

Annual Peak-Flow Frequency Analysis

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

Streamgauge number and name:

05275000 Elk River near Big Lake, Minn.

Peak-flow information:

| | |
|---|------|
| Number of systematic peak flows in record | 84 |
| Systematic period begins | 1911 |
| Systematic period ends | 2011 |
| Length of systematic record | 101 |
| Years without information | 17 |
| Number of historical peak flows in record | 0 |

Frequency analysis options:

| | |
|------------------------------------|----------------------------------|
| Method | Expected moments algorithm (EMA) |
| Skew option | Weighted |
| Generalized skew | -0.21 |
| Standard error of generalized skew | 0.4266 |
| Low-outlier method | Single Grubbs-Beck test |

EMA systematic record analysis results:

Moments of the common logarithms of the peak flows:

| | Standard | |
|--------|-----------|----------|
| Mean | deviation | Skewness |
| 3.1817 | 0.3486 | -0.778 |

Low-outlier information:

| | |
|------------------------|-----|
| Number of low outliers | 1 |
| Low-outlier threshold | 178 |

Final analysis results:

Moments of the common logarithms of the peak flows:

| | Standard | |
|--------|-----------|----------|
| Mean | deviation | Skewness |
| 3.1820 | 0.3473 | -0.559 |

Annual frequency curve at selected exceedance probabilities:

[WIE, Weighted independent estimate; --, not computed]

| Exceedance probability | Peak estimate | Lower-95 level | Upper 95 level | WIE estimate | Lower-95 WIE level | Upper 95 WIE level |
|------------------------|---------------|----------------|----------------|--------------|--------------------|--------------------|
| 0.9950 | 128 | 39.4 | 214 | -- | -- | -- |
| 0.9900 | 172 | 64.8 | 268 | -- | -- | -- |
| 0.9500 | 364 | 212.0 | 492 | -- | -- | -- |
| 0.9000 | 526 | 357.0 | 677 | -- | -- | -- |
| 0.8000 | 800 | 610.0 | 987 | -- | -- | -- |
| 0.6667 | 1,150 | 927.0 | 1,390 | -- | -- | -- |
| 0.5000 | 1,640 | 1,360.0 | 1,960 | 1,640 | 1,380 | 1,960 |
| 0.4292 | 1,880 | 1,570.0 | 2,240 | -- | -- | -- |
| 0.2000 | 3,020 | 2,540.0 | 3,600 | 3,000 | 2,540 | 3,540 |
| 0.1000 | 3,990 | 3,360.0 | 4,910 | 3,970 | 3,330 | 4,740 |
| 0.0400 | 5,230 | 4,300.0 | 6,860 | 5,190 | 4,180 | 6,460 |
| 0.0200 | 6,130 | 4,870.0 | 8,500 | 6,070 | 4,680 | 7,870 |
| 0.0100 | 7,010 | 5,330.0 | 10,300 | 6,940 | 5,110 | 9,420 |
| 0.0050 | 7,860 | 5,700.0 | 12,300 | -- | -- | -- |
| 0.0020 | 8,940 | 6,080.0 | 15,300 | 8,870 | 5,860 | 13,400 |

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 |
| 1911 | 264 | -- | 1961 | 486 | -- |
| 1912 | 5,180 | -- | 1962 | 2,040 | -- |
| 1913 | 426 | -- | 1963 | 982 | -- |
| 1914 | 925 | -- | 1964 | 1,620 | -- |
| 1915 | 432 | -- | 1965 | 7,360 | -- |
| 1916 | 4,130 | -- | 1966 | 2,090 | -- |
| 1917 | 2,930 | -- | 1967 | 2,630 | -- |
| Gap in systematic record | | | 1968 | 633 | -- |
| 1932 | 436 | -- | 1969 | 5,980 | -- |
| 1933 | 178 | -- | 1970 | 1,200 | -- |
| 1934 | 144 | * | 1971 | 1,630 | -- |
| 1935 | 690 | -- | 1972 | 2,140 | -- |
| 1936 | 2,000 | -- | 1973 | 2,440 | -- |
| 1937 | 1,160 | -- | 1974 | 599 | -- |
| 1938 | 2,740 | -- | 1975 | 2,910 | -- |
| 1939 | 2,920 | -- | 1976 | 1,980 | -- |
| 1940 | 1,240 | -- | 1977 | 779 | -- |
| 1941 | 1,450 | -- | 1978 | 2,060 | -- |
| 1942 | 1,560 | -- | 1979 | 2,740 | -- |
| 1943 | 3,500 | -- | 1980 | 912 | -- |
| 1944 | 1,740 | -- | 1981 | 686 | -- |
| 1945 | 3,150 | -- | 1982 | 2,380 | -- |
| 1946 | 1,960 | -- | 1983 | 2,750 | -- |
| 1947 | 950 | -- | 1984 | 4,980 | -- |
| 1948 | 2,800 | -- | 1985 | 2,520 | -- |
| 1949 | 1,750 | -- | 1986 | 2,990 | -- |
| 1950 | 2,730 | -- | 1987 | 590 | -- |
| 1951 | 3,280 | -- | Gap in systematic record | | |
| 1952 | 5,330 | -- | 1991 | 2,070 | -- |
| 1953 | 1,320 | -- | 1992 | 1,790 | -- |
| 1954 | 3,120 | -- | 1993 | 716 | -- |
| 1955 | 1,470 | -- | 1994 | 1,130 | -- |
| 1956 | 3,100 | -- | 1995 | 1,730 | -- |
| 1957 | 2,500 | -- | 1996 | 1,180 | -- |
| 1958 | 538 | -- | 1997 | 4,070 | -- |
| 1959 | 330 | -- | 1998 | 1,260 | -- |
| 1960 | 1,580 | -- | 1999 | 921 | -- |

| Water year | Peak flow | Peak-flow code |
|---------------|--------------|-------------------|
| 2000 | 426 | -- |
| 2001 | 4,490 | -- |
| 2002 | 2,240 | -- |
| 2003 | 1,620 | -- |
| 2004 | 1,130 | -- |
| 2005 | 1,250 | -- |
| 2006 | 1,720 | -- |
| 2007 | 1,110 | -- |
| 2008 | 1,200 | -- |
| 2009 | 2,810 | -- |
| 2010 | 1,370 | -- |
| 2011 | 2,260 | -- |