

The International **W**atersheds Initiative:

Implementing a New Paradigm
for Transboundary Basins



Third Report to Governments on
the International Watersheds Initiative

January 2009

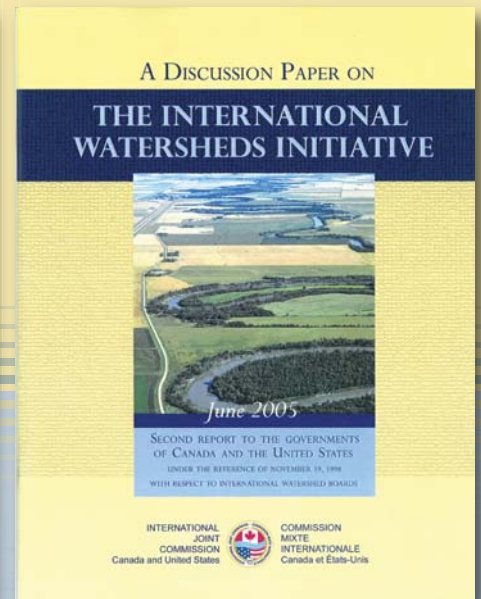
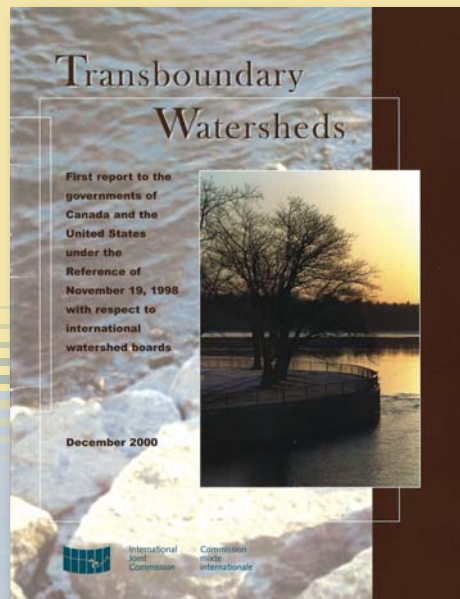


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Cover map:
Perspective view of the shared drainage
areas along the international boundary,
based on Canadian and U.S. national
hydrographic datasets.

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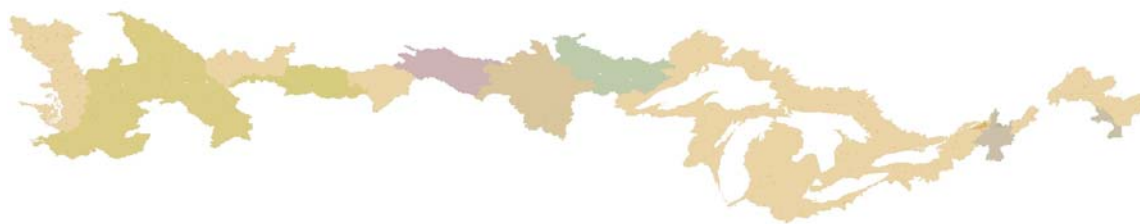


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I. Executive Summary

Shared waters comprise more than 40 percent of the 8,800-kilometer (5,500-mile) frontier between Canada and the United States, and more than 300 lakes and rivers are part of, or traverse, the international boundary. One hundred years ago, the Boundary Waters Treaty acknowledged that this geographical reality can, at times, give rise to disputes between the two countries. It established the International Joint Commission (IJC) to help prevent or resolve them. Over the years, the Commission has developed a number of productive approaches to fulfilling its mandate and assisting the Canadian and United States governments with transborder issues. Among these is the *International Watersheds Initiative (IWI)*.

The Commission developed and has begun implementing the IWI during the past decade, supported by special funding from the two federal governments. The underlying premise is that water resource and environmental problems can be anticipated, prevented or resolved at the local level before developing into international issues.

This requires an integrated, ecosystem approach that looks at complex interrelationships in the entire watershed, and not just at water quantity or quality within border lakes or rivers taken in isolation. Emerging environmental, economic and social challenges – e.g., population shifts, invasive species, climate change – make a watershed approach increasingly necessary.

After broad consultations, the IJC identified the St. Croix, Rainy, Red and Souris River basins as pilot areas for the establishment of international watershed boards. In the past several years, the existing boards have been developing or refining action plans for the implementation of a watershed approach.

The IWI is already paying important dividends for governments and local populations in these areas. It has:

- helped defuse tensions surrounding the controversial Devils Lake outlet by providing a detailed scientific basis for assessment of potential risks from introduced pathogens or parasites,
- contributed to a more informed discussion of legislation to relax restrictions on fish migration around dams in the St. Croix River,
- provided a mechanism for provincial, state and federal agencies and hydropower interests to come to an agreement that reduces fluctuations in dam outflows in the Rainy River that interfere with fish spawning, and
- stimulated cooperation to eliminate inconsistencies and disconnects in hydrographic datasets and maps at the international border.

“Decades ahead of their time and three quarters of a century before the Brundtland Commission – the World Commission on Environment and Development – raised awareness of the concept of sustainable development, the [Boundary Waters] Treaty and the International Joint Commission created an impartial regime for environmental stewardship. This regime is based on the principle that precious natural resources should be managed for the benefit of all.”

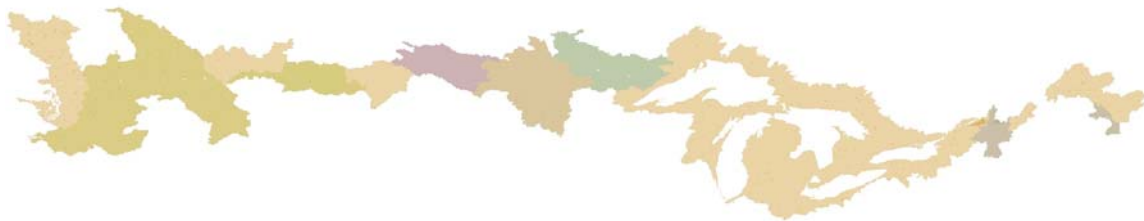
— **Minister of Foreign Affairs Lawrence Cannon**

“The Boundary Waters Treaty remains vibrant as it enters its second century. Recent International Joint Commission initiatives such as International Watershed Boards provide opportunities for local stakeholders to build networks that can prevent or resolve problems at the community level. The Treaty continues to be a model for managing shared resources and a tribute to the enduring friendship between the United States and Canada.”

— **Secretary of State Condoleezza Rice**

Recently, the IJC has stepped up its engagement with the IWI boards, with expanded dialogue on IWI aims, operating principles and emerging issues, leading to a more clearly defined framework for carrying the initiative forward. This included steps to enhance transparency and accountability in the selection, implementation and assessment of IWI projects and adopting a more strategic approach that makes better use of scarce resources. International watershed boards are seen to be an effective paradigm for preventing and resolving transboundary issues that could be replicated elsewhere along the border in response to local demand. Each board should be encouraged to evolve in its own way in response to local needs and circumstances, and in some basins alternative structures or arrangements may be more suitable.

The IWI has already demonstrated its utility and value, and the initiative is transforming the way the IJC does business. To realize the full potential and benefits of a watershed approach, modest sustained investments are needed over the next decade. It is therefore proposed that \$1 million annually, shared equally between the two countries, be established as the base funding level. Such a commitment would put the IWI on a more secure and predictable footing, and would allow the IWI boards to make significant further progress in developing local capacity to address transboundary concerns through strengthened public outreach and partnerships, enhanced scientific understanding of watershed dynamics, and a more consistent and coherent approach to the collection and organization of relevant geospatial data.



II. Introduction

At the request of the governments of Canada and the United States, the IJC has, since 1998, been developing ways to encourage a better integrated, more participatory, ecosystem-based approach to issues in transboundary water basins. The Commission has called it the International Watersheds Initiative (IWI). The underlying premise is that local people and institutions are often the best placed to anticipate, prevent or resolve many problems related to water resources and the environment, and to take shared actions towards shared sustainability objectives.

