TWENTY-THIRD ANNUAL REPORT

YELLOWSTONE RIVER

COMPACT COMMISSION

1974

YELLOWSTONE RIVER COMPACT COMMISSION

421 Federal Building
Helena, Montana

Honorable Stanley K. Hathaway
Governor of the State of Wyoming
Cheyenne, Wyoming

Honorable Thomas L. Judge
Governor of the State of Montana
Helena, Montana

Honorable Arthur A. Link
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 twenty-third annual report of activities for the period ending September 30, 1974.

The Commission held the annual meeting at Billings, Montana, on November 26, 1974. Mr. Orrin Ferris, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation, and Mr. Floyd A. Bishop, Wyoming State Engineer, the designated representatives of their respective States, and Mr. Walter R. Scott, the designated Federal representative and chairman were all present. Others present were: Ted Doney and Richard Munger, Department of Natural Resources and Conservation, Helena, Montana; George Christopulos and Joe Lord, Wyoming State Engineer's Office, Cheyenne, Wyoming; William Long and Ken Bower, Wyoming State Board of Control, Sheridan and Worland, Wyoming respectively; Delton D. Schulz, North Dakota State Water Commission, Bismarck, North Dakota; Phil Q. Gibbs and Dick Anesi, U.S. Bureau of Reclamation, Billings, Montana; Alvin E. Bielefeld, Field Solicitor, Department of the Interior, Billings, Montana; and George M. Pike and Betty L. Dean, U.S. Geological Survey, Helena, Montana.

There were no incidents during the year that required administration of the water in accordance with the provisions of the Compact. At the present level of water-resources development, the Commission feels that a program of intensive water-use regulations is not necessary. However, the attention of the Commission is focused on the need to define detailed procedures for implementing Compact provisions previous to the time when development of water within the Yellowstone River Basin requires that these provisions be enforced.

The interest in Yellowstone River water for coal development and peripheral needs has continued to increase and it is evident that, at some yet undetermined time, it will be necessary to divide the waters of the Yellowstone River System as allocated by Article V of the Compact.

The documentation of pre-1950 water rights has been completed in Wyoming. The new 1973 Montana Water Code is assisting that state in its documentation, although it is still incomplete.

A problem that continues to be of major long-range concern to the Commission is the uncertainty of the quantity of water to be used by Indians from those streams flowing through Indian reservations. The Commission believes that studies and action necessary to the quantification of Indian needs and rights should be expedited.

Intake Water Company filed suit against the Commission and its members in Federal District Court in Billings, Montana, on June 29, 1973, which was discussed in the twenty-second annual report. Since then the Montana Department of Natural Resources and Conservation has brought suit in state court to invalidate any water right which the Intake Water Company purported to hold for Yellowstone River waters. The parties are still taking depositions in this suit. The Federal District Judge has stayed the Federal action until it is determined whether the Intake Water Company actually has a water right. If the Company does not have a water right, the suit against the Commission would be dismissed.

Two changes were made in Commission membership during 1974. On March 25, 1974, Mr. Orrin Ferris, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation was appointed by Governor Thomas L. Judge to succeed Mr. Grant W. Buswell. On November 15, 1974, Mr. Walter R. Scott was appointed as Federal Representative to the chairman of the Commission by the Director of the U.S. Geological Survey succeeding Mr. Robert C. Williams who passed away March 21, 1974. Mr. Floyd A. Bishop announced his retirement as of December 1, 1974, at the November 26, 1974, annual meeting.

The Commission feels that due to the potential for large-scale use of water associated with coal development that joint allocation and development studies should be carried out in the near future. Study details are to be outlined to the chairman by the State members before January 1, 1975.

The budgets for fiscal years 1974 through 1977 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,

Floyd A. Bishop
Commissioner for Wyoming

Orrin Ferris
Commissioner for Montana

Walter R. Scott
Federal Representative

Cost:

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 1974 was $15,540, in accordance with the budget adopted for the year.

The budgets for Fiscal Years 1976 and 1977 were tentatively adopted subject to the availability of appropriations.

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

July 1, 1974 to June 30, 1975 (Fiscal Year 1975):	
Continuation of existing stream-gaging program	$16,480
July 1, 1975 to September 30, 1976 (Fiscal Year 1976): 1/	
Continuation of existing stream-gaging program	24,600
October 1, 1976 to September 30, 1977 (Fiscal Year 1977):	
Estimate for continuation of existing stream-gaging program	21,670

Gaging Stations:

Gaging stations at the measuring sites specified in the Compact were continued in operation and satisfactory discharge records collected at each. In addition, a station on Prairie Dog Creek near the Montana-Wyoming State line was operated for Compact administration purposes. Locations of gaging and reservoir stations are shown on a map of the Yellowstone River basin at the end of the report.

1/ The Federal fiscal year will change to run from 10/1/76 to 9/30/77, and the 15-month period is necessary to accomplish the shift. The first 12-month budget is $19,700.

During the Water Year ending September 30, 1974, annual streamflow at the designated points of measurement in Montana was slightly above average except in the Powder River basin where flow was 75 percent of average.

Water stored in the mountain snowpack was above average at the beginning of spring and a consequent good runoff occurred.

Details of streamflow for Water Year 1974 and bar graphs showing comparisons with average flows during selected base periods and with the preceding year are given in Appendix B.

Diversions:

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

Storage:

In 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 1,072,000 acre-feet at the beginning of the year and 1,056,000 acre-feet at the close. It fluctuated from a minimum of 756,400 acre-feet on May 2, 1974, to a maximum of 1,096,000 acre-feet on July 9, 1974. Boysen Reservoir, located on the Wind River and operated by the U.S. Bureau of Reclamation, began the year with 737,300 acre-feet in storage and ended with 633,700 acre-feet. Details regarding these reservoirs are given in Appendix C. 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.

In reservoirs existing on January 1, 1950

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

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 apportions 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 stream flow 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 NE 1/4 SE 1/4 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 NE 1/4 NE 1/4 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 NE 1/4 NE 1/4 sec.19, 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 SE 1/4, 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 SW 1/4 sec.14, 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 is 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, and be that of the United States Geological Survey, in Helena, Montana.

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. 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.

Douglas G. Smith
Commissioner for Montana

Floyd A. Bishop
Commissioner for Wyoming

ATTESTED:

Robert C. Williams
Federal Representative

Adopted November 17, 1953
Amended November 9, 1970

Table 5.--*Factors for converting English units to metric units*
(International System (SI) units)

The following factors may be used to convert the English units published herein to metric units. Subsequent reports will contain both the English and metric unit equivalents in the station manuscript descriptions until such time that all data will be published in metric units.

