

**REGIONAL ASSESSMENT  
MONTRÉAL-LONGUEUIL SECTOR**



# **Regional Assessment Montreal-Longueuil Sector**

Revised by  
**Marie-José Auclair**  
ZIP Working Group

## NOTE TO READERS

Reports on Priority Intervention Zones (known as ZIPs) are produced as part of the St. Lawrence Vision 2000 action plan by Environment Canada's St. Lawrence Centre, in conjunction with Fisheries and Oceans, Health Canada and the Ministère de l'Environnement et de la Faune du Québec.

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# Production Team

Concept and Writing  
(preliminary version)

Jean Robitaille  
Bureau d'Écologie d'Appliquée

Co-ordination and Editing

Marie-José Auclair

ZIP Working Group

Alain Armellin, Jean-François Bibeault,  
Jean Burton, Guy Fortin, Anne Jourdain,  
Pierre Mousseau, Yolaine St-Jacques

Cartographic Analysis  
and Illustrations

Marcel Houle

Text Revision  
(French version)

Monique Simond

Copyediting and Layout  
(English version)

Patricia Potvin

Figures Layout

Denise Séguin

# Contributors

**Ministère de l'Environnement  
et de la Faune du Québec**  
Secteur Environnement  
Direction des Écosystèmes Aquatiques

Paul Benoit  
Isabelle Guay  
Serge Hébert  
Carolle Lachapelle  
Denis Laliberté  
Louise Lapierre

Direction de la Conservation  
et du Patrimoine Écologique

Rosaire Jean

Secteur Faune  
Direction Régionale de Montréal  
Service de l'aménagement et  
de l'exploitation de la faune

Bruno Bélanger  
Pierre Dumont  
Pierre Fournier  
Yvon Gravel  
Michel Letendre  
Martin Léveillé

**Fisheries and Oceans**  
Fish Habitat Branch

Luce Chammard

**Health Canada**

Lynne Belle-Isle

**Environment Canada**  
Environmental Protection Branch

Caroll Bélanger  
Élie Fédida  
Vincent Jarry  
Alain Latreille  
Gervais Leclair  
André Pelletier  
Marc Villeneuve

Canadian Wildlife Service

Léo-Guy de Repentigny

Communications

Paul Milot

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# Preface

*In April, 1994, the governments of Canada and Québec approved a four-year action plan to carry on the work of the St. Lawrence Action Plan.*

*The goal of St. Lawrence Vision 2000 is to conserve and protect the St. Lawrence so that the people who live along its shores can reclaim use of their river in the spirit of sustainable development.*

*The Priority Intervention Zones Program – better known by its French acronym ZIP – is a major element of the Community Involvement component of the St. Lawrence Vision 2000 action plan.*

*Through the ZIP Program, riverside communities are invited to play an active part in achieving the objectives aimed at restoring the St. Lawrence.*

*The program urges various community partners, non-governmental organizations and citizens' committees to work together to identify common priorities for the conservation and restoration of the St. Lawrence River.*

*We are pleased to present this assessment, which reports on the uses, resources and main environmental problems specific to this area. It has been prepared using all the data available from the various federal departments and provincial ministries involved in St. Lawrence Vision 2000.*

*We hope it will prompt a more enlightened public debate based on information that is as objective as possible, and that the debate will help the various partners involved to develop and implement an action plan for restoration of the area in question.*

Jean-Pierre Gauthier  
Regional Director General  
Quebec Region  
Environment Canada

Co-Chair, St. Lawrence Vision 2000

Denys Jean  
Assistant Deputy Minister, Policy  
Ministère de l'Environnement et  
de la Faune du Québec

Co-Chair, St. Lawrence Vision 2000

# Management Perspective

The Priority Intervention Zones (ZIP) Program is a federal–provincial initiative that aims to involve stakeholders and riverside communities in implementing rehabilitation measures for the St. Lawrence River. The program has three phases: producing a regional assessment report on the state of the St. Lawrence, consulting riverside partners at all levels and setting priorities for action, and developing an ecological rehabilitation action plan.

The regional assessment is based on a synthesis of three technical reports focusing on the biological, physico-chemical and socio-economic aspects of the study area. These reports are prepared by the ZIP team of the St. Lawrence Centre in co-operation with the federal and provincial partners of the St. Lawrence Vision 2000 action plan, of which the ZIP Program is a component.

The process of gathering and analysing data on a local scale has never before been undertaken for the St. Lawrence. The technical reports go even further, providing an assessment of the current state of a given area based on known quality criteria.

The challenge, then, is to formulate a scientific opinion based on the available information. The pitfalls are numerous: the data were collected for other purposes, the geographic and temporal coverage is less than ideal and the chemical analysis methods are not standardized, to name but a few.

The ZIP team remains nonetheless convinced that an enlightened and thoughtful overview of each study area can be presented without further delay. This first assessment, written for the riverside partners in each study area, is therefore a starting point and discussion paper.

## Perspective de gestion

Le programme des Zones d'intervention prioritaire (ZIP) relève le défi de la concertation entre les gouvernements fédéral et provincial et de l'implication des intervenants et des communautés riveraines, en vue de mettre en oeuvre des mesures de réhabilitation du Saint-Laurent. Ce programme comporte trois grandes étapes, soit l'élaboration d'un bilan régional sur l'état du Saint-Laurent, la consultation auprès de tous les partenaires riverains, avec l'identification de priorités d'intervention, et l'élaboration d'un plan d'action de réhabilitation du milieu naturel.

Le bilan régional est établi à partir d'une synthèse des trois rapports techniques portant sur les aspects biologiques, physico-chimiques et socio-économiques du secteur étudié. Ces rapports sont préparés par l'équipe ZIP du Centre Saint-Laurent en collaboration avec les partenaires fédéraux et provinciaux du plan d'action Saint-Laurent Vision 2000, dont le programme ZIP est un des volets.

La cueillette et l'analyse des données existantes à l'échelle locale est une première pour le Saint-Laurent. Les rapports techniques vont plus loin encore, en proposant un bilan des connaissances sur l'état actuel d'un secteur à partir de critères de qualité connus.

Le défi consiste donc à poser un jugement scientifique fondé sur l'information disponible. Les embûches sont nombreuses : les données ont été recueillies à d'autres fins, la couverture spatiale ou temporelle n'est pas idéale, les méthodes d'analyses chimiques ne sont pas uniformes, etc.

L'équipe ZIP demeure convaincue qu'il est possible de poser, sans plus attendre, un regard éclairé et prudent sur chaque secteur. Cette première évaluation constitue un point de départ et un document de base rédigé à l'intention des partenaires riverains de chaque secteur d'étude.

## Abstract

The Montreal-Longueuil sector of the St. Lawrence (ZIP 9) is the most heavily developed portion between Lake Ontario and the sea. Tentacular urban development has resulted in many and varied encroachments on the aquatic and shoreline environments. Large expanses of wetlands, once prime wildlife habitats, have disappeared under backfill, buildings and all manner of structure. What land remains intact has been subjected to substantial pollutant discharges over a number of decades.

This area is an entirely urban one: only the Boucherville archipelago still hints at the country. Farming is still practised on some islands. Because Montreal is an island, road and rail accesses converge to span the river over several bridges. Development of highway networks in the 1960s paved the way for urban sprawl and the reorganization of industrial activity on the south shore and West Island of Montreal. This urban sprawl is unabated today.

The study area includes a number of islands; some remain in their natural state, while others have been greatly modified, if not wholly created, by humans. Spring floods formerly allowed the St. Lawrence to inundate large tracts of riparian land. Today, such flooding is restricted by the backfilling of banks. Flood-prone areas can still be found at Le Marigot point, at the mouth of Rivière aux Pins, on the flats east of Montreal and around islands.

Development of the port area caused the disappearance of natural aquatic and riparian environments and changed the flow regime of the water. The presence of the port gave rise to the first pocket of industrial activity in Montreal and thus to the concentration of pollutants discharged in the area over a long period. Today, the Montreal port area is considered one of the most heavily contaminated sites on the St. Lawrence.

With the process begun of connecting sewage discharge pipes to the MUC southeast intercepting sewer, the level of water contamination by bacteria, phosphorus and metals decreased on the north shore of the study area. However, the Port of Montreal area is still

contaminated by bacteria in household sewage discharged to the river by unconnected collector and storm sewers.

Except for the local contamination from storm sewers, the start-up of the south shore wastewater treatment plant (CÉRS) in 1992 has improved the bacteriological quality of water on the south shore.

Nonetheless, the water quality remains below acceptable levels, and swimming and other recreational activities may be a health risk.

Despite heavy shoreline development in the study area, all the islands offer a wide variety of prime wildlife habitats which have allowed a diversified fauna and flora to flourish, particularly in the Boucherville islands. The Boucherville archipelago alone contains most of the wetlands in this sector; however, few areas have been set aside for conservation purposes.

The Boucherville archipelago is one of the main sport fishing areas of the Montreal region. Mercury contamination has resulted in restrictions on fish consumption, especially of piscivorous fish species such as Northern pike and Walleye.

We have noted a trend toward the enhancement of St. Lawrence river banks and their reappropriation for public use. A number of recreational and tourism centres and parks have begun to spring up in riparian and island environments.

## Résumé

Le secteur Montréal-Longueuil est la portion du Saint-Laurent la plus artificialisée entre le lac Ontario et la mer. La croissance tentaculaire de la ville a multiplié les motifs et les occasions d'empiètements en milieux aquatiques et riverains. De grandes superficies de milieux humides, qui constituaient des habitats fauniques de première importance, ont disparu sous les remblais, les édifices ou les structures les plus diverses. Les parcelles encore intactes ont été soumises à des rejets importants de substances polluantes pendant des décennies.

L'ensemble du secteur est en milieu urbain. Les seules portions du territoire qui peuvent rappeler la campagne se trouvent dans l'archipel de Boucherville. L'agriculture se pratique toujours sur certaines des îles. Comme la ville est insulaire, les accès routiers et ferroviaires s'assemblent en faisceaux avant d'enjamber le fleuve par plusieurs ponts. Le développement d'axes routiers au cours des années 1960 a favorisé l'étalement urbain et un redéploiement de l'activité industrielle vers la rive sud de même qu'à l'ouest de l'île de Montréal. Parallèlement, les municipalités se voyaient privées de leurs industries. L'étalement de la banlieue se poursuit encore aujourd'hui.

Le secteur d'étude compte plusieurs îles, certaines encore naturelles, d'autres grandement modifiées sinon entièrement créées par l'humain. La crue printanière permettait autrefois au fleuve d'envahir de grandes superficies de terres riveraines. Ces débordements sont aujourd'hui limités par le remblayage de la plus grande partie des rives. Les zones encore exposées aux inondations se trouvent à la pointe Le Marigot, à l'embouchure de la rivière aux Pins, à la batture dans l'est de Montréal et en périphérie des îles.

L'aménagement de la zone portuaire a fait disparaître des milieux naturels aquatiques et riverains et changé les conditions d'écoulement de l'eau. La présence du port a donné naissance au premier foyer montréalais d'activités industrielles, et partant à la concentration dans le secteur des rejets polluants pendant une longue période. Aujourd'hui, la zone portuaire de Montréal est considérée comme l'un des sites les plus fortement contaminés le long du Saint-Laurent.

Depuis le début des raccordements à l'intercepteur sud-est de la CUM, le degré de contamination de l'eau par les bactéries, le phosphore et les métaux a diminué sur la rive nord du secteur d'étude. Toutefois, la zone portuaire de Montréal est toujours contaminée par les bactéries contenues dans les eaux domestiques déversées dans le fleuve par des collecteurs non raccordés et les déversoirs d'orage. À l'exception de la contamination locale causée par les déversoirs d'orage, la mise en service du Centre d'épuration de la Rive-Sud (CÉRS) en 1992 a amélioré la qualité bactériologique de l'eau sur la rive sud.

Néanmoins, la qualité de l'eau demeure insalubre et la pratique de la baignade et d'autres activités récréatives présente des risques pour la santé.

Malgré la forte artificialisation des rives du secteur d'étude, l'ensemble des îles offrent une grande variété d'habitats fauniques qui, particulièrement aux îles de Boucherville, favorisent le développement d'une flore et d'une faune diversifiées. L'archipel de Boucherville regroupe à lui seul la majorité des milieux humides du secteur d'étude. Toutefois, peu d'espaces sont réservés à la conservation.

L'archipel de Boucherville constitue l'un des principaux secteurs de la région montréalaise fréquentée pour la pêche sportive. La contamination par le mercure, particulièrement chez les espèces piscivores comme le Grand Brochet et le Doré jaune impose, toutefois des restrictions à la consommation.

On observe une tendance vers la mise en valeur et la réappropriation des abords du fleuve. Plusieurs pôles récréo-touristiques de même que plusieurs parcs riverains ont ainsi vu le jour en milieu riverain et insulaire.

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The mere mention of the St. Lawrence evokes in most Quebecers a deep-rooted feeling of belonging to this land traversed by the river on its way from the Great Lakes to the sea. Images of a mighty river spring to mind, hugged on either side by fertile plains, shaded banks and rich wildlife.

This country was born on the banks of the river – as is still evident today in the division of land, a vestige of the seigneurial system. Back then, people had to learn to live with the spring flooding of the St. Lawrence. In return, the river provided the European settlers, still struggling with unreliable harvests, with a sure supply of fish and first-rate means of communication, linking the first towns and villages that grew up along its banks.

With time, forests gave way to farmland, and then towns and cities sprang up. Until that point, the low population density and the very size of the St. Lawrence meant that human use of the river had had virtually no impact on its resources. But things would soon change. The first major impact appears to have been caused by logging and the beginnings of industrialization in the nineteenth century; this included log drives from the Ottawa River to Quebec City, the building of dams and sawmills along tributaries, and the construction and commissioning of the first hydro-electric power plants.

The pace of change accelerated in the twentieth century with the construction of major dams on the St. Lawrence to control the flow of water, of ship channels and then the St. Lawrence Seaway. More and more industries were established near towns and cities, often right on the river. The proximity of the river offered several advantages: it reduced the cost of transporting raw materials, solved water supply problems and provided an easy way of getting rid of waste.

The St. Lawrence gradually succumbed to the accumulated abuse. A few informed observers noted that some animal species were becoming less abundant and suggested that this was the result of habitat disturbance. Their warnings elicited little public interest, however.

Then, in the early 1970s, public opinion was suddenly roused when it was realized that mercury contamination of fish was not just an abstract research topic but a real risk to which some Native peoples and many sport fishermen were exposed. As the list of toxic substances reported in the aquatic environment continued to grow, the general public changed its perception of the problem and put the quality of the environment at the top of its list of concerns. There is virtually unanimous agreement now that the comforts afforded by an industrial society have a drawback: unbridled exploitation of resources and the increasing quantity of contaminants will eventually threaten all forms of life, including human beings.

Most industrialized countries have now agreed to base their economies on sustainable development. Profit can no longer be the sole guiding force of human activity. Given the fragile nature of our environment and the limitations of our planet, sustainable economic development must ensure that scarce resources are used for a variety of purposes; it must also take into account the quality of life of human beings and promote the maintenance of biological diversity.

