

**U.S. Department of the Interior
U.S. Geological Survey**

Rainfall and Runoff-Hydrograph Data for Selected Small Basins in Montana, 1992-97

By Timothy J. Morgan and Charles Parrett

Open-File Report 99-62

**In cooperation with the
MONTANA DEPARTMENT OF TRANSPORTATION and the
MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION**

U.S. Department of the Interior

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CONVERSION FACTORS

Multiply	By	To obtain
cubic foot per second (ft ³ /s)	0.028317	cubic meter per second
inch (in.)	25.4	millimeter
mile (mi)	1.609	kilometer
square mile (mi ²)	2.59	square kilometer

RAINFALL AND RUNOFF-HYDROGRAPH DATA FOR SELECTED SMALL BASINS IN MONTANA, 1992-97

By Timothy J. Morgan and Charles Parrett

Abstract

A cooperative data-collection program among the U.S. Geological Survey, the Montana Department of Transportation, and the Montana Department of Natural Resources and Conservation was begun in 1992 to collect rainfall and runoff-hydrograph information for the purpose of developing a data base for rainfall-runoff models. Seven sites were operated for various periods from 1992 through 1997. Rainfall and runoff-hydrograph data are presented in tabular and graphic form for 29 storms from 5 of the 7 gaging sites.

INTRODUCTION

The U.S. Geological Survey and the Montana Department of Transportation began a cooperative program in 1955 to collect peak-flow data to investigate the magnitude and frequency of floods in small-stream basins in Montana (Omang and others, 1979; Hull and Omang, 1990). From the peak-flow data base, regional flood-frequency relations have been developed for the estimation of flood peaks of various exceedance frequencies at ungaged sites (Omang, 1992). Although these relations have proven useful to design engineers, they provide no information about runoff volume and duration. Runoff volume and duration are determined from discharge data over some specified time period. The data commonly are displayed graphically as a runoff hydrograph.

Runoff-hydrograph data, as well as peak-flow data, are required to fully assess the risk of flooding to structures in or near streams. These assessments typically use rainfall-runoff models to calculate various design-storm hydrographs. Rainfall-runoff models require rainfall data together with runoff-hydrograph data for calibration. Thus, flood-risk assessments, which are increasingly being used by engineers and hydrologists for culvert and bridge design and for dam-safety analyses, require a data base of both rainfall and runoff-hydrograph data. Accordingly, the Montana Department of Transportation and the Montana Department of Natural Resources and Conservation entered

into a long-term cooperative program with the U.S. Geological Survey in 1992 to collect rainfall and runoff-hydrograph information from small stream basins in Montana.

Purpose and Scope

This report presents information about stream-flow-gaging station operation for the collection of rainfall and runoff data from seven sites in Montana during 1992-97. In 1992, data were collected at three sites. Beginning in 1993, data were collected at two additional sites. In 1997, two sites were discontinued and replaced by two new sites. The location of each site and corresponding drainage basin size, shape, and orientation are shown in figure 1. Data at all sites were collected on a seasonal basis, generally April to October. All small-stream hydrograph stations and their gaging equipment are described in table 1. Rainfall and discharge data are presented for 29 storms at 5 different sites (tables 2-20 and figures 2-20 at the back of the report) where the recurrence interval of the instantaneous peak discharge was equal to or greater than about 2 years. Because many rainfall-runoff models require characterization of antecedent moisture conditions in the basin for proper calibration, rainfall and discharge are shown 5 days prior to each runoff event on tables 2-20.

Station Operation

A streamflow-gaging station is a site on a stream where water level (stage) is recorded. Records of stage are used to compute the rate of streamflow or discharge. Discharge is computed from stage-discharge relation curves, which are constructed by plotting known discharges against the corresponding stages. The known discharges can be determined by direct measurements or by various indirect methods based on

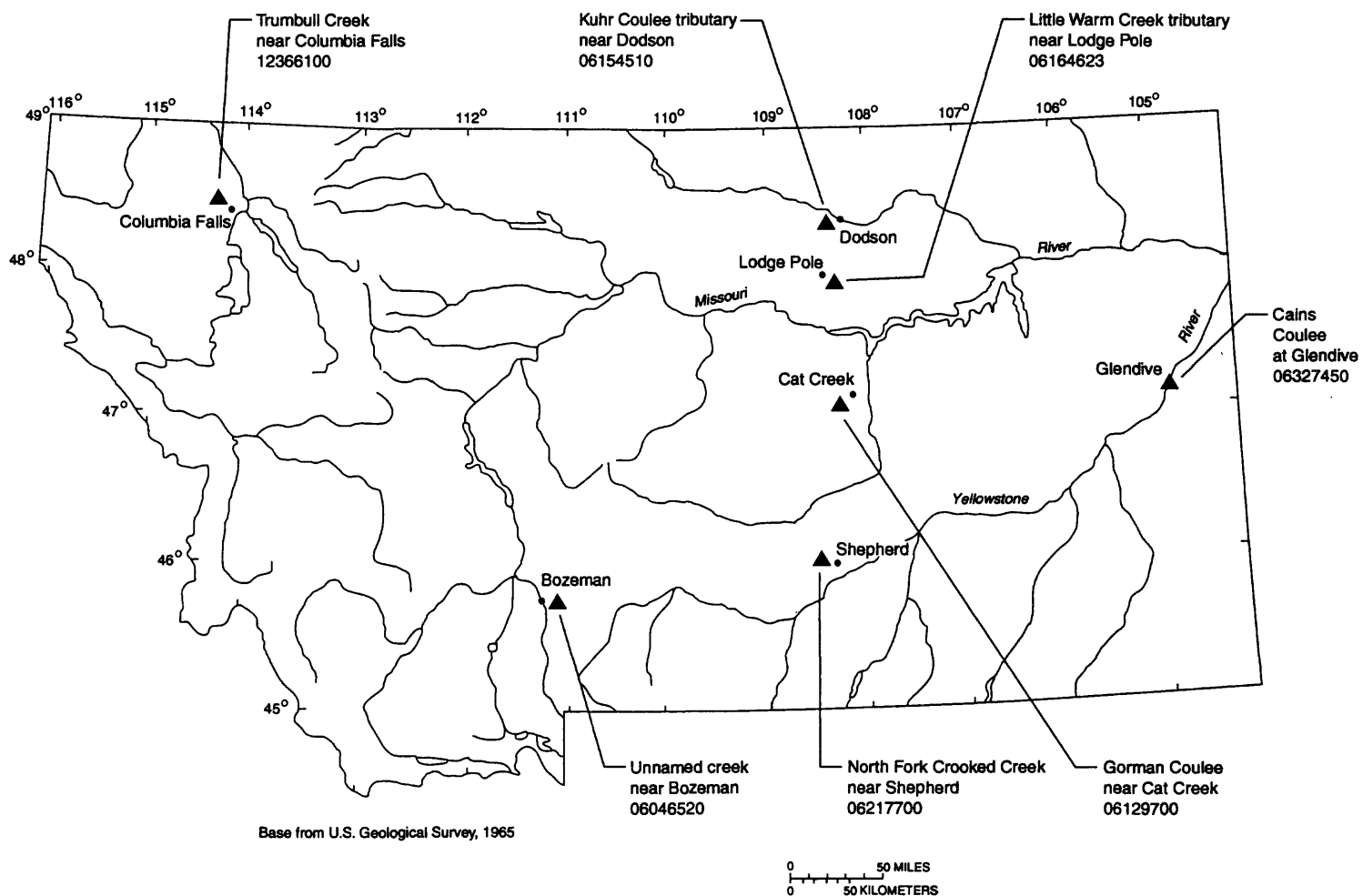


Figure 1. Location of small-stream hydrograph stations in Montana and corresponding drainage basin sizes, shapes and orientation.

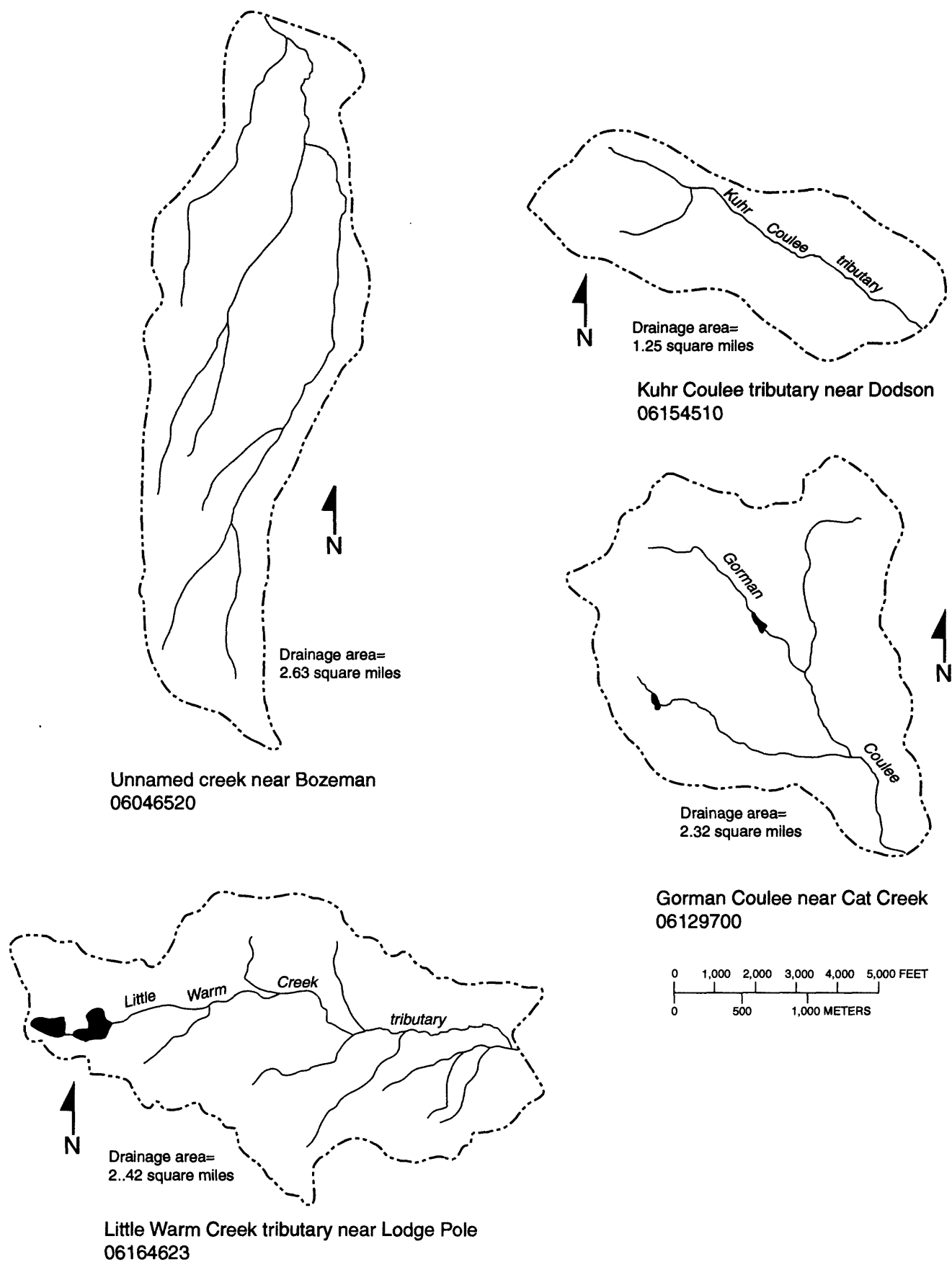


Figure 1. Location of small-stream hydrograph stations in Montana and corresponding drainage basin sizes, shapes and orientation.
(continued)

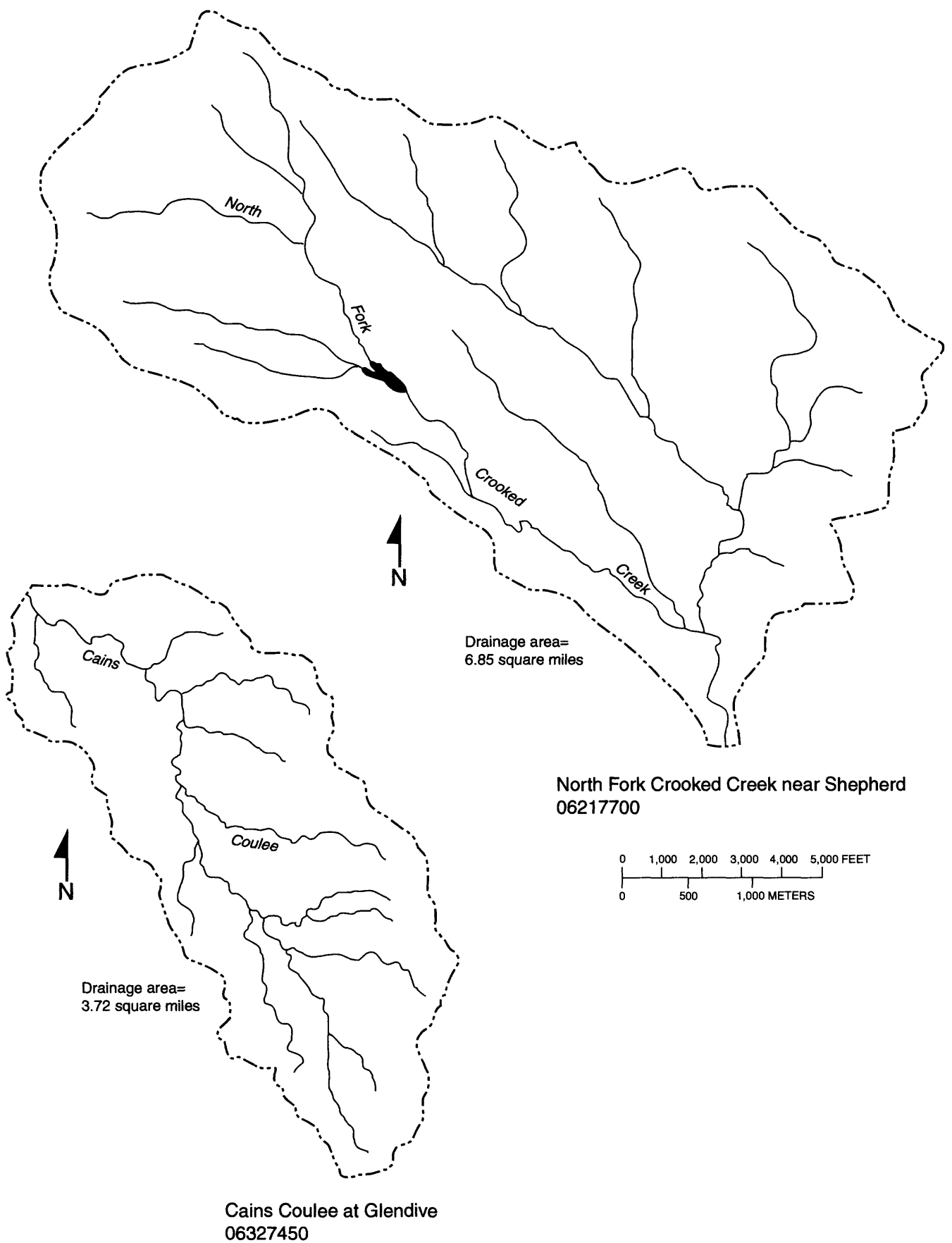


Figure 1. Location of small-stream hydrograph stations in Montana and corresponding drainage basin sizes, shapes and orientation.
(continued)

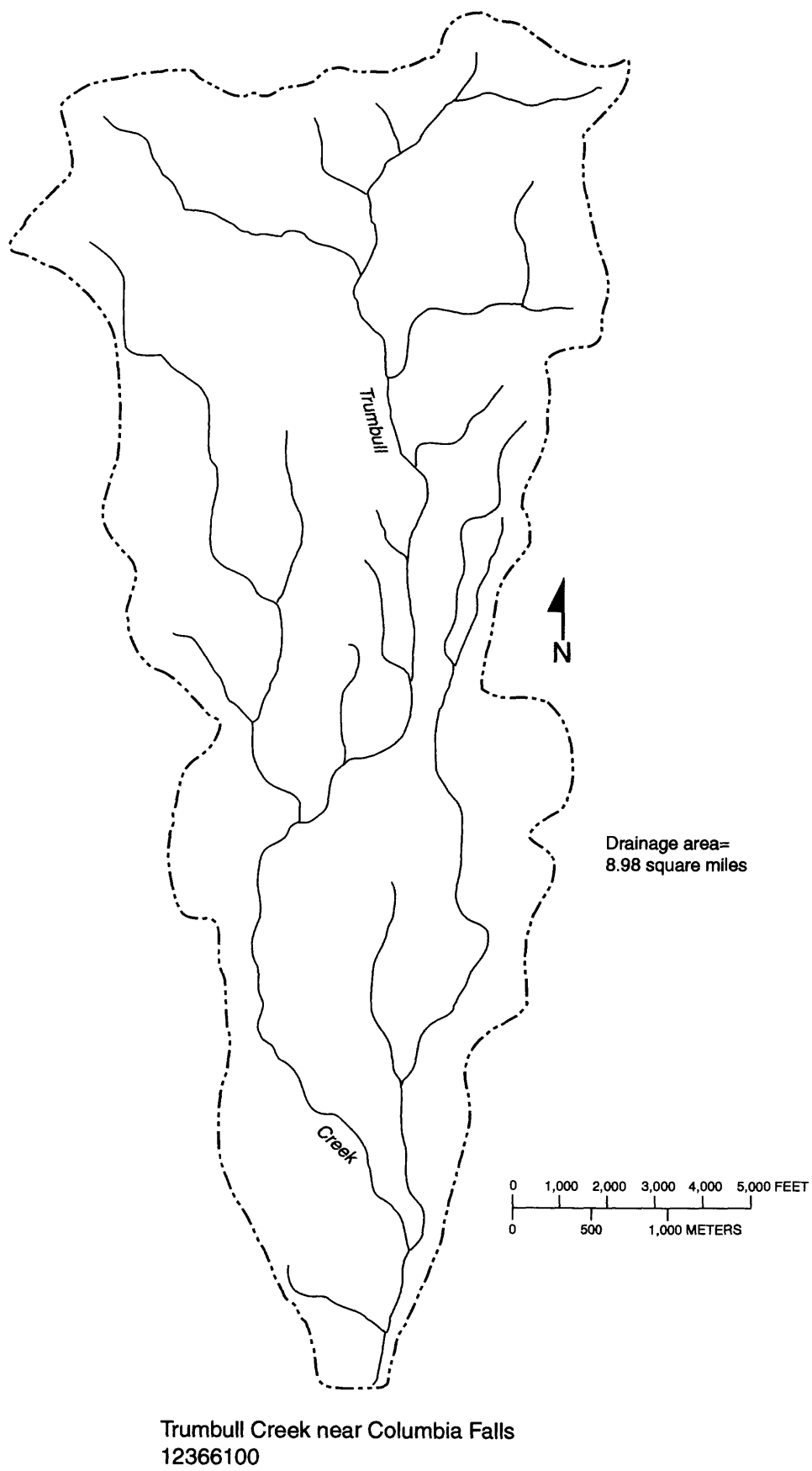


Figure 1. Location of small-stream hydrograph stations in Montana and corresponding drainage basin sizes, shapes and orientation.
(continued)

