LOCATION.--Lat 41°16'53", long 92°51'40.7" referenced to North American Datum of 1927, in SE 1/4 NE 1/4 SW 1/4 sec.19, T.75 N., R.17 W., Mahaska County, IA, Hydrologic Unit 07100009, on right bank 250 ft upstream from abandoned Bellefountaine bridge, 0.8 mi east of Tracy, 3.8 mi downstream from bridge on State Highway 92, 3.1 mi upstream from Cedar Creek, 6.4 mi downstream from English Creek, and 127.5 mi upstream from mouth.

DRAINAGE AREA.--12,479 mi².

PERIOD OF RECORD.--Discharge records from March 1920 to current year. Prior to March 1940, monthly mean discharge for some periods published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 670.91 ft above National Geodetic Vertical Datum of 1929. Prior to June 27, 1940, and June 30, 1952, to November 4, 1960, non-recording gage at site 250 ft downstream at same datum; June 27, 1940, to June 29, 1952, water-stage recorder at site 250 ft downstream at same datum.

REMARKS.--Flow regulated by Lake Red Rock (station 05488100), 11.9 mi upstream, since March 12, 1969.

EXTREMES OUTSIDE PERIOD OF RECORD.--Since at least 1851, no flood outside the period of record exceeded the June 14, 1947, stage of 26.50 ft. Flood of May 31, 1903, reached a stage of about 25 ft, discharge about 130,000 ft³/s. Minimum daily discharge since at least 1910, occurred January 21-31, 1940, 45 ft³/s.

A summary of all available data for this streamgage is provided through the USGS National Water Information System web interface (NWISWeb). The following link provides access to current/historical observations, daily data, daily statistics, monthly statistics, annual statistics, peak streamflow, field measurements, field/lab water-quality samples, and the latest water-year summaries. Data can be filtered by parameter and/or dates, and can be output in various tabular and graphical formats.

<http://waterdata.usgs.gov/nwis/inventory/?site_no=05488500>

The USGS WaterWatch Toolkit is available at:

<http://waterwatch.usgs.gov/?id=ww_toolkit>

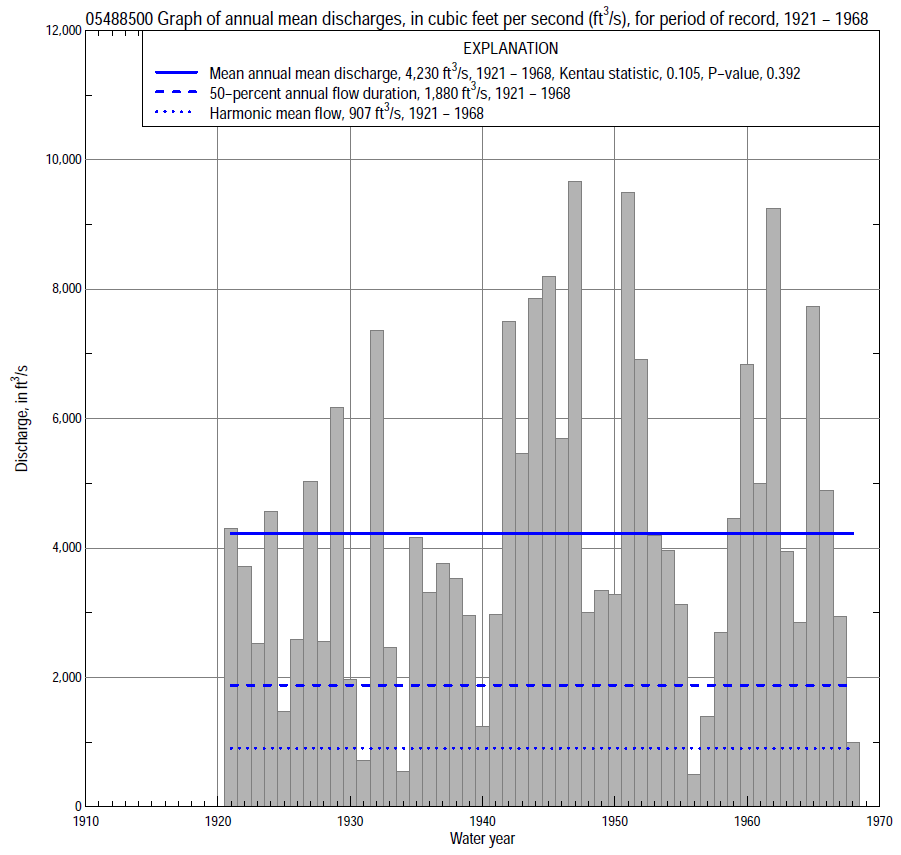
Tools for summarizing streamflow information include the duration hydrograph builder, the cumulative streamflow hydrograph builder, the streamgage statistics retrieval tool, the rating curve builder, the flood tracking chart builder, the National Weather Service Advanced Hydrologic Prediction Service (AHPS) river forecast hydrograph builder, and the raster-hydrograph builder. Entering the above number for this streamgage into these toolkit webpages will provide streamflow information specific to this streamgage.

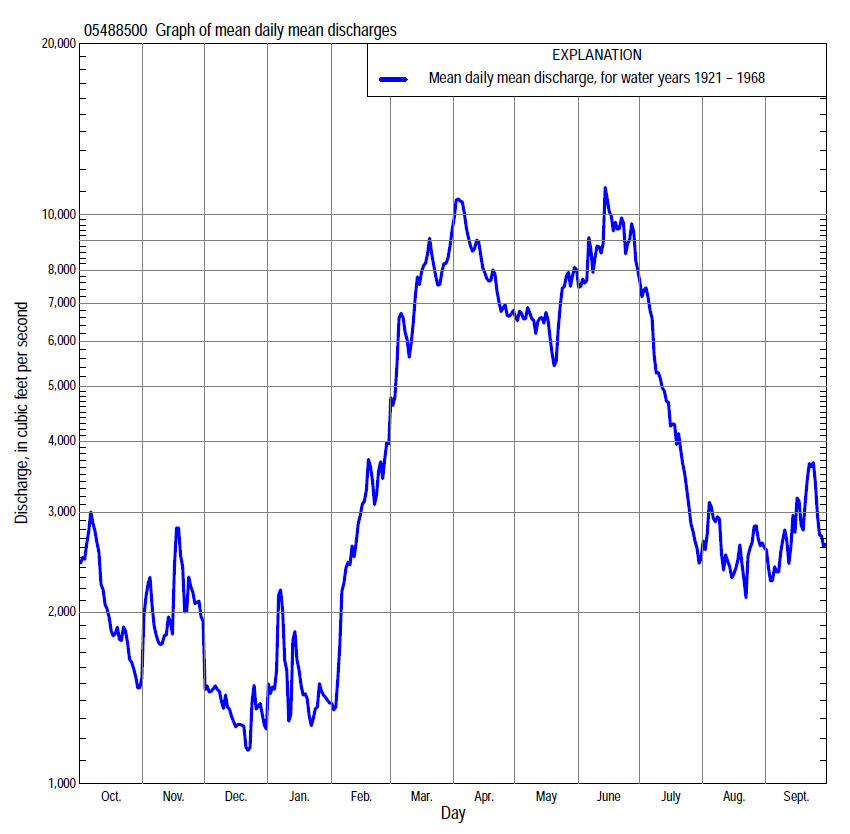
A description of the statistics presented for this streamgage is available in the main body of the report at:

