2021 Winter Dissolved Oxygen Survey

Summary of Results

PREPARED FOR
The Muriel Lake Basin Management Society

PREPARED BY
LICA-Environmental Stewards

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Background Photo: Dee Craggs

INTRODUCTION

BACKGROUND

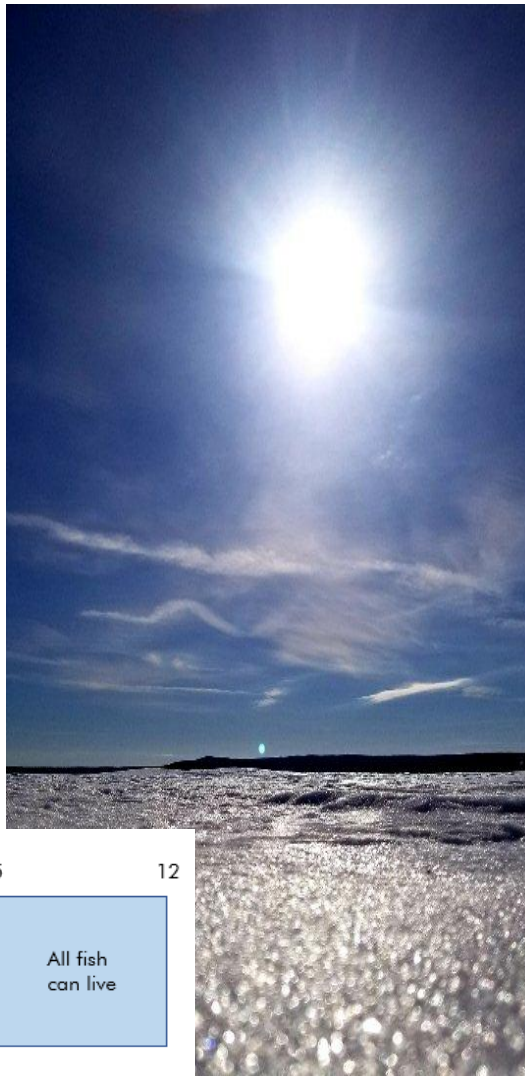
The Muriel Lake Basin Management Society (MLBMS) is a charitable, not-for-profit water stewardship association that aims to address declining water levels and fish spawning habitat, and water quality issues in Muriel Lake. The MLBMS has conducted winter dissolved oxygen (DO) measurements at the deepest point in Muriel Lake annually since 2018-2019 (MLBMS, n.d.).

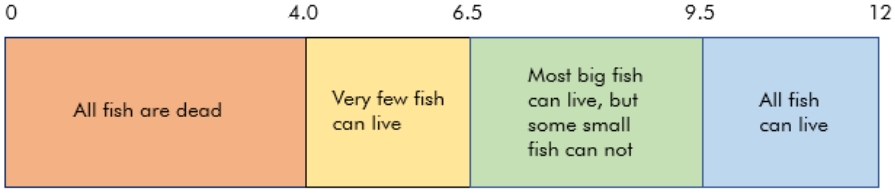
Sampling equipment for this project was provided by LICA-Environmental Stewards. LICA is a non-profit community association focused on environmental stewardship in the Lakeland region of Alberta. Among other roles, LICA is the Watershed Planning and Advisory Council for the Beaver River Watershed, which includes Muriel Lake (LICA, n.d.).

DO is being measured so the MLBMS can determine options for improving fish habitat to support year-round fish survival.

Oxygen is essential for fish survival and different species have varying oxygen needs, which can change depending on life stage. DO is the amount of oxygen dissolved in water and thus, available for aquatic species. The Environmental Quality Guidelines for Alberta Surface Waters lists the minimum short term DO level as 5 mg/L, with the long term (7 day mean) minimum at 6.5 mg/L for the protection of freshwater aquatic life (GOA, 2018, p.29).

Photo: Dee Craggs





(GNWT, n.d.)