Table 1. Small-stream hydrograph stations and gaging equipment in Montana

[Abbreviations: in., inch; lat, latitude; long, longitude; mi, mile; mi^2 , square mile; min, minute; sec., section]

Station name and number and period of record	Drainage area (mi^2)	Location	Equipment
Unnamed creek near Bozeman (06046520) 1997 ¹	2.63	Lat 45°39'59", long 110°58'52", in NE1/4 SE1/4 NE1/4, sec. 16, T. 2 S., R. 6 E., Gallatin County, Hydrologic Unit 10020008, on right bank at upstream end of culvert on Interstate Highway 90 at Fort Ellis Road overpass, 3.0 mi southeast of Bozeman.	Rainfall data collected by 0.01-in. resolution tipping-bucket rain gage recording at 5-min intervals from April to October 1997. Stage data collected by submersible pressure transducer coupled to an electronic data logger recording at 5-min intervals from April to October 1997.
Gorman Coulee near Cat Creek (06129700) 1993 to 1997 ¹	2.32	Lat 47°00'45", long 108°05'54", in SE1/4 SW1/4 SW1/4, sec. 31, T. 15 N., R. 29 E., Petroleum County, Hydrologic Unit 10040204, at upstream end of culvert on State Highway 200, 2.7 mi east of Box Elder Creek, 6.0 mi southwest of Cat Creek, and 10.7 mi east of Winnett.	Rainfall data collected by 0.1-in. resolution tipping-bucket rain gage recording at 5-min intervals from April 1993 to October 1996 and by 0.01-in. resolution tipping-bucket rain gage recording at 5-min intervals from April to October 1997. Stage data collected by continuous graphic recorder from April 1993 to October 1995 and by float-driven electronic data logger recording at 5-min intervals from April 1996 to October 1997.
Kuhr Coulee tributary near Dodson (06154510) 1993 to 1996	1.25	Lat 48°23'17", long 108°23'17", in SW1/4 NW1/4 SW1/4, sec. 20, T. 30 N., R. 26 E., Phillips County, Hydrologic Unit 10050009, at upstream end of culvert on county road 0.5 mi upstream of Kuhr Coulee and 8.5 mi southwest of Dodson.	Rainfall data collected by 0.1-in. resolution tipping-bucket rain gage recording at 5-min intervals from April 1993 to October 1996. Stage data collected by continuous graphic recorder from April 1993 to October 1995 and by submersible pressure transducer coupled to an electronic data logger recording at 5-min intervals from April to October 1996.
Little Warm Creek tributary near Lodge Pole (06164623) 1992 to 1996	2.42	Lat 47°59'43", long 108°19'09", in SW1/4 SE1/4 NW1/4, sec. 24, T. 26 N., R. 26 E., Phillips County, Hydrologic Unit 10050014, at upstream end of culvert on county road 0.3 mi northeast of Little Warm Creek, 1.3 mi east of Fort Belknap Indian Reservation boundary, 2.3 mi northeast of State Highway 191 and 10 mi southeast of Lodge Pole.	Rainfall data collected by 0.1-in. resolution tipping-bucket rain gage recording at 5-min intervals from April 1992 to October 1996. Stage data collected by float-driven electronic data logger recording at 15-min intervals from April 1992 and by float-driven electronic data logger recording at 5-min intervals from April 1993 to October 1996 with the exception of the July 1993 period in which continuous graphic record was used.
North Fork Crooked Creek near Shepherd (06217700) 1992 to 1997 ¹	6.85	Lat 46°04'23", long 108°30'09", in NW1/4 NE1/4 NW1/4, sec. 28, T. 4 N., R. 26 E., Yellowstone County, Hydrologic Unit 10070007, at downstream side of bridge on county road 1.7 mi west of U.S. Highway 87, 12 mi northwest of Shepherd, and 20 mi north of Billings.	Rainfall data collected by 0.1-in. resolution tipping-bucket rain gage recording at 5-min intervals from April 1992 to October 1996 and by 0.01-in. resolution tipping-bucket rain gage recording at 5-min intervals from April to October 1997. Stage data collected by float-driven electronic data logger recording at 15-min intervals from April to October 1992 and by float-driven electronic data logger recording at 5-min intervals from April 1993 to October 1997.
Cains Coulee at Glendive (06327450) 1992 to 1997 ¹	3.72	Lat 47°05'39", long 104°42'46", in SW1/4 SE1/4 SE1/4, sec. 35, T. 16 N., R. 55 E., Dawson County, Hydrologic Unit 10100004, at downstream end of pipe-arch culvert at Taylor Avenue near South Side Park at Glendive.	No rainfall data collected for 1992. Rainfall data collected by 0.1-in. resolution tipping-bucket rain gage recording at 5-min intervals from April 1993 to October 1996 and by 0.01-in. resolution tipping-bucket rain gage recording at 5-min intervals from April to October 1997. Stage data collected by float-driven electronic data logger recording at 15-min intervals from April to October 1992 and April to October 1994; by float-driven electronic data logger recording at 15-min intervals from April to October 1995 and April to October 1996; by continuous graphic recorder June 1993, July to October 1993, and April to October 1996; by continuous graphic recorder June 1993; and by submersible pressure transducer coupled to an electronic data logger, recording at 5-min intervals from April to October 1995 and April to October 1997.
Trumbull Creek near Columbia Falls (12366100) 1997 ¹	8.98	Lat 48°24'00", long 114°14'11", in SE1/4 SW1/4 SW1/4, sec. 36, T. 31 N., R. 21 W., Flathead County, Hydrologic Unit 17010210, on left bank at upstream end of culvert on county road 0.8 mi north of Halfmoon and 3.0 mi northwest of Columbia Falls.	Rainfall data collected by 0.01-in. resolution tipping-bucket rain gage recording at 5-min intervals from April to October 1997. Stage data collected by submersible pressure transducer coupled to an electronic data logger recording at 5-min intervals from April to October 1997.

¹Period of record may extend beyond 1997.

hydraulic computations, such as the computation of flow through culverts or bridges, the slope-area method, or the step-backwater method (Dalrymple and Benson, 1967; Matthai, 1967; Bodhaine, 1968; and Davidian, 1984). The stream attribute that most influences the stage-discharge relation is known as the control. Streamflow-gaging stations commonly are located at sites where some stable and hydraulically sensitive control feature is present. More information on determining stream discharges can be obtained from Rantz and others (1982).

The streamflow-gaging stations used in this study are located near bridges or culverts, which generally provide stable stage-discharge relations. Locating the gaging stations near bridges or culverts where indirect methods of computing discharge are applicable also aids in the development of stage-discharge relation curves. Because the selected small basins used in this study tend to be ephemeral in nature, measuring discharge directly can prove to be difficult, and stage-discharge relation curves for these sites are more easily developed through indirect methods.

Rainfall was measured at all five sites with 0.1-in. resolution tipping-bucket rain gages located near the streamflow gages from 1992 or 1993 through 1996. In an effort to improve the quality of recorded rainfall data, all rainfall sites in operation in 1997 were equipped with 0.01-in. resolution tipping-bucket rain gages.

In 1992 three sites--Little Warm Creek tributary near Lodge Pole (station 06164623), North Fork Crooked Creek near Shepherd (station 06217700), and Cains Coulee at Glendive (station 06327450)--were activated and equipped with float-driven electronic data loggers to collect stage data at either 5- or 15-minute intervals. Continuous graphic record also was collected as backup record. In 1993 two more sites--Gorman Coulee near Cat Creek (station 06129700) and Kuhr Coulee tributary near Dodson (station 06154510)--were activated and were equipped only with continuous graphic recorders. In 1995, the float-driven electronic data logger at Cains Coulee at Glendive was replaced with a submersible pressure transducer coupled to an electronic data logger. In 1996, all five gaging stations were equipped with either float-driven electronic data loggers or submersible pressure transducers coupled to electronic data loggers that collected stage at 5-minute intervals. Continuous graphic recorders were used occasionally at sites equipped with

data loggers to obtain stage record for backup in the event of equipment malfunction. In 1997, two of the gaging sites--Little Warm Creek tributary near Lodge Pole and Kuhr Coulee tributary near Dodson--were discontinued and replaced by two new sites--Unnamed creek near Bozeman (station 06046520) and Trumbull Creek near Columbia Falls (station 12366100). The two new sites were established to provide the Montana Department of Transportation with rainfall and runoff-hydrograph data from small basins in or near rapidly urbanizing areas.

Recorded stage and rainfall data periodically were retrieved from the field and returned to the office for computation and storage. Continuous graphic record was manually digitized in the office for computer computation and storage.

Rainfall and discharge data accuracy generally is considered to be good (± 10 percent). After the first year of data collection, efforts were made to improve accuracy of recorded stage. Beginning in 1993, electronic data loggers were installed at all sites to collect data at 5-minute intervals rather than at 15-minute intervals and to eliminate graphic record that had to be manually digitized.

Data for Cains Coulee at Glendive indicated several incomplete hydrographs in 1993, 1994, and 1996 because of sediment deposition in the stilling well. As discharge decreased after each runoff event, the float settled on top of the recently deposited sediment in the stilling well at a level greater than at the beginning of runoff. Thus, discharges could not be computed for stages less than the level of deposited sediment. To alleviate this problem, a submersible pressure transducer coupled to an electronic data logger was installed in 1995 and again in 1997 to record stages at a location that would be unaffected by sediment deposition. An incomplete hydrograph also resulted from missing data at Gorman Coulee near Cat Creek on July 20, 1993, because of equipment malfunction at the peak of the event. Surveyed high-water marks confirmed that the last recorded stage reading was the peak stage for this particular event, but stages after the peak were not recorded.

RAINFALL AND RUNOFF-HYDROGRAPH DATA

Data are presented in tabular form (tables 2-20) and graphically (figs. 2-20). Rainfall and runoff-hydrograph data collected electronically are presented

in the tables at 5- or 15-minute intervals. Runoff data collected from continuous graphic recorder are presented in the tables at irregular time intervals as a result of the manual digitizing process. By convention, rainfall data are presented as hyetographs having discrete 5-minute intervals, whereas runoff data are presented as continuous hydrographs.

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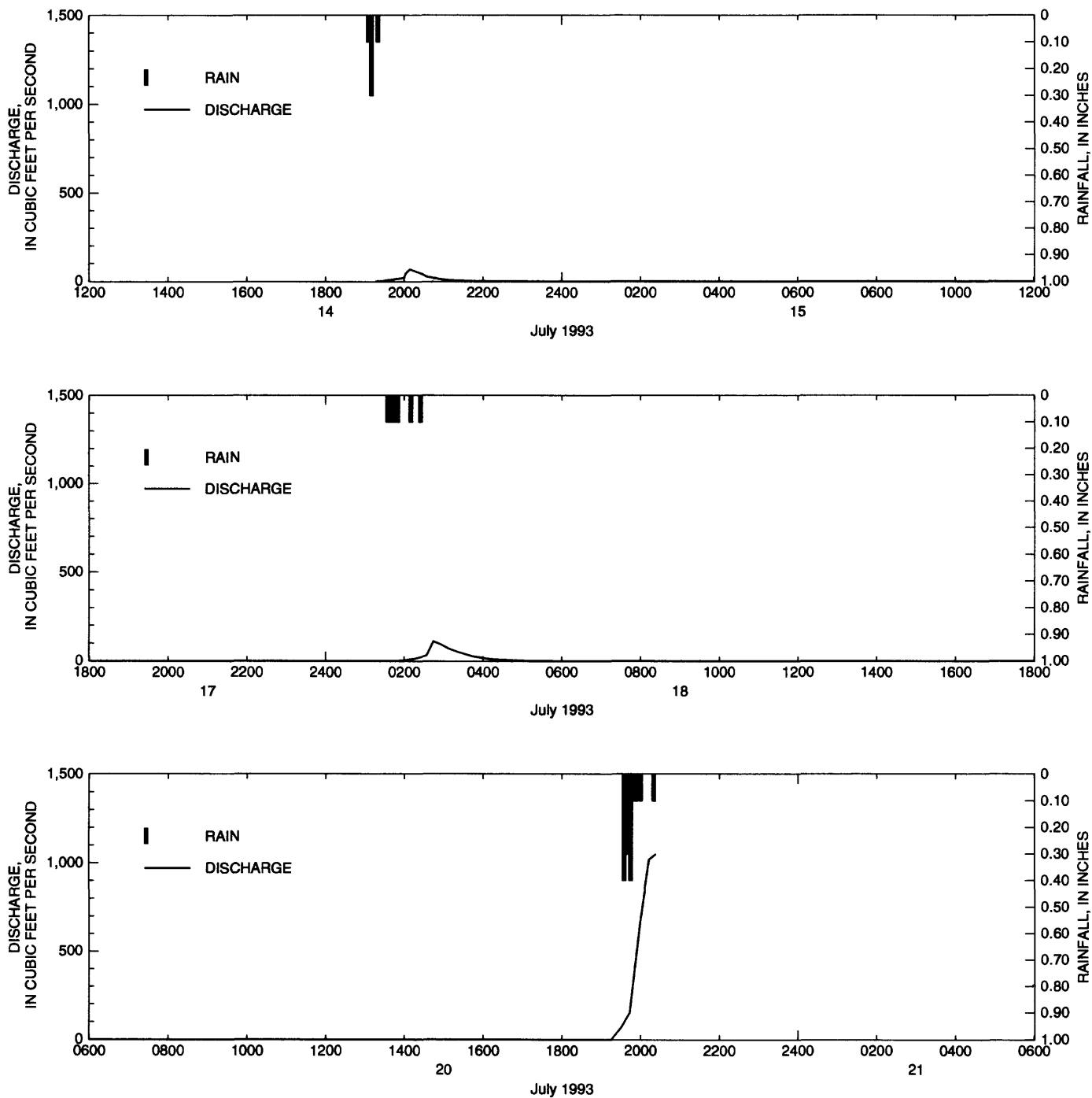


Figure 2. Rainfall hyetographs and runoff hydrographs for Gorman Coulee near Cat Creek, Mont. (station 06129700) for runoff events of July 14-15, 18, and 20, 1993.

Table 2. Rainfall and discharge data for Gorman Coulee near Cat Creek, Mont. (station 06129700) for runoff events of July 14-15, 18, and 20, 1993

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
July 9									
23:20	0.10	---	---	---	---	---	---	---	---
July 10									
---	---	---	---	---	---	---	---	---	---
July 11									
---	---	---	---	---	---	---	---	---	---
July 12									
01:10	.10	03:15	0.10	05:40	0.10	14:50	0.10	18:15	0.10
18:35	.10	19:05	.10	---	---	---	---	---	---
July 13									
---	---	---	---	---	---	---	---	---	---
July 14									
19:05	.10	19:10	.30	19:20	.10	---	---	---	---
July 15									
---	---	---	---	---	---	---	---	---	---
July 16									
10:10	.10	12:35	.10	15:20	.10	---	---	---	---
July 17									
---	---	---	---	---	---	---	---	---	---
July 18									
01:35	.10	01:40	.10	01:45	.10	01:50	.10	02:10	.10
02:25	.10	---	---	---	---	---	---	---	---
July 19									
---	---	---	---	---	---	---	---	---	---
July 20									
19:35	.40	19:40	.30	19:45	.40	19:50	.10	19:55	.10
20:00	.10	20:20	.10	---	---	---	---	---	---

Table 2. Rainfall and discharge data for Gorman Coulee near Cat Creek, Mont. (station 06129700) for runoff events of July 14-15, 18, and 20, 1993 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
July 9									
---	---	---	---	---	---	---	---	---	---
July 10									
---	---	---	---	---	---	---	---	---	---
July 11									
---	---	---	---	---	---	---	---	---	---
July 12									
---	---	---	---	---	---	---	---	---	---
July 13									
---	---	---	---	---	---	---	---	---	---
July 14									
19:16	0	19:26	0.76	19:31	5.51	19:41	9.78	19:59	20.5
20:02	42.7	20:08	67.1	20:25	44.6	20:34	26.5	20:53	14.1
21:03	9.32	21:17	5.79	21:27	3.69	21:38	2.57	21:56	1.45
22:11	.98	22:25	.93	22:40	.90	22:58	.87	23:08	.81
23:24	.75	23:39	.70	24:00	.64	---	---	---	---
July 15									
00:00	.64	00:16	.59	00:29	.55	00:52	.49	01:15	.44
01:40	.38	02:21	.30	03:03	.22	03:53	.16	04:27	.12
04:59	.09	05:41	.06	06:17	.03	07:01	0	---	---
July 16									
---	---	---	---	---	---	---	---	---	---
July 17									
---	---	---	---	---	---	---	---	---	---
July 18									
01:45	0	01:59	4.25	02:14	12.3	02:33	31.3	02:44	111
02:55	94.6	03:07	71.2	03:23	49.5	03:43	27.3	04:07	12.9
04:25	7.24	04:47	3.69	05:08	2.22	05:34	1.33	05:57	1.00
06:25	.91	06:50	.83	07:17	.76	07:57	.67	08:23	.62
08:53	.57	09:16	.54	09:43	.51	10:08	.48	10:32	.46
10:56	.43	11:29	.39	12:04	.36	12:35	.33	13:09	.31
14:04	.28	14:45	.25	15:19	.23	15:42	.22	16:24	.21
17:09	.20	17:55	.18	18:35	.16	19:21	.15	19:56	.13
20:38	.10	21:15	.07	22:03	.04	22:35	.01	23:09	0
July 19									
---	---	---	---	---	---	---	---	---	---
July 20									
19:15	0	19:30	66.0	19:43	150	19:58	656	20:12	1,023
20:23	1,053	---	---	---	---	---	---	---	---

