ST. LAWRENCE ACTION PLAN

ANNUAL REPORT 88~89

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MESSAGE FROM THE FEDERAL MINISTER OF THE ENVIRONMENT

The St. Lawrence River has always been important in the historical, economic and ecological life of our country. For this reason, the federal government has decided to make saving the St. Lawrence a major priority. In June 1988, it decided to launch a five-year plan to protect, conserve and restore the quality of the St. Lawrence's waters. Today, I present the Canadian public, with great enthusiasm, the first annual report of the St. Lawrence Action Plan.

Though its name makes reference to a limited geographical area, this Action Plan is a project of national interest. It may be considered a sort of melting pot from which will emerge new environmental technology, new methods of managing the environment, and valuable expertise which can be put to use in other parts of the country.

The St. Lawrence Action Plan, which is an initiative of the federal government, calls on the competence and resources of several federal departments, such as Fisheries and Oceans, Industry, Science and Technology and, of course, Environment, which is the driving force of the project.

A RICH PARTNERSHIP

These three federal departments are only a few of the many institutions which have agreed to participate in this vast undertaking. For, as we know, Mother Nature takes no heed of boundaries drawn by humans. Because of the interdependence of the stakeholders on the environmental scene, and the complementary nature of their roles and actions, tackling environmental problems requires a considerable amount of cooperative effort.

In this light, we must mention the important role played by the Quebec government in the St. Lawrence Action Plan. The excellent cooperation received from the *ministère de l'Environnement du Québec* and the *ministère du Loisir, de la Chasse et de la Pêche* allows us to share responsibilities and coordinate our respective actions.

The partnership elicited by the Action Plan extends as well to the university and scientific communities, private enterprise and non-governmental groups working to conserve and protect the environment. In short, the Plan is a collective undertaking which mobilizes everyone's efforts towards a single goal.

A REALISTIC CHALLENGE

The objective of the St. Lawrence Action Plan is clear: by 1993, to reduce by 90 percent the liquid toxic waste being discharged into the St. Lawrence by the 50 industrial plants considered to be the biggest polluters.

This, of course, is a major challenge. However, considering the resources assigned to the Action Plan and the cooperation it has received, we consider this objective to be attainable. We have attacked the problem with determination, and the following pages report on our progress after only a few months of activity. It also outlines our projects for the coming year.

We are committed to providing the Canadian public with concrete, measurable results which will testify to the success of our mission. We plan to inform Canadians regularly of the progress made in each of the components of the Action Plan.

SUSTAINABLE DEVELOPMENT

Considering the complexity of the task, the Plan must reconcile the socio-economic interests of all sectors concerned. In this perspective, all participants have joined forces in an effort to find solutions leading to sustainable development.

We are convinced that such solutions are possible and applicable to the problem at hand. Based on recommendations put forward by the Brundtland Commission, which were presented to the United Nations in April 1987, as well as a report produced by the National Task Force on Environment and Economy (CCREM) on September 24, 1987, the St. Lawrence Action Plan offers a realistic approach which marries economic needs and environmental concerns.

A growing number of firms have already recognized the urgency of taking concrete action to protect the environment. Aware of tangible corporate benefits related to increased control over their toxic waste, some of these companies have already started to move in the right direction.

We congratulate them and invite the entire economic community to join this movement today. It is obvious that the most diligent companies will be the first to benefit from the reduction of toxic waste.

In this light, one of the most important components of the St. Lawrence Action Plan will be developing and refining new technical processes which will allow more efficient control over discharges of toxic wastes at reasonable cost. This will fill a gap which the industrial sector has deplored for some time. Surely it will see this development as one more reason to become a partner in the Action Plan.

A MOMENT OF TRUTH

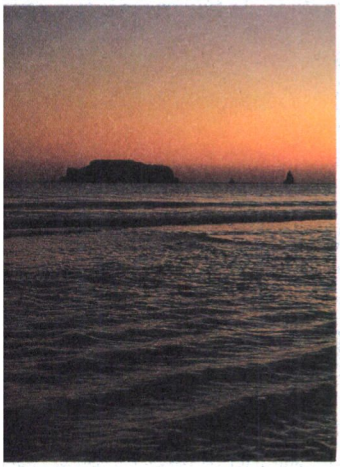
At the end of a century marked by fabulous progress in science and technology, we are taking a new step forward in our collective awareness concerning the state of the environment.

We have put an end to the uncontrolled exploitation of our natural resources. And we want to stop the thoughtless dumping of toxic substances into our natural environment. In short, we have arrived at a moment of truth — a sense of individual and collective responsibility which will lead to a viable future, in economic as well as ecological terms.

I therefore invite Canadians, public officials at all levels and other concerned groups — universities, scientists, business people, ecologists and others — to take up this challenge. Together, we can build the foundations of a promising future for ourselves and future generations.

Lucien Bouchard
Minister of the Environment

ST. LAWRENCE ACTION PLAN



The St. Lawrence River, the one we call "majestic", has always been an integral part of Canadian life: it is indeed one of the treasures of our natural heritage. Neglected far too long, often taken for granted, assaulted by human negligence — the St. Lawrence today brutally calls us to our senses.

Historically, the St. Lawrence was the route leading to the heart of a new continent. French explorers followed the river upstream to the Great Lakes. From there, they had access to another great waterway, the Mississippi, and went on to found towns such as New Orleans and St. Louis. The St. Lawrence made territorial and commercial conquests possible.

In economic terms, the St. Lawrence has always been the most important waterway in Canada, a vital artery for the transportation of merchandise. It was an essential factor in establishing and developing important economic activity. Still today, the river plays a major role in moving merchandise of all kinds.

It is obvious, when one looks at a map of Quebec, how important the St. Lawrence has been and still is today in the demographic evolution of this part of the country. Over 80 percent of Quebec's population is concentrated on the banks of the river, along a narrow inhabited corridor. Nearly 50 percent of the population takes its drinking water from the river. In Quebec, one is never very far from the St. Lawrence: it is the point of reference *par excellence*.

These are some of the reasons why the condition of the St. Lawrence is of such vital importance today. The seriousness of the situation makes us realize how much the river has always meant and given to us, and that, until today, it has received so little in return.

BACKGROUND

During the last decade, the Quebec government adopted a series of measures aimed at solving problems related to the poor quality of the St. Lawrence's waters. As the authority responsible for national and interprovincial rivers, lakes and streams, the federal government has supported actions undertaken by the Province. In the spring of 1988, both levels of government took a step forward and reached agreement on an ambitious plan which was approved in May by the federal Cabinet.

On June 3, 1988, the federal Minister of the Environment signed, with his Quebec counterpart and with the Quebec Minister, *Loisir, Chasse et Pêche*, a memorandum of understanding aimed at protecting and cleaning up the St. Lawrence. On July 14, the Treasury Board approved federal funds for the Plan amounting to $110 million over five years.

MANDATE AND OBJECTIVES

Inspired by the recommendations made by the Brundtland Report and the report produced by the National Task Force on Environment and Economy (CCREM), the St. Lawrence Action Plan was prepared within a perspective of sustainable development, i.e., development in which economic decisions are made with environmental considerations in mind. This is a sign of the federal government's determination to reconcile ecological and economic concerns.

The mandate of the St. Lawrence Action Plan is, by 1993, to reduce by 90 percent the liquid toxic waste being discharged into the St. Lawrence by 50 industrial plants recognized to be the biggest polluters. These companies represent six industrial sectors: pulp and paper, metallurgy, chemicals, mines, oil refining and metal-finishing.

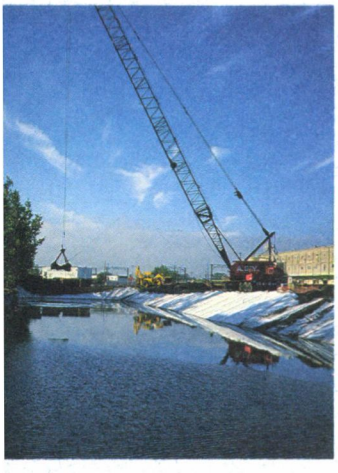
The Plan has complementary objectives, such as the development of environmental technology, the conservation of flora, fauna and ecosystems based on increased understanding of these elements, and the enhancement of increased individual and collective respect for the environment.

A FOUR-PART PLAN

In order to carry out this ambitious task, the St. Lawrence Action Plan has four intimately related targets.

Protection

The Quebec government has already taken important steps to see that municipalities bordering the St. Lawrence treat the liquid waste they dump into the river and its tributaries. However, one major problem still exists: contamination of the river by toxic substances of industrial origin.



This first component, which is directly related to the principal mandate of the St. Lawrence Action Plan, will assess externally generated toxic discharges, that is, contaminated material being carried down from the Great Lakes and the St. Lawrence's tributaries, and will work energetically to reduce the impact of industrial effluents.

Environmental technologies

A plant's ability to efficiently control its toxic emissions can be greatly hampered by the lack of appropriate technology. This is why the federal government intends, in the short run, to help eliminate the technical obstacles preventing plants from significantly reducing their toxic discharges and, in the long run, to play a major role in creating a state-of-the-art environmental industry.

To do so, the Action Plan will gear its efforts, first, towards developing industrial technologies which will contribute to its objective of reducing industrial toxic discharges, and secondly, towards developing resources and Canadian expertise in ecotoxicology and organic chemistry.

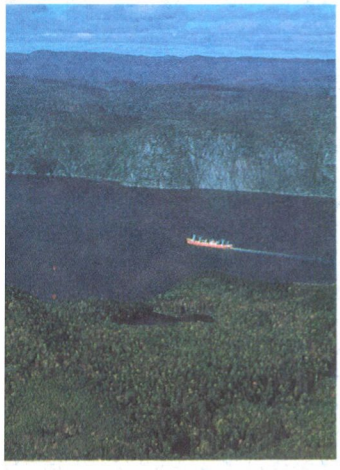
Restoration

This third component will allow the federal government to set an example by cleaning up federal sites bordering the St. Lawrence. One of the Plan's objectives will be to study the problem of contaminated sediments in federal port zones, such as Montréal, Trois-Rivières and Québec City, with a view to developing plans, in cooperation with its partners, for decontaminating these sites. Steps will also be taken to safely decontaminate the Lachine Canal.

Furthermore, a pilot project will explore new techniques for sediment management which will safely confine sediments transported by dredging. The project will work to create new wetlands for the conservation of animal and plant life and will restore habitats which are not in an irreversible process of deterioration.

