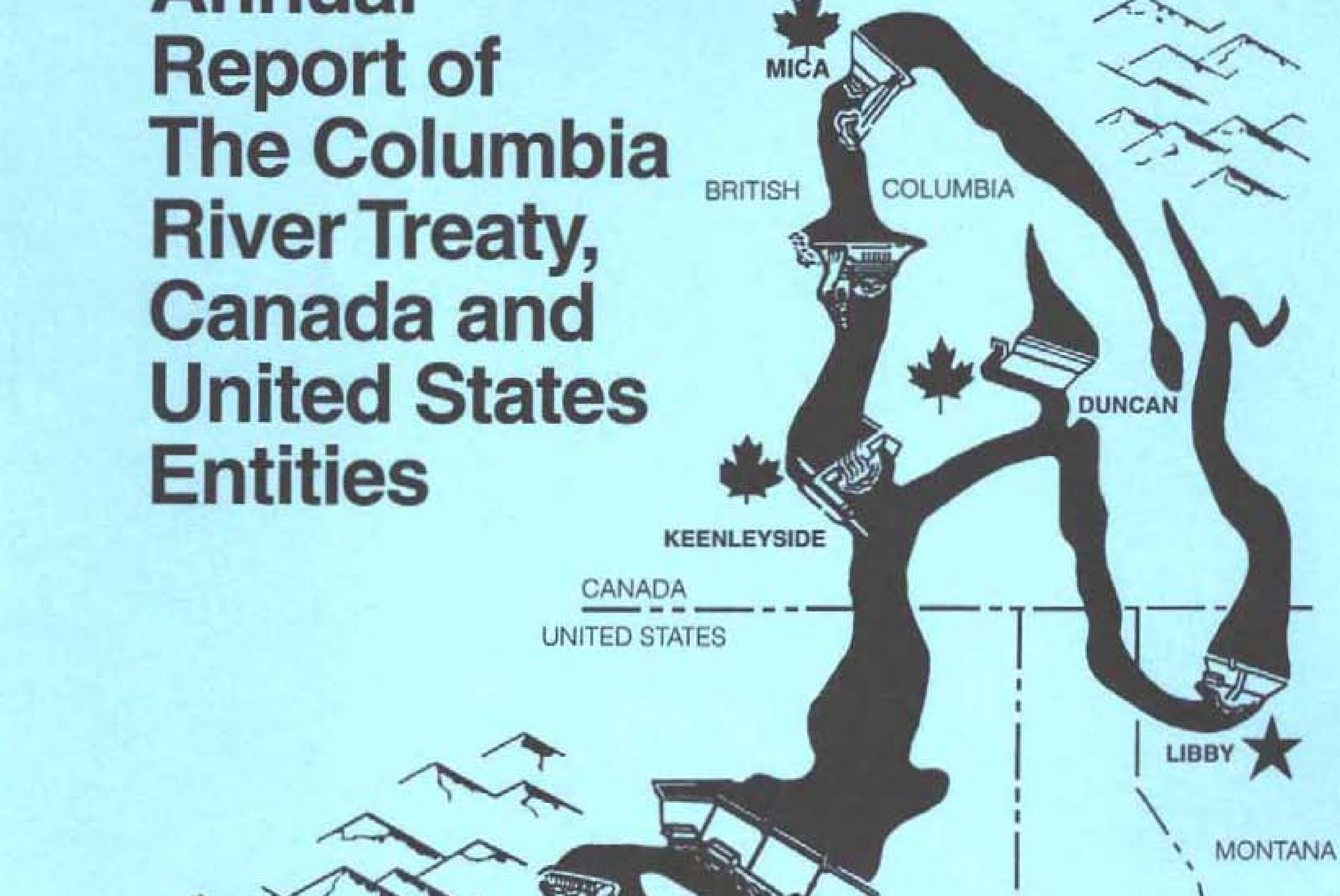
Annual Report of The Columbia River Treaty, Canada and United States Entities



1 October 1995 through
30 September 1996

November 1996

ANNUAL REPORT OF
THE COLUMBIA RIVER TREATY
CANADIAN AND UNITED STATES ENTITIES

FOR THE PERIOD

1 OCTOBER 1995 - 30 SEPTEMBER 1996

Executive Summary

Entity Agreements

Agreements approved by the Entities during the period of this report include:

- Columbia River Treaty Entity Agreement on the Detailed Operating Plan for Columbia River Storage for 1 August 1995 through 31 July 1996, signed 31 January 1996.
- Columbia River Treaty Entity Agreement on the Detailed Operating Plan for Columbia River Storage for 1 August 1996 through 31 July 1997, signed 29 August 1996.
- Columbia River Treaty Entity Agreement on Resolving the Dispute on Critical Period Determination, the Capacity Entitlement for the 1998/99, 1999/00, and 2000/01 AOP/DDPB's, and Operating Procedures for the 2001/02 and Future AOP's, signed 29 August 1996.

Operating Committee Agreements

Agreements approved by the Operating Committee include:

- Columbia Treaty Operating Committee Agreement on Operation of Treaty Storage for Non-Power Uses for 1 January 1996 through 31 July 1996, signed 30 April 1996.
- Columbia Treaty Operating Committee Agreement on Exchange of Libby and Arrow Water for 13 August 1966 through January 1977, signed 13 August 1996.

System Operation

The coordinated system filled to 89.2 percent of Treaty Storage Regulation (TSR) storage capacity by 31 July 1995. As a result, first year firm energy load carrying capability (FELCC) was adopted for the 1995-96 operating year. Actual storage capacity was filled to 91 percent, slightly above the TSR, the difference providing some operating room in the reservoirs. Due to above average stream flows throughout the year, the system generally operated to Operating Rule Curve or Flood Control Curve for the entire period.

The 1 January 1996 water supply forecast for the Columbia River at The Dalles (January-July) was 116.0 million acre feet (maf), or 110 percent of the 1961-90 average. With January and February rainfall above normal, the 1 March volume runoff forecast moved upward to 123 percent of normal. Below normal March rainfall turned the forecast downward to 119 percent for 1 April. April and May precipitation reversed the trend again with 1 June being at 133 percent. The actual January-July observed runoff was 139.3 maf, or 132 percent of average, which is the seventh highest in the 118 years of record. The peak daily average flow observed at The Dalles was 455,700 cfs on 11 June 1996.

The lower Columbia River flow was regulated for juvenile fish between 10 April and 31 August, based on recommendations of the "Technical Management Team" (TMT) consisting of representatives from five U.S. Federal agencies. State fishery agencies and Indian tribes also provided input at the TMT meetings. This information was usually provided through the Fish Passage Center (FPC). The TMT's Executive and Technical groups make recommendations to the two operating agencies (Corps of Engineers and Bureau of Reclamation) on dam and reservoir operations to optimize passage conditions for juvenile and adult anadromous salmonids in accordance with the National Marine Fisheries Service's Biological Opinion (BiOp). Each year, the TMT will also prepare a Water Management Plan to meet various fishery, flow, reservoir operation, and other objectives.

Coordinated System storage energy as of 31 July 1996 reached a level in the TSR of 99.7 percent of full. This value was used to determine the Firm Energy Load Carrying Capability (FELCC), with first-year FELCC being adopted for the 1996-97 operating year. The actual reservoir refill was 97 percent of full, slightly below the calculated TSR; the difference being adjustments to several reservoirs that in actual operation are required to be less than full in July.

From 1 August 1995 through 31 March 1996 generation at downstream projects in the United States, delivered to the Columbia Storage Power Exchange (CSPE) participants under the Canadian Entitlement Exchange Agreement, was approximately 268 average megawatts at rates up to 576 megawatts. From 1 April through 31 July 1996 the delivery was 254 average megawatts, at rates up to 486 megawatts. All CSPE power was used to meet Pacific Northwest loads.

From 1 April 1995 through 31 March 1996, the Canadian Entity delivered 2.0 average megawatts of energy and no dependable capacity to the U.S. Entity under the Canadian Entitlement Purchase Agreement, and between 1 April 1996 and 31 July 1996, the Canadian Entity delivered 0.9 average megawatts of energy and no dependable capacity to the U.S. entity under the CSPE/CEPA.

Also, between 1 August 1995 and 31 July 1996, the U.S. Entity delivered 20.9 megawatts of energy minus 3 percent losses, and no dependable capacity to the Canadian Entity. This was done in accordance with the 1995-96 DOP and is based on the U.S. selection of the option to provisionally draft Treaty Storage as permitted in the 1995-96 Assured Operating Plan.

Treaty Project Operation

The Canadian Treaty projects, Duncan, Mica, and Arrow, were operated throughout the year in accordance with the 1995-96 Detailed Operating Plan, the Flood Control Operating Plan, and the Operating Committee Non-power Uses Agreement. Throughout the year, Libby reservoir was operated in accordance with the flood control operating plan, as amended by the U.S. Corps of Engineers (ACE) "Review of Flood Control, Columbia River Basin, Columbia River & Tributaries Study, CRT-63", June 1981. The above were modified by a State of Montana request to limit Libby outflows to powerhouse capacity to alleviate Total Dissolved Gas (TDG) concerns. During a portion of the year, Libby was operated for power requirements according to the DOP, and during the remainder of the operating year Libby operated for storage and releases required for endangered White Sturgeon and Salmon as required by both the U.S. Fish and Wildlife Service and the National Marine Fishery Service Biological Opinions. However, there was no significant difference from a flood control operation during January through April 1996. The Canadian Entity has given notice that it considers the BiOp fishery operation to be inconsistent with the DOP and Columbia River Treaty.

Mica Treaty storage was 5.5 maf on 31 July 1995, and with continued storing, reached 6.9 maf or 98 percent of full content on 31 August 1995. The actual reservoir elevation reached a high of elevation 2470.7 feet (4.3 feet below full) on 21 August. By 31 December, Treaty storage was 4.8 maf and the observed reservoir level had dropped to elevation 2455.0 feet. Treaty storage reached the lowest level on 1 May 1996 at 0.5 maf. The reservoir reached its lowest level for the 1995-96 water year, elevation 2404.4 feet, on 18 May 1996, 30 feet higher than the previous year. From then on, Mica's Treaty storage refilled, reaching 95 percent of full (3356 thousand second foot days (ksfd) or 6.7 maf) on 31 July 1996.

The maximum level for 1996, elevation 2475.43 feet, 0.43 feet above normal full pool, was reached on 1 September 1996.

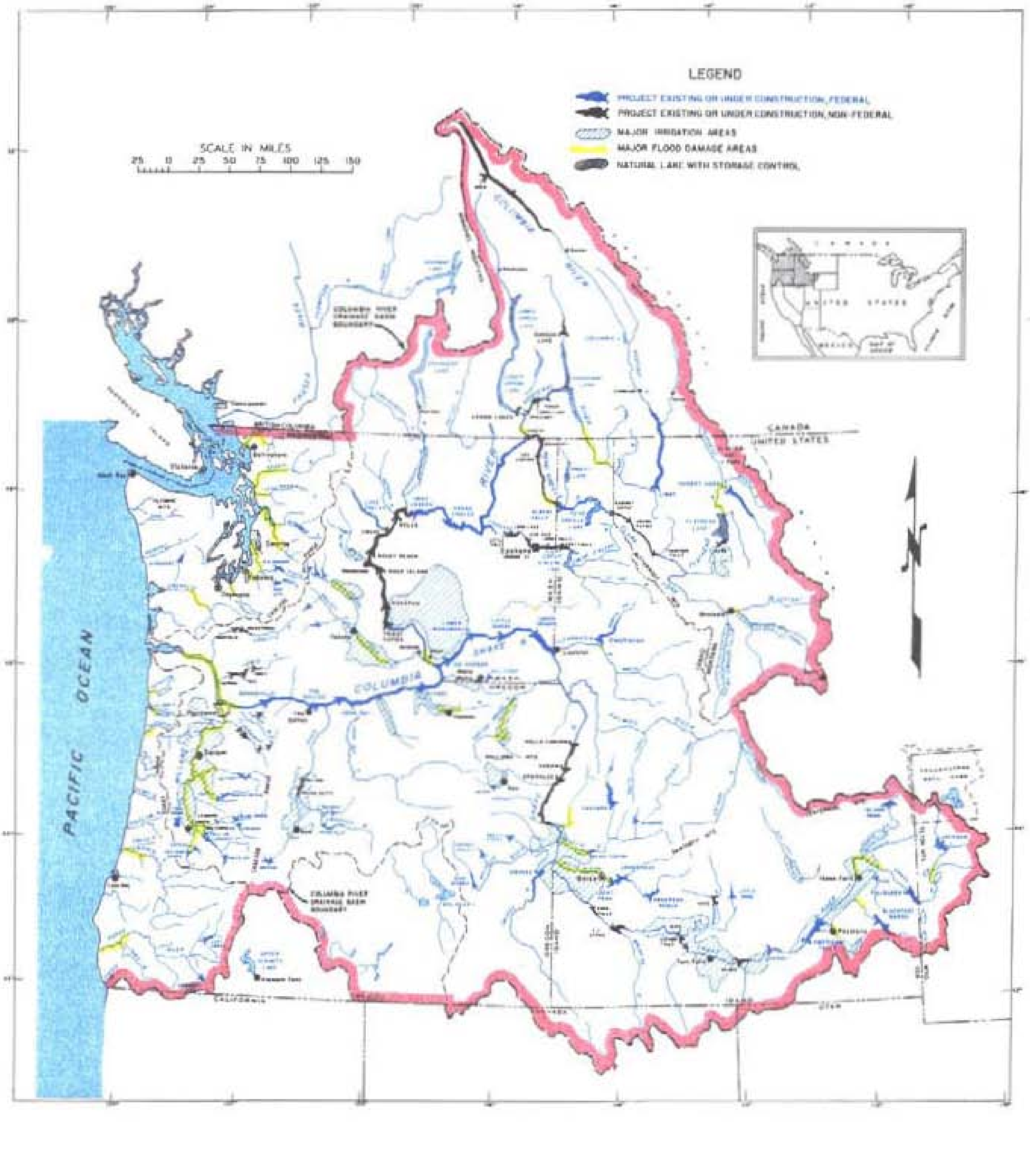
The Arrow Treaty storage account started the 1995-96 operating year (1 August 1995) at 6.9 maf, or 97 percent of full, following its 1995 operating year maximum level of elevation 1442.8 feet on 11 July 1995. The reservoir was drafted to elevation 1430.9 feet on 31 December 1995 with a Treaty storage of 6.9 maf or 98 percent of full. Special flood control operations were requested by the Corps of Engineers in November, December, and February to alleviate flooding in the Portland, Oregon area. During January through July, Arrow operated under an Operating Committee Agreement on the operation of Treaty storage for non-power uses. This agreement allowed the operation of Keenleyside Dam to be coordinated for both Canadian and U.S. fisheries, and recreation and dust storm avoidance benefits in Canada. Arrow reached its lowest level of the year elevation 1395.1 feet on 16 March 1996. Arrow Treaty storage reached its annual minimum on 20 March at 1.8 maf or 25 percent full. During April, Arrow discharges were held at 25 thousand cubic feet per second (kcfs) to ensure rainbow trout would not spawn at high river levels. This caused Arrow to fill to elevation 1407.2 feet by 30 April. During mid-May through mid-June, Keenleyside outflow began at 35 kcfs and increased to 55 kcfs which protected trout eggs. High spring runoff in the Kootenay River caused a backwater at the Norns Creek fan. The Arrow reservoir filled to elevation 1439.2 feet by 30 June. During July, Keenleyside discharge was increased as Treaty storage neared full. The Arrow Reservoir reached its highest level of elevation 1442.6 feet on 11 July 1996. The Arrow Treaty storage reached 100 percent full on 30 July 1996. During August, increased outflows drafted Arrow to elevation 1437.6 feet. Further drafting to elevation 1428.4†feet was done by 30 September 1996 with Arrow Treaty storage at 6.0 maf or 85 percent of full. To minimize spill at the Kootenay River plants in Canada, the B.C. Hydro - Bonneville Agreement permitted a Libby-Arrow water transfer agreement in 1996. Under the agreement, Libby volume releases were reduced by a total of 200 ksfd through late July to early August, and an equal amount of water was released from Arrow Reservoir. This water will be returned to Arrow Reservoir in the October to December period.

Duncan reservoir nearly filled by the end of the 1994-95 operating year with a reservoir level of elevation 1885.4 feet on 31 July 1995. The project reached full at elevation 1892.0 feet on 29 August. During September to December, Duncan was used to support the Kootenay Lake level and by 31 December, Duncan reservoir had drafted to elevation 1867.2 feet (70 percent of full). During early November and early December project releases were reduced in an effort to assist in flood control efforts downstream in the U.S. The project also went to minimum in early December when Kootenay Lake temporarily exceeded the IJC level. These operations contributed to later exceedance of the Duncan flood control curve. Drafting continued February through April, except for short periods of low flow to maintain within Kootenay Lake IJC limits. Duncan reached its lowest level during the 1995-96 operating year of elevation 1798.7 feet, on 2 May 1996. Minimum release during May to early July helped refill the reservoir to elevation 1892.2 feet (0.2 feet above full) by 31 July 1996. With outflows increased to near inflow, the project maintained near full pool. On 3 September, outflow was increased to begin drafting Duncan and filling Kootenay Lake. By 30 September 1996, Duncan had been drafted to elevation 1883.6†feet.

During the 1994-95 operating year, Libby reached its maximum level of elevation 2456.6 feet (2.4 feet below full pool) on 31 July 1995. By 12 September, the project drafted somewhat to elevation 2452.8 feet. By 25 October, the reservoir filled again to its peak summer level of elevation 2456.9 feet. Libby started the operating year with an imposed maximum outflow limit of 20 kcfs, the powerhouse hydraulic capacity of 4 units as Unit #3 was expected to be out of service until November. This limit was set by the State of Montana to alleviate possible high Total Dissolved Gas (TDG) amounts caused by spillway use. An outflow of 4 kcfs was maintained from 14 September through 26 October for Montana Department of Fish, Wildlife, and Parks continuation of fishery research work. During late October through December, Libby outflow was maintained at 20 kcfs to draft to its flood control level of elevation 2411 feet by 31 December. Between 28 November through 5 December, Libby released 4 kcfs as the Columbia River system was put on flood control based on flood stage forecasts at Vancouver, Washington. By 6 December, outflows were again increased to 20 kcfs to continue drafting for flood control. On 11 December, Unit #3, which had been out of service since May 1993, was returned to service and outflows were increased to 26 kcfs. Due to the restrictive outflow capability and between 180% to 227% of normal stream flow in November and December, Libby's 31 December pool level was elevation 2420.7 feet or 9.1 feet above the flood control level. With the 1 January water supply forecast being 94 percent of normal for the January-July period, Libby outflow during January was near full load of 25 kcfs to draft to its flood control level. During February and March, the intent was to draft Libby to flood control, but Columbia River flood control operations and Kootenay Lake IJC restrictions restricted draft of the Libby reservoir. The 31 March pool level was elevation 2366.0 feet, 79 feet above the flood control level of elevation 2287 feet. By 30 April, the reservoir level was elevation 2362.9 feet or 52 feet above flood control. Because of the Total Dissolved Gas concern, based on expected spill at Libby, the May, June, and July operation was planned to meet the sturgeon BiOp flows, while holding off filling the reservoir when inflows were above 25 kcfs. Due to changing volume forecasts, several proposals for discharge were discussed and evaluated related to the 1996 Sturgeon spawning enhancement. Outflows during the last half of May and during June were maintained at full powerhouse of near 25-28 kcfs as above normal runoff had the reservoir filling 1-3 feet per day. In late June the USF&W requested a 5-day fluctuation of 25 kcfs to 12 kcfs and back to 25 kcfs for sturgeon recruitment. Initially the discharge in July was planned to be full load of 25 kcfs since there was concern the project would not be able to provide flow pulsing flexibility for Sturgeon spawning while preventing the project from filling and spilling prior to the end of August. By 5 July, based on a request by the Kootenay River Steering Committee, outflows were reduced to 14 kcfs to prepare for a pulse of 24 kcfs on 10-12 July. This was followed by flows of near 10 kcfs to maintain an 11 kcfs flow at Bonners Ferry and refilling by month's end, reaching elevation 2458.96 feet on 31 July 1996.

The first 12 days of August saw Libby releasing 24 kcfs and then reducing to 12-14 kcfs for the remainder of the month to stem high water difficulties near Bonners Ferry. Libby did not release its full BiOp volume allocation because of high inflows and an agreement to store approximately 200 ksfd of Arrow Treaty water in Libby.

COLUMBIA RIVER AND COASTAL BASINS



1996 Report of The Columbia River Treaty Entities

Contents

1995 Report of The Columbia River Treaty Entities
Contents (continued)

I Introduction

This annual Columbia River Treaty Entity Report is for the 1996 Water Year, 1 October 1995 through 30 September 1996. It includes information on the operation of Mica, Arrow, Duncan, and Libby reservoirs during that period with additional information covering the reservoir system operating year, 1 August 1995 through 31 July 1996. The power and flood control effects downstream in Canada and the United States are described. This report is the thirtieth of a series of annual reports covering the period since the ratification of the Columbia River Treaty in September 1964.

Duncan, Arrow, and Mica reservoirs in Canada and Libby reservoir in the United States of America were constructed under the provisions of the Columbia River Treaty of January 1961. Treaty storage in Canada is required to be operated for the purposes of flood control and increasing hydroelectric power generation in Canada and the United States of America. In 1964, the Canadian and the United States governments each designated an Entity to formulate and carry out the operating arrangements necessary to implement the Treaty. The Canadian Entity is the British Columbia Hydro and Power Authority (B.C. Hydro). The United States Entity is the Administrator of the Bonneville Power Administration (BPA) and the Division Engineer of the North Pacific Division, Army Corps of Engineers (ACE).

The following is a summary of key features of the Treaty and related documents:

1. Canada is to provide 15.5 million acre-feet (maf) of usable storage. (This has been accomplished with 7.0 maf in Mica, 7.1 maf in Arrow and 1.4 maf in Duncan.)

2. For the purpose of computing downstream benefits the U.S. hydroelectric facilities will be operated in a manner that makes the most effective use of the improved streamflow resulting from operation of the Canadian storage.

3. The U.S. and Canada are to share equally the additional power generated in the U.S. resulting from operation of the Canadian storage.

4. The U.S. paid Canada a lump sum of the $64.4 million (U.S.) for expected flood control benefits in the U.S. resulting from operation of the Canadian storage.

5. The U.S. has the option of requesting the evacuation of additional flood control space above that specified in the Treaty, for a payment of $1.875 million (U.S.) for each of the first four requests for this "on-call" storage.

