

ANNEX A – SUMMARY OF U.S.–CANADIAN WATER AGREEMENTS

COLUMBIA RIVER

Preamble

The River System

The Columbia River is a very complex and heavily utilized resource. There are three main transboundary rivers in the Columbia watershed; from east to west, the Kootenay (US portion called: Kootenai), the Columbia and the Okanagan. In addition, there are a number of lesser transboundary rivers, notably the Kettle, the Similkameen and the Flathead/ Pend d'Oreille River. The Flathead in the south east corner of British Columbia has received considerable attention and is mentioned briefly in the following discussion. The Pend d'Oreille River is part of the Skagit Agreement (not part of the Columbia), discussed elsewhere.

Uses

The Columbia River Basin is the most hydroelectrically developed river system in the world. On the US side, more than 400 dams -- 11 run-of-the-river dams on the mainstream -- and hundreds of major and modest structures on tributaries block river flows and tap a large portion of the Columbia's **electric power** generating capacity of more than 21 million kilowatts. On the Canadian side there are twelve major dams: Aberfeldie, Duncan, Elko, Keenleyside, Kootenay Canal, Mica, Revelstoke, Seven Mile, Shuswap, Spillimacheen, Walter Hardman and Whatshan.

The last dams built on the Columbia under the Columbia River treaty, came on line during the 1960s and 1970s. In 1973, Canada completed the last of the mainstream dams, Mica Dam on the upper river. The dams have created large reservoirs that provide **flood control** and water for vast **irrigation** systems on the Columbia Plateau. Already, in 1948, the Columbia Basin Project was transporting Columbia River water by canal to more than 600 thousand acres. With the completion of four dams on the lower Snake River during the 1970s, the US engineers strung together a series of slackwater lakes that allowed barge **navigation** for about 750 kilometers from the Pacific to the inland port of Lewiston, Idaho.

Fish

The river **fishery** is both an environmental and a commercial resource. Between the 1860s and 1960s, commercial fisheries annually harvested millions of pounds of fish, especially five species of salmonids. Since the 1950s, the combined consequences of dams, increased ocean fishing, deterioration of stream and river habitats, and changing river conditions have made the Columbia less and less habitable for anadromous fish. The fish catch has dramatically declined. Today, hatchery-raised species making up more than 80 percent of commercially caught salmon in the river. Hatchery-raised stocks have become a major mitigation of dam-caused salmon declines during the late 20th century. In 1992, the US government listed the native Snake River

Sockeye salmon as endangered under the Endangered Species Act, and in 1998, the Willamette steelhead joined the list.

A: WATERSHED

Name: Columbia River Basin

Location: Southern British Columbia

Physical Description

A1: Columbia

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
(Portion of the drainage area in the United States is shown in brackets)			
(mouth to head of Columbia Lake)	2 000	671 300	
(International Boundary to head of Columbia Lake)	801	102 800 (568 500)	2 790

Water area: 6 400 km²

A2: Major Canadian Tributaries

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
Kootenay River*	780	37 700	850
Okanagan River (to head of Okanagan Lake)	314	21 600	-
Similkameen River	251	9 300	65
Kettle River (to head of Holmes Lake)	336	4 700	-

*Called Kootenai in the US

B: BILATERAL MANAGEMENT INSTRUMENTS*

In the following three boxes, the ‘a’s in each box refers to the same instrument, as do the ‘b’s, etc.

<p>Title:</p> <ul style="list-style-type: none"> a) Columbia River Treaty (signed January 1961, ratified September 1964)** b) Kootenay lake Order (1938) c) The IJC Order of Approval concerning the construction a control structure near the outlet of Osoyoos Lake (1982, as revised in 1985)***

*An IJC Order (1950) concerning the levels of Duck Lake, Kootenay District, is not included here.

**The Treaty is in effect for 60 years, until September 2024.

***The Okanagan, Similkameen Rivers are mentioned in this Order.

Managing Authority:

- a) The Governments of the USA and Canada
 - Permanent Engineering Board
- b) The IJC
 - Kootenay Lake Board of Control (1938)
- c) The IJC
 - International Osoyoos Lake Board of Control

Nature of Instrument:

a) The treaty is concerned with water amounts and the production of electricity. It is a mechanism for the development, scheduling and management of hydro production, including; dam construction(II, III, XII), Flood control (VI), Costs/Benefits sharing (V, VII, VIII, IX), Power transmission (X), Improved Stream Flow (XI), Diversions (XIII).

(I) Monitor the execution of the treaty and report to governments on deviations.

b) The Order is concerned with the construction and operation of Corra Linn dam at Granite, B.C. to store six feet of water in Kootenay Lake.

c) The Order is concerned with the levels of Osoyoos Lake as controlled by a new dam downstream from the outlet of Osoyoos Lake.

(I) Monitor the execution of the Order and report to the IJC on deviations.

C: CLIMATE SENSITIVITIES

Language Usage

As part of the evaluation of the climate-change sensitivity of agreements, the texts of the documents listed in Section B above, were subjected to a word search. The key search words used here were: climate, change, quality (water), fish, fishery, pollution, temperature, glacier, melt, drought, Kootenay, Okanagan, snow, allocation, precipitation, stream, flow, flood, environment, generation (power) and entitlement. The absence of some of these key words can be as important as their appearance in the text.

a) The following words appeared in the text of the Treaty: Kootenay (13), stream (22), flow (32), flood (72), generation (power) (24), entitlement (84), snow (1), allocation (1) and precipitation (1).

b) The following words appeared in the text of the Kootenay Order: power generations (10), flood (6) and flow (3).

c) The following words appeared in the text of the Osoyoos Order: flow (25), drought (8), flood (2) and Okanagan (5).

General

Issue Limitations

The Treaty is extremely focused. It deals with power production and floods on the Kootenay-Columbia water course. It considers no other tributaries or issues. The two basic obligations are:

Canada has the obligation to manage the flow of the river throughout the year through a series of structures on the Canadian side. The Treaty discusses the management of floods in great detail while drought situations are not mentioned.

The USA has the obligation to share with Canada the benefits of power production on the US side.

The Kootenay Order focuses on the maintenance of the Lake level within a range of 1.83 meters (six feet).

The Osoyoos Order deals with water levels only but does make reference to the Similkameen River or to drought.

Over the past decades environmental issues not treated by the Treaty or the Order have arisen. For example, nowhere in the Treaty are there formal provisions for the stewardship of fisheries (as suggested by the above word search).

Regional Limitations

The Treaty does not deal with the tributaries of the Columbia. This shortcoming has been corrected to some extent by more recent instruments. Some are discussed here.

The Treaty does not mention the Okanagan River. There is a rapidly increasing population in the Okanagan valley, a stark contrast to the empty wilderness character of the region just down river of the Canada-USA border. In 2002 it was reported the Okanagan sockeye spawned abundance had declined to record lows in three of the previous five years. Returns were recorded as high as 200,000 in 1967 and less than 5000 fish in 1994, 1995 and 1998. (Aboriginal Fisheries Journal, Newsletter of the BC Aboriginal Fisheries Commission Volume 6, No. 3 July 2000)

Climate-change-related changes in water quantity in the Canadian portion of the Okanagan catchment could have impacts in the USA, downstream. A shortage could put pressure on the Treaty management plans in the upper Columbia basin. Changes in water quantity could aggravate water quality problems in Canadian urban areas and downstream. Climate change could place further stress on the fish populations.

