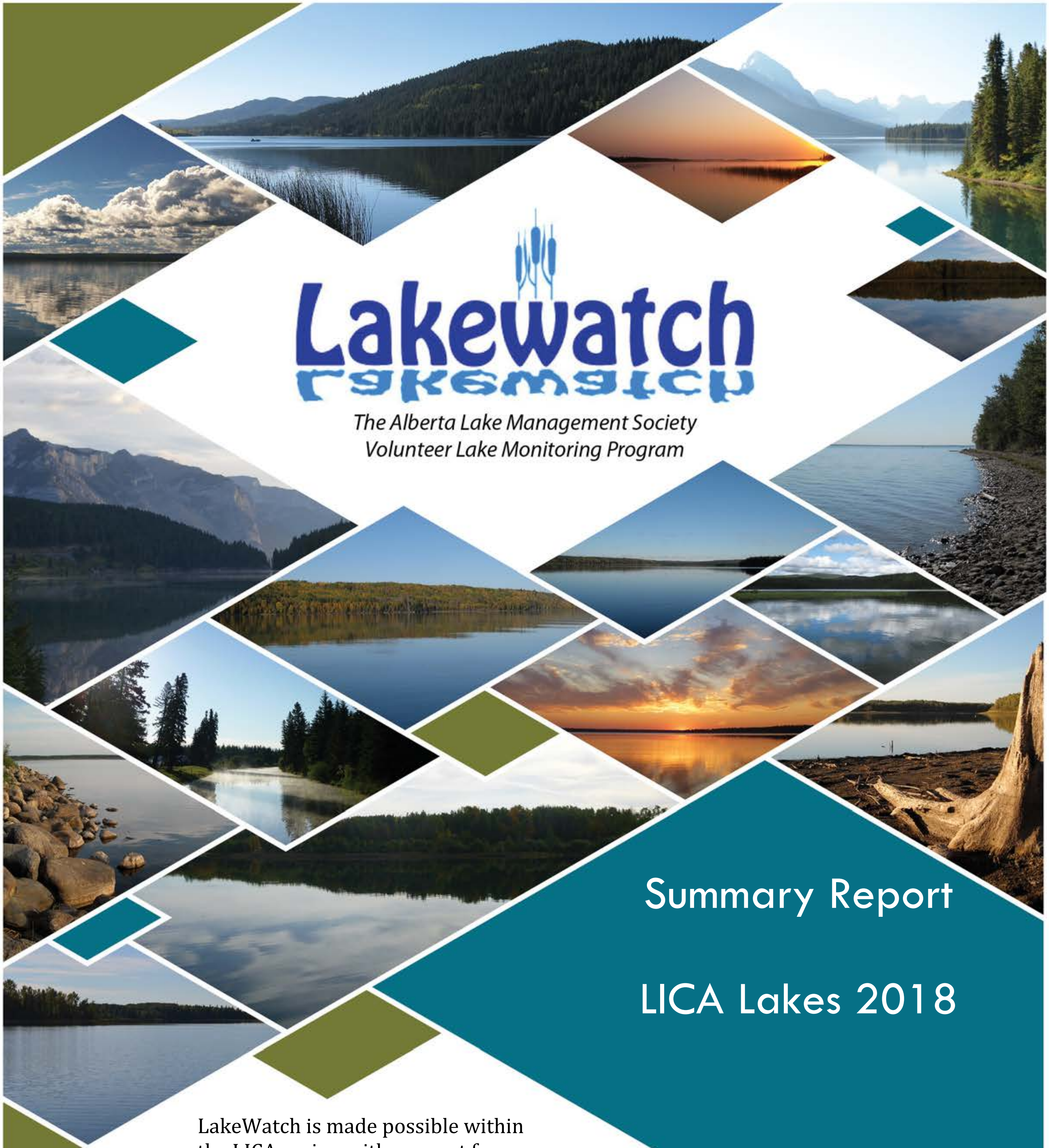

Lakewatch

The Alberta Lake Management Society
Volunteer Lake Monitoring Program

Summary Report

LICA Lakes 2018

LakeWatch is made possible within the LICA region with support from:

