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YELLOWSTONE RIVER
COMPACT COMMISSION

THIRTY-THIRD ANNUAL REPORT

1984

2011 299 8982

YELLOWSTONE RIVER COMPACT COMMISSION

821 East Interstate Avenue
Bismarck, North Dakota

Honorable Ed Herschler
Governor of the State of Wyoming
Cheyenne, Wyoming

Honorable Ted Schwinden
Governor of the State of Montana
Helena, Montana

Honorable Allen I. Olson
Governor of the State of North Dakota
Bismarck, North Dakota

Sirs:

Pursuant to Article III of the Yellowstone River Compact, the Commission submits the following thirty-third annual report of activities for the period ending September 30, 1984.

The Commission held the annual meeting at Sheridan, Wyoming, on November 20, 1984. Mr. George L. Christopulos, Wyoming State Engineer, Mr. Gary Fritz, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation, the designated representatives of their respective States, and Mr. L. Grady Moore, the designated Federal representative and chairman, were all present.

Others present were:

George M. Pike, U.S. Geological Survey, WRD, Helena, Montana,
Richard Moy, Montana Department of Natural Resources and
Conservation, Helena, Montana,
Paul Kawulok, Wyoming State Engineer's Office, Story, Wyoming,
Dan Ashenberg, Montana Department of Natural Resources and
Conservation, Helena, Montana,
Craig Cooper, Wyoming State Superintendent's Office, Division
III, Riverton, Wyoming,
Lou Allen, Wyoming State Engineer's Office, Cheyenne, Wyoming,
Dennis Cook, Wyoming Attorney General's Office, Cheyenne, Wyo-
ming,
Jeff Fassett, Wyoming State Engineer's Office, Cheyenne, Wyo-
ming,
Molly Galusha, Northern Plains Resource Council, Billings,
Montana,
Grant Parker, Powder River Basin Resource Council, Cheyenne,
Wyoming,
John Shields, Wyoming State Engineer's Office, Cheyenne, Wyo-
ming,
Larry Baccari, Engineer, Sheridan, Wyoming,

Susan Harlen, Sheridan Press, Sheridan, Wyoming,
Tom Howard, Billings Gazette, Billings, Montana,
Bill Long, Retired, Sheridan, Wyoming,

The Commission held a special meeting in Billings, Montana on April 17-18, 1984 to address two topics--interstate ditches and administration of Article V of the Compact. Mr. George L. Christopulos, Wyoming State Engineer, Mr. Gary Fritz, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation, the designated representatives of their respective States, and Mr. L. Grady Moore, the designated Federal representative and Chairman, were all present.

Others present were:

Lou Allen, Wyoming State Engineer's Office, Cheyenne, Wyoming,
Paul Kawulok, Wyoming State Engineer's Office, Story, Wyoming,
Lawrence Wolfe, Wyoming Attorney General's Office, Cheyenne,
Wyoming,
George M. Pike, U.S. Geological Survey, WRD, Helena, Montana,
Richard Moy, Montana Department of Natural Resources and Conservation, Helena, Montana,
Orrin Ferris, HKM Associates, representing Crow Tribe, Billings, Montana,
Dan Ashenberg, Montana Department of Natural Resources and Conservation, Helena, Montana,
Don MacIntyre, Montana Department of Natural Resources and Conservation, Helena, Montana,
Tom Asay, Representative District 50, Forsyth, Montana,
Steve Holnbeck, Montana Department of Natural Resources and Conservation, Helena, Montana,
Keith Kerbel, Montana Department of Natural Resources and Conservation, Billings, Montana,
Harry Roberts, Wyoming Heritage Society, Cody, Wyoming,
Bob Gibson, Billings Gazette, Cody, Wyoming,
Rick DeVore, U.S. Bureau of Reclamation, Billings, Montana,
Bob Delk, U.S. Bureau of Indian Affairs, Billings, Montana,
Joe Cichy, North Dakota State Water Commission, Bismarck, North Dakota,
Dennis Cook, Wyoming Attorney General's Office, Cheyenne, Wyoming,
Craig Goodwin, Wyoming Water Development Commission, Cheyenne, Wyoming,
Craig Cooper, Wyoming State Engineer's Office, Riverton, Wyoming,
John Shields, Wyoming State Engineer's Office, Cheyenne, Wyoming,
Jeff Fassett, Wyoming State Engineer's Office, Cheyenne, Wyoming,
Dick Bloyd, U.S. Geological Survey, Cheyenne, Wyoming,
Bill Hergett, Fiscal Agent, Belfry, Montana,
David B. Fuller, Fuller Ranch Company, Parkman, Wyoming,
Molly Galusha, Northern Plains Resource Council, Billings, Montana,

Grace Edwards, Northern Plains Resource Council, Billings,
Montana,
Grant Parker, Powder River Basin Resources Council, Sheridan,
Wyoming,
Larry Baccari, Engineer, Sheridan, Wyoming,
Katie Humphris, Powder River Basin Resources Council, Ran-
chester, Wyoming,
Howard D. Best, Powder River Protection Association, Broadus,
Montana,
Bob Gosman, Landowner, Casper, Wyoming

The Commission developed administrative rules, during the April 17 meeting, for the processing of claims for the use of water in interstate ditches. Draft rules were prepared and the procedures for advertising the rules were developed. Claim forms and procedures for processing the claims through the Commission and the State agencies were discussed. A review was made of known interstate ditches and a mailing list developed for notification of interstate ditch owners. Mapping requirements for the ditches were discussed.

Concepts and methods for administering Article V were presented by Dan Ashenberg. After much discussion of Ashenberg's concept and a simple example he presented, Messrs. Allen, Ashenberg, Kawulok, and Pike were asked to meet and develop a more complex example addressing the Tongue River basin for the Commission to review at it's annual meeting in November.

No incidents during the year required administration of water in accordance with the provisions of the Compact. At the present level of water-resources development, the Commission believes that a program of intense water-use regulation is not necessary. However, the attention of the Commission is continuing to focus on the need to define the detailed procedures for implementing Compact provisions for the time when development of water within the Yellowstone River Basin requires that these provisions be enforced.

Interstate ditches were a major topic of discussion and action this year. The rules for filing a claim were advertised in newspapers in both Montana and Wyoming in late July and early August. The rules were adopted by the Commission on September 20, 1984. Claim forms and instruction were mailed to all interested parties on October 2, 1984. The deadline for filing claims is December 31, 1984. No claims were filed with the Commission prior to this meeting. Therefore, the commissioners will attempt to contact the owners of each interstate ditch and check on the status of their claim application.

The Commission also discussed the mapping requirements for the processing of interstate ditch claims. The Wyoming State Engineer's office will work with the Montana Department of Natural Resources and Conservation (DNRC) to prepare draft requirements.

Several Montana DNRC representatives met on November 14, 1984, with Wyoming State representatives and the Denver officials of the U.S. Environmental Protection Agency, in Cheyenne, Wyoming, to discuss total dissolved solid levels in Salt Creek and the Powder River. It appears that materials from oil well "treaters" in the Salt Creek drainage may be the source of increased salinity in the streams. Additional water sampling runs will be made to help assess the salinity levels in both streams. The Commission was briefed on the meeting and discussed water quality of the Powder River.


The Montana District of the U.S. Geological Survey has submitted a proposal to their headquarters to perform a water quality trend analysis for the entire Yellowstone River basin. This study would help document any changes in water quality in the Salt Creek and Powder River drainages. The Commission will prepare a letter of support for this proposal.

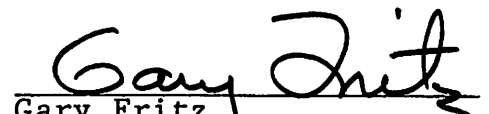
A technical committee was established to review Dan Ashenberg's example for the Tongue River basin proposing a method of administering Article V. The committee will review the proposal prior to a special meeting of the Commission to address the issue. The meeting will be held January 16, 1985, in Cheyenne, Wyoming.

