BC Lake Stewardship and Monitoring Program

Birch Lake 2008 - 2010

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

The Importance of Birch 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 (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 2008 - 2010 results of a Level I program for Birch Lake.

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.

Birch Lake has a perimeter of 7894 m and lies at an elevation of 1113 m. The surface area of the lake is 2.39 km^2 and the maximum depth is 37.8 m (FISS, 2011). Birch Lake is surrounded by rolling hills and drains into Phinetta Lake from the mid point of the north shore. Tortoise Lake (not shown on the bathymetric map) drains into Birch Lake from the south, while Deep Creek, a seasonal inflow, flows from Lac des Roches into Birch Lake approximately 800 m east of the west point (Ruegg 2011, Pers. Comm.). The main outflow is located along the north shore and flows into the west end of Phinetta Lake. Mooney Creek joins the outflow just north of Birch Lake from the west (Roy 2011, Pers. Comm.).

The lake contains burbot, largescale sucker, brook trout, longnose sucker, northern pikeminnow (formerly N. squawfish), peamouth chub, rainbow trout and redside shiner. The lake has been stocked with the rainbow trout for the last 5 years. (FISS, 2011)

What's Going on Inside Birch Lake?

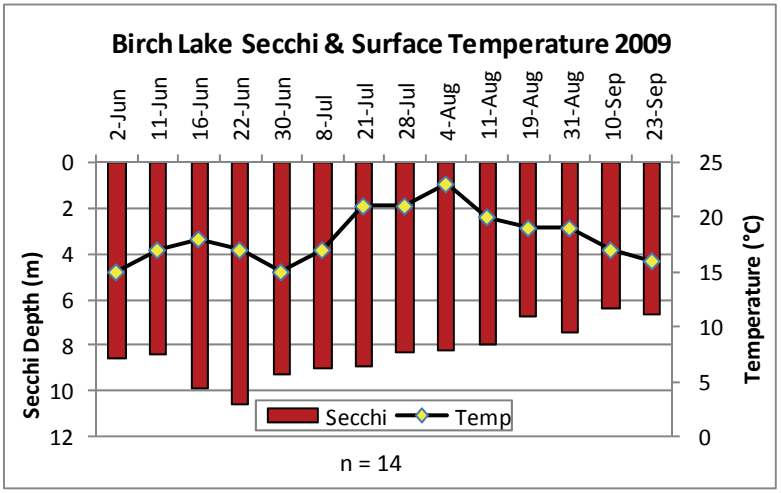
Temperature

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. Birch Lake 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 Birch Lake 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 Birch Lake from 2008-2010. Secchi and temperature readings from 2009 were comparable to those of 2008. The minimum data requirement was missed in 2010, therefore may not be representative of seasonal variation for that year. The adjacent graph illustrates the 2009 Secchi and temperature data for Birch Lake, as well as the number of readings (n). The maximum surface temperature was 23°C (August 4^{h}) and the minimum surface temperature was 15°C (June 2nd). The maximum surface temperatures measured in 2008 and 2010 were 21.0°C (August 16th) and 20.8°C (July 30th). respectively. Minimum surface temperatures were 13.0° C (June 6th and 13th) and 8.0°C (May 13th) in 2008 and 2010 respectively. Usually the lowest surface temperature readings occur shortly after ice-off and during spring overturn. Since monitoring in 2008 and 2009 did not begin until early June, the minimum temperatures for those years do not reflect the low surface temperatures that would likely occur in early spring months.