Conservation

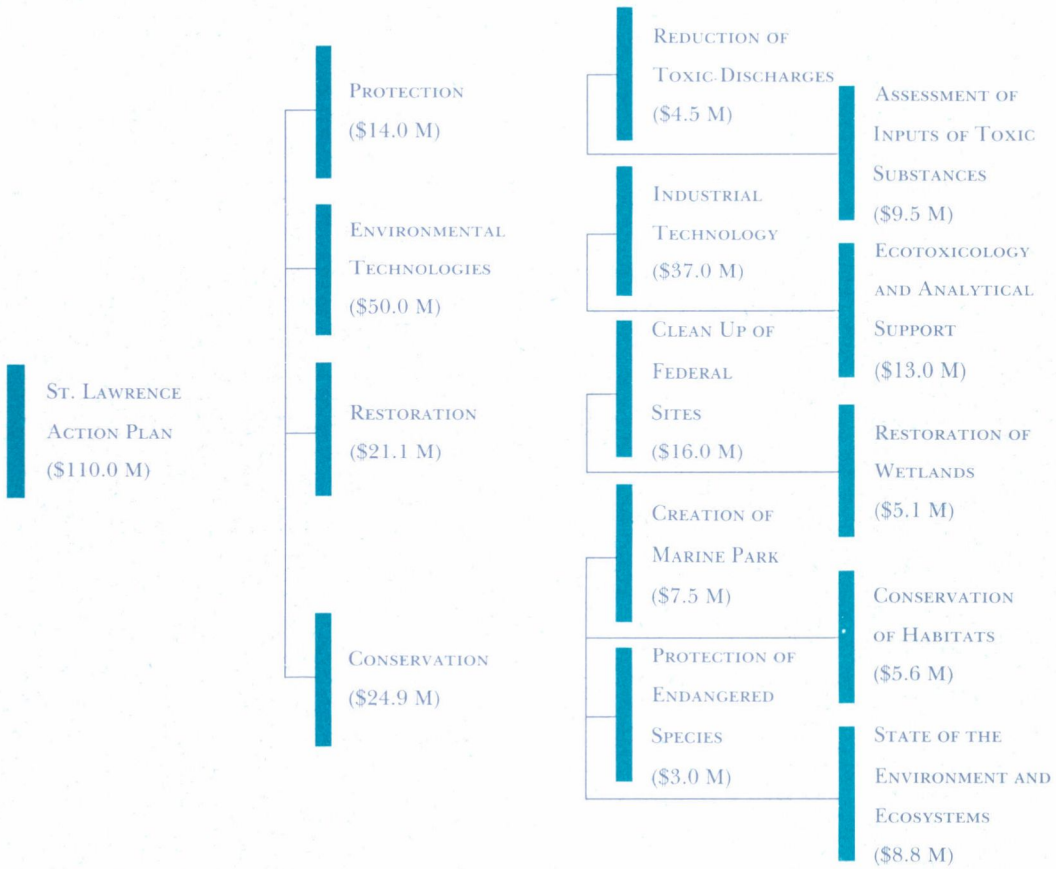
While working to reduce the negative impact of toxic discharges, the St. Lawrence Action Plan will strive to reinforce the conditions required for maintaining the river's ecosystems. A number of cooperative actions have been planned.



The Action Plan will contribute to conserving the natural heritage represented by the St. Lawrence, by working to save habitats, ecosystems and endangered or vulnerable plant and animal species. A marine park will be created at the mouth of the Saguenay. Some 500 hectares of land will be acquired in order to consolidate national wildlife areas; this initiative is over and above steps being taken to conserve 4500 hectares of particularly endangered coastal habitats. Survival plans have already been prepared for certain endangered species, such as the beluga, the peregrine falcon and the piping plover. The black sturgeon will soon be added to this list.

In addition, the Action Plan will devote an important part of its resources to gaining further knowledge about the state of the St. Lawrence's ecosystems and in preparing a precise bill of health for these ecosystems. In the short run, the quality of these ecosystems will be assessed by means of bio-indicators, i.e., animal or plant species whose state of health can be used as a "barometer" for the entire ecosystem. The Action Plan will make a special effort to disseminate the knowledge acquired. A full account will be published and a data bank including the most important findings of the project will be made available to the public.

FOUR COMPONENTS OF ACTION PLAN AND THEIR PROGRAMS

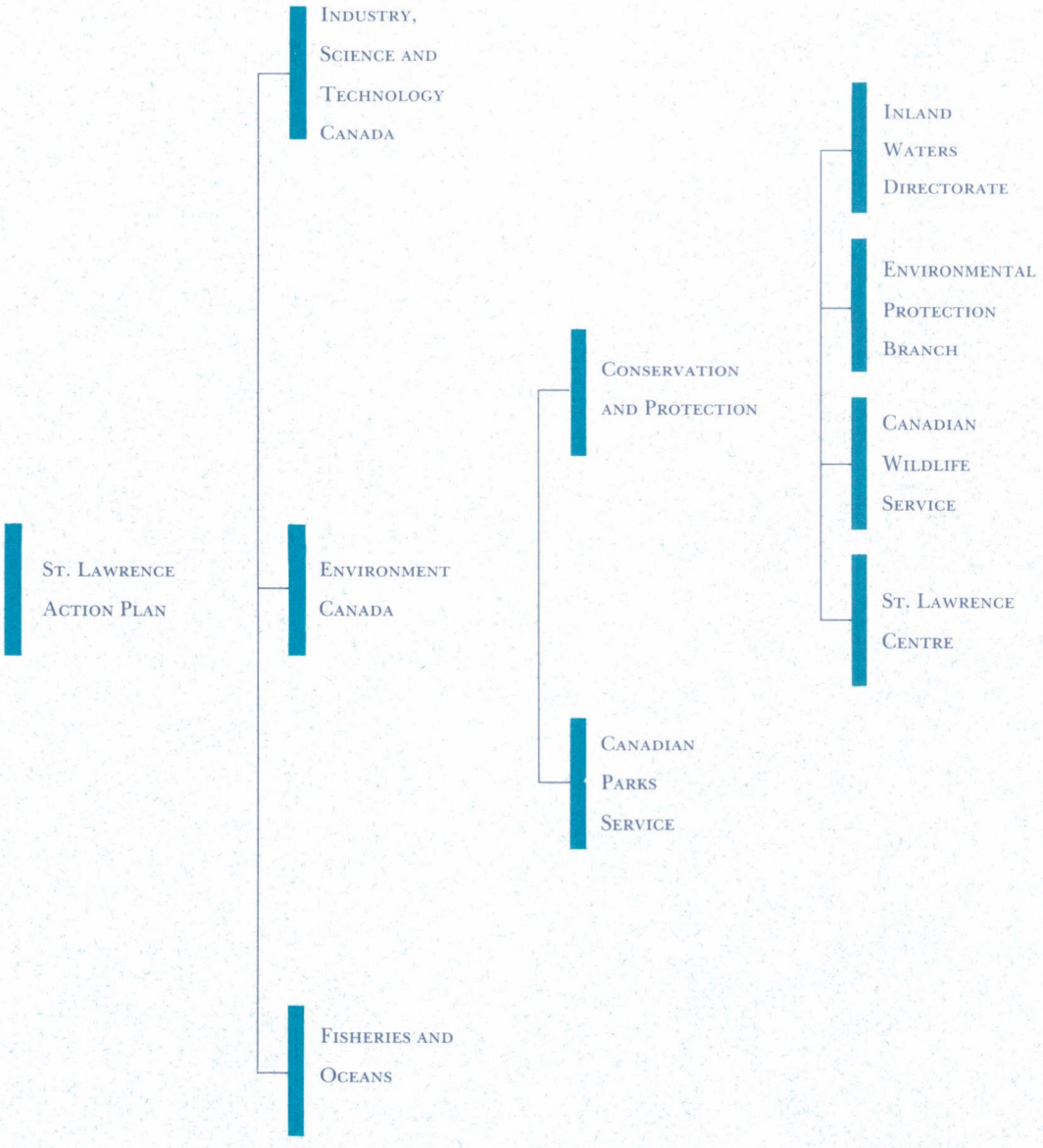


GOVERNMENT RESOURCES

The work of the St. Lawrence Action Plan has been made possible through the pooling of human, financial and technical resources provided by three federal departments: Environment; Industry, Science and Technology; and Fisheries and Oceans. These departments will allocate, respectively, $84 million, $20 million and $6 million, for a total of $110 million.

Each of these departments has assigned appropriate personnel to supervise the programs which concern them. As principal source of funds and driving force behind the Action Plan, Environment Canada has assigned the greatest number of human resources to the project. In order to complement the efforts of its other branches, Environment Canada has created a new organizational unit, the St. Lawrence Centre, which will be discussed further on in this document.

PRINCIPAL FEDERAL ACTORS



It should be emphasized that, in most cases, operational structures were set up only in the fall of 1988. By the end of the first fiscal year, most programs had been in operation for just four or five months, which explains the considerable variances between certain categories of expenses during Year I and projected expenditures for Year II. This also explains a certain imbalance within some programs between start-up activities and concrete achievements.

PARTNERSHIP AND CONTRACTING-OUT

The federal government considers the reduction of toxic discharges into the St. Lawrence and the conservation of our natural heritage to be a collective challenge, requiring action on the part of the greatest possible number of individuals and groups, working together cooperatively. That is why the St. Lawrence Action Plan emphasizes the creation of partnerships essential to the success of its mission.

Because of the areas of jurisdiction over which it has authority, the Quebec government is, of course, a major partner in the eyes of the Action Plan's managers. No significant progress can be made unless the actions taken within the context of the Plan are harmonized with those of the principal provincial actors, such as the *ministère de l'Environnement du Québec* and the *ministère du Loisir, de la Chasse et de la Pêche*. The federal government is pleased with the quick endorsement of the Action Plan by private enterprise and the scientific and university communities.

We must point out the valuable contribution being made by non-governmental groups in their work to conserve and protect the environment. Because of their initiative and commitment over past years, they are considered important partners in the success of the Action Plan. Contacts have already been established with these groups and the development of these relationships constitutes an important objective for the coming year.

In the same vein, and in order to rationalize the allocation of financial resources to the Action Plan, the administrators of the various programs strive to contract out the work that needs to be done within the context of the Plan. In the areas of expertise, experimentation or field sampling, there is an opportunity for competent professionals and firms to make a significative contribution to the objectives of the Action Plan.

Protection

Above all, we must have a solid understanding of the problem we are tackling. The St. Lawrence is suffering today the backlash of the socio-economic development it made possible. We must now adopt measures to identify the sources of the problem and to rid the St. Lawrence of the devastating consequences of toxic discharges.

This is why the St. Lawrence Action Plan has set itself the task of evaluating the input of toxic substances to the river basin and to study the hydrodynamic and physicochemical behaviour of these substances. The Action Plan is also working to identify sources of pollution

all along the river and to characterize the toxic discharges found, in order to implement reduction plans.

PROTECTION

One of the tasks that must be accomplished before being able to control toxic discharges into the St. Lawrence is the careful identification of the nature and source of these discharges. The component of the St. Lawrence Action Plan which deals with protection is exclusively devoted to this task. With a budget of $14 million, this part of the Plan operates through the close cooperation of Environment Canada and the *ministère de l'Environnement du Québec*. This component has two objectives:

First, **TO REDUCE THE AMOUNT OF TOXIC SUBSTANCES** poured directly into the St. Lawrence. Some $4.5 million will be spent to identify these toxic discharges and their sources before implementing a reduction plan.

