

REPORT OF
THE INTERNATIONAL JOINT COMMISSION
UNITED STATES AND CANADA
ON DEVELOPMENT OF THE
WATER RESOURCES OF THE ST CROIX RIVER BASIN

Ottawa - Washington

7 October 1979

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The Secretary of State for the Government of the United States and the Secretary of State for External Affairs for the Government of Canada, on June 10, 1955, made the following Reference to the International Joint Commission through identical letters addressed to the United States and Canadian sections of the Commission:

"In order to determine whether greater use than is now being made of the waters of the St Croix River Basin would be feasible and advantageous, the Governments of the United States of America and Canada have agreed to refer the matter to the International Joint Commission for investigation and report pursuant to Article IX of the Treaty concerning Boundary Waters between the United States and Canada, signed January 11, 1909.

"Having regard to the legal, engineering and economic aspects of the matter, it is desired that the Commission shall, after making the necessary preliminary investigations, indicate whether, in its judgment, further development of the water resources of the St Croix River Basin would be practicable and in the public interest from the point of view of the two Governments and which projects would seem to warrant further detailed study.

"In making its report the Commission should indicate:

(a) what projects or regimens should be further considered to improve the use, conservation and regulation of the waters of the Basin, taking into account the previous actions of the Commission as well as the present and future interests of both countries in the Basin;

(b) how the interests on either side of the Boundary would be benefited or adversely affected by any of the projects or regimens so indicated;

(c) the order of magnitude of costs of the indicated projects or regimens, including indemnification for damage to public and private property;

(4) how the costs mentioned in (c) should be apportioned.

"In the conduct of its investigations and otherwise in the performance of its duties under this Reference, the Commission may utilize the services of engineers and other specially qualified personnel of the technical agencies of Canada and the United States and will, so far as possible, make use of information and technical data heretofore acquired or which may become available during the course of the investigation."

International St Croix River Engineering Board

Upon receipt of the Reference, the Commission established the International St Croix River Engineering Board to carry out the necessary preliminary investigations and studies for this report. Personnel of the Engineering Board during the period of its preparation of a report to the Commission were as follows.

United States

Mr Carter Page, Chairman
Chief, Planning Division
Civil Works
Office of the Chief of
Engineers
Washington, D.C.

Mr W.R. Farley, Chief
Division of Licensed Projects
Federal Power Commission
Washington, D.C.

Mr J.C. Bradley
Office of Assistant Secretary
Department of the Interior
Washington, D.C.

Mr L.F. Warrick
(Appointed 6 Feb 57)
Technical Services Consultant
Water Supply and Water
Pollution Control Program
Dept of Health, Education and
Welfare
Washington, D.C.

Canada

Mr J.D. McLeod, Chairman
Chief Engineer
Water Resources Branch
Dept of Northern Affairs and
National Resources
Ottawa, Ontario

Dr A.L. Fritchard, Director
Conservation and Development
Service
Department of Fisheries
Ottawa, Ontario

Mr J.R. Menzies
(Appointed 6 Feb 57), Chief
Public Health Engineering Division
Dept of National Health and
Welfare
Ottawa, Ontario

The Engineering Board appointed an Engineering Committee consisting of representatives of its constituent agencies in the St Croix River Basin area and including representatives of appropriate agencies of the State of Maine and the Province of New Brunswick. These representatives and others who participated in the investigations and studies are listed in the report of the Engineering Board, which accompanies this report.

The St Croix River Basin

The St Croix River Basin is a sparsely populated area of 1,635 square miles of which 1,010 square miles are in Maine and 625 square miles are in New Brunswick. It contains extensive areas of lakes, ponds and swamps which provide substantial natural storage. The St Croix River, Spednik Lake, East Grand Lake, North Lake and Monument Brook are "boundary waters", as defined in the Preliminary Article of the Boundary Waters Treaty of 1909. Logging and paper production are the principal industries but the extensive lake areas in the Basin which have long been utilized by these commercial interests are becoming increasingly important from a recreational standpoint.