Trophic Status and Water Clarity

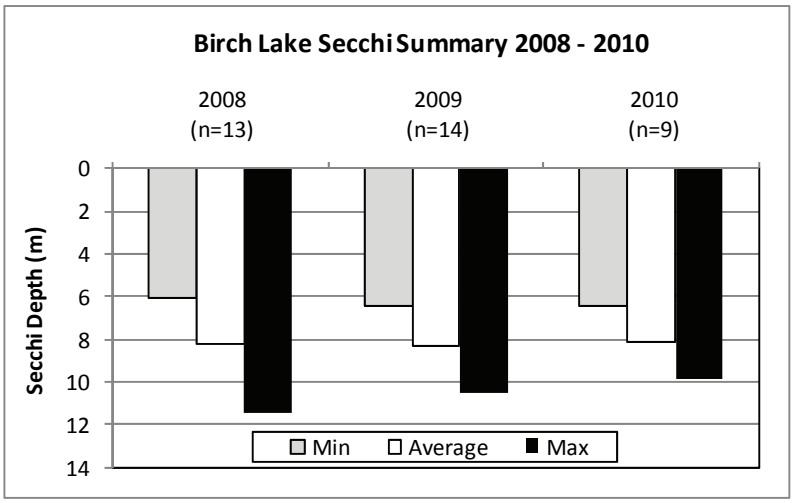
The term *trophic status* is used to describe a lake's level of productivity and depends on the amount of nutrients available for plant growth, including tiny floating algae called phytoplankton. Algae are important to the overall ecology of the lake because they are food for zooplankton, which in turn 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 2008 and 2010 data, however it is apparent in 2009, as seen in the graph above. Continued monitoring of the lake will provide a better interpretation of the data.

The adjacent graph illustrates the minimum, average and maximum Secchi readings from 2008 to 2010, as well as the number of readings per year (n). The maximum reading for all sampling years, 11.5 m, occurred on July 6th 2008. The lowest Secchi depth measured was 6.1 m in 2008 (September 12th). The average Secchi values ranged between 8.1 m (2010) and 8.3 m (2008) throughout the three years sampled. Based on the average summer Secchi values, Birch Lake was exhibiting oligotrophic (>6 m) conditions in all sampling years. It appears Birch Lake has remained stable throughout the sampling years.



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 Birch Lake is unknown at this time.

Land Use and Pollution Sources

Forestry and recreation (fishing, hunting) are considered to be the main land uses in the Birch Lake area. There are 15 part time residences on the lake, as well as the Opax Mountain Resort & Birch Lake Fish Camp that is operational throughout the entire year. (Roy 2011, Pers. Comm.)

Local residents are encouraged to ensure their septic systems are up to standard and that their land use activities are following good environmental practices. Recreational users of the lake are encouraged to ensure their boats and equipment are properly maintained. Further information on keeping Birch Lake healthy can be found on the following page.

Should Further Monitoring be Done on Birch Lake?