6. The U.S. constructed Libby Dam with a reservoir that extends 42 miles into Canada and for which Canada made the land available.

7. Both Canada and the United States have the right to make diversions of water for consumptive uses and, in addition, since September 1984 Canada has had the option of making for power purposes specific diversions of the Kootenay River into the headwaters of the Columbia River.

8. Differences arising under the Treaty which cannot be resolved by the two countries may be referred to either the International Joint Commission (IJC) or to arbitration by an appropriate tribunal.

9. The Treaty shall remain in force for at least 60 years from its date of ratification, 16 September 1964.

10. In the Canadian Entitlement Purchase Agreement of 13 August 1964, Canada sold its entitlement to downstream power benefits to the United States for 30-years beginning at Duncan on 1 April 1968, at Arrow on 1 April 1969, and at Mica on 1 April 1973.

11. Canada and the U.S. are each to appoint Entities to implement Treaty provisions and are to jointly appoint a Permanent Engineering Board (PEB) to review and report on operations under the Treaty.

II Treaty Organization

Entities

There were two meetings of the Columbia River Treaty Entities (including the Canadian and U.S. Entities and Entity Coordinators) during the year on the morning of 16 February 1996 in Victoria, British Columbia, and on the morning of 21 March 1995 in Portland, Oregon? The members of the two Entities at the end of the period of this report were:

UNITED STATES ENTITY
Mr. Randall W. Hardy, Chair
Administrator & Chief Executive Officer
Bonneville Power Administration
Department of Energy
Portland, Oregon

Colonel Bartholomew B. Bohn II, Member
Acting Division Engineer
North Pacific Division
Army Corps of Engineers
Portland, Oregon

CANADIAN ENTITY
Mr. Brian R. D. Smith, Chair
British Columbia
Hydro and Power Authority
Vancouver, British Columbia

Mr. Smith succeeded Mr. John Laxton effective 28 February 1996.
COL Bohn succeeded MG Russell Fuhrman effective 2 August 1996.

The Entities have appointed Coordinators and two joint standing committees to assist in Treaty implementation activities. These are described in subsequent paragraphs. The primary duties and responsibilities of the Entities as specified in the Treaty and related documents are:

1. Plan and exchange information relating to facilities used to obtain the benefits contemplated by the Treaty.

2. Calculate and arrange for delivery of hydroelectric power to which Canada is entitled and the amounts payable to the U.S. for standby transmission services.

3. Operate a hydrometeorological system.

4. Assist and cooperate with the Permanent Engineering Board in the discharge of its functions.

5. Prepare hydroelectric and flood control operating plans for the use of Canadian storage.

6. Prepare and implement detailed operating plans that may produce results more advantageous to both countries than those that would arise from operation under assured operating plans.

7. Address, if empowered by an exchange of notes, any other matter coming within the scope of the Treaty.

Entity Coordinators & Secretaries

The Entities have appointed members of their respective staffs to serve as coordinators or focal points on Treaty matters within their organizations.

The members are:

UNITED STATES ENTITY COORDINATORS

Judith A. Johansen, Coordinator
Vice President, Generation Supply
Bonneville Power Administration
Portland, Oregon

John E. Velehradsky, Coordinator
Director, Engineering & Technical Services
North Pacific Division
Army Corps of Engineers
Portland, Oregon

Dr. Anthony G. White, Acting Secretary
Resource Optimization
Hydro/Thermal Operations
Bonneville Power Administration
Vancouver, Washington

CANADIAN ENTITY COORDINATOR

T. J. (Tim) Newton, Coordinator
BC Hydro and Power Authority
Vancouver, British Columbia

Graeme L. Simpson, Secretary
Manager, Resource Optimization Dept.
BC Hydro and Power Authority
Vancouver, British Columbia

Dr. White was appointed to succeed Ms. Pamela Kingsbury effective 21 December 1995.

Columbia River Treaty Operating Committee

The Operating Committee was established in September 1968 by the Entities and is responsible for preparing and implementing operating plans as required by the Columbia River Treaty, making studies and otherwise assisting the Entities as needed. The Operating Committee consists of eight members as follows:

UNITED STATES SECTION	CANADIAN SECTION
Mark Maher, BPA, Co-Chair	Ralph D. Legge, B.C. Hydro, Chair
William E. Branch, ACE, Co-Chair	Kenneth R. Spafford, B.C. Hydro
Cynthia A. Henriksen, ACE	Henry C. Mark, B.C. Hydro
John M. Hyde, BPA	Thomas K. Siu, B.C. Hydro

Ms. Henriksen was appointed to succeed Mr. Russell George, effective 8 December 1995.
Mr. Hyde was appointed to succeed Mr. Steve Montfort, effective 21 December 1995.
Mr. William McGinnis was appointed to succeed Mr. Nicholas Dodge (temporarily) effective 3 January 1996.
Mr. Branch was then appointed to succeed Mr. McGinnis effective 1 June 1996.

There were six meetings of the Operating Committee during the year. The dates, places and number of persons attending those meetings were:

Date	Location	Attendees
7 November 1995	Vancouver, B.C.	18
11 January 1996	Portland, Oregon.	17
14 March 1996	Vancouver, B.C.	19
16 May 1996	Vancouver, Washington.	21
12 July 1996	Castlegar, B.C.	18
19 September 1996	Portland, Oregon.	18

The Operating Committee coordinated the operation of the Treaty storage in accordance with the current hydroelectric and flood control operating plans. This aspect of the Committee's work is described in following sections of this report which have been prepared by the Committee with the assistance of others. During the period covered by this report, the Operating Committee completed an agreement on "Resolving the Dispute on Critical Period Determination, the Capacity Entitlement for the 1998/99, 1999/00, and 2000/01 AOP/DDPB's, and Operating Procedures for the 2001/02 and Future AOP's". The Operating Committee also completed the 1 August 1995 through 31 July 1996 Detailed Operating Plans (DOP) and the 1 August 1996 through 31 July 1997 DOP for Columbia River Treaty Storage.

Columbia River Treaty Hydrometeorological Committee

The Hydrometeorological Committee was established in September 1968 by the Entities and is responsible for planning and monitoring the operation of data facilities in accord with the Treaty and otherwise assisting the Entities as needed. The Committee consists of four members as follows:

UNITED STATES SECTION	CANADIAN SECTION
Gregory K. Delwiche, BPA Chair	Brian H. Fast, BCH, Chair
Peter F. Brooks, ACE, Member	Heiki Walk, BCH, Member

There was one meeting of the Hydrometeorological Committee, on 26 October 1995, in Vancouver, B.C. The committee reviewed the 1995 volume forecast results, hydromet station changes, and developments in telemetry. There were some data exchange issues which required attention. Both Canadian and U. S. Entities reported that changes in forecast procedures were forthcoming. Both sides will be kept abreast of the others' progress.

Permanent Engineering Board

Provisions for the establishment of the Permanent Engineering Board (PEB) and its duties and responsibilities are included in the Treaty and related documents. The members of the PEB are presently:

UNITED STATES SECTION	CANADIAN SECTION
Steven L. Stockton, Chair, Washington, D.C. Ronald H. Wilkerson, Member Missoula, Montana	Daniel R. Whelan, Chair Ottawa, Ontario John Allan, Member Victoria, British Columbia
Daniel R. Burns, Alternate Washington, D.C. Thomas L. Weaver, Alternate Golden, Colorado	Jack Farrell, Alternate Victoria, British Columbia David Burpee, Alternate Ottawa, Ontario
Richard J. DiBuono, Secretary Washington, D.C.	David Burpee, Secretary Ottawa, Ontario

Mr. Stockton was appointed to replace Mr. John Elmore as Chair on 12 March 1996.
Mr. Whelan was appointed to replace Mr. David Oulton as Chair on 16 April 1996.
Mr. Farrell was appointed to replace Mr. Don Kasianchuk as Alternate in February 1996.

In general, the duties and responsibilities of the PEB are to assemble records of flows of the Columbia River and the Kootenay River at the international boundary; report to both governments if there is deviation from the hydroelectric or flood control operating plans, and if appropriate, include recommendations for remedial action; assist in reconciling differences that may arise between the Entities; make periodic inspections and obtain reports as needed from the Entities to assure that Treaty objectives are being met; make an annual report to both governments and special reports when appropriate; consult with the Entities in the establishment and operation of a hydrometeorological system; and, investigate and report on any other Treaty related matter at the request of either government.

The Entities continued their cooperation with the PEB during the past year by providing copies of Entity agreements, operating plans, downstream power benefit computations, corrections to hydrometeorological documents, and the annual Entity report to the Board for their review. A special joint meeting of the PEB and the Entities was held on 8 November 1995 in Vancouver, B.C. to discuss Entitlement Return issues. The annual joint meeting of the PEB and the Entities was held on the morning of 22 February 1996 in Portland, Oregon.

PEB Engineering Committee

The PEB has established a PEB Engineering Committee (PEBCOM) to assist in carrying out its duties. The members of PEBCOM at the end of the period of this report were:

UNITED STATES SECTION
Richard J. DiBuono, Chair
Washington, D.C.
Robert K. Johnson, Member
Golden, Colorado
Earl E. Eiker, Member
Washington, D.C.
Gary Fuqua, Member
Portland, Oregon
James Barton, Member
Portland, Oregon
Stephan J. Wright, Alternate Member
Washington, D.C.

CANADIAN SECTION
Larry Adamache, Member
Vancouver, British Columbia
David Burpee, Member
Ottawa, Ontario
Roger McLaughlin, Member
Victoria, British Columbia
Bala Balachandran, Member
Victoria, British Columbia
Bruno Gobeil, Member
Ottawa, Ontario

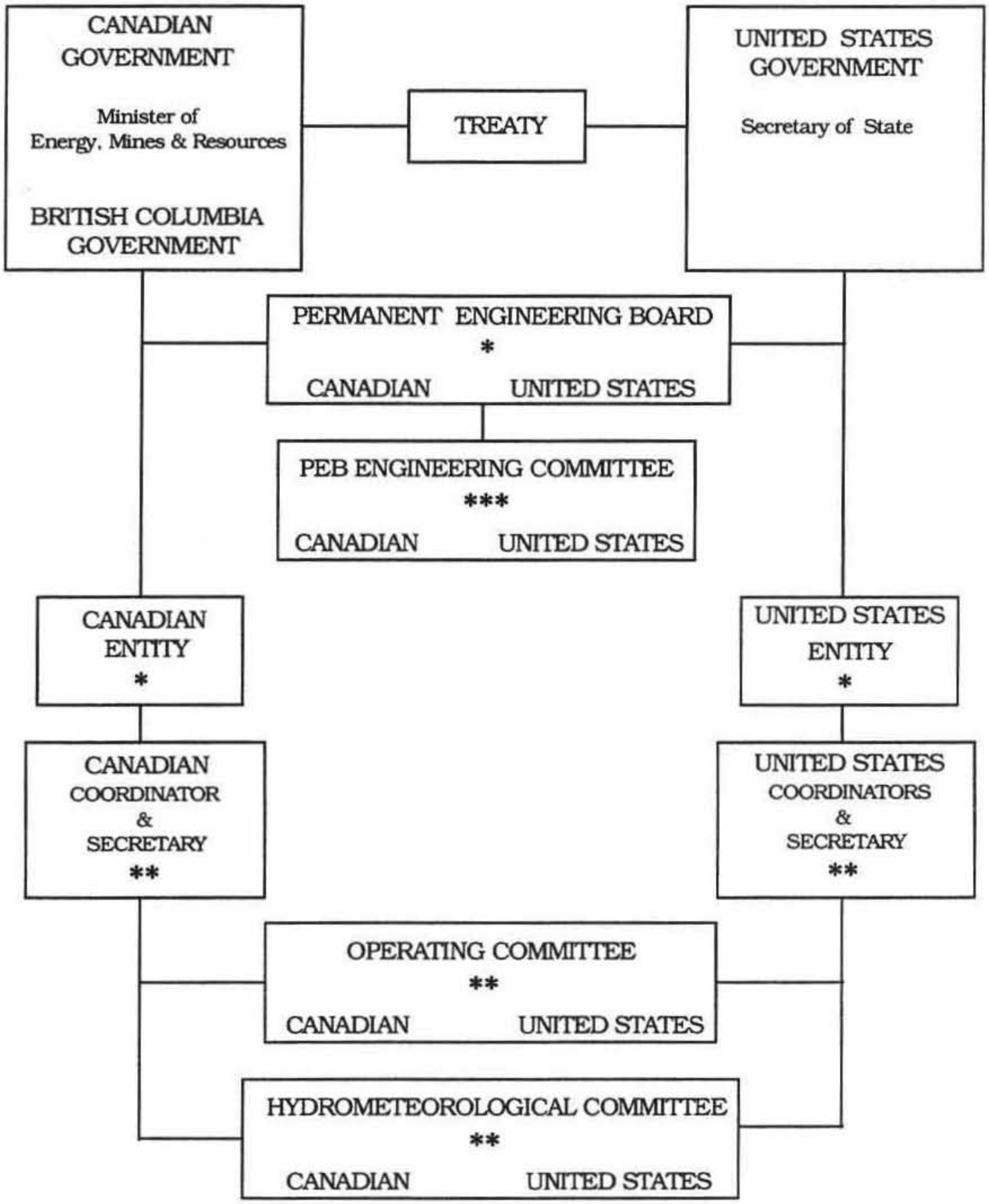
Mr. Adamache was appointed Chair of the Canadian Section to replace Mr. Neill Lyons, effective in April, 1996.
Mr. Johnson was appointed to replace Mr. Larry Eilts as a Member, effective 26 March 1996
Mr. Barton was appointed to replace Mr. Richard Mittelstadt as a Member, effective 31 July 1996.

International Joint Commission

The International Joint Commission (IJC) was created under the Boundary Waters Treaty of 1909 between Canada and the U.S. Its principal functions are rendering decisions on the use of boundary waters, investigating important problems arising along the common frontier not necessarily connected with waterways, and making recommendations on any question referred to it by either government. If a dispute concerning the Columbia River Treaty could not be resolved by the Entities or the PEB it may be referred to the IJC for resolution before being submitted to a tribunal for arbitration.

The IJC has appointed local Boards of Control to insure compliance with IJC orders and to keep the IJC currently informed. There are three such boards west of the continental divide. These are the International Kootenay Lake Board of Control, the International Columbia River Board of Control, and the International Osoyoos Lake Board of Control. The Entities and their committees conducted their Treaty activities during the period of this report so that there was no known conflict with IJC orders or rules.

COLUMBIA RIVER TREATY ORGANIZATION



* Established by TREATY ** Established by ENTITY *** Established by PEB

III Operating Arrangements

Power and Flood Control Operating Plans

The Columbia River Treaty requires that the reservoirs constructed in Canada be operated pursuant to flood control and hydroelectric operating plans developed thereunder. Annex A of the Treaty stipulates that the United States Entity will submit flood control operating plans and that the Canadian Entity will operate in accordance with flood control storage diagrams or any variation which the Entities agree will not be adverse to the desired aim of the flood control plan. Annex A also provides for the development of hydroelectric operating plans five years in advance to furnish the Entities with an Assured Operating Plan for Canadian storage. In addition, Article XIV.2.k of the Treaty provides that a Detailed Operating Plan may be developed to produce more advantageous results through the use of current estimates of loads and resources. The Protocol to the Treaty provides further detail and clarification of the principles and requirements of the Treaty.

The "Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans" dated December 1991 together with the "Columbia River Treaty Flood Control Operating Plan" dated October 1972, establish and explain the general criteria used to plan and operate Treaty storage during the period covered by this report. These documents were previously approved by the Entities. The flood control Storage Reservation Diagram for Libby contained in the 1972 Flood Control Plan, was amended by agreement of the Operating Committee to that contained in the U.S. Army Corps of Engineers (ACE) "Review of Flood Control, Columbia River Basin, Columbia River & Tributaries Study, CRT-63", dated June 1981.

The planning and operation of Treaty Storage as discussed on the following pages is for the operating year, 1 August through 31 July. The planning and operating for U.S. storage operated according to the Pacific Northwest Coordination Agreement has been changed to the same period. Most of the hydrographs and reservoir charts in this report are for a 13 month period, July 1995 through July 1996.

Assured Operating Plan

The Options for Development of the Detailed Operating Plan, dated January 1991 established Operating Rule Curves for Duncan, Arrow, and Mica during the 1995-96 operating year. The Operating Rule Curves provided guidelines for draft and refill. They were derived from Critical Rule Curves, Assured Refill Curves, Upper Rule Curves, and Variable Refill Curves, consistent with flood control requirements, as described in the 1991 Principles and Procedures document. The Flood Control Storage Reservation Curves were established to conform to the Flood Control Operating Plan of 1972.

Determination of Downstream Power Benefits

For each operating year, the Determination of Downstream Power Benefits resulting from Canadian Treaty storage is made six years in advance in conjunction with the Assured Operating Plan. For operating year 1995-96 the estimate of benefits resulting from operating plans designed to achieve optimum operation in both countries was less than that which would have prevailed from an optimum operation in the United States only. Therefore, in accordance with Sections 7 and 10 of the Canadian Entitlement Purchase Agreement, the Entities agreed that the United States was entitled to receive 2.0 average megawatts of energy and no dependable capacity during the period 1 August 1995 through 31 March 1996, and 0.9 average megawatts of energy and no dependable capacity during 1 April 96 through July 1996. Suitable arrangements were made between the Bonneville Power Administration and B.C. Hydro for delivery of this energy.

Detailed Operating Plan

During the period covered by this report, the Operating Committee used the 1 August 1995 through 31 July 1996 "Detailed Operating Plan for Columbia River Treaty Storage" (DOP), dated August 1995 and the 1 August 1996 through 31 July 1997 DOP dated August 1996, to guide storage operations. The DOP established criteria for determining the Operating Rule Curves for use in actual operations. The DOP used the AOP critical rule curves for Canadian Projects. The Variable Refill Curves and flood control requirements subsequent to 1 January 1996 were determined on the basis of seasonal volume runoff forecasts during actual operation. The regulation of the Canadian storage was directed by the Operating Committee on a weekly basis throughout the year.

Entity Agreements

During the period covered by this report, three joint US-Canadian arrangements were approved by the Entities. The following tabulation indicates the date each of these were signed and gives a description of the agreement:

Date Agreement Signed by Entities	Description
31 January 1996	Columbia River Treaty Entity Agreement on the Detailed Operating Plan for Columbia River Storage for 1 August 1995 through 31 July 1996.
27 August 1996	Columbia River Treaty Entity Agreement on the Detailed Operating Plan for Columbia River Storage for 1 August 1996 through 31 July 1997.
29 August 1996	Columbia River Treaty Entity Agreement on Resolving the Dispute on Critical Period Determination, the Capacity Entitlement for the 1998/99, 1999/00, and 2000/01 AOP/DDPB's, and Operating Procedures for the 2001/02 and Future AOP's.

Operating Committee Agreements

During the period covered by this report, two joint US-Canadian agreements were approved by the Operating Committee. The following tabulation indicates the dates they were signed, gives descriptions of the agreements, and cites the authorities:

Date Agreement Signed by Committee	Description	Authority
30 April 1996	Columbia Treaty Operating Committee Agreement on Operation of Treaty Storage for Non-Power Uses for 1 January through 31 July 1996	Letter of Delegation dated 3 August 1995

Long Term Non-Treaty Storage Contract

In accordance with the 9 July 1990 Entity Agreement which approved the contract between B.C. Hydro and BPA relating to the initial filling of non-Treaty storage, coordinated use of non-Treaty storage, and Mica and Arrow refill enhancement, the Operating Committee monitored the storage operations made under this Agreement throughout the operating year to insure that they did not adversely impact operation of Treaty storage required by the Detailed Operating Plan.

IV Weather and Streamflow

Weather

The 1996 Water Year was preceded by a cool, wet summer that reduced hydro-power and irrigation demands and left the Columbia Basin reservoirs with normal water contents by the end of September. As the new water year began, weather patterns continued the above normal rainfall conditions with varying warm and cool temperatures across the basin throughout most of the snow accumulation season of October - March (Charts 1 and 3). Snowpack accumulation started late as November and December saw above normal temperatures, but increased quickly throughout January and February. The latter month saw a decrease in snowpack early in the month due to heavy rainfall and high temperatures, but recovered. March saw a slow continuation of building snowpack as monthly precipitation was below normal (Chart 2). April and May saw an above normal building of the snowpack with wet cool weather during both months. This was followed by June, July, and August with below normal rainfall and normal to below normal temperatures (Charts 4 and 5).

Weather systems this year were more typical in that during the winter a quasi-stationary low pressure system settled in the Gulf of Alaska, periodically sending storms into the Basin which deposited snow in the mountains and watered the lowlands. Occasionally this low pressure system would be replaced by a high pressure system; and as these pressure systems moved and stalled, different air masses (warm or cold, wet or dry) would be ushered into the region. During the summer, high pressure generally dominated the Gulf of Alaska, blocking formation or passage of most storms.

This year the Columbia Basin was visited by six flood producing storms (two of which were major floods), six outbreaks of cold Arctic air, and three warm spells. Storms that resulted in heavy flood-producing rainfall were generated when three conditions occurred at the same time: (1) a large, deep low pressure system established itself just north of Hawaii, south of the typical winter position in the Gulf of Alaska, (2) a very flat high pressure ridge was located over the Oregon, Washington, and British Columbia coasts, and (3) a strong jet stream circled the low pressure system, picking up vast quantities of warm, moist air from near Hawaii that was then driven northeastward into cooler air in the Basin. The Arctic outbreaks of cold air generally occurred when a high pressure system established itself near the British Columbia coast and a low system was located over interior British Columbia. This pattern circulated cold air southward out of Alaska and northern Canada into the Basin. These periods usually have either clear weather or, if the air flow extended over the ocean, light showers or sometimes snow showers. The warm spells occurred when high pressure dominated the coast, drawing warm air northward from California.

Major storm conditions occurred this year at the end of November, mid-December, mid-January, early February, the latter part of April, and mid-May. All storms were three-component storms of varying duration and areal extent. The early February storm had significant snowmelt that contributed to the magnitude of the flood. For nearly ten days prior to the storm's onset, the region was enveloped in a cold air mass that was accompanied by snow, even at the lowest elevations. The effects of this storm extended from the coasts of southwest Washington and northwest Oregon into central Idaho and southwestern Montana. The snowpacks in this area were virtually eliminated and no major storm would replace the snowpack during the remainder of the year.

Springtime snowmelt occurred in an orderly manner with no sustained warm spell to create a significant crest from the snowmelt runoff.

The final monthly precipitation indices for the Columbia Basin above The Dalles are shown below for the 1996 Water Year. These indices are based on 60 stations and are computed at the end of each month after all the data are collected. Also shown in the table are the monthly indices as a percent of the 30-year average (1961-1990).

