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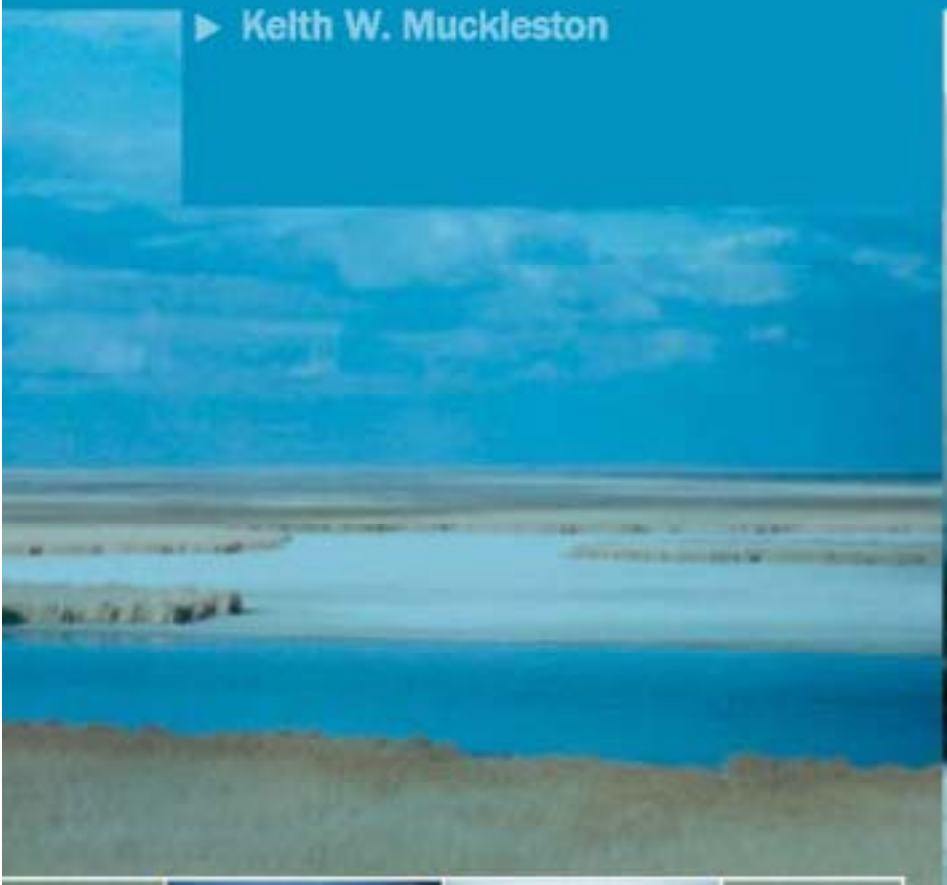
International Management in the Columbia River System

Keith W. Muckleston



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INTERNATIONAL MANAGEMENT IN THE COLUMBIA RIVER SYSTEM

Keith W. Muckleston

Oregon State University, Corvallis, Oregon, USA

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CONTENTS

INTERNATIONAL MANAGEMENT IN THE COLUMBIA RIVER SYSTEM

Various approaches to international water management have been practiced in the Columbia River system for almost eight decades. The hydrography of the upper part of the system results in both Canada and the US being upstream and downstream coriparians. The Kootenay River has been particularly significant in this respect. Negotiations have stressed equality rather than equity despite the asymmetry in the size of populations and economies. Equality stems from the Boundary Waters Treaty of 1909 and has been fostered by the International Joint Commission (IJC). The coriparians have enjoyed a long history of relatively harmonious relations, but irritants over use of boundary waters occasionally develop, most of which have been successfully addressed through the IJC.

This success was not the rule, however, through much of the 1950s. Disagreements over the proposed Libby Dam and the principle of sharing downstream benefits were exacerbated by a proposed hydropower project (the McNaughton Plan), which would have diverted part of the Columbia River in Canada into the Fraser System. During this period interests in both countries invoked water management principles in support of their positions, including: equitable utilization, historic use, riverine integrity, and absolute sovereignty. Disagreements were reduced near the end of the decade by US acceptance of sharing downstream benefits and completion of the IJC report affirming the feasibility of international development of the Columbia River.

By 1961 the federal governments had negotiated and signed the Columbia River Treaty (CRT), but the refusal of British Columbia to sign until concessions to its plans were made delayed ratification of the treaty until 1964. The CRT features equal sharing of downstream benefits for hydropower and flood control in the US that result from development and use of 19 km^3 of usable storage in Canada. The United States prepaid Canada's share of the value of benefits from 60 years of flood control and 30 years of hydropower, a sum sufficient to pay for the construction of the CRT dams. The CRT also allowed the US to build Libby Dam and disallowed the McNaughton Plan by limiting diversions out of the Columbia to consumptive uses.

The CRT's hydropower and flood control objectives have been met, but the coriparians are challenged to successfully deal with the increased value society places on endangered biota, environmental quality, and sustainability.

The report concludes, among other things, that successful international water management is more likely when coriparian states have a history of harmonious relations and have created a permanent legal/administrative framework designed to address problems from use of boundary waters.

CHAPTER 1

1.1. Background

Much of the following report is structured from questions posed by organizers of the Conflict to Cooperation Program (PCCP), a subdivision of UNESCO's World Water Assessment Program.

Before considering international water management in the Columbia River system, the article presents an overview of selected physical and human phenomena in the region. The collage of dams, canals, electric interconnections, government agencies, local boards, agreements, and treaties results in a synergism that comprises international water management in the system. Figure 1 is provided to orient readers unfamiliar with the US Pacific Northwest and Canadian province of British Columbia (BC). Reference to Figure 1 is made throughout the report. Nonmetric measurements are included in the text with metrics because international agreements in the Columbia Basin have relied on a combination of English measurements and those developed in western North America.

1.2. Physical–Hydrologic Characteristics

The Columbia River catchment may be placed among the world's major drainage basins, if not for drainage area and volume of discharge then for developed hydropower. The river system covers 670,810 km² (259,000 mi²), an area somewhat larger than France, draining lands in one Canadian Province and seven US states. Nine percent of British Columbia (BC) lies within the catchment; and relatively larger percentages of Washington (WA), Oregon (OR), Idaho (ID) and Montana (MT), which have 69, 57, 95, and 17 percent, respectively, of their lands within the system. Relatively small to miniscule portions of Wyoming, Nevada, and Utah are also within the catchment.

The location of the Columbia's drainage basin near the western side of the North American continent between 41 and 53 degrees north latitude places it in the zone of prevailing westerly winds off the Pacific Ocean. At this latitude and continental position maximum precipitation occurs during the cool season. Most of the catchment lies to the east of the north–south-trending Cascade Mountains (Figure 1, GF10-23), where lands below 1200 m (about 4000 feet) manifest strong dry shadow characteristics, with potential evapotranspiration being considerably greater than precipitation. Much of the precipitation east of the Cascades Range falls as snow on the numerous mountain ranges that comprise the Rocky Mountain Landform Region. Many of these ranges are aligned in a general NNW–SSE direction and retain much of the cool season precipitation as snow and ice until the May–July thaw period. The orographic precipitation falling on these mountain ranges accounts for an important part of the Columbia's total discharge.

The relationships between location (east or west of the Cascades), elevation, as well as the timing of runoff and water yield variations within the catchment help to explain some of the need for and characteristics of international water management within the drainage basin: The Northern Rocky Mountains – in both countries – contain 31 percent of the Columbia's catchment area but provide 50 percent of the runoff; the Columbia Plateau and Snake River Plains have 60 percent of the drainage area but generate only 25 percent of the runoff; and the relatively small area west of the Cascades covers only nine percent of the catchment while producing 25 percent of the basin's total runoff (President's Water Resources Policy Commission, 1950, Figure 1, p. 6). The first two areas produce a snowmelt regime with low flow from September through March. This is 180° out of phase with major seasonal precipitation and

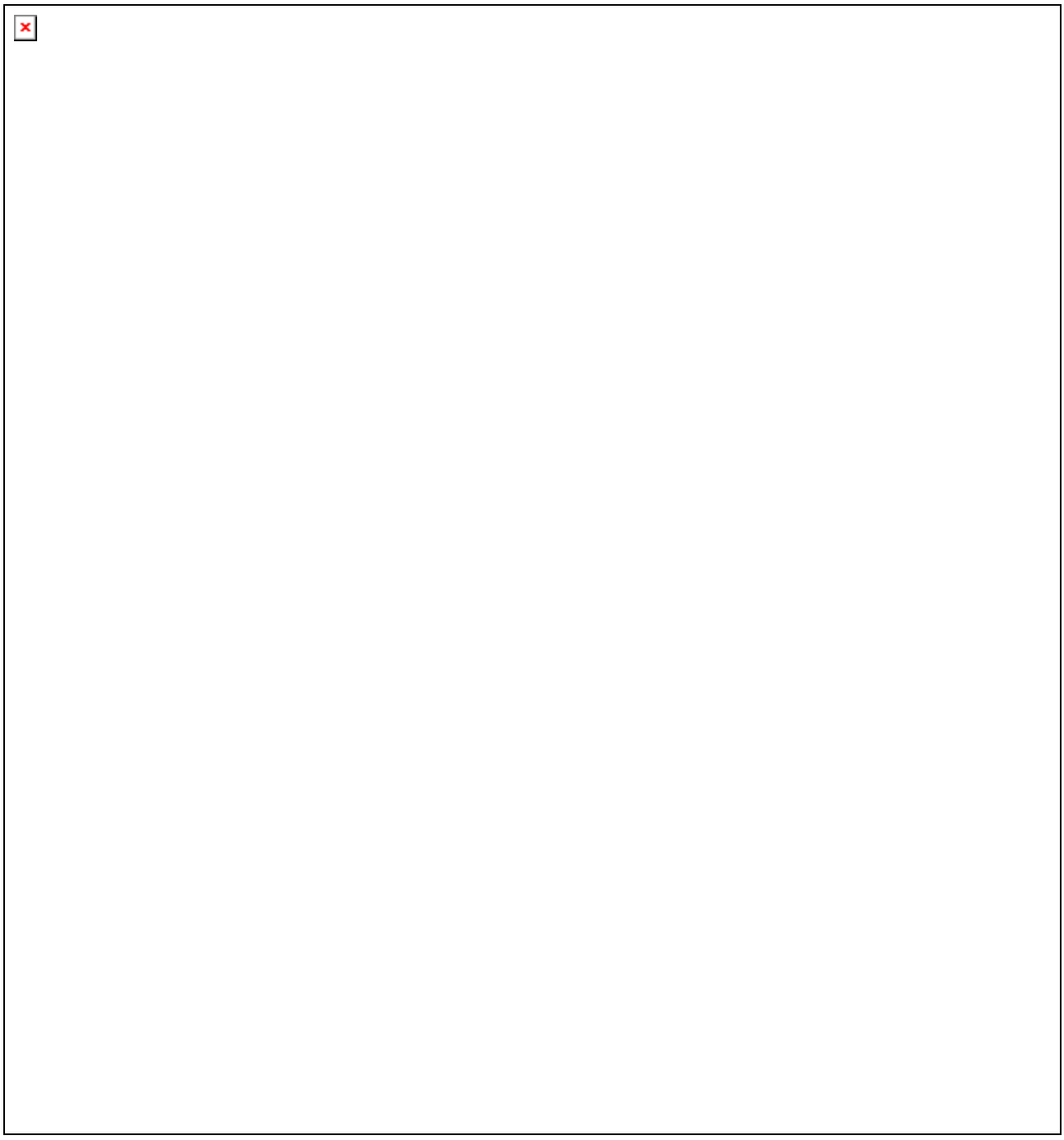

Figure 1. Columbia River catchment area

Source: Modified from Muckleston. 1993. "Water Resources". In: P. L. Jackson and A. J. Kimerling *Atlas of the Pacific Northwest*, 8th Edn, p. 79. Corvallis, Oreg. Oregon State University Press.

with higher regional demand for electric energy (Figure 2A). The relatively small area west of the Cascades displays a runoff regime similar to temporal patterns of precipitation: high river flows in the late fall and midwinter and low flows during the summer.

Much of the international management in the system takes place along the mainstem of the Columbia River in Canada and on one of its major headwater tributaries: the Kootenay River, the mainstem of which flows in both countries.[1] The Columbia's other major upper basin tributary, the Pend Oreille, is not included in the Columbia River Treaty (CRT) but has received close and fruitful attention from the International Joint Commission (IJC) on several occasions.[2] The relative significance of these waters and selected hydrologic characteristics are shown in Table 1.

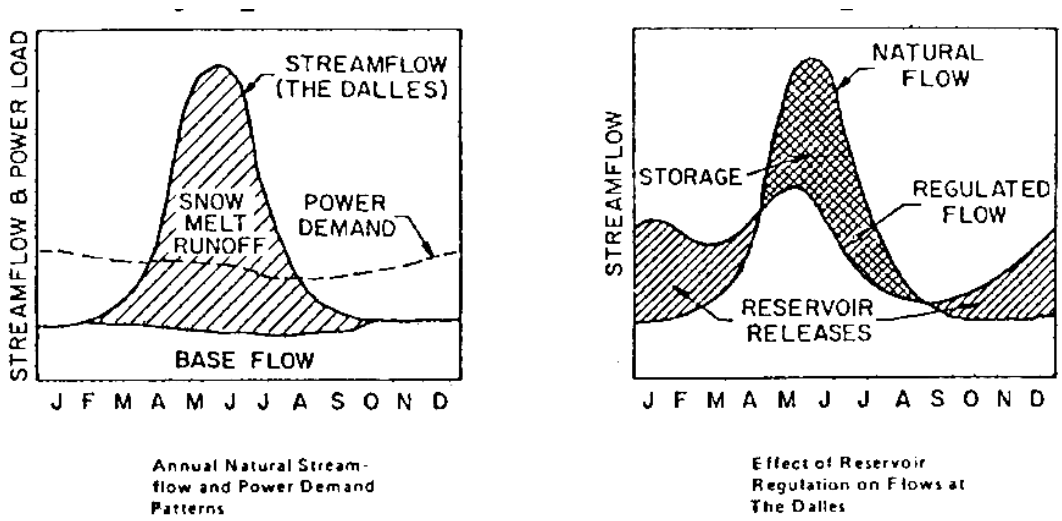

Figure 2.A and B. Seasonal precipitation and demand

Source: US Department of Interior, Bonneville Power Administration, Draft Environmental Impact Statement. *Part 2, the Role of BPA* (part of a six-part EIS entitled *The Role of the Bonneville Power Administration in the Pacific Northwest Power Sypply System Including its Participation in the Hydro-Thermal Power Program*, Figs. VIII-2 and 3, p. VIII-7.

The 49th parallel forms a 2048 km (1273 mile) linear border between Canada and the coterminous United States, starting at the Lake of the Woods (near the point where Manitoba, Ontario, and Minnesota meet) and runs westward into the Strait of Georgia near Vancouver, BC. Unlike the eastern portion of the US–Canadian border, where international waters predominate, water courses cut across the 49th parallel forming transboundary rivers, which are treated somewhat differently under the Boundary Waters Treaty of 1909 (BWT).[3] The 49th parallel divides the Columbia River System between Canada and the United States for 497 km (309 miles). BC is on the northern side of the political divide through the catchment, while on the south side WA, ID and MT lie along 280 km (174 miles), 72 km (45 miles) and 145 km (90 miles), respectively.

Whereas the mainstem of the Columbia River crosses the international border only once, the Kootenay follows a more complex route. It rises in BC (see Figure 1, P-7), flows close to and parallel to the Columbia but in an opposite direction, passing only 2.5 kilometers from the source of the Columbia as it continues southward. The Kootenay then crosses the 49th parallel and arcs through northwestern MT and the northeastern part of the ID panhandle before entering BC. It subsequently feeds into the southern end of Kootenay Lake 29 km (18 miles) north of the border and then turns westward and enters the southward flowing mainstem of the Columbia only 46

km (29 miles) above the international border. The serpentine course of the Kootenay has long challenged those seeking to design rules governing international water management, as will be described in following sections of the report.

Table 1: Area, runoff contribution, and yield of major units in the Columbia River system

Unit	*Catchment Area x10³ km²/mi²*	*Volume km³/maf*	*% of Total*	*Average Yield cm/inches*
Mainstem above Pend Oreille excluding the Kootenay	37.6/14.5	40.7/33	18.3	108.7/42.8
Kootenay River Basin	49.7/19.2	25.9/21	11.7	51.8/20.4
Clark Fork - Pend Oreille	67.3/26.0	23.4/19	10.6	34.8/13.7
Sub-total Upper Basin	*154.6/59.7*	*90/73*	*40.6*	*58.2/22.9*
Mainstem Tributaries from Intl. Boundary to Snake River Confluence	112.1/43.3	23.4/19	10.6	20.8/8.2
Snake River Basin	282.3/109	45.6/37	20.5	16.3/6.4
Mainstem and tributaries between Snake River and Cascade Range (Bonneville Dam)	72.5/28	11.1/9	5	15.2/6
Mainstem and tributaries west of the Cascade Range	49.2/19	51.8/42	23.3	105.2/41.4
Total	**670.8/259**	**221.9/180**	**100**	**33.0/13.0**

Source: Modified from The Departments of External Affairs and Northern Affairs and National Resources, The Columbia River Treaty, Protocol and Related Documents, Ottawa, Canada 1964, p. 22.

