



Water Quality

Ambient Water Quality Objectives For The Pouce Coupe River

Overview Report

*Water Quality Section
Water Management Branch
Ministry Of Environment*

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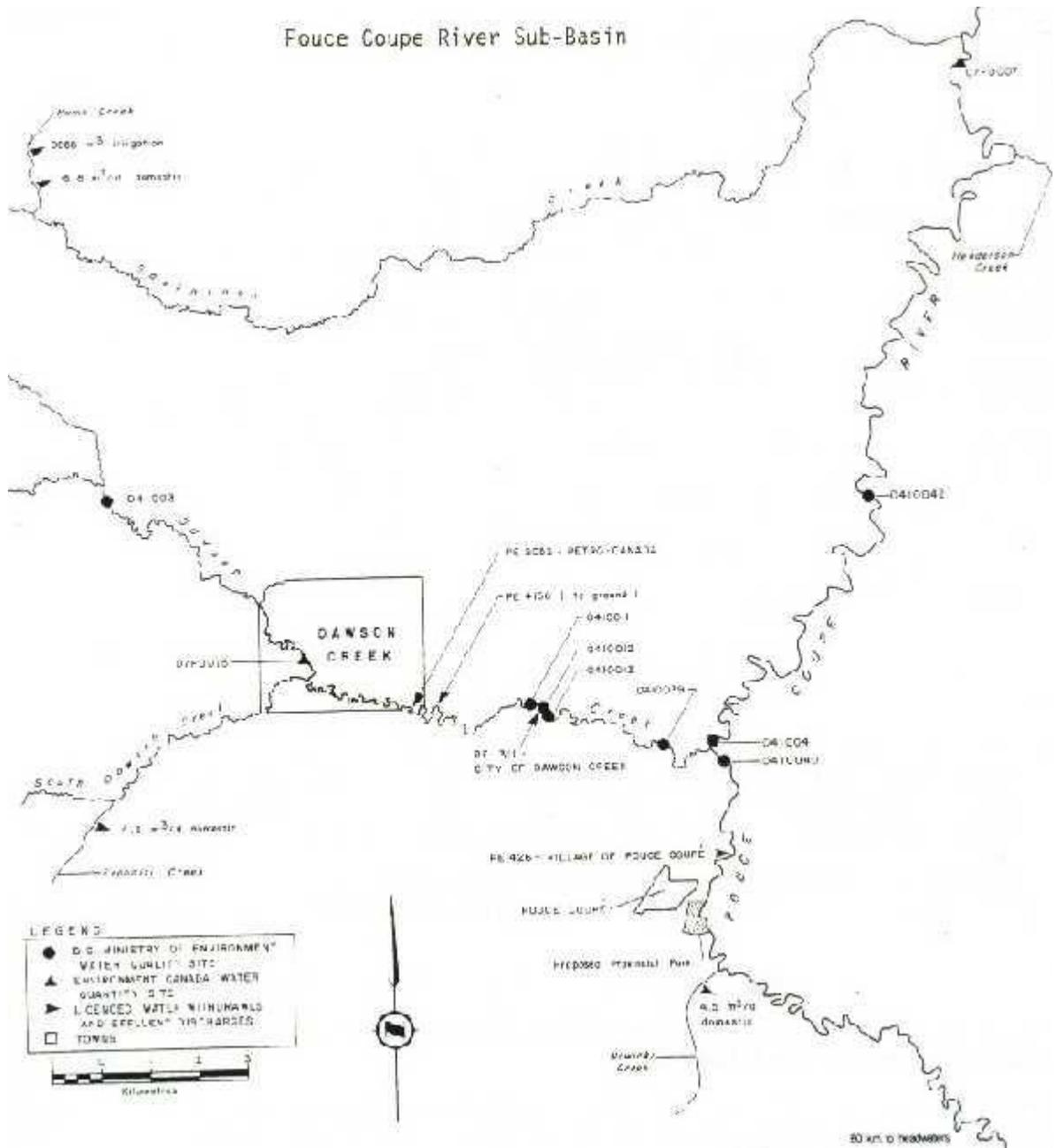
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FIGURE 1. Pouce Coupe River Sub-basin Map



PREFACE

Purpose of Water Quality Objectives

Water quality objectives are prepared for specific bodies of fresh, estuarine and coastal marine surface waters of British Columbia as part of the Ministry of Environment, Lands and Parks' mandate to manage water quality. Objectives are prepared only for those waterbodies and water quality characteristics that may be affected by human activity now or in the near future.

