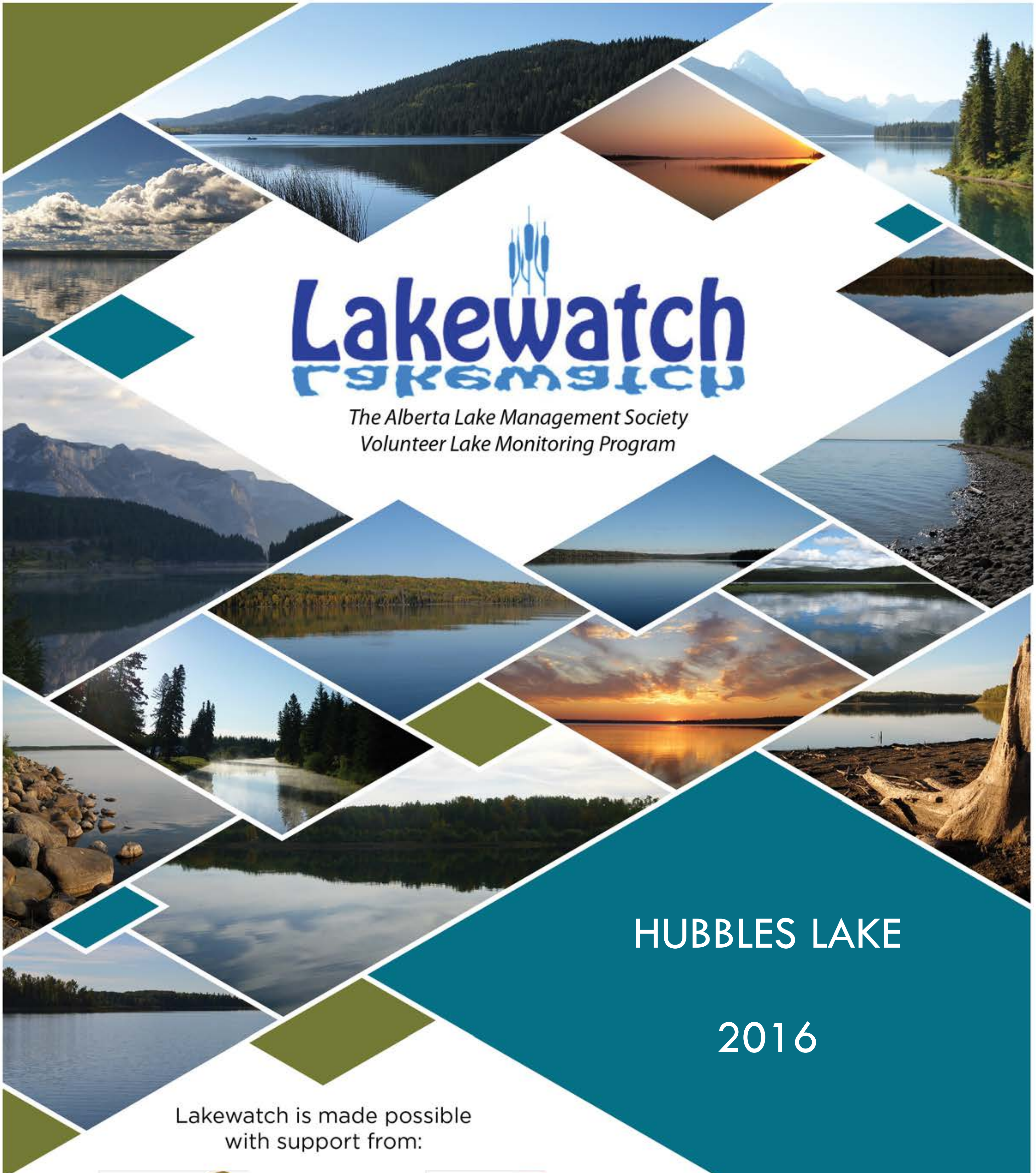


Lakewatch

The Alberta Lake Management Society
Volunteer Lake Monitoring Program

HUBBLES LAKE

2016

Lakewatch is made possible
with support from:

Beaver River Watershed Alliance

aemera.org

LICA Lakeland Industry & Community Association

Ce projet a été réalisé avec l'appui financier de :
This project was undertaken with the financial support of:

Environnement Canada Environment Canada

ALMS

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 people prove that ecological apathy can be overcome and give us hope that our water resources will not be the limiting factor in the health of our environment.

