

Annual Peak-Flow Frequency Analysis

For more information on the contents of this documentation, see Kessler and others (2013).

Streamgauge number and name:

04010500 Pigeon River at Middle Falls near Grand Portage, Minn.

Peak-flow information:

Number of systematic peak flows in record	88
Systematic period begins	1924
Systematic period ends	2011
Length of systematic record	88
Years without information	0
Number of historical peak flows in record	0

Frequency analysis options:

Method	Expected moments algorithm (EMA)
Skew option	Weighted
Generalized skew	0.5
Standard error of generalized skew	0.4266
Low-outlier method	Multiple Grubbs-Beck test

EMA systematic record analysis results:

Moments of the common logarithms of the peak flows:

	Standard	
Mean	deviation	Skewness
3.6277	0.1724	0.218

Low-outlier information:

Number of low outliers	8
Low-outlier threshold	2,470

Final analysis results:

Moments of the common logarithms of the peak flows:

	Standard	
Mean	deviation	Skewness
3.6282	0.1712	0.326

Annual frequency curve at selected exceedance probabilities:

Exceedance probability	Peak estimate	Lower-95 level	Upper-95 level
0.9950	1,740	1,160	2,100
0.9900	1,870	1,320	2,200
0.9500	2,310	1,860	2,560
0.9000	2,600	2,230	2,850
0.8000	3,030	2,730	3,300
0.6667	3,530	3,230	3,850
0.5000	4,160	3,810	4,560
0.4292	4,460	4,080	4,900
0.2000	5,870	5,320	6,610
0.1000	7,120	6,360	8,350
0.0400	8,840	7,670	11,200
0.0200	10,200	8,650	13,900
0.0100	11,700	9,620	17,200
0.0050	13,200	10,600	21,100
0.0020	15,400	11,900	27,700

Peak-flow data used in the analysis:

Explanation of symbols and codes

-- none

* Less than low-outlier threshold

Water	Peak	Peak-flow	Water	Peak	Peak-flow
year	flow	code	year	flow	code
1924	3,470	--	1961	3,540	--
1925	5,320	--	1962	1,580	*
1926	3,180	--	1963	2,850	--
1927	7,370	--	1964	8,270	--
1928	6,200	--	1965	4,390	--
1929	1,280	*	1966	4,050	--
1930	3,860	--	1967	3,990	--
1931	7,600	--	1968	3,630	--
1932	3,300	--	1969	4,700	--
1933	4,350	--	1970	5,780	--
1934	11,000	--	1971	5,040	--
1935	5,340	--	1972	4,830	--
1936	7,390	--	1973	3,200	--
1937	5,750	--	1974	4,560	--
1938	4,790	--	1975	3,550	--
1939	4,600	--	1976	6,450	--
1940	3,630	--	1977	10,500	--
1941	5,840	--	1978	3,890	--
1942	4,140	--	1979	7,490	--
1943	3,620	--	1980	2,990	--
1944	4,540	--	1981	3,320	--
1945	6,340	--	1982	5,820	--
1946	3,320	--	1983	3,360	--
1947	6,500	--	1984	3,510	--
1948	10,000	--	1985	4,010	--
1949	3,320	--	1986	5,340	--
1950	7,380	--	1987	2,000	*
1951	7,490	--	1988	4,160	--
1952	4,900	--	1989	3,680	--
1953	4,160	--	1990	3,060	--
1954	9,250	--	1991	3,790	--
1955	3,180	--	1992	4,260	--
1956	4,200	--	1993	3,010	--
1957	5,580	--	1994	3,800	--
1958	793	*	1995	2,470	--
1959	2,160	*	1996	6,410	--
1960	3,140	--	1997	3,810	--

Water year	Peak flow	Peak-flow code
1998	2,130	*
1999	4,690	--
2000	2,600	--
2001	5,880	--
2002	2,890	--
2003	3,550	--
2004	3,680	--
2005	3,770	--
2006	3,460	--
2007	1,010	*
2008	7,650	--
2009	4,180	--
2010	798	*
2011	3,500	--