



BC Lake Stewardship and Monitoring Program

Rosen Lake 2004 - 2006

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



The Importance of Rosen Lake & 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, 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 results of a Level I program for Rosen Lake for 2004, 2005 & 2006.

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. Thanks to the efforts of the dedicated volunteers at Rosen Lake, frequent water clarity (Secchi disk) and surface temperature readings were taken from the lake beginning in early April and continuing until October.

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.

Rosen Lake is located approximately 25 km west of Fernie in the East Kootenays. The lake was named after Jaffray pioneer Andrew Rosen. It has a surface area of 72.85 ha, perimeter of 5,034 m and lies at an elevation of 863 m. The average depth of Rosen Lake is 4.3 m, while the deepest point is 12.8 m. The lake contains rainbow trout, cutthroat trout, eastern brook trout and dolly varden. Currently, there are 101 lakefront residences, 19 are occupied by full-time residents. There are approximately 60 non-lakefront residences, the majority of which are occupied by full-time residents.

What's Going on Inside Rosen Lake?

Temperature

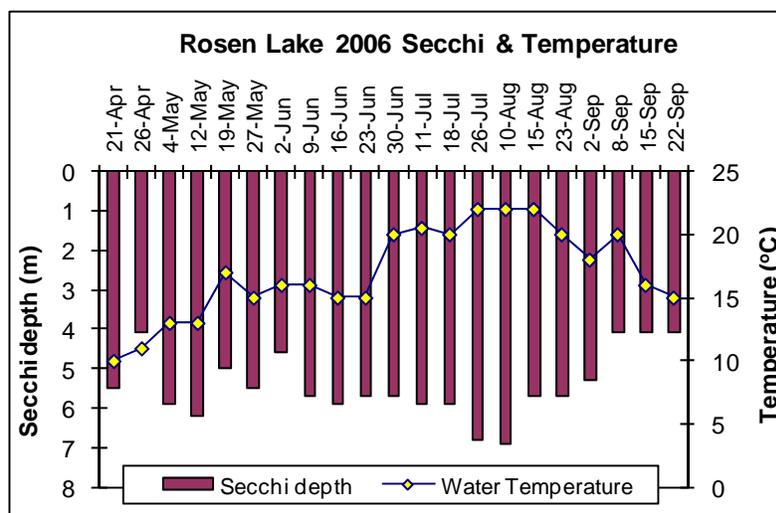
Lakes show a variety of annual temperature patterns based on their location and depth. Most interior lakes form layers (stratify), with the coldest water at the bottom. Because colder water is more dense, it resists mixing into the warmer upper layer for much of the summer. In spring and fall, these 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.

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. Local residents have been reporting ice-on and ice-off dates for Rosen Lake since 2004. Ice-on dates for 2004, 2005 and 2006 are November 29, December 1 and November 29, respectively. Ice-off dates are March 19, 2005 and April 6 in 2006 and 2007. By comparing these dates to climate change trends, we can examine how global warming is affecting our lakes.

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 (see map next page) on Rosen Lake. The adjacent graph illustrates the Rosen Lake Secchi depth and temperature for 2006. The maximum surface temperature was 22°C (July 26th, Aug 10th & 15th) and the minimum surface temperature was 10°C (April 21st). The maximum temperatures in 2004 and 2005 were 24°C (August 19th) and 21°C (July 28th), respectively. Minimum temperatures were 9°C (April 7th) and 8°C (April 13th) in 2004 and 2005, respectively.

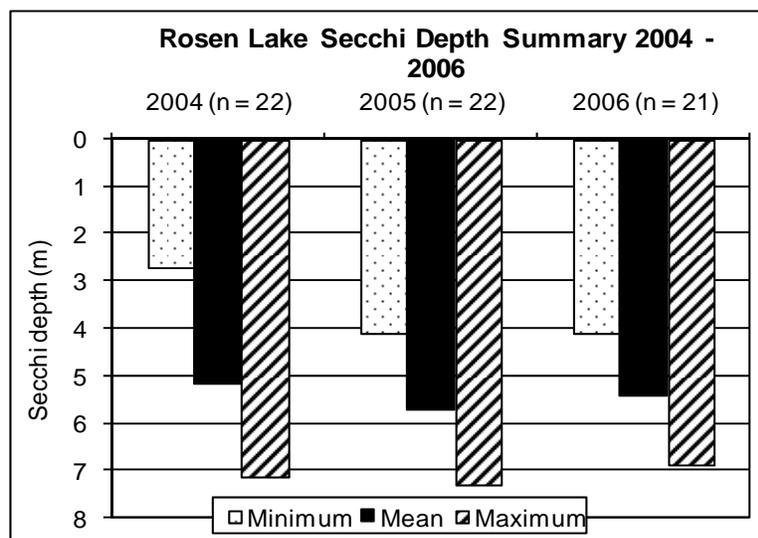


Trophic Status and Water Clarity

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.

