UNITED STATES DEPARTMENT OF THE INTERIOR
HAROLD L. ICKES, Secretary
GEOLOGICAL SURVEY
W. C. MENDENHALL, Director

Water-Supply Paper 745

# SURFACE WATER SUPPLY *of the* UNITED STATES

## 1933

## PART 5

## HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS

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## ILLUSTRATION

# SURFACE WATER SUPPLY OF HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS, 1933

## AUTHORIZATION AND SCOPE OF WORK

This volume is one of a series of 14 reports presenting results of measurements of flow made on streams in the United States during the year ending September 30, 1933.

The data presented in these reports were collected by the United States Geological Survey under the following authority contained in the organic law (20 Stat. L., p. 394):

*Provided*, That this officer [the Director] shall have the direction of the Geological Survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

The work was begun in 1888 in connection with special studies relating to irrigation. Since the fiscal year ending June 30, 1895, successive appropriation bills passed by Congress have carried the following items:

For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

*Annual appropriations for the fiscal years ending June 30, 1895–1934*

| | | | | | |
|---|---|---|---|---|---|
| 1895 | $12,500.00 | 1911–17 | $150,000.00 | 1928 | $147,000.00 |
| 1896 | 24,500.00 | 1918 | 175,000.00 | 1929 | 270,500.00 |
| 1897–99 | 50,000.00 | 1919 | 148,244.10 | 1930 | 275,000.00 |
| 1900 | 70,000.00 | 1920 | 175,000.00 | 1931 | 565,000.00 |
| 1901–2 | 100,000.00 | 1921–23 | 180,000.00 | 1932 | 711,000.00 |
| 1903–6 | 200,000.00 | 1924–25 | 170,000.00 | 1933 | 600,000.00 |
| 1907 | 150,000.00 | 1926 | 165,000.00 | 1934 | [1] 540,000.00 |
| 1908–10 | 100,000.00 | 1927 | 151,000.00 | | |

In the execution of the work many private and State organizations have cooperated, either by furnishing data or by assisting in collecting data. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected; cooperation of the second kind is acknowledged on page 10.

Measurements of stream flow have been made at about 6,680 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July 1933 2,800 gaging stations were being

[1] Only $340,000 available for expenditure.

maintained by the Geological Survey and the cooperating organizations. Many miscellaneous discharge measurements were made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in water-supply papers from time to time.

## DEFINITION OF TERMS

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups—(1) those that represent a rate of flow, as second-feet, gallons per minute, miner's inches, and discharge in second-feet per square mile, and (2) those that represent the actual quantity of water, as run-off in inches, acre-feet, and millions of cubic feet. The principal terms used in this series of reports are second-feet, second-feet per square mile, run-off in inches, and acre-feet. They may be defined as follows:

"Second-feet" is an abbreviation for "cubic feet per second." A second-foot is the rate of discharge of water flowing in a channel of rectangular cross section 1 foot wide and 1 foot deep at an average velocity of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in inches.

An "acre-foot", equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

"Stage-discharge relation", an abbreviation for the term "relation of gage height to discharge."

"Control", a term used to designate the natural section or stretch of the channel or artificial structure below the gage which determines the stage-discharge relation at the gage.

## EXPLANATION OF DATA

The data presented in this report cover the year beginning October 1, 1932, and ending September 30, 1933. At the beginning of January in most parts of the United States much of the precipitation in

the preceding three months is stored in the form of snow or ice, or in ponds, lakes, and swamps, or as underground water, and this stored water passes off in the streams during the spring break-up. At the end of September, on the other hand, the only stored water available for run-off is possibly a small quantity in the ground; therefore the run-off for the year beginning October 1 is practically all derived from precipitation within that year.

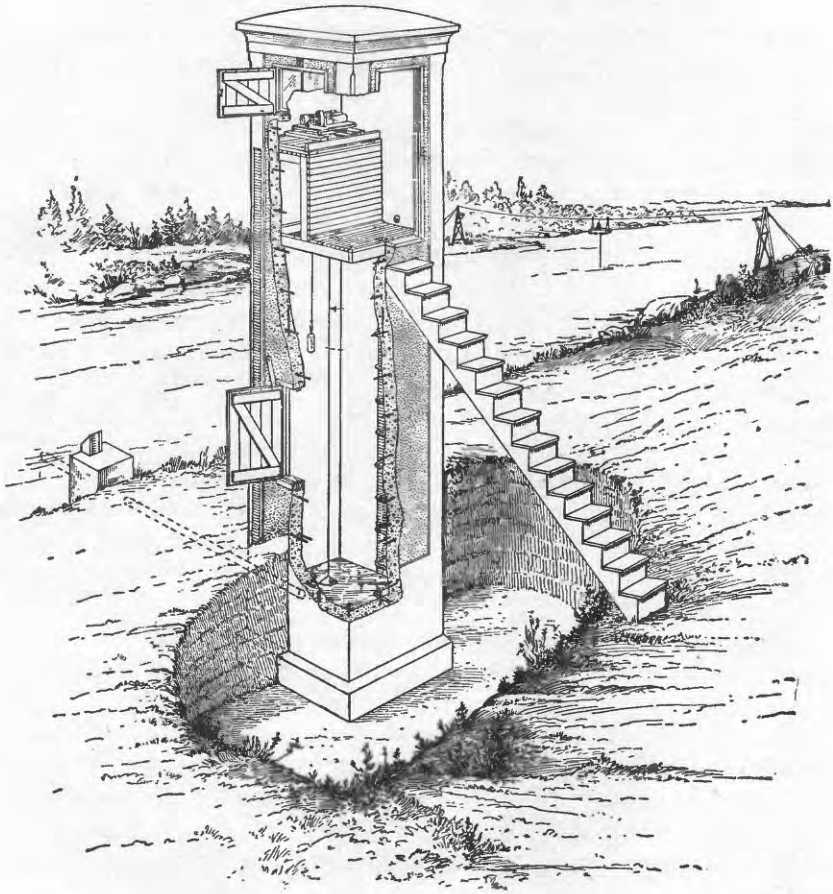

FIGURE 1.—Typical river-measurement station showing concrete well and house for water-stage recorder and staff gages, cable, and car.

The base data collected at gaging stations consist of records of stage, measurements of discharge, and general information used to supplement the gage heights and discharge measurements in determining the daily flow. The records of stage are obtained either from direct readings on a staff or chain gage, or from a water-stage recorder that gives a continuous record of the fluctuations. Measurements of discharge are made with a current meter by the general methods

outlined in standard textbooks on the measurement of river discharge. A typical gaging station, equipped with water-stage recorder and measuring cable and car, is shown in figure 1.

Rating tables giving the discharge for any stage are prepared from the discharge measurements. The application of the daily gage height to these rating tables gives the daily discharge from which the monthly and yearly mean discharge is computed.

The data presented for each gaging station in the area covered by this report comprise a description of the station, a table showing the daily discharge of the stream, and a table of monthly and yearly discharge and run-off.

The description of the station gives information in regard to the location and type of gage, diversions that decrease the flow at the gage, artificial regulation from pondage or storage, and the accuracy of the records. Information under "Discharge" gives the maximum and minimum recorded discharges and the average discharge. The maximum does not necessarily represent the crest discharge unless a water-stage recorder was in operation or a nonrecording gage was read at the time of the crest. Likewise, the minimum may not represent the lowest discharge. The average discharge is the average of the mean annual discharges for the years indicated. It is given only for stations for which there are 10 or more complete years of record.

The table of daily discharge gives, in general, the discharge in second-feet corresponding to the daily gage height, which may be a once daily reading or the mean of twice daily readings of a nonrecording gage, or the mean daily gage height obtained from a water-stage recorder graph.

At stations on streams subject to sudden or rapid diurnal fluctuation, the discharge obtained from the rating table and the mean daily gage height may not be the true mean discharge for the day. If such stations are equipped with water-stage recorders, the mean daily discharge may be obtained by averaging discharge for intervals during the day or by using the discharge integrator, an instrument for obtaining mean daily discharge from a continuous gage-height graph and containing as an essential element the rating curve of the station.

In the table of monthly discharge the column headed "Maximum" gives the maximum daily discharge and not the discharge when the water surface was at crest height. Likewise, in the column headed "Minimum" the quantity given is the minimum daily discharge. The column headed "Mean" is the average flow in cubic feet per second during the month. On this average flow are based computations recorded in the remaining columns, which are defined on page 2.

## ACCURACY OF FIELD DATA AND COMPUTED RESULTS

The accuracy of stream-flow data depends primarily (1) on the permanency of the stage-discharge relation and (2) on the accuracy of observation of stage, measurements of flow, and interpretation of records.

The station description gives a statement in regard to the general accuracy of the records. "Excellent" indicates that, in general, the daily records are accurate within 5 percent; "good", within 10 percent; "fair", within 15 percent; and "poor", within 20 percent or more.

The monthly means for any station may represent with high accuracy the quantity of water flowing past the gage, but the figures showing discharge per square mile and run-off in inches may be subject to gross errors caused by the inclusion of large noncontributing districts in the measured drainage area, by lack of information concerning water diverted for irrigation or other use, or by inability to interpret the effect of artificial regulation of the flow of the river above the station. "Second-feet per square mile" and "run-off in inches" are therefore not computed if such errors appear probable. The computations are also omitted for stations on streams draining areas in which the annual rainfall is less than 20 inches.

The tables of monthly discharge give a general idea of the flow at the station. The table of daily discharge allows more detailed studies of the variation in flow. It should be borne in mind, however, that the observations in each succeeding year may be expected to throw new light on data previously published.

Many gaging stations on streams in the irrigated areas of the United States are situated above most of the diversions from those streams, and the discharge recorded does not show the water supply available for further development, as prior appropriations below the stations must first be satisfied.

## PUBLICATIONS

Investigation of water resources by the United States Geological Survey has consisted in large part of measurements of the volume of flow of streams and studies of the conditions affecting that flow, but it has comprised also investigation of such closely allied subjects as irrigation, water storage, water power, underground waters, and quality of waters. Most of the results of these investigations have been published in the series of water-supply papers, but some have appeared in the bulletins, professional papers, monographs, and annual reports.

The results of stream-flow measurements are now published annually in 12 parts, each part covering an area whose boundaries coincide with natural drainage features as indicated below:

Part 1. North Atlantic slope basins (St. John River to York River).
2. South Atlantic slope and eastern Gulf of Mexico basins (James River to Mississippi River).
3. Ohio River Basin.
4. St. Lawrence River Basin.
5. Hudson Bay and upper Mississippi River Basins.
6. Missouri River Basin.
7. Lower Mississippi River Basin.
8. Western Gulf of Mexico basins.
9. Colorado River Basin.
10. The Great Basin.
11. Pacific slope basins in California.
12. North Pacific slope basins, in three parts:
    A, Pacific slope basins in Washington and upper Columbia River Basin.
    B, Snake River Basin.
    C, Pacific slope basins in Oregon and lower Columbia River Basin.

Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below.

1. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D.C., who will, on application, furnish lists giving prices.

2. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

3. Sets are available for consultation in the local offices of the water-resources branch of the Geological Survey, as follows:

Augusta, Maine, Statehouse.
Boston, Mass., 945 Post Office Building.
Hartford, Conn., 203 Federal Building.
Albany, N.Y., 353 Broadway.
Trenton, N.J., 228 Federal Building.
Harrisburg, Pa., 492 Education Building.
Charlottesville Va., University of Virginia.
South Charleston, W.Va., Naval Ordnance Plant.
Asheville, N.C., 220 Post Office Building.
Columbia, S.C., 801 National Loan & Exchange Bank Building.
Ocala, Fla., Post Office Building.
Montgomery, Ala., Post Office Building.
Chattanooga, Tenn., 217 Post Office Building.
Columbus, Ohio, Engineering Experiment Station, Ohio State University.
Indianapolis, Ind., 319 Federal Building.
Urbana, Ill., 302 University New Agricultural Building.
Madison, Wis., 337N State Capitol.
St. Paul, Minn., 808 New Post Office Building.
Iowa City, Iowa, 402 Hydraulic Laboratory, University of Iowa.
St. Louis, Mo., 3 Customhouse.

Rolla, Mo., Missouri Geological Survey Building, Missouri School of Mines and Metallurgy.
Topeka, Kans, 305 Federal Building.
Fort Smith, Ark., Post Office Building.
Austin, Tex., State Highway Building.
Santa Fe, N.Mex., State Capitol.
Tucson, Ariz., 210 Post Office Building.
Denver, Colo., 403 Post Office Building.
Salt Lake City, Utah, 303 Federal Building.
Idaho Falls, Idaho, 228 Federal Building.
Boise, Idaho, 429 Federal Building.
Helena, Mont., 421 New Federal Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 606 Post Office Building.
San Francisco, Calif., 303 Customhouse.
Los Angeles, Calif., 510 Eighth and Figueroa Building.
Honolulu, Hawaii, 225 Federal Building.

A list of the Geological Survey publications may be obtained by applying to the Director, United States Geological Survey, Washington, D.C.

Stream-flow records have been obtained at about 6,680 points in the United States, and the data obtained have been published in the reports tabulated as follows:

*Stream-flow data in reports of the United States Geological Survey*

[A=Annual Report; B=Bulletin; W=Water-Supply Paper]

| Report | Character of data | Year |
|---|---|---|
| 10th A, pt. 2 | Descriptive information only | |
| 11th A, pt. 2 | Monthly discharge and descriptive information | 1884 to September 1890. |
| 12th A, pt. 2 | do | 1884 to June 30, 1891. |
| 13th A, pt. 3 | Mean discharge in second-feet | 1884 to Dec. 31, 1892. |
| 14th A, pt. 2 | Monthly discharge (long-time records, 1871–1893) | 1888 to Dec. 31, 1893. |
| B 131 | Descriptions, measurements, gage heights, and ratings | 1893–94. |
| 16th A, pt. 2 | Descriptive information only | |
| B 140 | Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years). | 1895. |
| W 11 | Gage heights (also gage heights for earlier years) | 1896. |
| 18th A, pt. 4 | Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years). | 1895–96. |
| W 15 | Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas River. | 1897. |
| W 16 | Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte Rivers and western United States. | 1897. |
| 19th A, pt. 4 | Descriptions, measurements, ratings, and monthly discharge (also some long-time records). | 1897. |
| W 27 | Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River. | 1898. |
| W 28 | Measurements, ratings, and gage heights, Arkansas River and western United States. | 1898. |
| 20th A, pt. 4 | Monthly discharge (also for many earlier years) | 1898. |
| W 35 to 39 | Descriptions, measurements, gage heights, and ratings | 1899. |
| 21st A, pt. 4 | Monthly discharge | 1899. |
| W 47 to 52 | Descriptions, measurements, gage heights, and ratings | 1900. |
| 22d A, pt. 4 | Monthly discharge | 1900. |
| W 65, 66 | Descriptions, measurements, gage heights, and ratings | 1901. |
| W 75 | Monthly discharge | 1901. |
| W 82 to 85 | Complete data | 1902. |
| W 97 to 100 | do | 1903. |
| W 124 to 135 | do | 1904. |
| W 165 to 178 | do | 1905. |
| W 201 to 214 | do | 1906. |

*Stream-flow data in reports of the United States Geological Survey*—Continued

[A = Annual Report; B = Bulletin; W = Water-Supply Paper]

| Report | Character of data | Year |
|---|---|---|
| W 241 to 252 | Complete data | 1907–8. |
| W 261 to 272 | do | 1909. |
| W 281 to 292 | do | 1910. |
| W 301 to 312 | do | 1911. |
| W 321 to 332 | do | 1912. |
| W 351 to 362 | do | 1913. |
| W 381 to 394 | do | 1914. |
| W 401 to 414 | do | 1915. |
| W 431 to 444 | do | 1916. |
| W 451 to 464 | do | 1917. |
| W 471 to 484 | do | 1918. |
| W 501 to 514 | do | 1919–20. |
| W 521 to 534 | do | 1921. |
| W 541 to 554 | do | 1922. |
| W 561 to 574 | do | 1923. |
| W 581 to 594 | do | 1924. |
| W 601 to 614 | do | 1925. |
| W 621 to 634 | do | 1926. |
| W 641 to 654 | do | 1927. |
| W 661 to 674 | do | 1928. |
| W 681 to 694 | do | 1929. |
| W 696 to 709 | do | 1930. |
| W 711 to 724 | do | 1931. |
| W 726 to 739 | do | 1932. |
| W 741 to 754 | do | 1933. |

The records at most of the stations discussed in these reports extend over a series of years. Miscellaneous measurements at many points other than regular gaging stations have been made each year and are published under "Miscellaneous discharge measurements" at the end of each report in the same relative order as the regular gaging stations. An index of the reports containing records obtained prior to 1904 has been published in Water-Supply Paper 119.

The following table gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1933. The data for any particular station will, as a rule, be found in the reports covering the years during which the station was maintained. For example, data for 1910–20 for any station in the area covered by part 3 are published in Water-Supply Papers 283, 303, 323, 353, 383, 403, 433, 453, 473, and 503, which contain records for the Ohio River Basin for those years.

## *Numbers of water-supply papers containing results of stream measurements, 1889–1933*

[For basins included, see p. 6]

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12–A | 12–B | 12–C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1899 [a] | 35 | [b] 35, 36 | 36 | 36 | 36 | [c] 36, 37 | 37 | 37 | [d] 37, 38 | 38, [e] 39 | 38, [f] 39 | 38 | 38 | 38 |
| 1900 [g] | 47, [h] 48 | 48 | 48, [i] 49 | 49 | 49 | 49, [i] 50 | 50 | 50 | 50 | 51 | 51 | 51 | 51 | 51 |
| 1901 | 65, 75 | 65, 75 | 65, 75 | 65, 75 | [k] 65, 66, 75 | 66, 75 | [k] 65, 66, 75 | 66, 75 | 66, 75 | 66, 75 | 66, 75 | 66, 75 | 66, 75 | 66, 75 |
| 1902 | 82 | [b] 82, 83 | 83 | [l] 82, 83 | [k] 83, 85 | 84 | [k] 83, 84 | 84 | 85 | 85 | 85 | 85 | 85 | 85 |
| 1903 | 97 | [b] 97, 98 | 98 | 97 | [k] 98, 99, [m] 100 | 99 | [k] 98, 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1904 | [n] 124, [o] 125, [p]126 | [p] 126, 127 | 128 | 129 | [k] 128, 130 | 130, [q] 131 | [k] 128, 130 | 132 | 133 | 133, [r] 134 | 134 | 135 | 135 | 135 |
| 1905 | [n] 165, [o] 166, [p]167 | [p] 167, 168 | 169 | 170 | 171 | 172 | [k] 169, 173 | 174 | 175, [s] 177 | 176, [r] 177 | 177 | 178 | 178 | [t] 177, 178 |
| 1906 | [n] 201, [o] 202, [p]203 | [p] 203, 204 | 205 | 206 | 207 | 208 | [k] 205, 209 | 210 | 211, [s] 213 | 212, [r] 213 | 213 | 214 | 214 | 214 |
| 1907–8 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250, [r] 251 | 251 | 252 | 252 | 252 |
| 1909 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270, [r] 271 | 271 | 272 | 272 | 272 |
| 1910 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 292 | 292 |
| 1911 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 312 | 312 |
| 1912 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332–A | 332–B | 332–C |
| 1913 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362–A | 362–B | 362–C |
| 1914 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 |
| 1915 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 |
| 1916 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 |
| 1917 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 |
| 1918 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 |
| 1919–20 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 |
| 1921 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 |
| 1922 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 |
| 1923 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 |
| 1924 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 |
| 1925 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 |
| 1926 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 |
| 1927 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 |
| 1928 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 |
| 1929 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 |
| 1930 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 |
| 1931 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 |
| 1932 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 |
| 1933 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 |

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39. Tables for monthly discharge for 1899 in Twenty-first Annual Report, part 4.
[b] James River only.
[c] Gallatin River.
[d] Green and Gunnison Rivers and Colorado River above Gunnison River.
[e] Mojave River only.
[f] Kings and Kern Rivers and south Pacific slope basins.
[g] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Tables of monthly discharge for 1900 in Twenty-second Annual Report, part 4.
[h] Wissahickon and Shuylkill Rivers to James River.
[i] Scioto River.
[j] Loup, Platte, and Elkhorn Rivers and tributaries below the Platte.
[k] Tributaries of Mississippi River from east.
[l] Lake Ontario and tributaries to St. Lawrence River proper.
[m] Hudson Bay only.
[n] New England rivers only.
[o] Hudson River to Delaware River, inclusive.
[p] Susquehanna River to Yadkin River, inclusive.
[q] Platte and Kansas Rivers.
[r] The Great Basin in California, except Truckee and Carson River Basins.
[s] Below junction with Gila Tiver.
[t] Rogue, Umpqua, and Siletz Rivers only.

## COOPERATION

The work in the several States was done under cooperative agreements as follows: In Illinois with the Illinois Department of Purchases and Construction, Henry H. Kuhn, director, and with the Illinois Department of Registration and Education, M. F. Walsh, director; in Indiana with the Department of Conservation, Denzil Doggett, assistant State engineer; in Iowa with the Iowa Institute of Hydraulic Research, Prof. Floyd A. Nagler, director, the State Board of Conservation, M. L. Hutton, chief engineer, and the State Fish and Game Department, I. T. Bode, fish and game warden; in Minnesota with the Minnesota Department of Drainage and Waters, E. V. Willard, succeeded by W. S. Olson, director; in Missouri with the Missouri Bureau of Geology and Mines, H. A. Buehler, State geologist, and with the State Highway Department, T. H. Cutler, chief highway engineer; in North Dakota with the State engineer, Robert E. Kennedy; in Wisconsin with the Public Service Commission of Wisconsin, John Damon, chief engineer.

Acknowledgments are also due the Corps of Engineers, United States Army, for financial assistance in collecting records published herein. Several stations in Minnesota, Montana, and North Dakota were maintained from funds appropriated by the Department of State of the United States.

Full cooperation exists between this organization and the Dominion Water Power and Hydrometric Bureau, Department of the Interior, Canada. On waters adjacent to the international boundary certain stations are maintained jointly by the United States and Canada under the terms of the Boundary Waters Treaty of 1909, and others are maintained under a subsequent agreement between the two Governments. The records from all these stations are obtained in such a manner as to be equally acceptable and available in either country. These stations are herein designated international gaging stations.

Assistance in collecting records was also rendered by the following municipalities and corporations: In Iowa by the Mississippi River Power Co., the Des Moines Waterworks, the City of Cedar Rapids, the Decker Packing Co., the Boone Water Department, and the Iowa State College; in Minnesota by the Ford Motor Co.; in Wisconsin by the Northern States Power Co., the Wisconsin Public Service Corporation, and the Lake Superior District Power Co.

## DIVISION OF WORK

The data for the stations in the several States were collected and prepared for publication as follows: In Illinois (except the Mississippi River at Alton, Ill.) by J. H. Morgan, district engineer, assisted by L. C. Crawford, C. L. Muntz, A. G. Hely, Mrs. M. F. Bressler, William Sell, Espey Williamson, Benjamin Levy, and Mrs. Ruth

Zander; in Indiana by H. E. Grosbach, district engineer assisted by W. D. Mitchell, R. L. Spencer, W. E. Hiatt, and Mrs. C. Perrin; in Iowa by R. G. Kasel, district engineer, assisted by S. K. Jackson and Miss Doris Buchanan; in Minnesota and North Dakota and for all stations on the Mississippi River to Clayton, Iowa, and for the Whetstone River near Big Stone, S.Dak., by C. L. Batchelder, district engineer, assisted by A. H. Frazier, O. B. Johnson, A. B. Nelson, G. L. Oakland, H. A. Smith, R. J. Woolery, Miss C. E. Putz, and Mrs. M. S. Daly; in Missouri and the Mississippi River at Alton, Ill., by H. C. Beckman, district engineer, assisted by F. M. Bell, H. C. Bolon, W. M. Littlefield, R. D. Schmickle, C. J. Eyberg, and C. H. Jennings; in Montana by W. A. Lamb, district engineer, assisted by A. H. Tuttle, C. S. Heidel, Edward Post, E. H. Bekkedahl, H. C. Smith, and Mrs. G. Thompson; in Wisconsin (except the Mississippi River at Prescott and La Crosse) and the St. Croix River near Rush City, Minn., by S. B. Soulé, district engineer, assisted by C. C. Yonker, R. H. Brigham, Earl Harbeck, Paul Patterson, and Mrs. Elsie Fahringer.

The records were reviewed and the manuscript assembled by J Harold Baily.

## GAGING-STATION RECORDS

### HUDSON BAY DRAINAGE BASIN

#### ST. MARY RIVER BASIN

##### UPPER ST. MARY LAKE AT ST. MARY CHALET, MONT.

LOCATION.—Staff gage in NE¼ sec. 4, T. 34 N., R. 14 W., at St. Mary Chalet, half a mile above outlet in Glacier National Park.

RECORDS AVAILABLE.—May 1929 to September 1933.

EXTREMES.—Maximum stage during year, 6.70 feet June 17; minimum, 1.58 feet Sept. 14.

1929–33: Maximum stage, that of June 17, 1933; minimum, 0.02 foot Dec. 16, 29, 30, 1929, Jan. 1, 1930.

REMARKS.—Records excellent. No diversions.

*Gage-height, in feet, 1933*

| Day | June | July | Aug. | Sept. | Day | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.57 | 5.05 | 2.92 | 1.95 | 16 | 6.43 | 4.28 | 2.52 | 1.60 |
| 2 | 5.67 | 5.02 | 2.85 | 1.92 | 17 | 6.68 | 4.16 | 2.50 | 1.60 |
| 3 | 5.71 | 5.01 | 2.81 | 1.86 | 18 | 6.55 | 4.06 | 2.49 | 1.66 |
| 4 | 5.74 | 5.01 | 2.78 | 1.79 | 19 | 6.21 | 3.93 | 2.47 | 1.76 |
| 5 | 5.88 | 4.88 | 2.85 | 1.75 | 20 | 5.86 | 3.85 | 2.40 | ------ |
| 6 | 5.91 | 4.74 | 2.87 | 1.72 | 21 | 5.62 | 3.74 | 2.33 | ------ |
| 7 | 5.95 | 4.62 | 2.78 | 1.69 | 22 | 5.51 | 3.61 | 2.26 | ------ |
| 8 | 5.86 | 4.53 | 2.73 | 1.65 | 23 | 5.51 | 3.48 | 2.20 | ------ |
| 9 | 5.90 | 4.45 | 2.70 | 1.64 | 24 | 5.42 | 3.41 | 2.22 | ------ |
| 10 | 5.97 | 4.50 | 2.69 | 1.72 | 25 | 5.20 | 3.36 | 2.14 | ------ |
| 11 | 5.76 | 4.51 | 2.63 | 1.68 | 26 | 5.21 | 3.38 | 2.03 | ------ |
| 12 | 5.54 | 4.50 | 2.60 | 1.60 | 27 | 5.15 | 3.41 | 1.97 | ------ |
| 13 | 5.50 | 4.50 | 2.58 | 1.60 | 28 | 5.09 | 3.35 | 1.95 | ------ |
| 14 | 5.65 | 4.46 | 2.57 | 1.58 | 29 | 5.15 | 3.29 | 1.89 | ------ |
| 15 | 6.01 | 4.37 | 2.59 | 1.60 | 30 | 5.10 | 3.22 | 1.98 | ------ |
| | | | | | 31 | ------ | 3.05 | 1.98 | ------ |

### LOWER ST. MARY LAKE NEAR BABB, MONT.

LOCATION.—Water-stage recorder in NE¼ sec. 3, T. 35 N., R. 14 W., half a mile above outlet and 3 miles southeast of Babb.

RECORDS AVAILABLE.—May 1929 to September 1933.

EXTREMES.—Maximum stage during year, 4.90 feet June 7; minimum, 0.05 foot Oct. 18, 20.

1929–33: Maximum stage, that of June 7, 1933; minimum, 0.04 foot Oct. 24, 25, 1929.

REMARKS.—Records excellent. No diversions. Stage increased by inflow of Swiftcurrent Creek during part of year.

*Gage-height, in feet, 1932–33*

| Day | Oct. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | 0.08 | ------- | 1.29 | 4.12 | 3.06 | 1.84 | 1.34 |
| 2 | .07 | ------- | 1.45 | 4.48 | 2.98 | 1.81 | 1.32 |
| 3 | .08 | ------- | 1.69 | 4.66 | 2.95 | 1.78 | 1.31 |
| 4 | .09 | ------- | 1.95 | 4.72 | 2.94 | 1.77 | 1.30 |
| 5 | .25 | ------- | 2.12 | 4.74 | 2.90 | 1.76 | 1.29 |
| 6 | .46 | ------- | 2.23 | 4.81 | 2.83 | 1.77 | 1.28 |
| 7 | .53 | ------- | 2.28 | 4.81 | 2.84 | 1.75 | 1.27 |
| 8 | .50 | ------- | 2.33 | 4.70 | 2.82 | 1.73 | 1.25 |
| 9 | .45 | ------- | 2.41 | 4.64 | 2.78 | 1.71 | 1.26 |
| 10 | .37 | ------- | 2.44 | 4.69 | 2.75 | 1.68 | 1.26 |
| 11 | .26 | ------- | 2.47 | 4.64 | 2.73 | 1.66 | 1.23 |
| 12 | .16 | ------- | 2.48 | 4.48 | 2.78 | 1.66 | 1.21 |
| 13 | .08 | ------- | 2.43 | 4.21 | 2.82 | 1.67 | 1.20 |
| 14 | .07 | ------- | 2.37 | 4.07 | 2.83 | 1.65 | 1.19 |
| 15 | .06 | ------- | 2.35 | 4.00 | 2.80 | 1.66 | 1.07 |
| 16 | .06 | ------- | 2.38 | 4.17 | 2.73 | 1.64 | .87 |
| 17 | .06 | ------- | 2.47 | 4.47 | 2.63 | 1.64 | .72 |
| 18 | .05 | ------- | 2.53 | 4.61 | 2.57 | 1.63 | .64 |
| 19 | .06 | ------- | 2.58 | 4.51 | 2.47 | 1.60 | .57 |
| 20 | .05 | ------- | 2.54 | 4.23 | 2.38 | 1.57 | .52 |
| 21 | .07 | ------- | 2.52 | 3.94 | 2.29 | 1.56 | .48 |
| 22 | .08 | ------- | 2.50 | 3.70 | 2.18 | 1.56 | .49 |
| 23 | .08 | ------- | 2.48 | 3.57 | 2.07 | 1.55 | .46 |
| 24 | .09 | ------- | 2.47 | 3.48 | 1.98 | 1.59 | .45 |
| 25 | .09 | ------- | 2.50 | 3.35 | 1.92 | 1.61 | .44 |
| 26 | .10 | 0.84 | 2.59 | 3.22 | 1.90 | 1.56 | .41 |
| 27 | .13 | .98 | 2.72 | 3.13 | 1.92 | 1.51 | .40 |
| 28 | .17 | 1.17 | 2.86 | 3.08 | 1.94 | 1.47 | .38 |
| 29 | ------- | 1.18 | 3.07 | 3.09 | 1.93 | 1.42 | .36 |
| 30 | ------- | 1.20 | 3.24 | 3.08 | 1.89 | 1.40 | .33 |
| 31 | ------- | ------- | 3.63 | ------- | 1.87 | 1.38 | ------- |

### ST. MARY RIVER NEAR KIMBALL, ALBERTA

(International gaging station)

LOCATION.—Water-stage recorder in SW¼ sec. 25, T. 1 N., R. 25 W. fourth meridian, 1½ miles southwest of Kimball and 5 miles north of international boundary. Chain gage 3 miles downstream was used Nov. 1 to Apr. 30.

DRAINAGE AREA.—497 square miles.

RECORDS AVAILABLE.—January 1913 to September 1933. September 1902 to December 1912 at point half a mile north of international boundary. Comparable records from 1905–12 obtained by the Irrigation Branch, Department of the Interior, Canada, half a mile below present station.

DISCHARGE.—Maximum during year, 4,180 second-feet June 9 (gage height, 5.95 feet); minimum, 60 second-feet Mar. 7; ice present.

1902–33: Maximum (estimated), 18,000 second-feet June 5, 1908; minimum, 27.8 second-feet Dec. 18, 1930.

REMARKS.—Records good. Stage-discharge relation affected by ice Nov. 13 to Apr. 22. St. Mary Canal diverts water near Babb, Mont., to North Fork of Milk River; Alberta Railway & Irrigation Co.'s canal diverts 2 miles below station. Regulaiton on Swiftcurrent Creek. This station is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. The records have been collected and compiled jointly with the Dominion Water Power and Hydrometric Bureau, Department of the Interior, Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 279 | 278 | 235 | 220 | 122 | e 65 | e 235 | e 654 | 3,320 | 2,100 | 703 | 449 |
| 2 | 272 | e 288 | e 238 | e 214 | e 121 | 63 | 290 | 618 | 3,710 | 2,030 | 670 | 449 |
| 3 | 266 | 299 | 242 | 207 | e 120 | e 62 | e 260 | 799 | 3,780 | 1,990 | 631 | 444 |
| 4 | 258 | e 289 | e 233 | e 210 | 119 | 62 | 231 | 1,000 | 3,900 | 1,960 | 637 | 444 |
| 5 | 315 | 278 | 224 | 213 | e 112 | e 62 | e 248 | 1,140 | 4,080 | 1,900 | 637 | 433 |
| 6 | 424 | e 288 | e 214 | e 210 | 106 | e 61 | 265 | 1,250 | 4,120 | 1,830 | 631 | 409 |
| 7 | 474 | 299 | 203 | 207 | e 98 | 60 | e 273 | 1,250 | 4,020 | 1,820 | 625 | 386 |
| 8 | 464 | e 289 | e 208 | e 195 | e 90 | e 67 | 282 | 1,300 | 4,020 | 1,790 | 612 | 372 |
| 9 | e 432 | 278 | e 212 | 183 | 82 | 74 | e 259 | 1,430 | 4,100 | 1,720 | 587 | 368 |
| 10 | e 392 | e 288 | 217 | e 188 | e 78 | e 80 | 235 | 1,430 | 3,830 | 1,710 | 569 | 386 |
| 11 | 370 | 299 | e 228 | 193 | 74 | 86 | e 252 | 1,390 | 3,680 | 1,700 | 563 | 364 |
| 12 | 323 | e 274 | 238 | e 186 | e 80 | e 88 | 269 | 1,380 | 3,510 | 1,740 | 563 | 355 |
| 13 | 282 | 250 | e 238 | 180 | e 85 | 91 | e 319 | 1,340 | 3,350 | 1,740 | 569 | 355 |
| 14 | 243 | e 242 | 238 | e 190 | 91 | e 94 | 370 | 1,340 | 3,290 | 1,750 | 563 | 347 |
| 15 | 224 | 235 | e 233 | 200 | e 94 | 97 | e 400 | 1,380 | 3,320 | e 1,670 | 581 | 737 |
| 16 | 209 | e 231 | 227 | e 187 | 97 | e 98 | 432 | 1,450 | 3,490 | e 1,600 | 556 | 683 |
| 17 | 202 | 227 | e 217 | 174 | e 97 | 99 | e 367 | 1,530 | 3,710 | 1,520 | 563 | 587 |
| 18 | 188 | e 236 | 207 | e 176 | 97 | 106 | 303 | 1,620 | 3,760 | 1,430 | 550 | 538 |
| 19 | 140 | 246 | e 208 | 177 | e 94 | 106 | e 314 | 1,630 | 3,540 | 1,330 | 538 | 509 |
| 20 | 125 | e 260 | 210 | e 180 | 91 | e 107 | 326 | 1,600 | 3,270 | 1,240 | 515 | 492 |
| 21 | 125 | 273 | e 212 | 183 | e 88 | 109 | e 353 | 1,580 | 2,970 | 1,150 | 509 | 475 |
| 22 | 138 | e 262 | 213 | e 183 | 86 | e 112 | 380 | 1,570 | 2,780 | 1,020 | 492 | 492 |
| 23 | 221 | 250 | e 203 | 183 | e 80 | 116 | e 396 | 1,600 | 2,610 | 903 | 492 | 480 |
| 24 | 290 | e 252 | 193 | e 175 | 74 | e 123 | 413 | 1,610 | 2,460 | 814 | 563 | 454 |
| 25 | 246 | 254 | e 208 | 167 | e 73 | 129 | e 428 | 1,670 | 2,320 | 771 | 625 | 444 |
| 26 | 197 | e 244 | 224 | e 161 | 71 | e 141 | 444 | 1,850 | 2,270 | 764 | 600 | 433 |
| 27 | 227 | 235 | e 212 | 155 | e 69 | 149 | e 600 | 1,970 | 2,150 | 792 | 563 | 423 |
| 28 | 356 | e 240 | 200 | e 154 | 67 | e 155 | 757 | 2,080 | 2,130 | 814 | 515 | 418 |
| 29 | 323 | 246 | e 200 | 152 | ------ | 164 | e 724 | 2,250 | 2,140 | 807 | 486 | 418 |
| 30 | 311 | e 240 | 200 | e 144 | ------ | 171 | 690 | 2,520 | 2,140 | 764 | 503 | 413 |
| 31 | 307 | ------ | e 210 | 135 | ------ | 180 | ------ | 3,000 | ------ | 744 | 486 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 474 | 125 | 278 | 17,100 |
| November | 299 | 227 | 262 | 15,600 |
| December | 242 | 193 | 218 | 13,400 |
| January | 220 | 135 | 183 | 11,300 |
| February | 122 | 67 | 91.3 | 5,070 |
| March | 180 | 60 | 102 | 6,270 |
| April | 757 | 231 | 370 | 22,000 |
| May | 3,000 | 618 | 1,520 | 93,500 |
| June | 4,120 | 2,130 | 3,260 | 194,000 |
| July | 2,100 | 744 | 1,420 | 87,300 |
| August | 703 | 486 | 571 | 35,100 |
| September | 737 | 347 | 452 | 26,900 |
| The year | 4,120 | 60 | 729 | 528,000 |

e Interpolated.

### ST. MARY CANAL AT INTAKE, NEAR BABB, MONT.

(International gaging station)

LOCATION.—Water-stage recorder in NW¼NE¼ sec. 27, T. 36 N., R. 14 W., 600 feet below intake of canal on Blackfeet Indian Reservation and 1 mile east of Babb.

RECORDS AVAILABLE.—Irrigation seasons 1918–33.

REMARKS.—Records good. Discharge estimated Apr. 22, Sept. 2[illegible] to Oct. 3. This canal diverts from west bank of St. Mary River near Babb and discharges into North Fork of Milk River. The water then flows in the natural channel of Milk River through Canada and is finally used for irrigation in Milk River Valley, east of Havre, Mont. Water may be returned to St. Mary River at St. Mary Crossing. This station is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. The records have been collected and compiled jointly with the Dominion Water Power and Hydrometric Bureau, Department of the Interior, Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Apr. | May | June | July | Aug. | Sept. | Oct. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 265 | 496 | 690 | 724 | 596 | 54 |
| 2 | 0 | 0 | 347 | 495 | 685 | 726 | 594 | 54 |
| 3 | 0 | 0 | 421 | 496 | 685 | 727 | 593 | 190 |
| 4 | 0 | 0 | 479 | 498 | 685 | 730 | 593 | 366 |
| 5 | 0 | 0 | 491 | 496 | 686 | 727 | 591 | 470 |
| 6 | 0 | 0 | 488 | 495 | 690 | 727 | 590 | 457 |
| 7 | 0 | 0 | 491 | 505 | 692 | 727 | 591 | 288 |
| 8 | 0 | 0 | 494 | 291 | 692 | 730 | 590 | 84 |
| 9 | 0 | 0 | 492 | 119 | 694 | 728 | 590 | 84 |
| 10 | 0 | 0 | 494 | 521 | 692 | 733 | 590 | 81 |
| 11 | 0 | 0 | 492 | 529 | 692 | 733 | 590 | 79 |
| 12 | 0 | 0 | 494 | 528 | 694 | 733 | 590 | 78 |
| 13 | 0 | 0 | 495 | 537 | 694 | 732 | 590 | 74 |
| 14 | 0 | 0 | 490 | 552 | 698 | 733 | 524 | 68 |
| 15 | 0 | 0 | 492 | 561 | 712 | 732 | 69 | 67 |
| 16 | 0 | 0 | 491 | 587 | 715 | 730 | 63 | 66 |
| 17 | 0 | 0 | 495 | 612 | 724 | 732 | 62 | 66 |
| 18 | 63 | 0 | 495 | 634 | 724 | 733 | 61 | 28 |
| 19 | 116 | 0 | 495 | 644 | 721 | 732 | 60 | 0 |
| 20 | 115 | 0 | 496 | 662 | 714 | 728 | 59 | 0 |
| 21 | 117 | 0 | 495 | 664 | 710 | 728 | 58 | 0 |
| 22 | 117 | 28 | 494 | 667 | 710 | 730 | 58 | 0 |
| 23 | 71 | 42 | 495 | 674 | 710 | 727 | 56 | 0 |
| 24 | 43.1 | 42 | 492 | 688 | 714 | 700 | 56 | 0 |
| 25 | 100 | 42 | 495 | 694 | 720 | 644 | 56 | 0 |
| 26 | 102 | 86 | 495 | 696 | 724 | 608 | 56 | 0 |
| 27 | 83 | 88 | 498 | 697 | 726 | 603 | 55 | 0 |
| 28 | 0 | 88 | 500 | 694 | 728 | 601 | 54 | 0 |
| 29 | 0 | 90 | 502 | 691 | 726 | 598 | 54 | 0 |
| 30 | 0 | 129 | 504 | 691 | 724 | 598 | 54 | 0 |
| 31 | 0 | ------- | 500 | ------- | 724 | 598 | ------- | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| 1932 | | | | |
| October 18–27 | 117 | 43.1 | 92.7 | 1,840 |
| 1933 | | | | |
| April 22–30 | 129 | 28 | 70.6 | 1,260 |
| May | 504 | 265 | 480 | 29,500 |
| June | 697 | 119 | 570 | 33,900 |
| July | 728 | 685 | 706 | 43,400 |
| August | 733 | 598 | 701 | 43,100 |
| September | 596 | 54 | 305 | 18,100 |
| October 1–18 | 470 | 28 | 147 | 5,250 |
| The period | | | | 175,000 |

NOTE—No flow during months omitted.

### ST. MARY CANAL AT ST. MARY CROSSING, NEAR BABB, MONT.

(International gaging station)

LOCATION.—Water-stage recorder in NE ¼ sec. 30, T. 37 N., R. 13 W. 500 feet east of outlet of St. Mary River siphon, 9 miles northeast of Babb, and 10 miles below intake.

RECORDS AVAILABLE.—Irrigation seasons 1918–33.

REMARKS.—Records excellent. This station is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. The records have been collected and compiled jointly with the Dominion Water Power and Hydrometric Bureau, Department of the Interior, Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Apr. | May | June | July | Aug. | Sept. | Oct. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 189 | 441 | 611 | 628 | 524 | 0 |
| 2 | 0 | 0 | 278 | 441 | 609 | 630 | 524 | 0 |
| 3 | 0 | 0 | 346 | 443 | 607 | 632 | 524 | 16 |
| 4 | 0 | 0 | 408 | 443 | 607 | 632 | 522 | 277 |
| 5 | 0 | 0 | 424 | 444 | 609 | 632 | 520 | 417 |
| 6 | 0 | 0 | 425 | 443 | 607 | 632 | 519 | 424 |
| 7 | 0 | 0 | 425 | 451 | 609 | 634 | 519 | 344 |
| 8 | 0 | 0 | 430 | 350 | 609 | 636 | 517 | 88 |
| 9 | 0 | 0 | 435 | 21 | 611 | 634 | 519 | 72 |
| 10 | 0 | 0 | 435 | 422 | 613 | 632 | 522 | 70 |
| 11 | 0 | 0 | 435 | 474 | 609 | 632 | 520 | 68 |
| 12 | 0 | 0 | 435 | 474 | 613 | 632 | 517 | 68 |
| 13 | 0 | 0 | 436 | 481 | 611 | 632 | 517 | 64 |
| 14 | 0 | 0 | 435 | 497 | 613 | 634 | 510 | 56 |
| 15 | 0 | 0 | 435 | 501 | 624 | 634 | 100 | 50 |
| 16 | 0 | 0 | 435 | 522 | 624 | 632 | 0 | 10 |
| 17 | 0 | 0 | 436 | 544 | 634 | 634 | 0 | 51 |
| 18 | 29 | 0 | 438 | 565 | 634 | 632 | 0 | 31 |
| 19 | 105 | 0 | 438 | 576 | 630 | 634 | 0 | 0 |
| 20 | 105 | 0 | 438 | 592 | 626 | 628 | 0 | 0 |
| 21 | 104 | 0 | 438 | 592 | 624 | 626 | 0 | 0 |
| 22 | 111 | 0 | 438 | 596 | 622 | 630 | 0 | 0 |
| 23 | 37 | 0 | 440 | 603 | 620 | 628 | 0 | 0 |
| 24 | 20 | 0 | 438 | 613 | 626 | 624 | 0 | 0 |
| 25 | 15 | 0 | 438 | 618 | 626 | 576 | 0 | 0 |
| 26 | 95 | 0 | 441 | 620 | 630 | 534 | 0 | 0 |
| 27 | 92 | 0 | 441 | 620 | 632 | 528 | 0 | 0 |
| 28 | 30 | 0 | 444 | 620 | 632 | 526 | 0 | 0 |
| 29 | 10 | 7 | 446 | 613 | 636 | 528 | 0 | 0 |
| 30 | 0 | 87 | 449 | 611 | 632 | 526 | 0 | 0 |
| 31 | 0 | ------- | 449 | ------- | 630 | 526 | ------- | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| 1932 | | | | |
| October 18–29 | 111 | 10 | 62.8 | 1,490 |
| 1933 | | | | |
| April 29–30 | 87 | 7 | 47 | 186 |
| May | 449 | 189 | 420 | 25,800 |
| June | 620 | 21 | 508 | 30,200 |
| July | 636 | 607 | 620 | 38,100 |
| August | 636 | 526 | 610 | 37,500 |
| September 1–15 | 524 | 100 | 492 | 14,600 |
| October 3–18 | 424 | 10 | 132 | 4,190 |
| The period | | | | 151,000 |

NOTE.—No flow during months omitted.

### ST. MARY CANAL AT HUDSON BAY DIVIDE, NEAR BROWNING, MONT.

(International gaging station)

LOCATION.—Water-stage recorder in sec. 5, T. 37 N., R. 11 W., on Blackfeet Indian Reservation, 3 miles above canal outlet and 30 miles north of Browning.

RECORDS AVAILABLE.—Irrigation season, 1917–33.

REMARKS.—Records good. This station is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. The records have been collected and compiled jointly with the Dominion Water Power and Hydrometric Bureau, Department of the Interior, Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Apr. | May | June | July | Aug. | Sept. | Oct. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 55 | 432 | 611 | 620 | 516 | 0 |
| 2 | 0 | 0 | 92 | 430 | 604 | 614 | 516 | 0 |
| 3 | 0 | 0 | 288 | 428 | 607 | 627 | 514 | 0 |
| 4 | 0 | 0 | 358 | 432 | 602 | 639 | 516 | 24 |
| 5 | 0 | 0 | 408 | 432 | 600 | 641 | 512 | 283 |
| 6 | 0 | 0 | 426 | 430 | 602 | 634 | 514 | 397 |
| 7 | 0 | 0 | 420 | 432 | 602 | 636 | 514 | 376 |
| 8 | 0 | 0 | 420 | 438 | 602 | 639 | 512 | 229 |
| 9 | 0 | 0 | 434 | 204 | 595 | 636 | 512 | 90 |
| 10 | 0 | 0 | 436 | 142 | 600 | 636 | 523 | 68 |
| 11 | 0 | 0 | 434 | 428 | 593 | 636 | 507 | 61 |
| 12 | 0 | 0 | 434 | 466 | 595 | 632 | 512 | 64 |
| 13 | 0 | 0 | 438 | 470 | 589 | 491 | 512 | 67 |
| 14 | 0 | 0 | 438 | 485 | 591 | 609 | 510 | 58 |
| 15 | 0 | 0 | 432 | 492 | 598 | 623 | 393 | 51 |
| 16 | 0 | 0 | 436 | 507 | 602 | 616 | 79 | 42 |
| 17 | 0 | 0 | 436 | 527 | 607 | 620 | 5 | 6 |
| 18 | 0 | 0 | 443 | 545 | 611 | 632 | 0 | 27 |
| 19 | 0 | 0 | 445 | 565 | 607 | 630 | 0 | 6 |
| 20 | 5 | 0 | 436 | 580 | 600 | 614 | 0 | 0 |
| 21 | 78 | 0 | 438 | 584 | 598 | 625 | 0 | 0 |
| 22 | 88 | 0 | 445 | 591 | 598 | 620 | 0 | 0 |
| 23 | 81 | 0 | 441 | 589 | 598 | 625 | 0 | 0 |
| 24 | 18 | 0 | 436 | 598 | 598 | 634 | 0 | 0 |
| 25 | 6 | 0 | 432 | 607 | 600 | 580 | 0 | 0 |
| 26 | 6 | 0 | 445 | 611 | 602 | 536 | 0 | 0 |
| 27 | 39 | 5 | 430 | 609 | 607 | 516 | 0 | 0 |
| 28 | 27 | 2 | 436 | 618 | 616 | 514 | 0 | 0 |
| 29 | 18 | 0 | 441 | 618 | 620 | 516 | 0 | 0 |
| 30 | 14 | 1 | 438 | 611 | 614 | 523 | 0 | 0 |
| 31 | 12 | ------- | 438 | ------- | 620 | 516 | ------- | 0 |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| 1932 | | | | |
| October 20–31 | 88 | 5.0 | 32.7 | 778 |
| 1933 | | | | |
| April 27–30 | 5 | 0 | 2 | 16 |
| May | 445 | 55 | 404 | 24,800 |
| June | 618 | 142 | 497 | 29,600 |
| July | 620 | 589 | 603 | 37,100 |
| August | 641 | 491 | 601 | 37,000 |
| September 1–17 | 523 | 5 | 451 | 15,200 |
| October 4–19 | 397 | 6 | 116 | 3,680 |
| The period | | | | 147,000 |

NOTE.—No flow during months omitted.

### SWIFTCURRENT CREEK AT MANY GLACIER, MONT.

(International gaging station)

LOCATION.—Water-stage recorder in sec. 12, T. 35 N., R. 16 W., at outlet of McDermott Lake at Many Glacier, Glacier National Park, 14 miles southwest of Babb.

DRAINAGE AREA.—31.4 square miles.

RECORDS AVAILABLE.—June 1912 to September 1933.

DISCHARGE.—Maximum during year, 1,360 second-feet June 17 (gage height, 5.00 feet); minimum, 21.3 second-feet Oct. 12 (gage height, 1.57 feet).

1912–33: Maximum, 1,550 second-feet June 17, 1916; minimum 10 second-feet Nov. 6 and 7, 1921 (gage height, 1.22 feet).

REMARKS.—Records excellent. Observations discontinued during winter. No diversions or regulation. This station is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. The records have been collected and compiled jointly with the Dominion Water Power and Hydrometric Bureau, Department of the Interior, Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | May | June | July | Aug. | Sept. | Day | Oct. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 32 | e 160 | 1,000 | 560 | 153 | 101 | 16 | 113 | 415 | 1,300 | 329 | 135 | 87 |
| 2 | 33 | e 165 | 856 | 573 | 138 | 96 | 17 | 110 | 411 | 1,260 | 322 | 133 | 84 |
| 3 | 34 | e 170 | 796 | 608 | 135 | 84 | 18 | 99 | 344 | 990 | 318 | 128 | 96 |
| 4 | 34 | 179 | 876 | 551 | 153 | 78 | 19 | 77 | 280 | 753 | 315 | 123 | e 121 |
| 5 | 32 | 188 | 974 | 513 | 173 | 74 | 20 | 64 | 236 | 729 | 290 | 128 | e 115 |
| 6 | 34 | 210 | 871 | 439 | 176 | 76 | 21 | 60 | 233 | b 713 | 249 | 123 | e 110 |
| 7 | 34 | 220 | 821 | 396 | 159 | 73 | 22 | 70 | 249 | b 697 | 220 | 107 | e 105 |
| 8 | 34 | 226 | 777 | 400 | 153 | 67 | 23 | 79 | 297 | b 681 | 203 | 99 | e 99 |
| 9 | 30 | 216 | 1,150 | 407 | 156 | 66 | 24 | 75 | 333 | 613 | 203 | 103 | e 93 |
| 10 | 24 | 179 | 1,050 | 455 | 159 | 73 | 25 | 66 | 385 | 551 | 216 | 103 | 87 |
| 11 | 25 | 151 | 743 | 435 | 159 | 76 | 26 | 59 | 542 | 640 | 236 | 89 | 79 |
| 12 | 22.2 | 140 | 640 | 388 | 151 | 78 | 27 | b 62 | 635 | 617 | 262 | 78 | 81 |
| 13 | 27 | 140 | 757 | 404 | 148 | 76 | 28 | b 65 | 538 | 547 | 259 | 71 | 81 |
| 14 | 45.7 | 206 | 897 | 385 | 145 | 76 | 29 | b 68 | 538 | 591 | 229 | 73 | 92 |
| 15 | 89 | 340 | 1,110 | 347 | 140 | 79 | 30 | 71 | 787 | 613 | 197 | 86 | 98 |
| | | | | | | | 31 | e 70 | 1,160 | ------ | 179 | 96 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off | |
|---|---|---|---|---|---|---|
| | | | | | Inches | Acre-feet |
| October | 113 | 22.2 | 56.1 | 1.79 | 2.06 | 3,450 |
| May | 1,160 | 140 | 331 | 10.6 | 12.22 | 20,400 |
| June | 1,300 | 547 | 820 | 26.1 | 29.12 | 48,800 |
| July | 608 | 179 | 351 | 11.2 | 12.91 | 21,600 |
| August | 176 | 71 | 128 | 4.08 | 4.70 | 7,870 |
| September | ------ | 66 | 86.7 | 2.76 | 3.08 | 5,160 |

e Estimated.
b Interpolated.

### SHERBURNE LAKE RESERVOIR AT SHERBURNE, MONT.

LOCATION.—Water-stage recorder in gate house in sec. 35, T. 36 N., R. 15 W., at Sherburne Dam, about 6 miles southwest of Babb, installed May 7, 1931; prior to that date staff gage used. Zero of gage is 4,700.0 feet above mean sea level.

DRAINAGE AREA.—64 square miles.

RECORDS AVAILABLE.—May to June 1915; May 1917 to September 1918; June 1921 to September 1933.

EXTREMES.—Maximum contents during year, 53,435 acre-feet July 11 (water-surface elevation, 4,780.29 feet).

1915, 1917–18, 1921-33: Maximum contents, 60,420 acre-feet June 20, 1925 (water-surface elevation, 4,784.6 feet).

REMARKS.—Records good. Some gage-height records furnished by United States Bureau of Reclamation.

*Contents, in acre-feet, 1933*

| Day | May | June | July | Aug. | Sept. | Day | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ------- | 10,828 | 46,732 | 48,460 | 21,750 | 16 | 11,764 | 24,052 | 52,840 | 36,512 | 10,536 |
| 2 | ------- | 10,868 | 47,890 | 47,740 | 20,920 | 17 | 11,724 | 26,790 | 52,728 | 35,524 | 10,569 |
| 3 | ------- | 10,764 | 49,210 | 47,005 | 20,030 | 18 | 11,388 | 28,792 | 52,680 | 34,552 | 10,700 |
| 4 | 19,294 | 11,084 | 50,275 | 46,312 | 19,159 | 19 | 10,860 | 30,498 | 52,648 | 33,623 | 10,860 |
| 5 | 18,600 | 11,700 | 51,280 | 45,710 | 18,250 | 20 | 10,372 | 31,902 | 52,632 | 32,842 | 11,036 |
| 6 | 17,850 | 12,108 | 51,880 | 44,960 | 17,340 | 21 | 9,857 | 33,282 | 52,616 | 31,880 | 11,220 |
| 7 | 17,214 | 12,543 | 52,184 | 44,105 | 16,450 | 22 | 9,443 | 34,780 | 52,568 | 30,872 | 11,436 |
| 8 | 16,670 | 12,903 | 52,488 | 43,328 | 15,467 | 23 | 9,047 | 36,320 | 52,472 | 29,832 | 11,476 |
| 9 | 15,719 | 14,252 | 52,792 | 42,535 | 14,603 | 24 | 8,804 | 37,582 | 52,232 | 28,880 | 11,612 |
| 10 | 14,810 | 15,242 | 53,195 | 41,794 | 13,720 | 25 | 8,720 | 38,960 | 51,960 | 27,978 | 11,692 |
| 11 | 13,824 | 15,557 | 53,435 | 40,988 | 12,786 | 26 | 8,895 | 40,325 | 51,544 | 27,087 | 11,772 |
| 12 | 12,885 | 16,050 | 53,360 | 40,104 | 11,892 | 27 | 9,116 | 41,612 | 51,145 | 26,152 | 11,844 |
| 13 | 12,204 | 17,052 | 53,300 | 39,207 | 11,020 | 28 | 9,295 | 42,880 | 50,695 | 25,270 | 11,948 |
| 14 | 11,820 | 18,862 | 53,255 | 38,297 | 10,470 | 29 | 9,070 | 44,195 | 50,245 | 24,360 | 12,100 |
| 15 | 11,780 | 21,200 | 52,936 | 37,400 | 10,569 | 30 | 9,428 | 45,612 | 49,705 | 23,469 | 12,204 |
| | | | | | | 31 | 10,405 | ------- | 49,120 | 22,580 | ------- |

### SWIFTCURRENT CREEK AT SHERBURNE, MONT.

(International gaging station)

LOCATION.—Water-stage recorder in sec. 35, T. 36 N., R. 15 W., 800 feet below spillway of Sherburne Lake Dam at Sherburne.

DRAINAGE AREA.—64 square miles.

RECORDS AVAILABLE.—July 1912 to September 1933.

DISCHARGE.—Maximum during year, 1,150 second-feet June 2 (gage height, 5.88 feet); no flow Oct. 16.

1912–33: Maximum, 2,280 second-feet June 17, 1916 (gage height, 7.83 feet); no flow at various times when gates in dam were closed.

REMARKS.—Records good. Observations discontinued during winter. No diversions. Flow regulated by gate operation at dam. This station is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. The records have been collected and compiled jointly with the Dominion Water Power and Hydrometric Bureau, Department of the Interior, Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | May | June | July | Aug. | Sept. | Day | Oct. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 124 | 187 | 1,100 | 87 | 554 | 586 | 16 | 0.5 | 804 | 112 | 477 | 669 | 107 |
| 2 | 122 | 408 | 1,140 | 87 | 562 | 590 | 17 | .7 | 916 | 97 | 467 | 673 | 107 |
| 3 | 125 | 742 | 1,140 | 88 | 576 | 597 | 18 | 48.6 | 920 | 88 | 432 | 669 | 107 |
| 4 | 333 | 782 | 1,000 | 88 | 590 | 594 | 19 | 89 | 735 | 89 | 376 | 662 | 105 |
| 5 | 577 | 893 | 946 | 88 | 579 | 597 | 20 | 109 | 746 | 89 | 373 | 666 | 101 |
| 6 | 450 | 897 | 960 | 255 | 608 | 597 | 21 | 136 | 742 | 90 | 322 | 673 | 98 |
| 7 | 324 | 897 | 893 | 351 | 630 | 586 | 22 | 160 | 739 | 91 | 279 | 691 | 95 |
| 8 | 248 | 939 | 863 | 354 | 622 | 590 | 23 | 99 | 724 | 90 | 302 | 695 | 90 |
| 9 | 210 | 1,020 | 812 | 357 | 615 | 583 | 24 | 65 | 721 | 89 | 376 | 691 | 89 |
| 10 | 160 | 1,020 | 808 | 359 | 615 | 590 | 25 | 134 | 721 | 89 | 405 | 655 | 87 |
| 11 | 108 | 1,020 | 846 | 420 | 648 | 590 | 26 | 154 | 695 | 87 | 486 | 633 | 86 |
| 12 | 36.9 | 1,020 | 644 | 548 | 673 | 586 | 27 | 153 | 725 | 87 | 530 | 622 | 83 |
| 13 | 1.4 | 966 | 496 | 544 | 669 | 583 | 28 | 87 | 803 | 88 | 513 | 604 | 78 |
| 14 | 1.2 | 801 | 216 | 540 | 666 | 454 | 29 | 61 | 893 | 88 | 517 | 601 | 75 |
| 15 | 1.2 | 801 | 122 | 527 | 666 | 110 | 30 | 62 | 902 | 87 | 530 | 594 | 74 |
| | | | | | | | 31 | e60 | 1,010 | ------ | 544 | 583 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 577 | 0.5 | 137 | 8,420 |
| May | 1,020 | 187 | 813 | 50,000 |
| June | 1,140 | 87 | 445 | 26,500 |
| July | 548 | 87 | 375 | 23,100 |
| August | 695 | 554 | 634 | 39,000 |
| September | 597 | 74 | 320 | 19,000 |

e Estimated.

NOTE.—Flow Oct. 13–17 is leakage around gates.

### CANYON CREEK NEAR MANY GLACIER, MONT.

(International gaging station)

LOCATION.—Water-stage recorder at edge of heavy timber area, Glacier National Park, half a mile above mouth and 2 miles southeast of Many Glacier.

DRAINAGE AREA.—7.0 square miles.

RECORDS AVAILABLE.—July 1918 to September 1933.

DISCHARGE.—Maximum during year (estimated), 200 second-feet June 16; minimum, 0.7 second-feet Oct. 9 (gage height, 0.18 foot).

1918–33: Maximum (estimated), 500 second-feet May 16, 1922 (gage height, 3.34 feet); minimum, that of Oct. 9, 1932).

REMARKS.—Records poor. Observations discontinued during winter. No diversions. This station is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. The records have been collected and compiled jointly with the Dominion Water Power and Hydrometric Bureau, Department of the Interior, Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | June | July | Aug. | Sept. | Day | Oct. | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.4 | a 72 | 62 | a 29 | a 14 | 16 | 22.4 | a 200 | a 44 | 20.9 | a 15 |
| 2 | 5.4 | 74 | 67 | | | 17 | 18.4 | a 160 | | 20.3 | |
| 3 | 5.7 | 76 | 69 | | | 18 | 15.5 | a 130 | | 20.3 | |
| 4 | 5.7 | 84 | 57 | | | 19 | 13.5 | a 100 | | 20.3 | |
| 5 | 4.5 | a 110 | 55 | a 26 | | 20 | 12.6 | a 80 | a 41 | 20.3 | |
| 6 | 4.8 | | 51 | | | 21 | 15.5 | a 70 | | 18.7 | |
| 7 | 4.8 | a 80 | 50 | a 23 | | 22 | 16.5 | a 69 | | 16.5 | |
| 8 | 4.8 | | 51 | 23.4 | a 12 | 23 | 16.5 | 68 | a 38 | 15.6 | a 17 |
| 9 | 5.7 | a 130 | 52 | 23.4 | | 24 | 15.2 | 63 | | 17.6 | |
| 10 | 1.2 | 82 | a 50 | 24.1 | | 25 | 12.9 | 63 | a 35 | 18.2 | |
| 11 | 4.5 | 76 | | 22.8 | 11.8 | 26 | 12.2 | 71 | | | |
| 12 | 4.8 | a 70 | | 22.1 | | 27 | 16.5 | 60 | | | |
| 13 | 6.6 | a 68 | | 21.4 | a 12 | 28 | 15.2 | 60 | | a 16.0 | a 20 |
| 14 | 16.5 | a 90 | a 47 | 21.4 | | 29 | 13.5 | 77 | a 32 | | |
| 15 | 24.0 | a 130 | | 21.4 | | 30 | 12.6 | 70 | | | |
| | | | | | | 31 | a 12.0 | | | | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off | |
|---|---|---|---|---|---|---|
| | | | | | Inches | Acre-feet |
| October | 24.0 | 1.2 | 11.1 | 1.59 | 1.83 | 682 |
| June | 200 | 60 | 88.1 | 12.6 | 14.06 | 5,240 |
| July | 69 | | 45.4 | 6.49 | 7.48 | 2,790 |
| August | | 15.6 | 21.1 | 3.01 | 3.47 | 1,300 |
| September | | 11.8 | 15.0 | 2.14 | 2.39 | 893 |

a Estimated.

## RED RIVER BASIN

### OTTERTAIL RIVER BELOW PELICAN RIVER, NEAR FERGUS FALLS, MINN.

LOCATION.—Water-stage recorder in NE¼ sec. 34, T. 132 N., R. 44 W., 8 miles southwest of Fergus Falls and 9 miles below mouth of Pelican River.

RECORDS AVAILABLE.—October 1930 to September 1933.

DISCHARGE.—Maximum during year, 577 second-feet June 18 (gage height, 2.05 feet); maximum gage height, 3.33 feet Apr. 1, caused by ice jam; minimum discharge, 6 second-feet Nov. 24; minimum gage height, 0.45 foot Aug. 22.

1930–33: Maximum, 810 second-feet Dec. 11, 1930 (gage height, 2.19 feet); maximum gage height, 3.77 feet Apr. 7, 1932; minimum discharge, 4 second-feet Nov. 6, 1930; minimum gage height, that of August 1933.

REMARKS.—Records good. No record Nov. 25 to Mar. 31, Apr. 12–20.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 26 | 16 | 50 | 48 | 15 | 37 | 8.6 | 21 |
| 2 | 33 | 16 | 51 | 17 | 14 | 27 | 8.6 | 24 |
| 3 | 30 | 15 | 153 | 31 | 21 | 13 | 16 | 27 |
| 4 | 33 | 15 | 65 | 30 | 36 | 34 | 11 | 26 |
| 5 | 27 | 22 | 125 | 30 | 51 | 11 | 11 | 28 |
| 6 | 36 | 19 | 77 | 24 | 57 | 11 | 10 | 30 |
| 7 | 33 | 23 | 64 | 38 | 53 | 18 | 8.6 | 30 |
| 8 | 33 | 20 | 63 | 40 | 262 | 17 | 9.2 | 17 |
| 9 | 32 | 17 | 58 | 45 | 141 | 47 | 11 | 17 |
| 10 | 23 | 10 | 61 | 42 | 148 | 10 | 7.4 | 29 |
| 11 | 17 | 21 | 114 | 33 | 146 | 20 | 9.5 | 22 |
| 12 | 23 | 15 | ------- | 41 | 50 | 58 | 11 | 29 |
| 13 | 16 | 78 | ------- | 48 | 41 | 24 | 10 | 20 |
| 14 | 21 | 16 | ------- | 38 | 12 | 33 | 30 | 30 |
| 15 | 27 | 32 | ------- | 24 | 10 | 18 | 16 | 19 |
| 16 | 18 | 15 | ------- | 49 | 34 | 21 | 14 | 18 |
| 17 | 24 | 18 | ------- | 52 | 17 | 9 4 | 18 | 30 |
| 18 | 19 | 13 | ------- | 30 | 139 | 12 | 19 | 23 |
| 19 | 24 | 11 | ------- | 42 | 56 | 54 | 14 | 25 |
| 20 | 31 | 14 | ------- | 26 | 69 | 13 | 14 | 30 |
| 21 | 29 | 13 | 28 | 32 | 60 | 9 4 | 11 | 30 |
| 22 | 21 | 13 | 27 | 71 | 81 | 9.8 | 7.6 | 30 |
| 23 | 29 | 12 | 25 | 68 | 95 | 12 | 14 | 33 |
| 24 | 16 | 7 | 20 | 40 | 23 | 8 5 | 29 | 25 |
| 25 | 15 | ------- | 22 | 26 | 51 | 6 9 | 14 | 9.6 |
| 26 | 23 | ------- | 23 | 32 | 65 | 8 8 | 18 | 26 |
| 27 | 22 | ------- | 22 | 24 | 51 | 8 0 | 18 | 29 |
| 28 | 16 | ------- | 22 | 32 | 18 | 6 8 | 22 | 30 |
| 29 | 22 | ------- | 24 | 37 | 10 | 8 9 | 20 | 33 |
| 30 | 23 | ------- | 39 | 38 | 27 | 17 | 24 | 33 |
| 31 | 17 | ------- | ------- | 44 | ------- | 7.6 | 21 | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 36 | 15 | 24.5 | 1,510 |
| November 1–24 | 78 | 7 | 18.8 | 895 |
| May | 71 | 17 | 37.8 | 2,320 |
| June | 262 | 10 | 61.8 | 3,680 |
| July | 58 | 6.8 | 19.1 | 1,170 |
| August | 30 | 7.4 | 14.7 | 904 |
| September | 33 | 9.6 | 25.8 | 1,540 |

### RED RIVER AT FARGO, N.DAK.

LOCATION.—Staff gage in sec. 7, T. 139 N., R. 48 W., just above Island Park Dam, Fargo, and 10 miles above mouth of Sheyenne River. Zero of gage is 870.00 feet above mean sea level (1912 adjustment).