The principal problems of water resources development are (1) regulation of water levels and streamflow to prevent damage and insure optimum use for recreation, logging, power and other purposes; (2) prevention and abatement of pollution; and (3) possible restoration of anadromous fish runs.

Present Development of the Water Resources

The estimated usable storage in the St Croix River Basin amounts to 628,460 acre-feet, distributed as follows:

East Grand and Spednik Lakes	292,400 acre-feet
Syladobais and West Grand Lakes	185,800 " "
Grand Falls Flowage	150,260 " "
TOTAL	628,460 acre-feet

The water elevations of the international East Grand and Spednik Lakes, through which the International Boundary passes, are controlled for power and log driving purposes by dams located at Forest City and Vanceboro respectively. East Grand Lake is regulated to a maximum elevation of 434.94 feet m.s.l. and Spednik Lake to a maximum elevation of 385.80 m.s.l.

A dam at Grand Falls, owned by the St Croix Paper Company, regulates flows in the lower river, except during freshets when Grand Falls storage is at full capacity at elevation 203.5 feet m.s.l. The hydro-electric plant at Grand Falls develops a gross head of 52 feet and has an installed capacity of 9,652 kilowatts, with an average annual generation of about 48,000,000 kilowatt-hours.

The hydro-electric plant at Woodland develops a gross head of 48 feet and has an aggregate installed generating capacity of 2,250 kilowatts, in addition to 10,300 horsepower of mechanical power. Average, annual generation amounts to about 7, 500,000 kilowatt hours. The Grand Falls and Woodland plants supply power to the St Croix Paper Company's pulp and paper mill at Woodland and also serve residential loads in and around Woodland, Maine.

A hydro-electric plant downstream at Milltown, which was formerly owned by Textile Sales Limited, Montreal, and has since been acquired by the New Brunswick Electric Power Commission, develops a gross head of about 22 feet and has a total installed generating capacity of 2500 kilowatts. Average annual generation amounts to about 12,500,000 kilowatt-hours. In the past, this plant has supplied power to the textile mill at Milltown, N.B., with any surplus power going to the New Brunswick Electric Power Commission. However, on 29 July 1958, the Power Commission obtained licences from the Government of Canada for the construction of a 69,000 volt transmission line at Milltown to connect with a line in the United States, and the export of 15,000 K.W. of surplus interruptible power to the Eastern Maine Electric Co-operative.

Previous Actions of the International Joint Commission
Affecting Water Resources of the Basin

Most of the storage dams in the St Croix River Basin, including those at Forest City and Vanceboro, and the dams and hydro-electric developments at Woodland and Milltown were constructed prior to the signing of the Boundary Waters Treaty of 1909 and consequently at a time when approval by the International Joint Commission was not required for their construction. The dam and power canal at Grand Falls, however, were constructed in the period 1911-1915 without reference to the International Joint Commission, but subsequently application was made to the Commission for the approval required by the said Treaty.

By Order dated November 9, 1915, (International Joint Commission Dockets 10 and 11) the Commission approved the maintenance and operation of the dam at Grand Falls and the diversion and use of the waters of the river for the purpose of generating power, subject to specific conditions, including a maximum headwater elevation of 202.00 feet, mean sea level, at Grand Falls. The operation of the storage reservoirs and the Grand Falls works was placed under the direct control of the International St Croix River Board of Control, created for the purpose.

The Board's duties included the formulation of operating rules for these dams and works to prevent excess water levels at Grand Falls and to secure to downstream water users the flow of water to which they are entitled; and "to see that any rules or regulations now or hereafter made by proper authority are duly obeyed."

A further Order of the International Joint Commission, dated October 6, 1951, (International Joint Commission Becket 28) amended the earlier Order to permit an increase in the maximum head water level at the Grand Falls dam to elevation 203.5 feet m.s.l.; this remains the authorized maximum at the present time. Operation of the Grand Falls works is the responsibility of the owner, and the Board of Control exercises the necessary supervision over the regulation to ensure the owner's adherence to the requirements of the Order of Approval in respect to the maintenance of proper water levels in the forebay above the dam and to the protection of the interests of water users on the river below.