In contrast to the apparent neglect of the Okanagan basin, there has been considerable

attention given to transboundary environmental issues in the relatively small Flathead basin near the British Columbia-Alberta border. The Flathead River is 390 km long and the transboundary catchment covers 2 574 km². The area is a wilderness. In 1983, the Flathead Basin Commission was established to bring the governments of Montana and BC together to define and implement compatible management strategies on both sides of the 49th parallel. In 1984, a reference was made to the IJC concerning the development of coal mines on the Canadian side. In 1988, the IJC recommended that the mine should not be developed because of its transboundary impacts. The IJC went further to advise that both countries develop a “creative, binational approach... for defining and implementing compatible, equitable and sustainable development activities and management activities in the upper Flathead River basin,” in effect, endorsing the concept of an International Conservation Reserve. In 2000, the Flathead Basin Commission asked the International Joint Commission to establish an International Watershed Board to accomplish goals identified in the 1988 IJC referral, namely to create an International Conservation Reserve.

It might be argued that, as an International Conservation Reserve, the impacts of climate change on the Flathead watershed should not require intervention or adaptive interference by humans. With this notion in mind, the basin instruments were not analyzed for climate change implications.

Specific Obligations and Entitlements

Columbia River Treaty

The Treaty operates on the assumption that water quantities fluctuate within a known variability range. Treaty obligations and planning strategies could be challenged in the event that the amount of water increases or decreases in such a way as to exceed the customary or historical amount. Some examples follow.

Article II

Canada shall provide in the Columbia River basin in Canada 15,500,000 acre-feet of storage usable for improving the flow of the Columbia River. The necessary dams were built.

<p>The Columbia has an average annual runoff at the mouth of about 198,000,000 acre-feet (275,000 cfs). The Canadian portion of the basin generally contributes about 50,200,000 acre-feet annually. Hence, the storage capacity (15,500,000 acre-feet) is equivalent to about 31% of the annual Canadian runoff. Climate change induced changes in the Canadian runoff may significantly alter these basic numbers.</p>
--

Article III

The United States of America shall maintain and operate the hydroelectric facilities. In so doing, there are downstream power benefits to which Canada is entitled.

Climate change induced reduction in stream flow could impact of the US water availability far down stream. If Canada meets its Article II obligations then USA has the obligation to deliver the agreed power and will do so even if the water in the lower Columbia declines due to climate change, for example. The delivery of the power may/will require changes in USA usage, such as changes in levels of irrigation or local power usage.

Article VIII

Disposal of Entitlement to Downstream Power Benefits

(4) The bypassing at dams on the main stem of the Columbia River in the United States of Americas of an amount of water which could produce usable energy equal to the energy component of the downstream power benefits to which Canada is entitled but not delivered to Canada under Article V or disposed of in accordance with paragraphs (1) and (2) at the time the energy component was not so delivered or disposed of, is conclusive evidences that such energy component was not used in the United States of America and that the entitlement of Canada to such energy component is satisfied.

Does this mean that the USA is not obliged to deliver power commitments to Canada if the USA decides not to produce the power but rather to bypass the dam and send the water further downstream, for irrigation purposes, for example? This action could be an adaptation strategy to deal with drier conditions associated with climate change. Is this clause in conflict with Article III above?

Article XIII

Diversions

(1) Except as provided in this Article neither the United States of America nor Canada shall, without the consent of the other evidenced by an exchange of notes, divert for any use, other than a consumptive use, any water from its natural channel in a way that alters the flow of any water as it crosses the Canada-United States of America boundary within the Columbia River basin.

Definition---(e) "consumptive use" means use of water for domestic, municipal, stock-water, irrigation, mining or industrial purposes but does not include use for the generation of hydroelectric power;

1-Both countries can use water for irrigation without consultation. Note the River flows both into Canada from the USA and out of Canada to the USA.

2-There are important conditions attached to the introduction of diversions. A climate-change-driven reduction or increase in the water available may require diversions. Such adaptation measures should be examined in the light of the treaty, Article XIII. The treaty allows for such adaptations but does not seem to anticipate a major application.

Article XVIII

Liability for Damage

(1) The United States of America and Canada shall be liable to the other and shall make appropriate compensation to the other in respect of any act, failure to act, omission or delay amounting to a breach of the Treaty or of any of its provisions other than an act, failure to act, omission or delay occurring by reason of war, strike, major calamity, act of God, uncontrollable force or maintenance curtailment.

What is climate change? If the Treaty is in jeopardy because of lack of water, for example, is it “a breach of the Treatyoccurring by reason ofan uncontrollable force”?

Annex A

Principles of Operation:

For floods, the flow is managed through extra release and bypass at the generators. The schedules are prepared in advance and are complex. Under normal conditions, the Canadian reservoirs release specific amounts “Unless other-wise agreed by the entities”.

Schedules of operation can be changed by agreement in order to adapt to unusual situations. Climate change scenarios may constitute sufficient reason to change operations.

Paragraphs 6, 7 and 8 suggest power production strategies can be implemented for occasions when there is too little water to run all facilities ‘to achieve optimum power generation’.

The occurrence of wide-spread changes in climate is not addressed.

Five years in advance the countries ‘agree annually on operating plans and the resulting downstream power benefits for the sixth succeeding year of operation thereafter.’

Climate change induced changes in precipitation patterns and amounts as well as changes in the supply of glacial water may be rapid enough to require that the five year planning horizon should be shortened.

Annex B

Determination Of Downstream Power Benefits

Paragraph 6: --‘The critical stream flow period and the details of the assured plan of operation will be agreed upon by the entities at each determination. Unless otherwise

agreed upon by the entities, the determination of the downstream power benefits shall be based upon flows for the twenty year period beginning with July 1928 as contained in the report entitled Modified Flows at Selected Power Sites-Columbia River Basin, dated June 1957. No reduction in the downstream power benefits will be made at any time during the period of the Treaty. ’

The analysis of recent data and the predictions of the climate change scenarios used in this study may suggest that the historic data set is not relevant. Several data sets from the last 100 years are used in the Treaty.

The implications of the last quoted sentence, ‘No-reduction-in-benefits...’, above, are not clear and may require legal comment.

Kootenay Lake Order

Aside from details about the construction of the dam, the order deals with maintaining an annual cycle of lake levels required to deal with flooding and to accommodate land use activities (agriculture) up stream in both Canada and the USA. The levels clause states:

‘ after the high water of the spring and early summer flood and when the lake level at Nelson on its falling stage recedes to elevation 1743.32,.... the gates of the dam may be so operated as to retain it at said level until August 31st, and after said date the level of the main lake may be raised to elevation 1745.32, which shall be the maximum storage level until January 7, and thereafter it shall be lowered that shall not exceed elevation 1744 on February 1, elevation 1742.4 on March 1, and elevation 1739.32 (i.e., zero of the Nelson gauge) on or about April 1,.....’

with the caveat:

‘ except under extraordinary natural high inflow conditions, when sufficient gates shall be opened and remain open throughout such period of excess so as to lower the level of the main body of Kootenay Lake to the storage level at that time obtaining as above defined.’

Climate change scenarios may include situations where the levels required are not practical or desirable because of a change in the annual amount of water available and/or in the annual cycle of flow.

The caveat provides instruction under high flow conditions but not low flow conditions or a changed annual cycle. A change annual cycle of flow may impact on the total power produced over the year and hence, the financial returns from this enterprise.

