

YELLOWSTONE RIVER COMPACT COMMISSION

408 Federal Building

Helena, Montana

December 15, 1958

His Excellency Milward L. Simpson
Governor of the State of Wyoming
Cheyenne, Wyoming

His Excellency J. Hugo Aronson
Governor of the State of Montana
Helena, Montana

His Excellency John E. Davis
Governor of the State of North Dakota
Bismarck, North Dakota

Sirs:

Pursuant to Article III of the Yellowstone River Compact, the Commission created according to the terms of said Compact makes the following seventh annual report.

The seventh Annual Meeting of the Yellowstone River Compact Commission was held at Sheridan, Wyoming on November 14, 1958. The duly constituted members were in attendance.

The water uses in the several states which could be considered as coming within the percentage allocations of these states were not determined by your Commissioners for the report period ending September 30, 1958 or for any prior periods. These determinations would be highly involved and costly and were not considered necessary under the present state of water resources development as it is believed that allocable uses of upstream states were not excessive of allocations. No questions of water use were referred to the Commissioners.

Stream flows at the designated points of measurement were 5 to 35 percent less than those of the previous water year. The flows of the Clarks Fork Yellowstone River and of the Bighorn River were near the long-term average. Those of the Tongue and Powder Rivers were respectively 31 and 40 percent deficient of the long-term averages.

The administrative expenses of the Commission during the fiscal year ending June 30, 1958 were \$6,000, of which \$3,000 was borne by the federal government. The remaining \$3,000 was borne by contributions of

\$1500 each by the States of Montana and Wyoming. The budget for the fiscal year ending June 30, 1959 has been set in the same amounts and distribution. A budget of \$8,000 for the fiscal year ending June 30, 1960 was considered necessary to make certain gaging station repairs, collect additional data on the flow of the Clarks Fork Yellowstone River and to meet the rising cost level.

The Commission has directed its activity to the collection of stream flow data at the designated points of measurement and the assembly of information on water-right filings to aid in active administration of the Compact when the need arises. The Commissioner for Montana submitted the first detailed list of water-right filings that may be pertinent in that State. The Commissioner for Wyoming has periodically supplied such data for Wyoming where a centralized water permit system facilitates the compilation of such data and provides greater detail on the water right. Records of stream flow collected through the support of the Commission and data on storage in reservoirs as supplied by various governmental agencies are summarized in appendices to this report.

The Commissioner for Wyoming reported that the Columbia-Geneva Steel Division of the United States Steel Corporation has at least postponed plans to divert waters from the Yellowstone River basin to the North Platte River basin, a matter considered at the last annual meeting of the Commission. Present development plans call for a storage reservoir on Rock Creek, a tributary of the North Platte River and utilization of early downstream water rights of that basin.

Pertinent data and records are available in the files of the Commission maintained in the office of the U. S. Geological Survey at Helena, Montana.

Respectfully submitted,



Earl Lloyd
Commissioner for Wyoming



Fred E. Buck
Commissioner for Montana



Frank Stermitz
Federal Representative

GENERAL REPORT

Cost:

The work of the Commission continues to be financed by cooperative arrangements between the States of Wyoming and Montana and the United States of America.

The expense of the Commission during the fiscal year ending June 30, 1958 is given:

	<u>Total Cost</u>	<u>Borne by United States</u>	<u>Borne by Wyoming</u>	<u>Montana</u>
Gaging station operation and maintenance	\$5100			
Collection and assembly of data and administration	\$900	—	—	—
Total	\$6000	\$3000	\$1500	\$1500

The budget for the fiscal year ending June 30, 1959 has been set at \$6000, on the assumption that the current level of activity will not be exceeded. Relocation of the manual gage on Agency Canal will be necessary because of changes in U. S. Highway 87 at that point.

The budgets for the fiscal years ending June 30, 1960 and June 30, 1961 were each recommended in the amounts of \$8000. A cableway on the Clarks Fork Yellowstone River just above the mouth of Rock Creek is believed necessary to make discharge measurements at this point which is precisely the point of measurement specified in the Compact. The need for an auxiliary recording gage on the Bighorn River at its mouth was discussed with the object of improving the records of discharge of the Bighorn River at Bighorn, Montana during backwater periods. This was tentatively considered as an item in the second year of the biennium. Relocation of the gage on Agency Canal at Hardin will be required. The rising level of the cost of gaging station operation also was a factor in arriving at the need for an increased budget.

The budgets of the Commission do not include the salaries and necessary expenses of the State representative, nor the cost of the collection of hydrologic data which can be had from other sources.

