Floods of May-June 1953 in Missouri River Basin in Montana

FLOODS OF 1953

Prepared under the direction of J. V. B. WELLS, *Chief, Surface Water Branch*

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PREFACE

This report on the floods of 1953 in central and northern Montana was prepared by the Geological Survey, Water Resources Division, C. G. Paulsen, chief, under the general direction of J. V. B. Wells, chief, Surface Water Branch.

The field work and the collection and tabulation of basic information relating to stage and discharge were done by the staff of the Helena district office of the Surface Water Branch under the supervision of Frank Stermitz, district engineer. Valuable assistance to the field and office work was given by R. E. Oltman, hydraulic engineer.

The gaging stations on South Fork Milk River near the international boundary, North Fork Milk River above St. Mary Canal near Browning, St. Mary Canal at Hudson Bay Divide near Browning, North Fork Milk River near the international boundary, Milk River at Milk River, Alberta, and Milk River at the eastern crossing of the international boundary are maintained jointly by the United States Geological Survey and the Water Resources Division, Department of Northern Affairs and National Resources, Canada, under the Boundary Waters Treaty of 1909 or under subsequent agreement between the two countries.

The collection of basic records of stage and discharge in the area described in this report is a part of a continuous cooperative program with the Montana State Engineer; the Corps of Engineers, Department of the Army; and the Department of State. Special financial assistance was given by the Corps of Engineers for the indirect determination of discharge at four sites, and discharge measurements of the Milk River at Havre.

Acknowledgement is made to the following agencies for data furnished: the Corps of Engineers, the Bureau of Reclamation, the Weather Bureau, the Bureau of Indian Affairs, the Montana State Water Conservation Board, the Pondera County Canal and Reservoir Co., and the Montana Power Co.

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ABSTRACT

The floods of May-June 1953 in the Missouri River basin in Montana exceeded previously known floods in a somewhat localized area south and east of the city of Great Falls, and in a large surrounding area approached the disastrous flood of June 1908. From the standpoint of monetary loss the floods of 1953 were record breaking, with damage exceeding $8,600,000 in 15 counties. The operation of irrigation and flood-control reservoirs did much to reduce flood peaks and damages. No direct loss of life was reported.

The flood was caused by a series of heavy rains from May 23 to June 4, augmented on some streams by delayed snowmelt from mountain areas. The persistent and heavy rains repeated a storm pattern that occurred in 1908 and that has been a basic cause of other floods of a more local nature.

The Missouri River at Fort Benton reached a discharge of 78,700 cfs (cubic feet per second), which ranks second to the discharge of about 140,000 cfs in 1908, in records continuous since 1890. The peaks on about June 4 on Belt, Highwood, and Shonkin Creeks east and southeast of Great Falls were outstanding and probably exceeded those of 1908. The most notable rate of discharge recorded was 123 cfs per square mile from the 65-square-mile drainage basin of Highwood Creek.

INTRODUCTION

A combination of soil-priming rains, mountain snowmelt, and intense, widespread rains of early June produced a flood that ranks high in its scope, magnitude, and destruction among the known floods of the Missouri River basin and tributaries in a large part of Montana. The conditions that produced the floods are unusual only in degree; they are similar to the causal factors of the greater but less-documented flood of 1908 and other floods.

The Geological Survey maintains a network of gaging stations for the collection of river stages and discharges in cooperation with State and Federal agencies and the Dominion of Canada. The data thus collected have been supplemented by records of river stages, reservoir contents, and discharge releases at reservoirs, which were collected directly by State, Federal, and municipal agencies and private concerns to provide further hydrologic data for this report. This report is supplemental to the annual series of surface-water supply reports and presents detailed information not contained in those publications. A report prepared by the Corps of Engineers (1953) is the basis for the information given on damage.

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This report contains records of stage, discharge, and reservoir contents for the May-June period on the Missouri River and tributaries from Toston to Wolf Point, Mont. A general description of the flood, the concurrent meteorologic and hydrologic conditions, a brief discussion of previous floods, and reported estimates of damage are included. Figure 13 shows the area described in this report and the areas in which flooding was most severe.

GENERAL DESCRIPTION OF THE FLOODS

The floods of May-June 1953 in central and northern Montana were the result of an extended series of rains with many centers during May 23 to June 4 and the partial melt of mountain snow. Flooding occurred along the Missouri River and its tributaries in varying degrees of intensity from Helena to the mouth of the Milk River near Wolf Point. The detention of all floodwaters in Fort Peck Reservoir prevented flood damage downstream along the Missouri River. A beneficial effect of storage in Canyon Ferry, Gibson, and Fresno Reservoirs was also apparent. The latter part of the storms affecting Montana extended into southern Alberta and Saskatchewan, and considerable rain and flooding occurred as the storms continued beyond June 4. Unofficial reports of the Water Resources Division, Department of Northern Affairs and National Resources, Canada, point to the combined effect of snowmelt and rain resulting in floods generally exceeding those of 1923 but lower than those of 1908.

The most significant features of the flood were the extensive area affected, the threefold nature of the storm period--May 24-25, 29-30, and June 2-3--and the damage which apparently exceeded any previous flood. Except for Belt, Highwood, and Shonkin Creeks the floods have been exceeded by those of 1908 and by subsequent floods of more local nature. The residents of the Milk River valley were subjected to the second consecutive year of flooding, fortunately to a lesser degree and extent than in the preceding year.

The precipitation during the first storm period produced comparatively little runoff, as it was partly in the form of snow in many of the mountain areas, and at the lower elevations the rain fell on dry, receptive soils that absorbed much of it. The greatest 24-hour precipitation, 6.8 inches, occurred at Rogers Pass on May 25, and on the same day 6.51 inches occurred at the weather station 7 miles south of Shonkin. The two bridges across Shonkin Creek were destroyed, and minor other effects of localized flooding were reported.

The second storm period found the soils saturated in many localities. However, the greatest rainfall recorded during the period was at Fort Peck in an area where the soil still had considerable absorptive capacity; 3.77 inches of rain fell in 1 day, a greater part of it falling in 4 hours. Three- or four-day precipitation totals of about

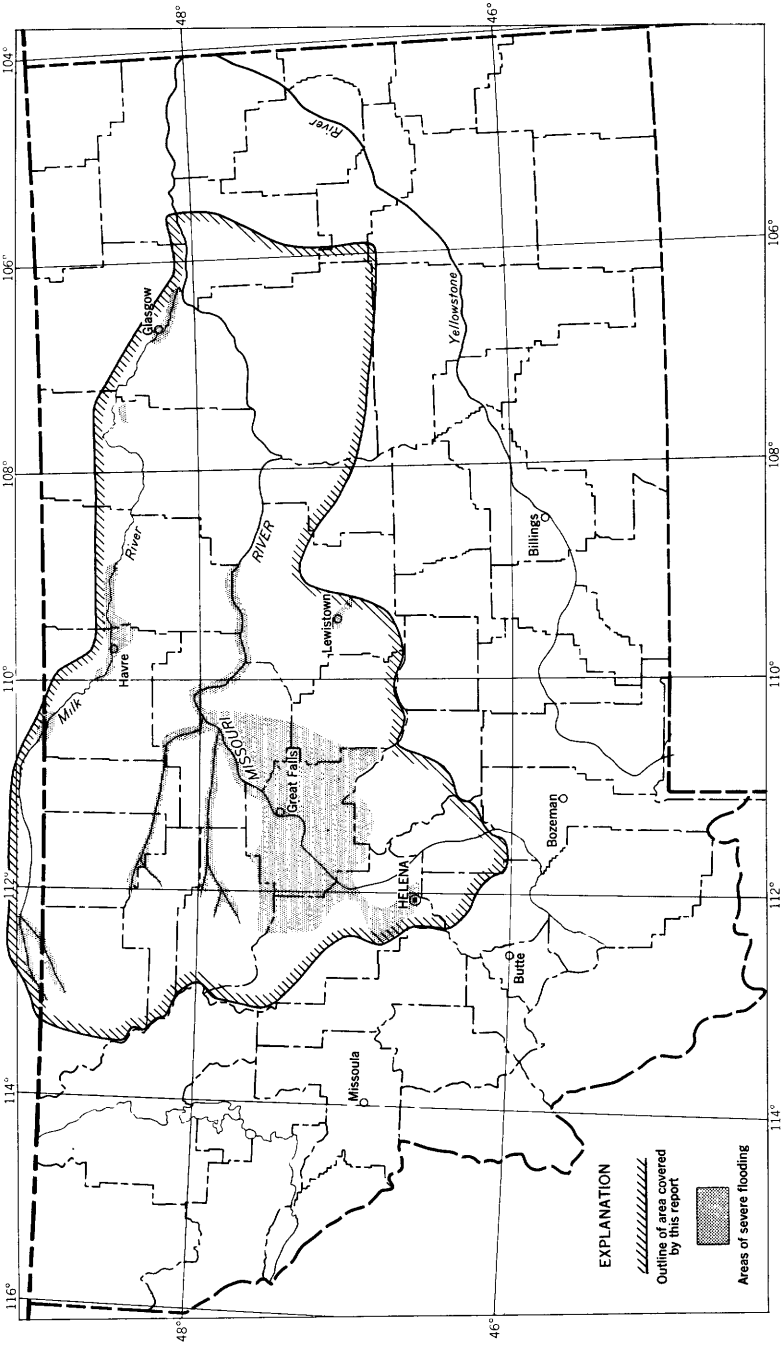

Figure 13.--Map showing outline of area covered by this report.

2 to 3 inches were general, and melting of mountain snow became a factor in producing runoff. Resultant flooding reached considerable proportions over a wide area. Damage to roads and bridges in the Prickly Pear and Little Prickly Pear Creek basins was reported. Sections of the Augusta-Fairfield road west of Great Falls were inundated as the crest on Sun River moved slowly down the Sun River valley, and overflow from tributaries of Marias River spilled over the highways in the Shelby area. Minor flooding occurred in Great Falls as drainage structures were inadequate to carry off the rapid local runoff. A landslide at the east edge of Great Falls temporarily halted rail service to Havre. Flooding began in Belt on May 30 when hastily constructed dikes failed to contain the overflow from rain-swollen Belt Creek, and the Highwood and Shonkin Creek areas were flooded for the second time since the general storm period began on May 23. Parts of Lewistown were flooded by Big Spring Creek as a result of a rainfall of more than 2 inches on May 29. A correspondent at Havre reported floods of "dam-buster and rock-roller" proportions in the Bearpaw Mountains, evidently the result of storms in the latter part of this period. The flows of Milk River tributaries farther downstream were of lesser magnitude, except for those in the vicinity of Fort Peck and Glasgow where the brunt of the concentrated storm of May 29 was felt.

The seriousness of the flood in the event of further rains was very apparent at the close of May. Flood warnings were widely disseminated, particularly for the Sun River and Milk River basins where progress of floodwaters along the relatively gentle river slopes was slow.

The third storm period began on June 1, with the greatest rain falling on June 2 and 3. It was during this third storm period that most of the streams reached their peaks and that the greatest flooding occurred.

Tenmile Creek near Rimini reached a peak at 10 p.m. on June 2. Near Helena the peak occurred at 11:30 p.m. on June 3, although for the few days earlier lowlands were flooded and the urban dwellings along the stream had flooded basements as a result of the preceding storm. The appreciable subsidence of floodwaters on June 4 was rapid along that stream and nearby Prickly Pear Creek. Little Prickly Pear Creek and its mountain tributaries did extensive damage to mountain roads and bridges and to the highway bridge at the town of Wolf Creek on State Route 33. Twelve families were evacuated from that town as an attempt of the night of June 3 was unsuccessful in confining flows to the Little Prickly Pear Creek channel. However, an old bridge across the stream remained passable to motor traffic. The flow of the Missouri River below Holter Dam was at a low level as the storage of upstream reservoirs held back the major part of the flood flows. The Dearborn River reached a peak at Craig, near its mouth, at 1 a. m. on June 4, before the upstream peak from mountain areas arrived.

Stickney Creek, a tributary of the Missouri River entering the Missouri River about 20 miles southwest of Cascade, cut through the approaches to the bridge on U. S. 91 when the concrete bridge collapsed under the pressure of drift and undermining, and partly blocked the stream (fig. 14). Traffic on this route was halted for

Figure 14. --Bridge on U. S. 91 across Stickney Creek collapsed during June flood. Approaches to bridge completely destroyed by scour.

a few days. At Cascade on the Missouri River the peak stage of 3,350.0 feet elevation was observed at 8 a. m. This peak was about 2½ feet lower than that of June 1908. The peak on Smith River near Eden occurred at 1 a. m. on June 4 at the upstream point of appreciable flooding in that basin. Hound Creek and minor tributaries from that point to the mouth furnished the greatest part of the flood flow in Smith River to a point near Truly where the peak reached 30,300 cfs. The conflicting recollections of residents, the only comparative data available along this stream concerning the relationship to the previous peak of 1908, point to nearly the same magnitude.

The early morning of June 3 saw a steady rise on tributaries of the Sun River, flooding of the highway at the town of Sun River 19 miles west of Great Falls, and minor overbank flooding in the nonresidential areas at the west end of Great Falls. The Weather Bureau predicted a crest that evening. The Corps of Engineers was ready to provide sandbags, and relief agencies were prepared. On the night of June 3 the town of Sun River was flooded throughout by Sun River. Only six families had moved out; the remaining families preferred to remain in their homes, although the river was flowing across State Route 20, cutting off travel to Great Falls from that direction. Many sections of the Sun River valley were under water that evening. Sandbagging and diking continued during the night of June 3 in the west part of Great Falls adjacent to the Sun River. Many homes in that general area were surrounded by water that lapped at their foundations. The struggle against the rising waters

continued in spite of breaks in temporary dikes. By noon of June 4 many families had evacuated their homes before the higher slow-moving waters in the west part of Great Falls. About 1,000 persons left or were evacuated from their homes. The rounded crest of the Sun River flood reached the gaging station near Vaughn at 1 p.m. on June 4. At Great Falls the gage readings at the 14th Street bridge show crests of the same height at 6 p.m. on June 4, and at 1:15 a.m. and 6 a.m. on June 5. The Corps of Engineers estimated that the peak was exceeded by that of June 1908 by 8-9 feet. Recession was slow, and continued high stages delayed any return of evacuees for days.

High runoff in the closed-basin tributaries to Greenfield Lake, about 40 miles northwest of Great Falls, inundated a rail line of the Milwaukee Road and a 200-foot stretch of the highway. The flooding did not abate for some time. Plans for the drainage of this closed-basin area to a stream course had been considered for some time, and the need for remedial action was greatly emphasized by the flood.

Belt Creek reached flood proportions at Neihart on the night of June 3, according to the mayor. He stated that the rise of the creek was more rapid than any other seen by several 80-year residents of that community. Many summer homes, cabins, and bridges were washed away in the Neihart-Monarch reach of the stream and downstream points. The peak reached the gaging station 9 miles west of Monarch at 5 a.m. on June 4, which is the approximate time of the peak at Belt about 12 miles downstream according to stage observations of the Corps of Engineers. Belt, a town of about 700, was hit hard, with much of the business and residential area damages and flooded for days (fig. 15). Only a few homes on the hillside escaped damage. Belt Creek continued its devastation through the narrow valley to its mouth about 20 miles farther downstream. The inactive branch line of the Great Northern Railway from Armington to Neihart was almost obliterated through damage to roadbed and bridges. U. S. 89 along Belt Creek south of Armington was out of service for weeks due to bridge washouts, loss of grade, and landslides (fig. 16). The damage caused by Belt Creek to transportation facilities was estimated at more than $1 million.

Highwood Creek was the stream with the highest recorded rate of runoff, 123 cfs per square mile. Snowmelt could hardly have been a factor as only a small part of the drainage area is mountainous. The stream reached a danger point at the town of Highwood late on June 3, rising through the morning of June 4 and receding that afternoon. One home was washed away and others were threatened. The county road along Highwood Creek was wrecked, and vast deposits of gravel and debris were left in the narrow valley (fig. 17). Figure 18 shows the evidence of scour in the creek channel; the stream has cut its bank past the edges of the adjacent ranch buildings.

Figure 15.--Aerial view of belt on June 4 showing inundation along Belt Creek. Photograph by Corps of Engineers.

Figure 16. --Otter Creek bridge on U. S. 89 destroyed by flood. Belt Creek in background. Photographed by Montana Aeronautics Commission.

The high flows of the Missouri River from Great Falls to Fort Benton passed the four powerplants in that reach with little major difficulty. These low-head plants are operated with the relatively small amount of channel storage created by low dams. At Fort Benton, where the peak stage occurred in the early morning of June 5, the damage was confined to a few houses along the Missouri River.

No reliable determination of discharge was possible on Shonkin Creek, which empties into the Missouri River at Fort Benton. The evidence of damage by this normally small stream indicates a high rate of peak flow. Precipitation at the weather station 7 miles south of Shonkin totaled 11.51 inches during May 24-30 and 8.39 inches June 1-4; 6.51 inches fell in a 24-hour period May 24-25, and 6.52 inches was measured for June 4.

In the Marias River basin heavy rains of June 2 brought cascading waters down coulees to flood some parts of the towns of Shelby and Kevin, and parts of U. S. 2 in the closed-basin area. The tributaries of the Marias River in the vicinity of Shelby and eastward caused flooding of parts of U. S. 2 and caused other damage. Construction of Tiber Dam on the Marias River was suspended because of flooding. The contractor at this Bureau of Reclamation project lost construction bridges and a section of the diversion tunnel with total damage estimated at about $700,000. The flooding along down-

Figure 17. --Highwood Creek, showing destruction of railroad crossing at Highwood. Note scour by overflow channel in middle background and debris in foreground. Photograph by Corps of Engineers.

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Figure 18. --Highwood Creek, showing scour in channel and damage to adjacent buildings. Photograph by Corps of Engineers.

stream reaches of the Marias River was minor, particularly in comparison with the much greater flood of 1948 on this stream.

Teton River, which joins the Marias River near Fort Benton, was relatively higher than the Marias and flooded 15,000 acres of land. Urban damage was largely confined to Choteau where, as late as June 8, floodwaters from the heavy rain of June 7 threatened school buildings and some residences. On June 7, 1.29 inches of rain fell, 0.86 inches of which was between 8 and 9 p. m. Choteau, situated at the junction of Muddy Creek, was damaged by flooding. Emergency chlorinators kept the water supply safe. The sloughing of steeply cut banks and bordering benchlands, which continued for some time after the general storm period, pointed to an unusually heavy absorption of precipitation.

From the mouth of the Marias River to Fort Peck Reservoir, the greatest flood on the Missouri River since 1908 caused light and isolated damage in this narrow and deeply entrenched valley, which supports few habitations or croplands. Higher stages have been experienced at many points during ice-jam floods. The peak daily inflow to Fort Peck Reservoir was computed at a daily maximum of 120,000 cfs by the Corps of Engineers.

Big Spring Creek, a tributary of Judith River, again caused considerable damage in and near Lewistown on June 4 as the highest flows in more than 30 years flooded parts of the business section of Lewistown and some residences. Unit runoff was not particularly high, but the small, shallow channel of this spring-fed stream through the city was entirely inadequate. Cottonwood Creek near Lewistown was also reported to have been extremely high, but no discharge data were collected.

For the second consecutive year the Milk River was in serious flood. Big Sandy Creek did not act as it did in 1952 and cause damage to the city of Havre. Bullhook Creek, which flows through Havre, sent a surge of water through the city on June 3, flooding some homes and a part of the business section. The Milk River flow was controlled in part through superstorage in Fresno Reservoir. Flooding of north Havre occurred on June 6 as dikes along the Milk River broke and floodwater also backed up from downstream (fig. 19). The earlier passage of the fewer flooding tributaries below Havre lessened flooding along the broad and low gradient of the Milk River. Flooding of cropland occurred for about 50 miles below Havre and damage was considerable to irrigation works repaired after the 1952 flood. The effect of the Milk River floods within Canada was not reported in the United States.

The storms that caused the floods in Montana continued into the Saskatchewan River basin in Canada. Floods on the lower sections of the Oldman River and downstream points on the Saskatchewan River generally exceeded those of 1923 but probably were less than

Figure 19. --Aerial view of north Havre on June 6 before Milk River reached its crest. Records of stage collected at bridge in lower left. Photographed by Corps of Engineers.

those of 1908, for which information is scant. The St. Mary River at Lethbridge, Alberta, reached about the stage and discharge of the peak of 1948.

Although Fort Peck Reservoir on the Missouri River is the only storage facility with a definite allocation of capacity for flood control, a substantial benefit accrued through storage or temporary detention in other reservoirs. According to the Corps of Engineers, Canyon Ferry Reservoir reduced flood flows on the Missouri River at Great Falls by about 7,000 cfs; through superstorage, Gibson Reservoir on the North Fork of Sun River reduced the flood flow of the Sun River at Great Falls by 500 cfs; and Fresno Reservoir on the Milk River reduced peak flow at Havre by about 1,500 cfs.

Fort Peck Reservoir completely regulates the flow of the Missouri River; the Corps of Engineers estimated that the reservoir reduced the flow of Missouri River at the mouth of Milk River from 130,000 to 13,000 cfs. Resulting stage reductions were estimated as about 7 feet at Bismarck, N. Dak., and about 3.5 feet at Waverly, Mo. The Corps of Engineers estimated that the regulation at Fort Peck Reservoir reduced flood damage by more than $13 million by preventing flooding of the valley downstream. Some local benefits probably accrued because of storage in Swift Reservoir, Two Medicine Lake, and lesser reservoirs. The contents of reservoirs on selected dates is tabulated on p.142.

METEOROLOGIC AND HYDROLOGIC FEATURES OF THE FLOOD

Snowmelt contributed to the floods of 1953 in the basins extending to the higher mountain areas. Because of the similarity of pattern to other outstanding floods of late May and June, a discussion of antecedent conditions is given in considerable detail.

Snow surveys on or about April 1 showed near-average water content in the mountain areas. There was substantially less snow than on equivalent dates in 1952. The weather pattern during April is presented in the following excerpts from a Weather Bureau publication (1953a).

> Only two Aprils in the past 59 years, 1909 and 1920, recorded a lower average temperature than this year's statewide average of 37.7°, which was 5.7° below normal***. The precipitation average of 1.70 inches was 0.56 inch above normal; this was the greatest April average recorded since 1940***. The snowfall average of 7.8 inches was unusually heavy for April.

Snow surveys on or about May 1 showed a contraseasonal increase in water content at the courses along the Continental Divide from Marias Pass at the south edge of Glacier Park to the Tenmile Creek courses near Helena. At lower elevations in the mountains, melting before May 1 was minor, so that an unusually large part of the winter's accumulation of snow remained on the ground. Snow surveys on May 5 and 6 at 5 courses in the Swiftcurrent Creek basin of Glacier Park showed an average water content of 37.8 inches. This was 138 percent of the mean of the previous 31 years and the fifth highest during that period. The tabular comparison of the available April and May surveys at 10 courses are given in table 1. The location of these courses may be seen on plate 3.

No snow surveys were made after those of about May 1. Temperature, precipitation, and streamflow records and general observations indicate that snowmelt was light through most of May, and that the mountain storms of about May 24-26 greatly offset previous diminution. The Weather Bureau (1953b) probably supplies the best factual data on the snow situation, excerpts from which are quoted:

> Snowfall, while heavier than normal, was not excessive except over some of the higher mountain areas during the storm of the 24-26th. At Rogers Pass 61.3 inches fell in the 3-day period, and Kings Hill had a monthly total of 66 inches--second only to Rogers Pass with 79.

The Weather Bureau (1953b) is quoted for other aspects of climate during May:

> Temperatures averaged 4.4° below normal across the State, making this the coldest Montana May since 1927***but departures below normal were only 3.1° in both the Western and North Central Divisions.
>
> Precipitation for the State as a whole averaged 3.81 inches, nearly double the normal of 1.99. Since 1895 the month has averaged wetter only three times, in 1906, 1908, and 1927. By divisions the wettest sections were the Northeastern, North Central, and Central, with averages and departures respectively (in inches) of 4.99, +3.16; 4.76, +2.88; and 4.93, +2.86. ***The highest total was 13.84 inches at Rogers Pass***. From the 19th to the end of the month Shonkin 7S measured a total of 13.13 inches. The greatest in any 24 hours was 6.80 inches at Rogers Pass on the 25th, with Shonkin 7S reporting 6.51 inches for the same date.

Table 1.--Snow-survey data of headwater regions, Montana, 1953

Symbol	Snow course	Stream basin	Township	Range	Elevation	Years of record	April 1, 1953 Water content	April 1, 1953 Percent of average	May 1, 1953 Water content	May 1, 1953 Percent of average
A	Tenmile Creek, Upper	Prickly Pear Creek	8N.	5W.	8,000	18	14.0	105	16.2	159
B	Tenmile Creek, Middle	do	8N.	6W.	6,250	18	11.6	110	11.8	187
C	Tenmile Creek, Lower	do	8N.	6W.	6,800	18	6.6	102	5.4	270
D	Chessman Reservoir	do	8N.	5W.	6,200	18	4.5	94	3.5	219
E	Stemple Pass	Little Prickly Pear Creek	13N.	7W.	6,900	15	10.4	106	8.8	149
F	Kings Hill	Smith River, Belt Creek	13N.	7E.	7,950	15	11.6	87	12.4	107
G	Goat Mountain	Sun River	22N.	10W.	7,000	15	10.4	101	-------	------
H	Benchmark a/	do	20N.	10W.	5,500	6	7.5	69	-------	------
I	Fright Creek a/	Teton River	26N.	10W.	6,000	6	21.4	111	-------	------
J	Marias Pass	Marias River	30N.	14W.	5,250	18	16.8	95	17.4	176

a/ Measured by U. S. Soil Conservation Service.

The storms of late May and June in northern and central Montana were the result of meteorological conditions that extended over a wide area. The following summary of these conditions was furnished by the U. S. Weather Bureau at Great Falls, Mont. (written communication):

> During the latter part of May and early June of 1953 numerous surface low-pressure systems moved from Western United States across the Rocky Mountains and into the Northern Great Plains country of Montana and the Dakotas. Most of those lows pursued a northeasterly course, for the most part, although some of them moved northerly and even northwesterly for brief periods after arriving east of the Rockies. Nearly all of them also slowed in their movement after reaching the Northern Plains.
>
> Throughout most of this period cool air from Canada and the North Pacific Ocean remained entrenched at and near the ground level over Montana and for a good portion of this time the cool air also persisted in the lower levels of the atmosphere over at least the western portions of the Dakotas. However, to the south and east of this area a broad southerly current of moist tropical air, existing to great heights, prevailed over much of the two-week period from May 24 through June 5.
>
> As each of the lows moved from the west or southwest into the Northern Great Plains during the period a fresh supply of moisture was fed into Montana over the underlying mass of cool air. This moisture was transported in an easterly current offshoot from the main current of tropical air. Unusual quantities of this moisture were precipitated as this air was lifted by convergence and upglide motion in the vicinity of the low. Some of this upglide motion was frontal in nature but a portion of it was orographic. The storm of June 2-4, which produced the heaviest rains during the two-week period and which was the cause of the disastrous floods in Central Montana, was particularly noteworthy for its orographic precipitation. Much of the heavy rain which fell in Central Montana in connection with this storm occurred when pressures were rising and northerly to northeasterly winds prevailed to considerable heights in the atmosphere.

The similarity of the conditions described above to those of previous storms is discussed in a short statement of the U. S. Weather Bureau office at Helena, which follows (written communication):

These June 1953 rain-producing weather patterns were not unusual, although the rainfall amounts broke records in a few localities. It is characteristic of heavy rainstorms that the highest isohyet rarely coincides with the peak rainfall area of earlier storms. While the heaviest rains seem to have occurred in 1953 in the Belt-Raynesford area, it should be recalled that earlier floods had similar patterns over nearby areas.

For example, in 1948 the center of heaviest rainfall was near Dupuyer, about 70 miles NW of Great Falls, during the June 16-17 storm. Then in 1906 an extremely heavy storm center near Warrick, 85 miles NE of Great Falls on June 6-8, and in 1908 a similar storm struck near Evans, 25 miles SSE of Great Falls on June 3-7. It is interesting to note that one of the 18-inch isohystal centers--possibly also a 20-inch isohyet--of the 1953 storm period almost coincides with the 1908 Evans center.

The combination of rain-producing factors that caused the 1953 storms is fairly common, but for a number of reasons revolving around general atmosphere circulation patterns, the various factors necessary occur almost invariably in Montana during the 40-day period May 21 to June 30. Since 1900, at least five severe storm patterns of this type have occurred, with no attempt to list several heavy storms in other years that produced lesser floods. Such things as dryness or wetness of antecedent weather conditions and spacing of rain periods all have their effects, and in most years floods of this type seem to arise from more than one individual rainstorm with very short periods of light or no rain between. The last 50 years seem to indicate that future storms of equal, or possibly somewhat greater, severity can be expected periodically.

A more detailed discussion of a storm of this type will be found in Monthly Weather Review, Volume 78, No. 1, January 1950.

Information from the total storm isohyetal map prepared by the Corps of Engineers, Fort Peck District, is presented as plate 4. Official weather records were supplemented by field surveys of the Corps of Engineers and the U. S. Bureau of Reclamation. The heaviest centers of nearly 20 inches of precipitation were in the Highwood and Little Belt Mountains. Lesser centers were in the drainage basins of the Smith, Sun, Teton, and Judith Rivers, and in the Bearpaw Mountains south of Havre. The prevalence of northerly

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to northeasterly winds cited by the Weather Bureau may be gathered from the fact that the heavy rains fell on the northern or eastern slopes of the mountain ranges.

There were generally three distinct periods of precipitation. They are depicted in figure 20 for five representative stations where

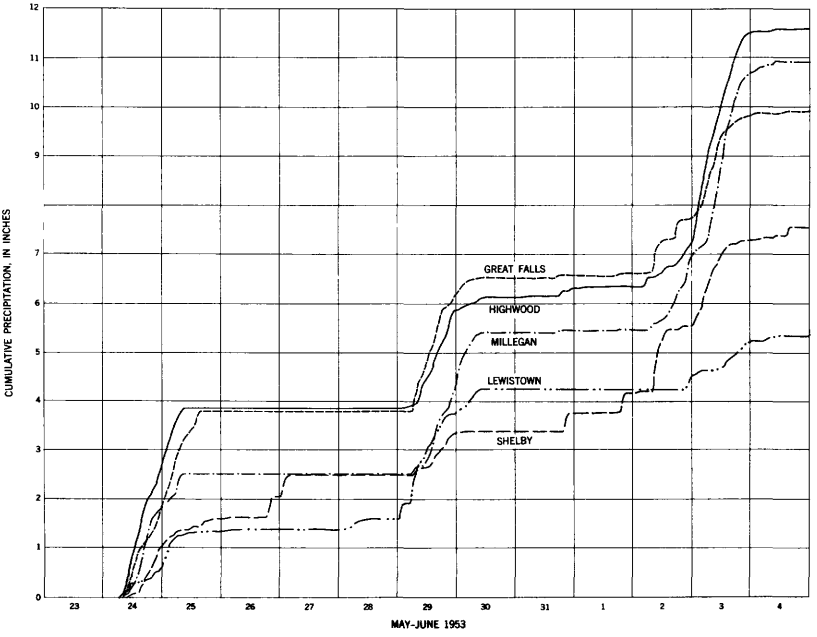

Figure 20. --Graph showing accumulated rainfall at five weather stations, May 23 to June 4, 1953.

hourly recording data are plotted. Additional data on precipitation are given in table 2, which lists daily precipitation totals at 13 other stations in the general flood area during the total storm period of May 23 to June 4.

Table 2. --Daily precipitation totals, in inches, at selected weather stations in the flood area

Station	May 1953									June 1953				Total
	23	24	25	26	27	28	29	30	31	1	2	3	4	
Augusta ------	0.07	-	-	0.21	0.11	-	0.99	-	0.25	0.37	1.25	1.15	0.22	4.62
Choteau ------	-	2.39	1.20	.07	.11	-	1.17	0.18	.59	.80	.59	1.21	.19	8.50
Cut Bank CAA-	-	(a)	(a)	1.64	.03	-	.69	.16	.38	.35	.48	1.30	-	5.03
Del Bonita ----	-	.28	.75	.16	-	-	.41	.13	.03	.48	.24	2.03	.03	4.54
Dupuyer 5SE --	.04	1.89	2.46	.33	.04	-	.89	.36	.19	.51	1.04	2.64	.19	10.58
Dutton 6SE----	-	2.42	1.33	-	.07	-	-	.23	.49	.17	1.23	1.85	.05	7.84
Fort Peck ----	-	.81	-	-	-	0.37	3.77	.18	-	.40	.16	.73	-	6.42
Gibson Dam---	.18	.75	1.67	.33	.07	(a)	.79	-	.26	.05	.76	.37	.54	5.77
Havre --------	-	1.15	.18	.02	-	-	.75	.02	.13	-	.53	.41	.04	3.23
Helena -------	.17	1.56	.29	-	-	.03	.28	.12	.01	.11	.65	.41	.07	3.70
Holter Dam ---	-	2.07	1.21	-	-	(a)	(a)	.85	.13	.18	.91	1.90	.12	7.37
Kings Hill ----	(a)	(a)	1.21	-	-	.10	1.25	.44	.13	.05	.78	1.56	.25	5.77
Lloyd --------	-	3.77	1.06	-	-	-	2.37	.30	.08	-	.10	3.93	.26	11.87

a/ Amount included in following measurement, time distribution unknown.

FLOOD DAMAGE

The floods of May-June 1953 may have been the most damaging in the history of Montana from the standpoint of monetary loss. A total damage of $8,670,170 was estimated by the Corps of Engineers on basis of field surveys. No lives were lost as a direct consequence of the floods, but two boys at Havre died on May 31 under a landslide caused by the rain. Although many of the peak stages occurred at night, the buildup to the peaks served to alert the population to the probable hazards. The floodwarning, evacuation, and relief activities of the Federal, State, county, and local agencies concerned and of the American Red Cross were effectively coordinated. The Governor of Montana proclaimed a disaster area covering 14 counties and requested the assistance of the Federal Government. The President of the United States allocated $250,000 on June 10 for emergency repair to public facilities. Several counties declared emergencies and appropriated special funds. State and local agencies concerned with public health rendered prompt service.

The floods inundated an estimated 76, 800 acres and left 3, 900 acres of cultivated land unfit for further cropping. Many additional acres of pastureland became scoured, rocky wastelands. More than 1, 400 people were evacuated from their homes. The damage to transportation facilities of more than $3 million was almost wholly confined to the rural areas where 220 bridges were washed out or made impassable by scour. Forty miles of railroad and 170 miles of highways and roads were washed out or scoured severely. At the Tiber Dam on Marias River, which was under construction at the time, the contractor lost about $700, 000 through the loss of three river crossings, the flooding or destruction of works under construction, and loss of earnings. Operations were suspended, and the loss in progress was estimated at more than 3 weeks. For the second consecutive year the Milk River valley was flooded, less severely than in April 1952.

The stream gradients in the flood areas ranged from steep to very flat. An official of the Civil Defense Administration stated that the flood was unique in his experience in that water merely rose in some areas and in other areas floodwaters struck with such devastating force. Some homes were washed away before household goods could be removed.

Flood damage extended into Canada in the Milk River basin, but losses there are not reported. More extensive damage occurred in Canada shortly after the crest of the Montana floods as the streams in Alberta and Saskatchewan reached high stages generally equal to or exceeding those of 1908.

The Corps of Engineers (1953) compiled a detailed estimate of flood damage in Montana. Damages by stream basins, summarized from that publication, are presented in table 3 for rural damage and table 4 for urban damage.

Table 3. --Rural flood damage

[Compiled by Corps of Engineers]

Description	People evacuated	Houses flooded	Acres inundated	Loss in dollars				
				Crop	Noncrop	Transportation	Miscellaneous	Total
Missouri River (main stem)	-	-	-	-	139,540	131,000	4,000	274,540
Minor tributaries	-	-	-	-	-	522,290	-	522,290
Dearborn River	-	-	1,200	11,200	97,500	-	3,100	111,800
Smith River	26	7	5,300	34,500	33,480	185,260	21,100	274,340
Sand Coulee Creek	42	44	2,000	17,570	50,930	151,770	6,300	226,570
Sun River	23	15	4,200	103,880	296,500	105,650	3,000	509,030
Belt Creek	48	43	3,000	27,140	182,600	1,087,030	1,050	1,297,820
Highwood Creek	10	7	5,000	41,330	145,190	294,500	49,700	530,720
Shonkin Creek	18	7	2,200	7,400	45,000	76,000	2,800	131,200
Teton River	-	-	15,000	5,730	65,010	307,900	600	379,240
Marias (exclusive of Teton) River	-	-	10,000	41,530	720,160	280,350	1,900	1,043,940
Judith River	-	3	3,500	35,920	48,380	76,500	-	160,800
Milk River	15	28	25,400	423,320	342,440	108,820	45,660	920,240
Closed-basin areas Toole and Lewis and Clark Counties	-	-	40,100	420,000	-	660,000	10,000	1,090,000
Total	182	154	116,900	1,169,520	2,166,730	3,987,070	149,210	7,472,530

Note. --Data for closed basins may not be complete in all respects.

