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The Canada Water Act

Annual Report

2004–2005



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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 2004-2005, which was completed under my leadership.

Sincerely,

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

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



Canada

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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 33rd report, covers progress on these activities from April 1, 2004 to March 31, 2005.

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/).

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
AOC	Area of Concern
CABIN	Canadian Aquatic Biomonitoring Network
CEPA	1988 <i>Canadian Environmental Protection Act</i>
CEPA 1999	<i>Canadian Environmental Protection Act, 1999</i>
CESI	Canadian Environmental Sustainability Indicators
COA	Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem
GBAP	Georgia Basin Action Plan
GEM	Global Environmental Multiscale
GLWQA	Canada–United States Great Lakes Water Quality Agreement
HAL	Hydrometeorology and Arctic Laboratory
HYDAT	Environment Canada’s hydrometric database
IJC	International Joint Commission
IMSL	Integrated Management of the St. Lawrence
MST	Microbial Source Tracking
NEI	Northern Ecosystem Initiative
NWRI	National Water Research Institute
PCBs	polychlorinated biphenyls
SLP	St. Lawrence Plan
SOAER	State of Aquatic Ecosystem Report
SOLEC	State of the Lakes Ecosystem Conference
ZIP	zone d’intervention prioritaire (priority intervention zone)

EXECUTIVE SUMMARY

Federal Programs

The *Canada Water Act* enables co-operative agreements for consultation and collaboration 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, or federal–provincial–territorial basis. Agreements for specific water programs provide for the participating governments to contribute funding, information, and expertise.

Various federal programs are highlighted in this Annual Report. For example, a federal workshop was held to support the development of the first annual report on Canadian Environmental Sustainability Indicators (CESI), which will include reporting on clean water. 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. Progress also continued on the work conducted by interjurisdictional boards, including the Ottawa River Regulation Planning Board, Prairie Provinces Water Board, and the Mackenzie River Basin Board.

As Canada's largest freshwater research facility, the National Water Research Institute (NWRI) leads research initiatives across the country to protect and sustain Canadian water resources. Highlights of 2004–2005 include publication of a science assessment on the threats to water availability in Canada, participation in the National Acid Rain Science Assessment, and re-investment of green savings of \$1 million into priority water research. This report also includes selected projects undertaken by the St. Lawrence Centre, the Pacific Environmental Science Centre and other research projects. In 2004–2005, the Ontario and Quebec Regions completed the Lake Ontario–St. Lawrence River studies in support of the International Joint Commission.

In regards to public education on water issues, searching the web using any of the top search engines and the search terms *water* and *Canada* regularly brings up the Freshwater Website webpage as the top hit. This report also highlights some of the other top federal water websites, such as the NWRI's website, Water Survey of Canada Website, and RésEau, an online project that demonstrates the sharing, discovery, access, and use of water information over the Internet.

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.

In 2004–2005, Canada and New Brunswick undertook a harmonized environmental impact assessment, which examined four options for a long-term solution to rehabilitate the Petitcodiac River estuary,

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. With broad, local support, non-profit organizations are incorporated at 14 sites across the region. Highlights of 2004–2005 progress include ecological effects of creosote contaminated sediments, watershed enhancement projects, and public education campaigns on water quality and conservation.

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.

The State of the St. Lawrence Monitoring Program continued monitoring the water quality, sediment quality, and biological resources of the St. Lawrence Basin. Workshops on invasive plants and the state of Lake Saint-Pierre were also held. Fact sheets on common indicators for the Great Lakes and the St. Lawrence were produced, and presentations were made at the biennial State of the Lakes Ecosystem Conference. A more interactive mapping application for wetlands using the Internet was also developed.

In 2004–2005, the program on fluvial biodiversity was in its second year. This program contributed to the study of the movement of invasive plant species and the dynamics of aquatic environments in relation to water level and organic load variations as well as the impact of contaminants on wildlife productivity.

The Urban Effluents Program focused mainly on the Montréal wastewater treatment plant. As part of this program, several projects continued, including the development of quantification methods and the evaluation of effects and impacts of contaminants, a study of the effect of pesticides, the effect of impacted sites on feminization of crustaceans in the Saguenay, the development of new ecotoxicological tools, and the identification, fate and bioavailability of pharmaceuticals. Work continued on expansion of the empirical infobase on the potential risk of feminization of certain organisms exposed to urban effluents, on the overall impact of effluents on endocrine response in mussels, particularly the zebra mussel, and on monitoring of the fate of nonylphenol surfactants in effluents.

Specialists at the Meteorological Service of Canada continued their digital modelling of the St. Lawrence River. Simulations for various scenarios for water inflow into the St. Lawrence River were produced for the section of the river between Cornwall and Trois-Rivières. New physical parameters, such as those related to waves, light, and water temperature were added to the tool box. Many biological models were calibrated and validated.

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 partner government departments and 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 2004–2005 included progress towards rehabilitating ecological systems in all AOCs, significant reduction of harmful pollutants, updates to Binational Lakewide Management Plans, and implementing an information management strategy for monitoring programs in the Great Lakes Basin.

The Canada–Ontario Water Use and Supply Project has made considerable progress throughout the past five years on a work-share basis and has completed many successful sub-projects as a result of the study. Within the region, water use and supply studies focused on gathering information at the watershed level to help assess human and ecological sensitivities to changes in water availability and climate change within the Great Lakes Basin.

Prairie and Northern Region

The Prairie and Northern Region encompasses more than 50% of Canada's land mass and includes five jurisdictions: Alberta, Saskatchewan, Manitoba, Northwest Territories, and Nunavut.

A key project, the Northern Ecosystem Initiative 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. Selected water-related projects in 2004–2005 included developing tools for setting thresholds and ensuring the sustainable development of freshwater, and community-led research on climate change impacts on drinking water quality.

The Prairie Provinces Water Board 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 Board also facilitates a cooperative approach for the integrated development and management of interprovincial streams and aquifers to ensure their sustainability. In 2004–2005, work continued on a charter and strategic plan, mapping and assessment of transboundary groundwater aquifers, trend analysis and water quality indicators, and other watery quality issues.

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. Progress in 2004–2005 included the publication of its first State of Aquatic Ecosystem Report, which analyzed indicators of water quality in the basin. The Board also developed an Interim Guideline for the Prior Notification and Consultation between Parties to the agreement.

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.

The federal–provincial Georgia Basin Action Plan (GBAP) 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. Highlighted 2004–2005 projects include continued monitoring of the Abbotsford aquifer, further development of the Water Balance Model for national application, stormwater management for subdivisions, and the benefits of green roofs in stormwater management.

The Pacific Environmental Science Centre continues to focus on research projects, such as bacterial source tracking in marine and freshwater systems, and coalbed methane water toxicological study.

The Pacific and Yukon Region also participates in several public information programs, such as an interactive pollution model, and an online guide to understanding and exploring the Fraser River Estuary.

HIGHLIGHTS, 2004–2005

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

1. Federal–Provincial–Territorial Programs

This section describes federal–provincial–territorial collaboration on:

- data collection and use;
- interjurisdictional boards; and
- ecosystem initiatives.

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.

Under an initiative known as the partnership renewal process, government partners have been reviewing the existing bilateral agreements in order to determine the best path forward for updating the 1975 agreements.

Work continues on re-engineering the collection of hydrometric data in order to minimize the associated field hazards. This program is being funded under the federal government's Program Integrity initiative, which allocated \$10 million over a five-year period, ending this fiscal year, to the Meteorological Service of Canada.

