Wasa Lake 2022

Year One Report

BC Lake Stewardship Society

Image by Kristi Carter

General Information

This report includes a year one summary of Level 1 Wasa Lake water quality data collected by volunteers from the Wasa Lake Land Improvement District in 2022. The Level 1 program includes seasonal Secchi depth and surface temperature measurements, with the addition of dissolved oxygen and temperature profiles.

Wasa Lake is located approximately 35 km east of Kimberley and 40 km north of Cranbrook in the East Kootenay region. Wasa Lake is sometimes referred to as Hanson Lake, named after Niles Hanson, an early settler who operated a movable sawmill and the Wasa Hotel (BCLSS, 2009). The lake lies at an elevation of 772 m. The lake has a maximum depth of 14 m and a mean depth of 3.8 m. The surface area is 1.1 km^2 and the shoreline perimeter is 6.98 km.

Wasa Lake has contained brook trout (Salvelinus fontinalis), Burbot (Lota lota), lake chub (*Couesius plumbeus*), largemouth bass (*Micropterus salmoides*), largescale sucker (*Catostomus macrocheilus*), northern pikeminnow (*Ptychocheilus oregonensis*), peamouth chub (*Mylocheilus caurinus*), rainbow trout (*Oncorhynchus mykiss*), threespine stickleback (*Gasterosteus aculeatus*) and yellow perch (*Perca flavescens*) (BCLSS, 2009). The lake is advertised as the warmest swimming lake in the Kootenays, which makes it a common vacation destination for families (BC Parks, 2023). There is also a provincial park with 104 campsites and a large day use area on the lake (BC Parks, 2023).

Wasa Lake is a kettle lake, it was formed as a depression in glacial deposits and has no continuous inputs or outputs. It remains a lake because the depression it forms is lower than the surrounding water table; this means that fluctuations in the water table result in fluctuations in the lake level (McArthur, 2005). During freshet, it appears that the Kootenay River is the major contributing factor to the lake's level (Baker, 1987). Wasa Lake's depth changes throughout the summer following changes in the level of the Kootenay River. High water levels in the Kootenay River affect water table levels, which in turn affect the water level in Wasa Lake (McArthur, 2005).

The flushing rate of Wasa Lake is unknown, however, considering that there are no inflows or outflows, it's likely that Wasa Lake has a low ability to assimilate nutrients.

Quality Assurance and Quality Control

BCLSS performed a phone audit of the volunteer from the Wasa Lake Land Improvement District monitoring Wasa Lake on August 18, 2022, to ensure correct sampling and calibration procedures were being followed. Results of the audit can be found in the attached appendix.

What's Going on Inside Wasa Lake?