DRAINAGE AREA.—6,420 square miles.

RECORDS AVAILABLE.—May 1901 to September 1933.

DISCHARGE.—Maximum during year, 605 second-feet Apr. 5 (gage height, 9.04 feet); no flow Nov. 27 to Dec. 1, Dec. 11 to Feb. 27, Aug. 13–25, Sept. 1–26, 29, 30.

1901–33: Maximum, 7,740 second-feet July 11, 1916 (gage height, 17.34 feet); no flow for several days in 1932 and 1933. Average, 31 years (1902–33), 482 second-feet.

REMARKS.—Records fair. Discharge estimated Feb. 27 to Mar. 3 and Apr. 27, when changes were made in fishway opening.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 13 | 15 | 0 | 0 | 8 | 238 | 52 | 105 | 42 | 2.2 | 0 |
| 2 | 12 | 13 | 4.2 | 0 | 27 | 309 | 54 | 76 | 42 | 3.2 | 0 |
| 3 | 12 | 10 | 7.0 | 0 | 58 | 403 | 54 | 68 | 36 | 5.7 | 0 |
| 4 | 13 | 10 | 8.4 | 0 | 75 | 580 | 61 | e64 | 28 | 5.7 | 0 |
| 5 | 15 | 13 | 9.2 | 0 | 127 | 605 | 68 | 59 | 23 | 5.7 | 0 |
| 6 | 12 | e12 | 10 | 0 | 200 | 580 | 66 | 54 | 15 | 5.7 | 0 |
| 7 | 12 | 12 | 8.4 | 0 | 238 | 346 | e68 | 42 | 20 | 5.7 | 0 |
| 8 | 12 | 8.4 | 7.0 | 0 | 255 | 384 | 71 | 36 | 20 | 3.2 | 0 |
| 9 | 12 | 10 | 4.2 | 0 | 153 | 309 | 54 | 35 | 23 | 3.2 | 0 |
| 10 | 12 | 13 | 1.4 | 0 | 121 | 255 | 54 | 31 | 20 | 2.2 | 0 |
| 11 | 11 | 17 | 0 | 0 | 147 | 238 | 61 | e24 | 19 | .4 | 0 |
| 12 | 13 | 9.2 | 0 | 0 | 118 | 238 | 66 | 18 | 19 | .1 | 0 |
| 13 | 13 | 7.7 | 0 | 0 | 94 | 220 | 73 | 22 | 19 | 0 | 0 |
| 14 | 15 | 5.6 | 0 | 0 | 64 | 203 | e67 | 84 | 16 | 0 | 0 |
| 15 | 16 | 4.9 | 0 | 0 | 24 | 176 | 61 | 136 | 12 | 0 | 0 |
| 16 | 15 | 5.6 | 0 | 0 | 26 | 193 | 61 | 139 | 11 | 0 | 0 |
| 17 | 12 | 1.4 | 0 | 0 | 55 | 163 | 61 | 120 | 12 | 0 | 0 |
| 18 | 17 | 1.4 | 0 | 0 | 106 | 103 | 61 | 76 | 12 | 0 | 0 |
| 19 | 20 | 3.5 | 0 | 0 | 127 | 85 | 76 | 59 | 8.3 | 0 | 0 |
| 20 | 13 | 5.6 | 0 | 0 | 137 | 71 | 73 | 40 | 8.3 | 0 | 0 |
| 21 | 13 | 5.6 | 0 | 0 | 140 | 62 | e60 | 31 | 7.0 | 0 | 0 |
| 22 | 12 | 5.6 | 0 | 0 | 147 | 62 | 48 | 28 | 5.7 | 0 | 0 |
| 23 | e12 | 4.9 | 0 | 0 | 147 | 62 | 73 | 26 | 15 | 0 | 0 |
| 24 | 12 | 3.5 | 0 | 0 | 147 | 52 | 84 | 22 | 14 | 0 | 0 |
| 25 | 13 | 2.8 | 0 | 0 | 140 | 48 | 71 | 19 | 9.6 | 0 | 0 |
| 26 | 13 | 1.4 | 0 | 0 | 140 | 45 | 73 | 18 | 5.7 | .1 | 0 |
| 27 | 15 | 0 | 0 | 1 | 147 | 41 | 90 | 14 | 1.4 | .8 | .1 |
| 28 | 17 | 0 | 0 | 4 | 147 | 44 | e121 | 12 | .2 | 2.2 | 2.2 |
| 29 | 21 | 0 | 0 | ------- | 200 | 42 | 152 | 35 | .4 | 1.4 | 0 |
| 30 | 21 | 0 | 0 | ------- | 255 | e47 | 129 | 40 | 3.2 | 1.4 | 0 |
| 31 | 17 | ------- | 0 | ------- | 238 | ------- | 120 | ------- | 5.7 | .4 | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 21 | 11 | 14.1 | 867 |
| November | 17 | 0 | 6.74 | 401 |
| December | 10 | 0 | 1.93 | 119 |
| January | 0 | 0 | 0 | 0 |
| February | 4.0 | 0 | 0.18 | 9.9 |
| March | 255 | 8.0 | 129 | 7,930 |
| April | 605 | 41 | 207 | 12,300 |
| May | 152 | 48 | 73.6 | 4,530 |
| June | 139 | 12 | 51.1 | 3,040 |
| July | 42 | 0.2 | 15.3 | 941 |
| August | 5.7 | 0 | 1.59 | 98 |
| September | 2.2 | 0 | .08 | 4.6 |
| The year | 605 | 0 | 41.7 | 30,200 |

e Interpolated.

### RED RIVER AT GRAND FORKS, N.DAK.

LOCATION.—Staff gage in sec. 34, T. 152 N., R. 50 W., in Grand Forks, 2 miles below mouth of Red Lake River. Zero of gage is 778.42 feet above mean sea level, revised (1929 adjustment).

DRAINAGE AREA.—25,500 square miles.

RECORDS AVAILABLE.—May 1901 to September 1933 (gage-height record 1882-1901 by United States Engineer Corps).

DISCHARGE.—Maximum during year, 4,380 second-feet Apr. 3 (gage height, 15.18 feet, affected by ice); minimum, 13 second-feet Oct. 19 (gage height, 1.18 feet, affected by aquatic growth).

1882–1933: Maximum, 43,000 second-feet Apr. 10, 1897 (gage height, 50.2 feet); minimum, that of Oct. 19, 1932. Average discharge, 32 years (1901–33), 2,200 second-feet.

REMARKS.—Records good except those for period affected by ice, Dec. 2 to Apr. 30, and for estimated period, Feb. 6–13, which are poor.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 25 | 88 | 76 | 36 | 27 | 77 | 2,300 | 824 | 754 | 128 | 76 | 21 |
| 2 | 23 | 94 | 76 | 36 | 22 | 81 | 3,730 | 789 | 754 | 121 | 72 | 23 |
| 3 | 26 | 100 | 76 | 32 | 22 | 88 | 4,380 | 789 | 754 | 114 | 72 | 22 |
| 4 | 22 | 114 | 76 | 34 | 22 | 100 | 4,140 | 754 | 720 | 114 | 68 | 23 |
| 5 | 19 | 114 | 75 | 36 | 22 | 414 | 3,850 | 789 | 687 | 114 | 61 | 25 |
| 6 | 16 | 114 | 74 | 37 | | 824 | 3,850 | 789 | 687 | 121 | 54 | 26 |
| 7 | 17 | 96 | 78 | 44 | | 897 | 3,210 | 789 | 590 | 128 | 50 | 27 |
| 8 | 17 | 78 | 81 | 37 | | 1,100 | 2,920 | 860 | 654 | 150 | 50 | 29 |
| 9 | 18 | 88 | 81 | 34 | | 894 | 2,580 | 897 | 590 | 175 | 48 | 30 |
| 10 | 18 | 80 | 71 | 31 | 15 | 687 | 2,360 | 860 | 622 | 158 | 54 | 31 |
| 11 | 18 | 71 | 71 | 34 | | 687 | 2,300 | 824 | 622 | 150 | 52 | 32 |
| 12 | 17 | 71 | 69 | 38 | | 720 | 2,200 | 860 | 559 | 150 | 54 | 34 |
| 13 | 17 | 69 | 67 | 40 | | 897 | 1,830 | 789 | 499 | 135 | 54 | 34 |
| 14 | 17 | 70 | 64 | 43 | 27 | 998 | 1,830 | 789 | 442 | 150 | 51 | 36 |
| 15 | 16 | 71 | 61 | 38 | 44 | 1,100 | 1,680 | 754 | 387 | 150 | 51 | 33 |
| 16 | 16 | 86 | 58 | 38 | 44 | 1,260 | 1,630 | 754 | 336 | 135 | 24 | 36 |
| 17 | 13 | 100 | 55 | 38 | 44 | 1,260 | 1,680 | 622 | 336 | 135 | 22 | 36 |
| 18 | 14 | 96 | 55 | 38 | 44 | 1,310 | 1,730 | 622 | 289 | 128 | 19 | 39 |
| 19 | 13 | 92 | 52 | 40 | 44 | 1,310 | 1,780 | 590 | 255 | 121 | 20 | 37 |
| 20 | 17 | 88 | 49 | 42 | 44 | 1,220 | 1,880 | 590 | 234 | 107 | 20 | 33 |
| 21 | 30 | 80 | 56 | 44 | 44 | 1,140 | 2,040 | 559 | 234 | 107 | 20 | 31 |
| 22 | 42 | 72 | 39 | 38 | 44 | 1,050 | 2,140 | 529 | 312 | 107 | 23 | 30 |
| 23 | 49 | 64 | 37 | 38 | 44 | 1,010 | 2,140 | 622 | 266 | 100 | 26 | 29 |
| 24 | 55 | 67 | 37 | 38 | 44 | 1,010 | 2,040 | 720 | 244 | 94 | 33 | 28 |
| 25 | 68 | 67 | 37 | 43 | 44 | 1,010 | 1,780 | 1,050 | 223 | 88 | 30 | 30 |
| 26 | 74 | 68 | 37 | 48 | 58 | 1,010 | 1,490 | 897 | 194 | 81 | 32 | 33 |
| 27 | 76 | 68 | 35 | 46 | 61 | 1,050 | 1,310 | 824 | 175 | 68 | 31 | 34 |
| 28 | 82 | 70 | 33 | 44 | 76 | 1,140 | 1,100 | 824 | 150 | 68 | 32 | 44 |
| 29 | 88 | 71 | 33 | 42 | ------- | 1,260 | 935 | 824 | 150 | 69 | 31 | 40 |
| 30 | 100 | 74 | 33 | 37 | ------- | 1,350 | 789 | 824 | 128 | 71 | 29 | 33 |
| 31 | 94 | ------- | 36 | 32 | ------- | 1,780 | ------- | 789 | ------- | 74 | 26 | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 100 | 13 | 36.0 | 2,210 |
| November | 114 | 64 | 82.7 | 4,920 |
| December | 81 | 33 | 57.4 | 3,530 |
| January | 48 | 31 | 38.6 | 2,370 |
| February | 76 | ------- | 33.6 | 1,870 |
| March | 1,780 | 77 | 927 | 57,000 |
| April | 4,380 | 789 | 2,250 | 134,000 |
| May | 1,050 | 529 | 768 | 47,200 |
| June | 754 | 128 | 428 | 25,500 |
| July | 175 | 68 | 116 | 7,130 |
| August | 76 | 19 | 41.5 | 2,550 |
| September | 44 | 21 | 31.3 | 1,860 |
| The year | 4,380 | 13 | 401 | 290,000 |

### BOIS DES SIOUX RIVER NEAR FAIRMOUNT, N.DAK.

LOCATION.—Staff gage near center of sec. 22, T. 130 N., R. 47 W., at Minneapolis, St. Paul & Sault Ste. Marie Railway bridge 2 miles east of Fairmount, 5 miles west of Tenney, Minn., and 15 miles below Lake Traverse.
DRAINAGE AREA.—1,460 square miles.
RECORDS AVAILABLE.—April 1919 to September 1933.
DISCHARGE.—1919–33: Maximum, 390 second-feet Apr. 22, 1922 (gage height, 5.7 feet); no flow in several different years. Average, 13 years (1920–33), 8.29 second-feet.
REMARKS.—No flow during the entire year.

### MUSTINKA RIVER ABOVE WHEATON, MINN.

LOCATION.—Chain gage on line between secs. 7 and 8, T. 127 N., R. 46 W., 1 mile upstream from Chicago, Milwaukee, St. Paul & Pacific Railway bridge, 1½ miles northeast of Wheaton, and 8 miles above mouth.
DRAINAGE AREA.—776 square miles.
RECORDS AVAILABLE.—March to September 1917; June 1919 to September 1924; March 1931 to September 1933. June to November 1916 at a point 3½ miles downstream.
DISCHARGE.—Maximum during year, 72 second-feet Mar. 2 (gage height, 4.71 feet, affected by ice); minimum, 0.4 second-foot June 29 and 30 (gage height, 0.42 foot).
1917, 1919–24, 1931–33: Maximum, about 2,340 second-feet Apr. 1, 1917 (gage height, 14.7 feet at former datum; relation to present datum unknown); no flow during several periods.
REMARKS.—Records poor. Stage-discharge relation affected by ice Feb. 26 to Apr. 4.

*Discharge, in second-feet, 1932–33*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 8.5 | 24 | 3.3 | 4.6 | 16 | | 5.8 | 3.3 | 3.1 | 1.8 |
| 2 | | 72 | 19 | 2.8 | 5.4 | 17 | | 8.1 | 3.1 | 3.1 | 1.5 |
| 3 | | 67 | 15 | 2.3 | 5.5 | 18 | | 4.2 | 3.1 | 3.0 | 1.5 |
| 4 | | 37 | 11 | 1.5 | 4.6 | 19 | | 5.1 | 3.0 | 2.6 | 1.3 |
| 5 | | 31 | 8.5 | 1.2 | 4.3 | 20 | | 3.8 | 2.8 | 2.6 | 1.3 |
| 6 | | 12 | 6.8 | 1.2 | 3.9 | 21 | | 4.4 | 3.1 | 2.8 | 1.0 |
| 7 | | 12 | 6.3 | 2.8 | 3.7 | 22 | | 4.7 | 2.8 | 9.6 | 1.0 |
| 8 | | 6.8 | 6.6 | 2.3 | 3.4 | 23 | | 3.8 | 1.4 | 8.8 | 1.0 |
| 9 | | 8.5 | 5.3 | 3.0 | 3.2 | 24 | | 5.3 | 1.5 | 8.1 | .9 |
| 10 | | 9.0 | 5.3 | 2.6 | 2.9 | 25 | | 3.3 | 2.0 | 7.1 | .9 |
| 11 | | 9.6 | 5.0 | 2.6 | 2.6 | 26 | 4.6 | 3.4 | 2.0 | 7.1 | .9 |
| 12 | | 7.4 | 4.6 | 3.0 | 2.6 | 27 | 5.8 | 3.0 | 1.5 | 7.7 | .9 |
| 13 | | 8.1 | 4.4 | 3.5 | 2.6 | 28 | 6.0 | 3.4 | 2.0 | 8.1 | .7 |
| 14 | | 5.9 | 3.5 | 3.3 | 2.2 | 29 | | 4.0 | 2.5 | 8.1 | .4 |
| 15 | | 5.8 | 3.6 | 3.1 | 2.1 | 30 | | 50 | 3.3 | 6.6 | .4 |
| | | | | | | 31 | | 31 | | 5.9 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| February 26–28 | 6.0 | 4.6 | 5.47 | 33 |
| March | 72 | 3.0 | 14.3 | 879 |
| April | 24 | 1.4 | 5.54 | 330 |
| May | 9.6 | 1.2 | 4.28 | 263 |
| June | 5.5 | .4 | 2.30 | 137 |
| The period | | | | 1,640 |

NOTE.—Little or no flow during period of no record Oct. 1 to Feb. 26 and July 1 to Sept. 30.

### WILD RICE RIVER NEAR ABERCROMBIE, N.DAK.

LOCATION.—Chain gage in SE ¼ sec. 25, T. 135 N., R. 49 W., 2 miles northwest of Abercrombie.

RECORDS AVAILABLE.—April 1932 to September 1933.

DISCHARGE.—Maximum during year, 75 second-feet Mar. 13 (gage height, 4.10 feet, affected by ice); no flow Oct. 1 to Feb. 26 and June 25 to Sept. 30.

1932–33: Maximum, that of Mar. 13, 1933; no flow for periods each year.

REMARKS.—Records fair. Stage-discharge relation affected by ice Feb. 27 to Apr. 25.

*Discharge, in second-feet, 1932–33*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 20 | 47 | 5.4 | 4.4 | 16 | 0 | 59 | 7.7 | 9.3 | 1.5 |
| 2 | 0 | 30 | 55 | 6.6 | 4.6 | 17 | 0 | 51 | 6.6 | 9.2 | 1.0 |
| 3 | 0 | 40 | 44 | 6.4 | 4.3 | 18 | 0 | 47 | 6.1 | 8.6 | .8 |
| 4 | 0 | 40 | 34 | 5.8 | 3.9 | 19 | 0 | 41 | 5.9 | 7.3 | .6 |
| 5 | 0 | 35 | 30 | 5.8 | 3.3 | 20 | 0 | 36 | 5.4 | 6.6 | .6 |
| 6 | 0 | 28 | 27 | 5.4 | 3.2 | 21 | 0 | 34 | 4.9 | 6.1 | .3 |
| 7 | 0 | 20 | 22 | 6.5 | 2.6 | 22 | 0 | 34 | 4.7 | 7.2 | .1 |
| 8 | 0 | 17 | 20 | 12 | 4.4 | 23 | 0 | 32 | 4.4 | 15 | .1 |
| 9 | 0 | 8.4 | 17 | 12 | 3.1 | 24 | 0 | 32 | 4.2 | 11 | .1 |
| 10 | 0 | 5.2 | 17 | 9.2 | 2.6 | 25 | 0 | 34 | 4.1 | 6.6 | 0 |
| 11 | 0 | 7.0 | 14 | 8.1 | 2.4 | 26 | 0 | 30 | 3.8 | 5.9 | 0 |
| 12 | 0 | 10 | 12 | 7.7 | 3.3 | 27 | 1 | 30 | 3.6 | 5.2 | 0 |
| 13 | 0 | 59 | 10 | 8.1 | 3.3 | 28 | 11 | 29 | 3.4 | 4.9 | 0 |
| 14 | 0 | 67 | 9.5 | 7.3 | 2.5 | 29 | ------ | 28 | 3.4 | 5.1 | 0 |
| 15 | 0 | 51 | 9.8 | 8.6 | 1.7 | 30 | ------ | 38 | 4.7 | 4.7 | 0 |
| | | | | | | 31 | ------ | 36 | ------ | 4.3 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| February | 11 | 0 | 0.43 | 24 |
| March | 67 | 5.2 | 33.2 | 2,040 |
| April | 55 | 3.4 | 14.7 | 875 |
| May | 15 | 4.3 | 7.48 | 460 |
| June | 4.6 | 0 | 1.82 | 108 |
| The year | 67 | 0 | 4.84 | 3,510 |

NOTE.—No flow during months omitted.

### SHEYENNE RIVER AT SHEYENNE, N.DAK.

LOCATION.—Staff gage installed Nov. 10, 1932, in T. 150 N., R. 66 W., 1 mile north of Sheyenne. Zero of gage is 1,410.14 feet above mean sea level (1912 adjustment).

RECORDS AVAILABLE.—April 1929 to June 1933 (discontinued).

DISCHARGE.—Maximum during year, 296 second-feet Mar. 2 (gage height, 6.08 feet, affected by ice); no flow for various periods during year.

1929–33: Maximum, 990 second-feet Feb. 24, 1930 (gage height, 8.79 feet); no flow for several periods.

REMARKS.—Records good except those for period affected by ice, Feb. 25 to Apr. 14, and period affected by aquatic growth, May 15 to June 30, which are poor.

*Discharge, in second-feet, 1932–33*

| Day | Feb. | Mar. | Apr. | May | June | July | Day | Feb. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 272 | 171 | 18 | 1.4 | ------ | 16 | 0 | 52 | 115 | 6.6 | 0 | ------ |
| 2 | 0 | 296 | 151 | 16 | 1.2 | ------ | 17 | 0 | 46 | 181 | 5 8 | 0 | ------ |
| 3 | 0 | 284 | 124 | 14 | 1.1 | 0.1 | 18 | 0 | 44 | 214 | 5 1 | 0 | ------ |
| 4 | 0 | 272 | 107 | 12 | 1.1 | ------ | 19 | 0 | 38 | 181 | 4 3 | 0 | ------ |
| 5 | 0 | 236 | 99 | 11 | .9 | ------ | 20 | 0 | 38 | 133 | 4 0 | 0 | ------ |
| 6 | 0 | 214 | 70 | 10 | 1.0 | ------ | 21 | 0 | 38 | 99 | 3 1 | 0 | ------ |
| 7 | 0 | 133 | 61 | 10 | .6 | ------ | 22 | 0 | 41 | 74 | 2.9 | .1 | ------ |
| 8 | 0 | 124 | 55 | 13 | .6 | ------ | 23 | 0 | 41 | 67 | 5 0 | .1 | ------ |
| 9 | 0 | 103 | 55 | 12 | .4 | ------ | 24 | 0 | 41 | 52 | 5 3 | .1 | ------ |
| 10 | 0 | 103 | 55 | 11 | .4 | ------ | 25 | 1.0 | 38 | 44 | 4.7 | .1 | ------ |
| 11 | 0 | 103 | 55 | 11 | .3 | ------ | 26 | 9.2 | 44 | 38 | 4.0 | .1 | ------ |
| 12 | 0 | 95 | 52 | 10 | .3 | ------ | 27 | 74 | 58 | 34 | 3.2 | .2 | ------ |
| 13 | 0 | 88 | 46 | 9.7 | .2 | ------ | 28 | 161 | 70 | 27 | 2.3 | .1 | ------ |
| 14 | 0 | 77 | 46 | 9.4 | .1 | ------ | 29 | ------ | 99 | 25 | 1.5 | .1 | ------ |
| 15 | 0 | 64 | 77 | 7.9 | 0 | ------ | 30 | ------ | 124 | 23 | 1.0 | .1 | ------ |
| | | | | | | | 31 | ------ | 181 | ------ | .9 | ------ | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| February | 161 | 0.0 | 8.76 | 487 |
| March | 296 | 38 | 112 | 6,890 |
| April | 214 | 23 | 84.4 | 5,020 |
| May | 18 | .9 | 7.57 | 465 |
| June | 1.4 | .0 | .35 | 21 |
| The period | | | | 12,900 |

NOTE.—Little or no flow Oct. 1 to Feb. 24.

### SHEYENNE RIVER AT WEST FARGO, N.DAK.

LOCATION.—Water-stage recorder in sec. 31, T. 140 N., R. 49 W., about half a mile north of West Fargo, formerly called Haggart. Prior to June 27 a chain gage in sec. 6, T. 139 N., R. 49 W., 100 feet above present site, was used.

RECORDS AVAILABLE.—September 1929 to September 1933; at station a quarter of a mile above, March 1902 to June 1907; March to August 1919.

DISCHARGE.—Maximum during year, 680 second-feet Mar. 11 (gage height, 11.82 feet, affected by ice); minimum, 6.8 second-feet Sept. 30 (gage height, 2.24 feet).

1902–07, 1919, 1929–33: Maximum, 2,030 second-feet Apr. 9–11, 1902 (gage height, 18.0 feet, former datum); minimum, 6 second-feet Jan. 9, 24, 27, Feb. 5, 1931.

REMARKS.—Records poor Oct. 1 to Mar. 28, good Mar. 29 to June 27, excellent June 28 to Sept. 30. Stage-discharge relation affected by debris on control and by ice Oct. 1 to Apr. 13.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 | a 32 | a 30 | 14 | b 15 | 41 | 585 | 216 | 113 | 43 | 37 | 11 |
| 2 | 19 | 32 | 28 | 16 | | 65 | 616 | 231 | 110 | 42 | 35 | 12 |
| 3 | 18 | 31 | 26 | a 16 | | 61 | 585 | 257 | 107 | 41 | 32 | 11 |
| 4 | a 18 | 31 | a 27 | 17 | | 82 | 540 | 262 | 102 | 36 | 27 | 11 |
| 5 | 17 | a 32 | 28 | 17 | | 92 | 468 | 268 | 97 | 38 | 24 | 12 |
| 6 | 16 | a 34 | 26 | | | 170 | 468 | 246 | 92 | 60 | 22 | 12 |
| 7 | 17 | a 35 | 26 | | | 268 | 496 | 236 | 92 | 77 | 21 | 12 |
| 8 | 18 | a 36 | 26 | | | 525 | 482 | 236 | 94 | 72 | 20 | 16 |
| 9 | a 18 | 37 | a 26 | | | 525 | 482 | 216 | 92 | 57 | 19 | 20 |
| 10 | 18 | a 38 | 25 | b 17 | b 14 | 570 | 426 | 216 | 84 | 49 | 18 | 18 |
| 11 | 17 | a 38 | a 24 | | | 680 | 426 | 216 | 77 | 48 | 17 | 16 |
| 12 | 17 | 39 | 24 | | | 632 | 426 | 206 | 70 | 49 | 17 | 15 |
| 13 | 16 | 43 | 24 | | | 555 | 412 | 188 | 64 | 46 | 15 | 14 |
| 14 | 15 | 37 | 22 | | | 555 | 412 | 170 | 77 | 43 | 15 | 13 |
| 15 | 16 | 36 | 20 | | | 540 | 399 | 170 | 70 | 40 | 15 | 14 |
| 16 | a 16 | 34 | 22 | | 14 | 496 | 399 | 162 | 64 | 35 | 14 | 14 |
| 17 | 16 | 31 | a 20 | | | 496 | 412 | 154 | 67 | 31 | 14 | 12 |
| 18 | 16 | 31 | 19 | | b 16 | 496 | 412 | 146 | 62 | 29 | 13 | 12 |
| 19 | 17 | 34 | a 18 | b 16 | | 440 | 399 | 139 | 57 | 29 | 13 | 11 |
| 20 | 20 | a 34 | 17 | | 17 | 412 | 386 | 132 | 50 | 33 | 12 | 11 |
| 21 | 28 | 34 | 17 | | 16 | 525 | 386 | 119 | 45 | 34 | 12 | 11 |
| 22 | 30 | 34 | 17 | | 14 | 454 | 386 | 119 | 42 | 32 | 12 | 9.8 |
| 23 | 25 | 36 | 16 | | 16 | 412 | 336 | 125 | 40 | 31 | 14 | 9.4 |
| 24 | 26 | 37 | 14 | | 14 | 440 | 301 | 146 | 41 | 31 | 16 | 9.2 |
| 25 | a 27 | 34 | a 15 | | 16 | 412 | 274 | 146 | 41 | 33 | 16 | 9.6 |
| 26 | 28 | 36 | 16 | | 14 | 426 | 252 | 139 | 42 | 32 | 15 | 9.6 |
| 27 | 30 | 34 | 15 | b 15 | 25 | 496 | 231 | 132 | 38 | 30 | 14 | 9.2 |
| 28 | 30 | 32 | 14 | | 32 | 440 | 216 | 125 | 34 | 25 | 13 | 9.2 |
| 29 | a 30 | 31 | a 16 | | ------ | 585 | 206 | 125 | 41 | 25 | 13 | 8.2 |
| 30 | 30 | 31 | 17 | | ------ | 496 | 226 | 125 | 41 | 23 | 13 | 7.2 |
| 31 | 31 | ------ | 15 | | ------ | 496 | ------ | 113 | ------ | 27 | 12 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 31 | 15 | 21.2 | 1,300 |
| November | 43 | 31 | 34.5 | 2,050 |
| December | 30 | 14 | 21.0 | 1,290 |
| January | ------ | ------ | 16.0 | 984 |
| February | 32 | ------ | 15.7 | 872 |
| March | 680 | 41 | 416 | 25,600 |
| April | 616 | 206 | 402 | 23,900 |
| May | 268 | 113 | 177 | 10,900 |
| June | 113 | 34 | 68.2 | 4,060 |
| July | 77 | 23 | 39.4 | 2,420 |
| August | 37 | 12 | 17.7 | 1,090 |
| September | 20 | 7.2 | 12.0 | 714 |
| The year | 680 | 7.2 | 104 | 75,200 |

a Interpolated.
b Estimated.

### DEVILS LAKE NEAR DEVILS LAKE, N.DAK.

LOCATION.—Staff gage at Lakewood, half a mile from the main lake on east bank of entrance to Creel Bay, an arm of Devils Lake 2 miles long and half a mile wide, on north side of the lake, about 6 miles southwest of city of Devils Lake.

RECORDS AVAILABLE.—1901–33 (fragmentary). Single gage heights in 1867, 1879, 1883, 1887, 1890, 1896.

REMARKS.—All gage heights published before 1921 refer to a gage on which the zero was 1,412.21 feet above mean sea level according to levels run by topographic branch of the United States Geological Survey in 1928.

*Elevation, in feet, 1932–33*

| Day | Oct. | Nov. | Feb. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 10.34 | | | 10.43 | 10.40 | 10.21 | 9.72 | 9.33 |
| 2 | 10.24 | 10.36 | | | 10.57 | 10.60 | 10.13 | 9.72 | 9.33 |
| 3 | 10.23 | 10.40 | | | | | | | |
| 4 | 10.20 | 10.37 | | | | | | | |
| 5 | 10.20 | 10.32 | | | | | | | |
| 6 | 10.17 | 10.34 | | | | | | | |
| 7 | 10.12 | 10.31 | | | | | | | |
| 8 | 10.08 | | | | | | | | |
| 9 | 10.11 | | | | | | | | |
| 10 | 10.14 | | | | | | | | |
| 11 | 10.04 | | | | | | | | |
| 12 | 10.12 | | | | | | | | |
| 13 | | | | | | | | | |
| 14 | | | | | | | | | |
| 15 | 10.03 | | | | | | | | |
| 16 | 10.02 | | | | | | | | |
| 17 | 10.03 | | | | | | | | |
| 18 | 9.97 | | | | | | | | |
| 19 | 9.92 | | | | | | | 9.53 | |
| 20 | 10.30 | | | | | | | | |
| 21 | 10.27 | | | | | | | | |
| 22 | 10.28 | | | | | | | | |
| 23 | 10.28 | | | | | | | 9.35 | |
| 24 | 10.21 | | | | | | | | |
| 25 | 10.24 | | 10.30 | | | | | | |
| 26 | 10.22 | | | | | | | | |
| 27 | 10.27 | | | | | | | | |
| 28 | 10.18 | | | | | | | | |
| 29 | 10.37 | | | 10.49 | | 10.46 | | | 9.03 |
| 30 | 10.37 | | | 10.43 | 10.59 | 10.26 | 9.70 | 9.34 | 8.98 |
| 31 | 10.37 | | | | 10.79 | | 9.72 | 9.36 | |

NOTE.—Add 1,400 feet to obtain elevation above mean sea level.

### BUFFALO RIVER NEAR DILWORTH, MINN.

LOCATION.—Chain gage on line between secs. 6 and 7, T. 140 N., R. 47 W., about 6 miles north of Dilworth.

RECORDS AVAILABLE.—March 1931 to September 1933.

DISCHARGE.—Maximum during year, 269 second-feet Apr. 3 (gage height, 9.02 feet, affected by ice); minimum, 0.4 second-foot Aug. 11 (gage height, 0.32 foot).

1931–33: Maximum, 311 second-feet Apr. 12, 1932 (gage height, 8.83 feet); minimum, that of August 1933.

REMARKS.—Records good except those for Oct. 2 to Nov. 26, Mar. 17 to Apr. 20, Sept. 21–30, when stage-discharge relation was affected by ice or debris on control. No record Nov. 27 to Mar. 16.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 13 | 13 | ------- | 241 | 56 | 60 | 17 | 3.6 | 8.2 |
| 2 | 12 | 14 | ------- | 262 | 69 | 60 | 17 | 2.8 | 7.4 |
| 3 | 13 | 14 | ------- | 269 | 74 | 52 | 13 | 2.6 | 5.9 |
| 4 | 11 | 12 | ------- | 269 | 84 | 43 | 14 | 2.7 | 6.2 |
| 5 | 13 | 12 | ------- | 248 | 89 | 36 | 11 | 1.8 | 6.2 |
| 6 | 12 | 14 | ------- | 220 | 89 | 32 | 9.6 | 1.9 | 6.7 |
| 7 | 13 | 14 | ------- | 186 | 89 | 28 | 11 | .8 | 6.0 |
| 8 | 14 | 14 | ------- | 160 | 84 | 26 | 10 | 1.0 | 11 |
| 9 | 14 | 14 | ------- | 142 | 79 | 32 | 10 | 1.2 | 10 |
| 10 | 14 | 14 | ------- | 112 | 74 | 34 | 8.4 | 1.0 | 10 |
| 11 | 14 | 11 | ------- | 118 | 60 | 27 | 8.2 | .4 | 10 |
| 12 | 14 | 13 | ------- | 124 | 56 | 24 | 9.3 | 11 | 10 |
| 13 | 13 | 10 | ------- | 118 | 56 | 26 | 16 | 15 | 9.3 |
| 14 | 13 | 9.1 | ------- | 100 | 56 | 24 | 13 | 12 | 8.4 |
| 15 | 13 | 8.8 | ------- | 106 | 52 | 20 | 10 | 6.7 | 7.7 |
| 16 | 12 | 12 | ------- | 89 | 48 | 20 | 9.6 | 4.4 | 10 |
| 17 | 11 | 8.1 | 79 | 74 | 48 | 18 | 11 | 5.4 | 11 |
| 18 | 14 | 6.4 | 75 | 69 | 45 | 16 | 9.8 | 4.9 | 9.5 |
| 19 | 13 | 5.8 | 74 | 64 | 41 | 15 | 8.0 | 3.7 | 8.6 |
| 20 | 10 | | 74 | 74 | 41 | 12 | 6.8 | 4.6 | 7.4 |
| 21 | 11 | | 79 | 74 | 40 | 12 | 6.2 | 3.8 | 7.2 |
| 22 | 11 | 5.0 | 84 | 64 | 38 | 11 | 4.6 | 3.3 | 8.6 |
| 23 | 11 | | 89 | 69 | 35 | 11 | 6.7 | 3.8 | 8.0 |
| 24 | 12 | | 84 | 52 | 45 | 8.9 | 7.9 | 6.0 | 6.3 |
| 25 | 13 | | 84 | 48 | 45 | 10 | 6.3 | 6.2 | 7.4 |
| 26 | 13 | 5.0 | 89 | 45 | 50 | 11 | 5.2 | 5.9 | 6.7 |
| 27 | 13 | ------- | 94 | 45 | 69 | 9.6 | 5.5 | 38 | 5.1 |
| 28 | 12 | ------- | 100 | 41 | 74 | 12 | 3.7 | 30 | 5.7 |
| 29 | 14 | ------- | 136 | 45 | 74 | 15 | 3.6 | 18 | 5.2 |
| 30 | 14 | ------- | 172 | 50 | 64 | 16 | 4.0 | 12 | 3.8 |
| 31 | 14 | ------- | 206 | ------- | 64 | ------- | 3.0 | 11 | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 14 | 10 | 12.7 | 781 |
| November 1–26 | 14 | 5.0 | 9.78 | 504 |
| March 17–31 | 206 | 74 | 101 | 3,000 |
| April | 269 | 41 | 119 | 7,080 |
| May | 89 | 35 | 60.9 | 3,740 |
| June | 60 | 8.9 | 24.0 | 1,430 |
| July | 17 | 3.0 | 9.01 | 554 |
| August | 38 | .4 | 7.27 | 447 |
| September | 11 | 3.8 | 7.78 | 463 |

### WILD RICE RIVER AT TWIN VALLEY, MINN.

LOCATION.—Chain gage in SE¼ sec. 22, T. 144 N., R. 44 W., three-quarters of a mile northeast of Twin Valley.

DRAINAGE AREA.—805 square miles.

RECORDS AVAILABLE.—July 1930 to September 1933. June 1909 to September 1917 at a station a quarter of a mile downstream.

DISCHARGE.—Maximum during year, 450 second-feet May 23 (gage height, 3.27 feet); minimum 2.8 second-feet Sept. 3 (gage height, 0.51 foot).

1909–17, 1930–33: Maximum, 9,200 second-feet July 22, 1909 (not referred to present gage); minimum, 1 second-foot Aug. 13, 1932 (gage height, 0.24 foot).

REMARKS.—Records fair. No records Nov. 27 to Mar. 29.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 3.8 | 8.0 | | 224 | 113 | 168 | 31 | 6.0 | 3.6 |
| 2 | 3.8 | 7.6 | | 272 | 122 | 168 | 31 | 7.5 | 3.6 |
| 3 | 4.0 | 7.6 | | 298 | 122 | 168 | 30 | 5.6 | 3.2 |
| 4 | 3.8 | 8.0 | | 285 | 113 | 158 | 30 | 4.0 | 3.7 |
| 5 | 4.1 | 8.6 | | 260 | 106 | 158 | 30 | 3.7 | 3.8 |
| 6 | 3.8 | 7.6 | | 285 | 106 | 158 | 31 | 8.4 | 3.9 |
| 7 | 3.8 | 7.6 | | 298 | 98 | 148 | 30 | 8.7 | 3.9 |
| 8 | 4.1 | 7.3 | | 285 | 106 | 148 | 31 | 11 | 4.0 |
| 9 | 4.3 | 6.8 | | 285 | 106 | 148 | 31 | 9.8 | 4.0 |
| 10 | 4.6 | 6.8 | | 285 | 98 | 139 | 30 | 6.0 | 4.4 |
| 11 | 4.6 | 7.3 | | 285 | 106 | 130 | 31 | 6.0 | 4.6 |
| 12 | 5.0 | | | 272 | 106 | 122 | 30 | 6.0 | 4.6 |
| 13 | 6.1 | | | 248 | 106 | 106 | 28 | 5.6 | 4.6 |
| 14 | 6.6 | | | 235 | 88 | 98 | 27 | 5.6 | 5.0 |
| 15 | 7.0 | | | 221 | 80 | 95 | 25 | 5.6 | 5.2 |
| 16 | 7.0 | | | 208 | 79 | 88 | 22 | 5.0 | 5.4 |
| 17 | 7.6 | | | 195 | 74 | 84 | 19 | 5.0 | 5.6 |
| 18 | 7.3 | | | 181 | 73 | 79 | 17 | 4.4 | 5.6 |
| 19 | 6.8 | 10 | | 168 | 73 | 70 | 16 | 4.0 | 6.0 |
| 20 | 7.3 | | | 158 | 72 | 65 | 16 | 4.0 | 6.0 |
| 21 | 7.3 | | | 158 | 72 | 58 | 12 | 3.6 | 5.6 |
| 22 | 7.8 | | | 158 | 84 | 56 | 11 | 3.6 | 5.6 |
| 23 | 7.8 | | | 139 | 323 | 52 | 9.0 | 3.8 | 5.4 |
| 24 | 7.8 | | | 122 | 200 | 50 | 6.3 | 3.8 | 5.2 |
| 25 | 7.6 | | | 122 | 236 | 47 | 5.2 | 4.0 | 5.2 |
| 26 | 7.3 | 12 | | 113 | 224 | 43 | 4.8 | 4.2 | 5.0 |
| 27 | 7.3 | | | 113 | 168 | 37 | 4.0 | 4.8 | 5.2 |
| 28 | 7.6 | | | 106 | 158 | 35 | 4.0 | 5.2 | 5.0 |
| 29 | 7.6 | | | 106 | 158 | 35 | 4.2 | 4.8 | 5.2 |
| 30 | 7.8 | | 200 | 113 | 168 | 33 | 4.4 | 4.4 | 9.0 |
| 31 | 7.8 | | 212 | | 168 | | 5.2 | 3.7 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 7.8 | 3.8 | 6.10 | 375 |
| November 1–26 | 12 | 6.8 | 9.05 | 467 |
| March 30–31 | 212 | 200 | 206 | 817 |
| April | 298 | 106 | 207 | 12,300 |
| May | 323 | 72 | 126 | 7,750 |
| June | 168 | 33 | 98.1 | 5,840 |
| July | 31 | 4.0 | 19.6 | 1,210 |
| August | 11 | 3.6 | 5.41 | 333 |
| September | 9.0 | 3.2 | 4.90 | 292 |

### RED LAKE AT WASKISH, MINN.

LOCATION.—Staff gage on line between secs. 8 and 9, T. 154 N., R. 30 W., on highway bridge across Tamarack River in village of Waskish, about quarter of a mile from lake.

DRAINAGE AREA.—1,950 square miles above outlet of lower Red Lake.

RECORDS AVAILABLE.—April 1930 to September 1933 (discontinued).

EXTREMES.—Maximum water-surface elevation during year, 1,174.13 feet May 25; minimum, 1,171.95 feet Sept. 21.

1930–33: Maximum water-surface elevation, 1,174.85 feet June 2, 1930; minimum, that of Sept. 21, 1933.

REMARKS.—Water level subject to fluctuation caused by direction and velocity of wind.

*Elevation, in feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 72.69 | 72.39 | 72.73 | ------ | ------ | ------ | ------ | 73.53 | 73.53 | 73.28 | 72.77 | 72.47 |
| 2 | 72.93 | 72.47 | 72.73 | ------ | ------ | ------ | ------ | 73.63 | 73.48 | 73.28 | 72.68 | 73.01 |
| 3 | 72.49 | 72.39 | 72.71 | 72.79 | 72.79 | 72.75 | ------ | 73.63 | 73.43 | 73.28 | 72.77 | 72.71 |
| 4 | 72.53 | 72.39 | ------ | ------ | ------ | ------ | 73.13 | 73.48 | 73.38 | 73.23 | 72.79 | 72.41 |
| 5 | 72.53 | 72.49 | ------ | ------ | ------ | ------ | ------ | 73.45 | 73.43 | ------ | 72.83 | 72.39 |
| 6 | 72.61 | 72.45 | ------ | 72.79 | 72.79 | ------ | ------ | 73.48 | 73.08 | 72.98 | 72.77 | 72.37 |
| 7 | 72.35 | 72.37 | 72.81 | ------ | ------ | ------ | ------ | 73.23 | 73.08 | 73.28 | 72.73 | 72.15 |
| 8 | 72.85 | 72.35 | ------ | ------ | ------ | ------ | 73.23 | 73.13 | 73.51 | 73.29 | 72.93 | 72.18 |
| 9 | 72.83 | 72.49 | ------ | 72.81 | ------ | 72.75 | ------ | 73.25 | 73.53 | 73.18 | 72.77 | 72.57 |
| 10 | 72.81 | 72.77 | 72.81 | ------ | 72.79 | ------ | ------ | 73.33 | 73.45 | 73.13 | 72.69 | 72.19 |
| 11 | 72.57 | 72.95 | ------ | ------ | ------ | 72.75 | 73.11 | 73.35 | 73.48 | 73.28 | 72.99 | 72.21 |
| 12 | 72.35 | 72.71 | ------ | ------ | 72.79 | ------ | ------ | 73.33 | 73.53 | 73.21 | 72.79 | 72.33 |
| 13 | 72.53 | 72.75 | ------ | 72.81 | ------ | 72.75 | ------ | 73.53 | 73.35 | 73.23 | 72.69 | 72.31 |
| 14 | 72.35 | 72.75 | 72.81 | ------ | ------ | ------ | 73.05 | 73.33 | 73.48 | 73.21 | 72.63 | 72.31 |
| 15 | 72.35 | 72.75 | ------ | ------ | ------ | ------ | ------ | 73.35 | 73.33 | 73.13 | 72.67 | 72.23 |
| 16 | 72.33 | 72.73 | ------ | ------ | ------ | ------ | ------ | 73.33 | 73.23 | 73.13 | 72.65 | 72.99 |
| 17 | 72.10 | 72.71 | 72.81 | 72.81 | 72.79 | ------ | 73.43 | 73.41 | 73.28 | 73.08 | 73.03 | 72.69 |
| 18 | 72.11 | 72.71 | ------ | ------ | ------ | ------ | 73.63 | 73.38 | 73.33 | 73.15 | 72.69 | 72.31 |
| 19 | 72.25 | 72.71 | 72.81 | ------ | ------ | 72.73 | 73.33 | 73.38 | 73.31 | 73.18 | 72.67 | 73.79 |
| 20 | 72.53 | 72.71 | ------ | 72.80 | 72.77 | ------ | 73.35 | 73.38 | 73.33 | 73.13 | 72.65 | 72.77 |
| 21 | 72.45 | 72.71 | ------ | ------ | ------ | ------ | 73.41 | 73.33 | 73.35 | 73.03 | 72.41 | 71.95 |
| 22 | 72.37 | 72.71 | ------ | ------ | ------ | ------ | 73.41 | 72.98 | 73.28 | 72.97 | 72.59 | 72.39 |
| 23 | 72.63 | 72.71 | 72.81 | ------ | ------ | ------ | 73.51 | 73.33 | 73.28 | 73.13 | 72.53 | 72.39 |
| 24 | 73.33 | 72.72 | ------ | 72.79 | 72.77 | ------ | 73.53 | 73.45 | 73.23 | 73.03 | 72.69 | 72.19 |
| 25 | 72.59 | 72.71 | ------ | ------ | ------ | 72.73 | 73.51 | 74.13 | 73.23 | 72.93 | 72.63 | 72.19 |
| 26 | 72.37 | 72.71 | ------ | ------ | ------ | ------ | 73.51 | 73.63 | 73.23 | 72.93 | 72.57 | 72.83 |
| 27 | 72.49 | 72.71 | ------ | ------ | 72.75 | 72.73 | 73.48 | 73.38 | 73.13 | 72.93 | 72.57 | 72.39 |
| 28 | 72.23 | 72.71 | ------ | 72.79 | ------ | ------ | 73.48 | 73.53 | 73.18 | 72.87 | 72.53 | 72.47 |
| 29 | 72.23 | 72.71 | ------ | ------ | ------ | ------ | 73.43 | 73.38 | 73.73 | 73.03 | 72.49 | 72.15 |
| 30 | 72.23 | 72.72 | ------ | 72.79 | ------ | ------ | 73.48 | 73.48 | 73.68 | 72.77 | 72.51 | 72.79 |
| 31 | 72.35 | ------ | 72.80 | ------ | ------ | 72.79 | ------ | 73.38 | ------ | 73.13 | 72.41 | ------ |

NOTE.—Add 1,100 feet to obtain elevation above mean sea level.

### RED LAKE AT REDBY, MINN.

LOCATION.—Staff gage in sec. 20, T. 151 N., R. 33 W., at mouth of Mud River, a quarter of a mile east of Redby.
DRAINAGE AREA.—1,950 square miles above outlet of lower Red Lake.
RECORDS AVAILABLE.—June 1930 to November 1932 (discontinued).
EXTREMES.—Maximum water-surface elevation during year, 1,172.49 feet Oct. 3, 15; minimum, 1,172.25 feet Oct. 25.
1930–33: Maximum water-surface elevation, 1,174.71 feet June 5, 6, 1930; minimum, 1,172.15 feet Sept. 25, 1932.
REMARKS.—Water level subject to fluctuation caused by direction and velocity of wind.

*Elevation, in feet, 1932*

| Day | Oct. | Nov. | Day | Oct. | Nov. | Day | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|
| 1 | 72.44 | 72.29 | 11 | 72.39 | ------- | 21 | 72.33 | ------- |
| 2 | 72.39 | ------- | 12 | 72.29 | ------- | 22 | 72.34 | ------- |
| 3 | 72.49 | ------- | 13 | 72.31 | ------- | 23 | 72.31 | ------- |
| 4 | 72.39 | ------- | 14 | 72.39 | ------- | 24 | 72.39 | ------- |
| 5 | 72.38 | ------- | 15 | 72.49 | ------- | 25 | 72.25 | ------- |
| 6 | 72.39 | ------- | 16 | 72.29 | ------- | 26 | ------- | ------- |
| 7 | 72.34 | ------- | 17 | 72.44 | ------- | 27 | ------- | ------- |
| 8 | 72.38 | ------- | 18 | 72.39 | ------- | 28 | ------- | ------- |
| 9 | 72.39 | ------- | 19 | 72.38 | ------- | 29 | ------- | ------- |
| 10 | 72.29 | ------- | 20 | 72.33 | ------- | 30 | 72.34 | ------- |
| | | | | | | 31 | 72.39 | ------- |

NOTE.—Add 1,100 feet to obtain elevation above mean sea level.

### RED LAKE NEAR RED LAKE, MINN.

LOCATION.—Staff gage in NW¼ sec. 28, T. 152 N., R. 36 W., just above dam at outlet, about 18 miles northwest of Red Lake, Minn.
DRAINAGE AREA.—1,950 square miles.
RECORDS AVAILABLE.—May to September 1933.
EXTREMES.—Maximum water-surface elevation during period, 1,173.60 feet July 6; minimum, 1,171.10 feet Sept. 19.
REMARKS.—Records excellent. Water level subject to fluctuation caused by direction and velocity of wind.

*Elevation, in feet, 1932–33*

| Day | May | June | July | Aug. | Sept. | Day | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ------- | 73.25 | 73.08 | 72.68 | 72.45 | 16 | 73.19 | 73.35 | 73.04 | 72.47 | 72.11 |
| 2 | ------- | 73.26 | 73.10 | 72.77 | 72.36 | 17 | 73.21 | 73.24 | 73.07 | 72.30 | 71.97 |
| 3 | 73.15 | 73.35 | 73.12 | 72.76 | 72.26 | 18 | 73.18 | 73.22 | 72.99 | 72.45 | 72.29 |
| 4 | 73.15 | 73.30 | 73.10 | 72.70 | 72.32 | 19 | 73.26 | 73.15 | 73.03 | 72.42 | 71.31 |
| 5 | 73.24 | 73.40 | 73.00 | 72.64 | 72.34 | 20 | 73.12 | 73.28 | 72.83 | 72.43 | 71.96 |
| 6 | 73.17 | 73.28 | 73.49 | 72.64 | 72.49 | 21 | 73.15 | 73.20 | 72.91 | 72.57 | 72.46 |
| 7 | 73.42 | 73.52 | 73.21 | 72.62 | 72.40 | 22 | 73.25 | 73.19 | 72.91 | 72.47 | 72.13 |
| 8 | 73.49 | 73.43 | 73.16 | 72.62 | 72.34 | 23 | 73.20 | 73.14 | 72.90 | 72.44 | 72.00 |
| 9 | 73.31 | 73.37 | 73.25 | 72.60 | 72.32 | 24 | 73.15 | 73.14 | 72.76 | 72.19 | 72.10 |
| 10 | 73.25 | 73.34 | 73.20 | 72.70 | 72.29 | 25 | 73.00 | 73.10 | 72.84 | 72.40 | 72.25 |
| 11 | 73.19 | 73.20 | 73.13 | 72.48 | 72.34 | 26 | 73.10 | 73.16 | 72.88 | 72.47 | 71.93 |
| 12 | 73.22 | 73.20 | 73.19 | 72.48 | 72.24 | 27 | 73.25 | 73.10 | 72.90 | 72.45 | 71.97 |
| 13 | 73.05 | 73.25 | 73.05 | 72.49 | 72.24 | 28 | 73.15 | 73.25 | 72.92 | 72.47 | 71.97 |
| 14 | 73.18 | 73.21 | 73.00 | 72.53 | 72.30 | 29 | 73.34 | 73.38 | 72.84 | 72.40 | 72.03 |
| 15 | 73.18 | 73.30 | 73.08 | 72.54 | 72.61 | 30 | 73.36 | 73.08 | 73.14 | 72.40 | 71.88 |
| | | | | | | 31 | 73.30 | ------- | 72.75 | 72.48 | ------- |

NOTE.—Add 1,100 feet to obtain elevation above mean sea level.

### RED LAKE RIVER NEAR RED LAKE, MINN.

LOCATION.—Staff gage in NW¼ sec. 28, T. 152 N., R. 36 W., just below dam at outlet of lower Red Lake, about 18 miles northwest of Red Lake, Minn. Zero of gage is 1,170 feet above mean sea level.

DRAINAGE AREA.—1,950 square miles.

RECORDS AVAILABLE.—May to September 1933.

DISCHARGE.—Maximum during period, 46 second-feet July 4 (gage height, 3.02 feet, affected by aquatic growth); no flow Sept. 16, 19.

REMARKS.—Records fair. Stage-discharge relation affected by aquatic growth May 27 to Sept. 30.

*Discharge, in second-feet, 1933*

| Day | May | June | July | Aug. | Sept. | Day | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0.6 | 36 | 12 | 9.0 | 16 | 0.5 | 0.7 | 6.7 | 6.4 | 2.4 |
| 2 | | .7 | 36 | 20 | 6.4 | 17 | .6 | .7 | 6.7 | 2.0 | 1.0 |
| 3 | 0.6 | .6 | 36 | 16 | 3.2 | 18 | .5 | .6 | 4.0 | 5.5 | 7.9 |
| 4 | .6 | .6 | 37 | 14 | 6.1 | 19 | .6 | .6 | 12 | 6.1 | .0 |
| 5 | .5 | .6 | 28 | 13 | 6.1 | 20 | .6 | .6 | 24 | 5.5 | 1.1 |
| 6 | .6 | .8 | 31 | 12 | 12 | 21 | .5 | .6 | 22 | 9.3 | 15 |
| 7 | .7 | .6 | 31 | 10 | 8.6 | 22 | .7 | .6 | 25 | 7.6 | 4.2 |
| 8 | .5 | .5 | 30 | 12 | 6.7 | 23 | .7 | .6 | 22 | 7.6 | 1.9 |
| 9 | .5 | .8 | 27 | 12 | 7.0 | 24 | .6 | .9 | 16 | 1.6 | 3.2 |
| 10 | .5 | .7 | 12 | 12 | 6.1 | 25 | .6 | .6 | 18 | 6.4 | 8.2 |
| 11 | .5 | .8 | 25 | 5.8 | 7.3 | 26 | .6 | .6 | 22 | 9.0 | 1.2 |
| 12 | .5 | .8 | 7.0 | 5.8 | 4.7 | 27 | .6 | .6 | 21 | 7.6 | 1.9 |
| 13 | .5 | .8 | 6.7 | 6.4 | 5.5 | 28 | 1.0 | .6 | 2 | 8.6 | 2.0 |
| 14 | .5 | .8 | 5.8 | 7.6 | 7.3 | 29 | 1.0 | 12 | 16 | 7.3 | 2.7 |
| 15 | .5 | .6 | 6.4 | 7.9 | 19 | 30 | .8 | 34 | 33 | 7.6 | 1.1 |
| | | | | | | 31 | .6 | | 12 | 9.0 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| May 3–31 | 1.0 | 0.5 | 0.60 | 35 |
| June | 34 | .5 | 2.15 | 128 |
| July | 37 | 4.0 | 20.5 | 1,260 |
| August | 20 | 1.6 | 8.83 | 543 |
| September | 19 | 0 | 5.63 | 335 |
| The period | | | | 2,300 |

### RED LAKE RIVER AT HIGHLANDING, NEAR GOODRIDGE, MINN.

LOCATION.—Staff gage on line between secs. 28 and 29, T. 153 N., R. 40 W., at bridge at Highlanding, 7 miles south of Goodridge. Gage datum lowered 1.00 foot May 18, 1933.

RECORDS AVAILABLE.—October 1930 to September 1933.

DISCHARGE.—Maximum during year, 76 second-feet Apr. 18 (gage height, 3.84 feet, present datum); no flow Oct. 10–12, June 28, July 3–6.

1930–33: Maximum, 254 second-feet Apr. 3, 1931 (gage height, 3.38 feet, present datum, affected by ice); maximum gage height, 4.37 feet, present datum, affected by ice, Apr. 9, 1932; no flow at times.

REMARKS.—Records good. Stage-discharge relation affected by ice Nov. 11 to Apr. 21 and by aquatic growth Oct. 1–18, July 6 to Sept. 30.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.2 | 52 | 18 | 12 | 9.8 | 6.3 | 16 | 6.8 | 11 | 0.1 | 15 | 6.8 |
| 2 | .2 | 38 | 18 | 12 | 8.3 | 6.3 | 16 | 7.8 | 12 | .1 | 16 | 5.3 |
| 3 | .2 | 43 | 17 | 12 | 7.3 | 5.3 | 16 | 8.3 | 11 | 0 | 16 | 3.0 |
| 4 | .1 | 38 | 18 | 11 | 8.3 | 6.3 | 16 | 11 | 8.8 | 0 | 17 | 1.8 |
| 5 | .1 | 34 | 17 | 9.8 | 7.3 | 7.3 | 16 | 9.8 | 7.8 | 0 | 17 | 3.0 |
| 6 | .1 | 42 | 17 | 10 | 6.3 | 5.8 | 16 | 8.8 | 9.8 | 0 | 15 | 2.2 |
| 7 | .1 | 34 | 16 | 9.8 | 6.3 | 6.8 | 16 | 7.8 | 8.8 | 6.3 | 15 | 4.3 |
| 8 | .1 | 29 | 15 | 12 | 6.3 | 6.3 | 16 | 6.8 | 13 | 32 | 14 | 3.4 |
| 9 | .1 | 28 | 14 | 11 | 5.8 | 4.8 | 16 | 7.8 | 12 | 30 | 13 | 3.0 |
| 10 | 0 | 32 | 15 | 11 | 5.8 | 4.3 | 18 | 6.8 | 11 | 28 | 13 | 2.2 |
| 11 | 0 | 37 | 14 | 11 | 6.3 | 3.9 | 18 | 5.8 | 6.8 | 34 | 11 | 1.4 |
| 12 | 0 | 52 | 14 | 11 | 5.3 | 2.6 | 22 | 4.8 | 5.8 | 31 | 11 | 1.4 |
| 13 | 16 | 35 | 13 | 9.8 | 5.8 | 1.4 | 22 | 3.9 | 5.8 | 28 | 11 | 3.0 |
| 14 | 19 | 30 | 13 | 11 | 5.3 | 1.8 | 25 | 3.0 | 6.3 | 23 | 10 | 4.8 |
| 15 | 17 | 28 | 12 | 9.8 | 5.3 | 1.8 | 28 | 2.2 | 5.8 | 22 | 12 | 4.8 |
| 16 | 15 | 26 | 12 | 11 | 6.3 | 1.8 | 32 | 2.2 | 5.8 | 19 | 9.8 | 10 |
| 17 | 16 | 25 | 11 | 11 | 3.9 | 1.8 | 53 | 3.0 | 5.3 | 16 | 9.8 | 8.8 |
| 18 | 23 | 24 | 11 | 9.3 | 3.9 | 1.8 | 76 | .8 | 3.9 | 12 | 8.8 | 3.9 |
| 19 | 26 | 24 | 12 | 10 | 3.0 | 1.8 | 68 | .3 | 3.0 | 6.3 | 8.3 | 1.8 |
| 20 | 34 | 22 | 11 | 8.8 | 2.2 | 3.9 | 54 | .2 | 1.8 | 3.9 | 7.3 | .5 |
| 21 | 43 | 21 | 11 | 7.8 | 1.4 | 1.4 | 46 | .2 | .5 | 3.0 | 6.3 | 3.9 |
| 22 | 43 | 21 | 13 | 8.8 | 1.4 | 1.8 | 33 | .2 | .4 | 2.6 | 5.3 | 5.3 |
| 23 | 34 | 20 | 11 | 8.3 | 2.2 | 2.6 | 24 | .4 | .3 | 3.0 | 8.3 | 3.9 |
| 24 | 28 | 20 | 12 | 10 | 3.0 | 3.9 | 18 | 2.2 | .2 | 2.6 | 13 | 3.4 |
| 25 | 23 | 18 | 12 | 8.8 | 3.9 | 5.3 | 15 | 5.8 | .1 | 2.6 | 12 | 2.2 |
| 26 | 25 | 18 | 13 | 9.8 | 3.0 | 6.3 | 11 | 6.8 | .1 | 2.2 | 12 | 3.4 |
| 27 | 31 | 17 | 13 | 11 | 3.9 | 4.8 | 11 | 4.8 | .1 | 8.8 | 11 | 3.0 |
| 28 | 32 | 17 | 13 | 11 | 6.3 | 6.3 | 8.8 | 5.8 | 0 | 15 | 9.3 | 2.2 |
| 29 | 31 | 18 | 13 | 10 | ------- | 7.8 | 7.8 | 14 | .2 | 15 | 8.8 | 1.8 |
| 30 | 28 | 20 | 12 | 11 | ------- | 11 | 5.8 | 13 | .1 | 14 | 9.3 | 2.2 |
| 31 | 24 | ------- | 12 | 9.8 | ------- | 15 | ------- | 12 | ------- | 15 | 8.3 | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 43 | 0 | 16.4 | 1,010 |
| November | 52 | 17 | 28 8 | 1,710 |
| December | 18 | 11 | 13.6 | 836 |
| January | 12 | 7.8 | 10.3 | 633 |
| February | 9.8 | 1.4 | 5 14 | 285 |
| March | 15 | 1.4 | 4 78 | 294 |
| April | 76 | 5.8 | 24 7 | 1,470 |
| May | 14 | .2 | 5.58 | 343 |
| June | 13 | 0 | 5 25 | 312 |
| July | 34 | 0 | 12.1 | 744 |
| August | 17 | 5.3 | 11.4 | 701 |
| September | 10 | .5 | 3.56 | 212 |
| The year | 76 | 0 | 11.8 | 8,550 |

### RED LAKE RIVER AT CROOKSTON, MINN.

LOCATION.—Water-stage recorder in sec. 30, T. 150 N., R. 46 W., at highway bridge in Crookston, a quarter of a mile below dam and power house of Crookston Light, Water & Power Co.

DRAINAGE AREA.—5,320 square miles.

RECORDS AVAILABLE.—May 1901 to September 1933.

DISCHARGE.—Maximum during year, 1,440 second-feet Apr. 2 (gage height, 5.92 feet); minimum, 5.5 second-feet Sept. 27 (gage height, 2.18 feet, affected by aquatic growth).

1901–33: Maximum, 14,700 second-feet July 5, 1919; minimum, 5 second-feet Aug. 6–8, 1925. Average, 32 years (1901–33), 1,010 second-feet.

REMARKS.—Records good. Stage-discharge relation affected by aquatic growth or sludge for practically the entire year. Flow regulated by power plant above station.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17 | 12 | 26 | 16 | 24 | 29 | 1,020 | 237 | 266 | 45 | 15 | 21 |
| 2 | 16 | 11 | 29 | 16 | 22 | 60 | 1,210 | 191 | 208 | 50 | 13 | 24 |
| 3 | 16 | 8.0 | 44 | 17 | 22 | 120 | 996 | 182 | 147 | 45 | 12 | 24 |
| 4 | 16 | 6.5 | 57 | 19 | 21 | 33 | 755 | 232 | 221 | 37 | 12 | 24 |
| 5 | 14 | 8.8 | 39 | 20 | 20 | 157 | 596 | 228 | 147 | 41 | 11 | 21 |
| 6 | 15 | 13 | 52 | 21 | 19 | 43 | 586 | 157 | 237 | 122 | 11 | 19 |
| 7 | 16 | 18 | 36 | 25 | 19 | 94 | 476 | 225 | 134 | 72 | 10 | 15 |
| 8 | 15 | 22 | 39 | 26 | 23 | 68 | 485 | 225 | 250 | 39 | 11 | 14 |
| 9 | 14 | 24 | 41 | 25 | 25 | 25 | 585 | 171 | 310 | 45 | 13 | 14 |
| 10 | 14 | 32 | 30 | 24 | 24 | 129 | 554 | 182 | 209 | 46 | 15 | 13 |
| 11 | 11 | 38 | 29 | 25 | 25 | 75 | 491 | 181 | 236 | 63 | 16 | 13 |
| 12 | 11 | 34 | 27 | 25 | 27 | 88 | 259 | 177 | 128 | 43 | 17 | 13 |
| 13 | 10 | 35 | 27 | 23 | 24 | 56 | 421 | 142 | 106 | 43 | 17 | 10 |
| 14 | 8.8 | 74 | 27 | 22 | 19 | 52 | 225 | 235 | 100 | 36 | 16 | 11 |
| 15 | 9.6 | 115 | 27 | 24 | 16 | 31 | 428 | 143 | 100 | 31 | 15 | 11 |
| 16 | 9.6 | 44 | 25 | 26 | 22 | 52 | 255 | 120 | 87 | 29 | 14 | 10 |
| 17 | 9.6 | 37 | 23 | 25 | 26 | 136 | 514 | 110 | 84 | 29 | 15 | 9.0 |
| 18 | 8.8 | 27 | 22 | 24 | 25 | 34 | 584 | 135 | 67 | 31 | 16 | 10 |
| 19 | 9.6 | 30 | 22 | 25 | 21 | 59 | 786 | 159 | 126 | 31 | 16 | 10 |
| 20 | 7.5 | 30 | 21 | 24 | 23 | 80 | 1,070 | 90 | 183 | 28 | 18 | 10 |
| 21 | 7.0 | 29 | 20 | 24 | 20 | 117 | 1,160 | 145 | 32 | 24 | 18 | 12 |
| 22 | 7.5 | 27 | 20 | 23 | 20 | 82 | 1,120 | 114 | 28 | 22 | 19 | 14 |
| 23 | 7.0 | 29 | 20 | 22 | 24 | 32 | 1,020 | 101 | 18 | 19 | 18 | 13 |
| 24 | 6.5 | 31 | 20 | 19 | 31 | 96 | 783 | 153 | 22 | 22 | 17 | 14 |
| 25 | 6.5 | 34 | 19 | 20 | 34 | 109 | 636 | 78 | 26 | 22 | 15 | 14 |
| 26 | 8.0 | 35 | 18 | 24 | 51 | 64 | 449 | 111 | 32 | 25 | 16 | 7.0 |
| 27 | 37 | 35 | 18 | 26 | 80 | 127 | 265 | 143 | 39 | 22 | 17 | 6.5 |
| 28 | 12 | 32 | 17 | 26 | 116 | 155 | 176 | 174 | 54 | 24 | 17 | 6.5 |
| 29 | 14 | 29 | 16 | 26 | ------ | 169 | 215 | 111 | 39 | 21 | 18 | 7.5 |
| 30 | 13 | 27 | 16 | 27 | ------ | 347 | 150 | 198 | 45 | 17 | 19 | 7.5 |
| 31 | 12 | ------ | 17 | 25 | ------ | 634 | ------ | 187 | ------ | 15 | 19 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 37 | 6.5 | 12.2 | 750 |
| November | 115 | 6.5 | 30.9 | 1,840 |
| December | 57 | 16 | 27.2 | 1,670 |
| January | 27 | 16 | 23.0 | 1,410 |
| February | 116 | 16 | 29.4 | 1,630 |
| March | 634 | 25 | 108 | 6,640 |
| April | 1,210 | 150 | 609 | 36,200 |
| May | 237 | 78 | 162 | 9,960 |
| June | 310 | 18 | 123 | 7,320 |
| July | 122 | 15 | 36.7 | 2,260 |
| August | 19 | 10 | 15.4 | 947 |
| September | 24 | 6.5 | 13.3 | 791 |
| The year | 1,210 | 6.5 | 98.7 | 71,418 |

### THIEF LAKE NEAR MIDDLE RIVER, MINN.

LOCATION.—Staff gage in sec. 20, T. 158 N., R. 41 W., on dam at outlet of Thief Lake, 10 miles east of Middle River.
RECORDS AVAILABLE.—April to September 1933.
EXTREMES.—Maximum gage height during period, −3.47 feet Apr. 25; minimum, −4.63 feet Sept. 6, 9.
REMARKS.—Zero of gage is at crest of dam. No outflow during entire year.