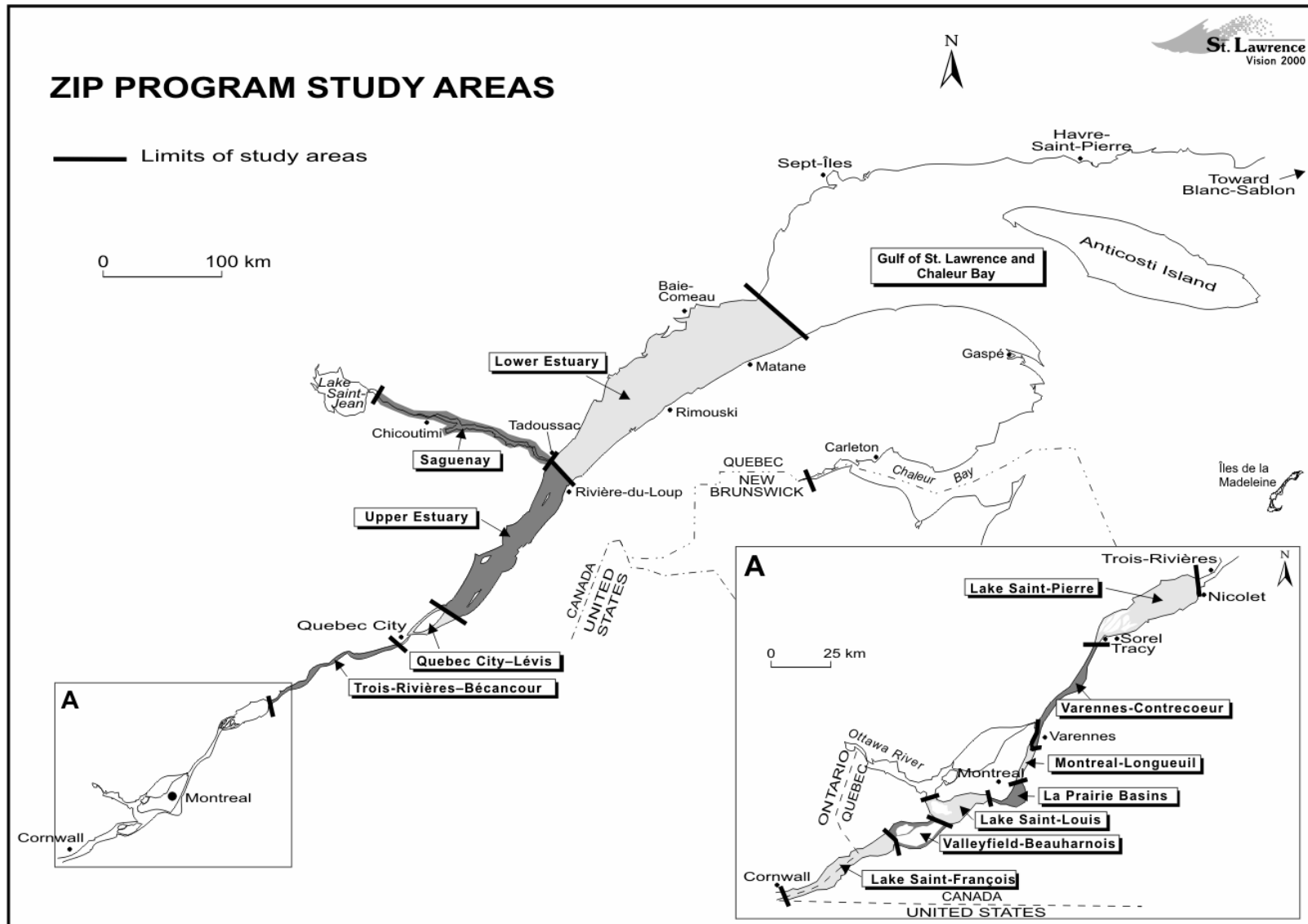
Beginning in the 1960s, the awakening of public opinion about the state of the environmental degradation of the Great Lakes and St. Lawrence River and the urgency of the situation prompted governments to undertake concrete, concerted action. This action paved the way for the 1972 Canada-U.S. agreement to clean up the Great Lakes. An amendment was made in 1987 to include a program to restore use at the local level (Remedial Action Plans, or RAPs). In addition, an agreement to control the discharge of toxic waste into the Great Lakes system and the Great Lakes Charter were signed in 1988 by Ontario, Quebec and the eight U.S. states concerned. Out of concern for the poor quality of water in the river and its tributaries, the Quebec government launched its own wastewater treatment program in 1978.

In 1989, the federal and Quebec governments agreed to coordinate their efforts under the St. Lawrence Action Plan; in 1994, the plan was extended and renamed St. Lawrence Vision 2000 (SLV 2000). One of the objectives of the plan is to draw up a comprehensive assessment of the state of the environment of the Quebec stretch of the river. Under the ZIP program, the St. Lawrence has been divided into 23 Priority Intervention Zones (better known as ZIPs) within which people and organizations will be encouraged on a local level to work together to restore and protect the river and coordinate its uses (Figure 1). As part of the groundwork for the consultations, SLV 2000 partners are reviewing and synthesizing current knowledge about the state of the environment in each area.

This report summarizes the highlights of the technical reports<sup>1</sup> and assesses current knowledge of the state of resources and present and future uses of the Montreal-Longueuil sector and attendant constraints.

---

<sup>1</sup> One report deals with the physico-chemical aspects of the water and sediments (Fortin 1995), another with the biological communities (Armellin et al. 1995), and a third with the relevant socio-economic aspects (Bibeault and Jourdain 1995).



**Figure 1** ZIP Program study areas



The purpose of this effort to review and synthesize our existing knowledge is to provide the various riverside stakeholders with accessible, objective scientific data so that they can define their priorities for action. They will then be able to draw up and implement action plans on a local and regional level, with each partner acting within its sphere of responsibility, but in coordination with the other partners.

## Characterization of the Montreal-Longueuil Sector

### 3.1 Physical Environment

Several thousand years ago during the last Ice Age, southern Quebec and Ontario was covered by a major arm of the sea. As the glacier retreated, the earth crust rose gradually, isolating the huge saltwater basins that became the Great Lakes. Today these bodies of water are fed by precipitation captured by a 1.2 million km<sup>2</sup> watershed. The excess water flows to the sea through the St. Lawrence River, passing through the outlet of Lake Ontario at an average rate of 6850 m<sup>3</sup>/s.

Over thousands of years, the river carved its bed out of the loose sediments and clays that had been deposited at the bottom of the former sound. This fertile plain, known as the St. Lawrence Lowlands, is bounded on the north by the Canadian Shield and on the south by the Appalachian Mountains.

From Lake Ontario, the St. Lawrence flows between Ontario and New York State for approximately 170 km before reaching Quebec. The water next passes through Lake Saint-François, then, for the most part, through the Beauharnois canal before reaching Lake Saint-Louis. Although the contribution of tributaries to the river flow is relatively minor between Lake Ontario and Lake Saint-Louis, this latter lake, located upstream of our study area, is characterized by the major inflow of the Ottawa River. Part of the Ottawa River meets the St. Lawrence at Lake Saint-Louis in the Vaudreuil and Sainte-Anne channels, while the rest flows through the Rivière des Prairies and the Mille-Îles River to the eastern tip of Montreal Island.

Inflow from the Ottawa River is significant not only because of its flow rate<sup>2</sup>, but also because of the chemical composition of its brown waters, which are softer, less conductive and

---

<sup>2</sup> The mean annual flow of the Ottawa River is approximately 2000 m<sup>3</sup>/s but its contribution may vary considerably with the seasons, unlike the water flowing from the Great Lakes, which is controlled by several dams. The flow rate, on average, is 800 m<sup>3</sup>/s at low water and 6500 m<sup>3</sup>/s at high water; however, it has exceeded 9200 m<sup>3</sup>/s in the past, which is almost equal to the mean flow rate of the St. Lawrence at LaSalle (9182 m<sup>3</sup>/s).

more turbid (cloudy) than the green waters of the Great Lakes. Most of the basin of this river is on the Canadian Shield, which is a factor in giving the waters certain characteristics that clearly distinguish it from the waters of the Great Lakes.

These two water masses flow over considerable distances before mixing completely. In the Montreal-Longueuil sector, a mixing zone can be distinguished (Ottawa River-Great Lakes) along the north shore, while the centre and the south shore are characterized by water typical of the Great Lakes, to which is added inflow from local tributaries. The relative size of the two water masses, particularly the Ottawa, varies with fluctuations in flow.

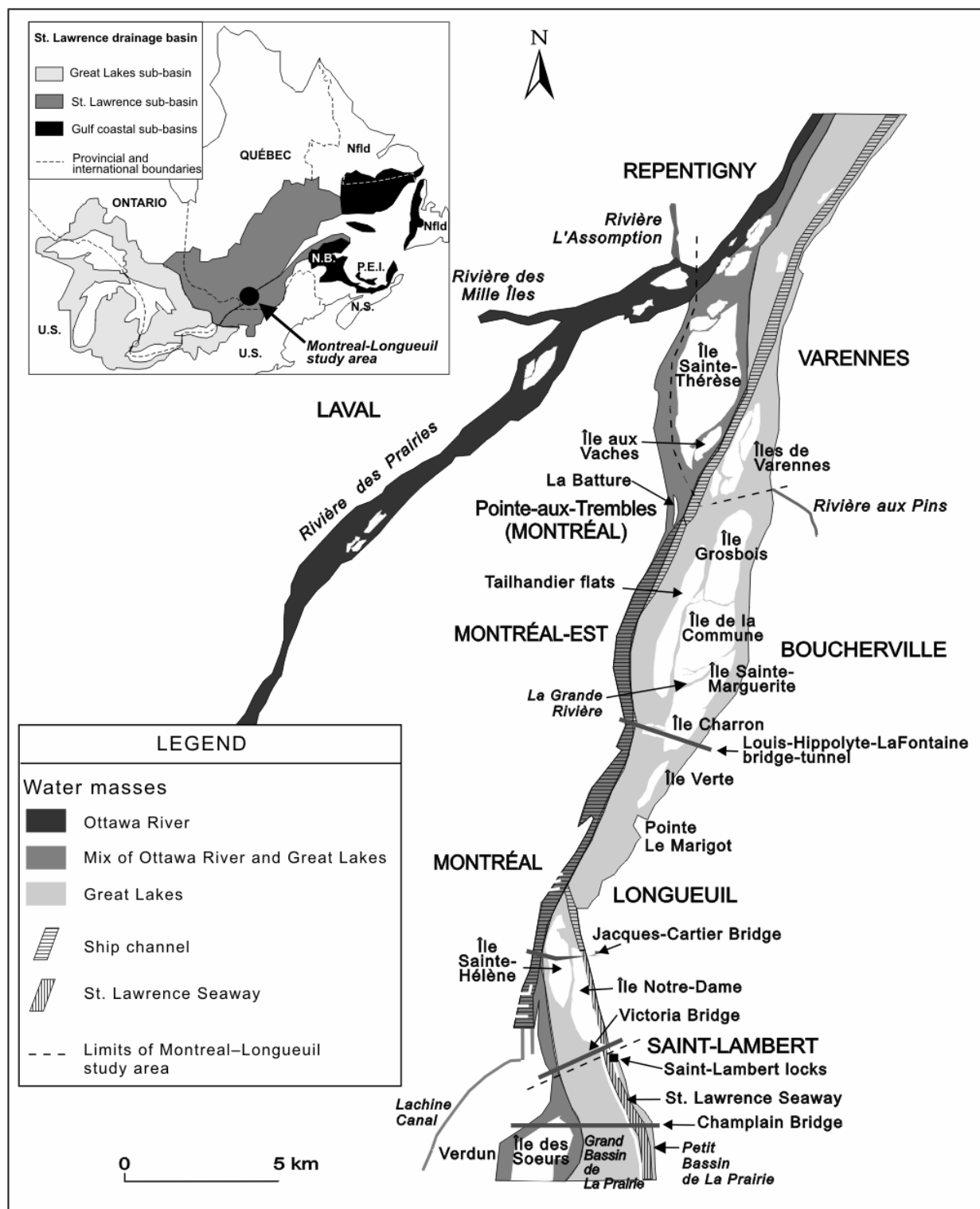
Our study sector begins at the upstream tip of Île Notre-Dame, ending on the south shore at Rivière aux Pins and on the north shore at Repentigny (Figure 2). It is 21 km long, but nowhere wider than 4 km. There are a number of islands, some of them still in their natural state, others considerably modified, if not wholly created, by humans.<sup>3</sup> The majority of the islands are part of the Boucherville archipelago, while others are across from Longueuil (Verte, Charron, Sainte-Hélène and Notre-Dame) and Pointe-aux-Trembles (La Batture).

The mean annual flow of the St. Lawrence in this area is 9182 m<sup>3</sup>/s, basically the same as at the outlet of Lake Saint-Louis, with three minor tributaries flowing into the lesser La Prairie basin and contributing a mere 7 m<sup>3</sup>/s. Between Île Notre-Dame and Montreal, almost the entire volume (99%) flows into the study area through the St. Lawrence itself; the remaining 1% flows through the St. Lawrence Seaway after transiting through the south shore canal and the lesser La Prairie basin.

On entering the study area, most of the river flow divides at the upstream tip of Île Sainte-Hélène. Most of the water flows between the Port of Montreal area and Île Sainte-Hélène, while the rest flows into the Le Moyne channel which separates Île Sainte-Hélène from Île Notre-Dame.

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<sup>3</sup> For example, parts of Sainte-Hélène, Notre-Dame, Verte, Charron and Sainte-Marguerite islands, and a few artificial islands built up with dredged material from the ship channel.



**Figure 2** Map of study area

The river narrows here, resulting in an increased flow rate which exceeds 1 m/s in the channel and rises as high as 3 m/s at Cité du Havre. Changes in current direction and the presence of piers and jetties cause eddies and countercurrents along the port area.

Flow is mainly along the north shore throughout the study area. Channel depth may be as much as 9 to 11 m in some places. The current is weaker on the south shore; speeds are generally around 30 cm/s, except in the ship channel accessing the St. Lawrence Seaway where it is twice that (60 cm/s). The slower flow favours the deposition of fine sediments which tend to accumulate in the Boucherville area.

Here, the nature of the river bottom differs from one shore to the other. Fine materials are more common along the south shore, while the substratum on the north shore is generally coarser. There is little sediment deposition in the centre.

Spring floods formerly caused the river to overflow over large areas of the shoreline. These floods are now limited by the backfilling of banks along most of the shoreline (construction of Highway 132, the Montreal Metro, Man and His World and various housing developments). The areas still exposed to flooding are at Le Marigot point, the mouth of Rivière aux Pins, at La Batture east of Montreal and most particularly around islands. A number of islands in the Boucherville archipelago, including Saint-Jean, Pinard and Commune islands, have a steep slope on the eastern side but a gentler slope on the west and are commonly flooded in the spring. Lafontaine, Montbrun and Dufault islands and the Tailhandier flats, along with the low islands along the ship channel, are almost entirely submerged during floods; only mounds formed by the dredged material deposited on the Tailhandier flats remain exposed.

The Boucherville islands are crossed by a number of channels, most of which are too shallow at low water to allow ships to pass. Only the channel known as La Grande Rivière, which separates Sainte-Marguerite island from Saint-Jean and Pinard islands, remains open throughout the summer season.

Table 1 summarizes certain characteristics of the Montreal-Longueuil sector in its present state.

**Table 1**  
**Some hydrological characteristics of the Montreal-Longueuil sector**

Water surface area	31 km <sup>2</sup>
Length	21 km
Width	Mean: 1.48 km Maximum: 4 km
Depth	Maximum: 11 m
Mean annual flow:	
- St. Lawrence at the inlet of the sector	9182 m <sup>3</sup> /s
- Tributaries	7 m <sup>3</sup> /s
- Total at the outlet of the sector	9189 m <sup>3</sup> /s

## 3.2 Biological Environment

For the passerby stopping at the water's edge, today's landscape and the ceaseless rumble of the city noise make it difficult to image how the river must have been at the beginning. No matter where we look, buildings, highways, bridges and power lines remind us that the St. Lawrence is now heavily marked by its proximity to the metropolis.

We might almost imagine there is no longer anything natural in this steel and concrete environment, and yet some habitats have survived to the present day and still support a fauna and flora worth protecting.

### 3.2.1 Vegetation and habitats

The city long ago replaced most of the natural woodlands in the study area. The only remaining one covers approximately 19 hectares (ha) in the middle of Île Grosbois; the main species are Red ash, Silver maple and Basswood.

The river banks have also been reshaped, resulting in the disappearance of the original plant associations. These changes have been instrumental in reducing the overall quality of the environment. A natural river bank normally slopes gently and displays a stratification of soils and vegetation, so that the transition between dry land and the aquatic environment is gradual. These fringes of shoreline habitat are home to a very rich fauna; mammals, birds, fish, amphibians and reptiles use these areas to reproduce or to find shelter and food. Figure 3 shows the habitats characteristic of wetlands in the area, and Figure 4 presents their geographical distribution. The last remaining areas of natural shoreline in the study area are mainly located around the Boucherville islands; however, the relief of these islands limits the surface area of wet meadows and swamps, ordinarily ideal habitats for wildlife.

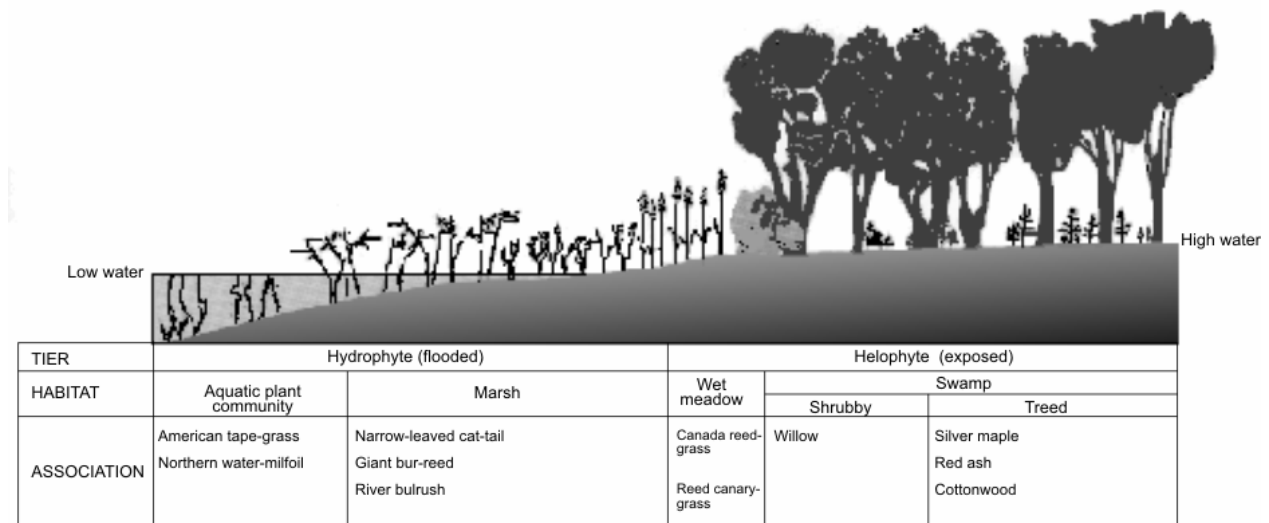
Barely 56 ha of swamp can be found in the archipelago, occupied mainly by shrubby stands of Willow, but also stands of Red ash, Silver maple and Cottonwood.