Multiply English units	By	To obtain metric units
	Length	
inch (in.)	2.54	centimetre (cm)
	25.4	millimetre (mm)
	.0254	metre (m)
foot (ft)	.3048	metre (m)
yard (yd)	.9144	metre (m)
rod	5.0292	metre (m)
mile (mi)	1.609	kilometre (km)
	Area	
acre	4047	square metre (m^2)
	.4047	*hectare (ha)
	.4047	square hectometre (hm^2)
	.004047	square kilometre (km^2)
square mile (mi^2)	2.590	square kilometre (km^2)
	Volume	
gallon (gal)	3.785	**litre (l)
	3.785	cubic decimetre (dm^3)
	3.785×10^{-3}	cubic metre (m^3)
million gallons (10^6 gal)	3785	cubic metre (m^3)
	3.785×10^{-3}	cubic hectometre (hm^3)
cubic foot (ft^3)	28.32	cubic decimetre (dm^3)
	.02832	cubic metre (m^3)
cubic foot per second-day (ft^3/s-day)	2447	cubic metre (m^3)
	2.447×10^{-3}	cubic hectometre (hm^3)
acre-foot (acre-ft)	1233	cubic metre (m^3)
	1.233×10^{-3}	cubic hectometre (hm^3)
	1.233×10^{-6}	cubic kilometre (km^3)
	Flow	
cubic foot per second (ft^3/s)	28.32	litre per second (l/s)
	28.32	cubic decimetre per second (dm^3/s)
	.02832	cubic metre per second (m^3/s)
gallon per minute (gpm)	.06309	litre per second (l/s)
	.06309	cubic decimetre per second (dm^3/s)
	6.309×10^{-5}	cubic metre per second (m^3/s)
million gallons per day (mgd)	43.81	cubic decimetre per second (dm^3/s)
	.04381	cubic metre per second (m^3/s)
	Mass	
ton (short)	907.2	kilogram (kg)
	.9072	tonne (t)

*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.

**The unit litre is accepted for use with the International System (SI). See NBS Special Bulletin 330, p. 13, 1972 edition.

MONTHLY SUMMARY OF DISCHARGE

Clarks Fork Yellowstone River near Silesia, Montana

LOCATION.--Lat 45°30'48", long 108°49'41", in NE¼SE¼ sec.1, T.4 S., R.23 E., Carbon County, on left bank 0.5 mi (0.8 km) downstream from Whitehorse Canal intake, 1 mi (1.6 km) upstream from Rock Creek, 3 mi (4.8 km) south of Silesia, and at mile 19 (30.6 km).

DRAINAGE AREA.--2,093 mi^2 (5,421 km^2).

PERIOD OF RECORD.--October 1969 to September 1974. Records for July 1921 to September 1969 (published as Clarks Fork Yellowstone River at Edgar) at site 5 mi (8.0 km) 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. Altitude of gage is 3,410 ft (1,039 m), from topographic map.

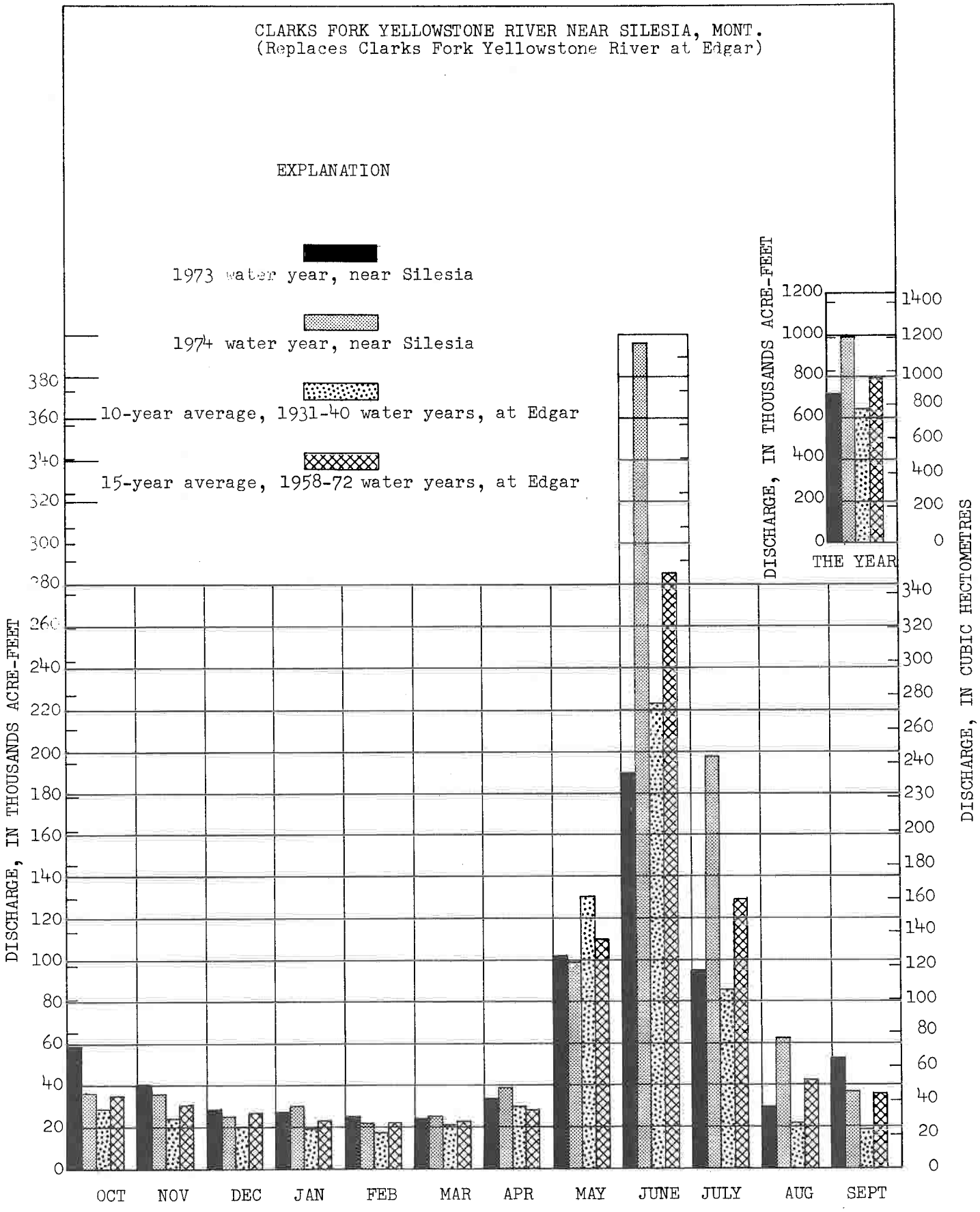
AVERAGE DISCHARGE.--5 years (1970-74), 1,254 ft^3/s (35.5 m^3/s), 908,500 acre-ft/yr (1.12 km^3/yr).

EXTREMES.--Current year: Maximum discharge, 11,000 ft^3/s (312 m^3/s) June 16, 17; maximum gage height, 7.59 ft (2.313 m) June 18; minimum daily discharge, 180 ft^3/s (5.10 m^3/s) Jan. 2.

Period of record: Maximum discharge, 11,800 ft^3/s (334 m^3/s) June 10, 1972, gage height, 7.51 ft (2.289 m); minimum daily, 140 ft^3/s (3.96 m^3/s) Dec. 4, 1972.