*Gage height, in feet, 1933*

| Day | Apr. | May | June | July | Aug. | Sept. | Day | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | −3.55 | | | | 16 | | −3.60 | | −3.95 | −4.39 | |
| 2 | | | −3.55 | | −4.21 | −4.59 | 17 | | −3.60 | | | | |
| 3 | | | −3.54 | | | | 18 | | −3.60 | | | | |
| 4 | | | | −3.85 | | | 19 | | | −3.67 | −4.00 | −4.43 | |
| 5 | | | −3.58 | −3.85 | | | 20 | | | −3.70 | −4.03 | | |
| 6 | | | | −3.77 | | −4.63 | 21 | | | | −4.05 | | |
| 7 | | | −3.58 | −3.80 | | | 22 | | | −3.74 | | | −4.55 |
| 8 | | | −3.49 | −3.81 | −4.26 | | 23 | | | −3.77 | | | −4.53 |
| 9 | | | −3.50 | | | −4.63 | 24 | | | −3.78 | | −4.46 | |
| 10 | | | | −3.83 | | | 25 | −3.47 | −3.59 | | −4.11 | | |
| 11 | | | | −3.84 | | | 26 | | −3.58 | −3.78 | −4.12 | −4.49 | |
| 12 | | | −3.57 | | −4.35 | | 27 | | −3.57 | −3.78 | | | |
| 13 | | | −3.57 | −3.89 | | −4.54 | 28 | | | −3.78 | −4.13 | | −4.45 |
| 14 | | | −3.58 | −3.92 | | −4.54 | 29 | | −3.55 | −3.78 | −4.15 | | |
| 15 | | | −3.60 | | | | 30 | | −3.55 | −3.79 | | −4.52 | −4.46 |
| | | | | | | | 31 | | −3.55 | | −4.20 | | |

### THIEF RIVER NEAR THIEF RIVER FALLS, MINN.

LOCATION.—Chain gage in sec. 3, T. 154 N., R. 43 W., 5 miles north of Thief River Falls.

DRAINAGE AREA.—1,010 square miles.

RECORDS AVAILABLE.—July 1909 to September 1917; April 1920 to September 1921; October 1922 to September 1924; October 1928 to September 1933.

DISCHARGE.—Maximum during year, 438 second-feet Apr. 18 (gage height, 6.31 feet); no flow for several months.

1909–17, 1920–21, 1922–24, 1928–33: Maximum, 4,080 second-feet Apr. 23, 1916 (gage height, 14.5 feet); no flow in fall and winter of several years. Average, 15 years (1909–17, 1922–24, 1928–33), 84.8 second-feet.

REMARKS.—Records good except those for periods Oct. 1–31, Mar. 22 to Apr. 8, May 12–28, and June 21 to July 4, which are fair. No record Nov. 1 to Mar. 21.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Mar. | Apr. | May | June | July | Day | Oct. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.8 | ------ | 86 | 36 | 41 | 0.5 | 16 | 0.3 | ------ | 145 | 13 | 37 | 0 |
| 2 | .8 | ------ | 58 | 31 | 38 | .6 | 17 | .2 | ------ | 262 | 8.5 | 29 | 0 |
| 3 | .9 | ------ | 79 | 36 | 37 | .2 | 18 | .2 | ------ | 438 | 7.0 | 27 | 0 |
| 4 | .7 | ------ | 98 | 35 | 35 | .2 | 19 | .4 | ------ | 40€ | 6.7 | 24 | 0 |
| 5 | .7 | ------ | 66 | 35 | 33 | 0 | 20 | .4 | ------ | 40€ | 6.1 | 18 | 0 |
| 6 | .6 | ------ | 59 | 32 | 49 | .1 | 21 | .4 | ------ | 342 | 6.7 | 10 | 0 |
| 7 | .5 | ------ | 80 | 31 | 33 | 0 | 22 | .3 | 0.4 | 231 | 5.8 | 6.1 | 0 |
| 8 | .5 | ------ | 121 | 29 | 91 | 0 | 23 | .4 | .4 | 189 | 6.1 | 5.2 | 0 |
| 9 | .3 | ------ | 104 | 24 | 50 | 10.0 | 24 | .6 | .4 | 140 | 6.7 | 2.8 | 0 |
| 10 | .3 | ------ | 114 | 21 | 37 | 9.0 | 25 | .6 | 1.0 | 87 | 8.0 | 1.4 | 0 |
| 11 | .2 | ------ | 89 | 21 | 34 | 1.0 | 26 | .8 | 1.7 | 79 | 9.5 | .9 | 0 |
| 12 | .3 | ------ | 71 | 18 | 29 | .3 | 27 | .6 | 4.6 | 64 | 10 | .9 | 0 |
| 13 | .2 | ------ | 59 | 18 | 34 | 0 | 28 | .6 | 2.0 | 54 | 10 | 8.5 | 0 |
| 14 | .4 | ------ | 61 | 14 | 37 | 0 | 29 | .6 | 6.7 | 32 | 38 | .9 | 0 |
| 15 | .4 | ------ | 86 | 13 | 32 | 0 | 30 | 1.0 | 43 | 35 | 41 | .8 | 0 |
| | | | | | | | 31 | .8 | 62 | ------ | 33 | ------ | 0 |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 1.0 | 0.2 | 0.51 | 31 |
| March 22–31 | 62 | .4 | 12.2 | 242 |
| April | 438 | 32 | 138 | 8,210 |
| May | 41 | 5.8 | 19.7 | 1,210 |
| June | 91 | .8 | 26.1 | 1,550 |
| July | 10 | 0 | .71 | 43 |

NOTE.—No flow during August and September.

### FOREST RIVER NEAR MINTO, N.DAK.

LOCATION.—Chain gage on line between secs. 1 and 12, T. 155 N., R. 53 W., 3 miles southwest of Minto.
RECORDS AVAILABLE.—March 1932 to September 1933.
DISCHARGE.—Maximum during year, 700 second-feet, Apr. 2 (gage height, 12.95 feet, affected by ice); no flow Oct. 1–14.
1932–33: Maximum, that of Apr. 2, 1933; no flow for several days each year.
REMARKS.—Records good except those for period of ice effect, Mar. 2 to Apr. 16, which are poor. No record Nov. 2 to Mar. 1 and July 1 to Sept. 30.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | Day | Oct. | Nov. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 15 | ------ | 546 | 35 | 18 | 16 | 3.6 | ------ | 10 | 84 | 22 | 9.9 |
| 2 | 0 | ------ | 69 | 628 | 32 | 18 | 17 | 4.0 | ------ | | 215 | 22 | 9.2 |
| 3 | 0 | ------ | 235 | 276 | 30 | 18 | 18 | 3.7 | ------ | | 414 | 20 | 8.6 |
| 4 | 0 | ------ | 187 | 235 | 29 | 17 | 19 | 8.6 | ------ | | 215 | 19 | 7.9 |
| 5 | 0 | ------ | 215 | 178 | 28 | 16 | 20 | 4.4 | ------ | | 136 | 18 | 7.4 |
| 6 | 0 | ------ | 187 | 144 | 27 | 16 | 21 | 8.6 | ------ | 5 | 96 | 18 | 7.2 |
| 7 | 0 | ------ | 115 | 122 | 26 | 15 | 2 | 10 | ------ | | 79 | 18 | 6.6 |
| 8 | 0 | ------ | 102 | 115 | 27 | 15 | 23 | 9.9 | ------ | | 65 | 19 | 6.4 |
| 9 | 0 | ------ | 69 | 108 | 27 | 14 | 24 | 9.6 | ------ | | 57 | 22 | 6.1 |
| 10 | 0 | ------ | 44 | 102 | 27 | 14 | 25 | 9.0 | ------ | | 54 | 23 | 6.0 |
| 11 | 0 | ------ | 29 | 122 | 27 | 13 | 26 | 9.0 | ------ | 10 | 50 | 22 | 6.0 |
| 12 | 0 | ------ | 26 | 122 | 27 | 12 | 27 | 7.9 | ------ | 10 | 47 | 22 | 6.0 |
| 13 | 0 | ------ | 24 | 102 | 26 | 11 | 28 | 8.9 | ------ | 20 | 41 | 22 | 5.6 |
| 14 | 0 | ------ | 16 | 90 | 24 | 11 | 29 | 8.9 | ------ | 22 | 38 | 22 | 5.6 |
| 15 | 2.2 | ------ | 10 | 90 | 23 | 10 | 30 | 8.6 | ------ | 27 | 36 | 20 | 5.4 |
| | | | | | | | 31 | 9.7 | ------ | 57 | ------ | 20 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 10 | 0 | 4.08 | 251 |
| March 2–31 | 235 | ---------- | 51.0 | 3,030 |
| April | 628 | 36 | 154 | 9,160 |
| May | 35 | 18 | 24.0 | 1,480 |
| June | 18 | 5.4 | 10.7 | 637 |

### PARK RIVER AT GRAFTON, N.DAK.

LOCATION.—Chain gage in NE¼ sec. 13, T. 157 N., R. 53 W., at Grafton.
RECORDS AVAILABLE.—April 1931 to September 1933.
DISCHARGE.—Maximum during period, 2,010 second-feet Apr. 2 (gage height, 15.18 feet, affected by ice); minimum, 0.7 second-foot Oct. 18 and June 30. 1931–33: Maximum, that of Apr. 2, 1933; no flow occasionally.
REMARKS.—Records good except those for period of ice effect, Mar. 29 to Apr. 3, which are poor. No record Oct. 1–17, Nov. 1 to Mar. 28, July 1 to Sept. 30.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Mar. | Apr. | May | June | Day | Oct. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 1,500 | 38 | 25 | 16 | | | 207 | 16 | 7.5 |
| 2 | | | 2,010 | 34 | 19 | 17 | | | 357 | 16 | 5.6 |
| 3 | | | 1,840 | 30 | 17 | 18 | 0.7 | | 443 | 15 | 4.4 |
| 4 | | | 1,180 | 25 | 17 | 19 | 2.5 | | 369 | 14 | 3.0 |
| 5 | | | 837 | 22 | 19 | 20 | 3.9 | | 285 | 13 | 2.0 |
| 6 | | | 456 | 21 | 17 | 21 | 3.2 | | 185 | 13 | 2.2 |
| 7 | | | 381 | 19 | 19 | 22 | 1.4 | | 143 | 13 | 2.3 |
| 8 | | | 273 | 21 | 40 | 23 | 1.7 | | 112 | 21 | 2.5 |
| 9 | | | 285 | 24 | 29 | 24 | 1.0 | | 92 | 18 | 1.7 |
| 10 | | | 262 | 25 | 34 | 25 | .9 | | 77 | 21 | 1.4 |
| 11 | | | 229 | 22 | 27 | 26 | 1.1 | | 68 | 22 | 1.3 |
| 12 | | | 185 | 21 | 24 | 27 | 1.3 | | 59 | 22 | 1.3 |
| 13 | | | 143 | 19 | 20 | 28 | 3.9 | | 51 | 30 | .9 |
| 14 | | | 112 | 22 | 13 | 29 | 2.5 | 58 | 46 | 36 | .8 |
| 15 | | | 112 | 18 | 9.6 | 30 | 1.9 | 229 | 42 | 32 | .7 |
| | | | | | | 31 | 1.9 | 819 | | 27 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October 18–31 | 3.9 | 0.7 | 1.99 | 55 |
| March 29–31 | 819 | 58 | 369 | 2,200 |
| April | 2,010 | 42 | 411 | 24,500 |
| May | 38 | 13 | 22.3 | 1,370 |
| June | 34 | 0.7 | 12.2 | 726 |

### SOUTH FORK OF TWO RIVERS AT PELAN, MINN.

LOCATION.—Chain gage in SW¼ sec. 30, T. 160 N., R. 44 W., a quarter of a mile west of Pelan.

RECORDS AVAILABLE.—August 1928 to September 1933.

DISCHARGE.—Maximum during year, 242 second-feet Apr. 3 (gage height, 4.90 feet, affected by ice); no flow for several months.

1928–33: Maximum, 1,810 second-feet May 13, 1930 (gage height, 10.18 feet); no flow frequently.

REMARKS.—Records good except those for Mar. 24–30 and for periods when discharge is less than 1 second-foot, which are poor. Discharge estimated Mar. 25–30. No record Oct. 1 to Mar. 23. Stage-discharge relation affected by ice Mar. 24 to Apr. 10, and by beaver dam throughout rest of year.

*Discharge, in second-feet, 1932–33*

| Day | Mar. | Apr. | May | June | July | Day | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 138 | 9.3 | 16 | 0.1 | 16 | | 84 | 2.8 | 2.0 | 0 |
| 2 | | 180 | 10 | 15 | .1 | 17 | | 70 | 3.4 | 1.4 | 0 |
| 3 | | 242 | 10 | 9.3 | .1 | 18 | | 50 | 4.0 | .4 | 0 |
| 4 | | 187 | 10 | 5.5 | 0 | 19 | | 44 | 4.2 | .3 | 0 |
| 5 | | 166 | 8.6 | 5.0 | 0 | 20 | | 36 | 4.5 | .1 | 0 |
| 6 | | 125 | 9.6 | 4.0 | .1 | 21 | | 27 | 1.5 | .1 | 0 |
| 7 | | 152 | 7.6 | 2.2 | .1 | 22 | | 20 | 1.7 | .2 | 0 |
| 8 | | 187 | 5.8 | 4.0 | 0 | 23 | | 16 | 3.0 | .1 | 0 |
| 9 | | 138 | 4.2 | 4.8 | 0 | 24 | 0.6 | 9.3 | 16 | .1 | 0 |
| 10 | | 112 | 2.8 | 13 | 0 | 25 | 2.0 | 9.3 | 17 | .1 | 0 |
| 11 | | 89 | 2.4 | 12 | 0 | 26 | 5.0 | 9.3 | 18 | .2 | 0 |
| 12 | | 66 | 2.4 | 9.3 | 0 | 27 | 10 | 9.3 | 17 | .2 | 0 |
| 13 | | 66 | 2.6 | 6.2 | 0 | 28 | 15 | 9.6 | 16 | .1 | 0 |
| 14 | | 70 | 2.8 | 4.5 | 0 | 29 | 20 | 9.0 | 18 | .1 | 0 |
| 15 | | 70 | 2.6 | 3.2 | 0 | 30 | 30 | 9.0 | 21 | .1 | 0 |
| | | | | | | 31 | 39 | | 24 | | 0 |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| March 24–31 | 39 | 0.6 | 15.2 | 241 |
| April | 242 | 9.0 | 80.0 | 4,760 |
| May | 24 | 1.5 | 8.48 | 521 |
| June | 16 | 0.1 | 3.98 | 237 |
| July | 0.1 | .0 | .02 | 1 |
| The period | | | | 5,760 |

NOTE.—No flow during August and September.

### SOUTH FORK OF TWO RIVERS AT BRONSON, MINN.

LOCATION.—Chain gage in SW¼ sec. 30, T. 161 N., R. 46 W., a quarter of a mile west of Bronson. Zero of gage is 930.46 feet above mean sea level (1928 adjustment by Geodetic Survey of Canada).

RECORDS AVAILABLE.—September 1928 to September 1933.

DISCHARGE.—Maximum during year, 415 second-feet Apr. 4 (gage height, 5.58 feet, affected by ice); minimum, somewhat less than 1.5 second-feet in August and September.

1928–33: Maximum, 1,820 second-feet May 15, 1930 (gage height, 8.90 feet); minimum, 1.4 second-feet Sept. 22, 1932.

REMARKS.—Records fair except those for period of ice effect, Mar. 30 to Apr. 10, and for period July 16 to Sept. 30, which are poor. Discharge estimated July 16 to Aug. 14, Aug. 16 to Sept. 7, Sept. 9–30. No record Nov. 1 to Mar. 29.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2.2 | | 208 | 27 | 32 | 2.5 | | |
| 2 | 2.4 | | 370 | 24 | 29 | 2.1 | | |
| 3 | 2.4 | | 390 | 23 | 28 | 2.1 | | |
| 4 | 2.6 | | 415 | 21 | 26 | 2.1 | | 2.5 |
| 5 | 2.6 | | 370 | 20 | 25 | 2.1 | | |
| 6 | 2.6 | | 310 | 19 | 23 | 2.5 | | |
| 7 | 2.6 | | 290 | 18 | 22 | 3.5 | 2.0 | |
| 8 | 2.6 | | 310 | 19 | 21 | 3.8 | | 2.1 |
| 9 | 2.6 | | 270 | 19 | 20 | 3.8 | | |
| 10 | 2.6 | | 252 | 19 | 20 | 3.0 | | |
| 11 | 2.4 | | 252 | 20 | 18 | 2.5 | | 1.5 |
| 12 | 2.4 | | 216 | 19 | 17 | 2.3 | | |
| 13 | 2.4 | | 208 | 19 | 17 | 2.3 | | |
| 14 | 2.6 | | 200 | 17 | 16 | 1.9 | | |
| 15 | 2.6 | | 184 | 16 | 16 | 2.1 | 1.9 | |
| 16 | 2.8 | | 184 | 16 | 15 | | | |
| 17 | 3.2 | | 192 | 15 | 14 | | | |
| 18 | 3.6 | | 200 | 13 | 12 | | | |
| 19 | 5.4 | | 168 | 12 | 9.6 | | 1.5 | |
| 20 | 5.4 | | 146 | 12 | 7.5 | | | 3.0 |
| 21 | 3.4 | | 124 | 12 | 6.1 | | | |
| 22 | 2.8 | | 98 | 12 | 4.8 | | | |
| 23 | 2.8 | | 76 | 20 | 4.2 | | | |
| 24 | 2.6 | | 67 | 25 | 4.2 | 2.0 | | |
| 25 | 2.6 | | 59 | 27 | 3.8 | | | |
| 26 | 2.6 | | 50 | 30 | 3.5 | | 4.0 | |
| 27 | 2.6 | | 39 | 32 | 3.5 | | | |
| 28 | 2.8 | | 35 | 30 | 3.0 | | | 1.5 |
| 29 | 3.2 | | 32 | 33 | 3.0 | | | |
| 30 | 3.0 | 111 | 29 | 35 | 2.8 | | | |
| 31 | 3.0 | 118 | | 33 | | | | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 5.4 | 2.2 | 2.88 | 177 |
| April | 415 | 29 | 191 | 11,400 |
| May | 35 | 12 | 21.2 | 1,300 |
| June | 32 | 2.8 | 14.2 | 845 |
| July | | | 2.28 | 140 |
| August | | | 2.46 | 151 |
| September | | | 2.25 | 134 |

### MIDDLE FORK OF TWO RIVERS NEAR HALLOCK, MINN.

LOCATION.—Vertical staff gage in SE¼ sec. 17, T. 161 N., R. 48 W., 1½ miles above mouth and 2½ miles southeast of Hallock.

RECORDS AVAILABLE.—April 1931 to September 1933.

DISCHARGE.—Maximum during year, 58 second-feet Apr. 1 (gage height, 2.84 feet, affected by ice), maximum gage height, 6.06 feet (affected by ice) Mar. 30; no flow for several months.

1931–33: Maximum, 265 second-feet Apr. 19, 1932; no flow for several months.

REMARKS.—Records fair except those for March, which are poor. Discharge estimated Mar. 26–29. Stage-discharge relation affected by ice Mar. 30 to Apr. 8.

*Discharge, in second-feet, 1932–33*

| Day | Mar. | Apr. | May | June | Day | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 58 | 3.3 | 10 | 16 | 0 | 12 | 0.8 | 0.5 |
| 2 | 0 | 32 | 3.7 | 7.6 | 17 | 0 | 12 | 1.0 | .6 |
| 3 | 0 | 15 | 2.9 | 6.4 | 18 | 0 | 12 | 1.0 | .5 |
| 4 | 0 | 15 | 2.3 | 5.8 | 19 | 0 | 11 | .5 | .4 |
| 5 | 0 | 9.5 | 2.3 | 5.8 | 20 | 0 | 9.0 | .5 | .3 |
| 6 | 0 | 14 | 2.1 | 7.6 | 21 | 0 | 8.5 | .5 | .2 |
| 7 | 0 | 13 | 1.9 | 4.7 | 22 | 0 | 7.3 | .5 | .1 |
| 8 | 0 | 22 | 1.9 | 3.9 | 23 | 0 | 7.1 | 1.6 | .1 |
| 9 | 0 | 14 | 2.6 | 3.7 | 24 | 0 | 6.2 | 4.5 | 0 |
| 10 | 0 | 14 | 1.8 | 2.7 | 25 | 0 | 6.2 | 3.7 | 0 |
| 11 | 0 | 12 | 1.2 | 1.5 | 26 | | 4.7 | 8.5 | 0 |
| 12 | 0 | 10 | .8 | 1.1 | 27 | 5 | 4.1 | 6.9 | 0 |
| 13 | 0 | 10 | 3.9 | .9 | 28 | | 4.1 | 6.7 | 0 |
| 14 | 0 | 9.5 | 1.9 | .8 | 29 | | 3.7 | 6.9 | 0 |
| 15 | 0 | 9.0 | 1.1 | .5 | 30 | 42 | 2.9 | 6.7 | 0 |
| | | | | | 31 | 50 | | 10 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| March | 50 | 0 | 3.61 | 222 |
| April | 58 | 2.9 | 12.3 | 732 |
| May | 10 | .5 | 3.03 | 186 |
| June | 10 | 0 | 2.19 | 130 |
| The year | 58 | 0 | 1.76 | 1,270 |

NOTE.—No flow during months omitted.

### NORTH FORK OF TWO RIVERS NEAR LANCASTER, MINN.

LOCATION.—Staff gage in NW¼ sec. 6, T. 162 N., R. 47 W., 8 miles north
Lancaster. Zero of gage is 963.50 feet above mean sea level (1928 adju
by Geodetic Survey of Canada).
RECORDS AVAILABLE.—April 1929 to September 193
DISCHARGE.—Maximum during year, 100 second-feet May 26 (gage heigh
feet); no flow for several months.
1929–33: Maximum, 212 second-feet May 12, 1930 (gage height, 3.00
no flow at times.
REMARKS.—Records poor. Discharge estimated Mar. 26–29.

*Discharge, in second-feet, 1932–33*

| Day | Mar. | Apr. | May | June | Day | Mar. | Apr. | May |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 25 | a 0.4 | 24 | 16 | 0 | a 15 | a 0.1 |
| 2 | 0 | a 32 | a .4 | a 21 | 17 | 0 | 17 | .1 |
| 3 | 0 | a 38 | a .3 | a 18 | 18 | 0 | 17 | a .1 |
| 4 | 0 | 45 | .3 | a 15 | 19 | 0 | 15 | a .0 |
| 5 | 0 | a 40 | .2 | a 12 | 20 | 0 | a 13 | .0 |
| 6 | 0 | 34 | .2 | a 9.0 | 21 | 0 | a 10 | a 3.0 |
| 7 | 0 | 26 | a .2 | 6.0 | 22 | 0 | a 8.0 | a 6.0 |
| 8 | 0 | 26 | a .2 | a 6.0 | 23 | 0 | a 5.6 | 9.0 |
| 9 | 0 | a 20 | a .1 | 6.0 | 24 | 0 | 3.4 | 65 |
| 10 | 0 | 15 | a .1 | a 4.6 | 25 | 0 | 1.1 | a 82 |
| 11 | 0 | a 15 | .1 | a 3.3 | 26 | 1 | .7 | 100 |
| 12 | 0 | 14 | .1 | a 2.0 | 27 | | .6 | 31 |
| 13 | 0 | a 14 | .1 | .6 | 28 | | a .6 | a 33 |
| 14 | 0 | a 13 | a .1 | .5 | 29 | | a .5 | a 34 |
| 15 | 0 | 13 | a .1 | a .5 | 30 | 2 | a .5 | a 36 |
| | | | | | 31 | 13 | | 38 |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| March | 13 | 0 | 0.61 | 38 |
| April | 45 | .5 | 15.9 | 946 |
| May | 100 | 0 | 14.2 | 873 |
| June | 24 | 0 | 4.33 | 258 |
| The year | 100 | 0 | 2.92 | 2,120 |

a Interpolated.

NOTE.—No flow during months omitted.

### STATE DITCH 85 NEAR LANCASTER, MINN.

LOCATION.—Staff gage in southwest corner of sec. 6, T. 162 N., R. 46 W., 7 miles northeast of Lancaster. Zero of gage is 969.03 feet above mean sea level (1928 adjustment by Geodetic Survey of Canada).

RECORDS AVAILABLE.—April 1929 to September 1933.

DISCHARGE.—Maximum during year, 112 second-feet Apr. 18 (gage height, 3.52 feet); no flow several months of year.

1929–33: Maximum, 202 second-feet Apr. 18, 1932 (gage height, 4.9 feet); no flow for several months most years.

REMARKS.—Records poor.

*Discharge, in second-feet, 1932–33*

| Day | Apr. | May | June | July | Day | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | [a]10 | 62 | [b]0.3 | 16 | [a]70 | [a]0.6 | [a]3.3 | 0 |
| 2 | [b]10 | [a]8.0 | [a]54 | [b].3 | 17 | 84 | .4 | [a]2.9 | 0 |
| 3 | [b]10 | [a]6.0 | [a]47 | [b].3 | 18 | 112 | [a].4 | [a]2.5 | 0 |
| 4 | 20 | 3.9 | [a]39 | [b]1.0 | 19 | 94 | [a].4 | [a]2.1 | 0 |
| 5 | [a]28 | 3.1 | [a]32 | [b]1.5 | 20 | [a]84 | .3 | [a]1.6 | 0 |
| 6 | 35 | 2.5 | [a]24 | [b]1.5 | 21 | [a]72 | [b]1.0 | 1.2 | 0 |
| 7 | 41 | [a]2.0 | 17 | 1.3 | 22 | [a]62 | [b]4.0 | [a]1.0 | 0 |
| 8 | 39 | [a]1.5 | [a]19 | 1.0 | 23 | [a]50 | 9.0 | [b].8 | 0 |
| 9 | [a]43 | [a]1.0 | 21 | [a].8 | 24 | [a]38 | 29 | .6 | 0 |
| 10 | 47 | [a].5 | [a]17 | [a].6 | 25 | 29 | [a]27 | [a].6 | 0 |
| 11 | [a]48 | .4 | [a]13 | [a].4 | 26 | 21 | 25 | [a].5 | 0 |
| 12 | [a]50 | .7 | [a]9.0 | [a].2 | 27 | 16 | 64 | .4 | 0 |
| 13 | [a]52 | 1.2 | 5.3 | 0 | 28 | [a]14 | [a]74 | [a].4 | 0 |
| 14 | [a]54 | [a]1.0 | 4.1 | 0 | 29 | [a]13 | [a]84 | [a].3 | 0 |
| 15 | 56 | [a].8 | [a]3.7 | 0 | 30 | [a]11 | [a]94 | .3 | 0 |
| | | | | | 31 | | 106 | | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| April | 112 | 0 | 43.4 | 2,580 |
| May | 106 | .3 | 18.1 | 1,110 |
| June | 62 | .3 | 12.9 | 768 |
| July | 1.5 | 0 | .30 | 18 |
| The year | 112 | 0 | 6.19 | 4,480 |

[a] Interpolated.
[b] Estimated.

NOTE.—No flow during months omitted.

### PEMBINA RIVER NEAR MANITOU, MANITOBA

LOCATION.—Chain gage on bridge near Lea's farm, 9 miles south of Manitou.
DRAINAGE AREA.—2,340 square miles.
RECORDS AVAILABLE.—October 1929 to September 1933.
DISCHARGE.—Maximum mean daily during year, 884 second-feet May 25; minimum, 17.0 second-feet Aug. 25.
1929–33: Maximum mean daily, that of May 25, 1933; minimum, 0.1 second-foot Aug. 18, 1931.
REMARKS.—Records furnished by Dominion Water Power and Hydrometric Bureau. No record Oct. 1 to Apr. 9.

*Discharge, in second-feet, 1933*

| Day | Apr. | May | June | July | Aug. | Sept. | Day | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 454 | 358 | 83 | 28.8 | 22.7 | 16 | 516 | 305 | 169 | 41.5 | 19.7 | 42.2 |
| 2 | | 443 | 333 | 80 | 27.7 | 21.5 | 17 | 551 | 295 | 158 | 40.0 | 19.5 | 44.4 |
| 3 | | 430 | 308 | 76 | 26.5 | 21.7 | 18 | 554 | 285 | 146 | 38.6 | 19.1 | 46.6 |
| 4 | | 418 | 302 | 72 | 26.2 | 21.8 | 19 | 544 | 275 | 142 | 37.2 | 18.7 | 46.0 |
| 5 | | 408 | 296 | 67 | 25.8 | 22.0 | 20 | 533 | 268 | 138 | 35.8 | 18.3 | 46.9 |
| 6 | | 394 | 289 | 63 | 25.5 | 22.8 | 21 | 534 | 260 | 135 | 35.4 | 18.0 | 47.8 |
| 7 | | 383 | 285 | 59 | 25.0 | 23.6 | 22 | 529 | 328 | 133 | 35.0 | 17.8 | 48.2 |
| 8 | | 372 | 281 | 55 | 24.5 | 24.5 | 23 | 516 | 396 | 131 | 34.5 | 17.5 | 48.6 |
| 9 | | 362 | 277 | 52 | 24.0 | 27.7 | 24 | 510 | 463 | 128 | 34.0 | 17.3 | 49.0 |
| 10 | 513 | 352 | 256 | 52 | 23.5 | 31.0 | 25 | 502 | 884 | 119 | 33.1 | 17.0 | 51 |
| 11 | 456 | 347 | 235 | 52 | 23.0 | 35.5 | 26 | 495 | 783 | 108 | 32.2 | 23.4 | 52 |
| 12 | 450 | 342 | 221 | 50 | 21.8 | 40.0 | 27 | 489 | 586 | 103 | 31.6 | 29.8 | 54 |
| 13 | 469 | 336 | 207 | 48.0 | 20.5 | 40.0 | 28 | 482 | 534 | 97 | 31.0 | 28.2 | 55 |
| 14 | 489 | 325 | 193 | 46.0 | 20.2 | 40.0 | 29 | 476 | 482 | 92 | 31.0 | 26.5 | 55 |
| 15 | 482 | 315 | 180 | 43.0 | 20.0 | 40.0 | 30 | 466 | 432 | 86 | 31.0 | 25.2 | 55 |
| | | | | | | | 31 | | 382 | | 29.9 | 23.9 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| April 10–30 | 554 | 450 | 503 | 20,900 |
| May | 884 | 260 | 408 | 25,100 |
| June | 358 | 86 | 197 | 11,700 |
| July | 83 | 29.9 | 46.8 | 2,880 |
| August | 29.8 | 17.0 | 22.7 | 1,400 |
| September | 55 | 21.5 | 39.2 | 2,330 |
| The period | | | | 64,300 |

### PEMBINA RIVER AT NECHE, N.DAK.

LOCATION.—Chain gage in sec. 36, T. 164 N., R. 54 W., half a mile north of Neche.
DRAINAGE AREA.—2,960 square miles.
RECORDS AVAILABLE.—May 1903 to September 1915; April 1919 to September 1933.
DISCHARGE.—Maximum during year, 1,420 second-feet May 26 (gage height, 10.09 feet); maximum gage height, 12.16 feet Apr. 2, affected by ice; no flow Jan. 1 to Mar. 28.

1903–15, 1919–33: Maximum, 3,870 second-feet May 2, 1904 (gage height, 20.9 feet); no flow on several days in 1932 and 1933. Average, 14 years (1919–33), 128 second-feet.

REMARKS.—Records good except those for period of shifting control, Oct. 22 to Nov. 9, Aug. 15 to Sept. 30, which are fair, and those for period of ice effect, Nov. 10 to Apr. 25, which are poor.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.6 | 11 | 7.0 | 0 | 796 | 536 | 686 | 140 | 38 | 19 |
| 2 | .4 | 13 | | 0 | 1,100 | 516 | 599 | 127 | 36 | 18 |
| 3 | .4 | 13 | 6 | 0 | 1,080 | 496 | 557 | 127 | 36 | 18 |
| 4 | .3 | 14 | | 0 | 1,020 | 496 | 516 | 123 | 36 | 18 |
| 5 | .2 | 14 | | 0 | 1,020 | 496 | 476 | 111 | 35 | 18 |
| 6 | .2 | 14 | 5 | 0 | 994 | 496 | 455 | 115 | 35 | 18 |
| 7 | .2 | 14 | | 0 | 950 | 476 | 433 | 111 | 35 | 18 |
| 8 | .2 | 15 | | 0 | 818 | 476 | 410 | 107 | 33 | 18 |
| 9 | .2 | 11 | 4 | 0 | 774 | 476 | 385 | 99 | 33 | 20 |
| 10 | .1 | 6.4 | | 0 | 708 | 455 | 385 | 87 | 33 | 21 |
| 11 | .1 | 4.8 | | 0 | 642 | 455 | 360 | 86 | 31 | 21 |
| 12 | .1 | 2.8 | 3 | 0 | 664 | 455 | 335 | 80 | 30 | 25 |
| 13 | .1 | 2.8 | | 0 | 642 | 455 | 335 | 76 | 30 | 26 |
| 14 | .2 | 4.2 | | 0 | 557 | 433 | 298 | 71 | 28 | 28 |
| 15 | .2 | 5.6 | | 0 | 516 | 433 | 298 | 66 | 28 | 30 |
| 16 | .3 | 7.0 | 2 | 0 | 599 | 433 | 285 | 66 | 26 | 33 |
| 17 | 1.9 | 8.4 | | 0 | 730 | 433 | 272 | 63 | 25 | 33 |
| 18 | 3.8 | 7.3 | | 0 | 730 | 410 | 260 | 60 | 23 | 34 |
| 19 | 15 | 6.2 | | 0 | 708 | 410 | 248 | 57 | 22 | 35 |
| 20 | 14 | | | 0 | 686 | 410 | 235 | 52 | 21 | 35 |
| 21 | 13 | | | 0 | 642 | 385 | 222 | 50 | 20 | 35 |
| 22 | 29 | | | 0 | 620 | 385 | 210 | 47 | 23 | 35 |
| 23 | 25 | | | 0 | 620 | 410 | 198 | 47 | 22 | 38 |
| 24 | 22 | | | 0 | 599 | 410 | 185 | 45 | 22 | 37 |
| 25 | 22 | 6 | 1 | 0 | 599 | 862 | 172 | 43 | 22 | 37 |
| 26 | 18 | | | 0 | 578 | 1,420 | 166 | 43 | 21 | 36 |
| 27 | 16 | | | 0 | 578 | 1,190 | 160 | 43 | 21 | 40 |
| 28 | 17 | | | 0 | 557 | 774 | 158 | 43 | 20 | 40 |
| 29 | 10 | | | 0.3 | 557 | 840 | 158 | 41 | 19 | 41 |
| 30 | 9.0 | | | 60 | 536 | 972 | 138 | 41 | 20 | 41 |
| 31 | 14 | | | 496 | | 862 | | 41 | 20 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 29 | 0.1 | 7.53 | 463 |
| November | 15 | 2.8 | 8.02 | 477 |
| December | | | 2.71 | 167 |
| March | 496 | 0 | 17.9 | 1,100 |
| April | 1,100 | 516 | 721 | 42,900 |
| May | 1,420 | 385 | 573 | 35,200 |
| June | 686 | 138 | 320 | 19,000 |
| July | 140 | 41 | 74.5 | 4,580 |
| August | 38 | 19 | 27.2 | 1,670 |
| September | 41 | 18 | 28.9 | 1,720 |
| The year | 1,420 | 0 | 148 | 107,000 |

NOTE.—No flow during January and February.

### ROSEAU RIVER AT MALUNG, MINN.

LOCATION.—Staff gage in sec. 18, T. 161 N., R. 39 W., half a mile north of Malung.
RECORDS AVAILABLE.—August 1928 to September 1933.
DISCHARGE.—Maximum during year, 276 second-feet Apr. 1 (gage height, 6.57 feet, affected by ice); no flow July 25 to Sept. 30.
1928–33: Maximum, 468 second-feet Apr. 13, 1932; no flow at times.
REMARKS.—Records fair. Discharge estimated July 18–25. Stage-discharge relation affected by ice Mar. 30 to Apr. 17 and by debris on control or aquatic growth Oct. 1–31, Apr. 18 to May 12, July 1–17. No record Nov. 1 to Mar. 29.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Mar. | Apr. | May | June | July | Day | Oct. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.8 | ------- | 244 | 52 | 26 | 4.4 | 16 | 1.8 | ------- | 58 | 26 | 12 | 0.2 |
| 2 | 4.8 | ------- | 199 | 52 | 24 | 3.8 | 17 | 1.3 | ------- | 96 | 26 | 11 | .1 |
| 3 | 4.6 | ------- | 157 | 52 | 21 | 3.2 | 18 | 1.1 | ------- | 96 | 24 | 10 | |
| 4 | 4.8 | ------- | 102 | 50 | 19 | 3.8 | 19 | 1.6 | ------- | 150 | 23 | 10 | |
| 5 | 4.6 | ------- | 65 | 45 | 18 | 3.4 | 20 | 1.8 | ------- | 144 | 22 | 9.5 | |
| 6 | 4.4 | ------- | 60 | 42 | 17 | 2.8 | 21 | 1.8 | ------- | 114 | 20 | 9.5 | .1 |
| 7 | 4.1 | ------- | 75 | 40 | 17 | 2.6 | 22 | 2.0 | ------- | 102 | 17 | 9.5 | |
| 8 | 3.9 | ------- | 102 | 38 | 18 | 2.6 | 23 | 2.3 | ------- | 90 | 16 | 7.5 | |
| 9 | 3.9 | ------- | 85 | 36 | 20 | 2.0 | 24 | 2.3 | ------- | 85 | 15 | 5.9 | |
| 10 | 2.8 | ------- | 70 | 34 | 22 | 1.8 | 25 | 2.8 | ------- | 75 | 15 | 5.5 | |
| 11 | 2.8 | ------- | 60 | 32 | 21 | 1.3 | 26 | 3.2 | ------- | 65 | 15 | 5.5 | 0 |
| 12 | 2.8 | ------- | 40 | 28 | 18 | 1.0 | 27 | 2.0 | ------- | 60 | 15 | 5.5 | 0 |
| 13 | 2.6 | ------- | 34 | 28 | 15 | .8 | 28 | 2.6 | ------- | 58 | 15 | 5.2 | 0 |
| 14 | 2.6 | ------- | 34 | 27 | 14 | .5 | 29 | 1.8 | ------- | 55 | 15 | 4.8 | 0 |
| 15 | 1.4 | ------- | 42 | 27 | 12 | .4 | 30 | 2.3 | 17 | 52 | 17 | 4.4 | 0 |
| | | | | | | | 31 | 2.0 | 144 | ------- | 18 | ------- | 0 |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 4.8 | 1.1 | 2.83 | 174 |
| March 30-31 | 144 | 17 | 80.5 | 319 |
| April | 244 | 34 | 89.0 | 5,300 |
| May | 52 | 15 | 28.5 | 1,750 |
| June | 26 | 4.4 | 13.3 | 791 |
| July | 4.4 | 0 | 1.15 | 71 |

NOTE.—No flow during August and September.

### ROSEAU RIVER NEAR ROSEAU, MINN.

LOCATION.—Staff gage in SW¼ sec. 24, T. 163 N., R. 40 W., on steel highway bridge 5½ miles north of Roseau.
RECORDS AVAILABLE.—April 1930 to June 1933.
EXTREMES (1930–33).—Maximum water-surface elevation, 1,034.86 feet Apr. 9, 1932; minimum, 1,023.34 feet Sept. 28, 1930.
REMARKS.—Records excellent. Gage heights have been reduced to mean sea level datum. No record during periods omitted.

*Elevation, in feet, 1930–33*

| Day | 1930 | | | | | | | 1931 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Apr. | May | June | July | Aug. | Sept. | Oct. | Apr. | May | June | July |
| 1 | | 24.65 | 25.32 | 27.94 | 23.90 | 23.44 | 23.42 | | 24.05 | 24.56 | 23.82 |
| 2 | | 26.22 | 25.03 | 28.10 | 23.88 | 23.43 | 23.42 | | 24.03 | 24.56 | 23.81 |
| 3 | | 26.84 | 24.52 | 27.98 | 23.84 | 23.42 | | | 24.03 | 24.41 | 23.78 |
| 4 | | 26.81 | 24.30 | 27.81 | 23.79 | 23.42 | 23.44 | | 24.07 | 24.35 | 23.77 |
| 5 | | 26.68 | 24.24 | 27.54 | 23.74 | 23.42 | 23.54 | 27.61 | 24.09 | 24.29 | 23.79 |
| 6 | 33.14 | 26.46 | 24.26 | 27.21 | 23.70 | 23.41 | 23.52 | 27.56 | 24.14 | 24.26 | 23.79 |
| 7 | 32.28 | 26.44 | 24.23 | 26.80 | 23.70 | 23.40 | 23.55 | 27.59 | 24.17 | 24.19 | 23.93 |
| 8 | 31.06 | 26.58 | 24.20 | 26.29 | 23.66 | 23.38 | 23.61 | 27.27 | 24.17 | 24.13 | 23.93 |
| 9 | 30.16 | 27.12 | 24.17 | 25.78 | 23.63 | 23.38 | 23.59 | 26.95 | 24.17 | 24.03 | 23.88 |
| 10 | 29.42 | 27.56 | 24.14 | 25.40 | 23.62 | 23.38 | 23.62 | 26.47 | 24.21 | 23.99 | 23.84 |
| 11 | 28.93 | 29.32 | 24.11 | 24.78 | 23.62 | 23.38 | 23.62 | 25.80 | 24.24 | 24.05 | 23.82 |
| 12 | 28.56 | 30.29 | 24.07 | 24.81 | 23.60 | 23.41 | 23.64 | 25.45 | 24.27 | 24.08 | 23.82 |
| 13 | 28.28 | 30.94 | 24.10 | 25.85 | 23.58 | 23.44 | 23.64 | 24.95 | 24.26 | 24.08 | 23.83 |
| 14 | 27.85 | 31.33 | 24.11 | 26.02 | 23.56 | 23.42 | 23.63 | 24.67 | 24.23 | | 23.80 |
| 15 | 27.49 | 31.34 | 24.10 | 25.74 | 23.54 | 23.40 | 23.63 | 24.46 | 24.16 | 24.07 | 23.75 |
| 16 | 27.01 | 31.07 | 24.12 | 25.12 | 23.53 | 23.40 | 23.63 | 24.34 | 24.11 | 24.06 | 23.71 |
| 17 | 26.52 | 30.69 | 24.12 | 24.64 | 23.52 | 23.42 | | 24.29 | 24.09 | 23.99 | 23.69 |
| 18 | 26.10 | 30.39 | 24.12 | 24.42 | 23.52 | 23.42 | | 24.23 | 24.10 | 23.93 | 23.70 |
| 19 | 25.58 | 30.16 | 24.12 | 24.34 | 23.52 | 23.42 | | 24.17 | 24.08 | 23.86 | |
| 20 | 25.21 | 29.89 | 24.12 | 24.30 | 23.52 | 23.41 | | 24.22 | 24.07 | 23.79 | |
| 21 | 24.94 | 29.69 | 24.08 | 24.25 | 23.52 | 23.41 | | 24.19 | 24.11 | 23.76 | |
| 22 | 24.62 | 29.46 | 24.06 | 24.20 | 23.52 | 23.41 | | 24.21 | 24.08 | 23.76 | |
| 23 | 24.36 | 29.15 | 24.08 | 24.18 | 23.56 | 23.41 | | 24.23 | 24.07 | 23.77 | |
| 24 | 24.24 | 28.82 | 24.12 | 24.14 | 23.59 | 23.39 | | 24.23 | 24.07 | 23.77 | |
| 25 | 24.19 | 28.44 | 24.13 | 24.11 | 23.52 | 23.38 | | 24.17 | 24.07 | 23.75 | |
| 26 | 24.14 | 28.08 | 24.18 | 24.08 | | 23.36 | | 24.15 | 24.05 | 23.73 | |
| 27 | 24.12 | 27.66 | 24.32 | 24.05 | | 23.35 | | 24.15 | 24.05 | 23.73 | |
| 28 | 24.12 | 27.22 | 24.55 | 24.02 | | 23.34 | | 24.12 | 24.13 | 23.70 | |
| 29 | 24.12 | 26.78 | 25.69 | 24.02 | 23.44 | 23.36 | | 24.09 | 24.30 | 23.69 | |
| 30 | 24.15 | 26.32 | 27.25 | 23.94 | 23.44 | 23.38 | | 24.07 | 24.55 | 23.67 | |
| 31 | | 25.78 | | | 23.43 | | | | 24.68 | | |

| Day | 1932 | | | 1933 | | |
|---|---|---|---|---|---|---|
| | Apr. | June | July | Apr. | May | June |
| 1 | | | | 30.80 | 26.56 | 26.66 |
| 2 | | | | 31.43 | 26.23 | 26.30 |
| 3 | | | | 30.38 | 25.98 | 26.08 |
| 4 | | | | 29.93 | 25.68 | 25.78 |
| 5 | | | | 29.38 | 25.46 | 25.56 |
| 6 | 25.76 | 23.92 | 23.84 | 29.18 | 25.16 | 25.06 |
| 7 | 32.66 | | | 29.08 | 24.93 | 24.58 |
| 8 | 34.44 | | 23.80 | 29.13 | 24.68 | 24.50 |
| 9 | 34.84 | | 23.84 | 28.88 | 24.58 | 24.58 |
| 10 | 34.41 | 23.86 | | 28.78 | 24.44 | 24.78 |
| 11 | 32.74 | | | 28.68 | 24.40 | 24.64 |
| 12 | 31.74 | | | 28.18 | 24.38 | 24.51 |
| 13 | 31.54 | 23.88 | | 27.93 | 24.34 | 24.34 |
| 14 | 31.32 | | | | 24.33 | 24.28 |
| 15 | 30.86 | 23.96 | | 27.48 | 24.29 | 24.18 |

| Day | 1932 | | | 1933 | | |
|---|---|---|---|---|---|---|
| | Apr. | June | July | Apr. | May | June |
| 16 | 30.41 | | | 27.65 | 24.26 | |
| 17 | | | | 28.03 | 24.20 | |
| 18 | 30.08 | 23.84 | | 28.66 | 24.18 | |
| 19 | 29.91 | | | 29.13 | 24.18 | |
| 20 | 29.76 | 23.81 | | 29.18 | | |
| 21 | 29.46 | | | 29.03 | 24.12 | |
| 22 | | 23.76 | | 28.84 | 24.10 | |
| 23 | | | | 28.73 | 24.18 | |
| 24 | | 23.82 | | 28.58 | 24.63 | |
| 25 | | | | 28.38 | 26.50 | |
| 26 | | | | 28.17 | 27.08 | |
| 27 | | | | 27.83 | 27.29 | |
| 28 | | 23.88 | | 27.58 | 27.27 | |
| 29 | | | | 27.26 | 27.26 | |
| 30 | | 23.84 | | 26.88 | 27.18 | |
| 31 | | | | | 26.96 | |

NOTE.—Add 1,000 feet to obtain elevation above mean sea level.

### ROSEAU RIVER AT ROSS, MINN.

LOCATION.—Water-stage recorder in SW¼ sec. 27, T. 163 N., R. 41 W., a quarter of a mile north of Ross. Zero of gage is 1,018.44 feet above mean sea level (1928 adjustment by Geodetic Survey of Canada).

DRAINAGE AREA.—1,030 square miles.

RECORDS AVAILABLE.—July 1928 to September 1933.

DISCHARGE.—Maximum during year, 912 second-feet Apr. 20–24; maximum gage height, 9.22 feet Apr. 8, affected by ice; minimum, 3 second-feet for several days in July and August.

1929–33: Maximum, 1,550 second-feet Apr. 13, 1932; minimum, that of 1933.

REMARKS.—Records good for October to November, April to June, and poor for remainder of year. Discharge estimated Nov. 26, 27, Dec. 7 to Jan. 8, Jan. 11 to Feb. 13, Feb. 15 to Mar. 22, Apr. 9–16, June 27 to July 17, July 19 to Aug. 15, Aug. 17 to Sept. 8, Sept. 10–13, when recorder did not operate. Stage-discharge relation affected by ice Nov. 3 to Apr. 16 and by aquatic growth Sept. 14–30.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 27 | 133 | 92 | | | | 401 | 621 | 637 | 16 | 4 | 5 |
| 2 | 25 | 126 | 92 | | | | 575 | 561 | 589 | 15 | 4 | 6 |
| 3 | 23 | 122 | 92 | 45 | 20 | | 605 | 519 | 561 | 14 | 3 | 6 |
| 4 | 22 | 126 | 89 | | | | 669 | 477 | 533 | 14 | 3 | 5 |
| 5 | 21 | 137 | 86 | | | | 718 | 438 | 477 | 14 | 3 | 5 |
| 6 | 20 | 137 | 86 | | | | 772 | 401 | 425 | 13 | 3 | 5 |
| 7 | 20 | 137 | | 40 | | | 812 | 354 | 354 | 12 | 3 | 5 |
| 8 | 20 | 161 | 80 | | 18 | | 852 | 299 | 321 | 12 | 3 | 5 |
| 9 | 20 | 201 | | 38 | | | 832 | 258 | 321 | 11 | 3 | 6.2 |
| 10 | 18 | 214 | | 38 | | | 812 | 233 | 299 | 10 | 3 | 6.6 |
| 11 | 19 | 278 | | | | | 812 | 210 | 268 | 10 | 3 | 7.1 |
| 12 | 19 | 288 | | | 16 | 15 | 812 | 196 | 219 | 11 | 3 | 7.5 |
| 13 | 19 | 253 | 70 | 35 | | | 754 | 183 | 170 | 12 | 3 | 8.0 |
| 14 | 20 | 219 | | | 16 | | 754 | 174 | 133 | 13 | 3 | 8.4 |
| 15 | 22 | 188 | | | | | 736 | 161 | 108 | 12 | 3 | 9.0 |
| 16 | 23 | 165 | | | | | 736 | 153 | 89 | 11 | 3.4 | 10 |
| 17 | 23 | 149 | | | | | 772 | 141 | 74 | 10 | 3 | 12 |
| 18 | 29 | 137 | 60 | 30 | | | 832 | 133 | 64 | 8.4 | 3 | 16 |
| 19 | 47 | 126 | | | | | 872 | 126 | 54 | 7 | 3 | 19 |
| 20 | 105 | 116 | | | | | 912 | 116 | 42 | 7 | 3 | 16 |
| 21 | 174 | 112 | | | 16 | | 912 | 105 | 34 | 6 | 3 | 14 |
| 22 | 188 | 108 | | | | | 912 | 98 | 28 | 5 | 3 | 11 |
| 23 | 178 | 105 | 50 | | | 16 | 912 | 149 | 24 | 5 | 4 | 11 |
| 24 | 174 | 102 | | | | 18 | 912 | 389 | 22 | 4 | 5 | 10 |
| 25 | 178 | 102 | | | | 19 | 872 | 589 | 21 | 4 | 6 | 10 |
| 26 | 183 | 99 | | 25 | | 20 | 852 | 701 | 20 | 4 | 8 | 11 |
| 27 | 174 | 95 | | | | 20 | 792 | 736 | 19 | 3 | 9 | 11 |
| 28 | 165 | 92 | 45 | | | 20 | 754 | 736 | 18 | 3 | 8 | 12 |
| 29 | 161 | 92 | | | | 21 | 718 | 718 | 18 | 3 | 7 | 11 |
| 30 | 157 | 92 | | | | 32 | 669 | 718 | 18 | 3 | 6 | 13 |
| 31 | 149 | ------ | | | ------ | 92 | ------ | 685 | ------ | 4 | 5 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 188 | 18 | 78.2 | 4,810 |
| November | 288 | 92 | 147 | 8,750 |
| December | 92 | 45 | 65.4 | 4,020 |
| January | 45 | 25 | 32.9 | 2,020 |
| February | 20 | 16 | 17.1 | 950 |
| March | 92 | 15 | 19 | 1,170 |
| April | 912 | 401 | 778 | 46,300 |
| May | 736 | 98 | 367 | 22,600 |
| June | 637 | 18 | 199 | 11,800 |
| July | 16 | 3 | 8.92 | 548 |
| August | 9 | 3 | 4.08 | 251 |
| September | 19 | 5 | 9.39 | 559 |
| The year | 912 | 3 | 143 | 104,000 |

### ROSEAU RIVER NEAR BADGER, MINN.

LOCATION.—Water-stage recorder in SW¼ sec. 30, T. 163 N., R. 41 W., 9 miles north of Badger.

RECORDS AVAILABLE.—August 1928 to September 1933.

EXTREMES.—Maximum water-surface elevation during year, 1,026.32 feet Apr. 4; minimum, 1,017.84 feet Aug. 22.

1928–33: Maximum water-surface elevation, 1,027.97 feet Apr. 14, 1932; minimum, 1,017.73 feet July 22, 1932, and Sept. 2, 1929.

REMARKS.—Record excellent. Gage heights have been reduced to sea level datum. No record Nov. 26 to Mar. 24.

*Elevation, in feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 18.48 | 20.20 | ------ | 24.17 | 24.00 | 24.27 | 18.15 | 17.98 | 17.92 |
| 2 | 18.41 | 20.10 | ------ | 25.84 | 23.72 | 24.01 | 18.11 | 17.97 | 17.95 |
| 3 | 18.39 | 20.10 | ------ | 26.13 | 23.46 | 23.82 | 18.10 | 17.96 | 17.95 |
| 4 | 18.30 | 20.16 | ------ | 26.30 | 23.20 | 23.58 | 18.11 | 17.95 | 17.89 |
| 5 | 18.27 | 20.25 | ------ | 26.21 | 22.91 | 23.31 | 18.13 | 17.95 | 17.88 |
| 6 | 18.24 | 20.29 | ------ | 26.18 | 22.62 | 22.98 | 18.13 | 17.95 | 17.86 |
| 7 | 18.21 | 20.28 | ------ | 26.03 | 22.23 | 22.45 | 18.11 | 17.95 | 17.84 |
| 8 | 18.23 | 20.47 | ------ | 26.18 | 21.80 | 22.06 | 18.11 | 17.93 | 17.87 |
| 9 | 18.21 | 20.92 | ------ | 26.23 | 21.48 | 22.03 | 18.10 | 17.95 | 17.91 |
| 10 | 18.19 | 21.30 | ------ | 26.09 | 21.23 | 21.87 | 18.08 | 17.96 | 17.92 |
| 11 | 18.19 | 21.76 | ------ | 25.92 | 21.01 | 21.59 | 18.10 | 17.97 | 17.92 |
| 12 | 18.16 | 22.17 | ------ | 25.71 | 20.84 | 21.19 | 18.15 | 17.97 | 17.92 |
| 13 | 18.15 | 21.96 | ------ | 25.46 | 20.70 | 20.68 | 18.20 | 17.95 | 17.92 |
| 14 | 18.16 | 21.69 | ------ | 25.27 | 20.58 | 20.23 | 18.27 | 17.93 | 17.91 |
| 15 | 18.25 | 21.43 | ------ | 25.07 | 20.45 | 19.91 | 18.25 | 17.91 | 17.90 |
| 16 | 18.28 | 21.16 | ------ | 25.02 | 20.35 | 19.63 | 18.22 | 17.94 | 18.01 |
| 17 | 18.30 | 20.94 | ------ | 25.11 | 20.25 | 19.40 | 18.18 | 17.95 | 18.11 |
| 18 | 18.40 | 20.81 | ------ | 25.25 | 20.14 | 19.20 | 18.14 | 17.92 | 18.18 |
| 19 | 18.70 | 20.72 | ------ | 25.39 | 20.08 | 19.03 | 18.10 | 17.92 | 18.38 |
| 20 | 19.55 | 20.61 | ------ | 25.49 | 19.95 | 18.83 | 18.10 | 17.92 | 18.32 |
| 21 | 20.46 | 20.54 | ------ | 25.51 | 19.81 | 18.65 | 18.05 | 17.89 | 18.19 |
| 22 | 20.73 | 20.50 | ------ | 25.52 | 19.70 | 18.48 | 18.00 | 17.86 | 18.16 |
| 23 | 20.66 | 20.46 | ------ | 25.50 | 19.26 | 18.35 | 17.99 | 17.92 | 18.17 |
| 24 | 20.59 | 20.48 | ------ | 25.45 | 22.31 | 18.28 | 17.99 | 17.98 | 18.09 |
| 25 | 20.63 | 20.50 | 20.02 | 25.35 | 23.85 | 18.23 | 17.98 | 18.03 | 18.05 |
| 26 | 20.68 | ------ | 20.08 | 25.19 | 24.51 | 18.22 | 17.95 | 18.10 | 18.08 |
| 27 | 20.63 | ------ | 20.09 | 24.99 | 24.77 | 18.20 | 17.94 | 18.12 | 18.07 |
| 28 | 20.53 | ------ | 20.10 | 24.79 | 24.78 | 18.18 | 17.93 | 18.07 | 18.09 |
| 29 | 20.46 | ------ | 20.15 | 24.55 | 24.75 | 18.17 | 17.94 | 18.03 | 18.05 |
| 30 | 20.40 | ------ | 20.52 | 24.28 | 24.69 | 18.20 | 17.92 | 17.99 | 18.09 |
| 31 | 20.32 | ------ | 21.56 | ------ | 24.53 | ------ | 17.98 | 17.94 | ------ |

NOTE.—Add 1,000 feet to obtain elevation above mean sea level.

### ROSEAU RIVER NEAR HAUG, MINN.

LOCATION.—Water-stage recorder in SE¼ sec. 21, T. 163 N., R. 42 W., 8¼ miles northwest of Haug and 5 miles south of international boundary.
RECORDS AVAILABLE.—April 1932 to September 1933.
EXTREMES.—Maximum water-surface elevation during year, 1,022.97 feet Apr. 11; minimum, 1,014.74 feet Aug. 8.
1932–33: Maximum water-surface elevation, 1,023.19 feet Apr. 14, 1932; minimum, that of Aug. 8, 1933.
REMARKS.—Records excellent. No record Oct. 1 to Mar. 25, Aug. 16 to Sept. 30.
The following discharge measurement was made during 1933:
Apr. 26: Water-surface elevation, 1,021.64 feet; discharge, 937 second-feet, not including the overflow above elevation 1,019.5 feet, which could not be measured.

*Elevation, in feet, 1932–33*

| Day | Mar. | Apr. | May | June | July | Aug. | Day | Mar. | Apr. | May | June | July | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 20.47 | 20.69 | 21.31 | 15.29 | 14.80 | 16 | | 22.65 | 17.32 | 16.83 | 15.16 | |
| 2 | | 21.40 | 20.43 | 21.08 | 15.26 | 14.83 | 17 | | 22.53 | 17.24 | 16.58 | 15.11 | |
| 3 | | 21.85 | 20.17 | 20.80 | 15.21 | 14.82 | 18 | | 22.42 | 17.13 | 16.38 | 15.08 | |
| 4 | | 22.22 | 19.93 | 20.56 | 15.19 | 14.81 | 19 | | 22.32 | 17.05 | 16.21 | 15.04 | |
| 5 | | 22.50 | 19.68 | 20.31 | 15.18 | 14.80 | 20 | | 22.23 | 16.97 | 16.06 | 15.02 | |
| 6 | | 22.66 | 19.43 | 20.03 | 15.23 | 14.80 | 21 | | 22.13 | 16.86 | 15.86 | 14.98 | |
| 7 | | 22.77 | 19.15 | 19.65 | 15.19 | 14.79 | 22 | | 22.06 | 16.78 | 15.72 | 14.98 | |
| 8 | | 22.81 | 18.77 | 19.27 | 15.12 | 14.77 | 23 | | 21.96 | 17.51 | 15.60 | 14.92 | |
| 9 | | 22.81 | 18.40 | 19.05 | 15.12 | 14.79 | 24 | | 21.88 | 18.79 | 15.49 | 14.88 | |
| 10 | | 22.87 | 18.13 | 18.87 | 15.10 | 14.80 | 25 | | 21.79 | 20.14 | 15.44 | 14.88 | |
| 11 | | 22.96 | 17.91 | 18.60 | 15.05 | 14.81 | 26 | 18.04 | 21.68 | 20.91 | 15.39 | 14.87 | |
| 12 | | 22.93 | 17.75 | 18.28 | 15.07 | 14.81 | 27 | 18.06 | 21.54 | 21.30 | 15.37 | 14.85 | |
| 13 | | 22.90 | 17.61 | 17.86 | 15.11 | 14.81 | 28 | 18.08 | 21.38 | 21.44 | 15.34 | 14.85 | |
| 14 | | 22.84 | 17.51 | 17.43 | 15.14 | 14.81 | 29 | 18.13 | 21.21 | 21.56 | 15.31 | 14.85 | |
| 15 | | 22.75 | 17.41 | 17.10 | 15.19 | 14.80 | 30 | 18.33 | 20.97 | 21.59 | 15.29 | 14.84 | |
| | | | | | | | 31 | 19.07 | | 21.51 | | 14.82 | |

NOTE.—Add 1,000 feet to obtain elevation above mean sea level.

### ROSEAU RIVER AT HEAD OF STATE DITCH 51, NEAR OAK POINT, MINN.

LOCATION.—Staff gage in NE¼ sec. 18, T. 163 N., R. 44 W., 2½ miles south and 3 miles east of Caribou.
RECORDS AVAILABLE.—April to September 1933.
EXTREMES.—Maximum water-surface elevation during period, 1,016.24 feet Apr. 23; minimum, 1,009.66 feet Aug. 11, 12.
REMARKS.—Records good. No record Oct. 1 to Apr. 22.

*Discharge measurements, 1933*

| Date | Gage height (feet) | Elevation above mean sea level (feet) | Discharge (sec.-ft.) | Date | Gage height (feet) | Elevation above mean sea level (feet) | Discharge (sec.-ft.) |
|---|---|---|---|---|---|---|---|
| Apr. 19 | 8.87 | 1,016.75 | 1,220 | May 11 | 4.74 | 1,012.62 | 254 |
| Apr. 27 | 7.95 | 1,015.83 | 932 | Sept. 8 | 2.05 | 1,009.93 | 3.5 |

*Elevation, in feet, of Roseau River at head of State ditch 51, near Oak Point, Minn., 1933*

| Day | Apr. | May | June | July | Aug. | Sept. | Day | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ------- | 15.18 | 15.58 | 10.12 | 9.80 | 10.02 | 16 | ------- | 12.04 | 11.56 | 9.92 | 9.72 | 10.10 |
| 2 | ------- | 14.96 | 15.40 | 10.08 | 9.78 | 9.92 | 17 | ------- | 11.96 | 11.36 | 9.96 | 9.74 | 10.14 |
| 3 | ------- | 14.68 | 15.20 | 10.04 | 9.76 | 9.94 | 18 | ------- | 11.82 | 11.38 | 9.92 | 9.78 | 10.22 |
| 4 | ------- | 14.52 | 14.94 | 10.02 | 9.74 | 9.96 | 19 | ------- | 11.78 | 11.04 | 9.94 | 9.80 | 10.26 |
| 5 | ------- | 14.30 | 14.74 | 10.00 | 9.72 | 9.98 | 20 | ------- | 11.74 | 10.86 | 9.96 | 9.82 | 10.30 |
| 6 | ------- | 14.02 | 14.44 | 10.06 | 9.70 | 9.94 | 21 | ------- | 11.62 | 10.66 | 9.92 | 9.86 | 10.26 |
| 7 | ------- | 13.82 | 14.14 | 10.04 | 9.70 | 9.92 | 22 | ------- | 11.58 | 10.58 | 9.90 | 9.82 | 10.26 |
| 8 | ------- | 13.48 | 13.76 | 10.00 | 9.68 | 9.94 | 23 | 16.24 | 13.02 | 10.46 | 9.92 | 9.80 | 10.24 |
| 9 | ------- | 13.06 | 13.54 | 10.00 | 9.70 | 9.96 | 24 | 16.12 | 13.24 | 10.30 | 9.90 | 10.00 | 10.24 |
| 10 | ------- | 12.82 | 13.32 | 9.98 | 9.68 | 9.98 | 25 | 16.04 | 14.24 | 10.26 | 9.88 | 9.94 | 10.22 |
| 11 | ------- | 12.68 | 13.06 | 9.96 | 9.66 | 10.02 | 26 | 15.92 | 15.04 | 10.22 | 9.90 | .94 | 10.22 |
| 12 | ------- | 12.46 | 12.78 | 9.92 | 9.66 | 10.04 | 27 | 15.83 | 15.58 | 10.18 | 9.88 | 10.08 | 10.20 |
| 13 | ------- | 12.38 | 12.40 | 9.90 | 9.68 | 10.02 | 28 | 15.66 | 15.68 | 10.18 | 9.82 | 10.10 | 10.16 |
| 14 | ------- | 12.24 | 11.94 | 9.88 | 9.70 | 10.04 | 29 | 15.58 | 16.12 | 10.16 | 9.80 | 10.10 | 10.14 |
| 15 | ------- | 12.14 | 11.76 | 9.94 | 9.68 | 10.08 | 30 | 15.44 | 15.82 | 10.10 | 9.80 | 10.08 | 10.12 |
| | | | | | | | 31 | ------- | 15.74 | ------- | 9.78 | 10.06 | ------ |

NOTE.—Add 1,000 feet to obtain elevation above mean sea level.

**ROSEAU RIVER AT OAK POINT, MINN.**

LOCATION.—Staff gage in SE¼ sec. 36, T. 164 N., R. 45 W., 2 miles east of Caribou.
RECORDS AVAILABLE.—April to August 1933 (fragmentary).
EXTREMES.—Maximum water-surface elevation during period, 1,013.17 feet Apr. 19; minimum, 1,006.38 feet Aug. 14.
REMARKS.—Records excellent.

*Elevation, in feet, 1933*

| Day | Apr. | May | June | Aug. | Day | Apr. | May | June | Aug. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | ------- | 11.75 | 12.16 | ------- | 16 | ------- | ------- | ------- | ------- |
| 2 | ------- | 11.45 | ------- | ------- | 17 | ------- | ------- | ------- | ------- |
| 3 | ------- | 11.40 | ------- | ------- | 18 | ------- | ------- | ------- | ------- |
| 4 | ------- | 11.00 | 11.25 | ------- | 19 | 13.17 | ------- | ------- | ------- |
| 5 | ------- | 10.80 | 10.34 | ------- | 20 | ------- | ------- | ------- | ------- |
| 6 | ------- | 10.55 | ------- | ------- | 21 | ------- | ------- | ------- | ------- |
| 7 | ------- | 10.25 | ------- | ------- | 22 | ------- | ------- | ------- | ------- |
| 8 | ------- | 9.90 | ------- | ------- | 23 | ------- | ------- | ------- | ------- |
| 9 | ------- | 9.55 | 10.25 | ------- | 24 | ------- | 10.04 | 7.21 | ------- |
| 10 | ------- | ------- | 9.74 | ------- | 25 | ------- | ------- | ------- | ------- |
| 11 | ------- | 8.97 | 9.45 | ------- | 26 | ------- | ------- | ------- | ------- |
| 12 | ------- | 8.78 | 9.15 | ------- | 27 | 12.30 | 12.10 | ------- | ------- |
| 13 | ------- | 8.60 | 8.76 | ------- | 28 | 12.18 | 12.26 | ------- | ------- |
| 14 | ------- | ------- | ------- | 6.38 | 29 | 12.10 | ------- | ------- | ------- |
| 15 | ------- | ------- | ------- | ------- | 30 | 11.95 | 12.38 | ------- | ------- |
| | | | | | 31 | ------- | 12.36 | ------- | ------- |

NOTE.—Add 1,000 feet to obtain elevation above mean sea level.

### ROSEAU RIVER BELOW CUT-OFF DITCH, NEAR CARIBOU, MINN.

(International gaging station)

LOCATION.—Water stage recorder in SW¼ sec. 34, T. 164 N., R. 45 W., 1 mile west of Caribou and 200 yards below mouth of State ditch 51, locally known as "Caribou Cut-off Ditch." Zero of gage is 1,002.14 feet above mean sea level (1928 adjustment by Geodetic Survey of Canada).

