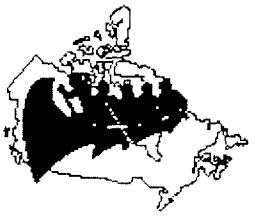
THE ST. CROIX RIVER, NEW BRUNSWICK

A DECADE IN THE CANADIAN HERITAGE RIVERS SYSTEM 1991 - 2000



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Presented to the Canadian Heritage Rivers Board

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FOREWORD

This report fulfils the requirement of the Canadian Heritage Rivers Board to review rivers designated to the Canadian Heritage Rivers System (CHRS) every ten years, or more frequently, to ensure that they continue to meet CHRS selection guidelines. This is a "ten-year" review of the condition of the section of the St. Croix River System in New Brunswick designated to the CHRS in January 1991. Since the designation of the St. Croix River to the CHRS in 1991, two important changes have occurred within the CHRS that have implications for this report.

- **Integrity Guidelines.** In 1990, new integrity guidelines were adopted by the Canadian Heritage Rivers Board for each set of nomination values: natural heritage, culture and recreation. These were modified in 1999. While the St. Croix River clearly meets the cultural and recreational integrity guidelines, in light of the five dams that control the flow of the river it would not now meet natural integrity guidelines. However, the St. Croix River's nomination for natural heritage values has been "grand-fathered" by the Board. The river's natural values are therefore addressed in this report to the extent possible given the man-made modifications to values such as seasonal flow pattern, river morphology and biotic environments.

- **National Frameworks.** National thematic frameworks were adopted by the Board between 1997 and 1998. These now provide a mechanism for organizing and classifying cultural and natural heritage values represented by rivers. They can also be used to measure the degree to which the System represents Canada's river heritage, and to identify unique or rare values that a river brings to the System. The structure of the frameworks is used throughout this report and the river's original natural and cultural "nomination values" are redefined according to the theme elements of the two frameworks. Values mentioned in the 1984 nomination document which do not fit the frameworks or which are not river-related are excluded, while others, identified through recent research, have been added. The revised list of CHRS values is contained in Section 6 of this report.

In this report, the integrity of the river is therefore assessed according to the guidelines introduced in 1990 and modified in 1999, and natural and cultural values are described and classified according to the theme elements they represent in the CHRS cultural and natural frameworks.

EXECUTIVE SUMMARY

This document reports on the condition of the natural, cultural, recreational and integrity values that are represented on the New Brunswick portion of the St. Croix River System and which are recognized as the basis for its inclusion in the Canadian Heritage Rivers System (CHRS). Changes that have occurred to these values since the river's designation in January 1991, both positive and negative, are described and the major studies, plans, events, and management actions that have affected them in the past ten years are summarized.

The section of the St. Croix River designated to the CHRS lies along the Canadian side of the international border between New Brunswick and Maine, extending from the source of Monument Brook in the north to the mouth of the St. Croix estuary in the south. The CHRS management area technically comprises the river and lakes on the New Brunswick side of the border and a corridor 76 meters wide along the shoreline. In fact, managing agencies make significant efforts within the entire watershed to manage the heritage and recreational values for which the river was nominated.

The St. Croix is an example of a working river in the CHRS, with a sizeable population located along its shores, ocean-going ships in its estuary, and industry and operating dams along much of its length. There are several key government agencies with various degrees of responsibility for managing the natural and cultural heritage and recreational values on the Canadian side of the river, most notably the New Brunswick Department of Natural Resources and Energy (DNRE), the Department of Environment and Local Government and the Department of Business New Brunswick. In addition there are two international commissions with indirect responsibility for the natural, cultural or recreational values of the system: the International Joint Commission (IJC) and the St. Croix International Waterway Commission (SCIWC).

The SCIWC was enacted by New Brunswick and Maine legislation in 1987 to help protect and manage both sides of the St. Croix boundary corridor, designated the "St. Croix International Waterway". In 1990, the Waterway Commission completed the document *Preliminary Plan for Long-Term Cooperative Management of the St. Croix International Waterway* that enabled the designation of the river to the CHRS. Following consensus on this plan, the Waterway Commission completed the document *St. Croix International Waterway: A Heritage - A Future*, as a co-management plan for both governments and as the basis for managing the waterway as a Canadian Heritage River. Formally adopted by Maine and New Brunswick in 1994, this plan contains 22 policies, toward which progress has been made to date on 20 of these.

Changes to River Values

The St. Croix is an actively managed multiple-use river for which water levels are regulated, effluent discharges are closely monitored and fisheries are overseen by several agencies. Largely because of this intensive management regime, many values have remained essentially unchanged over the past ten years. Values that have been subject to *major* changes over the past decade are described in the chart below, with a brief description of the change, either negative or positive. These and other 'significant' changes are described below in Section 3. Throughout the report, values are listed according to the theme elements of the natural and cultural CHRS frameworks. A complete list of the river's values, and a summary of changes and actions concerning them, is included in Section 6 of this report.

MAJOR CHANGES TO RIVER VALUES SINCE 1991

VALUE	IMPROVEMENTS	DETERIORATIONS
NATURAL THEME REPRESENTATIONS		
Hydrology Theme		
Water Content: Clear, neutral water in upper system.	Significant improvements in municipal and industrial waste discharges have reduced impacts on water chemistry of lower river.	
Biotic Environments Theme		
Oligotrophic Lakes: Spednic and East Grand.	Spednic Lake closed to alewives in early 1990's. Native smallmouth bass population recovered to almost 1980's level.	
Aquatic Ecosystems: 1. Subtidal Zone: Estuary 2. Intertidal Zone; Oak Bay		Continued scallop and urchin dragging is damaging bottom biota of the estuary. The herring weir fishery has ceased.
	Coliform pollution in Oak Bay has been significantly reduced.	
Terrestrial Ecosystems: Atlantic Maritime Forest.	157,833 hectares of private forestry lands were purchased by the province in 1999. Provincial shoreland regulations have prevented damage to shoreline ecosystems. Grassy Islands were designated an ecological reserve in 1995.	Forestry operations have continued in most of watershed. The extent of ecosystem and habitat alteration is not known.
Fauna Theme		
Significant Animal Populations Sub-theme		
Atlantic salmon	A native salmon restoration program was begun in 1993. Rearing tanks were installed at Milltown in 1999. In 2000, an innovative adult stocking program was initiated.	In spite of a major effort, the native stock has continued a significant decline from 207, counted at the Milltown fishway in 1991, to only 18 in 2000. This decline is, however, regionwide.
Smallmouth bass	The smallmouth bass population in Spednic Lake has recovered significantly from prior to designation, but is still lower than in early 1980's.	
Dragonfly Neurocordula nov.sp.	A new species was discovered in 1995	
CULTURAL THEME REPRESENTATIONS		
Water Transportation Theme		
French Exploration: St. Croix Island (International Historic Site)	The site is now publicly recognized and promoted through an outdoor interpretation facility overlooking the island.	Natural shoreline erosion of St. Croix Island has continued.
Riparian Settlement Theme		
River-Influenced Railways: McAdam Station NHS	The station roof was repaired. A local charitable trust was established which has acquired the building and begun renovations.	The condition of building has deteriorated since its abandonment in early 1990's.

VALUE	IMPROVEMENTS	DETERIORATIONS
Jurisdictional Use Theme		
European Internecine Conflict:	St. Andrews Blockhouse was restored by Parks Canada following a fire in 1993 and interpretive signage was upgraded.	
RECREATIONAL VALUES		
Canoeing	More consistent flows on the upper river and increased public access to information on water levels now support more and better distributed use. Several new put-ins and egresses have been developed along the river.	
Camping	The number of managed remote campsites increased to 25.	Funding reductions to DNRE have reduced provincial park operations.
Angling	Soft-shell clam digging in Oak Bay was permitted in 1999 after nearly 50 years of closure. New boat ramps were installed in several locations to benefit fishing access.	The Atlantic salmon fishery was suspended in the mid-1990's, as occurred elsewhere in southwestern New Brunswick.
Human Heritage Appreciation	New Brunswick purchased 24 acres of shoreland facing St. Croix Island International Historic Site for 2004 anniversary celebrations. Parks Canada acquired and constructed an interpretive facility on the upper 10 acres of this property. Downtown St. Andrews was recognized as a National Historic District in 1997. A memorial to loggers was erected at Diggity Stream in 1991.	
INTEGRITY VALUES		
Natural Integrity	Measures were taken to improve lake and river ecosystems, notably the 1995 St. Croix Shoreland Zoning Regulations, proposed NB Water Classification System, and consistent, managed flows. The smallmouth bass population rebounded from 1980's lows.	Major efforts to rebuild the native Atlantic salmon stock have been largely unsuccessful, probably due to oceanic conditions. Dragging for urchins and scallops continues to damage biota on the estuary floor.
Cultural Integrity	St. Andrews downtown was designated a National Historic District in 1997.	Many cultural sites are deteriorating through absence of recognition and protection.
Recreational Integrity	Shoreline development is now controlled by 1995 St. Croix Shoreland Zoning regulations. New Brunswick established a management program for lake and river recreational facilities.	An aggregate quarry at Bayside has altered the character of the estuary shoreline and affected air quality.

Highlights of the Past Decade

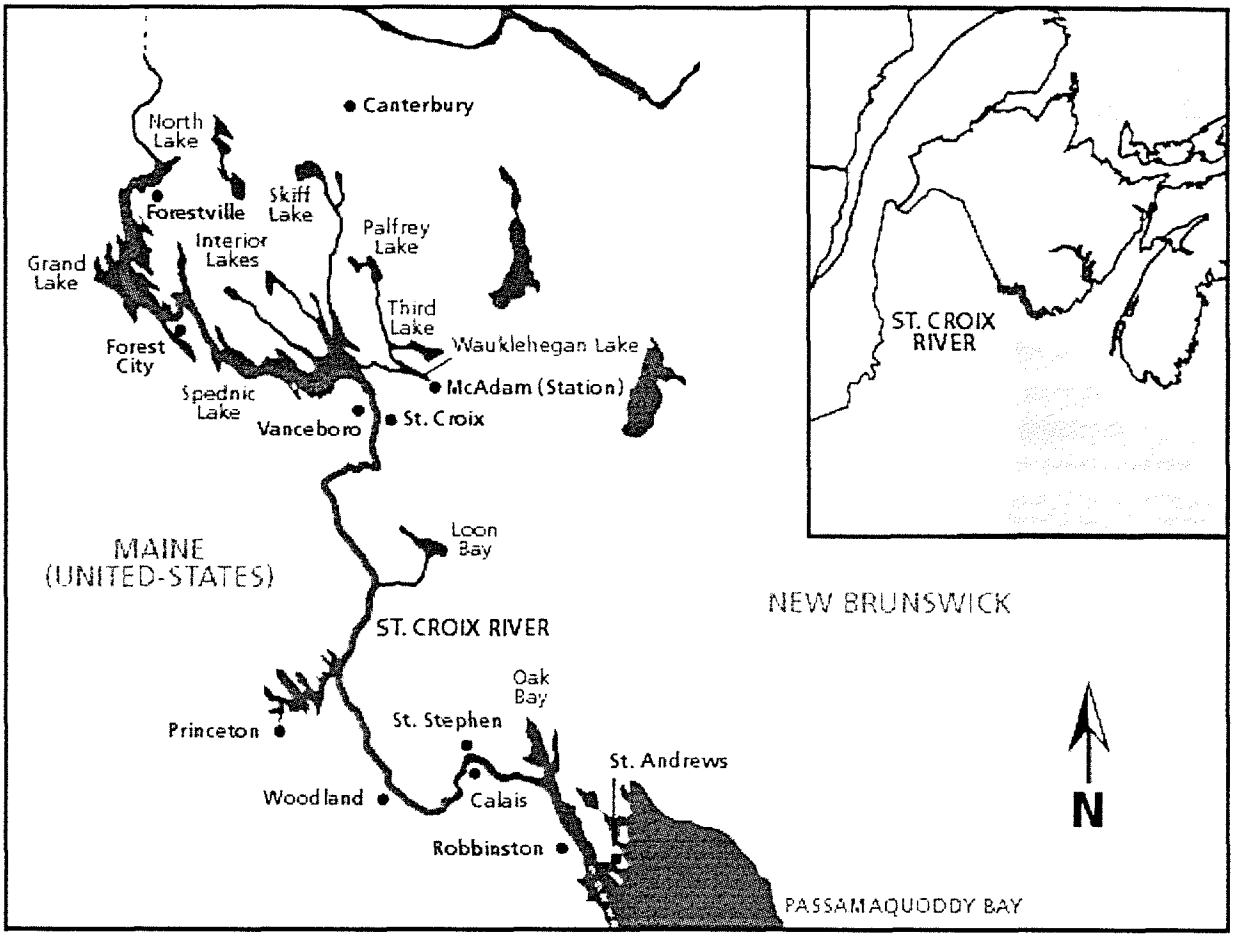
The St. Croix Waterway is essentially three distinct systems. The Chiputneticook Lakes comprise the headwaters and a controlled storage capacity for the main stem of the river between the communities of St. Croix and Milltown, below which the system comprises a large estuary. Changes to the condition of each can be summarized separately.

- **Chiputneticook Lakes.** The lakes section has seen the fewest changes over the past decade, and the area is still primarily natural. Improvements include the recovery of a

smallmouth bass population almost to its 1980 level when it had supported a renowned fishery, and the construction of some new boat access facilities. In addition, while the New Brunswick government has reduced its operation of provincial parks to minimal levels, DNRE was still been able to increase the number of managed remote campsites available for canoeists, mostly in the lakes section. While Georgia-Pacific Corporation, until recently the major landowner and forestry company, did not cut along shorelines or elsewhere in the CHRS management area, forestry operations have continued in the watershed, altering habitats and ecosystems. However, the St. Croix Shoreland Zoning Regulation adopted by New Brunswick in 1995 prevented unregulated development within 30-100 metres of the shorelines and New Brunswick's purchase of all Georgia-Pacific holdings on the Canadian side of the waterway in 1999 converted much of the upper watershed into Crown land. This offers the potential for additional protection of the lakes and upper river sections of the waterway. At this time, over 33,000 hectares adjacent to Spednic Lake has been proposed for inclusion in New Brunswick's protected area strategy.

- **St. Croix River.** In the river section, there have been some important gains and losses. Georgia-Pacific Corporation, which operates four major dams in the designated section of the waterway, has consistently met the requirements of effluent licenses at its Woodland pulp plant. Water quality has continued to improve throughout the past decade, helped by the natural flushing of debris from historic pulp and forestry operations. Georgia-Pacific voluntarily maintained more consistent water levels in the river, to the benefit of both canoeists and fisheries as well as the overall quality of the river's waters. However, in spite of a major restocking program, the population of native Atlantic salmon has declined in tandem with other regional populations, probably because of oceanic conditions. The blockage of the Woodland and Grand Falls fishways to the passage of alewives by the Maine government in 1995, combined with the blocking of alewives from entering Spednic Lake a few years earlier, appears to have caused a precipitous decline in this species. This, in turn, may have caused a decline in the osprey population, which feeds on alewives. On an entomological note, a new species of dragonfly was discovered in the corridor in 1995.

- **St. Croix Estuary.** In the estuary section of the waterway, there has been a significant reduction in bacterial contamination of Oak Bay, allowing the conditional re-opening of its clam beds for commercial and recreational digging after 50 years of virtual closure. Regional oceanic influences appear to be responsible for the decline not only of Atlantic salmon but also other species such as herring, which are now no longer harvested in traditional weirs. Dragging for urchins and scallops also continues to disrupt the natural bottom biota. In spite of this, the number of harbour porpoise, a threatened species, visiting the estuary appears to be increasing. In regard to the estuary's abundant cultural values, Parks Canada constructed an interpretive facility in support of St. Croix Island International Historic Site and restored the St. Andrews Blockhouse after a fire in 1993. The downtown area of St. Andrews, which contains numerous houses constructed by Loyalists, was declared a National Historic District in 1997.



Many of the improvements to the heritage and integrity of the waterway over the past decade stem from the implementation of policies and actions contained in the document *St. Croix International Waterway: A Heritage - A Future*. The author of this document, the St. Croix International Waterway Commission, has taken a leadership role in the most important aspect of managing the St. Croix River: the co-ordination of the many managing agencies and the involvement of communities and residents. Through direct action, facilitation, planning, co-ordination, public consultation and various forms of fund raising, the Waterway Commission appears to have created a holistic river management "culture" in which the numerous government and non-government agencies actively co-operate for the long-term betterment of the river and the residents of its watershed. After ten years in the CHRS the condition of St. Croix River has, on balance, improved significantly and the St. Croix International Waterway Commission can take a large part of the credit for this.

1. INTRODUCTION

1.1 BACKGROUND

The New Brunswick side of the St. Croix River was one of six rivers nominated to the Canadian Heritage Rivers System in June 1984, the same year that the System was initiated. It was the boldest of the early nominations, being not only an international river, but also a populated and controlled waterway. Moreover, for seven years it was the only river nominated to the CHRS in Atlantic Canada and, until 1988, stood as the only nominated river not located in a protected area.

