UNDERSTANDING THE RESULTS FROM THE COOPERATIVE LAKES MONITORING PROGRAM

Dr. Paul Steen
Michigan Clean Water Corps Program Manager
Huron River Watershed Council

Michigan Clean Water Corps

DEQ

Great Lakes Commission des Grands Lacs

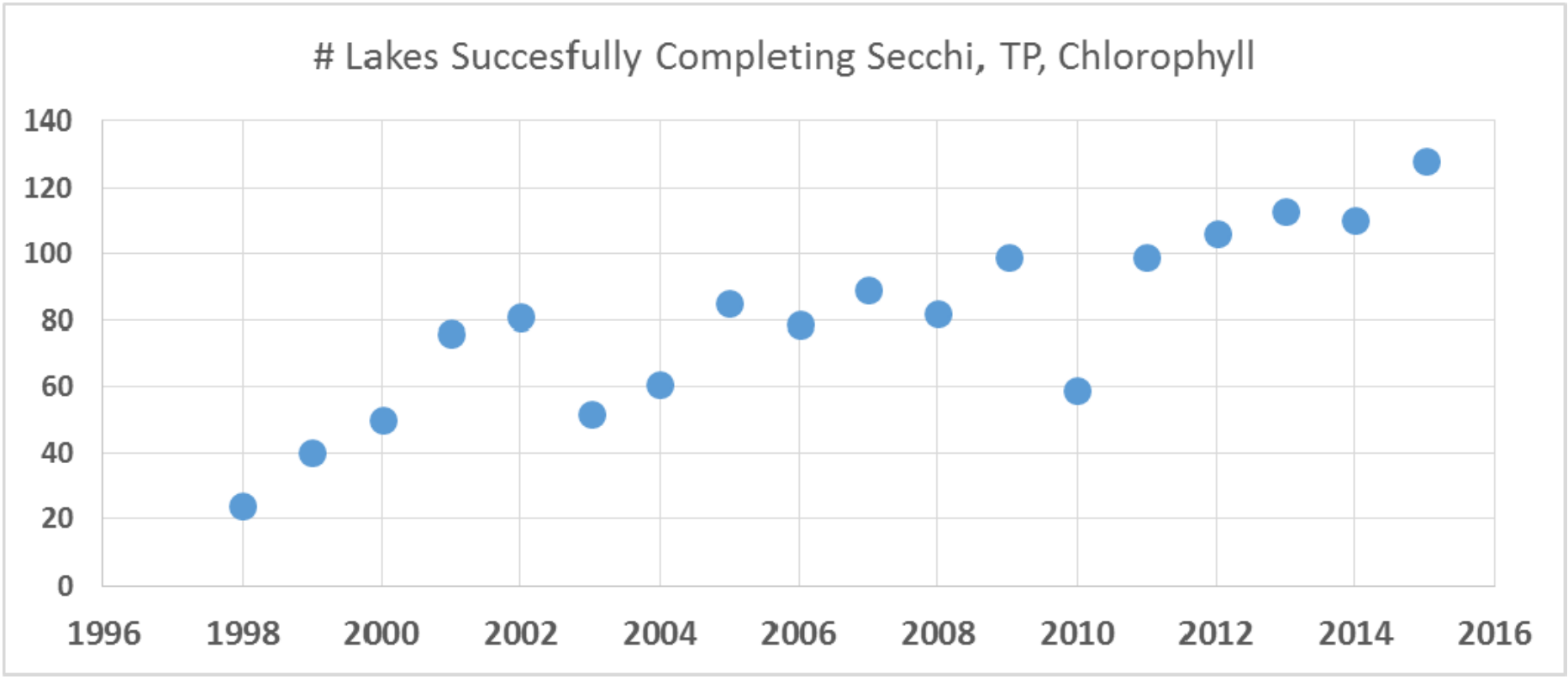
Huron River Watershed Council

MICHIGAN STATE UNIVERSITY

What is the CLMP?

- Volunteer lake monitoring program concentrating on water quality
- A partnership organization headed and funded by the Michigan DEQ
- Provides training, equipment, lab service, and long-term data storage.
- Data Reports are released February/March

How has the program grown over the years?



2015 Data Report

for

Crystal Lake, Oceana County

Site ID: 640062

43.65334°N, 86.38056°W

How are the reports made?

- Almost all of the report is derived from the MiCorps data exchange.
- I download each lake as an Excel Worksheet, then run through a long series of programmed code that:
  - 1) Troubleshoots problematic data; checks that minimum data requirements have been achieved
  - 2) Runs stats (averages, standard deviation, TSI)
  - 3) Creates big and small graphs
  - 4) Places everything properly
- Some things are done by hand– Score the Shore, aquatic plants, individual lake text.

Minimum data requirements

- 8 secchi disk measurements evenly spread through summer
- 4 chlorophyll measurements
- Without these you will see gaps in data tables and graphs.

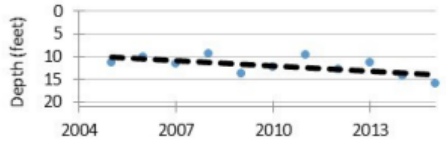
Crystal Lake, Oceana County

2015 CLMP Results

Cooperative Lakes Monitoring Program

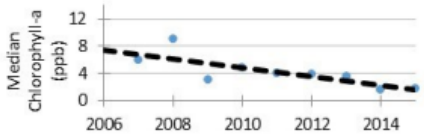
Secchi Disk Transparency (feet)

Year	# Readings	Min	Max	Average	Std. Dev	Carlson TSI
2015	15	11.0	19.0	15.9	2.4	37
2010-2014	84	2.0	24.0	12.0	4.1	41
2005-2009	80	3.0	24.0	11.2	3.6	42
2015 All CLMP Lakes	3018	1.5	42.0	12.6	6.1	42



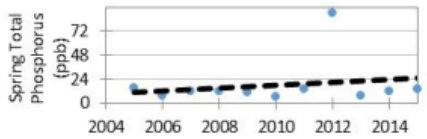
Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Median	Std. Dev	Carlson TSI
2015	4*	<1.0	3.2	1.8	1.2	36
2010-2014	25	<1.0	18.0	3.8	3.0	44
2006-2009	18	<1.0	17.0	3.8	4.3	48
2015 All CLMP Lakes	628	< 1.0	14.0	2.5	2.1	39



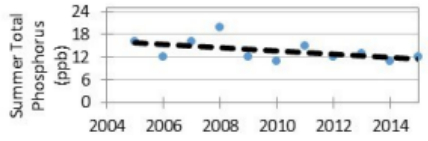
Spring Total Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev
2015	1	14	14	14.0	NA
2010-2014	5	7	90	26.2	35.8
2005-2009	5	8	15	11.6	2.5
2015 All CLMP Lakes	131	<= 3	70	11.5	13.7



Summer Total Phosphorus (parts per billion)

Year	# Samples	Min	Max	Average	Std. Dev	Carlson TSI
2015	1	12	12	12.0	NA	40
2010-2014	5	11	15	12.4	1.7	40
2005-2009	5	12	20	15.2	3.3	43
2015 All CLMP Lakes	173	<= 3	68	13.2	8.1	39



Dissolved Oxygen and Water Temperature Profile

Crystal Lake does not have 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	2015	2010-2014	2005-2009
Crystal Lake	38	42	45
All CLMP Lakes	40	NA	NA

With an average TSI score of 38 based on Secchi transparency, chlorophyll-a, and summer total phosphorus, this lake is rated between the oligotrophic and mesotrophic lake classification.

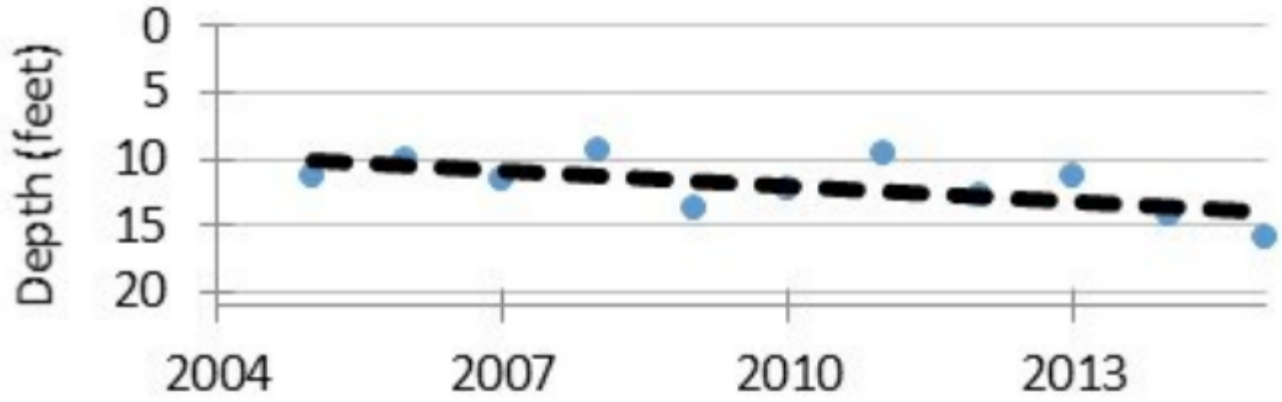
Long term monitoring shows downward slopes on the parameters, indicating a slow movement toward lower nutrient levels in the lake.

*= No sample received W= Value is less than the detection limit (<3 ppb) T= Value reported is less than the reporting limit (5 ppb). Result is estimated.
<1 = Chlorophyll-a: Sample value is less than limit of quantification (<1 ppb).