Osoyoos Lake Order

Preamble text

In the introduction to the Order there are references to past climatological records. These are used to infer future climatic conditions. Examples are:

“Whereas hydrological analyses indicate that the level of Osoyoos Lake has, and probably will again, exceed elevation 913.0 USCGS at least every other year and for a duration varying from two days to two months, that the probable recurrence interval of the lake level exceeding elevation 915.0 is 12 years and that in 1972 Osoyoos Lake level peaked at elevation 917.1 feet USCGS.”

“Whereas detailed analysis of recorded water levels of Osoyoos Lake from 1948 to 1981 inclusive indicates that for the period 1 April to 31 October in those years the levels have been 911.0 USCGS or above 82 percent of the time, 911.5 USCGS or above 50 percent of the time, 912.5 USCGS or above 11 percent of the time, and 913.0 USCGS or above 6 percent of the time. Moreover, the level of Osoyoos Lake has been maintained between elevation 911.0 and 911.5 USCGS 32 percent of the time.”

Climate change scenarios may show that past records are no longer reliable predictors of future climates and therefore they should not be used as a basis for ‘orders’ concerning the future management of water resources.

Condition 7

“Washington State will maintain the Lake level “between elevation 911.0 and 911.5 feet USCGS to the extent possible from 1 April to 31 October each year except under drought conditions in the Okanogan Valley” and “between elevation 909.0 and 911.5 feet USCGS from 1 November to 31 March each year.”

These mandatory levels should be examined in the light of the climate change scenarios.

Condition 8

“During a year of drought as determined by the Board of Control in accordance with the criteria set forth below, the levels of Osoyoos Lake may be raised to 913.0 feet USCGS and may be drawn down to 910.5 feet USCGS during the period 1 April to 31 October.”

Under extreme or long-term change in the hydrological regime, in particular less water, higher evaporation and/or changes in diurnal patterns, the proposed levels, notably, the minimum drawdown level in the summer may not be practical or possible.

Condition 10

The proposed levels, discussed above, can be changed under a number of conditions including:

“In the event of circumstances including but not restricted to a prolonged drought coupled with high evaporation from Osoyoos Lake, the Commission upon written advice and recommendation from the Board of Control may allow a temporary deviation from the levels prescribed in Conditions 7 and 8.”

This caveat may be sufficient to deal with climate change, depending on the magnitude of the change to the water supply.

D: REFERENCENCES

For links between The Flathead River and Pend D’Oreille River (Skagit Agreement) see map at: <http://www.cbfwa.org/files/province/mtncol/geography.htm>

Kootenay Lake Board of Control
<http://www.nwd-wc.usace.army.mil/>

ST. MARY’S AND MILK RIVERS

Preamble

Disputes involving Montana, Alberta and Saskatchewan over sharing the waters of the St. Mary and Milk Rivers were among the factors that led to the conclusion of the 1909 Boundary Waters Treaty. The treaty provided for equal apportionment of these waters, but it was left to the Commission to decide how this would be carried out in practice. The Commission issued an order in 1921 which put in place an apportionment regime that continues to be implemented effectively under the IJC (IJC 21ST C). In effect, the 1921 Order grants Canada a prior apportionment on the St. Mary River while the USA has a prior apportionment on the Milk. The Order also deals with the apportionment of the Eastern Tributaries of the Milk but is silent on the Southern Tributaries.

The St Mary flows into the Saskatchewan-Nelson system (Hudson Bay drainage) while the Milk flows into the Missouri-Mississippi system (Gulf of Mexico drainage). At their closest point they are only a few kilometers apart. The St. Mary is also the subject of interprovincial apportionment under the Prairie Provinces Water Board Master Agreement on Apportionment.

(In addition to the instruments concerning the St. Mary’s and the Milk Rivers discussed below, there may also be instruments for the Poplar and Big Muddy, which flow south to the Missouri. These four catchments occur over a 600-kilometer long stretch of the international border, from the B. C. -Alberta border to halfway across Saskatchewan.)

A: WATERSHED

Name: St. Mary’s River (South Saskatchewan Basin) Milk River (Missouri Basin)

Location: Southern Alberta and South-western Saskatchewan

Physical Description

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
Milk River	1 005	Can.:21 600 US: 39 600 Total: 61 200	
St. Mary			

B: BILATERAL MANAGEMENT INSTRUMENTS

In the following three boxes, the ‘a’s in each box refers to the same instrument, as do the ‘b’s.

Title:
a) Boundary Waters Treaty, 1909 : Article VI
b) International Joint Commission Order of 1921 (Not available)

Managing Authority:
a) International Joint Commission
b) Accredited Officers appointed in Canada by federal Order-in-Council and in the USA by the State Department.

Nature of Instrument:
a)

- Apportionment of waters of the St. Mary and Milk Rivers
- Diversion by USA of water from the St. Mary to the Milk
- Conveyance of St. Mary diversion water, via the Milk, though Canada and back to the USA.

b) Document not available.

- grants Canada a prior apportionment on the St. Mary River
- grants the USA a prior apportionment on the Milk

C: CLIMATE SENSITIVITIES

Language Usage

As part of the evaluation of the climate-change sensitivity of agreements, the text of the Boundary Waters Treaty was subjected to a word search. The search words were: climate, change, water quality, fisheries, pollute, temperature, glacier, melt , draught, Stikine, Yukon, Iskut, Taku, Skagit, division, snow, allocation, precipitation, stream, flow, flood, power (electrical), entitlement, diversion, Milk, Poplar, St. Mary, St. Laurence, irrigation, Great Lakes, St. Mary’s river (Ontario), Sault Ste. Marie, Niagara and Commission. The absence of some of these key words can be as important as their appearance in the text.

Only the following words appeared in the text of the Treaty: Commission 50, flow 22, diversion 21, St. Mary 7, Milk 4, division 3, stream 5, power (electrical) 6, Niagara 6, irrigation 4, St. Mary's River (Ontario) 2, Sault Ste. Marie 2, pollute (1).

General

Boundary Waters Treaty

Article VI of the Boundary Waters Treaty (the St. Mary and Milk Rivers article) refers to irrigation and power production only:

A-“The Rivers are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries....

B-...but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each.”

C-“It is further agreed that in the division of such waters during the irrigation season, between the 1st of April and 31st of October, inclusive, annually, the United States is entitled to a prior appropriation of 500 cubic feet per second of the waters of the Milk River, or so much of such amount as constitutes three-fourths of its natural flow, and that Canada is entitled to a prior appropriation of 500 cubic feet per second of the flow of St. Mary River, or so much of such amount as constitutes three-fourths of its natural flow.”

These arrangements could work well in the event of inadequate water supplies.

In the event of water shortage, as may occur under climate change, a country may wish to take most of or all of its share of water out of one river and little or none out of the other. This could only be done during the period November 1 to March 31. In fact, there is little opportunity for swaps as it would have to be done by mutual agreement and both countries want more Milk River water.

In the event of water shortage, as may occur under climate change, decreased flows could lead to renewed pressure in Alberta to construct the Milk River Dam. This initiative could lead to an international disagreement.

The St. Mary-Milk River arrangement relates only to water quantity. Under climate change, water quality degradation due to increased, upstream, irrigation return flows could become an issue.

During the irrigation season, the respective prior apportionment may not be enough to satisfy the needs of existing Montana and Alberta water licenses. The situation may be aggravated by senior water rights and differences in the urgency-of-need along the full length of the rivers in the two countries.

Flexibility: The Treaty stipulates that: “The measurement and apportionment of the water to be used by each country shall from time to time be made jointly by the properly constitutedofficers” from each country under the direction of the International Joint Commission.