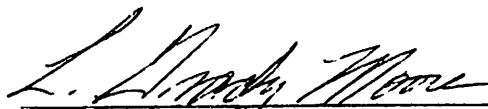
The Commission received a status report on the joint Wyoming-Montana Soil Conservation Service (SCS) project to forecast streamflow in the Clarks Fork basin. The modeling is being performed by the staff of the SCS's West National Technical Center in Portland, Oregon. Because of the lack of adequate data the SCS has abandoned an attempt to use the USGS's snow-melt runoff model and will modify a Corps of Engineer's model instead.

The budgets for fiscal years 1985 through 1986 are discussed in the following general report. The amount of funds required for future Commission activities will depend largely on the outcome of water-development plans, inflation, and the degree of water administration required.

Respectfully submitted,


George L. Christopoulos
Commissioner for Wyoming


Gary Fritz
Commissioner for Montana


L. Grady Moore
Federal Representative

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GENERAL REPORT

Cost of operation and budget

The work funded by the Commission, which to date has been primarily concerned with the collection of required hydrologic data, has been financed through cooperative arrangements whereby Montana and Wyoming each bear one-fourth of the cost and the remaining one-half is borne by the United States. The salaries and necessary expenses of the State and Federal representatives, and hydrologic data made available by other agencies, are not evaluated or considered as expenses of the Commission.

The expense of the Commission during fiscal year 1984 was \$29,720, in accordance with the budget adopted for the year.

The budgets for fiscal years 1985 and 1986 were tentatively adopted subject to the availability of appropriations.

The budgets for the three fiscal years are summarized as follows:

October 1, 1983, to September 30, 1984 (fiscal year 1984):

Continuation of existing stream-gaging programs \$29,720

October 1, 1984, to September 30, 1985 (fiscal year 1985):

Continuation of existing stream-gaging programs \$30,840

October 1, 1985, to September 30, 1986 (fiscal year 1986):

Estimate of continuation of existing stream-gaging
programs \$32,000

Stream-gaging-station operation

Gaging stations at the measuring sites specified in the Compact were continued in operation and satisfactory discharge records collected at each. Locations of gaging and reservoir stations are shown on a map of the Yellowstone River Basin at the end of the report.

During the water year ending September 30, 1984, annual streamflow was average in all four tributaries of the Yellowstone River as given in the following table:

<u>Measurement point</u>	<u>Percent of average</u>
Clarks Fork Yellowstone River near Silesia, Mont.	93
Bighorn River above Tullock Creek, near Bighorn, minus Little Bighorn River near Hardin, Mont. Adjusted for change in contents in Bighorn Lake	111
Tongue River at Miles City, Mont.	120
Powder River near Locate, Mont.	109

Details of streamflow for water year 1984 and bar graphs showing comparisons with average flows during selected base periods and with the preceding year are given in the section "Monthly summary of discharge for Compact stream-gaging stations."

Diversions

No incidents during the year required administration of the water in accordance with the provisions of the Compact. At the present level of water-resources development, the Commission believes that a program of intensive water-use regulations is not necessary.

Storage in reservoirs

Reservoirs completed after January 1, 1950

Bighorn Lake, a U.S. Bureau of Reclamation project on the Bighorn River, and the largest storage project in the basin, contained 1,043,000 acre-feet at the beginning of the year and 1,069,000 acre-feet at the close. It fluctuated from a minimum of 809,500 acre-feet on March 10, 1984, to a maximum of 1,108,000 acre-feet on August 7, 1984. Boysen Reservoir, located on the Wind River and operated by the U.S. Bureau of Reclamation, began the year with 667,300 acre-feet in storage and ended with 695,400 acre-feet. Details regarding these reservoirs are given in the section "Monthly summary of contents for Compact reservoirs completed after January 1, 1950." The Commission is cognizant of other reservoirs in this general group and considers their aggregate effect to be insufficient to warrant the collection of storage data at this time.

Reservoirs existing on January 1, 1950

As a matter of record and general information, month-end storage data are given later in the report for reservoirs in existence upstream from the points of measurement on January 1, 1950. These data are pertinent to allocation under Article V, Section C, Item 5 of the Compact.

MONTHLY SUMMARY OF DISCHARGE FOR COMPACT STREAM-GAGING STATIONS

06208800 Clarks Fork Yellowstone River near Silesia, Mont.

LOCATION.--Lat 45°30'48", long 108°49'42", in NW1/4 SE1/4 sec. 1, T. 4 S., R. 23 E., Carbon County, Hydrologic Unit 10070006, on left bank 0.5 mi downstream from Whitehorse Canal intake, 1 mi upstream from Rock Creek, 3 mi south of Silesia, and at mile 16.3.

DRAINAGE AREA.--2,093 mi².

PERIOD OF RECORD.--October 1969 to current year. Records for July 1921 to September 1969 (published as Clarks Fork Yellowstone River at Edgar) at site 5.8 mi upstream not equivalent owing to diversion in Whitehorse Canal during irrigation season. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Datum of gage is 3,405.79 ft National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers).

REMARKS.--Records fair except those for winter, which are poor. Diversion for irrigation of about 45,900 acres, of which 2,180 acres lies below station. In addition, about 56,200 acres of land above station are irrigated by diversions from the adjoining Rock Creek basin.

AVERAGE DISCHARGE.--15 years, 1,174 ft³/s, 850,600 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,500 ft³/s June 10, 1981, gage height, 8.36 ft; minimum, 56 ft³/s Apr. 25, 1981, gage height, 0.53 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 5,300 ft³/s and maximums(*):

<u>Date</u>	<u>Time</u>	<u>Discharge</u> <u>ft³/s</u>	<u>Gage height</u>
June 1	1500	6,090	5.73
July 1	1400	*6,420	*5.88

Minimum daily discharge, 190 ft³/s Dec. 24.

<u>Month</u>	<u>Second-foot days</u>	<u>Mean</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Runoff, in acre-feet</u>
October 1983	26,655	860	1,120	659	52,870
November	19,052	635	758	486	37,790
December	12,394	400	691	190	24,580
January 1984	15,950	515	850	250	31,640
February	11,600	400	460	370	23,010
March	11,671	376	390	341	23,150
April	13,749	458	667	347	27,270
May	56,151	1,811	3,650	565	111,400
June	108,540	3,618	5,770	1,250	215,300
July	79,160	2,554	6,020	1,330	157,000
August	25,839	834	1,620	529	51,250
September 1984	18,091	603	693	459	35,880
1984 water year	398,852	1,090	6,020	190	791,100

CLARKS FORK YELLOWSTONE RIVER NEAR SILESIA, MONT.
 (Replaces Clarks Fork Yellowstone River at Edgar)