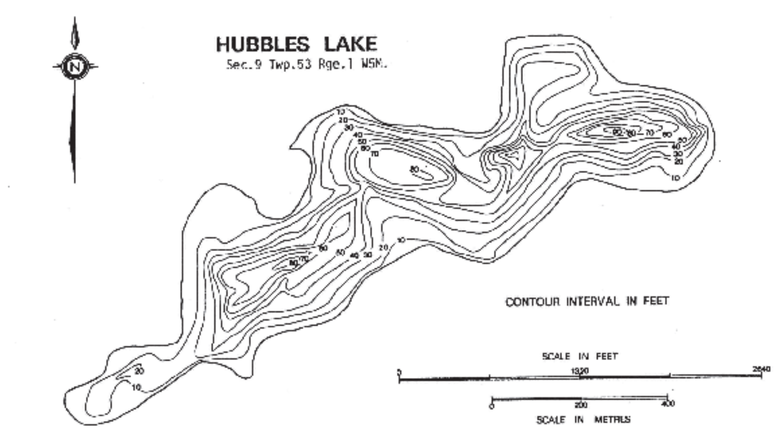
ACKNOWLEDGEMENTS

The LakeWatch program is made possible through the dedication of its volunteers. We would like to extend a special thanks to Judith & Skip Bowman and Jody Kyfiuk for the time and energy put into sampling Hubbles Lake in 2016. We would also like to thank Alicia Kennedy, Ageleky Bouzetos, and Breda Muldoon who were summer technicians in 2016. Executive Director Bradley Peter was instrumental in planning and organizing the field program. Alicia Kennedy was instrumental in report design. This report was prepared by Bradley Peter and Laura Redmond.

HUBBLES LAKE

Hubbles Lake is a small (surface area: 0.4 km^2) lake set in Parkland County in central Alberta. The lake is a 30 minute drive from Edmonton, located just 5 km west of Stony Plain on Highway 16. The lake was named after the founder of a resort which was built on the southeast shore of the lake in the '50s.[1] Hubbles Lake is short and narrow, though deep for its size, with a maximum depth of 30 m and an average depth of 10.1 m. Hubbles Lake is thought to have three deep spots, two with a depth of 25 m, and a third with a maximum depth of 30 m; however, the deepest of these spots has been difficult to locate. Motorized boats are not allowed on Hubbles Lake - battery powered pontoons are the most popular watercraft. The lake is also used by people who enjoy canoeing, kayaking, and paddle-boarding. Hubbles Lake is known to host the Great White North triathlon every year, and it is not unusual to observe people swimming the length of the lake. Historically, Hubbles Lake was a favourite spot used by SCUBA divers who sunk interesting objects to the bottom of the lake.

Sport fish at Hubbles Lake are limited to Northern Pike (*Esox lucius*) and Yellow Perch (*Perca flavescens*) which were stocked in the late '50s. In 1967, a community centennial project placed ~2,000 old tires at the bottom of the lake in effort to create a better fish habitat for the known species.[1] Numerous macrophytes are located in the littoral zone and riparian area of the lake, including species such as the common cattail, sedges, bulrush, arrowheads, and giant bur-reed. Submerged macrophytes include stonewort with low densities of northern water milfoil and sago pondweed. Waterfowl are commonly spotted around the lake and include species such as the mallard duck, Canadian goose, and common loon.



Bathymetric map of Hubbles Lake (Angler's Atlas)

Hubbles Lake has a watershed that is 20 times the surface area of the lake; however, its effective drainage basin is only 1.35 km^2. The lake is located in the boreal mixedwood ecoregion and most of the watershed is open agricultural land with patches of mixed wood and bushes. Hubbles Lake has numerous residential and recreational developments within the watershed and the Hubbles Lake Stewardship Society was recently formed to promote ecological stewardship and sustainable practices around the lake.

[1] University of Alberta. 2005. Atlas of Alberta Lakes; Hubbles Lake, Lake Basin Characteristics. University of Alberta Press. Available at: http://sunsite.ualberta.ca/Projects/Alberta-Lakes/ 4

To view Hubbles Lake's watershed map visit: http://alms.ca/wp-content/uploads/2016/12/Hubbles.pdf

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. See Table 2 for a complete list of parameters.