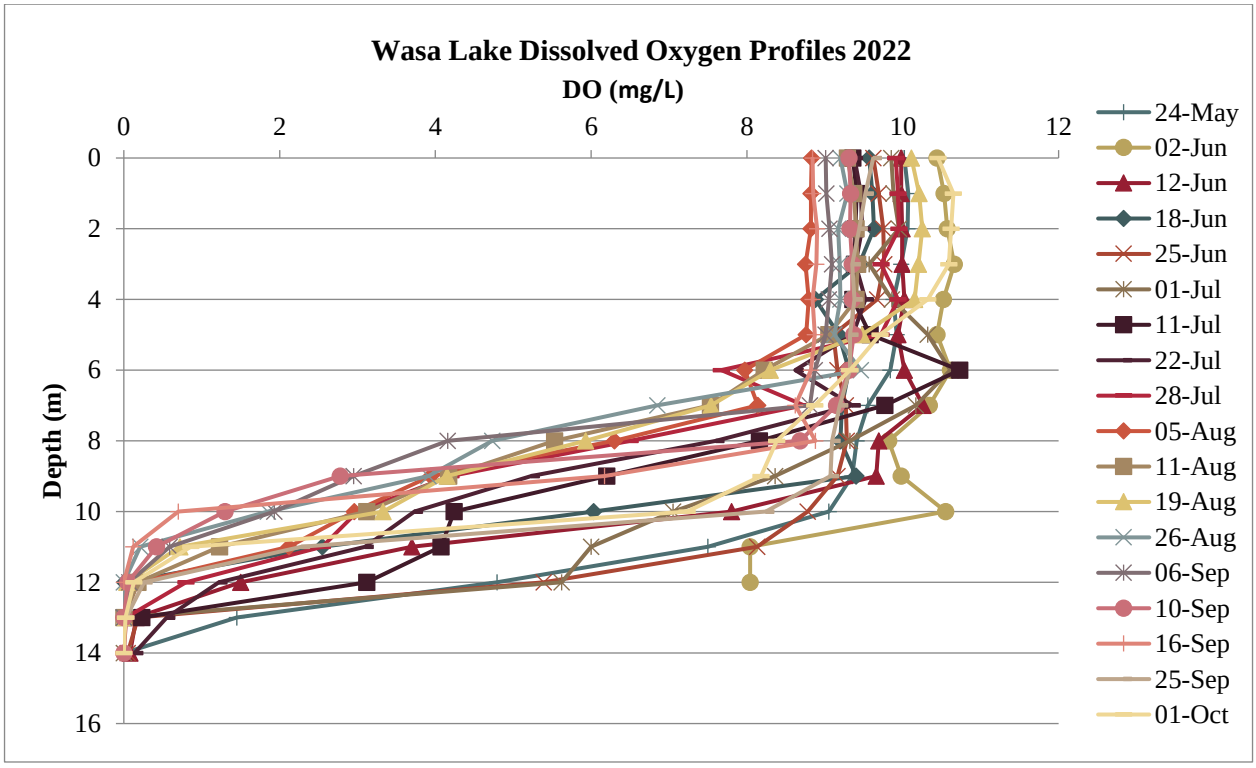
Lake Mixing

What is Dissolved Oxygen?

Dissolved oxygen (DO) is the amount of O_2 molecules that are dissolved into the water. The amount of O_2 that is dissolved in a lake depends on several factors including the mixing that occurs during the overturn of a lake, the amount of wind action a lake experiences, the temperature of the lake, the number of plants that photosynthesize in the lake, and daily fluctuation patterns.

Why Measure Dissolved Oxygen?

DO and temperature are measured from the surface to the bottom of the lake which is called a profile. The profile is done by measuring DO and temperature every meter from the surface to 1 m above the lake bottom. By developing an understanding of what DO and temperature look like from the surface to the bottom of the lake, more insight can be gained concerning the health of the lake. With climate warming, it is becoming increasingly important to document DO and temperature profiles for lakes in order to better predict locations and time periods that may experience increased or decreased DO concentrations in relation to changing temperatures. More information on DO and temperature profiles can also assist lake managers with understanding how sensitive a lake is to change due to climate warming. DO profiles were collected at the Deep Site on Wasa Lake from May 24th to October 1st, 2022, and are shown below.

