ST. LAWRENCE CENTRE PROGRAM, 2003–2008

Report DA-28

ST. LAWRENCE CENTRE PROGRAM, 2003-2008

St. Lawrence Centre
Environmental Conservation
Environment Canada – Quebec Region

October 2003

FOREWORD

This document presents the St. Lawrence Centre's science program for the period 2003-2008. The program does not represent a radical shift from the period 1998-2003, as it is largely based on continuing activities. However, the emphasis has been placed on an updated list of the main issues still confronted by the St. Lawrence River.

This program was developed with the active participation of SLC employees, who, generously and in large numbers, took advantage of the opportunity to provide their contributions at different stages of the program development process.

Finally, this document is specifically addressed to the scientific community of Quebec and the rest of Canada, who will find in it information relevant to the development of productive scientific partnerships.

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CHAPTER 1
INTRODUCTION

Created in 1988, the St. Lawrence Centre (SLC) is the only federal research and development centre devoted entirely to river ecosystems. Reporting to the Environmental Conservation Branch of Environment Canada, the SLC uses science to support action on behalf of all Canadians.

In 1998, the SLC obtained its own budget, independent of the St. Lawrence Action Plan, which allowed it to draw up its first five-year plan (1998-2003). The SLC presents herein its program for the period 2003-2008.

MISSION

The mission of the St. Lawrence Centre is to enhance understanding of St. Lawrence River ecosystems through science and based on an integrated-knowledge approach. The SLC favours a river management approach in which environmental concerns receive the same consideration as socio-economic and community interests.

MANDATES

To make its mission a reality, the SLC has four mandates:

- Maintain a leadership role in research and development on river ecosystems;
- Emphasize environmental components and ensure they are considered by major stakeholders in the management of the St. Lawrence River;
- Provide the regional branches of Environment Canada with scientific support as well as laboratory and technical services; and
- Contribute to the achievement of the goals of the St. Lawrence Action Plan.

CHAPTER 2

THE CONTEXT

The development of this science program took into account a set of priorities already identified at different levels, all of which are relevant to the St. Lawrence. Moreover, the SLC's areas of expertise, as well as its human and financial resources, were taken into consideration.

THE NATIONAL CONTEXT

Environment Canada has three long-term program priorities: reduce the health effects of environmental threats, sustain our natural environment, and move forward on climate change. Moreover, the National Water Research Institute (NWRI) has identified national priorities both for water quality and quantity (with the Meteorological Service of Canada). Some of these priorities specifically concern the St. Lawrence, namely, contaminants (pesticides, metals, naturally occurring trace elements, nutrients), municipal effluents, genetically modified organisms (GMOs) and Endocrine Disrupting Substances (EDS), the impact of water control structures and climate change. The SLC has considered these national priorities in its planning. We should note that many of these issues are also international priorities.

THE GREAT LAKES BASIN

In the context of monitoring the progress made under the Great Lakes Water Quality Agreement, in 2002 the International Joint Commission (IJC) also identified priorities for the Great Lakes, including water quality, contaminated sediments and invasive alien species. Because these issues also affect the St. Lawrence, the SLC took them into consideration.

For several years now, the SLC has participated in the State of the Lakes Ecosystem Conference (SOLEC). Work is proceeding, for example, on the development of water-quality and sediment-contamination indicators that would be applicable to the Great Lakes–St. Lawrence basin.

THE REGIONAL CONTEXT

The SLC's five-year plan also contributes to the achievement of regional priorities that involve understanding how human activities affect ecosystem health.

The SLC's accomplishments during its first decade in operation were among the goals of the St. Lawrence Action Plan. The focus was on industrial sources of toxic substances: we identified the presence of these substances in the water, in sediments, and in animal and plant species, and also developed tools to measure their impacts on the ecosystem. We published *State of the Environment — Report on the St. Lawrence River*, as well as a varied collection of documentation (e.g. Info-Flash fact sheets, regional updates, thematic reports) targeted at client groups with an interest in the St. Lawrence.

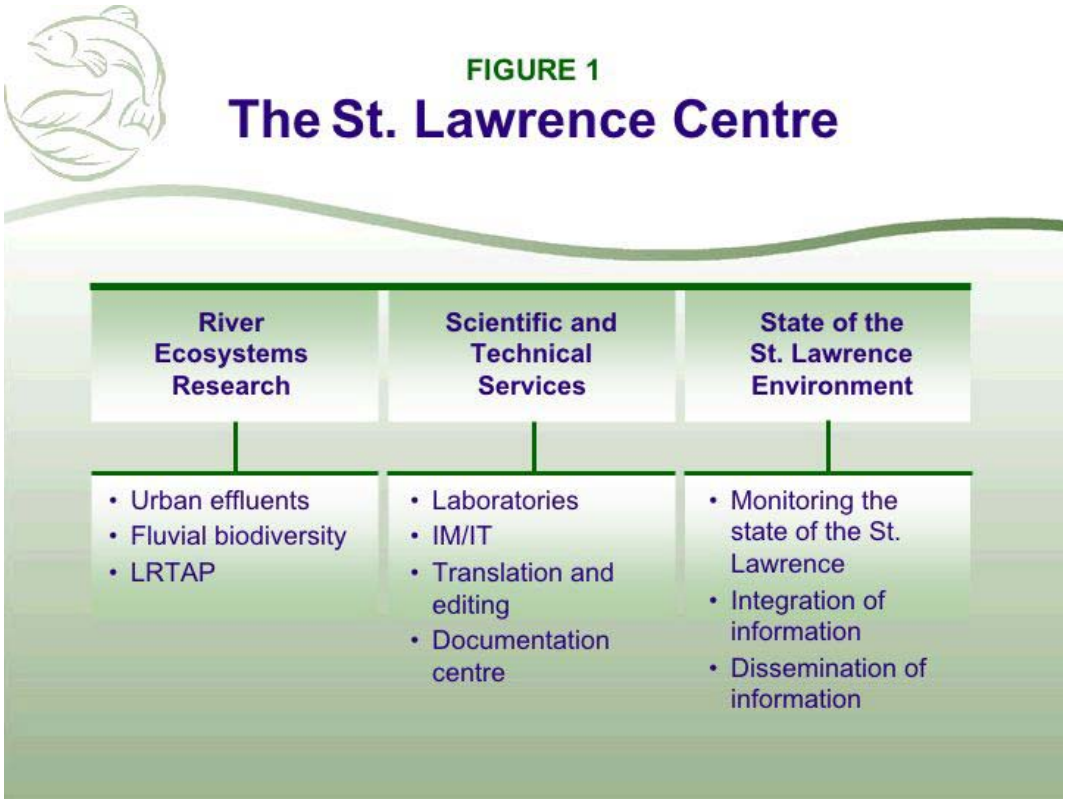
The SLC's programming for the period 1998-2003 reflected the fact that the acute contamination of the river decreased while the list of issues got longer, to include, in particular, water level fluctuations and the introduction of alien species. We were also interested in the effluent from the Montreal Urban Community's wastewater treatment plant (one of the largest in North America) and in measuring the environmental impacts of the plume, which stretches dozens of kilometres downstream from the Montreal archipelago.