WY 96 Precipitation Indices

Month	Precipitation		Month	Precipitation	
	(in.)	(%)		(in.)	(%)
Oct 95	2.57	157	Apr 96	2.64	165
Nov 95	4.83	177	May 96	3.15	173
Dec 95	3.28	109	Jun 96	1.26	69
Jan 96	3.41	115	Jul 96	0.61	56
Feb 96	3.00	143	Aug 96	0.52	42
Mar 96	1.43	76	Sep 96	1.30	93
			Water Year	28.00	120

Streamflow

The observed inflow and outflow hydrographs for the Treaty reservoirs for the period 1 July 1995 through 31 July 1996 are shown on Charts 6 through 9. Observed flows with the computed unregulated flow hydrographs for the same 13-month period for Kootenay Lake, Columbia River at Birchbank, Grand Coulee, and The Dalles are shown on Charts 10, 11, 12, and 13, respectively. Chart 14 is a hydrograph of observed and two unregulated flows at The Dalles during the April through July 1996 period, including a plot of flows occurring if regulated only by the Treaty reservoirs.

Composite operating year unregulated streamflows in the basin above The Dalles were much higher than the past few years, although with a slow start as only August and September 1995 were below normal at 92%. December and February were the high months, being in the 240% of normal range. The August 1995 through July 1996 runoff for The Dalles was 182.5 maf, 143% of the 1961-90 average. The peak regulated discharge for the Columbia River at The Dalles was 455,700 cfs on 11 June 1996. The 1995-96 monthly unregulated streamflows and their percent of the 1961-90 average monthly flows are shown in the following table for the Columbia River at Grand Coulee and at The Dalles. These flows have been corrected to exclude the effects of regulation provided by storage reservoirs.

Columbia River at Columbia River at

Time Period	Grand Coulee in cfs: Natural Flow	Grand Coulee in cfs: Percent of Average	The Dalles in cfs: Natural Flow	The Dalles in cfs: Percent of Average
Aug 95	96,900	92	126,800	92
Sep 95	59,900	93	88,700	92
Oct 95	63,700	132	103,520	120
Nov 95	92,360	190	167,430	183
Dec 95	108,830	248	223,550	237
Jan 96	60,860	148	140,580	143
Feb 96	102,080	227	279,100	249
Mar 96	70,880	120	201,890	143
Apr 96	178,670	153	343,650	153
May 96	260,260	99	443,220	105
Jun 96	381,080	116	578,490	116
Jul 96	255,330	133	326,450	127
Operating Year	144,240	128	251,950	134
Water Year	145,640	129	253,830	135

Seasonal Runoff Forecasts and Volumes

Observed 1996 April through August runoff volumes, adjusted to exclude the effects of regulation of upstream storage, are listed below for eight locations in the Columbia Basin:

Location	Volume In 1000 Acre-Feet	Percent of 1961-90 Average
Libby Reservoir Inflow	8,347	131
Duncan Reservoir Inflow	2,347	114
Mica Reservoir Inflow	12,454	108
Arrow Reservoir Inflow	25,436	109
Columbia River at Birchbank	48,027	118
Grand Coulee Reservoir Inflow	71,951	118
Snake River at Lower Granite Dam	29,462	128
Columbia River at The Dalles	111,080	119

Forecasts of seasonal runoff volume, based on precipitation and snowpack data, were prepared in 1996 for a large number of locations in the Columbia River Basin and updated each month as the season advanced. Table 1 lists the April through August volume inflow forecasts for Mica, Arrow, Duncan, and Libby projects, and for unregulated runoff for the Columbia River at The Dalles. Also shown in Table 1 are the actual volumes for these five locations. The forecasts for Mica, Arrow, and Duncan inflow were prepared by B.C. Hydro, and those for the lower Columbia River and Libby inflows were prepared by the National Weather Service and River Forecast Center in cooperation with the Corps of Engineers, National Resource Conservation Service, Bureau of Reclamation and B.C. Hydro. The 1 April 1996 forecast of January through July runoff for the Columbia River above The Dalles was 126.0 maf and the actual observed runoff was 139.3 maf.

The following tabulation summarizes monthly forecasts since 1970 of the January through July runoff for the Columbia River above The Dalles compared with the actual runoff measured in millions of acre-feet (maf). The average January-July runoff for the 1961-1990 period is 105.9 maf.

The Dalles Volume Runoff Forecasts in maf (Jan-Jul)

Year	Jan	Feb	Mar	Apr	May	June	Actual
1970	82.5	99.5	93.4	94.3	95.1		95.7
1971	110.9	129.5	126.0	134.0	133.0	135.0	137.5
1972	110.1	128.0	138.7	146.1	146.0	146.0	151.7
1973	93.1	90.5	84.7	83.0	80.4	78.7	71.2
1974	123.0	140.0	146.0	149.0	147.0	147.0	156.3
1975	96.1	106.2	114.7	116.7	115.2	113.0	112.4
1976	113.0	116.0	121.0	124.0	124.0	124.0	122.8
1977	75.7	62.2	55.9	58.1	53.8	57.4	53.8
1978	120.0	114.0	108.0	101.0	104.0	105.0	105.6
1979	88.0	78.6	93.0	87.3	89.7	89.7	83.1
1980	88.9	88.9	88.9	89.7	90.6	97.7	95.8
1981	106.0	84.7	84.5	81.9	83.2	95.9	103.4
1982	110.0	120.0	126.0	130.0	131.0	128.0	129.9
1983	110.0	108.0	113.0	121.0	121.0	119.0	118.7
1984	113.0	103.0	97.6	102.0	107.0	114.0	119.1
1985	131.0	109.0	105.0	98.6	98.6	100.0	87.7
1986	96.8	93.3	103.0	106.0	108.0	108.0	108.3
1987	88.9	81.9	78.0	80.0	76.7	75.8	76.5
1988	79.2	74.8	72.7	74.0	76.1	75.0	73.7
1989	101.0	102.0	94.2	99.5	98.6	96.9	90.6
1990	86.5	101.0	104.0	96.0	96.0	99.5	99.7
1991	116.0	110.0	107.0	106.0	106.0	104.0	107.1
1992	92.6	89.1	83.5	71.2	71.2	67.8	70.4
1993	92.6	86.5	77.3	76.6	81.9	86.1	88.0
1994	79.7	76.3	78.1	73.2	75.5	76.4	75.0
1995	101.0	99.6	94.3	99.6	99.6	97.9	104.0
1996	116.0	122.0	130.0	126.0	134.0	141.0	139.3

V Reservoir Operation

General

The 1995-96 operating year was characterized by above, to much above normal precipitation except for August 1995, March 1996, and June-July 1996. Temperatures generally were below normal for most of the year, except for late November and early December when high temperatures retarded snowpack accumulation. During mid-February higher than normal temperatures resulted in low level melting of the snowpack. Although the snowmelt season was generally characterized by below normal conditions, high April and June precipitation, along with cold May temperatures, gave increased late season snowpacks. July and August saw little precipitation and below normal temperatures resulting in a slow, prolonged runoff. At The Dalles, the observed January-July runoff was 132 percent of average, 22 percent higher than the January forecast, and 13 percent higher than the April forecast.

The operating year began with the coordinated system reservoirs officially filling to 89.2 percent of storage capacity on 31 July 1995. As a result, first year firm energy load carrying capability (FELCC) was adopted for the 1995-96 operating year. The actual reservoir refill was 91 percent of full, slightly above the calculated AER; with the difference providing some operating room in the reservoirs. The system generally operated to the Operating Rule Curve or flood control for the entire period due to above normal stream flows throughout the year,

The 1 January 1996 water supply forecast for The Dalles was 116.0 maf for the January-July period, or 110 percent of the 1961-90 average. Subsequent forecasts through March reflected an increasing trend to 130 percent, with the April forecast turning downward to 126 percent due to low March rainfall. May and June saw increasing amounts to 141 percent of normal. Actual runoff for January-July was 132 percent of normal.

During the 10 April - 31 August salmon flow augmentation period, U.S. projects were used to augment flows at Lower Granite and McNary. The National Marine Fisheries Service's Biological Opinion, released in early March 1995, listed target flows that were variable based on runoff volume forecasts. The target flows were:

- Lower Granite, 85,000-100,000 cfs during 10 April - 20 June, and 50,000-55,000 cfs during 21 June - 31 August;

- McNary, 220,000-260,000 cfs during 20 April - 30 June, and 200,000 cfs during 1 July-31 August.

Provision for adjusting target flows based on runoff volume forecasts was based on a sliding scale with Lower Granite at 100,000 cfs and 53,500 cfs for the two periods. McNary was at 260,000 cfs for the first period. The second period is set at 200,000 cfs and does not vary with runoff forecasts.

Daily flood control regulation was required twice during the 1995-1996 season. The first event occurred in late November into early December 1996. During this event B.C. Hydro participated by reducing Arrow outflow to natural flow of 25 kcfs. The maximum flow at The Dalles was 323,600 cfs on 3 December 1995. Again in early February 1996 the system went on daily flood control operations. B.C. Hydro reduced flow from Arrow to natural flow of 15 kcfs. The peak flow at The Dalles during the flood event was held to 332,500 cfs on 8 February 1996.

The system reached 99.4 percent of its full energy capacity in the Actual Energy Regulation (AER) on 31 July 1996, resulting in first-year FELCC being adopted for the 1996-97 operating year. The observed refill on 31 July 1996 was 97 percent of energy capacity, slightly below the calculated AER. The difference was due to adjustments in the AER because several reservoirs are required to be less than full in July.

Mica Reservoir

As shown in Chart 6, the Mica Reservoir (Kinbasket Lake) level was elevation 2463.6 feet, 11.4†feet below full pool level (elevation 2475 feet), on 31 July 1995. The reservoir continued to fill in early August, reaching its peak level for the year, elevation 2470.7 feet, on 21 August. The reservoir level remained above elevation 2460 feet until late November.

Mica Treaty storage was 2751 ksfd (5.5 maf) or 78 percent of full on 31 July 1995. Mica Treaty storage continued to fill during August, reaching a maximum of 3454 ksfd (6.9 maf) or 98 percent of full on 31 August. Actual Mica discharges were fairly high throughout the summer, and the Mica Treaty flex reached 402 ksfd on 31 August..

Mica powerhouse discharges during November and December averaged about 16 kcfs, and the reservoir drafted to elevation 2455.0 feet by 31 December 1995. Treaty storage on that date was

2420.1 ksfd (4.8 maf). Special operations were initiated to minimize flooding in the Portland, Oregon area during November.

Temperatures in January 1996 were relatively mild throughout the region. This, with corresponding lower loads and heavy inflows in the Lower Columbia enabled B.C. Hydro to store water into its Non-Treaty Storage Agreement (NTSA) to take advantage of the reduced h/k at U.S. downstream projects. Mica powerhouse discharges for January averaged around 25 kcfs. Because of continuing high water levels in the U.S., B.C. Hydro nearly filled its Non-Treaty Storage Agreement (NTSA) account by the end of February (1131 ksfd). The reservoir drafted to elevation 2427.4 feet by 28 February, with Treaty storage at 1187.2 ksfd and Mica Treaty flex at 350 ksfd on that date.

The Mica Reservoir continued to draft during March-April and the reservoir reached its lowest level for the 1995-96 water year, elevation 2404.4 feet, on 18 May 1996. This level was 30 feet higher than the previous year's low level. Mica Treaty storage reached a minimum of 229.1 ksfd (0.5 maf) on 1 May with Mica flex reaching 364 ksfd.

With the start of the spring freshet in early May, Mica discharges were reduced, and the reservoir refilled quickly. At the end of May, the Mica Treaty flex had been reduced to 6 ksfd. The Mica Treaty discharge was 10 kcfs for the months of May through July, allowing Treaty storage to refill to 3356.2 ksfd (6.7 maf, 95% of full) by 31 July. Actual Mica discharges during May-July averaged 20 kcfs, increasing the Mica Treaty flex to 252 ksfd by the end of July, by which time the reservoir had refilled to elevation 2470.0 feet.

The Mica Reservoir reached full pool on 12 August. The reservoir was maintained near full during August, reaching a peak level for the year of elevation 2475.43 feet (.43 feet above full) on 1 September. The Mica Treaty flex reached a maximum of 481 ksfd on 18 September, this was reduced to 478 ksfd by 30 September.

Revelstoke Reservoir

During the 1995-96 operating year, the Revelstoke project was operated generally as a run-of-river plant, with the reservoir level maintained within 5.3 feet of its normal full pool level, elevation 1880 feet. During the spring freshet, March through July, the reservoir was occasionally operated as low as elevation 1874.7 feet to provide additional operational space to control high local inflows.

Arrow Reservoir

As shown in Chart 7, the maximum Arrow Reservoir level for 1995 was elevation 1442.8 feet on 11 July 1995. Arrow Reservoir had drafted slightly to elevation 1438.3 feet by 31 July. On 31 July, the Arrow Treaty storage account was 3456 ksfd (6.9 maf) or 97 percent of full. The Arrow level was drafted slowly to elevation 1429.0 feet by the end of September.

Keenleyside discharges increased over the autumn months from an average of 24 kcfs in October to an average of 50 kcfs in December. The winter discharge peaked at 56 kcfs in mid-December. Arrow Reservoir drafted to elevation 1430.9 feet by 31 December 1995 and Arrow Treaty storage on that date was 3489 ksfd (6.9 maf) or 98 percent of full.

Special flood control operations were requested by the Corps of Engineers to alleviate flooding in the Portland, Oregon area during the months of November and December. Minimum actual discharge from Keenleyside for flood control in both November and December was 10 kcfs.

In early January, B.C. Hydro requested that Arrow outflows be selectively reduced below Treaty requests to keep river levels at acceptable and maintainable levels during Whitefish spawning and later emergence. BPA agreed to this change in exchange for a later Fall Flexibility Draft. The treaty requests were reduced and a total of 188 ksfd was held back. This storage was later returned and the Canadian Treaty Storage returned to TSR levels.

Arrow Reservoir continued to draft during the January-March period. For most of this period, B.C. Hydro released Non-Treaty Storage water to augment Treaty releases in an attempt to maintain the viability of mountain whitefish eggs spawned downstream of Keenleyside. Due to the variability of outflows from Keenleyside in January and February, B.C. Hydro was unable to maintain the viability of mountain whitefish eggs spawned downstream of Keenleyside. However, due to the flood control emergency operations encountered during this season, the Canadian Department of Fisheries and Oceans was satisfied that the operation was appropriate for the conditions experienced.

Arrow Reservoir reached its lowest level for the year, elevation 1395.1 feet, on 16 March 1996. Arrow Treaty storage reached its minimum of 890 ksfd (1.8 maf) or 25 percent of full, several days later on 20 March 1996.

Between 31 March and April 30, the Keenleyside discharge was kept to about 25 kcfs in an attempt to insure that rainbow trout would not spawn at higher river levels. Several trout redds, which were de-watered, were kept wetted for a limited time using a pump and sprinkler system.

During April through June, Arrow was operated under the terms of the agreement on "Non-power Use of Canadian Treaty storage" between the entities. This agreement allowed the U.S. to store and release water which was above proportional draft levels in Canadian Treaty space, and specified non-decreasing discharges from Arrow to avoid de-watering rainbow trout redds. With a 25 kcfs discharge throughout April, the Arrow Reservoir level rose to elevation 1407.2 feet by 30 April.

With the start of the spring freshet, increasing discharges from the Kootenay River created a backwater effect at the Norns Creek Fan, a prime spawning location for rainbow trout. Discharge from Keenleyside was held at 35 kcfs for the last half of May and gradually increased throughout the month of June. Arrow reached a level of elevation 1439.2 feet by 30 June 1996.

The Keenleyside discharge increased substantially in late June and July as Arrow Treaty storage neared full. The Arrow Reservoir reached its highest level for the year, elevation 1442.6 feet, on 11 July 1996. The Arrow Treaty storage content continued to fill and reached its highest level for the year of 3587 ksfd (7.1 maf) or 100% of full, on 30 July.

With the increased Keenleyside discharges in late July and August, the Arrow Reservoir drafted to elevation 1437.6 feet by the end of August. The Keenleyside discharge peaked for the summer at 88 kcfs in early August. By 30 September, the Arrow Reservoir level had drafted to elevation 1428.4 feet, with Treaty storage of 3043 ksfd (6.0 maf) or 85% of full.

To minimize spill at the Kootenay River plants in Canada and maintain Koocanusa water levels in Canada, the Canadian and U.S. Entities agreed to a Libby-Arrow water transfer for the late summer of 1996. Under the agreement, Libby volume releases were reduced by a total of 200 ksfd through August, and an equal amount of water was released from Arrow Reservoir. This Arrow water effectively stored in Libby will be returned to Arrow Reservoir in the October to December period.

Duncan Reservoir

As shown in Chart 8, the Duncan reservoir level was elevation 1888.4 feet (3.6 feet below full) on 31 July 1995. The reservoir filled to elevation 1892.0 feet by 29 August 1995.

During the month of September and early October, Duncan discharged an average of 8 kcfs to maintain the Kootenay Lake levels and Kootenay Lake flows. The project discharge was reduced to minimum in late October and remained at 100 cfs for most of November. Higher discharges in late December were necessary to again support Kootenay Lake levels and flows. The Duncan Reservoir level on 31 December 1995 was elevation 1867.2 feet (70% of full). During early November and early December project releases were reduced in an effort to assist in flood control efforts downstream in the U.S. The project also went to minimum in early December when Kootenay Lake temporarily exceeded the IJC level. These operations contributed to later exceedance of the Duncan flood control curve.

During January, the Duncan discharge increased to 10 kcfs. The reservoir was drafted throughout February and April, other than short reductions to low discharges (as low as 100 cfs) to meet Kootenay Lake IJC levels. The Duncan reservoir exceeded its Treaty flood control curve in mid-January but, with the concurrence of the U.S. Entity and Corps of Engineers, remained above this curve (while continuing to draft) until late April. The Duncan reservoir reached its lowest level for the year, elevation 1798.7 feet (4.5 feet above empty), on 2 May 1996.

The Duncan discharge was reduced to minimum, 100 cfs, on 1 May to begin refilling the reservoir. The reservoir level reached elevation 1821.2 feet by 31 May and elevation 1865.4 feet by 30 June. Duncan remained on minimum discharge until 12 July. At that time discharge was increased to slow the rate of reservoir refill. The Duncan reservoir reached elevation 1892.2 feet (0.2 feet above full) on 31 July 1996.

Duncan passed inflow for the remainder of August to maintain the reservoir near full pool. On 3 September, the Duncan discharge was increased to start drafting the reservoir and fill Kootenay Lake. Duncan had drafted to elevation 1883.7 feet by 30 September 1996.

Libby Reservoir

As shown in Chart 9, Lake Koocanusa started the operating year at elevation 2456.6 feet, 12 feet higher than last year and 2.4 feet below full. The lake reached its peak summer level of elevation 2456.90 feet on 25 October 1995.

Libby started the operating year with an imposed maximum outflow limit of 20 kcfs, the hydraulic capacity of 4 units since Unit # 3 was expected to be out of service until November. This limit was set by the State of Montana to prevent possible high Total Dissolved Gas (TDG) amounts caused by spillway use. The first 4 days of August saw a continuation of Libby release at 16 kcfs, along with an Arrow release of 4 kcfs, to complete the transfer of 194 ksfd of Arrow storage to Libby, with return callable by B.C. Hydro between Labor Day and 31 December 1995. The pool level on 4 August was elevation 2455.8 feet versus 2447.2 feet if the original 20 kcfs limit had been released through the July-August period. Libby outflows were maintained at 16 kcfs through 16 August, and then inflow for the remainder of the month. The month-end pool level was elevation 2454.2 feet or 8.0 feet above the AER level of 2446.2 feet.

September and October saw selective releases of 4 kcfs for an on-going Montana Department of Fish, Wildlife, and Parks fishery study, boat ramp work, and bridge pier removal. On 27 October, the outflow was increased to 20 kcfs to begin drafting the lake to its 31 December flood control level of elevation 2411 feet. This outflow was maintained until 27 November when the outflow was reduced to 4 kcfs through to 5 December as the Columbia River system was on flood control to reduce possible flood stage forecast at Vancouver, Washington. On 6 December, outflows were again increased to 20 kcfs to continue drafting to meet Libby flood control requirements. On 11 December, Unit # 3, which had been out of service since May 1993, was returned to service and outflows were increased to 26 kcfs. Due to the restrictive outflow capability and local stream flows respectively of 180% and 227% of normal in November and December, Libby's 31 December pool level elevation 2420.7 feet or 9.1 feet above the flood control level and TSR level of 2411 feet. Inflow during the October-December period was 169 percent of normal.

With the January early bird water supply forecast being 115% of normal for the April to August outflow during January was near full load in order to draft to the flood control level of elevation 2358 feet by 31 January. As in previous months, high inflows and restrictive outflow resulted in an actual pool level of elevation 2385.5 feet by that date.

February started out with 20-22 kcfs outflows as the above snowpack required heavy drafting of the lake. By 8 February, flood stage conditions in the Portland-Vancouver Harbor and Kootenay Lake exceedence its IJC rule curve required reducing Libby outflow to near inflow of 7 kcfs. The last half of February saw outflows about 10 kcfs, as the Kootenay Lake IJC draft continued. By 29 February, the pool was at elevation 2371.6 feet, 33.7 feet above the AER level of elevation 2337.9 feet and 63.9 feet above the flood control pool of elevation 2307.7 feet.

Outflows during the first week of March were maintained near 12 kcfs. From March 9 through April 9, Libby released inflow in the 4-6 kcfs range, as its flood control draft was limited by Kootenay Lake's IJC level. By 31 March, Libby's level was at elevation 2366.0 feet or 79 feet above the 31 March flood control pool of elevation 2287 feet.

Most of April saw flows in the 10 to 23 kcfs range to further draft for flood control. The April draft was restricted somewhat this year as the Kootenay Lake Board of Control made a ruling on the method to calculate IJC. In previous years, observed inflow to Kootenay Lake was used to calculate the lowering formula. This year, the natural inflow was used, resulting in a lower allowable level of the lake early in the spring, then a higher level during the spring runoff period. Libby's pool by 30 April was elevation 2362.9 feet or 52 feet above the flood control level of elevation 2310.7 feet. The January-April runoff was 169% of normal.

