BC Lake Stewardship and Monitoring Program

Little Lac des Roches 2006-2009

A partnership between the BC Lake Stewardship Society and the Ministry of Environment

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The Importance of Little Lac des Roches & its Watershed

British Columbians want lakes to provide good water quality, aesthetics, and recreational opportunities. When these features are not apparent in our local lakes, people begin to wonder why. Concerns often include whether the water quality is getting worse, if the lake has been impacted by land development or other human activities, and what conditions will result from more development within the watershed.

The BC Lake Stewardship Society (BCLSS), in collaboration with the Ministry of Environment (MoE), has designed a program, entitled *The BC Lake Stewardship and Monitoring Program*, to address these concerns. Through regular water sample collections, we can come to understand a lake's current water quality, identify the preferred uses for a given lake, and monitor water quality changes resulting from land development within the lake's watershed. There are different levels of lake monitoring and assessment. The level appropriate for a particular lake depends on the funding and human resources available. In some cases, data collected as part of a Level I or II program can point to the need for a more in-depth Level III program. This report gives the 2006 - 2009 results of a Level I program for Little Lac des Roches.

The BCLSS can provide communities with both lake-specific monitoring results and educational materials on general lake protection issues. This useful information can help communities play a more active role in the protection of the lake resource. Finally, this program allows government to use its limited resources efficiently with the help of local volunteers and the BCLSS.

A **watershed** is defined as the entire area of land that moves the water it receives into a common waterbody. The term watershed is misused when describing only the land immediately around a waterbody or the waterbody itself. The true definition represents a much larger area than most people normally consider.

Watersheds are where much of the hydrologic cycle occurs and play a crucial role in the purification of water. Although no "new" water is ever made, it is continuously recycled as it moves through watersheds and other hydrologic compartments. The quality of the water resource is largely determined by a watershed's capacity to buffer impacts and absorb pollution.

Every component of a watershed (vegetation, soil, wildlife, etc.) has an important function in maintaining good water quality and a healthy aquatic environment. It is a common misconception that detrimental land use practices will not impact water quality if they are kept away from the area immediately surrounding a waterbody. Poor land use practices in a watershed can eventually impact the water quality of the downstream environment.

Human activities that impact water bodies range from small but widespread and numerous *non-point* sources throughout the watershed to large *point* sources of concentrated pollution (e.g. waste discharge outfalls, spills, etc). Undisturbed watersheds have the ability to purify water and repair small amounts of damage from pollution and alterations. However, modifications to the landscape and increased levels of pollution impair this ability.

Little Lac des Roches has a perimeter of 3703 m and lies at an elevation of 1129 m. There are limited data on Little Lac des Roches, as it has never been formally surveyed, though it is believed that the maximum depth is approximately 14.4 m. Located 62 km southeast of 100 Mile House, Little Lac des Roches is surrounded by rolling hills and is connected to Lac des Roches through a small channel on the east end. There is a 20 km/h speed restriction on the lake. Land uses in the surrounding area include forestry, residential and recreation. There are 24 full time residents that live along the shores of Little Lac des Roches, as well as the Lac des Roches Resort which operates year round (Wallewein 2009, Pers. Comm.).

Aside from seasonal runoff, Little Lac des Roches has one small inlet from Muddy Lake, which flows mostly during rain events, and one outlet flowing into Lac des Roches. Little Lac des Roches is fed mainly by springs. The lake contains rainbow trout, burbot, northern pikeminnow, red sided shiner, fine scale sucker, large scale sucker and peamouth chub.

What's Going on Inside Little Lac des Roches?