With a view to planning the fourth phase of the St. Lawrence Action Plan in 2003, as of 2001, scientists began voicing their opinions on the main issues still threatening the St. Lawrence. At the same time, a long-term monitoring program for the St. Lawrence was put in place by four government partners: the ministère de l'Environnement du Québec (Quebec's department of the environment), the

Société de la faune et des parcs (Quebec's department of parks and wildlife), Fisheries and Oceans Canada and Environment Canada. Finally, the advice of the St. Lawrence Vision 2000 Advisory Committee and suggestions from non-governmental partners were taken into account in the programming.

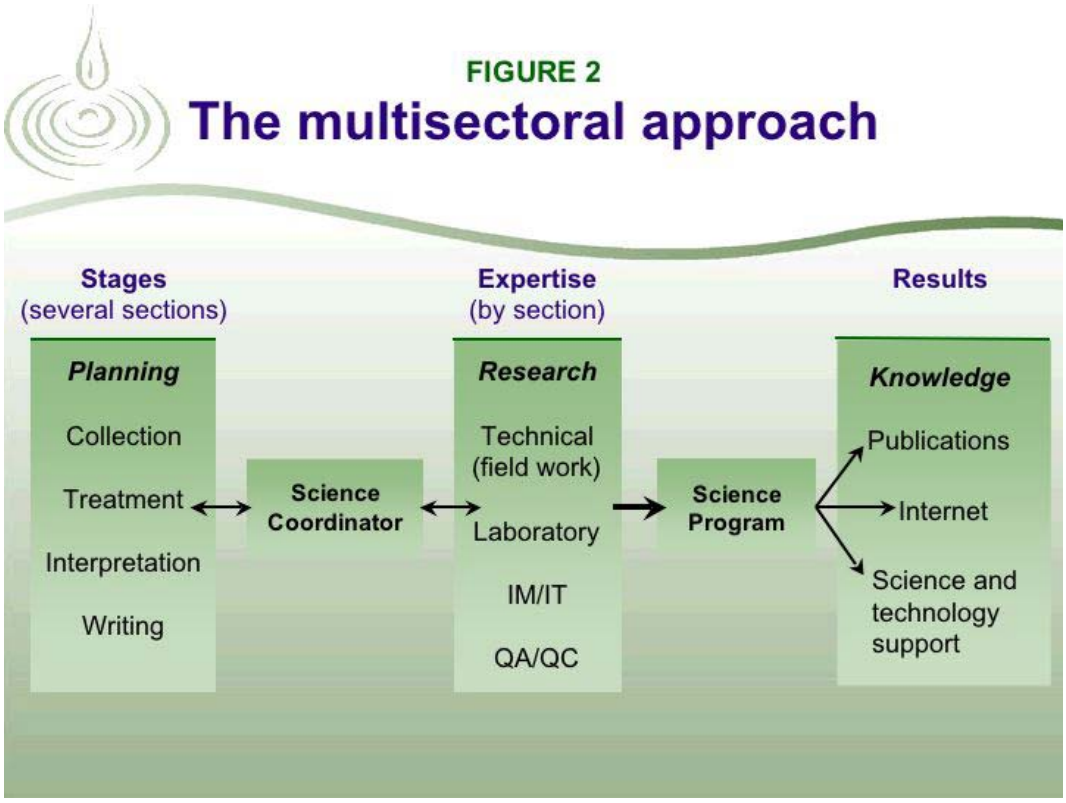
THE ST. LAWRENCE CENTRE CONTEXT

In 2002, the SLC adopted a new organizational structure (Figure 1) that corresponds to the SLC's three main functions: research and development, monitoring the state of the St. Lawrence, and scientific and technical services.



In addition, the SLC adopted a management framework that would facilitate multidisciplinary programs and created the post of "program science coordinator" to coordinate projects that are part of the same program but involve different work units, or sections (Figure 2). Each program is made up of a group of projects that lead toward the same goal.

FIGURE 2



CHAPTER 3

THE PROGRAM DEVELOPMENT PROCESS

The 2003-2008 program was drawn up in several stages and staff was encouraged to participate actively, in keeping with management's commitment to organizational health.

- A one-day workshop was held in December 2002 to emphasize the importance of contributing to the achievement of results.
- A discussion day for defining priority themes and identifying priority areas of science was held in January 2003.
- Also in January 2003, SLC scientists participated in a two-day workshop at the Université du Québec at Trois-Rivières, as part of a consultation organized by the Canada Research Chair in Freshwater Ecology.
- In March and April 2003, multidisciplinary teams from the SLC drew up proposals for science programs.

CHAPTER 4

THE SCIENCE PROGRAM

The St. Lawrence Centre's 2003-2008 science program is centred on three major programs:

- Research on urban effluents;
- Research on fluvial biodiversity; and
- Monitoring the state of the St. Lawrence.