REMARKS.--Records good except those for winter period, which are poor. Diversions for irrigation of about 42,600 acres (172 km^2) of which 1,100 acres (4.45 km^2) lies below station. In addition, about 9,000 acres (36.4 km^2) of land above station are irrigated by diversions from the adjoining Rock Creek basin.

Month	Second-foot days	Maximum	Minimum	Mean	Runoff in acre-feet
October 1973	18,355	733	486	592	36,410
November	18,234	800	480	608	36,170
December	12,423	558	200	401	24,640
January 1974	15,180	1,430	180	490	30,110
February	11,048	460	335	395	21,910
March	12,458	587	324	402	24,710
April	19,643	1,520	358	655	38,960
May	50,033	5,960	466	1,614	99,240
June	199,690	10,400	3,190	6,656	396,100
July	96,190	5,740	1,400	3,103	190,800
August	31,518	1,640	617	1,017	62,520
September 1974	18,613	882	455	620	36,920
Water Year 1973-74	503,385	10,400	180	1,379	998,500



Comparison of discharge during 1973 water year with 1974 water year, near Silesia and with average discharge for the water years 1931-40 and 1958-72 at Edgar.

MONTHLY SUMMARY OF DISCHARGE

Little Bighorn River near Hardin, Montana

LOCATION.--Lat 45°44'08", long 107°33'27", in NE¼NE¼ sec.19, T.1 S., R.34 E., Big Horn County, on left bank 50 ft (15 m) downstream from bridge on Sarpy Road, 0.2 mi (0.3 km) upstream from terminal wasteway of Agency Canal, 0.6 mi (1.0 km) upstream from mouth, and 2.3 mi (3.7 km) east of Hardin.

DRAINAGE AREA.--1,294 mi^2 (3,351 km^2).

PERIOD OF RECORD.--June 1953 to September 1974.

GAGE.--Water-stage recorder. Altitude of gage is 2,890 ft (881 m), from topographic map. Prior to Oct. 7, 1953, nonrecording gage at site 0.4 mi (0.6 km) downstream. Oct. 7, 1953, to May 6, 1963, water-stage recorder at site 0.3 mi (0.5 km) downstream. May 6, 1963, to Nov. 6, 1963, nonrecording gage at site 0.4 mi (0.6 km) downstream. All at different datums.

AVERAGE DISCHARGE.--21 years, 294 ft^3/s (8.33 m^3/s), 213,000 acre-ft/yr (262 hm^3/yr).

EXTREMES.--Current year: Maximum discharge, 1,970 ft^3/s (55.8 m^3/s) June 9, gage height, 4.55 ft (1.387 m); maximum gage height, 6.32 ft (1.926 m) Jan. 16 (backwater from ice); minimum daily discharge, 50 ft^3/s (1.42 m^3/s) Jan. 6.

Period of record: Maximum discharge, 4,520 ft^3/s (128 m^3/s) Apr. 2, 1965; maximum gage height, 11.78 ft (3.591 m) Mar. 20, 1960, site and datum then in use (backwater from ice); minimum discharge observed, 0.20 ft^3/s (0.006 m^3/s) Aug. 7, 1961, result of discharge measurement.

REMARKS.--Records good except those for winter period, which are poor. Flow partly regulated by Willow Creek Reservoir (capacity, 23,000 acre-ft, 28.4 hm^3). Diversions for irrigation of about 17,000 acres (68.8 km^2) above station. Figures of discharge given herein include flow of terminal wasteway of Agency Canal.

Month	Second-foot days	Maximum	Minimum	Mean	Runoff in acre-feet
October 1973	7,387	257	215	238	14,650
November	6,664	298	130	222	13,220
December	3,245	190	65	105	6,440
January 1974	8,472	1,120	50	273	16,800
February	5,765	261	110	206	11,430
March	7,552	326	190	244	14,980
April	12,284	715	209	409	24,370
May	18,342	1,590	366	592	36,380
June	36,761	1,850	683	1,225	72,920
July	9,966	761	152	321	19,770
August	5,083	197	125	164	10,080
September 1974	5,342	216	156	178	10,600
Water year 1973-74	126,863	1,850	50	348	251,600

MONTHLY SUMMARY OF DISCHARGE

Bighorn River at Bighorn, Montana

LOCATION.--Lat 46°08'50", long 107°28'00", in NE¼NE¼ sec.33, T.5 N., R.34 E., Treasure County, on right bank just downstream from bridge on old U.S. Highway 10, 0.3 mi (0.5 km) downstream from bridge on Interstate Highway 94, 0.7 mi (1.1 km) upstream from mouth, 1.3 mi (2.1 km) southwest of Bighorn, and 4.4 mi (7.1 km) east of Custer.

DRAINAGE AREA.--22,885 mi^2 (59,272 km^2). Area at site used prior to Oct. 7, 1955, 22,410 mi^2 (58,042 km^2).

PERIOD OF RECORD.--May 1945 to September 1974. Published as "near Custer", 1945-55. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Altitude of gage is 2,690 ft (820 m), by barometer. May 11 to Dec. 6, 1945, nonrecording gage, and Dec. 7, 1945, to Oct. 6, 1955, water-stage recorder, at site 4 mi (6.4 km) upstream at different datum.

AVERAGE DISCHARGE.--29 years, 3,903 ft^3/s (111 m^3/s), 2,828,000 acre-ft/yr (3.49 km^3/yr), unadjusted.

