

# Monitoring the State of the ST. LAWRENCE RIVER



BIOLOGICAL RESOURCES

WATER

SEDIMENTS

SHORELINES

USES

## Toxic Contamination of Freshwater Fish – 3<sup>rd</sup> edition



2010-2014

### Current status: Moderate

For the years 2010-2014, only Northern Pike from Lac Saint-Louis had mercury concentrations that exceeded the Canadian standard, and only Walleye near Montréal and in Lac Saint-Pierre exceeded the European Union standard for PCBs.

Change since 1976: There has been a sharp downward trend in mercury and PCB contamination since the 1970s.

### Classes for judging the state of fish contamination.

**Good:** all concentrations measured in fish flesh are below the standard – not a concern

**Moderate:** the concentrations measured in fish flesh are near the standard, but one species may exceed it on the local level – to be monitored

**Poor:** several species show above-standard concentrations in fish flesh or a single species presents above-standard concentrations throughout the fluvial corridor – of concern

The Canadian standard for the marketing of fish products is 0.5 mg/kg of flesh for mercury. The European Union standard is 125 µg/kg of flesh for polychlorinated biphenyls (PCBs) (the Canadian standard of 2,000 µg/kg is under review). There is no standard for polybrominated diphenyl ethers (PBDEs). For dioxins and furans, the European standard is 3.5 ng/kg of flesh.

## Overview of the Situation

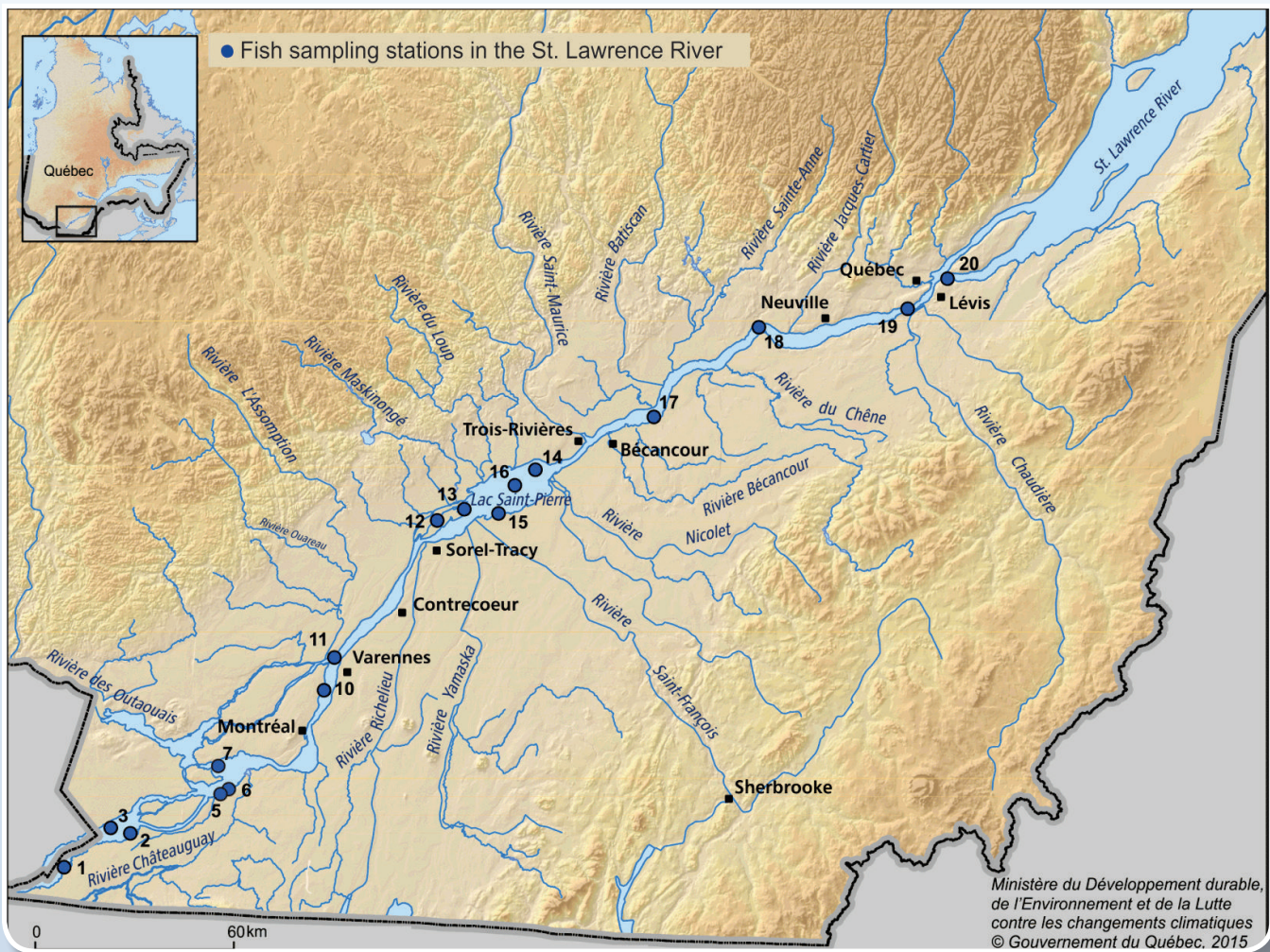
Various contaminants, including mercury and other metals, polychlorinated biphenyls (PCB), polybrominated diphenyl ethers (PBDE), and dioxins and furans have been detected in the flesh of fish from the St. Lawrence. Only mercury is present in concentrations that sometimes exceed the consumption guidelines, primarily in older specimens. Concentrations of other contaminants in fish flesh are often low.