Table 4. --Urban flood damage

[Compiled by Corps of Engineers]

Description	People evacuated	Residences		Businesses		Municipal damage	Miscellaneous damage	Flood fighting	Transportation facilities	Total
		No.	Damage	No.	Damage					
Missouri River (main stem)	18	15	$15,140	-	-	-	$30,370	$2,350	-	$47,860
Sun River	565	174	159,900	12	$12,860	$15,000	63,710	124,960		376,430
Belt Creek	292	146	155,820	25	50,300	141,710	66,950	11,240	$1,900	427,920
Highwood Creek	23	9	30,130	-	-	-	17,680	1,400	1,000	50,210
Teton River	-	31	10,300	-	-	11,000	-	3,000	-	24,300
Judith River	42	100	33,790	46	15,180	9,000	6,410	13,350	-	77,730
Milk River	308	143	52,460	12	11,840	17,250	22,250	9,090	300	113,190
Closed-basin area Toole County	-	-	23,000	-	27,000	30,000	-	-	-	80,000
Total	1,248	618	$480,540	95	$117,180	$223,960	$207,370	$165,390	$3,200	$1,197,640

Note. --Data for closed basins may not be complete in all respects.

MEASUREMENT OF FLOOD DISCHARGE

The development of a stage-discharge relationship from which discharge can be calculated when the stage is known is a fundamental operation at a stream-gaging station. The relationship is determined by current-meter measurements over the range of stage experienced, or over a sufficient range of stage so that the curve of relationship can be extended to maximum stage.

Travel in the critical areas during the flood was difficult and at times impossible, resulting in the lack of current-meter measurements for the determination of peak discharge at some sites. Indirect methods employed for computation of maximum discharge consisted of flow over dams, computation of flow through contracted openings, and computation of flow from slope-area observations.

Descriptions of the usual and indirect methods can be found in Corbett and others (1943). More detailed descriptions of the indirect methods are given in Johnson (1936), Dalrymple and others (1937, 1939), and McGlashan and Briggs (1939).

STAGES AND DISCHARGES AT STREAM-GAGING STATIONS

Explanation of Data

The basic data systematically collected at stream-gaging stations consist of records of stage, measurements of discharge, and general information useful in determining the daily flow from the records of gage heights and discharge measurements. The records of stage are obtained either by periodic readings on a nonrecording gage or by a water-stage recorder that provides a continuous graph of stage. Measurements of discharge are generally made by current meter. The determination sometimes must be made by indirect methods referred to in the preceding section of this report.

The data presented in the following tables for each stream-gaging station include, in general, a description of the gaging station, a table showing the daily discharges during the flood period (May to July 1953 for most stations), and a table showing the stage and discharge during major flood periods at intervals short enough to permit reliable definition of the flood hydrograph. A number of gaging-station records on tributaries of Milk River between Havre and Nashua have been omitted from this report as the flood did not reach significant proportions in that reach of river. The records omitted will appear in Water-Supply Paper 1279 of the yearly surface-water supply series.

The description of the station gives information concerning the location, datum, and type of gage, area of drainage basin, details of gage-height and discharge records, and miscellaneous remarks helpful to a better understanding of the records. The statement regarding the discharge record briefly explains the methods used in the definition of the stage-discharge relationship over the ranges of stage that occurred during the floods of May-July 1953, as well as of the previous maximum flood of record. The description also includes information about auxiliary methods used in obtaining the discharge and describes conditions that may have affected the stage-discharge relationship. The maximum stage and discharge at each gaging station are given for the floods of May-July 1953 and for the period before that time; additional information is included at some stations for floods antedating the period of record.

The table of daily mean discharge usually presents data for May to July 1953 where available, and covers not only the periods of major flood but also covers a sufficient length of time to show antecedent and recession discharges. The table shows the monthly mean discharge, in cubic feet per second, and the volume of run-off, in acre-feet and depth in inches over the drainage area. Figure 21 shows graphs of discharge at gaging stations on the Missouri River main stem. Figure 22 shows hydrographs at selected gaging stations on tributaries of the Missouri River.

The table that follows the tabulation of mean discharges gives (for each station where such detailed definition is necessary) the stages and discharges at indicated times of each day during the period of rapid change in stage and discharge. The time interval for selecting momentary data was chosen to offer adequate hydrograph definition without including unnecessary information. Data for each station are listed from the beginning of the flood until the recession is adequately defined by the daily mean discharges.

The gage heights were obtained from records of continuous water-stage recorders, where such records were available. For a station with an incomplete record, or where the records of stage consisted of only one or more manual-gage readings a day, graphs were constructed on the basis of available gage readings, high-water marks, and other pertinent evidence, and the stages at indicated time were taken from the graph. Departures from this general procedure are noted in the description under the heading "Gage-height record."

Records are presented in downstream order beginning with the Missouri River at Toston. Records for tributary stations appear before the next downstream station on the main stem. An exception has been made for reservoir records, which are presented as a group following the discharge records.

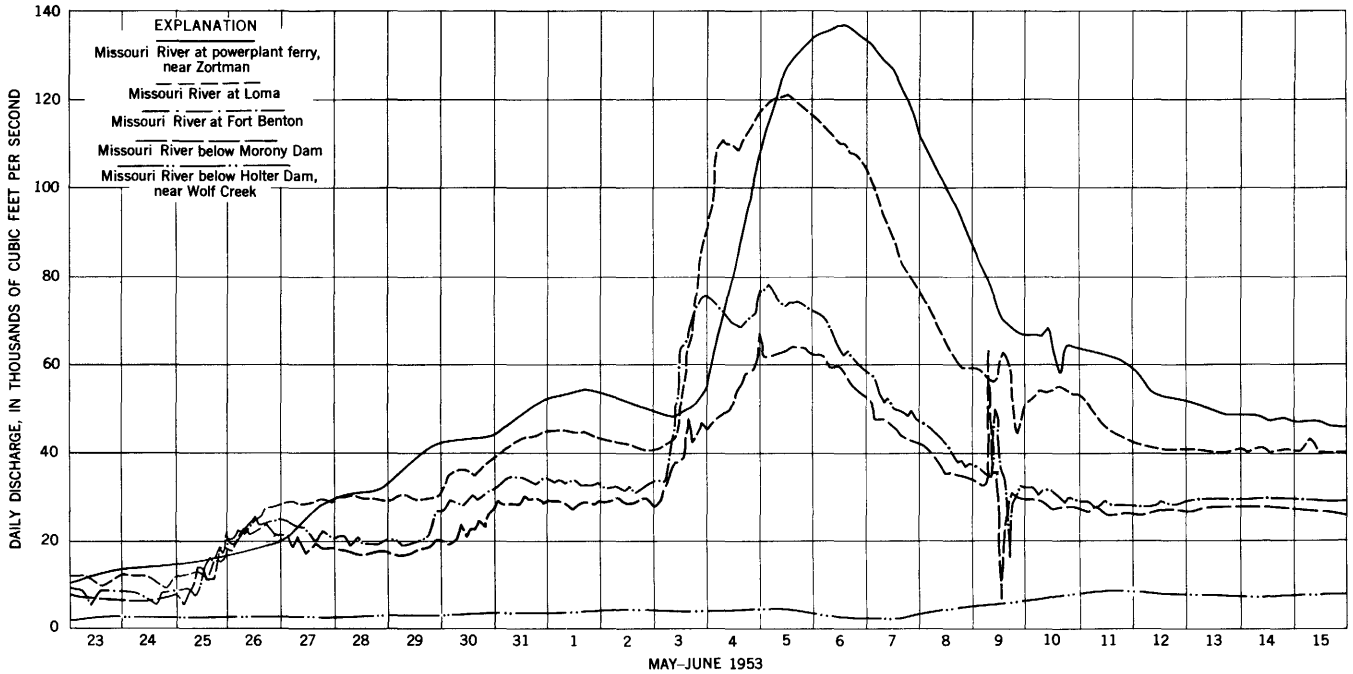

Figure 21. --Graphs of discharge at gaging stations on Missouri River, May 23 to June 15, 1953.

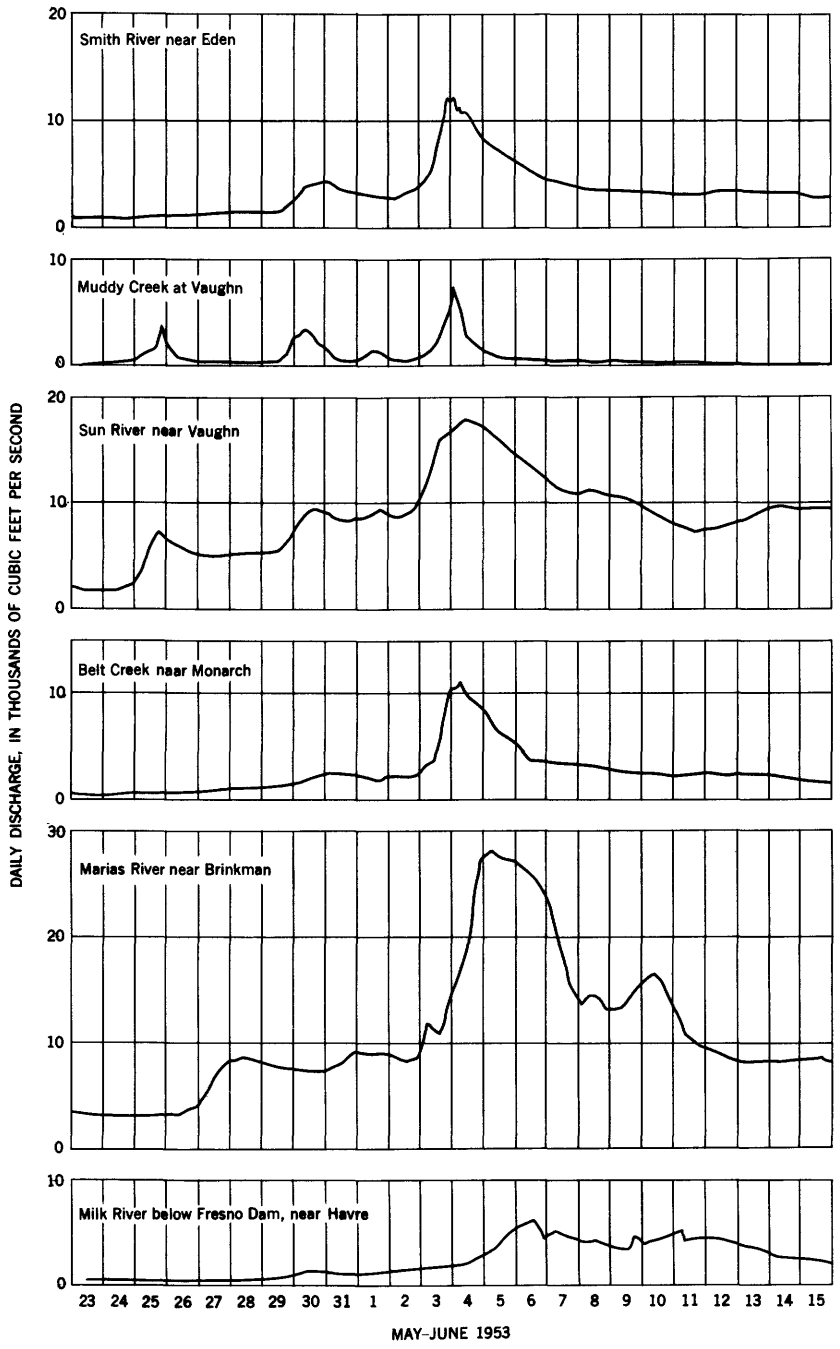

Figure 22.--Graphs of discharge at gaging stations on principal tributaries of Missouri River in flood areas, May 23 to June 15, 1953.

Missouri River at Toston, Mont.

Location.--Lat 46°09', long 111°26', in NW¼ sec. 36, T. 5N., R. 2 E., on left bank 2 miles southeast of Toston, 4½ miles upstream from Crow Creek, and 7 miles downstream from Sixteenmile Creek. Elevation of gage, 3,890 ft, approximately.
Drainage area. --14,470 sq mi (determined by Corps of Engineers).
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements.
Maxima.--May-July 1953: Discharge, 22,000 cfs 4 a.m. to noon June 16 (gage height, 10.00 ft). 1910-16, 1941 to April 1953: Discharge, 32,000cfs June 6, 1948 (gage height, 11.77 ft).
Remarks.--Some regulation by six reservoirs on tributaries. Diversions for irrigation of about 521,000 acres above station. East and West Broadwater canals with combined capacity of about 430 cfs divert water from a point 3 miles above station and furnish full or supplemental supply to irrigate about 15,000 acres below station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,620	7,230	8,910	11	4,520	15,500	5,180	21	4,520	20,600	3,210
2	5,220	7,900	9,150	12	4,270	16,700	4,990	22	4,720	18,500	3,100
3	4,830	9,310	8,820	13	4,000	18,200	4,790	23	4,790	15,900	2,910
4	4,290	12,200	8,370	14	3,760	20,000	4,610	24	4,730	13,800	2,860
5	4,030	14,600	8,040	15	3,570	21,400	4,460	25	4,950	12,800	2,750
6	3,910	16,700	7,450	16	3,370	21,900	4,400	26	5,450	11,800	2,620
7	4,010	16,200	6,840	17	3,230	21,300	4,270	27	5,420	10,500	2,170
8	4,420	14,800	6,070	18	3,230	20,800	4,030	28	5,540	9,350	2,280
9	4,750	14,400	5,570	19	3,270	20,900	3,670	29	6,080	8,960	2,190
10	4,610	14,900	5,370	20	3,800	21,500	3,380	30	6,830	8,660	2,110
								31	6,960	-	2,090
Monthly mean discharge, in cubic feet per second									4,603	15,240	4,731
Runoff, in acre-feet									283,000	907,100	290,900
Runoff, in inches									0.37	1.18	0.38

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 17		4	5.39	5,640		June 6		12	9.92	21,600
12	4.12	3,210	8	5.28	5,400	7	8.62	16,100		June 17	
	May 18		12	5.23	5,290	8	8.85	17,000	N	9.85	21,300
N	4.15	3,260		May 28		9	8.80	16,800	6	9.79	21,100
6	4.11	3,200	2	5.26	5,350	10	9.20	18,500	12	9.77	21,000
12	4.12	3,210	5	5.36	5,570	11	8.85	17,000		June 18	
	May 19		4	5.40	5,660	N	8.94	17,400	N	9.67	20,500
6	4.15	3,260	10	5.30	5,440	2	8.80	16,800	12	9.78	21,000
2	4.17	3,300	12	5.30	5,440	12	8.86	17,000		June 19	
4	4.02	3,050		May 29			June 7		N	9.70	20,600
8	4.20	3,350	6	5.54	6,000	N	8.64	16,200	12	9.84	21,300
12	4.27	3,470	N	5.61	6,170	12	8.45	15,400		June 20	
	May 20		12	5.68	6,350		June 8		N	9.92	21,600
N	4.42	3,730		May 30		N	8.27	14,700	6	9.92	21,600
12	4.72	4,270	4	5.84	6,760	12	8.24	14,600	12	9.89	21,500
	May 21		6	5.84	6,760		June 9			June 21	
8	4.85	4,520	10	5.68	6,350	N	8.18	14,400	6	9.82	21,200
N	4.87	4,550	2	5.90	6,920	12	8.18	14,400	N	9.68	20,600
12	4.91	4,630	6	5.99	7,170		June 10		12	9.46	19,600
	May 22		12	6.01	7,230	5a	8.29	14,800		June 22	
N	4.95	4,710		May 31		12	8.37	15,100	9p	9.02	17,700
12	5.01	4,830	6	5.88	6,870		June 11		12	8.88	17,100
	May 23		11	5.87	6,840	N	8.45	15,400		June 23	
2	5.02	4,850	3	5.89	6,890	12	8.64	16,200	6	8.65	16,200
11	4.84	4,500	6	5.95	7,060		June 12		6	8.51	15,600
2	5.02	4,850	12	5.92	6,980	6	8.75	16,600	12	8.34	15,000
4	5.09	4,990		June 1		N	8.76	16,600		June 24	
6	5.09	4,990	11	5.97	7,120	6	8.83	16,900	N	7.95	13,500
12	5.00	4,810	9	6.13	7,560	12	8.95	17,400	12	7.89	13,300
	May 24		12	6.13	7,560		June 13			June 25	
7	4.93	4,670		June 2		9	9.11	18,100	12	7.81	12,300
1	4.95	4,710	6	6.23	7,840	10	9.27	18,600		June 26	
4	4.99	4,790	N	6.28	7,980	N	9.17	18,300	12	7.34	11,500
6	4.99	4,790	12	6.29	8,010	6	9.19	18,400		June 27	
10	4.95	4,710		June 3		12	9.27	18,800	5	7.23	11,000
12	4.98	4,770	6	6.49	8,610		June 14		N	7.07	10,400
	May 25		3	6.85	9,720	N	9.55	20,000	12	6.91	9,910
5p	5.12	5,050	4	6.99	10,200	1	9.71	20,700		June 28	
12	5.13	5,070	5	6.91	9,910	3	9.65	20,400	6	6.76	9,460
	May 26		12	7.07	10,400	12	9.77	21,000	N	6.70	9,270
2	5.16	5,140		June 4			June 15		12	6.64	9,090
6	5.35	5,550	6	7.40	11,500	11	9.86	21,400		June 29	
2	5.41	5,680	N	7.62	12,300	N	9.92	21,600	N	6.59	8,970
8	5.26	5,350	6	7.84	13,100	2	9.87	21,400	12	6.54	8,820
12	5.23	5,290	12	7.97	13,600	6	9.88	21,500		June 30	
	May 27			June 5		12	9.95	21,800	6	6.47	8,640
6	5.21	5,240	N	8.26	14,700		June 16		N	6.44	8,550
11	5.37	5,590	6	8.38	15,100	4	10.00	22,000	4	6.49	8,700
			12	8.49	15,600	N	10.00	22,000	12	6.47	8,640

Prickly Pear Creek near Clancy, Mont.

Location.--Lat 46°31', long 111°57', in SW¼ sec. 23, T. 9 N., R. 3 W., on right bank 100 ft upstream from bridge on U. S. 91, 2½ miles downstream from Lump Gulch Creek, 4 miles north of Clancy, and 7½ miles southeast of Helena.
Drainage area.--188 sq mi (determined by Corps of Engineers).
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-29, July 8-31.
Maxima.--May-July 1953: Discharge, 476 cfs 12-4 a.m. June 4 (gage height, 4.98 ft). 1908-9, 1910-16, 1921-33, 1945 to April 1953: Discharge, 586 cfs June 5, 1948 (gage height, 6.35 ft).
Remarks.--Diversions for irrigation of about 700 acres above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	52	165	112	11	53	263	62	21	60	175	38
2	48	255	104	12	49	286	58	22	54	162	38
3	43	438	98	13	46	303	53	23	52	155	38
4	43	434	92	14	46	281	50	24	86	148	37
5	50	355	87	15	44	254	50	25	110	138	38
6	63	303	84	16	40	236	48	26	102	129	39
7	79	290	79	17	43	238	44	27	118	122	38
8	79	296	76	18	50	228	41	28	128	117	36
9	67	262	76	19	58	210	41	29	139	115	34
10	56	256	68	20	65	196	40	30	161	115	33
								31	161	-	32
Monthly mean discharge, in cubic feet per second									72.4	231	56.9
Runoff, in acre-feet									4,450	13,740	3,500
Runoff, in inches									0.44	1.37	0.35

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 22			May 30		7p	3.90	285		June 14	
12	1.81	52	6	2.81	153	12	3.91	286	4	4.00	300
	May 23		N	2.95	168		June 7		8	3.99	298
N	1.81	52	6	2.97	171	6	3.94	291	8	3.71	258
12	1.80	51	12	2.91	164	N	3.92	288	12	3.71	258
	May 24			May 31		3	3.87	281		June 15	
6	1.84	53	6	2.93	166	12	4.05	308	4	3.76	265
N	2.20	83	N	2.89	162		June 8		9	3.76	265
6	2.53	115	6	2.83	155	8	4.06	310	8	3.56	240
12	2.70	132	12	2.87	160	8	3.86	279	12	3.54	238
	May 25			June 1		12	3.83	275		June 16	
6	2.54	116	6	2.96	170		June 9		4	3.57	241
N	2.43	105	N	2.94	167	5	3.83	275	10	3.57	241
6	2.39	101	6	2.88	161	9	3.82	274	9	3.44	226
12	2.39	101	12	2.94	167	6	3.62	247	12	3.51	234
	May 26			June 2		12	3.62	247		June 17	
6	2.40	103	9	3.18	195		June 10		6	3.59	244
N	2.38	101	N	3.49	232	6	3.73	261	11	3.59	244
6	2.36	99	8	4.34	355	N	3.72	260	9	3.46	228
12	2.46	109	12	4.56	393	8	3.64	250	12	3.49	232
	May 27			June 3		12	3.71	258		June 18	
6	2.56	121	3	4.75	430		June 11		4	3.54	238
N	2.57	122	7	4.86	452	4	3.79	270	9	3.54	238
6	2.51	116	9	4.87	454	8	3.80	271	8	3.35	215
12	2.56	121	5	4.69	418	N	3.77	267	12	3.34	214
	May 28		12	4.98	476	6	3.64	250		June 19	
6	2.66	133		June 4		8	3.66	252	6	3.37	217
N	2.64	131	4	4.98	476	12	3.78	268	N	3.33	213
6	2.58	125	8a	4.89	458		June 12		6	3.26	204
12	2.56	123	9p	4.51	384	2	3.88	282	12	3.22	199
	May 29		12	4.54	389	7	4.00	300		June 20	
6	2.63	132		June 5		7	3.83	275	N	3.23	201
10	2.66	136	4a	4.51	384	12	3.94	291	12	3.09	184
11	2.87	159	7p	4.19	330		June 13				
2	2.78	149	12	4.14	322	5	4.09	314			
6	2.71	141		June 6		11	4.09	314			
12	2.71	141	6a	4.12	319	9	3.91	286			
						12	3.93	290			

Tenmile Creek near Rimini, Mont.

Location.--Lat 46°32', long 112°15', in NE¼ sec. 20, T. 9 N., R. 5 W., on left bank at Moose Creek ranger station, 500 ft upstream from Mosse Creek and 3 miles north of Ramini.
Drainage area.--34 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-10, May 18 to July 31.
Maxima.--May-July 1953: Discharge, 469 cfs 10 p.m. June 2 (gage height, 3.49 ft); gage height, 3.56 ft, 8 p.m. June 3.
1915 to April 1953: Discharge, 948 cfs May 15, 1917 (gage height, 4.87 ft, site and datum then in use).
Remarks.--Flow regulated by Chessman Reservoir on tributary above station (capacity, 1,750 acre-ft). Small diversion above station for water supply of Helena.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	37	234	28	11	44	266	5.4	21	59	87	2.3
2	33	329	26	12	42	297	4.4	22	53	79	2.3
3	33	422	23	13	39	295	4.4	23	50	73	2.5
4	34	395	24	14	33	255	4.4	24	65	67	2.4
5	35	342	24	15	33	230	4.6	25	62	60	2.6
6	56	293	18	16	38	186	3.8	26	75	55	2.3
7	73	284	13	17	48	169	3.8	27	96	62	1.9
8	68	275	12	18	58	145	3.6	28	100	44	1.7
9	66	251	9.9	19	70	117	3.4	29	128	38	2.0
10	56	249	6.4	20	70	104	2.8	30	242	36	2.6
								31	230	-	3.6
Monthly mean discharge, in cubic feet per second									68.6	191	8.10
Runoff, in acre-feet									4,220	11,380	498
Runoff, in inches									2.33	6.28	0.27

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 21		6	2.88	244		June 4		6	3.24	316
12	2.09	54	N	2.86	236	7	3.40	380	12	3.21	302
	May 22		5	2.92	260	11	3.40	380		June 12	
N	2.07	52	9	2.94	268	6	3.46	410	6	3.10	284
12	2.08	53	12	2.89	248	12	3.39	375	10	3.11	264
	May 23			May 31			June 5		N	3.11	264
4p	2.05	47	10	2.77	205	N	3.31	340	6	3.25	325
7	2.08	52	1	2.77	205	6	3.28	325	12	3.27	335
12	2.08	52	3	2.80	216	12	3.25	312		June 13	
	May 24		6	2.91	256		June 6		6	3.20	302
5	2.09	53	9	2.91	256	N	3.17	276	N	3.12	268
9	2.22	73	12	2.88	244	8	3.23	302	3	3.14	276
N	2.21	72		June 1		12	3.20	289	6	3.21	307
1	2.22	73	10	2.77	205		June 7		12	3.16	284
12	2.17	62	N	2.77	205	9	3.12	256		June 14	
	May 25		2	2.80	216	11	3.13	260	N	3.06	244
7	2.15	58	5	2.92	260	1	3.22	298	2	3.05	240
1	2.16	59	7	2.95	272	4	3.24	307	6	3.07	248
5	2.21	66	12	2.89	248	10	3.20	289	8	3.08	252
12	2.22	68		June 2		12	3.21	294	12	3.06	244
	May 26		3	2.84	230		June 8			June 15	
10	2.20	64	7	2.84	230	6	3.18	284	7	3.00	226
N	2.19	62	11	3.00	284	N	3.13	264	11	2.96	212
2	2.21	65	1	3.06	320	2	3.12	260	N	3.07	252
5	2.33	87	4	3.24	410	8	3.16	276	6	3.02	233
8	2.37	97	5	3.24	410	12	3.13	264	12	2.95	208
12	2.38	99	7	3.28	430		June 9			June 16	
	May 27		8	3.33	458	2p	3.04	230	N	2.85	174
10	2.33	85	9	3.27	425	9	3.15	272	4	2.86	178
11	2.32	83	10	3.49	469	12	3.14	268	10	2.89	188
8	2.45	111	12	3.45	447		June 10		12	2.88	185
12	2.41	101		June 3		6	3.07	244		June 17	
	May 28		6	3.41	4-5	N	3.04	233	8	2.83	171
10	2.38	94	10	3.38	385	3	3.05	236	9	2.80	161
2	2.38	94	N	3.41	395	6	3.11	260	2	2.79	158
8	2.45	109	4	3.49	425	8	3.12	264	5	2.82	168
12	2.47	114	6	3.53	447	12	3.10	256	7	2.83	171
	May 29		8	3.56	464		June 11		12	2.82	168
5p	2.50	122	10	3.54	452	6	3.06	240		June 18	
8	2.59	149	12	3.50	430	N	3.04	233	8	2.77	152
12	2.68	178				2	3.08	248	9	2.75	145
	May 30					5	3.22	307	4	2.71	133
4	2.85	233							8	2.72	136
									12	2.70	131

Tenmile Creek near Helena, Mont.

Location.--Lat 46°36', long 112°05', in SE¼ sec. 22, T. 10 N., R. 4 W., on right bank opposite Broadwater Hotel, 1½ miles west of Helena and 2½ miles upstream from Sevenmile Creek.
Drainage area.--103 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-9, May 16 to July 12.
Maxima.--May-July 1953: Discharge, 774 cfs 11:30 p.m. June 3 (gage height, 3.91 ft). 1908 to April 1953: Discharge, 865 cfs May 28, 1917, June 11, 1927; gage height, 6.58 ft June 11, 1927, datum then in use.
Remarks.--Diversions for irrigation of about 1,200 acres above station and for water supply for city of Helena.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	34	311	44	11	39	318	8.3	21	58	121	4.2
2	28	422	39	12	34	330	7.4	22	52	100	3.6
3	26	611	34	13	28	326	7.4	23	48	87	3.8
4	28	642	31	14	28	298	8.3	24	118	79	3.6
5	32	500	32	15	22	274	7.8	25	112	74	3.8
6	51	416	28	16	27	234	7.4	26	116	64	4.2
7	72	396	22	17	37	214	7.0	27	148	58	4.0
8	72	375	19	18	49	186	6.6	28	151	59	3.0
9	58	338	20	19	68	158	6.6	29	188	58	2.9
10	46	326	14	20	72	138	6.2	30	310	49	2.1
								31	305	-	2.0
Monthly mean discharge, in cubic feet per second									79.3	252	12.7
Runoff, in acre-feet									4,870	15,000	780
Runoff, in inches									0.89	2.73	0.14

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 22			May 27			June 1		8	3.61	614
12	2.12	49	3	2.58	161	N	2.89	298	12	3.54	576
	May 23		2	2.50	135	3	2.87	290		June 5	
N	2.11	48	5	2.49	132	9	2.99	339	N	3.38	495
8	2.09	45	12	2.59	165	12	2.99	339	12	3.26	435
12	2.13	51		May 28			June 2			June 6	
	May 24		N	2.54	144	6	2.94	334	N	3.20	411
3	2.16	56	6	2.54	144	10	2.94	334	12	3.19	406
8	2.19	61	12	2.59	161	N	3.01	366		June 7	
10	2.29	81		May 29		6	3.34	525	N	3.12	375
11	2.39	104	6	2.64	178	12	3.50	608	2	3.14	384
N	2.65	186	6	2.65	182		June 3		4	3.20	411
4	2.66	189	9	2.75	218	3	3.54	570	8	3.20	411
8	2.53	144	12	2.89	274	9	3.46	530	12	3.17	398
12	2.54	148		May 30		N	3.50	550		June 8	
	May 25		6	3.01	322	6	3.69	652	N	3.12	375
7	2.41	110	N	2.98	310	10	3.89	762	3	3.09	362
N	2.38	102	12	3.00	318	11:30	3.91	774	12	3.09	362
4	2.37	100		May 31		12	3.90	768		June 9	
12	2.42	112	N	2.92	298		June 4		6	3.04	339
	May 26		5	2.90	290	6	3.71	669	N	3.02	330
N	2.40	107	9	2.96	314	N	3.61	614	6	3.02	330
4	2.40	107	12	2.96	314	6	3.59	603	12	3.06	348
12	2.56	155									

Missouri River below Holter Dam, near Wolf Creek, Mont.

Location.--Lat 46°59'40", long 112°00'50", in S½ sec. 5, T. 14 N., R. 3 W., on left bank a quarter of a mile downstream from Holter Dam and 3 miles southeast of Wolf Creek.
Drainage area.--16,900 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements.
Maxima.--May-July 1953: Discharge, 13,500 cfs 10:30 a.m. June 19 (gage height, 6.10 ft). 1945 to April 1953: Discharge, 34,800 cfs June 8, 1948 (gage height, 11.70 ft).
Remarks.--Diversions for irrigation of about 574,000 acres above station. Flow regulated by four reservoirs (see p. 140).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,990	4,210	8,890	11	3,340	8,780	3,440	21	3,030	3,860	4,120
2	3,250	4,320	8,040	12	3,270	8,740	3,440	22	1,910	5,600	3,390
3	3,300	4,410	8,000	13	3,300	8,170	3,390	23	2,960	8,700	3,380
4	3,280	4,980	8,440	14	2,850	7,480	4,360	24	2,980	9,200	2,460
5	3,240	4,540	7,860	15	1,960	8,180	4,900	25	2,920	8,140	3,200
6	3,260	2,990	6,330	16	3,080	9,420	3,320	26	2,960	7,150	3,110
7	3,290	2,530	4,330	17	2,940	8,980	2,500	27	2,990	7,360	3,170
8	2,340	4,260	3,760	18	2,980	9,730	3,480	28	3,010	7,700	3,080
9	3,210	5,540	3,800	19	3,030	10,800	3,410	29	3,020	8,980	3,160
10	3,260	7,630	1,910	20	3,030	10,700	3,500	30	3,560	8,230	3,010
								31	3,450	-	2,300
Monthly mean discharge, in cubic feet per second									2,999	7,044	4,241
Runoff, in acre-feet									184,400	419,100	260,800
Runoff, in inches									0.20	0.47	0.29

Dearborn River near Clemons, Mont.

Location.--Lat 47°17'30", long 112°27'00", in SE¼SE¼ sec.23, T. 18 N., R. 7 W., on right bank 300 ft upstream from highway bridge, half a mile southeast of former post office of Clemons, 2 miles downstream from Falls Creek, and 14 miles south of Augusta.
Drainage area.--122 sq mi.
Gage-height record.--Water-stage recorder graph except period of no gage-height record, June 21-28.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Discharge for period of no gage-height record estimated on basis of records of station near Craig. Shifting-control method used May 1-6, May 11-28.
Maxima.--May-July 1953: Discharge, 3,200 cfs 4:00 p.m. June 4 (gage height, 6.20 ft). 1921-23, 1929-32, 1934 to April 1953: Discharge, 2,970 cfs (revised) June 4, 1948 (gage height, 5.97 ft.)
Remarks.--Diversions for irrigation of about 9,300 acres of which 9,000 acres lies below station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	344	1,600	555	11	416	1,200	357	21	470	690	188
2	302	2,260	530	12	368	1,500	341	22	428	650	170
3	282	2,630	505	13	340	1,590	325	23	403	650	152
4	292	3,040	495	14	324	1,340	313	24	450	630	150
5	356	2,580	465	15	302	1,080	297	25	569	580	150
6	495	1,850	442	16	296	974	268	26	592	540	150
7	632	1,560	414	17	336	968	240	27	671	520	148
8	620	1,380	401	18	376	976	218	28	776	520	139
9	530	1,190	392	19	475	855	206	29	943	560	117
10	455	1,070	378	20	525	756	200	30	1,490	560	101
								31	1,520	-	84
Monthly mean discharge, in cubic feet per second									528	1,210	287
Runoff, in acre-feet									32,490	72,000	17,630
Runoff, in inches									4.99	11.06	2.71

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 22		10	4.46	1,460		June 5			June 12	
12	2.88	416	3	4.46	1,460	3	5.86	2,860	2	4.40	1,520
	May 23		7	4.55	1,550	7	5.78	2,780	11	4.32	1,450
5p	2.83	396	9	4.64	1,640	N	5.56	2,560	2	4.31	1,440
12	2.83	396	12	4.64	1,640	6	5.45	2,460	7	4.39	1,510
	May 24			May 31		9	5.17	2,210	12	4.55	1,660
6	2.83	392	2	4.64	1,640	12	5.05	2,100		June 13	
8	2.85	400	1	4.41	1,420		June 6		1	4.57	1,670
N	3.02	475	5	4.41	1,420	6	4.86	1,930	4	4.57	1,670
5	3.01	470	12	4.66	1,660	2	4.68	1,770	11	4.48	1,590
8	3.09	510		June 1		3	4.72	1,810	3	4.38	1,500
12	3.10	515	4	4.70	1,700	5	4.64	1,740	8	4.47	1,580
	May 25		6	4.60	1,600	9	4.63	1,730	12	4.45	1,560
6	3.14	530	7	4.67	1,670	12	4.60	1,700		June 14	
10	3.13	525	8	4.58	1,580		June 7		5p	4.06	1,210
6	3.34	638	5	4.48	1,480	3	4.57	1,670	10	4.08	1,230
10	3.32	626	7	4.62	1,620	N	4.40	1,520	12	4.06	1,210
12	3.29	608	12	4.68	1,680	12	4.37	1,490		June 15	
	May 26			June 2			June 8		8	3.94	1,110
5	3.25	580	4	4.77	1,770	9	4.28	1,410	N	3.86	1,050
4	3.25	580	6	4.72	1,720	8	4.15	1,300	5	3.83	1,020
8	3.31	614	9	4.79	1,790	9	4.18	1,320	12	3.84	1,030
12	3.33	626	11	5.00	2,000	12	4.14	1,290		June 16	
	May 27		2	5.68	2,680		June 9		5p	3.71	937
2	3.35	632	6	5.85	2,850	6	4.10	1,250	12	3.75	965
N	3.33	620	12	5.74	2,740	5	3.98	1,140		June 17	
9	3.58	770		June 3		12	3.95	1,120	4p	3.70	930
12	3.59	777	10	5.52	2,520		June 10		8	3.82	1,020
	May 28		3	5.52	2,520	7	3.90	1,080	12	3.87	1,060
6	3.60	777	7	5.65	2,650	3	3.83	1,020		June 18	
N	3.59	770	11	5.87	2,870	4	3.83	1,020	4	3.86	1,050
12	3.61	784	12	5.87	2,870	12	3.95	1,120	2	3.70	930
	May 29			June 4			June 11		12	3.70	930
3	3.61	777	1	5.87	2,870	3	3.98	1,140		June 19	
8	3.71	847	2	5.80	2,800	8	3.99	1,150	N	3.58	847
2	3.78	896	3	5.87	2,870	N	3.95	1,120	12	3.50	795
5	3.90	980	4	5.98	2,980	4	3.97	1,140		June 20	
12	4.34	1,360	6	6.04	3,040	6	4.07	1,220	6a	3.45	762
	May 30		N	6.05	3,050	8	4.22	1,360	12	3.41	736
6	4.47	1,470	4	6.20	3,200	12	4.38	1,500			
9	4.43	1,440	10	6.05	3,050						
			12	5.97	2,970						

Dearborn River near Craig, Mont.

