

Flooding in the Mississippi River Basin in Minnesota, Spring 2001

INTRODUCTION

During spring 2001 there was much flooding in the Mississippi River Basin in Minnesota. Greater than normal precipitation starting with late fall rains in 2000, greater than normal snowfalls, a delayed snowmelt, and record rains in April, all contributed to the flooding. Parts of the southern one-half of Minnesota had streamflows of magnitudes not seen in more than 30 years. Approximately 50 counties were declared disaster areas with greater than 34 million dollars in total reported flood damage (S. Neudahl,

Department of Public Safety, Division of Emergency Management, oral commun. July 9, 2001).

Record flows were recorded at nine U.S. Geological Survey (USGS) continuous-streamflow gaging stations within Minnesota or along the Wisconsin border. In addition, 14 stations recorded their 2nd or 3rd highest peaks of record. These gaging stations are maintained by the USGS as part of a network of gages used by the USGS, U.S. Army Corps of Engineers, National Weather Service, Minnesota Department of Natural

Resources, as well as other State and local agencies. Stage and discharge data gathered at these gages are used for flood forecasting, operations of dams and diversions, managing emergency activities during floods, and performing follow-up studies to better understand river flood-flow characteristics. This report summarizes flooding in that part of the Mississippi River Basin that includes stream-gaging stations within the borders of Minnesota and monitoring points along the Minnesota-Wisconsin border.

Peak stages and discharges are included in this report for 44 stream-gaging stations (table 1) maintained by the USGS in the Mississippi River Basin. Stage, in feet, is based on an arbitrary scale established when a gaging station is installed. Discharges are instantaneous determinations of peak flow, in cubic feet per second. This peak flow information is ranked with the five greatest discharges of record for each station. In addition, flood-recurrence intervals are included for stations with at least 20 years of record, and/or with little influence on peak flows by regulation. Flood-recurrence intervals are expressed in years and are the probability of a flood of this magnitude occurring. A 25-year event can be expected to occur, on average, once every 25 years. This probability is independent of individual events, so two "25-year" floods can occur in successive years. It is also possible for the probability value assigned to a flood (for example, greater than 25-year event) to change over time. As peak flows are included from subsequent years, flood frequencies previously determined can change



Mississippi River at St. Paul, Minnesota, April 23, 2001. Retrofitting a monitoring station for high water. (U.S. Geological Survey)

Table 1. Provisional flood information on major Minnesota streams in the Mississippi River Basin.

[Peak stage and flow of 2001 compared with the five highest ranking flows of record. Provisional information is subject to review and change. Station names that are underlined indicate peak flows of record. Mi², miles squared; ft³/s, cubic feet per second; ~, approximately; --, not available; Minn, Minnesota; S. Dak, South Dakota; Wisc, Wisconsin]