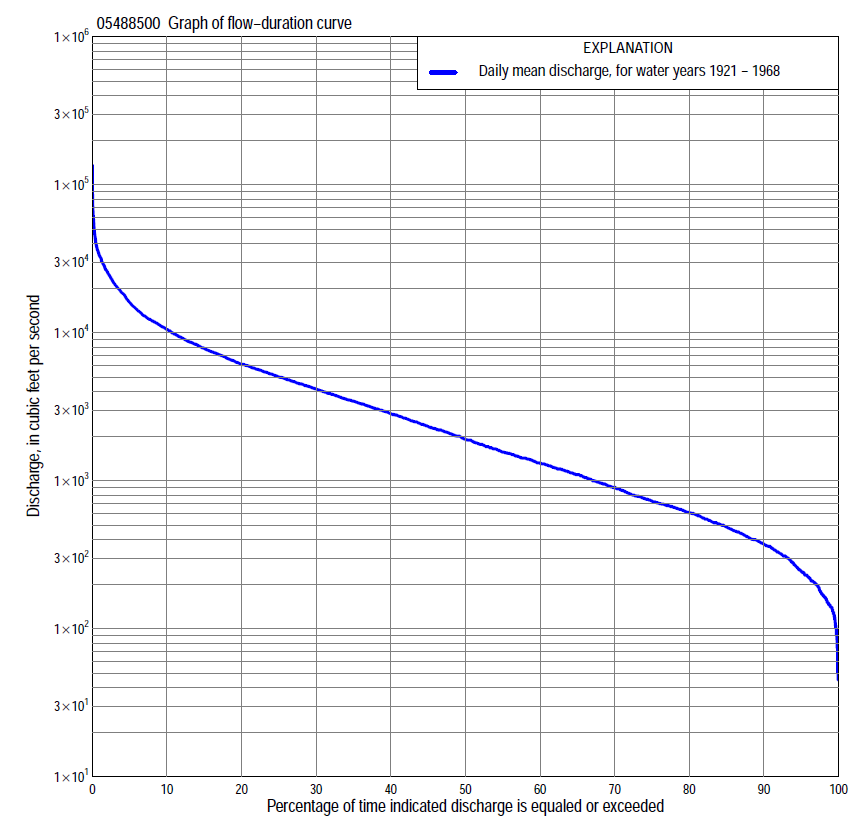
<http://dx.doi.org/10.3133/ofr20151214>

A link to other streamgages included in this report, a map showing the location of the streamgages, information on the programs used to compute the statistical analyses, and references are included in the main body of the report.

**Statistics Based on the Pre-regulated Streamflow Period of Record**

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**Statistics Based on the Pre-regulated Streamflow Period of Record**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 05488500 Monthly and annual flow durations, based on 1921–68 pre-regulated period of record (48 years) | | | | | | | | | | | | | |  |  |
| Percentage of days discharge equaled or exceeded |  |  |  |  | Discharge (cubic feet per second) | | | | |  |  |  |  | Annual flow durations | |
| Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Annual | Kentau statistic | P-value |
| 99 | 139 | 165 | 125 | 74 | 84 | 310 | 442 | 313 | 362 | 262 | 164 | 195 | 140 | -0.088 | 0.384 |
| 98 | 149 | 205 | 130 | 100 | 105 | 350 | 520 | 440 | 522 | 314 | 182 | 215 | 165 | -0.107 | 0.286 |
| 95 | 230 | 230 | 170 | 140 | 170 | 393 | 785 | 520 | 710 | 458 | 304 | 265 | 245 | -0.103 | 0.307 |
| 90 | 324 | 324 | 220 | 180 | 305 | 605 | 1,130 | 770 | 1,190 | 762 | 527 | 394 | 370 | -0.103 | 0.307 |
| 85 | 362 | 388 | 260 | 220 | 365 | 819 | 1,540 | 1,170 | 1,420 | 1,020 | 669 | 460 | 480 | -0.076 | 0.450 |
| 80 | 402 | 442 | 314 | 245 | 455 | 1,400 | 1,880 | 1,640 | 1,880 | 1,200 | 750 | 538 | 605 | -0.096 | 0.342 |
| 75 | 459 | 505 | 379 | 310 | 540 | 1,760 | 2,360 | 2,070 | 2,380 | 1,460 | 864 | 592 | 720 | -0.077 | 0.445 |
| 70 | 521 | 581 | 422 | 400 | 640 | 2,220 | 2,940 | 2,510 | 2,830 | 1,710 | 980 | 675 | 881 | -0.087 | 0.389 |
| 65 | 630 | 670 | 500 | 540 | 760 | 2,790 | 3,290 | 2,960 | 3,510 | 2,010 | 1,060 | 780 | 1,080 | -0.060 | 0.552 |
| 60 | 710 | 755 | 580 | 610 | 965 | 3,320 | 3,710 | 3,440 | 4,120 | 2,270 | 1,190 | 896 | 1,300 | -0.067 | 0.505 |
| 55 | 800 | 930 | 680 | 680 | 1,170 | 3,760 | 4,200 | 3,970 | 4,670 | 2,540 | 1,330 | 1,010 | 1,540 | -0.033 | 0.749 |
| 50 | 950 | 1,030 | 790 | 750 | 1,390 | 4,390 | 4,630 | 4,570 | 5,320 | 2,870 | 1,480 | 1,160 | 1,880 | -0.014 | 0.894 |
| 45 | 1,220 | 1,190 | 920 | 810 | 1,800 | 4,990 | 5,140 | 5,250 | 6,020 | 3,280 | 1,640 | 1,390 | 2,260 | -0.001 | 1.000 |
| 40 | 1,470 | 1,440 | 1,050 | 940 | 2,300 | 5,760 | 5,840 | 5,920 | 6,960 | 3,710 | 1,840 | 1,640 | 2,780 | 0.041 | 0.689 |
| 35 | 1,670 | 1,660 | 1,150 | 1,110 | 2,900 | 6,580 | 6,930 | 6,640 | 8,100 | 4,180 | 2,070 | 1,970 | 3,360 | 0.060 | 0.552 |
| 30 | 2,170 | 1,940 | 1,320 | 1,230 | 3,300 | 7,800 | 8,370 | 7,430 | 9,380 | 4,830 | 2,500 | 2,430 | 4,060 | 0.084 | 0.403 |
| 25 | 2,630 | 2,250 | 1,460 | 1,420 | 4,100 | 9,300 | 10,200 | 8,340 | 10,900 | 5,630 | 3,010 | 2,960 | 4,960 | 0.093 | 0.355 |
| 20 | 3,360 | 2,830 | 1,770 | 1,800 | 4,990 | 11,400 | 12,100 | 9,160 | 12,800 | 6,580 | 3,900 | 3,770 | 6,050 | 0.126 | 0.210 |
| 15 | 4,000 | 3,390 | 2,320 | 2,200 | 6,000 | 13,800 | 15,200 | 11,000 | 16,200 | 7,840 | 4,900 | 5,000 | 7,650 | 0.137 | 0.174 |
| 10 | 5,370 | 4,290 | 3,100 | 2,700 | 7,380 | 18,300 | 19,200 | 13,600 | 21,300 | 9,910 | 6,200 | 6,480 | 10,300 | 0.146 | 0.145 |
| 5 | 6,920 | 7,080 | 4,720 | 5,000 | 9,100 | 24,000 | 28,100 | 20,800 | 31,900 | 12,900 | 8,590 | 10,600 | 15,800 | 0.143 | 0.155 |
| 2 | 11,600 | 12,900 | 7,440 | 11,900 | 11,600 | 31,700 | 40,800 | 30,900 | 43,300 | 21,600 | 12,500 | 19,500 | 25,800 | 0.155 | 0.122 |
| 1 | 13,700 | 22,000 | 8,640 | 20,900 | 12,300 | 36,000 | 53,400 | 38,400 | 54,700 | 30,100 | 13,800 | 23,500 | 33,000 | 0.158 | 0.116 |

