
Florence Lake (1980-2009)

Water Quality Monitoring Program

(September 2011)

The Importance of Florence Lake and its Watershed

British Columbians want lakes to provide good water quality, aesthetics and recreational opportunity. When we do not see these features in our lakes, we want to know why. Through regular monitoring programs the Ministry of Environment (MoE) can come to understand a lake's current water quality, identify the designated uses for a given lake, and monitor changes resulting from land development within the lake's watershed. The MoE can work in partnership with local government, land owners, and the BC Lake Stewardship Society (BCLSS) to develop lake specific monitoring programs and provide educational materials on general lake protection issues. This useful information can help communities play a more active role in the protection of the lake resources.

Monitoring data for Florence Lake has been collected since 1980. This status report provides the results from all data collected up to 2009 and outlines long term and seasonal changes in the physical, chemical and biological makeup of the lake. The main focus of this study is to determine the overall health of the lake, its suitability as fish habitat and to identify potential threats that may compromise the integrity of the lake and its watershed. Recommendations for future monitoring are also provided.

Watersheds are a crucial component in the hydrological cycle and, when intact, support proper maintenance of ecosystem functions. Water is continuously cleansed and recycled as it moves through watersheds and other hydrological compartments. The quality of the water resource is largely determined by a watershed's capacity to buffer impacts and absorb pollution.

According to the Freshwater Atlas (GeoBC, 2011), Florence Lake's watershed (defined as the entire area of land that moves the water it receives to a common water body) drains an area of 1.48 km² (Figure 1).

Florence Lake lies within the Coastal Douglas-fir biogeoclimatic zone and is located on Vancouver Island, in the southeast region of the City of Langford, at an altitude of 81 m. The lake's surface area is approximately 8.4 hectares, its perimeter 1500 m (FIDQ, 2011a), and it is relatively shallow with a mean and maximum depth of 1.92 m, and 4.27 m, respectively (FIDQ, 2011b).

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 water body. Poor land-use practices anywhere in a watershed can eventually impact the water quality of the downstream environment.

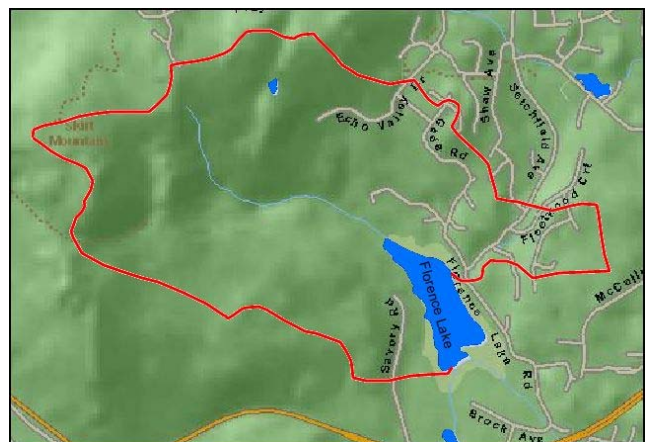


Figure 1: Florence Lake with its watershed outlined in red (iMapBC, 2011).

Florence Lake is largely surrounded by rocky hills to the east, west and north of the drainage basin. Of these, Skirt Mountain has the highest peak at 316 meters. The mountains to the west of the lake, including the southern Vancouver Island range and the Olympic Mountains, provide the lake a rain shadow, which effectively reduces precipitation at the site, resulting in relatively dry summers (McCullough, 1980). Figure 2 shows a bathymetric map of Florence Lake, including the boat launch, water monitoring location, inflow and outflow points, and a small seasonal water body located just south of the permanent lake. The Florence Lake watershed is a tributary to Millstream Creek which drains into Price Bay.

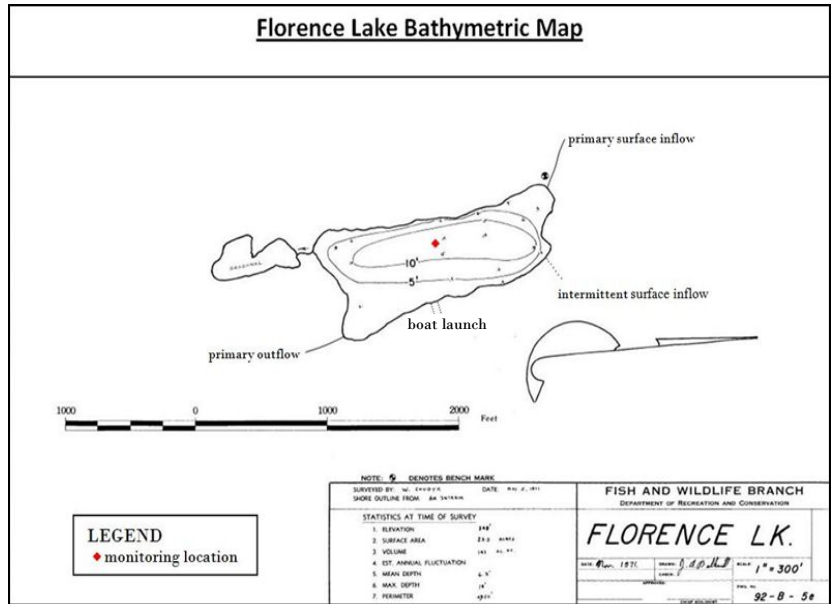


Figure 2: Florence Lake bathymetric map (FIDQ, 2011), modified by Scott Skagford June 20, 2011.