Location.--Lat 47°12', long 112°05', in SE¼ sec. 27, T. 17 N., R. 4 W., on right bank just upstream from bridge on State Route 33, 5 miles downstream from South Fork, 10 miles northwest of Craig, and 12 miles upstream from mouth.
Drainage area.--310 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-20.
Maxima.--May-July 1953: Discharge, 7,960 cfs 1 a.m. June 4 (gage height, 9.58 ft).
1945-April 1953: Discharge, 4,400 cfs June 5, 1948 (gage height, 7.89 ft); gage height, 7.97 ft March 15, 1947 (backwater from ice).
Remarks.--Diversions for irrigation of about 9,000 acres, of which 6,600 acres lies below station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	647	2,950	743	11	640	1,860	430	21	689	993	236
2	563	3,860	704	12	556	2,100	410	22	612	909	226
3	500	5,100	665	13	494	2,190	385	23	570	916	204
4	470	6,580	646	14	464	1,980	362	24	812	895	194
5	528	4,940	613	15	440	1,680	344	25	3,030	802	198
6	689	3,590	576	16	422	1,500	326	26	1,900	750	190
7	894	2,920	540	17	458	1,390	294	27	1,800	704	184
8	942	2,490	492	18	500	1,410	274	28	2,060	685	174
9	846	2,140	480	19	619	1,290	258	29	2,170	730	159
10	710	1,900	458	20	734	1,130	246	30	3,180	736	147
								31	3,140	-	128
Monthly mean discharge, in cubic feet per second									1,035	2,037	364
Runoff, in acre-feet									63,630	121,200	22,390
Runoff, in inches									3.85	7.33	1.35

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 23			May 30		5	8.40	5,490	12	5.76	1,880
12	4.78	556	2	7.02	3,000	6	8.55	5,790	6	5.70	1,820
	May 24		6	7.07	3,080	7	8.78	6,260	8	5.70	1,820
8	4.78	556	11	7.23	3,340	9	8.90	6,510	12	5.83	1,950
N	4.85	605	N	7.21	3,310	12	9.45	7,670		June 12	
2	4.97	689	1	7.24	3,350		June 4		4	5.98	2,100
6	5.32	970	9	7.11	3,150	1	9.58	7,960	6	6.01	2,130
9	5.85	1,300	10	7.17	3,240	4	9.10	7,000	10	6.02	2,140
11	6.00	1,670	12	7.16	3,230	6	8.95	6,710	7	5.95	2,070
12	6.08	1,770		May 31		9	8.88	6,580	9	5.96	2,080
	May 25		3	7.18	3,260	10	8.77	6,390	12	6.03	2,150
4	6.55	2,340	4	7.13	3,180	N	8.78	6,400		June 13	
6	7.00	2,970	5	7.20	3,290	3	8.68	6,220	4	6.12	2,240
7	7.14	3,190	10	7.15	3,210	12	8.65	6,170	7	6.14	2,270
9	7.19	3,270	1	7.10	3,130		June 5		2	6.08	2,200
10	7.24	3,350	2	7.11	3,150	7	8.08	5,140	8	5.97	2,090
N	7.49	3,770	6	7.01	2,990	N	7.94	4,900	12	6.00	2,120
1	7.55	3,880	7	7.05	3,050	2	7.79	4,660		June 14	
2	7.53	3,840	9	6.99	2,960	6	7.65	4,440	3	6.03	2,150
3	7.38	3,580	12	6.98	2,940	12	7.54	4,260	9	5.94	2,060
6	7.16	3,230		June 1			June 6		9	5.67	1,790
7	7.18	3,260	4	7.03	3,020	6	7.29	3,860	12	5.66	1,780
12	6.65	2,480	10	7.03	3,020	4	6.95	3,330		June 15	
	May 26		1	6.93	2,870	12	6.80	3,120	4	5.66	1,780
2	6.47	2,230	4	6.89	2,820		June 7		9	5.60	1,730
6	6.30	2,030	6	6.97	2,930	3	6.75	3,050	7	5.44	1,590
N	6.13	1,830	8	6.92	2,860	6	6.74	3,040	12	5.42	1,570
6	6.02	1,690	9	6.99	2,960	10	6.65	2,910		June 16	
12	6.05	1,730	12	6.98	2,940	N	6.65	2,910	6a	5.40	1,550
	May 27			June 2		5	6.60	2,840	12	5.22	1,400
2	6.09	1,780	2	7.00	2,970	6	6.63	2,880		June 17	
8	6.10	1,790	6	7.00	2,970	12	6.52	2,730	8	5.26	1,430
2	6.08	1,770	8	7.06	3,070		June 8		8	5.16	1,350
5	6.08	1,770	10	7.25	3,370	N	6.33	2,500	12	5.20	1,380
12	6.25	1,970	N	7.42	3,650	10	6.15	2,280		June 18	
	May 28		3	7.95	4,600	12	6.10	2,220	4a	5.31	1,470
5	6.36	2,100	4	8.03	4,750		June 9		8a	5.32	1,480
7	6.37	2,100	7	8.16	5,010	2	6.13	2,260	10p	5.14	1,330
4	6.33	2,070	11	7.90	4,510	7	6.10	2,220	12	5.14	1,330
12	6.27	1,990	12	7.97	4,640	7	5.91	2,030		June 19	
	May 29			June 3		12	5.88	2,000	6	5.15	1,340
5	6.25	1,970	2	7.91	4,530		June 10		N	5.11	1,310
6	6.27	1,990	3	7.93	4,560	6a	5.84	1,960	12	4.98	1,200
2	6.34	2,080	7	7.76	4,260	8p	5.69	1,810		June 20	
5	6.42	2,170	N	7.85	4,420	12	5.69	1,810	N	4.90	1,140
12	6.90	2,830	2	7.90	4,510		June 11		12	4.76	1,040
			3	8.00	4,690	6	5.76	1,880			

Missouri River at Cascade, Mont.

Location.--Lat 47°16'10", long 111°41'45", in NW¼SE¼ sec. 35, T. 18 N., R. 1 W., on downstream side of highway bridge at Cascade, 26 miles upstream from mouth of Smith River. Datum of gage is 3,273.36 ft above mean sea level.
Drainage area.--18,046 sq mi (determined by Corps of Engineers).
Stage record.--Wire-weight gage read at 8 a.m.
Maxima.--May-July 1953: Elevation observed 3,350.50 ft 8 a.m. June 4.
1902-1915: Discharge observed, 49,300 cfs, June 5, 1908 (elevation 3,353.15 ft).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	-----	44.69		11	42.16	44.73		21	42.11	-----	
2	41.61	44.05		12	42.13	44.66		22	42.08	41.67	
3	-----	45.95		13	42.03	44.61		23	-----	-----	
4	41.93	50.50		14	42.26	-----		24	-----	44.06	
5	42.13	48.06		15	42.03	44.05		25	43.83	44.26	
6	42.16	45.66		16	-----	44.36		26	43.83	43.72	
7	42.41	-----		17	-----	44.29		27	43.53	43.86	
8	42.41	44.28		18	42.13	44.29		28	43.58	-----	
9	-----	44.18		19	42.23	44.67		29	43.35	44.02	
10	-----	44.43		20	42.66	44.85		30	45.06	-----	
								31	-	-	
Monthly mean discharge, in cubic feet per second											
Runoff, in acre-feet											
Runoff, in inches											

Newland Creek near White Sulphur Springs, Mont.

Location.--Lat 46°44', long 110°50', near line between secs. 9 and 10, T. 11 N., R. 7 E., on left bank 13 miles north of White Sulphur Springs, and 15 miles upstream from mouth.
Drainage area.--7.74 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 40 cfs and extended to peak stage. Shifting-control method used May 1-20.
Maxima.--May-July 1953: Discharge, 56 cfs 7 to 8 p.m. June 4 (gage height, 3.50 ft).
1945 to April 1953: Discharge, 29 cfs May 8, 1948 (gage height, 2.64 ft).
Remarks.--Small diversions for irrigation of hay meadows above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2.1	41	7.1	11	1.8	26	5.5	21	5.1	13	5.1
2	2.1	36	6.7	12	3.0	23	5.3	22	6.3	11	4.9
3	2.1	43	6.5	13	2.8	21	5.3	23	6.9	10	4.8
4	2.2	52	6.1	14	3.0	19	5.3	24	8.1	10	4.8
5	2.5	49	6.1	15	3.1	17	5.1	25	8.6	9.5	4.6
6	2.7	43	5.9	16	3.4	16	5.3	26	9.9	8.6	4.4
7	2.8	39	5.7	17	3.7	15	5.3	27	11	8.4	4.4
8	2.8	36	5.7	18	3.5	14	5.1	28	12	8.1	4.4
9	2.8	32	5.3	19	4.4	14	4.9	29	15	7.8	4.0
10	3.0	29	5.5	20	5.1	14	5.1	30	25	7.3	3.9
								31	37	-	3.9
Monthly mean discharge, in cubic feet per second									6.57	22.4	5.23
Runoff, in acre-feet									404	1,330	321
Runoff, in inches									0.98	3.23	0.78

Newland Creek near White Sulphur Springs, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
		May 25			June 3			June 8			June 16
12	2.48	9.5	4	3.26	42	1	3.31	45	1p	2.69	16
		May 26	7	3.20	39	3	3.21	40	12	2.67	15
N	2.48	9.5	N	3.23	40	6	3.16	37			June 17
12	2.53	11	3	3.25	42	2	3.11	34	2	2.70	16
		May 27	7	3.38	49	12	3.09	34	6	2.70	16
11a	2.54	11	9	3.41	51			June 9	11	2.68	15
12	2.54	11	12	3.36	48	N	3.08	33	8	2.64	14
		May 28			June 4	7	3.04	31	12	2.64	14
N	2.56	12	3	3.36	48	12	3.03	30			June 18
12	2.56	12	9	3.41	51			June 10	1p	2.64	14
		May 29	2	3.43	52	N	3.00	29	5	2.62	14
5	2.57	12	5	3.49	55	7	2.97	28	12	2.62	14
8	2.65	14	6	3.48	55	12	2.96	27			June 19
N	2.70	16	7	3.50	56			June 11	3p	2.62	14
5	2.71	16	8	3.50	56	N	2.94	26	6	2.61	13
9	2.78	19	9	3.48	55	6	2.89	24	9	2.66	15
12	2.75	18	12	3.44	52	12	2.89	24	12	2.66	15
		May 30			June 5			June 12			June 20
9	2.85	22	7	3.40	50	N	2.87	23	8	2.66	15
N	2.88	23	8	3.42	51	4	2.85	22	5	2.60	13
5	3.03	30	N	3.40	50	12	2.85	22	10	2.59	13
12	3.08	33	12	3.33	46			June 13	12	2.59	13
		May 31			June 6	11	2.83	21			June 21
N	3.15	36	6p	3.23	40	5	2.79	20	11	2.59	13
5	3.22	40	8	3.27	42	12	2.79	20	7	2.56	12
12	3.25	42	9	3.26	42			June 14	12	2.56	12
		June 1	10	3.28	43	11	2.79	20			June 22
N	3.25	42	12	3.25	42	6	2.74	18	11	2.55	12
7	3.20	39			June 7	12	2.74	18	7	2.51	10
12	3.19	38	5	3.20	39			June 15	12	2.51	10
		June 2	1	3.16	37	11	2.74	18			
2p	3.12	35	8	3.19	38	8	2.70	16			
7	3.12	35	8	3.17	38	12	2.70	16			
12	3.21	40	10	3.29	44						
			12	3.27	42						

Newland Creek near dam site, near White Sulphur Springs, Mont.

Location.--Lat 46°38', long 110°57', in NW¼ sec. 14, T. 10 N., R. 6 E., on right bank 50 ft upstream from farm bridge, 4 miles downstream from U. S. 89, and 6 miles north of White Sulphur Springs.

Drainage area.--43.2 sq mi.

Gage-height record.--Wire-weight gage read once daily. Gage heights computed from graph based on gage readings May 29 to June 10.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 140 cfs and extended to peak stage. Shifting-control method used July 15-31.

Maxima.--May-July 1953: Discharge 227 cfs 8 a.m. June 5 (gage height, 3.83 ft).
1950 to April 1953: Discharge observed, 53 cfs May 14, 15 1951 (gage height, 1.28 ft, site and datum then in use).

Remarks.--Diversions for irrigation of about 200 acres above station. Flow may be supplemented by diversion from Sheep Creek, in sec. 26, T. 12 N., R. 7 E., which enters 8 miles upstream.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	12	139	27	11	12	105	17	21	12	44	18
2	12	124	26	12	12	98	16	22	14	41	18
3	12	165	25	13	12	75	15	23	18	38	17
4	12	208	24	14	13	64	15	24	23	36	16
5	10	210	22	15	13	67	16	25	23	37	17
6	9.8	182	21	16	11	61	17	26	24	34	16
7	9.3	187	21	17	11	59	17	27	23	32	16
8	9.3	159	20	18	11	53	17	28	25	31	16
9	9.3	129	19	19	11	46	17	29	39	32	16
10	9.3	113	21	20	12	51	18	30	69	28	15
								31	120	-	15
Monthly mean discharge, in cubic feet per second									19.8	88.6	18.4
Runoff, in acre-feet									1,220	5,270	1,130
Runoff, in inches									0.53	2.29	0.49

Newland Creek near dam site, near White Sulphur Springs, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 28			June 1			June 4			June 7	
12p	1.20	30	6	2.88	140	6	3.70	214	6a	3.54	200
	May 29		N	2.89	141	N	3.63	208	10	3.54	200
10a	1.58	38	6	2.85	138	6	3.80	205	6	3.24	173
6	1.50	43	12	2.80	133	12	3.62	207	12	3.11	161
12	1.63	50		June 2			June 5			June 8	
	May 30		6	2.75	128	6	3.72	216	10	3.22	171
6	1.78	58	N	2.70	124	8	3.83	227	6	3.00	151
10	1.88	64	6	2.65	120	10	3.82	226	12	2.88	140
6	2.13	80	12	2.54	111	N	3.79	223		June 9	
12	2.30	92		June 3		4	3.60	205	8	2.80	133
	May 31		2	2.52	110	8	3.50	196	4	2.70	124
6	2.50	108	6	2.76	129	12	3.46	192	12	2.64	119
N	2.67	122	N	3.31	179		June 6			June 10	
6	2.82	135	6	3.50	196	6	3.42	189	8	2.58	114
12	2.86	138	12	3.62	207	N	3.45	192	4	2.55	112
						6	3.46	192	12	2.50	108
						12	3.50	196			

Sheep Creek near White Sulphur Springs, Mont.

Location.--Lat 46°46', long 110°48', in SW¼SE¼ sec. 26, T. 12 N., R. 7 E., on right bank 7 miles upstream from Moose Creek and 16 miles north of White Sulphur Springs.
Drainage area.--35.5 sq mi.
Gage-height record.--Wire-weight gage read once daily except May 13, 14 17, 20, June 6, 8-12, 14, 16, 17, 19-21, 24, 25.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1 to July 31.
Maxima.--May-July 1953: Discharge observed, 420 cfs 8 p.m. June 3, 6 p.m. June 4 (gage height, 5.58 ft).
1941 to April 1953: Discharge observed, 356 cfs May 26, 1942 (gage height approximately 5.1 ft, present datum).
Remarks.--Diversions for irrigation of about 200 acres above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	28	210	92	11	45	310	60	21	63	150	45
2	25	262	92	12	42	320	60	22	72	148	44
3	24	392	87	13	36	330	58	23	65	136	43
4	29	401	85	14	33	300	56	24	84	120	42
5	49	371	79	15	32	276	54	25	77	110	40
6	54	360	74	16	40	250	53	26	76	104	40
7	74	339	70	17	42	220	51	27	97	104	40
8	56	330	68	18	45	184	51	28	111	97	38
9	52	320	62	19	49	170	49	29	162	91	37
10	49	310	66	20	55	160	47	30	224	91	36
								31	216	-	36
Monthly mean discharge, in cubic feet per second									67.9	232	56.6
Runoff, in acre-feet									4,180	13,820	3,480
Runoff, in inches									2.21	7.30	1.84

Smith River near Eden, Mont.

Location.--Lat 47°12', long 112°23', in SW¼SW¼ sec. 29, T. 17 N., R. 3 E., on left bank a quarter of a mile upstream from Mullens Creek, 2 miles upstream from Hound Creek, and 7 miles southwest of Eden.
Drainage area.--1,601 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 3,800 cfs and extended on basis of slope-area determination of peak flow.
Maxima.--May-July 1953: Discharge, 12,300 cfs 11:30 p.m. June 3 and 1 a.m. June 4; gage height, 10.46 ft 1 a.m. June 4.
1951 to April 1953: Discharge, 1,980 cfs May 5, 1952 (gage height, 3.94 ft), gage height, 4.35 ft Nov. 26, 1952 (backwater from ice).
Remarks.--Diversions for irrigation of about 24,500 acres above station. Flow affected by storage in Smith River Reservoir (usable contents, 10,700 acre-ft).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	317	3,070	962	11	393	3,040	525	21	827	2,090	350
2	289	3,070	914	12	354	3,330	496	22	804	1,820	342
3	258	7,430	855	13	313	3,340	473	23	820	1,630	330
4	233	10,500	777	14	305	3,180	450	24	801	1,490	318
5	218	7,160	725	15	313	2,930	442	25	1,080	1,370	306
6	229	5,390	689	16	321	2,680	432	26	1,160	1,270	302
7	297	4,300	635	17	329	2,540	424	27	1,370	1,170	302
8	393	3,850	600	18	367	2,480	398	28	1,510	1,090	283
9	411	3,480	588	19	420	2,330	378	29	1,640	1,100	279
10	371	3,160	550	20	617	2,270	362	30	3,710	1,020	268
								31	3,720	-	265
Monthly mean discharge, in cubic feet per second									780	3,119	485
Runoff, in acre-feet									47,980	185,600	29,790
Runoff, in inches									0.56	2.17	0.35

Smith River near Eden, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time,

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 19		8	3.54	1,520	1	7.66	7,120	12	5.13	3,260
12	2.04	478	12	3.51	1,490	3	8.26	8,170		June 10	
	May 20			May 29		4	8.96	9,460	2	5.11	3,230
7	2.14	529	5	3.50	1,480	7	9.56	10,600	7	5.11	3,230
N	2.30	614	N	3.54	1,520	9	10.16	11,700	9	5.10	3,220
6	2.46	706	3	3.61	1,580	10	10.35	12,100	7	4.98	3,080
12	2.58	782	8	3.88	1,830	11	10.35	12,100	12	4.94	3,030
	May 21		12	4.30	2,250	11:30	10.44	12,300		June 11	
2	2.62	808		May 30		12	10.20	11,800	2p	4.94	3,030
10a	2.68	847	1	4.62	2,590		June 4		11	4.97	3,060
12	2.63	815	3	4.83	2,820	1	10.46	12,300	12	5.00	3,100
	May 22		8	5.56	3,790	2	10.40	12,200		June 12	
N	2.63	814	10	5.65	3,920	3	10.06	11,600	6	5.20	3,350
6	2.60	795	1	5.64	3,910	6	9.86	11,200	1	5.22	3,380
12	2.56	769	7	5.82	4,180	7	10.01	11,500	2	5.20	3,350
	May 23		12	5.82	4,180	8	9.78	11,000	12	5.23	3,390
3	2.57	776		May 31		9	9.81	11,100		June 13	
9	2.69	854	2	5.79	4,140	N	9.63	10,700	7a	5.22	3,380
N	2.71	867	4	5.80	4,150	3	9.31	10,100	12	5.14	3,270
12	2.58	782	N	5.54	3,760	6	9.10	9,730		June 14	
	May 24		7	5.24	3,340	7	8.84	9,240	7	5.14	3,270
6	2.54	756	12	5.10	3,160	12	8.36	8,350	6	4.99	3,090
3	2.59	788		June 1			June 5		12	4.94	3,030
6	2.63	815	3	5.08	3,130	2	8.26	8,170		June 15	
10	2.74	888	10	5.09	3,150	4	8.10	7,880	N	4.87	2,940
12	2.86	972	6	4.97	2,990	9a	7.79	7,340	12	4.75	2,800
	May 25		12	4.90	2,900	12	7.09	6,150		June 16	
5	3.01	1,080		June 2			June 6		12	4.54	2,560
7a	3.03	1,100	3	4.88	2,880	8a	6.74	5,580		June 17	
12	3.00	1,080	7	4.91	2,910	12	6.18	4,720	6	4.51	2,530
	May 26		11	4.92	2,930		June 7		6	4.54	2,560
2	3.01	1,080	2	5.01	3,040	3a	6.08	4,570	12	4.49	2,510
10	3.17	1,210	5	5.12	3,190	6p	5.76	4,100		June 18	
9	3.10	1,150	8	5.15	3,220	12	5.67	3,980	9a	4.49	2,510
12	3.12	1,170	9	5.21	3,300		June 8		12	4.40	2,410
	May 27		12	5.54	3,760	4p	5.54	3,800		June 19	
5	3.24	1,260		June 3		8	5.53	3,780	12	4.25	2,250
10	3.39	1,380	2	5.71	4,020	12	5.45	3,680		June 20	
2	3.45	1,440	3	5.72	4,030		June 9		N	4.30	2,300
12	3.47	1,450	7	6.36	4,990	N	5.31	3,490	5	4.29	2,290
	May 28		N	7.34	6,580	8	5.19	3,340	12	4.22	2,220
8	3.55	1,520									

Missouri River above Sun River at Great Falls, Mont.

Location.--Lat 47°29'30", long 111°18'20", near center of NW¼NE¼ sec. 14, T. 20 N., R. 3 E., on right bank 800 ft upstream from mouth of Sun River at city water-supply pumping plant.

Drainage area.--20,680 sq mi (determined by Corps of Engineers).

Stage record.--Float gage in forebay of pumping plant except temporary staff used June 4-6.

Maxima.--May-July 1953: Elevation 3,317.84 ft 8:30 to 10 a.m. June 5 (from floodmarks). 1930 to April 1953: Elevation 3,316.4 June 6 or 7, 1948, from floodmark to intake to water plant.

Remarks.--Records furnished by City of Great Falls.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	10.3	14.2	11.7	11	10.5	13.8	9.5	21	10.9	13.0	9.1
2	10.2	14.1	11.3	12	10.5	13.8	9.8	22	10.9	11.5	9.9
3	10.1	16.1	11.4	13	10.5	13.7	9.3	23	10.6	12.0	9.4
4	10.0	17.58	11.4	14	10.3	13.7	9.3	24	10.8	12.0	9.3
5	9.8	17.61	11.3	15	10.2	13.4	9.2	25	12.8	12.0	9.6
6	9.8	16.4	10.9	16	10.1	13.3	9.2	26	12.1	11.7	9.4
7	9.9	15.1	10.9	17	10.2	13.2	9.4	27	12.7	11.6	9.2
8	10.1	14.3	10.3	18	10.2	12.3	9.1	28	12.6	11.7	8.8
9	10.0	14.1	9.8	19	10.3	13.2	9.2	29	12.8	11.7	8.9
10	10.2	13.9	9.6	20	10.7	13.3	9.1	30	13.8	11.8	8.8
								31	14.2		8.8

North Fork of North Fork Sun River near Augusta, Mont.

Location.--Lat 47°38'30", long 112°51'40", in NW¼NW¼ sec. 26, T. 22 N., R. 10 W., on left bank 400 ft upstream from Medicine Creek, 1 mile upstream from confluence with South Fork of North Fork, and 25 miles northwest of Augusta.
Drainage area.--258 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 12 to July 22.
Maxima.--May-July 1953: Discharge, 3,990 cfs 10 p.m. June 3 (gage height, 6.44 ft).
1911-12, 1945 to April 1953: Discharge, 4,320 cfs June 3, 1948 (gage height, 7.03 ft).
Remarks.--No regulation or diversion above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	480	2,920	1,760	11	679	2,700	1,050	21	1,120	1,580	446
2	398	3,260	1,640	12	576	3,350	1,010	22	1,040	1,470	414
3	362	3,710	1,610	13	532	3,710	984	23	948	1,590	386
4	423	3,370	1,530	14	564	3,140	956	24	1,250	1,520	366
5	623	2,730	1,350	15	592	2,670	865	25	1,720	1,320	378
6	1,010	2,460	1,300	16	660	2,440	728	26	2,170	1,250	354
7	1,390	2,650	1,250	17	810	2,550	625	27	2,330	1,250	324
8	1,320	2,710	1,220	18	953	2,600	580	28	2,060	1,270	309
9	1,030	2,320	1,250	19	1,260	2,320	530	29	2,600	1,440	297
10	809	2,330	1,170	20	1,420	1,890	490	30	3,070	1,620	285
								31	2,700	-	273
Monthly mean discharge, in cubic feet per second									1,190	2,338	830
Runoff, in acre-feet									73,190	139,100	51,050
Runoff, in inches									5.32	10.11	3.71

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 3			May 9		6	2.98	640		May 23	
12	2.53	422	6	3.67	1,090	12	3.16	746	6	3.50	97[illegible]
	May 4		N	3.57	1,020		May 17		N	3.44	928
6	2.44	386	6	3.48	956	4	3.26	806	6	3.41	907
10	2.38	362	12	3.40	900	6	3.26	806	12	3.49	963
N	2.40	370		May 10		N	3.23	788		May 24	
1	2.43	382	6	3.32	844	4	3.22	782	6	3.57	1,020
4	2.45	390	N	3.29	824	6	3.25	800	N	3.81	1,200
6	2.57	438	6	3.17	752	12	3.46	942	3	3.99	1,340
10	2.83	565	12	3.14	734		May 18		6	4.09	1,430
12	2.85	575		May 11		2	3.48	956	11	4.36	1,670
	May 5		6	3.10	710	6	3.46	942	12	4.36	1,670
6	2.79	545	N	3.06	686	N	3.40	900		May 25	
10	2.75	525	6	2.99	645	4	3.39	893	1	4.36	1,670
N	2.76	530	12	2.93	615	6	3.43	921	6	4.24	1,570
2	2.77	535		May 12		12	3.76	1,160	11	4.10	1,440
4	2.87	585	6	2.84	570		May 19		1	4.10	1,440
6	3.07	692	10	2.79	545	4	3.83	1,210	5	4.49	1,790
10	3.37	879	N	2.81	555	6	3.83	1,210	6	4.67	1,970
12	3.42	914	6	2.89	595	N	3.79	1,180	8	4.82	2,120
	May 6		12	2.84	570	2	3.79	1,180	10	4.90	2,200
2	3.45	935		May 13		4	3.84	1,220	12	4.91	2,210
6	3.40	900	6	2.76	530	6	3.93	1,290		May 26	
10	3.36	872	11	2.70	500	9	4.14	1,480	2	4.88	2,180
N	3.36	872	1	2.71	505	12	4.23	1,560	6	4.74	2,040
3	3.39	893	4	2.76	530		May 20		9	4.65	1,950
8	3.90	1,270	7	2.77	535	2	4.24	1,570	11	4.64	1,940
10	4.03	1,380	12	2.83	565	6	4.20	1,530	N	4.67	1,970
12	4.10	1,440		May 14		N	4.08	1,420	6	4.96	2,260
	May 7		3	2.84	570	6	3.97	1,330	9	5.19	2,500
4	4.07	1,410	6	2.83	565	12	3.86	1,240	12	5.18	2,490
6	4.01	1,360	N	2.81	555		May 21			May 27	
N	3.95	1,310	5	2.80	550	6	3.75	1,150	3	5.11	2,410
1	3.94	1,300	12	2.89	595	N	3.67	1,090	6	4.98	2,280
4	3.97	1,330		May 15		4	3.63	1,060	10	4.83	2,130
7	4.11	1,450	3	2.90	600	6	3.63	1,060	N	4.81	2,110
10	4.15	1,480	6	2.89	595	10	3.70	1,110	2	4.90	2,200
12	4.14	1,480	N	2.86	580	12	3.70	1,110	6	5.17	2,480
	May 8		4	2.84	570		May 22		8	5.21	2,520
6	4.06	1,400	6	2.86	580	6	3.64	1,070	12	5.11	2,410
N	3.93	1,290	12	2.97	635	N	3.58	1,030		May 28	
6	3.86	1,240		May 16		3	3.55	1,000	6	4.87	2,170
8	3.87	1,250	4	3.02	662	6	3.52	984	N	4.65	1,950
12	3.78	1,170	10	3.00	650	12	3.56	1,010	2	4.58	1,880
			N	2.99	645				5	4.59	1,890

North Fork of North Fork Sun River near Augusta, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
				June 4		4	5.22	2,530		June 18	
6	4.62	1,920				6	5.41	2,740	3	5.55	2,800
8	4.68	1,980	3	6.29	3,800	10	5.84	3,240	6	5.49	2,730
12	4.70	2,000	6	6.13	3,590	12	5.93	3,350	N	5.34	2,560
	May 29		N	5.92	3,330		June 12		4	5.22	2,440
4	4.72	2,020	6	5.72	3,090	2	5.97	3,390	6	5.21	2,430
6	4.80	2,100	12	5.63	2,990	6	5.93	3,350	10	5.29	2,520
10	5.11	2,410		June 5		N	5.80	3,190	12	5.28	2,510
N	5.18	2,490	6	5.52	2,860	2	5.77	3,150		June 19	
4	5.50	2,840	N	5.39	2,720	3	5.78	3,170	6	5.16	2,390
6	5.76	3,140	6	5.25	2,560	5	5.86	3,260	N	5.05	2,280
8	5.89	3,300	10	5.25	2,560	9	6.11	3,550	3	5.01	2,240
9	5.90	3,310	12	5.23	2,540	12	6.26	3,740	5	5.01	2,250
12	5.84	3,240		June 6			June 13		7	5.02	2,260
	May 30		6	5.16	2,470	1	6.29	3,780	12	4.94	2,180
6	5.75	3,130	N	5.07	2,370	5	6.37	3,890		June 20	
N	5.69	3,060	3	5.01	2,310	7	6.37	3,890	6	4.77	2,020
6	5.63	2,990	4	5.01	2,310	N	6.21	3,670	8	4.70	1,950
10	5.62	2,970	6	5.08	2,380	4	6.11	3,530	N	4.60	1,860
12	5.59	2,940	10	5.35	2,680	9	6.21	3,640	6	4.50	1,760
	May 31		12	5.42	2,750	12	6.18	3,600	12	4.43	1,700
6	5.42	2,750		June 7			June 14			June 21	
N	5.26	2,580	1	5.43	2,760	3	6.11	3,500	6	4.35	1,640
3	5.18	2,490	2	5.43	2,760	6	5.99	3,350	N	4.27	1,570
5	5.18	2,490	6	5.37	2,700	N	5.74	3,030	6	4.18	1,490
8	5.35	2,680	N	5.23	2,540	4	5.62	2,880	12	4.20	1,510
11	5.59	2,940	2	5.20	2,510	5	5.61	2,870		June 22	
12	5.61	2,960	4	5.20	2,510	6	5.61	2,870	3	4.20	1,520
	June 1		6	5.26	2,580	9	5.70	2,960	6	4.17	1,490
3	5.67	3,030	11	5.50	2,840	11	5.72	2,990	N	4.11	1,440
6	5.63	2,990	12	5.52	2,860	12	5.71	2,970	4	4.07	1,400
N	5.45	2,780		June 8			June 15		6	4.07	1,400
3	5.40	2,730	2	5.52	2,860	6	5.57	2,800	8	4.13	1,470
4	5.40	2,730	6	5.49	2,830	N	5.39	2,600	12	4.30	1,620
6	5.50	2,840	N	5.39	2,720	4	5.31	2,510		June 23	
9	5.68	3,050	6	5.28	2,600	6	5.33	2,530	2	4.32	1,640
12	5.75	3,130	12	5.23	2,540	10	5.38	2,590	4	4.32	1,640
	June 2			June 9		12	5.37	2,580	6	4.31	1,630
3	5.76	3,140	6	5.11	2,410		June 16		N	4.24	1,580
6	5.73	3,110	N	4.99	2,290	6	5.29	2,480	5	4.18	1,520
9	5.70	3,070	6	4.88	2,180	N	5.20	2,380	6	4.17	1,510
11	5.71	3,080	8	4.90	2,200	3	5.15	2,330	8	4.20	1,540
N	5.75	3,130	12	5.03	2,330	5	5.15	2,330	12	4.28	1,610
3	5.93	3,340		June 10		7	5.19	2,370		June 24	
6	6.02	3,450	3	5.06	2,360	9	5.28	2,480	2	4.28	1,620
10	6.08	3,530	6	5.05	2,350	12	5.35	2,550	6	4.23	1,580
11	6.08	3,530	N	4.93	2,230		June 17		N	4.17	1,530
12	6.08	3,530	3	4.89	2,190	2	5.36	2,560	6	4.09	1,460
	June 3		4	4.89	2,190	6	5.32	2,520	12	4.04	1,410
6	6.16	3,630	6	4.98	2,280	N	5.24	2,430			
9	6.16	3,630	10	5.21	2,520	3	5.22	2,410			
N	6.14	3,600	12	5.26	2,580	5	5.27	2,470			
2	6.16	3,630		June 11		9	5.52	2,750			
4	6.22	3,710	2	5.30	2,620	11	5.58	2,820			
6	6.33	3,850	6	5.29	2,610	12	5.59	2,830			
8	6.41	3,950	N	5.21	2,520						
10	6.44	3,990	2	5.18	2,490						
12	6.40	3,940									

North Fork Sun River near Augusta, Mont.