Crystal Lake, Oceana County

Secchi Disk Transparency (feet)

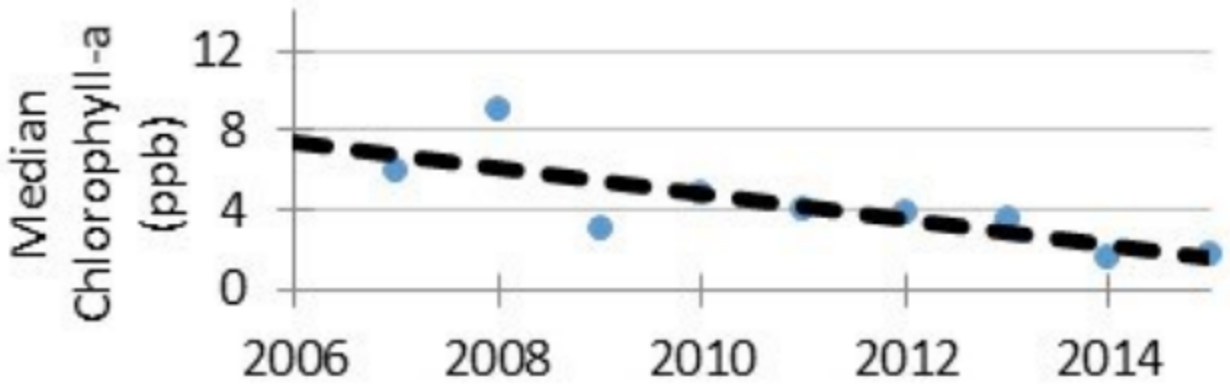
	Year	# Readings	Min	Max	Average	Std. Dev	Carlson TSI
Current Year	2015	15	11.0	19.0	15.9	2.4	37
5 year window	2010-2014	84	2.0	24.0	12.0	4.1	41
All data > 5 years old	2005-2009	80	3.0	24.0	11.2	3.6	42
How do you compare to other lakes?	2015 All CLMP Lakes	3018	1.5	42.0	12.6	6.1	42



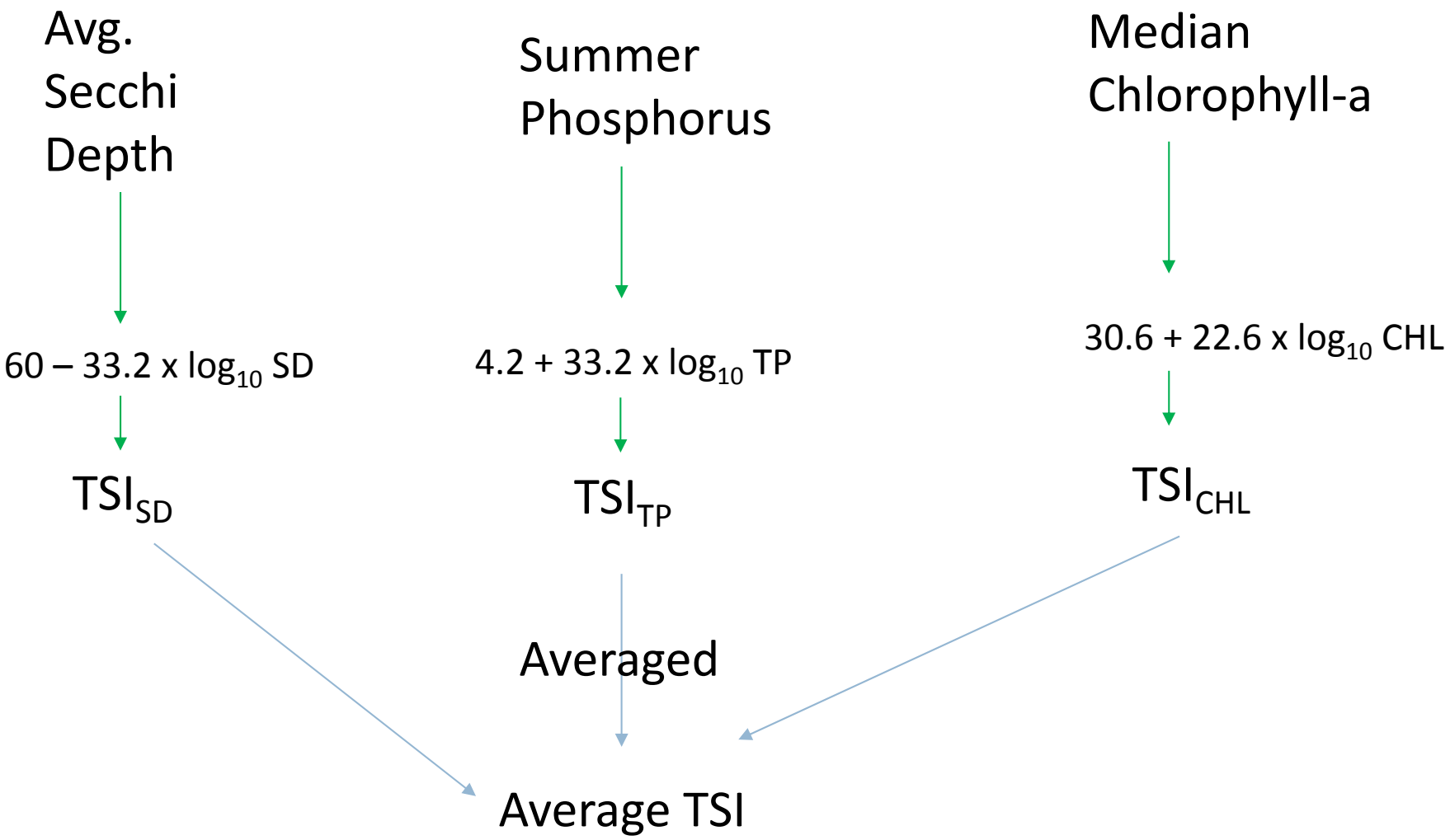
Crystal Lake, Oceana County

Chlorophyll-a (parts per billion)

Year	# Samples	Min	Max	Median	Std. Dev	Carlson TSI
2015	4*	<1.0	3.2	1.8	1.2	36
2010-2014	25	<1.0	18.0	3.8	3.0	44
2006-2009	18	<1.0	17.0	3.8	4.3	48
2015 All CLMP Lakes	628	< 1.0	14.0	2.5	2.1	39

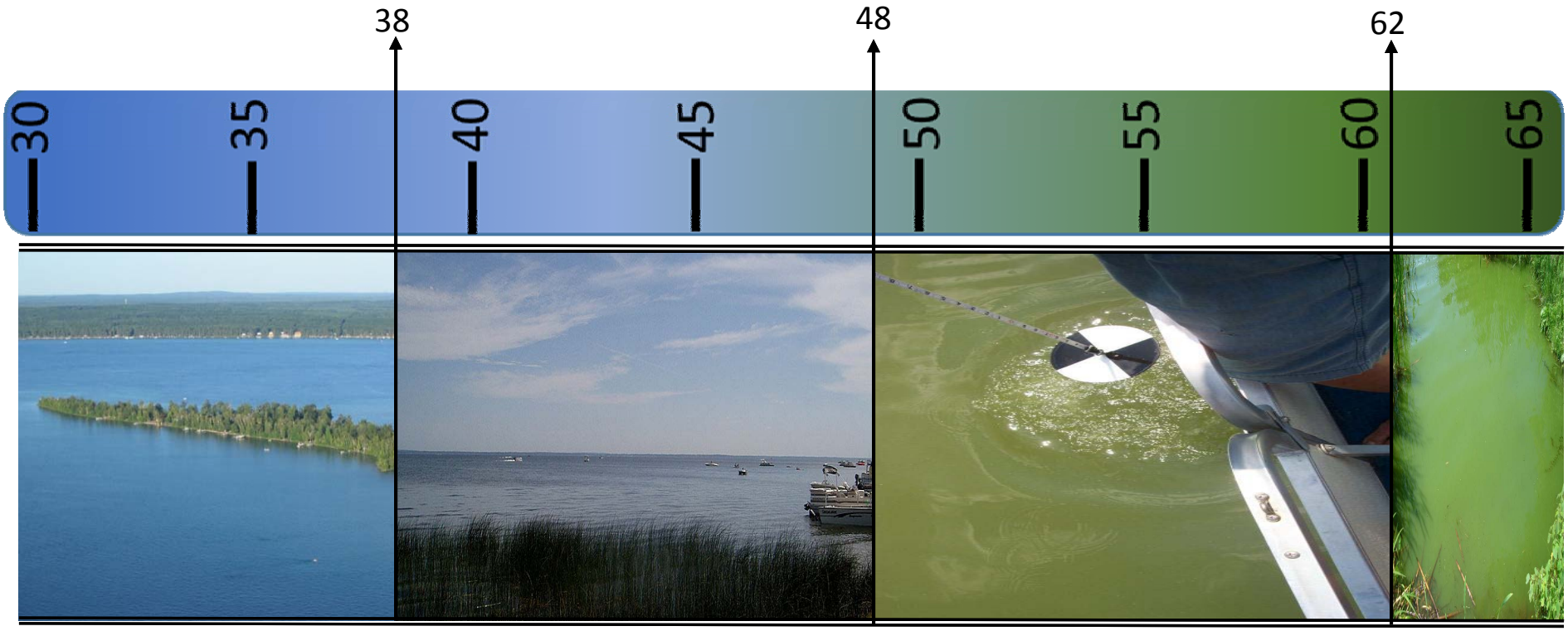


What is Trophic Status Index?