Historically, cutthroat trout, rainbow trout, sunfish, prickly sculpin and smallmouth bass have been observed in Florence Lake. From 1977 to 1985, the lake was stocked exclusively with cutthroat trout, and from 1986 to 1997 it was stocked with both cutthroat and rainbow trout. All stocking up to this point released yearling, diploid trout (fertile fish each having two complete sets of chromosomes). However, with concerns regarding water quality during the summer and its affect on trout growth mechanisms, the lake was solely stocked with catchable-sized, triploid rainbow trout (infertile fish, each having three sets of chromosomes) (FIDQ, 2011c), in an effort to create an instant fishery. The stocking program ended in 2007 due to inadequate public access, which essentially resulted in a private fishery for local residents, water quality issues that contributed to constantly waning fish populations, more opportune lakes on Vancouver Island to receive stocking efforts, and a general lack of interest from the angling community to fish Florence Lake (Silvestri, pers. comm., 2011). Florence Lake is also habitat to freshwater jellyfish. There are 20 known species of freshwater jellyfish; however, only *Craspedacusta sowerbii* has been observed in North America (Smith & Alexander, 2008). These creatures remain relatively enigmatic and have only been observed in eight other freshwater lakes in BC.

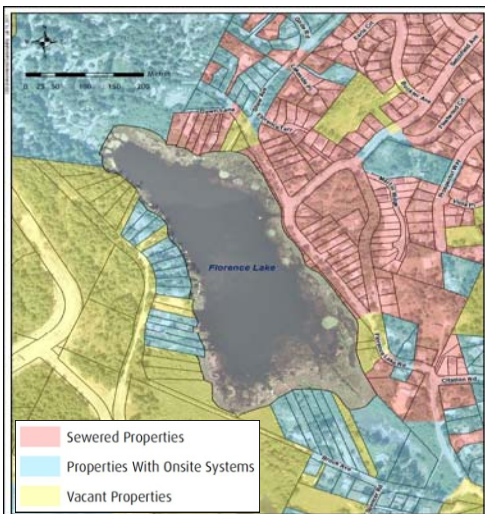


Figure 3. Septic (blue), sewage (red), and vacant (yellow) properties surrounding Florence Lake (CRD, 2011).

Urban residential development borders approximately 75% of the lake perimeter with the remainder privately owned but undeveloped thus far (Figure 3). Most of the properties on the east side of Florence Lake are connected to the municipal sewer system; however, there are many residences within the watershed that utilize septic tanks. The majority of onsite systems are located on the west and north of the lake in a steep and rocky area conducive to surface runoff directly into the lake (McCullough, 1980). Approximately 100 mobile homes, located to the north of the lake, rely entirely upon a septic system which is regularly pumped to remove effluents. While there are no current cases citing failing septic tanks around the lake (Mills, pers. comm., 2011), some of these systems are older and may not be functioning properly. Langford Bylaw 1066 stipulates that all homes within the watershed are to be connected to municipal sewage. Corix Utilities Division has connected 177 residences within the Florence Lake watershed to the municipal sewage system from February, 2007

to June, 2011. While there are still remaining properties that are not hooked up to the sewage system, the City of Langford is satisfied with the number of homes that have been connected to date (Manson, pers. comm., 2011). Future plans to connect homes off of Savory Road and Brock Avenue (southwest of the lake) to the municipal sewage system are contingent on the completion of the Spencer Highway Interchange which is to be constructed on the southwest side of the lake (Parkinson, pers. comm., 2011).

Challenges to water quality management on Florence Lake include phosphorous loading from non-point sources, shallow depths, warm temperatures and low oxygen levels, primarily during the summer months. Excess phosphorous can cause spring and summer algal blooms as well as the spread of aquatic vegetation. When the vegetation and blooms die off and settle to the bottom, this can lead to oxygen depletion in the lake which can affect aquatic life, such as fish. Nutrient loading is compounded by the lake's shallow depth, which provides favourable temperatures and photic opportunities for algae growth throughout the water column. Furthermore, as oxygen levels decrease near the bottom, internal nutrient loading occurs, whereby phosphorous is released from the sediment and enters the water column, exacerbating an already nutrient rich environment. With the lack of flushing of the lake in the fall and winter months, these nutrients are not removed and the process begins all over again.

Another foreseeable challenge to the health of the lake and its watershed depends upon possible future developments on Skirt Mountain. Currently, Skirt Mountain is the site of the Bear Mountain Resort, golf course and community. To date, development has been focused on the east and north facing slopes, which lie outside of the lakes drainage basin (Figure 4). However, developers own portions of the south and west facing slopes that are inside the watershed (Blackwood, pers. comm., 2011). Although developers are managing runoff to limit their effect on the watershed, expansion into this area could still impact the watershed and lake. Similarly, construction of the Spencer Interchange, located just southwest of the watershed (Figure 4), could also affect lake quality as prevailing winds flow across the lake from south to north and could deposit sediments and other pollutants from the construction site, and eventual roadway, into the watershed or directly into the lake itself.