Alberta

LICA ENVIRONMENTAL STEWARDS

ALBERTA LAKE MANAGEMENT SOCIETY'S LAKEWATCH PROGRAM

LakeWatch has several important objectives, one of which is to collect and interpret water quality data on Alberta Lakes. Equally important is educating lake users about their aquatic environment, encouraging public involvement in lake management, and facilitating cooperation and partnerships between government, industry, the scientific community and lake users. LakeWatch Reports are designed to summarize basic lake data in understandable terms for a lay audience and are not meant to be a complete synopsis of information about specific lakes. Additional information is available for many lakes that have been included in LakeWatch and readers requiring more information are encouraged to seek those sources.

ALMS would like to thank all who express interest in Alberta's aquatic environments and particularly those who have participated in the LakeWatch program. These leaders in stewardship give us hope that our water resources will not be the limiting factor in the health of our environment.

This report has been prepared with un-validated data.

ACKNOWLEDGEMENTS

The LakeWatch program is made possible through the dedication of its volunteers. We would also like to thank Alanna Robertson, Lindsay Boucher and Shona Derlukewich, who were summer technicians in 2018. Executive Director Bradley Peter and Program Coordinator Laura Redmond were instrumental in planning and organizing the field program. This report was prepared by Caitlin Mader and Bradley Peter.

INTRODUCTION

In 2018, ALMS received funding from through the Lakeland Industry and Community Association (LICA), and Alberta Environment and Parks, to conduct LakeWatch a volunteer based water quality monitoring program in the LICA region. Lakes sampled for within the LICA region are part of the larger province-wide LakeWatch program, which included 32 lakes in total in 2018. This report presents data on only the ten of these lakes within the LICA region. Data presented below has not completed its final validation process.

SAMPLE RECORD

Three summer field technicians (Alanna Roberts, Lindsay Boucher and Shona Derlukewich) were hired in May of 2018 to conduct water quality sampling. ALMS completed a standard monitoring program at 10 lakes in the LICA region. From June through early October 2018, lakes were visited four or five times each. In 2018, 47 of 50 scheduled trips were completed. This resulted in a completion rate of 94% (Table 1). Missed trips were a result of volunteer unavailability, one boat mechanical issue, and unsafe weather.

VOLUNTEERS

In 2018, across all 10 LICA lakes included in the LakeWatch program, ALMS worked with 20 unique volunteers for a total of 181 volunteer hours spent sampling lakes. Each year ALMS volunteers show outstanding dedication and commitment to the LakeWatch program.

Left: Shona Derlukewich, and Robert and Shelley Tymofichuck sampling on Stoney Lake.
Right: Brad Peter and Orest Kitt brave the cold to sample on Skeleton Lake North.

Table 1- The LICA LakeWatch sample completion record for 2018.

Lake	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5
Beaver	14-Jun	15-Jul	05-Aug	26-Aug	Missed
Crane	18-Jun	13-Jul	06-Aug	21-Aug	14-Sep
Hilda	13-Jun	10-Jul	01-Aug	16-Aug	11-Sep
Jessie	20-Jun	17-Jul	07-Aug	27-Aug	11-Sep
Laurier	3-Jun	9-Jul	30-Jul	21-Aug	5-Sep
Minnie	21-Jun	12-Jul	08-Aug	Missed	6-Sep
Moose	Missed	10-Jul	31-Jul	17-Aug	18-Sep
Skeleton North	5-Jun	16-Jul	11-Aug	25-Aug	10-Sep
Skeleton South	5-Jun	5-Jul	11-Aug	25-Aug	10-Sep
Vincent	15-Jun	6-Jul	31-Jul	17-Aug	8-Sep

RESULTS

While ALMS collects a large suite of water chemistry parameters, this report will highlight the variability which exists across only a few of our major parameters: Secchi Depth, Total Phosphorus, Chlorophyll-a, and Microcystin. The variation within these parameters does not necessarily reflect a degree of lake management, for many factors outside of human control also impact lake water quality. The depth of the lake, the size of the drainage basin, lake order, and the composition of bedrock and sediment are just some of the factors which affect lake water quality and should be taken into consideration when reading these results.

