

Candle Lake Water Quality Summary
2008

Prepared for
Candle Lake Stewardship Group

Monitoring and Assessment Branch
Stewardship Division
June 2008

330 – 350 Third Ave N
Saskatoon SK S7K 2H6

www.swa.ca

Table of Contents

Acknowledgements.....	1
1.0 Introduction.....	2
1.1 Lake Stewardship & the Candle Lake Stewardship Group	2
2.0 Water Quality Sampling	2
2.1 Water Quality Sampling Sites.....	2
2.2 Water Quality Index: Assessing General Water Quality	3
3.0 Water Quality Results and Discussion.....	6
3.1 Baseline Station Summary	6
3.1.1 Laboratory Parameters	6
Nutrients.....	6
Metals.....	7
Major Ions.....	7
Microbiology.....	8
3.1.2 Field Measurements	8
pH.....	8
Dissolved Oxygen.....	9
Temperature	9
Specific Conductivity.....	9
Turbidity	10
Secchi Disk Depth.....	10
3.2 Remaining Parameters	10
4.0 Recommendations.....	10
5.0 References Cited	11

List of Figures

Figure 1: Map of Candle Lake 2008 baseline sampling station.....	4
--	---

List of Tables

Table 1: Objectives for the Water Quality Index.....	5
Table 2: Candle Lake Baseline Surface 2008 Analytical Results.....	13
Table 3: Dissolved Oxygen, Temperature and Conductivity Profiles for Candle Lake, Baseline 2008.....	14
Table 4: Candle Lake Baseline Surface 2008 Metal Parameters	15
Table 5: Candle Lake Baseline Bottom 2008 Analytical Results.....	16
Table 6: Candle Lake Baseline Bottom 2008 Metal Parameters	17

Acknowledgements

Thanks to Saskatchewan Ministry of Environment's Candle Lake Conservation Officer, Michael Paschke for providing transportation onto Candle Lake. Water quality sampling was conducted by Saskatchewan Watershed Authority staff Allen Young, Deanne Schulz and Lorelei Benoit.

1.0 Introduction

1.1 Lake Stewardship & the Candle Lake Stewardship Group

On the 6th of October 2007, Candle Lake community members held a meeting to learn more about Saskatchewan Watershed Authority's *Lake Stewardship Program*. At the meeting, a presentation on lake stewardship and information regarding lake water quality sampling was given. Following the meeting, the Candle Lake Watershed Stewards provided Saskatchewan Watershed Authority with correspondence outlining their mission to "To promote watershed sustainability through awareness and good management practices that will sustain and enhance the water quality in Candle Lake." In addition, the group provided letters of support from the Candle Lake Chamber of Commerce, the Resort Village of Candle Lake, the Candle Lake Fish Advisory Committee and the Board of Directors for the Candle Lake Ratepayers Co-operative Limited.

Given the level of interest, Saskatchewan Watershed Authority welcomed the group into the *Lake Stewardship Program* in February 2008. Two water samples were taken during winter on February 5 and March 5, 2008. The cancellation of the *Lake Stewardship Program* in March 2008 ended water quality sampling by Saskatchewan Watershed Authority.

In June 2008, the Candle Lake Watershed Stewards were provided with the results from Saskatchewan Watershed Authority's water quality testing on Candle Lake. Additionally, the group was given a copy of Saskatchewan Watershed Authority's *Standard Sampling Procedures Manual* and the *Lake Stewardship Water Quality Guide*.

2.0 Water Quality Sampling

The objective of water quality sampling was to provide background (normal or average) water quality values for Candle Lake. Though water quality sampling through the Lake Stewardship Program ceased in March 2008, the data collected from Candle Lake (by Saskatchewan Watershed Authority and Saskatchewan Environment) is helpful to parties interested in understanding the lake's water quality. The water quality information can also be used to make more informed decisions on the management or activities in and around the lake.

2.1 Water Quality Sampling Sites

The standard lake sampling schedule for Saskatchewan Watershed Authority's *Lake Stewardship Program* included two winter (January to March) and four summer samples (May to October) per year. Samples sites were divided into *Baseline Stations* and *Shoreline Stations* (Figure 1). Shoreline stations are not sampled during the winter.