Progress (to March 31, 2005)

Three provincial administrators (Nova Scotia, New Brunswick and Newfoundland and Labrador) and the federal administrator of the hydrometric agreements met to discuss the draft template of the new bilateral agreement negotiated under the partnership renewal process. The provincial administrators agreed to proceed as a "bloc" in the approval process. The

province of Prince Edward Island has a separate Memorandum of Agreement on Water with Environment Canada, which covers the quantity and quality of surface and ground water. Four discontinued hydrometric stations in Newfoundland were successfully decommissioned.

The Program Integrity initiative continued to focus on research and development. Significant progress was made in testing and evaluating hydroacoustic technologies for suitability as an operational tool within the water survey field program. The Acoustic Doppler Current Profiler, used to measure how fast water is moving, 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 included in situ acoustic velocity meters and non-contact stage, velocity, and flow meters using radar and laser systems. Additional 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 hydrometric stations to estimate stream flows at ungauged sites.

Detailed discussions were held with federal, provincial, and private sector partners regarding the provision of gridded hydrological data products derived from the Global Environmental Multiscale (GEM) model, a numerical weather prediction tool. As a result of the feedback received, work has started on the design of a web-based data extraction tool and a web portal for disseminating specialized information to the hydrological community about gridded data products, and other related meteorological products.

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 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, Food and Rural Affairs, 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, 2005)

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

The Water Supply Working Group compiled summary streamflow statistics for a set of Water Survey of Canada gauging locations. In addition, work continued to refine estimates of base flow index across the sub-watersheds of the Great Lakes Basin.

The Water Use Working Group spent time refining the Water Use Report and the Demand Forecasting Report that were developed during the previous year.

The Ecological Requirements Working Group initiated a project to identify wetland sensitivity to changes in water supply. The goal is to be able to rank watersheds within the Great Lakes Basin according to the sensitivity of their wetland resources. The Ecological Requirements Working Group also received funding through the Climate Change Action Fund to look at how changes in water quantity may impact water

quality in watersheds within the Great Lakes Basin. The modeling work is event-based and uses a range of possible future precipitation scenarios to test the relative watershed sensitivity. The Working Group continued to characterize the relationship between landscape disturbance and the biophysical conditions of streams that drain into Lake Ontario. The work is required to develop predictive models for assessing ecological sensitivity at the watershed scale.

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 revised 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 (e.g. toxicity, coliform levels, conventional parameters) based on its analysis capabilities.

Progress (to March 31, 2005)

In New Brunswick, 10 long-term surface water quality stations continued to be monitored under the federal–provincial agreement. These stations were used to report on freshwater quality in the 2005 Canadian Environmental Sustainability Indicators (CESI) report.

In Newfoundland and Labrador, 77 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 2004–05. The ashkui stations are now integrated into the Canada–Newfoundland and Labrador Water Quality Agreement. Selected stations were used to report on freshwater quality in the 2005 CESI report.

Lake water quality monitoring now includes New Brunswick, Nova Scotia and western Newfoundland 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 2004–2005 in the Atlantic Region. Water quality monitoring continues in New Brunswick in support of long-term multi-agency research projects on the impacts of forestry operations on water quality at Catamaran Brook. The Pockwock-Bowater Watershed Project finished monitoring and began the reporting phase.

Annual meetings were held by representatives for the Canada–PEI Memorandum of Understanding 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.

In Quebec, the cooperative effort arising from 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 and its tributaries, the region of Quebec where the risks associated with farming are the highest. The project involved monitoring problematic tributaries of the St. Lawrence River (Yamaska, Nicolet, and Saint-François) to identify pesticide type, their concentrations, and

their temporal distribution patterns. The data from the second year of sampling were included in the initial report on the project.

As part of an action plan to measure mercury in precipitation, an agreement was reached between Environment Canada and the Quebec Ministry of the Environment (2001–2004) at the request of the Conference of New England Governors and Eastern Canadian Premiers. Under the agreement, mercury is measured in precipitation at two sites in Quebec along the St. Lawrence River (Saint-Anicet and Mingan). Work continued in 2004–2005. The measurements will be incorporated into the North American Mercury Deposition Network.

Environment Canada and Manitoba Water Stewardship continue 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. Ions, nutrients, metals, and pesticides are monitored in water under the Agreement. In addition to this monthly program, automated Water Quality Monitor is operated on the Red River at the international boundary, providing near real-time information via satellite on dissolved oxygen, conductivity, pH, and temperature.

Environment Canada and the British Columbia Ministry of Water, Land and Air Protection jointly conducted bi-weekly water quality monitoring at 34 stream or river sites in British Columbia. Cooperative arrangements to test groundwater quality at wells continue where cost-effective. Environment Canada monitored water quality at an additional six stream or river sites in British Columbia and three sites in Yukon in cooperation with the Parks Canada Agency. The water quality website project, which was developed as a pilot in 2002–2003 in cooperation with the Canadian Information System for the Environment, continued to evolve with funding support from RésEau, a Government On-Line project, and the GBAP. The website (www.waterquality.ec.gc.ca/EN/home.htm) provides water quality trend data. Developments in 2004–2005 included updates to the online mapping capabilities to include information from the National Pollutant Release Inventory, access to groundwater data and information, and an inventory of Yukon water quality data and reports.

1.1.4 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, 2005)

A national pilot project, based on the work started in Quebec Region and applied in the Pacific and Yukon Region, was incorporated into the Meteorological Service of Canada's Data Management Framework project. The Quebec Region participated in the production of various components of this project (e.g. quality control, and data and metadata management).

1.1.5 Petitcodiac River Estuary Restoration

Background

In 1968, a one-kilometre 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, 2005)

As part of efforts to rehabilitate the estuary, Canada and New Brunswick undertook a harmonized environmental impact assessment to help identify a long-term solution to the fish passage and ecosystem problems. The guidelines issued for the environmental impact assessment by the New Brunswick Department of the Environment and Local Government provided a comprehensive list of the subject areas that the study would address. The primary goal of the study was to assess the environmental and socio-economic impacts associated with four possible modifications to the existing causeway:

- Option 1 — replacing the existing fishway;

- Option 2 — opening the existing gates at peak periods of fish migration;
- Option 3 — permanently opening the gates; and
- Option 4 — replacing part of the existing causeway with a partial bridge.

Preliminary results show that:

- Option 1 does not meet the project objectives and is not viable because a direct technology or a combination of technologies could not be found that would satisfy the fish passage requirements of the project.
- Option 2 does not meet the project objectives and is not viable because the gates cannot be opened on a daily basis due to ice and sedimentation
- Option 3 and 4 remain technically viable and will be examined through further modeling and full cost accounting analysis.

Further information can be found online at www.petitcodiac.com.

1.1.6 Canadian Environmental Sustainability Indicators

Background

Following the recommendations of the 2003 National Round Table on the Environment and the Economy Report, the Government of Canada committed in the federal budget in March 2004 to develop and report better environmental indicators on clean air, clean water, and greenhouse gas emissions.

Progress (to March 31, 2005)

Environment Canada, in partnership with Statistics Canada and Health Canada, is working to complete the first annual CESI report. A federal–provincial workshop was held in February 2005 to discuss all of the necessary steps to developing a Water Quality Index to enable annual reporting on a national basis. The workshop discussions included an assessment of the quality and availability of data to support implementation of a water quality index, methodological issues in national application of the index, and a national reporting framework.