An inventory will be made of the industrial plants bordering the St. Lawrence. For each of the 50 plants considered a priority, an action plan and timetable will be prepared as part of a clean-up program. Based on criteria developed to evaluate the quality of aquatic environments, and taking into account existing treatment techniques, levels of tolerable toxic concentrations will be established, along with maximum limits for each plant.

By 1992, each of these plants must have a clean-up program in place. The firms will assume all expenses related to the program, according to the "polluter-pays" principle. The companies will be expected to respect the discharge standards which are established, or pay fines. Respect of standards will be assured by legal and administrative provisions adopted by the Quebec government and, if necessary, by federal legislation.

Secondly, $9.5 million will go **TO EVALUATE INPUTS OF TOXIC SUBSTANCES** from the Great Lakes, from the international portion of the river basin above Québec City, and from its main tributaries on Quebec soil. The hydrodynamic and physicochemical behaviour of these toxic substances, as they are transported down the St. Lawrence, will be studied. These studies will make it possible to evaluate the progress being made by the program to reduce toxic substances and, if necessary, to change the direction of the program.

Once we have a more precise understanding of the ways toxic pollutants are carried and spread through the waters of the St. Lawrence, we shall be in a better position to develop agreements with other governments and to evaluate the effectiveness of actions taken to control toxic discharges.

The **TOXIC SUBSTANCES REDUCTION** program has spent some $615,000 on such activities as an inventory of the industrial plants located along the St. Lawrence, characterization of the discharges of eight of these plants, and a synthesis which assesses the environmental impact of the discharges of 50 of these plants and constraints related to the uses of the river. We have also developed remote sensing methods, using satellite imagery, to survey industrial discharges in the river. Three projects to modernize treatment processes, which are being carried out at Beauharnois, Valleyfield and Sorel plants, have been monitored closely.

This first year of operation has been punctuated by close contacts with the *ministère de l'Environnement du Québec*, principally concerning the creation of a federal-provincial interdepartmental task force and the preparation of a joint action plan to reduce the input of toxic substances from the Great Lakes.

Concerning the **ASSESSMENT OF THE INPUT OF TOXIC SUBSTANCES,** some $449,000 have been invested in various projects. One of these projects is studying, in Lake Saint-François, PCBs originating from Massena, using young fish as bio-indicators. All along the river between Cornwall and Québec City, young fish were studied to obtain the spatial distribution of persistant contaminants. Year II will see the chemical analysis of the specimens gathered and interpretation of results.

Three other projects have been designed to draw conclusions from various studies carried out by other groups. These projects are summarizing acquired knowledge about the transport of contaminants, the sedimentology of the river system, the presence of pollutants in the river's tributaries and their flow towards the river, and the contaminants found in the sediments of Lakes Saint-Louis and Saint-Pierre.

These studies will allow us to clearly understand the nature of the problem and set priorities, so that a study program for the Action Plan can be proposed. A great deal of time and energy was also spent setting up the program to reduce the input of toxic substances, at the St. Lawrence Centre.

AGENDA FOR YEAR II

Year II will see expenditures of nearly $1,058,000 for the **reduction of toxic substances**. Among other activities, a series of reports are planned:

- an inventory of the 50 plants earmarked by the Action Plan
- reports characterizing the discharges of 30 plants (to be jointly financed by governments and the firms involved)
- a preliminary evaluation of the local impact of the industrial discharges emanating from each of the 50 plants
- a report recommending treatment technologies

In addition, we expect to obtain the cooperation of some ten industrial plants which urgently require a clean-up program. If necessary, we shall impose upon these firms a program to reduce toxic discharges. At the same time, a computerized data management and cartographic system will be put into operation.

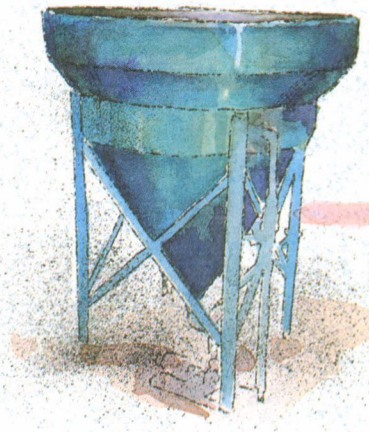
The program assessing the inputs of toxic substances has planned numerous activities to which it will allocate $1,201,000. Work will be carried out primarily in two target locations — Cornwall and Lake Saint-François. Results of this work will allow us to act more efficiently in other parts of the St. Lawrence.

Chemical analysis and interpretation of biological data will be conducted from samples taken at Cornwall, and a study will be done on the hydrodynamics and transportation of contaminants. Lake Saint-François will be the site for a study on sediments and their contamination. The project will evaluate the inputs of toxic substances from Massena, Cornwall and Lake Ontario, and will clarify the role of Lake Saint-François as retention site for contaminants.

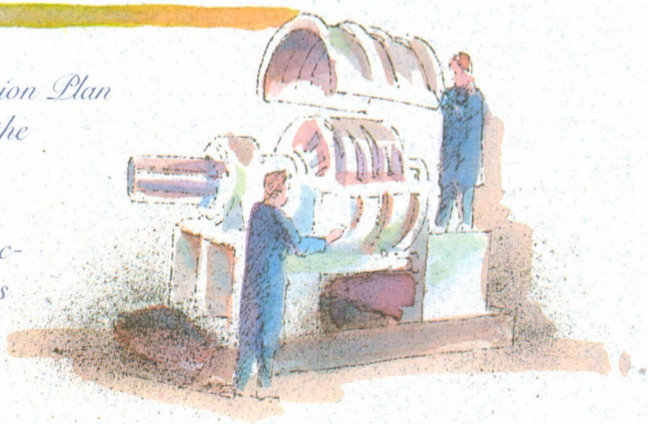
A new concept — the hydrozone — will be further developed, which will allow systematic study of the river environment and determination of actions to be taken. Priority zones will be identified within these hydrozones to evaluate the corrective measures to be applied.

The studies and data collected to date will be summarized in a status report on toxic substances in the St. Lawrence and its tributaries. The dynamics of contaminants will be studied, experimenting with young fish as bio-indicators, as well as the ecotoxicology of sediments on the river bottom and the role of macrophytes as traps for contaminants.

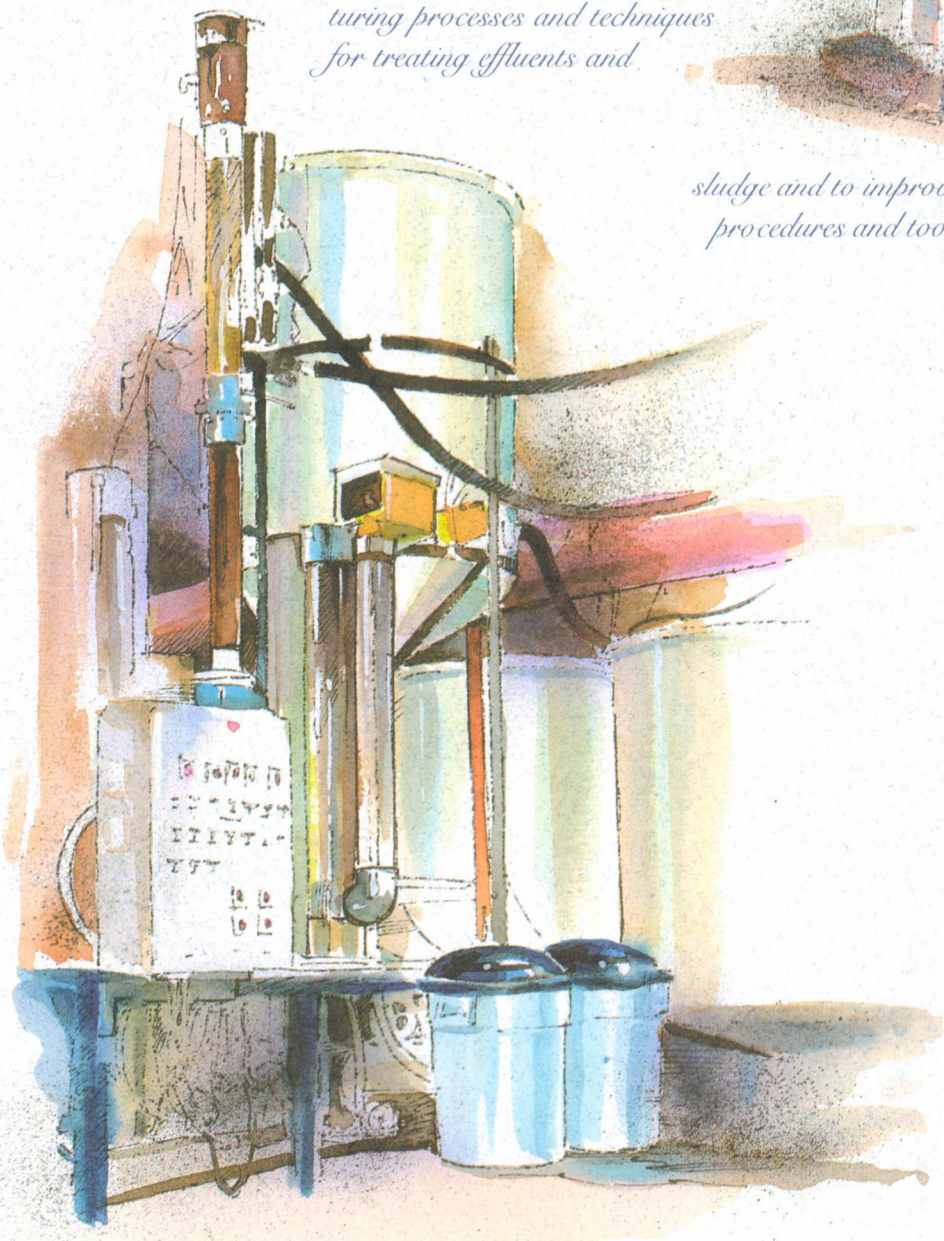
Environmental Technologies



In order to act efficiently in correcting the situation, appropriate tools must be developed. Existing technology and scientific approaches must be improved. Whenever required, we must innovate.



This is what the St. Lawrence Action Plan intends to do as it works to reduce the impact of industrial discharges to a minimum. The Plan will work to develop increasingly efficient manufacturing processes and techniques for treating effluents and sludge and to improve appropriate ecotoxicological procedures and tools for dealing with the problem posed by the St. Lawrence.



ENVIRONMENTAL TECHNOLOGIES

Judging by the size of the budget — $50 million — it is obvious that this component is the keystone of the St. Lawrence Action Plan. Responsibility for this part is shared by the federal departments of Industry, Science and Technology and Environment, through the St. Lawrence Centre. The two programs in this component deal, respectively, with the development of **industrial technology** ($37 million), and the improvement and use of expertise in **ecotoxicology and analytical support** ($13 million).

The importance of the environmental technologies component is clear when it is understood that its primary mandate is to provide the tools required by many of the other programs in the Action Plan. In order to protect, restore and conserve the environment, it is often necessary to innovate, develop new processes or refine existing technology.