Difficulties in preparing a management plan for this complex 185 kilometre-long river delayed designation until January 1991. At that time, the New Brunswick government tabled with the CHR Board the document *Preliminary Plan for Long-Term Cooperative Management of the St. Croix International Waterway*, prepared by the St. Croix International Waterway Commission (SCIWC) . This was accepted by the CHR Board as sufficient commitment on the part of New Brunswick to manage the river as a Canadian Heritage River and the river was officially designated at that time. In October 1993, the final plan was completed[1] and the unveiling of a commemorative plaque in St. Stephen in 1995 concluded the river's lengthy road to recognition as a Canadian Heritage River.

1.2 PURPOSE OF THIS DOCUMENT.

Part 5 of the *Canadian Heritage Rivers System Principles, Procedures and Guidelines*[2] requires that every ten years, or more frequently, the government with responsibility for managing each Canadian Heritage River must provide to the Canadian Heritage Rivers Board an assessment of the condition of the river's values.

"The [Canadian Heritage Rivers] Board will review each designation every ten years in conjunction with the managing jurisdiction. This review should take the form of an independent assessment whenever possible".

This report is intended to provide the Canadian Heritage Rivers Board with:

- an independent review of the present condition of the St. Croix River and its role in the CHRS;
- a description of changes in the river's heritage, recreation and integrity values[3], both positive and negative, over the river's ten years in the System, from January1991 to December 2000; and
- a summary of events, research, planning, and management actions that have occurred in regard to these changes over the past ten years.

Figure 1. Birch Island Cove, Spednic Lake.

[1] *St. Croix International Waterway: A Heritage - A Future.* St. Croix International Waterway Commission. October 1993.

[2] *Canadian Heritage Rivers System Principles, Procedures and Guidelines.* Draft. September 2000. This document has been approved by the CHR Board and is awaiting final publication.

[3] The river's CHRS values are defined here in terms of the CHRS Natural and Cultural Frameworks. Values mentioned in the nomination document that were not river-related or which did not fit into framework theme elements were not included. Significant values not mentioned in the nomination document were added.

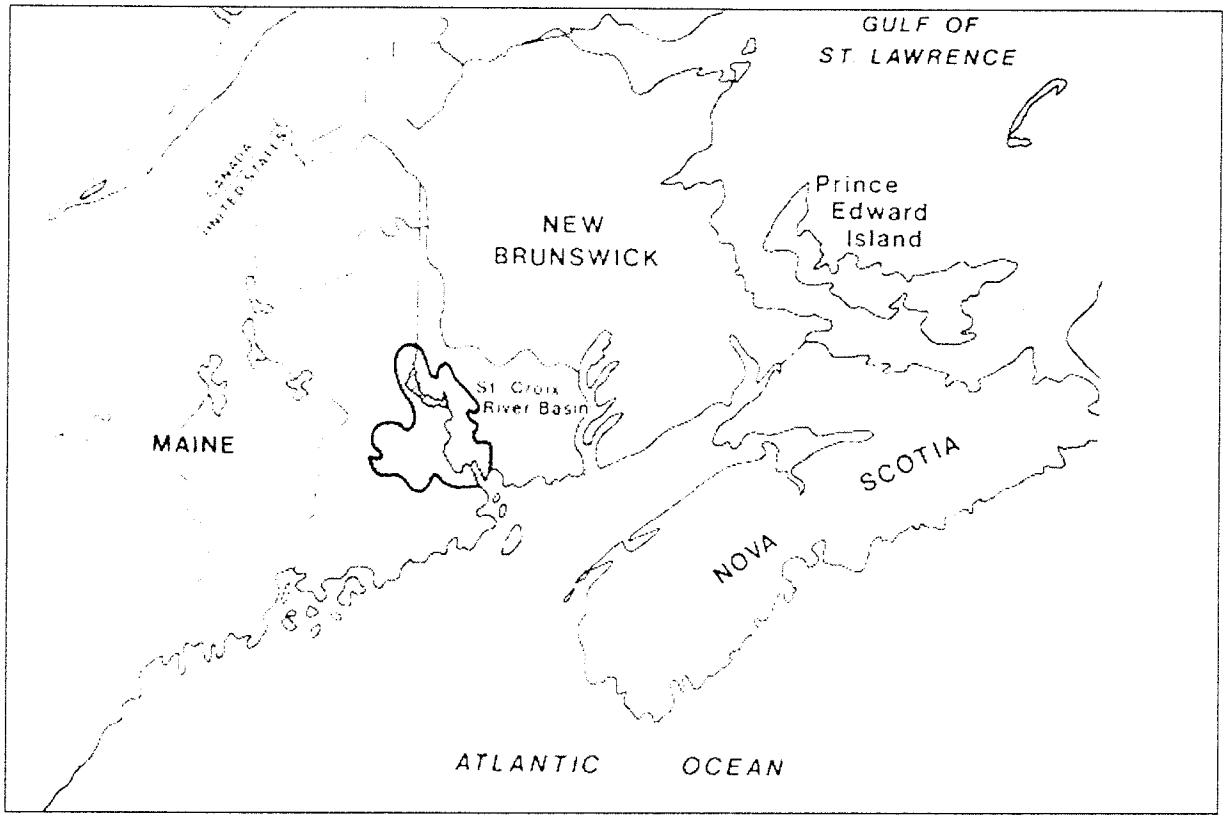


Figure 2. Regional Setting of the St. Croix River

Figure 3. CHRS designation ceremony in St. Stephen, 1995.

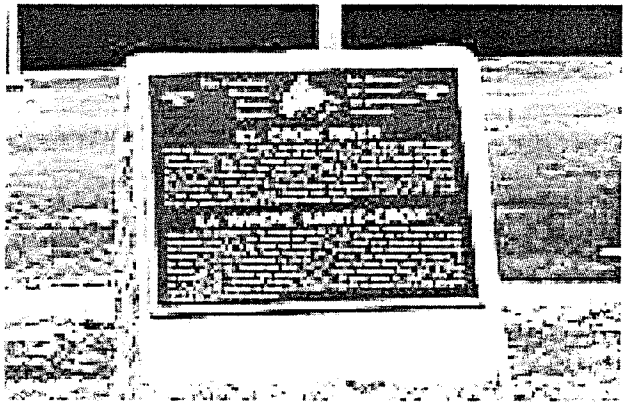


Figure 4. Bilingual CHRS plaque unveiled at the 1995 ceremony.

2. OVERVIEW OF ST. CROIX RIVER MANAGEMENT 1991-2000

Management of the St. Croix Waterway requires a major intergovernmental co-operative effort. A total of 23,000 Canadians and Americans live along the 185-kilometre waterway, 40% of whom live in St. Stephen, NB and Calais, ME. Occupations are mostly resource-based with forest industries providing the bulk of employment.

Until Georgia-Pacific Corporation disposed of its timberland holdings in1999, there was relatively little publicly owned land on either the American or Canadian side of the river. Three provincial parks, some isolated campsites operated through an agreement with Georgia-Pacific, and some urban waterfront lands were the primary areas of public access to the river. Except for largely unused "chain reserves" along the waterfront, much of the shoreline was held by Georgia-Pacific Corporation or other private landowners.

The following is a brief description of the activities of the major managing agencies in the New Brunswick portion of the St. Croix drainage basin during the past ten years.

2.1 ST. CROIX INTERNATIONAL WATERWAY COMMISSION.

The lead entity for managing the St. Croix as a Canadian Heritage River is the St. Croix International Waterway Commission (SCIWC). This body was created by New Brunswick and the State of Maine in 1986 to jointly protect and manage the St. Croix boundary corridor, designated the "St. Croix International Waterway". Enabled by legislation in 1987 in both jurisdictions, the Waterway Commission was established in 1988 and charged with planning and facilitating the waterway's management in co-operation with local residents, users and all levels of government. The Waterway Commission has a small part-time staff and an international office located in St. Stephen, N.B.

2.1.1 Support of the Waterway Commission.

About one third of the Waterway Commission's funding is derived from direct government appropriations from Maine and New Brunswick, while the remainder is made up from a wide variety of grants, contracts, and in-kind and financial donations[4] that the Waterway Commission is empowered to receive but which staff must solicit. The list of financial and in-kind supporters from both sides of the border is long.

To date, direct government funding has been provided annually by the N. B. Department of Natural Resources and Energy and the State of Maine. Both contributions have declined significantly over the decade. The Commission also solicits funding and inkind support from government agencies including Environment Canada, Fisheries & Oceans Canada, N.B. Department of Environment & Local Government, Maine Department of Marine Resources and the U.S. Fish & Wildlife Service. Other notable supporters include Georgia-Pacific Corporation, N. B. Environmental Trust Fund, N.B. Wildlife Trust Fund, Maine Chapter - Atlantic Salmon Federation, Maine Outdoor Heritage Fund, and New Brunswick Power Corporation.

2.1.2 Scope of the Waterway Commission.

The designated International Waterway is a relatively small part of the 4,235 square kilometre watershed. From the north, it consists of the waters of Monument Brook,

[4] In 1990, the Waterway Commission became a charitable not-for-profit organization in both U.S.A and Canada.

the boundary lakes (North, East Grand, Mud, Spednic and Palfrey), the St. Croix River, the estuary and a land corridor extending 75 metres inland from these waterbodies. Management goals address the balanced management of the natural, cultural and recreational values of the Waterway, identify land use priorities and strengthening public and private partnerships. To this end, the *St. Croix International Waterway: A Heritage - A Future*[5], describes 22 policies which New Brunswick and Maine have agreed to pursue. In order for these policies to be implemented, the Waterway Commission sometimes takes a watershed-wide approach to the management of the waterway.

2.1.3 Agency Coordination.

The Waterway Commission has taken a leadership role in the most important aspect of managing the St. Croix River, the co-ordination of managing agencies, communities and residents. In addition to taking direct action, the Waterway Commission has initiated interagency meetings, advised government agencies, hosted workshops, co-ordinated public consultations, and pursued various forms of program fund raising. With minimal resources, the Waterway Commission has brought together representatives of the numerous government and non-government bodies involved in managing the waterway, who now actively co-operate for the long-term betterment of the waterway and the residents of its watershed.

2.1.4 Water Quality Monitoring.

The Waterway Commission has taken a leadership role in water quality monitoring and remediation. Through workshops, programs and day-to-day operations, the Waterway Commission has worked closely with the IJC, the St. Croix Estuary Project and municipal, provincial, state and federal agencies, First Nations, and numerous residents and private users.

Among its many actions, in 1992 the Waterway Commission initiated the St. Croix Water Watch which, in cooperation with volunteers and government agencies, provides consistent baseline data on the water quality in the waterway. Initially covering 7 lakes, the program has since expanded to 13 lakes and the full river system. Since 1999, the Waterway Commission has also worked with provincial and local interests to develop a proposal for the quality classification of all provincial waters in the watershed as a pilot project for the New Brunswick's Water Classification Program.

2.1.5 Fisheries Management

The Waterway Commission has cooperated with government agencies and private interests in the maintenance and restoration of fisheries in the waterway. For example, in 1994, in cooperation with nine local partners and five government agencies, the SCIWC conducted creel surveys, monitored fish traps, and stocked juvenile Atlantic salmon. In the same year, the SCIWC undertook a survey of salmonid habitat on 40 km of streams that feed the lake system. In the 1994-97, the Waterway Commission carried out surveys of habitat for various fish species along nearly 50 km of the river. The Waterway Commission has also taken a leadership role in the restoration of Atlantic salmon to the river and participated in a number of initiatives to this end. While these efforts have had little success, in 1999 the Waterway Commission was instrumental in the building of rearing tanks at Milltown fishway and in 2000 has coordinated an innovative scheme for the restocking of adult salmon (see 3.2.7 below)

[5] This is the final version of the 1991 designation document *Preliminary Plan for the Long-Term Management of the St. Croix River as a Canadian Heritage River.*

2.2 NEW BRUNSWICK DEPARTMENT OF NATURAL RESOURCES AND ENERGY (DNRE).

DNRE is the lead provincial agency in managing the St. Croix River as a Canadian Heritage River and provides direct financial and in-kind support to the Waterway Commission on an annual basis. In 1982, New Brunswick designated much of the St. Croix drainage basin as the St. Croix Waterway Recreation Area. The purpose of this designation was to promote tourism and protect natural resources. These objectives have been absorbed into the St. Croix International Waterway management plan.

2.2.1 Crown Lands Management.

DNRE also manages all Crown lands in New Brunswick and has responsibility for a "natural areas system" including Canadian Heritage Rivers and provincial parks. It has jurisdiction over Crown lands on the St. Croix which, prior to 1999, included 800 hectares of intertidal shorelands, about 9,000 hectares of land submerged on the bottom of lakes, the estuary and the river itself, and narrow strips of land along 48 kilometres of shoreline set aside as "chain reserves". DNRE also has jurisdiction over the Grassy Islands ecological reserve.

The Department also licenses 730 hectares of shorefront Crown land between Loon Bay and Grand Falls Flowage to timber interests and leases a number of small lots for recreation and private uses throughout the system. The 1999 purchase of all Georgia-Pacific Corporation holdings in New Brunswick placed DNRE in control of land use on an additional 157, 833 hectares of new Crown land.

2.2.2 Provincial Parks.

At the time of designation, the Department operated three provincial parks in the waterway: Oak Bay, Spednic Lake and North Lake. Since 1996, Departmental policy has evolved toward the leasing of provincial parks to the private sector. In 1997, Oak Bay was transferred to another department and subsequently leased to a private operator under government direction. The other parks are now managed with minimal staff.

Figure 5. Access to Spednic Lake in Spednic Lake Provincial Park.

2.2.3 Waterway Recreational Facilities.

DNRE has developed and now manages 5 access points and 27 remote campsites, some of which, until 1998, were administered through a co-management agreement with Georgia-Pacific. Most of the campsites are in attractive remote settings that are inaccessible by vehicle, all are free of charge and provide basic services such as toilets and tent pads but no garbage pick-up. DNRE has continued to allocate specific budgetary resources to the management of these campsites and other recreational facilities in the St. Croix waterway.

Figure 6. A river access point.

2.2.4 Fisheries Management.

The Department also manages all freshwater fisheries and thus has an ongoing role in the assessment, enhancement, monitoring and planning of recreational fisheries on the St. Croix.

2.3 OTHER PROVINCIAL AND STATE AGENCIES

Several other government departments have significant interests in the St. Croix basin:

2.3.1 Department of Environment and Local Government.

This Department has cooperated with the SCIWC on several water quality testing programs in the past decade. Up to 6 times each year, the Department of Environment has monitored effluent from sewage treatment facilities on the New Brunswick side of the river at St. Andrews, St. Stephen, Milltown, McAdam, Huntsman Marine Science Centre, the St. Andrews Fisheries Biological Station, Champlain Industrial Park, and Oak Bay Park.

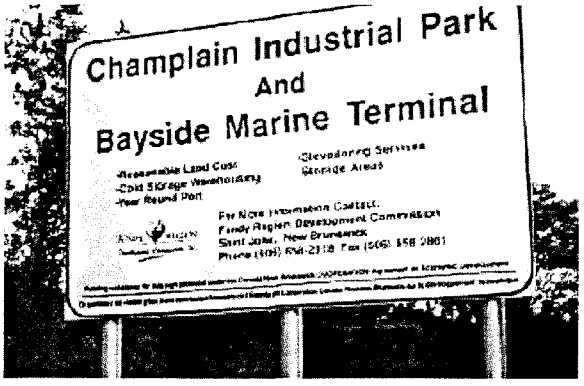


Figure 7. Entrance to Champlain Industrial Park, Bayside.

In 1995, the Department initiated a Water Classification Program[6] intended to place all surface waters in the province into five categories based on water quality goals (see Section 3 below). The St. Croix is one of the watersheds now piloting this classification program.

2.3.2 Culture and Sports Secretariat (formerly part of the Department of Economic Development, Tourism and Culture).

Housed within the Department of Education, this agency includes the New Brunswick Historic Sites program, which includes the archaeological arm of the program. This small program has undertaken several important digs in the St. Croix area, although none in the last ten years. The Secretariat also has an interest in promoting canoeing on the river as part of its responsibility for encouraging healthy lifestyles.

2.3.3 Department of Business New Brunswick (formerly part of the Department of Economic Development, Tourism and Culture).

Business New Brunswick owns and has responsibility for the lease of the 13 hectare Oak Bay Park, previously a provincial park under DNRE. It also owns an industrial park comprised of some 200 hectares at Bayside, on the St. Croix Estuary.

2.3.3 Department of Health and Wellness.

This Department has worked closely with the St. Croix Estuary Project, and subsequently with the SCIWC to reduce pollution in the upper estuary and Oak Bay.