Baseline Station: Baseline stations are generally deep, centrally located sites chosen to represent typical water quality conditions in the lake. Certain parameters (i.e. dissolved oxygen and temperature) are recorded at intervals throughout the depth of the site. Baseline stations are

sampled on all six sample dates during the year. If sufficient number of samples is collected, water quality results from baseline stations can be used to calculate a Water Quality Index (WQI) score.

Shoreline Stations: Shoreline stations were monitored to determine the effects of local influences on water quality. When sampled, water quality results for these shoreline stations are compared to Saskatchewan's *Surface Water Quality Objectives for Recreation and Aesthetics* (Interim Edition, July 2006).

2.2 Water Quality Index: Assessing General Water Quality

The Water Quality Index (WQI) provides a means of assessing the overall quality of lake water in Saskatchewan. To calculate the WQI, analytical results of the water quality sampling are compared to provincial objectives for specific water uses such as irrigation and the protection of aquatic life. The WQI combines key chemical and biological aspects of water quality (including major ions, nutrients, heavy metals, bacteria, dissolved oxygen and pH) to define overall water quality and summarize these parameters in a single score.

A single score for each year allows easy comparison of general water quality trends over time and identifies parameters considered important to overall lake health. The WQI score is adjusted for each parameter that exceeds its objective, taking into account the magnitude and frequency of exceedances. Deviation from objective values does not necessarily indicate poor lake health or that water quality is worsening. Certain parameters (i.e. arsenic, chloride and pH) may naturally exceed the WQI objectives in Saskatchewan lakes due to geological and hydrological history. The WQI does not differentiate 'natural-source deviation' or exceedances which are a result of human influences. As such, it is important to examine lake water quality over time in order to assess if human activity may be impacting lake water quality. ¹

The WQI could not be calculated for Candle Lake in 2008 due to an insufficient number of samples; however, data collected by Saskatchewan Environment (1995) in 1993/1994 did not exceed the Saskatchewan Surface Water Guidelines at the time of their study. Though the index was not applied due to insufficient number of samples in 2008, none of the parameters tested exceeded the objectives used today (SE 2006). See list of objectives in Table 1.

Because the strength of the WQI is determined by the number of parameters entered for any given sample and the number of samples within a defined time period it requires complete sets of data with sufficient numbers of parameters tested to be meaningful. Historical WQI for Candle Lake Baseline Station (centre of the lake) could not be calculated due to either lack of samples or parameters required for the computation of the scores.

¹ For a more complete explanation about the Water Quality Index (WQI) or the parameters used to determine WQI scores, please refer to the "Lake Stewardship Water Quality Guide" online at www.swa.ca.

