

ST. LAWRENCE
CENTRE

**Charting
the Course
for Fluvial
Ecology**



THE MISSION OF ENVIRONMENT CANADA'S ST. LAWRENCE CENTRE (SLC) IS TO GAIN A CLEARER UNDERSTANDING OF ST. LAWRENCE RIVER ECOSYSTEMS. THE SLC'S NUMEROUS SCIENTIFIC AND TECHNICAL ACTIVITIES OFFER UP-TO-DATE KNOWLEDGE THAT WILL LEAD TO SUSTAINABLE USE AND MANAGEMENT OF THE RIVER.



Created in 1988 in the wake of the St. Lawrence Action Plan¹, the SLC initially concentrated its research efforts on industrial toxins. Since 1998, however, it has broadened its range of work to include many new issues affecting the River. The only federal research and development centre devoted to river ecosystems, the SLC is now a leader in fluvial ecology, in both Canada and the world.

One of the Centre's mandates is to highlight the environmental aspects of the River so that managers and users of the St. Lawrence will give them the same consideration as they do its socio-economic aspects.

In addition to research and monitoring, technical laboratory services and the sharing of knowledge play important roles at the SLC, which employs a staff of specialists. Some 7500 documents and more than 15000 electronic files pertaining to the St. Lawrence River and its environment can be consulted at the Centre, by both specialists and the public. Research, however, is the Centre's main activity. Some 60 research scientists work here—usually in collaboration with researchers from other organizations—on a multitude of projects whose results are divided into three major programs: *Urban Effluents*, *Fluvial Biodiversity* and *Monitoring the State of the St. Lawrence*.

1. The St. Lawrence Action Plan is a Canada—Quebec initiative put in place in 1988 with the triple objective of protecting, conserving and restoring the St. Lawrence River ecosystem.



Urban Effluents

A MAJOR SOURCE OF POLLUTION IN THE ST. LAWRENCE RIVER, URBAN EFFLUENT DISCHARGES REPRESENT A SIGNIFICANT PROBLEM FOR THE ECOSYSTEM AND A HEALTH RISK TO USERS. MONTREAL'S WASTEWATER TREATMENT PLANT ALONE (THE LARGEST IN THE ST. LAWRENCE VALLEY) TREATS 2.4 MILLION CUBIC METRES OF WASTEWATER EACH DAY, PRODUCED BY NEARLY TWO MILLION CITIZENS AND MORE THAN 4 000 INDUSTRIAL AND COMMERCIAL ESTABLISHMENTS.

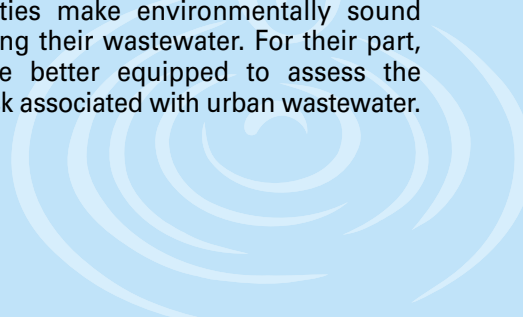
The effluents discharged by these establishments account for about 20% of Montreal's total wastewater production. Despite primary treatment that eliminates suspended solids, dozens of tonnes of heavy metals (e. g., copper, zinc, chromium and mercury) reach the River each year, in addition to many organic substances of pharmaceutical, domestic and industrial origins, whose effects are still largely unknown.

The *Urban Effluents* Program deals mainly with the effluent discharged by Montreal's wastewater treatment plant. It aims to identify potentially toxic substances and to measure their effects on the environment. This program will provide a better understanding of the fate of pollutants in urban effluents and a better knowledge of organic substances that may not have severe, immediate effects, but may damage the biological functioning of aquatic organisms in the long term. Indeed, some studies have already demonstrated that radical changes occur in the endocrine system of molluscs exposed to various substances over a long period of time. Research will also explain the interactions and combined effects of the various elements found in the complex environment of urban effluents. Overall,

the program will lead to a better assessment of the impact of urban wastewater on aquatic life and on water quality downstream of these effluents.

Research approaches call on different disciplines: analytical chemistry, to identify substances and follow their fate in the receiving environment; ecotoxicology, to assess the toxicity of substances for aquatic organisms; and parasitology, to verify whether the presence of certain toxins in urban wastewater makes fish more vulnerable to parasitic infections. This innovative approach is proving especially interesting, as it will eventually enable researchers to use parasitic diseases as indicators of chemical stress in fish and to measure the impact of urban wastewater according to its distance from the treatment plant outfall along the dispersion plume.