This report summarizes accomplishments and progress made in building local capacity for implementing a watershed approach along the international boundary, and outlines the Commission's thinking on the future direction of the IWI, with recommended next steps.

The watershed approach is transforming the way the IJC does business, stimulating new ways of sharing information and data, employing new technologies, and renewing a commitment to engage all sectors and stakeholders to address issues in transboundary basins.

III. The IWI: Origins and Objectives

The idea of an IWI was introduced by the Commission in its 1997 report, *The IJC and the 21st Century* (IJC, 1997), produced at the request of the two governments to advise them on "how the Commission itself might best assist the parties to meet the environmental challenges of the 21st Century within the framework of their treaty responsibilities." A key conclusion of the Commission was that:

In the past, transboundary water issues were often seen as localized at a specific dam or structure, or were examined as pollution problems in isolation from other factors. Experience with the Great Lakes Water Quality Agreement and the ecosystem approach [has] changed that perspective. Transboundary waters must be addressed in an integrative manner, including both biophysical and human aspects.

...the new international watershed boards would adopt an integrative, ecosystem approach to the full range of water-related issues that arise in the transboundary environment, including consumptive uses, diversions and effects of air deposition and volatilization on water quality.

In their meeting on March 10, 1998, the U.S. Secretary of State and the Canadian Minister of Foreign Affairs "welcomed the recommendations of the report, and accepted in principle the proposal to establish international watershed boards that would adopt an integrated, watershed approach to transboundary watershed issues." In a letter (Reference) dated November 10, 1998, the two governments asked the IJC, in consultation with relevant stakeholders, to "further define the general framework under which watershed

boards would operate", to make detailed recommendations on the location, structure and operation of the first watershed board, and to identify and plan for additional watershed boards.

In response to the charge from the two governments, the IJC worked to develop the watershed concept, taking into account the views of a broad array of interests at the local, provincial/state and federal levels. The results of this effort were presented in two IJC reports. The first of these, *Transboundary Watersheds* (IJC, 2000a), noted widespread interest and support for a watershed approach. It reported the amalgamation of pre-existing IJC boards with water quantity and water quality responsibilities in two watersheds (Red River and St. Croix River watersheds), and ongoing steps to combine the boards in two other basins (Rainy River and Souris River). It announced plans to strengthen the Red River Board, to continue working with provincial and state bodies in the various watersheds, and to develop a pilot international watershed board. The Canadian and U.S. governments responded positively, and subsequently provided special funding to facilitate the development and implementation of the IWI.

In a subsequent *Discussion Paper on the International Watersheds Initiative* (IJC, 2005), the Commission focused on strengthening the capabilities of existing boards to anticipate and respond to issues by:

- employing a broader, systemic perspective;
- expanding outreach and cooperation;
- promoting the development of a common vision;
- developing a better hydrologic understanding; and,
- creating the conditions for the resolution of specific issues.

The Commission identified three watersheds as pilots for the IWI concept: the St. Croix River (New Brunswick, Maine), the Red River (principally North Dakota, Minnesota, Manitoba), and the Rainy River (Minnesota, Ontario). In 2007, the Souris River (Saskatchewan, North Dakota, Manitoba) was added to the list of pilot boards. These watersheds were considered the most promising for the development of the IWI because they already had effective IJC boards working with local organizations and interests, and because they were seen to face a range of intermediate- to long-term challenges that could emerge as cross-border issues if not resolved locally at an early stage.



Announcing the IJC's first international watershed board are Commissioner Jack Blaney, Board Co-chairs Colonel Curtis Thalken and Bill Appleby, Commissioner Irene Brooks and Commissioner Allen Olson.

IJC Commissioners and staff have been working to strengthen the capacity of the IWI boards, providing catalytic funding for selected projects involving activities such as developing harmonized transboundary watershed maps and geographic information system (GIS) data; modelling river and reservoir hydraulics; and expanding outreach to the public. For the 2005-2012 period, the two federal governments have provided or pledged a total of nearly \$4 million, in roughly equal shares. This funding has allowed the IJC to support over 30 projects in the four pilot areas. Examples and statistical summaries of these projects are provided in subsequent sections.

Of the IWI boards, the St. Croix River board has made the greatest progress so far, and in April 2007 was designated the first full-fledged international watershed board.

The IJC is exploring ways to progressively expand the watershed approach, where suitable, along the entire length of the border. The Commission believes that more can be done to strengthen local participation, foster a more strategic approach, share information and lessons learned, and accelerate the pace of implementation. These and other questions were discussed by Board members, IJC Commissioners and staff, and other stakeholders at two International Watersheds Initiative Workshops, held in Vancouver, British Columbia, on March 18-19, 2008, and in Ottawa, Ontario, on October 27, 2008 (IJC, 2008a; IJC, 2008b). These discussions contributed to the IWI framework and operating principles that are outlined in this report.

What Are IJC Boards? The IJC has established various boards and task forces, consisting of experts from Canada and the United States, to help it carry out its responsibilities. Some boards have a mandate to oversee operation of a dam according to specified procedures. Others have the responsibility to monitor and advise on water quality issues. Under the IWI, there has been an effort to merge or consolidate boards with responsibility for water quantity and water quality issues in the same geographic region. Currently there are 21 active boards and task forces. A full list is provided at:

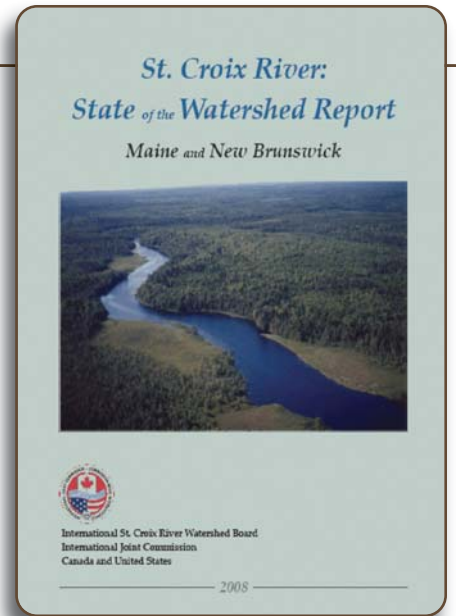
http://www.ijc.org/en/boards/boards_conseils.htm.

IV. Some Key Accomplishments by the IWI Boards

St. Croix River. The International St. Croix River Watershed Board became the IJC's first international watershed board in April 2007. Recent accomplishments include: development of a GIS Atlas of the Watershed; application of a reservoir simulation model (ResSim) and a rainfall-runoff model (HEC-HMS) to study hydrological processes in the basin; merging data from Canada and the U.S. to develop a seamless, harmonized set of watershed boundaries and watershed stream networks; and preparation of a State of the Watershed Report that summarizes available information on the basin for a broad audience (see inset). The Board has taken a leadership role in promoting and disseminating scientific information regarding the management of migratory river herring (alewife), thus contributing to the partial reversal of Maine legislation that blocked fishways on the St. Croix River. It also recently brought together local and state/provincial authorities to exchange information on efforts to eliminate combined sewer overflows (CSOs). With many initial projects at or nearing completion, the board is developing a five-year action plan to build on work thus far. Future board-supported efforts may include additional data/map products and organization of forums on topics of interest on both sides of the border.

State of the Watershed Report:

The International St. Croix River Watershed Board guided the preparation and release in October 2008 of a State of the Watershed Report for the St. Croix Basin (IJC, 2008d). This was the first attempt in this area to compile information from both sides of the border into an integrated report on environmental indicators and trends. The report highlighted positive conditions and trends, particularly in the upper reaches, but also spotlighted problems in the more densely populated downstream areas and emerging issues of concern. It has provided citizens' groups, local, provincial/state and regional officials and other stakeholders an overview of trends in: socioeconomic factors; land use; water quality and quantity; water uses; fish, wildlife and vegetation; air quality; and, climate. The report serves as a basis for continued efforts by the board to address issues of concern in the basin, including the persistence of combined sewer overflows in both Maine and New Brunswick.