These three programs figure among the anticipated outcomes of the St. Lawrence Action Plan.

It should be remembered that research and monitoring are two complementary scientific activities, both in terms of project planning and the scientists involved.

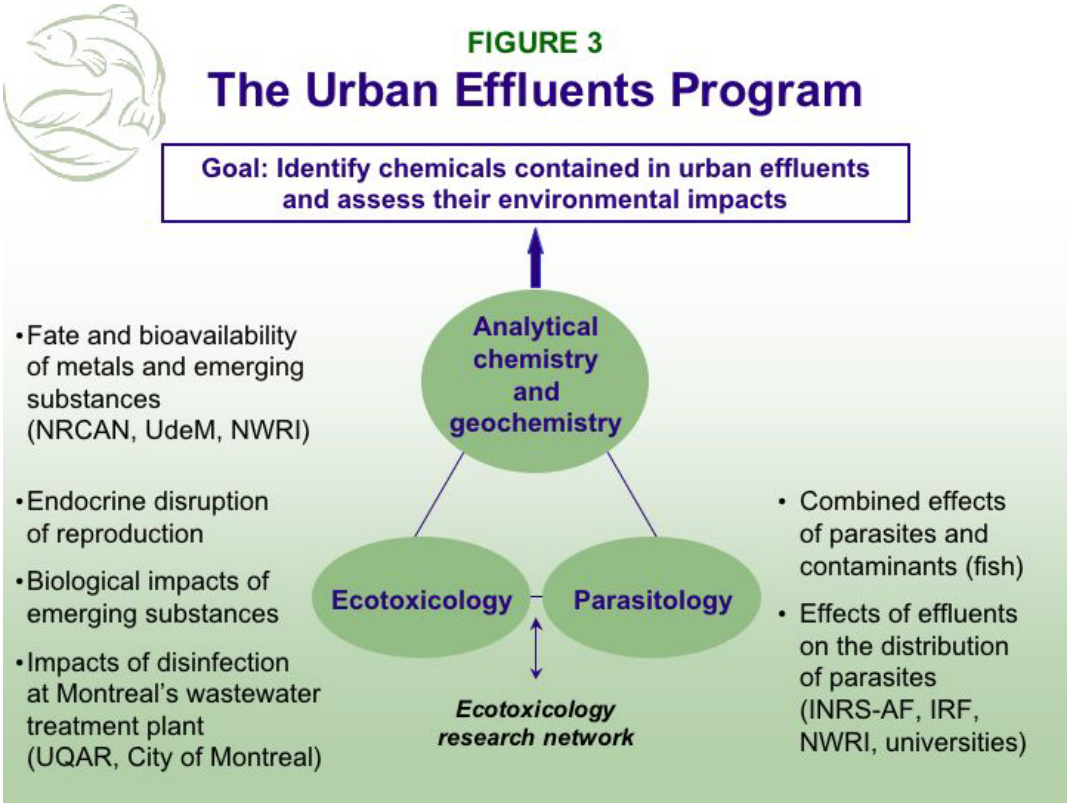
The 2003-2008 science program does not constitute a radical shift from the preceding period as it is mainly based on continuing activities: the Program on the Impacts of Water Level and Flow Fluctuations (or "Water Levels Program"), with the financing of the International Joint Commission (2000-2005); the State of the St. Lawrence Monitoring Program (2003-2010) and the Urban Effluents Program, underway since 2001-2002.

Nevertheless, the emphasis is on an updated list of the main issues, taking into account the SLC's pool of expertise, as well as the research activities already underway in partnership with the scientific community of Quebec and the rest of Canada.

RESEARCH ON URBAN EFFLUENTS

GOAL

Identify the specific chemical compounds discharged in urban effluents and measure their impacts on the environment by means of approaches and models utilized in the fields of ecotoxicology, analytical chemistry and parasitology (Figure 3).



JUSTIFICATION

In our regions, the discharge of urban effluents is considered a major source of unpleasantness to users of the St. Lawrence River and poses a hazard to their health. What's more, these effluents are a major source of pollution in the river.

The St. Lawrence River receives the effluent from the largest water treatment plant in the St. Lawrence Valley. This plant treats 2.4 million cubic metres of wastewater each day from Montreal and serves 1.8 million residents and 4000 industrial and commercial establishments; the latter account for up to 20% of the annual throughput of the plant and explain the heavy load of various chemicals discharged. For example, dozens of tonnes of heavy metals, such as copper and zinc, not counting the many organic substances with as-yet-unknown impacts, are discharged into the river annually.

CLIENTS

The activities of this research program figure among the anticipated outcomes of the St. Lawrence Action Plan IV, which are to better understand certain stresses, notably urban discharges, affecting the ecosystems, in order to ensure their protection, while permitting the full use of the St. Lawrence. The results of this work will enable the City of Montreal and other cities to make the most environmentally sound choices for wastewater treatment and the management of the sewage system. Finally, the information generated will help the scientific community to better understand the processes governing the fate and the impacts of chemicals in municipal wastewater.

OBJECTIVES

The main objectives of this program are to:

- Identify the chemicals particular to municipal effluents that could be toxic to the ecosystem;
- Choose a certain number of these discharged substances in wastewater treatment systems and confirm their presence through chemical analyses; and
- Measure the impacts of these substances with the appropriate ecotoxicological tools, both in the effluent and dispersion plume from Montreal and in other discharges. The parasitological approach will allow us to verify if the presence

of certain toxic substances makes fish more vulnerable to parasitic infections. Finally, the work will be done through the use of mesocosm studies at Montreal's wastewater treatment plant in order to measure the changes in the toxic load before and after the disinfection of wastewater.

PLANNING

Most research work (Table 1) will deal with the municipal effluents of the city of Montreal, the largest effluent discharged into the St. Lawrence River. Preliminary knowledge of this effluent (characteristics, plume) and of its importance for the river system clearly justifies this choice. Finally, the City of Montreal must choose an additional wastewater treatment and the SLC and its partners will influence this choice by providing results on the post-treatment toxicity of these waters. At the same time, other urban effluent discharges, which have been subjected to different types of treatments, will be studied in order to obtain a more complete portrait of environmental impacts; the urban effluent discharged by the City of Chambly (aerated sewage lagoon) has been identified as the second effluent to be studied.