Gaging Stations:

Records of stream flow were collected at the designated points of measurements as described in the Compact or as near thereto as the Commission deemed practical. Supplementary data collection consisted of miscellaneous measurements of the Whitehorse Canal near Edgar and approximations of seasonal diversion, and daily discharge records of the Little Bighorn River near Crow Agency and the Agency Canal at Crow Agency. Backwater from the Yellowstone River affected the stage-discharge relation of the Bighorn River at Bighorn,

Montana for a considerable period of time. Manual readings of an auxiliary gage were used to evaluate backwater effect; a recording auxiliary gage may be necessary to determine the flow with reasonable accuracy. The discharge records at the designated points of measurement and supplementary data are given in Appendix B.

The Commission decided that the records of the Little Bighorn River at Crow Agency could be discontinued at the close of the water year ending September 30, 1959. Six years of concurrent discharge record for the Little Bighorn River near Hardin should indicate sufficient relations with the long-term record at Crow Agency to satisfy Commission needs. Comparison of the two records for a five year period show the maximum annual difference to be less than 6 percent. Differences in individual months vary more widely because of intermediate diversion and return flow. The records for the Little Bighorn River at its mouth enters into Compact allocation only as a subtractive item to the measured flow of the Bighorn River at its mouth before application of the percentage formula to determine the shares for Wyoming and Montana.

Diversions:

The Commissioners for Montana and Wyoming are in agreement that uses allocable under the Compact did not reach the pro rata share in either state during the water year. This was based upon available information of new water-right filings or permits, general knowledge of developments since January 1, 1950 and the records of stream flow.

A revised list of water use permits issued in the Yellowstone River basin in Wyoming from January 1, 1950 to December 31, 1957 was received by the Commission. It excluded previously furnished material on small stock-ponds which does not apply. The Montana representative furnished a list of recorded water-right filings in the Yellowstone River basin in Montana since January 1, 1950 as were available to about November, 1958. It must be understood the quantities used are probably far less than the amount indicated in the permit or filing, particularly in Montana where a filing is often a declaration of intent which may be inconsistent with the ability to use or the probable supply.

Storage:

In reservoirs completed after January 1, 1950:

Boysen Reservoir on the Bighorn River is the principal reservoir in this category, records for which are tabulated in Appendix C. The remaining reservoirs completed since January 1, 1950 are, in the aggregate, relatively small. Details of their operations have not been collected.

In reservoirs existing on January 1, 1950:

Compact allocations are affected by storage in these reservoirs only in so far as utilized for new developments. The extent of that use is

known to be minor or relatively negligible. As a matter of information the quantities in storage on month-ends in the larger reservoirs in this category, namely Bull Lake, Pilot Butte, Buffalo Bill and Tongue River Reservoirs are tabulated in Appendix D.

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 at Edgar, Montana and which is located in SW $\frac{1}{4}$ sec. 24, T. 4 S., R. 24 E., shall temporarily be the point of measurement for the Clarks Fork, subject to whatever mutually agreeable corrections to the stream-flow records at this point as may be deemed practical to meet the terms of the Compact.

2. Bighorn River (exclusive of Little Bighorn River)

The gaging station known as the Bighorn River near Custer, Montana and located near the center of sec. 10, T. 4 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 S $\frac{1}{2}$, SE $\frac{1}{4}$ sec. 18, 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 $\frac{1}{4}$ 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 NE $\frac{1}{4}$ sec. 26, 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 specified 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 to cooperative agreements for such purpose, shall employ the U. S. Geological Survey on a yearly basis to render such engineering and clerical aid as may reasonably be necessary for the administration of the Compact. Said agreement 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.
 4. 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.

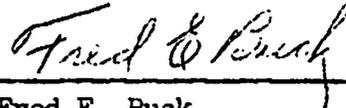
An annual meeting of the Commission shall be held on the third Tuesday of each November at some mutually agreeable point in the Yellowstone River Basin for consideration of the annual report for the water year ending the preceding September 30th, and for

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.

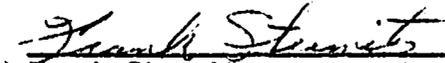


Fred E. Buck
Commissioner for Montana



L. C. Bishop
Commissioner for Wyoming

Attested:



Frank Stermitz
Federal Representative

Adopted November 17, 1953

MONTHLY SUMMARY OF DISCHARGE

Clarks Fork Yellowstone River at Edgar, Montana
(Formerly called Clarks Fork at Edgar, Mont.)

