Lakewatch

THE ALBERTA LAKE MANAGEMENT SOCIETY

VOLUNTEER LAKE MONITORING PROGRAM

2015 Goose Lake Report

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

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.

This report has been published before the completion of the data validation process.

Acknowledgements

The LakeWatch program is made possible through the dedication of its volunteers. We would like to thank Sheryl & Fred Buxton for their assistance with sampling Goose Lake in 2015. We would also like to thank Laticia McDonald, Ageleky Bouzetos, and Mohamad Youssef who were summer technicians with ALMS in 2015. Executive Director Bradley Peter was instrumental in planning and organizing the field program. Mike Bilyk was involved in the training aspects of the program. Lisa Reinbolt was responsible for data management. This report was prepared by Bradley Peter and Alicia Kennedy. The Beaver River Watershed Alliance (BRWA), the Lakeland Industry and Community Association (LICA), the Alberta Environmental Monitoring Evaluation and Reporting Agency (AEMERA), and Environment Canada, were major sponsors of the program.

GOOSE LAKE:

Goose Lake is located 20 km west of Fort Assiniboine, in the Athabasca River Basin and Woodlands County. The lake is both fed and drained by Goose Creek, which enters the lake in the northwest corner and exits in the southwest. As the name suggests, both the lake and creek are likely named after the abundance of geese found in the area[1].

Figure 1 – The view from a dock at the Goose Lake day-use area. Photo by Laticia McDonald 2015.

The lake lies within the High Boreal Mixedwood ecoregion, and much of the lakeshore borders Crown Land. There are a few private residences and cleared agricultural regions around the lake, and public access is available along the south shore, near the hamlet of Lone Pine. Areas of public access include two private campgrounds and the county-operated Goose Lake Recreation and Day-Use Area.

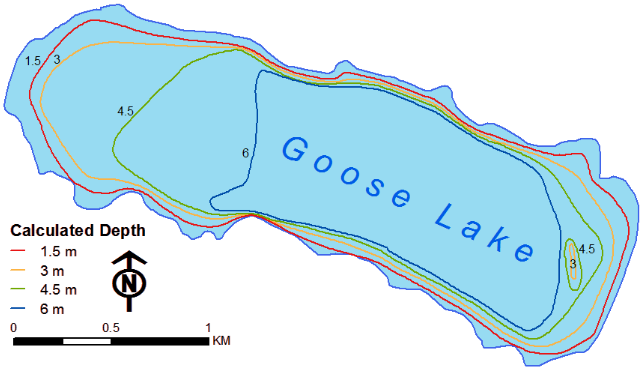

Figure 2 *– Bathymetric map of Goose Lake. GIS data from GeoDiscover Alberta Portal 2015.*

The drainage basin is very large in relation to the lake size, and the gently rolling landscape may result in the lake receiving lots of runoff. The lake has a surface area of 3.07 km^2, while the drainage basin, lying mostly to the north and northwest of the lake, measures over 150 km^2. The drainage basin is primarily forested, with some smaller areas cleared for agriculture. The maximum depth of the lake has been recorded as approximately 7.5 m, but the bottom is relatively shallow and uniform throughout (~ 6 m).

Northern pike (*Esox lucius*) and yellow perch (*Perca flavescens*) occur naturally within the lake, but past attempts to introduce walleye (*Stizostedion viteum*) and more perch have not been very successful.

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[1] Concise Place Names of Alberta, edited by Merrily K. Aubrey (Calgary, AB: University of Calgary Press, 2006)

WATER QUANTITY:

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 Environment and Sustainable Resource Developments Monitoring and Science division.

Water levels have fluctuated with a ~0.5 m range since 1972 at Goose Lake. A historical maximum of 725.12 meters above sea level (m asl) was observed in 2001, and a historical minimum of 723.863 was observed in 1968.