Station number (Figure 1)	U.S. Geological Survey gaging station and (downstream order number)	Drainage area (mi ²)	Years of peak flow record	Date of flood	Peak Stage (feet)	Peak Discharge (ft ³ /s)	Recurrence interval (years)
Mississippi River Basin							
1	Mississippi River at Grand Rapids, Minn. (05211000)	3,370	118	Sept. 3, 1948	¹ 15.20	12,500	--
				April 17, 1969	--	² 4,610	--
				May 29, 1950	--	4,160	--
				April 16, 1945	--	4,070	--
				Aug. 21, 1999	--	4,060	--
				Apr. 18, 2001	10.06	³ 2,740	--
2	Mississippi River at Aitkin, Minn. (05227500)	6,140	102	May 20, 1950	22.49	20,000	--
				May 3, 1975	--	14,500	--
				April 23, 1969	--	14,400	--
				April 28, 2001	17.74	13,900	--
				April 26, 1965	--	13,400	--
3	<u>Mississippi River at Brainerd</u> (05242300)	7,320	14	April 30, 2001	16.70	17,800	--
				April 10, 1997	16.03	15,400	--
				April 30, 1996	14.59	14,000	--
				May 18, 1999	14.52	13,000	--
				July 10, 1993	13.65	12,200	--
4	Crow Wing River at Nimrod, Minn. (05244000)	1,030	73	Oct. 10, 1973	7.35	3,700	50-100
				April 18, 1979	7.24	3,610	50-100
				April 13, 1965	⁴ 7.57	2,890	10-25
				May 23, 1962	6.04	2,750	10-25
				June 9, 1968	6.07	2,750	10-25
				April 12, 2001	4.86	1,720(24th)	2-5
5	Long Prairie River at Long Prairie, Minn. (05245100)	434	30	July 22, 1972	9.37	3,270	50-100
				April 9, 2001	8.81	2,660	25-50
				April 20, 1979	7.55	1,850	10-25
				April 8, 1997	7.90	1,580	5-10
				April 1, 1986	7.10	1,570	5-10
6	<u>Crow Wing River near Pillager, Minn.</u> (05247500)	3,520	33	April 12, 2001	12.12	17,200	--
				April 12, 1969	--	16,600	--
				April 7, 1997	11.73	16,300	--
				April 15, 1996	10.16	13,900	--
				April 14, 1974	--	12,200	--
7	Sauk River near St. Cloud, Minn. (05270500)	1,030	67	April 13, 1965	10.68	9,100	200-500
				April 13, 1951	7.89	5,580	25-50
				April 13, 1952	7.78	5,410	25-50
				April 11, 1969	7.96	5,300	25-50
				April 6, 1997	8.72	5,150	~25
				April 14, 2001	8.37	4,780 (6th)	10-25
8	<u>Mississippi River at St. Cloud, Minn.</u> (05270700)	13,320	13	April 15, 2001	11.74	50,100	--
				April 8, 1997	11.44	46,900	--
				May 17, 1999	9.38	33,800	--
				April 22, 1996	8.70	27,300	--
				May 2, 1994	8.24	23,300	--
9	Elk River near Big Lake, Minn. (05275000)	559	75	April 16, 1965	10.86	7,360	50-100
				April 10, 1969	10.08	5,980	25-50
				April 10, 1952	10.36	5,330	10-25
				May 7, 1912	10.10	5,180	10-25
				June 16, 1984	9.87	4,980	10-25
				April 27, 2001	9.46	4,520 (6th)	10-25

Table 1. Provisional flood information on major Minnesota streams in the Mississippi River Basin. (Continued)

Station number (Figure 1)	U.S. Geological Survey gaging station and (downstream order number)	Drainage area (mi ²)	Years of peak flow record	Date of flood	Peak Stage (feet)	Peak Discharge (ft ³ /s)	Recurrence interval (years)
10	Crow River at Rockford, Minn. (05280000)	2,640	80	April 16, 1965	19.27	22,400	100-200
				April 13, 1969	16.51	15,100	25-50
				April 13, 1952	16.24	13,900	~25
				June 26, 1957	16.14	13,500	10-25
				April 16, 2001	14.50	13,400	10-25
11	Rum River near St. Francis, Minn. (05286000)	1,360	72	April 20, 1965	11.57	10,100	10-25
				April 13, 1969	11.63	10,100	10-25
				July 29, 1972	11.20	9,540	10-25
				April 13, 1952	11.03	9,260	10-25
				April 28, 2001	10.47	8,500	10-25
12	<u>Elm Creek near Champlin, Minn.</u> (05287890)	86	23	April 25, 2001	10.03	880	10-25
				Mar. 27, 1986	9.93	812	10-25
				April 30, 1994	9.69	669	5-10
				Mar. 18, 1985	9.50	579	5-10
				May 15, 1999	9.40	538	2-5
13	Mississippi River at Anoka, Minn. (05288500)	19,100	71	April 17, 1965	19.53	91,000	100-200
				April 14, 1952	17.51	75,900	25-50
				April 14, 1969	16.84	72,500	25-50
				April 9, 1997	16.44	69,800	25-50
				April 15, 2001	15.77	65,600	10-25
Minnesota River Basin							
14	Little Minnesota River near Peever, S. Dak (05290000)	438	54	July 25, 1993	13.58	8,900	50-100
				April 8, 1952	12.16	4,730	10-25
				Mar. 25, 1943	⁴ 13.35	4,320	10-25
				Mar. 28, 1997	8.82	3,590	10-25
				April 12, 2001	8.64	3,510	10-25
15	<u>Whetstone River near Big Stone City, S. Dak</u> (05291000)	398	75	April 8, 2001	15.93	9,980	25-50
				April 6, 1997	14.21	7,940	10-25
				April 8, 1969	14.32	6,870	10-25
				April 8, 1952	13.64	5,710	10-25
				April 11, 1947	13.95	5,500	10-25
16	Minnesota River at Ortonville, Minn. (05292000)	1,160	64	April 10, 1997	12.85	5,070	--
				April 14, 2001	12.06	4,850	--
				April 13, 1952	12.92	3,060	--
				July 28, 1993	9.99	2,950	--
				Mar. 27, 1989	10.76	⁵ 2,780	--
17	<u>North Fork Yellow Bank River near Odessa, S. Dak</u> (05292704)	208	11	April 8, 2001	16.84	7,300	--
				Mar. 31, 1997	15.94	4,670	--
				July 8, 1994	14.62	2,580	--
				April 19, 1995	14.15	2,420	--
				June 18, 1992	13.32	2,020	--
18	<u>Minnesota River near Lac qui Parle, Minn.</u> (05301000)	4,050	55	April 14, 2001	⁶ 40.05	30,000	--
				April 12, 1969	39.75	29,400	--
				April 10, 1952	37.98	⁷ 19,700	--
				April 8, 1986	36.80	⁷ 13,200	--
				April 14, 1965	36.17	⁷ 10,700	--
19	Chippewa River near Milan, Minn. (05304500)	1,880	65	April 6, 1997	18.03	14,400	50-100
				April 10, 2001	14.63	11,600	25-50
				April 9, 1969	⁸ 15.45	11,400	25-50
				July 6, 1995	⁸ 13.48	8,440	10-25
				April 6, 1952	⁸ 12.12	6,930	10-25