Because of the Total Dissolved Gas concern based on spill at Libby, the May, June, and July operation to meet the sturgeon BiOp flows was held off during filling while inflows were above 25 kcfs. Because of changing volume forecasts during the July-August period, several proposals for increasing discharge were discussed and evaluated related to the 1996 Sturgeon spawning enhancement. These proposals were introduced by various groups, i.e., U.S. Fish & Wildlife Service (USF&W), Kootenay River Steering Committee, and the Technical Management Team. Outflows during the last half of May and during June were maintained at full powerhouse of near 25-28 kcfs because above normal runoff had the lake filling 1-3 feet per day. Late June saw the USF&W request a 5-day fluctuation of 25 kcfs to 12 kcfs and back to 25 kcfs for sturgeon recruitment. Originally to be initiated by water temperature, this request was made based on sturgeon movement as water temperatures remained below the target values.

Initially the discharge in July was to be full load of 25 kcfs as there was concern the project would not be able to provide flow pulsing flexibility for Sturgeon spawning while preventing the project from filling and spilling prior to the end of August. On 5 July, outflows were reduced to 14 kcfs to prepare for a pulse of 24 kcfs on 10-12 July requested by the Kootenay River Steering Committee. This was followed by flows of near 10 kcfs to maintain 11 kcfs at Bonners Ferry. Libby refilled at month's end, to elevation 2458.96 feet.

The first 12 days of August saw Libby releasing 24 kcfs, reducing to 12-14 kcfs for the remainder of the month because of high water difficulties near Bonners Ferry. Libby did not release its full BiOp volume allocation due to the Arrow Libby swap of nearly 200 ksfd, and this water was delivered from Arrow Lakes instead. September outflows were in the 8-12 kcfs range for an on-going Montana Fish, Wildlife & Parks fishery study. The observed pool level on 30 September 1996 was elevation 2448.7 feet, while the proportional draft point (PDP) was elevation 2432.3 feet. The April - August seasonal runoff was 131 percent of normal.

Kootenay Lake

As shown in Chart 10, the level of Kootenay Lake at Queens Bay was elevation 1743.2 feet on 31†July 1995, and the level at Nelson was already below the late summer IJC maximum level of elevation 1743.32 feet. Discharges were adjusted to pass inflow during August.

For the month of September, the Kootenay Lake discharge was adjusted to keep the downstream Brilliant plant at full load without spill, approximately 19 kcfs. The lake level dropped to a low of elevation 1742.7 feet (2.6 feet below the IJC level) on 30 October. For the rest of November and early December the lake was refilled.

The lake exceeded the IJC level by 0.2 feet on 1 December, 1995 and outflows from Duncan were reduced to minimum at this time to lower the lake level. Both Libby and Duncan reduced discharges to control the Kootenay Lake level. By 31 December 1995 the lake was at near full pool at elevation 1744.9 feet (0.4 feet from full pool).

Beginning in January, Kootenay Lake was drafted to avoid violating the IJC Order. The lake did again exceed the IJC order level on 10 February 1996, reaching compliance with the order several days later. Duncan discharges were reduced to assist in drafting the lake below the IJC level. Local inflows into Kootenay Lake at this time peaked at 58.5 kcfs. The lake then continued to draft, reaching its lowest level for the year, elevation 1739.1 feet, on 7 April 1996. The lake level exceeded the threshold IJC level, elevation 1739.32 feet, on 9 April, 1996 and began filling.

Inflows to Kootenay Lake increased throughout May, and the lake reached its peak level for the year, elevation 1751.9 feet, on 10 June. With receding runoff in the latter part of June and reduced Libby discharges in July, Kootenay Lake drafted, with the lowest summer lake elevation occurring on 29 August with a level of elevation 1743.8 feet. The Nelson gauge level dropped below the IJC summer level of elevation 1743.32 feet on 25 August 1996. Lake discharges were adjusted to keep the Nelson gauge level below elevation 1743.32 feet until the end of August. During September, lake discharges were set to avoid spill at Brilliant, and the lake refilled to elevation 1744.9 feet by 30 September 1996.

During 1996, an interpretation on the IJC order was requested from the Board of Control by the U.S. Army Corps of Engineers. The past interpretation had been that the regulated inflows (equal to or less than the natural flows) into Kootenay Lake should be used for the calculation of the IJC level. The Board of Control ruled that the natural (unregulated) flows are to be used in the calculation.

Storage Transfer Agreements

In the 1995-96 operating year, the Canadian and U.S. Entities entered into a storage transfer agreement for the summer of 1996 in which increased releases from Canadian Treaty projects were used to reduce the outflow from Libby. This operation resulted in about 200 ksfd less water being released from Libby during August, reducing the amount of spill at Canadian power plants on the Kootenay River, and maintaining higher Lake Koocanusa levels in Canada and the U.S. than would otherwise have resulted/occurred, thus improving recreation. The additional water taken out of Columbia River Treaty Storage will be returned by 31 December 1996.

VI Power and Flood Control Accomplishments

General

During the period covered by this report, Duncan, Arrow, and Mica reservoirs were operated in accordance with the Columbia River Treaty. Specifically, the operation of the reservoirs was governed by the:

1. "Detailed Operating Plan for Columbia River Treaty Storage - 1 August 1995 through 31 July 1996," dated August 1995.
2. "Detailed Operating Plan for Columbia River Treaty Storage - 1 August 1996 through 31 July 1997," dated 1 August 1996.
3. "Columbia River Treaty Flood Control Operating Plan," dated October 1972.
4. "Columbia River Treaty Entity Agreement On Operation of Treaty Storage for Non-Power Uses for January 1, 1996 through July 31, 1997." dated 30 April 1996.

Consistent with all Detailed Operating Plans (DOP) prepared since the installation of generation at Mica, the 1995-96 DOP was designed to achieve optimum power generation at-site in Canada and downstream in Canada and the United States, in accordance with paragraph 7 of Annex A of the Treaty. As contemplated in the March 1991 Entity Agreement on "Options for the Development of the Detailed Operating Plan for Operating Year 1995-96", the 1995-96 Options for Development of the Detailed Operating Plan, prepared in January 1991, was used as the basis for the preparation of the 1995-96 DOP.

During the period covered by this report, Libby reservoir was operated in accordance with the 1972 "Columbia River Treaty Flood Control Operating Plan," as amended by the U.S. Army Corps of Engineers (ACE) "Review of Flood Control, Columbia River Basin, Columbia River & Tributaries Study, CRT-63", dated June 1981. During the operating year, Libby operated for storage and releases required for endangered White Sturgeon and Salmon as required by both the U.S. Fish and Wildlife Service and the National Marine Fishery Service Biological Opinions. The Canadian Entity has given notice that it considers the BiOp fishery operation to be inconsistent with the DOP and Columbia River Treaty.

Power Deliveries

The Canadian Entitlement to downstream power benefits from Duncan, Arrow and Mica for the 1995-96 operating year had been purchased in 1964 by the Columbia Storage Power Exchange (CSPE). In accordance with the Canadian Entitlement Exchange Agreement dated 13 August 1964, the U.S. Entity delivered capacity and energy to the CSPE participants. The generation at downstream projects in the United States, delivered under the Canadian Entitlement Exchange, was 268 average megawatts from 1 August 1995 through 31 March 1996 and 254 average megawatts from 1 April through 31 July 1996. Capacity deliveries were up to 576 megawatts from 1 August 1995 through 31 March 1996 and 486†megawatts from 1 April through 31 July 1996.

In accordance with the Entity Agreement on the Determination of Downstream Power Benefits for Operating Year 1995-96, the Canadian Entity delivered to the U.S. Entity 2.0 average megawatts of annual energy and no dependable capacity during the period 1 August 1995 through 31 March 1996. In accordance with the Entity Agreement on the Determination of Downstream Power Benefits for Operating Year 1996-97, the Canadian Entity delivered to the U.S. Entity 0.9 average megawatts of annual energy and no dependable capacity during the period 1 April 1996 through 31 July 1996. These energy deliveries were required by Section 7 of the August 1964 Canadian Entitlement Purchase Agreement.

In accordance with the 1995-96 DOP, and as required in the March 1991Entity Agreement on "Options for Development of the Detailed Operating Plan for Operating Year 1995-96", the U.S. Entity delivered to the Canadian Entity 20.9 megawatts of average annual energy, minus 3 percent losses, and no dependable capacity, during the period 1 August 1995 through 31 July 1996. This energy represents the increase in the purchases portion of the Canadian Entitlement resulting from including the effect of firm energy shifting in the Assured Operating Plan.

Power Operations

The Coordinated System storage level at the beginning of the 1995-96 operating year was 89.2 percent full which resulted in the System adopting a 1st-year firm energy load carrying capability (FELCC) from the critical period studies. Due to above average stream flows throughout the year, the system generally operated to Operating Rule Curve (ORC) or flood control for the entire period, producing large amounts of surplus energy. The system storage energy reached 99.4 percent full on 31 July 1996, and the system adopted 1st-year FELCC from the 1996-97 PNCA Final Regulation study.

The following table shows the status of the energy stored in Coordinated System reservoirs at the end of each month in the 1995/96 operating year compared to the ORC (or proportioned draft points were applicable). Normal full Coordinated System reservoir storage energy is approximately 63.7 thousand (K-MW-Mo).

END OF PERIOD ENERGY STORAGE

	Coordinated System Storage			Canadian Treaty Storage		
Period	ORC/PDP (K-MW-Mo)	Actual (K-MW-Mo)	Difference (K-MW-Mo)	ORC/PDP (K-MW-Mo)	Actual (K-MW-Mo)	Difference (K-MW-Mo)
Aug-95	55.2	58.3	3.2	21.4	21.1	-0.3
Sep-95	51.9	56.3	4.4	20.5	20.2	-0.3
Oct-95	51.1	54.2	3.1	20.9	20.1	-0.8
Nov-95	50.7	55.5	4.8	19.7	20.1	0.4
Dec-95	48.3	51.9	3.6	17.7	18.5	0.8
Jan-96	34.0	41.2	7.2	10.0	12.8	2.8
Feb-96	28.1	35.4	7.3	5.4	7.9	2.5
Mar-96	21.6	23.5	1.9	4.2	5.0	0.8
Apr-96	23.5	25.8	2.3	3.3	5.4	2.1
May-96	32.6	35.3	2.7	5.5	8.6	3.1
Jun-96	55.9	52.3	-3.6	17.0	15.9	-1.1
Jul-96	62.9	63.0	0.1	22.0	22.1	0.1

As of 30 September 1995, the sum of Canadian Treaty storage was positioned 194 ksfd below the AER study storage total as per terms of the 1995 Libby-Arrow water transfer agreement. The two Entities agreed to return Treaty storage to the AER study level such that half of the difference (97 ksfd) would be filled during the U.S. Vernita Bar spawning season, with the other half being filled during the Canadian whitefish spawning season.

Treaty operations during the period December 1995 through April 1996 were planned to facilitate meeting fisheries objectives in Canada and the U.S. These objectives covered mountain whitefish and rainbow trout spawning in Canada between Keenleyside Dam and the border, and Vernita Bar, and Flow Augmentation storage of up to 1 maf (subject to flood control limits) for U.S. salmon objectives.

In order to keep Keenleyside discharges as low as possible during the mountain whitefish spawning period, B.C. Hydro and BPA agreed that BPA would forego their Treaty provisional draft right of 5 kcfs during the peak spawning season in return for "in lieu" energy during the same period.

Rather than being obligated to return the in-lieu energy to B.C. Hydro after the spawning period, BPA decided to "pre-store" this energy with BC Hydro during light load hours (LLH) in the latter part of October 1995. B.C. Hydro made 50% of its LLH import capability during late October available for these in-lieu pre-storage deliveries, and BPA stored 77.2 GWh.

It was intended that the energy be returned to BPA in LLH during the peak mountain whitefish spawning period in lieu of provisional draft water releases. All of the pre-stored energy was to have been returned to BPA by 31 December 1995. However, with a warm and wet December, this energy, if returned to BPA, would have been spilled. Therefore, B.C. Hydro agreed to extend the energy return date to 31 March 1996.

In January, the Keenleyside Treaty discharge was reduced from 85 kcfs to 60 kcfs for approximately one week to keep mountain whitefish spawning at the lowest practical river levels. In return, the U.S. received the right to an equivalent flexibility draft below AER (188 ksfd) on Treaty storage between Labor Day 1996 and the start of the mountain whitefish spawning period (nominally 1 December 1996). The flexibility draft is to be returned by 30 April 1997, excluding March to avoid reducing whitefish incubation flows.

During the January through July 1996 period, water was retained in Arrow above its PDP under terms of the 1995-96 Entity Agreement on the Operation of Treaty Storage for Non-Power uses and the flood control requirements for the February flood event. By 30 April 1996, the Arrow Treaty elevation was approximately 1.5 maf above PDP elevation. During the May through July period, this water was released to augment lower Columbia River stream flows for salmon migration in the U.S. in a manner consistent with Canadian needs for trout spawning and progressive Arrow refill. Considering the higher than normal stream flows and unusual hydrologic events, U.S. and Canadian fisheries objectives were satisfied to the extent possible.

Higher than normal stream flows coupled with BPA load reductions produced substantial surplus throughout the 1995-96 operating year. The following table is a summary of non-firm and surplus firm sales to Northwest and Southwest utilities (in MW-months) and federal purchases during August 1995 through July 1996.

BPA PURCHASES WITH NON-FIRM AND SURPLUS FIRM SALES (MW-Months)

Period	Purchases*	Sales To Northwest		Sales To Southwest	
		Non-Firm	Surplus Firm	Non-Firm	Surplus Firm
Aug 95	169	377	67	175	397
Sep 95	105	47	16	119	480
Oct 95	992	597	308	763	761
Nov 95	869	519	702	1365	791
Dec 95	484	1522	1095	2247	759
Jan 96	335	650	1706	1847	1662
Feb 96	189	869	1719	512	1637
Mar 96	200	2028	762	1105	1020
Apr 96	138	1063	1014	1528	1602
May 96	0	1110	1075	703	2369
Jun 96	0	38	16	0	0
Jul 96	51	(est) 1047	(est) 598	(est) 763	(est) 3383
TOTAL	3531	9867	9078	11127	14861

* Previous years' reports did not include spot purchases.

Flood Control

The Columbia River Basin reservoir system, including the Columbia River Treaty projects, was operated for flood control twice during the winter of 1995-96. In both instances, most of the flood contribution came from the Willamette River and lower Columbia River tributaries.

Treaty projects' outflows were reduced to alleviate flooding conditions in the Portland-Vancouver harbor during both of these high water events as upper Basin projects were drafting heavily in preparation for the spring runoff. Flood control operation consisted of reducing draft flows to near inflow, hence a hydrograph for this period is not included in this report. Regulated flows at The Dalles were 323,600 cfs on 3 December 1995 and 376,400 cfs on 10 February 1996. The unregulated flows were 446,000 cfs on 2 December 1995 and 483,000 cfs on 11 February 1996.

With a flood stage at Vancouver of 16 feet, the observed peak stage on 1 December 1995 was 18.5 feet. A significantly higher stage occurred during the February high water with a peak stage of 27.2 feet on 9 February 1996. The unregulated stages for these two events would have been 22.8 feet on 3 December 1995 and 29.0 feet on 11 February 1996, respectively.

Slightly below flood stage conditions at Vancouver, Washington occurred during the spring runoff with significant flood control provided by Treaty projects. The observed and unregulated hydrographs for the Columbia River at The Dalles between 1 April 1996 and 31 July 1996 are shown on Chart 14. The unregulated peak flow at The Dalles would have been 718,480 cfs on 11 June 1996 and it was controlled to a maximum of 455,700 cfs on 11 June 1996.

The observed peak stage at Vancouver, Washington was 14.9 feet on 13 June 1996 and the unregulated stage would have been 24.4 feet on 12 June 1996. Chart 15 documents the relative filling of Arrow and Grand Coulee during the principal filling period, and compares the regulation of these two reservoirs to guidelines in the Treaty Flood Control Operating Plan. Because of earlier minimum fishery releases and this year's runoff pattern, drafting of Arrow lakes prior to the spring runoff resulted with no flood control operation at Arrow after 30 April 1995 as the curve on Chart 15 did not guide the operation after that date.

Computations of the Initial Controlled Flow (ICF) for system flood control operation were made in accordance with the Treaty Flood Control Operating Plan. Computed Initial Controlled Flows at The Dalles were 387,000 cfs on 1 January 1996, 407,000 cfs on 1 February, 400,000 cfs on 1 March, 365,000†cfs on 1 April, and 396,000 cfs on 1 May. As mentioned earlier, the observed peak flow at The Dalles was 455,700 cfs. Data for the 1 May ICF computation are given in Table 6.

Table 1
Unregulated Runoff Volume Forecasts
Million of Acre-Feet
1996

Forecast Date - 1st of	Duncan Most Probable 1 April - 31 August	Arrow Most Probable 1 April - 31 August	Mica Most Probable 1 April - 31 August	Libby Most Probable 1 April - 31 August	Columbia River at The Dalles, Oregon Most Probable 1 April - 31 August
January	2.4	26.2	13.3	7.6	102.0
February	2.3	26.5	13.5	7.7	105.0
March	2.3	26.0	13.0	8.0	105.0
April	2.2	25.7	12.9	7.7	97.1
May	2.2	26.3	13.1	8.0	108.0
June	2.3	26.2	12.8	8.6	115.0
Actual	2.3	25.4	12.5	8.3	111.1

NOTE: These data were used in actual operations. Subsequent revisions have been made in some cases.

TABLE 2
1996 Variable Refill Curve
Mica Reservoir

			INITIAL	JAN 1	FEB 1	MAR 1	APR 1	MAY 1	JUN 1
"PROBABLE DATE-31JULY INFLOW, KAF"				10977.3	11194.9	10513.5	10146.2	9670.2	7830.5
"PROBABLE DATE-31JULY INFLOW, KSFD"				5534.4	5644.0	5300.5	5115.3	4875.3	3947.8
"95% FORECAST ERROR FOR DATE, KSFD"				682.7	551.3	513.4	460.4	440.9	470.5
"95% CONF.DATE-31JULY INFLOW, KSFD"	1/			4851.7	5092.7	4787.1	4654.9	4434.4	3477.3
"ASSUMED FEB1-JUL31 INFLOW,% OF VOL."				100.0					
"ASSUMED FEB1-JUL31 INFLOW, KSFD"	2/			4851.7					
"FEB MINIMUM FLOW REQUIREMENT,CFS"	3/			3000.0					
"MIN FEB1-JUL31 OUTFLOW, KSFD"	4/			2165.0					
"MIN JAN31 RESERVOIR CONTENT, KSFD"	5/			842.5					
"MIN JAN31 RESERVOIR CONTENT, FEET"	6/			2414.0					
"JAN31 ECC, FT"	7/			2410.1					
"BASE ECC, FT"			2410.1						
"LOWER LIMIT, FT"		2406.6							
"ASSUMED MAR1-JUL31 INFLOW,% OF VOL."				97.7	97.7				
"ASSUMED MAR1-JUL31 INFLOW, KSFD"	2/			4740.1	4975.6				
"MAR MINIMUM FLOW REQUIREMENT,CFS"	3/			3000.0	3000.0				
"MIN MAR1-JUL31 OUTFLOW, KSFD"	4/			2078.0	2078.0				
"MIN FEB28 RESERVOIR CONTENT, KSFD"	5/			867.1	631.6				
"MIN FEB28 RESERVOIR CONTENT, FEET"	6/			2414.5	2409.1				
"FEB28 ECC, FT"	7/			2398.5	2398.5				
"BASE ECC, FT"			2398.5						
"LOWER LIMIT, FT"		2394.1							
"ASSUMED APR1-JUL31 INFLOW,% OF VOL."				95.3	95.3	97.5			
"ASSUMED APR1-JUL31 INFLOW, KSFD"	2/			4623.7	4853.3	4667.4			
"APR MINIMUM FLOW REQUIREMENT,CFS"	3/			10000.0	10000.0	10000.0			
"MIN APR1-JUL31 OUTFLOW, KSFD"	4/			1985.0	1985.0	1985.0			
"MIN MAR31 RESERVOIR CONTENT, KSFD"	5/			890.5	660.9	846.8			
"MIN MAR31 RESERVOIR CONTENT, FEET"	6/			2415.1	2409.7	2414.1			
"MAR31 ECC, FT"	7/			2382.1	2382.1	2382.1			
"BASE ECC, FT"			2382.1						
"LOWER LIMIT, FT"		2394.1							
"ASSUMED MAY1-JUL31 INFLOW,% OF VOL."				90.4	90.4	92.4	94.8		
"ASSUMED MAY1-JUL31 INFLOW, KSFD"	2/			4385.9	4603.8	4423.3	4412.8		
"MAY MINIMUM FLOW REQUIREMENT,CFS"	3/			10000.0	10000.0	10000.0	10000.0		
"MIN MAY1-JUL31 OUTFLOW, KSFD"	4/			1685.0	1685.0	1685.0	1685.0		
"MIN APR30 RESERVOIR CONTENT, KSFD"	5/			828.3	610.4	790.9	801.4		
"MIN APR30 RESERVOIR CONTENT, FEET"	6/			2413.6	2408.6	2412.8	2413.0		
"APR30 ECC, FT"	7/			2366.9	2366.9	2366.9	2366.9		
"BASE ECC, FT"			2366.9						
"ASSUMED JUN1-JUL31 INFLOW,% OF VOL."				72.6	72.6	74.2	76.0	80.2	
"ASSUMED JUN1-JUL31 INFLOW, KSFD"	2/			3522.3	3697.3	3552.1	3537.7	3556.4	
"JUN MINIMUM FLOW REQUIREMENT, CFS"	3/			20000.0	20000.0	20000.0	20000.0	20000.0	
"MIN JUN1-JUL31 OUTFLOW, KSFD"	4/			1375.0	1375.0	1375.0	1375.0	1375.0	
"MIN MAY31 RESERVOIR CONTENT, KSFD"	5/			1381.9	1206.9	1352.1	1366.5	1347.8	
"MIN MAY31 RESERVOIR CONTENT, FEET"	6/			2426.1	2422.2	2426.4	2425.7	2425.3	
"MAY31 ECC, FT"	7/			2369.9	2369.9	2369.9	2369.9	2369.9	
"BASE ECC, FT"			2369.9						
"ASSUMED JUL1-JUL31 INFLOW,% OF VOL."				35.8	35.9	36.7	37.8	39.7	49.5
"ASSUMED JUL1-JUL31 INFLOW, KSFD"	2/			1741.8	1828.3	1756.9	1750.2	1760.5	1721.3
"JUL MINIMUM FLOW REQUIREMENT, CFS"	3/			25000.0	25000.0	25000.0	25000.0	25000.0	25000.0
"MIN JUL1-JUL31 OUTFLOW, KSFD"	4/			775.0	775.0	775.0	775.0	775.0	775.0
"MIN JUN30 RESERVOIR CONTENT, KSFD"	5/			2562.4	2475.9	2547.3	2554.0	2543.7	2582.9
"MIN JUN30 RESERVOIR CONTENT, FEET"	6/			2450.9	2449.1	2450.6	2450.7	2450.6	2451.3
"JUN30 ECC, FT"	7/			2396.9	2396.9	2396.9	2396.9	2396.9	2396.9
"BASE ECC, FT"			2396.9						
"JUL 31 ECC, FT"				2469.8	2469.8	2469.8	2469.8	2469.8	2469.8

** FORECAST START DATE IS 1FEB OR LATER. OBSERVED INFLOW FROM 1JAN-DATE IS SUBTRACTED.
1/ PROBABLE INFLOW MINUS (95% ERROR & JAN1-DATE INFLOW). 2/ PRECEEDING LINE TIMES 1/.
3/ POWER DISCHARGE REQUIREMENTS. 4/ CUMULATIVE MINIMUM OUTFLOW FROM 3/,DATE TO JULY."
5/ FULL CONTENT (3529.2 KSFD) PLUS 4/ MINUS /2. 6/ ELEV FROM 5/, INTERP FR STORAGE CONTENT TABLE.A143"
7/ LOWER OF ELEV. FROM 6/ OR BASE ECC DETERMINED PRIOR TO YR (INTL), BUT NOT LESS THAN LOWER LIMIT.