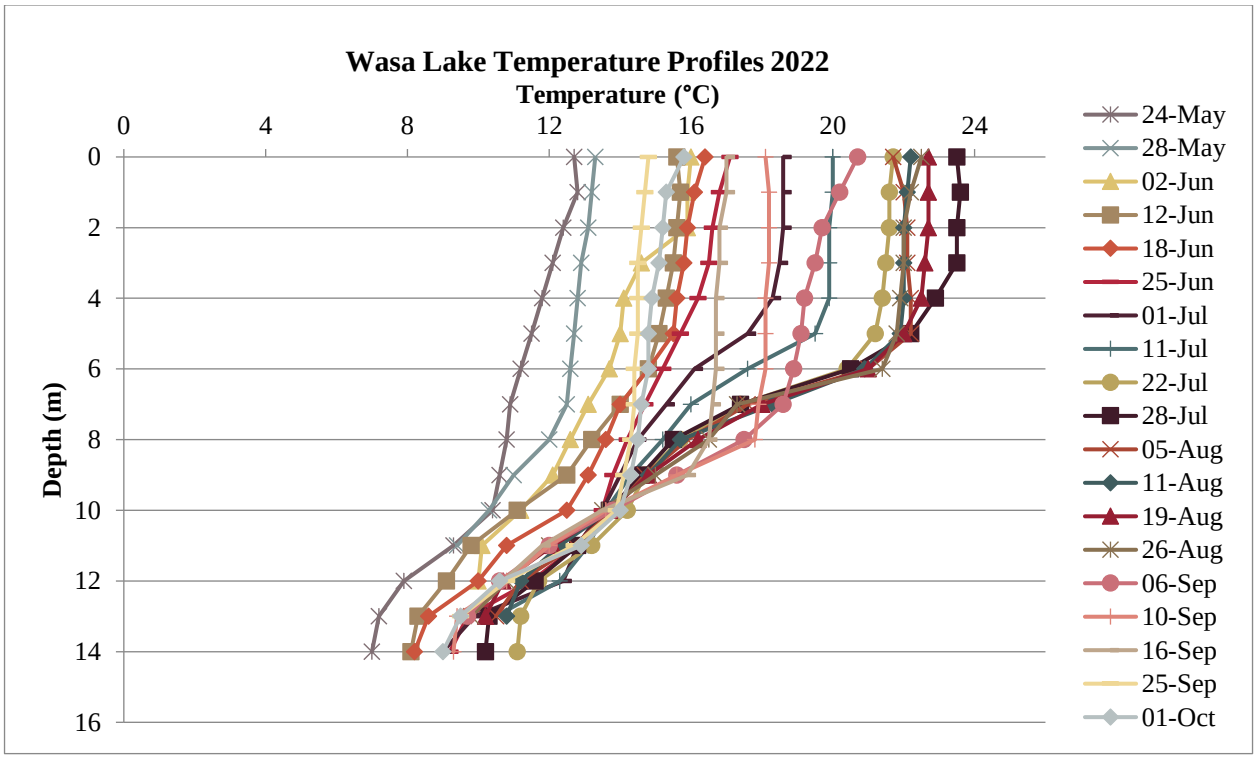


Dissolved oxygen depletion is evident in depths below approximately 7 m with anoxic conditions evident between 12-14 m depth. Dissolved oxygen was not replenished to bottom waters between May 24th and October 1st, 2022.

Why Measure Temperature?

Measuring temperature throughout the water column and over time allows us to understand a lake's specific thermal structure. It allows us to predict the patterns of other variables (e.g., dissolved oxygen and phosphorus) that play a key role in lake productivity and recreational water quality. It is also an important measurement to better understand how lakes throughout BC respond to climate change. By measuring temperature throughout the water column, we may be able to detect changes in the time of lake turnover, changes to the depth of the thermocline, warming surface waters, and other impacts.

Temperature stratification (i.e., vertical water column layering) patterns are very important to lake water quality as they can determine much of the seasonal oxygen, nutrient, and biological conditions. Temperature profiles were collected at the Deep Site from May 24th to October 1st, 2022, and are shown below.



