



**Friends of  
Kootenay Lake**

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# **2013 Kootenay Lake Water Quality Monitoring Report**

**Summary of the 2013 Near-Shore Water Quality Monitoring Program**



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**Friends of Kootenay Lake**

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# Introduction

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As part of Friends of Kootenay Lake's commitment to the fish and wildlife habitat of Kootenay Lake, a three year water quality monitoring program was initiated. The near-shore program was conducted by trained volunteers all over Kootenay Lake, and monitoring water clarity and temperature of Kootenay Lake according to guidelines provided by the British Columbia Lake Stewardship Society's (BCLSS) Lake Sampling Program (BCLSMP). Kootenay Lake is approximately 104 km long from the north to south end, with an approximately 30 km long left arm. There can be a lot of variance in lake health in different areas of the lake. By recruiting volunteers all over the lake to monitor water quality in different areas, we have tried to address this aspect and monitor as many areas as possible with intent to identify regions of the lake that may be feeling more pressure than others. Monitoring was mostly carried out within 10 meters of the shoreline with the exception being Longbeach 2 (Appendix B, Site C).

Water quality monitoring enables people to acquire important knowledge about the lake, the habitat it provides, and threats the lake and all of its inhabitants face. Following completion of FOKL's three year monitoring program, BCLSS will summarize the three year data collected in one document. This document will provide a comprehensive analysis of Kootenay Lake water quality, available to everyone on the lake. This baseline information regarding Kootenay Lake water quality is an important asset to help determine sensitive regions of the lake, as well as creating reference material for future work surrounding Kootenay Lake.

Water clarity was measured by secchi depth readings. Secchi disks are an indicator of suspended particles in the lake, and give information about the depth at which suspended particles prevent visible light from reaching. This is important in understanding productivity of aquatic plants, as they require light energy to grow. It also gives insight into the abundance of phytoplankton in the lake, as phytoplankton makes up a large proportion of suspended particles in water. Understanding phytoplankton abundance is vital to protect lake health. Human activity often leads to increased abundance of phytoplankton due to fertilizer runoff, which also speeds up eutrophication of the lake. This can lead to anoxia and algal blooms, which kill aquatic fish and plants, and restrict recreation. BC Water Quality Guidelines suggest secchi disks be visible at a minimum depth of 1.2 m (Ministry of Environment Water Management Branch, 2001). We used this value as a trigger point for understanding where and when the lake was healthy versus unhealthy with regards to water clarity.

Water temperature was measured by thermometer. Water temperatures help predict what fish species might exist and where. They also alert us to areas where fish or other aquatic species might be experiencing stress. Recreation such as swimming, building or boating is often governed by temperature of the water. A maximum of 15°C is recommended for drinking water, while for recreation the maximum is 30°C (Ministry of Environment Water Management Branch, 2001).

Eighteen distinct places around Kootenay Lake were monitored at varied times and for varied lengths from April to October. Graphical representation of the results for each separate spot can

be found in Appendix B. Given coordinates, the map represents exact monitoring spots (Appendix A). Graphs without coordinates provided are an approximation of the monitoring spot, and the map may not reflect the exact place monitored. Citizens were trained on the proper use of a secchi disk, and the proper method of measuring water temperature following standards put forward by the BCLSMP. Training was conducted through four Lake Watcher's Workshops held in July 2012. The exact methodology followed can be found in Appendix B of the 2013 Water Quality Monitoring Report for the West Arm of Kootenay Lake (De la Salle and Drake, 2014).