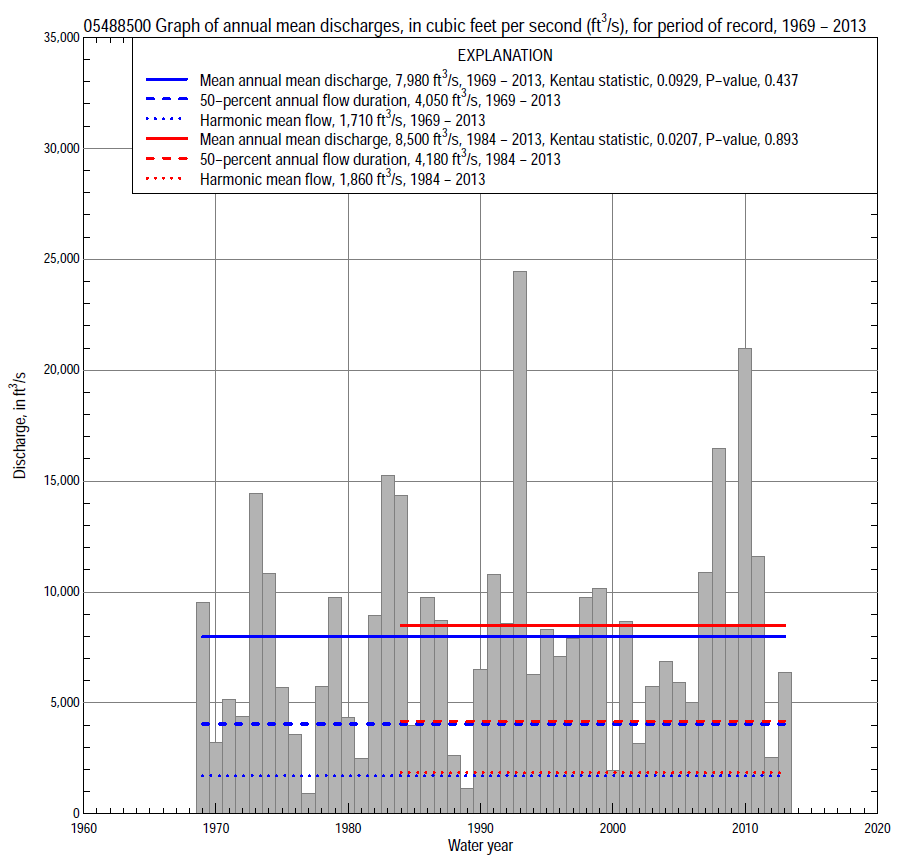
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 05488500 Annual exceedance probability of instantaneous peak discharges, in cubic feet per second (ft3/s), for the pre-regulated period of record based on the expected moments algorithm/multiple Grubbs-Beck analysis computed using a historical period length of 117 years (1852–1968)a | | | | |
| Annual exceed-ance probability | Recur-rence interval (years) | Discharge (ft3/s) | 95-percent lower confi-dence interval (ft3/s) | 95-percent upper confi-dence interval (ft3/s) |
| 0.500 | 2 | 32,900 | 27,500 | 39,200 |
| 0.200 | 5 | 53,300 | 44,700 | 64,100 |
| 0.100 | 10 | 67,800 | 56,300 | 82,600 |
| 0.040 | 25 | 86,800 | 70,600 | 109,000 |
| 0.020 | 50 | 101,000 | 80,800 | 132,000 |
| 0.010 | 100 | 116,000 | 90,400 | 158,000 |
| 0.005 | 200 | 131,000 | 99,600 | 189,000 |
| 0.002 | 500 | 152,000 | 111,000 | 236,000 |
| Kentau statistic | | 0.141 |  |  |
| P-value | | 0.155 |  |  |
| Begin year | | 1920 |  |  |
| End year | | 1968 |  |  |
| Number of peaks | | 49 |  |  |
| aWeighted Independent Estimates were not computed because regional regression equations are not applicable due to size of drainage area. | | | | |
| **Note: The above discharges are for the pre-regulated period of record and they are not applicable for flood-plain management regulation or for design purposes.** | | | | |

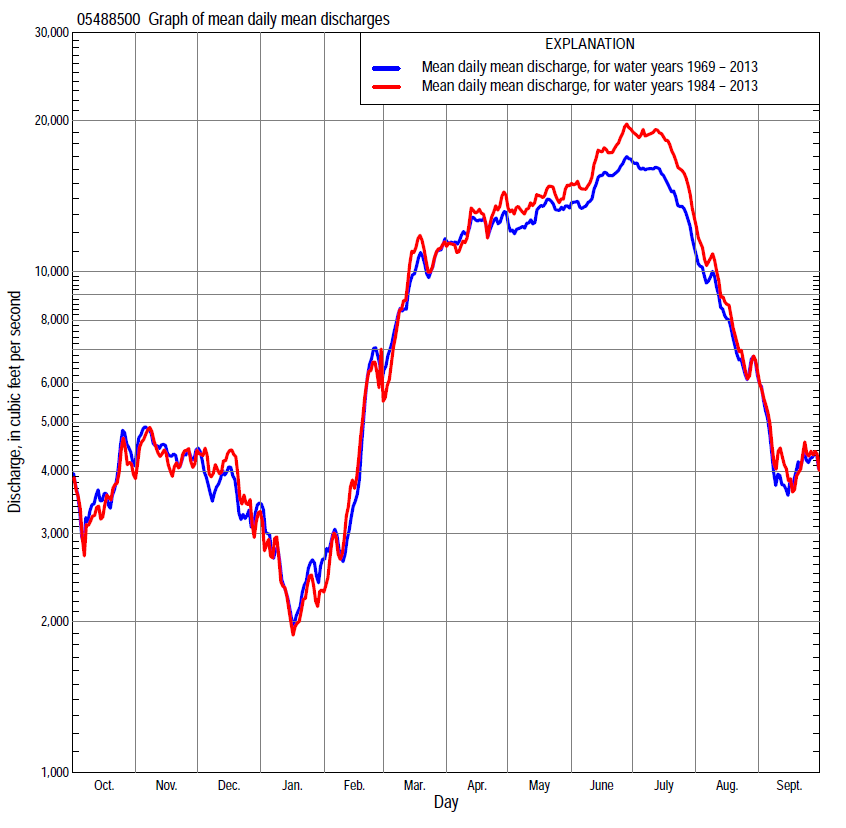
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 05488500 Annual exceedance probability of high discharges, based on 1921–68 pre-regulated period of record (48 years) | | | | | | |
| Annual exceed-ance probability | Recur-rence interval (years) | Maximum average discharge (cubic feet per second) for indicated number of consecutive days | | | | |
| 1 | 3 | 7 | 15 | 30 |
| 0.990 | 1.01 | 4,310 | 3,440 | 2,320 | 1,820 | 1,230 |
| 0.950 | 1.05 | 8,690 | 7,440 | 5,540 | 4,100 | 2,900 |
| 0.900 | 1.11 | 12,200 | 10,700 | 8,280 | 6,030 | 4,350 |
| 0.800 | 1.25 | 17,600 | 15,800 | 12,800 | 9,210 | 6,760 |
| 0.500 | 2 | 32,100 | 29,600 | 24,900 | 18,200 | 13,700 |
| 0.200 | 5 | 51,500 | 47,500 | 40,100 | 30,900 | 23,400 |
| 0.100 | 10 | 62,900 | 57,500 | 48,200 | 38,500 | 29,100 |
| 0.040 | 25 | 75,400 | 67,900 | 56,100 | 46,900 | 35,300 |
| 0.020 | 50 | 83,400 | 74,200 | 60,600 | 52,300 | 39,100 |
| 0.010 | 100 | 90,400 | 79,500 | 64,200 | 56,900 | 42,400 |
| 0.005 | 200 | 96,500 | 83,900 | 67,000 | 60,900 | 45,200 |
| 0.002 | 500 | 103,000 | 88,600 | 69,900 | 65,500 | 48,200 |
| Kentau statistic | | 0.163 | 0.163 | 0.144 | 0.131 | 0.184 |
| P-value | | 0.104 | 0.104 | 0.152 | 0.191 | 0.066 |
| **Note: The above discharges are for the pre-regulated period of record and they are not applicable for flood-plain management regulation or for design purposes.** | | | | | | |