TABLE 3

1996 Variable Refill Curve

Arrow Reservoir

	INITIAL	JAN 1	FEB 1	MAR 1	APR 1	MAY 1	JUN 1
		Local	Local	Local	Local	Local	Local
"PROBABLE DATE-31JULY INFLOW, KAF"		12079.1	12206.5	11762.0	11166.7	10414.0	7957.9
& IN KSFD **		6089.9	6154.1	5930.0	5629.9	5250.4	4012.1
"95% FORECAST ERROR FOR DATE IN KSFD"		822.5	651.0	572.3	474.5	457.7	508.1
"95% CONF.DATE-31JULY INFLOW, KSFD" 1/		5267.4	5503.1	5357.7	5155.4	4792.7	3504.0
"ASSUMED FEB1-JUL31 INFLOW, % OF VOL."		100.0					
"ASSUMED FEB1-JUL31 INFLOW, KSFD" 2/		5267.4					
"MIN FEB1-JUL31 OUTFLOW, KSFD" 3/		2970.0					
"MICA REFILL REQUIREMENTS, KSFD" 4/		3793.0					
"MIN FEB28 RESERVOIR CONTENT, KSFD" 5/		-2510.8					
"MIN JAN31 RESERVOIR CONTENT, FEET" 6/		1377.9					
"JAN31 ECC, FT" 7/		1392.1					
"BASE ECC, FT"	1412.6						
"LOWER LIMIT, FT"	1392.1						
"ASSUMED MAR1-JUL31 INFLOW,% OF VOL."		97.0	97.0				
"ASSUMED MAR1-JUL31 INFLOW, KSFD" 2/		5109.4	5338.0				
"MIN MAR1-JUL31 OUTFLOW, KSFD" 3/		2825.0	2825.0				
"MICA REFILL REQUIREMENTS, KSFD " 4/		3126.0	3178.5				
"MIN FEB28 RESERVOIR CONTENT, KSFD" 5/		-1830.8	-2111.9				
"MIN FEB28 RESERVOIR CONTENT, FEET " 6/		1377.9	1377.9				
"FEB28 ECC, FT" 7/		1383.8	1383.8				
"BASE ECC, FT"	1397.8						
"LOWER LIMIT, FT" 1383.8							
"ASSUMED APR1-JUL31 INFLOW, % OF VOL."		93.7	93.7	96.6			
"ASSUMED APR1-JUL31 INFLOW, KSFD" 2/		4935.6	5156.4	5175.5			
"MIN APR1-JUL31 OUTFLOW, KSFD" 3/		2670.0	2670.0	2670.0			
"MICA REFILL REQUIREMENTS, KSFD" 4/		2444.0	2496.5	2444.0			
"MIN MAR31 RESERVOIR CONTENT, KSFD"5/		-1130.0	-1403.3	-1369.9			
"MIN MAR31 RESERVOIR CONTENT, FEET "6/		1377.9	1377.9	1377.9			
"MAR31 ECC, FT" 7/		1382.3	1382.3	1382.3			
"BASE ECC, FT"	1401.2						
"LOWER LIMIT, FT"	1382.3						
"ASSUMED MAY1-JUL31 INFLOW,% OF VOL."		85.5	85.5	88.1	91.2		
"ASSUMED MAY1-JUL31 INFLOW, KSFD" 2/		4503.6	4705.2	4720.1	4701.7		
"MIN MAY1-JUL31 OUTFLOW, KSFD" 3/		2445.0	2445.0	2445.0	2445.0		
"MICA REFILL REQUIREMENTS, KSFD " 4/		1664.0	1718.5	1664.0	1827.0		
"MIN APR30 RESERVOIR CONTENT, KSFD" 5/		-143.0	-399.1	-359.5	-504.1		
"MIN APR30 RESERVOIR CONTENT, FEET" 6/		1377.9	1377.9	1377.9	1377.9		
"APR30 ECC, FT" 7/		1377.9	1377.9	1377.9	1377.9		
"BASE ECC, FT"	1403.8						
"ASSUMED JUN1-JUL31 INFLOW,% OF VOL."		61.2	61.2	63.1	65.3	71.6	
"ASSUMED JUN1-JUL31 INFLOW, KSFD" 2/		3223.6	3367.9	3380.7	3366.5	3431.6	
"MIN JUN1-JUL31 OUTFLOW, KSFD" 3/		2135.0	2135.0	2135.0	2135.0	2135.0	
"MICA REFILL REQUIREMENTS, KSFD" 4/		1354.0	1406.6	1354.0	1317.0	1354.0	
"MIN MAY31 RESERVOIR CONTENT,KSFD"5/		1137.0	940.1	979.9	1031.1	929.0	
"MIN MAY31 RESERVOIR CONTENT,FEET "6/		1402.4	1398.6	1399.3	1400.4	1398.3	
"MAY31 ECC, FT" 7/		1402.4	1398.6	1399.3	1400.4	1398.3	
"BASE ECC, FT"	1418.1						
"ASSUMED JUL1-JUL31 INFLOW,% OF VOL."		25.6	25.6	26.4	27.4	30.0	41.9
"ASSUMED JUL1-JUL31 INFLOW, KSFD " 2/		1348.5	1408.8	1414.4	1412.6	1437.8	1468.2
"MIN JUL1-JUL31 OUTFLOW, KSFD" 3/		1085.0	1085.0	1085.0	1085.0	1085.0	1085.0
"MICA REFILL REQUIREMENTS, KSFD " 4/		1054.0	1106.5	1054.0	1017.0	1054.0	922.4
"MIN JUN30 RESERVOIR CONTENT,KSFD" 5/		2262.1	2149.3	2196.2	2235.0	2172.8	2274.0
"MIN JUN30 RESERVOIR CONTENT,FEET" 6/		1422.8	1420.9	1421.7	1422.4	1421.3	1423.0
"JUN30 ECC, FT" 7/		1422.8	1420.9	1421.7	1422.4	1421.3	1423.0
"BASE ECC, FT"	1436.7						
"JUL 31 ECC, FT"		1444.0	1444.0	1444.0	1444.0	1444.0	1444.0

** FORECAST START DATE IS 1FEB OR LATER. OBSERVED INFLOW FROM 1JAN-DATE IS SUBTRACTED.

1/ PROBABLE INFLOW MINUS (95% ERROR & JAN1-DATE INFLOW). 2/PRECEEDING LINE TIMES 1/.

3/ CUMMULATIVE MINIMUM OUTFLOW FROM DATE TO JULY, USING POWER DISCHARGE REQUIREMENTS"

4/ UPSTREAM DISCHARGE REQUIREMENT. 5/ FULL CONTENT (3579.6 KSFD) MINUS 2/ PLUS 3/ MINUS 4.

6/ ELEV. FROM 5/, INTERP. FROM STORAGE CONTENT TABLE"7/ LOWER OF ELEV. FROM 6/ OR ELEV DETERMINED PRIOR TO YEAR (INTIAL), BUT NOT LESS THAN LOWER LIMIT."

TABLE 4
1996 Variable Refill Curve
Duncan Reservoir

		INITIAL	JAN 1	FEB 1	MAR 1	APR 1	MAY 1	JUN 1
"PROBABLE DATE-31JULY INFLOW, KAF"			2032.3	1988.4	1951.1	1831.7	1734.5	1360.3
& IN KSFD"	**		1024.6	1002.5	983.7	923.5	874.5	685.8
"95% FORECAST ERROR FOR DATE,IN KSFD"			112.4	97.8	93.4	91.9	84.8	85.7
"95% CONF.DATE-31JULY INFLOW, KSFD"	1/		912.2	904.7	890.3	831.6	789.7	600.1
"ASSUMED FEB1-JUL31 INFLOW,% OF VOL."			100.0					
"ASSUMED FEB1-JUL31 INFLOW, KSFD"	2/		912.2					
"FEB MINIMUM FLOW REQUIREMENT,CFS "	3/		100.0					
"MIN FEB1-JUL31 OUTFLOW, KSFD"	4/		18.2					
"MIN JAN31 RESERVOIR CONTENT, KSFD"	5/		-188.2					
"MIN JAN31 RESERVOIR CONTENT, FEET"	6/		1794.2					
"JAN31 ECC, FT"	7/		1794.5					
"BASE ECC, FT"		1838.8						
"LOWER LIMIT, FT"		1794.5						
"ASSUMED MAR1-JUL31 INFLOW,% OF VOL."			97.9	97.9				
"ASSUMED MAR1-JUL31 INFLOW, KSFD"	2/		893.0	885.7				
"MAR MINIMUM FLOW REQUIREMENT,CFS"	3/		100.0	100.0				
"MIN MAR1-JUL31 OUTFLOW, KSFD"	4/		15.3	15.3				
"MIN FEB28 RESERVOIR CONTENT,KSFD"	5/		-171.9	-164.6				
"MIN FEB28 RESERVOIR CONTENT,FEET"	6/		1794.2	1794.2				
"FEB28 ECC, FT"	7/		1794.6	1794.6				
"BASE ECC, FT"		1838.5						
"LOWER LIMIT, FT"		1794.6						
"ASSUMED APR1-JUL31 INFLOW,% OF VOL."			95.4	95.4	97.5			
"ASSUMED APR1-JUL31 INFLOW, KSFD"	2/		870.2	863.1	868.0			
"APR MINIMUM FLOW REQUIREMENT,CFS"	3/		100.0	100.0	100.0			
"MIN APR1-JUL31 OUTFLOW, KSFD"	4/		12.2	12.2	12.2			
"MIN MAR31 RESERVOIR CONTENT,KSFD"	5/		-152.2	-145.1	-150.0			
"MIN MAR31 RESERVOIR CONTENT,FEET "	6/		1794.2	1794.2	1794.2			
"MAR31 ECC, FT"	7/		1794.4	1794.4	1794.4			
"BASE ECC, FT"		1838.8						
"LOWER LIMIT, FT"		1794.4						
"ASSUMED MAY1-JUL31 INFLOW,% OF VOL."			89.5	89.5	91.5	93.8		
"ASSUMED MAY1-JUL31 INFLOW, KSFD"	2/		816.4	809.7	814.6	780.0		
"MAY MINIMUM FLOW REQUIREMENT,CFS "	3/		100.0	100.0	100.0	100.0		
"MIN MAY1-JUL31 OUTFLOW, KSFD"	4/		9.2	9.2	9.2	9.2		
"MIN APR30 RESERVOIR CONTENT,KSFD"	5/		-101.4	-94.7	-99.6	-65.0		
"MIN APR30 RESERVOIR CONTENT,FEET "	6/		1794.2	1794.2	1794.2	1794.2		
"APR30 ECC, FT"	7/		1794.2	1794.2	1794.2	1794.2		
"BASE ECC, FT"		1837.1						
"ASSUMED JUN1-JUL31 INFLOW,% OF VOL."			68.7	68.7	70.2	72.0	76.7	
"ASSUMED JUN1-JUL31 INFLOW, KSFD"	2/		626.7	621.5	625.0	598.8	605.7	
"JUN MINIMUM FLOW REQUIREMENT,CFS"	3/		100.0	100.0	100.0	100.0	100.0	
"MIN JUN1-JUL31 OUTFLOW, KSFD"	4/		6.1	6.1	6.1	6.1	6.1	
"MIN MAY31 RESERVOIR CONTENT,KSFD"	5/		85.2	90.4	86.9	113.1	106.2	
"MIN MAY31 RESERVOIR CONTENT,FEET"	6/		1811.2	1812.1	1811.5	1815.8	1814.7	
"MAY31 ECC, FT"	7/		1811.2	1812.1	1811.5	1815.8	1814.7	
"BASE ECC, FT"		1850.6						
"ASSUMED JUL1-JUL31 INFLOW,% OF VOL."			32.1	32.1	32.8	33.7	35.9	46.8
"ASSUMED JUL1-JUL31 INFLOW, KSFD"	2/		292.8	290.4	292.0	280.2	283.5	280.8
"JUL MINIMUM FLOW REQUIREMENT,CFS"	3/		100.0	100.0	100.0	100.0	100.0	100.0
"MIN JUL1-JUL31 OUTFLOW, KSFD"	4/		3.1	3.1	3.1	3.1	3.1	3.1
"MIN JUN30 RESERVOIR CONTENT, KSFD"	5/		416.1	418.5	416.9	428.7	425.4	428.1
"MIN JUN30 RESERVOIR CONTENT, FEET"	6/		1857.8	1858.1	1857.9	1859.4	1859.0	1859.3
"JUN30 ECC, FT"	7/		1857.8	1858.1	1857.9	1859.4	1859.0	1859.3
"BASE ECC, FT"		1873.0						
"JUL 31 ECC, FT................."		1892.0	1892.0	1892.0	1892.0	1892.0	1892.0	

** FORECAST START DATE IS 1FEB OR LATER. OBSERVED INFLOW FROM 1JAN-DATE IS SUBTRACTED.
1/ PROBABLE INFLOW MINUS (95% ERROR & JAN1-DATE INFLOW). 2/PRECEEDING LINE TIMES 1/.
"3/ POWER DISCHARGE REQUIREMENTS. 4/ CUMULATIVE MINIMUM OUTFLOW FROM 3/,DATE TO JULY."
"5/ FULL CONTENT (705.8 KSFD) PLUS 4/ MINUS /2. 6/ ELEV FROM 5/, INTERP FROM STORAGE CONTENT TABLE.""7/ LOWER OF ELEV. FROM 6/ OR BASE ECC DETERMINED PRIOR TO YEAR (INTIAL),BUT NOT LESS THAN LOWER LIMIT."

TABLE 5

1996 Variable Refill Curve

Libby Reservoir

		INITIAL	JAN 1	FEB 1	MAR 1	APR 1	MAY 1	JUN 1
"PROBABLE DATE-31JULY INFLOW, KAF"			7534.0	7717.0	8138.0	7924.0	8239.0	8770.0
"PROBABLE DATE-31JULY INFLOW, KSFD"			3798.4	3890.7	4102.9	3995.0	4153.8	4421.5
"OBSERVED JAN1-DATE INFLOW, IN KSFD"			886.8	606.4	552.5	533.4	474.5	367.5
"95% FORECAST ERROR FOR DATE, KSFD"			0.0	157.8	324.2	485.0	933.2	1740.4
"95% CONF.DATE-31JULY INFLOW, KSFD"	1/		2911.6	3126.4	3226.2	2976.6	2746.1	2313.7
"ASSUMED FEB1-JUL31 INFLOW,% OF VOL."			97.1					
"ASSUMED FEB1-JUL31 INFLOW, KSFD"	2/		2828.3					
"FEB MINIMUM FLOW REQUIREMENT,CFS "	3/		4000.0					
"MIN FEB1-JUL31 OUTFLOW, KSFD"	4/		724.0					
"MIN JAN31 RESERVOIR CONTENT,KSFD"	5/		406.2					
"MIN JAN31 RESERVOIR CONTENT,FEET"	6/		2331.5					
"JAN31 ECC, FT"	7/		2333.3					
"BASE ECC, FT"		2416.6						
"LOWER LIMIT, FT"	2333.3							
"ASSUMED MAR1-JUL31 INFLOW,% OF VOL."			94.5	97.3				
"ASSUMED MAR1-JUL31 INFLOW, KSFD"	2/		2750.6	3040.5				
"MAR MINIMUM FLOW REQUIREMENT,CFS"	3/		4000.0	4000.0				
"MIN MAR1-JUL31 OUTFLOW, KSFD"	4/		612.0	612.0				
"MIN FEB28 RESERVOIR CONTENT, KSFD "	5/		371.9	82.0				
"MIN FEB28 RESERVOIR CONTENT, FEET "	6/		2328.3	2297.3				
"FEB28 ECC, FT"	7/		2328.3	2322.3				
"BASE ECC, FT"		2413.8						
"LOWER LIMIT, FT"	2322.3							
"ASSUMED APR1-JUL31 INFLOW,% OF VOL."			91.2	93.9	96.6			
"ASSUMED APR1-JUL31 INFLOW, KSFD"	2/		2656.6	2936.4	3115.9			
"APR MINIMUM FLOW REQUIREMENT,CFS"	3/		4000.0	4000.0	4000.0			
"MIN APR1-JUL31 OUTFLOW, KSFD"	4/		488.0	488.0	488.0			
"MIN MAR31 RESERVOIR CONTENT, KSFD"	5/		41.9	62.1	-117.4			
"MIN MAR31 RESERVOIR CONTENT, FEET"	6/		2325.4	2294.8	2260.9			
"MAR31 ECC, FT"	7/		2325.4	2294.8	2292.9			
"BASE ECC, FT"		2411.5						
"LOWER LIMIT, FT"	2292.9							
"ASSUMED MAY1-JUL31 INFLOW,% OF VOL."			83.2	85.7	88.1	94.0		
"ASSUMED MAY1-JUL31 INFLOW, KSFD"	2/		2422.8	2677.8	2841.6	2798.9		
"MAY MINIMUM FLOW REQUIREMENT,CFS"	3/		4000.0	4000.0	4000.0	4000.0		
"MIN MAY1-JUL31 OUTFLOW, KSFD"	4/		368.0	368.0	368.0	368.0		
"MIN APR30 RESERVOIR CONTENT, KSFD"	5/		455.7	200.7	36.8	79.6		
"MIN APR30 RESERVOIR CONTENT, FEET"	6/		2336.0	2310.9	2291.6	2297.0		
"APR30 ECC, FT"	7/		2336.0	2310.9	2291.6	2297.0		
"BASE ECC, FT"		2411.0						
"ASSUMED JUN1-JUL31 INFLOW,% OF VOL."			56.9	57.5	59.1	63.1	67.1	
"ASSUMED JUN1-JUL31 INFLOW, KSFD"	2/		1655.5	1797.7	1907.7	1878.8	1843.5	
"JUN MINIMUM FLOW REQUIREMENT,CFS "	3/		4000.0	4000.0	4000.0	4000.0	4000.0	
"MIN JUN1-JUL31 OUTFLOW, KSFD"	4/		244.0	244.0	244.0	244.0	244.0	
"MIN MAY31 RESERVOIR CONTENT, KSFD"	5/		1099.0	956.8	846.8	875.7	911.0	
"MIN MAY31 RESERVOIR CONTENT, FEET"	6/		2386.3	2376.4	2368.4	2370.5	2373.1	
"MAY31 ECC, FT"	7/		2386.3	2376.4	2368.4	2370.5	2373.1	
"BASE ECC, FT"		2432.8						
"ASSUMED JUL1-JUL31 INFLOW,% OF VOL."			19.4	20.0	20.5	21.9	23.3	34.7
"ASSUMED JUL1-JUL31 INFLOW, KSFD"	2/		565.1	624.7	662.7	652.8	640.4	803.8
"JUL MINIMUM FLOW REQUIREMENT,CFS"	3/		4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
"MIN JUL1-JUL31 OUTFLOW, KSFD"	4/		124.0	124.0	124.0	124.0	124.0	124.0
"MIN JUN30 RESERVOIR CONTENT, KSFD"	5/		2069.4	2009.8	1971.8	1981.7	1994.1	1830.7
"MIN JUN30 RESERVOIR CONTENT, FEET"	6/		2439.4	2436.5	2434.7	2435.2	2435.8	2427.9
"JUN30 ECC, FT "	7/		2439.4	2436.5	2434.7	2435.2	2435.8	2427.9
"BASE ECC, FT"		2451.9						
"JUL 31 ECC, FT"			2459.0	2459.0	2459.0	2459.0	2459.0	2459.0
"JAN1-JUL31 FORECAST,-EARLYBIRD,MAF "	8/		122.0	121.0	121.0	127.0	130.0	138.0

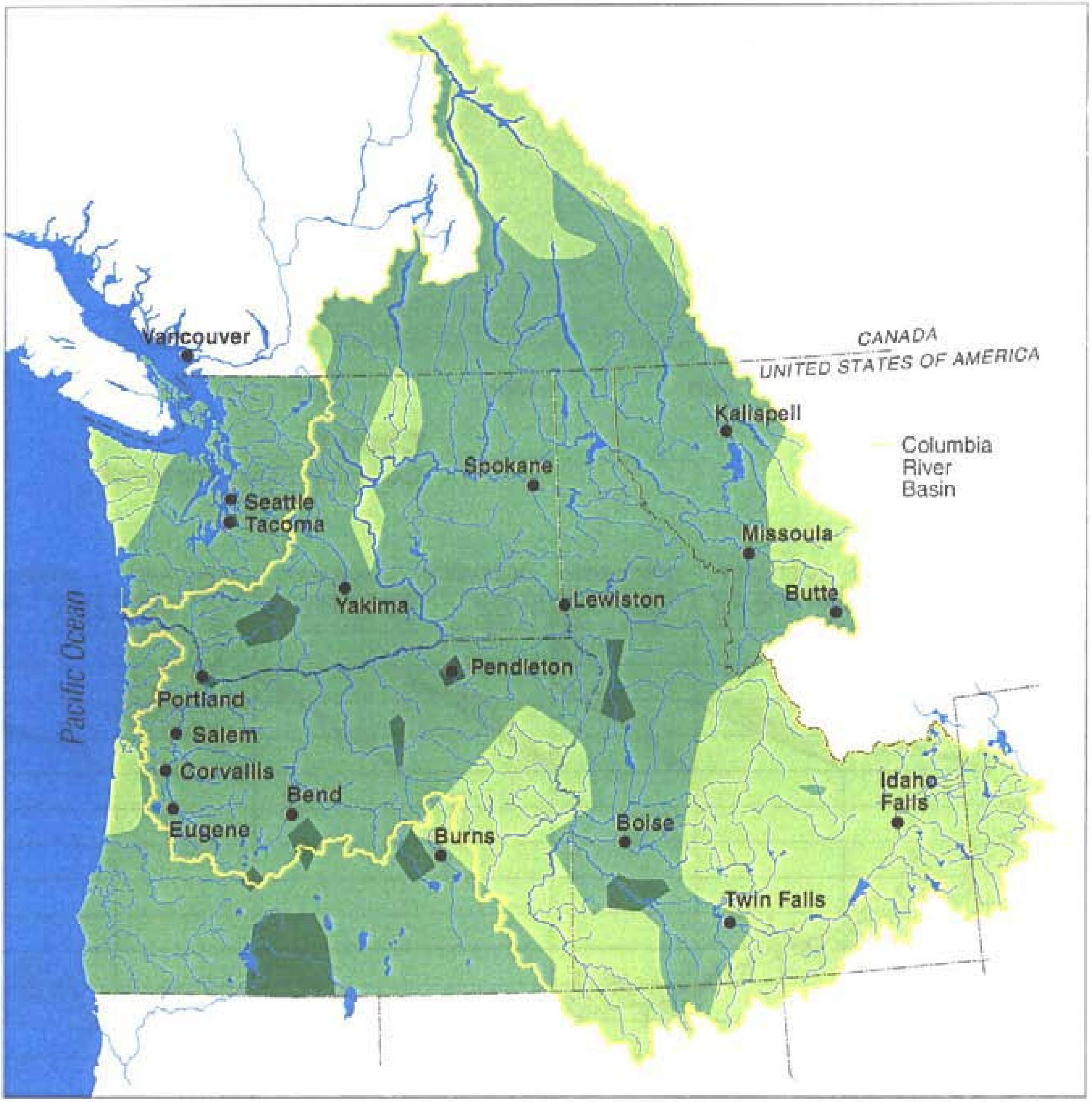
1/ PROBABLE INFLOW MINUS (95% ERROR & JAN1-DATE INFLOW) MINUS OBSERVED INFLOW. 2/PRECEEDING LINE TIMES 1/. 3/ POWER DISCHARGE REQUIREMENTS. 4/ CUMULATIVE MINIMUM OUTFLOW FROM 3/,DATE TO JULY." 5/ FULL CONTENT (2510.5 KSFD) PLUS 4/ MINUS /2. 6/ ELEV FROM 5/, INTERP FROM STORAGE CONTENT TABLE.A143" 7/ LOWER OF ELEV. FROM 6/ OR BASE ECC DETERMINED PRIOR TO YEAR (INTIAL),BUT NOT LESS THAN LOWER LIMIT. 8/ USED TO CALCULATE THE POWER DISCHARGE REQUIREMENTS FOR 3/.