By Order dated October 3, 1923, (International Joint Commission Docket 18) the Commission approved of the construction and repair of fishways at two dams on the St Croix River, one above St Stephen owned by the St Croix Gas Light Company and one at Milltown owned by Canadian Cottons Limited, in accordance with plans agreed upon between the Commissioner of Inland Fisheries and Game for the State of Maine and the Department of Marine and Fisheries of Canada. By disease and reconstruction, the fishways originally provided at these dams had become inefficient or totally obliterated.

By Order dated October 2, 1934, (International Joint Commission Docket 32) the International Joint Commission approved the reconstruction of a portion of the dam at Milltown owned by Canadian Cottons Limited, on condition that the reconstructed dam would be so operated that the forebay levels would not exceed the levels which had obtained under the operation of the dam being replaced. Operation of the dam, insofar as necessary to ensure observance of the provisions of the Order, was placed under the International St Croix River Board of Control.

Report of the International St Croix River
Engineering Board

The necessary field surveys and office studies under this Reference were carried out by the Engineering Board through its field representatives. The Commission made an initial reconnaissance of the area in 1956 soon after the initiation of studies under the Reference and held additional joint meetings with the Engineering Board during the course of the investigation.

The Board's Report to the International Joint Commission on Preliminary Investigations of the Water Resources of the St Croix River Basin, dated September, 1957, is enclosed herewith and forms part of the present report. The Board concluded in its report that consideration of a multiple purpose program for the further development of the potential resources of the St Croix River Basin is justified at this time, and pointed out that the impact of the program on the paper industry, the largest employer in the area, should be given further study in relation to the future welfare of the Basin.

The report indicates the principal features which should be included in a water resources development program and outlines a number of specific projects or regimens which the Board regarded as worthy of further consideration.

On 16 June 1958, at the request of the Commission, the Board submitted a special report on the subject of rule operation of the principal storages existing in the St Croix River Basin, namely, East Grand and Spednik Lakes on the east branch and West Grand Lake on the west branch. That report indicated the approximate average energy loss that would result from imposing specified minimum outflows from the two reservoir areas and dependable flow below the Grand Falls dam and pointed out that some compromise in the requirements of the different interests will be needed to meet as far as possible the widely divergent requirements of these interests. The Board's report established the physical practicability of devising rules of operation for the principal storages on the St Croix River, and the need for further detailed studies, taking into account all uses of the river and their relative economics, in order to formulate such rules.

Public Hearing

After preliminary analysis of the Engineering Board's report, the Commission made copies of the report available to the parties principally at interest in the area and distributed a summary of information on the report to all persons known to be interested. All interests were invited to present their views to the Commission at a public hearing which was held in Calais, Maine on June 27, 1958, at which time the members of the Commission also made a further reconnaissance of the area. Copies of the transcript of the public hearing have been made available to the Department of External Affairs of Canada and the Department of State of the United States and to other interested agencies of each Government.

There were many representations at the public hearing in favor of the Engineering Board's recommendations for development of a comprehensive program for the St Croix River Basin. There were, however, a number of representations cautioning that any action towards pollution control and restoration of anadromous fish runs should not be such as to adversely affect the economic position of the paper industry in the area. Also, it was suggested by

representatives of U.S. power interests that consideration be given to joint United States-Canadian redevelopment of the lower river power potential near Milltown rather than the all-Canadian redevelopment which was envisioned in the report of the Board.