RECORDS AVAILABLE.—April 1929 to September 1933.

DISCHARGE.—Maximum during year, 1,350 second-feet Apr. 17; maximum gage height 7.14 feet (affected by ice) Apr. 9; minimum, 2.4 second-feet Aug. 14 (gage height, 1.09 feet).

1929–33: Maximum 1,880 second-feet Apr. 13, 1932 (gage height, 8.80 feet, affected by ice); minimum, that of Aug. 14, 1933.

REMARKS.—Records excellent except those for periods of ice effect, Nov. 2, 3, Nov. 10 to Jan. 10, Mar. 22 to Apr. 17, which are fair, and those for estimated period, Jan. 11 to Mar. 21, which are poor. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 32 | 162 | 102 | 38 | 20 | 15 | 340 | 740 | 860 | 18 | 5.4 | 5.2 |
| 2 | 31 | 166 | 102 | 36 | 20 | 15 | 400 | 684 | 830 | 20 | 4.6 | 4.8 |
| 3 | 27 | 150 | 107 | 36 | 20 | 15 | 436 | 632 | 740 | 15 | 4.4 | 3.7 |
| 4 | 27 | 141 | 107 | 37 | 20 | 15 | 484 | 593 | 710 | 13 | 4.8 | 2.9 |
| 5 | 24 | 148 | 104 | 37 | 20 | 15 | 484 | 544 | 645 | 13 | 4.6 | 2.9 |
| 6 | 24 | 154 | 99 | 35 | 20 | 15 | 496 | 508 | 606 | 13 | 4.4 | 3.5 |
| 7 | 23 | 164 | 99 | 34 | 20 | 15 | 544 | 472 | 544 | 14 | 4.2 | 3.5 |
| 8 | 22 | 168 | 98 | 32 | 20 | 15 | 645 | 412 | 484 | 13 | 3.7 | 3.8 |
| 9 | 22 | 192 | 98 | 32 | 20 | 15 | 830 | 352 | 436 | 11 | 3.5 | 3.5 |
| 10 | 22 | 249 | 89 | 32 | 20 | 15 | 860 | 296 | 400 | 11 | 3.5 | 3.2 |
| 11 | 22 | 188 | 86 | 30 | 16 | 15 | 890 | 270 | 364 | 11 | 3.4 | 2.9 |
| 12 | 20 | 178 | 79 | 30 | 16 | 15 | 985 | 245 | 318 | 8.8 | 3.0 | 3.8 |
| 13 | 20 | 292 | 74 | 30 | 16 | 15 | 1,090 | 223 | 265 | 8.8 | 2.8 | 5.0 |
| 14 | 21 | 296 | 67 | 30 | 16 | 15 | 1,160 | 206 | 208 | 10 | 2.6 | 5.0 |
| 15 | 22 | 274 | 64 | 30 | 16 | 15 | 1,230 | 192 | 162 | 10 | 2.5 | 4.4 |
| 16 | 20 | 241 | 61 | 30 | 16 | 15 | 1,310 | 178 | 132 | 13 | 3.5 | 7.6 |
| 17 | 25 | 198 | 58 | 30 | 16 | 15 | 1,350 | 168 | 107 | 11 | 3.5 | 8.2 |
| 18 | 26 | 164 | 55 | 30 | 16 | 15 | 1,310 | 154 | 86 | 11 | 3.2 | 6.4 |
| 19 | 31 | 152 | 47 | 30 | 16 | 15 | 1,230 | 143 | 72 | 9.6 | 2.8 | 12 |
| 20 | 39 | 141 | 45 | 30 | 16 | 15 | 1,160 | 134 | 60 | 9.2 | 2.8 | 8.2 |
| 21 | 82 | 130 | 43 | 25 | 16 | 15 | 1,120 | 125 | 51 | 7.9 | 2.8 | 14 |
| 22 | 156 | 121 | 41 | 25 | 16 | 17 | 1,090 | 113 | 40 | 7.3 | 2.6 | 13 |
| 23 | 186 | 117 | 40 | 25 | 16 | 17 | 1,020 | 176 | 34 | 7.3 | 3.8 | 11 |
| 24 | 188 | 109 | 40 | 25 | 16 | 18 | 985 | 364 | 29 | 6.4 | 5.0 | 8.2 |
| 25 | 182 | 110 | 40 | 25 | 16 | 19 | 985 | 556 | 25 | 5.6 | 5.2 | 9.6 |
| 26 | 188 | 112 | 39 | 25 | 16 | 18 | 950 | 710 | 24 | 5.4 | 4.4 | 10 |
| 27 | 190 | 114 | 39 | 25 | 16 | 18 | 920 | 800 | 22 | 5.8 | 4.4 | 8.2 |
| 28 | 192 | 110 | 39 | 25 | 16 | 18 | 890 | 860 | 21 | 5.6 | 4.8 | 8.5 |
| 29 | 186 | 102 | 39 | 25 | ------- | 25 | 860 | 920 | 21 | 5.6 | 5.8 | 8.2 |
| 30 | 188 | 102 | 39 | 25 | ------- | 127 | 800 | 920 | 19 | 5.4 | 5.6 | 9.6 |
| 31 | 168 | ------- | 39 | 25 | ------- | 182 | ------- | 890 | ------- | 6.1 | 5.2 | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 192 | 20 | 77.6 | 4,770 |
| November | 296 | 102 | 165 | 9,820 |
| December | 107 | 39 | 67.1 | 4,130 |
| January | 38 | 25 | 29.8 | 1,830 |
| February | 20 | 16 | 17.4 | 966 |
| March | 182 | 15 | 25.0 | 1,540 |
| April | 1,350 | 340 | 895 | 53,300 |
| May | 920 | 113 | 438 | 26,900 |
| June | 860 | 19 | 277 | 16,500 |
| July | 20 | 5.4 | 10.1 | 621 |
| August | 5.8 | 2.5 | 3.96 | 243 |
| September | 14 | 2.9 | 6.69 | 398 |
| The year | 1,350 | 2.5 | 167 | 121,000 |

### ROSEAU RIVER AT INTERNATIONAL BOUNDARY, NEAR CARIBOU, MINN.

LOCATION.—Water-stage recorder near center of sec. 29, T. 164 N., R. 45 W., about 400 feet upstream from last international-boundary crossing and about 3 miles northwest of Caribou.

RECORDS AVAILABLE.—May to August 1933.

EXTREMES.—Maximum water-surface elevation during period, 1,005.30 feet May 29; minimum, 1,001.97 feet Aug. 14.

REMARKS.—Records good. No record July 4–13.

*Elevation, in feet, 1932–33*

| Day | May | June | July | Aug. | Day | May | June | July | Aug. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 5.10 | 2.75 | 2.35 | 16 | 3.44 | 3.38 | 2.60 | |
| 2 | | 4.99 | 2.79 | 2.35 | 17 | 3.40 | 3.30 | 2.60 | |
| 3 | | 4.83 | 2.74 | 2.31 | 18 | 3.40 | 3.22 | 2.58 | |
| 4 | | 4.70 | | 2.27 | 19 | 3.37 | 3.18 | 2.56 | |
| 5 | | 4.57 | | 2.25 | 20 | 3.36 | 3.12 | 2.52 | |
| 6 | | 4.44 | | 2.22 | 21 | 3.34 | 3.07 | 2.51 | |
| 7 | | 4.30 | | 2.18 | 22 | 3.33 | 3.00 | 2.47 | |
| 8 | | 4.17 | | 2.15 | 23 | 3.50 | 2.96 | 2.47 | |
| 9 | | 4.05 | | 2.13 | 24 | 3.92 | 2.90 | 2.45 | |
| 10 | | 3.98 | | 2.09 | 25 | 4.32 | 2.83 | 2.42 | |
| 11 | 3.74 | 3.89 | | 2.06 | 26 | 4.67 | 2.80 | 2.38 | |
| 12 | 3.60 | 3.81 | | 2.03 | 27 | 4.93 | 2.79 | 2.38 | |
| 13 | 3.53 | 3.70 | | 2.01 | 28 | 5.08 | 2.79 | 2.40 | |
| 14 | 3.49 | 3.57 | 2.59 | 1.98 | 29 | 5.27 | 2.79 | 2.37 | |
| 15 | 3.46 | 3.47 | 2.59 | | 30 | 5.28 | 2.78 | 2.37 | |
| | | | | | 31 | 5.20 | | 2.36 | |

NOTE.—Add 1,000 feet to obtain elevation above mean sea level.

### SOUTH FORK OF ROSEAU RIVER NEAR MALUNG, MINN.

LOCATION.—Staff gage in center of sec. 7, T. 161 N., R. 39 W., 1 mile northwest of Malung.

DRAINAGE AREA.—265 square miles.

RECORDS AVAILABLE.—May 1911 to September 1914; July 1928 to September 1933.

DISCHARGE.—Maximum during year, 246 second-feet Apr. 1 (gage height, 7.13 feet, affected by ice); no flow at various times.

1911–14, 1928–33: Maximum, 1,040 second-feet Oct. 1, 1912; maximum gage height, 12.00 feet Apr. 7, 1932; no flow at times.

REMARKS.—Records fair. Stage-discharge relation affected by ice Mar. 30 to Apr. 17. No record Nov. 1 to Mar. 29.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Mar. | Apr. | May | June | July | Day | Oct. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | ------ | 234 | 3.5 | 1.1 | 0.1 | 16 | 0 | ------ | 56 | 0.6 | 1.9 | 0 |
| 2 | 0 | ------ | 198 | 4.5 | 1.9 | .1 | 17 | 0 | ------ | 68 | .6 | 1.3 | 0 |
| 3 | 0 | ------ | 155 | 6.0 | 3.5 | .1 | 18 | 0 | ------ | 84 | .4 | .6 | 0 |
| 4 | 0 | ------ | 56 | 4.2 | 3.1 | .1 | 19 | 0 | ------ | 80 | .3 | .6 | 0 |
| 5 | 0 | ------ | 37 | 2.8 | 2.8 | .2 | 20 | 0 | ------ | 68 | .2 | .6 | 0 |
| 6 | 0 | ------ | 44 | 2.8 | 2.2 | .2 | 21 | 0 | ------ | 46 | .6 | .6 | 0 |
| 7 | 0 | ------ | 77 | 2.8 | 2.2 | .3 | 22 | 0 | ------ | 31 | .6 | .6 | 0 |
| 8 | 0 | ------ | 68 | 3.1 | 2.8 | .3 | 23 | 0 | ------ | 22 | .9 | .6 | 0 |
| 9 | 0 | ------ | 59 | 1.3 | 3.1 | .2 | 24 | .1 | ------ | 22 | .8 | .4 | 0 |
| 10 | 0 | ------ | 56 | 1.1 | 3.5 | .1 | 25 | .1 | ------ | 16 | .4 | .4 | 0 |
| 11 | 0 | ------ | 44 | .9 | 2.8 | .1 | 26 | .1 | ------ | 8.0 | .3 | .3 | 0 |
| 12 | 0 | ------ | 39 | .9 | 2.5 | 0 | 27 | .1 | ------ | 8.0 | .3 | .3 | 0 |
| 13 | 0 | ------ | 35 | .8 | 2.5 | 0 | 28 | .2 | ------ | 8.0 | .3 | .2 | 0 |
| 14 | 0 | ------ | 33 | .8 | 2.5 | 0 | 29 | .2 | ------ | 8.0 | .3 | .2 | 0 |
| 15 | 0 | ------ | 37 | .6 | 2.2 | 0 | 30 | .2 | 1.2 | 5.0 | .3 | .2 | 0 |
| | | | | | | | 31 | .2 | 37 | ------ | .6 | ------ | 0 |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 0.2 | 0 | 0.04 | 2.5 |
| April | 234 | 5.0 | 56.7 | 3,370 |
| May | 6.0 | .2 | 1.41 | 87 |
| June | 3.5 | .2 | 1.58 | 94 |
| July | .3 | 0 | .06 | 3.7 |

NOTE.—No flow during August and September.

### MUD CREEK NEAR SPRAGUE, MANITOBA

(International gaging station)

LOCATION.—Water-stage recorder in NE¼ sec. 34, T. 164 N., R. 38 W., half a mile south of international boundary, 3½ miles south of Sprague, Manitoba, and 14 miles northeast of Roseau, Minn. Zero of gage is 1,038.4 feet above mean sea level (1928 adjustment by Geodetic Survey of Canada).

DRAINAGE AREA.—162 square miles.

RECORDS AVAILABLE.—September 1928 to September 1933.

DISCHARGE.—Maximum during year, 580 second-feet Apr. 20 (gage height, 10.33 feet); minimum, 0.1 second-foot Sept. 5 (gage height, 0.36 foot).

1928–33: Maximum 1,040 second-feet May 13, 1930 (gage height, 12.34 feet); minimum, that of Sept. 5, 1933.

REMARKS.—Records excellent except those for periods of ice effect, Nov. 3–21, Mar. 31 to Apr. 15, which are fair. No record Nov. 22 to Mar. 30. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.9 | 72 | ------ | 86 | 185 | 219 | 3.5 | 0.7 | 0.3 |
| 2 | 6.6 | 64 | ------ | 104 | 170 | 212 | 3.3 | .5 | .3 |
| 3 | 5.9 | 62 | ------ | 112 | 156 | 212 | 3.3 | .5 | .2 |
| 4 | 5.6 | 58 | ------ | 120 | 144 | 195 | 3.3 | .5 | .3 |
| 5 | 5.5 | 60 | ------ | 124 | 136 | 170 | 3.1 | .5 | .1 |
| 6 | 5.4 | 55 | ------ | 128 | 124 | 152 | 2.9 | .4 | .1 |
| 7 | 5.4 | 55 | ------ | 136 | 116 | 128 | 2.6 | .7 | .2 |
| 8 | 5.1 | 72 | ------ | 165 | 104 | 136 | 2.4 | .3 | .1 |
| 9 | 4.3 | 58 | ------ | 195 | 96 | 144 | 2.3 | .3 | .1 |
| 10 | 4.4 | 69 | ------ | 219 | 86 | 124 | 2.2 | .4 | .5 |
| 11 | 4.2 | 72 | ------ | 226 | 81 | 101 | 3.0 | .3 | .5 |
| 12 | 4.2 | 81 | ------ | 242 | 76 | 78 | 6.4 | .3 | .4 |
| 13 | 4.0 | 81 | ------ | 200 | 72 | 58 | 7.6 | .3 | .4 |
| 14 | 4.4 | 78 | ------ | 200 | 65 | 45 | 6.0 | .3 | .4 |
| 15 | 4.4 | 67 | ------ | 212 | 62 | 37 | 4.4 | .1 | |
| 16 | 5.1 | 58 | ------ | 251 | 58 | 34 | 3.5 | .2 | 1.0 |
| 17 | 7.5 | 55 | ------ | 320 | 53 | 30 | 3.0 | .2 | 1.5 |
| 18 | 11 | 53 | ------ | 448 | 50 | 25 | 1.8 | .4 | 1.5 |
| 19 | 28 | 53 | ------ | 550 | 45 | 20 | 1.7 | .4 | 1.4 |
| 20 | 86 | 46 | ------ | 580 | 40 | 16 | 1.5 | .4 | 1.2 |
| 21 | 97 | 42 | ------ | 535 | 36 | 13 | 1.8 | .4 | 1.5 |
| 22 | 90 | ------ | ------ | 476 | 34 | 10 | 1.9 | .6 | 1.6 |
| 23 | 83 | ------ | ------ | 420 | 69 | 8.3 | 1.1 | .3 | 1.5 |
| 24 | 90 | ------ | ------ | 378 | 185 | 6.9 | .8 | 2.0 | 1.3 |
| 25 | 101 | ------ | ------ | 331 | 242 | 6.4 | .9 | .5 | 1.6 |
| 26 | 97 | ------ | ------ | 290 | 290 | 5.9 | .7 | .7 | 2.0 |
| 27 | 92 | ------ | ------ | 251 | 290 | 5.5 | .9 | .5 | 1.8 |
| 28 | 86 | ------ | ------ | 234 | 290 | 5.4 | .6 | .4 | 1.7 |
| 29 | 86 | ------ | ------ | 219 | 320 | 4.8 | .7 | .7 | 1.6 |
| 30 | 83 | ------ | ------ | 200 | 300 | 3.6 | .7 | .3 | 1.9 |
| 31 | 76 | ------ | 35 | ------ | 260 | ------ | .9 | .3 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 101 | 4.0 | 38.5 | 2,370 |
| November 1–21 | 81 | 42 | 62.4 | 2,600 |
| April | 580 | 86 | 265 | 15,800 |
| May | 320 | 34 | 137 | 8,420 |
| June | 219 | 3.6 | 73.5 | 4,370 |
| July | 7.6 | .6 | 2.54 | 156 |
| August | 2.0 | .1 | .46 | 28 |
| September | 2.0 | .1 | .91 | 54 |

### PINE CREEK NEAR PINE CREEK, MINN.

(International gaging station)

LOCATION.—Water-stage recorder in NW¼ sec. 35, T. 164 N., R. 41 W., half a mile south of international boundary and 2 miles northeast of Pine Creek. Zero of gage is 1,038.42 feet (revised) above mean sea level (1928 adjustment by Geodetic Survey of Canada).

DRAINAGE AREA.—76 square miles.

RECORDS AVAILABLE.—August 1928 to September 1933.

DISCHARGE.—Maximum during year, 500 second-feet May 25 (gage height, 9.03 feet); minimum, 2.3 second-feet Sept. 2 (gage height, 1.20 feet, affected by weeds).

1928–33: Maximum, that of May 25, 1933; minimum, that of Sept. 2, 1933.

REMARKS.—Records good except those for periods affected by ice, Nov. 1–19, Mar. 23 to Apr. 10, and for estimated periods Apr. 11–17, May 9–24, which are poor. Stage-discharge relation affected by aquatic growth or debris on control Oct. 8 to Nov. 10, July 10 to Sept. 30. No record Nov. 20 to Mar. 22. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 13 | 32 | ------- | 122 | 40 | 82 | 8.3 | 4.4 | 2.8 |
| 2 | 12 | 37 | ------- | 144 | 38 | 95 | 8.1 | 4.2 | 2.8 |
| 3 | 12 | 31 | ------- | 152 | 34 | 89 | 7.5 | 3.9 | 2.8 |
| 4 | 12 | 36 | ------- | 168 | 32 | 85 | 7.2 | 3.8 | 3.0 |
| 5 | 11 | 36 | ------- | 183 | 33 | 69 | 6.8 | 3.5 | 3.3 |
| 6 | 11 | 33 | ------- | 192 | 29 | 60 | 6.5 | 3.4 | 3.6 |
| 7 | 11 | 38 | ------- | 197 | 27 | 45 | 6.8 | 3.9 | 3.8 |
| 8 | 10 | 52 | ------- | 197 | 25 | 57 | 6.5 | 3.8 | 5.1 |
| 9 | 9.9 | 57 | ------- | 148 | 24 | 52 | 6.1 | 3.7 | 6.2 |
| 10 | 9.5 | 48 | ------- | 122 | 22 | 42 | 6.5 | 4.2 | 5.5 |
| 11 | 9.5 | 44 | ------- | 115 | 21 | 30 | 8.5 | 4.4 | 5.1 |
| 12 | 9.3 | 49 | ------- | 108 | 20 | 22 | 6.1 | 3.8 | 5.3 |
| 13 | 9.3 | 45 | ------- | 105 | 18 | 18 | 5.3 | 3.6 | 6.1 |
| 14 | 10 | 38 | ------- | 105 | 17 | 15 | 4.9 | 3.5 | 6.7 |
| 15 | 12 | 32 | ------- | 108 | 16 | 13 | 5.0 | 3.3 | 6.5 |
| 16 | 12 | 30 | ------- | 111 | 14 | 11 | 5.1 | 3.7 | 7.4 |
| 17 | 12 | 29 | ------- | 115 | 13 | 9.3 | 4.9 | 4.4 | 12 |
| 18 | 18 | 28 | ------- | 119 | 12 | 7.7 | 4.6 | 4.4 | 9.5 |
| 19 | 41 | 28 | ------- | 136 | 11 | 6.9 | 4.6 | 3.9 | 6.4 |
| 20 | 76 | ------- | ------- | 140 | 9.5 | 6.2 | 4.2 | 3.4 | 6.9 |
| 21 | 84 | ------- | ------- | 129 | 8.5 | 5.9 | 4.0 | 3.2 | 6.0 |
| 22 | 72 | ------- | ------- | 108 | 7.5 | 5.6 | 4.1 | 3.2 | 5.0 |
| 23 | 62 | ------- | 3.0 | 92 | 115 | 5.6 | 4.5 | 4.4 | 4.7 |
| 24 | 62 | ------- | 3.6 | 82 | 270 | 5.7 | 4.5 | 6.1 | 4.7 |
| 25 | 62 | ------- | 3.6 | 73 | 460 | 6.0 | 4.1 | 6.2 | 5.0 |
| 26 | 57 | ------- | 5.1 | 63 | 460 | 6.1 | 4.0 | 4.8 | 6.5 |
| 27 | 50 | ------- | 6.7 | 57 | 360 | 5.9 | 4.0 | 3.8 | 6.7 |
| 28 | 48 | ------- | 8.3 | 54 | 253 | 5.7 | 4.1 | 3.4 | 5.9 |
| 29 | 42 | ------- | 11 | 50 | 183 | 6.7 | 4.2 | 3.3 | 5.4 |
| 30 | 39 | ------- | 19 | 45 | 148 | 7.7 | 4.5 | 3.2 | 5.3 |
| 31 | 34 | ------- | 52 | ------- | 111 | ------- | 4.6 | 2.9 | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | 84 | 9.3 | 30.1 | 1,850 |
| November 1–19 | 57 | 28 | 38.1 | 1,440 |
| March 23–31 | 52 | 3.0 | 12.5 | 223 |
| April | 197 | 45 | 118 | 7,020 |
| May | 460 | 7.5 | 91.3 | 5,610 |
| June | 95 | 5.6 | 29.2 | 1,740 |
| July | 8.5 | 4.0 | 5.49 | 338 |
| August | 6.2 | 2.9 | 3.93 | 242 |
| September | 12 | 2.8 | 5.53 | 329 |

### BADGER CREEK NEAR BADGER, MINN.

LOCATION.—Staff gage in NE¼ sec. 2, T. 161 N., R. 42 W., 1 mile northwest of Badger. Zero of gage is 1,047.5 feet above mean sea level (1928 adjustment by Geodetic Survey of Canada).

RECORDS AVAILABLE.—April 1929 to September 1930; October 1931 to September 1933.

DISCHARGE.—Maximum during year, 55 second-feet Apr. 3; maximum gage height 4.52 feet Mar. 31 (affected by ice); no flow for several months.

1929–30, 1931–33: Maximum, 146 second-feet May 11, 1930 (gage height, 4.88 feet); no flow for several months of each year.

REMARKS.—Records fair except those for period of ice effect, Mar. 29 to Apr. 4, which are poor.

*Discharge, in second-feet, 1932–33*

| Day | Mar. | Apr. | May | June | Day | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 22 | 0.2 | 0.9 | 16 | 0 | 16 | 0 | 0 |
| 2 | 0 | 36 | .9 | .8 | 17 | 0 | 19 | 0 | 0 |
| 3 | 0 | 55 | .6 | .4 | 18 | 0 | 13 | 0 | 0 |
| 4 | 0 | 49 | .1 | .4 | 19 | 0 | 14 | 0 | 0 |
| 5 | 0 | 45 | 0 | 0 | 20 | 0 | 8.6 | 0 | 0 |
| 6 | 0 | 41 | 0 | 0 | 21 | 0 | 5.6 | 0 | 0 |
| 7 | 0 | 45 | 0 | 0 | 22 | 0 | 3.9 | 0 | 0 |
| 8 | 0 | 38 | 0 | .5 | 23 | 0 | 3.0 | .2 | 0 |
| 9 | 0 | 22 | 0 | .3 | 24 | 0 | 1.8 | 2.0 | 0 |
| 10 | 0 | 21 | 0 | .1 | 25 | 0 | 1.0 | 2.0 | 0 |
| 11 | 0 | 20 | 0 | 0 | 26 | 0 | .7 | 2.2 | 0 |
| 12 | 0 | 13 | 0 | 0 | 27 | 0 | .8 | 1.4 | 0 |
| 13 | 0 | 12 | 0 | 0 | 28 | 0 | .6 | 1.3 | 0 |
| 14 | 0 | 11 | 0 | 0 | 29 | 0 | .9 | 2.8 | 0 |
| 15 | 0 | 11 | 0 | 0 | 30 | 4.2 | .4 | 1.1 | 0 |
| | | | | | 31 | 16 | | 1.0 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| March | 16 | 0 | 0.65 | 40 |
| April | 55 | .4 | 17.7 | 1,050 |
| May | 2.8 | 0 | .51 | 31 |
| June | .9 | 0 | .11 | 7 |
| The year | 55 | 0 | 1.56 | 1,130 |

NOTE.—No flow during months omitted.

### SOURIS RIVER NEAR SHERWOOD, N.DAK.
(International gaging station)

LOCATION.—Staff gage in NE¼ sec. 33, T. 164 N., R. 87 W., 16 miles northwest of Sherwood and three-quarters of a mile south of international boundary.

RECORDS AVAILABLE.—March 1930 to September 1933.

DISCHARGE.—1930–33: Maximum, 1,370 second-feet Mar. 31, 1933 (gage height, 13.10 feet, affected by ice); no flow on several days of each year.

REMARKS.—Records good except those for 1931, which are fair, and those for periods of ice effect, Mar. 11 to Apr. 18, 1930; Apr. 2–11, 1931; Mar. 13 to Apr. 13, 1932; Feb. 26 to Mar. 31, 1933, which are poor. No record Nov. 23, 1930, to Apr. 1, 1931; Oct. 1, 1931, to Mar. 12, 1932; Oct. 1, 1932, to Feb. 25, 1933. Little or no flow during periods of no record. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

*Discharge, in second-feet, 1930–33*

| Day | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1930–31 | | | | | | | | | | | | | |
| 1 | ------- | 625 | 130 | 46 | 19 | 6.6 | 0.2 | 0 | 1.4 | ------- | 15 | 3.5 | 0.3 |
| 2 | ------- | 637 | 122 | 46 | 19 | 6.6 | .2 | 0 | 1.3 | 3.6 | 16 | 3.2 | .3 |
| 3 | ------- | 649 | 122 | 43 | 18 | 6.4 | .2 | .1 | 1.3 | 3.8 | 16 | 3.0 | .3 |
| 4 | ------- | 649 | 114 | 40 | 17 | 6.0 | 0 | .4 | 1.2 | 5.0 | 16 | 2.7 | .2 |
| 5 | ------- | 649 | 114 | 40 | 17 | 5.4 | 0 | .5 | 1.2 | 5.2 | 15 | 2.5 | .2 |
| 6 | ------- | 709 | 114 | 37 | 17 | 5.0 | 0 | .6 | 1.2 | 5.8 | 16 | 2.3 | .2 |
| 7 | ------- | 805 | 114 | 37 | 16 | 5.2 | 0 | .6 | 1.2 | 8.5 | 12 | 2.1 | .1 |
| 8 | ------- | 817 | 106 | 37 | 16 | 4.1 | 0 | 1.0 | 1.2 | 11 | 12 | 1.9 | .1 |
| 9 | ------- | 805 | 106 | 37 | 15 | 3.9 | 0 | 1.3 | 1.2 | 11 | 10 | 1.7 | .1 |
| 10 | ------- | 817 | 106 | 37 | 14 | 3.6 | 0 | 1.6 | 1.2 | 12 | 9.5 | 1.5 | 0 |
| 11 | 98 | 817 | 106 | 34 | 13 | 3.0 | 0 | 2.1 | 1.2 | 11 | 8.5 | 1.3 | 0 |
| 12 | 122 | 781 | 102 | 34 | 12 | 3.0 | 0 | 2.0 | 1.2 | 9.3 | 8.3 | 1.1 | 0 |
| 13 | 122 | 637 | 98 | 34 | 12 | 2.6 | 0 | 1.9 | 1.2 | 15 | 7.8 | 1.0 | 0 |
| 14 | 175 | 565 | 98 | 37 | 11 | 2.4 | 0 | 2.0 | 1.2 | 18 | 8.0 | .8 | 0 |
| 15 | 225 | 529 | 102 | 37 | 11 | 2.1 | 0 | 1.9 | 1.2 | 17 | 7.5 | .6 | 0 |
| 16 | 255 | 351 | 98 | 34 | 10 | 2.1 | 0 | 2.0 | 1.2 | 15 | 7.8 | .5 | 0 |
| 17 | 245 | 307 | 90 | 34 | 26 | 2.0 | 0 | 1.9 | 1.2 | 12 | 7.5 | .3 | 0 |
| 18 | 225 | 285 | 86 | 34 | 23 | 1.8 | 0 | 2.0 | 1.2 | 12 | 7.2 | .1 | 0 |
| 19 | 225 | 265 | 86 | 32 | 16 | 1.7 | 0 | 1.9 | 1.0 | 13 | 6.9 | 0 | 0 |
| 20 | 285 | 265 | 83 | 30 | 14 | 1.7 | 0 | 2.0 | .9 | 14 | 6.6 | 0 | 0 |
| 21 | 373 | 255 | 80 | 26 | 12 | 1.4 | 0 | 1.9 | .7 | 15 | 6.4 | 0 | 0 |
| 22 | 417 | 225 | 76 | 24 | 11 | 1.4 | 0 | 2.0 | .6 | 16 | 6.4 | 0 | 0 |
| 23 | 472 | 215 | 69 | 23 | 11 | 1.1 | 0 | 1.9 | ------- | 16 | 6.0 | 0 | 0 |
| 24 | 494 | 195 | 66 | 22 | 10 | 1.1 | 0 | 2.0 | ------- | 16 | 6.0 | .2 | 0 |
| 25 | 505 | 185 | 66 | 20 | 8.5 | 1.0 | 0 | 1.9 | ------- | 16 | 5.6 | .2 | 0 |
| 26 | 517 | 175 | 66 | 20 | 7.3 | .9 | 0 | 2.0 | ------- | 16 | 5.2 | .2 | 0 |
| 27 | 541 | 166 | 66 | 20 | 9.8 | .6 | 0 | 1.9 | ------- | 16 | 4.8 | .3 | 0 |
| 28 | 589 | 148 | 58 | 19 | 10 | .5 | 0 | 1.8 | ------- | 15 | 4.4 | .3 | 0 |
| 29 | 601 | 139 | 52 | 19 | 10 | .5 | 0 | 1.7 | ------- | 15 | 4.1 | .3 | 0 |
| 30 | 601 | 130 | 52 | 18 | 8.8 | .4 | 0 | 1.6 | ------- | 15 | 3.8 | .3 | 0 |
| 31 | 601 | ------- | 49 | ------- | 7.3 | .3 | ------- | 1.5 | ------- | ------- | 3.8 | ------- | 0 |

*Discharge, in second-feet, of Souris River near Sherwood, N.Dak., 1930–33*—Contd.

| Day | Nov. | Mar. | Apr. | May | June | July | Aug. |
|---|---|---|---|---|---|---|---|
| 1931–32 | | | | | | | |
| 1 | | | 13 | 55 | 4.3 | 32 | 1.9 |
| 2 | | | 13 | 46 | 3.9 | 37 | 2.3 |
| 3 | | | 15 | 40 | 3.6 | 40 | 3.0 |
| 4 | | | 49 | 32 | 3.4 | 43 | 3.5 |
| 5 | | | 83 | 29 | 3.4 | 62 | 3.8 |
| 6 | | | 86 | 26 | 3.4 | 12 | 4.1 |
| 7 | | | 83 | 25 | 3.4 | 10 | 4.6 |
| 8 | | | 86 | 24 | 3.4 | 9.0 | 6.2 |
| 9 | | | 83 | 22 | 3.4 | 7.5 | 3.9 |
| 10 | | | 90 | 21 | 3.4 | 6.6 | 2.2 |
| 11 | | | 76 | 18 | 3.4 | 6.2 | 1.4 |
| 12 | | | 90 | 16 | 3.4 | 4.6 | .7 |
| 13 | | 0.2 | 80 | 14 | 3.4 | 3.9 | .4 |
| 14 | | .2 | 52 | 13 | 3.1 | 3.6 | .3 |
| 15 | | .8 | 49 | 12 | 2.8 | 3.4 | .2 |
| 16 | | .8 | 46 | 12 | 2.6 | 2.8 | .1 |
| 17 | 0.1 | .8 | 40 | 11 | 2.4 | 2.4 | 0 |
| 18 | | 1.2 | 34 | 10 | 2.0 | 2.2 | 0 |
| 19 | | 1.7 | 32 | 9.0 | 32 | 2.0 | 0 |
| 20 | | 2.7 | 30 | 7.5 | 58 | 2.0 | 0 |
| 21 | | 3.4 | 28 | 7.0 | 46 | 1.8 | 0 |
| 22 | | 5.6 | 32 | 7.0 | 25 | 1.6 | 0 |
| 23 | | 5.0 | 32 | 6.6 | 22 | 1.4 | 0 |
| 24 | | 3.9 | 31 | 6.2 | 28 | 1.2 | 0 |
| 25 | | 4.1 | 32 | 5.4 | 37 | 1.0 | 0 |
| 26 | | 4.1 | 32 | 4.6 | 55 | .9 | 0 |
| 27 | | 3.1 | 32 | 4.3 | 52 | .6 | 0 |
| 28 | | 4.1 | 37 | 3.9 | 31 | .5 | 0 |
| 29 | | 11 | 69 | 3.9 | 24 | .4 | 0 |
| 30 | | 14 | 62 | 3.9 | 13 | .2 | 0 |
| 31 | | 11 | | 3.9 | | .2 | 0 |

| Day | Nov. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1932–33 | | | | | | | | | |
| 1 | | | 21 | 1,140 | 55 | 775 | 49 | 3.2 | 1.0 |
| 2 | | | 21 | 793 | 52 | 892 | 46 | 2.8 | 1.0 |
| 3 | | | 19 | 601 | 49 | 973 | 41 | 2.4 | 1.0 |
| 4 | | | 11 | 461 | 46 | 1,000 | 39 | 2.0 | .8 |
| 5 | | | 12 | 340 | 43 | 1,000 | 37 | 1.8 | .8 |
| 6 | | | 12 | 307 | 41 | 959 | 34 | 17 | .7 |
| 7 | | | 19 | 245 | 42 | 801 | 32 | 12 | .7 |
| 8 | | | 26 | 205 | 42 | 563 | 31 | 12 | .7 |
| 9 | | | 14 | 205 | 41 | 407 | 30 | 12 | .6 |
| 10 | | | 7 | 166 | 41 | 339 | 28 | 12 | .6 |
| 11 | | | 6 | 148 | 38 | 284 | 28 | 13 | .6 |
| 12 | | | 6 | 175 | 37 | 240 | 26 | 14 | .6 |
| 13 | | | 7 | 195 | 34 | 220 | 24 | 12 | .6 |
| 14 | | | 6 | 157 | 30 | 200 | 20 | 9.6 | .6 |
| 15 | | | 40 | 148 | 28 | 180 | 18 | 8.4 | .6 |
| 16 | | | 185 | 148 | 27 | 160 | 16 | 6.0 | .8 |
| 17 | | | 265 | 139 | 25 | 150 | 15 | 5.2 | .7 |
| 18 | | | 265 | 130 | 25 | 122 | 15 | 4.8 | .8 |
| 19 | | | 275 | 130 | 24 | 113 | 12 | 4.0 | .8 |
| 20 | | | 285 | 114 | 24 | 104 | 10 | 2.0 | .8 |
| 21 | 0.5 | | 285 | 102 | 23 | 100 | 9.6 | 1.5 | .8 |
| 22 | | | 296 | 94 | 25 | 91 | 9.0 | 1.0 | .7 |
| 23 | | | 296 | 90 | 27 | 83 | 8.7 | .7 | .6 |
| 24 | | | 296 | 83 | 35 | 79 | 7.5 | 1.0 | .6 |
| 25 | | | 351 | 76 | 56 | 79 | 6.3 | 1.0 | .6 |
| 26 | | 3 | 373 | 72 | 91 | 75 | 6.0 | 1.0 | .8 |
| 27 | | 23 | 450 | 69 | 140 | 67 | 5.4 | 1.0 | .8 |
| 28 | | 21 | 577 | 66 | 150 | 60 | 4.6 | 1.0 | .8 |
| 29 | | | 805 | 62 | 180 | 52 | 4.0 | 1.0 | 1.0 |
| 30 | | | 1,070 | 58 | 317 | 49 | 4.0 | 1.0 | 1.0 |
| 31 | | | 1,350 | | 563 | | 3.6 | 1.0 | |

*Discharge, in second-feet, of Souris River near Sherwood, N. Dak., 1930–33*—Contd.

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| **1930** | | | | |
| March 11–31 | 601 | 98 | 366 | 15,200 |
| April | 817 | 130 | 460 | 27,400 |
| May | 130 | 49 | 90.2 | 5,550 |
| June | 46 | 18 | 31.7 | 1,890 |
| July | 26 | 7.3 | 13.6 | 836 |
| August | 6.6 | .3 | 2.72 | 167 |
| September | .2 | 0 | .02 | 1.2 |
| The period | | | | 51,000 |
| **1930–31** | | | | |
| October | 2.1 | 0 | 1.48 | 91 |
| November 1–22 | 1.4 | .6 | 1.15 | 50 |
| April 2–30 | 18 | 3.6 | 12.4 | 713 |
| May | 16 | 3.8 | 8.71 | 536 |
| June | 3.5 | 0 | 1.06 | 63 |
| July | .3 | 0 | .06 | 3.7 |
| **1932** | | | | |
| March 13–31 | 14 | .2 | 4.09 | 154 |
| April | 90 | 13 | 50.6 | 3,010 |
| May | 55 | 3.9 | 16.1 | 990 |
| June | 58 | 2.0 | 16.1 | 958 |
| July | 62 | .2 | 9.74 | 599 |
| August | 6.2 | 0 | 1.25 | 77 |
| The period | | | | 5,790 |
| **1933** | | | | |
| February 26–28 | 23 | 3.0 | 15.7 | 93 |
| March | 1,350 | 6.0 | 247 | 15,200 |
| April | 1,140 | 58 | 224 | 13,300 |
| May | 563 | 23 | 75.8 | 4,660 |
| June | 1,000 | 49 | 341 | 20,300 |
| July | 49 | 3.6 | 20.0 | 1,230 |
| August | 17 | 0.7 | 5.40 | 332 |
| September | 1.0 | 0.6 | 0.75 | 45 |
| The period | | | | 55,200 |

NOTE.—No flow during August and September 1931, September 1932, and little or no flow Oct. 1, 1932, to Feb. 25, 1933.

### SOURIS RIVER AT McKINNEY, N.DAK.

LOCATION.—Staff gage on line between secs. 14 and 23, T. 161 N., R. 86 W., at highway bridge in McKinney.
RECORDS AVAILABLE.—February to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 10.0 feet April 1; minimum, 0.4 foot Feb. 23.
REMARKS.—Records fair.

*Gage height, in feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 1.1 | 10.0 | 1.05 | 4.1 | 16 | | 2.2 | 2.0 | 0.7 | 2.0 |
| 2 | | 1.65 | 9.6 | 1.0 | 5.3 | 17 | | 2.1 | 2.0 | .7 | 1.9 |
| 3 | | 1.8 | 8.4 | 1.0 | 6.2 | 18 | | 2.8 | 1.95 | .7 | 1.8 |
| 4 | | 1.95 | 5.8 | .9 | 6.8 | 19 | | 5.1 | 1.8 | .7 | 1.6 |
| 5 | | 1.8 | 4.6 | 1.0 | 7.0 | 20 | | 5.1 | 1.9 | .7 | 1.5 |
| 6 | | 1.6 | 3.4 | 1.0 | 7.1 | 21 | | 5.2 | 1.6 | .7 | 1.5 |
| 7 | | 1.6 | 3.1 | .9 | 6.9 | 22 | | 5.3 | 1.6 | .7 | 1.4 |
| 8 | | 1.7 | 2.6 | .9 | 5.9 | 23 | | 5.3 | 1.5 | .7 | 1.3 |
| 9 | | 2.9 | 2.3 | .8 | 5.1 | 24 | 0.4 | 5.2 | 1.4 | .8 | 1.3 |
| 10 | | 3.0 | 2.1 | .8 | 4.0 | 25 | .5 | 5.2 | 1.3 | .8 | 1.3 |
| 11 | | 2.9 | 2.1 | .8 | 3.2 | 26 | .9 | 5.4 | 1.3 | .8 | 1.1 |
| 12 | | 2.8 | 1.9 | .8 | 2.8 | 27 | 1.1 | 5.6 | 1.2 | .8 | 1.1 |
| 13 | | 2.4 | 2.1 | .8 | 2.5 | 28 | 1.2 | 5.9 | 1.2 | .9 | 1.1 |
| 14 | | 2.4 | 2.3 | .8 | 2.4 | 29 | 1.2 | 6.4 | 1.1 | 1.0 | 1.0 |
| 15 | | 2.4 | 2.1 | .7 | 2.2 | 30 | | 7.45 | 1.1 | 1.4 | 1.0 |
| | | | | | | 31 | | 8.84 | | 2.6 | |

### SOURIS RIVER NEAR CARPIO, N.DAK.

LOCATION.—Chain gage on line between sec. 1, T. 157 N., R. 85 W., and sec. 36, T. 158 N., R. 85 W., 6 miles east of Carpio, N.Dak.
RECORDS AVAILABLE.—February to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 9.88 feet Apr. 8; minimum, 1.64 feet May 22.
REMARKS.—Records good.

*Gage height, in feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 2.20 | 7.74 | 2.20 | 1.96 | 16 | | 2.50 | 3.40 | 1.68 | 3.96 |
| 2 | | 1.94 | 9.77 | 2.14 | 2.40 | 17 | | 2.20 | 3.38 | 1.70 | 3.60 |
| 3 | | 1.68 | 9.88 | 1.96 | 4.96 | 18 | | 2.24 | 3.30 | 1.68 | 3.54 |
| 4 | | 1.70 | 9.80 | 1.96 | 5.92 | 19 | | 2.26 | 3.18 | 1.66 | 3.52 |
| 5 | | 1.80 | 8.10 | 1.94 | 7.44 | 20 | | 3.20 | 3.28 | 1.66 | 3.52 |
| 6 | | 1.80 | 7.76 | 2.00 | 8.70 | 21 | | 3.64 | 2.94 | 1.65 | 3.50 |
| 7 | | 1.74 | 6.70 | 1.98 | 9.12 | 22 | | 5.20 | 2.84 | 1.64 | 3.49 |
| 8 | | 3.70 | 5.70 | 2.06 | 9.30 | 23 | | 5.94 | 2.80 | 1.70 | 3.49 |
| 9 | | 2.60 | 4.50 | 2.04 | 9.20 | 24 | | 6.20 | 2.72 | 2.40 | 3.48 |
| 10 | | 2.24 | 4.04 | 1.96 | 8.80 | 25 | | 6.32 | 2.68 | 2.44 | 3.46 |
| 11 | | 2.06 | 3.69 | 1.84 | 7.74 | 26 | 2.52 | 6.50 | 2.50 | 2.20 | 3.47 |
| 12 | | 2.20 | 4.69 | 1.80 | 7.00 | 27 | 2.56 | 6.38 | 2.40 | 1.96 | 3.40 |
| 13 | | 2.70 | 4.00 | 1.79 | 6.40 | 28 | 2.54 | 6.30 | 2.36 | 1.76 | 3.20 |
| 14 | | 2.24 | 3.30 | 1.76 | 5.36 | 29 | | 6.32 | 2.34 | 1.74 | 3.00 |
| 15 | | 2.40 | 3.22 | 1.70 | 4.42 | 30 | | 6.34 | 2.26 | 1.72 | 2.60 |
| | | | | | | 31 | | 6.50 | | 1.76 | |

### SOURIS RIVER AT BURLINGTON, N.DAK.

LOCATION.—Chain gage in sec. 1, T. 155 N., R. 84 W., on highway bridge half a mile east of Burlington, N.Dak.
RECORDS AVAILABLE.—February to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 10.56 feet Apr. 5; minimum, 2.20 feet Feb. 26.
REMARKS.—Records good.

*Gage height, in feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 4.48 | 8.09 | 3.20 | 2.44 | 16 | | 4.63 | 4.31 | 2.58 | 5.35 |
| 2 | | 4.52 | 8.75 | 3.18 | 2.33 | 17 | | 5.18 | 4.34 | 2.54 | 4.86 |
| 3 | | 4.34 | 9.61 | 3.12 | 2.86 | 18 | | 5.32 | 4.29 | 2.51 | 4.52 |
| 4 | | 4.15 | 10.19 | 3.05 | 4.64 | 19 | | 5.47 | 4.22 | 2.49 | 4.34 |
| 5 | | 3.89 | 10.53 | 2.90 | 6.76 | 20 | | 5.74 | 4.56 | 2.46 | 4.20 |
| 6 | | 3.54 | 10.36 | 2.88 | 7.82 | 21 | | 5.47 | 4.55 | 2.42 | 3.94 |
| 7 | | 3.80 | 9.74 | 2.87 | 8.77 | 22 | | 5.18 | 4.22 | 2.34 | 3.70 |
| 8 | | 4.86 | 8.71 | 2.90 | 9.33 | 23 | | 5.40 | 4.10 | 2.33 | 3.58 |
| 9 | | 5.18 | 7.16 | 2.96 | 9.59 | 24 | | 6.31 | 3.95 | 2.49 | 3.43 |
| 10 | | 5.24 | 5.78 | 2.87 | 9.68 | 25 | | 6.40 | 3.83 | 2.73 | 3.50 |
| 11 | | 4.94 | 5.02 | 2.88 | 9.50 | 26 | 2.20 | 7.30 | 3.61 | 3.16 | 3.45 |
| 12 | | 4.62 | 4.87 | 2.84 | 8.70 | 27 | 3.11 | 7.54 | 3.48 | 3.10 | 3.40 |
| 13 | | 4.48 | 4.94 | 2.76 | 7.72 | 28 | 3.50 | 8.13 | 3.41 | 2.90 | 3.24 |
| 14 | | 4.24 | 4.59 | | 6.73 | 29 | | 8.47 | 3.48 | 2.71 | 3.16 |
| 15 | | 4.25 | 4.31 | 2.66 | 5.90 | 30 | | 8.42 | 3.36 | 2.58 | 3.02 |
| | | | | | | 31 | | 8.24 | | 2.54 | |

### SOURIS RIVER AT MINOT, N.DAK.

LOCATION.—Staff gage at Ann Street footbridge, northeast of Great Northern Railway roundhouse at Minot.

DRAINAGE AREA.—10,270 square miles.

RECORDS AVAILABLE.—May 1903 to March 1924; April 1927 to September 1928; October 1929 to September 1933.

DISCHARGE.—Maximum during year, 1,040 second-feet Apr. 6 (gage height, 10.00 feet); minimum, not determined.

1903–24, 1927–28, 1929–33: Maximum, 12,000 second-feet Apr. 20, 1904 (gage height, 21.9 feet); no flow at times during February 1930. Average, 20 years (1913–33), 150 second-feet.

REMARKS.—Records good for period Mar. 27 to June 30 and poor for remainder of year. Flow during low periods consists chiefly of industrial waste water.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | 77 | 620 | 81 | 37 | 86 | | |
| 2 | | | | | | 124 | 676 | 73 | 32 | | | |
| 3 | | | | | | 130 | 785 | 65 | 27 | 80 | | |
| 4 | | | | | | 124 | 903 | 57 | 136 | | | |
| 5 | | | | | | 65 | 995 | 54 | 351 | | 5 | |
| 6 | | | | | 0.5 | 36 | 1,040 | 50 | 480 | | | |
| 7 | | | | | | 50 | 995 | 50 | 648 | | | |
| 8 | | | | | | 114 | 834 | 50 | 759 | 60 | | |
| 9 | | | | | | 90 | 620 | 54 | 810 | | | |
| 10 | | 0.6 | | | | 81 | 480 | 57 | 857 | | | |
| 11 | | | | | | 81 | 328 | 57 | 857 | | | |
| 12 | | | | | | 57 | 284 | 57 | 785 | | | |
| 13 | | | | | | 37 | 284 | 54 | 648 | 40 | 4 | |
| 14 | | | | | | 26 | 252 | 54 | 536 | | | |
| 15 | | | | | | 34 | 222 | 50 | 426 | | | 1.0 |
| 16 | 0.4 | | 0.6 | 0.5 | | 43 | 203 | 46 | 328 | | | |
| 17 | | | | | | 81 | 194 | 43 | 284 | | 3 | |
| 18 | | | | | | 124 | 203 | 40 | 263 | 30 | | |
| 19 | | | | | | 142 | 222 | 37 | 242 | | | |
| 20 | | .6 | | | 1.0 | 155 | 242 | 34 | 203 | | 1 | |
| 21 | | | | | | 155 | 222 | 34 | 203 | | 1 | |
| 22 | | | | | | 155 | 222 | 31 | 203 | | 1 | |
| 23 | | | | | | 177 | 203 | 34 | 169 | 20 | 1 | |
| 24 | | | | | | 203 | 185 | 50 | 155 | | 1 | |
| 25 | | .6 | | | | 284 | 169 | 50 | 142 | | 1 | |
| 26 | | | | | | 351 | 142 | 69 | 130 | | 1 | |
| 27 | | | | | 19 | 351 | 119 | 109 | 109 | | 1 | |
| 28 | | | | | 50 | 536 | 109 | 65 | 99 | | 1 | |
| 29 | | | | | ------- | 759 | 99 | 57 | 90 | 10 | 1 | |
| 30 | | | | | ------- | 704 | 90 | 54 | 86 | | 1 | |
| 31 | | ------- | | | ------- | 648 | ------- | 43 | ------- | | 1 | ------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| October | ---------- | ---------- | 0.40 | 25 |
| November | ---------- | ---------- | .60 | 36 |
| December | ---------- | ---------- | .60 | 37 |
| January | ---------- | ---------- | .50 | 31 |
| February | 50 | ---------- | 3.18 | 177 |
| March | 759 | 26 | 193 | 11,900 |
| April | 1,040 | 90 | 398 | 23,700 |
| May | 109 | 31 | 53.5 | 3,290 |
| June | 859 | 27 | 336 | 20,000 |
| July | ---------- | ---------- | 39.2 | 2,410 |
| August | ---------- | ---------- | 3.0 | 184 |
| September | ---------- | ---------- | 1.0 | 60 |
| The year | 1,040 | ---------- | 85.4 | 61,800 |

### SOURIS RIVER NEAR MINOT, N.DAK.

LOCATION.—Chain gage on line between sec. 33, T. 155 N., R. 82 W., and sec. 4, T. 154 N., R. 82 W., on highway bridge 5 miles southeast of Minot. Zero of gage is 2 feet lower than that of the staff gage used in 1929.
RECORDS AVAILABLE.—October 1928 to September 1929, February to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 8.76 feet Apr. 6; minimum, 1.24 feet June 25.
1928–29, 1933: Maximum gage height, that of Apr. 6, 1933; minimum, 0.58 foot (present datum) July 30, 1929.
REMARKS.—Records good.

*Gage height, in feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 3.62 | 6.92 | 1.92 | 1.56 | 16 | | 3.48 | 2.92 | 1.52 | 4.02 |
| 2 | | 5.10 | 6.96 | 1.90 | 1.54 | 17 | | 3.96 | 2.94 | 1.48 | 3.80 |
| 3 | | 4.70 | 6.94 | 1.86 | 1.48 | 18 | | 4.42 | 2.96 | 1.44 | 3.68 |
| 4 | | 4.92 | 7.66 | 1.80 | 1.44 | 19 | | 4.94 | 2.94 | 1.42 | 3.08 |
| 5 | | 4.52 | 8.38 | 1.72 | 3.80 | 20 | | 5.00 | 3.28 | 1.42 | 2.90 |
| 6 | | 3.92 | 8.76 | 1.58 | 5.02 | 21 | | 5.28 | 3.24 | 1.42 | 2.12 |
| 7 | | 3.76 | 7.98 | 1.46 | 6.20 | 22 | | 5.38 | 3.04 | 1.40 | 1.86 |
| 8 | | 3.54 | 7.12 | 1.32 | 6.90 | 23 | | 4.88 | 2.82 | 1.54 | 1.28 |
| 9 | | 3.86 | 6.60 | 1.44 | 7.32 | 24 | | 5.32 | 2.62 | 2.04 | 1.26 |
| 10 | | 3.72 | 5.48 | 1.68 | 7.62 | 25 | | 5.66 | 2.50 | 2.00 | 1.24 |
| 11 | | 3.68 | 4.76 | 1.70 | 7.70 | 26 | 1.56 | 6.40 | 2.38 | 1.92 | 1.26 |
| 12 | | 3.88 | 4.02 | 1.64 | 7.48 | 27 | 3.54 | 7.12 | 2.22 | 1.90 | 1.28 |
| 13 | | 3.96 | 3.52 | 1.64 | 6.54 | 28 | 3.18 | 7.54 | 2.04 | 1.74 | 1.32 |
| 14 | | 3.60 | 3.48 | 1.56 | 5.34 | 29 | | 8.40 | 2.02 | 1.68 | 1.32 |
| 15 | | 3.12 | 3.16 | 1.52 | 4.48 | 30 | | 8.62 | 1.98 | 1.62 | 1.34 |
| | | | | | | 31 | | 7.68 | | 1.62 | |

### SOURIS RIVER AT LOGAN, N.DAK.

LOCATION.—Chain gage on line between secs. 13 and 24, T. 154 N., R. 82 W., on highway bridge in Logan.
RECORDS AVAILABLE.—February to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 9.90 feet Mar. 30; minimum, 1.72 feet May 7.
REMARKS.—Records good.

*Gage height, in feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 4.37 | 7.98 | 2.58 | 2.16 | 16 | | 3.77 | 3.72 | 2.05 | 5.29 |
| 2 | | 5.23 | 7.45 | 2.50 | 2.10 | 17 | | 4.23 | 3.63 | 2.02 | 5.02 |
| 3 | | 6.10 | 7.34 | 2.48 | 2.02 | 18 | | 4.60 | 3.73 | 1.95 | 4.32 |
| 4 | | 5.88 | 7.98 | 2.48 | 2.06 | 19 | | 4.88 | 3.68 | 1.93 | 4.03 |
| 5 | | 5.58 | 8.61 | 2.23 | 4.28 | 20 | | 5.62 | 3.90 | 1.92 | 3.77 |
| 6 | | 5.13 | 8.96 | 2.12 | 5.55 | 21 | | 5.91 | 4.00 | 1.92 | 3.59 |
| 7 | | 4.49 | 8.96 | 1.76 | 6.47 | 22 | | 6.13 | 3.88 | 1.92 | 2.91 |
| 8 | | 4.95 | 8.55 | 1.74 | 7.35 | 23 | | 5.60 | 3.73 | 2.00 | 2.84 |
| 9 | | 5.55 | 7.64 | 2.04 | 7.54 | 24 | | 5.58 | 3.35 | 2.90 | 2.88 |
| 10 | | 5.20 | 6.42 | 2.20 | 7.94 | 25 | | 6.06 | 3.18 | 2.50 | 2.99 |
| 11 | | 4.84 | 5.44 | 2.17 | 8.11 | 26 | 1.91 | 7.15 | 3.15 | 2.05 | 2.96 |
| 12 | | 4.83 | 4.63 | 2.16 | 7.94 | 27 | 3.36 | 7.61 | 2.96 | 1.78 | 2.87 |
| 13 | | 4.53 | 4.19 | 2.18 | 7.61 | 28 | 4.50 | 8.15 | 2.76 | 2.95 | 2.79 |
| 14 | | 4.15 | 4.23 | 2.15 | 6.69 | 29 | | 9.10 | 2.70 | 1.96 | 2.68 |
| 15 | | 3.74 | 3.97 | 2.08 | 5.70 | 30 | | 9.85 | 2.71 | 2.09 | 2.24 |
| | | | | | | 31 | | 9.52 | | 2.16 | |

### SOURIS RIVER AT SAWYER, N.DAK.

LOCATION.—Chain gage in sec. 11, T. 153 N., R. 81 W., on highway bridge half a mile north of Sawyer.
RECORDS AVAILABLE.—February to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 11.00 feet Mar. 31; minimum, 1.74 feet May 30.
REMARKS.—Records good.

*Gage height, in feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 7.71 | 10.20 | 2.76 | 2.06 | 16 | | 7.03 | 4.13 | 2.09 | 5.77 |
| 2 | | 7.28 | 9.59 | 2.62 | 1.97 | 17 | | 7.16 | 3.95 | 2.08 | 5.18 |
| 3 | | 7.44 | 8.18 | 2.55 | 1.90 | 18 | | 7.16 | 3.91 | 2.02 | 4.80 |
| 4 | | 7.72 | 8.29 | 2.52 | 1.83 | 19 | | 7.52 | 3.88 | 2.00 | 4.46 |
| 5 | | 7.44 | 8.84 | 2.45 | 1.94 | 20 | | 7.75 | 3.93 | 1.94 | 4.14 |
| 6 | | 7.55 | 9.44 | 2.34 | 4.97 | 21 | | 7.89 | 4.11 | 1.93 | 3.63 |
| 7 | | 7.25 | 9.60 | 2.22 | 6.24 | 22 | | 7.98 | 4.19 | 1.91 | 3.58 |
| 8 | | 8.50 | 9.44 | 1.93 | 7.19 | 23 | | 8.05 | 3.94 | 2.01 | 3.68 |
| 9 | | 8.32 | 8.73 | 2.01 | 7.74 | 24 | | 7.84 | 3.61 | 2.36 | 2.96 |
| 10 | | 8.37 | 7.53 | 2.26 | 8.18 | 25 | | 7.75 | 3.44 | 3.45 | 3.11 |
| 11 | | 7.89 | 6.35 | 2.29 | 8.43 | 26 | 5.90 | 8.54 | 3.33 | 2.51 | 3.08 |
| 12 | | 7.71 | 5.33 | 2.20 | 8.53 | 27 | 7.28 | 9.08 | 3.17 | 1.88 | 3.01 |
| 13 | | 7.65 | 4.62 | 2.24 | 8.29 | 28 | 7.47 | 9.54 | 2.99 | 2.95 | 2.90 |
| 14 | | 7.33 | 4.48 | 2.20 | 7.69 | 29 | | 10.07 | 2.87 | 2.62 | 2.87 |
| 15 | | 7.07 | 4.40 | 2.14 | 6.72 | 30 | | 10.43 | 2.81 | 1.80 | 2.50 |
| | | | | | | 31 | | 10.74 | | 2.11 | |

### SOURIS RIVER AT VELVA, N.DAK.

LOCATION.—Chain gage on line between secs. 22 and 23, T. 153 N., R. 80 W., on highway bridge half a mile north of Velva.
RECORDS AVAILABLE.—February to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 9.70 feet Mar. 29; minimum, 1.90 feet Feb. 24.
REMARKS.—Records good.

*Gage height, in feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 4.97 | 8.55 | 2.56 | 2.13 | 16 | | 3.88 | 3.82 | 2.13 | 5.52 |
| 2 | | 4.65 | 7.98 | 2.50 | 2.08 | 17 | | 4.05 | 3.68 | 2.10 | 4.72 |
| 3 | | 4.43 | 7.65 | 2.42 | 2.00 | 18 | | 4.33 | 3.57 | 2.10 | 4.21 |
| 4 | | 4.69 | 7.51 | 2.40 | 2.00 | 19 | | 4.62 | 3.49 | 2.06 | 3.91 |
| 5 | | 4.25 | 7.90 | 2.36 | 1.97 | 20 | | 4.82 | 3.45 | 2.04 | 3.60 |
| 6 | | 4.20 | 8.48 | 2.29 | 3.62 | 21 | | 5.05 | 3.59 | 2.03 | 3.39 |
| 7 | | 4.22 | 8.84 | 2.26 | 4.90 | 22 | | 5.34 | 3.62 | 2.04 | 2.93 |
| 8 | | 5.39 | 8.90 | 2.12 | 5.94 | 23 | | 5.47 | 3.54 | 2.08 | 2.76 |
| 9 | | 5.14 | 8.58 | 2.02 | 6.64 | 24 | 1.90 | 5.53 | 3.28 | 2.28 | 3.06 |
| 10 | | 5.44 | 7.65 | 2.16 | 7.12 | 25 | 2.10 | 5.23 | 3.10 | 3.06 | 2.55 |
| 11 | | 5.03 | 6.30 | 2.23 | 7.52 | 26 | 2.80 | 5.59 | 2.97 | 2.74 | 2.64 |
| 12 | | 4.61 | 5.22 | 2.20 | 7.73 | 27 | 4.60 | 6.24 | 2.88 | 2.20 | 2.62 |
| 13 | | 4.46 | 4.29 | 2.19 | 7.68 | 28 | 4.75 | 7.53 | 2.77 | 2.12 | 2.55 |
| 14 | | 4.17 | 3.97 | 2.18 | 7.28 | 29 | | 9.16 | 2.68 | 2.78 | 2.52 |
| 15 | | 3.93 | 3.94 | 2.17 | 6.50 | 30 | | 9.28 | 2.59 | 2.07 | 2.69 |
| | | | | | | 31 | | 8.73 | | 2.06 | |

### SOURIS RIVER NEAR VERENDRYE, N.DAK.

LOCATION.—Chain gage on line between secs. 20 and 29, T. 154 N., R. 78 W., on highway bridge half a mile east and 1 mile north of Verendrye.
RECORDS AVAILABLE.—February to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 11.62 feet Apr. 1; minimum, 3.04 feet June 5.
REMARKS.—Records good.

*Gage height, in feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | Day | Feb. | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 7.28 | 11.62 | 4.00 | 3.16 | 16 | | 5.08 | 5.54 | 3.32 | 7.84 |
| 2 | | 7.60 | 11.42 | 3.96 | 3.32 | 17 | | 5.04 | 5.40 | 3.24 | 6.88 |
| 3 | | 7.16 | 10.46 | 3.84 | 3.18 | 18 | | 5.00 | 5.24 | 3.30 | 6.24 |
| 4 | | 6.68 | 9.84 | 3.72 | 3.14 | 19 | | 5.22 | 5.18 | 3.18 | 5.84 |
| 5 | | 6.80 | 9.42 | 3.66 | 3.04 | 20 | | 5.54 | 5.08 | 3.12 | 5.48 |
| 6 | | 6.18 | 9.38 | 3.64 | 3.26 | 21 | | 5.88 | 5.04 | 3.10 | 5.14 |
| 7 | | 5.82 | 9.54 | 3.52 | 5.48 | 22 | | 6.12 | 5.18 | 3.08 | 4.80 |
| 8 | | 5.80 | 9.84 | 3.46 | 6.46 | 23 | | 6.38 | 5.28 | 3.16 | 4.54 |
| 9 | | 5.36 | 9.96 | 3.18 | 7.38 | 24 | | 6.72 | 5.10 | 3.52 | 4.34 |
| 10 | | 5.54 | 9.62 | 3.06 | 7.98 | 25 | | 6.80 | 4.80 | 4.00 | 4.30 |
| 11 | | 5.88 | 8.90 | 3.18 | 8.36 | 26 | | 6.60 | 4.62 | 4.64 | 4.00 |
| 12 | | 5.88 | 7.76 | 3.40 | 8.68 | 27 | 3.96 | 6.70 | 4.54 | 4.34 | 4.04 |
| 13 | | 5.70 | 6.52 | 3.30 | 8.90 | 28 | 6.14 | 7.28 | 4.32 | 3.40 | 3.88 |
| 14 | | 5.48 | 5.82 | 3.35 | 8.86 | 29 | | 8.64 | 4.20 | 3.66 | 3.86 |
| 15 | | 5.36 | 5.58 | 3.40 | 8.54 | 30 | | 10.70 | 4.10 | 4.16 | 4.02 |
| | | | | | | 31 | | 11.60 | | 3.20 | |

### SOURIS RIVER NEAR DENBIGH, N.DAK.

LOCATION.—Chain gage on line between secs. 23 and 26, T. 155 N., P. 77 W., on highway bridge 2 miles east and 6½ miles south of Denbigh.
RECORDS AVAILABLE.—March to June 1933 (discontinued).
EXTREMES.—Maximum gage height during period, 11.66 feet Apr. 4; minimum, 2.60 feet May 13.
REMARKS.—Records good.

*Gage height, in feet, 1933*

| Day | Mar. | Apr. | May | June | Day | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 11.10 | 3.40 | 3.08 | 16 | 5.80 | 5.20 | 2.80 | 7.96 |
| 2 | | 11.60 | 3.26 | 2.76 | 17 | 5.56 | 5.00 | 2.80 | 7.50 |
| 3 | | 11.64 | 3.22 | 2.74 | 18 | 5.36 | 4.88 | 2.78 | 6.60 |
| 4 | | 11.66 | 3.16 | 2.72 | 19 | 5.24 | 4.68 | 2.76 | 6.02 |
| 5 | 7.66 | 11.30 | 3.12 | 2.72 | 20 | 5.32 | 4.52 | 2.76 | 5.28 |
| 6 | 7.58 | 10.84 | 3.10 | 2.68 | 21 | 5.56 | 4.36 | 2.76 | 4.82 |
| 7 | 7.18 | 10.72 | 3.08 | 2.64 | 22 | 5.88 | 4.34 | 2.74 | 4.48 |
| 8 | 6.90 | 10.30 | 3.06 | 4.46 | 23 | 6.22 | 4.32 | 2.84 | 4.16 |
| 9 | 6.24 | 10.04 | 2.98 | 5.16 | 24 | 6.44 | 4.42 | 2.92 | 3.84 |
| 10 | 6.32 | 9.90 | 2.88 | 6.04 | 25 | 6.62 | 4.34 | 3.26 | 3.84 |
| 11 | 6.12 | 9.54 | 2.76 | 6.56 | 26 | 6.90 | 4.08 | 3.36 | 3.80 |
| 12 | 6.00 | 8.98 | 2.64 | 7.32 | 27 | 7.04 | 3.88 | 3.64 | 3.42 |
| 13 | 6.22 | 7.56 | 2.60 | 7.78 | 28 | 7.14 | 3.74 | 3.88 | 3.42 |
| 14 | 6.16 | 6.82 | 2.68 | 8.10 | 29 | 7.66 | 3.68 | 3.38 | 3.36 |
| 15 | 6.00 | 5.78 | 2.80 | 8.20 | 30 | 8.56 | 3.54 | 3.40 | 3.32 |
| | | | | | 31 | 9.86 | | 3.44 | |

### SOURIS RIVER AT TOWNER, N.DAK.

LOCATION.—Staff gage in sec. 10, T. 156 N., R. 76 W., at Great Northern Railway bridge three-fourths of a mile northwest of Towner.
RECORDS AVAILABLE.—March to September 1933.
DISCHARGE.—Maximum during period, 1,080 second-feet Apr. 10 (gage height, 9.02 feet); minimum, 0.6 second-foot Sept. 27, 30 (gage height, 0.86 foot).
REMARKS.—Records fair. Stage-discharge relation affected by ice Mar. 4 to Apr. 11. Discharge estimated Aug. 19–23, 25–27; interpolated Mar. 26 and Apr. 9.