## **Results and Analysis**

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Water temperature varied from 5 to 24 degrees Celsius through the sampling season. August had the highest average temperature, at 18.8 °C. The highest temperature overall was recorded in July. Water temperature increased steadily from April to July, plateauing as it reached August, and then decreased much at the same speed it increased. Whereas air temperature was more variable, water temperature followed a smoother, more predictable trend (Appendix B). Average water temperature was above the recommended guideline for drinking water from July through September. (Table 1)

Secchi depths ranged from 1.2 meters deep to 12 meters deep. There was quite a bit of variability site to site concerning secchi depth range. This is likely due to higher variability in near shore ecosystems compared to deep water. Since near shore stations are much closer to run off of fertilizer and sediment, they can accumulate more phytoplankton and other suspended particles, especially after a heavy rain fall. Table 2 shows lower secchi depths in spring, likely indicative of the reduced clarity due to spring runoff. Graphs in the appendix show the same trend; secchi depths decreasing May through June likely due to spring runoff, and then increasing again July to October. Secchi depth reached the minimum recommended depth of 1.2 meters, but did not dip below this. (Table 2)



Table 1: Kootenay Lake average water temperatures by month

<b>Water temperature</b>	<b>April</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>August</b>	<b>September</b>	<b>October</b>
Highest Temperature	8	13	16	24	22	20	14
Lowest Temperature	5	8	5	6	11	7	10.5
Average Temperature	6.6	9.18	12.1071	16.18542	18.7775	16.74615385	11.45833333
Replicates	5	20	43	47	40	39	23

Table 2: Kootenay Lake average secchi depths by month

<b>Secchi Depth</b>	<b>April</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>August</b>	<b>September</b>	<b>October</b>
Deepest measurement	5.8	8.4	5.3	5.4	11.5	11	12
Smallest measurement	4	1.2	1.7	1.9	3.4	5	7.5
Average Depth	4.9	4.916667	3.75	4.199286	6.283333	8.9	10.46429
Replicates	2	9	23	28	24	21	14

## Closing

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Water quality monitoring only increases in importance as developmental pressures are exerted on the lake. FoKL recommends all shore line homeowners to invest in their lake by monitoring the water to aid in developing a comprehensive lake wide understanding of the water quality. Since water quality can differ station to station, it is important to monitor as many places as possible to understand the many different aspects of the lake, and identify areas that might be feeling more pressure than others.

Concerning secchi depths, the BC drinking water guideline suggests a minimum secchi depth of 1.2 m, the bottom of our range observed in this monitoring program. It is important to keep monitoring these depths to guarantee secchi depths stay high enough to maintain safe drinking water, due to the high number of lake residents who draw their water from the lake. Secchi depths are a measure of suspended particles in the water, which are often phytoplankton. Therefore, these measures also gave us insight into areas which might have higher phosphorus concentrations and more algae. When there is an excess of nutrients, phytoplankton can create algal mats on the surface of the water, which limit the light that can penetrate to deeper parts, and therefore stress both aquatic plant and animal life. When the phytoplankton decompose, it uses up dissolved oxygen in the water which can cause hypoxia and again stress aquatic life. Therefore, it is important that we keep monitoring to guarantee that Kootenay Lake stays healthy. Water temperatures were within a healthy range for aquatic life and drinking water. For a more in depth look at the results from the 2013 monitoring program, please see FoKL's 2013 West Arm monitoring report.

FoKL is always interested in engaging community members. If you are interested in becoming involved with what we do, feel free to look at our website, sign up for our mailing list, and become a member. If you have any concerns or interests regarding the lake, contact us and we may be able to provide assistance. We highly encourage community members to initiate their own stewardship projects to be involved with the health of their lake, and are happy to help out with guiding you in developing your project.