Work on the chemical component deals with the analysis of chemical forms as well as the fate of conventional substances. We will begin to conduct research aimed at identifying emerging substances, such as pharmaceuticals, as well as their fate in receiving waters during wastewater treatment.

Among the ecotoxicological approaches developed at the SLC, new biological tests and biomarkers of effects will be developed to measure the noxiousness of chemicals for aquatic organisms in the receiving waters.

TABLE 1
THE URBAN EFFLUENTS PROGRAM:
PLANNED ACTIVITIES

ACTIVITIES	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
1. Ecotoxicological assessment of the impacts of urban effluent discharges on river water quality	Development of an animal model	Validation of a hepatocyte test	Effects of the transformation of pharmaceuticals on the presence and virulence of parasites	Measurement of impacts on fish and bivalves	Integration and dissemination of results and knowledge
2. Identification of emerging substances and assessment of their fate in the environment	Study of the fate of pharmaceuticals and their effects in the environment	Application of biomarkers and validation of effects	Assessment of the life span, bioavailability and transformations of pharmaceuticals	Application of different treatments and assessment of the distribution in receiving waters	Integration, interpreta-tion and dissemination of results and knowledge

The parasitological approach is innovative; the prevalence of parasitic diseases may be an indication of the effects of chemical stressors on the health of organisms. In addition, we can use fish parasites as indicators of the structure of the food chain in affected sites. Finally, infected fish may be more sensitive to the effects of stress induced by toxic substances.

The research program will be made up of projects using different approaches to better understand the issue of urban effluents. A multidisciplinary approach is thus needed, in addition to arranging partnerships with universities, government centres and the private sector. Because this is a broad area and resources are limited, careful planning will be required from the start in order to target a limited number of well-defined research activities.

PARTNERS

This program involves working in collaboration with individuals involved in the fields of ecotoxicology, parasitology and environmental chemistry. This program is closely linked to the Réseau de recherche en écotoxicologie du Québec (ecotoxicology research network of Quebec), which assembles parties active in this huge field in Quebec, particularly the INRS-Institut Armand-Frappier research centre. Le SLC concentrates its research on the presence of certain chemicals and their impacts on the ecosystem; the partnerships established will allow us to assess the environmental impacts of urban effluent discharges as well as wastewater treatment techniques.

RESULTS

The following results are anticipated:

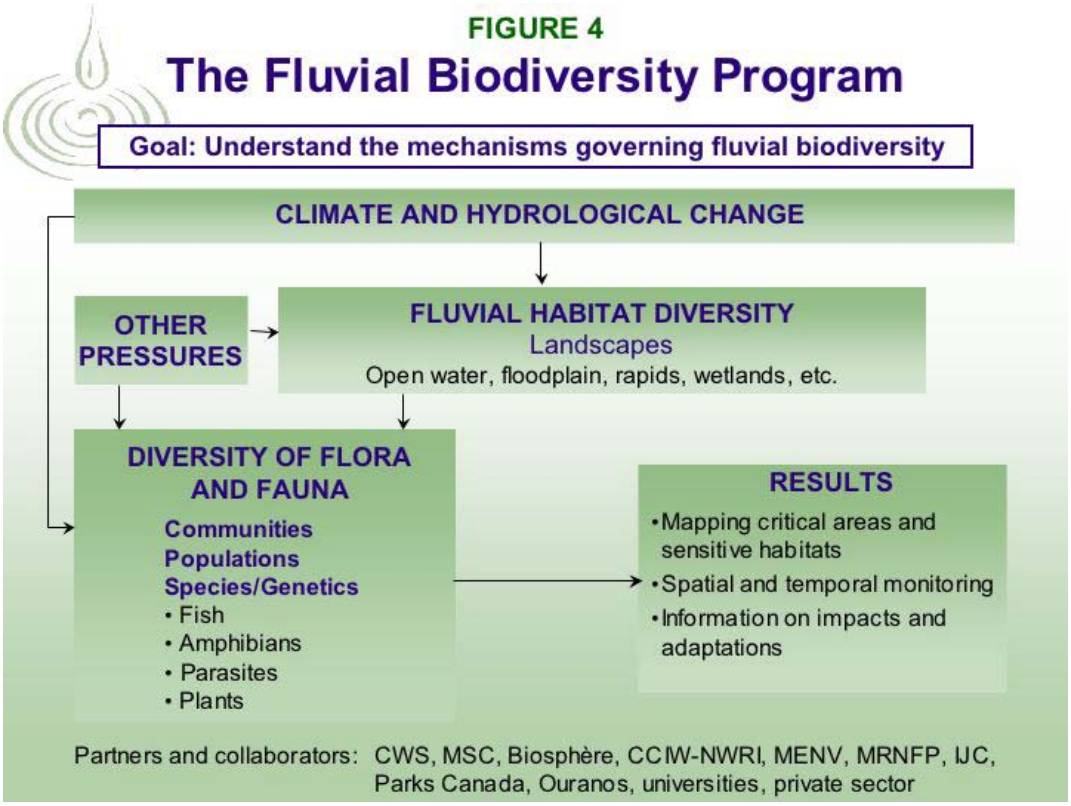
- A clearer understanding of the fate of pollutants we know are present in urban effluents;
- A more detailed identification of emerging substances in urban effluents and a better understanding of their fate;
- A better assessment of the impact of urban wastewater on the health of fish, with regard to parasitic infections; and
- A more precise toxicological assessment of the impacts of urban effluents on St. Lawrence River water quality.

OUTLOOK

This program was developed to provide an understanding of the fate and effects of particular substances in order to better assess the environmental risk associated with urban effluents. This approach can also be applied to several other types of contaminants that could be present in effluents, as well as in wastewater effluents treated in different ways.