Total Phosphorus (TP) in Hubbles Lake had an average concentration of 18 µg/L in 2016, putting it in the mesotrophic trophic classification (Table 2). TP levels in Hubbles Lake in 2016 are on the low end of the observed historical averages. TP was relatively constant throughout the summer, with the maximum concentration of 34 µg/L measured on August 12 (Figure 1).

Chlorophyll-*a* concentrations increased over the course of the summer, with an average concentration of 5.7 µg/L in 2016 (Table 2). This also puts Hubbles Lake in the mesotrophic trophic status class. A maximum concentration of 7.3 µg/L was reached on August 12 (Figure 1).

Hubbles Lake had an average total Kjeldahl nitrogen (TKN) concentration of 0.86 mg/L over 5 sampling dates in 2016 (Table 2). On June 20, TKN concentration was at its seasonal maximum of 0.95 mg/L (Figure 1).

Average pH measured as 8.10 in 2016, buffered by moderate alkalinity (122 mg/L $CaCO_3$) and bicarbonate (148 mg/L HCO_3). Sulphate was the dominant ion contributing to a moderate conductivity measure of 606 µS/cm (Table 2).

METALS

Samples were analyzed for metals twice 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.

Metals were measured once at Hubbles Lake and all measured values fell within their respective guidelines (Table 3).

