



Environment  
Canada

Environnement  
Canada

**Environment**  
**Canada**

# **The Canada Water Act**

## **Annual Report**

**2003–2004**



**Canada**



# The Canada Water Act

## Annual Report

2003–2004



Over 50% recycled  
paper including 10%  
post-consumer fibre.

Published by authority of  
the Minister of the Environment

© Her Majesty the Queen in Right of Canada, 2007

*Print version*  
Cat. No. En36-426/2004  
ISBN 978-0-662-49681-6

Online in HTML and PDF at [www.ec.gc.ca/water](http://www.ec.gc.ca/water)  
*PDF version*  
Cat. No. En36-426/2004E-PDF  
ISBN 978-0-662-44563-0

Minister of the Environment



Ministre de l'Environnement

Ottawa, Canada K1A 0H3

Her Excellency  
The Right Honourable Michaëlle Jean,  
C.C., C.M.M., C.O.M., C.D.  
Governor General of Canada  
Rideau Hall  
Ottawa, Ontario  
K1A 0A1

Excellency:

I respectfully submit to Your Excellency and to the Parliament of Canada the annual report on operations under the *Canada Water Act* for the fiscal year 2003-2004, which was completed under my leadership.

Sincerely,

A handwritten signature in black ink, appearing to read "John Baird".

John Baird, P.C., M.P.





# CONTENTS

PREFACE .....	vii
EXECUTIVE SUMMARY .....	xi
HIGHLIGHTS, 2003–2004 .....	1
COMPREHENSIVE WATER RESOURCE MANAGEMENT (Part I of the <i>Canada Water Act</i> ) .....	1
1. Federal–Provincial–Territorial Programs .....	1
1.1 Data Collection and Use .....	1
1.2 Interjurisdictional Boards .....	5
1.3 Ecosystem Initiatives: Watershed and Water-related Activities .....	8
2. Water Research .....	15
2.1 National Water Research Institute .....	15
2.2 St. Lawrence Centre .....	17
2.3 Pacific Environmental Science Centre .....	20
2.4 Other Research Highlights .....	21
PUBLIC INFORMATION PROGRAM (Part IV of the <i>Canada Water Act</i> ) .....	25
1. Freshwater Web Site .....	25
2. Water Survey of Canada Web Site .....	25
3. Environment Canada’s Biosphère .....	25
4. RésEau – Building Canadian Water Connections .....	25
5. Canadian Digital Drainage Area Framework .....	26
6. Pacific and Yukon Region .....	26
APPENDIX A: AGREEMENTS .....	27
APPENDIX B: FOR MORE INFORMATION .....	28



## PREFACE

The *Canada Water Act*, proclaimed on September 30, 1970, provides the framework for cooperation with provinces and territories in the conservation, development, and utilization of Canada's water resources. Section 38 requires that a report on the operations under the Act be laid before Parliament after the end of each fiscal year. This, the 32<sup>nd</sup> report, covers progress on these activities from April 1, 2003 to March 31, 2004.

The report describes a wide range of federal activities conducted under the authority of the Act, including participation on federal–provincial–territorial agreements and undertakings, significant water research, and a public information program. A map depicting Canada's major drainage areas and drainage flows is provided in Figure 1.

### Provisions of the *Canada Water Act*

The following is a summary of the major provisions of the Act.

**Part I, Section 4**, provides for the establishment of federal–provincial consultative arrangements for water resource matters. **Sections 5, 6, and 8** provide the vehicle for cooperative agreements with the provinces to develop and implement plans for the management of water resources. **Section 7** enables the Minister, directly, or in cooperation with any provincial government, institution, or person, to conduct research, collect data, and establish inventories associated with water resources.

**Part II** provides for federal–provincial management agreements where water quality has become a matter of urgent national concern. It permits the joint establishment and use of federal or provincial incorporated agencies to plan and implement approved water quality management programs. The application of alternative cooperative approaches and programs has resulted in Part II never having been used.

**Part III**, which provided for regulating the concentration of nutrients in cleaning agents and water conditioners, was incorporated into the *Canadian Environmental Protection Act* (CEPA) in 1988 and later into sections 116-119 (Part VII, Division I) of the new *Canadian Environmental Protection Act, 1999*, which came into force March 31, 2000. (See the CEPA annual report to Parliament, available at [www.ec.gc.ca/CEPARRegistry/gene\\_info/](http://www.ec.gc.ca/CEPARRegistry/gene_info/)).

**Part IV** contains provisions for the general administration of the Act. In addition, Part IV provides for inspection and enforcement, allows the Minister to establish advisory committees, and permits the Minister, either directly or in cooperation with any government, institution, or person, to undertake public information programs.

Figure 1. Major Drainage Areas and Drainage Flows in Canada.



### Comments on the Report

At the end of this report, a feedback form has been included to share your comments. Feedback on the report is appreciated and will help Environment Canada better understand the variety of audiences that read the report, as well as help shape future annual reports on operations under the *Canada Water Act*.

## List of Acronyms

ACAP	Atlantic Coastal Action Program
AMAP	Arctic Monitoring and Assessment Programme
AOC	Area of Concern
CABIN	Canadian Aquatic Biomonitoring Network
CCME	Canadian Council of Ministers of the Environment
CEPA	1988 <i>Canadian Environmental Protection Act</i>
CEPA 1999	<i>Canadian Environmental Protection Act, 1999</i>
COA	Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem
EEM	environmental effects monitoring
EIA	environmental impact assessment
EMAN	Ecological Monitoring and Assessment Network
GEM	Global Environmental Multiscale
GIS	geographic information system
HYDAT	Environment Canada's hydrometric database
IJC	International Joint Commission
INRE	Institut national de recherche sur les eaux
INRS	Institut national de la recherche scientifique
NEI	Northern Ecosystem Initiative
NGO	nongovernmental organization
NREI	Northern Rivers Ecosystem Initiative
NWRI	National Water Research Institute
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
POPs	persistent organic pollutants
PPWB	Prairie Provinces Water Board
SOAER	State of Aquatic Ecosystem Report
ZIP	zone d'intervention prioritaire (priority intervention zone)



## EXECUTIVE SUMMARY

### Federal Programs

The *Canada Water Act* enables co-operative agreements for consultation between the federal, provincial and territorial governments in matters relating to water resources. Joint projects involve the regulation, apportionment, monitoring, or surveying of water resources and the pre-planning, planning, or implementation of sustainable water resource programs. The planning studies encompass interprovincial, international, or other basins where federal interests are important. Implementation of planning recommendations occurs on a federal, provincial, territorial, and federal–provincial–territorial basis. Agreements for specific water programs provide for the participating governments to contribute funding, information, and expertise in agreed ratios.

Various federal programs are highlighted in this *Canada Water Act* Annual Report. For example, Program Integrity is an initiative to collect hydrometric data across the country and includes modernizing stations and gauging sites and improving the technology used in monitoring. As well, a number of federal–provincial–territorial water quality monitoring agreements have been developed since the early 1980s to provide data on water quality. Highlights of 2003–2004 progress in this area include Environment Canada’s completion of discussions with Manitoba on the Canada–Manitoba Water Quality Agreement and the initiation of a joint study under the Canada–Quebec agreement on pesticides within tributaries of the St. Lawrence River. Progress also continued on the work conducted by interjurisdictional boards, including the Prairie Provinces Water Board (PPWB), the Ottawa River Regulation Planning Board, and the Mackenzie River Basin Board.

As Canada’s largest freshwater research facility, the National Water Research Institute (NWRI) leads initiatives across the country to protect and sustain Canadian water resources. Highlights of 2003–2004 include completion of a survey of sediments in the Great Lakes, which showed that levels of certain contaminants have dropped significantly; first steps in the design and implementation of a dedicated national water quality monitoring network focused on key water uses; publication of a comprehensive review of contamination of the Arctic environment by persistent organic pollutants, which underlines increasing concentrations of flame retardants; and new findings from a study of large-scale circulation patterns over the Northern Hemisphere and the relationship with recent prairie droughts.

In regards to public education on water issues, searching the web using any of the top search engines and the search terms *water* and *research* regularly brings up the NWRI web page as the top hit.

### Atlantic Region

The Atlantic Region consists of the provinces of Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador. In this region, water quality monitoring, toxicological and ecosystem research, and integrated watershed management initiatives are the key components of *Canada Water Act* activities.

A project initiated in 2003 showed that acetaminophen and carbamazepine were the only two neutral pharmaceuticals detected in effluent from sewage treatment plants. Also, a 20-year record indicated that the concentration of total polycyclic aromatic hydrocarbons in wet precipitation in Atlantic Canada declined steadily during 1980–2001.

In 2003–2004, Fisheries and Oceans Canada led an environmental impact assessment (EIA) with the province of New Brunswick to evaluate options for rehabilitating the Petitcodiac River estuary. Environment Canada contributed in-kind expertise to the EIA in the form of monitoring, data provision and analysis, and professional advice.

Atlantic Region staff participated with Environment Canada’s Knowledge Integration Directorate in a pilot project for the regional application of the Canadian Council of Ministers of the Environment Water Quality Indicators.

A key watershed initiative in the region is the Atlantic Coastal Action Program (ACAP). ACAP is a community-based funding program designed to address environmental and sustainable development issues at a watershed level throughout Atlantic Canada.

### **Quebec Region**

In the Quebec Region, the St. Lawrence River and connected ecosystems are the main focus of the *Canada Water Act*. At the St. Lawrence Centre, which is the only federal research and development centre devoted entirely to the river ecosystem, specialists are involved in a number of studies and research programs aimed at better understanding how the ecosystems of the St. Lawrence River function and how to keep this knowledge up to date.

Following the release of the initial results of the State of the St. Lawrence Monitoring Program, two workshops on indicators of shoreline conditions and community involvement in monitoring of the St. Lawrence were held. Also the following projects were carried out in support of river monitoring: chemical characterization of organic contaminants and heavy metals in surface sediments in Lake Saint-Pierre and Lake Saint-Louis; mapping of industrial contamination of sediment in Lake Saint-François; continued monitoring of water contamination by toxic substances at the Quebec City (downstream) and Wolfe Island (upstream) stations; establishment of a new monitoring station at Carillon (mouth of the Ottawa River); a comprehensive study of pesticides in Lake Saint-Pierre; and, continued monitoring of wetland vegetation, with the first cartographic databases online.

A new program on river biodiversity knowledge was launched in 2003–2004. According to this program, new inventories were started in order to learn more about the St. Lawrence River's biodiversity, particularly the importance of amphibians. Work on the vulnerability of the river's biodiversity was carried out, one focal point being the impact of parasites on the health of selected species and whether parasites can serve as indicators of biodiversity.

The Urban Effluents Program focused mainly on the Montréal wastewater treatment plant. According to the work published in 2003–2004, the program dealt specifically with the potential risk of feminization of certain organisms exposed to urban effluent, the assessment of nonylphenol surfactants in urban effluent, documentation of the bioaccumulation of heavy metals in the dispersion plume of wastewater, and a study of the combined effect of parasites and heavy metals on aquatic organisms.

Specialists at the Meteorological Service of Canada continued their digital modelling of the St. Lawrence River. Simulations representing the physical variables for various scenarios for water inflow into the St. Lawrence River were produced for the section of the river between Cornwall and Trois-Rivières.

### **Ontario Region**

Ontario Region's activities in the Great Lakes Basin under the federal Great Lakes Program, are key components of Environment Canada's *Canada Water Act* deliverables. The activities of the partners government departments/agencies that participate in the federal Great Lakes program are organized in relation to three main goals (healthy environment, healthy citizens, and sustainable communities) and seven objectives (restore Areas of Concern [AOCs], conserve ecologically important areas, control introduction of exotic species, assess and manage ecosystem health, protect and promote human health, reduce harmful pollutants, and advance sustainable use).

Through the 2002 Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem, accomplishments in 2003–2004 include progress towards rehabilitating ecological systems in all AOCs and the publication of a detailed status report on actions to be taken to restore beneficial uses in the 15 remaining AOCs, entitled *Canada's Remedial Action Plan Progress Report 2003*, available online at [www.on.ec.gc.ca/water/raps/report\\_2003/Introduction\\_e.html](http://www.on.ec.gc.ca/water/raps/report_2003/Introduction_e.html).

Within the region, water use and supply studies focus on gathering information at a watershed level to determine ecological sensitivities, impacts of climate change, and future projections.

### ***Prairie and Northern Region***

The Prairie and Northern Region encompasses more than 50% of Canada's land mass and includes five political jurisdictions: Alberta, Saskatchewan, Manitoba, Northwest Territories, and Nunavut. In this region, two main initiatives are noted in the *Canada Water Act* Annual Report: the Northern Rivers Ecosystem Initiative (NREI) and the Northern Ecosystem Initiative (NEI).

The NREI ran from 1998 to 2003, with reporting completed in 2004. It was initiated by the governments of Canada, Alberta, and the Northwest Territories in response to the recommendations made by the Northern River Basins Study. Through the NREI, science teams focused on priorities such as pollution prevention, endocrine disruption in fish, drinking water, and the effects of land use, flow regulation, and climate change on aquatic ecosystems.

The NEI supports partnership-based efforts to improve understanding of impacts and adaptation to climate change, investigations of local contaminant concerns, improved management of resource use activities, and the development of a northern monitoring network in support of status and trend reporting.

The PPWB was established in this region to ensure that eastward-flowing interprovincial streams are shared equitably and that water quality at interprovincial boundaries is maintained at acceptable levels. The PPWB also facilitates a cooperative approach for the integrated development and management of interprovincial streams and aquifers to ensure their sustainability. It continues to monitor and report on water chemistry, the condition of benthic macroinvertebrate communities and fish, and contaminant levels at PPWB monitoring sites. The PPWB is also considering the application of a water quality index for the presentation of water quality data at its transboundary monitoring sites.