The Pend Oreille system has characteristics somewhat similar to that of the Kootenay, in that along its course the United States and Canada are both upstream and downstream parties within its drainage basin. This system, also known as the Clark Fork–Flathead–Pend Oreille, receives most of its waters from the Rocky Mountains in western MT, but one of its tributaries – the North Fork of the Flathead – rises in the southeastern corner of BC (Figure 1, 10-R). The Clark Fork flows out of MT crosses the ID panhandle, becomes the Pend Oreille, and then turns north, flowing through northeastern WA before crossing into BC. It then turns westward and flows only 26 km (16 miles) before its confluence with the Columbia River just north of the international borders (Figure 1, 11-M). Over the last 55 km (34 miles) of its course the Pend Oreille is confined to a deep canyon and descends rapidly, which results in a large hydroelectric potential (now developed) on each side of the border. The innovative approaches to international management on this reach of the river are described in later sections of this report.

West of the Columbia's mainstem in BC, several relatively small tributaries flow generally southward across the 49th parallel.[4] Relatively minor problems and issues regarding international waters management on these tributaries have been addressed by the IJC through the last decades but are not included in the CRT.

It is noteworthy that both the United States and Canada are upstream and downstream parties in the Columbia River system. The bulk of the water crossing southward into the United States originates in BC however, and this is reflected in the CRT. With only 15 percent of the Columbia's drainage area, Canada contributes 30 percent of the discharge into the Pacific Ocean. Of even greater importance to international management, however, is the significantly larger Canadian contribution to flow east of the Cascades where most of the US hydroelectric plants are located.

Thus, when discharge from the Columbia's tributaries west of the Cascades is subtracted from the total, runoff originating in Canada comprises over 40 percent of the total at Bonneville Dam, the lowest power plant on the Columbia's mainstem, and increases dam by dam upstream to Grand Coulee Dam, where the Canadian contribution approaches 70 percent. As noted above, this is very significant to US hydropower output on the Columbia River. On the 725 km (452 miles) of river between Grand Coulee Dam and Bonneville Dam, 192 generating units at eleven dams presently (2002) have an installed capacity of over 19,565 MW and generate a yearly average of 91,918 GWH. It is improbable that the development of this massive hydropower infrastructure would have been feasible without the type of international water management incorporated in the CRT: provision of upstream storage in Canada in return for equal sharing of derived downstream benefits in the United States.

Upstream storage in Canada also contributes to flood hazard reduction. Approximately half of the discharge during the flood of record (1894) at The Dalles originated north of the 49th parallel. The value of flood loss reduction in the United States that results from upstream storage in Canada is equally shared under the CRT. While most of the savings are derived from flood crest reduction in the greater Portland area (Figure 1, 19-E), flood prone lands in BC along the Kootenay and mainstem of the Columbia River from Castlegar to the border are also less frequently inundated since construction of the four treaty dams.

1.3. Selected Demographic and Economic Characteristics

The asymmetry between the United States and Canada in regard to the size of population and subsequent scope of economic development has a bearing on international water management. Canada (in this case BC) has 15 percent of the Columbia River catchment area but only between six and seven percent of the population (Johnson, 1966, p. 685). The population ratios are shown in Table 2: for the Columbia catchment, for the international drainage basins in the two countries, and for the total populations.

Table 2. Approximate Populations Ratios, United States and Canada

	USA	*Canada*
Columbia Catchment	15	1
All Boundary Catchments	3	1
Total Population	9–10	1

Sources:

1. R. Shaftner, F. Quinn, and J. Carrol, 1980. Other Replenishable Resources. In: C.E. Beige and H.O. Hero Jr. (Eds.), *Natural Resources in United States–Canadian Relations*, Vol. II, Ch. 13, pp. 565–7. Boulder, Colo., Westview.
2. *Pacific Northwest River Basins Commission, Columbia–North Pacific Region Comprehensive Framework Study*. 1970. Appendix VI, p. 12. Economic Base and Projections, Vancouver, Wash.

Most of the area within the catchment of the Columbia River is sparsely populated, reflecting both biophysical and political–economic phenomena. Much of the drainage area in its unaltered state is unsuitable for agriculture: either too high, and/or too rugged, and/or too dry for crop production. The latter characteristic has been overcome to some degree by irrigation development, most of which is in the US part of the drainage basin.

Another obstacle facing settlement has been extensive government ownership of lands. In the US portion of the catchment most of the extensive federal holdings are owned and managed by the US Forest Service, the Bureau of Land management, and the National Park Service. In Canada the federal government is a minor owner but BC

holds a large proportion of lands within the catchment. Government ownership of land is particularly significant in the upper reaches of the Columbia drainage where questions about international management are more significant.

The remoteness of much of the Columbia's catchment has been another factor inhibiting the attraction and sustainability of sizable concentrations of population. Many communities there lack low-cost access to major regional markets, and to world markets that are reached through them. Two of the three major regional markets lie outside the Columbia catchment. They are Vancouver, BC, in the southwestern corner of the province, and the Seattle–Tacoma–Everett conurbation along the eastern shore of Puget Sound (Figure 1, 11 E-F and 14-15 F, respectively). The lower Columbia ports, especially those in greater Portland, are an exception to the problems of remoteness, in that low-cost river transport and water grade rail transport connect part of the Columbia–Snake drainage area to major regional markets and access to maritime commerce. Much of the upper Columbia system does not have this low-cost access, however, because unimpeded inland water transport is not available on the mainstem of the Columbia River above its confluence with the Snake River (Figure 1, 18-K). For more than half a century the region's major population growth has taken place in a narrow band along the north–south axis from Vancouver BC to Eugene, OR (Figure 1, 11E to 23D).

In much of the upper system of the Columbia – which includes the Kootenay and Pend Oreille – small communities in both countries were founded in the late nineteenth and early twentieth centuries based on the extraction and primary processing of natural resources. Logging and mining predominated; agriculture, while present in some valleys, generally remains of less importance. Most of these communities have not grown appreciably after the first few decades of settlement, and some have declining populations. Economic stagnation has often reflected the exhaustion of high-grade and economically accessible raw materials. Chronically high unemployment encourages emigration to regional centers of economic activity.

The settlements, transportation infrastructure, and socioeconomic activities that remain continue to be concentrated in narrow valleys. These valleys became prime candidates for reservoirs created to provide upstream storage in the Columbia River system. While the creation of reservoirs in these narrow valleys would cause dislocation and hardship for a significant portion of local inhabitants (see for example Wilson, 1973), the principal benefits from upstream storage were bestowed upon major regional population centers distant from the dam sites, and in the majority of the cases outside the Columbia catchment. This spatial asymmetry of costs and benefits, which often accompanies water resources development the world over, has become an important consideration both at the intra and international levels in the Columbia River catchment.

Within the last decade the hardships experienced by communities in upstream storage areas have been addressed in BC. The Columbia Basin Trust (CBT) is a regional corporation created by BC in 1995.[5] An initial lump sum payment of C$45 million to start operations is being followed by an additional C$500 million spread over a ten-year period to assist in the construction, purchase, and upgrading of hydropower facilities by the CBT.

A principal source of funding is derived from part of the downstream power benefits from the United States, which since 1997 are being returned in kind to BC under provisions in the CRT. Borrowing of additional funds will bring the CBT an investment pool of approximately C$1 billion. The CBT will be self-supporting and able to deliver benefits to the upper Columbia drainage area from the sale of hydropower generated at the three sites: Keenleyside, Brilliant, and Waneta Dams. The former is one of the CRT dams, at which the CBT has built a 185 MW powerhouse, while the latter two dams already had developed hydropower and were purchased from a large

mining–smelting corporation. The three dams are in close proximity to Castlegar, BC, where the CBT's main administrative headquarters is located (Figure 1, 11-M-N).

The goals of the CBT are to promote social well-being in the Upper Columbia drainage area through investments in economic development and environmental enhancement. Although traditional extractive industries (principally forestry and mining) and the processing of their raw materials will receive considerable support, economic diversification and training in new job skills and education will also receive considerable investment. While it is still early in the CBT's regional improvement program, this organization and its approach to regional development may serve as a model for water resources planners and managers in other countries where developments may cause (or have already caused) hardship and dislocation in upstream reservoir areas.

Finally, an introductory word on the background to international relations between the two countries. By world standards the United States and Canada have had a long and remarkably congenial relationships along their 8882 km (5520 mile) border. This amiable relationship across the world's lengthiest border between two countries has endured for almost two centuries; it is the prime reason underlying the ability to create innovative and effective approaches to the management of international water resources utilized by the two countries.

Irritants do exist however, and the process of resolving them has also contributed to advances in cooperative water management. The asymmetry of population size – approximately 10:1 – plus the concentration of Canadian population relatively close to the southern border, coupled with Canada's strong economic ties with the United States, have meant that the Canadian public is much more knowledgeable of and concerned about US–Canadian interrelationships than vice versa. Also there is no gainsaying that governments in Canada, both federal and provincial, are more focused on US–Canadian relationships than their American counterparts. In the later half of the twentieth century US-owned media outlets (especially TV) have penetrated Canadian territory to a significant degree. This has buttressed a desire in Canada to preserve Canadian identity, which includes the goal of greater economic independence. Because the American public is often ignorant of Canadian concerns, it is therefore surprised when Canadian positions are belatedly covered in the US media (Johnson, 1966). These factors were present during the formative period of the CRT and continue to the present.

CHAPTER 2: INTERNATIONAL LEGAL PRINCIPLES AND DOCTRINES INVOKED

2.1. Background

Most of the invocations over Columbia River development took place during the 1950s and were stimulated by a variety of interests in the United States and Canada. The invocations included interpretations of international law, the Boundary Waters Treaty of 1909 (BWT), and water use doctrines employed in both countries.

The International Joint Commission (IJC) had begun a comprehensive study of the Columbia System in 1944 to ascertain the feasibility of future development and explore questions related to international management (Bloomfield and Fitzgerald, 1958, pp. 164–5). Although the study would not be completed until 1959, water resources were being rapidly developed in the US part of the Columbia River system. In the 1950s no water resource developments had been started on the mainstem of the river in Canada, construction being limited to the Kootenay and lower Pend Oreille. As development progressed in the United States, it became increasingly evident that more upstream storage was necessary.

Two events in the 1950s fueled conflict: the unsuccessful applications by the United States to gain IJC permission to build a dam on the Kootenai River in MT, and the failure of the parties to agree on a remedy to the impasse; and the McNaughton plan calling for a diversion out of the Columbia into the Fraser River.

In January 1951 the United States applied to the IJC (Bloomfield and Fitzgerald, 1958, pp. 190–5) for permission to build Libby Dam near the small town of Libby, MT (Figure 1, 13-Q). The raison d'être for the Libby project was provision of a large volume of upstream storage (over 6 km^3) to increase firm power output at large existing and planned hydroelectric plants downstream on the Columbia's mainstem. The other projected benefit would be flood crest reduction. Backers of the dam felt this would be viewed positively because a disastrous system-wide flood of 1948 was still fresh in the memories of people on both sides of the border. US advocates pointed out that downstream interests in Canada would gain firmed up flows for the several hydroelectric plants on the river below Kootenay Lake (Figure 1, 10-M-N) as well as flood crest reduction in flood prone areas.

The size of the proposed reservoir and its extent of encroachment onto Canadian Territory were significant. Of the more than 6.3 km^3 (5.11 million acre feet (maf)) of total usable storage water in the reservoir created by Libby Dam, over 1.4 km^3 (1.1 maf) would be in BC. At that level of storage the depth of the reservoir would be 45.7 meters (150 feet) at the border (Swainson, 1979, p. 377n16 with diagram), and back water 68 km (42 miles) into BC, disrupting communities, transport infrastructure, and economic activities.

To compensate for this inundation, the United States offered to reimburse Canada the costs of resettlement, relocation of transport infrastructure, and clearing the reservoir site (Bloomfield and Fitzgerald, 1958, pp. 140–1). In addition, no charge would be made for downstream benefits in Canada occurring at hydroelectric plants and on flood-prone lands along the Kootenay, although it is doubtful that charges could have been collected given that the United States had not yet agreed to the principle of sharing downstream benefits. Through the IJC, Canadian representatives insisted that the above conditions be met, and in addition noted that because over 45 meters of head on Canadian land would increase the hydropower output at Libby appreciably, some of the energy generated at Libby Dam should be returned to Canada, the amount to be determined later by the IJC (Bloomfield and Fitzgerald, 1958, p. 192). This opened a near decade-long disagreement over the question of sharing downstream benefits.

American representation within the IJC rejected this aspect of international management and withdrew its application for the Libby Dam from the IJC in April 1953 (Bloomfield and Fitzgerald, 1958). Withdrawal was prudent at that time for US project advocates because, in addition to Canada's conditions, dissatisfaction with the consequences of constructing Libby Dam were being voiced in Montana. Clearly the USACE needed to rework its plans, which was done over the next year. Opponents to Libby Dam in Montana were placated by moving the planned structure upstream.

In May 1954 the United States submitted a second application for Libby Dam to the IJC (Bloomfield and Fitzgerald, 1958, pp.192–5), with essentially the same offer previously made to Canada. This time Canadian negotiators introduced additional conditions in exchange for agreeing to the construction of Libby: the sharing of downstream benefits from storage in Canada at all existing and future hydroelectric plants on the mainstem of the US section of the Columbia (Johnson, 1966, pp. 713–14). US negotiators did not agree, believing that eventually Canada would develop its part of the Columbia, thereby providing downstream benefits to the United States as a byproduct of dam construction and reservoir formation. The precedent for this had been set by the earlier creation of storage at Kootenay Lake.

During this period an additional aspect was introduced by Canadian negotiators: a diversion was being studied that would transfer part of the Kootenay's flow into the Columbia at Canal Flats (Johnson 1966; see also Figure 1, 9-P). This would increase the potential hydroelectric output on the Canadian portion of the Columbia. This possibility dismayed US negotiators, for diminished flows at the proposed site at Libby Dam would decrease the already questionable economic feasibility of the project. The US negotiators remained adamant about not sharing downstream benefits and as a result the Canadian section of the IJC did not approve construction of Libby Dam. The project was not approved for another decade, until the ratification of the Columbia River Treaty and Protocol in 1964.

The introduction of the McNaughton plan in the mid-1950s did more to stimulate invocations of legal doctrines and principles from both countries than any single event during the decade of controversy. As the Chairman of the Canadian Section of the IJC, General McNaughton had been instrumental in forcefully projecting Canada's claim to a share of downstream benefits. As US negotiators continued to balk at this principle, McNaughton introduced the idea of annually diverting 18.3 km^3 (15 maf) from the Columbia near Revelstoke (Figure 1, 7-L) into the Fraser River system, which empties into the Strait of Georgia near Vancouver, BC. To be economically viable the interbasin diversion scheme would also require the Kootenay-to-Columbia diversion at Canal Flats noted above. Only "surplus water" – that is, snowmelt runoff – would be diverted three months each year (Johnson, 1966, p. 717; Martin, 1957, pp. 3–4). To some prominent US policy makers the McNaughton Plan jeopardized over a century of amiable relations between the two countries. In a report of the Chairman of Senate Committee on Interior and Insular Affairs, Senator Neuberger stated, "the Columbia River dispute threatens the 'gravest crisis in modern US–Canada relations'" (Johnson, 1960, p. 390).

2.2. Doctrines and Principles

Numerous articles by legal scholars and other interested parties exchanged published salvos in the later half of the 1950s. Invocations were based on legal principles used within the United States and Canada as well as on interpretations of international laws. Many of the arguments turned on the interpretation of Article II of the BWT. This article gives both countries (or their political subdivisions) "exclusive jurisdiction and control over the use and diversion . . . of all waters on its own side of the line" (36 Stat. 2448; TS548). This absolute sovereignty (The Harmon Doctrine) is modified in Article II by an ambiguous provision that parties injured by such actions on the other

side of the border will have the same rights and legal remedies as if the injury took place where such action (a diversion) occurs.

In reference to the spate of articles regarding the Columbia River dispute, Martin succinctly stated that:

> The issues in law are 1) the right of Canada to divert her upstream waters in the Columbia and Kootenay Rivers a) under international law, and b) under the Treaty of 1909; and 2) the fact and extent of liability on Canada's part, if any.
>
> (Martin, 1957, p. 2)

In 1958, Bloomfield and Fitzgerald encapsulated the legal principles and arguments being used on each side of the Columbia-to-Fraser diversion question (Bloomfield and FitzGerald, 1958, pp. 168–70). Following are their six major points and counterpoints by US and Canadian interests, respectively. The relationships to water use doctrines are italicized in each case.