Kayaker on Jessie Lake, 2018

WATER CLARITY AND SECCHI DEPTH

Water clarity is influenced by suspended materials both living and dead, as well as dissolved colored compounds in the water column. During the melting of snow and ice in spring, lake water can become turbid (cloudy) from silt transported into the lake. Lake water usually clears in late spring but then becomes more turbid with increased algal growth as the summer progresses. The easiest and most widely used measure of lake water clarity is the Secchi disk depth. Two times the Secchi disk depth equals the euphotic depth – the depth to which there is enough light for photosynthesis.

Average Secchi depths within the LICA region in 2018 ranged from a minimum of 0.88 m at Jessie Lake to a maximum of 4.02 m at Crane Lake (Figure 1, Table 2). Secchi depth averages were significantly negatively correlated with average chlorophyll-*a* concentrations across lakes (Kendalls' Tau-b, τ_b= -0.51, *p-value* =0.047). This means that across all lakes, water turbidity was largely associated with algae blooms.

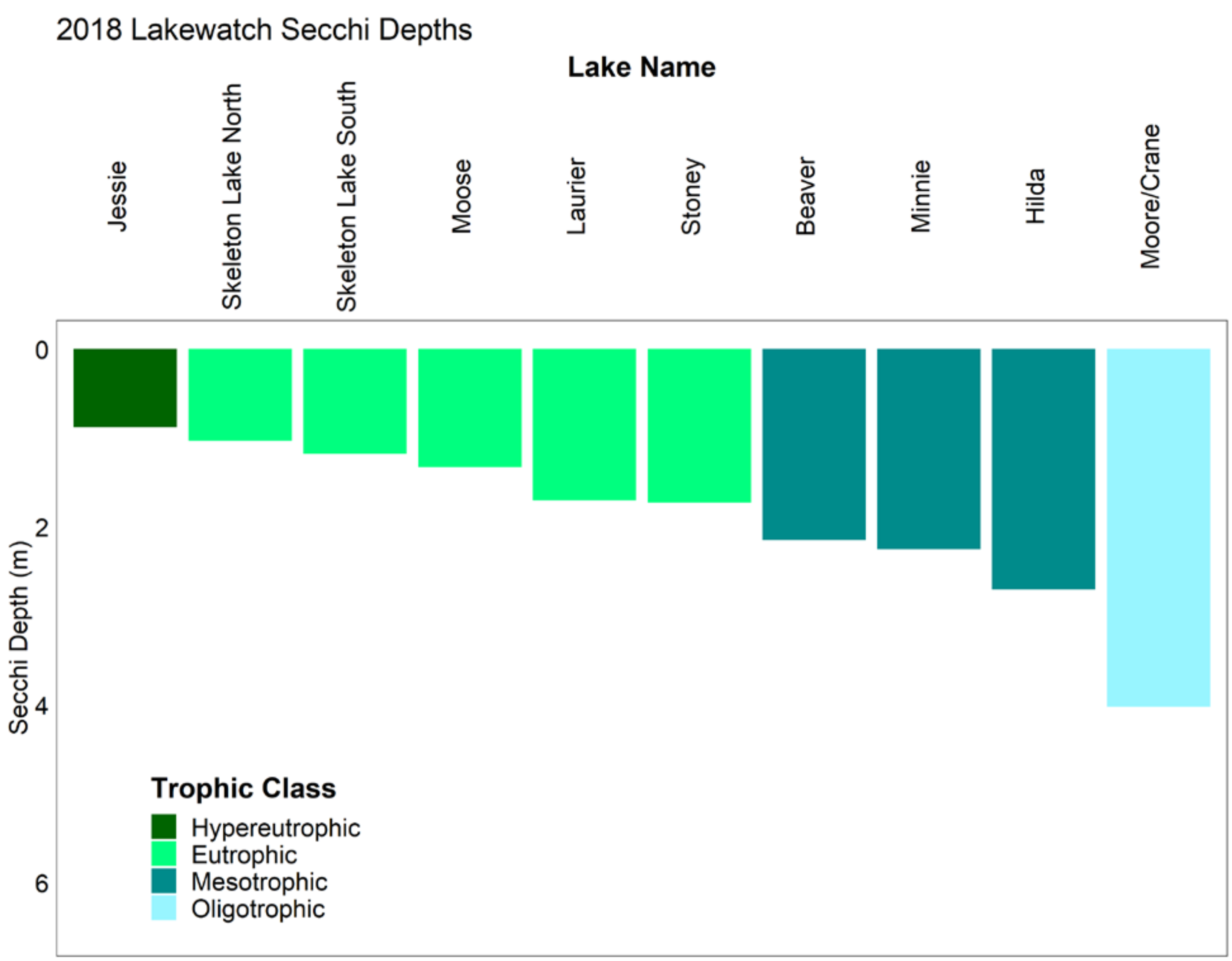

Figure 1*:* Average Secchi disk depth (m) values measured at 10 LICA lakes during the summer of 2018.

WATER CHEMISTRY

ALMS measures a suite of water chemistry parameters. Phosphorus, nitrogen, and chlorophyll-a are important because they are indicators of eutrophication, or excess nutrients, which can lead to harmful algal/cyanobacteria blooms. One direct measure of harmful cyanobacteria blooms are Microcystins, a common group of toxins produced by cyanobacteria.

Average total phosphorus concentrations ranged from a minimum of 12.5 μg/L at Crane Lake to a maximum of 1050 μg/L at Jessie Lake (Figure 3, Table 2).