The Mackenzie River Basin Board was created in 1997 to ensure a healthy and diverse aquatic ecosystem for the benefit of present and future generations within the Mackenzie River Basin. In 2003–2004, the major initiative of the Board was the drafting and completion of its first State of Aquatic Ecosystem Report, which analyzed indicators of water quality in the basin.

### ***Pacific and Yukon Region***

The Pacific and Yukon Region encompasses British Columbia and Yukon. The region is characterized by rugged terrain and variations in the amount, distribution, and form of water, resulting in a diverse climate. Water issues in the region stem from conflict or uncertainty in the allocation of water and adequate quality and quantity to meet human and ecosystem needs, now and in the future. Stresses from urban growth, rural development, agriculture, industry, and resource use have impacts on the quality and quantity of water suitable for human and environmental uses. Other water issues stem from fundamental human conflict with the environment: urban and rural development versus floods and drought versus agricultural and municipal water needs. The conflict is compounded by the mosaic of international, interprovincial, municipal, and First Nations interests, each with its own perspectives on the issues, root causes, and solutions.

The federal–provincial Georgia Basin Action Plan was announced on April 2, 2003, as a renewal of the Georgia Basin Ecosystem Initiative. The Action Plan is built upon a vision of “healthy, productive, and sustainable ecosystems and communities in the Georgia Basin” and is a key component of this region's initiatives on water. Under the Action Plan, projects and research are funded to address threats to and pressures and impacts on the sustainability of the Georgia Basin. Priorities include habitat and species conservation, reduction of pollutants, remediation of shellfish-growing areas, and improved local decision-making.



# HIGHLIGHTS, 2003–2004

## COMPREHENSIVE WATER RESOURCE MANAGEMENT (Part I of the *Canada Water Act*)

### 1. Federal–Provincial–Territorial Programs

In this section of the annual report, the following aspects of federal–provincial–territorial programs are discussed: federal–provincial–territorial collaboration on data collection and use, progress achieved within interjurisdictional boards, and ecosystem initiatives, as well as highlights of other types of collaborations on water, such as through the Canadian Council of Ministers of the Environment (CCME).

#### 1.1 Data Collection and Use

##### 1.1.1 Collection of Water Quantity Data

###### **Background**

Under hydrometric agreements administered since 1975 with the provinces and territories, government agencies have gathered, analyzed, and interpreted water quantity data to meet a wide range of client needs in the hydrologic community.

In 1997, all the parties agreed that there was a need to review the existing bilateral agreements and determine the path forward for updating the 1975 agreements. This initiative became known as the partnership renewal process.

In 2000, under the federal government's Program Integrity initiative, the Meteorological Service of Canada was allocated \$10 million over a five-year period. The funding was to be used for reengineering the collection of hydrometric data in order to minimize the associated field hazards.

###### **Progress (to March 31, 2004)**

In 2003–2004, 6 new groundwater stations were activated in New Brunswick, for a total of 10 stations operated under the Canada–New Brunswick Hydrometric Agreement.

The initial focus of the Program Integrity initiative has been on research and development. Testing

and evaluation of hydroacoustic technologies for suitability as an operational tool within the water survey field program have also taken place. The acoustic Doppler current profiler has shown great promise in reducing the time expended and dangers encountered by field staff when conducting velocity and flow measurements. It also reduces the time needed to obtain river velocity measurements and uses new deployment platforms, including small hand-carried tethered boats, remote-controlled boats, and remote-controlled cableway rovers. Other technologies investigated include in situ acoustic velocity meters and noncontact stage, velocity, and flow meters using radar and laser systems. Significant progress was made in the development of hydraulic and hydrological techniques that will reduce the risks associated with field measurements and will allow for the extrapolation of data from existing sites to estimate stream flows at ungauged sites.

Preliminary discussions were held regarding the provision to provincial and federal partners of gridded hydrological data products derived from the operational numerical weather prediction Global Environmental Multiscale (GEM) model. More comprehensive consultation sessions are planned for 2004–2005.

##### 1.1.2 Water Use and Supply Data

###### **Background**

In the fall of 2000, Canada and the province of Ontario initiated a joint federal–provincial water use and supply project for the Great Lakes Basin. The primary objectives of this Canada–Ontario project are to gain baseline information, at the sub-basin level, on water supply, use, and demand; to identify the system's ecological sensitivities to water resources; and to make projections for the future, including the potential impacts of climate change.

Environment Canada and the Ontario Ministry of Natural Resources co-lead the project. The project management team includes members

from these two agencies, along with the Ontario Ministry of the Environment, the Ontario Ministry of Agriculture and Food, Conservation Ontario, and Fisheries and Oceans Canada. Three technical working groups (water use, water supply, and ecological requirements) conduct the work.

### ***Progress (to March 31, 2004)***

The Canada–Ontario Water Use and Supply Project has made considerable progress throughout the past three years on a work-share basis and has completed many successful sub-projects as a result of the study.

The Water Use Working Group compiled data by tertiary watershed for the entire study area for the years 1991, 1996, 1998, 2000, and 2001 and continued to refine the current data-gathering methods. A Demand Forecasting Report with a 25-year time horizon (2001–2026) was updated to incorporate three different scenarios: water conservation, population and economic growth, and climate change. The Water Supply Working Group compiled climate data for Ontario, Quebec, and the Great Lakes states, compiled a sewage treatment plant data set for Ontario, compiled a data set of regulation structures (dams) for Ontario, developed new digital HYDAT watersheds (based on the stream gauging network), and estimated groundwater flow in terms of base flow index for all Canadian and U.S. stations using multiple techniques. The Ecological Requirements Working Group continued to identify species at risk, extracted indicators of stream health for sites located within the Lake Ontario basin, and initiated a study that characterizes the relationship between the effects of imperviousness in upstream catchments and biophysical characteristics of streams that drain into Lake Ontario.

### ***1.1.3 Water Quality Monitoring Agreements***

#### ***Background***

Beginning in the early 1980s, federal–provincial–territorial agreements were negotiated with several provinces and territories, including British Columbia (1985), Manitoba (1988), New Brunswick (1988), Newfoundland (1986), Northwest Territories (1995), Prince Edward Island (1989), Quebec (1983), and Yukon (1995).

The agreement with New Brunswick was modified in 1995 when the provincial government undertook to collect, analyze, and manage the data for the water quality monitoring program. The agreement with Prince Edward Island was incorporated into the Canada–Prince Edward Island Water Annex in 1996, which expired in 1999 and was replaced with the Canada–Prince Edward Island Memorandum of Agreement on Water signed in May 2001. Water quality monitoring continues under this new agreement.

The agreement with Quebec was terminated in 1995 because activities were similar to those in the St. Lawrence Action Plan. A specific framework agreement was negotiated with Quebec for the monitoring of the state of the St. Lawrence River, including long-term water quality monitoring. The agreement marks the first partnership between Environment Canada–Quebec Region, Fisheries and Oceans Canada–Quebec Region, the Quebec Ministry of the Environment, and the Société de la faune et des parcs du Québec. St. Lawrence River water quality monitoring stations are shared by Environment Canada and the Quebec Ministry of the Environment. In addition, each stakeholder provides water quality data (toxicity, coliform levels, conventional parameters, etc.) based on its analysis capabilities.

As part of an action plan to measure mercury in precipitation, an agreement was extended between Environment Canada and the Quebec Ministry of the Environment for a further three years (2001–2004) at the request of the Conference of New England Governors and Eastern Canadian Premiers. Under the agreement, mercury will be measured in precipitation at two sites in Quebec along the St. Lawrence River (Saint-Anicet and Mingan). Work continued in 2003–2004. The measurements will be incorporated into the North American Mercury Deposition Network.

### ***Progress (to March 31, 2004)***

Environment Canada and the B.C. Ministry of Water, Land and Air Protection jointly conducted biweekly water quality monitoring at 31 stream or river sites in British Columbia. Cooperative arrangements to test groundwater quality at wells have also been implemented where cost-effective. Environment Canada monitored water quality at

an additional four stream and/or river sites in British Columbia and four sites in Yukon in cooperation with the Parks Canada Agency. The water quality web project, which was developed as a pilot in 2002–2003 in cooperation with the Canadian Information System for the Environment, continued to evolve. The web site ([www.waterquality.ec.gc.ca/EN/home.htm](http://www.waterquality.ec.gc.ca/EN/home.htm)) makes water quality trend data accessible through the Internet. Developments in 2003–2004 include the introduction of web services to facilitate customized client applications regarding access to Environment Canada–Pacific and Yukon Region data and the incorporation of an online mapping solution based on open geographic information system (GIS) standards to facilitate the client's use of geospatial data with these water quality data.

Environment Canada Water Stewardship continues to support the Canada–Manitoba Water Quality Monitoring Agreement. Environment Canada monitored water quality each month on five rivers at sites located on either interprovincial or international boundaries under the agreement. Ions, nutrients, metals and pesticides are monitored in water under the Agreement. In addition to this monthly program, an automonitor is operated on the Red River at the international boundary.

In New Brunswick, 10 long-term surface water quality stations continued to be monitored in accordance with the federal–provincial agreement. These stations were used in the Application and Testing of Water Quality Index in Atlantic Canada pilot project.

In Newfoundland and Labrador, 91 water quality sites continued to be sampled under the federal–provincial agreement. Water quality monitoring at a selected network of Labrador ashkui sites (the term ashkui refers to the first open water area in the spring) continued during 2003–2004. The ashkui stations are now integrated into the Canada–Newfoundland and Labrador Water Quality Agreement. A Special Study report on water quality within the Exploits River was finalized this year, and several projects that coordinate databases were implemented as a first step in development of the CANAL website. Selected stations were used in the Application and testing of Water Quality Index in Atlantic Canada pilot project.

Annual meetings were held by representatives for the Canada-PEI Memorandum of Agreement on Water. Three Federal–Provincial hydrometric stations and two water management stations were operated this year. Eight groundwater wells are being monitored, and 14 freshwater stations were sampled. These stations were used in the Application and Testing of Water Quality Index in Atlantic Canada pilot project.

Lake water quality monitoring continued in Nova Scotia and Newfoundland's west coast for Environment Canada's ongoing Long-range Transport of Airborne Pollutants Program. Research on the aquatic ecosystem impacts of mercury and acid rain continued in 2003–2004. Water quality monitoring continued in New Brunswick and Nova Scotia in support of long-term multiagency research projects on the impacts of forestry operations on water quality at Catamaran Brook (NB), and the Pockwock Bowater Watershed Project (NS).

A pilot project was initiated in 2003 to investigate the occurrence of pharmaceuticals in sewage treatment plant effluents. Eight sewage treatment plants were sampled for final effluents. The acid pharmaceuticals were present at concentrations up to 23.0 µg/l in all the samples. Acetaminophen and carbamazepine were the only two neutral pharmaceuticals detected in the effluent.

A spatial and temporal trend analysis was completed for 14 polycyclic aromatic hydrocarbons (PAHs) that were measured in wet precipitation samples collected monthly from five sites in Atlantic Canada during 1980–2001. The 20-year record indicates that during this time period, the total PAH concentration in wet precipitation declined steadily.

In Quebec, the cooperation initiated under the Canada–Quebec agreement on the St. Lawrence and the federal–provincial agreement on the State of the St. Lawrence Monitoring Program led to a joint study on pesticides in Lake Saint-Pierre (St. Lawrence River) and tributaries, where pressure from farming is among the highest in Quebec. This project involved monitoring problematic tributaries on the St. Lawrence River (Yamaska, Nicolet, and Saint-François) in order to characterize pesticide type, concentration, and temporal distribution

patterns. During this first sampling year, pesticides such as atrazine were found in relatively high concentrations.

#### **1.1.4 Cooperative Modelling in the St. Lawrence River and the Great Lakes Connecting Channels**

##### **Background**

Since 2001, several studies have been undertaken as part of the revision of the water level regulation plan for Lake Ontario and the St. Lawrence River. Plan 1958-D, which was developed over 30 years ago, is the Lake Ontario–St. Lawrence River regulation plan, which established flow release levels according to criteria that included hydropower, commercial navigation, and flooding. Environment Canada–Quebec Region is involved in various working groups on issues such as the environment, coastal processes, hydrology, data management, pleasure boating, and nautical tourism. The results of the studies will be used as performance indicators to evaluate and propose an update of Plan 1958-D.

##### **Progress (to March 31, 2004)**

The Meteorological Service of Canada (Hydrology Section) has completed a two-dimensional digital modelling of Lake Saint-François and Lake Saint-Pierre between Cornwall and Trois-Rivières and of the Ottawa River between the Carillon dam and Lake Saint-Louis. These two areas are covered by the Lake Ontario–St. Lawrence River regulation plan. A number of physical parameters have been incorporated into the model in order to improve the simulation of the effects of water level fluctuations. In 2003–2004, special attention was paid to erosion and flooding problems and the development of habitat models for various plant and animal species based on the integration of physics and biology expertise.

The Meteorological Service of Canada was also involved in managing the georeferenced data obtained by the International Joint Commission (IJC) and Environment Canada and their partners for the study plan. A data storage and management service was established for the portion of the IJC's work covering the lower St. Lawrence River.

The Environmental Conservation Branch (St. Lawrence Centre and Canadian Wildlife Service) completed a series of projects and field studies (specifically in wetlands) to acquire a better understanding of the relationships between water levels and ecosystem components. The results of these studies made it possible to develop a series of solid empirical relationships and established the relative sensitivity of those components to changes in water levels. The relationships will be used as the basis for validating the hydrologic model and criteria in order to update the regulation plan.

A multipartner hydrologic modelling initiative aimed at predicting inflows to the Great Lakes and St. Lawrence basin was launched. The 2003–2004 component of the study focused on the development of methodologies for estimating the contribution of snowmelt runoff to the St. Lawrence stream flow downstream of Cornwall.

#### **1.1.5 Automated Quality Control**

##### **Background**

The Meteorological Service of Canada–Quebec Region participated in the implementation of a pilot project involving the automated, real-time application of quality control algorithms to data from hydrometric and meteorological monitoring networks. Traditional methods of managing these data were also reviewed and optimized in accordance with the most up-to-date concepts and technologies in the field.