1. Differing interpretations of *reasonable use*, that is, *equitable utilization*. Pro-US: Diversions under Article II of the Boundary Waters Treaty mean "only normal uses of water, not a major alteration of flow." Pro-Canada: The diversion from the Columbia into the Fraser would be about 18.5 km^3 (15 maf) annually. Since this is less than 25 percent of the runoff at the border, it is "neither unreasonable nor inequitable."
2. Interpretation of the Boundary Waters Treaty, including *historic use*. Pro-US: Downstream losses will be suffered by the United States (at hydroelectric dams built by the US Bureau of Reclamation and US Army Corps of Engineers); in other words, one of the High Contracting Parties in the 1909 Treaty (the United States) will be injured. Therefore redress provided under Article II will not be limited to that of an injured "party" with the letter "p" in the lower case. Pro-Canada: Any injury – that is, loss of hydroelectric output downstream in the United States – "would be suffered by the US Government as a proprietor (lowercase "p") or other than as a sovereign". Cohen comments on ambiguities in reference to meaning of parties with "p" in the lower case vs. large "P" (Cohen, 1958, p. 70).
3. *Riverine integrity* vs. *absolute sovereignty* justified by Article II. Pro-US: Under common law riparian doctrine, Canada has no right to divert the Columbia's flow as this would violate riparian rights to substantially undiminished flow. Pro-Canada: Article II gives exclusive jurisdiction of all waters within each state's territory. Therefore the United States claim outside the Treaty is difficult to justify.
4. *Historic rights* and the *doctrine of prior appropriation* (used in the seventeen western states of the United States) vs. *absolute sovereignty* through the use of BC's Water Act. Pro-US: Under the principle of prior appropriation Canada has no right to divert waters of the Columbia. The United States has made substantial investments downstream and owners of these investments have a right to continue established uses. Pro-Canada: First, rights to Columbia River waters "are defined by the British Columbia Water Act . . . which provide that only the holder of a license issued by BC . . . has a right to the use and flow of water . . . in the province." Since the American claimants downstream have no such license, they would be "out of court". Second, American claims based on prior appropriation are invalid for two reasons: a) they include future uses, and b) the prior appropriation doctrine is unsuitable for BC and for Canada.
5. Disagreement over the meaning of *equitable apportionment*. Pro-US: Application of the doctrine of "equitable apportionment" requires water to be shared

equitably. Therefore Canada would only have the right to reasonable diversions "but the proposed diversions are unreasonable." Moreover, the doctrine of equitable apportionment does not contemplate unilateral determination of the reasonableness of diversions. Pro-Canada: if equitable apportionment were to be used, the substantial benefits in the United States from Canadian storage would be shared, which is unacceptable to the United States.

6. Lack of agreement on the degree to which the United States had disavowed the *Harmon Doctrine* and the need to adhere to the Boundary Waters Treaty. Pro-US: In reality the United States "has never . . . followed the Harmon Doctrine embodied in Article II of the Treaty". As the Harmon Doctrine (absolute sovereignty) is not a general principle of international law, it "cannot be invoked to support such a diversion as the one contemplated by Canada." Pro-Canada: The major issue is not whether the Harmon doctrine is used but rather "a solemn treaty which has been adhered to for nearly fifty years, that determines the rules applicable to the Columbia case." Moreover, in recent years council representing the United States at the IJC has relied on the Harmon Doctrine.

Another argument used by those favoring the US case was that the principle of *rebus sic standibus* could be used to abrogate the treaty (Bloomfield and Fitzgerald, 1958, p. 169). Essential changes had indeed taken place between the ratification of the BWT early in the twentieth century and the 1950s. The essential change was of course the greatly increased significance of hydropower. It may be assumed that *rebus sic standibus* also resonated positively north of the border because in 1956 both governments agreed to undertake a major appraisal of the treaty (Cohen, 1958, p. 32). Thus far, no modifications of the treaty have taken place.

Although the McNaughton Plan calling for a diversion from the Columbia into the Fraser River was particularly nettlesome to US interests and did precipitate many of the articles on legal principles and doctrines, it did not move US negotiators to agree to the principle of sharing downstream benefits. Knowledgeable people on both sides of the border discounted the viability of the proposed Columbia–Fraser diversion. Johnson notes economic and political reasons that militated against realization of the McNaughton Plan (Johnson, 1966, p. 725). First, to reimburse the costs of the contemplated interbasin transfer would require that the Fraser be developed into a major producer of hydroelectric energy. Such a development was unlikely however because the undammed Fraser was a premier salmon producer for BC; and the numerous dams necessary to produce the energy would block or seriously impede the necessary movement of the bountiful runs of anadromous salmonids. The influential fishing industry – from fishers to processors – could be expected to vehemently oppose this form of water resources development. Second, studies had shown that the McNaughton Plan was very expensive relative to alternative hydroelectric schemes. And third, such an interbasin transfer would have generated widespread ill will in the United States, which would be periodically revitalized during years of lower than normal runoff.

CHAPTER 3: INSTITUTIONAL FRAMEWORK

3.1 Background

The institutional frameworks that have evolved in the United States and Canada are somewhat dissimilar. This is germane in regard to the relative degree of jurisdictional rights and responsibilities exercised by national and subnational levels of government over natural resource management for both domestic waters and international catchments. While both countries have federal systems, the US version delegates much more power and responsibility to its national level than the Canadian model does. This difference meant, for example, that during the CRT negotiations US participants could often speak with one voice, whereas their Canadian counterparts had to represent positions that both federal and provincial levels would agree to, because each needed the other's approval before finalizing an international agreement. Over much of the twenty-year period required to complete the process culminating in the CRT and Protocol, the Canadian federal government and BC coordinated their approaches quite closely. But during the last five years, periods of dissonance between the governments of BC and Canada caused much of the three-year delay between the signing of the CRT in 1961 by the federal governments of the United States and Canada and its ratification in 1964.

Differences in the foundation documents of the United States and Canada help to explain why the federal level in the United States has become dominant over the states in matters of water resources development, while in Canada a sometimes-unwieldy partnership is present. The US Constitution was often vague vis-à-vis federal vs. states rights, which enabled the courts, over time, to grant increasing powers to the federal level, whereas the British North American Act of 1867 was specific in assigning proprietary rights over most natural resources to the provinces, in addition to granting them legislative powers (Uslaner, 1992, pp. 42–3). The provincial role in foreign treaties, which proved crucial in the formation of the CRT, was clarified and strengthened in 1937 when the Privy Council ruled that joint federal and provincial approval was necessary to implement treaty obligations involving the natural resources of a province (Swainson, 1979, p. 17). The principal institutions of both countries are reviewed below in regard to their roles in international water management in the Columbia Catchment.

3.2. US Institutions

3.2.1. The Constitution

The basic document undergirding federal power is the Constitution of the United States (1789). The four most common constitutional clauses used to justify federal involvement in water resources are Treaty, Commerce, Property, and General Welfare (Pacific Northwest River Basins Commission, 1970, p.1). Each has been used by the federal government in the US part of the Columbia Catchment, but only the first has direct bearing on the CRT.

Treaty-making powers required less federal interpretation than the other clauses. The President with the consent of the US Senate exercises this power. The authority of the US State Department's representatives was based on this clause when they negotiated the CRT and Protocol. The other considerable powers over water resources in the United States came to the federal level in the nineteenth and twentieth centuries through various court interpretations. These powers have an indirect bearing on the CRT and international management of water resources.

The most influential legal interpretations re water resources stem from the Commerce Clause, Article II, Section 8. In attenuated interpretations of this clause the federal level gained the power to manage navigable waters, and eventually many

of their non-navigable tributaries. Under this clause, commerce, in this instance interpreted to mean water transport, became the responsibility of the federal government, allowing it to enhance navigation by: removal and/or regulation of obstacles (natural and anthropogenic); stream improvement, i.e. channel alterations; and by the construction of dams and navigation locks. Conversely, navigability could also be destroyed under the Commerce Clause by the construction of dams without locks (Sax, 1968, pp. 81–2).

While application of the clause did not directly affect CRT negotiations, Congress used it, among others, to justify the construction of four large dams on the mainstem of the Columbia below its confluence with the Snake River. These dams, Bonneville, The Dalles, John Day and McNary (Figure 1, 19E-18J), did greatly improve conditions for inland water transport by providing slack water conditions and deeper navigation channels connected by spacious locks; and they also generated very large amounts of hydroelectric energy. It was apparent, however, that much more energy could be produced with upstream storage to firm up fall and winter flows (Fig 2, A). During the 1940s and 1950s it became increasingly evident that the volume of storage called for in the detailed USACE plans could not be provided in the US part of the Columbia Catchment for sociopolitical reasons.[6] As a result storage in Canada became increasingly desirable from the US point of view, and its provision became one of the major focal points in the CRT negotiations.

The courts have interpreted the Property Clause of the US Constitution (Article IV, Section 3) in such a manner that considerable additional control over water resources may be exercised by instrumentalities of the federal government. Two aspects of these interpretations apply directly to the US part of the Columbia and indirectly to international water management.

First, the Property Clause has been interpreted to give the federal government the authority to own, sell, and distribute electrical energy produced at its dams (Trelease et al., 1965, p. 316). This relates to the CRT because on the mainstem of the Columbia River in the United States six large federal dams, each with considerable generating capacity, produce electrical energy which, under the Property Clause, belongs to the federal government. Additional upstream storage would increase their hydropower production greatly while implementation of the McNaughton Plan would decrease their output. The Bonneville Power Administration (BPA) distributes and sells energy from all federally owned power plants in the Pacific Northwest, most of which comes from installations within the Columbia River system. This connection explains why BPA is one of the two US Entities delegated to administer the CRT.

Another aspect of the Property Clause is that the federal government may reserve water for present and future uses from watercourses crossing or abutting federal lands. Much of the Columbia Catchment is on federally owned lands, particularly in the mountainous headwaters where most of the US contribution to the Columbia's runoff originates. While reserve rights under the Property Clause have not been significant thus far in the CRT, their potential use to secure water rights for Native American reservations may become important.

The General Welfare Clause, Article I, Sections 8 and 9 of the US Constitution gave Congress the power to levy taxes and provide funds for the general welfare of the country. Eventually judicial interpretations construed this to mean that Congress had the power to fund water projects (some at a very large scale) for reclamation, irrigation and other internal improvements, including flood-control projects since 1936 (Pacific Northwest River Basins Commission, 1970, pp. 3, 12).

The large-scale irrigation projects undertaken by the US Bureau of Reclamation (Bu Rec) are indirectly related to the CRT. Most notable was the question about the role that pumping irrigation water for the Bu Rec's massive Columbia Basin Project should have in the calculation of benefits from storage in BC. In addition, the greatly increased generating capacity at Grand Coulee Dam (from 2400 to 6494 MW)

resulting from CRT's creation of upstream storage not only enhanced energy production in the United States, but also was used, in part, to subsidize irrigation development in the Pacific Northwest (Muckleston, 1992, pp. 385–6).

The General Welfare Clause was also interpreted to include flood control, which comes within the purview of the CRT. When Congress passed the Flood Control Acts of 1936 and 1938, the federal level became responsible for much of the control of floodwaters on watercourses where significant property value and numbers of people were considered vulnerable to flood hazards.[7] The USACE was delegated most of the authority to implement these acts. The flood control function became an important part of project benefit–cost analyses in the Columbia Catchment and was one of the major reasons Libby Dam was proposed, as noted above. Because flood control is one of the two major water-related outputs of the CRT, the USACE is one of the two US Entities established by the Treaty to carry out its implementation

3.3. Principal US Federal Agencies

Numerous federal-level instrumentalities (agencies, commissions, etc.) use the authority and funds provided by Congress to carry out water management in the US part of the Columbia Catchment. They operate under hundreds of Public Laws, some spanning decades and containing numerous amendments, Executive Orders, and interagency agreements. Only those related to international management are presented below.

The relevant federal agencies may be divided into two groups. The first group has continued to function under earlier laws that reflected the prevailing social values of the late nineteenth century and first five to seven decades of the twentieth. Therefore they tend to be oriented towards the traditional/utilitarian outputs of water management: hydroelectric power, irrigation, navigation improvements, and flood damage reduction through structural means. These institutions remain dominant among water management agencies in the region. The creation of new agencies and/or public laws during the later decades of the twentieth century reflects evolving social values vis-à-vis the natural environment that were not widely articulated until that time. In general, this second group of smaller agencies and more recent public laws have had less influence on domestic and international management of water resources in the Columbia River system than those of the longer-established institutions. Indeed, attempts to implement some of the new laws have created dissonance within the water management organizations on both sides of the international border. Agencies in the first group are now considered.

3.3.1. USACE

This organization has functioned continually since 1802, making it the most senior among the many federal agencies involved in water resources management. This organization operates under the Civilian Branch of the US Army, which in turn is under the cabinet-level Department of Defense. Through the nineteenth century the USACE dealt principally with navigational improvements and in special instances with flood control.

Congress expanded the USACE's responsibilities in the first half of the twentieth century to include generation of hydroelectric energy, nationwide flood control operations, and the creation of detailed and comprehensive river basin plans. Although responsibilities for several additional water-related outputs have been assigned to the USACE, they are secondary to its principal tasks, are shared with other agencies, and until recently have had little bearing on international water management in the Columbia Catchment. The USACE's role in planning, flood control,

and hydroelectric production and its relationship to international water management is now considered.

The Rivers and Harbors Act of 1927 gave the USACE the responsibility of preparing basin-wide plans (the 308 Reports) for the nation's major river systems.[8] In 1932 it promulgated a voluminous study and development plan for the US part of the Columbia River system.[9] Among other things it called for 24.7 km^3 (20 maf) of upstream storage in the United States at six major reservoirs (Marts, 1954). Storage in Canada was not considered necessary. But in 1948, when the question of sharing downstream benefits had not been officially broached, the USACE published a multivolume *Review Report on the Columbia River and Tributaries* with a special appendix covering potential storage sites in Canada, noting that they could be part of comprehensive, cooperative development of the system (USACE, 1948). This was a significant move towards recognition that joint US–Canadian development could be mutually beneficial.

The publication of the review report also reflected the difficulty of procuring an adequate volume of upstream storage in the United States called for in the original 308 Report, even though economic and engineering factors were favorable for full development within the United States (Marts, 1954). The USACE's comprehensive plans for development on the US side of the border were an integral part of the rapid water resources development there in the three decades proceeding the CRT; and the existence of these developments – existing, under construction, and planned – was an important consideration for both countries during the negotiations that culminated in the CRT.

The USACE's wide-ranging responsibilities for flood control within the Columbia River system have also resulted in this agency's important role in the implementation and ongoing management of the CRT. The Flood Control Act of 1936 and its subsequent amendments added significantly to the USACE's extensive authority and responsibilities across the nation.[10] In the Columbia River system major reservoirs are regulated from the USACE's Reservoir Control Center in Portland, OR, in order to achieve flood-crest reduction as stipulated by plans formulated by the USACE in cooperation with other entities. These reservoirs include those owned by the Bureau of Reclamation (Bu Rec), public and private utilities, and CRT reservoirs owned by BC Hydro. It is noteworthy that flood control takes precedence over all other functions. Therefore during several months each year upper rule curves (URC) must be observed by managers of storage reservoirs throughout the system so as to assure that the amount of potential storage needed is available to protect against downstream flooding. Because flood control is an important function of the CRT, the USACE was designated by the treaty to be one of the two US Entities charged with its implementation and operation (Figure 3).

Large-scale production of hydroelectric energy from the Columbia River system has also involved the USACE in international water management. On the mainstem of the Columbia River below CRT storage this agency has five dams presently with 8078 MW of installed generating capacity, the energy output of which is increased appreciably by releases from BC and Libby Dam (for generating capacity at all dams in the Columbia catchment, see Columbia River Water Management Group, 1996, pp. C-6–12). In years following finalization of the CRT, generating capacity on the mainstem in the United States was increased markedly to take advantage of greater river regulation.

In addition, the USACE's Libby Dam on the Kootenai River has 525 MW of generating capacity, which is dependent to a significant degree on a reservoir (Lake Koocanusa) that extends far into BC. Under Article XII (5) of the CRT, the USACE is obligated to coordinate operations at Libby Dam with the needs of Canadian-owned hydroelectric plants downstream on the Kootenay as long as it would not be disadvantageous to the United States (Departments of External Affairs and Northern

Affairs and National Resources, 1964, p. 130). Two years after the USACE completed Libby Dam in 1973, BC Hydro increased downstream generating capacity on that tributary of the Columbia several fold with the completion of the 528 MW Kootenay Canal generating facilities (Columbia River Water Management Group, 1996, p. C-6).

3.3.2. Bonneville Power Administration (BPA)

This is the other federal instrumentality responsible for much of the international management in the Columbia River system. Together with the USACE, BPA shares the role as US Entity in the administrative machinery set up by the CRT (Figure 3). And similar to its US Entity partner, BPA directs much of the reservoir management and river flow in the system. Indeed when flood control considerations are not paramount, BPA directs reservoir operation in much of the system so as to maximize the output of hydroelectric energy. Unlike the USACE, Bu Rec, and utilities, BPA owns neither dams nor generating equipment.