SOURIS RIVER

A: WATERSHED

Name: Souris River Basin (Assiniboine-Red)

Location: SE Saskatchewan-SW Manitoba and North Dakota

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
Souris River	696		

B: BILATERAL MANAGEMENT INSTRUMENTS

In the following three boxes, the ‘a’s in each box refers to the same instrument, as do the ‘b’s, etc.

Title:
 a) Boundary Water Treaty* (1909)
 b) Interim measures (1940, 1959 and 1992)
 c) Canada-U.S. Agreement for Water Supply and Flood Control in the Souris River Basin (1989)
 d) Amendments(December 2000) to: Canada-U.S. Agreement for Water Supply and Flood Control in the Souris River Basin (1989)

*The Boundary Water Treaty is the over-riding instrument

Managing Authority:
 a) IJC through the International Souris-Red Rivers Engineering Board 1948
 b) IJC through the International Souris River Board of Control (1959)
 c) IJC through the International Souris River Board of Control (1959) supported by the Souris

River Bilateral Water Quality Monitoring Group
d) IJC through the International Souris River Board (2001)

Nature of Instrument:

- a) Use and apportionment of boundary waters
- b) Establish objectives and monitor storage and apportionment
- c) Establish objectives and monitor storage, apportionment and quality(Article IV)
- d) Establish objectives and monitor storage, apportionment and evaporation losses

C: CLIMATE SENSITIVITIES

Language Usage

The Treaty has been examined earlier in this report. The additional instruments noted above are very specific and were not screened for language use. One exception is noteworthy. The most recent instrument, 'Amendments to: Canada-U.S. Agreement for Water Supply and Flood Control in the Souris River Basin (December 2000)' makes no reference to climate change, as is the case for the other instruments.

General

The river valley is flat and shallow and its semi-arid prairie has been extensively cultivated.

The valley is vulnerable to floods and drought. Agriculture can require irrigation. The management of floods, droughts and irrigation could be challenging in the event that climate change alters the water regime.

Prairie Farm Rehabilitation Administration has determined that, at present, the net water availability in much of the Souris watershed (Canada Side), after accounting for allocations, is zero.

See: Rural Water Mapping Initiative (<http://www.agr.gc.ca/pfra/pub/rwmi.htm>)

Specific Obligations and Entitlements

Only the most recent instrument, 'December 2000 Amendment to the Agreement Between Canada and the United States for the Water Supply and Flood Control of the Souris River Basin', is considered here since it reflects current 'Obligations and Entitlements' and replaces, for the most part, earlier instruments. The December 2000 Amendment replaces several section of the Agreement with a section called 'Annex B'. This annex is the focus of the following analysis.

Annex B

The text covers a wide range of caveats, variations and options so that it is not a simple matter to extract the key points which might lead to difficulties in a new climate regime. Nor is it the intention of this analysis to probe all the nuances of the Amendment. In the following, several climate situations are listed along with sections of text which should be considered.

Simple, equal sharing – normal climate conditions (A Treaty Cornerstone)

‘The Province of Saskatchewan shall have the right to divert, store, and use waters which originate in the Saskatchewan portion of the Souris River basin, provided that such diversion, storage, and use shall not diminish the annual flow of the river at the Sherwood Crossing more than 50 percent of that which would have occurred in a state of nature...’ (Preamble in Annex B and Clause (a))

Quantitative Minimum flows - droughts

The flow at the boundary ‘shall not be less than 0.113 cubic metres per second (4 cubic feet per second) when that much flow would have occurred under the conditions of water use development prevailing in the Saskatchewan portion of the Souris River basin prior to construction of the Boundary Dam, Rafferty Dam and Alameda Dam.’ (Preamble in Annex B)

Evaporation Losses from Reservoirs

‘Under certain conditions, a portion of the North Dakota share will be in the form of evaporation...’ and in such as event ‘the minimum amount of flow actually passed to North Dakota will be 40 percent of the annual natural flow volume’ ‘This lesser amount is in recognition of Saskatchewan's operation of Rafferty Dam and Alameda Dam for flood control in North Dakota and of evaporation as a result of the project.’ (Preamble in Annex B) Evaporation is taken into account in international (and PPWB) apportionment calculations. The issue here is: since water is being held in Canada to provide flood control in the US, the Americans should bear some of the evaporative loss. At the moment, evaporation from Boundary Reservoir (including forced evaporation) is charged in its entirety to Canada.

High flow years – floods or US reservoir is high

‘Saskatchewan will deliver a minimum of 40 percent of the annual natural flow volume’ when ‘The annual natural flow volume at Sherwood Crossing [the border] is greater than 50 000 cubic decameters and the current year June 1 elevation of Lake Darling [US reservoir] is greater than 486.095 metres (1594.8 feet) (Sub clause a (i))

Spring-delivery obligation

‘Notwithstanding the annual division of flows that is described in (a), in each year Saskatchewan will, so far as is practicable as determined by the Board, deliver to North Dakota prior to June 1, 50 percent of the first 50 000 cubic decametres (40 500 acre-feet) of natural flow which occurs during the period January 1 to May 31.’ (Clause (b))

The extracted texts contain quantitative commitments. Meeting these commitments may become more difficult with climate change. The climate scenarios should be examined for changes in total amount of water available, changes in evaporation rates from reservoirs, extreme water events such as floods and droughts and changes in the pattern of annual flow.

The meaning of the term 'a state of nature'

'Flow releases to the United States should occur (except in flood years) in the pattern which would have occurred in a state of nature.'

The terms 'natural flow' and 'state of nature' occur throughout the document and imply a condition in the past before the dams. However, would a new climate regime constitute a new 'state of nature', and therefore, a new reference point for the whole Amendment?

Generally in 'natural' flow calculations, the result is the flow in the absence of structures. Land use change, for example, is not considered. A better term would be 'apportionment flow', i.e. the flow subject to apportionment.

Flexibility in unusual situations

The text allows for flexibility in unusual situations.

Concerning the Spring-delivery obligation: '...as far as is practicable as determined by the Board.' (Clause (b))

Concerning the operational plans for refuges, 'Barring unforeseen circumstances, operations will follow said plans during each given year.' (Clause (c))

The Amendment is sensitive to unforeseen events. Climate change may require consideration and use of these flexibilities.

RED RIVER

Preamble

At Wahpeton, North Dakota, the river elevation is 287 meters above sea level. At Lake Winnipeg (the mouth), the elevation is 218 m, a difference of only 70 m over a distance of about 877 river km. In essence, the basin is completely flat with few natural features to slow water if there is a flood and that is, few natural places to store water. Consequently, lack of water supply can be as much of a problem as flooding.

There are no bilateral treaties or agreements relating directly to the basin. The basin has been examined and managed through a number of references to the IJC and subsequent directives from the IJC to standing boards and study boards. Some of these instruments are discussed here.

The important issues in the basin are: water quality, floods/droughts, diversions, allocations, aquifer utilization and ecosystem health.

These issues are currently receiving varying degrees of attention. Emphasis has changed over the years from allocations in the 50s, to water quality in the 60s and 70s, to diversions, to floods and ecosystem health more recently. All issues are sensitive to changes in climate.

A: WATERSHED

Name: Red River Basin

Location: Southern Manitoba

Physical Description

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
Red River (Mouth at Lake Winnipeg to head at Wahpeton)	877	CAN-138 600 USA-148 900	

B: BILATERAL MANAGEMENT INSTRUMENTS

In the following three boxes, the 'a)'s in each box refers to the same instrument, as do the 'b)'s, etc.