There has been a sharp downward trend in contamination since the 1970s, especially for mercury and PCBs. As a result, fish from the St. Lawrence River can be consumed without risk, so long as the [recommendations](#) issued by the *Ministère du Développement durable, de l'Environnement et de la Lutte*

*contre les changements climatiques*<sup>1</sup> and the *Ministère de la Santé et des Services sociaux*<sup>2</sup> are followed.

The species studied to determine the contaminant concentrations in fish flesh include the Walleye, the Northern Pike and the Yellow Perch, which are sport fish species. Whole white sucker was also analysed to obtain estimates on the exposure to contaminants of fish-eating terrestrial wildlife who consume whole fish.

**Figure 1** Location of fish sampling stations in the St. Lawrence River



1 Québec Minister of Sustainable Development, Environment and the Fight against Climate Change

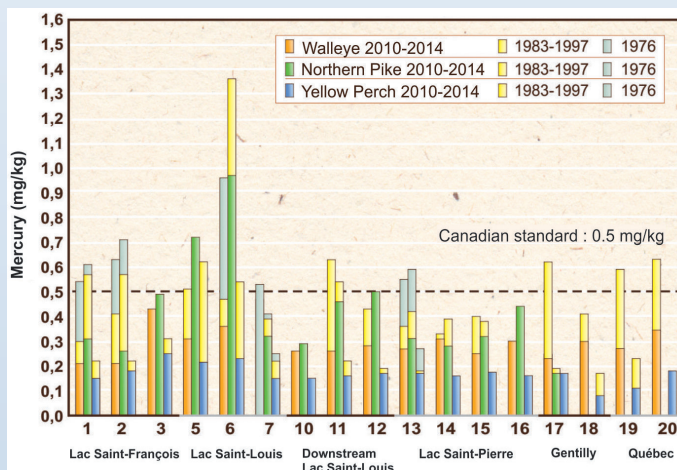
2 Québec Minister of Health and Social Services

## Mercury

When we compare the values observed in 1976 and for the period 1983-1997 to the data for the period 2010-2014, it is apparent that the efforts invested in reducing mercury contamination in the river have yielded positive results since, generally speaking, mercury concentrations in fish have fallen (figure 2). Average mercury concentrations in the flesh of Walleye (425 mm), Northern Pike (600 mm) and Yellow Perch (215 mm) were below the Canadian fish marketing standard (0.5 mg/kg) (figure 2). Average values that exceeded the Canadian standard, however, were observed in Northern Pike (0.72 mg/kg and 0.97 mg/kg) from Lac Saint-Louis in the Îles de la Paix sector (stations 5 and 6). It appears that the local contamination from past industrial activities is persisting in this area and continuing to influence the levels of mercury contamination in fish. In 2006, sediments contaminated with mercury were removed near the outlet of the Saint-Louis River.

