

Shawnigan Lake Water Quality Study 1984

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

SUMMARY

This study was undertaken at the request of the Cowichan Valley Regional District (C.V.R.D.) in response to general concerns with deterioration in water quality and effects of increased housing in the watershed on water quality. The C.V.R.D. wanted to use the information to assist with decisions on future planning and zoning within the watershed.

The project required evaluation of two related ecosystems: the aquatic and terrestrial; and this report outlines the result of the investigations of the aquatic environment - the lake and inflow streams. A separate report supplies information on soils, and transfer of nutrients to the lake.

Data were collected from 1977 to 1979 for a variety of parameters of water chemistry and biology at two deep water stations (main basin and south basin), as well as several shallow water stations, and the inflow streams.

Generally it was noted from historical data that minor changes in zooplankton species composition have occurred over the past 40 years, and a significant change in phytoplankton (recorded in the lake sediment) did occur approximately 75 years ago, probably as a consequence of logging and initial settlement in the watershed. The logging and sawmilling activities may also have contributed to an abnormally high hypolimnetic oxygen depletion due to deposition of wood waste on the lake bottom.

Monitoring of inflow streams indicated that the amount of nutrients and other materials generated from different watersheds was apparently proportional to the amount and density of development. The runoff water from the Village area was very poor and significantly different from less disturbed watersheds such as Shawnigan Creek inflow.

One major goal was to document the level of nutrients, their major sources, and the physical processes affecting nutrient distribution. The results indicate that the present concentrations of nutrients and algal growth are relatively low and the general water quality is good in terms of recreation and water supply (there are a large number of private intakes on the lake in addition to the waterworks). The factors which contribute to this relatively good water quality are:

- (1) favourable lake water residence time (one year) which tends to "flush" a portion of nutrients from the lake.
- (2) a favourable hydrologic regime - common to many coastal lakes, such that the

nutrients from the watershed are supplied to the lake in the autumn in a period when no algal growth is stimulated and much of the nutrients are either lost through sedimentation or outflow.

(3) localized nutrient loading: the highest loadings (on a mass/area basis) from the Village area and these nutrients affect a limited area and, being close to the outlet, are partially removed from the lake system.

(4) low nutrient loading: the key nutrient controlling algal growth (phosphorus) is in very low, supply because the soils in the watershed have a very high affinity for phosphorus, and bind much of what originates from natural and man made sources. Monitoring of water quality since 1979 indicated that no significant change has occurred in the nutrient concentration of the open water areas since that time.

Another major goal was to investigate the level of contamination by coliform bacteria in the lake. A significant result was elevated fecal conform concentrations in shallow water areas. The levels of contamination were well within standards for body contact recreation but since there are numerous intakes licenced for domestic water supply the possibility of contaminated drinking water exists. Although surface water for domestic supply must be treated to destroy potential pathogens (by chlorination for instance) many supplies to single family dwellings may not have any treatment capability. No direct evidence as to the source of this contamination was found, but poorly located or poorly maintained older septic tank systems are a likely source. Because of the fluctuating lake levels and high winter water levels, some tile field systems may not provide adequate capability for filtering bacteria and removing nutrients. Other sources of nutrients and suspended sediments would also include road building and clearing and ditching for drainage.

The following provisional water quality objectives are proposed to protect water uses (bulk water supply, water based recreation and fisheries) and prevent eutrophication:

Phosphorus: total phosphorus concentration at spring overturn shall not exceed 8 ug/L. This objective applies to the average of at least three samples taken 1 m below the surface, at mid depth and 1 m above the bottom, at about mid-lake.

Turbidity: the turbidity shall not exceed 5 NTU in any grab sample taken within 10 m of a domestic Intake, nor shall the means from at least 10 such samples taken throughout the year exceed 1 NTU.

Fecal Colifora Bacteria: the fecal coliform density shall not exceed 10 MPN per 100 ML in 90 percent of lake water samples, taken in any consecutive 30-day period, within 10 m of a domestic intake.

Suspended Solids: In streams flowing into the lake, the suspended solids shall not exceed 25 mg/L in any grab sample.

The objective for total phosphorus was met in 1977-79 throughout the lake. The turbidity objectives were also met although some higher readings were recorded at depths below 15 m. The fecal conform objective was met in the main body of the lake with some higher values being recorded in the West Arm and northern section near the lake outlet. The objective for suspended solids was met in all streams, except for some occasional high values in the Village inflow.

For protection of water quality, the recommendations are:

- to implement controls to minimize the amount of land disturbance within the watershed due to more construction, road building and ditching which generate suspended sediments and phosphorus;
- to consider higher standards for new septic tank installations to reduce phosphorus and bacterial contamination of the lake; and
- to put in place regulations which would cause upgrading of older, inefficient septic tank tile-field systems.