Congress created the BPA in 1937 to market electric energy from the first two federal dams (Bonneville and Grand Coulee) on the mainstem Columbia that were being constructed at the time.[11] BPA was initially in the US Department of Interior until 1977, when it was transferred to the newly formed US Department of Energy. The Roosevelt Administration deemed creation of the BPA necessary to address the growing competition between the USACE and the Bu Rec, because both planned to market electric energy produced at their respective dams. As the number of federal dams and generation plants rapidly increased, BPA soon became the region's unrivaled leader in the marketing and transmission of electric energy, a position it retains in the twenty-first century.

BPA wholesales much of its low-cost energy to public and private utilities, the former receiving significantly more under the Preference Clause of the 1920 Federal Power Act.[12] It retails a significant part of its energy to a select number of industries that use extraordinarily large volumes of power per unit of output.

This federal entity is also a key actor in three arrangements that were vital to the formation of the CRT. Two are institutional arrangements that had to be formed before finalization of the CRT and Protocol. In addition, BPA is the integral part of an institutional/technical configuration necessary to US participation in the CRT. First is the Coordination Agreement with sixteen participants in the United States that are legally bound to operate generating and related facilities so as to assure the most efficient use of CRT storage (Power Planning Committee, 1964). Second is BPA's role in the 41-member Columbia Storage and Power Exchange (CSPE), which raised the funds to make a lump sum prepayment to Canada for the first thirty years of that country's downstream power benefits. And third is BPA's role in the Pacific Northwest–Southwest Extra High Voltage Intertie (the Intertie).[13] BPA controls access to the Intertie, coordinates its use and owns part of the lines and related infrastructure. Among other things, the Intertie allowed utilities in the Pacific Northwest to market surplus hydropower in California, which became abundant in the first decades of CRT operations. In addition, BCH has some access to markets in California via the Intertie.

Finally, BPA is the principal US institution involved with BCH over coordinated international management of the 6.12 km^3 (5 maf) of nontreaty storage in the reservoir behind Mica Dam. This storage is in addition to the 8.6 km^3 (7 maf) of CRT storage in that reservoir. This present agreement, in effect since the 1990s, does not interfere with river operations under the CRT and gives increased flexibility and benefits to stakeholders on each side of the 49th parallel (Bonneville Power Administration, 1990, pp. 3–5).

3.3.3. Bureau of Reclamation (Bu Rec)

Bu Rec is another major federal water management agency in the US section of the Columbia River system. Its involvement with international management is, however, rather limited relative to the roles played by the USACE and BPA. The Bu Rec was created by the Reclamation Act of 1902 and had its functions expanded by several major amendments enacted by Congress over the decades.[14] Part of the US Department of Interior, the Bu Rec's *raison d'être* has been to foster irrigation in the seventeen western states. Soon after it began operations, the sale of hydropower generated at its large storage projects was utilized to subsidize irrigation development, a practice that became increasingly significant in the twentieth century.

In the Pacific Northwest most of the Bu Rec's projects do not affect international water management, because they are located in the Snake River system and/or far downstream from the headwater catchments. The Bu Rec's Columbia Basin Irrigation Project does however involve international management to some degree, largely because it required the construction of Grand Coulee Dam. Started in 1933, this dam was for several decades the world's largest concrete structure and leading producer of hydroelectric power. It also permanently blocked approximately 1850 km (1150 miles) of salmon habitat above it, a significant part of which was in BC (Muckleston, 1992, p. 386). The IJC recommended coordinated releases of hatchery fish that the United States promised to provide in such a manner as to secure equitable distribution throughout the reservoir (Broomfield and FitzGerald, 1958, p. 156) (this would assume that the future reservoir would reach into BC, which it did not).

Filling the reservoir created by Grand Coulee Dam was subject to IJC permission as the Bu Rec was uncertain whether it would encroach into Canadian territory. The United States applied to the IJC in 1940 (years after commencement of construction) and received permission in December 1941 to fill and operate the reservoir, subject to the provision for indemnity if the hydroelectric output at the planned Waneta Dam on the Pend Oreille in BC would be reduced due to tailwater encroachment (Broomfield and FitzGerald, 1958). Waneta was built in the next decade and no indemnity has been necessary because the head of Franklin Delano Roosevelt Lake is at least 8 km (5 miles) south of the 49th parallel. When filled to its normal maximum elevation of 393.2 meters (1290 feet), it reaches 243 km (151 miles) above Grand Coulee Dam and contains about 6.4 km^3 (5.19 maf) of active storage. A preliminary Bu Rec study on the impacts of raising the reservoir level by 12.2 meters (40 feet) indicated that 4.23 km^3 (3.5 maf) of active storage would be added. This would result in large hydropower and irrigation benefits, but the encroachment onto Canadian territory was so extensive that the proposal was not followed up by additional study (USACE, 1963, pp. 208–9).

Finalization of the CRT prompted the Bu Rec to utilize the increased storage above the Grand Coulee Dam by markedly increasing generating capacity at the dam. The original structure underwent extensive modification and a massive third powerhouse was added, increasing the original generating capacity of Grand Coulee from under 2000 MW to over 6000 MW.

In some respects both past potential and existing Bu Rec activities on the Pend Oreille–Clark Fork–Flathead system relate to international water management. Past potential activities include some of the early plans for irrigating the Columbia Basin, which called for a large intrabasin transfer from the Pend Oreille near Albani Falls (Figure 1, 13-N). The water would then flow by gravity over 200 km (125 miles) to the center of the project area (Figure 1, 16-J). Such a diversion would have been legal under Article II of the Boundary Waters Treaty, with many fewer complications than the proposed McNaughton Plan would have caused due to the relatively limited development potential on the Canadian part of the Pend Oreille. Had such a diversion taken place, however, the 888 MW of presently installed generating capacity in BC on

the short lower reach of the river at Seven Mile and Waneta Dams would probably not have been practical to develop.

Over 6.2 km^3 (5maf) of active storage in the Pend Oreille system on the US side of the Border presently firm up winter flows significantly for hydroelectric generation in BC at Seven Mile and Waneta Dams. The Bu Rec's Hungry Horse Dam on the Southfork of the Flathead River (Figure 1, 13-S) provides the greatest single volume of active storage capacity in the Pend Oreille system, containing over 3.7 km^3 (3 maf). Canada does not share downstream benefits, as the Pend Oreille system is not included in the CRT. It is noteworthy however that American provision of upstream storage in the Pend Oreille system produces much larger benefits to downstream interests in the United States than those that accrue to BC at Seven Mile and Waneta Dams.

3.3.4. Other US Agencies

The many remaining instrumentalities dealing with water and related outputs play a relatively minor role in the international water management in the Columbia River drainage area. As described in Chapter 5, the US Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) did gain an increased role in the 1990s after several species of fish were listed under the Endangered Species Act (ESA). Divided responsibilities for fish listed under the ESA reflect the administrative fragmentation not infrequently present at the federal level: the FWS, part of the Department of Interior, assumes managerial responsibility for resident fish – e.g., white sturgeon in the Kootenay system – while NMFS, under the Department of Commerce, has managerial responsibility for anadromous salmonids listed under the ESA in the Columbia River System.

The National Park Service (NPS), in the Department of Interior, is marginally involved with international water management in two parts of the Columbia River System. In the first the NPS owns and manages much of the extensive shoreline on the 243 km (151 mile) long reservoir formed by Grand Coulee Dam. The NPS is involved because the reservoir is designated a National Recreation Area.[15] When full, as it usually is for part of each year, the reservoir (Roosevelt Lake) reaches close to the US–Canadian border; therefore recreational potential can be adversely affected by actions upstream that range from CRT reservoir operations to use of the river for industrial waste carriage. For example heavy spilling at Keenleyside Dam 60 km (37 miles) above the border as part of CRT operations causes supersaturated water to enter Roosevelt Lake, which can be harmful to various species of fish there.[16] Also adversely affecting recreational and tribal fishing is the pollution from lead and zinc smelters entering the river at Trail, BC, 16 km (10 miles) above the 49th parallel. Starting in the last decade this long-standing irritant has been intermittently addressed by a coalition of interests on both sides of the border (Day, 1999, p. 13). While recreational use of Roosevelt Lake is not heavy, as it is far from population centers and has few developed access points along the reservoir, tribal fisheries are becoming more important.

In another part of the Columbia River system the NPS is also tangentially concerned with international waters. The North Fork of the Flathead in MT forms the western boundary of Glacier National Park after it flows out of the southeastern corner of BC, where it is known as the Flathead River. The river's contiguity with a national park and designation as a Wild and Scenic River had international ramification in that some US interests expressed grave concern about maintenance of water quality if mining interests in BC were to begin planned large scale operations. Resolution of the question through the IJC action is addressed in Chapter 5.

3.4. Canadian Institutions

3.4.1. Federal

As noted above, federal institutions in Canada play a markedly less significant role in water resources planning and management than their US counterparts. This is particularly evident at intranational levels where the provinces are dominant, while at the international level provincial–federal partnership is more often the rule.

In some respects however the Canadian federal level has exercised considerable influence in questions of international water management in the Columbia River catchment. First, it plays an important role through the BWT as it is a High Contracting Party in that Treaty and has equal representation with the United States in IJC actions (see Chapter 4). Second, since passage of the International Rivers Improvement Act in 1955, developments on international rivers that would affect US crossborder interests must receive a license from the federal level. This act effectively blocked an agreement in the 1950s between BC and the US-based Kaiser Company for construction of a hydroelectric dam on the Columbia River in the Arrow Lakes reach (Swainson, 1979, p. 61). In addition, the Canadian federal instrumentalities can exercise varying levels of authority over water development if such actions would affect any of the following: First Nations (Native Canadians), fish, wildlife, migratory birds, and environmental quality of natural resources (Day et al., 1998, p. 5).

Although twenty federal agencies deal with some aspects of water resources, the Department of Fisheries and Oceans and especially Environment Canada carry out the lion's share of federal responsibilities in BC (Day et al., 1998). Environment Canada administers federal water programs and is the lead agency in several key federal programs addressing water-related phenomena (Departments of External Affairs, 1964, pp. 100–9). But with few exceptions, the Canadian federal level assists BC in shaping water planning, development, and management in the Columbia River system. In sum, the relative roles of national and subnational levels of government re international water management are the reverse of that in the United States, where the federal level is dominant.

3.4.2. Provincial

BC, like other provinces, gained proprietary rights over natural resources from the BNA of 1867. This authority was enhanced by Section 92 of the BNA, which grants the provinces legislative competence over resources as well as over companies, public or private, within them.

Regarding international water management, The Privy Council Decision of 1937 requires joint federal–provincial action if natural resources are involved. BC's authority over waters within the Columbia River system was further strengthened by the Canada–British Columbia Agreements of 1963 and 1964, wherein the province assumed responsibility for the construction and operation of water projects built under the CRT and received in return "all proprietary rights, title, benefits, and monies paid by the United States to Canada" (for downstream benefits) (Smith, 2001, p. 75). Clearly, basic national laws and agreements grant BC extraordinary responsibility for and power over water resources in the Canadian portion of the Columbia River system.

This authority is buttressed by creation of provincial laws and instrumentalities to implement them. For example, The Constitution Act "assigns responsibility for the majority of natural resources, public lands, and property to the province".[17] The BC Water Act establishes not only proprietary rights but also absolute rights over "the use and flow of all waters at any time in any place in the province" (Swainson, 1979, p. 14). As Swainson notes, this abrogates riparian rights as well as rights from established use (Swainson, 1979). Moreover BC deems which particular water uses

are beneficial, requires the applicant to procure a license, which is revocable, and pay rent for use of the water (Smith, 2001, 75–8).

BC has a number of provincial instrumentalities to administer water-related laws. Two are significant for international management in the Columbia River system: the British Columbia Hydro and Power Authority (BCH) and the Ministry of Environment, Lands, and Parks (MELP). BCH is the preeminent provincial agency within the Canadian portion of the system. As the Canadian Entity within the CRT's administrative framework, it is charged with day-to-day implementation of the Treaty in cooperation with its US counterparts: the USACE and BPA. As the operator of CRT reservoirs, BCH's decisions can have a significant impact on other water users on both sides of the international border. BCH also provides a significant part of the BC's revenue thereby enhancing its influence in provincial matters.

MELP also affects water resources management in the Canadian portion of the Columbia River system, although relative to BCH its role is considerably less. MELP administers resident fisheries in addition to the quantitative and qualitative aspects of the BC Water Act. It also administers thirteen other provincial acts that address various facets of water resources. Over the last two decades MELP's activities have assumed increasing significance, reflecting the growing concerns of society about environmental quality, leisure-time uses of resources, and issues of sustainability.

CHAPTER 4: MECHANISMS FOR CONFLICT PREVENTION AND RESOLUTION

4.1. Background

Canada and the United States have a long history in the development and use of institutional mechanisms to resolve disharmony along their lengthy border. The development of these institutions is in part an accident of history. The two countries share a common heritage and have similar democratic values (although each is governed through distinctive political institutions), in addition to an advanced level of economic development and technology. These historical–institutional factors notwithstanding, complex hydrographic patterns along the 8882 km (5520 miles) of borders, combined with common usage of international and transboundary waters, necessitated innovative approaches to conflict avoidance and/or resolution. Navigational rights for citizens of both countries began in 1783 with the first treaty between the United States and Great Britain. These rights were continued in several subsequent treaties as frontiers were pushed westward across the North American continent. When the disputed border west of the Rocky Mountains was settled in 1846 by the Northwest Boundary Treaty (The Oregon Treaty), 15 percent of the Columbia River system remained in territory under the sovereignty of Great Britain.[18] The Oregon Treaty granted navigational rights to British subjects on waters of the northern Columbia System and on the mainstem to the ocean. Navigational rights to connect with maritime trade had rather limited utility for those north of the 49th parallel, because of limited supply and demand, and the difficulty of using for commerce a river that descended quickly to the sea with numerous rapids and hazardous reaches.

4.2. BWT and IJC

During the second half of the nineteenth century socioeconomic conditions changed rapidly across the North American continent. Rapid expansion of population and economic productivity stimulated the use of boundary and transboundary waters, making it increasingly apparent that the growing number of water-related disputes should be addressed in a standardized fashion rather than by an ad hoc approach. After several years of difficult negotiations the Boundary Waters Treaty (BWT) was signed in 1909; it then became and has remained the foundation document for resolution of water-related disputes between the two countries.[19] The Dominion of Canada gained much from its interests being represented by Great Britain: the BWT stresses equality rather than equity despite the striking asymmetry of population and economic power between Canada and the United States (US Congress, 1948, p. a-4). Although in some respects the BWT appeared increasingly anachronistic by the middle of the twentieth century – because its framers could not foresee either the new demands for and technologies of water use or the changing public perceptions of water and its place in the growing concern for environmental quality – a study in 1974 on the question of the suitability of the BWT in the latter part of the twentieth century "concluded that it would be impossible to negotiate as good a treaty" in the conditions of that time (Le Marquand, 1993, p. 90). The BWT was considered to be a "living document" with guidelines elastic enough to meet new and evolving challenges (Le Marquand, 1993).

One of the BWT's major accomplishments was the formation of an international commission, which serves as the institutional machinery to implement the desired effects of the treaty (Le Marquand, 1993, p. 65). The International Joint Commission (IJC) has six commissioners: three appointed by each country and staffed from agencies' personnel as the demand arises. The IJC's powers are categorized as

judicial, investigative, administrative, and arbitral (Bloomfield and FitzGerald, 1958, pp. 15–56). The first two have been widely employed, the third sparingly, and the fourth never. The IJC has been widely praised for its long record of successfully dealing with most of the potential and actual disputes referred to it arising from the use of boundary and transboundary waters (Le Marquand, 1993, pp. 77–8).

David Le Marquand, a recognized authority on the problems and issues of international water management, is generally positive about the IJC's efficacy, but cites some weaknesses as well as strengths (Le Marquand, 1993, pp. 77–9). He notes that positive attributes include the provision of a collegial working environment, approach to problems independent of either government's influence, adaptability and flexibility, and impartiality, along with fulfilling the roles of arbiter of fact, important generator of information, facilitator of consensus, and problem-solving facilitator. He continues that the IJC's principal weakness is its being limited to an advisory role; and that other weaknesses may include: dependence on the governments for secondment of technical personnel as well as for budget and staff resources; being able to deal with international water use questions only after being assigned a "reference" by the governments; and the variable expertise of its commissioners as their appointments may reflect the vicissitudes of patronage.

Canada and the United States have made frequent use of the IJC in the Columbia River System. For purposes of discussion these IJC actions are divided into three groups.

- The first includes generally small-to-medium scale water-related development actions before finalization of the CRT. These actions, which started in 1927, have no direct relationship with the CRT.
- The second group is directly related to the CRT and took place between 1944 and 1960. This group has three subdivisions:
  1. actions re the Libby Dam applications in the 1950s
  2. determination of whether and how cooperative development of the Columbia River System would be feasible, 1944–59
  3. devising principles for CRT negotiators to use re the determination and allocation of benefits from cooperative development.
- IJC activities in group three took place after finalization of the CRT and are not directly related to the treaty. Most notable are the IJC roles in the Ross Dam Treaty of 1984 and the 1988 report with recommendations on the proposed coal mine development in the Flathead River drainage.