Average mercury concentrations for the three species exceed the criterion of 0.057 mg/kg for fish-eating terrestrial wildlife at all sites. This exceedance is not exceptional, however, as this criterion is exceeded by the majority of fish in the province of Québec owing to the atmospheric transport of mercury.

**Figure 2 Changes in average mercury concentrations in Walleye, Northern Pike and Yellow Perch in the St. Lawrence River for the period 1976-2014**



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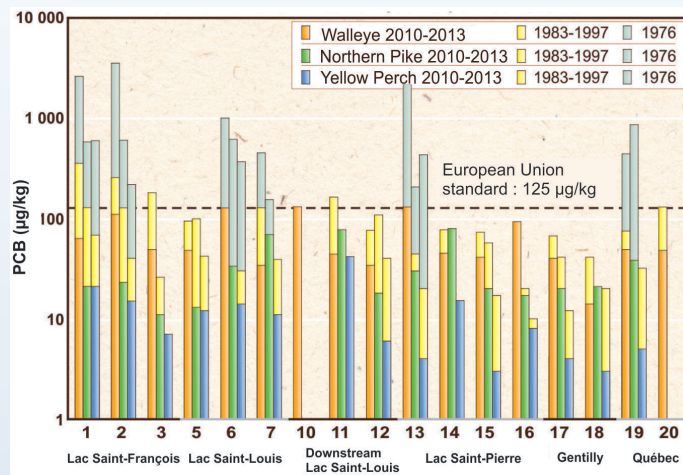
## Polychlorinated biphenyls PCB

Major reductions in PCB concentrations from the values observed in 1976 and over the period 1983-1997 were observed during the period 2010-2013. The most important reductions were observed between 1976 and 1983-1997. These reductions demonstrate that the banning of PCBs and the efforts to recover and destroy them have led to major reductions in the contamination of the St. Lawrence. In fact, over the period 2010-2013, average PCB concentrations in the flesh of Walleye, Northern Pike and Yellow Perch in the St. Lawrence River were below the Canadian standard of 2,000 µg/kg (under review) for the marketing of fish products (figure 3). These values are also generally below the European Union standard of 125 µg/kg for the marketing of fish products. Only two sites show PCB concentrations above 125 µg/kg. These concentrations (130 µg/kg) were observed only in Walleye near Montréal (station 10) and in Lac Saint-Pierre (station 13).

The average PCB concentrations measured in these three species during the period 2010-2013 remain below the criterion for the protection of fish-eating terrestrial wildlife (160 µg/kg). However, the concentrations reported here, since they derive from measurements of the flesh rather than of the fish as a whole, constitute a less than ideal indicator for assessing the potential risk to protected fish-eating terrestrial wildlife. It is a fact that PCB concentrations in the flesh are lower than in the fish as a whole since these contaminants tend to accumulate much more in the fatty

tissues than in the flesh. It is worth noting that concentrations close to the criterion likely indicate a potential risk to this wildlife and the food chain as a whole, since these species represent part of the diet of numerous wildlife species. Note as well that PCB concentrations measured in the whole white sucker (unrepresented on figure 3) during the period 2010-2013 exceeded the criterion of 160 µg/kg at several sites located near Montréal (stations 10 et 11) and in Lac Saint-Pierre, with concentrations frequently hovering between 160 and 450 µg/kg.

**Figure 3 Changes in average PCB concentrations in Walleye, Northern Pike and Yellow Perch in the St. Lawrence River for the period 1976-2013**



### Polybrominated diphenyl ethers PBDE

Analyses of PBDE in the flesh of fish from the St. Lawrence River began in 2002. PBDE concentrations remained relatively stable during the studied period of 2002-2013.

There is no standard governing the quantity of PBDEs in fish flesh deemed acceptable for human consumption. The concentrations normally measured are not deemed to pose a significant risk to human health.