One example is the difficulty some firms face due to a lack of financially feasible processes available for reducing their discharges of toxic substances. In this area, the ideal solution is to prevent the formation and emission of toxic substances by developing new manufacturing processes. Otherwise, the effects of industrial discharges must be reduced to a minimum by developing confinement, handling and decontamination techniques for sludge or by treating effluents. These techniques often prove to be costly and represent no immediate advantages for the firm.

In the short run, this component aims to meet the inherent needs of the St. Lawrence Action Plan. But in the long run, it also aims to stimulate the growth of a relatively new economic sector — the environmental industry. In addition, the activities of the environmental technologies component will encourage the creation of centres of expertise and excellence in environmental technology. In the area of ecotoxicology, we want to develop high-level expertise which will allow us to meet growing needs in this area. To do this, ecotoxicological procedures and tools will be developed to deal appropriately with the challenges presented by the St. Lawrence.

To reach their objectives, the managers of the environmental technologies thrust recommend the creation of financial and technical consortia representing government, universities and industry.

ACTIVITY REPORT

To date, the **INDUSTRIAL TECHNOLOGY** program has spent some $493,000 to get its services up and running, establish consultative procedures, identify its partners and prepare audio-visual material. In order to prepare subsequent steps, Environment Canada and Industry, Science and Technology Canada have signed a memorandum of understanding to coordinate the management of funds allocated to technological development. The two departments have also set up a joint committee which will set priorities, develop policy and evaluate the development proposals submitted. In the same vein, Environment Canada expects to sign an agreement with the *ministère de l'Environnement du Québec* in June 1989.

More concretely, two contracts have been awarded to private firms, one to identify a network of Quebec experts, primarily in the area of industrial clean-up technology, and the other to organize jointly, with the *ministère de l'Environnement du Québec*, a symposium, to be held in June 1989, which will bring together specialists in the industrial sectors directly affected by the St. Lawrence Action Plan.

Furthermore, we have analysed and approved six technology demonstration projects which will be implemented over the next year. These three-year projects will be carried out jointly with the private companies promoting them.

As for the **ECOTOXICOLOGY AND ORGANIC CHEMISTRY** program, $685,000 were spent, namely to validate an avant-garde ecotoxicological approach which will make it possible, by next year, to more efficiently evaluate industrial discharges. As well, quality control was provided for the analysis being carried out to characterize industrial discharges. In addition, our laboratories were equipped to prepare for new analytic activities to begin in Year II. Lastly, we began negotiating with future partners of the St. Lawrence Centre in an effort to build up local expertise in ecotoxicology.

AGENDA FOR YEAR II

During the coming year, the **industrial technology** program intends to invest more than $5,461,000 in the following projects:

- A joint committee created by Environment Canada and Industry, Science and Technology Canada will grant contracts for technological development, according to criteria it will have established. These contracts will be awarded to private firms or consortia which can include, for example, private companies, Crown corporations, universities, research teams and non-profit organizations.
- The St. Lawrence Centre will evaluate and authorize some 30 research projects, some of which will be managed in cooperation with the *ministère de l'Environnement du Québec* and private enterprise. The projects will deal primarily with identifying needs for technological development in the six industrial sectors mentioned earlier in this report, as well as needs and solutions regarding the treatment of toxic wastes.
- In June 1989, the St. Lawrence Centre will organize a symposium on new technology and will also participate, with certain private companies, in "Globe 90", an international symposium on the environment, to be held in Vancouver in March 1990.

The budget envelope for the **ecotoxicology and organic chemistry** program for Year II is $2,515,000. Work previously undertaken in three different areas will be pursued:

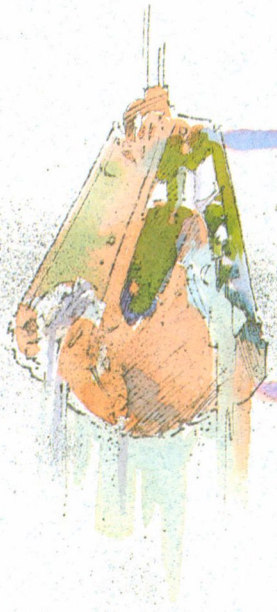
- Analytical support and quality control for the other programs in the St. Lawrence Action Plan

  Examples: work being done to develop an appropriate methodology for assessing the inputs of toxic substances from the Great Lakes and tributaries of the St. Lawrence; validation of an ecotoxicological approach, using 30 industrial discharges which have been identified; development of ecotoxicological tools specifically adapted to the requirements of the Action Plan; and development of an approach for the evaluation of ecosystems.
- Development of ecotoxicological procedures

  In cooperation with the team assigned to the ecosystems program, this group will participate in selecting bio-indicators which will eventually allow us to evaluate the aquatic environment. This sector of activity will produce various publications for national and international distribution.
- Development of ecotoxicological tools

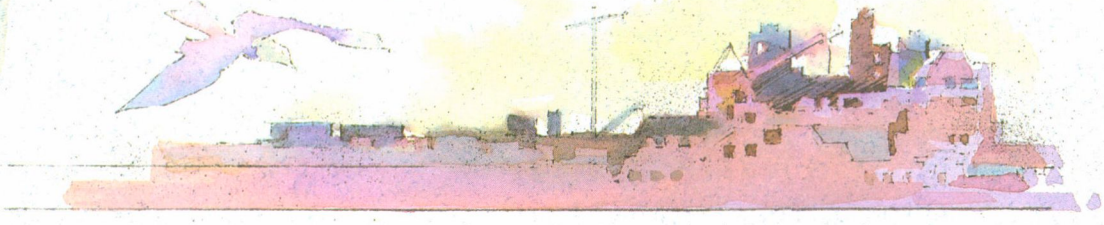
  During Year II, the St. Lawrence Centre's laboratory will become a veritable pivot for regional expertise in the field of ecotoxicology, through various forms of cooperation already being implemented with other specialized centres (research centres, universities and private enterprise). We shall also begin transferring this technology to other parts of Canada.

Restoration



Having, in the past, allowed things to indiscriminately move full steam ahead, we now have no choice but to back up and correct the situation. We must clean up critical zones and perfect new processes for the confinement of contaminated sediments.

In addition to decontaminating the Lachine Canal, the St. Lawrence Action Plan will see that decontamination plans are prepared for the



ports of Montréal, Trois-Rivières and Québec. It will facilitate research and the application of new technology which will allow us to safely deal with contaminated sediments, either by storing, confining, stabilizing or recycling them.

RESTORATION

By allocating $21 million to the restoration component, the Action Plan demonstrates its firm intention to mitigate the problem caused by contaminated sediments and to further the restoration of wetlands which are not irreversibly deteriorated. To do this, the Canadian Parks Service and the Conservation and Protection service of Environment Canada work hand in hand with the federal Department of Fisheries and Oceans.

The Action Plan intends to **clean up federal sites**. A sum of $16 million will be spent on this program which, in addition to setting an example, will allow us to build up a valuable body of information for consultants and developers for projects involving dredging. An inventory of contaminated sites along the St. Lawrence will be made and sediments in the harbours of Montréal, Trois-Rivières and Québec City will be characterized. Based on this information, appropriate decontamination plans will be developed.

We shall also attack the formidable task of cleaning up the Lachine Canal. This commitment means decontaminating the canal bottom over a distance of 13 kilometres, from 1991-1993, in order to make the canal usable by the public for certain recreational activities.

This obviously involves the use of highly efficient dredging techniques and, if necessary, the development of new, more appropriate techniques. The confinement of dredging sediments will be of special interest.

This explains the St. Lawrence Centre's particular interest in developing dredging technology. Data banks will be created and guidelines for dredging will be prepared. An inventory will be made of dredging equipment presently being used on the St. Lawrence and its efficiency will be evaluated. Criteria presently being used to evaluate sediments will be revised. This will mean an improvement in our ability to evaluate the quality of sediments and allow us to better direct the efforts of those working on other parts of the Action Plan, namely, those working to identify and control the various sources of pollution.

Thus, by combining results from inventory, characterization and technological development projects, the Action Plan will provide tools and techniques to consultants and developers of dredging projects, which should allow them to better evaluate the environmental impact of their projects and to reduce the risks of suspending and dispersing contaminants.

The **WETLANDS RESTORATION** program will allocate $5 million towards two objectives. It will work to solve the problem of the gradual disappearance of the wetlands bordering the St. Lawrence, by looking at the possibility of creating new habitats out of the dredged material and, secondly, it will strive to further research and application of new technology which will safely eliminate contaminated sediments, either by storing, confining, stabilizing or recycling them.

A summary will be prepared of experiments that have been conducted in other countries in improving and restoring habitats by using dredged sediments. The applicability of these methods to the St. Lawrence will be evaluated. Procedural guidelines will be prepared for improving, restoring and creating habitats for the St. Lawrence's wildfowl and fish. The program includes activities which will increase our knowledge about the feasibility of man-made improvements to increase habitat productivity.

On the technological level, we shall endeavour, for example, to exploit the possibilities offered by encapsulation. A pilot project which would improve wildlife habitats, by using dredged sediments, is being considered.

ACTIVITY REPORT

The program to **CLEAN UP FEDERAL SITES** has spent some $317,000 to prepare the groundwork for activities planned for Year II. Regarding the Lachine Canal clean-up project, guidelines have been established for an impact study on four different options.

Data has been entered on dredging technology, in order to build up data banks on the quality of sediments and dredging volumes, and to create a bibliography on environments likely to be sensitive to dredging.

The **WETLANDS RESTORATION** program spent $90,000 on an inventory of degraded coastal habitats in the St. Lawrence estuary and gulf, and, among those, a selection of habitats with a potential for restoration.

AGENDA FOR YEAR II

During the coming year, the **federal site clean-up** program should spend about $2,102,000.

Within the context of the Lachine Canal clean-up program, meetings will be organized with concerned municipalities and environmental groups in order to include their comments and concerns during the preliminary planning stages. Meetings will also be held with companies using the Canal. In the spring of 1989, the Canadian Parks Service will request the federal Minister of the Environment to set up an environmental review panel to examine the impact of this project. The work on the characterization of sediments will be pursued and we shall begin developing clean-up plans for sectors already characterized.

Regarding dredging technology, guidelines will be prepared to control the quality of analytic data collected on sediments. In cooperation with the Quebec government, Environment Canada will also prepare guidelines for the environmental evaluation of dredging projects. The activity already underway to enter data will be completed and mapping and data analysis will begin. All dredging equipment presently in use on the St. Lawrence will be evaluated.

Under the **wetlands restoration** program, nearly $731,000 will be spent on activities planned for Year II. A summary will be prepared of the experiments conducted in other countries on the use of dredged sediments to improve and restore habitats, and the applicability of these experiments to the St. Lawrence will be evaluated.

Conservation

Reestablishing the environmental balance of the river also means taking concrete action to save endangered habitats and plant and animal life. To do so, we must broaden our knowledge of the river from an ecosystemic perspective.

