Water Quality

Ambient Water Quality Objectives For The Thompson River

Overview Report

Water Management Branch
Environment And Resource Division
Ministry Of Environment, Lands And Parks

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Original Signed By J. O'riordan
Assistant Deputy Minister
Environment And Lands Hq Division
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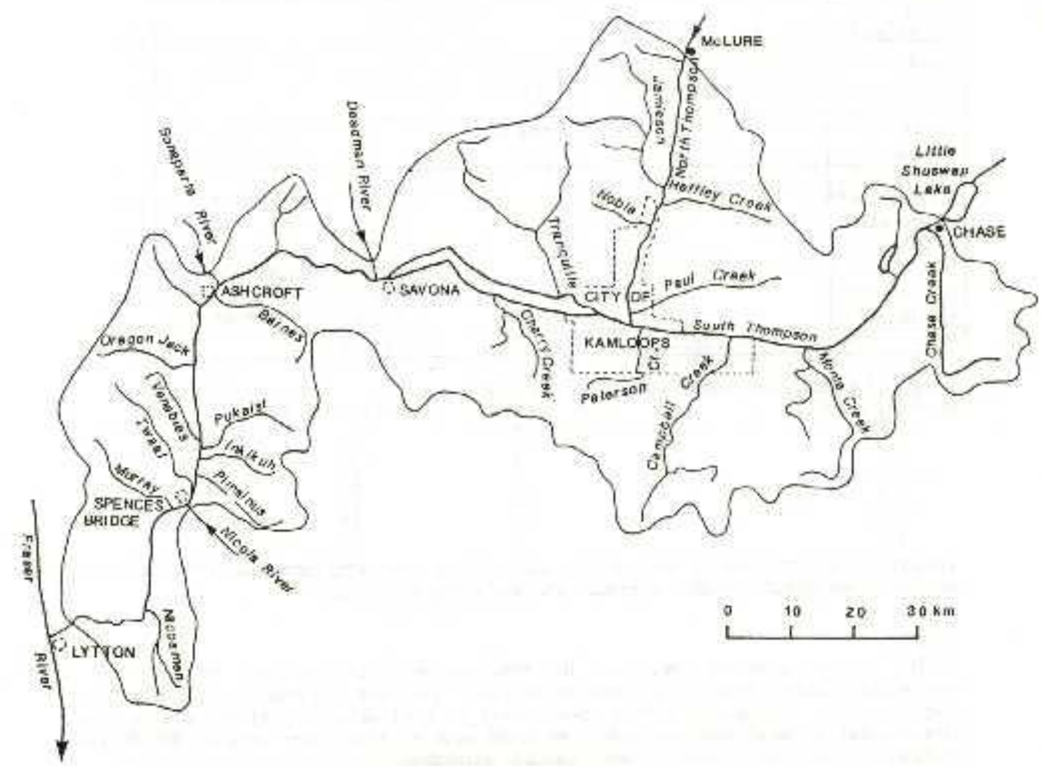
Figure 1. Thompson River Location Map



INTRODUCTION

This report was written to summarize the water quality of the mainstem Thompson River and to propose water quality objectives Table 1. which would protect existing and future water uses. The geographic limits of the study include the South Thompson River and its tributaries between Little Shuswap Lake and the confluence with the Notrth Thompson at Kamloops, the North Thompson downstream from McClure and the lower Thompson River to its confluence with the Fraser River including Kamloops Lake. The study areaFigure 1. does not include three watersheds tributary to the lower Thompson which are the subject of past or future water quality studies (the Bonaparte, Deadman and Nicola Rivers). Designated water uses throughout the drainage basin include protection of aquatic life, irrigation, livestock watering and wildlife water supply, recreation and industrial water supply.

In general, the water quality of the mainstem Thompson is relatively good although there have been, in some cases, significant impacts from municipal or industrial discharges as well as from non-point inputs. Water uses have been identified and water quality objectives set for characteristics such as microbial indicators, colour, chlorinated organics and resin acids in various reaches of the Thompson to provide a basis for future water quality protection and management.