One measure of productivity is water clarity. The more productive a lake, the greater the algal growth and, therefore, the less clear the water becomes. Water clarity can be measured using a Secchi disk, a black and white disk 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 temperature increases during the summer months, the 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 decreases. This trend is not strongly evident in the 2006 data (see graph above) which may be due to the shallow depth of the lake.



The lower graph on the previous page shows the minimum, mean, and maximum Secchi depths recorded on Rosen Lake from 2004 to 2006, as well as the number of readings for each year (n). From 2004 to 2006 the mean Secchi depth measurements ranged from 5.2 m (2004) to 5.7 m (2005) indicating little change over the sampling years. Rosen Lake's mean Secchi reading for the sampling period is 5.5 m. Based on these Secchi values, Rosen Lake was exhibiting oligotrophic conditions.

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. Flushing rate data are not available for Rosen Lake. Collection of data necessary to calculate the flushing rate would assist in determining Rosen Lake's ability to assimilate additional nutrients.

Land Use and Pollution Sources

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

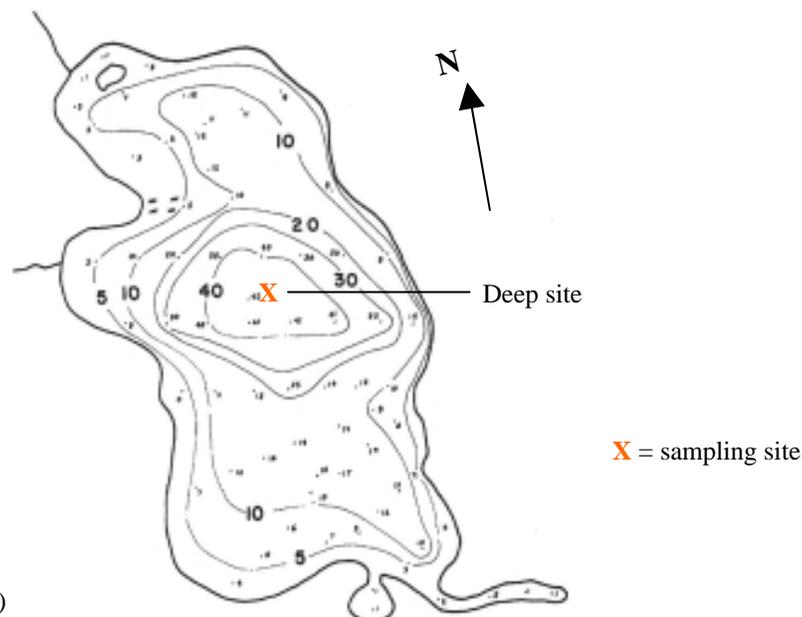
At this time, there are no obvious land use impacts on water quality in this area, however, a detailed survey has not been conducted. Local residents are encouraged to ensure their septic systems are up to standard and that their land use activities are following good environmental practices. Further information can be found on the following page.

Should Further Monitoring be Done on Rosen Lake?

The data collected on Rosen Lake from 2004 to 2006 indicates that the water quality has remained relatively stable over the sampling years. However, all residents and land developers within the watershed are advised to continue to practice good land management techniques so that nutrient migration to the lake and its tributaries is minimized.

Local volunteer monitors are encouraged to continue monitoring Secchi depth and surface temperature. Volunteers have been monitoring ice-on and ice-off dates since 2004 which will be valuable for long term climate change studies.

Rosen Lake Bathymetric Map



Map obtained from FishWizard (2005)

Tips to Keep Rosen Lake 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 waterbodies.
- Conserve water: run the washing machine and dishwasher only when full and use only low-flow showerheads 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.

Who to Contact for More Information

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