How Objectives Are Determined

Water quality objectives are based the BC approved and working criteria as well as national water quality guidelines. Water quality criteria and guidelines are safe limits of the physical, chemical, or biological characteristics of water, biota (plant and animal life) or sediment which protect water use. Objectives are established in British Columbia for waterbodies on a site-specific basis. They are derived from the criteria by considering local water quality, water uses, water movement, waste discharges, and socio-economic factors.

Water quality objectives are set to protect the most sensitive designated water use at a specific location. A designated water use is one that is protected in a given location and is one of the following:

- raw drinking water, public water supply, and food processing
- aquatic life and wildlife
- agriculture (livestock watering and irrigation)
- recreation and aesthetics
- industrial water supplies.

Each objective for a location may be based on the protection of a different water use, depending on the uses that are most sensitive to the physical, chemical or biological characteristics affecting that waterbody.

How Objectives Are Used

Water quality objectives routinely provide policy direction for resource managers for the protection of water uses in specific waterbodies. Objectives guide the evaluation of water quality, the issuing of permits, licences and orders, and the management of fisheries and the province's land base. They also provide a reference against which the state of water quality in a particular waterbody can be checked, and help to determine whether basin-wide water quality studies should be initiated.

Water quality objectives are also a standard for assessing the Ministry's performance in protecting water uses. While water quality objectives have no legal standing and are not directly enforced, these objectives become legally enforceable when included as a requirement of a permit, licence, order, or regulation, such as the Forest Practices Code Act, Water Act regulations or Waste Management Act regulations.

Objectives and Monitoring

Water quality objectives are established to protect all uses which may take place in a waterbody. Monitoring (sometimes called sampling) is undertaken to determine if all the designated water uses are being protected. The monitoring usually takes place at a critical time when a water quality specialist has determined that the water quality objectives may not be met. It is assumed that if all designated water uses are protected at the critical time, then they also will be protected at other times when the threat is less.

The monitoring usually takes place during a five week period, which allows the specialists to measure the worst, as well as the average condition in the water.

For some waterbodies, the monitoring period and frequency may vary, depending upon the nature of the problem, severity of threats to designated water uses, and the way the objectives are expressed (*i.e.*, mean value, maximum value).

INTRODUCTION

This assessment deals with the Pouce Coupe River and its major tributary, Dawson Creek. It is one of seven assessments being carried out for the Peace River area. A detailed technical appendix to this report was prepared and forms the basis for the conclusions presented here.

This report is the product of data assessments undertaken during 1983. In general, the study was designed to examine the status of existing and future water uses and waste discharges. Included in this report are provisional water quality objectives to protect designated water uses and a recommended monitoring program. The goal of this assessment is to guide water and waste management in the Pouce Coupe River sub-basin.

HYDROLOGY

The Pouce Coupe River is tributary to the Peace River and lies entirely within the Alberta Plateau Plains. Dawson Creek is a tributary of the Pouce Coupe River (see [Figure 1.](#)).

The seasonal flow pattern is characterized by snowmelt flood peaks from March to June, declining to mid-summer low flows. During the mid-summer low flows, Dawson Creek may dry up except for sewage effluent from the City of Dawson Creek. The Pouce Coupe River also experiences extremely low flows and may almost dry up near the Village of Pouce Coupe. Minimum flows also occur during the winter: both Dawson Creek and the Pouce Coupe River are completely ice-covered, and Dawson Creek may freeze to the bottom.

There are no existing or known future potential water withdrawals upstream from existing waste discharges that could reduce downstream dilution. Also, there are no existing or future potential

withdrawals downstream from the existing waste discharges which would be adversely affected by effluent input.

WATER USES

No salmonid fish species are known to occur in the Pouce Coupe River sub-basin. The fish habitat has low capability due to high sediment levels, low flows and abundant algal growth. Recreational water use is also minimal as a result of sewage contamination and low flows. However, children do play along the banks of both Dawson Creek and the Pouce Coupe River and swimming has occurred in the Pouce Coupe River downstream from the municipal discharge.

WASTE DISCHARGES

Agriculture is the dominant land use in this sub-basin, and potentially contributes non-point discharges of suspended sediment, pesticides and nutrients to the Pouce Coupe River sub-basin. The permitted waste sources that were studied in this report include the municipal discharges for the Village of Pouce Coupe and the City of Dawson Creek. There have been few direct measurements of the water quality of the Pouce Coupe River and its tributary, Dawson Creek. Conclusions in this report were derived mainly by projecting the effects of municipal discharges at various streamflows.