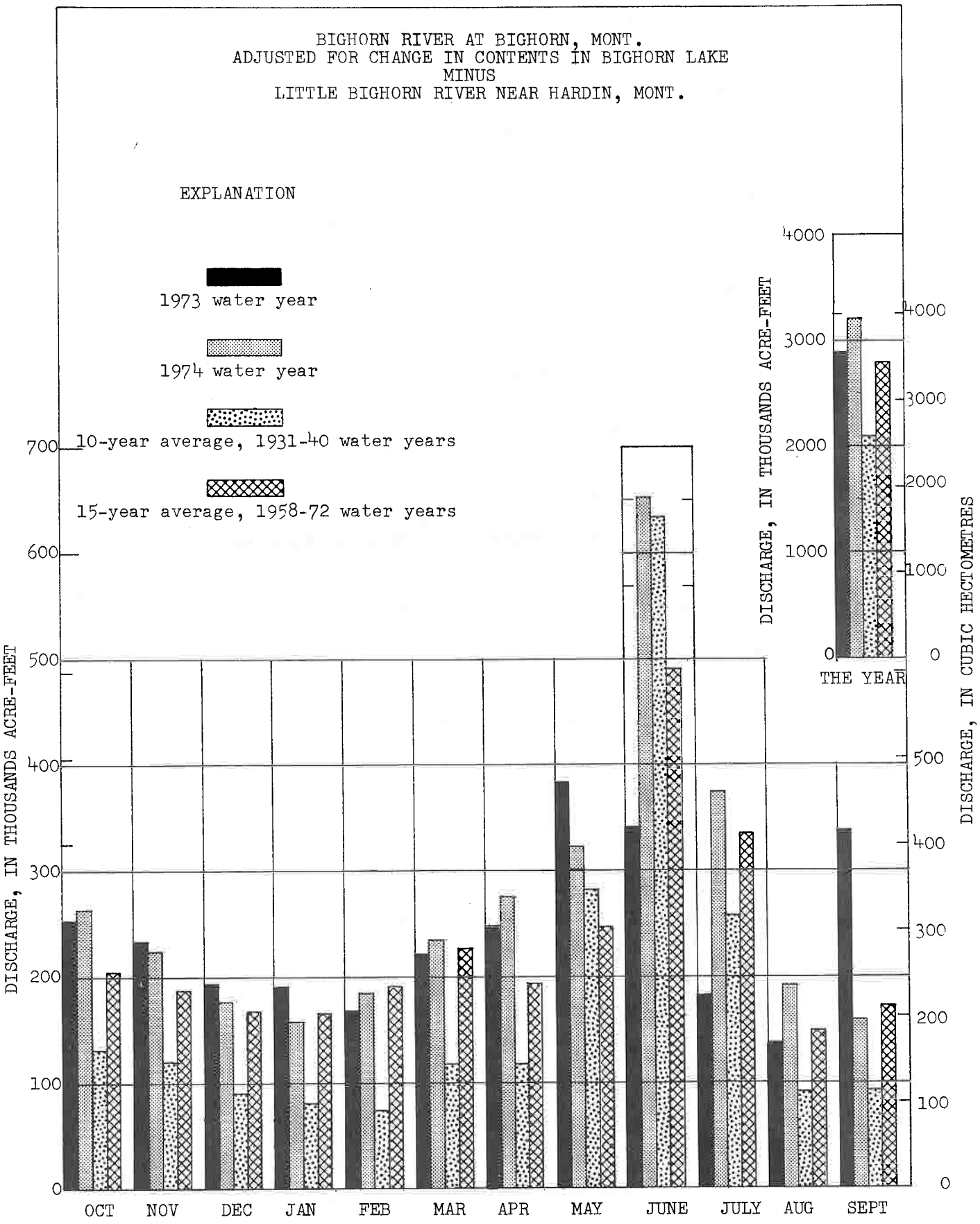
EXTREMES.--Current year: Maximum discharge, about 10,200 ft^3/s (289 m^3/s) July 1 (backwater from Yellowstone River); maximum gage height, 7.93 ft (2.417 m) Jan. 17 (backwater from ice); minimum daily discharge, 807 ft^3/s (22.9 m^3/s) Oct. 20.

Period of record: Maximum discharge, 26,200 ft^3/s (742 m^3/s) June 24, 1947, gage height, 8.79 ft (2.679 m), site and datum then in use, from rating curve extended above 12,500 ft^3/s (354 m^3/s); maximum gage height recorded, 14.21 ft (4.331 m) Apr. 2, 1965 (ice jam); minimum discharge, about 275 ft^3/s (7.79 m^3/s) Nov. 15, 1959, result of freezeup; minimum daily, 400 ft^3/s (11.3 m^3/s) Apr. 4, 1967.

REMARKS.--Records good except those for period of backwater from Yellowstone River (May 28 to Aug. 6), which are fair. Flow regulated by Bighorn Lake beginning November 1965 (usable capacity, 1,356,000 acre-ft, 1.67 km^3). 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, 1.73 km^3 (see Appendixes C and D). Diversions for irrigation of about 465,000 acres (1,880 km^2) above station.

Month	Second-foot days	Maximum	Minimum	Mean	Runoff in acre-feet	Adjusted runoff in acre-feet*
Oct. 1973	143,977	5,960	807	4,655	285,600	278,600
Nov.	167,960	7,720	1,920	5,599	333,100	238,500
Dec.	96,520	3,420	1,860	3,114	191,400	183,500
Jan. 1974	99,570	5,500	2,300	3,212	197,500	174,800
Feb.	119,110	4,910	2,930	4,254	236,300	196,800
Mar.	156,970	5,370	4,910	5,064	311,300	249,600
Apr.	190,910	7,470	5,190	6,364	378,700	299,100
May	165,300	8,400	3,970	5,332	327,900	358,700
June	229,550	9,950	6,270	7,652	455,300	725,500
July	210,240	10,100	4,010	6,782	417,000	394,000
Aug.	91,700	3,880	2,190	2,958	181,900	202,900
Sept. 1974	86,940	3,620	2,500	2,898	172,400	170,400
Water year 1973-74	1,758,747	10,100	807	4,818	3,488,000	3,472,000

*Adjusted for change in contents in Bighorn Lake.



Comparison of discharge during 1973 water year with 1974 water year and with average discharge for water years 1931-40 and 1958-72

Appendix B

MONTHLY SUMMARY OF DISCHARGE

Prairie Dog Creek near Acme, Wyoming

LOCATION.--Lat 44°59'02", long 106°50'21", in NE¼SW¼SW¼ sec. 23, T.58 N., R.83 W., Sheridan County, on right bank 600 ft (183 m) upstream from county bridge, 0.9 mi (1.5 km) upstream from mouth, 2.8 mi (4.5 km) downstream from Coutant Creek, and 7.6 mi (12.2 km) northeast of Acme.

DRAINAGE AGEA.--358 mi^2 (927 km^2).

PERIOD OF RECORD.--October 1970 to September 1974. Records for May 1965 to September 1970 in files of Office of Wyoming State Engineer.

GAGE.--Water-stage recorder. Altitude of gage is 3,450 ft (1,052 m), from topographic map.

EXTREMES.--Current year: Maximum discharge, 197 ft^3/s (5.58 m^3/s) Feb. 16, gage height, 3.14 ft (0.957 m), from rating curve extended above 190 ft^3/s (5.38 m^3/s) on basis of step-backwater computation; maximum gage height, 4.09 ft (1.247 m) Jan. 16 (backwater from ice); minimum daily discharge, 6.6 ft^3/s (0.187 m^3/s) July 23, Aug. 3.

Period of record: Maximum discharge, 673 ft^3/s (19.1 m^3/s) May 22, 1972, gage height, 5.59 ft (1.704 m), from rating curve extended above 190 ft^3/s (5.38 m^3/s) on basis of step-backwater computation; maximum gage height, 5.62 ft (1.713 m) Feb. 16, 1971 (backwater from ice); minimum daily discharge, 6.6 ft^3/s (0.187 m^3/s) July 23, Aug. 3, 1974.

REMARKS.--Records good except those for winter period, which are poor. Diversions for irrigation of about 13,600 acres (55.0 km^2) above station of which about 60 acres (243,000 m^2) lies below station. Flow supplemented by 3 transbasin diversions from North Piney Creek and South Piney Creek via Prairie Dog ditch, Piney and Cruse ditch and Mead-Coffeen ditch.