Table 6

Computation of Initial Controlled Flow
Columbia River at The Dalles
1 May 1996

1 May Forecast of May-August Unregulated Runoff Volume, maf		87.5
Less Estimated Depletions, maf		1.5
Less Upstream Storage Corrections, maf		26.080
MICA	6.300	
ARROW	5.000	
DUNCAN	1.336	
LIBBY	4.980	
LIBBY + DUNCAN UNDER DRAFT	-1.537	
HUNGRY HORSE	1.646	
FLATHEAD LAKE	0.500	
NOXON RAPIDS	0.000	
PEND OREILLE LAKE	0.500	
GRAND COULEE	4.200	
BROWNLEE	0.600	
DWORSHAK	0.844	
JOHN DAY	0.200	
TOTAL	24.569	26.069
Forecast of Adjusted Residual Runoff Volume, maf		61.431
Computed Initial Controlled Flow from Chart 1 of Flood Control Operating Plan, 1,000 cfs		396

Chart 1
Seasonal Precipitation
Columbia River Basin
October 1994 - March 1995
Percent of 1961 -1985 Average



- Precipitation very high and more than 150% of average
- Precipitation high and more than 120% of average
- Precipitation near normal and more than 80% of average
- Precipitation very low and more than 50% of average
- Precipitation very low and less than 50% of average

Information prepared by
NATIONAL WEATHER SERVICE
Northwest River Forcast Center
Portland, Oregon

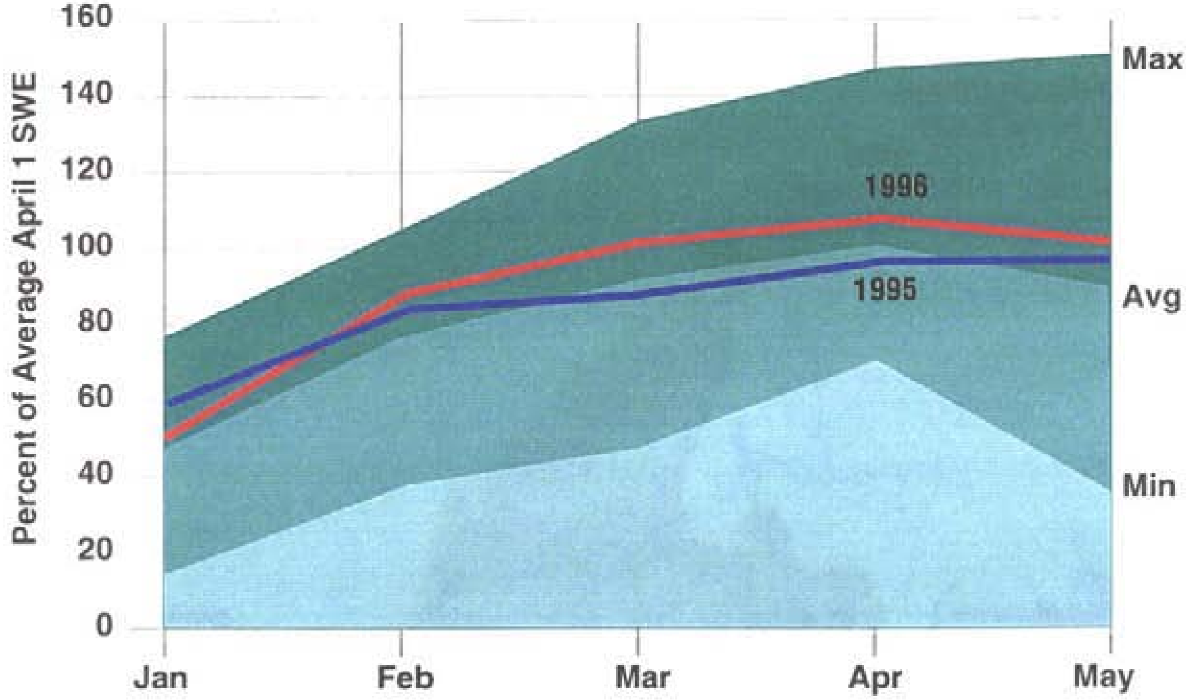
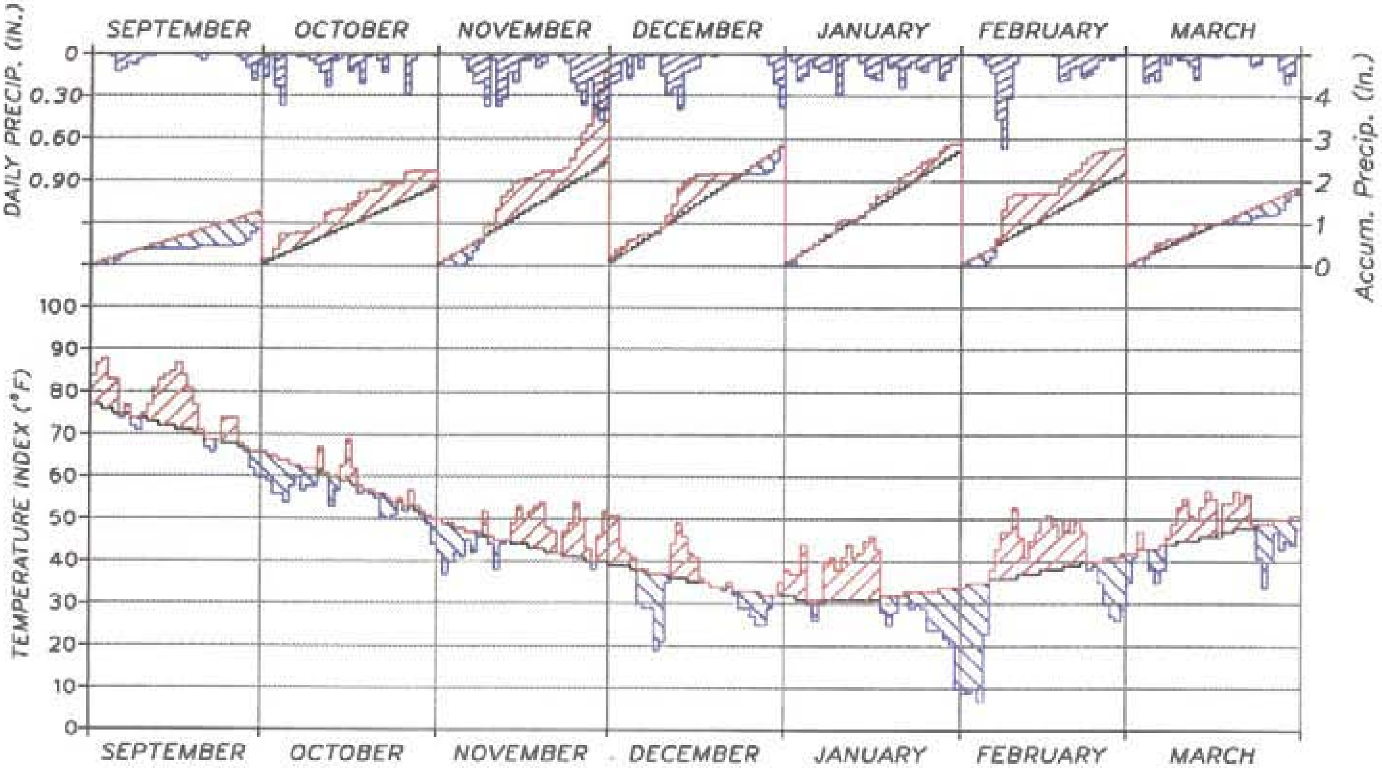
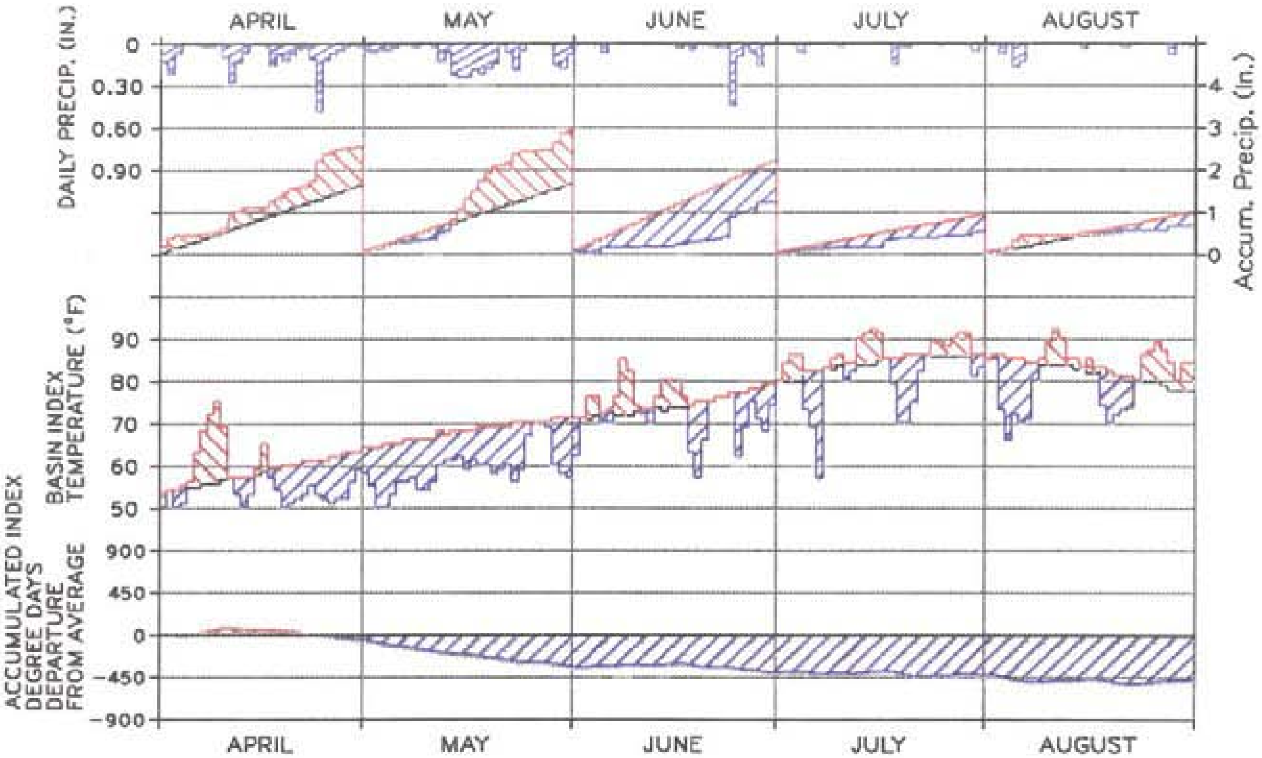


