

# FLOODS OF MAY 1978 IN SOUTHEASTERN MONTANA AND NORTHEASTERN WYOMING

Report prepared jointly by the U.S. Geological Survey  
and the National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF THE INTERIOR



U.S. DEPARTMENT OF COMMERCE



U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1244

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OF THE INTERIOR

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## CONVERSION FROM INCH-POUND SYSTEM TO SI UNITS

Inch-pound	to	SI	SI	to	Inch-pound
<u>Length</u>					
inch (in.)	=	25.4 mm	millimeter (mm)	=	0.03937 in.
foot (ft)	=	0.3048 m	meter (m)	=	3.2808 ft
mile (mi)	=	1.6093 km	kilometer (km)	=	0.6214 mi
<u>Area</u>					
square mile (mi <sup>2</sup> )	=	2.5900 km <sup>2</sup>	square kilometer (km <sup>2</sup> )	=	0.3861 mi <sup>2</sup>
<u>Volume</u>					
acre-foot (acre-ft)	=	1233 m <sup>3</sup>	cubic meter (m <sup>3</sup> )	=	0.00081 acre-ft
<u>Velocity</u>					
mile per hour (mi/h)	=	0.4470 cm/s	kilometer per hour (km/h)	=	2.237 mi/h
<u>Discharge</u>					
cubic foot per second (ft <sup>3</sup> /s)	=	0.02832 m <sup>3</sup> /s	cubic meter per second (m <sup>3</sup> /s)	=	35.3147 ft <sup>3</sup> /s
cubic foot per second per square mile [(ft <sup>3</sup> /s)mi <sup>2</sup> ]	=	0.01094 (m <sup>3</sup> /s)km <sup>2</sup>	cubic meter per second per square kilometer [(m <sup>3</sup> /s)km <sup>2</sup> ]	=	91.40768 (ft <sup>3</sup> /s)/mi <sup>2</sup>
ton per day (ton/d)	=	0.9072 Mg/d	megagram per day (Mg/d)	=	1.102 ton/d
<u>Pressure</u>					
[The National Weather Service uses millibar as customary unit for atmospheric pressure]					
inch of mercury at 32°F	=	33.8639 mb	millibar (mb)	=	0.02953 in. of mercury

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**GLOSSARY**


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**Acre-foot (acre-ft).** The volume of water required to cover 1 acre to a depth of 1 ft. It equals 43,560 ft<sup>3</sup> (cubic feet), 325,851 gal (gallons), or 1,233 m<sup>3</sup> (cubic meters).

**Contents.** The volume of water in a reservoir or lake. Content is computed on the basis of a level pool or reservoir backwater profile and does not include bank storage.

**Convection cloud.** A cloud which owes its vertical development, and possibly its origin, to convection.

**Convective cell.** An organized, convective, fluid motion characterized by the presence of distinct upward motion in the center of the cell and sinking or downward flow in the outer regions.

**Cubic foot per second (ft<sup>3</sup>/s).** A rate of discharge. One cubic foot per second is equal to the discharge of a stream of rectangular cross section 1 ft wide and 1 ft deep, flowing at an average velocity of 1 ft/s. It equals 28.32 L/s (liters per second) or 0.02832 m<sup>3</sup>/s (cubic meter per second).

**Cubic foot per second per square mile, (ft<sup>3</sup>/s)/mi<sup>2</sup>.** The average number of cubic feet of water flowing per second from each square mile of area drained by a stream, assuming that the runoff is distributed uniformly in time and area. One ft<sup>3</sup>/s per square mile is equivalent to 0.0733 m<sup>3</sup>/s per square kilometer.

**Dew point (or dew-point temperature).** The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content for saturation to occur.

**Drainage area of a stream at a specific location.** An area, measured on a horizontal plane, bounded by topographic divides. Drainage area is given in square miles. One m<sup>2</sup> is equivalent to 2.590 km<sup>2</sup> (square kilometers).

**Exceedance probability.** The probability, expressed as a percentage, that a given magnitude of flood discharge will be exceeded during any given year. The reciprocal of exceedance probability is recurrence interval. Thus a flood magnitude with an exceedance probability of 1 percent has a recurrence interval of 100 years.

**Flood.** Any streamflow that overtops natural or artificial banks of a stream and inundates land not usually underwater.

**Front.** The interface or transition zone between two air masses of different densities.

**Gaging station.** A particular site on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are made.

**K Index.** A measure of the airmass moisture content and static stability given by:

$$K = (T_{850} - T_{500}) + T_{d850} - (T_{700} - T_{d700})$$

where  $T$  is temperature and  $T_d$  is dewpoint, in degrees Celsius, and the subscripts denote pressure level in millibars. The larger the  $K$  index of the airmass, the more unstable it is.

**Low.** Center of low barometric pressure.

**National Geodetic Vertical Datum of 1929 (NGVD of 1929).** A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "mean sea level."

**Millibar (mb).** A unit of pressure equal to 1,000 dynes per square centimeter.

**Peak discharge.** The maximum instantaneous discharge attained during a flood.

**Peak stage.** The highest instantaneous stage attained during a flood.

**Precipitable water.** The total atmospheric water vapor contained in a vertical column of unit cross-sectional area extending from the surface up to a specified pressure level, usually 500 mb.

**Recurrence interval.** As applied to hydrologic events, the average number of years within which a given hydrologic event will be exceeded once.

**Suspended sediment.** The sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

**Suspended-sediment discharge.** The rate at which dry weight of sediment passes a section of a stream, or the quantity of sediment, as measured by dry weight or by volume, that passes a section in a given time.

**Temperature.** Air temperature is expressed in degrees Fahrenheit. Water and dew-point temperatures are expressed in degrees Celsius. Temperature in degrees Celsius is equivalent to  $5/9(^{\circ}\text{F} - 32)$ .

**Time of day is expressed in 24-hour time.** For example, 12:30 a.m. is 0030 hours; 1:00 p.m. is 1300 hours.

**Vorticity.** A vector measure of local rotation in a fluid flow, defined mathematically as the curl of the velocity vector:

$$\vec{\zeta} = \nabla \times \vec{v}$$

where  $\vec{\zeta}$  is the vorticity,  $\nabla$  the del-operator, and  $\vec{v}$  the velocity.

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## ABSTRACT

Intense rain and some snow fell on previously saturated ground in southeastern Montana and northeastern Wyoming during May 16-19, 1978. The 7.60 inches that fell within a 72-hour period, measured at Lame Deer, Montana, set a record for the month of May in that region.

Widespread flooding occurred in the drainages of the Yellowstone River and its tributaries as well as the Belle Fourche, Cheyenne, and North Platte Rivers. The previous maximum flood of record was exceeded at 48 gaged sites, and the 1-percent-chance flood was equaled or exceeded at 24 sites. Flood damage was extensive, exceeding \$33 million. Nineteen counties in the two States were declared major disaster areas.

Mean daily suspended-sediment discharges exceeded previously recorded maximum mean daily values at four sites on the Powder River. The maximum daily suspended-sediment discharge of 2,810,000 tons occurred on May 20 at the Powder River site near Arvada, Wyoming.

## INTRODUCTION

Widespread and steady rain mixed with some snow at higher elevations fell during May 16-19, 1978, over southeastern Montana and northeastern Wyoming. Rainfall was greatest in the upper Tongue River drainage, where precipitation exceeded 7 in. The ground was saturated from earlier storms, and streams were generally flowing bankfull from snowmelt runoff. Subsequent flooding occurred along the Yellowstone River and its major tributaries the Bighorn, Tongue, and Powder Rivers as well as the Belle Fourche, Cheyenne, and North Platte Rivers. Flood peaks at about one-third of the streamflow-gaging stations in the area exceeded the maximum flows previously known. Record values for suspended-sediment discharge were established at some sites along the Powder and Bighorn Rivers.

Flood damage to roads, bridges, cropland, and buildings was extensive. Nineteen counties in Montana and

Wyoming were declared major disaster areas by the Federal Government. The area affected by flooding is shown in figure 1.

This report documents the meteorological setting and hydrologic conditions of the flooding. Included are analyses of the distribution of storm rainfall and the magnitude and exceedance probability of the flood-peak discharges. A specific account is given of flood conditions for each of the affected drainage basins. The effect of reservoir storage on discharge also is assessed. Flood-stage and discharge data with corresponding exceedance probabilities and significant sediment-discharge data are also presented.

## ACKNOWLEDGMENTS

Many of the meteorological analyses were produced by the National Meteorological Center of the National Weather Service. Other analyses are based on data collected and observations made by National Weather Service field offices. Flood data in this report were collected as part of cooperative programs among the U.S. Geological Survey, the States of Montana and Wyoming, and agencies of the Federal Government. Information on reservoir operation and flood photographs were provided by the U.S. Bureau of Reclamation. Flood-damage data were obtained from the Federal Disaster Assistance Administration, the U.S. Agricultural Stabilization and Conservation Service, and the Wyoming Disaster and Civil Defense Agency. Selected photographs were provided by the Montana Department of Highways. The assistance provided by these agencies is gratefully acknowledged.



## MAY 1978 FLOODS, SOUTHEASTERN MONT. AND NORTHEASTERN WYO.

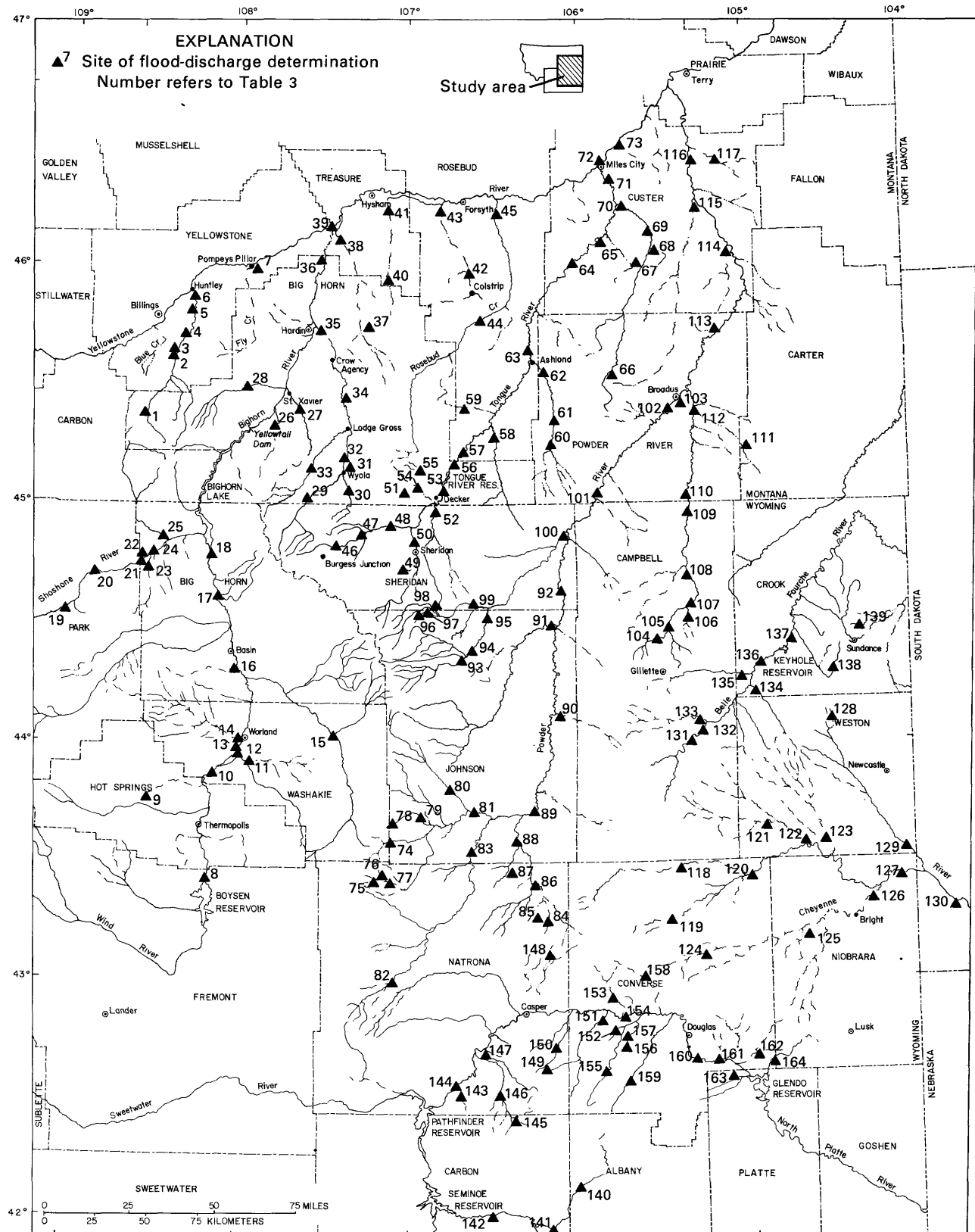


FIGURE 1. Area affected by floods and location of flood-discharge-determination sites.

## METEOROLOGICAL SITUATION

Greater-than-normal precipitation during late April and early May occurred both in south-central and southeastern Montana and in central and northeastern Wyoming. Two antecedent storms occurred in the 3 weeks before the storm began on May 16. The first, on April 26-30, left the soil saturated. The second occurred

during May 2-8. During May 4-7 a snowstorm deposited 15 to 32 in. of wet, heavy snow in much of central and eastern Wyoming. This period was followed by a warming trend that culminated on May 15 in maximum temperatures of 95°F at Broadus, Mont., 90°F at Lame Deer, Mont., 87°F at Sheridan Wyo., 86°F at Casper, Wyo., and 94°F at Redbird, Wyo. (fig. 2). Melting snow caused mountain streams to flow at bankfull stages

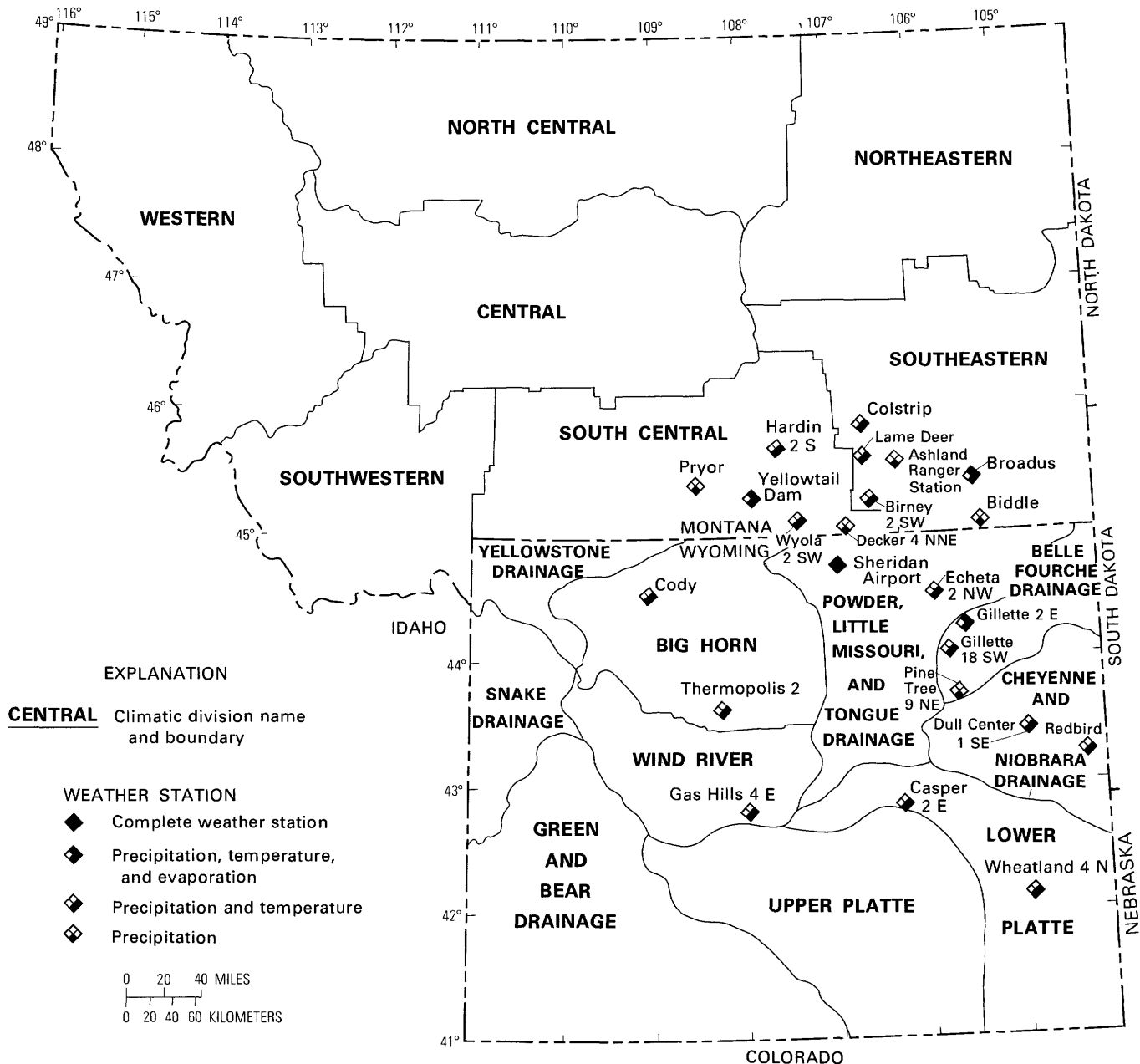


FIGURE 2. Climatic divisions and location of selected weather stations in Montana and Wyoming.

prior to the onset of the May 16-19 storm. The following precipitation amounts were recorded at selected stations during the 3 weeks before May 15. Snow depth has been converted to equivalent water depth.

Gillette 18 SW, Wyo	5.30 in.
Sheridan Airport, Wyo	4.09 in.
Ashland Ranger Station, Mont	3.70 in.
Yellowtail Dam, Mont	6.96 in.

By comparison, the normal monthly precipitation at Sheridan Airport, Wyo., for May is 2.45 in.

In addition to precipitation during May 16-19, much precipitation also fell during 10 other days of the month. Precipitation amounts at some sample stations compared with climatological averages are given in table 1. The much-greater-than-normal precipitation was not limited to individual stations but extended throughout southeastern Montana and northeastern Wyoming. Average precipitation for May 1978 in climatic divisions in this region is listed in table 2. The demarcation of climatic divisions as used by the National Climatic Center of the National Oceanic and Atmospheric Administration is shown in figure 2.

On May 14 at 0500 m.s.t., 2 days before the storm, a deep upper trough existed off the Pacific coast from 850 mb to above 500 mb. At the surface the weather system consisted of a complex series of Lows and fronts. The primary weather feature was a Low about 400 mi west of the British Columbia-Washington coast. The associated cold front, extending eastward from the center, was about 50 mi from the Washington and Ore-

TABLE 1.—Precipitation amounts at selected National Weather Service stations

Station	Years of record	Precipitation (inches)			Dates of occurrence (May)
		Long-term May average	May 1978	Storm totals	
Montana:					
Decker 4 NNE	19	---	7.12	4.40	16-18
Hardin 2 S	37	1.70	6.47	4.19	17-19
Pryor	28	---	8.46	5.79	17-19
Wyola 2 SW	47	2.45	8.65	5.11	17-19
Yellowtail Dam	16	---	9.28	5.38	16-19
Biddle	27	---	7.40	2.66	17-19
Birney 2 SW	24	---	7.71	4.48	17-19
Broadus	46	2.23	7.10	3.41	16-19
Colstrip	50	2.47	9.27	4.80	17-19
Lame Deer	45	2.59	12.44	7.60	17-19
Wyoming:					
Gillette 2 E	58	2.50	11.08	5.06	17-19
Gillette 18 SW	28	---	10.27	5.40	16-19
Echeta 2 NW	15	---	11.26	4.65	16-19
Sheridan Airport	83	2.45	6.80	3.78	16-19
Casper 2 E	59	2.41	7.18	3.58	16-18
Dull Center 1 SE	49	2.28	6.93	3.57	17-19
Wheatland 4 N	65	2.58	3.86	1.78	17-18
Thermopolis 2	14	1.90	10.31	5.17	17-19
Cody	68	1.51	4.73	3.36	17-19

TABLE 2.—Average precipitation for May 1978 compared with climatic normals for selected climatic divisions

Division	Precipitation (inches)		
	Average, May 1978	Normal	Departure
<b>Montana:</b>			
Northeastern	5.29	1.74	+3.55
South Central	6.43	2.40	+4.03
Southeastern	6.91	2.09	+4.82
<b>Wyoming:</b>			
Big Horn	5.29	1.53	+3.76
Powder, Little Missouri, and Tongue drainage	8.02	2.34	+5.78
Belle Fourche drainage	8.37	2.68	+5.69
Cheyenne and Niobrara drainage	5.27	2.51	+2.76
Wind River	4.55	1.98	+2.57

gon coast. A second Low was located in eastern Washington and Oregon, and a third Low was in central Alberta province, Canada. Precipitation was widespread over southern British Columbia, Washington, and northern Oregon west of the Cascade Range.

Over Montana and Wyoming the winds aloft were westerly and southwesterly, and were associated with the trough off the Pacific coast and a ridge that extended from central New Mexico north-northeastward to central North Dakota. At the surface, winds were light with a generally southerly flow east of the Rocky Mountains, bringing moisture northward from the Gulf of Mexico. Average surface dew point over the Montana-Wyoming region on the leeward side of the Rocky Mountains was about 45°F, compared with the monthly mean for May of 35°F. The average precipitable water in this region, however, was close to the monthly mean of 0.35 in. estimated from Lott (1976).

The weather system moved eastward, and by 0500 m.s.t. on May 15, the upper trough and the primary surface Low were both located along the Pacific coast. The associated cold front, ahead of the surface Low, now extended from the British Columbia-Alberta border southward and then southwestward through central Idaho and northwestern Nevada and exited the coast in the vicinity of San Francisco Bay. By 0500 m.s.t. May 16 this cold front had reached eastern Montana and extended through southeastern Wyoming, northwestern Colorado, and southeastern Utah (fig. 3). Then the movement of the northern part of this front slowed and

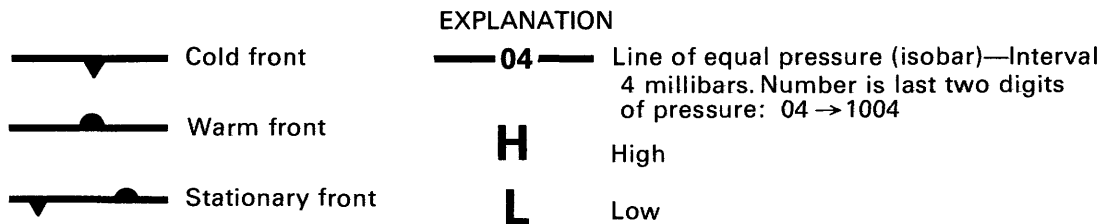
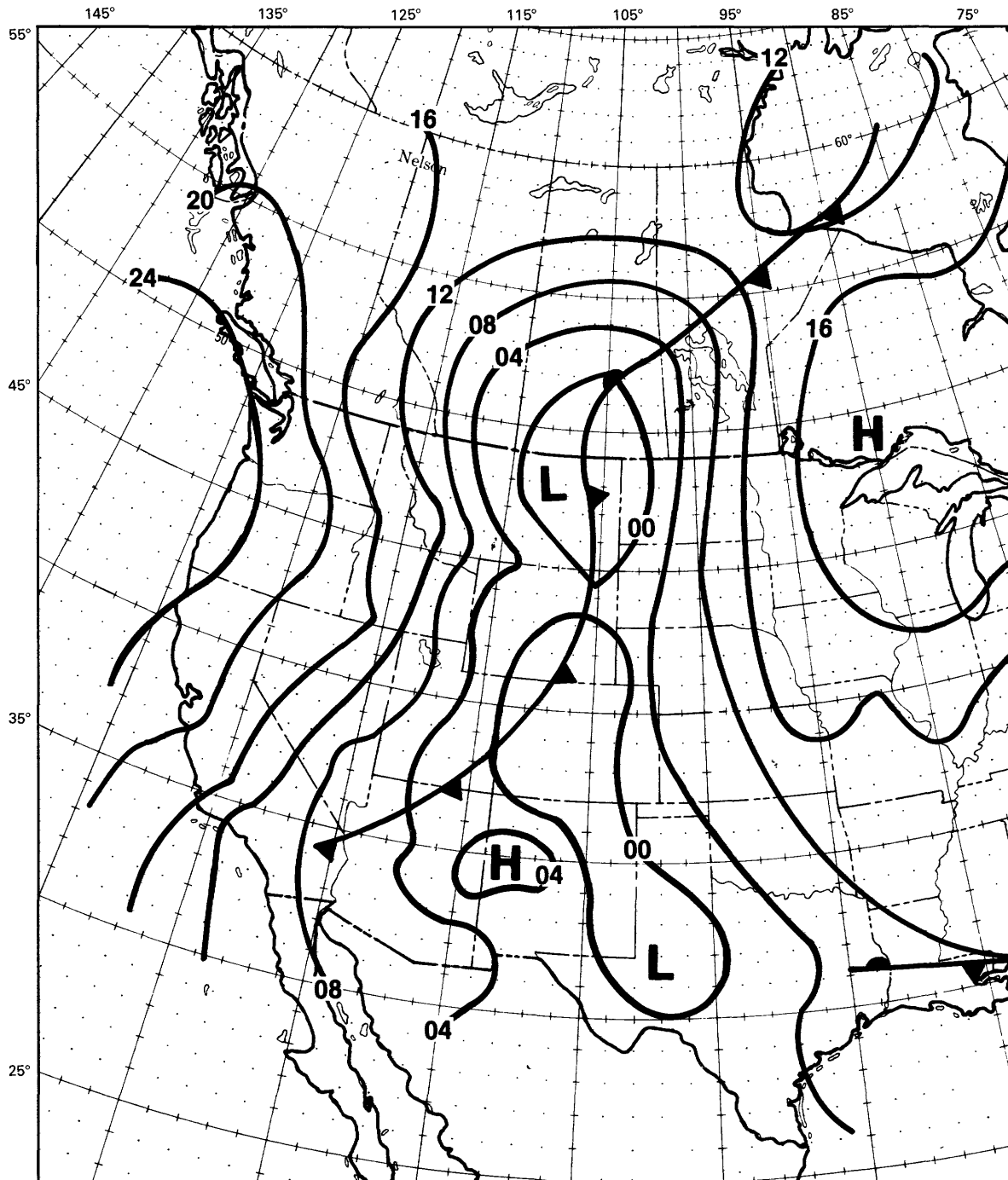


FIGURE 3. Surface weather chart of Western United States and Canada for 0500 m.s.t. May 16, 1978.

the front became stationary over eastern Montana, Wyoming, and the Dakotas. Meanwhile, an incipient closed Low appeared in Colorado. This Low became associated with the southern part of the cold front, and both became nearly stationary. By 0500 m.s.t. May 17, the entire cold front was oriented nearly north-south (fig. 4).

Before the storm began, the Montana-Wyoming region had been located under 700-mb and 500-mb trough-to-ridge flow patterns (figs. 5 and 6). Usually, low-level horizontal convergence, high-level horizontal divergence, and upward vertical motion exist between trough and downwind ridge, and are conditions favorable to subsequent storm development provided that adequate moisture supply is available.

Persistent southerly flow in the lower levels brought moist air that had originated over the Gulf of Mexico. Precipitable water over the region increased steadily after May 15, reaching an average of 0.70 in. by 0500 m.s.t. May 17, which was 200 percent of the mean monthly precipitable water for May of 0.35 in. estimated over the same area. For comparison, the maximum precipitable water that has been observed during May 16-31 over this same region is 1.00 in. (Riedel and Ho, 1979). The average surface dew-point temperature estimated for the region was 58°F at 1700 m.s.t. May 16, when rain began over northeastern Wyoming. By comparison, the climatic mean surface dew-point temperature over the region for May is 35°F (U.S. Environmental Science Services Administration, 1968). Aloft over the region, dew-point depression during the storm was only 0° to 1°C at 700 mb and 2°C at 500 mb. The mean relative humidity throughout the lower layers of the atmosphere, averaged over the whole region, was 60 percent during the evening of May 16, increasing to more than 90 percent by the evening of May 18. All these conditions indicated that an abundant moisture supply was available.

The 1700 m.s.t. May 16 analysis of 500-mb heights and vorticity showed that the absolute vorticity over the region was about  $10 \times 10^{-5}$  per second. It increased to  $16 \times 10^{-5}$  per second in a closed center of maximum absolute vorticity by 0500 m.s.t. May 18. Strong cyclonic circulation, low-level convergence, and rising motion generally occur concurrently with the vorticity maximum. Areas of vertical velocity exceeding 2.2 cm/s (centimeters per second) first appeared over eastern Wyoming and then moved over eastern Montana. The vorticity maximum progressed eastward toward the Dakotas and left the region by 0500 m.s.t. May 19.

The frontal system extending from the Low in southern Wyoming and northern Colorado moved slowly eastward. By morning of May 19 the Low and the associated frontal system were over the central Dakotas.

The 700-mb Low also moved to the east of the region, and northerly flow began to replace the persistent southerly flow of the previous 3 days. This change in the upper airflow pattern also put the region under a 500-mb ridge-to-trough pattern. With relatively dry and cool northerly flow prevailing and with a ridge approaching from the west, the sky cleared and the storm ended. By 1700 m.s.t. May 19, a high-pressure cell was established over north-central Wyoming.

## PRECIPITATION DISTRIBUTION

Intense rain began in northeastern Wyoming early in the evening of May 16. The southerly flow at 500 mb forced the precipitation area northward, parallel to the front. Intense rain began in southeastern Montana later in the same evening. Except for occasional brief intermissions, the precipitation continued from the evening of May 16 until the morning of May 19. Precipitation the evening of May 16 was in the form of rain in all sectors, but by morning of May 17 snow was falling at some locations with elevations as low as 5,500 ft. Most of the snow melted as it touched the ground; however, deep accumulations occurred in some areas with elevations above 6,000 ft. Weather station Gas Hills 4E in Wyoming, at an elevation of 7,000 ft, reported a maximum accumulation of 25 in. of snow on the ground on May 18. The presence of the quasistationary synoptic scale frontal boundary parallel to the upper-air flow during May 16 and 17 (figs. 4, 7, 8) helped to focus the precipitation over this region for about 60 hours.

