

Monitoring the State of the

St. Lawrence River

WATER

SEDIMENTS

SHORELINES

BIOLOGICAL RESOURCES

USES

2nd edition

WATER QUALITY IN THE FLUVIAL SECTION

Physicochemical and Bacteriological Parameters

Background

Major initiatives have been undertaken in the watersheds and riverside municipalities of the St. Lawrence over the past 20 years to address the issue of municipal waste-

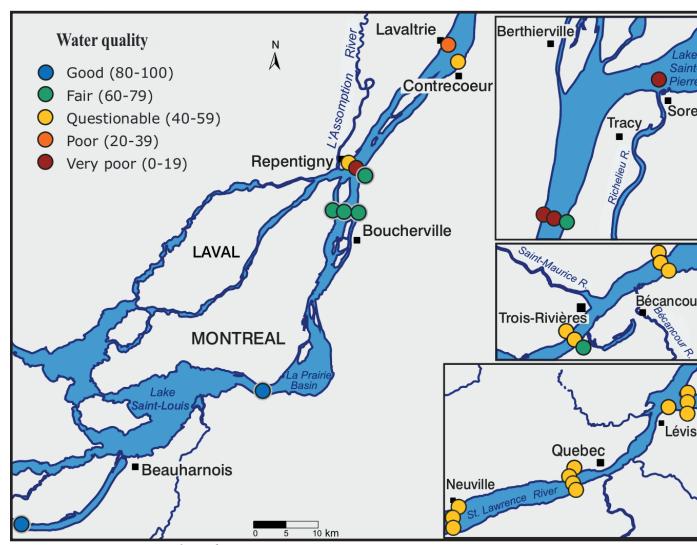
water cleanup. Action has also been taken to reduce agricultural pollution along the fluvial corridor and in the St. Lawrence Lowlands. The water quality monitoring program based on parameters related to nontoxic pollution (eutrophication, hypoxia, erosion, fecal

and organic contamination) allows us to measure the environmental benefits of past and future cleanup initiatives. This program also allows us to point up the effects of flow regime modification on water quality. The Ministère du Développement Durable, de l'Environnement et des Parcs du Québec

Overview of the Situation

Today

Figure 1 presents an overview of the St. Lawrence water quality as measured during the summers of 2004 and 2005 using the Index of Bacteriological and Physicochemical Quality (see sidebar *Key Variables*). The water quality is good in the Beauharnois Canal and at the outlet of Lake Saint-Louis, but deteriorates downstream, especially between Repentigny and Sorel. In the fluvial section, the main problems and water



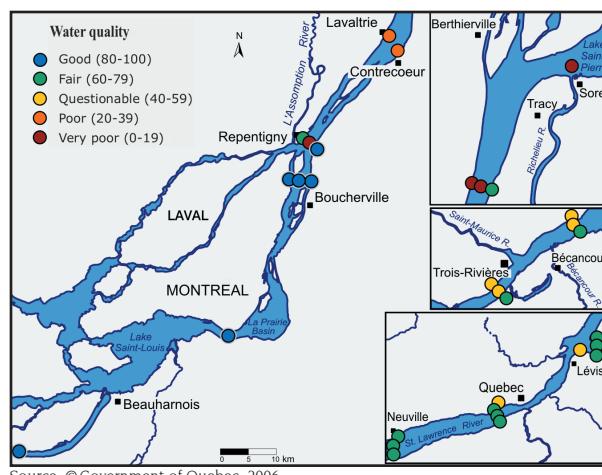
use losses affect the shipping channel and the water mass immediately north of it. These problems are primarily the result of bacteriological contamination from the wastewater treatment plants of Montreal, Longueuil and Repentigny (which do not disinfect their treated wastewater before discharging it to the river), and from sewer overflows during heavy rains. This bacteriological contamination begins to decline in Lake Saint-Pierre, but remains perceptible until Bécancour, some 125 km downstream of Montreal. Despite the improvement in bacteriological quality downstream of Lake Saint-Pierre and in the Quebec City region, the river's main water masses are turbid and the water quality is questionable.