Red River. The International Red River Board has continued its focus on the factors that affect the water quality, water quantity, water levels and aquatic ecological integrity of the Red River. It has been instrumental in addressing environmental issues arising from the diversion of water from Devils Lake into the Red River watershed (see inset). The board has proposed a process for setting nutrient objectives for the Red River at the international boundary, with the

long-term aim of addressing nutrient loading issues in the river and Lake Winnipeg. The board outlined a proposed multi-year framework for the development and implementation of water quantity apportionment procedures. It formed a task team to plan and oversee hydraulic modelling efforts to help understand and alleviate episodic flooding problems in the lower Pembina River basin.

Red River Flooding: Major flooding in the Red River basin in 1997 caused nearly \$5 billion in damage and disrupted the lives of over 100,000 people in Manitoba, Minnesota and North Dakota for many months. The IJC, in its report, *Living with the Red* (IJC, 2000b), outlined the steps required to reduce flood impacts in the basin. The International Red River Board has played a significant role in coordinating the implementation of those recommendations. In October 2003, the board completed a basin-wide survey, titled *Flood Preparedness and Mitigation in the Red River Basin*. It contributed to the IJC's 2005 Comprehensive Flood Mitigation Plan, and remains engaged in the development of what is now called the Comprehensive Flood Mitigation Strategy, including work on an inventory of flood mitigation activities and their status. Work is currently underway to develop a tracking system to monitor progress on these important recommendations. Actions undertaken in the basin by governments, non-governmental organizations and individuals have already significantly reduced the vulnerability to flooding, as demonstrated by the diminished impact of a high-flow event in 2006.

Devils Lake Parasites and Pathogens: The International Red River Board (IRRB) has helped defuse contentious issues surrounding the construction of an outlet to divert rising water from the historically isolated Devils Lake basin in North Dakota into the Red River watershed. The board organized and is overseeing an impartial, binational scientific survey of fish pathogens and parasites in the Devils Lake and Red River basin – most likely the largest study of fish health ever conducted in North America. This is helping to address concerns about the possibility of ecological harm from introduction of species from one basin to another. Three years of field collections (2006-08) have been completed, and samples are currently being analyzed. In 2009 the IRRB will oversee a scientific risk assessment based on results obtained from the study.

Rainy River/Lake. In the Rainy River basin, the IJC works with two closely linked boards – with responsibility for water quantity and quality, respectively – to build watershed capabilities through improved understanding of the hydrology and hydraulics of the system and broader engagement with local stakeholders. In 2006 and 2007, with IJC funding, cross-sectional surveys and floodplain LIDAR mapping of 138.2 km (85.9 miles) of the river between International Falls/Fort Frances and the confluence with Lake of the Woods were completed. The resulting data contributed to the development of a hydraulic model of the main stem of the river and its flood plain. Responding to the boards' expressed concerns about the ability of resource agencies to continue monitoring the ecological and socio-economic impact of dam operation rules, the IJC created the 2000 Rule Curve Assessment Workgroup in October 2007. In a separate, noteworthy application of a participatory, watershed approach, the two Rainy River boards established an informal work group with relevant stakeholders to develop a cooperative mechanism to balance needs for hydropower with ecological requirements during the spring fish-spawning period (see inset). In April 2008, the two boards indicated to the Commission their support for a proposed merger and the expansion of their mandate to include water quality issues in Rainy and Namakan lakes and Lake of the Woods, while noting that a number of questions and issues would first need to be addressed.

Souris River. In April 2007, the International Souris River Board, which combines the ongoing responsibilities of the former International Souris River Board of Control and the Souris River aspects of the former International Souris-Red Rivers Engineering Board, was designated a pilot International Watershed Board. A work plan and organizational structure for the newly formed board are under development. The board has expressed strong support

for the implementation of an Integrated Hydrologic Basin Mapping Initiative for the Souris watershed, modelled after the St. Croix digital mapping effort. It has initiated a project with IWI funding to develop an information bulletin describing the hydrology, water quality and water management challenges in the Souris River basin, with an explanation of the board's mandate, role and principal contacts, and a directory of water management agencies in the basin.

Minimizing Hydropower Impacts on Fish Spawning:

The Rainy boards, working closely with dam operators and provincial, state and federal agency representatives, successfully concluded an agreement to limit fluctuations in water flows driven by variations in demand for electricity – “peaking” and “ponding” – from hydropower facilities at Fort Frances - International Falls, in order to minimize adverse environmental impacts. In 2006, the boards convened an informal work group to design and establish an informal process to balance hydropower needs with fish spawning needs during the spring spawning period on a two-year trial basis. The work group agreed on an annual 2½-month spring spawning window during which no hydropower peaking would take place for 2007 and 2008. The general start and end dates for this window were April 15th to June 30th, but the dates can be adjusted to reflect the actual timing of the walleye and sturgeon spawning and incubation.

V. Potential Interest and Activities in Other Basins

Although the focus of the IWI has been on the four identified IWI watersheds, the Commission has remained open to opportunities to strengthen a watershed approach in other transboundary basins.

Osoyoos Lake/Okanagan River.

The International Osoyoos Lake Board of Control, established by the IJC in 1946, supervises operation of Zosel Dam. As presently structured, the board is concerned with water levels and flows and compliance with the Commission's Orders of Approval. There is no permanent, ongoing mechanism to address water resource issues in a basin-wide, integrated fashion that takes into account concerns and interests on both sides of the border. In 2007 there was evidence of growing local interest in expanding cooperative transboundary watershed efforts in the Osoyoos Lake/Okanagan River basin. The Osoyoos Lake Water Science Forum – prepared and carried out largely by board members and interested scientists, regional officials, Native American participants and others – highlighted the need for binational watershed planning, the importance of harmonized basin mapping and data-sharing, and a general interest in maintaining momentum and expanding cross-border dialogue. Further discussion took place in October 2008 at the "One Watershed – One Water" regional conference in Kelowna, B.C., organized by the Canadian Water Resources Association and the Okanagan Basin Water Board, where the IJC presented a paper outlining the potential of an IWI approach (Blaney et al., 2008).

Lake Champlain. Since 2004, the governments of Canada and the United States have asked the IJC to facilitate and coordinate specific tasks aimed at addressing water quality issues in Missisquoi Bay, which is the northeastern transboundary extension of Lake Champlain. The Commission does not have a longstanding board or presence in the Missisquoi basin, but – working with local partners such as the Province of Quebec, the State of Vermont, and the Lake Champlain Basin Program – it is open to exploring ways it can contribute to an integrated watershed approach. In September 2008, the IJC established the International Missisquoi Bay Study Board to provide advice on a project under a Reference from Canada and the United States to identify critical source areas of phosphorus loading in the Vermont portion of the basin, to complement work undertaken in Quebec.

St Mary/Milk Rivers. A dispute between Alberta and Montana over apportionment of water in these adjacent rivers, which are linked by an irrigation canal, dates back more than a century. It is one of the specific issues mentioned in the Boundary Waters Treaty, and has resurfaced from time to time. Apportionment has been carried out by accredited officers under an IJC Order. This is a situation where a watershed approach that empowers local people and involves appropriate levels of government can offer substantial benefits. Following public meetings in the basins in 2004 and the completion of an Administrative Measures Task Force, the IJC encouraged Alberta and Montana to enter into a high-level dialogue regarding the use and management of the shared waters. This has contributed to the creation in November 2008 of a broad-based Water Management Initiative between Montana and Alberta.

Flathead River. The North Fork Flathead River originates in southeastern British Columbia and flows into Montana, where it joins with other tributaries that are part of the Columbia River basin. Proposals for energy development in the river's headwaters have raised concerns on both sides of the border. The IJC was asked to address one such dispute in the 1980s. The Commission believes that a watershed approach could help prevent or resolve ongoing and future issues in the basin.

Alaska/British Columbia/Yukon Area. With increased development in river basins in this area, the potential for disagreements and the need for a watershed approach increases.