Month	Second-foot days	Maximum	Minimum	Mean	Runoff in acre-feet
October 1973	1,845	69	51	59.5	3,660
November	1,309	54	32	43.6	2,600
December	893	43	13	28.8	1,770
January 1974	828.0	100	8.0	26.7	1,640
February	2,315	174	20	82.7	4,590
March	1,550	79	29	50.0	3,070
April	1,718	85	38	57.3	3,410
May	831	50	12	26.8	1,650
June	653	39	14	21.8	1,300
July	322.2	17	6.6	10.4	639
August	755.0	40	6.6	24.4	1,500
September 1974	943	44	19	31.4	1,870
Water year 1973-74	13,962.2	174	6.6	38.3	27,690

MONTHLY SUMMARY OF DISCHARGE

Tongue River at Miles City, Montana

LOCATION.--Lat 46°21'30", long 105°48'24", in SE¼ sec.23, T.7 N., R.47 E., Custer County, on right bank 4 mi (6.4 km) south of Miles City and 8 mi (12.9 km) upstream from mouth.

DRAINAGE AREA.--5,379 mi^2 (13,932 km^2).

PERIOD OF RECORD.--April 1938 to April 1942, April 1946 to September 1974. 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 discharge only for some periods, published in WSP 1309. Records since January 1950 available in annual report of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Altitude of gage is 2,370 ft (722 m), by barometer. April 1938 to April 1942, nonrecording gage at site 8 mi (12.9 km) upstream at different datum. April 1946 to Sept. 30, 1963, at datum 1.00 ft (0.30 m) higher.

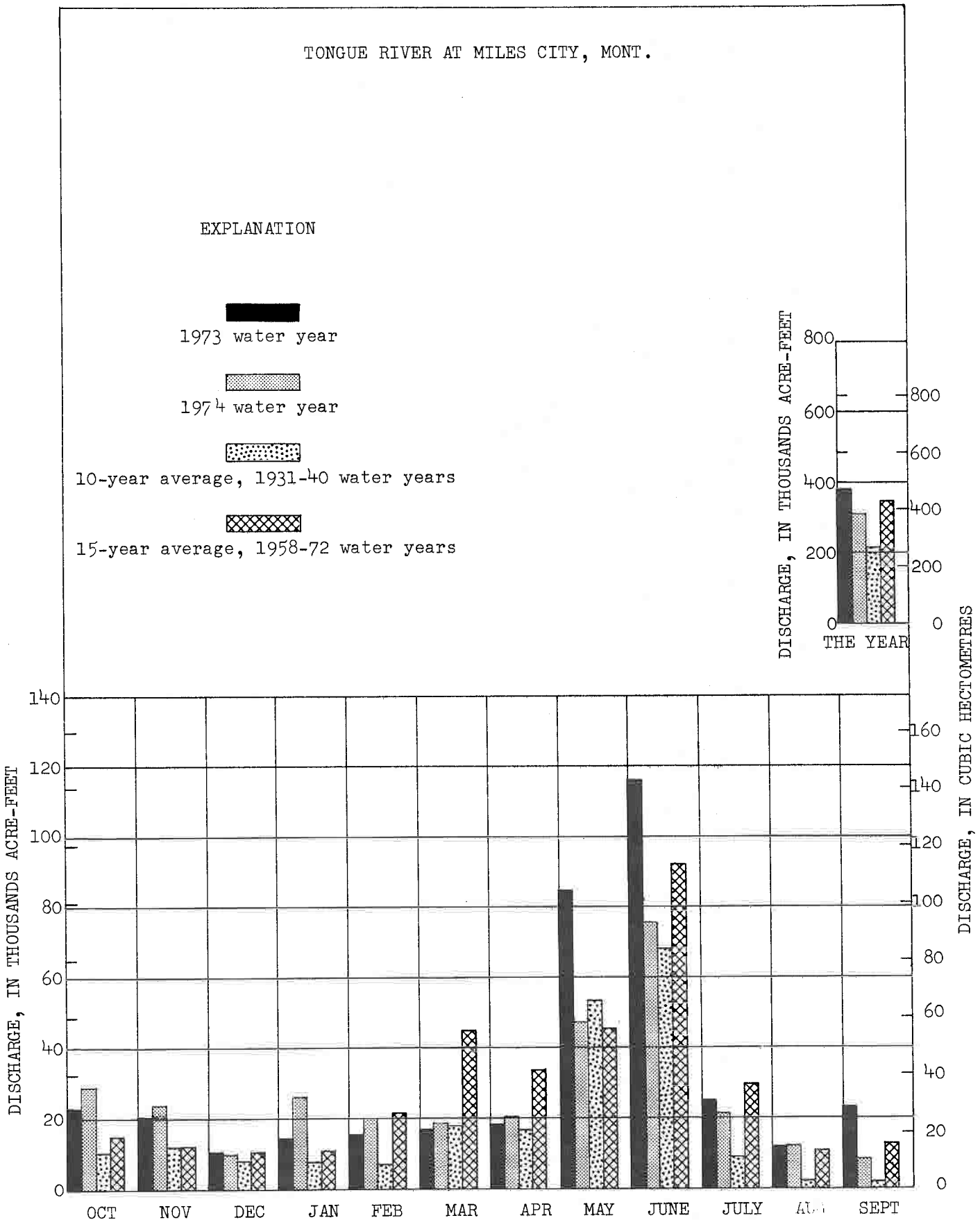
AVERAGE DISCHARGE.--31 years (1938-41, 1946-74), 427 ft^3/s (12.1 m^3/s), 309,400 acre-ft/yr (381 hm^3/yr).

EXTREMES.--Current year: Maximum discharge, 1,870 ft^3/s (53.0 m^3/s) June 21, gage height, 4.66 ft (1.420 m); minimum daily, 75 ft^3/s (2.12 m^3/s) Dec. 22.

Period of record: Maximum discharge, 13,300 ft^3/s (377 m^3/s) June 15, 1962, gage height, 12.33 ft (3.758 m), present datum, from rating curve extended above 5,200 ft^3/s (147 m^3/s) on basis of float measurement; maximum gage height, 13.27 ft (4.045 m), present datum, Mar. 19, 1960, Feb. 15, 1971 (ice jam); no flow July 9-19, Aug. 13, 14, Sept. 28, 1940.

REMARKS.--Records good except those for winter period, which are poor. Flow regulated by Tongue River Reservoir (Appendix C) and many small reservoirs in Wyoming (combined capacity, about 15,000 acre-ft, 18.5 hm^3). Diversions for irrigation of about 90,000 acres (364 km^2) above station.

Month	Second-foot days	Maximum	Minimum	Mean	Runoff in acre-feet
October 1973	14,587	514	408	471	28,930
November	11,966	560	254	399	23,730
December	5,164	312	75	167	10,240
January 1974	13,110	900	110	423	26,000
February	10,120	400	340	361	20,070
March	9,388	424	220	303	18,620
April	10,335	585	225	345	20,500
May	23,777	1,120	594	767	47,160
June	38,064	1,840	778	1,269	75,500
July	10,883	880	138	351	21,590
August	6,009	264	140	194	11,920
September 1974	4,289	196	107	143	8,510
Water year 1973-74	157,692	1,840	75	432	312,800



Comparison of discharge during 1973 water year with 1974 water year and with average discharge for water years 1931-40 and 1958-72

Appendix B

MONTHLY SUMMARY OF DISCHARGE

Powder River near Locate, Montana

LOCATION.--Lat 46°26'56", long 105°18'44", in NW¼SW¼ sec.14, T.8 N., R.51 E., Custer County, on left bank 1.5 mi (2.4 km) downstream from bridge on U.S. Highway 12 at present site of Locate (5 mi, 8.0 km, west of former site of Locate), 1.5 mi (2.4 km) upstream from Locate Creek, and 25 mi (40 km) east of Miles City.