Mean figures of reservoir contents, or of discharge, 1953

Date	Contents in Gibson Reservoir (acre-ft)	Change in contents Gibson Reservoir (equivalent cfs-days)	Flow in Pishkun Canal (cfs)	Flow in Willow Creek feeder canal (cfs)	Observed flow over diversion dam (cfs)	Adjusted flow over diversion dam (cfs)
May 1	74,840	+480	530	0	360	1,370
2	75,330	+250	620	0	250	1,120
3	75,700	+190	1,350	0	250	1,790
4	76,060	+180	670	0	150	1,000
5	76,310	+130	390	0	400	920
6	78,400	+1,050	260	0	280	1,590
7	82,570	+2,100	260	0	290	2,650
8	87,270	+2,370	260	0	460	3,090
9	90,890	+1,820	260	0	1,460	3,540
10	91,530	+320	340	0	1,850	2,510
11	91,530	0	230	0	1,580	1,810
12	91,020	-260	120	0	1,610	1,470
13	91,150	+70	100	0	1,610	1,780
14	91,150	0	100	0	1,330	1,430
15	91,150	0	240	0	1,380	1,620
16	91,400	+130	310	0	1,200	1,640
17	91,660	+130	310	0	1,380	1,820
18	92,180	+260	400	0	1,790	2,450
19	92,440	+130	570	0	1,940	2,640
20	93,210	+390	470	0	2,500	3,360
21	93,080	-70	410	0	2,610	2,950
22	92,700	-190	410	0	2,270	2,490
23	92,440	-130	340	0	1,910	2,120
24	92,310	-70	140	0	1,970	2,040
25	92,950	+320	50	0	2,830	3,200
26	93,470	+260	50	0	3,750	4,070
27	93,730	+130	50	0	4,290	4,470
28	93,990	+130	50	0	4,560	4,740
29	93,990	0	50	0	4,550	4,610
30	95,670	+850	50	0	6,900	7,800
31	95,920	+130	50	0	6,960	7,140
June 1	95,920	0	50	0	7,000	7,050
2	96,310	+200	50	0	7,760	8,010
3	97,990	+850	60	0	9,900	10,810
4	97,990	0	50	0	10,010	10,060
5	96,960	-520	30	0	8,150	7,660
6	96,050	-460	30	0	6,800	6,370
7	95,920	-70	30	0	6,650	6,610
8	96,180	+130	30	0	6,950	7,110
9	95,800	-190	30	0	6,400	6,240
10	95,410	-200	30	0	5,820	5,650
11	95,670	+130	30	0	6,300	6,460
12	97,090	+720	30	0	8,370	9,120
13	98,120	+520	30	0	10,070	10,620
14	99,810	+850	40	0	9,520	10,410
15	99,020	-400	40	0	8,150	7,790
16	97,730	-650	40	0	6,950	6,340
17	97,220	-260	40	0	6,650	6,430
18	97,220	0	130	0	7,050	7,180
19	97,340	+60	170	0	6,300	6,530
20	97,990	+330	170	0	5,290	5,790
21	95,670	-1,170	170	0	4,210	3,210
22	94,890	-390	450	0	3,590	3,650
23	96,180	+650	610	0	2,570	3,830
24	98,510	+1,170	660	0	2,140	3,970
25	99,280	+390	880	0	2,300	3,570
26	99,280	0	1,050	0	1,820	2,870
27	99,150	-70	1,130	0	1,670	2,730
28	98,900	-130	1,130	0	1,670	2,670
29	98,900	0	1,060	0	1,670	2,730
30	99,540	+320	1,050	0	1,970	3,350

North Fork Sun River near Augusta, Mont.--Continued

Mean figures of reservoir contents, or of discharge, 1953

Date	Contents in Gibson Reservoir (acre-ft)	Change in contents Gibson Reservoir (equivalent cfs-days)	Flow in Pishkun Canal (cfs)	Flow in Willow Creek feeder canal (cfs)	Observed flow over diversion dam (cfs)	Adjusted flow over diversion dam (cfs)
July 1	103,000	+1,740	1,010	80	2,300	5,130
2	103,400	+200	920	80	2,470	3,670
3	103,100	-150	890	80	2,470	3,290
4	103,100	0	890	80	2,470	3,440
5	102,800	-150	930	80	2,300	3,160
6	99,680	-1,570	1,000	80	2,140	1,650
7	99,150	-270	1,100	80	1,820	2,730
8	99,960	+410	1,180	30	560	2,180
9	101,700	+880	1,260	30	540	2,710
10	103,500	+910	1,320	30	450	2,710
11	104,900	+710	1,340	30	400	2,480
12	106,000	+550	1,340	30	510	2,430
13	106,400	+200	1,340	30	690	2,260
14	106,600	+100	1,340	30	780	2,250
15	106,600	0	1,340	30	780	2,150
16	106,100	-250	1,340	30	600	1,720
17	105,700	-200	1,340	20	430	1,590
18	105,300	-200	1,340	40	290	1,470
19	105,000	-150	1,340	40	220	1,450
20	104,200	-400	1,340	40	220	1,200
21	103,600	-300	1,340	40	220	1,300
22	103,000	-300	1,340	40	220	1,300
23	101,900	-550	1,340	40	220	1,050
24	100,900	-500	1,340	40	220	1,100
25	99,680	-620	1,340	40	220	980
26	98,640	-520	1,340	40	220	1,080
27	97,600	-520	1,280	30	220	1,010
28	96,310	-650	1,250	30	290	920
29	94,760	-780	1,300	30	330	880
30	93,210	-780	1,300	30	330	880
31	91,530	-850	1,300	30	320	800
May	-	+11,100	305	0	2,086	2,749
June	-	+1,810	310	0	5,790	6,161
July	-	-4,010	1,238	43.9	815	1,967

Sun River at Simms

Location.--Lat 47°30'25", long 111°55'50", in SW¼NE¼ sec. 12, T. 20 N., R. 3 W. on right bank at downstream side of county bridge 1 mile north of Simms and 1 mile downstream from Simms Creek. Datum of gage is 3,548.8 ft above mean sea level based reportedly on Great Northern Railway datum.
Stage record.--Staff gages read once daily at 8 a.m. and at additional times as show
Maxima.--May-June 1953: Elevation observed, 3,557.1 ft 8 a.m. June 4.
Remarks.--Records furnished by U. S. Weather Bureau.

Elevation, in feet

Day	May	June	Day	May	June	Day	May	June
1	3,550.3	3,554.8	11	3,551.8	3,554.1	21	3,552.3	
2		3,554.8	12	3,551.8	3,554.5	22	3,552.0	3,552.8
3		3,555.9	13	3,551.4	3,555.3	23		3,551.8
4	3,550.1	3,557.1	14	3,551.4	3,555.2	24		3,551.0
5	3,550.0	3,555.9	15	3,551.3	3,555.4	25	3,553.2	3,551.3
6	3,550.3	3,555.2	16		3,554.8	26	3,553.4	3,551.1
7	3,550.2		17		3,554.5	27	3,553.5	
8	3,550.3	3,555.1	18	3,551.4	3,554.5	28		
9		3,554.7	19	3,551.3	3,554.5	29		3,550.8
10		3,554.4	20	3,551.8		30	3,554.8	
						31		

Muddy Creek at Vaughn, Mont.

Location.--Lat 47°34', long 112°33', in SE¼ sec. 24, T. 21 N., R. 1 E., near center of span of upstream side of old highway bridge at Vaughn.
Drainage area.--268 sq mi (determined by Corps of Engineers).
Gage-height record.--Twice-daily wire-weight gage readings May 1-10, June 13 to July 31; graph based on twice-daily gage readings May 11 to June 12.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 3,000 cfs and extended on basis of slope-area determination of peak flow. Shifting-control method used July 10-31.
Maxima.--May-July 1953: Discharge, 7,600 cfs 2 a.m. June 4 (gage height, 16.7 ft, from floodmark).
1925-26, 1934 to April 1953: Discharge, about 3,500 cfs June 23, 1938 (gage height 15.15 ft, from graph based on gage readings), from rating curve extended above 600 cfs.
Flood of June 1908 reached a stage of about 23 ft (discharge not determined); flood of June 1932 reached a stage of about 18 ft (discharge, 9,000 cfs, from rating curve extended above 600 cfs), from information by local residents.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	36	971	220	11	58	259	251	21	113	216	251
2	34	526	204	12	69	227	256	22	90	198	242
3	31	2,380	229	13	145	218	258	23	87	181	282
4	28	3,500	262	14	138	205	253	24	310	168	314
5	28	919	242	15	134	192	246	25	2,030	176	344
6	27	536	232	16	132	187	254	26	856	190	410
7	26	441	226	17	146	184	270	27	322	186	380
8	26	473	238	18	151	174	277	28	251	200	344
9	28	381	245	19	126	159	293	29	661	262	355
10	35	306	243	20	110	150	312	30	2,650	234	341
								31	585	-	338
Monthly mean discharge, in cubic feet per second									305	480	278
Runoff, in acre-feet									18,770	28,580	17,080
Runoff, in inches									1.31	2.00	1.20

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 10			May 19			May 27		10	14.90	4,660
12	0.58	37	6	1:40	130	6	2.90	360	12	15.85	5,910
	May 11		N	1.48	141	N	2.54	302		June 4	
6	.80	58	6	1.30	117	6	2.35	272	2	16.70	7,600
N	.90	68	12	1.20	104	12	2.26	258	6	15.00	4,760
6	.85	63		May 20			May 28		8	14.60	4,380
12	.75	53	6	1.25	110	N	2.20	248	9	13.00	3,440
	May 12		N	1.38	127	6	2.18	245	N	10.80	2,640
6	.85	63	6	1.20	104	12	2.25	256	6	8.58	1,900
N	1.00	79	12	1.12	94		May 29		12	7.20	1,460
6	.92	70		May 21		8	2.50	296		June 5	
8	.90	68	6	1.18	101	N	3.00	378	6	6.05	1,120
12	1.00	79	N	1.30	117	8	5.70	1,010	N	5.05	828
	May 13		6	1.38	127	12	10.00	2,370	6	4.50	690
6	1.45	137	12	1.30	117		May 30		12	4.20	615
N	1.82	190		May 22		4	13.05	3,460		June 6	
2	1.82	190	6	1.20	104	8	12.85	3,380	6	4.05	580
6	1.48	141	N	1.08	89	N	12.10	3,100	N	3.85	540
12	1.38	127	6	.95	74	6	9.10	2,060	6	3.62	494
	May 14		12	.90	68	12	6.50	1,750	12	3.35	441
6	1.45	137		May 23			May 31			June 7	
N	1.55	151	6	.90	68	8	3.85	540	6	3.10	396
6	1.45	137	N	1.00	79	N	3.45	460	N	3.28	428
12	1.35	124	6	1.16	99	6	3.00	378	10	3.62	494
	May 15		12	1.45	137	9	3.00	378	12	3.60	490
6	1.42	133		May 24		12	3.35	441		June 8	
N	1.50	144	6	1.80	187		June 1		8	3.31	434
6	1.42	133	N	2.32	267	6	5.10	840	N	3.38	446
12	1.38	127	6	3.05	387	N	6.62	1,290	8	3.72	514
	May 16		12	4.40	665	2	6.62	1,290	12	3.70	510
6	1.41	131		May 25		6	6.10	1,130		June 9	
N	1.50	144	6	6.10	1,130	12	4.75	752	6	3.20	414
6	1.40	130	N	8.55	1,890		June 2		N	2.90	360
12	1.30	117	4	11.00	2,720	6	3.55	480	6	2.70	328
	May 17		8	14.00	3,930	10	3.02	382	12	2.72	331
6	1.45	137	12	8.90	2,000	N	3.02	382		June 10	
N	1.67	168		May 26		6	3.70	510	2	2.76	338
6	1.55	151	4	6.60	1,280	12	4.72	745	N	2.52	299
12	1.45	137	7	5.00	815		June 3		6	2.45	288
	May 18		N	4.60	715	6	6.65	1,300	12	2.45	288
6	1.53	148	4	4.26	630	N	8.90	2,000		June 11	
N	1.70	172	12	3.40	450	6	12.02	3,070	N	2.25	256
6	1.55	151				8	13.70	3,750	12	2.12	235
12	1.40	130								June 12	
									N	2.06	226
									12	2.03	222

Sun River near Vaughn, Mont.

Location.--Lat 47°32', long 111°29', in SE¼ sec. 33, T. 21 N., R. 2 E., on right bank 4 miles downstream from Muddy Creek, 5 miles southeast of Vaughn, and 10 miles upstream from mouth.
Drainage area.--2,190 sq mi (determined by Corps of Engineers).
Gage-height record.--Water-stage recorder graph except July 21-31, when there was no gage-height record.
Discharge record.--Stage-discharge relation defined by current-meter measurements. No gage-height record July 21-31; discharge estimated on basis of one discharge measurement and records for Muddy Creek at Vaughn. Shifting-control method used May 1-23, May 29 to June 1, June 9 to July 20.
Maxima.--May-July 1953: Discharge, 17,900 cfs 11 a.m. to 2 p.m. June 4; (gage height, 16.38 ft 2 p.m. June 4, from floodmark on gage house).
1934 to April 1953: Discharge, 14,300 cfs June 6, 1948 (gage height, 13.48 ft).
Remarks.--Flow regulated by Gibson, Pishkun, Willow Creek and Nilan Reservoirs (see p.140). Diversions for irrigation of about 110,000 acres above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	610	8,820	2,580	11	1,660	7,620	835	21	2,340	6,100	570
2	660	9,040	2,760	12	1,670	7,670	735	22	2,250	5,150	560
3	610	14,200	2,800	13	1,510	8,830	690	23	1,980	3,870	530
4	540	17,600	2,740	14	1,430	9,780	810	24	1,930	2,970	500
5	467	16,100	2,660	15	1,400	9,640	920	25	5,390	2,960	540
6	540	13,400	2,380	16	1,320	9,170	890	26	5,910	2,800	580
7	530	11,400	2,120	17	1,310	8,180	820	27	5,060	2,530	600
8	560	11,000	1,890	18	1,510	7,640	750	28	5,150	2,360	640
9	808	10,400	1,190	19	1,640	7,610	640	29	5,720	2,470	680
10	1,440	8,990	956	20	1,850	7,050	590	30	8,680	2,460	690
								31	8,580	-	680
Monthly mean discharge, in cubic feet per second									2,421	7,927	1,172
Runoff, in acre-feet									148,900	471,700	72,050
Runoff, in inches									1.27	4.04	0.62

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 8		N	2.73	1,680		May 26		12	9.02	8,390
12	1.63	600	3	2.67	1,620	1	7.67	6,690		June 1	
	May 9		7	2.65	1,600	3	7.53	6,530	4	9.08	8,440
N	1.80	770	12	2.70	1,650	5	7.37	6,360	7	9.19	8,560
12	2.12	1,090		May 20		7	7.23	6,200	11	9.40	8,770
	May 10		N	2.88	1,820	9	7.09	6,050	2	9.71	9,100
N	2.54	1,500	12	3.16	2,100	11	6.98	5,930	4	9.77	9,160
12	2.69	1,650		May 21		1	6.84	5,770	5	9.80	9,180
	May 11		N	3.44	2,380	5	6.64	5,550	6	9.82	9,190
4	2.74	1,700	2	3.47	2,410	12	6.35	5,240	7	9.82	9,190
N	2.70	1,660	3	3.55	2,490		May 27		8	9.80	9,170
12	2.65	1,610	12	3.48	2,420	4	6.22	5,110	12	9.65	8,990
	May 12			May 22		10	6.12	5,010		June 2	
5	2.65	1,610	4	3.46	2,400	2	6.11	5,000	5	9.44	8,740
8	2.75	1,710	4	3.21	2,150	5	6.12	5,010	7	9.40	8,690
5	2.74	1,700	12	3.16	2,100	12	6.22	5,110	9	9.38	8,670
12	2.69	1,650		May 23			May 28		11	9.48	8,790
	May 13		N	3.04	1,980	6	6.28	5,170	2	9.61	8,940
4	2.66	1,620	12	2.93	1,870	N	6.27	5,160	5	9.77	9,130
9	2.54	1,500		May 24		6	6.24	5,130	8	9.97	9,370
6	2.48	1,440	11	2.91	1,840	12	6.25	5,148	10	10.27	9,750
12	2.48	1,440	5	3.01	1,940		May 29		12	10.57	10,100
	May 14		7	3.06	1,990	6	6.28	5,170		June 3	
7p	2.47	1,430	9	3.13	2,060	10	6.42	5,360	3	11.12	10,900
12	2.42	1,380	10	3.20	2,130	N	6.45	5,410	4	11.52	11,400
	May 15		12	3.41	2,340	3	6.67	5,690	5	12.52	12,700
6	2.41	1,360		May 25		5	6.92	5,980	7	12.97	13,300
5	2.49	1,440	1	3.56	2,490	7	7.30	6,400	9	13.47	13,900
12	2.45	1,400	2	3.78	2,710	12	7.95	7,170	11	13.87	14,400
	May 16		3	4.08	3,000		May 30		N	14.06	14,700
6	2.43	1,380	4	4.39	3,280	6	8.52	7,900	3	14.54	15,400
N	2.34	1,290	6	5.00	3,890	9	8.92	8,410	5	14.74	15,600
3	2.35	1,300	8	5.51	4,400	N	9.42	9,050	7	14.94	15,900
7	2.31	1,260	10	6.24	5,130	1	9.55	9,220	8	15.10	16,100
12	2.31	1,260	N	6.96	5,910	3	9.70	9,420	9	15.17	16,200
	May 17		2	7.61	6,620	5	9.74	9,390	10	15.28	16,400
6	2.31	1,260	3	7.84	6,870	7	9.73	9,480	12	15.56	16,800
N	2.35	1,300	4	7.94	6,980	9	9.68	9,400		June 4	
12	2.44	1,390	5	8.00	7,050	12	9.52	9,170	5	16.07	17,500
	May 18		6	8.06	7,120		May 31		8	16.23	17,700
N	2.57	1,520	7	8.08	7,140	5	9.25	8,790	10	16.31	17,800
6	2.60	1,550	8	8.04	7,090	7	9.14	8,630	11	16.33	17,900
12	2.60	1,610	10	7.88	6,920	11	9.07	8,520	1	16.34	17,900
	May 19		12	7.74	6,760	6	8.94	8,330	2	16.38	17,900
9	2.73	1,680				8	9.00	8,390	5	16.30	17,800

Sun River near Vaughn, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time,

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	June 4			June 13			June 23			July 2	
9	16.10	17,500	1	9.59	8,150	2	6.65	4,690	6a	4.89	2,730
12	15.94	17,300	5	9.84	8,450	4	6.45	4,490	6	4.96	2,800
	June 5		N	10.14	8,810	7	6.03	4,070	12	4.96	2,800
6	15.55	16,800	6	10.43	9,160	8	5.84	3,880		July 3	
11	15.20	16,300	12	10.80	9,610	10	5.67	3,710	8	5.00	2,820
2	15.00	16,000		June 14		1	5.58	3,620	5	4.97	2,790
6	14.62	15,500	4	10.93	9,750	5	5.48	3,520	6	4.99	2,810
12	14.10	14,700	8	11.00	9,840	12	5.47	3,510	8	4.97	2,790
	June 6		10	11.09	9,960		June 24		12	4.97	2,790
7	13.50	14,000	N	11.09	9,960	3	5.45	3,460		July 4	
9	13.30	13,700	5	11.00	9,840	5	5.27	3,280	4	4.95	2,750
N	13.08	13,400	10	10.78	9,560	8	4.89	2,940	N	4.93	2,730
5	12.70	12,900	12	10.78	9,560	10	4.75	2,800	8	4.92	2,720
6	12.52	12,700		June 15		N	4.70	2,750	12	4.94	2,740
7	12.55	12,700	N	10.90	9,690	3	4.69	2,740		July 5	
12	12.17	12,200	5	10.90	9,690	7	4.76	2,810	N	4.88	2,660
	June 7		7	10.87	9,650	12	4.82	2,870	6	4.86	2,640
6	11.76	11,700	12	10.80	9,560		June 25		12	4.79	2,570
N	11.40	11,200		June 16		6	4.90	2,920		July 6	
2	11.27	11,100	N	10.52	9,190	N	4.92	2,940	11	4.62	2,380
3	11.26	11,000	6	10.35	8,990	5	5.02	3,030	7	4.52	2,280
4	11.28	11,100	12	10.12	8,710	9	5.04	3,050	12	4.50	2,260
5	11.28	11,100		June 17		12	5.02	3,030		July 7	
9	11.17	10,900	N	9.67	8,150		June 26		5	4.42	2,160
12	11.15	10,900	6	9.46	7,900	5	4.95	2,940	6	4.36	2,110
	June 8		12	9.36	7,780	11	4.80	2,790	9	4.30	2,070
3	11.13	10,900		June 18		8	4.67	2,660	4	4.28	2,090
7	11.17	10,900	N	9.25	7,620	12	4.63	2,620	7	4.28	2,110
N	11.35	11,200	6	9.21	7,570		June 27		12	4.25	2,100
3	11.40	11,200	9	9.21	7,570	6p	4.55	2,490		July 8	
8	11.33	11,100	12	9.26	7,630	12	4.45	2,410	1p	4.08	2,030
12	11.17	10,900		June 19			June 28		3	3.98	1,940
	June 9		4	9.31	7,670	9a	4.39	2,320	7	3.65	1,630
4	11.02	10,700	8	9.32	7,680	12	4.47	2,400	9	3.52	1,510
N	10.82	10,500	N	9.32	7,680		June 29		12	3.38	1,380
6	10.67	10,200	6	9.20	7,540	N	4.60	2,500		July 9	
12	10.47	9,930	12	9.11	7,440	5	4.61	2,500	6	3.21	1,240
	June 10			June 20		12	4.55	2,450	N	3.11	1,170
2	10.39	9,800	3	9.07	7,370		June 30		7	3.03	1,120
8	10.00	9,240	8	8.93	7,220	6	4.53	2,410	12	2.94	1,030
N	9.83	8,990	3	8.66	6,920	N	4.57	2,450		July 10	
6	9.50	8,520	9	8.50	6,740	7	4.60	2,480	N	2.85	950
12	9.20	8,090	12	8.38	6,610	9	4.64	2,520	8	2.82	920
	June 11			June 21		12	4.63	2,510	12	2.77	870
6	9.00	7,790	3p	7.83	5,980		July 1				
N	8.84	7,540	8	7.61	5,740	4	4.65	2,510			
6	8.77	7,390	12	7.48	5,600	7	4.72	2,580			
12	8.87	7,440		June 22		6	4.72	2,580			
	June 12		N	7.04	5,110	12	4.82	2,680			
N	9.10	7,630	12	6.70	4,770						
8	9.30	7,830									
12	9.52	8,090									

Sun River at Great Falls, Mont.

Location.--Lat 47°29'40", long 111°20' in NE¼ sec. 15, T. 20 N., R. 3 E., at 14th St. bridge, 1 mile upstream from mouth. Elevation of reference point reported as 3,328.6 by Corps of Engineers.

Stage record.--Stage observations made one to twelve times daily by measuring downstream from reference point on handrail of bridge.

Maxima.--June 2-14, 1953: Elevation, 3,319.1 ft about 6 p.m. June 4 (floodmark), 1:15 a.m. and 6 a.m. June 5 (observed).

Photograph of June 1908 shows a river stage captioned as 2 ft below peak. Corps of Engineers estimate peak of 1908 was 8 to 9 ft higher than that of 1953, or about 3,328 ft.

Remarks.--Stage observations furnished by Corps of Engineers.

Elevation, in feet, at indicated time, 1953

Hour	Elevation	Hour	Elevation	Hour	Elevation	Hour	Elevation	Hour	Elevation
June 2		11	3,319.0	N	3,318.31	12	3,316.2	12	3,315.0
12	3,315.5	12	3,319.0	4	3,318.13	June 9		June 12	
June 3		June 5		12	3,317.8	6a	3,316.1	8	3,315.0
12	3,317.6	1:15	3,319.1	June 7		8p	3,315.8	2:45	3,315.1
June 4		6	3,319.1	6:55	3,317.43	12	3,315.7	6	3,315.1
2	3,317.7	7:40	3,319.07	8:15	3,317.3	June 10		12	3,315.2
6	3,317.9	4:30	3,319.03	5:15	3,316.95	11	3,315.45	June 13	
10:30	3,318.3	9:50	3,318.95	12	3,316.8	6	3,315.35	7:50	3,315.4
4:15	3,318.7	12	3,318.85	June 8		12	3,315.2	5:10	3,315.6
6	3,319.1	June 6		6:50	3,316.4	June 11		12	3,315.7
7:10	3,318.95	2	3,318.8	11:30	3,316.4	7:15	3,315.1	June 14	
8:30	3,318.9	4	3,318.7	7:30	3,316.3	6:06	3,315.0	6:15a	3,315.8

Missouri River below Morony Dam, Mont.

Location.--Lat 47°34'50", long 111°03'40", in NW¼ sec. 14, T. 21 N., R 5 E., on Missouri River 10 miles northeast of Great Falls. Datum of gage is at mean sea level (levels by The Montana Power Co.).
Drainage area.--23,400 sq mi, approximately.
Maxima.--May-July 1953: Discharge, 66,600 cfs, 12 p.m. June 4.
1930 to April 1953: Daily discharge, 51,900 cfs June 7, 1948.
Remarks.--Discharge record furnished by The Montana Power Co. Complete records in their files.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,280	28,700	14,300	11	7,010	27,000	6,580	21	7,170	22,400	5,000
2	5,550	29,000	14,400	12	6,840	26,900	4,230	22	8,230	18,600	4,950
3	5,210	38,200	13,900	13	6,990	27,900	6,720	23	7,210	12,900	5,510
4	4,970	52,600	13,600	14	6,590	28,100	5,730	24	6,670	15,000	4,510
5	5,440	63,100	14,100	15	6,170	27,500	5,370	25	11,800	15,900	4,520
6	4,880	58,200	13,400	16	6,020	25,500	5,890	26	21,600	15,200	4,020
7	5,670	46,200	11,900	17	4,840	24,500	6,750	27	19,300	13,200	4,620
8	5,650	37,400	9,410	18	6,090	23,100	4,210	28	17,500	13,000	4,480
9	5,540	31,900	7,520	19	6,200	22,800	5,040	29	17,900	13,200	4,120
10	5,260	28,500	6,780	20	6,160	23,500	5,520	30	22,300	13,900	4,880
								31	29,000	-	4,500
Monthly mean discharge, in cubic feet per second									9,227	27,460	7,305
Runoff, in acre-feet									567,400	1634,000	449,200
Runoff, in inches									0.45	1.31	0.36

Discharge, in cubic feet per second, at indicated time, 1953

Hour	Discharge	Hour	Discharge	Hour	Discharge	Hour	Discharge
	May 24	N	17,200		June 3		June 8
12	7,580	4	18,400	4	28,900	4	40,800
	May 25	8	19,100	8	35,600	8	39,100
4	5,530	10	20,600	10	37,900	N	35,500
6	7,280	12	20,300	N	38,100	4	35,500
8	9,520		May 30	2	38,700	8	35,500
10	13,400	4	19,400	4	47,900	12	34,500
N	14,100	8	20,600	6	42,000		June 9
2	11,700	10	23,800	8	45,100	4	33,000
6	11,600	N	20,700	10	47,200	6	33,800
8	18,500	2	23,000	12	45,200	7	63,600
10	16,900	4	23,000		June 4	8	44,900
12	21,600	6	24,400	4	46,900	9	35,500
	May 26	8	23,000	8	49,300	11	36,200
2	19,300	10	26,000	N	49,600	N	20,700
4	19,200	12	27,200	2	53,700	1	7,240
6	20,200		May 31	6	58,200	2	21,200
8	23,100	2	28,900	10	59,200	4	29,300
10	21,400	4	28,500	12	66,600	6	31,100
N	21,600	6	28,700		June 5	8	30,200
2	22,500	N	28,500	2	61,700	12	20,000
6	23,500	2	30,600	6	62,000		June 10
10	21,500	4	29,000	N	63,300	4	29,600
12	21,400	8	29,800	4	64,100	8	29,200
	May 27	10	28,600	8	63,700	N	27,700
3	21,300	12	29,500	12	62,200	4	28,000
6	18,500		June 1		June 6	8	27,900
8	21,300	2	29,200	4	62,200	12	27,600
10	19,100	6	29,200	8	59,600		June 11
N	16,800	N	27,200	N	58,800	4	27,100
4	19,900	4	28,700	4	56,700	8	28,200
8	18,600	6	29,800	8	54,500	N	26,600
12	18,400	10	28,400	12	52,700	4	26,400
	May 28	12	29,100		June 7	8	26,600
2	18,400		June 2	2	51,900	12	26,600
6	17,800	4	29,100	4	47,800		June 12
N	16,800	8	29,800	8	47,900	4	26,500
4	17,000	N	28,400	N	46,200	8	26,600
8	17,600	4	28,300	4	44,100	N	26,800
12	17,600	8	29,600	8	43,100	6	27,400
	May 29	10	29,600	12	42,300	12	27,200
4	16,800	12	27,700				
8	16,700						

Belt Creek near Monarch, Mont.

Location.--Lat 47°12', long 110°56', in SE¼NW¼ sec. 26, T. 17 N., R. 6 E., on left bank half a mile south of Riceville and 9 miles northwest of Monarch.
Drainage area.--350 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,500 cfs and extended on basis of slope-area determination of peak flow. Shifting-control method used May 1-7.
Maxima.--May-July 1953: Discharge, 11,000 cfs 5 a.m. June 4 (gage height, 10.12 ft).
1951 to April 1953: Discharge 1,290 cfs May 4, 1952 (gage height, 4.58 ft).
Flood of 1908 was several feet lower than in 1953, according to local resident.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	159	2,060	473	11	253	2,250	233	21	625	948	142
2	138	2,150	446	12	211	2,470	214	22	604	832	136
3	117	5,020	424	13	189	2,360	203	23	556	754	130
4	113	9,930	401	14	192	2,130	195	24	630	727	126
5	122	6,800	374	15	186	1,810	186	25	776	661	122
6	180	4,290	345	16	203	1,540	186	26	798	600	120
7	292	3,580	321	17	260	1,410	172	27	963	550	115
8	357	3,180	301	18	317	1,300	162	28	1,020	515	109
9	329	2,770	267	19	439	1,200	153	29	1,230	515	108
10	285	2,410	249	20	588	1,120	146	30	2,240	496	106
								31	2,290	-	104
Monthly mean discharge, in cubic feet per second									537	2,213	218
Runoff, in acre-feet									33,050	131,700	13,430
Runoff, in inches									1.77	7.05	0.72

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
		May 18			May 29			June 4			June 13
12	2.87	370	6	4.09	1,040	2	10.01	10,700	7	5.74	2,410
		May 19	11	4.19	1,100	4	10.03	10,800	4	5.59	2,260
2a	2.86	392	3	4.47	1,300	5	10.12	11,000	9	5.68	2,350
6p	3.01	460	6	4.56	1,360	2	9.59	9,590	12	5.68	2,350
12	3.15	525	9	4.79	1,540	3	9.66	9,780			June 14
		May 20	12	4.92	1,650	12	9.18	8,530	6p	5.32	2,000
6p	3.35	625			May 30			June 5	12	5.32	2,000
12	3.36	630	5	5.31	1,990	N	8.41	6,600			June 15
		May 21	1	5.69	2,360	12	7.88	5,460	6p	4.99	1,700
9p	3.34	620	10	5.89	2,570			June 6	12	4.96	1,680
12	3.36	630	12	5.84	2,510	N	7.03	3,960			June 16
		May 22			May 31	12	6.89	3,770	6p	4.69	1,460
3	3.39	645	4	5.82	2,490			June 7	12	4.69	1,460
1	3.27	585	N	5.57	2,240	N	6.75	3,570			June 17
12	3.27	585	7	5.44	2,110	12	6.61	3,390	6	4.67	1,450
		May 23	12	5.50	2,170			June 8	8	4.69	1,460
4p	3.18	540			June 1	N	6.43	3,180	6	4.53	1,340
12	3.19	545	8	5.38	2,050	12	6.25	2,960	12	4.57	1,370
		May 24	9	5.42	2,090			June 9			June 18
7a	3.18	540	4	5.29	1,970	N	6.07	2,770	N	4.49	1,310
12	3.66	793	12	5.44	2,110	12	5.89	2,570	7	4.39	1,240
		May 25			June 2			June 10	12	4.41	1,260
N	3.60	760	3a	5.48	2,150	N	5.74	2,410			June 19
12	3.66	793	5p	5.42	2,090	12	5.58	2,250	7p	4.27	1,160
		May 26	9	5.54	2,210			June 11	12	4.33	1,200
5p	3.63	776	12	5.79	2,460	11	5.47	2,140			June 20
12	3.83	888			June 3	3	5.49	2,160	2	4.34	1,210
		May 27	6	6.39	3,130	7	5.63	2,300	9	4.29	1,170
4a	3.91	936	11	6.94	3,840	10	5.84	2,510	N	4.22	1,120
12	4.04	1,010	3	7.61	4,920	12	5.89	2,570	12	4.04	1,010
		May 28	5	7.93	5,560			June 12			
12	4.07	1,030	7	8.51	6,840	4p	5.73	2,400			
			8	9.06	8,220	12	5.80	2,470			
			11	9.91	10,400						
			12	9.95	10,500						

Missouri River at Fort Benton, Mont.

Location.--Lat 47°49', long 110°39', in NE¼ sec. 26, T. 24 N., R. 8 E., on left bank at downstream side of highway bridge at Fort Benton, 4 miles upstream from Shonkin Creek.
Drainage area.--24,600 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 25 to June 5.
Maxima.--May-July 1953: Discharge, 78,700 cfs 3 a.m. June 5 (gage height, 13.57 ft).
1881-April 1953: Discharge observed, about 140,000 cfs June 6, 1908 (gage height, 18.5 ft, present datum), from rating curve extended above 63,000 cfs.
Remarks.--Diversions for irrigation of about 730,000 acres above station. Flow regulated by eight reservoirs (see p. 141). Considerable diurnal fluctuation at medium and low flow caused by seven powerplants above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,680	33,400	14,800	11	7,360	28,700	7,130	21	7,860	23,900	5,400
2	6,030	32,200	14,800	12	7,580	28,700	5,370	22	8,990	21,000	5,300
3	5,600	54,400	14,400	13	7,510	29,600	6,590	23	8,290	14,200	5,800
4	5,300	71,700	13,400	14	7,100	30,200	6,280	24	7,750	14,900	5,250
5	5,630	75,300	13,800	15	6,600	29,600	6,040	25	12,100	16,300	4,940
6	5,280	65,900	13,700	16	6,480	27,400	6,200	26	23,300	16,100	4,930
7	5,780	52,100	12,400	17	5,680	26,700	7,270	27	22,300	14,200	4,750
8	5,790	42,100	10,200	18	6,180	24,700	5,500	28	20,100	13,600	5,330
9	6,200	34,500	8,500	19	6,760	23,800	5,350	29	21,000	13,600	4,530
10	5,820	30,800	7,660	20	7,120	24,600	5,460	30	29,400	14,300	5,020
								31	34,000	-	5,000
Monthly mean discharge, in cubic feet per second									10,370	30,950	7,779
Runoff, in acre-feet									637,900	1,842,000	478,300
Runoff, in inches									0.49	1.40	0.36

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 23		8	5.71	19,500		June 3		6	8.82	37,800
12	3.39	8,620	11	5.90	20,600	2	8.11	33,800	7	8.92	38,600
	May 24		12	5.88	20,500	5	8.03	33,300	9	8.73	37,100
7	3.34	8,440		May 29		6	8.07	33,500	12	8.82	37,800
10	2.73	6,590	1	5.83	20,200	10	9.85	46,600		June 9	
N	2.63	6,290	5	5.81	20,100	11	10.95	55,400	6	8.50	35,400
4	2.27	5,260	7	5.65	19,200	1	11.94	64,000	9	8.48	35,200
6	3.42	8,720	10	5.66	19,300	3	12.06	65,000	10	9.99	46,600
12	3.56	9,210	N	5.77	19,900	7	12.81	72,200	10:30	10.43	50,000
	May 25		6	5.90	20,700	10	13.10	75,000	11	10.26	48,700
6	3.65	9,520	11	6.96	26,800	12	13.18	75,700	1	8.76	37,400
10	3.13	7,790	12	6.90	26,400		June 4		3	8.27	33,700
N	3.80	10,000		May 30		3	13.11	74,900	5	5.51	16,600
2	4.90	14,600	4	7.37	29,300	9	12.75	71,300	6	6.56	22,500
4	5.30	16,500	7	7.34	29,100	N	12.64	69,900	7	7.76	30,100
6	5.07	15,500	11	7.15	27,900	4	12.53	68,700	10	8.16	32,900
10	4.96	15,100	3	7.58	30,600	11	12.88	71,900	12	8.10	32,500
12	5.70	18,800	5	7.38	29,300	12	13.38	76,900		June 10	
	May 26		10	7.71	31,500		June 5		4	8.05	32,200
1	5.98	20,300	12	7.71	31,500	1	13.33	76,400	6	7.77	30,200
3	5.94	20,200		May 31		3	13.57	78,700	8	7.93	31,300
5	6.35	22,500	7	8.19	34,700	1	13.05	73,500	N	7.98	31,700
8	6.22	21,900	4p	8.10	34,100	2	13.15	74,500	6	7.57	28,800
N	6.78	25,300	5	8.36	35,900	6	13.15	74,500	8	7.74	30,000
2	6.55	23,900	7	7.94	33,000	12	12.97	72,700	12	7.68	29,600
6	6.65	24,600	10	8.16	34,500		June 6			June 11	
9	6.69	24,800	12	8.16	34,500	6	12.77	70,700	5	7.62	29,100
11	6.77	25,300		June 1		9	12.56	68,600	7	7.39	27,600
12	6.75	25,200	3	8.02	33,500	N	12.10	64,300	N	7.64	29,300
	May 27		6	8.08	33,900	2	11.87	62,200	2	7.55	28,700
3	6.47	23,500	9	7.99	33,300	4	12.01	63,500	6	7.55	28,700
8	6.44	23,400	1	8.10	34,000	12	11.51	59,000	9	7.49	28,300
10	6.15	22,900	3	7.93	32,800		June 7		12	7.53	28,500
N	6.40	23,100	9	7.93	32,800	5	11.21	56,500		June 12	
4	5.76	19,700	10	7.98	33,100	8	10.64	51,700	8	7.50	28,400
8	6.28	22,500	12	7.95	32,900	10	10.76	52,700	N	7.53	28,500
11	5.79	19,800		June 2		N	10.53	50,800	2	7.65	29,400
12	5.88	20,300	2	7.86	32,200	7	10.25	48,600	4	7.57	28,800
	May 28		5	7.90	32,500	9	10.40	49,800	6	7.59	28,900
2	6.00	21,000	9	7.89	32,400	12	10.14	47,700	8	7.55	28,700
6	5.99	21,000	11	7.76	31,500		June 8		12	7.64	29,300
8	5.60	18,800	1	7.87	32,200	4	10.00	46,600			
11	5.95	20,800	4	7.72	31,200	N	9.43	42,400			
1	5.71	19,500	12	8.01	33,200						

Two Medicine River near Browning, Mont.