The workshop identified several areas for future improvement including expansion of the existing water quality monitoring network to address major gaps, especially in Canada's north; national criteria and methods for development of locally relevant guidelines, selection of parameters for inclusion in the index, sampling frequency, and trends analysis; development of a new indicator for application to drinking water sources; and the inclusion of biological information. These improvements will be built incrementally into the national reporting framework.

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, 2005)

The spring of 2004 brought freshet flows well above normal. Flood warning levels were reached in a number of municipalities including

Maniwaki, Mattawa, Pembroke, Fort Coulonge, and the Britannia sector of Ottawa. Two flood peaks were measured at Carillon, the first being the largest at 4,910 cubic metres per second. Flood damages begin when the flow reaches 5,000 cubic metres per second.

There were four meetings of the Board in locations in Ontario and Quebec. There were no contentious issues that arose during the year, and agenda items at Board meetings were more of a routine business nature.

The sixth annual public meeting of the Board was held in Angliers, Quebec in August 2004. There was a relatively large and interested audience in attendance in this part of the basin. The attendees were mostly interested in the how regulation decisions were made for reservoirs, the seasonal water level ranges for Lake Temiscaming, and the causes of ice problems and winter flooding in the Montréal area.

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 International Joint Commission under the terms of the 1909 Canada–United States Boundary Waters Treaty. Under Schedule C, the Prairie Provinces Water Board 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, 2005)

During 2004, 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 72% of the natural flow on the

South Saskatchewan River at the Alberta–Saskatchewan boundary to 230% 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.

Throughout 2004, the Prairie Provinces Water Board continued work on the development of a Charter and Strategic Plan, building on input provided at a planning workshop held in Winnipeg in February 2004. The Charter and Strategic Plan will be finalized in 2005.

In 2004, the Board initiated development of a paper that will identify areas of potential collaboration between the provinces and Canada on water issues. Board Members believe that there are a number of areas of common interest where the federal government can provide leadership and assistance related to water within the Prairie provinces.

The Committee on Hydrology initiated work on terms of reference for a study into future water use in the Saskatchewan River Basin to allow the Board to look at possible future pressures related to apportionment. The Committee also completed a report on an earlier Drainage Workshop, where scientists from universities across western Canada provided advice on next steps for further assessing the hydrologic impacts of land drainage.

The Committee on Groundwater initiated work on mapping and assessment of transboundary groundwater aquifers at the Manitoba–Saskatchewan boundary. Mapping of the Alberta–Saskatchewan boundary aquifers should be completed in 2005. The Board will review the results to identify how groundwater should be managed at transboundary locations.

The Committee on Water Quality continued work related to trend analysis and water quality indicators. This work will improve the ability of agencies to more quickly assess the state of water quality, especially when objectives are not being met. The Committee also updated its spill contingency plan to deal with spills that pose a threat to water quality.

Streamflow, water quality and climate monitoring data are integral to the function of the Prairie

Provinces Water Board to assess how the terms and conditions of the Master Agreement are being met. Because the adequacy of the various networks is an ongoing concern for the Board, it requested the Committees on Hydrology and Water Quality to review existing monitoring to ensure that it is appropriate for administering the Agreement.

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. When these bilateral agreements are complete, they will 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 near

the centre of the Mackenzie River Basin in Fort Smith, Northwest Territories.

The website (www.mrbb.ca) went online in 2002. News items, maps, and reports can be downloaded. The website plays a role in providing public information about water in the basin.

Progress (to March 31, 2005)

The Mackenzie River Basin Board is responsible under the Master Agreement for producing a State of Aquatic Ecosystem Report (SOAER) for the Mackenzie River Basin every five years. The board's first SOAER (2003) was published and released to the Ministers of the Environment and Indian Affairs and Northern Development, as well as the public, during the summer of 2004. Climate change and contaminants were identified as major basin-wide issues. A highlights version (www.mrbb.ca) accompanies the SOAER and summarizes 13 key observations and advice. The Secretariat and partner jurisdictions distributed printed copies of the SOAER widely throughout the Basin as well as nationally and internationally. The Secretariat also developed and delivered a series of presentations to diverse stakeholder groups.

The Board developed an Interim Guideline for Prior Notification and Consultation between Parties to the Agreement. Implementation of this guideline delivers on the commitment of the Parties to early and effective consultation, notification, and sharing of information on developments and activities that might affect the ecological integrity of aquatic ecosystems in another jurisdiction. Each of the partner jurisdictions files an agency report that summarizes activities in their part of the basin that may affect water resources elsewhere. These reports are circulated with the minutes of Board meetings.

1.3 Ecosystem Initiatives: Watershed and Water-related Activities

During the year 2004–2005, Environment Canada continued the implementation of its major ecosystem initiatives. Ecosystem Initiatives have been developed with a wide range of partners, as an effort to respond to the unique and complex problems of targeted areas and communities and address environmental, economic, and social concerns.

Through the application of an ecosystem approach, Ecosystem Initiatives achieve results by relying on measurable environmental results, aligned and coordinated efforts, collaborative governance mechanisms, integrated sound science and monitoring, community involvement, sharing information and experiences, and informed decision making. A wide variety of products, tools and information was produced by these initiatives this year. However, 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, non-profit organizations were 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.

Progress (to March 31, 2005)

ACAP organizations worked on a variety of projects within their local communities. ACAP Saint John determined the potential ecological effects of creosote contaminated sediments in Marsh Creek. They discovered that toxic components of creosote were found in the tissues of plants in the contaminated section of Marsh Creek. The results indicated that there is the potential for creosote to be transferred from sediments into the food chain by the abundant waterfowl that consume the plants in the area.

A Watershed Enhancement Project in Prince Edward Island conducted a variety of stream enhancement and riparian zone activities at several river systems. This project enhanced 6-kilometres of stream, planted over 20 000 large stock trees from a local tree nursery, and produced a management plan for the Montague/Valleyfield watershed.

ACAP Cape Breton worked on reducing the amount of oil and fuel pumped into marine waters from the bilge of recreational and commercial boats. Organizers promoted bilge socks to boat owners as an inexpensive solution to a serious problem and emphasized the importance of safe disposal of bilge and bilge socks. The campaign gave away 180 bilge socks to boaters. In addition, a Water Conservation Program focused on protecting public and private water supplies in the community as well as providing educational campaigns on residential septic systems, wells, municipal sewage treatment and municipal water treatment.

1.3.2 St. Lawrence Plan

Background

Originally launched in 1988, the St. Lawrence Plan (SLP) 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, non-governmental organizations, 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 the SLP began in 1998 and concluded in March 2003. Discussions concerning the renewal of an agreement are ongoing, and a signature is anticipated by the end of 2005.

Progress (to March 31, 2005)

Accomplishments in 2004–2005 included:

- *Integrated Management of the St. Lawrence* — Despite the absence of a formal agreement, the government partners continued with activities related to the programs that will be rolled over into the new agreement and have begun the development of a new concept for the Integrated Management of the St. Lawrence (IMSL). The Intergovernmental Working Group on the

IMSL, established at the end of 2003, organized, through the *Stratégies Saint-Laurent*, a forum on the IMSL, which provided an opportunity to take stock of the community's expectations and identify the key components for improved governance. The Working Group also initiated targeted consultations with various organizations involved in the IMSL.