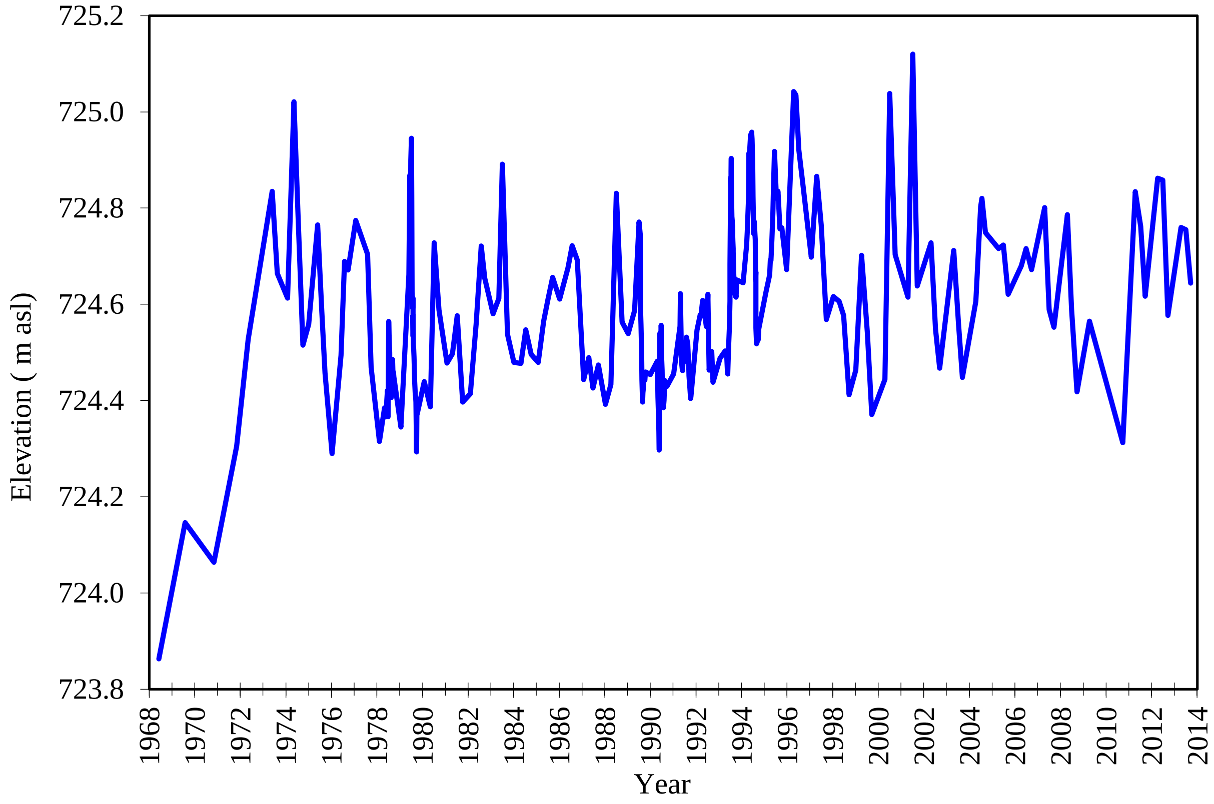

Figure 3 – Secchi disk depths measured at Goose Lake during the summer of 2015.

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 2015 measured 1.78 m (Table 2). In June, Secchi depth was at a seasonal maximum of 2.75 m – this coincides with the lowest concentrations of phytoplankton observed in 2015 (Figure 4). As the summer progressed, Secchi depth dropped to a seasonal minimum of 1.25 m on July 15th. As Goose Lake is a relatively shallow lake, suspended sediments created by wind and boating activity may have an impact on water clarity. In addition, field observations suggest that dissolved organic carbons, which can add colour to lake water, may be contributing to a reduction in water clarity.

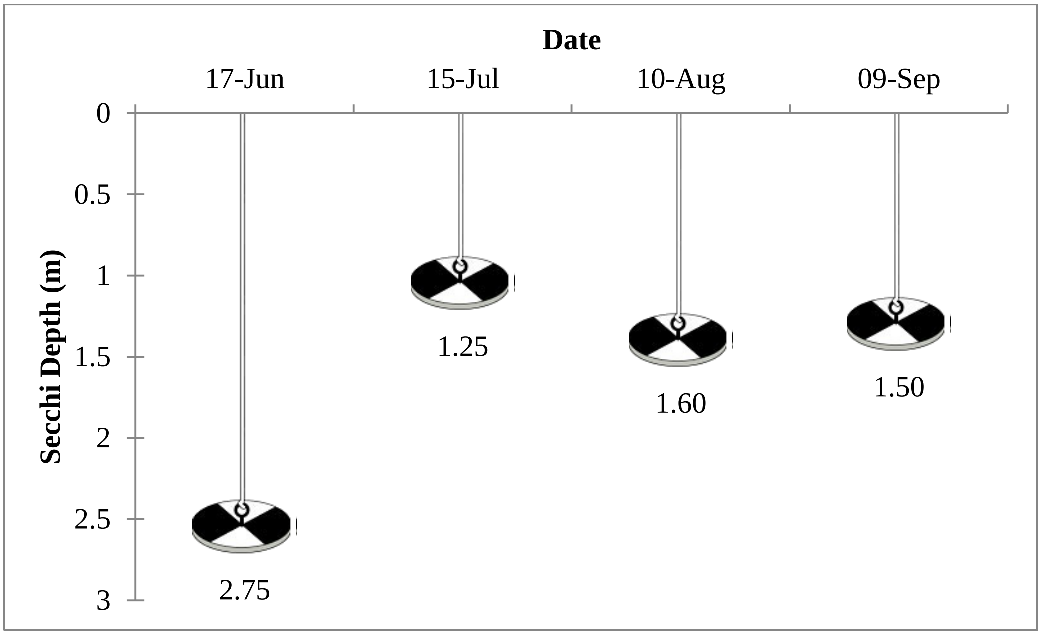

Figure 4 – Secchi disk depths measured at Goose Lake during the summer of 2015.