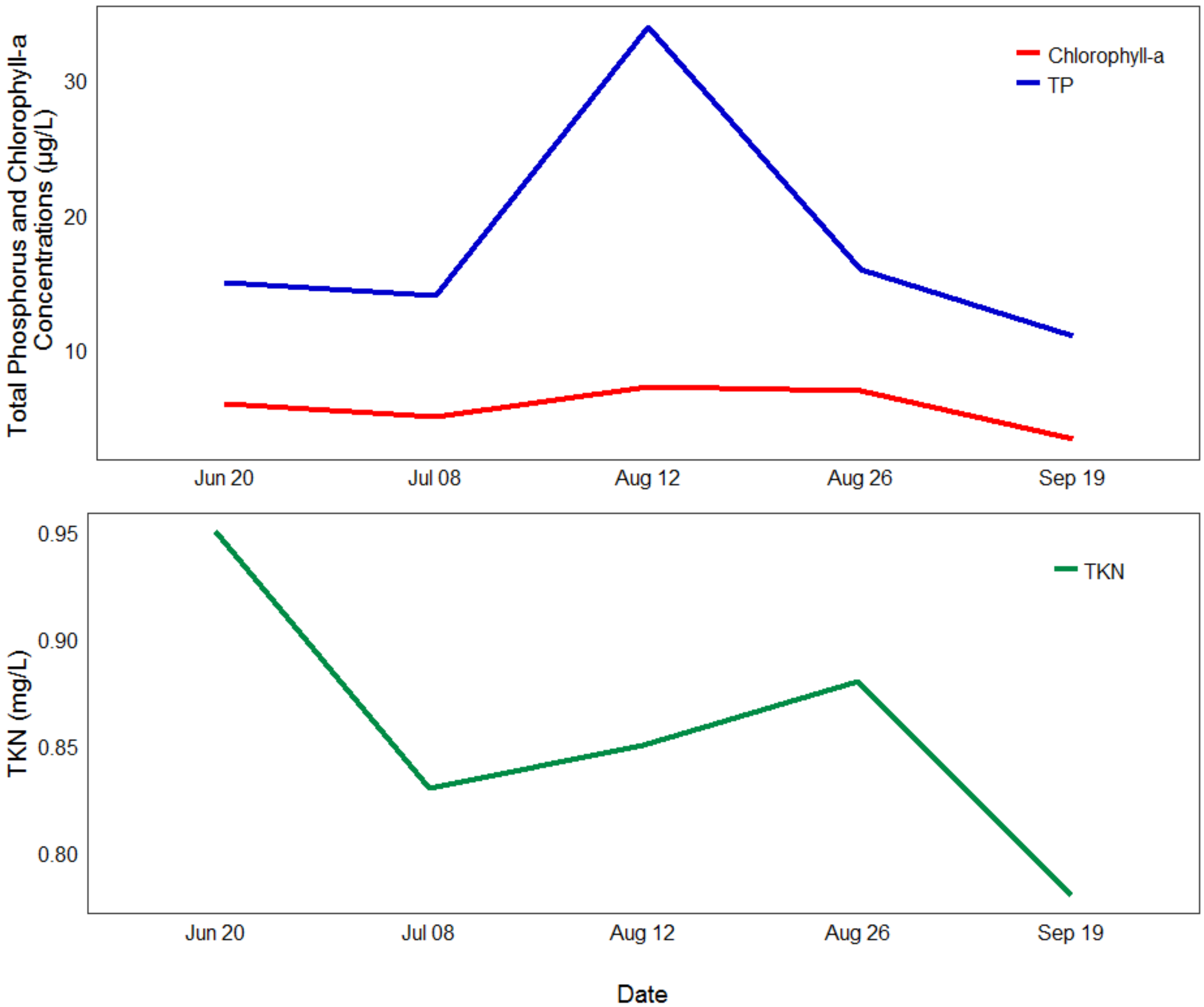


Figure 1- Total Phosphorus (TP), Total Kjeldahl Nitrogen (TKN), and Chlorophyll-*a* concentrations measured five times over the course of the summer at Hubbles Lake.

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 depth in 2016 was 5.55 m, classifying Hubbles Lake as oligotrophic, or low productivity (Figure 2). A maximum Secchi depth of 6.00 m was recorded on June 20 and September 19, but water clarity remained deep for the entire season. Secchi depth remained relatively constant throughout the sampling season.