Location.--Lat 48°28'30", long 112°48'10", in SW¼ sec. 5, T. 31 N., R. 9 W., on right bank 800 ft upstream from new bridge on U. S. 89, 10 miles upstream from Badger Creek, and 11 miles southeast of Browning.
Drainage area.--316 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1 to June 2, June 5.
Maxima.--May-July 1953: Discharge, 6,520 cfs 5 a.m. June 4 (gage height, 6.78 ft).
1907-24, 1951 to April 1953: Discharge observed, 7,600 cfs June 9, 1909 (gage height, 8.15 ft, site and datum then in use), but flood in 1908, which destroyed gage, was larger.
Remarks.--Diversions above station into Two Medicine Canal for irrigation of about 10,000 acres below station. Flow affected by storage in Lower Two Medicine Lake (see p.140).

Mean discharge, in cubic feet per second,1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,360	2,510	895	11	1,440	2,120	696	21	1,540	1,200	352
2	1,210	2,660	904	12	1,240	2,190	680	22	1,450	1,080	316
3	1,220	3,420	904	13	1,130	2,360	672	23	1,290	1,010	284
4	1,290	5,790	904	14	1,130	2,190	664	24	1,390	958	239
5	1,620	4,210	859	15	1,150	1,980	632	25	1,990	895	218
6	1,990	3,110	805	16	1,170	1,770	551	26	3,630	850	210
7	2,240	2,790	769	17	1,160	1,620	506	27	2,950	814	191
8	2,260	2,980	744	18	1,280	1,550	454	28	2,550	796	179
9	1,850	2,480	744	19	1,630	1,440	415	29	2,660	886	165
10	1,670	2,320	720	20	1,840	1,340	380	30	2,960	868	152
								31	2,640	-	142
Monthly mean discharge, in cubic feet per second									1,770	2,006	527
Runoff, in acre-feet									108,900	119,400	32,420
Runoff, in inches									6.46	7.08	1.92

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 23			May 29			June 3		N	4.77	2,790
12	3.59	1,250	4	4.57	2,520	9	4.75	2,760	6	4.66	2,620
	May 24		8	4.59	2,540	N	4.85	2,920	12	4.79	2,820
6	3.64	1,300	N	4.56	2,500	2	4.99	3,150		June 8	
N	3.70	1,360	4	4.67	2,660	3	5.15	3,420	7	5.06	3,270
6	3.84	1,520	12	4.99	3,190	6	5.45	3,960	N	4.94	3,070
12	3.84	1,520		May 30		9	5.89	4,790	6	4.80	2,840
	May 25		2	5.00	3,190	12	6.44	5,800	12	4.71	2,700
8	4.03	1,760	N	4.80	2,860		June 4			June 9	
4	4.24	2,050	6	4.82	2,890	4	6.75	6,460	N	4.55	2,460
12	4.75	2,810	12	4.81	2,870	5	6.78	6,520	8	4.46	2,320
	May 26			May 31		9	6.68	6,320	12	4.49	2,360
4	5.36	3,830	2	4.81	2,870	N	6.55	6,060		June 10	
7	5.62	4,320	N	4.64	2,600	7	6.06	5,100	8	4.53	2,420
N	5.20	3,550	8	4.54	2,460	12	5.84	4,700	8	4.37	2,190
3	5.14	3,440	12	4.58	2,520		June 5		12	4.40	2,230
6	5.19	3,530		June 1		6	5.70	4,510		June 11	
12	5.14	3,440	4	4.65	2,620	N	5.57	4,320	6p	4.26	2,030
	May 27		6	4.64	2,600	6	5.37	3,890	12	4.37	2,190
6	5.00	3,200	6	4.50	2,400	12	5.20	3,550		June 12	
N	4.80	2,870	8	4.50	2,400		June 6		4a	4.42	2,260
8	4.65	2,640	12	4.63	2,590	8	5.03	3,220	6p	4.30	2,090
12	4.69	2,700		June 2		N	4.93	3,050	12	4.43	2,280
	May 28		3	4.75	2,780	4	4.86	2,940		June 13	
3	4.72	2,740	6	4.75	2,780	8	4.80	2,840	2	4.50	2,380
8	4.64	2,620	6	4.61	2,560	12	4.81	2,860	2p	4.52	2,410
4	4.52	2,440	9	4.60	2,540		June 7		6	4.44	2,290
8	4.48	2,380	12	4.63	2,590	3	4.85	2,920	12	4.45	2,300
12	4.54	2,470				6	4.82	2,870			

Badger Creek near Browning, Mont.

Location.--Lat 48°21'00", long 112°50'20", in NE¼ sec. 24, T. 30 N., R. 10 W., on right bank just upstream from point of diversion to Four Horns Canal, 15 miles above mouth and 17 miles southeast of Browning.
Drainage area.--133 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,600 cfs and extended to peak stage. Shifting-control method used May 1-24.
Maxima.--May-July 1953: Discharge, 4,220 cfs 4 a.m. June 4 (gage height, 6.28 ft).
1951 to April 1953: Discharge, 1,350 cfs June 16, 1951 (gage height, 4.92 ft).
Remarks.--Water diverted into Four Horns Canal at station for irrigation of about 6,000 acres below station. Daily figures do not include flow in canal; monthly figures are combined flow. Diversions into Four Horns Canal are listed below:

Month	Mean Cubic feet per second	Runoff (acre-feet)
May---------	1.36	84
June--------	1.83	109
July--------	18.1	1,110

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	416	1,410	661	11	505	1,440	440	21	685	684	250
2	380	1,610	617	12	440	1,690	434	22	631	653	240
3	356	2,350	610	13	416	1,820	410	23	569	693	224
4	386	3,560	596	14	434	1,460	386	24	642	638	224
5	505	2,280	540	15	446	1,250	368	25	959	596	218
6	709	1,670	519	16	505	1,120	333	26	1,480	589	218
7	864	1,620	505	17	533	1,110	310	27	1,220	561	208
8	837	1,780	486	18	624	1,050	282	28	1,130	575	200
9	669	1,360	479	19	793	911	272	29	1,190	677	190
10	568	1,330	466	20	864	798	266	30	1,420	661	177
								31	1,360	-	168
Monthly mean discharge, in cubic feet per second									728	1,266	383
Runoff, in acre-feet									44,770	75,340	23,520
Runoff, in inches									6.31	10.62	3.32

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 22			May 31			June 5			June 13	
12	3.94	589	N	4.72	1,330	N	5.30	2,220	4a	5.14	1,960
	May 23		6	4.65	1,240	7	5.14	1,960	7p	4.96	1,680
N	3.90	568	12	4.78	1,410	12	5.10	1,900	12	4.99	1,720
7	3.87	547		June 1			June 6			June 14	
12	3.92	582	4	4.80	1,440	N	4.92	1,610	6p	4.67	1,270
	May 24		N	4.72	1,330	6	4.85	1,510	12	4.77	1,400
6	3.96	617	5	4.68	1,280	12	4.96	1,680		June 15	
N	4.00	645	12	4.98	1,710		June 7		5p	4.56	1,140
7	4.02	661		June 2		2	4.98	1,710	12	4.64	1,230
12	4.10	725	4a	5.02	1,770	4	4.98	1,710		June 16	
	May 25		6p	4.82	1,470	2	4.84	1,500	1p	4.49	1,080
2	4.16	776	9	4.82	1,470	6	4.83	1,480	6	4.45	1,040
N	4.28	882	12	4.86	1,520	12	5.10	1,900	12	4.53	1,120
4	4.39	981		June 3			June 8			June 17	
8	4.58	1,160	6	5.00	1,740	3	5.15	1,980	3a	4.55	1,140
12	4.81	1,450	N	5.24	2,120	N	5.03	1,790	4p	4.46	1,050
	May 26		2	5.38	2,360	12	4.86	1,520	8	4.52	1,100
3a	4.93	1,630	4	5.45	2,490		June 9		10	4.58	1,160
5p	4.77	1,400	7	5.72	3,000	6p	4.65	1,240	12	4.60	1,180
12	4.74	1,360	10	5.99	3,580	12	4.72	1,330		June 18	
	May 27		12	6.15	3,930		June 10		2	4.60	1,180
4p	4.53	1,120		June 4		5	4.77	1,400	1	4.46	1,050
12	4.62	1,210	1	6.25	4,150	4	4.63	1,220	2	4.37	963
	May 28		2	6.15	3,930	7	4.67	1,270	6	4.35	945
6	4.60	1,180	3	6.15	3,930	12	4.86	1,520	12	4.40	990
5	4.48	1,070	4	6.28	4,220		June 11			June 19	
12	4.52	1,100	7	6.20	4,040	4p	4.70	1,300	N	4.30	900
	May 29		9	6.15	3,900	6	4.72	1,330	12	4.25	855
N	4.56	1,140	N	6.00	3,600	12	5.05	1,820			
12	4.75	1,370	6	5.75	3,060		June 12				
	May 30		12	5.64	2,840	2	5.07	1,850			
6	4.75	1,370				N	4.89	1,570			
6	4.80	1,440				3	4.85	1,510			
12	4.86	1,520				5	4.85	1,510			
						12	5.14	1,960			

Cut Bank Creek at Cut Bank, Mont.

Location.--Lat 48°38'00", long 112°20'40", in NE¼ sec. 11, T. 33 N., R. 6 W., on right bank at highway bridge half a mile west of Cut Bank and 12 miles upstream from confluence with Two Medicine River.
Drainage area.--971 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,400 cfs and extended to peak stage. Shifting-control method used June 23 to July 31.
Maxima.--May-July 1953: Discharge, 5,640 cfs 2 p.m. June 8 (gage height, 8.46 ft).
1905-19, 1922-24, 1951 to April 1953: Discharge observed, 8,810 cfs June 5, 1908 (gage height, 10.0 ft, site and datum then in use), from rating curve extended above 1,200 cfs.
Remarks.--Few minor diversions for irrigation of hay meadows above station. Natural flow of stream affected by water from Two Medicine Canal which irrigates land above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	846	1,110	618	11	560	1,330	421	21	702	822	279
2	662	1,140	596	12	495	1,190	408	22	608	668	258
3	555	2,500	565	13	421	1,220	394	23	505	591	229
4	515	3,970	550	14	395	1,380	390	24	442	575	208
5	510	2,490	545	15	372	1,430	394	25	543	565	205
6	580	2,100	480	16	380	1,160	390	26	789	525	217
7	702	1,670	445	17	394	1,010	358	27	1,130	535	220
8	792	3,860	430	18	394	935	324	28	1,300	530	202
9	816	3,100	430	19	440	928	296	29	1,070	596	191
10	674	1,840	430	20	586	948	286	30	1,080	635	182
								31	1,240	-	171
Monthly mean discharge, in cubic feet per second									661	1,378	358
Runoff, in acre-feet									40,640	82,020	22,040
Runoff, in inches									0.78	1.58	0.43

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 23			May 31		1	7.52	4,230	2	6.27	2,740
12	3.31	465	2	4.58	1,190	3	7.30	3,920	6	6.11	2,560
	May 24		9	4.74	1,310	7	6.75	3,260	12	6.00	2,440
5p	3.28	421	11	4.74	1,310	10	6.43	2,910		June 10	
12	3.35	455	8	4.60	1,200	12	6.29	2,760	8	5.51	1,950
	May 25		12	4.58	1,190		June 5		4	5.15	1,630
N	3.51	535		June 1		3	6.14	2,590	8	5.02	1,530
12	3.72	646	8p	4.36	1,040	7	6.07	2,520	12	4.95	1,470
	May 26		12	4.42	1,080	3	6.02	2,460		June 11	
7p	4.09	864		June 2		12	5.89	2,330	4	4.87	1,410
9	4.17	916	3	4.45	1,100		June 6		N	4.77	1,330
12	4.24	961	7	4.56	1,180	N	5.66	2,100	10	4.62	1,220
	May 27		11	4.50	1,140	12	5.42	1,870	12	4.60	1,200
N	4.50	1,140	N	4.55	1,170		June 7			June 12	
12	4.68	1,260	2	4.55	1,170	5p	5.06	1,560'	4p	4.58	1,190
	May 28		12	4.45	1,100	7	5.04	1,540	7	4.59	1,200
8	4.80	1,360		June 3		10	5.08	1,570	12	4.55	1,170
N	4.80	1,360	9	4.87	1,410	12	5.16	1,640		June 13	
6	4.69	1,270	N	5.17	1,650		June 8		6	4.56	1,180
12	4.55	1,170	4	5.74	2,180	2	5.57	2,010	4	4.67	1,260
	May 29		5	6.23	2,690	5	6.05	2,500	12	4.68	1,260
6	4.45	1,100	6	7.38	4,030	7	6.40	2,880		June 14	
5	4.37	1,050	7	8.24	5,280	8	6.68	3,190	4	4.69	1,270
9	4.32	1,010	8	8.23	5,270	11	6.98	3,540	N	4.82	1,370
12	4.32	1,010	9	8.25	5,300	N	7.80	4,620	12	5.06	1,560
	May 30		12	8.06	5,000	1	8.35	5,460		June 15	
7	4.35	1,030		June 4		2	8.46	5,640	2	5.06	1,560
2	4.43	1,090	3	7.68	4,450	3	8.40	5,540	2	4.88	1,420
12	4.56	1,180	5	7.57	4,300	8	7.78	4,590	12	4.67	1,260
			8	7.66	4,420	12	7.73	4,520		June 16	
			11	7.61	4,350		June 9		N	4.52	1,150
						2	7.55	4,270	6	4.47	1,110
						6	6.96	3,510	12	4.38	1,050
						11	6.44	2,920		June 17	
									10a	4.33	1,020
									12	4.22	948

Marias River near Shelby, Mont.

Location.--Lat 48°26', long 111°53', in SE¼ sec. 20, T. 31 N., R. 2 W., on left bank 200 ft downstream from bridge on U. S. 91, 7 miles south of Shelby, and 24 miles downstream from Cut Bank Creek.
Drainage area.--2,610 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 25 to June 4.
Maxima.--May-July 1953: Discharge, 21,900 cfs 2 a.m. June 5 (gage height, 12.77 ft). 1902-8, 1911 to April 1953: Discharge, 40,000 cfs June 18, 1948 (gage height, 17.75 ft, from floodmark), but may have been exceeded in June 1908 (no record available).
Remarks.--Diversions for irrigation of about 65,000 acres of which about 15,000 acres are below the station. Flow affected for four reservoirs (see p. 141).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,450	7,400	3,130	11	3,130	7,880	2,120	21	3,900	4,550	1,210
2	2,950	8,040	3,120	12	2,770	7,460	2,040	22	3,480	3,950	1,140
3	2,550	11,400	3,040	13	2,550	7,740	1,980	23	3,140	3,580	1,040
4	2,430	19,800	2,920	14	2,350	8,000	1,910	24	2,820	3,460	949
5	2,550	19,600	2,880	15	2,300	7,320	1,810	25	3,490	3,330	886
6	3,100	13,900	2,720	16	2,330	6,500	1,750	26	6,310	3,060	872
7	3,780	10,900	2,550	17	2,400	5,940	1,620	27	8,630	3,000	879
8	4,220	11,800	2,350	18	2,500	5,560	1,450	28	7,660	2,880	830
9	4,160	12,800	2,250	19	2,830	5,310	1,330	29	6,850	2,920	774
10	3,600	9,190	2,180	20	3,680	5,020	1,250	30	7,630	3,200	739
								31	7,970	-	684
Monthly mean discharge, in cubic feet per second									3,921	7,516	1,755
Runoff, in acre-feet									241,100	447,300	107,900
Runoff, in inches									1.73	3.21	0.78

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 18		12	8.17	8,350	12	10.47	14,600	2	10.53	15,000
12	5.46	2,680		May 28			June 4		4	10.49	14,900
	May 19		6	8.02	7,990	6	11.92	19,300	6	10.35	14,500
5	5.51	2,760	N	7.81	7,480	8	12.25	20,300	N	9.77	12,900
4	5.50	2,740	6	7.77	7,390	10	12.27	20,400	6	9.12	11,200
12	5.87	3,300	12	7.71	7,240	N	12.37	20,700	12	8.73	10,200
	May 20			May 29		1	12.30	20,400		June 10	
9	5.97	3,450	6	7.56	6,890	4	12.39	20,700	6	8.49	9,620
4	6.23	3,880	N	7.45	6,640	6	12.35	20,500	N	8.27	9,080
8	6.35	4,090	2	7.44	6,620	8	12.55	21,100	6	8.12	8,710
12	6.35	4,090	6	7.52	6,800	9	12.67	21,500	12	8.02	8,470
	May 21		12	7.59	6,960	12	12.72	21,700		June 11	
8	6.26	3,930		May 30			June 5		6	7.82	7,990
6	6.20	3,830	6	7.62	7,030	2	12.77	21,900	N	7.70	7,700
12	6.14	3,730	N	7.87	7,630	3	12.75	21,800	6	7.73	7,770
	May 22		6	8.12	8,230	4	12.57	21,200	12	7.68	7,650
4p	5.90	3,340	9	8.16	8,320	6	12.49	20,900		June 12	
8	5.94	3,400	12	8.11	8,200	7	12.52	21,000	6	7.55	7,340
12	5.92	3,370		May 31		N	12.22	20,000	10	7.48	7,170
	May 23		3	8.04	8,030	6	11.62	18,100	N	7.48	7,170
N	5.75	3,120	6	8.00	7,940	12	11.15	16,700	6	7.67	7,630
12	5.63	2,940	N	8.00	7,940		June 6		12	7.75	7,820
	May 24		6	8.01	7,960	6	10.62	15,200		June 13	
6	5.57	2,840	12	7.99	7,910	N	10.06	13,700	6	7.67	7,630
N	5.50	2,740		June 1		6	9.58	12,400	9	7.62	7,510
4	5.49	2,730	6	7.82	7,510	12	9.27	11,600	N	7.61	7,480
6	5.52	2,770	N	7.69	7,190		June 7		2	7.64	7,560
12	5.64	2,950	3	7.65	7,100	4	9.10	11,200	6	7.78	7,890
	May 25		6	7.69	7,190	6	9.11	11,200	12	7.90	8,180
6	5.77	3,140	8	7.70	7,220	8	9.13	11,200		June 14	
N	6.01	3,520	9	7.82	7,510	N	9.03	11,000	4	7.90	8,180
4	6.05	3,580	12	7.81	7,480	2	8.95	10,800	6	7.88	8,130
12	6.42	4,250		June 2		6	8.90	10,600	N	7.80	7,940
	May 26		3	7.77	7,390	9	8.83	10,500	6	7.79	7,920
3	6.77	4,970	6	7.80	7,460	12	8.84	10,500	12	7.74	7,800
6	6.97	5,430	9	7.78	7,410		June 8			June 15	
N	7.29	6,180	N	7.85	7,580	2	8.84	10,500	6	7.62	7,510
6	7.72	7,220	6	8.22	8,470	4	8.94	10,800	N	7.51	7,240
12	8.22	8,470	12	8.82	9,970	6	8.94	10,800	6	7.47	7,150
	May 27			June 3		N	9.20	11,400	12	7.37	6,920
2	8.31	8,680	2	8.95	10,300	3	9.36	11,900		June 16	
6	8.31	8,680	6	8.97	10,400	6	9.66	12,600	6	7.24	6,640
N	8.31	8,680	10	8.95	10,300	12	10.39	14,600	N	7.13	6,420
6	8.28	8,610	N	9.10	10,700		June 9		6	7.10	6,360
10	8.25	8,540	6	9.67	12,300	1	10.48	14,800	12	7.04	6,250

Marias River near Shelby, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	June 17			June 20			June 25			June 29	
6	6.94	6,060	N	6.38	5,040	N	5.36	3,330	N	5.05	2,860
N	6.83	5,850	12	6.26	4,830	12	5.27	3,180	6	5.11	2,940
6	6.82	5,840		June 21			June 26		12	5.25	3,160
12	6.76	5,730	N	6.10	4,560	N	5.17	3,040		June 30	
	June 18		12	5.91	4,240	6	5.14	2,990	6	5.34	3,290
6	6.67	5,570		June 22		12	5.17	3,040	N	5.24	3,140
N	6.62	5,480	N	5.72	3,910		June 27		5	5.23	3,120
6	6.67	5,570	12	5.62	3,740	3	5.21	3,100	7	5.29	3,220
12	6.66	5,550		June 23		N	5.13	2,980	12	5.29	3,220
	June 19		N	5.49	3,530	12	5.11	2,940			
6	6.57	5,390	12	5.48	3,520		June 28				
N	6.49	5,240		June 24		8	5.09	2,920			
6	6.49	5,240	N	5.41	3,410	6	5.02	2,820			
12	6.45	5,170	12	5.46	3,490	12	5.04	2,850			

Marias River near Brinkman, Mont.

Location.--Lat 48°16', long 110°42', in SE¼SE¼ sec. 17, T. 29 N., R. 8 E., on left bank 4 miles southwest of Brinkman post office and 11 miles downstream from Cottonwood Creek.
Drainage area.--6,400 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1 to June 2, June 11 to July 1.
Maxima.--May-July 1953: Discharge, 28,100 cfs 6 a.m. June 5 (gage height, 16.28 ft).
1921 to April 1953: Discharge, 50,700 cfs June 19, 1948 (gage height, 21.0 ft, from floodmark).
Maximum discharge known, about 70,000 cfs (gage height about 24.0 ft, present datum), occurred during flood of 1908.
Remarks.--Diversions for irrigation of about 65,000 acres above station. Flow affected by four reservoirs (see p. 141).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,610	9,100	3,250	11	3,400	11,000	2,120	21	3,320	5,280	1,290
2	3,350	8,620	3,180	12	3,010	8,960	2,050	22	3,620	4,830	1,240
3	3,030	11,800	3,130	13	2,680	8,260	1,960	23	3,340	4,260	1,200
4	2,700	19,800	3,060	14	2,460	8,320	1,880	24	3,100	3,840	1,120
5	2,480	27,700	2,930	15	2,320	8,620	1,810	25	3,040	3,690	1,060
6	2,400	25,900	2,870	16	2,210	8,030	1,700	26	3,290	3,570	1,010
7	2,600	18,800	2,740	17	2,260	7,170	1,650	27	6,530	3,280	954
8	3,300	13,900	2,550	18	2,330	6,410	1,580	28	8,540	3,130	927
9	3,820	14,000	2,360	19	2,390	6,040	1,480	29	7,980	3,000	899
10	3,820	15,800	2,240	20	2,680	5,640	1,360	30	7,460	2,950	845
								31	8,200	-	772
Monthly mean discharge, in cubic feet per second									3,718	9,390	1,846
Runoff, in acre-feet									228,600	558,700	113,500
Runoff, in inches									0.67	1.64	0.33

Marias River near Brinkman, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 24			June 1			June 8			June 16	
12	6.84	3,080	9a	9.74	9,070	2	11.97	13,800	N	9.43	7,970
	May 25		12	9.71	9,000	6	11.99	13,900	8	9.35	7,820
N	6.80	3,010		June 2		9	12.04	14,000	12	9.28	7,660
12	6.84	3,080	6	9.62	8,740	N	12.26	14,600		June 17	
	May 26		2	9.49	8,390	3	12.17	14,400	N	9.01	7,130
8	6.84	3,060	7	9.57	8,520	8	11.84	13,500	12	8.83	6,750
3	7.01	3,350	12	9.64	8,670	12	11.68	13,100		June 18	
7	7.05	3,420		June 3			June 9		N	8.64	6,340
10	7.20	3,680	1	10.03	9,600	6	11.74	13,200	12	8.58	6,220
12	7.38	4,000	2	10.43	10,600	11	11.88	13,600		June 19	
	May 27		4	10.84	11,600	7	12.32	14,800	N	8.46	5,960
2	7.60	4,400	6	11.00	12,000	12	12.59	15,600	8	8.50	6,040
4	7.96	5,100	8	10.98	11,900		June 10		12	8.46	5,960
7	8.29	5,790	N	10.73	11,300	6	12.89	16,400		June 20	
N	8.73	6,750	4	10.61	11,000	11	12.99	16,700	N	8.28	5,580
6	9.11	7,630	6	11.16	12,400	3	12.89	16,400	12	8.20	5,430
12	9.43	8,360	10	11.53	13,400	6	12.62	15,700		June 21	
	May 28		12	11.77	14,200	12	11.79	13,400	N	8.12	5,280
3	9.51	8,520		June 4			June 11		7	8.07	5,180
7	9.58	8,690	7	12.94	17,200	6	11.16	11,800	12	8.05	5,140
11	9.55	8,620	N	13.41	18,500	N	10.73	10,700		June 22	
6	9.51	8,520	4	14.05	20,400	6	10.45	10,000	12	7.73	4,520
12	9.42	8,320	6	15.16	24,000	12	10.27	9,640		June 23	
	May 29		12	16.15	27,600		June 12		N	7.59	4,270
N	9.24	7,900		June 5		10	9.94	8,900	12	7.44	4,000
9	9.21	7,830	6	16.28	28,100	6	9.88	8,760		June 24	
12	9.19	7,790	1	16.16	27,600	12	9.75	8,480	5	7.37	3,860
	May 30		8	16.13	27,500		June 13		7	7.40	3,910
8	9.04	7,440	12	16.07	27,300	8	9.56	8,080	6	7.32	3,770
10	9.02	7,400		June 6		11	9.55	8,060	12	7.32	3,770
7	9.02	7,400	7	15.89	26,600	6	9.68	8,370		June 25	
12	8.97	7,280	4	15.58	25,500	12	9.69	8,390	N	7.28	3,690
	May 31		8	15.40	24,800		June 14		12	7.24	3,620
5	9.02	7,400	12	15.14	23,800	N	9.58	8,170		June 26	
2	9.34	8,130		June 7		12	9.73	8,550	N	7.22	3,570
4	9.49	8,480	5	14.63	22,000		June 15		8	7.17	3,480
5	9.74	9,070	9	14.08	20,100	8	9.78	8,690	12	7.29	3,690
7	9.81	9,240	6	12.66	15,800	4	9.76	8,670			
12	9.85	9,340	12	12.09	14,200	12	9.67	8,480			

Teton River near Farmington, Mont.

Location.--Lat 47°53', long 112°36', in NE¼NW¼ sec. 35, T. 25 N., R. 8 W., on left bank 300 ft downstream from highway bridge, 1½ miles downstream from South Fork Teton River, and 20 miles west of Farmington.
Drainage area.--111 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-4, 7-29, June 3, 4, 7-30.
Maxima.--May-July 1953: Discharge, 2,400 cfs 9 p.m. June 3 (gage height, 6.87 ft).
1947-53: Discharge, 2,780 cfs June 3, 1948 (gage height, 5.32 ft), from rating curve extended above 1,100 cfs; gage height observed, 7.34 ft Jan. 6, 1950 (ice jam).
Remarks.--Negligible diversions above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	211	1,090	644	11	297	1,330	510	21	390	828	338
2	214	1,170	620	12	274	1,620	503	22	346	750	320
3	208	1,820	620	13	262	1,850	503	23	366	732	308
4	205	2,040	612	14	262	1,520	496	24	454	750	290
5	211	1,600	573	15	274	1,400	482	25	638	669	296
6	251	1,490	566	16	279	1,220	447	26	805	628	278
7	284	1,620	552	17	279	1,260	410	27	768	604	255
8	288	1,620	545	18	297	1,240	392	28	748	604	249
9	284	1,350	545	19	356	1,120	380	29	812	538	244
10	292	1,300	524	20	414	952	362	30	1,070	612	228
								31	1,070	-	217
Monthly mean discharge, in cubic feet per second									416	1,178	429
Runoff, in acre-feet									25,600	70,070	26,400
Runoff, in inches									4.33	11.84	4.46

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 23		12	5.68	1,110		June 6			June 13	
12	4.65	396		June 1		10	5.60	1,500	5	5.87	1,880
	May 24		6	5.72	1,150	11	5.59	1,490	7	5.92	1,940
N	4.77	450	N	5.62	1,050	6	5.56	1,450	11	5.83	1,840
12	4.89	522	5	5.59	1,020	12	5.65	1,560	N	6.03	2,080
	May 25		12	5.75	1,180		June 7		2	5.80	1,800
N	4.99	575		June 2		5	5.67	1,600	4	5.85	1,860
4	5.08	638	11	5.64	1,070	N	5.64	1,560	11	5.70	1,680
9	5.35	859	N	5.86	1,290	12	5.80	1,750	12	5.77	1,760
12	5.34	850	4	5.70	1,130		June 8			June 14	
	May 26		10	5.78	1,210	8a	5.77	1,730	N	5.43	1,360
N	5.29	787	12	6.09	1,520	12	5.50	1,400	5	5.40	1,320
2	5.29	787		June 3			June 9		6	5.61	1,570
12	5.30	796	2	5.88	1,310	N	5.41	1,310	7	5.66	1,630
	May 27		4	6.18	1,620	2	5.46	1,370	12	5.58	1,540
5p	5.28	769	6	6.04	1,470	12	5.40	1,300		June 15	
12	5.19	696	7	6.34	1,790		June 10		N	5.44	1,380
	May 28		N	6.24	1,680	1	5.43	1,330	12	5.37	1,300
4	5.28	760	4	6.41	1,870	9	5.42	1,320		June 16	
2	5.26	744	6	6.53	2,000	3	5.36	1,250	N	5.27	1,190
4	5.27	752	8	6.64	2,130	12	5.41	1,310	3	5.25	1,170
12	5.27	752	9	6.87	2,400		June 11		4	5.21	1,130
	May 29		10	6.79	2,380	7	5.38	1,280	12	5.37	1,310
N	5.32	787	12	6.56	2,310	N	5.33	1,230		June 17	
8	5.39	850		June 4		3	5.32	1,220	N	5.28	1,200
10	5.50	949	5	6.36	2,210	4	5.47	1,390	12	5.37	1,310
12	5.52	967	8	6.40	2,240	8	5.47	1,390		June 18	
	May 30		3	5.95	1,890	12	5.65	1,610	N	5.30	1,230
7	5.64	1,070	7	5.89	1,830		June 12		12	5.27	1,190
2	5.65	1,080	12	5.82	1,760	10	5.55	1,490		June 19	
4	5.67	1,100		June 5		4	5.56	1,500	N	5.21	1,120
12	5.66	1,090	9	5.67	1,580	5	5.81	1,800	12	5.12	1,030
	May 31		11	5.65	1,560	12	5.87	1,870		June 20	
4	5.72	1,150	3	5.67	1,580				N	5.04	950
N	5.50	940	12	5.61	1,510				12	4.97	880
7	5.68	1,110								June 21	
									N	4.92	820
									12	4.89	790

Missouri River at Loma, Mont.

Location.--Lat 47°56', long 110°28', in lot 6, SE¼ sec. 8, T. 25 N., R. 10 E., on right bank at Loma, half a mile downstream from Marias River.
Drainage area.--34,100 sq mi, approximately.
Gage-height record.--Water-stage recorder graph except June 4 to 7 when a graph based on high-water mark in the well and readings of water surface from a temporary reference mark on walkway to gage house was used.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 66,000 cfs and extended to peak stage.
Maxima.--May-July 1953: Discharge, 121,000 cfs 10 a.m. to 2 p.m. June 5; gage height, 20.99 ft noon June 5, from high-water mark in well.
1935 to April 1953: Discharge, 92,000 cfs June 20, 1948 (gage height, 17.63 ft), from rating curve extended above 60,000 cfs by logarithmic plotting.
Remarks.--Diversions for irrigation of about 830,000 acres above station. Flow regulated by 12 reservoirs (see p. 140).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	10,600	44,600	18,200	11	10,500	47,600	9,620	21	10,600	31,100	7,300
2	10,000	41,900	18,600	12	10,700	41,700	8,610	22	12,400	28,600	6,360
3	8,980	55,600	18,100	13	10,100	40,600	8,000	23	11,800	20,900	6,880
4	8,420	109,000	17,200	14	9,620	40,900	8,600	24	11,200	19,400	6,620
5	8,270	119,000	17,100	15	9,040	40,900	7,920	25	14,000	20,700	6,180
6	7,880	111,000	17,000	16	8,800	38,600	7,920	26	24,000	20,600	5,980
7	8,240	90,200	15,900	17	8,320	36,200	8,980	27	28,900	18,900	5,600
8	8,820	66,200	14,000	18	8,020	33,600	7,750	28	29,900	17,500	6,200
9	9,660	56,500	11,800	19	9,030	31,800	6,840	29	29,900	17,400	5,660
10	9,840	54,000	10,400	20	9,600	32,000	6,910	30	35,700	17,500	5,820
								31	42,800	-	5,950
Monthly mean discharge, in cubic feet per second									14,050	44,820	9,935
Runoff, in acre-feet									864,100	2,667,000	610,900
Runoff, in inches									0.48	1.47	0.34

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 24		9	9.13	30,100	6	19.76	110,000	12	12.35	50,800
12	5.81	12,100	12	9.15	30,200	8	19.90	111,000		June 10	
	May 25			May 30		11	19.74	110,000	3	12.70	53,200
2	5.92	12,600	3	9.80	34,200	N	19.70	110,000	7	12.84	54,300
11	6.00	13,000	8	10.11	36,200	2	19.60	109,000	10	12.80	54,000
3	5.71	11,700	11	10.14	36,400	3	19.60	109,000	3	13.02	55,600
4	5.79	12,100	3	9.93	35,000	5	19.74	110,000	10	12.72	53,400
7	6.92	17,400	4	9.92	35,000	6	19.78	111,000	12	12.72	53,400
9	7.14	18,600	7	10.28	37,300	12	20.53	117,000		June 11	
12	7.04	18,000	10	10.40	38,100		June 5		3	12.61	52,600
	May 26		12	10.52	38,900	6	20.94	120,000	9	12.06	48,700
2	7.01	17,900		May 31		10	20.98	121,000	N	11.71	46,300
3	7.10	18,400	2	10.68	39,900	N	20.99	121,000	6	11.49	44,700
5	7.60	21,100	11	11.20	43,300	2	20.98	121,000	12	11.25	43,000
10	8.14	24,100	2	11.29	43,900	12	20.58	117,000		June 12	
1	8.16	24,300	7	11.30	44,000		June 6		8	11.10	42,000
3	8.34	25,300	10	11.45	44,900	2p	19.80	110,000	4	10.95	41,000
5	8.66	27,300	12	11.45	44,900	3	19.74	110,000	7	10.98	41,200
8	8.71	27,600		June 1		5	19.56	108,000	12	10.95	41,000
12	8.83	28,300	2	11.45	44,900	7	19.46	108,000		June 13	
	May 27		3	11.48	45,100	9	19.37	107,000	4	10.94	40,900
4	8.95	29,000	8	11.47	45,100	12	19.19	105,000	N	10.83	40,200
6	8.93	28,900	2	11.40	44,600		June 7		3	10.82	40,100
9	8.85	28,400	5	11.40	44,600	4	18.69	101,000	4	10.78	39,900
11	8.85	28,400	12	11.19	43,200	4	16.71	84,200	7	10.92	40,800
3	8.93	28,900		June 2		7	16.34	81,200	12	10.98	41,200
6	9.05	29,600	6	11.08	42,500	12	15.72	76,300		June 14	
9	8.93	28,900	N	11.02	42,100		June 8		4	10.88	40,500
10	8.93	28,900	9	10.79	40,600	6	15.09	71,200	9	11.00	41,300
12	9.06	29,700	12	10.79	40,600	3	13.99	62,900	11	10.98	41,200
	May 28			June 3		6	13.64	60,300	2	10.87	40,500
2	9.12	30,000	3	10.88	41,200	8	13.54	59,600	10	10.98	41,200
6	9.13	30,100	6	11.04	42,300	12	13.53	59,500	12	10.94	40,900
10	9.20	30,500	9	11.21	43,400		June 9			June 15	
2	9.08	29,800	10	11.31	44,000	4	13.48	59,100	2	10.84	40,300
6	9.09	29,800	11	11.50	45,200	10	13.09	56,200	4	10.87	40,500
12	9.00	29,300	N	11.87	47,700	11	13.11	56,300	6	11.00	41,300
	May 29		2	12.93	55,100	N	13.39	58,400	8	11.31	43,500
2	9.00	29,300	4	13.89	62,200	1	13.81	61,600	N	10.92	40,800
3	9.03	29,500	6	14.48	66,600	2:30	14.06	63,400	5	10.88	40,500
4	9.17	30,300	9	16.16	79,800	3	13.91	62,300	9	10.81	40,100
5	9.21	30,600	12	17.41	90,100	4	13.75	61,100	12	10.80	40,000
9	9.18	30,400		June 4		6	13.22	57,200			
N	9.06	29,700	3	18.39	98,400	8	11.77	46,700			
2	9.03	29,500	4	19.42	107,000	9	11.50	44,800			

Missouri River at Loma, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	June 16			June 19			June 22		N	7.69	20,400
10	10.69	39,300	11	9.54	31,800	3	9.23	29,800	4	7.32	18,400
N	10.49	38,000	4	9.46	31,300	6	9.09	28,900	6	7.43	19,000
2	10.44	37,700	6	9.51	31,600	11	9.15	29,300	8	7.52	19,500
7	10.49	38,000	12	9.48	31,400	2	8.99	28,200	10	7.72	20,600
12	10.32	36,900		June 20		4	9.01	28,400	12	7.67	20,300
	June 17		4	9.51	31,600	8	8.79	27,000		June 24	
9a	10.27	36,600	8	9.61	32,300	11	8.90	27,700	7	6.98	16,500
10p	10.08	35,300	3	9.61	32,300	12	8.70	26,500	10	7.43	19,000
12	10.00	34,800	12	9.50	31,600		June 23		N	7.57	19,700
	June 18			June 21		3	8.27	23,900	3	7.61	20,000
2	9.91	34,200	N	9.50	31,600	5	7.95	22,000	5	7.71	20,600
6	9.96	34,500	3	9.31	30,300	8	7.73	20,700	12	7.71	20,600
N	9.87	34,000	6	9.36	30,600						
3	9.82	33,600	12	9.27	30,100						
7	9.63	32,400									
12	9.65	32,500									

Judith River near Utica, Mont.