The South Thompson River

The South Thompson has numerous water licences authorizing withdrawals for a variety of purposes: drinking water, irrigation, waterworks and industrial use. The river receives a number of permitted waste discharges (wastewater from small industrial as well as municipal and other sources) which appear to have only minor effects on water quality based on existing data. Another concern appears to be non-point sources affecting water quality. These include agriculture, on-site sewage disposal systems, land erosion and storm drains. As specific sources of pollution are identified, they will be targeted for attention by the appropriate government agency.

The water quality of the South Thompson, on the basis of the data collected over the past 20 years, is relatively good and no strong evidence couls be found for trends of water quality deterioration over the period for most characteristics. The characteristic for which some concern is noted is the microbiological quality of the water, probably originating from non-point discharges. Water quality objectives for this characteristic are proposed.

The North Thompson River

The North Thopmson River below McClure has numerous licences authorizing withdrawal for domestic use and irrigation. Protection of aquatic life is also a designated usse for water in this reach of the river. There are no direct discharges to the river, but there are a variety of indirect discharges to ground water. The water quality of the North Thompson is relatively similar to the South except that it has higher colour and suspended sediments but it is generally of good quality. The major difference from the South Thompson is that it is basically a free flowing system with a large contribution from glacial or snow melt sources, whereas the South Thompson originates from a lake system. Provisional water quality objectives are proposed for fecal coliforms and *E. coli* as an indicator of microbial pathogens to protect drinking water uses and body-contact recreation.

The Thompson River Above Kamloops Lake

The section of the Thompson River between the confluence of the North and South Thompson Rivers and Kamloops Lake is an important one as it is the location of the two largest point source discharges to the river system. The municipal discharge for the city of Kamloops has been upgraded and modified in several ways to reduce phosphorus input to the river. This course of action has been followed in response to the problems with excessive algal biomass in the lower Thompson experienced in the early and mid 1970's. At present, the city discharges phosphorus-reduced effluent directly to the river only in the spring when dilution is high and no downstream algal problems occur. The city also discharges part of its effluent by way of spray irrigation and rapid infiltration. As a result of these changes, the phosphorus contribution from the City of Kamloops has been reduced substantially over the past 15 years.

The other major discharge to the system is the Weyerhaeuser bleached kraft pulp mill. The components of the discharge which are of concern are nutrients, colour, and chlorinated organics. Over the period of record, improvements have been made in all of these areas but concerns still remain as to the effects of these and other discharge components. Increasing production, in some cases, has reduced the net effectiveness of the improvements made in effluent quality by increasing the overall amount of these discharge components. There are few ambient water quality data available for this section of the river because of the difficulties in obtaining representative samples.

Water quality objectives in this section of the river include microbiological indicators to protect the water for use as drinking water supply and for recreational use, objectives for clour, chlorinated dioxins and furans (in water, sediments and in fish tissue) and resin acids. In this section of the river channel there is very little mixing of the separate contributions of river flow from the North and Soputh Thompson. They remain distinct at least until they reach Kamloops Lake. Because of the flow pattern, the discharges from the two major wastewater sources at times of low flow are not dispersed quickly into the river and in the case of the pulp mill can be readily seen as a discrete plume of effluent along the south shore of the river. The objectives proposed are to apply to an area outside the initial dilution zoine which is defined as being 100 metres downstream of the points of discharge. For one objective, colour, the objective proposed is a long term one which will probably not be met in the short term.

Kamloops Lake

Kamloops Lake is a distinctive component of the Thomson system. Because of the large volume of river flow compared to the volume of the lake, the lake is strongly influenced by the river. The water chemistry and biology data for the lake were reviewed to determine if any changes had occurred. The only possible change noted was in the zooplankton community. Concerns about oxygen depletion and increase in phytoplankton productivity appear to have few supporting data. As in the immediate upstream area, water quality objectives for microbiological indicators, colour, chlorinated dioxins and furans and resin acids are proposed.

The Lower Thompson River

The lower Thompson River is subject to a number of influences. There are no major discharges which have significant effects on water quality. The pulp mill, the Kamloops sewage treatment discharge upstream form the lake and non-point sources influence water quality in the lower Thompson. A long-term sampling station near Spences Bridge provides the best record of changes in water quality in the lower Thompson. At present, with limited data, there are no obvious trends.