##### **Progress (to March 31, 2004)**

The data model and the bank of suitable data have been reviewed and optimized. This model has incorporated new data, including updated bathymetry. Quality control algorithms for the domain of variation and for temporal variability were applied at a large number of hydrometric and meteorological stations to assess the capacity of the system to handle large quantities of data in real time. The project for all of the St. Lawrence River section (except Lake Saint-Pierre) was completed in 2003–2004. A national pilot project developed in part on the basis of that work was applied to the Pacific and Yukon Region.

### **1.1.6 Petitcodiac River Estuary Restoration**

#### **Background**

In 1968, a 1-km-long causeway and dam with five sluice gates was built across the Petitcodiac River estuary in southern New Brunswick. While beneficial as a crossing, the causeway is also a barrier that impedes freshets and tidal flows. Over the years, this condition has created ecological issues related to fish passage, levels of nutrients and dissolved oxygen, pollution, and channel sedimentation.

#### **Progress (to March 31, 2004)**

As part of efforts to rehabilitate the estuary, Canada and New Brunswick agreed to undertake a harmonized environmental impact assessment (EIA) for achieving a long-term solution to the fish passage and ecosystem problem. The EIA will consider proposed modifications to the Petitcodiac River causeway. Environment Canada is providing in-kind support (i.e., laboratory water quality analysis and engineering expertise) for the EIA. Water level stations continue to be operated on the Petitcodiac River in support of sediment and hydrodynamic modelling requirements for the EIA.

### **1.1.7 Canadian Environmental Sustainability Indicators**

#### **Background**

Following the recommendations of the 2003 National Round Table on the Environment and the Economy Report on Environmental Sustainable Development Indicators, the Government of Canada committed in the federal budget in March 2004 to develop and report regularly on a suite of environmental indicators, including indicators of water quality, air quality, and greenhouse gases.

#### **Progress (to March 31, 2004)**

Environment Canada is leading this effort with key input from Statistics Canada and Health Canada, using the CCME Water Quality Index as the model to evaluate monitoring data and report meaningful findings.

In collaboration with provincial and territorial partners, it is proposed that Environment Canada

will design and implement improvements to the federal–provincial–territorial water quality monitoring network focused on key water uses with a view to reporting nationally, regionally and by major drainage basins. Work will begin in 2004–2005, with the first national report targeted for fall 2005.

### **1.2 Interjurisdictional Boards**

#### **1.2.1 Ottawa River Regulation Planning Board**

#### **Background**

In 1983, Canada, Quebec, and Ontario concluded an Agreement Respecting Ottawa River Basin Regulation. Under its terms, a board was constituted to plan and recommend regulation criteria for the 13 principal reservoirs of the basin, taking into account flood protection, hydroelectric power production, and other interests. Supported by a regulating committee and a secretariat, the Ottawa River Regulation Planning Board endeavours to ensure that the integrated management of the reservoirs provides protection against flooding along the Ottawa River and its tributaries and along its channels in the Montréal region.

During the spring freshet, hydrometric and meteorological data are collected daily and are used to develop inflow forecasts. A simulation model is used to evaluate the effects of sub-basin inflows and regulatory decisions on flows and levels throughout the basin. The secretariat provides information on flows and levels to the public. Since 1986, flood reserves have been implemented in three of the principal reservoirs (Quinze, Timiskaming, and Poisson Blanc) to improve downstream flood reduction. One of the main benefits of the reserves is to enable operation of the Grand Moulin dam to provide protection for residents along the Mille-Îles River in the Montréal region.

#### **Progress (to March 31, 2004)**

The spring of 2003 was marked by low inflows to reservoirs and, hence, low peak flows. There were no reports of flooding during the spring melt period. By contrast, the peak flow measured at Carillon was greater in November than during the spring freshet due to heavy fall rains over large parts of the basin.

The board met four times during the year to deal with matters under its jurisdiction, as defined in the federal–provincial agreement. The board also hosted its fifth annual public meeting on August 26, 2003, in Mattawa, Ontario. The secretariat gave a presentation on the mandate of the board and on how the members are involved in coordinating the integrated management of the 13 principal reservoirs in the basin. Information was also provided more specifically on the operation of the reservoirs in the area of interest to the residents of the Mattawa area, from Lake Temiskaming to the Des Joachims generating station near Rolphton.

### **1.2.2 Prairie Provinces Water Board**

#### **Background**

In 1969, Canada, Alberta, Manitoba, and Saskatchewan signed the Master Agreement on Apportionment, which provides for the equitable apportionment of eastward-flowing Prairie rivers and the consideration of water quality problems. Schedules A and B provide general principles to apportion water between the provinces. Lodge and Battle Creeks in southwestern Saskatchewan are apportioned under Article 6, Schedule A, of the Master Agreement and the 1921 Order of the IJC under the terms of the 1909 Canada–United States Boundary Waters Treaty. Under Schedule C, the Prairie Provinces Water Board (PPWB) was reconstituted to administer the provisions of the Master Agreement. Schedule E specifies acceptable water quality objectives in each river reach along the interprovincial boundaries and further defines the duties of the board with respect to its water quality mandate.

#### **Progress (to March 31, 2004)**

During 2003, all apportionment obligations were met between the provinces. Runoff was generally close to normal in most locations, providing for flows that were surplus to apportionment requirements. Deliveries varied from a low of 79% of the natural flow on the South Saskatchewan River at the Alberta–Saskatchewan boundary to 176% of the natural flow on the Qu’Appelle River at the Saskatchewan–Manitoba boundary. The Qu’Appelle River normally delivers well in excess of natural flows because the province of Saskatchewan augments supplies with releases from Lake Diefenbaker.

The PPWB agencies supported studies, done under the Climate Change Action Fund, to consider the potential impacts of climate change on water availability and on the vulnerability of various water use sectors.

Since 1985, the Committee on Hydrology has sought ways to improve the effectiveness of apportionment monitoring of Lodge, Middle, and Battle creeks at the Alberta–Saskatchewan border. Middle Creek is a tributary of Battle Creek and the confluence of the two is in Saskatchewan. The board approved changes to the natural flow computation procedure recommended by the Committee on Hydrology to improve the accuracy of apportionment monitoring in these two interprovincial streams. Because these waters are also shared with the United States and are subject to the 1909 Boundary Waters Treaty, the PPWB must consider how apportionment changes between Alberta and Saskatchewan affect the apportionment arrangement at the international boundary. Therefore, some recommended changes have been postponed until similar changes are accepted in the international computations by the IJC Accredited Officers.

The Committee on Groundwater recommended specific tasks that should be completed before negotiating a groundwater apportionment agreement between the provinces, including the mapping and assessment of transboundary aquifers, the definition of sustainable yield, and aquifer management plans. A pilot study to map and assess a transboundary aquifer was conducted in 2003.

The Committee on Water Quality continued its integrated aquatic ecosystem monitoring program. The program includes the collection of key water chemistry, biota, and sediment samples with which water quality and aquatic ecosystem health can be assessed. The Committee on Water Quality annually reviews the results from this integrated program and compares the data with PPWB water quality objectives. Similar to previous years, in 2003, more than 94% of all samples were in adherence with these objectives. The Committee on Water Quality, in collaboration with NWRI, applied the CCME Water Quality Index to basins with PPWB monitoring sites, and the results were reviewed. Although the CCME Water Quality Index is a valuable tool, further development is under way, including applying the index to five-year running

averages and coordinating analysis and interpretative approaches with the CCME and the National Guidelines and Standards Office of Environment Canada.

Also in 2003–2004, the Committee on Water Quality reviewed trend detection techniques that compensate for variations in natural stream flow, and plans are in place to apply appropriate methods at the PPWB sites in 2004–2005. The PPWB continued monitoring fish conditions and contaminant levels on a five-year cycle at PPWB monitoring sites. Specific biological pilot studies, which include benthic macroinvertebrate communities and periphyton measurements, were completed in 2003–2004. This pilot study will be used to determine the feasibility of an ongoing biological assessment program for the PPWB that would identify the current status of aquatic ecosystem health and evaluate changes in ecosystem health over time. Finally, the Committee on Water Quality continued to develop appropriate nutrient water quality objectives, including an examination of the approaches proposed by the Canadian Guidance Framework for the Management of Phosphorus in Freshwater Systems.

### **1.2.3 Mackenzie River Basin Board**

#### **Background**

The governments of Canada, British Columbia, Alberta, Saskatchewan, the Northwest Territories, and Yukon signed the Mackenzie River Basin Transboundary Waters Master Agreement in July 1997. The Master Agreement endorses the principle of managing water resources for future generations in a manner consistent with the maintenance of the ecological integrity of the aquatic ecosystem. It provides for early and effective consultation on potential developments and activities in the basin that could affect the integrity of the aquatic ecosystem. It also contains provisions for seven sets of bilateral agreements between adjacent jurisdictions in the basin. These bilateral agreements identify scientific criteria for water quality, water quantity, and seasonal timing of flows at boundary crossing points required to maintain the integrity of the aquatic ecosystem of transboundary water bodies.

The Mackenzie River Basin Board administers the Master Agreement. Its members are appointed and represent all parties: Canada,

British Columbia, Alberta, Saskatchewan, the Northwest Territories, and Yukon. Federal members include representatives of Environment Canada, Indian and Northern Affairs Canada, and Health Canada. There are five Aboriginal board members nominated by Aboriginal organizations in each of the jurisdictions.

Under the Master Agreement, Environment Canada is responsible for managing the expenditures of the board, which are cost-shared equally by the parties. Shareable costs include, among other things, the staffing and operation of a secretariat to support the board at the working level. An executive director of the secretariat is hired within Environment Canada–Prairie and Northern Region to plan, direct, and manage board operations. The secretariat is located in the middle of the Mackenzie River Basin in Fort Smith, Northwest Territories, providing accessibility to the people who live in the basin.

The web site ([www.mrbba.ca](http://www.mrbba.ca)) went online in 2002. The site is continually being refined. News items, maps, and reports can be downloaded. The web site plays a major role in providing public information about water in the basin.

#### **Progress (to March 31, 2004)**

The Mackenzie River Basin Board has a major responsibility under the Master Agreement to produce a State of Aquatic Ecosystem Report (SOAER) for the Mackenzie River Basin every five years. Most of the financial and human resources were devoted to the board's first SOAER during 2003–2004. The board established an SOAER Committee to prepare the report. A senior author/editor was seconded from Environment Canada. The SOAER was structured by sub-basins, which facilitates a focus on the aquatic ecosystem and ties in development of bilateral agreements and the interests of local people. The report used Environment Canada's Pressure State Response Model and included a whole basin overview, future predictions based on current trends, and observations and advice to the ministers responsible for water management in the basin.

The report begins with an overview chapter followed by six sub-basin chapters, while the board's strategic plan was used to provide the focus of the chapters. Each sub-basin chapter was

prepared by a team composed of representatives of the jurisdictions involved in the sub-basins, and traditional environmental knowledge based on existing documentation was used throughout the report. Environmental indicators were used to track the questions posed under the Pressure State Response Model.

The SOAER was completed in the spring of 2004 and released to the ministers and the public in the summer of 2004. Climate change and contaminants were identified as major whole basin issues. A Highlights version accompanies the SOAER and summarizes 13 key observations and advice. Both the highlights and the full report are available online at [www.mrbb.ca](http://www.mrbb.ca).

### **1.3 Ecosystem Initiatives: Watershed and Water-related Activities**

During the year 2003–2004, Environment Canada continued the development and implementation of its major ecosystem initiatives, covering a wide variety of sensitive marine and freshwater systems across Canada. A five-year, \$122.5 million funding authorization, which began in 1998–1999, has supported the program.

Although each initiative has unique features, common management principles are observed throughout. These principles stress ecosystem and precautionary approaches to pollution prevention, citizen and community involvement in the design and implementation of initiatives, long-term stewardship through partnerships and governments working together, and sound science combined with local and traditional knowledge as the basis for identifying and resolving issues.

The ecosystem approach itself takes into consideration complex interrelationships among water, land, air, wildlife, and human activities. The focus of this report is primarily on water-related activities and their interjurisdictional arrangements.

#### **1.3.1 Atlantic Coastal Action Program**

##### **Background**

The Atlantic Coastal Action Program (ACAP) was initiated by Environment Canada in 1991. It is centred on community-based leadership and delivery to address environmental and sustainable development issues in ecosystems involving watersheds and coastal areas

throughout Atlantic Canada. With broad local support, nonprofit organizations have been incorporated at 14 sites across Atlantic Canada. At these sites, Environment Canada contributes funding, technical and scientific expertise, and direct staff support with respect to four broad categories of projects relevant to the *Canada Water Act*: clean water, atmospheric emissions, toxics, and natural habitat.

Over the past decade, some 800 projects have been undertaken. These projects have already resulted in significant water quality improvements in several coastal river systems. For example, a project in the Annapolis River, Nova Scotia reviewed the management regime for the disposal or treatment of septage and made recommendations on improving sewage management in Nova Scotia. In northern New Brunswick, a project measured polychlorinated biphenyl (PCB) levels and identified the source of contaminants found in sediment and finfish throughout the Napan River watershed. The study also provided a comparative report of PCB levels in sediments and finfish.

##### **Progress (to March 31, 2004)**

Several ACAP organizations worked on multiyear projects on a variety of issues within their local communities. The Bluenose ACAP (now the Bluenose Coastal Action Foundation) delivered a Clean Boating Program aimed at reducing the environmental impact of recreational boating in and around the waters of Lunenburg County. This was achieved through the installation of sewage pump-out facilities, the promotion of environmentally responsible boating practices, and the successful designation of a “No Discharge” zone. Humber Arm Environmental Association Inc. developed a student-based water sampling initiative called Trading Books for Boats. Piloted in 2002, this project provided the foundation for a long-term, student-based water quality monitoring program. This program is based on the learning objectives set out by the Newfoundland and Labrador Department of Education.