- *Community Interaction Program* — During 2004–2005, the Community Interaction Program supported the implementation of 51 projects, 20 of which were carried out by ZIP committees, and are related to certain elements of the Ecological Rehabilitation Action Plans in their intervention zones. Projects funded by the Community Interaction Program covered clean-up activities, shore stabilization and revegetation, restoration of wetlands and sensitive areas, outreach activities, and environmentally-friendly, public access to shorelines.
- *Ecological Rehabilitation Action Plans* — An analysis of the results of the Ecological Rehabilitation Action Plans was carried out by the SLP coordination office. Over 500 projects have been carried out by ZIP committees since the establishment of the ZIP program in 1993. The committees have demonstrated that they can mobilize and unite the community to work toward common goals and concrete results. ZIP committees have also succeeded in influencing local decision-makers with regard to the clean-up of water and sediments.
- *Youth Programs* — Also in the area of community involvement and outreach, the Biosphère studied the youth outreach needs of ZIP committees and developed a proposed youth program to be implemented in the context of the new SLP Agreement.
- *Monitoring the State of the St. Lawrence Program* — The Monitoring the State of the St. Lawrence Program continued its monitoring activities and initiated the development of new indicators related to land use along the shoreline of the Great Lakes–St. Lawrence drainage basin and to benthic communities and invasive plants in Lake Saint-Pierre wetlands. Workshops on invasive aquatic species and on the changing state of Lake Saint-Pierre were held in December 2004 as part of the

conference of the Ecological Monitoring and Assessment Network.

- *Ecological Integrity*— During 2004–2005, the partners of the Ecological Integrity Consensus Building Committee carried out several projects related to the understanding of species and their habitats, the development and implementation of conservation plans, and the network of protected sites and species at risk. The Technical Working Group on the Environment and Wetlands, which has participated in the work of the IJC International Lake Ontario–St. Lawrence River Study Board since 2001, published various articles on the vulnerability of certain ecosystem components to hydrological conditions. Drafting of a scientific summary of the work of Environment Canada and its partners on water levels in the St. Lawrence has begun.
- *Navigation Committee* — The Navigation Consensus Building Committee published its Sustainable Navigation Strategy and has begun development of a standard management approach for dredging and sediments. A working group made up of representatives of the federal and provincial governments has reviewed the chemical criteria for sediment quality and will publish a guidance document in the summer of 2005 on the integrated management of dredging operations in the St. Lawrence.
- *Agriculture Projects* — In the area of agriculture, Environment Canada continued its sampling work at Saint-Anicet and in Saint-François Bay to study the life-cycle of pesticides in marshes.

1.3.3 Great Lakes Program

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 has evolved over time through subsequent renewals of the program: in 1994 as Great Lakes 2000; in 2000 as Great Lakes Basin 2020; and the most

recent announcement in 2005, to continue work to restore AOCs.

The federal Great Lakes Program is a partnership of seven federal departments and one federal agency, whose goals are 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 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 five national priority ecosystem initiatives 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 AOCs designated under the GLWQA. As well as restoring AOCs, the Great Lakes Program seeks to engage government, non-governmental organizations, 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 the province 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 COAs represent a successful 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 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 priority, the 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 are:

- 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; and
- 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 the Environment, Ontario Ministry of Natural Resources, and Ontario Ministry of Agriculture, Food and Rural Affairs).

Progress (to March 31, 2005)

In February 2005, the Government of Canada renewed its Great Lakes Program funding of \$40 million dollars over five years. This funding renewal builds on past achievements to improve the ecological integrity of the Great Lakes and enables continuity in work to restore key AOCs.

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. In 2004–2005, with three years of

work under the 2002 COA, over 650 projects were underway. Steady progress has been made in relation to all COA results.

Accomplishments in 2004–2005 included:

- *Biennial Progress Report* — Production for the second biennial Progress Report under the 2002 COA was initiated. It will describe Canada’s and Ontario’s achievements in the first two years of the COA and highlight the work by governments, industries, non-government agencies, and the public, which is required to protect and conserve the Great Lakes Basin.
- *Pollutant Reductions* — Regulatory as well as voluntary measures by the public and industry have resulted in significant reductions in concentrations of harmful pollutants since 1988, including high level PCBs by 89%, mercury by 84%, dioxins/furans by 87%, benzo(a)pyrene by 45%, and hexachlorobenzene by 68%.
- *Burn it Smart!* — In 2004–2005, over 1000 people attended Burn it Smart workshops in Ontario. These workshops help users make their wood-burning habits safer, cleaner, and more efficient.
- *Reducing Burn Barrel Pollution* — In March 2005, two workshops were held in Thunder Bay, Ontario, and Duluth, Minnesota, to provide options for reducing pollution from burn barrels. Burn barrels or open barrels are often used to burn household garbage. They are expected to be identified as the largest source of dioxin emissions once air emission standards for industrial sources are in place.
- *Updating Binational Reports* — In April 2004, Updates of the Binational Lakewide Management Plan were completed for Lakes Superior, Erie, and Ontario, which describe the state of each lake, causes of impairment, and required actions to restore environmental quality. In addition, the 2004 report of the Lake Huron Binational Partnership Action Plan was completed, which provides information on priority issues, trends, goals, research, monitoring, on the ground activities, and future needs.
- *Great Lakes Sustainability Fund* — The Great Lakes Sustainability Fund provided

\$4.5 million for fish and wildlife habitat rehabilitation, contaminated sediment management, and urban and rural wastewater control projects. Project partners contributed \$17 million to the 85 projects funded to advance restoration of the Great Lakes AOCs.

- *Information Management Strategy* — In the fall of 2004, the Great Lakes Binational Monitoring Inventory was launched as a first step towards implementing a long-term Information Management Strategy for monitoring programs in the Great Lakes Basin. Since then, over 1 000 programs have been added to the Inventory and plans are now under way to integrate this system with the Great Lakes–St. Lawrence Research Inventory coordinated by the Council of Great Lakes Research Managers.
- *Great Lakes Cooperative Monitoring Initiative* — The Great Lakes Cooperative Monitoring Initiative attempts to address key information needs identified by the Lakewide Management Plan working groups through new monitoring and research on a specific Great lake. The expertise and participation of agency staff and academia is actively sought in designing a program to address that need; 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 focuses on one lake at a time, according to a Binational Executive Committee’s endorsed rotational cycle. The Cooperative Monitoring Initiative’s activities in 2004 focused on Lake Erie and examined changes to Lake Erie’s ecosystem since the invasion of the zebra mussel; mussel distribution and density; and changes in lake physics and nutrient content since their invasion.
- *Lakeviews* — Lakeviews is an interoperable system of distributed databases linked by web services and mapping technologies, which serves as a discovery, access, visualization, and decision support tool for information regarding trends in environmental quality. It is designed to provide easy access to environmental information using an interactive mapping tool and provides a

snapshot of environmental programs. With the architecture already in place for this application, the current focus is on content development—helping information custodians and their clients understand what web services are, how to develop them, how to use them, and why they are so beneficial.