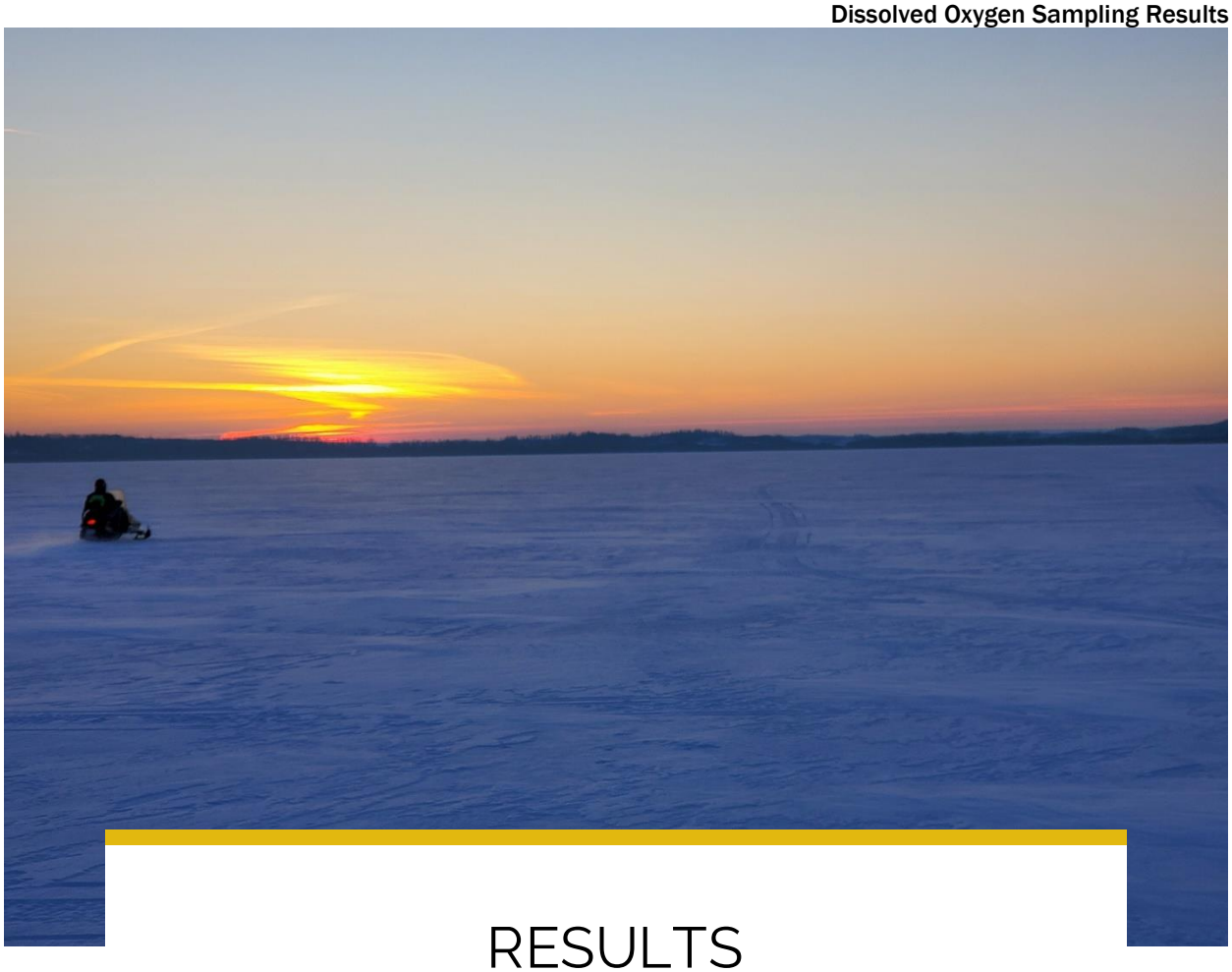
The amount of DO available for fish depends on the amount of oxygen entering the lake and the amount being used up by aquatic species. There are several natural methods where oxygen is added to a lake. Points of oxygen entry is also determined by whether the lake is open or frozen (AEP, 2021). The amount of dissolved oxygen available to fish in the winter depends on water temperature, the amount of ice and snow cover, daylight hours, plant activity, and the breathing rate of fish (MN, 2010). In this case, winter DO is measured to determine if Muriel Lake can support fish life while the lake is frozen.

