Water Quality in the Fluvial Section

Physicochemical and Bacteriological Parameters – 3rd Edition

Background

The St. Lawrence River is the largest river in Quebec. It is crucial to economic activity in the province and provides critical habitat for many plant and animal species. It is also the source of drinking water for half of Quebec’s residents and is used for a wide variety of recreational and tourism activities.

Major initiatives have been undertaken in the watersheds of the St. Lawrence over the past 25 years to address the issue of municipal wastewater cleanup. Treatment plants in the main municipalities along the river began operating between 1988 and 1995. Action has also been taken to reduce agricultural pollution along the fluvial corridor and in the St. Lawrence Lowlands. Other projects aimed at reducing sewer overflows during heavy rains and disinfecting treated water are already or soon will be under way. The water quality monitoring program based on parameters related to nontoxic pollution (eutrophication, hypoxia, erosion, fecal contamination) allows us to measure the environmental benefits of past and future cleanup initiatives. This program also allows us to evaluate the effects of river flow regime modification on water quality.

The Ministère du Développement durable, de l’Environnement, de la Faune et des Parcs du Québec operates a monitoring network made up of 27 sampling stations. It stretches from the outlet of Lake Saint-François down to the western tip of Île d’Orléans. Monitoring is also performed near Quebec City (at the Lévis water intake) by Environment Canada.
Overview of the situation

Today

Figure 1 presents an overview of the St. Lawrence River water quality as measured during the summers of 2008 to 2010 using the Index of Bacteriological and Physicochemical Quality (IQBP, see the Key variables sidebar). Note that suspended solids have replaced turbidity in the calculation of the IQBP since the last edition of this fact sheet.

Water quality is good in the Beauharnois Canal and at the outlet of Lake Saint-Louis, but deteriorates significantly downstream between Varennes and Sorel. This deterioration is caused by bacteriological contamination from the wastewater treatment plants of Montréal, Longueuil and Repentigny, which do not disinfect their wastewater before discharging it to the river. In the fluvial section, poor water quality affects the shipping channel and the water mass immediately north. Water quality improves in Lake Saint-Pierre but remains questionable until Bécancour. In contrast, the water mass flowing south of the channel is good or fair, even in the Varennes-Sorel section. The water quality remains good or fair along the south shore of the river until it reaches Quebec City. In the Quebec City region, water quality is fair at all of the sampling stations except one, which is located in the middle of the river, upstream of Quebec City. Water quality at that station is questionable, bordering on fair, because of slightly higher suspended solid concentrations than at the other sampling sites.

Figure 1. Water quality in the St. Lawrence River during the summers of 2008 to 2010
Over the years

Although there were a few interannual fluctuations between 1995 and 2010, no trend was detected during that period, and the average percentage of stations with good or fair water quality was 72% (Figure 2).

Figure 2. Percentage of stations with good or fair water quality

The water quality near Quebec City is influenced by local pollution sources, as well as by pollution sources existing further upstream. This area acts as a microcosm of what is going on in the fluvial environment as a whole.

For the period 1995 to 2010, no significant trend was detected in suspended solids or phosphorus, the median concentrations of which were 10.3 and 0.026 mg/l respectively (Figures 3 and 4). However, an increase was seen in fecal coliform concentrations, the estimated concentration of which rose from 107 CFU/100 ml at the start of the period to 171 CFU/100 ml by the end of 2010 (Figure 5). This rise is thought to be due to an increase in untreated wastewater overflows after heavier precipitation in recent years, since the average annual precipitation recorded from May to October in southern Quebec increased between 2000 and 2010. Note that the retention basins built to control sewer overflows into the river in Quebec City were not yet fully operational between 2006 and 2010.
Key variables

The IQBP (Index of Bacteriological and Physicochemical Quality) is used to assess the general quality of freshwater for the following uses: swimming and water sports, protection of aquatic life, protection from eutrophication and raw water supply intended for consumption. The index is based on conventional water quality parameters and combines, in this report, six variables: total phosphorus, fecal coliforms, suspended solids, ammonia, nitrates/nitrites, and total chlorophyll a (chlorophyll a plus pheopigments). Note that suspended solids have replaced turbidity in the calculation of the IQBP since the last edition of this fact sheet.

The IQBP ranges from 0 to 100 and defines five classes of water quality:

- A (80–100): good
- B (60–79): fair
- C (40–59): questionable
- D (20–39): poor
- E (0–19): very poor

Changes in the annual percentage of sampling stations with water of good (A) or fair (B) quality as well as changes in concentrations of certain key parameters (suspended solids, phosphorus and fecal coliforms) near Quebec City indicate whether the water quality of the St. Lawrence River is improving or deteriorating.

To know more


Outlook

The state of health of the St. Lawrence River reached a critical level in the early 1970s. Initiatives undertaken in the late 1980s and early 1990s as part of the municipal wastewater cleanup program have led to significant improvements in water quality. Since then, the St. Lawrence has compared favourably to other large North American and European rivers. However, there have been few changes since 1995, and any new improvements will first require the implementation of major initiatives, such as the disinfection of the wastewater from Montréal and Longueuil and the construction of additional retention basins to reduce the frequency of sewer overflows during rainfall events.

Flow rate is an important factor governing the water quality of the St. Lawrence River. Any major change to the river’s flow will have an impact on the concentration of certain parameters, such as phosphorus and suspended solids. Over the 1995 to 2010 period, however, no significant trend was detected in the flow rate of the river near Quebec City.

State of the St. Lawrence Monitoring Program

Four government partners – Environment Canada, Fisheries and Oceans Canada, Parks Canada Agency, and the Ministère du Développement durable, de l’Environnement, de la Faune et des Parcs du Québec – and Stratégies Saint-Laurent, a nongovernmental organization that works actively with riverside communities, are pooling their expertise and efforts to provide Canadians with information on the state of the St. Lawrence and its long-term evolution.

To this end, environmental indicators have been developed on the basis of data collected as part of each organization’s ongoing environmental monitoring activities. These activities cover the main components of the environment, namely water, sediments, biological resources, uses and shorelines.

For more information on the State of the St. Lawrence Monitoring Program, please visit our Web site at http://www.planstlaurent.qc.ca/.

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