The precipitation was associated with a slowly moving quasistationary frontal system. Moisture supply in the storm area was abundant. However, the combined thermal and moisture vertical structure of the atmosphere was only moderately unstable. The estimated *K* index for the region did not exceed 28 for the duration of the storm, denoting moderate thunderstorm potential and little likelihood of severe thunderstorms. Precipitation was produced mainly by imbedded convective cells associated with the cold front. Most of the precipitation was in the sector behind the cold front.

Selected mass precipitation curves for four representative stations are shown in figure 9. Total storm precipitation is shown in figure 10. The drainages receiving substantial precipitation were those of the Big Horn (including the Little Big Horn), Tongue, Powder, Belle Fourche, and Cheyenne Rivers.

The maximum point rainfall was 7.60 in., recorded at Lame Deer, Mont., within the 72 hours ending 1600 m.s.t. May 19. This amount far exceeded the corresponding 100-year 72-hour precipitation of 4.40 in. determined with the procedures developed by Miller (1964)

# PRECIPITATION DISTRIBUTION

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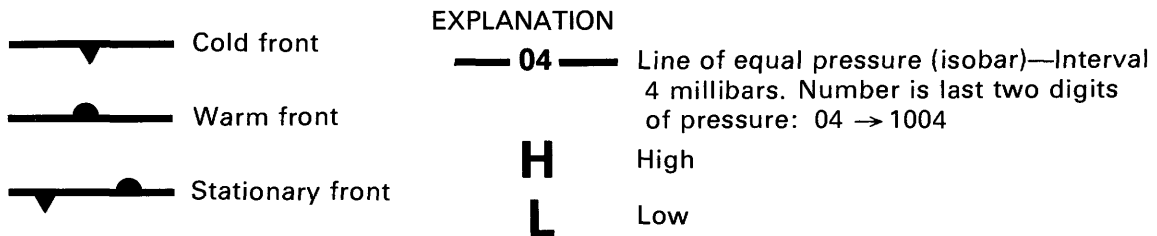
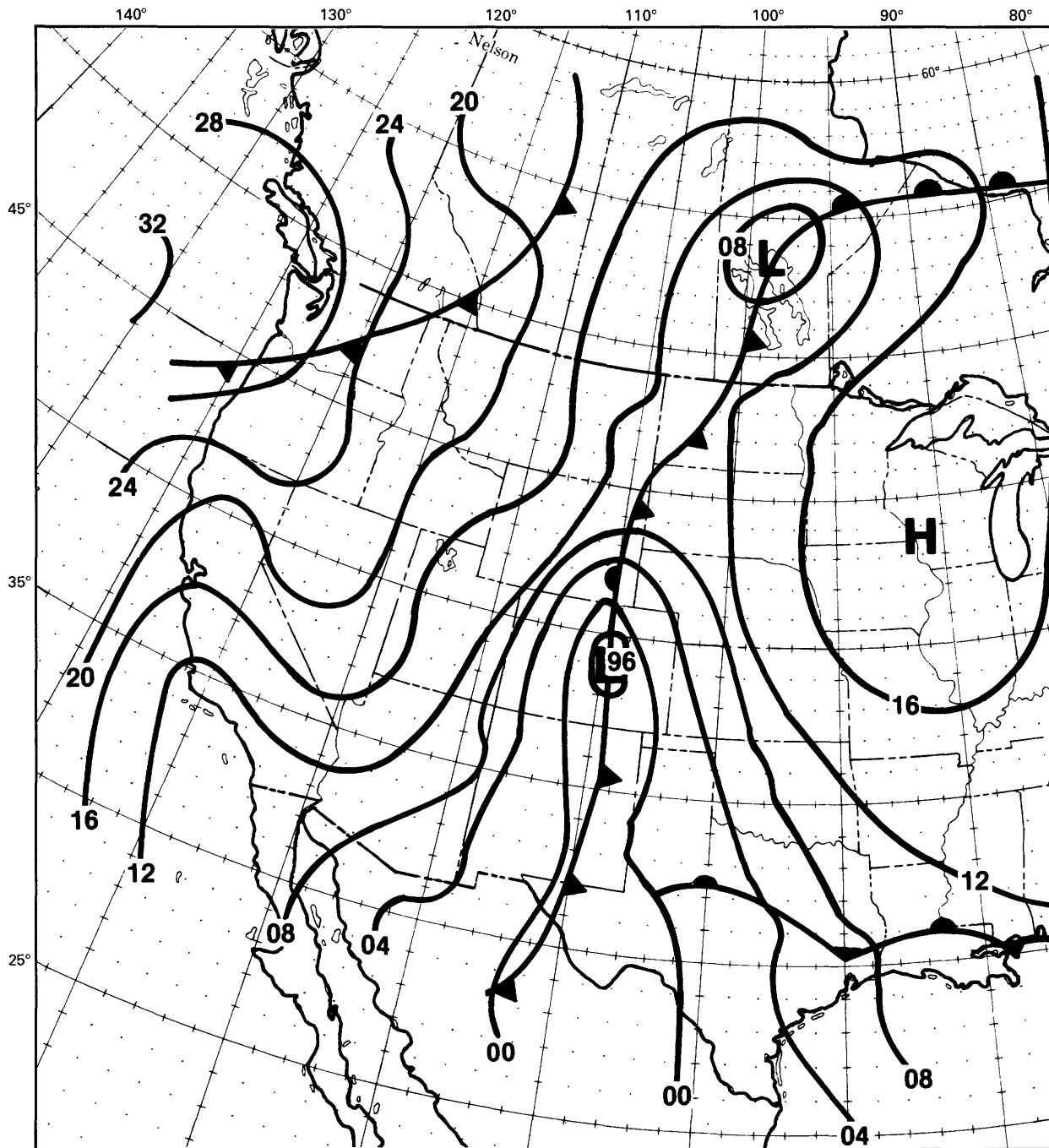


FIGURE 4. Surface weather chart of Western United States and Canada for 0500 m.s.t. May 17, 1978.

## MAY 1978 FLOODS, SOUTHEASTERN MONT. AND NORTHEASTERN WYO.

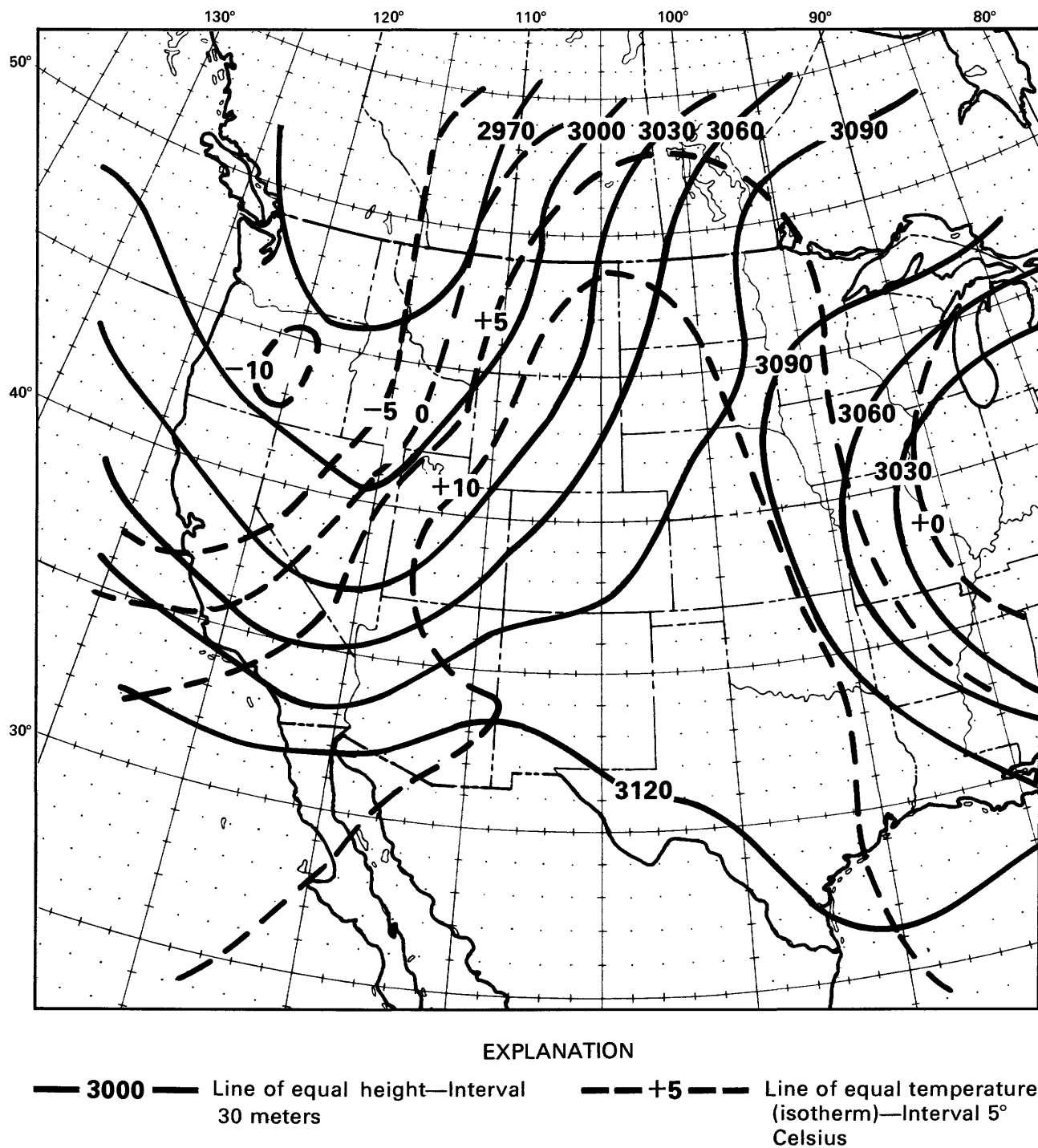
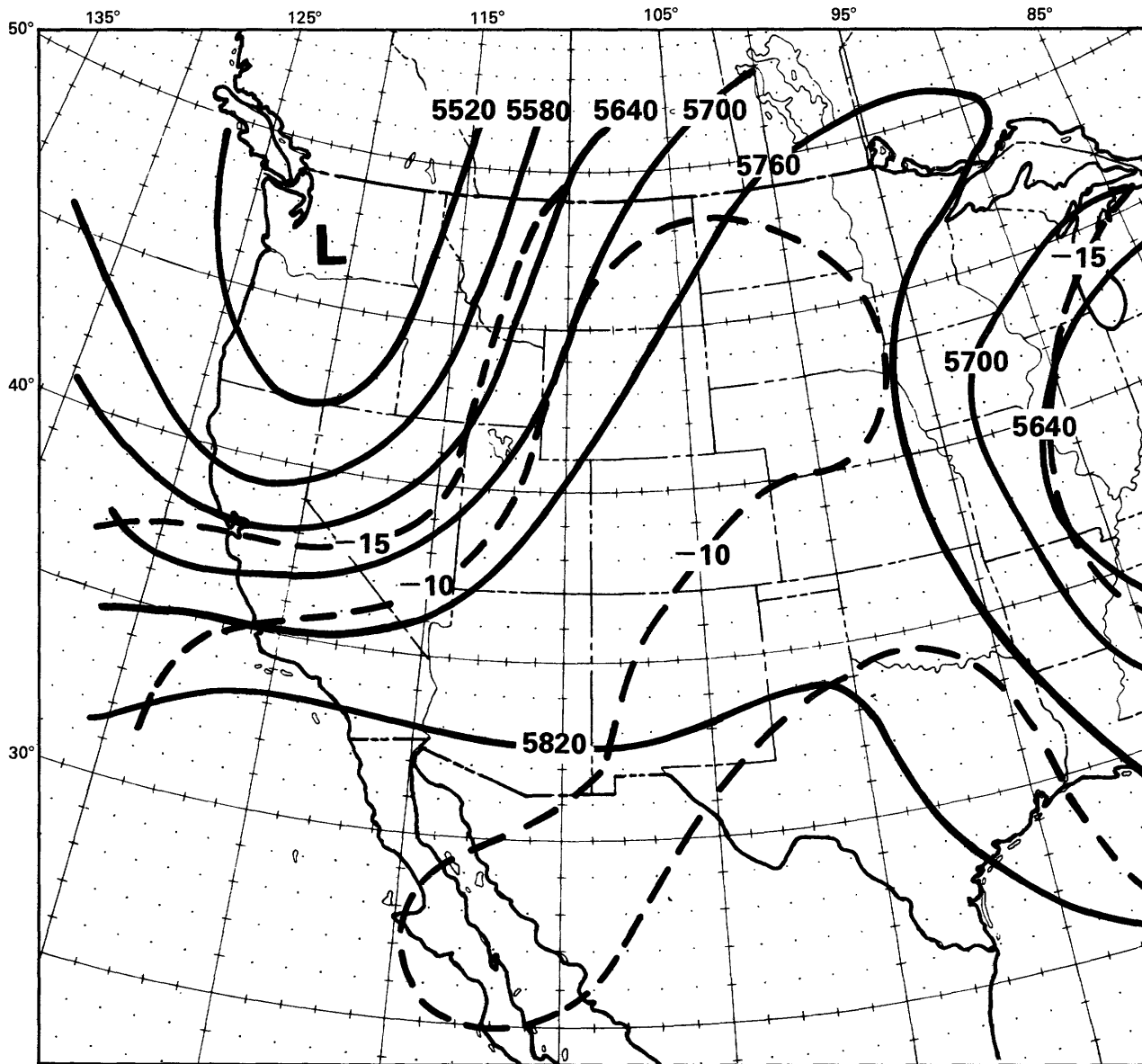


FIGURE 5. 700-millibar chart of Western United States for 1700 m.s.t. May 15, 1978.

# PRECIPITATION DISTRIBUTION

9



## EXPLANATION

**— 5700 —** Line of equal height—Interval  
60 meters

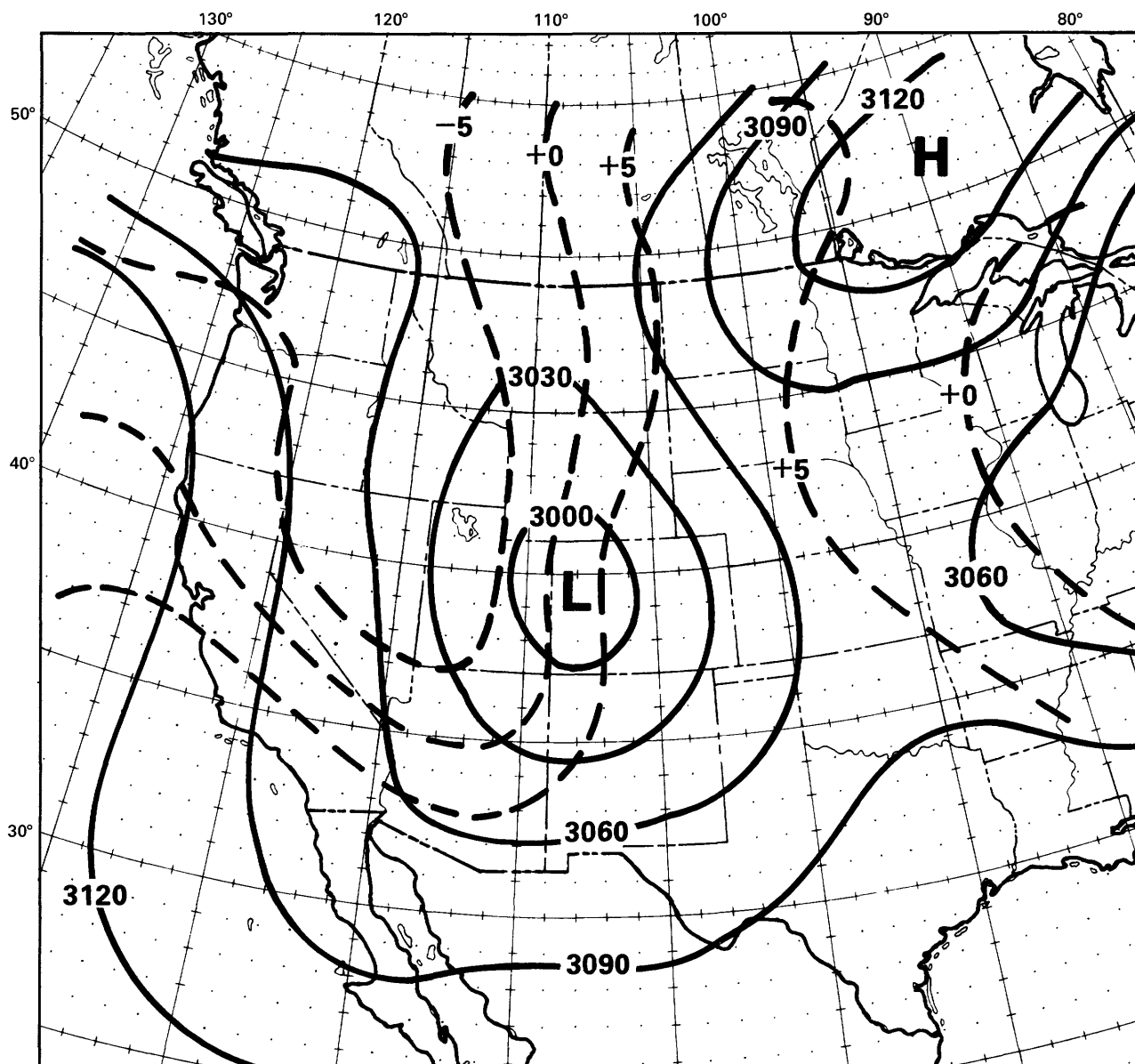
**L** Low

**- - - 10 - - -** Line of equal temperature  
(isotherm)—Interval 5°  
Celsius

FIGURE 6. 500-millibar chart of Western United States for 1700 m.s.t. May 15, 1978.



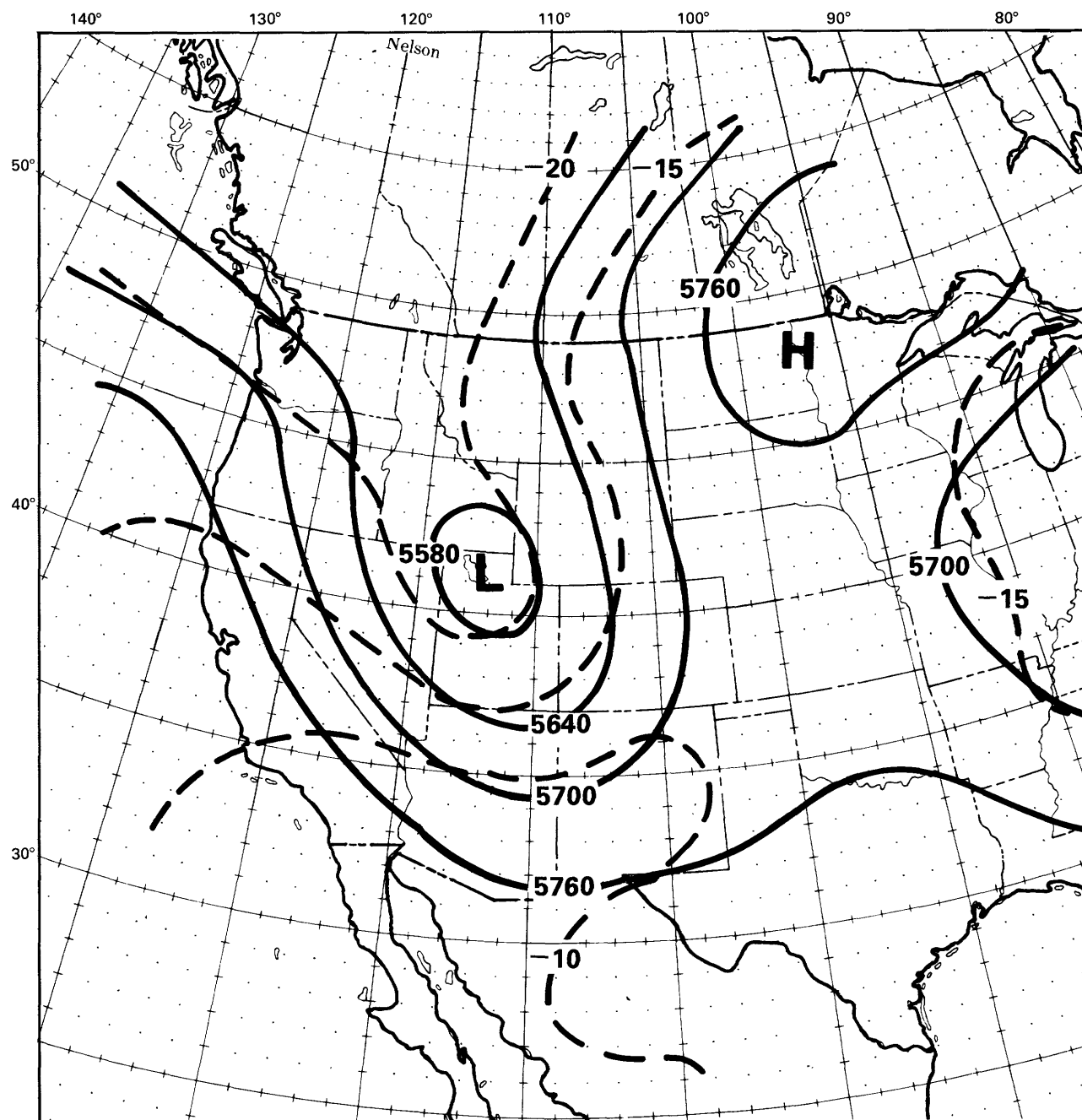
## MAY 1978 FLOODS, SOUTHEASTERN MONT. AND NORTHEASTERN WYO



## EXPLANATION

<b>—3090—</b>	Line of equal height—Interval 30 meters	<b>- - - +5 - - -</b>	Line of equal temperature (isotherm)—Interval 5° Celsius
<b>H</b>	High		
<b>L</b>	Low		

FIGURE 7. 700-millibar chart of Western United States for 0500 m.s.t. May 17, 1978.



## EXPLANATION

- |               |   |                    |  |
|---------------|---|--------------------|--|
| <b>—5700—</b> | Line of equal height—Interval 60 meters | <b>--- -10 ---</b> | Line of equal temperature (isotherm)—Interval 5° Celsius |
| <b>H</b>      | High                                    |                    |  |
| <b>L</b>      | Low                                     |                    |  |

FIGURE 8. 500-millibar chart of Western United States for 0500 m.s.t. May 17, 1978.

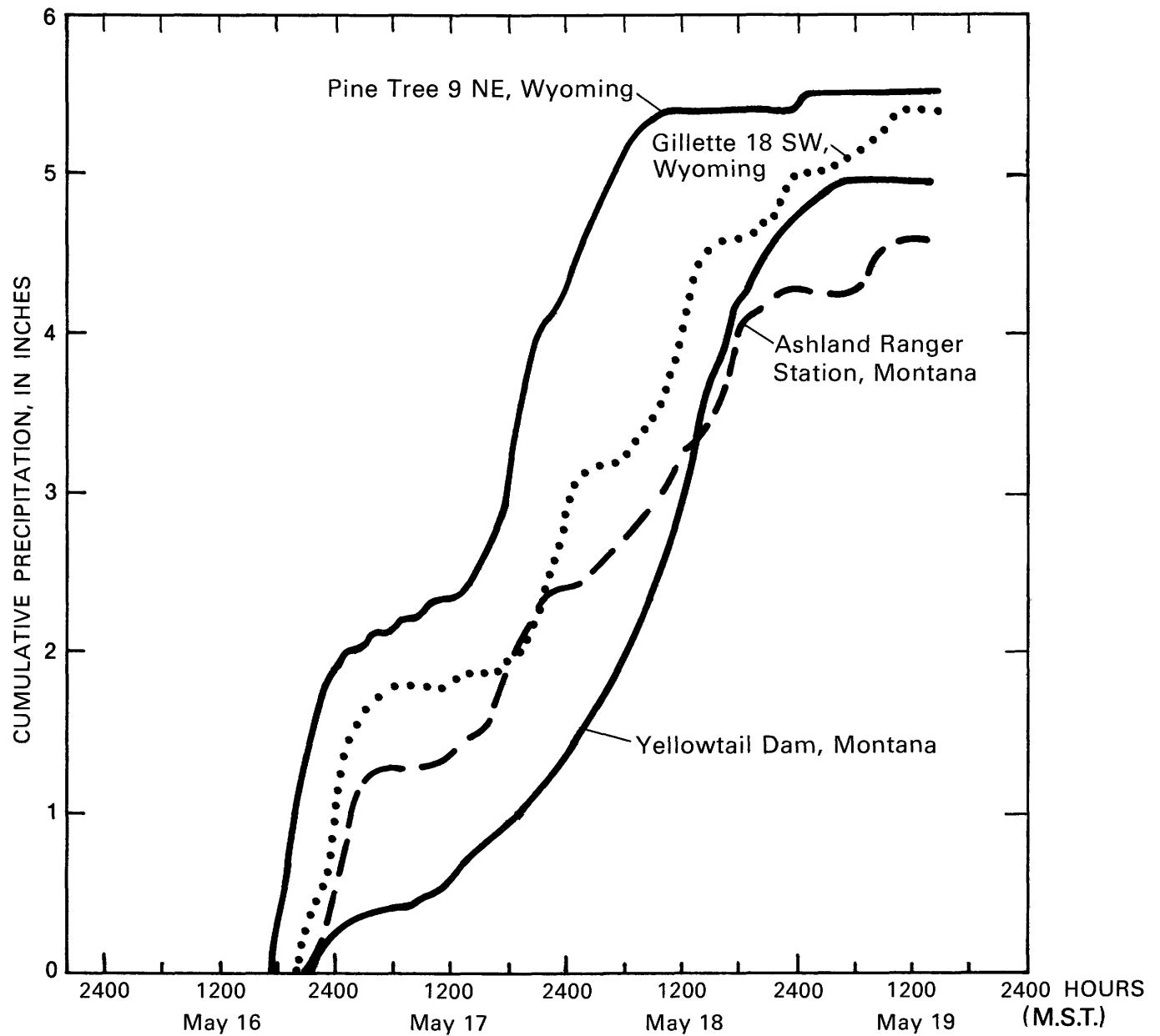
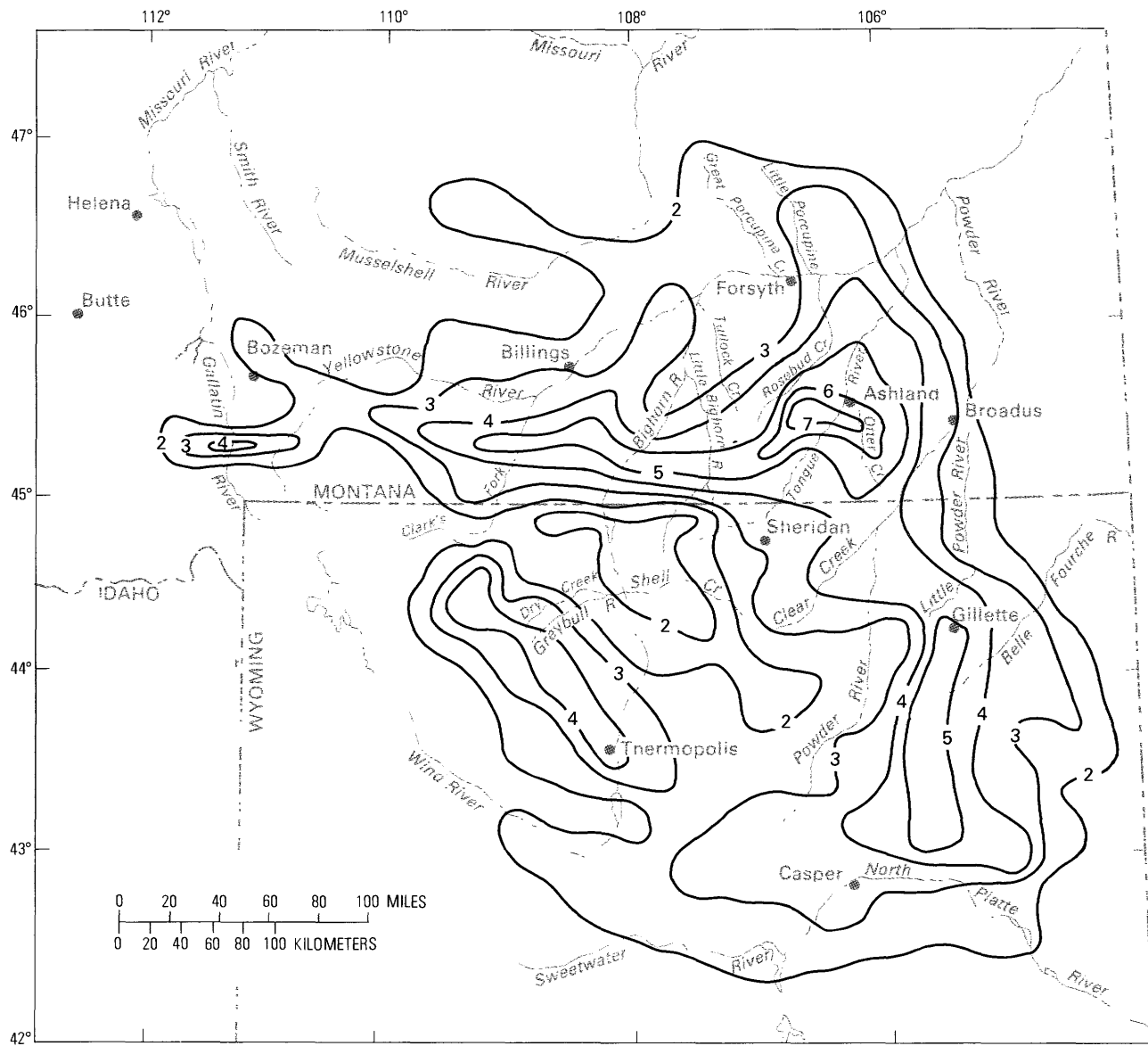


FIGURE 9. Mass precipitation curves for four weather stations, May 16-19, 1978.