4.2.1. IJC Actions Prior to the CRT

Many of the IJC dockets in Group One concerned small-scale reclamation and/or dyking activities (Bloomfield and FitzGerald, 1958, pp. vii–ix; sixteen of the twenty-one Dockets cited). Most of these actions were along the Kootenay mainstem in BC near the international border after the river flows north out of ID, and concerned remedial works that might affect waters levels in that state. Since the Kootenay is a transboundary river, the IJC dealt with these cases under Article IV of the BWT. Another small project, in this instance in the US, concerned the Zosel Dam on the Okanogan River built for municipal purposes by the small community of Oroville, Wash., (Figure 1, 11-12–J-K). The dam raised the level of Osoyoos Lake, a transboundary body of water. By mutual agreement lake levels were modified and a board set up by IJC to supervise implementation of the agreement.

Most of the remaining IJC dockets in Group One dealt with requests to raise the level of Kootenay Lake for storage and power production by the West Kootenay Power and Light Company (IJC Dockets Nos. 27, 39, 43, 45, and 59). The initial request in 1929 was opposed by ID. This was based on the concern that the increased level of

Kootenay Lake would impair the functioning of drainage districts formed under state law for sanitary purposes (Bloomfield and FitzGerald, 1958, p. 125). The application was withdrawn five years later but filed again in the absence of continued opposition by ID; and in subsequent dockets IJC approval allowed Kootenay Lake to be raised 2.44 m (8 feet) on condition that various safeguards were taken against upstream flooding. An International Kootenay Lake Board of Control was established with members appointed by the IJC to supervise dam operations effecting lake levels (Cohen, 1958, pp. 32–3; Bloomfield and FitzGerald, 1958, pp. 125–33). It is noteworthy that while the additional water stored in Kootenay Lake for the benefit of the West Kootenay Power and Light Company also increases hydroelectric output at US hydro plants below it, downstream benefits are not shared.

The last two cases in group one are: the extent of Franklin D. Roosevelt Lake formed by Grand Coulee Dam and the Waneta hydropower dam in BC on the Pend Oreille. As noted above (Section 3.3.3), in 1940 the United States applied to the IJC for permission to inundate land in BC along the Columbia when the reservoir behind Grand Coulee Dam filled (Bloomfield and FitzGerald, 1958, p. 158, Docket 44). Uncertainty prevailed as to what the precise length of the reservoir would be at full pool. Approval was granted approximately fifteen months later, but the IJC retained jurisdiction in the event that indemnity should be paid to the owners of the future Waneta hydroelectric dam. Indemnity would be necessary if Grand Coulee's reservoir encroached on Waneta's tailwater, thereby reducing output. As it turned out the head of the reservoir at normal full pool is approximately eight kilometers (five miles) from the international border. Therefore no applications have been made to the IJC for indemnity due to tailwater encroachment (Bloomfield and FitzGerald, 1958, p. 158fn 1; personal communication with Craig Sprenkle, Bu Rec, March 2002). It should be observed that the dilatory nature of the US application to the IJC in 1940 – seven years after construction on the dam had begun – drew criticism in Canada (see for example: Cohen, 1958, p. 33).

The Waneta Dam was again subject to IJC attention in the following decade. In 1951 a Canadian company applied to the IJC to build and operate a hydroelectric dam whose reservoir would flood a small parcel of land in WA on a left-bank tributary of the Pend Oreille. The IJC approved the application about one year later, noting however that the United States as the upstream country reserved the right to develop or otherwise use the waters of the Pend Oreille as it saw fit under Article II of the BWT (Cohen, 1958; Bloomfield and FitzGerald, 1958) (it should be recalled that the interpretation of Article II of the BWT evoked much controversy later in that decade regarding the McNaughton Plan (see Sections 2.1 and 2.2).

Although sharing of downstream benefits is often associated with international cooperation, in the development of the Columbia River System it is evident that this is not always the case. As noted above, storage upstream of Waneta Dam in the United States increased the dam's output but downstream benefits are not shared with the United States. This is similar to storage in Kootenay Lake, but in this instance the United States is the downstream beneficiary that does not share benefits. However, the comparative volume of storage and amount to installed generating capacity are quite dissimilar. In the Pend Oreille system the United States has 6.2 km^3 (5 maf) of active storage that can be utilized by a total of 888 MW of generating capacity in BC at Waneta and Seven Mile (completed 1979) hydroelectric dams, whereas Kootenay Lake provides 0.83 km^3 (0.67 maf) of storage, used by 19,565 MW of generating capacity downstream on the mainstem of the Columbia River (Columbia River Water Management Group, 1992, pp. C-6–13).

4.2.2. IJC Role in the CRT

In Group Two IJC activities directly affecting the CRT are presented. The first of the subgroups concerns the unsuccessful US applications to the IJC for the construction of Libby Dam on the Kootenai River in MT (IJC Dockets 65 and 69) (Figure 1, 13-Q). The near decade-long inability of the IJC to resolve the controversy stemming from these applications ventilated the issues of sharing downstream benefits and the need to clarify rights of the upstream country under Article II of the BWT (see Sections 2.1 and 2.2). The uncharacteristic breakdown of a joint cooperative approach to the Libby Dam problem by the US and Canadian sections of the IJC sent a clear signal to both governments that discussion of the issues should be carried out at higher levels. Thus the failure of the IJC in this instance helped to move the issues to the negotiation table.

In Subgroup Two the IJC's massive report on the Columbia River System is significant, because without this information meaningful negotiations could not take place. In 1944 the United States and Canada directed the IJC to study and report on the feasibility of cooperative development of the Columbia River System. The study report was to be done under Article IX of the BWT; this meant that the IJC would act as a generator and arbiter of fact.

In the 1944 reference the two governments instructed the IJC to:

- Investigate and report on the feasibility of cooperative development.
- To do this for the following water-related goods and/or services: domestic and sanitation, navigation, development of hydropower, flood control, irrigation, reclamation of wetlands, fish and wildlife conservation, and "other beneficial purposes."
- If cooperative development were found to be feasible, indicate the resulting distribution of costs and damages.
- Investigate and report on the existing water-related works when applicable to cooperative development.

The governments granted the IJC the right to utilize services of agency personnel to carry out this weighty charge.[20]

The fifteen-year period required to complete the report probably reflects the magnitude of the undertaking (over 670,000 km^2 catchment area), the additional weighty obligations (the St. Lawrence Seaway investigation), and the asymmetry of agency personnel available for service from the two countries.

The IJC formed the International Columbia River Engineering Board to carry out the formidable task stipulated in the 1944 reference. In 1959 the Board's massive report, *Water Resources of the Columbia River Basin*, concluded that cooperative development was feasible for hydropower development and some other types of water-related outputs, particularly for those resulting in flood control in the United States. The report noted the necessity of providing large additional increments to the then existing 16.1 km^3 (13.02 maf) of upstream storage in the Columbia System, most of which was in the United States (Departments of External Affairs, 1964, p. 47). The report continued that full cooperative development would require provision of between 38.7 and 47.1 km^3 (31.4–38.2 maf) of active storage, bringing the total to between 54.75 and 63.13 km^3 (44.4–51.2 maf) (Departments of External Affairs, 1964, p. 34). This would transform the hydrograph shown in Figure 2A to approximately that in 2B. Such an undertaking would be expensive: converted to year 2001 prices, investment costs ranged between US$17.9 and 19.9 billion, while annual costs added another $833 to 910 million yearly.[21]

Three alternative plans were provided. Two of the three included intrabasin transfers from the Kootenay to the Columbia, and two of the three alternatives

included Libby Dam. Conspicuous by its absence was reference to the McNaughton Plan, which called for an interbasin transfer from the Columbia to the Fraser River. The report also noted that agreement was necessary on general principles for sharing costs and benefits (Department of External Affairs, 1964, p. 38). This point was quickly acted upon by the United States and Canada, which leads to Subgroup Three of IJC actions on the CRT.

The governments requested the IJC to prepare at an early date a special report recommending principles to be employed when determining, first, the benefits of cooperative development and, second, the apportionment of such between the United States and Canada (Krutilla, 1967, p. 59, citing parallel letters from the US and Canadian governments to the IJC). The only water-resource-related activities to be considered were hydropower, electric transmission lines, and flood control (Krutilla, 1967). It is noteworthy that the range of water-related goods and services mentioned in the 1944 reference to the IJC had diminished markedly.

The IJC labored for almost a year to devise the requested principles, a period which Krutilla notes was about as long as negotiators required to complete the initial version of the CRT in 1961.[22] Libby Dam was an important issue during the IJC's deliberations on the requested principles. The US section in the IJC remained strongly in favor of the project but its construction would preclude some projects in BC. Compromise wording on Libby and on the Arrow Lakes project resulted in qualifications allowing flexibility to negotiators. After criticizing the IJC principles for their equivocation, Krutilla concludes that despite the shortcomings the principles are "a contribution of substance" and that they "articulated an advanced understanding of economic and equity considerations confronting such a cooperative undertaking" (Krutilla, 1967, p. 67). The IJC placed the principles in three categories: general, power, and flood control, for which it devised three, six and six principles, respectively (Departments of External Affairs, 1964, pp. 39–55). With the principles in hand, the two governments started negotiating a treaty on the cooperative development of the Columbia River six weeks later.

4.2.3. IJC Actions Since the CRT

The third group of IJC actions took place after finalization of the CRT in 1964. These include the Ross Dam Treaty in 1984, and in 1988 a report and recommendations on the potential impacts of a large coal mine in BC in the Flathead River System. In 1984 the United States and Canada finalized a treaty resolving the Ross Dam controversy.[23] The IJC is credited with playing a key role in the dispute resolution prerequisite to the treaty (See for example: Krolopp-Kirn and Marts, 1986). Although the short title of the treaty would suggest that it does not fall within the purview of this report – as Ross Dam is on the Skagit River (Figure 1, 12-H), adjacent to but outside the Columbia System – it is germane to the discussion because part of the treaty includes a transboundary reach of the Pend Oreille River.[24]

In 1980 the IJC intervened in a bitter and protracted dispute between BC and the City of Seattle. At issue was the municipality's plan to raise the level of the Ross Dam reservoir 37.24 meters (122.5 ft), which would increase the area in BC already flooded by the Ross Dam reservoir by approximately ten times. Seattle had received IJC approval to raise the dam in 1944 and 1967, which was also agreed to by BC's Social Credit government. The dispute stemmed from two things. There was a change of government in BC in 1972, the new one being hostile to the earlier agreements. In addition there was growing opposition to the project by environmental organizations on both sides of the border. In 1974 and 1980, BC appealed to the IJC to rescind the approval to raise Ross Dam, while Seattle remained steadfast in planning to exercise its legal right to proceed with the plan. A win–lose situation had been created for BC and Seattle.

In 1980 the IJC appointed highly qualified special advisors who convinced the two parties that they must negotiate a settlement satisfactory to each. The negotiations eventually produced the innovative "paper dam" solution, by which Seattle agreed to pay BC the construction and operational costs it would have incurred if it had raised the dam, while in return BC would provide equivalent electric power to Seattle (Krolopp-Kirn and Marts, 1986, esp. p. 271).

Section 8 of the treaty allows BCH to raise the Seven Mile Dam reservoir on the Pend Oreille River by 4.56 m (15 ft), which backs water across the international border and encroaches on the tailwater of Seattle City Light's Boundary Dam located 17.7 km (11 miles) upstream (Figure 1, 11-12-N). In return BCH will deliver electric energy and capacity to Seattle City Light equivalent to the loss at Boundary Dam from tailwater encroachment. BC will also use part of the increased output at Seven Mile Dam to provide about a half of the electric power it owes Seattle under the "paper dam" agreement on the Skagit River.[25]

Wider application of the creative approach to international water management employed at Seven Mile and Boundary Dams does of course depend on the circumstances of any particular case. In this case, the area of land in the United States flooded by raising Seven Mile Dam was relatively small and owned by Seattle City Light. The utility was also willing to give up some of its "vertical sovereignty" by allowing tailwater encroachment to reduce the electric power output at Boundary Dam.[26] This was negotiable because the power loss at Boundary is replaced and because an increased output from a higher Seven Mile Dam also contributes significantly to BC's power replacement obligation stemming from the "paper dam" agreement under the Ross Dam Treaty. The existence of an organization like the IJC, and in this case its proactive approach to conflict resolution, rounded out a set of fortuitous circumstances resulting in innovative conflict resolution.

In the Cabin Creek Case, IJC actions took the following course: after a decade of tension over potential damage to a downstream area in the United States with special environmental attributes that might result from resource development upstream in BC, the US and Canadian governments directed the IJC to find the relevant facts and report on the situation. The Cabin Creek Case is rather unusual in two respects. First, the report is more than a compilation of nonbiased facts: it also recommends actions that the governments may wish to take. And second, the area of potential environmental degradation is of exceptional value to NGOs, and to stakeholders at subnational, national, and UN levels of organization.

The issue began to develop in the early 1970s when a mining company, Sage Creek Coal Limited, applied to BC for permission to open a large coal mine in the Flathead River Drainage 10 km (6 miles) above the international border (Figure 1, 11-R; International Joint Commission, 1988, p. 19). Fear was expressed by some US federal and state agencies and by NGOs that water quality downstream would be seriously degraded by operation of such a large mine. It was contended that water-quality degradation would not only damage valuable aquatic biota but also degrade a larger land area that was being managed for preservation and environmental protection, including parts of Glacier National Park. The United States protested the potential impacts of the mine operation on the Flathead River, noting that MT had classified the river A-1, the state's highest water quality category (International Joint Commission, 1988). In addition the US Congress employed the Wild and Scenic River Act of 1968 (16 USC sec. 1271), designating the Flathead a wild and scenic river (ibid., 1274 and 1276). This was done without consulting Canada (Bruce and Quinn, 1979, pp. 8–9) and placed Canadian resource development interests and the BC Government in an awkward position because a similar mining development in the United States after designation would have been illegal. In February 1984 BC granted approval in principle to Sage Creek Coal Limited to extract over two million metric tons yearly from the Cabin Creek Mine. The stage was set for IJC involvement.

Within a year of the approval in principle, the IJC received a reference by parallel letters from the US and Canadian governments under Article IX of the BWT (in December 1984 and February 1985, respectively). The IJC was requested to "examine into and report upon" water quality as it relates to transboundary implications under Article IV of the BWT (International Joint Commission, 1988, p. 15). The IJC responded by establishing the Flathead River International Study Board (the Board) which in turn set up technical committees to examine various facets of the issue. These binational technical committees produced eight wide-ranging reports for the Board between 1986 and 1988 (International Joint Commission, 1988, p. 4). In 1988 the IJC issued its report with conclusions and recommendations (International Joint Commission, 1988, p. 11). Recommendations included that: the existing mine proposal be denied and future proposals not approved unless the Board is satisfied that the risk is acceptable to both governments. Also included was the requirement that full mitigation of impacts on sports fish populations and habitat be met as a prerequisite to approval. Subsequently, Sage Creek Coal Limited withdrew its application, allowing environmental stakeholders on each side of the border to pursue management options focused on sustaining environmental values.

The Cabin Creek Case in the Flathead System exemplifies the dissonance that can result in transboundary waters when interests on one side of the border wish to undertake traditional approaches to natural resources development while those on the other side of the boundary have come to focus on preservation of environmental values. As Bruce and Quinn point out, this is not an isolated case due to the dissimilar spatial patterns of population and economic activities along much of the US–Canadian border (Bruce and Quinn, 1979, pp. 8–9). West of the Great Lakes, many areas near the northern border of the United States are relatively remote and undeveloped by US standards making them good candidates for preservation of environmental values, whereas on the Canadian side of the border the relative proximity of population centers and natural resources encourage these borderlands to be seen as a "development corridor" (Bruce and Quinn, 1979, p. 9). It would appear that the IJC may be called on in the future regarding similar situations.

CHAPTER 5: AGREEMENTS AND THEIR IMPLEMENTATION

5.1. Introduction

Of the numerous international agreements over waters in the Columbia River system, the Treaty Between Canada and the United States of America Relating to Co-operative Development of the Columbia River Basin (CRT) towers over the combined total of all the others.[27] This comparison includes monetary expenditures, magnitude and duration of human effort to gather and analyze data, production of engineering and planning studies, negotiations (both inter and intranational), required institutional/legal changes in both countries, size of the structures built, and the volume of reservoir storage created to attain the basic requirement for treaty implementation. Implementation required that storage substantially modify the Columbia's runoff regime, thereby providing flood-crest reduction and increased hydropower output during the high demand period in the winter. The bulk of this section deals with the finalized form of the CRT in 1964.

Regarding other international agreements over waters in the Columbia River system, some are covered above, while others are presented at the end of this section. The latter include agreements on managing 6.17 km^3 (5 maf) of nontreaty storage in CRT reservoirs, and agreements that fine tune reservoir operations in an attempt to accommodate emergent societal values not covered in the CRT, namely the preservation and/or enhancement of selected fish and wildlife species, environmental values, and leisure time uses of water.