- *Wetlands: Wet, Wild & Essential* — This educational, curriculum-based poster was produced and distributed to teachers throughout the Canadian Great Lakes Basin.
- *Marsh Havens* — The fact sheet *Marsh Havens: Improving Marsh Habitats for Birds in the Great Lakes Basin*, produced by Bird Studies Canada, provides guidance for habitat management, conservation, and stewardship practices to benefit marsh birds in the Great Lakes region. Efforts are linked to other conservation efforts aimed at enhancing Great Lakes marshes and enriching the ecosystem for the health of birds, other wildlife, and the many people who also rely on the Great Lakes Basin for the necessities of life.
- *State of the Lakes Ecosystem Conference* — The State of the Lakes Ecosystem Conference (SOLEC) was established in 1992 to coordinate reporting on the state of health of the Great Lakes Basin ecosystem, a requirement under the GLWQA and of the International Joint Commission. In January 2004, at an Indicator Review Workshop, the SOLEC indicator suites were revised to ensure their continued utility, success, and effectiveness to evaluate the current health and trends for the Great Lakes.

1.3.4 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 development of a northern monitoring network in support of status and trend reporting. NEI supported projects that addressed 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, 2005)

With funding support from NEI, a number of new water-related projects were initiated:

- *Investigation of How Great Bear Lake Interacts with the Atmosphere in Relation to Climate Change and Local Meteorological Events* — This three-year project will involve field measurements, modeling, and the participation of local residents.
- *Community-led Research on Climate Change Impacts on Drinking Water Quality in Nunatsiavut (the Inuit land-claim region of Labrador)* — The project involves merging scientific and traditional knowledge. Progress to date includes the identification of key issues on freshwater in Inuit communities, the establishment of a network of individuals involved in freshwater issues, compilation of an English glossary of freshwater terms that was translated into Inuktitut, as well as Inuktitut terms on freshwater with explanations translated to English.
- *Multi-year Project to Develop Tools for Setting Thresholds and Ensuring the Sustainable Development of Freshwaters in Canada's North* — In this initial year, the project team conducted a review of thresholds currently used for waters in Canada, defined the scope of the project with input from northern groups, and investigated how changes in northern land use affect fish, insects (benthic invertebrates), and water quality.
- *Multi-year Study on Better Understanding Climate-driven Trends in Freshwater Systems (physical, biological, geochemical) and Evaluation and Refinement of Selected Indicators for Ongoing Monitoring* — The study will contribute to a network of key

representative freshwater sites for inter-comparative process and modeling studies in Canada's North and the circumpolar north. Work to date has focused on the Mackenzie Delta Region in the Northwest Territories.

- *Multi-year Study Investigating Potential Linkages Between a Warming Climate and Increased Levels of Mercury in Northern Biota* — This study will analyze mercury and other toxic metals in muscle tissue of archived and newly collected landlocked Arctic Char from lakes in Canada's North. Early results confirm that mercury concentrations are relatively high in most landlocked char.
- *Two-year Study Investigating Mercury Levels in Lake Trout from Nunavik, Northern Quebec* — This study is investigating mercury chemical concentration in lake trout and the potential related risk exposure to communities
- *Two-year Study to Collect and Disseminate Information on Waste Management and Contaminated Sites within the Yukon River Watershed* — Progress to date includes a series of community meetings to obtain local knowledge of previously undocumented sites and generate awareness of known sites, and development of maps identifying and characterizing all sites.

1.3.5 Georgia Basin Action Plan

Background

The federal-provincial GBAP (2003–2008) was announced on April 2, 2003, and is a renewal of the Georgia Basin Ecosystem Initiative (1998–2003). The GBAP 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 British Columbia Ministry of Water, Land and Air Protection, and the British Columbia Ministry of Sustainable Resource Management. The GBAP 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 and other toxics) in municipal wastewater and urban and agricultural non-point 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 GBAP. 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, 2005)

Accomplishments in 2004–2005 included:

- *Stream Condition Assessment* — The Canadian Aquatic Biomonitoring Network (CABIN) approach continues to be implemented and expanded in the region to assess aquatic ecosystem health. This approach is based on assessing the structure of stream benthic communities. Twelve water quality monitoring sites in the Georgia Basin were sampled for biological conditions using the CABIN approach for the second consecutive year. Temporal changes in the reference database were investigated by re-sampling 23 reference sites in the Fraser Basin, which were last sampled about 10 years ago. Support was provided for the development of tools, such as on-line software, analysis reports, and protocols manuals, to facilitate CABIN use by interested users within and outside of government. An agreement was negotiated between Environment Canada and the North American Benthological Society to develop a bi-national Taxonomic Certification Program; the U.S. Environmental Protection Agency and the U.S. Geological Survey are other significant contributors. This national approach was promoted by providing advice to various new users of CABIN and a training workshop for provincial agencies,

municipalities, First Nations, consultants, and stewardship groups.

- *Comparing Benthic Biomonitoring Methods* — Environment Canada, in collaboration with regional and municipal partners in the Greater Vancouver region, undertook a side-by-side comparison of two benthic biomonitoring methods for evaluating stream health. The two methods are the Benthic Index of Biotic Integrity method, which is widely used in the Greater Vancouver region, and the CABIN approach. This study contributed much needed data to the discussion of whether the two methods are equally able to track changes in stream health as watersheds undergo land use changes.
- *Abbotsford Aquifer Groundwater Monitoring* — Groundwater samples taken from 23 locations in the Abbotsford aquifer were monitored monthly for nitrate from non-point source pollution. Non-point 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. Recent results from the monitoring program are available on Environment Canada–Pacific and Yukon Region’s Environmental Indicators website at www.ecoinfo.ec.gc.ca/env_ind/region/nitrate/nitrate_e.cfm and on the water quality website at www.waterquality.ec.gc.ca/EN/home.htm. Environment Canada also participated with provincial environment and health agencies and a local university in an extensive groundwater quality survey comprising about 150 sites on the Canadian portion of the aquifer. Sampling was conducted for nitrate concentrations and coliform counts. Results of the survey are planned to be reported in 2006.

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 has developed a web-based library, housed on the Waterbucket.ca website (www.waterbucket.ca), listing current water conservation resources from various government and industry publications. A web-based user survey was developed to track outreach efforts and document who is accessing water conservation information and for what purpose.
- *Water Balance Model* — The Water Balance Model (www.waterbalance.ca) is an Internet-based decision support tool designed to enable non-technical users to integrate stormwater management with land use planning and development decisions. It is a publicly accessible tool that allows users to quantify the benefits of incorporating various source controls for managing stormwater runoff volume. Developed by a broad partnership of local and senior government agencies in British Columbia, including Environment Canada, the model was launched for British Columbia users in 2003. In 2004–2005, the Water Balance Model was developed further to allow for national application of this stormwater management tool.
- *Watershed Modeling* — A modeling 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 modeling 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 sub-model and for a predictive fecal coliform sub-model 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 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.

- *Stormwater Management for Subdivisions* — This project monitors the hydrologic performance of an integrated system of rain gardens, infiltration swales (ditches or channels with permeable soils that permit infiltration into groundwater), and detention facilities (storage ponds) installed as stormwater source controls in a 393-unit residential subdivision. The site drains to watercourses that are considered environmentally sensitive. This was the first year of a three-year monitoring program to assess the effectiveness of the project in reducing stormwater runoff.
- *Evaluating the Benefits of Green Roofs in Stormwater Management* — The environmental performance of an experimental green roof research facility was monitored through 2004–2005. The purpose was to quantify the capacity of two green roof designs to reduce stormwater runoff volume and control peak runoff rates, as well as to mitigate stormwater quality. The performance of the roof designs will be compared against performance data from other roofs in the Greater Vancouver area and in the Ottawa region to understand regional differences in roof performance.