2.3.4 Maine Department of Environmental Protection.

Although the Canadian Heritage River is located on the New Brunswick side of the waterway, the action of U.S. agencies has a significant impact on its integrity. The Maine Department of Environmental Protection requires and carries out regular monitoring of

[6] This was originally called a *river* classification program.

all licensed discharges into the St. Croix.[7] The Department also conducts watershed baseline water quality sampling every 3 years.

2.3.5 Maine Department of Inland Fisheries and Wildlife.

This state Department works in close cooperation with DNRE to manage the St. Croix's lake and river fish stocks and wildlife resources.

2.3.6 Maine Atlantic Salmon Commission.

This agency is responsible for managing the state's Atlantic salmon resource and has an integral role in the restoration program for this species on the St. Croix system.

2.4 FEDERAL AGENCIES.

A number of federal agencies are involved with management of the natural and cultural values of the St. Croix:

2.4.1 Parks Canada.

While Parks Canada is the lead federal agency in the CHRS it has little direct role in management of the St. Croix. It provided funding and technical support for background studies in the 1980's leading to the preparation of the designation document completed by SCIWC in 1989.

Parks Canada's two specific management responsibilities are the operation of the St. Andrews Blockhouse National Historic Site and and maintenance of an outdoor interpretive facility constructed in 1988 for St. Croix Island International Historic Site beside Highway 127 at Bayside.

2.4.2 Environment Canada.

Environment Canada operated a number of water quality monitoring stations in the system until 1997 and has been active in cooperating with the SCIWC in water quality monitoring in the lake and estuary portions of the waterway. It also sponsors the Atlantic Coastal Action Program (ACAP). Under ACAP the St. Croix is one of thirteen estuaries in Atlantic Canada receiving special support for planning and development related to enhancing the health and economic well-being of local residents. Through ACAP, Environment Canada funds the St. Croix Estuary Project which carried out research, water quality testing and, in 1997, produced a detailed long-term plan for the estuary.

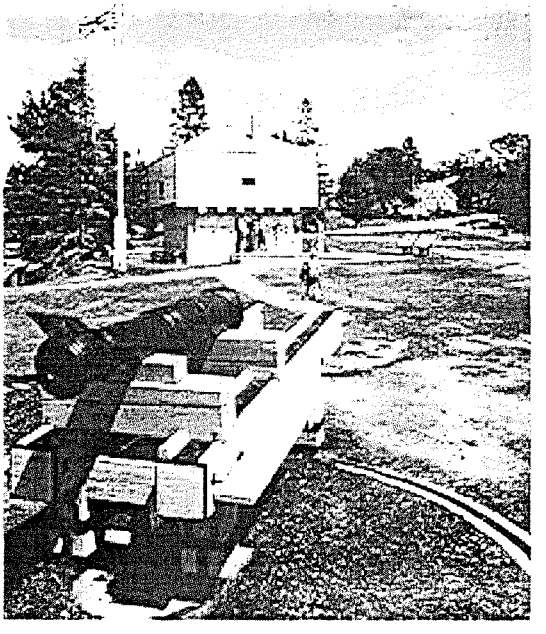


Figure 8. St. Andrews Blockhouse National Historic Site, operated by Parks Canada, was restored in 1995 after fire damaged the interior of the structure.

2.4.3 Fisheries and Oceans Canada.

Under the *Canada Fisheries Act*, the Department of Fisheries and Oceans is responsible for marine fisheries and for the habitat of anadromous fish in the St. Croix Waterway. It has played an active role in programs to restore Atlantic salmon and softshell clam stocks to the St. Croix.

[7] Sampling frequency ranges from daily to annually, depending upon the type of discharge

Figure 9. Releasing an adult Atlantic salmon as part of the St. Croix salmon restoration program.

2.5 GEORGIA-PACIFIC CORPORATION

Prior to the sale in 1999 of its Canadian land holdings to the New Brunswick government and Maine holdings to private interests, Georgia-Pacific Corporation owned nearly 80% of all lands in the St. Croix basin. It still controls the levels of the lakes through a series of impoundments, and its mill operations at Woodland are an important source of employment for area residents.

Figure 10. Former Georgia-Pacific woodlands operations headquarters, now owned by DNRE, at the community of St. Croix.

Prior to 1999, under an agreement with DNRE, the company restricted cutting near waterfronts and permitted the province to maintain remote campsites on its lands. Until 1996, the company released additional water on weekends to enhance river canoeing. However, since this time it has voluntarily discharged water more constantly to benefit both weekday canoeing and river fish stocks.

The company has made significant efforts to be a good corporate citizen. It has consistently met effluent discharge requirements at its main pulp manufacturing facility at Woodland on the American side of the river. It cooperates with the IJC and other local interests in maintaining water levels and flows within specified guidelines on the lakes and river.

2.6 INTERNATIONAL JOINT COMMISSION.

Under the U.S.-Canada Boundary Waters Treaty, The International Joint Commission is responsible for approving conditions for water impoundments and withdrawal on the St. Croix. The IJC can also set guidelines for water quality and can study, and even resolve, water-related issues when so directed by the federal governments. It has been responsible recently for a review of water level and flow management within the St. Croix system, and of dam safety.

Two IJC sub-committees were established for the St. Croix, the International Advisory Board on Pollution Control and the International St. Croix Board of Control. These boards and their functions were merged in late 2000.

The IJC's St. Croix boards include individuals who serve in government and non-government agencies in Canada and the U.S. The Pollution Advisory Board monitors water quality in the St. Croix basin and consults with agencies and individuals on setting and maintaining internationally agreed water quality objectives. The Control Board oversees compliance with IJC approvals for the boundary dams. The Pollution Advisory Board, while not directly conducting water monitoring, does prepare an annual report summarizing monitoring activities by federal, state and provincial agencies and others

3. SIGNIFICANT CHANGES TO HERITAGE, RECREATION AND INTEGRITY VALUES

3.1 CHANGES IN THE LAND AND WATER MANAGEMENT CONTEXT.

The condition of the St. Croix River's heritage and recreational values should be considered in the context of three major events that have occurred in the past decade. While most of the anticipated impacts of these events have not yet occurred, they are likely to have profound implications for the future of the heritage and recreational values of the river as well as for the integrity of the system as a whole.

3.1.1 Purchase of Georgia Pacific Corp. Holdings.

In 1998, New Brunswick agreed to purchase all holdings of Georgia Pacific Corporation in the Canadian part of the St. Croix watershed, a total of 157, 833 hectares. This was precipitated by the company's decision to divest all of its own timber lands and to concentrate on pulp production. The sale was concluded in May 1999 at a price of $62.5 million. This effectively ended the control of most of the upper watershed by a private company, obviating the need for future agreements between G-P and the Province for recreational and land uses within the CHRS corridor. The Provincial government is reviewing its options for the future uses of these lands, including timber licensing. Two areas in the watershed have been proposed as components of the provincial Protected Areas Strategy and one of these lies in part within the waterway corridor area (see 3.1.3).

3.1.3 Shoreline Protection Measures.

The Provincial government has enacted two measures intended to protect the integrity of the shoreline of the St. Croix waterway:

3.1.3.1 Provincial Watercourse Buffer Zone Guidelines. These guidelines were introduced by the Department of Natural Resources and Energy in1995 for use on all Crown Lands and Crown Timber Licenses in New Brunswick. Under these guidelines, timber cutting and piling is not permitted within an area extending in width up to 60 metres from watercourses depending on the size of the stream and drainage area, soil erosion, bank slope. No vehicles are permitted within 15 metres of any watercourse. The buffer zone is 75 metres along certain designated watersheds, and up to 100 metres on those designated for drinking water use.

3.1.3.2 St. Croix Shoreland Zoning Regulations. Also in 1995, based on local stakeholder input, the provincial government enacted shoreland zoning regulations specific to the St. Croix waterway. These regulations establish standards for development and vegetation removal on all lands, including those that are privately owned, to a depth of up to75 metres from the water's edge. These regulations mirror similar measures already implemented in Maine.

3.1.3 New Brunswick Protected Areas Strategy:

A protected areas strategy for the province is currently being developed by DNRE. Eight areas were proposed in 1999 as a result of extensive public hearings, to which a DNRE stakeholders committee recently added two areas in the St. Croix watershed: 3,931 hectares in the Canoose Flowage and 33,198 hectares beside Spednic Lake - on provincial lands acquired from Georgia-Pacific

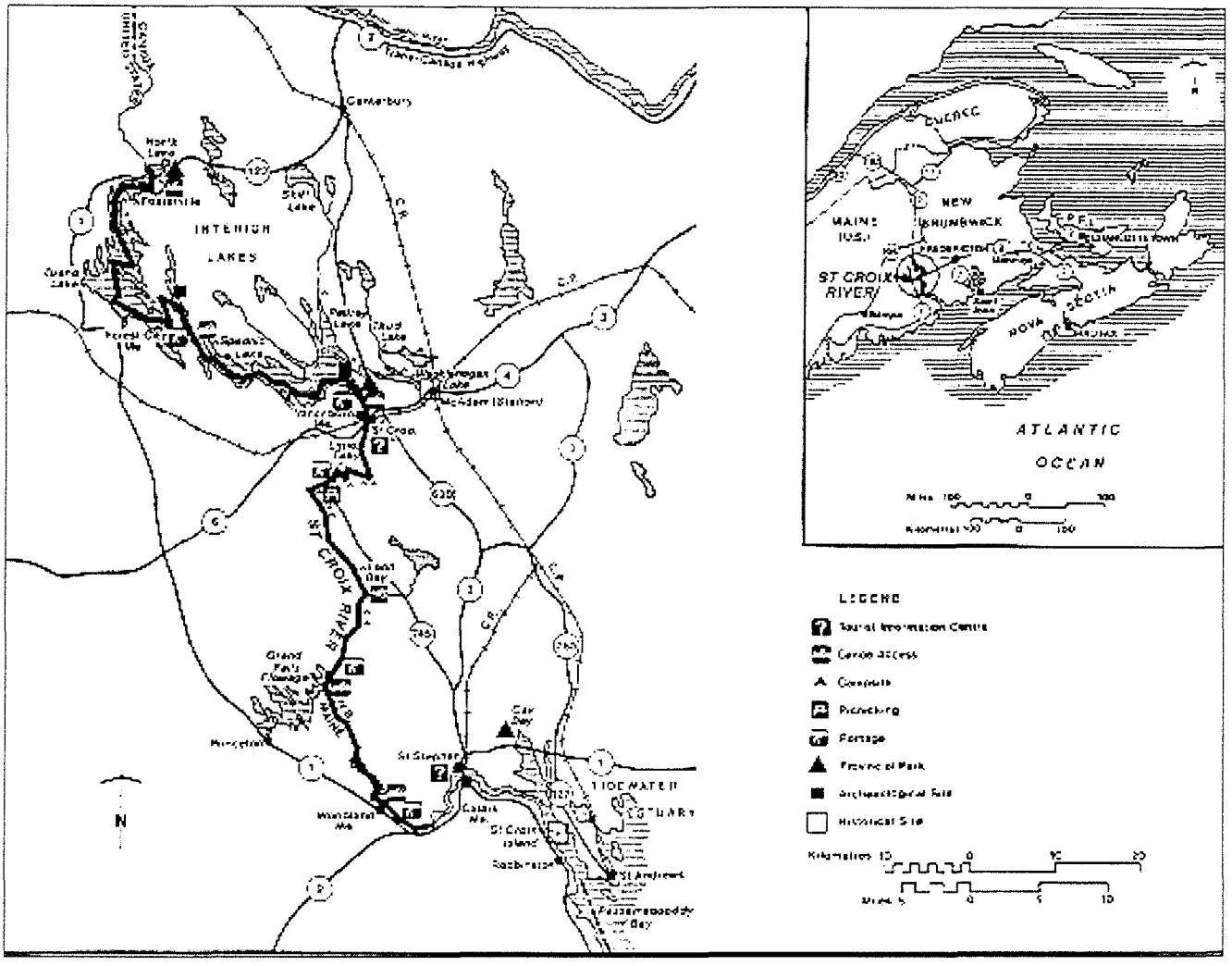


Figure 11. Significant Features of the St. Croix International Waterway (courtesy Canadian Heritage Rivers Board).

If approved by the provincial Cabinet, this would bring a large area representing the Atlantic Maritime terrestrial ecosystem, and significant examples of many other natural values, under the direct jurisdiction of DNRE.

3.2 CHANGES TO NATURAL HERITAGE VALUES

Natural values which have undergone a *significant* change in the past decade are described below, with a brief commentary They are listed in the order they appear in the CHRS Natural Framework[8], and the theme elements that they represent are noted in parentheses. A full listing of the river's representations of natural themes, and summary descriptions of changes to them, is included in Section 6.1 below[9].

3.2.1 Water Content: Minor sedimentation, low turbidity, moderate dissolved solids. (Theme Element 1.1.9)
The content of the St. Croix's water has been closely monitored over the past decade for bacterial and other pollutants originating from activities in its lower section. As a result of improvements in municipal and industrial discharges, the chemistry and sediment load of the river's water[10] now more closely resemble the natural conditions that were present before nineteenth century developments.

3.2.2 Seasonal Variation: Temperate Spring. (Theme Element 1.2.7)[11]
Minimum flows are regulated at three dams on the St. Croix. Since 1996, G-P has voluntarily maintained its discharge from the Vanceboro dam, at the head of the river, at more constant levels during the summer months, more closely reflecting the river's natural flow.

3.2.3 Aquatic Ecosystems: Subtidal Zone. (Theme Element 4.1.7)
In the estuary, the bottom biota are disturbed by continued dragging for scallop and urchins. A decline in the herring stocks appears to be due to oceanic conditions. Declines in alewives due to the closure of fishways to spawning areas, and in elvers (young eels) due to over-fishing, may be temporary. The alewife situation is presently under close scrutiny. Management measures have already been implemented to reduce the harvesting of elvers.

3.2.4 Aquatic Ecosystems: Intertidal Zone. (Theme Element 4.1.8)
The intertidal zone of the estuary, and the Oak Bay clam beds in particular, have been subject to bacterial contamination for the past 50 years. Sampling and sanitary surveys were initiated under the 1989 "Clam Action Plan" of the Premier of New Brunswick.

Figure 12. Narrow intertidal zone at St. Stephen.

The St. Croix Estuary Project, established in 1993 under the Atlantic Canada Action Program, helped to identify the sources of bacterial contamination in the estuary in 1996.

[8] *A Framework for the Natural Values of Canadian Heritage Rivers*, March 1998.
[9] Note that changes to facilities for the interpretation of natural values are described in Section 3.4.6.
[10] As far as this can be known given the longstanding modifications to the river system.
[11] Not properly exhibited because of control of discharges by dams.

Following this, coordinated efforts in reducing bacterial contamination from residential and wastewater plant effluent were made by the SCIWC in cooperation with provincial and federal agencies and local interests. This has resulted in significantly improved bacterial levels in the estuary and permitted the reopening of the soft-shell clam fishery in Oak Bay[12] in 1999. While the pollution did not directly affect the clams and may have indirectly permitted an expansion of the population, management measures are being implemented to ensure that the harvest is sustainable.

3.2.5 Terrestrial Ecosystems: Atlantic Maritime Forest. (Theme Element 4.2.14)

While the immediate shoreline and CHRS management area along the St. Croix have been protected for forestry operations, timber harvesting in the watershed has affected the composition of the forest ecosystem to an unknown extent.

Figure 13. Atlantic Maritime forest system near Duck Point

In 1995, the Grassy Islands, comprising 13 small islands in the river near Loon Bay, were designated as a Provincial ecological reserve. These islands are also recognized as an International Biological Program (IBP) site.

Figure 14. Grassy Islands, designated an Ecological Reserve in 1995.

3.2.6 Significant Animal Communities (Fish): Smallmouth Bass. (Theme Element 6.1.1)

In the mid-1980's, the once renowned recreational smallmouth bass population in Spednic Lake suffered a significant decline which continued into the early 1990's. As a result of stock management measures, including the closure of the lake to sea run alewives and the institution of catch and release fishing only, the bass population has rebounded.

[12] The success of this action has not only enhanced the natural value of Oak Bay, but reintroduced potential for part-time employment for up to 200 diggers in an industry worth between $1-2 million

Figure 15. Robertson Cove, on Spednic Lake.

3.2.7 Significant Animal Communities (Fish): Atlantic Salmon. (Theme Element 6.1.1)

There has been a significant effort in the past decade to restore the native Atlantic salmon population in the St. Croix River. A number of government agencies and volunteer groups have provided funding and in-kind support to this effort. The Milltown fishway was repaired in 1991 and a downstream fishway installed at Woodland in 1992. Rearing tanks were installed at the Milltown fishway in 1999. The effort peaked in 1997, when 126,000 young native-strain salmon were released into the river.