Wet meadows (151 ha), dominated by Reed canary grass, Canada reed grass and Prairie cord grass, are located on Île Verte, the Tailhandier flats, the western shores of Lafontaine, Pinard and Commune islands and at Rivière aux Pins.

Marshes cover approximately 201 ha along Courant channel in the Boucherville islands, made up mostly (72%) of stands of Narrow-leaved cat-tail. Other marshes on the shores of Île Grosbois are dominated by River bulrush, with secondary stands of Giant bur-reed, Broad-leaved arrowhead, Erect arrowhead and American bulrush. The little marsh at the mouth of Rivière aux Pins, on the south bank, is characterized by an introduced species, Flowering rush.

Losses of aquatic plant communities have not been as severe as the land-based and shoreline vegetation; today, they cover roughly 537 ha. Practically non-existent on the north shore, they ring most of the islands and are particularly dense in the channels. Dominant species in these plant formations are Northern water-milfoil and American tape-grass. Plant communities in the western part of the Boucherville archipelago, near the ship channel, are mainly composed of submerged species (Northern water-milfoil, Canada waterweed, Dubius water-stargrass, Pectinate pondweed and Star duckweed).

Semi-aquatic mammals	◄———— Zone used by Muskrat, Beaver and Mink ————►			
AMPHIBIANS AND REPTILES	◄———— Zone used by turtles, frogs and salamanders ————►			
FISH	◄———— Spring feeding zone for fish (Walleye, Yellow perch, Northern pike, Smallmouth bass, Brown bullhead, Lake sturgeon) ————► ◄———— Spawning of Northern pike and Yellow perch in spring ————► ◄———— Spawning of Largemouth bass and Brown bullhead ————►			
BIRDS	Migrating diving ducks Dabbling ducks Great blue heron American wigeon Pied-billed grebe (feeding)	Dabbling ducks (feeding and brood rearing) Great blue heron Marsh wren (feeding) Black tern Swamp sparrow Virginia rail (nesting)	Dabbling ducks Swamp sparrow (nesting)	Great blue heron (nesting) Wood duck (nesting) Willow flycatcher Yellow warbler

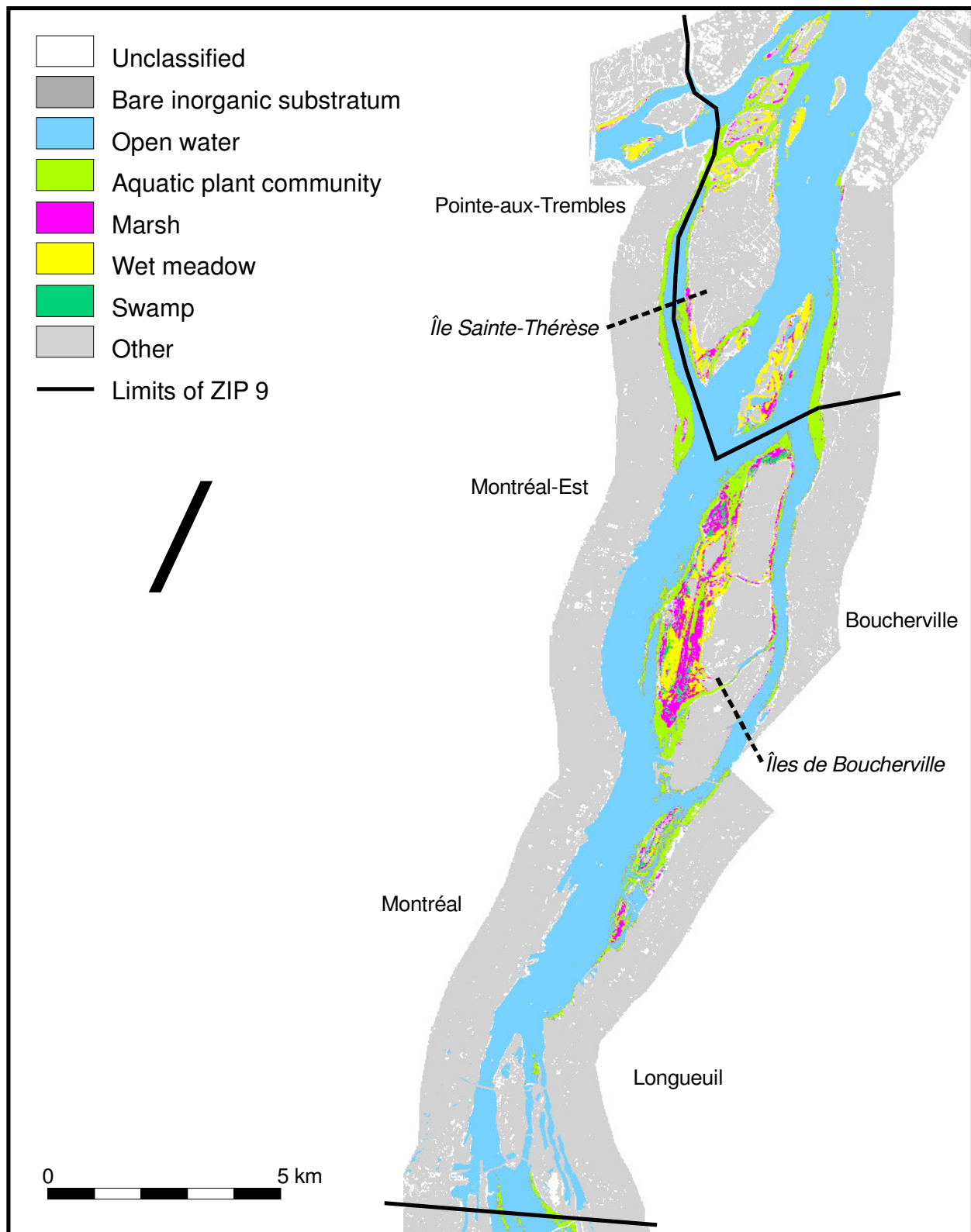


Adapted from: St. Lawrence Centre and Université Laval. 1992. *A Mosaic of Habitats: Freshwater and Brackish Ecosystems*. Environmental Atlas of the St. Lawrence. "St. Lawrence UPDATE" series. Environment Canada, Conservation and Protection, Quebec Region.

Source: Armellin, A., P. Mousseau, and P. Turgeon. 1995. *Synthèse des connaissances sur les communautés biologiques du secteur d'étude Montréal-Longueuil*. Technical Report. Priority Intervention Zone 9. Environment Canada - Quebec Region, Environmental Conservation, St. Lawrence Centre.

**Figure 3 Principal characteristic wetland habitats of the Montreal-Longueuil study area**





Taken from: Létourneau, G. 1995. *Répertoire de télédétection au Centre Saint-Laurent*.  
 Environment Canada - Québec Region, Environmental Conservation, St. Lawrence Centre.

**Figure 4** Wetlands in the Montreal-Longueuil study area

These very dense communities of aquatic plants are home to an abundant and diversified fauna made up of small invertebrates, which find shelter and food there; this concentration of prey in turn attracts waterbirds and fish. The plant communities are also major spawning areas for a number of fish species, particularly Yellow perch and Northern pike, as the plants support the eggs above the mud. After hatching, the fry can find food and shelter at the same site. These are also prime habitats for amphibians, certain reptiles and Muskrat. Figure 5 shows the main prime wildlife areas in the study area, mainly in the Boucherville archipelago and along the south shore of the St. Lawrence.

### **3.2.2 Benthos**

The heading benthos covers all the animal or plant organisms that live on, attach to or burrow into the water bottom.

The study of benthic animals yields a great deal of useful information for the description of aquatic habitats. On the one hand, these organisms are positioned at the base of the food chain and their abundance is important to the establishment of populations of higher organisms such as fish and birds. The distribution of benthic animals in the environment is also highly dependent on local conditions (presence of aquatic plant communities, nature of bottom, depth) and the requirements of each species in this respect; one species may be found almost solely in aquatic plant communities, while another will seek areas with no vegetation.

Surveys of benthos in the study area were carried out primarily under the Archipel Project in the 1980s. This research yielded descriptions of 30 typical habitats<sup>4</sup> in the waters surrounding Montreal. Ten of these habitats are represented in the Montreal-Longueuil sector. The environmental variables most closely related to benthos composition are water type (mixed or green), nature of bottom, current speed and depth.

Benthos in this sector is generally less abundant and less diversified than in Lake Saint-Louis or the greater La Prairie basin. The dominant benthic animal groups are gastropods, particularly *Bithynia tentaculata* and *Amnicola limosa* species, commonly known as snails,

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<sup>4</sup> In what is defined as a typical habitat, no matter the location, we find a similar benthos composition.

pelecypods (mussels) and oligochaetes (worms).<sup>5</sup> The highest density of gastropods measured in the plant communities was 10 000 individuals/m<sup>2</sup>.

### 3.2.3 Fish

The fish fauna of the Montreal-Longueuil sector includes 58 species and is somewhat less diversified than neighbouring water bodies. Some fish (Rosyface shiner, Channel catfish, Stonecat, Slimy sculpin and Johnny darter) found in the Lachine Rapids or the greater La Prairie basin have never been reported here, perhaps due to the more limited variety of habitats available.

Inventories carried out with gillnets have shown that Brown bullhead, Yellow perch, Walleye and White sucker dominate fish communities in the upstream portion of the study area, while the most abundant species downstream are White sucker, Longnose sucker and Shorthead redhorse, along with Northern pike and Smallmouth bass.

We can well imagine that the variety of fish must have been greater prior to the destruction of most of the shallow habitats along the shoreline on which many species depend. However, we do not have the inventory data with which to make a more accurate assessment of the effects of these changes on fish.

Recognized spawning grounds in the Montreal-Longueuil sector are located mainly in still water, most often in the dense aquatic plant communities in the Boucherville archipelago and along the south shore (Figure 5). The only potential spawning ground in moving water in this sector is in the Le Moyne channel, between Île Sainte-Hélène and Île Notre-Dame, although some species can easily go as far as the Lachine Rapids to spawn.

### 3.2.4 Birds

Apart from the Boucherville archipelago, the study area offers few suitable habitats for waterfowl.

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<sup>1</sup> This group of annelids (segmented worms), includes 60 species divided into 4 families: Lubiculids, Enchytraeds, Tubificids and Naidids. A strong predominance of Tubificids in a given area is normally a good indicator of organic pollution.

The level of use by waterfowl during the migration season in this sector is low. In the spring of 1990, approximately 5100 individuals, mainly dabbling ducks, were counted on the Tailhandier flats and the western shores of other islands in the Boucherville archipelago; species observed were Black duck, Mallard, Common merganser, Gadwall and American widgeon. In the fall of the same year, the number of migrating birds resting here was barely 1200 individuals, mainly Black duck, Mallard and Gadwall. This estimate is much lower than the number of individuals crossing through the area during the fall migration. These dabblers leave around mid-October, abandoning the site to a few hundred scoters.

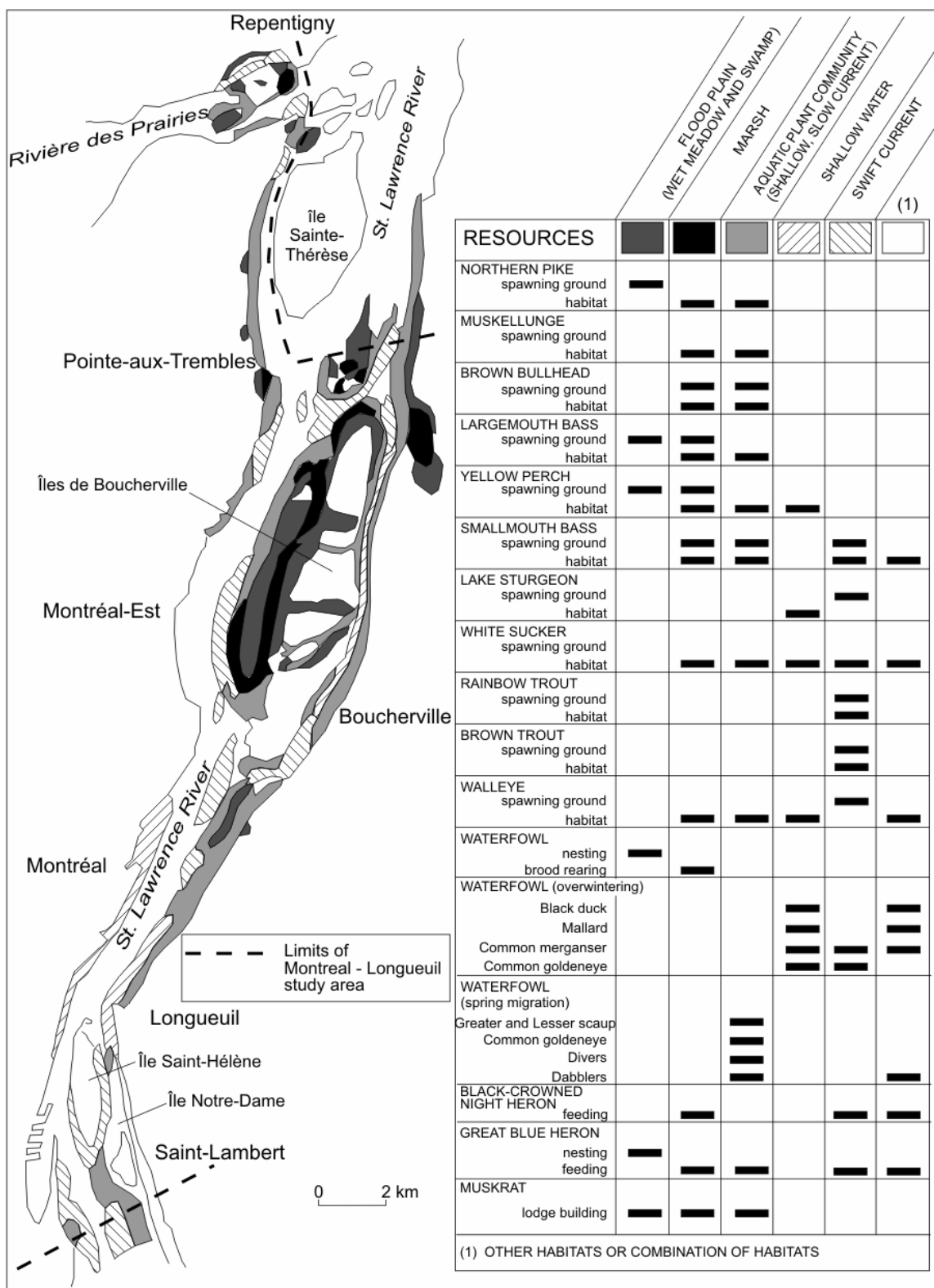
Some ducks nest on the islands of the archipelago, particularly in the wet prairies of high grasses in Île Verte and Île Saint-Jean (Figure 5). The Courant channel seems to be used by a number of pairs to raise their broods. Among the species breeding on the islands are Redheads, a diving duck species, and eight species of dabbling ducks, the most common being Northern pintail, American widgeon and Gadwall.

In the past, there were two colonies of Ring-billed gull in the Montreal-Longueuil sector. The first, on Moffat island, disappeared as a result of backfilling of Expo 67 islands; the second, at Île Verte, was abandoned in the early 1970s because of exceptionally high water levels.

Both Great blue heron and Black-crowned night-heron nest on Hérons island at the foot of the Lachine Rapids and come to feed along Notre-Dame and Sainte-Hélène islands. Groups of shorebirds (sandpipers and willets) have been seen in the fall along the shores, especially from Marie-Victorin park to Le Marigot point, and on certain parts of the archipelago islands.

### **3.3 Human Occupation**

The Lachine Rapids, which had been an obstacle to Jacques Cartier's efforts to find a western passage, became in later years one of the main reasons for founding Ville Marie and then developing the Port of Montreal. As a hub for the transportation of goods toward western Canada and the northern United States, Montreal's industrial activity developed first around the port and then along the Lachine Canal.



Sources: Auger, D., M. Bureau, J. Dubé, Y. Gravel, J. Leclerc, G. Lépine, M. Léveillé, P. Ragault, and M. Rousseau. 1984. *La faune et son habitat: Problématique, synthèse et éléments de solution*. Ministère du Loisir, de la Chasse et de la Pêche, Service Archipel. Technical report.

Ministère du Loisir, de la Chasse et de la Pêche. 1984. *Synthèse des études biologiques et des études sur le loisir: Atlas cartographique*. Direction générale de Montréal, Service Archipel.

**Figure 5 Main prime wildlife areas in the Montreal-Longueuil sector**

Since the opening of the St. Lawrence Seaway, in 1954 to 1959, the Port of Montreal has maintained its advantages as a terminus for ocean-going vessels. The growth of container handling has enabled the Port of Montreal to maintain its level of activity at close to 20 million tonnes per year. Petroleum products account for some 30% of the products handled. In general, port activity depends on the economic situation and also to a great extent on international trade.