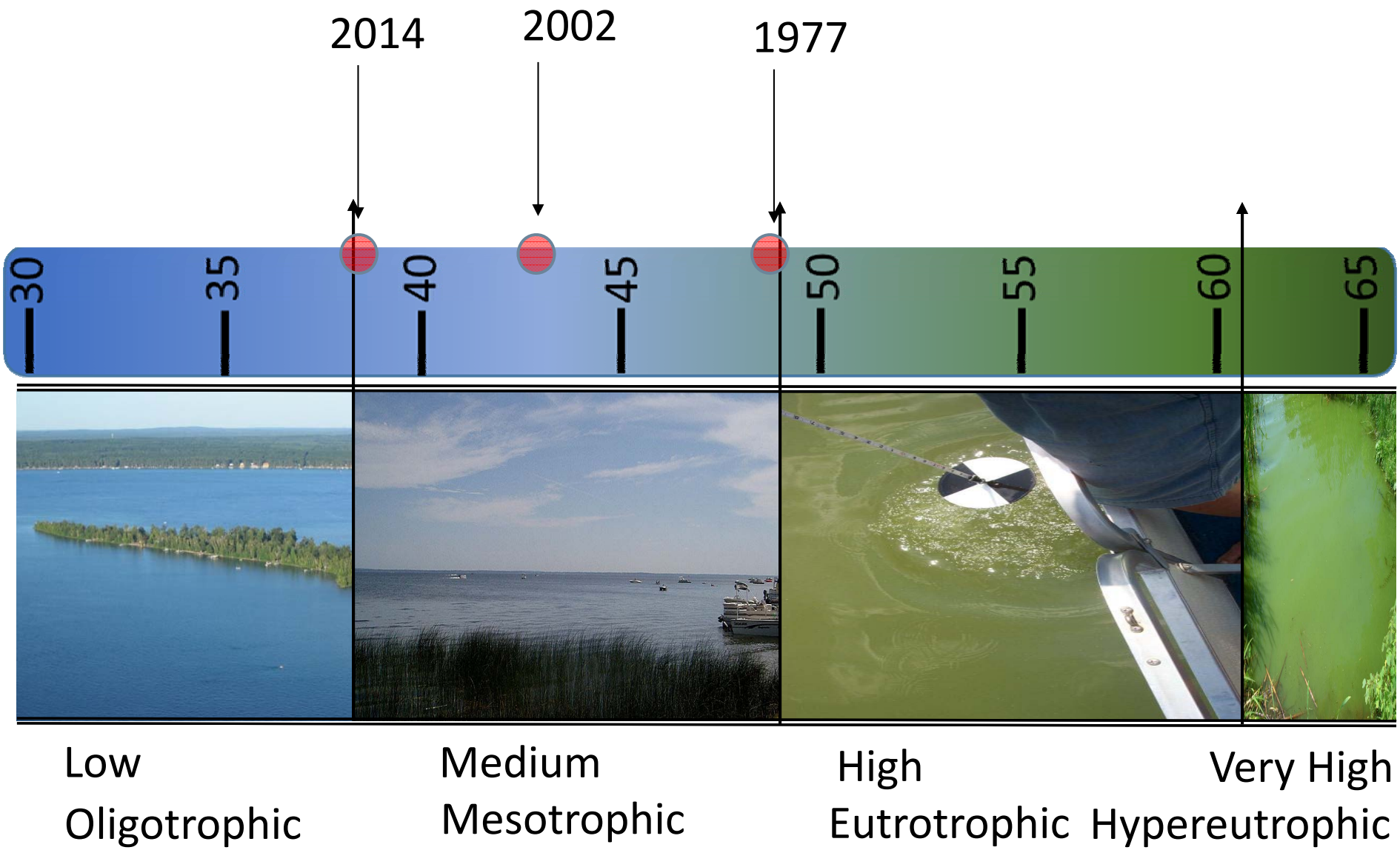
Trophic Status

Secchi	15 feet	7.5 feet	3 feet
Total Phos.	11 ppb	21 ppb	50 ppb
Chl-a	2.5 ppb	6 ppb	22 ppb



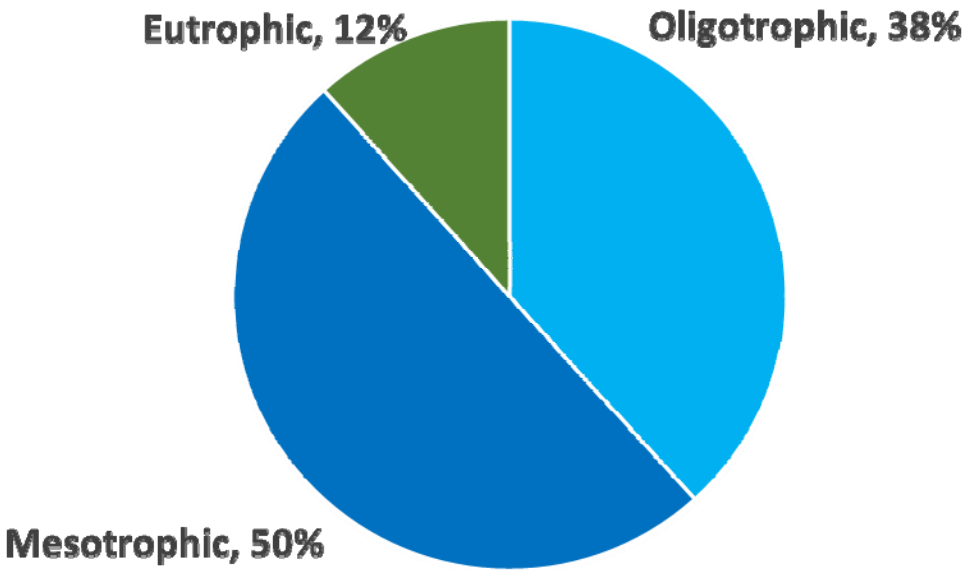
Low	Medium	High	Very High
Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic

Baseline Lake, Washtenaw/Livingston Co.

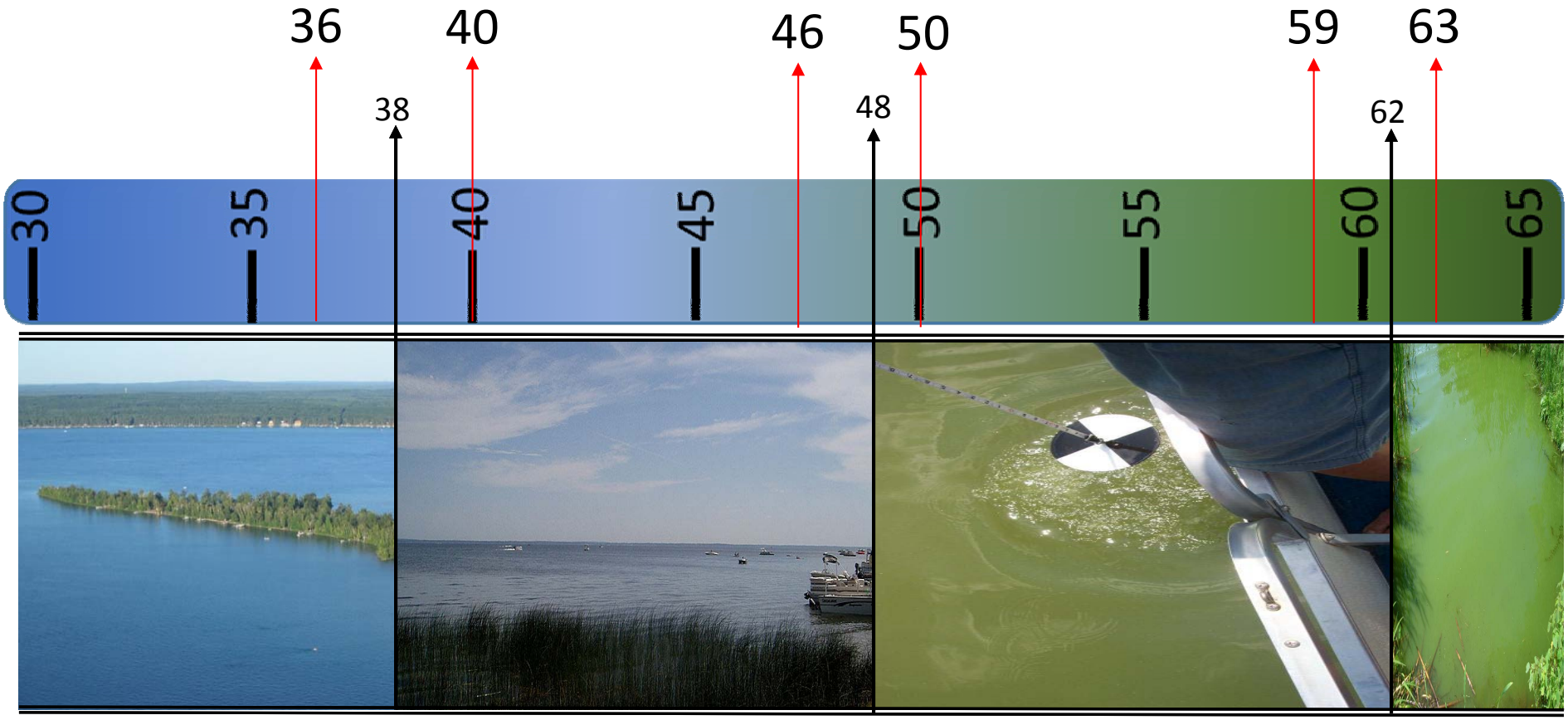


Current snapshot: Trophic Status (2015)

- Based on full participation in Secchi, Chlorophyll, Total Summer Phosphorus in 2015
- N = 128

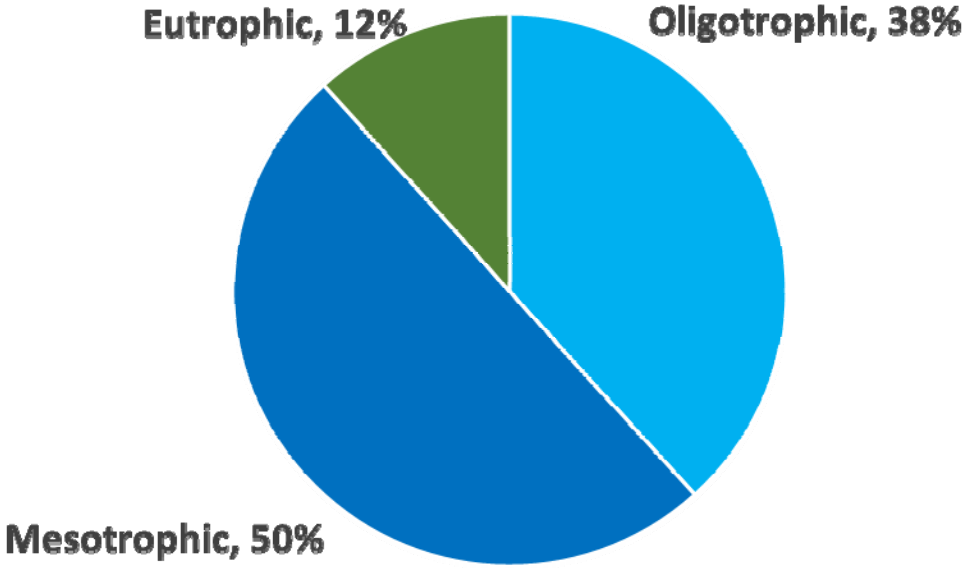


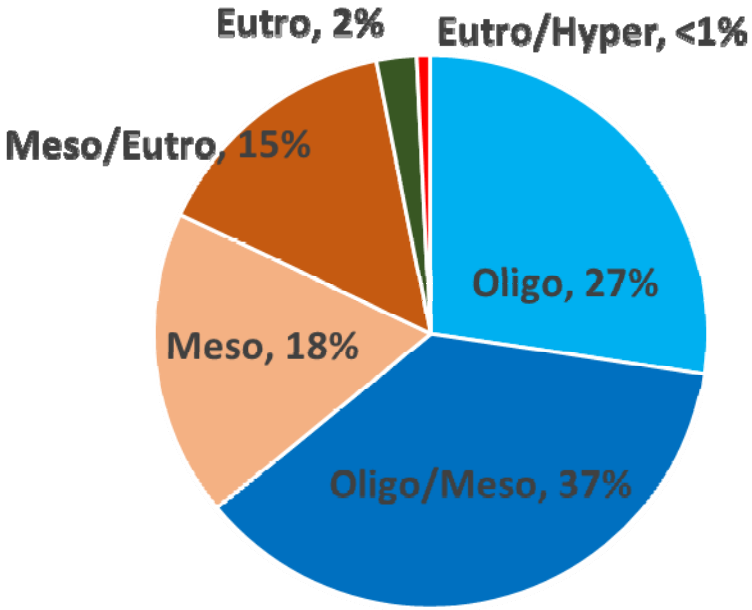
Extra Categories



Current snapshot: Trophic Status (2015)

- Based on full participation in Secchi, Chlorophyll, Total Summer Phosphorus in 2015
- N = 128





Crystal Lake-- Summary

Summary

Average TSI	2015	2010-2014	2005-2009
Crystal Lake	38	42	45
All CLMP Lakes	40	NA	NA

With an average TSI score of 38 based on Secchi transparency, chlorophyll-a, and summer total phosphorus, this lake is rated between the oligotrophic and mesotrophic lake classification.