In Prince Edward Island, a three-year study was initiated to determine the effectiveness of filter strip and buffer zone composition in reducing the contaminant content of agricultural runoff. Concern for the quality of water within the local watershed was raised when agricultural runoff

was associated with fish kills in the province. Developed jointly between ACAP, the Government of Prince Edward Island, and Environment Canada–Atlantic Region, this project was based on filter strip research through the provision of chemical composition and toxicity data on agricultural runoff at sites in Prince Edward Island where potato crops were cultivated under typical farm conditions.

### **1.3.2 Georgia Basin Action Plan: Cooperative Arrangements in the Georgia Basin**

#### **Background**

The federal–provincial Georgia Basin Action Plan (2003–2008) was announced on April 2, 2003, and is a renewal of the Georgia Basin Ecosystem Initiative (1998–2003). The Georgia Basin Action Plan is built upon a vision of “healthy, productive, and sustainable ecosystems and communities in the Georgia Basin” that is shared by Environment Canada, Fisheries and Oceans Canada, Parks Canada Agency, the B.C. Ministry of Water, Land and Air Protection, and the B.C. Ministry of Sustainable Resource Management. The Georgia Basin Action Plan focuses on the following departmental priorities as they pertain to clean water:

- conservation and protection of habitats and species;
- reduction of pollutants (including persistent organic pollutants [POPs] and other toxics) in municipal wastewater and in urban and agricultural nonpoint sources;
- remediation of shellfish growing areas; and
- development and transfer of science, tools, and knowledge to support improved decision-making towards sustainability in the Georgia Basin.

Regional and transboundary relationships were strengthened through the Georgia Basin Action Plan. Examples include the Environment Canada–U.S. Environmental Protection Agency Joint Statement of Cooperation on the Georgia Basin and Puget Sound Ecosystem, the Fraser Basin Council, the Coast Salish Sea Initiative, the Pacific Coast Joint Venture, and the emerging Biodiversity Conservation Strategy for the Greater Vancouver Regional District.

#### **Progress (to March 31, 2004)**

*Federal–Provincial Water Quality Monitoring Agreement:* Four sites in Georgia Basin rivers were added to the federal–provincial water quality network in British Columbia. The network, now consisting of 34 sites, had been established to determine water quality trends in ambient surface water and is a cost-shared program between Environment Canada and the province. In a related project, a study was initiated in the Fraser River estuary to determine the best method for monitoring water quality in the tidal reaches of the lower Fraser River. When methods are established, regular monitoring at the river’s mouth may be undertaken.

*Stream Condition Assessment:* Nine water quality monitoring sites in the Georgia Basin were assessed for biological condition using the Canadian Aquatic Biomonitoring Network (CABIN) approach, which is based on stream benthic communities. This serves as a pilot project for applying the CABIN bioassessment at all water quality monitoring sites in the region and adding a biological component to the network. The application of this national approach was promoted by Environment Canada. For example, training on CABIN was presented to provincial agencies, municipalities, First Nations, consultants, and stewardship groups in 2004.

*Abbotsford Aquifer Groundwater Monitoring:* Groundwater samples taken from 23 locations in the Abbotsford aquifer were monitored monthly for nitrate from nonpoint source pollution. Nonpoint source pollution cannot be pinpointed to a source, but includes manure, fertilizer, or pesticides applied to farm fields, oil leaks from cars, and household cleaners that seep into groundwater, rivers, and creeks. Elevated nitrate concentrations have been measured for many years at locations in the aquifer. The overall average concentration of nitrate at the monitoring wells is higher than the Canadian drinking water guideline. Recent results from the monitoring program are available on Environment Canada–Pacific and Yukon Region’s Environmental Indicators web site at [www.ecoinfo.ec.gc.ca/env\\_ind/region/nitrate/nitrate\\_e.cfm](http://www.ecoinfo.ec.gc.ca/env_ind/region/nitrate/nitrate_e.cfm).

Since 1996, Environment Canada has implemented, in partnership with other federal, provincial, and municipal agencies, projects to educate the public on groundwater stewardship.

Recent efforts have included support to the Raspberry Industry Development Council's education and awareness initiatives. Environment Canada is currently working with researchers at Simon Fraser University to develop a model that will be used to assess the environmental impacts of land use practices and land management strategies. Phase One was a groundwater flow model, and Phase Two models contaminant transport in the groundwater. Environment Canada continues to work with other agencies and stakeholders to prevent nitrate contamination of the aquifer.

*Waterbucket.ca:* The Water Sustainability Committee of the British Columbia Water and Waste Association is developing a web-based library, to be housed on the Waterbucket.ca web site ([www.waterbucket.ca](http://www.waterbucket.ca)), listing current water conservation resources from various government and industry publications. A web-based user survey will be developed to track outreach efforts and document who is accessing water conservation information and for what purpose.

*Watershed Modelling:* A modelling approach that will result in predictive scenarios of stream flow and water quality is being developed and evaluated to support local decision-making on small watersheds. Hydrologic modelling has begun for two watersheds in the Saanich Inlet on Vancouver Island and three streams in the Lower Fraser Valley. Algorithms for a predictive water temperature submodel and for a predictive fecal coliform submodel have been designed.

*Headwaters Model Sustainable Community in Surrey:* Phase One of the Headwaters Model Sustainable Community in Surrey project involved the creation of a Neighbourhood Concept Plan for East Clayton, Surrey. Principles for sustainable urban development have been shaped into plans through a series of charrettes, meetings, and design sessions with different stakeholders as well as design and technical specialists. The East Clayton Land-Use Plan was adopted by council in late 1999, and the full Neighbourhood Concept Plan was approved in early 2001. Currently, the City of Surrey, along with the Headwaters partners, is undertaking Phase Two of the Headwaters project, which will develop standards to ensure the long-term health of the area's streams and agricultural lowlands and will set a precedent for future development in the area.

### **1.3.3 Great Lakes Program: Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem**

#### **Background**

The Government of Canada launched the Great Lakes Action Plan in 1989 to integrate its efforts to restore the health of the Great Lakes Basin ecosystem. This is a coordinated effort among federal departments to ensure that Canada's commitments under the Canada–United States Great Lakes Water Quality Agreement (GLWQA) are met. The federal Great Lakes Program was renewed in 1994 as Great Lakes 2000 and more recently in 2000 through the Government of Canada's announcement of the Great Lakes Basin 2020 initiative.

The federal Great Lakes Program is a partnership of seven federal departments and one federal agency which has as its goal the attainment of a healthy environment, healthy citizens, and sustainable communities. Program partners include Agriculture and Agri-Food Canada, Environment Canada, Fisheries and Oceans Canada, Health Canada, Natural Resources Canada, Parks Canada Agency, Public Works and Government Services Canada, and Transport Canada. This important coordinated federal program significantly bolsters Canada's efforts to protect and restore the Great Lakes Basin ecosystem, particularly in combination with Environment Canada's Great Lakes Basin Ecosystem Initiative, which is one of six national priority ecosystem initiatives targeted for funding (\$10 million annually) to address and solve complex environmental, economic, and social issues.

In addition, the Great Lakes Basin 2020 initiative provides \$40 million over five years (i.e., \$8 million annually until March 2005) to restore environmental quality in significantly degraded Areas of Concern (AOCs) designated pursuant to the Canada–United States GLWQA. As well as restoring AOCs, the Great Lakes Program seeks to engage government, nongovernmental organizations (NGOs), and citizens in addressing priority threats to the Great Lakes ecosystem, including harmful pollutants, loss of fish and wildlife habitat, climate change, alien invasive species, and population growth and development.

Federal partner departments' activities are integrated with those of Ontario through the 2002 Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA). The governments of Canada and Ontario signed their first COA in 1971 to demonstrate their joint commitment to stemming the tide of environmental degradation within the basin. The COA has been renewed several times to reflect new challenges and changing conditions within the basin.

The successive COA represents a model of federal-provincial cooperation that recognizes the shared jurisdiction surrounding many of the issues faced within the Great Lakes Basin, establishes common goals and results, and coordinates actions to eliminate overlap and optimize use of resources for maximum results. Achievements include reduced levels of many pollutants, improved water quality, and restored species and their habitats.

The 2002 COA is guided by the vision of a "healthy, prosperous, and sustainable Great Lakes Basin for present and future generations." It has enabled the continuation of progress on priority issues. Through the COA, both governments have set out environmental priorities and specific goals and actions for the enhancement and preservation of the basin's ecosystem. The 2002 COA focuses on four major environmental priorities that will benefit from federal-provincial cooperation and coordinated action. For each major environmental priority, the 2002 COA sets out a series of desirable goals and actions to be achieved over the five-year duration of the agreement. The four major environmental priorities were as follows:

- cleanup of the remaining AOCs within the basin;
- significant reduction or virtual elimination of harmful pollutants within the basin;
- implementation of a series of binational lakewide management plans to address problems unique to each of the Great Lakes;
- improve monitoring and information management.

Signatories to the COA include eight federal departments and agencies (Agriculture and Agri-

Food Canada, Environment Canada, Fisheries and Oceans Canada, Health Canada, Natural Resources Canada, Parks Canada Agency, Public Works and Government Services Canada, and Transport Canada) and three provincial ministries (Ontario Ministry of Agriculture, Food and Rural Affairs, Ontario Ministry of the Environment, and Ontario Ministry of Natural Resources).

#### **Progress (to March 31, 2004)**

Canada and Ontario have been working cooperatively to implement the 2002 COA. It will take considerable time, effort, and resources to achieve the extensive results set out in the agreement. With two years of work under the 2002 COA, over 700 projects were underway in 2003-2004. Steady progress has been made in relation to all COA results.

Accomplishments in 2003-2004 include the following:

- *Canada's Remedial Action Plan Progress Report 2003* was published, detailing status and actions to be taken to restore beneficial uses in the 15 remaining AOCs ([www.on.ec.gc.ca/water/raps/report\\_2003/Introduction\\_e.html](http://www.on.ec.gc.ca/water/raps/report_2003/Introduction_e.html)).
- Biennial Lakewide Management Plan reports were prepared in 2004 for Lakes Erie, Ontario, and Superior. The first biennial document for Lake Huron was also completed in 2004. Discussions to establish a binational program for Lake St. Clair are underway. Also, a binational, multi-agency monitoring strategy for Lake Ontario, which is being considered as a model for the other lakes, was implemented.
- Regulatory as well as voluntary measures by the public and industry have resulted in significant reductions in concentrations of harmful pollutants, including 86% for PCBs, 83% for mercury, 84% for dioxins/furans, 45% for benzo(a)pyrene, and 65% for hexachlorobenzene since 1988.
- The latest in the Great Lakes Fact Sheet series titled *Fish and Wildlife Health Effects in the Canadian Great Lakes Areas of Concern* ([www.on.ec.gc.ca/wildlife/publications-e.html](http://www.on.ec.gc.ca/wildlife/publications-e.html)) was published. This fact sheet summarizes early findings on wildlife

health resulting from a multiyear study led by Environment Canada. The goal of this systematic assessment in Canadian AOCs is to determine if there are health effects on fish and wildlife associated with contaminants in the aquatic environment, that are similar to those reported for the human population in Health Canada studies.

- Canada and Ontario, together with municipalities, evaluated new treatment technologies for the removal of ammonia, pathogens, and other harmful pollutants in municipal wastewater.
- The Great Lakes Sustainability Fund provided funding for 103 projects to advance restoration in the Great Lakes AOCs.
- The Great Lakes Cooperative Monitoring Initiative, initiated in 2003 for Lake Ontario, is an approach that attempts to address key information needs identified by the Lakewide Management Plans working groups through new monitoring and research on the lake. The expertise and participation of agency staff and academia is actively sought in: designing a program to address those needs; coordinating these new activities to the extent possible with ongoing programs; providing seed money and, in some cases, grants to conduct the work; arranging for technology transfer and sharing of equipment and expertise; and, as necessary, arranging for data sharing agreements. The Initiative will focus on one lake at a time, according to a Binational Executive Committee's endorsed rotational cycle. Three separate projects were undertaken as part of the Lake Ontario Cooperative Monitoring Initiative in 2003: Assessment and Status of the Lower Food Web; Atmospheric Deposition Study; and Organic Chemical Intercomparison Study between US and Canadian Federal Agencies, State and Provincial governments.
- The second edition of *A Framework for Guiding Habitat Restoration in Great Lakes Areas of Concern* was prepared, entitled *How Much Habitat is Enough?* ([www.on.ec.gc.ca/wildlife/publications-e.html](http://www.on.ec.gc.ca/wildlife/publications-e.html)). This publication provides planners and rehabilitation teams with the best available science for decisions on rehabilitating local watersheds and

landscapes, in particular wetland and riparian habitats.

- The Great Lakes Innovation Committee, a multistakeholder advisory group, was established to assist with the identification of opportunities for overcoming barriers to COA implementation.
- A collaborative four-year project that began in 2002 continued to assist in the development of a best management practices manual for biosolids and manure application to agricultural land.

### **1.3.4 St. Lawrence Action Plan / Vision 2000**

#### **Background**

Originally launched in 1988, the St. Lawrence Action Plan is a Canada–Quebec ecosystem initiative to protect, preserve, and restore the St. Lawrence River ecosystem. This five-year plan has been renewed twice since 1988 and has achieved concrete results through concerted efforts on the part of federal and provincial departments, aided by the private sector, universities, research centres, ZIP (Zone d'intervention prioritaire [priority intervention zone]) committees, nongovernmental agencies, and riverside communities. Efforts are focused on the St. Lawrence River and its major tributaries, from Lake Saint-François at the Quebec–Ontario border to the eastern end of the Gulf of St. Lawrence.

Phase III of St. Lawrence Vision 2000 was initiated in 1998 and carried forward the efforts of the previous 10 years, in particular the reduction of industrial and agricultural pollution, protection and conservation of biodiversity, and involvement of communities located along the St. Lawrence. A new component, related to shipping, was added to the third phase of St. Lawrence Vision 2000.