The St. Lawrence Action Plan is therefore involved with conserving sensitive habitats and implementing survival plans for endangered, vulnerable and declining species. The Action Plan is also working to perfect approaches and tools which will allow it to closely monitor the evolution of the river environment and keep the public informed.

Last but not least, the component dealing with conservation will use $25 million, first, to ensure the survival of wildlife and plant species, habitats and ecosystems, and second, to collect and disseminate information on the state of the environment. The challenge is great, which explains why this part of the Plan mobilizes such an impressive number of participants.

Environment Canada is involved in this component through the Canadian Wildlife Service, the Canadian Parks Service and the St. Lawrence Centre. Joining these services are the federal departments of Fisheries and Oceans, Transportation, Regional Industrial Development, Indian and Northern Affairs, Public Works and the Royal Canadian Mounted Police.

On the provincial level, participants are the *ministère du Loisir, de la Chasse et de la Pêche*, the *ministère de l'Agriculture, des Pêcheries et de l'Alimentation* and, of course, the *ministère de l'Environnement du Québec*. These actors cooperate and coordinate their activities to improve the effectiveness of the four programs that make up the component on conservation.

The first program, with a budget of $7.5 million, is looking at the feasibility of **creating a marine park at the mouth of the Saguenay.** This project is important because of the presence, in this geographical area, of animal and plant species which are representative of the Saguenay and the St. Lawrence estuary. After what had been an encouraging start, federal-provincial negotiations to reach an agreement on this issue have slowed down.

A second program, with a budget of $5.5 million, is geared toward **habitat conservation**. The objective is to slow down the deterioration and disappearance of fragile ecosystems and essential habitats required for the survival of endangered species. We plan to protect 5000 hectares of habitats along the St. Lawrence, including its islands, through direct acquisition by Environment Canada or joint acquisition with provincial partners, and by giving technical, scientific and financial assistance to non-governmental groups working to conserve habitats. One of our primary actions will be to create a conservation zone in the archipelago between Montréal and Sorel.

In order to better protect the habitats of fish and marine mammals, such as the beluga, and to facilitate the integrated planning of resources, we intend to establish a plan for the use of coastal zones and set standards for the protection of fish.

The third program, with a budget of $3 million, is designed to **protect endangered species**. The task here is to offer aid to the more sensitive species and, more particularly, to set up survival plans for species which are endangered, vulnerable or in decline, such as the St. Lawrence's beluga, the peregrine falcon, the piping plover, the black duck, the blue-winged teal, the striped bass and the black sturgeon.

The fourth program will spend $9 million to prepare a **report on the state of the environment and its ecosystems**. This program is working to increase our knowledge of the St. Lawrence from an ecosystemic perspective. This implies summarizing all data collected to date and developing approaches and devices which will allow us to closely monitor the evolution of the St. Lawrence environment.

We shall study the flow of contaminants and their effects on the environment. In order to evaluate the progress being made in cleaning up the St. Lawrence, we shall

also develop methodologies for ecotoxicological monitoring and the use of bio-indicators, i.e., animal or plant life used as a "barometer" for the whole environment. A sophisticated system of computer analysis will merge all the information collected to establish the combined effect of environmental factors in the critical zones.

The program will also handle the production and public dissemination of factual, precise information on the status of health of the river. The primary vehicle will be a series of state-of-the-environment reports on the St. Lawrence. In addition, the most relevant information contained in the numerous data banks managed by the various federal participants will be summarized and made available to the public, so that they may keep informed about the state of health of the St. Lawrence and follow its progress.

ACTIVITY REPORT

Concerning the **creation of a marine park**, we have, in addition to negotiating with provincial authorities, done preliminary studies to catalogue and analyse winter fishing in the Saguenay area. We have also studied the complementary aspects of the Saguenay Provincial Park and the proposed marine park, in terms of services and structure. An inventory of the ice movements in the Saguenay area was made and a bank of underwater photos was produced.

The program to **conserve habitats** terminated its fiscal year with expenses of nearly $407,000, devoted primarily to the acquisition of additional land to be used to consolidate three national wildlife areas — Lake Saint-François, the Baie de L'Isle-Verte and Cap Tourmente. In addition, we explored the potential of island habitats in order to eventually create a conservation zone in the archipelago between Montréal and Sorel.

We evaluated the efficiency of certain actions taken to improve environmental conditions prevailing along the St. Lawrence's shoreline. For example, we are interested in the restoration of wooded habitats and the positive impact of creating additional ice-extraction pans to encourage the proliferation of various plant and animal species. The program also supported non-governmental organizations which are concerned with conserving and protecting certain habitats. In order to protect the beluga's habitat, we prepared a map synthesis of past and present habitats.

To **protect endangered species**, $301,000 was spent to preserve aquatic and shoreline species of the St. Lawrence. Primarily, we identified endangered halieutic[1] species living in the St. Lawrence river system, and established priorities.

The beluga received special attention as we pursued the survival plan prepared for this species. For example, in August and March, an aerial count was made of the beluga population. Contamination levels found in the beluga's potential prey were studied in order to verify the hypothesis that the transfer of contaminants to the beluga is effected via its food supply. In cooperation with Queen's University, certain genetic characteristics of the St. Lawrence beluga population were studied and compared with those of Arctic populations. The carcasses of 21 belugas whose bodies had washed to shore were recovered and analysed, from the pathological and contamination points of view.

1 Fish exploited commercially or for recreational purposes.

A list of endangered Quebec birds and a bibliography of Quebec plant and animal species were prepared. Special activities were organized for specific species. For instance, material was designed and produced for an awareness campaign on the piping plover, an endangered species found today only on the Îles-de-la-Madeleine. We also prepared an inventory of the eider in its winter habitat in the area of Mingan, near Anticosti Island.

For the program on the **STATE OF THE ENVIRONMENT AND ECOSYSTEMS**, a sum of $729,000 went towards collecting and analysing data required to gain a coherent picture of the St. Lawrence's environment. We initiated discussions with numerous governmental, university and industrial partners, as well as with certain environmental groups, in order to develop agreements and cooperative strategies for activities of common interest.

Regarding the state of the ecosystems, we have evaluated the major results expected from this program. Available knowledge and the data collected to date on the St. Lawrence's ecosystems and their biotopes and organisms have been synthesized. We have isolated the physical, chemical and geological (sediments) factors governing these ecosystems. We have collected samples and analysed them in order to better understand how organic and inorganic contaminants are reintroduced into circulation by sediments in the river section that runs from Kingston to Québec City.

A preliminary study has been done on fish contamination on the south shore of the St. Lawrence's middle estuary. A laboratory has been set up which will study, for example, the stress indicators for cod. A review has been made of all literature available on the St. Lawrence's ecological zones. The bio-indicators which will permit us to monitor the evolution of the ecosystems were identified. Indicators of sub-lethal effects were reviewed as well, which will allow us to evaluate the state of health of various organisms and their response to environmental conditions.

Regarding the state of the environment, we studied the results of existing environmental reports and began reviewing the literature available on the St. Lawrence's socio-economic zones. A cartographic analysis will be carried out for these zones. We identified the data-processing needs of our clients and designed a computerized system to manage the data collected.

We also laid the groundwork for a geographic information system (SPANS), which will allow experts and the public to rapidly visualize the state and evolution of the environment in a given ecosystem. Related to this project, we began work on a bibliographic reference centre and a centre to process information on the St. Lawrence, which will be accessible to the public. A pilot project on an integrated information system is presently in progress.

We started work on our first data bank, which will integrate the environmental and socio-economic data collected from the Cornwall-Québec City stretch of the St. Lawrence.

AGENDA FOR YEAR II

It is difficult to make formal budget estimates for Year II for the program to **create a marine park at the mouth of the Saguenay**, because costs are related to the time required to reach an agreement in principle with provincial authorities. Considering the seasonal nature of the work to be done, we hope this agreement will be signed as soon as possible.

We hope a formal agreement will be signed with Quebec before year end, so that we may begin setting the terms of reference and determining, in cooperation with concerned partners, the objectives of the park. We also intend to begin the study and research program required for this project.

Regarding **habitat conservation**, nearly $1,414,000 will be spent on various programs. We shall increase the technical, scientific and financial support provided to non-governmental organizations involved in conserving specific habitats, and take advantage of the cooperation of these groups to improve supervision of these sites. We shall continue experimenting with possible habitat improvements (ice-extraction pans and planting) and publishing information on wetlands and national wildlife areas for the general public.

We shall also work to define the beluga's natural habitat more precisely. In an effort to eventually plan the uses of the coastline, we shall prepare profiles of typical habitats within the estuary. Methods and techniques used throughout North America and Europe to restore, improve and create coastal habitats will be reviewed, and new standards for the conservation of habitats will be established.

Concerning the **protection of endangered species**, expenditures of $760,000 are planned, the major portion of which will be devoted to implementing survival plans for such species as the piping plover, the peregrine falcon, the beluga and certain commercial fish species. Concerning the latter, factorial diagnoses will be done on selected species and appropriate action plans will be prepared. Furthermore, we will determine, with greater precision, the needs of declining species such as the eiderdown and the black duck, specifically regarding habitats suited for raising their young.

In the case of the beluga, we shall evaluate the feasibility of a method which should allow us to determine the degree of contamination within living specimens. We shall increase the number of aerial photos taken in order to study population movements and seasonal distribution. We will move ahead on the study of genetic variability and comparisons with Arctic populations. We will explore the beluga's feeding grounds and continue studying how contaminants are transferred via its food supply. Carcasses washed ashore will continue to be recovered for analysis.

As for the **STATE OF THE ENVIRONMENT AND ECOSYSTEMS**, some $2,170,000 will go towards activities of a technical nature.

Regarding the state of ecosystems, a number of zones will be selected for study and action, taking into consideration such factors as the locations of the 50 industrial plants included in the Action Plan, as well as critical zones likely to be most affected by the inputs of toxic substances from the Great Lakes and the St. Lawrence's tributaries. More specifically, the study on the reintroduction of contaminants by sediments will be continued, but this time at the head of the maritime estuary. Available data on the biological communities located in the zones selected for study will be synthesized. Guidelines, quality standards and integrity indices to be used to evalute the ecosystems will be reviewed.

A series of indicators allowing us to implement an evaluation procedure for ecosystems will be developed. We will look at the mathematical indices used to measure the integrity of the biocenoses[1] and trophic networks[2], as well as the ecotoxicological, biological and ecological indicators used to measure the quality of ecosystems. A pilot study carried out at Lake Saint-François will allow us to test and adapt certain known indicators to the communities of plankton-feeding[3] and benthos-feeding[4] fish living there. We will pursue the project on stress indicators for the cod; samples will be taken in the spring and fall of next year.

An atlas will be produced which will include a description of the St. Lawrence's biocenoses and their geographic distribution. The physical changes undergone by the habitats of the St. Lawrence and its estuary between 1945 and 1988 will be evaluated and the impact of these changes on coastal commercial fishing will be studied. Along the same lines, we will look at the changes that took place in the quality and productivity of these habitats.