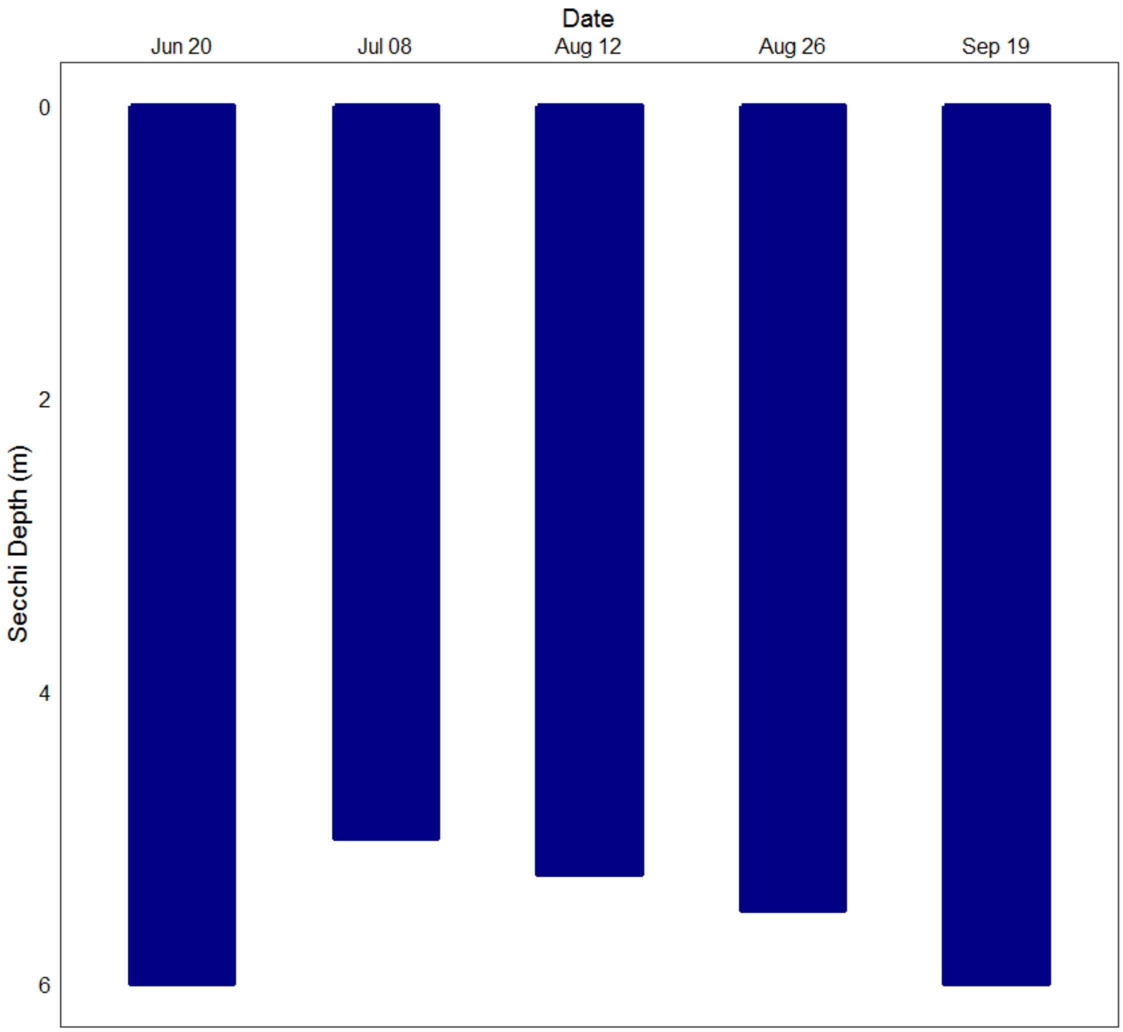


Figure 2 – Secchi depth values measured five times over the course of the summer at Hubbles Lake in 2016.

WATER TEMPERATURE AND DISSOLVED OXYGEN

Water temperature and dissolved oxygen profiles in the water column can provide information on water quality and fish habitat. The depth of the thermocline is important in determining the depth to which dissolved oxygen from the surface can be mixed. Please refer to the end of this report for descriptions of technical terms.

Hubbles Lake water temperatures varied throughout the summer (Figure 3a). A maximum temperature of 21.92 °C was observed on August 12. Hubbles Lake remained thermally stratified over the course of the sampling season, and the thermocline deepened as temperatures warmed.

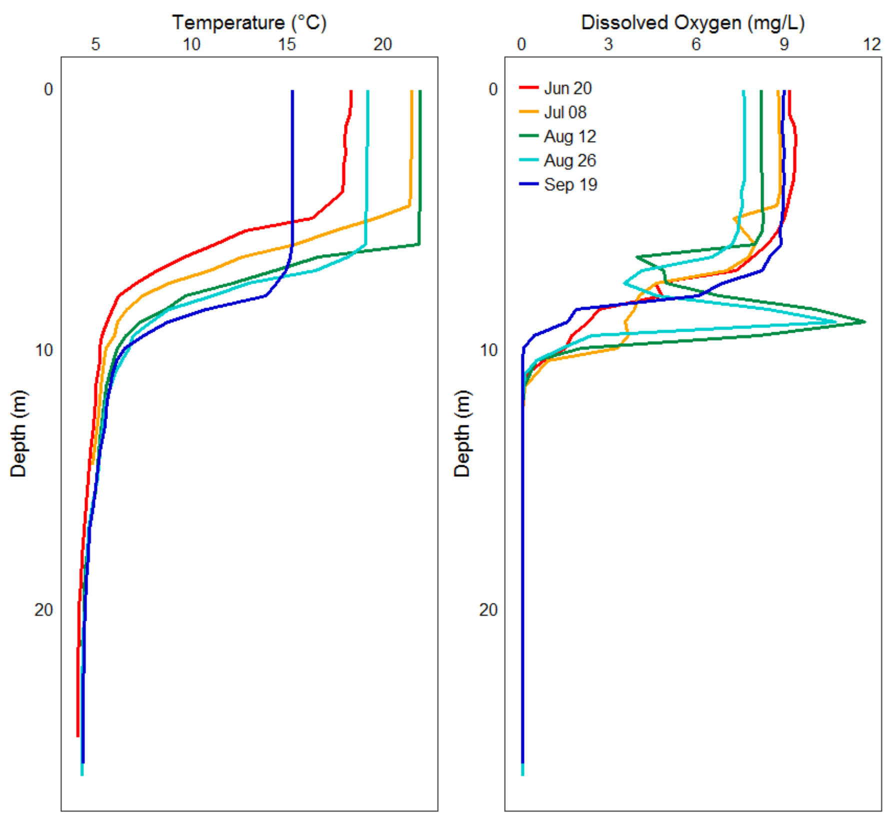


Figure 3 – a) Temperature (°C) and b) dissolved oxygen (mg/L) profiles for Hubbles Lake measured five times over the course of the summer of 2016.