DRAINAGE AREA.--13,194 mi^2 (34,172 km^2). Area at site used prior to Oct. 1, 1965, 13,189 mi^2 (34,160 km^2).

PERIOD OF RECORD,--March 1938 to September 1974. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Altitude of gage is 2,390 ft (728 m), by barometer. Prior to July 11, 1947, nonrecording gage at bridge 1.5 mi (2.4 km) upstream and July 11, 1947, to Sept. 30, 1965, water-stage recorder at site near bridge at different datum. Oct. 1, 1965, to Oct. 4, 1966, nonrecording gage, and Oct. 5, 1966, to Apr. 15, 1969, water-stage recorder at site 200 ft (61 m) upstream at present datum.

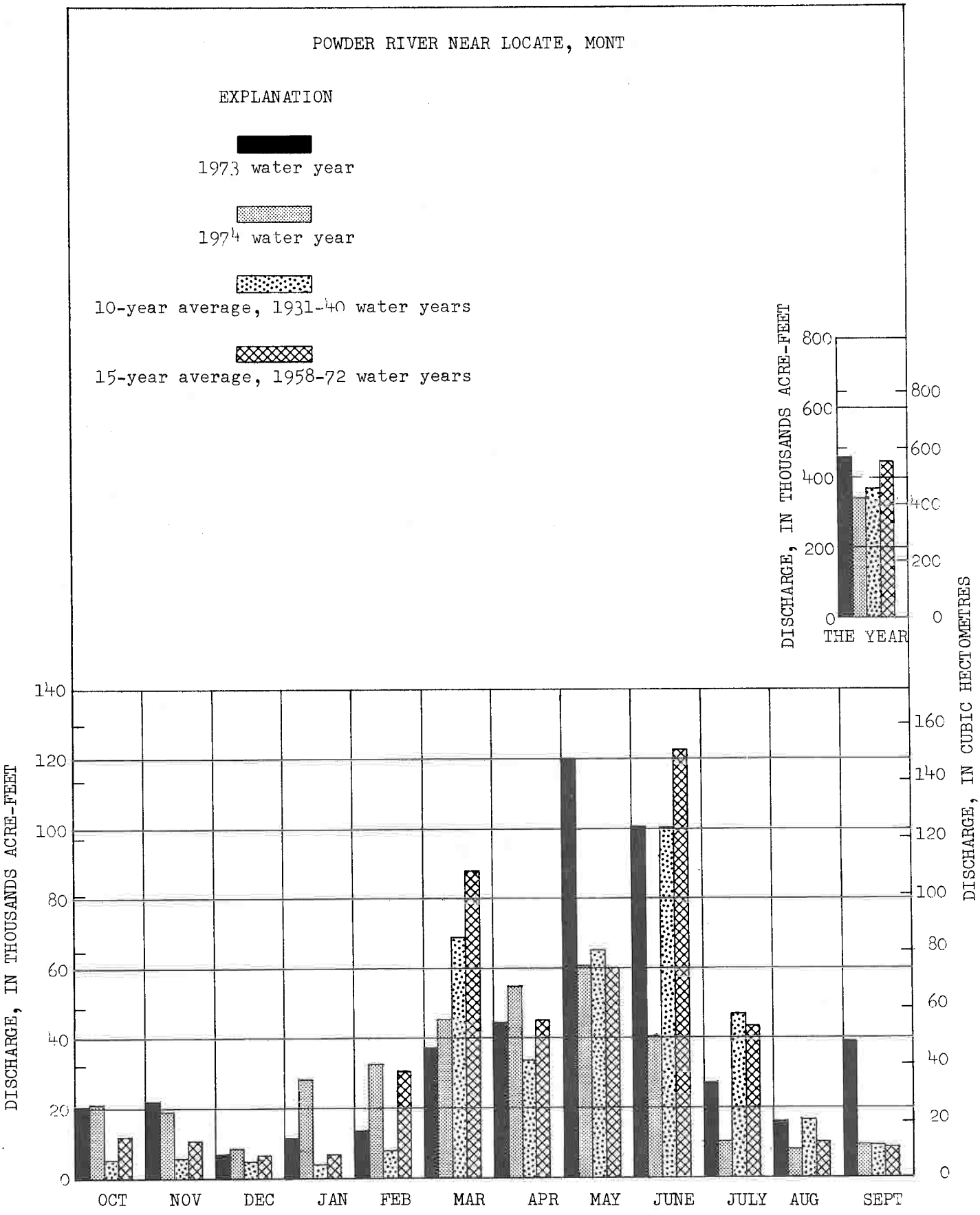
AVERAGE DISCHARGE.--36 years, 616 ft^3/s (17.4 m^3/s), 446,300 acre-ft/yr (550 hm^3/yr).

EXTREMES.--Current Year: Maximum discharge observed, 4,790 ft^3/s (136 m^3/s) Apr. 24, gage height, 5.90 ft (1.798 m); maximum gage height, 7.17 ft (2.185 m) Mar. 4 (backwater from ice); minimum discharge observed, 34 ft^3/s (0.96 m^3/s) July 26, gage height, 1.34 ft (0.415 m).

Period of record: Maximum discharge observed, 31,000 ft^3/s (878 m^3/s) Feb. 19, 1943, gage height, 11.23 ft (3.423 m), site and datum then in use, from rating curve extended above 17,000 ft^3/s (481 m^3/s); no flow Jan. 16 to Feb. 12, Feb. 22-24, 1950, July 27, Sept. 21-27, Oct. 1, 1960, Sept. 4-8, 1961.

REMARKS.--Records good except those for winter period, which are poor. Some regulation by three reservoirs in Wyoming with combined usable capacity of 36,800 acre-ft (45.4 hm^3). Diversions for irrigation of about 52,000 acres (210 km^2).

Month	Second-foot days	Maximum	Minimum	Mean	Runoff in acre-feet
October 1973	10,608	466	220	342	21,040
November	9,513	676	90	317	18,870
December	4,300	260	50	139	8,530
January 1974	14,225	1,100	120	459	28,220
February	16,300	1,300	300	582	32,330
March	22,922	1,400	340	739	45,470
April	27,770	3,830	424	926	55,080
May	30,538	2,090	557	985	60,570
June	20,311	1,750	295	677	40,290
July	5,071	739	42	164	10,060
August	3,877	320	43	125	7,690
September 1974	4,371	184	107	146	8,670
Water year 1973-74	169,806	3,830	42	465	336,800



Comparison of discharge for 1973 water year with 1974 water year and with average discharge for water years 1931-40 and 1958-72

RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

Boysen Reservoir, Wyoming

LOCATION.--Lat 43°25'00", long 108°10'37", in NW¼NW¼ sec. 16, T.5 N., R.6 E., Fremont County, at dam on Wind River, 13 mi (21 km) north of Shoshoni, Wyoming.