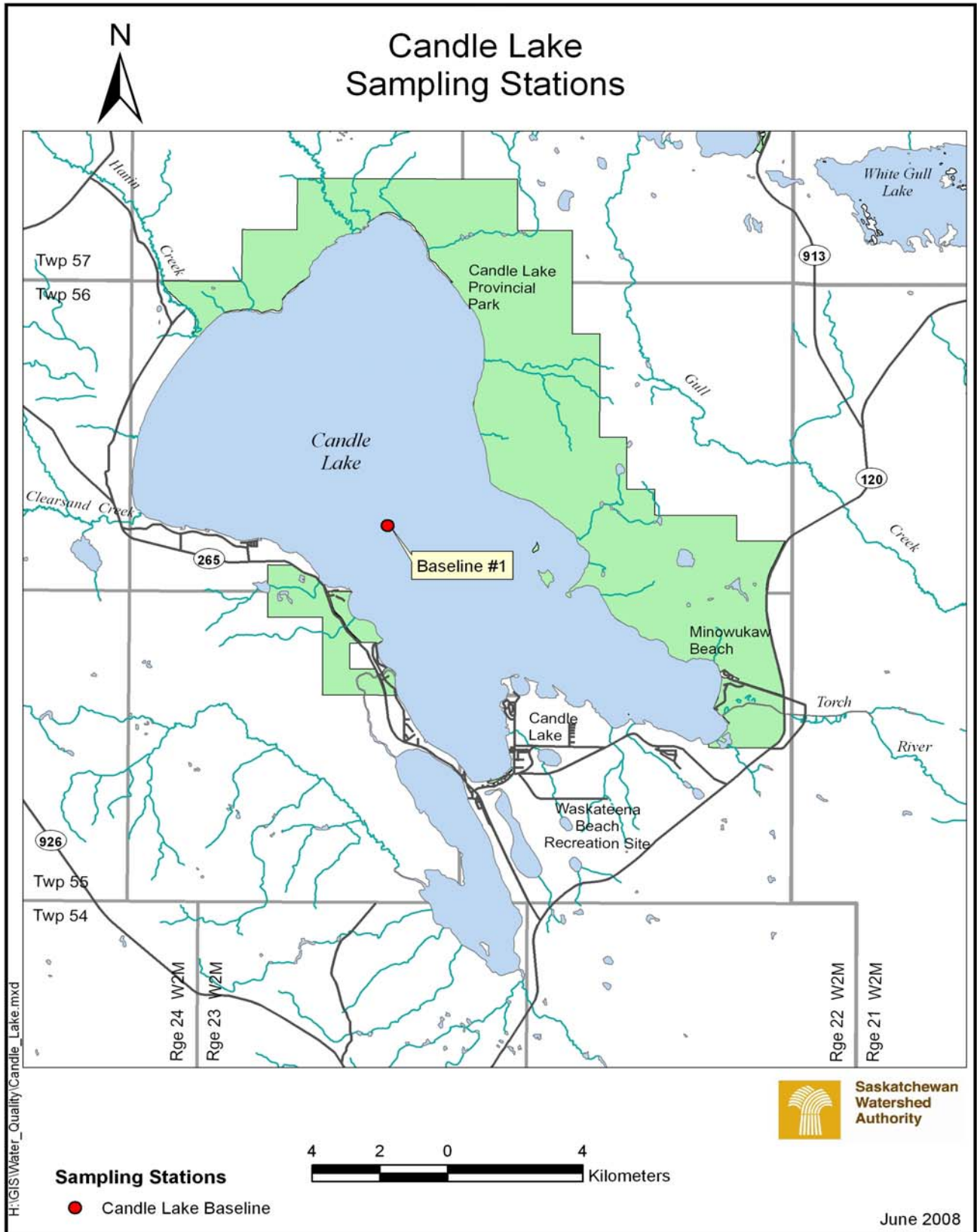


Figure 1: Map of Candle Lake 2008 baseline sampling station

Table 1: Objectives for the Water Quality Index

Parameter	Objective
Nutrients	
Total Phosphorus (mg/L)	0.1 ²
Unionized Ammonia (µg/L)	19* ¹
NO ₃ -N (mg/L)	2.9 ²
Metals	
Mercury - Inorganic (µg/L)	0.026 ¹
Aluminum (mg/L)	0.1 ¹
Chromium (µg/L)	1 ¹
Arsenic (µg/L)	5 ¹
Major Ions	
Chloride (mg/L)	100 ¹
Sodium (mg/L)	100 ²
Sulphate (mg/L)	1000 ⁴
Herbicides	
MCPA (µg/L)	0.025 ⁴
2'4-D (µg/L)	4 ¹
Microbiological Water Quality	
E. coli Bacteria (units/100mL)	200 ¹
General Parameters	
Dissolved Oxygen (mg/L)	5.5 ¹
pH (units)	6.5-9.0 ³
Chlorophyll <i>a</i> (µg/L)	50 ²

*Value calculated based on pH and temperature.

¹ Saskatchewan's Surface Water Quality Objectives, Interim Edition, 2006.

² Saskatchewan Watershed Authority target value.

³ Canadian Council of Ministers of the Environment (2006) Canadian Water Quality Guidelines for the Protection of Aquatic Life.

⁴ Canadian Council of Ministers of the Environment (2005) Canadian Water Quality Guidelines for the Protection of Agricultural Uses.

3.0 Water Quality Results and Discussion

3.1 Baseline Station Summary

For the purpose of this report, previous baseline station data collected by Saskatchewan Environment and current Saskatchewan Watershed Authority data collected in 2008 was summarized for a better understanding of Candle Lake's water quality. Historical data, when mentioned, includes Saskatchewan Environment's data collected in open water season 1993, 1994 and 2002. It is important to note that no direct relationships (i.e. water quality improving/deteriorating) can be determined by the data as there is simply not enough data to be considered and inconsistencies in the type, timing and frequency of the information collected. As such, the key parameters tested by Saskatchewan Watershed Authority are discussed in reference to the historical range of data collected by Saskatchewan Environment. It is important to note that there are a few consultant reports and student data collected by students attending SIAST Woodland Campus; however, though important these were not utilized as data sources for the purpose of this report.