RESEARCH ON FLUVIAL BIODIVERSITY

This program is a major innovation in St. Lawrence research. Until now, many research programs dealing with the St. Lawrence have used a "pressure-state-response" approach, having been designed to analyse a particular stress (such as industrial contamination, water levels or urban pollution) and the way one or several elements of the St. Lawrence ecosystem have responded. Yet, biodiversity is the cumulative response to a set of such pressures. Nevertheless, the relative importance of factors directly and indirectly ensuring the maintenance and dynamics of biodiversity remains to be explained and quantified, beyond the work already conducted on the St. Lawrence River (e.g. its biogeography and the portrait of its biodiversity).



The new Fluvial Biodiversity Program seeks to explain the mechanisms and main factors ensuring the maintenance and dynamics of St. Lawrence biodiversity, approaching them specifically from the angle of climatic change (Figure 4). This program depends from the outset on SLC expertise in aquatic ecology and aims to apply the knowledge acquired within the framework of the Water Levels Program: hydrological conditions are fundamental to fluvial ecosystem dynamics and are sensitive to the effects of climate change. Climatic factors like temperature and ice cover also affect the biodiversity of species and communities, either by altering the distribution of habitats by plant species and their use by animals, by affecting productivity cycles or by providing conditions favourable to the introduction and invasion of non-native species.

GOALS

- Understand the mechanisms governing fluvial biodiversity, as far as the processes and functioning of aquatic ecosystems are concerned;
- Document spatial and temporal variations in diversity and transformations in aquatic ecosystems;
- Identify critical or sensitive areas that are important for the preservation of St. Lawrence biodiversity; and
- Supply scientific advice and tools for environmental monitoring to support the strategy for species and habitat conservation.

JUSTIFICATION

The loss of biodiversity is at the forefront of international concerns. It is generally accepted that the conservation and integrity of ecosystems are closely linked to mechanisms controlling and ensuring the maintenance and dynamics of ecological diversity in time and space. The long-term survival of ecosystems is thus directly linked to the spatial and temporal dynamics of factors affecting biological diversity.

With its complex mosaic of ecosystems that are products of factors both natural and anthropogenic, the St. Lawrence River illustrates these dynamics particularly well. Regrettably, there is already a long list of species at risk; what's more, the number of exotic species in the river continues to grow, thereby reducing biodiversity. The hydrology and physical geography of the St. Lawrence have been profoundly altered by the major engineering work associated with the St. Lawrence Seaway. To this must be added the more recent threat of climate change and variability, which are liable to dramatically modify the biodiversity of landscapes and fluvial communities.

In order to protect the fluvial biodiversity of the St. Lawrence, the functions controlling the dynamics of biodiversity must be maintained. This program is justified mainly by the need to develop an integrated and dynamic vision of biodiversity and to propose to decision-makers safeguards for the conservation of St. Lawrence biodiversity despite current and future stresses.

The environmental gradients that control biodiversity can be arranged according to three main scales of influence:

- The global scale, particularly climatic effects;
- The regional scale, associated with the hydrology and characteristics of the drainage basin, including the impacts of the introduction of exotic species and the cumulative impacts associated with land use; and
- The local scale, associated with local pressures, be they permanent or temporary, of natural or human origin, including local pollution and habitat loss.

In the case of the St. Lawrence, the relative importance these three scales on the generation and maintenance of biodiversity remains poorly understood. Thus, fluvial diversity could be examined at many different levels (landscapes, communities, species, populations, genetics), thereby calling for the integration of work and knowledge in time and space.

CLIENTS

The results of the Fluvial Biodiversity Program are destined mainly for governmental and non-governmental managers who administer programs dealing with the conservation, acquisition and management of fluvial species, populations, communities, ecosystems and landscapes along the St. Lawrence.

OBJECTIVES

- Integrate the findings previously acquired within the context of the Water Levels Program with new work on biodiversity at the ecosystem and landscape scales (e.g. analyses of the interrelations and the dynamics of several abiotic and biotic components with uses for a given section of the river, like Lake Saint-Pierre or the Boucherville Islands);
- Define the links between species diversity and the biological productivity of various elements in aquatic ecosystems;
- Develop indices of fluvial biodiversity and assess the stability of plant and animal communities at various spatial and temporal scales;
- Measure and quantify the links between the variability of aquatic biodiversity indicators and long-term hydrological variability stemming from the impacts of climate change;
- Assess the relative importance of invasive and alien species on fluvial biodiversity; and
- Identify characteristic and unique species, populations, ecosystems and landscapes that could be affected by variables indicative of anticipated climatic changes.

PLANNING

The Fluvial Biodiversity Program will be developed over the year 2003-2004, concurrently with the completion of work conducted for the IJC (Table 2). For the moment, the basic outline of this program has been painted in broad strokes

(Figure 4), based in particular on the extensive knowledge accumulated since 2001 on the impacts of fluctuating water levels on certain aspects of St. Lawrence ecosystems.

TABLE 2
THE FLUVIAL BIODIVERSITY PROGRAM:
ACTIVITIES IN PROGRESS

CURRENT ACTIVITIES	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Water levels (IJC)					
Plants, fish and spawning grounds, invertebrates and parasites, anthropogenic uses	✓	✓			
Climate change					
Wetlands and recreational boating	✓				

PARTNERS

Partnerships will be determined on a project-by-project basis, as opportunities arise. We also expect the contribution of partners interested in the overall results. Certain partnerships have already been established and we expect to continue them as the program develops: within Environment Canada (CWS, MSC, Biosphère, CCIW-NWRI), with other federal departments (DFO, Parks Canada), with provincial ministries and agencies (MENV, MRNFP, Ouranos), with universities in Quebec, Ontario and the United States, with the private sector (Polygo) and with the IJC.

RESULTS

Biodiversity will be analysed from the perspective of climate change and the following results are expected:

- A clearer understanding of how ecosystems and landscapes function, of their strength and vulnerability;
- An identification of conditions ensuring the maintenance and integrity of the St. Lawrence ecosystem (e.g. water levels) and their spatial and temporal monitoring; and
- An identification of characteristic, unique or vulnerable ecosystems and landscapes.