# PRECIPITATION DISTRIBUTION

13



## EXPLANATION

— 2 — Line of equal precipitation (isohyet)  
Interval 1 inch

FIGURE 10. Total storm precipitation, May 16-19, 1978.

and 1- and 24-hour values from Miller and others (1973).

Considering the scarcity of actual rainfall observations in this region, the maximum point value probably was not recorded. Therefore, the greatest observed rainfall is assumed to represent the average depth over an appreciable area, rather than the maximum point rainfall. A common assumption is that the maximum station rainfall represents an average depth over 10 mi<sup>2</sup>. In practice, precipitation amounts for past significant storms were tabulated for durations of 6, 12, 18, 24, 48, and 72 hours. The May 16-19, 1978, storm actually lasted about 60 hours. Therefore, the maximum 72-hour precipitation over 10 mi<sup>2</sup> was considered conservatively to be 7.60 in. For comparison, 5.50 in. is the greatest observed 10-mi<sup>2</sup> 72-hour precipitation for the month of May in a section enclosing Lamar, Mont., bounded by latitude 44°N. and 49°N., and by longitude 105°W. and 110°W. (United States-Canada boundary).

The precipitation for the May 16-19, 1978, storm established a record for May. However, when all months are considered, the rank of this storm is third greatest. The historical file used as a basis for comparison consists of extreme areal storm-rainfall depths that have been determined by the U.S. Army, Corps of Engineers, and other Government agency field offices (U.S. Army, Corps of Engineers, updated annually since 1945). The stratification by duration and geographical area used in this comparison is from the National Weather Service, Hydrometeorological Branch (1979).

## GENERAL DESCRIPTION OF FLOODS

The area affected by the May 1978 floods in Montana and Wyoming is shown in figure 1. Major drainages in Montana where flooding occurred include the Yellowstone River and its major tributaries the Bighorn River, Tongue River, and Powder River. Drainages affected in Wyoming include these three tributaries of the Yellowstone River as well as the Belle Fourche River, Cheyenne River, and North Platte River. Peaks in the North Platte River drainage generally resulted from the first rain on May 16 or the early morning of May 17, whereas peaks in the more northerly basins were caused by the later rains.

Streams throughout the area generally were flowing near or at bankfull stage before the May 16-19 precipitation because of greater-than-average precipitation and snowmelt runoff during early May. The high antecedent flows, generally saturated ground conditions, and stockwater reservoirs already at or near capacity

contributed to the record and near-record floodflows that occurred.

The precipitation at the higher elevations was snowfall (Burgess Junction, in the Big Horn Mountains in Wyoming, reported 27 in.), which delayed runoff of some of the mountain streams. These streams peaked several days later when warm temperatures melted the snow. Flooding would have been much more severe if all the precipitation had been rainfall.

Peak discharges and peak stages were determined at 164 selected sites. At 30 of the sites, peak discharges were determined by indirect methods after the floodwaters receded. The remaining sites were either active or discontinued streamflow-gaging stations where stage-discharge relationships already were available. In all instances, trained personnel from the U.S. Geological Survey were dispatched to collect stage data, measure streamflow where possible, and obtain onsite survey data required for the indirect discharge measurements. Sites where data were collected and peak discharges determined are shown in figure 1.

The peak discharges and stages are given in table 3 (at end of report). The numbers in the first column of table 3 correspond to the site numbers shown in figure 1. For convenience, site numbers are used throughout this report. The permanent station number is the number of the streamflow-gaging-station used in the annual data reports of the Geological Survey. The sites are numbered consecutively in downstream order. Sites on tributaries are listed between sites on the main stream in the order in which those tributaries enter the main stream. Sites on tributaries entering upstream from all main-stream sites are listed before the first main-stream site.

## FLOOD MAGNITUDE

Peak discharges at about one-third of the streamflow-gaging stations were the largest since the stations were established. A comparison of May 1978 flood discharges with the greatest known flood discharges in the area can be made from figure 11, which relates discharge, in cubic feet per second per square mile, to corresponding drainage area. Enveloping curve A, defined by the largest known flood discharges, and enveloping curve B, defined by the May 1978 flood discharges, indicate that the May 1978 peak flows generally were about 50 percent less than the maximum known peak flows for drainage areas greater than 100 mi<sup>2</sup>. For drainages smaller than 100 mi<sup>2</sup>, the May 1978 peak discharges were about 50-80 percent less than the maximum known peak discharges. The gradual flattening of curve B for drainage areas less than 100 mi<sup>2</sup> indicates that

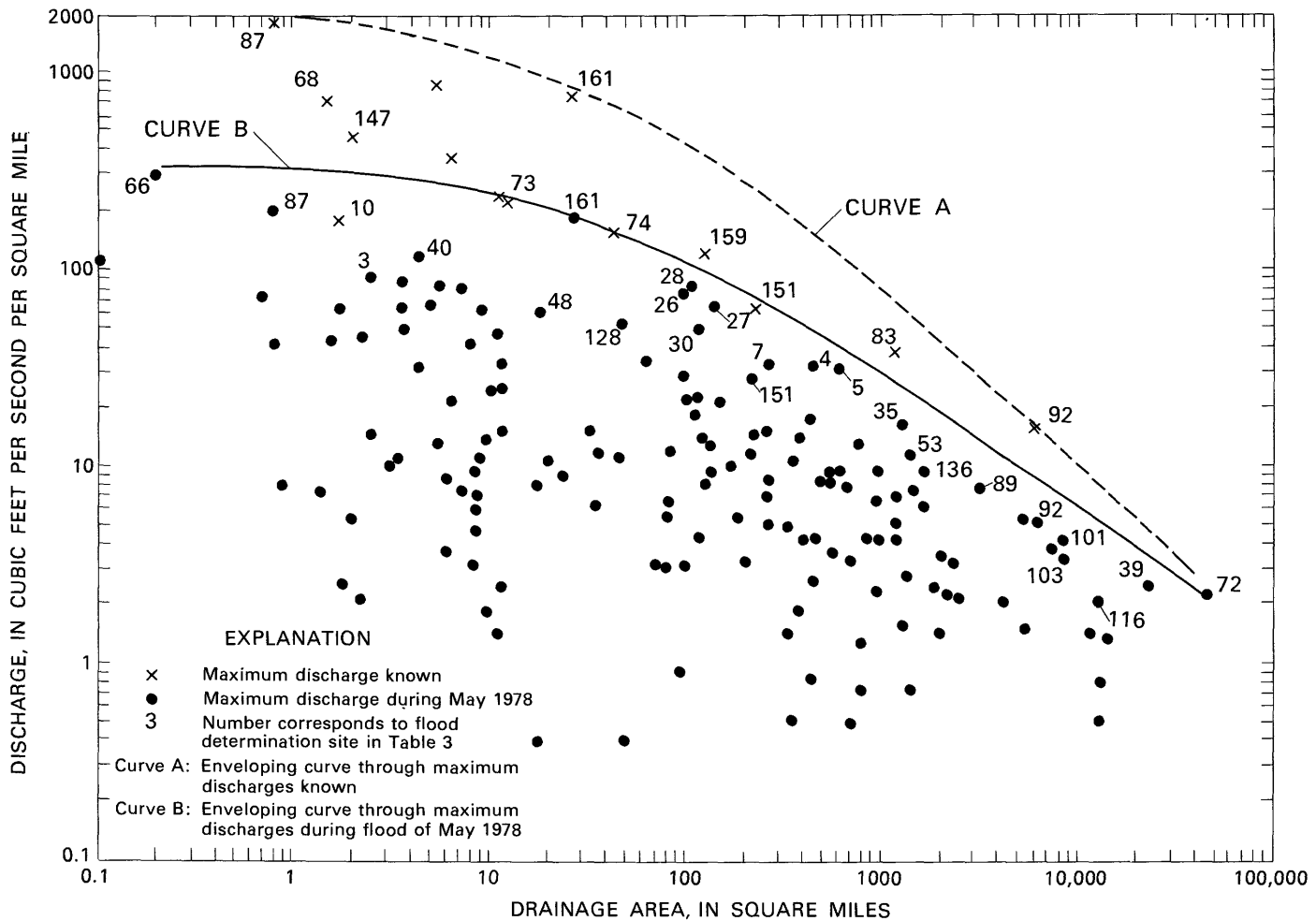


FIGURE 11. Comparison of May 1978 peak discharges with maximum known flood peaks.

smaller streams in the area did not flood appreciably, and that record flooding on the larger streams was not the result of peak-flow contributions from some small tributaries. Rather, all tributaries appeared to be contributing to a gradual buildup of flow that culminated in large discharges on the larger streams.

## FLOOD FREQUENCY

Information on the magnitude and frequency of flooding is necessary for the adequate design of flood-plain structures and for making management decisions about flood-plain land use. In this report the frequency of flooding is expressed as the percentage chance of exceeding a specified flood magnitude during any 1-year period. Thus, a 2-percent-chance flood has 2 chances in

100 of being exceeded during any 1-year period. The occurrence of floods is assumed to be random in time; no schedule or regularity of occurrence is implied. The occurrence of a 2-percent-chance flood is no guarantee, therefore, that a similar-size flood will not occur next week or next year.

For time periods longer than 1 year, the risks of experiencing large floods increase in a nonadditive fashion. For example, the risk of exceeding a 1-percent-chance flood one or more times during a 30-year period is 25 percent and during a 70-year period is 50 percent.

The frequency of flooding was derived from a statistical analysis of annual peak flows at the gaging stations in the flood area. The method generally used to determine the flood-flow frequencies is described by the U.S. Water Resources Council (1977). At gaging sites in Montana having short flood records (less than 10 years), flood frequencies were determined from a re-

gional flood-frequency study by the U.S. Geological Survey (Johnson and Omang, 1975). Flood-frequency information was not developed for sites on streams materially affected by regulation or diversion, or for Wyoming stream sites where the record length was less than 10 years.

## RESERVOIRS

In Montana, the only major storage reservoirs located in the flood area are Bighorn Lake, which is formed behind Yellowtail Dam on the Bighorn River, and the Tongue River Reservoir on the Tongue River.

On the Bighorn River, peak flows and stages were reduced substantially as a result of reservoir flood-control operations. Thus, although the peak inflow to Bighorn Lake was 27,000 ft<sup>3</sup>/s on May 18, the release to the river downstream from the dam was held to 1,220 ft<sup>3</sup>/s on May 20-21 (U.S. Bureau of Reclamation, 1979). The U.S. Bureau of Reclamation also estimated that peak discharge of the Bighorn River at Bighorn, Mont. (site 39), was reduced by about 25,000 ft<sup>3</sup>/s; for the Yellowstone River at Miles City (site 72) the peak discharge was reduced about 22,000 ft<sup>3</sup>/s and the peak stage was reduced 2 ft as a result of operation of Bighorn Lake. The reduction in stage at the Bighorn River site (site 39) could not be determined because of unknown backwater effects at higher flows. A summary of stage and contents for Bighorn Lake during May-June 1978 is presented in table 4. Curves of reservoir inflow, outflow, and storage contents through early June are shown in figure 12.

Although the Tongue River Reservoir is not operated as a flood-control structure, reservoir storage significantly reduced the peak discharge of the Tongue River, from 17,500 ft<sup>3</sup>/s at the Montana-Wyoming State line (site 53) to 10,800 ft<sup>3</sup>/s at Tongue River Dam (site 56). Nevertheless, high flows at the dam seriously damaged the reservoir outlet structure and spillway. Although daily reservoir stages are not available, a composite hydrograph showing discharge at State line and at Tongue River Dam is shown in figure 13.

In Wyoming, the only major reservoir affected by large-scale flooding was Keyhole Reservoir on the Belle Fourche River. This reservoir spilled for the first time in its 26-year history and reached a record storage level on May 22, 1978. The peak outflow (combined spill and release) recorded on May 23 also was a new maximum of record. As is indicated by the curves of inflow, outflow, and storage contents in figure 14, the peak discharge of the Belle Fourche River was reduced by about 14,000 ft<sup>3</sup>/s as a result of the storage in Keyhole Reservoir. The reduction in stage was not determined.

TABLE 4.—Summary of stage and contents for Bighorn Lake near St. Xavier, Mont.

[Station 06286400; time 2400 hours, m.s.t. Maximum reservoir inflow, 27,000 cubic feet per second, May 18. Maximum reservoir contents, 1,236,700 acre-feet, July 13. Records furnished by U.S. Bureau of Reclamation]

Day	May 1978			June 1978		
	Elevation above NGVD of 1929 (feet)	Contents (acre-feet)	Change in storage (acre-feet)	Elevation above NGVD of 1929 (feet)	Contents (acre-feet)	Change in storage (acre-feet)
1	3,608.45	828,500	-----	3,640.07	1,116,900	- 500
2	3,609.54	836,000	+ 7,500	3,639.82	1,113,700	-3,200
3	3,610.41	841,500	+ 5,500	3,639.55	1,110,400	-3,300
4	3,611.08	845,400	+ 3,900	3,639.20	1,105,000	-5,400
5	3,611.84	850,000	+ 4,600	3,638.95	1,102,800	-2,200
6	3,612.94	857,500	+ 7,500	3,638.41	1,096,200	-6,600
7	3,613.90	865,200	+ 7,700	3,638.30	1,094,900	-1,300
8	3,614.76	873,400	+ 8,200	3,638.27	1,094,500	- 400
9	3,615.34	878,700	+ 5,300	3,638.20	1,093,700	- 800
10	3,615.84	883,100	+ 4,400	3,638.52	1,097,600	+3,900
11	3,616.35	887,400	+ 4,300	3,638.98	1,103,200	+5,600
12	3,616.74	890,600	+ 3,200	3,639.07	1,104,300	+1,100
13	3,617.23	894,400	+ 3,800	3,639.05	1,104,100	- 200
14	3,617.73	898,200	+ 3,800	3,639.04	1,104,000	- 100
15	3,618.10	901,000	+ 2,800	3,639.56	1,110,500	+6,500
16	3,618.73	905,600	+ 4,600	3,640.27	1,119,500	+9,000
17	3,619.88	914,000	+ 8,400	3,640.74	1,125,600	+6,100
18	3,624.17	949,900	+35,900	3,641.12	1,130,500	+4,900
19	3,628.93	993,300	+43,400	3,641.27	1,132,200	+2,000
20	3,632.79	1,032,300	+39,000	3,641.43	1,134,600	+2,100
21	3,634.54	1,051,300	+19,000	3,641.50	1,135,500	+ 900
22	3,635.81	1,065,500	+14,200	3,641.50	1,135,500	0
23	3,636.92	1,078,400	+12,900	3,641.70	1,138,200	+2,700
24	3,637.92	1,090,300	+11,900	3,641.86	1,140,300	+2,100
25	3,638.75	1,100,400	+10,100	3,642.10	1,143,500	+3,200
26	3,639.40	1,108,500	+ 8,100	3,642.20	1,144,900	+1,400
27	3,639.71	1,112,400	+ 3,900	3,642.15	1,144,200	- 700
28	3,639.85	1,114,100	+ 1,700	3,642.19	1,144,700	+ 500
29	3,640.00	1,116,000	+ 1,900	3,642.55	1,149,600	+4,900
30	3,640.09	1,117,200	+ 1,200	3,643.11	1,157,200	+7,600
31	3,640.11	1,117,400	+ 200	-----	-----	-----

## MAJOR RIVER BASINS

### YELLOWSTONE RIVER BASIN

Record flooding occurred on several streams tributary to the Yellowstone River. Of the small tributaries, flooding was severe on Pryor Creek and Fly Creek near Billings, Mont. The Bighorn River, a major tributary, flooded extensively as did its major tributaries. Flooding was minor on the small Yellowstone River tributaries downstream from the mouth of the Bighorn River. Record flooding occurred on the Tongue River and its tributaries upstream from Tongue River Reservoir, but little overbank flooding occurred downstream from the Tongue River Reservoir. Significant flooding also occurred along upstream reaches of the Powder River and its tributaries, but little flooding occurred at the mouth.

### YELLOWSTONE RIVER

Although the peak flood discharge of the Yellowstone River at Miles City, Mont. (site 72), was the greatest

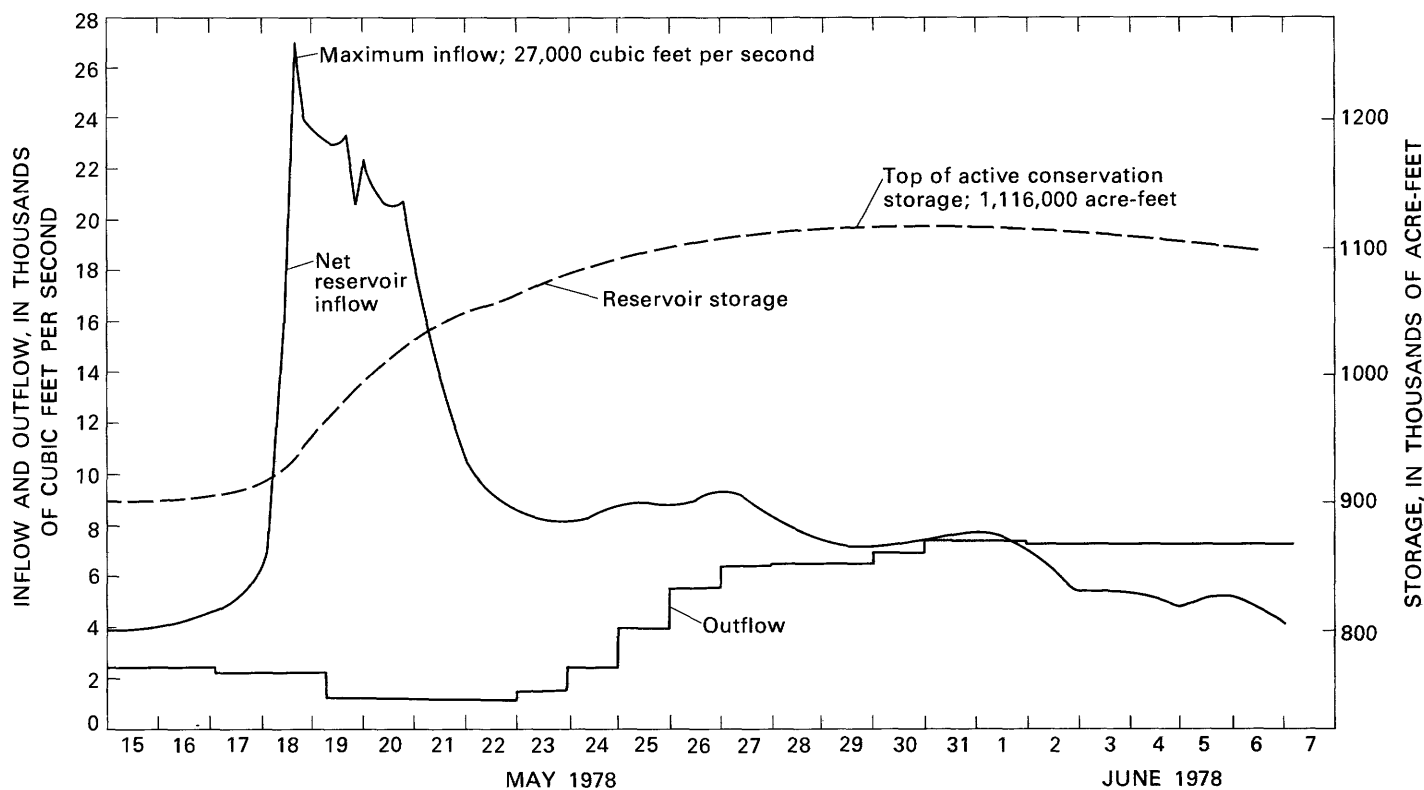


FIGURE 12. Inflow, outflow, and storage contents of Bighorn Lake, Mont. Data from U.S. Bureau of Reclamation.

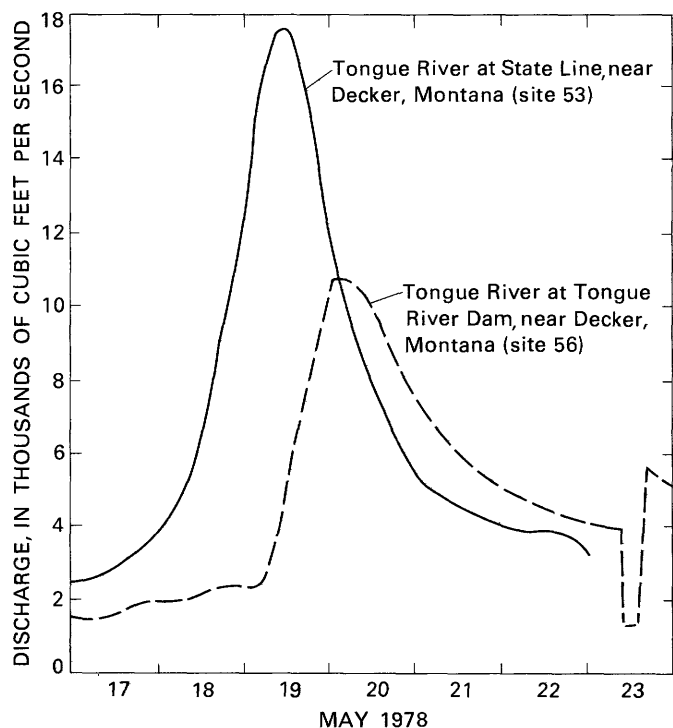


FIGURE 13. Hydrographs of discharge of the Tongue River near Decker, Mont., May 17-23, 1978.

at that site since records began in 1922, flood damage generally was minor. High flood stages due to ice jamming are not unusual on the Yellowstone River and have caused considerably more damage than the May 1978 flood. No appreciable flooding occurred on the Yellowstone River downstream from Miles City, Mont., or upstream from the mouth of Pryor Creek near Billings, Mont. A flood hydrograph of the Yellowstone River at Miles City, Mont., is shown in figure 15.

#### PRYOR CREEK

Flooding was severe along Pryor Creek (sites 1, 4, 5, and 6), a small tributary of the Yellowstone River just downstream from Billings, Mont. Several State and county highway bridges were washed out along the Pryor Creek road, and substantial agricultural and residential property damage occurred on farms and ranches. A Burlington Northern Railroad bridge was washed out at the mouth of Pryor Creek, and the Big Horn Canal near Huntley was extensively damaged by Pryor Creek floodwaters. The only reported death resulting from the May 1978 flood occurred on Pryor Creek near Pryor when the victim left a flood-stranded



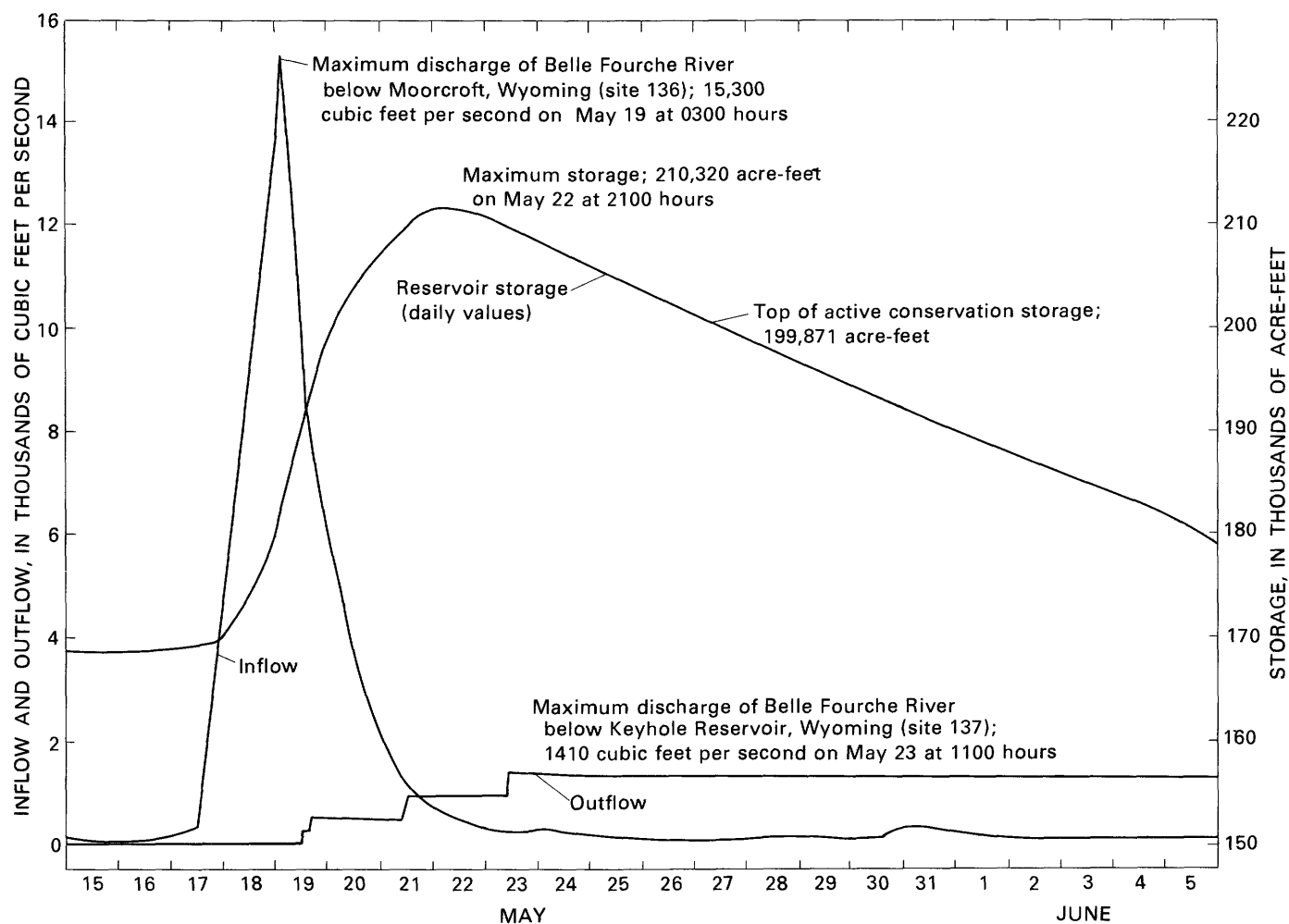


FIGURE 14. Inflow, outflow, and storage contents of Keyhole Reservoir, Wyo., May 15-June 5, 1978.

automobile and was evidently washed away by the current. Extensive urban property damage occurred near the town of Huntley (fig. 16). The peak discharge at the old gaging station, Pryor Creek near Billings (site 4), was more than four times that of the previous flow of record. The peak discharge at the upstream Pryor Creek gaging station (site 1) also was more than four times the maximum discharge previously known. At both sites the May 1978 flood exceeded the 1-percent-chance flood discharge.

#### FLY CREEK

Fly Creek is another small (drainage area less than 300 mi<sup>2</sup>) tributary of the Yellowstone River that flooded during May 1978. Residential property was in-

undated in and near the small community of Pompeys Pillar, and substantial agricultural flood damage occurred upstream from Pompeys Pillar. The peak discharge for May 1978 (site 7) was almost 4 times the previously known peak discharge and was greater than the 1-percent-chance flood.

#### BIGHORN RIVER

Flooding was widespread and severe throughout the Bighorn River basin, with some of the largest unit flows and greatest flood damages occurring on the Bighorn River tributaries of Soap Creek (site 26), Beauvais Creek (site 28), Rotten Grass Creek (site 27), and the Little Bighorn River (sites 32 and 35). Flooding on the Bighorn River was severe upstream from Yel-

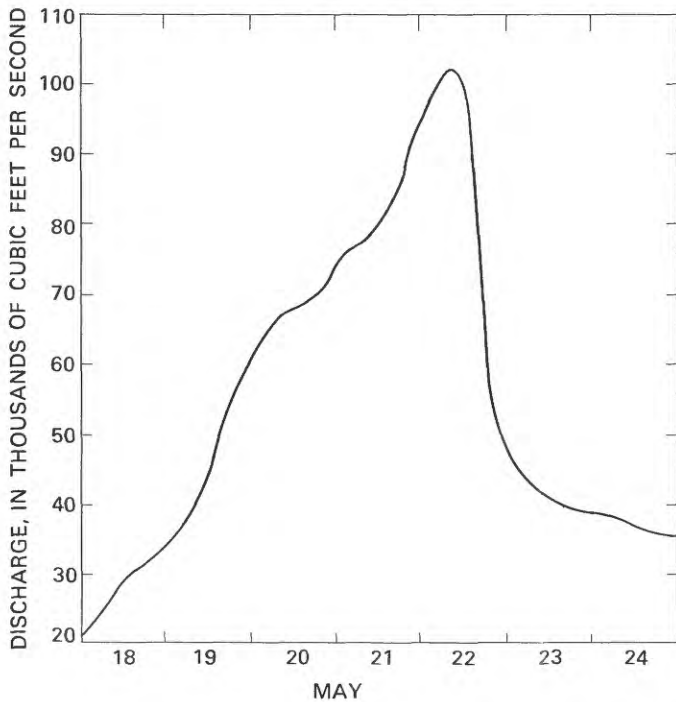


FIGURE 15. Hydrograph of discharge of the Yellowstone River at Miles City, Mont. (site 72), May 18-24, 1978.

lowtail Dam<sup>1</sup> (fig. 17) where the tributaries Fifteen Mile Creek (site 13), and Nowood River (site 15), contributed record flood discharges to the main stem. The May 1978 peak discharge on Fifteen Mile Creek was about a 1-percent-chance flood. A hydrograph of discharge for the Norwood River is shown in figure 18.

Flow on the main stem downstream from Yellowtail Dam was completely contained only as far downstream as the mouth of Soap Creek. Extreme runoff from Soap Creek, Rotten Grass Creek, Beauvais Creek, and the Little Bighorn River caused record flooding on the Bighorn River from St. Xavier to the mouth of the Bighorn River near Bighorn, Mont. The peak discharge of the Bighorn River at Bighorn (site 39) was more than twice the previous maximum of record and exceeded the 1-percent flood discharge. Agricultural flood damage was extensive along the Bighorn River (fig. 19), and numerous irrigation structures were destroyed. Residential flood damage occurred at scattered locations along the main stem, particularly near St. Xavier and Hardin, Mont. A flood hydrograph of the Bighorn River at Bighorn is shown in figure 20.