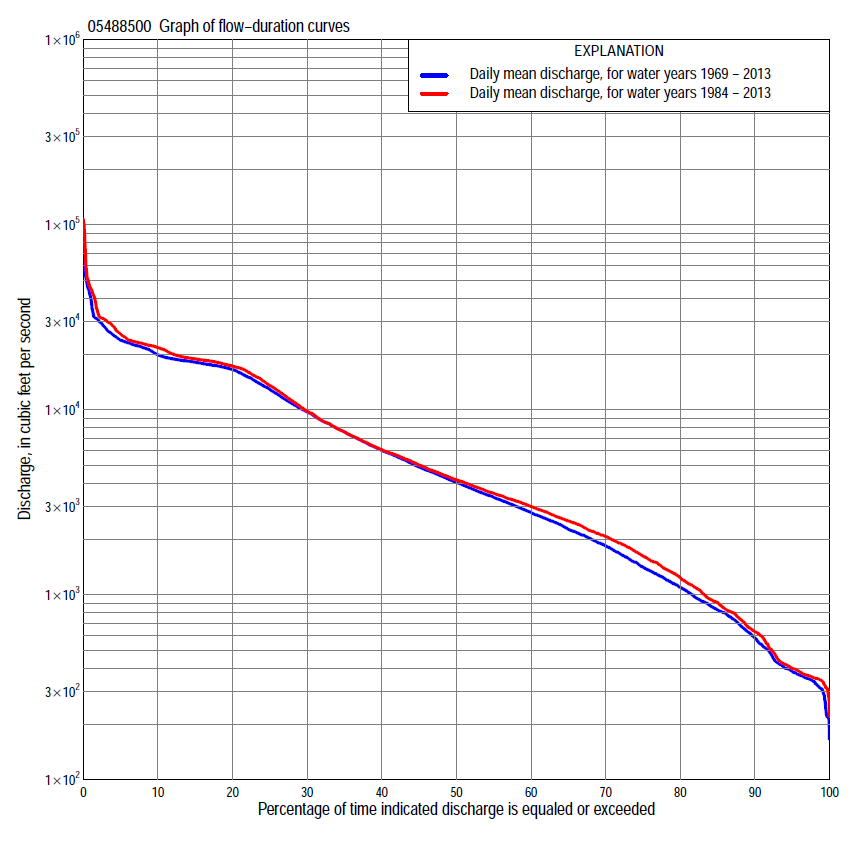
|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 05488500 Annual nonexceedance probability of low discharges, based on April 1920 to March 1969 pre-regulated period of record (49 years) | | | | | | | | |  |
| Annual nonexceed-ance probability | Recur-rence interval (years) | Minimum average discharge (cubic feet per second) for indicated number of consecutive days | | | | | | | | |
| 1 | 3 | 7 | 14 | 30 | 60 | 90 | 120 | 183 |
| 0.01 | 100 | 46 | 46 | 49 | 51 | 62 | 78 | 102 | 111 | 133 |
| 0.02 | 50 | 60 | 60 | 63 | 67 | 81 | 101 | 131 | 144 | 176 |
| 0.05 | 20 | 87 | 88 | 92 | 98 | 118 | 148 | 189 | 211 | 266 |
| 0.10 | 10 | 119 | 121 | 127 | 136 | 163 | 205 | 261 | 294 | 379 |
| 0.20 | 5 | 170 | 175 | 183 | 199 | 238 | 299 | 380 | 435 | 574 |
| 0.50 | 2 | 317 | 332 | 350 | 386 | 464 | 588 | 756 | 886 | 1,220 |
| 0.80 | 1.25 | 551 | 582 | 621 | 699 | 850 | 1,100 | 1,450 | 1,730 | 2,460 |
| 0.90 | 1.11 | 715 | 757 | 815 | 928 | 1,140 | 1,480 | 2,000 | 2,420 | 3,470 |
| 0.96 | 1.04 | 924 | 980 | 1,070 | 1,230 | 1,530 | 2,020 | 2,790 | 3,410 | 4,940 |
| 0.98 | 1.02 | 1,080 | 1,150 | 1,260 | 1,460 | 1,830 | 2,440 | 3,440 | 4,220 | 6,160 |
| 0.99 | 1.01 | 1,230 | 1,310 | 1,440 | 1,690 | 2,130 | 2,880 | 4,130 | 5,100 | 7,470 |
| Kentau statistic | | -0.077 | -0.034 | -0.043 | -0.057 | -0.065 | -0.056 | -0.056 | -0.071 | -0.058 |
| P-value | | 0.443 | 0.737 | 0.673 | 0.569 | 0.518 | 0.575 | 0.575 | 0.474 | 0.564 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 05488500 Annual nonexceedance probability of seasonal low discharges, based on April 1920 to March 1969 pre-regulated period of record (49 years) | | | | | | | | | | |
| Annual nonexceed-ance probability | Recur-rence interval (years) | Minimum average discharge (cubic feet per second) for indicated number of consecutive days | | | | | | | | |
| 1 | 7 | 14 | 30 |  | 1 | 7 | 14 | 30 |
|  |  | January-February-March | | | |  | April-May-June | | | |
| 0.01 | 100 | 48 | 48 | 51 | 66 |  | 141 | 174 | 193 | 240 |
| 0.02 | 50 | 64 | 64 | 68 | 88 |  | 195 | 241 | 268 | 334 |
| 0.05 | 20 | 96 | 99 | 106 | 134 |  | 313 | 385 | 430 | 541 |
| 0.10 | 10 | 136 | 145 | 155 | 194 |  | 468 | 572 | 642 | 815 |
| 0.20 | 5 | 204 | 225 | 243 | 304 |  | 745 | 903 | 1,020 | 1,310 |
| 0.50 | 2 | 440 | 504 | 556 | 702 |  | 1,690 | 2,010 | 2,300 | 3,030 |
| 0.80 | 1.25 | 932 | 1,070 | 1,210 | 1,590 |  | 3,540 | 4,100 | 4,740 | 6,470 |
| 0.90 | 1.11 | 1,370 | 1,550 | 1,790 | 2,420 |  | 5,030 | 5,750 | 6,680 | 9,300 |
| 0.96 | 1.04 | 2,050 | 2,270 | 2,680 | 3,770 |  | 7,160 | 8,040 | 9,400 | 13,400 |
| 0.98 | 1.02 | 2,660 | 2,880 | 3,460 | 5,000 |  | 8,870 | 9,850 | 11,600 | 16,700 |
| 0.99 | 1.01 | 3,340 | 3,550 | 4,320 | 6,440 |  | 10,700 | 11,700 | 13,800 | 20,300 |
| Kentau statistic | | -0.118 | -0.081 | -0.085 | -0.071 |  | 0.065 | 0.110 | 0.121 | 0.121 |
| P-value | | 0.234 | 0.418 | 0.393 | 0.474 |  | 0.518 | 0.270 | 0.224 | 0.224 |
|  |  | July-August-September | | | |  | October-November-December | | | |
| 0.01 | 100 | 102 | 110 | 122 | 158 |  | 66 | 76 | 85 | 102 |
| 0.02 | 50 | 126 | 136 | 150 | 194 |  | 81 | 93 | 103 | 125 |
| 0.05 | 20 | 172 | 185 | 206 | 265 |  | 112 | 126 | 141 | 171 |
| 0.10 | 10 | 227 | 245 | 273 | 351 |  | 149 | 167 | 186 | 228 |
| 0.20 | 5 | 318 | 345 | 385 | 498 |  | 211 | 236 | 264 | 326 |
| 0.50 | 2 | 609 | 668 | 753 | 988 |  | 411 | 470 | 531 | 665 |
| 0.80 | 1.25 | 1170 | 1310 | 1500 | 2010 |  | 806 | 966 | 1,110 | 1,420 |
| 0.90 | 1.11 | 1650 | 1870 | 2150 | 2940 |  | 1,150 | 1,430 | 1,670 | 2,150 |
| 0.96 | 1.04 | 2380 | 2740 | 3190 | 4440 |  | 1,680 | 2,180 | 2,600 | 3,380 |
| 0.98 | 1.02 | 3020 | 3520 | 4120 | 5820 |  | 2,140 | 2,890 | 3,480 | 4,580 |
| 0.99 | 1.01 | 3740 | 4420 | 5200 | 7440 |  | 2,670 | 3,740 | 4,560 | 6,030 |
| Kentau statistic | | -0.022 | -0.010 | -0.012 | 0.026 |  | -0.071 | -0.029 | -0.019 | -0.033 |
| P-value | | 0.829 | 0.924 | 0.911 | 0.803 |  | 0.474 | 0.776 | 0.856 | 0.743 |

