U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
Following Bulletin 17-B Guidelines
Program peakfq
(Version 4.0, December, 2000)

Station - 05378500 MISSISSIPPI RIVER AT WINONA, MN
2002 MAR 13 09:02:57

I N P U T D A T A S U M M A R Y

Number of peaks in record	=	121
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	121
Historic peaks in analysis	=	0
Years of historic record	=	0
Generalized skew	=	-0.397
Standard error of generalized skew	=	0.550
Skew option	=	WEIGHTED
Gage base discharge	=	0.0
User supplied high outlier threshold	=	--
User supplied low outlier criterion	=	--
Plotting position parameter	=	0.00

********* NOTICE -- Preliminary machine computations. *********
********* User responsible for assessment and interpretation. *********

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE. 0.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION. 22845.0
WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE. 340194.2

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ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.9453	0.1904	-0.163
BULL.17B ESTIMATE	0.0	1.0000	4.9453	0.1904	-0.197

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL EXCEEDANCE PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	'EXPECTED PROBABILITY' ESTIMATE	95-PCT CONFIDENCE LIMITS FOR BULL. 17B ESTIMATES LOWER	UPPER
0.9950	26290.0	26650.0	25570.0	22410.0	29990.0
0.9900	29850.0	30180.0	29220.0	25800.0	33710.0
0.9500	41860.0	42030.0	41450.0	37420.0	46040.0
0.9000	49840.0	49910.0	49540.0	45260.0	54180.0
0.8000	61250.0	61200.0	61080.0	56500.0	65860.0
0.5000	89430.0	89210.0	89430.0	83740.0	95550.0
0.2000	127900.0	127900.0	128300.0	119000.0	138800.0
0.1000	153100.0	153300.0	153800.0	141000.0	168300.0
0.0400	184200.0	185200.0	185900.0	167600.0	205900.0
0.0200	207000.0	208700.0	209500.0	186700.0	234000.0
0.0100	229300.0	231900.0	232900.0	205200.0	261900.0
0.0050	251400.0	255000.0	256300.0	223300.0	289900.0
0.0020	280500.0	285600.0	287500.0	246900.0	327200.0
0.6667	73871.1	(1.50-year flood)			
0.4292	96721.3	(2.33-year flood)			

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I N P U T D A T A L I S T I N G

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1879	65500.0		1941	86700.0	
1880	172000.0		1942	103000.0	
1881	129000.0		1943	135000.0	
1882	132000.0		1944	105000.0	
1883	102000.0		1945	115000.0	
1884	90400.0		1946	92700.0	
1885	63600.0		1947	79400.0	
1886	81900.0		1948	77100.0	
1887	85200.0		1949	65200.0	
1888	140000.0		1950	122000.0	
1889	32600.0		1951	178000.0	
1890	58000.0		1952	190000.0	
1891	63600.0		1953	82800.0	
1892	101000.0		1954	156000.0	
1893	108000.0		1955	64400.0	
1894	118000.0		1956	91700.0	
1895	49000.0		1957	95800.0	
1896	104000.0		1958	43500.0	
1897	164000.0		1959	41900.0	
1898	83000.0		1960	70000.0	
1899	95600.0		1961	67600.0	
1900	72200.0		1962	92200.0	
1901	96900.0		1963	51400.0	
1902	47200.0		1964	65700.0	
1903	136000.0		1965	268000.0	
1904	75300.0		1966	105000.0	
1905	125000.0		1967	166000.0	
1906	118000.0		1968	75000.0	
1907	115000.0		1969	218000.0	
1908	119000.0		1970	64400.0	
1909	75300.0		1971	133000.0	
1910	63600.0		1972	98700.0	
1911	32600.0		1973	136000.0	
1912	95600.0		1974	81600.0	
1913	67400.0		1975	166000.0	
1914	107000.0		1976	120000.0	
1915	73200.0		1977	44800.0	
1916	160000.0		1978	89000.0	
1917	116000.0		1979	131000.0	
1918	80800.0		1980	69000.0	
1919	110000.0		1981	69800.0	
1920	157000.0		1982	138000.0	
1921	44700.0		1983	138000.0	
1922	145000.0		1984	106000.0	
1924	54400.0		1985	101000.0	
1925	38000.0		1986	167000.0	
1926	57100.0		1987	40900.0	
1927	62600.0		1988	46800.0	

1928	80800.0	1989	79400.0
1929	78300.0	1990	74700.0
1930	41100.0	1991	92900.0
1931	31600.0	1992	92000.0
1932	62600.0	1993	168000.0
1933	38600.0	1994	107000.0
1934	55500.0	1995	84100.0
1935	76200.0	1996	144000.0
1936	94900.0	1997	194000.0
1937	49200.0	1998	118000.0
1938	93400.0	1999	110000.0
1939	93900.0	2000	62700.0
1940	51700.0		

Explanation of peak discharge qualification codes

PEAKFQ CODE	WATSTORE CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
H	7	Historic peak