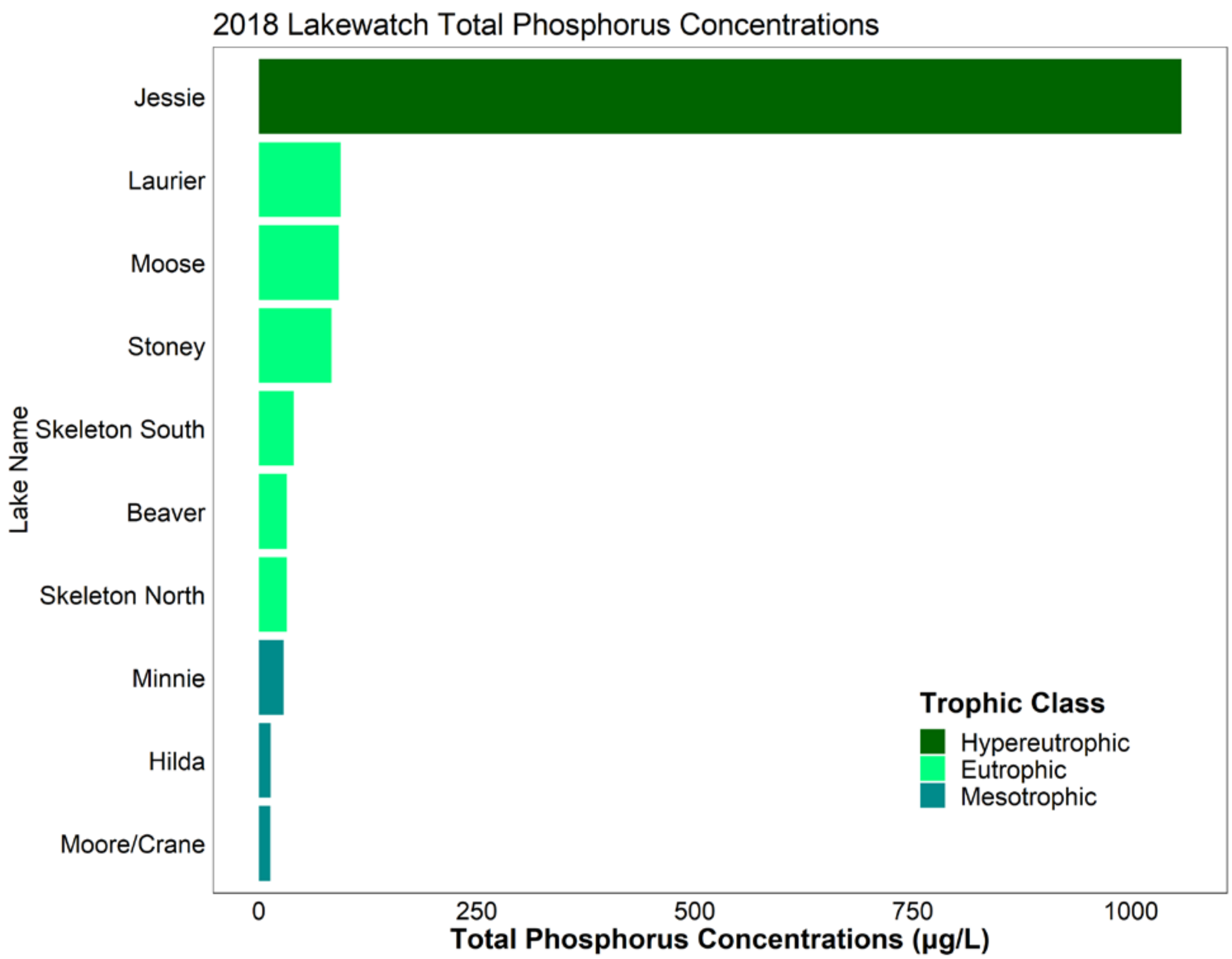

Figure 3: Average total phosphorus (TP) concentrations measured at 10 LICA lakes during the summer of 2018.

CHLOROPHYLL-A

Chlorophyll-a is the green pigment found in plants and algae's that allows them to photosynthesize. Measuring the concentration of chlorophyll-a is a common way of testing how much algae is present in lake water, because any green algae will contain it.

Average chlorophyll-*a* concentrations ranged from a minimum of 4.55 µg /L at Crane Lake to a maximum of 91.2 µg /L at Moose Lake (Figure 4, Table 2).

Chlorophyll-*a* and TP averages were significantly correlated across lakes (Kendalls' Tau, τ= 0.73, *p-value* = 0.002).