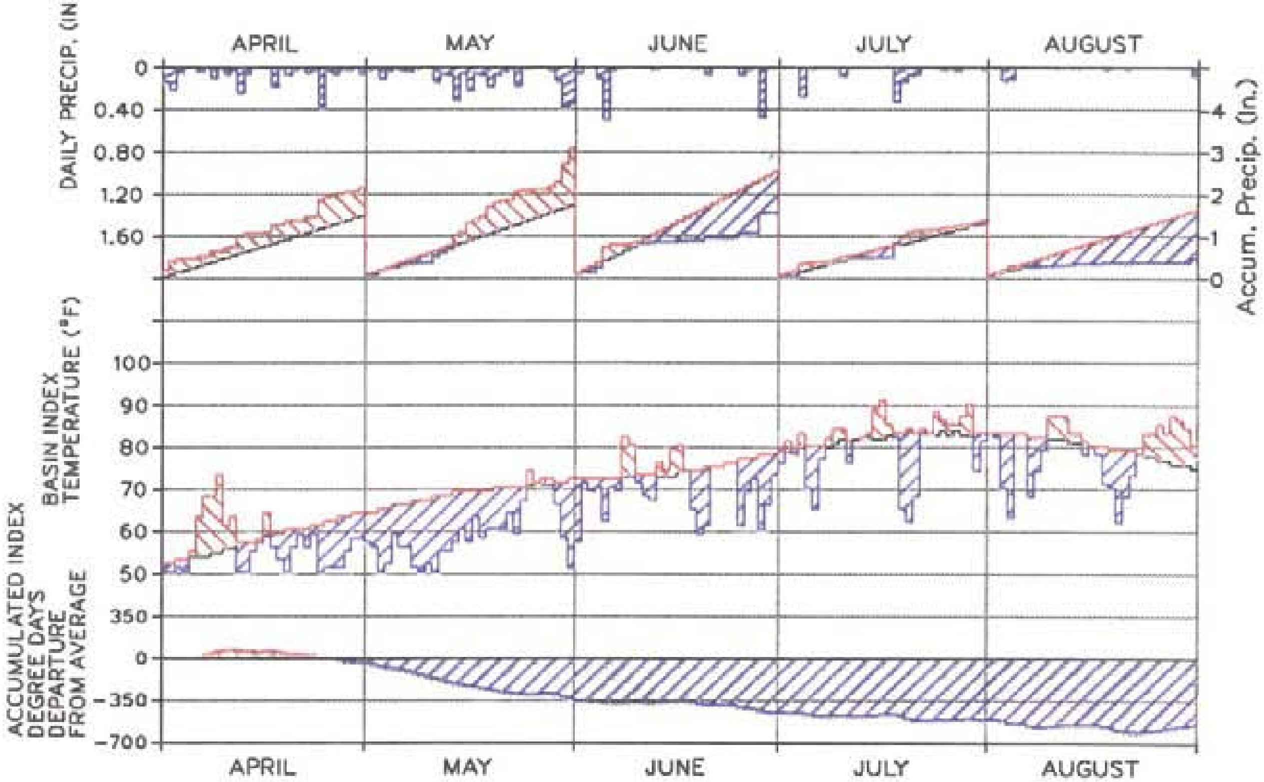
Chart 2
Columbia Basin Snowpack



WINTER SEASON CHART 3
TEMPERATURE AND PRECIPITION INDEX 1995–1996
COLUMBIA RIVER BASIN ABOVE THE DALLES, OR

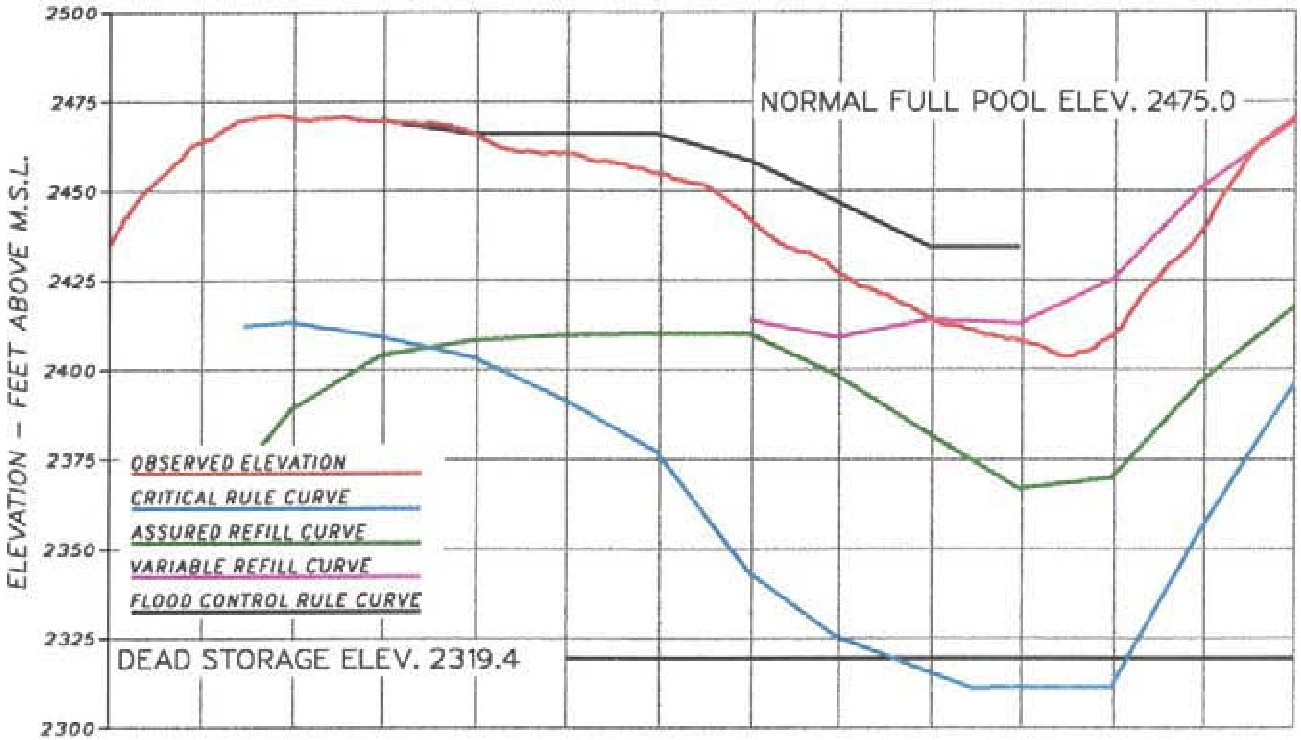


1996 SNOWMELT SEASON CHART 4
TEMPERATURE AND PRECIPITATION INDEX
COLUMBIA RIVER BASIN ABOVE THE DALLES, OR



1996 SNOWMELT SEASON Chart 5
TEMPERATURE AND PRECIPITATION INDEX
COLUMBIA RIVER BASIN IN CANADA

CHART 6
REGULATION OF MICA
1 JULY 1995 – 31 JULY 1996



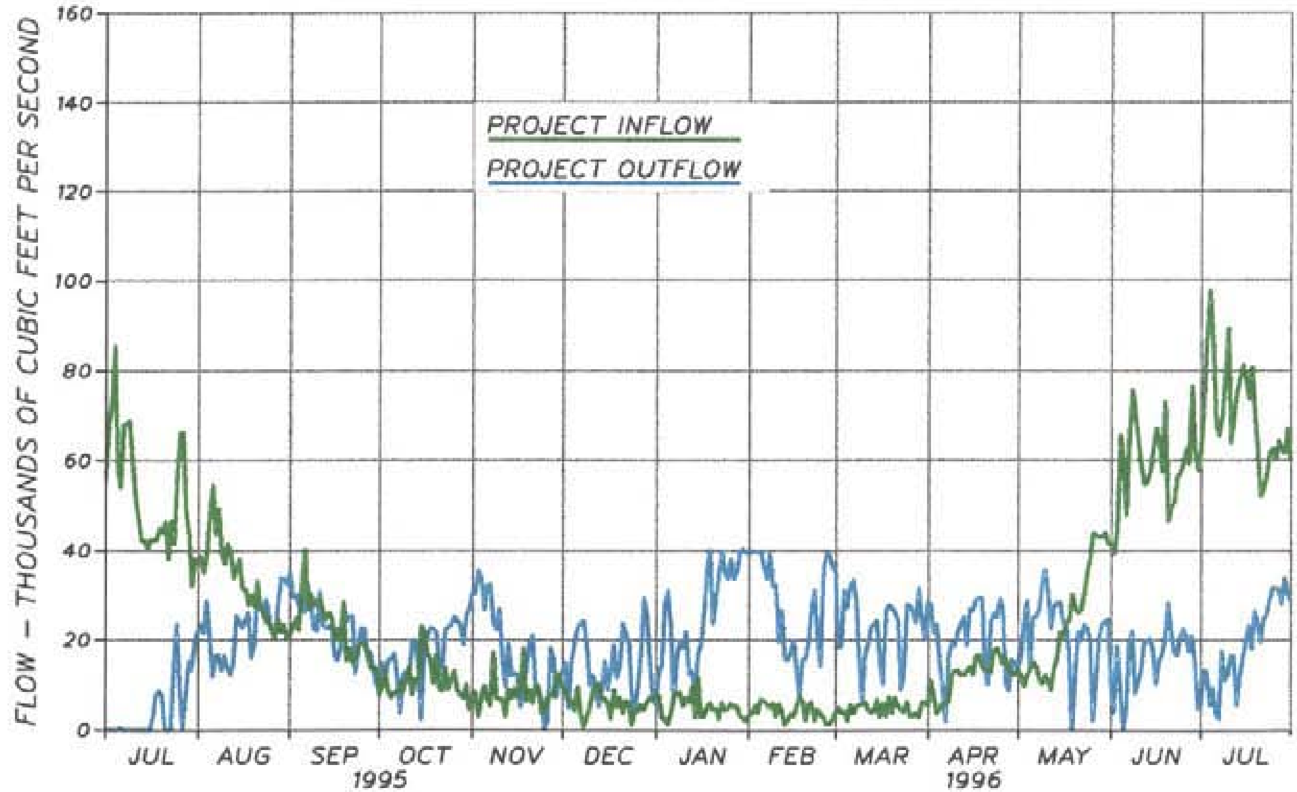
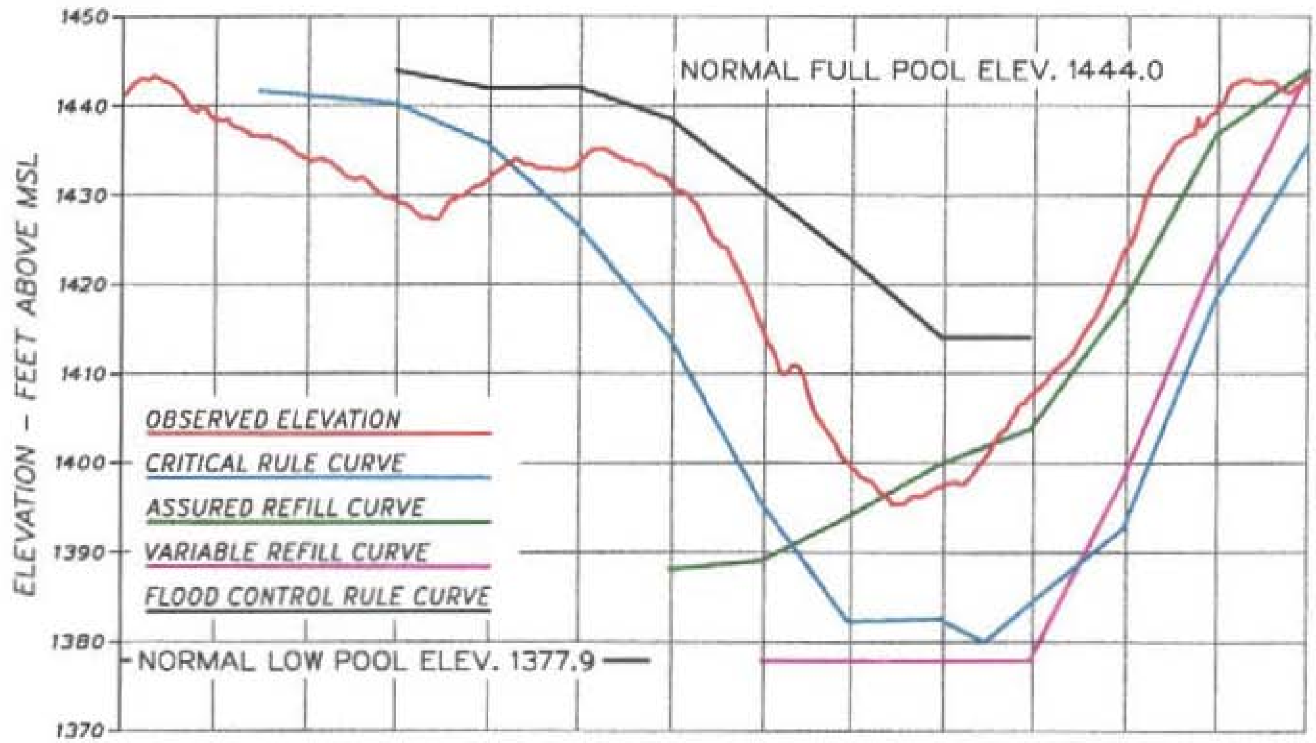


CHART 7
REGULATION OF ARROW
1 JULY 1995 - 31 JULY 1996



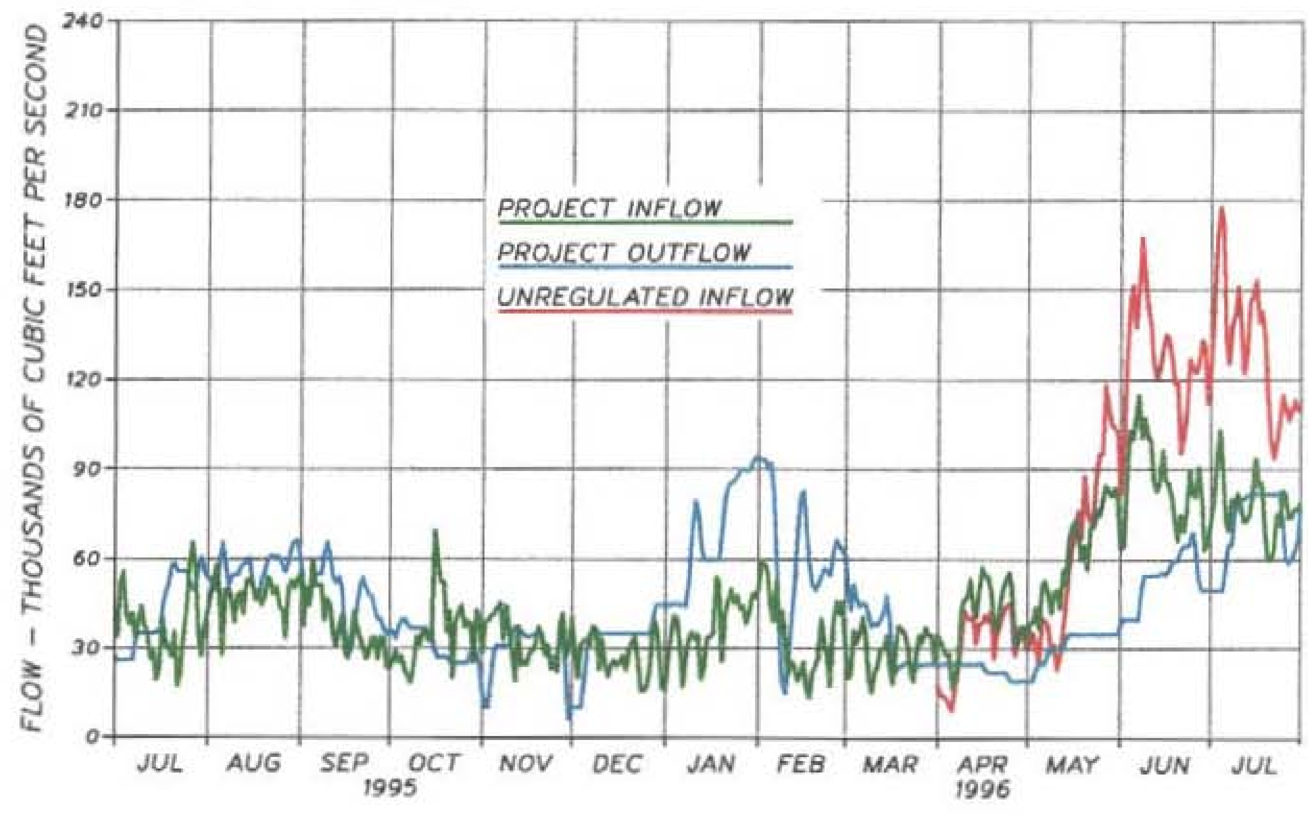
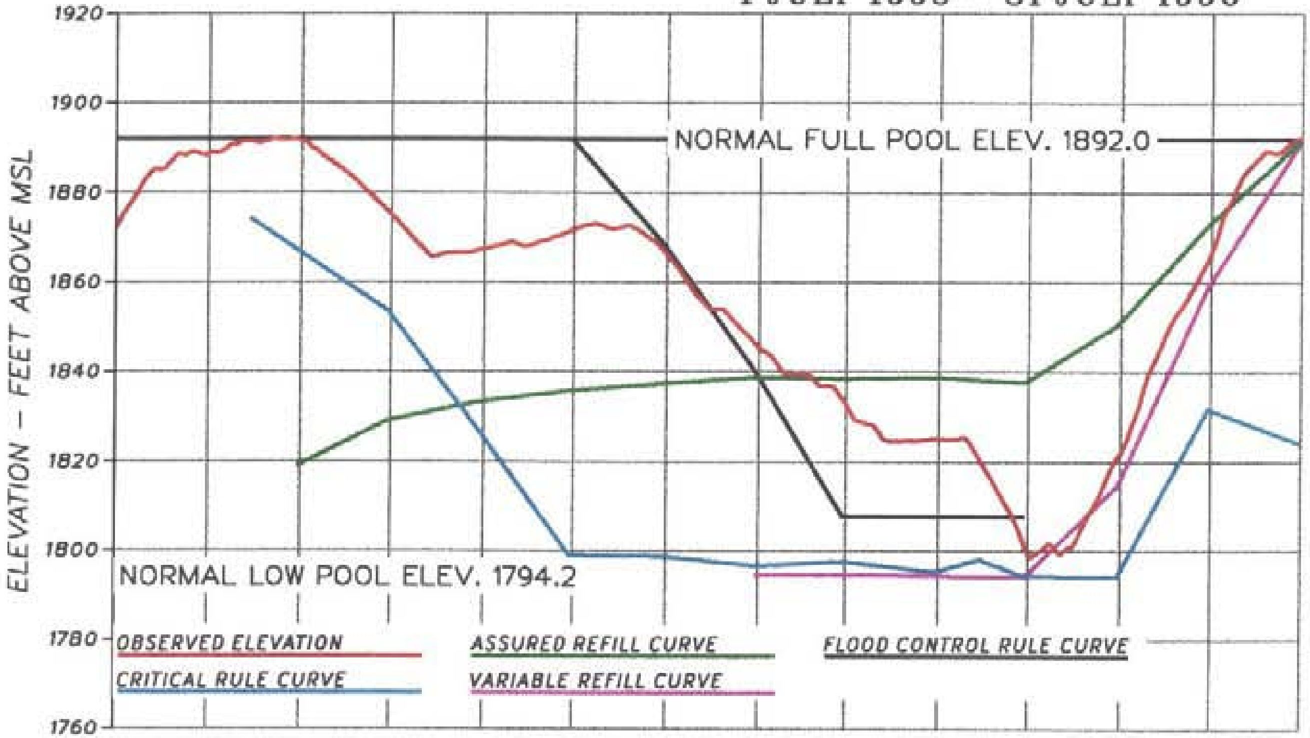


CHART 8
REGULATION OF DUNCAN
1 JULY 1995 – 31 JULY 1996



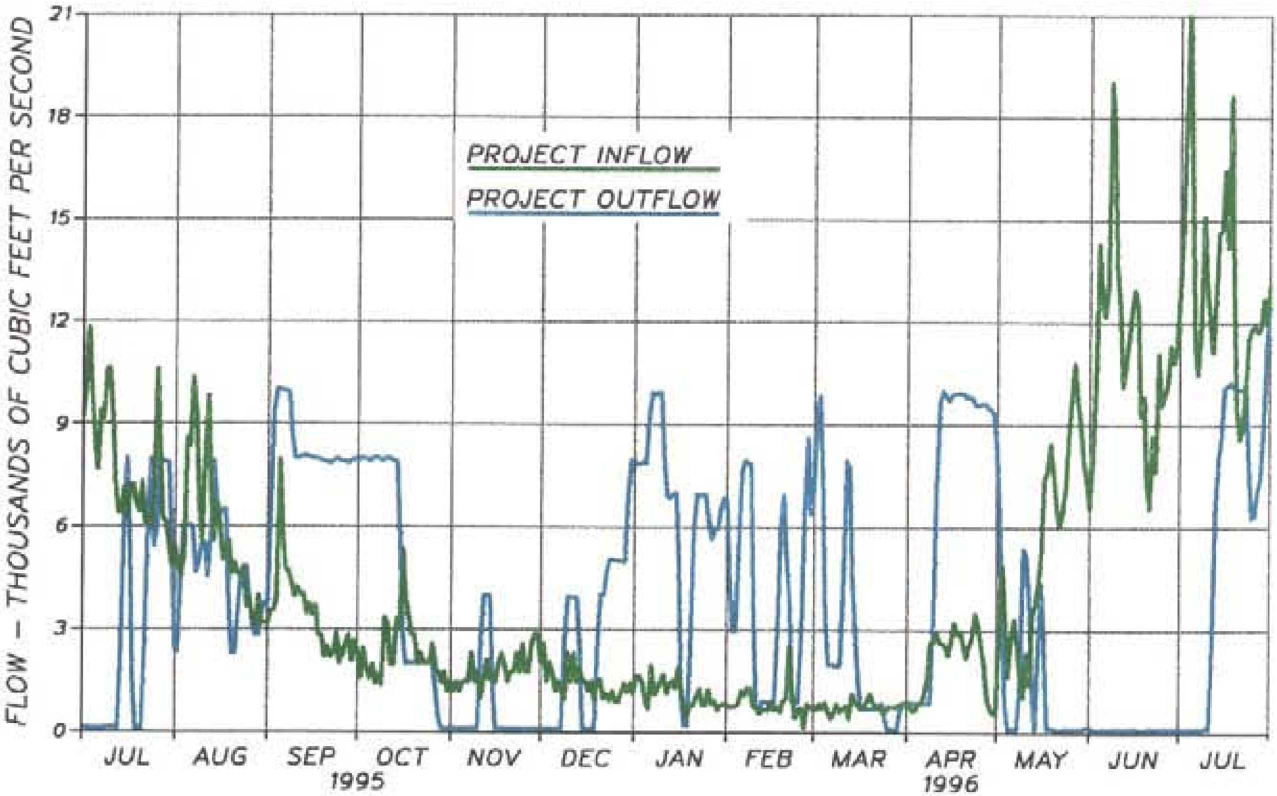
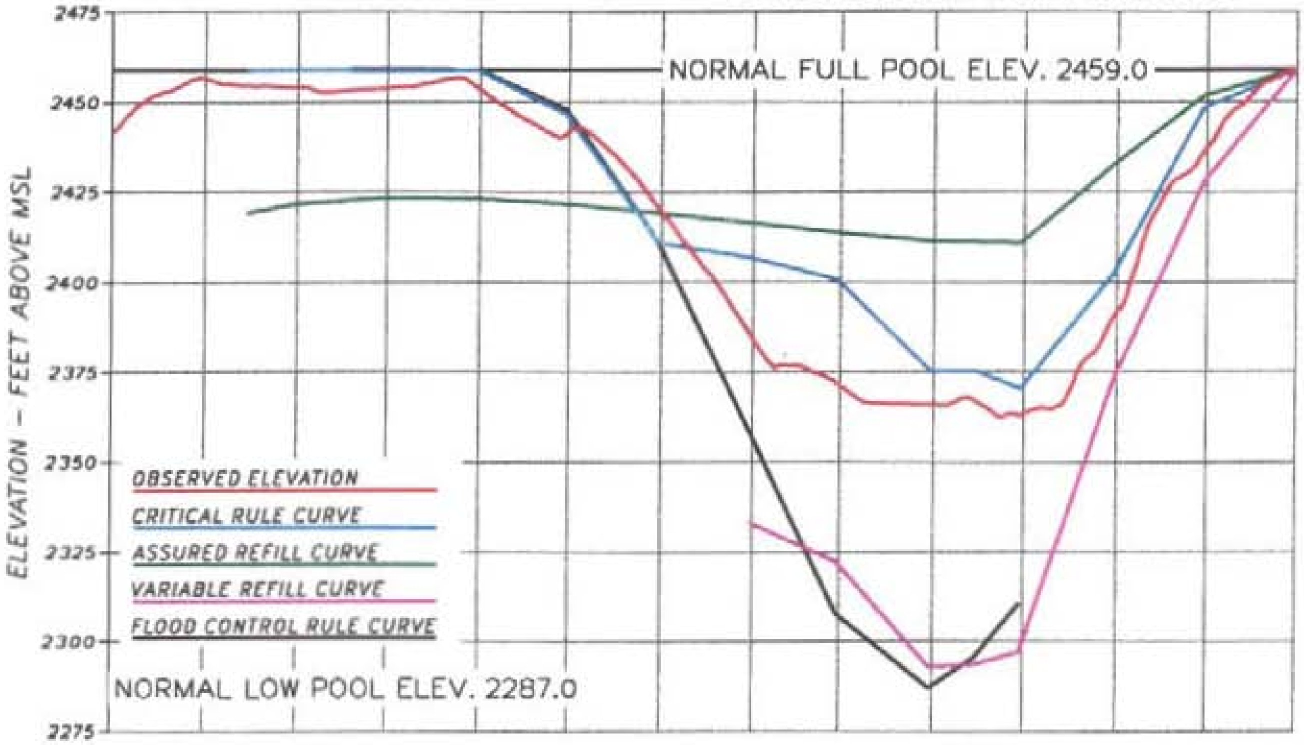


CHART 9
REGULATION OF LIBBY
1 JULY 1995 – 31 JULY 1996



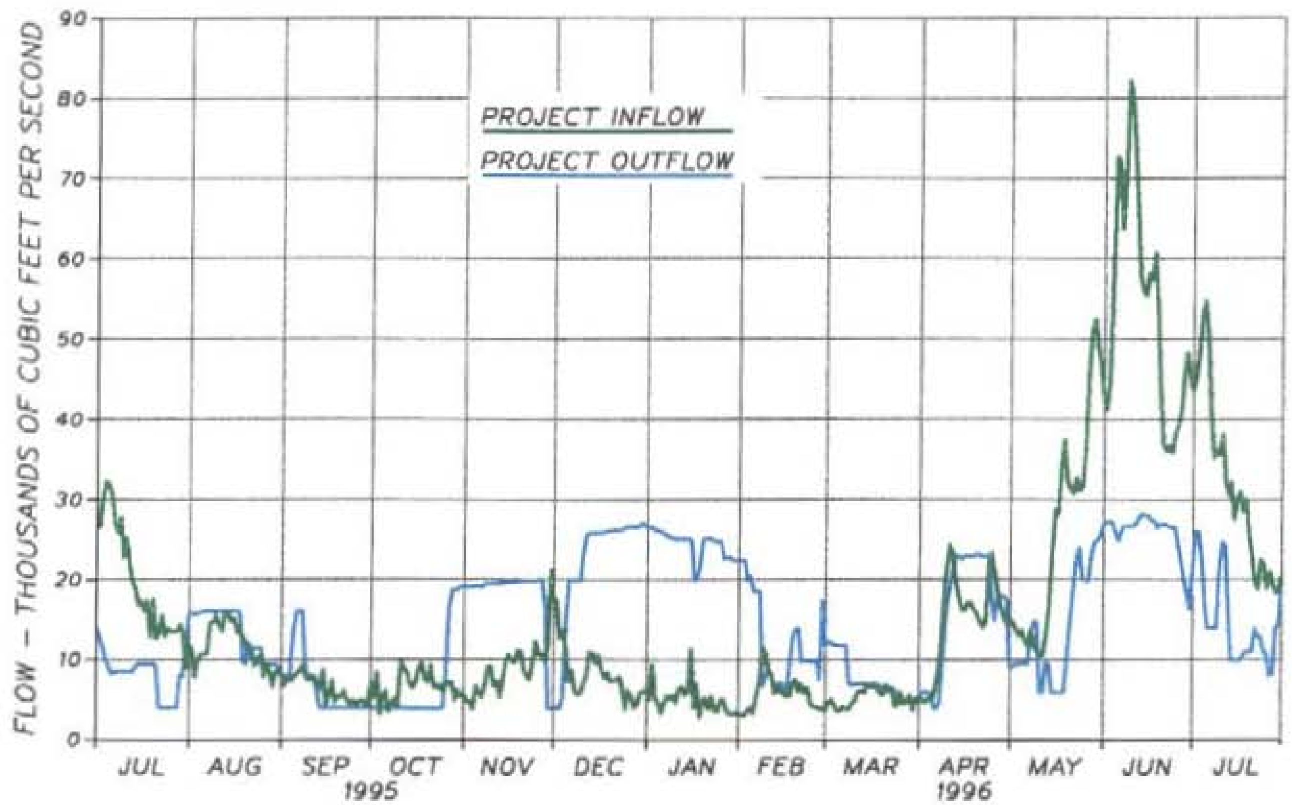
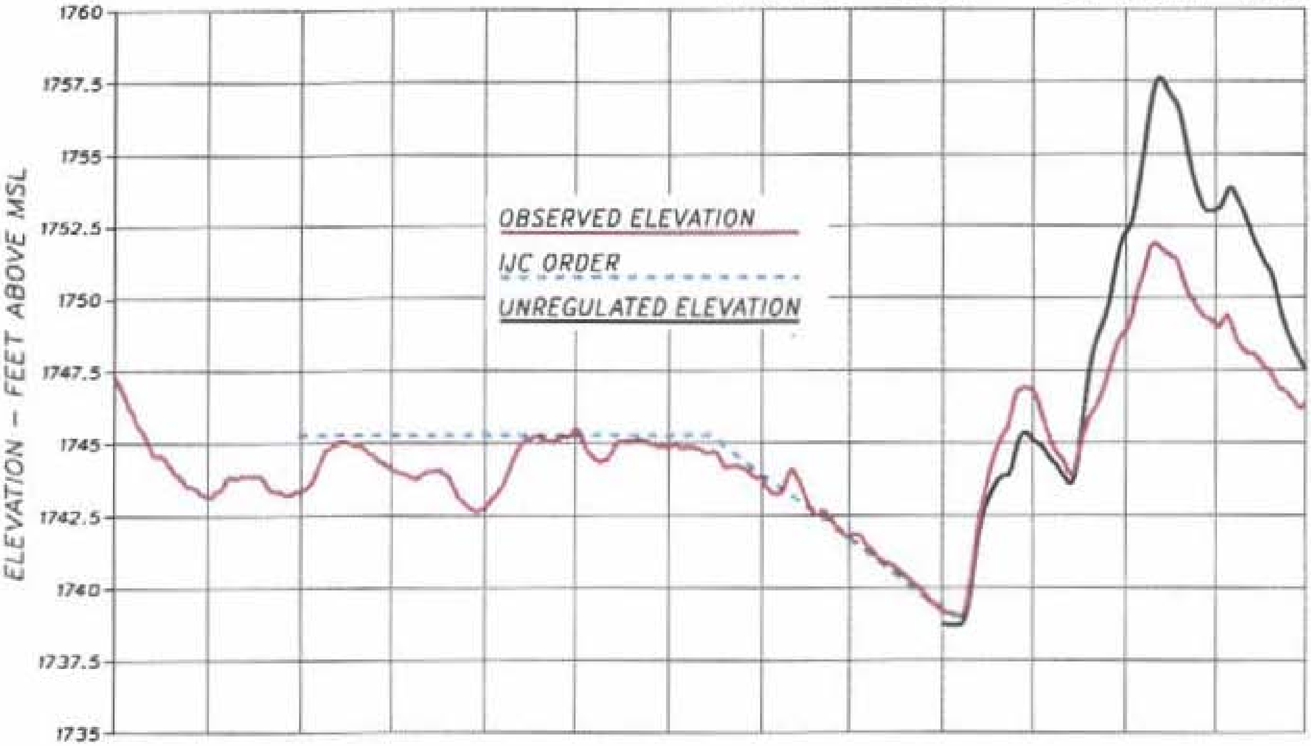