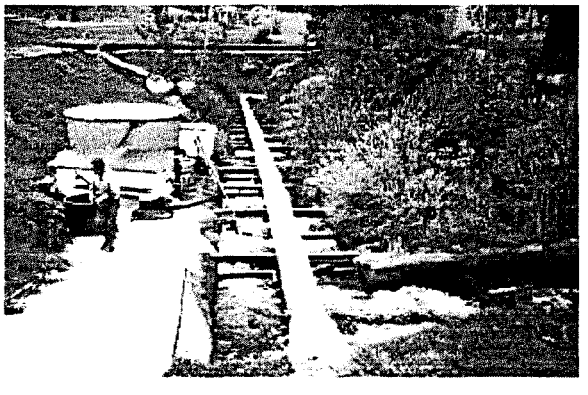


Figure 16. Lower part of Milltown fishway and one of the new salmon rearing tank.

Unfortunately, the efforts have been relatively fruitless and there has actually been a decline in the population of Atlantic salmon in the St. Croix during the past ten years. A total of 207 wild or stocked salmon were recorded at the Milltown fishway in 1991 but only 20 were recorded in 2000. The decline has been attributed to fewer spawning fish, reduced stocking in the mid-1990's and discontinued smolt stocking in 1997. It has also been speculated that a precipitous decline in alewife stocks may have reduced alternative prey for estuarine fish and exposed young salmon to heavier mortality. However, since the decline is common to all rivers in southwestern New Brunswick, it is likely that unfavorable marine conditions are the most important cause.

Now as an endangered species in the U.S., funds have been made available for rebuilding Atlantic salmon stocks in certain American rivers. Although the St. Croix was not considered as one of these rivers[13], the (SCIWC) arranged with federal and state agencies to have the St. Croix used as a major experimental site for salmon restoration techniques. A total of 750 mature fish reared from St. Croix and nearby stocks were released into the river in October 2000 as new spawners, in the largest stocking of adult Atlantic salmon in recent history. The success of this approach will be monitored over the next five years as the offspring hatch, go to sea and eventually return as adults.

3.2.8 Significant Animal Species (Birds): Osprey (Theme Element 6.1.3)

The osprey population in the estuary area declined significantly in the 1990's and many

[13] The St. Croix River was excluded from consideration due to its international status.

nests were abandoned, possibly due to the decline of alewife, a major source of food for the species. Bald eagles, which have a broader diet, do not seem to have been affected. Anecdotal observations in 1999-2000, however, indicate that ospreys may be returning.

3.2.9 Rare Species (Mammals): Harbour Porpoise. (Theme Element 6.2.2)

The harbour porpoise, listed as threatened by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) since 1991, was not considered as one of the river's nomination values in 1986. However, anecdotal observations of increasing numbers in the past two years in the estuary imply that the St. Croix may now be an important part of their habitat.

Figure 17. Spednic Lake, with Todds Island in foreground.

3.3 CHANGES TO CULTURAL VALUES

As in the case of natural values, *significant* changes to the St. Croix's cultural values over the past decade are noted below with a brief commentary[14]. The values subject to change are listed below in the order of the theme elements that they represent in the CHRS Cultural Framework[15]. A full listing of the river's representations of cultural themes, and summary descriptions of changes to them, is included in Section 6.2 below.

3.3.1 Resource Harvesting (Historic Domestic Fishing): Herring Weirs. (Theme Element 1.1.2)[16]

The tradition of catching herring with nets staked in the intertidal zone of the estuary is at least two centuries old and may have been practiced by natives since around the time of the arrival of Europeans. However, the decline in inshore stocks of herring, presumably due to oceanic conditions, has resulted in the cessation of this tradition in the St. Croix estuary during the past decade. It is not known if there has been any attempt to preserve associated artifacts.

3.3.2 Resource Harvesting (Shellfish): Clam Digging. (Theme Element 1.1.4)

Clam harvesting is affected by bacterial pollution in the estuary. This impact was significantly reduced in the past decade due to improvements in municipal and residential septic systems (see 2.4.2 and 3.2.4 above). This traditional harvesting activity, testified to by at least two known native shell-middens in the estuary area, is has now been revived in Oak Bay, the St Croix's largest intertidal area.

3.3.3 Resource Harvesting (Extraction of Water): Milltown Rope Drive Generator[17]. (Theme Element 1.3.4)

The use of a rope drive for power generation, originally constructed to serve the Milltown cotton mill in 1882, is the only one known in North America. It is still in use. The rope was most recently replaced in 2000, however it is not known if the old rope was retained as an artifact.

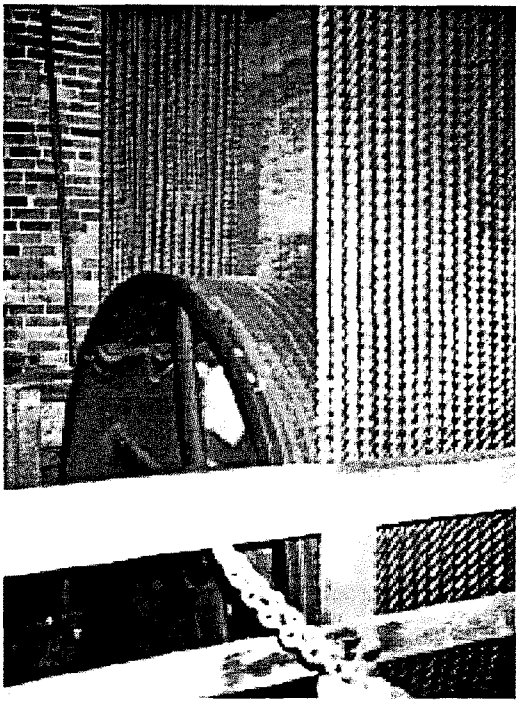


Figure 18. Rope drive at Milltown generating station

3.3.4 Water Transport (French Exploration): St. Croix Island International Historic Site. (Theme Element 2.3.1)

The management plan for St. Croix Island International Historic Site, the site of the

[14] Changes in the interpretation and commemoration of cultural values are described in Section 3.4.6 below.

[15] *A Framework for the Cultural Values of Canadian Heritage Rivers*. 2nd Edition.. January 2000.

[16] This value was not mentioned in the 1986 nomination document.

[17] This value was not recognized in the 1986 nomination document.

first French settlement in North America, has been updated by the U.S. National Parks Service[18] in cooperation with Parks Canada. The New Brunswick government purchased 24 acres on the shore facing the island in 1993 and sold 10 acres to Parks Canada. Parks Canada has developed an outdoor interpretive display there, adjacent to Highway 127, and may build an interpretive centre at this location for the celebration of the 400th anniversary in 2004. New Brunswick has set aside the remainder of the land as a park to be used during the anniversary celebrations.

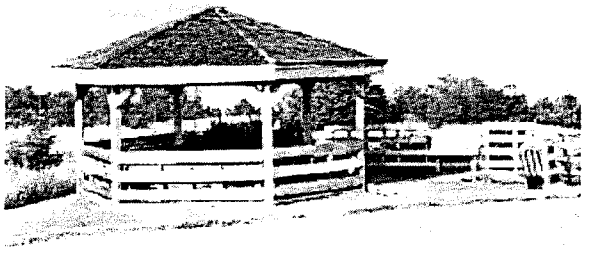


Figure 19. Picnic shelter at Parks Canada's St. Croix Island interpretive site.

Natural erosion of St. Croix Island has continued throughout the 1990's and the U.S. National Parks Service has monitored this. However, no data was available for this report on the rate of erosion.

3.3.5 Riparian Settlement (River Industry-based Structures): Ganong Chocolate Factory.[19] (Theme Element 3.2.3)

The famous Ganong Brothers chocolate factory in St. Stephen was established in 1875, in large part due to its location on a navigable estuary and its proximity to United States markets. The 1990's saw the phasing out the company's waterfront manufacturing location in favour of a modern facility further inland and retrofitting of the original building for alternative uses including a chocolate museum.

3.3.6 Riparian Settlement (River Industry-based Structures): Milltown Cotton Mill. [19] (Theme Element 3.2.3)

The foundations of the Milltown cotton mill are all that remain of one of the largest cotton mills in North America in the 19th century. These foundations were incorporated into a small riverside park in 1991. A bail of cotton originally shipped to the mill was located in the neighboring generating station, but has not been curated.

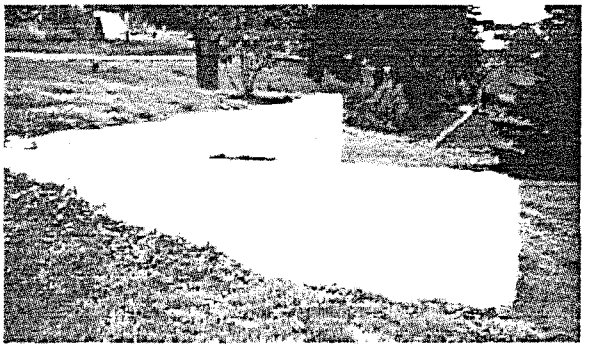


Figure 20. Remains of foundations of Milltown cotton mill.

3.3.7 Riparian Settlement (River Influenced Transportation): St. Stephen Rail Bridge. [19] (Theme Element 3.3.3)

The international rail bridge at St. Stephen, which dates from the mid-1880's, was subject to preventative maintenance in 1997 when trestle pilings were reinforced. The original architecture of the bridge was, however, unaffected.

[18] The island is in U.S. territory.

[19] This value was not recognized in the 1986 nomination document.

3.3.8 Riparian Settlement (River Influenced Railways): McAdam Railway Station. [19] (Theme Element 3.3.4)

In the early 1990's rail service to McAdam was suspended and this nationally significant station fell into disrepair. The station was transferred to municipal interests in 1999 when it was acquired by a local charitable trust that has begun repairs and restorations.

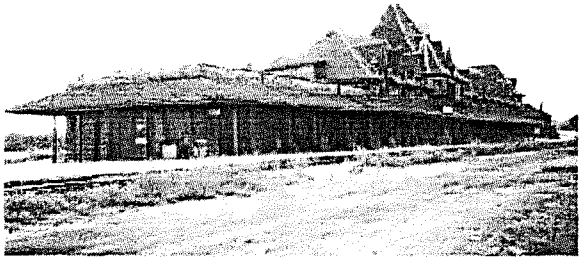


Figure 21. McAdam railway station, a National Historic Site and designated historic railway station..

3.3.9 Culture and Recreation (Early Recreation): Angling. [19] (Theme Element 4.3.2)

As noted above (Sections 3.2.6 and 3.2.7), considerable effort was made in the 1990's to revive the St. Croix smallmouth bass and Atlantic salmon fisheries, both of which contributed to the system's identification as a sportsman's haven. The decline of the smallmouth bass fishery in the 1980's was halted and the stock has recovered significantly. However, the Atlantic salmon fishery has not revived as returns of adult fish to the river have declined in spite of major restocking activities.

3.3.9 Jurisdictional Use (European Internecine Conflict): St. Andrews Blockhouse. (Theme Element 5.1.3)

A fire in 1993 damaged the interior of this national historic site. It was restored by Parks Canada in 1995 and new interpretive signage was installed. Work on a revised management plan was also begun in 2000.

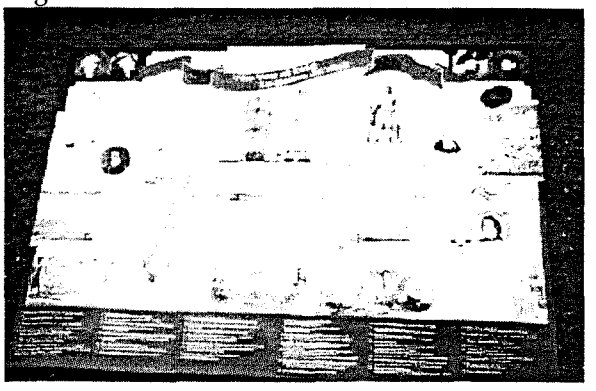


Figure 22. New interpretive display at St. Andrews Blockhouse National Historic Site installed during restoration work on the blockhouse in 1995.

3.3.11 Jurisdictional Use (Improvements in Aquatic Ecosystem Management): Fishways and Fish Management. (Theme Element 5.3.3)

New Brunswick and Maine have cooperated for many years on the management of the St. Croix waterway and its fisheries. Fishways were first constructed in the 1880's to permit anadromous species to by-pass the newly constructed dams. Two fishways were modified in the 1990's - the Milltown fishway was repaired in 1991 and a downstream fishway was constructed at Woodland by Georgia Pacific Corp. in 1992. The institution of catch and release for the smallmouth bass fishery on Spednic Lake has helped the species recover from the mid-1980's. However, as previously mentioned, a major Atlantic salmon restocking program and the curtailment of salmon fishing on the river has not helped recovery of this species. Sea-run alewife numbers have declined dramatically in large part due to the 1995 blockage the spawning run of this species at two fishways in Maine.

3.4 CHANGES TO RECREATION VALUES

Significant changes to the recreational values of the St. Croix River are described below[20]. In the absence of a recreation framework similar to the natural and cultural frameworks, activities subject to *significant* change are described here in the order that they appear in the 1986 nomination document. A full listing of the river's recreational values, and summary descriptions of changes to them, is included in Section 6.3 below.

3.4.1 Boating

Boat ramps were installed at various places along the river in the past decade enabling significant lengths of the main stem and the lakes to be more accessible to boaters and fishermen. Docks or ramps were constructed at several locations including Woodland Flowage, Milltown, Spednic Lake Provincial Park, Grand Falls Flowage and Fosterville. A recent recreational survey[21] indicated, however, that there still a need for more boat access to the river and lakes

In 1997, an environmental permit was issued for a granite quarry in the provincially-owned Champlain Industrial Park at Bayside, adjacent to the commercial port facility. Operational since 1998, local residents have complained of noise and dust problems from this site but, from the river's standpoint, another significant impact is aesthetic: large piles of granite aggregate are visible from some distance on the estuary.

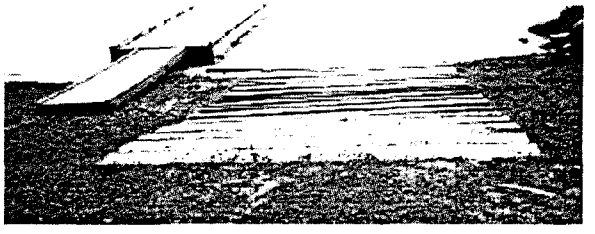


Figure 23 Dock and boat ramp installed at Spednic Lake Provincial Park campground in 1996.

3.4.2 Canoeing.

High weekend water discharges by Georgia- Pacific for canoeists were ended in 1996 in favour of more constant flows on all days of the week, extending canoeing opportunities and benefiting fish populations. In spite of dry spells and lower than average precipitation in the past three years, this has proved sustainable except for a 5 week period in 1999 when part of the river was not navigable.

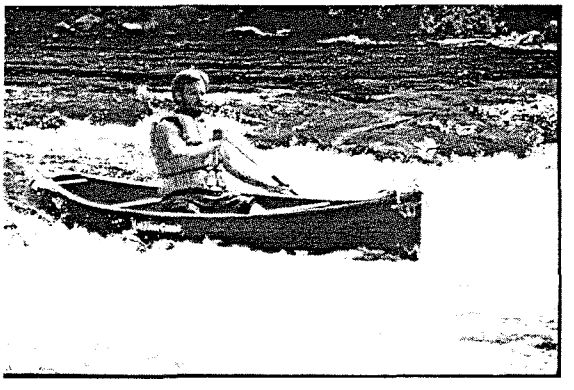


Figure 24. Running the Little Falls rapids.

At. St. Croix Landing, a large parking area and canoe put-in has been constructed near the CHRS plaque in an area formerly used by Georgia-Pacific for drying fire-fighting hoses near its woodlands headquarters building.

[20] In the CHRS context recreational activities include heritage interpretation and appreciation.

[21] *Recreational Use Assessment of the St. Croix International Waterway.* University of New Brunswick. March 2000.

Information for canoeists was recently made available on the World Wide Web. Automated monitoring of water flows at Baring and Vanceboro can be accessed by the public to determine the suitability of the river for canoeing. Georgia-Pacific has also maintains a dedicated phone line which gives callers information on water levels and flows for all parts of the St. Croix System.

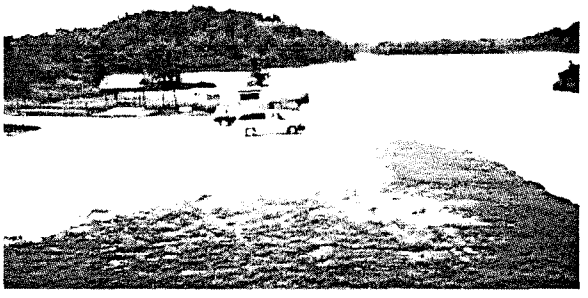


Figure 25. Newly developed boat access point on former Georgia-Pacific lands at St. Croix Landing.

Two recreational sub-divisions were established in remote parts of the river system - near Grassy Islands and at the Canoose River mouth. Covenants restricting location, shoreline vegetation, paint colour, etc., have proved effective and there is minimal intrusion into the river environment.