Location.--Lat 46°54', long 110°14', in NW¼ sec. 17, T. 13 N., R. 12 E., on left bank at Noel ranch, 3½ miles downstream from confluence of South and Middle Forks and 10 miles upstream from Utica.
Drainage area.--331 sq mi.
Gage-height record.--Water-stage recorder.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 400 cfs and extended to peak stage. Shifting-control method used May 1 to July 31.
Maxima.--May-July 1953: Discharge, 894 cfs noon June 4 (gage height, 5.17 ft).
1919 to April 1953: Discharge, 1,100 cfs May 25, 1942 (gage height, 5.56 ft), from rating curve extended above 500 cfs.
Remarks.--Few minor diversions for irrigation of hay meadows above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2.0	364	147	11	68	535	80	21	109	307	57
2	2.0	397	139	12	58	613	74	22	109	271	54
3	2.0	552	130	13	57	645	69	23	107	247	51
4	2.0	853	124	14	60	633	67	24	118	237	50
5	2.0	785	118	15	60	556	67	25	133	220	50
6	2.4	673	114	16	56	486	80	26	137	202	48
7	33	602	104	17	57	448	72	27	145	178	44
8	66	577	94	18	62	412	67	28	163	174	40
9	71	542	87	19	74	394	64	29	223	169	38
10	68	521	83	20	101	361	59	30	352	152	37
								31	355	-	37
Monthly mean discharge, in cubic feet per second									92.1	437	75.6
Runoff, in acre-feet									5,660	26,000	4,650
Runoff, in inches									0.32	1.47	0.26

Ross Fork near Hobson, Mont.

Location.--Lat 46°59', long 109°48', in NW¼ sec. 11, T. 14 N., R. 15 E., on left bank 1 mile downstream from Hauck Coulee, 3½ miles east of Hobson, and 7 miles upstream from mouth.
Drainage area.--330 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used during entire period.
Maxima.--May-July 1953: Discharge, 421 cfs, 9 to 10 a.m. June 5 (gage height, 5.71 ft). 1946 to April 1953: Discharge, 1,160 cfs Mar. 22, 1947 (gage height, 7.80 ft), from rating curve extended above 360 cfs by logarithmic plotting.
Remarks.--Small diversions for irrigation of hay meadows above station. Flow may be augmented by operation of Ackley Lake (see p. 141), which receives water from Judith River.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4.3	64	12	11	10	28	6.4	21	8.2	6.0	3.2
2	4.3	42	9.5	12	10	44	6.0	22	6.4	5.3	2.8
3	4.9	47	7.2	13	11	79	5.3	23	6.0	5.4	2.4
4	4.7	152	7.9	14	12	28	5.1	24	7.6	11	1.6
5	5.4	351	8.4	15	11	14	4.9	25	16	13	1.4
6	5.1	194	8.6	16	9.5	8.6	4.7	26	12	10	1.6
7	4.5	105	8.4	17	10	7.6	4.3	27	12	9.5	1.4
8	4.5	72	8.2	18	10	5.3	4.2	28	11	11	.9
9	5.1	49	7.6	19	9.2	5.3	3.4	29	35	13	.5
10	7.4	39	7.6	20	7.9	7.4	3.1	30	104	13	.4
								31	98	-	.6
Monthly mean discharge, in cubic feet per second									15.1	48.0	4.83
Runoff, in acre-feet									926	2,860	297
Runoff, in inches									0.05	0.16	0.02

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 28			June 1			June 5			June 11	
12	3.25	11	N	3.80	64	2	5.01	278	12	3.11	21
	May 29		12	3.59	49	6	5.57	389		June 12	
6	3.25	11		June 2		8	5.70	418	4p	3.02	17
10	3.43	19	1p	3.40	38	9	5.71	421	5	3.85	69
11	3.53	24	6	3.38	37	10	5.71	421	6	3.87	74
1	3.60	29	8	3.43	40	N	5.66	409	7	3.81	73
2	3.62	31	12	3.48	43	12	4.98	270	9	4.19	124
5	3.82	44		June 3			June 6		10	4.23	130
7	4.14	68	4	3.44	40	6a	4.72	222	11	4.16	120
12	4.32	89	10	3.41	38	12	4.25	132	12	4.22	128
	May 30		N	3.43	40		June 7			June 13	
2	4.36	96	6	3.60	53	6p	3.98	89	2	4.25	132
7	4.21	85	12	3.78	69	12	3.96	85	4	4.10	111
10	4.21	88		June 4			June 8		6	4.08	107
6	4.40	120	6	3.92	87	N	3.85	73	9	3.87	83
9	4.45	132	9	4.05	104	12	3.68	58	N	3.72	68
12	4.43	130	N	4.26	136		June 9		6	3.56	54
	May 31		5	4.75	222	12	3.41	40	12	3.39	42
N	4.11	91	9	4.79	232		June 10			June 14	
6	4.03	84	12	4.88	253	4a	3.39	38	6p	3.10	21
12	4.00	81				9a	3.46	42	12	3.04	18
						12	3.33	34			

Big Spring Creek near Lewistown, Mont.

Location.--Lat 47°01', long 109°21', in NW¼ sec. 5, T. 14 N., R. 19 E., on downstream side of left wing wall of highway bridge, half a mile downstream from Big Springs and 5 miles southeast of Lewistown.
Drainage area.--20 sq mi, approximately.
Gage-height record.--Observer's readings made three or four times weekly and graph through observer's readings and high-water mark May 23 to June 8.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 120 cfs and extended to peak stage.
Maxima.--May-July 1953: Discharge, 250 cfs 4 to 6 a.m. May 30 (gage height, 1.95 ft, from floodmark).
1932 to April 1953: Discharge observed, 226 cfs Mar. 25, 1951 (gage height, 0.76 ft).
Remarks.--City of Lewistown diverts water above station for municipal supply.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	99	127	116	11	97	130	107	21	106	117	106
2	99	124	114	12	97	124	108	22	106	116	106
3	99	156	113	13	97	123	109	23	113	116	106
4	99	195	113	14	100	122	109	24	112	116	106
5	97	156	113	15	103	121	109	25	125	116	106
6	95	143	113	16	103	120	109	26	124	116	106
7	96	141	112	17	103	119	109	27	114	116	106
8	96	141	110	18	103	118	109	28	117	117	106
9	97	138	109	19	104	118	108	29	161	117	105
10	97	135	108	20	106	117	106	30	226	116	107
								31	152	-	105
Monthly mean discharge, in cubic feet per second									111	128	109
Runoff, in acre-feet									6,830	7,600	6,680
Runoff, in inches											

Wolf Creek near Stanford, Mont.

Location.--Lat 47°07', long 110°17', in NE¼SE¼ sec. 26, T. 16 N., R. 11 E., on right bank half a mile below confluence of Dry Wolf and Running Wolf Creeks and 4 miles southwest of Stanford.
Drainage area.--118 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 52 cfs and extended on basis of velocity-area study.
Maxima.--May-July 1953: Discharge, 578 cfs (does not include an estimated 50 cfs in bypass channel on left bank) 1 p.m. June 4 (gage height, 4.51 ft).
1950 to April 1953: Discharge, 42 cfs June 6, 1952 (gage height, 2.50 ft); gage height, 2.87 ft Mar. 7, 1951 (backwater from ice).
Remarks.--Some regulation from a small dam a quarter of a mile upstream. Several diversions for irrigation of hay meadows above station.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4.6	5.2	42	11	3.9	282	20	21	4.1	160	14
2	3.0	5.8	36	12	3.5	332	18	22	4.1	119	14
3	3.4	64	33	13	3.7	353	18	23	3.9	100	13
4	3.5	478	33	14	3.9	353	16	24	4.6	97	12
5	3.7	405	30	15	3.9	310	13	25	3.5	80	13
6	3.7	307	28	16	3.5	279	14	26	3.0	60	13
7	3.7	250	25	17	4.1	282	15	27	4.3	48	12
8	3.7	225	23	18	3.9	282	16	28	4.3	44	10
9	3.7	205	21	19	3.5	259	15	29	5.5	49	9.0
10	3.7	200	21	20	4.3	220	14	30	6.6	52	7.2
								31	5.2	-	6.3
Monthly mean discharge, in cubic feet per second									4.00	197	18.5
Runoff, in acre-feet									246	11,710	1,140
Runoff, in inches									0.04	1.86	0.18

Missouri River at powerplant ferry, near Zortman, Mont.

Location.--Lat 47°44', long 108°56', in E½NE¼ sec. 30, T. 23 N., R. 22 E., on left bank at powerplant ferry, 5 miles downstream from Cow Creek and 22 miles southwest of Zortman. Datum of gage is 2,273.02 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area.--40,600 sq mi, approximately.
Gage-height record.--Water-stage recorder graph except May 24 to June 30 when a graph based on once-daily gage readings was used.
Discharge record.--Stage-discharge relation defined by current-meter measurements.
Maxima.--May-July 1953: Discharge, 137,000 cfs noon to 4 p.m. June 6; gage height, 22.20 ft, 2 to 4 p.m. June 6, from graph based on gage readings.
1934 to April 1953: Discharge, 93,200 cfs June 21, 1948 (gage height, 18.18 ft); gage height, 30.16 ft Mar. 19, 1947 (ice jam), from floodmark.
Remarks.--Diversions for irrigation of about 850,000 acres above station. Flow regulated by 12 reservoirs (see p. 140).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	10,900	53,500	22,000	11	10,900	62,100	12,400	21	10,300	35,500	7,740
2	11,900	51,700	22,600	12	11,000	54,300	11,500	22	11,100	34,000	8,100
3	11,400	50,100	22,500	13	11,700	50,200	10,900	23	12,800	31,300	7,170
4	10,300	80,600	21,600	14	11,200	48,200	8,480	24	14,000	29,200	7,390
5	9,400	124,000	20,400	15	10,800	47,200	10,400	25	15,700	27,900	7,540
6	8,880	136,000	20,200	16	10,100	45,900	9,520	26	18,200	27,000	6,880
7	8,990	126,000	20,200	17	9,740	42,100	8,930	27	25,300	26,600	6,710
8	8,480	100,000	18,900	18	9,550	40,200	9,750	28	31,000	26,200	6,270
9	9,660	74,300	16,900	19	8,340	37,600	10,100	29	38,200	25,400	6,610
10	10,500	64,800	14,500	20	10,000	35,300	7,280	30	43,000	23,800	6,440
								31	48,600	-	6,230
Monthly mean discharge, in cubic feet per second									15,220	53,700	12,130
Runoff, in acre-feet									936,100	3,195,000	746,100
Runoff, in inches									0.43	1.48	0.34

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 23			June 5			June 12			June 21	
12	6.37	13,400	N	21.10	127,000	8	12.70	54,600	6p	10.30	35,800
	May 24		4	21.50	130,000	N	12.52	53,200	12	10.28	35,600
12	6.67	14,700	10	21.80	133,000	12	12.38	52,000		June 22	
	May 25		12	21.88	134,000		June 13		N	10.06	34,000
12	7.10	16,700		June 6		6a	12.28	51,200	6	9.92	33,000
	May 26		4	21.96	135,000	6p	12.00	49,000	12	9.86	32,600
6p	7.50	18,800	8	22.08	136,000	12	11.97	48,800		June 23	
12	7.72	19,900	N	22.18	137,000		June 14		6a	9.83	32,400
	May 27		2	22.20	137,000	4a	11.96	48,700	6p	9.50	30,200
6p	9.20	28,300	4	22.20	137,000	2p	11.84	47,700	12	9.45	29,900
12	9.40	29,600	12	21.92	134,000	8	11.90	48,200		June 24	
	May 28			June 7		12	11.85	47,800	12	9.24	28,500
6p	9.70	31,500	N	21.08	127,000		June 15			June 25	
12	9.94	33,200	6	20.45	121,000	N	11.80	47,400	N	9.14	27,900
	May 29		12	19.60	113,000	6	11.70	46,600	12	9.02	27,200
6p	11.00	41,000		June 8		12	11.68	46,400		June 26	
12	11.14	42,100	N	18.10	99,900		June 16		12	8.95	26,800
	May 30		6	17.50	94,800	6	11.61	45,900		June 27	
6p	11.30	43,400	12	16.60	87,100	N	11.65	46,200	12	8.90	26,500
12	11.38	44,000		June 9		6	11.60	45,800		June 28	
	May 31		N	14.82	72,000	12	11.47	44,800	12	8.82	26,000
6p	12.26	51,100	6	14.40	68,400		June 17			June 29	
12	12.42	52,400	12	14.24	67,100	4a	11.28	43,200	12	8.62	24,800
	June 1			June 10		6p	11.00	41,000		June 30	
6p	12.66	54,300	8	14.20	66,700	12	10.97	40,800	6p	8.35	23,300
12	12.60	53,800	11	14.40	68,400		June 18		12	8.30	23,000
	June 2		3	13.25	59,000	12	10.80	39,500			
12	12.08	49,600	4	13.15	58,200		June 19				
	June 3		5	13.25	59,000	6a	10.71	38,800			
10a	11.92	48,400	6	13.90	64,200	6p	10.40	36,500			
6p	12.16	50,300	7	13.95	64,600	12	10.30	35,800			
12	12.77	55,200	12	13.80	63,400		June 20				
	June 4			June 11		6p	10.20	35,000			
N	15.72	79,600	6p	13.60	61,800	12	10.21	35,100			
12	18.98	108,000	12	13.32	59,600						

Musselshell River at Mosby, Mont.

Location.--Lat 47°00', long 107°54', in NW¼ sec. 11, T. 14 N., R. 30 E., on downstream side of highway bridge, half a mile west of Mosby and 6 miles downstream from Boxelder Creek.
Drainage area.--8,010 sq mi, approximately.
Gage-height record.--Wire-weight gage read twice daily. Gage heights computed from graph based on gage readings May 29, and May 31 to July 14.
Discharge record.--Stage-discharge relation defined by current-meter measurements.
Maxima.--May to July 1953: Discharge observed, 9,300 cfs 4 p.m. June 3 (gage height, 10.55 ft).
1929-32, 1934 to April 1953: Discharge, 18,000 cfs June 18, 1944 (gage height, 14.43 ft), from rating curve extended above 10,000 cfs.
Remarks.--Some regulation by Durand, Martinsdale, and Deadmans Basin Reservoirs with a combined capacity of 82,600 acre-ft.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	49	1,580	401	11	36	2,020	60	21	80	968	5.2
2	38	1,150	401	12	38	1,780	35	22	54	917	.8
3	35	4,110	324	13	32	1,760	28	23	25	975	.4
4	28	4,890	270	14	24	1,680	31	24	28	1,380	.3
5	17	1,640	245	15	18	2,000	25	25	28	1,080	.5
6	22	1,490	245	16	15	2,020	23	26	25	892	.2
7	56	1,880	214	17	16	1,880	19	27	15	738	.2
8	45	2,190	179	18	14	1,480	16	28	20	694	17
9	42	2,190	142	19	12	1,210	9.8	29	652	601	25
10	43	2,350	110	20	35	1,030	5.2	30	4,000	409	15
								31	1,600	-	8.0
Monthly mean discharge, in cubic feet per second									230	1,632	92.1
Runoff, in acre-feet									14,170	97,120	5,660
Runoff, in inches									0.03	0.23	0.01

Dry Creek near Van Norman, Mont.

Location.--Lat 47°21', long 106°22', in NW¼ sec. 3, T. 18 N., R. 42 E., on left bank 500 ft downstream from Little Dry Creek, 1.2 miles southeast of Van Norman, and 26 miles east of Jordan.
Drainage area.--2,530 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 10 to July 30.
Maxima.--May-July 1953: Discharge, 8,210 cfs 1:30 a.m. May 30 (gage height, 8.41 ft).
1939 to April 1953: Discharge, 24,600 cfs Mar. 21, 1947 (gage height, 13.39 ft); gage height, 15.26 ft Mar. 21, 1947 (ice jam).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	26	207	99	11	57	170	19	21	1.0	223	3.7
2	19	209	90	12	46	171	16	22	.5	150	3.3
3	52	746	128	13	57	289	14	23	.4	135	3.0
4	20	940	82	14	33	260	12	24	33	677	2.4
5	10	694	61	15	28	235	8.4	25	52	487	3.3
6	5.6	450	52	16	14	172	8.4	26	70	241	3.0
7	4.0	313	44	17	5.6	140	6.9	27	48	155	3.0
8	2.4	250	37	18	1.6	115	5.7	28	48	125	2.7
9	2.4	214	28	19	1.0	384	5.1	29	2,760	429	3.0
10	57	190	25	20	1.3	436	4.1	30	3,400	115	3.0
								31	406	-	92
Monthly mean discharge, in cubic feet per second									234	311	28.0
Runoff, in acre-feet									14,400	18,490	1,720
Runoff, in inches											

Fort Peck Reservoir at Fort Peck, Mont.

Location.--Lat 48°00'26", long 106°23'49", in sec. 14, T. 26 N., R. 41 E., in no. 4 emergency gate shaft of dam on Missouri River at Fort Peck, 2 miles downstream from Bear Creek, 9½ miles southwest of Nashua, and about 9½ miles upstream from Milk River. Datum of gage is at mean sea level, datum of 1929.

Drainage area.--57,725 sq mi.

Gage-height record.--Water-stage recorder graph. Elevations at 12 p.m. used to determine contents.

Maxima.--May-July 1953: Contents, 16,450,000 acre-ft July 12, 13 (elevation, 2,239.99 ft). 1937 to April 1953: Contents, 17,550,000 acre-ft July 15, 1948 (elevation, 2,244.80 ft).

Remarks.--Reservoir is formed by earth-fill dam; storage began in 1937; dam completed in 1939. Usable capacity, 18,800,000 acre-ft between elevations 2,095 ft (lowest outlet) and 2,250 ft (top of 25-foot gates). Elevation of crest of spillway, 2,225 ft. Dead storage below elevation 2,095 ft, 617,000 acre-ft. Figures given herein represent contents above elevation 2,095 ft. Water is stored to supplement low-water flow of Missouri River during navigation season. Elevations materially affected by wind. Elevations furnished by Corps of Engineers.

Elevation, in feet, and contents, in acre-feet, at 12 p.m. of indicated day

	May		June		July	
Day	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	2,221.62	12,630,000	2,225.38	13,360,000	2,238.88	16,200,000
2	2,221.62	12,630,000	2,225.89	13,460,000	2,239.01	16,230,000
3	2,221.61	12,630,000	2,226.62	13,610,000	2,239.18	16,260,000
4	2,221.60	12,630,000	2,227.13	13,710,000	2,239.36	16,300,000
5	2,221.58	12,630,000	2,227.94	13,870,000	2,239.49	16,330,000
6	2,221.54	12,620,000	2,229.05	14,100,000	2,239.59	16,360,000
7	2,221.50	12,610,000	2,230.18	14,330,000	2,239.68	16,380,000
8	2,221.47	12,600,000	2,231.20	14,540,000	2,239.75	16,390,000
9	2,221.46	12,600,000	2,231.93	14,700,000	2,239.83	16,410,000
10	2,221.49	12,610,000	2,232.62	14,840,000	2,239.93	16,430,000
11	2,221.53	12,630,000	2,233.08	14,940,000	2,239.98	16,440,000
12	2,221.58	12,630,000	2,233.60	15,050,000	2,239.99	16,450,000
13	2,221.61	12,630,000	2,234.24	15,180,000	2,239.98	16,440,000
14	2,221.64	12,640,000	2,234.67	15,280,000	2,239.97	16,440,000
15	2,221.67	12,640,000	2,235.04	15,360,000	2,239.97	16,440,000
16	2,221.70	12,650,000	2,235.40	15,430,000	2,239.92	16,430,000
17	2,221.72	12,650,000	2,235.77	15,510,000	2,239.85	16,410,000
18	2,221.72	12,650,000	2,236.03	15,570,000	2,239.81	16,400,000
19	2,221.71	12,650,000	2,236.38	15,650,000	2,239.76	16,390,000
20	2,221.70	12,650,000	2,236.70	15,720,000	2,239.72	16,380,000
21	2,221.72	12,650,000	2,236.93	15,770,000	2,239.66	16,370,000
22	2,221.74	12,660,000	2,237.18	15,820,000	2,239.58	16,350,000
23	2,221.74	12,660,000	2,237.50	15,890,000	2,239.49	16,330,000
24	2,221.93	12,690,000	2,237.76	15,950,000	2,239.34	16,300,000
25	2,222.12	12,730,000	2,237.85	15,970,000	2,239.20	16,270,000
26	2,222.25	12,750,000	2,238.01	16,000,000	2,239.09	16,240,000
27	2,222.53	12,810,000	2,238.18	16,040,000	2,239.02	16,230,000
28	2,222.80	12,860,000	2,238.38	16,090,000	2,238.93	16,210,000
29	2,223.63	13,020,000	2,238.54	16,120,000	2,238.81	16,180,000
30	2,224.38	13,170,000	2,238.70	16,160,000	2,238.68	16,150,000
31	2,224.90	13,270,000			2,238.55	16,120,000
Change in contents, acre-feet		+640,000		+2,890,000		-40,000

Missouri River below Fort Peck Dam, Mont.

Location.--Lat 48°02'30", long 106°21'10", in NW¼ sec. 6, T. 26 N., R. 42 E., on right bank about 2 miles upstream from Milk River, 6 miles south of Nashua and 8 miles downstream from Fort Peck Dam. Datum of gage is 2,020.00 ft above mean sea level, datum of 1929 (Corps of Engineers benchmark).
Drainage area.--57,800 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements except for period of backwater from Milk River May 26 to June 29 and from spillway operation July 13-30. Record of discharge from Fort Peck Reservoir as furnished by Corps of Engineers, Fort Peck District, used for these periods. Shifting-control method used May 1-25, June 30 to July 6.
Maxima.--May to July 1953: Daily discharge, 19,100 cfs July 25.
1934-April 1953: Discharge, 51,000 cfs (includes 32,000 cfs in flow from spillway 1 mile downstream from station) Aug. 8, 1946; gage height observed, 12.30 ft Mar. 10, 1936 (ice jam), site and datum then in use.
Remarks.--Flow completely regulated by Fort Peck Reservoir (see preceding page).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	10,700	3,280	4,720	11	8,270	3,180	5,690	21	10,600	3,920	12,900
2	10,700	3,230	4,250	12	7,190	3,350	6,290	22	9,670	3,980	14,000
3	10,400	3,350	4,390	13	6,900	4,150	7,080	23	9,570	3,470	16,100
4	10,800	3,360	3,980	14	8,390	2,860	10,000	24	8,880	3,680	18,000
5	10,600	3,700	3,400	15	10,300	4,610	10,900	25	6,410	3,580	19,100
6	11,700	3,370	3,810	16	9,640	4,770	11,500	26	7,110	3,850	18,400
7	11,300	2,910	4,760	17	9,840	3,320	13,000	27	4,600	3,360	18,000
8	12,700	3,140	5,190	18	11,500	4,390	13,000	28	4,990	3,740	16,800
9	11,300	3,120	5,100	19	11,600	4,990	13,000	29	4,500	3,550	18,000
10	10,300	3,130	5,230	20	10,900	4,600	12,000	30	2,890	4,570	19,000
								31	2,720	-	19,000
Monthly mean discharge, in cubic feet per second									8,935	3,684	10,860
Runoff, in acre-feet									549,400	219,200	667,600
Runoff, in inches									0.17	0.07	0.22

South Fork Milk River near International Boundary
(International gaging station)

Location.--Lat 49°00'50", long 112°32'20", in NW¼ sec. 6, T. 1., R. 19 W., fourth meridian, in Alberta, on left bank 1 mile north of international boundary, 19 miles upstream from mouth, and 20 miles west of Milk River, Alberta.
Drainage area.--433 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,300 cfs.
Maxima.--May-July 1953: Discharge, 4,600 cfs 11 a.m. June 4 (gage height, 5.70 ft).
1931 to April 1953: Discharge, 5,880 cfs June 18, 1948 (gage height, 6.83 ft), from rating curve extended above 1,300 cfs.
Remarks.--Several diversions for irrigation above station. This is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. Records collected and compiled jointly with the Water Resources Division, Department of Northern Affairs and National Resources, Canada.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	560	515	324	11	352	950	152	21	288	560	94
2	468	540	270	12	324	683	143	22	248	397	96
3	392	1,420	328	13	300	638	136	23	218	353	92
4	404	3,900	222	14	284	654	125	24	209	336	85
5	456	2,180	219	15	264	562	114	25	284	411	81
6	560	1,240	213	16	260	492	105	26	894	362	98
7	633	998	190	17	228	466	103	27	1,260	319	129
8	612	2,060	175	18	194	431	100	28	955	357	116
9	528	2,320	168	19	174	402	98	29	560	357	103
10	404	1,500	162	20	248	508	94	30	648	397	94
								31	780	-	87
Monthly mean discharge, in cubic feet per second									451	877	143
Runoff, in acre-feet									27,750	52,180	8,780
Runoff, in inches									1.20	2.26	0.38

South Fork Milk River near International Boundary--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 24			May 31			June 5			June 10	
12	1.51	212	6	2.64	866	6	4.10	2,470	6	3.43	1,700
	May 25		N	2.55	790	N	3.75	2,060	N	3.15	1,400
6	1.54	221	6	2.43	698	6	3.53	1,810	6	3.03	1,290
N	1.61	244	12	2.34	633	12	3.32	1,580	12	2.91	1,170
6	1.83	334		June 1			June 6			June 11	
9	1.91	370	6	2.22	553	6	3.13	1,380	6	2.78	1,060
12	2.17	522	N	2.14	504	N	2.96	1,220	N	2.65	940
	May 26		6	2.07	462	6	2.82	1,090	6	2.52	836
6	2.35	640	12	2.05	450	12	2.72	1,000	12	2.42	762
N	2.69	911		June 2			June 7			June 12	
6	2.93	1,150	3	2.10	480	6	2.63	924	6	2.35	714
12	3.01	1,230	6	2.06	456	N	2.65	940	N	2.29	674
	May 27		N	2.10	480	6	2.76	1,040	6	2.25	648
1a	3.04	1,260	6	2.39	668	12	2.92	1,180	12	2.22	628
6p	3.04	1,260	12	2.34	633		June 8			June 13	
12	3.01	1,230		June 3		2	3.03	1,290	6	2.21	622
	May 28		3	2.30	605	5	3.57	1,860	N	2.22	628
6	2.91	1,130	6	2.42	690	9	3.36	1,630	6	2.26	654
N	2.75	970	10	3.01	1,230	N	3.50	1,780	12	2.28	667
6	2.54	782	N	3.07	1,290	6	4.24	2,640		June 14	
12	2.36	647	6	3.56	1,820	10	4.46	2,930	6	2.27	660
	May 29		12	4.56	3,060	12	4.37	2,810	N	2.27	660
6	2.23	560		June 4			June 9		6	2.26	654
N	2.25	572	6	5.21	3,910	6	4.13	2,510	12	2.20	615
6	2.19	534	11	5.70	4,600	N	3.86	2,180		June 15	
12	2.14	504	N	5.67	4,560	6	3.85	2,170	6	2.16	591
	May 30		6	5.23	3,940	12	3.71	2,010	N	2.11	560
6	2.24	566	12	4.67	3,200				6	2.06	531
N	2.30	605							12	2.03	514
6	2.46	720									
12	2.68	902									

North Fork Milk River above St. Mary Canal, near Browning, Mont.
(International gaging station)

Location.--Lat 48°59', long 113°03', in NE¼ sec. 16, T. 37 N., R. 11 W., on left bank 1¼ miles upstream from outlet of canal, 2 miles south of international boundary, and 29 miles north of Browning.
Drainage area.--62 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 110 cfs and by slope-area measurement at gage height 7.55 ft; shifting-control method used May 9 to June 13.
Maxima.--May-July 1953: Discharge, 796 cfs 2 p.m. June 3 (gage height, 5.35 ft).
1911-12, 1921-April 1953: Discharge, 2,120 cfs Apr. 22, 1953 (gage height, 7.55 ft, from floodmarks in well), by slope-area determination.
Remarks.--This is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. Records collected and compiled jointly with the Water Resources Division, Department of Northern Affairs and National Resources, Canada.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	64	52	71	11	48.8	130	57	21	39.1	90	54
2	61	77	69	12	46.3	121	56	22	36.8	86	51
3	56	454	67	13	44.6	132	54	23	34.6	84	49.6
4	64	229	68	14	44.6	109	52	24	39.9	94	49.6
5	77	132	68	15	44.6	104	51	25	87	88	62
6	82	113	64	16	43.8	103	51	26	106	81	57
7	77	150	62	17	41.5	97	52	27	63	80	52
8	67	383	62	18	43.0	92	52	28	48.8	80	49.6
9	54	299	60	19	45.4	118	52	29	60	85	48.8
10	49.6	174	59	20	45.4	109	55	30	72	75	47.9
								31	50	-	46.3
Monthly mean discharge, in cubic feet per second									56.0	133	56.4
Runoff, in acre-feet									3,440	7,940	3,470
Runoff, in inches									1.04	2.40	1.05

North Fork Milk River above St. Mary Canal, near Browning, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 24			May 30			June 4			June 9	
12	1.54	44.6	3	1.86	74	3	3.68	342	6	3.93	396
	May 25		6	1.97	85	6	3.28	267	N	3.54	317
6	1.91	78	9	1.96	84	N	2.86	198	6	2.94	212
N	2.08	95	N	1.88	76	4	2.68	171	8	2.88	202
6	2.05	92	6	1.76	64	6	2.71	176	11	2.93	210
12	2.32	121	12	1.68	57	12	2.68	171	12	3.14	245
	May 26			May 31			June 5			June 10	
3	2.52	145	N	1.59	49.6	3	2.62	162	1	3.16	248
6	2.38	128	9	1.54	45.4	6	2.51	147	6	2.85	198
N	2.07	94	12	1.56	47.1	N	2.34	125	N	2.62	164
6	2.03	90		June 1		6	2.24	114	6	2.44	139
12	1.92	79	6	1.56	47.1	12	2.18	108	12	2.40	134
	May 27		N	1.56	47.1		June 6			June 11	
6	1.80	68	7	1.53	44.6	6	2.16	105	N	2.41	135
N	1.73	62	9	1.90	78	N	2.14	103	6	2.32	124
6	1.66	56	12	1.99	87	5	2.08	97	12	2.29	121
12	1.62	52		June 2		11	2.65	166		June 12	
	May 28		1	2.04	92	12	2.62	162	N	2.32	124
N	1.58	48.8	3	2.01	89		June 7		10	2.24	115
12	1.54	45.4	6	1.84	72	6	2.38	130	12	2.36	129
	May 29		N	1.71	60	N	2.21	111		June 13	
6	1.55	46.3	2	1.70	59	6	2.14	103	5a	2.55	154
N	1.80	68	6	1.88	76	9	2.41	134	8	2.53	151
2	1.86	74	12	2.18	106	12	2.94	210	6p	2.24	115
6	1.83	71		June 3			June 8		12	2.19	110
12	1.74	63	3	2.51	147	6	4.32	485			
			6	3.51	309	8	4.43	513			
			N	5.01	679	N	3.97	403			
			2	5.35	796	6	3.68	342			
			6	4.69	583	12	3.65	336			
			9	4.03	416						
			12	3.81	369						

St. Mary Canal at Hudson Bay divide, near Browning, Mont.

Location.--Lat 48°59', long 113°04', in sec. 5, T. 37 N., R. 11 W., on right bank 3 miles upstream from canal outlet and 30 miles north of Browning on Blackfeet Indian Reservation.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--May-July 1953: Discharge, 736 cfs 5 p.m. June 3 (gage height, 7.33 ft); daily discharge, 664 cfs June 3.
1917 to April 1953: Daily discharge, 758 cfs June 13, 1937.

Remarks.--This is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. Records collected and compiled jointly with the Water Resources Division, Department of Northern Affairs and National Resources, Canada.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	526	467	84	11	542	75	74	21	530	26.0	70
2	524	520	81	12	540	55	74	22	540	22.6	71
3	522	664	79	13	538	60	74	23	534	20.7	245
4	524	498	78	14	532	45.5	73	24	536	21.0	425
5	534	262	80	15	526	36.0	73	25	564	20.7	439
6	536	187	79	16	524	34.1	72	26	574	20.1	436
7	548	179	79	17	524	33.3	73	27	508	57	432
8	550	280	76	18	524	28.5	73	28	465	83	429
9	534	290	76	19	520	30.3	72	29	469	91	429
10	536	152	73	20	528	34.1	71	30	488	86	432
								31	472	-	436
Monthly mean discharge, in cubic feet per second									526	146	173
Runoff, in acre-feet									32,350	8,690	10,630
Runoff, in inches											

North Fork Milk River near International Boundary
(International gaging station)

Location.--Lat 49°02', long 112°58', in NE¼ sec. 11, T. 1 R. 23 W., fourth meridian, on left bank 50 ft downstream from highway bridge, 2 miles north of international boundary, 2 miles east of Whiskey Gap, Alberta, and 11 miles southeast of Kimball, Alberta.

Drainage area.--101 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 630 cfs and extended to peak stage on basis of slope-area determination at gage height 4.95 ft.

Maxima.--May-July 1953: Discharge, 1,680 cfs 10 a.m. June 3 (gage height 5.17 ft). 1909 to April 1953: Discharge, 2,170 cfs June 17, 1948 (gage height, 6.47 ft), from rating curve extended above 700 cfs.

