2023085

LAKE CHECK Water Quality Monitoring Report

Customer
Reeds Lake

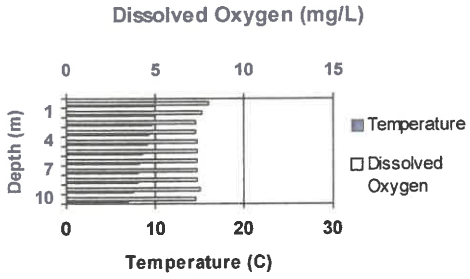
Waterbody
Reeds Lake

Sample Information
Date: 4/13/2023

Site: Deep Hole

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen mg/L	Dissolved Oxygen %
0	10.1	8.0	74
1	9.9	7.6	69
2	9.7	7.3	67
3	9.4	7.3	66
4	9.1	7.4	66
5	8.6	7.4	65
6	8.2	7.4	65
7	8.1	7.4	65
8	8.1	7.4	65
9	7.5	7.5	64
10	7.0	7.3	63



Secchi Disk Depth	2.5	meters
Thermocline Depth		meters

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli		CFU/100 mL	N/A
Conductivity	514	uS/cm	Moderate concentration of dissolved salts
Total Dissolved Solids	467	mg/L	
pH	8.6	S.U.	Water is slightly alkaline
Alkalinity	160	mg CaCO3/L	Water is hard
Total Phosphorus	25	ug/L	Moderately phosphorus enriched
Nitrates	450	ug/L	Slightly nitrogen enriched
Chlorophyll	N/A		

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	47	mesotrophic
Based on Total Phosphorus	46	mesotrophic
Based on Chlorophyll	N/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Sample is somewhat phosphorus enriched. Create natural buffer between lawn & lakeshore.
- Repeat LakeCheck in Fall.

- WARNING. condition requires immediate attention.
- CAUTION. condition requires further evaluation.
- OK. condition within acceptable limits.
- NEUTRAL. condition neither good nor bad.

Notes

Report describes conditions at the time the sample was collected.

Approved by Jaimee Desjardins Date 10/18/2023

Mrs. Jaimee Desjardins, Technical Services Manager

FROM YOUR WQ PRO DEALER

PLM Lake & Land Management Corp
P.O. Box 132
Caledonia MI 49316-
Phone: (616) 891-1294

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is nearly low enough to adversely affect sensitive fish.
- Bottom water is deoxygenated, preventing fish from living in cooler water at bottom of lake.
- pH is within acceptable limits.
- Sample is highly phosphorus enriched. Consider nutrient abatement measures.
- Deep water sample indicates possible internal loading of nutrients.
- REPEAT LakeCheck NEXT YEAR!

- WARNING. condition requires immediate attention.
- CAUTION. condition requires further evaluation.
- OK. condition within acceptable limits.
- NEUTRAL. condition neither good nor bad.

Notes

Report describes conditions at the time the sample was collected.

Approved by Jaimee Desjardins Date 10/18/2023

Mrs. Jaimee Desjardins, Technical Services Manager

FROM YOUR WQ PRO DEALER

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2023086

LAKE CHECK Water Quality Monitoring Report

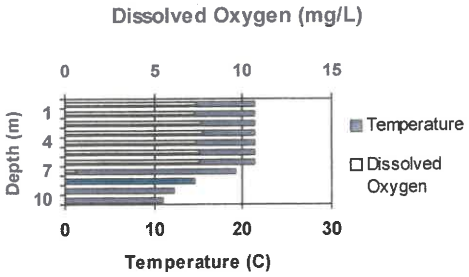
Customer	Waterbody	Sample Information
Reeds Lake	Reeds Lake	Date: 9/15/2023
		Site: Deep Hole

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen mg/L	Dissolved Oxygen %
0	21.4	7.4	72
1	21.4	7.3	71
2	21.4	7.6	74
3	21.4	7.7	76
4	21.4	7.4	73
5	21.4	7.5	75
6	21.4	7.5	72
7	19.2	0.6	7
8	14.5	0.2	2
9	12.2	0.1	1
10	11.0	0.1	1

Secchi Disk Depth 2.3 meters

Thermocline Depth 6.5 meters



Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli		CFU/100 mL	N/A
Conductivity	714	uS/cm	Moderate concentration of dissolved salts
Total Dissolved Solids	464	mg/L	
pH	8.6	S.U.	Water is slightly alkaline
Alkalinity	166	mg CaCO3/L	Water is hard
Total Phosphorus	139	ug/L	Phosphorus polluted
Nitrates	270	ug/L	Slightly nitrogen enriched
Chlorophyll	N/A		

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	48	moderately eutrophic
Based on Total Phosphorus	71	hypereutrophic
Based on Chlorophyll	N/A	

Bacteria Sampling Report

Waterbody:
Reeds Lake

Reeds Lake

Date Sampled:
8/8/2023

Location	*E. coli*	Total Coliforms	Interpretation
1	<4		Water meets bacteriological standards for safe swimming.
2	4		Water meets bacteriological standards for safe swimming.
3	<4		Water meets bacteriological standards for safe swimming.

