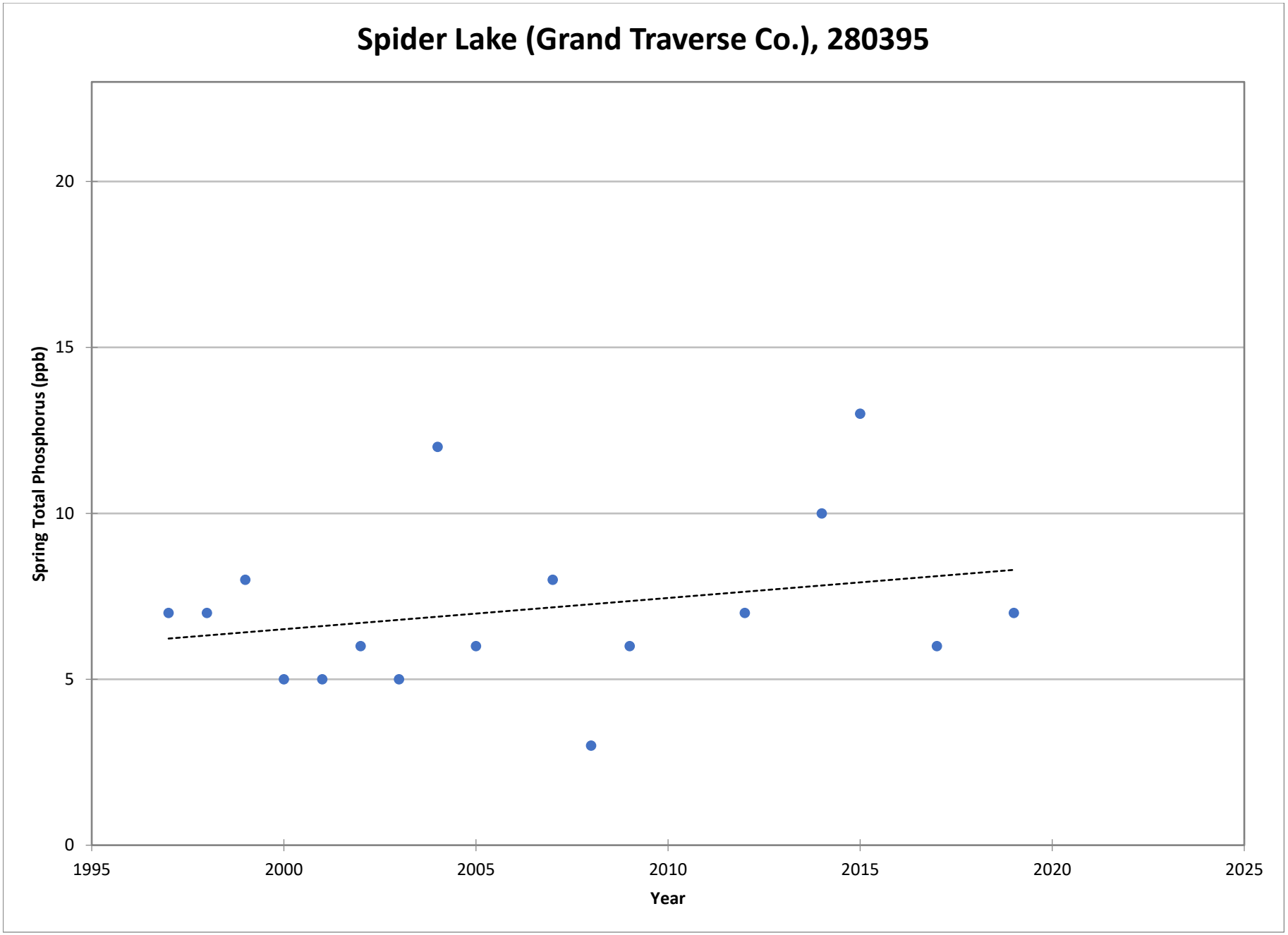


COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEAN TRANSPARENCY

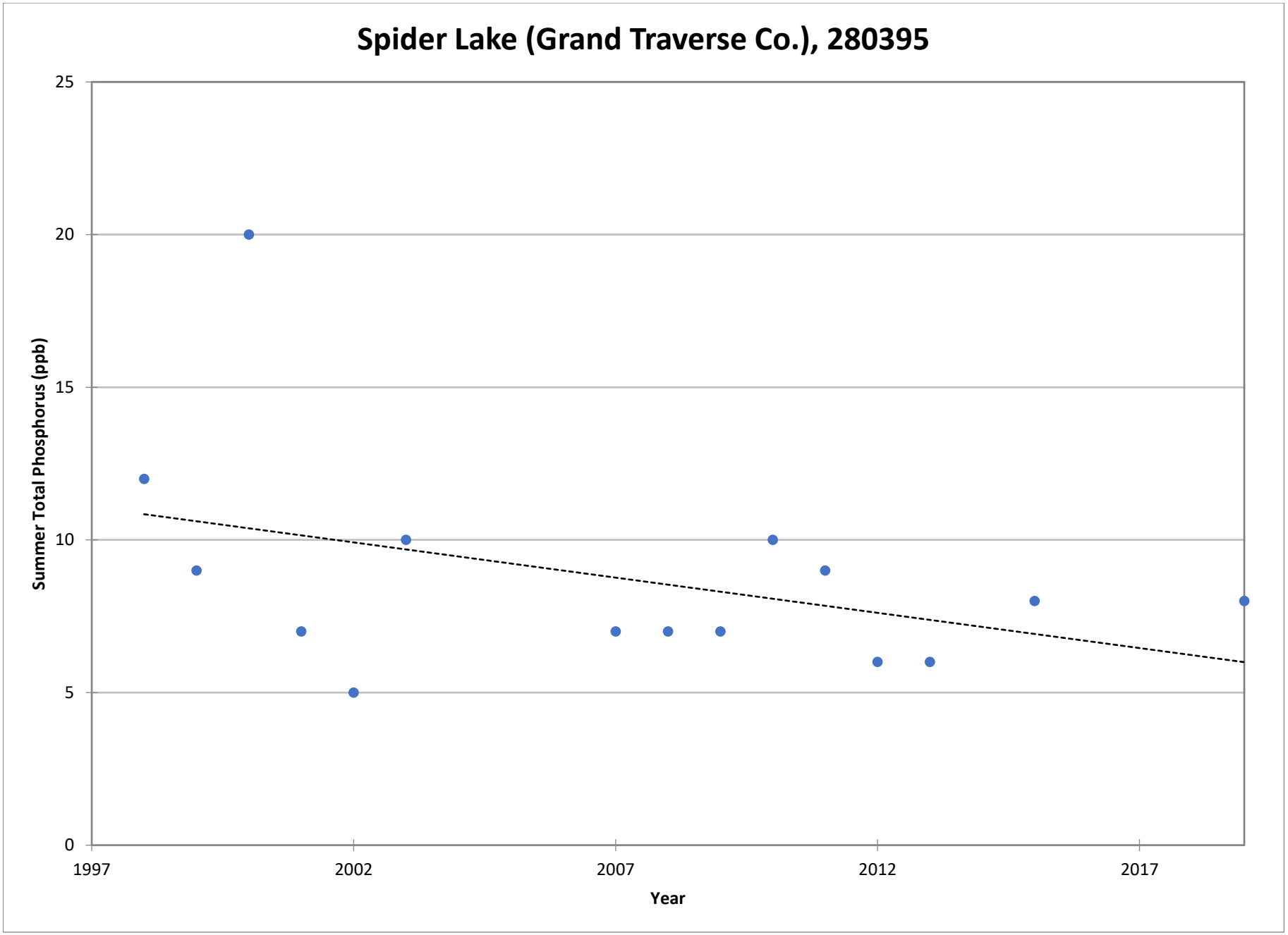


Vertical bars indicate standard deviation

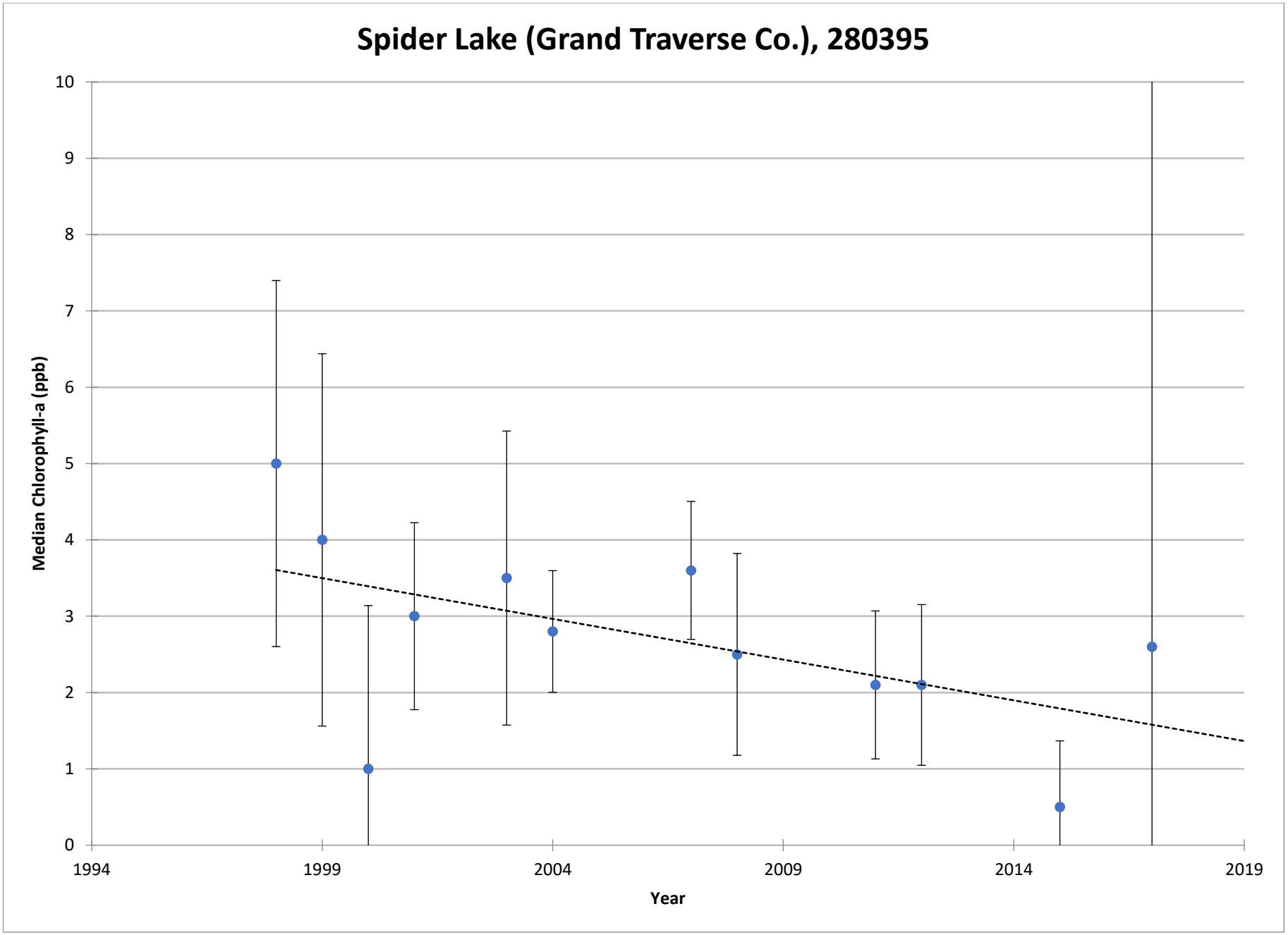
COOPERATIVE LAKES MONITORING PROGRAM
SPRING TOTAL PHOSPHORUS