Hubbles Lake remained well oxygenated at the surface throughout the summer, measuring above the Canadian Council for Ministers of the Environment guidelines of 6.5 mg/L for the Protection of Aquatic Life (Figure 3b). Hubbles Lake reached anoxic conditions at the bottom on all sampling visits. This is due to the separation of atmospheric oxygen from the surface by way of thermal stratification. On both visits in August there is a striking increase in oxygen at about 10 m depth, which could be due to a cold-water algal bloom just below the thermocline.

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.

Table 1 – Microcystin concentrations measured five times at Hubbles Lake in 2016. All measured values remained below the recommended guidelines for recreational use.

Date	**Microcystin Concentration (µg/L)**
Jun 20	0.16
Jul 8	0.26
Aug 12	0.51
Aug 26	0.46
Sep 19	0.22
Average	0.32

INVASIVE SPECIES MONITORING

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 and facilities.

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 2016, no invasive mussels were detected in Hubbles Lake.

WATER LEVELS

There are many factors influencing water quantity. Some of these factors include the size of the lakes drainage basin, precipitation, evaporation, water consumption, ground water influences, and the efficiency of the outlet channel structure at removing water from the lake. Requests for water quantity monitoring should go through Alberta Environment and Parks Monitoring and Science division.

Water levels in Hubbles Lake have decreased since Alberta Environment began monitoring the lake in 1968 (Figure 4). Since 1968, Hubbles Lake water levels have fluctuated between 729 m asl and 727.8 m asl, with a decreasing trend since about the early 1990s.

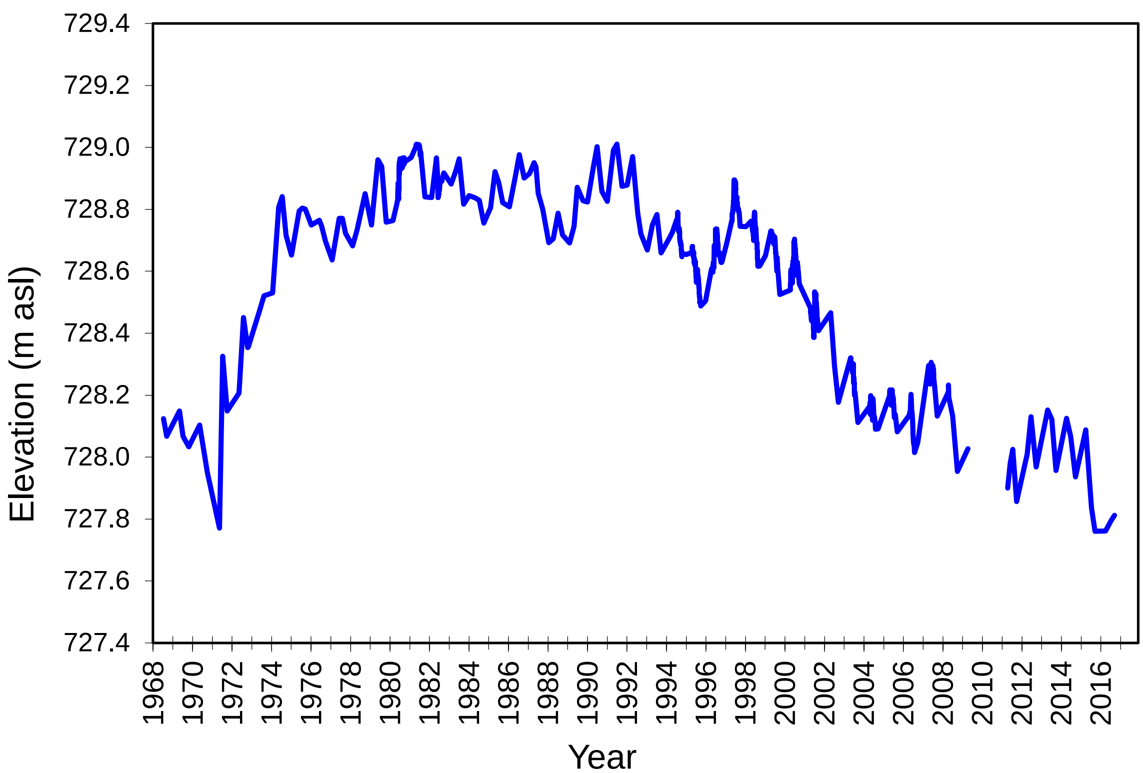


Figure 4- Water levels measured in meters above sea level (m asl) from 1968- 2016. Data retrieved from Alberta Environment.