Long term monitoring shows downward slopes on the parameters, indicating a slow movement toward lower nutrient levels in the lake.

Crystal Lake-- Summary

Summary

Average TSI	2015	2010-2014	2005-2009
Crystal Lake	38	42	45
All CLMP Lakes	40	NA	NA

Same year windows

NA explanation

With an average TSI score of 38 based on Secchi transparency, chlorophyll-a, and summer total phosphorus, this lake is rated between the oligotrophic and mesotrophic lake classification.

TSI Statement

Long term monitoring shows downward slopes on the parameters, indicating a slow movement toward lower nutrient levels in the lake.

Trend Statement

No statistical testing conducted because of time constraints

White Lake- Summary

Summary

Average TSI	2015	2013-2014	1989-1996
White (East) Lake	50	51	49
All CLMP Lakes	40	40	NA

With an average TSI score of 50 based on Secchi transparency, chlorophyll-a, and summer total phosphorus, this lake is rated between the mesotrophic and eutrophic lake classification. The lake leans slightly more eutro than meso. The lake keeps some dissolved oxygen in the bottom waters through early summer, but by mid-summer 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.

TSI Statement

DO Statement

Trend Statement

Lake Diane, Hillsdale County

Summary

Average TSI	2015	2010-2014	2007-2009
Lake Diane	64	63	64
All CLMP Lakes	40	NA	NA

With a TSI score of 64 based on Secchi transparency, this lake is rated as hypereutrophic lake.

TSI Statement

Due to the high nutrient level, the lake loses dissolved oxygen in the bottom waters in early summer.

DO Statement

Long term trends indicate that the trophic status parameters have not changed beyond minor year-to year variation since monitoring began in 2007.

Trend Statement

DO data has to be within 5 years to be shown

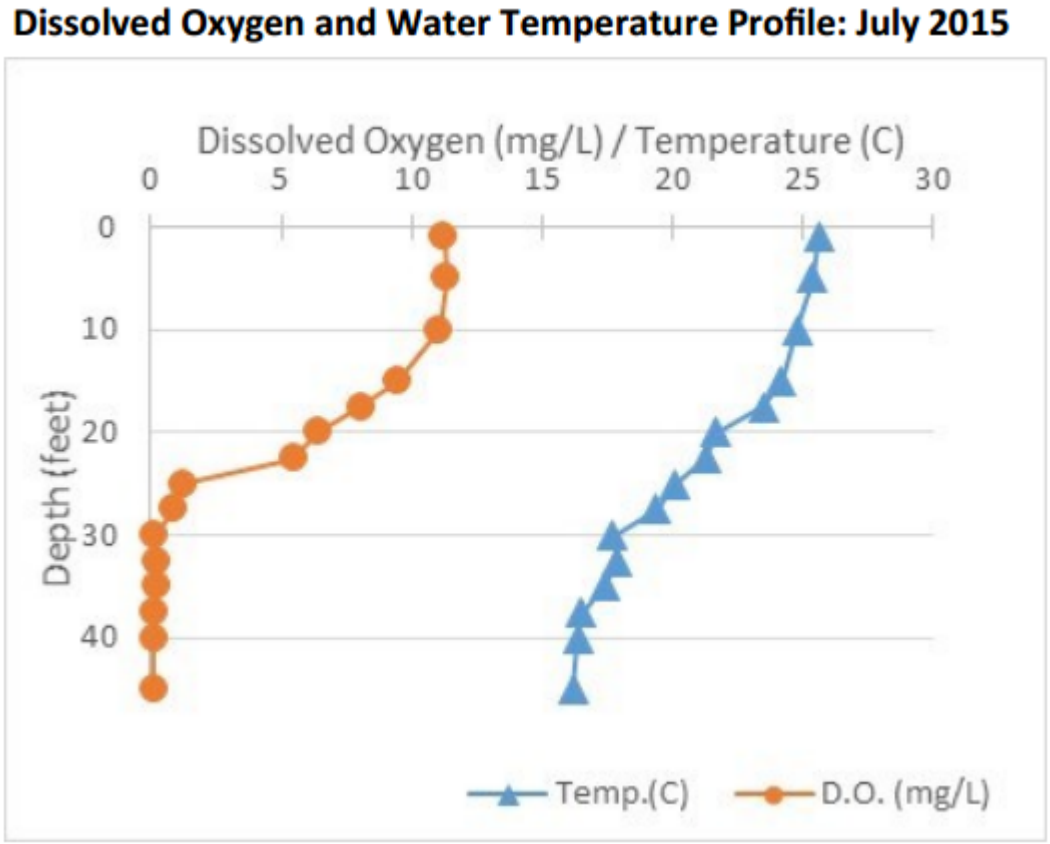
Dissolved Oxygen and Water Temperature Profile

Crystal Lake does not have 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.

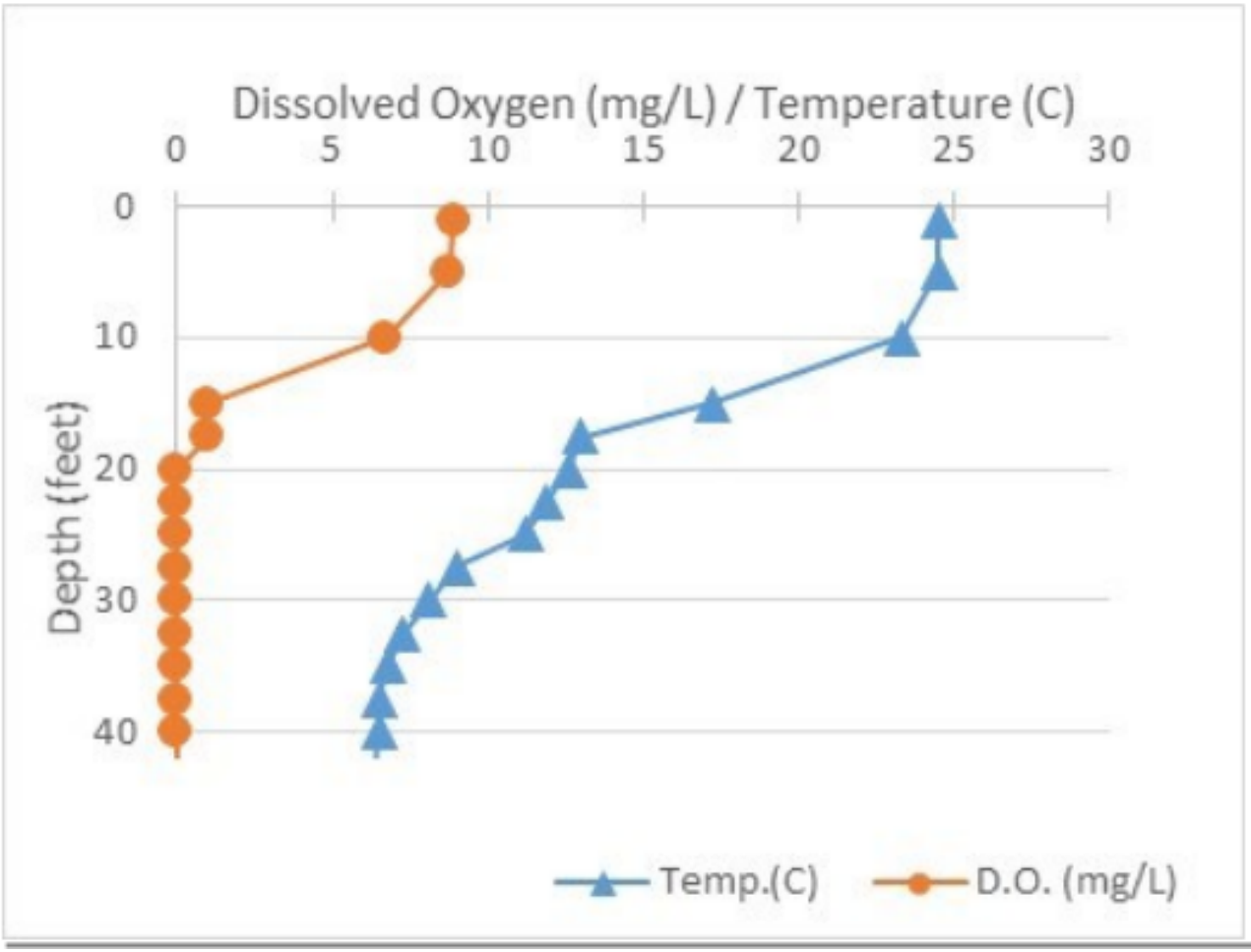
White Lake, Muskegon County

- I select one graph from the normal 5-10 that the volunteers measure
- When/if does the lake stratify?
- What depth does the stratification take place?