Bridge construction and the development of major highway links during the 1960s encouraged urban sprawl and the movement of industrial activity toward the south shore and the western part of Montreal Island.

Such reshaping of the urban fabric meant encroaching on farmlands and riparian habitats. Montreal itself was particularly affected by the aging of the industrial structure, the exodus of young families (leading to a lower population growth rate), a stagnant housing market and a higher unemployment rate.

At the present time, this trend is unabated and urban sprawl continues. Over the past 30 years, Boucherville in particular has been subjected to the strong pressure of urbanization.

The land adjacent to the water body examined here covers 219 km<sup>2</sup> and has a population of approximately 590 000, 69% of whom live on Montreal Island in the municipalities of Montreal and Montréal-Est; the remainder of the population lives on the south shore, in Saint-Lambert, Longueuil or Boucherville. The highest population density, 10 700 inhabitants/km<sup>2</sup>, is in the Plateau Mont-Royal/Centre-Sud area of Montreal and the lowest density (304 inhabitants/km<sup>2</sup>) in Montréal-Est.

The study area as a whole is an urban environment. The only parts of the area that still recall the country are in the Boucherville archipelago, where a small number of homes, cottages and farm buildings on Commune and Grosbois islands are still in use. Farming is still practised in these areas and on neighbouring islands.

## CHAPTER 4      **Human Activities and Their Main Effects on the River**

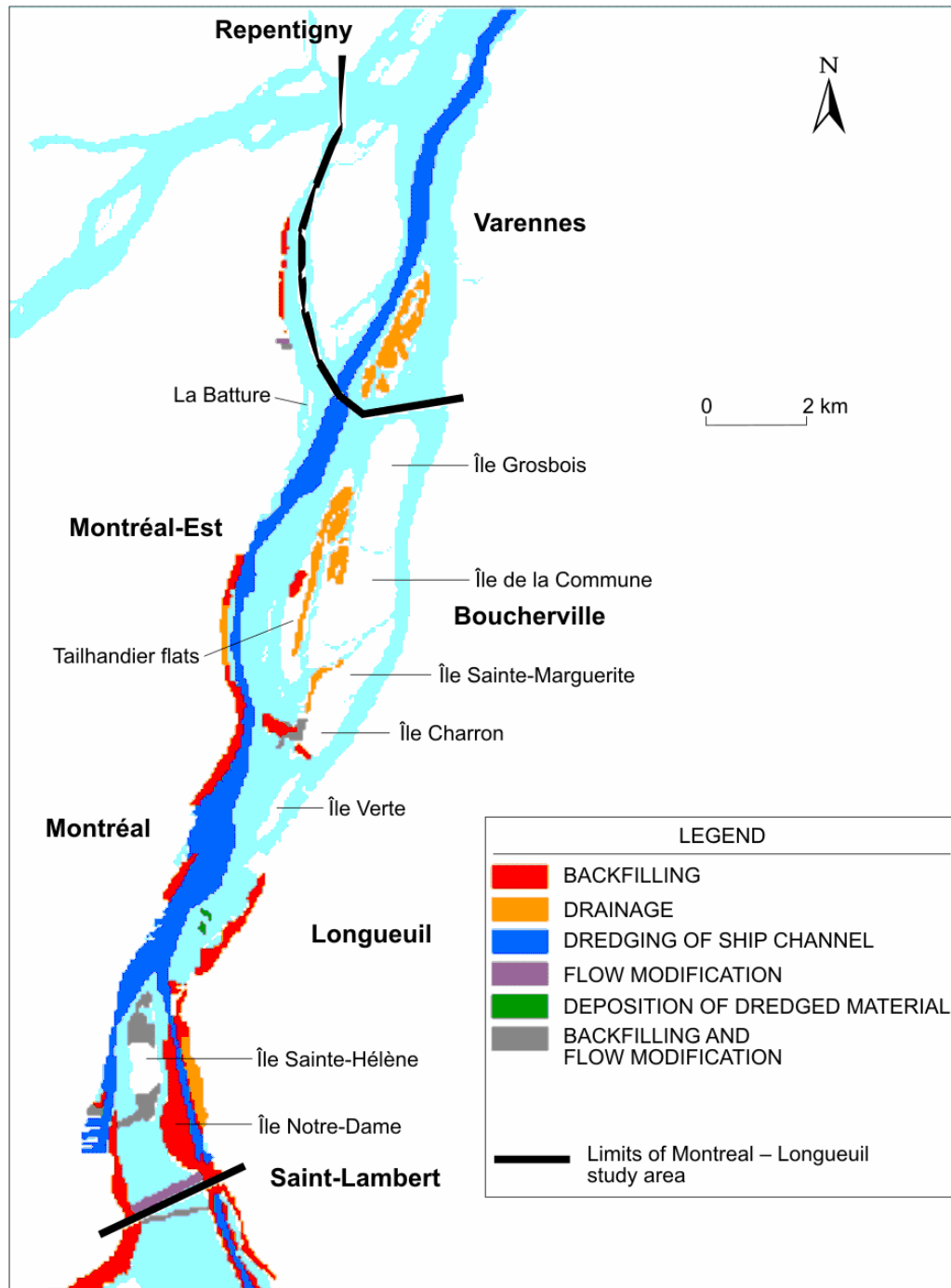
### **4.1      Physical Changes to Aquatic and Riparian Environments**

The section of the St. Lawrence examined here is the most heavily developed segment between Lake Ontario and the sea. The tentacular growth of the city has resulted in a number of encroachments on the aquatic and riparian environments (Figure 6). Even though their combined effect is quite significant, it is practically impossible to assess the individual consequences of these encroachments. The first changes date back to the 18th and 19th centuries, took place on a fairly small scale, and their apparent effects were local in scope. The rate and extent of change, however, has increased during the 20th century.

These changes may take the shape of backfilling to transform a marshy area, deemed useless in the eyes of developers, into building lots or perhaps a dike to protect a property from flooding. A variety of structures may also be involved (bridges, pilings, breakwaters, wharfs or other structures), either in the river itself or on the banks, with consequences for flow conditions. Other activities such as dredging or sediment dumping in open water change the water bottom configuration and sediment distribution.

Today, almost all banks in the study area have been built on. It is estimated that at least 1590 ha of natural habitats were destroyed between 1945 and 1984 in the Montreal-Longueuil sector (Table 2). Approximately 480 ha of wetland habitats were destroyed by backfilling and drainage. Aquatic plant communities were reduced by 39%; marshes and wet meadows by 30%.

The portions of developed shoreline are much poorer and less productive environments than the parts that have been kept in their natural state. Backfilling has made slopes steeper, thus eliminating transition zones between the aquatic and terrestrial environments; coarse material, laid down to resist currents, prevents vegetation from flourishing. Not only do fauna and flora disappear from the backfill sites themselves, but the abundance and the diversity of neighbouring land and aquatic environments are reduced.



*Sources:*

Marquis, H., J. Therrien, P. Bérubé, and G. Shooner. 1991. Modifications physiques de l'habitat du poisson en amont de Montréal et en aval de Trois-Pistoles de 1945 à 1988 et effets sur les pêches commerciales. Study carried out by the Groupe Environnement Shooner Inc. for Fisheries and Oceans and Environment Canada. Report and map atlas.

Robitaille, J. A., Y. Vigneault, G. Shooner, C. Pomerleau, and Y. Mailhot. 1988. Modifications physiques de l'habitat du poisson dans le Saint-Laurent de 1945 à 1988 et effets sur les pêches commerciales. Rapp. Tech. Can. Sci. Halieut. 1608. Report and map atlas.

**Figure 6**

**Physical changes to fish habitats in the Montreal-Longueuil sector between 1945 and 1984**



**Table 2**  
**Areas of disturbance inventoried, by habitat affected,**  
**in the Montreal-Longueuil sector between 1945 and 1984**

Change	Area affected, by type of environment (ha)			Total
	Deep water	Marshes and wet meadows	Aquatic plant communities	
Backfilling	150	30	267	447
Drainage	0	120	66	186
Deposition of dredged material	6	0	0	6
Dredging	814	0	0	814
Flow modifications	37	0	0	37
Flow modifications and backfilling	86	4	16	106
Total	1093	154	349	1596

*Sources:* Marquis, H., J. Therrien, P. Bérubé, and G. Shooner. 1991. *Modifications physiques de l'habitat du poisson en amont de Montréal et en aval de Trois-Pistoles de 1945 à 1988 et effets sur les pêches commerciales*. Study carried out by Groupe Environnement Shooner Inc. for Fisheries and Oceans and Environment Canada. Report and map atlas.

Robitaille, J.A., Y. Vigneault, G. Shooner, C. Pomerleau, and Y. Mailhot. 1988. *Modifications physiques de l'habitat du poisson dans le Saint-Laurent de 1945 à 1984 et effets sur les pêches commerciales*. *Rapp. Tech. Can. Sci. Halieut. 1608*. Report and map atlas.

Some terrestrial habitats subject to spring flooding are important spawning and nursery sites (Figure 5). This is the case, for example, for the lowlands around many islands and the areas near the mouth of Rivière aux Pins in Boucherville. In the spring, a number of species, including Northern pike, leave the cold waters of the St. Lawrence to spawn in flooded fields. Egg incubation time and growth of fry are accelerated in these calm, shallow waters, which are quickly warmed by the sun. Flood control thus limits the reproduction of a number of fish species.

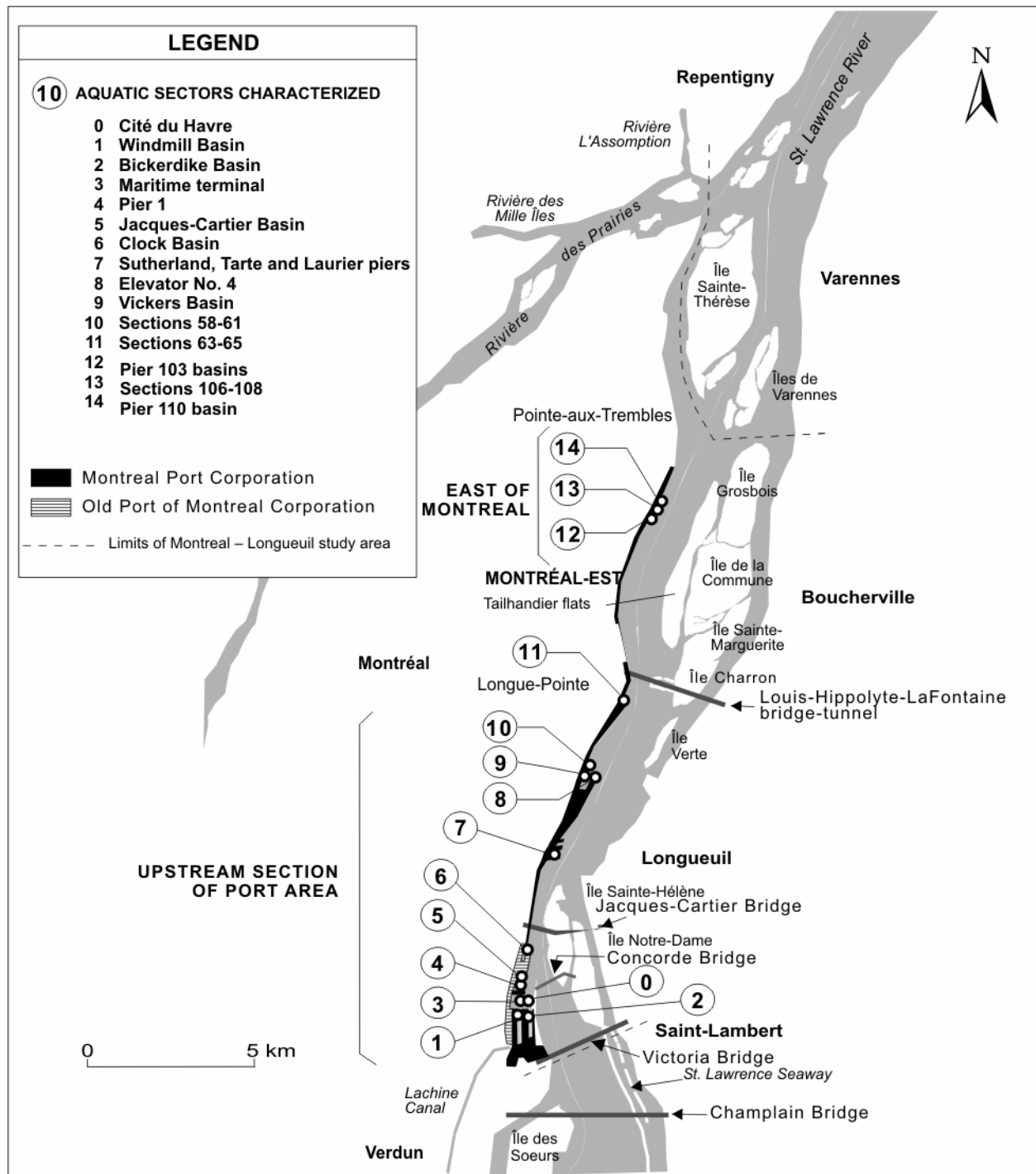
Changes associated with port activities and shipping also seem to have had significant impacts on natural environments in the study area. Over 800 ha had to be dredged over the past few decades to increase the water depth to 10 m in areas where ships navigate. The ship channel forks off here, one branch leading to the port, and the other to the St. Lawrence Seaway that begins at the Saint-Lambert locks, just upstream from the study area. At Longueuil and Saint-Lambert, a long dike runs along the canal leading to the first lock. A small hydro-electric power plant is being built at the Saint-Lambert locks.

Although the Montreal port area extends from the Victoria Bridge to Saint-Joseph-de-Sorel, its infrastructures are concentrated on Montreal Island (Figure 7), stretching over 20 km along the shoreline and covering 150 ha. Most of this area is reserved for port activities, while the rest has been transformed in recent years into green spaces and recreational or tourist areas.

Port facilities and activities have had considerable repercussions on the natural environment. Dredging of basins and the construction of piers and jetties at first had the direct effect of destroying or disturbing aquatic and riparian environments. In certain cases, the structures have been in existence for quite some time, but they have been renovated or enlarged as needed. The consequences of port development on the flow of the river have never been assessed in detail, but we may assume that port structures have contributed to increasing the flow rate between the port and Île Sainte-Hélène, and that they cause a number of eddies and counter-currents. As well, protected from the current, area basins are ideal accumulation zones for sediment and contaminants. The very presence of the port in this area gave rise to Montreal's first industrial zone and thus to the concentration of pollutant waste in the area over a long period. Today, the Port of Montreal area is considered one of the most heavily contaminated sites along the St. Lawrence River. Accordingly, it is being given special attention, with specific efforts aimed at its restoration.<sup>6</sup>

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<sup>6</sup> Under the St. Lawrence Action Plan and St. Lawrence Vision 2000 (SLV 2000).



Source: Environment Canada. 1993. *La contamination des sédiments de la zone portuaire. Etat de situation et solutions envisagées*. Conservation and Protection, Quebec Region, Environmental Protection Branch.