Table 2: Average Secchi depth and water chemistry values for Hubbles Lake. Historical values are given for reference.

Parameter	1976	1980	1981	1986	2014	2015	2016
TP (µg/L)	25	30	24	/	17	28	18
TDP (µg/L)	/	/	/	9	9	8	5
Chlorophyll-*a* (µg/L)	/	10.3	7.7	/	1.8	3.6	5.7
Secchi depth (m)	/	5.20	3.90	/	6.85	4.63	5.55
TKN (mg/L)	1.2	/	1.0	/	0.8	1.3	0.86
NO_2 and NO_3 (µg/L)	25.3	/	6	/	28	2.5	2.5
NH_3 (µg/L)	100	/	73	/	55	30	32.8
DOC (mg/L)	/	/	/	/	8.53	9.22	9.46
Ca (mg/L)	/	/	/	47	50	48	48
Mg (mg/L)	40	/	/	35	35	39	41
Na (mg/L)	11	/	/	9	15	15	15
K (mg/L)	8.33	/	/	11	11	11	12
SO_4^{2-} (mg/L)	159	/	/	185	173	190	190
Cl^- (mg/L)	0.5	/	/	/	3.87	4.24	4
CO_3 (mg/L)	/	/	2	/	0.10	0.25	0.25
HCO_3 (mg/L)	/	/	163	/	158	156	148
pH	7.87	/	/	7.7	8.14	8.06	8.10
Conductivity (µS/cm)	567	/	/	418	600	612	606
Hardness (mg/L)	280	/	275	/	269	284	286
TDS (mg/L)	368	/	/	383	368	382	382
Microcystin (µg/L)	/	/	/	/	0.12	0.05	0.32
Total Alkalinity (mg/L $CaCO_3$)	173	/	138	/	129	130	122

Table 3: Concentrations of metals measured once in Hubbles Lake. The CCME heavy metal Guidelines for the Protection of Freshwater Aquatic Life (unless otherwise indicated) are presented for reference.

Metals (Total Recoverable)	**2014**	**2015**	**2016**	**Guidelines**
Aluminum µg/L	10.1	28.5	8.7	100[a]
Antimony µg/L	0.045	0.048	0.047	6[d]
Arsenic µg/L	1.4	1.42	1.26	5
Barium µg/L	80	73	64.1	1000[d]
Beryllium µg/L	0.004	0.004	0.004	100[c,e]
Bismuth µg/L	0.0005	0.001	0.001	/
Boron µg/L	122	125	132	1500
Cadmium µg/L	0.001	0.001	0.002	0.26[b]
Chromium µg/L	0.2	0.4	0.1	/
Cobalt µg/L	0.032	0.032	0.011	1000[e]
Copper µg/L	0.83	0.9	1	4[b]
Iron µg/L	17.1	18.2	11.7	300
Lead µg/L	0.039	0.037	0.019	7[b]
Lithium µg/L	49.7	54	62.3	2500[f]
Manganese µg/L	37.9	72.9	17.5	200[f]
Molybdenum µg/L	0.05865	0.0617	0.057	73[c]
Nickel µg/L	0.14	0.033	0.004	150[b]
Selenium µg/L	0.08	0.06	0.1	1
Silver µg/L	0.001	0.002	0.001	0.25
Strontium µg/L	500	541	494	/
Thallium µg/L	0.0022	0.0014	0.00045	0.8
Thorium µg/L	0.0005	0.0069	0.0037	/
Tin µg/L	0.014	0.015	0.026	/
Titanium µg/L	0.86	0.7	0.5	/
Uranium µg/L	0.187	0.235	0.205	15
Vanadium µg/L	0.17	0.2	0.19	100[e,f]
Zinc µg/L	1.6	0.8	1.2	30

Values represent means of total recoverable metal concentrations.
[a] Based on pH ≥ 6.5
[b] Based on water hardness > 180mg/L (as CaCO3)
[c] CCME interim value.
[d] Based on Canadian Drinking Water Quality guideline values.
[e] Based on CCME Guidelines for Agricultural use (Livestock Watering).
[f] Based on CCME Guidelines for Agricultural Use (Irrigation).
A forward slash (/) indicates an absence of data or guidelines.