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.

Thermal stratification was observed only once at Goose Lake in 2015 – this occurred on July 15th, when weak stratification was observed after two meters of depth. This thermal stratification has the ability to limit mixing of surface waters with deeper waters, resulting in reduced oxygen in deeper portions of the lake. Goose Lake was warm in 2015, measuring a maximum of 23.49 °C at the surface of the lake. On August 10th, a maximum temperature of 19.61 °C was observed at a depth of 7.0 m. Warm water temperatures may create stressful environments for fish. By September 9th, the lake became well mixed and water temperatures were consistent from the surface to the sediment, measuring approximately 15 °C for the length of the water column.

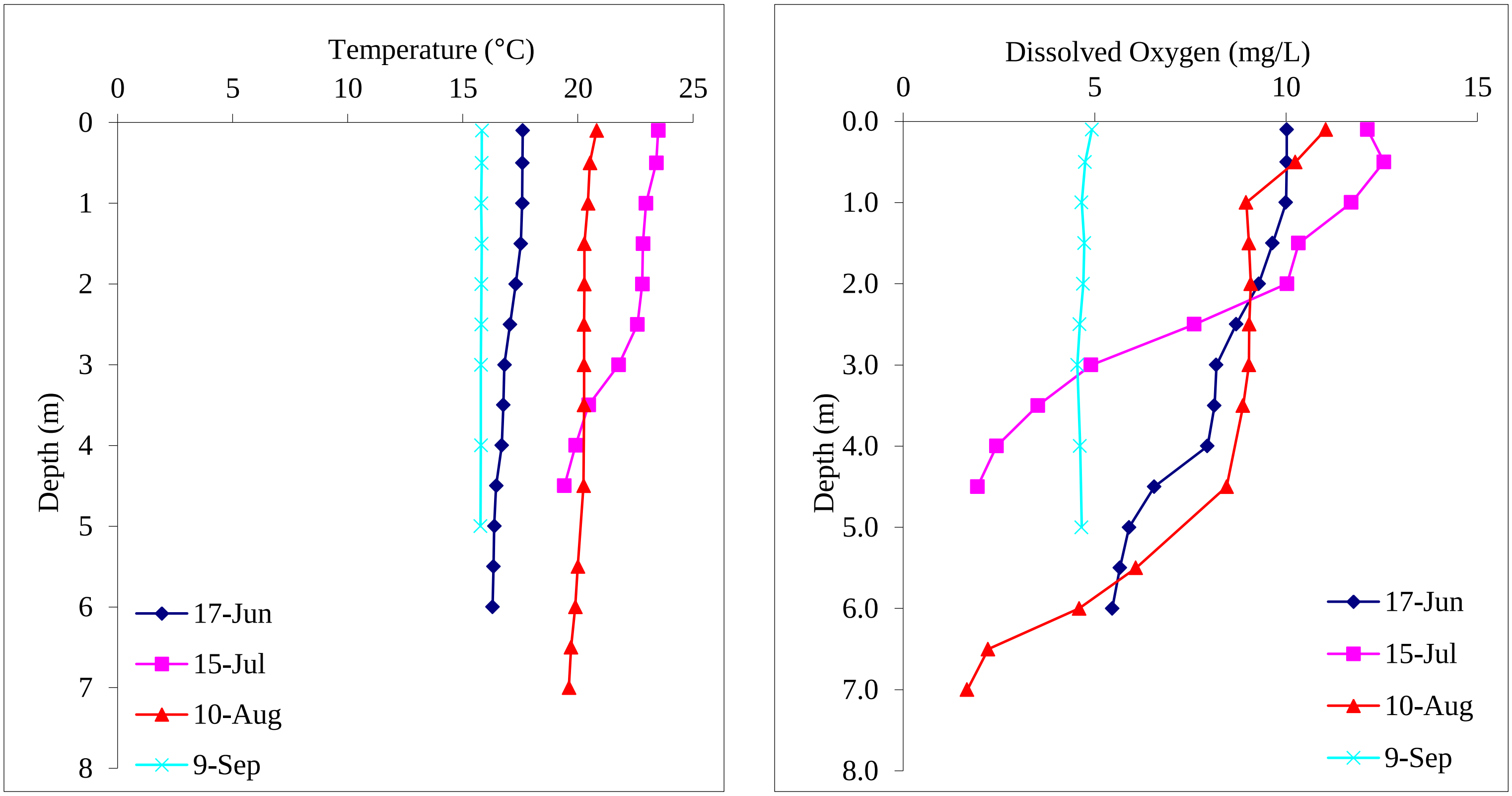

Figure 5 – a) Temperature (°C) and b) dissolved oxygen (mg/L) profiles for Goose Lake measured five times over the course of the summer of 2015.