Table 1. Provisional flood information on major Minnesota streams in the Mississippi River Basin. (Continued)

Station number (Figure 1)	U.S. Geological Survey gaging station and (downstream order number)	Drainage area (mi ²)	Years of peak flow record	Date of flood	Peak Stage (feet)	Peak Discharge (ft ³ /s)	Recurrence interval (years)
20	Minnesota River at Montevideo, Minn. (05311000)	6,180	92	April 6, 1997	23.90	47,500	100-200
				April 12, 1969	21.68	35,100	50-100
				April 13, 2001	⁹ 22.15	33,800	50-100
				April 10, 1952	20.02	24,500	25-50
				June 25, 1919	17.45	22,000	~25
21	Yellow Medicine River near Granite Falls, Minn. (05313500)	664	71	April 10, 1969	14.90	17,200	100-200
				June 18, 1957	12.41	11,800	50-100
				April 9, 1952	10.50	9,610	25-50
				Mar. 31, 1997	11.80	9,020	25-50
				June 21, 1993	11.46	8,380	10-25
April 26, 2001	8.00	3,860 (10th)	5-10				
22	Redwood River near Marshall, Minn. (05315000)	259	62	May 9, 1993	17.00	6,380	50-100
				April 10, 1969	--	5,590	~50
				June 17, 1957	⁸ 10.14	5,370	25-50
				April 24, 2001	15.65	3,930	10-25
				Mar. 30, 1997	15.82	3,310	10-25
23	Redwood River near Redwood Falls, Minn. (05316500)	629	76	June 18, 1957	15.92	19,700	100-200
				April 9, 1969	14.58	14,100	50-100
				June 18, 1993	15.73	12,600	25-50
				Mar. 31, 1960	10.95	7,660	10-25
				Mar. 30, 1997	11.84	³ 7,200	10-25
April 25, 2001	10.93	5,830 (8th)	10-25				
24	Cottonwood River near New Ulm, Minn. (05317000)	1,300	75	April 10, 1969	19.15	28,700	~100
				April 8, 1965	³ 20.86	26,000	50-100
				June 19, 1993	18.90	24,300	50-100
				April 25, 2001	18.18	20,200	25-50
				Mar. 30, 1962	15.88	14,200	10-25
25	Little Cottonwood River near Courtland, Minn. (05317200)	170	28	June 20, 1993	¹⁰ 10.45	3,520	100-200
				April 5, 2001	9.31	2,010	10-25
				June 17, 1996	¹¹ 8.02	1,470	5-10
				Mar. 16, 1985	8.96	1,340	5-10
				Mar. 22, 1986	8.56	1,060	2-5
26	Watonwan River near Garden City, Minn. (05319500)	851	31	June 20, 1993	¹² 15.91	13,900	50-100
				April 15, 2001	12.28	7,400	~10
				May 21, 1944	9.84	5,620	5-10
				June 2, 1980	9.80	5,250	5-10
				June 20, 1996	9.44	4,820	2-5
27	Blue Earth River near Rapidan, Minn. (05320000)	2,410	89	April 9, 1965	21.36	43,100	--
				April 8, 1951	14.97	26,100	--
				April 10, 1969	13.54	21,100	--
				June 20, 1993	13.32	20,300	--
				June 9, 1953	12.91	19,700	--
April 14, 2001	12.04	17,200 (6th)	--				
28	Le Sueur River near Rapidan, Minn. (05320500)	1,110	59	April 8, 1965	22.10	24,700	~100
				May 22, 1960	22.72	21,200	50-100
				June 16, 2001	13.80	14,600	10-25
				April 7, 1951	19.73	13,200	10-25
				Feb. 28, 1992	⁴ 14.18	12,600	10-25
29	Minnesota River at Mankato, Minn. (05325000)	14,900	99	April 10, 1965	⁸ 29.09	94,100	100-200
				April 10, 1997	27.61	79,800	50-100
				April 12, 1969	⁸ 27.07	76,700	50-100
				June 21, 1993	30.11	75,600	50-100
				April 16, 2001	26.96	73,700	25-50