3.1.1 Laboratory Parameters

Nutrients

Nutrients are essential for the growth and survival of all organisms. The amount of nutrients in a system influence how much life it can support. In aquatic systems nutrients can come from a variety of sources. In some lakes nutrients can increase as a result of human activities. Increased nutrients can potentially lead to a variety of problems. As a result, some key nutrients were monitored as part of the *Lake Stewardship Program*.

Dissolved Organic Carbon (DOC) – Organic carbon compounds are from decomposition of living organisms. DOC is often an important source of energy in lakes. Historically ranging from 10.0-15.0 mg/L, DOC in Candle Lake 2008 ranged from 12.9-15.5 mg/L; however, there is no objective for DOC as high levels are not considered a risk to aquatic life.

Ortho-Phosphate – is the form of phosphorous most readily available to plants and algae in water. Historically ranging from 0.02-0.09 mg/L, results in 2008 were 0.06 mg/L on both 2008 sampling occasions.

Total Phosphorus – In freshwater lakes, phosphorus is the nutrient most often associated with increased plant and algal growth. Increased plant and algal growth can impact recreational activities and the aesthetic value of the lake. Candle Lake historically ranged from 0.02-0.11 mg/L and from 0.06-0.07 mg/L in 2008. When comparing historical data to Saskatchewan Watershed Authority's target value of 0.1 mg/L for total phosphorus, it exceeded twice June 20th and 22nd, 2002 (SE 2002).

Ammonia – is a form of nitrogen that can be toxic to aquatic organisms under certain concentrations and conditions of temperature and pH. The historical value for ammonia was 0.02 mg/L while 2008 sampling ranged from 0.02-0.04 mg/L remaining below the Saskatchewan's Surface Water Quality Objective (2006).

Nitrate – In addition to ammonia, nitrate and nitrite are also forms of nitrogen. Similarly nitrate may be a concern when at levels greater than 2.9 mg/L as suggested by Saskatchewan Watershed Authority's target value. Historically the nitrate ranged from <0.2 mg/L to 0.3 mg/L. Samples taken in 2008 measured <0.04 mg/L.

Chlorophyll *a* – is a measure of the productivity of a lake. A specific pigment found in algae, this parameter helps determine the productivity based on the proportion of algal growth. Historical chlorophyll *a* ranged from <0.2-3.7 µg/L while winter sampling in 2008 ranged from <0.2-1.18 µg/L. All values both historical and present are below Saskatchewan Watershed Authority's target value of 50 µg/L.

Metals

The concentration of metals in lakes is dependent on geology, chemistry and human activity in the watershed. Some metals are important because they have the potential to be toxic to fish and other aquatic organisms. The four metals assessed that can influence aquatic health are mercury, aluminum, chromium and arsenic. The objectives used for each of these metals reflect the freshwater concentrations that are considered safe for the protection of aquatic life.

Mercury – was not sampled by Saskatchewan Environment in 1993, 1994 or 2002. Sampling in 2008 indicated that the level of mercury at Candle Lake baseline was <0.05 µg/L which due to detection level, it cannot be concluded that it is below Saskatchewan's Surface Water Quality Objective of 0.026 µg/L (2006).

Aluminum – was not sampled by Saskatchewan Environment in 1993, 1994 or 2002. Sampling in 2008 indicated that the level of aluminum at Candle Lake baseline was <0.005 mg/L which is well below Saskatchewan's Surface Water Quality Objective of 0.1 mg/L (2006).

Chromium – was not sampled by Saskatchewan Environment in 1993, 1994 or 2002. Sampling in 2008 indicated that the level of chromium at Candle Lake baseline was <0.001 mg/L which is well below Saskatchewan's Surface Water Quality Objective of 1 mg/L (2006).

Arsenic – was not sampled by Saskatchewan Environment in 1993, 1994 and 2002. Sampling in 2008 indicated that the level of arsenic at Candle Lake baseline was 1.0µg/L to 1.1µg/L which is well below Saskatchewan's Surface Water Quality Objective of 5µg/L (2006).

Major Ions

Ions are charged particles dissolved in water. Many metals and minerals are also present in ionic form, but the major ions are salts and include chloride, sodium and sulphate. Processes like erosion, runoff, evaporation/precipitation and human activity can contribute to concentration of and dissolved ions in the water.