Title:

- a) Governments' Reference Letter To The International Joint Commission (1948)
- b) IJC Revised Directive To International Red River Pollution Board (1995)
- c) IJC Directive to the International Red River Board (2001)

Managing Authority:

- a) Federal Governments
IJC - establishes International Souris-Red Rivers Engineering Board (1948)*
- b) IJC
IJC- through International Red River Pollution Board (1969)
- c) IJC
International Red River Board (an amalgamation of the International Souris-Red Rivers Engineering Board and the International Red River Pollution Board)

* The activities of The Board included investigations of the Souris River, Poplar River, Pembina River, Roseau River and the Garrison Diversion Unit.

Nature of Instrument:

- a) Establishes International Souris-Red Rivers Engineering Board to monitor water quantity and report on all trans-boundary Prairie waters considering apportionment, conservation and utilization.
- b) Focuses on water quality with monitoring, assessment and reporting. Replaces the directive of 1969 which established International Red River Pollution Board.
- c) Replaces directives to former two boards. Provides general guidelines focusing on water quality, quantity, levels and ecological integrity. Places emphasis on flood management.

C: CLIMATE SENSITIVITIES

Language Usage

As part of the evaluation of the climate-change sensitivity of agreements, the texts of the documents listed in Section B above, were subjected to a word search. The key search words used here were : water quality, fisheries, pollution, temperature, climate, glacier, melt, drought, precipitation, snow, stream flow, flood, quantity, levels, power generation, utilization, allocation, apportionment, diversion and entitlement. The absence of some of these key words can be as important as their appearance in the text.

- a) The following words appeared in the Governments' Reference Letter To The IJC: apportionment (3), conservation (1) and utilization (1).
- b) The following words appeared in the IJC Directive To International Red River Pollution Board: water quality (6)
(The word 'pollution' occurred but only in the Board's title.)
- c) The following words appeared in the IJC Directive to the International Red River Board: water quality (6), flow (1), flood (17), water quantity (3), water levels (3), and aquifer (1).

General

Issue Limitations

The focus of the instruments has changed with time as demonstrated by the word search. The absence of allocations and diversions in the current focus is notable.

Regional Limitations

The geographical scope of the instruments has become narrower over the past 50 years.

Specific Obligations and Entitlements

Governments' Reference to the International Joint Commission (1948)-replaced

On receipt of this reference, the IJC established the International Souris-Red Rivers Engineering Board. This reference became the directive to the new board, which remained active until 1997.

The geographic scope of this reference was large, including,

“... the waters which are of common interest along, across, or in the vicinity of the international boundary from the eastern boundary of the Milk River drainage basin on the west up to and including the drainage basin of the Red River of the North on the east.”

The focus of the reference was water quantity. The purpose was to investigate, to report and “to make advisory recommendations concerning the apportionment” of waters where needed and subsequently, “to prepare a comprehensive plan or plans...”

Today, even though there is a possibility of water shortages due to climate change, the notion of apportionment is not receiving a great deal of attention within the IJC

framework. Only the Souris and Poplar rivers have apportionment instruments. The need for formal apportionment of the Red River basin as a whole will become increasing evident with the potential increase in irrigated agriculture and the US push for more flood control structures (e.g. the proposed Devils Lake project in northeastern North Dakota) .

IJC Directive to International Red River Pollution Board (1995)-replaced

In 1969, the IJC established this board. The boards was directed to assist the IJC in complying with its authorization concerning supervision over quality of waters in the Red River, as described in the IJC report of 1968. The 1969 directive was revised in 1995.

The 1995 Directives required that the Board maintain surveillance, carry out assessments and keep the IJC informed on matters related to water quality objectives. It required that the board report on "...developments, actual or anticipated, which have the potential to adversely affect the quality of the water and the health of the Red River trans-boundary aquatic ecosystem."

A significant change in climate could constitute such an 'anticipated development' if there was less water, due to less precipitation and/or higher evaporation, and hence, less dilution of water contaminants.

IJC Directive to the International Red River Board (2001)

This directive replaces the above two instruments and is intended to embrace the water quantity aspects of the 1948 reference and the water quality aspect of the 1995 directive.

The Directive Article 5. A. requires: 'Maintain an awareness of basin-wide development activities and conditions that may affect water levels and flows, water quality and the ecosystem....'

The 2001, 45-page first annual report of the Board does not mention the word 'climate' and gives scant reference to apportionment (11), conservation of water (0), snow (2), precipitation (3), evaporation (0), utilization (1), entitlement (0), diversion (0) and aquifers (0). Regarding the aquifers, the report does mention that it should report on aquifers but it does not do so.

On the other hand the report refers to water quality and flood extensively: water quality (157), fish (35), pollution (39), and flood (64).

Climate change implications have not been address by the Board though they could have significant impacts on the basin.

If the climate change scenarios predict important changes in the climate, then apportionment, diversion, entitlements and aquifers could become important. In addition, because of the link between water quality and quantity, due to dilution, changes in the climate could impact on the water quality.

Comment

The Dakota Water Resources Act 2000 concerns the large-scale inter-basin transfers (Garrison Diversion Unit) of Missouri River water into the Red River Valley. Canada and Manitoba have a longstanding policy of opposing such inter-basin transfers.

Climate change may increase the need for new sources of water in the upper Red River valley and thus put further pressure on the USA to implement the inter-basin transfer.

D: REFERENCENCES

International Red River Board: <http://www.ijc.org/boards/irrb/irrb.html>

International Red River Basin Task Force: <http://www.ijc.org/boards/rbtf.html>

Basin wide: <http://www.basinwide.org>

Garrison Dam: <http://www.gov.mb.ca/conservation/transboundary/maps/map2.html>

The Dakota Water Resources Act 2000: <http://www.garrisondiv.org/pdfs/dwrafinal.PDF>

LAKE OF THE WOODS - RAINY RIVER

Preamble

Boards

For the past eighty years, the instruments developed for the Lake of the Woods and Rainy River basins have all dealt with one main issue, water levels. The two basins have been treated separately. An IJC Board of Control exists for each, the International Rainy Lake Board of Control (1941) and the International Lake of the Woods Board of Control (1925). In addition, there is a Canadian Lake of the Woods Board of Control (1925), which deals with the level of the Lake of the Woods and the flow into the Winnipeg River.

In the Lake of the Woods, the Canadian Board manages the levels when they are within a range of 321.87 to 323.47 m while the International Board manages those situations when the levels fall outside this range. With relatively few exceptions, such as the 1985 high water levels which slightly exceeded 323.47 m (1,061 ft.), the lake has remained within the water level range where it is under the full authority of the Canadian Board. In order to ensure the fullest measure of co-operation, the Government of Canada appoints one member of the Canadian Board as its representative on the International Board (Paragraph 4 of the Protocol attached to the 1925 Agreement on Level of Lake of the Woods).

Instruments

There has been a wide array of Conventions, Agreements, Acts, Orders and Directives. Only two instruments, one from each basin, will be analyzed in detail here.

- Agreement Between the United States of America and Canada to Regulate the Level of Lake of the Woods (July 1925). The Agreement had an attached Protocol which a) gives guidelines for initiating the Agreement and b) refers to the IJC some questions concerning the regulation of levels in the Rainy Lake Watershed.
- The IJC Order Prescribing Method of Regulating the Levels of Boundary Waters in the Rainy Lake Watershed (January 2001).