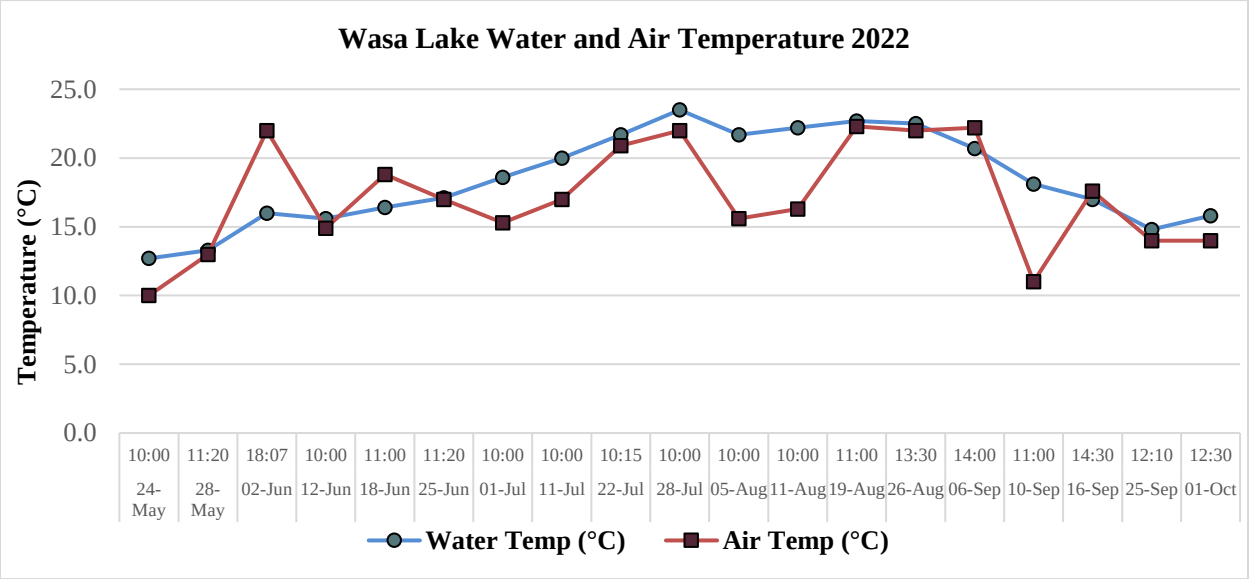
The lake was beginning to stratify when the first profile was taken on May 24th with surface water temperature relatively uniform to a 10 m depth. The thermocline appears to be between 3 m and 8 m. Late summer overturn was not captured as the lake remained stratified on October 1st.

Surface Temperature

Why Measure Surface Temperature?

Measuring temperature over time allows us to understand a lake's specific thermal structure. Temperature measurement also provides important information on the health of the biological community by indicating when and where the temperature tolerances of fish and other animals or plants may be exceeded. Surface temperature monitoring is important to provide background conditions and therefore identify trends that may be present. Surface temperature also helps to determine much of the seasonal oxygen, phosphorus, and algal conditions.

Surface temperature readings were collected by volunteers throughout the 2022 season. The temperature summary below shows surface water temperature and air temperature from May 24th to October 1st, 2022.



The maximum surface water temperature reading was 23.5°C (July 28) and the minimum was 12.7°C (May 24). The average surface temperature reading from May to October was 18.4°C. The maximum air temperature recorded was 22.3°C (August 19) and the minimum was 10.0°C (May 24). The average air temperature for 2023 was 17.2°C.