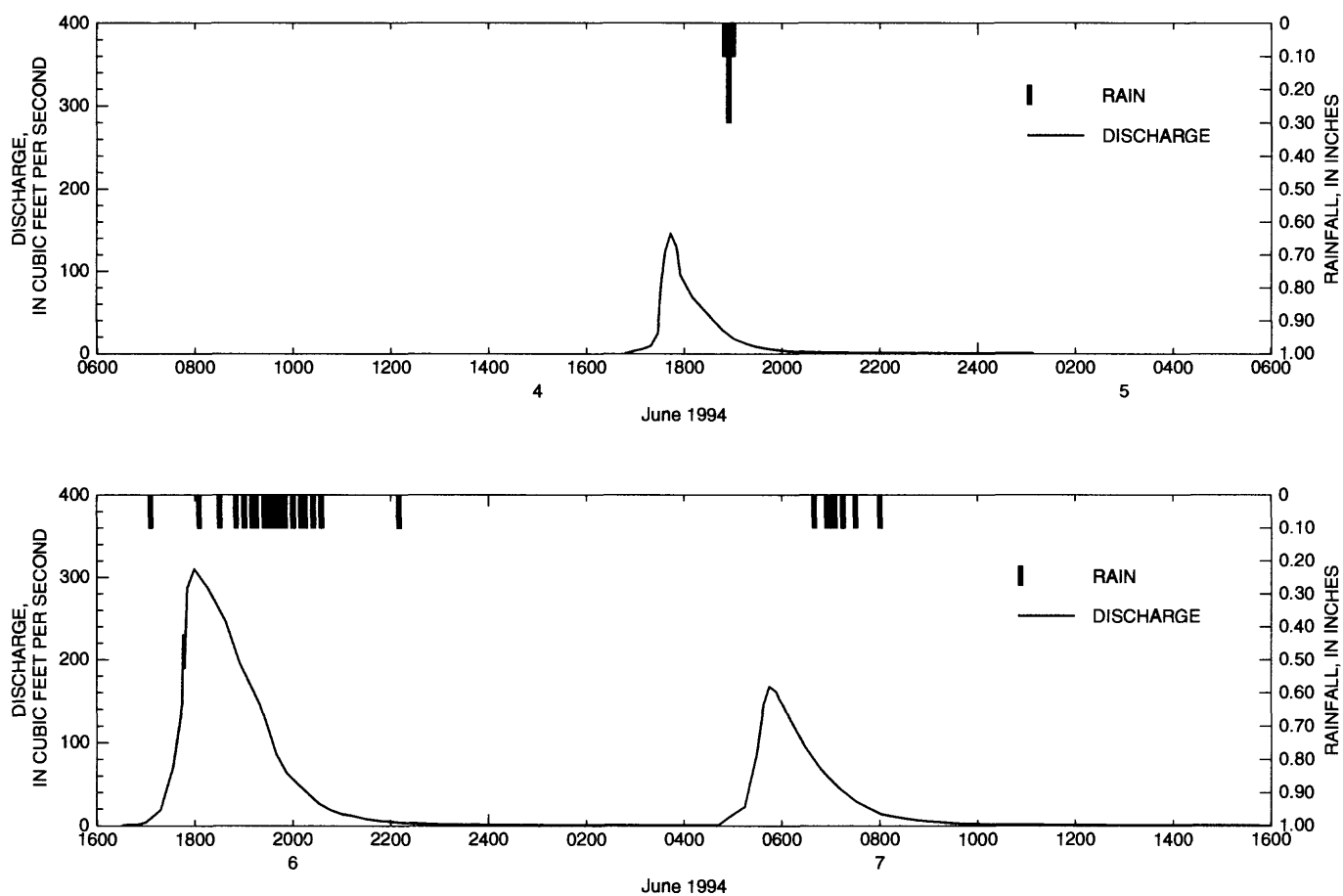


Figure 3. Rainfall hyetographs and runoff hydrographs for Gorman Coulee near Cat Creek, Mont. (station 06129700) for runoff event of June 4-7, 1994.

Table 3. Rainfall and discharge data for Gorman Coulee near Cat Creek, Mont. (station 06129700) for runoff event of June 4-7, 1994

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
May 30									
---	---	---	---	---	---	---	---	---	---
May 31									
---	---	---	---	---	---	---	---	---	---
June 1									
08:35	0.10	22:40	0.10	---	---	---	---	---	---
June 2									
---	---	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
18:50	.10	18:55	.30	19:00	0.10	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
17:05	.10	18:05	.10	18:30	.10	18:50	0.10	19:00	0.10
19:10	.10	19:15	.10	19:25	.10	19:30	.10	19:35	.10
19:40	.10	19:45	.10	19:50	.10	20:00	.10	20:10	.10
20:15	.10	20:25	.10	20:35	.10	22:10	.10	---	---
June 7									
06:40	.10	06:55	.10	07:00	.10	07:05	.10	07:15	.10
07:30	.10	08:00	.10	---	---	---	---	---	---

Table 3. Rainfall and discharge data for Gorman Coulee near Cat Creek, Mont. (station 06129700) for runoff event of June 4-7, 1994 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
May 30									
24:00	---	---	---	---	---	---	---	---	---
May 31									
24:00	---	---	---	---	---	---	---	---	---
June 1									
24:00	---	---	---	---	---	---	---	---	---
June 2									
24:00	---	---	---	---	---	---	---	---	---
June 3									
24:00	---	---	---	---	---	---	---	---	---
June 4									
18:47	.32	18:51	1.09	18:56	2.91	19:09	5.68	19:18	9.15
19:27	24.9	19:31	82.4	19:36	124	19:43	146	19:50	129
19:55	95.7	20:09	68.6	20:26	50.9	20:46	28.9	21:00	18.1
21:15	11.6	21:28	8.35	21:45	5.40	21:56	4.25	22:09	2.91
22:31	1.93	22:47	1.53	22:56	1.35	23:13	1.14	23:28	.98
23:44	.94	23:56	.91	24:00	.90	---	---	---	---
June 5									
00:06	.88	00:29	.82	00:46	.79	00:58	.77	01:11	.74
01:27	.73	01:43	.70	01:58	.67	02:13	.65	02:14	.65
02:29	.64	02:32	.62	02:46	.61	02:48	.61	02:56	.59
02:57	.59	03:08	.58	---	---	---	---	---	---
June 6									
18:31	.76	18:49	1.24	18:59	3.84	19:17	18.8	19:33	71.2
19:44	146	19:45	230	19:47	190	19:50	287	19:58	310
20:15	287	20:37	247	20:54	196	21:06	171	21:19	146
21:26	125	21:39	85.9	21:51	64.0	22:03	53.1	22:09	46.5
22:31	26.6	22:45	19.5	22:59	13.9	23:12	11.6	23:28	8.16
23:47	5.68	23:59	5.00	24:00	4.92	---	---	---	---
June 7									
00:26	2.71	00:47	2.01	00:59	1.72	01:12	1.46	01:25	1.19
01:42	1.00	02:00	.94	02:17	.89	02:31	.85	02:48	.82
03:01	.80	03:14	.77	03:30	.76	03:46	.73	03:58	.71
04:11	.70	04:31	.67	04:47	.65	05:00	.64	05:11	.62
05:30	.61	05:48	.61	05:59	.59	06:09	.58	06:25	.58
06:42	.80	06:56	10.7	07:14	22.8	07:29	85.9	07:37	146
07:44	168	07:53	161	07:57	152	08:01	146	08:10	128
08:28	95.1	08:47	69.1	08:58	56.7	09:10	45.2	09:30	29.4
09:46	20.9	10:01	14.4	10:11	12.3	10:31	8.55	10:50	5.98
10:58	5.27	11:12	4.54	11:32	2.91	11:47	2.34	11:59	2.09
12:14	1.72	12:32	1.35	12:50	1.14	12:59	1.04	13:11	.98
13:30	.92	13:44	.89	14:00	.85	14:15	.82	14:31	.80
14:44	.77	15:00	.76	15:10	.74	15:32	.71	15:44	.70
15:59	.68	16:08	.67	16:30	.64	16:49	.62	17:00	.61
17:09	.61	17:30	.59	17:46	.58	---	---	---	---

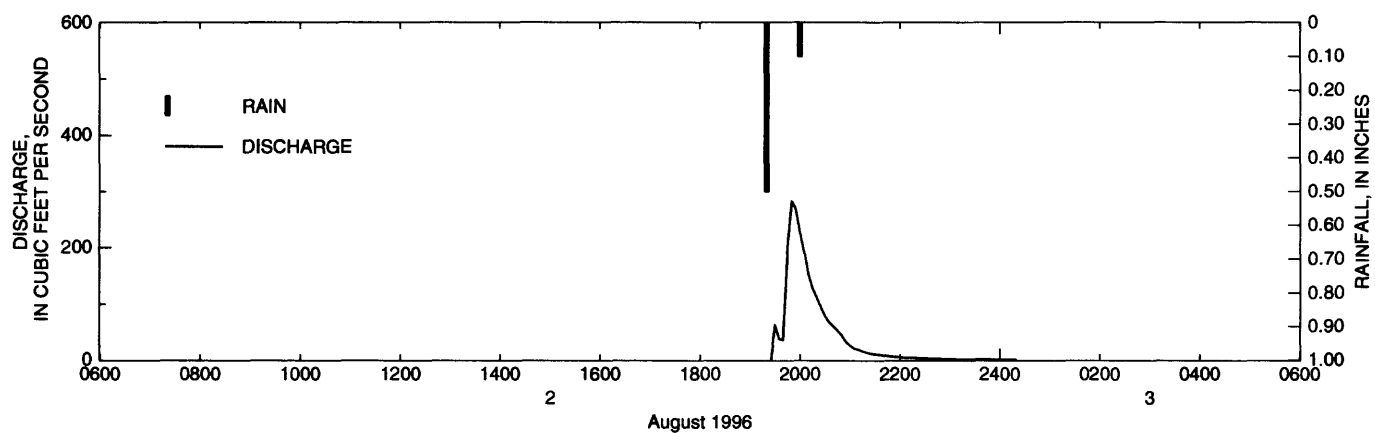


Figure 4. Rainfall hyetograph and runoff hydrograph for Gorman Coulee near Cat Creek, Mont. (station 06129700) for runoff event of August 2-3, 1996.

Table 4. Rainfall and discharge data for Gorman Coulee near Cat Creek, Mont. (station 06129700) for runoff event of August 2-3, 1996

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
July 28									
---	---	---	---	---	---	---	---	---	---
July 29									
---	---	---	---	---	---	---	---	---	---
July 30									
---	---	---	---	---	---	---	---	---	---
July 31									
---	---	---	---	---	---	---	---	---	---
August 1									
---	---	---	---	---	---	---	---	---	---
August 2									
19:20	0.50	20:00	0.10	---	---	---	---	---	---
August 3									
---	---	---	---	---	---	---	---	---	---
Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
July 28									
---	---	---	---	---	---	---	---	---	---
July 29									
---	---	---	---	---	---	---	---	---	---
July 30									
---	---	---	---	---	---	---	---	---	---
July 31									
---	---	---	---	---	---	---	---	---	---
August 1									
---	---	---	---	---	---	---	---	---	---
August 2									
19:25	0.85	19:30	63.0	19:35	38.4	19:40	35.5	19:45	196
19:50	283	19:55	269	20:00	228	20:05	193	20:10	154
20:15	128	20:20	113	20:25	95.1	20:30	79.5	20:35	67.5
20:40	60.5	20:45	52.6	20:50	45.2	20:55	33.9	21:00	25.7
21:05	21.3	21:10	18.8	21:15	15.9	21:20	13.6	21:25	12.1
21:30	11.3	21:35	9.78	21:40	8.74	21:45	7.61	21:50	6.76
21:55	5.98	22:00	5.40	22:05	4.84	22:10	4.84	22:15	4.54
22:20	4.25	22:25	3.97	22:30	3.59	22:35	3.35	22:40	3.12
22:45	2.91	22:50	2.71	22:55	2.52	23:00	2.25	23:05	2.09
23:10	2.01	23:15	1.86	23:20	1.72	23:25	1.65	23:30	1.53
23:35	1.46	23:40	1.41	23:45	1.29	23:50	1.24	23:55	1.19
24:00	1.14	---	---	---	---	---	---	---	---
August 3									
00:05	1.09	00:10	1.09	00:15	1.09	00:20	1.04	---	---

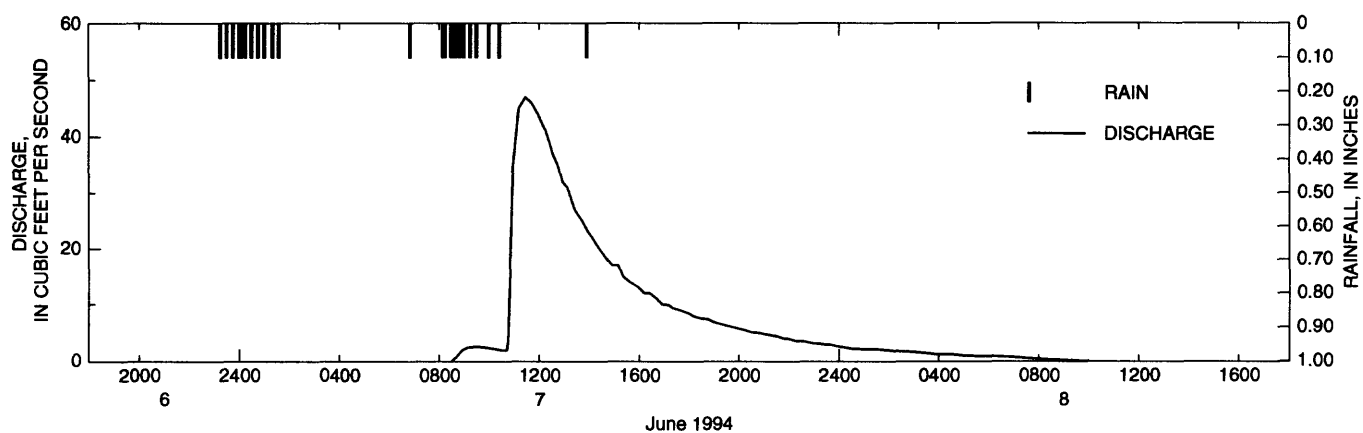


Figure 5. Rainfall hyetograph and runoff hydrograph for Kuhr Coulee tributary near Dodson, Mont. (station 06154510) for runoff event of June 7-8, 1994.

Table 5. Rainfall and discharge data for Kuhr Coulee tributary near Dodson, Mont. (station 06154510) for runoff event of June 7-8, 1994

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
June 2									
00:35	0.10	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
08:15	.10	18:05	0.10	---	---	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
23:15	.10	23:30	.10	23:45	0.10	24:00	0.10	---	---
June 7									
00:05	.10	00:15	.10	00:30	.10	00:45	.10	01:00	0.10
01:20	.10	01:35	.10	06:50	.10	08:10	.10	08:15	.10
08:30	.10	08:40	.10	08:50	.10	09:00	.10	09:15	.10
09:30	.10	10:00	.10	10:25	.10	13:55	.10	---	---
June 8									
---	---	---	---	---	---	---	---	---	---

Table 5. Rainfall and discharge data for Kuhr Coulee tributary near Dodson, Mont. (station 06154510) for runoff event of June 7-8, 1994 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
June 2									
---	---	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
---	---	---	---	---	---	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
---	---	---	---	---	---	---	---	---	---
June 7									
08:29	0	08:41	0.70	08:55	1.88	09:08	2.44	09:31	2.64
09:52	2.44	10:09	2.24	10:29	1.88	10:42	1.88	10:45	3.65
10:48	12.5	10:56	34.4	11:10	44.7	11:26	47.2	11:41	46.1
11:56	43.6	12:08	42.2	12:15	40.8	12:24	38.8	12:32	37.1
12:44	34.7	12:55	32.4	13:06	30.8	13:24	27.4	13:42	25.0
13:57	23.5	14:07	22.0	14:24	20.0	14:43	18.4	14:55	17.3
15:09	16.5	15:20	15.2	15:36	14.2	15:57	13.2	16:11	12.5
16:24	11.7	16:41	11.0	16:54	10.3	17:10	9.89	17:19	9.45
17:36	9.01	17:59	8.35	18:10	7.93	18:29	7.51	18:44	7.30
18:56	6.90	19:05	6.69	19:28	6.30	19:49	5.91	19:59	5.71
20:10	5.52	20:29	5.15	20:46	4.95	20:57	4.76	21:12	4.56
21:30	4.38	21:47	4.01	21:56	4.01	22:16	3.65	22:33	3.47
22:48	3.30	23:00	3.07	23:12	3.07	23:26	2.85	23:38	2.85
23:57	2.64	24:00	2.61	---	---	---	---	---	---
June 8									
00:30	2.24	00:57	2.06	01:28	2.06	01:58	1.88	02:26	1.71
02:57	1.55	03:31	1.40	03:58	1.22	04:32	1.22	04:58	1.05
05:30	.87	05:59	.87	06:57	.70	07:57	.35	08:57	.17
10:00	0	---	---	---	---	---	---	---	---

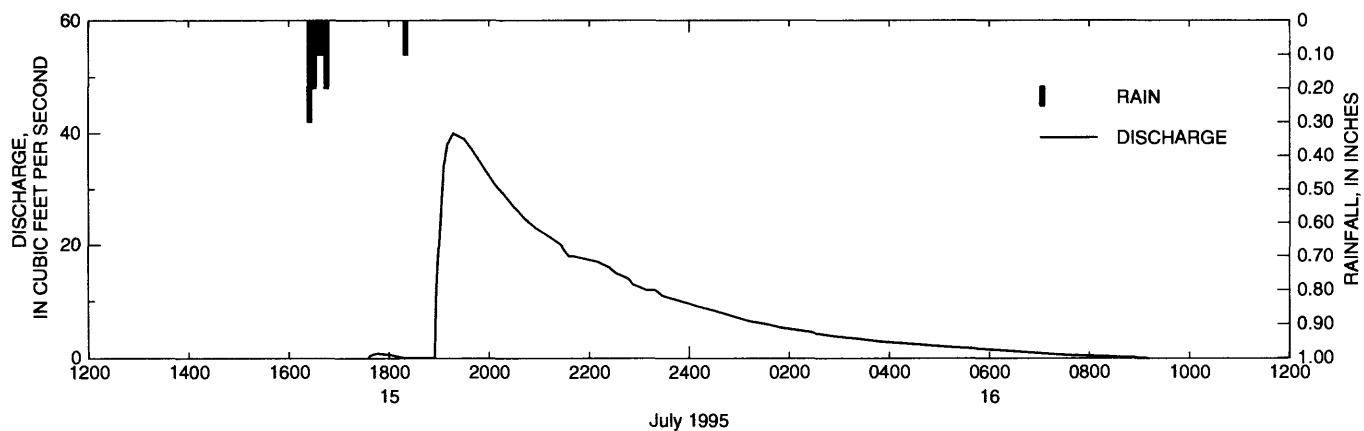


Figure 6. Rainfall hyetograph and runoff hydrograph for Kuhr Coulee tributary near Dodson, Mont. (station 06154510) for runoff event of July 15-16, 1995.