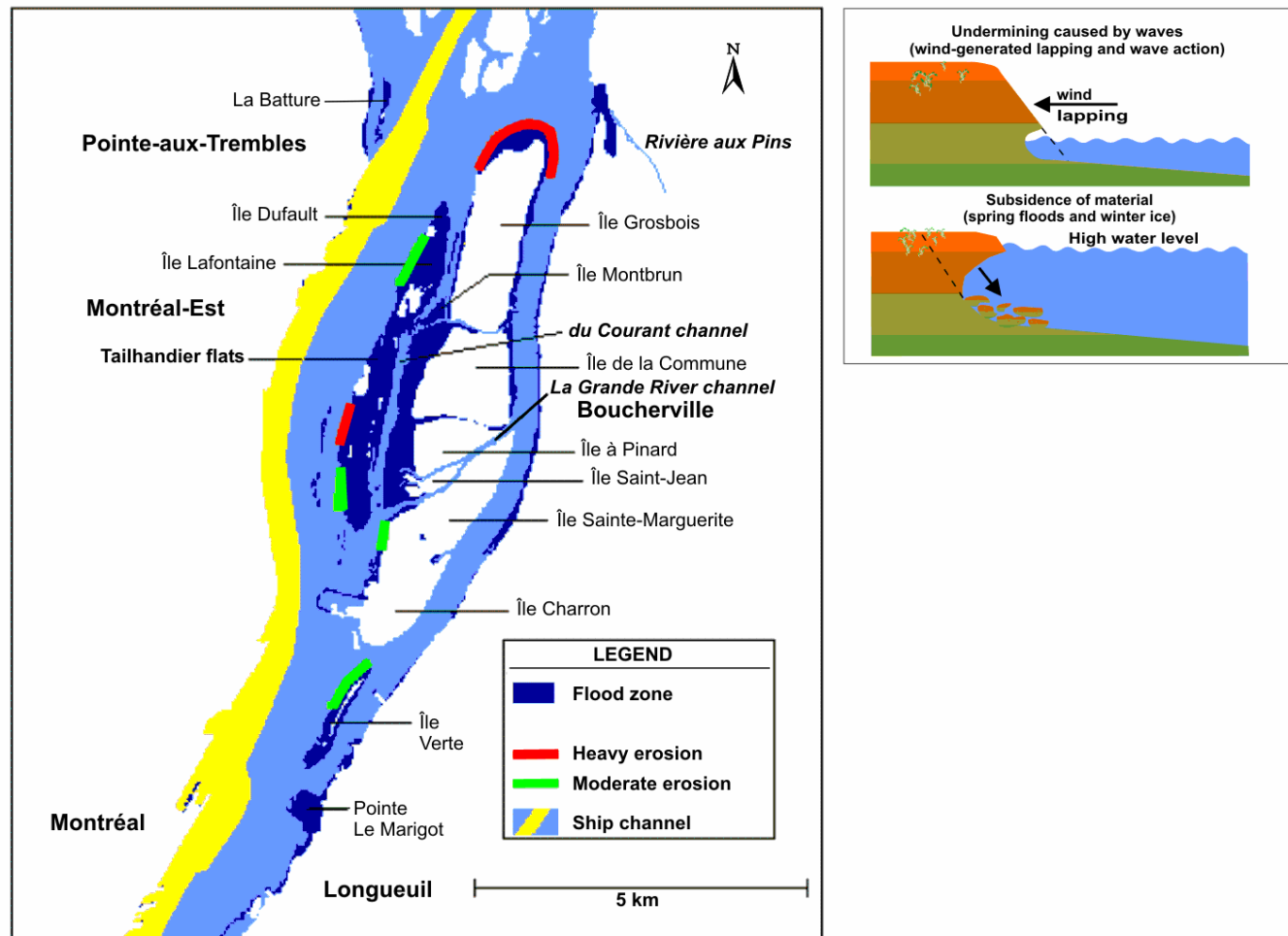
**Figure 7 Port of Montreal area**

Urban development has caused other physical changes to natural environments. Since the city of Montreal is on an island, road and rail accesses converge to cross the river over several bridges. There are four bridges within the study area itself: the Louis-Hippolyte-Lafontaine bridge-tunnel and the Victoria, Concorde and Jacques-Cartier bridges. Large sections of the natural shoreline have disappeared under backfill deposited to construct residential or commercial complexes, and for infrastructure such as Highway 132 and the south shore wastewater intercepting sewer.

The shores of a number of islands – e.g. Verte, Charron and Sainte-Marguerite – have been subject to the same degradation as the banks of the river. The best known case involves Sainte-Hélène and Notre-Dame islands. In preparation for the 1967 World's Fair, Île Sainte-Hélène was enlarged considerably and Île Notre-Dame was wholly created by the deposition of dredged material from the river, taken along the St. Lawrence Seaway dike. By reducing the flow section around these islands and the Cité du Havre pier, the current speed was increased to a rate of 3 m/s.

Many of these artificial structures modified the circulation of water masses around Montreal; the consequences on available aquatic habitats and on the movement of fish have never been assessed.

Table 3 shows the present distribution of different types of environments in the Montreal-Longueuil sector. A few remnants of natural shoreline still exist along the south shore and in the Boucherville archipelago. In the latter area, erosion due to wave action (lapping) has also contributed to the disappearance of habitats; the shores of some islands near the ship channel recede by several metres each year because of ship-induced waves (Figure 8).



## Flood and erosion zones of the Boucherville archipelago, Île Verte and Île La Batture

Adapted from:

Pilon, C., J. M. Boisvert, D. Carrière, J. Champagne, P. Chevalier, D. La Quère, V. Sicard, and G. Sylvain. 1980. *Les îles du Saint-Laurent de Boucherville à Contrecoeur: Environnement biophysique*. Centre de Recherches Ecologiques de Montréal.

Bertrand, P., D. Gamache, B. Houde, and J. Lavoie. 1991. *L'érosion des îles du Saint-Laurent, tronçon Montréal-lac Saint-Pierre*. Argus Groupe-Conseil.

**Figure 8** Shore erosion in the Montreal-Longueuil sector

**Table 3**  
**Distribution of various types of wetland**  
**and other environments in the study area in 1990**

<i>Type of environment</i>	<i>Area (ha)</i>		<i>% of total area</i>
	<i>Boucherville archipelago</i>	<i>Total area</i>	
Aquatic plant communities	196	537	5.4
Marshes	170	201	2.0
Wet meadows	130	151	1.5
Swamps	48	56	0.6
<b>Subtotal</b>	<b>545</b>	<b>945</b>	<b>9.5</b>
Open water	-	2562	26.0
Woodlands	26	145	1.5
Dry grasslands	2	6	0.1
Green space and farmland	270	823	8.3
Fallow land	94	225	2.3
Built up areas	257	4501	45.6
Others	129	653	6.7
<b>Total</b>	<b>1325</b>	<b>9860</b>	<b>100</b>

*Source:* Létourneau, G. 1995. *Répertoire de télédétection au Centre Saint-Laurent*. Environment Canada - Quebec Region, Environmental Conservation, St. Lawrence Centre.

## 4.2 Pollution

The river was long considered a convenient and low-cost means of getting rid of wastewater. Industries, municipalities and farms discharged their effluents and drainage waters into the river with no prior treatment, until the effects of pollution were clearly evident. The extent of the problem forced governments to monitor wastewater and establish standards for the

levels of various substances. Unfortunately, a number of products have, in one way or another, established themselves in the environment, which they continue to contaminate many years after having been discharged.

The volume and nature of effluents determine their effects on the environment. For example, industries are usually the main sources of toxic products, while municipal sewage contributes to bacterial contamination and an increase in biological production which, among other things, causes algal proliferation and smelly water, making the shores rather unattractive.

It has been estimated that the main sources of pollution in the Montreal-Longueuil sector are the upstream section of the river itself, industrial discharges and municipal sewage, in that order. Surface runoff in urban areas, hazardous waste sites and air pollution are also likely sources of contamination of the aquatic environment; however, the contribution of these sources is difficult to assess for the moment because they are so widespread.

#### **4.2.1 Sources of pollution**

##### **4.2.1.1 *Fluvial inputs***

Only fragmentary data are available on the contaminant load transported by the waters of the river. The figures shown in Table 4 are merely an indication and are subject to a number of reservations. The total quantities flowing into the study area were obtained by adding the contaminant load estimated at the entrance to Lake Saint-François in the early 1990s with the contribution of various sources between this location and the Montreal-Longueuil sector. Total contaminant loads do not take into account the quantities of contaminants deposited in sediments between Cornwall and the outlet of Lake Saint-Louis. In addition, the figures shown for PCBs should be multiplied by four because the PCBs analysed represent approximately one-quarter of PCBs found in the environment. Mean annual fluvial inputs of PCBs would thus be roughly 125 kg.

Fluvial inputs of metals come from the erosion of rocks and soils in the drainage basin (natural sources), as well as human activities (anthropic contribution). Despite the lack of precise data on the relative contribution of each source, we may assume that the anthropic contribution has decreased since the end of the 1960s, when pollution of the St. Lawrence River

reached its peak. Broad historical trends traced in sediment layers in Lake Saint-Louis upstream of the study area show that fluvial inputs of certain metals (nickel and chromium) are only slightly higher than before the industrial period. Conversely, pollution by other trace metals, notably cadmium, is still high. For toxic organic substances (PCBs, PAHs, DDT, etc.), inputs result solely from human activity, except for certain PAHs released into the environment by natural phenomena such as forest fires or volcanic eruptions.

#### **4.2.1.2    *Industry***

The Montreal region is one of the most heavily industrialized areas through which the St. Lawrence flows in Quebec. The port and railway terminals were factors that helped create Montreal's first industrial centre, well before those on the eastern part of the island or the south shore.

Before connection to the Montreal Urban Community (MUC) sewer system, the wastewater from a number of manufacturing plants of all types was discharged into the Windmill and Maritime terminal basins in the Old Port (Figure 7). The effluent that ended up around the Laurier, Tarte and Sutherland piers and at Longue-Pointe (sectors 8 to 11) came from plants operating in such fields as photography, photoengraving, printing, plating, foundries and jewellery-making. This waste contained large quantities of heavy metals and organic compounds. Discharges from cement plants, dye works, adhesives, textiles, petrochemical and steel plants affected that part of the port where the oil terminals are located (sectors 12 to 14).

No detailed information is available on the quantities of contaminants discharged from each of these plants, since the wastewater was often combined before it reached the river. We may nevertheless assume that the quantity and toxicity of this waste, which is now governed by an inter-municipal (MUC) bylaw and government regulation (Ministère de l'Environnement et de la Faune and Environment Canada), were higher in the past. Moreover, a number of facilities have closed their doors or modernized their facilities, leading either way to a reduction in the quantity of toxic substances discharged to the environment. However, the high level of



**Table 4**  
**Estimates of mean annual inputs of metals and organic contaminants**  
**from the St. Lawrence River at the entrance to the Montreal-Longueuil sector**

<i>Chemical</i>	<i>Mean annual load (kg/year)</i>				
	<i>River at Cornwall</i>	<i>+Ottawa R.<sup>a</sup></i>	<i>+other tributaries<sup>b</sup></i>	<i>+Action Plan plants<sup>c</sup></i>	<i>= total at Montreal</i>
<b>Metals</b>					
Cadmium	4 206	441	36	281	4 964
Cobalt	43 690	5 174	384	ND	49 248
Chromium	363 606	20 242	344	3	384 195
Copper	168 015	14 691	551	687	183 944
Iron	36 120 789	352 618	148 960	8 101	41 630 468
Manganese	1 290 348	318 254	19 527	1 176	1 629 305
Nickel	354 987	13 686	619	ND	369 292
Lead	52 352	5 438	193	ND	57 982
Zinc	597 795	45 535	4 500	19 307	667 337
<b>Toxic organic substances</b>					
PCBs <sup>d</sup>	29	2.4	<0.1	NF	31.4
Total PAHs <sup>e</sup>	2 298	214	25.6	NF	2 537.6
Hexachlorobenzene	1	0.4	<0.1	ND	1.4
Total BHCs <sup>f</sup>	10	1.6	0.1	ND	11.7
Chlordane <sup>g</sup>	69	4	0.1	ND	73.1
Total DDT <sup>h</sup>	162	15.6	0.4	ND	178.0
2,3,4,6-Tetrachlorophenol <sup>i</sup>	18	3.2	<0.1	ND	21.2
Pentachlorophenol	75	14	0.1	ND	89.1
Atrazine	1 544	26.8	5.2	ND	1 576.0
Diazinon	704	99.6	4.4	ND	808.0

ND = no data.

NF = not found.

a Data for Ottawa River at Pointe-Fortune adjusted (load multiplied by 0.4) by apportioning flow: 40% through Vaudreuil and Sainte-Anne-de-Bellevue channels and 60% through the des Prairies and Mille Îles rivers.

b St Regis (St Regis Reserve), Salmon, Saint-Louis, Châteauguay, St Regis (Sainte-Catherine), La Tortue, Saint-Jacques, Beaudette, Delisle, Rouge and Quinchien rivers.

c Expro Chemical Products Inc., Canadian Electrolytic Zinc Inc. and PPG Canada Inc.

d Sum of thirteen congeners (77, 101, 105, 118, 126, 128, 138, 153, 169, 170, 180, 183 and 194).

e Sum of 16 or 20 compounds.

f Sum of lindane,  $\alpha$ -BHC and  $\beta$ -BHC.

g Sum of cis- and trans-chlordane.

h Sum of five isomers: o,p'-DDT, p,p'-DDT, o,p'-DDD, p,p'-DDD and p,p'-DDE.

i Associated with particle phase only.

Source: Taken from Fortin, Guy R. 1995. Synthèse des connaissances sur les aspects physiques et chimiques de l'eau et des sédiments du secteur de Montréal-Longueuil. Technical report. Priority Intervention Zone (ZIP) 9. Environment Canada - Quebec Region, Environmental Conservation, St. Lawrence Centre.

contamination in Port of Montreal basins, which received untreated industrial and municipal sewage for many years, is one of the main obstacles to restoration of these environments.

Eight plants located in the study area have been targeted by the St. Lawrence Action Plan and are now part of the group of 106 facilities identified as priorities under St. Lawrence Vision 2000 for reduction of liquid toxic waste discharges.

Cleanup measures have already been implemented for most of these plants; the summary data in Table 5 are based on wastewater characterizations carried out between 1989 and 1993.

The Noranda Minerals Inc. smelter refines copper and also produces some precious metals (platinum, silver, gold and palladium). The plant has three outfalls: one for process water, one for cooling water and one for domestic waste and rain water, for a total flow of approximately 23 500 m<sup>3</sup>/day (1992). Since 1989, the most heavily contaminated water has been routed to a treatment plant before being combined with cooling and rain water and domestic sewage, and then rerouted to the Durocher collector in the Montréal-Est sewage network. This collector, which formerly entered the port around the oil terminals, is now connected to the MUC sewage treatment plant. The most important contaminants discharged by this plant after system start-up were arsenic, copper and selenium.

The Shell Canada Products Ltd. refinery produces solvents, fuel, lubricants and asphalt. The company treats its process water and rain water before their discharge to the river at a rate of 9700 m<sup>3</sup>/day (1992), although there are plans to collect this effluent using the MUC's southeast intercepting sewer. Domestic wastewater is rerouted into the MUC municipal sewer system. When this wastewater was sampled, the substances of greatest concern in terms of toxicity for the aquatic environment were heavy metals, and oils and greases.

Petromont Co. Limited produces ethylene oxide and derivatives. All effluent goes through a primary treatment unit before being discharged to the Notre-Dame collector at a rate of 4200 m<sup>3</sup>/day (1992) which, prior to connection to the MUC sewage treatment plant in December 1993, was discharged to the river. The main contaminants are oils and greases; heavy metals, dioxins and furans are also found, but in very small quantities.

**Table 5**  
**St. Lawrence Action Plan priority plants in the Montreal-Longueuil sector and general characteristics of their wastewater**  
**(readings taken from 1989 to 1992)**

<i>Company</i>	<i>Location</i>	<i>Production</i>	<i>Main pollutants in wastewater</i>	<i>Wastewater discharge point</i>	<i>Chimiotox ranking (out of 48<sup>a</sup>)</i>	<i>Reduction in Chimiotox Index<sup>b</sup> (1988-1995)</i>
Noranda Minerals Inc., CCR refinery	Montréal-Est	Copper and precious metals	Arsenic, copper, selenium	Sewer system to MUC sewage treatment plant	13	90%
Shell Canada Products Ltd.	Montréal-Est	Fuel and petroleum derivatives	Heavy metals, mineral oils and greases	St. Lawrence River, pending collection by the southeast intercepting sewer	33	76%
Petromont Co. Limited (formerly Union Carbide)	Montréal-Est	Ethylene oxide and polyethylene	Mineral oils and greases; heavy metals; dioxins, small quantities of furans	Sewer system to MUC sewage treatment plant	27	75%
Demtec Petrochemicals Inc. (now Coastal Canada Petroleum Inc.)	Montréal-Est	Acetone, paraxylene and gasoline bases	Phenols, mineral oils and greases	Sewer system to MUC sewage treatment plant	32	98%
Petro Canada Products Inc.	Montreal	Fuel and petroleum derivatives	Mineral oils and greases, semi-volatile organic compounds	St. Lawrence River, pending collection by the southeast intercepting sewer	19	81%

<i>Company</i>	<i>Location</i>	<i>Production</i>	<i>Main pollutants in wastewater</i>	<i>Wastewater discharge point</i>	<i>Chimiotox ranking (out of 48<sup>a</sup>)</i>	<i>Reduction in Chimiotox Index<sup>b</sup> (1988-1995)</i>
Héroux Inc.	Longueuil	Hydraulic systems and landing gear	Small quantities of heavy metals			
Pratt & Whitney Canada Inc.	Longueuil	Aircraft motors and turbines	Oils, greases, small quantities of heavy metals			
Nacan Products Ltd.	Boucherville	Adhesives and resins	Small quantities of oils and greases			

Kemtec Petrochemicals Inc. closed in 1991 and reopened in 1994 under the name Coastal Canada Petroleum Inc. Before its closure in 1991, it produced acetone, paraxylenes and gasoline bases. Process water, rain water and domestic sewage were treated before being piped to the Durocher collector of the Montreal sewer system, at a rate of 12 000 m<sup>3</sup>/day (1991). The most harmful products in the process water were phenols, oils and greases.

The Petro Canada Products Inc. refinery produces combustibles, fuels and lubricants. The plant treats its process water before discharging it to the river at the rate of 10 800 m<sup>3</sup>/day (1992), while awaiting connection to the MUC's southeast intercepting sewer. Toxicity of this wastewater is mainly due to concentrations of benzidine, and oils and greases. Subsequent samplings in 1993 failed to show any benzidine.

Héroux Inc. of Longueuil are active in the maintenance and assembly of hydraulic systems and aircraft landing gear involving the surface treatment of certain parts. The plant has treated its effluent since 1990, and the wastewater is piped through the Longueuil municipal system to the south shore sewage treatment plant (CÉRS) on Île Charron, which has been in operation since 1992. Flows from the metal treatment plant fell from roughly 130 m<sup>3</sup>/day in 1990 to 40 m<sup>3</sup>/day in 1994.