*Discharge, in second-feet, 1932–33*

| Day | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | ------ | 640 | 154 | 142 | 124 | 32 | 11 |
| 2 | ------ | 730 | 136 | 106 | 124 | 30 | 11 |
| 3 | ------ | 775 | 130 | 94 | 118 | 28 | 8.4 |
| 4 | 54 | 835 | 124 | 94 | 100 | 28 | 5.8 |
| 5 | 355 | 848 | 118 | 94 | 100 | 26 | 4.6 |
| 6 | 475 | 872 | 118 | 88 | 106 | 24 | 2.2 |
| 7 | 445 | 896 | 115 | 80 | 106 | 20 | .8 |
| 8 | 430 | 920 | 112 | 112 | 106 | 18 | .8 |
| 9 | 415 | 1,000 | 112 | 229 | 154 | 16 | 1.0 |
| 10 | 385 | 1,080 | 118 | 385 | 166 | 12 | 1.0 |
| 11 | 355 | 1,020 | 100 | 565 | 142 | 11 | 1.0 |
| 12 | 340 | 995 | 88 | 715 | 112 | 11 | .8 |
| 13 | 310 | 848 | 88 | 760 | 100 | 11 | 4.6 |
| 14 | 296 | 675 | 94 | 835 | 88 | 11 | 1.0 |
| 15 | 282 | 531 | 100 | 835 | 80 | 9.7 | 3.4 |
| 16 | 268 | 430 | 94 | 850 | 70 | 7.9 | 7.0 |
| 17 | 242 | 386 | 94 | 820 | 49 | 7.9 | 7.9 |
| 18 | 178 | 352 | 94 | 775 | 56 | 7.9 | 8.8 |
| 19 | 154 | 329 | 94 | 685 | 60 | 7.2 | .8 |
| 20 | 154 | 308 | 88 | 625 | 56 | 6.4 | .8 |
| 21 | 154 | 284 | 94 | 550 | 54 | 5.6 | .8 |
| 22 | 148 | 276 | 88 | 445 | 49 | 4.9 | .8 |
| 23 | 178 | 260 | 94 | 385 | 51 | 4.2 | .8 |
| 24 | 216 | 260 | 100 | 310 | 56 | 3.4 | .8 |
| 25 | 242 | 260 | 118 | 255 | 47 | 3.4 | .8 |
| 26 | 276 | 244 | 136 | 203 | 45 | 3.4 | .8 |
| 27 | 310 | 226 | 154 | 178 | 38 | 3.4 | .6 |
| 28 | 340 | 208 | 203 | 148 | 40 | 3.4 | .8 |
| 29 | 385 | 189 | 203 | 130 | 34 | 4.6 | .8 |
| 30 | 430 | 166 | 166 | 124 | 34 | 12 | .6 |
| 31 | 535 | ------ | 148 | ------ | 32 | 12 | ------ |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| March 4–31 | 535 | 54 | 298 | 16,600 |
| April | 1,080 | 166 | 561 | 33,400 |
| May | 203 | 88 | 119 | 7,320 |
| June | 850 | 80 | 387 | 23,000 |
| July | 166 | 32 | 80.5 | 4,950 |
| August | 32 | 3.4 | 12.4 | 762 |
| September | 11 | .6 | 3.01 | 179 |
| The period | ------ | ------ | ------ | 86,200 |

### SOURIS RIVER NEAR UPHAM, N.DAK.

LOCATION.—Staff gage on line between secs. 28 and 33, T. 160 N., R. 78 W., 4 miles north of Upham.
RECORDS AVAILABLE.—March to June 1933 (discontinued).
EXTREMES.—Maximum gage height occurred during period when gage was not read; minimum, 2.18 feet May 22, 23.
REMARKS.—Records good. Gage not read Apr. 2–17.

*Gage height, in feet, 1933*

| Day | Mar. | Apr. | May | June | Day | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 5.20 | 4.00 | 3.44 | 16 | | | 2.30 | 5.00 |
| 2 | | | | 3.50 | 17 | | | 2.20 | 5.16 |
| 3 | | | 3.40 | 3.40 | 18 | | 5.66 | 2.20 | |
| 4 | | | 3.30 | | 19 | | 5.50 | 2.24 | 5.36 |
| 5 | | | 3.16 | 3.10 | 20 | 4.34 | | 2.20 | |
| 6 | | | 3.00 | 3.00 | 21 | 4.98 | 5.30 | | 5.50 |
| 7 | | | | | 22 | 5.00 | 5.16 | 2.18 | 5.54 |
| 8 | | | 2.80 | 2.80 | 23 | 5.00 | | 2.18 | 5.56 |
| 9 | | | 2.76 | 2.76 | 24 | 4.34 | 4.70 | | 5.58 |
| 10 | | | | 2.70 | 25 | 4.70 | 4.66 | 2.72 | |
| 11 | | | 2.68 | | 26 | | | | 5.20 |
| 12 | | | 2.60 | 3.00 | 27 | 4.70 | 4.36 | 2.74 | 5.00 |
| 13 | | | 2.54 | 3.60 | 28 | 4.80 | | | |
| 14 | | | | 4.40 | 29 | 4.90 | 4.30 | 3.32 | 4.80 |
| 15 | | | 2.36 | 4.60 | 30 | 5.20 | | | 4.70 |
| | | | | | 31 | 5.20 | | 3.44 | |

### SOURIS RIVER NEAR WESTHOPE, N.DAK.

(International gaging station)

LOCATION.—Chain gage in T. 163 N., R. 79 W., 2½ miles east of Westhope. Zero of gage is 1,404.72 feet above mean sea level.

RECORDS AVAILABLE.—July 1929 to September 1933.

DISCHARGE.—Maximum during year, 1,130 second-feet Apr. 19 (gage height, 7.25 feet); no flow Oct. 1–31.

1929–33: Maximum, 1,130 second-feet Mar. 31 to Apr. 2, 1930, and Apr. 19, 1933; maximum gage height, that of Apr. 19, 1933; no flow for several periods.

REMARKS.—Records good Apr. 1 to May 16; fair for period affected by ice, Mar. 23–31, and period affected by aquatic growth, May 19 to Sept. 30; poor Nov. 1–21. No record Nov. 22 to Mar. 22. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

*Discharge, in second-feet, 1932–33*

| Day | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 5.7 | -------- | 815 | 446 | 168 | 272 | 123 | 16 |
| 2 | 10 | -------- | 870 | 410 | 168 | 272 | 115 | 12 |
| 3 | 15 | -------- | 870 | 381 | 159 | 272 | 107 | 10 |
| 4 | 19 | -------- | 930 | 355 | 168 | 261 | 107 | 10 |
| 5 | 22 | -------- | 870 | 318 | 159 | 261 | 103 | 9.0 |
| 6 | 18 | -------- | 815 | 294 | 159 | 261 | 95 | 7.3 |
| 7 | 16 | -------- | 815 | 272 | 159 | 250 | 88 | 7.1 |
| 8 | 14 | -------- | 815 | 261 | 159 | 250 | 80 | 7.3 |
| 9 | 14 | -------- | 815 | 239 | 159 | 250 | 77 | 8.1 |
| 10 | 12 | -------- | 870 | 218 | 159 | 239 | 70 | 8.5 |
| 11 | 11 | -------- | 815 | 218 | 150 | 228 | 63 | 8.3 |
| 12 | | -------- | 870 | 198 | 141 | 228 | 60 | 8.3 |
| 13 | 10 | -------- | 870 | 188 | 141 | 218 | 54 | 7.7 |
| 14 | | -------- | 930 | 188 | 141 | 208 | 51 | 8.1 |
| 15 | | -------- | 995 | 178 | 141 | 208 | 48 | 8.5 |
| 16 | | -------- | 1,060 | 178 | 141 | 208 | 45 | 24 |
| 17 | | -------- | 1,130 | 178 | 150 | 208 | 40 | 20 |
| 18 | 5 | -------- | 1,130 | 178 | 159 | 208 | 38 | 18 |
| 19 | | -------- | 1,130 | 168 | 168 | 208 | 38 | 15 |
| 20 | | -------- | 1,130 | 168 | 178 | 198 | 35 | 14 |
| 21 | 4 | -------- | 1,130 | 159 | 188 | 188 | 33 | 12 |
| 22 | -------- | -------- | 995 | 159 | 208 | 188 | 30 | 11 |
| 23 | -------- | 45 | 930 | 168 | 218 | 178 | 29 | 11 |
| 24 | -------- | 107 | 870 | 159 | 228 | 178 | 26 | 8.5 |
| 25 | -------- | 178 | 815 | 159 | 239 | 168 | 24 | 7.3 |
| 26 | -------- | 272 | 715 | 159 | 239 | 159 | 23 | 7.5 |
| 27 | -------- | 342 | 630 | 159 | 250 | 159 | 22 | 6.9 |
| 28 | -------- | 427 | 592 | 159 | 261 | 150 | 22 | 6.7 |
| 29 | -------- | 557 | 524 | 159 | 272 | 141 | 22 | 5.7 |
| 30 | -------- | 630 | 494 | 168 | 272 | 141 | 21 | 4.9 |
| 31 | -------- | 765 | -------- | 159 | -------- | 123 | 19 | -------- |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| November 1–21 | 22 | ---------- | 10.7 | 446 |
| March 23–31 | 765 | 45 | 369 | 6,590 |
| April | 1,130 | 494 | 875 | 52,100 |
| May | 446 | 159 | 219 | 13,500 |
| June | 272 | 141 | 183 | 10,900 |
| July | 272 | 123 | 209 | 12,900 |
| August | 123 | 19 | 55.1 | 3,390 |
| September | 24 | 4.9 | 10.3 | 613 |

NOTE.—No flow during October.

### LAKE UPSILON NEAR ST. JOHN, N.DAK.

LOCATION.—Staff gage in SE¼ sec. 3, T. 163 N., R. 71 W., 7 miles west of St. John.
DRAINAGE AREA.—4 square miles.
RECORDS AVAILABLE.—September 1931 to August 1933 (discontinued).
EXTREMES.—Maximum water-surface elevation during year, 2,105.10 feet June 13, 17; minimum, 2,102.97 feet Oct. 16.
1931–33: Maximum water-surface elevation, that of June 13, 17, 1933; minimum, that of Oct. 16, 1932.
REMARKS.—Gage heights have been reduced to sea-level datum. Gage read to hundredths twice a week. No record Nov. 2 to May 1.

*Elevation, in feet, 1932–33*

| Day | Oct. | Nov. | May | June | July | Aug. | Day | Oct. | Nov. | May | June | July | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 3.48 | | | | | 16 | 2.97 | | 4.28 | | 4.68 | |
| 2 | | | 4.26 | 4.94 | | 4.46 | 17 | | | | 5.10 | | |
| 3 | | | | | | | 18 | | | | | | |
| 4 | | | | | 4.89 | | 19 | | | | | | |
| 5 | | | | | | 4.42 | 20 | | | 4.27 | | 4.63 | |
| 6 | | | | 5.04 | | | 21 | | | | 5.04 | | |
| 7 | | | | | | | 22 | 3.27 | | | | | |
| 8 | | | 4.30 | | 4.86 | | 23 | | | 4.38 | | | |
| 9 | | | | | | 4.34 | 24 | | | | | | |
| 10 | 3.01 | | | 5.08 | | | 25 | | | | 5.02 | | |
| 11 | | | | 5.09 | | | 26 | | | 4.76 | | 4.58 | |
| 12 | | | | | 4.78 | 4.28 | 27 | | | 4.80 | | | |
| 13 | 2.99 | | 4.29 | 5.10 | | | 28 | | | | | | |
| 14 | | | | | | | 29 | | | | 4.96 | 4.53 | |
| 15 | | | | | | | 30 | | | | | | |
| | | | | | | | 31 | | | | | | |

NOTE.—Add 2,100 feet to obtain elevation above mean sea level.

## RAINY RIVER BASIN

### KAWISHIWI RIVER NEAR WINTON, MINN.

LOCATION.—In lot 3, sec. 20, T. 63 N., R. 11 W., at power plant of Minnesota Power & Light Co., just above Fall Lake and 2½ miles east of Winton.

DRAINAGE AREA.—1,300 square miles (revised).

RECORDS AVAILABLE.—June 1905 to June 1907; October 1912 to September 1919; September 1923 to September 1933.

DISCHARGE.—Maximum mean daily during year, 2,410 second-feet May 25; minimum, 67 second-feet Mar. 26.

1905–7, 1912–19, 1923–33: Maximum mean daily, 6,030 second-feet Apr. 26, 1927; no flow a number of times 1905–7 and 1923–28. Average, 16 years (1913–19, 1923–33), 761 second-feet.

REMARKS.—Records good except those for periods of high water, which are fair. Flow is entirely regulated by several reservoirs. Records collected by Minnesota Power & Light Co., under general supervision of the United States Geological Survey in connection with a Federal Power Commission project.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 333 | 366 | 345 | 419 | 408 | 318 | 129 | 770 | 1,950 | 597 | 500 | 514 |
| 2 | 260 | 329 | 345 | 346 | 493 | 235 | 282 | 863 | 1,870 | 513 | 657 | 235 |
| 3 | 317 | 358 | 414 | 580 | 363 | 206 | 99 | 960 | 1,730 | 502 | 554 | 195 |
| 4 | 505 | 353 | 428 | 663 | 313 | 194 | 351 | 992 | 1,620 | 298 | 727 | 185 |
| 5 | 496 | 398 | 396 | 640 | 163 | 131 | 383 | 1,050 | 1,540 | 463 | 597 | 503 |
| 6 | 463 | 131 | 396 | 598 | 425 | 281 | 319 | 1,110 | 1,620 | 528 | 378 | 534 |
| 7 | 528 | 395 | 450 | 565 | 533 | 331 | 351 | 1,200 | 1,340 | 568 | 546 | 663 |
| 8 | 384 | 442 | 534 | 357 | 516 | 113 | 297 | 1,150 | 1,320 | 631 | 598 | 876 |
| 9 | 461 | 427 | 581 | 512 | 566 | 109 | 255 | 1,230 | 1,360 | 663 | 565 | 534 |
| 10 | 515 | 314 | 557 | 523 | 402 | 413 | 364 | 1,210 | 1,210 | 824 | 748 | 246 |
| 11 | 432 | 192 | 375 | 490 | 290 | 331 | 233 | 1,280 | 1,090 | 663 | 503 | 302 |
| 12 | 438 | 225 | 602 | 523 | 229 | 106 | 431 | 1,310 | 1,190 | 604 | 290 | 395 |
| 13 | 463 | 225 | 641 | 510 | 410 | 107 | 405 | 1,300 | 1,220 | 591 | 226 | 375 |
| 14 | 528 | 273 | 627 | 436 | 396 | 334 | 372 | 1,260 | 1,250 | 446 | 727 | 472 |
| 15 | 336 | 284 | 695 | 196 | 291 | 432 | 435 | 1,090 | 1,220 | 560 | 463 | 306 |
| 16 | 175 | 284 | 727 | 319 | 363 | 240 | 260 | 1,180 | 1,250 | 551 | 534 | 258 |
| 17 | 420 | 284 | 630 | 493 | 473 | 285 | 507 | 1,160 | 1,220 | 536 | 541 | 163 |
| 18 | 463 | 284 | 384 | 576 | 529 | 256 | 364 | 1,170 | 1,190 | 660 | 528 | 431 |
| 19 | 463 | 252 | 676 | 406 | 196 | 99 | 461 | 1,360 | 1,040 | 631 | 598 | 469 |
| 20 | 463 | 379 | 631 | 493 | 496 | 248 | 461 | 1,450 | 1,140 | 632 | 357 | 430 |
| 21 | 463 | 396 | 663 | 423 | 515 | 299 | 380 | 1,450 | 1,050 | 533 | 560 | 261 |
| 22 | 176 | 396 | 695 | 433 | 547 | 267 | 420 | 1,520 | 889 | 495 | 598 | 97 |
| 23 | 196 | 364 | 631 | 418 | 483 | 299 | 292 | 1,630 | 788 | 253 | 663 | 129 |
| 24 | 479 | 396 | 595 | 428 | 483 | 267 | 423 | 2,050 | 770 | 566 | 496 | 215 |
| 25 | 382 | 364 | 389 | 396 | 282 | 219 | 425 | 2,410 | 649 | 430 | 228 | 364 |
| 26 | 447 | 313 | 442 | 541 | 164 | 67 | 427 | 2,010 | 612 | 494 | 290 | 559 |
| 27 | 414 | 351 | 580 | 452 | 399 | 432 | 493 | 2,130 | 468 | 397 | 228 | 227 |
| 28 | 411 | 270 | 663 | 511 | 483 | 409 | 461 | 2,180 | 501 | 593 | 496 | 245 |
| 29 | 411 | 329 | 695 | 131 | ------- | 398 | 372 | 1,990 | 561 | 631 | 566 | 258 |
| 30 | 196 | 290 | 631 | 464 | ------- | 243 | 622 | 2,110 | 727 | 330 | 502 | 161 |
| 31 | 317 | ------- | 629 | 566 | ------- | 212 | ------- | 1,840 | ------- | 722 | 430 | ------- |

| Month | Observed | | | Gain or loss in storage, mean (second-feet) | Corrected for storage[a] | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 528 | 175 | 398 | −192 | 206 | 0.158 | 0.18 |
| November | 442 | 131 | 322 | +561 | 883 | .679 | .76 |
| December | 727 | 345 | 550 | −187 | 363 | .279 | .32 |
| January | 663 | 131 | 465 | −259 | 206 | .158 | .18 |
| February | 566 | 163 | 400 | −242 | 158 | .122 | .13 |
| March | 432 | 67 | 257 | −199 | 58 | .045 | .05 |
| April | 622 | 99 | 369 | +506 | 875 | .673 | .75 |
| May | 2,410 | 770 | 1,430 | +321 | 1,750 | 1.35 | 1.56 |
| June | 1,950 | 468 | 1,150 | +58 | 1,210 | .931 | 1.04 |
| July | 824 | 253 | 545 | −133 | 412 | .317 | .37 |
| August | 748 | 226 | 506 | −435 | 71 | .055 | .06 |
| September | 876 | 97 | 353 | −28 | 325 | .250 | .28 |
| The year | 2,410 | 67 | 564 | −21 | 543 | .418 | 5.68 |

[a] Corrections have been made for storage in the following lakes, the regulation from some being artificial and from others natural: Garden, Farm, Little Farm, White Iron, Birch, Gabbro, Little Gabbro, Bald Eagle, and Camp Six.

### BURNTSIDE LAKE NEAR ELY, MINN.

LOCATION.—Staff gage in SE¼ sec. 23, T. 63 N., R. 13 W., at Burntside Lake Lodge, 6 miles northwest of Ely.
RECORDS AVAILABLE.—August to September 1933.
EXTREMES.—Maximum water-surface elevation during period, 1,370.74 feet Sept. 8–10, 20; minimum, 1,370.53 feet Sept. 7.
REMARKS.—Record furnished by city engineer of Ely. Gage heights have been reduced to mean sea-level datum.

*Elevation, in feet, 1933*

| Day | Aug. | Sept. | Day | Aug. | Sept. | Day | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | | 70.62 | 11 | | | 21 | | 70.70 |
| 2 | | 70.64 | 12 | | 70.70 | 22 | | 70.69 |
| 3 | | | 13 | | 70.68 | 23 | | 70.67 |
| 4 | | | 14 | | 70.66 | 24 | | |
| 5 | | 70.56 | 15 | | 70.64 | 25 | 70.72 | 70.67 |
| 6 | | 70.56 | 16 | | 70.66 | 26 | 70.72 | 70.73 |
| 7 | | 70.53 | 17 | | | 27 | | 70.70 |
| 8 | | 70.74 | 18 | | 70.69 | 28 | | 70.72 |
| 9 | | 70.74 | 19 | | 70.71 | 29 | | 70.71 |
| 10 | | 70.74 | 20 | | 70.74 | 30 | 70.62 | 70.72 |
| | | | | | | 31 | | |

NOTE.—Add 1,300 feet to obtain elevation above mean sea level.

## UPPER MISSISSIPPI RIVER BASIN

### LAKE ITASCA AT LAKE ITASCA, MINN.

LOCATION.—Staff gage in sec. 2, T. 143 N., R. 36 W., on east shore of Lake Itasca, one-eighth mile above outlet and about one-eighth mile from Lake Itasca post office.
RECORDS AVAILABLE.—May to September 1933.
EXTREMES.—Maximum stage during year, 1,474.12 feet May 8, June 30, July 1; minimum, 1,473.76 feet Sept. 5–7.
REMARKS.—Records furnished by Minnesota Division of Forestry. Elevation of lake regulated by dam at outlet and by storage in lakes above.

*Elevation, in feet, 1933*

| Day | May | June | July | Aug. | Sept. | Day | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 74.04 | 74.12 | 73.86 | 73.80 | 16 | 73.96 | 73.96 | 74.04 | 73.78 | 73.84 |
| 2 | | 74.00 | 74.10 | 73.86 | 73.78 | 17 | 73.94 | 73.96 | 74.04 | 73.82 | 73.84 |
| 3 | | 73.96 | 74.10 | 73.84 | 73.78 | 18 | 73.94 | 73.96 | 74.02 | 73.82 | |
| 4 | | 73.96 | 74.10 | 73.82 | 73.78 | 19 | 73.94 | 73.94 | 74.02 | 73.82 | |
| 5 | 74.08 | 73.94 | 74.08 | 73.80 | 73.76 | 20 | 73.96 | 73.94 | 74.02 | 73.82 | 73.86 |
| 6 | 74.06 | 73.96 | 74.06 | 73.80 | 73.76 | 21 | 73.96 | 73.94 | 73.98 | 73.80 | 73.86 |
| 7 | 74.06 | 73.96 | 74.08 | 73.78 | 73.76 | 22 | 73.96 | 73.94 | 73.98 | 73.78 | |
| 8 | 74.12 | 73.96 | 74.08 | 73.78 | 73.82 | 23 | 74.10 | 73.94 | 73.98 | 73.78 | 73.86 |
| 9 | 74.10 | 73.96 | 74.08 | 73.84 | 73.82 | 24 | 74.10 | 73.92 | 73.98 | 73.86 | 73.86 |
| 10 | 74.06 | 73.94 | 74.10 | 73.86 | 73.82 | 25 | 74.08 | 73.94 | 73.96 | 73.86 | |
| 11 | 74.04 | 73.94 | 74.10 | 73.86 | 73.84 | 26 | 74.06 | 73.98 | 73.96 | 73.86 | 73.82 |
| 12 | 74.02 | 73.94 | 74.10 | 73.84 | 73.82 | 27 | 74.04 | 73.98 | 73.92 | 73.86 | |
| 13 | 74.00 | 73.96 | 74.08 | 73.84 | | 28 | 74.06 | 73.98 | 73.92 | 73.84 | |
| 14 | 73.98 | 73.96 | 74.06 | 73.84 | | 29 | 74.08 | 74.06 | 73.92 | 73.84 | 73.78 |
| 15 | 73.96 | 73.96 | 74.04 | 73.78 | | 30 | 74.06 | 74.12 | 73.90 | 73.84 | 73.78 |
| | | | | | | 31 | 74.06 | | 73.88 | 73.82 | |

NOTE.—Add 1,400 feet to obtain elevation above mean sea level.

### MISSISSIPPI RIVER BELOW SANDY RIVER, NEAR LIBBY, MINN.

LOCATION.—Water-stage recorder in sec. 25, T. 50 N., R. 24 W., 600 feet below mouth of Sandy River and three-quarters of a mile northwest of Libby. Zero of gage is 1,204.55 feet above mean sea level (1912 adjustment).

DRAINAGE AREA.—5,060 square miles.

RECORDS AVAILABLE.—April 1930 to September 1933.

DISCHARGE.—Maximum during year, 3,690 second-feet May 23 (gage height, 8.74 feet); minimum, 104 second-feet Dec. 29; minimum gage height, 1.48 feet Sept. 7.

1930–33: Maximum, that of May 23, 1933; minimum, that of Dec. 29, 1932.

REMARKS.—Records excellent except those for period of ice effect, Nov. 17 to Apr. 7, which are fair. Discharge interpolated Feb. 8–11 and Mar. 11–17. Flow regulated by Government reservoirs above.

*Discharge, in second-feet 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 246 | 508 | 672 | 430 | 238 | 241 | 1,300 | 1,800 | 3,060 | 695 | 306 | 185 |
| 2 | 319 | 380 | 695 | 448 | 380 | 348 | 1,400 | 1,900 | 3,000 | 628 | 346 | 188 |
| 3 | 323 | 456 | 770 | 587 | 506 | 376 | 1,500 | 2,100 | 2,840 | 672 | 484 | 172 |
| 4 | 250 | 492 | 845 | 372 | 497 | 398 | 1,440 | 2,200 | 2,890 | 524 | 402 | 271 |
| 5 | 202 | 474 | 920 | 214 | 492 | 443 | 1,170 | 2,140 | 2,620 | 315 | 340 | 186 |
| 6 | 271 | 629 | 578 | 227 | 497 | 492 | 1,070 | 1,940 | 2,240 | 358 | 398 | 141 |
| 7 | 275 | 574 | 358 | 448 | 546 | 412 | 1,170 | 1,940 | 2,200 | 628 | 362 | 131 |
| 8 | 291 | 348 | 605 | 479 | 526 | 259 | 1,340 | 2,040 | 2,040 | 672 | 208 | 205 |
| 9 | 303 | 381 | 695 | 456 | 507 | 315 | 1,270 | 1,900 | 2,000 | 628 | 222 | 211 |
| 10 | 335 | 735 | 650 | 502 | 487 | 348 | 1,140 | 1,900 | 2,040 | 628 | 358 | 220 |
| 11 | 330 | 1,140 | 587 | 307 | 468 | 379 | 1,140 | 1,900 | 2,100 | 533 | 340 | 380 |
| 12 | 220 | 1,440 | 551 | 327 | 448 | 410 | 1,040 | 1,840 | 1,800 | 461 | 323 | 380 |
| 13 | 271 | 1,300 | 452 | 389 | 348 | 441 | 1,020 | 1,900 | 2,000 | 578 | 376 | 384 |
| 14 | 295 | 1,540 | 299 | 416 | 398 | 472 | 945 | 1,940 | 1,600 | 569 | 348 | 528 |
| 15 | 295 | 1,340 | 371 | 628 | 376 | 503 | 895 | 1,940 | 1,500 | 551 | 196 | 587 |
| 16 | 315 | 1,200 | 456 | 438 | 407 | 534 | 945 | 1,700 | 1,440 | 628 | 178 | 628 |
| 17 | 319 | 1,270 | 506 | 217 | 488 | 565 | 1,140 | 1,540 | 1,340 | 582 | 291 | 650 |
| 18 | 329 | 1,300 | 510 | 185 | 492 | 596 | 1,040 | 1,540 | 1,340 | 307 | 319 | 695 |
| 19 | 267 | 1,240 | 479 | 323 | 412 | 582 | 1,140 | 1,500 | 1,300 | 327 | 319 | 605 |
| 20 | 319 | 1,340 | 456 | 389 | 430 | 538 | 1,600 | 1,400 | 945 | 461 | 389 | 510 |
| 21 | 407 | 1,240 | 271 | 448 | 430 | 672 | 1,900 | 1,400 | 795 | 478 | 366 | 592 |
| 22 | 416 | 820 | 311 | 546 | 291 | 672 | 1,540 | 1,500 | 895 | 497 | 201 | 587 |
| 23 | 425 | 628 | 492 | 672 | 323 | 672 | 1,540 | 2,890 | 895 | 592 | 168 | 574 |
| 24 | 474 | 995 | 820 | 578 | 578 | 650 | 1,300 | 3,690 | 895 | 596 | 275 | 542 |
| 25 | 444 | 1,100 | 895 | 287 | 770 | 628 | 1,240 | 3,450 | 845 | 461 | 307 | 605 |
| 26 | 340 | 995 | 695 | 190 | 474 | 672 | 1,500 | 3,110 | 795 | 371 | 311 | 574 |
| 27 | 402 | 970 | 321 | 315 | 384 | 795 | 1,600 | 2,780 | 628 | 564 | 244 | 461 |
| 28 | 443 | 1,040 | 150 | 416 | 252 | 628 | 1,600 | 2,500 | 672 | 600 | 199 | 551 |
| 29 | 492 | 920 | 117 | 569 | ------ | 600 | 1,540 | 2,560 | 845 | 515 | 153 | 596 |
| 30 | 502 | 628 | 289 | 605 | ------ | 870 | 1,600 | 2,840 | 845 | 492 | 133 | 628 |
| 31 | 560 | ------ | 470 | 340 | ------ | 1,170 | ------ | 2,940 | ------ | 533 | 147 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 506 | 202 | 345 | 0.068 | 0.08 |
| November | 1,540 | 348 | 914 | .181 | .20 |
| December | 920 | 117 | 525 | .104 | .12 |
| January | 672 | 185 | 411 | .081 | .09 |
| February | 770 | 238 | 444 | .088 | .09 |
| March | 1,170 | 241 | 538 | .106 | .12 |
| April | 1,900 | 895 | 1,300 | .257 | .29 |
| May | 3,690 | 1,400 | 2,150 | .425 | .49 |
| June | 3,060 | 628 | 1,610 | .318 | .35 |
| July | 695 | 307 | 530 | .105 | .12 |
| August | 484 | 133 | 291 | .058 | .07 |
| September | 695 | 131 | 432 | .085 | .09 |
| The year | 3,690 | 117 | 791 | .156 | 2.11 |

### MISSISSIPPI RIVER NEAR ROYALTON, MINN.

LOCATION.—In lot 2, sec. 20, T. 39 N., R. 32 W., at power plant of Minnesota Power & Light Co. 5 miles northwest of Royalton and 5 miles below mouth of Swan River.

DRAINAGE AREA.—11,600 square miles.

RECORDS AVAILABLE.—March 1924 to September 1933.

DISCHARGE.—Maximum mean daily during year, 9,200 second-feet June 2; minimum, 488 second-feet Aug. 13, 15.

1924–1933: Maximum mean daily, 12,600 second-feet Apr. 22, 1927; minimum, 351 second-feet Jan. 4, 1925.

REMARKS.—Records good except those for periods of high water, which are fair. Flow regulated by Government reservoirs on headwaters. Records collected by Minnesota Power & Light Co., under general supervision of the United States Geological Survey in connection with a Federal Power Commission project.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 960 | 914 | 1,520 | 583 | 792 | 883 | 1,690 | 2,950 | 9,100 | 2.000 | 1,120 | 828 |
| 2 | 617 | 973 | 1,320 | 600 | 808 | 993 | 2,250 | 2,990 | 9,200 | 1.660 | 1,200 | 775 |
| 3 | 617 | 1,090 | 1,420 | 633 | 842 | 858 | 2,810 | 3,060 | 8,980 | 1.780 | 1,110 | 635 |
| 4 | 500 | 1,150 | 1,280 | 633 | 600 | 779 | 3,320 | 3,020 | 8,990 | 1.620 | 820 | 991 |
| 5 | 583 | 1,000 | 1,200 | 700 | 735 | 778 | 2,810 | 3,020 | 8,570 | 1.490 | 924 | 538 |
| 6 | 625 | 867 | 1,210 | 779 | 556 | 743 | 2,850 | 3,430 | 7,720 | 1.520 | 789 | 609 |
| 7 | 504 | 997 | 841 | 717 | 788 | 891 | 2,660 | 3,660 | 7,810 | 1.630 | 900 | 638 |
| 8 | 700 | 1,230 | 992 | 756 | 819 | 945 | 2,680 | 3,560 | 7,280 | 1.430 | 679 | 701 |
| 9 | 633 | 1,490 | 1,060 | 633 | 785 | 875 | 2,670 | 4,150 | 6,760 | 1.180 | 803 | 701 |
| 10 | 550 | 1,540 | 917 | 758 | 888 | 936 | 2,390 | 3,850 | 6,620 | 974 | 841 | 738 |
| 11 | 649 | 1,320 | 736 | 783 | 865 | 875 | 2,400 | 4,120 | 6,050 | 1.700 | 858 | 738 |
| 12 | 533 | 879 | 869 | 721 | 883 | 959 | 2,510 | 3,770 | 5,860 | 1.600 | 658 | 757 |
| 13 | 677 | 1,050 | 928 | 808 | 719 | 987 | 2,740 | 3,960 | 5,390 | 2.340 | 488 | 650 |
| 14 | 658 | 1,530 | 1,020 | 788 | 859 | 913 | 2,090 | 3,820 | 5,270 | 1.830 | 493 | 713 |
| 15 | 698 | 1,260 | 867 | 750 | 839 | 923 | 1,920 | 3,700 | 4,650 | 1.520 | 488 | 563 |
| 16 | 623 | 980 | 783 | 722 | 767 | 965 | 2,120 | 3,990 | 4,550 | 1.490 | 901 | 889 |
| 17 | 739 | 1,080 | 850 | 671 | 744 | 1,040 | 2,270 | 4,000 | 3,980 | 1.200 | 725 | 1,090 |
| 18 | 592 | 1,500 | 755 | 768 | 771 | 1,050 | 2,370 | 4,160 | 3,450 | 1.260 | 675 | 1,160 |
| 19 | 703 | 1,390 | 533 | 864 | 773 | 1,100 | 2,240 | 3,790 | 2,900 | 1.380 | 688 | 1,590 |
| 20 | 817 | 1,430 | 651 | 825 | 660 | 1,120 | 2,640 | 4,180 | 2,960 | 1.410 | 571 | 1,240 |
| 21 | 717 | 1,540 | 733 | 746 | 725 | 1,010 | 2,660 | 3,710 | 3,370 | 1.250 | 683 | 1,260 |
| 22 | 650 | 1,500 | 633 | 667 | 817 | 1,200 | 2,770 | 3,910 | 2,990 | 1.470 | 699 | 1,320 |
| 23 | 916 | 1,580 | 800 | 671 | 742 | 1,180 | 2,420 | 4,220 | 2,650 | 1.510 | 613 | 1,350 |
| 24 | 717 | 1,600 | 700 | 738 | 753 | 1,200 | 2,790 | 3,980 | 2,340 | 1.350 | 663 | 1,110 |
| 25 | 700 | 1,630 | 633 | 808 | 717 | 1,310 | 2,970 | 4,980 | 2,180 | 1.100 | 628 | 1,160 |
| 26 | 835 | 1,230 | 625 | 867 | 700 | 1,340 | 2,820 | 7,170 | 2,200 | 1,320 | 683 | 1,100 |
| 27 | 819 | 937 | 717 | 900 | 600 | 1,220 | 2,480 | 7,730 | 2,050 | 1,320 | 628 | 1,280 |
| 28 | 805 | 1,150 | 883 | 1,090 | 783 | 1,600 | 2,470 | 7,550 | 2,050 | 1,380 | 663 | 1,200 |
| 29 | 1,010 | 1,450 | 1,020 | 875 | ------- | 1,500 | 2,490 | 7,780 | 1,900 | 1,370 | 623 | 1,230 |
| 30 | 980 | 1,470 | 800 | 736 | ------- | 2,060 | 2,820 | 8,120 | 2,000 | 1,240 | 663 | 1,150 |
| 31 | 1,080 | ------- | 700 | 733 | ------- | 1,910 | ------- | 8,650 | ------- | 1,220 | 592 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,080 | 500 | 716 | 0.062 | 0.07 |
| November | 1,630 | 867 | 1,260 | .109 | .12 |
| December | 1,520 | 533 | 903 | .078 | .09 |
| January | 1,090 | 583 | 752 | .065 | .07 |
| February | 888 | 556 | 762 | .066 | .07 |
| March | 2,060 | 743 | 1,100 | .095 | .11 |
| April | 3,320 | 1,690 | 2,540 | .219 | .24 |
| May | 8,650 | 2,950 | 4,550 | .392 | .45 |
| June | 9,200 | 1,900 | 4,990 | .430 | .48 |
| July | 2,340 | 974 | 1,470 | .127 | .15 |
| August | 1,200 | 488 | 738 | .064 | .07 |
| September | 1,590 | 538 | 957 | .082 | .09 |
| The year | 9,200 | 488 | 1,730 | .149 | 2.01 |

### MISSISSIPPI RIVER AT ELK RIVER, MINN.

LOCATION.—Water-stage recorder in SE¼ sec. 34, T. 33 N., R. 26 W. in Elk River, 2,500 feet below mouth of Elk River. Zero of gage is 847.92 feet above mean sea level (1912 adjustment).

DRAINAGE AREA.—14,500 square miles.

RECORDS AVAILABLE.—July 1915 to September 1933.

DISCHARGE.—Maximum during year, 11,800 second-feet June 3 (gage height, 6.51 feet); minimum, 628 second-feet Sept. 15 (gage height, 1.75 feet).

1915–33: Maximum, 27,000 second-feet Apr. 7, 1916 (gage height, 10.8 feet); minimum, that of Sept. 15, 1933. Average discharge, 18 years (1915–33), 4,420 second-feet.

REMARKS.—Records excellent except those for period of ice effect, Nov. 15 to Mar. 30, which are fair. Flow partly regulated by Government reservoirs on headwaters.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,110 | 1,170 | 1,320 | 965 | 952 | 1,130 | 3,860 | 3,440 | 10,800 | 1,970 | 1,380 | 804 |
| 2 | 1,230 | 1,520 | 1,530 | 1,000 | 965 | 926 | 3,440 | 3,440 | 11,500 | 2,020 | 1,470 | 770 |
| 3 | 1,100 | 1,410 | 1,720 | 978 | 978 | 1,180 | 2,820 | 3,860 | 11,100 | 2,100 | 1,090 | 939 |
| 4 | 1,170 | 1,230 | 1,260 | 780 | 978 | 1,360 | 3,440 | 3,760 | 11,500 | 1,970 | 1,460 | 1,130 |
| 5 | 900 | 1,280 | 1,440 | 804 | 1,060 | 1,290 | 4,280 | 3,970 | 11,100 | 1,800 | 1,290 | 864 |
| 6 | 816 | 1,440 | 1,350 | 852 | 952 | 1,300 | 3,760 | 3,970 | 10,500 | 1,940 | 1,230 | 816 |
| 7 | 804 | 1,160 | 965 | 939 | 900 | 1,290 | 3,660 | 4,280 | 9,600 | 1,610 | 965 | 738 |
| 8 | 926 | 1,470 | 876 | 1,130 | 780 | 1,110 | 3,440 | 4,940 | 9,900 | 1,820 | 926 | 748 |
| 9 | 852 | 2,150 | 780 | 1,130 | 804 | 1,130 | 3,240 | 4,940 | 9,290 | 1,880 | 1,030 | 728 |
| 10 | 852 | 1,990 | 939 | 1,070 | 852 | 1,110 | 3,240 | 5,280 | 8,360 | 1,420 | 852 | 965 |
| 11 | 864 | 2,100 | 939 | 900 | 888 | 1,290 | 2,620 | 5,050 | 8,360 | 1,630 | 840 | 876 |
| 12 | 770 | 1,970 | 991 | 804 | 952 | 1,280 | 2,720 | 5,400 | 7,450 | 1,580 | 952 | 804 |
| 13 | 770 | 1,520 | 780 | 828 | 965 | 1,350 | 3,130 | 5,280 | 7,020 | 2,220 | 1,130 | 804 |
| 14 | 978 | 1,260 | 792 | 926 | 1,000 | 1,320 | 3,340 | 5,280 | 6,310 | 2,170 | 900 | 913 |
| 15 | 852 | 816 | 1,040 | 952 | 780 | 1,320 | 2,820 | 4,830 | 6,180 | 2,460 | 828 | 656 |
| 16 | 965 | 1,100 | 1,240 | 1,060 | 864 | 1,400 | 2,620 | 4,940 | 5,520 | 2,080 | 816 | 1,090 |
| 17 | 1,040 | 1,360 | 1,060 | 1,070 | 888 | 1,260 | 2,370 | 5,280 | 5,050 | 1,470 | 696 | 852 |
| 18 | 840 | 1,220 | 965 | 991 | 780 | 1,420 | 2,620 | 5,280 | 4,500 | 1,850 | 748 | 1,100 |
| 19 | 1,060 | 1,630 | 1,070 | 828 | 926 | 1,410 | 2,720 | 5,160 | 4,180 | 1,420 | 816 | 1,320 |
| 20 | 1,090 | 1,440 | 978 | 926 | 888 | 1,600 | 2,820 | 5,160 | 3,660 | 1,380 | 696 | 1,440 |
| 21 | 1,100 | 1,300 | 939 | 978 | 888 | 1,400 | 2,920 | 5,160 | 3,550 | 1,520 | 770 | 1,660 |
| 22 | 1,040 | 1,850 | 939 | 1,040 | 864 | 1,360 | 3,440 | 4,610 | 3,660 | 1,600 | 748 | 1,160 |
| 23 | 1,100 | 2,190 | 1,040 | 1,060 | 852 | 1,600 | 3,240 | 5,050 | 3,340 | 1,440 | 728 | 1,500 |
| 24 | 1,000 | 1,820 | 1,070 | 926 | 939 | 1,660 | 3,020 | 5,280 | 3,240 | 1,970 | 780 | 1,380 |
| 25 | 991 | 2,150 | 1,100 | 900 | 965 | 1,770 | 2,820 | 5,400 | 2,620 | 1,600 | 840 | 1,500 |
| 26 | 1,200 | 1,700 | 978 | 828 | 1,020 | 1,830 | 3,440 | 6,870 | 2,240 | 1,530 | 926 | 1,170 |
| 27 | 1,130 | 1,550 | 965 | 1,000 | 965 | 1,880 | 3,440 | 9,600 | 2,440 | 1,040 | 1,100 | 1,380 |
| 28 | 1,130 | 1,490 | 840 | 1,160 | 926 | 1,870 | 3,020 | 9,600 | 2,350 | 1,530 | 804 | 1,230 |
| 29 | 1,220 | 1,320 | 888 | 978 | ------ | 2,010 | 2,620 | 9,900 | 2,040 | 1,490 | 770 | 1,470 |
| 30 | 1,380 | 1,610 | 1,240 | 1,100 | ------ | 2,720 | 3,020 | 10,200 | 2,200 | 1,500 | 816 | 1,440 |
| 31 | 1,230 | ------ | 1,240 | 1,180 | ------ | 3,440 | ------ | 10,200 | ------ | 1,650 | 728 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,380 | 770 | 1,020 | 0.070 | 0.08 |
| November | 2,190 | 816 | 1,540 | .106 | .12 |
| December | 1,720 | 780 | 1,070 | .074 | .09 |
| January | 1,180 | 780 | 970 | .067 | .08 |
| February | 1,060 | 780 | 913 | .063 | .07 |
| March | 3,440 | 926 | 1,520 | .105 | .12 |
| April | 4,280 | 2,370 | 3,130 | .216 | .24 |
| May | 10,200 | 3,440 | 5,660 | .390 | .45 |
| June | 11,500 | 2,040 | 6,320 | .436 | .49 |
| July | 2,460 | 1,040 | 1,730 | .119 | .14 |
| August | 1,470 | 696 | 940 | .065 | .07 |
| September | 1,660 | 656 | 1,070 | .074 | .08 |
| The year | 11,500 | 656 | 2,160 | .149 | 2.03 |

### MISSISSIPPI RIVER NEAR ANOKA, MINN.

LOCATION.—Water-stage recorder in SW¼ sec. 12, T. 119 N., R. 21 W., half a mile below Coon Creek, 1½ miles downstream from Coon Rapids hydroelectric plant of Northern States Power Co., and 6½ miles downstream from Anoka. Prior to June 14, 1932, a water-stage recorder above Coon Creek was used.

DRAINAGE AREA.—19,100 square miles (19,000 square miles used prior to June 14, 1932).

RECORDS AVAILABLE.—June 1931 to September 1933.

DISCHARGE.—Maximum during year, 12,500 second-feet June 5 (gage height, 5.56 feet); minimum, 830 second-feet Sept. 8 (gage height, 0.64 foot).

1931–33: Maximum, that of June 5, 1933; minimum, that of Sept. 8, 1933.

REMARKS.—Records excellent. Discharge from power-house records Dec. 6 to Mar. 21. Discharge estimated Nov. 15, 19, 20, 26, and 27. Flow partly regulated by Government reservoirs on headwaters.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,180 | 1,280 | 1,670 | 1,100 | 1,230 | 1,640 | 4,420 | 3,880 | 11,200 | 2,020 | 1,630 | 880 |
| 2 | 1,320 | 1,590 | 1,690 | 1,120 | 1,040 | 1,690 | 4,310 | 3,880 | 11,800 | 2,060 | 1,560 | 1,010 |
| 3 | 1,230 | 1,590 | 1,980 | 1,180 | 1,090 | 1,690 | 3,780 | 4,200 | 12,200 | 2,290 | 1,330 | 902 |
| 4 | 1,180 | 1,470 | 1,800 | 937 | 1,070 | 1,990 | 3,880 | 4,200 | 11,500 | 1,910 | 1,440 | 1,320 |
| 5 | 1,120 | 1,370 | 1,570 | 932 | 1,120 | 2,020 | 4,860 | 4,310 | 11,800 | 2,000 | 1,400 | 1,170 |
| 6 | 1,010 | 1,710 | 1,790 | 952 | 1,140 | 1,980 | 4,750 | 4,310 | 11,200 | 1,990 | 1,360 | 945 |
| 7 | 963 | 1,280 | 1,170 | 1,030 | 936 | 2,000 | 4,200 | 4,530 | 9,980 | 1,940 | 1,210 | 969 |
| 8 | 964 | 1,630 | 949 | 1,150 | 926 | 1,840 | 4,200 | 5,580 | 9,980 | 1,720 | 1,020 | 858 |
| 9 | 1,030 | 2,180 | 927 | 1,180 | 877 | 1,470 | 3,880 | 5,710 | 9,380 | 2,010 | 1,140 | 910 |
| 10 | 976 | 2,400 | 935 | 1,180 | 962 | 1,650 | 3,880 | 6,100 | 8,800 | 1,700 | 1,190 | 986 |
| 11 | 1,030 | 2,150 | 1,360 | 1,030 | 1,010 | 1,710 | 3,280 | 6,100 | 8,800 | 1,640 | 1,020 | 1,090 |
| 12 | 947 | 2,170 | 1,180 | 937 | 1,170 | 1,750 | 3,280 | 6,360 | 7,680 | 1,810 | 1,050 | 958 |
| 13 | 955 | 1,750 | 1,180 | 950 | 1,030 | 1,830 | 3,580 | 6,490 | 7,680 | 2,120 | 1,060 | 904 |
| 14 | 963 | 1,240 | 970 | 1,020 | 1,160 | 1,710 | 3,780 | 6,490 | 6,880 | 2,180 | 1,210 | 1,110 |
| 15 | 1,220 | 1,050 | 1,150 | 1,080 | 1,050 | 1,730 | 3,480 | 5,840 | 6,490 | 2,570 | 990 | 892 |
| 16 | 976 | 1,300 | 1,280 | 1,170 | 961 | 1,810 | 3,280 | 5,710 | 6,230 | 2,380 | 982 | 1,200 |
| 17 | 1,250 | 1,540 | 1,140 | 1,230 | 1,070 | 1,860 | 2,980 | 5,840 | 5,460 | 1,700 | 982 | 1,070 |
| 18 | 1,060 | 1,660 | 1,050 | 1,130 | 1,080 | 1,840 | 3,080 | 6,230 | 4,980 | 1,780 | 926 | 1,110 |
| 19 | 1,170 | 1,900 | 1,210 | 963 | 1,020 | 1,760 | 2,980 | 6,100 | 4,420 | 1,730 | 894 | 1,530 |
| 20 | 1,220 | 1,800 | 1,120 | 1,060 | 1,050 | 1,770 | 3,480 | 5,710 | 3,980 | 1,480 | 903 | 1,400 |
| 21 | 1,250 | 1,660 | 1,070 | 1,060 | 1,100 | 1,940 | 3,280 | 5,840 | 3,660 | 1,570 | 868 | 1,900 |
| 22 | 1,200 | 2,000 | 996 | 1,140 | 940 | 1,800 | 3,980 | 5,460 | 3,730 | 1,640 | 848 | 1,380 |
| 23 | 1,280 | 2,470 | 1,180 | 1,150 | 1,010 | 1,880 | 3,580 | 5,580 | 3,440 | 1,720 | 846 | 1,450 |
| 24 | 1,180 | 2,060 | 1,180 | 1,140 | 1,080 | 1,980 | 3,580 | 5,970 | 3,530 | 1,920 | 875 | 1,590 |
| 25 | 1,180 | 2,390 | 1,210 | 997 | 1,140 | 2,030 | 3,180 | 6,230 | 2,780 | 1,830 | 1,010 | 1,570 |
| 26 | 1,270 | 2,100 | 1,120 | 957 | 1,290 | 2,070 | 3,580 | 7,140 | 2,580 | 1,650 | 926 | 1,470 |
| 27 | 1,340 | 1,800 | 1,100 | 1,060 | 1,280 | 2,080 | 4,090 | 9,680 | 2,460 | 1,380 | 1,170 | 1,320 |
| 28 | 1,270 | 1,550 | 1,030 | 1,260 | 1,380 | 2,340 | 3,480 | 9,980 | 2,550 | 1,410 | 1,190 | 1,370 |
| 29 | 1,250 | 1,630 | 968 | 1,140 | ------- | 2,500 | 3,180 | 10,600 | 2,190 | 1,620 | 914 | 1,490 |
| 30 | 1,550 | 1,680 | 1,350 | 1,140 | ------- | 3,380 | 3,280 | 10,600 | 2,370 | 1,610 | 908 | 1,650 |
| 31 | 1,430 | ------- | 1,380 | 1,240 | ------- | 3,580 | ------- | 10,900 | ------- | 1,690 | 918 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,550 | 947 | 1,160 | 0.061 | 0.07 |
| November | 2,470 | 1,050 | 1,750 | .092 | .10 |
| December | 1,980 | 927 | 1,250 | .065 | .07 |
| January | 1,260 | 932 | 1,080 | .057 | .07 |
| February | 1,380 | 877 | 1,080 | .057 | .06 |
| March | 3,580 | 1,470 | 1,980 | .104 | .12 |
| April | 4,860 | 2,980 | 3,690 | .193 | .22 |
| May | 10,900 | 3,880 | 6,310 | .330 | .38 |
| June | 12,200 | 2,190 | 6,660 | .349 | .39 |
| July | 2,570 | 1,380 | 1,840 | .096 | .11 |
| August | 1,630 | 846 | 1,090 | .057 | .07 |
| September | 1,900 | 858 | 1,210 | .063 | .07 |
| The year | 12,200 | 846 | 2,430 | .127 | 1.73 |

### MISSISSIPPI RIVER AT ST. PAUL, MINN.

LOCATION.—Staff gage in St. Paul, 6 miles below mouth of Minnesota River. Prior to Mar. 11, 1933, water-stage recorder was used. Zero of gage is 684.16 feet above mean sea level.

DRAINAGE AREA.—36,800 square miles.

RECORDS AVAILABLE.—March 1887 to September 1933.

DISCHARGE.—Maximum mean daily, 14,400 second-feet Apr. 6; minimum, 1,020 second-feet Aug. 31.

1887–1933: Maximum, 80,800 second-feet Apr. 6, 1897 (gage height, 18.0 feet); minimum, that of Aug. 31, 1933.

Maximum known, 117,000 second-feet July 22, 1867. Average discharge, 41 years (1892–1933), 9,390 second-feet.

REMARKS.—Records fair. Discharge determined from records of the Mississippi River above Minnesota River and of the Minnesota River. Partial regulation by Government reservoirs on headwaters. Regulation negligible during summer of 1933. Gage in backwater of Hastings Dam.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,610 | 1,690 | 2,320 | 1,550 | 2,170 | 4,240 | 8,950 | 5,630 | 12,000 | 2,560 | 2,030 | 1,140 |
| 2 | 1,540 | 1,860 | 2,190 | 1,470 | 1,670 | 4,770 | 10,000 | 5,520 | 12,100 | 2,560 | 1,980 | 1,220 |
| 3 | 1,690 | 1,920 | 2,450 | 1,600 | 1,600 | 4,990 | 10,200 | 5,680 | 12,400 | 2,710 | 1,960 | 1,320 |
| 4 | 1,480 | 2,070 | 2,270 | 1,400 | 1,500 | 5,650 | 11,000 | 5,760 | 11,800 | 2,420 | 1,560 | 1,630 |
| 5 | 1,610 | 1,750 | 2,120 | 1,300 | 1,480 | 5,550 | 13,700 | 5,620 | 12,200 | 2,500 | 1,810 | 1,380 |
| 6 | 1,380 | 2,010 | 2,260 | 1,290 | 1,550 | 5,100 | 14,400 | 5,750 | 11,600 | 2,300 | 1,710 | 1,290 |
| 7 | 1,330 | 1,750 | 1,580 | 1,330 | 1,510 | 4,690 | 13,400 | 6,260 | 10,800 | 2,580 | 1,700 | 1,060 |
| 8 | 1,280 | 2,480 | 1,480 | 1,450 | 1,370 | 4,370 | 13,300 | 7,380 | 10,000 | 2,050 | 1,380 | 1,090 |
| 9 | 1,430 | 2,590 | 1,330 | 1,540 | 1,440 | 3,790 | 11,800 | 7,300 | 9,700 | 2,400 | 1,310 | 1,120 |
| 10 | 1,280 | 3,080 | 1,530 | 1,640 | 1,500 | 3,680 | 11,400 | 7,060 | 9,130 | 2,820 | 1,480 | 1,530 |
| 11 | 1,420 | 2,510 | 1,520 | 1,490 | 1,510 | 3,540 | 10,000 | 7,380 | 9,190 | 2,200 | 1,330 | 1,500 |
| 12 | 1,330 | 2,620 | 1,710 | 1,270 | 1,570 | 3,470 | 9,410 | 7,370 | 8,830 | 2,130 | 1,300 | 1,240 |
| 13 | 1,420 | 2,230 | 1,630 | 1,240 | 1,730 | 3,770 | 8,750 | 7,930 | 8,370 | 2,470 | 1,390 | 1,200 |
| 14 | 1,320 | 1,570 | 1,480 | 1,340 | 1,630 | 3,830 | 8,490 | 7,440 | 7,710 | 2,870 | 1,520 | 1,260 |
| 15 | 1,410 | 1,740 | 1,410 | 1,420 | 1,740 | 3,760 | 7,770 | 7,500 | 7,190 | 2,760 | 1,480 | 1,410 |
| 16 | 1,280 | 1,500 | 1,610 | 1,560 | 1,420 | 3,650 | 7,010 | 7,060 | 7,100 | 2,890 | 1,360 | 1,610 |
| 17 | 1,460 | 1,930 | 1,640 | 1,490 | 1,480 | 3,550 | 6,390 | 7,060 | 6,350 | 2,860 | 1,320 | 1,530 |
| 18 | 1,500 | 2,100 | 1,380 | 1,630 | 1,490 | 3,520 | 6,020 | 7,520 | 5,580 | 1,830 | 1,330 | 1,200 |
| 19 | 1,320 | 2,110 | 1,560 | 1,390 | 1,470 | 3,410 | 5,620 | 7,940 | 4,910 | 2,250 | 1,230 | 2,000 |
| 20 | 1,530 | 2,130 | 1,620 | 1,390 | 1,480 | 3,140 | 5,790 | 7,030 | 4,400 | 1,830 | 1,100 | 1,700 |
| 21 | 1,570 | 1,890 | 1,520 | 1,460 | 1,400 | 3,590 | 5,540 | 7,080 | 4,310 | 1,800 | 1,070 | 2,100 |
| 22 | 1,650 | 2,320 | 1,440 | 1,650 | 1,460 | 3,520 | 6,040 | 7,030 | 4,300 | 1,830 | 1,180 | 1,870 |
| 23 | 1,480 | 2,780 | 1,440 | 1,520 | 1,570 | 3,570 | 5,610 | 6,690 | 4,170 | 2,250 | 1,170 | 1,430 |
| 24 | 1,530 | 2,580 | 1,790 | 1,520 | 1,830 | 3,890 | 5,790 | 7,510 | 4,100 | 2,060 | 1,140 | 1,980 |
| 25 | 1,520 | 2,810 | 1,550 | 1,440 | 2,270 | 3,820 | 5,250 | 7,540 | 3,520 | 2,250 | 1,120 | 1,920 |
| 26 | 1,550 | 2,550 | 1,520 | 1,620 | 2,430 | 3,480 | 5,180 | 7,900 | 3,090 | 2,030 | 1,110 | 1,980 |
| 27 | 1,540 | 2,160 | 1,500 | 1,640 | 3,200 | 3,480 | 5,770 | 10,200 | 2,940 | 1,730 | 1,400 | 1,280 |
| 28 | 1,610 | 2,100 | 1,540 | 1,900 | 3,780 | 3,990 | 5,370 | 10,900 | 2,990 | 1,370 | 1,620 | 1,690 |
| 29 | 1,860 | 2,080 | 1,390 | 2,070 | ------- | 4,120 | 5,110 | 11,700 | 2,910 | 1,710 | 1,200 | 1,520 |
| 30 | 1,630 | 2,140 | 1,580 | 2,050 | ------- | 6,460 | 4,760 | 11,100 | 2,710 | 1,730 | 1,040 | 1,930 |
| 31 | 1,990 | ------- | 1,770 | 2,140 | ------- | 7,100 | ------- | 11,600 | ------- | 2,110 | 1,020 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,990 | 1,280 | 1,500 | 0.041 | 0.05 |
| November | 3,080 | 1,500 | 2,170 | .059 | .07 |
| December | 2,450 | 1,330 | 1,680 | .046 | .05 |
| January | 2,140 | 1,240 | 1,540 | .042 | .05 |
| February | 3,780 | 1,370 | 1,760 | .048 | .05 |
| March | 7,100 | 3,140 | 4,180 | .114 | .13 |
| April | 14,400 | 4,760 | 8,260 | .224 | .25 |
| May | 11,700 | 5,520 | 7,590 | .206 | .24 |
| June | 12,400 | 2,710 | 7,210 | .196 | .22 |
| July | 2,890 | 1,370 | 2,240 | .061 | .07 |
| August | 2,030 | 1,020 | 1,400 | .038 | .04 |
| September | 2,100 | 1,060 | 1,500 | .041 | .05 |
| The year | 14,400 | 1,020 | 3,420 | .093 | 1.27 |

### MISSISSIPPI RIVER AT PRESCOTT, WIS.

LOCATION.—Water-gage recorder in sec. 9, T. 26 N., R. 20 W., in Prescott, 200 feet below mouth of St. Croix River. Zero of gage is 669.28 feet above mean sea level (1912 adjustment).

DRAINAGE AREA.—45,000 square miles.

RECORDS AVAILABLE.—June 1928 to September 1933.

DISCHARGE.—Maximum, 19,800 second-feet Apr. 7 (gage height, 6.32 feet); minimum, 2,520 second-feet Sept. 1 (gage height, —3.59 feet).

1928–33: Maximum, 49,600 second-feet Mar. 25, 1929 (gage height, 12.3 feet); minimum, that of Sept. 1, 1933.

REMARKS.—Records excellent except those for periods of backwater from ice, Nov. 23 to Mar. 31, and of backwater from debris, Aug. 17 to Sept. 6, which are fair. Flow partly regulated by reservoirs and power plants above.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3,490 | 3,850 | 4,470 | 3,490 | 3,950 | 6,620 | 10,700 | 9,740 | 16,800 | 4,630 | 3,670 | 2,520 |
| 2 | 3,490 | 3,950 | 4,470 | 3,490 | 4,050 | 7,040 | 12,300 | 9,560 | 17,400 | 4,690 | 3,670 | 2,800 |
| 3 | 3,490 | 3,850 | 4,470 | 3,490 | 3,950 | 7,620 | 13,800 | 9,560 | 18,000 | 4,470 | 3,760 | 2,800 |
| 4 | 3,490 | 4,250 | 4,580 | 3,490 | 3,850 | 7,920 | 15,200 | 10,100 | 18,600 | 4,470 | 3,580 | 2,940 |
| 5 | 3,410 | 4,150 | 4,360 | 3,490 | 3,760 | 8,070 | 16,500 | 11,100 | 18,600 | 4,360 | 3,490 | 3,410 |
| 6 | 3,330 | 4,150 | 4,150 | 3,410 | 3,760 | 7,920 | 18,300 | 11,500 | 18,300 | 4,250 | 3,410 | 3,410 |
| 7 | 3,330 | 4,250 | 3,950 | 3,410 | 3,670 | 7,620 | 19,800 | 11,300 | 18,300 | 4,150 | 3,410 | 3,330 |
| 8 | 3,410 | 4,470 | 3,850 | 3,410 | 3,580 | 7,320 | 19,500 | 11,700 | 17,100 | 4,150 | 3,330 | 3,330 |
| 9 | 3,330 | 4,930 | 3,850 | 3,330 | 3,580 | 6,900 | 19,500 | 12,900 | 15,700 | 4,050 | 3,250 | 3,330 |
| 10 | 3,410 | 5,290 | 3,760 | 3,330 | 3,410 | 7,040 | 18,900 | 13,600 | 15,200 | 4,150 | 3,170 | 3,250 |
| 11 | 3,330 | 5,540 | 3,670 | 3,330 | 3,410 | 7,040 | 17,700 | 13,400 | 14,300 | 4,580 | 3,090 | 3,410 |
| 12 | 3,330 | 5,410 | 3,580 | 3,410 | 3,410 | 6,900 | 16,300 | 13,400 | 13,100 | 4,580 | 3,090 | 3,410 |
| 13 | 3,330 | 5,670 | 3,490 | 3,490 | 3,330 | 6,620 | 14,800 | 13,600 | 11,900 | 4,470 | 3,010 | 3,330 |
| 14 | 3,250 | 5,800 | 3,410 | 3,410 | 3,250 | 6,200 | 13,600 | 13,400 | 11,300 | 4,470 | 2,940 | 3,250 |
| 15 | 3,410 | 5,410 | 3,410 | 3,410 | 3,330 | 6,060 | 13,400 | 12,900 | 11,100 | 4,470 | 2,870 | 3,250 |
| 16 | 3,490 | 5,050 | 3,330 | 3,330 | 3,330 | 6,060 | 13,100 | 12,500 | 10,500 | 4,470 | 2,870 | 3,410 |
| 17 | 3,330 | 4,690 | 3,330 | 3,250 | 3,330 | 6,060 | 12,500 | 12,500 | 10,100 | 4,470 | 2,870 | 3,490 |
| 18 | 3,490 | 4,690 | 3,330 | 3,250 | 3,330 | 6,200 | 11,500 | 12,500 | 9,740 | 4,260 | 2,800 | 3,330 |
| 19 | 3,490 | 4,580 | 3,250 | 3,250 | 3,330 | 6,200 | 11,300 | 13,600 | 8,860 | 4,150 | 2,730 | 3,490 |
| 20 | 3,760 | 4,470 | 3,250 | 3,250 | 3,330 | 6,060 | 11,900 | 13,800 | 8,380 | 4,150 | 2,660 | 3,490 |
| 21 | 3,580 | 4,470 | 3,330 | 3,170 | 3,250 | 5,800 | 11,900 | 14,300 | 7,770 | 4,050 | 2,660 | 3,330 |
| 22 | 3,670 | 4,250 | 3,330 | 3,490 | 3,250 | 5,930 | 11,500 | 13,600 | 7,180 | 3,850 | 2,660 | 3,580 |
| 23 | 3,760 | 4,470 | 3,330 | 3,850 | 3,250 | 6,060 | 11,700 | 12,500 | 6,900 | 3,950 | 2,590 | 3,490 |
| 24 | 3,670 | 4,360 | 3,330 | 3,850 | 3,490 | 6,060 | 11,300 | 12,700 | 6,760 | 3,850 | 2,660 | 3,490 |
| 25 | 3,670 | 4,470 | 3,410 | 3,950 | 3,850 | 6,060 | 11,100 | 12,700 | 6,480 | 3,850 | 2,660 | 3,490 |
| 26 | 3,670 | 4,470 | 3,330 | 3,950 | 4,360 | 5,930 | 10,900 | 12,900 | 6,200 | 3,850 | 2,660 | 3,760 |
| 27 | 3,760 | 4,580 | 3,330 | 3,950 | 5,050 | 5,930 | 10,700 | 12,900 | 5,800 | 3,850 | 2,590 | 3,580 |
| 28 | 3,670 | 4,470 | 3,250 | 3,850 | 5,930 | 6,060 | 10,700 | 14,300 | 5,540 | 3,670 | 2,730 | 3,580 |
| 29 | 3,850 | 4,470 | 3,330 | 3,950 | ------- | 6,480 | 10,300 | 16,000 | 5,290 | 3,580 | 2,730 | 3,490 |
| 30 | 3,760 | 4,360 | 3,330 | 3,950 | ------- | 7,920 | 10,100 | 17,100 | 5,050 | 3,490 | 2,660 | 3,580 |
| 31 | 3,850 | ------- | 3,490 | 3,850 | ------- | 9,920 | ------- | 17,100 | ------- | 3,490 | 2,590 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 3,850 | 3,250 | 3,530 | 0.078 | 0.09 |
| November | 5,800 | 3,850 | 4,630 | .103 | .11 |
| December | 4,580 | 3,250 | 3,640 | .081 | .09 |
| January | 3,950 | 3,170 | 3,530 | .078 | .09 |
| February | 5,930 | 3,250 | 3,690 | .082 | .09 |
| March | 9,920 | 5,800 | 6,760 | .150 | .17 |
| April | 19,800 | 10,100 | 13,700 | .304 | .34 |
| May | 17,100 | 9,560 | 12,900 | .287 | .33 |
| June | 18,600 | 5,050 | 11,500 | .256 | .29 |
| July | 4,930 | 3,490 | 4,170 | .093 | .11 |
| August | 3,760 | 2,590 | 3,000 | .067 | .08 |
| September | 3,760 | 2,520 | 3,340 | .074 | .08 |
| The year | 19,800 | 2,520 | 6,200 | .138 | 1.87 |

### MISSISSIPPI RIVER AT WINONA, MINN.

LOCATION.—Staff gage in sec. 23, T. 107 N., R. 7 W., on stone pier at right end of highway bridge at Winona. Zero of gage is 640.12 feet above mean sea level (1912 adjustment).

DRAINAGE AREA.—59,200 square miles.

RECORDS AVAILABLE.—June 1928 to September 1933.

DISCHARGE.—Maximum, 38,600 second-feet Apr. 13, 14 (gage height, 6.62 feet); minimum, 5,430 second-feet Sept. 1 (gage height, −2.47 feet).

1928–33: Maximum, 78,300 second-feet Apr. 3, 4, 1929 (gage height, 11.50 feet); minimum, that of Sept. 1, 1933.