3.4.3 Camping.

At the time of designation to the CHRS there were about 20 remote campsites and three provincial parks in the St. Croix system - Oak Bay, Spednic Lake and North Lake. Remote camping opportunities have increased to 27 sites, most with improved basic facilities, and the management of camping opportunities within provincial parks has been significantly modified as a result of the provincial government's 1996 policy to privatize all parks.

- Oak Bay Park still contains 13 hectares, 110 campsites and a beach but has been transferred to Business New Brunswick and was leased on a long-term basis in 1997 to a private operator.
- North Lake Provincial Park. At the time of writing, privatization of the 76-hectare North Lake Provincial Park was in the proposal process. It contains 60 campsites as well as a boat launch and beach.
- Spednic Lake Provincial Park, with 350 hectares and approximately 25 campsites, is the largest of the three parks and is still managed by DNRE. A new boat ramp and dock were installed in 1997, but camping fees are no longer collected.

The 1996 provincial park policy not only outlined a paring down of existing parks to meet new priorities but also announced the creation of two special linear parks in the province, one on the Bay of Fundy and the other along the St. Croix Waterway. Public consultations were held to establish development priorities for a proposed St. Croix Provincial Park in 1996-97 and these were extensively documented. While the provincial government has set aside funds and staff for the park, there has been no further on-ground progress on this initiative.

3.4.4 Angling

As mentioned in several places above, there were some losses and gains for anglers on the St. Croix in the 1990's. A small Atlantic salmon fishery, despite major efforts to rebuild stocks by SCIWC and other agencies, was curtailed due to low runs, as described in Section 3.2.

A famed smallmouth bass fishery in Spednic Lake, which had declined in the

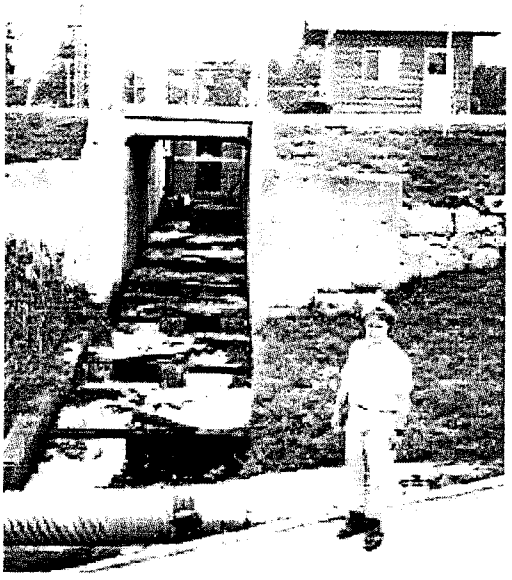


Figure 26. Lee Sochasky, Executive Director of the St. Croix International Waterway Commission, at the Milltown fishway.

1980's[22] was on a catch and release basis for the entire decade. This, along with other measures, such as the restriction of alewives from Spednic Lake, appears to have revived the bass population although not yet to 1980 levels.

Soft-shell clams in Oak Bay, the largest arm of the St. Croix estuary, have since 1950 been affected by bacterial and closed to recreational diggers[23]. The digging beds were conditionally re-opened in 1999 to both commercial and recreational harvesting after successful efforts to reduce pollution (see Section 3.2.4 above).

3.4.5 Hiking

The hiking trail at Spednic Provincial Park was modestly upgraded before the new parks policy was introduced in 1996 and interpretive signage improved. A trail was initiated at Wingdam Island in 2000. In 1994, a section of the multi-purpose New Brunswick Trail was proposed along the river, but shelved. In 1998, however, a section of the Trial linking McAdam to the community of St. Croix has brought this to the river.

Visual and pedestrian access to the river has been improved in several urban locations. In St. Stephen, four waterfront parks and a waterfront walkway have been established.

3.4.6 Natural Heritage Interpretation

The SCIWC published an interpretive brochure in 1995 which was widely distributed. It contains short information items on some key natural features including wildlife, fisheries and morphology. An interpretive kiosk, providing visitors with information on the St. Croix's natural heritage, was also erected in St. Andrews.

Figure 27. Waterfront park development in St. Stephen.

The interpretive trail in Spednic Lake Provincial Park was maintained and the signs upgraded. A new interpretive trial was initiated at Wingdam Island by the SCIWC and Georgia-Pacific.

[22] The smallmouth bass fishery was still considered to be a nomination value in 1986.

[23] Depuration of clams enabled continuation of some commercial digging after 1950.

3.4.7 Cultural Heritage Interpretation

Plaques commemorating the designation of the St. Croix to the CHRS were unveiled in three locations: St. Stephen (1995), St. Andrews (1996), and St. Croix Landing (1998).

Figure 28. CHRS plaque unveiling ceremony at St. Stephen in 1995.

In recognition of its unique wealth of Loyalist architecture, the central part of the Town of St. Andrews was officially designated a historic district by the Historic Sites and Monuments Board of Canada in 1997. A plaque was unveiled to recognize this in 1998.

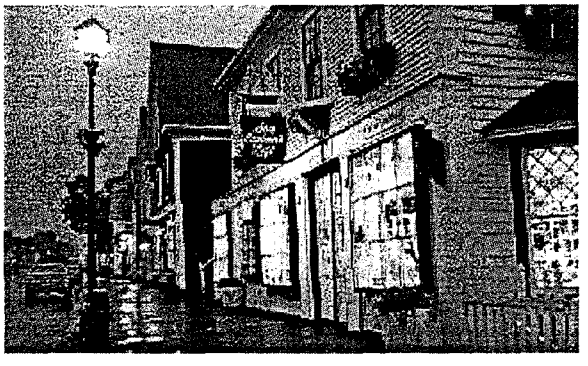


Figure 29. Main Street of St. Andrews where Loyalist residences date back to the 18th Century.

A monument to the log driving history of the St. Croix River was erected on Diggity Stream in 1991.

The Ganong chocolate factory building in St. Stephen was adapted for use as a museum when the company moved to more modern quarters inland from the waterfront.

3.4.8 Other Recreational Activities

Several whale-watching tour companies, and two sea-kayaking companies have located in St. Andrews since 1991. The town has become a significant focal point for these activities in Passamaquoddy Bay and beyond.

Figure 30. Whale watching tour boats docked at St. Andrews.

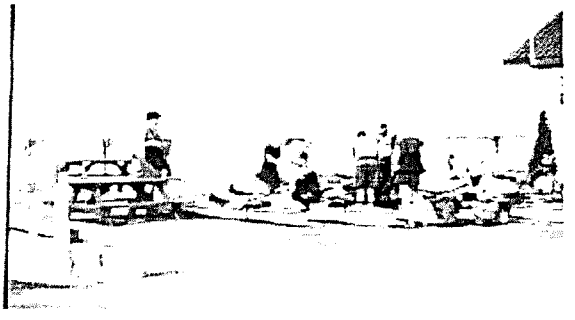


Figure 31. Sea kayakers at St. Andrews wharf

3.5 CHANGES TO INTEGRITY VALUES

In 1991, the integrity guidelines described in the original CHRS policy document[24] were expanded to describe separate integrity requirements for natural, cultural and recreational values[25]. *Significant* changes to the integrity of the St. Croix River after ten years as a Canadian Heritage River are therefore noted below in terms of the three value sets[26]. A more complete listing of integrity values, and summary descriptions of changes to them, is included in Section 6.4 below.

3.5.1 Changes to Natural Integrity[27]

- **3.5.1.1 Size of the Management Area.** The management area of the St. Croix River technically remains as it was when the river was designated – a 75 metre strip along the Canadian side of the river. However, there have been several significant measures in the past decade which effectively expanded this corridor. Some are described in detail in Section 3.1 above. They include:
- Provincial Watercourse Buffer Zone Guidelines for Crown lands, introduced in 1995 (see Section 3.1.3.1 above);
- St. Croix Shoreland Zoning Regulations, also introduced in 1995 (see Section 3.1.3.2 above);
- Designation of Grassy Islands Ecological Reserve in1995;
- Transformation of 157,833 hectares of Georgia-Pacific Corporation's private Canadian holdings into Crown lands in 1999;
- Provincial protected areas strategy currently being developed by DNRE which proposes setting aside 33,198 hectares bordering Spednic Lake.
- Ongoing cooperation between New Brunswick and the State of Maine on fisheries, water quality and other issues affecting the natural, cultural and recreational values of the river.

3.5.1.2 Natural Aquatic Ecosystems. While the lake and upper river system of the St. Croix are in generally excellent condition, especially considering their long history of multipurpose use and water level regulation, there are instances where aquatic ecosystems do not appear to be in their natural state, although it should be recognized that in some cases it is difficult to determine what the original state actually was. Recent changes include:

- Alewives are now prevented from ascending above the lower river by dam closures at Woodland and Grand Falls. This closure may also inhibit early run salmon from reaching spawning grounds;
- Minor nutrient loading has been noted in a small part of East Grand Lake in relation to cottage development.
- In 1997 and 1998, harvesting of immature eels on the Maine side of the estuary significantly lowered numbers of elvers in the system.

3.5.1.3 Natural Aesthetic Value.

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[24] *Canadian Heritage Rivers System Objectives, Principles and Procedures*. Parks Canada 1984. Section 4.3.

[25] *Canadian Heritage Rivers System Principles, Procedures and Operational Guidelines*. September 2000. Section 3.3.

[26] Subtitles throughout section 3.5 are paraphrasings of the integrity guidelines. The complete guidelines are quoted in the summary charts in Section 6.4 below.

[27] It should be noted that because of impoundments the river would not meet current integrity guidelines. Its integrity was "grand-fathered" when the new guidelines were adopted by the CHR Board. Three guidelines which mention impoundments are not addressed here.

Two cottage subdivisions were permitted on the largely undeveloped upper river in the early 1990's, with each having restrictive covenants on visual impacts. The 1995 St. Croix Shoreland Zoning Regulation has minimized future intrusions on the views of canoeists and other river tourists. However, cottages on East Grand Lake caused a small algae bloom in 1992 and some instances of foam have been seen recently in the estuary.

However, the establishment of a granite aggregate quarry at the Champlain Industrial Park in 1998 has resulted in the piling of large quantities of aggregate on the shipping dock, in full view of the estuary.

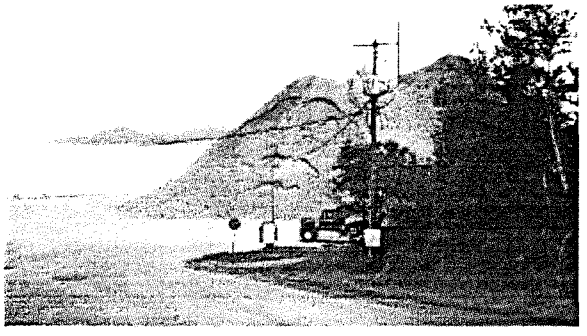

Figure 32. Granite aggregate piled on loading dock at Bayside.

3.5.1.4 Water Quality.

Water quality in the middle and upper parts of the system varies from that in the lower, more populated section. The lake system and upper river has generally no significant water quality problems and the International Joint Commission and Environment Canada have judged the water above Woodland as esentially pristine. The lower river system, however, is still recovering from a century of logging and industrial discharges. Sawdust, submerged logs and industrial and municipal waste discharges have altered water quality in the lower 35 km of the system, and although there is considerable natural recovery, Maine still classifies this section as Class C, the lowest of three possible quality classes.

Significant efforts have been made over the past decade to increase monitoring of water quality in the St. Croix River and to remedy pollution sources. Three entities in particular have taken responsibility for this: the Maine Department of Environmental Protection, the St. Croix International Waterway

Figure 33. Milltown Rapids, where natural flushing of old logging debris has improved water quality and river bottom ecosystems.

Commission, and the New Brunswick Department of Environment.

Municipal and industrial discharges, which occur on the lower river, are tested regularly. With few exceptions, all discharge points met objectives throughout the ten years. There has been discussion over whether or not to raise the dissolved oxygen objective to a higher level to benefit Atlantic salmon.

Specific measures taken by managing agencies and water users to improve water quality in the past ten years include:

- Treatment facilities upgraded to separate storm water and sewage in the City of Calais, 1991;
- Recovery boiler installed at Woodland

pulp mill, 1991;
- Humus pump-out facility installed at Oak Bay Park, 1995;
- New automatic water quality monitor installed at Milltown, 1995;
- Pumping and repairing of residential septic systems in Oak Bay, 1995-97;
- 25% reduction in water consumption by Georgia-Pacific at Woodland Mill, 1996;
- Cooling towers built at Woodland pulp mill, 1995-96;
- Chlorine no longer used by Georgia-Pacific in pulp manufacturing, 1997;
- Improved chlorination/dechlorination system added to the Oak Bay sewage treatment plant, 1997;
- Aeration lagoon at Woodland reinforced, 1998.

Only a small number of relatively minor events threatened water quality over the decade. These included:
- Nutrient loading from an increase in the number of cottages on East Grand Lake appeared to cause small algae blooms, detected in 1992;

Figure 34. Water quality in Spednic Lake has remained essentially unchanged since 1991.

- In 1994, US Geological Survey, following suspension of funding by the IJC, reduced operation of the key automatic water quality monitoring station at Milltown from full-time to summer seasonal.[28];
- Tan House Brook, a small tributary near St. Stephen, discharged high levels of bacteria and hydrocarbons into the river in 1995.
- Environment Canada reduced support for all monitoring of water quality and levels in the system, 1997;
- Spills of titanium dioxide, an inert whitening agent used in pulp manufacture, in August 1999 and June 2000, made waters below Woodland cloudy for 2 weeks[29].
- Operational difficulties at the St. Stephen sewage treatment plan have resulted n periodic reduction of treatment capabilities and in 1999 one sewage spill occurred.

3.5.2 Cultural Integrity

3.5.2.1 Size of the Management Area. Expansion of the management area in ways described in section 3.5.1.1 above have had relatively little impact on the river's cultural values. Only those parts of the towns of St. Stephen and St. Andrews within 200 feet of the river or estuary are technically included within the CHRS management area.

3.5.2.2 Visual Appearance. The visual appearance of the vast majority of the river corridor has not changed over the past decade. In particular, the Town

[28] As a result, only uncorrected data was collected at this station in the summer of 1995. USGS has since agreed to fund operation of a new automatic monitor, installed by the IJC, during summer months.

[29] Georgia-Pacific Corporation was fined, on the basis of discoloration of the waters, for this incident, which had no lasting chemical impact.

of St. Andrews has gone to some lengths to ensure that its Loyalist heritage remains intact, aided by the Historic Sites and Monument Board's designation of the downtown area as a National Historic District in 1997. There is, in fact, only one significant new blemish on the landscape since 1991 – the appearance, since 1998, of stored gypsum and granite aggregate piles on the loading dock at the Bayside Port and their associated dust. Clearly visible from the estuary, this testifies to the fact that the river is a "working river", but detracts from the cultural experience of river tourists.

3.5.2.3 Key Artifacts.

Although the St. Croix River, and estuary area in particular, is very rich in cultural sites and artifacts, most agencies which are active in managing the waterway are concerned primarily with its natural values. Major historic sites have been recognized and maintained. Parks Canada has restored and even enhanced the St. Andrews Blockhouse, and the McAdam Railway Station has now been acquired by a charitable trust and repair work has begun. It is noticeable, however, that some other cultural values of the river are not recognized as such, potentially threatening the cultural integrity of the river. Examples of this lack of recognition include certain Milltown cotton mill artifacts, notably a cotton bale and the generator rope drive replaced in 2000, which have not been protected or curated

A number of other sites along the system are not protected and may be presumed to be deteriorating through natural processes:

- Log driving sites and artifacts, such as boom moorings and a log sluice;

Figure 35. Bale of cotton from Milltown cotton mill, found at Milltown generating station

- Remaining signs of the Skedaddle Ridge settlement;
- Native shell middens;
- Herring weir equipment;
- International boundary markers;
- Remnants of 19th century wharves in St. Andrews and St. Stephen;
- Shipbuilding sites;
- St. Croix Island International Historic Site, whose shores are slowly eroding.

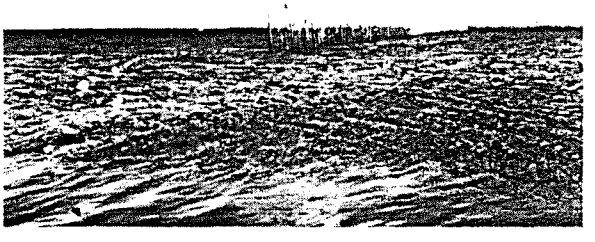

Figure 36. Herring weir, once a common sight in Passamaquoddy Bay in the 1980's.

Many privately owned structures of cultural value are well maintained by their owners, and the designation of downtown St. Andrews as a National Historic District by the Historic Sites and Monuments Board of Canada in 1997 may have served to highlight the significance of many private dwellings to their owners. However, such recognition has not been extended to, for example, many loyalist dwellings in St. Stephen or early sport fishing camps along the river. While the preservation of cultural artifacts is an expensive business, recognition of their significance by their owners can be an inexpensive first step toward their protection.