Table 1. Provisional flood information on major Minnesota streams in the Mississippi River Basin. (Continued)

Station number (Figure 1)	U.S. Geological Survey gaging station and (downstream order number)	Drainage area (mi ²)	Years of peak flow record	Date of flood	Peak Stage (feet)	Peak Discharge (ft ³ /s)	Recurrence interval (years)
30	High Island Creek near Henderson, Minn. (05327000)	238	27	July 25, 1997	9.31	2,830	10-25
				June 17, 1993	9.72	2,750	10-25
				April 18, 2001	¹⁰ 9.81	2,200	5-10
				Sep. 15, 1992	8.32	1,770	2-5
				Aug. 25, 1981	9.09	1,760	2-5
31	Minnesota River near Jordan, Minn. (05330000)	16,200	67	April 11, 1965	--	⁸ 117,000	~100
				June 24, 1993	33.52	92,200	25-50
				April 18, 2001	33.11	87,100	25-50
				April 14, 1969	32.85	84,600	25-50
				April 12, 1997	32.24	82,300	25-50
Mississippi River Basin							
32	Mississippi River at St. Paul, Minn. (05331000)	36,800	134	April 16, 1965	⁸ 26.01	171,000	200-500
				April 15, 1969	⁸ 24.52	156,000	100-200
				April 18, 2001	23.46	140,000	50-100
				April 13, 1997	⁸ 22.37	134,000	50-100
				April 16, 1952	⁸ 22.02	125,000	25-50
St. Croix River Basin							
33	Kettle River below Sandstone, Minn. (05336700)	868	35	July 23, 1972	15.38	17,200	25-50
				April 24, 2001	14.67	15,600	10-25
				April 21, 1979	13.40	13,700	10-25
				April 1965	12.96	13,400	10-25
				April 12, 1971	12.36	12,100	5-10
34	<u>Knife River near Mora, Minn.</u> (05337400)	102	27	April 23, 2001	7.76	3,450	25-50
				April 6, 1997	6.48	1,870	5-10
				May 10, 1979	6.31	1,840	5-10
				April 1, 1986	6.22	1,780	5-10
				Aug. 27, 1995	6.00	1,580	~5
35	Snake River near Pine City, Minn. (05338500)	974	51	July 27, 1972	10.38	14,300	25-50
				May 9, 1950	--	12,500	10-25
				April 18, 1965	9.56	11,500	10-25
				April 27, 2001	9.23	11,000	10-25
				April 12, 1969	9.08	10,200	5-10
36	<u>St. Croix River at St. Croix Falls, WI</u> (05340500)	6,240	96	April 25, 2001	25.88	60,900	50-100
				May 8, 1950	25.19	54,900	25-50
				April 18, 1965	20.98	45,700	10-25
				Mar. 20, 1945	20.53	44,600	10-25
				May 4, 1954	20.40	44,400	10-25
Mississippi River Basin							
37	Mississippi River at Prescott, WI (05344500)	44,800	73	April 18, 1965	43.11	228,000	100-200
				April 16, 1969	41.48	199,000	50-100
				April 16, 2001	40.35	178,000	25-50
				April 12, 1997	40.09	161,000	25-50
				April 16, 1952	39.03	155,000	~25
38	Vermillion River near Empire, Minn. (05345000)	129	33	Sep. 16, 1992	10.00	6,570	25-50
				April 1965	7.50	6,200	25-50
				June 27, 1998	9.17	3,490	10-25
				Sep. 18, 1942	6.00	2,030	5-10
				June 18, 1993	8.37	1,780	~5
April 8, 2001	6.81	677 (14th)	1-2				
39	Straight River near Faribault, Minn. (05353800)	435	36	July 7, 1990	11.31	6,030	10-25
				April 13, 2001	10.73	6,010	10-25
				May 1, 1990	11.20	5,990	10-25
				July 1, 1983	11.11	5,840	10-25
				June 17, 1993	11.16	5,730	10-25