We will work to better understand the environmental impact of toxic discharges, principally through a study of the ways pollutants are carried in the various physical compartments of the ecosystem. We will also try to determine how contaminants are transferred via the food supply; one project will deal with the transfer and effects of contaminants on the bacteria, phytoplankton, zooplankton and fish making up the beluga's food supply. A series of sectorial reports will be prepared on the short-, medium- and long-term aspects of toxic discharges and ecosystem evaluation using bio-indicators.

As for the report on the state of the environment, a computerized atlas will be produced on the health of the St. Lawrence, which will emphasize the interdependence of natural resources and human activities. Along with the atlas, a first version of a bibliographic reference centre will be made accessible to the public, and fact sheets and maps will be distributed which will show the various uses made of the St. Lawrence in relation to its quality, i.e., in terms of sediments, water quality and wetlands.

In view of the eventual preparation of a report on the state of the environment, we shall produce the table of contents, develop work plans, prepare a concept document and develop consultation and approval procedures. The pilot project on the use of an integrated information system will be continued.

1 Geographic areas in which there is a certain homogeneity among animal and plant species.

2 Concerning nutrition of these species.

3 Mass of microscopic plant or animal life that floats or drifts in salt or fresh water. Phytoplankton is plant plankton and zooplankton is animal plankton.

4 Mass of organisms living on or near the floor of oceans or fresh water bodies.

St. Lawrence Centre

The St. Lawrence Centre is the real hub of all the Action Plan's scientific research, development and management activities. Indeed, the Centre sees its role as integrator and catalyst. Its central role within the Action Plan puts the Centre in the best possible position to constantly synthesize the results obtained through collective action and to build cooperation among the various partners of the Plan and other actors working to clean up the river.

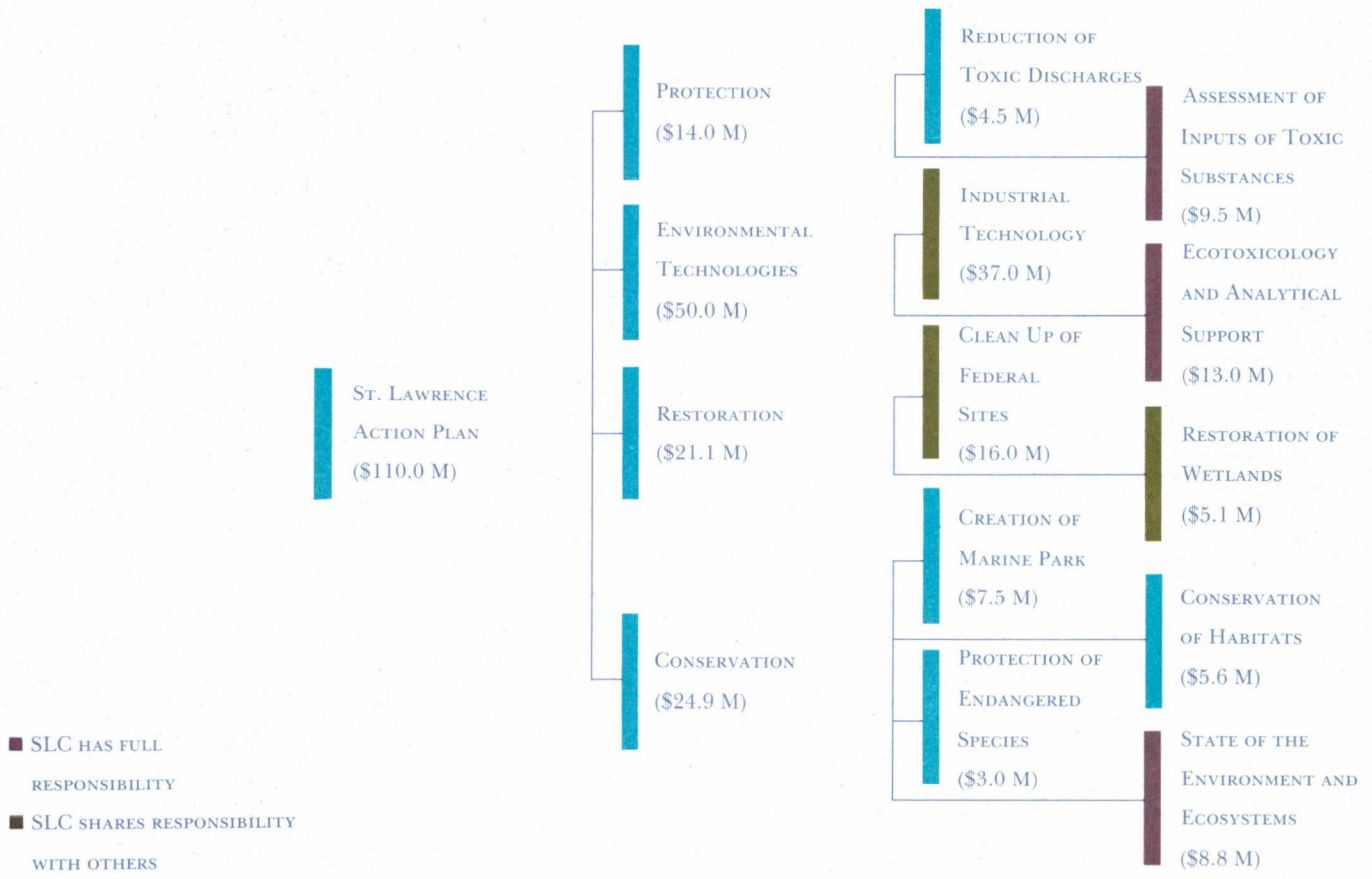
ST. LAWRENCE CENTRE

FOCUS OF ACTIVITIES

Because of the extent of the activities to be managed and the scientific and technical resources required, the federal government decided to give full support to the Action Plan by creating the St. Lawrence Centre. Unlike the Action Plan which has a five-year life span, the St. Lawrence Centre is a permanent structure of the Conservation and Protection service (Quebec Region) of Environment Canada.

It is easy to grasp the importance of the Centre when we learn that it manages 50 percent of the Action Plan's total budget and is responsible for 60 percent of all activities. With offices in Montréal and Québec City, and laboratories in Longueuil, the Centre is unique in that it has a strong decentralized approach to actions concerning the environment. It is more than a simple physical location or separate infrastructure: it is the focus, the hub of all the scientific research, development and management activities called for by the St. Lawrence Action Plan.

ACTION PLAN PROGRAMS RELATED TO ST. LAWRENCE CENTRE



The Centre brings experts together, who join forces with all other concerned actors from government or other sectors, in order to reach the objectives of the St. Lawrence Action Plan.

MANDATE

The mandate of the St. Lawrence Centre is to support the development and application of state-of-the-art environmental technology designed to control toxic discharges. In other words, its primary function is to provide the tools required for the Action Plan's success.

The Centre has as specific role the establishment of a program to analyse and evaluate the state of the environment. It also heads up the Plan's ecotoxicology and organic chemistry program.

However, the specific vocation of the St. Lawrence Centre can be summarized in two words: *integrator* and *catalyst*. Its central role within the Action Plan places it in an ideal position to be able to make constant syntheses of results obtained through collective effort and to promote cooperation among the various partners and other actors working to control toxic discharges into the St. Lawrence.

For example, in February 1989, the Centre organized an expert workshop which attracted some 50 scientists from Quebec and the National Water Research Institute in Burlington, Ontario. This workshop dealt with the characterization and monitoring of toxic substances and ecosystems in the St. Lawrence.

The Centre's long-term role is to promote and stimulate — on the provincial, national and international level — the development and pooling of expertise concerning the management of large river systems. The Centre intends to contribute to the development of Quebec and Canadian expertise in environmental technology related to the control of toxic discharges, as well as participate in international efforts to conserve and protect the environment. In this light, it is inspired by the leitmotif of the world-renowned ecologist, René Dubos: think globally, act locally.

PHILOSOPHY

The philosophy of the St. Lawrence Centre is based on two principles: partnership and contracting-out.

Because the Centre is convinced that the control of toxic wastes can only be achieved through the cooperation of all concerned, the Centre actively cooperates with provincial and regional authorities.

The Centre also directs its action in such a way as to encourage the interest and support of the scientific and business communities. One of the Centre's favoured means is the creation of a vast network which brings together all the major university, industrial and government partners likely to cooperate in the Action Plan's programs. To this end, the Centre actively participated in information sessions organized by the managers of the Action Plan in Québec City and Montréal in the fall of 1988, in an effort to make contact with private companies and universities. The Centre also participated in information sessions with various non-governmental organizations working to conserve and protect the environment.

The Centre knows how important the knowledge acquired through the St. Lawrence Action Plan will surely be on an international level; for this reason, it intends to develop and maintain fruitful exchanges with the rest of the world.

In addition to its desire not to use public monies needlessly to create expensive new facilities and services, the Centre applies contracting-out to support the development of Quebec expertise in environmental action, especially in closely related scientific areas.

By explicitly favouring contracting-out, the Centre is offering Quebec firms and professionals an opportunity to improve their competence in a relatively new field and to participate in creating a nucleus of expertise which can be applied elsewhere.

Priority use of Quebec expertise in a context of open partnership: that, in short, is the philosophy of the St. Lawrence Centre.

ACTION STRATEGIES

In managing its operations, the St. Lawrence Centre has adopted a dynamic approach which essentially tries to exploit the synergy created by bringing environmental specialists together, with a view to furthering the Action Plan.

For example, the Centre proposes to interact with partners who, like itself, are engaged in scientific and technological research directed to the conservation and protection of the environment. One task the Centre has set for itself is to identify environmental experts, in each of the areas covered by the Action Plan, and to solicit their cooperation on specific projects. In this way, the Centre works to facilitate the solution to particular environmental problems. It will particularly encourage concrete solutions which are likely to contribute to the Action Plan's goals.