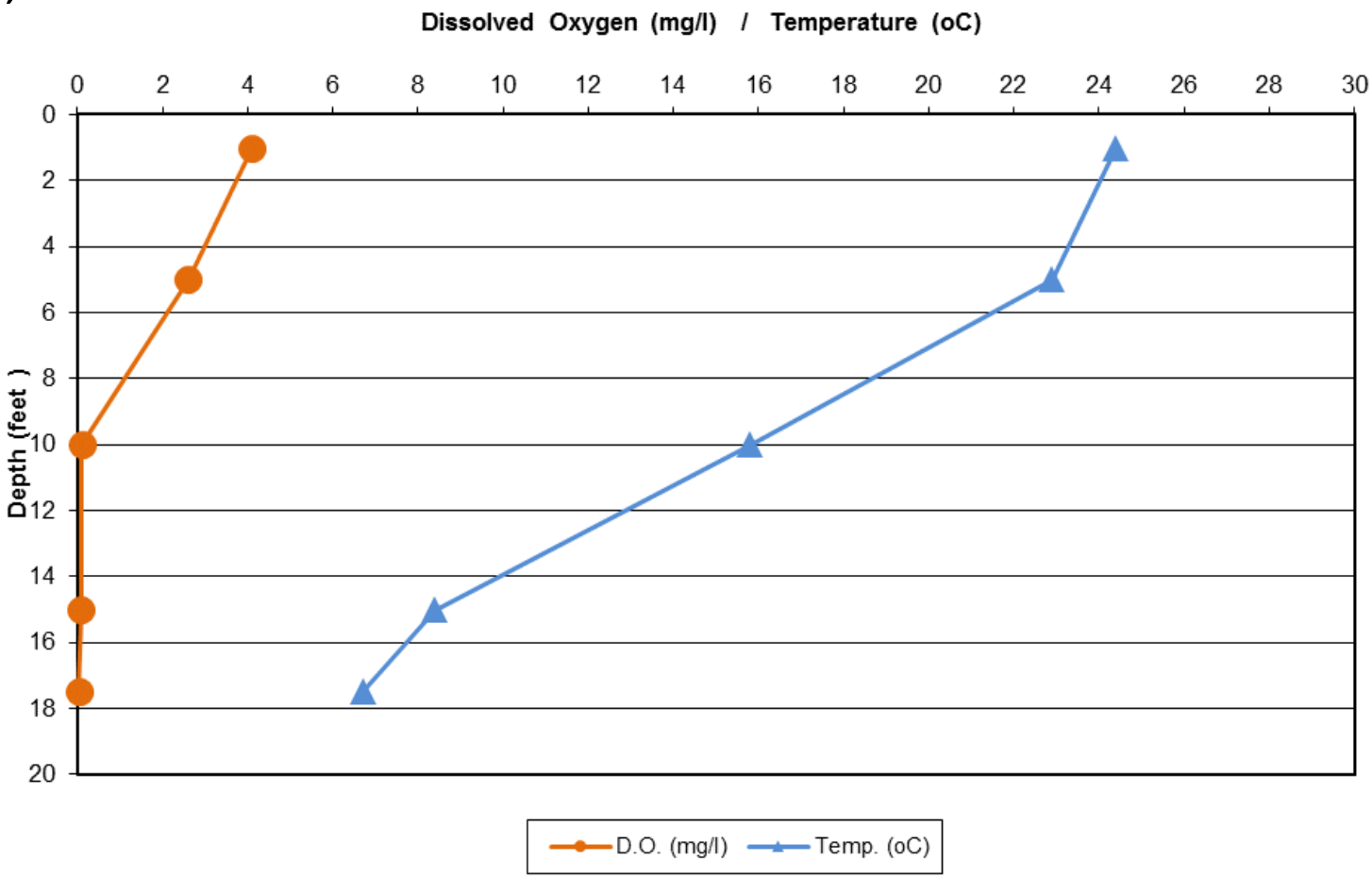
Lake Diane, Hillsdale County

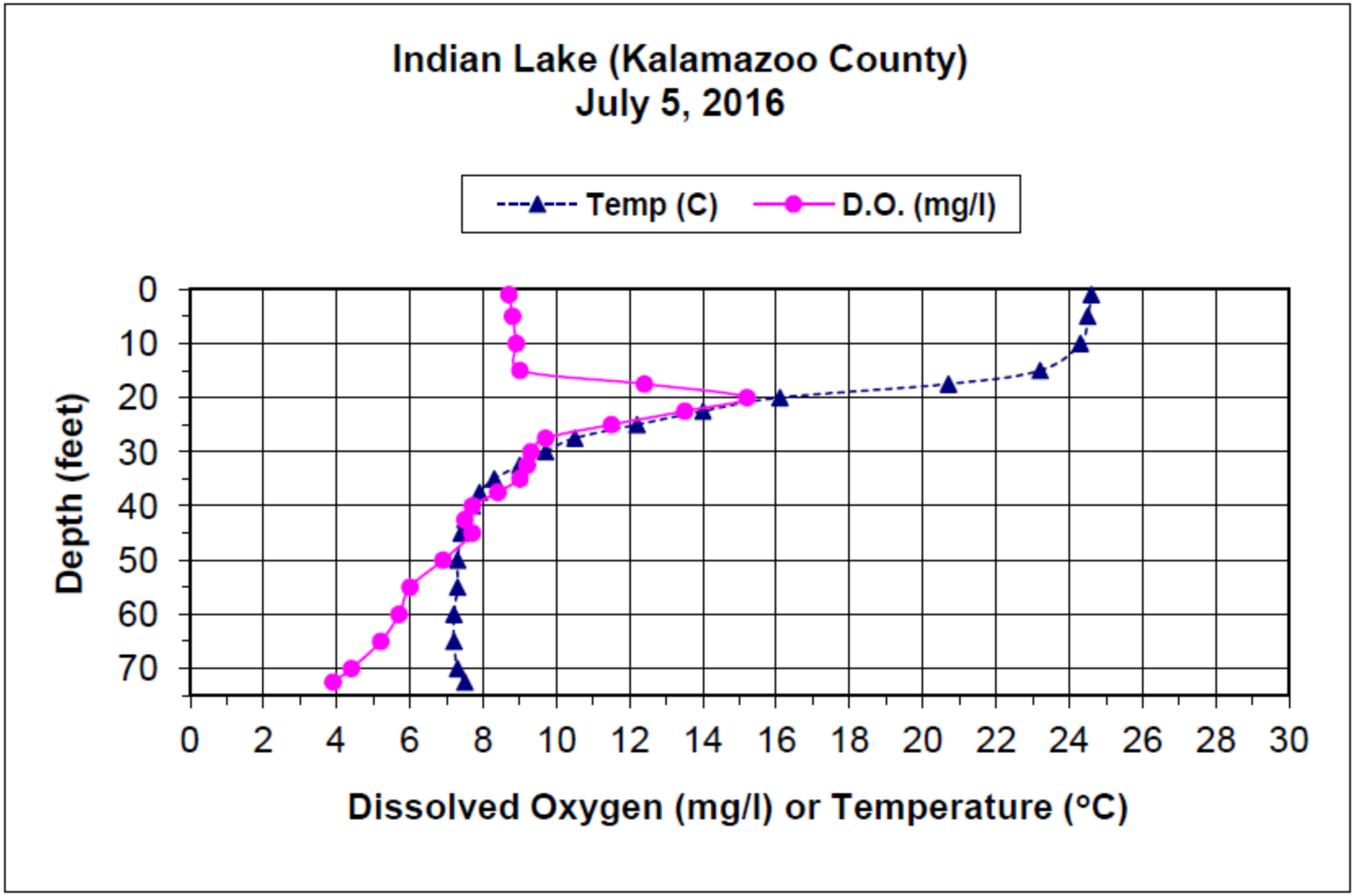
Dissolved Oxygen and Water Temperature Profile: June 2014