Location.--Lat 45°28', long 108°51', in SW $\frac{1}{4}$ sec. 24, T. 4 S., R. 23 E., on right bank just downstream from highway bridge, half a mile east of Edgar and 6 miles upstream from Rock Creek.

Drainage area.--2,070 sq mi, approximately.

Records available.--July 1921 to September 1958.

Gage.--Water-stage recorder. Altitude of gage is 3,440 ft (by barometer). Prior to Sept. 18, 1940, chain gage and Sept. 18, 1940, to Aug. 31, 1953, wire-weight gage, at same site and datum.

Average discharge.--25 years (1930-31, 1934-58), 1,036 cfs (750,000 acre-ft per year).

Extremes.--Maximum discharge during year, 6,950 cfs May 26 (gage height, 7.00 ft); minimum daily, 290 cfs Feb. 9, 14.

1921-58: Maximum discharge observed, 10,900 cfs June 2, 1936 (gage height, 8.62 ft); minimum observed, 41 cfs July 25, 1931.

Remarks.--Records good except those for periods of ice effect, which are poor. Upstream diversions for irrigation of about 41,500 acres, of which 840 acres lie below the station. In addition, about 6,300 acres of land lying above station are irrigated by diversions from the adjoining Rock Creek basin. The following discharge measurements were made of the Whitehorse Canal near point of diversion about 3 miles downstream in SW $\frac{1}{4}$ sec. 1, T. 4 S., R. 23 E: June 3, 1958, 40.4 cfs; Aug. 19, 1958, 24.9 cfs; Sept. 19, 1958, 17.4 cfs, Oct. 2, 1958, 16.7 cfs. On basis of discharge measurements and an irrigator's statement of canal operation, the seasonal diversion is estimated at about 9000 acre-feet.

Month	Second-foot days	Maximum	Minimum	Mean	Runoff in Acre-feet
October 1957	18,502	725	510	597	36,700
November	17,901	719	500	597	35,510
December	15,075	530	425	486	29,900
January 1958	13,230	500	320	427	26,240
February	10,481	500	290	374	20,790
March	10,543	365	324	340	20,910
April	12,233	653	315	408	24,260
May	96,122	6,510	480	3,101	190,700
June	102,930	4,710	2,140	3,431	204,200
July	28,337	1,660	594	914	56,210
August	16,838	1,120	389	543	33,400
September 1958	12,728	594	362	424	25,250
Water year 1957-58	354,920	6,510	290	972	704,100

MONTHLY SUMMARY OF DISCHARGE

Little Bighorn River near Crow Agency, Montana

Location.--Lat 45°34', long 107°27', in E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 13 T. 3 S., R. 34 E., on right bank at Chicago, Burlington & Quincy Railroad bridge, 2 miles south of Crow Agency and 17 miles (revised) upstream from mouth.

Drainage area.--1,180 sq mi, approximately.

Records available.--April 1912 to September 1924, August 1928 to December 1932, April 1938 to September 1958 (few winter records in earlier years). March 1905 to June 1906 at site at Crow Agency, 2 miles downstream, records not equivalent because Crow Agency ditch diverts water between the two sites. October 1914 to September 1940, published as Little Horn River near Crow Agency.

Gage.--Water-stage recorder. Datum of gage is 3,045 ft above mean sea level, datum of 1929. April 11, 1912 to Sept. 30, 1918, staff or chain gage; Oct. 1, 1918, to Sept. 30, 1924, Aug. 26, 1928, to Sept. 30, 1930, water-stage recorder; Oct. 1, 1930, to Dec. 5, 1932, Apr. 1, 1938 to May 6, 1947, wire-weight or chain gage; all at same site and datum.

Average discharge.--22 years (1928-29, 1931-32, 1938-58), 258 cfs (186,800 acre-feet per year).

Extremes.--Maximum discharge during year, 952 cfs June 14 (gage height 6.43 ft); minimum discharge, 30 cfs Sept. 14 (gage height, 3.88 ft).

1912-24, 1928-32, 1938-58: Maximum discharge observed, 6,200 cfs (revised) July 23, 1923 (gage height, 14.0 ft); no flow July 28 to Aug. 6, 1921.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are poor. Diversions for irrigation of about 13,700 acres above station. The maximum of record and a number of annual peaks have been revised and are scheduled to appear in U.S. Geo. Survey Water Supply Paper 1559.