#### Soap Creek, Beauvais Creek, and Rotten Grass Creek

Flooding was severe on Soap Creek, Beauvais Creek, and Rotten Grass Creek, three relatively small (less than 150 mi<sup>2</sup> drainage area) tributaries of the Bighorn River. Peak discharges during the May 1978 flood exceeded the 1-percent flood on all three streams and also greatly exceeded the previous peak of record on all three streams. Development along these streams is sparse, and residential property damage consequently was limited. Agricultural damage was extensive along all three streams, however, and severe channel erosion occurred on Beauvais Creek.

#### Little Bighorn River and Tributaries

Extensive flooding occurred on the Little Bighorn River from Pass Creek downstream to its confluence with the Bighorn River near Hardin, Mont. Upstream from Pass Creek, no flooding occurred on the Little Bighorn River main stem. Flooding was minor on smaller tributaries of the Little Bighorn River, as evidenced by the relatively small peak discharges of the Little Bighorn River tributary near Wyola, Mont. (site 31), and Long Otter Creek near Lodge Grass, Mont. (site 34).

On Pass Creek near Wyola, Mont. (site 30), however, the May 1978 peak discharge was almost five times the previous peak flow of record. Residential property in Wyola was flooded, and several bridges were washed out upstream from Wyola. The May 1978 peak flow exceeded the 1-percent-chance flood.

Lodge Grass Creek also flooded extensively. The small community of Lodge Grass, Mont., in particular, suffered severe residential and commercial damage (fig. 21). Flood damage upstream from the town was generally limited to agricultural range, cropland, roads, and bridges. At the only discharge-determination site (site 33) on Lodge Grass Creek, the May 1978 peak discharge was about 10 percent less than the largest known peak discharge. At this site, about 17 mi upstream from Lodge Grass, the May 1978 flood was about a 2-percent-chance flood. At Lodge Grass the magnitude of the May 1978 flood was probably greater than a 2-percent-chance flood, because the urban damage was reported to be the greatest since at least 1900 (Hardin Herald, 1978).

The Little Bighorn River caused extensive flood damage from the mouth of Pass Creek downstream to the confluence with the Bighorn River near Hardin. Substantial urban property damage occurred in and near the small community of Crow Agency (fig. 22). The I-90 highway interchange near Crow Agency was severely damaged. The Burlington Northern Railroad

<sup>1</sup>Confines the water of Bighorn Lake



FIGURE 16. Flooding along U.S. Highway 312 near Huntley, Mont., from Pryor Creek overflow, May 19, 1978. View is westward. Photograph by U.S. Bureau of Reclamation.

also suffered extensive track damage from Wyola to Hardin.

The May 1978 peak discharge at the gaging station downstream from Pass Creek (site 32) was more than twice the highest previously known. Downstream near Hardin (site 35), the May 1978 peak discharge of the Little Bighorn River was more than four times the highest previously known flood discharge. At both sites, the May 1978 peak was greater than the 1-percent-chance flood. Flood hydrographs for both Little Bighorn River gaging stations are shown in figure 23.

#### ROSEBUD CREEK

Minor flooding occurred on Rosebud Creek near its mouth and damage was slight. No flooding occurred upstream from the gage site near Colstrip, Mont. (site

44). The May 1978 flood on Rosebud Creek was greater than a 1-percent-chance flood at the mouth (site 45) but was only a 15-percent-chance flood near Colstrip.

#### TONGUE RIVER AND TRIBUTARIES

Extensive flooding occurred on the Tongue River and its larger tributaries upstream from the Tongue River Reservoir. Flooding was minor or nonexistent on the upper Tongue River stations near Dayton, Wyo. (sites 46 and 47), but record flooding occurred near the Wyoming-Montana border (site 53). However, flood damage was minor along the main stem of the river because of sparse development. Overbank flooding was minor on the Tongue River downstream from the Tongue River Reservoir. Tributaries downstream from the reservoir did not flood appreciably.

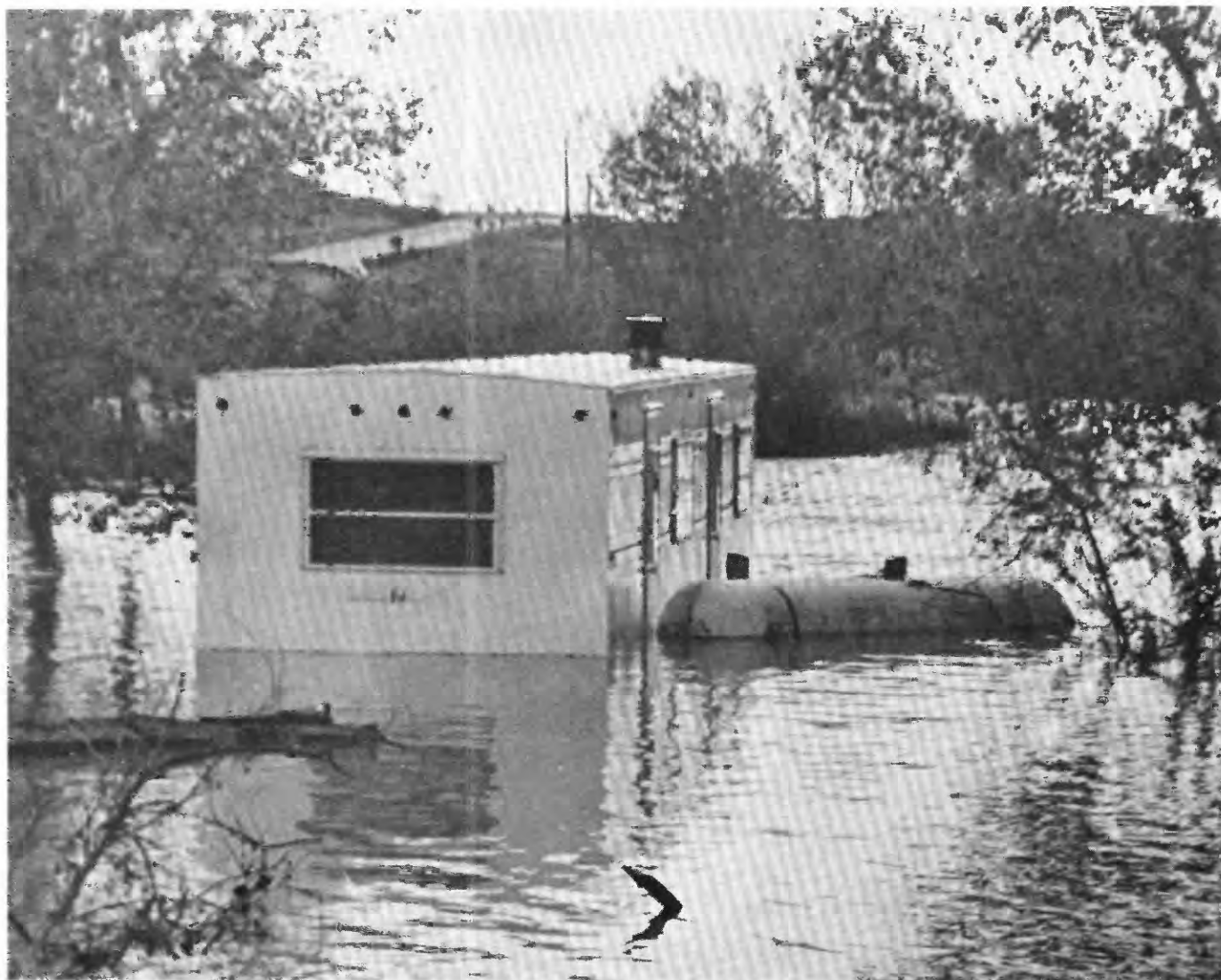


FIGURE 17. Flooded mobile home along the east bank of the Bighorn River near Manderson, Wyo., May 19, 1978.

Upstream from the reservoir, Goose Creek (site 50) and Prairie Dog Creek (site 52) flooded extensively and were the largest contributors to the record Tongue River flows at the State line. Smaller tributaries did not flood significantly anywhere along the Tongue River.

The May 1978 peak discharge on the Tongue River at the State line site was more than twice the maximum previously known. This peak flow exceeded the 1-percent-chance flood. The May 1978 peak flow on Goose Creek was near the maximum peak flow previously known and was about a 3-percent-chance flood. A flood hydrograph for Goose Creek is shown in figure 24. The Prairie Dog Creek flood peak was more than five times

greater than the previously known maximum and was about a 1-percent-chance flood.

#### POWDER RIVER AND TRIBUTARIES

Flooding within the Powder River basin generally was limited to the main stem Powder River and its larger tributaries. Overbank flooding was probably most severe on the Powder River from Sussex, Wyo. (site 89), to Broadus, Mont. (site 103). Some urban property flood damage occurred at Broadus, and agricultural damage occurred throughout the reach. From Broadus to Locate, Mont. (site 116), the May 1978 peak



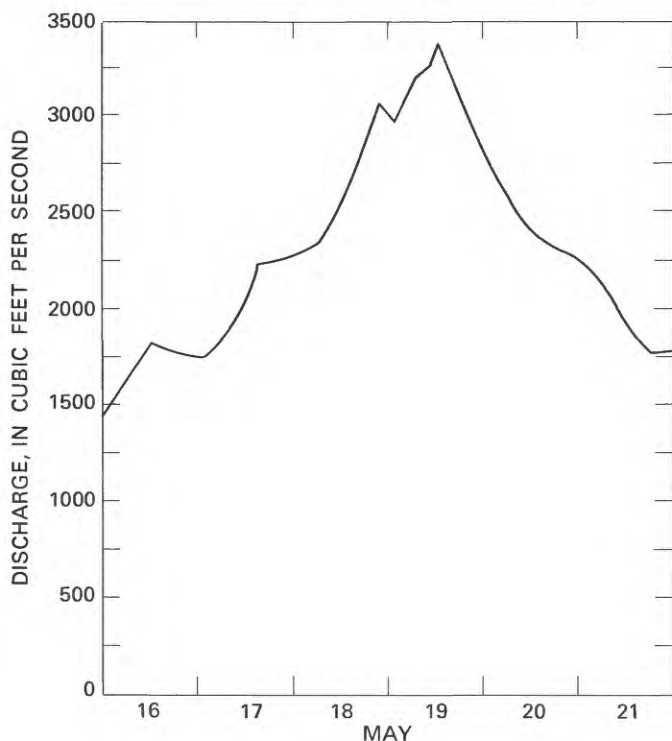


FIGURE 18. Hydrograph of discharge of the Nowood River near Tensleep, Wyo. (site 15), May 16-21, 1978.

flow was reduced from 30,000 to 27,400  $\text{ft}^3/\text{s}$  by channel and valley storage, with a corresponding decrease in flooding. The May 1978 peak discharge on the Powder River exceeded the previous maximum for the period of record at Moorhead, Mont. (site 101), and at Broadus, Mont., but probably was not as great as the 1923 flood. At both sites the May 1978 peak was about a 3-percent-chance flood. At the other Powder River main-stem stations (sites 81, 89, 92, and 116), peak flows ranged from about a 4- to a 7-percent-chance flood.

Powder River tributaries that flooded significantly were the South Fork Powder River (site 82) and Salt Creek (site 88) in Wyoming, and the Little Powder River in both Montana and Wyoming. Damage along these streams was relatively minor because of sparse development. Peak discharges on the South Fork Powder River during May 1978 ranged from a 20-percent-chance flood (site 83) to about a 1-percent-chance flood (site 82). The peak flow of Little Powder River near Broadus (site 112) was equivalent to that of a 2-percent-chance flood. A flood hydrograph for the Little Powder River above Dry Creek in Wyoming (site 109) is shown in figure 25.

## CHEYENNE RIVER BASIN

### CHEYENNE RIVER

Flooding in the Cheyenne River basin was extensive and record floods occurred on the Cheyenne River and several of its tributaries. In the upper reaches of the Cheyenne River, Antelope Creek (site 118) and Dry Fork Cheyenne River (site 119) contributed substantially to the extensive flooding of the Cheyenne River near Dull Center, Wyo. (site 120). Flow records at these sites are unavailable prior to 1976. However, floodmarks and information furnished by local residents indicate that larger flows have occurred in the past.

Farther downstream, record or near-record floods on Black Thunder Creek and Lance Creek caused extensive agricultural damage. Considerable road and bridge damage also took place, particularly on Black Thunder Creek. A road washout on Lance Creek that resulted from a heavy load of debris in the floodwaters is dramatically illustrated in figure 26. The peak discharge on Black Thunder Creek (site 122) was more than six times the largest discharge during the 6-year period on record. The peak discharge on Lance Creek (site 126), a 4-percent-chance flood, was slightly less than the largest discharge previously known. A flood hydrograph for Lance Creek is shown in figure 27. The first peak on the hydrograph resulted from the intense but more isolated rain on May 16 that fell in the headwater area near Orin, Wyo. The May 16 storm in this area caused the extreme flow of Sand Creek near Orin (note plotting of site 161 on fig. 11), which inundated and closed Interstate Highway 25 for a short time.

The main stem of the Cheyenne River also flooded extensively downstream from the mouth of Lance Creek and caused considerable agricultural and road damage (fig. 28). At the gaging station near Riverview, Wyo. (site 127), the May 1978 peak discharge of the Cheyenne River was almost twice the maximum flood previously known and was greater than the 1-percent-chance flood.

Downstream from Riverview the peak discharge of the Cheyenne River attenuated as far as the confluence of Beaver Creek, where large inflow was again supplied. Thus, at the gaging site near Edgemont, S. Dak. (site 130), the peak discharge of the Cheyenne River was about the same as at site 127. The May 1978 peak discharge near Edgemont was more than twice the highest peak previously known and was about a 1-percent-chance flood.

### BELLE FOURCHE RIVER

Severe flooding occurred on the Belle Fourche River and some of its larger tributaries. Agricultural damage



FIGURE 19. Flooded farmsteads on the left bank of the Bighorn River, 2 mi northeast of Hardin, Mont., May 19, 1978. View is northwestward. Photograph by U.S. Bureau of Reclamation.

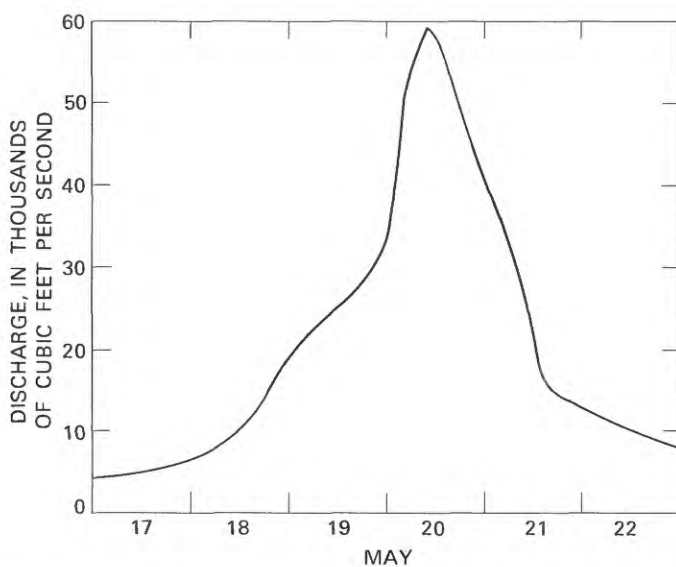


FIGURE 20. Hydrograph of discharge of the Bighorn River at Bighorn, Mont. (site 39), May 17-22, 1978.

was substantial along the entire main stem in Wyoming. Record flood levels were reached at all gaging stations (sites 131 and 132, near Piney; site 136, below Moorcroft; and site 137, below Keyhole Reservoir). Some unusual road-culvert damage caused by the large flows of the upper Belle Fourche River is shown in figure 29.

Tributary streams where high flows were recorded and agricultural damage occurred include Caballo Creek (site 133) and Donkey Creek (site 135). A flood hydrograph for Donkey Creek near Moorcroft, Wyo. (site 135), is shown in figure 30.

The May 1978 peak discharges on the Belle Fourche River near Piney, Wyo. (sites 131 and 132), were greatly affected by impounded water released when an earthen dam washed out upstream. On the Belle Fourche River below Moorcroft, Wyo. (site 136), the 1978 peak discharge was more than three times the previous maximum discharge during the period of record and was the greatest since the flood in 1908. The



FIGURE 21. Flooding at Lodge Grass, Mont., May 19, 1978. Lodge Grass is situated at the mouth of Lodge Grass Creek at the Little Bighorn River. View is southeastward. Photograph by U.S. Bureau of Reclamation.



FIGURE 22. Flooding of the Little Bighorn River in the town of Crow Agency, Mont., at the Interstate Highway I-94 interchange, May 19, 1978. View is northward. Photograph by U.S. Bureau of Reclamation.



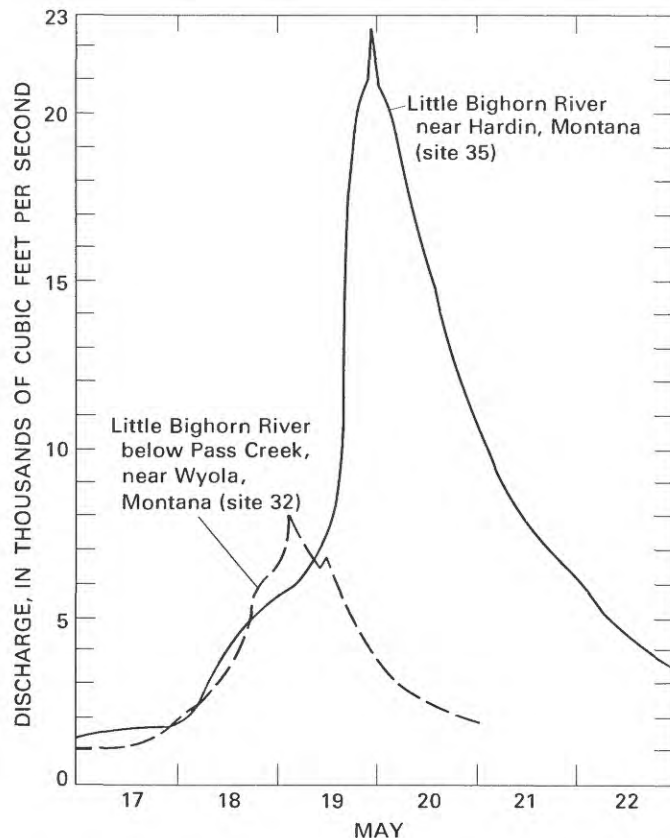


FIGURE 23. Hydrographs of discharge of the Little Bighorn River, May 17-22, 1978.

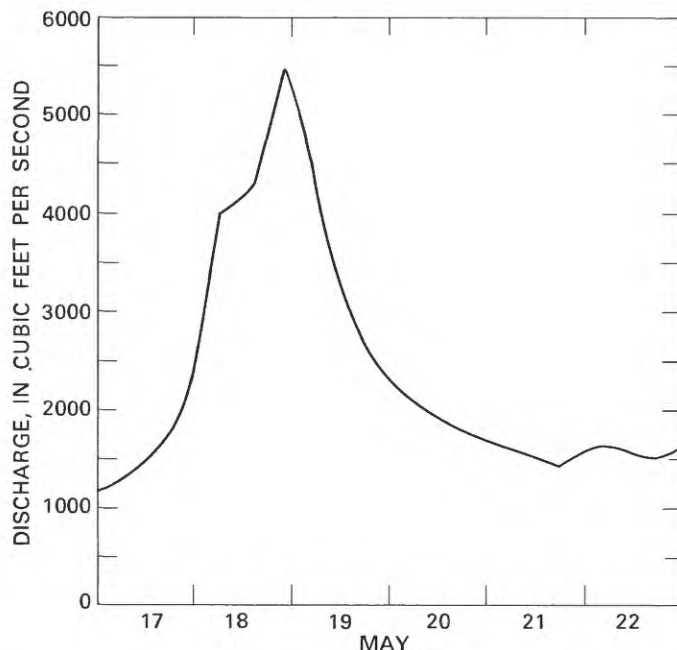


FIGURE 24. Hydrograph of discharge of Goose Creek below Sheridan, Wyo. (site 50), May 17-22, 1978.

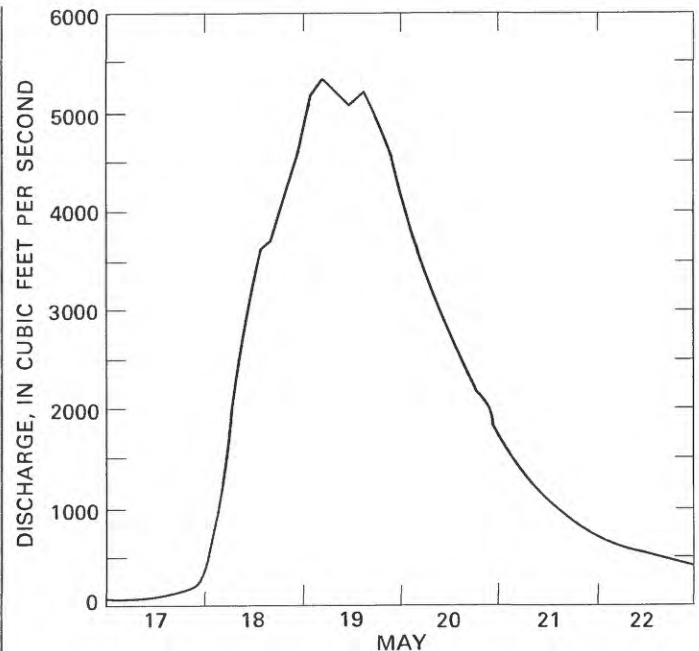


FIGURE 25. Hydrograph of discharge of the Little Powder River above Dry Creek near Weston, Wyo. (site 109), May 17-22, 1978.

May 1978 peak exceeded the 1-percent-chance flood at site 136.

## PLATTE RIVER BASIN

### MEDICINE BOW RIVER

Severe flooding occurred on the Little Medicine Bow River near Medicine Bow, Wyo. (site 141). Agricultural damage was substantial, but little structural damage occurred because of sparse development.

The flood flow from the Little Medicine Bow River contributed heavily to flooding on the Medicine Bow River. Upstream from Seminoe Reservoir (site 142), the May 1978 peak was about a 3-percent-chance flood. A discharge hydrograph for the Medicine Bow River is shown in figure 31.

### NORTH PLATTE RIVER

The North Platte River basin has many reservoirs, and the manipulation of storage and releases during the May 1978 flood reduced the flood potential from the major tributaries. The flood peak on Deer Creek, at Glenrock, Wyo. (site 151), was a 3-percent-chance flood; the peak on Box Elder Creek, at Box Elder, Wyo. (site 155), was a 3-percent-chance flood; and that on Sand Creek, near Orin, Wyo. (site 161), was a 5-percent-chance flood.

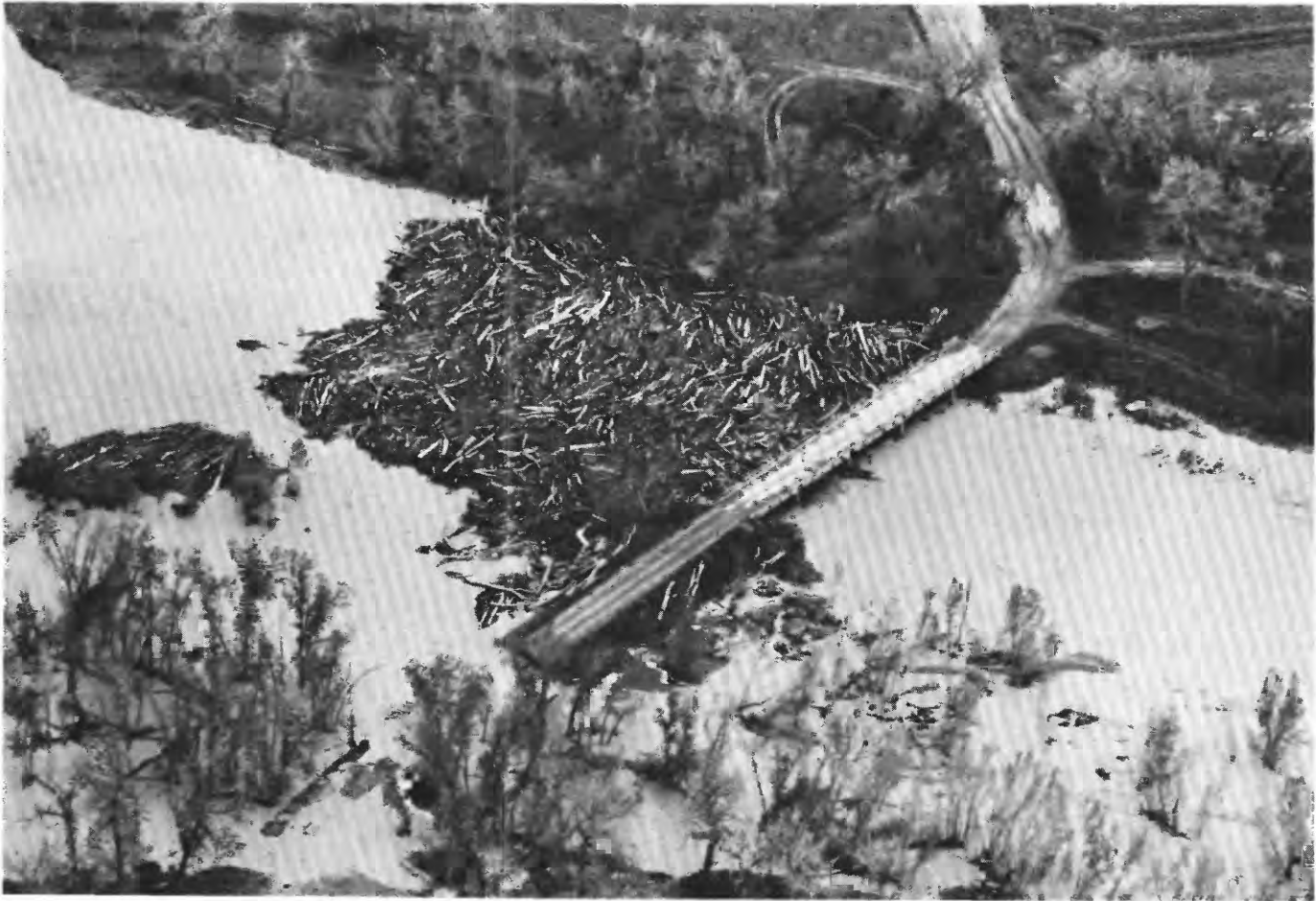


FIGURE 26. Flooding of Lance Creek near Bright, Wyo., May 19, 1978. The force of debris and water would have destroyed the bridge had the water not breached the road.

The May 1978 peak on the main stem of the North Platte River in Wyoming was well below the record flow of 1965 near Glenrock (site 154) and at Orin (site 163). Glendo Reservoir, just downstream from Orin, remained well below the maximum storage level. Downstream from the reservoir, the flow in the North Platte River was about normal for May.

### FLOOD DAMAGE

One life was lost as a direct result of the May 1978 flooding, and damage to roads, bridges, railroads, irrigation structures, cropland, homes, and businesses was severe. On May 29, President Carter declared the flooded areas of Montana and Wyoming major disaster areas, thereby qualifying the areas for various Federal funds for relief and recovery efforts. In Montana, the

initial disaster declaration affected the counties of Big Horn, Powder River, Rosebud, Treasure, and Yellowstone. In Wyoming, the affected counties were Big Horn, Campbell, Converse, Crook, Hot Springs, Johnson, Park, Natrona, Niobrara, Sheridan, Washakee, and Weston. Carbon and Stillwater Counties in Montana were subsequently added to the list of disaster-affected counties, but estimated damages in the two counties were considerably less than in the other flood-damaged counties.

Estimates of flood damage were compiled by various State and Federal agencies and were made available by the Federal Disaster Assistance Administration (Dave Grier, written commun., 1978), the U.S. Agricultural Stabilization and Conservation Service (James Eggen, oral commun., 1979), and the Wyoming Disaster and Civil Defense Agency (1978). Total estimated damages for May 1978 are listed in table 5.

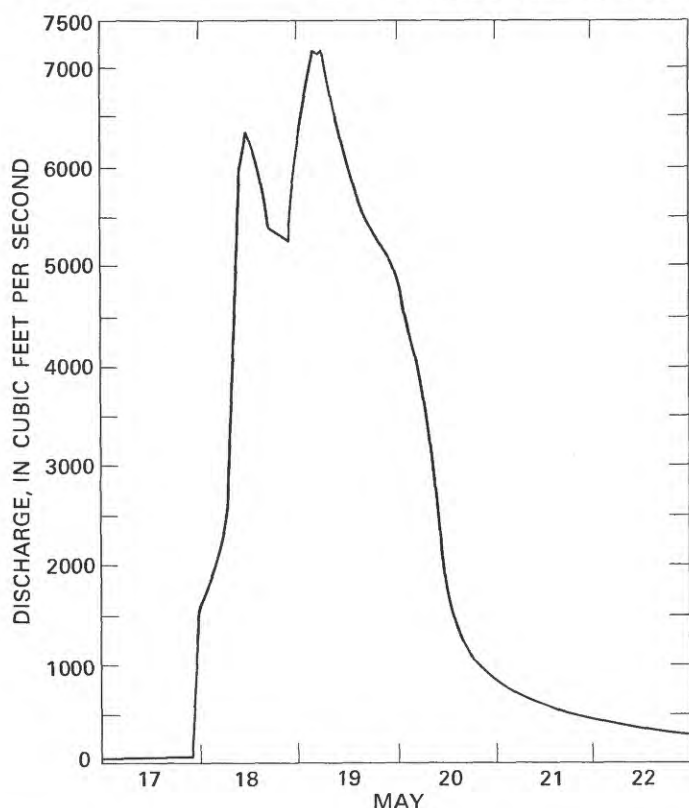


FIGURE 27. Hydrograph of discharge of Lance Creek near Riverview, Wyo. (site 126), May 17-22, 1978.