Photo: YSI Professional Plus

METHODS

Data was collected using a YSI Professional Plus probe which measures temperature, dissolved oxygen, pH, conductivity, and total dissolved solids (TDS). The YSI probe was calibrated as needed following YSI protocols (YSI Inc., 2009) and inserted into a hole in the ice. Measurements were taken at the deepest known part of Muriel Lake, which has a depth of 4.5 meters (m), and measurements were recorded at every 0.5 m of depth. Other recorded information included: date, GPS coordinates for the sampling location, air temperature, wind speed and direction, percent cloud cover, and ice thickness. The MLBMS conducted water measurements in early January, February, and March 2021. Unsafe ice conditions prevented a fourth trip in December 2020 and late March 2021.

Photo: Winter DO sampling
Credit: (MLBMS, n.d.)



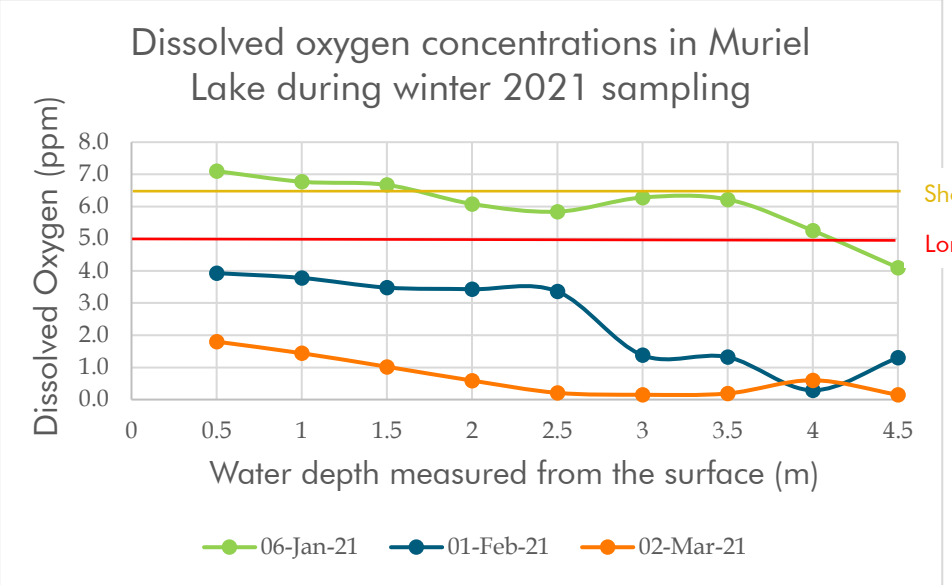
RESULTS

DO concentrations were reported above 6.5 parts per million (ppm), the minimum long term requirement for the protection of freshwater aquatic life, for water depths of 0.5 to 1.5 m during the January 2021 sampling trip. DO results were between 6.5 and 5.0 ppm, the minimum short term requirement for the protection of freshwater aquatic life, for water depths of 2.0 to 4.0 m during the January 2021 sampling trip. DO results were below 5.0 ppm for water depths of 4.5 m during the January sampling trip and for all measurements during the February and March 2021 trips.

The highest recorded DO level was 7.10 ppm at a water depth of 0.5 m in January 2021. The lowest recorded DO level was 0.15 ppm at a water depth of 3.0 m and 4.5 m in March 2021.

Please note, 1 mg/L is approximately equal to 1 ppm.

Photo: Dee Craggs



Date	Depth (m)	Dissolved Oxygen (ppm)
06-Jan-21	0.5	7.10
	1	6.77
	1.5	6.67
	2	6.08
	2.5	5.84
	3	6.28
	3.5	6.22
	4	5.25
	4.5	4.10
01-Feb-21	0.5	3.93
	1	3.78
	1.5	3.48
	2	3.43
	2.5	3.36
	3	1.38
	3.5	1.32
	4	0.29
	4.5	1.30
02-Mar-21	0.5	1.80
	1	1.44
	1.5	1.02
	2	0.59
	2.5	0.21
	3	0.15
	3.5	0.19
	4	0.60
	4.5	0.15

Red: Values < 5.0 ppm Yellow: Values < 6.5 ppm

CONCLUSION

DO concentrations in Muriel Lake did not support winter survival of fish in 2020-2021.

REFERENCES

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