Oxygen concentrations varied greatly at Goose Lake. Because Goose Lake has high concentrations of phytoplankton which photosynthesize, Goose Lake was often supersaturated with oxygen at the surface. On July 15th, a maximum oxygen concentration of 12.13 mg/L was observed at the lake's surface. Below the surface, oxygen concentrations often declined dramatically. Decomposition on the lake bed consumes oxygen, resulting in deeper portions of the water column falling below the Canadian Council for Ministers of the Environment guidelines of 6.5 mg/L for the Protection of Aquatic Life (PAL). On September 9th, when the lake became isothermal, the entire water column fell below 6.5 mg/L.

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 1 for a more complete list of parameters.

Goose Lake has a history of high phosphorus concentrations, consistently falling into the eutrophic or hypereutrophic classifications. In 2015, Goose Lake fell into the hypereutrophic classification with an average total phosphorus concentration of 127 μg/L (Table 2). Phosphorus concentration increased throughout the summer of 2015, from a seasonal minimum of 37 μg/L on June 17th to a seasonal maximum of 23 μg/L on September 9th (Figure 6). This increase throughout the open-water season is typical of lakes which experience short periods of stratification and mixing as anoxic conditions near the sediment may promote phosphorus release which is distributed throughout the water column.

Chlorophyll-*a* concentration at Goose Lake fell into the hypereutrophic classification, measuring an average of 44.2 µg/L (Table 2). An average of 44.2 µg/L falls toward the high end of the historical variation observed at Goose Lake. Peak chlorophyll-*a* concentration occurred on August 10th, measuring 69.1 µg/L (Figure 6). Taxonomic data is not yet available to determine which species of phytoplankton were dominant in Goose Lake, though field observations noted dense blooms of *Aphanizomenon* spp.

Total Kjeldahl Nitrogen (TKN) concentration measured an average of 1.8 mg/L in 2015 (Table 2). This average falls into the hypereutrophic classification – though many lakes across the province have high concentrations of TKN.

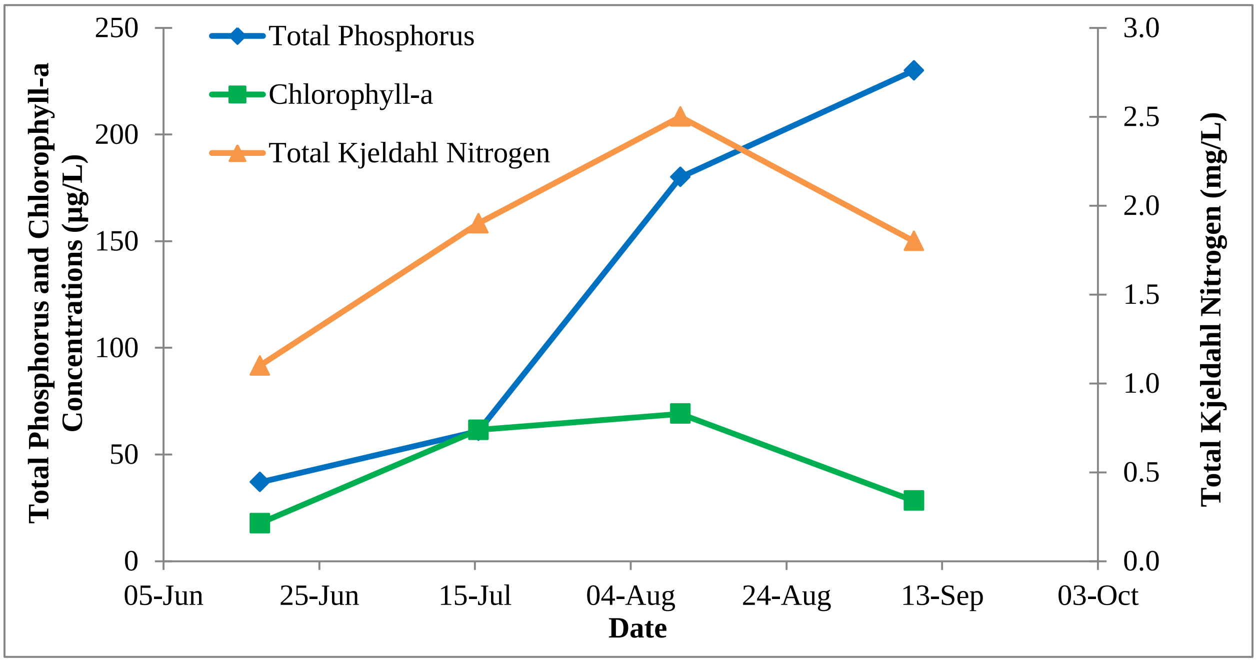

Figure 6 – Temperature and dissolved oxygen profiles measured four times over the course of the summer of 2015 at Goose Lake.