Table 6. Rainfall and discharge data for Kuhr Coulee tributary near Dodson, Mont. (station 06154510) for runoff event of July 15-16, 1995

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
July 10									
20:35	0.10	21:00	0.10	---	---	---	---	---	---
July 11									
17:40	.10	---	---	---	---	---	---	---	---
July 12									
14:15	.10	---	---	---	---	---	---	---	---
July 13									
16:30	.10	16:45	.10	17:15	0.10	---	---	---	---
July 14									
---	---	---	---	---	---	---	---	---	---
July 15									
16:25	.30	16:30	.20	16:35	.10	16:40	0.10	16:45	0.20
18:20	.10	---	---	---	---	---	---	---	---
July 16									
---	---	---	---	---	---	---	---	---	---

Table 6. Rainfall and discharge data for Kuhr Coulee tributary near Dodson, Mont. (station 06154510) for runoff event of July 15-16, 1995 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
July 10									
---	---	---	---	---	---	---	---	---	---
July 11									
---	---	---	---	---	---	---	---	---	---
July 12									
---	---	---	---	---	---	---	---	---	---
July 13									
---	---	---	---	---	---	---	---	---	---
July 14									
---	---	---	---	---	---	---	---	---	---
July 15									
17:35	0	17:36	0.37	17:41	0.68	17:46	0.79	18:02	0.54
18:12	.16	18:18	0	18:25	0	18:33	0	18:39	0
18:43	0	18:50	0	18:54	0	18:56	12.0	19:05	34.1
19:09	38.1	19:16	40.1	19:29	39.4	19:40	37.4	19:52	34.4
20:06	31.5	20:18	29.2	20:28	26.8	20:34	25.9	20:40	25.0
20:47	24.1	20:56	23.5	21:07	22.0	21:16	21.2	21:26	20.0
21:30	19.2	21:35	18.4	21:40	17.6	22:10	16.5	22:23	15.7
22:31	14.7	22:46	13.7	22:52	13.0	23:08	12.2	23:19	11.5
23:27	10.8	23:53	9.89	24:00	9.60	---	---	---	---
July 16									
00:08	9.23	00:29	8.35	00:40	7.93	00:53	7.30	01:11	6.53
01:35	5.87	01:49	5.41	02:12	4.91	02:27	4.56	02:31	4.38
02:56	3.77	03:24	3.35	03:49	2.92	04:23	2.48	05:07	2.00
05:48	1.65	06:30	1.17	07:04	.79	07:32	.54	08:11	.31
09:10	0	09:57	0	---	---	---	---	---	---

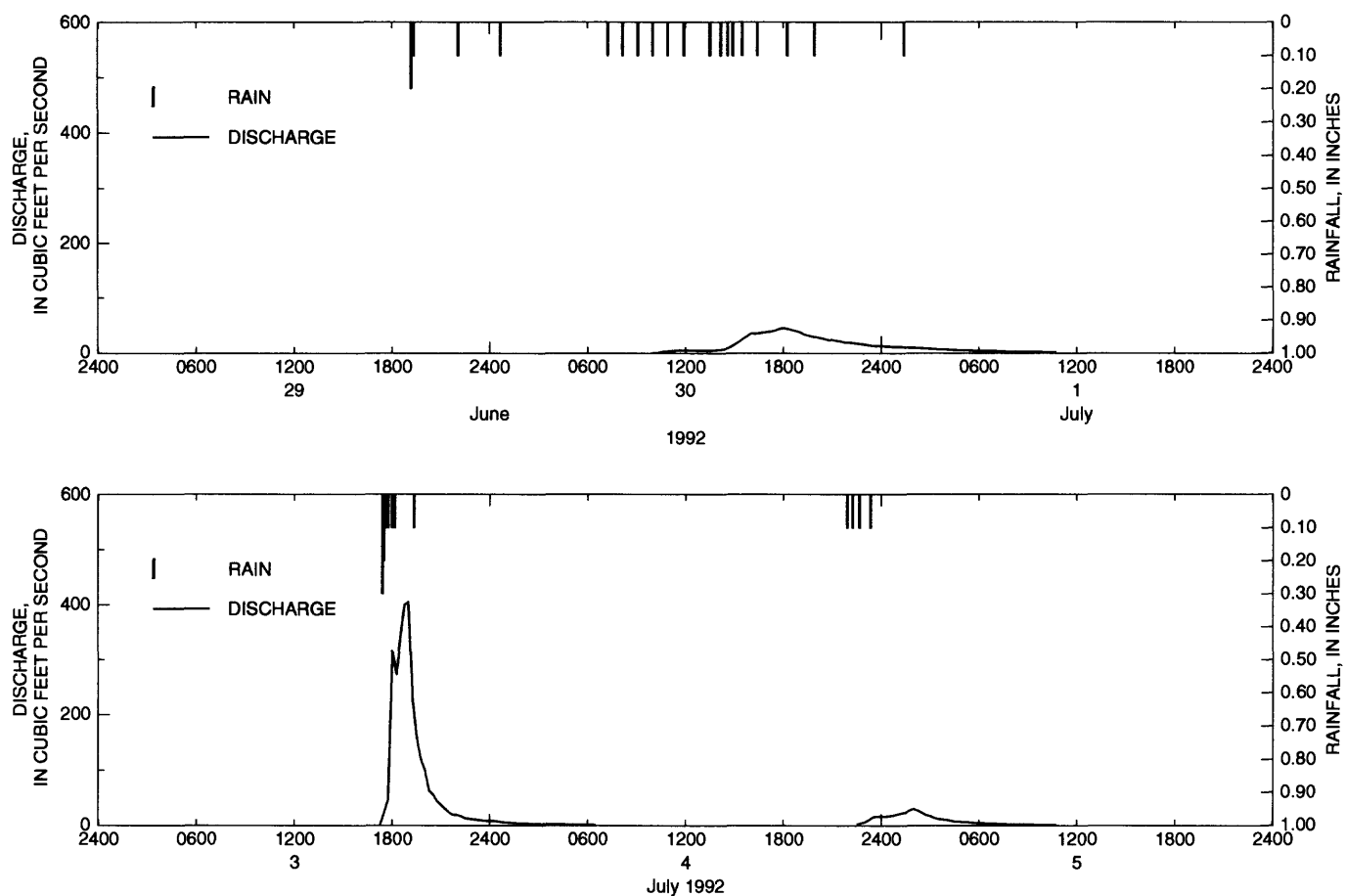


Figure 7. Rainfall hyetographs and runoff hydrographs for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff events of June 30 and July 1, 3-5, 1992.

Table 7. Rainfall and discharge data for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff events of June 30 and July 1, 3-5, 1992

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
June 25									
---	---	---	---	---	---	---	---	---	---
June 26									
---	---	---	---	---	---	---	---	---	---
June 27									
---	---	---	---	---	---	---	---	---	---
June 28									
---	---	---	---	---	---	---	---	---	---
June 29									
19:10	0.20	19:20	0.10	22:05	0.10	---	---	---	---
June 30									
00:40	.10	07:15	.10	08:10	.10	09:05	0.10	10:00	0.10
10:55	.10	11:55	.10	13:30	.10	14:10	.10	14:35	.10
14:55	.10	15:30	.10	16:25	.10	18:15	.10	19:55	.10
July 1									
01:25	.10	---	---	---	---	---	---	---	---
July 2									
---	---	---	---	---	---	---	---	---	---
July 3									
17:25	.30	17:30	.20	17:35	.10	17:40	.10	17:45	.10
18:00	.10	18:10	.10	19:20	.10	---	---	---	---
July 4									
21:55	.10	22:15	.10	22:40	.10	23:20	.10	---	---
July 5									
---	---	---	---	---	---	---	---	---	---

Table 7. Rainfall and discharge data for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff events of June 30 and July 1, 3-5, 1992 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
June 25									
---	---	---	---	---	---	---	---	---	---
June 26									
---	---	---	---	---	---	---	---	---	---
June 27									
---	---	---	---	---	---	---	---	---	---
June 28									
---	---	---	---	---	---	---	---	---	---
June 29									
---	---	---	---	---	---	---	---	---	---
June 30									
10:15	0.12	10:30	1.58	10:45	2.43	11:00	3.45	11:15	3.95
11:30	4.65	11:45	4.84	12:00	4.84	12:15	4.65	12:30	4.65
12:45	4.47	13:00	4.47	13:15	4.29	13:30	4.47	13:45	4.84
14:00	5.03	14:15	6.24	14:30	7.82	14:45	10.9	15:00	14.9
15:15	19.7	15:30	24.9	15:45	29.8	16:00	34.7	16:15	35.2
16:30	35.7	16:45	36.9	17:00	37.6	17:15	39.5	17:30	41.4
17:45	43.6	18:00	44.6	18:15	44.2	18:30	41.8	18:45	40.4
19:00	38.3	19:15	34.5	19:30	32.3	19:45	29.8	20:00	28.6
20:15	27.4	20:30	26.2	20:45	22.8	21:00	23.9	21:15	22.2
21:30	20.6	21:45	19.4	22:00	18.6	22:15	17.8	22:30	16.6
22:45	16.0	23:00	15.2	23:15	14.3	23:30	13.3	23:45	12.9
24:00	12.6	---	---	---	---	---	---	---	---
July 1									
00:15	12.0	00:30	11.7	00:45	11.2	01:00	10.9	01:15	10.7
01:30	10.1	01:45	9.57	02:00	9.31	02:15	8.80	02:30	8.55
02:45	8.30	03:00	7.58	03:15	7.12	03:30	6.67	03:45	6.46
04:00	6.24	04:15	5.82	04:30	5.22	04:45	4.84	05:00	4.65
05:15	4.65	05:30	4.29	05:45	4.12	06:00	3.78	06:15	3.61
06:30	3.45	06:45	3.14	07:00	2.99	07:15	2.85	07:30	2.70
07:45	2.57	08:00	2.43	08:15	2.17	08:30	2.17	08:45	2.05
09:00	1.93	09:15	1.81	09:30	1.69	09:45	1.58	10:00	1.48
10:15	1.38	10:30	1.28	10:45	1.18	---	---	---	---
July 2									
---	---	---	---	---	---	---	---	---	---
July 3									
17:30	23.3	17:45	47.2	18:00	316	18:15	273	18:30	338
18:45	400	19:00	405	19:15	224	19:30	158	19:45	121
20:00	100	20:15	63.1	20:30	55.9	20:45	43.6	21:00	37.2
21:15	30.3	21:30	23.3	21:45	19.2	22:00	18.9	22:15	16.0
22:30	13.3	22:45	11.8	23:00	11.2	23:15	9.84	23:30	9.05
23:45	8.30	24:00	8.06	---	---	---	---	---	---

Table 7. Rainfall and discharge data for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff events of June 30 and July 1, 3-5, 1992 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA--Continued									
July 4									
00:15	8.06	00:30	7.12	00:45	6.03	01:00	5.22	01:15	4.65
01:30	4.29	01:45	3.95	02:00	3.45	02:15	2.99	02:30	2.70
02:45	2.57	03:00	2.57	03:15	2.43	03:30	2.17	03:45	2.05
04:00	1.81	04:15	1.58	04:30	1.48	04:45	1.38	05:00	1.28
05:15	1.28	05:30	1.09	05:45	1.00	06:00	.92	06:15	.76
06:30	.69	22:30	1.58	22:45	3.45	23:00	5.82	23:15	10.1
23:30	15.2	23:45	16.0	24:00	16.3	---	---	---	---
July 5									
00:15	16.3	00:30	16.6	00:45	18.3	01:00	19.7	01:15	21.7
01:30	23.3	01:45	26.9	02:00	30.3	02:15	27.2	02:30	22.8
02:45	19.2	03:00	17.2	03:15	13.9	03:30	12.0	03:45	11.5
04:00	10.4	04:15	8.55	04:30	7.35	04:45	6.67	05:00	6.24
05:15	5.62	05:30	5.03	05:45	4.47	06:00	3.95	06:15	3.78
06:30	3.30	06:45	2.99	07:00	2.70	07:15	2.43	07:30	2.17
07:45	2.05	08:00	1.93	08:15	1.69	08:30	1.58	08:45	1.48
09:00	1.38	09:15	1.28	09:30	1.09	09:45	1.00	10:00	.92
10:15	.84	10:30	.76	10:45	.69	---	---	---	---

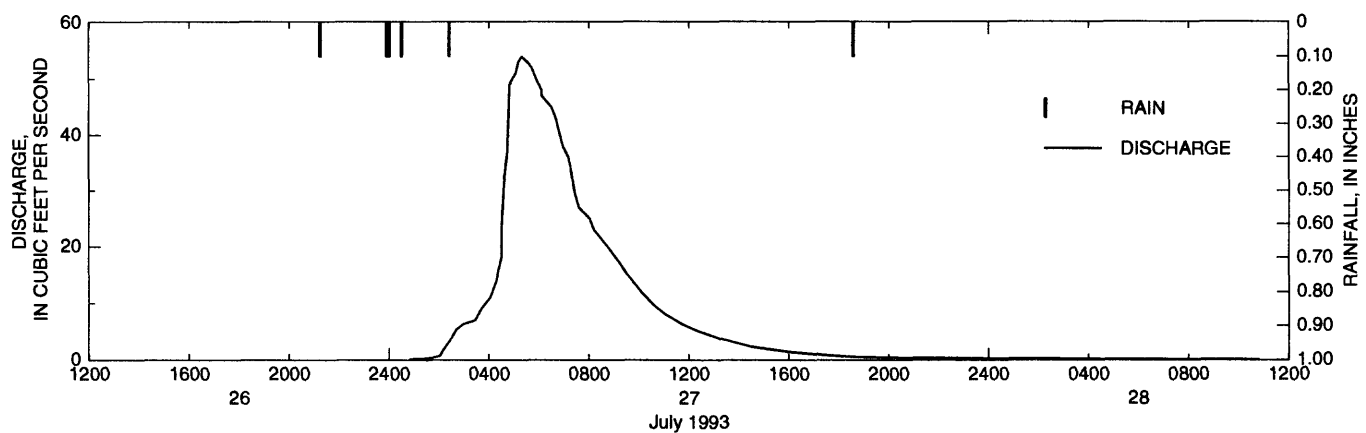


Figure 8. Rainfall hyetograph and runoff hydrograph for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff event July 27-28, 1993.

Table 8. Rainfall and discharge data for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff event of July 27-28, 1993

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
July 22									
---	---	---	---	---	---	---	---	---	---
July 23									
---	---	---	---	---	---	---	---	---	---
July 24									
14:40	0.10	---	---	---	---	---	---	---	---
July 25									
---	---	---	---	---	---	---	---	---	---
July 26									
21:15	.10	23:55	0.10	24:00	0.10	---	---	---	---
July 27									
00:30	.10	02:25	.10	18:35	.10	---	---	---	---
July 28									
---	---	---	---	---	---	---	---	---	---

Table 8. Rainfall and discharge data for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff event of July 27-28, 1993 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
July 22									
---	---	---	---	---	---	---	---	---	---
July 23									
---	---	---	---	---	---	---	---	---	---
July 24									
---	---	---	---	---	---	---	---	---	---
July 25									
---	---	---	---	---	---	---	---	---	---
July 26									
---	---	---	---	---	---	---	---	---	---
July 27									
00:49	0.10	01:21	0.19	01:42	0.32	02:01	0.71	02:08	1.56
02:17	2.64	02:30	3.92	02:41	5.33	02:58	6.34	03:26	7.02
03:42	9.12	04:03	11.1	04:17	13.6	04:30	18.1	04:30	23.0
04:35	30.7	04:43	37.3	04:49	48.5	05:05	51.2	05:10	52.8
05:19	54.1	05:32	53.5	05:43	52.1	05:53	49.9	06:05	48.2
06:06	46.7	06:29	44.5	06:40	42.6	06:47	40.5	06:57	38.5
07:11	36.5	07:17	34.4	07:24	29.8	07:35	26.8	08:01	24.6
08:11	23.3	08:23	21.7	08:45	19.6	09:15	17.1	09:33	14.6
10:06	11.8	10:35	9.67	11:03	7.96	11:46	6.22	12:21	5.14
13:13	3.82	13:53	2.97	14:29	2.35	15:08	1.86	16:01	1.38
16:48	1.05	17:35	.77	18:43	.51	19:45	.42	20:58	.35
22:23	.29	23:33	.25	24:00	.23	---	---	---	---
July 28									
00:53	.21	02:04	.18	03:39	.15	05:15	.11	06:35	.09
07:46	.08	09:14	.07	10:50	.06	12:24	.06	---	---

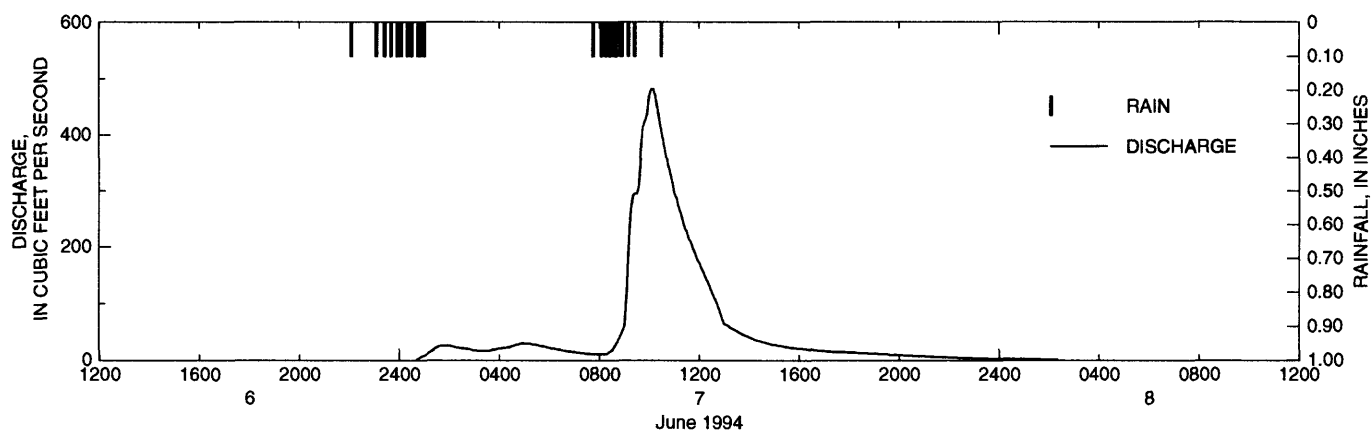


Figure 9. Rainfall hyetograph and runoff hydrograph for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff event of June 7-8, 1994.