Table 1. Provisional flood information on major Minnesota streams in the Mississippi River Basin. (Continued)

Station number (Figure 1)	U.S. Geological Survey gaging station and (downstream order number)	Drainage area (mi ²)	Years of peak flow record	Date of flood	Peak Stage (feet)	Peak Discharge (ft ³ /s)	Recurrence interval (years)
40	Cannon River at Welch, Minn. (05355200)	1,340	70	April 8, 1965	14.01	36,100	200-500
				June 27, 1998	15.05	23,500	25-50
				Feb. 10, 1966	⁴ 13.93	20,800	25-50
				Sep. 22, 1986	13.80	18,900	10-25
				June 17, 1993	13.19	17,200	10-25
				April 12, 2001	11.43	11,900 (9th)	5-10
41	South Fork Zumbro River at Rochester, Minn. (05372995)	303	51	July 6, 1978	⁸ 23.36	30,500	100-200
				Mar. 1, 1965	⁸ 19.12	19,600	25-50
				Mar. 29, 1962	⁸ 18.46	18,000	25-50
				July 21, 1951	⁸ 17.50	15,000	25-50
				Mar. 26, 1961	⁸ 15.43	10,900	10-25
				April 12, 2001	13.68	5220 (17th)	2-5
42	Mississippi River at Winona, Minn. (05378500)	59,200	122	April 19, 1965	20.77	268,000	200-500
				April 17, 2001	20.07	237,000	~100
				April 19, 1969	19.44	218,000	50-100
				April 11, 1997	18.27	194,000	25-50
				April 20, 1952	17.91	190,000	~25
43	Cedar River near Austin, Minn. (05457000)	399	62	July 10, 2000	21.49	15,300	100-200
				July 17, 1978	20.35	12,400	25-50
				Aug. 15, 1993	19.43	10,800	10-25
				Mar. 29, 1962	17.18	9,530	10-25
				Mar. 26, 1961	17.03	9,400	10-25
				April 12, 2001	15.77	7,710 (11th)	5-10
Des Moines River Basin							
44	Des Moines River at Jackson, Minn. (05476000)	1,250	76	April 11, 1969	19.45	15,700	~200
				April 9, 1965	--	9,530	25-50
				June 8, 1953	17.43	8,360	25-50
				July 7, 1993	16.67	8,250	25-50
				April 13, 1984	16.31	7,770	10-25
				April 28, 2001	15.47	6,590 (6th)	10-25

¹ Result of dam failure.

² Daily-mean discharge

³ Reached a higher discharge on Nov. 11, 2000; discharge, 2,980 ft³/s.

⁴ Backwater from ice.

⁵ Estimated value.

⁶ Flood of April 7, 1997 reached a stage of 41.66 ft (information from the U.S. Army Corp of Engineers)

⁷ Affected to an unknown degree by regulation.

⁸ Site then in use.

⁹ Gage height from U.S. Army Corp of Engineers.

¹⁰ Possible backwater from the Minnesota River.

¹¹ Maximum recorded, was probably higher.