Chloride, Sodium and Sulphate – Historically chloride, sodium and sulphate ranged from <2-3 mg/L, 8-10 mg/L and <10-11 mg/L respectively. Analysis in 2008 had chloride, sodium and sulphate values from 1.3 mg/L, 9-10 mg/L and 5.8-6.1 mg/L respectively. Neither the historical or present samples exceeded the objectives as outlined in Table 1.

Total Dissolved Solids (TDS) – is the sum of the major ions dissolved in the water and is also used as a measure of salinity. Historical TDS ranged from 287-360 mg/L while 2008 results ranged from 329-332 mg/L. The only provincial objective for TDS is agricultural uses; therefore, this parameter is only used as an indicator of the sum of all major ions and the salinity.

Total Suspended Solids (TSS) – is a measure of undissolved and unsettled particles in the water. They reduce water clarity and may interfere with gill function in aquatic organisms. The historical range for TSS is 2-3 mg/L. The results in 2008 for TSS are approximately 1mg/L most likely a result of the lake having low turbulence due to ice on during sampling dates.

Alkalinity, Total – is a measure of the acid-neutralizing capacity of the water. Bicarbonate and carbonate are two sources of alkalinity. Total alkalinity in Candle Lake historically ranged from 198-200 mg/L while sampling in 2008 measured 202-206 mg/L. Increased alkalinity means an increased ability for the water to resist changes in pH.

Total Hardness – A function of local geology, hardness is a measurement of certain ions in the water, primarily calcium and magnesium. Hard water is not usually an aquatic health concern, but can affect the suitability of water for human purposes due to the crusty deposits that build up on water pipes. Overall, historical and 2008 data had a very small range of total hardness from 188-199 mg/L.

Potassium – is one of the major ions measured for basic water chemistry and historically ranges from 3-4 mg/L. Results in 2008 samples are identical to the historical range.

Microbiology

Total Coliform Bacteria and *E.coli* – Coliform bacteria and *E.coli* are present in the environment as well as the digestive tract of animals. While some coliform bacteria can be harmful (i.e. strains of *E. coli* such as *E. coli* 0157:H7), most are not problematic in recreational waters. Their abundance is used to indicate conditions that may indicate the presence of harmful pathogens. Bacterial numbers vary drastically and are highly dependant on site specific activities (i.e. animal feces, livestock operations, human activities) in and around the lake. Total coliform bacteria (including *E.coli*) measurements did not exceed the Saskatchewan's Surface Water Quality Objectives of <200 counts/100mL (2006).

3.1.2 Field Measurements

Surface water quality parameters measured at the baseline station include five important field measurements, which contribute to a complete assessment and better understanding of Candle Lake's water quality. These five parameters include: dissolved oxygen (DO), temperature, specific conductivity, turbidity, and Secchi disk depth.

pH

pH is an important water quality parameter that affects chemical and biological reactions within lakes. Extremes in pH or rapid changes in pH can negatively impact aquatic life. Saskatchewan lakes demonstrate a variety of pH levels from basic to acidic. Candle Lake historically ranges

from 8.23 to 8.61. In 2008 winter sampling, Candle Lake had a pH of 8.3 falling within the historical range.

Dissolved Oxygen

Dissolved oxygen concentrations are variable based on time, weather, and temperature. Dissolved oxygen affects both chemical processes within the lake and biological organisms. For example, certain fish species are sensitive to low levels of dissolved oxygen and may experience stress or death due to lack of dissolved oxygen in the water. For the protection of aquatic life the objective is no less than 5.5mg/L. Both surface and profile measurements for dissolved oxygen in Candle Lake in winter 2008 indicate that it is, for the most part, well oxygenated except for the lower 4-6 m of the water column (Figure 2). Given the volume of Candle Lake and the well-oxygenated upper depths it is highly unlikely that it poses any risk to the health of the fishery during the winter months.