The Pratt & Whitney Canada Inc. plant in Longueuil manufactures high-performance engines for the aircraft industry, along with gas turbines. Since 1990, the surface treatment plant has significantly reduced its flow of rinse water. The waters piped to CÉRS represent a flow of 2240 m<sup>3</sup>/day, while those discharged directly to the river make up 1500 m<sup>3</sup>/day and, after treatment, contain suspended solids, oils and greases, and small quantities of metals.

Nacan Products Ltd. of Boucherville produces industrial adhesives and plastic resins from various chemical compounds. Water is used for product preparation, washing and cooling. In 1992, the plant discharged just 14 m<sup>3</sup> of wastewater daily. Treated water is directed to the Boucherville municipal sewer system, which is connected to CÉRS. Rain water and cooling water are discharged to the Marie-Victorin storm sewer.

Between 1988 and 1992, a major reduction was seen in many contaminants for all of the St. Lawrence Action Plan priority plants. Plants located on the south shore were

responsible for a much smaller toxic load than those on Montreal Island, on the north shore of the study area.

In addition to wastewater, these plants produce hazardous waste that is deposited in landfill sites. Over time, these sites may also contribute to contamination of the aquatic environment. Certain products may leak and migrate into the groundwater, finally reaching the river itself.

There are 26 hazardous waste sites in the study area, almost all of them on Montreal Island. Half of them contain waste from the oil industry. Some of these sites constitute a risk for the local contamination of groundwater, while others may form a direct threat to the quality of St. Lawrence River water. However, the link between these contaminated landfill sites and their impact on the pollution of the river has so far not been established. The island of Montreal is the site of a great deal of human activity that is likely to have a negative impact on the quality of groundwater. It is thus difficult to isolate the relative contribution of a given source of diffuse contamination.

Nevertheless, the Longue-Pointe armed forces base and Montreal port area are among the most heavily contaminated – the former by lead and hydrocarbons, and by heavy metals, oils, mineral greases and hydrocarbons in the port area. In addition, the STOLport site, a former dump for domestic and industrial waste a little upstream from the study area, has been identified as a source of contamination of the river by toxic organic substances and lead.

#### **4.2.1.3 *Municipalities***

The entire population of the study area is served by municipal sewer systems which, only a few years ago, discharged mostly untreated sewage into the river. At the time, these sewer systems took advantage of their proximity to the river and had located a number of sewer outfalls along both shores of the St. Lawrence.

In 1994, almost all the municipal sewage in the study area was directed to regional sewage treatment plants. On the north shore, this means that the wastewater of the four riverside districts of Montreal and Montréal-Est (some 548 000 m<sup>3</sup>/day) arrives at the MUC sewage treatment plant on the eastern tip of Montreal Island through the southeast intercepting sewer.

The treated water is discharged downstream of the study area, around Île aux Vaches. To prevent overflow problems at the MUC sewage treatment plant during heavy rains or snow thaws, the surplus is discharged to the river through the interception system. Under these conditions, the wastewater is not treated.

The Saint-Pierre collector discharging near the Champlain Bridge may alone account for up to 25% of the capacity of the southeast intercepting sewer, to which it will only be connected sometime in 1995. At the present time, this outfall is a source of contamination for the river and port area with phosphorus, ammonia nitrogen, metals and fecal coliforms.

Sewage on the south shore (280 000 m<sup>3</sup>/day) has since 1992 been treated at the south shore sewage treatment plant (CÉRS) on Île Charron, before being discharged to the nearby ship channel, inside the Montreal-Longueuil sector. Frequent overflow problems were reported on the south shore during 1993 and 1994. A sewage treatment plant on Île Notre-Dame treats wastewater from Sainte-Hélène and Notre-Dame islands.

The city of Montreal also dumps snow removed from city streets into the St. Lawrence at the Concorde Bridge and piers 30 and 52 in the Port of Montreal – some three million cubic metres per year. The impact of this dirty snow on the aquatic environment derives mainly from its heavy metal, chloride and light or heavy oil content. In 1996, Quebec municipalities will have to find alternatives to dumping snow into lakes and streams.

#### **4.2.2 Impact of pollution on the aquatic environment**

Whatever their origin, the pollutants found in the aquatic environment present varying degrees of risk for the normal functioning of living organisms. Certain types of pollution have no lasting effects, and the quality of the environment improves rapidly as soon as discharge stops, particularly in a rapid-flow system like the St. Lawrence. This is the case, for example, with bacterial pollution, enrichment of waters by nutrients or highly soluble substances that are almost entirely transported by the current to the sea. Some pollutants may, however, concentrate in sediments and organisms because they are chemically stable in their original form or as the byproducts of break-down in the environment. Interaction between several chemical substances

may also amplify their toxic effects. Substances that persist in the environment may be found in high concentrations in living organisms.

The concentration of a toxic substance may increase in an organism throughout its life, a phenomenon known as bioaccumulation. But it may also increase from one link in the food chain to another by the process of biomagnification. Substances are thus gradually transferred to predators (fish, birds or mammals) occupying the higher levels of the food pyramid, where they may reach elevated concentrations (Figure 9).

Biomagnification can provide useful clues to researchers seeking to confirm the presence of a product in the environment. Analysis of the flesh of predator fish occasionally shows the presence of contaminants in quantities too small to be detected directly in the water or sediments, even with the best analytic techniques.

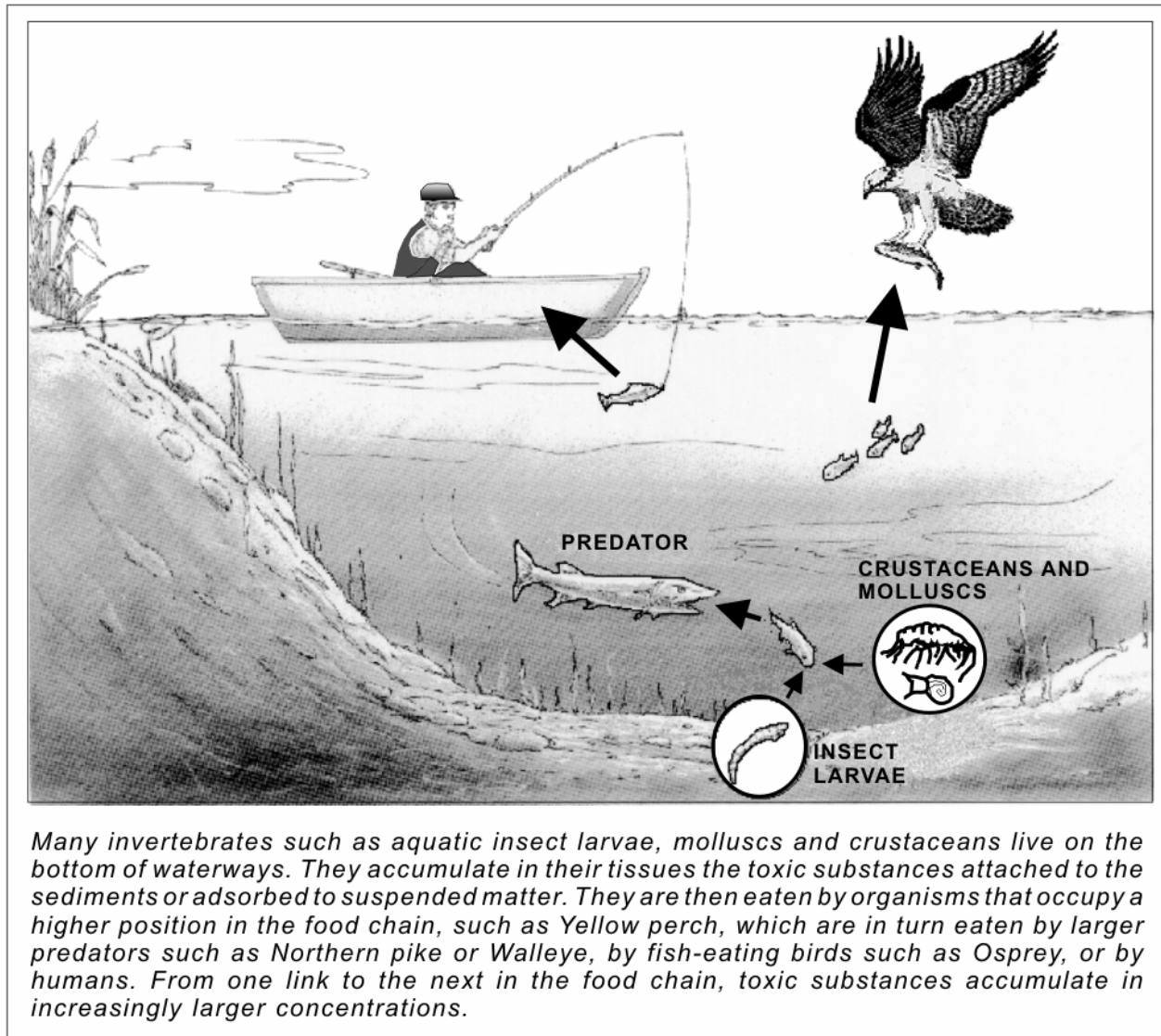
Criteria such as the quality of water, sediments and aquatic organisms are used to calculate the extent of contamination of the aquatic environment and the resulting loss in use (Appendix 2).

#### **4.2.2.1    *Water***

Data currently available to assess water quality and determine lost use of an environment were collected for a variety of purposes and contain certain gaps. Furthermore, surveys carried out between 1985 and 1993 may not be representative of the current situation following implementation of more recent cleanup measures.

A clear decline was observed in phosphorus in the port area and on the north shore downstream of Montreal between 1987 and 1993. Nevertheless, phosphorus levels in 1993 exceeded the criterion for the protection of aquatic life in the area of the Old Port and in the plume of the Saint-Pierre collector. These high phosphorus concentrations in the environment are linked to untreated urban sewage. Enrichment of rivers and streams by nutrients such as phosphorus leads to a proliferation of aquatic plants where the environment is so predisposed. The resulting process of decomposition then reduces the dissolved oxygen content of the water. These conditions are unfavourable to aquatic species, as well as being unsightly and foul smelling.



**BIOMAGNIFICATION**

Adapted from: *Toxics in the St. Lawrence: An Invisible but Real Threat*. 1990. "St. Lawrence UPDATE" series. Environment Canada, Conservation and Protection, Quebec Region, St. Lawrence Centre.

**Figure 9** Risks of biomagnification

The start-up of regional sewage treatment plants in the early 1990s considerably reduced the number of fecal coliforms in the river water, but based on bacteriological samples taken between 1991 and 1993, the water nevertheless remained polluted on the north shore. In all readings taken close to the banks, bacteriological criteria for swimming were exceeded. The situation appears less serious in the ship channel and along the south shore, although there have also been reports of readings here exceeding the limit set for safe swimming. Not all Montreal sewers were connected to the treatment plant at the time these water samples were drawn. When this process is completed, sometime in 1995, we should see an improvement in water quality with respect to nutrients and fecal bacteria. While the treatments applied reduce the discharge of micro-organisms to the environment, it should be noted that the MUC and south shore sewage treatment plants nevertheless do not disinfect wastewater.

In the case of metals, data for 1985 to 1990 show that the water mass flowing past Montreal Island picks up heavy metals (arsenic, chromium, copper, iron, lead and zinc) as it moves through the Port of Montreal area. This sometimes results in exceedances of water quality criteria for copper and chromium. Only arsenic was found in concentrations frequently exceeding one water quality criterion (1985 to 1987), that of raw water (untreated water taken directly from the river). The fairly uniform readings in the St. Lawrence/Great Lakes system as a whole indicate that arsenic concentrations correspond to natural concentrations rather than to sources of contamination.

In 1993, the degree of contamination in this area saw a net decline following the connection of a number of collector sewers to the southeast intercepting sewer. Copper levels only rarely exceeded the criteria for chronic toxicity of aquatic life.

As for organic substances, PCB concentrations measured in 1993 in the area downstream of the study sector exceeded the criteria for raw water quality and contamination of aquatic organisms.

#### **4.2.2.2 Sediments**

A number of contaminants bind to suspended particles in water, tending to settle on the bottom in areas of slow current. In this way, beds of polluted sediments are formed which contribute to the contamination of organisms in that environment. Zones of sediment deposition often correspond to aquatic plant communities, which are ordinarily heavily used by benthic organisms at the base of the food chain. The presence of contaminated sediments thus constitutes a risk for the fish, birds and mammals that feed in these areas and, ultimately, for the hunters or fishermen who eat them.

A sampling campaign carried out in 1976 found that the sediments in one part of the south shore contained lead and copper on the Longueuil shore and chromium and copper in the Boucherville islands, in concentrations that could be harmful to benthic fauna; that is, at levels exceeding the Toxic Effect Threshold (TET). Downstream of the Montreal port area, the contaminants of greatest concern were copper, chromium, lead and zinc.

The area with the most acute sediment contamination problem is the Port of Montreal (Figure 7). In the basins sheltered from the current, there is an accumulation of large quantities of sediments contaminated with heavy metals<sup>7</sup> PAHs and PCBs from industrial wastewater, by the numerous combined sewers (industrial and municipal effluents) that discharge in this area, and from port operations. Heavy metals and PAHs exceed the TET for benthic organisms.

Recognized as one of the most heavily contaminated sites along the St. Lawrence, the Port of Montreal has received special attention with a view to restoration under the St. Lawrence Action Plan and SLV 2000. A preliminary characterization divided up the area on the basis of flow conditions, inputs of pollutants and infrastructure. Sediment sampling then further defined this classification by considering degree of contamination. Seven of the fifteen sectors thus defined were selected for more detailed study in order to characterize the sediments and also to determine the appropriate remedial techniques (sectors 2 to 9 - Figure 7). More recently, in 1994, further studies were begun on Pier 103 basins (sector 12).

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<sup>7</sup> Arsenic, cadmium, chromium, copper, mercury, nickel, lead and zinc.

Based on a preliminary assessment, there is nearly 700 000 m<sup>3</sup> of contaminated sediment at the bottom of these basins, forming a layer which ranges from 0.7 m to more than 3 m thick.

#### **4.2.2.3    *Aquatic organisms***

There is a considerable amount of information on the impact of contamination on aquatic organisms in the Montreal-Longueuil sector. For example, a 1985 study of zooplanktonic crustaceans showed a drastic reduction in the number of species (from 31 to 9) in the water of the river as it flowed past Montreal Island. The author attributed this decline to the degradation of water quality by local sources of pollution.

Benthos is the group that best lends itself to an assessment of the state of aquatic habitats in various parts of the study area. Since these organisms are not very mobile, their degree of contamination offers a good idea of the distribution of toxic products. Changes in the composition of benthic communities in the affected environments may thus be more easily quantified than among higher, more mobile animals.

Data of the Archipel Project were reviewed in 1992 to compare the composition of benthic communities at certain sites to that which might be found in a healthy habitat of the same type. It was concluded that benthic communities in the study area were in a state described variously as acceptable to degraded, the latter term being applied to certain Port of Montreal sites. At this location, there was a clear dominance of tubificid oligochaetes, a group of benthic organisms whose presence is an indication of organic pollution.

In a study of oligochaetes, samples taken of these benthic organisms in 1984 at a series of sampling stations along the Port of Montreal area showed changes in the composition of these communities at Pier 30, which was used as a dumping point for collected snow. Some pollution-tolerant species were also found there.

Metal tests were carried out in 1975 and 1976 and again in 1982 on benthic organisms, including bivalves (mussels). Concentrations measured in some cases exceeded both

the criteria for mercury for the protection of aquatic life and the limits set for the commercial sale of fish and seafood for lead.

In 1976, some contaminants were reported in fish flesh. Mean concentrations of mercury in Northern pike, Smallmouth bass, Walleye, American eel, Bowfin and Rock bass exceeded the 0.5 mg/kg limit set for their commercial sale. In general, predator species, particularly large fish, had higher levels. Marketing standards were also exceeded for lead (0.5 mg/kg) in Lake sturgeon and for PCBs (2.0 mg/kg) in White sucker, Walleye, Lake sturgeon and American eel. Samples taken in 1985 and 1986 found mercury levels exceeding the marketing limit in large specimens of Northern pike and Walleye. The most recent studies on mercury and PCB contamination of fish in the St. Lawrence did not deal with the study area; however, an improvement in the quality of fish flesh was found in the fluvial lakes.

Mercury levels in fish flesh exceeded the criteria for protection of aquatic life (0.1 mg/kg) in several species. Even though this level of contamination is not a threat to human health, it is nevertheless cause for concern, particularly for piscivorous (fish-eating) organisms (Figure 9). Given the affinity of certain organic compounds for tissue other than flesh and the fact that piscivorous organisms swallow fish whole, certain vital functions (reproduction, development) may be altered.

#### **4.2.3 Risks for human health**

It is recognized that some contaminants may have an effect on human health. People living along the St. Lawrence River may be exposed to these contaminants by drinking water and eating fish from the river and through the practice of recreational activities. Some people are at greater risk because of more frequent exposure due to their lifestyles or due to their greater sensitivity.