#### **Progress (to March 31, 2004)**

The year 2003–2004 marked the transition between the third and fourth phases of the St. Lawrence Action Plan, discussed with two successive Quebec governments. The next Canada–Quebec agreement on the St. Lawrence is under negotiation. Despite the absence of a formal agreement, many activities were carried out in the areas of community

involvement, navigation, and monitoring of the state of the St. Lawrence. Additional interventions for the St. Lawrence were also undertaken (e.g., decontamination, research, education, and hydrodynamic modelling).

The signing of funding agreements with the 14 ZIP committees made it possible to support mobilization of the local population in implementing their ecological rehabilitation action plans. In 2003–2004, the 14 ZIP committees met twice to discuss common issues and concerns, such as oil and gas exploration in the St. Lawrence. The Community Interaction Program provided funding for 22 ecological rehabilitation action plans and other community projects. The projects covered environmental characterization, integrated island management, restoration, environmental protection and enhancement, shoreline accessibility, and public awareness of environmental conservation. For example, modelling of the bacteriological quality of the water by the Quebec City ZIP committee helped determine the potential for swimming at Jacques Cartier beach.

New projects related to indicators for monitoring the St. Lawrence ecosystem were undertaken, a sustainable navigation strategy was reviewed and validated by several local stakeholders, an integrated sediment management plan was developed for the St. Lawrence, and research continued to identify new sediment quality criteria. A special session entitled “The St. Lawrence River: Research in Action” was held during the Second International Symposium on Contaminated Sediment in Quebec City. The results of studies monitoring sediment quality and review of the criteria required for sediment management were highlighted. New criteria, based on the CCME sediment quality criteria, will be available in 2005. In addition to the St. Lawrence Centre, the Environmental Protection Branch of Environment Canada’s Quebec Region was involved in the event, at which research and fieldwork were discussed.

Studies on decontamination of the mouth of the Saint-Louis River were also completed, with rehabilitation expected to begin in the summer of 2005. Work on the area around sector 103 of the Port of Montréal (aquatic environment) is scheduled for the fall of 2005 or spring of 2006. A work area was targeted in the contamination of Sandy Beach harbour (Gaspé), and options are being evaluated in order to define a specific

restoration project for November 2005. Finally, toxic effluent from the Technoparc near downtown Montréal is still a major concern for the St. Lawrence ecosystem, and all of the parties involved — municipal, provincial, and federal — are working to find a lasting solution.

In support of the plan of study for the regulation of Lake Ontario and the St. Lawrence River, studies conducted by the region (St. Lawrence Centre, Canadian Wildlife Service) were expanded to take greater account of birds and species at risk, and other work was carried out on fish habitat, fish communities, and aquatic plants. The Meteorological Service of Canada continued its digital modelling of the St. Lawrence River. The hydrodynamics of the Lake Saint-Louis and Lake des Deux Montagnes reaches were simulated, and a two-dimensional model of water temperature was developed in cooperation with the Institut national de la recherche scientifique—Eau (INRS-Eau, now centre Eau, Terre et Environnement de l’INRS). Modelling of the fish habitat continued in cooperation with the Quebec Ministry of the Environment and the Société de la faune et des parcs du Québec.

Lastly, a project dealing with the impact of pesticides (National Pesticide Fund with Agriculture and Agri-Food Canada) was started in Lake Saint-Pierre, a World Biosphere Reserve and Ramsar site (or Wetland of International Importance). This is an effort to learn more about the impact of pesticides and determine the feasibility of a review of current controls on farm effluent that could affect the St. Lawrence. Evaluation of the effects of pesticides used in growing corn continued in 2003–2004, with systematic measurement of pesticides planned until 2005 in Saint-Anicet and Saint-François Bay on Lake Saint-Pierre as part of the Canadian Atmospheric Network for Currently Used Pesticides. Additional efforts were also made to establish an integrated ecosystem research plan focusing specifically on pesticides. A workshop held in Montréal in September 2003 and attended by 15 researchers dealt with pesticides used in intensive agriculture in order to set up a research program involving both university and government researchers.

The Biosphère (Environment Canada–Quebec Region), a unique museum devoted to water resources, developed a number of networks involving young people in initiatives and

information gathering related to the health of aquatic ecosystems.

### **1.3.5 Northern Ecosystem Initiative**

#### **Background**

The Northern Ecosystem Initiative (NEI) was launched in 1998 and renewed for a second five-year mandate in 2003. NEI supports partnership-based efforts to improve understanding of impacts and adaptation to climate change, investigations of local contaminant concerns, improved management of resource use activities, and the development of a northern monitoring network in support of status and trend reporting. NEI supported projects that address science and capacity-building needs throughout the Canadian North, including Yukon, the Northwest Territories, Nunavut, the lowlands of northern Manitoba and Ontario, northern Quebec, and Labrador.

The initiative is guided by the principle of sustainable development and follows an interdisciplinary scientific approach that also seeks to promote the use of local and traditional knowledge systems in combination with western scientific knowledge and methodologies.

#### **Progress (to March 31, 2004)**

With funding support from NEI, a number of water-related projects were undertaken. These included a workshop that brought together Aboriginal people from five regions of the Northwest Territories to share observations and synthesize the most obvious impacts of climate change and water-related issues. Recommendations from the workshop included holding a youth gathering to improve communications and an international climate change gathering of Indigenous Peoples.

NEI provided funding support for a Yukon Community Stewardship Program that assisted communities in identifying local stewardship priorities and developing relevant plans, programs, and projects related to local lakes and wetlands. Communication links were forged among stakeholders.

NEI supported a workshop in Inuvik that involved women from six Inuit regions of Canada and focused on steps to reduce the environmental impact of day-to-day activities. The workshop

included a discussion on options for maintaining a clean environment through proper waste management practices, adequate sewage treatment, and the unwanted effects of household cleaners and chemicals on freshwater systems.

With NEI support, the Ecological Monitoring and Assessment Network–North (EMAN-North) completed a plain-language water quality manual to be used by researchers as well as nonspecialists such as park wardens, renewable resource officers, and community workers. The manual was designed to combine key information in assisting Northern personnel in answering questions on water quality issues and designing appropriate monitoring and assessment projects. The manual is available online at [www.emannorth.ca/reports/waterqualitymanual.cfm](http://www.emannorth.ca/reports/waterqualitymanual.cfm).

NEI continued to support projects investigating mercury in northern aquatic ecosystems. Research included work investigating mercury isotopes as well as studies of mercury levels in sediments of several northern lakes, fish in Great Bear Lake, and mink in Yukon. Mercury has emerged as a priority contaminant in the Arctic and inland lakes of central and eastern Canada. The studies supported by NEI helped complete knowledge of mercury loadings in these important aquatic ecosystems across Canada's North.

Two local contaminant study projects were also funded by NEI. One study investigated a progressively increasing problem of trees drying out in the Colville Lake area. The second study collected soil and water samples from two sites near Martin House on the Arctic Red River in the Northwest Territories. Water samples taken from the sites were tested for the presence of metals, salts, and hydrocarbons.

Through NEI funding, the Labrador Contaminants Working Group completed two Projects: 1) Initial Review of Local Contaminants Concerns in Labrador and 2) Collating existing Inventories and Databases of Contaminants-Related Information for Labrador. Overall, these efforts will provide the necessary foundation to enable the Labrador Contaminants Working Group to develop a contaminant research and monitoring agenda for Labrador.

In 2003–2004, a third intensive measurement campaign was carried out in northern Quebec

(Kuujjuarapik) in cooperation with German, French, and Canadian researchers in an effort to learn more about the way in which mercury is exchanged between the atmosphere and snow cover. This scientific work is directly linked to the health of Aboriginal communities, whose diet is based on wildlife and is subject to mercury deposition from the atmosphere in the North.

### **1.3.6 Northern Rivers Ecosystem Initiative**

#### **Background**

Undertaken pursuant to an agreement signed by Canada, Alberta, and the Northwest Territories in 1991, the Northern River Basins Study assessed the cumulative effects of industrial, agricultural, municipal, and other developments on the aquatic ecosystems of the Peace, Athabasca, and Slave river systems. The final report, with key findings and recommendations, was completed and transmitted to ministers in June 1996.

A joint governmental response to the recommendations was released in November 1997. In the response, commitments to undertake follow-up activities were made by a number of federal departments, including Fisheries and Oceans Canada, Indian and Northern Affairs Canada, Health Canada, Canadian Heritage, and Environment Canada, as well as Alberta and the Northwest Territories. These activities included research to improve the understanding of the effects of nutrients and contaminants on the river system and work to understand the interrelationships of hydrology and climate in northern deltas.

Follow-up activities have been cooperatively undertaken by Canada, Alberta, and the Northwest Territories through the Northern Rivers Ecosystem Initiative (NREI). This five-year initiative began in April 1998 under the direction of a steering committee co-chaired by Environment Canada and Alberta Environment. The NREI concluded in 2003, with final reporting occurring in 2004. Information on the NREI and the Northern River Basins Study can be found at [www.pnr-rpn.ec.gc.ca/nature\\_ecosystems/nrei-iern/index.en.html](http://www.pnr-rpn.ec.gc.ca/nature_ecosystems/nrei-iern/index.en.html).

#### **Progress (to March 31, 2004)**

More than 15 research projects were concluded in 2003, with reports prepared during 2004. These projects focused on pollution prevention,

drinking water, and research into contaminants, nutrients, endocrine disruption in fish, dissolved oxygen, and hydrology. Technical reports on the projects have been received by the NREI Steering Committee. These technical reports were compiled in digital format and put onto a CD entitled NREI Collective Findings. The technical reports, along with a summary of the policy initiatives undertaken in response to the original Northern River Basins Study recommendations, formed the basis for an NREI Synthesis Report. In addition, an NREI Final Report was prepared, providing a detailed description of the actions undertaken to meet the commitments of the Government of Canada, Alberta, and the Northwest Territories included in the Northern River Basins Study recommendations. In many instances, initiatives by industry also addressed the recommendations. Where information was available and appropriate, the results were included in the Final Report and incorporated into the Synthesis Report. A Key Findings Document will be put online in the next year.

## **2. Water Research**

### **2.1 National Water Research Institute**

#### **Background**

As Canada's largest freshwater research institute, NWRI leads initiatives from five locations across the country to protect and sustain Canada's aquatic ecosystems, aquatic biodiversity, and the quality and quantity of Canadian water resources. NWRI collaborates with partners from governments, universities, and the private sector to confront Canadian and global freshwater problems and to restore damaged sediments, lakes, rivers, groundwater, and wetlands.

#### **Progress (to March 31, 2004)**

*Recognition of Expertise in Water Research:* At the Fifth Cannes Water Symposium in June 2003, NWRI was presented the Cannes International Prize for Water and Sciences in recognition of contributions to water science over the past 30 years.

*Communicating Water Knowledge to the Public:* Searching the web using any of the top search engines and the search terms *water* and *research* regularly brings up the NWRI web page

([www.nwri.ca](http://www.nwri.ca)) as the top hit: numbers 1 through 4 on MSN; 1 on Lycos; 1 through 3 on Google searching the Canadian pages only, number 2 for the whole web (out of ~1.7 million sites); and 1 on Yahoo's unsponsored links. Among other features, the site provides maps and details of NWRI research across Canada and abroad.

*NWRI and Water Reuse and Recycling:* NWRI, on behalf of the CCME, organized a workshop, *Linking Water Science to Policy: Water Reuse and Recycling*, that brought together over 50 invited participants from various sectors and addressed the main issues of municipal wastewater reclamation and reuse and industrial water recycling. The final report on workshop findings was released in 2003–2004 and dealt with water reuse categories; water reuse regulations, quality criteria, and guidelines; wastewater treatment technologies for reclamation and reuse; industrial wastewater recycling; reclaimed water storage and distribution; planning wastewater reclamation and reuse; and workshop recommendations. The report can be downloaded in both official languages from the CCME web site at [www.ccme.ca](http://www.ccme.ca).

*Canadian Prairie Droughts of 2001 and 2002:* Droughts present a serious threat to water quantity and water quality across Canada. An improved understanding of the physical causes of Canadian droughts will lead to better prediction of these events, both in the short term (seasonal) and for those future events associated with climate change. Large-area, prolonged droughts, such as those affecting the Canadian Prairies during 2001 and 2002, are not well understood in terms of their large-scale atmospheric causes.

To address this issue, NWRI became involved in a study examining atmospheric circulation patterns associated with the 2001 and 2002 Canadian Prairie droughts, including comparisons with other 20th-century severe dry periods over western Canada. Results revealed that large-scale circulation patterns over the Northern Hemisphere were markedly different when compared with those associated with previous severe dry periods over western Canada and indicated that more research into the large-scale causes of droughts over Canada and North America is required. Main partners included Agriculture and Agri-Food Canada and the Saskatchewan Research Council.

*Building Water Monitoring Networks in Atlantic Canada:* As part of an NWRI initiative to develop a national biomonitoring program, training workshops were held at Acadia University and the University of New Brunswick (Fredericton), attended by approximately 30 people representing 19 different organizations, including NGOs, academic institutions, other provincial and federal departments, and First Nations.

The course taught participants how to design a stream assessment study to use sampling protocols and a specialized database, taxonomic identification, as well as methods of data analysis and interpretation. At the end of the course, NGOs were provided with a stream sampling kit to allow them to participate in the program. This was the second year of this program; as a result of the first year's project, 15 groups participated, and data were collected from over 100 sites in Atlantic Canada.

*Contaminants in the Great Lakes — Past and Present:* NWRI and partners completed a survey of Great Lakes sediments to discover the extent of contamination by toxic substances and to determine if cleanup efforts had the expected effects. They compared current levels of contamination in the sediments with historical levels to get a picture of trends over time and assess improvements in environmental quality since measures were first taken to reduce discharges of toxic contaminants. This information also helps identify potential sources of these compounds and regions where contamination exceeds sediment quality guidelines for the protection of aquatic biota.