Agricultural losses were much greater than either private- or public- facility losses in both Montana and Wyoming (table 5). The estimates for crop loss included such items as field washout of newly planted crops and sediment deposition in fields. The livestock loss figure was large; many newborn lambs and calves perished from the flooding and cold weather, and herds of cattle in Wyoming drowned in the rapidly rising water in some steep-sided river valleys. Miscellaneous agricultural damage included the cost of fence replacement; removal of debris from fields; and grading, shaping, and repair of private irrigation facilities.

In the public-damage category, severe road and bridge damage occurred in both States. In Montana, numerous public irrigation facilities also were washed out or severely damaged.

## SEDIMENTATION

### MONTANA

Sedimentation, which includes erosion, deposition, and other physical processes, was unusually large in

TABLE 5.—Summary of flood damage

[Data from the Federal Disaster Assistance Administration, the U.S. Agricultural Stabilization and Conservation Service, and the Wyoming Disaster and Civil Defense Agency]

Type of damage	Montana	Wyoming	Total
Private damage:	\$ 2,850,000	\$ 2,500,000	\$ 5,350,000
Residences	2,500,000	2,000,000	4,500,000
Businesses	350,000	500,000	850,000
Agricultural damage:	10,915,300	12,320,000	23,235,300
Buildings and equipment	3,025,000	190,000	3,215,000
Crop loss	2,630,300	4,800,000	7,430,300
Livestock loss	2,062,000	4,460,000	6,522,000
Miscellaneous	3,198,000	2,870,000	6,068,000
Public damage:	3,798,400	1,500,200	5,298,600
Road systems	1,418,400	1,266,600	2,685,000
Public utilities	89,500	85,100	174,600
Debris removal	28,750	48,600	77,350
Water-control facilities	1,572,000	32,500	1,604,500
Parks and recreational facilities	194,250	6,800	201,050
Other public damage	495,500	60,600	556,100
Total damage	17,563,700	16,320,200	33,883,900

both Montana and Wyoming as a result of the flooding of May 1978. In comparing sediment data for three Montana stations on the Powder River, suspended-sediment concentration and suspended-sediment discharge obviously decreased as the peak flows moved downstream. The inability of the channel to contain the flood flow forced the water out onto the flood plain, where decreased velocities caused a settling of sediment. At all stations the maximum concentration preceded the maximum sediment discharge. Maximum daily suspended-sediment discharges as listed in table 6 exceeded the previous recorded maximum at all stations. However, only the Powder River at Moorhead had a mean daily sediment concentration that exceeded any previously recorded values; that concentration was 41,000 mg/L (milligrams per liter).

Sediment movement in the Tongue River was considerably less than that in the Powder River, partly because the Tongue River Reservoir moderated flows and trapped much of the sediment from upstream sources. For the Tongue River in Montana, maximum mean daily suspended-sediment concentration was 5,900 mg/L and suspended-sediment discharge was 84,400 ton/d at Miles City (site 71) on May 18. The short period of record does not justify historical comparisons.

### WYOMING

Precipitation from storms of April 26-30 and May 2-8 provided saturated soil conditions favorable to flooding and erosion. Subsequent intense rains May 16-19 produced the stream flooding and large increases in sediment discharge. The contribution to sediment loads was



FIGURE 28. Bridge on the Cheyenne River near Riverview, Wyo., May 25, 1978. View from the right bank shows approach to bridge completely washed out. Washout probably occurred late May 19 or early May 20, 1978.



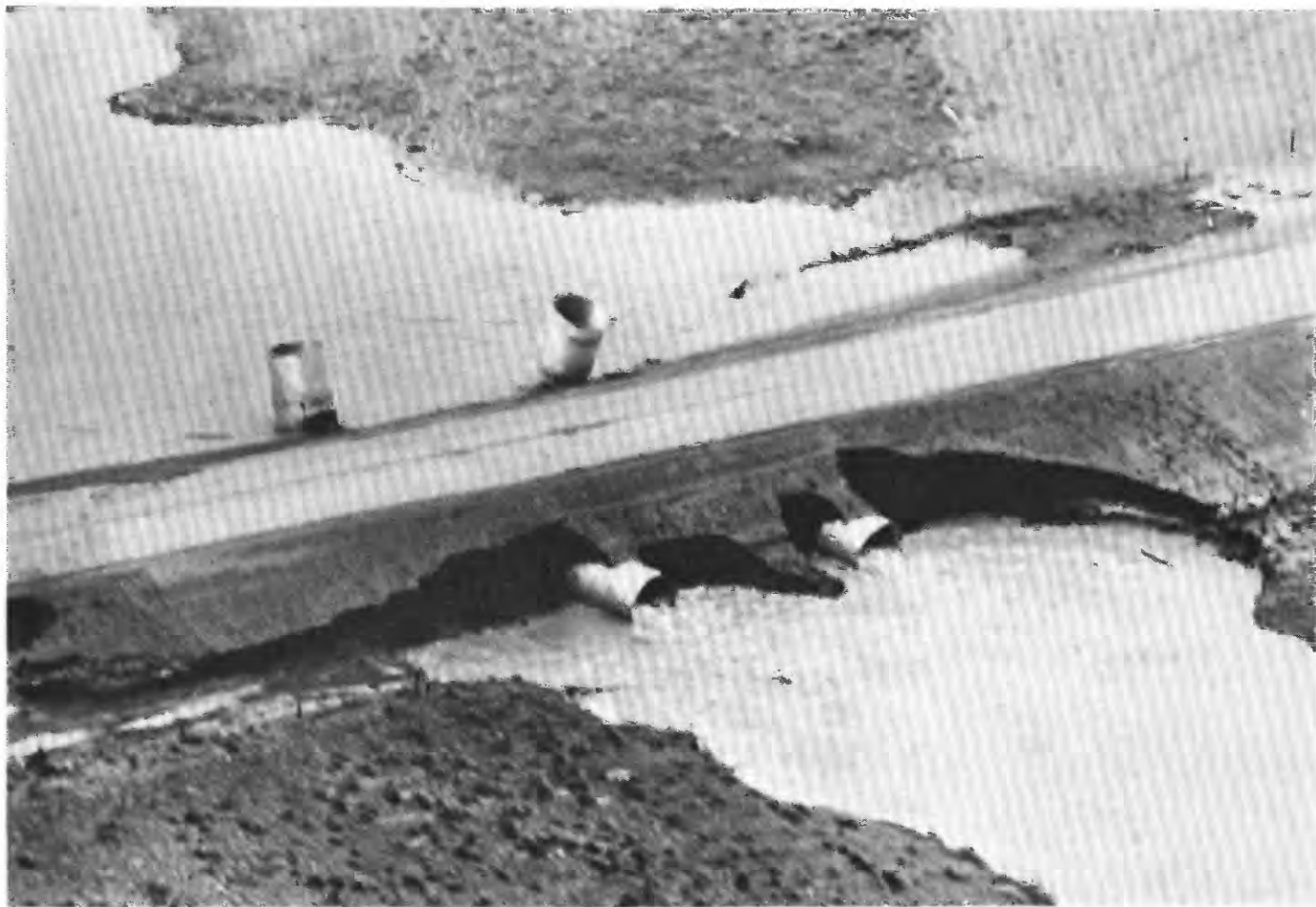


FIGURE 29. Flood damage along the Belle Fourche River below Rattlesnake Creek near Piney, Wyo. (site 131), May 19, 1978. Upstream ends of culverts were bent upward, one more than 90°. Flow over the road beginning at left side of photograph and flow through culverts caused extensive erosion on the downstream side of the road.

from enlargement of gullies, headcutting (see fig. 32), sloughing of river banks, and degrading of the stream channels.

Large suspended-sediment concentrations and suspended-sediment discharge were prevalent in most streams. For example, a new maximum daily suspended-sediment discharge for the period of record, April 1946 to September 1957, October 1967 to September 1971, and January 1975 to May 1978, was measured at Powder River at Arvada, Wyo. (site 92). The suspended-sediment discharge on May 20, 1978, was 2,810,000 tons transported by a mean daily discharge of 22,600 ft<sup>3</sup>/s with a mean daily concentration of 46,000 mg/L. The previous maximum at this site was 2,340,000

tons on May 24, 1952. Another example of large quantities of sediment was the suspended-sediment discharge of 460,000 tons on May 20, 1978, at Bighorn River near Kane, Wyo. (site 18). This sediment discharge was obtained from the suspended-sediment transport curve (Colby, 1956) of figure 33. The mean daily discharge on this date was 17,900 ft<sup>3</sup>/s. The maximum suspended-sediment discharge at this site on June 25, 1946, was 972,000 tons, computed from mean daily values of concentration and flow. The period of record at this site is March 1946 to September 1964 and December 1969 to May 1978. Sediment data collected during the flood period in both Montana and Wyoming are summarized in table 7 (at end of report).

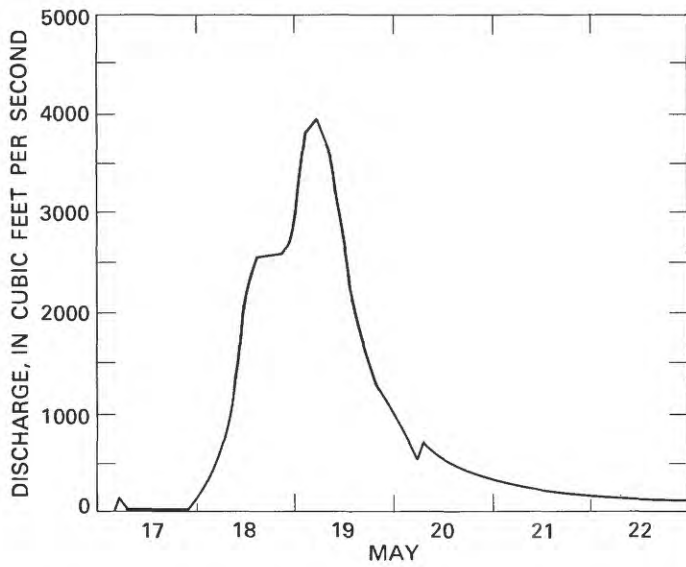


FIGURE 30. Hydrograph of discharge of Donkey Creek near Moorcroft, Wyo. (site 135), May 17-22, 1978.

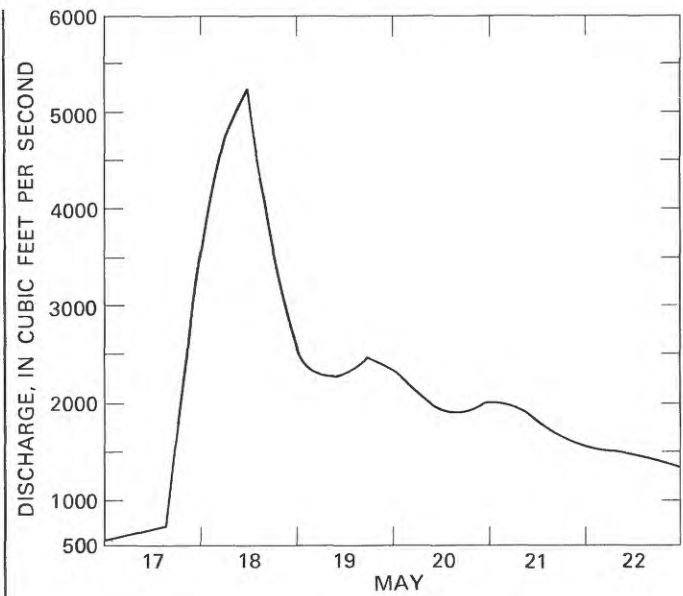


FIGURE 31. Hydrograph of discharge for the Medicine Bow River above Seminole Reservoir near Hanna, Wyo. (site 142), May 17-22, 1978.



FIGURE 32. Headcutting near the mouth of Black Thunder Creek, near Hampshire, Wyo. (site 122), May 19, 1978.

TABLE 6.—*Daily suspended-sediment discharge for the Powder River in Montana*

Site	Date	Maximum suspended-sediment discharge (tons)
At Moorhead (site 101)	May 20, 1978	2,230,000
At Broadus (site 103)	May 21, 1978	1,570,000
Near Locate (site 116)	May 22, 1978	739,000

### AERIAL PHOTOGRAPHY

Aerial photographs were taken at or near the crest of the flood on several streams in Montana. The black-and-white photographs taken by the Montana Department of Highways are useful in identifying inundated areas. The areas flown and the photography numbers and scales are listed in table 8. The approximate location of the flight lines is shown in figure 34. The photographs are on file in the U.S. Geological Survey district office, Helena, Mont.

### FLOOD-HYDROGRAPH DATA

Gage heights and discharges at selected times during the flood at streamflow-gaging stations are given in table 9 (at end of report). All continuous-record stations where the 1978 peak flow was at least that of a 10-percent-chance flood are included. The period included begins before the start of the major rise of the streams and extends to an arbitrary cutoff point when the discharge approached that of the antecedent flow. The time intervals used to identify stage and discharge data in table 9 provide sufficient detail to adequately define the flood hydrograph.

### SUMMARY

Intense rains and some snow, produced by imbedded convective cells associated with a cold front, occurred over southeastern Montana and northeastern Wyoming May 16-19, 1978. Precipitation on previously saturated ground caused widespread flooding in the Yellowstone, Cheyenne, Belle Fourche, and North Platte River drainages. Maximum measured rainfall was 7.60 in. within 72 hours at Lame Deer, Mont. The storm established a precipitation record for that area for May, but ranks third when all months are considered.

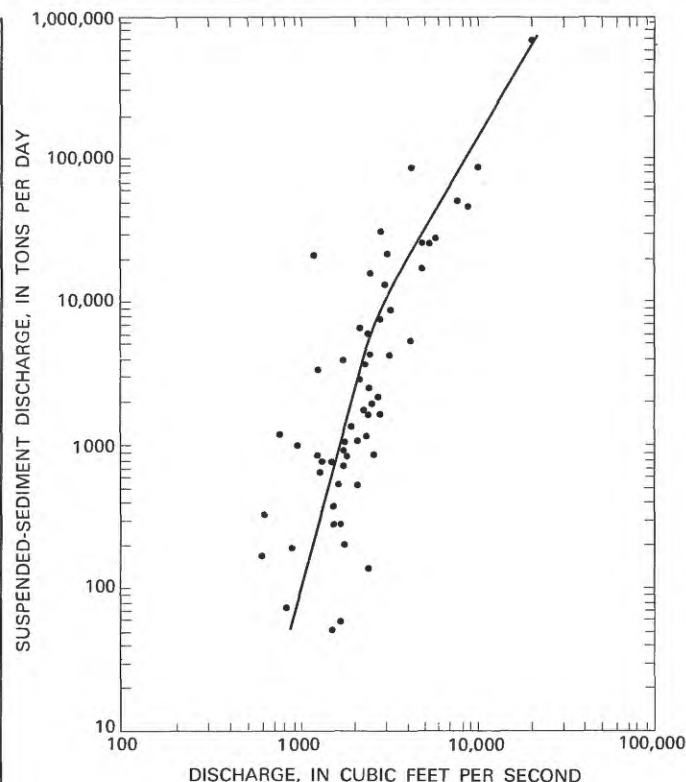


FIGURE 33. Suspended-sediment transport curve of the Bighorn River near Kane, Wyo. (site 18), October 1969 to September 1978.

Peak discharges were determined at 164 selected sites in the area. Peak discharges at 48 of these sites exceeded the maximum peak discharges previously known and equaled or exceeded the 1-percent-chance flood at 24 sites.

Peak flows and stages on several rivers were substantially reduced by large reservoirs in the area. Peak discharge of the Yellowstone River at Miles City, Mont., was reduced by about 22,000 ft<sup>3</sup>/s as a result of storage in Big Horn Lake. Keyhole Reservoir in Wyoming reached a record storage level and record peak outflow as a result of the storm. The storage capacity of the reservoir reduced the peak discharge by about 14,000 ft<sup>3</sup>/s in the reach below the dam.

Flood damage was extensive, exceeding \$33 million in the two States. Nineteen counties were declared major disaster areas.

Daily suspended-sediment discharges were particularly large in the Powder River basin and exceeded previously recorded maximum values at four sites. The maximum daily suspended-sediment discharge was 2,810,000 tons on May 20 for the Powder River near Arvada, Wyo.

TABLE 8.—*Aerial photography of the May 1978 flood in Montana*  
 [Photography by Montana Department of Highways]

Stream	Flight line number	Location	Photograph number	Date in May	Scale
Yellowstone River	1	Pompeys Pillar Bridge	352-10 to 12	19	1:10,000
	2	Hysham to Bighorn River	FLT 1:353-77 to 91	20	1:12,000
	3	Hysham to Bighorn River	FLT 2:353-92 to 100	20	1:12,000
Blue Creek	4	Mouth to Basin Creek	352-194 to 200	19	1:10,000
Pryor Creek	5	U.S. Highway 87 to Huntley	FLT 1:352-150 to 169	19	1:9,600
	6	U.S. Highway 87 to Huntley	FLT 2:352-170 to 180	19	1:9,600
	7	Huntley area	FLT 1:352-181 to 189	19	1:9,600
	8	Huntley area	FLT 2:352-190 to 193	19	1:9,600
Fly Creek	9	Pompeys Pillar area	352-1 to 9	19	1:10,000
Bighorn River	10	Mouth to Bighorn County	353-101 to 104	20	1:12,000
	11	North Hardin area	FLT 1:352-14 to 17	19	1:10,000
	12	North Hardin area	FLT 2:352-18 to 27	19	1:10,000
Little Bighorn	13	Mouth to Crow Agency	FLT 1:352-127 to 134	19	1:16,000
	14	Mouth to Crow Agency	FLT 2:352-135 to 139	19	1:16,000
	15	Mouth to Crow Agency	FLT 3:352-140 to 149	19	1:16,000
	16	Crow Agency area	352-28 to 43	19	1:10,000
	17	Crow Agency to Wyola	352-44 to 89	19	1:10,000
Pass Creek	18	Wyola to State line	352-90 to 100	19	1:10,000
Tongue River	19	Tongue River Reservoir to State line	FLT 1:352-101 to 111	19	1:12,000
	20	Tongue River Reservoir to State line	FLT 2:352-113 to 126	19	1:12,000
	21	Decker to Ashland	FLT 1:353-1 to 12	20	1:12,000
	22	Decker to Ashland	FLT 2:353-13 to 29	20	1:12,000
	23	Decker to Ashland	FLT 3:353-30 to 38	20	1:12,000
	24	Decker to Ashland	FLT 4:353-39 to 41	20	1:12,000
	25	Decker to Ashland	FLT 5:353-42 to 76	20	1:12,000



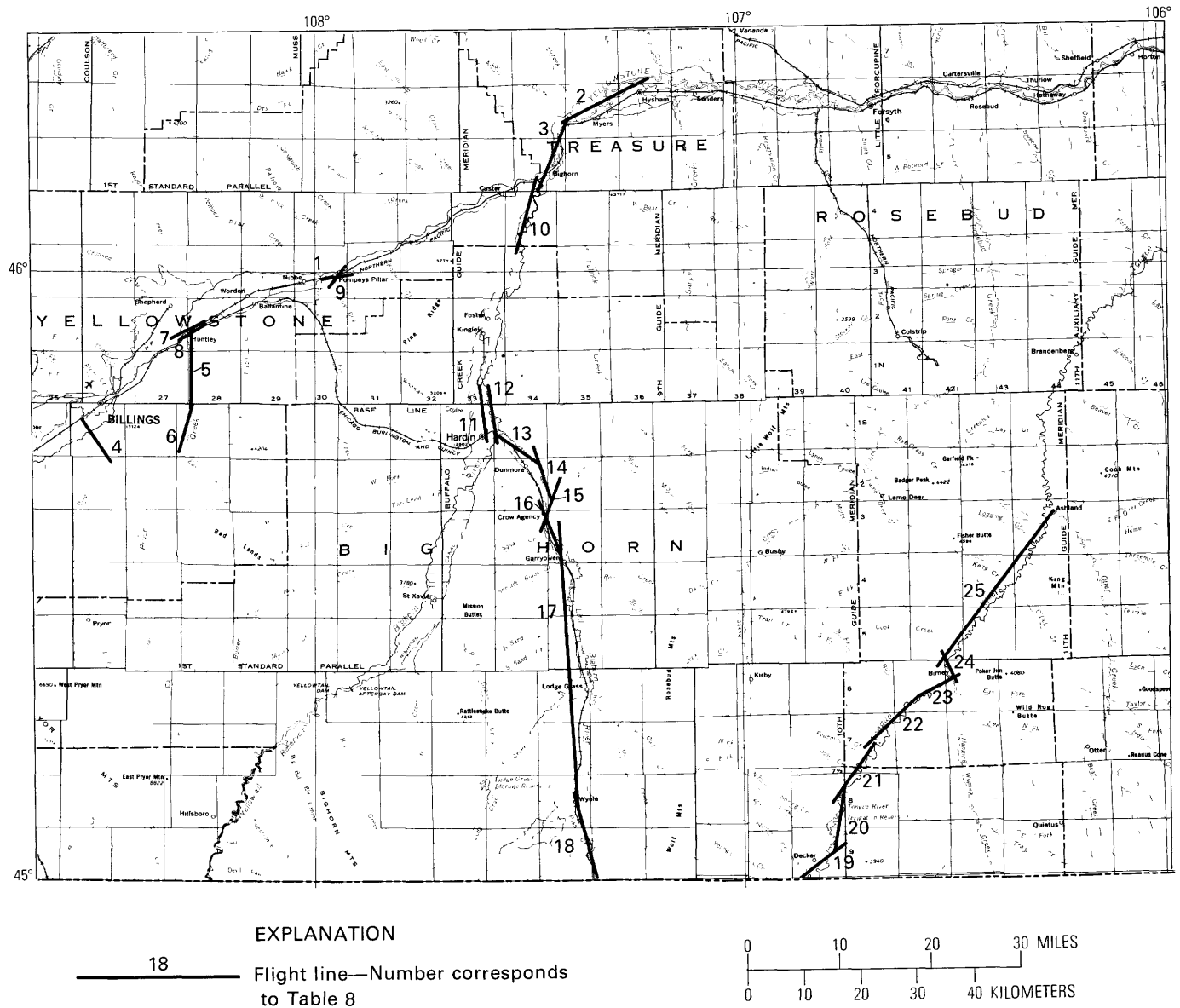


FIGURE 34. Location of flight lines along streams where aerial photographs were obtained at or near crest of flood, May 19-20, 1978.

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TABLES 3, 7, AND 9

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TABLE 3.—*Summary of flood stages and discharges*  
[mi<sup>2</sup>, square miles; ft, feet; ft<sup>3</sup>/s, cubic feet per second]

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceed-ance <sup>a</sup>
1	06216000	Pryor Creek at Pryor, Mont.	117	b <sub>3</sub> ,900	1921-24; 1966-78	6-26-69	6.13	468	19	8.88	2,280	<1
2	06216200	West Wets Creek near Billings, Mont.	8.80	---	1955-78	4-26-64	6.90	565	19	6.81	545	1
3	06216300	West Buckeye Creek near Billings, Mont.	2.64	---	1955-73	7-18-69	5.05	924	19	3.68	240	14
4	06216500	Pryor Creek near Billings, Mont.	440	c <sub>3</sub> ,310	1911-24; 1938-53; 1953-73	4-26-64	15.04	3,720	19	18.90	d <sub>14</sub> ,900	<1
5	---	Pryor Creek at I-94 crossing near Huntley, Mont.	606	---	---	---	---	---	19	---	18,200	<1
6	---	Pryor Creek at Huntley, Mont.	606	---	---	---	---	---	19	---	e <sub>9</sub> ,000	---
7	06217750	Fly Creek at Pompeys Pillar, Mont.	285	c <sub>2</sub> ,870	1968-78	2-14-71	9.23	2,680	19	15.94	10,300	<1
8	06259000	Wind River below Boysen Reservoir, Wyo.	7,701	4,608.58	1951-78	7-07-67	13.35	13,500	19	---	f <sub>480</sub>	---
9	06265200	Sand Draw near Thermopolis, Wyo.	6.33	---	1960-78	6-09-60	822.58	2,490	19	4.49	d <sub>58</sub>	>50
10	06265600	Tie Down Gulch near Worland, Wyo.	1.78	---	1961-78	8-31-63	8.62	328	19	6.11	114	33
11	06267260	North Prong East Fork Nowater Creek near Worland, Wyo.	3.77	---	1964-78	9-18-67	5.47	394	18	5.29	332	11
12	06267400	East Fork Nowater Creek near Colter, Wyo.	149	c <sub>4</sub> ,165	1971-78	7-06-75	3.68	1,270	18	6.65	3,040	(h)
13	06268500	Fifteenmile Creek near Worland, Wyo.	518	c <sub>4</sub> ,070	1951-78	5-22-52	i <sub>5</sub> .77	3,300	18	10.58	4,270	1
14	06268600	Bighorn River at Worland, Wyo.	10,810	4,035.78	1965-69	6-23-67	13.69	15,900	19	14.45	17,500	(h)

TABLES

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceedance <sup>a</sup>
15	06270000	Nowood River near Tensleep, Wyo.	803	c4,420	1938-43; 1950-55; 1972-78	6-16-55	i12.30	3,330	19	12.94	3,380	5
16	06274250	Elk Creek near Basin, Wyo.	96.9	---	1959-78	6-06-67	10.91	4,260	19	9.30	2,450	14
17	06279090	Shell Creek near Greybull, Wyo.	560	---	1951; 1965-78	---	---	---	19	7.82	2,150	--
18	06279500	Bighorn River near Kane, Wyo.	15,765	c3,660	1928-78	6-16-35	i11.10	25,200	20	9.89	20,700	14
19	06282000	Shoshone River below Buffalo Bill Reservoir, Wyo.	1,538	c4,900	1921-78	5-28-28	i10.62	14,700	19	---	f1,230	--
20	06284200	Shoshone River at Willwood, Wyo.	1,980	c4,300	1974-78	6-20-74	10.43	12,100	19	7.89	5,000	(f)
21	06284400	Shoshone River near Garland, Wyo.	2,036	4,073.67	1958-78	7-01-67	i8.76	13,300	19	7.50	4,550	50
22	06284500	Bitter Creek near Garland, Wyo.	80.5	c4,080	1950-53; 1957-60; 1968-78	7-04-75	4.74	1,230	17	3.04	552	>50
23	06284800	Whistle Creek near Garland, Wyo.	101	c4,150	1958-60; 1968-78	7-03-75	12.44	4,780	18	7.47	2,340	7
24	06285100	Shoshone River near Lovell, Wyo.	2,350	c3,850	1966-78	7-01-67	6.49	13,400	18	6.25	7,680	50
25	06285400	Sage Creek at Sidon Canal near Deaver, Wyo.	341	c4,020	1958-60; 1968-78	6-08-58	9.22	2,250	19	5.32	518	33
26	06287500	Soap Creek near St. Xavier, Mont.	98.3	c3,250	1911-12; 1913; 1939-53; 1963; 1967-72	4-28-63	14.96	4,170	19	16.95	7,810	<1
27	06288000	Rotten Grass Creek near St. Xavier, Mont.	147	c3,150	1913-19; 1919-22; 1967-72	2-28-72	9.16	900	19	13.60	9,740	<1

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceedance <sup>a</sup>
28	06288200	Beauvais Creek near St. Xavier, Mont.	100	c3,350	1967-77	6-09-68	8.00	1,600	19	9.54	8,580	<1
29	06289000	Little Bighorn River at State line near Wyola, Mont.	193	c4,450	1939-78	6-03-44	4.87	2,730	24	3.53	1,120	50
30	06290000	Pass Creek near Wyola, Mont.	111	---	1935-56	6-04-44	4.82	1,150	19	10.90	5,560	<1
31	06290200	Little Bighorn River tributary near Wyola, Mont.	4.43	---	1973-78	6-10-77	3.79	201	19	3.39	136	27
32	06290500	Little Bighorn River below Pass Creek near Wyola, Mont.	428	c3,600	1939-75; 1977-78	6-14-63	7.43	3,630	19	10.02	8,010	<1
33	06291500	Lodge Grass Creek above Willow Creek diversion near Wyola, Mont.	80.7	c4,360	1939-74	6-09-64	6.14	1,130	19	6.27	990	2
34	06293300	Long Otter Creek near Lodge Grass, Mont.	11.7	---	1973-78	4-04-75	4.60	176	19	8.04	298	10
35	06294000	Little Bighorn River near Hardin, Mont.	1,294	2,891.64	1953-78	4-02-65	---	4,520	19	11.20	22,500	<1
36	06294400	Andresen Coulee near Custer, Mont.	2.35	---	1963-78	6-04-63	1.57	40	18	.47	5	>50
37	06294600	Tullock Creek tributary near Hardin, Mont.	8.63	---	1973-78	3-03-75	3.38	171	18	1.67	60	33
38	06294690	Tullock Creek near Bighorn, Mont.	446	c2,770	1974-78	3-02-76	7.40	1,960	18	6.39	1,220	25
39	06294700	Bighorn River at Bighorn, Mont.	22,885	c2,690	1945-78	6-24-47	8.79	26,200	20	14.15	59,200	<1
40	06294930	Sarpy Creek tributary near Colstrip, Mont.	4.44	---	1972-78	1972	4.33	194	18	4.77	488	<1
41	06294940	Sarpy Creek near Hysham, Mont.	453	c2,680	1973-78	3-04-75	12.43	428	21	11.63	372	>50