## References

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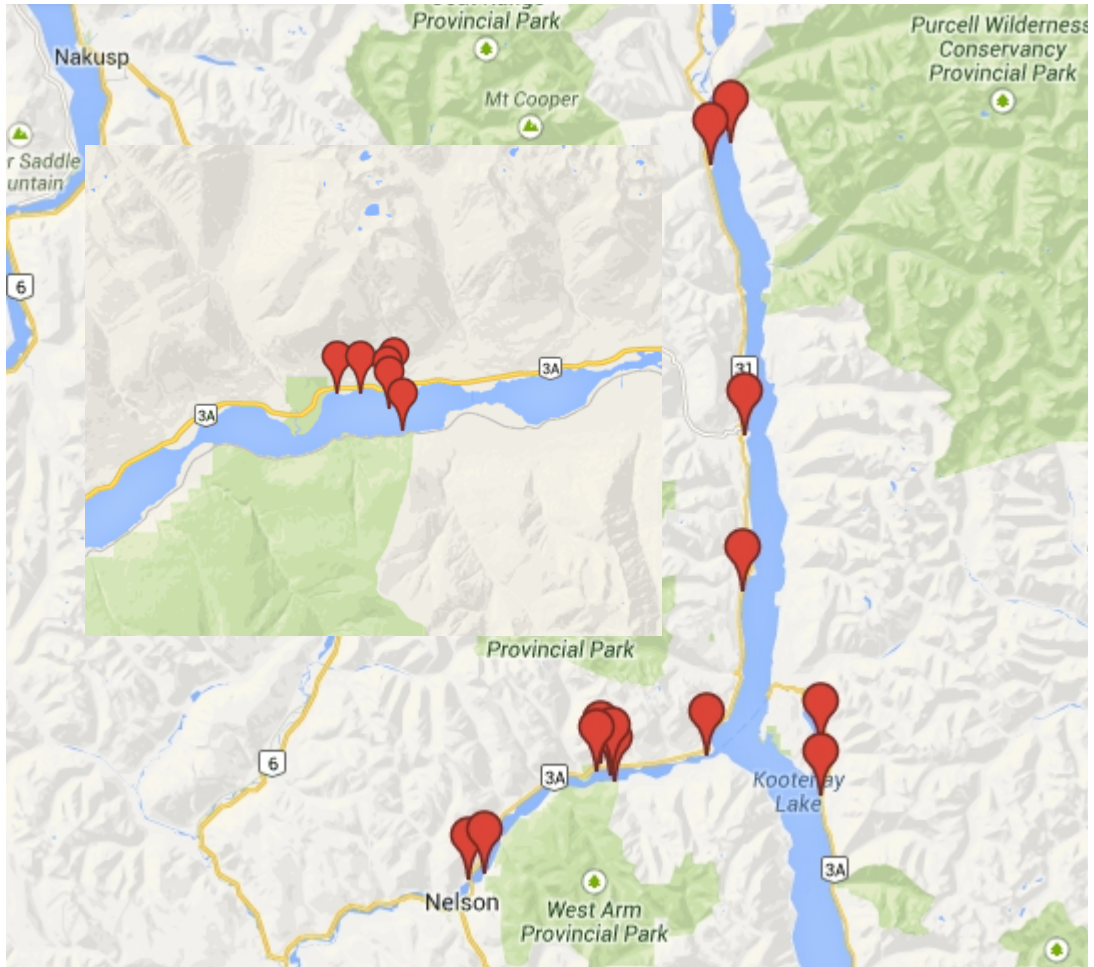
De la Salle, C. Drake, S. 2014. Friends of Kootenay Lake. 2013 Water Quality Monitoring Report for the West Arm of Kootenay Lake. Appendix B.

Water Management Branch, Environment and Lands Headquarters Division, Ministry of Environment. 2001. Water Quality Guidelines for Temperature, Overview Report.

Water Management Branch Environment and Lands Headquarters Division Ministry of Environment. 2001. Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments, Overview Report.

## Appendix A – Map of Sampling Locations

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## Appendix B - Figures

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49° 36.687' N 117° 06.133' W

49°36.44' N 117°05.308' W

49°36.58' N 117°05.35' W

49°36.07' N 117°04.98' W

49°38' N 116°48' W

50.147034 116.951952

(No description of area)

Kootenay Lake, no other description

Kootenay Lake West Arm, no other description