Figure 37. Colonial era residence in St. Stephen.

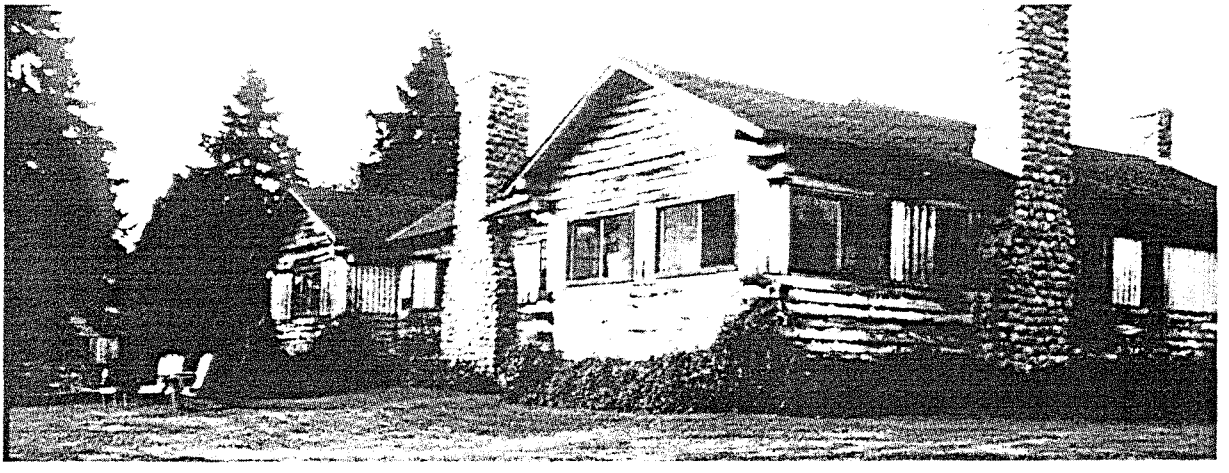

Figure 38. Loon Bay Lodge, a possible unrecognized representation of early recreational history on the St. Croix.

4. PUBLICATIONS, REPORTS AND PLANS.

In addition to actual changes that have occurred to the St. Croix River over the past ten years, it is valuable to acknowledge the efforts of various agencies to manage the river. Their efforts have served directly or indirectly to maintain the values in their original designated condition. Those that are published documents are described below in the chronological order of their release. Three categories are used: broad-distribution publications, research reports, and planning documents.

4.1 BROAD-DISTRIBUTION DOCUMENTS

Several documents were published in the past decade for distribution to the general public, particularly in the St. Croix area. Two of these are annual reports, while others provide information to residents and visitors for using, appreciating or improving the waterway.

St. Croix Waterway Recreation Area. 1990 For sale primarily to canoeists, this is a bilingual fold-out map printed on waterproof paper prepared by the New Brunswick government in 1991. At scales of 1:30,000 and 1:50,000 it is able to show all navigational details, recreational facilities, access roads and placenames. In addition some jurisdictional boundaries are marked , notably the international boundary and provincial parks.

International Advisory Board on Pollution Control St. Croix River. Progress Reports to the International Joint Commission. 1991-1999
While perhaps not produced for broad distribution these reports are written for consumption by laypersons. Eight reports were prepared by the IJC Advisory Board over the period 1991-99[30] summarizing the actions of the Board and other organizations with which it worked, in pollution abatement, surveillance and monitoring, and fisheries restoration, in both Maine and New Brunswick.

SCIWC Annual Reports 1996- 1999
Each year since 1996, the St. Croix International Waterway Commission has published a 4-6 page annual report summarizing its numerous activities over the previous year. These are undertaken in respect of the 1993 *document St. Croix International Waterway: A Heritage – A Future* (see below). The report also serves to recognize the many financial and in-kind contributors and volunteers who participate in maintaining and enhancing the waterway, and provides details on how to contact the Waterway Commission.

The Lake Book. Actions You Can Take to Protect Your Lake. St. Croix Edition. June. 1992.
This publication of the Congress of Lake Associations, based in Maine, was adapted by the SCIWC for use by both American and Canadian stakeholders in the St. Croix area. The general information on how to protect lake fisheries, aquatic ecosystems, adjacent wildlife and how to combat acid rain. Contact agencies on both side of the corridor are listed. Numerous copies of the publication have been distributed to the public in the St. Croix area by SCIWC over the past eight years.

St. Croix International Waterway. A Heritage to Experience in Maine and New Brunswick. 1995. This 12-leaf folding brochure targeted both visitors to and residents of the area with a view to increasing their awareness and

[30] Reports for 1996 and 1997 were combined.

appreciation of the waterway's heritage and recreational attractions. It contains a full page map with commentary on key sites in the watershed in both Maine and New Brunswick. On the reverse, there is more detailed information on the history, natural values and recreation, and contact information for the traveler and resident.

4.2 RESEARCH REPORTS

Economic Impact of Recreational Users of the St. Croix River, New Brunswick. March 1993.

In an attempt to determine the economic impact of designating rivers to the CHRS and to provide baseline information on the economics of use of the St. Croix River, a survey was undertaken in the summer of 1992. The survey addressed overnight visitors only, including users of various types of roofed accommodation on the Canadian side of the waterway. Data were collected from both users and operators of commercial establishments, and cottagers, both owners and renters.

An attempt was made to assess how much of the expenditures made by these people could be attributed to the waterway's presence in the CHRS. However, a very low level of knowledge about the CHRS precluded such estimates. In addition, the absence of data from one key establishment, Loon Bay Lodge, significantly skewed final economic impact estimates.

St. Croix Waterwatch. 1992-1999

Since 1992, with the endorsement of the International Joint Commission, the SCIWC has pursued a program of water quality monitoring on the lakes of the St. Croix system which it has termed the *St. Croix Waterwatch*. Beginning with baseline surveys of 7 Canadian or international lakes in 1992, the program has since included sampling of water at least once from 13 Canadian or international lakes, as shown in the chart below. For all surveys, water was sampled for at least 17 parameters according to protocols of the provincial Department of the Environment.

St. Croix Waterwatch Surveys

Lake	'92	'93	'95	'98	'99
Bolton		X			X
Canoose Lake	X			X	
East Grand	X			X	
Fifth					X
Grand Falls Flowage		X			X
Modsley					X
North	X			X	
Sixth		X			X
Skiff	X			X	
Spednic	X			X	
Palfrey	X			X	
Waughlehegan	X			X	
Woodland Flowage			X		

1992 data were compared with those of surveys over the previous 20 years. While not totally comparable, it appeared that there had been no significant change except for a lowering of nutrient levels in Waughlehegan Lake, near the town of McAdam, presumably due to improved municipal waste treatment. Lakes were found to be generally of neutral pH and slight declines in alkalinity were detected in East Grand and Skiff Lakes from readings taken in the 1980's.

These surveys have consistently found little change in water quality in the lakes, which remains for the most part virtually pristine. Minor changes, such as nutrient loading in part of East Grand Lake near cottage development, appear to be temporary.

Waterwatch includes a volunteer monitoring program focusing on water clarity and temperature. Under this program local volunteers collect information on clarity and temperature in the same 7 lakes. In addition, the Lake Book (see above) was distributed to American and Canadian landowners on Canadian and international lakes as part of a landowner education program.

Prospective Heritage Oriented Small Business Opportunities for the St. Croix, A Canadian Heritage River. February 1994.

While designation of the St. Croix River to the CHRS was made in 1990 to protect its heritage values, there was recognition that the designation would stimulate complementary economic development in the region. Since such development rarely occurs without encouragement from government, this study was prepared under the Canada-New Brunswick Cooperation Agreement on Planning. The report contains a socio-economic analysis of the incorporated and unincorporated jurisdictions that abut the Canadian side of the St. Croix. It lists heritage-oriented businesses on both sides of the river and investigates such businesses on selected corridors elsewhere in North America. From 16 general categories of business opportunities, 10 specific opportunities were identified based on their suitability to the corridor, their economic viability, environmental sustainability, and compatibility with the waterway management plan. A much longer list of all opportunities identified is also included for reference.

Final Report: 1994 St. Croix Recreational Fisheries Development Program. January 1995.

Under the Canada/New Brunswick Cooperation Agreement on Recreational Fisheries Development (the "RecFish" Agreement) in 1993-94 the SCIWC led a cooperative program for the assessment and development of sport fisheries on the river. Together with nine local partners and five government agencies, the estimated value of this program in cash and kind contributions was over C$.5 million. While more than half of this value can be attributed to the value of Atlantic salmon smolt and fry provided by the U.S. Fish and Wildlife Service, significant contributions were also made by New Brunswick Wildlife Federation and SCIWC.

The report describes a number of field projects including creel and habitat surveys in the lake section, monitoring of fishway traps for Atlantic salmon and alewife, collection of Atlantic salmon broodstock, stocking of juvenile Atlantic salmon, and a survey of fish habitat in three tributaries. Public information and volunteer involvement were a large part of the project, and a fish habitat workshop for wood harvesters proved highly successful. Boat ramps were constructed at Woodland Flowage and Milltown rapids, opening up 12 km of the river to Canadian boaters. In addition, the first part of the systematic habitat survey of the main stem was initiated, as described in the document *St. Croix Fish Habitat Surveys 1994-1997* and noted below.

1994 Inventory of the Streams and Stream Salmonid Habitat of the Chiputneticook Lakes, St. Croix River System, New Brunswick, Canada and Maine, U.S.A. March 1995.

Undertaken by the SCIWC, this study addressed fish habitat in the lower sections of 66 streams feeding the five lakes located along the international boundary: North East Grand, Spednic, Mud and Palfrey. These lakes are important fisheries for Canadian and Americans for smallmouth bass,

landlocked salmon, lake trout and other species. Field surveys documented the extent of "salmonid riffle" and salmon run in accessible parts of each stream, a total of nearly 40 km. Recommendations included remedial work on three streams with high potential, two of which are located on the Canadian side of Spednic and North Lakes. (This was carried out in 2000).

St. Croix 1994 Estuary Sanitary Survey. November 1995.
The closure of the clam beds in Oak Bay in the 1950's due to bacterial contamination was an indication of serious pollution in the upper St. Croix estuary. This three-pronged study by the Department of Health and Community Services, with federal and provincial environment agencies and the St. Croix Estuary Project, attempted to identify the precise sources of this pollution. On-site surveys were made of properties along the upper reaches of the Bay, and water quality monitoring was performed on inflows to the Bay. In addition, discharges from wastewater treatment plants on the Canadian side of the estuary as a whole were monitored. The study revealed a public perception that the main polluters were town sewage treatment plants, the Woodland pulp and paper mill, Bayside lumber mill, Oak Haven septic disposal site, and, especially, Oak Bay Park. In reality, the most serious sources were home and cottage owners who grossly neglected their own septic systems. Recommendations focused on remedial actions to ensure that these systems were properly maintained.

St. Croix Fish Habitat Surveys 1994-1997. December 1997.
Since the 19th century, the St. Croix River and lake system has provided an important recreational fishery for smallmouth bass, was of some importance as a salmon river, and temporarily supported a commercial alewife fishery. However, at the time of designation to the CHRS, the only available information on salmonid habitat dated from 1956, and none existed on smallmouth bass habitat. To provide comprehensive baseline information on riverine habitat along the main stem of the river, the St. Croix International Waterway Commission began a survey in 1994. Over the next three years, with support from various Canadian and U.S. government agencies, Georgia-Pacific Corporation and the National Fish and Wildlife Foundation, about 60% of the river's length on both sides of the river was surveyed.

Information collected included channel types, water character and substrate types, bank characteristics, inflows, bottom woody debris and aquatic vegetation. The location and extent of these features were noted along 48.4 kilometres of the river, and the rate of river flow at the time recorded. Eight reaches were identified between the Vanceboro Dam and the Milltown Dam, each divided into a series of units defined according to major streambed or shoreline features, and surveys of all but one were completed by 1997. The database allows for the extraction of data on the location and size of units containing prime salmonid and smallmouth bass spawning and nursery habitat.

1997 Oak Bay Project. December 1997.
Clam harvesting in Oak Bay in the 1950's yielded 90 metric tons of clams per year, which represents a resource that could today provide seasonal employment to 200 diggers and a harvest worth $1-2 million. The SCIWC set out in 1997, with a large number of government and non-government partners, to take action on the bacterial pollution that was identified in previous studies including the St. Croix

Estuary Project (see above). The report documents the results of three initiatives:

- bacterial source identification and remediation
- public awareness and involvement
- clam management options

Potential sources of pollution examined included 189 residential septic systems, 3 wastewater treatment facilities, and non-point sources including 6 tributaries flowing into the Bay. The N.B. Department of Health and Community Services helped to ensure that remedial action was taken where residential coliform sources were located. Harvest potential was re-estimated at perhaps double the 1950 harvest, although this would depend on management practices.

Recreational Use Assessment of the St. Croix International Waterway. March 2000.

Based on information from 404 completed questionnaires, returned after initial interviews of 680 individual users, this survey provided some basic information on the characteristics and preferences of waterway users, both Canadian and American. It revealed that, although encounters with other canoeists are still relatively infrequent, the waterway is being used at almost capacity as perceived by existing canoe campers, and that there is a need for some minor remedial action to enhance the users' experience. These actions are generally of a labour intensive nature, however, and include litter collection, control of the inconsiderate behaviour of other users, noise and visual pollution, especially at organized campsites.

4.3 PLANNING DOCUMENTS

St. Croix International Waterway: A Heritage - A Future. October, 1993.

This plan, which closely resembled the draft document that permitted designation of the waterway to the CHRS in 1990, is essentially the blueprint for the actions of the St. Croix International Waterway Commission, which prepared the document. It was approved by the New Brunswick government in January, 1994, and by the Maine government the following September.

The plan addresses the long-term management of water quality, shorelines, recreation, and fisheries in both Maine and New Brunswick. In addition, the plan commits the Waterway Commission to the encouragement of sustainable economic development, heritage promotion and to facilitating coordinated planning and management and public involvement. 22 policy statements are articulated for developing the waterway's identity (1), environmental management (4), human heritage (1), natural heritage (3), recreational heritage (6), economic development (2), and waterway management (5). This is the *key* reference document for management of the St. Croix as a Canadian Heritage River.

Caring for Our Coast: A Plan for Community Management of the St. Croix Estuary Area. March 1997.

The St. Croix Estuary Project was founded in 1992 through the federal Atlantic Canada Action Program to provide community-based support for maintaining or restoring ecosystem health in the St. Croix Estuary. The plan defines a community vision for the sustainable management of the estuary area and discusses issues affecting eight uses of the estuary: wastewater discharges, land uses, fisheries, aquaculture, shipping, rockweed harvesting, tourism, and environmental research. 50 actions are described, 7 of which are considered urgent and 29 as "necessary". The remainder are classed as

"desirable". Due to an apparent paucity of data, many issues were discussed in hypothetical terms of typical situations rather than the specific concerns of the St. Croix Estuary. As a result, in addition to some specific actions on wastewater discharges, many recommendations concern planning or further research, including:

- Contingency planning for oil spills;
- Education campaign on ballast water discharges;
- Assessment of the impacts of aquaculture in Passamaquoddy Bay;
- Study of impacts of scallop dragging;
- Research on rockweed harvesting.

While hindered by a lack of information, this document nevertheless represents an important compendium of issues in the St. Croix estuary area and the first steps towards their solution. Numerous links are made between the plan's actions and the policies of the CHRS designation document, the 1993 *Plan for Long-Term Cooperative Management of the St. Croix International Waterway*, prepared by the SCIWC. No other similar document has been prepared for this part of the designated area and it is an important supplement to SCIWC's CHRS designation document.

Initial Public Consultation Regarding a Proposed St. Croix Provincial Park. March 1997.

In April 1996, the Department of Natural Resources and Energy adopted a new provincial parks policy which redefined the park system to focus on a network of a smaller number of significant parks. Two new parks were also proposed, both linear; one along the Fundy coast, and the other along the St. Croix River. It was anticipated that the park would focus on existing provincial resources in the area and on cooperation with local public and private interests. The report documents case studies of similar linear parks in North America.

Public consultation was undertaken by the SCIWC on behalf of DNRE through a mailed questionnaire to 817 local property owners, 70 interviews, and 3 community meetings. Over 2,000 individual recommendations were collected, which provide some insights into the recreational and other needs of local people. Over 500 of these recommendations concerned the improvement of water access and other recreational facilities. 370 recommendations concerned improved interpretation and education, 230 recommendations concerned the augmentation of natural resource protection, about the same number concerned increased business opportunities, and 350 recommendations concerned improved recreational management on the waterway. The provincial government has to date acted on some these recommendations however there has been no further indication that park planning will be initiated.

Review of the Orders of Approval St. Croix River Basin Maine and New Brunswick. November 1997

This document is the final report of the Working Group established by the International Joint Commission in 1993 to review its water management objectives for flood control, hydro generation, fisheries, recreation and regulatory requirements. This followed critical comments received by the Commission during a public hearing in 1992. A stakeholder group was established to provide input to the working group and to participate in the public education part of the review.