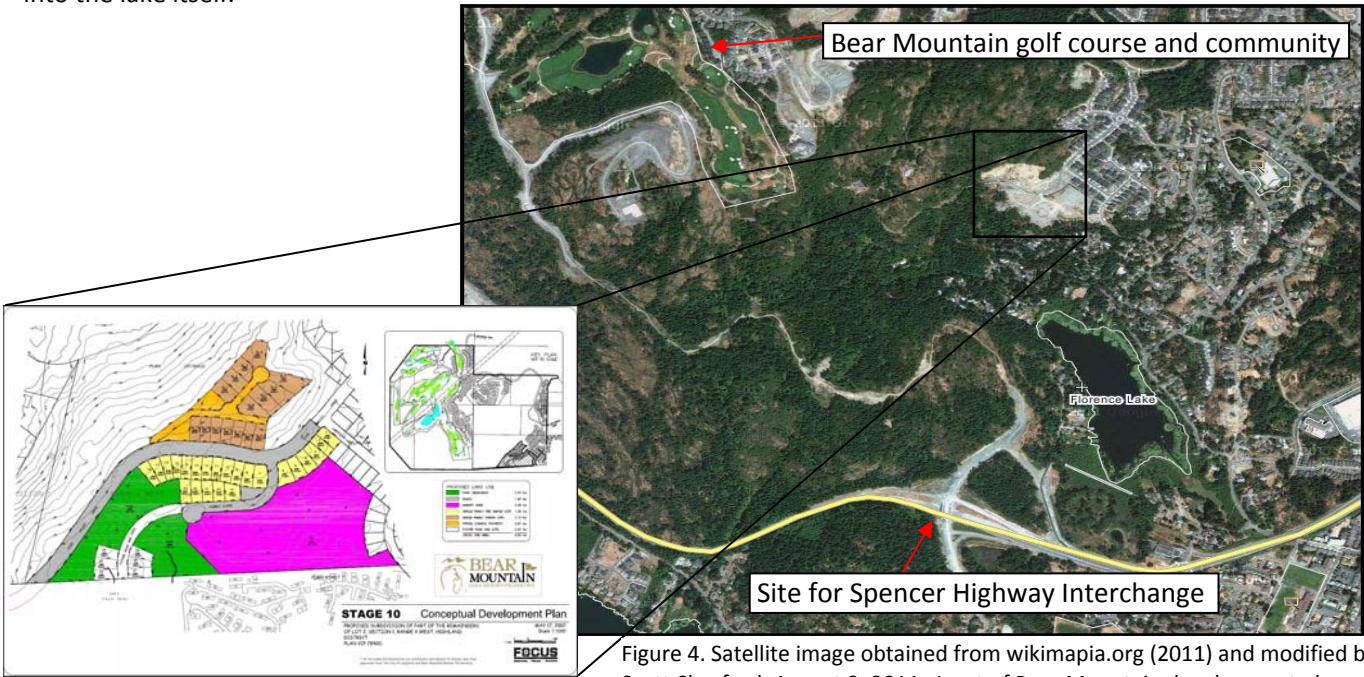


Figure 4. Satellite image obtained from wikimapia.org (2011) and modified by Scott Skagford, August 2, 2011. Inset of Bear Mountain development plans obtained from the City of Langford, 2011.

Non-Point Source Pollution and Florence Lake

Point source pollution originates from municipal or industrial effluent outfalls. Other pollution sources exist over broader areas and may be hard to isolate as distinct effluents. These are referred to as non-point sources (NPS) of pollution (Figure 5). Shoreline modification, urban stormwater runoff, onsite septic systems, agriculture and forestry are common contributors to NPS pollution. One of the most detrimental effects of NPS pollution is phosphorous loading to water bodies. The amount of total phosphorous (TP) in a lake can be greatly influenced by human activities. If local soils and vegetation do not retain this phosphorous, it will enter water courses where it will become available for algal production. Watersheds have the ability to buffer against pollution in time but the ability is impeded with landscape modification and/or significant increases in pollution.



Photo 1: Picture of Florence Lake with Skirt Mountain in background. (2011).

Land Use

Lakeshore property owner's rights and increasing land values can promote high land use expectations at the expense of lake-shore riparian areas. Residential development generally includes clear-cutting and other vegetation removal for placement of structures. This can be limited to just the building site requirements or can include removal of riparian vegetation, land clearing for lawns or agricultural activities, shoreline protection structures, and docks. All of these land disturbance activities can alter water flow, and potentially increase sediment and phosphorous inputs to water bodies.

Agriculture

Agriculture, including livestock, the production of grains, and mixed farming can alter water flow and increase sediment, chemical, bacterial, and parasitic input into water bodies. Agricultural runoff is a potential source of freshwater eutrophication – a process where organic and inorganic compounds such as nitrogen and phosphorous, not normally present in such abundance, are introduced to a lake. The usual result of eutrophication is an overabundance of algae growth on the lake surface.

Onsite Septic Systems and Greywater

As long as onsite septic systems are properly located, designed, installed and maintained, they can effectively treat human wastewater and wash water (grey water). Failure of onsite septic systems can cause significant nutrient and pathogenic waste to enter the water body and can be dangerous to human and animal health.

Storm Water Runoff

Lawn and garden fertilizer, sediment eroded from modified shorelines or infill projects, lawn chemicals, oil and fuel leaks from vehicles and boats, road salt, and litter can all be washed by rain and snowmelt from properties and streets into water courses. Phosphorous and sediment are of greatest concern, providing nutrients, and/or rooting medium for aquatic plants and algae. Paved structures prevent infiltration of water to soils, collect hydrocarbon contaminants during dry weather, and increase direct runoff of these contaminants to lakes during heavy rain events. Severe stormwater runoff can cause soils to erode and can result in property loss. As a common resource, it is the responsibility of everyone to ensure that the freshwater resources remain clean. The control of runoff pollution, at the source, is vital to the protection of this precious resource.



Figure 5. Non-point sources of pollution in a watershed.

What's Going on Inside Florence Lake?