Considerable public and government concern has been directed to potential contaminants from the Kamloops pulp mill, particularly dioxins and furans. Recent studies have examined the amounts of these contaminants in fish tissues, river sediments and water. As a result of these and previous studies, some Ministry of Health consumption advisories have been issued. Recent improvements at the pulp mill have resulted in reduced amounts of discharges of these compounds of concern.

The problem of heavy attached algal biomass in the lower Thompson, sampled at Savona and Walhachin, is discussed in the technical appendix in relationship to trends in nutrient supply and other causal factors. On the basis of recommendations of a Federal-Provincial study in 1975, inputs of phosphorus were reduced from the City of Kamloops. Although the data base is poor, it appears that the amount of attached algae has also been reduced from the obvious problem levels of the early 1970's. However, over the time period examined, phosphorus inputs have decreased, and then gradually increased, without any corresponding increase in algal biomass. These data, along with research data published by Environment Canada, indicate that nutrient input/or concentration may not be the only factors controlling algal biomass in the Thompson and that invertebrate grazers and other factors may play a role in determining algal biomass.

In this reach of the river there are water quality objectives set for microbiological indicators, colour, chlorinated dioxins and furans and resin acids. As well, there is an objective set for attached algal biomass as a means of protecting the aesthetic attributes of this section of the river.

TABLES

Table 1. Provisional Water Quality Objectives for the Thompson River

Water Body	South Thompson	North Thompson	confluence to Kamloops L.	Kamloops L.	lower Thompson
designated water uses	for all water bodies: protection of aquatic life, irrigation, drinking water. livestock watering and wildlife water supply, recreation, industrial water supply.				
dioxins and furans (TEQ TCDD) in water	not applicable		0.2 pg/L maximum		
dioxins and furans (TEQ TCDD) in fish tissuer	not applicable		1.0 pg/g (wet weight) maximum		

dioxins and furans (TEQ TCDD) in sediment	**not applicable**	**0.7 pg/g (dry weight) maximum**	
colour	**not applicable**	**15 TCU**	
resin acids	**not applicable**	**see Table 2.**	
algal biomass	**not applicable**		**50 mg/m^2 as chlorophyll a**
fecal coliforms	**10/100 mL 90th percentile**		
E. coli	**2000/L geometric mean**		

1. The fecal coliform and E. coli average, geometric mean, and the 90th percentiles are calculated from at least five weekly samples taken in a period of 30 days. For values recorded as less than the detection limit, the detection limit itself should be used in calculating the statistic. The measurement in fecal coliforms refers to areas near drinking water intakes, the E. coli objective is for areas used for body contact recreation.
2. The only exception to the colour value would be if the natural colour of the North Thompson Riover exceeded 15 TCU, then the Lower Thompson should not be more than 5 TCU greater than the mean of the North and South Thompson since they contribute approximately equal volume to the Lower Thompson. For example, if the North Thompson is 18 TCU and the South Thompson were 8 TCU, the Lower Thompson should not exceed 18 TCU: ((18+8)/2)+5.
3. The average algal biomass is calculated from at least 6 randomly selected samples from natural substrates at each site on a particular sampling date.
4. The fish tissue objective applies to the muscles tissue (not to the whole fish or organs) of a fish of any species caught in any part of any of the waterbodies, including initial dilution zones of effluents.
5. The sediment level is the average from at least three replicate samples of bottom surface sediments at each site on any one sampling date.

Table 2. Resin Acid Water Quality Objective Concentrations

pH of ambient water	DHA (micrograms/L)	total resin acids (micrograms/L)
6.0	2	4
6.5	4	9
7.0	8	25
7.5	12	45
8.0	13	52
8.5	14	60

Total resin acids are defined as the sum of the individual concentrations for abietic, dehydroabietic, isopimaric, levopimaric, neoabietic, pimaric and sandaracopimaric acids.

Richard N. Nordin
Water Quality Branch, Victoria
Donald W. Holmes
Environmental Protection, Kamloops
Environmental Protection Department
Ministry of Environment, Lands and Parks