Changes proposed by the Stakeholder Group were assessed against a hydrological model based on 20 years of

water flow and found to be untenable. The changes would have exceeded the quantity of water available in normal dry years. A revised proposal was also found to be untenable in large part because of the minimum discharge requirement of the U.S. Environmental Protection Agency at Baring, below the Woodland Dam. Until this requirement can be reviewed, it was concluded that the Orders of Approval were adequate to guarantee the existing uses of the river, and that recent accommodations by Georgia Pacific Corporation satisfied most of the concerns voiced by stakeholders. A possible future scenario was developed, treating all stakeholder concerns as equal, that might be implemented through agreements within the context of the Orders of Approval. Future scenarios might improve on this by giving different weights to different uses.

Protected Areas Strategy for New Brunswick: Summary of Public Hearings and Recommendations. 1999; and Stakeholder Committee Report. June 2000.

These two documents describe proposals of DNRE to fulfil the province's commitment to establish a comprehensive network of protected areas in New Brunswick by 2005. The areas would represent each of New Brunswick's 7 ecological regions. In 1997, Dr. L. LaPierre of the University of Moncton was retained to develop a strategy using primarily crown lands. His proposal was reviewed in a series of public meetings held in late1999. An area including Loch Alva and the Nerepis Hills near Gagetown was intended to represent the region in which the St. Croix River system lies.

A stakeholder committee, comprising representation from major industries and non-government organizations, was convened in January 2000 to review the proposed areas and other recommendations of Dr. LaPierre's report. To augment the degree of representation in the ecoregion, the Loch Alva/Nerepis Hills area was greatly reduced and two areas from within the former Georgia Pacific lands were added. These were 3,931 hectares in the Canoose Flowage and 33,198 hectares beside Spednic Lake, both within the St. Croix River system. These areas have been recommended to the N. B. Department of Natural Resources and Energy.

Future Water Quality in the St. Croix Watershed: A Proposal for Preliminary Surface Water Classification under New Brunswick's Clean Water Act. March 2000.

Section 40 of the 1989 *New Brunswick Clean Water Act* allows for the establishment of a water classification regulation. These classifications were intended to reflect current conditions and future targets for all water bodies in the province. Prepared by the SCIWC for the provincial Department of Environment, with funding from the New Brunswick Environmental Trust Fund, this report on the Canadian part of the St. Croix watershed was one of several similar pilot projects in the province. A similar, but not identical, classification system already exists in Maine. The study investigated point and non-point influences on water quality, potential and actual uses, and water test results for all sub-basins in the watershed. Although no waterbodies were classified in the highest class, Class O (for outstanding), preliminary recommendations are for very high classifications including three drinking water designations near St. Stephen, Class A for the river above Woodland, and Class AL (for lakes only) for North, East Grand, Spednic, Mud, Palfrey Lakes. Only some waters in the lower watershed

received a recommendation for Class C, the lowest classification.

5. CHRONOLOGY OF EVENTS AFFECTING THE ST. CROIX WATERWAY

The following is a chronology of major events, in headline banner form, over the period 1990 to 2000. For details on the most significant of these items the reader is referred to the text above and the charts below.

1990

- *Preliminary Plan for Long-Term Cooperative Management of the St. Croix International Waterway* published.

1991

- St. Croix River designated to CHRS in January
- Public consultation on *Preliminary Plan* initiated
- IJC water quality baseline study initiated
- Remote campsite improvement program initiated by NB
- Calais sewer system upgraded
- Recreation sub-division approved near Grassy Islands

1992

- Native Atlantic salmon restoration project initiated
- Water quality evaluation in upper watershed initiated
- CHRS economic impact study prepared
- Spill containment system built by Georgia Pacific at Woodland plant
- St. Croix version of the *Lake Book* published
- Waterfront parks in St. Stephen and Calais completed
- First annual river volunteer cleanup held
- St. Croix featured on cover of Canada's River Heritage stamp release

Figure 39. Scene on St. Croix used as the basis for the cover of a Canada Post river heritage series in 1992.

- IJC open houses on river and lake water levels held
- CHRS planners' workshop held at Loon Bay Lodge
- St. Croix Estuary Project launched
- St. Croix Water Watch initiated on 6 lakes
- Fish passage upgraded at Woodland Dam

1993

- *St. Croix International Waterway: A Heritage - A Future* management plan completed by SCIWC
- Charlotte County designated a Canadian Heritage Region
- NB purchases 24 acre Ross Farm estate facing St. Croix Island

- IJC and SCIWC initiate review of upper watershed flows

Figure 40. CHRS planners visit St. Croix Island in 1992.

- SCIWC Water Watch surveys water quality of 7 lakes
- Cooperative intensive recreational use study of East Grand Lake begun
- Cooperative recreational fisheries program initiated
- St. Andrews Blockhouse NHS damaged by fire

1994

- *A Heritage - A Future* approved by Maine and New Brunswick
- NB purchases 16 hectares at Canoose River mouth
- Study of bacterial discharges into Oak Bay initiated
-

Figure 41. St. Stephen town dock in newly upgraded waterfront setting.

- Grassy Islands designated as Ecological Reserve
- St. Stephen and St. Andrews waterfront improvement projects
- McAdam Station restoration campaign initiated
- Boat ramps constructed at Woodland Flowage and Milltown
- Modelling begun by IJC in review of upper watershed flows

1995

- CHRS plaque unveiled in St. Stephen
- NB adopts shoreline zoning regulations for 350 km of St. Croix waterfront.
- Maine closes fishways to alewives at Woodland and Grand Falls
- Water Classification System for New Brunswick launched
- Planning for 400th anniversary of French settlement of St. Croix Island launched
- New dragonfly species discovered
- *SCIWA heritage to Experience* brochure published
- St. Andrews wharf damaged by fire
- St. Andrews Blockhouse restoration completed

1996

- NB announces proposal to create St. Croix Provincial Waterway Park
- Management plan for St. Croix Island completed by US NPS
- McAdam Railway Station donated to McAdam Historical Restoration Commission
- *Caring for Our Coast* completed by St. Croix Estuary Project
- IJC completes 3-year review/modelling of upper watershed flow management
- NB Trail linking McAdam to St. Croix River initiated

1997

- Parks Canada's St. Croix Island interpretive display completed
- SCIWC inaugurates St. Croix Heritage Honour Roll
- Bayside granite quarry environmental permit issued
- St. Stephen waterfront redevelopment plan unveiled
- St. Andrew's wharf re-opened
- 300-acre reserve at Todd's Point proposed by NB Nature Trust
- Multiple-use planning workshop held in St. Stephen

1998

- NB agrees to purchase all Georgia-Pacific holding on the St. Croix
- 2004 St. Croix Island anniversary master plan initiated
- Rearing tanks for Atlantic salmon installed at Milltown

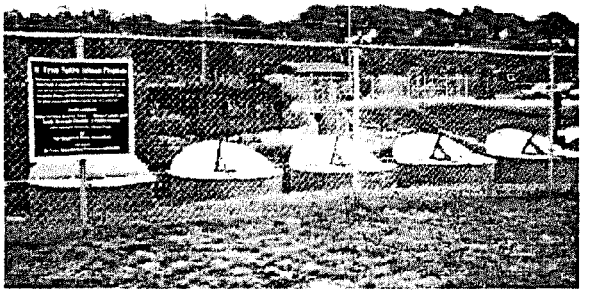

Figure 42. Salmon rearing tanks at the Milltown fishway.

- Gateway Park opened in St. Stephen
- Calais adopts waterfront redevelopment plan, including a heritage center
- Georgia Pacific Corp. takes over operation of Baring flow gauge

1999

- Oak Bay conditionally re-opened for clam digging
- Anadromous Fisheries studies
- Titanium dioxide spill at Woodland pulp mill
- Workshop held on International St. Croix River Issues and Solutions for the 21st Century

2000

- Classification proposal submitted to set standards for St. Croix waters
- St. Croix lands proposed for inclusion in N.B. Protected Areas strategy
- Fish habitat improved on streams in upper watershed
- Adult salmon stocking program initiated
- Second titanium dioxide spill at Woodland
- Release of CHRS video with St. Croix highlights
- Television episode filmed on St. Croix heritage

6. SUMMARY OF THE CONDITION OF HERITAGE, RECREATION AND INTEGRITY VALUES

The following charts provide a quick reference to the condition of *all* values for which the St. Croix River is recognized as a Canadian Heritage River. There are four sections in these charts: natural heritage values, cultural heritage values, recreational values and integrity values. From left to right, the five columns contain:

- descriptions of the theme elements represented by the St. Croix River. Natural and cultural values are listed and defined according in the CHRS natural and cultural frameworks;
- A brief description of how and where the representations are manifested on the river;
- Notable improvements to the condition of the values that have occurred in the past ten years;
- Notable deteriorations in the condition of the values that have occurred in the past ten years;
- Actions taken by managing agencies, including research and planning.

6.1 CONDITION OF NATURAL HERITAGE VALUES

Theme/ Sub-theme	Theme Representation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
1. Hydrology				
1.1.9 Water Content: clear water	Lakes have clear, neutral waters. Colour and chemistry alter down-stream with influence of marshes, submerged logs and discharges.	Improvements in municipal and industrial discharges in lower watershed reduced impacts on water chemistry	Some evidence of slight pH reduction in Spednic and East Grand Lakes. Some effluent spills (e.g. titanium dioxide) have occurred in lower river, with no lasting effects.	Lake monitoring carried out annually for clarity, on a 6 year cycle for 33 other parameters. Water data gathered at 88 sites in watershed in 1999 for provincial water classification. Quality in lower river is monitored on an on-going basis.
1.2.7 Seasonal Variation: Temperate spring	Not properly exhibited because of controls by dams. Minimum flow is regulated.	Since 1996, upper river flows more closely reflect natural cycle.	Low precipitation in 1998-2000 varies from historic profile.	Beginning in 1996, May-Oct. flows managed to be more consistent with natural regime. International water controls reviewed in 1993-1997.

6.1 CONDITION OF NATURAL HERITAGE VALUES (Continued)

Theme/ Sub-theme	Theme Representation in 1991	Changes since 1991 Positive	Negative	Actions and Related Research
1.3.5 Drainage Basin: Coastal River Basin	Entire basin.			
1.4.5 River Size: Small river, stream order 1	Annual mean flow 20 m3/sec at lakes outlet; 75m3/sec at lower river			
2. Physiography				
2.1.4 Hydrogeology: Impervious	Complex of Devonian granites in lakes section and Ordovician slate and quartzite in river section			
2.1.7 Hydrogeology: Sand and Gravel	Wide evidence of porous surficial glacial deposits.			
2.2.2 Geological events: Faulting	Oak Bay fault			
2.2.7 Geological events: Glacial Retreat	Large eskers near E. Grand Lake and Oak Bay. Numerous drumlins in lakes and upper river.			
2.3.10 Physio-graphic region: Appalachian Acadian Uplands	Entire watershed			
2.4.1 Topography: Shallow gradient	Velocity and gradient affected by dams. Tidal range 7.5m in estuary			
3. River Morphology				
3.1.7 Valley type: Ill-defined valley, rounded/flat interfluves	Central river section			

6.1 CONDITION OF NATURAL HERITAGE VALUES (continued)

Theme/ Sub-theme	Theme Representation in 1991	Changes since 1991 Positive	Negative	Actions and Related Research
3.2.4 Lakes and Ponds: Lake-balanced river	Lake levels and size artificially controlled by dams.			Release of water from lakes modified in 1996 to allow for more constant flow. International Joint Commission is reviewing minimum flows.
3.3.1 Waterfalls/ Rapids: Riffles	Numerous riffles along length, levels affected by dam discharges	A more constant flow regime was adopted in1996 enabling the features of some waterfalls and rapids to be better manifested.		
3.3.5 Waterfalls/ Rapids: Ledges	Canoose Ledges, Milltown Rapids			
3.3.6 Waterfalls/ Rapids: Cascading falls	Mud Lake Falls			
3.4.7 Fluvial Land-forms: Undercutting	Shores of estuary affected by tidal action			
4. Biotic Environments				
4.1.4 Aquatic Ecosystems: Oligotrophic Lakes	East Grand Lake, Spednic Lake	Spednic Lake was closed to alewives in early 1990's. Native small-mouth bass population is recovering.	Some minor nutrient loading in E. Grand Lake due to cottage developments.	
4.1.7 Aquatic Eco-systems: Subtidal zone	Large estuary		Scallop and urchin dragging continue to affect bottom biota, although restrictions have been applied	St. Croix Estuary Project established in 1993 to enhance health of estuary.
4.1.8 Aquatic Eco-systems: Intertidal zone	Estuary. Oak Bay is largest estuarine bay with 1,400 intertidal acres.	Oak Bay soft-shell clam population estimated to be at 1972 level. Opened to clam digging in 1999.	New rockweed (seaweed) harvesting industry on NB coast could have minor impact on estuary.	St. Croix Estuary Project established in 1993 to enhance health of estuary.
4.1.10 Bogs	Large post-glacial bogs in McAdam and St. Croix area			

6.1 CONDITION OF NATURAL HERITAGE VALUES (continued)

Theme/ Sub-theme	Theme Representation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
4.1.12 Aquatic Eco-systems: Swamps	Numerous swamps and marshes drain into river.			
4.2.14 Terrestrial Ecosystems: Atlantic Maritime	Most of the watershed is forested, managed for sustainable timber harvest.		Ongoing timber harvesting affects forest composition.	157,833 hectares of private forest lands owned by Georgia-Pacific Corporation purchased by New Brunswick in 1999.
5. Vegetation				
5.1.2 Significant Plant Communities: Number of species representations	Cardinal flower, highbush blueberry, various vibernums of provincial significance	Grassy Islands designated as a NB ecological reserve in 1995.		St. Croix Corridor Zoning Regulation (1995) protects shoreland plant communities.
6. Fauna				
6.1.1 Significant Animal Communities (Fish): Smallmouth bass & Atlantic salmon	Historic population of smallmouth bass in Spednic Lake and main river.	Spednic Lake bass numbers rebound after severe decline in 1980s.		Restoration program begun in late 1980s is successfully rebuilding Spednic bass population. Surveys and other studies provide future management data.
	Atlantic salmon stocking program underway to rebuild native population		Number of adult returns from sea declines from 207 in 1991 to 18 in 2000; similar declines found on most Atlantic Coast rivers.	Habitat surveys conducted 1994-1997. Tanks installed at Milltown in 1998 to rear native strain salmon. Schools and volunteers help with restoration program. 750 adult salmon released to spawn in the river in 2000.
6.1.3 Significant Animal Communities (Birds): Bald eagle	Waterway supports majority of the region's breeding pairs			Nesting locations monitored annually. Two remote campsites closed to prevent human disturbance of nests.
Osprey	Significant number of osprey nests in upper river and lakes area.		Many osprey nests were abandoned in mid-1990's possibly due to decline in alewives.	

6.1 CONDITION OF NATURAL HERITAGE VALUES (continued)

Theme/ Sub-theme	Theme Representation in 1991	Changes since 1991 Positive	Negative	Actions and Related Research
6.1.4 Significant Animal Communities (Other): Soft-shell clam	Estuary has significant population of clams but harvesting is restricted by bacterial pollution.			Stock assessments in Oak Bay in 1998 show populations similar to 1972. A 1998 trial demonstrates the potential to stock young clams in under-utilized areas.
6.1.4 Significant Animal Communities (Other): Dragonflies	Greatest diversity of dragonfly species in region found on St. Croix tributaries	New species identified in Canoose Stream in 1995.		Research in 1996-1998. Studied by Dragonfly Society of North America in 1997 and Atlantic Dragonfly Inventory Program.
6.2. Rare Fauna: Eastern panther	Anecdotal sightings of Eastern panther throughout St. Croix area. (COSEWIC Indeterminate)			
Harbour porpoise	Harbour porpoise found seasonally in estuary (COSEWIC Threatened)	Number of porpoises in estuary appeared to rise significantly in 2000.		

6. SUMMARY OF CONDITION OF VALUES (continued)

6.2 CONDITION OF CULTURAL VALUES

Theme/Sub-theme	Cultural Theme Representation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
1. Resource Harvesting				
1.1.3 Commercial Fishing	Traditional herring weirs located in lower estuary		Weirs no longer operated due to decline in inshore herring stocks. Fate of equipment is not known.	
1.1.4 Shellfish harvesting	Two known aboriginal shell middens in estuary. Present-day clamming limited by bacterial levels.	Sections of the estuary re-opened to conditional clam digging in 1999.		Four year effort to reduce bacterial pollution in Oak Bay leads to resumed clam harvest in 1999, after 50 year closure.
1.3.4 Industrial Extraction	Rope drive hydro-electric generator (1881) at Milltown dam	New rope installed in 2000.	Fate of old rope from drive unknown.	
2. Water Transport				
2.1.4 Surface Bulk Transportation:	Log driving 1800s-1900s: boom moorings, landings, a wing dam and log sluice remain along the waterway.		Artifacts and sites not protected – deteriorating through natural processes.	Commemorative plaque erected at Diggity Stream
2.2.2 Navigational Improvements (Portages)	North & E. Grand Lakes – aboriginal portage between St. John and Penobscot watersheds.			
2.3.1 French Exploration	St. Croix Island -- Site of first permanent French settlement in North America (1604-5); International Historic Site.	Facing mainland property acquired in 1995 for interpretation; Interpretive display built by Parks Canada in 1997.	Some natural erosion of shoreline which is monitored by US National Park Service.	Management plan updated by US National Park Service in 1997-1999 in cooperation with Parks Canada. Planning begins for 400th anniversary celebrations in 2004.