The Great Lakes. The Great Lakes Water Quality Agreement of 1978 calls for an ecosystem approach, but it is generally conceded that initiatives to advocate for and apply it in this region are in their infancy (GLIN, 2009). The vast extent and complexity of this system, which contains about 84% of North America's surface fresh water, pose difficult environmental and management challenges. Lessons learned in the much smaller IWI basins may provide useful insights and approaches that may, in the course of time, be scaled up and implemented in the Great Lakes context.

VI. A Framework for the IWI

The Commission, working closely with its boards, has developed a framework that spells out a shared understanding of:

- (1) an ecosystem approach,
- (2) a list of priority areas for action and emerging issues,
- (3) IWI operating principles, and
- (4) a clearer and more strategic process for organization and management of IWI boards and IWI-funded projects.

These elements of the IWI framework are described in the sections that follow.

VII. An Ecosystem Approach

Underlying the IWI is the fundamental understanding that dealing effectively with environmental issues at the border requires an ecosystem approach. According to one definition (WRI, 2000), an *ecosystem approach* “broadly evaluates how people’s use of an ecosystem affects its functioning and productivity”, and:

... is an integrated approach that considers the entire range of goods and services that can be derived from the environment and that attempts to maximize the mix of benefits.

... recognizes that ecosystems function as whole entities and should be managed as such, looking beyond traditional jurisdictional boundaries.

... takes a long-term view, considering impacts and benefits as they play out over decades and affect future generations.

... integrates economic and social information with environmental data, explicitly linking human needs to the capacity of ecosystems to fulfill those needs.

... maintains the productive potential of ecosystems, seeking to preserve or increase their capacity to produce desired benefits in the future.

Applying an ecosystem approach entails action in several areas:

- acquiring accurate knowledge of the current condition of ecosystems and how they function, allowing us to see the trade-offs we are making when we make management decisions.
- setting an explicit value on ecosystem services, so that these can be factored into planning processes.
- engaging in a public dialog on trade-offs and management policies; and,
- involving local communities in managing ecosystems.

In the water sector, this approach has also been referred to as integrated water resources management (CWRA, 2004; Environment Canada, 2005).

VIII. Priority Area for Action: Hydro-graphic Data Harmonization

An essential, early step in fostering an integrated ecosystem approach in any basin is the development of a better understanding of the watershed. This requires consistent, coherent and compatible data that cover the area seamlessly, notwithstanding the international boundary. Under the IWI, the IJC has since 2005 supported work to produce consistent and comparable geographic data sets for river basins along the Canada-U.S. boundary. Over the years, each country has developed its own geographic information system (GIS) datasets, but these stop at the international border.

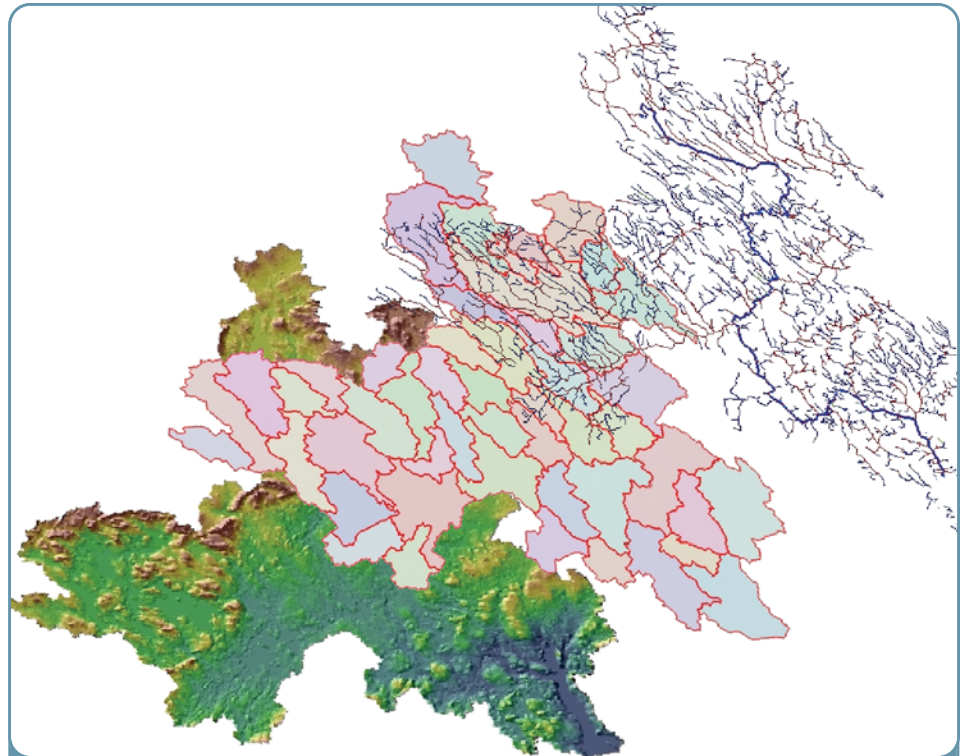
Initial attempts to splice the data from the two countries at the frontier have revealed various inconsistencies and anomalies: rivers and other features do not quite line up; elevation contours do not connect or are not expressed in the same units; geographic features are shown at different levels of detail and resolution; lines defining catchment areas (indicating areas where surface waters converge) do not match; and terminology for geographic features, ground cover or land use are inconsistent.

Such disconnects have hampered local efforts to develop an integrated understanding of transboundary basins. Recognizing this problem, the IJC initiated a pilot effort in the St. Croix basin to develop a “harmonized” GIS data set, in which available data from both sides of the border are melded into a single, seamless product that provides a unified picture of the watershed. Such GIS information typically begins with basic geographic features such as rivers, lakes, wetlands, but additional data layers can be added as information becomes available for political features, soil types, land use, etc.

A complicating factor is that the needed data for any basin or region have been collected and stored by a variety of different federal and state/provincial agencies in each country. It is therefore important, as a first step, to bring together representatives of these agencies to create a complete data inventory, which spells out what information is available, who has it, how it is stored, what formats, standards and definitions are used, and so on. After that, the careful work of reconciling the data and structuring it into an agreed format that best serves the needs of all interests can begin.

For the St. Croix pilot exercise, the IJC provided catalytic funding to the United States Geological Survey (USGS) in 2005-06 to produce a suite of seamless, harmonized hydrographic GIS data for the St. Croix River basin. Responding to provincial and state requirements, the USGS, working with the active cooperation and financial and in-kind contributions of the U.S. Army Corps of Engineers and the New Brunswick Department of Environment, recommended a focus on the synchronization of drainage area accounting units (topographically delineated watersheds with unique addressees) and the harmonization of all the hydrographic features such as water bodies, lakes, reservoirs, streams and rivers. Once the appropriate technical people were identified, the New Brunswick Department of Environment hosted three harmonization workshops, involving local experts from both sides of the border.

The harmonization workshops encouraged a hands-on approach, where all participants contributed their expertise. Building on published hydrographic data from New Brunswick and Maine, workshop participants were able to agree on common watershed interpretations, address assignments and naming protocols. The resulting harmonized hydrographic data layers include a seamless layer of topographically based drainage areas – the International



A staggered view of three data layers from the harmonized St. Croix River basin dataset, showing elevation, sub-basins and stream network.

Watershed Boundary Dataset (IWBD) – and a synchronized hydrographic dataset that includes all the water bodies, lakes, reservoirs, streams and rivers – the International Hydrographic Dataset (IHD). These data sets provide a basic framework, to which maps and data products can be added in response to local needs.

Now, for the first time, managers and planners on both sides of the border are able to speak the same language and share the same data and analytical tools with regard to the geological and hydrological features of the St. Croix watershed. This is valuable for long-term planning, and can also facilitate a coordinated response to possible incidents such as a chemical spill or flooding event. Local participation in the creation of the data sets and local stewardship and maintenance of the data are essential to the success of this approach. Local and provincial/state entities may also need some assistance and encouragement to make optimal use of harmonized data; efforts along

these lines are underway in the St. Croix basin. The IJC is not in the business of creating or warehousing GIS data, but can help the relevant state, provincial and federal partners come together to develop data sets that meet their needs.