¹² Maximum stage and discharge outside the period of record: April 7, 1965, stage, 18.89 ft; discharge, 19,000 ft³/s. Historic peaks used in flood-frequency analysis.

July 16, 2001, URL http://climate.umn.edu/doc/journal/flood_2001/flood_2001.htm). With additional snowfall throughout the winter, total accumulation in parts of southern Minnesota was 18 to 24 inches greater than for a normal winter, placing total snowfall in the 90 to 95 percentiles. Typically, the snow pack would lose much of its' water equivalence from late winter to early spring, before the arrival of spring rains. However, below-normal temperatures for February and March delayed the snowmelt and only compacted the existing snow cover. Snow-to-water equivalents in early March ranged from 3 to 5 inches and by the end of March had changed little. In April, heavy rains fell over much of the central and southern parts of the State. Precipitation totals for the month were greater than 6 inches in some areas, which was greater than 4 inches above normal. This rainfall, along with the greater than normal snow-to-water equivalents, provided the runoff that resulted in spring flooding. These climatic conditions accounted for most of the flooding in Minnesota during spring 2001. Depth of ground frost, which was minimized by early snowfalls that insulated the ground from the cold winter air, was minimal in many parts of southern Minnesota that otherwise had most of the conditions that can lead to serious flood potential.

CHRONOLOGY OF FLOODING

By the first week of April, tributaries to the Minnesota River, Mississippi River,

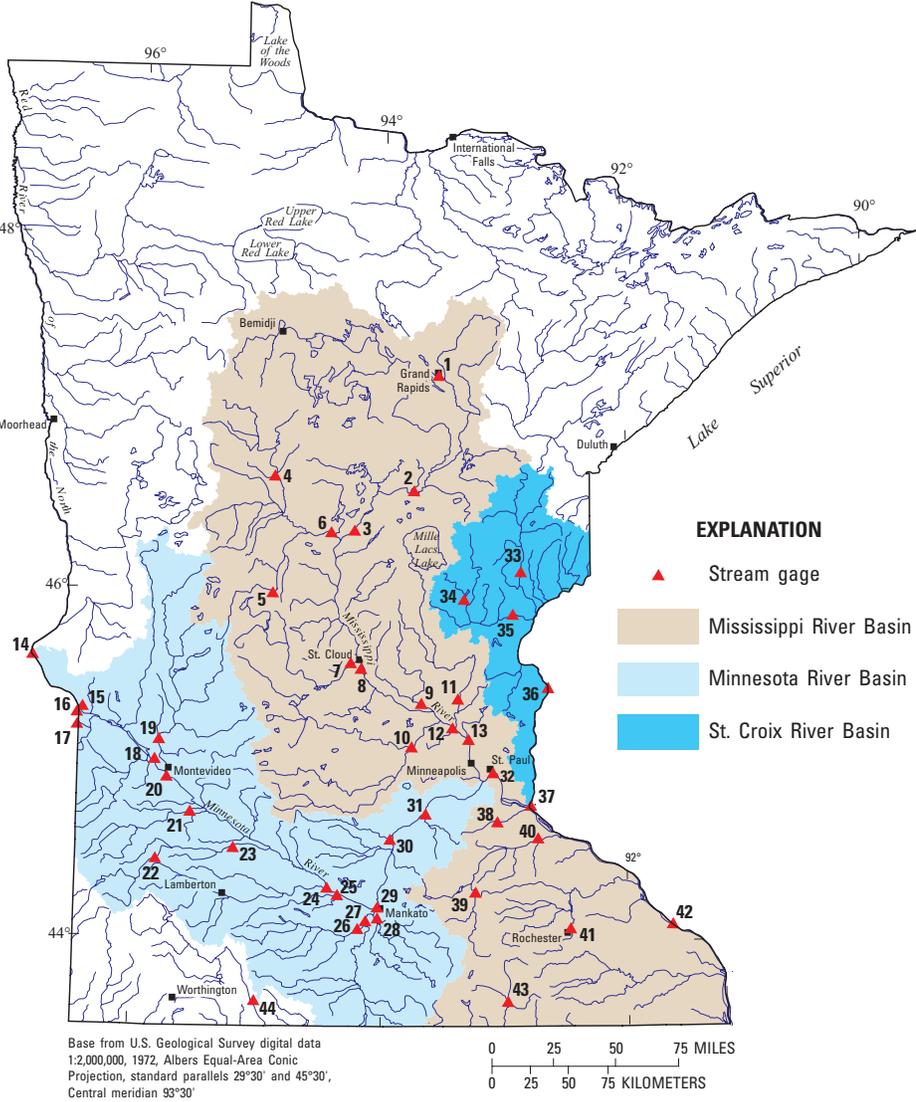


Figure 1. Location of stream-gaging stations.