The Village of Pouce Coupe has a population of 847 (1982) and is predominantly residential in character. The existing treatment system, modified in 1983, consists of two anaerobic cells, two facultative lagoons in series and a large stabilization-storage lagoon. Treated effluent which was discharged on a year-round basis, will now be discharged from April to June. Review of existing effluent monitoring data shows that the treatment system produced good quality effluent relative to the permit issued in 1976. However, during the August and October-April 10-year low flow, effluent dilution can fall below 20:1.

Effluent quality is expected to meet upgraded 1982 permit conditions with an expanded lagoon capacity constructed in 1983. This lagoon will allow year-round storage with discharge during spring flows, April-June. However, continuous effluent discharge during this period does not guarantee 20:1 dilution. During the 10-year low flow for the discharge period, dilution could fall to 10:1. Only careful effluent discharge proportional to available stream flow will provide greater than 20:1 dilution for this period.

The City of Dawson Creek has a population of 11634 (1982) and is mainly residential with some light industry. The sewage treatment facilities consist of a series of two anaerobic lagoons, two aerobic lagoons and one stabilization lagoon discharging to Dawson Creek on a year-round basis via a series of beaver ponds. Discharge is as minimal as possible during winter. Review of effluent monitoring data for the period 1971 to 1982 shows that the system produced high quality effluent relative to permit conditions, although permitted conditions were not consistently met.

WATER QUALITY

During summer low flows and with present waste loading, the Pouce Coupe River probably experiences significant dissolved oxygen reduction, high fecal coliform densities and toxic levels of un-ionized ammonia-nitrogen rendering the water unsuitable for aquatic life and water contact recreation.

One way of ensuring a high dilution of municipal effluent would be to adjust the effluent flow according to the available streamflow. This could be accomplished by installing a staff gauge and developing a stage discharge curve for the Pouce Coupe River at the Village. Municipal staff could then refer to the curve when regulating effluent flow.

Flow in Dawson Creek may completely cease during low flow periods and both past and present waste loads probably result in severe dissolved oxygen depletions, toxic levels of un-ionized ammonia-nitrogen and fecal coliform densities hazardous to human health, rendering the water unsuitable for aquatic life and water contact recreation. Effluent quality is expected to improve in the future with the planned installation of mechanical aeration in 1984.

Aeration is not expected to eliminate the severe water quality degradation projected for Dawson Creek for the next 10 years. Even attainment of the highest quality effluent in keeping with Provincial Effluent Objectives would not eliminate this problem. Alternative treatment and disposal methods which could improve Dawson Creek water quality will need to be investigated. These alternatives include pipelining the effluent to another watercourse, land disposal and advanced treatment.

PROVISIONAL WATER QUALITY OBJECTIVES

Designated uses proposed for the Pouce Coupe River and Dawson Creek include water contact recreation (Pouce Coupe River only), and use by non-salmonid aquatic life. Provisional water quality objectives are proposed which will protect these uses. The objectives apply to discrete samples outside the initial dilution zones of the municipal wastewater discharges, on a year-round basis, except for the fecal coliform objective which applies only during the recreation season (June 1 to September 30).

The provisional water quality objectives are summarized in [Table 1](#). The objectives are based on preliminary working criteria for water quality and on available data on ambient water quality, waste discharges, water uses and river flows.

The objectives will remain provisional until receiving water monitoring programs provide adequate data and the Ministry has established approved water quality criteria for the characteristics of concern.

The objectives can be considered as policy guidelines for resource managers to protect water uses in the specified water bodies. For example, they can be used to draw up waste management permits and plans, regulate water use or plan fisheries management. They can also provide a reference against which the state of water quality in a particular water body can be checked.

Water quality objectives have no legal standing and their direct enforcement would not be practical. This would be due to the difficulty of accurately measuring contaminants in receiving water and attributing the contamination exceeding the objective to particular sources for legal purposes, and thus of proving

violations and their causes. Hence, although water quality objectives should be used when determining effluent permit limits, they should not be incorporated as part of the conditions in a waste management permit.

Depending on the circumstances, water quality objectives may already be met in a water body, or may describe water quality conditions which can be met in the future. To limit the scope of the work, objectives are only being prepared for water bodies and water quality characteristics which may be affected by man's activities, now and in the foreseeable future.