Water Clarity

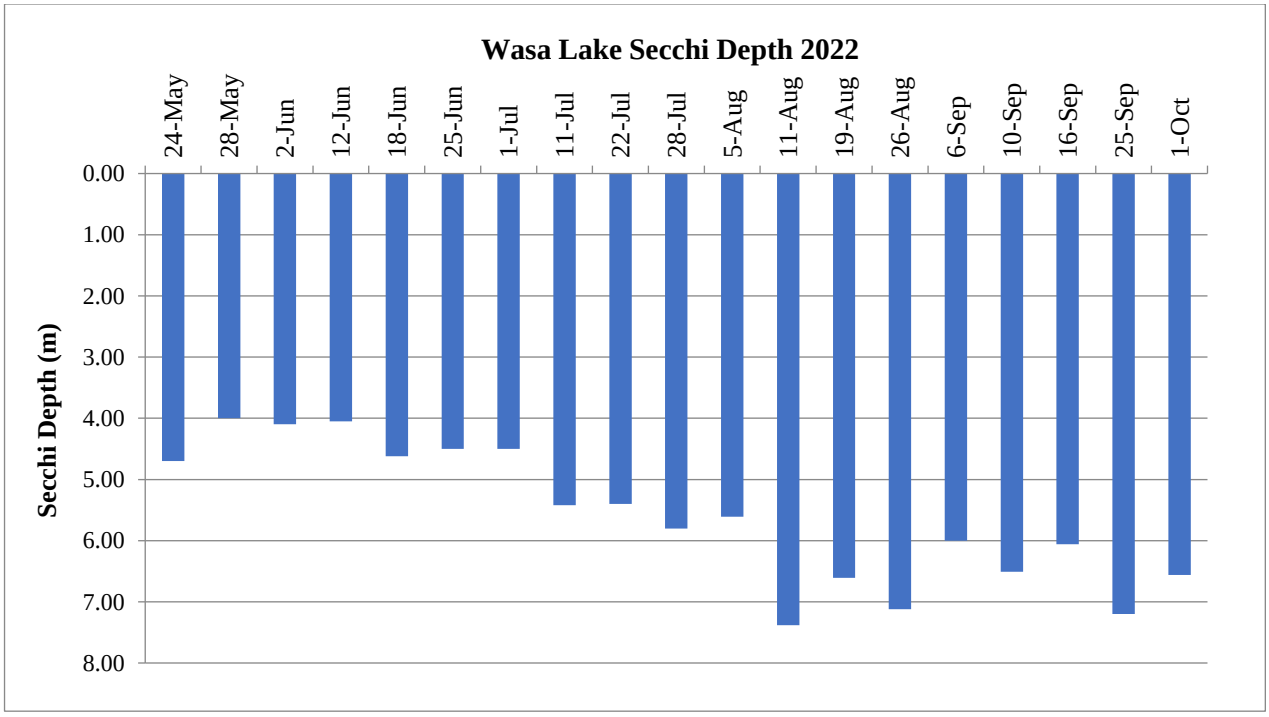
What is a Secchi Disk?

The Secchi disk typically used in lakes is a 20 cm disk with alternating black and white quadrants. It is attached to a tape measure and lowered into the water until the observer can no longer see it. The depth of disappearance, called the Secchi depth, is a measure of the transparency of the water.

Why Measure Water Clarity?

Transparency (clarity) is a good indicator of the impacts from human activity on the land surrounding the water body. If transparency is measured through the season and from year to year, trends can be observed. It can serve as an early warning that activities on the land are affecting water quality. The clarity of the water impacts the amount of light penetration and in turn can affect photosynthesis and the distribution of organisms. Clarity decreases as colour, algae, or suspended sediment increases. The colouration could be due to staining which is largely from the decay of plant material. Algae growth is promoted by nutrient inputs, mainly phosphorus. Suspended sediments can increase as a result of increased runoff from urban or agricultural environments. Glacial sediments can also impact water clarity as the fine glacial silts remain suspended in the waterbody.

The graph below shows the Secchi readings collected by volunteers between May 24th and October 1st, 2022. The minimum data requirement of 12 readings over the sampling season was met and the spread of measurements was evenly distributed from spring through fall.



The maximum reading was 7.4 m (August 11) and the minimum was 4.0 m (May 28). The average Secchi depth was 5.6 m in 2022.

Tips to Keep Wasa Lake Healthy

- Inspect your sewage system yearly and have the septic tank pumped regularly.
- Minimize the disturbance of shoreline areas by maintaining natural vegetation cover.
- Replant lakeside grassed areas with native vegetation.
- Watch your wake. Waves can increase shoreline erosion and churn up bottom sediment which decreases water clarity and can also reintroduce harmful nutrients.

Ice on / Ice off data

Why Collect Ice-On and Ice-Off Data?

By collecting Ice-on and Ice-Off data, volunteers contribute to a scientific understanding of climate change. By analyzing citizen records, scientists have found that the freeze-thaw cycles of Northern water bodies are changing. The BCLSS submits data to the IceWatch program by NatureWatch. This program is designed to help identify ecological changes that may be affecting our environment.