Over the Years

For the purpose of comparison, the results obtained during the summers of 2000 and 2001 are presented in Figure 2. The "fair" water quality measured at several stations in 2000 and 2001 fell to "questionable" for the period 2004–2005. The percentage of stations with "good" or "fair" water quality remained above 65% for the period 1995 to 2002. Since 2003, however, it has dropped below 33% (Figure 3).

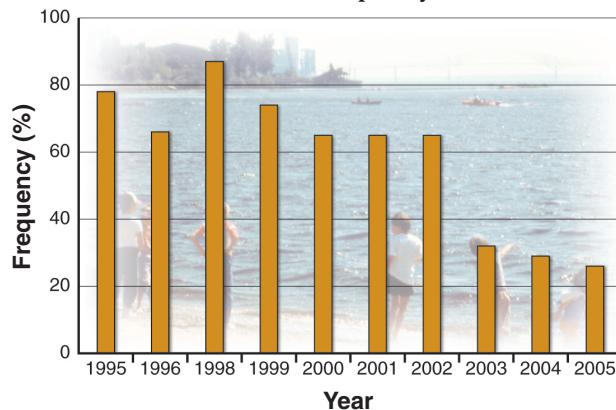
Since 2003, we have observed a generalized increase in water turbidity. Downstream of Lake Saint-Pierre, this phenomenon is often linked to an increase in suspended solids and phosphorus concentrations. These changes are not likely the result of higher urban effluent discharges or agricultural activities. They could rather be linked to a modification of the river's flow regime and increased erosion processes. During the summers of 2003 to 2005 (May to October), rainfalls were more abundant than in previous years. More precipita-

Figure 2. Water quality in the St. Lawrence River during the summers of 2000 and 2001



Source: © Government of Quebec, 2006

Figure 3. Percentage of stations with good or fair water quality

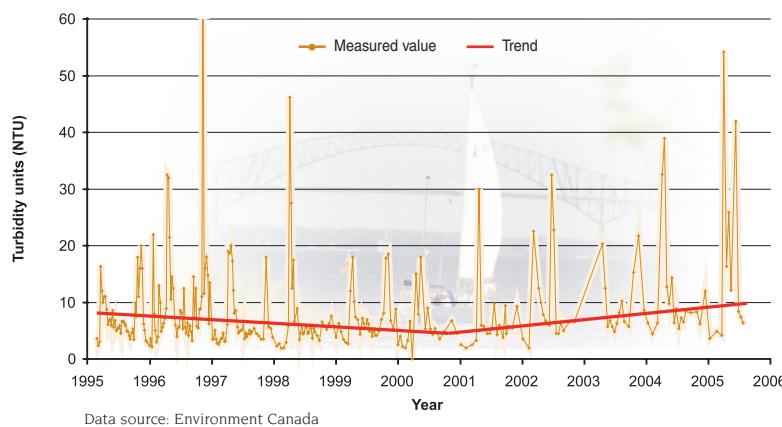
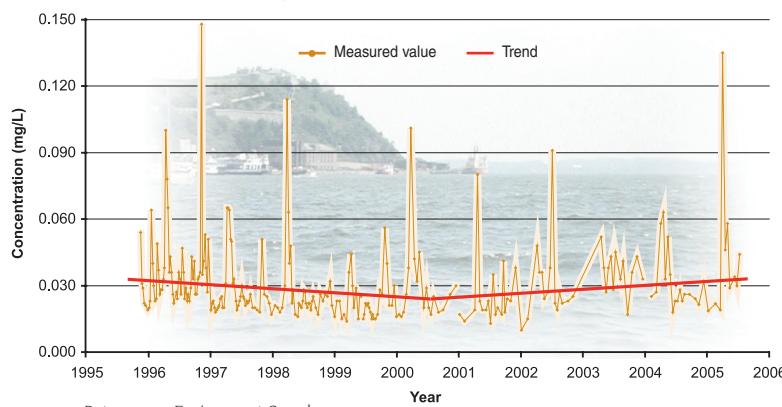
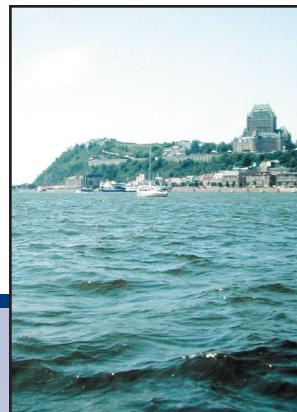
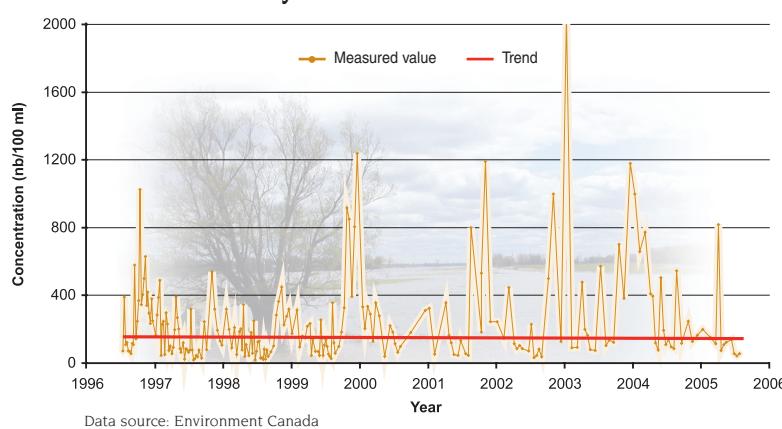