Environment Canada has established criteria, however, for different congener groups of PBDEs in order to protect fish-eating wildlife and birds. For the three main congener groups normally detected in fish, ie, the tetra BDE, penta BDE and hexa BDE, the criteria are 44 µg/kg, 3 µg/kg and 4 µg/kg respectively. All average tetra BDE and

hexa BDE concentrations in Walleye, Northern Pike and Yellow Perch are below the established criteria (44 µg/kg and 4 µg/kg respectively). With respect to the penta BDE, criterion of 3 µg/kg is exceeded in the Walleye and Northern Pike at Boucherville (station 10), Lac Saint-Pierre and Québec City, with concentrations ranging from 3.86 µg/kg to 14.1 µg/kg.



As with PCBs, however, PBDE concentrations measured in whole white suckers over the period 2002-2013 exceeded the criteria at several sites. At the sites near Montréal (station 11), they reached values of 303 µg/kg for tetra BDEs, 46.8 µg/kg for penta BDEs and 15.5 µg/kg for hexa BDEs. Similarly, the concentrations measured at Lac Saint-Pierre (station 13) reached values of 84 µg/kg for tetra BDEs, 14.7 µg/kg for penta BDEs and 5.9 µg/kg for hexa BDEs and posed a potential risk to fish-eating terrestrial wildlife and birds.

## Dioxins and Furans

Analyses of dioxins and furans in the flesh of fish in the St. Lawrence River were initiated in 1991 with some exploratory sampling. Given the relatively low concentrations measured, the analyses were subsequently limited to a few species, generally the largest fish.

From 2001 to 2013, dioxin and furan concentrations remained low and relatively similar. The Canadian standard of 20 ng/kg for 2,3,7,8 TCDD is under review. The European Union standard for the marketing of fish products is 3.5 ng/kg. All the 2,3,7,8 TCDD toxic equivalence concentrations measured in the flesh of Walleye, Northern Pike and Yellow Perch from the St. Lawrence River were below the European Union standard and are not deemed to pose a major risk to human health.



In whole white suckers, the 2,3,7,8 TCDD toxic equivalence concentrations occasionally exceed the criterion of 0.66 ng/kg for the protection of fish-eating wildlife and birds. Most of the values that exceed the criterion are less than twice the criterion value and do not pose a major risk given the limited number of measurements that exceed the criterion. Most of the highest concentrations were measured in 2001 and 2002 near Montréal and in the Boucherville and Repentigny areas (stations 10 et 11); the concentrations exceeding the criterion ranged from 0.732 to 1.546 ng/kg.



## Perspectives

Thanks to stronger regulations and several government programs, we have seen significant reductions in the release of contaminants into the Great Lakes – St. Lawrence system. Current levels of toxic contamination are low enough to allow the public to resume its traditional usage of the river, ie, fishing and fish consumption. The available data indicate that the presence of toxins does not preclude the enjoyment, at this time, of eating fish from the river and reaping the health benefits associated with such a diet. These contaminants will likely still be present, but in decreasing quantities, for decades to come in the water, the sediments and the biological communities of the St. Lawrence.



## To Learn More

*Guide de consommation du poisson de pêche sportive en eau douce, Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques and Ministère de la Santé et des Services sociaux, Québec.*

[www.mddelcc.gouv.qc.ca/eau/guide/index.htm](http://www.mddelcc.gouv.qc.ca/eau/guide/index.htm)

LALIBERTÉ, D. 2011. *Teneurs en polybromodiphényléthers (PBDE) dans les poissons du fleuve Saint-Laurent et des lacs et rivières du Québec<sup>3</sup> (2002-2008)*. Québec, Ministère du Développement durable, de l'Environnement et des Parcs, Direction du suivi de l'état de l'environnement, ISBN 978-2-550-60987-2 (PDF), 48 p.

### State of the St. Lawrence Monitoring Program

Five government partners – Environment and Climate Change Canada, Fisheries and Oceans Canada, Parks Canada, the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec and the Ministère des Forêts, de la Faune et des Parcs du Québec – and Stratégies Saint-Laurent, a non-governmental 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 water-quality changes.

### Source of data and writing:

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Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques

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<sup>3</sup> Polybrominated diphenyl ether (PBDE) concentrations in fish in the St. Lawrence River and lakes and rivers in the province of Québec

<sup>4</sup> Environmental monitoring branch