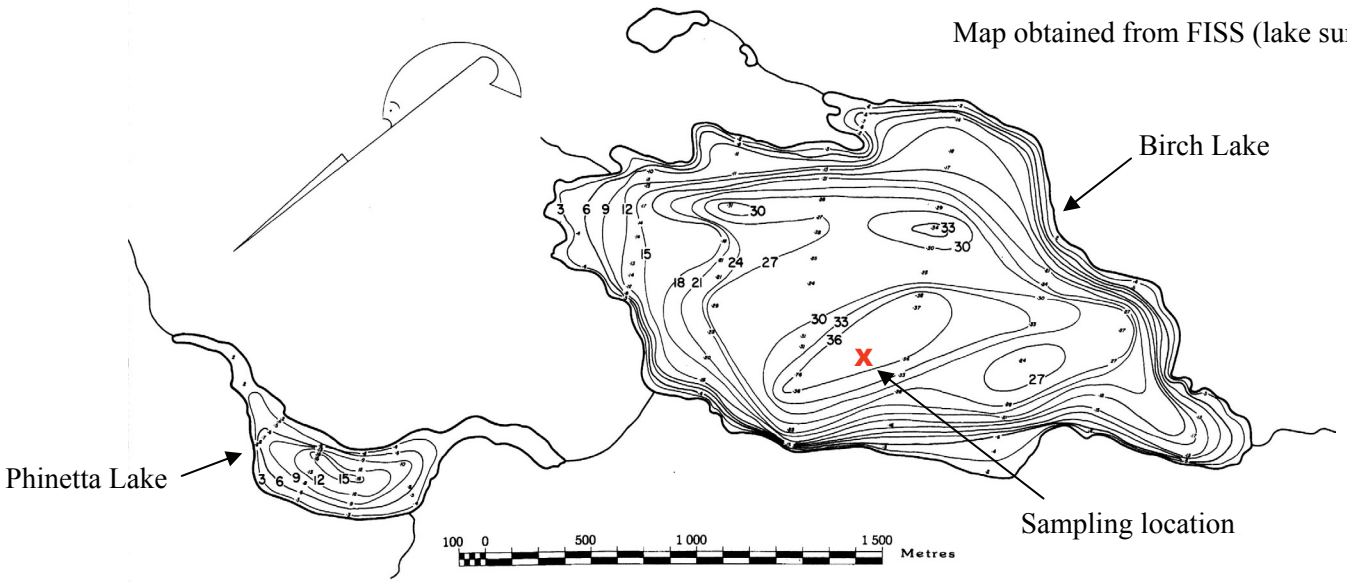
Based on average summer Secchi data, Birch Lake was exhibiting oligotrophic conditions in all sampling years. The data collected on Birch Lake from 2008 to 2010 indicate that the water quality has remained very stable, therefore further monitoring is not necessary at this time. However, if volunteers are willing to continue monitoring at a Level 1 (min. 12 evenly spaced readings from ice-off through September), the data could help identify early warning signs should there be a deterioration in water quality.

In 2004, the Lemieux Creek Water Availability Study was prepared for Land and Water British Columbia Inc. and discusses the water availability of Lemieux Creek, a stream located in the major watershed that drains the Birch Lake area (Sidney 2011, Pers. Comm.). For more information on this report, please visit http://www.env.gov.bc.ca/wsd/water_rights/wap/si/2004_Lemieux.pdf.

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. 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.

Birch Lake Bathymetric Map

Map obtained from FISS (lake surveyed 1959)



Tips to Keep Birch 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 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

Ministry of Environment

1259 Dalhousie Drive
Kamloops, BC V2E 1Y6

Phone: (250) 371-6200
Fax: (250) 828-4000

The BC Lake Stewardship Society

203 - 1889 Springfield Rd.
Kelowna, BC V1Y 5V5

Phone: (250) 717-1212
Toll free: 1-877-BC-LAKES
Email: info@bclss.org
Fax: (250) 717-1226
Website: www.bclss.org

Friends of Lac des Roches and Birch Lake

www.lacdesroches.org

Acknowledgements

Volunteer Monitoring by:

Heidi Ruegg (Friends of Lac des Roches and Birch Lake)

Data Compiling by:

Skye Dunbar (BCLSS)

Brochure Produced by:

Skye Dunbar (BCLSS)

Report Reviewed by:

Marge Sidney, Ministry of Environment

Photo Credit:

Heidi Ruegg

Bathymetric Map:

Fisheries Information Summary System (FISS)

References

FISS. 2011. Fisheries Inventory Summary System [online database]. Accessed April 29, 2010. http://www.env.gov.bc.ca/fish/fiss/index.html

Nordin, R.N. 1985. Water Quality Criteria for Nutrients and Algae. Water Quality Unit, Resource Quality Section. Ministry of Environment, Lands and Parks. Victoria, B.C.

Roy, C. 2011. Personal communication - Birch and Phinetta Lake general information. Friends of Lac des Roches and Birch Lake. May 17, 2011.

Ruegg, H. 2011. Personal communication - Birch Lake general information. Friends of Lac des Roches and Birch Lake. July 28, 2011.

Sidney, M. 2011. Email communication - general lake information. Water Quality/Quantity Specialist, Ministry of Environment, Kamloops. June 15, 2011.