

Annual Peak-Flow Frequency Analysis

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

Streamgauge number and name:

05319500 Watonwan River near Garden City, Minn.

Peak-flow information:

| | | |
|---|------|------------------|
| Number of systematic peak flows in record | 39 | |
| Systematic period begins | 1940 | |
| Systematic period ends | 2011 | |
| Length of systematic record | 72 | |
| Years without information | 33 | |
| Number of historical peak flows in record | 5 | 1953, 1965, 1969 |

Frequency analysis options:

| | |
|------------------------------------|----------------------------------|
| Method | Expected moments algorithm (EMA) |
| Skew option | Weighted |
| Generalized skew | -0.13 |
| Standard error of generalized skew | 0.426 |
| 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 |
| 3.4801 | 0.3728 | -0.228 |

Low-outlier information:

| | |
|------------------------|----------------|
| Number of low outliers | 0 |
| Low-outlier threshold | Not determined |

Final analysis results:

Moments of the common logarithms of the peak flows:

| | Standard | |
|--------|-----------|----------|
| Mean | deviation | Skewness |
| 3.4793 | 0.3718 | -0.178 |

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 | 288 | 69.9 | 516 | -- | -- | -- |
| 0.9900 | 368 | 111.0 | 619 | -- | -- | -- |
| 0.9500 | 707 | 347.0 | 1,040 | -- | -- | -- |
| 0.9000 | 991 | 582.0 | 1,390 | -- | -- | -- |
| 0.8000 | 1,480 | 997.0 | 1,990 | -- | -- | -- |
| 0.6667 | 2,130 | 1,540.0 | 2,800 | -- | -- | -- |
| 0.5000 | 3,090 | 2,310.0 | 4,010 | 3,060 | 2,380 | 3,950 |
| 0.4292 | 3,600 | 2,720.0 | 4,650 | -- | -- | -- |
| 0.2000 | 6,240 | 4,750.0 | 8,110 | 6,170 | 4,740 | 8,050 |
| 0.1000 | 8,870 | 6,710.0 | 12,000 | 8,780 | 6,530 | 11,800 |
| 0.0400 | 12,800 | 9,440.0 | 19,100 | 12,700 | 8,890 | 18,000 |
| 0.0200 | 16,100 | 11,500.0 | 26,400 | 16,000 | 10,600 | 24,000 |
| 0.0100 | 19,700 | 13,600.0 | 36,000 | 19,700 | 12,400 | 31,100 |
| 0.0050 | 23,700 | 15,600.0 | 48,200 | -- | -- | -- |
| 0.0020 | 29,500 | 18,000.0 | 69,500 | 29,500 | 16,300 | 53,400 |

Peak-flow data used in the analysis:

Explanation of symbols and codes

-- none

H Historic, outside of systematic record

| Water | Peak | Peak-flow | Water | Peak | Peak-flow |
|-------|--------|-----------|-------|--------|-----------|
| year | flow | code | year | flow | code |
| 1940 | 331 | -- | 1988 | 533 | -- |
| 1941 | 1,490 | -- | 1989 | 2,560 | -- |
| 1942 | 1,530 | -- | 1990 | 1,910 | -- |
| 1943 | 4,380 | -- | 1991 | 3,410 | -- |
| 1944 | 5,620 | -- | 1992 | 3,150 | -- |
| 1945 | 3,050 | -- | 1993 | 13,900 | -- |
| | | | 1994 | 2,090 | -- |
| 1953 | 17,700 | H | 1995 | 2,370 | -- |
| | | | 1996 | 4,820 | -- |
| 1965 | 19,000 | H | 1997 | 3,310 | -- |
| | | | 1998 | 3,540 | -- |
| 1969 | 11,800 | H | 1999 | 2,670 | -- |
| | | | 2000 | 1,000 | -- |
| 1977 | 1,350 | -- | 2001 | 7,400 | -- |
| 1978 | 2,720 | -- | 2002 | 920 | -- |
| 1979 | 4,100 | -- | 2003 | 1,270 | -- |
| 1980 | 5,250 | -- | 2004 | 3,290 | -- |
| 1981 | 2,910 | -- | 2005 | 5,450 | -- |
| 1982 | 1,730 | -- | 2006 | 4,200 | -- |
| 1983 | 4,180 | -- | 2007 | 5,180 | -- |
| 1984 | 4,400 | -- | 2008 | 3,040 | -- |
| 1985 | 3,590 | -- | 2009 | 791 | -- |
| 1986 | 2,900 | -- | 2010 | 16,100 | -- |
| 1987 | 1,100 | -- | 2011 | 9,730 | -- |