5.2 Negotiating the Treaty

Negotiations between the US and Canadian governments began in 1960 after significant bodies of data and guiding principles had been completed by the IJC (see Section 4.2.2). Although the basic principle of sharing downstream benefits is simple, difficulties arose due to the extreme complexity entailed in the selection, sizing, and sequencing of numerous potential treaty projects in a manner that would maximize and equally divide benefits (Krutilla, 1967, pp. 98–118).

Resolution of the knotty problem of selecting and sequencing projects came about by sacrificing optimization of economic output to sociopolitical realities on both sides of the border. British Columbia had resisted projects that would flood two of its settled eastern valleys, while the USACE and allied interests insisted on the construction of the Libby Dam in the United States. They did so even though, within the context of optimal coordinated development, Libby Dam was suboptimal (Krutilla, 1967, pp. 97, 192, 202–3; Swainson, 1979, pp. 49, 116). Negotiators eventually agreed that it would be sufficient if cooperative development of the Columbia resulted in benefits to each country greater than those that would accrue to each if independent development were pursued. US negotiators were spurred on by memories of the serious energy shortfalls during dry years of the previous decade and catastrophic flood losses in 1948.

Initially, the process moved rapidly. In January 1961 the CRT was signed by the Eisenhower Administration as well as by the necessary federal officials in Ottawa and ratified relatively soon by the US Senate. But BC rejected some provisions of the treaty and thereby delayed its final ratification until the autumn of 1964. Disagreement between BC and the Canadian federal government lasted from 1961 well into 1963. Resolution came only after the Canadian federal government acquiesced to British Columbia's demands. The province held veto power over conclusion of the CRT because within the Canadian federal system provinces have sovereignty over their natural resources and share in decision making when natural resources are involved (see Section 3.4.2).

The conflict turned, first, on the disposition of Canada's share of downstream hydroelectric energy benefits and, second, on which river system(s) would be developed at that time. The federal government insisted that, in accordance with existing policy, Canada's share of downstream power be returned to and used in Canada, and that developments on one river – the Columbia – would provide adequate energy at the lowest cost. British Columbia contended that the Canadian share of downstream energy must be sold to the United States in advance, and that in addition to Columbia River development, the Peace River in the northern interior of the province be developed for hydropower production. Construction of dams on the Peace River was the *sine qua non* in the provincial government's plan to develop resources and promote settlement in a remote northern part of its territory, while the advanced sale of Canada's share of downstream hydropower benefits was viewed by BC as the principal source of funding for the three treaty dams on the Columbia.

Acquiescence by Ottawa probably took place to salvage the treaty as events of the early 1960s appeared to make the United States less eager to develop the Columbia cooperatively. A new Democratic administration in Washington, D.C., was more sympathetic to creation of upstream storage by large federal dams in the United States than the former Eisenhower Administration had been, and plans were underway to connect the US Pacific Northwest and the Pacific Southwest with extra-high-voltage electrical interties. Implementation of this technology would lessen the need for upstream storage due to the complementarity of energy supply and demand in the two US regions and could take advantage of the complementarity between hydro and thermal-based systems in the Pacific Northwest and Southwest (Krutilla,1967, pp. 158, 160, 183–4; Swainson, 1979, p. 238). It is noteworthy that use of this technology would also facilitate BC's development of the Peace River, which was remote from provincial load centers.

The second phase of negotiations were able to start after the governments of British Columbia and Canada reached agreement, and talks on the treaty and protocol were soon reopened between the United States and Canada. They started with a sense of urgency in August 1963 and were completed in September 1964. Questions of project siting and sequencing were not reopened despite new information and altered conditions, both of which might have affected the selection and timing of dam construction (Krutilla, 1967, pp. 158, 162). During this phase of negotiations principal questions were complex and technical in nature, but their resolution appreciably affected the costs and benefits for the two countries. Included were problems of determining:

- the value of thirty years of Canada's downstream energy benefits and how this sum would be paid
- how sixty years of Canada's flood control benefits would be valued
- an estimation of future energy loads in the US
- the length of Columbia River flow records to be used when calculating benefits
- how to treat the Bu Rec's irrigation pumping requirements at Grand Coulee.

Canada's keen interest in pursuing these questions increased appreciably Canadian benefits over the 1961 version of the Treaty (Departments of External Affairs, 1964, pp. 124–7).

5.3. The Columbia River Treaty and Protocol (1964)

The goal of the CRT is simple and straightforward: create upstream storage in Canada and share the power and flood control benefits derived therefrom downstream in the United States. The details of how to achieve this goal, however, are lengthy and

complex, leaving room for interpretation in some instances. The principal parts of the CRT include the following.[28]

- Canada develops 19.11 km^3 (15.5 maf) of active storage in its portion of the Columbia System. The storage is provided at three projects: Mica with 8.6 km^3 (7 maf), High Arrow with 8.8 km^3 (7.1 maf), and Duncan with 1.7 km^3 (1.4 maf). The first two dams are on the mainstem of the Columbia (Figure 1, L 4-5 and M-11), while Duncan is in the Kootenay subbasin 13.4 km (8.6 miles) north of Kootenay Lake (Figure 1, N-8). It is noteworthy that more storage was created than stipulated in the CRT. Almost all of the additional storage is in Kinbasket Lake (formerly Hugh McNaughton Lake), formed by the construction of Mica Dam. This reservoir contains approximately 14.92 km^3 (12.1 maf) of usable storage which is 73 percent more than the CRT requires.
- Almost all of the storage for flood control – 10.42 km^3 (8.45 maf) – is assigned to the Arrow Lakes and Duncan projects. Mica's principal purpose under the CRT is provision of storage for hydroelectric production downstream in the United States. Considerable on site power production also takes place at Mica and Revelstoke Dams (the latter using storage from Mica). This power is not shared with the United States. It is noteworthy that water filling the storage space designated for flood control is used later for power production downstream in the United States, Canada receiving 50 percent of the benefits. This takes place because the flood season and period of high power demand are six months out of phase. (See Figure 2.) The CRT takes advantage of the seasonal complementary between power demand and need for flood control in the Pacific Northwest.
- For 50 percent of the flood control benefits over the sixty years that were expected to accrue in the downstream country, the US Federal Government paid Canada US$64.4 million dollars. Most of this sum was paid when the storage in Duncan and Arrow Lakes became available, in 1967 and 1968, respectively. The United States may call for additional flood control storage when the Columbia's discharge reaches or is forecast to reach 16,992 m^3s (600,000 cfs) at The Dalles, OR (Figure 1, H-19), provided that no available storage remains in the US Columbia River system. If additional flood storage is called for, Canada is reimbursed for electric power lost and operational expenses.
- For 50 percent of the downstream power benefits over the first thirty years of treaty reservoir operation, the Columbia Storage Power Exchange (CSPE), a consortium of US utilities, paid Canada US$254.4 million at the time of CRT ratification.[29] The entire sum was paid in October 1964, well in advance of any actual power benefits. This large payment (worth $1,172 million in 2001 dollars), plus flood control payments, enabled BC to finance much of the cost of the three CRT dams and part of the cost of developing on-site power at Mica Dam.[30]
- The United States was given a five-year option to build Libby Dam on the Kootenai River in MT (Figure 1, Q-13). Since the option was exercised, the USACE must coordinate Libby's reservoir operation for flood control and power needs downstream in Canada unless to do so would disadvantage the United States. Canada does not share with the United States the benefits it derives from use of Libby's large active storage – 6.14 km^3 (4.98 maf) – but in return, allows the project reservoir (Lake Koocanusa) to inundate 68 km (42 miles) of BC. Canada also bore the expense of reservoir preparation in BC, including relocation of infrastructure and communities. The United States derives significant downstream power and flood control benefits from Libby storage along the mainstem of the Columbia, including those from the volume of storage and head in Lake Koocanusa on Canadian territory, and does not share them with Canada. Libby must also be operated in accordance with water levels in Kootenay Lake set by the IJC some years prior to treaty negotiations.

- Both countries may divert water out of the Columbia River system but only for consumptive uses, in other words, not for the production of hydropower.[31] This ruled out the McNaughton Plan. Under certain conditions Canada may use an intrabasin diversion from the Kootenay to the Columbia for power development purposes. Thus far Canada has not elected to exercise this option.
- Organizational and procedural arrangements for implementation of the CRT received careful attention.[32] Figure 3 depicts the organization in schematic form. The two governments were required to establish Entities as soon as possible to carry out implementation of the CRT. The BC Hydro and Power Authority (BCH) serves as the Canadian Entity, while this duty is shared by two US federal agencies with a regional orientation: the Bonneville Power Administration (BPA) and the North Pacific Division of the USACE. (Additional information on the three CRT Entities appears in Sections 3.3.1, 3.3.2, and 3.4.2.) Responsibilities that the Entities are directed to perform include: coordinating plans, exchanging information, establishing and operating a hydrometeorological system, and preparing on an annual basis operating plans six years in advance and detailed operating plans for the next year. By exchange of notes the United States and Canada may empower or charge the Entities with other duties. A Permanent Engineering Board (PEB) was established to review and supervise Entity operations as required. Four members, two from each country, assist in reconciling technical differences, report to the two governments when substantial deviation from plans takes place, and report yearly on CRT achievements. The PEB reports are prima facie evidence unless rebutted. Thus far Entity operations have required relatively little input from the PEB.
- Procedures for settling differences were carefully crafted.[33] Unresolved disputes may be referred to the IJC. If the IJC does not arrive at a decision within three months, the dispute may be submitted to a tribunal by either party for arbitration. If agreement cannot be reached on membership of the three-person arbitral tribunal, the President of the International Court of Justice may appoint one or more members of the tribunal. Canada and the United States are obliged to accept decisions of the IJC or tribunal if they opt to use this form of dispute resolution. The governments also may agree on alternative procedures for dispute resolution by exchange of notes. Thus far resolution of difference has been dealt with largely by the Entities.

5.4. Implementation of the CRT

Implementation of the CRT requires a large volume of upstream storage available for management. Before considering the management of that storage it may be helpful to review the sequence of its development. Shortly after ratification of the CRT in 1964, construction on the designated dams began and progressed rapidly: in 1967 the first increment of treaty storage became available at the Duncan project, which provided 1.7 km^3 (1.4 maf). One year later, 8.8 km^3 (7.1 maf) were added to the system by completion of the Arrow Lakes project; and in 1973 storage from both the Mica and Libby projects came on line, adding 8.6 km^3 (7maf) and 6.3 km^3 (5 maf), respectively. Thus, nine years after ratification, 25.3 km^3 (20.5 maf) of usable upstream storage resulting from the CRT became available for management under terms of the treaty. This was a significant addition to the 16.4 km^3 (13.3 maf) that had been available in the entire system when the CRT was signed in 1961.

The 25.3 km^3 (20.5 maf) of storage resulting from the CRT is almost one-half of the total 51.8 km^3 (42 maf) available above The Dalles for flood control and hydropower.[34] This volume of storage however only partially controls the river because it is equal to about 31 percent of the average yearly discharge of the

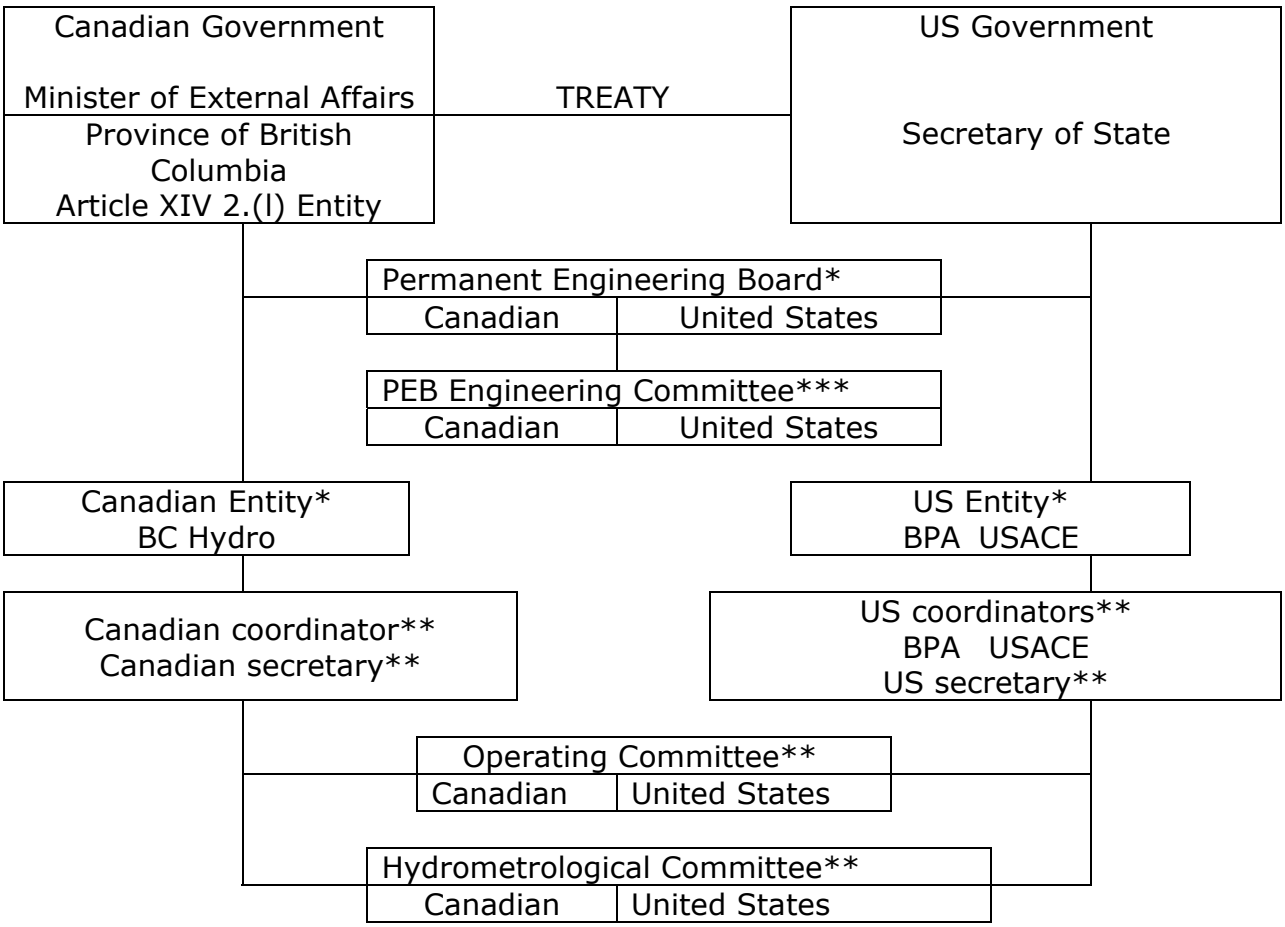

Figure 3. Columbia River Treaty Organization

Notes:
* Established by treaty
** Established by Entity
*** Established by PEB

Source: Annual Report of the Columbia River Treaty, Canada and United States Entities, November, 1999, p. 9.

Columbia River at The Dalles.[35] Therefore careful management of the storage is necessary to achieve CRT objectives.

Objectives have been largely met by frequent communication between like-minded personnel with common technical backgrounds who are employed by the Entities. Much of the day-to-day management is accomplished by the Operating Committee (Figure 3). Conference calls, telecommunications, and bimonthly meetings enable the Canadian and US personnel to remain abreast of changing hydrometeorological and demand phenomena in a well-informed and coordinated manner. Forecasting the quantity and timing of runoff is an ongoing process carried out by the Hydrometeorological Committee (Figure 3). Depth of snowpack, accumulated precipitation, and probable future temperatures and precipitation are assessed and frequently reassessed by sophisticated models.[36] The hydro–meteorological phenomena and data on reservoir storage are meshed with forecasts and models incorporating electric power requirements and system capabilities, which are coordinated by operating plans.

One such plan is the product of the Northwest Coordination Agreement of 1964 which directs sixteen US utilities with diverse ownership to function in a coordinated manner, as if they were under a single owner.[37] This coordination is necessary in order to make optimal use in the United States of the CRT storage releases from Canada. The Northwest Coordination Agreement was finalized shortly before the CRT was ratified to assure that the Canadian share of thirty years of downstream power benefits (usually referred to as "the Canadian Entitlement"), for which the CSPE had prepaid US$254.4 million, would actually be generated at US dams downstream on the mainstem of the Columbia River. The value of this payment in 2001 dollars is US$1,171.9 million.