2. Water Research

This section describes selected research activities conducted by the NWRI, the St. Lawrence Centre, the Pacific Environmental Science Centre, and other research highlights.

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. A primary goal is to make timely water science information available to science users, providing the targeted research results needed by environmental policy-makers and managers to address specific environmental problems.

Progress (to March 31, 2005)

Linking Water Science with Water Science Users

- *Threats to Water Availability in Canada* — Policy and decision-makers, resource managers, and the research community all need up-to-date information on threats to Canadian water resources to help develop future research directions and priorities, and sound management policies and practices. National concern about water quantity issues (floods, droughts, glacier retreat, and the impacts of climate change) prompted a national science assessment in 2004. *Threats to Water Availability in Canada* (www.nwri.ca/threats2full/intro-e.html) was developed by NWRI and the Meteorological Service of Canada, Canada's leader in weather forecasting and climate science. Written by experts from academia, industry, and various levels of government, the assessment covers dams, reservoirs and flow regulation; droughts; floods; residential/urban development; industrial/manufacturing demands; mining; climate variability and change; and integrated and cumulative impacts. Each chapter details current status, trends, and knowledge and program needs.
- *Microbial Source Tracking of Sources of Fecal Contamination* — Municipal, provincial, and federal water quality decision-makers across Canada are increasingly interested in the emerging field of Microbial Source Tracking

(MST) for identifying sources of fecal contamination responsible for beach and shellfish closures, boil water advisories, etc. Determining waterborne pathogen risk and enhancing targeted and cost-effective corrective actions are driving much of this need. In another of the NWRI-led Science-Policy Workshop series, key Canadian, U.S. and international experts assessed the state of MST science, concluding that while MST offers much promise, the field is still in development. Information on the state of the MST science, readiness for application, recent initiatives, and drivers and needs across the country was provided to scientists and users. (www.nwri.ca/microbialsourcetracking/intro-e.html)

Lake Winnipeg — Gathering Information — Preparing for Action

- Excessive nutrient levels in Lake Winnipeg and the resulting changes in water quality are a cause of growing government and public concern. NWRI scientists, in collaboration with Natural Resources Canada and Fisheries and Oceans Canada, conducted a study of dated sediment cores to reconstruct the history of nutrient loading and trophic conditions in Lake Winnipeg (bottom sediments are known to provide a valuable record of changes in a lake). They found that although several prominent phosphorus peaks occurred over a 700-year history, resulting from alteration of dry and wet cycles, there was a steady increase in phosphorus concentrations from the 1930s due to anthropogenic activities in the watershed. Work will continue to gather information required to identify actions needed to restore the water quality of Lake Winnipeg and its watershed.

National Acid Rain Science Assessment

- NWRI experts on acidifying pollution produced major components of the 2004 Canadian Acid Deposition Science Assessment, which is quantifying and predicting acid rain effects on aquatic ecosystems: *Effects on Aquatic Chemistry and Biology; Recovery of Aquatic Ecosystems; and Critical Loads: Are They Being Exceeded?* (www.msc-smc.ec.gc.ca/saib/acid/assessment2004/summary/summary_e.html)

Working with Other Federal Departments to Protect Water Quality

- *Watershed Evaluation of Beneficial Management Practices* — The Agriculture and Agri-Food Canada project, *Watershed Evaluation of Beneficial Management Practices*, is a four-year initiative that began in summer 2004 to evaluate effects of agricultural beneficial management practices on water quality, from both an environmental and economic standpoint. Seven watersheds are involved: Salmon River Watershed, near Salmon Arm, B.C.; Lower Little Bow Watershed, near Lethbridge, Alta.; South Tobacco Creek Watershed near Miami, Man.; South Nations watershed, near Ottawa, Ont.; Bras d'Henri watershed south of Quebec City, Que.; Black Brook watershed near Grand Falls, N.B.; and Thomas Brook watershed near Berwick, N.S. Environment Canada is contributing watershed management and water quality expertise.
- *Canadian Recreational Water Quality Guidelines* — NWRI was invited to participate in Health Canada's newly formed Working Group on Recreational Water Quality to review scientific knowledge generated since the last time the Guidelines for Canadian Recreational Water Quality were published in 1992. This includes new knowledge in areas such as microbiology (e.g. emerging waterborne pathogens and microbial source tracking), molecular biology (e.g. rapid microbial detection methods), and microbial ecology (e.g. persistence of *E. coli* in beach sand). The Working Group is made up of representatives from the provinces and the U.S. Environmental Protection Agency. Revised Guidelines will be provided to the Federal/Provincial/Territorial Committee on Health and the Environment for approval in 2006. (www.hc-sc.gc.ca/ewh-semt/water-eau/recreat/index_e.html)

Working with Provinces — Source Water Protection in Ontario

- The Water Well Data Improvement Project of the Ontario Ministry of the Environment aims to produce an authoritative version of the Ministry's Water Well Information System to be used in source water protection planning initiatives. NWRI researchers with experience

in the use of water well information in regional groundwater studies are providing expertise through the External Advisory Committee to the project. In the longer term, the project will guide the development and maintenance of the Water Well Information System. (groups.projectforum.com/wwdip/28)

Working with Municipalities — Urban Water Management

- NWRI shared expertise on innovative methods for stormwater control with the Federation of Canadian Municipalities /National Research Council Working Group, charged with developing a best practice document on stormwater control in Canada. The report will help municipal water managers in addressing sustainability and infrastructure issues related to stormwater runoff from urban areas. (www.infraguide.ca/bestPractices/PublishedBP_e.asp#sw)

Savings from Greening Federal Facilities Support Water Research

- Energy conservation initiatives at the Canada Centre for Inland Waters achieved ongoing savings of about \$1 million, which was reinvested into priority water research programs. Greenhouse gas emissions have been reduced by about 6 700 tonnes per year. This equates to an individual achievement of a reduction of about 10 tonnes per federal employee at the Centre. (www.nwri.ca/whatsnew/greenhousegas/greenhouse-e.html, www.nwri.ca/whatsnew/FBI/fbi-e.html)

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 the Centre introduced a new program that is 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, 2005)

The current year marks the first year of consolidation of work in the context of new research programs. Ongoing and new research programs in 2004–2005 included:

- *Impacts of Water Level Fluctuations on River Biodiversity* — The analyses for the study on changes in water level and the testing of the St. Lawrence hydrological model have been completed. Information on aquatic plants, fish populations and bird communities, including species at risk, was validated, and key indicators were chosen for the evaluation and formulation of regulation plans.

In the context of the effect of changes in water levels, other input in the form of socio-economic surveys of water use (impact on pleasure boaters, infrastructures, and tourism related to pleasure boating) were also incorporated in the hydrological model.

In collaboration with the Ontario Region and U.S. partners in efforts to support the International Joint Commission, an initial series of preliminary plans was developed on the basis of the indicators chosen, and evaluated according to their individual performance in terms of meeting requirements related to environmental and socio-economic components.

A study focusing specifically on wetlands and invasive plants was conducted in the Boucherville Islands, and a more accurate account prepared of sediment contamination in Lake Saint-François during the 1990s. As an aquatic species that has reached the Richelieu River, a gateway to the St. Lawrence, the zebra mussel was also monitored.

New organisms were examined for the impact of pesticides as endocrine disruptors affecting reproduction.