depending on the magnitude of these additional flows. This is a primary reason why flood frequencies are not included in this report for stations with less than 20 years of record. Even with 20 or more years of record, significant changes to previously established flood frequencies are possible.

This report presents preliminary water-resources 2001 flood data obtained from streamflow-gaging stations in the Mississippi River Basin (fig. 1).

CLIMATIC CONDITIONS

Above normal rains in early November 2000 followed by snowfalls later in the month resulted in precipitation totals that were well above historical

averages for the month, particularly in the central and southwestern portions of Minnesota (Minnesota State Climatology Office, electronic commun., accessed



Mississippi River at Harriet Island, downtown St. Paul, Minn., April 19, 2001. (U.S. Geological Survey)

and St. Croix Rivers were on the rise. Rainfall amounts ranging from about 1.0 inch to greater than 2.0 inches fell in west-central Minnesota and east-central South Dakota on April 6th and 7th. On April 8th the Whetstone River near Big Stone City, South Dakota (station number 15, table 1) crested at a stage of 15.93 feet while the North Fork of the Yellow Bank River near Odessa (station number 17, table 1) crested at 16.84 feet. Both crests were records for the period of gage operation. The recurrence interval of the peak discharge on the Whetstone River was between 25-year and 50-years. Other tributaries to the Minnesota River, as well as the Minnesota River at and upstream of Montevideo, were cresting by the second week of April.

Record flows were recorded on the Crow Wing River near Pillager (April 12, station number 6, table 1), Minnesota River near Lac qui Parle (April 14th, station

number 18, table 1), and Mississippi River at St. Cloud (April 15th, station number 8, table 1), and Elm Creek near Champlin, Minn. (April 25, station number 12, table 1). These three sites are influenced by regulation and thus no recurrence intervals were computed. By comparison, the Minnesota River at Montevideo (station number 20, table 1) reached its' third highest discharge of record on April 13. This flow had a recurrence interval of between 50 and 100 years. On April 23rd the flooding was aggravated and prolonged when a storm produced greater than two inches of rain throughout much of Minnesota, and in some localities, greater than 3 inches (Minnesota State Climatology Office, electronic comm., accessed Aug. 15, 2001, URL <http://climate.umn.edu/doc/journal/april2001.htm>). The cities of Lamberton, St. Cloud, and Worthington all reported greater than 3.5 inches of rain. Rivers

tributary to the St. Croix as well as the St. Croix River itself crested towards the end of April. Record flows were recorded at the Knife River near Mora (April 23rd, station number 34, table 1) and the St. Croix River at St. Croix Falls, Wisconsin (April 25th, station number 36, table 1). The peak flow at St. Croix River at St. Croix Falls had a recurrence interval of 50-100 years, while the recurrence intervals for the peak flows on the Knife and Kettle (station number 33, table 1) Rivers were in the 25-50 and 10-25 year range, respectively.

In summary, four stream-gaging stations recorded peak flows between the 50-year and 100-year recurrence interval: the Minnesota River at Montevideo; Mississippi River at St. Paul; St. Croix River at St. Croix Falls, Wisconsin; and Mississippi River at Winona. Six stations with at least 20 years of record had record peak flows. These include the Crow Wing River near Pillager; Elm Creek near Champlin; Whetstone River near Big Stone City, South Dakota; Minnesota River near Lac qui Parle; Knife River near Mora; and St. Croix River at St. Croix Falls, Wisconsin.

The USGS wishes to acknowledge the support and cooperation of these agencies that assisted with the collection of field data: U.S. Army Corps of Engineers, Minnesota Department of Natural Resources, and National Weather Service.

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Log jam on the Minnesota River at Carver, Minn., April 25, 2001. (Minnesota Department of Public Safety, Emergency Management)

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