Average pH at Goose Lake measured 8.40 (Table 2). This is well above neutral, and based on Goose Lake's alkalinity (137.5 mg/L), it is well buffered against changes to pH. Dominant ions in Goose Lake include calcium (36.5 mg/L) and magnesium (9.7 mg/L) – overall concentration of ions in Goose Lake is low, resulting in a specific conductance of 255 uS/cm.

Metals were measured three times at Goose Lake, and all values, with the exception of manganese (310.7 µg/L), fell within their respective guidelines. Average manganese exceeded the recommended concentrations for agricultural use in 2015 based on the Canadian Council for Ministers of the Environment guidelines.

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.

In 2015, concentrations of microcystin reached an observed maximum of 3.64 μg/L on September 9th. The average concentration for the 2015 sampling season was 1.68 μg/L (Table 1). All of the samples taken in 2015 fell well below the recommended recreational guideline of 20 μg/L. Not all species of cyanobacteria produce microcystin toxin, so caution should be observed when recreating in waters experiencing any cyanobacteria blooms.

Table 1 – Microcystin concentrations measured five times at Goose Lake in 2015.

Date	Microcystin Concentration (μg/L)
17-Jun-15	0.12
15-Jul-15	0.34
10-Aug-15	2.60
09-Sep-15	3.64
Average	**1.68**

INVASIVE SPECIES:

Quagga and Zebra mussels are invasive species which, if introduced to our lakes, will have significant negative ecological, economical, and recreational impacts. ALMS collects water samples which are analyzed for mussel veligers (juveniles) and monitors substrates for adult mussels. In order to prevent the spread of invasive mussels, always clean, drain, and dry your boat between lakes. To report mussel sightings or mussel-fouled boats, call the confidential Alberta hotline at 1-855-336-BOAT.

In 2015, no zebra or quagga mussels were detected in Goose Lake.

Table 2 – Average Secchi disk depth and water chemistry values for Goose Lake. Limited data from previous years is provided for comparison.

Parameter	**1987**	**1988**	**1989**	**1992**	**1993**	**1994**	**1995**	**2005**	**2008**	**2015**
TP (µg/L)	322.3	203.3	125.5	71.8	62.8	64.7	54.8	110.8	105	127
TDP (µg/L)	260.4	147.1	85.8	20.8	32.3	35.8	22.3	50.8	43.2	47
Chlorophyll-*a* (µg/L)	43.6	37.3	28.6	51.5	17.9	22.6	14.8	50.6	29.9	44.2
Secchi depth (m)	2.3	2.8	3.2	2.7	2.9	2	3.1	1.1	1.5	1.78
TKN (mg/L)	1.5	1.7	1.7	1.5	1.0	1.4	0.9	1.5	1.2	1.8
NO_2 and NO_3 (µg/L)	9	31	15	12	4	31	19	27	15	10.4
NH_3 (µg/L)	63	126	181	17	55	163	45	52	34.2	89.7
DOC (mg/L)	/	/	/	/	/	/	/	/	19.1	22
Ca (mg/L)	37	38.7	34.6	33.6	33.1	32.2	35.4	31.4	34.5	37
Mg (mg/L)	10	10.9	10	10.7	10.9	10.2	10.1	7.8	8.4	9.7
Na (mg/L)	9	9	9	11.3	11.7	9.8	9.4	8	8.9	7.4
K (mg/L)	2.4	2.4	2.2	2.4	2.3	2.2	2.1	2.8	2.9	3.2
SO_4^{2-} (mg/L)	<5	4.7	2.2	4	<3	<3	3	5	3	<1
Cl^- (mg/L)	<1	0.5	1.1	0.7	0.7	0.7	0.7	0.8	1	1.0
CO_3 (mg/L)	37	38.7	34.6	33.6	33.1	32.3	35.4	31.4	8.5	4.3
HCO_3 (mg/L)	107	176.5	164.2	178.6	182.3	168.4	179	158.5	160.7	158
pH	9.2	8.5	8.3	8.5	8.4	8.3	8.1	8.3	8.5	8.40
Conductivity (µS/cm)	263	293.7	272.2	267.6	280.7	262.9	270.3	354	260.3	255
Hardness (mg/L)	/	/	/	/	/	/	/	/	/	130
TDS (mg/L)	153	161	151	149.9	151.9	141.4	148.3	136	143	155
Microcystin (µg/L)	/	/	/	/	/	/	/	/	/	1.68
Total Alkalinity (mg/L $CaCO_3$)	148	156.9	146.2	150.2	151.7	140.1	147.1	134	141.3	138

Note: TP = total phosphorus, TDP = total dissolved phosphorus, Chl-*a* = chlorophyll-*a*, TKN = total Kjeldahl nitrogen. NO_{2+3} = nitrate+nitrite, NH_3 = ammonia, DOC = dissolved organic carbon, Ca = calcium, Mg = magnesium, Na = sodium, K = potassium, SO_4 = sulphate, Cl = chloride, CO_3 = carbonate, HCO_3 = bicarbonate, TDS = total dissolved solids. A forward slash (/) indicates an absence of data.