Source: © Government of Quebec, 2006

tion means more surface runoff and thus higher inputs to the river. Despite the less pronounced spring flooding, the river's flow has displayed an upward trend since 2003. Erosion of the river bed and banks also increases when the discharge is higher.

The water quality near Quebec City depends on the pollution sources existing upstream but also on the river's flow. This area thereby acts as a microcosm of what is going on in the fluvial environment as a whole. For the period 1995 to 2000, which corresponds to a period of low flow, we observe a reduction in

turbidity of 1.7 NTU (Figure 4) and a decrease in phosphorus concentrations of 0.009 mg/L (Figure 5). On the other hand, for the period 2001 to 2005, which corresponds to a period of increased flow, we note a rise in turbidity of 3.7 NTU and a rise in phosphorus of 0.009 mg/L. If we consider the whole period, phosphorus concentrations returned to their initial levels and turbidity increased by 2 NTU. With regard to fecal coliform concentrations, which are not correlated with flow, no significant trend was detected (Figure 6).

Figure 4. Changes in turbidity near Quebec City**Figure 5. Changes in phosphorus concentrations near Quebec City****Figure 6. Changes in fecal coliform concentrations near Quebec City**

KEY VARIABLES

The IQBP (Index of Bacteriological and Physicochemical Quality) is used to assess the general quality of fresh water 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, eight variables: total phosphorus, fecal coliforms, turbidity, ammonia, nitrates/nitrites, total chlorophyll a (chlorophyll a plus pheophytins), dissolved oxygen and pH.

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 (turbidity, phosphorus and fecal coliforms) near Quebec City indicate if the water quality of the St. Lawrence River is improving or deteriorating.

Outlook

The state of health of the St. Lawrence River reached a critical level in the early 1970s. Since then, initiatives undertaken as part of a number of cleanup programs have led to great improvements in the water quality. Today, the St. Lawrence compares favourably to other large North American rivers that flow through industrialized areas. Compared to some large European rivers, the water quality of the St. Lawrence River is clearly superior.

Discharge is an important factor governing the water quality of the St. Lawrence River. Any process or measure that modifies the river flow will have an impact on some water quality parameters linked to nontoxic pollution, like phosphorus, suspended solids and turbidity. The repercussions of changes in the river's flow regime related to climate change or Great Lakes water level regulation can be documented through the State of the St. Lawrence Monitoring Program.

To Know More

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State of the St. Lawrence Monitoring Program

Six government partners — Environment Canada, Fisheries and Oceans Canada, the Canadian Space Agency, Parks Canada Agency, the Ministère du Développement durable, de l'Environnement et des Parcs du Québec, the Ministère des Ressources naturelles et de la Faune 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 long-term trends affecting it.

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 [<www.planstlaurent.qc.ca>](http://www.planstlaurent.qc.ca) or contact our offices at the following address:

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