Temperature

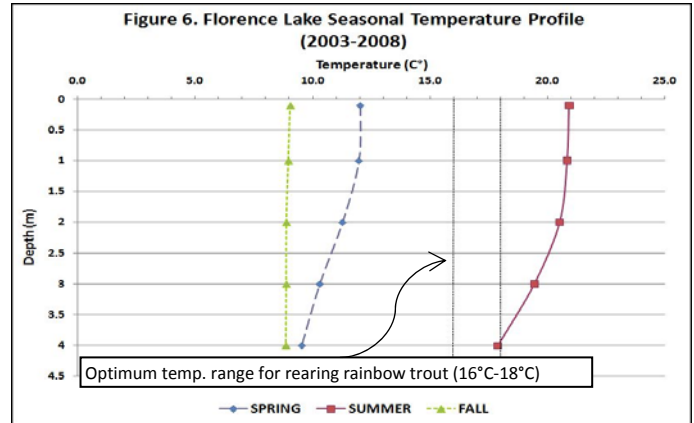
Temperature can affect the solubility of many chemicals and can therefore influence the effect of pollutants on aquatic life. If lake temperature drops more than 1°C over an increase in depth of 1 m, a thermocline develops, effectively layering (stratifying) the water body and preventing overturning (mixing from top to bottom). Colder water is denser and heavier and lies on the bottom overlain by subsequent warmer, less dense layers. Temperature stratification patterns are important to lake water quality because they determine much of the seasonal oxygen, phosphorous, and algal conditions. Most Vancouver Island lakes stratify in the summer and, like coastal lakes, are typically monomictic, overturning once during late winter or spring as wind energy overcomes the differences in temperature and density between layers within the water column. Without adequate wind agitation, shallow lakes may exhibit heightened temperatures, which in turn, elevate the metabolic oxygen demand of aquatic organisms while reducing the solubility of oxygen in the water.

Table 1 shows the optimum temperature ranges for both rainbow and cutthroat trout during various life history stages. Understanding the temperature trends of water bodies can help identify suitable habitat and forecast species distribution. Furthermore, long-term monitoring of lake temperatures can help to determine the potential effects of climate change and how it might affect water quality over time.

Species	Incubation	Rearing	Spawning
cutthroat	9.0-12.0	7.0-16.0	9.0-12.0
rainbow	10.0-12.0	16.0-18.0	10.0-15.5

Florence Lake temperature data were collected at the deep mid-lake station (Figure 1) 15 times from 2003 to 2009. A seasonal depth profile for temperature was created by summarizing data into seasonal classes (Figure 6). The seasons are classified to represent temperature trends for Vancouver Island and have been divided into spring (Feb 21–June 20), summer (June 21 – Sept 20), and fall (Sept 21 –Dec 19). No data were collected during the winter season

(Dec 20–Feb 20). A maximum temperature measurement of 22.33°C was recorded on July 22, 2008 and a minimum value of 5.40°C was recorded on March 16, 2003.

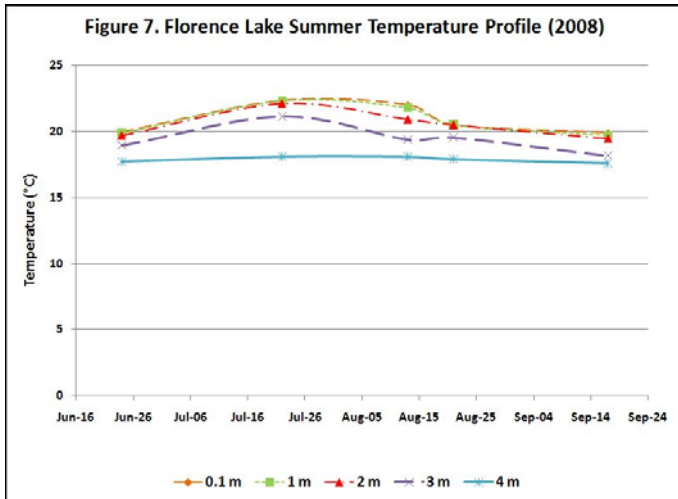


Nearly all seasonal temperature averages, from surface to bottom waters, are outside the optimum temperature range for rearing rainbow trout, making Florence Lake poor habitat for natural recruitment. Although fall and spring temperatures are tolerable for most fish species, during the summer, water temperature becomes elevated and may negatively impact fish survival rates. The elevated temperatures also reduce the availability of oxygen, making fish species even more vulnerable in the summer.

The absorption of solar radiation and its conversion into heat have profound effects on the thermal structure, stratification and circulation pattern of lakes (Wetzel, 2001). Based on the seasonal temperature profile, Florence Lake tends to be isothermic (its temperature is relatively uniform from top to bottom) in the fall, with average surface and bottom temperatures of 9.1 °C and 8.9 °C, respectively. The lake began to stratify during the spring with an average temperature of 11.3 °C at 4 m; 1 degree colder than the average temperature at 3 m. In the summer, the lake tends to form a weak thermocline, with average temperatures of 20.5, 19.4 and 17.9 °C at 2, 3 and 4 m deep, respectively, during the sample period.

Temperature data, recorded by depth during the summer of 2008 (Figure 7 (n=25)), showed that summer temperatures in Florence Lake are high throughout the

water column, and ranged from 22.33 °C, on July 22nd at 0.1 m, to 17.59 °C on September 17th at 4 m. Surface and bottom water temperatures had the greatest separation on July 22nd, with surface temperature measuring 22.33 °C and bottom temperature measuring 18.11 °C.