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1957	4,841	185	131	156	9,600
November	4,977	198	130	166	9,870
December	4,737	180	125	153	9,400
January 1958	4,075	140	120	131	8,080
February	3,760	160	115	134	7,460
March	4,314	190	125	139	8,560
April	4,100	205	117	137	8,130
May	11,371	500	222	367	22,550
June	11,701	800	219	390	23,210
July	4,930	287	83	159	9,780
August	2,845	145	64	91.8	5,640
September 1958	<u>1,451</u>	66	32	48.4	<u>2,880</u>
Water year 1957-58	63,102	800	32	173.	125,200

MONTHLY SUMMARY OF DISCHARGE

Agency Canal at Crow Agency, Montana

Location.--Lat 45°35'55", long 107°27'15", near center of sec. 1, T. 3 S., R. 34 E., on downstream right abutment of bridge at intersection of U. S. Highway No. 87 and the main street of Crow Agency, a third of a mile downstream from headgate.

Records available.--Fragmentary records for 1953-58.

Gage.--Staff gage read twice daily during canal operation. Some recorder record during 1953.

Extremes.--Maximum daily discharge during year, 94 cfs May 21; no flow Nov. 13 to Apr. 30.

Remarks.--Canal operated Oct. 1 to Nov. 12 and May 1 to Sept. 30 for irrigation of about 3,500 acres of land. Records fair due to operation of check gates downstream from gage.

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1957	668	33	0	21.5	1,320
November	228	19	0	7.60	452
May	1,958	94	29	63.2	3,880
June	1,763	71	49	58.8	3,500
July	1,545	68	21	49.8	3,060
August	2,035	72	56	65.6	4,040
September 1958	<u>1,275</u>	57	30	42.5	<u>2,530</u>
Water year 1957-58	9,472	94	0	26.0	18,780

MONTHLY SUMMARY OF DISCHARGE

Little Bighorn River near Hardin, Montana

Location.--Lat $45^{\circ}44'$, long $107^{\circ}34'$, on line between SE $\frac{1}{4}$ sec. 18 and NE $\frac{1}{4}$ sec. 19, T. 1 S., R. 34 E., on right bank 425 ft upstream from county road bridge, about a quarter of a mile upstream from mouth, and 2.4 miles east of Hardin.

Drainage area.--1,290 sq mi, approximately.

Records available.--June 1953 to September 1958.

Gage.--Water-stage recorder. Altitude of gage is 2,880 ft (by barometer). Prior to Oct. 7, 1953, wire-weight gage on bridge 425 ft downstream at different datum.

Extremes.--Maximum discharge during year, 680 cfs June 14 (gage height 5.17 ft); maximum gage height, 5.42 ft Feb. 17 (backwater from ice); minimum discharge, 15 cfs Sept. 13 (gage height, 2.74 ft).

1953-58: Maximum discharge, 2,990 cfs June 19, 1957; maximum gage height, 11.16 ft Mar. 20, 1956 (backwater from ice); minimum discharge, 4.2 cfs Aug. 10, 1956.

Remarks.--Records good except those for periods of ice effect, which are poor. Diversions for irrigation of about 17,000 acres above station.

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1957	5,040	190	128	163	10,000
November	5,051	207	105	168	10,020
December	4,399	176	90	142	8,730
January 1958	4,155	160	95	134	8,240
February	3,780	160	120	135	7,500
March	4,402	193	120	142	8,730
April	3,978	179	116	133	7,890
May	10,170	450	182	328	20,170
June	11,292	642	228	376	22,400
July	4,289	332	37	138	8,510
August	2,194	135	28	70.8	4,350
September 1958	<u>1,208</u>	69	17	40.3	<u>2,400</u>
Water year 1957-58	59,958	642	17	164	118,900

MONTHLY SUMMARY OF DISCHARGE

Bighorn River at Bighorn, Montana

Location.--Lat 46°08'50", long 107°27'20", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, T. 5 N., R. 34 E., on right bank just downstream from bridge on U. S. Highway 10, three-quarters of a mile upstream from mouth, 1 mile southwest of Bighorn, and 4 miles east of Custer.

Drainage area.--23,100 sq mi, approximately.

Records available.--May 1945 to September 1958. Published as "near Custer" 1945-58.

Gage.--Water-stage recorder. Altitude of gage is 2,690 ft (by barometer). Prior to Oct. 7, 1955, water-stage recorder at site 4 miles upstream at different datum (May 11 to Dec. 6, 1945, wire-weight gage at same datum).

Average discharge.--13 years, 3,860 cfs (2,795,000 acre-ft per year).