**Statistics Based on the Regulated Streamflow Period of Record**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Statistics Based on the Regulated Streamflow Period of Record**  05488500 Monthly and annual flow durations, based on 1969–2013 regulated period of record (45 years) | | | | | | | | | | | | | |  |  |
| Percentage of days discharge equaled or exceeded |  |  |  |  | Discharge (cubic feet per second) | | | | |  |  |  |  | Annual flow durations | |
| Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Annual | Kentau statistic | P-value |
| 99 | 277 | 314 | 325 | 295 | 290 | 262 | 613 | 359 | 225 | 216 | 228 | 326 | 309 | 0.006 | 0.961 |
| 98 | 311 | 329 | 350 | 330 | 315 | 486 | 661 | 506 | 329 | 218 | 356 | 339 | 339 | 0.037 | 0.725 |
| 95 | 323 | 345 | 370 | 382 | 400 | 733 | 1,070 | 1,230 | 1,790 | 740 | 390 | 351 | 384 | 0.041 | 0.696 |
| 90 | 364 | 399 | 610 | 520 | 583 | 1,300 | 1,920 | 2,880 | 3,280 | 1,250 | 552 | 372 | 581 | 0.065 | 0.538 |
| 85 | 397 | 580 | 818 | 610 | 703 | 1,910 | 3,070 | 4,250 | 3,960 | 1,730 | 861 | 421 | 825 | 0.045 | 0.667 |
| 80 | 451 | 839 | 1,020 | 728 | 780 | 2,610 | 3,830 | 5,220 | 4,820 | 2,510 | 1,060 | 534 | 1,100 | 0.031 | 0.769 |
| 75 | 531 | 1,060 | 1,280 | 825 | 899 | 3,220 | 4,700 | 6,200 | 5,790 | 3,370 | 1,350 | 758 | 1,410 | 0.031 | 0.769 |
| 70 | 649 | 1,310 | 1,500 | 920 | 1,070 | 3,700 | 5,470 | 7,340 | 7,120 | 4,580 | 1,630 | 844 | 1,840 | 0.034 | 0.747 |
| 65 | 913 | 1,640 | 1,790 | 1,050 | 1,320 | 4,200 | 6,050 | 8,430 | 9,060 | 6,450 | 2,030 | 973 | 2,260 | 0.037 | 0.725 |
| 60 | 1,210 | 1,910 | 2,010 | 1,170 | 1,560 | 4,810 | 7,030 | 10,400 | 11,500 | 8,830 | 2,520 | 1,150 | 2,780 | 0.038 | 0.717 |
| 55 | 1,630 | 2,140 | 2,230 | 1,310 | 1,840 | 5,640 | 8,440 | 12,500 | 14,000 | 11,200 | 2,980 | 1,380 | 3,360 | 0.033 | 0.754 |
| 50 | 2,060 | 2,490 | 2,550 | 1,460 | 2,160 | 6,350 | 9,870 | 14,600 | 16,400 | 13,800 | 3,480 | 1,580 | 4,050 | 0.022 | 0.837 |
| 45 | 2,380 | 2,800 | 2,920 | 1,730 | 2,500 | 7,360 | 11,500 | 16,500 | 17,300 | 16,500 | 4,370 | 1,920 | 4,900 | 0.025 | 0.814 |
| 40 | 2,680 | 3,340 | 3,290 | 2,100 | 2,900 | 8,420 | 13,300 | 17,300 | 17,700 | 17,600 | 5,320 | 2,260 | 6,010 | 0.043 | 0.681 |
| 35 | 3,200 | 3,930 | 3,710 | 2,400 | 3,660 | 9,740 | 15,400 | 17,900 | 18,300 | 18,400 | 7,040 | 2,650 | 7,570 | 0.030 | 0.777 |
| 30 | 3,650 | 4,780 | 4,280 | 2,800 | 4,100 | 11,600 | 17,500 | 18,300 | 19,100 | 18,800 | 9,450 | 3,120 | 9,710 | 0.086 | 0.411 |
| 25 | 4,430 | 6,030 | 4,740 | 3,110 | 4,730 | 14,000 | 18,900 | 18,500 | 21,200 | 19,200 | 13,300 | 3,710 | 12,900 | 0.093 | 0.373 |
| 20 | 5,830 | 7,320 | 5,470 | 3,600 | 5,770 | 16,700 | 21,800 | 19,000 | 22,100 | 21,500 | 17,000 | 5,720 | 16,500 | 0.154 | 0.140 |
| 15 | 7,480 | 9,240 | 6,300 | 4,200 | 7,410 | 19,500 | 24,200 | 19,800 | 22,700 | 23,000 | 17,700 | 8,850 | 18,100 | 0.201 | 0.053 |
| 10 | 10,400 | 12,300 | 8,170 | 5,530 | 10,800 | 23,000 | 26,100 | 21,400 | 23,400 | 28,300 | 18,600 | 13,700 | 19,800 | 0.213 | 0.040 |
| 5 | 16,500 | 16,700 | 11,500 | 8,280 | 17,500 | 26,100 | 28,600 | 23,000 | 30,700 | 39,900 | 24,800 | 17,400 | 23,800 | 0.139 | 0.180 |
| 2 | 18,300 | 18,900 | 15,000 | 11,200 | 25,200 | 29,200 | 31,100 | 25,600 | 41,800 | 52,700 | 45,000 | 29,500 | 30,600 | 0.158 | 0.129 |
| 1 | 19,000 | 19,500 | 16,600 | 16,100 | 25,900 | 31,000 | 31,300 | 31,200 | 59,600 | 88,800 | 47,000 | 32,400 | 40,400 | 0.151 | 0.148 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 05488500 Annual exceedance probability of instantaneous peak discharges, in cubic feet per second (ft3/s), based on U.S. Army Corps of Engineers regulated flow frequency studya, analysis computed using a record length of 92 years (1917–2008) | | | | |
| **USACE Regulated Flow Frequency Analysis** | | | | |
| [ND, not determined] | | | | |
| Annual exceedance probability | Recurrence interval (years) | Discharge (ft3/s) | 95-percent lower confidence interval (ft3/s) | 95-percent upper confidence interval (ft3/s) |
| 0.500 | 2 | 25,700 | ND | ND |
| 0.200 | 5 | ND | ND | ND |
| 0.100 | 10 | 31,000 | ND | ND |
| 0.040 | 25 | ND | ND | ND |
| 0.020 | 50 | 68,700 | ND | ND |
| 0.010 | 100 | 93,600 | ND | ND |
| 0.005 | 200 | 137,000 | ND | ND |
| 0.002 | 500 | 137,000 | ND | ND |
| aU.S. Army Corps of Engineers, 2010, Des Moines River regulated flow frequency study: Rock Island District, 82 p., accessed September 9, 2014, at http://www.mvr.usace.army.mil/Portals/48/docs/FRM/DMRRFFS/DMRRFFS-FinalReport.pdf. | | | | |
| **USGS Kendall's Tau Trend Analysis** | | | | |
| Kentau statistic | | 0.121 |  |  |
| P-value |  | 0.244 |  |  |
| Begin year |  | b1969 |  |  |
| End year |  | b2013 |  |  |
| Number of peaks | | 45 |  |  |
| bKendall's tau trend analysis computed using the regulated period of record which is not the same period of record used for the above regulated flow frequency analysis. | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 05488500 Annual exceedance probability of high discharges, based on 1969–2013 regulated period of recorda (45 years) | | | | | | |