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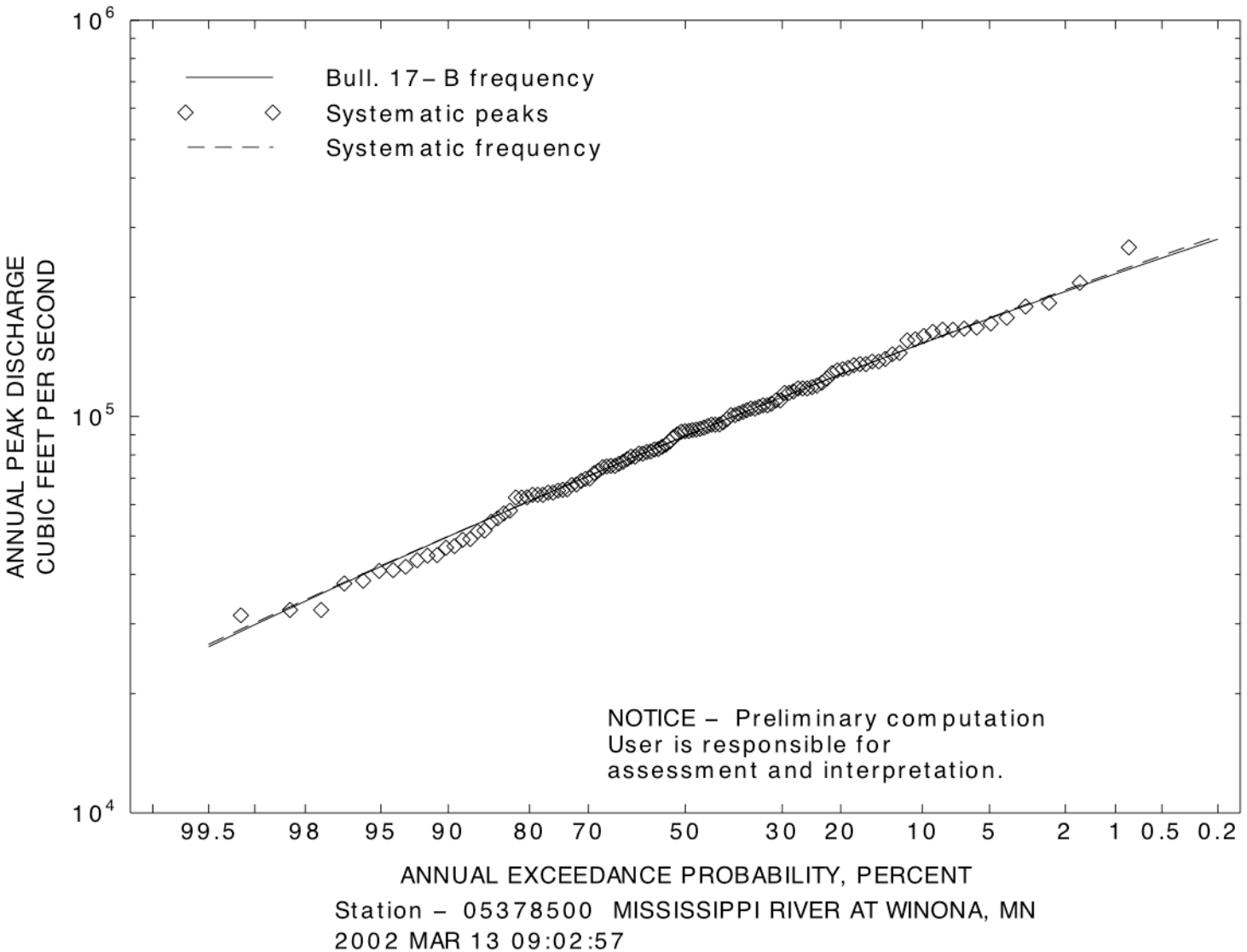
EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	BULL.17B ESTIMATE
1965	268000.0	0.0082	0.0082
1969	218000.0	0.0164	0.0164
1997	194000.0	0.0246	0.0246
1952	190000.0	0.0328	0.0328
1951	178000.0	0.0410	0.0410
1880	172000.0	0.0492	0.0492
1993	168000.0	0.0574	0.0574
1986	167000.0	0.0656	0.0656
1967	166000.0	0.0738	0.0738
1975	166000.0	0.0820	0.0820
1897	164000.0	0.0902	0.0902
1916	160000.0	0.0984	0.0984
1920	157000.0	0.1066	0.1066
1954	156000.0	0.1148	0.1148
1922	145000.0	0.1230	0.1230
1996	144000.0	0.1311	0.1311
1888	140000.0	0.1393	0.1393
1982	138000.0	0.1475	0.1475
1983	138000.0	0.1557	0.1557
1903	136000.0	0.1639	0.1639
1973	136000.0	0.1721	0.1721
1943	135000.0	0.1803	0.1803
1971	133000.0	0.1885	0.1885
1882	132000.0	0.1967	0.1967
1979	131000.0	0.2049	0.2049
1881	129000.0	0.2131	0.2131
1905	125000.0	0.2213	0.2213
1950	122000.0	0.2295	0.2295
1976	120000.0	0.2377	0.2377
1908	119000.0	0.2459	0.2459
1894	118000.0	0.2541	0.2541
1906	118000.0	0.2623	0.2623
1998	118000.0	0.2705	0.2705
1917	116000.0	0.2787	0.2787
1907	115000.0	0.2869	0.2869
1945	115000.0	0.2951	0.2951
1919	110000.0	0.3033	0.3033
1999	110000.0	0.3115	0.3115
1893	108000.0	0.3197	0.3197
1914	107000.0	0.3279	0.3279
1994	107000.0	0.3361	0.3361
1984	106000.0	0.3443	0.3443
1944	105000.0	0.3525	0.3525
1966	105000.0	0.3607	0.3607
1896	104000.0	0.3689	0.3689
1942	103000.0	0.3770	0.3770
1883	102000.0	0.3852	0.3852
1892	101000.0	0.3934	0.3934