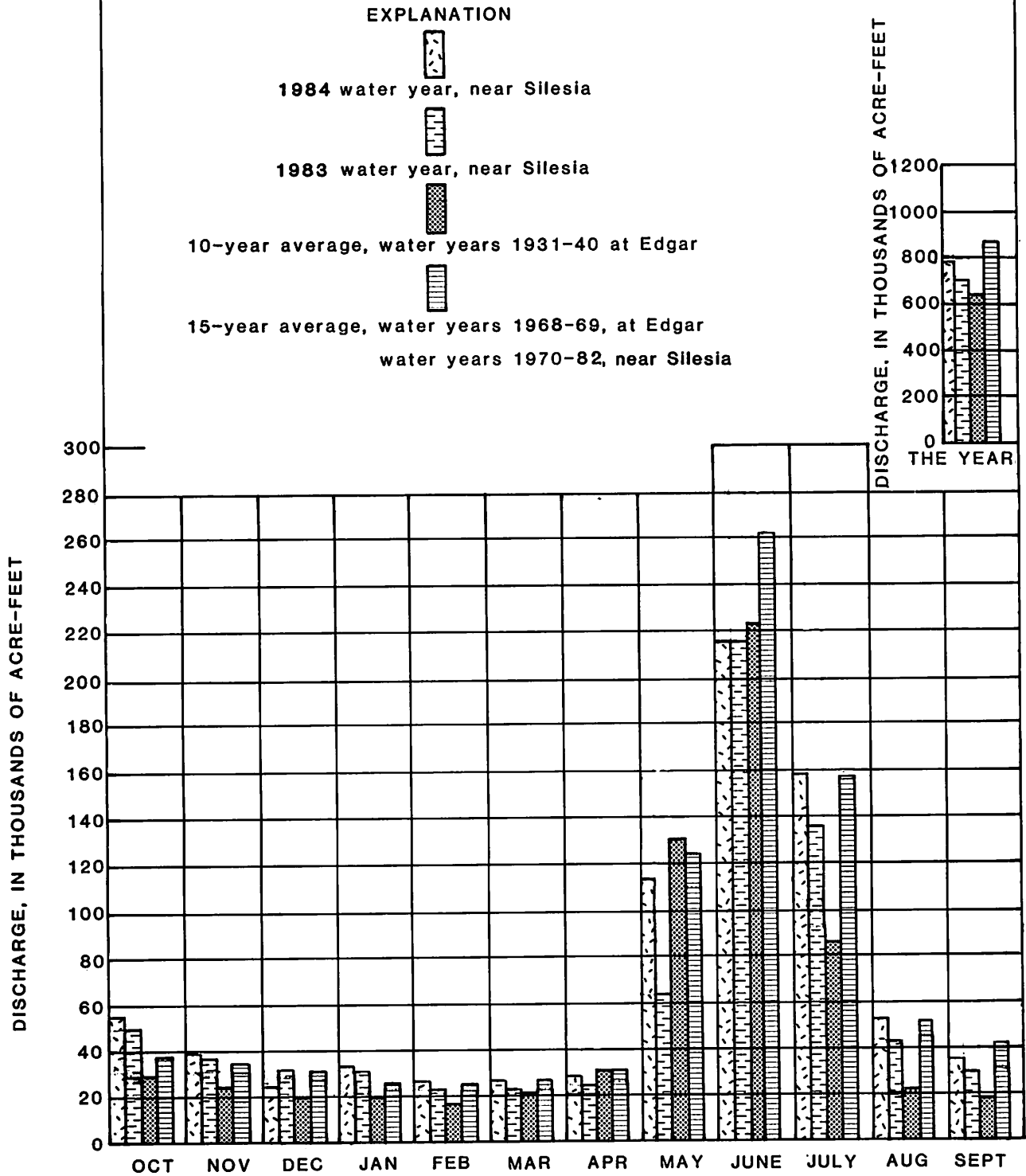


Figure 1.--Comparison of discharge for 1984 water year with 1983 water year near Silesia and with average discharge for water years 1931-40 at Edgar and for water years 1968-69 at Edgar and 1970-82 near Silesia.

06294000 Little Bighorn River near Hardin, Mont.

LOCATION.--Lat 45°44'09", long 107°33'24", in SE1/4 NE1/4 NE1/4 sec. 19, T. 1 S., R. 34 E., Big Horn County, Hydrologic Unit 10080016, on left bank 50 ft downstream from bridge on Sarpy Road, 0.2 mi upstream from terminal wasteway of Agency Canal, 0.6 mi upstream from mouth, and 2.3 mi east of Hardin.

DRAINAGE AREA.--1,294 mi².

PERIOD OF RECORD.--June 1953 to current year. Records since June 1953 available in annual reports of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Datum of gage is 2,882.29 ft National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Oct. 7, 1953, nonrecording gage at site 0.4 mi downstream. Oct. 7, 1953, to May 6, 1963, water-stage recorder at site 0.3 mi downstream. May 6, 1963, to Nov. 6, 1963, nonrecording gage at site 0.4 mi downstream. All at different datums. Nov. 7, 1963, to Aug. 15, 1976, water-stage recorder at site 35 ft downstream at present datum. Aug. 15, 1976, to Sept. 30, 1979, water-stage recorders located on each bank downstream of Sarpy Road bridge and were used depending on control conditions.

REMARKS.--Records good except those for winter period, which are poor. Flow partly regulated by Willow Creek Reservoir (capacity 23,000 acre-ft). Diversions for irrigation of 20,980 acres above station. Figures of discharge given herein include flow of terminal wasteway of Agency Canal.

AVERAGE DISCHARGE.--31 years, 315 ft³/s, 228,200 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,600 ft³/s, May 19, 1978, gage height, 11.20 ft, used gage height as obtained at bridge on Sarpy Road; maximum gage height, 11.78 ft Mar. 20, 1960, site and datum then in use (backwater from ice); minimum discharge observed, 0.20 ft³/s Aug. 7, 1961, result of discharge measurement.

EXTREMES FOR CURRENT YEAR--Peak discharges above base of 1,000 ft³/s and maximums(*):

<u>Date</u>	<u>Time</u>	<u>Discharge</u> <u>ft³/s</u>	<u>Gage height</u>
May 11	1700	1,720	4.61
May 18	1400	*2,210	*5.09
June 2	2015	1,800	4.69
June 18	1230	1,730	4.56

Minimum daily discharge, 55 ft³/s Dec. 25, result of freezeup.

<u>Month</u>	<u>Second-foot days</u>	<u>Mean</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Runoff, in</u> <u>acre-feet</u>
October 1983	4,667	151	165	137	9,260
November	4,352	145	160	110	8,630
December	3,160	102	150	55	6,270
January 1984	6,140	198	350	90	12,180
February	6,450	222	350	150	12,790
March	9,743	314	668	150	19,330
April	8,221	274	349	198	16,310
May	39,625	1,278	2,160	382	78,600
June	38,230	1,274	1,680	796	75,830
July	11,242	363	774	187	22,300
August	4,574	148	259	70	9,070
September 1984	4,179	139	248	87	8,290
1984 water year	140,583	384	2,160	55	278,800

06294500 Bighorn River above Tullock Creek, near Bighorn, Mont.

LOCATION.--Lat 46°07'29", long 107°28'06", in SE1/4 SE1/4 NE1/4 sec. 3, T. 4 N., R. 34 E., Treasure County, Hydrologic Unit 10080015, on right bank, 1.9 mi upstream from Tullock Creek, 3.0 mi upstream from mouth, 3.6 mi southwest of Bighorn, and 4.5 mi southeast of Custer.

DRAINAGE AREA.--22,414 mi². Area at site used Oct. 7, 1955, to Sept. 30, 1981, 22,885 mi².

PERIOD OF RECORD.--Oct. 1, 1981, to current year. Records since January 1950 available in annual reports of the Yellowstone River Compact Commission. Previously, published as "06294700 Bighorn River at Bighorn, MT," 1956-81, and as "near Custer," 1945-55. Flows are equivalent at all sites.

GAGE.--Water-stage recorder. Altitude of gage is 2,700 ft, from topographic map. May 11 to Dec. 6, 1945, nonrecording gage, and Dec. 7, 1945, to Oct. 6, 1955, water-stage recorder at different datum. Oct. 7, 1955, to Sept. 30, 1981, at site 2.3 mi downstream at different datum.

REMARKS.--Records good except those for December to January, which are fair. Flow regulated by Bighorn Lake beginning November 1965 (usable capacity, 1,356,000 acre-ft). Major regulation prior to November 1965 by 14 reservoirs in Wyoming and 1 in Montana with combined usable capacity of about 1,400,000 acre-ft; see sections "Monthly summary of contents for Compact reservoirs." Diversions for irrigation of about 445,200 acres above station.

AVERAGE DISCHARGE.--39 years (water years 1946-81, 1982-84), 3,950 ft³/s 2,862,000 acre-ft/yr, unadjusted.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 59,200 ft³/s May 20, 1978, gage height, 14.15 ft; maximum gage height recorded, 14.21 ft Apr. 2, 1965 (ice jam); minimum discharge, about 275 ft³/s Nov. 15, 1959, result of freezeup; minimum daily, 400 ft³/s Apr. 4, 1967.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,700 ft³/s July 4, 1983, gage height, 5.66 ft; maximum gage height, 8.52 ft Jan. 14, 1982 (ice jam); minimum daily discharge, 1,270 ft³/s Oct. 17, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,080 ft³/s June 21, gage height, 4.28 ft; maximum gage height, 8.3 ft (date unknown), backwater from ice; minimum daily discharge, 1,750 ft³/s Oct. 21.