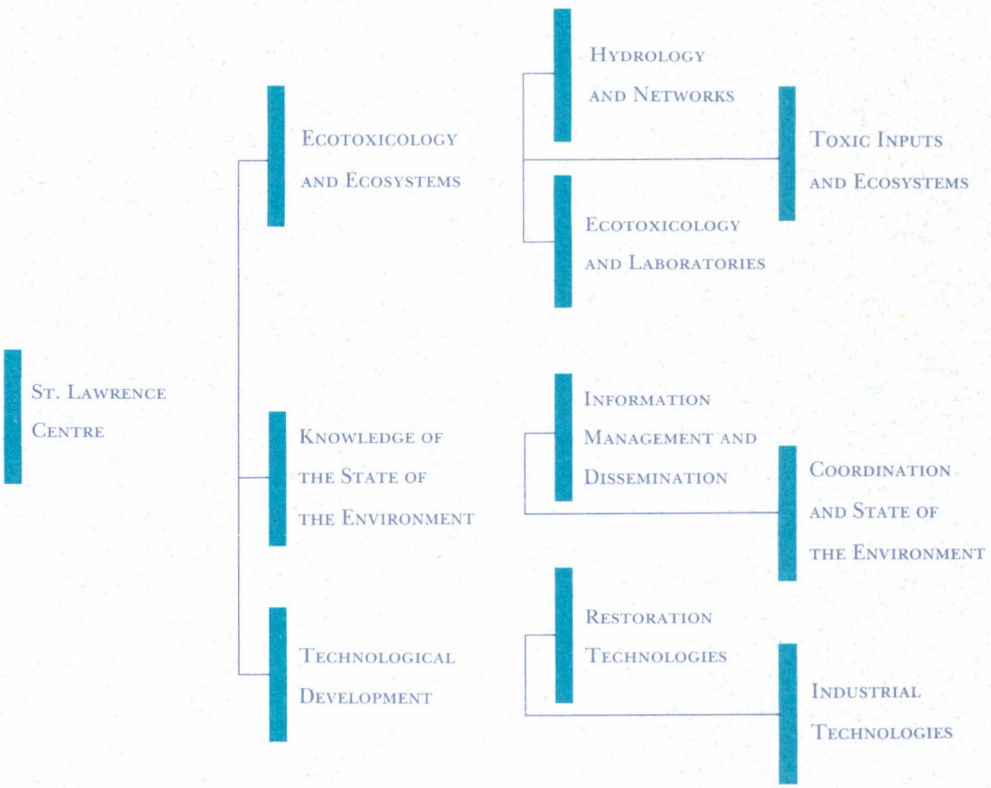
Moreover, the Centre encourages the direct application of results obtained through its scientific and technical environmental research. To this end, it widely disseminates the results of work done within the context of the Action Plan and actively encourages the use of the methods and procedures which are developed. In the same light, the Centre solicits the participation of industry in its development activities.

The Centre also uses the knowledge acquired as an instrument to direct actions to conserve and protect the St. Lawrence. Of course, it is important to keep the public informed of the changing state of health of the river. But the Centre intends to go further by actively encouraging public access to this information. It intends to make all the necessary tools and assistance available to citizens, groups, associations, institutions and industry, so that the various environmental factors will be integrated into the decision-making process.

STRUCTURE

The principles guiding the activities of the Centre are reflected in its operational structure. The Centre is organized so that resources assigned to each of the components of the Action Plan are closely linked with one other, which stimulates exchange and the wide circulation of information. In other words, its organizational structure encourages the cross-fertilization of knowledge and allows for integration of that knowledge through a vibrant synergy. This structure, which focusses the Centre's activities in an efficient way, is based on three divisions.

ST. LAWRENCE CENTRE ORGANIZATIONAL CHART



Ecotoxicology and Ecosystems

This division contains three sections. The first section, called "Hydrology and Networks", is responsible for the regular program of the Inland Waters Directorate, i.e., the body which monitors the quality and quantity of water for the Quebec region of Environment Canada. The second section, "Toxic Inputs and Ecosystems", evaluates toxic substances present in the milieu and assesses their effects on biological communities and the risks they represent for humans. The third section, "Ecotoxicology and Laboratories", provides the technical support required for biochemical analysis, while continuing the development of expertise in this area. All laboratories presently located in Longueuil, on the outskirts of Montréal, will be relocated at the Centre itself by 1991.

Knowledge of the State of the Environment

The two sections within this division, "Information Management and Dissemination" and "Coordination and State of the Environment", work together to analyse the interactions among various environmental disciplines and to ensure wide dissemination of this information. The first section is more specifically responsible for managing environmental data, controlling quality and developing sophisticated computer aids to integrate, analyse and disseminate this information. The other section is working primarily to prepare an environmental report which will monitor the evolution of the quality of the St. Lawrence's waters, and recommend action.

Technological Development

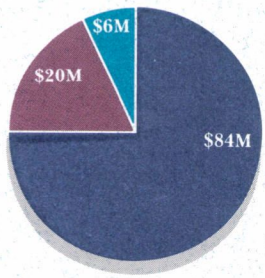
This division has two sections. "Restoration Technologies" studies dredging processes and equipment being used on the St. Lawrence, as well as the safe confinement of sediments disturbed during dredging. The "Industrial Technologies" group devotes its energy to research on industrial technology which will prove to be the most efficient in environmental terms. This group encourages and supports experiments, pilot projects and demonstrations of manufacturing processes and methods used for treating effluents and residual sludge.

BUDGET BREAKDOWNS

FEDERAL FUNDS COMMITTED TO ST. LAWRENCE ACTION PLAN

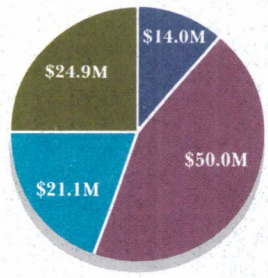
(MILLIONS $)

	DE	(C&P+CPS)	DIST	DFO	GRAND TOTAL
PROTECTION					
REDUCTION OF TOXIC WASTES	4.5	(4.5+—)	—	—	4.5
ASSESSMENT OF TOXIC INPUTS	9.5	(9.5+—)	—	—	9.5
TOTAL	**14.0**	**(14.0+—)**	**—**	**—**	**14.0**
ENVIRONMENTAL TECHNOLOGIES					
INDUSTRIAL TECHNOLOGY	17.0	(17.0+—)	20.0	—	37.0
ECOTOXICOLOGY AND ANALYTICAL SUPPORT	13.0	(13.0+—)	—	—	13.0
TOTAL	**30.0**	**(30.0+—)**	**20.0**	**—**	**50.0**
RESTORATION					
CLEAN UP OF FEDERAL SITES	16.0	(6.0+10.0)	—	—	16.0
RESTORATION OF WETLANDS	4.0	(4.0+—)	—	1.1	5.1
TOTAL	**20.0**	**(10.0+10.0)**	**—**	**1.1**	**21.1**
CONSERVATION					
CREATION OF MARINE PARK	7.5	(—+7.5)	—	—	7.5
CONSERVATION OF HABITATS	5.0	(5.0+—)	—	0.6	5.6
PROTECTION OF ENDANGERED SPECIES	1.0	(1.0+—)	—	2.0	3.0
STATE OF THE ENVIRONMENT AND ECOSYSTEMS	6.5	(6.5+—)	—	2.3	8.8
TOTAL	**20.0**	**(12.5+7.5)**	**—**	**4.9**	**24.9**
GRAND TOTAL	**84.0**	**(66.5+17.5)**	**20.0**	**6.0**	**110.0**



SOURCES OF FUNDS

- DEPARTMENT OF THE ENVIRONMENT
- DEPARTMENT OF INDUSTRY, SCIENCE AND TECHNOLOGY
- DEPARTMENT OF FISHERIES AND OCEANS



BUDGET BREAKDOWN FOUR PROGRAMS

- PROTECTION
- ENVIRONMENTAL TECHNOLOGIES
- RESTORATION
- CONSERVATION

YEAR I (1988-1989)
FEDERAL SOURCES OF FUNDING FOR ACTIVITIES

($000)

	DE	(C&P+CPS)	DIST	DFO	GRAND TOTAL
PROTECTION					
REDUCTION OF TOXIC WASTES	615	(615+—)	—	—	615
ASSESSMENT OF TOXIC INPUTS	449	(449+—)	—	—	449
TOTAL	**1,064**	**(1,064+—)**	**—**	**—**	**1,064**
ENVIRONMENTAL TECHNOLOGIES					
INDUSTRIAL TECHNOLOGY	393	(393+—)	100	—	493
ECOTOXICOLOGY AND ANALYTICAL SUPPORT	685	(685+—)	—	—	685
TOTAL	**1,078**	**(1,078+—)**	**100**	**—**	**1,178**
RESTORATION					
CLEAN UP OF FEDERAL SITES	317	(287+30)	—	—	317
RESTORATION OF WETLANDS	—	(—+—)	—	90	90
TOTAL	**317**	**(287+30)**	**—**	**90**	**407**
CONSERVATION					
CREATION OF MARINE PARK	—	(—+—)	—	—	—
CONSERVATION OF HABITATS	256	(256+—)	—	151	407
PROTECTION OF ENDANGERED SPECIES	141	(141+—)	—	160	301
STATE OF THE ENVIRONMENT AND ECOSYSTEMS	387	(387+—)	—	342	729
TOTAL	**784**	**(784+—)**	**—**	**653**	**1,437**
GRAND TOTAL	**3,243**	**(3,213+30)**	**100**	**743**	**4,086**

YEAR II (1989-1990)
FEDERAL SOURCES OF FUNDING FOR ACTIVITIES

($000)

	DE	(C&P+CPS)	DIST	DFO	GRAND TOTAL
PROTECTION					
REDUCTION OF TOXIC WASTES	1,058	(1,058+—)	—	—	1,058
ASSESSMENT OF TOXIC INPUTS	1,201	(1,201+—)	—	—	1,201
TOTAL	**2,259**	**(2,259+—)**	**—**	**—**	**2,259**
ENVIRONMENTAL TECHNOLOGIES					
INDUSTRIAL TECHNOLOGY	4,461	(4,461+—)	1,000	—	5,461
ECOTOXICOLOGY AND ANALYTICAL SUPPORT	2,515	(2,515+—)	—	—	2,515
TOTAL	**6,976**	**(6,976+—)**	**1,000**	**—**	**7,976**
RESTORATION					
CLEAN UP OF FEDERAL SITES	2,102	(1,886+216)	—	—	2,102
RESTORATION OF WETLANDS	575	(575+—)	—	156	731
TOTAL	**2,677**	**(2,461+216)**	**—**	**156**	**2,833**
CONSERVATION					
CREATION OF MARINE PARK	—	(—+—)	—	—	—
CONSERVATION OF HABITATS	1,152	(1,152+—)	—	262	1,414
PROTECTION OF ENDANGERED SPECIES	280	(280+—)	—	480	760
STATE OF THE ENVIRONMENT AND ECOSYSTEMS	1,568	(1,568+—)	—	602	2,170
TOTAL	**3,000**	**(3,000+—)**	**—**	**1,344**	**4,344**
GRAND TOTAL	**14,912**	**(14,696+216)**	**1,000**	**1,500**	**17,412**

DE: DEPARTMENT OF THE ENVIRONMENT
C&P: CONSERVATION AND PROTECTION
CPS: CANADIAN PARKS SERVICE
DFO: DEPARTMENT OF FISHERIES AND OCEANS
DIST: DEPARTMENT OF INDUSTRY, SCIENCE AND TECHNOLOGY