TABLES

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceedance <sup>a</sup>
42	06294985	East Fork Armells Creek tributary near Colstrip, Mont.	1.87	---	1973-78	1-21-75	2.72	50	18	3.59	5	>50
43	06294995	Armells Creek near Forsyth, Mont.	370	2,560	1974-78	1-21-75	4.80	k500	20	4.91	711	46
44	06295250	Rosebud Creek near Colstrip, Mont.	799	3,000	1974-78	5-17-75	6.92	406	21	9.02	605	20
45	06296003	Rosebud Creek at mouth, near Rosebud, Mont.	1,302	2,480	1974-78	2-26-75	5.78	k1,200	19	6.78	2,620	41
46	06297480	Tongue River at Tongue River Campground near Dayton, Wyo.	202	4,210	1974-78	5-10-77	4.30	k2,750	18	3.29	651	(f)
47	06298000	Tongue River near Dayton, Wyo.	204	4,060	1918-29; 1940-78	6-03-44	6.45	3,400	18	3.38	649	>50
48	06299900	Slater Creek near Monarch, Wyo.	18.0	---	1967-78	6-15-67	61.30	1,700	18	59.97	k1,100	11
49	---	Jackson Creek near Big Horn, Wyo.	7.44	---	---	---	---	---	18	---	810	---
50	06305500	Goose Creek below Sheridan, Wyo.	392	3,701.36	1941-78	6-16-63	7.82	5,450	18	8.33	5,430	3
51	06306100	Squirrel Creek near Decker, Mont.	33.6	3,680	1975-78	May 1975	2.33	12	18	7.27	584	4
52	06306250	Prairie Dog Creek near Acme, Wyo.	358	3,450	1970-78	3-05-75	6.01	738	19	12.60	3,940	1
53	06306300	Tongue River at State line, near Decker, Mont.	1,477	3,429.14	1960-78	6-15-67	10.86	7,480	19	14.25	17,500	41
54	06306900	Spring Creek near Decker, Mont.	34.7	---	1958-78	2-14-71	6.50	1,400	18	2.79	225	33
55	06306950	Leaf Rock Creek near Kirby, Mont.	6.14	---	1958-78	6-15-63	6.77	222	19	.94	24	>50

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceed- ance <sup>a</sup>
56	06307500	Tongue River at Tongue River Dam, near Decker, Mont.	1,770	3,344.40	1939-78	6-15-67	8.20	7,340	20	20.00	10,800	--
57	06307520	Canyon Creek near Birney, Mont.	50.2	---	1972-78	6-14-76	2.28	182	18	.93	20	>50
58	06307600	Hanging Woman Creek near Birney, Mont.	470	3,150	1973-78	3-04-75	9.77	986	19	11.56	2,060	11
59	06307620	Tie Creek near Birney, Mont.	18.7	---	1973-78	3-03-75	2.36	9	19	1.40	7	>50
60	06307700	Cow Creek near Fort Howes ranger station, near Otter, Mont.	8.37	---	1972-78	1972	2.39	43	18	1.65	8	>50
61	06307720	Brian Creek near Ashland, Mont.	8.03	---	1973-78	3-01-75	3.75	93	19	1.94	25	50
62	06307740	Otter Creek near Ashland, Mont.	707	2,920	1972-78	3-06-75	7.05	341	21	7.33	392	>50
63	06307780	Stebbins Creek at mouth, near Ashland, Mont.	19.9	---	1963-78	3-19-69	4.45	570	19	3.46	203	25
64	06307830	Tongue River below Brandenburg bridge, near Ashland, Mont.	4.062	2,710	1973-78	6-18-67	---	5,740	22	9.96	8,340	10
65	06307930	Jack Creek near Volborg, Mont.	5.47	---	1973-78	5-05-75	4.56	271	18	5.62	448	6
66	06308100	Sixmile Creek tributary near Epsie, Mont.	.24	---	1973-78	6-18-72	3.18	74	18	4.30	73	3
67	06308200	Basin Creek tributary near Volborg, Mont.	.14	---	1955-78	7-02-58	6.96	390	18	1.31	16	>50
68	06308330	Deer Creek tributary near Volborg, Mont.	1.65	---	1973-78	1973	11.55	1,170	18	4.26	75	20
69	06308340	La Grange Creek near Volborg, Mont.	3.66	---	1973-78	5-06-75	7.62	378	18	5.17	182	17

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TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceed-ance <sup>a</sup>
70	06308400	Pumpkin Creek near Miles City, Mont.	697	52,490	1972-78	5-06-75	12.27	2,890	19	11.13	2,390	40
71	06308500	Tongue River at Miles City, Mont.	5,379	2,375.76	1938-42; 1947-78	6-15-62	12.33	13,300	23	10.18	8,650	13
72	06309000	Yellowstone River at Miles City, Mont.	48,253	2,333.3	1922-23; 1928-78	6-19-44	12.74	96,300	22	16.50	102,300	<1
73	06309080	Deep Creek near Kinsey, Mont.	11.5	---	1962-78	6-09-72	16.78	2,430	18	4.70	400	>50
74	06309200	Middle Fork Powder River near Barnum, Wyo.	45.2	57,220	1961-78	6-15-63	12.60	7,110	16	3.61	469	>50
75	06309260	Buffalo Creek above North Fork Buffalo Creek near Arminto, Wyo.	8.80	57,660	1974-78	6-18-75	2.02	117	16	2.05	92	(h)
76	06309270	North Fork Buffalo Creek near Arminto, Wyo.	8.10	57,720	1974-78	6-18-75	2.64	201	16	2.06	75	(h)
77	06309280	Buffalo Creek below North Fork Buffalo Creek near Arminto, Wyo.	18.6	57,500	1974-78	6-18-75	2.16	295	16	1.91	149	(h)
78	06309450	Beaver Creek below Bayer Creek near Barnum, Wyo.	10.9	57,030	1974-78	8-04-76	2.19	148	16	2.69	176	(h)
79	06309460	Beaver Creek above White Panther Ditch near Barnum, Wyo.	24.2	55,350	1974-78	6-18-75	2.00	222	17	2.57	220	(h)
80	06311400	North Fork Powder River below Pass Creek near Mayoworth, Wyo.	100	55,700	m1940-78	8-11-41	7.64	1,270	18	5.22	313	50
81	06312500	Powder River near Kaycee, Wyo.	980	4,533.76	1933-35; 1938-71	n8-11-41	12.57	5,230	--	11.32	k4,200	4
82	06312700	South Fork Powder River near Powder River, Wyo.	262	---	1961-78	9-11-73	8.52	1,200	18	8.75	1,800	<1

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceed- ance <sup>a</sup>
83	06313000	South Fork Powder River near Kaycee, Wyo.	1,150	c4,590	1911; 1938-40; 1950-69	5-22-62	14.43	35,500	18	i7.20	k8,200	20
84	06313020	Bobcat Creek near Edgerton, Wyo.	8.29	---	1965-78	9-11-73	4.62	1,060	18	1.88	64	>50
85	06313050	East Teapot Creek near Edgerton, Wyo.	5.44	---	1965-78	6-10-65	9.92	4,450	18	2.18	250	>50
86	06313100	Coal Draw near Midwest, Wyo.	11.4	---	1961-78	6-22-64	13.40	2,620	18	6.93	300	>50
87	06313180	Dugout Creek tributary near Midwest, Wyo.	.8	c4,930	1965-78	7-15-67	9.10	1,590	18	2.93	160	>50
88	06313400	Salt Creek near Sussex, Wyo.	769	c4,480	1976-78	5-31-76	6.43	3,480	18	9.88	10,200	(h)
89	06313500	Powder River at Sussex, Wyo.	3,090	4,362.95	1938-40; 1950-57; 1977	5-23-52	i12.60	32,500	19	15.16	24,000	5
90	06313700	Dead Horse Creek near Buffalo, Wyo.	151	c3,970	1958-78	6-22-76	11.32	2,480	18	10.08	1,420	25
91	06316400	Crazy Woman Creek at upper station near Arvada, Wyo.	945	c3,765	1963-70; 1977	6-15-65	16.02	15,800	20	10.00	2,200	(h)
92	06317000	Powder River at Arvada, Wyo.	6,050	3,622.01	1919-78	9-29-23	i23.70	k100,000	20	16.9	k32,500	4
93	06318500	Clear Creek near Buffalo, Wyo.	120	5,184.83	1894; 1896-99; 1917-27; 1938-78	6-15-63	6.19	3,420	18	3.70	550	>50
94	06320200	Clear Creek below Rock Creek near Buffalo, Wyo.	322	c4,480	1971-78	5-30-71	6.28	2,060	18	6.00	1,620	(h)
95	06320400	Clear Creek at Ucross, Wyo.	409	c4,070	1976-78	5-11-77	7.46	1,280	19	9.07	1,740	(h)

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TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceed-ance <sup>a</sup>
96	06321000	South Piney Creek near Story, Wyo.	69.4	5,590	1951-78	6-15-63	4.37	2,090	18	2.97	214	>50
97	06321100	South Piney Creek below Mead-Coffeen Ditch near Story, Wyo.	69.5	5,520	1974-78	5-10-77	3.32	524	18	2.73	225	(h)
98	06321500	North Piney Creek near Story, Wyo.	36.8	5,290	1951-78	6-15-63	5.04	1,820	18	3.04	459	>50
99	06323500	Piney Creek at Ucross, Wyo.	267	4,066.83	1917-23; 1950-78	6-16-63	7.33	3,570	19	5.30	1,260	33
100	06324000	Clear Creek near Arvada, Wyo.	1,110	3,506.51	1915-19; 1928-29; 1939-78	8-05-54	10.45	9,600	18	9.03	5,210	17
101	06324500	Powder River at Moorhead, Mont.	8,088	3,334.6	1929-72; 1974-78	P6-17-62	12.77	23,000	20	15.24	33,000	<1
102	06324700	Sand Creek near Broadus, Mont.	10.6	3,090	1955-78	6-09-72	5.39	715	18	2.12	27	>50
103	06324710	Powder River at Broadus, Mont.	8,748	3,016.30	1975-78	P6-24-76	6.19	6,740	21	12.96	30,000	<1
104	06324800	Little Powder River tributary near Gillette, Wyo.	.81	---	1960-78	6-22-64	96.44	176	18	7.97	33	17
105	06324890	Little Powder River below Corral Creek near Weston, Wyo.	204	3,980	1977-78	---	---	---	18	9.61	2,410	(h)
106	06324900	Cedar Draw near Gillette, Wyo.	3.45	---	1959-78	6-22-64	9.75	758	18	6.87	230	25
107	06324910	Cow Creek tributary near Weston, Wyo.	.72	---	1971-78	7-02-76	8.17	153	18	5.93	51	25
108	06324925	Little Powder River near Weston, Wyo.	540	3,680	1977-78	---	---	---	19	13.32	4,460	(h)

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceed-ance <sup>a</sup>
109	06324970	Little Powder River above Dry Creek near Weston, Wyo.	1,235	c3,410	1972-78	1-17-74	8.05	1,000	19	11.62	5,300	(h)
110	06324995	Badger Creek at Biddle, Mont.	6.06	---	1972-78	6-23-76	7.97	414	18	2.48	54	33
111	06325400	East Fork Little Powder River near Hammond, Mont.	3.45	---	1974-78	6-23-76	6.18	155	18	5.69	40	33
112	06325500	Little Powder River near Broadus, Mont.	2,039	b3,020	1947-53; 1957-61; 1962-72	1972	9.30	2,700	20	9.85	j3,160	2
113	06325700	Powder River tributary near Powderville, Mont.	3.20	---	1973-78	1973	16.91	480	18	2.42	32	33
114	06325950	Cut Coulee near Mizpah, Mont.	2.23	---	1973-78	5-05-75	8.45	272	18	4.17	103	20
115	06326300	Mizpah Creek near Mizpah, Mont.	797	c2,490	1974-78	5-06-75	9.80	1,920	19	7.04	1,030	>50
116	06326500	Powder River near Locate, Mont.	13,194	b2,400	1938-78	P2-19-43	11.23	31,000	23	11.27	27,400	7
117	06326510	Locate Creek tributary near Locate, Mont.	.91	---	1973-78	1973	2.41	22	19	1.40	7	>50
118	06364700	Antelope Creek near Teckla, Wyo.	959	c4,450	1977-78	---	---	---	18	8.83	6,600	(h)
119	06365300	Dry Fork Cheyenne River near Bill, Wyo.	128	c5,060	1976-78	---	---	---	18	4.01	1,010	(h)
120	06365900	Cheyenne River near Dull Center, Wyo.	1,527	c,i4,312	1976-78	7-08-77	5.50	2,570	18	i12.00	11,800	(h)
121	06375600	Little Thunder Creek near Hampshire, Wyo.	234	c4,400	1977-78	---	---	---	18	9.02	3,030	(h)
122	06376300	Black Thunder Creek near Hampshire, Wyo.	535	c4,060	1972-78	9-09-73	11.49	804	18	14.13	5,050	(h)

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TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceedance <sup>a</sup>
123	06378300	Lodgepole Creek near Hampshire, Wyo.	354	c3,950	1977-78	---	---	---	18	4.08	166	(h)
124	06379600	Box Creek near Bill, Wyo.	112	---	1956-58; 1959; 1961-78	5-05-71	7.92	1,720	18	8.15	2,570	4
125	06382200	Pritchard Draw near Lance Creek, Wyo.	k5.1	---	1964-78	9-03-68	13.29	4,050	18	4.78	360	>50
126	06386000	Lance Creek near Riverview, Wyo.	2,070	c3,750	1948-54; 1956-78	5-24-71	9.67	7,410	19	9.43	7,190	4
127	06386500	Cheyenne River near Riverview, Wyo.	5,270	c3,600	1948-74	5-22-62	8.74	16,000	---	12.22	k28,000	<1
128	06387500	Turner Creek near Osage, Wyo.	47.8	---	1959-78	6-15-62	16.72	3,000	18	15.57	2,480	11
129	06394000	Beaver Creek near Newcastle, Wyo.	1,320	c3,660	1943-78	6-16-62	19.98	11,900	19	16.37	3,870	3
130	06395000	Cheyenne River at Edgemont, S. Dak.	7,143	3,414.56	1903-06; 1928-33; 1946-78	5-25-71	10.57	13,800	20	13.65	k28,000	1
131	06425720	Belle Fourche River below Rattlesnake Creek near Piney, Wyo.	495	c4,540	1975-78	6-13-77	5.86	489	18	11.33	4,100	(h)
132	06425780	Belle Fourche River above Dry Creek near Piney, Wyo.	594	c4,460	1975-78	6-13-77	11.81	1,630	18	16.3	k5,630	(h)
133	06425900	Caballo Creek at mouth near Piney, Wyo.	260	c4,370	1977-78	---	---	---	19	8.66	2,170	(h)
134	06425950	Raven Creek near Moorcroft, Wyo.	76.0	c4,234	1977-78	---	---	---	19	5.55	236	(h)
135	06426400	Donkey Creek near Moorcroft, Wyo.	246	c4,200	1977-78	---	---	---	19	14.60	3,950	(h)

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum Flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceed-ance <sup>a</sup>
136	06426500	Belle Fourche River below Moorcroft, Wyo.	1,670	4,119.2	1943-70; 1975-78	5-27-62	14.33	4,420	19	14.60	15,300	<1
137	06427500	Belle Fourche River below Keyhole Reservoir, Wyo.	2,000	4,031.26	1951-78	9-05-51	6.30	1,020	23	5.85	1,410	---
138	06427700	Inyan Kara Creek near Upton, Wyo.	96.5	---	1959-78	7-01-59	12.99	4,660	18	6.33	90	>50
139	06429300	Ogden Creek near Sundance, Wyo.	8.42	---	1962-78	5-06-67	3.93	423	18	1.72	49	25
140	06634300	Sheep Creek near Medicine Bow, Wyo.	174	---	1961-78	7-07-61	11.48	1,900	17	9.76	1,700	5
141	06634600	Little Medicine Bow River near Medicine Bow, Wyo.	963	6,600	1973-78	4-17-75	9.05	3,060	17	14.10	49,500	(h)
142	06635000	Medicine Bow River above Seminoe Reservoir near Hanna, Wyo.	2,338	6,415.40	1939-78	3-29-43	5.23	6,590	18	6.25	5,220	3
143	06641400	Bear Springs Creek near Alcova, Wyo.	9.33	---	1960-78	10-06-62	12.36	533	17	12.24	131	50
144	06642000	North Platte River at Alcova, Wyo.	10,812	5,299.40	1904-05; 1934-78	6-6, 10 11-1905	11.50	13,400	17	---	4395	---
145	06642700	Lawn Creek near Alcova, Wyo.	11.5	---	1961-78	8-10-74	9.15	1,250	17	7.60	565	13
146	06642760	Stinking Creek near Alcova, Wyo.	117	---	1961-78	8-12-63	7.93	2,750	17	7.12	1,750	20
147	06643300	Coal Creek near Goose Egg, Wyo.	5.39	---	1960-78	6-12-70	8.72	514	17	6.70	69	>50
148	06644840	McKenzie Draw tributary near Casper, Wyo.	2.02	---	1965-78	9-11-73	7.03	970	18	1.45	11	>50

TABLES

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceedance <sup>a</sup>
149	06645150	Smith Creek above Otter Creek near Casper, Wyo.	9.91	6,550	1974-78	5-13-75	3.40	40	17	1.37	19	(h)
150	06645160	Smith Creek at Otter Creek near Casper, Wyo.	10.9	6,360	1974-78	5-13-75	1.54	39	17	2.84	16	(h)
151	06646600	Deer Creek below Millar Wasteway at Glenrock, Wyo.	213	4,980	1961-78	6-12-70	9.45	14,200	17	8.87	6,090	3
152	06646700	East Fork Dry Creek tributary near Glenrock, Wyo.	2.60	----	1961-78	5-14-65	11.00	550	18	6.65	39	>50
153	06646780	Sand Creek near Glenrock, Wyo.	79.9	5,000	1977-78	----	----	----	18	3.87	460	(h)
154	06646800	North Platte River near Glenrock, Wyo.	13,538	4,920	1959-78	5-14-65	7.10	16,000	19	4.80	6,440	25
155	06647500	Box Elder Creek at Box Elder, Wyo.	63.0	6,710	1946-51; 1961-67; 1971-78	5-14-65	18.58	4,530	17	6.61	2,230	3
156	06647890	Little Box Elder Creek near Careyhurst, Wyo.	7.18	5,670	1974-78	6-18-75	1.31	21	18	1.69	54	(h)
157	06647900	Little Box Elder Creek at Little Box Elder Cave near Careyhurst, Wyo.	8.47	5,480	1974-78	9-18-76	1.80	23	18	2.07	41	(h)
158	06648780	Sage Creek tributary near Orpha, Wyo.	1.38	----	1965-78	7-25-65	2.00	229	17	.40	10	>50
159	06649000	LaPrele Creek near Douglas, Wyo.	135	85,600	1919-78	6-12-70	13.01	17,300	17	10.66	1,700	13
160	06649900	North Platte River tributary near Douglas, Wyo.	8.53	----	1961-78	5-22-61	11.32	1,400	18	4.97	91	50
161	06651800	Sand Creek near Orin, Wyo.	27.8	----	1955; 1961-78	8-07-55	----	20,700	16	10.2	5,460	5

TABLE 3.—Summary of flood stages and discharges—Continued

Site number (fig. 1)	Permanent station number	Site of flood-discharge determination	Drainage area (mi <sup>2</sup> )	Datum of gage above NGVD of 1929 (ft)	Period of record	Maximum flood previously known			Maximum flood of May 1978			
						Date	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Day	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Percent chance of exceedance <sup>a</sup>
162	---	Shawnee Creek near Orin, Wyo.	k90	---	---	---	---	---	16	---	9,210	---
			k100	---	---	8-07-55	---	7,530	---	---	---	---
163	06652000	North Platte River at Orin, Wyo.	14,888	c4,660	1895-99; 1917-18; 1924; 1958-78	5-15-65	10.00	23,800	17	7.76	12,200	14
164	06652400	Watkins Draw (formerly Watson Draw) near Lost Springs, Wyo.	6.95	---	1960-78	5-28-61	14.78	2,100	16	8.81	581	5

a <, less than; >, greater than.

b Altitude from barometer.

c Altitude from topographic map.

d Estimated.

e Does not include bypass flow of about 9,200 cubic feet per second.

f Mean daily discharge.

g Affected by backwater.

h Less than 10 years of record (Wyoming stations only).

i Site and datum then in use.

j Revised from Omang and Hull (1978).

k Approximate measurement.

l Peak-flow record prior to 1974 water year includes records for station 06311500 (North Fork River near Mayoworth, Wyo.).

n Flood of Sept. 30, 1923, reached a stage of 18.00 feet (discharge not determined).

p Flood of September 1923 was probably greater.

q Gage moved 125 feet upstream during 1969 (same datum).

r Flood of Apr. 7, 1924, reached a stage of 12.60 feet at site of former gaging station, 4.2 miles upstream at different datum; discharge, 12,500 cubic feet per second. Flood in June 1908 reached a stage about 2.50 feet higher than that of Apr. 7, 1924.

s Altitude approximate from nearby line of levels.

t Outside period of record.



TABLE 7.—*Sediment data*  
[°C, degrees Celsius; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; ton/d, tons per day; mm, millimeter]

Date	Time	Temperature (°C)	Streamflow, instantaneous (ft <sup>3</sup> /s)	Sediment suspended (mg/L)	Sediment discharge (ton/d)	Suspended sediment					
						Fall diameter	Percent finer than	Indicated size, in millimeters			
						0.004	0.016	0.062	0.125	0.250	0.500
06214500--Yellowstone River at Billings, Mont. (Lat 45°47'48" Long 108°28'12")											
17	1700	11.0	21700	4260	250000	40	57	82	92	97	100
18	1400	9.0	30200	4130	357000	46	62	66	96	99	100
19	0815	9.0	50190	4550	615000	47	68	93	98	100	--
19	1415	9.0	42700	5160	595000	41	60	78	69	96	100
06267400--East Fork Nowater Creek near Colter, Wyo. (site 12)											
17	1750	8.5	512	68100	94100	--	--	--	--	--	--
18	1415	6.0	1550	41800	175000	--	--	--	--	--	--
06270000--Nowood River near Tensleep, Wyo. (site 15)											
15	1230	11.0	1390	5950	22300	--	--	--	--	--	--
18	2030	4.0	3060	5650	46700	--	--	--	--	--	--
19	2010	6.5	3000	3520	28500	--	--	--	--	--	--
06279500--Bighorn River near Kane, Wyo. (site 18)											
20	1350	9.0	20700	11700	654000	54	67	92	96	98	100
06294700--Bighorn River at Bighorn, Mont. (site 39)											
21	1230	14.5	20000	2800	151000	66	86	95	99	100	--
06295000--Yellowstone River at Forsyth, Mont. (Lat 46°15'53" Long 106°41'43")											
21	1430	12.0	103000	1920	534000	--	--	--	--	--	--
22	1700	17.0	37500	1250	130000	--	--	--	--	--	--
24	1100	17.5	30000	796	64500	--	--	--	--	--	--
06296120--Yellowstone River near Mills City, Mont. (Lat 46°23'51" Long 105°53'36")											
21	1800	15.0	77300	2830	591000	58	73	84	93	99	100
06305500--Goose Creek below Sheridan, Wyo. (site 50)											
18	1720	8.0	5540	1660	24800	45	64	81	90	95	99
19	1030	--	3980	1240	13300	--	--	--	--	--	100
19	1740	--	2960	1060	8470	--	--	--	--	--	87
21	1010	--	2000	423	2280	--	--	--	--	--	83
06307525--Prairie Dog Creek above Jack Creek near Birney, Mont. (Lat 45°20'08" Long 106°46'25")											
15	1720	19.5	1.7	253	1.2	--	--	--	--	--	83
24	1450	15.0	5.3	175	2.5	--	--	--	--	--	--
25	1445	14.0	4.8	126	1.6	--	--	--	--	--	--

TABLE 7.—Sediment data—Continued

Date	Time	Temperature (°C)	Streamflow, instantaneous (ft <sup>3</sup> /s)	Sediment suspended (mg/L)	Sediment discharge (ton/d)	Suspended sediment				Suspended sediment								
						Fall diameter Percent finer than Indicated size, in millimeters	0.004	0.016	0.062	0.125	0.250	0.500	1.00	0.062	0.125	0.250	0.500	1.00
06307528--Prairie Dog Creek near Birney, Mont. (Lat 45°17'28" Long 106°40'56")																		
18	1700	10.0	15	1420	58	--	--	--	--	--	--	--	--	100	--	--	--	--
24	1205	17.5	4.1	93	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--
25	1200	--	3.4	72	.66	--	--	--	--	--	--	--	--	--	--	--	--	--
06307560--East Trail Creek near Otter, Mont. (Lat 45°04'09" Long 106°24'35")																		
16	1430	17.5	.25	41	.03	--	--	--	--	--	--	--	--	--	--	--	--	--
19	1200	9.0	36	454	44	--	--	--	--	--	--	--	--	--	--	--	--	--
06307600--Hanging Woman Creek near Birney, Mont. (site 58)																		
17	1215	14.0	8.2	74	1.6	--	--	--	--	--	--	--	--	--	--	--	--	--
20	1635	14.0	359	566	549	--	--	--	--	--	--	--	--	96	--	--	--	--
06307610--Tongue River below Hanging Woman Creek, near Birney, Mont. (Lat 45°20'19" Long 106°31'28")																		
17	1015	11.0	1660	134	601	--	--	--	--	--	--	--	--	95	--	--	--	--
06307735--Home Creek near Ashland, Mont. (Lat 45°32'35" Long 106°11'39")																		
19	1530	12.0	23	356	22	--	--	--	--	--	--	--	--	99	--	--	--	--
06307740--Otter Creek near Ashland, Mont. (site 62)																		
21	1330	15.5	390	397	418	--	--	--	--	--	--	--	--	95	--	--	--	--
06307830--Tongue River below Brandenburg Bridge, near Ashland, Mont. (site 64)																		
17	1000	14.5	1550	510	2130	--	--	--	--	--	--	--	--	69	--	--	--	--
21	1500	--	5440	1440	21200	46	68	--	--	--	--	--	--	81	67	93	97	100
22	1730	--	8260	1120	25000	41	61	--	--	--	--	--	--	75	80	87	95	100
23	1350	--	6060	730	11900	42	62	81	88	98	100	--	--	--	--	--	--	--
06308160--Pumpkin Creek near Loesch, Mont. (Lat 45°42'40" Long 105°43'50")																		
15	1120	24.5	.04	121	.01	--	--	--	--	--	--	--	--	--	--	--	--	--
20	1400	14.0	146	136	54	--	--	--	--	--	--	--	--	99	--	--	--	--
06308400--Pumpkin Creek near Miles City, Mont. (site 70)																		
15	1600	24.5	16	146	6.3	--	--	--	--	--	--	--	--	99	--	--	--	--

TABLE 7.—Sediment data—Continued

Date	Time	Temperature (°C)	Streamflow, instantaneous (ft <sup>3</sup> /s)	Sediment suspended (mg/L)	Sediment discharge (ton/d)	Suspended sediment				Suspended sediment									
						Fall diameter Percent finer than Indicated size, in millimeters	0.004	0.016	0.062	0.125	0.250	0.500	1.00	0.062	0.125	0.250	0.500	1.00	2.00
06308500--Tongue River at Miles City, Mont. (site 71)																			
16	0800	17.5	1460	604	2380	--	--	--	--	--	--	--	--	72	--	--	--	--	
19	0940	11.5	6980	5090	95900	75	86	90	95	98	100	--	--	--	--	--	--	--	
21	1600	17.5	4490	1710	20700	44	61	78	89	99	100	--	--	--	--	--	--	--	
23	1645	18.0	7700	2070	43000	30	42	--	--	--	--	--	--	54	61	68	82	99	100
06313400--Salt Creek near Sussex, Wyo. (site 88)																			
23	1115	--	96	1570	407	66	93	94	97	100	--	--	--	--	--	--	--	--	--
06313500--Powder River at Sussex, Wyo. (site 89)																			
19	1200	9.0	10500	48500	1380000	31	48	81	95	100	--	--	--	--	--	--	--	--	--
24	1700	16.0	2530	9560	65300	29	43	73	89	99	100	--	--	--	--	--	--	--	--
06316400--Crazy Woman Creek at Upper Station, near Arvada, Wyo. (site 91)																			
19	1930	9.0	1640	2765	12200	62	76	86	92	97	99	100	--	--	--	--	--	--	--
25	1600	9.0	1109	2280	6830	43	60	79	91	97	99	100	--	--	--	--	--	--	--
06317000--Powder River at Arvada, Wyo. (site 92)																			
19	1305	9.0	16400	41500	1840000	39	57	81	95	100	--	--	--	--	--	--	--	--	--
20	1435	13.0	17800	38700	1860000	41	61	83	94	99	100	--	--	--	--	--	--	--	--
21	1415	16.5	5050	32000	436000	38	58	85	96	99	100	--	--	--	--	--	--	--	--
06318500--Clear Creek near Buffalo, Wyo. (site 93)																			
19	1340	--	414	78	87	--	--	--	--	--	--	--	--	45	--	--	--	--	--
06320200--Clear Creek below Rock Creek near Buffalo, Wyo. (site 94)																			
17	1300	4.0	1240	346	1160	--	--	--	--	--	--	--	--	--	--	--	--	--	--
19	1440	8.0	1140	241	742	--	--	--	--	--	--	--	--	69	--	--	--	--	--
06320400--Clear Creek at Ucross, Wyo. (site 95)																			
19	1545	10.0	1410	594	2260	37	53	75	86	91	98	100	--	--	--	--	--	--	--
20	1830	10.5	1090	517	1520	--	--	--	--	--	--	--	--	57	--	--	--	--	--
21	1640	12.0	1190	477	1530	--	--	--	--	--	--	--	--	65	--	--	--	--	--
06321500--North Piney Creek near Story, Wyo. (site 98)																			
19	0900	--	375	174	176	--	--	--	--	--	--	--	--	72	--	--	--	--	--
20	0935	--	290	53	41	--	--	--	--	--	--	--	--	61	--	--	--	--	--