OUTLOOK

The biodiversity of the St. Lawrence as we know it today is the result of a set of natural conditions and changes experienced by the ecosystem since it was formed, nearly 10 000 years ago. Over the last decade, we have witnessed the emergence of additional threats — climate change and variability — that hint at profound changes in the structure and functioning of the fluvial ecosystem as a whole. The chronic decrease in flow rates could reduce the size of the floodplain and the wetland areas of the St. Lawrence, consequently modifying the distribution of habitats and increasing human pressure on the banks accordingly. These conditions could prove favourable to certain tolerant species, at the expense of those that are more sensitive, and will open the door to the proliferation of more aggressive or completely exotic species, from the south or elsewhere. The program should evolve toward the development of knowledge oriented toward a better understanding and follow-up of the factors or influences that speed up or slow down the introduction and expansion of alien species.

Human adaptation to climate change (land use changes, increased demands on water supplies, use of genetically modified species and organic pesticides) could aggravate the pressures on the fluvial ecosystem, and have unknown consequences for biodiversity. These pressures, analysed in a cumulative manner with the development of appropriate analytical grids, should also be approached as another aspect modifying the dynamics of fluvial biodiversity.

The Fluvial Biodiversity Program will provide a global picture of the different organizational scales of the fluvial ecosystem, from the local (number of species at a given site) to the landscape (habitat and community diversity in the fluvial section). This overview is particularly important considering the retroactive effects between the climate, fluvial landscapes and habitats, the organisms that depend on them and human activities in the drainage basin.

Finally, regarding decision-making, the program should look into the analysis and development of explanatory models incorporating human activities that act directly or indirectly on the dynamics and conservation of fluvial biodiversity, for the purpose of providing a better decision-making structure for intervention strategies.

MONITORING THE STATE OF THE ST. LAWRENCE

GOAL

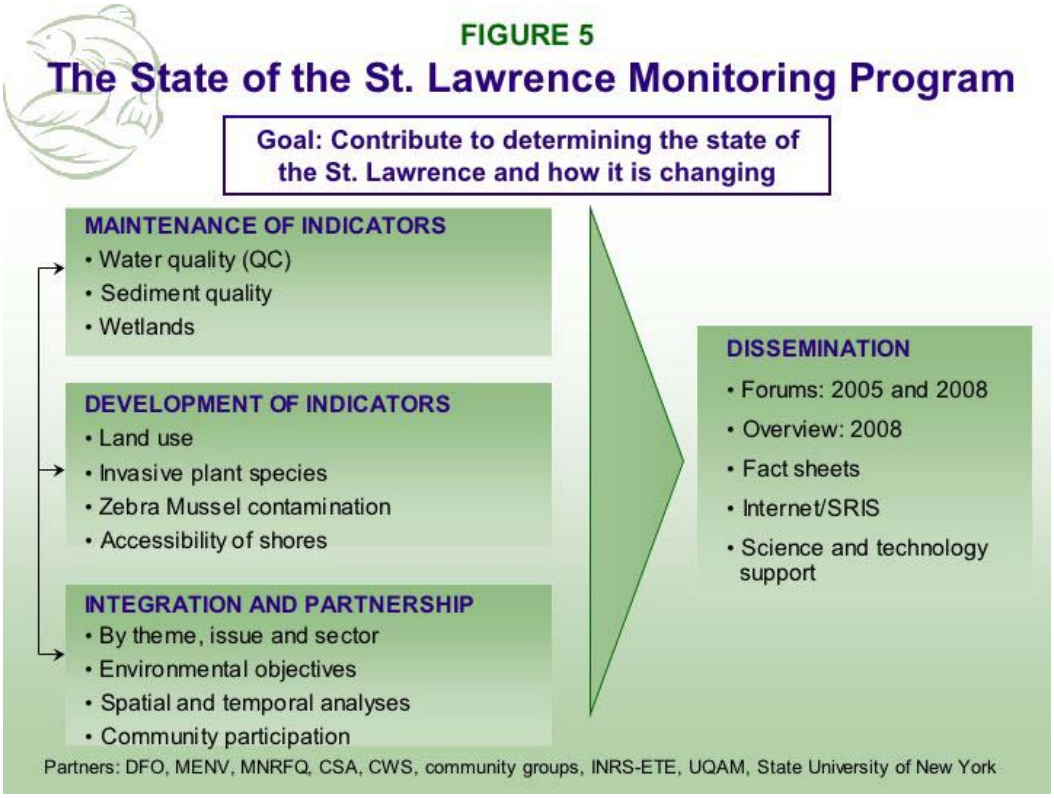
The State of the St. Lawrence Monitoring Program (SSLMP) aims to report regularly on the state of the St. Lawrence River and how it is changing.

JUSTIFICATION

This program is intended to fill the need expressed by many stakeholders in recent years for information on the state of the St. Lawrence River and how it is changing. In fact, while many different reports on the state of the ecosystem were completed during preceding stages of the St. Lawrence Action Plan, until now, no information had been collected from the perspective of long-term environmental monitoring. In this respect, the SSLMP is one of the first to respond to a need that was clearly expressed and supported by those involved.

For their part, the ZIP committees have expressed on many occasions, notably during the community involvement forum of September 2001, their need for

recent information on the overall state of the St. Lawrence that takes into account both local and regional characteristics.



The St. Lawrence Vision 2000 Advisory Committee has also issued an advisory regarding the importance of continuity in determining the state of the St. Lawrence, and of integrating and disseminating the information so that it is understandable and accessible. Furthermore, a poll of about 1000 Quebecers conducted in June 2001 revealed that the state of the St. Lawrence is one of the most important environmental issues about which they would like to be informed. Finally, many individuals, be they experts or ordinary citizens interested in or attached to this mighty river, ask themselves this simple yet infinitely complicated question: “Is the St. Lawrence doing any better?”