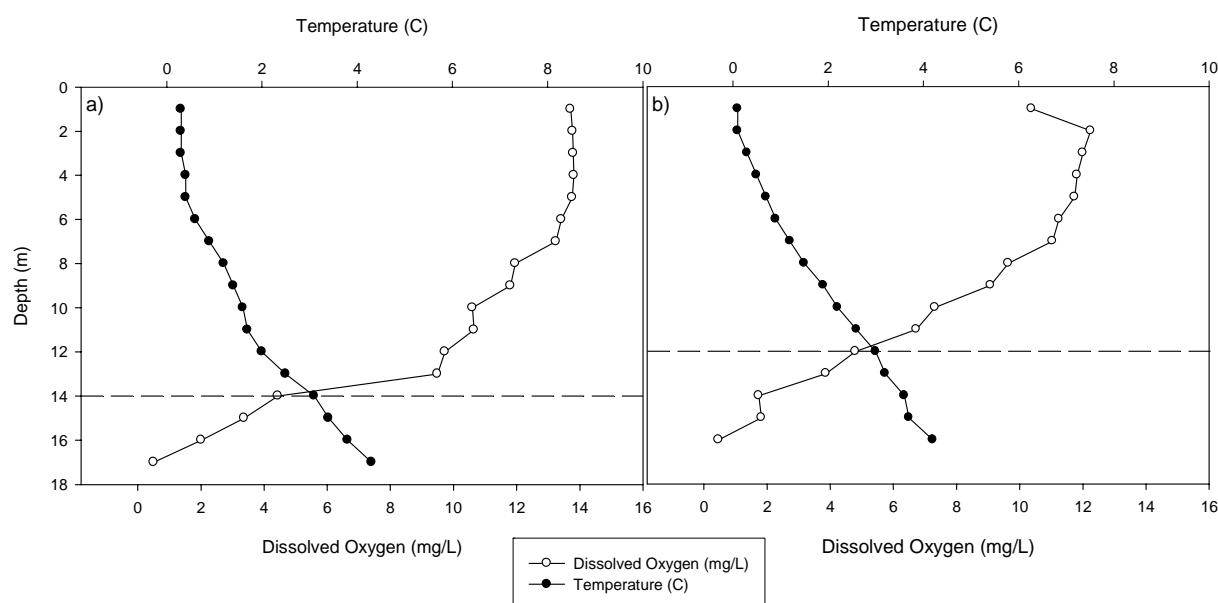


Figure 2. Depth profile showing dissolved oxygen (mg/L) and temperature (°C) at Candle Lake Baseline for a) February 5th and b) March 5th, 2008. Dashed line indicates the point in the profile which has the largest change in temperature over the shortest interval of depth, termed the thermocline (change of >1°C per metre). The presence of the thermocline delineates the water column into the epilimnion (upper layer), metalimnion (middle layer) and hypolimnion (bottom layer). In the graphs above you can see that the hypolimnion increases in size as winter progresses, this is due to lack of mixing and increased decomposition (oxygen utilization) occurring at the bottom of the lake.

Temperature

This parameter is measured because of the influence it has on other parameters such as dissolved oxygen and specific conductivity. Temperature can influence the spatial distribution of fish (i.e. cold water vs. warm water species) and plant growth. Temperature values observed during winter sampling at baseline in Candle Lake 2008 ranged from 0.1 to 4.4°C.

Conductivity

Conductivity is a measure of water's ability to conduct an electrical current, which depends on the concentration of dissolved ions in solution. It is used as a measure of salinity and is influenced

by the watershed geology and soil composition. Candle Lake's specific conductivity (corrected for temperature) historically ranged from 342-416 $\mu\text{S}/\text{cm}$. Field measurements in 2008 ranged from 375-385 $\mu\text{S}/\text{cm}$. Values for conductivity this low indicate fresh water.

Turbidity

Turbidity is a measure of water clarity. A reduction in water clarity may be caused by solids suspended in the water, including: sediment (e.g. during lake overturn) and plankton (small plants and animals). Other sources which may be seen closer to shore include shoreline erosion (due to ice scour or wave action from wind or boat traffic), waste discharge, urban runoff, algal growth, sediment disruption from human activities or bottom feeding organisms. A change in turbidity may affect fish habitat, light penetration, plant growth, water temperature and dissolved oxygen concentrations. For recreational purposes, the surface water objective for turbidity is less than 50 NTU. Turbidity is low (meaning good light penetration) in Candle Lake ranging historically from 0.54-1.05 NTU. Measurements in 2008 were 0.6-4.4 NTU.

Secchi Disk Depth

Secchi disk depth is a measure of water transparency which is affected by suspended sediment, plankton and water colour. A similar measurement to turbidity the Secchi disk depth can be measured easily with a marked disk and measured rope. At Candle Lake baseline, the historical Secchi disk reading ranged from 4.0-4.6 m. Secchi disk sampling was not measured during winter 2008 sampling due to ice cover.