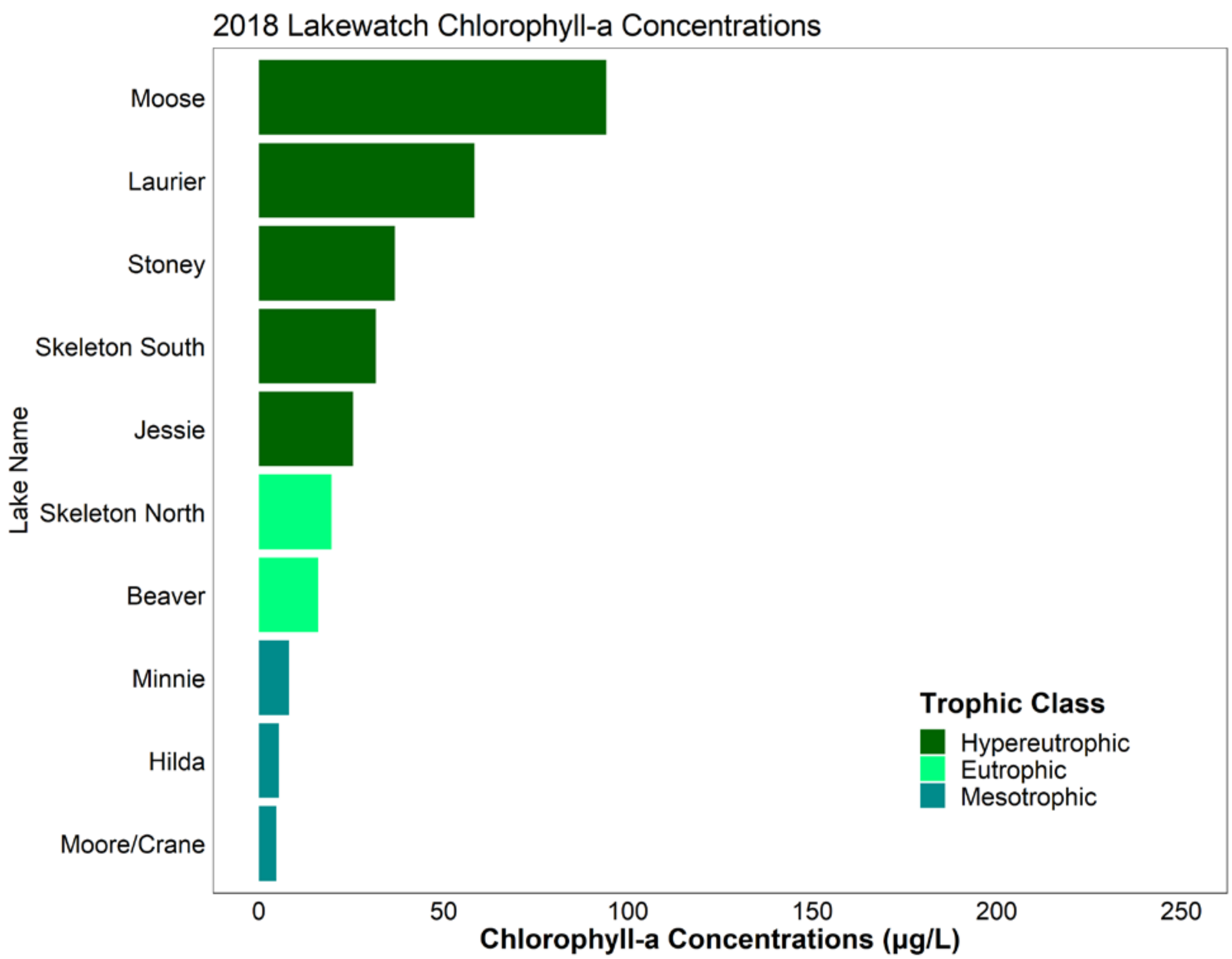

Figure 4: Average chlorophyll-*a* values measured at 10 LICA lakes during the summer of 2018.

MICROCYSTIN

Microcystins are toxins produced by cyanobacteria (blue-green algae) which, when ingested, can cause severe liver damage. Microcystins are produced by many species of cyanobacteria which are common to Alberta's Lakes, and are thought to be the one of the most common cyanobacteria toxins. In Alberta, recreational guidelines for microcystin are set at 20 µg/L.

Microcystin was detected at all lakes in the LICA region (Figure 5), with the highest average concentration observed at Moose Lake, measuring 3.72 µg /L (Table 2). None of the lakes sampled measured higher than the recreational guideline of 20 µg /L at any time throughout the summer of 2018. However, samples from individual locations not sampled by ALMS may display toxin concentrations higher than the recreational guidelines, and caution should be observed when recreating in or around cyanobacteria.