- *State of the St. Lawrence River* — Activities on the state of the St. Lawrence were carried out through federal–provincial collaboration involving long-term monitoring of the St. Lawrence River system's main environmental components.

In 2004–2005, Environment Canada organized an initial series of workshops to set ecological targets for the St. Lawrence, along with thematic workshops on invasive plants and the state of Lake Saint-Pierre. The workshop results are posted online at www.slv2000.qc.ca.

Water quality, wetland, and sediment monitoring was also consolidated through another year of data collection. Historical data were also recovered with a view to improving time sequences of available information and supporting the development of enhanced databases.

Monitoring of water quality and toxic substances (e.g. heavy metals) in the St. Lawrence was consolidated through a second year of data collection on inflow from the Ottawa River, and through the monitoring of pesticides in Lake Saint-Pierre, including sampling stations affected by agricultural pressures (Yamaska, Richelieu and Nicolet as well as discharge from the lake to the south shore).

In cooperation with the Université de Montréal and the Quebec Ministry of the Environment, an initial round of sampling was conducted in the context of the CABIN protocol to form the core of a new network to monitor benthic communities in the St. Lawrence.

An initial feasibility study was initiated in Lake Saint-Pierre for an integrated biodiversity indicator covering conditions related to water quality, sediments, plants, and anourans (frogs and toads).

- *Urban Pollution* — In 2004–2005, new data were collected in close collaboration with the Montréal Metropolitan Community and university partners. Close cooperation with the authority responsible for the wastewater treatment plant continued and fostered the establishment of a new closed-circuit laboratory to conduct ecotoxicological analyses and help develop disinfection technology tailored to wastewater quality. Several scientific articles were published. Work included:
 - continued study of endocrine disturbances and the potential feminization of certain

organisms exposed to urban effluents (impact of urban sewage on fish and molluscs);

- continued evaluation of the presence of nonylphenol surfactants (endocrine disruptors) in urban effluents (source, transport, and fate of endocrine-disrupting chemicals);
- development of new ecotoxicological tests and biomarkers; and
- studies of the numerous physiological consequences of minnows (*Notropis hudsonius*) when exposed to xenoestrogens under natural conditions.

With a view to a joint project with the NWRI 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 Institut national de la recherche scientifique–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 was collaboration with NWRI 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.

- *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 (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.

The Collaborative Mercury Research Network, which is funded by the National Research Council of Canada, has approximately 20 researchers taking a multidisciplinary ecosystem approach to the impact of the presence of mercury in the environment. The Meteorological Service of Canada's significant contribution to maintaining the integrated research station in Saint-François Bay (Lake Saint-Pierre) continued in 2004–2005. One of the network's research themes is a better scientific and ecosystem understanding that could lead to modeling 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 Science and Technology Branch 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 GBAP, 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, 2005)

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 were tested to measure biological genetic 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 were conducted in cooperation with the Capital Regional District of Victoria and the Greater Vancouver Regional District.

The Pacific Environmental Science Centre laboratory is also collaborating 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 research programs included:

- *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 at Environment Canada Shellfish Monitoring Program, British Columbia Ministry of Water, Land and Air Protection, First Nations, and several regional health authorities to determine sources of fecal contamination. The laboratory is working with the University of Oregon to develop additional genetic sequences (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 British Columbia 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.

2.4 Other Research Highlights

Environment Canada conducts many water-related investigations in addition to the research undertaken at the major institutes. Interdisciplinary projects and studies are often fostered in partnership with educational institutions or 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 being undertaken.

2.4.1 Hydrometeorology and Arctic Laboratory

Background

In April 2004, work began on establishing the Hydrometeorology and Arctic Laboratory (HAL). First announced by the Environment Minister in 2003, 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.

A client planning workshop, held in Saskatoon in January 2004, established the following priority areas for work:

- *Support to the Operational Hydrology Community* — Develop products and real-time information on precipitation (including intensity), evaporation (open water and land

surface), sublimation, evapotranspiration, solar radiation, and soil moisture.

- *Modeling Research* — Employ a coupled models approach for modeling prairie watersheds and support for prediction in ungauged basin studies.
Precipitation and Storm Studies — Conduct research into radar derived quantitative precipitation estimates and analysis of major storms and extreme precipitation events.
- *Precipitation Estimates* — Conduct radar–Quantitative Precipitation Estimation validation and snowfall estimates. Conduct snow water equivalent research and mapping.
- *Evaporation and sublimation studies* — Research the contribution of evapotranspiration to convection.

Progress (to March 31, 2005)

An investment has been made in computer server infrastructure designed to enhance research on hydrological modeling. In conjunction with this investment, a three-year contract was signed with the University of Waterloo for cooperative hydrologic model development. The computer facility became operational in late spring with help from Canadian Meteorological Centre and Waterloo and is currently conducting research employing the WATFLOOD and WATCLASS coupled models.

Activities underway in 2004-2005 included the following:

- Worked with Canadian Meteorological Centre and Water Survey Directorate to develop gridded data products derived from the GEM model for testing. A meeting was held in October involving representatives from Canadian Meteorological Centre, NWRI, HAL, hydro companies, and provincial flood forecasting agencies to establish protocols and workplans for testing these products.
- Participated in the formation of a Canadian team for hydrological ensemble prediction experiment (HEPEX) in conjunction with the Canadian Meteorological Centre. An ensemble prediction system involves multiple predictions from a group of slightly different

initial conditions and/or various versions of computer models. Ensembles can be used by forecasters as a tool to help measure the probability or likelihood of a forecast.

- Continued work on research into improved land surface model representations employing WATCLASS and testing of the newer WATISBA model. Work will focus on improved snow and ice representation and will focus on northern basins.
- Applied the WATFLOOD and WATISBA models to a Great Lakes flow forecasting system as part of larger operational hydrology program.
- Participated in the Prairie Drought Study.
- Worked on establishing “super sites” within existing GEM-Limited Area Model domains in conjunction with other partners.
- Worked with the University of Manitoba and the City of Winnipeg to employ the radar network and high resolution rain gauge network data in an effort to improve Quantitative Precipitation Estimation. If successful, this project will be expanded to incorporate radar and rain gauge data from other cities.

2.4.2 Integrated Modeling 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 modeling 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 website of Quebec’s climate change impacts and adaptation resource centre (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 Quebec Ministry of the Environment (*Water Environment Directorate*), 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, Institut national de recherche scientifique – Eau, et École Polytechnique), and the IJC.

Progress (to March 31, 2005)

In 2004–2005, the development of fluvial hydrodynamic model for diverse hydrological conditions was continued. Preliminary

simulations were conducted for Lake des Deux-Montagnes and La Prairie Basin. Hydrodynamic models between Montréal and Trois-Rivières were refined to include the hydrologic effect of the existing bridge pillars localized in the river (e.g. Laviolette bridge) Several parameters were modeled by whole area simulations. Modeling improvements were made to include light penetration in the water column and water temperature distribution. This last parameter will become important in the next few years in dealing with complex problems related to nutrients, primary productivity, and eutrophication phenomena.

An integrated physical and biological modeling system was developed and implemented, which permits the evaluation of subsequent impacts of changing hydrology on river ecosystems. This allowed for the development and calibration of vegetative models that helps to predict the changes for the main categories of wetlands. Following this development, in collaboration with many federal and provincial partners, various wildlife models were developed which allowed the assessment of impacts of flow management of the St. Lawrence River by the International Joint Commission. This work has been highlighted in several publications and was the focus of a special session at an international workshop on eco-hydrology in Spain.