DRAINAGE AREA.--7,700 mi^2 (19,943 km^2).

RECORDS AVAILABLE.--October 1951 to September 1974 (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is at mean sea level, datum of 1933 (levels by Bureau of Reclamation).

EXTREMES.--Current year: Maximum daily contents, 745,300 acre-ft (919 hm^3) July 3, elevation, 4,725.16 ft (1,440.229 m); minimum daily, 467,600 acre-ft (577 hm^3) May 26, elevation, 4,708.83 ft (1,435.251 m).

Period of record: Maximum daily contents, 862,500 acre-ft (1,060 hm^3) July 6, 7, 1967, elevation, 4,730.83 ft (1,441.957 m); minimum daily (since normal use of water started), 189,800 acre-ft (234 hm^3) Mar. 18, 19, 1956, elevation, 4,684.18 ft (1,427.738 m), capacity table then in use.

REMARKS.--Reservoir is formed by rock-fill dam completed in October 1951. Storage began Oct. 11, 1951. Usable capacity, 742,100 acre-ft (915 hm^3) between elevation 4,657.00 ft (1,419.454 m), invert of penstock pipe, and 4,725.00 ft (1,440.180 m), top of spillway gate. Dead storage, 59,880 acre-ft (73.8 hm^3) below elevation 4,657.00 ft (1,419.454 m). Prior to Jan. 1, 1966, usable capacity was 757,800 acre-ft (934 hm^3) and dead storage was 62,000 acre-ft (76.4 hm^3), at same elevations. Crest of dam is at elevation 4,758 ft (1,450 m). Figures given herein represent usable contents. Water used for irrigation, flood control, and power development.

COOPERATION.--Records furnished by Bureau of Reclamation.

Month	Water-surface elevation in feet	Contents in acre-feet*	Change in contents during month in acre-feet
September 30, 1973	4,724.75	737,300	--
October 31	4,723.13	706,100	-31,200
November 30	4,722.05	685,900	-20,200
December 31	4,721.18	669,900	-16,000
January 31, 1974	4,719.98	648,100	-21,800
February 28	4,717.01	596,200	-51,900
March 31	4,713.60	540,200	-56,000
April 30	4,710.18	487,600	-52,600
May 31	4,711.45	506,700	+19,100
June 30	4,725.12	744,500	+237,800
July 31	4,724.20	726,600	-17,900
August 31	4,720.47	657,000	-69,600
September 30, 1974	4,719.17	633,700	-23,300
Water year 1973-74			-103,600

*Does not include dead storage of 59,880 acre-ft (73.8 hm^3).

RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

Anchor Reservoir, Wyoming

LOCATION.--Lat 43°39'50", long 108°49'27", in sec.26, T.43 N., R.100 W., Hot Springs County, at dam on South Fork Owl Creek, 2 mi (3.2 km) downstream from Middle Fork, 3 mi (4.8 km) southeast of Anchor, and 32 mi (51 km) west of Thermopolis.

DRAINAGE AREA.--125 mi^2 (324 km^2), approximately.

RECORDS AVAILABLE.--November 1960 to September 1974 (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is at mean sea level (Bureau of Reclamation datum).

EXTREMES.--Current year: Maximum daily contents, 4,180 acre-ft (5.15 hm^3) June 24, elevation, 6,397.56 ft (1,949.976 m); no storage on many days.

Period of record: Maximum daily contents, 9,250 acre-ft (11.4 hm^3) July 4, 1967, elevation, 6,418.52 ft (1,956.365 m); no storage on many days each year.

REMARKS.--Reservoir is formed by concrete arch dam completed in 1960. Usable capacity, 17,170 acre-ft (21.2 hm^3) between elevation 6,343.75 ft (1,933.575 m), invert of river outlet, and 6,441.00 ft (1,963.217 m), spillway crest, not including 68 acre-ft (83,800 m^3) below elevation 6,343.75 ft (1,933.575 m). Prior to Oct. 1, 1971, usable capacity was 17,280 acre-ft (21.3 hm^3) not including 149 acre-ft (184,000 m^3) below the invert. Figures given herein represent usable contents. Water is used for irrigation of lands in Owl Creek basin.

COOPERATION.--Records furnished by Bureau of Reclamation.

Month	Water-surface elevation in feet	Contents in acre-feet*	Change in contents during month in acre-feet
September 30, 1973	6,365.52	613	-
October 31	6,360.32	375	-238
November 30	-	0	-375
December 31	-	0	-
January 31, 1974	-	0	-
February 28	-	0	-
March 31	-	0	-
April 30	6,374.82	1,250	+1,250
May 31	6,377.95	1,530	+280
June 30	6,391.32	3,150	+1,620
July 31	-	0	-3,150
August 31	-	0	-
September 30, 1974	-	0	-
Water year 1973-74			-613

*Does not include dead storage of 68 acre-feet (83.800 m^3).

RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

Bighorn Lake near St. Xavier, Montana

LOCATION.--Lat 45°18'27", long 107°57'26", in SW¼SE¼ sec.18, T.6 S., R.31 E., Big Horn County, in block 13 of Yellowtail Dam on Bighorn River, 1.3 mi (2.1 km) upstream from Grapevine Creek, 15.5 mi (24.9 km) southeast of St. Xavier, and at mile 81.0 (130.3 km).

DRAINAGE AREA.--19,626 mi^2 (50,831 km^2).

PERIOD OF RECORD.--November 1965 to September 1974 (monthend contents only). Prior to October 1969, published as "Yellowtail Reservoir."

GAGE.--Water-stage recorder in powerhouse control room. Datum of gage is at mean sea level (levels by Bureau of Reclamation).

EXTREMES.--Current year: Maximum contents, 1,096,000 acre-ft (1.35 km^3) July 9 (elevation, 3,639.90 ft or 1,109.442 m); minimum, 756,400 acre-ft (933 hm^3) May 2 (elevation, 3,600.61 ft or 1,097.466 m).

Period of record: Maximum contents, 1,346,000 acre-ft (1.66 km^3) July 6, 1967 (elevation, 3,656.43 ft or 1,114.480 m); minimum since first filling, 660,700 acre (815 hm^3) Mar. 11, 1970 (elevation, 3,584.45 ft or 1,092.540 m).

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 (1.67 km^3) between elevation 3,296.50 ft (1,004.773 m), river outlet invert, and 3,657.00 ft (1,114.654 m), top of flood control. Elevation of spillway crest, 3,593.00 ft (1,095.146 m). Normal maximum operating level, 1,097,000 acre-ft (1.35 km^3), elevation, 3,640.00 ft (1,109.472 m). Minimum operating level, 483,400 acre-ft (596 hm^3), elevation, 3,547.00 ft (1,081.126 m). Dead storage, 18,970 acre-ft (23.4 hm^3) below elevation 3,296.50 ft. (1,004.773 m). Figures given herein represent usable contents. Water is used for power production, flood control, irrigation, and recreation.