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER TOTAL PHOSPHORUS



COOPERATIVE LAKES MONITORING PROGRAM
SUMMER MEDIAN CHLOROPHYLL-A



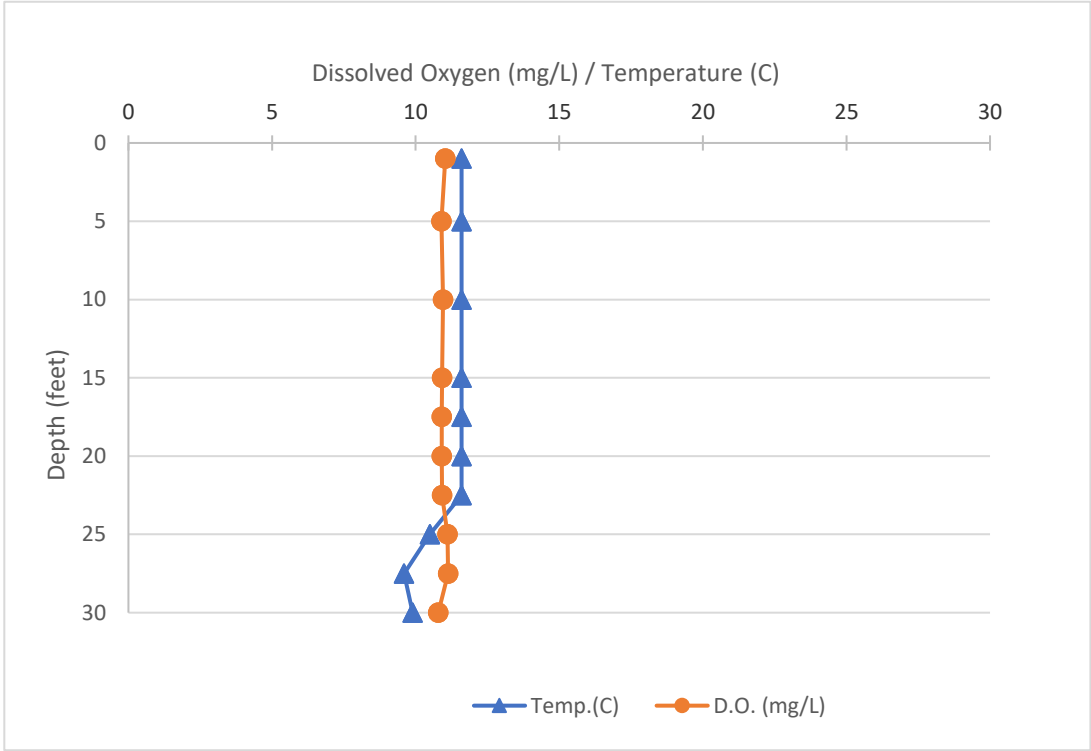
Vertical bars indicate standard deviation

Name: Spider Lake
County: Grand Traverse
Site ID: 280395
Date: 5/8/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	11.6	11.03
1	11.6	11.03
5	11.6	10.9
5	11.6	10.9
10	11.6	10.95
10	11.6	10.95
15	11.6	10.92
15	11.6	10.92
17.5	11.6	10.91
17.5	11.6	10.91
20	11.6	10.91
20	11.6	10.91
22.5	11.6	10.92
22.5	11.6	10.92
25	10.5	11.11
25	10.5	11.11
27.5	9.6	11.13
27.5	9.6	11.13
30	9.9	10.79
30	9.9	10.79