The results of these studies will be particularly useful to the City of Montreal, especially in its selection of a secondary disinfection treatment. They will also help other municipalities make environmentally sound choices for treating their wastewater. For their part, scientists will be better equipped to assess the environmental risk associated with urban wastewater.






Fluvial Biodiversity

THANKS TO ITS INTEGRATED APPROACH TO BIODIVERSITY, THE SLC'S NEW *FLUVIAL BIODIVERSITY* PROGRAM REPRESENTS A MAJOR INNOVATION IN ST. LAWRENCE RIVER RESEARCH.

The various stresses affecting the St. Lawrence River exert a cumulative effect on the biodiversity of the ecosystem. Much research has been conducted on these stresses, such as industrial contamination, urban pollution and fluctuating water levels. Nevertheless, little research has yet been done on the mechanisms that ensure the conservation and the dynamics of biodiversity. Because the long-term survival of ecosystems depends on these mechanisms, their conservation is even more important, considering the regrettably long list of species that are already at risk. At the same time, the number of alien species in the River continues to grow, further contributing to the loss of native biodiversity.

Thanks to its integrated approach to biodiversity, the SLC's new *Fluvial Biodiversity* Program represents a major innovation in St. Lawrence River research. It aims to understand the processes that determine biodiversity and to design new tools that will allow variations in biodiversity, as well as changes in ecosystems, to be monitored at all levels (local, regional, global; species, populations, communities...). Another program objective is to identify sensitive areas that are important for the conservation of biodiversity and to contribute to the establishment of a conservation strategy for species and habitats at risk.



Some of this work will involve the links between the diversity of species and the biological productivity of different aquatic ecosystems, such as marshes and floodplains. At the same time, using data that has been accumulated over the past 50 years, research scientists will attempt to determine the stability of the fluvial system's biodiversity over time. Indicators of biodiversity, such as the variety of species and the presence of fish and amphibian parasites in the food chain, will also be developed. Finally, researchers will assess the importance of invasive alien species, such as Purple Loosestrife, Zebra Mussels and crayfish.

Work for this new program will depend in part on the results of another SLC program that studies fluctuating water levels, which are fundamental to the conservation of ecosystems and to the monitoring of their dynamics. These activities will be conducted from the perspective of climate change, which will have long-term, determining repercussions on biodiversity due to changes in temperature or ice cover, or to engineering work required to counter the impacts of these very changes.



Monitoring the State of the St. Lawrence

HOW IS THE ST. LAWRENCE RIVER DOING NOW THAT VARIOUS EFFORTS HAVE BEEN DEVOTED TO IMPROVING ITS HEALTH AND RESTORING ITS FORMER USES TO THE POPULATION? IT IS TO ANSWER THIS AND MANY OTHER QUESTIONS FROM CITIZENS, ENVIRONMENTALISTS AND EXPERTS SEEKING OBJECTIVE DOCUMENTATION THEY CAN RELY ON THAT THE *MONITORING THE STATE OF THE ST. LAWRENCE PROGRAM* WAS LAUNCHED.