Conclusions

After consideration of the report of the Engineering Board and the views of various interests as developed at the public hearing and otherwise in the course of the investigation, the Commission has reached the following conclusions which are generally in accord with those formulated by the Engineering Board:

1. Further development of the water resources of the St Croix River Basin is practicable and in the public interest from the point of view of the Governments of Canada and the United States of America.
2. A multiple purpose program for such further development should include the following principal features:
 - (a) the adoption of highwater elevations of East Grand and Spednik Lakes;
 - (b) the operation of storage reservoirs and regulation

- (c) the maintenance and improvement of inland fishery resources;
- (d) the restoration of anadromous fish runs;
- (e) the establishment of water quality objectives, the treatment of industrial and domestic pollutants for the benefit of water supply users and of the finfish, shellfish and recreation industries and the mitigation of existing physical pollution such as that caused by coarse wood waste and coal ash discharges;
- (f) the redevelopment of the existing hydro-electric power plant at Milltown; and
- (g) the further development of recreational facilities in the Basin.

3. The use, conservation and regulation of the waters of the basin should be improved by:

- (a) adoption of the hitherto existing high water elevations of 434.94 feet m.s.l. at the dam at Forest City which controls the water elevation on East Grand Lake and 385.80 feet m.s.l. at the dam at Vanceboro which controls the water elevation on Spednik Lake;

- (b) construction of facilities at an estimated cost of \$5000 for the maintenance of a continuous record of water elevations on East Grand and Spednik Lakes;
- (c) construction of a stream gauging station downstream from the dam at Woodland at an estimated cost of \$3900 to provide data on stream flows in that area;
- (d) formulation of rules of operation for the East Grand Lake, Spednik Lake and Grand Falls flowage storage reservoirs, and all other dams downstream on the main stem of the St Croix River, having due regard to all water uses and the need for maintaining adequate flows downstream from the several dams.

4. Pollution should be abated and prevented by initiation of a program of chemical, physical and bacteriological pollution abatement in order to bring the boundary waters of the Basin into satisfactory condition, as contemplated by Article IV of the Boundary Waters Treaty. Adequate treatment of industrial wastes and domestic sewage, and prevention of physical pollution by solid refuse such as coarse wood wastes and coal ash would be required in order to improve the quality of the waters in both countries for domestic and municipal purposes, recreation and other uses, and to reduce contamination of shellfish growing areas.

The construction costs for domestic sewage and industrial waste treatment facilities based on 1956 price levels have been estimated as follows:

Municipal primary treatment plants and interceptors at Woodland and Calais, Maine, St Stephen and Milltown, New Brunswick	\$712,000
Disposal system at Hobbinston, Maine	10,300
Industrial waste treatment at pulp and paper mill	2,880,000
TOTAL	\$3,602,300

These estimates are for treatment facilities only and do not include sewer systems and extensions or in-plant collection costs for the industrial waste.

5. When satisfactory progress has been made in the pollution abatement program referred to above, a program for the restoration of anadromous fish runs and the improvement of conditions for resident fish and shellfish should be initiated. Particular attention would need to be given, in such a program, to:

- (a) construction and operation of fishways in existing and future dams;
- (b) operation of storage and maintenance of adequate flows.

In so far as the existing dams are concerned the estimated costs of the provision of passage facilities for anadromous fish are as follows:

(1) Existing Milltown dam	\$87,000
(2) Woodland dam	\$110,000
(3) Grand Falls dam	\$50,000
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TOTAL	\$247,000

In the event of redevelopment of the Milltown site for power the cost of fish passage facilities is estimated to be \$105,000.

6. The preliminary studies carried out by the Engineering Board indicate that redevelopment of the existing Milltown hydro-electric plant is the only undeveloped power potential in the Basin which is worthy of further consideration at this time. The estimated cost of this redevelopment, including the cost of constructing suitable dykes and canals for the protection of Barn Meadows and the Magurroock Marshes in the Massachusetts Migratory Wildlife Refuge, but excluding the cost of passage facilities for anadromous fish, is \$5,345,000.