Using the St. Croix experience as a model, the IJC plans to extend this approach to GIS data harmonization to other basins. The eventual aim is to stimulate the harmonization of GIS layers across the entire Canada-U.S. frontier. This is already starting to happen; for example, agency partners in the Maine-New Brunswick region are, of their own accord, undertaking a harmonized approach to the St. John River watershed.

The focus here is at the watershed/basin level, but such efforts need to fit into the broader national-level framework of hydrographic and topographic data and maps. In July 2008, the IJC therefore convened the Transboundary Hydrographic Data Harmonization Task Force (THDHTF) to promote the coordination of data harmonization efforts of resource agencies at the federal level. Representatives of Agriculture and Agri-Foods Canada, Environment Canada, Natural Resources Canada, the U.S. Environmental Protection Agency (EPA), and the U.S. Geological Survey (USGS) participated. This activity is viewed by all participants as being in their mutual interest and as responding to a shared need. The task force agreed on the goal of completing, by March 2010, the following tasks:

- harmonization of water-related geospatial datasets at a resolution suitable for local water resource planning and management along the boundary;
- preparation of technical guidance and documentation of ongoing and future harmonization activities;
- incorporation of the harmonized data into the participating agencies' respective geospatial programs and databases;
- building a shared and sustainable data dissemination plan for all the harmonized data products; and
- encouraging the development of applications and best practices to help others use the harmonized data effectively.

Responsibility for this work rests with the individual agencies, but the IJC served as a catalyst, bringing together the relevant technical experts and water managers. The data harmonization initiative, the IJC believes, will hasten the day when border communities concerned about water quality, availability and use will have access to seamless maps and data, for an integrated picture of transboundary watersheds. To reach this goal, the IJC will need to depend on geospatial expertise that resides within the organization and that remains available to advise and direct GIS-related work of the IJC and its boards in a continuous manner over a period of several years. Thus far, the IJC's GIS capacity has been derived on an intermittent and ad-hoc basis from temporary detail assignments and contracts. While there are costs to developing in-house geospatial data management expertise, failure to absorb and integrate state-of-the-art mapping and GIS technologies may entail far greater costs in terms of inefficiencies and ineffectiveness in developing and applying integrated, ecosystem approaches in the transboundary environment.

IX. Other Activities to Improve Understanding of Transboundary Watersheds

Under the IW, the IJC, with the support of the Canadian and U.S. governments, has promoted various other activities to improve local scientific knowledge and understanding of transboundary basins. Among these is the development of hydrological models – computerized conceptual representations or simulations of the movement and flow of water into, through and out of watersheds. These models can be useful to local communities in efforts to predict flood and drought risk, to reduce their vulnerabilities to such events, to enhance operation of dams for water supply, navigation, hydroelectric power generation, recreation, environmental benefits such as riparian restoration projects, to manage agricultural productivity, to predict geomorphologic changes such as erosion or sedimentation, and to assess the impacts of natural and anthropogenic environmental change on water resources.

Other activities supported by the initiative include: collection of basic hydrologic, water-chemistry and biological data; analyzing trends in water quality; developing protocols and methodologies for environmental monitoring; analyzing regulatory frameworks and legal regimes governing water resources; and preparing reports and maps to increase public knowledge and awareness of watershed issues.

X. Emerging Issues

The Commission has identified two areas that have until recently received only limited attention by IWI boards and that require added emphasis. These are:

- (1) climate change and vulnerability, and
- (2) the interaction between water quality and human health. Both topics were discussed at the IWI Workshop held in October 2008.

Climate Change and Vulnerability

The International Upper Great Lakes Study has reviewed climate trends and recent scientific studies affecting its area of interest. Although this is a complex subject with many assumptions and caveats, the emerging scientific consensus (Moin, 2008) seems to indicate that the border area may experience significant climatic changes in the coming decades, with predictions of:

- warmer temperatures year-round, particularly in winter;
- increased precipitation overall, with wetter winters and springs and drier summers;
- in general, increased runoff and increasing drought;
- changes in ground water;
- lengthened growing season and freeze-free season;
- more rainy and fewer snowy days; and,
- shifts in ecosystem boundaries.

The effects of various climate scenarios on levels and outflows from the Great Lakes have been modelled. Possible effects of a changing climate in IWI basins have received little attention to date, but the models developed for the Great Lakes will be available for other boards. The Rainy River Board would certainly benefit from this, given their proximity to the Great Lakes. Some IWI boards are reporting greater climate variability in recent years; others are seeing noticeable trends.

An important question is whether existing IJC regulation plans are sufficiently robust to take into account potential predicted changes in climate. Traditional water management agencies assume nature is stationary. However, with mounting evidence of change occurring and the dramatic potential for future change, many prominent hydrologists are questioning the assumption of stationarity (Milley et al. 2008). IJC directives generally do not explicitly mention climatic change, but the issue does appear in the founding documents for the IWI in the list of emerging challenges that argue for adopting a more comprehensive watershed approach to transboundary basins. The foregoing considerations suggest that IWI boards need to give this issue more attention in their strategic planning process.

Water Quality and Health

The IJC's Health Professionals Task Force (HPTF), has been evaluating human health challenges for transboundary watersheds. The Task Force has identified several key challenges:

- emerging chemicals such as pharmaceuticals;
- local loadings of persistent toxic substances;
- eutrophication and harmful algal blooms;
- changes in recreational water quality;
- surface and groundwater quality for drinking water; and,
- effects of urban sprawl.

These have received some attention in the Great Lakes context, but have not featured prominently thus far in the thinking of the IWI boards. A preliminary HPTF scoping exercise in 2008 focused on three predominantly rural transboundary watersheds (Red, St. Croix, Souris) found that:

- (1) data are located in many places,
- (2) public health responsibility is exercised differently on each side of the border,
- (3) public health and water quality jurisdictions are generally not linked, and
- (4) the capacity to respond to a disease outbreak or emerging public health threat has not been tested.

These findings suggest a need for more emphasis on the link between water quality and health, and that comprehensive watershed management strategies need to anticipate health problems.

HPTF members are working now with several boards to develop project proposals for consideration and funding under the IWI.

XI. Organization and Management of the IWI

Extensive discussion and consultations with IWI boards, including two workshops held in March and October 2008, have contributed to an evolution in the Commission's thinking about the operating principles and institutional framework for the IWI. The emerging concepts on which there is substantial agreement among the current IWI boards are outlined below.

Operating Principles

The fundamental aim of the IWI is to facilitate watershed-level solutions to transboundary environmental challenges by promoting communication, collaboration and coordination among the various stakeholders and interests, using an integrated, ecosystem approach.

This effort is informed and guided by the IJC's tradition and spirit of independence, impartiality, openness, binational participation, consensus-seeking, while respecting existing treaties, orders and jurisdictional authorities.

Each watershed is unique. Effective, lasting solutions to issues must recognize the local context and specificities, and cannot be imposed from the outside. The emphasis in the IWI is on facilitating, fostering and enabling local action, rather than controlling and directing it (with the exception of areas where the governments have given the IJC an explicit mandate to carry out a controlling or regulatory function). The underlying premise is that local people, given appropriate assistance, are best positioned to resolve many local transboundary problems. Strengthening local capacity can help avoid transborder disputes or facilitate their resolution.