Their findings showed a dramatic and definitive drop in most contaminants — most notably lead (attributed to its ban from use in gasoline), mercury, and PCBs. Key factors contributing to the overall decline in contaminant levels are binational initiatives such as the Canada–United States Great Lakes Water Quality Agreement and the Binational Toxics Strategy, which target specific harmful compounds and encourage both the public and private industry to engage in more environmentally responsible practices. Another goal was the early identification and tracking of toxics of emerging concern in the Great Lakes, including compounds such as polybrominated flame retardants, which were introduced to replace the banned PCBs. Concentrations of some of these compounds are on the rise, so ongoing research and monitoring are essential.

*Arctic Monitoring and Assessment Programme (AMAP) — Persistent Organic Pollutants (POPs):* NWRI researchers led the development of an AMAP report that was three years in the making and gave a comprehensive review of contamination of the Arctic environment by POPs. The report underlined the increasing concentrations of flame retardants and other new contaminants in marine and freshwater animals and stressed that PCB concentrations remain high enough to affect the health of top predators, particularly polar bears and sea gulls. The document can be obtained at [www.amap.no/](http://www.amap.no/).

*Arctic Monitoring and Assessment Programme (AMAP) — Acidification:* AMAP intends to release a follow-up report to Chapter 9 of the 1998 AMAP assessment, *Acidifying Pollutants, Arctic Haze and Acidification in the Arctic*. NWRI is providing research results to this follow-up, which will be released in 2006. In the Canadian Arctic, the 1998 assessment focused on air quality issues, and this information will be updated. An analysis of real or potential aquatic effects will be an important new component. Such information was largely missing from the 1998 report.

*Aquatic Cumulative Effects Assessment — Developing New Tools:* Under the NREI, a decision-support software tool was developed by NWRI to assist with watershed- to regional-scale aquatic cumulative effects assessment. The tool, called EcoAtlas—Cumulative Effects, incorporates water quantity, water and biological quality, and point source quality (pulp mill and sewage effluents) data from federal and Alberta provincial databases. It integrates the CCME Water Quality Index and data from Environment Canada's Environmental Effects Monitoring (EEM) Program. The EEM software is now being used nationally by federal departments and by industry and consultants to develop consistent analyses and streamline reporting.

*Vulnerability of Prairie Lakes and Wetlands to Climate Change — Past, Present, and Future:* With funding from the Climate Change Impacts and Adaptation Program, NWRI began an investigation of the vulnerability of prairie lakes to climate change. Researchers are compiling historic water level and water chemistry records to identify long-term fluctuations and current conditions. A subset of lakes has been selected for further investigation, including analysis of air photo images, land survey records, and on-site

elevation surveys. These lakes are being examined for current water chemistry, total phosphorus, chlorophyll, and zooplankton populations. In terms of water chemistry and declines in depth, high-salinity lakes have shown the greatest response to the recent dry period. Nevertheless, many low-salinity lakes have lower lake levels, although water chemistry has not changed markedly.

*Leading the Way in Environmental Testing:* The National Laboratory for Environmental Testing at NWRI has offered accredited analysis for acid and neutral herbicides for many years. Prior to 2003–2004, there was no performance testing program offered by the Canadian Association for Environmental Analytical Laboratories for these parameters. The National Laboratory for Environmental Testing took part in a pilot program involving a selected number of these herbicides, by analyzing four water samples for each type and comparing the results with those of approximately 30 other participants. The National Laboratory for Environmental Testing received perfect scores for the acid herbicide parameters and scored very well for neutral herbicides. Beginning in July 2003, the laboratory is participating in the performance testing program developed for these analyses twice per year, on an ongoing basis.

## **2.2 St. Lawrence Centre**

### **Background**

The St. Lawrence Centre has carried out a number of major studies since 1993 on the state of the St. Lawrence River ecosystem, including water quality monitoring and a mass balance study of chemical contaminants. In December 1998, a new strategic plan for research was approved and implemented. In 2002–2003, the plan was reviewed and updated and a new program was introduced, focusing on the evaluation of urban wastes, in-depth understanding of the biodiversity of the St. Lawrence River and pressures on it, and the long-term monitoring of the state of the river.

### **Progress (to March 31, 2004)**

Ongoing and new research programs in 2003–2004 include the following activities.

*Impacts of Water Level Fluctuations on River Biodiversity:* The data collection and fieldwork

phases of the study of changes in water levels were completed. Analysis is under way, and the first series of mathematical relationships were established on an empirical basis for aquatic plants, fish communities, northern pike, and bird communities. Two projects on the impact of climate on aquatic communities (plants and fish) were developed to assess the effects on distribution and productivity.

In the context of the effect of changes in water levels, other contributions were made in the form of socioeconomic surveys of usage (impact on pleasure boaters, infrastructures, and tourism related to pleasure boating) and modelling of the effects in extreme water level situations (high and low).

The results of the examination of these effects were shared with various technical groups and the public advisory committee set up under a mandate from the IJC to evaluate and develop a new regulation plan for Lake Ontario and the St. Lawrence River.

An inventory of amphibians along the shore of Lake Saint-Pierre was taken to assess biodiversity and species–habitat relationships. Attempts were also made to evaluate the structure of the land habitat and the characteristics of the plants that make up their habitat.

The impact of pesticides as endocrine disruptors affecting reproduction in copper redhorse (a prominent species at risk in Quebec) was examined in cooperation with the INRS–Institut Armand-Frappier, the University of Ottawa, and the Quebec Ministry of the Environment, with support from the Interdepartmental Recovery Fund. From an ecosystem perspective, studies were conducted on the combined effect of metals (zinc) and parasites (ectoparasites) on the relative sensitivity of organisms (guppy fish) to multiple environmental stresses or the effect of pesticides on the virulence of parasites in leopard frogs.

Laboratory work was completed on invasive species through an assessment of the treatment of ballast wastewater from ships in order to minimize introduction risks. This will be followed by on-site tests aboard vessels. Annual monitoring of fish communities makes it possible to track changes in the composition of communities and species likely to increase.

In support of the quality of resources in national parks, a joint initiative with EMAN contributed to a study of parasites in fish in national parks as an indicator of disturbance.

*State of the St. Lawrence River:* Activities on the state of the St. Lawrence were realized through a federal–provincial collaboration regarding the long-term monitoring of the St. Lawrence River system’s main environmental components.

In 2003–2004, new data were collected from surface sediment in connection with contamination in Lake Saint-Pierre and Lake Saint-Louis (heavy metals and organic compounds such as PAHs and PCBs). The new data complement an earlier profile of St. Lawrence lake environments.

Cartographic analysis of St. Lawrence wetland vegetation continued in order to complete the geographic profile of area, distribution, and abundance. An initial series of data was also put online in the form of a series of maps ([www.qc.ec.gc.ca/geo/mil/mil001\\_e.html](http://www.qc.ec.gc.ca/geo/mil/mil001_e.html)).

Monitoring of water quality and toxic substances (heavy metals, etc.) in the St. Lawrence continued, and a new water quality station was set up in Carillon to determine the extent to which the Ottawa River contributes to the overall situation. A study began on the profile of pesticides in Lake Saint-Pierre, including four new stations at the mouths of tributaries that are under pressure from agriculture (Yamaska, Richelieu, and Nicolet and the outlet of the lake on the south shore). A joint initiative with the Quebec Ministry of the Environment to incorporate data from stations farther upstream and in other tributaries on the north shore of Lake Saint-Pierre was undertaken.

Work was done in cooperation with the Université de Montréal and the Quebec Ministry of the Environment to conduct a feasibility study on application of the CABIN protocol to the St. Lawrence, with a view to monitoring benthic communities.

Fact sheets were produced on the monitoring of the state of the St. Lawrence in cooperation with Fisheries and Oceans Canada–Quebec Region, the Quebec Ministry of the Environment, and the Société de la faune et des parcs du Québec through a joint federal–provincial committee.

These fact sheets are available at [www.slv2000.qc.ca/](http://www.slv2000.qc.ca/).

As part of the ongoing monitoring of the state of the ecosystem, a workshop on indicators of the state of the shores of the St. Lawrence was held to take stock of knowledge, available data, and future monitoring options. Another workshop was held to evaluate communities' contribution to and interest in monitoring of the St. Lawrence. Among the main concerns stated by the community members who attended the workshop, were the lack of consideration of and use of local knowledge, and the lack of monitoring of specific use of the river. The community members also showed interest in both supplying and distributing information.

At the first *Rendez-vous Saint-Laurent* forum, held in February 2003, a series of 16 fact sheets, a general profile of the state of the St. Lawrence, and a distribution schedule were released. This was followed by a number of media interviews, lectures, and presentations concerning the state of the St. Lawrence. This interest in the St. Lawrence was also conveyed through active input into programming for the biennial State of the Lakes Ecosystem Conference held in 2004.

*Urban Pollution:* In 2003–2004, new data were collected in collaboration with the Montréal Metropolitan Community. Close cooperation with the authority responsible for the wastewater treatment plant also fostered the establishment of a new closed circuit laboratory to conduct ecotoxicological analyses and help develop disinfection technology tailored to wastewater quality. Furthermore, a new team was set up to better study pharmaceutical products and their impact on urban effluent.

Work accomplished in 2003–2004 dealt with the following:

- study of endocrine disturbances and the potential feminization of certain organisms exposed to urban effluent (impact of urban sewage on fish and molluscs);
- evaluation of the presence of nonylphenol surfactants (endocrine disruptors) in urban effluent (source, transport, and fate of endocrine-disrupting chemicals);
- documentation of the bioaccumulation of heavy metals in the dispersion plume of

effluent (geochemical behaviour of metals in the dispersion plume found in urban effluents);

- a study of biomarkers and the combined effect of parasites and urban pollution; and
- measurement of the impact of urban effluent on the abundance of parasites in fish in the Ottawa and Richelieu rivers.

With a view to a joint project with the Institut national de recherche sur les eaux (INRE) and a tie-in with the Great Lakes, the health of the spottail shiner, a reference species for Lake Ontario and Lake Erie AOCs, was monitored. The work was done in the St. Lawrence and the Richelieu rivers.

The Urban Effluents Program at the St. Lawrence Centre is leading projects related to new environmental issues carried out in cooperation with the Montréal Metropolitan Community, the INRS–Institut Armand-Frappier, and the Government of Quebec (Quebec Ministry of the Environment and Société de la faune et des parcs du Québec. Concordia University, the Université de Montréal, and the Université du Québec à Montréal were also involved. Another link was established this year, with the Réseau de recherche en écotoxicologie du Saint-Laurent, including cooperation with the Maurice Lamontagne Institute (Mont-Joli) and the Institut scientifique des Sciences de la mer (Université du Québec à Rimouski) to facilitate the integration of approaches in freshwater and marine environments. Finally, there were collaborations with INRE and the Institute for Inland Fisheries in Potsdam-Sacrow, Germany, St. Mary's University in Halifax, the University of Waterloo, Environment Canada's Moncton office and the National Wildlife Research Centre in Ottawa.

*Long-range Transport of Airborne Pollutants:* In 2003–2004, under a national mandate on air quality and the impact of acid components, the St. Lawrence Centre was heavily involved in preparing a national report on acid rain. A chapter on the effects on forests and watershed soil was drafted. The Centre also contributed to the chapter on the effect of acid rain on the quality of lake water.

*Partnerships:* Under a program on the impacts of water level fluctuations, research projects were undertaken with the Quebec provincial

government (Société de la faune et des parcs du Québec), universities (Université de Montréal and Université du Québec à Montréal), and regional components of Environment Canada (St. Lawrence Centre, Meteorological Service of Canada, and the Canadian Wildlife Service). Close scientific cooperation also exists with Environment Canada–Ontario Region as part of the current review of the Lake Ontario and St. Lawrence River regulation plan. Work is moving forward in this third year of the plan of study, and the first scientific results are being published.

With respect to biodiversity, many partnerships have been established in the various research areas with Quebec universities (McGill, Laval, Université de Montréal, Université du Québec à Montréal, and Université du Québec à Trois-Rivières). Post-graduate students have taken part in the development of research and also increased their expertise. The Pesticide Science Fund has also contributed.

Lastly, it is important to mention the Collaborative Mercury Research Network, which is funded by the National Research Council of Canada. The Collaborative Mercury Research Network's approximately 20 researchers take a multidisciplinary ecosystem approach to the impact of the presence of mercury in the environment. The Meteorological Survey of Canada's significant contribution to maintaining the integrated research station in Saint-François Bay (Lake Saint-Pierre) continued in 2003–2004. One of the network's research themes is a better scientific and ecosystem understanding that could lead to modelling of the movement of mercury between air, water, soil, and vegetation.

### **2.3 Pacific Environmental Science Centre**

#### **Background**

The Pacific Environmental Science Centre of Environment Canada's Pacific and Yukon Region has conducted a number of studies since 2003 on the toxicology and chemistry of fresh and marine water in the Georgia Basin. As projects under the Georgia Basin Action Plan, these studies have focused on emerging environmental concerns to water, such as endocrine disruptor effects on aquatic organisms as a result of exposure to varying

concentrations of municipal, agricultural, and industrial effluents.

#### **Progress (to March 31, 2004)**

A particular focus of these studies has been the emerging toxicological issue of endocrine disruptor effects on fish as a result of exposure to low concentrations of pharmaceuticals and personal care products in water bodies. Effluents and receiving waters have been tested to measure biological effects on fish using the state of science gene microarray technology (genomics). Chemical analysis profiling to determine concentrations of acid-based drugs, antibiotics, estrogenic compounds, and fragrance compounds has always been conducted in parallel with the biology. Results from these studies will determine if receiving water concentrations of effluent are capable of causing endocrine disruptor effects on fish. The studies have been conducted in agreement with the Capital Regional District of Victoria and the Greater Vancouver Regional District.

The Pacific Environmental Science Centre laboratory is also in collaboration with the University of Victoria to study amphibian-based molecular effects of effluents on thyroid hormone action. This work is supported by a Natural Sciences and Engineering Research Council strategic grant.