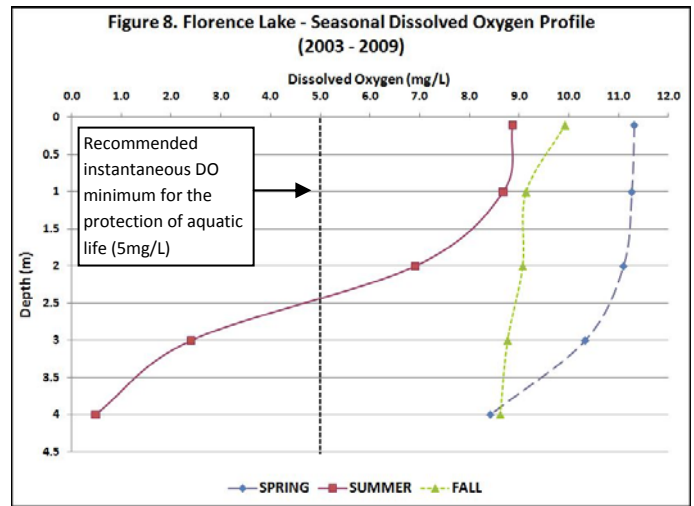
Dissolved Oxygen

The availability of oxygen in water is critical to the maintenance of aquatic life. Oxygen enters the water as dissolved oxygen (DO) from many sources including air, wind action, and through plant photosynthesis. Oxygen is consumed by the respiration of plants and animals and through the decomposition of dead organic material by bacteria (Carter & Roumiew, 2008).

Lakes that are low in productivity (oligotrophic) typically have sufficient levels of oxygen to support life at all depths. As lakes become more productive (eutrophic) and more organisms consume oxygen, its availability becomes increasingly limited and sufficient quantities to accommodate new life may only be found at certain depths. Fish, for example, can become stressed when oxygen levels fall below 5 mg/L, the instantaneous minimum level recommended for the protection of aquatic life (MoE, 2001). However, sufficient amounts of oxygen may not be at depths that correspond with the optimum temperature ranges that support certain species.

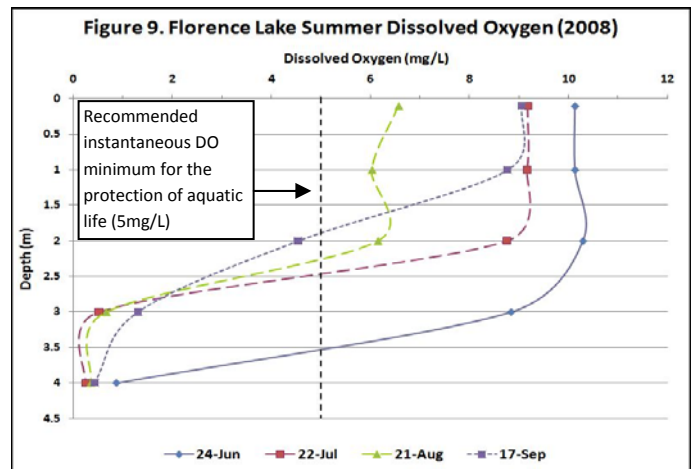
From 2003 to 2009, dissolved oxygen data for Florence Lake was collected 15 times at the deep station. Figure 8 shows the seasonal averages for dissolved oxygen by depth. Dissolved oxygen ranged from a maximum of 14.6

mg/L in March, 2005 to a minimum of 0.25 mg/L in July, 2008 at depths of 0.1 and 4 m, respectively.



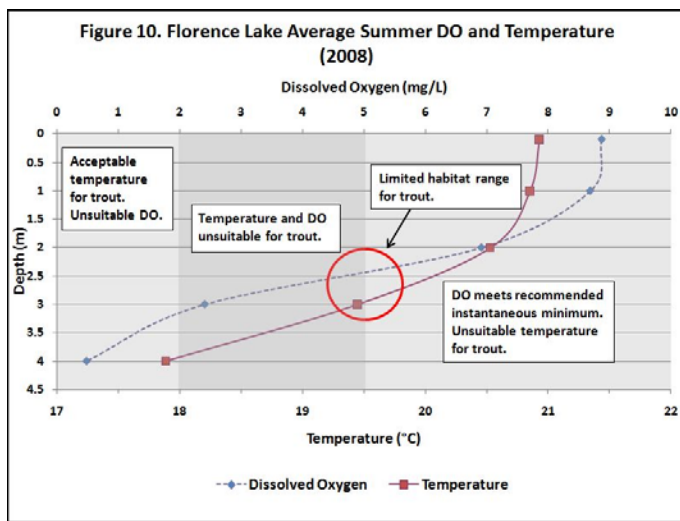
Dissolved oxygen levels in Florence Lake tend to stratify during the summer months and, during this time, the instantaneous DO minimum for the protection of aquatic life was not met at depths greater than 2.5 m.

During the summer of 2008, data for DO was collected four times, once in each month, from June to September (Figure 9).



A maximum oxygen level of 10.29 mg/L was observed at a depth of 2 meters on June 24th and a minimum oxygen level of 0.25 mg/L was measured at a depth of 4 meters on July 22nd. The average DO concentration for surface depths (the epilimnion, 0-1 m) was 8.15 mg/L (n=15), and for bottom depths (the hypolimnion, ≥ 3 m), the average DO concentration was just 1.44 mg/L (n=10). The insufficient amount of DO in deeper waters during the summer can restrict productivity in the hypolimnion and confine habitat suitability to depths no deeper than 2.5 m.

However, because shallower water can be exposed to greater amounts of solar radiation, the temperature of such depths may not be fitting for certain organisms or particular life stages of many species. For example, during the summer of 2008 Florence Lake did not exhibit adequate DO concentrations at depths that correspond to the optimum temperatures for rearing rainbow trout (Figure 10). These fish would be physically stressed with a limited habitat range in the lake, represented by the red circle in Figure 10. The capacity for water to carry DO is inversely related to temperature, and so, the shallow nature of Florence Lake is a challenge to many aquatic species both in terms of elevated temperatures and limited DO.