Members of the current and pilot international watershed boards see the following activities as central to their mission:

- *building a shared understanding of the watershed by harmonizing data and information, developing shared tools, sharing knowledge and expertise, expanding outreach to and cooperation among stakeholders;*
- *communicating watershed issues at all levels of government in order to increase awareness;*
- *contributing to the resolution of watershed issues by facilitating discussions, participating in development of shared solutions, creating technical tools, fostering development of common ground, brokering resolutions, and bringing unresolved issues to IJC attention; and,*
- *administering existing orders and references from the two governments, recognizing that these might need updating.*

Organization and Coordination of International Watershed Boards

There is broad agreement that each international watershed board needs to chart its own course (within the constraints of the IJC's mandate from governments), responding to local circumstances and needs. Each board needs balanced representation and expertise. In some cases that expertise may reside outside the board membership. Taking on an integrated, ecosystem approach may require enlargement of some boards that previously had more narrowly defined functions; but boards should not become so large that decision-making becomes bogged down and accountability is

diluted. Specialized committees, each focused on a subset of board issues, may offer a mechanism to compensate for possible downsides of board enlargement. Consideration may also need to be given to separating or compartmentalizing strictly regulatory and oversight functions (e.g., implementation of the rule curves for a dam) that involve technical decisions requiring prompt attention.

By IJC tradition, newly appointed board members are advised that they serve the Commission "in their personal and professional capacity, and not as representatives of their agencies or employers". This allows them to carry out their board functions impartially, speaking freely and weighing issues on their merits, without engaging their parent agencies/employers. Nevertheless, most current board members are in fact employees of government agencies that have important roles in overseeing, regulating or managing the river basin in question or its infrastructure, and so they bring the perspective of their agencies (and their knowledge, contacts, influence and potential resources) to the board table at least in an informal sense. The fact that board members wear multiple hats may create some ambiguities to those less familiar with the process, and in extreme instances may require members to recuse themselves from specific board discussions; but on the whole the ability of Board Members to act in their personal and professional capacity is beneficial.

Public involvement has been a hallmark of IJC boards, but in many cases that involvement has been limited to perfunctory scheduling of one or two public board meetings per year – meetings that might or might not be well attended. In transitioning to a more integrated, ecosystem approach, it may be desirable to consider further diversifying the membership of boards in order to bring in local knowledge and expertise and linkages to citizens' groups and other interests in a more meaningful way. The advantages of such a diversification would need to be weighed against the risks of politicizing or polarizing board deliberations.

The transition to a watershed approach also risks overloading a board with a multiplicity of tasks and activities. Careful planning and prioritization of board activities will become increasingly important.

Resources for International Watershed Boards

The 1998 Reference from the two governments that gave the green light to launch the IWI asked the Commission to provide "cost projections and *possible sources of funding, including innovative funding mechanisms*" for the task of forming the first international watershed board and carrying out any special studies that would be anticipated in the first years of operation. They further specified that the IJC and governments should be "guided by the principle that forming and operating the new board shall entail *the least possible requirement for new resources.*" Also, they asked that the IJC "initiate its work on these tasks *drawing on resources from its current reference levels*" and they encouraged the Commission to draw on existing available expertise, data and technology, and to draw upon and complement existing initiatives (emphasis added throughout).

The above stipulations made clear the governments' initial intention that the IWI effort not become a major new program with a substantial new funding stream. It should be noted, furthermore, that the IJC does not have a budget line item for the operation of any of its boards. (The participating agencies use their own funds to cover the involvement of their staff in board activities.)

The Commission has sought to make a virtue of these necessities and constraints. The IWI would not become a cumbersome, costly or intrusive and expanded bureaucracy. Rather, it would be a light, catalytic mechanism to encourage, promote, and help coordinate a watershed approach in transboundary basins, working by and large through and with existing and ongoing structures, activities and budgets. That, the Commission believes, has been the IWI's strength, and on that strength it proposes to build, incrementally and modestly, to help the two countries resolve environmental and water-related issues along the common border.

Notwithstanding the limited resource expectations at the outset, the governments came forward in subsequent years with modest, targeted funding – approximately \$2 million in commitments or expenditures from each side between 2005 and 2012 (see Table 1). These funds tended to be unpredictable at first, and remain subject to the vagaries of the national budget processes in each country. This made it necessary for the Commission to adopt a somewhat ad-hoc, opportunistic approach to the designation and funding of projects under the IWI. Nevertheless, it was possible to support a substantial number of projects, many of which have been completed and produced tangible reports, maps and analytical results of substantial benefit to the basins in which they were carried out.

Table 1: Resources for IWI Projects

Fiscal Year	USA (US\$) ¹	Fiscal Year	Canada (CDN\$) ²
2005	\$ 325,000	2004-2005	\$ -
2006	\$ 965,000	2005-2006	\$ -
2007	\$ 696,000	2006-2007	\$ -
2008	\$ -	2007-2008	\$ 487,000 (-\$216,503)
2009	\$ -	2008-2009	\$ 381,000 (+\$216,503)
2010	\$ -	2009-2010	\$ 574,000
2011	\$ -	2010-2011	\$ 158,000
2012	\$ -	2011-2012	\$ 352,000
TOTAL	\$ 1,986,000	TOTAL	\$ 1,952,000

¹ Excludes Lake Champlain

² Re-profiled \$216,503 from 2007-2008 to 2008-2009

Toward a More Strategic Approach

Now that the IWI has matured and undertaken some significant work (See Table 2 and 3), the time seems ripe for a new phase. The Commission therefore announced, in mid 2008, a new approach designed to enhance transparency and accountability in the submission, evaluation, selection and implementation of projects. Henceforth, IJC boards will be the prime initiators of project requests that fit within each board's prioritized work plan. Projects should contribute to a watershed approach and the overall objectives of the IWI. The project proposals will be screened and evaluated by IJC staff against clearly articulated criteria. Staff will then make their recommendation to the Commissioners. Projects will be monitored by staff while they are being implemented, and the results will be evaluated. The enhanced openness and accountability will, it is hoped, establish a track record that will demonstrate the utility and benefits of a watershed approach.

Results from the first tranche of proposals handled under the revised procedures were encouraging. In mid-September, 2008, the IJC approved 10 proposals for projects under the IWI amounting to \$545,724 (CDN). The proposals were submitted over the summer by IJC boards covering the Rainy, Red, Souris, St. Croix and Osoyoos basins, with the aim of helping to implement an integrated, ecosystem approach in their respective transboundary watersheds. The review committee was impressed by the response. Of the proposals approved, most were accepted as is, with some approved provisionally pending minor modifications or further consultations. In their diversity and variety, the successful proposals demonstrated how each board has identified and acted on its own priorities in response to local needs and challenges.

Table 2: Examples of U.S. Funded Projects

2005-2006 (US\$)		
Cost	Title	Lead
\$ 16,627	St. Croix River: Pilot Project for Cross-Border Mapping	U.S. Geological Survey
\$ 40,000	Red River: Nutrient and Ion Data Studies	International Water Institute
\$ 31,000	Red River: Structural Inventory of the Lower Pembina River Basin	Red River Basin Commission
\$ 93,000	Rainy River: Hydrologic Data Collection	U.S. Geological Survey
\$ 261,109	Devils Lake and Red River Basin: Fish Parasite and Pathogen Monitoring Program	U.S. Fish and Wildlife Service
\$ 4,313	Red River: Report and Flyer on Water Regulation Jurisdictional and Policy Issues	Red River Basin Commission
\$ 192,000	St. Croix River: Rainfall Runoff Model	U.S. Army Corps of Engineers
\$ 264,000	Rainy River: Flow Hydraulic Models	U.S. Army Corps of Engineers

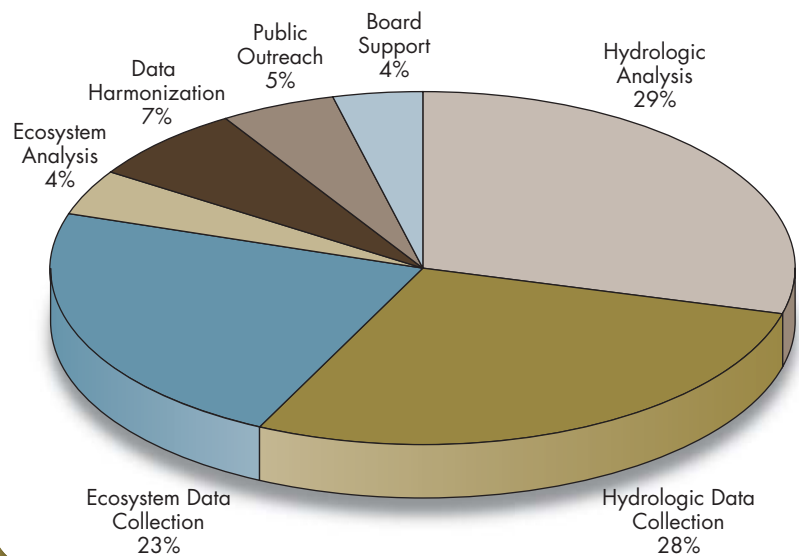
Table 3: Examples of Canadian Funded Projects