Bacterial counts are expressed as the number of Colony Forming Units per 100 milliliters (CFU/100mL).

For full body contact recreation (including swimming) counts of E. coli should not exceed 130 (CFU/100mL)as a monthly geometric mean of at least five samples per the State of Michigan standard, or single samples should not exceed 298 (CFU/100mL) [235 CFU/100mL in a designated bathing beach area] per Federal (EPA) guidelines.

Current recreational water quality standards do not rely on Total Coliform counts.

Approved by Jaimee Desjardins
Mrs. Jaimee Desjardins, Technical Services Manager

Date 18-Aug-23

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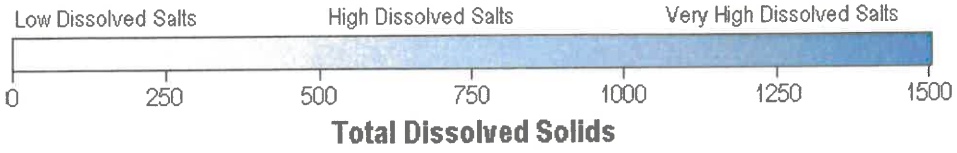
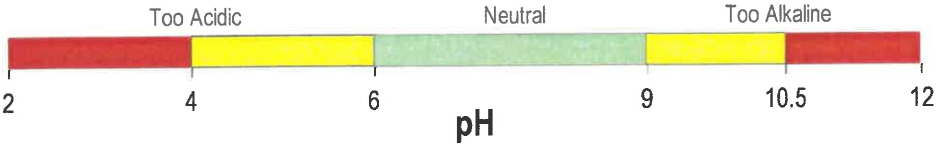
LAKE CHECK WATER QUALITY MEASUREMENTS

Conductivity and Total Dissolved Solids (TDS) measure the total amount of material dissolved in the water. Higher values indicate potentially richer, more productive water, whereas lower values indicate potentially cleaner, less productive water. Localized increases in conductivity and TDS may indicate inputs of groundwater or other nutrient-enriched water. [Note: Human activities that result in nutrient pollution (e.g., fertilizer runoff) can increase the productivity of algae and other organisms without raising conductivity/total dissolved solids very much. If nutrient pollution is occurring, the total phosphorus concentration is a much better indicator of potential productivity.]

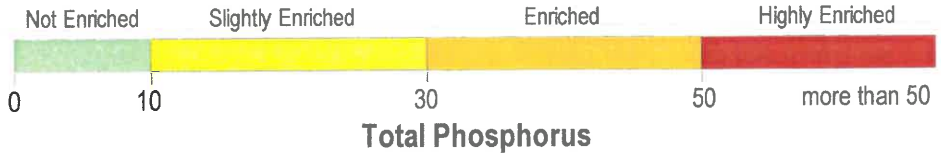


pH describes the balance between acids and bases in the water. Neutral values of pH (between 6 and 9) are desirable. Low pH values typically result either from the growth of bog vegetation (such as peat moss), acid precipitation ("acid rain"), or acid runoff (as in acid mine drainage). Excessive growth of certain plants and algae can raise pH values above 9.0 or 10.0.

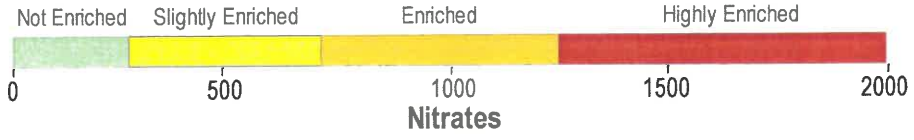


Alkalinity measures the concentration of carbonates and bicarbonates in the water. These compounds and other ions associated with them make water "hard". High alkalinity lakes are hardwater lakes, while low alkalinity lakes are softwater lakes. Different kinds of plants, algae, and other aquatic organisms live in hardwater than in softwater. Alkalinity also influences the effectiveness of some herbicides and algicides. Alkalinity is a basic characteristic of water, but is neither inherently good nor bad.

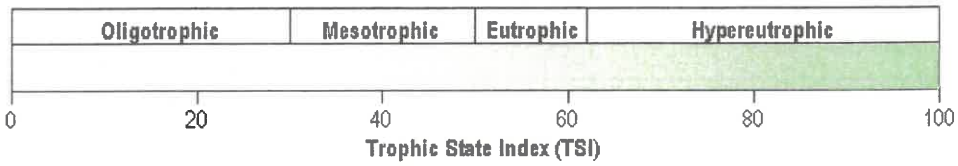
Total Phosphorus measures the total (organic and inorganic, dissolved and particulate) amount of phosphorus in the water. Phosphorus is usually the plant nutrient (i.e., fertilizer) that controls the amount of algal growth in lakes and ponds. Most Midwestern lakes have more phosphorus and more algae than is desirable, so lower values are generally better, though very unproductive water bodies typically support little fish production.