Trophic Status and Phosphorus

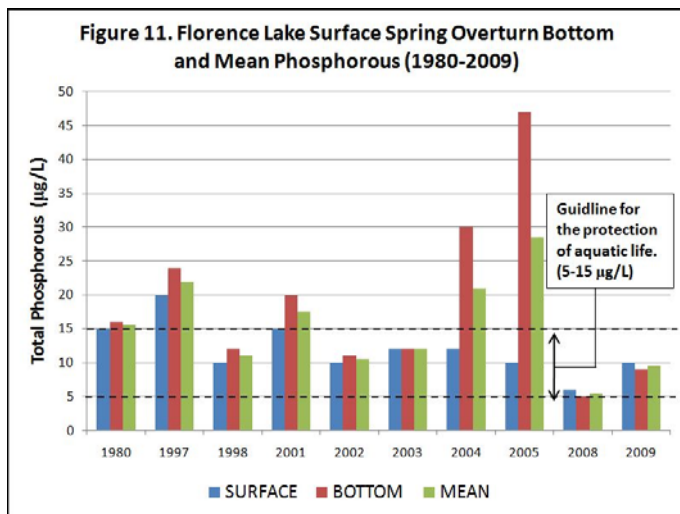
The term trophic status is used to describe a lake's level of productivity and depends upon the amount of nutrients available for plant growth, including tiny floating algae called phytoplankton. Algae are important to the overall ecology of the lake because they are food for zooplankton, which in turn are food for other organisms, including fish. In many lakes phosphorus is the nutrient in shortest supply, acting as the nutrient limiting aquatic life production. When in excess, phosphorus accelerates growth and can artificially advance a lake towards a higher trophic status. As mentioned on Page 4, TP in a lake can be greatly influenced by human activities.

The trophic status of a lake can be determined by measuring productivity. Productivity is determined by measuring nutrient levels and chlorophyll (the green

photosynthetic pigment in plants). The more productive a lake is the higher the algal growth and the less clear the water. Phosphorus concentrations measured during spring overturn are often used to assess current productivity and predict summer algal productivity. Lakes of low productivity, referred to as oligotrophic, are typically clear water lakes with low nutrient levels (1-10 µg/L TP), sparse plant life (0-2 µg/L chl. *a*), and low fish production. Lakes of high productivity are called eutrophic. They have abundant plant life (> 7 µg/L chl. *a*), including algae, due to higher nutrient levels (> 30 µg/L TP). Lakes with an intermediate productivity are called mesotrophic (10-30 µg/L TP and 2-7 µg/L chl. *a*) (Nordin, 1985). Mesotrophic lakes tend to encompass some characteristics of oligotrophic and eutrophic lakes.

Lake sediments can themselves be a major source of phosphorus. If deep-water oxygen becomes depleted, a chemical shift occurs in bottom sediments. This shift causes sediment to release phosphorus to overlying waters. The release of TP from sediments can cause algal blooms and lead to further oxygen depletion when algae die. This internal loading of phosphorus can be natural but is often the result of phosphorus pollution. Lakes displaying internal loading usually have elevated algal levels and typically lack recreational appeal. The phosphorus guideline recommended for the protection of aquatic life is 5-15 µg/L TP and for recreational utility, phosphorus should not exceed 10 µg/L (MoE, 2001).

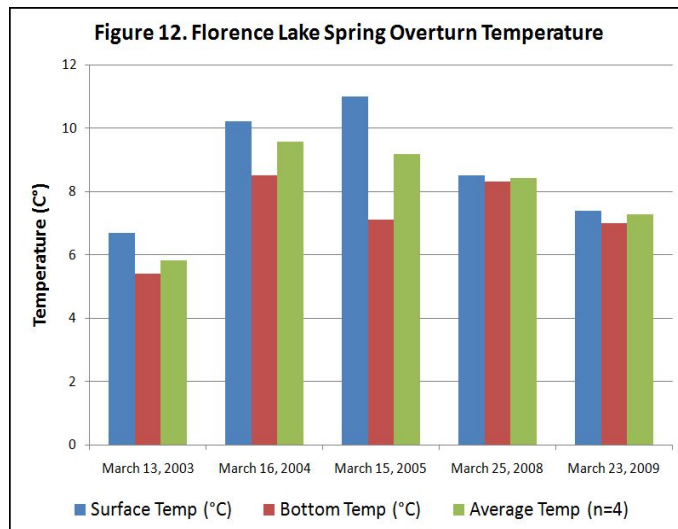
Total phosphorus data were collected at Florence Lake from 1980-2009. Figure 11 shows surface and bottom phosphorus concentrations during the spring overturn months of February and March. Surface and bottom phosphorus readings were also averaged to display an overall lake mean value for TP. At spring overturn, the water column is isothermal, providing a good representation of the supply of phosphorus to the lake over the following summer growing period (Nordin, 1985). Generally, biomass (as chlorophyll *a*) at this time is low (less than 0.5 µg/L) as biological activity has not begun.



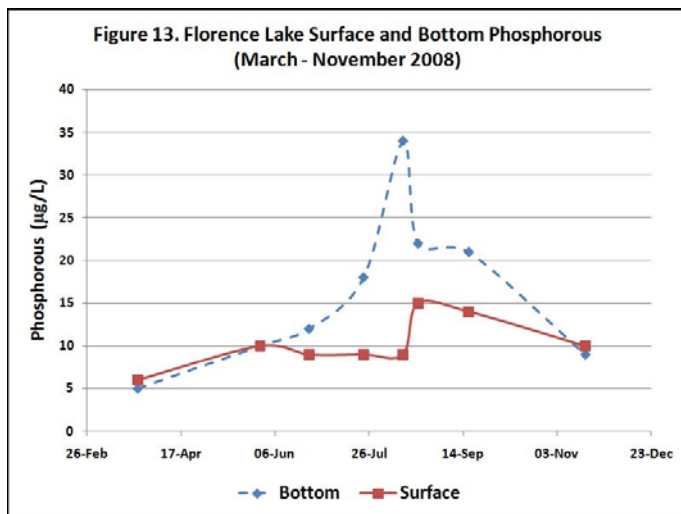
In Florence Lake, total phosphorous concentrations vary from year to year with mean spring overturn levels ranging from 5.5 µg/L in 2008 to a maximum of 28.5 µg/L in 2005. Based only on spring overturn TP data, Florence Lake nutrient levels have varied in recent years, exhibiting moderate to high levels of phosphorous.