Table 9. Rainfall and discharge data for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff event of June 7-8, 1994

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
June 2									
00:55	0.10	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
---	---	---	---	---	---	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
22:05	.10	23:05	0.10	23:25	0.10	23:40	0.10	23:55	0.10
24:00	.10	---	---	---	---	---	---	---	---
June 7									
00:05	.10	00:20	.10	00:30	.10	00:45	.10	00:50	.10
01:00	.10	07:45	.10	08:05	.10	08:15	.10	08:25	.10
08:30	.10	08:35	.10	08:40	.10	08:50	.10	08:55	.10
09:10	.10	09:25	.10	10:30	.10	---	---	---	---
June 8									
---	---	---	---	---	---	---	---	---	---

Table 9. Rainfall and discharge data for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff event of June 7-8, 1994 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
June 2									
---	---	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
---	---	---	---	---	---	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
---	---	---	---	---	---	---	---	---	---
June 7									
00:40	1.18	00:45	3.14	00:50	5.22	00:55	6.90	01:00	8.80
01:05	11.5	01:10	13.9	01:15	16.0	01:20	18.0	01:25	20.8
01:30	23.0	01:35	24.9	01:40	26.2	01:45	26.4	01:50	26.4
01:55	26.2	02:00	25.5	02:05	24.9	02:10	23.9	02:15	23.0
02:20	22.2	02:25	21.7	02:30	21.1	02:35	20.6	02:40	20.3
02:45	19.7	02:50	19.2	02:55	18.3	03:00	17.8	03:05	17.2
03:10	16.9	03:15	16.6	03:20	16.6	03:25	16.6	03:30	16.6
03:35	17.2	03:40	17.8	03:45	18.6	03:50	19.4	03:55	20.0
04:00	20.8	04:05	21.4	04:10	21.7	04:15	22.2	04:20	22.8
04:25	23.3	04:30	24.9	04:35	26.2	04:40	27.4	04:45	28.4
04:50	29.1	04:55	29.6	05:00	29.6	05:05	29.6	05:10	29.3
05:15	28.8	05:20	28.4	05:25	27.6	05:30	26.9	05:35	26.2
05:40	25.2	05:45	24.6	05:50	23.6	05:55	22.8	06:00	21.9
06:05	21.4	06:10	20.6	06:15	20.0	06:20	19.2	06:25	18.6
06:30	18.0	06:35	17.5	06:40	16.9	06:45	16.3	06:50	15.7
06:55	15.2	07:00	14.6	07:05	14.3	07:10	13.6	07:15	13.3
07:20	12.6	07:25	12.3	07:30	11.8	07:35	11.7	07:40	11.5
07:45	11.2	07:50	11.2	07:55	10.9	08:00	10.9	08:05	10.9
08:10	11.2	08:15	11.5	08:20	12.9	08:25	15.7	08:30	18.3
08:35	22.8	08:40	28.8	08:45	35.7	08:50	43.2	08:55	50.8
09:00	60.8	09:05	119	09:10	209	09:15	265	09:20	292
09:25	296	09:30	296	09:35	312	09:40	375	09:45	415
09:50	426	09:55	436	10:00	470	10:05	482	10:10	482
10:15	470	10:20	448	10:25	426	10:30	405	10:35	385
10:40	365	10:45	347	10:50	333	10:55	316	11:00	296
11:05	288	11:10	273	11:15	262	11:20	248	11:25	234
11:30	228	11:35	215	11:40	209	11:45	197	11:50	189
11:55	178	12:00	173	12:05	163	12:10	156	12:15	146
12:20	140	12:25	131	12:30	121	12:35	112	12:40	105
12:45	95.1	12:50	86.0	12:55	73.7	13:00	64.0	13:05	62.5
13:10	60.6	13:15	58.5	13:20	56.3	13:25	54.2	13:30	52.1
13:35	49.9	13:40	47.8	13:45	46.0	13:50	44.2	13:55	42.5

Table 9. Rainfall and discharge data for Little Warm Creek tributary near Lodge Pole, Mont. (station 06164623) for runoff event of June 7-8, 1994 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA--Continued									
June 7--Continued									
14:00	40.9	14:05	39.0	14:10	37.6	14:15	36.5	14:20	35.2
14:25	34.0	14:30	32.8	14:35	31.8	14:40	31.0	14:45	30.1
14:50	29.3	14:55	28.4	15:00	27.6	15:05	27.2	15:10	26.4
15:15	25.5	15:20	24.9	15:25	24.2	15:30	23.6	15:35	23.0
15:40	22.5	15:45	22.2	15:50	21.7	15:55	21.4	16:00	20.8
16:05	20.6	16:10	20.0	16:15	19.7	16:20	19.4	16:25	18.9
16:30	18.6	16:35	18.0	16:40	17.8	16:45	17.5	16:50	17.2
16:55	16.9	17:00	16.6	17:05	16.3	17:10	16.0	17:15	15.7
17:20	15.4	17:25	15.4	17:30	15.2	17:35	15.2	17:40	14.9
17:45	14.6	17:50	14.6	17:55	14.3	18:00	14.3	18:05	13.9
18:10	13.6	18:15	13.6	18:20	13.3	18:25	13.3	18:30	12.9
18:35	12.6	18:40	12.6	18:45	12.3	18:50	12.3	18:55	12.0
19:00	11.8	19:05	11.7	19:10	11.5	19:15	11.2	19:20	11.2
19:25	10.9	19:30	10.7	19:35	10.4	19:40	10.1	19:45	9.84
19:50	9.57	19:55	9.57	20:00	9.31	20:05	9.05	20:10	8.80
20:15	8.55	20:20	8.55	20:25	8.06	20:30	8.06	20:35	7.82
20:40	7.58	20:45	7.35	20:50	7.35	20:55	7.12	21:00	6.90
21:05	6.67	21:10	6.67	21:15	6.46	21:20	6.24	21:25	6.03
21:30	6.03	21:35	5.82	21:40	5.62	21:45	5.42	21:50	5.22
21:55	5.22	22:00	5.03	22:05	4.84	22:10	4.65	22:15	4.65
22:20	4.47	22:25	4.29	22:30	4.29	22:35	4.12	22:40	3.95
22:45	3.78	22:50	3.78	22:55	3.61	23:00	3.61	23:05	3.45
23:10	3.30	23:15	3.30	23:20	3.14	23:25	2.99	23:30	2.99
23:35	2.85	23:40	2.85	23:45	2.70	23:50	2.70	23:55	2.57
24:00	2.43	---	---	---	---	---	---	---	---
June 8									
00:05	2.43	00:10	2.30	00:15	2.30	00:20	2.17	00:25	2.17
00:30	2.05	00:35	2.05	00:40	1.93	00:45	1.93	00:50	1.93
00:55	1.81	01:00	1.81	01:05	1.69	01:10	1.69	01:15	1.58
01:20	1.58	01:25	1.58	01:30	1.48	01:35	1.48	01:40	1.38
01:45	1.38	01:50	1.38	01:55	1.28	02:00	1.28	02:05	1.28
02:10	1.28	02:15	1.18	---	---	---	---	---	---

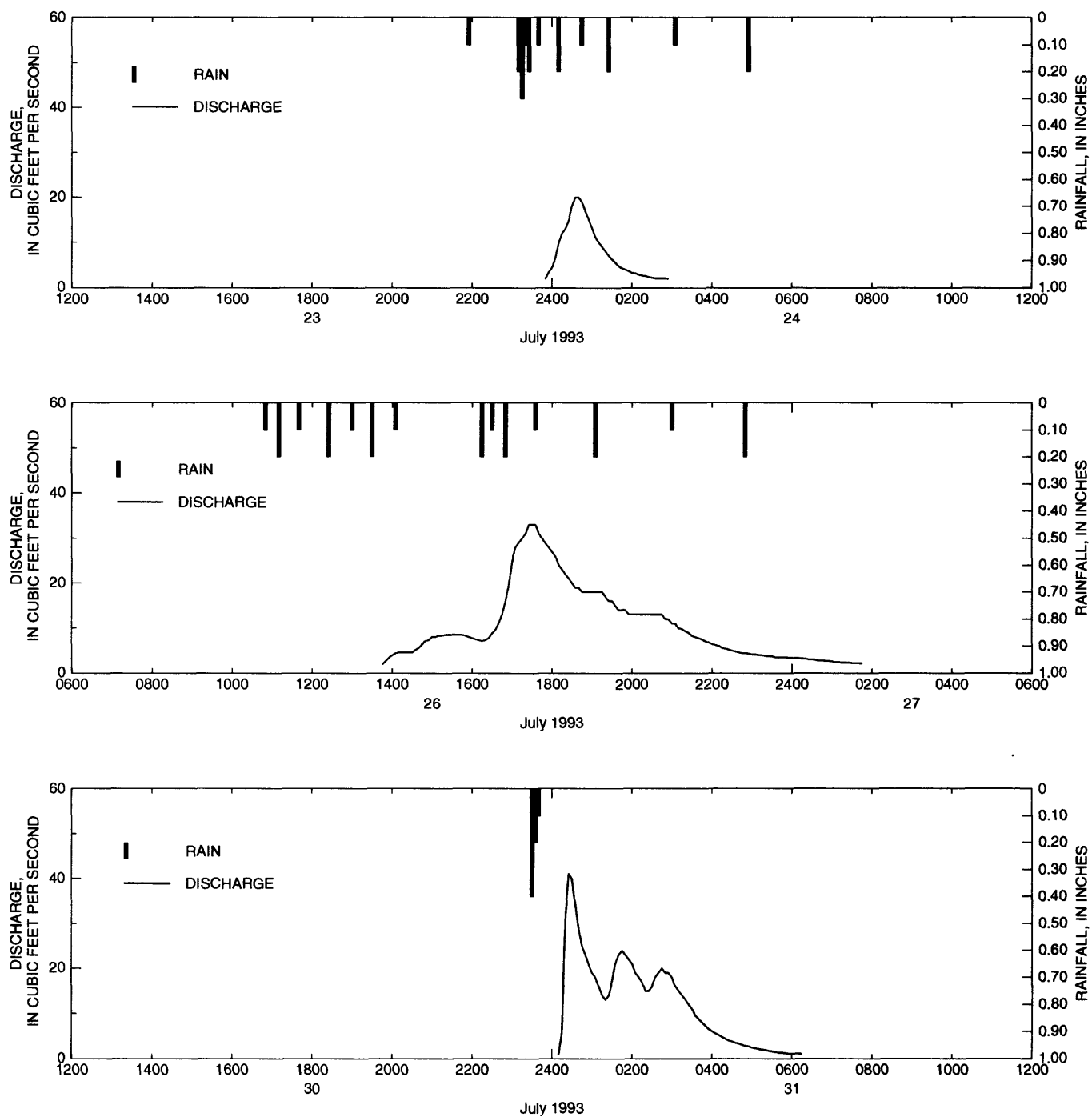


Figure 10. Rainfall hyetographs and runoff hydrographs for North Fork Crooked Creek near Shepherd, Mont. (station 06217700) for runoff events of July 23-24, 26-27, and 31, 1993.

Table 10. Rainfall and discharge data for North Fork Crooked Creek near Shepherd, Mont. (station 06217700) for runoff events of July 23-24, 26-27, and 31, 1993

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
July 18									
01:00	0.20	---	---	---	---	---	---	---	---
July 19									
---	---	---	---	---	---	---	---	---	---
July 20									
---	---	---	---	---	---	---	---	---	---
July 21									
---	---	---	---	---	---	---	---	---	---
July 22									
---	---	---	---	---	---	---	---	---	---
July 23									
21:55	.10	23:10	0.20	23:15	0.30	23:20	0.10	23:25	0.20
23:40	.10	---	---	---	---	---	---	---	---
July 24									
00:10	.20	00:45	.10	01:25	.20	03:05	.10	04:55	.20
July 25									
---	---	---	---	---	---	---	---	---	---
July 26									
10:50	.10	11:10	.20	11:40	.10	12:25	.20	13:00	.10
13:30	.20	14:05	.10	16:15	.20	16:30	.10	16:50	.20
17:35	.10	19:05	.20	21:00	.10	22:50	.20	---	---
July 27									
---	---	---	---	---	---	---	---	---	---
July 28									
---	---	---	---	---	---	---	---	---	---
July 29									
---	---	---	---	---	---	---	---	---	---
July 30									
23:30	.40	23:35	.20	23:40	.10	---	---	---	---
July 31									
---	---	---	---	---	---	---	---	---	---

Table 10. Rainfall and discharge data for North Fork Crooked Creek near Shepherd, Mont. (station 06217700) for runoff events of July 23-24, 26-27, and 31, 1993 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
July 18									
---	---	---	---	---	---	---	---	---	---
July 19									
---	---	---	---	---	---	---	---	---	---
July 20									
---	---	---	---	---	---	---	---	---	---
July 21									
---	---	---	---	---	---	---	---	---	---
July 22									
---	---	---	---	---	---	---	---	---	---
July 23									
23:50	1.89	23:55	3.41	24:00	4.44	---	---	---	---
July 24									
00:05	6.63	00:10	10.1	00:15	12.2	00:20	13.2	00:25	14.6
00:30	18.4	00:35	20.2	00:40	20.2	00:45	18.9	00:50	16.8
00:55	14.6	01:00	12.5	01:05	11.3	01:10	10.1	01:15	9.02
01:20	8.01	01:25	7.07	01:30	6.21	01:35	5.58	01:40	4.80
01:45	4.27	01:50	3.96	01:55	3.68	02:00	3.28	02:05	3.16
02:10	2.92	02:15	2.67	02:20	2.55	02:25	2.43	02:30	2.21
02:35	2.10	02:40	2.10	02:45	2.10	02:50	2.10	02:55	1.99
July 25									
---	---	---	---	---	---	---	---	---	---
July 26									
13:45	1.89	13:50	2.55	13:55	3.41	14:00	3.96	14:05	4.44
14:10	4.62	14:15	4.62	14:20	4.62	14:25	4.62	14:30	4.62
14:35	5.18	14:40	5.58	14:45	6.42	14:50	7.07	14:55	7.30
15:00	8.01	15:05	8.01	15:10	8.26	15:15	8.26	15:20	8.51
15:25	8.51	15:30	8.51	15:35	8.51	15:40	8.51	15:45	8.51
15:50	8.26	15:55	8.01	16:00	7.77	16:05	7.53	16:10	7.30
16:15	7.07	16:20	7.30	16:25	7.77	16:30	8.76	16:35	9.56
16:40	10.7	16:45	12.9	16:50	16.4	16:55	20.2	17:00	24.6
17:05	27.8	17:10	29.0	17:15	29.6	17:20	30.7	17:25	32.6
17:30	33.2	17:35	33.2	17:40	31.3	17:45	30.2	17:50	29.0
17:55	27.8	18:00	27.3	18:05	25.6	18:10	24.1	18:15	23.1
18:20	22.1	18:25	20.7	18:30	20.2	18:35	19.3	18:40	18.9
18:45	18.4	18:50	18.4	18:55	18.0	19:00	18.0	19:05	18.0
19:10	18.0	19:15	17.6	19:20	17.2	19:25	16.0	19:30	15.7
19:35	14.9	19:40	13.9	19:45	13.9	19:50	13.5	19:55	12.9
20:00	12.9	20:05	12.9	20:10	12.9	20:15	12.9	20:20	13.2
20:25	13.2	20:30	13.2	20:35	13.2	20:40	13.2	20:45	12.5
20:50	12.2	20:55	11.9	21:00	11.3	21:05	11.0	21:10	10.1
21:15	9.83	21:20	9.29	21:25	9.02	21:30	8.26	21:35	8.01

Table 10. Rainfall and discharge data for North Fork Crooked Creek near Shepherd, Mont. (station 06217700) for runoff events of July 23-24, 26-27, and 31, 1993 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA--Continued									
July 26--Continued									
21:40	7.77	21:45	7.53	21:50	7.07	21:55	6.85	22:00	6.42
22:05	6.21	22:10	6.00	22:15	5.58	22:20	5.38	22:25	5.18
22:30	4.99	22:35	4.80	22:40	4.62	22:45	4.44	22:50	4.44
22:55	4.27	23:00	4.10	23:05	4.10	23:10	3.96	23:15	3.96
23:20	3.82	23:25	3.68	23:30	3.68	23:35	3.54	23:40	3.54
23:45	3.54	23:50	3.54	23:55	3.41	24:00	3.41	---	---
July 27									
00:05	3.28	00:10	3.28	00:15	3.16	00:20	3.16	00:25	3.04
00:30	3.04	00:35	2.92	00:40	2.80	00:45	2.80	00:50	2.67
00:55	2.67	01:00	2.55	01:05	2.43	01:10	2.43	01:15	2.32
01:20	2.32	01:25	2.32	01:30	2.21	01:35	2.21	01:40	2.21
01:45	2.10	---	---	---	---	---	---	---	---
July 28									
---	---	---	---	---	---	---	---	---	---
July 29									
---	---	---	---	---	---	---	---	---	---
July 30									
---	---	---	---	---	---	---	---	---	---
July 31									
00:10	.90	00:15	5.58	00:20	31.3	00:25	40.6	00:30	39.9
00:35	33.8	00:40	29.0	00:45	25.1	00:50	22.6	00:55	21.1
01:00	18.9	01:05	17.6	01:10	15.7	01:15	14.2	01:20	13.2
01:25	14.2	01:30	17.2	01:35	21.1	01:40	23.1	01:45	23.6
01:50	23.1	01:55	22.1	02:00	21.1	02:05	19.3	02:10	18.0
02:15	16.8	02:20	15.3	02:25	14.9	02:30	16.4	02:35	18.0
02:40	19.3	02:45	19.8	02:50	19.3	02:55	18.9	03:00	17.6
03:05	16.0	03:10	14.9	03:15	13.9	03:20	12.5	03:25	11.6
03:30	10.7	03:35	9.56	03:40	8.76	03:45	8.01	03:50	7.30
03:55	6.63	04:00	6.00	04:05	5.58	04:10	5.18	04:15	4.80
04:20	4.44	04:25	3.96	04:30	3.82	04:35	3.54	04:40	3.28
04:45	3.04	04:50	2.80	04:55	2.67	05:00	2.43	05:05	2.32
05:10	2.10	05:15	1.99	05:20	1.89	05:25	1.70	05:30	1.60
05:35	1.51	05:40	1.34	05:45	1.26	05:50	1.18	05:55	1.11
06:00	1.11	06:05	1.11	06:10	1.11	06:15	1.03	06:20	1.03

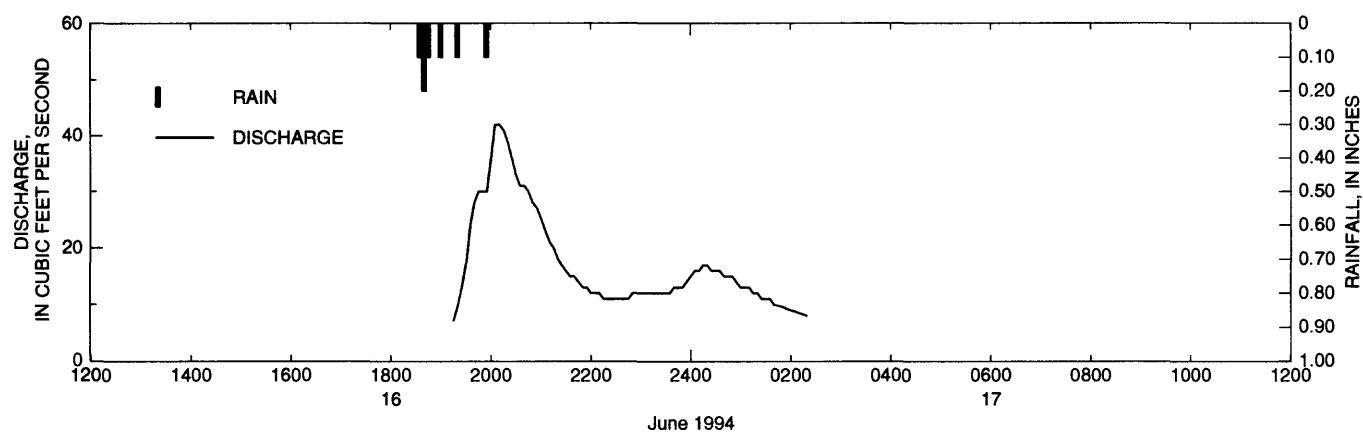


Figure 11. Rainfall hyetograph and runoff hydrograph for North Fork Crooked Creek near Shepherd, Mont. (station 06217700) for runoff event of June 16-17, 1994.