There is a third instrument of interest, the Convention between the United States of America and Canada Providing for Emergency Regulation of the Level of Rainy Lake and of Other Boundary Waters in the Rainy Lake Watershed (1938). This document was not available for analysis. In its stead the 2001 IJC Order, which provides the latest guidance on the Rainy River basin lake levels, is analyzed.

A: WATERSHED

Name: Lake of the Woods / Rainy River Basins

Location: NW Ontario

Physical Description

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
Lake of the Woods and Rainy River system		70,400	460 (into Winnipeg River)

B: BILATERAL MANAGEMENT INSTRUMENTS

In the following three boxes, the ‘a’s in each box refers to the same instrument, as do the ‘b’s.

Title:

- Agreement Between the United States of America and Canada to Regulate the Level of Lake of the Woods (July 1925).*
- The IJC Order Prescribing Method of Regulating the Levels of Boundary Waters in the Rainy Lake Watershed (January 2001).

*International Boundary Waters Treaty Act is the umbrella instrument

Managing Authority:

- IJC
International Lake of the Woods Control Board (1925)
Canadian Lake of the Woods Control Board (1919)

b) IJC International Rainy Lake Board of Control – 1941

Nature of Instrument:

- a) Regulates and controls the outflow of the waters of Lake of the Woods.
- b) Regulates and controls levels controlled by private dams in Rainy River Basin

C: CLIMATE SENSITIVITIES

Language Usage

As part of the evaluation of the climate-change sensitivity of agreements, the texts of the documents listed in Section B above, were subjected to a word search. The key search words used here were: climate, change, quality (water), fish, fishery, pollution, temperature, glacier, melt, drought, snow, allocation, precipitation, stream, flow, flood, environment, generation (power), apportionment, conservation, utilization, diversion, trends, aquifer, levels, quantity and entitlement. The absence of some of these key words can be as important as their appearance in the text.

The following words appeared in the Agreement Between the United States of America and Canada to Regulate the Level of Lake of the Woods (1925): fish (2), precipitation (3), flow (amounts) (5), flood (1), power generation (1), diversion (1) and (water) levels (32).

The following words appeared in the IJC Order Prescribing Method of Regulating the Levels of Boundary Waters in the Rainy Lake Watershed (2001): water quality (1), drought (4), precipitation (1), flow (28), flood (5), power generation (6) and (water) levels (54).

Specific Obligations and Entitlements

Agreement between the United States of America and Canada to Regulate the Level of Lake of the Woods

Articles 3 and 4

The Canadian Board regulates and control the outflow of the waters of Lake of the Woods when the levels of the lake of the Woods falls between elevation 323.47 m (1061 ft.) sea level datum and 321.87 m (1056 ft.) sea level datum. Whenever the level of the lake rises above elevation 323.47 m sea level datum or falls below elevation 321.87 m sea level datum, the rate of total discharge shall be subject to the approval of the International Board, which has two members. This situation has occurred infrequently in the past.

If, because of climate change, the Lake levels fall outside the accepted range more frequently than in the past, the IJC might consider altering the reference levels. In addition, the IJC might consider augmenting the size of the International board so that a broader range of opinion and experience is available to the International Board.

Article 5

During periods of excessive precipitation an adjusted range of allowed levels on the Lake shall be permitted as prescribed by the International Board. Such flexibility might help to accommodate climate change effects.

Article 7

“The outflow capacity of the outlets of Lake of the Woods shall be so enlarged as to permit the discharge of not less than forty-seven thousand cubic feet of water per second (47,000 c.f.s.) when the level of the lake is at elevation 1061 sea level datum.”

Climate change may be such that the flow out of the Lake of the Woods is far greater than in the past and the discharge capacity specified is insufficient. In such an event, the outlet may have to be further enlarged.

The IJC Order Prescribing Method of Regulating the Levels of Boundary Waters in the Rainy Lake Watershed (January 2001)

This Order takes account of the original 1938 convention between the two countries, the 1949 Order and subsequent Supplementary Orders of 1957, 1970 and 2002. The Order is directed to the two companies, Boise Cascade Corporation and Abitibi-Consolidated Inc., which currently own and operate the discharge facilities at the outlets of Rainy and Namakan lakes. They manage the dam at the outlet of Rainy Lake, the International Falls Dam and upstream, at the outlet from the Namakan string of lakes, Kettle Falls. They produce hydro power at the dams.

The Order provided extremely detail quantitative levels for the Lakes for up to seven different parts of the years. On those occasions when the levels cannot be maintain within the normal range, because there is too little water, the outflow from the lakes at the dams is reduce. If the levels of the lakes continue to fall to the level called the drought line, then the outflow is further restricted. No guidelines are provided for those cases where the amount of water greatly exceeds current experience.

Paragraphs 1(a), 1(b) and 1(c)

For example, the level of Namakan Lake must lies between 339.70 m and 340.00 m during the period January 1 to April 1. If the flow drops below 339.70 m, the outflow is reduced to 30 m³ /s. If the level continues to drop to what is called the drought line, 338.95 m in this case, then the outflow is further reduced to not less than 15 m³ /s.

Under extremely dry climate conditions, it may not be possible to operate the level control facilities in a manner which will maintain the lake levels within the prescribed ranges.

Paragraph 3

“... if extremely high or low inflows to Namakan Lake or Rainy Lake are anticipated, the ... Board of Control,... may authorize the levels ... be raised temporarily to greater than the maximum or lowered temporarily to less than the minimum elevations respectively prescribed in Paragraphs numbered 1(a) and 2(a) of this Order.”

This flexibility is desirable given the uncertainty of future climates. In fact, it would appear that the prospect of climate change has been anticipated here, though the actual phenomenon is not mentioned.

Paragraph 5

“This Order shall be subject to review 15 years following adoption of the Commission's Supplementary Order of 5 January 2000, or as otherwise determined by the Commission.”

Given the possible pace of climatic change, this 15 year review period may be too long.

Note:

In 2001 the water level exceeded 323.67 m for several days in June & July 2001. Earlier this year following a series of heavy rains in June 9-11 period, the entire system was subjected to high flows and elevations. For example, Lake of the Woods peaked at 323.676 m (0.206 m above bounds) on July 12 with a maximum outflow of 1411.5 cms on July 15. (Private communication from Syed M. A. Moin, Ph.D., P.Eng. Senior Hydrologic Engineer, Environment Canada.)

GREAT LAKES BASIN - NIAGARA RIVER

Preamble

The total generating capacity at Niagara is about 4.4 million kilowatts (5 million horsepower). The Niagara River Treaty stipulates that the river flow used for hydro-electric generation be shared equally by Canada and the United States. There is one exception to the equal sharing formula. The quantity of water diverted into the Great Lakes basin from the Albany River Basin as a consequence of the Long Lac-Ogoki diversions is governed by an “Exchange of Notes Between the United States of America and Canada Constituting an Agreement Regarding the Development of Certain Portion of the Great Lakes – St. Lawrence Basin Project” , 1940. This agreement is also examined here.

This treaty is unusual because it amends the fundamental Boundary Waters Treaty (1909) by terminating its third, fourth, and fifth paragraphs of Article V.

It was preceded by a number of agreements or notes, May 20 1941, October 27 1941, November 27 1941 and December 23 1948.

A: WATERSHED

Name: Great Lakes Basin - Niagara River

Location: Southern Ontario

Physical Description

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
Niagara River	56	684,000	5,700 (variable)*

*The flow at Queenston for the period of record 1860 to present.