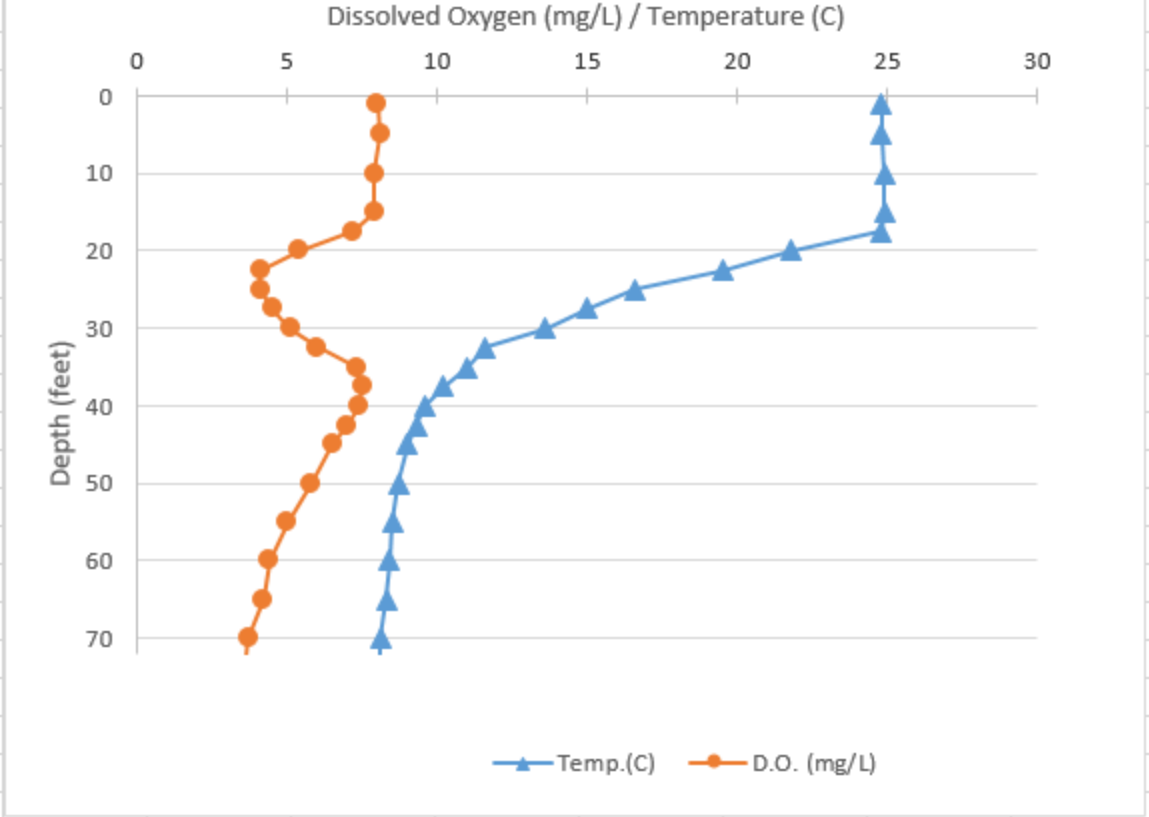
First Sister Lake, Washtenaw County

Aug 9, 2013

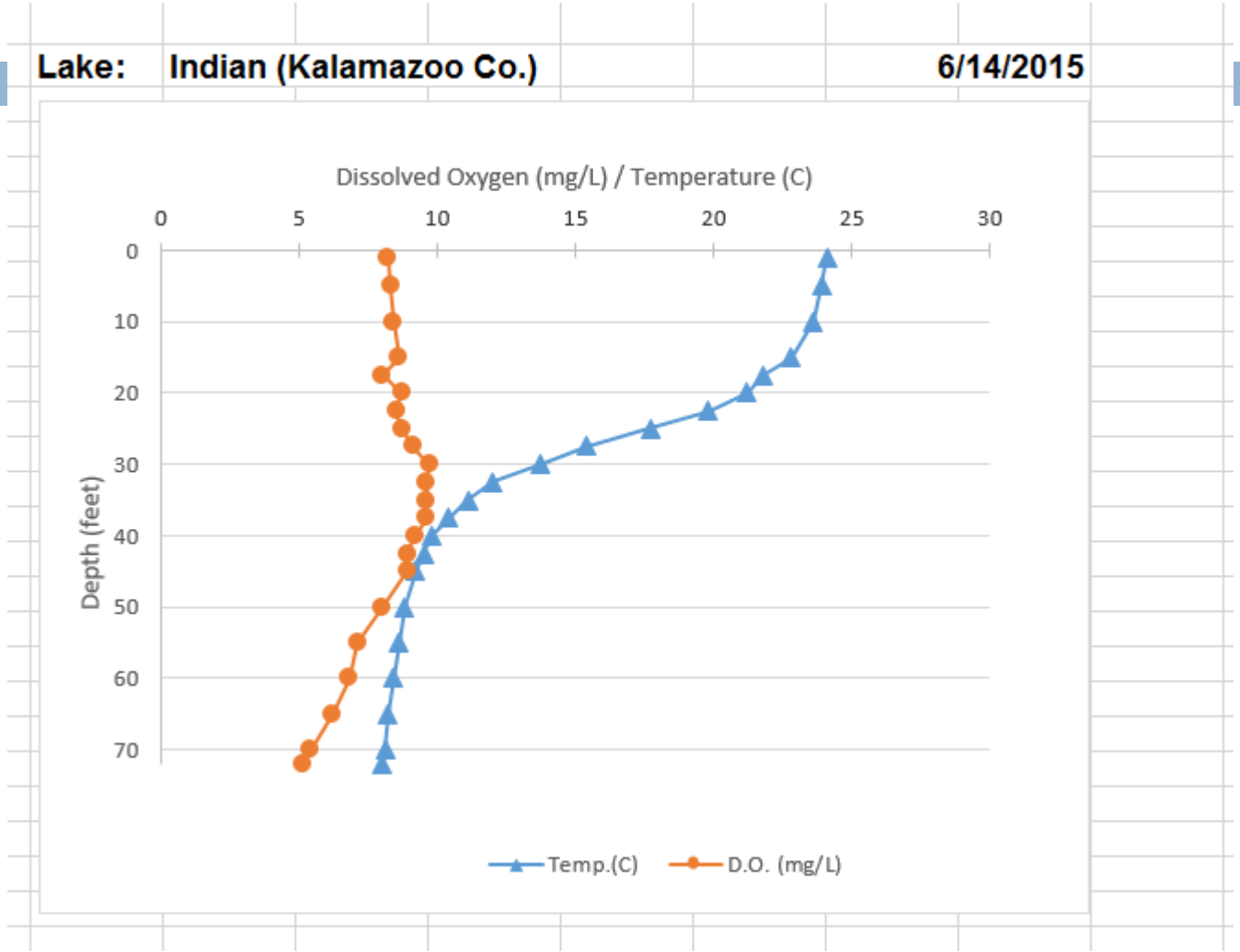



Indian Lake (Kalamazoo County)
July 5, 2016
Temp (C)
D.O. (mg/l)
Depth (feet)
0
10
20
30
40
50
60
70
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Dissolved Oxygen (mg/l) or Temperature (°C)

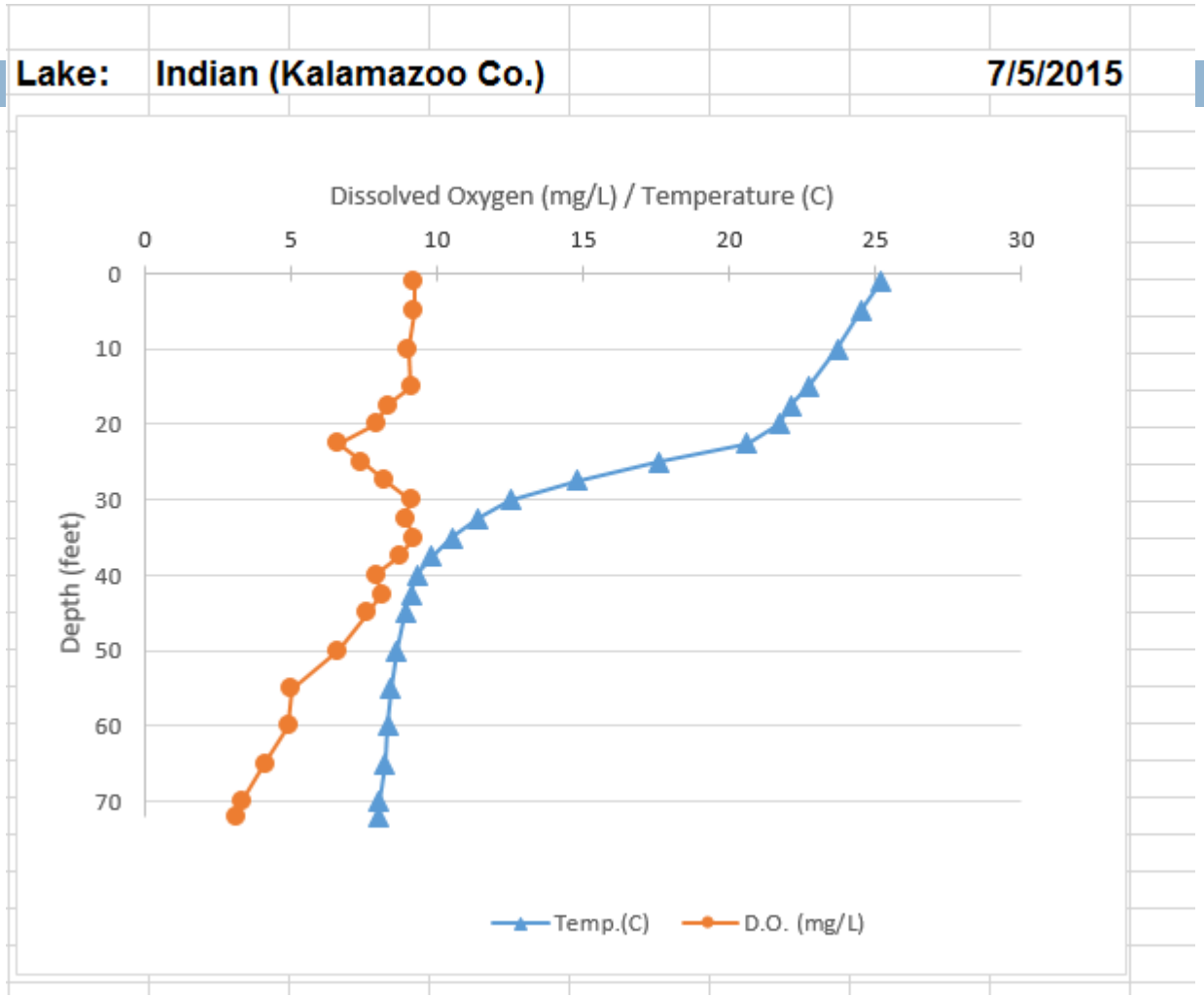
Lake: Indian (Kalamazoo Co.) **8/5/2015**



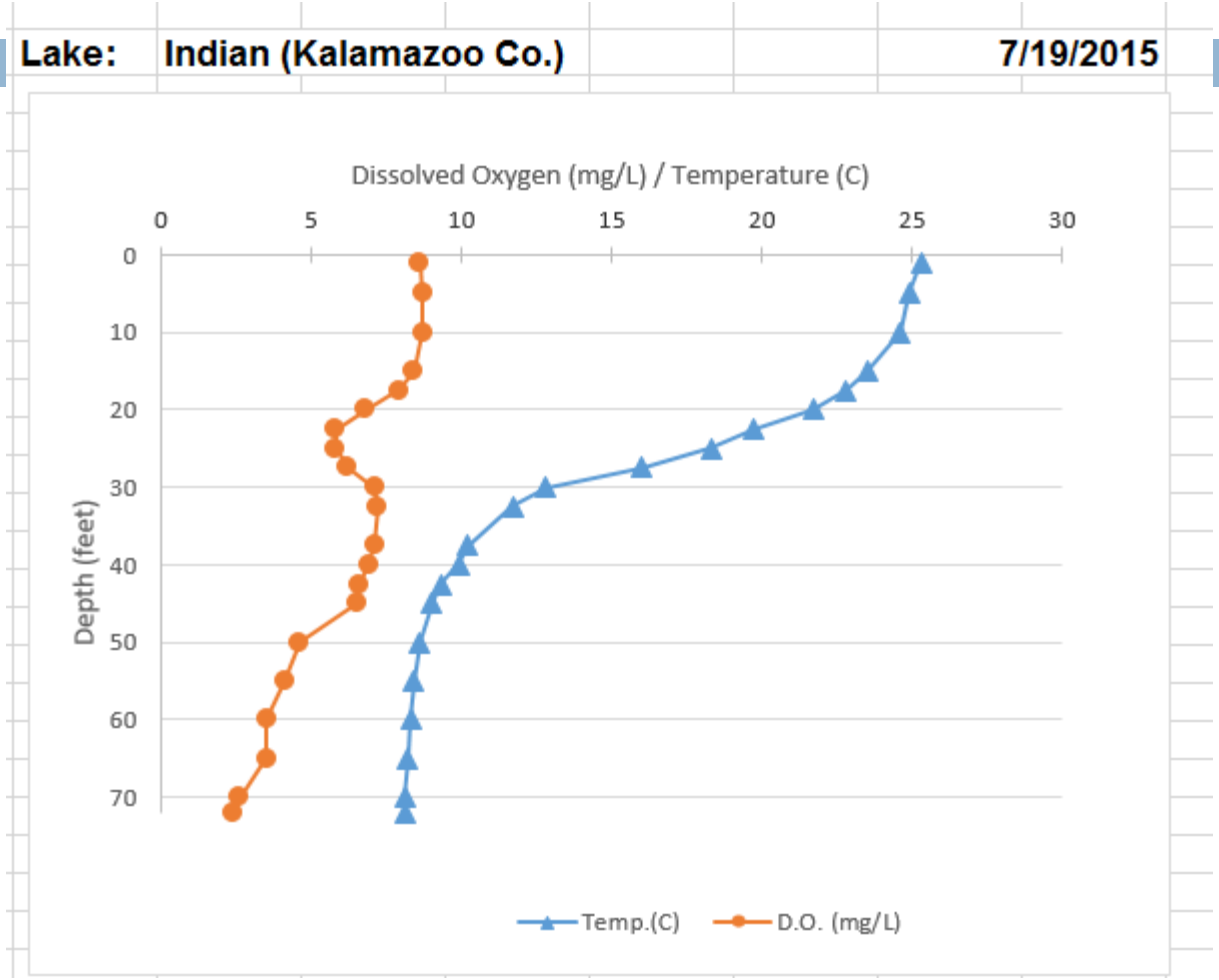
Lake: Indian (Kalamazoo Co.) **6/14/2015**