Table 11. Rainfall and discharge data for North Fork Crooked Creek near Shepherd, Mont. (station 06217700) for runoff event of June 16-17, 1994

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
June 11									
---	---	---	---	---	---	---	---	---	---
June 12									
---	---	---	---	---	---	---	---	---	---
June 13									
---	---	---	---	---	---	---	---	---	---
June 14									
00:25	0.10	01:10	0.10	01:45	0.10	---	---	---	---
June 15									
---	---	---	---	---	---	---	---	---	---
June 16									
18:35	.10	18:40	.20	18:45	.10	19:00	0.10	19:20	0.10
19:55	.10	---	---	---	---	---	---	---	---
June 17									
---	---	---	---	---	---	---	---	---	---

Table 11. Rainfall and discharge data for North Fork Crooked Creek near Shepherd, Mont. (station 06217700) for runoff event of June 16-17, 1994 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
June 11									
---	---	---	---	---	---	---	---	---	---
June 12									
---	---	---	---	---	---	---	---	---	---
June 13									
---	---	---	---	---	---	---	---	---	---
June 14									
---	---	---	---	---	---	---	---	---	---
June 15									
---	---	---	---	---	---	---	---	---	---
June 16									
19:15	7.07	19:20	9.56	19:25	13.2	19:30	17.2	19:35	23.6
19:40	27.8	19:45	29.6	19:50	30.2	19:55	30.2	20:00	35.8
20:05	42.1	20:10	42.1	20:15	40.6	20:20	38.5	20:25	36.5
20:30	33.2	20:35	31.3	20:40	30.7	20:45	29.6	20:50	27.8
20:55	26.7	21:00	24.6	21:05	23.1	21:10	21.1	21:15	20.2
21:20	18.4	21:25	17.2	21:30	16.4	21:35	15.3	21:40	14.6
21:45	13.9	21:50	13.2	21:55	12.5	22:00	12.2	22:05	11.9
22:10	11.6	22:15	11.3	22:20	11.0	22:25	11.0	22:30	11.0
22:35	11.0	22:40	11.3	22:45	11.3	22:50	11.6	22:55	11.6
23:00	11.6	23:05	11.6	23:10	11.9	23:15	11.9	23:20	11.9
23:25	11.9	23:30	12.2	23:35	12.2	23:40	12.5	23:45	12.5
23:50	13.2	23:55	14.2	24:00	15.3	---	---	---	---
June 17									
00:05	16.0	00:10	16.4	00:15	16.8	00:20	16.8	00:25	16.4
00:30	16.0	00:35	16.0	00:40	15.3	00:45	14.9	00:50	14.6
00:55	13.9	01:00	13.2	01:05	12.9	01:10	12.5	01:15	12.2
01:20	11.9	01:25	11.3	01:30	11.0	01:35	10.7	01:40	10.4
01:45	9.83	01:50	9.56	01:55	9.29	02:00	9.02	02:05	8.76
02:10	8.51	02:15	8.26	02:20	8.01	02:25	8.01	---	---

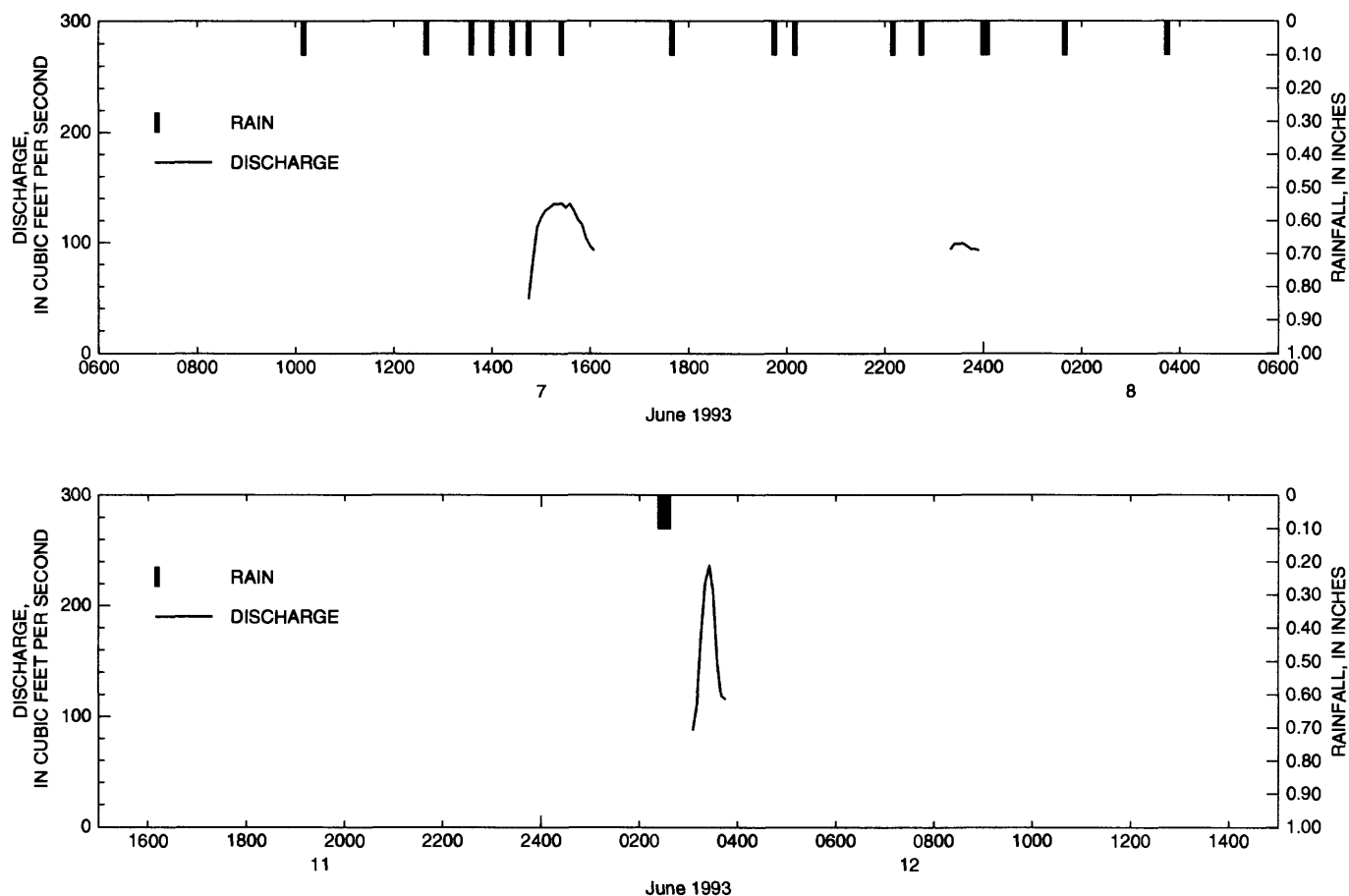


Figure 12. Rainfall hyetographs and runoff hydrographs for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of June 7 and 12, 1993.

Table 12. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of June 7 and 12, 1993

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
June 2									
23:25	0.10	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
---	---	---	---	---	---	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
---	---	---	---	---	---	---	---	---	---
June 7									
05:40	.10	10:10	0.10	12:40	0.10	13:35	0.10	14:00	0.10
14:25	.10	14:45	.10	15:25	.10	17:40	.10	19:45	.10
20:10	.10	22:10	.10	22:45	.10	24:00	.10	---	---
June 8									
00:05	.10	01:40	.10	03:45	.10	---	---	---	---
June 9									
---	---	---	---	---	---	---	---	---	---
June 10									
---	---	---	---	---	---	---	---	---	---
June 11									
---	---	---	---	---	---	---	---	---	---
June 12									
02:25	.10	02:30	.10	02:35	.10	---	---	---	---

Table 12. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of June 7 and 12, 1993
(Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
June 2									
---	---	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
---	---	---	---	---	---	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
---	---	---	---	---	---	---	---	---	---
June 7									
14:45	49.0	14:50	83.7	14:55	114	15:00	123	15:05	129
15:10	132	15:15	135	15:20	135	15:25	136	15:30	132
15:35	135	15:40	129	15:45	121	15:50	117	15:55	104
16:00	97.2	16:05	93.0	23:20	94.4	23:25	98.6	23:30	98.6
23:35	98.6	23:40	97.2	23:45	94.4	23:50	94.4	23:55	93.0
June 8									
---	---	---	---	---	---	---	---	---	---
June 9									
---	---	---	---	---	---	---	---	---	---
June 10									
---	---	---	---	---	---	---	---	---	---
June 11									
---	---	---	---	---	---	---	---	---	---
June 12									
03:05	87.6	03:10	113	03:15	172	03:20	221	03:25	237
03:30	212	03:35	150	03:40	119	03:45	116	---	---

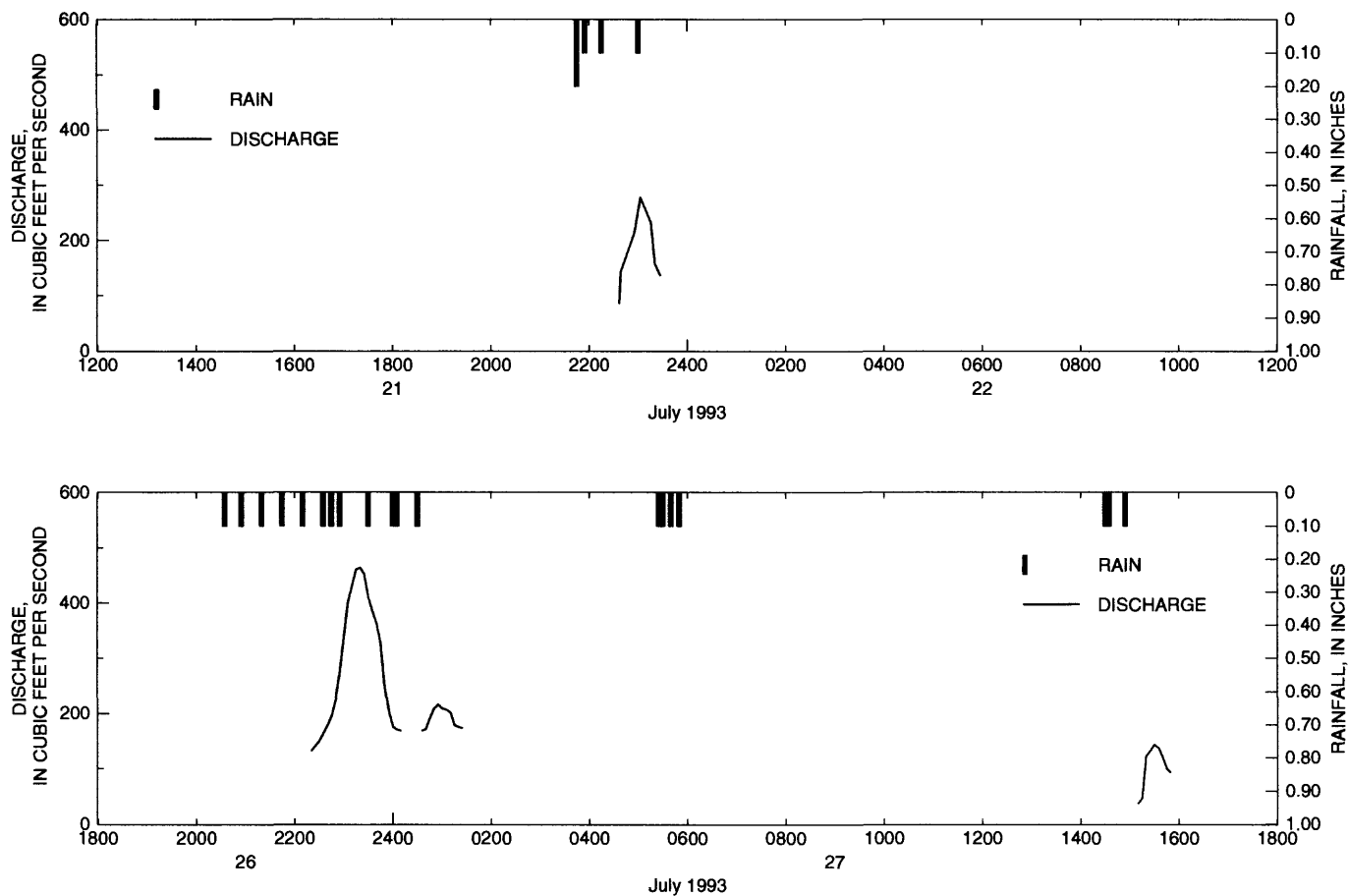


Figure 13. Rainfall hyetographs and runoff hydrographs for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of July 21 and 26-27, 1993.

Table 13. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of July 21 and 26-27, 1993

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
July 16									
09:00	0.10	12:10	0.10	---	---	---	---	---	---
July 17									
---	---	---	---	---	---	---	---	---	---
July 18									
---	---	---	---	---	---	---	---	---	---
July 19									
---	---	---	---	---	---	---	---	---	---
July 20									
---	---	---	---	---	---	---	---	---	---
July 21									
07:10	.10	21:45	.20	21:55	0.10	22:15	0.10	23:00	0.10
July 22									
---	---	---	---	---	---	---	---	---	---
July 23									
11:10	.10	---	---	---	---	---	---	---	---
July 24									
---	---	---	---	---	---	---	---	---	---
July 25									
---	---	---	---	---	---	---	---	---	---
July 26									
15:15	.10	20:35	.10	20:55	.10	21:20	.10	21:45	.10
22:10	.10	22:35	.10	22:45	.10	22:55	.10	23:30	.10
24:00	.10	---	---	---	---	---	---	---	---
July 27									
00:05	.10	00:30	.10	05:25	.10	05:30	.10	05:40	.10
05:50	.10	14:30	.10	14:35	.10	14:55	.10	---	---

Table 13. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of July 21 and 26-27, 1993
(Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
July 16									
---	---	---	---	---	---	---	---	---	---
July 17									
---	---	---	---	---	---	---	---	---	---
July 18									
---	---	---	---	---	---	---	---	---	---
July 19									
---	---	---	---	---	---	---	---	---	---
July 20									
---	---	---	---	---	---	---	---	---	---
July 21									
22:36	84.7	22:37	142	22:54	214	23:02	278	23:15	232
23:19	158	23:26	136	---	---	---	---	---	---
July 22									
---	---	---	---	---	---	---	---	---	---
July 23									
---	---	---	---	---	---	---	---	---	---
July 24									
---	---	---	---	---	---	---	---	---	---
July 25									
---	---	---	---	---	---	---	---	---	---
July 26									
22:20	132	22:25	141	22:30	150	22:35	165	22:40	179
22:45	196	22:50	226	22:55	274	23:00	335	23:05	401
23:10	432	23:15	461	23:20	464	23:25	453	23:30	411
23:35	386	23:40	365	23:45	330	23:50	253	23:55	205
24:00	176	---	---	---	---	---	---	---	---
July 27									
00:05	171	00:10	169	00:35	169	00:40	172	00:45	192
00:50	210	00:55	217	01:00	210	01:05	207	01:10	202
01:15	179	01:20	176	01:25	174	06:05	174	06:10	181
06:15	179	06:20	181	06:25	179	15:10	36.5	15:15	47.1
15:20	123	15:25	133	15:30	144	15:35	138	15:40	121
15:45	100	15:50	93.0	15:55	93.0	---	---	---	---

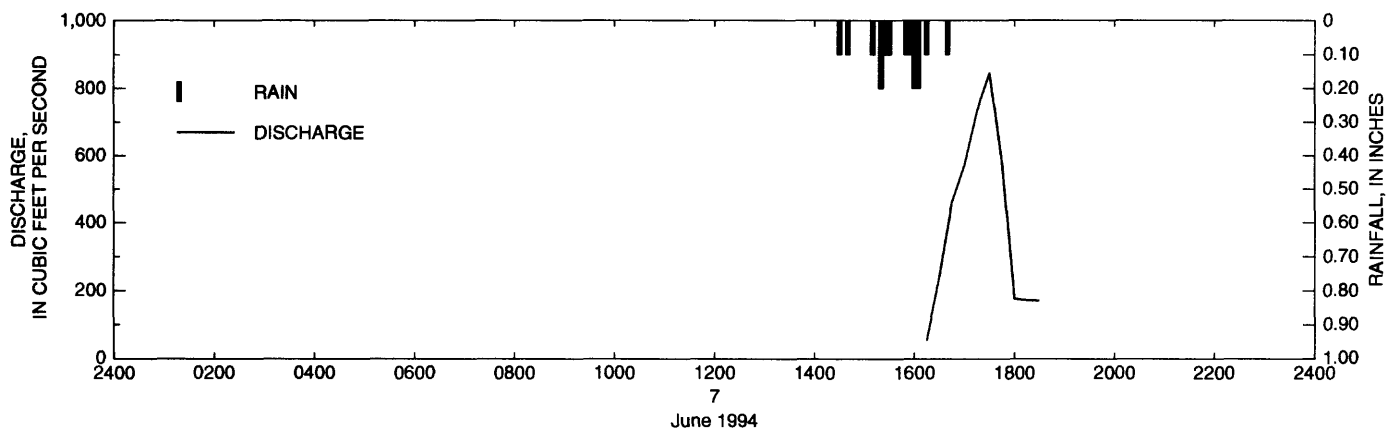


Figure 14. Rainfall hyetograph and runoff hydrograph for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of June 7, 1994.