Temperature

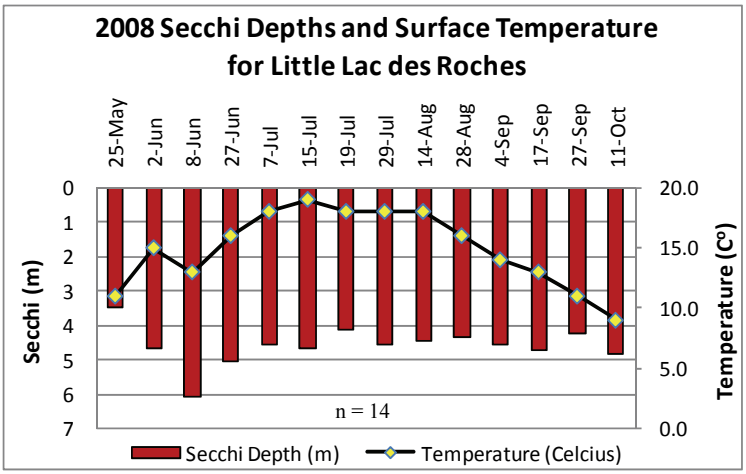
Lakes show a variety of annual temperature patterns based on their location and depth. Most interior lakes form layers (stratify), with the coldest water at the bottom. Because colder water is more dense, it resists mixing into the warmer upper layer for much of the summer. In spring and fall, these lakes usually mix from top to bottom (overturn) as wind energy overcomes the reduced temperature and density differences between surface and bottom waters. In the winter, lakes re-stratify under ice with the densest water (4 °C) near the bottom. These lakes are called dimictic lakes because they turn over twice per year. They are the most common type of lake in British Columbia. Little Lac des Roches is classified as a dimictic lake.

Coastal lakes in BC are more often termed warm monomictic lakes because they turn over once per year. These lakes have temperatures that do not fall below 4°C. Warm monomictic lakes generally do not freeze and circulate freely in the winter at or above 4°C, and stratify only in the summer.

Ice-on and ice-off dates for BC lakes are important data for climate change research. By comparing these dates to climate change trends, we can examine how global warming is affecting our lakes. If ice-on/ice-off dates for Little Lac des Roches are currently being recorded, please forward the data to the BCLSS office.

Surface temperature readings serve as an important ecological indicator. By measuring surface temperature, we can record and compare readings from season to season and year to year. Surface temperature helps to determine much of the seasonal oxygen, phosphorus, and algal conditions.

Temperature and Secchi depth (water clarity) were measured at the deep site on Little Lac des Roches from 2005-2009, though only 3 Secchi readings were taken in September 2005 and are not included in this report. Secchi and temperature readings from September 2005 were comparable to those of 2006. The adjacent graph illustrates the 2008 Secchi and temperature data for Little Lac des Roches, as well as the number of readings (n). The maximum surface temperature was 19°C (July 15th) and the minimum surface temperature was 9°C (October 11th). The maximum surface temperatures measured in 2006, 2007, and 2009 were 20°C (July 23rd), 21°C (July 16th) and 23°C (July 28th). respectively. Minimum surface temperatures were 6°C (May 3rd and October 21st), 8°C (October 8th), 9°C (Oct. 11th) and 10°C (May 17th) in 2006, 2007, 2008 and 2009 respectively.



Trophic Status and Water Clarity

The term *trophic status* is used to describe a lake's level of productivity and depends on the amount of nutrients available for plant growth, including tiny floating algae called phytoplankton. Algae are important to the overall ecology of the lake because they are food for zooplankton, which in turn are food for other organisms, including fish. In most lakes, phosphorus is the nutrient in shortest supply and thus acts to limit the production of aquatic life. When in excess, phosphorus accelerates growth and may artificially age a lake. Total phosphorus (TP) in a lake can be greatly influenced by human activities.

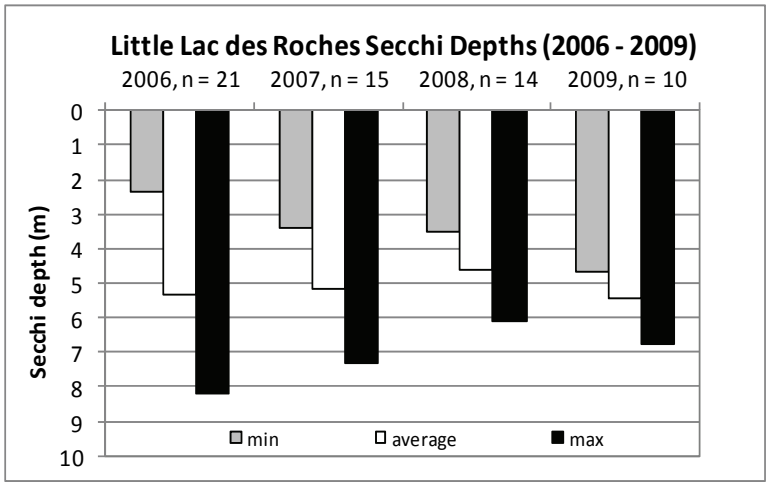
Lakes of low productivity are referred to as ***oligotrophic***, meaning they are typically clear water lakes with low nutrient levels, sparse plant life and low fish production. Lakes of high productivity are ***eutrophic***. They have abundant plant life because of higher nutrient levels. Lakes with an intermediate productivity are called ***mesotrophic*** and generally combine the qualities of oligotrophic and eutrophic lakes.