2.4.3 Climate Change, Impacts, and Adaptation

In 2004–2005, as part of the support provided to the consensus building committees of the St. Lawrence Plan, collaboration was initiated between the St. Lawrence Centre and the Canadian Coast Guard – Quebec Region, to study climate change adaptation options for commercial shipping. The project is funded by the Climate Change Action Fund and the Quebec-based Ouranos Consortium.

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

Background / Progress (to March 31, 2005)

1. Freshwater Website

The Freshwater Website (www.ec.gc.ca/water) continues to provide basic information on a wide range of water-related topics, comprehensive educational materials (e.g. water fact sheets, *A Primer on Fresh Water*, *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). In addition, the links to specific issues at other governmental and non-governmental sites across the country continue to be regularly updated and expanded, as does the calendar of water-related conferences and events. The site is heavily used (averaging over 100 000 visits each month) and is often referenced on other websites and in print material produced by other agencies.

In December 2004, a new product entitled *Did You Know? Freshwater Facts for Canada and the World* was released on the website. This collection of over 150 facts from reputable national and international sources is highlighted by 30 colourful and instructive infographics. Other additions to the site included six case studies highlighting best practices on source water protection in Canada, the 2001 Municipal Water Use Database and summary report, and an aid for finding freshwater maps in *The Atlas of Canada*.

2. Water Survey of Canada Website

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. In the case of Quebec, the province collects water resource data for the Water Survey of Canada. The Water Survey of Canada 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 hydrometric database (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 2 500 active and 5 500 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 website (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 2004–2005, 61 000 visitors, including 28 500 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.

In 2004–2005, the Biosphère developed an exhibition on the Great Lakes–St. Lawrence Basin. Several models and interactive games were produced to help convey a better understanding of water-level issues and the complexity of the system. Two other exhibits were developed and made available to visitors: one on the architect of the Biosphère, Buckminster Fuller, and the other entitled "Water Wonders!" on experimentation and interactions with water. A new water experimentation laboratory was also created. The Freshwater Fish Ecowatch Network continued and expanded its activities in Quebec, as did the project, *Adopt a River*, undertaken in cooperation with the Comité de valorisation de la rivière Beauport.

4. RésEau – Building Canadian Water Connections

Implementation of the first phase of the RésEau Government On-Line project began and will continue for a two-year demonstration period ending on March 31, 2006. Aiming to establish partnerships and projects to demonstrate the sharing, discovery, access, and use of water information over the Internet, RésEau's user-driven focus targets information for a wide range of generalists and specialists, from high school level youth to water resource managers. A Partnership Fund has been established to promote collaboration among distribution networks of partners. Four projects in support of water outreach and community engagement activities were funded in 2004–2005.

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. The framework is 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 in June 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 geographical information systems. The framework is available at www.geogratis.cgdi.gc.ca/clf/en.

6. Pacific and Yukon Region

The Aquatic Sciences Section in the Environmental Conservation Branch encouraged environmental stewardship among the public by informing them of emerging environmental issues, ecological connections in the environment, and stewardship programs. Examples of public information sharing include:

- *An Interactive Pollution Model* — This website provides a do-it-yourself guide for building an interactive pollution model of a community (www.pyr.ec.gc.ca/EN/IPM).
- *Discover Your Estuary* — This online resource provides a guide to understanding and exploring the aquatic environment of the Fraser River Estuary (www.pyr.ec.gc.ca/EN/DYE/index.shtml).
- *The Pacific and Yukon Water Quality Monitoring Program* — This website provides access to federal-provincial-territorial water quality data, guidelines, reports, publications, links to stewardship programs, and online resources for designing a water quality monitoring program (waterquality.ec.gc.ca/EN/home.htm).
- *Workshops on Environment Canada's CABIN Network* — 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 bioassessment (cabin.cciw.ca/application/welcome.asp?Lang=en).

APPENDIX A

AGREEMENTS

The following *Canada Water Act* Agreements¹ were ongoing during 2004–2005:

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)

Water Management Programs

- Mackenzie River Basin Transboundary Waters Master Agreement

¹ 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

Centre de ressources en impacts et adaptation
au climat et à ses changements (in French only)

www.criacc.qc.ca/index_e.html

Freshwater Website (including *Canada Water
Act* annual reports)

www.ec.gc.ca/water/e_main.html

Weather and Meteorology

www2.ec.gc.ca/weath_e.html

Research Institutes

National Water Research Institute

www.nwri.ca/nwri-e.html

St. Lawrence Centre

www.qc.ec.gc.ca/csl/acc/csl001_e.html

Ecosystem Initiatives

Atlantic Coastal Action Program

atlantic-web1.ns.ec.gc.ca/community/acap/

Canada–Quebec Agreement St. Lawrence
Vision 2000

www.slv2000.qc.ca

Georgia Basin Ecosystem Initiative

www.pyr.ec.gc.ca/GeorgiaBasin/index_e.htm

Great Lakes Program

www.on.ec.gc.ca/water/greatlakes/intro-e.html

Northern Ecosystem Initiative

www.pnr-rpn.ec.gc.ca/nature/ecosystems/nei-ien/index.en.html

Federal Departments

Agriculture and Agri-Food Canada

www.agr.gc.ca/index_e.php

Fisheries and Oceans Canada

www.dfo-mpo.gc.ca/home-accueil_e.htm

Health Canada

www.hc-sc.gc.ca/index_e.html

Indian and Northern Affairs Canada

www.ainc-inac.gc.ca/index_e.html

Natural Resources Canada

www.nrcan-rncan.gc.ca/inter/index_e.html

Federal–Provincial–Territorial Council

Canadian Council of Ministers of the
Environment

www.ccme.ca/about

Interprovincial River Boards

Lake of the Woods Control Board

www.lwcb.ca/

Mackenzie River Basin Board

www.mrbba.ca

Ottawa River Regulation Planning Board

www.ottawariver.ca/emain.htm

Prairie Provinces Water Board

www.pnr-rpn.ec.gc.ca/water/fa01/index.en.html

International Organizations

Arctic Council

www.arctic-council.org

International Joint Commission
www.ijc.org/en/home/main_accueil.htm

United Nations Environment Programme: GEMS/
Water Global Environment Monitoring System
www.gemswater.org

United Nations University: International Network
on Water, Environment and Health
www.inweh.unu.edu/inweh

Associations, Networks, and Journals

Canadian Water Resources Association
www.cwra.org

Canadian Water and Wastewater Association
www.cwwa.ca/home_e.asp

Ecological Monitoring and Assessment Network
www.eman-rese.ca/eman

Federation of Canadian Municipalities
www.fcm.ca/english/main.html

Great Lakes Information Network
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/wqrjc/

WaterCan
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
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: 819-994-1412
E-mail: enviroinfo@ec.gc.ca

Science Liaison Branch
National Water Research Institute
Environment Canada
Canada Centre for Inland Waters
867 Lakeshore Road, P.O. Box 550
Burlington, ON L7R 4A6
Tel.: 905-336-4503
Fax: 905-336-6444
E-mail: nwriscience.liaison@ec.gc.ca

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11 Innovation Boulevard
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Fax: 416-739-4691

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1141 route de l'Église
Sainte-Foy, QC G1V 3W5
Tel.: 418-648-4077
Fax: 418-649-6213

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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* 2004–2005 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:

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Gatineau, QC K1A 0H3
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