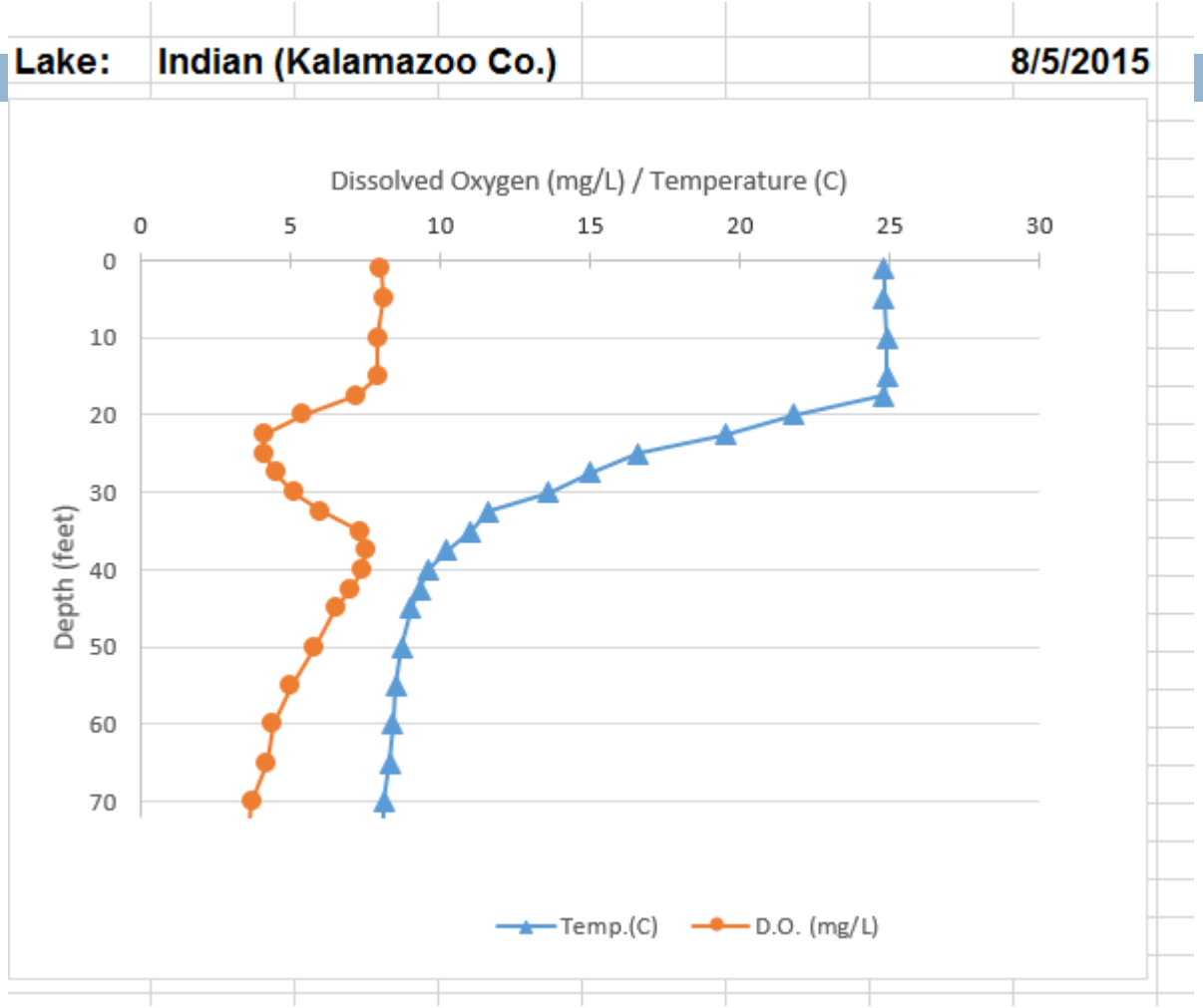
Lake: Indian (Kalamazoo Co.) **7/5/2015**



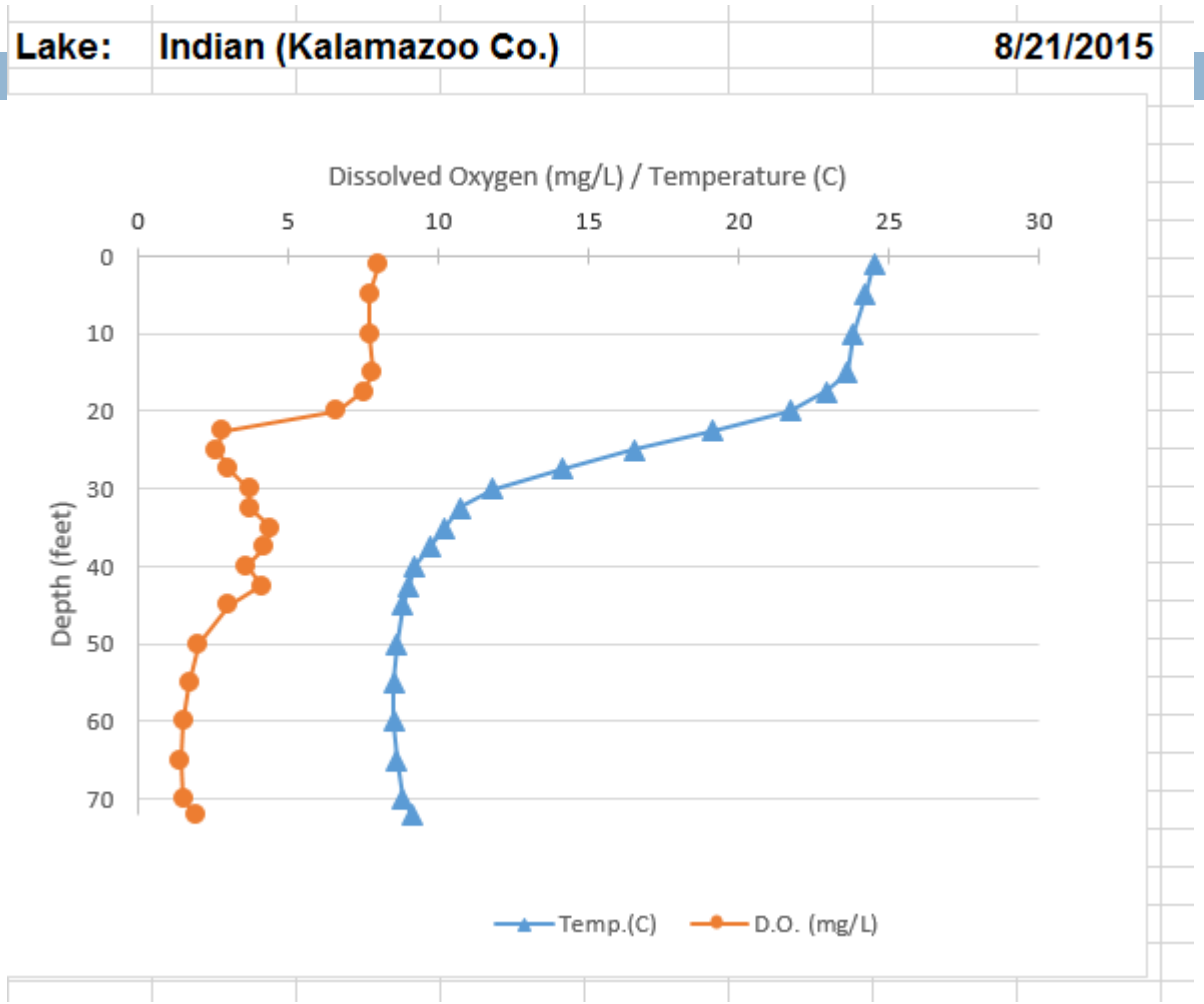
Lake: Indian (Kalamazoo Co.) **7/19/2015**



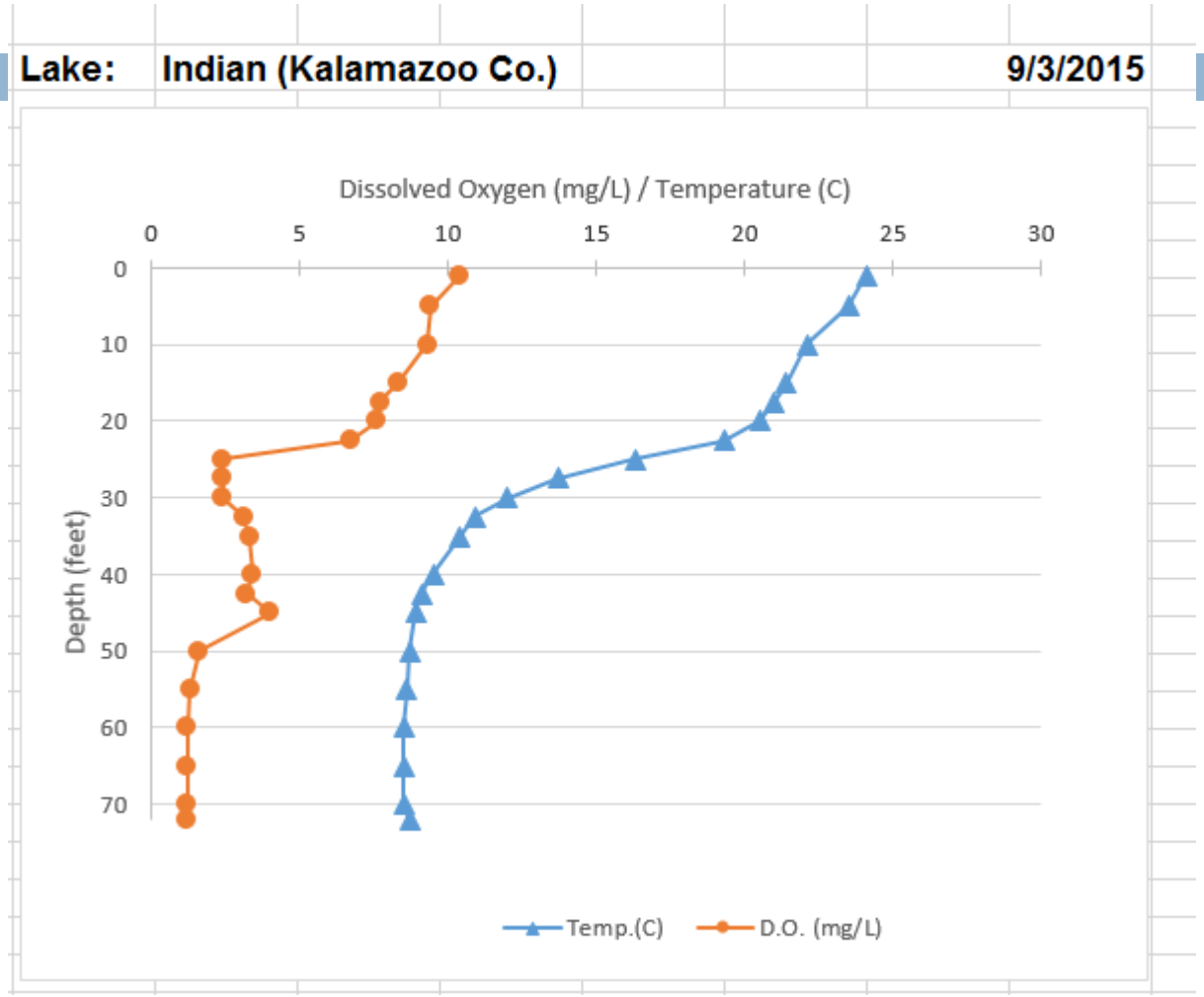
Lake: Indian (Kalamazoo Co.) **8/5/2015**