Table 14. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of June 7, 1994

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
June 2									
---	---	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
13:00	0.10	---	---	---	---	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
---	---	---	---	---	---	---	---	---	---
June 7									
14:30	.10	14:40	0.10	15:10	0.10	15:20	0.20	15:25	0.10
15:30	.10	15:50	.10	15:55	.10	16:00	.20	16:05	.20
16:15	.10	16:40	.10	---	---	---	---	---	---

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
June 2									
---	---	---	---	---	---	---	---	---	---
June 3									
---	---	---	---	---	---	---	---	---	---
June 4									
---	---	---	---	---	---	---	---	---	---
June 5									
---	---	---	---	---	---	---	---	---	---
June 6									
---	---	---	---	---	---	---	---	---	---
June 7									
16:15	52.8	16:30	239	16:45	459	17:00	570	17:15	735
17:30	845	17:45	577	18:00	176	18:15	172	18:30	171

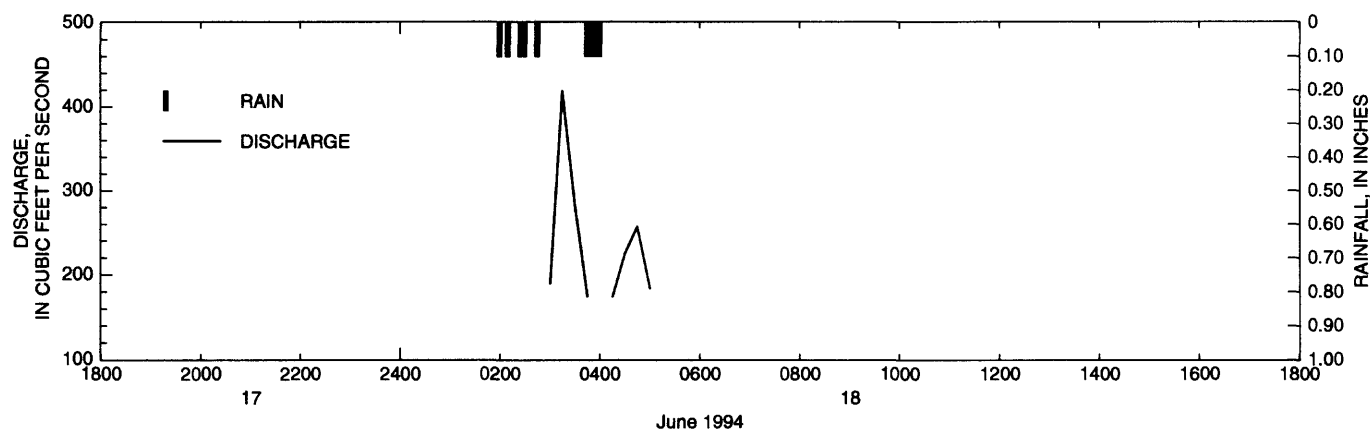


Figure 15. Rainfall hyetograph and runoff hydrograph for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of June 18, 1994.

Table 15. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of June 18, 1994

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
June 13									
10:00	0.10	---	---	---	---	---	---	---	---
June 14									
---	---	---	---	---	---	---	---	---	---
June 15									
---	---	---	---	---	---	---	---	---	---
June 16									
07:35	.10	18:10	0.10	22:00	0.10	23:05	0.10	---	---
June 17									
---	---	---	---	---	---	---	---	---	---
June 18									
02:00	.10	02:10	.10	02:25	.10	02:30	.10	02:45	0.10
03:45	.10	03:50	.10	03:55	.10	04:00	.10	---	---

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
June 13									
---	---	---	---	---	---	---	---	---	---
June 14									
---	---	---	---	---	---	---	---	---	---
June 15									
---	---	---	---	---	---	---	---	---	---
June 16									
---	---	---	---	---	---	---	---	---	---
June 17									
---	---	---	---	---	---	---	---	---	---
June 18									
03:00	189	03:15	419	03:30	283	03:45	174	04:15	174
04:30	225	04:45	257	05:00	183	---	---	---	---

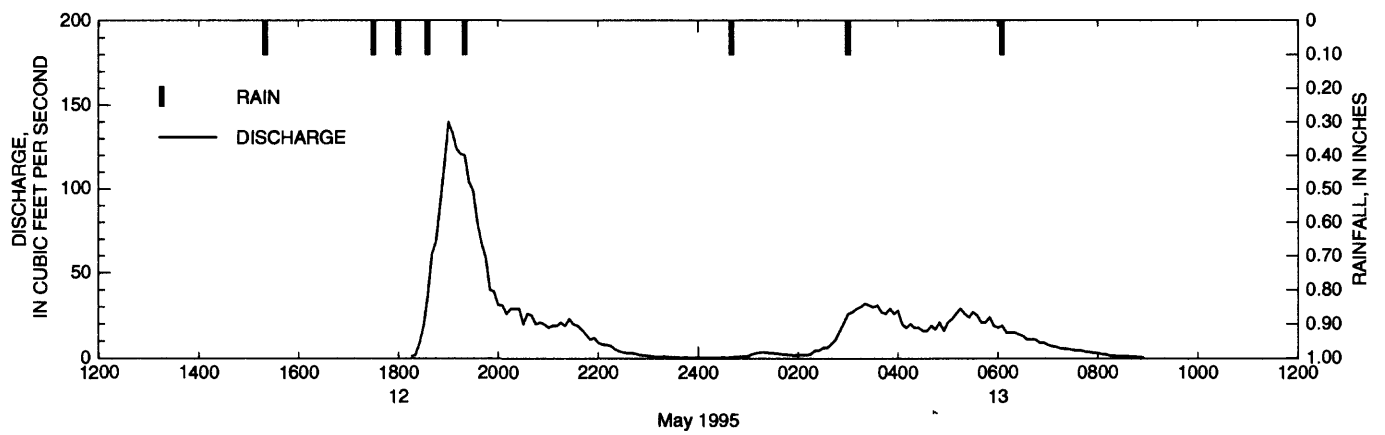


Figure 16. Rainfall hyetograph and runoff hydrograph for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of May 12-13, 1995.

Table 16. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of May 12-13, 1995

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
May 7									
24:00	---	---	---	---	---	---	---	---	---
May 8									
24:00	---	---	---	---	---	---	---	---	---
May 9									
---	---	---	---	---	---	---	---	---	---
May 10									
---	---	---	---	---	---	---	---	---	---
May 11									
---	---	---	---	---	---	---	---	---	---
May 12									
15:20	0.10	17:30	0.10	18:00	0.10	18:35	0.10	19:20	0.10
May 13									
00:40	.10	03:00	.10	06:05	.10	---	---	---	---

Table 16. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of May 12-13, 1995
(Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
May 7									
---	---	---	---	---	---	---	---	---	---
May 8									
---	---	---	---	---	---	---	---	---	---
May 9									
---	---	---	---	---	---	---	---	---	---
May 10									
---	---	---	---	---	---	---	---	---	---
May 11									
---	---	---	---	---	---	---	---	---	---
May 12									
18:15	0.90	18:20	1.80	18:25	8.40	18:30	19.2	18:35	36.5
18:40	60.7	18:45	69.4	18:50	91.7	18:55	114	19:00	140
19:05	134	19:10	124	19:15	121	19:20	120	19:25	104
19:30	98.6	19:35	80.0	19:40	68.3	19:45	58.7	19:50	40.4
19:55	38.8	20:00	30.7	20:05	30.7	20:10	25.6	20:15	29.4
20:20	28.7	20:25	28.7	20:30	20.2	20:35	25.6	20:40	25.0
20:45	20.2	20:50	21.4	20:55	19.7	21:00	17.6	21:05	18.6
21:10	19.2	21:15	20.8	21:20	19.2	21:25	22.5	21:30	20.2
21:35	18.6	21:40	17.1	21:45	14.3	21:50	10.7	21:55	11.8
22:00	9.02	22:05	8.11	22:10	7.81	22:15	7.25	22:20	5.28
22:25	4.25	22:30	3.53	22:35	2.88	22:40	2.88	22:45	2.57
22:50	1.92	22:55	1.71	23:00	1.44	23:05	.90	23:10	.81
23:15	.72	23:20	.90	23:25	.63	23:30	.63	23:35	.45
23:40	.36	23:45	.45	23:50	.36	23:55	.27	24:00	.27
May 13									
00:05	.27	00:10	.27	00:15	.27	00:20	.36	00:25	.36
00:30	.45	00:35	.36	00:40	.45	00:45	.72	00:50	.90
00:55	1.08	01:00	1.17	01:05	2.43	01:10	2.88	01:15	3.36
01:20	3.53	01:25	3.20	01:30	3.03	01:35	2.72	01:40	2.29
01:45	2.16	01:50	1.92	01:55	1.80	02:00	2.04	02:05	2.04
02:10	2.04	02:15	2.43	02:20	4.44	02:25	4.64	02:30	6.22
02:35	6.22	02:40	8.40	02:45	11.4	02:50	16.1	02:55	20.8
03:00	25.6	03:05	26.8	03:10	28.7	03:15	30.1	03:20	32.1
03:25	31.4	03:30	30.1	03:35	30.7	03:40	27.5	03:45	26.2
03:50	29.4	03:55	26.2	04:00	28.1	04:05	20.2	04:10	18.1
04:15	20.2	04:20	17.6	04:25	18.1	04:30	16.1	04:35	16.1
04:40	18.6	04:45	17.1	04:50	21.4	04:55	16.1	05:00	20.8
05:05	23.1	05:10	26.2	05:15	29.4	05:20	25.6	05:25	24.4
05:30	26.8	05:35	25.0	05:40	20.8	05:45	21.4	05:50	24.4
05:55	18.6	06:00	17.6	06:05	19.2	06:10	14.7	06:15	14.7
06:20	15.2	06:25	14.3	06:30	13.4	06:35	11.4	06:40	11.4
06:45	11.1	06:50	9.02	06:55	9.02	07:00	7.81	07:05	6.98

Table 16. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of May 12-13, 1995
(Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA--Continued									
May 13--Continued									
07:10	6.72	07:15	5.74	07:20	5.50	07:25	5.28	07:30	4.85
07:35	4.64	07:40	4.64	07:45	3.88	07:50	3.53	07:55	3.20
08:00	2.88	08:05	2.29	08:10	2.16	08:15	1.44	08:20	1.44
08:25	1.08	08:30	1.17	08:35	1.08	08:40	.90	08:45	.72
08:50	.63	08:55	.45	---	---	---	---	---	---

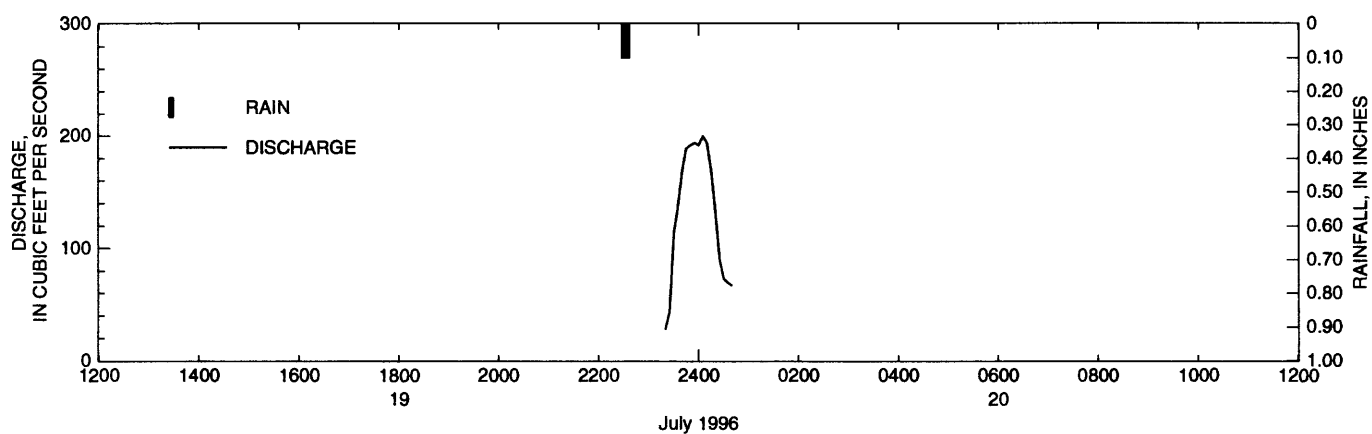


Figure 17. Rainfall hyetograph and runoff hydrograph for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of July 19-20, 1996.

Table 17. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of July 19-20, 1996

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
July 14									
---	---	---	---	---	---	---	---	---	---
July 15									
---	---	---	---	---	---	---	---	---	---
July 16									
---	---	---	---	---	---	---	---	---	---
July 17									
---	---	---	---	---	---	---	---	---	---
July 18									
---	---	---	---	---	---	---	---	---	---
July 19									
01:50	0.10	22:30	0.10	22:35	0.10	---	---	---	---
July 20									
---	---	---	---	---	---	---	---	---	---

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
July 14									
---	---	---	---	---	---	---	---	---	---
July 15									
---	---	---	---	---	---	---	---	---	---
July 16									
---	---	---	---	---	---	---	---	---	---
July 17									
---	---	---	---	---	---	---	---	---	---
July 18									
---	---	---	---	---	---	---	---	---	---
July 19									
23:20	27.6	23:25	43.8	23:30	114	23:35	137	23:40	169
23:45	189	23:50	192	23:55	194	24:00	192	---	---
July 20									
00:05	200	00:10	194	00:15	169	00:20	131	00:25	91.4
00:30	72.9	00:35	69.9	00:40	67.0	---	---	---	---

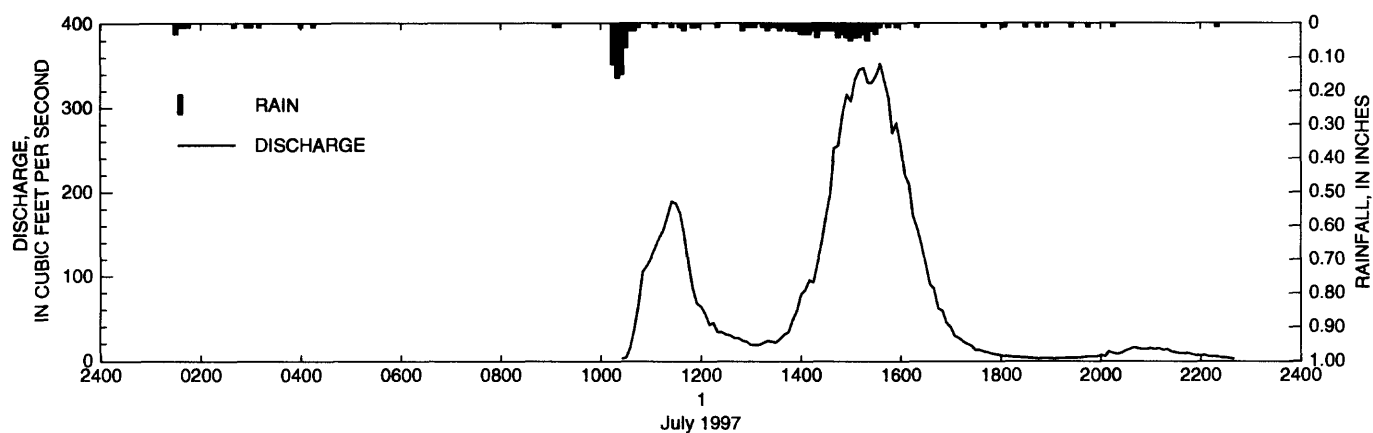


Figure 18. Rainfall hyetograph and runoff hydrograph for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of July 1, 1997.