LIST OF CONTRACTS AWARDED TO DATE TO PRIVATE COMPANIES FOR ACTIVITIES RELATED TO THE ST. LAWRENCE ACTION PLAN

Description	Consultant	Breakdown		
		Source	$000	Period
Effect of storage on the quality and fertilizing value of liquid and dewatered sewage sludge	Aquatech UDA	SLC	25.0	89-90
		DSS	213.9	88-89
		Total	238.9	
Treatment of a pulp and paper mill effluent using aerated biofiltration	Le Groupe Teknika	SLC	7.0	88-89
		SLC	20.0	89-90
		DSS	208.0	88-89
		DSS	26.7	89-90
		Total	261.7	
Microbiological study of an aerobic treatment in a factory environment	Institut Armand-Frappier	SLC	15.0	88-89
		MENVIQ	23.0	88-89
		Total	38.0	
Inventory of Quebec expertise in areas related to SLC programs and activities	Centre de recherche industrielle du Québec	SLC	39.0	88-89
		SLC	24.4	89-90
		Total	63.4	
Compilation of data on the quality of the St. Lawrence's sediments	MESIQ	SLC	30.0	88-89
		SLC	22.9	89-90
		Total	52.9	
Bibliographic research on sensitive environments in the St. Lawrence	Lavalin Environnement inc.	SLC	35.0	88-89
		SLC	28.0	89-90
		Total	63.0	
Assessment of toxic inputs from the tributaries to the St. Lawrence	Entraco	SLC	26.0	88-89
		SLC	14.1	89-90
		Total	40.1	
Evaluation of the transport of toxic substances in water and in suspended solids in the St. Lawrence	Hydrotech inc.	SLC	15.0	88-89
Study to measure the influence of ice and cold on the St. Lawrence's flow rate	Laboratoire d'hydraulique Lasalle ltée	SLC	15.0	88-89
		SLC	10.1	89-90
		Total	25.1	
Characterization of the St. Lawrence's biocenoses	Lavalin Environnement inc.	SLC	65.0	88-89
		DFO	35.0	88-89
		SLC	50.0	89-90
		Total	150.0	
Feasibility study concerning preparation of an environmental atlas on the St. Lawrence	Université Laval	SLC	8.9	88-89
		SLC	1.6	89-90
		Total	10.5	
Feasibility study on the impact of pollutants on the St. Lawrence's vegetation	Université de Montréal	SLC	10.0	88-89

C&P: Conservation and Protection (Environment Canada)
CWS: Canadian Wildlife Service (Environment Canada)
EPB: Environmental Protection Branch (Environment Canada)
SLC: St. Lawrence Centre (Environment Canada)
DFO: Department of Fisheries and Oceans
DSS: Department of Supply and Services
MENVIQ: Ministère de l'Environnement du Québec

Description	Consultant	Breakdown		
		Source	$000	Period
Feasibility study on the cartography of the St. Lawrence's shoreline (remote sensing)	Octographe inc.	SLC	6.6	88-89
Inventory of the major industrial plants bordering the St. Lawrence and Saguenay Rivers	L.G.L. ltée	EPB	54.0	88-89
		EPB	25.9	89-90
		Total	79.9	
Characterization of the industrial effluents of Reynolds, Baie-Comeau	Envirolab	EPB	40.0	88-89
		EPB	53.5	89-90
		Total	93.5	
Characterization of the industrial effluents of Nacan	Enviroservices inc.	EPB	18.0	88-89
		EPB	9.9	89-90
		Total	27.9	
Characterization of the industrial effluents of Alcan, Jonquière	Pluritech (Écosag)	EPB	63.0	88-89
		MENVIQ	87.0	88-89
		Alcan	100.0	88-89
		Total	250.0	
Characterization of the industrial effluents of Pratt and Whitney	Sodexen inc.	EPB	30.2	89-90
Characterization of the industrial effluents of Pétromont and Locweld	Sodexen inc.	EPB	40.0	88-89
		EPB	4.3	89-90
		Total	44.3	
Characterization of the industrial effluents of Kruger	Envirolab	EPB	45.0	88-89
		EPB	9.0	89-90
		Total	54.0	
Characterization of the industrial effluents of Consolidated Bathurst	Éco-Recherches (Canada) inc.	EPB	60.0	88-89
		EPB	13.9	89-90
		Total	73.9	
Preliminary evaluation of the local impact of industries bordering the St. Lawrence	Aménatech inc.	EPB	23.8	88-89
		EPB	16.0	89-90
		Total	39.8	
Development of a computerized management system for industrial waste data	I.G.U. Inc.	EPB	35.0	88-89
		EPB	61.5	89-90
		Total	96.5	
Characterization of sediments in the Montréal harbour	Environnement Illimité	EPB	40.0	88-89
		EPB	60.0	89-90
		Total	100.0	
Characterization of sediments in the Québec City harbour	Procéan Enr.	EPB	30.0	88-89
		EPB	120.0	89-90
		Total	150.0	

Description	Consultant	Breakdown		
		Source	$000	Period
Characterization of sediments in the Trois-Rivières harbour	G.D.L. Environnement Ltée	EPB	20.0	88-89
		EPB	58.0	89-90
		Total	78.0	
Inventory and prioritization of contaminated aquatic sites bordering the St. Lawrence	Lavalin Environnement inc.	EPB	24.0	88-89
		EPB	20.0	89-90
		Total	44.0	
Evaluation of the avifaunal potential of the islands between Montréal and Sorel	Alain Demers	CWS	2.0	88-89
Potential for the creation of ice-extraction pans in the spartina marshes of the St. Lawrence	LAPEL Groupe-Conseil inc.	CWS	18.9	88-89
Preparation of a protection plan for the avifauna of the Cacouna area	Scobiv	CWS	2.5	88-89
Ecology of shrub and tree species appropriate for birds, and improvement plans	Paysage Nature inc.	CWS	3.8	88-89
Workshop leader on the protection of wildlife habitats in Quebec	S.O.M. inc.	CWS	1.7	88-89
Preparation of an integrated management plan for the *Îles de l'estuaire* National Wildlife Area	Sauvagîles Ltée	CWS	9.9	88-89
			14.9	89-90
		Total	24.8	
Design of a plan for a man-made freshwater basin and island	Louise Gratton	CWS	1.0	88-89
Report on endangered and declining bird species within the St. Lawrence corridor	Association québécoise des groupes d'ornithologues	CWS	14.9	88-89
		SLC	4.0	88-89
		Total	18.9	
Bibliographic review of endangered animal and plant species within the St. Lawrence corridor	Le Groupe Dryade ltée	CWS	5.0	88-89
		SLC	7.5	88-89
		Total	12.5	
Classification, compilation and entry of relevant CWS data into the system of the *Centre de données sur le patrimoine naturel du Québec.*	The Nature Conservancy of Canada	CWS	7.0	89-90
		SLC	9.6	88-89
		SLC	8.8	89-90
		Total	25.4	
Interviews with Gaspé and North Shore fishermen in order to determine their catch of marine mammals	P.M. Fontaine	DFO	6.7	88-89
Review of pertinent literature on the effects of PCBs and PAHs on the immune system	Phocet Bioservice	DFO	10.5	88-89

Description	Consultant	Breakdown		
		Source	$000	Period
Stranding of marine mammals	The World Wildlife (Canada)	DFO	20.6	88-89
Characterization of the cod's bacterial and viral flora	Université de Montréal	DFO	26.0	88-89
Indicators of sub-lethal effects of aquatic contaminants and the St. Lawrence's bio-indicators	Procéan Enr.	DFO	24.5	88-89
Fecundity study on the snowcrab of the North Shore and the Saguenay fiord	L. Girard	DFO	2.9	88-89
Consultation on the aquaculture and environmental conditions of Chaleur Bay	Biorex	DFO	0.5	88-89
Determination of contaminant level in the sediments and organisms of the St. Lawrence's middle estuary	Pluritech	DFO	34.9	88-89
Characterization and cartography of the St. Lawrence beluga's habitats	LAPEL Groupe-Conseil Inc.	DFO	36.7	88-89
Winter inventory of the St. Lawrence beluga population	Institut national d'écotoxicologie du St-Laurent	DFO	7.7	88-89
		DFO	3.0	88-89
	Les Ailes de Charlevoix Montmagny Air Service	DFO	1.0	88-89
Synthesis of existing knowledge concerning contamination in the St. Lawrence estuary	Patrick Gearing	DFO	10.0	88-89
Identification of endangered halieutic species in the St. Lawrence river system and selection of species requiring protection, reintroduction, restoration and/or improvements to habitats	Consultants St-Laurent	DFO	30.0	88-89
Inventory of degraded coastal habitats, within the St. Lawrence and Saguenay estuary and gulf, with interesting potential for environmental and/or economic recovery	Procéan Enr.	DFO	51.0	88-89
Organization of a documentation centre on the St. Lawrence	Fulmar Inc.	DFO	10.0	88-89

LIST OF THE 50 PRIORITY INDUSTRIAL PLANTS

Dominion Textile Inc., Saint-Timothée

Noranda Inc., (CCR Division), Montréal-Est

Shell Canada Inc., Montréal-Est

Union Carbide of Canada Inc., Montréal-Est

Kemtec Inc. (Gulf), Montréal-Est

Petro-Canada Inc./Petrochem, Pointe-aux-Trembles

Expro Chemical Products Inc., Saint-Timothée

C.E. Zinc Canada Ltd., Valleyfield

Alcan Aluminium Ltd., Melocheville

Domtar Inc. (Fine Papers Division), Beauharnois

Elkem Metal Canada Inc., Beauharnois

P.P.G. Canada Inc., Beauharnois

Locweld Inc., Candiac

Perkins Papers Ltd., Candiac

Monsanto Canada Inc., Ville LaSalle

Héroux Inc., Longueuil

Pratt and Whitney Canada Inc., Longueuil

Nacan Products Ltd., Boucherville

Commercial Alcohols Ltd., Varennes

Albright & Wilson Americas, Varennes

Hoescht Canada Inc., Varennes

N.L. Chem Canada Inc., Varennes

Pétromont Inc., Varennes

Sidbec-Dosco Ltd., Contrecoeur

Atlas Steel Ltd., Rio Algom Division, Tracy

Wood Preservation Industries Ltd., Tracy

Tioxide Canada Inc., Tracy

Q.I.T. Inc., Sorel

C.I.L. Inc., Bécancour

Canadian Pacific Forest Products Ltd., Trois-Rivières

Consolidated Bathurst Inc., Trois-Rivières

Kruger Inc., Trois-Rivières

A.B.I., Bécancour

Reynolds Canada Ltd., Cap-de-la-Madeleine

Domtar Inc. (Newsprint and Kraft Pulp Division), Donnacona

Daishowa Forest Products Ltd., Québec

Ultramar Canada Inc., Saint-Romuald

Abitibi Price Ltd., Beaupré

Donohue Inc., Clermont

F.F. Soucy Inc., Rivière-du-Loup

Quebec and Ontario Paper Co. Ltd., Baie-Comeau

Reynolds Canada Ltd., Baie-Comeau

Cascades (Jonquière) Inc., Jonquière

Consolidated Bathurst Inc., La Baie

Abitibi Price Inc., Alma

Abitibi Price Inc., Jonquière

Alcan Smelters & Chemicals Ltd., Alma

Alcan Smelters & Chemicals Ltd., Jonquière

Alcan Smelters & Chemicals Ltd., La Baie

T.M.G. Services Inc., Saint-Honoré