Remarks.--Several small diversions for irrigation above station. This is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. Records collected and compiled jointly with the Water Resources Division, Department of Northern Affairs and National Resources, Canada.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	620	547	180	11	620	272	153	21	590	145	145
2	620	656	169	12	615	231	149	22	595	134	140
3	605	1,330	167	13	610	244	147	23	590	124	270
4	610	868	169	14	605	195	142	24	600	167	506
5	630	495	171	15	600	173	140	25	687	155	552
6	651	356	165	16	595	169	140	26	742	128	544
7	651	396	161	17	590	159	142	27	608	153	532
8	646	884	157	18	590	147	143	28	537	189	525
9	610	760	155	19	590	165	140	29	552	209	521
10	615	466	153	20	600	191	143	30	601	189	525
								31	545	-	525
Monthly mean discharge, in cubic feet per second									610	343	254
Runoff, in acre-feet									37,530	20,420	15,610
Runoff, in inches									6.97	3.79	2.90

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 24			May 31			June 5		N	3.95	798
12	3.65	615	N	3.49	541	N	3.26	483	9	3.55	598
	May 25		9	3.46	527	12	3.01	393	12	3.52	586
6	3.75	668	12	3.47	532		June 6			June 10	
N	3.79	690		June 1		N	2.87	347	5	3.57	607
6	3.82	706	N	3.47	532	8	2.80	325	N	3.18	454
12	3.91	756	6	3.40	523	12	2.96	377	6	2.92	364
	May 26		12	3.75	668		June 7		12	2.75	310
6	4.00	810		June 2		3	3.08	418		June 11	
N	3.89	744	3	3.70	640	7	3.04	404	6	2.67	287
6	3.81	700	4	3.83	712	9	3.08	418	N	2.62	273
12	3.76	673	N	3.67	625	N	3.01	394	6	2.55	254
	May 27		4	3.67	625	6	2.90	357	12	2.48	236
N	3.62	600	12	3.79	690	7	3.12	432		June 12	
12	3.53	558		June 3		8	2.91	360	N	2.48	236
	May 28		3	3.97	792	10	2.95	374	10	2.41	218
N	3.48	536	6	4.53	1,180	12	3.22	468	12	2.43	224
12	3.44	519	10	5.17	1,680		June 8			June 13	
	May 29		N	5.10	1,620	3	3.64	638	6	2.57	259
6	3.45	523	4	5.07	1,600	6	4.19	944	9	2.61	270
N	3.52	554	12	4.50	1,220	9	4.44	1,120	N	2.58	262
6	3.58	581		June 4		N	4.30	1,020	3	2.51	244
12	3.58	581	6	4.32	1,030	3	4.14	911	5	2.53	249
	May 30		N	4.00	825	12	4.06	861	10	2.38	211
6	3.61	595	6	3.76	695		June 9		12	2.38	211
N	3.68	630	12	3.60	620	3	4.05	855			
12	3.56	572				6	4.08	873			

Milk River at Milk River, Alberta
(International gaging station)

Location.--Lat 49°09', long 112°05', in SE¼ sec. 28, T. 2, R. 16 W., fourth meridian, on left bank 700 ft downstream from highway bridge at Milk River, Alberta, and 20 miles downstream from confluence of North and South Forks. Datum of gage is 3,402.78 ft above mean sea level (Geodetic Surveys of Canada datum).
Drainage area.--1,104 sq mi.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,700 cfs and extended to peak stage on basis of area-velocity study.
Maxima.--May-July 1953: Discharge, 7,200 cfs 9 p.m. June 4 (gage height, 9.41 ft).
1909 to April 1953: Discharge, 7,460 cfs May 22, 1927 (gage height, 11.41 ft), by slope-area determination.
Remarks.--Several diversions for irrigation above station. This is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. Records collected and compiled jointly with the Water Resources Division, Department of Northern Affairs and National Resources, Canada.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,580	1,230	653	11	1,080	2,190	375	21	911	923	227
2	1,360	1,110	571	12	1,050	1,470	364	22	904	731	232
3	1,260	2,770	520	13	1,020	1,200	343	23	879	642	222
4	1,190	5,980	480	14	975	1,160	321	24	848	618	258
5	1,220	4,900	469	15	923	1,020	295	25	898	713	520
6	1,280	2,630	463	16	898	879	269	26	1,280	719	589
7	1,380	1,760	441	17	873	817	263	27	1,990	618	595
8	1,380	2,620	419	18	854	762	258	28	1,810	624	595
9	1,300	4,620	397	19	842	713	243	29	1,300	677	577
10	1,160	3,480	381	20	867	725	232	30	1,190	689	566
								31	1,420	-	560
Monthly mean discharge, in cubic feet per second									1,159	1,633	410
Runoff, in acre-feet									71,250	97,170	25,190
Runoff, in inches									1.21	1.65	0.43

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 25			May 31			June 5			June 10	
12	3.25	949	6	3.86	1,360	6	8.39	6,010	6	6.59	3,940
	May 26		N	4.09	1,540	N	7.19	4,630	N	6.19	3,510
6	3.42	1,060	6	4.00	1,470	6	6.45	3,780	6	5.73	3,050
N	3.70	1,250	12	3.91	1,400	12	6.00	3,320	12	5.39	2,710
6	3.95	1,430		June 1			June 6			June 11	
12	4.38	1,790	6	3.77	1,300	6	5.63	2,950	6	5.11	2,450
	May 27		N	3.66	1,220	N	5.27	2,590	N	4.80	2,170
3	4.57	1,960	6	3.52	1,130	6	4.95	2,300	6	4.53	1,930
6	4.64	2,030	12	3.49	1,110	12	4.68	2,060	12	4.31	1,730
N	4.64	2,030		June 2			June 7			June 12	
6	4.60	1,990	6	3.46	1,090	6	4.46	1,860	6	4.14	1,580
12	4.59	1,980	N	3.45	1,080	N	4.29	1,710	N	3.97	1,450
	May 28		6	3.46	1,090	6	4.17	1,610	6	3.85	1,360
6	4.52	1,920	12	3.67	1,230	12	4.23	1,660	12	3.74	1,280
N	4.43	1,840		June 3			June 8			June 13	
6	4.29	1,710	6	4.13	1,570	6	4.49	1,890	6	3.69	1,240
12	4.09	1,540	N	5.35	2,670	9	4.68	2,060	N	3.62	1,190
	May 29		6	6.64	4,000	N	5.24	2,570	6	3.57	1,160
6	3.90	1,390	12	7.04	4,460	3	5.84	3,160	12	3.57	1,160
N	3.73	1,270		June 4		6	5.86	3,180		June 14	
6	3.61	1,190	6	7.88	5,420	12	6.56	3,900	6	3.60	1,180
12	3.62	1,190	9	8.23	5,820		June 9		9	3.62	1,190
	May 30		N	8.39	6,010	6	7.30	4,760	N	3.60	1,180
6	3.59	1,170	6	8.77	6,450	9	7.47	4,950	6	3.52	1,130
N	3.58	1,170	9	9.41	7,200	N	7.49	4,970	12	3.46	1,090
6	3.64	1,210	12	9.26	7,020	3	7.41	4,880		June 15	
12	3.69	1,240				6	7.19	4,630	6	3.42	1,060
						12	6.79	4,170	N	3.36	1,020
									6	3.29	975
									12	3.21	923

Milk River at eastern crossing of International Boundary
(International gaging station)

Location.--Lat 49°00'00", long 110°35'30", in NE¼ sec. 6, T. 37 N., R. 9 E., on right bank 400 ft south of international boundary, 500 ft downstream from Canada Coulee, 30 miles north of Rudyard, Mont., and 37 miles south of Many Berries, Alberta.
Drainage area.--2,514 sq mi.
Gage-height record.--Water-stage recorder graph except parts of June 6-9, 11-14, for which gage heights were partly estimated.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 2-27, June 16 to July 16.
Maxima.--May-July 1953: Discharge, 7,540 cfs 3 a.m. June 6 (gage height, 7.75 ft). 1909 to April 1953: Discharge, 9,530 cfs Mar. 31, 1952 (gage height, 9.34 ft), from rating curve extended above 2,600 cfs, but may have been higher on Mar. 28, 1952; maximum gage height, 13.65 ft Mar. 28, 1952 (ice jam).
Remarks.--Several diversions for irrigation above station.
Cooperation.--This is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. Records collected and compiled jointly with the Water Resources Division, Department of Northern Affairs and National Resources, Canada.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,310	1,840	760	11	1,410	4,230	424	21	987	875	290
2	1,840	2,060	740	12	1,250	2,780	410	22	941	862	287
3	1,490	2,280	740	13	1,120	2,020	396	23	981	1,030	276
4	1,400	5,330	640	14	1,090	1,580	372	24	948	849	273
5	1,260	7,010	565	15	1,050	1,380	344	25	1,010	760	290
6	1,220	6,410	526	16	1,010	1,290	316	26	1,020	740	207
7	1,290	3,270	500	17	974	1,160	298	27	1,480	836	373
8	1,460	2,820	487	18	915	1,050	292	28	2,330	811	565
9	1,560	4,310	470	19	895	981	292	29	2,210	702	604
10	1,540	5,630	443	20	1,050	935	292	30	2,100	734	593
								31	1,730	-	599
Monthly mean discharge, in cubic feet per second									1,351	2,219	443
Runoff, in acre-feet									83,050	132,000	27,260
Runoff, in inches									0.62	0.98	0.20

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 24			May 31			June 5			June 11	
12	2.64	1,120	2	3.35	1,840	5	7.53	6,950	6	5.75	4,640
	May 25		6	3.31	1,800	6	7.36	6,950	N	5.50	4,300
N	2.49	987	N	3.20	1,700	N	7.32	6,890	6	5.09	3,770
12	2.45	961	6	3.15	1,660	6	7.45	7,080	12	4.76	3,350
	May 26		12	3.14	1,650	12	7.62	7,340		June 12	
N	2.54	1,030		June 1			June 6		6	4.49	3,030
12	2.59	1,060	6	3.28	1,770	3	7.75	7,540	N	4.23	2,730
	May 27		N	3.38	1,860	6	7.71	7,480	6	4.03	2,510
6	2.66	1,130	6	3.45	1,920	9	7.67	7,420	12	3.85	2,320
8	2.84	1,320	12	3.53	2,000	N	7.38	6,980		June 13	
N	3.01	1,490		June 2		6	6.16	5,210	6	3.68	2,150
3	3.20	1,680	6	3.44	1,920	12	5.48	4,270	N	3.54	2,010
6	3.26	1,740	10	3.40	1,880		June 7		6	3.39	1,870
12	3.41	1,890	N	3.51	1,980	6	4.92	3,550	12	3.28	1,770
	May 28		2	3.72	2,190	N	4.58	3,140		June 14	
6	3.79	2,260	6	3.54	2,010	6	4.35	2,860	6	3.17	1,670
N	4.01	2,490	10	3.96	2,440	12	4.27	2,780	N	3.05	1,560
2	3.97	2,450	12	3.83	2,300		June 8		6	2.96	1,480
4	4.04	2,520		June 3		6	4.22	2,720	12	2.90	1,430
6	4.00	2,480	3	3.63	2,100	N	4.23	2,730		June 15	
12	3.85	2,320	6	3.44	1,920	6	4.32	2,830	6	2.85	1,390
	May 29		8	3.45	1,920	12	4.62	3,180	N	2.80	1,350
6	3.76	2,230	N	3.79	2,260		June 9		6	2.85	1,390
N	3.71	2,180	6	4.08	2,570	6	4.98	3,620	12	2.85	1,390
6	3.71	2,180	8	4.15	2,640	N	5.45	4,240			
12	3.72	2,190	12	4.01	2,490	4	5.98	4,960			
	May 30			June 4		6	6.03	5,030			
4	3.83	2,300	1	4.00	2,480	12	6.22	5,300			
6	3.78	2,250	2	4.11	2,600		June 10				
9	3.78	2,250	6	5.81	4,720	6	6.53	5,730			
N	3.66	2,130	N	6.60	5,830	N	6.68	5,940			
6	3.50	1,970	6	7.10	6,410	6	6.48	5,660			
12	3.30	1,790	12	7.45	6,860	12	6.04	5,050			

Milk River below Fresno Dam, near Havre, Mont.

Location.--Lat 48°36', long 109°57', in SE¼ sec. 19, T. 33 N., R. 14 E., in control works of Fresno Dam on Milk River, 15 miles west of Havre, and at mile 440. Datum of gage is at mean sea level (levels by Bureau of Reclamation).
Drainage area.--3,400 sq mi, approximately.
Gage-height record.--Gage read two or more times daily to half-tenths.
Discharge record.--Flow occurred over spillway May 28 to July 9, through outlet tunnel May 1-30, June 4-11, June 27 to July 31. Discharge for 12 p.m. and other scattered times taken from discharge hydrograph.
Maxima.--May-July 1953: Discharge observed, 6,060 cfs 4 p.m. June 6 (elevation, 2,578.5 ft), elevation observed, 2,578.75 ft 8 a.m. to noon June 7.
1940 to April 1953: Discharge observed, 6,500 cfs Apr. 3, 1952 (elevation, 2,579.35 ft).
Remarks.--Records furnished by Bureau of Reclamation. See page 142 for contents of Fresno Reservoir at selected dates.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	840	1,280	930	11	595	4,580	875	21	595	1,220	1,120
2	700	1,580	380	12	595	4,250	0	22	595	1,100	1,120
3	700	1,840	830	13	595	3,670	1,050	23	595	1,100	1,120
4	700	2,040	780	14	595	2,880	1,050	24	595	1,100	1,120
5	595	4,000	735	15	595	2,330	1,220	25	595	995	1,120
6	595	5,600	690	16	595	1,970	1,220	26	595	995	1,120
7	595	4,860	1,180	17	595	1,840	1,220	27	595	1,130	1,120
8	595	4,160	995	18	595	1,580	1,220	28	620	1,030	945
9	595	3,910	887	19	595	1,340	1,220	29	935	980	945
10	595	4,420	875	20	595	1,220	1,220	30	1,420	930	945
								31	1,050	-	945
Monthly mean discharge, in cubic feet per second									666	2,331	990
Runoff, in acre-feet									40,960	138,700	60,890
Runoff, in inches									0.23	0.76	0.34

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	June 4		N	78.45	5,960		June 9			June 11	
12	----	2,750	4	78.5	6,060	8	78.05	3,620	4	----	4,960
	June 5		10	----	4,720	4p	78.05	3,620	8	78.4	5,160
8	77.65	3,230	12	----	4,800	5	78.05	4,650	10	78.4	4,280
1	77.9	4,020		June 7		8	78.0	4,550	2	78.4	4,280
2	77.95	4,280	3	----	4,960	12	----	4,040	4	78.45	4,380
4	78.0	4,550	8	78.75	5,060		June 10		12	----	4,380
6	78.05	4,820	N	78.75	5,060	2	77.95	3,940		June 12	
8	78.1	5,260	6	78.6	4,720	8	78.05	4,120	8	78.45	4,380
10	78.15	5,360	12	----	4,440	10	78.05	4,480	4	78.35	4,180
12	----	5,450		June 8		3	78.15	4,660	12	----	4,020
	June 6		8	78.35	4,200	6	78.15	4,660		June 13	
4	78.3	5,660	N	78.35	4,200	8	78.2	4,760	8	78.2	3,880
9	78.35	5,760	4	78.3	4,100	10	78.2	4,760	4	78.0	3,500
			12	----	3,840	12	----	4,800	12	----	3,230

Note.--Add 2,500 ft to obtain elevation above mean sea level.

Big Sandy Creek near Assinniboine, Mont.

Location.--Lat 48°32', long 109°50', in SW¼SW¼ sec. 18, T. 32 N., R. 15 E., on right bank 2 miles northwest of Assinniboine, 7 miles upstream from mouth, and 16 miles downstream from Sage Creek.
Drainage area.--2,000 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements.
Maxima.--May-July 1953: Discharge, 714 cfs 3 to 5 a.m. June 6 (gage height, 6.56 ft).
1946 to April 1953: Discharge 5,570 cfs Apr. 3, 1952 (gage height, 14.70 ft, from floodmarks).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1.2	35	95	11	0.3	340	38	21	1.0	143	18
2	.9	103	93	12	.4	271	34	22	.5	135	18
3	.5	203	82	13	.4	222	28	23	.4	126	18
4	.4	412	72	14	.3	190	25	24	.8	114	20
5	1.2	533	65	15	.2	173	23	25	3.6	105	23
6	1.1	664	55	16	.2	154	23	26	3.8	98	22
7	.8	514	51	17	.2	135	22	27	6.0	102	22
8	.4	459	51	18	.2	131	20	28	11	98	20
9	.4	381	44	19	.1	156	19	29	8.0	96	18
10	.3	336	39	20	.3	150	18	30	10	95	18
								31	14	-	17
Monthly mean discharge, in cubic feet per second									2.22	222	35.8
Runoff, in acre-feet									137	13,240	2,200
Runoff, in inches									0.01	0.12	0.02

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 23			May 29			June 3		N	6.45	678
12	2.12	0.3	8a	2.56	6.2	5	3.99	145	6	6.28	625
	May 24		4	2.63	8.5	8	4.11	161	12	6.11	574
8	2.07	.3	12	2.72	12	2	4.50	222		June 7	
11	2.00	.3		May 30		4	4.60	238	5	5.97	533
1	2.00	.3	N	2.68	10	6	4.65	247	11	5.88	508
3	2.08	.3	12	2.65	8.5	8	4.73	261	6	5.83	494
5	2.24	.9		May 31		12	4.94	299	12	5.80	486
9	2.35	2.1	N	2.64	8.9		June 4			June 8	
12	2.38	2.5	1	2.66	9.7	1	4.97	305	11a	5.72	468
	May 25		2	2.70	11	2	5.01	312	12	5.51	418
N	2.46	3.9	4	2.83	19	5	5.11	332		June 9	
12	2.47	4.1	6	2.88	23	8	5.26	361	8	5.37	385
	May 26		12	2.87	22	1	5.59	437	2	5.32	374
4	2.49	4.4		June 1		4	5.79	486	12	5.24	357
8a	2.48	4.2	6	2.87	22	5	5.82	494		June 10	
12	2.40	2.8	11	3.03	34	6	5.84	500	4p	5.08	326
	May 27		5	3.08	38	8	5.81	491	12	5.07	324
10	2.38	2.5	7	3.15	45	12	5.71	465		June 11	
8	2.46	3.9	12	3.37	67		June 5		10	5.22	354
9	2.86	21		June 2		4	5.66	452	2	5.22	354
10	2.93	26	11	3.50	82	7	5.66	452	8	5.11	332
12	2.88	23	1	3.55	88	10	5.71	465	12	5.00	310
	May 28		2	3.62	96	1	5.86	502		June 12	
6	2.72	12	3	4.00	146	6	6.24	613	6	4.86	285
N	2.65	9.3	4	4.30	190	9	6.42	669	N	4.75	265
1	2.68	10	5	4.18	171	12	6.52	701	12	4.64	245
6	2.60	7.3	7	3.88	129		June 6				
12	2.57	6.5	8	3.84	124	3	6.56	714			
			9	3.84	124	5	6.56	714			
			12	3.88	129						

Milk River at Havre, Mont.

Location.--Lat 48°33'30", long 109°40'10", in SW¼SW¼ sec. 4, T. 32 N., R. 16 E., on right bank pier of former highway bridge on 7th Ave., East of Havre, just downstream from present mouth of Bullhook Creek, 15 miles downstream from Fresno Reservoir, and at mile 423. Datum of gage is 2,474.72 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--5,707 sq mi (determined by Corps of Engineers).

Stage record.--Staff gage read by Corps of Engineers as indicated.

Maxima.--May-July 1953: Discharge observed, about 6,900 cfs 10:20 p.m. June 6, (elevation, 2,477.65 ft).

1899-1952: Discharge, about 20,000 cfs Apr. 12, 1899 (elevation 2,480.24 ft, from floodmark) from rating curve extended above 5,200 cfs by logarithmic plotting.

Flood of June 9, 1908 reached an observed elevation of 2,477.94 ft; ice-affected flood of Mar. 12, 1916 reached on observed elevation of 2,478.17 ft; flood of Apr. 3, 1952 reached an observed elevation of 2,479.62 ft.

Remarks.--Some regulation by Fresno Reservoir since 1939. Discharge at Havre is approximately that of Milk River below Fresno Dam plus flow of Big Sandy Creek near Assiniboine.

Mean discharge, in cubic feet per second, 1953

June	6	6,370	June	10	5,000
	7	6,250		11	5,280
	8	5,440		12	4,790
	9	4,710			

Elevation, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Elevation	Discharge	Hour	Elevation	Discharge	Hour	Elevation	Discharge	Hour	Elevation	Discharge
	June 5			June 7			June 9			June 11	
7	74.2	3,870	4	77.45	6,650	6	75.43	4,840	6	76.03	5,320
N	74.7	4,260	8	77.22	6,380	N	75.25	4,700	N	76.22	5,480
4	75.2	4,660	N	77.00	6,160	6	75.00	4,500	2	76.22	5,480
8	75.85	5,180	4	76.83	6,000	9	74.87	4,400	6	75.85	5,180
12	76.30	5,540	8	76.78	5,950	12	75.42	4,840	8	75.72	5,080
	June 6		12	76.70	5,880		June 10		12	75.66	5,030
4	76.23	5,480		June 8		2	75.62	5,000		June 12	
8	77.07	6,230	6	76.39	5,610	6	75.62	5,000	6	75.58	4,960
N	77.38	6,570	N	76.20	5,460	10	75.48	4,880	N	75.43	4,840
2	77.51	6,720	6	75.94	5,250	N	75.47	4,880	6	75.16	4,630
6	77.62	6,870	12	75.66	5,030	2	75.54	4,930	12	74.90	4,420
10:20	77.65	6,900				6	75.69	5,050			
12	77.63	6,880				9	75.85	5,180			
						12	75.88	5,200			

Note.--Add 2,400 ft to obtain elevation above mean sea level.

Milk River at Nashua, Mont.

Location.--Lat 48°07'50", long 106°21'50", in NE¼NE¼ sec. 1, T. 27 N., R. 41 E., on right bank at downstream side of highway bridge, 0.6 mile southwest of Nashua, 5 miles upstream from Porcupine Creek, and at mile 24. Datum of gage is 2,027.71 ft above mean sea level, datum of 1929.
Drainage area.--23,300 sq mi, approximately.
Gage-height record.--Water-stage recorder graph except May 25 to June 26 when graph based on observers twice-daily wire-weight gage readings was used.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-controm method used May 31 to July 3, July 18-31.
Maxima.--May-July 1953: Discharge, 13,400 cfs 2 to 6 p.m. May 31; gage height, 25.50 ft 4 to 5 p.m. May 31, from graph based on observer's readings.
1939 to April 1953: Discharge, 45,300 cfs Apr. 18, 1952 (gage height, 31.38 ft).
Remarks.--Many diversions above station. Flow regulated by Fresno and Nelson Reservoirs (see p. 141).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	191	11,400	2,530	11	1,310	6,160	1,470	21	783	6,210	534
2	711	9,540	2,130	12	1,370	6,090	1,320	22	1,010	6,370	477
3	1,100	9,100	1,890	13	1,290	6,210	1,080	23	1,160	6,400	395
4	1,200	9,660	1,690	14	1,340	6,240	937	24	998	6,380	343
5	1,460	9,830	1,470	15	1,130	6,230	870	25	1,300	6,160	338
6	1,560	8,960	1,600	16	818	5,820	812	26	4,650	5,490	380
7	1,490	8,170	1,750	17	780	5,630	782	27	4,570	4,500	421
8	1,360	7,600	1,710	18	808	5,580	761	28	3,540	3,660	455
9	1,230	7,020	1,620	19	792	5,680	694	29	4,120	3,090	471
10	1,220	6,460	1,490	20	775	5,970	577	30	8,010	2,720	484
								31	12,800	-	471
Monthly mean discharge, in cubic feet per second									2,093	6,611	1,031
Runoff, in acre-feet									128,700	393,400	63,380
Runoff, in inches									0.10	0.32	0.05

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 24		10	12.72	3,710		June 2			June 10	
12	6.04	935	N	12.94	3,850	4	21.70	9,860	6	17.22	6,550
	May 25		2	13.24	4,050	8	21.40	9,640	N	17.08	6,450
5	6.00	925	4	13.60	4,280	N	21.22	9,500	6	16.95	6,360
8	6.02	930	6	14.02	4,550	4	21.03	9,360	12	16.82	6,270
N	6.42	1,040	8	14.50	4,870	8	20.88	9,250		June 11	
2	6.91	1,180	10	15.06	5,260	12	20.77	9,170	N	16.63	6,140
4	7.50	1,370	12	15.68	5,700		June 3		12	16.53	6,070
6	8.20	1,620		May 30		6	20.65	9,080		June 12	
8	8.88	1,850	2	16.16	6,030	N	20.61	9,050	8	16.52	6,060
10	9.69	2,160	4	16.50	6,270	6	20.66	9,080	6	16.60	6,120
12	10.58	2,510	6	16.90	6,550	12	20.87	9,240	12	16.67	6,160
	May 26		8	17.38	6,890		June 4			June 13	
2	11.50	2,970	10	17.94	7,280	3	21.08	9,400	8	16.75	6,220
4	12.40	3,500	N	18.58	7,740	6	21.28	9,550	2	16.76	6,230
6	13.13	3,970	2	19.26	8,240	9	21.44	9,670	12	16.72	6,200
8	13.67	4,330	4	20.00	8,800	N	21.47	9,690		June 14	
10	14.09	4,600	6	20.88	9,460	3	21.54	9,740	6	16.70	6,190
N	14.52	4,880	8	21.60	10,000	6	21.62	9,800	N	16.74	6,210
2	14.92	5,160	10	22.25	10,500	12	21.74	9,900	6	16.87	6,300
4	15.30	5,430	12	22.87	11,000		June 5		12	16.94	6,350
6	15.56	5,610		May 31		6	21.80	9,940		June 15	
9	15.65	5,680	2	23.45	11,400	N	21.75	9,900	2	16.94	6,350
12	15.58	5,630	4	24.02	12,000	6	21.56	9,760	8	16.88	6,310
	May 27		6	24.55	12,500	12	21.26	9,540	4	16.72	6,200
2	15.49	5,560	8	25.00	13,000		June 6		12	16.46	6,020
4	15.34	5,460	10	25.22	13,200	6	20.82	9,200		June 16	
6	15.08	5,280	N	25.37	13,300	N	20.44	8,920	N	16.10	5,770
8	14.62	4,950	2	25.45	13,400	6	20.13	8,690	4	16.05	5,730
10	14.21	4,680	4	25.50	13,400	12	19.87	8,490	6	16.07	5,740
N	13.85	4,440	5	25.50	13,400		June 7		12	16.02	5,710
2	13.54	4,240	6	25.48	13,400	6	19.62	8,300		June 17	
4	13.30	4,080	8	25.37	13,200	N	19.44	8,160	N	15.91	5,630
6	13.09	3,950	10	25.20	13,000	6	19.27	8,040	8	15.85	5,580
9	12.85	3,790	12	25.02	12,800	12	19.07	7,880	12	15.84	5,580
12	12.67	3,680		June 1			June 8			June 18	
	May 28		3	24.72	12,500	6	18.87	7,650	N	15.86	5,580
4	12.52	3,580	6	24.38	12,100	N	18.71	7,610	12	15.88	5,600
8	12.43	3,520	9	24.00	11,700	6	18.57	7,510		June 19	
N	12.42	3,510	N	23.59	11,300	12	18.35	7,360	N	15.97	5,650
6	12.40	3,500	3	23.14	11,000		June 9		12	16.17	5,820
12	12.41	3,510	6	22.72	10,600	6	18.12	7,190		June 20	
	May 29		9	22.38	10,400	N	17.88	7,020	N	16.44	5,980
4	12.47	3,550	12	22.06	10,100	6	17.63	6,840	12	16.63	6,110
8	12.58	3,620				12	17.41	6,690			

Milk River at Nashua, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	June 21			June 24			June 27			June 30	
N	16.78	6,210	8	17.08	6,400	N	14.37	4,490	10	10.86	2,730
12	16.92	6,300	4	17.05	6,380	6	13.97	4,250	4	10.64	2,650
	June 22		12	16.98	6,330	12	13.59	4,020	8	10.63	2,640
8	17.02	6,370		June 25			June 28		12	10.61	2,640
6	17.05	6,390	8	16.85	6,230	8	13.12	3,760		July 1	
12	17.08	6,410	4	16.68	6,110	4	12.70	3,530	6	10.54	2,610
	June 23		12	16.42	5,930	12	12.31	3,340	N	10.40	2,560
8	17.10	6,420		June 26			June 29		12	9.83	2,350
4	17.08	6,400	6	16.15	5,730	8	11.93	3,150		July 2	
10	17.05	6,380	N	15.82	5,500	4	11.60	3,010	8	9.40	2,190
12	17.05	6,380	6	15.47	5,250	12	11.26	2,880	4	9.02	2,050
			12	15.12	5,000				12	8.75	1,960

Wolf Creek near Wolf Point, Mont.

Location.--Lat 48°06', long 105°41', near center of N½ sec. 17, T. 27 N., R. 47 E., on right bank half a mile upstream from bridge on U. S. 2, 2 miles northwest of Wolf Point and 2½ miles upstream from mouth.
Drainage area.--245 sq mi, approximately.
Gage-height record.--Water-stage recorder graph.
Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used throughout the period.
Maxima.--May-July 1953: Discharge, 1,010 cfs 7:30 p.m. June 3 (gage height, 7.29 ft). 1909-14, 1950 to April 1953: Discharge, 7,050 cfs April 7, 1952 (gage height, 9.25 ft), by contracted-opening determination.

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	22	55	16	11	17	18	2.5	21	9.3	36	0.9
2	25	126	20	12	18	14	2.2	22	9.3	31	.9
3	23	439	20	13	17	12	2.0	23	8.2	35	.9
4	21	274	17	14	17	9.3	1.7	24	11	26	.9
5	17	84	15	15	16	7.7	1.5	25	25	24	.8
6	15	51	12	16	14	6.3	1.4	26	26	21	.7
7	14	36	7.5	17	11	5.1	1.2	27	23	19	.7
8	11	31	5.1	18	9.3	4.0	1.1	28	21	16	.8
9	9.3	29	3.4	19	7.7	4.3	1.1	29	36	18	.7
10	14	23	3.0	20	8.0	10	1.0	30	64	18	.6
								31	66	-	.5
Monthly mean discharge, in cubic feet per second									19.5	49.4	4.62
Runoff, in acre-feet									1,200	2,940	284
Runoff, in inches									0.09	0.23	0.02

Missouri River near Wolf Point, Mont.

Location.--Lat 48°04', long 105°32', in NW¼ sec. 28, T. 27 N., R. 48 E., on right bank 500 ft downstream from bridge on State Route 13, 6 miles southeast of Wolf Point and 6 miles downstream from Wolf Creek. Datum of gage is 1,958.57 ft above mean sea level, datum of 1929.
Drainage area.--83,200 sq mi. approximately.
Gage-height record.--Water-stage recorder graph.
Maxima.--May-July 1953: Discharge, 17,200 cfs 12 p.m. June 1 (gage height, 7.43 ft). 1928 to April 1953: Discharge, 66,800 cfs Mar. 25, 1939 (gage height, 14.4 ft, ice present, from rating curve extended above 39,000 cfs); gage height observed, 17.45 ft Mar. 30, 1930 (ice jam).
Remarks.--Flow regulated by Fort Peck Reservoir (see p. 126).

Mean discharge, in cubic feet per second, 1953

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	12,700	15,800	7,420	11	12,800	9,980	6,610	21	11,700	11,300	13,600
2	11,400	16,700	7,450	12	10,400	9,510	6,870	22	11,300	10,900	13,600
3	11,500	15,200	6,630	13	9,390	9,910	7,770	23	10,600	10,700	15,000
4	11,600	15,400	6,510	14	8,830	10,400	7,840	24	10,600	11,700	16,600
5	11,900	15,600	6,090	15	9,650	10,200	10,100	25	10,600	10,500	18,500
6	12,000	14,300	5,240	16	11,200	10,100	12,000	26	8,100	10,100	19,700
7	12,900	13,000	5,250	17	10,700	10,900	12,600	27	11,200	9,740	19,200
8	12,700	11,900	6,280	18	10,600	10,600	13,600	28	11,400	8,960	18,800
9	14,000	11,100	6,730	19	11,800	9,810	14,500	29	8,850	8,310	17,900
10	13,200	10,600	6,610	20	12,300	11,300	14,300	30	11,000	7,690	18,400
								31	12,000	-	19,400
Monthly mean discharge, in cubic feet per second									11,260	11,410	11,650
Runoff, in acre-feet									692,100	678,800	716,200
Runoff, in inches									0.16	0.15	0.16

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 23			May 31		12	5.85	12,500	N	5.06	10,600
12	4.97	10,700	6	5.34	11,400		June 8		2	5.04	10,600
	May 24		N	5.52	11,900	N	5.62	11,900	4	5.06	10,700
10	4.85	10,400	6	5.78	12,500	6	5.53	11,600	12	5.28	11,200
N	4.94	10,600	12	6.20	13,600	12	5.46	11,500		June 18	
4	4.94	10,600		June 1			June 9		3	5.29	11,300
5	4.99	10,700	6	6.66	14,900	6	5.35	11,200	6	5.24	11,200
12	5.09	11,000	N	7.06	16,100	N	5.28	11,000	2	4.88	10,300
	May 25		6	7.36	17,000	12	5.26	10,900	6	4.78	10,000
8	5.14	11,100	9	7.42	17,100		June 10		12	4.70	9,850
N	5.10	11,000	12	7.43	17,200	N	5.09	10,500		June 19	
4	4.99	10,700		June 2		10	5.07	10,400	10	4.55	9,510
8	4.70	9,980	3	7.39	17,000	12	5.05	10,400	N	4.57	9,550
12	4.31	9,000	5	7.39	17,000		June 11		6	4.70	9,900
	May 26		N	7.27	16,700	N	4.85	9,850	12	4.96	10,500
6	3.76	7,700	3	7.25	16,600	12	4.84	9,800		June 20	
10	3.58	7,290	5	7.19	16,400		June 12		9	5.34	11,400
N	3.59	7,310	7	7.21	16,500	N	4.68	9,390	N	5.35	11,500
6	4.00	8,260	12	7.04	16,000	3	4.69	9,410	4	5.31	11,400
12	4.49	9,430		June 3		12	4.71	9,480	8	5.35	11,400
	May 27		3	7.00	15,800		June 13		12	5.45	11,700
6	4.88	10,400	6	6.99	15,800	3	4.74	9,550		June 21	
N	5.23	11,200	5	6.59	14,600	9	4.70	9,480	4	5.47	11,800
4	5.44	11,800	7	6.62	14,700	N	4.74	9,600	N	5.22	11,100
8	5.61	12,200	12	6.74	15,000	4	4.86	9,900	4	5.17	11,000
12	5.72	12,500		June 4		10	5.30	11,000	12	5.32	11,300
	May 28		6	6.89	15,500	12	5.22	10,800		June 22	
3	5.75	12,500	8	6.91	15,600		June 14		3	5.34	11,400
6	5.67	12,300	N	6.84	15,300	10	4.92	10,100	6	5.31	11,300
N	5.39	11,600	4	6.81	15,200	1	4.92	10,100	3	5.06	10,600
6	5.00	10,600	8	6.86	15,400	6	5.04	10,400	7	5.04	10,600
12	4.60	9,650	12	6.93	15,600	12	5.16	10,800	12	5.09	10,700
	May 29			June 5			June 15			June 23	
7	4.17	8,590	6	7.04	15,900	2	5.17	10,800	4	5.10	10,700
10	4.13	8,500	9	7.05	15,900	5	5.14	10,700	8	5.06	10,600
N	4.07	8,350	N	7.00	15,800	4	4.80	9,880	N	5.04	10,500
2	4.08	8,380	12	6.68	14,800	12	4.72	9,700	4	5.05	10,500
6	4.20	8,670		June 6			June 16		12	5.30	11,200
12	4.64	9,720	6	6.60	14,500	8	4.67	9,600		June 24	
	May 30		N	6.52	14,300	N	4.73	9,780	3	5.34	11,200
4	4.99	10,600	6	6.46	14,100	8	5.11	10,700	6	5.51	11,600
8	5.19	11,100	12	6.37	13,800	12	5.26	11,100	9	5.76	12,300
N	5.25	11,200		June 7			June 17		11	5.83	12,400
4	5.26	11,200	N	6.01	12,900	3	5.30	11,200	N	5.83	12,400
12	5.22	11,200	6	5.92	12,700	6	5.25	11,100	4	5.64	12,000

Missouri River near Wolf Point, Mont.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1953

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
8	5.44	11,400			June 29	6	3.69	7,180	4	2.89	5,260
12	5.28	11,000	2	4.23	8,500	12	3.66	7,090	8	3.13	5,730
		June 25	8	4.09	8,160			July 3	12	3.34	6,170
10	5.04	10,400	N	4.07	8,120	11	3.36	6,420			July 8
5	4.98	10,200	6	4.17	8,350	3	3.35	6,400	5	3.44	6,380
12	5.00	10,300	10	4.19	8,430	12	3.53	6,760	N	3.32	6,130
		June 26	12	4.17	8,380			July 4	3	3.30	6,080
4	5.00	10,300			June 30	4	3.54	6,760	6	3.36	6,210
11	4.90	10,000	9	3.85	7,640	N	3.38	6,400	12	3.62	6,760
2	4.90	10,000	N	3.78	7,500	4	3.35	6,340			July 9
6	4.91	10,000	2	3.76	7,450	12	3.41	6,440	4	3.71	6,960
12	4.94	10,100	12	3.79	7,500			July 5	6	3.71	6,960
		June 27			July 1	5	3.41	6,440	N	3.56	6,630
6	4.85	9,900	3	3.76	7,430	N	3.24	6,060	4	3.51	6,520
N	4.73	9,630	10	3.65	7,160	12	3.04	5,630	8	3.54	6,590
4	4.71	9,580	1	3.66	7,180			July 6	12	3.64	6,810
12	4.73	9,630	6	3.82	7,520	N	2.81	5,160			
		June 28	12	3.99	7,910	12	2.74	4,990			
4	4.65	9,460			July 2			July 7			
N	4.38	8,810	3	4.00	7,910	6	2.72	4,960			
6	4.29	8,620	6	3.95	7,800	N	2.74	4,980			
12	4.25	8,520	N	3.75	7,310						

RESERVOIRS IN FLOOD AREA, MAY-JULY, 1953

The importance of reservoirs in the reduction of peak and volume flows has prompted the presentation of data on reservoir stages and contents on dates corresponding to the storm periods. The brief descriptions and the tabulation of stages and contents are presented in downstream order. The number below the reservoir names in the tabulation correspond to those in table 5 and indicate the downstream relationship of the separate reservoirs with respect to discharge stations.