Ongoing and new research programs include the following activities.

*Bacterial Source Tracking in Marine and Freshwater Systems:* Using a DNA-based method, samples from fresh and marine water from locations in British Columbia are tested to identify sources of fecal contamination. This unique water quality tool helps pollution abatement managers to identify sources of fecal pollution. The method is used by the Environment Canada Shellfish Monitoring Program, B.C. Ministry of Water, Land and Air Protection, First Nations, and several regional health authorities to determine sources of water contamination. The laboratory is working with the University of Oregon to develop additional primers to expand the current capabilities of the existing method. The laboratory is collaborating with researchers at the University of Victoria under a Canadian Institutes of Health Research grant to further develop the method.

*Coalbed Methane Water Toxicological Study:* Since the fall of 2004, the Pacific Environmental Science Centre has been conducting studies for the B.C. Ministry of Energy and Mines (Oil and Gas Division) on the potential toxicity of groundwater associated with coalbed methane mining. This new mining activity has the potential to be very extensive in British Columbia. Limited water quality information is available on the water associated with coalbed methane. Studies will determine the toxicity of extracted water to several species of aquatic organisms. Additionally, the study will aid in the establishment of water quality guidelines for coalbed methane mining operations.

*Ammonia Toxicity Associated with Municipal Wastewater:* Since 2002, the Pacific Environmental Science Centre has been conducting toxicological studies in support of the CEPA 1999 guideline for ammonia to determine the toxicity of un-ionized ammonia dissolved in water. These studies were conducted to determine the effect of aeration on the shift of pH in the standard toxicity test for water and aid in the drafting of the CEPA 1999 ammonia guideline. Results from this work were instrumental in the recent publication of the CEPA 1999 Guideline for the Release of Ammonia in Water Found in Wastewater Effluents, published in the Canada Gazette on December 4, 2004.

## **2.4 Other Research Highlights**

Environment Canada conducts many water-related investigations in addition to the research undertaken at the major institutes. Interdisciplinary endeavours are often fostered in partnership with educational institutions or with the institutes or agencies of other governments and federal departments.

This section highlights examples of water research activities not reported elsewhere in the text. Although not comprehensive, the selections are representative of some of the activities.

### **2.4.1 Atlantic Region**

Environment Canada research during 2003–2004 indicated that surface waters in parts of Nova Scotia have the highest total mercury and methylmercury concentrations of any location in northeastern North America, including New

England and New York state. The reason for this seems to be the abundance of wetlands in Nova Scotia, which absorb atmospheric mercury and allow it to be transmitted to other parts of the ecosystem.

Acid rain research in Atlantic Canada during 2003–2004 indicated that despite significant decreases in sulphur deposition, the recovery to former background levels chemical constituent is not occurring. This is due to the long-term degradation of poorly buffered soils in large parts of Nova Scotia. Current research is aimed at determining rates of recovery, as well as the effects of nitrogen deposition, which has not changed over the last 20 years.

In a collaboration among Nova Forest Alliance, Halifax Regional Municipality Water Commission, and other partners in the region, the impact of changes in landscape characteristics (land cover) in the Pockwock/Bowater watershed on stream water quality was examined. Pockwock Lake is the watershed source of drinking water for the city of Halifax. This information will help to define the streamside buffer zone for developing best forest management practices.

A report on the state of groundwater quality in the Minas Basin watershed in Nova Scotia was initiated. This review will include an analysis of groundwater availability, groundwater quality and contamination, groundwater use, land use, and environmental issues in the watershed.

Lastly, a protocol to summarize data from the Nova Scotia Water Well Database (average well depths, casing lengths, yields, etc.) was developed.

### **2.4.2 Atlantic Environmental Science Network — Freshwater and Estuarine Ecosystems**

#### **Background**

Early in 2000, Environment Canada initiated the development of an Atlantic Environmental Science Network in association with Atlantic Region universities. The broad focus of this research network is to increase environmental science capacity in the Atlantic Region. It is a network of networks (thematic cooperatives), including environment and human health, climate change, watersheds, biodiversity, environmental engineering, and marine life.

### **Progress (to March 31, 2004)**

The Atlantic Environmental Science Network held a workshop on Watershed Management and Policy in Wolfville, Nova Scotia, in November 2003. A prospectus was developed for a Collaborative Research Initiative in March 2004.

#### **2.4.3 Hydrology and Arctic Laboratory (Saskatoon)**

In March 2003, the federal Environment Minister announced the establishment of a national laboratory for research in Arctic meteorology and hydrometeorology. This laboratory is part of a national network of laboratories designed to complement Environment Canada's existing science and technology infrastructure for atmospheric and hydrologic research. The hydrometeorology component of the laboratory, based in Saskatoon, is designed to take advantage of the facilities and expertise already in place at NWRI.

The laboratory will address the following two themes: 1) meteorological applications in support of hydrology and 2) hydrological applications to address water resource issues. Priorities for work in the hydrometeorology laboratory are determined through client consultation sessions involving representatives from the provincial governments, universities, and other federal government departments. The laboratory will focus on the following activities:

- *Support to the Operational Hydrology Community:* Develop both model and data products and real-time information necessary for hydrological practitioners.
- *Coupled Models:* Research into coupled atmospheric hydrological approaches for modelling water availability and the state of the land surface across Canada in real time, in conjunction with the operational national weather forecasts.
- *Water Availability:* Probabilistic quantitative runoff forecasts and validation of both quantitative precipitation estimate products and land-use and runoff models.
- *Validation:* Quantitative precipitation estimate validation, snowfall estimates,

snow–water equivalent research, and mapping.

- *Drought monitoring and research:* Provide in kind, research and modelling support to the Canadian Foundation for Climate and Atmospheric Sciences funded Canadian Drought Research Initiative.
- *Evaporation and sublimation studies:* Support Prairie Provinces Water Board water apportionment agreements by providing evaporation estimates to the Committee on Hydrology.

#### **2.4.4 Integrated Modelling of the St. Lawrence River**

##### **Background**

Since 1997, the Hydrology Section of the Meteorological Service of Canada–Quebec Region has been working with partners on numerical modelling of the St. Lawrence River between Cornwall and Trois-Rivières. The models provide a better understanding of the physical and biotic environment of the river and how it is used. This work is part of an effort to understand the interactions that exist among the following:

- pressures resulting from climate change and from natural and anthropogenic changes (e.g., hydro-electric developments and construction of port infrastructures). With the implementation of the web site of Quebec's climate change impacts and adaptation resource centre ([www.criacc.qc.ca](http://www.criacc.qc.ca)) in 2000, it is possible to more closely monitor climate change in Quebec, and more specifically in the St. Lawrence watershed;
- physical characteristics of the river environment (e.g., flows, levels, currents, temperatures, substrates, and banks);
- chemical characteristics of the water (e.g., turbidity, colour, and presence of pollutants); and
- life in the river environment, whether it be human (social, economic, or recreational use), plant (aquatic or emergent vegetation), or animal (aquatic and riparian wildlife).

In the context of this approach, the physical environment of the river is considered the focal point of exchanges within the ecosystem. The approach lends itself well to quantification of the impacts of fluctuating flow and water levels on the various ecosystem components in the St. Lawrence River.

In its research and development of the St. Lawrence River ecosystem, the Hydrology Section of the Meteorological Service of Canada–Quebec Region collaborates with several organizations, including the Société de la faune et des parcs du Québec, the Direction du milieu hydrique (in French only) of the Quebec Ministry of the Environment, the regional branches of Environment Canada (Conservation Branch, Canadian Wildlife Service, St. Lawrence Centre), the Canadian Coast Guard (Laurentian Region), universities (Université du Québec à Trois-Rivières, INRS–Eau, et École Polytechnique), and the IJC.

#### ***Progress (to March 31, 2004)***

In 2003–2004, hydrodynamic simulations were completed for the reaches of the St. Lawrence River between Cornwall and Trois-Rivières and for the Ottawa River between the Carillon dam and Lake Saint-Louis. The simulations represent physical variables such as levels and currents for a set of hydrological scenarios.

The Meteorological Service of Canada–Quebec Region did simulations of the transport and fate of pollutants in two separate exercises involving several federal and provincial departments as well as representatives of municipalities and the private sector: 1) the benzene spill near the City of Montréal wastewater outlet on October 1, 2003, and 2) the gasoline spill in Montréal harbour on November 13, 2003. A number of integrated models were produced in different areas and led to a series of scientific communications involving multiple partners. Among the issues addressed in those communications and publications were flooding and fish habitat assessment.

#### ***2.4.5 Climate Change, Impacts, and Adaptation***

In 2003–2004, the St. Lawrence Centre, in cooperation with the Meteorological Service of Canada, the Chair of Urban Ecosystem Studies (Université du Québec à Montréal), and two ZIP

committees (in the Upper St. Lawrence and Ville-Marie), completed a two-year study on the integrated evaluation of climate change impacts at the local scale (Lake Saint-Louis), including four public consultations on impact and local adaptations.

Public information meetings and discussions on climate change and adaptations were held. In the Quebec Region and for the area around Lake Saint-Louis (St. Lawrence River), a series of four information sessions in Montréal-area ZIPs dealing with the Climate Change Action Fund water resources project were held in 2003–2004. The aim of the meetings was to share information on the effect of climate change and options for adaptation across a sub-basin of the St. Lawrence. The meetings were conducted by NGOs (Haut Saint-Laurent and Ville-Marie ZIP committees).

The report, completed and produced jointly in March 2004, covered local and regional climate data, the hydrology of the environment, and various water level scenarios (including extremes) and analyzed the effects on a number of sensitive uses (drinking water, shoreline flooding, pleasure boating). The report also included local data provided by residents and members of various organizations.

This first integration report addressed both impacts and adaptations and also covered the work of researchers and representatives of riverside communities. The information has been posted on the Centre de ressources en impacts et adaptation au climat et à ses changements web site at [www.criacc.qc.ca/](http://www.criacc.qc.ca/).

#### ***2.4.6 Water Modelling Workshop (Winnipeg)***

Environment Canada sponsored a workshop in Winnipeg in October 2003 that was designed to provide an opportunity for participants to collectively explore how the water modelling community can collaborate more effectively to advance issues of common interest. This event brought together some 40 researchers and policy-makers from Environment Canada, other federal departments, provincial government agencies, and the private sector. Specific objectives were to:

- provide a foundation for the development of an integrated water science program within

Environment Canada that provides world-class modelling capabilities for Canadians;

- increase trust and promote open communication within the modelling community;
- help senior management define the role and leadership of various Environment Canada laboratories as the first step towards

improving coordination of modelling activities so that they directly support specific departmental priorities, objectives, and initiatives; and

- develop a departmental vision and framework on the way forward in collaborative water modelling.

## PUBLIC INFORMATION PROGRAM (Part IV of the *Canada Water Act*)

### **Background / Progress (to March 31, 2004)**

#### **1. Freshwater Web Site**

The Freshwater web site continues to provide basic information on a wide range of water-related topics, comprehensive educational materials (e.g., *A Primer on Fresh Water*, the Water Fact Sheets, *Explore Water with Holly Heron*, and *Let's Not Take Water for Granted — A Resource Guide*), and the full text of key water publications (e.g., the *Federal Water Policy*, the *Canada Water Act Annual Report*, and reports on water use and pricing) via the Internet. In addition, the links to specific issues at other governmental and nongovernmental sites across the country continue to be regularly updated and expanded, as does the calendar of water-related conferences and events. The site is visited over 90 000 times each month by everyone from students and teachers to academics and policy-makers. It is also often referenced on other web sites and in print material produced by other agencies.

The Freshwater web site can be accessed at [www.ec.gc.ca/water/](http://www.ec.gc.ca/water/).

#### **2. Water Survey of Canada Web Site**

The Water Survey of Canada is the national agency responsible for the collection, interpretation, and dissemination of standardized water resource data and information in Canada. It does this in collaborative agreements with the provinces and territories. In the case of the Province of Quebec, the Water Survey of Canada has an agreement with that province whereby the province collects water resource data for the Water Survey of Canada. The agency plays a major role in the activities of numerous international and interprovincial boards and commissions involved in the management of Canada's water resources. It is the designated agency responsible for water resource monitoring in support of interjurisdictional agreements and treaties.

Each year, Environment Canada produces a national HYDAT CD-ROM, which provides access to the National Water Data Archive. The archive contains daily, monthly, and

instantaneous data for stream flow, water level, and sediment data for over 2500 active and 5500 discontinued hydrometric monitoring stations across Canada. Using a Windows-based software interface, users have the ability to retrieve, view, subset, download, and print selected data from the CD-ROM. The HYDAT software page contains tips for users, answers to frequently asked questions, and information on the latest version of the software. The data contained on HYDAT can also be downloaded directly from the Water Survey of Canada web site at [www.wsc.ec.gc.ca/products/main\\_e.cfm?cname=products\\_e.cfm](http://www.wsc.ec.gc.ca/products/main_e.cfm?cname=products_e.cfm).

#### **3. Environment Canada's Biosphère**

Environment Canada's Biosphère is an interpretation centre designed to help young Canadians become aware of water and ecosystem issues in the Great Lakes and the St. Lawrence. In 2003–2004, 70 000 visitors, including 33 000 children, took part in educational programs or toured exhibitions. One exhibition, VIGILI URBANI, used images of fire hydrants, symbols of the availability of water in urban areas, to address the issue of drinking water conservation. An exhibition entitled *Toute l'eau du monde* gave visitors a better understanding of the importance and value of the St. Lawrence–Great Lakes watershed as a source of fresh water for Canada.

In addition to exhibitions, the Biosphère offers hands-on environmental projects through its freshwater fish observation network and adopt a waterway program. In these projects, more than 2500 young people learn to gather and analyze data that help them assess the health of aquatic ecosystems.