As directed by the CRT each year the Entities complete two plans: an Assured Operating Plan (AOP), which is made six years in advance; and a Detailed Operating Plan (DOP) for the following year. The AOP contains operating rule curves, which provide guidelines for drafting and refilling treaty reservoirs, and data for determination of downstream power benefits.[38] Based on current hydrometerological information and other conditions, the DOP establishes criteria for determining the operational rule curves used in the actual operations for the following year (Annual Report of the Columbia River Treaty, 1997, p. 12). This approach to a complex river management problem appears successful. For example in regard to hydropower, yearly calculations of downstream power benefits often reveal that actual output is within a few percentage points of the possible optimum.[39]

Flood-damage mitigation under CRT operation also appears successful. This became evident soon after the availability of CRT storage, when in 1972 and 1974 rapid melt of heavy snowpacks would have caused discharge rates at The Dalles to reach approximately 28,320 m^3s (1 million cfs). This magnitude of flow was similar to that of the disastrous 1948 flood when the Portland–Vancouver area in particular suffered devastating losses. Major storage projects in the Columbia system were credited in 1972 and 1974 with preventing losses of US$474 and US$538 million, with a significant part of that flood-damage mitigation credited to storage created by the CRT (Columbia River Water Management Group, 1992, p. 67). In 2001 dollars, the value is approximately US$2,391 million for the two years. In many of the following years over the next two decades, small to moderate savings from flood damage mitigation were also realized. In regard to a more recent flood, the important role that the CRT reservoirs played during the 1997 high water season can be seen in Figure 4. That year natural peak flow at The Dalles would have been almost 25,488 m^3s (900,000 cfs) but was reduced to 16,091 m^3s (568,200 cfs) by all storage in the system. The discharge curve between the two extremes resulted from storage in the four CRT projects, which was clearly responsible for well over half of the total flood flow reduction.

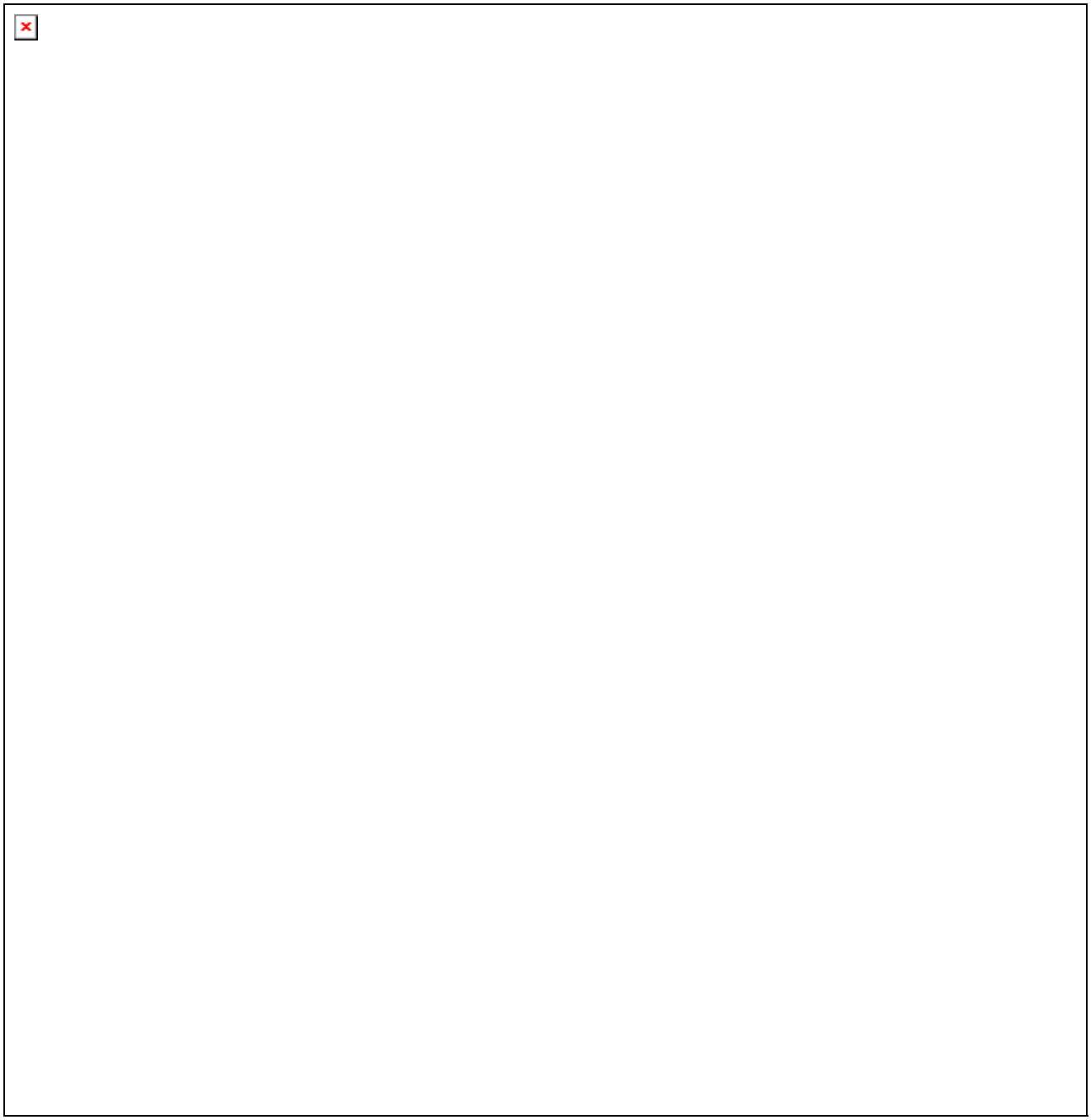

Figure 4. CRT reservoirs during the 1997 high water season

Source: Modified from "Annual Report of the Columbia River Treaty, Canada and United States Entities", October 1 1996 through September 30 1997, n.p., Nov. 1997, Chart 14, p. 52

5.5. Addressing New Concerns: Selected Post-CRT Agreements

From the foregoing material it is apparent that the CRT was well designed to promote successful cooperative international management of hydropower and flood control. Also present within the Columbia River system are examples of successful international management of hydropower that are not part of the CRT although related to it. These agreements stemmed from a fundamental disagreement between BCH and BPA over Columbia River water used to fill:

- the reservoir formed behind Revelstoke Dam (Figure 1, L 5–6)
- storage in Lake Kinbasket (Mica Dam) over and above the volume stipulated in the CRT (Figure 1, M-N 4–5)

BCH's position was that it had the right to fill non-treaty storage space without compensation to those experiencing reductions of hydropower output downstream in the United States (BPA, 1983, p. 3). Conversely, BPA's position was that pursuant to the CRT, BCH must compensate US interests for any reduction in the flow of water at the US–Canadian border resulting from filling non-treaty reservoir space (BPA, 1983, p.5).

Downstream hydropower losses from filling new reservoirs would not be insignificant. For example, during the year required to fill the Revelstoke reservoir with 5.3 km^3 (4.3 maf) of Columbia River flow, energy output downstream in the United States would be reduced by 525 aMW (BPA, 1983), an amount sufficient to supply a city of half a million. Instead of pursuing their respective legal positions, the two parties negotiated a number of mutually beneficial agreements on filling reservoirs with non-treaty storage, including a joint management agreement for the 6.17 km^3 (5 maf) of non-treaty storage behind Mica Dam.[40] The latter agreement increases the flexibility of operating the systems for production and marketing hydropower for both BPA and BCH while avoiding lengthy legal dueling.

It is suggested that of all the water-related goods and services, hydropower production presents the fewest obstacles to international management. This is generally the case because parties can often predict with confidence various levels of output under differing hydrologic conditions, can agree on the unit value of the output, analyze the suitability of various approaches through simulation models, and instantly deliver the product to markets over a wide geographic area.

In contrast to hydropower, several other water-related outputs have proven more difficult to manage cooperatively across the international border in the Columbia River catchment. In some instances the management guidelines established by the CRT reduced the required flexibility that might otherwise have been available to stakeholders wishing to enhance environment-oriented societal values, which gained increasing attention in the decades after ratification of the CRT.

The difficult progression from rigidity to increased flexibility in the use of treaty storage for non-treaty purposes may be seen when fish migration is considered. In 1977 severe drought conditions had reduced summer flows in the Columbia to levels that seriously impeded downriver migration of juvenile salmonids. Less current in the reservoirs meant more time in impoundments, where thermal pollution and predation were becoming increasingly serious. More critical however was lack of water for planned spill, which during years of normal runoff allowed some juvenile fish passage over the dams by utilizing spillways and thereby avoiding the route through hydro turbines. While some water was present in upstream treaty reservoirs – which had been partially filled by relatively light spring snowmelt – it was not available to aid salmon migration because the AOP called for holding much of the storage water until the cooler months when it would be released to meet the seasonally higher demand for electric energy. With effective aid from federal agencies doubtful, the Department of Ecology in WA state (DOE) approached BCH for storage releases but was unable to pay the high price required.[41] The "makeshift remedial measures" employed by the DOE and other salmon oriented actors proved inadequate as the mortality rate of juvenile salmonids migrating to the sea exceeded 95 percent.

During much of the next decade CRT storage was ruled ineligible for fish flows. This began officially in 1982 when the newly formed Northwest Power Planning Council (NPPC) requested 4.25 km^3 (3.45 maf) of storage releases during the downriver migration period for its water budget. Canada objected and moved the matter to the PEB, which ruled that fish flows should not be included in the AOP (Hyde, 2000, p. 5).

By 1988 however the Entities had agreed on limited load shaping in the spring, which allowed approximately 2.47 km^3 (2 maf) of storage use to increase fish flows (Hyde, 2000).

Increasingly flexible operations began in the next decade, albeit not without friction between the CRT participants. From the US perspective, new water management approaches became necessary to carry out the mandates under the ESA. In the 1990s several species of Columbia River salmonids as well as white sturgeon in the Kootenay System were listed as endangered under the ESA. The listings elevated water for fish flows to unprecedented significance in the US portion of the Columbia System, an action which eventually affected water management operations in BC also. As a result of the listings the US National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (FWS) were empowered to produce yearly Biological Opinions (BiOps), which directed US water management agencies to carry out operations in a manner that would not jeopardize endangered fish. Thus, the US CRT Entities (USACE and BPA) became obligated to follow BiOps directives under most circumstances. This led to challenging water management issues within the CRT organization because similar programs were not being implemented in Canada.

Between 1995 and 1998 the BiOps called for increasingly higher levels of storage releases in the spring and summer to encourage spawning (in the case of Kootenay white sturgeon) and downstream migration of salmonids in the mainstem of the Columbia River. Storage releases from Libby Dam's Lake Koocanusa were deemed necessary by the FWS and NMFS for sturgeon spawning and contribution to flow enhancement for downstream salmon migration in the US portion of the Columbia River below Chief Joseph Dam. The USACE subsequently modified reservoir operations at the Libby project by releasing much more water in May and June than designated in the AOP and DOP (Hyde, 2000). This additional release of 1.233 km^3 (1 maf) meant that less water was available for storage releases in the winter to firm up hydropower production on the Kootenay River in BC where the output of over 800 MW of installed generating capacity was adversely affected. Canada charged that this operation was not in compliance with the CRT and was causing several problems (Hyde, 2000):

- a $12 million (Canadian) loss in the value of hydropower production on the Canadian Kootenay between 1994–9[42]
- flooding on the Canadian part of the Kootenay System downstream of Libby Dam (Figure 1, O-11)
- recreational losses on Lake Koocanusa due to lower water levels in the summer (Figure 1, Q-11).

The BiOps also called on US CRT Entities to attempt to procure more storage releases from CRT reservoirs and to attempt to reallocate flood control storage from Arrow Lakes to Kinbasket Lake. BCH refused to do either because from BC's perspective such actions would not be in compliance with the CRT. The issue was eventually taken from the CRT organization by the US and Canadian governments. This was followed by a 38-month diplomatic impasse over the modified operations at Libby Dam, including an exchange of diplomatic notes. The impasse was ended in January 1999 when the CRT Entities received permission from their governments to negotiate a solution (Hyde, 2000).

This led only thirteen months later to the Libby Coordination Agreement. The Agreement reflects the collegial working relations and creativity of personnel serving the Entities, who capitalized on the fortuitous patterns of hydrography and geographic positions of proximate upstream storage in the subregion. The Columbia–Kootenay confluence is just 10 km (6 miles) downstream from Keenleyside Dam that impounds 8.75 km^3 (7.1 maf) of active storage; while 26 km (16 miles) upstream on the

Kootenay system there are 0.83 km^3 (0.67 maf) of active storage in Kootenay Lake, and an additional 1.7 km^3 (1.4 maf) in Duncan Reservoir close to the North Arm of Kootenay Lake. Somewhat further upstream Libby Dam impounds an additional 6.17 km^3 (5 maf) of active storage, the management of which can influence discharge rates and water levels in the free flowing 55 km (34 mile) reach of the Columbia mainstem between Keenleyside Dam and the international border (Figure 1, M-11). In recent decades this free-flowing reach has become a significant source of recreation and fish habitat for stakeholders and resource managers in BC. These factors contributed to a potential for mutually beneficial international management, which is realized in the Libby Coordination Agreement.

The Agreement accomplishes the following (Hyde, 2000):

- Recognizes that Libby Dam operations will continue to provide flows for endangered white sturgeon and salmon, in addition to other non-power requirements.
- Maintains 1.233 km^3 (1 maf) of flows from Canada for downstream migration of salmon in the United States.
- Excludes the effect of the Libby sturgeon/salmon operations on the AOPs.
- Provides for BPA to mitigate BCH's loss of hydropower output resulting from US fish flow operations and creates operational procedures for the Arrow Lakes Reservoir.
- Continues the Libby/Canadian storage exchanges that mitigate the negative effects of Libby fish flow operations on recreation and hydropower production in BC.
- Limits maximum outflows from Arrow Lakes in January to reduce dissolved gas problems downstream in the United States.

In addition to the Libby Coordination Agreement other agreements between the Entities provide for the realization of a variety on non-treaty benefits. In BC these include recreation, enhancement of mountain whitefish and rainbow trout, and mitigation of dust problems in the seasonally dewatered upper portion of the Arrow Lakes reservoir near Revelstoke (Annual Report of the Columbia River Treaty, 2001, pp. 46–7).

In summation, over the recent decades international water management under the CRT Entities has begun a transition from rather rigid adherence to the provision of hydropower and flood control to a more flexible approach that gives more recognition when possible to emergent societal values favoring environmental and leisure time phenomena associated with water.

CHAPTER 6: CONCLUSIONS

Some of the following conclusions drawn from international management in the Columbia River Basin suggest their possible application in other international river systems. It must be stressed however that in each international drainage basin the gestalt stemming from a combination of hydrophysical and human phenomena is unique. Therefore transferability of the following observations will vary widely from case to case.

1. A history of amiable relations between coriparian states lays the foundation upon which mutually satisfactory agreements are built that relate to international management of shared waters. These conditions have enhanced efforts by Canada and the United States to address effectively numerous disagreements over use of international and transboundary waters along the world's lengthiest border between two states. In the Columbia River drainage basin, international water resource issues have been addressed by numerous IJC actions, by the CRT, and by various agreements among and between public and private actors within the two countries.
2. The establishment of a permanent comprehensive legal/administrative framework enables coriparian states to address water-related issues in an organized manner, thereby avoiding problems associated with ad hoc approaches. By concluding the BWT early in the twentieth century, Canada and the United States provided such a framework, which has been periodically employed in the Columbia River basin over the last eight decades. The BWT also created the IJC, which has figured prominently in numerous agreements relating to international water management within the Columbia River system. An important challenge is how to introduce modifications that add flexibility to time-tested institutions such as the BWT and IJC without undermining their stability enhancing characteristics.
3. In negotiations over international water use and development, following the principle of equality rather than equity provides more certainty and less opportunity for subjectivity. This principle is derived from the BWT and often employed in the Columbia drainage basin despite the historic asymmetry of population and economic power between Canada and the United States. The CRT is also based on equality. Downstream hydropower and flood-control benefits from upstream storage are equally shared. On the other hand, in a number of additional examples from the Columbia River system, downstream benefits are not shared across the international border by either Canada or the United States. It is problematic, however, whether this *a priori* results in an inequitable situation between coriparians.
4. As the number of negotiating parties increases so does the difficulty of reaching accord. The federal negotiators from Canada and the United States were able to reach agreement on the CRT in approximately one year. When BC's goals were belatedly incorporated into the negotiations, a long delay followed during which both federal governments were obliged to make significant adjustments in order to finalize the CRT and Protocol.
5. Significant mutual advantages may be gained by cooperative development of international and/or transboundary waters. By increasing the size of the management unit through inclusion of an entire drainage area, it becomes less difficult to take advantage of positive spillover effects while internalizing or avoiding potential negative externalities stemming from water resource development. The CRT was able to capitalize on, first, the complementarity of hydropower and flood control that exists in this drainage basin due to the

characteristics of its annual discharge regime; and second, the preexisting downstream development of hydroelectric generating capacity in the United States that lacked adequate upstream storage capacity. On the other hand, these positive spillover effects regarding hydropower and flood control in the Columbia River system caused further harm to anadromous salmonids, the consideration of which was not included in the CRT.