Canyon Ferry Reservoir. --On the Missouri River, 15 miles east of Helena, completed in 1953 for power production, flood control and irrigation, it has usable capacity of 2,043,000 acre-feet. Records furnished by Bureau of Reclamation.

Lake Helena. --Since April 1945 separated from Hauser Lake by works permitting independent regulation, it has usable capacity of 10,400 acre-feet. Records furnished by the Montana Power Co.

Hauser Lake. --On Missouri River, 13 miles northeast of Helena, completed in 1907 for power, it has usable capacity of 52,100 acre-feet. Records furnished by the Montana Power Co.

Holter Lake. --On Missouri River, 26 miles north of Helena, completed in 1918 for power, it has usable capacity of 81,900 acre-feet. Records furnished by the Montana Power Co.

Gibson Reservoir. --On Sun River, 20 miles northwest of Augusta, completed in 1929 for irrigation, it has usable capacity of 105,000 acre-feet (88,560 acre-feet before 1941). Records furnished by Bureau of Reclamation.

Willow Creek Reservoir. --On Willow Creek, 5 miles northwest of Augusta, completed in 1911 for irrigation, it has usable capacity of 32,000 acre-feet (16,700 acre-feet before 1941). Supplemental supply diverted from Sun River at point 18 miles northwest of Augusta. Records furnished by Bureau of Reclamation.

Pishkun Reservoir. --Water diverted from Sun River at point 18 miles northwest of Augusta, completed in 1925 for irrigation, it has usable capacity of 32,050 acre-feet (lesser capacities before 1940).) Records furnished by Bureau of Reclamation.

Nilan Reservoir. --Water diverted from Smith and Ford Creeks at points about 10 miles southwest of Augusta, completed in 1951 for irrigation, it has usable capacity of 10,090 acre-feet. Records furnished by Montana Water Conservation Board.

Lower Two Medicine Lake. --On Two Medicine River, 4 miles northwest of town of Glacier Park, completed in 1913 for irrigation, it has usable capacity of 16,620 acre-feet. Records furnished by Bureau of Indian Affairs.

Four Horns Lake. --Water is diverted from Badger Creek at a point 6 miles north of Heart Butte. Completed in 1932 for irrigation, it has usable capacity of 19,250 acre-feet. Records furnished by Bureau of Indian Affairs.

Swift Reservoir. --On Birch Creek, 18 miles west of Dupuyer, completed in 1915 for irrigation, it has usable capacity of 30,000 acre-feet. Records furnished by Ponder County Canal & Reservoir Co.

Lake Frances. --The water is diverted from Birch and Dupuyer Creeks at points 8 miles northwest and 9 miles northeast of Dupuyer. Completed about 1913 for irrigation, it has usable capacity of 112,000 acre-feet (25,000 acre-feet before 1927). Records furnished by Pondera County Canal & Reservoir Co.

Bynum Reservoir. --The water is diverted from Teton River at a point 15 miles northwest of Choteau. Completed in 1910 for irrigation and enlarged to present capacity in 1927, it has usable capacity of 74,500 acre-feet. Records furnished by Teton Cooperative Reservoir Co.

Ackley Lake. --The water is diverted from Judith River at a point 4 miles east of Utica. Completed in 1939 for irrigation, it has usable capacity of 5,820 acre-feet. Records furnished by Montana Water Conservation Board.

Fort Peck Reservoir. --On the Missouri River, $9\frac{1}{2}$ miles southwest of Nashua and 11 miles upstream from Milk River, completed in 1939 for power production, flood control and navigation, it has usable capacity of 18,800,000 acre-feet. Records furnished by Missouri River Division, Corps of Engineers.

Fresno Reservoir. --On Milk River, 15 miles west of Havre, completed in 1939 for irrigation, it has usable capacity of 127,200 acre-feet. Records furnished by Bureau of Reclamation.

Nelson Reservoir. --The water is diverted from Milk River at point about 6 miles west of Dodson. Completed in 1922 for irrigation, it has usable capacity of 66,800 acre-feet. Records furnished by Bureau of Reclamation.

Elevation, in feet, and contents, in acre-feet, on indicated days, 1953

	Canyon Ferry Reservoir (2)		Lake Helena (6)		Hauser Lake (7)		Holter Lake (8)		Gibson Reservoir (21)		Willow Creek Reservoir (24)		Pishkun Reservoir (25)		Nilan Reservoir (26)	Lower Two Medicine Lake (37)	
	Elev. a/	Contents	Elev. b/	Contents	Elev. b/	Contents	Elev. b/	Contents	Elev. a/	Contents	Elev. a/	Contents	Elev. a/	Contents	Contents	Elev. c/	Contents
April 30	3,682.50	72,520	3,633.1	6,860	3,633.1	45,010	3,553.5	36,610	4,699.6	73,890	4,139.1	28,180	4,362.6	19,940	d9,000	4,865.0	7,270
May 20	--------	------	3,634.7	9,820	3,634.7	50,940	3,561.2	68,950	4,715.1	93,210	4,138.7	27,630	4,369.0	28,940	d9,800	4,868.5	9,570
23	3,685.96	98,310	3,634.7	9,820	3,634.7	50,940	3,562.3	73,970	4,714.5	92,440	4,138.7	27,630	4,369.2	29,240	d9,800	4,868.5	9,570
26	3,688.05	99,440	3,635.0	10,890	3,635.0	52,860	3,563.1	77,670	4,715.3	93,470	4,139.2	28,310	4,369.4	29,530	d9,800	4,868.5	9,570
29	3,691.07	115,600	3,635.2	10,890	3,635.2	52,860	3,564.05	82,160	4,718.7	93,990	4,139.3	28,450	4,369.5	29,680	d9,800	4,868.5	9,570
31	3,694.17	135,100	3,635.3	11,110	3,635.3	53,240	3,564.0	81,920	4,717.2	95,920	4,139.3	28,450	4,369.6	29,830	d9,800	-------	d9,960
June 3	3,699.25	167,100	3,634.9	10,240	3,634.9	51,700	3,563.95	81,680	4,718.8	97,990	4,139.5	28,720	4,371.0	32,050	d9,800	4,870.0	10,550
4	3,702.20	188,900	3,634.3	9,020	3,634.3	49,420	3,563.75	80,730	4,718.8	97,990	4,139.6	28,860	4,371.4	32,700	d9,800	4,870.0	10,550
5	3,705.80	216,800	3,633.8	8,080	3,633.8	47,550	3,563.5	79,550	4,718.0	96,960	4,139.7	28,990	4,371.4	32,700	d9,800	4,870.0	10,550
6	3,709.57	246,100	3,633.4	7,370	3,633.4	46,090	3,563.7	80,490	4,717.3	96,050	4,139.8	29,130	4,371.4	32,700	d9,800	4,872.5	12,390
9	3,719.18	333,600	3,633.9	8,270	3,633.9	47,920	3,563.6	80,020	4,717.1	95,800	4,139.6	28,860	4,371.3	32,540	d9,800	4,870.0	10,550
12	3,724.49	389,900	3,634.6	9,620	3,634.6	50,560	3,562.9	76,740	4,718.1	97,090	4,138.4	27,220	4,371.3	32,540	d9,800	4,870.0	10,550
15	3,730.75	459,500	3,635.4	11,340	3,635.4	53,630	3,562.6	75,350	4,719.6	99,020	4,136.6	24,780	4,371.3	32,540	d9,660	4,870.0	10,550
18	3,737.40	545,300	3,635.2	10,890	3,635.2	52,860	3,561.9	72,140	4,718.2	97,220	4,135.8	23,690	4,371.2	32,380	d9,440	4,870.0	10,550
20	3,741.25	598,000	3,635.2	10,890	3,635.2	52,860	3,560.1	63,970	4,718.8	97,990	4,135.4	23,140	4,371.2	32,380	9,300	4,810.0	10,550
30	3,748.80	715,200	3,635.3	11,110	3,635.3	53,240	3,563.5	79,550	4,720.0	99,540	4,134.2	21,660	4,371.1	32,210	d9,040	4,870.0	e10,550
July 15	3,751.20	753,700	3,635.4	11,340	3,635.4	53,630	3,563.15	77,910	4,725.2	106,600	4,134.9	22,480	4,369.0	28,940	d8,500	4,869.0	9,900
31	3,751.55	760,200	3,633.0	6,690	3,633.0	44,650	3,563.5	79,550	4,713.8	91,530	4,134.9	22,480	4,363.1	20,590	8,190	4,868.2	e9,370

	Four Horns Lake (40)		Swift Reservoir (41)		Lake Frances (42)		Bynum Reservoir (47)		Ackley Lake (50)	Fort Peck Reservoir (58)		Fresno Reservoir (66)		Nelson Reservoir (70)	
	Elev. c/	Contents	Elev. f/	Contents	Elev. f/	Contents	Elev.	Contents	Contents	Elev. g/	Contents	Elev. a/	Contents	Elev. a/	Contents
April 30	4,105.5	11,590	4,927.6	21,980	3,814.04	101,400	4,170	69,000	e2,520	2,221.58	12,630,000	2,569.35	97,490	2,215.5	36,660
May 20	4,106.0	11,940	4,947.57	30,260	3,814.83	105,600	4,171.4	73,900	------	2,221.70	12,650,000	2,574.00	121,500	--------	------
23	4,106.0	11,940	4,947.41	30,190	3,814.89	105,900	-------	------	------	2,221.74	12,660,000	2,574.30	123,200	--------	------
26	4,106.0	11,940	4,947.90	30,400	3,815.25	107,800	-------	------	------	2,222.25	12,750,000	2,574.70	125,500	--------	------
29	4,106.0	11,940	4,947.75	30,340	3,815.47	109,000	-------	------	------	2,223.63	13,020,000	2,575.60	130,700	--------	------
31	4,105.6	11,660	4,947.75	30,340	3,815.47	109,000	-------	------	e3,160	2,224.90	13,270,000	2,576.35	135,200	2,218.90	49,440
June 3	4,106.0	11,940	4,947.96	30,430	3,815.80	110,800	4,172.0	76,000	------	2,226.62	13,610,000	2,576.95	138,800	--------	------
4	4,106.0	11,940	4,948.38	30,620	3,815.92	111,400	-------	------	------	2,227.13	13,710,000	2,577.10	139,700	--------	------
5	4,106.0	11,940	4,947.99	30,440	3,815.84	111,000	-------	------	------	2,227.94	13,870,000	2,577.70	143,500	--------	------
6	4,106.0	11,940	4,947.79	30,350	3,815.82	110,900	-------	------	------	2,229.03	14,100,000	2,578.40	147,900	--------	------
9	4,106.0	11,940	4,947.78	30,350	3,815.78	110,700	-------	------	------	2,231.93	14,700,000	2,578.05	145,600	--------	------
12	4,106.0	11,940	4,947.80	30,360	3,815.50	109,100	-------	------	------	2,233.60	15,050,000	2,578.40	147,900	--------	------
15	4,106.0	11,940	4,947.67	30,300	3,815.26	107,800	-------	------	------	2,235.04	15,360,000	2,577.30	141,000	--------	------
18	4,106.0	11,940	4,947.60	30,270	3,815.05	106,700	-------	------	------	2,236.03	15,570,000	2,576.75	137,600	--------	------
20	4,106.0	11,940	4,947.59	30,260	3,814.97	106,300	-------	------	------	2,236.70	15,720,000	2,576.45	135,800	--------	------
30	4,106.0	e11,940	4,947.43	30,190	3,814.81	105,400	4,172.0	76,000	e3,950	2,238.70	16,160,000	2,575.85	132,200	2,220.00	53,860
July 15	4,105.0	11,240	4,947.36	30,160	3,814.59	104,300	-------	------	------	2,239.97	16,440,000	2,573.85	120,700	--------	------
31	4,104.0	e10,550	4,946.20	29,650	3,813.40	98,080	-------	------	3,120	2,238.55	16,120,000	2,567.45	88,770	2,218.00	45,930

a Datum of gage is at mean sea level (levels by Bureau of Reclamation).
b Datum of gage is at mean sea level (levels by The Montana Power Co.).
c Datum of gage is at mean sea level (levels by Bureau of Indian Affairs).
d Contents interpolated from readings made on days other than those indicated.
e Contents first day of following month.
f Datum of gage is at mean sea level (levels by Pondera County Canal and Reservoir Co.).
g Datum of gage is at mean sea level datum of 1929 (by Corps of Engineers).

SUMMARY OF FLOOD STAGES AND DISCHARGES

The determinations of maximum flood flows at existing stream-gaging stations and other places on streams in the area covered by this report are summarized and presented in table 5. Maximum content of reservoirs is also shown. The reference number indicates the location on plate 3.

The discharges for existing stream-gaging stations were generally determined by methods described in greater detail in "Stages and discharges at stream-gaging stations." Where methods other than the usual stage-discharge relationship were used, that fact is indicated by an explanatory footnote.

Figure 23 shows the flood discharges in cubic feet per second per square mile plotted against drainage areas. The reference numbers are those used in table 5 and plate 3. The discharges are given as observed, except for computed flow from North Fork Sun River near Augusta; some discharges are affected by artificial storage and release or other factors, which are noted in the individual station records appearing in "Stages and discharges at stream-gaging stations."

The basic data and computations for the determinations of discharge are filed in the Montana District office of the Geological Survey and may be examined in that office.

Table 5.--Summary of flood stages and discharges in the Missouri River basin for floods of 1953

[Maximum discharges for the floods of 1953 were obtained from gaging-station records, except as otherwise indicated by the following symbols: A, contracted-opening determination; B, slope-area determination]

No. on pl.	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during present flood			
				Date	Gage height (feet)	Discharge (cfs)	Cfs per square mile	Date and hour	Gage height (feet)	Discharge (cfs)	Cfs per square mile
1	Missouri River at Toston----------	14,470	1910-16,1941-53	June 6, 1948	11.77	32,000	2.21	June 16,4 a.m. to 12 noon.	10.00	22,000	1.52
2	Canyon Ferry Reservoir near Helena-----	15,860	1953	(a)	--------	---------	-----	July 31----------	3,751.55	b760.2	-----
3	Prickly Pear Creek near Clancy---------	188	1908-9,1910-16, 1921-33,1945-53	June 5, 1948	6.35	586	3.12	June 4,12-4 a.m.-	4.98	476	2.53
4	Tenmile Creek near Rimini----------	34	1915-53	May 15, 1917	c4.87	948	27.9	June 2, 10 p.m.--	3.49	469	13.8
5	Tenmile Creek near Helena----------	103	1908-53	May 28, 1917 June 11, 1927	-------- c6.58	865	8.40	June 3,11:30 p.m.	3.91	744	7.51
6	Lake Helena near Helena[d]----------	---------	1940-53	Nov. 30 Dec. 31, 1951	3,635.5	b c11.56	-----	June 14,July 15--	3,635.5	b11.56	-----
7	Hauser Lake near Helena[d]----------	16,565	1940-53	Nov. 30. Dec. 31, 1951	3,635.5	b c54.02	-----	June 14,July 15--	3,635.5	b54.02	-----
8	Holter Lake near Helena----------	---------	1940-53	Aug. 31, 1951	3,564.25	b c83.10	-----	June 28----------	3,564.15	b82.63	-----
9	Missouri River below Holter Dam, near Wolf Creek.	16,900	1945-53	June 8, 1948	11.70	34,800	2.06	June 19,10:30a.m.	6.10	13,500	.80
10	Dearborn River near Clemons----------	122	1921-23,1929-32, 1934-53,	June 4, 1948	5.97	2,970	24.3	June 4, 4 p.m.---	6.20	3,200	26.2
11	Dearborn River near Craig----------	310	1945-53	June 5, 1948	f7.89	4,400	14.2	June 4, 1 a.m.---	9.58	7,960	25.7
12	Missouri River at Cascade----------	18,046	1902-15,1951-53	June 5, 1908	g3,353.15	49,300	2.73	June 4, 8 a.m.---	g3,350.50	---------	-----
13	Newland Creek near White Suplhur Springs.	7.74	1945-53	May 8, 1948	2.64	29	3.75	June 4, 7-8 p.m.-	3.50	56	7.24
14	Newland Creek near dam site, near White Sulphur Springs.	43.2	1950-53	May 14,15,1951	1.28	53	1.23	June 5, 8 a.m.---	3.83	227	5.25
15	Sheep Creek near White Sulphur Springs-	35.5	1941-53	May 26, 1942	g5.1	356	10.0	June 3, 8 p.m., June 4, 6 p.m.	g5.58	420	11.8
16	Smith River near Eden----------	1,601	1951-53	May 5, 1952	h3.94	1,980	1.24	June 4, 1 a.m.---	10.46	12,300	7.68
17	Hound Creek near Eden----------	232	----------	----------	--------	---------	-----	June 4----------	--------	7,500A	32.3

18	Smith River at Truly	2,015	1905-7,1929-32	June 24, 1907	9.00	4,010	1.99	June 4	--------	30,300B	15.0
19	Missouri River above Sun River, at Great Falls.	20,680	1930-53	June 6 or 7, 1948.	3,316.4	---------	-----	June 5,8-10 a.m.	3,317.84	---------	-----
20	North Fork of North Fork Sun River near Augusta.	258	1911-12,1945-53	June 3, 1948	7.03	4,320	16.8	June 3, 10 p.m.	6.44	3,990	15.5
21	Gibson Reservoir near Augusta	---------	1940-53	June 30, 1950	4,725.3	b e106.8	-----	July 14, 15	4,752.2	b106.60	-----
22	North Fork Sun River near Augusta	e609	1889-90,1903-28, 1936-38.	June 21, 1916	11.4	j32,300	53.1	June 3	--------	k10,800	17.7
				May 28, 1938	4.18	6,000	9.88	June 13	--------	m10,100	16.6
24	Willow Creek Reservoir near Augusta	---------	1940-53	June 30, 1944	4,140.1	b e29.50	-----	June 6	4,139.8	b29.13	-----
25	Pishkun Reservoir near Fairfield	---------	----------	June 30, 1953	4,371.1	b e32.21	-----	June 4-6	4,371.4	b32.70	-----
26	Nilan Reservoir near Augusta	---------	1952-53	May 31, 1952	4,437.4	b e7.60	-----	May 9-June 13	4,441.9	b9.8	-----
27	Sun River at Simms	---------	----------	----------	--------	---------	-----	June 4, 8 a.m.	g3,557.1	--------	-----
28	Muddy Creek at Vaughn	268	1925-26,1934-53	June 23, 1938	n15.15	3,500	13.1	June 4, 2 a.m.	16.7	7,600	28.4
29	Sun River near Vaughn	2,190	1934-53	June 6, 1948	13.48	14,300	6.53	June 4, 1 p.m.	16.38	17,900	8.18
30	Sun River at Great Falls	---------	----------	June 1908	p3,328	---------	-----	June 4, 5	3,319.1	---------	-----
31	Missouri River below Morony Dam	23,400	1930-53	June 7, 1948	--------	q51,900	2.21	June 4, 12 p.m.	--------	66,600	2.85
32	Belt Creek near Monarch	350	1951-53	May 4, 1952	r4.58	1,290	3.69	June 4, 5 a.m.	10.12	11,000	31.4
33	Belt Creek near Belt	s678	1905-6	June 7, 1906	s5.25	1,370	2.02	June 4	--------	15,600B	23.0
34	Highwood Creek near Highwood	57	1905-6	June 7, 1906	s4.02	---------	-----	----------	--------	---------	-----
35	Highwood Creek above Highwood	t75	----------	----------	--------	---------	-----	June 4	--------	9,210B	123
36	Missouri River at Fort Benton	24,600	1881-1953	June 6, 1908	18.5	140,000	5.69	June 5, 3 a.m.	13.57	78,700	3.20
37	Lower Two Medicine Lake	---------	1940-53	May 31, 1944	4,875.7	b e14.8	-----	June 6	4,872.5	b12.39	-----
38	Two Medicine River near Browning	316	1907-24,1951-53	June 9, 1909	s w8.15	7,600	24.0	June 4, 5 a.m.	6.78	6,520	20.6
39	Badger Creek near Browning	133	1951-53	June 16, 1951	4.92	1,350	10.1	June 4, 4 a.m.	6.28	4,220	31.7
40	Four Horns Reservoir	---------	1940-53	Aug.,Sept.1941, May,June 1942.	4,107.4	b e13.00	-----	May 20-29, June 3-30.	4,106.0	b11.94	-----
41	Swift Reservoir	---------	----------	May 31, 1945	4,947.7	b e30.30	-----	June 4	4,948.38	b30.62	-----
42	Lake Frances	---------	----------	June 30, 1943	3,815.8	b e110.8	-----	June 4	3,815.92	b111.4	-----
43	Cut Bank Creek at Cut Bank	971	1905-19,1922-24, 1951-53.	June 5, 1908	e g10.0	8,810	9.08	June 8, 2 p.m.	8.46	5,640	5.81

Table 5.--Summary of flood stages and discharges in the Missouri River basin for floods of 1953--Continued

No. on pl.	Stream and place of determination	Drainage area (square mile)	Period of record	Maximum flood previously known				Maximum during present flood			
				Date	Gage height (feet)	Discharge (cfs)	Cfs per square mile	Date and hour	Gage height (feet)	Discharge (cfs)	Cfs per square mile
44	Marias River near Shelby	2,610	1902-8,1922-53	June 18, 1948	v17.75	40,000	15.3	June 5, 2 a.m.	12.77	21,900	8.39
45	Marias River near Brinkman	6,400	1921-53	June 19, 1948	w21.0	50,700	7.93	June 5, 6 a.m.	16.28	28,100	4.40
46	Teton River near Farmington	111	1947-53	June 3, 1948	x5.32	2,780	25.0	June 3, 9 p.m.	6.87	2,400	21.6
47	Bynum Reservoir near Bynum	---	1930-53	June 1, 1934	4,173.6	b81.6	-----	June 3-30	4,172.0	b76.0	-----
48	Missouri River at Loma	34,100	1935-53	June 20, 1948	17.63	92,000	2.70	June 5, 10 a.m.-2 p.m.	20.99	121,000	3.53
49	Judith River near Utica	331	1919-53	May 25, 1942	5.56	1,100	3.32	June 4, 12 noon	5.17	894	2.70
50	Ackley Lake near Hobson	---	1940-53	May 31, 1942, May 31, June 30, 1943, June 30, 1950.	2,982.0	be5.98	-----	July 1	2,973.0	bf3.95	-----
51	Ross Fork near Hobson	330	1946-53	Mar. 22, 1947	7.80	1,160	3.52	June 9, 9-10 a.m.	5.71	421	1.28
52	Big Spring Creek near Lewistown	20	1932-53	Mar. 25, 1951	.76	y226	11.3	May 30, 4-6 a.m.	1.95	y250	12.5
53	Big Spring Creek above Casion Creek, near Lewistown.	103	---	---	---	---	-----	May 29 or 30	---	z1,200B	11.6
54	Wolf Creek near Stanford	118	1950-53	June 6, 1952	aa2.50	42	.36	June 4, 1 p.m.	4.51	ab578	4.90
55	Missouri River at powerplant ferry, near Zortman.	40,600	1934-53	June 21, 1948	ac18.18	93,200	2.30	June 6, 2-4 p.m.	22.20	137,000	3.38
56	Musselshell River at Mosby	8,010	1929-32,1934-53	June 18, 1944	14.43	18,000	2.25	June 3, 4 p.m.	10.55	9,300	1.16
57	Dry Creek near Van Norman	2,530	1939-53	Mar. 21, 1947	ad15.26	24,600	9.72	May 30, 1:30 a.m.	8.41	8,210	3.24
58	Fort Peck Reservoir	57,725	1937-53	July 15, 1948	2,244.80	bj17,550	-----	July 12, 13	2,239.99	bj16,440	-----
59	Missouri River below Fort Peck Dam	57,800	1934-53	Aug. 8, 1946	---	ak51,000	.88	July 25	---	al19,100	.33
60	South Fork Milk River near international boundary.	433	1931-53	June 18, 1948	6.83	5,880	13.6	June 4, 11 a.m.	5.70	4,600	10.6
61	North Fork Milk River above St. Mary Canal, near Browning.	62	1911-12,1921-53	Apr. 22, 1953	7.55	2,120	34.2	June 3, 2 p.m.	5.35	796	12.8
62	St. Mary Canal at Hudson Bay Divide, near Browning af/	---	1917-53	June 13, 1937	---	q758	-----	June 3, 5 p.m.	7.33	736	-----

63	North Fork Milk River near international boundary.	101	1909-53	June 17, 1948	6.47	2,170	21.5	June 3, 10 a.m.--	5.17	1,680	16.6
64	Milk River at Milk River, Alberta------	1,104	1909-53	May 22, 1927	11.41	7,460	6.76	June 4, 9 p.m.---	9.41	7,200	6.52
65	Milk River at eastern crossing of international boundary.	2,514	1909-53	Mar. 21, 1952	[aq]9.34	9,530	8.46	June 6, 3 a.m.---	7.75	7,540	3.00
66	Fresno Reservoir near Havre----------	3,400	1940-53	Apr. 3, 1952	2,579.35	[b]154	-----	June 7, 8 a.m. to 12 noon.	2,578.75	[b]150.1	-----
67	Milk River below Fresno Reservoir, near Havre.	3,400	1940-53	Apr. 3, 1952	--------	[g]6,500	1.91	June 6, 4 p.m.---	--------	[g]6,060	1.78
68	Big Sandy Creek near Assinniboine------	2,000	1946-53	Apr. 3, 1952	14.70	5,570	2.78	June 6, 3-5 a.m.-	6.56	714	.36
69	Milk River at Havre----------	5,707	1899-1922, 1952-53.	Apr. 12, 1899	2,480.24	20,000	3.51	June 6,10:30 p.m.	2,477.65	6,900	1.21
70	Nelson Reservoir----------	---------	1940	June 12,16,20, 23, 1940.	[b]2,219.6	[i] [b]52.24	-----	June 30----------	2,220.0	[b]53.86	-----
71	Milk River at Nashua----------	23,300	1939-53	Apr. 18, 1952	31.38	45,300	1.94	May 31, 4-5 p.m.-	25.50	13,400	.57
72	Wolf Creek near Wolf Point----------	245	1909-14,1950-53	Apr. 7, 1952	9.25	7,050	28.8	June 3, 7:30 p.m.	7.29	1,010	4.12
73	Missouri River near Wolf Point---------	83,200	1928-53	Mar. 25, 1939	[ah]17.45	66,800	.80	June 1, 12 p.m.--	7.43	17,200	2.06

[a] Newly constructed.
[b] Contents in 1,000 acre-ft.
[c] Site and datum then in use.
[d] Lake Helena and Hauser Lake separated by control works (see p.140).
[e] Maximum month-end contents; daily contents not readily available.
[f] Gage height of 7.97 ft occurred Mar. 15, 1947, backwater from ice.
[g] Observed.
[h] Gage height of 4.35 ft occurred Nov. 26, 1951, backwater from ice.
[i] Revised.
[j] Includes diversion to Pishkun and Willow Creek Reservoirs.
[k] Daily observed discharge adjusted for diversion and storage.
[m] Daily observed discharge over diversion dam.
[n] Local residents report flood of June 1908 reached a stage of about 23 ft; flood of June 1932 reached a stage of about 18 ft, discharge about 9,000 cfs.
[p] Approximate stage deduced by Corps of Engineers from photo of 1908 flood.
[q] Daily mean discharge.
[r] Flood of 1908 several feet lower than that of 1953, according to local resident.
[s] At site of 1953 determination; drainage area approximately 686 sq mi at former gaging station.
[t] About 4 miles downstream from former gaging station near Highwood; Highwood townsite moved since 1906.
[u] Exceeded by flood of June 1908, which destroyed gage.
[v] May have been exceeded in June 1908; record discontinued January 1908.
[w] Maximum discharge known, about 70,000 cfs June 1908 (gage height, about 24 ft, present datum).
[x] Gage height of 7.34 ft occurred Jan. 6, 1950, backwater from ice.
[y] Includes flow of about 105 cfs from spring.
[z] Includes flow of about 105 cfs (see preceding station) and undetermined flow from other springs.
[aa] Gage height of 2.87 ft occurred Mar. 7, 1951, backwater from ice.
[ab] Does not include bypass overflow of about 50 cfs in distant channel on left bank.
[ac] Gage height of 30.16 ft occurred Mar. 19, 1947, backwater from ice.
[ad] Backwater from ice.
[ae] Includes 32,000 cfs inflow from spillway 1 mile downstream.
[af] Irrigation diversion from St. Mary River basin.
[ag] Gage height of 13.65 ft occurred Mar. 28, 1952, backwater from ice.
[ah] Occurred Mar. 30, 1930, backwater from ice.

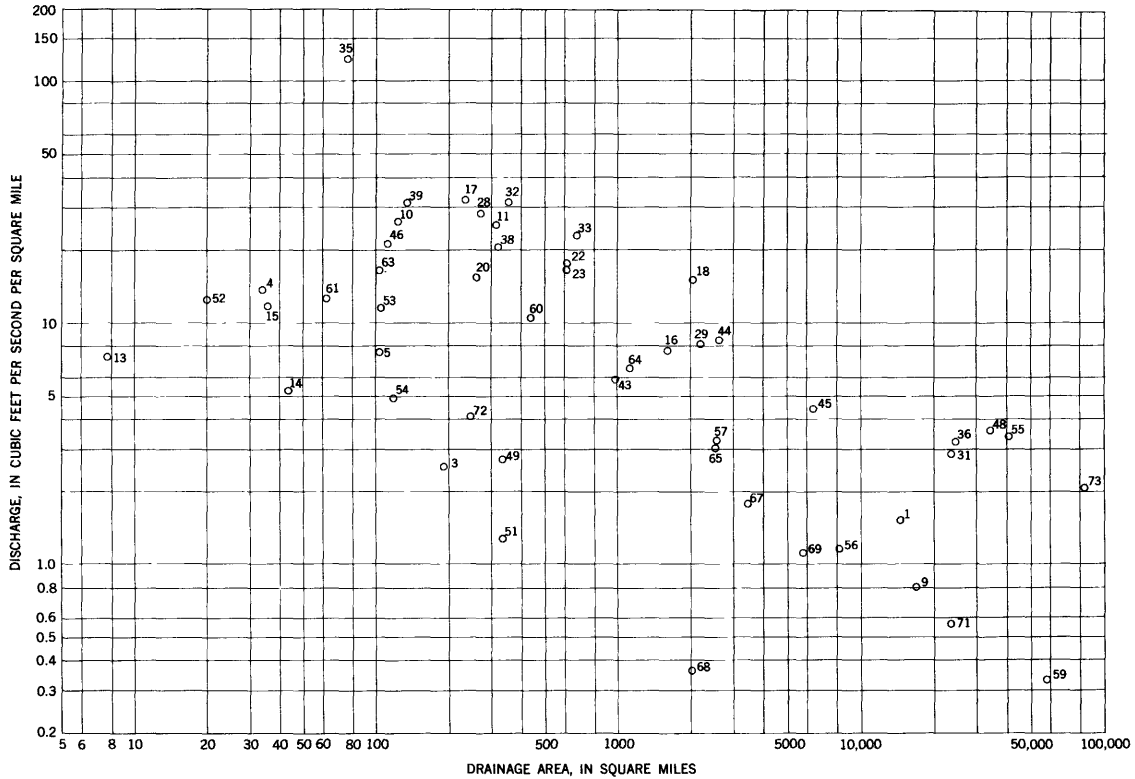

Figure 23. --Relation of unit discharge to size of drainage basin.

RECORDS OF PREVIOUS FLOODS

Information on Missouri River basin floods in Montana before the turn of the century is meager. The largest floods since then were the Milk River flood of June 1906, the general severe flooding of June 1908, the fairly general floods of 1948, and the Milk River flood of April 1952.

The first and last of these occurred in the Milk River basin and are reported in some detail in Follansbee, Meeker, and Stewart (1907) and U. S. Geological Survey (1955), respectively. The first was caused by a severe storm of June 6-8, 1906, in the central part of the Milk River basin, which followed heavy May precipitation. At Havre the peak stage of Milk River was about 2 feet below the floodmark of April 2, 1899. At Glasgow the stage evidently exceeded that of 1899 by several inches. Evidence of driftwood logs in the vicinity of Glasgow indicated that a stage at least 2 feet higher had occurred in the late 1870's or early 1880's. The Milk River floods of 1952, caused entirely by snowmelt, exceeded those of 1953 by a considerable amount.

The floods of June 1908 were considered record floods in the memory of the residents, and still stand as the record floods in most of the Missouri River basin as far downstream as the Milk River and on the main stem of Missouri River throughout the State. Precipitation during May 1908 exceeded previous records at many weather stations, particularly above Great Falls. Large amounts of mountain snow were reported near Helena and probably covered much of the mountain area. Precipitation through early June continued to be excessive and was unusually heavy about June 3 to 6. Flooding of note was recorded as early as June 1 and reached its peak about June 5 or 6 in most areas. Streams caused great damages to railroads, and interruptions to service lasted as much as 2 weeks. The smelter at Great Falls and the copper mines at Butte were closed for months because of damage to rail transportation. At least six lives were lost in Lewis and Clark, and Cascade Counites. No estimate of damage was recorded, yet the scattered items noted in the press indicate direct damage in millions of dollars. Records collected by the Missouri River Power Co. at Canyon Ferry Dam on the Missouri River near Helena give the peak daily inflow of 31, 500 cfs on June 8 or 9 and a second peak of 31, 000 on June 14 and 15. The peak discharge of 49, 300 cfs observed on the Missouri River at Cascade occurred on June 6. Floodmarks uncovered in more recent years together with other information indicate that the flood of 1908 has not since been exceeded along the main stem of the Missouri River and most tributaries from somewhere near Helena to the junction with the Yellowstone River. Belt Creek and possibly Milk River may be the principal exceptions. The floods of 1908 were also severe in the Columbia River drainage basin in Montana.

The floods of 1948 were general in the Missouri River basin, followed closely by intense flooding in the Marias River basin about 10 days later. The peak flow of the Missouri River at Toston was 32,000 cfs on June 6; the Montana Power Co. reported a daily maximum of 33,875 cfs at the dam on Hauser Lake near Helena on June 7; the peak flow below Holter Dam near Wolf Creek was 34,800 cfs on June 8; and the peak flow of 52,800 cfs occurred at Fort Benton on June 7. The discharge at Fort Benton had dropped to 31,400 cfs when the peak flow of the Marias River reached Loma, about 12 miles downstream from Fort Benton. The general floods in the entire basin were caused by thawing rains following delayed snowmelt. In the Marias River basin, intense rains were centered near Valier on June 15-17. The peak flow of the Marias River at Shelby was determined at 40,000 cfs on June 18; conflicting information indicates about the same stage as occurred in 1908. At Brinkman a peak discharge of 50,700 cfs was reached on June 19. The peak at Brinkman was 3 feet higher in 1908, with a discharge estimated at about 70,000 cfs. At Loma, the next station downstream on the Missouri River, the peak flow of 92,000 cfs occurred on June 20. The U. S. Weather Review reported on the Marias storm and flood (1950). The flooding in the Columbia River basin in 1948 is reported by the U. S. Geological Survey (1949).

LITERATURE CITED

Corbett, D. M., and others, 1943, Stream-gaging procedure, a manual describing methods and practices of the Geological Survey: U. S. Geol. Survey Water-Supply Paper 888, 245 p.

Corps of Engineers, Department of the Army, 1953, Report on May-June 1953 floods: Fort Peck district, Fort Peck, Mont.

Dalrymple, Tate, and others, 1937, Major Texas floods of 1936: U. S. Geol. Survey Water-Supply Paper 816, 146 p.

———1939, Major Texas floods of 1935: U. S. Geol. Survey Water-Supply Paper 796-G.

Follansbee, Robert, Meeker, R. I., and Stewart, J. E., 1907, Surface water supply of Missouri River drainage, 1906: U. S. Geol. Survey Water-Supply Paper 208, 190 p.

Johnson, Hollister, 1936, The New York State flood of July 1935: U. S. Geol. Survey Water-Supply Paper 773-E.

McGlashan, H. D., and Briggs, R. C., 1939 [1940], Floods of December 1937 in northern California: U. S. Geol. Survey Water-Supply Paper 843, 497 p.

U. S. Geol. Survey, 1949, Floods of May-June 1948 in Columbia River basin, with a section on magnitude and frequency of floods by S. E. Rantz and H. C. Riggs; U. S. Geol. Survey Water-Supply Paper 1080, 476 p.

———1955, Floods of April 1952 in the Missouri River basin: U. S. Geol. Survey Water-Supply Paper 1260-B.

U. S. Weather Bureau, 1953a, Climatological Data, Montana, v. 56, no. 4.

———1953b, Climatological Data, Montana, v. 56, no. 5.

———1950, Montana Marias basin rainstorm, June 16-17, 1948: Monthly Weather Rev., v. 78, p. 6-12.

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