**Risks linked to drinking water and swimming.** The entire population is served by water-supply systems which draw water from the river. On the north shore, the Atwater and Charles-J.-Des Bailleurs plants take their water upstream from the Lachine Rapids. The two

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<sup>8</sup> These mussels are not locally consumed by humans.

Longueuil filtration plants draw water from an intake in the Le Moyne channel, while the Saint-Lambert plant draws its water from the lesser La Prairie basin.

In general, the chemical quality of the water is acceptable as a supply source for drinking-water plants; however, in the sector downstream from Montreal, PCBs exceed the quality criteria for raw water. In this case, however, the low concentrations do not jeopardize the quality of the drinking water supply. On the other hand, PCBs are bioaccumulable substances, and if water consumption is combined with the consumption of aquatic organisms, there may be long-term health risks (Appendix 1). It should be noted that the drinking water of the entire population is treated.

The bacteriological quality of the water deteriorates rapidly as it passes through the Montreal-Longueuil sector. Because of the high level of fecal coliforms, swimming is a health risk, particularly along both shores downstream from Montreal and Longueuil.

**Risks related to fish consumption.** The flesh of fish contains contaminants that call for certain limitations on consumption. That the limits set for the commercial sale of certain species, as previously described, are exceeded does not prevent sport fishermen from eating their catch; however, moderation appears to be in order, particularly for the consumption of larger predator fish.

The recommendations of the Ministère de la Santé et des Services Sociaux and Ministère de l'Environnement et de la Faune regarding frequency of consumption based on size, fish species and body of water are presented in the *Guide de consommation du poisson de pêche sportive en eau douce* (1993). If these recommendations are followed, the health benefits related to eating fish offset the risks that might be associated with this practice. The Montreal-Longueuil sector is not specifically listed; however, the following general consumption rules would apply:

It is recommended to eat low-contamination sport species such as Brown trout and Rainbow trout no more than eight (8) times per month. For more contaminated species such as Yellow perch, Brown bullhead and Lake sturgeon, it is recommended that consumption be kept to four (4) times per month, and for heavily contaminated species (Northern pike, Bass, Walleye and Muskellunge), a maximum of two (2) meals per month are recommended. Pregnant women and young children are recommended to limit their consumption to the less-contaminated species.

### 4.3 Shipping

There are two major shipping infrastructures in the Montreal-Longueuil sector: the Port of Montreal and the Saint-Lambert locks.

The Port of Montreal is served by some 40 shipping companies that link it to 200 ports worldwide. The St. Lawrence River provides access to a market of approximately 100 million people in Canada and the United States. Despite the presence of ice, the port has been open 12 months a year since 1964.

As Canada's leading container port, it also receives various kinds of merchandise and liquid and solid bulk shipments. To handle this cargo, the port includes five container terminals, two grain elevators, 22 transit hangars and pierside stations for bulk products (liquid and solid). A rail network of over 100 km of track also allows goods to be transferred between ships and trains. All these facilities cover close to 25 km of shoreline and occupy an area of over 150 ha.

Furthermore, the Port of Montreal is a major hub for shipments of petroleum products, which represent close to 30% of the cargo handled.

Several hundred thousand tonnes of petroleum products and thousands of tonnes of liquid chemicals have gone through the port, but no major spills have occurred in the past 10 years. An emergency team made up of various private-sector and government stakeholders is on standby, with necessary equipment located in the Port of Montreal on Montreal Island and also a little downstream of the Montreal-Longueuil sector, at Verchères and Contrecoeur. Drills are held regularly to check the effectiveness of emergency measures.

In addition to the 1982 dredging operations to build the Racine terminal, approximately 2000 m<sup>3</sup> of material is moved annually to ensure the safety of navigation and facilitate mooring and ship manoeuvrability in the Montreal port area. This material is made up of various types of debris, stones and finer materials such as sand and clay. Most of the debris, such as steel and blocks of stone or concrete, is recovered and reused, while the other materials are dumped in open water in the river, as well as in the deeper part of the Vickers Basin.

Whether directly or indirectly, the Port of Montreal supports close to 11 500 jobs in Quebec, and another 2500 elsewhere in Canada, generating close to \$1.25 billion in economic

activity. The port is also a transit point or destination for many ocean and river cruise passengers.

In addition to the Port of Montreal, shipping also benefits from the Saint-Lambert locks, the gateway to the St. Lawrence Seaway heading toward the Great Lakes. Thirty-two million tonnes of merchandise was shipped through the locks between Montreal and Lake Ontario in 1993, along with close to 6400 cruise passengers and 15 000 pleasure boats.

To increase the usefulness of the locks, a small run-of-river power plant is currently being built at the seaway diversion canal. This small plant should generate a maximum of 5.8 megawatts.

#### **4.4 Commercial Fishing**

Freshwater commercial fishing was a flourishing activity in Quebec in the past, especially from 1929 to 1939, during the Depression. Today, the practice has declined considerably as a result of tighter regulation, the ban on selling certain contaminated species and decreased abundance of the resource. In 1991, there were no commercial fishermen in the study area and only two bait fishermen were still working, but catches were down.



## CHAPTER 5      **Recreation, Tourism and Conservation**

The urban nature of the Montreal-Longueuil sector places limitations on some recreational and tourism activities normally associated with bodies of water in rural areas. For example, there are no specifically nature-oriented accommodations available, and cottaging is limited to a few cottages on some of the Boucherville islands. Instead, the river is accessed through riverside parks that form windows on the river, particularly on the south shore. The Port of Montreal area forms a barrier that limits access to the river on the north shore. The bridges that span the river, along with Highway 132 that runs its length and the islands that attract tourists and vacationers make the St. Lawrence very visible in the eyes of residents of Montreal and the south shore.

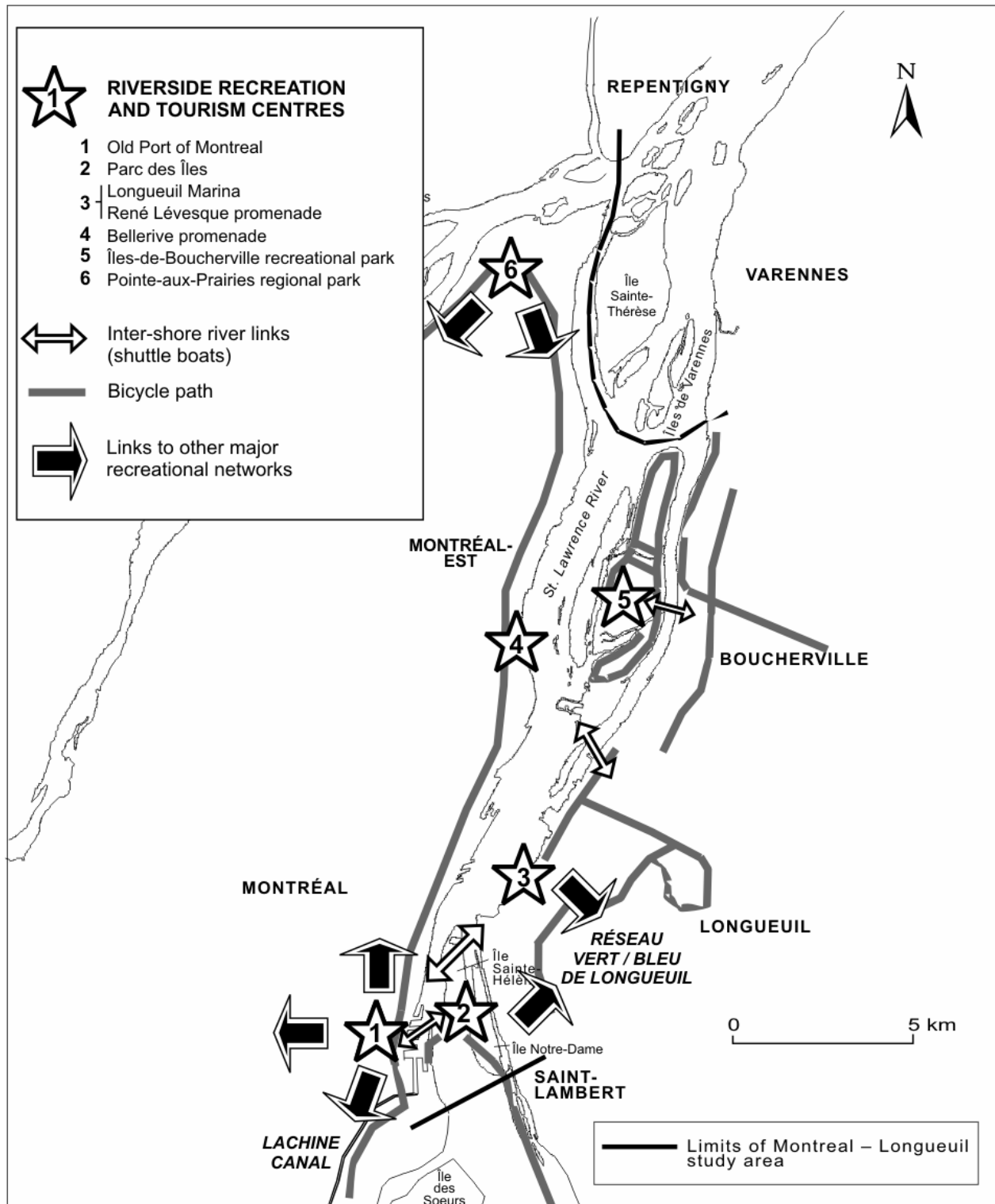
### **5.1      Water-Based Recreational Centres**

Over the past few decades, the Montreal-Longueuil sector has acquired a number of tourist centres and tour routes (Figure 10). In Montreal alone, there are five major centres, two of which are close to the St. Lawrence: Old Montreal, including the Old Port area, and the park on Sainte-Hélène and Notre-Dame islands.<sup>9</sup> On the south shore, the main attractions are Îles-de-Boucherville park, which is oriented toward recreation and conservation, and the riverside parks developed in the last few years in Longueuil and Saint-Lambert. This means that 48% of the area bordering on the river is used for recreation, in addition to the Boucherville, Sainte-Hélène and Notre-Dame islands.

As the venue for a number of large-scale events attracting millions of visitors (Expo 67, Man and His World, some Olympic events, Les Floralies), Parc des Îles (Île Sainte-Hélène and Île Notre-Dame) has been the site of considerable investment. Today, it depends on its permanent facilities along with annual events to attract tourists to the city (Casino, Biosphere, La Ronde, fireworks competitions, etc.).

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<sup>9</sup> The three other centres are in downtown Montreal, the Maisonneuve district (Olympic Stadium, Botanical Garden, and Biodome) and the Mount Royal/Oratory centre.



Taken from: Bibault, J.-F., and A. Jourdain. 1995. *Synthèse des connaissances sur les aspects socio-économiques du secteur d'étude Montréal-Longueuil*. Technical report. Priority Intervention Zone (ZIP) 9. Environment Canada - Quebec Region, Environmental Conservation, St. Lawrence Centre.

**Figure 10 Recreation and tourism centres and itineraries in Montreal-Longueuil**

## 5.2 Swimming

Due to the poor bacteriological quality of the water and the disappearance of swimming in the study area, there is no site reserved for swimming in the river. It is nonetheless possible to enjoy this activity in the study area at a filtering lake on Île Notre-Dame. Water taken directly from the river is filtered through a marsh, a key element of the treatment system. The beach on this island has a capacity of 5000 people per day; 875 000 visitors used it between 1990 and 1992.

## 5.3 Pleasure Boating

The waters of the study area place a number of limitations on pleasure boating. Strong currents, ship traffic and the shallows around some islands present risks that are not to be taken lightly. Despite these difficulties, many pleasure boaters use the area and take advantage of the boating services available at some 15 locations on either side of the river.<sup>10</sup>

Depending on the season, other types of craft can also be seen on the river, including boats used by hunters and fishermen, small ferries and shuttle boats, and a few vessels offering short cruises and excursions around the Old Port of Montreal.

## 5.4 Wildlife-Related Activities

In this section of the St. Lawrence, sport fishermen are mainly after Yellow perch, Smallmouth bass and Northern pike. Just as in other bodies of water in the Montreal area, Yellow perch ranks first in terms of catch, even if its relative abundance is still low here. This river section is also distinguished by the presence of salmonids (seeded specimens) and Sauger.

Despite opportunities to access the river, structured fishing facilities are few and so too are fishermen. When the water is ice-free, fishing is mainly practised in the Boucherville islands and Le Moyne channel between Notre-Dame and Sainte-Hélène islands, and along riverside parks in the spring. There are few sites suitable for ice fishing because the current in

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<sup>10</sup> At Saint-Lambert, Boucherville, Longueuil, Pointe-aux-Trembles, La Ronde and the Old Port.

many places prevents the formation of ice thick enough to be safe. However, the south shore and Boucherville islands are suitable for this activity.

In the late 1970s, hunters killed an estimated 50 000 ducks every fall in the area between Montreal and Sorel, mainly dabblers (64%) and divers (22%). In the fall of 1979, 2200 hunters were active in the area. Hunting sites here are primarily concentrated in the Boucherville archipelago, particularly along the Courant channel and around the Tailhandier flats, Île Grosbois and Île Verte.

With the creation of the Îles-de-Boucherville park in 1984 (actually even earlier, in 1981) hunting was prohibited at the perimeters of this area, thereby limiting the hunters' access to river banks. As well, in order not to disturb residents and other users of the area, the municipality of Longueuil regulates hunting in the area along the shoreline. During the fall, hunting is only allowed early in the morning.

The best bird-watching sites are located along the Longueuil shore (Promenade René-Levesque) and on the Boucherville islands.

## **5.5 Conservation and Development**

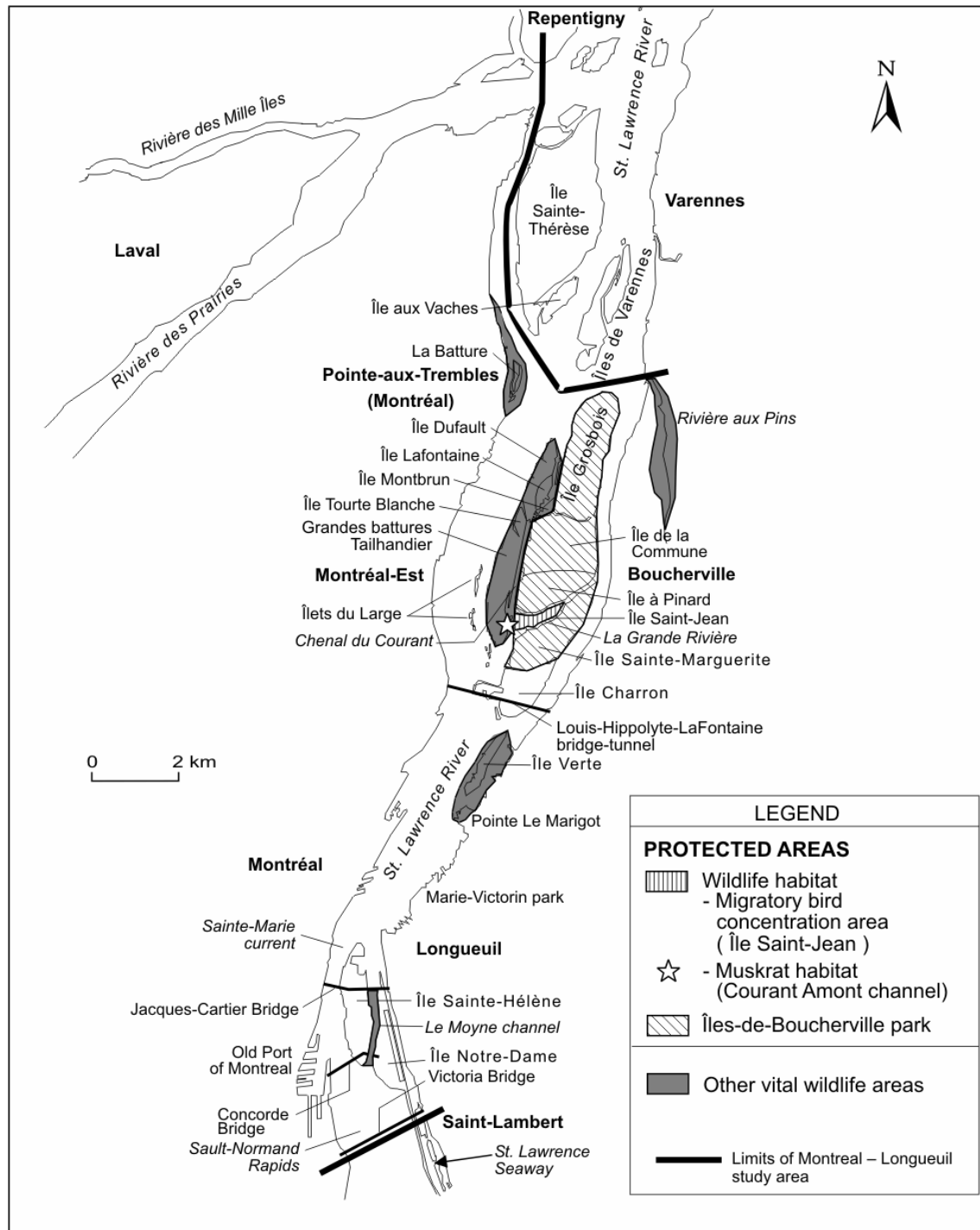
The Montreal-Longueuil study sector contains few conservation areas (2% of the area);<sup>11</sup> almost all the shoreline has been built up and appears as an urban landscape. The few natural-looking shore areas are in the islands and at the mouth of Rivière aux Pins.