Table 18. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of July 1, 1997

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
June 26									
---	---	---	---	---	---	---	---	---	---
June 27									
---	---	---	---	---	---	---	---	---	---
June 28									
19:30	0.01	19:35	0.04	---	---	---	---	---	---
June 29									
21:30	.01	21:35	.01	21:40	0.01	21:50	0.01	21:55	0.01
22:00	.01	22:05	.01	22:10	.02	22:15	.01	22:20	.04
22:25	.14	22:30	.01	22:35	.01	23:10	.01	---	---
June 30									
02:15	.01	02:40	.01	---	---	---	---	---	---
July 1									
01:30	.03	01:35	.01	01:40	.01	01:45	.01	02:40	.01
02:55	.01	03:00	.01	03:10	.01	04:00	.01	04:15	.01
09:05	.01	09:10	.01	10:15	.12	10:20	.16	10:25	.15
10:30	.07	10:35	.02	10:40	.02	10:45	.01	11:05	.01
11:25	.01	11:35	.01	11:40	.02	11:50	.01	11:55	.01
12:20	.01	12:50	.02	12:55	.01	13:00	.01	13:05	.01
13:15	.01	13:20	.02	13:25	.01	13:30	.01	13:35	.02
13:40	.01	13:45	.02	13:50	.02	13:55	.02	14:00	.03
14:05	.03	14:10	.03	14:15	.02	14:20	.04	14:25	.02
14:30	.02	14:35	.02	14:40	.02	14:45	.04	14:50	.03
14:55	.04	15:00	.05	15:05	.04	15:10	.04	15:15	.03
15:20	.05	15:25	.02	15:30	.03	15:35	.01	15:45	.01
15:55	.01	16:20	.01	17:40	.01	18:05	.01	18:30	.01
18:45	.01	18:55	.01	19:25	.01	19:45	.01	20:15	.01
22:20	.01	---	---	---	---	---	---	---	---

Table 18. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event July 1, 1997 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
June 26									
---	---	---	---	---	---	---	---	---	---
June 27									
---	---	---	---	---	---	---	---	---	---
June 28									
---	---	---	---	---	---	---	---	---	---
June 29									
---	---	---	---	---	---	---	---	---	---
June 30									
---	---	---	---	---	---	---	---	---	---
July 1									
10:25	3.03	10:30	4.25	10:35	13.9	10:40	36.5	10:45	66.1
10:50	106	10:55	113	11:00	122	11:05	134	11:10	146
11:15	155	11:20	172	11:25	189	11:30	187	11:35	175
11:40	150	11:45	114	11:50	86.4	11:55	68.3	12:00	63.9
12:05	55.7	12:10	42.9	12:15	44.6	12:20	34.3	12:25	34.3
12:30	31.4	12:35	30.1	12:40	27.5	12:45	26.8	12:50	24.4
12:55	22.5	13:00	18.6	13:05	19.2	13:10	19.2	13:15	20.8
13:20	23.7	13:25	22.5	13:30	21.9	13:35	26.2	13:40	30.7
13:45	34.3	13:50	48.2	13:55	58.7	14:00	78.8	14:05	83.8
14:10	95.8	14:15	93.0	14:20	117	14:25	141	14:30	170
14:35	198	14:40	252	14:45	255	14:50	293	14:55	316
15:00	308	15:05	334	15:10	346	15:15	348	15:20	330
15:25	330	15:30	339	15:35	353	15:40	332	15:45	312
15:50	270	15:55	282	16:00	257	16:05	221	16:10	209
16:15	172	16:20	157	16:25	138	16:30	114	16:35	90.3
16:40	85.1	16:45	61.8	16:50	58.7	16:55	44.6	17:00	39.6
17:05	29.4	17:10	26.8	17:15	23.1	17:20	19.7	17:25	17.6
17:30	12.6	17:35	13.0	17:40	10.7	17:45	10.3	17:50	8.71
17:55	7.81	18:00	6.47	18:05	5.97	18:10	5.50	18:15	4.85
18:20	4.64	18:25	4.44	18:30	4.25	18:35	3.70	18:40	3.53
18:45	3.03	18:50	3.53	18:55	3.36	19:00	3.20	19:05	2.88
19:10	3.36	19:15	3.53	19:20	3.70	19:25	3.88	19:30	3.70
19:35	4.06	19:40	4.64	19:45	5.50	19:50	5.28	19:55	5.50
20:00	6.72	20:05	5.28	20:10	11.4	20:15	9.34	20:20	8.40
20:25	9.67	20:30	12.2	20:35	13.9	20:40	15.7	20:45	14.7
20:50	14.3	20:55	14.3	21:00	15.2	21:05	14.3	21:10	14.7
21:15	13.4	21:20	13.9	21:25	11.1	21:30	10.3	21:35	9.34
21:40	9.02	21:45	9.67	21:50	8.11	21:55	6.98	22:00	6.47
22:05	6.72	22:10	5.50	22:15	5.28	22:20	5.28	22:25	4.06
22:30	4.06	22:35	3.53	22:40	2.43	---	---	---	---

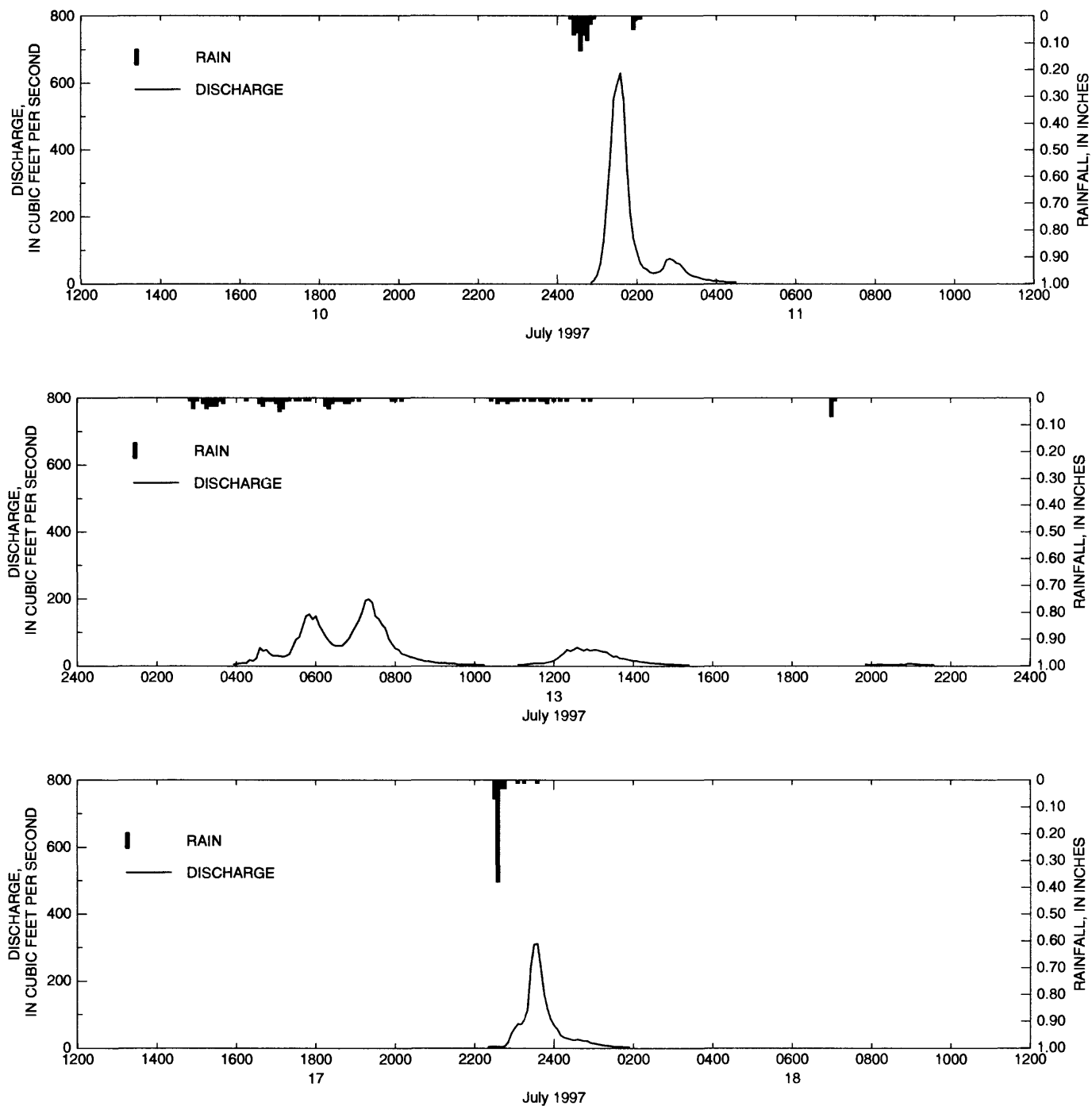


Figure 19. Rainfall hyetographs and runoff hydrographs for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of July 11, 13, and 17-18, 1997.

Table 19. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of July 11, 13, and 17-18, 1997

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
July 6									
---	---	---	---	---	---	---	---	---	---
July 7									
---	---	---	---	---	---	---	---	---	---
July 8									
---	---	---	---	---	---	---	---	---	---
July 9									
---	---	---	---	---	---	---	---	---	---
July 10									
---	---	---	---	---	---	---	---	---	---
July 11									
00:20	0.01	00:25	0.07	00:30	0.06	00:35	0.13	00:40	0.07
00:45	.09	00:50	.03	00:55	.01	01:55	.05	02:00	.01
02:05	.01	---	---	---	---	---	---	---	---
July 12									
19:15	.01	19:25	.01	19:30	.01	19:35	.01	19:45	.01
19:50	.01	20:00	.01	20:10	.01	20:25	.01	20:35	.01
July 13									
02:50	.01	02:55	.04	03:00	.01	03:10	.02	03:15	.04
03:20	.03	03:25	.03	03:30	.03	03:35	.01	03:40	.02
04:15	.01	04:35	.02	04:40	.03	04:45	.01	04:50	.01
04:55	.01	05:00	.02	05:05	.05	05:10	.04	05:15	.01
05:20	.01	05:30	.01	05:35	.01	05:45	.01	05:50	.01
06:15	.03	06:20	.04	06:25	.02	06:30	.01	06:35	.01
06:40	.01	06:45	.02	06:50	.02	06:55	.01	07:05	.01
07:55	.01	08:00	.01	08:10	.01	10:25	.01	10:35	.02
10:40	.01	10:45	.01	10:50	.02	10:55	.01	11:00	.01
11:05	.01	11:15	.01	11:25	.01	11:30	.01	11:40	.01
11:45	.01	11:50	.02	12:00	.01	12:10	.01	12:20	.01
12:45	.01	12:55	.01	19:00	.07	19:05	.01	---	---
July 14									
---	---	---	---	---	---	---	---	---	---
July 15									
---	---	---	---	---	---	---	---	---	---
July 16									
02:45	.01	02:50	.01	02:55	.01	---	---	---	---
July 17									
22:30	.07	22:35	.38	22:40	.03	22:45	.03	23:05	.01
23:15	.01	23:35	.01	---	---	---	---	---	---
July 18									
---	---	---	---	---	---	---	---	---	---

Table 19. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of July 11, 13, and 17-18, 1997 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA									
July 6									
---	---	---	---	---	---	---	---	---	---
July 7									
---	---	---	---	---	---	---	---	---	---
July 8									
---	---	---	---	---	---	---	---	---	---
July 9									
---	---	---	---	---	---	---	---	---	---
July 10									
---	---	---	---	---	---	---	---	---	---
July 11									
00:50	2.57	00:55	10.0	01:00	24.4	01:05	58.7	01:10	131
01:15	246	01:20	381	01:25	556	01:30	596	01:35	630
01:40	545	01:45	357	01:50	209	01:55	134	02:00	97.2
02:05	62.8	02:10	49.1	02:15	43.8	02:20	35.0	02:25	32.1
02:30	33.5	02:35	37.3	02:40	46.4	02:45	71.7	02:50	76.4
02:55	71.7	03:00	62.8	03:05	59.7	03:10	48.2	03:15	36.5
03:20	27.5	03:25	23.1	03:30	20.8	03:35	17.6	03:40	14.3
03:45	11.4	03:50	10.7	03:55	7.81	04:00	8.71	04:05	6.72
04:10	6.47	04:15	4.25	04:20	4.44	04:25	4.06	04:30	3.20
July 12									
---	---	---	---	---	---	---	---	---	---
July 13									
03:55	3.70	04:00	6.47	04:05	7.25	04:10	9.02	04:15	8.40
04:20	17.6	04:25	15.2	04:30	22.5	04:35	53.7	04:40	45.5
04:45	48.2	04:50	35.7	04:55	31.4	05:00	31.4	05:05	30.1
05:10	28.1	05:15	30.1	05:20	35.0	05:25	56.7	05:30	78.8
05:35	86.4	05:40	117	05:45	149	05:50	155	05:55	140
06:00	149	06:05	121	06:10	105	06:15	87.7	06:20	75.2
06:25	63.9	06:30	59.7	06:35	59.7	06:40	60.7	06:45	70.5
06:50	82.5	06:55	102	07:00	120	07:05	138	07:10	163
07:15	196	07:20	200	07:25	189	07:30	149	07:35	141
07:40	124	07:45	113	07:50	81.3	07:55	66.1	08:00	52.8
08:05	48.2	08:10	36.5	08:15	34.3	08:20	30.1	08:25	25.0
08:30	23.1	08:35	19.2	08:40	17.1	08:45	14.3	08:50	13.9
08:55	12.2	09:00	10.3	09:05	9.34	09:10	9.02	09:15	8.71
09:20	7.25	09:25	6.72	09:30	6.72	09:35	4.44	09:40	4.64
09:45	4.44	09:50	4.44	09:55	4.44	10:00	3.70	10:05	3.53
10:10	3.03	10:15	2.72	11:05	3.03	11:10	3.53	11:15	4.06
11:20	5.28	11:25	6.22	11:30	7.53	11:35	7.81	11:40	7.81
11:45	7.81	11:50	11.1	11:55	12.6	12:00	15.7	12:05	22.5
12:10	30.7	12:15	38.0	12:20	49.1	12:25	45.5	12:30	50.0
12:35	55.7	12:40	50.9	12:45	46.4	12:50	50.9	12:55	46.4

Table 19. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff events of July 11, 13, and 17-18, 1997 (Continued)

Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
DISCHARGE DATA--Continued									
July 13--Continued									
13:00	48.2	13:05	48.2	13:10	45.5	13:15	42.9	13:20	41.2
13:25	34.3	13:30	28.1	13:35	29.4	13:40	22.5	13:45	23.1
13:50	19.7	13:55	18.1	14:00	15.7	14:05	16.1	14:10	13.4
14:15	12.2	14:20	10.7	14:25	9.34	14:30	8.11	14:35	7.53
14:40	7.25	14:45	6.22	14:50	5.28	14:55	5.28	15:00	4.85
15:05	3.70	15:10	4.06	15:15	3.20	15:20	3.53	15:25	2.72
19:50	4.64	19:55	3.36	20:00	2.43	20:05	3.03	20:10	4.06
20:15	4.06	20:20	3.03	20:25	2.43	20:30	2.16	20:35	2.16
20:40	3.03	20:45	3.70	20:50	3.03	20:55	5.97	21:00	6.47
21:05	5.06	21:10	4.64	21:15	3.53	21:20	2.88	21:25	2.43
21:30	2.29	21:35	2.16	---	---	---	---	---	---
July 14									
---	---	---	---	---	---	---	---	---	---
July 15									
---	---	---	---	---	---	---	---	---	---
July 16									
---	---	---	---	---	---	---	---	---	---
July 17									
22:20	3.36	22:25	3.53	22:30	3.88	22:35	3.70	22:40	3.36
22:45	4.44	22:50	16.1	22:55	42.1	23:00	58.7	23:05	71.7
23:10	70.5	23:15	85.1	23:20	114	23:25	246	23:30	310
23:35	312	23:40	241	23:45	162	23:50	117	23:55	86.4
24:00	68.3	---	---	---	---	---	---	---	---
July 18									
00:05	55.7	00:10	38.0	00:15	32.1	00:20	28.7	00:25	26.2
00:30	23.1	00:35	26.2	00:40	24.4	00:45	20.8	00:50	20.8
00:55	16.1	01:00	14.3	01:05	12.2	01:10	9.67	01:15	8.11
01:20	6.72	01:25	5.97	01:30	4.44	01:35	4.64	01:40	4.25
01:45	3.36	01:50	2.88	01:55	2.72	---	---	---	---

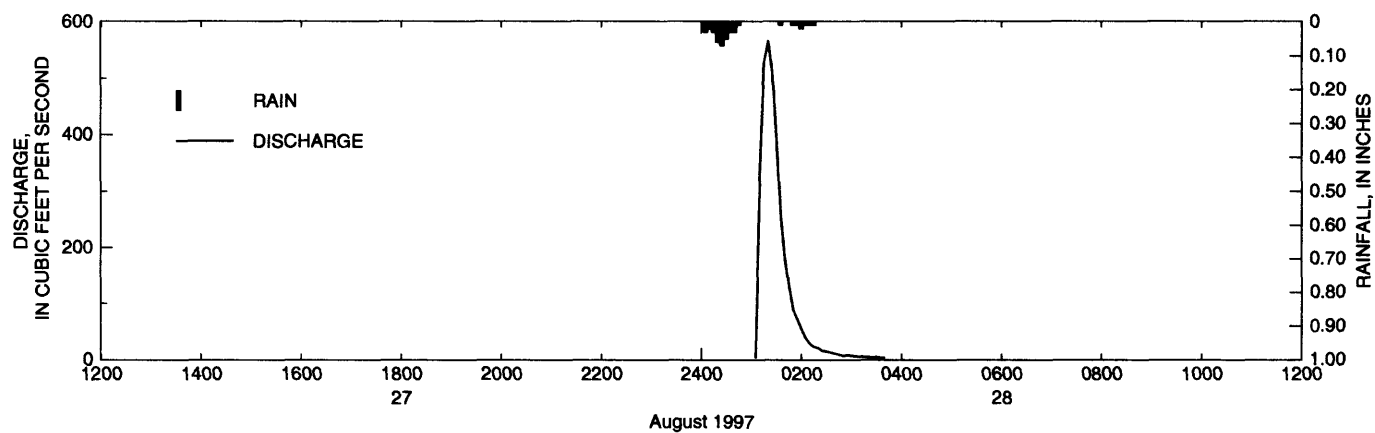


Figure 20. Rainfall hyetograph and runoff hydrograph for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of August 28, 1997.

Table 20. Rainfall and discharge data for Cains Coulee at Glendive, Mont. (station 06327450) for runoff event of August 28, 1997

[Abbreviations: ft³/s, cubic feet per second; hr, hours; in., inches; min, minutes. Symbol: ---, no data. Rainfall and discharge data shown for 5 days preceding first runoff period]

Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)	Time (hr:min)	Rainfall (in.)
RAINFALL DATA									
August 23									
---	---	---	---	---	---	---	---	---	---
August 24									
---	---	---	---	---	---	---	---	---	---
August 25									
---	---	---	---	---	---	---	---	---	---
August 26									
---	---	---	---	---	---	---	---	---	---
August 27									
---	---	---	---	---	---	---	---	---	---
August 28									
00:05	0.03	00:10	0.02	00:15	0.03	00:20	0.06	00:25	0.07
00:30	.05	00:35	.03	00:40	.03	00:45	.01	01:35	.01
01:50	.01	01:55	.01	02:00	.02	02:05	.01	02:10	.01
02:15	.01	---	---	---	---	---	---	---	---
DISCHARGE DATA									
Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)	Time (hr:min)	Discharge (ft ³ /s)
August 23									
---	---	---	---	---	---	---	---	---	---
August 24									
---	---	---	---	---	---	---	---	---	---
August 25									
---	---	---	---	---	---	---	---	---	---
August 26									
---	---	---	---	---	---	---	---	---	---
August 27									
---	---	---	---	---	---	---	---	---	---
August 28									
01:05	3.20	01:10	319	01:15	527	01:20	566	01:25	513
01:30	391	01:35	255	01:40	182	01:45	129	01:50	89.0
01:55	71.7	02:00	53.7	02:05	38.8	02:10	28.7	02:15	23.1
02:20	20.8	02:25	15.7	02:30	14.7	02:35	12.6	02:40	11.1
02:45	9.34	02:50	7.53	02:55	8.11	03:00	7.25	03:05	6.22
03:10	5.97	03:15	4.85	03:20	4.85	03:25	4.06	03:30	4.44
03:35	3.53	03:40	3.20	03:45	3.20	---	---	---	---