TABLE 7.—Sediment data—Continued

Date	Time	Temperature (°C)	Streamflow, instantaneous (ft <sup>3</sup> /s)	Sediment suspended (mg/L)	Sediment discharge (ton/d)	Suspended sediment				Suspended sediment							
						Fall diameter Percent finer than Indicated size, in millimeters	0.004	0.016	0.062	0.125	0.250	0.500	1.00	0.062	0.125	0.250	0.500
06323000--Piney Creek at Kearny, Wyo. (Lat 44°32'08" Long 106°49'18")																	
19	0750	--	1010	225	614	--	--	--	--	--	--	--	--	--	--	--	--
20	0845	--	634	82	140	--	--	--	--	--	--	--	--	57	--	--	--
06323500--Piney Creek at Ucross, Wyo. (site 99)																	
19	1610	--	1090	217	639	49	68	84	90	97	100	--	--	--	--	--	--
20	1800	--	680	183	336	--	--	--	--	--	--	--	--	58	--	--	--
21	1610	--	614	162	269	--	--	--	--	--	--	--	--	61	--	--	--
06324000--Clear Creek near Arvada, Wyo. (site 100)																	
20	1230	12.0	3020	1300	10600	34	54	75	83	86	92	100	--	--	--	--	--
21	1240	12.5	2080	1170	6570	--	--	--	--	--	--	--	--	56	--	--	--
06324710--Powder River at Broadus, Mont. (site 103)																	
18	1030	12.0	6300	19300	328000	27	43	82	96	99	100	--	--	--	--	--	--
22	1520	17.0	8910	22600	544000	45	69	90	97	100	--	--	--	--	--	--	--
06324890--Little Powder River below Corral Creek, near Weston, Wyo. (site 105)																	
16	1430	17.0	10	.81	--	--	--	--	--	--	--	--	--	--	--	--	--
06324925--Little Powder River near Weston, Wyo. (site 108)																	
16	1000	15.5	31	400	33	--	--	--	--	--	--	--	--	96	--	--	--
19	1030	10.0	4250	9130	105000	90	98	100	--	--	--	--	--	--	--	--	--
06324970--Little Powder River above Dry Creek near Weston, Wyo. (site 109)																	
16	1200	16.5	103	377	105	--	--	--	--	--	--	--	--	99	--	--	--
06326500--Powder River near Locate, Mont. (site 116)																	
22	1400	--	22600	19000	1160000	--	--	--	--	--	--	--	--	77	--	--	--
1430	18.0	--	24100	14700	957000	55	73	85	95	100	--	--	--	--	--	--	--
1500	--	--	23000	17000	1060000	--	--	--	--	--	--	--	--	81	--	--	--
1600	--	--	23600	17700	1130000	--	--	--	--	--	--	--	--	81	--	--	--
1700	18.0	--	23500	17900	1140000	--	--	--	--	--	--	--	--	62	--	--	--
1800	17.5	--	24000	18200	1180000	--	--	--	--	--	--	--	--	84	--	--	--
1900	17.5	--	24100	18700	1220000	--	--	--	--	--	--	--	--	82	--	--	--
2000	17.0	--	24700	19000	1270000	--	--	--	--	--	--	--	--	83	--	--	--
2100	--	--	25200	19000	1290000	--	--	--	--	--	--	--	--	83	--	--	--
2330	--	--	26600	18500	1330000	--	--	--	--	--	--	--	--	85	--	--	--
0100	--	--	27200	17500	1290000	--	--	--	--	--	--	--	--	85	--	--	--

TABLE 7.—Sediment data—Continued

Date	Time	Temperature (°C)	Streamflow, instantaneous (ft <sup>3</sup> /s)	Sediment suspended (mg/L)	Sediment discharge (ton/d)	Suspended sediment				Suspended sediment									
						Fall diameter Percent finer than Indicated size, in millimeters	0.004	0.016	0.062	0.125	0.250	0.500	1.00	0.062	0.125	0.250	0.500	1.00	2.00
06326500--Powder River near Locate, Mont. (site 116)--Continued																			
	0230	--	26800	16800	1220000	--	--	--	--	--	--	--	--	83	--	--	--	--	--
	0400	--	27000	15300	1120000	--	--	--	--	--	--	--	--	86	--	--	--	--	--
	0600	15.0	25600	15100	1040000	--	--	--	--	--	--	--	--	82	--	--	--	--	--
06326530--Yellowstone River near Terry, Mont. (Lat 46°48'17" Long 105°17'36")																			
22	0900	16.0	103000	5560	1550000	48	65	79	95	99	100	--	--	--	--	--	--	--	--
06326600--O'Fallon Creek near Ismay, Mont. (Lat 46°25'00" Long 104°46'00")																			
17	1145	17.0	25	160	11	82	96	--	--	--	--	--	--	--	--	--	--	--	--
22	1615	21.0	84	320	73	90	97	--	--	--	--	--	--	--	--	--	--	--	--
25	1045	14.0	4.9	10	.13	--	--	--	--	--	--	--	--	--	--	--	--	--	--
06326953--Clear Creek near Hoyt, Mont. (Lat 47°00'05" Long 104°56'31")																			
06326995--Upper Sevenmile Creek near Lindsay, Mont. (Lat 47°08'17" Long 104°56'40")																			
18	1115	15.0	.97	9	.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--
06327850--Glendive Creek near Glendive, Mont. (Lat 47°07'16" Long 104°39'51")																			
22	1400	31.0	.20	131	.07	--	--	--	--	--	--	--	--	97	--	--	--	--	--
06328000--Deer Creek near Glendive, Mont. (Lat 47°09'44" Long 104°42'08")																			
25	1045	19.0	3.1	30	.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--
06329000--Cottonwood Creek near Intake, Mont. (Lat 47°14'50" Long 104°18'150")																			
22	1900	22.0	.50	68	.09	--	--	--	--	--	--	--	--	--	--	--	--	--	--
06329500--Yellowstone River near Sidney, Mont. (Lat 47°40'42" Long 104°09'22")																			
19	1700	15.0	33100	8820	788000	--	--	--	--	--	--	--	--	90	--	--	--	--	--
20	0700	14.0	43400	7980	935000	--	--	--	--	--	--	--	--	89	--	--	--	--	--
21	0700	15.0	57200	9080	1400000	--	--	--	--	--	--	--	--	89	--	--	--	--	--
21	0700	13.0	72100	7590	1480000	--	--	--	--	--	--	--	--	87	--	--	--	--	--
1700		15.0	78700	6800	1440000	--	--	--	--	--	--	--	--	87	--	--	--	--	--
22	0630	14.5	85600	4540	1050000	--	--	--	--	--	--	--	--	80	--	--	--	--	--
1700		16.0	91900	5080	1260000	--	--	--	--	--	--	--	--	83	--	--	--	--	--
23	0630	17.0	99600	4280	1150000	--	--	--	--	--	--	--	--	84	--	--	--	--	--
1145		17.0	103000	3950	1100000	54	72	87	96	99	100	--	--	--	--	--	--	--	--
1700		18.0	108000	3710	1080000	--	--	--	--	--	--	--	--	86	--	--	--	--	--
24	0510	17.5	103000	5040	1400000	59	77	86	92	96	98	100	--	--	--	--	--	--	--

TABLE 7.—Sediment data—Continued

Date	Time	Temperature (°C)	Streamflow, instantaneous (ft <sup>3</sup> /s)	Sediment suspended (mg/L)	Sediment discharge (ton/d)	Suspended sediment			Suspended sediment									
						Fall diameter	Percent finer than	Indicated size, in millimeters	Sieve diameter	Percent finer than	Indicated size, in millimeters	0.004	0.016	0.062	0.125	0.250	0.500	1.00
06329500--Yellowstone River near Sidney, Mont. (Lat 47°40'42" Long 104°09'22")--Continued																		
25	0900	19.0	93800	5540	1400000	65	86	95	98	100	--	--	--	--	--	--	--	--
	1220	19.0	81900	5590	1240000	58	78	93	98	100	--	--	--	--	--	--	--	--
	1700	20.0	67200	5820	1060000	--	--	--	--	--	--	--	--	93	--	--	--	--
	0630	19.0	53000	4050	580000	--	--	--	--	--	--	--	--	89	--	--	--	--
	1700	20.0	49200	3630	482000	--	--	--	--	--	--	--	--	88	--	--	--	--
06364700--Antelope Creek near Teckla, Wyo. (site 118)																		
25	1230	18.0	80	147	32	--	--	--	--	--	--	--	--	--	--	--	--	--
06365300--Dry Fork of Cheyenne River near Bill, Wyo. (site 119)																		
18	1300	5.0	870	15300	35900	83	99	100	--	--	--	--	--	--	--	--	--	--
19	1350	9.0	65	8750	1540	95	100	--	--	--	--	--	--	--	--	--	--	--
06365900--Cheyenne River near Dull Center, Wyo. (site 120)																		
15	1700	26.0	39	317	33	--	--	--	--	--	--	--	98	--	--	--	--	--
17	1530	10.0	2030	8920	48900	--	--	--	--	--	--	--	--	--	--	--	--	--
06375600--Little Thunder Creek near Hampshire, Wyo. (site 121)																		
20	1430	12.0	178	1150	553	89	99	100	--	--	--	--	--	--	--	--	--	--
06378300--Lodgepole Creek near Hampshire, Wyo. (site 123)																		
19	1045	10.0	160	413	178	75	95	100	--	--	--	--	--	--	--	--	--	--
06425720--Belle Fourche River below Rattlesnake Creek near Piney, Wyo. (site 131)																		
18	1750	--	1060	927	2650	66	81	100	--	--	--	--	--	--	--	--	--	--
06425780--Belle Fourche River above Dry Creek near Piney, Wyo. (site 132)																		
15	1630	--	14	42	1.6	--	--	--	--	--	--	--	--	--	--	--	--	--
18	1500	--	2500	3570	24100	--	--	--	--	--	--	--	--	--	--	--	--	--
06425900--Camallo Creek at Mouth near Piney, Wyo. (site 133)																		
18	1900	9.0	1040	1300	3650	82	95	100	--	--	--	--	--	--	--	--	--	--
06425950--Raven Creek near Moorcroft, Wyo. (site 134)																		
25	1915	15.0	2.0	26	.14	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 7.—Sediment data—Continued

Date	Time	Temperature (°C)	Streamflow, instantaneous (ft <sup>3</sup> /s)	Sediment suspended (mg/L)	Sediment discharge (ton/d)	Suspended sediment				Suspended sediment			
						Fall diameter Indicated size, in millimeters	Percent finer than			Sieve diameter Percent finer than Indicated size, in millimeters			
						0.004	0.016	0.062	0.125	0.250	0.500	1.00	2.00
06426400--Donkey Creek near Moorcroft, Wyo. (site 135)													
18	1600	10.0	2530	2080	14200	72	80	86	94	100	--	--	--
20	1430	11.0	482	708	921	49	60	76	91	99	100	--	--
06634600--Little Medicine Bow River near Medicine Bow, Wyo. (site 141)													
18	1630	5.0	1590	5360	23000	39	58	85	96	98	100	--	--
22	1400	9.5	863	235	548	--	--	--	--	--	--	83	--
06635000--Medicine Bow River above Siminoe Reservoir near Hanna, Wyo. (site 142)													
19	1400	7.0	2220	3770	22600	44	64	82	86	89	98	100	--
23	0945	8.0	1400	1670	6310	46	66	89	95	98	100	--	--
06646780--Sand Creek near Glenrock, Wyo. (site 153)													
17	1445	9.0	.58	1850	2.9	72	99	100	--	--	--	--	--



TABLE 9.—*Gage heights and discharges at selected gaging stations*  
[ft, feet; ft<sup>3</sup>/s, cubic feet per second]

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06216000.</u> Pryor Creek at Pryor, Mont. (site 1)			<u>06217750.</u> Fly Creek at Pompeys Pillar, Mont. (site 7)--Continued			<u>06267400.</u> East Fork Nowater Creek near Colter, Wyo. (site 12)--Continued		
May 16:			May 19:			May 18:		
2400	3.55	101	0400	15.90	9,640	0300	3.80	1,170
0600	3.62	106	0800	15.94	10,300	0600	3.74	1,130
1200	3.80	120	1200	15.85	9,020	0800	3.66	1,090
1800	3.99	137	1600	15.65	6,900	1200	4.03	1,310
2400	4.42	187	2000	15.50	5,630	1300	4.16	1,390
No gage-height record to 1200 hours on May 23			2400	15.40	4,900	1500	5.37	2,140
May 23:			May 20:			1700	6.47	2,910
1200	5.08	299	0600	15.30	4,270	2000	6.30	2,790
1800	5.09	301	1200	15.20	3,710	2330	6.65	3,040
2400	5.05	291	1800	15.00	2,800	2400	6.20	2,720
May 24:			2400	14.45	1,250	No gage-height record May 19 through May 22		
0600	4.99	277	May 21:			<u>06270000.</u> Nowood River near Tensleep, Wyo. (site 15)		
1200	5.08	299	0600	13.30	716	May 15:		
1800	5.07	296	1000	11.80	540	2400	8.97	1,450
2400	5.02	284	1400	10.18	449	May 16:		
<u>06217750.</u> Fly Creek at Pompeys Pillar, Mont. (site 7)			1800	9.40	324	0600	9.44	1,630
(Gage heights estimated on basis of daily wire-weight gage readings)			2400	8.72	268	1200	9.91	1,820
May 17:			May 22:			1800	9.78	1,770
2400	5.80	64	0600	8.25	226	2400	9.71	1,740
May 18:			1200	7.90	196	May 17:		
0400	6.45	100	1800	7.60	175	0600	9.97	1,850
0800	7.60	187	2400	7.40	160	1200	10.46	2,080
1000	9.10	303	<u>06267400.</u> East Fork Nowater Creek near Colter, Wyo. (site 12)			1500	10.77	2,240
1200	11.10	470	May 16:			1800	10.78	2,240
1400	13.10	682	2400	0.82	0	2400	10.85	2,280
1600	14.40	1,160	May 17:			May 18:		
1800	14.95	2,610	0400	.82	0	0600	10.97	2,340
2000	15.30	4,270	0600	.98	0.39	1200	11.46	2,580
2400	15.70	7,380	1200	1.18	7.4	1800	12.10	2,900
			1400	1.35	26	2100	12.41	3,070
			1500	1.59	75	2400	12.24	2,970
			1700	2.45	420			
			1800	3.09	754			
			1900	3.32	882			
			2100	3.81	1,180			
			2200	3.95	1,260			
			2300	4.18	1,400			
			2400	4.10	1,350			

## MAY 1978 FLOODS, SOUTHEASTERN MONT. AND NORTHEASTERN WYO.

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06270000.</u> Nowood River near Tensleep, Wyo. (site 15)-- Continued			<u>06279500.</u> Bighorn River near Kane, Wyo. (site 18)-- Continued			<u>06290500.</u> Little Bighorn River below Pass Creek near Wyola, Mont. (site 32)-- Continued		
May 19:			May 20:			May 19:		
0600	12.66	3,220	0300	9.48	19,400	0300	10.02	8,010
0900	12.67	3,270	0600	9.55	19,800	0600	9.72	7,200
1100	12.94	3,380	1200	9.83	20,500	1000	9.41	6,430
1500	12.55	3,200	1500	9.89	20,700	1200	9.55	6,770
1800	12.43	3,080	1800	8.91	17,400	1500	9.06	5,630
2400	11.88	2,790	2100	6.75	11,400	1800	8.75	5,050
			2400	6.06	9,550	2100	8.35	4,400
May 20:						2400	7.92	3,790
0600	11.45	2,580	May 21:			May 20:		
1200	11.10	2,400	0600	5.59	8,350	0400	7.41	3,160
1800	10.97	2,330	1200	5.18	7,500	0800	6.99	2,740
2400	10.84	2,270	1800	4.86	6,800	1200	6.63	2,450
			2400	4.55	6,150	1600	6.30	2,200
May 21:			May 22:			2000	6.00	1,980
0600	10.59	2,140	0600	4.41	5,880	2400	5.82	1,860
1200	10.16	1,930	1200	4.37	5,770			
1800	9.82	1,790	1800	4.26	5,550	<u>06294000.</u> Little Bighorn River near Hardin, Mont. (site 35)		
2400	9.87	1,810	2400	4.12	5,270	May 16:		
<u>06279500.</u> Bighorn River near Kane, Wyo. (site 18)			<u>06290500.</u> Little Bighorn River below Pass Creek near Wyola, Mont. (site 32)			2400	4.08	1,440
May 16:			May 16:			May 17:		
2400	3.18	3,480	2400	4.10	1,090	0600	4.18	1,520
May 17:			May 17:			1200	4.22	1,560
0600	3.16	3,440	1200	4.40	1,190	1800	4.28	1,610
1200	3.27	3,640	1600	4.58	1,270	2400	4.47	1,780
1800	3.86	4,750	2000	5.00	1,490	May 18:		
2400	4.13	5,290	2400	5.61	1,860	0600	5.35	2,690
May 18:			May 18:			1200	6.35	3,970
0600	5.60	8,480	0400	6.23	2,290	1800	7.05	5,010
1200	6.86	11,800	0800	6.81	2,740	2400	7.46	5,680
1800	7.48	13,200	1200	7.41	3,300	May 19:		
2400	7.81	14,500	1600	8.13	4,120	0600	7.70	6,150
May 19:			1800	8.88	5,280	1200	8.32	7,500
0600	8.23	15,700	2000	9.24	6,030	1400	8.63	8,290
1200	8.75	17,300	2400	9.46	6,550	1600	9.64	11,700
1800	9.06	18,200				1800	10.88	19,000
2400	9.31	18,900				2000	11.04	20,500
						2200	11.08	21,000
						2245	11.20	22,500
						2400	11.07	20,900

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06294000.</u> Little Bighorn River near Hardin, Mont. (site 35)--Continued			<u>06294700.</u> Bighorn River at Bighorn, Mont. (site 39)--Continued			<u>06296003.</u> Rosebud Creek at mouth, near Rosebud, Mont. (site 45)		
May 20:			May 19:			May 16:		
0200	11.03	20,400	0200	8.50	20,200	2400	2.26	151
0400	10.95	19,600	0400	8.88	21,500			
0600	10.84	18,600	0600	9.19	22,600	May 17:		
0800	10.70	17,500	0800	9.43	23,500	0600	2.35	168
1000	10.59	16,600	1000	9.63	24,200	1200	2.39	176
1200	10.40	15,500	1200	9.85	25,000	1800	2.59	217
1800	9.91	13,000	1400	10.16	26,200	2400	2.80	265
2400	9.39	10,700	1600	10.36	27,000			
			1800	10.44	27,400	May 18:		
May 21:			2000	10.86	29,600	0600	3.26	393
0600	8.87	9,010	2200	11.22	31,500	1200	3.88	628
1200	8.47	7,870	2400	11.63	34,000	1800	4.44	895
1800	8.08	6,930				2400	4.92	1,160
2400	7.72	6,190	May 20:					
			0200	12.45	39,600	May 19:		
May 22:			0400	13.39	48,400	0600	4.71	1,040
0600	7.20	5,250	0600	13.82	54,300	0700	4.67	1,020
1200	6.81	4,640	0800	13.94	56,200	0800	4.66	1,010
1800	6.34	3,960	1000	14.15	59,200	0900	4.99	1,210
2400	6.00	3,500	1200	14.09	58,300	1000	5.54	1,570
			1400	13.89	55,300	1100	6.74	2,590
<u>06294700.</u> Bighorn River at Bighorn, Mont. (site 39)			1600	13.71	52,500	1130	6.78	2,620
			1800	13.50	49,200	1200	6.78	2,620
May 16:			2000	13.22	46,200	1300	6.77	2,610
2400	3.02	4,090	2200	12.97	43,700	1400	6.76	2,600
			2400	12.70	41,000	1500	6.74	2,590
May 17:						1600	6.69	2,540
0600	3.22	4,510	May 21:			1800	6.56	2,420
1200	3.45	5,060	0200	12.40	38,400	2400	6.14	2,050
1800	3.75	5,780	0400	12.07	35,800			
2400	4.07	6,610	0600	11.71	33,100	May 20:		
			1000	10.58	26,200	0600	5.76	1,740
			1200	9.11	19,900	1200	5.26	1,380
May 18:			1600	7.88	15,400	1800	4.95	1,180
0600	4.45	7,590	2000	7.40	13,900	2400	4.73	1,050
1000	5.05	9,210	2400	7.00	12,600			
1200	5.39	10,200				May 21:		
1400	5.78	11,300	May 22:			0600	4.56	958
1600	6.20	12,500	0400	6.65	11,600	1200	4.44	895
1800	6.63	13,800	0800	6.37	10,700	1800	4.32	833
2000	7.14	15,400	1200	6.11	9,840	2400	4.16	755
2200	7.67	17,300	1600	5.93	9,230			
2400	8.10	18,800	2000	5.71	8,480			
			2400	5.53	7,890			

TABLE 9.—*Gage heights and discharges at selected gaging stations—Continued*

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06296003.</u> Rosebud Creek at mouth, near Rosebud, Mont. (site 45)--Continued			<u>06305500.</u> Goose Creek below Sheridan, Wyo. (site 50)--Continued			<u>06306100.</u> Squirrel Creek near Decker, Mont. (site 51)--Continued		
May 22:			May 22:			May 19:		
0600	3.97	668	0600	5.04	1,640	0200	6.52	380
1200	3.75	574	1200	4.96	1,560	0400	6.62	403
1800	3.56	498	1800	4.89	1,500	0600	6.52	380
2400	3.43	450	2400	5.02	1,620	0800	6.32	339
<u>06305500.</u> Goose Creek below Sheridan, Wyo. (site 50)			<u>06306100.</u> Squirrel Creek near Decker, Mont. (site 51)			1000	6.19	313
May 16:			May 16:			1200	6.14	304
2400	3.97	1,180	2400	2.46	16	1400	6.25	325
May 17:			May 17:			1600	6.30	335
0600	4.14	1,280	0200	2.69	22	1800	6.27	329
1200	4.49	1,490	0400	2.89	27	2000	6.17	310
1800	4.81	1,720	0600	2.71	22	2200	6.04	287
2100	5.14	1,950	0800	2.67	21	2400	5.90	264
2400	5.71	2,370	1000	2.67	21	May 20:		
May 18:			1200	2.66	21	0600	5.23	173
0300	6.39	2,950	1400	2.67	21	1200	4.80	132
0600	7.26	3,980	1600	2.74	23	1800	4.55	111
1200	7.39	4,140	1800	2.91	28	2400	4.31	94
1800	7.93	4,800	2000	3.16	36	May 21:		
2100	8.25	5,300	2200	3.70	59	0600	4.14	83
2230	8.33	5,430	2400	4.14	84	1200	3.95	72
2400	8.24	5,280	May 18:			1800	3.84	66
May 19:			0200	4.44	104	2400	3.75	61
0600	7.48	4,250	0400	4.26	91	<u>06306250.</u> Prairie Dog Creek near Acme, Wyo. (site 52)		
0900	7.05	3,730	0600	4.17	85	May 16:		
1200	6.70	3,310	0800	4.65	120	2400	2.48	69
1500	6.36	2,900	1000	5.62	222	May 17:		
1800	6.07	2,570	1200	6.82	456	0600	2.55	75
2400	5.71	2,240	1400	6.82	456	1200	2.70	90
May 20:			1600	6.52	383	1800	2.84	104
0600	5.53	2,080	1800	7.02	509	2400	3.31	159
1200	5.31	1,880	1900	7.27	584			
1800	5.13	1,720	2000	7.04	515			
2400	5.05	1,640	2200	6.92	481			
May 21:			2400	6.62	405			
0600	5.02	1,620						
1200	4.91	1,520						
1800	4.80	1,430						
2400	4.96	1,560						

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06306250.</u> Prairie Dog Creek near Acme, Wyo. (site 52)--Continued			<u>06306300.</u> Tongue River at State line, near Decker, Mont. (site 53)--Continued			<u>06306300.</u> Tongue River at State line, near Decker, Mont. (site 53)--Continued		
May 18:			May 17:			May 21:		
0200	3.63	199	0600	6.39	2,600	0600	8.24	4,950
0400	3.94	244	1200	6.60	2,830	1200	8.00	4,600
0600	4.43	321	1800	6.93	3,210	1800	7.80	4,320
0800	4.96	415	2400	7.35	3,730	2400	7.57	4,010
1000	5.45	509						
1200	5.84	590	May 18:			May 22:		
1400	6.43	721	0400	7.79	4,310	0600	7.39	3,780
1600	7.03	864	0800	8.39	5,170	1200	7.44	3,840
1800	8.23	1,180	1200	9.22	6,500	1800	7.44	3,840
2000	9.30	1,500	1400	9.64	7,220	2400	7.32	3,690
2100	9.51	1,560	1600	10.11	8,060			
No gage-height record to 0900 hours on May 20			1800	10.64	9,050	<u>06307500.</u> Tongue River at Tongue River Dam, near Decker, Mont. (site 56)		
			2000	11.24	10,300			
			2200	11.65	11,100			
			2400	12.00	11,900			
May 20:			May 19:			May 16:		
0900	9.51	1,550	0200	12.53	13,100	2400	13.64	1,510
1200	8.90	1,370	0400	13.16	14,600			
1400	8.35	1,210	0600	13.73	16,100	May 17:		
1600	7.96	1,100	0800	14.03	16,900	0600	13.64	1,510
1800	7.66	1,020	1000	14.20	17,400	1200	13.64	1,510
2000	7.40	950	1200	14.25	17,500	1800	14.09	1,880
2200	7.11	877	1400	14.15	17,200	2400	14.10	1,890
2400	6.86	816	1600	13.92	16,600			
May 21:			1800	13.54	15,600	May 18:		
0200	6.61	754	2000	13.07	14,400	0600	14.11	1,900
0400	6.44	714	2200	12.61	13,300	1200	14.40	2,160
No gage-height record to 0900 hours			2400	12.11	12,100	1800	14.61	2,360
						2400	14.63	2,380
			May 20:			May 19:		
0900	6.05	627	0200	11.65	11,100	0600	14.66	2,410
1200	5.87	588	0400	11.30	10,400	0800	15.16	2,930
1800	5.65	542	0600	10.97	9,700	1000	15.90	3,800
2400	5.46	503	0800	10.63	9,040	1200	16.65	4,800
<u>06306300.</u> Tongue River at State line, near Decker, Mont. (site 53)			1000	10.30	8,410	1400	17.32	5,800
			1200	10.00	7,860	1600	17.93	6,790
May 16:			1400	9.70	7,330	1800	18.50	7,800
2400	6.31	2,520	1600	9.44	6,880	2000	18.96	8,660
			1800	9.22	6,500	2200	19.40	9,540
			2000	9.02	6,170	2400	19.75	10,300
			2200	8.86	5,900			
			2400	8.68	5,620			

## MAY 1978 FLOODS, SOUTHEASTERN MONT. AND NORTHEASTERN WYO.

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06307500.</u> Tongue River at Tongue River Dam, near Decker, Mont. (site 56)--Continued			<u>06307500.</u> Tongue River at Tongue River Dam, near Decker, Mont. (site 56)--Continued			<u>06307830.</u> Tongue River below Brandenburg bridge, near Ashland, Mont. (site 64) --Continued		
May 20:			May 25:			May 23:		
0200	19.95	10,700	0600	16.38	4,430	0600	9.23	7,170
0330	20.00	10,800	1200	16.34	4,370	1200	8.92	6,690
0600	19.95	10,700	1800	16.34	4,370	1800	8.45	5,930
0800	19.89	10,600	2400	16.31	4,330	2400	8.01	5,310
1000	19.80	10,400	<u>06307830.</u> Tongue River below Brandenburg bridge, near Ashland, Mont. (site 64)			May 24:		
1200	19.66	10,100	May 17:			0600	7.63	4,780
1400	19.49	9,720	2400	5.22	1,720	1200	7.38	4,410
1600	19.25	9,230	May 18:			1800	7.08	3,970
1800	19.07	8,880	0600	5.30	1,800	2400	6.48	3,170
2000	18.85	8,450	1200	5.44	1,940	<u>06309000.</u> Yellowstone River at Miles City, Mont. (site 72)		
2200	18.51	7,820	1800	5.69	2,210	May 16:		
2400	18.43	7,670	2400	6.05	2,630	2400	5.28	14,400
May 21:			May 19:			May 17:		
0300	18.15	7,170	0600	6.44	3,120	0600	5.44	15,100
0600	17.91	6,760	1200	6.60	3,320	1200	5.66	16,100
0900	17.68	6,370	1800	6.58	3,300	1800	5.92	17,400
1200	17.47	6,030	2400	6.57	3,290	2400	6.63	20,900
1800	17.10	5,460	May 20:			May 18:		
2400	16.81	5,030	0600	6.62	3,350	0600	7.31	24,600
May 22:			1200	6.66	3,400	1200	8.10	29,300
0600	16.59	4,720	1800	6.89	3,700	1800	8.47	31,600
1200	16.42	4,480	2400	7.42	4,470	2400	8.84	34,000
1800	16.27	4,280	May 21:			May 19:		
2400	16.16	4,130	0600	7.64	4,790	0600	9.30	37,100
May 23:			1200	7.86	5,100	0800	9.68	39,700
0600	16.04	3,980	1800	8.19	5,560	1000	9.93	41,500
0900	16.01	3,940	2400	8.47	5,960	1200	10.35	44,600
1000	13.42	1,350	May 22:			1400	10.77	47,800
1200	13.26	1,240	0600	9.21	7,140	1600	11.32	52,200
1400	13.45	1,370	1200	9.74	7,980	1800	11.53	53,900
1500	14.92	2,680	1500	9.95	8,320	2000	11.86	56,700
1600	16.85	5,090	1600	9.96	8,340	2200	12.17	59,300
1700	17.17	5,570	1700	9.93	8,290	2400	12.42	61,500
1800	17.13	5,500	1800	9.91	8,250			
2400	16.89	5,150	2400	9.61	7,770			
May 24:								
0600	16.70	4,870						
1200	16.56	4,670						
1800	16.49	4,580						
2400	16.43	4,500						