Only one area in the Boucherville archipelago, where migrating birds and Muskrat gather, has the status of a wildlife habitat in the meaning of the *Act respecting the conservation and development of wildlife*; however, the Montreal-Longueuil sector still has a number of sites that are attractive to wildlife (Figure 11).

The Îles-de-Boucherville park is made up of Sainte-Marguerite, Saint-Jean, Pinard, Commune and Grosbois islands and covers 814 ha. It is primarily a recreational park with the focus on outdoor activities (golf, cycling, canoeing, picnicking and hiking). The natural environment is protected indirectly, but heavy use also disturbs wildlife. Because of both their

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<sup>11</sup> Based on development plans.



Adapted from: Ministère de l'Environnement et de la Faune. 1994. Map of wildlife areas and protected natural sites and descriptive summaries of wildlife areas. Direction régionale de la faune, Service de l'aménagement et de l'exploitation de la faune.

Ministère du Loisir, de la Chasse et de la Pêche. 1992. *Les habitats fauniques*. Map 31H 11-200-0101. Longueuil.

Ministère du Loisir, de la Chasse et de la Pêche. 1986. *Parc des îles-de-Boucherville. Le plan directeur d'aménagement*. Service des plans directeurs.

**Figure 11** Protected sites and other important wildlife areas

fragility and their ecological value, some parts of the park have also been granted protected status, which limits access and gives them some measure of protection.

In addition, part of the mouth of Rivière aux Pins in Boucherville belongs to the Ministère de l'Environnement et de la Faune du Québec, which should help ensure the protection of some habitats.

The Tailhandier flats and neighbouring islands belonging to Ports Canada are the most favourable sites for wildlife habitats in the area. No agreement as to the protection or enhancement of these areas exists between Ports Canada and organizations concerned with wildlife management.

It also appears that what farming is still practised on some islands interferes with waterfowl nesting and the raising of broods. Certain modifications to existing farming practices might attenuate this interference, but to date no arrangement has been made with the farmers concerned.

## CHAPTER 6      **Current Situation and Future Directions**

### **6.1      State of Resources and Uses**

The portion of the St. Lawrence with which we are concerned is the most heavily developed segment between the Great Lakes and the sea. The natural resources of the river have been altered significantly. While part of the strictly aquatic habitat and some islands have been saved from encroachment, the shores of the river have been degraded by urban development. Large tracts of wetlands, which constitute wildlife habitats of vital importance, have disappeared under backfill, buildings and a wide variety of structures. Lots still intact have been subject to large-scale dumping of pollutants for several decades.

The most degraded and heavily contaminated area is unquestionably the Port of Montreal. In addition to destroying some natural environments, the construction of port facilities has modified flow conditions in neighbouring waters. Mooring basins have for years been discharge sites for municipal and industrial sewage carrying a high toxic load. Today, rehabilitation of this heavily contaminated site poses many problems.

The wetlands that are still attractive to wildlife are today spread out at a few points in areas such as the mouth of Rivière aux Pins and the Boucherville archipelago (Tailhandier flats and other nearby islands), as well as at Île Verte. These important habitats for wildlife resources have no legal status ensuring their protection. Only Île Saint-Jean and the Courant channel enjoy wildlife habitat status. The Tailhandier flats and Verte, Montbrun, Lafontaine and Dufault islands belong to Ports Canada, and at the moment island resources are neither protected nor managed.

Lastly, the shores of some of the Boucherville islands near the ship channel are subject to heavy erosion from wave action caused by passing ships.

### **6.2      Toward Sustainable Development of the River**

To redirect planning of the use of these water bodies to meet the objectives of sustainable development, aspects of some issues previously touched upon must be kept in mind.

Apart from limiting certain types of uses, we must also take into account the permanence of certain changes it would be unrealistic to try to reverse. Existing bridges, highways and other structures are constraints that must be considered irreversible in the framework of a planning exercise. However, we might envisage giving more importance to protection of the remaining natural environments, revegetating some sites where this might be possible and improving wildlife habitats. Given the large population of the area, consideration might also be given to increasing access to green spaces along the river.

There are some indications that contamination of the environment by industrial and municipal waste is declining, but care should be taken not to relax efforts toward this end, since the gains remain fragile and must be constantly consolidated. As well, the persistence and high degree of contamination of sediments in the port basins is a major element of the overall problem in the Montreal-Longueuil sector.

The high degree of shoreline development could be used by certain interests to justify construction of additional structures in the aquatic environment or permanent encroachments on shores which, in any case, are already degraded. This approach would cause the irreparable loss of sites that might one day be restored to a condition very close to their natural state and eventually colonized by plants and animals.

To prevent hasty, short-term decisions, made on the basis of limited interests, from further damaging these environments, we must begin now to plan the use of this area.

These issues should be assessed and discussed by groups interested in the river and the quality of life in their environment, so that the selected direction meets the needs of the entire community. Table 6 provides an initial outline for the discussion of possible development directions for the water bodies in this area; it may, of course, be added to and improved by local stakeholders. The elements selected correspond to principles of sustainable development: maintenance of biodiversity, multiplicity of use and quality of life.

Once a consensus has been established as to priorities, it becomes simpler to transform these priorities into a concrete action plan to which partners can willingly adhere. It should be possible, through these discussions, to harmonize use so as to limit further damage to the natural environment and begin the rehabilitation of certain sites.



**Table 6**  
**Issues relating to the sustainable development of the St. Lawrence in the Montreal-Longueuil sector**

<i>Characteristics of Study Area</i>	<i>Main Effects on the River and its Resources</i>	<i>Current Situation</i>	<i>Future Possibilities</i>
Encroachments on aquatic and riparian environments (backfill and various structures)  Port development	Destruction of wetlands which are vitally important wildlife habitats. Disappearance or decreased abundance of several species at the site itself, and in neighbouring terrestrial and aquatic sections. Loss of elements of natural landscape. Accumulation of sediments and contaminants in Port of Montreal basins.	<p><b>Biodiversity:</b> A number of living communities (terrestrial, riparian and aquatic) have undergone decreases in abundance and diversity as a result of destruction or modification of these environments. Few natural spaces are reserved for conservation.</p> <p><b>Uses:</b> A number of uses are restricted by such changes: commercial and sport fishing (decline in the resource and lack of structured facilities), cottaging, hunting, etc.</p> <p><b>Quality of life:</b> Population density and the proximity of major highways engender a number of inconveniences: noise, dust and other disturbances. Over the past few decades, the river has been developed in terms of recreational and tourist itineraries and municipal and regional shoreline parks. Despite efforts to create windows on the river, the degraded shoreline is not inviting.</p>	<p><b>Biodiversity:</b> Certain measures can improve biological diversity: shoreline and contaminated-site restoration, planting trees or shrubs, creation and protection of animal and plant habitats. Some farming practices in the Boucherville islands might be modified to allow for waterfowl reproduction. Priority should be given to protection of existing natural environments, especially those in the Boucherville archipelago and at Rivière aux Pins.</p> <p><b>Uses and quality of life:</b> Present uses correspond to an urban lifestyle. It is likely, however, that advantages such as access to riverside green spaces or abundance of wildlife resources would be appreciated.</p>
Pollution (industrial and municipal effluent)	For decades, industrial and municipal effluents were discharged to the river, especially in the port area. Industrial and municipal cleanup programs have reduced inputs of toxic substances into the environment; however, the serious contamination of port basins complicates restoration of these sites. Municipal sewage contributes to microbial pollution and to increased nutrients in the environment. This is particularly true in the case of overflows, which remain untreated.	<p><b>Biodiversity:</b> Pollution leads to a reduction in the numbers of many species and modifies the structure of living communities by limiting their development. Species that can tolerate the degradation of their environment become predominant.</p> <p><b>Uses:</b> Effluents discharged to the river without prior treatment contaminate the environment and have a whole range of negative effects on most uses, including: limitations on fish consumption, health risks associated with swimming and other water-contact activities. As well, discharges of nutrients lead to the proliferation of plants where the environment is so predisposed, harming aquatic life and pleasure boaters, in addition to being unsightly and foul smelling.</p> <p><b>Quality of life:</b> Pollution diminishes the sense of well-being of riverside residents. It has indirect repercussions on potential recreational use.</p>	<p><b>Biodiversity:</b> The effects of disturbance from pollution factors are reversible some time in the long term, depending on the nature of the substances discharged, the length of time they remain in the environment and their effects on aquatic organisms. Reduction of pollution is essential to maintenance of biodiversity.</p> <p><b>Uses:</b> The most effective means to limit loss of use resulting from pollution is control of discharge at source by all water users (industrial, domestic, business). This option will prove economically beneficial in the long term compared to all the indirect costs of doing nothing.</p> <p><b>Quality of life:</b> Pollution control returns to communities all the benefits of proximity to a body of water and instills a feeling of pride.</p>

<i>Characteristics of Study Area</i>	<i>Main Effects on the River and its Resources</i>	<i>Current Situation</i>	<i>Future Possibilities</i>
Recreation and tourism, hunting and fishing	<p>Recreation and tourism are focused on pleasure boating, cruises, visits to riverside and island parks, outdoor activities and nature-watching.</p> <p>Hunting and fishing are also practised but less frequently than in other river sectors.</p> <p>Infrastructure construction may destroy aquatic and riparian habitats. Pleasure boating may be a source of bacteriological and chemical contamination whose significance cannot be assessed.</p>	<p><b>Biodiversity:</b> Animal populations can generally tolerate resource exploitation. Shoreline infrastructure construction may affect plant and animal habitats.</p> <p><b>Uses:</b> Water-based recreational and tourism activities do not appear to conflict with other uses. Pleasure boating is regulated by safety and water-use rules. Hunting is also subject to regulations.</p> <p><b>Quality of life:</b> The possibility of using the water to practise these activities contributes to the well-being of riverside residents and also attracts tourists. Well structured recreational and tourism activities can generate long-term economic spinoffs.</p>	<p><b>Biodiversity:</b> Protection of wildlife habitats ensures the maintenance of animal and plant populations, and thus of the leisure activities that depend on them.</p> <p><b>Uses:</b> Pleasure boating, hunting and fishing must be controlled to avoid conflicts with other uses of the environment (disturbing wildlife, respecting the public's right to access to the shores, safety). The growing popularity of nature-watching and interpretation must also be considered, however.</p> <p><b>Quality of life:</b> Various swimming, outdoor and nature-watching activities can be promoted as tourist attractions. The necessary equipment and the activities themselves must be carefully chosen and located so that neither the environment nor quality of life are degraded.</p>

# Appendices

# 1 St. Lawrence Action Plan Priority Species Found in the Montreal-Longueuil Sector

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## Plants

Dragonroot, *Arisaema dracontium*  
Lake cress, *Armoracia aquatica*  
Hackberry, *Celtis occidentalis*  
Reed cinna, *Cinna arundinacea*  
Spring beauty, *Claytonia virginica*  
Engelman's cyperus, *Cyperus engelmannii*  
Fuzzy wild rye, *Elymus villosus*  
American water-willow, *Justicia americana*  
Guadeloupe naias, *Najas guadalupensis*  
Switchgrass, *Panicum virgatum*  
Clammyweed, *Polanisia dodecandra* ssp. *dodecandra*  
Long-beaked water-crowfoot, *Ranunculus longirostris*  
Northern dropseed, *Sporobolus heterolepis*  
Wild bean, *Strophostyles helvola*  
Pale manna-grass, var. pale, *Terreyochloa pallida* var. *pallida*  
Simple vervain, *Verbena simplex*

## Fish

Lake sturgeon, *Acipenser fulvescens*  
American shad, *Alosa sapidissima*  
River redhorse, *Moxostoma carinatum*

## Amphibians

Northern chorus frog, *Pseudacris t. triseriata*  
Pickerel frog, *Rana palustris*

## Reptiles

Blanding's turtle, *Emydoidea blandingi*  
Map turtle, *Graptemys geographica*  
Northern water snake, *Nerodia sipedon*  
Brown snake, *Storeria dekayi*  
Spiny softshell turtle, *Trionyx spiniferus*

## Birds

Peregrine falcon, *Falco peregrinus*  
Least bittern, *Ixobrychus exilis*

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Note: Migratory fish are included, but only bird species that breed on the river are listed.

## 2 Environmental Quality Criteria (for assessing loss of use)

<i>Ecosystem Components</i>	<i>Reference Criteria</i>	<i>Objectives</i>
<b>WATER</b>	Raw water (untreated, taken directly from a body of water) (MENVIQ, 1990)	Protect the health of a person who may both drink water directly from a body of water and eat aquatic organisms caught there throughout his or her life.
	Contamination of aquatic organisms (MENVIQ, 1990)	Protect human health, which could be endangered by eating aquatic organisms.
	Aquatic life (chronic toxicity) (MENVIQ, 1990)	Protect aquatic organisms and their offspring, as well as wildlife that eat them.
	Recreational activities (primary contact) (MENVIQ, 1990)	Protect the health of humans engaging in a recreational activity in which the entire body is regularly in contact with water, such as swimming or windsurfing.
<b>SEDIMENT</b>	Minimal effect threshold (MET) (SLC and MENVIQ, 1992)	Contaminant levels above which minor but tolerable effects on most benthic organisms are observed.
	Toxic effect threshold (TET) (SLC and MENVIQ, 1992)	Contaminant levels above which effects harmful to most benthic organisms are observed.
<b>AQUATIC ORGANISMS</b>	Protection of aquatic life (IJC, 1987)	Protect health of piscivorous aquatic organisms.
	Fish marketing standards (Health and Welfare Canada, 1985)	Maximal contaminant levels in fish to protect human health.
	Poultry marketing standards (Canada, 1971)	Maximal contaminant levels in fowl to protect human health.
	<i>Guide de consommation du poisson de pêche sportive en eau douce</i> (MSSS and MENVIQ, 1993)	Rules on eating sport fish to prevent harmful effects of contaminants on human health.

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### 3 Glossary

**Alkaline water :** Water with a pH value greater than 7.

**Benthos:** The plants (phytobenthos) and animals (zoobenthos) that inhabit the bottom of a body of water.

**Biomass:** The dry weight of living matter, altogether or by systematic group, expressed in terms of a given unit of surface area or volume of the habitat at a given time; examples are plant biomass, insect biomass, herbivorous biomass or carnivorous biomass.

**Body of water:** Volume of water having relatively homogeneous physical and chemical properties. Water from the Great Lakes is a distinct body of water, separate from that of the Ottawa River.

**Community:** All plants and animals living in the same habitat.

**Continental waters:** Water table or natural or artificial water courses, such as lakes, rivers, streams and irrigation, industrial or shipping canals, reservoirs and impoundments in which water is in direct contact with atmosphere. Also called *surface water*.

**Drainage basin:** The geographical catchment area from which the waters (originating as precipitation) of a particular watercourse or body of water are drawn. Also called *hydrographic basin* or *watershed*.

**Ecosystem productivity:** Biomass produced each year to maintain balance between animal and plant populations.

**Ecosystem:** Entire physico-chemical environment (biotope or habitat) and the living beings in it (biocenosis, or community), which can perpetuate itself indefinitely with inputs of matter and energy.

**Effluent:** General term for any emission, chiefly liquid, or a source of pollution, whether as the result of inhabited areas (municipal effluent or sewage) or industrial facilities (industrial wastewater or effluent). (Outfalls or sewers: places where liquid pollutants are discharged.

**Flood plain:** Flat alluvial expanse bordering a waterway that is only under water during a spate.

**Flow:** Volume of water running through a watercourse, pipe, etc., in a given time. Usually expressed in m<sup>3</sup>/s, but sometimes in L/s for small drainage basins.

**Fry:** Immature fish that have not yet attained adult form.

**Habitat:** Ecological niche in which an organism, species, population or group of species live.

**Hard water:** Water containing a high level of mineral salts, especially calcium or magnesium (> 150 mg/L CaCO<sub>3</sub>), liable to form scale.

**Non-point source pollution:** Pollutants indirectly introduced into a given environment. Agricultural pollution is non-point source pollution, since fertilizers and pesticides are spread over a wide area.

**Sediment:** Solid fragmental material formed by the weathering of rocks or other chemical or biological processes, which is transported or deposited by air, water or ice.

**Sediment dynamics:** All the features of the flow of a watercourse influencing sediment transport, sedimentation and erosion.

**Spawning ground:** Location where fish come together to breed.

**Suspended solids:** Small particles of solid matter (> 0.45 µm) floating in a liquid. Also called *suspended material* or *suspended load* (see Sediment).

**Thermal stratification:** Presence of layers or different temperatures in bodies of water, with the warmer water above the cooler water.

**Waterfowl:** Collective name for geese and ducks.

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