One measure of productivity is water clarity. The more productive a lake, the higher the algal growth and, therefore, the less clear the water becomes. The clarity of the water can be evaluated by using a Secchi disc, an 8 inch diameter black and white disc that measures the depth of light penetration.

Natural variation and trends in Secchi depth and temperature not only occur between years, but also throughout one season. In general, as temperatures increase during the summer months, Secchi depth decreases. As the temperature of the lake increases, so do some species of algae. Due to the increase in algae, the water clarity can decrease. This general trend is not apparent in the 2007 data. Continued monitoring of the lake will provide a better interpretation of data.

The graph on the following page illustrates the minimum, average and maximum Secchi readings from 2006 to 2009. The maximum reading for all sampling years, 8.2 m, occurred on August 12th 2006. The lowest Secchi depth measured was 2.4 m in 2006 (June 3rd). The average Secchi values ranged between 4.6 m and 5.4 m throughout the four years sampled. Based on the average Secchi values, Little Lac des Roches is exhibiting mesotrophic (2 - 5 m) to marginally oligotrophic (> 5 m) conditions.

It is important to note that in 2006, four Secchi measurements were taken during the month of May, as compared to none in 2007, one in 2008 and two in 2009. This explains why the minimum Secchi reading for 2006 is slightly lower than the minimums recorded in 2007, 2008 and 2009, as these early measurements are more likely to capture spring overturn when water is less clear due to mixing. Also, Secchi depths in June 2008 were slightly lower than at the same time in previous years, although there was little variation in Secchi depths throughout the season. As a result, the graph shows the 2008 maximum Secchi depth is lower, yet the average Secchi depth remained relatively stable.



The flushing rate, another factor that affects water quality, is the rate of water replacement in a lake and depends on the amount of inflow and outflow of a lake. The higher the flushing rate, the more quickly excess nutrients can be removed from the system. The flushing rate for Little Lac des Roches is unknown at this time.

Land Use and Pollution Sources

Though forestry is considered one of the main land uses in the area, there is little active logging. It is worth noting that the land west of Eagle Island (on Lac des Roches) is classified as old growth forests, as zoned by the Cariboo Regional District, whereas Lac des Roches east of Eagle Island is within the Thompson-Nicola Regional District and is zoned for development. Near the north shore of Little Lac des Roches, there is currently a plan to develop 40 - 10 acre residential parcels on what is currently used for cattle grazing. Residents have expressed concern regarding riparian and shoreline habitats as a result of increased development. The surrounding area has been hard hit with Mountain Pine Beetle, Spruce budworm and fir beetle, which may also have an effect on water quality of Little Lac des Roches (and Lac des Roches) in future years.

Local residents are encouraged to ensure their septic systems are up to standard and that their land use activities are following good environmental practices. Further information on keeping Little Lac des Roches healthy can be found on the following page.