2007-2009 (CDN\$)		
Cost	Title	Lead
\$ 28,000	Red River, Pembina River: Refinement of MIKE 11 Hydraulic Model with New Data Sets	Prairie Farm Rehabilitation Administration
\$ 15,000	Rainy River: 2000 Rule Curve Assessment Workshop	Ontario Ministry of Natural Resources
\$ 15,000	Red River: Statistical Analysis of Trends in Water Quality at the International Boundary over a 45-year Period	University of Manitoba
\$ 24,500	Red River: How Are We Living with the Red?	Robert Halliday & Associates
\$ 24,500	Literature Review of Apportionment Procedures on the Red River	Rob de Loe Consulting Services
\$ 177,724	Devils Lake and Red River Basin: Fish Parasites and Pathogen Survey	Environment Canada, Fisheries and Oceans Canada
\$ 25,000	Souris River: A Watershed Backgrounder for the International Souris River Basin	Canadian Environmental Assistance Consultants
\$ 9,800	St. Croix River: Developing a Land Cover Tool (Impervious Surface Analysis) for Integrated Planning	St. Croix Waterway Commission

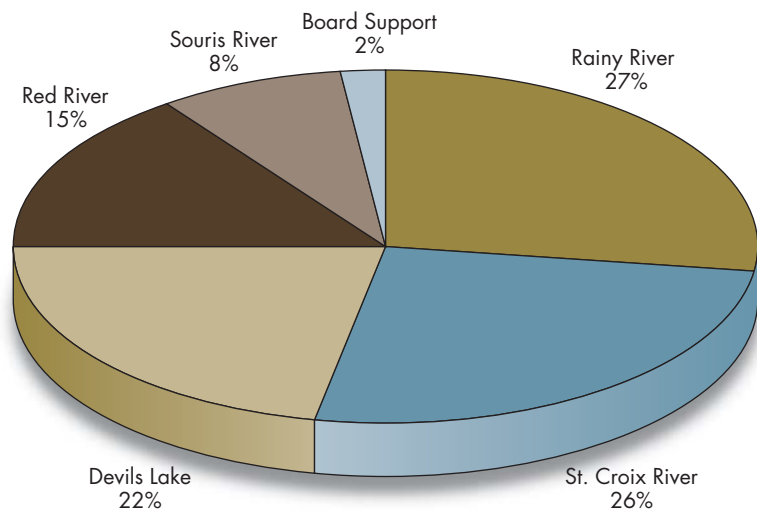
While committed to a grassroots, bottom-up approach to IWI projects, the Commission recognizes that it is also necessary to look in the aggregate at the kinds of activities that are being supported and where along the border they are taking place. The pie charts below provide an indication of how resources have been allocated. We caution that these figures are only approximations. Some IWI contracts involved multiple activities, but they were categorized by the main type of work involved. Also, governments chose to fund some projects through the IWI in certain years, but through alternative mechanisms in other years; hence the totals shown here may not accurately reflect the full range of IWI-related activities that took place. Nevertheless, the charts show that, during the 2004-08 period, more than 57% of IWI resources went to hydrologic data collection and analysis; 27% ecosystem data collection and analysis; and, the remainder into data harmonization, public outreach and board support. As the IWI matures, it would seem desirable that there would be a decreasing emphasis on data collection (currently 51%), with a corresponding increase in analytical work (currently 33%).

Regarding the allocation of resources by basin, the bulk of funding has gone to the Rainy River, the St. Croix River, and Devils Lake (overseen by the International Red River Board). The Red River system and the Souris basin have received a lesser proportion of funds thus far. This pattern mirrors in part the priorities expressed by the two governments. It also reflects the evolution of the IWI since 1998, with the boards or basins identified earlier having received more funds than more recently designated IWI boards. That said, it is instructive to continue tracking the geographic dispersion of IWI funds to ensure a certain equity in breadth of coverage, as well as continued responsiveness to priority issues and areas.

IWI Projects 2004-08 by Activity



IWI Projects 2004-08 by Basin



XII. Key Findings

An assessment of its experience with the International Watersheds Initiative since its inception 10 years ago leads the Commission to the following conclusions:

1. *The watershed approach is an effective approach.* Taking an integrated, ecosystem approach to transboundary waters by improving scientific knowledge and strengthening capacity at the local level is effective, practical and intellectually sound.
2. *The watershed approach is already paying important dividends.* This has been amply demonstrated by the accomplishments of the IWI boards in recent years, as documented in this report.
3. *Emerging challenges and threats make a watershed approach increasingly necessary.* Population shifts, urbanization, enhanced mobility, increasingly globalized commerce, and climate change are placing new pressures on water resources along the international border. Responding to these challenges will require enhanced mechanisms for binational cooperation and collaboration at the basin level.
4. *The watershed approach can and should be strengthened.* Recent IJC efforts to enhance outreach, increase opportunities for learning and information exchange among boards, promote partnerships and increase transparency and accountability in IWI activities have been well received, and will be continued.
5. *International watershed boards can be an effective paradigm for implementing a watershed approach along the international border.* The merging of water quality and water quantity boards in, for example, the St. Croix and Red River basins has enhanced local capacity to deal with water resource issues in an integrated manner.
6. *Each transboundary basin is different, and various models or paths to a watershed approach may be appropriate, depending on the local context and circumstances.* The initial IWI focus on establishment of international watershed boards should continue, and may be expanded to other basins; but different mechanisms may be appropriate elsewhere along the border.
7. *Implementing a watershed approach is not without its challenges.* The IWI has progressed at a measured pace, starting with four pilot basins; but taking the time to share information, develop relationships and build confidence is leading to more lasting and durable results.
8. *The watershed approach as implemented by IJC is cost-effective.* By building on existing boards, linking with existing local groups, and focusing on catalytic demonstration projects, the IWI has maximized the return on investment. Much has been accomplished with limited resources.
9. *To realize the full benefits and potential of a watershed approach, modest additional investments are needed over the coming decade.* More consistent and predictable funding for IWI projects will improve boards' ability to address emerging issues. Investments in additional capacity at the IJC staff level in geospatial data management and information technology will allow the Commission to take advantage of new technologies.
10. *The watershed approach is changing the way the IJC does business.* Implementing a watershed approach along the international border entails more than just a change in emphasis and tone. It is a paradigm shift that has the potential to transform how our two countries view and manage transboundary waters. The IWI experience has reinforced a recognition of the complex interplay of economic, sociological and environmental factors that affect the quantity and quality of our shared waters. Dealing effectively with these complex interrelationships will require new ways of sharing information and data, new technologies, and a renewed commitment to involve and engage local citizens, Native Americans, First Nations, private sector, academia, provinces, states and federal agencies for a truly integrated watershed approach.

XIII. Moving Forward

In order to maintain and build on the momentum that has been generated, there is a role for various actors and institutions – the IWI Boards, the IJC and the Canadian and US governments. The recommended next steps are grouped accordingly.

International Watershed Boards:

- It is important that the boards continue to evolve according to the IWI mandate and principles that have been established, with a focus on public outreach, development of partnerships, enhancement of scientific understanding of watershed dynamics, and a coherent approach to collection and organization of relevant geospatial data.
- The boards need to explore all opportunities to leverage and obtain additional resources (people, ideas, funding) to help undertake IWI activities.
- The boards need to reach out to provincial, state and local governments, non-governmental organizations and institutions in developing partnerships and in the expansion of the board membership.