Comparing phosphorous levels during spring overturn with corresponding water temperatures (Figure 12) shows that temperature likely has an effect on the amount and distribution of phosphorous in Florence Lake. When colder water settles towards the bottom, it takes phosphorous with it, concentrating TP in the hypolimnion. In Florence Lake, stratification had already begun during March in 2004 and 2005 which prevented mixing between the epilimnion and hypolimnion while surface temperatures supported biological uptake of surface TP. When algae died off and sank to the bottom, they contributed to an environment already rich in phosphorous. Consequently, there is greater separation between surface and bottom TP values in 2004 and 2005. Conversely, the lake was still isothermic and overturning in March of 2008 and 2009, resulting in similar surface and bottom TP readings, and with decreasing surface temperatures (2005: 11 °C, 2008: 8.5 °C, 2009: 7.4 °C), biological activity was relatively limited. The relatively large drop in TP from 2005 to 2008 may also be attributed to the number of homes that were connected to sewage in 2007. In total, 32 residencies were connected to sewage, and of these, nine are considered lakeside properties, located less than 100 m from the water. As well, at least six other properties connected in 2007 are no more than 250 m from the shoreline. Wastewater can contain large

amounts of nutrients such as nitrogen and phosphorous, and as such, the removal of potentially compromised or failing septic systems from the Florence Lake watershed would decrease the amount of external nutrient loading to the lake.



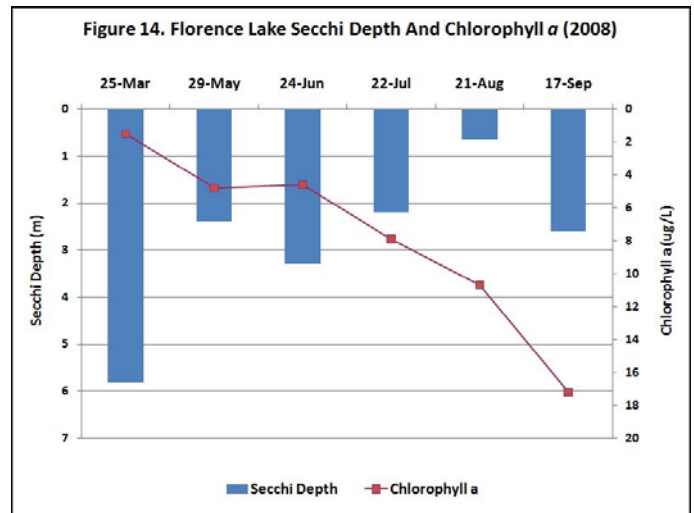
Seasonal fluxes of phosphorous levels in Florence Lake are shown in Figure 13, which charts the changes in surface and bottom phosphorous concentrations from spring to early fall of 2008. Surface and bottom phosphorous levels remained similar from late March to mid-June and indicate that the lake was relatively isothermal, while in June, bottom TP levels began to increase due to temperature stratification and algal die off. TP levels in the hypolimnion continue to increase throughout most of the summer as low oxygen levels chemically activate the release of phosphorous from the lake substrate. While bottom TP levels rose steadily, surface values concurrently dropped for approximately two months, primarily due to biological uptake. Bottom concentrations reached a maximum value of 34 µg/L, on August 13th, 2008, when surface values were relatively low at 9 µg/L. In mid August, TP trends briefly reverse as surface values rose sharply; a simultaneous and equally sharp decrease was seen in levels of bottom TP. This is likely due to wind storm events that can occur in the summer, a fairly common occurrence in shallow lakes. From late summer to fall, both bottom TP, and to a lesser extent, surface TP levels decreased until similar levels were found in the hypolimnion and epilimnion of Florence Lake, indicating that thorough water column mixing had occurred.



Summer plant life samples, as measured by chlorophyll *a*, were collected in 2008 from March to December in the epilimnion. Chlorophyll *a* concentrations are displayed with Secchi depth readings in Figure 14. Secchi depth is an indicator of water clarity and is measured by submerging a 20 cm diameter black and white disc into the lake and recording the depth at which the disc is no longer visible.

In 2008, chlorophyll *a* concentrations were relatively low in spring to early summer with March, May and June readings of 1.5, 4.8 and 4.6 µg/L, respectively. However, by July 22nd, concentrations had increased significantly to 7.9 µg/L and this trend continued into late summer with high readings on August 21st (10.7 µg/L) and September 17th (17.2 µg/L). This increase in chlorophyll *a* was caused by warming temperatures that not only supported algae

growth directly but led to a decrease in DO (as more organisms grew, more oxygen was consumed and higher temperatures increase an organism's metabolic rate). In turn, anoxic conditions in the benthic environment triggered the remobilization of phosphorous into the water column, which further supported algae. Generally, Secchi depth displays a negative correlation to concentrations of chlorophyll *a* because algal blooms reduce water clarity. In March, May and June, when chlorophyll *a* concentrations were relatively low, Secchi depth averaged 3.83 meters.



When concentrations were relatively high in July, August and September, Secchi depth averaged 1.82 meters. Using 2008 chlorophyll *a* data as a basis for plant abundance and trophic status, Florence Lake becomes eutrophic in late spring to early July.