The provisional objectives are probably not being met in Dawson Creek due to the discharge from the City of Dawson Creek. If the objectives are to be met, this municipal effluent must either be given some form of advanced treatment or disposed of elsewhere. In the Pouce Coupe River upstream from Dawson Creek, the provisional objectives are probably not met all year round. One way of achieving the objectives would be to regulate the discharge from the Village of Pouce Coupe according to available streamflow, thereby providing sufficient dilution. In the Pouce Coupe River downstream from Dawson Creek, the objectives are probably frequently not being met. This situation will be corrected when suitable control measures for the municipal discharges are worked out.

MONITORING RECOMMENDATIONS

Recommendations for effluent and receiving water monitoring in the Pouce Coupe River sub-basin are summarized in [Table 2](#). The monitoring recommendations were made from a technical perspective and the extent to which monitoring is conducted will depend on the overall priorities and monitoring resources available for the Region and Province.

TABLES

Table 1. Provisional Water Quality Objectives for the Pouce Coupe River and Dawson Creek

Water Body	Dawson Creek	Pouce Coupe River
designated water uses	aquatic life	aquatic life and recreation
fecal coliforms	not applicable	less than or equal to 200 MPN/100 mL as a geometric mean less than or equal to 400 MPN/100 mL as a 90th percentile

turbidity	5 NTU maximum increase when the upstream value is less than or equal to 50 NTU 10% maximum increase when the upstream value exceeds 50 NTU
suspended solids	10 mg/L maximum increase when the upstream value is less than or equal to 100 mg/L 10% maximum increase when the upstream value exceeds 100 mg/L
total chlorine residual	0.01 mg/L maximum
periphyton growth	25% maximum increase in biomass/unit area
un-ionized ammonia-nitrogen	0.03 mg/L maximum
nitrite-nitrogen	0.06 mg/L maximum
dissolved oxygen	5.5 mg/L minimum

Note: The objectives apply to discrete samples from all parts of the water bodies, except from initial dilution zones of effluents. These excluded dilution zones are defined as extending 100 m downstream from the discharge point and no more than 50 percent across the width of the stream, from the surface to the bottom.

- 1. The fecal coliform geometric mean and 90th percentile are calculated from at least 5 weekly samples taken in a period of 30 days. The objectives apply during the recreation season only.**
- 2. For turbidity, suspended solids and periphyton growth the increase, in NTU, mg/L or %, is over levels measured at a site upstream from a discharge or series of discharges, and as close to them as possible, and applies to downstream levels. Periphyton growth should be measured at sites subject to similar light and flow conditions.**
- 3. Since the total chlorine residual objective is equal to the minimum detectable concentration, it may be necessary to estimate the receiving water concentration using effluent loading and streamflow. The objective applies only if sewage effluent is chlorinated.**

Table 2. Recommended Routine Water Quality Monitoring for Dawson Creek and the Pouce Coupe River

sites	frequency and timing	characteristics
City of Dawson Creek effluent (PE 311)	monthly	flow, BOD ₅ , suspended solids, fecal coliforms, ammonia-nitrogen
City of Dawson Creek effluent (PE 311)	4 times per year when the creek is monitored	flow, BOD ₅ , suspended solids, fecal coliforms, ammonia-nitrogen, nitrate-nitrogen, nitrite-nitrogen, dissolved phosphorus
Village of Pouce Coupe effluent (PE 426)	3 times per year during the effluent discharge period in the spring	flow, BOD ₅ , suspended solids, fecal coliforms, ammonia-nitrogen, nitrate-nitrogen, nitrite-nitrogen, dissolved phosphorus, total phosphorus
Dawson Creek: site 0410039, u/s from PE 426 and 100 m d/s Pouce Coupe River: sites 0410040, 0410041 and 0410042	3 times per year during the effluent discharge period in the spring	flow, suspended solids, fecal coliforms, ammonia-nitrogen, nitrate-nitrogen, nitrite-nitrogen, dissolved phosphorus, dissolved oxygen, pH, turbidity, temperature
Dawson Creek: sites 0410031 and 0410039, u/s from PE 311 and 100 m d/s Pouce Coupe River: sites 0410040, 0410041 and 0410042	4 times per year: twice at peak Dawson Creek effluent flow, once in summer and once in fall at low creek flow	flow, suspended solids, fecal coliforms, ammonia-nitrogen, nitrate-nitrogen, nitrite-nitrogen, dissolved phosphorus, dissolved oxygen, pH, turbidity, temperature

Sampling may need to be increased to check objectives, depending on circumstances.

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