Summary

Volunteers are beginning to establish an excellent data set. Local volunteers are encouraged to continue to record Secchi and surface temperature readings, and dissolved oxygen and temperature profiles for a minimum of two more years, with an emphasis on collecting a minimum of 12 evenly spaced readings between ice-off and ice-on. After three years of data collection, a full analysis of the data will be done, and the present 3 year program will be compared to the historic data from 2004-2006 as a potential indicator of change. A report will be written and published in the BCLSS Library. This volunteer collected data is important for long term records and can help identify early warning signs should there be a deterioration in water quality from its current state. Local volunteer monitors are also encouraged to continue recording ice-on and ice-off dates for long term climate change records.

References

Baker, R. 1987. *Wasa Lake*. Water Management Branch, Region 4, Nelson.

BC Lake Stewardship Society [BCLSS]. 2009. *Wasa Lake 2004 - 2006*. https://www.bclss.org//wp-content/uploads/2017/05/wasa_lake_04-06.pdf

BC Ministry of Environment [FIDQ]. 2023. Fish Stocking Query [online database]. Accessed January 26, 2023. https://a100.gov.bc.ca/pub/fidq/infoFishStocking.do

BC Parks. 2023. Wasa Lake Provincial Park. Accessed January 26, 2022. https://bcparks.ca/explore/parkpgs/wasa_lk/

McArthur, R. 2005. *Drought Planning for the Wasa Lake Area*. McArthur Consulting. Prepared by R. McArthur.

Appendix

Wasa Lake audit form - August 18, 2022

BC LAKE STEWARDSHIP SOCIETY
1257 Erskine Street
Coquitlam BC, V3B 6R3
Phone: 604-474-2441 Toll free: 1.877 BC LAKES
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Level 1 Audit Checklist

Date: Aug 18, 2022 Time: 1:00 pm

Auditor: Marie McCallum

Sampler Name(s): Nowell Berg

Lake: Wasa Lake Site: Virtual audit

Sampler	Time (24hr)	Weather Conditions	Water Conditions	Secchi Depth (m)	Surface Temp. (°C)
Volunteer	NA	NA	NA	NA	NA
Auditor	NA	NA	NA	NA	NA

Safety:	Y/N	Comments
Safety waiver signed?		
Check that weather is safe?	Y	
Follow a check in procedure/go with partner?	Y	
Monitor at same time each week?	Y	Thursday or Friday 10 am every week.
Anchor at deep site?	Y	
Followed COVID safety guidelines?	NA	
Secchi:		
Measuring between 10 a.m.–2 p.m.?	Y	
Sunglasses off?	Y	
Measure from shady side of the boat?	Y	
Lower Secchi - is it straight down/vertical?	Y	Has weight on disk.
Average of the two measurements?	Y	
Is Secchi reading accurate?	NA	
Is Secchi depth recorded to nearest 0.01 m?	Y	

Other:	Y/N	Comments
Temperature - read thermometer immediately?	Y	
Discuss the frequency and timing of monitoring – weekly preferred but minimum of 12 readings spaced evenly from spring to fall (biweekly). If the volunteer misses one on a biweekly schedule, they should do it the following week so as not to have a one month gap between readings. Also, remind volunteers that they can monitor +/- a day in subsequent weeks i.e., if week 1 is Wed, then the next week can be Tues or Thurs if they can't get out Wed, and so on.	Y	Monitors weekly. Able to monitor into September this year as water level is 66 cm higher than last year and it is draining more slowly. When water level drops, volunteers are not able to get their boats out onto the water.
Dissolved Oxygen (ProSolo):		
Is the DO meter calibrated before taking measurements?	Y	
Is the DO meter calibrated correctly? (no water on ODO sensor cap or temperature sensor, no seal around probe, wait 10 minutes)	Y	Reminded volunteer to check for water on the sensor cap before calibrating.
Is the sensor cap in good condition?	Y	
Measurements taken every meter?	Y	
Sensor stored correctly (sponge is moist, if sensor dries out, it is rehydrated for >8 hours and recalibrated before use)	Y