Month	Second-foot days	Mean	Maximum	Minimum	Runoff, in acre-feet	Adjusted runoff, in acre-feet*
October 1983	132,480	4,274	4,950	1,750	262,800	254,500
November	152,680	5,089	5,200	4,930	302,800	236,500
December	122,880	3,964	5,120	3,300	243,700	145,700
January 1984	115,330	3,720	4,600	3,100	228,800	182,600
February	101,420	3,497	3,660	3,230	201,200	147,900
March	115,760	3,734	4,080	3,400	229,600	222,100
April	114,200	3,807	4,220	3,420	226,500	208,500
May	190,760	6,154	6,850	4,570	378,400	396,800
June	191,770	6,392	6,850	5,390	380,400	452,400
July	148,080	4,777	6,440	2,970	293,700	286,400
August	116,830	3,769	4,390	3,120	231,700	189,600
September 1984	92,240	3,075	3,910	2,790	183,000	186,700
1984 water year	1,594,430	4,356	6,850	1,750	3,163,000	2,910,000

*Adjusted for change in contents in Bighorn Lake minus Little Bighorn River near Hardin.

BIGHORN RIVER ABOVE TULLOCK CREEK, NEAR BIGHORN, MONT.
 (Adjusted for change in contents in Bighorn Lake
 minus
 Little Bighorn River near Hardin, Mont.)

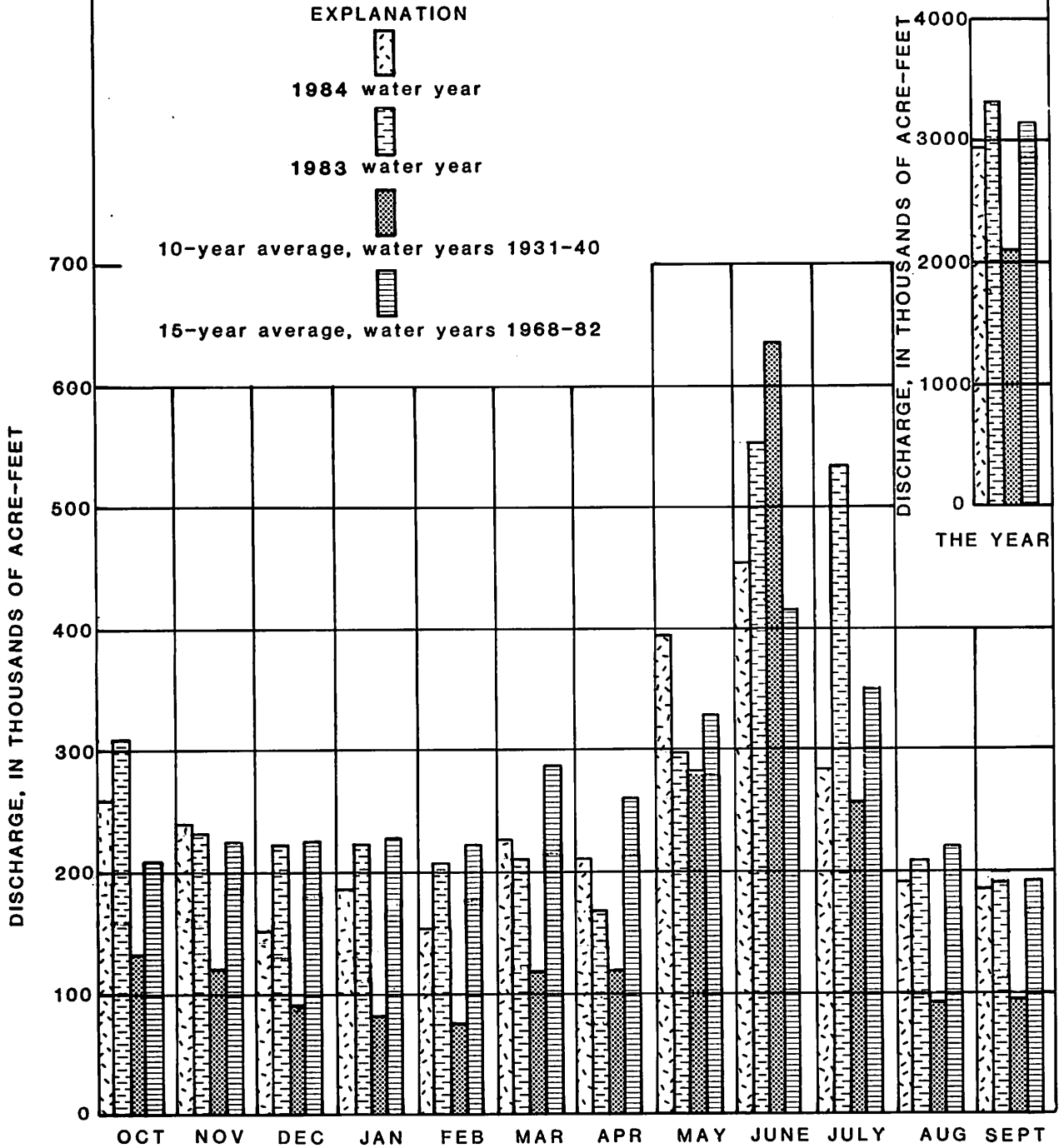


Figure 2.--Comparison of discharge for 1984 water year with 1983 water year and with average discharge for water years 1931-40 and 1968-82.

06308500 Tongue River at Miles City, Mont.

LOCATION.--Lat 46°20'44", long 105°48'10", in NE1/4 NE1/4 SE1/4 sec. 23, T. 7 N., R. 47 E., Custer County, Hydrologic Unit 10090102, on right bank 4 mi south of Miles City and at mile 8.1.

DRAINAGE AREA.--5,379 mi².

PERIOD OF RECORD.--April 1938 to April 1942, April 1946 to current year. Published as "near Miles City" April 1938 to April 1942. Not equivalent to records published as "near Miles City" May 1929 to October 1932. Monthly discharges only for some periods, published in WSP 1309. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Datum of gage is 2,375.76 ft National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). April 1938 to April 1942, nonrecording gage at site 8 mi upstream at different datum. April 1946 to Sept. 30, 1963, at datum 1.00 ft higher.

REMARKS.--Records good except those for winter period, which are poor. Flow regulation by Tongue River Reservoir (see section "Monthly summary of contents for Compact reservoirs existing on January 1, 1950") and many small reservoirs in Wyoming (combined capacity, about 15,000 acre-ft). Diversions for irrigation of about 100,800 acres above station.

AVERAGE DISCHARGE.--41 years (1938-41, 1946-84), 442 ft³/s, 320,200 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,300 ft³/s June 15, 1962, gage height, 12.33 ft, present datum, from rating curve extended above 8,220 ft³/s on basis of float measurement; maximum gage height, 13.27 ft, Mar. 19, 1960, Feb. 15, 1971 (ice jam), present datum; no flow July 9-19, Aug. 13, 14, Sept. 28, 1940.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,570 ft³/s June 16, gage height, 6.52 ft; minimum daily, 100 ft³/s Dec. 24, result of freezeup.

<u>Month</u>	<u>Second-foot days</u>	<u>Mean</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Runoff, in acre-feet</u>
October 1983	4,244	137	170	108	8,420
November	4,117	137	180	120	8,170
December	4,945	160	210	100	9,810
January 1984	7,080	228	320	140	14,040
February	7,200	248	300	210	14,280
March	7,912	255	295	241	15,690
April	8,405	280	450	194	16,670
May	39,480	1,274	2,460	416	78,310
June	78,990	2,633	3,020	1,220	156,700
July	16,380	528	1,170	248	32,490
August	7,637	246	323	192	15,150
September 1984	<u>7,455</u>	249	299	204	<u>14,790</u>
1984 water year	193,845	530	3,020	100	384,500

TONGUE RIVER AT MILES CITY, MONT.