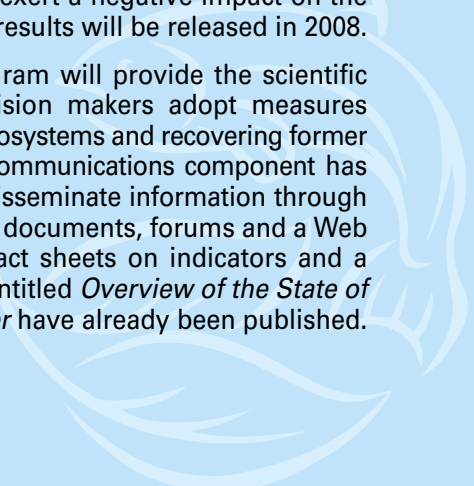


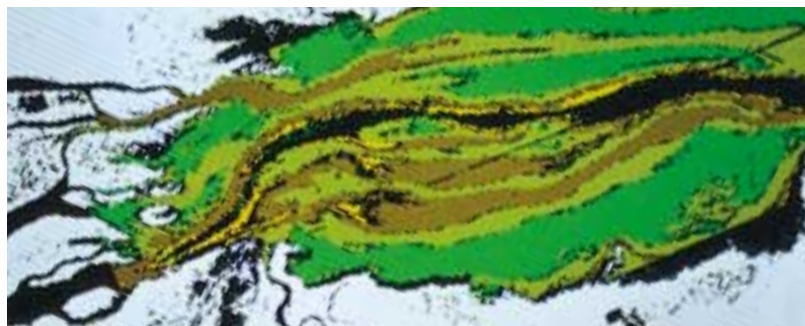
Many reports on the St. Lawrence ecosystem have already been completed as part of the St. Lawrence Action Plan, but none have taken the perspective of long-term environmental monitoring. In this program, four government partners—Environment Canada, the Ministère de l'Environnement du Québec, Fisheries and Oceans Canada, and the Ministère des Ressources naturelles, de la Faune et des Parcs du Québec—pool their expertise to report regularly on the state of the St. Lawrence River and how it is changing.

Monitoring is based on environmental indicators that have been selected as signs or signals of trends occurring in the main components of the ecosystem (water, riverbed, banks, biological resources and uses). So far, 21 indicators have been selected. They include such things as the state of a bird population, the level of water or sediment contamination, the surface area of freshwater wetlands, the presence of invasive species or the safety of potential swimming sites. By monitoring the changes in several indicators at once, scientists are able to draw up an ongoing overview of the system as a whole. Several means are used to study these indicators, particularly airborne and satellite remote sensing.

Initial monitoring results for the St. Lawrence were released at the beginning of 2003. They show that the River is in better shape now than it was during the second half of the 20th century, but that it remains vulnerable. Contamination by toxins has diminished; certain animal populations have recovered or are recovering; fish are suitable for consumption; and water quality is relatively good. Furthermore, the system still supports vast wetlands that ensure reproductive and feeding habitats for abundant, diverse wildlife. Nevertheless, bacterial contamination still adversely affects certain recreational uses; contaminants in sediments still pose a long-term health threat; and certain human activities continue to exert a negative impact on the ecosystem. The next results will be released in 2008.

This monitoring program will provide the scientific support to help decision makers adopt measures aimed at protecting ecosystems and recovering former uses of the River. A communications component has been established to disseminate information through fact sheets, summary documents, forums and a Web site. A series of 16 fact sheets on indicators and a summary pamphlet entitled *Overview of the State of the St. Lawrence River* have already been published.





Other Activities

THE SLC ALSO PARTICIPATES IN NATIONAL PROGRAMS, SUCH AS THE *LONG-RANGE TRANSPORT OF AIRBORNE POLLUTANTS (LRTAP) PROGRAM* AND THE *PESTICIDE SCIENCE FUND*.



Under the LRTAP Program, the SLC monitors 43 lakes in the St. Lawrence watershed to assess the effectiveness of Canadian and U.S. programs fighting acid rain. Research scientists are trying to understand the ways, the rate and the extent to which lakes recover. The program includes a component for disseminating results, which indicate a slow rate of recovery for certain lakes. As for the Pesticide Science Fund, the SLC's role is to detect the presence of pesticides in the waters of the St. Lawrence and in agricultural tributaries, and to study their effects on amphibians.

In addition, the St. Lawrence Centre is an active, influential member of the Réseau de recherche en écotoxicologie du Saint-Laurent, which is financially supported by Valorisation-Recherche Québec.

In most of its activities, the SLC works in collaboration with other government bodies and non-governmental organizations, including Environment Canada's National Water Research Institute (NWRI), the National Laboratory for Environmental Testing (NLET), the International Joint Commission (IJC) and the State of the Lakes Ecosystem Conference (SOLEC). Research scientists also collaborate with riverside communities and a host of other stakeholders interested in the River.

Finally, the St. Lawrence Centre is very active internationally. It regularly participates in international symposiums, organizes its own and welcomes delegations from many countries.

The St. Lawrence River is an ecosystem with diverse habitats, an immense freshwater resource, a true source of well-being for millions of riverside residents and an economic engine for the entire country. A complex system whose every element participates in its healthy functioning, its richness is immeasurable.

Yet enormous economic, social and environmental pressures are being brought to bear on this ecosystem, to the point of jeopardizing its sustainability. With a better understanding of its strengths and the way it functions, we will be able to maintain its richness for generations to come.

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