The Auditor General of Canada emphasized in a report the need to monitor the St. Lawrence from a global perspective that takes into account the Great Lakes–St.

Lawrence basin. The report also denounced our limited ability to report on the state of the St. Lawrence in a systemic manner capable of leading to a better overall understanding.

In response to the demand, work began in 1999, within the framework of St. Lawrence Vision 2000. Program partners pooled their monitoring activities, which they had already been conducting under their respective mandates, and committed themselves to continue these activities until 2010. In its current form, the program includes 21 St. Lawrence monitoring activities at a global scale that cover the main components of the ecosystem and allow us to draw up a report on its evolution. The official launch of the SSLMP and of its first findings took place on February 27, 2003. Environment Canada shares leadership of this program with the ministère de l'Environnement du Québec.

CLIENTS

The SSLMP targets two types of clients:

- Informed clients: governmental (federal, provincial and municipal) and non-governmental (industrial and institutional users) decision-makers and environmental groups; and
- Non-specialist clients: citizens of riverside municipalities and river users.

OBJECTIVES

The data generated by the Program will serve to:

- Provide objective, integrated information on spatial and temporal trends;
- Aid decision-making and guide the actions necessary to ensure the integrity of the system and to recover its former uses; and
- Encourage an accurate, scientifically supported perception of the St. Lawrence, based on its present state.

PLANNING

A collection of 16 fact sheets concerning indicators, and one summary pamphlet, entitled *Overview of the State of the St. Lawrence River*, were officially launched and distributed during the *Rendez-vous Saint-Laurent* forum. Environment Canada authored eight of the 16 fact sheets, three of which were produced by the SLC and stem from its current monitoring activities, namely:

- Contamination of water by toxic substances at the Lévis sampling station (annual);
- Toxic contamination of sediments in Lake Saint-François (next report due in 2009);
- The surface area of wetlands (next report due in 2006); and
- Freshwater wetlands and exotic plant species (next report due in 2006).

A five-year development plan was drawn up by the State of the St. Lawrence Monitoring Committee. Following are the additional monitoring activities that will be led by the SLC as of 2004:

- Land use along the St. Lawrence and Great Lakes;
- Shore accessibility;
- Water contamination by toxic substances at the mouth of the Ottawa River and at Wolfe Island (Lake Ontario);
- Toxic contamination of sediments in Lake Saint-Pierre;
- Metal contamination of the Zebra Mussel; and
- A community-based monitoring activity (possibly on invasive plants in wetlands).

SLC activities that are not related to monitoring will also contribute to the development of the Program. Projects under consideration concerning the Lake Saint-Pierre floodplain, such as erosion-sensitive zones, suspended solids and ice dynamics, will be taken into account during the update of present indicators and the development of new ones.

As for the integration and management of information, the following activities have been planned:

- Documenting and updating metadata and monitoring activities in the form of a distributed network of metadata;
- Holding four workshops concerning, for example, environmental components, environmental issues, or sectors of the St. Lawrence, that bring together Program scientists and other researchers; and
- Comparing and interpreting common indicators on the state of the Great Lakes (SOLEC) and of the St. Lawrence (SSLMP) for such factors as the contamination of water and sediments and the number and surface area of wetlands.

In collaboration with its partners and community representatives, the SLC will reflect on the development of environmental objectives for the St. Lawrence.

As for the dissemination of information, activities will include:

- Writing and producing fact sheets on current monitoring activities and planned activities (as set out in the schedule);
- Holding triennial forums (2005 and 2008);
- Writing and producing a summary document to integrate the results of the SSLMP (2008);
- Using GIS to provide target clients with access to Program results (as of 2004);
- Using the Internet to disseminate data and information on the state of the St. Lawrence generated by the SLC (as of 2003);
- Providing scientific and technical support to community groups (ongoing); and
- Working out new ways to disseminate information that utilize, in particular, intermediaries between the SLC and the communities (ongoing).

The Program will also intensify its partnership with the State of the Lakes Ecosystem Conference (SOLEC) in order to target indicators that best lend

themselves to providing an understanding of the entire drainage basin, notably the toxic contamination of water and sediments and the surface area of wetlands.

To summarize, the following table outlines the main activities planned over the next few years within the framework of the Program:

TABLE 3
THE STATE OF THE ST. LAWRENCE MONITORING PROGRAM: PLANNED ACTIVITIES

ACTIVITIES	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Maintenance of current indicators:					
Water contamination	✓	✓	✓	✓	✓
Sediment contamination					(in 2009)
Surface area of wetlands				✓	
Invasive plants				✓	
Development of new indicators	✓	✓	✓	✓	
Integration and management of information	✓	✓	✓	✓	✓
Dissemination of information:					
Fact sheets			✓	✓	
Summary document					✓
Internet	✓	✓	✓	✓	✓
Scientific and technical support	✓	✓	✓	✓	✓
Holding a forum		✓			✓

PARTNERS

The Program's four partners — Environment Canada, ministère de l'Environnement du Québec, Fisheries and Oceans Canada and Société de la faune et des parcs du Québec — are committed to continuing current monitoring activities until 2010 and to developing new activities to the extent permitted by their respective budgets. It should also be noted that the participation of Stratégies

Saint-Laurent in the development of the Program ensured that the communities' interest in contributing to its implementation was regularly emphasized.

The development of the Program will require the involvement of new government partners (Canadian Space Agency and Parks Canada Agency) for the monitoring of land use on the shores of the St. Lawrence; the participation of riverside communities will also be required for the collection of information about new indicators and the dissemination of this information to local clients.

RESULTS

The Program will help to better describe the current overall state of the St. Lawrence and the Great Lakes–St. Lawrence basin and how it is changing. The spatial and temporal changes observed will help us to better identify emerging environmental issues. The development of environmental objectives will help to integrate the results of the Program and to direct our activities so as to ensure the protection and conservation of the ecosystem. Target clients will have easier and more regular access to the results of the SSLMP, hence a more accurate perception of the state of the St. Lawrence.