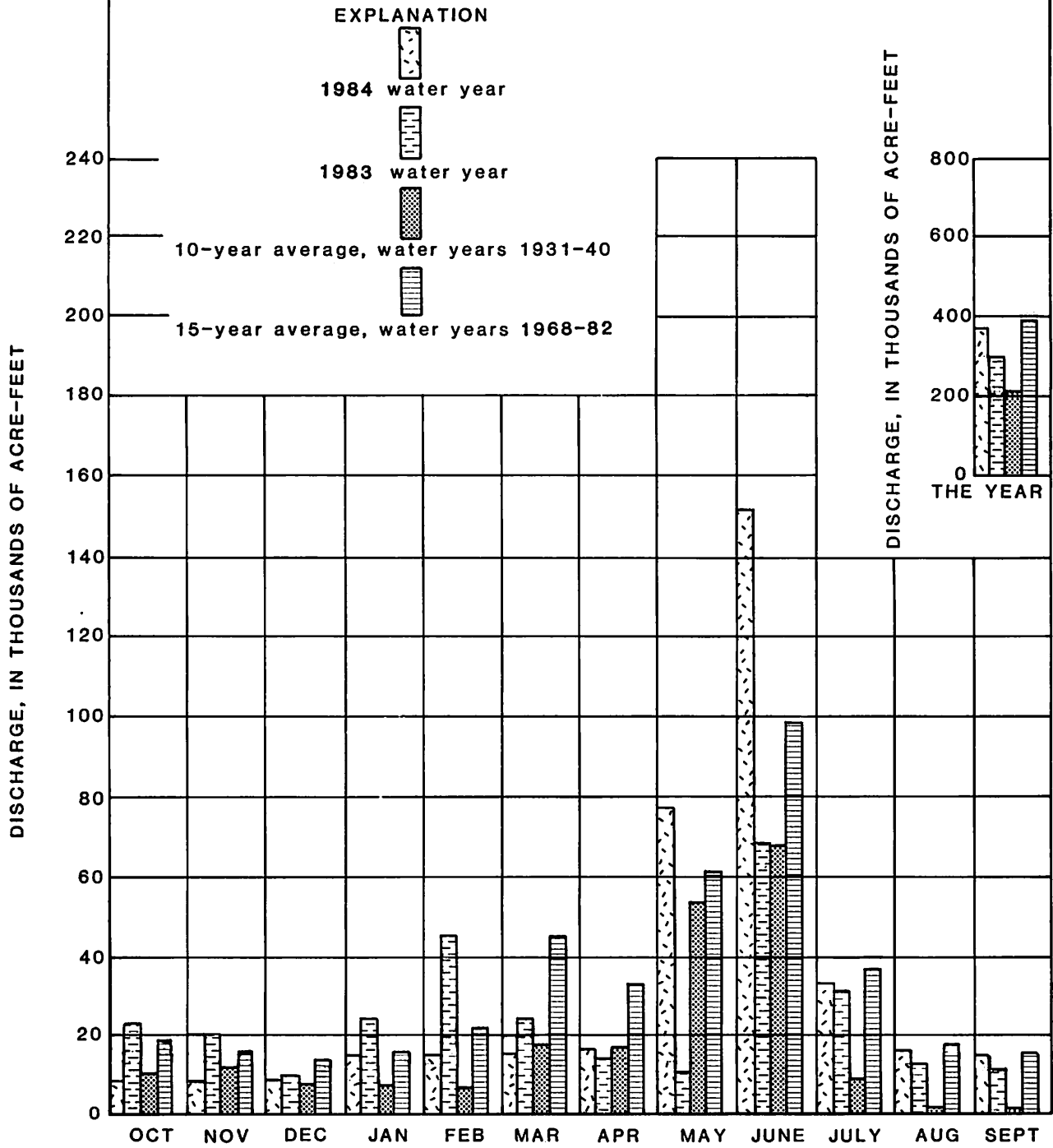


Figure 3.--Comparison of discharge for 1984 water year with 1983 water year and with average discharge for water years 1931-40 and 1968-82.

06326500 Powder River near Locate, Mont.

LOCATION.--Lat 46°26'56", long 105°18'44", in NW1/4 SW1/4 sec. 14, T. 8 N., R. 51 E., Custer County, Hydrologic Unit 10090209, on left bank 1.5 mi downstream from bridge on old U.S. Highway 12 at present site of Locate, 1.5 mi upstream from Locate Creek, 5 mi west of former site of Locate, 25 mi east of Miles City, and at mile 27.9.

DRAINAGE AREA.--13,194 mi². Drainage area at site 1.5 upstream, 13,189 mi².

PERIOD OF RECORD.--March 1938 to current year. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

REVISED RECORDS.--WSP 926: 1939. WSP 1309: 1938-39 (M). WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,384.79 ft National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to July 11, 1947, nonrecording gage at bridge 1.5 mi upstream, and July 11, 1947, to Sept. 30, 1965, water-stage recorder at site near upstream bridge at different datum. Oct. 1, 1965, to Oct. 4, 1966, nonrecording gage, and Oct. 5, 1966, to Mar. 21, 1978, water-stage recorder at present site and datum. Mar. 22, 1978, to Apr. 23, 1981, water-stage recorder 1.5 upstream at different datum, Apr. 24 to Aug. 20, 1981, water-stage recorder at present site and datum, and Aug. 21, 1981, to Sept. 30, 1981, water-stage recorder 1.5 mi upstream at different datum. Effective Oct. 1, 1981, recording and nonrecording gages will be maintained at both the upstream and present gage locations and each site will be employed depending on the water-stage control conditions and for the capability of recording useful gage-height data.

REMARKS.--Records fair except those for winter periods, which are poor. Some regulation by three reservoirs in Wyoming with combined usable capacity of 36,800 acre-ft. Diversions for irrigation of about 101,800 acres above station.

AVERAGE DISCHARGE.--46 years, 613 ft³/s, 444,100 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge observed, 31,000 ft³/s Feb. 19, 1943, maximum gage height, 12.27 ft Mar. 16, 1978 (backwater from ice); no flow Jan. 16 to Feb. 12, Feb. 22-24, 1950, July 27, Sept. 21-27, Oct. 1, 1960, Sept. 4-8, 1961.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,450 ft³/s June 19, gage height, 5.54 ft, no peaks above base of 5,000 ft³/s; maximum gage height, 9.42 ft Mar. 19 (backwater from ice); minimum daily discharge, 30 ft³/s Dec. 25, result of freezeup.

<u>Month</u>	<u>Second-foot days</u>	<u>Mean</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Runoff, in acre-feet</u>
October 1983	6,051	195	279	91	12,000
November	7,598	253	342	40	15,070
December	2,400	77.4	110	30	4,760
January 1984	5,950	192	330	70	11,800
February	10,340	357	400	290	20,510
March	24,323	785	1,700	360	48,240
April	19,563	652	1,000	399	38,800
May	69,655	2,247	3,710	945	138,200
June	73,710	2,457	4,190	1,290	146,200
July	16,944	547	1,220	96	33,610
August	5,056	163	274	63	10,030
September 1984	2,594	86.5	167	52	5,150
1984 water year	244,184	667	4,190	30	484,300

POWDER RIVER NEAR LOCATE, MONT.