3.2 Remaining Parameters

For a complete description of each parameter and their contribution to water quality see the *Lake Stewardship Water Quality Guide*, which you can find on our website www.swa.ca.

4.0 Recommendations

Candle Lake was sampled twice through the former Lake Stewardship Program. Though the program has ceased, the information collected thus far provides lake users, residents, managers and other interested parties with a starting point for understanding water quality in Candle Lake. Saskatchewan Watershed Authority encourages the group to continue educating themselves and other lake users about the water quality and how to best protect Candle Lake.

To maintain the water quality of Candle Lake, it is recommended that recreational users, upland and upstream stakeholders minimize negative additions to the lake (i.e. nutrients/sediment). Fertilizer use and disruption of natural vegetation and shoreline should be kept to a minimum. Enhancement of shoreline buffer zones to slow erosion and slow the flow of surface runoff to Candle Lake will help reduce the amount contaminants entering the lake.

The Saskatchewan Watershed Authority encourages the continuation of public education and outreach by the Candle Lake Watershed Stewards to teach lake users and stakeholders to follow healthy shoreline living practices such as those outlined in *On the Living Edge – Your Handbook for Waterfront Living* (Kipp & Gallaway 2003).

5.0 References Cited

Canadian Council of Ministers of the Environment. 1999. Canadian water quality guidelines for the protection of aquatic life: 2006 Update. Canadian Council of Ministers of the Environment, Winnipeg.

Canadian Council of Ministers of the Environment. 1999. Water Quality Index 1.0, Technical Report. In: Canadian environmental quality guidelines. 1999. Canadian Council of Ministers of the Environment, Winnipeg.

Kipp, S. and C. Gallaway. 2003. On the Living Edge – Your handbook for water front living. Saskatchewan/Manitoba Edition. Federation of British Columbia Naturalist: British Columbia. Available through Nature Saskatchewan.

Saskatchewan Environment, Drinking Water Quality Section. 2006. Surface Water Quality Objectives: Interim Edition EPB 356. p. 7.

Saskatchewan Research Council. 2006. Candle Lake Watershed Study: Initial Phase. Draft Report. SRC Publication No. 12157-4E06. p.27.

Wetzel, R.G. 2001. Limnology: Lake and River Ecosystems, 3rd Edition. Academic Press: San Diego, CA.

Data Tables

2008

Table 2: Candle Lake Baseline Surface 2008 Analytical Results

Parameters	February 5	March 5
Nutrients (mg/L)		
Dissolved Organic Carbon	12.9	15.5
Nitrate, as Nitrogen	<0.04	<0.04
Ammonia, as Nitrogen	0.02	0.04
Total Kjeldahl Nitrogen	0.6	0.6
Total Phosphorous	0.07	0.06
Ortho-Phosphate, as P	0.06	0.06
Solids (mg/L)		
Total Dissolved	329	332
Suspended, Fixed	<1	<1
Suspended, Volatile	1	<1
Suspended, Total	1	<1
Bacteria (orgs/100 mL)		
E. Coli	<10	<10
Total Coliform	<10	<10
Major Ions (mg/L)		
Alkalinity, Total	202	206
Alkalinity, Phenol	0.0	2.5
Bicarbonate	246	245
Calcium	39	40
Carbonate	0	3
Chloride	1.3	1.3
Hardness, Total	196	199
Magnesium	24	24
Potassium	3	4
Sodium	10	9
Sulphate	5.8	6.1
Other		
Chlorophyll <i>a</i> (µg/L)	1.18	<0.20
Conductivity (µS/cm)	375	385
pH (pH units)	8.3	8.3
Turbidity (NTU)	0.6	4.4
Biochemical Oxygen Demand (mg/L)	<2	<2
Chemical Oxygen Demand (mg/L)	32.0	35.3
Field Data		
Time	12:00	11:30
Air Temperature (°C)	-22	-25
pH (pH units)	8.482	8.800
Turbidity (NTU)	0.64	0.00
Wind Speed (km/hr)	5	6.5
Cloud Cover (%)	<5	0
Ice Depth (cm)	50	70

Table 3: Dissolved Oxygen, Temperature and Conductivity Profiles for Candle Lake, Baseline 2008