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

Month	Water-surface elevation in feet	Contents in acre-feet*	Change in contents during month in acre-feet
September 30, 1973	3,637.99	1,072,000	--
October 31	3,637.39	1,065,000	-7,000
November 30	3,628.52	970,400	-94,600
December 31	3,627.68	962,500	-7,900
January 31, 1974	3,625.19	939,800	-22,700
February 28	3,620.54	900,300	-39,500
March 31	3,612.95	838,600	-61,700
April 30	3,601.01	759,000	-79,600
May 31	3,605.60	789,800	+30,800
June 30	3,636.98	1,060,000	+270,200
July 31	3,634.93	1,037,000	-23,000
August 31	3,636.80	1,058,000	+21,000
September 30, 1974	3,636.64	1,056,000	-2,000
Water year 1973-74			-16,000

*Does not include dead storage of 18,970 acre-ft (23.4 hm^3).

RESERVOIRS IN EXISTENCE 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 monthend 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. 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 agency furnished operating data.

Contents in acre-feet

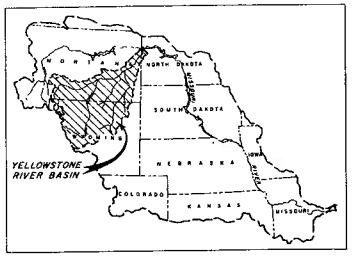
Month	a/Bull Lake	b/Pilot Butte Reservoir	c/Buffalo Bill Reservoir	d/Tongue River Reservoir
September 30, 1973	144,300	18,360	241,400	41,790
October 31	143,900	13,040	217,400	30,540
November 30	143,000	-	222,900	26,890
December 31	141,700	-	211,700	26,890
January 31, 1974	140,200	-	199,800	29,100
February 28	138,400	-	184,900	32,230
March 31	136,700	-	171,300	38,270
April 30	114,700	28,770	181,500	45,650
May 31	113,600	20,530	235,500	57,620
June 30	149,900	21,900	447,500	60,100
July 31	147,700	21,660	425,300	47,980
August 31	116,000	18,650	368,000	31,660
September 30, 1974	81,270	19,030	314,700	30,900
Change in Contents during water year	-63,030	+670	+73,300	-10,890

a/ Usable contents, from revised capacity table effective Oct. 1, 1965. Dead storage is 722 acre-feet (890,000 m^3).

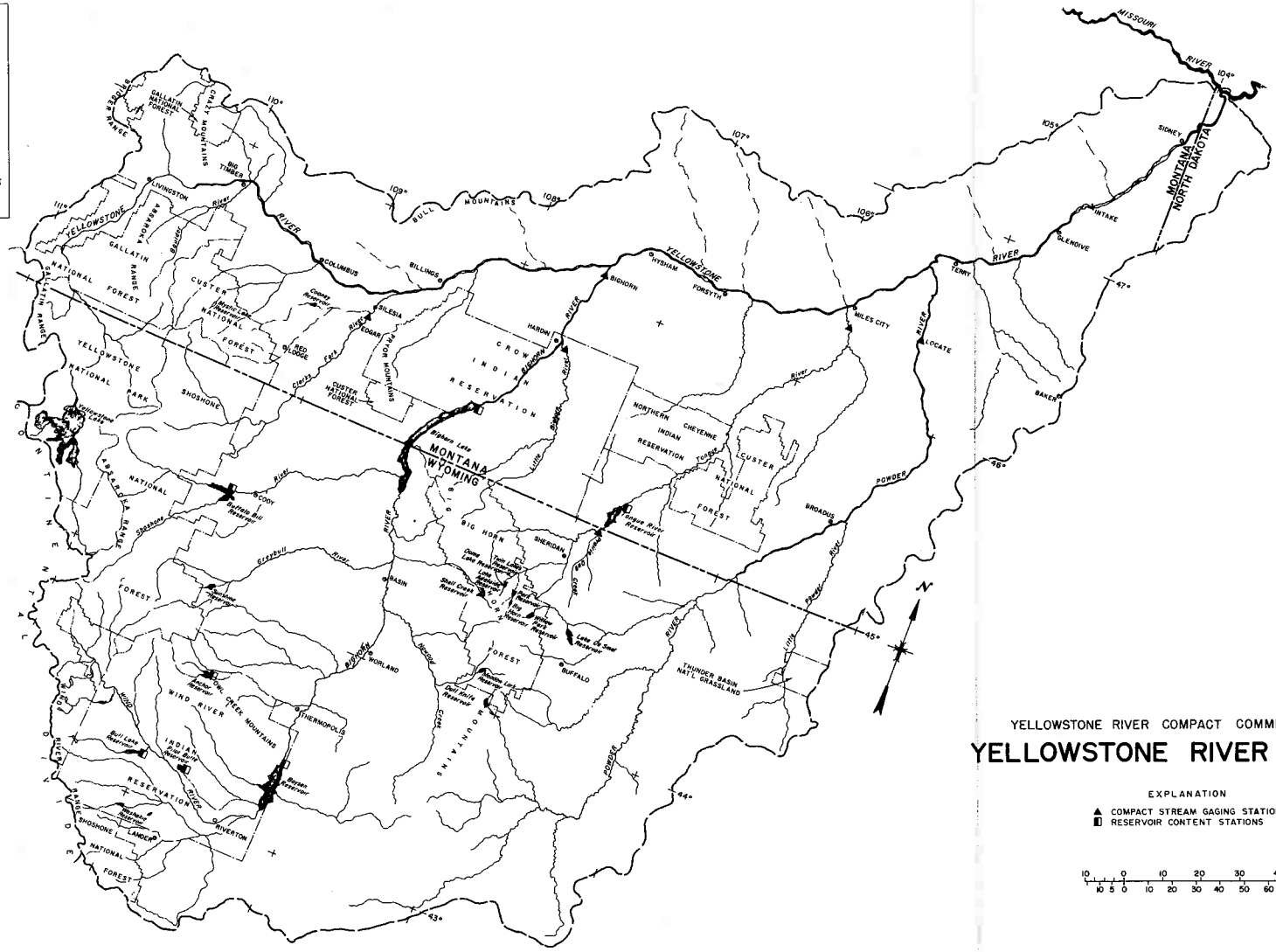
b/ Usable contents. Dead storage is 5,360 acre-ft (6.61 hm^3). Gage out of order November to March.

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 (1.73 hm^3). Contents based upon sedimentation surveys of October 1948.



LOCATION MAP



YELLOWSTONE RIVER COMPACT COMMISSION

YELLOWSTONE RIVER BASIN

EXPLANATION

▲ COMPACT STREAM GAGING STATIONS
◧ RESERVOIR CONTENT STATIONS

10 0 10 20 30 40 MILES
10 5 0 10 20 30 40 50 60 KILOMETERS