Table 3 - Concentrations of metals measured in Goose Lake on June 17th, August 10th, September 9th 2015. The values presented are an average of those two dates. The CCME heavy metal Guidelines for the Protection of Freshwater Aquatic Life (unless otherwise indicated) are presented for reference.

Metals (Total Recoverable)	**2015**	**Guidelines**
Aluminum µg/L	16.1	100[a]
Antimony µg/L	0.043	6[e]
Arsenic µg/L	0.778	5
Barium µg/L	61.9	1000[e]
Beryllium µg/L	0.007	100[d,f]
Bismuth µg/L	0.0025	/
Boron µg/L	21.3	5000[ef]
Cadmium µg/L	0.003	0.085[b]
Chromium µg/L	0.10	/
Cobalt µg/L	0.043	1000[f]
Copper µg/L	0.38	4[c]
Iron µg/L	223	300
Lead µg/L	0.024	7[c]
Lithium µg/L	7.6	2500[g]
Manganese µg/L	311	200[g]
Mercury @ 0.1 m	0.81	26
Mercury @ 4.0 m	0.65	26
Molybdenum µg/L	0.282	73[d]
Nickel µg/L	0.305	150[c]
Selenium µg/L	0.06	1
Silver µg/L	0.001	0.1
Strontium µg/L	151.3	/
Thallium µg/L	0.0012	0.8
Thorium µg/L	0.0035	/
Tin µg/L	0.046	/
Titanium µg/L	2.76	/
Uranium µg/L	0.124	100[e]
Vanadium µg/L	0.19	100[f,g]
Zinc µg/L	0.7	30

Values represent means of total recoverable metal concentrations.

[a] Based on pH ≥ 6.5; calcium ion concentrations $[Ca^{+2}] \geq 4$ mg/L; and dissolved organic carbon concentration [DOC] ≥ 2 mg/L.

[b] Based on water Hardness of 300 mg/L (as $CaCO_3$)

[c] Based on water hardness > 180mg/L (as $CaCO_3$)

[d] CCME interim value.

[e] Based on Canadian Drinking Water Quality guideline values.

[f] Based on CCME Guidelines for Agricultural use (Livestock Watering).

[g] Based on CCME Guidelines for Agricultural Use (Irrigation).

A forward slash (/) indicates an absence of data or guidelines.

A BRIEF INTRODUCTION TO LIMNOLOGY

INDICATORS OF WATER QUALITY:

Water samples are collected in LakeWatch to determine the chemical characteristics that characterize general water quality. Though not all encompassing, the variables collected in LakeWatch are sensitive to human activities in watersheds that can cause degraded water quality. For example, nutrients such as phosphorus and nitrogen are important determinants of lake productivity. The concentrations of these nutrients in a lake are impacted (typically elevated) by land use changes such as increased crop production or livestock grazing. Elevated nutrient concentrations can cause increases in undesirable algae blooms resulting in low dissolved oxygen concentrations, degraded habitat for fish and noxious smells. A large increase in nutrients over time may also indicate sewage inputs which in turn may result in other human health concerns associated with bacteria or the protozoan *Cryptosporidium*.

TEMPERATURE AND MIXING:

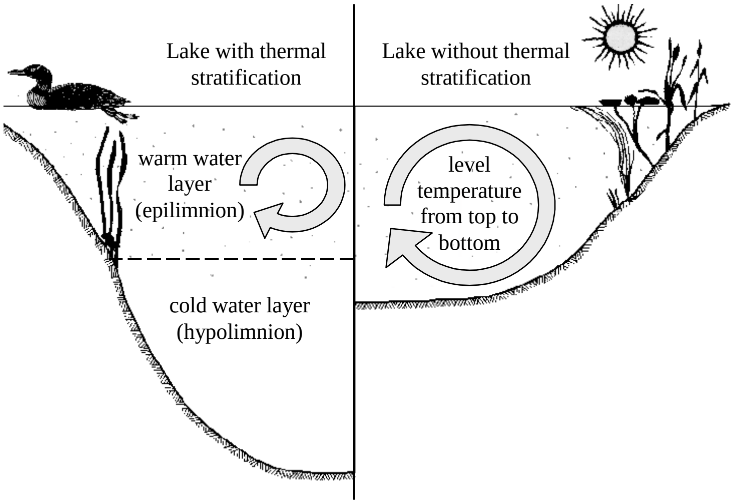

Figure A: Difference in the circulation of the water column depending on thermal stratification.