B: BILATERAL MANAGEMENT INSTRUMENTS

In the following three boxes, the 'a's in each box refers to the same instrument, as do the 'b's, etc.

Title:

- a) Niagara River Treaty* (1950) (formal title: Treaty Between the United States of America and Canada Relating to the Uses of the Waters of the Niagara River)
- b) Exchange of Notes Between the United States of America and Canada Constituting an Agreement Regarding the Development of Certain Portion of the Great Lakes – St. Lawrence Basin Project (1940) also known as The Long Lac-Ogoki diversions

*The Treaty will remain in force for 50 years and thereafter until one of the parties notifies the other that it wishes to terminate the treaty.

Managing Authority:

- a) The two federal governments through:
 - i. International Niagara Committee (1950-Article VII) – inspecting plants, monitor water available and water used for power – report to Governments
 - ii. International Niagara Board of Control (1953 by the IJC) supervising water levels regulated by the operation of remedial works – reports to IJC
- b) The two federal government with the support of the Government of Ontario

Nature of Instrument:

- a) The preservation and enhancement the scenic beauty of the Niagara Falls and the production of hydro-electric power, including the construction of remedial works.
- b) Enhance power production at Niagara Falls for the war effort

C: CLIMATE SENSITIVITIES

Language Usage

As part of the evaluation of the climate-change sensitivity of agreements, the text of the document listed in Section B above, was subjected to a word search. The key search

words used were: climate , change, water quality , fisheries , pollution , temperature , glacier, melt , drought, snow , allocation , precipitation , stream , flow , flood , power (generation) , entitlement , apportionment, conservation, utilization, diversion, trends, aquifer, levels, and quantity (water). The absence of some of these key words can be as important as their appearance in the text.

The following words appeared in the text of the Treaty: power (generation) (12), diversion (8), flow (3) and quantity (water) (1).

The following words appeared in the text of the diversion agreement letters: flow (2), power (generation) (8), utilization (2), diversion (2) and quantity (2).

Specific Obligations and Entitlements

Niagara River Treaty

Article III

“Waters which are being diverted into the natural drainage of the Great Lakes System through the existing Long Lac-Ogoki works shall continue to be governed by the notes exchanged between the Government of the United States of America and the Government of Canada at Washington on October 14 and 31 and November 7, 1940 and shall not be included in the waters allocated under the provisions of this Treaty.”

The Long Lac-Ogoki works divert 5,000 cubic feet per second into the Great Lakes Basin. (It has not been confirmed that this amount has remained constant since 1940.) At some times of day and for some months (see below) this water is equivalent to 10 % of the flow over Niagara Falls. The water is available to Canada for power production before apportioning of the water is done, ‘off the top’ so to speak.

Should the amount of water in the Niagara River become seriously reduced because of climate change, then this small fixed amount may become important and could be a point of renegotiation between the two countries.

Article IV

“In order to reserve sufficient amounts of water in the Niagara River for scenic purposes, no diversions of the water specified in Article III of this Treaty shall be made for power purposes which will reduce the flow over Niagara Falls to less than one hundred thousand cubic feet [2,826.2 cubic metres]* per second each day between the hours of eight a.m., E.S.T**., and ten p.m., E.S.T., during the period of each year beginning April 1 and ending September 15, both dates inclusive, or to less than one hundred thousand cubic feet per second each day between the hours of eight a.m., E.S.T., and eight p.m., E.S.T., during the period of each year beginning September 16 and ending October 31, both dates inclusive, or to less than fifty thousand cubic feet [1,413.1 cubic metres] per second at any other time;...”

*The Governemnts agreed that the metric conversions for the minimum Falls flows, are 2832 cubic metres per second for 100,000 cubic feet per second and 1416 cubic metres per second for 50,000 cubic feet per second.

** By an exchange of notes dated April 17, 1973, the Governments agreed the Treaty be interpreted to provide that Eastern Daylight Savings Time be utilized to determine the hours of flows specified in Article IV during the periods when EDST is legally in effect in the City of Niagara Falls New York or the city of Niagara Falls, Ontario.

These absolute flow requirements may be challenged should climate change result in a reduction in available water to the point where reduced power production becomes important.
--

Article VI

“The waters made available for power purposes by the provisions of this Treaty shall be divided equally between the United States of America and Canada.”

The exception is the diversion water from the Long Lac-Ogoki works, in Article III.

Long Lac-Ogoki Diversions Agreement (done by the exchange of letters)

Formally called: Exchange of Notes Between the United States of America and Canada Constituting an Agreement Regarding the Development of Certain Portion of the Great Lakes – St. Lawrence Basin Project, Signed at Washington 14 and 31st October and 7th November 1940

October 14th 1940 – USA to Canada

“Meanwhile, to assist in providing an adequate supply to meet Canadian defense needs and contingent upon the Province of Ontario provide immediately for diversions into the Great Lakes System of waters of the Albany River Basin which normally flow into Hudson Bay, the Government of the United States will interpose no objection, pending the conclusion of a final Great Lakes-St. Lawrence Basin agreement between the two countries, to the immediate utilization for power at Niagara Falls by the Province of Ontario of additional waters equivalent in quantity to the diversions into the Great Lakes Basin above referred to.”

Final exchange: November 7th, 1940 – Canada to USA

“I note also that the Canadian Government is giving appropriate instructions to authorize the additional diversion of 5,000 cubic feet [141.58 cubic metres] per second of water at Niagara Falls by the Hydro-Electric Commission of Ontario.”

Note: There is no mention of the exact amount of water which must be diverted at Long Lac-Ogoki, into the Great Lakes Basin. There is reference to ‘utilization for power at

Niagara Falls by the Province of Ontario of additional waters equivalent in quantity to the diversions into the Great Lakes Basin ...' The role of the Ontario Government has not been examined. The content of the Great Lakes-St. Lawrence Basin Agreement (March 1941) has not been examined.

Under certain climate change scenarios the relatively small quantity of equivalent water allowed for power production by Canada (Ontario) may become more important given the flow requirements of the Treaty.

Comments:

1--From: International Niagara Board of Control, Ninety-Eighth Semi-Annual Progress Report to the IJC, March 2002.

“For the months of September 2001 through February 2002, the level of Lake Erie continued below its long-term average but was nearly at average in February. Precipitation on the Lake Erie basin was above average during this period. This helped move the lake nearer to its long-term average as the period progressed. Lakes Michigan and Huron remain well below their long-term average levels, resulting in generally lower than average inflows to Lake Erie from upstream.”

2-- The average combined LL/O diversion for Jan '44 to Dec 2001 is 153 cubic metres per second. (Private communication from Ralph Moulton, Water Issues Division, Environment Canada)

D: REFERENCES

Long Lac-Ogoki Diversions Agreement

<http://www.internationalwaterlaw.org/RegionalDocs/St-Lawrence.htm>

Niagara River Treaty

http://www.law.buffalo.edu/Academics/courses/775/Canada_Diversion_Treaty.htm

Information on the falls and the flow control plan.

<http://www.infoniagara.com/d-att-river.html>

ST. CROIX AND ST. JOHN RIVERS

Preamble

St. Croix River

The IJC Order of Approval for dams set the terms on which these works could be built and operated. The two IJC boards, the International St. Croix River Board of Control and the International Advisory Board on Pollution Control - St. Croix River, have assessed the need to modify the Commission's St. Croix Orders of Approval. The review report is examined here. The Review is not a legal instrument but it reveals issues of interest here.

In 2000, the International Joint Commission formally combined the two boards and established the International St. Croix River Board.