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06309000. Yellowstone River at Miles City, Mont. (site 72)--Continued</u>			<u>06320200. Clear Creek below Rock Creek near Buffalo, Wyo. (site 94)--Continued</u>			<u>06320200. Clear Creek below Rock Creek near Buffalo, Wyo. (site 94)--Continued</u>		
May 20:			May 15:			May 20:		
0600	12.97	66,400	0200	3.67	471	0600	5.10	1,080
1200	13.18	68,300	0600	3.65	464	1400	4.92	990
1800	13.37	70,000	1200	3.58	441	1800	5.10	1,080
2400	13.87	74,800	1400	3.57	438	2400	5.39	1,220
			1900	4.26	683			
May 21:			2400	4.76	912	<u>06324000. Clear Creek near Arvada, Wyo. (site 100)</u>		
0600	14.12	77,200				May 15:		
1200	14.44	80,400	May 16:			2400	3.42	656
1800	14.96	85,700	0400	4.76	912			
2000	15.37	89,900	0800	4.65	862	May 16:		
2200	15.59	92,300	1200	4.50	795	0600	3.63	748
2400	15.83	94,900	1700	4.39	746	1200	3.69	777
			2100	4.57	826	1800	3.75	806
May 22:			2400	4.93	995	2400	4.10	985
0200	16.07	97,500						
0400	16.29	99,900	May 17:			May 17:		
0600	16.41	101,000	0200	5.25	1,160	0200	4.69	1,300
0800	16.50	102,300	0400	5.26	1,160	0400	5.44	1,790
1000	16.44	102,000	0600	5.44	1,250	0500	5.77	2,020
1200	16.20	98,900	0800	5.55	1,320	0600	6.20	2,350
1400	15.57	92,100	1200	5.39	1,220	0800	6.45	2,540
1600	14.19	77,900	1500	5.47	1,270	1200	5.72	1,990
1800	12.39	61,200	1800	5.59	1,340	1600	5.27	1,670
2000	11.44	53,200	2100	5.72	1,420	1900	5.14	1,590
2200	11.03	49,900	2400	5.84	1,510	2100	5.19	1,620
2400	10.80	48,100				2200	5.33	1,710
			May 18:			2400	5.83	2,070
May 23:			0200	5.88	1,540			
0600	10.23	43,700	0600	5.74	1,440	May 18:		
1200	9.90	41,300	1200	5.59	1,340	0300	6.44	2,520
1800	9.69	39,800	1500	5.82	1,490	0700	7.31	3,250
2400	9.57	39,000	1800	5.95	1,580	1500	7.62	3,560
			2100	6.00	1,620	1800	8.41	4,450
May 24:			2400	5.81	1,490	2100	8.85	4,980
0600	9.45	38,100				2230	9.03	5,210
1200	9.29	37,000	May 19:			2400	8.93	5,100
1800	9.13	35,900	0300	5.63	1,360			
2400	9.11	35,800	0600	5.51	1,290	May 19:		
			1200	5.27	1,160	0200	8.87	5,050
<u>06320200. Clear Creek below Rock Creek near Buffalo, Wyo. (site 94)</u>			1500	5.22	1,140	0600	8.71	4,870
May 14:			1800	5.24	1,150	1200	8.53	4,660
2400	3.65	464	2100	5.27	1,160	1500	8.22	4,310
			2400	5.27	1,160	1800	7.79	3,850
						2400	7.50	3,560



TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06324000.</u> Clear Creek near Arvada, Wyo. (site 100)--Continued			<u>06324500.</u> Powder River at Moorhead, Mont. (site 101)--Continued			<u>06324710.</u> Powder River at Broadus, Mont. (site 103)--Continued		
May 20:			May 21:			May 19:		
0600	7.32	3,420	0100	14.74	29,100	0600	10.61	15,600
1200	6.73	2,890	0200	14.09	26,700	1200	11.14	17,300
1800	6.30	2,540	0300	13.35	24,000	1800	11.57	18,800
2400	6.10	2,380	0400	12.44	21,000	2400	11.77	19,500
May 21:			0800	10.17	14,100	May 20:		
0600	5.91	2,250	1000	9.95	13,400	0600	11.89	20,300
1200	5.69	2,090	1100	9.49	12,200	1200	11.83	20,000
1500	5.64	2,050	No gage-height record to 1800 hours			1800	11.85	20,100
1600	5.64	2,050				2400	11.75	19,600
2000	5.75	2,130				May 21:		
2400	5.79	2,160	1800	8.36	9,320	0600	12.24	22,900
<u>06324500.</u> Powder River at Moorhead, Mont. (site 101)			2400	7.97	8,400	0800	12.50	25,400
May 16:			May 22:			1000	12.63	26,800
2400	4.12	2,110	0600	7.88	8,200	1200	12.89	29,300
May 17:			1200	7.40	7,130	1230	12.96	30,000
0600	4.90	3,330	1800	7.03	6,340	1300	12.90	29,600
1200	6.08	5,440	2400	6.98	6,240	1400	12.92	29,700
1800	6.42	6,120	May 23:			1600	12.76	29,300
2400	6.33	5,930	0600	7.00	6,280	1800	12.44	28,000
May 18:			1200	6.88	6,040	2000	11.89	25,300
0200	7.13	7,640	1800	6.71	5,690	2200	10.98	21,300
0600	8.26	10,300	2400	6.57	5,420	2400	10.02	17,200
1200	9.60	13,900	<u>06324710.</u> Powder River at Broadus, Mont. (site 103)			May 22:		
No gage-height record to 1300 hours on May 20			May 16:			0200	9.11	13,300
May 20:			2400	4.68	2,800	0400	8.65	11,900
1300	13.59	26,700	May 17:			0600	8.22	10,700
1500	14.03	28,300	0600	4.86	3,350	0800	7.92	9,900
1800	14.81	31,300	1200	4.94	3,470	1000	7.72	9,400
2000	15.09	32,400	1800	5.93	4,030	1200	7.58	9,050
2100	15.13	32,500	2100	6.63	5,230	1800	7.34	8,480
2115	15.24	33,000	2400	7.03	5,990	2400	6.79	7,230
2200	15.12	32,500	May 18:			<u>06324890.</u> Little Powder River below Corral Creek near Weston, Wyo. (site 105)		
2300	15.12	32,500	0600	7.25	6,440	May 15:		
2400	14.90	31,600	1200	7.96	7,990	2400	2.04	11
			1800	8.63	9,590			
			2400	9.74	12,700			

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
06324890. Little Powder River below Corral Creek near Weston, Wyo. (site 105)--Continued			06324925. Little Powder River near Weston, Wyo. (site 108)			06324925. Little Powder River near Weston, Wyo. (site 108)--Continued		
May 16:			May 16:			May 22:		
0600	2.01	11	2400	2.94	27	0300	5.57	197
1200	1.98	10				0600	5.32	176
1800	1.94	9.3	May 17:			1200	4.98	150
2400	1.98	10	0600	2.96	28	1800	4.69	128
			0800	3.47	52	2400	4.51	115
May 17:			1000	3.35	46			
0600	2.52	24	1100	3.68	64	06324970. Little Powder River above Dry Creek near Weston, Wyo. (site 109)		
0900	3.27	50	1300	5.01	152			
1800	4.19	96	1800	6.20	256	May 16:		
2100	4.88	140	2100	7.32	439	2400	4.10	95
2200	5.24	166	2400	8.28	694			
2400	7.04	380				May 17:		
			May 18:			1600	4.17	104
May 18:			0300	8.82	902	2000	4.45	146
0600	8.62	1,260	0400	9.08	1,020	2300	4.95	237
0900	8.94	1,570	0600	11.83	2,860	2400	5.67	382
1200	9.40	2,100	0900	13.07	4,160			
1430	9.61	2,410	1000	13.13	4,230	May 18:		
1800	9.37	2,060	1200	13.06	4,150	0400	7.11	910
2400	8.92	1,550	1800	11.95	2,970	0700	8.95	2,100
			2100	12.99	4,070	0900	9.51	2,600
May 19:			2400	13.31	4,440	1200	10.12	3,250
0100	9.05	1,580				1400	10.41	3,600
0300	9.10	1,740	May 19:			1600	10.47	3,670
0900	8.56	1,210	0045	13.32	4,460	2100	10.83	4,140
1200	8.18	922	0600	12.47	3,490	2400	11.13	4,560
1500	7.83	708	1200	11.42	2,500			
1800	7.54	563	1500	11.44	2,520	May 19:		
2400	6.92	353	1800	11.16	2,290	0300	11.54	5,170
			2400	10.15	1,570	0530	11.62	5,300
May 20:						0730	11.59	5,250
0300	6.75	320	May 20:			1200	11.44	5,020
0700	6.55	289	0300	9.75	1,340	1600	11.55	5,190
1500	5.96	221	0600	9.46	1,190	2400	10.92	4,270
1900	5.60	193	1200	9.01	984			
2100	5.47	183	1800	8.39	733	May 20:		
2200	5.48	184	2400	7.68	518	0400	10.42	3,610
2400	5.57	190				1000	9.95	3,060
May 21:			May 21:			1400	9.51	2,600
0600	5.00	148	0600	7.04	384	1800	9.00	2,140
1200	4.55	118	0900	6.69	322	2000	8.83	2,000
1800	4.12	92	1200	6.47	290	2400	8.39	1,670
2400	3.89	80	1800	6.12	248			
			2400	5.86	222			

## MAY 1978 FLOODS, SOUTHEASTERN MONT. AND NORTHEASTERN WYO.

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06324970. Little Powder River above Dry Creek near Weston, Wyo. (site 109)--Continued</u>			<u>06326500. Powder River near Locate, Mont. (site 116)--Continued</u>			<u>06365300. Dry Fork Cheyenne River near Bill, Wyo. (site 119)--Continued</u>		
May 21:			May 23:			May 18:		
0500	7.91	1,350	0100	11.27	27,400	0200	3.00	348
1300	7.28	995	0200	11.22	26,900	0430	3.88	894
2400	6.60	684	0400	11.22	26,900	0900	4.01	1,010
May 22:			0600	11.15	26,200	1130	4.00	1,000
0300	6.46	629	0800	10.92	24,300	1330	3.82	846
1700	6.00	468	1200	10.02	19,300	1500	3.47	592
2400	5.68	384	1800	8.28	13,500	1700	3.12	400
<u>06326500. Powder River near Locate, Mont. (site 116)</u>			2400	7.66	11,600	1900	2.93	318
May 17:			May 24:			2400	2.90	306
2400	4.12	2,890	0600	7.18	10,300	May 19:		
May 18:			1200	6.97	9,720	0700	2.94	322
0600	4.24	3,110	1800	6.83	9,350	0900	2.23	112
1200	4.50	3,590	2400	6.61	8,770	1500	1.87	56
1800	4.92	4,430	<u>06365300. Dry Fork Cheyenne River near Bill, Wyo. (site 119)</u>			2400	1.58	28
2400	5.49	5,660	May 15:			May 20:		
May 19:			2400	0.70	0.80	0600	1.45	20
0600	6.15	7,350	May 16:			1200	1.37	15
1200	6.50	8,220	1800	.67	.70	1800	1.30	12
1800	6.80	9,000	1830	2.27	120	2400	1.25	10
2400	7.06	9,690	1900	1.89	58	<u>06365900. Cheyenne River near Dull Center, Wyo. (site 120)</u>		
May 20:			1930	2.10	89	May 15:		
0600	7.41	10,800	2200	1.42	18	2400	0.92	38
1200	7.75	11,800	2400	1.62	31	May 16:		
1800	8.12	12,900	May 17:			2030	.84	24
2400	8.47	13,900	0500	1.33	14	2200	1.40	159
May 21:			0900	1.32	13	2230	1.71	271
0600	8.98	15,600	1330	1.45	20	2300	3.60	1,270
1200	9.35	16,800	1400	1.77	45	2400	3.75	1,360
1800	9.67	18,100	2100	2.33	133			
2400	9.89	19,000	2400	2.75	250			
May 22:								
0600	10.28	20,400						
1200	10.43	21,200						
1800	10.87	23,900						
2400	11.19	26,600						

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06365900.</u> Cheyenne River near Dull Center, Wyo. (site 120)—Continued			<u>06375600.</u> Little Thunder Creek near Hampshire, Wyo. (site 121)			<u>06376300.</u> Black Thunder Creek near Hampshire, Wyo. (site 122)		
May 17:			May 16:			May 16:		
0130	4.17	1,620	2400	2.17	0.40	2400	0.67	1.0
0230	3.88	1,430						
0330	4.84	2,030	May 17:			May 17:		
0600	6.11	2,900	0500	2.18	.50	1400	.69	1.0
0730	5.50	2,460	0600	5.45	407	1430	4.40	226
0900	5.15	2,210	0700	6.48	790	1500	7.00	456
1400	5.06	2,130	0800	6.96	1,060	1600	9.05	652
1530	4.90	2,030	0900	6.69	900	1900	10.00	746
1800	5.17	2,250	1200	6.12	629	2400	10.75	828
1900	5.59	2,580	1500	5.55	425			
2100	6.45	3,290	1800	5.21	331	May 18:		
2200	7.75	4,460	2100	5.02	285	0600	11.50	1,060
2300	8.85	5,560	2400	5.77	497	1200	12.25	2,040
2400	10.09	6,910				1800	13.11	3,370
			May 18:			2230	14.13	5,050
May 18:			0300	6.95	1,050	2400	14.12	5,030
0100	10.77	7,900	0600	7.90	1,770			
0200	11.73	10,300	0900	7.38	1,350	May 19:		
0300	12.00	11,800	1200	6.89	1,010	0600	13.51	4,010
0600	11.66	10,200	1300	8.10	1,950	1200	12.72	2,740
0900	11.85	11,100	1315	9.02	3,030	1800	12.00	1,670
1100	11.66	10,200	1800	8.10	1,950	2400	11.21	933
1530	11.44	9,520	2400	6.98	1,070			
1900	11.35	9,250				May 20:		
2200	10.43	7,540	May 19:			0600	10.25	760
2400	9.76	6,710	0300	6.57	836	1400	8.59	538
			0600	6.43	766	1800	7.40	382
May 19:			1200	6.56	831	2400	6.48	268
0200	9.21	6,110	1800	6.27	693			
0300	8.26	5,150	2100	5.95	561	May 21:		
0400	8.04	4,940	2400	5.45	407	0600	5.81	190
0600	7.16	4,110				1200	5.31	137
0800	6.32	3,380	May 20:			1800	4.92	99
1130	5.60	2,800	0300	5.15	316	2400	4.67	77
1230	5.59	2,790	0600	4.88	251			
1800	4.62	2,070	0900	4.72	216	<u>06386000.</u> Lance Creek near Riverview, Wyo. (site 126)		
2400	3.68	1,460	1200	4.48	183			
			1800	4.26	145	May 16:		
May 20:			2400	3.97	101	2400	1.40	30
0600	3.14	1,140						
1200	2.64	880	May 21:			May 17:		
1700	2.25	695	0300	3.81	82	1800	1.39	30
2400	2.09	625	0600	3.63	63	2230	1.48	37
			1200	3.42	44	2300	5.15	1,140
			1800	3.30	35	2400	5.75	1,560
			2400	3.17	28			

## MAY 1978 FLOODS, SOUTHEASTERN MONT. AND NORTHEASTERN WYO.

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06386000. Lance Creek near Riverview, Wyo. (site 126)--Continued</u>			<u>06394000. Beaver Creek near Newcastle, Wyo. (site 129)</u>			<u>06395000. Cheyenne River near Edgemont, S. Dak. (site 130)</u>		
May 18:			May 16:			May 16:		
0400	6.15	1,880	2400	2.33	26	2400	2.58	120
0700	6.70	2,400						
0800	7.45	3,240	May 17:			May 17:		
0900	8.30	4,500	0800	2.37	28	0600	2.58	120
1100	9.03	6,080	1200	2.52	37	1200	2.58	120
1200	9.14	6,350	1400	2.45	33	1800	2.57	117
1500	9.02	6,050	2000	2.43	32	2400	2.71	157
1800	8.73	5,360	2200	2.46	34			
2200	8.67	5,240	2300	2.62	45	May 18:		
2400	8.98	5,950	2400	3.15	95	0600	2.84	199
						0900	3.96	758
May 19:			May 18:			1000	6.97	3,150
0500	9.42	7,160	0200	5.12	307	1200	8.08	5,020
0600	9.40	7,100	0400	7.54	636	1800	9.34	7,900
0630	9.43	7,190	0600	9.66	1,020	2100	9.59	8,570
0730	9.33	6,890	0900	11.22	1,360	2400	10.05	9,510
1230	8.80	6,120	1200	11.97	1,540			
1530	8.54	5,610	1500	12.49	1,680	May 19:		
2400	8.17	4,980	1800	12.75	1,740	0600	10.34	10,300
			2300	13.08	1,830	1200	10.67	11,300
May 20:			2400	13.08	1,830	1800	11.52	14,100
0700	7.39	3,780				2400	12.68	18,900
0900	6.91	3,150	May 19:					
1100	5.92	2,100	0100	13.03	1,820	May 20:		
1230	5.36	1,630	0600	11.89	1,520	0600	13.65	28,000
1500	4.89	1,290	0800	11.61	1,450	1200	13.35	26,500
1900	4.41	1,010	1000	11.53	1,440	1800	12.45	22,000
2400	4.00	823	1300	11.65	1,460	2100	11.61	18,400
			1800	13.16	1,850	2400	10.43	14,300
May 21:			2000	15.13	2,830			
0600	3.65	684	2200	15.85	3,420	May 21:		
1200	3.36	579	2400	16.37	3,870	0300	9.20	9,510
1800	3.10	494				0600	8.40	8,880
2400	2.89	433	May 20:			1200	7.38	6,790
			0600	15.65	3,260	1800	6.37	4,890
May 22:			1200	15.10	2,800	2400	5.02	2,790
0600	2.76	396	1800	14.40	2,280			
1200	2.63	358	2400	13.28	1,880	May 22:		
1800	2.50	325				0600	4.58	2,230
2400	2.40	299	May 21:			1200	4.34	1,960
			0300	11.37	1,390	1800	4.12	1,720
			0600	9.72	1,030	2400	4.08	1,680
			1200	7.83	684			
			1800	6.40	465			
			2400	5.30	324			

TABLE 9.—*Gage heights and discharges at selected gaging stations—Continued*

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06425780. Belle Fourche River above Dry Creek near Piney, Wyo. (site 132)</u>			<u>06425900. Caballo Creek at mouth near Piney, Wyo. (site 133)--Continued</u>			<u>06425900. Caballo Creek at mouth near Piney, Wyo. (site 133)--Continued</u>		
May 15:			May 16:			May 20:		
2400	3.25	14	0600	2.08	.90	0300	6.07	505
			1200	2.07	.80	0600	5.81	419
May 16:			1800	2.06	.70	1200	5.38	303
0600	3.23	13	2200	2.06	.70	1800	5.07	236
1200	3.24	14	2400	2.33	3.1	2400	4.82	188
1800	3.24	14						
2400	3.33	17	May 17:			May 21:		
			0100	2.41	4.5	0600	4.53	144
May 17:			0200	3.50	42	1200	4.37	123
0200	3.65	32	0300	3.40	37	1800	4.24	108
0600	3.90	47	0430	3.54	45	2400	4.11	94
1100	4.10	59	0600	3.09	23			
1200	6.53	264	1200	2.49	6.1			
1400	7.32	369	1800	2.40	4.3	<u>06426400. Donkey Creek near Moorcroft, Wyo. (site 135)</u>		
1700	6.41	249	1900	2.46	5.4			
1900	5.99	205	2000	2.66	12	May 16:		
2100	5.92	198	2100	3.18	27	2400	1.60	3.2
2400	7.62	417	2200	3.94	75			
			2300	4.77	178	May 17:		
May 18:			2400	5.20	260	0400	1.56	2.4
0100	8.54	588				0515	4.03	154
0200	9.11	718	May 18:			0600	3.24	86
0500	9.37	782	0200	5.82	422	0700	2.54	35
0600	11.19	1,380	0500	4.83	190	2100	2.45	30
0800	12.81	2,210	0700	5.86	435	2200	2.59	38
1000	13.25	2,520	0900	6.18	545	2400	3.70	123
1200	13.43	2,660	1100	6.66	748			
1530	13.16	2,450	1300	7.14	996	May 18:		
1830	11.83	1,640	1500	6.73	781	0600	7.05	559
1930	11.76	1,610	1700	7.33	1,100	1000	9.80	1,220
2140	14.68	3,800	1800	7.22	1,040	1200	12.24	2,060
2200	15.36	4,530	2100	7.62	1,290	1500	13.39	2,550
2230	16.3	5,630	2400	8.01	1,560	2400	13.90	2,840
2400	14.90	4,020						
No gage-height record May 19 through May 21			May 19:			May 19:		
			0600	8.39	1,890	0300	14.55	3,820
			0915	8.66	2,170	0545	14.60	3,950
			1200	8.12	1,650	0900	14.44	3,550
<u>06425900. Caballo Creek at mouth near Piney, Wyo. (site 133)</u>			1500	7.73	1,360	1200	13.49	2,590
			1800	7.46	1,180	1500	11.95	1,950
May 15:			2100	6.83	831	1700	11.04	1,620
2400	2.10	1.0	2400	6.53	688	1800	10.68	1,490
						2100	9.79	1,210
						2400	9.14	1,030

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06426400.</u> Donkey Creek near Moorcroft, Wyo. (site 135)--Continued			<u>06426500.</u> Belle Fourche River below Moorcroft, Wyo. (site 136)--Continued			<u>06635000.</u> Medicine Bow River above Seminoe Reservoir near Hanna, Wyo. (site 142)--Continued		
May 20:			May 21:			May 21:		
0100	8.97	980	0800	11.32	1,670	0600	3.77	1,950
0600	6.77	514	1200	11.08	1,510	1200	3.66	1,830
0700	7.80	700	1500	10.76	1,340	1800	3.48	1,630
1200	6.77	514	1900	10.15	1,110	2400	3.37	1,520
2400	5.31	306	2400	9.19	845			
May 21:			May 22:			May 22:		
0300	5.08	277	0400	8.50	692	0600	3.34	1,500
0600	4.90	254	1000	7.69	545	1200	3.33	1,490
1200	4.59	216	1800	6.96	444	1800	3.24	1,410
1800	4.33	186	2400	6.45	381	2400	3.13	1,310
2400	4.15	167						
May 22:			<u>06635000.</u> Medicine Bow River above Seminoe Reservoir near Hanna, Wyo. (site 142)			<u>06646600.</u> Deer Creek below Millar Wasteway at Glenrock, Wyo. (site 151)		
0600	3.97	148				May 15:		
1200	3.82	134	May 16:			2400	5.00	340
1800	3.52	108	2400	2.20	590	May 16:		
2400	3.26	87				0600	5.09	385
<u>06426500.</u> Belle Fourche River below Moorcroft, Wyo. (site 136)			May 17:			1000	5.11	396
No gage-height record May 17 to 2400 hours on May 18			1200	2.22	604	1300	4.89	290
			1500	2.38	716	1400	4.84	268
			1800	3.44	1,590	1800	4.82	259
			2100	4.43	2,720	2200	4.85	272
			2400	4.95	3,380	2400	4.93	308
May 18:			May 18:			May 17:		
2400	14.41	13,400	0600	6.00	4,720	0330	5.29	494
May 19:			1230	6.25	5,220	0430	5.75	775
0300	14.60	15,300	1800	5.08	3,540	0600	7.70	2,620
0600	14.39	13,200	2400	4.18	2,420	0700	8.57	4,650
1100	14.05	10,200				0730	8.74	6,090
1600	13.73	7,780	May 19:			0800	8.71	5,755
2200	13.64	7,200	0600	4.04	2,250	0830	8.84	5,560
2400	13.47	6,300	1200	4.02	2,220	1000	8.75	5,000
			1800	4.18	2,420	1130	8.61	4,650
May 20:			2400	4.11	2,330	1400	7.89	3,030
0700	12.99	4,500				1800	7.24	2,330
1400	12.53	3,350	May 20:			2100	7.03	2,110
2200	11.94	2,350	0600	3.91	2,100	2400	7.08	2,160
2400	11.83	2,200	1200	3.72	1,890			
			1800	3.70	1,870			
			2400	3.82	2,000			

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
<u>06646600.</u> Deer Creek below Millar Wasteway at Glenrock, Wyo. (site 151)--Continued			<u>06646780.</u> Sand Creek near Glenrock, Wyo. (site 153)--Continued			<u>06646800.</u> North Platte River near Glenrock, Wyo. (site 154)--Continued		
May 18:			May 18:			May 17:		
0030	7.11	2,190	0300	3.61	344	0600	2.31	1,430
1000	6.69	1,770	0600	3.51	308	0900	3.17	2,740
1700	6.24	1,380	0900	3.76	407	1200	4.51	5,660
2000	6.23	1,370	0930	3.87	460	1300	4.71	6,190
2400	6.37	1,490	1300	3.27	232	1800	3.73	3,820
			1600	2.73	103	1900	3.14	2,680
May 19:			1700	2.84	125	2000	3.90	4,190
0200	6.36	1,480	1900	3.51	308	2100	3.80	3,970
0700	5.96	1,170	2000	3.71	385	2200	3.55	3,460
1400	5.67	972	2400	3.25	227	2400	3.52	3,400
1700	5.61	936						
2400	5.87	1,110	May 19:			May 18:		
			0100	2.96	151	0600	3.80	3,970
May 20:			0200	2.80	117	1200	4.12	4,700
0400	5.79	1,050	0300	2.62	83	1800	4.16	4,790
1000	5.49	864	0600	2.43	54	1900	4.19	4,860
1900	5.28	739	0900	2.19	27	2000	4.35	5,250
2400	5.31	756	1200	2.00	8.0	2400	4.52	5,680
			1500	1.80	2.6			
May 21:			2400	1.77	1.8	May 19:		
0600	5.27	734				0100	4.48	5,580
1200	5.17	678	May 20:			0600	4.61	5,920
1800	5.10	640	0500	1.77	1.8	1000	4.59	5,870
2400	5.05	615	1200	1.74	1.2	1200	4.72	6,220
			1500	1.75	1.4	1330	4.80	6,440
<u>06646780.</u> Sand Creek near Glenrock, Wyo. (site 153)			1800	1.72	1.0	1800	4.65	6,030
			2400	1.72	1.0	2400	4.60	5,890
May 16:			May 21:			May 20:		
2400	1.66	0.40	0600	1.73	1.0	0200	4.43	5,450
			1200	1.73	1.0	0600	4.36	5,280
May 17:			1500	1.75	1.2	1200	4.03	4,490
1200	1.68	.60	1800	1.74	1.1	1800	3.81	4,000
1600	1.76	1.6	2400	1.74	1.1	2400	3.78	3,930
1700	1.95	10						
1800	2.46	60	<u>06646800.</u> North Platte River near Glenrock, Wyo. (site 154)			May 21:		
1900	2.37	48				0600	3.60	3,560
2200	2.68	96				1200	3.42	3,200
2300	2.53	70				1800	3.60	3,560
2400	2.78	113	May 16:			2400	3.92	4,240
			2400	2.19	1,290			



## MAY 1978 FLOODS, SOUTHEASTERN MONT. AND NORTHEASTERN WYO.

TABLE 9.—Gage heights and discharges at selected gaging stations—Continued

Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)	Time	Gage height (ft)	Discharge (ft <sup>3</sup> /s)
06647500. Box Elder Creek at Box Elder, Wyo. (site 155)			06649000. LaPrele Creek near Douglas, Wyo. (site 159)			06652000. North Platte River at Orin, Wyo. (site 163)		
May 15: 2400	3.96	424	May 15: 2400	7.06	317	May 15: 2400	3.90	2,460
May 16: 0300	3.99	436	May 16: 0400	7.28	345	May 16: 0600	3.86	2,440
0600	3.94	416	1200	6.98	305	1200	3.82	2,380
1200	3.88	392	1400	6.62	257	1800	3.75	2,270
1500	3.86	384	2000	6.68	265	2000	4.01	2,690
1800	3.92	408	2400	7.40	364	2100	4.91	4,400
2130	4.34	580				2200	6.32	7,790
2200	4.37	595	May 17: 0300	8.85	582	2300	7.11	10,100
2300	4.53	675	0600	10.59	1,530	2400	6.80	9,130
2400	5.04	964	0700	10.66	1,700			
May 17: 0100	5.37	1,180	0900	10.62	1,610	May 17: 0100	6.76	9,100
0330	6.61	2,230	1200	10.31	1,080	0230	7.76	12,200
0600	6.28	1,910	1800	10.06	848	0400	6.77	9,130
0900	5.85	1,540	2400	10.52	1,410	0500	6.07	7,200
1400	5.54	1,300				0600	5.56	5,930
2000	5.42	1,210	May 18: 0600	10.57	1,510	0800	4.89	4,420
2400	5.30	1,130	1200	10.29	1,050	1000	4.70	4,030
May 18: 0600	5.10	1,000	1500	9.96	802	1200	4.58	3,790
1200	4.90	880	2400	9.77	748	1400	4.42	3,480
1500	4.89	874				1500	4.42	3,480
1730	4.93	898	May 19: 0600	9.13	627	1800	4.47	3,580
2400	4.70	760	1200	8.72	561	2000	4.67	3,970
			1800	8.36	504	2100	4.96	4,570
			2400	8.24	486	2200	5.48	5,740
May 19: 0300	4.60	710				2400	6.56	8,530
0600	4.54	680	May 20: 0600	8.07	459			
1200	4.44	630	1200	7.88	431	May 18: 0200	7.01	9,930
1500	4.43	625	1800	7.58	387	0300	7.09	10,200
1800	4.44	630	2400	7.58	387	0400	7.09	10,200
2400	4.37	595				0600	7.03	9,990
May 20: 0600	4.27	548	May 21: 0600	7.50	376	0900	6.79	9,280
1200	4.18	512	1200	7.32	350	1200	6.66	8,900
1500	4.15	500	1400	7.27	343	1800	6.51	8,480
1800	4.18	512	1600	7.50	376	2000	6.59	8,700
2100	4.22	528	1800	8.14	469	2400	6.63	8,820
2400	4.18	512	1800	8.36	504			
			2100	8.05	456	May 19: 0400	6.53	8,620
			2400	7.85	427	0800	6.41	8,280
						1200	6.57	8,730
						1400	6.60	8,820
						2100	6.56	8,700
						2400	6.44	8,360
						May 20: 0300	6.37	8,250
						0600	6.32	8,120
						1200	6.25	7,920
						1500	6.16	7,680
						1800	6.03	7,340
						2100	5.88	6,950
						2400	5.66	6,390
						May 21: 0600	5.36	5,740
						1200	5.24	5,460
						1800	5.13	5,210
						2400	4.94	4,780