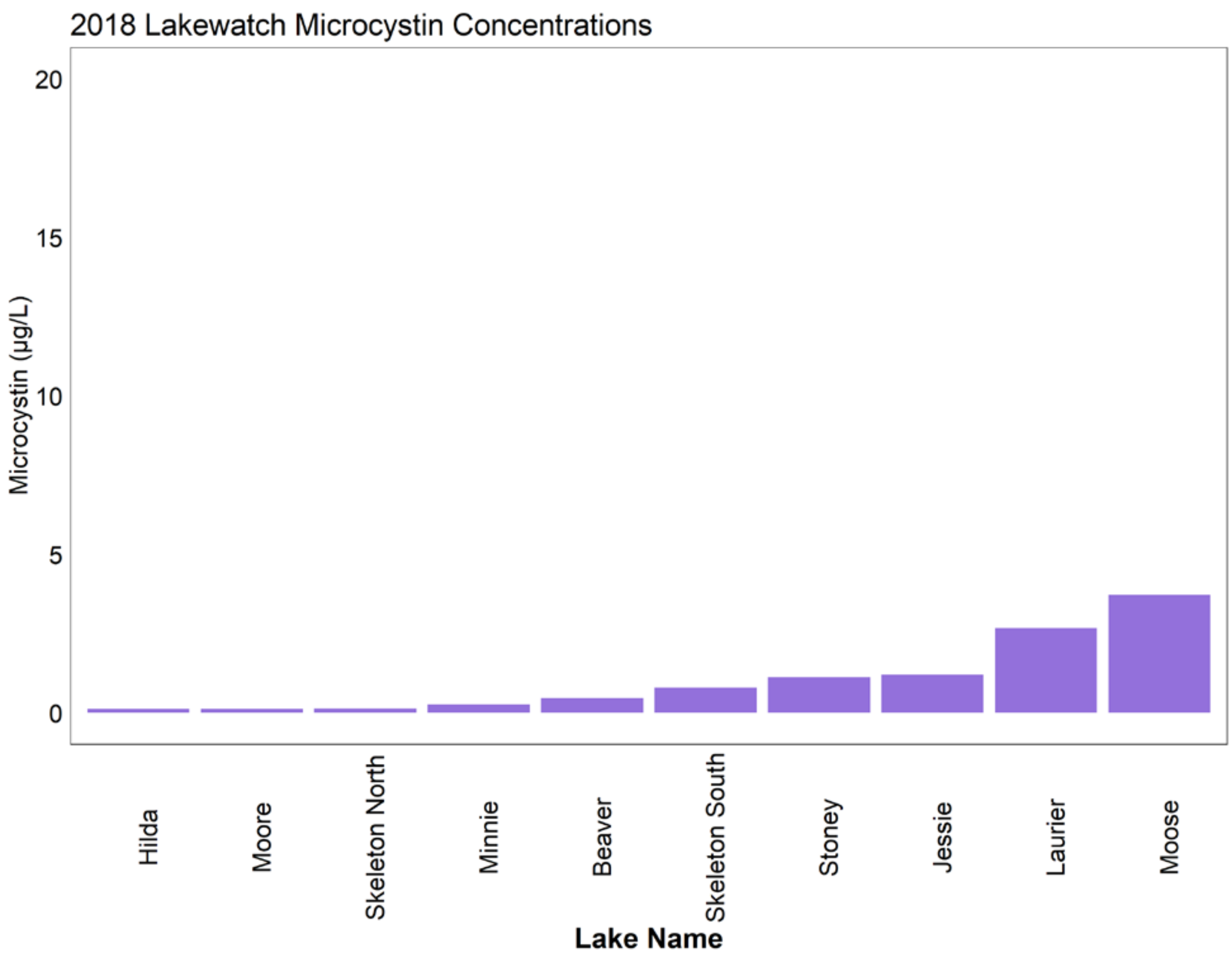

Figure 5: Average microcystin concentrations measured at the 10 LICA lakes during the summer of 2018.

Invasive Species

Dreissenid mussels pose a significant concern for Alberta because they impair the function of water conveyance infrastructure and adversely impact the aquatic environment. These invasive mussels have been linked to creating toxic algae blooms, decreasing the amount of nutrients needed for fish and other native species, and causing millions of dollars in annual costs for repair and maintenance of water-operated infrastructure.