OUTLOOK

The use of a constant reference point, based on a limited number of indicators, will make us increasingly able to report on the changing state of the river. In time, the combined influence of monitoring and research activities will allow us to adjust the Program so that it exacts a more precise, relevant response to the question: "How is the state of the St. Lawrence changing?" Holding forums, regularly disseminating information and gradually involving riverside communities and other partners in the Program will encourage feelings of ownership and dialogue that encourage the safeguarding of the St. Lawrence. Regular access to accurate, up-to-date information will lead to better decisions aimed at protecting and conserving the St. Lawrence for present and future generations.

OTHER SCIENTIFIC ACTIVITIES

Some of the SLC's other scientific activities fall under the framework of national programs. The SLC participates in the Long-Range Transport of Airborne Pollutants (LRTAP) program by monitoring 43 lakes and conducting a mass balance study of Laflamme Lake, as well as through its research partnership with the ministère des Ressources naturelles, de la Faune et des Parcs du Québec (Quebec's department of natural resources, wildlife and parks). Another SLC project deals with the presence and ecotoxicity of products of biotechnology and GMOs (Environmental Management of Biotechnology for Regulation and Research). The SLC also participates in the Interdepartmental Recovery Fund through its work on a threatened species, the Copper Redhorse. Finally, within the context of the national pesticide research program (Pesticide Science Fund), SLC research deals with the presence of pesticides in the river and agricultural tributaries as well as their effects on certain amphibians.

The SLC also maintains biology and chemistry labs that offer scientific and technical expertise, as well as analysis, to different branches of Environment Canada, specifically with respect to the application of the *Canadian Environmental Protection Act*. The SLC also devotes a great deal of effort to the management and dissemination of information. Finally, the SLC coordinates the Regional Water Framework.

In addition to the three programs presented here, which are outcomes of the St. Lawrence Action Plan, the SLC will participate in activities that fall under the themes "sustainable navigation," "disseminating knowledge" and "community involvement."

CHAPTER 5

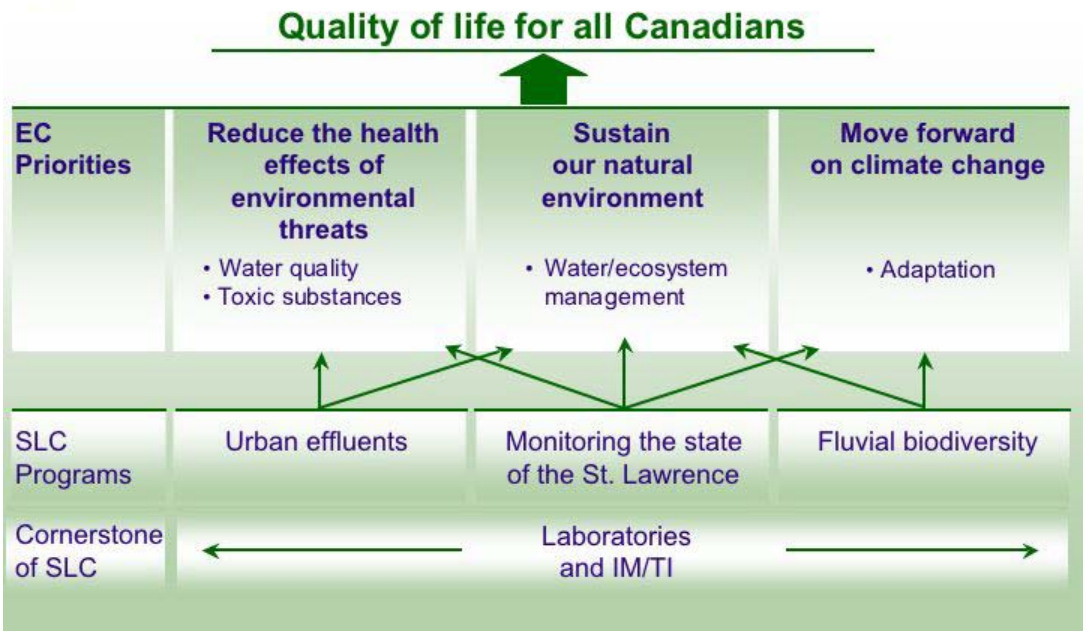
NATIONAL DIMENSIONS

The SLC's science program contributes directly to Environment Canada's three long-term priorities (Figure 6):

- Reduce the health effects of environmental threats;
- Sustain our natural environment; and
- Move forward on climate change.

FIGURE 6

The SLC's contribution to national priorities



The SLC also adheres to the approach to change adopted by Environment Canada, which favours knowledge and services, partnerships and strategic alliances, as well as the use of innovative tools, particularly regarding management and the dissemination of information. Finally, science and technology, the cornerstone of the Department, are also fundamental to SLC activities; lab activities as well as information management and technologies (IM/IT) support the SLC's research activities.

The National Water Research Institute (NWRI) is the largest freshwater research facility in Canada. Partnerships between the NWRI and the SLC already exist, particularly regarding the chemical contamination of water and sediments. The exchange of information on chemicals in urban discharge, as well as analytical laboratory services, and the exchange of scientific information with the National Laboratory for Environmental Testing (NLET), should also be mentioned.

In the future, new partnership possibilities may be considered. The program on urban effluents probably offers the most potential in this regard: the NWRI concentrates on overflows during heavy rain while the SLC focuses on treated wastewater. The SSLMP, which foresees intensified linkages between the St. Lawrence and the Great Lakes (on water and sediment quality, for example), also provides increased opportunities for collaboration.

CHAPTER 6

OUTLOOK

The St. Lawrence Centre's program is based on researching and monitoring the St. Lawrence, laboratory support and making information available to target clients.

We are currently considering whether to include the impact of agricultural tributaries in the Fluvial Biodiversity Program, because of the importance of this issue. We would look at how the biodiversity of the St. Lawrence is affected by the chemical compounds and biological components identified at the mouth of these tributaries.

It is already clear that current issues will not all be fully dealt with by 2008; additional research and monitoring efforts will be required for a more complete understanding.


Canada