Water temperature in a lake dictates the behavior of many chemical parameters responsible for water quality. Heat is transferred to a lake at its surface and slowly moves downward depending on water circulation in the lake. Lakes with a large surface area or a small volume tend to have greater mixing due to wind. In deeper lakes, circulation is not strong enough to move warm water to depths typically greater than 4 or 5 m and as a result cooler denser water remains at the bottom of the lake. As the difference in temperature between warm surface and cold deeper water increases, two distinct layers are formed. Limnologists call these layers of water the **epilimnion** at the surface and the **hypolimnion** at the bottom. The layers are separated by a transition layer known as the **metalimnion** which contains the effective wall separating top and bottom waters called a **thermocline**. A thermocline typically occurs when water temperature changes by more than one degree within one meter depth. The hypolimnion and epilimnion do not mix, nor do elements such as oxygen supplied at the surface move downward into the hypolimnion. In the fall, surface waters begin to cool and eventually reach the same temperature as hypolimnetic water. At this point the water mixes from top to bottom in what is often called a **turnover** event. Surface water cools further as ice forms and again a thermocline develops this time with 4° C water at the bottom and near 0° C water on the top.

In spring another turnover event occurs when surface waters warm to 4° C. Lakes with this mixing pattern of two stratification periods and two turnover events are called **dimictic** lakes. In shallower lakes, the water column may mix from top to bottom most of the ice-free season with occasional stratification during periods of calm warm conditions. Lakes that mix frequently are **termed polymictic** lakes. In our cold climate, many shallow lakes are **cold monomictic meaning a thermocline develops every winter, there is one turnover event in spring but the remainder of the ice free season the lake is polymictic.**

DISSOLVED OXYGEN:

Oxygen enters a lake at the lake surface and throughout the water column when produced by photosynthesizing plants, including algae, in the lake. Oxygen is consumed within the lake by respiration of living organisms and decomposition of organic material in the lake sediments. In lakes that stratify (see temperature above), oxygen that dissolves into the lake at the surface cannot mix downward into the hypolimnion. At the same time oxygen is depleted in the hypolimnion by decomposition. The result is that the hypolimnion of a lake can become **anoxic**, meaning it contains little or no dissolved oxygen. When a lake is frozen, the entire water column can become anoxic because the surface is sealed off from the atmosphere. Winter anoxic conditions can result in a fish-kill which is particularly common during harsh winters with extended ice-cover. Alberta Surface Water Quality Guidelines suggest dissolved oxygen concentrations (in the epilimnion) must not decline below 5 $mg\bullet L^{-1}$ and should not average less than 6.5 $mg\bullet L^{-1}$ over a seven-day period. However, the guidelines also require that dissolved oxygen concentrations remain above 9.5 $mg\bullet L^{-1}$ in areas where early life stages of aquatic biota, particularly fish, are present.

GENERAL WATER CHEMISTRY:

Water in lakes always contains substances that have been transported by rain and snow or have entered the lake in groundwater and inflow streams. These substances may be dissolved in the water or suspended as particles. Some of these substances are familiar minerals, such as sodium and chloride, which when combined form table salt, but when dissolved in water separate into the two electrically charged components called **ions**. Most dissolved substances in water are in ionic forms and are held in solution due to the polar nature of the water molecule. **Hydrophobic** (water-fearing) compounds such as oils contain little or no ionic character, are non-polar and for this reason do not readily dissolve in water. Although hydrophobic compounds do not readily dissolve, they can still be transported to lakes by flowing water. Within individual lakes, ion concentrations vary from year to year depending on the amount and mineral content of the water entering the lake. This mineral content can be influenced by the amount of precipitation and other climate variables as well as human activities such as fertilizer and road salt application.

PHOSPHORUS AND NITROGEN:

Phosphorus and nitrogen are important nutrients limiting the growth of algae in Alberta lakes. While nitrogen usually limits agricultural plants, phosphorus is usually in shortest supply in lakes. Even a slight increase of phosphorus in a lake can, given the right conditions, promote algal blooms causing the water to turn green in the summer and impair recreational uses. When pollution originating from livestock manure and human sewage enters lakes not only are the concentrations of phosphorus and nitrogen increased but nitrogen can become a limiting nutrient which is thought to cause blooms of toxic algae belonging to the cyanobacteria. Not all cyanobacteria are toxic, however, the blooms can form decomposing mats that smell and impair dissolved oxygen concentrations in the lake.