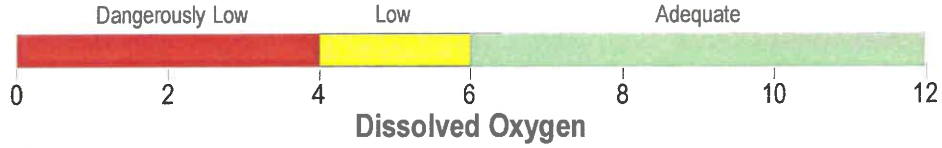
Nitrate measures the total inorganic amount of nitrogen in the water. Nitrogen is the plant nutrient (i.e., fertilizer) most likely to control the amount of rooted plant growth in lakes and ponds. Most Midwestern lakes have more nitrogen and more rooted plant growth than is desirable, so lower values are generally considered better



Trophic State Indices calculate the trophic status of the waterbody. Waterbodies are classified as oligotrophic, mesotrophic, eutrophic or hypereutrophic depending on the overall amount of plants, algae and other organisms the waterbody supports. Lakes of different trophic states vary in a number of chemical characteristics and support different types of organisms (see the enclosure "Lake Trophic States and Eutrophication"). Thus the trophic state of a waterbody provides a wealth of information concerning the types of organisms living in the waterbody, the processes likely to occur there and the kinds of problems to be expected. Trophic State Index values can be calculated from a number of variables. LakeScan calculates Carlson's Trophic State Index (TSI) from total phosphorus, Secchi disk depth and chlorophyll (separate TSI values are calculated for each of the variables that was measured as part of your LakeCheck package).

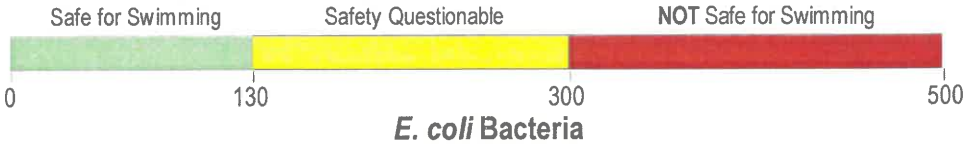


Dissolved Oxygen is a measure of the amount of oxygen dissolved in the water. Oxygen is needed by fish and other aquatic organisms to allow them to "breath" underwater. Plants and algae produce oxygen by photosynthesizing during the day and use oxygen for respiration at night.



Temperature provides information about the kinds of fish that can grow in a lake, information necessary for interpretation of other parameters, and information about the extent to which a lake is stratified into layers having water of different temperatures. If the lake is stratified, the **thermocline depth** tells how deep the surface layer of warm water is.

Fecal Indicator Bacteria (*E. coli*) measurements count the number of live fecal indicator bacteria in the sample. These bacteria are considered reliable indicators of fecal contamination—when they are found in a pond or lake, it is very likely that the water is being contaminated by animal feces. Contamination can potentially be derived from a number of sources, including failed septic systems, agricultural runoff, or waterfowl or wildlife droppings.



- *E. coli* counts of 300 (CFU/100 mL) and above in a single sample are considered to represent conditions that are **UNSAFE** for swimming and other body contact recreation.
- *E. coli* counts of 130 (CFU/100 mL) and above averaged (using a geometric mean) over measurements made during a 30-day period are considered to represent conditions that are UNSAFE for swimming and other body contact recreation. When values of 130 (CFU/100 mL) or higher but less than 300 are encountered, LakeCheck rates the safety of the water for swimming as questionable.
- *E. coli* counts below 130 are considered safe for swimming and other body-contact recreation

We recommend prompt retesting whenever Fecal Indicator Bacteria counts exceed 100 (CFU/100 mL) to determine whether contamination is an ongoing problem. If frequent contamination is detected, steps to identify and eliminate the source of contamination are highly recommended.

- Overall, the lake is doing well despite the cautions on the reports. As we both know, there is an excessive amount of phosphorus in the lake which is to be somewhat expected given the more suburban environment/watershed. Also, the lake and immediate shoreline have a long history of development and use. Based on our findings, it appears that a majority of the nutrients currently enriching the lake are coming from the lake sediments not necessarily from the watershed. In lakes that are enriched, nutrients are released from the sediment during peak summer months when the lake is thermally stratified and the colder deep water is devoid of oxygen. This process is known as "internal loading" of nutrients. External loading is when nutrients enter the lake from the surrounding watershed (i.e. inlets, lawns, leaky septics, agriculture etc.). Typically developed lakes are enriched from both internal and external sources.

- The other caution listed on the reports was that the dissolved oxygen was once again depleted under the thermocline during the warm summer months. This is very typical for nutrient rich West Michigan lakes. The separation of cold water (bottom) and warmer water (top) creates two separate sections of the lake. The bottom cold water does not mix with the surface therefore it is unable to replenish with oxygen. However, bacteria and other organisms are still present in the bottom layer, using oxygen. So over the summer months the oxygen gets consumed but not replenished, hence the void we are seeing in the dissolved oxygen profile. Once the lake turns over in the fall the entire water column becomes well oxygenated once again.

Thank you,
Jaimee Desjardins, Environmental Scientist
West MI Regional Manager
PLM Lake & Land Management Corp.

PLM
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