| [ND, not determined] | | | | | | |
| Annual exceedance probability | Recur-rence interval (years) | Maximum average discharge (cubic feet per second) for indicated number of consecutive days | | | | |
| 1 | 3 | 7 | 15 | 30 |
| 0.990 | 1.01 | ND | ND | ND | ND | ND |
| 0.950 | 1.05 | ND | ND | ND | ND | ND |
| 0.900 | 1.11 | ND | ND | ND | ND | ND |
| 0.800 | 1.25 | ND | ND | ND | ND | ND |
| 0.500 | 2 | ND | ND | ND | ND | ND |
| 0.200 | 5 | ND | ND | ND | ND | ND |
| 0.100 | 10 | ND | ND | ND | ND | ND |
| 0.040 | 25 | ND | ND | ND | ND | ND |
| 0.020 | 50 | ND | ND | ND | ND | ND |
| 0.010 | 100 | ND | ND | ND | ND | ND |
| 0.005 | 200 | ND | ND | ND | ND | ND |
| 0.002 | 500 | ND | ND | ND | ND | ND |
| Kentau statistic | | 0.145 | 0.147 | 0.153 | 0.158 | 0.176 |
| P-value | | 0.162 | 0.156 | 0.142 | 0.129 | 0.091 |
| aContact the U.S. Army Corps of Engineers, Rock Island District, for the annual exceedance probability of high discharges. | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 05488500 Annual nonexceedance probability of low discharges, based on April 1969 to March 2013 regulated period of record (44 years) | | | | | | | | |  |
| Annual nonexceed-ance probability | Recur-rence interval (years) | Minimum average discharge (cubic feet per second) for indicated number of consecutive days | | | | | | | | |
| 1 | 3 | 7 | 14 | 30 | 60 | 90 | 120 | 183 |
| 0.01 | 100 | 146 | 146 | 146 | 147 | 147 | 148 | 168 | 187 | 248 |
| 0.02 | 50 | 174 | 175 | 176 | 177 | 178 | 188 | 221 | 251 | 329 |
| 0.05 | 20 | 205 | 208 | 217 | 231 | 238 | 268 | 331 | 387 | 498 |
| 0.10 | 10 | 241 | 247 | 265 | 291 | 312 | 370 | 473 | 562 | 714 |
| 0.20 | 5 | 299 | 310 | 344 | 389 | 439 | 549 | 724 | 873 | 1,090 |
| 0.50 | 2 | 479 | 515 | 603 | 706 | 883 | 1,190 | 1,610 | 1,950 | 2,390 |
| 0.80 | 1.25 | 839 | 944 | 1,140 | 1,360 | 1,890 | 2,610 | 3,490 | 4,160 | 5,020 |
| 0.90 | 1.11 | 1,170 | 1,350 | 1,660 | 1,960 | 2,880 | 3,990 | 5,190 | 6,060 | 7,290 |
| 0.96 | 1.04 | 1,710 | 2,050 | 2,520 | 2,940 | 4,600 | 6,290 | 7,860 | 8,930 | 10,700 |
| 0.98 | 1.02 | 2,220 | 2,720 | 3,350 | 3,860 | 6,300 | 8,470 | 10,300 | 11,400 | 13,700 |
| 0.99 | 1.01 | 2,840 | 3,570 | 4,380 | 4,970 | 8,420 | 11,100 | 13,000 | 14,100 | 16,900 |
| Kentau statistic | | 0.055 | 0.038 | 0.052 | 0.042 | 0.038 | 0.042 | 0.042 | 0.047 | 0.015 |
| P-value | | 0.606 | 0.723 | 0.627 | 0.693 | 0.723 | 0.693 | 0.693 | 0.664 | 0.895 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 05488500 Annual nonexceedance probability of seasonal low discharges, based on April 1969 to September 2013 regulated period of record (44–45 years) | | | | | | | | | | |
| Annual nonexceed-ance probability | Recur-rence interval (years) | Minimum average discharge (cubic feet per second) for indicated number of consecutive days | | | | | | | | |
| 1 | 7 | 14 | 30 |  | 1 | 7 | 14 | 30 |
|  |  | January-February-March | | | |  | April-May-June | | | |
| 0.01 | 100 | 189 | 204 | 206 | 206 |  | 204 | 235 | 275 | 333 |
| 0.02 | 50 | 222 | 243 | 247 | 249 |  | 313 | 363 | 431 | 545 |
| 0.05 | 20 | 284 | 319 | 330 | 344 |  | 571 | 668 | 809 | 1,070 |
| 0.10 | 10 | 359 | 411 | 431 | 462 |  | 929 | 1,100 | 1,350 | 1,840 |
| 0.20 | 5 | 483 | 565 | 602 | 666 |  | 1,580 | 1,910 | 2,360 | 3,280 |
| 0.50 | 2 | 888 | 1,080 | 1,190 | 1,380 |  | 3,740 | 4,680 | 5,860 | 8,010 |
| 0.80 | 1.25 | 1,730 | 2,190 | 2,470 | 2,980 |  | 7,230 | 9,490 | 11,800 | 15,100 |
| 0.90 | 1.11 | 2,520 | 3,230 | 3,710 | 4,510 |  | 9,510 | 12,800 | 15,900 | 19,200 |
| 0.96 | 1.04 | 3,830 | 4,980 | 5,810 | 7,120 |  | 12,100 | 16,800 | 20,600 | 23,500 |
| 0.98 | 1.02 | 5,070 | 6,650 | 7,840 | 9,630 |  | 13,800 | 19,600 | 23,800 | 26,000 |
| 0.99 | 1.01 | 6,570 | 8,690 | 10,300 | 12,700 |  | 15,300 | 22,100 | 26,600 | 27,900 |
| Kentau statistic | | 0.154 | 0.137 | 0.129 | 0.109 |  | 0.035 | 0.051 | 0.065 | 0.129 |
| P-value | | 0.142 | 0.192 | 0.221 | 0.302 |  | 0.739 | 0.632 | 0.538 | 0.214 |
|  |  | July-August-September | | | |  | October-November-December | | | |
| 0.01 | 100 | 232 | 232 | 233 | 233 |  | 135 | 135 | 141 | 141 |
| 0.02 | 50 | 251 | 251 | 252 | 252 |  | 165 | 165 | 178 | 178 |
| 0.05 | 20 | 289 | 293 | 293 | 315 |  | 212 | 225 | 252 | 277 |
| 0.10 | 10 | 308 | 330 | 347 | 420 |  | 265 | 299 | 347 | 411 |
| 0.20 | 5 | 349 | 400 | 450 | 614 |  | 355 | 427 | 514 | 656 |
| 0.50 | 2 | 554 | 719 | 883 | 1410 |  | 661 | 880 | 1,120 | 1,560 |
| 0.80 | 1.25 | 1300 | 1820 | 2270 | 3760 |  | 1,350 | 1,910 | 2,510 | 3,600 |
| 0.90 | 1.11 | 2430 | 3460 | 4200 | 6680 |  | 2,030 | 2,930 | 3,880 | 5,500 |
| 0.96 | 1.04 | 5520 | 7800 | 8880 | 12900 |  | 3,230 | 4,700 | 6,240 | 8,550 |
| 0.98 | 1.02 | 10200 | 14200 | 15200 | 20300 |  | 4,430 | 6,430 | 8,530 | 11,300 |
| 0.99 | 1.01 | 18900 | 25500 | 25600 | 31100 |  | 5,950 | 8,580 | 11,300 | 14,500 |
| Kentau statistic | | 0.008 | -0.010 | -0.014 | -0.051 |  | -0.035 | -0.039 | -0.082 | -0.025 |
| P-value | | 0.945 | 0.930 | 0.899 | 0.632 |  | 0.746 | 0.716 | 0.436 | 0.816 |