Recommendations for Water Quality Management at Florence Lake

Florence Lake weakly stratifies during the summertime due to its shallow nature, which demands less wind energy to disrupt the layers (i.e., lake water temperatures can become uniform during the summer) (McCullough, 1980). Within the hypolimnion, DO levels during the summer are depleted below the recommended instantaneous minimum of 5 mg/L. Conversely, at this same time, while DO levels in the epilimnion are sufficient for the protection of aquatic life, the water temperatures are elevated (above 18°C). Due to this, Florence Lake is not considered suitable habitat for cold water fish species for natural recruitment, nor as a site for stocking programs.

Lake monitoring results suggest that Florence Lake generally has moderate water quality conditions, with water quality greatly compromised during the summer due to algal blooms. It is a eutrophic lake; however, due to its relatively small size and shallow depth, there is the potential for Florence Lake to become hyper eutrophic if nutrient inputs to the lake are not monitored and properly managed. Hyper eutrophic episodes would alter the lakes consistency and change its color to

green, widespread throughout the lake; degrading its aesthetic appeal, reducing its recreational utility and potentially lowering property values surrounding the water body. Therefore, all residences within the watershed should be connected to the municipal sewage system in a timely fashion to reduce the potential for external nutrient loading. Water quality monitoring at Florence Lake should resume and include a nutrient budget to assess if the lake is trending towards hyper eutrophication.

Bacteriological data has not been collected in Florence Lake. Considering the number of homes within the watershed that still utilize onsite septic systems, it is recommended that monitoring be implemented to assess fecal coliform content of the lake and ensure that values do not exceed the BC Water Quality Guidelines for primary contact recreation. This data would also support the need to ensure all homes in the area are connected to the sewer system.

Construction projects within a watershed can increase the amount of pollution and sediment discharge into a lake. Current construction plans for the Spencer Interchange, to be located to the southwest of the lake, and residential development to the north on Skirt Mountain could both impact the health of the lake. Water quality monitoring at Florence Lake should include monitoring of turbidity, which would help determine how these projects may impact the water body and the effectiveness of the management of runoff from development. As well, BC Lake Stewardship Society lake monitoring could be conducted and Florence Lake is a potential site to study the freshwater jellyfish, *Craspedacusta sowerbii*.

All lakeside residents and those living in or developing in the watershed are advised to practice good land management such that pollution, nutrient or sediment input into Florence Lake or its tributary is minimized.

-----Tips to Keeping Florence Lake Healthy-----

Yard Maintenance, Landscaping & Gardening

- Minimize the disturbance of shoreline areas by maintaining natural vegetation cover
- Minimize high-maintenance grassed areas
- Replant lake-side 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 apply fertilizers or pesticides before or during rain due to the likelihood of runoff
- Compost yard and food waste and use it to boost your garden's health as an alternative to chemical fertilizers
- 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

Agriculture

- Locate confined animal facilities away from water bodies and divert incoming water and treat outgoing effluent from these facilities
- Limit the use of fertilizers and pesticides
- Construct adequate manure storage facilities
- Do not spread manure during wet weather, on frozen ground, in low-lying areas prone to flooding, within 3 m of ditches, 5 m of streams, 30 m of wells, or on land where runoff is likely to occur
- Install barrier fencing to prevent livestock from grazing on stream banks and lake-shores
- If livestock cross streams, provide gravelled or hardened access points
- Provide alternate watering systems, such as troughs, dugouts, or nose pumps for livestock
- Maintain or create a buffer zone of vegetation along a stream bank, river or lake-shore and avoid planting crops right up to the edge of a water body

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
- Conserve water: run the washing machine and dishwasher only when full and use only low-flow showerheads, faucets, and toilets.
- Do not put toxic chemicals (paints, varnishes, thinners, waste oils, photographic solutions, or pesticides) down the drain. They can kill the bacteria at work in your on-site sewage system and can contaminate water bodies

Auto Maintenance

- Use a drop cloth if you fix problems yourself
- Recycle used motor oil, antifreeze, and batteries
- Use phosphate-free biodegradable products to clean your car and wash your car over gravel or grassy areas, but not over sewage systems

Boating

- Do not throw trash overboard or use lakes or other water bodies as toilet
- Use biodegradable, phosphate-free cleaners instead of harmful chemicals
- Use absorbent bilge pads to soak up minor leaks or spills
- Check for and remove all aquatic plant fragments from boats and trailers before entering or leaving a lake. Eurasian milfoil is an aggressive invasive aquatic weed. Be sure to familiarize yourself with this plant and remove and discard any fragments
- 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 and label them with owner's name and phone number in case they wash away.

Who to Contact for More Information

Ministry of Environment

2080-A Labieux Road
Nanaimo, BC V9T 6J9
Phone: (250) 751-3100
Fax: (250) 751-3103

The BC Lake Stewardship Society

#4-552 West Ave.
Kelowna, BC V1Y 4Z4
Phone: 1-877-BC-LAKES or
(250) 717-1212
Fax: (250) 717-1226
Email: bclss@shaw.ca
Website: www.bclss.org

CRD Environmental Services

General Manager
625 Fisgard Street
Victoria, British Columbia
Canada V8W 1R7
Phone: (250) 360-3000

City of Langford, Parks and Recreation

Parks Manager
2nd Floor - 877 Goldstream Avenue
Langford, British Columbia
Canada, V9B 2X8
Phone: (250) 361-3162
Website: www.cityoflangford.ca

-----Acknowledgements-----

Data Compilation and Document Produced By:

Scott Skagford (BC Ministry of Environment, Nanaimo)

Technical Review By:

Rosie Barlak and Deb Epps

(BC Ministry of Environment, Nanaimo)

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