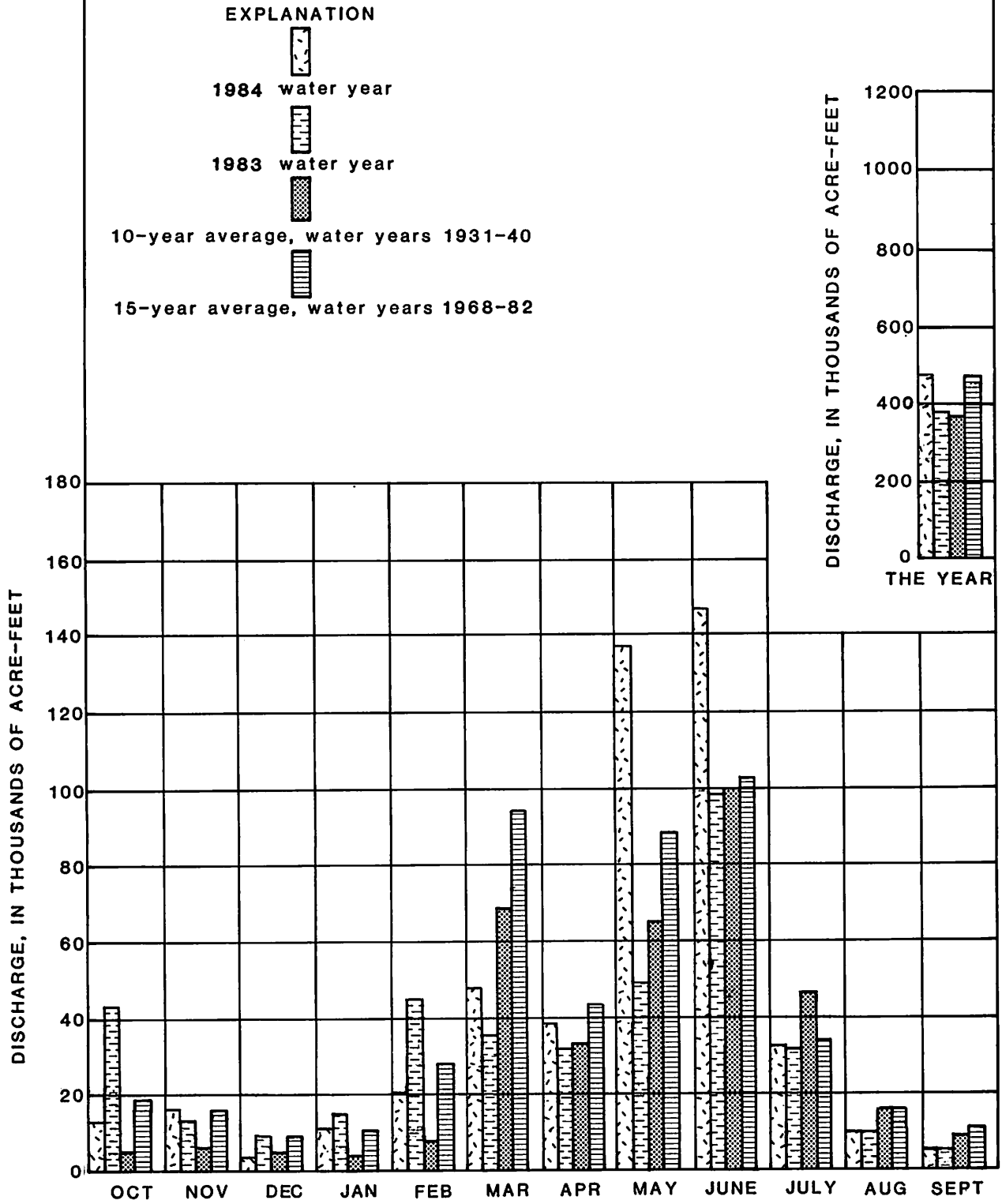


Figure 4.--Comparison of discharge for 1984 water year with 1983 water year and with average discharge for water years 1931-40 and 1968-82.

MONTHLY SUMMARY OF CONTENTS FOR COMPACT RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

06258900 Boysen Reservoir, Wyo.

LOCATION.--Lat 43°25'00", long 108°10'37", in NW1/4 NW1/4 sec. 16, T. 5 N., R. 6 E., Fremont County, Hydrologic Unit 10080005, at dam on Wind River and 13 mi north of Shoshoni, Wyoming.

DRAINAGE AREA.--7,700 mi².

PERIOD OF RECORD.--October 1951 to current year (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is referenced to National Geodetic Vertical Datum of 1929 (levels by U.S. Bureau of Reclamation).

REMARKS.--Reservoir is formed by rock-fill dam completed in October 1951. Storage began Oct. 11, 1951. Usable capacity, 742,100 acre-ft between elevation 4,657.00 ft, invert of penstock pipe, and 4,725.00 ft, top of spillway gate. Dead storage, 59,880 acre-ft below elevation 4,657.00 ft. Prior to Jan. 1, 1966, usable capacity was 757,800 acre-ft and dead storage was 62,000 acre-ft at same elevations. Crest of dam is at elevation 4,758 ft. Figures given herein represent usable contents. Water used for irrigation, flood control, and power development.

COOPERATION.--Records furnished by U.S. Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum usable daily contents, 862,500 acre-ft July 6, 7, 1967, elevation, 4,730.83 ft; minimum usable daily since normal use of water started, 191,900 acre-ft Mar. 18, 19, 1956, elevation, 4,684.18 ft, capacity table then in use.

EXTREMES FOR CURRENT YEAR.--Maximum usable contents, 742,900 acre-ft Aug. 3, elevation, 4,725.04 ft; minimum usable, 477,500 acre-ft May 13, elevation, 4,709.50 ft.

<u>Month</u>	<u>Water-surface elevation, in feet</u>	<u>Contents*, in acre-feet</u>	<u>Change in contents, in acre-feet</u>
September 30, 1983.	4,721.04	667,300	
October 31.	4,719.65	642,200	-25,100
November 30	4,716.79	592,500	-49,700
December 31	4,715.63	573,100	-19,400
January 31, 1984.	4,714.43	553,500	-19,600
February 29	4,713.18	533,500	-20,000
March 31.	4,712.39	521,200	-12,300
April 30.	4,710.46	491,800	-29,400
May 31.	4,714.78	559,100	+67,300
June 30	4,720.65	660,200	+101,100
July 31	4,724.82	738,600	+78,400
August 31	4,723.65	716,000	-22,600
September 30, 1984.	4,722.56	695,400	-20,600
1984 water year			+28,100

*Does not include dead storage of 59,880 acre-ft.

06260300 Anchor Reservoir, Wyo.

LOCATION.--Lat 43°39'50", long 108°49'27", in sec. 26, T. 43 N., R. 100 W., Hot Springs County, Hydrologic Unit 10080007, at dam on South Fork Owl Creek, 2 mi downstream from Middle Fork, 3 mi southeast of Anchor, and 32 mi west of Thermopolis.

DRAINAGE AREA.--131 mi².

PERIOD OF RECORD.--November 1960 to current year (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is referenced to National Geodetic Vertical Datum of 1929 (U.S. Bureau of Reclamation benchmark).

REMARKS.--Reservoir is formed by concrete arch dam completed in 1960. Usable capacity, 17,170 acre-ft between elevation 6,343.75 ft, invert of river outlet, and 6,441.00 ft, spillway crest, not including 68 acre-ft below elevation 6,343.75 ft. Prior to Oct. 1, 1971, usable capacity was 17,280 acre-ft not including 149 acre-ft below the invert. Figures given herein represent usable contents. Water is used for irrigation of land in Owl Creek basin.

COOPERATION.--Records furnished by U.S. Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily contents, 9,250 acre-ft July 4, 1967 (elevation, 6,418.52 ft); no storage on many days each year.

EXTREMES FOR CURRENT YEAR.--Maximum usable daily contents, 2,690 acre-ft June 2, elevation, 6,388.15 ft; no storage most days.

<u>Month</u>	<u>Water-surface elevation, in feet</u>	<u>Contents*, in acre-feet</u>	<u>Change in contents, in acre-feet</u>
September 30, 1983.	* 6,304.30	0	0
October 31.	* 6,304.30	0	0
November 30	* 6,304.30	0	0
December 31	* 6,304.30	0	0
January 31, 1984.	* 6,304.30	0	0
February 29	* 6,304.30	0	0
March 31.	* 6,304.30	0	0
April 30.	6,340.00	0	0
May 31.	6,384.90	2,270	+2,270
June 30	6,369.95	911	-1,359
July 31	* 6,349.00	70	- 841
August 31	* 6,340.00	0	0
September 30, 1984.	* 6,304.30	0	0
1984 water year			0

*Does not include dead storage of 68 acre-ft.

06286400 Bighorn Lake near St. Xavier, Mont.

LOCATION.--Lat 45°18'27", long 107°57'26", in SW1/4 SE1/4 sec. 18, T. 6 S., R. 31 E., Big Horn County, Hydrologic Unit 10080010, in block 13 of Yellowtail Dam on Bighorn River, 1.3 mi upstream from Grapevine Creek, 15.5 mi southeast of St. Xavier, and at mile 86.6.