Date	Depth (m)	Dissolved Oxygen (mg/L)	Conductivity ($\mu\text{S/cm}$)	Water Temperature ($^{\circ}\text{C}$)
February 5, 2008	1.0	13.71	183.8	0.3
	2.0	13.78	183.8	0.3
	3.0	13.80	184.1	0.3
	4.0	13.82	184.1	0.4
	5.0	13.76	184.8	0.4
	6.0	13.42	185.3	0.6
	7.0	13.25	186.0	0.9
	8.0	11.96	188.9	1.2
	9.0	11.80	191.1	1.4
	10.0	10.60	195.8	1.6
	11.0	10.65	201.6	1.7
	12.0	9.73	204.2	2.0
	13.0	9.49	206.6	2.5
	14.0	4.44	211.2	3.1
	15.0	3.37	215.9	3.4
March 5, 2008	1.0	10.38	-	0.1
	2.0	12.25	-	0.1
	3.0	12.00	169.5	0.3
	4.0	11.82	192.4	0.5
	5.0	11.74	199.2	0.7
	6.0	11.25	200.0	0.9
	7.0	11.04	200.5	1.2
	8.0	9.64	201.9	1.5
	9.0	9.08	203.4	1.9
	10.0	7.32	208.2	2.2
	11.0	6.73	210.8	2.6
	12.0	4.80	215.3	3.0
	13.0	3.87	219.6	3.2
	14.0	1.74	225.3	3.6
	15.0	1.82	230.2	3.7
16.0	0.46	238.1	4.2	
16.5	0.42	239.4	4.4	

Table 4: Candle Lake Baseline Surface 2008 Metal Parameters

Parameters	February 5	March 5
Metals (mg/L)		
Mercury ($\mu\text{g/L}$)	<0.05	<0.05
Aluminum	<0.005	<0.005
Arsenic ($\mu\text{g/L}$)	1.0	1.1
Barium	0.059	0.060
Beryllium	<0.001	<0.001
Boron	0.023	0.028
Cadmium	<0.001	<0.001
Chromium	<0.001	<0.001
Cobalt	<0.001	<0.001
Copper	<0.001	0.002
Iron	0.002	0.006
Lead	<0.002	<0.002
Manganese	0.002	0.002
Molybdenum	<0.001	<0.001
Nickel	<0.001	<0.001
Phosphorous	<0.01	<0.01
Silicon, Soluble	7.3	7.3
Silver	<0.001	<0.001
Strontium	0.14	0.14
Titanium	<0.001	<0.001
Vanadium	<0.001	<0.001
Zinc	<0.005	<0.005
Zirconium	<0.001	<0.001

Table 5: Candle Lake Baseline Bottom 2008 Analytical Results

Parameters	February 5
Nutrients (mg/L)	
Dissolved Organic Carbon	12.5
Nitrate, as Nitrogen	0.14
Ammonia, as Nitrogen	<0.02
Total Kjeldahl Nitrogen	0.6
Total Phosphorous	0.08
Ortho-Phosphate, as P	0.08
Solids (mg/L)	
Total Dissolved	342
Suspended, Fixed	<1
Suspended, Volatile	1
Suspended, Total	1
Bacteria (orgs/100 mL)	
E. Coli	<10
Total Coliform	<10
Major Ions (mg/L)	
Alkalinity, Total	311
Alkalinity, Phenol	0.0
Bicarbonate	257
Calcium	42
Carbonate	0
Chloride	1.6
Hardness, Total	204
Magnesium	24
Potassium	3
Sodium	9
Sulphate	5.3
Other	
Chlorophyll <i>a</i> (µg/L)	1.18
Conductivity (µS/cm)	397
pH (pH units)	7.9
Turbidity (NTU)	1.1
Biochemical Oxygen Demand (mg/L)	<2
Chemical Oxygen Demand (mg/L)	30.2

Table 6: Candle Lake Baseline Bottom 2008 Metal Parameters

Parameters	February 5
Metals (mg/L)	
Mercury ($\mu\text{g/L}$)	<0.05
Aluminum	<0.005
Arsenic ($\mu\text{g/L}$)	1.0
Barium	0.063
Beryllium	<0.001
Boron	0.021
Cadmium	<0.001
Chromium	<0.001
Cobalt	<0.001
Copper	<0.001
Iron	0.022
Lead	<0.002
Manganese	0.19
Molybdenum	<0.001
Nickel	<0.001
Phosphorous	<0.01
Silicon, Soluble	8.4
Silver	<0.001
Strontium	0.14
Titanium	<0.001
Vanadium	<0.001
Zinc	<0.005
Zirconium	<0.001