CHART 10
REGULATION OF KOOTENAY LAKE
1 JULY 1995 - 31 JULY 1996



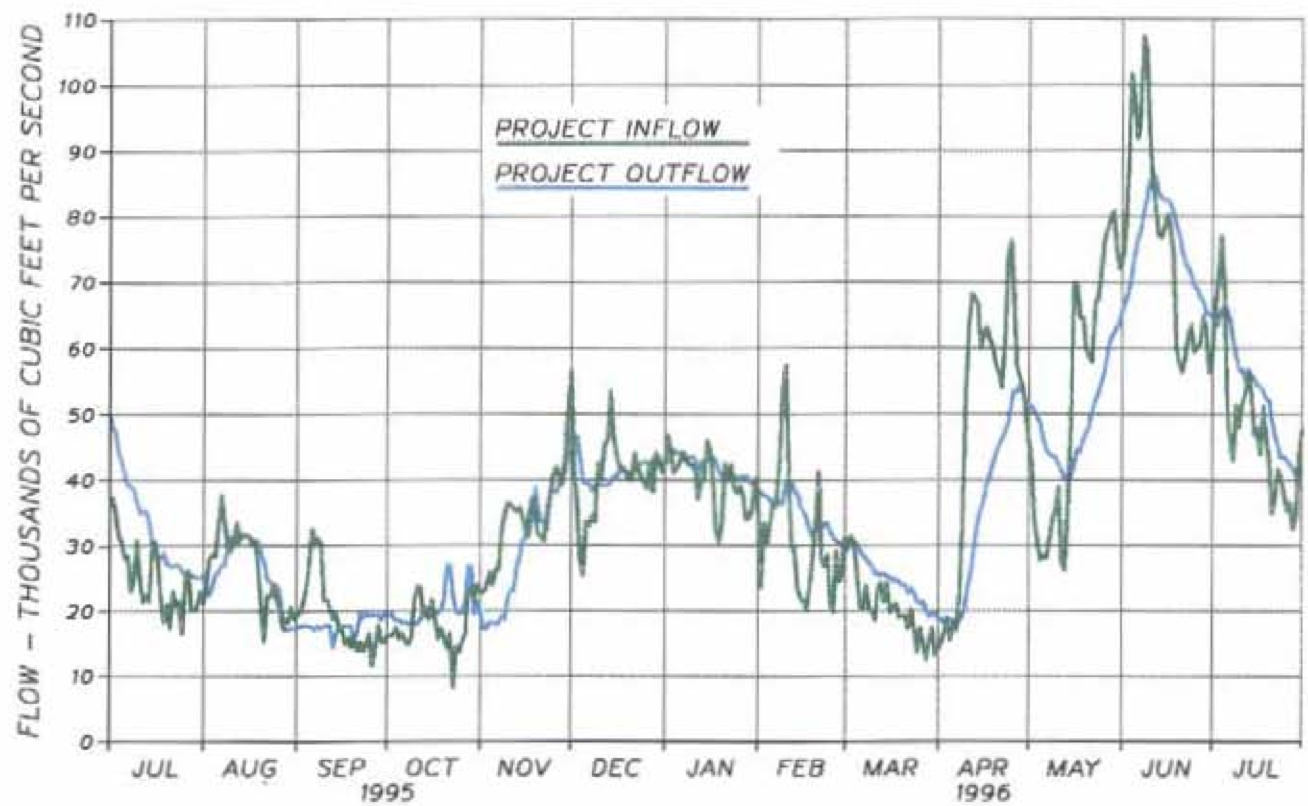


CHART 11
COLUMBIA RIVER AT BIRCHBANK
1 JULY 1995 – 31 JULY 1996

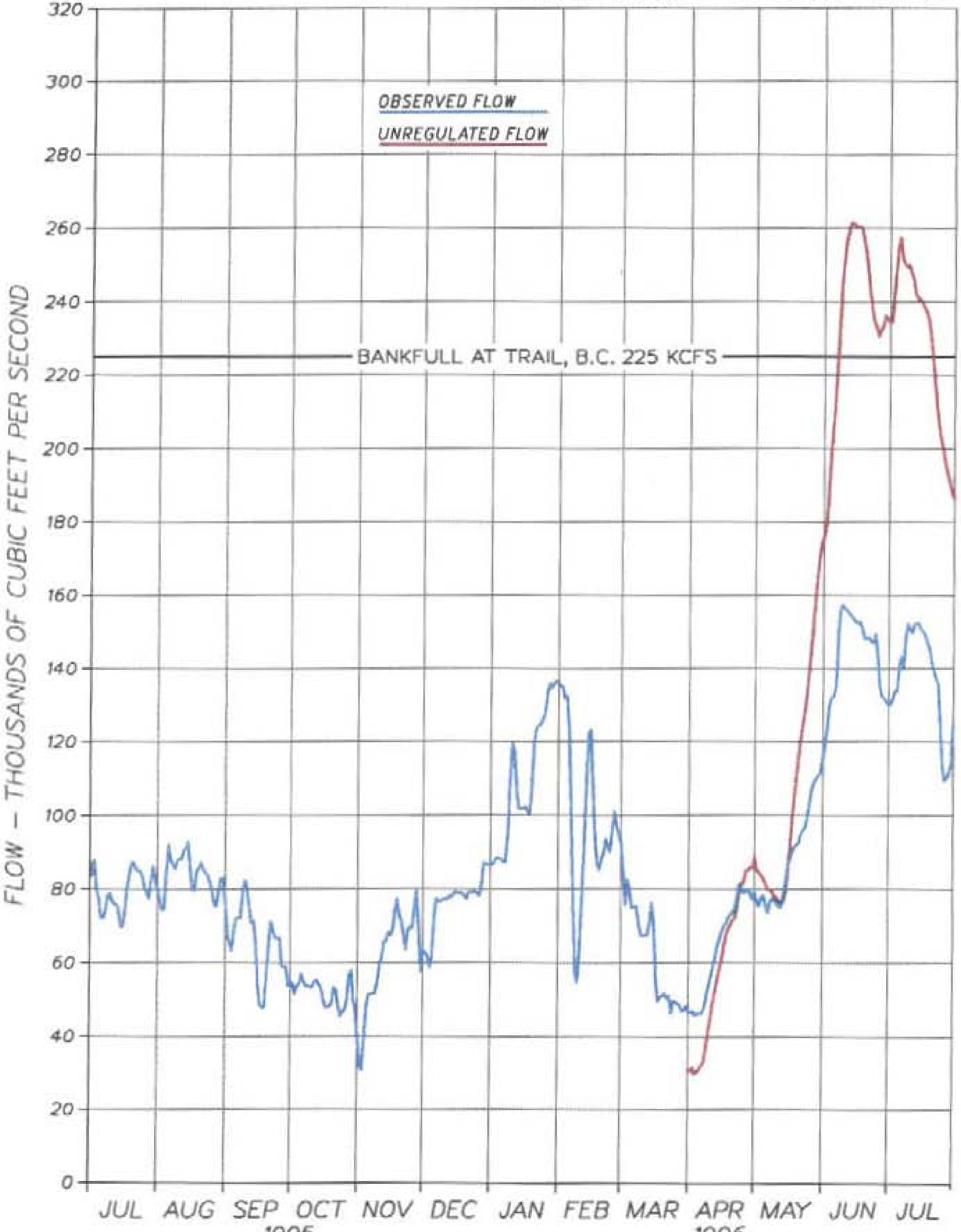
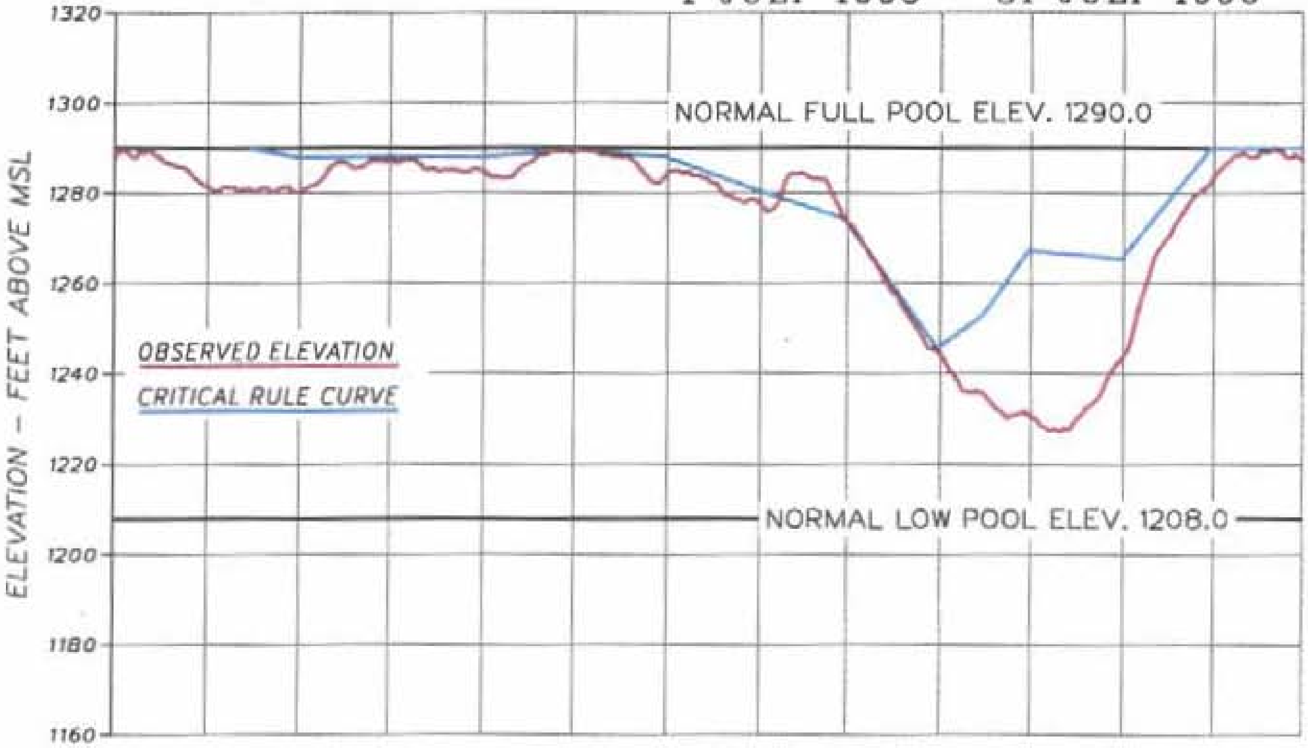


CHART 12
REGULATION OF GRAND COULEE
1 JULY 1995 – 31 JULY 1996



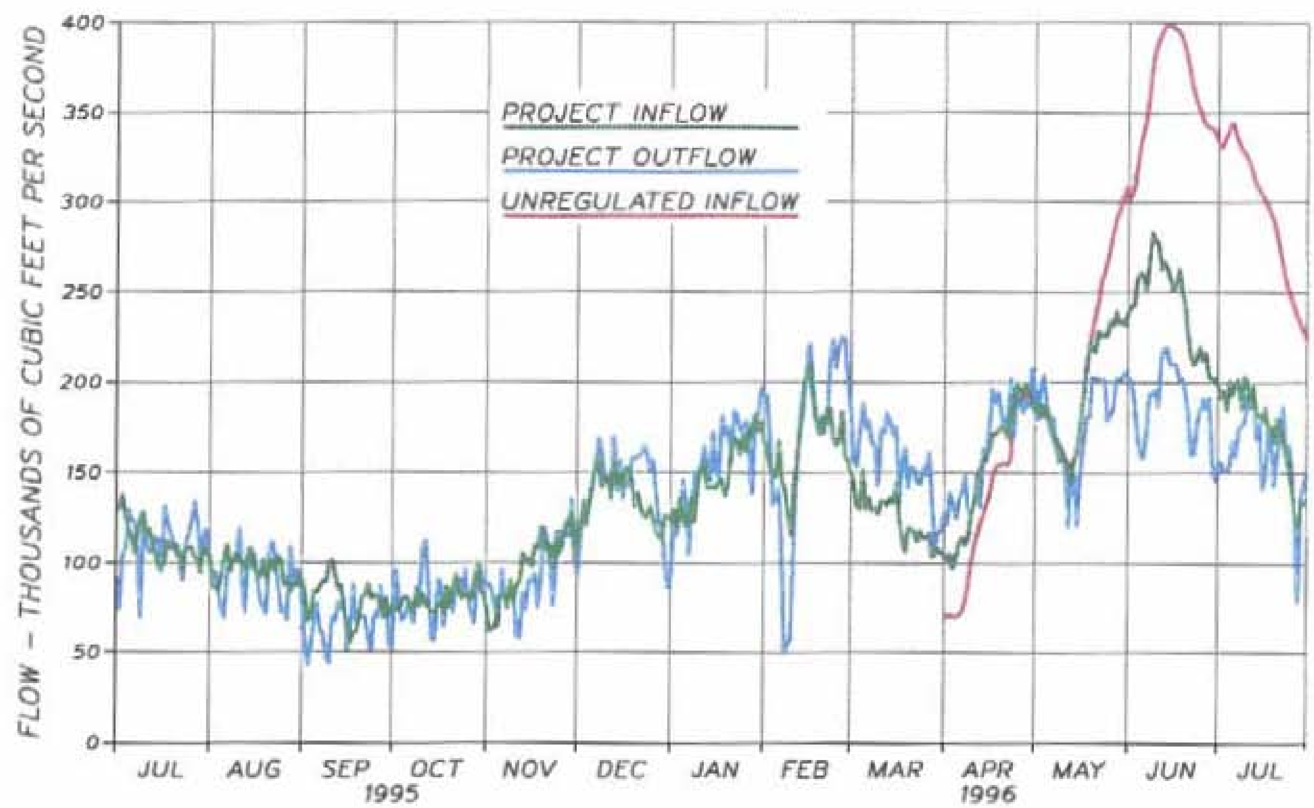


Chart 13
Columbia River at The Dalles
1 July 1995 - 31 July 1996

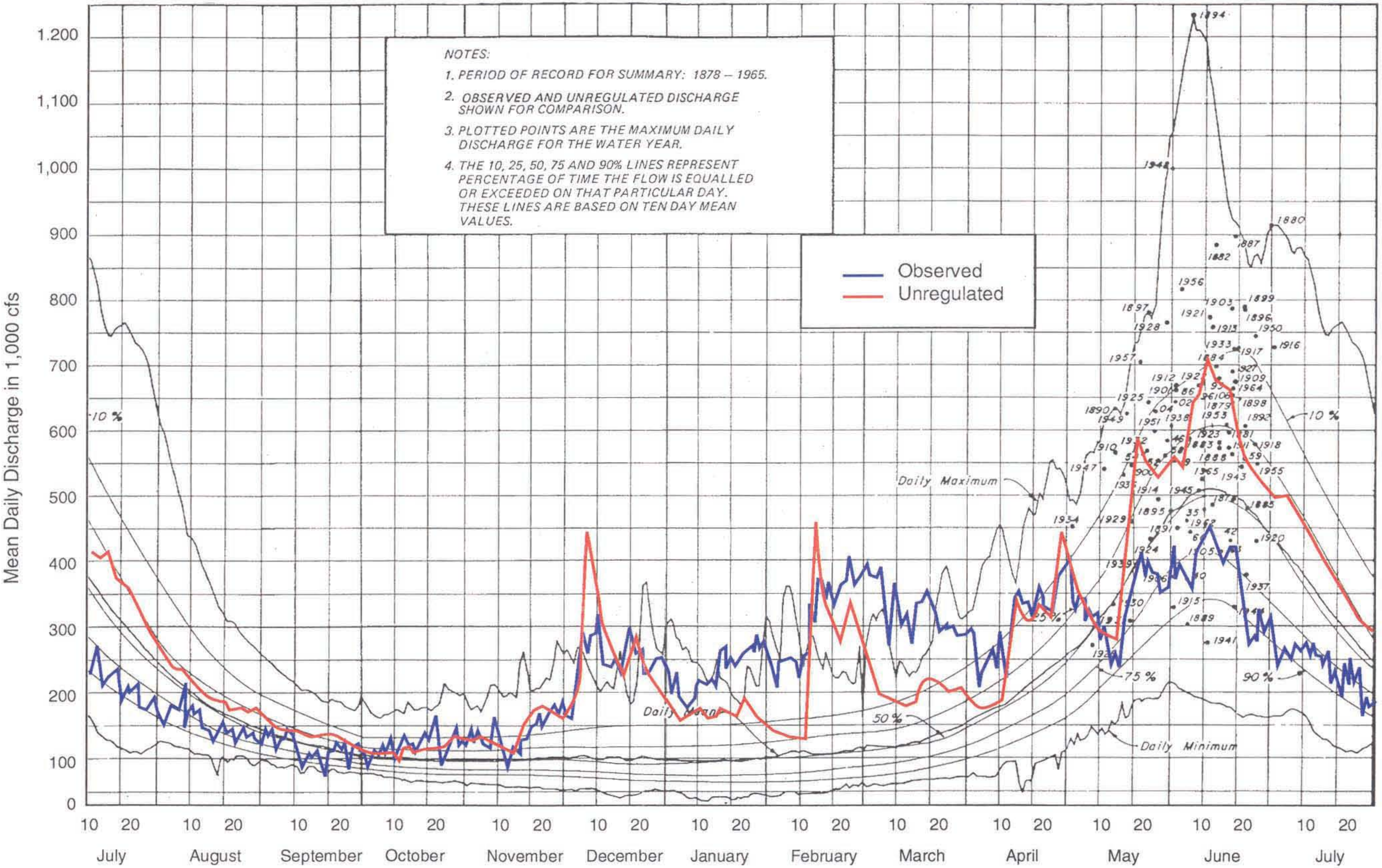


CHART 14
COLUMBIA RIVER AT THE DALLES
1 APRIL 1996 - 31 JULY 1996

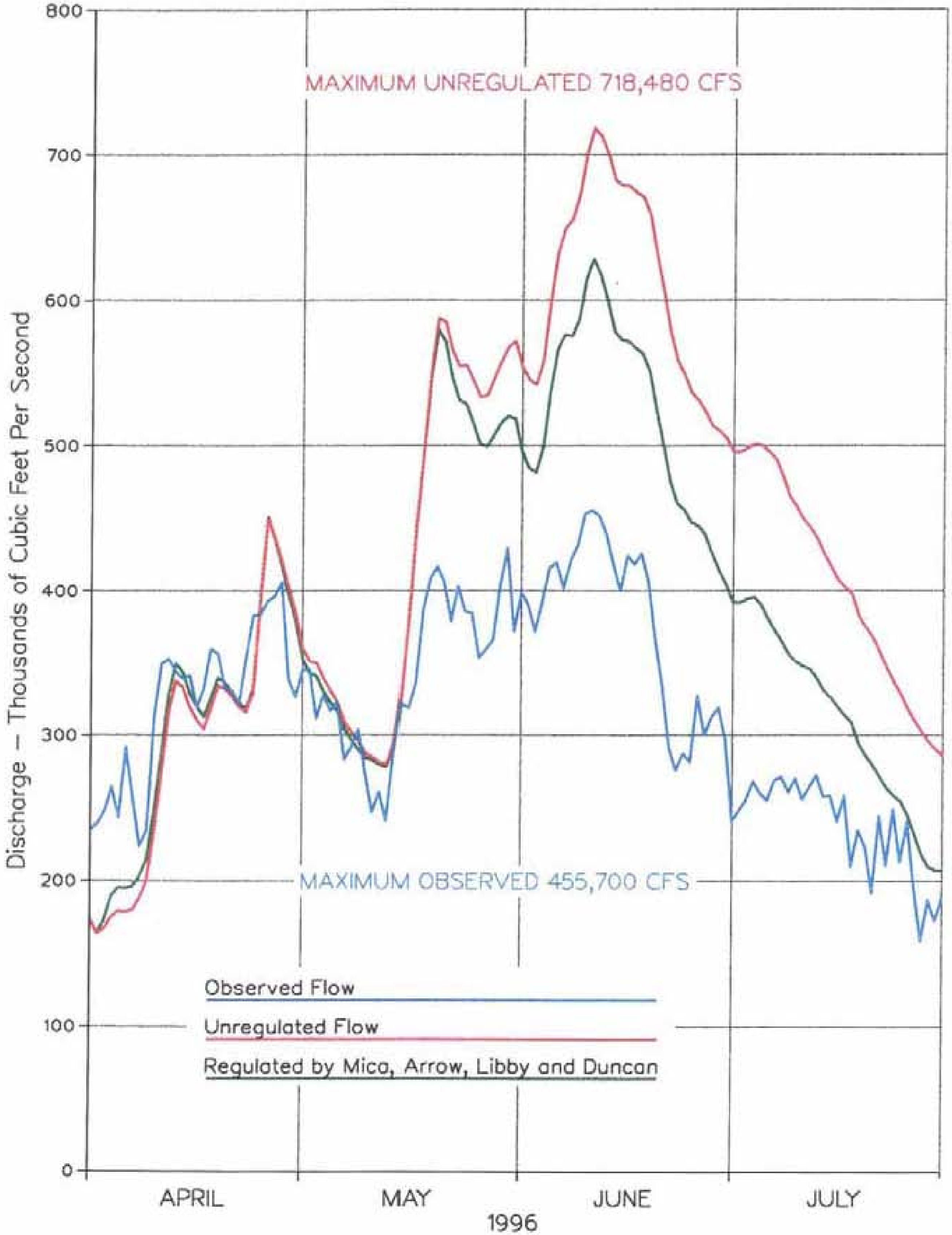


CHART 15
1996 RELATIVE FILLING
ARROW AND GRAND COULEE