DRAINAGE AREA.--19,626 mi².

PERIOD OF RECORD.--November 1965 to current year (monthend contents only). Prior to October 1969, published as "Yellowtail Reservoir."

GAGE.--Water-stage recorder in powerhouse control room. Datum of gage is referenced to National Geodetic Vertical Datum of 1929 (levels by U.S. Bureau of Reclamation).

REMARKS.--Reservoir is formed by thin concrete-arch dam; construction began in 1961; completed in 1967. Storage began Nov. 3, 1965. Usable capacity, 1,356,000 acre-ft between elevation 3,296.50 ft, river outlet invert, and 3,657.00 ft, top of flood control. Elevation of spillway crest, 3,593.00 ft. Normal maximum operating level, 1,097,000 acre-ft, elevation, 3,640.00 ft. Minimum operating level, 483,400 acre-ft, elevation 3,547.00 ft. Dead storage, 18,970 acre-ft below elevation 3,296.50 ft. Figures given herein represent usable contents. Water is used for power production, flood control, irrigation, and recreation.

COOPERATION.--Elevations and capacity table furnished by U.S. Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily contents, 1,346,000 acre-ft July 6, 1967, elevation, 3,656.43 ft; minimum since first filling, 660,700 acre-ft Mar. 11, 1970, elevation, 3,584.45 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 1,108,000 acre-ft Aug. 7, elevation, 3,640.83 ft; minimum, 809,500 acre-ft Mar. 10, elevation, 3,608.44 ft.

<u>Month</u>	<u>Water-surface elevation, in feet</u>	<u>Contents*, in acre-feet</u>	<u>Change in contents, in acre-feet</u>
September 30, 1983	3,635.52	1,043,000	
October 31	3,635.59	1,044,000	+ 1,000
November 30.	3,630.16	986,300	-57,700
December 31.	3,619.82	894,600	-91,700
January 31, 1984	3,615.44	860,000	-34,000
February 29.	3,609.97	820,100	-40,500
March 31	3,611.98	831,900	+11,800
April 30	3,511.71	830,200	- 1,700
May 31	3,623.74	927,200	+97,000
June 30.	3,638.22	1,075,000	+147,800
July 31.	3,639.46	1,090,000	+15,000
August 31.	3,636.75	1,057,000	-33,000
September 30, 1984	3,637.74	1,069,000	+12,000
1984 water year			+26,000

* Does not include dead storage of 18,970 acre-ft.

MONTHLY SUMMARY OF CONTENTS FOR COMPACT RESERVOIRS EXISTING ON JANUARY 1, 1950

The extent, if any, of the use of reservoirs in this category which may be subject to Compact allocations was not determined. As a matter of hydrologic interest the month-end contents in acre-feet of four reservoirs are given. The first three reservoirs are in the Bighorn River basin, Wyoming, and data on contents were furnished by the U.S. Bureau of Reclamation. The Tongue River Reservoir in Montana is operated under the supervision of the Water Resources Division of the Montana Department of Natural Resources and Conservation, which furnished the operating data.

Contents, in acre-feet

Month	06224500 <u>a/Bull Lake</u>	b/Pilot Butte <u>Reservoir</u>	06281500 <u>c/Buffalo</u> Bill <u>Reservoir</u>	06307000 <u>d/Tongue</u> River <u>Reservoir</u>
September 30, 1983. . .	103,800	15,840	332,700	10,490
October 31.	104,200	14,000	330,300	13,000
November 30	105,200	13,890	336,600	15,110
December 31	106,300	13,890	328,600	13,000
January 31, 1984. . . .	106,600	13,890	320,300	14,230
February 29	106,800	13,890	309,700	15,720
March 31.	106,800	15,020	298,700	23,950
April 30.	101,100	23,320	285,500	22,460
May 31.	111,300	23,760	352,400	42,250
June 30	143,400	23,150	450,000	50,390
July 31	144,100	18,860	431,700	44,400
August 31	118,600	18,940	393,100	25,720
September 30, 1984. . .	86,400	18,300	357,000	15,880
Change in contents during water year. . .	-17,400	+2,460	+24,300	+5,390

a/ Usable contents, from revised capacity table effective October 1, 1965. Dead storage is 722 acre-ft.

b/ Usable contents. Dead storage is 5,360 acre-ft.

c/ Usable contents, from revised capacity table based on survey of 1959. Contents prior to October 1960 based on survey of 1941. Dead storage is negligible.

d/ Usable contents. Dead storage is 1,400 acre-ft. Contents based upon sedimentation surveys of October 1948.

RULES AND REGULATIONS FOR ADMINISTRATION OF
THE YELLOWSTONE RIVER COMPACT

A compact, known as the Yellowstone River Compact, between the States of Wyoming, Montana, and North Dakota, having become effective on October 30, 1951, upon approval of the Congress of the United States, which apports the waters of certain interstate tributaries of the Yellowstone River which are available after the appropriative rights existing in the States of Wyoming and Montana on January 1, 1950, are supplied, and after appropriative rights to the use of necessary supplemental water are also supplied as specified in the Compact, the following rules and regulations are adopted subject to the provisions for amendment, revision or abrogation as provided herein.

Article I. Collection of Water Records

- A. It shall be the joint and equal responsibility of the members of the States of Wyoming and Montana to collect, cause to be collected, or otherwise furnish records of tributary streamflow at the points of measurement specified in Article V (B) of the Compact, or as near thereto as is physically or economically feasible or justified.

1. Clarks Fork

The gaging station known as Clarks Fork near Silesia, Montana and located in NW1/4 SE1/4 sec. 1, T. 4 S., R. 23 E., shall be the point of measurement for the Clarks Fork.

2. Bighorn River (exclusive of Little Bighorn River)

The gaging station known as the Bighorn River at Bighorn, Montana, and located in NE1/4 NE1/4 sec. 33, T. 5 N., R. 34 E., shall temporarily be the designated point of measurement on that stream. The flow of the Little Bighorn River as measured at the gaging station near Hardin, Montana, and located in SW1/4 NW1/4 sec. 20, T. 1 S., R. 34 E., shall be considered the point of measurement for that stream, except that if or when satisfactory records are not available, the records for the nearest upstream station with practical corrections for intervening inflow or diversion shall be used.

3. Tongue River

The gaging station known as the Tongue River at Miles City, Montana, and located in SE1/4 sec. 23, T. 7 N., R. 47 E., shall temporarily be the point of measurement for that stream.

4. Powder River

The gaging station known as the Powder River near Locate, Montana, and located in SE1/4 sec. 23, T. 8 N., R. 51 E., shall temporarily be the designated point of measurement for that stream.

- B. Records of total annual diversion in acre-feet above the points of measurement designated in the Compact for irrigation, municipal, and industrial uses developed after January 1, 1950, shall be furnished by the members of the Commission for their respective States, at such time as the Commission deems necessary for interstate administration as provided by the terms of the Compact. Providing that if it be acceptable to the Commission, reasonable estimates thereof may be substituted.
- C. Annual records of the net change in storage in all reservoirs, not excluded under Article V (E) of the Compact, above the point of measurement specified in the Compact and completed after January 1, 1950, and the annual net change in reservoirs existing prior to January 1, 1950, which is used for irrigation, municipal, and industrial purposes developed after January 1, 1950, shall be the primary responsibility of the member of the Commission in whose State such works are located; providing such data are not furnished by Federal agencies under the provisions of Article III (D) of the Compact, or collected by the Commission.

Article II. Office and Officers

- A. The office of the Commission shall be located at the office of the Chairman of the Commission.
- B. The Chairman of the Commission shall be the Federal representative as provided in the Compact.
- C. The Secretary of the Commission shall be as provided for in Article III of these rules.
- D. The credentials of each member of the Commission shall be placed on file in the office of the Commission.