Lake: Spider Lake (Grand Traverse Co.) **5/8/2019**

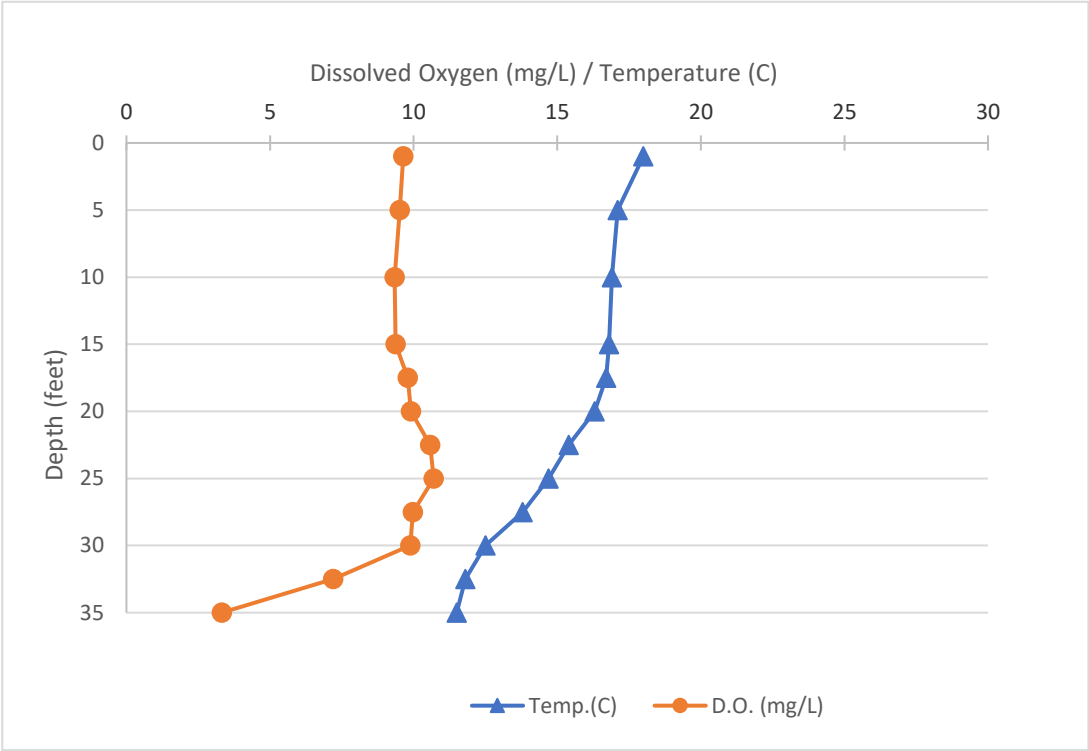


Name: Spider Lake
County: Grand Traverse
Site ID: 280395
Date: 5/29/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	18	9.64
5	17.1	9.52
10	16.9	9.34
15	16.8	9.37
17.5	16.7	9.8
20	16.3	9.91
22.5	15.4	10.58
25	14.7	10.7
27.5	13.8	9.97
30	12.5	9.88
32.5	11.8	7.2
35	11.5	3.32

Lake: Spider Lake (Grand Traverse Co.) **5/29/2019**

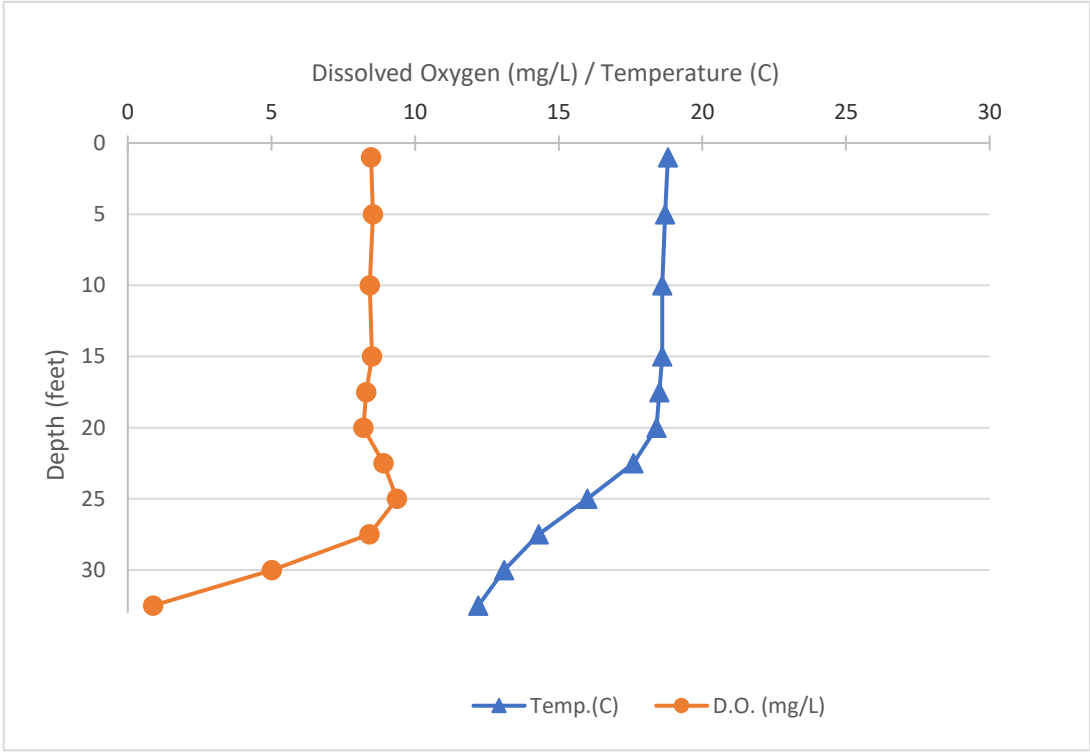


Name: Spider Lake
County: Grand Traverse
Site ID: 280395
Date: 6/16/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	18.8	8.47
5	18.7	8.53
10	18.6	8.42
15	18.6	8.5
17.5	18.5	8.3
20	18.4	8.2
22.5	17.6	8.9
25	16	9.37
27.5	14.3	8.41
30	13.1	5.01
32.5	12.2	0.88

Lake: Spider Lake (Grand Traverse Co.) **6/16/2019**



Name: Spider Lake
County: Grand Traverse
Site ID: 280395
Date: 7/18/2019

Dissolved Oxygen and Temperature Profile

Depth (ft)	Temp.(C)	D.O. (mg/L)
1	26.4	7.96
5	26.4	7.83
10	26.3	7.61
15	25.2	7.52
17.5	24.3	7.12
20	22	7.46
22.5	20.4	5.71
25	18.4	5.5
27.5	16.6	3.78
30	14.7	1.06
32.5	14.3	0.31
35	13.7	0.03

Lake: Spider Lake (Grand Traverse Co.) **7/18/2019**