REMARKS.—Records excellent except those for period affected by ice, Nov. 14 to Mar. 5, which are fair. Flow partly regulated by reservoirs and power plants above.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7,000 | 7,400 | 8,600 | 6,010 | 12,600 | 23,600 | 31,600 | 22,200 | 23,600 | 12,100 | 8,200 | 5,430 |
| 2 | 7,000 | 7,400 | 8,600 | 6,600 | 12,800 | 23,600 | 33,300 | 21,300 | 23,100 | 12,100 | 8,000 | 5,620 |
| 3 | 7,000 | 7,200 | 8,400 | 6,800 | 12,800 | 23,600 | 31,000 | 20,900 | 23,600 | 11,600 | 8,000 | 5,820 |
| 4 | 7,000 | 7,200 | 8,400 | 7,200 | 12,100 | 23,600 | 27,700 | 21,300 | 24,600 | 11,100 | 8,000 | 5,820 |
| 5 | 7,000 | 7,600 | 8,600 | 7,000 | 11,100 | 23,100 | 27,200 | 22,700 | 25,100 | 10,900 | 8,000 | 6,210 |
| 6 | 7,000 | 7,600 | 8,600 | 7,000 | 10,700 | 22,700 | 28,800 | 24,100 | 25,100 | 10,700 | 7,800 | 7,000 |
| 7 | 7,000 | 7,600 | 8,600 | 7,200 | 10,200 | 20,400 | 30,500 | 24,600 | 25,100 | 10,200 | 7,600 | 7,000 |
| 8 | 7,000 | 8,000 | 8,400 | 7,200 | 9,500 | 19,600 | 31,600 | 25,100 | 26,600 | 10,000 | 7,600 | 6,800 |
| 9 | 7,000 | 8,400 | 8,000 | 7,000 | 9,500 | 19,200 | 33,800 | 24,600 | 26,100 | 9,700 | 7,400 | 6,800 |
| 10 | 7,000 | 8,400 | 7,600 | 7,200 | 9,000 | 18,800 | 36,200 | 24,100 | 25,600 | 9,500 | 7,200 | 6,800 |
| 11 | 7,000 | 8,800 | 7,200 | 6,800 | 9,000 | 18,000 | 37,400 | 24,600 | 25,600 | 9,300 | 7,000 | 7,400 |
| 12 | 7,000 | 9,000 | 6,800 | 6,210 | 8,800 | 17,000 | 38,600 | 25,100 | 25,100 | 9,300 | 7,000 | 7,400 |
| 13 | 6,800 | 9,300 | 6,600 | 6,600 | 9,000 | 17,300 | 38,600 | 25,100 | 24,600 | 9,300 | 6,800 | 7,000 |
| 14 | 6,800 | 9,300 | 6,600 | 6,800 | 9,000 | 17,300 | 38,000 | 25,600 | 23,100 | 9,500 | 6,800 | [a]6,900 |
| 15 | 6,800 | 9,300 | 6,400 | 6,800 | 9,000 | 16,600 | 36,200 | 25,600 | 21,800 | 9,500 | 6,600 | [a]6,800 |
| 16 | 7,000 | 9,300 | 6,210 | 7,000 | 9,000 | 16,600 | 34,400 | 25,100 | 20,900 | 9,300 | 6,400 | [a]6,900 |
| 17 | 7,200 | 9,300 | 6,010 | 7,200 | 9,000 | 17,000 | 32,200 | 24,100 | 20,400 | 9,000 | 6,400 | 7,200 |
| 18 | 7,000 | 9,300 | 6,210 | 6,800 | 9,300 | 17,000 | 30,500 | 24,100 | 19,600 | [a]9,000 | 6,600 | 7,400 |
| 19 | 7,000 | 9,000 | 6,210 | 7,000 | 9,000 | 17,000 | 28,800 | 24,100 | 18,800 | 8,800 | 6,400 | 7,000 |
| 20 | 7,200 | 8,800 | 6,210 | 7,000 | 9,300 | 17,000 | 27,200 | 25,100 | 18,000 | 8,600 | 6,210 | 7,200 |
| 21 | 7,400 | 8,800 | 6,400 | 7,000 | 9,300 | 17,000 | 26,100 | 25,100 | 17,300 | 8,800 | 6,010 | 7,200 |
| 22 | 7,400 | 8,600 | 6,400 | 8,200 | 9,500 | 17,000 | 26,100 | 24,600 | 16,600 | [a]8,700 | 6,010 | 6,800 |
| 23 | 7,200 | 9,000 | 6,400 | 11,800 | 9,700 | 17,000 | 26,100 | 24,100 | 16,000 | [a]8,000 | 5,820 | 6,800 |
| 24 | 7,400 | 8,800 | 6,800 | 15,100 | 11,100 | 16,000 | 25,600 | 23,100 | 15,400 | [a]8,500 | 5,820 | 6,800 |
| 25 | 7,400 | 8,400 | 7,400 | 15,100 | 13,600 | 16,000 | 25,600 | 23,100 | 14,800 | [a]8,300 | 5,820 | 6,800 |
| 26 | 7,400 | 8,400 | 7,600 | 14,500 | 15,700 | 16,000 | 25,100 | 23,100 | 14,500 | [a]8,000 | 5,820 | 7,000 |
| 27 | 7,400 | 8,400 | 7,600 | 14,200 | 18,800 | 15,700 | 24,100 | 22,700 | 13,900 | [a]7,800 | 5,820 | 7,000 |
| 28 | 7,400 | 8,600 | 7,400 | 13,900 | 22,200 | 15,400 | 23,100 | 22,200 | 13,300 | [a]7,800 | 5,620 | 7,000 |
| 29 | 7,400 | 8,600 | 7,200 | 13,600 | ------- | 16,000 | 22,700 | 22,200 | 12,800 | [a]8,400 | 5,620 | 7,000 |
| 30 | 7,600 | 8,800 | 7,200 | 13,100 | ------- | 18,000 | 22,200 | 23,100 | 12,300 | 8,200 | 5,620 | 6,800 |
| 31 | 7,400 | ------- | 6,600 | 12,600 | ------- | 27,700 | ------- | 23,100 | ------- | 8,200 | 5,620 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 7,600 | 6,800 | 7,140 | 0.121 | 0.14 |
| November | 9,300 | 7,200 | 8,490 | .143 | .16 |
| December | 8,600 | 6,010 | 7,270 | .123 | .14 |
| January | 15,100 | 6,010 | 8,920 | .151 | .17 |
| February | 22,200 | 8,800 | 11,100 | .188 | .20 |
| March | 27,700 | 15,400 | 18,700 | .316 | .36 |
| April | 38,600 | 22,200 | 30,000 | .507 | .57 |
| May | 25,600 | 20,900 | 23,700 | .400 | .46 |
| June | 26,100 | 12,300 | 20,400 | .345 | .38 |
| July | 12,100 | 8,200 | 9,620 | .162 | .19 |
| August | 8,200 | 5,620 | 6,700 | .113 | .13 |
| September | 7,400 | 5,430 | 6,790 | .115 | .13 |
| The year | 38,600 | 5,430 | 13,200 | .223 | 3.03 |

[a] Estimated.

### MISSISSIPPI RIVER AT LA CROSSE, WIS.

LOCATION.—Staff gage in sec. 31, T. 16 N., R. 7 W., on left pier of wagon bridge in La Crosse. Zero of the gage used Oct. 1 to Feb. 17 was 626.43 feet above mean sea level (1912 adjustment). Zero of gage used Feb. 18 to Sept. 30 was 626.32 feet above mean sea level (1912 adjustment).

DRAINAGE AREA.—62,800 square miles.

RECORDS AVAILABLE.—June 1929 to September 1933.

DISCHARGE.—Maximum during year, 45,900 second-feet Apr. 2 (gage height, 9.09 feet); minimum, 6,400 second-feet Aug. 31, Sept. 1 and 2 (gage height, −2.22 feet).

1929–33: Maximum, 64,800 second-feet Apr. 15 and 16, 1932; minimum, that of Aug. 31, Sept. 1 and 2, 1933.

Maximum stage known, 16.2 feet June 19, 1880.

REMARKS.—Records good except those for period of ice effect, Nov. 23 to Mar. 18, and for period of backwater from Root River flood, Apr. 1–4, which are fair. Flow partly regulated by reservoirs and power plants above.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8,040 | 8,610 | 9,600 | 6,960 | 14,800 | 26,000 | 43,000 | 25,000 | 26,000 | 14,000 | 9,400 | 6,400 |
| 2 | 8,040 | 8,610 | 9,600 | 7,500 | 15,100 | 26,500 | 45,900 | 25,000 | 26,500 | 14,700 | 9,400 | 6,400 |
| 3 | 8,040 | 8,610 | 9,400 | 7,500 | 14,800 | 26,500 | 44,500 | 25,000 | 27,000 | 14,200 | 9,400 | 6,400 |
| 4 | 8,040 | 8,610 | 9,400 | 7,860 | 13,700 | 26,500 | 42,400 | 25,000 | 27,000 | 13,400 | 9,400 | 6,600 |
| 5 | 8,040 | 8,610 | 9,600 | 8,040 | 12,200 | 26,000 | 41,700 | 26,000 | 27,500 | 12,700 | 9,180 | 7,000 |
| 6 | 8,040 | 8,800 | 9,600 | 7,860 | 11,700 | 25,000 | 40,300 | 27,500 | 27,500 | 12,200 | 8,960 | 7,860 |
| 7 | 7,860 | 9,000 | 9,400 | 8,040 | 11,200 | 23,000 | 41,000 | 28,500 | 27,500 | 11,700 | 8,740 | 8,520 |
| 8 | 8,040 | 9,200 | 9,400 | 8,040 | 10,800 | 21,800 | 40,300 | 28,500 | 27,500 | 11,400 | 8,520 | 8,300 |
| 9 | 8,040 | 9,600 | 8,800 | 7,860 | 10,600 | 21,000 | 40,300 | 28,500 | 27,500 | 11,200 | 8,520 | 7,860 |
| 10 | 8,040 | 10,000 | 8,420 | 8,040 | 10,000 | 20,600 | 42,400 | 28,000 | 28,000 | 11,000 | 8,300 | 7,860 |
| 11 | 8,040 | 10,200 | 7,860 | 7,500 | 10,000 | 19,800 | 43,800 | 28,000 | 28,000 | 10,700 | 8,080 | 8,300 |
| 12 | 8,040 | 10,400 | 7,680 | 6,960 | 10,200 | 19,000 | 43,800 | 29,000 | 27,500 | 10,700 | 8,080 | 9,180 |
| 13 | 8,040 | 10,600 | 7,140 | 7,320 | 10,000 | 19,000 | 44,500 | 30,100 | 27,000 | 10,700 | 7,860 | 9,400 |
| 14 | 8,040 | 10,800 | 7,140 | 7,500 | 10,000 | 19,400 | 44,500 | 30,700 | 26,000 | 10,500 | 7,640 | 8,960 |
| 15 | 8,040 | 10,600 | 6,960 | 7,500 | 10,000 | 19,400 | 43,800 | 30,100 | 25,000 | 10,700 | 7,640 | 8,520 |
| 16 | 8,040 | 10,600 | 6,790 | 7,860 | 10,000 | 19,000 | 41,700 | 30,100 | 24,000 | 10,700 | 7,420 | 8,300 |
| 17 | 8,040 | 10,600 | 6,790 | 8,040 | 10,000 | 18,600 | 39,700 | 29,500 | 22,600 | 10,500 | 7,640 | 8,080 |
| 18 | 8,230 | 10,600 | 6,960 | 7,500 | 9,840 | 19,000 | 37,300 | 29,000 | 21,800 | 10,300 | 8,080 | 8,520 |
| 19 | 8,230 | 10,600 | 6,790 | 7,860 | 9,840 | 19,000 | 34,300 | 28,000 | 20,600 | 10,100 | 7,860 | 8,300 |
| 20 | 8,230 | 10,600 | 6,790 | 7,860 | 10,100 | 18,600 | 31,900 | 28,500 | 20,200 | 9,840 | 7,420 | 8,300 |
| 21 | 8,230 | 10,400 | 7,140 | 8,230 | 10,300 | 19,000 | 30,100 | 29,000 | 19,400 | 9,630 | 7,210 | 8,300 |
| 22 | 8,420 | 10,400 | 7,140 | 9,600 | 10,500 | 19,800 | 29,000 | 29,000 | 18,600 | 11,700 | 7,000 | 8,080 |
| 23 | 8,610 | 10,200 | 7,320 | 13,700 | 10,700 | 19,800 | 28,500 | 28,500 | 17,900 | 13,400 | 6,800 | 7,860 |
| 24 | 8,420 | 10,000 | 7,680 | 17,500 | 12,900 | 19,800 | 28,500 | 28,000 | 17,300 | 11,700 | 6,800 | 7,860 |
| 25 | 8,420 | 9,600 | 8,800 | 17,500 | 15,600 | 19,800 | 28,000 | 27,000 | 16,700 | 11,200 | 6,800 | 7,640 |
| 26 | 8,610 | 9,400 | 9,000 | 16,300 | 17,900 | 19,800 | 27,500 | 26,500 | 16,100 | 10,700 | 6,600 | 7,860 |
| 27 | 8,610 | 9,400 | 9,200 | 16,300 | 21,000 | 19,000 | 27,000 | 25,500 | 15,800 | 10,300 | 6,600 | 7,860 |
| 28 | 8,610 | 9,600 | 9,000 | 16,000 | 21,800 | 18,200 | 26,500 | 25,000 | 15,300 | 10,100 | 6,600 | 8,080 |
| 29 | 8,610 | 9,600 | 8,610 | 15,400 | ------- | 18,200 | 25,500 | 25,000 | 14,700 | 9,840 | 6,400 | 8,080 |
| 30 | 8,610 | 9,800 | 8,610 | 14,800 | ------- | 22,200 | 25,500 | 25,500 | 14,200 | 9,630 | 6,400 | 8,080 |
| 31 | 8,610 | ------- | 7,680 | 14,000 | ------- | 33,100 | ------- | 26,000 | ------- | 9,420 | 6,400 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 8,610 | 7,860 | 8,220 | 0.131 | 0.15 |
| November | 10,800 | 8,610 | 9,790 | .156 | .17 |
| December | 9,600 | 6,790 | 8,200 | .131 | .15 |
| January | 17,500 | 6,960 | 10,100 | .161 | .19 |
| February | 21,800 | 9,840 | 12,300 | .196 | .20 |
| March | 33,100 | 18,200 | 21,400 | .341 | .39 |
| April | 45,900 | 25,500 | 36,800 | .586 | .65 |
| May | 30,700 | 25,000 | 27,600 | .439 | .51 |
| June | 28,000 | 14,200 | 22,700 | .361 | .40 |
| July | 14,700 | 9,400 | 11,300 | .180 | .21 |
| August | 9,400 | 6,400 | 7,780 | .124 | .14 |
| September | 9,400 | 6,400 | 7,960 | .127 | .14 |
| The year | 45,900 | 6,400 | 15,300 | .244 | 3.30 |

### MISSISSIPPI RIVER AT CLAYTON, IOWA

LOCATION.—Staff gage in NE ¼ sec. 1, T. 93 N., R. 3 W., a quarter of a mile downstream from railroad station in Clayton. Zero of gage is 602.60 feet above mean sea level (1912 adjustment). Prior to Dec. 27, 1932, a staff gage in sec. 35, T. 94 N., R. 3 W., was used. Zero of gage was 602.63 feet above mean sea level.

DRAINAGE AREA.—79,200 square miles.

RECORDS AVAILABLE.—April 1930 to September 1933.

DISCHARGE.—Maximum during year, 77,700 second-feet Apr. 4 and 5 (gage height, 10.60 feet); minimum, 10,700 second-feet Sept. 3 and 4 (gage height, −0.96 foot) and Dec. 12–19, when stage-discharge relation was affected by ice.

1930–33: Maximum, 95,200 second-feet Apr. 18, 1932 (gage height, 12.36 feet); minimum, that of Dec. 12–19, 1932, and Sept. 3 and 4, 1933.

REMARKS.—Records good except those for periods of ice effect, Nov. 24 to Jan. 22, Jan. 25 to Feb. 27, and Mar. 7–20, which are fair. Flow partly regulated by reservoirs and power plants.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 13,200 | 13,500 | 13,200 | 12,500 | 24,400 | 31,300 | 62,700 | 41,600 | 40,900 | 22,400 | 15,400 | 10,900 |
| 2 | 13,200 | 13,500 | 13,700 | 12,500 | 24,400 | 32,300 | 72,500 | 41,600 | 39,500 | 26,500 | 15,200 | 10,900 |
| 3 | 13,000 | 13,500 | 14,000 | 13,300 | 24,400 | 32,800 | 76,600 | 41,600 | 40,200 | 34,500 | 15,200 | 10,700 |
| 4 | 12,700 | 13,500 | 14,500 | 13,600 | 22,800 | 33,900 | 77,700 | 40,900 | 39,500 | 36,300 | 14,900 | 10,700 |
| 5 | 12,500 | 13,500 | 15,000 | 13,300 | 19,700 | 35,100 | 77,700 | 40,200 | 39,500 | 33,300 | 14,900 | 11,100 |
| 6 | 12,200 | 13,500 | 15,200 | 13,300 | 20,000 | 35,700 | 75,500 | 40,200 | 38,800 | 29,300 | 14,700 | 11,500 |
| 7 | 12,500 | 13,500 | 14,200 | 13,300 | 18,300 | 34,500 | 73,500 | 40,900 | 38,800 | 26,100 | 14,400 | 12,300 |
| 8 | 12,500 | 14,000 | 13,500 | 13,300 | 15,700 | 33,300 | 72,500 | 45,300 | 38,800 | 23,200 | 14,100 | 12,800 |
| 9 | 12,500 | 14,500 | 12,500 | 13,300 | 16,000 | 32,800 | 73,500 | 48,500 | 38,800 | 21,200 | 13,900 | 12,800 |
| 10 | 12,500 | 15,000 | 12,500 | 13,100 | 16,000 | 30,800 | 76,600 | 50,100 | 38,800 | 19,700 | 14,100 | 12,500 |
| 11 | 12,500 | 15,500 | 11,500 | 13,100 | 15,700 | 28,800 | 74,500 | 50,100 | 38,800 | 19,000 | 13,900 | 12,500 |
| 12 | 12,700 | 16,100 | 10,700 | 12,800 | 15,400 | 27,900 | 72,500 | 48,500 | 38,800 | 18,600 | 13,600 | 12,500 |
| 13 | 13,000 | 16,100 | 10,700 | 12,500 | 15,400 | 28,800 | 74,500 | 46,900 | 38,100 | 17,900 | 13,100 | 13,100 |
| 14 | 13,000 | 16,400 | 10,700 | 12,000 | 15,200 | 28,300 | 75,500 | 46,900 | 37,500 | 17,200 | 12,800 | 14,400 |
| 15 | 12,700 | 16,700 | 10,700 | 11,800 | 15,200 | 28,800 | 73,500 | 46,900 | 37,500 | 17,200 | 12,500 | 14,400 |
| 16 | 12,700 | 16,400 | 10,700 | 13,100 | 15,400 | 31,300 | 71,500 | 47,700 | 36,900 | 17,200 | 12,500 | 14,100 |
| 17 | 12,700 | 16,100 | 10,700 | 13,100 | 15,400 | 30,800 | 69,500 | 46,900 | 35,700 | 17,200 | 12,500 | 13,600 |
| 18 | 13,000 | 16,100 | 10,700 | 12,800 | 15,700 | 29,800 | 69,500 | 46,900 | 35,100 | 16,600 | 12,500 | 13,300 |
| 19 | 13,000 | 15,800 | 10,700 | 13,100 | 15,700 | 28,800 | 68,500 | 48,500 | 33,900 | 16,300 | 12,300 | 13,300 |
| 20 | 13,000 | 14,700 | 11,000 | 13,100 | 15,700 | 27,000 | 67,500 | 53,700 | 32,300 | 16,300 | 12,300 | 12,800 |
| 21 | 13,000 | 14,000 | 11,700 | 13,300 | 16,300 | 25,600 | 61,800 | 52,800 | 31,300 | 15,700 | 12,300 | 12,800 |
| 22 | 13,000 | 14,000 | 11,700 | 16,900 | 16,900 | 26,100 | 57,300 | 53,700 | 30,800 | 15,700 | 12,000 | 12,800 |
| 23 | 13,200 | 13,500 | 12,000 | 21,600 | 18,300 | 27,400 | 51,900 | 53,700 | 30,300 | 19,300 | 11,800 | 12,500 |
| 24 | 13,200 | 13,200 | 13,000 | 23,200 | 21,200 | 27,900 | 49,300 | 52,800 | 28,300 | 22,000 | 11,800 | 12,500 |
| 25 | 13,500 | 13,200 | 16,700 | 25,200 | 24,400 | 29,300 | 48,500 | 51,000 | 27,000 | 22,000 | 11,800 | 12,300 |
| 26 | 13,500 | 13,200 | 17,300 | 24,800 | 26,500 | 29,800 | 46,900 | 48,500 | 25,200 | 20,400 | 11,800 | 12,300 |
| 27 | 13,500 | 13,700 | 16,300 | 24,000 | 28,300 | 30,300 | 44,500 | 45,300 | 24,000 | 19,300 | 11,500 | 12,500 |
| 28 | 13,500 | 14,000 | 15,700 | 23,600 | 30,800 | 30,800 | 43,700 | 43,000 | 22,800 | 19,000 | 11,300 | 12,800 |
| 29 | 13,200 | 13,700 | 15,200 | 24,000 | ------- | 32,300 | 42,300 | 42,300 | 22,400 | 17,900 | 11,100 | 12,800 |
| 30 | 13,500 | 13,200 | 14,100 | 23,600 | ------- | 42,300 | 40,900 | 42,300 | 22,400 | 16,600 | 10,900 | 12,500 |
| 31 | 13,200 | ------- | 13,300 | 24,000 | ------- | 55,500 | ------- | 41,600 | ------- | 15,700 | 10,900 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 13,500 | 12,200 | 12,900 | 0.163 | 0.19 |
| November | 16,700 | 13,200 | 14,500 | .183 | .20 |
| December | 17,300 | 10,700 | 13,000 | .164 | .19 |
| January | 25,200 | 11,800 | 16,200 | .205 | .24 |
| February | 30,800 | 15,200 | 19,300 | .244 | .25 |
| March | 55,500 | 25,600 | 31,600 | .399 | .46 |
| April | 77,700 | 40,900 | 64,800 | .818 | .91 |
| May | 53,700 | 40,200 | 46,500 | .587 | .68 |
| June | 40,900 | 22,400 | 34,100 | .431 | .48 |
| July | 36,300 | 15,700 | 21,000 | .265 | .31 |
| August | 15,400 | 10,900 | 13,000 | .164 | .19 |
| September | 14,400 | 10,700 | 12,500 | .158 | .18 |
| The year | 77,700 | 10,700 | 24,900 | .314 | 4.28 |

### MISSISSIPPI RIVER AT ALTON, ILL.

LOCATION.—Wire gage in sec. 14, T. 5 N., R. 10 W., at Missouri & Illinois Bridge & Belt Railroad bridge at Alton, 7½ miles above mouth of Missouri River. Zero of gage is 395.54 feet above mean Gulf level and 395.65 feet above mean sea level (1929 adjustment of U.S. Coast and Geodetic Survey).

RECORDS AVAILABLE.—March to September 1933.

DISCHARGE.—Maximum during period, 265,000 second-feet May 17 (gage height, 23.3 feet); minimum, 27,000 second-feet Sept. 11; minimum gage height, 1.1 feet Sept. 14.

Maximum stage known, 37.0 feet June 1844.

REMARKS.—Records good. Stage-discharge relation affected by backwater from Missouri River. Discharge determined on basis of slope as obtained by use of auxiliary gages maintained by the Corps of Engineers, United States Army at Grafton, Ill., and at the mouth of Missouri River. Gage-height record furnished by United States Weather Bureau.

*Discharge, in second-feet, 1933*

| Day | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | | 110,000 | 136,000 | 248,000 | 78,100 | 45,400 | 35,300 |
| 2 | | 134,000 | 135,000 | 234,000 | 129,000 | 46,100 | 32,200 |
| 3 | | 152,000 | 132,000 | 225,000 | 135,000 | 45,900 | 29,900 |
| 4 | | 163,000 | 127,000 | 198,000 | 124,000 | 46,600 | 31,000 |
| 5 | | 173,000 | 124,000 | 189,000 | 99,000 | 46,500 | 31,300 |
| 6 | | 179,000 | 123,000 | 179,000 | 77,800 | 46,100 | 30,000 |
| 7 | | 195,000 | 125,000 | 167,000 | 69,500 | 44,700 | 30,100 |
| 8 | | 199,000 | 133,000 | 161,000 | 76,200 | 44,000 | 29,800 |
| 9 | | 204,000 | 142,000 | 154,000 | 84,900 | 43,600 | 29,800 |
| 10 | | 210,000 | 148,000 | 146,000 | 88,200 | 42,200 | 29,200 |
| 11 | | 223,000 | 146,000 | 137,000 | 87,300 | 45,100 | 27,000 |
| 12 | | 233,000 | 148,000 | 129,000 | 81,100 | 47,300 | 28,200 |
| 13 | | 241,000 | 176,000 | 124,000 | 76,000 | 47,600 | 28,400 |
| 14 | | 241,000 | 212,000 | 118,000 | 72,900 | 45,600 | 28,000 |
| 15 | | 236,000 | 238,000 | 111,000 | 72,500 | 44,700 | 31,200 |
| 16 | | 233,000 | 262,000 | 109,000 | 67,100 | 43,000 | 29,100 |
| 17 | | 229,000 | 265,000 | 103,000 | 61,200 | 41,400 | 28,200 |
| 18 | | 223,000 | 252,000 | 96,800 | 58,700 | 39,400 | 28,900 |
| 19 | | 219,000 | 229,000 | 91,800 | 57,600 | 39,000 | 28,700 |
| 20 | 80,900 | 210,000 | 214,000 | 84,400 | 56,300 | 39,300 | 28,000 |
| 21 | 80,800 | 199,000 | 209,000 | 83,300 | 54,300 | 38,700 | 28,300 |
| 22 | 79,900 | 193,000 | 214,000 | 82,400 | 51,200 | 39,000 | 28,700 |
| 23 | 78,300 | 185,000 | 216,000 | 82,300 | 49,700 | 38,100 | 29,600 |
| 24 | 77,200 | 177,000 | 222,000 | 78,900 | 47,700 | 36,900 | 30,700 |
| 25 | 79,700 | 170,000 | 228,000 | 76,600 | 46,700 | 36,300 | 31,400 |
| 26 | 88,200 | 164,000 | 228,000 | 73,400 | 45,400 | 34,200 | 31,400 |
| 27 | 92,600 | 159,000 | 237,000 | 72,700 | 44,800 | 33,100 | 32,100 |
| 28 | 93,000 | 153,000 | 250,000 | 69,800 | 42,800 | 33,000 | 34,300 |
| 29 | 88,300 | 147,000 | 260,000 | 66,700 | 42,600 | 33,800 | 34,500 |
| 30 | 87,400 | 142,000 | 264,000 | 65,400 | 43,400 | 34,500 | 36,200 |
| 31 | 93,500 | | 258,000 | | 44,700 | 34,800 | |

| Month | Maximum | Minimum | Mean | Run-off in acre-feet |
|---|---|---|---|---|
| March 20–31 | 93,500 | 77,200 | 85,000 | 2,020,000 |
| April | 241,000 | 110,000 | 190,000 | 11,300,000 |
| May | 265,000 | 123,000 | 195,000 | 12,000,000 |
| June | 248,000 | 65,400 | 125,000 | 7,440,000 |
| July | 135,000 | 42,600 | 69,900 | 4,300,000 |
| August | 47,600 | 33,000 | 41,200 | 2,530,000 |
| September | 36,200 | 27,000 | 30,400 | 1,810,000 |
| The period | | | | 41,400,000 |

### CROW WING RIVER AT NIMROD, MINN.

LOCATION.—Chain gage in sec. 32, T. 137 N., R. 33 W., on highway bridge half a mile north of Nimrod.

DRAINAGE AREA.—1,010 square miles.

RECORDS AVAILABLE.—April 1910 to September 1914; July 1930 to September 1933.

DISCHARGE.—Maximum during year, 1,150 second-feet May 29 (gage height, 4.22 feet); minimum, 116 second-feet July 10 (gage height, 2.62 feet).

1910–14, 1930–33: Maximum, 2,000 second-feet June 9, 1914; minimum, 59 second-feet Aug. 25, 1930; minimum gage height, 2.42 feet May 26, 1931, Aug. 15, 1932.

REMARKS.—Records fair. Stage-discharge relation affected by aquatic growth Oct. 1 to Nov. 9, May 10 to Sept. 30, and by ice Nov. 10–19; Apr. 1–3. No record Nov. 20 to Mar. 31.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 136 | 169 | 890 | 435 | 830 | 152 | 144 | 144 |
| 2 | 132 | 169 | 830 | 420 | 830 | 147 | 144 | 144 |
| 3 | 132 | 169 | 770 | 392 | 770 | 140 | 144 | e 145 |
| 4 | 128 | 169 | 710 | 420 | e 725 | 140 | 144 | e 147 |
| 5 | 136 | 169 | 650 | 450 | 680 | 127 | 144 | 148 |
| 6 | 140 | 174 | 650 | 480 | 622 | 127 | 144 | e 152 |
| 7 | 144 | 174 | 595 | 480 | 595 | 127 | 144 | 156 |
| 8 | 148 | 178 | 565 | 565 | 565 | 127 | 144 | 164 |
| 9 | 148 | 182 | 508 | 565 | 535 | e 122 | 160 | 178 |
| 10 | 144 | 187 | 508 | 535 | 508 | 118 | 144 | 169 |
| 11 | 140 | 182 | 480 | 480 | 508 | 148 | 144 | 160 |
| 12 | 140 | 182 | 450 | 480 | 450 | 148 | 144 | 156 |
| 13 | 140 | 182 | 480 | 508 | 450 | 161 | 148 | 156 |
| 14 | 144 | 182 | 480 | 480 | 420 | 152 | 148 | 148 |
| 15 | 136 | 182 | 480 | 450 | 392 | 177 | 140 | 148 |
| 16 | 136 | 182 | 450 | 420 | 365 | 177 | 164 | 187 |
| 17 | 140 | 182 | 420 | 420 | 360 | 169 | e 159 | e 178 |
| 18 | 140 | 182 | 392 | 420 | 343 | 164 | e 154 | 169 |
| 19 | 148 | 182 | 365 | 392 | 299 | 158 | e 148 | 174 |
| 20 | 160 | ------- | 354 | 348 | 277 | 153 | e 142 | e 164 |
| 21 | 160 | ------- | 343 | 310 | 260 | 148 | 136 | e 154 |
| 22 | 160 | ------- | 321 | 392 | 250 | 156 | 136 | 144 |
| 23 | 164 | ------- | 321 | 950 | 215 | 156 | 144 | 144 |
| 24 | 164 | ------- | 310 | 950 | 196 | 153 | 152 | e 150 |
| 25 | 164 | ------- | 299 | 830 | 187 | 144 | 144 | 156 |
| 26 | 164 | ------- | 277 | 830 | 220 | 144 | e 148 | 156 |
| 27 | 169 | ------- | e 320 | 830 | 210 | 144 | e 152 | 156 |
| 28 | 169 | ------- | e 363 | 950 | 192 | 144 | 156 | 160 |
| 29 | 169 | ------- | e 406 | 1,150 | 187 | 144 | 156 | 160 |
| 30 | 169 | ------- | 450 | 1,080 | 169 | 144 | 148 | 152 |
| 31 | 169 | ------- | ------- | 950 | ------- | 144 | 148 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 169 | 128 | 149 | 0.148 | 0.17 |
| November 1-19 | 187 | 169 | 178 | .176 | .12 |
| April | 890 | 277 | 481 | .476 | .53 |
| May | 1,150 | 310 | 592 | .586 | .68 |
| June | 830 | 169 | 420 | .416 | .46 |
| July | 178 | 116 | 147 | .146 | .17 |
| August | 164 | 136 | 147 | .146 | .17 |
| September | 187 | 144 | 157 | .155 | .17 |

e Interpolated.

### LITTLE SAND LAKE OUTLET NEAR DORSET, MINN.

LOCATION.—Staff gage in NE¼ sec. 36, T. 141 N., R. 34 W., 2 miles northeast of Dorset.

RECORDS AVAILABLE.—July 1930 to September 1933.

DISCHARGE.—Maximum during period, 42 second-feet May 23 (gage height, 2.12 feet); minimum, 0.1 second-foot Sept. 30 (gage height, 0.73 foot).

1930–33: Maximum, that of May 23, 1933; minimum, 0.1 second-foot Oct. 1, 3, 4, Nov. 7–12, 1930, Sept. 30, 1933.

REMARKS.—Records good. No record Oct. 12 to Apr. 11. Stage-discharge relation entirely changed during period of no record by construction of bridge below gage to replace small culverts.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | 3.2 | | 26 | 38 | 30 | 4.9 | 0.7 |
| 2 | 1.5 | | 26 | 37 | 30 | 4.3 | .6 |
| 3 | 1.5 | | 24 | 37 | 29 | 3.9 | .5 |
| 4 | 1.7 | | 24 | 37 | 27 | 3.5 | .5 |
| 5 | 1.6 | | 22 | 36 | 26 | 3.2 | .4 |
| 6 | 1.2 | | 22 | 25 | 25 | 3.0 | .5 |
| 7 | 1.3 | | 22 | 35 | 25 | 2.8 | .6 |
| 8 | 1.5 | | 25 | 37 | 25 | 2.6 | .9 |
| 9 | 1.6 | | 26 | 38 | 24 | 2.6 | .9 |
| 10 | 1.5 | | 25 | 37 | 24 | 2.4 | .8 |
| 11 | 1.4 | | 25 | 36 | 23 | 2.2 | .7 |
| 12 | | 25 | 25 | 35 | 23 | 2.1 | .7 |
| 13 | | 25 | 26 | 33 | 23 | 2.0 | .7 |
| 14 | | 24 | 26 | 32 | 21 | 1.8 | .6 |
| 15 | | 24 | 26 | 30 | 19 | 1.7 | .6 |
| 16 | | 23 | 25 | 29 | 18 | 1.7 | .8 |
| 17 | | 23 | 25 | 28 | 17 | 1.7 | .8 |
| 18 | | 23 | 24 | 28 | 16 | 1.6 | .6 |
| 19 | | 23 | 24 | 26 | 15 | 1.4 | .7 |
| 20 | | 23 | 23 | 27 | 13 | 1.2 | .6 |
| 21 | | 23 | 23 | 26 | 13 | 1.1 | .4 |
| 22 | | 23 | 24 | 25 | 12 | 1.0 | .4 |
| 23 | | 23 | 42 | 25 | 13 | 1.2 | .4 |
| 24 | | 22 | 41 | 25 | 11 | 1.2 | .4 |
| 25 | | 22 | 40 | 25 | 10 | 1.2 | .4 |
| 26 | | 21 | 38 | 26 | 8.4 | 1.1 | .3 |
| 27 | | 20 | 38 | 26 | 7.4 | 1.0 | .3 |
| 28 | | 20 | 38 | 30 | 7.4 | 1.0 | .2 |
| 29 | | 20 | 41 | 31 | 6.4 | .8 | .2 |
| 30 | | 24 | 40 | 31 | 5.6 | .8 | .2 |
| 31 | | | 41 | | 5.6 | .7 | |

| Month | Maximum | Minimum | Mean | Month | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|
| October 1–11 | 3.2 | 1.2 | 1.64 | July | 30 | 5.6 | 17.8 |
| April 12–30 | 25 | 20 | 22.7 | August | 4.9 | .7 | 1.99 |
| May | 42 | 22 | 28.9 | September | .9 | .2 | .55 |
| June | 38 | 25 | 31.4 | | | | |

### PLATTE RIVER AT ROYALTON, MINN.

LOCATION.—Chain gage in sec. 35, T. 39 N., R. 32 W., on highway bridge at east edge of Royalton, 6 miles above junction with Mississippi River.
DRAINAGE AREA.—338 square miles.
RECORDS AVAILABLE.—May 1929 to September 1933.
DISCHARGE.—Maximum during period, 167 second-feet Apr. 1 (gage height, 2.60 feet); minimum, 0.6 second-foot Aug. 15; minimum gage height, 1.25 feet Oct. 13.

1929–33: Maximum, 1,330 second-feet May 30, 1931 (gage height, 5.90 feet); minimum, that of Aug. 15, 1933.

REMARKS.—Records good except those for period affected by aquatic growth, May 14 to Sept. 30, which are fair. No record Nov. 20 to Mar. 31.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 14 | 23 | 167 | 38 | 54 | 5.4 | 3.5 | 1.4 |
| 2 | 12 | 25 | 147 | 41 | 53 | 5.4 | 3.5 | 2.2 |
| 3 | 11 | 27 | 127 | 43 | 56 | 4.8 | 3.5 | 2.5 |
| 4 | 11 | 28 | 109 | 46 | 64 | 4.5 | 3.0 | 3.5 |
| 5 | 9.5 | 26 | 95 | 44 | 58 | 4.2 | 2.8 | 4.0 |
| 6 | 9.5 | 28 | 78 | 46 | 52 | 4.0 | 2.4 | 4.8 |
| 7 | 11 | 32 | 68 | 51 | 46 | 4.0 | 2.0 | 6.8 |
| 8 | 10 | 34 | 68 | 67 | 47 | 4.0 | 1.8 | 8.6 |
| 9 | 9.5 | 37 | 68 | 74 | 42 | 3.5 | 1.4 | 9.0 |
| 10 | 8.6 | 38 | 72 | 81 | 36 | 3.5 | 1.2 | 12 |
| 11 | 8.6 | 41 | 56 | 89 | 32 | 5.9 | 1.0 | 15 |
| 12 | 9.0 | 44 | 51 | 95 | 32 | 6.8 | .8 | 14 |
| 13 | 7.7 | 46 | 51 | 92 | 26 | 6.4 | .8 | 16 |
| 14 | 8.6 | 47 | 58 | 89 | 23 | 6.8 | .8 | 11 |
| 15 | 9.5 | 47 | 58 | 84 | 19 | 6.4 | .6 | 16 |
| 16 | 11 | 44 | 53 | 81 | 16 | 6.4 | .8 | 20 |
| 17 | 14 | 42 | 49 | 74 | 15 | 5.4 | 1.2 | 18 |
| 18 | 16 | 40 | 48 | 70 | 12 | 5.4 | 1.8 | 17 |
| 19 | 17 | 36 | 46 | 64 | 10 | 4.8 | 2.0 | 20 |
| 20 | 18 | ------- | 46 | 60 | 8.6 | 5.4 | 2.0 | 19 |
| 21 | 16 | ------- | 46 | 56 | 8.6 | 4.8 | 1.4 | 20 |
| 22 | 18 | ------- | 41 | 62 | 8.2 | 4.8 | 1.2 | 20 |
| 23 | 20 | ------- | 42 | 68 | 8.2 | 5.4 | 1.3 | 18 |
| 24 | 20 | ------- | 41 | 62 | 7.2 | 6.4 | 1.4 | 17 |
| 25 | 20 | ------- | 41 | 66 | 6.8 | 6.8 | 1.4 | 16 |
| 26 | 20 | ------- | 36 | 82 | 7.7 | 5.4 | 1.6 | 15 |
| 27 | 20 | ------- | 33 | 82 | 7.7 | 5.0 | 1.4 | 14 |
| 28 | 20 | ------- | 30 | 74 | 6.4 | 4.5 | 1.3 | 13 |
| 29 | 22 | ------- | 33 | 76 | 6.4 | 4.5 | 1.0 | 13 |
| 30 | 22 | ------- | 36 | 72 | 5.4 | 4.0 | 1.2 | 11 |
| 31 | 23 | ------- | ------- | 62 | ------- | 4.0 | 1.0 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 23 | 7.7 | 14.4 | 0.043 | 0.05 |
| November 1–19 | 47 | 23 | 36.1 | .107 | .08 |
| April | 167 | 30 | 63.1 | .187 | .21 |
| May | 95 | 38 | 67.5 | .200 | .23 |
| June | 64 | 5.4 | 25.8 | .076 | .08 |
| July | 6.8 | 3.5 | 5.12 | .015 | .02 |
| August | 3.5 | .6 | 1.65 | .0049 | .006 |
| September | 20 | 1.4 | 12.6 | .037 | .04 |

### SAUK RIVER NEAR ST. CLOUD, MINN.

LOCATION.—Chain gage in sec. 8, T. 124 N., R. 28 W., on highway bridge 3 miles west of St. Cloud and 4 miles above junction with Mississippi River.

DRAINAGE AREA.—816 square miles.

RECORDS AVAILABLE.—July 1909 to December 1913; May 1929 to September 1933.

DISCHARGE.—Maximum during year, 284 second-feet May 16 (gage height, 2.86 feet); minimum, 2.0 second-feet Aug. 15; minimum gage height, 1.44 feet Sept. 29.

1909–13, 1929–33: Maximum, 1,620 second-feet May 11, 1912 (gage height, 8.7 feet, old datum); minimum, that of August 1933.

REMARKS.—Records fair. Stage-discharge relation affected by ice Nov. 12–19, Mar. 27 to Apr. 4 and by aquatic growth throughout remainder of year. Diurnal fluctuation caused by power plants above. No record Nov. 20 to Mar. 26.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 11 | 27 | ------- | 118 | 35 | 176 | 14 | 20 | 10 |
| 2 | 9.6 | 38 | ------- | 89 | 26 | 152 | 7.8 | 20 | 22 |
| 3 | 14 | 40 | ------- | 120 | 72 | 145 | 5.4 | 42 | 6.6 |
| 4 | 12 | 73 | ------- | 176 | 32 | 114 | 5.7 | 43 | 7.8 |
| 5 | 17 | 32 | ------- | 150 | 27 | 38 | 7.2 | 42 | 7.2 |
| 6 | 26 | 24 | ------- | 176 | 21 | 213 | 8.4 | 32 | 7.2 |
| 7 | 33 | 23 | ------- | 152 | 33 | 176 | 15 | 4.8 | 7.8 |
| 8 | 43 | 37 | ------- | 164 | 44 | 176 | 17 | 10 | 7.2 |
| 9 | 27 | 54 | ------- | 32 | 164 | 188 | [a] 11 | 6.6 | 7.2 |
| 10 | 23 | 43 | ------- | 33 | 164 | 200 | 4.8 | 5.1 | 8.4 |
| 11 | 18 | 24 | ------- | 103 | 188 | [a] 128 | 70 | 3.9 | 9.0 |
| 12 | 20 | 38 | ------- | 64 | 124 | 55 | 92 | 3.9 | 9.0 |
| 13 | 20 | 42 | ------- | 43 | 164 | 47 | 72 | [a] 3.6 | 11 |
| 14 | 22 | 47 | ------- | 106 | 97 | 72 | 96 | 3.3 | [a] 9.7 |
| 15 | 24 | 34 | ------- | 62 | 51 | 33 | 79 | 2.0 | 7.8 |
| 16 | 61 | 38 | ------- | 33 | 269 | 33 | 39 | 3.6 | 22 |
| 17 | 29 | 46 | ------- | 21 | 200 | 18 | 38 | 3.9 | [a] 23 |
| 18 | 18 | 48 | ------- | 47 | 114 | 19 | 35 | 3.6 | 22 |
| 19 | 28 | 43 | ------- | 61 | 176 | 9.6 | 34 | 3.9 | 14 |
| 20 | 20 | ------- | ------- | 61 | 42 | 9.0 | 33 | 3.6 | 11 |
| 21 | 15 | ------- | ------- | 70 | [a] 44 | 9.6 | 23 | 4.2 | 10 |
| 22 | 17 | ------- | ------- | 39 | 47 | 12 | 22 | 4.8 | 11 |
| 23 | 21 | ------- | ------- | 32 | 28 | 14 | 29 | 4.8 | 9.0 |
| 24 | 19 | ------- | ------- | 20 | 34 | 11 | 37 | 6.0 | 8.4 |
| 25 | 15 | ------- | ------- | 64 | 116 | [a] 11 | 23 | 4.5 | 9.6 |
| 26 | 19 | ------- | ------- | 14 | 137 | 11 | 21 | 5.7 | 9.6 |
| 27 | 23 | ------- | 164 | 24 | 126 | 9.6 | 23 | [a] 6.4 | 8.4 |
| 28 | 26 | ------- | 164 | 22 | 118 | 7.8 | 23 | 7.2 | 9.0 |
| 29 | 32 | ------- | 150 | 13 | 44 | 9.0 | 23 | 7.2 | 6.0 |
| 30 | 29 | ------- | 130 | 24 | 42 | 10 | 14 | 6.6 | 9.0 |
| 31 | 26 | ------- | 134 | ------- | 40 | ------- | 34 | 7.8 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 61 | 9.6 | 23.1 | 0.028 | 0.03 |
| November 1–19 | 73 | 23 | 39.5 | .048 | .03 |
| March 27–31 | 164 | 130 | 148 | .181 | .03 |
| April | 176 | 13 | 71.1 | .087 | .10 |
| May | 269 | 21 | 90.9 | .111 | .13 |
| June | 213 | 7.8 | 70.2 | .086 | .10 |
| July | 96 | 4.8 | 30.8 | .038 | .04 |
| August | 43 | 2.0 | 10.5 | .013 | .01 |
| September | 23 | 6.0 | 10.7 | .013 | .01 |

[a] Interpolated.

### ELK RIVER NEAR BIG LAKE, MINN.

LOCATION.—Chain gage in sec. 23, T. 33 N., R. 27 W., on highway bridge 4 miles east of Big Lake and 4 miles below mouth of St. Francis River.

DRAINAGE AREA.—615 square miles.

RECORDS AVAILABLE.—April 1911 to September 1917; April 1931 to September 1933.

DISCHARGE.—Maximum during year, 178 second-feet May 31 (gage height, 1.13 feet); minimum, 15 second-feet July 10; minimum gage height, 0.37 foot Sept. 30.

1911–17, 1931–33: Maximum, 5,100 second-feet May 7, 1912 (gage height, 10 feet); minimum, 11 second-feet July 30, 31, 1931 (gage height, 0.32 foot).

REMARKS.—Records good except those for period affected by aquatic growth, June 18 to Sept. 30, and for periods affected by ice, Nov. 12–19, Mar. 20–27, which are fair. No record Nov. 20 to Mar. 19.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 27 | 59 | ------- | 148 | 101 | 153 | 29 | 27 | 22 |
| 2 | 28 | 59 | ------- | 136 | 97 | 136 | 28 | 27 | 24 |
| 3 | 28 | 61 | ------- | 136 | 93 | 127 | 24 | 29 | 25 |
| 4 | 30 | 61 | ------- | 132 | 85 | 123 | 25 | 28 | 25 |
| 5 | 30 | 59 | ------- | 136 | 85 | 118 | 22 | 27 | 29 |
| 6 | 33 | 59 | ------- | 136 | 81 | 118 | 19 | 27 | 28 |
| 7 | 33 | 59 | ------- | 134 | 89 | 112 | 19 | 25 | 28 |
| 8 | 36 | 77 | ------- | 136 | 141 | 105 | 18 | 24 | 25 |
| 9 | 36 | 108 | ------- | 132 | 165 | 101 | 16 | 21 | 27 |
| 10 | 36 | 112 | ------- | 127 | 160 | 93 | 15 | 19 | 24 |
| 11 | 36 | 100 | ------- | 118 | 158 | 87 | 36 | 19 | 24 |
| 12 | 36 | 108 | ------- | 112 | 160 | 77 | 72 | 19 | 24 |
| 13 | 39 | 68 | ------- | 108 | 163 | 70 | 119 | 21 | 23 |
| 14 | 39 | 70 | ------- | 105 | 160 | 64 | 120 | 19 | 22 |
| 15 | 50 | 70 | ------- | 99 | 153 | 57 | 105 | 19 | 21 |
| 16 | 52 | 61 | ------- | 99 | 146 | 51 | 93 | 21 | 42 |
| 17 | 50 | 33 | ------- | 101 | 141 | 45 | 87 | 19 | 42 |
| 18 | 52 | 36 | ------- | 101 | 132 | 39 | 85 | 19 | 40 |
| 19 | 56 | 33 | ------- | 101 | 136 | 39 | 73 | 18 | 40 |
| 20 | 59 | ------- | 91 | 97 | 123 | 37 | 68 | 17 | 37 |
| 21 | 63 | ------- | 85 | 97 | 114 | 36 | 66 | 18 | 36 |
| 22 | 59 | ------- | 97 | 93 | 105 | 35 | 57 | 21 | 35 |
| 23 | 57 | ------- | 93 | 89 | 95 | 36 | 57 | 28 | 30 |
| 24 | 56 | ------- | 97 | 89 | 89 | 35 | 57 | 29 | 28 |
| 25 | 56 | ------- | 77 | 85 | 85 | 35 | 54 | 28 | 28 |
| 26 | 54 | ------- | 101 | 81 | 95 | 45 | 51 | 25 | 30 |
| 27 | 56 | ------- | 118 | 77 | 110 | 43 | 48 | 22 | 28 |
| 28 | 56 | ------- | 110 | 75 | 116 | 45 | 42 | 21 | 24 |
| 29 | 57 | ------- | 112 | 73 | 151 | 39 | 33 | 23 | 22 |
| 30 | 57 | ------- | 136 | 85 | 165 | 32 | 27 | 22 | 21 |
| 31 | 59 | ------- | 160 | ------- | 165 | ------- | 22 | 23 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 63 | 27 | 45.7 | 0.074 | 0.09 |
| November 1–19 | 112 | 33 | 68.1 | .111 | .08 |
| March 20–31 | 160 | 85 | 106 | .172 | .08 |
| April | 148 | 73 | 108 | .176 | .20 |
| May | 165 | 81 | 124 | .202 | .23 |
| June | 153 | 32 | 71.1 | .116 | .13 |
| July | 120 | 15 | 51.3 | .083 | .10 |
| August | 29 | 17 | 22.7 | .037 | .04 |
| September | 42 | 21 | 28.5 | .046 | .05 |

### CROW RIVER AT ROCKFORD, MINN.

LOCATION.—Chain gage in sec. 29, T. 119 N., R. 24 W., at Rockford, 1 mile below junction of North and South Forks.
DRAINAGE AREA.—2,520 square miles.
RECORDS AVAILABLE.—June 1909 to September 1917; April 1929 to September 1933.
DISCHARGE.—Maximum during year, 693 second-feet Mar. 4 (gage height, 2.56 feet); minimum, 5.2 second-feet Aug. 11–13 (gage height, 0.54 foot).
1909–17, 1929–33: Maximum, 10,600 second-feet Apr. 2, 3, 1916 (gage height, 15.9 feet, former datum); minimum, that of Aug. 11–13, 1933.
REMARKS.—Records fair. Stage-discharge relation affected by ice Mar. 1–26 and by aquatic growth May 17 to July 6. No record Nov. 20 to Feb. 28.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 23 | 39 | 520 | 434 | 147 | 194 | [a] 17 | 8.2 | 7.0 |
| 2 | 23 | 36 | 577 | 462 | 137 | 173 | 16 | 12 | 8.2 |
| 3 | 23 | 36 | 606 | 377 | 137 | 147 | 16 | 12 | 8.2 |
| 4 | 23 | 36 | 693 | 332 | 147 | 132 | 16 | 16 | 8.2 |
| 5 | 23 | 36 | 664 | 310 | 142 | 98 | 18 | 12 | 8.2 |
| 6 | 23 | 36 | 635 | 299 | 127 | 93 | 18 | 12 | 8.2 |
| 7 | 23 | 39 | 520 | 287 | 122 | 93 | 16 | 10 | 8.2 |
| 8 | 23 | 48 | 462 | 265 | 142 | 93 | 16 | 8.2 | 8.2 |
| 9 | 23 | 74 | 315 | 238 | 199 | 88 | 16 | 8.2 | 7.0 |
| 10 | 23 | 79 | 238 | 226 | 232 | 74 | 16 | 8.2 | 8.2 |
| 11 | 26 | 79 | 194 | 210 | 260 | 65 | 36 | 5.2 | 11 |
| 12 | 23 | 54 | 178 | 210 | 254 | 60 | 30 | 5.2 | [a] 13 |
| 13 | 23 | 48 | 178 | 194 | 254 | 54 | 30 | 5.2 | [a] 15 |
| 14 | 23 | 48 | 142 | 178 | 254 | 51 | 30 | 5.8 | [a] 17 |
| 15 | 28 | 42 | 137 | 168 | 226 | 48 | 26 | 5.8 | [a] 19 |
| 16 | 30 | 42 | 137 | 168 | 221 | 45 | 26 | 8.2 | 21 |
| 17 | 30 | 48 | 137 | 157 | 216 | 39 | 23 | 6.4 | 13 |
| 18 | 30 | 48 | 127 | 157 | 210 | 36 | 23 | 5.2 | 15 |
| 19 | 36 | 48 | 127 | 147 | 221 | 28 | 19 | 6.4 | 23 |
| 20 | 33 | ------ | 127 | 147 | 265 | 23 | 19 | 6.4 | 18 |
| 21 | 30 | ------ | 122 | 142 | 321 | 23 | 16 | 6.4 | 16 |
| 22 | 30 | ------ | 112 | 122 | 377 | 23 | 13 | 5.8 | 15 |
| 23 | 30 | ------ | 112 | 117 | 406 | 25 | 13 | 6.4 | 13 |
| 24 | 45 | ------ | 112 | 117 | 377 | 21 | 13 | 6.4 | 13 |
| 25 | 45 | ------ | 112 | 117 | 355 | 21 | 12 | 7.0 | 16 |
| 26 | 42 | ------ | 112 | 107 | 338 | 23 | 10 | 6.7 | 16 |
| 27 | 42 | ------ | 162 | 98 | 304 | 23 | 9.4 | 7.0 | 16 |
| 28 | 42 | ------ | 189 | 98 | 248 | 18 | 9.4 | 6.7 | 15 |
| 29 | 42 | ------ | 205 | 88 | 260 | 18 | 7.6 | 6.1 | 12 |
| 30 | 39 | ------ | 260 | 112 | 254 | 18 | 7.0 | 6.4 | 12 |
| 31 | 42 | ------ | 332 | ------ | 226 | ------ | 7.0 | 6.1 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 45 | 23 | 30.4 | 0.012 | 0.01 |
| November 1–19 | 79 | 36 | 48.2 | .019 | .01 |
| March | 693 | 112 | 276 | .110 | .13 |
| April | 462 | 88 | 203 | .081 | .09 |
| May | 406 | 122 | 238 | .094 | .11 |
| June | 194 | 18 | 61.6 | .024 | .03 |
| July | 36 | 7.0 | 17.6 | .0070 | .008 |
| August | 16 | 5.2 | 7.66 | .0030 | .003 |
| September | 23 | 7.0 | 13.0 | .0052 | .006 |

[a] Interpolated.

### MILLE LACS LAKE NEAR WEALTHWOOD, MINN.

LOCATION.—Staff gage in sec. 20, T. 45 N., R. 26 W., in Wealthwood.
RECORDS AVAILABLE.—June 1931 to September 1933.
EXTREMES 1931–33.—Maximum water-surface elevation, 1,249.36 feet June 20, 1931; minimum, 1,247.20 feet Sept. 30, 1933.
REMARKS.—Records furnished by St. Paul Army Engineer District for period June 1931 to December 1932. No record during winter periods.

*Elevation, in feet, 1931–33*

| Day | 1931 | | | | | | 1932 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | June | July | Aug. | Sept. | Oct. | Nov. | May | June | July | Aug. | Sept. |
| 1 | ------- | 49.28 | 48.92 | 48.58 | 48.38 | 48.14 | ------- | 48.72 | 48.62 | 48.34 | 48.08 |
| 2 | ------- | 49.24 | 48.94 | 48.58 | 48.40 | 48.12 | ------- | 48.72 | 48.62 | 48.34 | 48.04 |
| 3 | ------- | 49.22 | 48.98 | 48.56 | 48.38 | 48.12 | ------- | 48.72 | 48.60 | 48.30 | 48.00 |
| 4 | ------- | 49.24 | 49.00 | 48.56 | 48.38 | 48.10 | ------- | 48.72 | 48.62 | 48.28 | 47.96 |
| 5 | ------- | 49.22 | 49.00 | 48.56 | 48.38 | 48.12 | ------- | 48.72 | 48.62 | 48.28 | 47.94 |
| 6 | ------- | 49.26 | 48.98 | 48.58 | 48.38 | 48.14 | ------- | 48.72 | 48.54 | 48.26 | 47.90 |
| 7 | ------- | ------- | 48.96 | 48.56 | 48.38 | 48.14 | 48.50 | 48.72 | 48.50 | 48.24 | 47.90 |
| 8 | ------- | 49.12 | 48.98 | 48.54 | 48.38 | 48.12 | 48.54 | 48.70 | 48.48 | 48.20 | 47.88 |
| 9 | ------- | 49.14 | 48.94 | 48.54 | 48.40 | 48.12 | 48.64 | 48.70 | 48.48 | 48.16 | 47.90 |
| 10 | ------- | 49.12 | 48.84 | 48.52 | 48.38 | 48.14 | 48.66 | 48.68 | 48.50 | 48.18 | 47.90 |
| 11 | 48.94 | ------- | 48.88 | 48.54 | 48.36 | 48.12 | 48.68 | 48.68 | 48.48 | 48.16 | 47.90 |
| 12 | 49.00 | 49.08 | 48.86 | 48.54 | 48.36 | 48.14 | 48.70 | 48.70 | 48.48 | 48.16 | 47.90 |
| 13 | 49.06 | 49.06 | 48.86 | 48.56 | 48.34 | 48.12 | 48.70 | 48.70 | 48.44 | 48.14 | 47.94 |
| 14 | ------- | 49.04 | 48.88 | 48.54 | 48.30 | 48.16 | 48.70 | 48.72 | 48.44 | 48.12 | 47.98 |
| 15 | 49.08 | 49.08 | 48.84 | 48.52 | 48.28 | 48.16 | 48.68 | 48.72 | 48.44 | 48.10 | 47.94 |
| 16 | 49.10 | 49.08 | 48.82 | 48.54 | 48.28 | 48.18 | 48.70 | 48.70 | 48.46 | 48.10 | 47.92 |
| 17 | ------- | 49.06 | ------- | 48.50 | 48.26 | 48.18 | 48.70 | 48.70 | 48.44 | 48.04 | 47.88 |
| 18 | 49.08 | 49.06 | 48.84 | 48.48 | 48.26 | 48.20 | 48.70 | 48.72 | 48.44 | 48.04 | 47.86 |
| 19 | 49.06 | ------- | 48.86 | 48.50 | 48.26 | 48.20 | 48.70 | 48.70 | 48.42 | 48.02 | 47.84 |
| 20 | 49.36 | 49.06 | 48.82 | 48.50 | 48.26 | 48.22 | 48.70 | 48.70 | 48.40 | 48.02 | 47.84 |
| 21 | ------- | 49.04 | 48.80 | 48.52 | 48.26 | 48.24 | 48.72 | 48.68 | 48.40 | 48.02 | 47.82 |
| 22 | ------- | 49.02 | 48.80 | 48.50 | 48.24 | 48.26 | 48.72 | 48.68 | 48.38 | 48.04 | 47.74 |
| 23 | ------- | 49.00 | 48.82 | 48.48 | 48.24 | 48.28 | 48.72 | 48.68 | 48.38 | 48.02 | 47.70 |
| 24 | 49.24 | 49.00 | 48.80 | 48.44 | 48.24 | 48.30 | 48.72 | 48.68 | 48.38 | 48.02 | 47.68 |
| 25 | 49.26 | 48.98 | 48.82 | 48.44 | 48.24 | 48.30 | 48.70 | 48.70 | 48.38 | 48.00 | 47.68 |
| 26 | 49.28 | 48.96 | 48.80 | 48.42 | 48.22 | ------- | 48.68 | 48.70 | 48.40 | 47.96 | 47.66 |
| 27 | 49.28 | 48.94 | ------- | 48.44 | 48.20 | ------- | 48.68 | 48.70 | 48.40 | 47.94 | 47.66 |
| 28 | 49.28 | 48.90 | 48.74 | 48.44 | 48.18 | ------- | 48.68 | 48.68 | 48.40 | 47.94 | 47.64 |
| 29 | 49.28 | 48.88 | 48.54 | 48.42 | 48.18 | ------- | 48.70 | 48.66 | 48.38 | 48.06 | 47.64 |
| 30 | 49.28 | 48.86 | 48.60 | 48.40 | 48.14 | ------- | 48.70 | 48.64 | 48.36 | 48.04 | 47.62 |
| 31 | ------- | 48.90 | 48.58 | ------- | 48.14 | ------- | 48.70 | ------- | 48.34 | 48.08 | ------- |

*Elevation, in feet, of Mille Lacs Lake near Wealthwood, Minn., 1931–33*—Continued

| Day | Oct. | Nov. | Dec. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1932-33 | | | | | | | | |
| 1 | 47.62 | 47.42 | | | 48.16 | 48.02 | 47.74 | 47.30 |
| 2 | 47.62 | 47.44 | | | 48.16 | 48.00 | 47.72 | 47.30 |
| 3 | 47.60 | 47.44 | | 47.71 | 48.18 | 48.00 | 47.72 | 47.34 |
| 4 | 47.54 | 47.42 | 47.50 | 47.72 | 48.18 | 47.98 | 47.70 | 47.36 |
| 5 | 47.50 | 47.42 | | 47.74 | 48.18 | 47.94 | 47.68 | 47.38 |
| 6 | 47.52 | 47.40 | | 47.76 | 48.20 | 47.94 | 47.64 | 47.38 |
| 7 | 47.50 | 47.42 | | 47.78 | 48.20 | 47.92 | 47.60 | 47.40 |
| 8 | 47.46 | 47.44 | | 47.79 | 48.20 | 47.90 | 47.54 | 47.42 |
| 9 | 47.44 | 47.46 | | 47.80 | 48.22 | 47.90 | 47.52 | 47.42 |
| 10 | 47.44 | 47.48 | | 47.82 | 48.22 | 47.92 | 47.50 | 47.44 |
| 11 | 47.44 | 47.46 | | 47.84 | 48.20 | 47.92 | 47.48 | 47.44 |
| 12 | 47.44 | 47.44 | | 47.86 | 48.20 | 47.94 | 47.46 | 47.44 |
| 13 | 47.44 | 47.44 | | 47.88 | 48.18 | 47.94 | 47.46 | 47.46 |
| 14 | 47.42 | 47.42 | 47.54 | 47.90 | 48.16 | 47.96 | 47.48 | 47.46 |
| 15 | 47.38 | 47.40 | | 47.92 | 48.16 | 47.96 | 47.48 | 47.46 |
| 16 | 47.36 | 47.38 | | 47.92 | 48.14 | 47.96 | 47.48 | 47.48 |
| 17 | 47.36 | 47.38 | | 47.94 | 48.12 | 47.94 | 47.46 | 47.44 |
| 18 | 47.38 | 47.40 | | 47.94 | 48.12 | 47.94 | 47.46 | 47.42 |
| 19 | 47.42 | | | 47.95 | 48.12 | 47.92 | 47.44 | 47.42 |
| 20 | 47.54 | | | 47.96 | 48.10 | 47.90 | 47.44 | 47.40 |
| 21 | 47.54 | | | 47.96 | 48.10 | 47.90 | 47.42 | 47.40 |
| 22 | 47.54 | | | 47.98 | 48.08 | 47.88 | 47.40 | 47.38 |
| 23 | 47.54 | | | 48.00 | 48.08 | 47.88 | 47.40 | 47.38 |
| 24 | 47.54 | | 47.52 | 48.00 | 48.06 | 47.84 | 47.38 | 47.34 |
| 25 | 47.50 | 47.49 | | 48.00 | 48.06 | 47.82 | 47.36 | 47.32 |
| 26 | 47.48 | | | 48.02 | 48.06 | 47.80 | 47.36 | 47.30 |
| 27 | 47.44 | | | 48.03 | 48.04 | 47.78 | 47.34 | 47.28 |
| 28 | 47.40 | | | 48.06 | 48.04 | 47.78 | 47.34 | 47.24 |
| 29 | 47.38 | | | 48.10 | 48.04 | 47.76 | 47.32 | 47.22 |
| 30 | 47.40 | | | 48.12 | 48.02 | 47.76 | 47.32 | 47.20 |
| 31 | 47.42 | | | 48.14 | | 47.74 | 47.32 | |

NOTE.—Add 1,200 feet to obtain elevation above mean sea level.

### RUM RIVER NEAR ST. FRANCIS, MINN.

LOCATION.—Chain gage on bridge between secs. 19 and 30, T. 33 N., R. 24 W., 5 miles south of St. Francis and 15¾ miles above junction with Mississippi River.

DRAINAGE AREA.—1,360 square miles.

RECORDS AVAILABLE.—May 1929 to September 1933.

DISCHARGE.—Maximum during year, 600 second-feet May 12, 13 (gage height, 3.52 feet); minimum, 39 second-feet Sept. 5 (gage height, 2.10 feet).

1929–33: Maximum, 3,760 second-feet May 18, 1930 (gage height, 6.53 feet); minimum, that of Sept. 5, 1933.

REMARKS.—Records fair. No record Nov. 20 to Mar. 18.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 64 | 89 | ------- | 220 | 159 | 465 | 68 | 64 | 41 |
| 2 | 64 | 89 | ------- | 240 | 162 | 490 | 68 | 64 | 41 |
| 3 | 64 | 89 | ------- | 240 | 159 | 518 | 66 | 64 | 41 |
| 4 | 64 | 89 | ------- | 236 | 156 | 545 | 64 | 64 | 41 |
| 5 | 64 | 89 | ------- | 236 | 148 | 490 | 64 | 64 | 39 |
| 6 | 64 | 89 | ------- | 236 | 145 | 390 | 64 | 64 | 41 |
| 7 | 64 | 89 | ------- | 232 | 142 | 322 | 66 | 64 | 43 |
| 8 | 64 | 89 | ------- | 228 | 145 | 280 | 66 | 64 | 47 |
| 9 | 64 | 89 | ------- | 232 | 196 | 248 | 66 | 68 | 47 |
| 10 | 64 | 89 | ------- | 236 | 300 | 224 | 66 | 66 | 47 |
| 11 | 64 | 89 | ------- | 232 | 440 | 200 | 66 | 61 | 47 |
| 12 | 66 | 94 | ------- | 224 | 600 | 184 | 66 | 55 | 49 |
| 13 | 68 | 97 | ------- | 220 | 600 | 166 | 66 | 47 | 51 |
| 14 | 71 | 100 | ------- | 204 | 545 | 156 | 68 | 47 | 51 |
| 15 | 71 | 105 | ------- | 192 | 490 | 145 | 68 | 43 | 51 |
| 16 | 71 | 108 | ------- | 188 | 465 | 124 | 68 | 43 | 51 |
| 17 | 71 | 108 | ------- | 184 | 390 | 110 | 70 | 43 | 49 |
| 18 | 71 | 105 | ------- | 173 | 368 | 107 | 68 | 43 | 47 |
| 19 | 71 | 111 | 228 | 166 | 300 | 102 | 68 | 41 | 47 |
| 20 | 75 | ------- | 228 | 166 | 280 | 99 | 66 | 41 | 47 |
| 21 | 80 | ------- | 216 | 159 | 280 | 96 | 64 | 41 | 49 |
| 22 | 84 | ------- | 204 | 152 | 280 | 93 | 61 | 41 | 51 |
| 23 | 89 | ------- | 188 | 152 | 322 | 93 | 61 | 41 | 51 |
| 24 | 89 | ------- | 173 | 152 | 345 | 88 | 61 | 41 | 51 |
| 25 | 89 | ------- | 159 | 156 | 368 | 88 | 61 | 41 | 51 |
| 26 | 89 | ------- | 145 | 159 | 368 | 85 | 61 | 41 | 51 |
| 27 | 89 | ------- | 152 | 159 | 368 | 75 | 61 | 41 | 49 |
| 28 | 89 | ------- | 170 | 162 | 390 | 68 | 64 | 41 | 45 |
| 29 | 89 | ------- | 184 | 162 | 390 | 68 | 64 | 41 | 49 |
| 30 | 89 | ------- | 196 | 159 | 415 | 68 | 64 | 41 | 49 |
| 31 | 89 | ------- | 208 | ------- | 440 | ------- | 64 | 41 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 89 | 64 | 74.3 | 0.055 | 0.06 |
| November 1–19 | 111 | 89 | 95.1 | .070 | .05 |
| March 19–31 | 228 | 145 | 189 | .139 | .07 |
| April | 240 | 152 | 195 | .143 | .16 |
| May | 600 | 142 | 328 | .241 | .28 |
| June | 545 | 68 | 206 | .151 | .17 |
| July | 70 | 61 | 65.1 | .048 | .06 |
| August | 68 | 41 | 50.4 | .037 | .04 |
| September | 51 | 39 | 47.1 | .035 | .04 |

### MINNESOTA RIVER NEAR MONTEVIDEO, MINN.

LOCATION.—Chain gage in sec. 19, T. 117 N., R. 40 W., at highway bridge 500 feet below mouth of Chippewa River and 1 mile south of Montevideo. Zero of gage is 910.87 feet above mean sea level (1912 adjustment).

DRAINAGE AREA.—6,300 square miles.

RECORDS AVAILABLE.—July 1909 to September 1933.

DISCHARGE.—Maximum during year, 430 second-feet May 20 (gage height, 4.19 feet); no flow for a few days in August and September.

1909–33: Maximum, about 22,000 second-feet June 25, 1919 (gage height, about 18.85 feet); minimum, that of August and September 1933. Average, 24 years (1909–33), 536 second-feet.