6. Agreements over international water management should provide means to compensate communities that will suffer dislocation and other losses from water development schemes. Such communities are often in the mountainous headwaters of large river systems where favorable sites are found for storage reservoirs. Funds for compensation may be drawn from principal project beneficiaries, who are often downstream in more populous parts of the drainage basin being developed, and/or outside the drainage system when hydropower production is part of the development. Plans for adequate compensation were not considered seriously in the study area until recently, and then only in BC. The Columbia Basin Trust, founded less than a decade ago, derives an important part of its funds from some of the energy returned to BC under benefit-sharing provisions of the CRT. Among the Trust's goals are job training, education, economic stimulation, and diversification, in addition to improving the environmental quality of the region.
7. Agreement over international development of hydropower is the least difficult water-related output to negotiate. There are several reasons for this, two of which are of prime significance. First, consensus on the unit value of the output is more easily reached than it is for other water-related goods and services, because electric energy is generally priced and those prices widely accepted. Second, a scientific body of knowledge exists on the relationships between changes of hydrologic input and hydropower output. In addition, there is not infrequently a large existing and/or potential market for electric energy after generating capacity is developed. Moreover, accessibility to major markets has been enhanced by advances in transmission technology over the last several decades, which have markedly extended the distance that electric energy may be economically moved. All of these factors played a positive role in the formation of international agreements in the Columbia River system, and may be applicable in other river systems with large hydroelectric potential and accessible power markets.
8. International water management agreements should have some flexibility, containing provisions for periodic review and assessment so that emergent societal values, changing market conditions, and other unforeseen circumstances may be addressed. The CRT does not contain such provisions and has a sixty-year life, which has resulted in occasional dissatisfaction among treaty participants or nonparticipating stakeholders. The CRT's near exclusive concern for hydropower and flood control has made it difficult to address the increased societal value placed on endangered biota, leisure time uses of water, environmental quality, and sustainability. While innovative management by the CRT Entities has allowed some accommodation for values outside of hydropower and flood control, solving emerging issues will be challenging within the existing CRT framework.
9. Negotiating parties should avoid attempts to optimize cooperative water-related outputs (in the narrow economic sense) in favor of satisficing. Agreements will be more attainable if a satisficing approach is used, making sure however that all parties to the agreement will benefit more from cooperative development than they would by independent action. Negotiators of the CRT started with optimization as the goal but were overwhelmed by complexities stemming from

the timing, siting, and sizing of the many alternative projects. Some "suboptimal" projects were included to bring closure to the negotiations.

ABBREVIATIONS AND GLOSSARY

Active storage: Portion of the reservoir that can be used for storage and withdrawal for beneficial purposes.

aMW: A unit of average energy over a specified time period. An American city with one million population uses 1000 aMW.

AOP: Assured Operation Plan is drawn up annually by the CRT Entities six years in advance. The AOP provides long range operating guidelines. (See DOP)

BC: British Columbia. The only Canadian province with land in the Columbia River system. BC is one of the three signatories of the CRT and was delegated the Canadian rights and responsibilities associated with the CRT.

BCH: British Columbia Hydro and Power Authority. The provincial utility that is one of the three Entities in the CRT administrative organization. BCH is responsible for operation of the three CRT reservoirs. (See Entities)

BiOp: Biological Opinion. A set of recommendations made by the NMFS and FWS that define what the operations of the Columbia River system should be so that endangered species will not be jeopardized. (See ESA)

BNA: British North America Act, 1867. Canada's first constitution grants the provinces proprietary rights over their natural resources.

BPA: Bonneville Power Administration. One of the two US Entities in the CRT administrative framework. BPA is the US actor responsible for hydropower-related phenomena in the CRT. The agency has additional energy-related duties in the United States.

BWT: Boundary Waters Treaty, 1909. The foundation document for US–Canadian Cooperative treatment of international and transboundary waters along their 8882 km (5520 mile) border. The BWT also created the IJC. (See IJC.)

C$: Canadian dollars.

Canadian Entitlement: Canada's share of downstream hydropower benefits resulting from the CRT. In 1964 the first thirty years of the Entitlement was sold in advance for a lump sum payment of US$254.4 million. Benefits now flow back to BC in kind.

CRT: Columbia River Treaty and Protocol (1964). Full title: Treaty Between Canada and the United States of America Relating to Cooperative Development of The Water Resources of The Columbia River Basin. Downstream benefits from increased hydropower and flood control resulting from upstream storage and releases are shared by the two countries.

CSPE: Columbia Storage Power Exchange. A consortium of US utilities that raised funds and then paid Canada US$254.4 million for the first thirty years of the Canadian Entitlement. (See PNCA)

DOP: Detailed Operation Plan is drawn up annually by the Entities based on current hydrometerological information and other conditions. It establishes criteria for determining operational rule curves to be used in the actual operations for the next year.

Entities: Principal actors within the CRT administrative organization that are responsible for implementation and operation of the CRT. BCH, BPA, and the North Pacific Division of the USACE are the CRT Entities.

ESA: Endangered Species Act, 1973 and later amendments. Intended to protect species from extinction. Listing of several salmon runs in the mainstem of the Columbia River and white sturgeon in the Kootenay has led to habitat and water management actions in the United States that strained cooperative management under the CRT. (See BiOp, FWS and NMFS)

FWS: US Fish and Wildlife Service. Operates under the ESA after resident fish are listed as endangered. FWS BiOps for white sturgeon in the Kootenay system have resulted in operational adjustments by the CRT Entities.

Hydropower: Electric energy and capacity produced by water power. As used in the report, hydropower refers to energy and/or capacity.

IJC: International Joint Commission. Created under Appendix Two of the BWT, the IJC is a binational commission granted judicial, investigative, administrative, and arbitral powers. The IJC has been active in the Columbia River boundary waters for approximately eight decades.

ID: Idaho. US state that shares 72 km (45 miles) of border with BC within the Columbia River drainage basin. The Kootenay River flows from ID into BC.

maf: million acre feet. Unit of water volume used in the Western United States and in the CRT, referring to either volumes of water stored in reservoirs and/or annual discharge of rivers. One maf equals 1.233 km^3.

MELP: Ministry of Environment, Lands and Parks in BC. Administers BC's Water Act and a number of additional acts that relate to water resources.

MT: Montana. US state that shares 145 km (90 miles) of border with BC within the Columbia River drainage basin. Two significant tributaries flow from BC into MT, the Flathead and Kootenay.

NTSA: Nontreaty Storage Agreement between BCH and BPA cooperatively manages the active storage in treaty reservoirs that exceeds the volume stipulated in the CRT. Most of this excess storage, approximately 6.17 km (5 maf), is in Lake Kinbasket formed by Mica Dam. The principal goal is enhanced hydropower output.

NMFS: National Marine Fisheries Service. Operates under the ESA after anadromous fish are listed as endangered. NMFS BiOps for salmonids in the mainstem of the Columbia River have resulted in operational adjustments by the CRT Entities.

OR: Oregon. US state benefiting from flood-crest reduction that resulted from the CRT. The greatest flood-control benefits in the Columbia system are in the Portland metropolitan area.

PNCA: Pacific Northwest Coordination Agreement. A contractual plan by major generating utilities in the region, requiring the participants to operate as if under one owner. This increased efficiency was considered necessary to actually generate the thirty years of hydropower paid for in advance for the Canadian Entitlement. (See CSPE and Canadian Entitlement).

Rule curves: Water levels for each reservoir that are graphically depicted over an operating year. They are used to guide reservoir operations and as such are part of the AOPs and DOPs. Six different rule curves are frequently used in the Columbia River system reservoirs, guiding filling, drafting, flood control, energy production, and so on.

Run-of-river hydro plant: Most of the plants on the middle and lower Columbia and lower Snake Rivers are this type. They depend on the flow of the river (with the exception of short periods of pondage use) and therefore can produce much more on an annual basis and during the season of high demand with water released from upstream storage reservoirs.

Spill: The discharge of water through gates, spillways, or conduits that bypass the turbines of a hydroplant. Spill may be planned or involuntary.

Tailwater: That part of the river or reservoir immediately downstream from a powerhouse. Downstream activities that raise the level of the tailwater reduce hydropower output. This potential/existing transboundary situation was considered when filling Roosevelt Lake and increasing the reservoir level at Sevenmile Dam in regard to the hydropower output at Waneta and Boundary Dams, respectively.

USACE: US Army Corps of Engineers. The North Pacific Division of USACE is one of the two US Entities (with BPA) within the CRT administrative framework. From its Reservoir Control Center in Portland, OR, it directs and coordinates reservoir operations in most of the Columbia River system, including treaty reservoirs in BC.

WA: Washington. US state sharing 280 km (174 miles) of border with BC within the Columbia River Drainage Basin. The Columbia River mainstem flows through WA before turning westward where it forms the boundary between WA and OR. The greatest amount of hydroelectric generating capacity in the Columbia drainage is located within WA.

NOTES

1. The Kootenay is spelled Kootenai in the United States. Generally, the Canadian spelling will be used in the text because most of the river system is in Canada. The US spelling is employed when referring to specific sites on the river in MT and ID.
2. The Pend Oreille is spelled Pend d'Oreille in Canada. The American spelling is used throughout the text because only a short reach of the river is in Canada.
   The complete title of the CRT is: Treaty between Canada and the United States of America relating to Cooperative Development of the Water Resources of the Columbia River Basin, 15 U.S.T. and O.I.A. vol. 2, T.I.A.S. No. 5638.

3. Treaty between the United States and Great Britain relating to Boundary Waters, and Questions Arising between the United States and Canada. 35 Stat. 2448, TS No. 548.
4. In an east to west direction these rivers are: the Kettle, Okagogan (Okanogan in the US), and Similkameen.
5. Much of the data on the CRT in this and the following paragraphs is from: Columbia Basin Trust, Columbia Basin Management Plan, n.p. July, 1997, 26 pp. More information is available at www.cbt.org.
6. This was the USACE's first detailed report on the Columbia River which was promulgated in 1932: USACE, Columbia River & Minor Tributaries, July 1931, H.D. 103, 73rd Cong., 1st Sess., n.p., 1932.
7. For the Flood Control Acts of 1936 and 1938, see 49 Stat. 1570 and 52 Stat. 1215, 1216, 1225: U.S.C. 701 b-1 and j.
8. 44 Stat. 1010, 1015.
9. Ibid., n. 6 above.
10. See n. 7 above.
11. Bonneville Project Act of 1937, PL 75–309, 50 Stat. 731.
12. 41 Stat. 1063. 16 U.S.C. 832 c(a).
13. PL 88–552.
14. 32 Stat. 388; 43 U.S.C. sec 391.
15. Since 1974 the Colville Confederated Tribes and the Spokane Tribe administer approximately 45 percent of the reservoir. See SOR Interagency Team, Columbia River System Operation Review, Final EIS, Appendix J, Recreation, DOE/EIS-0170, Portland, Oreg., 1995, pp. 2, 59–62.
16. Supersaturation from spill at Keenleyside is expected to diminish when operation of the newly built hydroelectric plant at the dam begins in 2002.
17. British Columbia, Revised Statutes (1960), C.405, 5.3., cited from Swainson, 1979, pp. 14 and 372 (fn 2).
18. 9 Stat. 869; TS 120.
19. 36 Stat. 2448; TS 548.
20. Information for this paragraph was drawn from the Reference to the IJC of March 9, 1944. See, Departments of External Affairs and Northern Affairs and National Resources, *The Columbia River Treaty, Protocol and Related Documents*, Ottawa, Canada, Queens Printer and Controller of Stationary, 1964, p. 17.
21. Ibid., p. 36 for 1957 costs. Conversion from 1957 to 2001 prices used the GDP Deflator of 5.112, www.jsc.nasa.gov
22. Krutilla, 1967. Much of course remained to be accomplished between completion of the CRT in 1961 and completion of the Protocol in 1964.
23. Treaty between the United States of America and Canada Relating to the Skagit River and Ross lake, and the Seven Mile Reservoir on the Pend d'Oreille River. TIAS 11088.
24. Section 8 of the Treaty, TIAS 11088.
25. Krolopp-Kirn and Marts, 1986. This Treaty (TIAS 11088) is related to the CRT to some degree because in the event of BC defaulting on its obligations to deliver power to Seattle City Light, BC may be obliged to forfeit part of the downstream energy benefits it receives under the CRT.
26. For a discussion of "vertical sovereignty" see G. J. Cano: Argentina, Brazil, and the de la Plata River Basin, a Summary Review of Their Legal Relationship, *Natural Resources Journal*, Vol. 16, No. 4 (October, 1976), 879–82.
27. U.S.T. and O.I.A., Vol. 2, T.I.A.S. No. 5638. Also available at http://mgd.nacse.org/qml/waterway/textdocs/international/99.html and 100.html
28. Material on the following eight aspects of the CRT represents the author's interpretation of the CRT as it appears in Departments of External Affairs, 1967, pp. 58–73.
29. A consortium of forty-one utilities in the US Pacific Northwest. It was created to raise capital for the advanced purchase of Canadian downstream power benefits for thirty years. Members of the CSPE sold bonds for the purchase and receive power in proportion to their contribution.
30. At the time of CRT ratification it was thought that the large advanced payments would be sufficient for construction of the treaty dams and part of the cost of hydropower development at Mica Dam. The rapid escalation of construction costs was not foreseen,

however, which meant that the advanced payments covered somewhat less than originally anticipated.

31. "Consumptive use" means the use of water for domestic, municipal, stock-water, irrigation, mining or industrial purposes but does not include use for the generation of hydroelectric power," CRT, Art. I, par. 1(e).
32. Ibid., Arts. XIV and XV.
33. Ibid., Art. XVI.
34. In the Snake River subsystem most of the upstream storage, 16 km^3 (13 maf), is used for irrigation and is therefore not included in the 51.8 km^3 (42 maf). John M. Hyde (BPA member of the CRT Operating Committee), "US – Canada Columbia River Treaty and Flows for Salmon," presentation at Oregon State University, Corvallis, May 23 2000.
35. This may be contracted to "controlled" rivers such as the Missouri and Colorado where storage makes up 112 and 422 percent of average runoff, respectively. Bruce L. Foxworthy and David W. Moody, "National Perspective on Surface Water Resources" in *National Water Summary*, 1985, USGS Water Supply Paper 2300, USGPO, Washington, D.C., 63–4.
36. Models used include: the Hydro System Seasonal Regulation Program (HYSSR); the Hydro Simulator Program (HYDROSIM), and the Pacific Northwest Coordination Agreement Seasonal Regulation Program (HYDREG). Some other programs help guide daily and hourly operations while others deal in greater detail with fish passage and wildlife requirements. See, for example: Columbia River System Operations Review (Columbia Operations), *Modeling the System: How Computers are Used in Columbia river Planning*, Portland, Oregon, October, 1992, 43 pp; and Columbia Operations, *Daily/Hourly Hydrosystem Operation: How the Columbia River System Responds to Short-Term Needs*, Portland, Oregon, February, 1994, 51 pp.
37. A legal document among the BPA, USACE, BuRec and the major hydrogenerating utilities in the region which coordinates generation as though the system belonged to a single owner.
38. Water levels for each reservoir that are graphically depicted over an operating year. They are used to guide reservoir operations. Six different rule curves are frequently used in the Columbia system reservoirs, guiding filling, drafting, flood control, energy production, etc.
39. Yearly calculations of the downstream power benefits indicate that actual hydropower output is within a few percentage points of the possible optimum. Annual Report of the Columbia River Treaty, 1997, p.4.
40. Agreement executed by the United States of America Department of Energy acting by and through the Bonneville Power Administration and British Columbia Hydro and Power Authority relating to: 1) Use of Columbia River Non-Treaty Storage; 2) Mica and Arrow Reservoir Refill Enhancement; and 3) Initial Filling of Non-Treaty Reservoirs. Contract No. DE MS79–90BP92754, Date 07/05/90, 31 pp.
41. William G. Hallauer: Agreements and Aftermaths: The British Columbia-Washington State Boundary, *Canadian Water Resources Journal*, Vol. 4, No. 3, 1979, 50–1. DOE requested 1.2 km^3 (1 maf) which would have cost US$6 million in 1977 dollars.
42. This loss resulted because the 832 MW of generating capacity between the western end of Kootenay Lake and the Columbia–Kootenay confluence produced less energy in the winter, when prices are high, and more in the summer when prices are lower.

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Index list: international water management, Columbia River Treaty, sharing downstream benefits, International Joint Commission (IJC)

Contacts:

UNESCO
Division of Water Sciences

1, rue Miollis
F-75015 Paris, France

Tel: (+33) 1 45 68 41 80
Fax: (+33) 1 45 68 58 11

E-mail: pccp@unesco.org
Website: www.unesco.org/water/wwap/pccp

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The Governments of the States Parties to this Constitution on behalf of their peoples declare:

That since wars begin in the minds of men, it is in the minds of men that the defences of peace must be constructed;

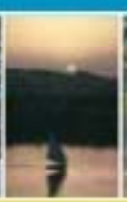
That ignorance of each other's ways and lives has been a common cause, throughout the history of mankind, of that suspicion and mistrust between the peoples of the world through which their differences have all too often broken into war;

That the great and terrible war which has now ended was a war made possible by the denial of the democratic principles of the dignity, equality and mutual respect of men, and by the propagation, in their place, through ignorance and prejudice, of the doctrine of the inequality of men and races;

That the wide diffusion of culture, and the education of humanity for justice and liberty and peace are indispensable to the dignity of man and constitute a sacred duty which all the nations must fulfil in a spirit of mutual assistance and concern;

That a peace based exclusively upon the political and economic arrangements of governments would not be a peace which could secure the unanimous, lasting and sincere support of the peoples of the world, and that the peace must therefore be founded, if it is not to fail, upon the intellectual and moral solidarity of mankind…





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