Extremes.--Maximum daily discharge during year, 8,920 cfs June 27; maximum gage height, 8.95 ft Feb. 12 (backwater from ice); minimum daily discharge, 1,430 cfs July 17; minimum gage height, 1.57 ft July 17.

1945-58: Maximum discharge, 26,200 cfs June 24, 1947 (gage height 8.79 ft, site and datum then in use), from rating curve extended above 12,500 cfs by logarithmic plotting; maximum gage height recorded, 10.65 ft, Mar. 20, 1947 (ice jam), site and datum then in use; minimum discharge, 756 cfs Dec. 13, 1949.

Remarks.--Records good except those for periods of ice effect, which are poor.

Diversions for irrigation of about 465,000 acres above station. Major regulation by 14 reservoirs in Wyoming and 1 in Montana with combined usable capacity of about 1,400,000 acre ft. Daily discharge for April 24, 1957 revised from 10,200 to 9,100 cfs. See U.S.G.S. Water Supply Paper 1509 for related monthly and yearly figures.

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1957	123,530	4,560	3,380	3,985	245,000
November	125,460	4,510	2,900	4,182	248,800
December	104,230	4,200	2,830	3,362	206,700
January 1958	120,500	4,200	3,000	3,887	239,000
February	124,600	6,000	2,900	4,450	247,100
March	107,360	4,100	2,960	3,463	212,900
April	75,030	3,180	2,220	2,501	148,800
May	137,790	7,560	2,500	4,445	273,300
June	179,020	8,920	4,080	5,967	355,100
July	90,240	6,600	1,430	2,911	179,000
August	121,200	5,150	3,320	3,910	240,400
September 1958	<u>109,320</u>	<u>4,580</u>	<u>2,640</u>	<u>3,644</u>	<u>216,800</u>
Water year 1957-58	1,418,280	8,920	1,430	3,886	2,813,000

MONTHLY SUMMARY OF DISCHARGE

Tongue River at Miles City, Montana

Location.--46°21', long 105°48', in SE¹ sec. 23, T. 7 N., R. 47 E., on right bank 4 miles south of Miles City and 8 miles upstream from mouth.

Drainage area.--5,380 sq mi, approximately.

Records available.--April 1938 to April 1942, April 1946 to September 1958.

Published as "near Miles City" April 1938 to April 1942. Not equivalent to records published as "near Miles City" May 1929 to September 1932.

Gage.--Water-stage recorder. Altitude of gage is 2,370 ft (by barometer). April 1938 to April 1942, wire-weight gage at site 8 miles upstream at different datum.

Average discharge.--14 years (1938-39, 1940-41, 1946-58), 381 cfs (275,800 acre-ft per year).

Extremes.--Maximum discharge during year, 6,970 cfs July 3, (gage height, 7.59 ft) minimum, 16 cfs Sept. 17.

1938-42, 1946-58: Maximum discharge, 12,000 cfs Mar. 6, 1949 (gage height, 10.6 ft), float measurement; maximum gage height, 11.80 ft Mar. 6, 1949 (ice jam); no flow July 9-19, Aug. 13, 14, Sept. 28, 1940.

Remarks.--Records good except those for periods of ice effect, which are poor. Diversions for irrigation of about 90,000 acres above station. Flow regulated by Tongue River Reservoir, and many small reservoirs (combined capacity, about 15,000 acre-ft).

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1957	7,694	468	72	248	15,260
November	4,958	240	112	165	9,830
December	5,075	210	110	164	10,070
January 1958	5,165	210	140	167	10,240
February	4,760	300	130	170	9,440
March	7,153	400	184	231	14,190
April	6,174	233	178	206	12,250
May	16,277	1,130	35	525	32,280
June	19,750	928	289	658	39,170
July	17,389	4,280	114	561	34,490
August	2,502	178	20	80.7	4,960
September 1958	<u>1,095</u>	78	17	36.5	<u>2,170</u>
Water year 1957-58	97,992	4,280	17	268	194,400

MONTHLY SUMMARY OF DISCHARGE

Powder River near Locate, Montana

Location.--Lat $46^{\circ}26'$, long $105^{\circ}18'$, in NE $\frac{1}{4}$ sec. 26, T. 8 N., R. 51 E., on right bank 50 ft downstream from bridge on U. S. Highway 12 at present site of Locate (5 miles west of former site of Locate), 3 miles upstream from Locate Creek, and 25 miles east of Miles City.

Drainage area.--13,200 sq mi, approximately.

Records available.--March 1938 to September 1958.