1985	101000.0	0.4016	0.4016
1972	98700.0	0.4098	0.4098
1901	96900.0	0.4180	0.4180
1957	95800.0	0.4262	0.4262
1899	95600.0	0.4344	0.4344
1912	95600.0	0.4426	0.4426
1936	94900.0	0.4508	0.4508
1939	93900.0	0.4590	0.4590
1938	93400.0	0.4672	0.4672
1991	92900.0	0.4754	0.4754
1946	92700.0	0.4836	0.4836
1962	92200.0	0.4918	0.4918
1992	92000.0	0.5000	0.5000
1956	91700.0	0.5082	0.5082
1884	90400.0	0.5164	0.5164
1978	89000.0	0.5246	0.5246
1941	86700.0	0.5328	0.5328
1887	85200.0	0.5410	0.5410
1995	84100.0	0.5492	0.5492
1898	83000.0	0.5574	0.5574
1953	82800.0	0.5656	0.5656
1886	81900.0	0.5738	0.5738
1974	81600.0	0.5820	0.5820
1918	80800.0	0.5902	0.5902
1928	80800.0	0.5984	0.5984
1947	79400.0	0.6066	0.6066
1989	79400.0	0.6148	0.6148
1929	78300.0	0.6230	0.6230
1948	77100.0	0.6311	0.6311
1935	76200.0	0.6393	0.6393
1904	75300.0	0.6475	0.6475
1909	75300.0	0.6557	0.6557
1968	75000.0	0.6639	0.6639
1990	74700.0	0.6721	0.6721
1915	73200.0	0.6803	0.6803
1900	72200.0	0.6885	0.6885
1960	70000.0	0.6967	0.6967
1981	69800.0	0.7049	0.7049
1980	69000.0	0.7131	0.7131
1961	67600.0	0.7213	0.7213
1913	67400.0	0.7295	0.7295
1964	65700.0	0.7377	0.7377
1879	65500.0	0.7459	0.7459
1949	65200.0	0.7541	0.7541
1955	64400.0	0.7623	0.7623
1970	64400.0	0.7705	0.7705
1885	63600.0	0.7787	0.7787
1891	63600.0	0.7869	0.7869
1910	63600.0	0.7951	0.7951
2000	62700.0	0.8033	0.8033
1927	62600.0	0.8115	0.8115
1932	62600.0	0.8197	0.8197
1890	58000.0	0.8279	0.8279
1926	57100.0	0.8361	0.8361
1934	55500.0	0.8443	0.8443
1924	54400.0	0.8525	0.8525
1940	51700.0	0.8607	0.8607
1963	51400.0	0.8689	0.8689
1937	49200.0	0.8770	0.8770
1895	49000.0	0.8852	0.8852

1902	47200.0	0.8934	0.8934
1988	46800.0	0.9016	0.9016
1977	44800.0	0.9098	0.9098
1921	44700.0	0.9180	0.9180
1958	43500.0	0.9262	0.9262
1959	41900.0	0.9344	0.9344
1930	41100.0	0.9426	0.9426
1987	40900.0	0.9508	0.9508
1933	38600.0	0.9590	0.9590
1925	38000.0	0.9672	0.9672
1889	32600.0	0.9754	0.9754
1911	32600.0	0.9836	0.9836
1931	31600.0	0.9918	0.9918


Bull. 17–B frequency
Systematic peaks
Systematic frequency
NOTICE – Preliminary computation
User is responsible for
assessment and interpretation.
ANNUAL PEAK DISCHARGE
CUBIC FEET PER SECOND
10^6
10^5
10^4
99.5 98 95 90 80 70 50 30 20 10 5 2 1 0.5 0.2
ANNUAL EXCEEDANCE PROBABILITY, PERCENT
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