REMARKS.—Records good except those for period of ice effect, Nov. 10 to Mar. 28, which are fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.5 | 10 | 10 | [a] 2.9 | 3.3 | 73 | 161 | 68 | 82 | 3.9 | 0.7 | 0.4 |
| 2 | 1.5 | 8.8 | 9.6 | 3.0 | [a] 3.8 | 68 | 178 | 78 | 64 | 3.6 | 1.2 | .4 |
| 3 | 1.8 | 8.8 | 9.6 | [a] 2.9 | [a] 4.3 | 68 | 239 | 68 | 60 | 5.1 | 1.0 | .4 |
| 4 | 1.8 | 7.6 | [a] 9.8 | 2.8 | 4.8 | 64 | 186 | 68 | 56 | 4.5 | 1.0 | .2 |
| 5 | 2.4 | 7.6 | 10 | [a] 3.4 | [a] 4.0 | 68 | 138 | 64 | 52 | 2.8 | .9 | .1 |
| 6 | 2.0 | 7.2 | [a] 9.4 | [a] 4.0 | 3.3 | 68 | 203 | 68 | 60 | 2.6 | .9 | .2 |
| 7 | 1.8 | 6.4 | 8.8 | 4.5 | [a] 2.8 | 73 | 221 | 73 | 68 | 2.4 | .7 | .3 |
| 8 | 1.8 | 6.4 | [a] 8.8 | [a] 4.8 | 2.4 | 82 | 146 | 64 | 60 | 2.4 | .7 | .3 |
| 9 | 1.8 | 12 | [a] 8.8 | 5.1 | [a] 2.5 | 78 | 124 | 68 | 64 | 2.6 | .7 | .9 |
| 10 | 2.2 | 12 | 8.8 | [a] 4.0 | [a] 2.5 | 73 | 118 | 78 | 56 | 2.6 | .7 | 2.4 |
| 11 | 2.7 | 16 | [a] 9.2 | 3.0 | 2.6 | 56 | 153 | 86 | 52 | 2.2 | .7 | 2.1 |
| 12 | 3.0 | 8.0 | 9.6 | [a] 2.9 | [a] 2.6 | 44 | 146 | 86 | 73 | 2.2 | .4 | 1.4 |
| 13 | 3.0 | 6.4 | [a] 9.0 | [a] 2.9 | 2.6 | 48 | 124 | 118 | 52 | 2.2 | .2 | 1.2 |
| 14 | 3.0 | 6.4 | 8.4 | 2.8 | [a] 2.6 | 48 | 124 | 131 | 39 | 1.0 | 0 | 1.2 |
| 15 | 3.0 | 4.8 | [a] 7.9 | [a] 2.6 | 2.6 | 52 | 112 | 118 | 33 | 1.4 | 0 | 1.1 |
| 16 | 6.8 | 3.3 | [a] 7.4 | 2.4 | [a] 3.0 | 52 | 96 | 112 | 26 | 1.2 | 0 | 1.0 |
| 17 | 8.4 | 4.2 | 6.8 | [a] 2.2 | 3.3 | 48 | 82 | 118 | 23 | .9 | 0 | .8 |
| 18 | 8.4 | 5.1 | [a] 6.2 | 2.1 | 3.0 | 48 | 82 | 106 | 24 | 1.4 | 0 | .0 |
| 19 | 5.7 | 5.7 | 5.7 | [a] 2.9 | [a] 8.0 | 48 | 78 | 112 | 20 | 1.4 | .2 | .2 |
| 20 | 4.8 | 7.6 | [a] 6.8 | [a] 3.7 | 13 | 52 | 68 | 430 | 15 | 1.4 | .3 | .4 |
| 21 | 4.8 | 8.4 | 8.0 | 4.5 | 13 | 45 | 76 | 319 | 10 | 1.0 | .4 | .2 |
| 22 | 4.8 | 7.6 | [a] 7.1 | [a] 3.9 | 14 | 56 | 86 | 221 | 10 | 1.0 | 1.0 | .2 |
| 23 | 4.8 | 7.2 | [a] 6.2 | 3.3 | 29 | 60 | 78 | 153 | 12 | 1.2 | 2.0 | .2 |
| 24 | 6.0 | 10 | 5.4 | [a] 3.3 | 82 | 64 | 76 | 118 | 8.8 | 1.2 | .6 | .2 |
| 25 | 5.4 | 9.6 | [a] 4.1 | 3.3 | 82 | 73 | 82 | 169 | 5.7 | 1.2 | 1.0 | .2 |
| 26 | 5.4 | 9.6 | 2.8 | [a] 3.3 | 96 | 78 | 82 | 153 | 7.2 | 1.0 | .8 | .2 |
| 27 | 5.4 | 9.6 | [a] 2.8 | [a] 3.3 | 82 | 86 | 64 | 118 | 6.0 | 1.0 | .6 | .1 |
| 28 | 6.0 | 9.6 | 2.8 | 3.3 | 86 | 101 | 60 | 96 | 5.7 | 1.0 | .6 | .1 |
| 29 | 11 | 9.6 | [a] 2.8 | [a] 2.8 | ------- | 138 | 64 | 112 | 5.7 | .8 | .4 | 0 |
| 30 | 19 | 11 | [a] 2.8 | 2.4 | ------- | 138 | 68 | 124 | 4.8 | .8 | .4 | 0 |
| 31 | 14 | ------- | 2.8 | [a] 2.9 | ------- | 153 | ------- | 96 | ------- | .7 | .4 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 19 | 1.5 | 4.97 | 0.00073 | 0.0009 |
| November | 16 | 3.3 | 8.22 | .0013 | .001 |
| December | 10 | 2.8 | 7.04 | .0011 | .001 |
| January | 5.1 | 2.1 | 3.26 | .00052 | .0006 |
| February | 96 | 2.4 | 20.0 | .0032 | .003 |
| March | 153 | 44 | 71.1 | .011 | .01 |
| April | 239 | 60 | 117 | .019 | .02 |
| May | 430 | 64 | 122 | .019 | .02 |
| June | 82 | 4.8 | 35.2 | .0056 | .006 |
| July | 5.1 | .7 | 1.89 | .00030 | .0003 |
| August | 2.0 | 0 | .60 | .000095 | .0001 |
| September | 2.4 | 0 | .57 | .000090 | .0001 |
| The year | 430 | 0 | 32.7 | .0052 | .06 |

[a] Interpolated.

### MINNESOTA RIVER AT MANKATO, MINN.

LOCATION.—Water-stage recorder in sec. 7, T. 108 N., R. 26 W., at Main Street Bridge in Mankato, 2 miles below mouth of Blue Earth River. Zero of gage is 748.82 feet above mean sea level (1912 adjustment).

DRAINAGE AREA.—14,600 square miles.

RECORDS AVAILABLE.—March 1922 to September 1933. May 1903 to October 1921 at a site 1,000 feet below mouth of Blue Earth River.

DISCHARGE.—Maximum during year, 13,400 second-feet Apr. 3 (gage height, 15.02 feet); minimum, 46 second-feet Aug. 21 (gage height, 1.95 feet).

1903–32: Maximum, 43,800 second-feet June 26, 1908 (gage height at old site, 21.2 feet); minimum, 40 second-feet Sept. 13, 1931 (gage height, 2.02 feet). Average, 30 years (1903–33), 2,400 second-feet.

Maximum known stage, about 27 feet at old site in 1881 (discharge, about 65,000 second-feet).

REMARKS.—Records good except those for period of ice effect, Nov. 15 to Mar. 14, which are fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 110 | 142 | 150 | 101 | 361 | 4,010 | 8,760 | 860 | 701 | 154 | 254 | 58 |
| 2 | 102 | 125 | 144 | 77 | 238 | 3,900 | 10,600 | 1,020 | 678 | 320 | 236 | 75 |
| 3 | 80 | 99 | 150 | 76 | 161 | 3,210 | 12,900 | 952 | 652 | 184 | 271 | 126 |
| 4 | 85 | 134 | 113 | 107 | 174 | 2,300 | 13,100 | 904 | 631 | 290 | 188 | 102 |
| 5 | 106 | 151 | 114 | 77 | 179 | 2,200 | 11,600 | 936 | 527 | 276 | 132 | 157 |
| 6 | 80 | 135 | 120 | 76 | 210 | 1,950 | 9,520 | 920 | 585 | 616 | 209 | 129 |
| 7 | 77 | 106 | 104 | 104 | 214 | 1,950 | 7,950 | 802 | 605 | 504 | 93 | 168 |
| 8 | 92 | 161 | 109 | 76 | 179 | 1,900 | 6,820 | 992 | 549 | 323 | 114 | 157 |
| 9 | 112 | 263 | 78 | 73 | 179 | 1,180 | 5,920 | 846 | 562 | 295 | 157 | 124 |
| 10 | 83 | 223 | 90 | 102 | 206 | 830 | 5,220 | 895 | 533 | 188 | 82 | 212 |
| 11 | 80 | 168 | 74 | 85 | 220 | 954 | 4,520 | 917 | 460 | 242 | 74 | 156 |
| 12 | 78 | 163 | 74 | 72 | 257 | 1,010 | 4,220 | 952 | 352 | 186 | 73 | 184 |
| 13 | 80 | 184 | 73 | 74 | 138 | 1,030 | 3,520 | 920 | 425 | 124 | 66 | 124 |
| 14 | 78 | 143 | 74 | 87 | 128 | 1,230 | 3,230 | 870 | 348 | 168 | 77 | 102 |
| 15 | 92 | 126 | 99 | 93 | 154 | 1,030 | 2,850 | 851 | 313 | 178 | 97 | 104 |
| 16 | 102 | 120 | 76 | 76 | 94 | 1,060 | 2,560 | 792 | 313 | 162 | 80 | 134 |
| 17 | 78 | 120 | 76 | 69 | 101 | 1,110 | 2,320 | 727 | 298 | 100 | 106 | 164 |
| 18 | 91 | 142 | 90 | 68 | 84 | 1,230 | 2,180 | 669 | 292 | 98 | 100 | 78 |
| 19 | 117 | 160 | 85 | 67 | 103 | 1,030 | 1,940 | 815 | 214 | 90 | 88 | 81 |
| 20 | 103 | 122 | 73 | 78 | 82 | 752 | 1,760 | 992 | 252 | 80 | 60 | 70 |
| 21 | 80 | 94 | 70 | 78 | 82 | 815 | 1,630 | 1,160 | 310 | 81 | 82 | 65 |
| 22 | 84 | 111 | 73 | 252 | 80 | 946 | 1,500 | 1,320 | 256 | 93 | 133 | 69 |
| 23 | 89 | 136 | 72 | 672 | 106 | 922 | 1,360 | 1,400 | 238 | 416 | 77 | 76 |
| 24 | 101 | 117 | 74 | 533 | 834 | 766 | 1,270 | 1,420 | 232 | 258 | 85 | 86 |
| 25 | 123 | 150 | 99 | 521 | 1,360 | 914 | 1,160 | 936 | 181 | 188 | 58 | 66 |
| 26 | 114 | 131 | 80 | 786 | 1,900 | 890 | 1,070 | 912 | 160 | 202 | 68 | 71 |
| 27 | 117 | 116 | 74 | 938 | 3,040 | 766 | 960 | 1,000 | 144 | 289 | 85 | 86 |
| 28 | 121 | 110 | 107 | 731 | 3,680 | 852 | 920 | 936 | 135 | 274 | 58 | 94 |
| 29 | 124 | 132 | 78 | 527 | ------- | 1,360 | 920 | 912 | 135 | 253 | 58 | 66 |
| 30 | 94 | 139 | 100 | 358 | ------- | 3,100 | 976 | 728 | 130 | 218 | 60 | 66 |
| 31 | 122 | ------- | 81 | 322 | ------- | 6,620 | ------- | 672 | ------- | 150 | 57 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 124 | 77 | 96.6 | 0.0066 | 0.008 |
| November | 263 | 94 | 141 | .0097 | .01 |
| December | 150 | 70 | 92.7 | .0063 | .007 |
| January | 938 | 67 | 237 | .016 | .02 |
| February | 3,680 | 80 | 519 | .036 | .04 |
| March | 6,620 | 752 | 1,670 | .114 | .13 |
| April | 13,100 | 920 | 4,440 | .304 | .34 |
| May | 1,420 | 669 | 936 | .064 | .07 |
| June | 701 | 130 | 374 | .026 | .03 |
| July | 616 | 80 | 226 | .015 | .02 |
| August | 271 | 57 | 109 | .0075 | .009 |
| September | 212 | 58 | 108 | .0074 | .008 |
| The year | 13,100 | 57 | 742 | .051 | .69 |

### WHETSTONE RIVER NEAR BIG STONE, S.DAK.

LOCATION.—Chain gage in sec. 18, T. 121 N., R. 46 W., 1½ miles west of Big Stone.

DRAINAGE AREA.—420 square miles.

RECORDS AVAILABLE.—March 1931 to September 1933. September 1909 to November 1912 at a site 2 miles downstream.

DISCHARGE.—Maximum during year, 45 second-feet June 6 (gage height, 2.84 feet); no flow for several days in July and August.

1931–33: Maximum, 1,320 second-feet May 28 (gage height, 7.1 feet); no flow Sept. 13–15, 1931, July 31 to Aug. 23, 1933.

REMARKS.—Records good except those for period of ice effect, Mar. 2 to Apr. 3, which are fair. No record Nov. 1 to Mar. 1.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.4 | ------- | 6.7 | 5.8 | 3.2 | 0.3 | 0 | 0.3 |
| 2 | .5 | 12 | 7.0 | 6.2 | 2.5 | .3 | 0 | .3 |
| 3 | .6 | 13 | 7.2 | 4.8 | 2.2 | .3 | 0 | .3 |
| 4 | .8 | 10 | 7.8 | 5.3 | 4.0 | .3 | 0 | .3 |
| 5 | 1.0 | 9.4 | 6.7 | 5.3 | 13 | .3 | 0 | .3 |
| 6 | 1.3 | 7.2 | 6.2 | 5.3 | 43 | .3 | 0 | .2 |
| 7 | 1.3 | 8.3 | 6.2 | 5.8 | 22 | .3 | 0 | .2 |
| 8 | 2.5 | 8.3 | 5.3 | 5.3 | 15 | .4 | 0 | .2 |
| 9 | 2.5 | 8.9 | 4.8 | 4.4 | 9.4 | .8 | 0 | .2 |
| 10 | 2.5 | 9.4 | 4.8 | 4.4 | 7.8 | .8 | 0 | 1.2 |
| 11 | 3.0 | 10 | 4.0 | 4.4 | 5.8 | .7 | 0 | 1.6 |
| 12 | 2.5 | 8.3 | 3.6 | 4.8 | 4.4 | .5 | 0 | 1.0 |
| 13 | 2.0 | 6.7 | 4.0 | 4.8 | 4.0 | .4 | 0 | .7 |
| 14 | 2.5 | 5.0 | 3.6 | 4.8 | 2.8 | .3 | 0 | .4 |
| 15 | 3.7 | 6.1 | 3.6 | 4.8 | 1.9 | .3 | 0 | .4 |
| 16 | 3.5 | 7.2 | 3.2 | 4.8 | 1.9 | .3 | 0 | .5 |
| 17 | 3.0 | 6.2 | 2.8 | 4.6 | 1.3 | .2 | 0 | .5 |
| 18 | 3.0 | 6.2 | 2.8 | 10 | 1.0 | .2 | 0 | .4 |
| 19 | 4.3 | 6.2 | 2.8 | 10 | .5 | .2 | 0 | .4 |
| 20 | 2.0 | 6.2 | 3.2 | 5.8 | .5 | .4 | 0 | .3 |
| 21 | 1.0 | 6.2 | 2.8 | 6.7 | .4 | .5 | 0 | .2 |
| 22 | 1.3 | 5.8 | 2.8 | 7.2 | .5 | .5 | 0 | .2 |
| 23 | 1.3 | 5.8 | 2.8 | 6.2 | .5 | .5 | 0 | .2 |
| 24 | 1.3 | 5.6 | 2.8 | 4.8 | .4 | .5 | 4.0 | .2 |
| 25 | 1.6 | 5.5 | 2.8 | 4.0 | .5 | .3 | 5.5 | .2 |
| 26 | 2.0 | 5.4 | 2.5 | 2.8 | .4 | .3 | 4.0 | .2 |
| 27 | 2.0 | 5.3 | 2.5 | 2.8 | .4 | .2 | 1.9 | .2 |
| 28 | 2.0 | 6.7 | 2.2 | 4.8 | .4 | .2 | .8 | .3 |
| 29 | 1.6 | 6.7 | 4.8 | 4.4 | .5 | .1 | .7 | .3 |
| 30 | 2.5 | 6.0 | 6.2 | 4.0 | .4 | .1 | .4 | .7 |
| 31 | 4.3 | 6.2 | ------- | 3.6 | ------- | 0 | .4 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 4.3 | 0.4 | 2.06 | 0 0049 | 0.006 |
| March 2-31 | 13 | 5.0 | 7.33 | .017 | .02 |
| April | 7.8 | 2.2 | 4.28 | .010 | .01 |
| May | 10 | 2.8 | 5.25 | .012 | .01 |
| June | 43 | .4 | 5.02 | .012 | .01 |
| July | 0.8 | .0 | .35 | .00083 | .001 |
| August | 5.5 | .0 | .57 | .0014 | .002 |
| September | 1.6 | .2 | .41 | .00098 | .001 |

### POMME DE TERRE RIVER NEAR APPLETON, MINN.

LOCATION.—Staff gage in NE¼ sec. 1, T. 120 N., R. 43 W., 3 miles northeast of Appleton and 5 miles above mouth.

DRAINAGE AREA.—950 square miles.

RECORDS AVAILABLE.—March 1931 to September 1933.

DISCHARGE.—Maximum during year, 195 second-feet Feb. 25 (gage height, 3.38 feet, affected by ice); minimum, 0.5 second-foot Aug. 14 (gage height, 0.21 foot).

1931–33: Maximum, 212 second-feet Feb. 29, 1932 (gage height 3.66 feet, affected by ice); minimum, that of Aug. 14, 1933.

REMARKS.—Records fair. Stage-discharge relation affected by ice Feb. 23 to Mar. 31 and by aquatic growth Oct. 1 to Nov. 4 and May 12 to Sept. 30. No record Nov. 5 to Feb. 22.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.4 | 15 | ------- | 66 | 75 | 29 | 5.5 | 0.8 | 0.6 | 4.2 |
| 2 | 6.4 | 16 | ------- | 67 | 61 | 33 | 3.8 | .8 | .7 | 4.4 |
| 3 | 5.8 | 16 | ------- | 62 | 53 | 29 | 3.2 | .8 | .7 | 4.4 |
| 4 | 6.1 | 14 | ------- | 66 | 44 | 26 | 3.6 | .8 | .8 | 4.0 |
| 5 | 6.7 | ------- | ------- | 68 | 48 | 27 | 3.2 | .8 | .8 | 3.6 |
| 6 | 6.7 | ------- | ------- | 44 | 48 | 27 | 2.0 | .9 | .8 | 3.4 |
| 7 | 6.4 | ------- | ------- | 16 | 51 | 27 | 1.5 | .9 | .8 | 3.2 |
| 8 | 6.7 | ------- | ------- | 38 | 37 | 35 | 2.1 | .8 | .8 | 3.0 |
| 9 | 6.4 | ------- | ------- | 67 | 46 | 34 | 1.8 | 1.6 | .8 | 2.8 |
| 10 | 7.1 | ------- | ------- | 15 | 42 | 36 | 1.6 | 1.6 | .7 | 7.9 |
| 11 | 7.1 | ------- | ------- | 18 | 39 | 34 | 1.7 | 1.4 | .8 | 6.4 |
| 12 | 7.1 | ------- | ------- | 15 | 34 | 35 | 1.7 | 1.0 | .8 | 6.4 |
| 13 | 8.3 | ------- | ------- | 14 | 37 | 43 | 1.8 | .9 | .6 | 6.7 |
| 14 | 7.9 | ------- | ------- | 13 | 35 | 46 | 2.0 | .8 | .6 | 6.4 |
| 15 | 13 | ------- | ------- | 16 | 29 | 39 | 2.0 | .6 | .7 | 6.1 |
| 16 | 10 | ------- | ------- | 16 | 29 | 47 | 2.2 | .8 | .9 | 7.5 |
| 17 | 10 | ------- | ------- | 16 | 27 | 42 | 2.6 | .9 | 1.0 | 6.4 |
| 18 | 10 | ------- | ------- | 13 | 26 | 37 | 2.1 | .9 | .8 | 5.5 |
| 19 | 12 | ------- | ------- | 8 | 25 | 130 | 2.6 | .9 | .9 | 4.6 |
| 20 | 10 | ------- | ------- | 18 | 23 | 57 | 2.2 | 1.0 | .8 | 4.6 |
| 21 | 10 | ------- | ------- | 23 | 24 | 30 | 2.0 | .8 | .9 | 4.4 |
| 22 | 11 | ------- | ------- | 21 | 23 | 22 | 1.9 | .8 | 1.3 | 4.2 |
| 23 | 11 | ------- | 98 | 25 | 22 | 16 | 2.0 | .9 | 4.0 | 3.8 |
| 24 | 11 | ------- | 63 | 32 | 22 | 17 | 1.9 | 1.6 | 6.1 | 3.6 |
| 25 | 11 | ------- | 146 | 71 | 22 | 20 | 1.7 | 1.7 | 10 | 3.4 |
| 26 | 11 | ------- | 138 | 82 | 21 | 23 | 1.6 | 1.5 | 13 | 3.4 |
| 27 | 12 | ------- | 115 | 82 | 22 | 21 | 1.4 | .9 | 9.1 | 3.4 |
| 28 | 12 | ------- | 100 | 70 | 21 | 10 | 1.3 | .8 | 7.5 | 3.8 |
| 29 | 12 | ------- | ------- | 98 | 21 | 8.7 | 1.2 | .6 | 6.4 | 3.4 |
| 30 | 12 | ------- | ------- | 64 | 25 | 6.7 | .9 | .6 | 4.9 | 2.4 |
| 31 | 13 | ------- | ------- | 108 | ------- | 6.1 | ------- | .6 | 4.2 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 13 | 5.8 | 9.23 | 0.0097 | 0.01 |
| November 1–4 | 16 | 14 | 15.2 | .016 | .002 |
| February 23–28 | 146 | 63 | 110 | .116 | .03 |
| March | 108 | 8 | 43.0 | .045 | .05 |
| April | 75 | 21 | 34.4 | .036 | .04 |
| May | 130 | 6.1 | 32.0 | .034 | .04 |
| June | 5.5 | .9 | 2.17 | .0023 | .003 |
| July | 1.7 | .6 | .96 | .0010 | .001 |
| August | 13 | .6 | 2.67 | .0028 | .003 |
| September | 7.9 | 2.4 | 4.58 | .0048 | .005 |

### LAC QUI PARLE RIVER NEAR LAC QUI PARLE, MINN.

LOCATION.—Staff gage on line between secs. 27 and 28, T. 118 N., R. 42 W., 1 mile southwest of Lac qui Parle.

DRAINAGE AREA.—1,040 square miles.

RECORDS AVAILABLE.—March 1931 to September 1933. April 1910 to November 1914 at station 2 miles downstream.

DISCHARGE.—Maximum recorded during year, 360 second-feet May 19 (gage height, 3.11 feet); little or no flow for several days in 1933.

1910–14, 1931–33: Maximum, 1,550 second-feet May 5, 6, 1912 (gage height, 7.6 feet at old station); no flow for various periods.

REMARKS.—Records fair except those for period of ice effect, Mar. 2–25, which are poor. No record Oct. 1 to Mar. 1.

*Discharge, in second-feet, 1933*

| Day | Mar. | Apr. | May | June | Day | Mar. | Apr. | May | June |
|---|---|---|---|---|---|---|---|---|---|
| 1 | ------ | 38 | 4.2 | 8.8 | 16 | | 6.3 | 8.1 | 7.5 |
| 2 | 10 | 33 | 4.2 | 7.5 | 17 | 1.5 | 5.7 | 8.8 | 6.9 |
| 3 | 1.6 | 28 | 3.7 | 6.9 | 18 | | 5.7 | 238 | 6.3 |
| 4 | | 26 | 3.2 | 11 | 19 | 2.0 | 5.2 | 360 | 5.7 |
| 5 | | 20 | 3.4 | 22 | 20 | 6.9 | 4.6 | 158 | 4.6 |
| | 2 | | | | | | | | |
| 6 | | 20 | 3.6 | 26 | 21 | 11 | 4.6 | 68 | 4.2 |
| 7 | | 27 | 4.6 | 20 | 22 | 13 | 4.6 | 44 | 3.2 |
| 8 | | 12 | 5.7 | 27 | 23 | 4.6 | 4.2 | 37 | .9 |
| 9 | | 12 | 6.3 | 26 | 24 | 8.4 | 3.2 | 26 | .6 |
| 10 | 1 | 8.8 | 7.5 | 26 | 25 | 12 | 4.2 | 22 | .6 |
| 11 | | 10 | 9.2 | 26 | 26 | 11 | 3.2 | 15 | .5 |
| 12 | 1.5 | 10 | 11 | 27 | 27 | 10 | 3.2 | 12 | .4 |
| 13 | 1.5 | 8.1 | 11 | 15 | 28 | 8.8 | 3.2 | 14 | .3 |
| 14 | 1.3 | 7.5 | 8.8 | 12 | 29 | 13 | 3.6 | 13 | .2 |
| 15 | 1.5 | 6.9 | 8.1 | 11 | 30 | 22 | 4.6 | 12 | .2 |
| | | | | | 31 | 30 | ------ | 11 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| March 2–31 | 30 | 1.0 | 6.22 | 0.006 | 0.01 |
| April | 38 | 3.2 | 11.1 | .011 | .01 |
| May | 360 | 3.2 | 36.8 | .035 | .04 |
| June | 27 | .2 | 10.5 | .010 | .01 |

NOTE.—Little or no flow during July, August, and September.

### CHIPPEWA RIVER NEAR WATSON, MINN.

LOCATION.—Chain gage on line between secs. 22 and 15, T. 118 N., R. 41 W., 1½ miles northeast of Watson, 2 miles below Dry Weather Creek, and 10 miles above mouth.

DRAINAGE AREA.—1,850 square miles.

RECORD AVAILABLE.—April 1910 to September 1917; March 1931 to September 1933.

DISCHARGE.—Maximum during year, 86 second-feet Mar. 2 (gage height, 4.64 feet, affected by ice); no flow July 25 to Aug. 27.

1910–17, 1931–33: Maximum 9,600 second-feet Apr. 4, 1917 (gage height, 17.86 feet, old datum); minimum, that of 1933.

REMARKS.—Records good except those for period of ice effect, Feb. 23 to Mar. 27, which are fair. No record Nov. 1 to Feb. 22.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.2 | | 66 | 57 | 37 | 46 | 1.1 | 0 | 0.8 |
| 2 | 1.7 | | 75 | 53 | 40 | 43 | 1.1 | 0 | 1.9 |
| 3 | 1.7 | | 35 | 57 | 38 | 40 | .9 | 0 | 2.3 |
| 4 | 1.3 | | 46 | 61 | 39 | 45 | .8 | 0 | 2.3 |
| 5 | 1.5 | | 57 | 66 | 42 | 40 | .5 | 0 | 1.6 |
| 6 | 1.5 | | 53 | 66 | 42 | 37 | .5 | 0 | 1.2 |
| 7 | 1.7 | | 50 | 57 | 43 | 33 | .5 | 0 | 1.1 |
| 8 | 2.1 | | 17 | 57 | 45 | 33 | .5 | 0 | .5 |
| 9 | 2.1 | | 15 | 53 | 43 | 31 | 1.6 | 0 | .5 |
| 10 | 1.5 | | 14 | 53 | 40 | 29 | 1.6 | 0 | 4.4 |
| 11 | 1.9 | | 9 | 50 | 40 | 25 | 1.2 | 0 | 8.3 |
| 12 | 1.9 | | 16 | 46 | 40 | 21 | 1.1 | 0 | 5.8 |
| 13 | 1.7 | | 15 | 40 | 50 | 18 | .9 | 0 | 3.0 |
| 14 | 1.7 | | 15 | 45 | 53 | 16 | .8 | 0. | 2.3 |
| 15 | 3.8 | | 18 | 43 | 53 | 12 | .5 | 0 | 2.3 |
| 16 | 2.7 | | 18 | 40 | 50 | 11 | .2 | 0 | 3.7 |
| 17 | 2.3 | | 14 | 40 | 50 | 8.3 | .2 | 0 | 3.7 |
| 18 | 2.3 | | 15 | 40 | 46 | 6.5 | .2 | 0 | 2.6 |
| 19 | 3.3 | | 19 | 39 | 46 | 5.1 | .1 | 0 | 1.9 |
| 20 | 3.3 | | 14 | 39 | 53 | 3.7 | .1 | 0 | 1.1 |
| 21 | 3.3 | | 25 | 40 | 57 | 3.7 | .1 | 0 | 1.2 |
| 22 | 5.9 | | 19 | 39 | 53 | 2.6 | .1 | 0 | 1.1 |
| 23 | 7.2 | 53 | 15 | 38 | 50 | 2.6 | .1 | 0 | .9 |
| 24 | 6.5 | 61 | 28 | 37 | 50 | 1.6 | .1 | 0 | .9 |
| 25 | 5.9 | 66 | 42 | 35 | 50 | 1.2 | 0 | 0 | 1.1 |
| 26 | 5.9 | 70 | 35 | 33 | 46 | 2.3 | 0 | 0 | .9 |
| 27 | 5.9 | 50 | 13 | 34 | 45 | 1.6 | 0 | 0 | 1.1 |
| 28 | 5.9 | 66 | 13 | 34 | 50 | 1.6 | 0 | 1.6 | 1.2 |
| 29 | 6.5 | | 57 | 35 | 57 | 1.2 | 0 | 1.2 | 1.6 |
| 30 | 5.9 | | 53 | 33 | 53 | 1.1 | 0 | 1.2 | 1.1 |
| 31 | 4.7 | | 61 | | 50 | | 0 | 1.1 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 7.2 | 1.2 | 3.38 | 0.0018 | 0.002 |
| February 23–28 | 70 | 50 | 61.0 | .033 | .007 |
| March | 75 | 9 | 30.4 | .016 | .02 |
| April | 66 | 33 | 45.3 | .024 | .03 |
| May | 57 | 37 | 46.8 | .025 | .03 |
| June | 46 | 1.1 | 17.4 | .0094 | .01 |
| July | 1.6 | 0 | .49 | .00026 | .0003 |
| August | 1.6 | 0 | .16 | .000086 | .0001 |
| September | 8.3 | .5 | 2.08 | .0011 | .001 |

### YELLOW MEDICINE RIVER NEAR GRANITE FALLS, MINN.

LOCATION.—Chain gage in sec. 35, T. 115 N., R. 39 W., 6 miles above mouth and 8 miles south of Granite Falls.
DRAINAGE AREA.—540 square miles.
RECORDS AVAILABLE.—March 1931 to September 1933.
DISCHARGE.—Maximum during year, 56 second-feet Feb. 25 (gage height, 2.88 feet); no flow for several days.
1931–33: Maximum, 476 second-feet Mar. 1, 1932 (gage height, 4.20 feet); no flow July 26 to Aug. 27, 1930, and several days in 1933.
REMARKS.—Records fair. Stage-discharge relation affected by debris on control Oct. 1–31 and Feb. 25 to June 20. No record Nov. 1 to Feb. 24.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.3 | | 32 | 22 | 6.8 | 1.1 | 0 | 0 | 0.5 |
| 2 | 2.4 | | 35 | 21 | 4.3 | 1.3 | .6 | .5 | 1.1 |
| 3 | .9 | | 31 | 19 | 6.2 | 1.1 | .9 | 0 | .7 |
| 4 | 2.8 | | 28 | 21 | 4.6 | 2.4 | .5 | .2 | 1.1 |
| 5 | 1.3 | | 24 | 20 | 5.6 | 1.2 | 0 | .3 | .1 |
| 6 | 1.3 | | 26 | 17 | 7.4 | 1.2 | .6 | .1 | .1 |
| 7 | 3.2 | | 24 | 15 | 7.4 | 1.1 | 1.1 | .1 | 0 |
| 8 | 2.4 | | 14 | 14 | 8.6 | 9.2 | .8 | .1 | .7 |
| 9 | 2.4 | | 12 | 13 | 7.4 | 19 | .5 | .5 | 0 |
| 10 | 2.0 | | 12 | 12 | 6.2 | 45 | .6 | 0 | 4.3 |
| 11 | 1.2 | | 9.8 | 12 | 6.2 | 12 | 1.1 | 0 | 5.6 |
| 12 | 2.8 | | 11 | 10 | 5.6 | 5.6 | .1 | 0 | 2.0 |
| 13 | 2.8 | | 9.8 | 10 | 6.8 | 7.4 | .6 | 0 | .3 |
| 14 | 2.0 | | 6.2 | 9.2 | 6.8 | 4.6 | .1 | 0 | 1.2 |
| 15 | 1.1 | | 8.0 | 8.0 | 5.6 | 3.2 | .1 | .1 | .8 |
| 16 | 1.1 | | 8.0 | 8.0 | 5.0 | 2.4 | .1 | 0 | 1.3 |
| 17 | 2.0 | | 8.6 | 8.0 | 6.2 | 3.2 | .1 | 0 | 2.0 |
| 18 | 2.4 | | 12 | 9.2 | 5.0 | 2.4 | .3 | .1 | 2.8 |
| 19 | 2.4 | | 7.4 | 8.0 | 5.6 | .9 | .1 | .1 | 2.8 |
| 20 | 1.7 | | 8.6 | 4.6 | 4.6 | .8 | 0 | 0 | 1.2 |
| 21 | 1.3 | | 9.8 | 5.0 | 3.2 | 1.3 | .5 | .8 | .5 |
| 22 | 1.7 | | 12 | 5.6 | 3.9 | 1.3 | .5 | .3 | .2 |
| 23 | 2.4 | | 9.8 | 3.9 | 2.4 | 1.3 | .1 | 2.0 | .9 |
| 24 | .9 | | 10 | 4.6 | .7 | .5 | .2 | 3.9 | .9 |
| 25 | 2.4 | 56 | 12 | 6.2 | .8 | .3 | .8 | .3 | .9 |
| 26 | 1.7 | 37 | 11 | 2.8 | .9 | 1.1 | .1 | 1.2 | 1.1 |
| 27 | 1.7 | 28 | 12 | 3.2 | 1.1 | .3 | 0 | .5 | 2.4 |
| 28 | 2.4 | 30 | 14 | 3.5 | 2.4 | .1 | 0 | .7 | 1.1 |
| 29 | 2.8 | | 15 | 4.6 | 3.9 | .2 | 0 | .1 | 1.3 |
| 30 | 1.2 | | 15 | 4.6 | 2.8 | 0 | 0 | .2 | 1.1 |
| 31 | 3.2 | | 16 | | 1.3 | | 0 | 0 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 3.2 | 0.9 | 1.97 | 0.0056 | 0.004 |
| February 25–28 | 56 | 28 | 37.8 | .070 | .01 |
| March | 35 | 6.2 | 15.0 | .028 | .03 |
| April | 22 | 2.8 | 10.2 | .019 | .02 |
| May | 8.6 | .7 | 4.69 | .0087 | .01 |
| June | 45 | 0 | 4.38 | .0081 | .009 |
| July | 1.1 | 0 | .34 | .00063 | .0007 |
| August | 3.9 | 0 | .39 | .00072 | .0008 |
| September | 5.6 | 0 | 1.30 | .0024 | .003 |

### REDWOOD RIVER NEAR REDWOOD FALLS, MINN.

LOCATION.—Chain gage in NE ¼ sec. 9, T. 112 N., R. 36 W., 3 miles west of Redwood Falls.

DRAINAGE AREA.—703 square miles.

RECORDS AVAILABLE.—July 1909 to September 1914; August 1930 to September 1933.

DISCHARGE.—Maximum during year, 110 second-feet Mar. 2 (gage height, 2.38 feet); minimum, 0.5 second-foot July 16, 18, and Aug. 14 (gage height, 1.16 feet).

1909–14, 1930–33: Maximum, 781 second-feet, by current-meter measurement, July 2, 1909 (gage height, 3.98 feet, present datum); minimum, 0.4 second-foot July 19–22, 1911, and July 24, 1931 (gage height, 1.30 feet).

REMARKS.—Records good except those for period of debris on control, Oct. 1–31, and for period of ice effect, Mar. 1–18, which are fair. No record Nov. 1 to Feb. 28.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.8 | 108 | 55 | 14 | 8.4 | 0.8 | 0.6 | 0.9 |
| 2 | 2.0 | 108 | 49 | 14 | 9.0 | .9 | 1.3 | 1.3 |
| 3 | 1.9 | 95 | 49 | 15 | 7.8 | 1.0 | 1.3 | 1.3 |
| 4 | 2.0 | 85 | 42 | 16 | 14 | .9 | 1.2 | 1.1 |
| 5 | 1.8 | 81 | 36 | 16 | 11 | .6 | .9 | .9 |
| 6 | 1.9 | 64 | 32 | 17 | 9.0 | .6 | .9 | .9 |
| 7 | 1.8 | 60 | 27 | 15 | 7.8 | .7 | .8 | .8 |
| 8 | 1.7 | 21 | 30 | 20 | 14 | .7 | .8 | .9 |
| 9 | 1.7 | 22 | 25 | 17 | 15 | .9 | .7 | .9 |
| 10 | 1.5 | 22 | 24 | 16 | 16 | .9 | .6 | 10 |
| 11 | 1.6 | 22 | 21 | 14 | 14 | .8 | .6 | 4.2 |
| 12 | 1.9 | 22 | 20 | 14 | 11 | .8 | .6 | 1.8 |
| 13 | 1.8 | 27 | 18 | 14 | 9.6 | .7 | .6 | 1.3 |
| 14 | 1.7 | 28 | 18 | 14 | 7.8 | .7 | .5 | 1.3 |
| 15 | 2.0 | 33 | 17 | 14 | 6.0 | .6 | .6 | 1.2 |
| 16 | 2.2 | 40 | 16 | 13 | 5.1 | .5 | .9 | 6.0 |
| 17 | 2.0 | 49 | 16 | 13 | 4.2 | .6 | .9 | 2.1 |
| 18 | 1.9 | 42 | 15 | 14 | 3.0 | .5 | .9 | 1.3 |
| 19 | 2.1 | 36 | 16 | 11 | 2.6 | .6 | .8 | 1.3 |
| 20 | 2.6 | 34 | 16 | 11 | 2.6 | .6 | .7 | .7 |
| 21 | 2.2 | 36 | 14 | 8.4 | 2.8 | .6 | .8 | .9 |
| 22 | 2.0 | 42 | 13 | 6.6 | 2.2 | 3.6 | .9 | 1.0 |
| 23 | 1.8 | 35 | 14 | 7.8 | 1.6 | 6.6 | 1.0 | 1.0 |
| 24 | 1.7 | 35 | 11 | 7.2 | 1.4 | 1.8 | 1.2 | .9 |
| 25 | 1.6 | 27 | 11 | 5.4 | 1.4 | 1.0 | 1.2 | 1.0 |
| 26 | 1.7 | 39 | 13 | 5.4 | 1.8 | .9 | 1.0 | 1.1 |
| 27 | 1.5 | 71 | 10 | 5.7 | 1.4 | .6 | .9 | 1.2 |
| 28 | 1.6 | 49 | 9 | 10 | 1.3 | .8 | .9 | 1.2 |
| 29 | 1.5 | 43 | 10 | 14 | .9 | .9 | 1.0 | 1.2 |
| 30 | 1.5 | 44 | 16 | 7.8 | .9 | .9 | 1.0 | 1.3 |
| 31 | 1.5 | 49 | ------- | 7.8 | ------- | .6 | .9 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 2.6 | 1.5 | 1.8? | 0.0026 | 0.003 |
| March | 108 | 21 | 47.4 | .067 | .08 |
| April | 55 | 9 | 22.1 | .031 | .03 |
| May | 20 | 5.4 | 12.2 | .017 | .02 |
| June | 16 | .9 | 6.45 | .0092 | .01 |
| July | 6.6 | .5 | 1.0? | .0015 | .002 |
| August | 1.3 | .5 | .87 | .0012 | .001 |
| September | 10 | .7 | 1.7? | .0024 | .003 |

### COTTONWOOD RIVER NEAR NEW ULM, MINN.

LOCATION.—Chain gage in sec. 31, T. 110 N., R. 30 W., 2 miles southwest of New Ulm and 4 miles above mouth.

DRAINAGE AREA.—1,190 square miles.

RECORDS AVAILABLE.—March 1931 to September 1933. July 1909 to December 1913 at station 2 miles downstream (relation between gage datums not determined).

DISCHARGE.—Maximum during year, 2,010 second-feet Feb. 27 (gage height, 8.50 feet, affected by ice); minimum, 1.2 second-feet Aug. 17 (gage height, 2.16 feet).

1909–13, 1931–33: Maximum, 4,580 second-feet Feb. 29, 1932 (gage height, 11.20 feet, affected by ice); minimum, that of Aug. 17, 1933.

REMARKS.—Records good except those for period of ice effect, Feb. 23 to Mar. 15, and for period of backwater caused by debris, Oct. 16–31, which are fair. No record Nov. 1 to Feb. 22.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 7.0 | | 890 | 276 | 41 | 34 | 11 | 1.6 | 1.4 |
| 2 | 6.2 | | 710 | 218 | 38 | 37 | 10 | 12 | 2.6 |
| 3 | 7.0 | | 525 | 187 | 40 | 37 | 13 | 7.0 | 6.2 |
| 4 | 9.4 | | 525 | 158 | 43 | 78 | 61 | 4.7 | 5.5 |
| 5 | 8.2 | | 460 | 140 | 44 | 61 | 61 | 3.2 | 2.9 |
| 6 | 6.2 | | 429 | 123 | 37 | 45 | 42 | 4.0 | 2.9 |
| 7 | 5.5 | | 399 | 107 | 43 | 48 | 33 | 3.2 | 2.2 |
| 8 | 4.7 | | 328 | 101 | 51 | 52 | 21 | 2.9 | 1.6 |
| 9 | 4.7 | | 240 | 92 | 57 | 43 | 15 | 2.9 | 2.0 |
| 10 | 5.5 | | 276 | 82 | 59 | 34 | 10 | 2.6 | 2.0 |
| 11 | 6.2 | | 328 | 78 | 59 | 34 | 12 | 2.2 | 2.0 |
| 12 | 6.2 | | 289 | 74 | 57 | 31 | 20 | 2.2 | 2.0 |
| 13 | 5.5 | | 252 | 78 | 53 | 28 | 17 | 1.9 | 3.0 |
| 14 | 7.0 | | 264 | 78 | 51 | 22 | 10 | 1.6 | 3.0 |
| 15 | 7.0 | | 276 | 69 | 45 | 19 | 8.2 | 1.6 | 3.0 |
| 16 | 7.6 | | 158 | 63 | 42 | 20 | 6.2 | 1.6 | 3.0 |
| 17 | 8.2 | | 187 | 59 | 36 | 18 | 4.7 | 1.2 | 4.0 |
| 18 | 8.2 | | 149 | 60 | 39 | 15 | 3.2 | 1.4 | 4.0 |
| 19 | 5.5 | | 61 | 61 | 43 | 10 | 3.2 | 1.4 | 4.0 |
| 20 | 6.2 | | 51 | 63 | 42 | 12 | 2.9 | 1.4 | 4.7 |
| 21 | 7.6 | | 123 | 60 | 39 | 12 | 3.2 | 1.6 | 4.7 |
| 22 | 8.2 | | 102 | 52 | 41 | 9.4 | 4.0 | 1.9 | 3.2 |
| 23 | 6.2 | 218 | 88 | 45 | 107 | 9.4 | 12 | 1.9 | 2.6 |
| 24 | 6.6 | 525 | 107 | 41 | 86 | 7.0 | 11 | 1.9 | 4.7 |
| 25 | 8.8 | 1,200 | 115 | 36 | 85 | 8.8 | 7.6 | 2.2 | 3.2 |
| 26 | 10 | 1,730 | 140 | 34 | 63 | 6.6 | 5.5 | 1.9 | 4.7 |
| 27 | 7.6 | 1,870 | 132 | 32 | 53 | 5.5 | 4.7 | 2.2 | 3.2 |
| 28 | 7.6 | 1,200 | 140 | 32 | 42 | 4.7 | 3.2 | 1.9 | 4.0 |
| 29 | 8.8 | | 149 | 34 | 42 | 6.2 | 2.9 | 1.6 | 3.2 |
| 30 | 10 | | 302 | 51 | 38 | 6.6 | 2.4 | 1.6 | 2.9 |
| 31 | 8.8 | | 302 | | 34 | | 2.1 | 1.9 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 10 | 4.7 | 7.17 | 0.006 | 0.007 |
| February 23–28 | 1,870 | 218 | 1,120 | .941 | .21 |
| March | 890 | 51 | 274 | .230 | .27 |
| April | 276 | 32 | 86.1 | .072 | .08 |
| May | 107 | 34 | 50.0 | .042 | .05 |
| June | 78 | 4.7 | 25.1 | .021 | .02 |
| July | 61 | 2.1 | 13.6 | .011 | .01 |
| August | 12 | 1.2 | 2.62 | .0022 | .003 |
| September | 6.2 | 1.4 | 3.28 | .0028 | .003 |

### ST. CROIX RIVER AT SWISS, WIS.

LOCATION.—Chain gage in sec. 33, T. 42 N., R. 15 W., at highway bridge at Swiss, 10 miles northeast of Danbury. Namakagon River enters 3½ miles above station.

DRAINAGE AREA.—1,550 square miles.

RECORDS AVAILABLE.—March 1914 to September 1933.

DISCHARGE.—Maximum during year, 3,160 second-feet Apr. 3, 4 (gage height, 3.6 feet); minimum, 434 second-feet Aug. 14 (gage height, 0.02 foot).

1914–33: Maximum, 8,480 second-feet Apr. 22, 1916 (gage height, 6.73 feet); minimum, that of Aug. 14, 1933. Average, 19 years, 1,160 second-feet.

REMARKS.—Records good except those for period of ice effect, Nov. 16 to Apr. 4, which are fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 606 | 675 | 575 | 575 | 641 | 780 | 2,690 | 2,570 | 1,340 | 640 | 544 | 518 |
| 2 | 575 | 710 | 575 | 608 | 606 | 815 | 3,040 | 2,690 | 1,260 | 606 | 544 | 575 |
| 3 | 575 | 710 | 575 | 640 | 575 | 762 | 3,160 | 2,460 | 1,180 | 544 | 544 | 492 |
| 4 | 575 | 745 | 544 | 640 | 544 | 710 | 3,040 | 2,340 | 1,230 | 606 | 518 | 471 |
| 5 | 544 | 710 | 544 | 640 | 531 | 692 | 2,230 | 2,230 | 1,110 | 606 | 518 | 518 |
| 6 | 575 | 710 | 544 | 640 | 518 | 675 | 1,610 | 2,000 | 1,180 | 606 | 518 | 606 |
| 7 | 544 | 745 | 544 | 640 | 505 | 658 | 1,610 | 1,900 | 1,110 | 606 | 471 | 606 |
| 8 | 575 | 960 | 544 | 658 | 492 | 640 | 1,610 | 2,000 | 1,110 | 606 | 492 | 640 |
| 9 | 575 | 1,340 | 531 | 675 | 518 | 623 | 1,520 | 2,000 | 1,110 | 606 | 492 | 640 |
| 10 | 544 | 1,520 | 518 | 675 | 544 | 606 | 1,430 | 1,900 | 1,110 | 640 | 471 | 640 |
| 11 | 544 | 1,430 | 518 | 675 | 544 | 693 | 1,430 | 1,710 | 1,110 | 745 | 471 | 518 |
| 12 | 544 | 1,340 | 518 | 625 | 544 | 780 | 1,340 | 1,610 | 960 | 1,030 | 450 | 544 |
| 13 | 544 | 1,260 | 518 | 575 | 544 | 745 | 1,340 | 1,610 | 960 | 1,030 | 471 | 544 |
| 14 | 544 | 1,110 | 518 | 590 | 544 | 710 | 1,430 | 1,520 | 960 | 1,030 | 434 | 544 |
| 15 | 606 | 960 | 518 | 606 | 531 | 745 | 1,520 | 1,520 | 887 | 1,030 | 518 | 544 |
| 16 | 575 | 887 | 518 | 606 | 518 | 780 | 1,710 | 1,520 | 887 | 887 | 518 | 575 |
| 17 | 544 | 861 | 518 | 606 | 518 | 820 | 2,000 | 1,520 | 887 | 745 | 518 | 575 |
| 18 | 606 | 815 | 492 | 640 | 518 | 861 | 2,000 | 1,610 | 887 | 745 | 471 | 518 |
| 19 | 606 | 815 | 492 | 675 | 531 | 702 | 2,230 | 1,610 | 780 | 710 | 492 | 640 |
| 20 | 606 | 780 | 492 | 658 | 544 | 544 | 2,340 | 1,430 | 745 | 675 | 518 | 606 |
| 21 | 606 | 745 | 505 | 640 | 560 | 627 | 2,230 | 1,430 | 780 | 675 | 450 | 606 |
| 22 | 606 | 745 | 518 | 658 | 575 | 710 | 2,110 | 1,260 | 745 | 606 | 492 | 575 |
| 23 | 606 | 710 | 546 | 675 | 590 | 675 | 2,110 | 1,340 | 745 | 640 | 492 | 544 |
| 24 | 606 | 710 | 575 | 675 | 606 | 780 | 2,000 | 1,340 | 710 | 575 | 471 | 575 |
| 25 | 606 | 675 | 625 | 675 | 640 | 820 | 1,900 | 1,340 | 745 | 575 | 492 | 544 |
| 26 | 606 | 675 | 675 | 675 | 675 | 861 | 1,800 | 1,260 | 745 | 575 | 471 | 575 |
| 27 | 606 | 640 | 640 | 675 | 710 | 910 | 1,610 | 1,180 | 675 | 575 | 492 | 544 |
| 28 | 606 | 640 | 606 | 658 | 745 | 960 | 1,520 | 1,180 | 675 | 544 | 450 | 575 |
| 29 | 675 | 606 | 606 | 640 | ------ | 1,280 | 1,520 | 1,110 | 675 | 544 | 471 | 544 |
| 30 | 675 | 606 | 606 | 658 | ------ | 1,610 | 1,900 | 1,340 | 675 | 544 | 471 | 518 |
| 31 | 675 | ------ | 590 | 675 | ------ | 2,110 | ------ | 1,340 | ------ | 492 | 471 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 675 | 544 | 570 | 0.381 | 0.44 |
| November | 1,520 | 606 | 861 | .555 | .62 |
| December | 675 | 492 | 551 | .355 | .41 |
| January | 675 | 575 | 644 | .415 | .48 |
| February | 745 | 492 | 588 | .366 | .38 |
| March | 2,110 | 544 | 829 | .535 | .62 |
| April | 3,160 | 1,340 | 1,930 | 1.25 | 1.40 |
| May | 2,690 | 1,110 | 1,670 | 1.08 | 1.24 |
| June | 1,340 | 675 | 933 | .602 | .67 |
| July | 1,030 | 492 | 679 | .438 | .50 |
| August | 544 | 434 | 490 | .316 | .36 |
| September | 640 | 471 | 564 | .364 | .41 |
| The year | 3,160 | 434 | 860 | .555 | 7.53 |

### ST. CROIX RIVER NEAR GRANTSBURG, WIS.

LOCATION.—Chain gage near center of sec. 30, T. 40 N., R. 18 W., at Norway Point Ferry, half a mile below mouth of Sand Creek and 10 miles north of Grantsburg.

DRAINAGE AREA.—2,820 square miles.

RECORDS AVAILABLE.—April 1923 to September 1933.

DISCHARGE.—Maximum during year, 4,890 second-feet Apr. 2 (gage height, 7.06 feet); minimum, 572 second-feet Aug. 15 (gage height, 3.30 feet).

1923–33: Maximum, 13,300 second-feet Mar. 18, 1927 (gage height, 11.4 feet); minimum, that of Aug. 15, 1933. Average, 10 years, 1,830 second-feet.

REMARKS.—Records fair. Stage-discharge relation affected by ice Nov. 14 to Apr. 1.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,020 | 1,240 | 1,320 | 800 | 1,020 | 1,020 | 3,850 | 3,450 | 2,540 | 945 | 835 | 670 |
| 2 | 945 | 1,240 | 1,240 | 870 | 1,020 | 1,020 | 4,580 | 4,280 | 2,300 | 945 | 768 | 768 |
| 3 | 945 | 1,170 | 1,240 | 870 | 945 | 1,020 | 3,710 | 4,580 | 2,070 | 870 | 768 | 800 |
| 4 | 870 | 1,240 | 1,240 | 835 | 945 | 1,020 | 2,790 | 4,130 | 2,180 | 870 | 735 | 870 |
| 5 | 945 | 1,240 | 1,170 | 800 | 870 | 1,020 | 2,920 | 3,710 | 2,070 | 870 | 702 | 835 |
| 6 | 945 | 1,240 | 1,240 | 800 | 870 | 1,020 | 2,670 | 3,450 | 1,850 | 870 | 702 | 835 |
| 7 | 945 | 1,240 | 1,020 | 1,020 | 800 | 1,020 | 2,540 | 3,180 | 1,850 | 835 | 702 | 870 |
| 8 | 945 | 1,320 | 768 | 1,020 | 702 | 1,020 | 2,790 | 3,310 | 1,750 | 800 | 670 | 945 |
| 9 | 945 | 1,660 | 702 | 1,020 | 718 | 945 | 2,540 | 3,580 | 1,660 | 768 | 638 | 1,020 |
| 10 | 945 | 2,180 | 800 | 1,020 | 735 | 945 | 2,420 | 3,710 | 1,660 | 768 | 638 | 945 |
| 11 | 945 | 2,540 | 870 | 1,020 | 768 | 945 | 2,300 | 3,710 | 1,660 | 870 | 638 | 870 |
| 12 | 945 | 2,420 | 945 | 1,020 | 800 | 1,020 | 2,300 | 3,450 | 1,660 | 945 | 605 | 835 |
| 13 | 945 | 2,300 | 870 | 945 | 768 | 1,020 | 2,300 | 3,180 | 1,400 | 1,170 | 605 | 835 |
| 14 | 945 | 1,960 | 870 | 945 | 768 | 945 | 2,300 | 3,050 | 1,400 | 1,170 | 605 | 835 |
| 15 | 1,020 | 1,660 | 870 | 1,020 | 768 | 1,020 | 3,050 | 2,790 | 1,320 | 1,170 | 572 | 870 |
| 16 | 1,020 | 1,480 | 870 | 1,020 | 800 | 1,090 | 2,920 | 2,670 | 1,240 | 1,170 | 670 | 945 |
| 17 | 1,020 | 1,240 | 835 | 1,020 | 835 | 1,090 | 3,310 | 2,540 | 1,240 | 1,090 | 702 | 945 |
| 18 | 1,020 | 1,240 | 835 | 1,020 | 835 | 1,170 | 3,580 | 2,670 | 1,170 | 945 | 702 | 870 |
| 19 | 1,090 | 1,240 | 835 | 1,020 | 870 | 1,170 | 3,580 | 2,540 | 1,170 | 945 | 670 | 945 |
| 20 | 1,090 | 1,240 | 835 | 1,020 | 870 | 1,090 | 3,580 | 2,420 | 1,090 | 945 | 670 | 1,020 |
| 21 | 1,090 | 1,240 | 870 | 1,020 | 870 | 1,020 | 3,710 | 2,300 | 1,090 | 945 | 670 | 945 |
| 22 | 1,090 | 1,240 | 870 | 1,020 | 870 | 1,090 | 3,580 | 2,180 | 1,020 | 835 | 638 | 1,020 |
| 23 | 1,090 | 1,240 | 870 | 1,020 | 870 | 1,170 | 3,450 | 2,070 | 1,020 | 870 | 670 | 945 |
| 24 | 1,090 | 1,240 | 945 | 1,090 | 870 | 1,170 | 3,310 | 2,300 | 1,020 | 870 | 670 | 945 |
| 25 | 1,090 | 1,240 | 945 | 1,090 | 945 | 1,240 | 3,050 | 2,300 | 1,020 | 800 | 670 | 945 |
| 26 | 1,090 | 1,240 | 1,020 | 1,020 | 945 | 1,320 | 2,920 | 2,300 | 945 | 835 | 670 | 945 |
| 27 | 1,090 | 1,240 | 1,020 | 1,020 | 945 | 1,480 | 2,790 | 2,070 | 945 | 835 | 670 | 945 |
| 28 | 1,090 | 1,170 | 1,020 | 1,020 | 945 | 1,660 | 2,920 | 1,960 | 945 | 768 | 670 | 945 |
| 29 | 1,170 | 1,240 | 1,020 | 1,020 | ------ | 1,850 | 2,420 | 1,960 | 945 | 800 | 638 | 945 |
| 30 | 1,170 | 1,240 | 870 | 1,020 | ------ | 2,300 | 2,540 | 2,180 | 1,020 | 768 | 670 | 945 |
| 31 | 1,170 | ------ | 835 | 1,020 | ------ | 3,050 | ------ | 2,540 | ------ | 870 | 670 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,170 | 870 | 1,020 | 0.362 | 0.42 |
| November | 2,540 | 1,170 | 1,450 | .514 | .57 |
| December | 1,320 | 702 | 957 | .339 | .39 |
| January | 1,090 | 800 | 983 | .349 | .40 |
| February | 1,020 | 702 | 856 | .304 | .32 |
| March | 3,050 | 945 | 1,220 | .433 | .50 |
| April | 4,580 | 2,300 | 3,020 | 1.07 | 1.19 |
| May | 4,580 | 1,960 | 2,920 | 1.04 | 1.20 |
| June | 2,540 | 945 | 1,440 | .511 | .57 |
| July | 1,170 | 768 | 908 | .322 | .37 |
| August | 835 | 572 | 674 | .239 | .28 |
| September | 1,020 | 670 | 902 | .320 | .36 |
| The year | 4,580 | 572 | 1,360 | .482 | 6.57 |

### ST. CROIX RIVER NEAR RUSH CITY, MINN.

LOCATION.—Chain gage in SW¼ sec. 8, T. 37 N., R. 20 W., at Northern Pacific Railway bridge 5 miles east of Rush City and 10 miles below mouth of Snake River.

DRAINAGE AREA.—5,120 square miles.

RECORDS AVAILABLE.—April 1923 to September 1933.

DISCHARGE.—Maximum during year, 5,610 second-feet May 3 (gage height, 4.44 feet); minimum, 630 second-feet Aug. 14, 23 (gage height, 2.33 feet).

1923–33: Maximum, 26,700 second-feet Mar. 18, 1927 (gage height, 10.2 feet); minimum, that of Aug. 14, 23, 1933. Average, 10 years, 2,670 second-feet.

REMARKS.—Records good except those for period of ice effect, Nov. 14 to Apr. 1, which are fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,260 | 1,360 | 1,410 | 1,060 | 1,320 | 1,220 | 4,150 | 3,750 | 5,370 | 1,120 | 834 | 904 |
| 2 | 1,170 | 1,460 | 1,410 | 1,140 | 1,410 | 1,140 | 4,560 | 5,370 | 5,370 | 1,120 | 842 | 904 |
| 3 | 1,170 | 1,460 | 1,410 | 1,060 | 1,320 | 1,060 | 4,860 | 5,610 | 4,860 | 1,120 | 849 | 904 |
| 4 | 1,170 | 1,460 | 1,320 | 1,060 | 1,220 | 1,060 | 5,120 | 5,370 | 5,370 | 1,120 | 857 | 904 |
| 5 | 1,170 | 1,460 | 1,320 | 1,060 | 1,220 | 1,060 | 3,900 | 4,860 | 4,860 | 1,030 | 865 | 1,070 |
| 6 | 1,170 | 1,560 | 1,320 | 1,140 | 1,060 | 1,060 | 3,900 | 4,560 | 4,560 | 952 | 872 | 1,070 |
| 7 | 1,170 | 1,560 | 1,060 | 982 | 982 | 1,140 | 3,600 | 3,900 | 3,600 | 952 | 880 | 1,070 |
| 8 | 1,170 | 1,560 | 830 | 982 | 905 | 1,060 | 3,600 | 4,220 | 3,300 | 872 | 888 | 1,070 |
| 9 | 1,170 | 2,230 | 830 | 1,140 | 1,060 | 1,140 | 3,600 | 4,560 | 3,000 | 798 | 812 | 1,260 |
| 10 | 1,170 | 3,000 | 830 | 1,220 | 1,060 | 1,060 | 3,450 | 5,120 | 2,730 | 872 | 888 | 1,070 |
| 11 | 1,170 | 3,600 | 905 | 1,220 | 905 | 1,060 | 3,300 | 5,370 | 2,860 | 936 | 812 | 904 |
| 12 | 1,170 | 3,450 | 905 | 1,220 | 905 | 1,060 | 3,300 | 5,120 | 2,470 | 1,100 | 742 | 904 |
| 13 | 1,170 | 3,300 | 982 | 1,060 | 982 | 1,220 | 3,150 | 4,860 | 2,120 | 1,170 | 742 | 904 |
| 14 | 1,170 | 2,400 | 982 | 1,060 | 1,060 | 1,320 | 2,860 | 4,560 | 2,000 | 1,260 | 630 | 904 |
| 15 | 1,260 | 1,650 | 982 | 1,060 | 905 | 1,140 | 3,150 | 4,560 | 1,890 | 1,360 | 742 | 904 |
| 16 | 1,360 | 1,650 | 1,010 | 1,140 | 830 | 1,220 | 3,450 | 4,220 | 1,780 | 1,260 | 742 | 1,260 |
| 17 | 1,360 | 1,650 | 1,030 | 1,140 | 982 | 1,410 | 4,060 | 3,900 | 1,780 | 1,260 | 742 | 1,260 |
| 18 | 1,170 | 1,650 | 1,060 | 1,220 | 1,060 | 1,650 | 4,560 | 3,900 | 1,670 | 1,170 | 742 | 1,070 |
| 19 | 1,170 | 1,530 | 1,140 | 1,220 | 1,060 | 1,410 | 4,560 | 3,600 | 1,560 | 1,100 | 742 | 904 |
| 20 | 1,260 | 1,530 | 1,140 | 1,320 | 1,140 | 1,320 | 4,860 | 3,600 | 1,460 | 1,170 | 742 | 1,070 |
| 21 | 1,360 | 1,530 | 1,140 | 1,140 | 1,060 | 1,320 | 4,860 | 3,300 | 1,360 | 1,080 | 742 | 1,260 |
| 22 | 1,360 | 1,530 | 1,140 | 1,060 | 1,060 | 1,220 | 4,560 | 3,000 | 1,360 | 1,000 | 742 | 1,070 |
| 23 | 1,360 | 1,530 | 1,140 | 1,140 | 1,060 | 1,410 | 4,560 | 3,000 | 1,260 | 1,000 | 640 | 1,080 |
| 24 | 1,360 | 1,530 | 1,140 | 1,140 | 1,140 | 1,530 | 4,060 | 3,300 | 1,170 | 1,080 | 756 | 920 |
| 25 | 1,360 | 1,530 | 1,140 | 1,140 | 1,140 | 1,650 | 3,750 | 3,600 | 1,170 | 1,080 | 756 | 920 |
| 26 | 1,360 | 1,530 | 1,220 | 1,140 | 1,140 | 1,650 | 3,450 | 3,450 | 1,170 | 1,080 | 756 | 1,080 |
| 27 | 1,360 | 1,410 | 1,320 | 1,220 | 1,140 | 1,410 | 3,300 | 3,000 | 1,080 | 920 | 756 | 920 |
| 28 | 1,360 | 1,410 | 1,410 | 1,220 | 1,140 | 1,900 | 3,150 | 3,000 | 1,080 | 920 | 756 | 920 |
| 29 | 1,560 | 1,410 | 1,410 | 1,220 | ------- | 1,780 | 2,860 | 2,730 | 1,170 | 920 | 756 | 1,080 |
| 30 | 1,360 | 1,410 | 1,320 | 1,320 | ------- | 2,150 | 2,860 | 3,000 | 1,170 | 904 | 756 | 920 |
| 31 | 1,360 | ------- | 1,140 | 1,320 | ------- | 3,650 | ------- | 4,220 | ------- | 826 | 756 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,560 | 1,170 | 1,260 | 0.246 | 0.28 |
| November | 3,600 | 1,360 | 1,810 | .354 | .40 |
| December | 1,410 | 830 | 1,140 | .223 | .26 |
| January | 1,320 | 982 | 1,150 | .225 | .26 |
| February | 1,410 | 830 | 1,080 | .211 | .22 |
| March | 3,650 | 1,060 | 1,400 | .273 | .31 |
| April | 5,120 | 2,860 | 3,850 | .752 | .84 |
| May | 5,610 | 2,730 | 3,960 | .773 | .89 |
| June | 5,370 | 1,080 | 2,490 | .486 | .54 |
| July | 1,360 | 798 | 1,050 | .205 | .24 |
| August | 888 | 630 | 779 | .152 | .18 |
| September | 1,260 | 904 | 1,020 | .199 | .22 |
| The year | 5,610 | 630 | 1,750 | .342 | 4.64 |

### ST. CROIX RIVER NEAR ST. CROIX FALLS, WIS.

LOCATION.—In sec. 18, T. 34 N., R. 18 W., at power plant of Northern States Power Co., near St. Croix Falls.

DRAINAGE AREA.—5,930 square miles.

RECORDS AVAILABLE.—January 1910 to September 1933.

DISCHARGE.—Maximum mean daily during year, 7,060 second-feet May 4; minimum, 375 second-feet Dec. 11.

1910–33: Maximum mean daily, 35,800 second-feet Mar. 26, 1920; no flow Sept. 30, 1929. Average, 23 years, 3,200 second-feet.