International Joint Commission:

- The Commission will continue to strengthen the existing IWI boards, helping some of them move from the pilot stage to full-fledged international watershed board status. This will involve working more closely with individual boards to help them formulate concrete, prioritized action plans. It will also entail working with the IWI boards collectively, bringing them together periodically in workshops or through information-sharing software that permit exchange of information and best practices.
- It is important that the Commission maintain a transparent and accountable system for awarding and reporting on how the IWI funds are spent and what benefits are derived from IWI activities.

- The Commission will regularly report to governments on the progress that is being made and alert the governments of any issues.
- The Commission will continue, as needed, its role as a catalyst in the harmonization of environmental data and information in the transboundary basins. In order to do this effectively the Commission is strengthening its GIS capacity.
- The Commission will work with the IWI boards to help them address emerging issues such as climate change and health effects. It will provide expertise and information from major IJC studies that are being undertaken and through the Health Professionals Task Force.
- The Commission will continue to identify and recommend other boards that may benefit from becoming an IWI board, and it will explore alternative models or mechanisms for implementing a watershed approach in basins where establishing a board is not feasible or necessary.
- The Commission will expand its outreach to provincial, state and local officials and institutions and non-governmental organizations, encouraging their participation in the IWI.

Canadian and U.S. Governments:

- The funding that has been provided by the two governments to date has made possible the accomplishments described above, but limitations in the sums that have been made available thus far and the lack of continuity have presented challenges. Sustained and effective implementation of the IWI will require a more predictable binational funding stream in the coming years. It is therefore proposed that \$1 million annually, shared equally between the two countries, be established as a base funding level for the IWI. The recent commitment from the Canadian government to increase its annual base funding to the IJC by \$1 million, starting in 2012, will make it possible to step up support for the IWI in a manner that, it is hoped, will be matched by the United States.
- The governments' continued interest in and involvement with the IWI is indispensable to the initiative's ongoing success. This includes guidance and approval with respect to the establishment of additional IWI boards and advice from federal policymakers on other mechanisms to promote an integrated approach to transboundary watersheds that responds to local needs and interests.
- Governments should encourage their respective environmental and natural resource agencies to step up their support of the IWI, by making personnel available to participate as board members or expert advisers, by providing the secretariat functions needed for smooth board operation, and by carrying out monitoring and analytical studies to provide essential baseline data and to discern and improve understanding of significant trends in transboundary basins.

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XV. Acknowledgements

The Commission wishes to acknowledge the contribution of many IJC board members to the successful development of this initiative. Giving their time and expertise while typically holding busy "day jobs", they have made the accomplishments of the past decade possible. IWV Coordinators Willem Brakel and Ted Yuzyk were lead drafters of this report, with expertise in geospatial data systems provided by Michael Laitta, and with valuable input from IJC staff in Ottawa and Washington. Funding from the two governments has made it possible to begin the task of translating the concept of an integrated, participatory approach to transboundary basins into concrete actions for the benefit of our citizens living along the international border.



Signed this 16th day of January 2009 as the International Joint Commission's Third Report to the governments of Canada and the United States on the International Watersheds Initiative.

Rt. Hon. Herb Gray
Chair, Canadian Section

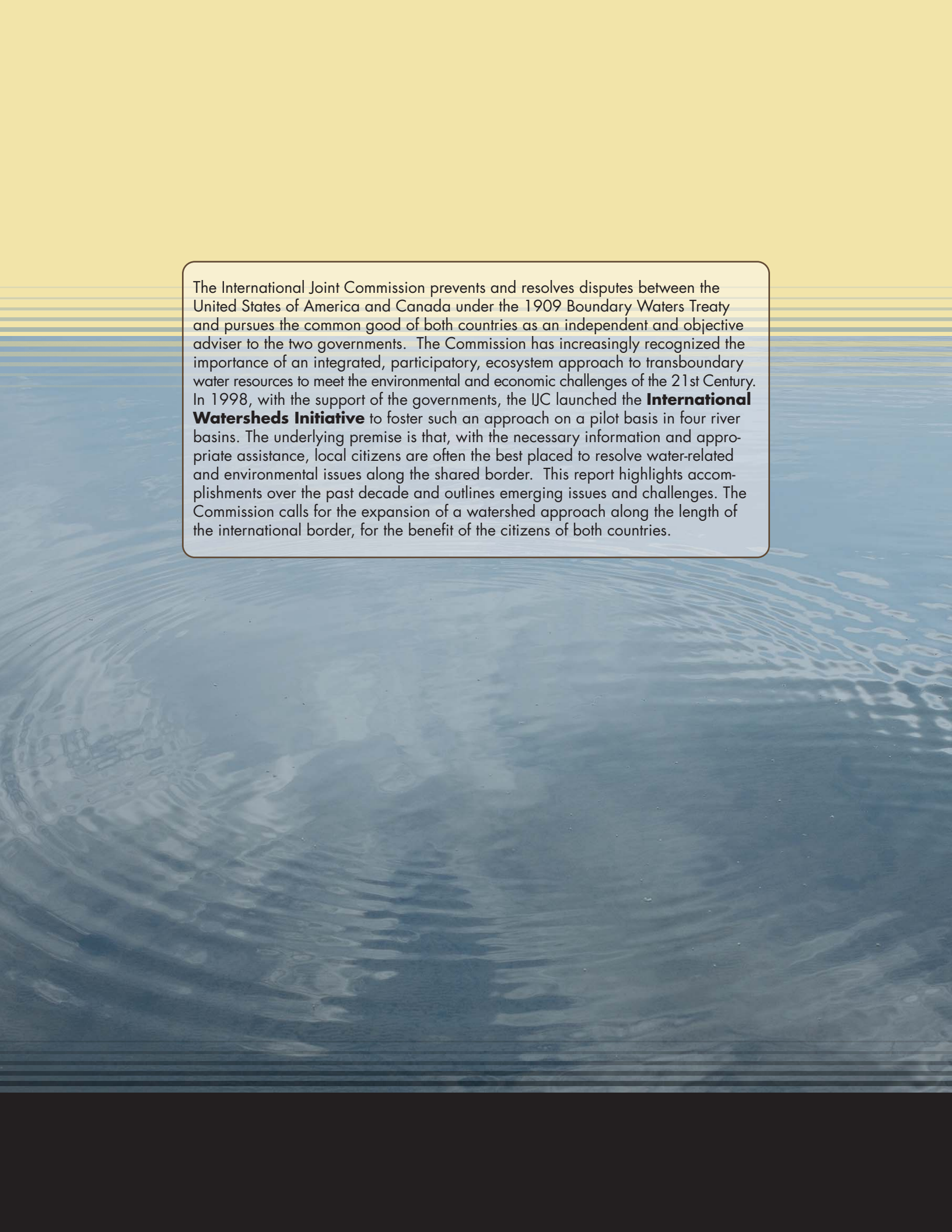
Hon. Irene Brooks
Chair, United States Section

Jack P. Blaney
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Allen I. Olson
Commissioner

Pierre Trépanier
Commissioner

Sam Speck
Commissioner



The International Joint Commission prevents and resolves disputes between the United States of America and Canada under the 1909 Boundary Waters Treaty and pursues the common good of both countries as an independent and objective adviser to the two governments. The Commission has increasingly recognized the importance of an integrated, participatory, ecosystem approach to transboundary water resources to meet the environmental and economic challenges of the 21st Century. In 1998, with the support of the governments, the IJC launched the **International Watersheds Initiative** to foster such an approach on a pilot basis in four river basins. The underlying premise is that, with the necessary information and appropriate assistance, local citizens are often the best placed to resolve water-related and environmental issues along the shared border. This report highlights accomplishments over the past decade and outlines emerging issues and challenges. The Commission calls for the expansion of a watershed approach along the length of the international border, for the benefit of the citizens of both countries.