Article III. Secretary

- A. The Commission, subject to the approval of the Director of the United States Geological Survey, shall enter into cooperative agreements with the U.S. Geological Survey for such engineering and clerical services as may reasonably be necessary for the administration of the Compact. Said agreements shall provide that the Geological Survey shall:

1. Maintain and operate gaging stations at or near the points of measurement specified in Article V (A) of the Compact.
 2. Assemble factual information on stream flow, diversion, and reservoir storage for the preparation of an annual report to the Governors of the signatory States.
 3. Make such investigations and reports as may be requested by the Commission in aid of its administration of the Compact.
- B. The Geological Survey shall act as Secretary to the Commission.

Article IV. Budget

- A. At the annual meeting of each even-numbered year or prior thereto, the Commission shall adopt a budget for operation during the ensuing biennium beginning July first. Such budget shall set forth the total cost of construction, maintenance and operation of gaging stations, the cost of engineering and clerical aid, and other necessary expenses excepting the salaries and personal expenses of the Commissioners. On odd-numbered years revisions of the budget shall be considered.
- B. It shall be the obligation of the Commissioners of the States of Montana and Wyoming to endeavor to secure from the Legislature of their respective States sufficient funds with which to meet the obligations of this Compact, except insofar as provided by the Federal government.

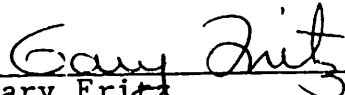
Article V. Meetings

An annual meeting of the Commission shall be held each November at some mutually agreeable point in the Yellowstone River Basin for consideration of the annual report for the water year ending the preceding September 30th, and for the transaction of such other business consistent with its authority; provided that by unanimous consent of the Commission the date and place of the annual meeting may be changed. Other meetings as may be deemed necessary shall be held at a time and place set by mutual agreement, for the transaction of any business consistent with its authority.

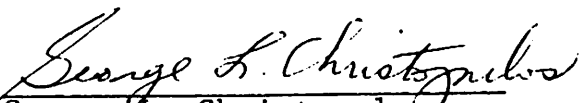
No action of the Commission shall be effective until approval by the Commissioners for the States of Wyoming and Montana.

Article VI. Amendments, Revisions and Abrogations.

The Rules and Regulations of the Commission may be amended or revised by a unanimous vote at any meeting of the Commission.

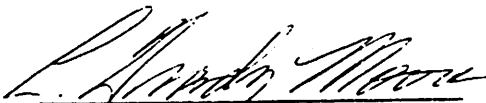


Gary Fritz
Commissioner for Montana



George L. Christopoulos
Commissioner for Wyoming

ATTESTED:



L. Grady Moore
Federal Representative

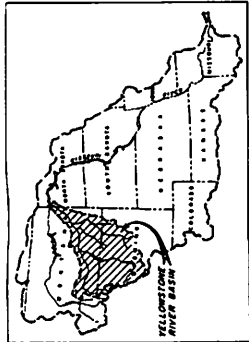
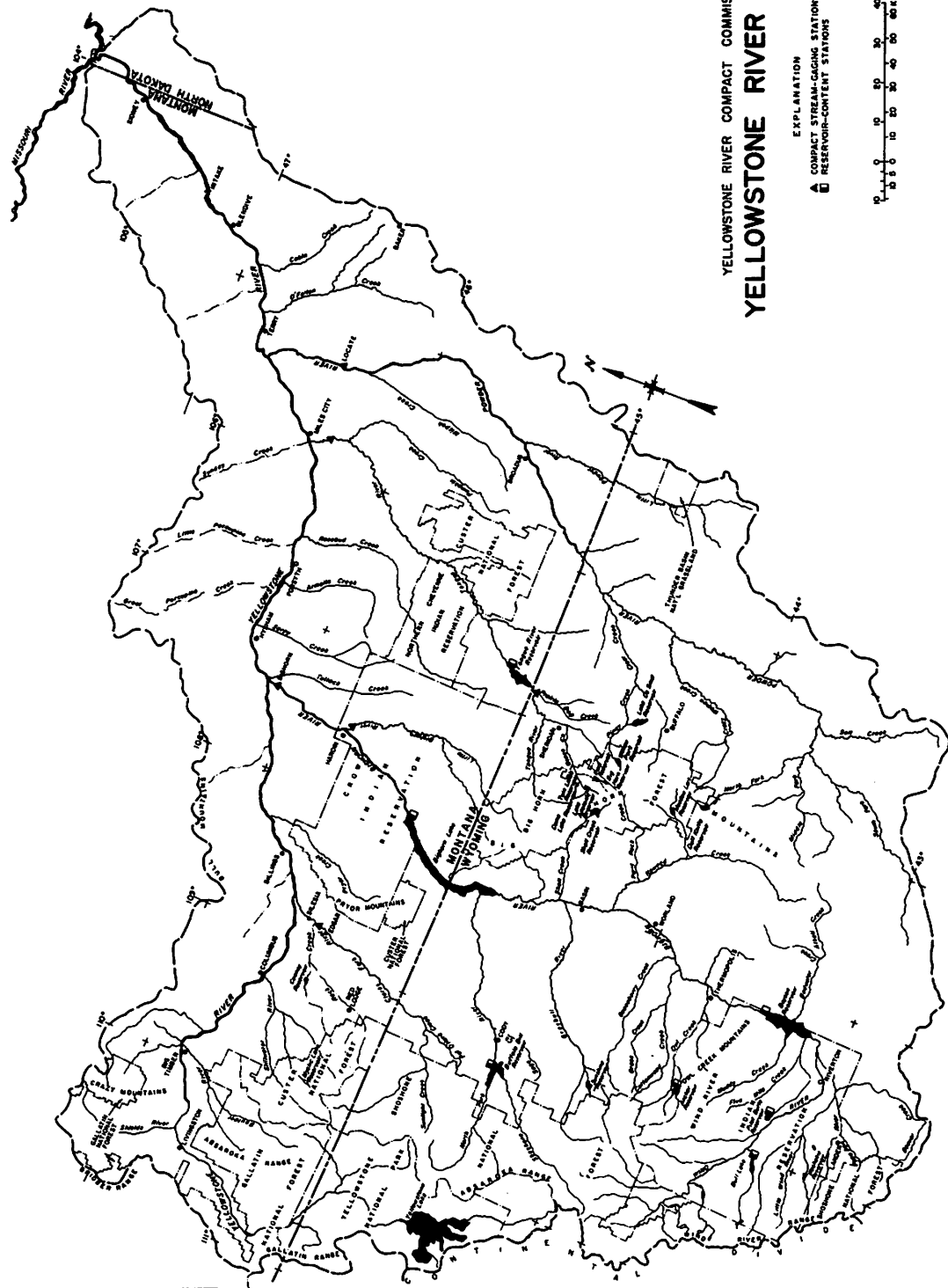
Adopted November 17, 1953
Amended April 9, 1980

METRIC CONVERSION TABLE

The following factors may be used to convert the inch-pound units published herein to the International System (SI) of metric units. Subsequent reports will contain both the inch-pound and SI unit equivalents in the station manuscript descriptions until such time that all data will be published in SI units.

<u>Multiply inch-pound units</u>	<u>By</u>	<u>To obtain SI units</u>
Length		
feet (ft)	.3048	meters (m)
miles (mi)	1.609	kilometers (km)
Area		
acres	4047	square meters (m ²)
	.4047	*hectares (ha)
	.4047	square hectometer (hm ²)
	.004047	square kilometers (km ²)
square miles (mi ²)	2.590	square kilometers (km ²)
Volume		
cfs-day (ft ³ /s-day)	2447	cubic meters (m ³)
	.002447	cubic hectometers (hm ³)
acre-feet (acre-ft)	1233	cubic meters (m ³)
	.001233	cubic hectometers (hm ³)
	.000001233	cubic kilometers (km ³)
Flow		
cubic feet per second (ft ³ /s)	28.32	liters per second (L/s)
	28.32	cubic decimeters per second (dm ³ /s)
	.02832	cubic meters per second (m ³ /s)

*The unit hectare is approved for use with the International System (SI) for a limited time. See NBS Special Bulletin 330, p. 15, 1972 edition.



MAP SHOWING LOCATIONS OF COMPACT STREAM-GAGING AND RESERVOIR-CONTENT STATIONS