**Statistics Based on the 1984–2013 Regulated Streamflow Period of Record**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 05488500 Monthly and annual flow durations, based on 1984–2013 regulated period of record (30 years) | | | | | | | | | | | | | |  |  |
| Percentage of days discharge equaled or exceeded |  |  |  |  | Discharge (cubic feet per second) | | | | |  |  |  |  | Annual flow durations | |
| Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Annual | Kentau statistic | P-value |
| 99 | 286 | 312 | 342 | 366 | 430 | 501 | 675 | 658 | 959 | 388 | 359 | 296 | 341 | -0.009 | 0.957 |
| 98 | 314 | 331 | 354 | 372 | 492 | 610 | 685 | 818 | 1,200 | 422 | 363 | 343 | 354 | -0.034 | 0.803 |
| 95 | 326 | 347 | 370 | 408 | 600 | 948 | 1,190 | 2,090 | 2,450 | 855 | 395 | 353 | 400 | -0.032 | 0.817 |
| 90 | 365 | 372 | 597 | 630 | 690 | 1,770 | 2,430 | 4,180 | 3,540 | 1,500 | 516 | 373 | 632 | -0.025 | 0.858 |
| 85 | 397 | 430 | 818 | 743 | 800 | 2,560 | 3,140 | 5,310 | 4,330 | 2,010 | 907 | 416 | 907 | -0.041 | 0.762 |
| 80 | 431 | 627 | 1,130 | 850 | 1,050 | 3,080 | 3,810 | 6,160 | 5,200 | 3,080 | 1,230 | 508 | 1,230 | -0.067 | 0.617 |
| 75 | 512 | 966 | 1,420 | 930 | 1,320 | 3,380 | 4,700 | 7,190 | 6,240 | 4,200 | 1,580 | 681 | 1,620 | -0.067 | 0.617 |
| 70 | 634 | 1,310 | 1,830 | 1,120 | 1,520 | 3,810 | 5,520 | 7,920 | 8,060 | 5,910 | 1,910 | 816 | 2,070 | -0.062 | 0.643 |
| 65 | 850 | 1,630 | 2,120 | 1,260 | 1,810 | 4,280 | 6,040 | 9,450 | 10,800 | 8,930 | 2,220 | 917 | 2,500 | -0.044 | 0.748 |
| 60 | 1,140 | 1,920 | 2,400 | 1,390 | 2,040 | 4,950 | 7,030 | 11,800 | 13,300 | 12,600 | 2,680 | 1,060 | 3,000 | -0.011 | 0.943 |
| 55 | 1,510 | 2,130 | 2,700 | 1,600 | 2,400 | 5,770 | 8,500 | 14,200 | 16,000 | 15,200 | 3,060 | 1,190 | 3,530 | -0.030 | 0.830 |
| 50 | 2,080 | 2,440 | 3,100 | 1,900 | 2,630 | 6,620 | 9,960 | 16,300 | 17,700 | 17,500 | 3,510 | 1,430 | 4,180 | -0.053 | 0.695 |
| 45 | 2,380 | 2,620 | 3,440 | 2,100 | 2,910 | 7,480 | 11,500 | 17,500 | 18,600 | 18,300 | 4,210 | 1,590 | 5,030 | -0.041 | 0.762 |
| 40 | 2,630 | 3,090 | 3,750 | 2,370 | 3,540 | 8,420 | 13,300 | 18,200 | 19,500 | 18,800 | 4,890 | 1,870 | 6,090 | -0.030 | 0.830 |
| 35 | 3,180 | 3,630 | 4,240 | 2,700 | 3,930 | 9,560 | 15,500 | 18,500 | 21,100 | 19,000 | 6,220 | 2,220 | 7,570 | -0.044 | 0.748 |
| 30 | 3,560 | 4,380 | 4,610 | 2,950 | 4,310 | 11,400 | 18,100 | 18,700 | 22,000 | 20,700 | 8,220 | 2,650 | 9,830 | 0.000 | 1.000 |
| 25 | 4,350 | 5,400 | 5,200 | 3,200 | 4,950 | 13,900 | 20,000 | 19,200 | 22,400 | 22,300 | 12,300 | 3,310 | 13,500 | 0.018 | 0.901 |
| 20 | 5,570 | 6,780 | 5,800 | 3,590 | 5,680 | 16,700 | 22,300 | 19,800 | 22,900 | 23,500 | 16,900 | 4,890 | 17,200 | 0.083 | 0.532 |
| 15 | 6,650 | 8,990 | 6,700 | 4,080 | 6,800 | 18,900 | 24,300 | 20,500 | 23,400 | 28,300 | 18,000 | 8,720 | 18,800 | 0.099 | 0.453 |
| 10 | 9,210 | 12,500 | 7,990 | 4,590 | 8,870 | 23,000 | 26,200 | 22,100 | 27,000 | 30,900 | 19,800 | 16,200 | 21,700 | 0.117 | 0.372 |
| 5 | 15,900 | 17,700 | 10,200 | 6,620 | 14,800 | 26,400 | 29,800 | 23,000 | 35,000 | 48,900 | 41,800 | 19,200 | 25,600 | 0.085 | 0.521 |
| 2 | 18,400 | 19,300 | 14,400 | 8,260 | 22,000 | 29,800 | 31,200 | 30,800 | 53,600 | 75,800 | 46,000 | 31,300 | 33,000 | 0.106 | 0.422 |
| 1 | 19,400 | 19,500 | 16,600 | 9,920 | 25,200 | 31,300 | 31,600 | 31,600 | 67,000 | 94,100 | 49,400 | 36,000 | 45,000 | 0.094 | 0.475 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 05488500 Annual exceedance probability of high discharges, based on 1984–2013 regulated period of recorda (30 years) | | | | | | |
| [ND, not determined] | | | | | | |
| Annual exceedance probability | Recur-rence interval (years) | Maximum average discharge (cubic feet per second) for indicated number of consecutive days | | | | |
| 1 | 3 | 7 | 15 | 30 |
| 0.990 | 1.01 | ND | ND | ND | ND | ND |
| 0.950 | 1.05 | ND | ND | ND | ND | ND |
| 0.900 | 1.11 | ND | ND | ND | ND | ND |
| 0.800 | 1.25 | ND | ND | ND | ND | ND |
| 0.500 | 2 | ND | ND | ND | ND | ND |
| 0.200 | 5 | ND | ND | ND | ND | ND |
| 0.100 | 10 | ND | ND | ND | ND | ND |
| 0.040 | 25 | ND | ND | ND | ND | ND |
| 0.020 | 50 | ND | ND | ND | ND | ND |
| 0.010 | 100 | ND | ND | ND | ND | ND |
| 0.005 | 200 | ND | ND | ND | ND | ND |
| 0.002 | 500 | ND | ND | ND | ND | ND |