Monitoring involved two components: monitoring for juvenile mussel veligers using a plankton net and monitoring for attached adult mussels using substrates installed in each lake. In 2018, no mussels were detected in the 10 lakes sampled.

Metals

Samples were analyzed for metals once throughout the summer (Table 3). In total, 27 metals were sampled for. It should be noted that many metals are naturally present in aquatic environments due to the weathering of rocks and may only become toxic at higher levels. In this report we highlight the results of arsenic, boron, aluminum and selenium as they have fallen above their recommended guidelines in the LICA region in previous years. Individual LakeWatch reports will present the complete suite of metal results.

In wet years, metals in LICA region lakes may be elevated as a result due to groundwater recharge and the weathering of rocks and sediments.

Arsenic may be introduced to aquatic environments through industrial or municipal discharges or from the combustion of fossil fuels. Arsenic is known to be naturally elevated in the Beaver River Watershed, and in 2018, Minnie Lake and Stoney Lake exceeded the Canadian Council for Ministers of the Environment (CCME) recommended guidelines for the Protection of Aquatic Life (PAL; 5.0 μg/L). This is not an unusual occurrence at lakes in the LICA region.

Boron is naturally occurring in many minerals, particularly in clay-rich sediments. Natural weathering can release boron into the environment at a higher rate than industrial sources. While two lakes exceeded Boron concentrations in 2017, none of the sampled LICA lakes exceeded the CCME PAL guidelines (1500 μg/L) in 2018.

Aluminum occurs naturally in the sediment and was not in exceedance in the 2018 LICA lakes.

Selenium can be found in water from both natural and anthropogenic sources. Examples of anthropogenic sources of selenium are the burning of coal and oil, and agriculture. In 2018, only Jessie Lakes was in exceedance of the CCME recommended guidelines for the Protection of Aquatic Life (1 μg/L; Table 2).

Table 2- Average metal summaries for LICA lakes in the 2018 season.

Lake	Aluminum[a] (µg/L)	Arsenic[b] (µg/L)	Boron[c] (µg/L)	Selenium[d] (µg/L)
Beaver Lake	1.9	1.75	87.3	0.3
Crane (Moore) Lake	1.7	4.08	289	0.8
Hilda Lake	8.9	2.16	233	0.7
Jessie Lake	40.5	4.39	420	3.0
Laurier Lake	3.9	2.13	140	0.6
Minnie Lake	1.8	7.70	170	0.7
Moose Lake	1.3	2.18	172	0.4
Skeleton Lake North	2.8	0.84	94.6	0.2
Skeleton Lake South	1.8	1.03	106	<0.2
Stoney Lake	1.4	5.05	177	0.4

[a]Guideline: 100 µg/L
[b]Guideline: 5 µg/L
[c]Guideline: 1500 µg/L
[d]Guideline: 1 µg/L

Table 3- Average water chemistry and secchi depth summaries for LICA lakes in the 2018 season.

Lake Name	Total Phosphorus (µg/L)	Chlorophyll-a (µg/L)	Total Dissolved Phosphorus (µg/L)	Microcystin (µg/L)	Secchi depth (m)
Beaver Lake	31.8	16.0	6.88	0.46	2.15
Crane Lake	12.5	4.66	4.18	0.12	4.02
Hilda Lake	13.1	5.38	7.84	0.12	2.70
Jessie Lake	1058	25.4	992	1.20	0.88
Laurier Lake	93.6	58.3	16.6	2.68	1.70
Minnie Lake	28.0	8.08	9.18	0.27	2.25
Moose Lake	91.3	94.1	18.1	3.72	1.33
Skeleton Lake North	31.6	19.6	7.66	0.13	1.03
Skeleton Lake South	39.6	31.6	6.68	0.79	1.18
Stoney Lake	83.0	36.8	23.0	1.13	1.73