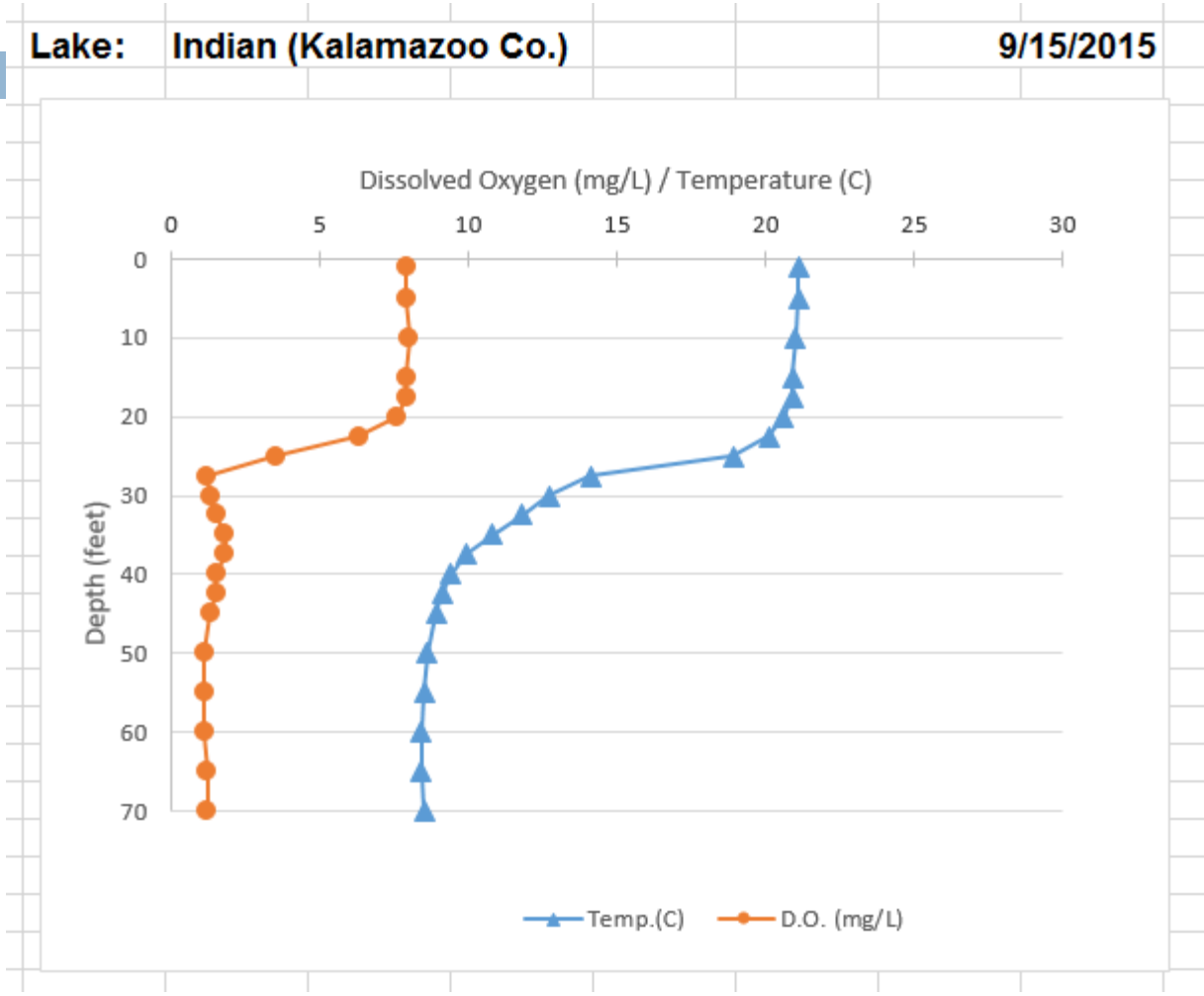
Lake: **Indian (Kalamazoo Co.)** **8/21/2015**



Lake: Indian (Kalamazoo Co.) **9/3/2015**



Lake: **Indian (Kalamazoo Co.)** **9/15/2015**



White (East) Lake, Muskegon County

2015 Exotic Aquatic Plant Watch Results

The Exotic Aquatic Plant Watch was conducted on White Lake (East) 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 White Lake (East).

White Lake (East), Muskegon County

2015 Exotic Aquatic Plant Watch Results

Survey Dates: May 15, August 4

Species	Status	Comments
Eurasian watermilfoil	FOUND	At Montague public boat launch & Ellenwood marina
Starry stonewort	Not found	
Curly-leaf pondweed	FOUND—but not in lake	In White River at Pines Point (upriver from lake)
Hydrilla	Not found	

Score the Shore

Lake	# of Lakeshore Sections	Houses/Docks per 1000 ft	Averages			
			Total Score	Littoral	Riparian	Erosion
Duck	15	5.9	79	67	82	87
Deer	13	11.0	74	80	65	77
Independence	36	8.2	71	64	70	79
Pleasant	15	13.2	58	50	52	73
Stony	20	15.7	55	55	44	65
Klinger	25	28.0	48	39	50	56
Eagle	7	67.1	42	45	27	56

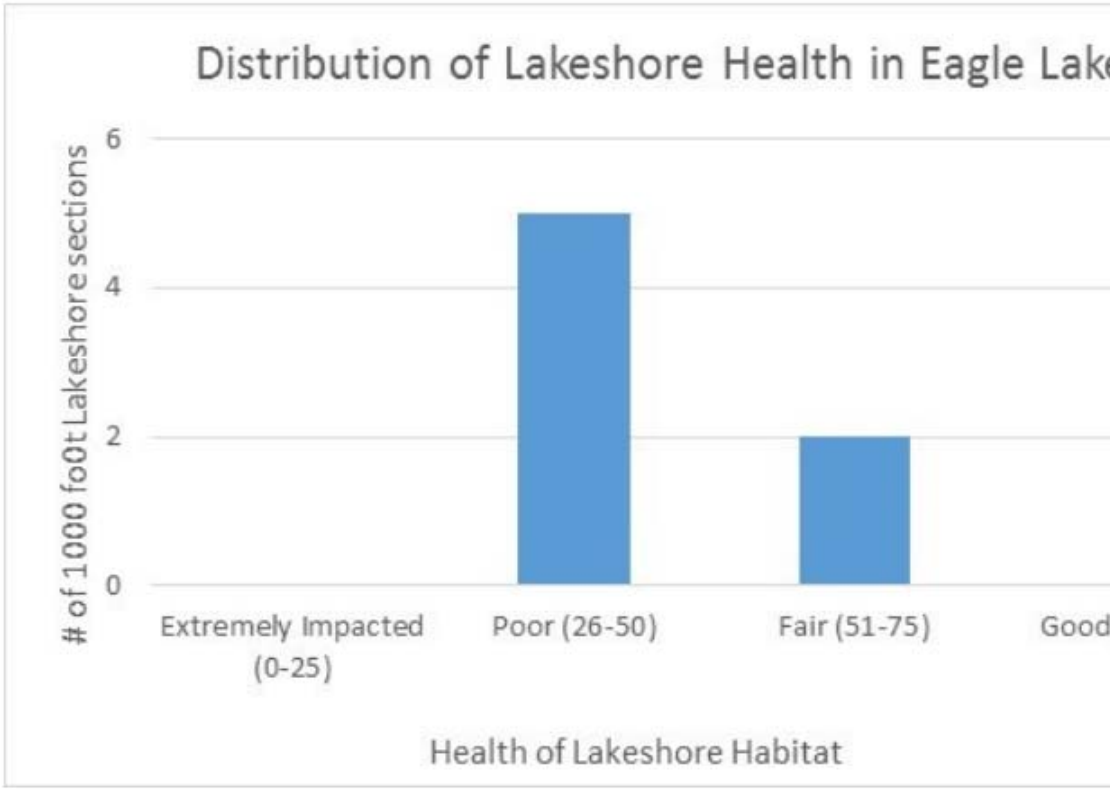
Analysis specific to Eagle Lake:

Summary

With a very high density of houses and docks on Eagle Lake, it logically follows that the overall lakeshore health is poor. The lake is characterized by sea walls, few unmowed areas, and very little aquatic vegetation.

Highlight the worst score and give some tips

The weakest point of Eagle Lake was the riparian zone (land adjacent to the water), scoring only a 27 out of 100. Reducing the amount of mowed grass and increasing the amount of un-mowed vegetation would be the primary way to boost the overall score of Eagle Lake. Residents should be encourage to plant 20 foot wide strips of native plants along the lakeshore.



The full score breakdown for each section can be obtained by requesting it of Paul Steen (psteen@hrwc.org).