RECOMMENDATIONS

1. The Commission recommends that this report, together with the supporting data prepared by the International St Croix River Engineering Board, be authorized for distribution to interested persons in order that the data contained therein may be available to all concerned for consideration in planning further development of the water resources of the St Croix River Basin.
2. The Commission recommends that the Governments of the United States and Canada concur in the appropriateness of the course of action described in subparagraphs (a) and (b) of this recommendation as a means of furthering the purposes and intent of the Reference dated 10 June 1955 with respect to the use, conservation and regulation of the waters of the basin:
 - (a) Adoption by the Commission and its International St Croix River Board of Control of 434.94 feet m.s.l. and 325580 feet m.s.l. as the maximum water elevations to be permitted at the dams at Forest City and Vanceboro, respectively, said maximum water elevations to be adopted after the Commission

has determined that the owners of the said dams have appropriate flowage rights covering all lake shore property in Maine and New Brunswick that may be affected by such water elevations.

- (b) Adoption by the Commission and its International St Croix River Board of Control of a requirement that the owners of the storage dams referred to in subparagraph (a) above maintain and make available to the Commission and its Board of Control continuous records of the water elevations on East Grand and Spednik Lakes.

3. The Commission recommends that an International stream gauging station be installed by the appropriate agencies of the United States and Canada at a suitable location downstream from the dam at Woodland.

4. The Commission recommends that the "Objectives for Boundary Waters Quality Control" which were set forth in the Commission's Report on the Pollution of Boundary Waters, dated October 11, 1950, attached hereto as Appendix A, be adopted by the Governments of Canada, the United States, New Brunswick and Maine as the criteria to be met in maintaining the boundary waters of the St Croix River Basin in satisfactory condition as contemplated in Article IV

of the Boundary Waters Treaty of 1909. In applying the "Objectives" to the St Croix River Basin, the word "unreasonably", which appears under "(4) Deoxygenating Wastes", is to be interpreted as "below 5 p.p.m."

Dissolved oxygen determinations are to be made as given in Standard Methods for the Examination of Water and Sewage, American Public Health Association, New York.

5. The Commission recommends that those responsible for existing or potential pollution put into effect the remedial measures already known to be necessary to meet the "Objectives" set forth in Appendix A, and any additional measures that may prove to be necessary in the future to meet the "Objectives".

6. The Commission recommends that it be authorized to establish and maintain continuing supervision over boundary waters pollution in the St Croix River Basin through a technical advisory board appointed by the Commission. In carrying out this function, the Commission shall notify those responsible for any pollution found objectionable in the light of the "Objectives" set forth in Appendix A and, in the event that assurance is not received that such pollution will be corrected in a reasonable time, shall make recommendations to the appropriate authority having jurisdiction as to the further action deemed desirable.

7. The Commission recommends that it be authorized to review the possibility of restoration of anadromous fish runs in the St Croix River Basin when water quality conditions improve as the result of the action outlined in Recommendations 4, 5 and 6 above. Pending further recommendations to the two Governments on possible restoration of anadromous fish runs, the Commission recommends that all new construction or redevelopment of dams in the St Croix River Basin should include, or have provision made in the basic design to facilitate the ultimate inclusion of, facilities necessary to permit the restoration of anadromous fish runs.

8. The Commission recommends that it be authorized to continue studies of the possibilities for development of the water resources of the St Croix River Basin, and to make further recommendations to the two Governments from time to time as may seem appropriate.

9. The output from the hydro-electric development at Milltown, which was recently acquired from Textiles Sales Limited by the New Brunswick Electric Power Commission, has from its inception been utilized in Canada. Similarly the hydro-electric developments at Grand Falls and Woodland were carried out by a United States company and the entire output has been utilized in the United States.

Accordingly the Commission recommends that, in order to achieve a more equitable allocation between the two countries of the power resources in the Basin, any redevelopment of the Milltown site for power and other purposes should be carried out by Canadian interests; this without prejudice to any mutually satisfactory arrangements which may be made by Canadian and United States interests for inter-connection and the utilization of the power produced, duly approved by the appropriate authorities in the respective countries. Plans for development of the Milltown site shall include provision for suitable dykes and canals for the protection of Barn Meadows and Magurrevoek Marshes.

Signed at Ottawa this seventh day of October, 1959.

J. P. D. McNaughton
 Eugene W. Wilson
 J. Louis Denon
 Francis H. Edwards
 R. W. Phillips