St. John River

Few instruments were identified and the one noted below could not be found.

A: WATERSHED

Name: St. Croix River and St. John River Basins

Location: Southern New Brunswick

Physical Description

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
St. Croix River (length along boundary only)	185 km	4 230	
Saint John River	673	Can.: 35 500 US: 19 700 Total: 55 200	1 130

B: BILATERAL MANAGEMENT INSTRUMENTS

In the following three boxes, the 'a's in each box refers to the same instrument, as do the 'b's.

Title:

- a) Review of the Orders of Approval St. Croix River Basin Maine and New Brunswick (1997)
- b) Agreement Relating to the Establishment of a Canada-United States Committee on Water Quality in the St. John River and its Tributary Rivers and Streams which cross the Canada-United States Boundary (with annex) (1972, amended 1984) *

*The text for this Agreement could not be found.

Managing Authority:

a) IJC through:

- International St. Croix River Board of Control - oversees operation of dams and fisheries (1915 by IJC)
- International Advisory Board on Pollution Control - monitors water quality (1962 by governments)

Nature of Instrument:

a) Assesses local concerns in context of Orders on river levels and flows

C: CLIMATE SENSITIVITIES

The “Review of the Orders of Approval St. Croix River Basin Maine and New Brunswick” is not a legal instrument. However, it provides some insight into potential climate change induced difficulties.

The Review received and analyzed proposals from a wide range of interested parties. The proposals were examined to see if they violated the existing Orders of Approval for the river. “...one of the most significant factors that caused violations in the analyses was a 750 cubic foot per second discharge requirement at Baring, Maine imposed by the United States Environmental Protection Agency. Since this discharge must be met year-round, the basin managers needed to utilize storage from the reservoirs during the summer periods when inflow was historically at its lowest.” Baring is near the mouth of the river.

The climate change scenarios may indicate important change to the flow of the river. These changes may aggravate or remove the problems associated with the minimum flow requirement.

The analysis involved the application of a model, which determined the impact of each of the fourteen proposals on the flow record for the period 1970 to 1989. All produced violations of the Orders. The technical staff tried to develop a modified scenario from all the proposals submitted. “It was not possible to develop a scenario that was successful in all 20 years of record. However the Working Group did identify operating controls which could be attained for 19 years out of the 20 of record from 1970 to 1989. Only 1985, the driest year of record, showed violations.” The Review concluded that the Orders should stand unchanged, for the moment.

The utilization of the period 1970 to 1989 may be unrealistic in the light of climate change scenarios.

The review further concluded that:

“No further work should be performed examining potential changes in the Orders of Approval until the 750 cfs discharge at Baring is reviewed by the St. Croix International Advisory Board on Pollution Control in conjunction with the United States Environmental Protection Agency and the Maine Department of Environmental Protection.”

The climate change scenarios may indicate important future changes to the water resources. The examination of the Orders and the review of the USEPA discharge requirements should consider the implications of climate change.

D: REFERENCENCES

Review of the Orders of Approval St. Croix River Basin Maine and New Brunswick (1997), <http://www.ijc.org/comm/stcroixrev.html>

YUKON RIVER

A: WATERSHED

Name: Yukon River Basin

Location: Yukon Territories

Physical Description

Flowing Water Feature	Length (km)	Drainage Area (km ²)	Mean Discharge (m ³ /s)
(Portion of the drainage area in the United States is shown in brackets)			
Yukon River (mouth to head of Nisutlin River)	3 185	-	-
(International Boundary to head of Nisutlin River)	1 149	323 800 (515 400)	2 300
Porcupine River*	721	61 400	-
White River	265	38 000 (12 500)	-

*Porcupine River: the drainage area in the USA is not available.

B: BILATERAL MANAGEMENT INSTRUMENTS

In the following three boxes, the ‘a’s in each box refers to the same instrument, as do the ‘b’s, etc.

Title:
 a) Yukon Waters Act* – 1992 (Replaced Northern Inland Waters Act - 1970)
 b) Pacific Salmon Treaty** – signed/ratified June 1999 (replaces treaty of 1985)
 c) Yukon River Treaty – signed, March, 2001 (also known as the Yukon River Salmon

Treaty). The Yukon River Treaty is an annex to the Pacific Salmon Treaty.

*The Yukon Waters Act is unilateral. It sets the stage for further agreement development.

** Pacific Salmon Treaty will be in effect for ten years.

Managing Authority:

- a) Canadian Federal Government
 - Yukon Territory Water Board
- b) Federal Governments of Canada and the USA
- c) Federal Governments of the UASA and Canada
 - Bilateral Yukon River Panel

Nature of Instrument:

- a) The management of water use through the issuing of permits.
- b) The management of Pacific salmon fisheries and the equitable harvest of salmon stocks
- c) The management and allocation of salmon catches on the Yukon River

C: CLIMATE SENSITIVITIES

The Yukon River Treaty is not yet available for analysis.

Language Usage

As part of the evaluation of the climate-change sensitivity of agreements, the texts of the documents listed in Section B above, were subjected to a word search. The key search words used here were: water quality, fisheries, pollution, temperature, climate, glacier, melt, drought, precipitation, snow, allocation, stream flow, flood, power generation, and entitlement. The absence of some of these key words can be as important as their appearance in the text.

Only the following words appeared in the text of the Yukon Waters Act: water quality (9), fisheries (1), pollution (1) and flood (1).

The following key words appeared in the text of the Pacific Salmon Treaty Agreement: fisheries (123), allocation (4) and entitlement (1).

General

Issue Limitations

The Yukon Waters Act is limited to the management of water use through the issuing of permits. The act includes consideration for the pollution of water by local sources. It also provides for the alteration of water ways. “Water use” means a direct or indirect use of any kind, including, without limiting the generality of the foregoing,

- (a) Any diversion or obstruction of waters,
- (b) Any alteration of the flow of waters, and

(c) Any alteration of the bed or banks of a river, stream, lake or other body of water, whether or not the body of water is seasonal,

The Act does not include a use connected with shipping activities.

Water use issues which might require attention in a climate change regime are not identified specifically in the act. However, the permitting process may provide the necessary mechanism for including climate change considerations.

The Pacific Salmon Treaty Agreement is concerned primarily with the maintenance of the fisheries resource.

Regional Limitation

The Yukon Waters Act is a Canadian Instrument. It is referenced here because it provides mechanisms for the compliance to bilateral instruments. Specific obligations and entitlements are not evaluated in this study.

This Pacific Salmon Treaty Agreement applies mainly to the Pacific coastal rivers, south of the Bering Sea. However, it includes Article 8: Yukon River. In addition, the Yukon River Treaty is an annex to the Agreement, and therefore is closely connected to the parent agreement.

Specific Obligations and Entitlements

The Pacific Salmon Treaty Agreement is discussed fully in the following sections dealing with the north-west river of British Columbia and the Skagit. However, specific details concerning allocations are contained in agreements for individual rivers, such as the Yukon River Treaty, below.

The signing of the Yukon River Treaty on March 26 2001, ended sixteen years of negotiations. The specific obligations and entitlements of this agreement are not yet available for assessment. Ratification is expected by the summer of 2002.

D: REFERENCES

Yukon Waters Act:

<http://lois.justice.gc.ca/en/Y-4.6/>

Pacific Salmon Treaty:

http://www.dfo-mpo.gc.ca/pst-tsp/main_e.htm

Yukon River Treaty - Interim

information

site:

<http://www.landbigfish.com/articles/default.cfm?ID=20>