#### **4. RésEau – Building Canadian Water Connections**

Atlantic Region staff led the development of a proposal for *RésEau*, which aims to create a Government On-Line demonstration project to highlight the discovery, access, and use of water data and information. Information will include quality, quantity, use, and availability dimensions from surface water to groundwater sources through existing and new multijurisdictional

partnerships. *RésEau* will be a web portal for Canadians and partners to contribute and share water data.

## 5. Canadian Digital Drainage Area Framework

A partnership between Environment Canada, Statistics Canada, Natural Resources Canada, and Agriculture and Agri-Food Canada was initiated in 2001 to collaborate on the development of the Canadian Digital Drainage Area Framework, a spatial database consisting of several layers of hydrological features, including rivers, lakes, and watershed boundaries, that is designed to support water-related research and analysis.

The framework was released online and free of charge to the public on June 29, 2003, the result of nearly three years of federal collaboration and consultation with several provincial agencies. This national framework is a welcome tool for the planning, analysis, and management of environmental monitoring networks and is also an excellent means of reporting data, information, and knowledge about watersheds at regional, national, and even continental scales. The data can be easily imported into standard GIS. The framework is available at [www.geogratis.cgdi.gc.ca/clf/en](http://www.geogratis.cgdi.gc.ca/clf/en).

## 6. Pacific and Yukon Region

The Aquatic Sciences Section in the Environmental Conservation Branch encouraged environmental stewardship amongst the public by informing them of emerging environmental issues, ecological connections in the environment, and human impacts through stewardship programs including:

- Promotion, distribution and organization of the “Interactive Non-point Source Pollution Model Poster” ([www.pyr.ec.gc.ca/EN/IPM/](http://www.pyr.ec.gc.ca/EN/IPM/)) and the “Discover Your Estuary” ([www.pyr.ec.gc.ca/EN/DYE/index.shtml](http://www.pyr.ec.gc.ca/EN/DYE/index.shtml)). Both products have been sustainable, much used and requested. They are available as web-based information and as tools on the Water Quality Monitoring, Green Lane, and the Georgia Basin Ecosystem Initiative Web sites. Hard copies of the model poster are distributed widely by GVRD, within BC and USA schools systems, Ducks Unlimited and by DFO.

- Developed, launched and promoted the Pacific and Yukon Water Quality Monitoring web site: ([www.waterquality.ec.gc.ca/EN/home.htm](http://www.waterquality.ec.gc.ca/EN/home.htm)). This pilot Web site project provides timely access to all Federal–provincial–territorial water quality data from all surface and groundwater sampling sites. Information on the Web site includes: surfing for water quality data by station, geographic area and by river basins, water quality guidelines, reports, publications, links to community stewardship programs, on-line resources including documents for designing water quality monitoring programs and “Contact Us” details.
- Field and laboratory manuals and brochures were written and distributed, and workshops were given for Environment Canada's Canadian Aquatic Biomonitoring Network (CABIN) ([cabin.cciw.ca/intro.asp](http://cabin.cciw.ca/intro.asp)). CABIN provides web-accessible resources such as standardized sampling methods, a national reference database for benthic invertebrates, analytical software and reporting tools for communities, general public and professionals. CABIN training workshops have been given in the Pacific and Yukon Region since 2003 to a wide audience to encourage the use of the standardized protocols for collection and analysis of data for stream assessment. The development of CABIN from a scientifically sound research program allows stream keepers and other watershed stewards to use the available tools to take their observations one step further to a formalized scientifically defensible assessment.

## APPENDIX A

### AGREEMENTS

The following *Canada Water Act* Agreements<sup>1</sup> were ongoing during 2003–2004:

#### Apportionment and Monitoring Programs

- Agreements on water quantity surveys with all provinces and with Indian and Northern Affairs Canada for the territories
- Canada–Quebec Protocol on Administrative Arrangements under the Canada–Quebec Agreement on Hydrometric and Sedimentological Networks in Quebec
- Master Agreement on Water Apportionment in the Prairie Provinces (Prairie Provinces Water Board)
- Water quality monitoring agreements with British Columbia, Newfoundland and

Labrador, New Brunswick, Manitoba, Yukon, and Northwest Territories

- Agreement Respecting Ottawa River Basin Regulation
- Canada–Quebec State of the St. Lawrence Monitoring Program ([www.slv2000.qc.ca/plan\\_action/phase3/biodiversite/suivi\\_ecosysteme/accueil\\_a.htm](http://www.slv2000.qc.ca/plan_action/phase3/biodiversite/suivi_ecosysteme/accueil_a.htm))

#### Water Management Programs

- Mackenzie River Basin Transboundary Waters Master Agreement

---

<sup>1</sup> For which *Canada Water Act* authority exists (in most cases, by Order in Council).

## APPENDIX B

### FOR MORE INFORMATION

#### Selected Web Sites

Clean Water  
[www.ec.gc.ca/water\\_e.html](http://www.ec.gc.ca/water_e.html)

Centre de Ressources en Impacts et Adaptation  
au Climat et à ses Changements—CCIACC (in  
French only)  
[www.criacc.qc.ca/index\\_e.html](http://www.criacc.qc.ca/index_e.html)

Environment Canada Freshwater (including  
*Canada Water Act* annual reports)  
[www.ec.gc.ca/water/e\\_main.html](http://www.ec.gc.ca/water/e_main.html)

Weather and Meteorology  
[www2.ec.gc.ca/weath\\_e.html](http://www2.ec.gc.ca/weath_e.html)

#### Research Institutes

National Water Research Institute  
[www.nwri.ca/nwri-e.html](http://www.nwri.ca/nwri-e.html)

St. Lawrence Centre  
[www.qc.ec.gc.ca/csl/acc/csl001\\_e.html](http://www.qc.ec.gc.ca/csl/acc/csl001_e.html)

#### Ecosystem Initiatives

Atlantic Coastal Action Program  
[http://atlantic.web1.ns.ec.gc.ca/  
community/acap/](http://atlantic.web1.ns.ec.gc.ca/community/acap/)

Canada—Quebec Agreement St. Lawrence  
Vision 2000  
[www.slv2000.qc.ca](http://www.slv2000.qc.ca)

Georgia Basin Ecosystem Initiative  
[www.pyr.ec.gc.ca/GeorgiaBasin/index\\_e.htm](http://www.pyr.ec.gc.ca/GeorgiaBasin/index_e.htm)

Great Lakes 2000 Program  
[www.on.ec.gc.ca/water/greatlakes/intro-e.html](http://www.on.ec.gc.ca/water/greatlakes/intro-e.html)

Northern Ecosystem Initiative  
[www.pnrrpn.ec.gc.ca/nature/ecosystems/  
nei-ien/index.en.html](http://www.pnrrpn.ec.gc.ca/nature/ecosystems/nei-ien/index.en.html)

Northern Rivers Ecosystem Initiative  
[www.pnr-rpn.ec.gc.ca/nature/ecosystems/  
nrei-ien/index.en.html](http://www.pnr-rpn.ec.gc.ca/nature/ecosystems/nrei-ien/index.en.html)

#### Other Federal Departments

Agriculture and Agri-Food Canada  
[www.agr.gc.ca/index\\_e.php](http://www.agr.gc.ca/index_e.php)

Fisheries and Oceans Canada  
[www.dfo-mpo.gc.ca/home-accueil\\_e.htm](http://www.dfo-mpo.gc.ca/home-accueil_e.htm)

Health Canada  
[www.hc-sc.gc.ca/index\\_e.html](http://www.hc-sc.gc.ca/index_e.html)

Indian and Northern Affairs Canada  
[www.ainc-inac.gc.ca/index\\_e.html](http://www.ainc-inac.gc.ca/index_e.html)

Natural Resources Canada  
[www.nrcan-rncan.gc.ca/inter/index\\_e.html](http://www.nrcan-rncan.gc.ca/inter/index_e.html)

#### Federal—Provincial

Canadian Council of Ministers of the  
Environment (CCME)  
[www.ccme.ca/about](http://www.ccme.ca/about)

#### Interprovincial River Boards

Lake of the Woods Control Board  
[www.lwcb.ca/](http://www.lwcb.ca/)

Mackenzie River Basin Board  
[www.mrbba.ca](http://www.mrbba.ca)

Ottawa River Regulation Planning Board  
[www.ottawariver.ca/emain.htm](http://www.ottawariver.ca/emain.htm)

Prairie Provinces Water Board  
[www.pnr-rpn.ec.gc.ca/water/fa01/  
index.en.html](http://www.pnr-rpn.ec.gc.ca/water/fa01/index.en.html)

## **International**

Arctic Council  
[www.arctic-council.org](http://www.arctic-council.org)

International Joint Commission  
[www.ijc.org/en/home/main\\_accueil.htm](http://www.ijc.org/en/home/main_accueil.htm)

United Nations Environment Programme:  
GEMS/Water Global Environment Monitoring  
System  
[www.gemswater.org](http://www.gemswater.org)

United Nations University: International Network  
on Water, Environment and Health  
[www.inweh.unu.edu/inweh](http://www.inweh.unu.edu/inweh)

## **Associations, Networks, and Journals**

Canadian Water Resources Association  
[www.cwra.org](http://www.cwra.org)

Canadian Water and Wastewater Association  
[www.cwwa.ca/home\\_e.asp](http://www.cwwa.ca/home_e.asp)

Ecological Monitoring and Assessment Network  
(EMAN)  
[www.eman-rese.ca/eman](http://www.eman-rese.ca/eman)

Federation of Canadian Municipalities  
[www.fcm.ca/english/main.html](http://www.fcm.ca/english/main.html)

Great Lakes Information Network  
[www.great-lakes.net/](http://www.great-lakes.net/)

HYDAT (Meteorological Service of Canada)  
[www.wsc.ec.gc.ca/products/  
main\\_e.cfm?cname=products\\_e.cfm](http://www.wsc.ec.gc.ca/products/main_e.cfm?cname=products_e.cfm)

Water Quality Research Journal of Canada  
(Canadian Association on Water Quality)  
[www.cciw.ca/wqrc/](http://www.cciw.ca/wqrc/)

WaterCan  
[www.watercan.com/](http://www.watercan.com/)

## Inquiries

### General Information

Boundary Water Issues Division  
Meteorological Service of Canada  
Environment Canada  
Ontario  
Canada Centre for Inland Waters  
867 Lakeshore Road  
Burlington, ON L7R 4A6  
Tel.: 905-336-4712  
Fax: 905-336-8901

Environmental Stewardship Branch  
Sustainable Water Management Division  
Environment Canada  
Ottawa, ON K1A 0H3  
Tel.: 819-997-2307  
Fax: 819-994-0237

Prairie Provinces Water Board  
Transboundary Waters Unit  
Environment Canada  
Prairie and Northern Region  
2365 Albert Street, Room 300  
Regina, SK S4P 4K1  
Tel.: 306-780-6042  
Fax: 306-780-6810

### Publications (Public Information Program)

Inquiry Centre  
Environment Canada  
Ottawa, ON K1A 0H3  
Toll free: 1-800-668-6767  
Local: 819-997-2800  
Fax: 819-953-2225  
E-mail: [enviroinfo@ec.gc.ca](mailto:enviroinfo@ec.gc.ca)

Science Liaison  
National Water Research Institute  
Canada Centre for Inland Waters  
867 Lakeshore Road, P.O. Box 550  
Burlington, ON L7R 4A6  
Fax: 905-336-6444  
E-mail: [nwriscience.liaison@ec.gc.ca](mailto:nwriscience.liaison@ec.gc.ca)

Science Liaison  
National Hydrology Research Centre  
11 Innovation Boulevard  
Saskatoon, SK S7N 3H5  
Tel.: 306-975-5779  
Fax: 306-975-5143

St. Lawrence Centre  
Environment Canada  
Québec  
105 McGill Street, 7th Floor  
Montréal, QC H2Y 2E7  
Tel.: 514-283-7000  
Fax: 514-283-1719  
e-mail: [quebec.csl@ec.gc.ca](mailto:quebec.csl@ec.gc.ca)

### Regional Offices

Director General  
Environment Canada  
Atlantic Region  
45 Alderney Drive  
Dartmouth, NS B2Y 2N6  
Tel.: 902-426-4824  
Fax: 902-426-5168

Director General  
Environment Canada  
Ontario Region  
4905 Dufferin Street  
Downsview, ON M5H 5T4  
Tel.: 416-739-4490

Director General  
Environment Canada  
Quebec Region  
1141 route de l'Église  
Sainte-Foy, QC G1V 3W5  
Tel.: 418-648-4077  
Fax: 418-649-6213

Director General  
Environment Canada  
Pacific and Yukon Region  
201-401 Burrard Street  
Vancouver, BC V6C 3S5  
Tel.: 604-664-9100  
Fax: 604-664-9126

Director General  
Environment Canada  
Prairie and Northern Region  
4999-48 Avenue, Room 200  
Edmonton, AB T6B 2X3  
Tel.: 780-951-8700  
Fax: 780-495-2615





# Canada Water Act Annual Report

## Comments

Thank you for reading the *Canada Water Act* 2003–2004 Annual Report. While Environment Canada is legislatively required to report annually on operations under the *Canada Water Act*, we endeavour to publish a report that is both informative and useful to a variety of audiences. Your feedback is appreciated, and your opinions provided below will help shape future annual reporting under the *Canada Water Act*.

Please rate the report on the following:

	Excellent	Good	Satisfactory	Unsatisfactory	Suggestions for Improvement
Clarity					
Level of Detail					
Usefulness of Information					
Format					
Overall Presentation					

In what capacity did you read the report?

- Environmental Manager
- Government/Regulatory Authority
- Employee of a Research/Educational Facility
- Representative of an Environmental NGO/NPO
- Member of the Press
- Student
- Other (please specify) \_\_\_\_\_

Comments and Suggestions:

---

---

---

---

Send to:

Sustainable Water Management Division  
Environment Canada  
Place Vincent Massey, 7<sup>th</sup> Floor  
351 St-Joseph Boulevard  
Gatineau, QC K1A 0H3  
Fax: 819-994-0237