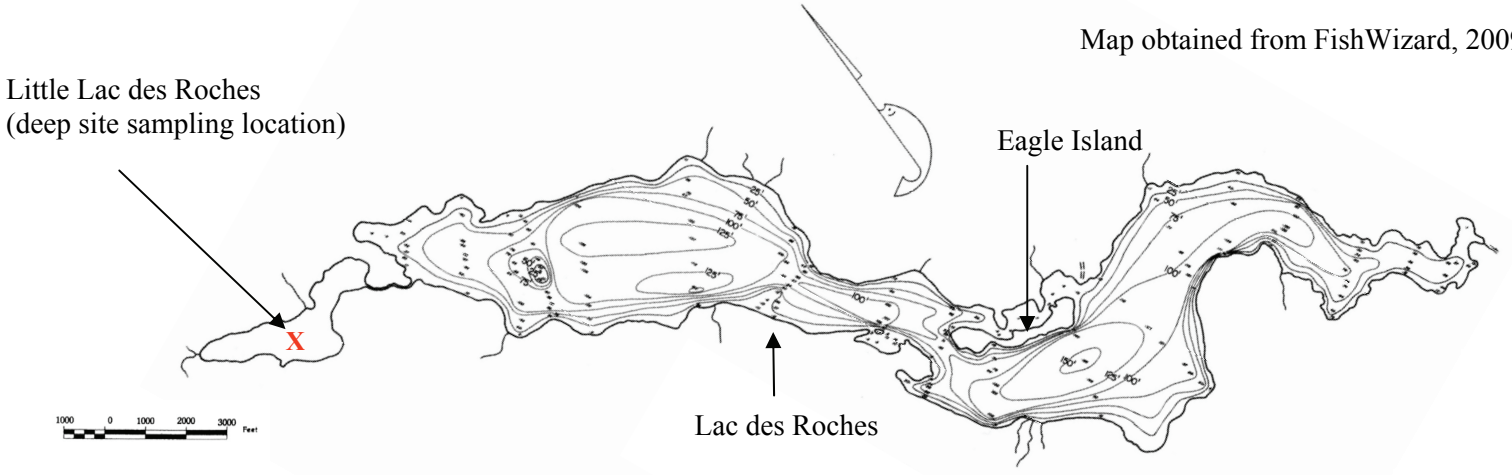
Should Further Monitoring be Done on Little Lac des Roches?

The data collected on Little Lac des Roches from 2005 to 2008 indicates that the water quality has remained relatively stable over the sampling years. Based on Secchi data, Little Lac des Roches is exhibiting mesotrophic to slightly oligotrophic conditions. These data provide a baseline for future comparison. However, all residents and land developers within the watershed are advised to continue to practice good land management so that nutrient migration to the lake and its tributaries are minimized.

If volunteers are willing to continue monitoring Little Lac des Roches, the data could help identify early warning signs should there be a deterioration in water quality. Long-term collection of temperature and ice-on/ice-off data is also valuable for monitoring climate change over time. If volunteers are currently collecting ice data, please forward the data to the BCLSS office.

Little Lac des Roches Bathymetric Map

Map obtained from FishWizard, 2009



Tips to Keep Little Lac des Roches Healthy

Onsite Sewage Systems

- Inspect your system yearly, and have the septic tank pumped every 2 to 5 years by a septic service company. Regular pumping is cheaper than having to rebuild a drain-field.
- Use phosphate-free soaps and detergents.
- Do not put toxic chemicals (paints, varnishes, thinners, waste oils, photographic solutions, or pesticides) down the drain because they can kill the bacteria at work in your onsite sewage system and can contaminate water-bodies.
- Conserve water: run the washing machine and dish-washer only when full and use only low-flow shower-heads and toilets.

Yard Maintenance, Landscaping and Gardening

- Minimize the disturbance of shoreline areas by maintaining natural vegetation cover.
- Minimize high-maintenance grassed areas.
- Replant lakeside grassed areas with native vegetation. Do not import fine fill.
- Use paving stones instead of pavement.
- Stop or limit the use of fertilizers and pesticides.
- Do not use fertilizers in areas where the potential for water contamination is high, such as sandy soils, steep slopes, or compacted soils.
- Do not apply fertilizers or pesticides before or during rain due to the likelihood of runoff.
- Hand pull weeds rather than using herbicides.
- Use natural insecticides such as diatomaceous earth. Prune infested vegetation and use natural predators to keep pests in check. Pesticides can kill beneficial and desirable insects, such as ladybugs, as well as pests.
- Compost yard and kitchen waste and use it to boost your garden's health as an alternative to chemical fertilizers.

Boating

- Do not throw trash overboard or use lakes or other water bodies as toilets.
- Use biodegradable, phosphate-free cleaners instead of harmful chemicals.
- Conduct major maintenance chores on land.
- Keep motors well maintained and tuned to prevent fuel and lubricant leaks.
- Use absorbent bilge pads for minor leaks or spills.
- Recycle used lubricating oil and left over paints.
- Check for and remove all aquatic plant fragments from boats and trailers before entering or leaving a lake.
- Do not use metal drums in dock construction. They rust, sink and become unwanted debris. Use blue or pink closed-cell extruded polystyrene billets or washed plastic barrel floats. All floats should be labelled with the owner's name, phone number and confirmation that barrels have been properly maintained.
- Be respectful of loon nesting areas along the shoreline.

Who to Contact for More Information

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Fish Wizard (www.fishwizard.com)

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