

# Shawnigan Lake Water Quality Study 2004

The Summary section of that report provides an overview of **Shawnigan Lake Water Quality** issues.

## Summary

Shawnigan Lake is the second largest lake on southern Vancouver Island. The lake provides a number of uses including drinking water, fisheries and recreation. Development within the watershed has increased steadily over the years and the population continues to grow as more people make Shawnigan Lake their permanent residence. Concern over the sustainability of the water resources of Shawnigan Lake at the local level prompted the Ministry of Water, Land and Air Protection (WLAP) in Nanaimo to make assessing the water quality a regional priority.

This study examined the physical, chemical and biological aspects of water quality in Shawnigan Lake from February 2003 to February 2004. Samples were collected from the lake basin, perimeter, inflows and the outflow. These results were compared to historical data collected by WLAP (formerly Environment, Lands and Parks) staff since the 1970's. Specific comparisons were made to the work of Nordin and McKean (1984), which proposed provisional water quality objectives for Shawnigan Lake, to determine if any trends in water quality were apparent.

Water temperature, stratification patterns and water clarity were consistent with previous reports. Dissolved oxygen concentrations were similar as well, however a greater period of oxygen supersaturation was noted in the two deep sites sampled.

Spring overturn phosphorus levels were below guideline levels (10 µg/L) as well as the proposed water quality objective (8 µg/L) over the period of record and showed a general decreasing trend since the mid-1980's. The spring overturn phosphorus concentration was very low in 2004 at 2 µg/L. There was no obvious reason for this decrease in phosphorus. Nitrogen and total organic carbon concentrations were also below guideline levels and showed no trend over the period of record. The nutrient results indicate that Shawnigan Lake continues to be oligotrophic, which is desirable from a recreational and drinking water supply water quality perspective.

The monitoring results of other water chemistry parameters showed that the water quality of Shawnigan Lake has been consistently good over the period of study, despite significant changes within the watershed. No parameters measured showed levels or trends which would cause concern for aquatic life and recreational water uses at this time. The surface microlayer was also sampled and again, the results indicated good water quality.

The results of the biological monitoring support this interpretation of the water chemistry data. 'Chlorophyll a' concentrations have decreased over time suggesting a reduction in the primary productivity of the lake. The phytoplankton and zooplankton

communities are typical of oligotrophic conditions; however, dominance by some blue-green algae species in the summer months of 2003 was noted. This appears to be the result of a decrease in nitrogen concentrations in the epilimnion rather than an increase in phosphorus concentrations.

The results for the microbiological indicators (*E. coli*, enterococci and fecal coliforms) showed values which exceeded drinking water guidelines at all sites sampled during the fall freshet period and on all inflows sampled during the summer low flow period. Only one lake site exceeded the drinking water guidelines during the summer low flow period. The recreational primary contact guidelines were met most of the time, but the enterococci guideline was exceeded at all the inflow sites during the summer low flow period. Overall, these results suggest a risk to drinking water quality and further monitoring should be considered.

Based on the results reported here, it is recommended that:

- Ministry of Water, Land and Air Protection (WLAP) staff should continue spring overturn sampling, including water chemistry at multiple depths and biological parameters (chlorophyll a, phytoplankton, zooplankton).
- WLAP staff should conduct additional bacteriological sampling in 2004 to confirm results noted in this study. Efforts should be concentrated to areas in the lake within 10 m from domestic intakes as well as McGee Creek and the Shawnigan Creek inflow. Samples should be collected a minimum of five times in a 30-day period.
- WLAP should review and formalize the water quality objectives for Shawnigan Lake proposed by Nordin and McKean (1984).
- Support should be provided to organized lake stewards to continue with basic water quality sampling through the BC Lake Stewardship Society. Other activities for lake stewards could include monitoring of aquatic macrophyte growth and distribution, and tracking sportfishing catches to monitor fish populations, especially bass and trout.
- The Cowichan Valley Regional District should ensure residential and commercial land development within the watershed take into account the potential impacts on the water quality of any such activities. Appropriate best management practices and planning techniques should be applied to protect Shawnigan Lake for domestic purposes and other current and future water uses.