Gage.--Water-stage recorder and wire-weight gage. Prior to July 11, 1947, wire-weight gage at bridge 50 ft upstream at same datum.

Average discharge.--20 years, 614 cfs (444,500 acre-ft per year).

Extremes.--Maximum discharge during year, 6,440 cfs July 3 (gage height, 5.71 ft); minimum, 0.5 cfs Sept. 19.

1938-58: Maximum discharge observed, 31,000 cfs Feb. 19, 1943 (gage height, 11.23 ft), from rating curve extended above 17,000 cfs; no flow Jan. 16 to Feb. 12, Feb. 22-24, 1950.

Remarks.--Records good except those for periods of ice effect, which are poor. Diversions for irrigation of about 52,000 acres above station. Some regulation by tributary reservoirs with combined usable capacity of 36,800 acre-ft.

<u>Month</u>	<u>Second foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-ft</u>
October 1957	3,909	234	64	126	7,750
November	5,705	420	70	190	11,320
December	3,873	200	60	125	7,680
January 1958	4,790	180	90	155	9,500
February	5,430	400	130	194	10,770
March	10,239	792	245	330	20,310
April	12,442	578	338	415	24,680
May	25,656	1,480	207	828	50,890
June	29,727	3,770	309	991	58,960
July	28,740	4,360	265	927	57,000
August	7,484.4	1,240	9.4	241	14,850
September 1958	<u>266.2</u>	42	0.6	8.87	<u>528</u>
Water year 1957-58	138,261.6	4,360	0.6	379	274,200

RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

BOYSEN RESERVOIR

Water-stage recorder at dam on Bighorn River, about 21 miles south of Thermopolis, Wyoming. Reservoir formed by earth-fill dam, construction of which began in 1947. Storage began on October 11, 1951. Dead storage, 62,000 acre-feet at elevation 4657.0. Usable contents, 758,000 acre-feet at elevation 4725.0 (top of gates). Crest of dam at elevation 4758.

Records given herein represent usable contents. Water is used for irrigation and power development. Allocation for flood control provided. Data furnished by U. S. Bureau of Reclamation.

Extremes.--Maximum usable contents during year, 723,300 acre-feet Oct. 21; minimum, 379,300 acre-feet May 6.

1953-58: Maximum usable contents, 857,400 acre-feet, July 5, 1957; minimum, 189,800 acre-feet March 18, 19, 1956.

<u>Month</u>	<u>Water-Surface elevation in feet</u>	<u>*Contents in Acre-feet</u>	<u>Change in contents during month in acre-feet</u>
September 30, 1957	4723.27	724,300	
October 31	4722.45	708,700	- 15,600
November 30	4719.79	659,900	- 48,800
December 31	4716.97	610,500	- 49,400
January 31, 1958	4711.45	520,400	- 90,100
February 28	4706.57	447,100	- 73,300
March 31	4704.00	410,600	- 36,500
April 30	4702.90	395,700	- 14,900
May 31	4717.45	618,700	+ 223,000
June 30	4722.11	702,400	+ 83,700
July 31	4720.99	681,600	- 20,800
August 31	4720.55	673,600	- 8,000
September 30, 1958	4716.72	606,200	- 67,400
Water year 1957-58			- 118,100

* Does not include dead storage of 62,000 acre-feet

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 month-end contents in acre-feet of four reservoirs are given. The first three reservoirs are in the Bighorn River Basin in 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 Montana State Water Conservation Board which agency furnished operating data.

	Contents in Acre-feet			
	<u>Bull Lake</u>	<u>Pilot Butte Reservoir</u>	<u>Buffalo Bill Reservoir</u>	<u>a/Tongue River Reservoir</u> <u>b/</u>
September 30, 1957	127,500	7,700	359,200	8,300
October 31	102,600	4,900	326,300	4,100
November 30	95,700	8,000	298,900	8,500
December 31, 1957	86,500	11,300	272,700	9,200
January 31, 1958	75,100	14,500	248,900	10,100
February 28	66,500	15,900	221,500	9,200
March 31	60,600	20,700	189,600	11,000
April 30	56,600	27,700	165,700	13,400
May 31	99,900	28,300	346,500	26,300
June 30	134,900	27,900	452,200	33,700
July 31	124,000	7,200	404,700	32,900
August 31	97,700	6,900	211,900	30,100
September 30, 1958	80,500	4,400	93,000	24,700

a/ Contents based upon sedimentation surveys of October, 1948

b/ Contents generally interpolated from readings made five or less days prior to month end.