6.2 CONDITION OF CULTURAL VALUES (Continued)

Theme/Sub-theme	Cultural Theme Representation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
3. Riparian Settlement				
3.2.1 Permanent Shoreline Aboriginal Settlements	Paleo-Indian (22 known sites) and Late Archaic (27 known sites) cultures represented.			
3.2.3 River industry-Based Structures	St. Stephen – Ganong Bros. chocolate factory (est. 1875)	Factory converted to new uses, including museum. Architecture retained.		Building retrofitted and chocolate museum established after company relocates further inland.
	Milltown – remnants of 19th century cotton mill, one of largest in Canada	Cotton factory foundations incorporated into community park; dam remains in use.	Cotton mill artifacts (e.g. cotton bale) not stored or curated.	Waterfront park created at factory site in 1991.
3.2.4 River-crossing Based Communities	St. Stephen – 1800s milling and shipping: period buildings , wharf remnants	Charlotte County Museum has preserved numerous related artifacts.	Sites such as old wharves are deteriorating	
3.3.3 River-influenced Roads and Railways	St. Stephen – bridge and rail crossing sites to U.S. in continuous use since mid-1800s.	Rail trestle pilings reinforced in 1997; architecture retained.		Additional bridge proposed to reduce downtown congestion; under study by NB and Maine in 2000.
	McAdam – Railway station is National Historic Site, and Historic Railway Station.	Roof repaired: architecture retained.	Some natural deterioration since abandonment.	Passenger service to McAdam abandoned in early 1990s. Building vacated, in need of major repairs. Local charitable trust established which has acquired building and begun renovations.
4. Culture and Recreation				
4.2.1 Cultural Expression: Riverside Museums	Charlotte County Museum, St. Stephen.	Part of Ganong factory building adapted as chocolate museum in 1998.		

6.2 CONDITION OF CULTURAL VALUES (Continued)

Theme/Sub-theme	Cultural Theme Representation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
4.2.1 Cultural Expression: Commemorative Structures.	Numerous plaques note historic houses in St. Andrews. National Historic Site (NHS) plaques at St. Andrews Blockhouse, St. Andrews Post Office, McAdam Railway Station, St. Stephen Post Office	3 CHRS plaques unveiled; Historic Sites & Monuments Board of Canada erects plaque for designation of St. Andrews as National Hjstoric District,1998; Diggity Stream monument to aboriginals and loggers erected, 1991.		
4.3.2 Early Recreation: Angling	St. Croix lakes were a 19th century sportsmen's haven.	Smallmouth bass population is recovering.	Continued absence of interpretation. No recognition of significance of old lodges.	
5. Jurisdictional Use				
5.1.3 European Internecine Conflict: War of 1812	St. Andrews Blockhouse built during War of 1812, National Historic Site	Blockhouse restored in 1995 following a fire in 1993; interpretive signage upgraded.	Fire damaged the interior of blockhouse in 1993.	Parks Canada begins update of management plan for site in 2000.
5.1.3 European Internecine Conflict: American War of Independence	St. Andrews - Major Loyalist seaport incorporated1783: internationally significant collection of early Loyalist houses; 1800s wharf remnants.			Downtown St. Andrews is designated a National Historic District in 1997.
5.1.3 European Internecine Conflict:; American Civil War	Skedaddle Ridge, an American civil war refuge.		Few signs of the Skedaddle Ridge community remain; no protection.	

6.2 CONDITION OF CULTURAL VALUES (Continued)

Theme/Sub-theme	Cultural Theme Representation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
5.2.1 International Borders.	U.S.-Canada boundary runs the length of the entire river system, marked by international boundary markers.		Some new markers introduced by International Boundary Commission. Original marker pins not being preserved.	
5.3.2 Improvements in Water Management	Dams enable water control for multiple use and flood control since 1880s.		**Since 1997 flow has been more constant as a result of voluntary modification of releases at Georgia Pacific Corp. dams.**	International Joint Commission called for review of dam safety in 1998; dam safety workshop held the same year.
	Flow monitored on on-going basis since 1919 at various stations			
5.3.3 Improvements in Aquatic Ecosystem Management	Fishways constructed since the 1880's.	Milltown fishway repaired and Woodland downstream fishway built.	No artifacts from old fishways retained.	
	Fisheries management I	Smallmouth bass population is recovering significantly	Efforts to revive Atlantic salmon fishery unsuccessful to date. Sea-run alewife numbers decline sharply due to Maine blockage; population at risk.	Fishing for bass on Spednic and Atlantic salmon on river was curtailed to help populations recover. Alewife spawning run blocked since 1995 by Maine law; change to be considered in 2001.
	Water quality monitored since 1965 at various stations		Environment Canada discontinued water quality monitoring on the river in 1997.	Network of 88 monitoring stations established throughout the watershed in 1999 for NB water classification study. Waterway Commission initiates 6-year monitoring cycle on lakes.

6. SUMMARY OF CONDITION OF VALUES (continued)

6.3 CONDITION OF RECREATIONAL VALUES

Recreational Value	Nature of Value in 1991	Changes since 1991		Actions and Related Research
		Positive	Negative	
Boating	Public and private accesses to the water and shores are found at points along the length of the waterway	Additional boat and shore accesses created by the province and municipalities.		Four new boat ramps. Four new urban waterfront parks. Two major canoe accesses made public and upgraded. NB land acquisitions at Bayside and in upper watershed create new access options.
Canoeing	Lakes, river and estuary provide three different experiences. An estimated 3500 canoeists use the upper river annually; many canoeists and boaters use other parts of the system.	Upper river use increases to an estimated 5000 canoeists, with limited impact on river experience to date.	Ongoing forestry operations in viewshed can affect views.	More uniform river flows beginning in 1996 extend canoeing opportunities. Shore clean-ups and campsite maintenance enhance natural and recreational setting. St. Croix Corridor Zoning Regulation (1995) preserves natural character. Recreational user surveys conducted in 1991 and 1999.
Camping	80 campsites available at North Lake and Spednic provincial parks, 110 sites in Oak Bay. NB operates 22 water access remote sites, 3 drive-in sites.	Regular maintenance programs started for remote NB and Maine campsites. Oak Bay park successfully operated as private campground.	Planned privatization of other provincial parks may impact quality and availability of camping.	NB DNRE designates staff and funding for St. Croix park, campsite and access management beginning in 1998. Waterway Commission assumes maintenance of Maine river sites in 1997; involves agencies and local interests in transboundary planning.
Angling	Small Atlantic salmon fishery in lower river.		Fishery suspended. Salmon restoration program has had little success.	See Natural Heritage Values 6.1
	Historic smallmouth bass fishery on Spednic Lake.	Bass population has recovered significantly almost to 1980s levels.	Catch and release program still in force.	Catch and release imposed for past ten years on smallmouth bass fishery.
	Many species caught from boats in river and lakes.			Extensive fish habitat surveys undertaken of lake tributaries and main stem of river. Angler surveys done on lakes

6.3 CONDITION OF RECREATIONAL VALUES (Continued)

Recreational Value	Nature of Value in 1991	Changes since 1991 Positive	Negative	Actions and Related Research
Angling (continued)				
	Clam digging in Oak Bay limited to companies who purify clams of bacteria.	Oak Bay conditionally opened to public clam digging in 1999.		
Natural Heritage Appreciation	Potential for interpretation of wildlife and landscapes throughout the system. Nature trails at St. Andrews and Spednic Provincial Park.	Interpretive brochure published 1995. Spednic Lake PP trail signs upgraded. Interpretive sign erected in St. Stephen waterfront park. Nature trail built at Wingdam Island in 2000.		"Quoddy Loop" literature encourages tourists to discover natural assets of the St. Croix. Downeast Heritage Center, under development, will provide exhibits on and directions to heritage features starting in 2004. Many interpretive recommendations made in St. Croix linear park consultation but no action taken.
Human Heritage Appreciation	Historic buildings and signs in St. Andrews and Stephen; touring information available. Charlotte County Museum offers heritage exhibits in St. Stephen. Numerous historic plaques and markers in St. Andrews.	Chocolate museum created in old Ganong factory. Plaques - 3 CHRS in St. Stephen, St. Andrews and St. Croix Landing; Diggity Stream logging memorial. Interpretive brochure published 1995. Interpretive display for St. Croix Island built in 1997. St. Andrews National Historic District designated in 1997.		NB purchased lands adjacent to St. Croix Island for recreation, interpretation and island 400th anniversary celebrations. St. Croix Heritage Honour Roll initiated in 1996. St. Stephen celebrated its 125th anniversary, in period costume, in 1996. Books published locally on St. Andrews and St. Stephen heritage. Many interpretive recommendations made in St. Croix linear park consultation but no action taken to date. Charlotte County Heritage Region designated nationally in 1995.
Hiking	Marked trails at Spednic Park and St. Andrews.	Urban trail created along sections of St. Stephen waterfront. Trail linking McAdam to river initiated.		Trail groups formed to develop multiple use trails in areas near McAdam and St. Stephen. St. Stephen redevelopment includes a waterfront trail.

6. SUMMARY OF CONDITION OF VALUES (continued)

6.4 INTEGRITY VALUES

Integrity Guideline	Situation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
Natural Integrity				
The nominated area is of sufficient size and contains all or most of the key interrelated and interdependent elements to demonstrate the key aspects of the natural processes or other phenomena which give the river its outstanding natural value.	75 metre strip designated on Canadian side of river. Some co-management agreements with Georgia Pacific for remote campsites.	Provincial Watercourse Buffer Zone guidelines and St. Croix Shoreland Zoning Regulations effectively enlarged corridor in 1995. Grassy Islands designated as Ecological reserve in 1994.		157,833 hectares of former Georgia-Pacific holdings are purchased by NB as Crown lands in 1999. Provincial Protected Areas Strategy in 2000 includes proposals for 3,931 hectares in Canoose Flowage, and 33,198 hectares north of Spednic Lake.
The nominated area contains those ecosystem components required for the continuity of the species, features or objects to be protected.	Lake and river ecosystems are altered from natural state by dams, past log drives and, in lower reaches, urban and industrial uses.	Lower river continues to clear of 19th century sawdust. Aquatic indicators show good river condition.	Sea-run alewife population in severe decline due to blocked spawning run, with effects on integrated ecosystem. Exotic species (landlocked alewives) found in lakes. Native Atlantic salmon stock continues to decline.	Maine closes Woodland and Grand Falls dams to spawning alewives beginning in 1995. Industrial and municipal improvements in effluent treatment show in improved study results for aquatic indicators. Efforts are made to restore Atlantic salmon but show little success to date.
There are no man-made impoundments with the nominated section	Not applicable. River system was grand-fathered.			
All key elements and ecosystem components are unaffected by impoundments located outside the nominated section.	Not applicable. Ecosystem components grand-fathered.			

6.4 INTEGRITY VALUES (Continued)

Integrity Guideline	Situation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
Natural values for which the river is nominated have not been created by impoundments.	Not applicable. Natural values grand-fathered.			
The natural aesthetic value of the river is not compromised by human developments.	Headwater lakes retain their naturalness. Significant industrial and residential developments on lower river and in estuary, although most of shoreline still undeveloped..		Cottage developments on North and E. Grand Lakes and near Grassy Islands; only at the latter is visible from the water. Granite quarry at Bayside has resulted in visual intrusion on the estuary.	
The river's water must be uncontaminated to the extent that its natural aquatic ecosystem is intact.	Full length of waterway included in CHRS designation. Lakes and upper river quality almost pristine. Lower river affected by industrial and municipal effluent. Estuary affected by coliform from sewage systems and bottom biota disturbed by dragging.	Quality in lower river continues to improve. Coliform in some parts of estuary is reduced to levels that permit shellfish harvesting.	Minor nutrient loading from cottage developments on lakes. Occasional spills in lower river caused temporary impacts.	Numerous water quality surveys on lakes, river and estuary conducted over the decade. Suspended data collection at some stations by government cutbacks has been addressed. Georgia-Pacific actions have included reduced water consumption, cooling towers, recovery boiler & reinforced aeration lagoon, elimination of chlorine use. City of Calais, Maine has improved its treatment plant and separated storm water and sewage lines. Town of St. Stephen has made treatment plant improvements. Oak Bay campground upgraded its disposal system and residential septic systems upgraded on parts of estuary to reduce bacteria. NB is preparing water quality standards that will be applied to all St. Croix waters in the next few years.

6.4 INTEGRITY VALUES (Continued)

Integrity Guideline	Situation in 1991	Changes since 1991 Positive	Changes since 1991 Negative	Actions and Related Research
Cultural Integrity				
The nominated area is of sufficient size and contains all or most of the key interrelated and interdependent elements to demonstrate the key aspects of the features, activities, or other phenomena which give the river its outstanding cultural value.	76 metre strip designated on Canadian side of river. Some co-management agreements with Georgia Pacific for remote campsites.	Provincial Watercourse Buffer Zone guidelines and St. Croix Shoreland Zoning Regulations protect much of the corridor in 1995.		157,833 hectares of former Georgia-Pacific holdings are purchased by NB as Crown lands in 1999. Provincial Protected Areas Strategy in 2000 includes proposal for 33,198 hectares beside Spednic Lake.
The visual appearance of the nominated section of the river enables an appreciation of at least one of the periods of the river's historical importance.	Loyalist era probably the best represented and best preserved era. Native Fishing, French Exploration, International Border, 19th Century Logging, Early Recreation, and Early Water Management are other possible eras.	Shoreland development now guided by zoning regulations, to preserve quality and character.	Waterfront quarry opened on estuary at Bayside, with visual, sound and dust impacts.	Downtown section of St. Andrews designated as a National historic District by Heritage Canada in 1997. Plaque unveiled in 1998. St. Croix Corridor Zoning Regulation (1995) sets shoreland development standards. NB acquires much of upper watershed from Georgia-Pacific in 1999 and is now considering options for future land use.
The key artifacts and sites comprising the values for which the river is nominated are unimpaired by impoundments and human land uses.	Impoundments and human land uses have affected some archaeological sites but also demonstrate a cultural value in themselves.		Some sites are not recognized and/or protected, e.g. log driving sites, boundary markers. Loyalist houses in St. Stephen	

6.4 INTEGRITY VALUES (Continued)

Integrity Guideline	Situation in 1991	Changes since 1991		Actions and Related Research
		Positive	Negative	
The water quality of the nominated section does not detract from the aesthetic appearance or the cultural experience provided by its cultural values	Some impairment of river water due to industrial and municipal waste discharges and remnant sawdust and sunken logs from a century of logging operations	Industrial discharges have been reduced and bacterial contamination in the estuary has been significantly reduced. Logging debris is being naturally flushed from river.	Small algae bloom around cottage development on E. Grand Lake. Recent foam, believed related to undersea fault, is observed in estuary. Minor industrial and municipal spills occur.	Georgia-Pacific meets all water quality discharge requirements in the past decade except for two non-toxic incidents.
Recreational Integrity				
The river possesses water of a quality suitable for contact recreational activities, including those for which it is nominated	Water is swimmable in all parts of river and lakes and capable of supporting Atlantic salmon and major smallmouth bass fishery. Recreational clam fishery in estuary closed due to bacterial pollution.	Bacterial discharges in Oak Bay controlled and recreational clam digging re-opened conditionally.		Numerous efforts to monitor and control contamination of water (see natural integrity above).
The river's visual appearance is capable of providing river travellers with a continuous natural experience or a combined natural and cultural experience without significant interruption by modern human intrusions	St. Croix provides combined natural experience in the lakes section with a natural and cultural experience ion the river and estuary area.	Cultural experience enhanced by additional commemorative plaques – 3 CHRS plaques, Diggity Stream logging memorial, St. Andrews National Historic District.	Intrusive piles of bulk gypsum and granite aggregate stored on Bayside Port waterfront.	
The river is capable of supporting increased recreational uses without significant loss of or impact on its natural, cultural or aesthetic values.	Main activities were angling, canoeing, cottaging.	A more constant flow regime adopted in 1996, has increased numbers and prolonged distribution of canoeing opportunities.	Atlantic salmon fishery cannot be sustained. Smallmouth bass fishery has not recovered to its 1980 level.	Recreational use survey indicated that canoeing use had not reached maximum.

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