CHLOROPHYLL-*A*:

Chlorophyll *a* is a photosynthetic pigment that green plants, including algae, possess enabling them to convert the sun's energy to living material. Chlorophyll *a* can be easily extracted from algae in the laboratory. Consequently, chlorophyll *a* is a good estimate of the amount of algae in the water. Some highly productive lakes are dominated by larger aquatic plants rather than suspended algae. In these lakes, chlorophyll *a* and nutrient values taken from water samples do not include productivity from large aquatic plants. The result, in lakes like Chestermere which are dominated by larger plants known as macrophytes, can be a lower trophic state than if macrophyte biomass was included. Unfortunately, the productivity and nutrient cycling contributions of macrophytes are difficult to sample accurately and are therefore not typically included in trophic state indices.

SECCHI DISK TRANSPARENCY:

Lakes that are clear are more attractive for recreation, whereas those that are turbid or murky are considered by lake users to have poor water quality. A measure of the transparency or clarity of the water is performed with a Secchi disk with an alternating black and white pattern. To measure the clarity of the water, the Secchi disk is lowered down into the water column and the depth where the disk disappears is recorded. The Secchi depth in lakes with a lot of algal growth will be small while the Secchi depth in lakes with little algal growth can be very deep. However, low Secchi depths are not caused by algal growth alone. High concentrations of suspended sediments, particularly fine clays or glacial till, are common in plains or mountain reservoirs of Alberta. Mountain reservoirs may have exceedingly low Secchi depths despite low algal growth and nutrient concentrations.

The euphotic zone or the maximum depth that light can penetrate into the water column for actively growing plants is calculated as twice the Secchi depth. Murky waters, with shallow Secchi depths, can prevent aquatic plants from growing on the lake bottom. Conversely, aquatic plants can ensure lakes have clear water by reducing shoreline erosion and stabilizing lake bottom sediments. In Alberta, many lakes are shallow and bottom sediments contain high concentrations of nutrients. Without aquatic plants, water quality may decline in these lakes due to murky, sediment laden water and excessive algal blooms. Maintaining aquatic plants in certain areas of a lake is often essential for ensuring good water clarity and a healthy lake as many organisms, like aquatic invertebrates and insects, depend on aquatic plants for food and shelter.

TROPHIC STATE:

Trophic state is classification of lakes into four categories of fertility and is a useful index for rating and comparing lakes. From low to high nutrient and algal biomass (as chlorophyll) concentrations, the trophic states are; **oligotrophic**, **mesotrophic**, **eutrophic** and **hypereutrophic (Table 2)**.

A majority of lakes in Alberta contain naturally high levels of chlorophyll *a* (8 to 25 µg/L) due to our deep fertile soils. These lakes are usually considered fertile and are termed eutrophic. The nutrient and algal biomass concentrations that define these categories are shown in the following table, a figure of Alberta lakes compared by trophic state can be found on the ALMS website.

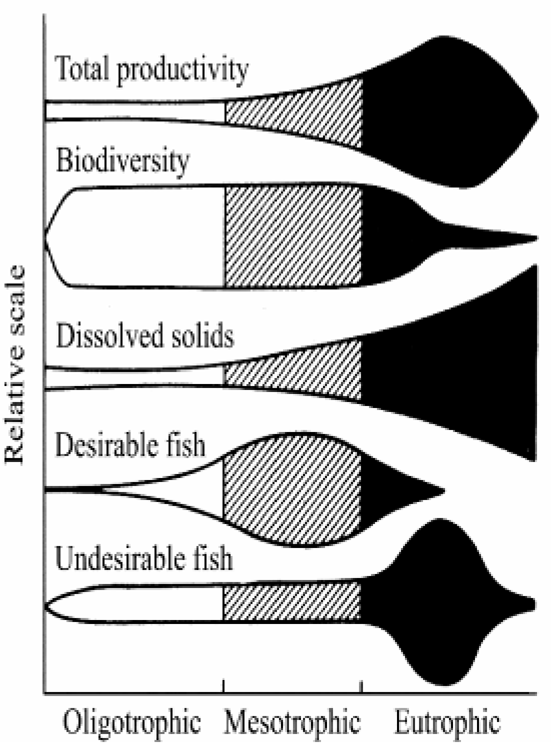

Figure B: Suggested changes in various lake characteristics with eutrophication. From “Ecological Effects of Wastewater”, 1980.

Table A - Trophic status classification based on lake water characteristics.

Trophic state	Total Phosphorus ($\mu g \bullet L^{-1}$)	Total Nitrogen ($\mu g \bullet L^{-1}$)	Chlorophyll a ($\mu g \bullet L^{-1}$)	Secchi Depth (m)
Oligotrophic	< 10	< 350	< 3.5	> 4
Mesotrophic	10 – 30	350 - 650	3.5 - 9	4 - 2
Eutrophic	30 – 100	650 - 1200	9 - 25	2 - 1
Hypereutrophic	> 100	> 1200	> 25	< 1