| Kentau statistic | | 0.069 | 0.076 | 0.085 | 0.131 | 0.136 |
| P-value | | 0.605 | 0.568 | 0.521 | 0.318 | 0.301 |
| aContact the U.S. Army Corps of Engineers, Rock Island District, for the annual exceedance probability of high discharges. | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 05488500 Annual nonexceedance probability of low discharges, based on April 1983 to March 2013 regulated period of record (30 years) | | | | | | | | |  |
| Annual nonexceed-ance probability | Recur-rence interval (years) | Minimum average discharge (cubic feet per second) for indicated number of consecutive days | | | | | | | | |
| 1 | 3 | 7 | 14 | 30 | 60 | 90 | 120 | 183 |
| 0.01 | 100 | 147 | 148 | 149 | 150 | 151 | 152 | 182 | 208 | 263 |
| 0.02 | 50 | 196 | 197 | 198 | 199 | 200 | 201 | 246 | 286 | 354 |
| 0.05 | 20 | 234 | 235 | 248 | 252 | 264 | 303 | 381 | 450 | 545 |
| 0.10 | 10 | 271 | 272 | 297 | 318 | 352 | 428 | 550 | 660 | 788 |
| 0.20 | 5 | 328 | 332 | 376 | 423 | 498 | 641 | 841 | 1,020 | 1,210 |
| 0.50 | 2 | 500 | 524 | 624 | 748 | 967 | 1,310 | 1,780 | 2,180 | 2,590 |
| 0.80 | 1.25 | 823 | 914 | 1,120 | 1,360 | 1,870 | 2,520 | 3,460 | 4,230 | 5,180 |
| 0.90 | 1.11 | 1,100 | 1,280 | 1,570 | 1,880 | 2,650 | 3,450 | 4,760 | 5,760 | 7,230 |
| 0.96 | 1.04 | 1,540 | 1,890 | 2,310 | 2,680 | 3,830 | 4,740 | 6,520 | 7,790 | 10,100 |
| 0.98 | 1.02 | 1,950 | 2,480 | 3,000 | 3,390 | 4,860 | 5,750 | 7,900 | 9,350 | 12,500 |
| 0.99 | 1.01 | 2,420 | 3,200 | 3,840 | 4,200 | 6,020 | 6,800 | 9,320 | 10,900 | 14,900 |
| Kentau statistic | | 0.064 | 0.044 | 0.018 | -0.016 | -0.076 | -0.034 | -0.044 | -0.057 | -0.085 |
| P-value | | 0.630 | 0.748 | 0.901 | 0.915 | 0.568 | 0.803 | 0.748 | 0.669 | 0.521 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 05488500 Annual nonexceedance probability of seasonal low discharges, based on October 1983 to September 2013 regulated period of record (30 years) | | | | | | | | | | |
| Annual nonexceed-ance probability | Recur-rence interval (years) | Minimum average discharge (cubic feet per second) for indicated number of consecutive days | | | | | | | | |
| 1 | 7 | 14 | 30 |  | 1 | 7 | 14 | 30 |
|  |  | January-February-March | | | |  | April-May-June | | | |
| 0.01 | 100 | 245 | 246 | 259 | 260 |  | 344 | 359 | 447 | 611 |
| 0.02 | 50 | 293 | 301 | 318 | 319 |  | 487 | 519 | 644 | 896 |
| 0.05 | 20 | 377 | 407 | 431 | 453 |  | 791 | 870 | 1,080 | 1,530 |
| 0.10 | 10 | 472 | 529 | 563 | 615 |  | 1,180 | 1,330 | 1,660 | 2,370 |
| 0.20 | 5 | 618 | 721 | 774 | 879 |  | 1,830 | 2,150 | 2,690 | 3,830 |
| 0.50 | 2 | 1,040 | 1,280 | 1,400 | 1,660 |  | 3,790 | 4,740 | 6,080 | 8,380 |
| 0.80 | 1.25 | 1,730 | 2,220 | 2,480 | 2,960 |  | 6,750 | 9,010 | 12,000 | 15,500 |
| 0.90 | 1.11 | 2,270 | 2,920 | 3,320 | 3,920 |  | 8,650 | 11,900 | 16,200 | 20,100 |
| 0.96 | 1.04 | 3,020 | 3,890 | 4,500 | 5,210 |  | 10,800 | 15,500 | 21,600 | 25,400 |
| 0.98 | 1.02 | 3,630 | 4,670 | 5,460 | 6,200 |  | 12,300 | 18,000 | 25,600 | 28,900 |
| 0.99 | 1.01 | 4,290 | 5,490 | 6,480 | 7,200 |  | 13,700 | 20,300 | 29,300 | 32,000 |
| Kentau statistic | | -0.009 | -0.025 | -0.034 | -0.051 |  | 0.007 | 0.057 | 0.062 | 0.090 |
| P-value | | 0.957 | 0.858 | 0.803 | 0.708 |  | 0.972 | 0.669 | 0.643 | 0.498 |
|  |  | July-August-September | | | |  | October-November-December | | | |
| 0.01 | 100 | 314 | 322 | 323 | 324 |  | 129 | 135 | 144 | 150 |
| 0.02 | 50 | 315 | 326 | 328 | 330 |  | 166 | 172 | 174 | 180 |
| 0.05 | 20 | 319 | 338 | 350 | 376 |  | 224 | 234 | 248 | 272 |
| 0.10 | 10 | 327 | 358 | 370 | 459 |  | 276 | 308 | 344 | 415 |
| 0.20 | 5 | 351 | 407 | 451 | 615 |  | 363 | 435 | 510 | 675 |
| 0.50 | 2 | 508 | 666 | 828 | 1,280 |  | 655 | 870 | 1,090 | 1,600 |
| 0.80 | 1.25 | 1,190 | 1,720 | 2,200 | 3,460 |  | 1,290 | 1,830 | 2,330 | 3,450 |
| 0.90 | 1.11 | 2,370 | 3,510 | 4,340 | 6,510 |  | 1,920 | 2,760 | 3,480 | 4,990 |
| 0.96 | 1.04 | 6,070 | 8,960 | 10,300 | 13,900 |  | 3,010 | 4,340 | 5,340 | 7,220 |
| 0.98 | 1.02 | 12,500 | 18,200 | 19,400 | 24,000 |  | 4,090 | 5,860 | 7,050 | 9,040 |
| 0.99 | 1.01 | 26,100 | 35,000 | 36,100 | 40,500 |  | 5,460 | 7,730 | 9,040 | 11,000 |
| Kentau statistic | | 0.108 | 0.016 | -0.025 | -0.076 |  | -0.062 | -0.060 | -0.122 | -0.048 |
| P-value | | 0.412 | 0.915 | 0.858 | 0.568 |  | 0.643 | 0.656 | 0.354 | 0.721 |