REMARKS.—Records good. Flow controlled by operation of gates of power plant and by regulation at Never's dam, 10 miles upstream. Records of daily discharge computed from power-house records by Northern States Power Co.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,230 | 1,570 | 1,830 | 614 | 1,530 | 1,690 | 4,160 | 3,860 | 5,780 | 1,280 | 1,150 | 936 |
| 2 | 1,170 | 1,720 | 1,630 | 990 | 1,460 | 1,570 | 4,150 | 5,110 | 5,040 | 1,200 | 1,130 | 962 |
| 3 | 1,280 | 1,620 | 1,660 | 1,840 | 1,440 | 1,850 | 3,100 | 5,310 | 5,140 | 1,190 | 1,050 | 1,000 |
| 4 | 1,190 | 1,680 | 606 | 1,640 | 1,650 | 1,750 | 5,100 | 7,060 | 4,610 | 1,210 | 1,070 | 1,040 |
| 5 | 1,230 | 1,820 | 1,810 | 1,420 | 515 | 1,010 | 3,880 | 5,780 | 4,970 | 1,090 | 1,040 | 1,080 |
| 6 | 1,150 | 1,540 | 1,820 | 1,210 | 1,620 | 1,970 | 4,020 | 4,110 | 4,860 | 1,080 | 878 | 1,210 |
| 7 | 1,380 | 1,750 | 1,920 | 1,440 | 1,470 | 2,020 | 3,330 | 2,440 | 4,000 | 1,230 | 1,080 | 1,030 |
| 8 | 1,300 | 2,130 | 1,540 | 815 | 1,390 | 1,780 | 3,100 | 5,680 | 3,280 | 1,060 | 1,020 | 1,310 |
| 9 | 1,190 | 2,250 | 1,370 | 1,650 | 1,280 | 1,510 | 2,890 | 5,060 | 3,850 | 1,120 | 960 | 1,130 |
| 10 | 1,240 | 2,770 | 1,350 | 1,590 | 1,220 | 1,570 | 3,360 | 5,490 | 3,230 | 1,060 | 961 | 1,280 |
| 11 | 1,260 | 3,310 | 375 | 1,420 | 1,460 | 1,740 | 3,610 | 6,190 | 2,470 | 1,190 | 940 | 1,250 |
| 12 | 1,200 | 3,320 | 1,260 | 1,450 | 482 | 559 | 3,210 | 5,970 | 2,640 | 1,110 | 894 | 1,150 |
| 13 | 1,190 | 3,250 | 1,420 | 1,410 | 1,460 | 2,060 | 2,650 | 4,600 | 2,350 | 1,340 | 860 | 944 |
| 14 | 1,250 | 2,140 | 1,390 | 1,250 | 1,430 | 1,690 | 2,470 | 3,220 | 2,500 | 1,550 | 919 | 1,110 |
| 15 | 1,340 | 1,790 | 1,310 | 584 | 1,240 | 1,780 | 2,850 | 5,100 | 2,580 | 1,100 | 871 | 1,020 |
| 16 | 1,460 | 1,550 | 1,230 | 1,460 | 1,150 | 1,730 | 3,120 | 5,230 | 2,170 | 1,600 | 832 | 1,290 |
| 17 | 1,510 | 1,520 | 1,450 | 1,570 | 1,210 | 1,870 | 3,760 | 4,850 | 1,960 | 1,530 | 911 | 1,280 |
| 18 | 1,420 | 1,720 | 590 | 1,450 | 1,570 | 2,430 | 4,860 | 4,960 | 1,690 | 1,440 | 911 | 1,180 |
| 19 | 1,390 | 1,870 | 1,490 | 1,330 | 403 | 722 | 5,210 | 3,620 | 1,860 | 1,260 | 930 | 1,290 |
| 20 | 1,610 | 681 | 1,380 | 1,340 | 1,650 | 2,350 | 4,220 | 3,320 | 1,810 | 1,210 | 918 | 1,090 |
| 21 | 1,400 | 2,030 | 1,430 | 1,520 | 1,450 | 1,700 | 4,520 | 2,410 | 1,820 | 1,390 | 903 | 1,210 |
| 22 | 1,500 | 2,030 | 1,510 | 642 | 1,400 | 1,750 | 4,560 | 5,180 | 1,680 | 1,170 | 922 | 1,290 |
| 23 | 1,430 | 2,030 | 1,300 | 1,650 | 1,300 | 1,480 | 3,480 | 5,400 | 1,450 | 1,170 | 926 | 1,250 |
| 24 | 1,510 | 1,400 | 1,550 | 1,510 | 1,290 | 1,770 | 5,660 | 3,980 | 1,500 | 1,120 | 951 | 1,180 |
| 25 | 1,570 | 3,280 | 841 | 1,450 | 1,380 | 1,900 | 5,530 | 4,250 | 1,330 | 1,300 | 943 | 1,190 |
| 26 | 1,550 | 1,690 | 727 | 1,450 | 856 | 1,920 | 4,830 | 3,730 | 1,290 | 1,260 | 877 | 1,230 |
| 27 | 1,420 | 750 | 1,860 | 1,380 | 1,730 | 1,840 | 4,400 | 3,560 | 1,340 | 1,220 | 875 | 1,140 |
| 28 | 1,500 | 2,070 | 1,690 | 1,740 | 1,680 | 2,210 | 3,260 | 2,630 | 1,280 | 1,140 | 921 | 1,200 |
| 29 | 1,600 | 1,970 | 1,500 | 460 | ------ | 2,470 | 2,970 | 4,350 | 1,270 | 1,090 | 895 | 1,090 |
| 30 | 1,560 | 1,810 | 1,550 | 1,740 | ------ | 3,240 | 1,990 | 2,860 | 1,360 | 1,100 | 878 | 1,200 |
| 31 | 1,740 | ------ | 1,860 | 1,550 | ------ | 3,100 | ------ | 4,530 | ------ | 1,070 | 865 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,740 | 1,150 | 1,380 | 0.233 | 0.27 |
| November | 3,320 | 681 | 1,970 | .332 | .37 |
| December | 1,920 | 375 | 1,400 | .236 | .27 |
| January | 1,840 | 460 | 1,340 | .226 | .26 |
| February | 1,730 | 403 | 1,310 | .221 | .23 |
| March | 3,240 | 559 | 1,840 | .310 | .36 |
| April | 5,660 | 1,990 | 3,810 | .642 | .72 |
| May | 7,060 | 2,410 | 4,510 | .761 | .88 |
| June | 5,780 | 1,270 | 2,700 | .455 | .51 |
| July | 1,600 | 1,060 | 1,220 | .206 | .24 |
| August | 1,150 | 832 | 944 | .159 | .18 |
| September | 1,310 | 936 | 1,150 | .194 | .22 |
| The year | 7,060 | 375 | 1,970 | .332 | 4.51 |

### NAMAKAGON RIVER NEAR TREGO, WIS.

LOCATION.—In SW¼ sec. 17, T. 40 N., R. 12 W., at power house of Wisconsin Hydroelectric Co., 5 miles northwest of Trego.

DRAINAGE AREA.—476 square miles.

RECORDS AVAILABLE.—October 1927 to September 1933. Records collected at Trego, 5 miles upstream (drainage area, 420 square miles) 1914 to 1927.

DISCHARGE.—Maximum mean daily during year, 751 second-feet May 1; minimum, 152 second-feet Aug. 27. Extremes caused by regulation.

1927–33: Maximum mean daily, 1,360 second-feet Sept. 14, 1928; minimum, 113 second-feet Aug. 17, Sept. 7, 1930.

REMARKS.—Records good. The discharge is computed from hourly records of load and head on the power plant.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 250 | 278 | 276 | 237 | 237 | 354 | 633 | 751 | 451 | 213 | 216 | 194 |
| 2 | 207 | 260 | 275 | 237 | 237 | 245 | 638 | 704 | 450 | 221 | 216 | 227 |
| 3 | 248 | 260 | 275 | 285 | 237 | 315 | 552 | 706 | 452 | 291 | 216 | 177 |
| 4 | 248 | 260 | 387 | 237 | 239 | 278 | 587 | 725 | 295 | 267 | 215 | 211 |
| 5 | 250 | 260 | 278 | 254 | 263 | 190 | 600 | 576 | 430 | 247 | 235 | 277 |
| 6 | 250 | 260 | 276 | 254 | 239 | 240 | 583 | 653 | 445 | 249 | 177 | 206 |
| 7 | 250 | 260 | 278 | 239 | 219 | 276 | 527 | 601 | 400 | 245 | 210 | 212 |
| 8 | 250 | 376 | 219 | 239 | 218 | 299 | 520 | 653 | 441 | 245 | 201 | 212 |
| 9 | 207 | 459 | 219 | 239 | 218 | 293 | 466 | 640 | 447 | 240 | 180 | 305 |
| 10 | 250 | 521 | 219 | 239 | 218 | 295 | 444 | 584 | 460 | 233 | 179 | 178 |
| 11 | 219 | 395 | 219 | 254 | 218 | 282 | 506 | 579 | 331 | 462 | 180 | 229 |
| 12 | 218 | 383 | 218 | 237 | 239 | 172 | 499 | 576 | 388 | 425 | 182 | 208 |
| 13 | 218 | 314 | 218 | 237 | 219 | 275 | 492 | 540 | 388 | 419 | 154 | 218 |
| 14 | 216 | 343 | 218 | 253 | 219 | 314 | 483 | 511 | 390 | 432 | 223 | 203 |
| 15 | 212 | 243 | 218 | 237 | 239 | 303 | 461 | 590 | 392 | 324 | 202 | 201 |
| 16 | 229 | 245 | 218 | 237 | 240 | 318 | 513 | 547 | 403 | 239 | 194 | 219 |
| 17 | 257 | 245 | 218 | 239 | 241 | 324 | 451 | 548 | 415 | 273 | 194 | 157 |
| 18 | 336 | 264 | 218 | 235 | 241 | 318 | 494 | 549 | 314 | 274 | 194 | 235 |
| 19 | 281 | 243 | 218 | 239 | 241 | 197 | 592 | 474 | 288 | 273 | 194 | 218 |
| 20 | 281 | 216 | 216 | 232 | 241 | 303 | 531 | 535 | 287 | 248 | 162 | 235 |
| 21 | 316 | 255 | 263 | 239 | 243 | 339 | 534 | 439 | 283 | 219 | 226 | 226 |
| 22 | 319 | 255 | 264 | 296 | 243 | 277 | 564 | 530 | 283 | 241 | 194 | 204 |
| 23 | 257 | 254 | 264 | 235 | 243 | 279 | 508 | 522 | 283 | 197 | 194 | 223 |
| 24 | 260 | 253 | 256 | 237 | 243 | 312 | 501 | 508 | 297 | 239 | 194 | 180 |
| 25 | 260 | 260 | 305 | 238 | 243 | 387 | 611 | 465 | 320 | 239 | 194 | 226 |
| 26 | 260 | 260 | 287 | 239 | 276 | 256 | 629 | 453 | 280 | 240 | 220 | 205 |
| 27 | 260 | 239 | 239 | 250 | 231 | 388 | 597 | 460 | 265 | 241 | 152 | 237 |
| 28 | 244 | 260 | 239 | 257 | 361 | 399 | 588 | 332 | 265 | 241 | 194 | 226 |
| 29 | 243 | 277 | 264 | 239 | ------- | 402 | 578 | 447 | 261 | 241 | 194 | 176 |
| 30 | 291 | 276 | 253 | 237 | ------- | 439 | 550 | 324 | 237 | 184 | 183 | 208 |
| 31 | 278 | ------- | 254 | 254 | ------- | 640 | ------- | 450 | ------- | 216 | 183 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 336 | 207 | 254 | 0.534 | 0.62 |
| November | 521 | 216 | 289 | .607 | .68 |
| December | 387 | 216 | 251 | .527 | .61 |
| January | 296 | 232 | 245 | .515 | .59 |
| February | 361 | 218 | 241 | .506 | .53 |
| March | 640 | 172 | 313 | .658 | .76 |
| April | 638 | 444 | 541 | 1.14 | 1.27 |
| May | 751 | 324 | 547 | 1.15 | 1.33 |
| June | 460 | 237 | 355 | .746 | .83 |
| July | 462 | 184 | 268 | .563 | .65 |
| August | 235 | 152 | 195 | .410 | .47 |
| September | 305 | 157 | 214 | .450 | .50 |
| The year | 751 | 152 | 310 | .651 | 8.84 |

### APPLE RIVER NEAR SOMERSET, WIS.

LOCATION.—In sec. 21, T. 31 N., R. 19 W., at power plant of Northern States Power Co. 3½ miles below Somerset.
DRAINAGE AREA.—550 square miles.
RECORDS AVAILABLE.—January 1901 to September 1933.
DISCHARGE.—Maximum mean daily during year, 1,300 second-feet Apr. 1; no flow Aug. 2.
1901–33: Maximum mean daily, 2,280 second-feet in June 1905; no flow Sept. 30, 1929, and Aug. 2, 1933. Average, 32 years, 305 second-feet.
REMARKS.—Records fair. Regulation at power plant. Records of discharge, computed from power-house records, furnished by Northern States Power Co.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 99 | 124 | 134 | 123 | 166 | 207 | 1,300 | 257 | 195 | 97 | 158 | 89 |
| 2 | 74 | 116 | 140 | 115 | 109 | 207 | 997 | 252 | 177 | 74 | 0 | 88 |
| 3 | 68 | 155 | 172 | 153 | 132 | 195 | 792 | 205 | 144 | 66 | 7 | 77 |
| 4 | 84 | 187 | 195 | 153 | 123 | 192 | 685 | 193 | 225 | 41 | 42 | 95 |
| 5 | 108 | 119 | 132 | 126 | 115 | 252 | 539 | 207 | 291 | 56 | 77 | 83 |
| 6 | 87 | 122 | 146 | 150 | 115 | 226 | 520 | 169 | 283 | 39 | 77 | 101 |
| 7 | 108 | 101 | 97 | 138 | 114 | 255 | 406 | 218 | 221 | 57 | 71 | 89 |
| 8 | 116 | 189 | 115 | 132 | 107 | 213 | 502 | 271 | 187 | 71 | 60 | 75 |
| 9 | 99 | 264 | 136 | 118 | 111 | 147 | 386 | 364 | 132 | 60 | 66 | 98 |
| 10 | 81 | 224 | 136 | 160 | 124 | 195 | 264 | 272 | 122 | 63 | 101 | 121 |
| 11 | 76 | 252 | 138 | 106 | 115 | 236 | 366 | 213 | 112 | 109 | 158 | 54 |
| 12 | 87 | 239 | 100 | 132 | 126 | 231 | 338 | 237 | 111 | 200 | 70 | 71 |
| 13 | 78 | 128 | 103 | 117 | 103 | 235 | 301 | 326 | 138 | 130 | 85 | 89 |
| 14 | 87 | 122 | 126 | 130 | 117 | 223 | 307 | 272 | 101 | 83 | 123 | 95 |
| 15 | 108 | 106 | 91 | 144 | 115 | 245 | 354 | 240 | 117 | 176 | 54 | 83 |
| 16 | 151 | 118 | 94 | 91 | 115 | 204 | 223 | 223 | 122 | 142 | 69 | 95 |
| 17 | 92 | 177 | 100 | 126 | 134 | 352 | 241 | 197 | 112 | 97 | 95 | 130 |
| 18 | 120 | 142 | 79 | 145 | 120 | 490 | 246 | 267 | 112 | 101 | 120 | 58 |
| 19 | 164 | 144 | 103 | 125 | 111 | 165 | 261 | 285 | 97 | 97 | 54 | 16 |
| 20 | 110 | 117 | 114 | 138 | 104 | 120 | 242 | 279 | 79 | 130 | 77 | 71 |
| 21 | 94 | 131 | 114 | 144 | 104 | 285 | 215 | 216 | 91 | 109 | 60 | 86 |
| 22 | 104 | 163 | 117 | 138 | 118 | 241 | 210 | 159 | 115 | 112 | 86 | 71 |
| 23 | 69 | 160 | 117 | 161 | 109 | 278 | 321 | 216 | 109 | 95 | 66 | 89 |
| 24 | 75 | 116 | 144 | 190 | 176 | 184 | 175 | 257 | 120 | 89 | 72 | 85 |
| 25 | 132 | 122 | 126 | 144 | 194 | 221 | 159 | 201 | 91 | 65 | 80 | 92 |
| 26 | 150 | 146 | 190 | 154 | 178 | 216 | 191 | 134 | 97 | 77 | 77 | 148 |
| 27 | 139 | 153 | 141 | 132 | 160 | 221 | 166 | 168 | 79 | 83 | 71 | 127 |
| 28 | 129 | 113 | 172 | 138 | 251 | 237 | 171 | 150 | 71 | 83 | 74 | 94 |
| 29 | 116 | 131 | 120 | 161 | ------- | 358 | 233 | 286 | 59 | 89 | 48 | 107 |
| 30 | 93 | 128 | 132 | 138 | ------- | 448 | 199 | 200 | 111 | 95 | 49 | 118 |
| 31 | 121 | ------- | 128 | 144 | ------- | 947 | ------- | 271 | ------- | 142 | 86 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 164 | 68 | 104 | 0.189 | 0.22 |
| November | 264 | 101 | 150 | .273 | .30 |
| December | 195 | 79 | 127 | .231 | .27 |
| January | 190 | 91 | 138 | .251 | .29 |
| February | 251 | 103 | 131 | .238 | .25 |
| March | 947 | 120 | 265 | .482 | .56 |
| April | 1,300 | 159 | 377 | .685 | .76 |
| May | 364 | 134 | 232 | .422 | .49 |
| June | 291 | 59 | 134 | .244 | .27 |
| July | 200 | 39 | 94.4 | .172 | .20 |
| August | 158 | 0 | 75.2 | .137 | .16 |
| September | 148 | 16 | 89.8 | .163 | .18 |
| The year | 1,300 | 0 | 160 | .291 | 3.95 |

### CANNON RIVER AT WELCH, MINN.

LOCATION.—Water-stage recorder in sec. 28, T. 113 N., R. 16 W., at Welch, 3 miles above mouth of Belle Creek. Zero of present gage is 3.0 feet above that of previous gage.

DRAINAGE AREA.—1,290 square miles.

RECORDS AVAILABLE.—June 1909 to January 1914; November 1930 to September 1933.

DISCHARGE.—Maximum during year, 7,490 second-feet Jan. 22 (gage height, 11.44 feet); minimum, 29 second-feet Sept. 6 (gage height, 1.69 feet).

1909–14, 1930–33: Maximum, that of Jan. 22, 1933; minimum, that of Sept. 6, 1933.

REMARKS.—Records good except those for period of shifting control, Oct. 1 to Nov. 4, which are fair, and those for periods of ice effect, Dec. 7 to Jan. 11, Jan. 31 to Feb. 28, which are poor. Discharge regulated by power plants above.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 88 | 80 | 76 | 104 | 299 | 1,680 | 3,320 | 278 | 364 | 107 | 91 | 68 |
| 2 | 76 | 122 | 75 | 83 | 286 | 1,560 | 2,870 | 274 | 381 | 114 | 123 | 85 |
| 3 | 61 | 124 | 86 | 93 | 362 | 1,360 | 2,330 | 258 | 399 | 95 | 143 | 49 |
| 4 | 86 | 122 | 107 | 138 | 278 | 1,100 | 2,020 | 311 | 149 | 109 | 142 | 44 |
| 5 | 88 | 121 | 94 | 143 | 295 | 967 | 1,840 | 309 | 205 | 112 | 151 | 45 |
| 6 | 90 | 77 | 123 | 190 | 323 | 839 | 1,700 | 301 | 298 | 112 | 120 | 38 |
| 7 | 90 | 67 | 78 | 188 | 315 | 778 | 1,400 | 217 | 301 | 114 | 82 | 40 |
| 8 | 90 | 192 | 97 | 113 | 381 | 808 | 802 | 377 | 319 | 118 | 100 | 101 |
| 9 | 79 | 178 | 102 | 90 | 344 | 665 | 676 | 484 | 208 | 105 | 98 | 122 |
| 10 | 70 | 202 | 80 | 170 | 322 | 691 | 839 | 439 | 164 | 65 | 96 | 116 |
| 11 | 94 | 184 | 68 | 138 | 259 | 680 | 870 | 372 | 126 | 162 | 84 | 71 |
| 12 | 95 | 124 | 74 | 138 | 307 | 737 | 748 | 410 | 96 | 212 | 84 | 130 |
| 13 | 101 | 104 | 88 | 145 | 315 | 748 | 748 | 405 | 128 | 208 | 84 | 105 |
| 14 | 103 | 86 | 136 | 143 | 350 | 748 | 664 | 279 | 130 | 208 | 68 | 70 |
| 15 | 97 | 127 | 120 | 111 | 372 | 691 | 659 | 315 | 134 | 199 | 61 | 57 |
| 16 | 82 | 103 | 76 | 88 | 216 | 680 | 455 | 366 | 140 | 130 | 108 | 60 |
| 17 | 64 | 136 | 84 | 146 | 219 | 680 | 343 | 326 | 156 | 78 | 122 | 54 |
| 18 | 95 | 130 | 96 | 189 | 194 | 680 | 408 | 589 | 150 | 107 | 88 | 58 |
| 19 | 103 | 182 | 70 | 206 | 158 | 614 | 354 | 699 | 86 | 109 | 82 | 114 |
| 20 | 95 | 110 | 94 | 185 | 172 | 655 | 307 | 654 | 111 | 114 | 55 | 112 |
| 21 | 103 | 70 | 112 | 188 | 232 | 444 | 349 | 584 | 170 | 109 | 58 | 112 |
| 22 | 69 | 102 | 112 | 3,840 | 231 | 408 | 474 | 598 | 142 | 116 | 60 | 101 |
| 23 | 74 | 96 | 143 | 3,600 | 208 | 498 | 203 | 705 | 142 | 152 | 97 | 78 |
| 24 | 65 | 93 | 177 | 2,080 | 453 | 628 | 180 | 560 | 140 | 122 | 114 | 39 |
| 25 | 98 | 90 | 145 | 1,400 | 1,070 | 633 | 301 | 303 | 179 | 151 | 130 | 44 |
| 26 | 106 | 121 | 97 | 1,070 | 1,880 | 581 | 250 | 359 | 138 | 163 | 95 | 84 |
| 27 | 110 | 98 | 85 | 633 | 1,840 | 412 | 199 | 371 | 132 | 149 | 57 | 41 |
| 28 | 107 | 97 | 130 | 593 | 1,800 | 461 | 214 | 273 | 164 | 144 | 49 | 36 |
| 29 | 103 | 93 | 123 | 303 | ------- | 700 | 281 | 286 | 128 | 125 | 80 | 37 |
| 30 | 77 | 91 | 128 | 199 | ------- | 2,250 | 258 | 201 | 120 | 116 | 80 | 72 |
| 31 | 57 | ------- | 117 | 276 | ------- | 1,570 | ------- | 262 | ------- | 61 | 82 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 110 | 57 | 87.6 | 0.068 | 0.08 |
| November | 202 | 67 | 117 | .091 | .10 |
| December | 177 | 68 | 103 | .080 | .09 |
| January | 3,840 | 83 | 548 | .425 | .49 |
| February | 1,880 | 158 | 481 | .373 | .39 |
| March | 2,250 | 408 | 837 | .649 | .75 |
| April | 3,320 | 180 | 869 | .674 | .75 |
| May | 705 | 201 | 392 | .304 | .35 |
| June | 399 | 86 | 183 | .142 | .16 |
| July | 212 | 61 | 129 | .100 | .12 |
| August | 151 | 49 | 93.0 | .072 | .08 |
| September | 130 | 36 | 72.8 | .056 | .06 |
| The year | 3,840 | 36 | 325 | .252 | 3.42 |

### CHIPPEWA RIVER AT BISHOPS BRIDGE, NEAR WINTER, WIS.

LOCATION.—Water-stage recorder in sec. 23, T. 39 N., R. 6 W., at highway bridge 3 miles below Chippewa Reservoir Dam and 4 miles northwest of Winter.

DRAINAGE AREA.—775 square miles.

RECORDS AVAILABLE.—February 1912 to September 1933.

DISCHARGE.—Maximum during year, 746 second-feet many days in November, December, June, and July (gage height, 5.20 feet); minimum, 114 second-feet many days in May and June (gage height, 3.85 feet).

1912–33: Maximum, 6,940 second-feet Apr. 22, 1916 (gage height, 9.56 feet); minimum, 14 second-feet Apr. 17–20, 1925 (gage height, 3.25 feet). Average, 20 years (1913–33), 654 second-feet.

REMARKS.—Records good. Stage-discharge relation affected by ice Nov. 15–25, Feb. 4 to Mar. 25. Part of table of monthly discharge corrected for regulation by storage in Chippewa and Moose Lake Reservoirs.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 462 | 462 | 746 | 579 | 383 | 220 | 142 | 157 | 114 | 746 | 711 | 643 |
| 2 | 462 | 462 | 746 | 579 | 383 | 220 | 142 | 157 | 114 | 746 | 711 | 643 |
| 3 | 462 | 462 | 746 | 579 | 383 | 220 | 142 | 151 | 114 | 746 | 711 | 643 |
| 4 | 462 | 462 | 746 | 579 | 383 | 220 | 151 | 142 | 122 | 746 | 711 | 643 |
| 5 | 462 | 462 | 746 | 579 | 383 | 220 | 157 | 142 | 114 | 746 | 711 | 643 |
| 6 | 462 | 462 | 746 | 579 | 383 | 220 | 157 | 142 | 127 | 746 | 711 | 610 |
| 7 | 462 | 462 | 746 | 579 | 383 | 220 | 236 | 127 | 157 | 746 | 711 | 610 |
| 8 | 462 | 462 | 711 | 579 | 383 | 220 | 253 | 127 | 142 | 746 | 711 | 610 |
| 9 | 462 | 462 | 711 | 579 | 383 | 220 | 157 | 127 | 142 | 746 | 711 | 610 |
| 10 | 462 | 462 | 711 | 579 | 383 | 220 | 157 | 127 | 142 | 746 | 711 | 610 |
| 11 | 462 | 462 | 711 | 579 | 383 | 220 | 157 | 127 | 142 | 746 | 711 | 610 |
| 12 | 462 | 462 | 711 | 579 | 383 | 220 | 157 | 127 | 142 | 746 | 711 | 610 |
| 13 | 462 | 462 | 711 | 519 | 383 | 220 | 142 | 127 | 151 | 746 | 711 | 610 |
| 14 | 462 | 462 | 690 | 383 | 383 | 220 | 127 | 122 | 151 | 746 | 711 | 610 |
| 15 | 462 | 462 | 610 | 383 | 383 | 220 | 142 | 114 | 142 | 746 | 711 | 610 |
| 16 | 462 | 462 | 610 | 383 | 383 | 220 | 142 | 114 | 142 | 746 | 711 | 610 |
| 17 | 462 | 462 | 610 | 383 | 383 | 220 | 142 | 114 | 409 | 746 | 643 | 610 |
| 18 | 462 | 462 | 610 | 383 | 127 | 220 | 142 | 122 | 409 | 746 | 643 | 610 |
| 19 | 462 | 462 | 610 | 383 | 127 | 142 | 142 | 127 | 560 | 746 | 643 | 610 |
| 20 | 462 | 462 | 610 | 383 | 127 | 142 | 142 | 127 | 746 | 746 | 643 | 383 |
| 21 | 462 | 462 | 610 | 383 | 127 | 142 | 142 | 127 | 746 | 746 | 643 | 210 |
| 22 | 462 | 462 | 610 | 383 | 220 | 142 | 142 | 114 | 746 | 746 | 643 | 188 |
| 23 | 462 | 462 | 610 | 383 | 220 | 142 | 142 | 122 | 746 | 746 | 643 | 188 |
| 24 | 462 | 462 | 610 | 383 | 220 | 142 | 142 | 127 | 746 | 746 | 643 | 188 |
| 25 | 452 | 462 | 610 | 383 | 220 | 142 | 142 | 122 | 746 | 746 | 643 | 188 |
| 26 | 435 | 462 | 610 | 383 | 220 | 142 | 142 | 114 | 746 | 746 | 643 | 188 |
| 27 | 435 | 676 | 610 | 383 | 220 | 142 | 142 | 114 | 746 | 746 | 643 | 188 |
| 28 | 435 | 746 | 610 | 383 | 220 | 142 | 142 | 122 | 746 | 746 | 643 | 188 |
| 29 | 435 | 746 | 610 | 383 | ------ | 142 | 142 | 122 | 746 | 746 | 643 | 188 |
| 30 | 435 | 746 | 598 | 383 | ------ | 142 | 157 | 114 | 746 | 711 | 643 | 188 |
| 31 | 435 | ------ | 579 | 383 | ------ | 172 | ------ | 114 | ------ | 711 | 643 | ------ |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 462 | 435 | 456 | −742 | 179 | 0.231 | 0.27 |
| November | 746 | 462 | 498 | −96 | 461 | .595 | .66 |
| December | 746 | 579 | 659 | −1,440 | 121 | .156 | .18 |
| January | 579 | 383 | 463 | −1,090 | 56 | .072 | .08 |
| February | 383 | 127 | 306 | −128 | 253 | .326 | .34 |
| March | 220 | 142 | 188 | +550 | 393 | .507 | .58 |
| April | 253 | 127 | 152 | +3,770 | 1,610 | 2.08 | 2.32 |
| May | 157 | 114 | 127 | +2,480 | 1,050 | 1.35 | 1.56 |
| June | 746 | 114 | 391 | +265 | 493 | .636 | .71 |
| July | 746 | 711 | 744 | −1,290 | 262 | .338 | .39 |
| August | 711 | 643 | 678 | −1,380 | 163 | .210 | .24 |
| September | 643 | 188 | 468 | −590 | 241 | .311 | .35 |
| The year | 746 | 114 | 429 | +309 | 439 | .566 | 7.68 |

### CHIPPEWA RIVER NEAR BRUCE, WIS.

LOCATION.—Chain gage in sec. 4, T. 35 N., R. 7 W., 1 mile east of Bruce, just below mouth of Thornapple River.

DRAINAGE AREA.—1,600 square miles.

RECORDS AVAILABLE.—December 1913 to September 1933.

DISCHARGE.—Maximum during year, 4,350 second-feet Apr. 1 (gage height, 6.2 feet); minimum, 229 second-feet Sept. 30 (gage height, 1.20 feet).

1914–33: Maximum, 14,900 second-feet Apr. 10, 1922 (gage height, 13.7 feet); minimum, 155 second-feet June 10, 1932 (gage height, 0.9 foot). Average, 19 years, 1,300 second-feet.

REMARKS.—Records good except those for period of ice effect, Nov. 15 to Apr. 3, which are fair. Discharge estimated Apr. 18–20. Part of table of monthly discharge corrected for regulation by storage in Chippewa and Moose Lake Reservoirs.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 680 | 718 | 756 | 680 | 643 | 402 | 4,350 | 3,280 | 756 | 873 | 834 | 718 |
| 2 | 680 | 680 | 718 | 680 | 643 | 434 | 4,110 | 3,280 | 680 | 873 | 834 | 718 |
| 3 | 680 | 680 | 606 | 756 | 606 | 434 | 3,890 | 2,470 | 606 | 912 | 834 | 718 |
| 4 | 680 | 680 | 606 | 795 | 535 | 434 | 3,280 | 1,860 | 834 | 912 | 795 | 718 |
| 5 | 680 | 718 | 606 | 834 | 500 | 402 | 2,920 | 1,520 | 912 | 873 | 795 | 718 |
| 6 | 680 | 756 | 606 | 834 | 467 | 434 | 2,830 | 1,190 | 756 | 873 | 795 | 718 |
| 7 | 680 | 756 | 570 | 834 | 434 | 467 | 2,740 | 1,190 | 756 | 873 | 795 | 680 |
| 8 | 680 | 873 | 570 | 834 | 467 | 467 | 2,030 | 1,110 | 680 | 873 | 795 | 680 |
| 9 | 680 | 1,030 | 570 | 795 | 467 | 467 | 1,940 | 1,440 | 643 | 912 | 795 | 680 |
| 10 | 680 | 1,030 | 500 | 795 | 467 | 371 | 2,120 | 1,440 | 570 | 912 | 795 | 680 |
| 11 | 680 | 990 | 606 | 795 | 434 | 371 | 2,030 | 1,190 | 535 | 900 | 795 | 680 |
| 12 | 680 | 873 | 680 | 795 | 434 | 434 | 1,860 | 1,110 | 500 | 951 | 795 | 680 |
| 13 | 680 | 873 | 643 | 795 | 434 | 434 | 1,860 | 1,280 | 467 | 834 | 756 | 680 |
| 14 | 680 | 951 | 643 | 795 | 402 | 434 | 1,770 | 1,360 | 434 | 951 | 756 | 680 |
| 15 | 680 | 371 | 643 | 756 | 402 | 434 | 1,940 | 1,280 | 434 | 912 | 756 | 680 |
| 16 | 680 | 643 | 606 | 643 | 402 | 500 | 2,380 | 1,280 | 402 | 912 | 756 | 680 |
| 17 | 680 | 680 | 606 | 570 | 402 | 570 | 2,380 | 1,190 | 434 | 912 | 756 | 680 |
| 18 | 680 | 467 | 606 | 500 | 402 | 570 | 2,250 | 1,110 | 535 | 912 | 756 | 643 |
| 19 | 680 | 606 | 606 | 535 | 402 | 570 | 2,120 | 1,190 | 643 | 912 | 756 | 680 |
| 20 | 680 | 570 | 606 | 643 | 402 | 570 | 1,990 | 1,110 | 912 | 912 | 756 | 643 |
| 21 | 680 | 570 | 606 | 643 | 402 | 570 | 1,860 | 951 | 990 | 912 | 756 | 570 |
| 22 | 680 | 606 | 606 | 643 | 402 | 570 | 1,690 | 834 | 912 | 912 | 756 | 283 |
| 23 | 680 | 643 | 606 | 643 | 371 | 606 | 1,440 | 873 | 912 | 912 | 756 | 255 |
| 24 | 680 | 680 | 643 | 643 | 384 | 718 | 1,360 | 873 | 912 | 873 | 756 | 255 |
| 25 | 643 | 606 | 718 | 643 | 371 | 756 | 1,110 | 795 | 873 | 873 | 756 | 255 |
| 26 | 643 | 535 | 718 | 643 | 341 | 795 | 990 | 718 | 873 | 834 | 756 | 283 |
| 27 | 643 | 535 | 718 | 643 | 341 | 834 | 951 | 680 | 873 | 834 | 756 | 283 |
| 28 | 643 | 834 | 718 | 643 | 341 | 990 | 912 | 643 | 873 | 834 | 718 | 255 |
| 29 | 680 | 795 | 718 | 643 | ------- | 1,280 | 834 | 756 | 873 | 834 | 718 | 255 |
| 30 | 718 | 718 | 718 | 643 | ------- | 1,860 | 1,360 | 990 | 873 | 834 | 718 | 229 |
| 31 | 718 | ------- | 680 | 643 | ------- | 3,280 | ------- | 990 | ------- | 834 | 718 | ------- |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 718 | 643 | 678 | −742 | 401 | 0.251 | 0.29 |
| November | 1,030 | 371 | 716 | −96 | 679 | .424 | .47 |
| December | 756 | 500 | 639 | −1,440 | 101 | .063 | .07 |
| January | 834 | 500 | 701 | −1,090 | 294 | .184 | .21 |
| February | 643 | 341 | 439 | −128 | 386 | .241 | .25 |
| March | 3,280 | 371 | 692 | +550 | 897 | .561 | .65 |
| April | 4,350 | 834 | 2,110 | +3,770 | 3,560 | 2.22 | 2.48 |
| May | 3,280 | 643 | 1,290 | +2,480 | 2,220 | 1.39 | 1.60 |
| June | 990 | 402 | 715 | +265 | 817 | .511 | .57 |
| July | 990 | 834 | 889 | −1,290 | 407 | .254 | .29 |
| August | 834 | 718 | 770 | −1,380 | 255 | .159 | .18 |
| September | 718 | 229 | 556 | −590 | 329 | .205 | .23 |
| The year | 4,350 | 220 | 851 | +309 | 861 | .538 | 7.29 |

### CHIPPEWA RIVER AT CHIPPEWA FALLS, WIS.

LOCATION.—In lot 1, sec. 12, T. 28 N., R. 9 W., at Chippewa Falls, 1 mile below mouth of Duncan Creek.

DRAINAGE AREA.—5,600 square miles.

RECORDS AVAILABLE.—June 1888 to September 1933.

DISCHARGE.—Maximum during year, 24,300 second-feet Apr. 6 (gage height, 11.80 feet); minimum, 143 second-feet Sept. 24 (gage height, 1.10 feet) measured while power plant was shut off.

1888–1933: Maximum, 78,000 second-feet Mar. 27, 1920 (gage height, 17.0 feet at old site); minimum, 23 second-feet Sept. 22, 1929. Average, 23 years (1907–10, 1913–33), 4,680 second-feet.

Maximum stage known, 26.94 feet Sept. 10, 1884.

REMARKS.—Records Nov. 13 to Apr. 4, May 1–13 fair. Discharge computed from records at Chippewa Falls power plant and estimated inflow between plant and gaging station. Records Oct. 1 to Nov. 12, Apr. 5–30, May 14 to Sept. 30 good. Discharge computed from record of water-stage recorder. Flow regulated by Chippewa power plant immediately above station and by many others above and by Chippewa, Moose Lake, Flambeau, and Rest Lake Reservoirs. Part of table of monthly discharge corrected for storage in these reservoirs.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,710 | 1,400 | 1,780 | 870 | 2,000 | 3,430 | 4,250 | 11,200 | 4,870 | 1,970 | 2,100 | 2,000 |
| 2 | 898 | 1,680 | 1,880 | 870 | 2,300 | 3,470 | 2,070 | 20,600 | 4,490 | 970 | 1,890 | 1,350 |
| 3 | 1,820 | 1,800 | 2,320 | 2,180 | 2,150 | 3,770 | 6,030 | 17,600 | 4,070 | 1,700 | 1,780 | 1,000 |
| 4 | 2,210 | 1,530 | 920 | 2,080 | 2,230 | 3,370 | 6,440 | 11,600 | 1,050 | 970 | 1,390 | 1,010 |
| 5 | 1,780 | 1,600 | 2,770 | 2,330 | 590 | 1,430 | 9,910 | 10,200 | 2,960 | 1,930 | 1,540 | 1,780 |
| 6 | 1,570 | 561 | 2,500 | 2,110 | 1,940 | 3,670 | 21,000 | 8,270 | 3,110 | 2,060 | 976 | 2,120 |
| 7 | 1,530 | 1,710 | 2,380 | 1,810 | 1,900 | 3,360 | 21,000 | 5,440 | 3,900 | 2,260 | 1,330 | 2,180 |
| 8 | 1,550 | 2,470 | 2,150 | 450 | 1,850 | 3,360 | 17,600 | 6,330 | 3,600 | 1,690 | 1,650 | 1,860 |
| 9 | 944 | 2,860 | 2,180 | 2,050 | 1,800 | 3,240 | 13,600 | 6,240 | 4,330 | 890 | 1,750 | 1,400 |
| 10 | 1,610 | 2,600 | 1,410 | 2,510 | 1,520 | 2,610 | 15,200 | 5,980 | 4,830 | 1,850 | 1,690 | 1,120 |
| 11 | 1,900 | 3,020 | 350 | 2,210 | 1,330 | 2,130 | 14,500 | 6,510 | 1,120 | 1,990 | 1,410 | 1,610 |
| 12 | 2,130 | 3,170 | 1,200 | 2,120 | 525 | 860 | 11,700 | 5,840 | 2,610 | 2,110 | 1,340 | 1,820 |
| 13 | 1,790 | 1,360 | 1,450 | 1,920 | 2,700 | 3,710 | 7,690 | 5,130 | 2,790 | 1,900 | 894 | 1,930 |
| 14 | 1,850 | 2,440 | 1,600 | 2,170 | 3,100 | 2,940 | 10,600 | 2,750 | 2,410 | 1,760 | 1,640 | 1,640 |
| 15 | 1,750 | 1,530 | 1,700 | 740 | 2,850 | 2,600 | 6,250 | 6,070 | 2,500 | 1,060 | 1,960 | 1,960 |
| 16 | 879 | 1,600 | 1,650 | 1,790 | 2,880 | 2,810 | 8,950 | 6,270 | 2,450 | 790 | 1,930 | 1,520 |
| 17 | 1,920 | 1,520 | 1,780 | 1,730 | 2,750 | 2,860 | 6,250 | 5,790 | 2,380 | 1,650 | 1,520 | 1,030 |
| 18 | 2,100 | 1,560 | 275 | 2,290 | 2,650 | 4,200 | 9,740 | 4,960 | 880 | 2,080 | 1,420 | 1,550 |
| 19 | 1,980 | 1,620 | 2,300 | 1,750 | 700 | 1,960 | 10,600 | 5,790 | 1,870 | 2,000 | 1,330 | 1,810 |
| 20 | 1,700 | 440 | 2,690 | 1,620 | 3,150 | 4,140 | 11,400 | 4,360 | 2,410 | 2,270 | 854 | 1,710 |
| 21 | 1,600 | 2,110 | 1,990 | 1,570 | 3,660 | 4,080 | 10,300 | 2,500 | 1,890 | 2,040 | 1,650 | 1,850 |
| 22 | 1,540 | 2,180 | 1,950 | 750 | 3,250 | 3,620 | 9,740 | 5,630 | 1,980 | 2,310 | 1,850 | 2,170 |
| 23 | 808 | 1,790 | 1,950 | 1,770 | 3,400 | 2,290 | 8,190 | 4,900 | 1,950 | 1,080 | 1,840 | 1,620 |
| 24 | 1,950 | 300 | 2,000 | 2,450 | 3,200 | 2,420 | 8,190 | 4,760 | 1,620 | 1,890 | 1,640 | 518 |
| 25 | 1,900 | 2,130 | 1,220 | 2,030 | 3,020 | 2,060 | 4,920 | 4,830 | 1,030 | 2,050 | 1,590 | 1,580 |
| 26 | 1,520 | 2,330 | 1,660 | 1,900 | 1,300 | 700 | 4,920 | 3,780 | 1,720 | 1,960 | 1,150 | 1,460 |
| 27 | 1,600 | 560 | 2,350 | 1,610 | 3,100 | 2,470 | 4,920 | 4,550 | 2,190 | 1,930 | 939 | 1,440 |
| 28 | 1,610 | 2,460 | 2,300 | 2,720 | 3,600 | 3,600 | 3,910 | 1,330 | 2,070 | 2,010 | 1,540 | 1,240 |
| 29 | 1,760 | 2,460 | 3,040 | 730 | ------- | 3,760 | 4,500 | 3,740 | 1,870 | 1,860 | 2,010 | 1,600 |
| 30 | 916 | 2,500 | 2,860 | 1,730 | ------- | 5,550 | 1,780 | 1,750 | 1,910 | 921 | 2,010 | 1,180 |
| 31 | 1,620 | ------- | 2,200 | 2,440 | ------- | 5,700 | ------- | 4,200 | ------- | 2,010 | 1,860 | ------- |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 2,210 | 808 | 1,630 | −1,520 | 1,060 | 0.189 | 0.22 |
| November | 3,170 | 300 | 1,840 | +120 | 1,890 | .338 | .38 |
| December | 3,040 | 275 | 1,900 | −2,560 | 944 | .169 | .19 |
| January | 2,720 | 450 | 1,780 | −1,950 | 1,050 | .188 | .22 |
| February | 3,660 | 525 | 2,340 | −343 | 2,200 | .393 | .41 |
| March | 5,700 | 700 | 3,100 | +634 | 3,340 | .596 | .69 |
| April | 21,000 | 1,780 | 9,200 | +6,920 | 11,900 | 2.12 | 2.36 |
| May | 20,600 | 1,330 | 6,420 | +4,590 | 8,130 | 1.45 | 1.67 |
| June | 4,870 | 880 | 2,560 | +732 | 2,840 | .507 | .57 |
| July | 2,270 | 790 | 1,730 | −2,410 | 830 | .148 | .17 |
| August | 2,100 | 854 | 1,560 | −2,540 | 612 | .109 | .13 |
| September | 2,180 | 518 | 1,570 | −1,490 | 995 | .178 | .20 |
| The year | 21,000 | 275 | 2,970 | +182 | 2,980 | .532 | 7.21 |

### CHIPPEWA RIVER AT DURAND, WIS.

LOCATION.—Water-stage recorder in SW¼ sec. 21, T. 25 N., R. 13 W., at Durand, 400 feet above toll bridge. Zero of gage is 695.20 feet above mean sea level.

DRAINAGE AREA.—9,010 square miles.

RECORDS AVAILABLE.—July 1928 to September 1933.

DISCHARGE.—Maximum during year, 26,200 second-feet Apr. 8 (gage height, 8.52 feet); minimum, 1,550 second-feet Aug. 14 (gage height, 1.36 feet).

1928–33: Maximum, 44,300 second-feet Apr. 10, 1932 (gage height, 11.85 feet); minimum (estimated), 646 second-feet Feb. 10, 1930.

Maximum stage known, 18.4 feet Sept. 12, 1884.

REMARKS.—Records fair except those for period of ice effect, Dec. 7 to Mar. 24, which are poor. Regulation by operation of power plants and Chippewa, Moose Lake, Flambeau, and Rest Lake Reservoirs. Part of table of monthly discharge corrected for storage in these reservoirs.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2,650 | 2,650 | 3,700 | 2,230 | 3,800 | 8,350 | 13,800 | 5,400 | 6,850 | 3,380 | 2,850 | 2,750 |
| 2 | 2,560 | 2,370 | 3,480 | 2,280 | 4,580 | 8,670 | 14,600 | 14,200 | 7,430 | 3,270 | 3,160 | 3,060 |
| 3 | 2,070 | 2,560 | 3,270 | 2,190 | 4,130 | 8,350 | 10,400 | 22,700 | 6,710 | 2,100 | 3,060 | 2,240 |
| 4 | 2,850 | 2,960 | 3,380 | 2,560 | 3,800 | 8,670 | 11,100 | 19,500 | 6,030 | 2,650 | 3,060 | 2,000 |
| 5 | 3,060 | 3,060 | 2,650 | 3,160 | 3,480 | 8,350 | 11,500 | 13,800 | 3,480 | 1,980 | 2,560 | 2,080 |
| 6 | 2,960 | 2,460 | 3,380 | 3,480 | 2,560 | 6,440 | 15,900 | 13,000 | 5,160 | 3,160 | 2,000 | 2,560 |
| 7 | 2,460 | 2,000 | 3,270 | 3,700 | 2,370 | 6,440 | 24,700 | 10,400 | 6,030 | 3,590 | 1,660 | 3,060 |
| 8 | 2,560 | 2,960 | 3,060 | 4,020 | 2,650 | 6,710 | 25,200 | 8,350 | 6,440 | 3,700 | 1,870 | 3,270 |
| 9 | 2,460 | 4,580 | 2,960 | 3,700 | 2,750 | 5,900 | 21,800 | 10,000 | 6,440 | 2,960 | 2,260 | 2,850 |
| 10 | 1,900 | 4,810 | 2,370 | 3,480 | 2,460 | 5,400 | 18,100 | 10,000 | 6,300 | 2,020 | 2,460 | 2,170 |
| 11 | 2,560 | 4,700 | 2,750 | 3,700 | 2,460 | 5,640 | 16,400 | 10,700 | 6,300 | 3,590 | 2,260 | 1,930 |
| 12 | 2,850 | 4,920 | 2,150 | 3,160 | 2,170 | 5,770 | 15,500 | 10,400 | 3,700 | 3,270 | 2,260 | 2,370 |
| 13 | 3,160 | 5,280 | 1,770 | 3,060 | 1,960 | 5,770 | 14,200 | 9,670 | 4,580 | 3,700 | 1,900 | 2,850 |
| 14 | 2,960 | 3,060 | 1,960 | 3,160 | 2,560 | 5,900 | 12,600 | 8,040 | 4,810 | 3,380 | 1,600 | 2,850 |
| 15 | 3,160 | 3,910 | 2,140 | 3,160 | 3,700 | 6,570 | 12,300 | 6,440 | 4,470 | 3,160 | 2,190 | 2,370 |
| 16 | 3,060 | 2,850 | 2,460 | 2,560 | 3,700 | 6,570 | 10,000 | 9,330 | 4,240 | 2,460 | 2,650 | 3,060 |
| 17 | 2,030 | 2,960 | 2,230 | 2,750 | 3,700 | 6,850 | 10,400 | 9,000 | 3,910 | 1,930 | 3,270 | 2,850 |
| 18 | 3,060 | 2,750 | 2,280 | 2,850 | 3,700 | 7,000 | 10,700 | 8,670 | 3,910 | 2,560 | 2,650 | 2,120 |
| 19 | 3,700 | 2,650 | 2,080 | 2,850 | 3,800 | 8,040 | 12,300 | 8,040 | 2,460 | 3,480 | 2,280 | 2,230 |
| 20 | 3,700 | 2,850 | 2,070 | 2,650 | 2,460 | 6,850 | 13,000 | 8,040 | 3,160 | 3,480 | 2,170 | 2,750 |
| 21 | 2,850 | 2,650 | 2,960 | 2,650 | 3,590 | 8,350 | 13,000 | 6,570 | 4,020 | 3,700 | 1,770 | 2,560 |
| 22 | 2,750 | 3,060 | 3,060 | 2,750 | 4,360 | 7,730 | 12,300 | 4,920 | 3,700 | 3,700 | 2,100 | 2,650 |
| 23 | 2,560 | 3,910 | 2,750 | 3,590 | 4,360 | 6,850 | 12,300 | 7,430 | 3,380 | 3,800 | 3,160 | 3,380 |
| 24 | 1,900 | 3,700 | 2,850 | 4,920 | 4,700 | 5,640 | 10,000 | 7,430 | 3,270 | 2,460 | 2,650 | 2,560 |
| 25 | 2,650 | 2,750 | 3,060 | 5,160 | 5,040 | 5,900 | 10,000 | 7,140 | 3,060 | 3,380 | 2,650 | 1,880 |
| 26 | 2,850 | 2,650 | 2,460 | 4,920 | 5,770 | 6,160 | 8,350 | 7,140 | 2,370 | 3,270 | 2,560 | 2,370 |
| 27 | 2,650 | 3,270 | 2,370 | 5,040 | 6,160 | 5,160 | 7,580 | 6,710 | 2,960 | 3,270 | 2,070 | 2,850 |
| 28 | 2,560 | 3,060 | 2,560 | 4,360 | 7,580 | 6,160 | 7,430 | 6,030 | 3,380 | 3,270 | 1,670 | 2,460 |
| 29 | 2,850 | 3,270 | 2,560 | 3,910 | ------- | 7,430 | 7,280 | 3,910 | 3,380 | 3,380 | 2,150 | 2,370 |
| 30 | 2,650 | 3,800 | 2,560 | 3,270 | ------- | 8,670 | 7,000 | 5,520 | 3,380 | 3,270 | 2,650 | 2,650 |
| 31 | 1,980 | ------- | 2,750 | 3,270 | ------- | 10,700 | -------- | 4,130 | ------- | 2,000 | 3,160 | ------ |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 3,700 | 1,900 | 2,710 | −1,520 | 2,140 | 0.238 | 0.27 |
| November | 5,280 | 2,000 | 3,280 | +120 | 3,330 | .370 | .41 |
| December | 3,700 | 1,770 | 2,690 | −2,560 | 1,730 | .192 | .22 |
| January | 5,160 | 2,190 | 3,370 | −1,950 | 2,640 | .293 | .34 |
| Febrnary | 7,580 | 1,960 | 3,730 | −343 | 3,590 | .398 | .41 |
| March | 10,700 | 5,160 | 7,000 | +634 | 7,240 | .804 | .93 |
| April | 25,200 | 7,000 | 13,000 | +6,920 | 15,700 | 1.74 | 1.94 |
| May | 22,700 | 3,910 | 9,120 | +4,590 | 10,800 | 1.20 | 1.38 |
| June | 7,430 | 2,370 | 4,510 | +732 | 4,790 | .532 | .59 |
| July | 3,800 | 1,930 | 3,070 | −2,410 | 2,170 | .241 | .28 |
| August | 3,270 | 1,600 | 2,410 | −2,540 | 1,460 | .162 | .19 |
| September | 3,380 | 1,880 | 2,570 | −1,490 | 2,000 | .222 | .25 |
| The year | 25,200 | 1,600 | 4,790 | +182 | 4,800 | .533 | 7.21 |

### FLAMBEAU RIVER AT FLAMBEAU RESERVOIR, WIS.

LOCATION.—Chain gage near north line of sec. 3, T. 41 N., R. 2 E., a quarter of a mile below dam of Flambeau Reservoir.
DRAINAGE AREA.—620 square miles.
RECORDS AVAILABLE.—September 1927 to September 1933.
DISCHARGE.—Maximum during year, 643 second-feet Oct. 1 (gage height, 4.75 feet); minimum, 95 second-feet Apr. 29, May 1–6 (gage height, 3.27 feet).
1927–33: Maximum, 2,140 second-feet Oct. 21, 1928 (gage height, 6.76 feet); minimum, 11 second-feet June 15, 1930 (gage height, 2.52 feet).
REMARKS.—Records good. Slight ice effect Mar. 9, 10, 15, 19, 23, 24. Part of table of monthly discharge corrected for storage in Flambeau and Rest Lake Reservoirs.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 643 | 448 | 516 | 590 | 565 | 426 | 204 | 95 | 305 | 61e | 590 | 565 |
| 2 | 590 | 470 | 516 | 565 | 565 | 426 | 204 | 95 | 305 | 61e | 565 | 565 |
| 3 | 540 | 470 | 516 | 590 | 565 | 426 | 197 | 95 | 305 | 61e | 565 | 565 |
| 4 | 540 | 470 | 516 | 565 | 540 | 405 | 197 | 95 | 305 | 61e | 565 | 565 |
| 5 | 540 | 470 | 516 | 590 | 540 | 405 | 200 | 95 | 305 | 61e | 565 | 565 |
| 6 | 540 | 470 | 516 | 590 | 540 | 344 | 197 | 95 | 305 | 61e | 565 | 565 |
| 7 | 540 | 493 | 516 | 590 | 540 | 324 | 204 | 132 | 305 | 61e | 565 | 565 |
| 8 | 540 | 493 | 516 | 590 | 516 | 364 | 197 | 175 | 324 | 61e | 565 | 590 |
| 9 | 540 | 405 | 516 | 590 | 516 | 344 | 197 | 221 | 344 | 61e | 565 | 590 |
| 10 | 540 | 405 | 516 | 590 | 516 | 344 | 197 | 267 | 344 | 61e | 565 | 590 |
| 11 | 540 | 364 | 516 | 565 | 493 | 344 | 197 | 267 | 344 | 61e | 565 | 590 |
| 12 | 540 | 324 | 516 | 590 | 493 | 344 | 197 | 267 | 344 | 59e | 565 | 565 |
| 13 | 540 | 493 | 516 | 565 | 493 | 344 | 191 | 249 | 448 | 59e | 565 | 590 |
| 14 | 540 | 493 | 516 | 565 | 493 | 344 | 191 | 249 | 590 | 59e | 565 | 590 |
| 15 | 516 | 493 | 516 | 565 | 470 | 344 | 191 | 249 | 616 | 59e | 565 | 565 |
| 16 | 470 | 493 | 540 | 590 | 470 | 324 | 191 | 249 | 616 | 59e | 565 | 590 |
| 17 | 470 | 493 | 590 | 590 | 470 | 324 | 194 | 249 | 616 | 59e | 565 | 590 |
| 18 | 470 | 493 | 590 | 590 | 470 | 324 | 166 | 249 | 616 | 59e | 565 | 590 |
| 19 | 470 | 493 | 590 | 590 | 470 | 305 | 127 | 249 | 616 | 590 | 565 | 590 |
| 20 | 470 | 493 | 590 | 590 | 470 | 305 | 106 | 249 | 616 | 590 | 565 | 590 |
| 21 | 470 | 516 | 590 | 565 | 470 | 305 | 106 | 249 | 616 | 590 | 565 | 565 |
| 22 | 470 | 516 | 590 | 590 | 448 | 305 | 106 | 249 | 616 | 590 | 565 | 590 |
| 23 | 470 | 516 | 590 | 590 | 448 | 305 | 106 | 249 | 616 | 590 | 565 | 590 |
| 24 | 470 | 516 | 590 | 590 | 448 | 305 | 106 | 249 | 616 | 590 | 565 | 590 |
| 25 | 470 | 516 | 590 | 590 | 448 | 305 | 106 | 249 | 616 | 59e | 565 | 565 |
| 26 | 470 | 516 | 590 | 590 | 448 | 305 | 100 | 267 | 616 | 59e | 565 | 565 |
| 27 | 470 | 516 | 590 | 565 | 448 | 305 | 100 | 267 | 616 | 565 | 565 | 540 |
| 28 | 470 | 516 | 590 | 590 | 448 | 305 | 97 | 286 | 616 | 565 | 565 | 540 |
| 29 | 470 | 516 | 565 | 590 | ------ | 324 | 95 | 286 | 616 | 565 | 565 | 516 |
| 30 | 405 | 516 | 590 | 590 | ------ | 249 | 97 | 286 | 616 | 565 | 565 | 493 |
| 31 | 405 | ------ | 590 | 565 | ------ | 200 | ------ | 305 | ------ | 565 | 565 | ------ |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 643 | 405 | 504 | −775 | 215 | 0.347 | 0.40 |
| November | 516 | 324 | 480 | +216 | 563 | .908 | 1.01 |
| December | 590 | 516 | 552 | −1,120 | 134 | .216 | .25 |
| January | 590 | 565 | 583 | −864 | 260 | .419 | .48 |
| February | 565 | 448 | 493 | −215 | 404 | .652 | .68 |
| March | 426 | 200 | 333 | +84 | 364 | .587 | .68 |
| April | 204 | 95 | 159 | +3,150 | 1,380 | 2.23 | 2.49 |
| May | 305 | 95 | 220 | +2,110 | 1,010 | 1.63 | 1.88 |
| June | 616 | 305 | 491 | +467 | 671 | 1.08 | 1.20 |
| July | 616 | 565 | 595 | −1,120 | 177 | .285 | .33 |
| August | 590 | 565 | 566 | −1,160 | 133 | .215 | .25 |
| September | 590 | 493 | 571 | −901 | 223 | .360 | .40 |
| The year | 643 | 95 | 462 | −128 | 458 | .739 | 10.05 |

### FLAMBEAU RIVER NEAR BUTTERNUT, WIS.

LOCATION.—Chain gage in lot 10, sec. 28, T. 41 N., R. 1 E., 6 miles southeast of Butternut. Apr. 27 to Nov. 15, 1932, staff gage on bridge 600 feet upstream was used.

DRAINAGE AREA.—660 square miles.

RECORDS AVAILABLE.—July 1914 to September 1933.

DISCHARGE.—Maximum during year, 717 second-feet Apr. 19, 20, 21 (gage height, 2.46 feet); minimum, 179 second-feet May 8, 10.

1914–33: Maximum, 5,430 second-feet Apr. 22, 23, 1916 (gage height, 9.0 feet); minimum, 91 second-feet Sept. 18, 19, 1925 (gage height, 0.25 foot). Average, 19 years, 655 second-feet.

REMARKS.—Records fair. Discharge estimated during period of ice effect, Nov. 16 to Apr. 14, from records of Flambeau River at Flambeau Reservoir. Part of table of monthly discharge corrected for storage in Flambeau and Rest Lake Reservoirs.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 674 | 432 | 546 | 605 | 575 | 473 | 255 | 354 | 369 | 593 | 555 | 555 |
| 2 | 674 | 500 | 546 | 605 | 575 | 451 | 259 | 448 | 354 | 593 | 555 | 536 |
| 3 | 555 | 500 | 546 | 580 | 575 | 451 | 259 | 415 | 384 | 593 | 518 | 536 |
| 4 | 555 | 518 | 546 | 605 | 575 | 451 | 252 | 326 | 369 | 593 | 518 | 536 |
| 5 | 555 | 536 | 546 | 580 | 550 | 430 | 252 | 248 | 369 | 593 | 518 | 536 |
| 6 | 555 | 518 | 546 | 605 | 550 | 430 | 255 | 179 | 369 | 593 | 518 | 536 |
| 7 | 555 | 555 | 546 | 605 | 550 | 369 | 252 | 212 | 369 | 593 | 518 | 536 |
| 8 | 555 | 593 | 546 | 605 | 550 | 349 | 259 | 179 | 369 | 593 | 536 | 573 |
| 9 | 555 | 518 | 546 | 605 | 526 | 389 | 252 | 273 | 369 | 593 | 536 | 555 |
| 10 | 555 | 500 | 546 | 605 | 526 | 369 | 252 | 286 | 369 | 593 | 536 | 555 |
| 11 | 555 | 482 | 546 | 605 | 526 | 369 | 252 | 299 | 369 | 593 | 536 | 555 |
| 12 | 536 | 384 | 546 | 580 | 503 | 369 | 252 | 326 | 354 | 593 | 536 | 555 |
| 13 | 555 | 384 | 546 | 605 | 503 | 369 | 252 | 400 | 369 | 593 | 536 | 573 |
| 14 | 555 | 384 | 546 | 580 | 503 | 369 | 245 | 400 | 555 | 573 | 518 | 555 |
| 15 | 555 | 432 | 546 | 580 | 503 | 369 | 248 | 384 | 633 | 573 | 518 | 555 |
| 16 | 500 | 538 | 546 | 580 | 480 | 369 | 312 | 354 | 654 | 573 | 518 | 633 |
| 17 | 482 | 538 | 570 | 605 | 480 | 349 | 340 | 354 | 674 | 573 | 518 | 593 |
| 18 | 482 | 538 | 620 | 605 | 480 | 349 | 482 | 384 | 674 | 573 | 518 | 573 |
| 19 | 482 | 538 | 620 | 605 | 480 | 349 | 717 | 415 | 633 | 573 | 518 | 555 |
| 20 | 465 | 538 | 620 | 605 | 480 | 330 | 717 | 465 | 633 | 573 | 518 | 573 |
| 21 | 465 | 538 | 620 | 605 | 480 | 330 | 717 | 432 | 613 | 573 | 518 | 593 |
| 22 | 465 | 561 | 620 | 580 | 480 | 330 | 633 | 400 | 613 | 573 | 518 | 593 |
| 23 | 500 | 561 | 620 | 605 | 458 | 330 | 573 | 354 | 613 | 573 | 518 | 573 |
| 24 | 482 | 561 | 620 | 605 | 458 | 330 | 482 | 354 | 613 | 573 | 536 | 573 |
| 25 | 465 | 561 | 620 | 605 | 458 | 330 | 482 | 340 | 613 | 573 | 536 | 573 |
| 26 | 465 | 561 | 620 | 605 | 458 | 330 | 432 | 326 | 613 | 573 | 536 | 573 |
| 27 | 465 | 561 | 620 | 605 | 458 | 330 | 384 | 299 | 613 | 555 | 536 | 555 |
| 28 | 482 | 561 | 620 | 580 | 458 | 330 | 312 | 312 | 613 | 555 | 536 | 536 |
| 29 | 500 | 561 | 620 | 605 | ------- | 330 | 273 | 400 | 613 | 555 | 536 | 518 |
| 30 | 432 | 561 | 595 | 605 | ------- | 349 | 312 | 384 | 613 | 536 | 536 | 500 |
| 31 | 432 | ------- | 620 | 605 | ------- | 274 | ------- | 369 | ------- | 536 | 536 | ------- |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 674 | 432 | 520 | −775 | 231 | 0.350 | 0.40 |
| November | 593 | 384 | 517 | +216 | 600 | .909 | 1.01 |
| December | 620 | 546 | 579 | −1,120 | 161 | .244 | .28 |
| January | 605 | 580 | 599 | −864 | 276 | .418 | .48 |
| February | 575 | 458 | 507 | −215 | 418 | .633 | .66 |
| March | 473 | 274 | 366 | +84 | 397 | .602 | .69 |
| April | 717 | 245 | 365 | +3,150 | 1,580 | 2.39 | 2.67 |
| May | 465 | 179 | 344 | +2,110 | 1,130 | 1.71 | 1.97 |
| June | 674 | 354 | 512 | +467 | 692 | 1.05 | 1.17 |
| July | 593 | 536 | 577 | −1,120 | 159 | .241 | .28 |
| August | 555 | 518 | 529 | −1,160 | 96 | .145 | .17 |
| September | 633 | 500 | 559 | −901 | 211 | .320 | .36 |
| The year | 717 | 179 | 498 | −128 | 494 | .748 | 10.14 |

### FLAMBEAU RIVER AT BABBS ISLAND, NEAR WINTER, WIS.

LOCATION.—Water-stage recorder on west line of sec. 16, T. 38 N., R. 3 W., 10 miles east of Winter.

DRAINAGE AREA.—964 square miles.

RECORDS AVAILABLE.—August 1929 to September 1933.

DISCHARGE.—Maximum during period, 2,010 second-feet Apr. 20 (gage height, 12.37 feet); minimum, 279 second-feet Aug. 15 (gage height, 10.42 feet).

1929–33: Maximum, 2,010 second-feet June 27, 1931, and Apr. 20, 1933 (gage height, 12.40 feet); minimum, 218 second-feet July 9, 1930 (gage height, 9.73 feet).

REMARKS.—Records fair. No records Nov. 13 to Apr. 17. Part of table of monthly discharge corrected for storage in Flambeau Reservoir.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 664 | 544 | ------- | 1,090 | 664 | 772 | 664 | 590 |
| 2 | 664 | 567 | ------- | 1,170 | 614 | 664 | 614 | 522 |
| 3 | 664 | 590 | ------- | 1,090 | 590 | 717 | 772 | 614 |
| 4 | 614 | 664 | ------- | 955 | 614 | 717 | 664 | 522 |
| 5 | 567 | 772 | ------- | 890 | 614 | 590 | 664 | 501 |
| 6 | 590 | 664 | ------- | 772 | 614 | 717 | 664 | 544 |
| 7 | 590 | 567 | ------- | 664 | 590 | 590 | 439 | 717 |
| 8 | 590 | 772 | ------- | 567 | 590 | 717 | 567 | 590 |
| 9 | 590 | 955 | ------- | 614 | 567 | 830 | 614 | 614 |
| 10 | 590 | 890 | ------- | 567 | 522 | 614 | 614 | 590 |
| 11 | 614 | 772 | ------- | 567 | 522 | 717 | 590 | 439 |
| 12 | 614 | 717 | ------- | 567 | 501 | 772 | 717 | 614 |
| 13 | 664 | ------- | ------- | 614 | 480 | 772 | 772 | 590 |
| 14 | 717 | ------- | ------- | 830 | 439 | 717 | 420 | 567 |
| 15 | 717 | ------- | ------- | 717 | 544 | 664 | 439 | 567 |
| 16 | 567 | ------- | ------- | 717 | 664 | 664 | 590 | 590 |
| 17 | 501 | ------- | ------- | 717 | 772 | 590 | 567 | 717 |
| 18 | 590 | ------- | 1,700 | 664 | 664 | 717 | 567 | 480 |
| 19 | 567 | ------- | 1,850 | 614 | 567 | 717 | 590 | 614 |
| 20 | 567 | ------- | 1,930 | 614 | 717 | 772 | 664 | 590 |
| 21 | 567 | ------- | 1,780 | 664 | 717 | 772 | 439 | 614 |
| 22 | 567 | ------- | 1,620 | 664 | 717 | 664 | 567 | 614 |
| 23 | 544 | ------- | 1,470 | 717 | 664 | 717 | 614 | 590 |
| 24 | 522 | ------- | 1,320 | 664 | 614 | 614 | 590 | 567 |
| 25 | 614 | ------- | 1,090 | 614 | 717 | 772 | 544 | 480 |
| 26 | 614 | ------- | 830 | 567 | 664 | 664 | 664 | 717 |
| 27 | 614 | ------- | 830 | 522 | 664 | 772 | 590 | 614 |
| 28 | 590 | ------- | 772 | 522 | 772 | 634 | 363 | 614 |
| 29 | 614 | ------- | 772 | 544 | 717 | 634 | 501 | 544 |
| 30 | 614 | ------- | 830 | 717 | 717 | 717 | 544 | 544 |
| 31 | 480 | ------- | ------- | 717 | ------- | 501 | 544 | ------- |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 717 | 480 | 599 | −775 | 310 | 0.322 | 0.37 |
| November 1–12 | 955 | 544 | 706 | +1 | 707 | .733 | .33 |
| April 18–30 | 1,930 | 772 | 1,290 | +2,060 | 3,120 | 3.24 | 1.56 |
| May | 1,170 | 522 | 707 | +2,110 | 1,490 | 1.55 | 1.79 |
| June | 772 | 439 | 627 | +467 | 807 | .837 | .93 |
| July | 830 | 501 | 695 | −1,120 | 277 | .287 | .33 |
| August | 772 | 363 | 586 | −1,160 | 153 | .159 | .18 |
| September | 717 | 439 | 582 | −901 | 234 | .243 | .27 |

### FLAMBEAU RIVER NEAR LADYSMITH, WIS.

LOCATION.—In sec. 35, T. 36 N., R. 5 W., at Big Falls power plant of Lake Superior District Power Co., 14 miles above Ladysmith.

DRAINAGE AREA.—1,910 square miles.

RECORDS AVAILABLE.—October 1923 to September 1933. January 1914 to September 1923 about 8 miles below present site. From February 1903 to December 1906 at Ladysmith.

DISCHARGE.—Maximum mean daily during year, 5,140 second-feet Apr. 20; minimum, 308 second-feet Nov. 20.

1903–6, 1914–33: Maximum, 19,500 second-feet Apr. 11, 1922; minimum, 176 second-feet Aug. 30, 1925. Average, 19 years (1914–33), 1,640 second-feet.

REMARKS.—Records good. Discharge computed from power-house records. Part of table of monthly discharge corrected for storage in Flambeau and Rest Lake Reservoirs. Daily-discharge records furnished by Lake Superior District Power Co.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 976 | 694 | 1,010 | 621 | 827 | 739 | 1,580 | 3,260 | 1,410 | 1,080 | 619 | 694 |
| 2 | 532 | 688 | 994 | 729 | 861 | 722 | 1,940 | 3,440 | 1,230 | 700 | 657 | 711 |
| 3 | 850 | 760 | 995 | 763 | 810 | 762 | 2,400 | 3,280 | 1,150 | 702 | 790 | 696 |
| 4 | 836 | 869 | 387 | 974 | 963 | 916 | 2,780 | 3,060 | 1,260 | 741 | 795 | 696 |
| 5 | 868 | 500 | 843 | 935 | 671 | 502 | 3,050 | 2,710 | 1,260 | 792 | 777 | 609 |
| 6 | 870 | 1,120 | 843 | 1,040 | 664 | 706 | 3,360 | 2,510 | 1,320 | 854 | 668 | 602 |
| 7 | 985 | 1,170 | 808 | 1,000 | 701 | 672 | 3,240 | 2,300 | 1,250 | 794 | 612 | 862 |
| 8 | 775 | 877 | 658 | 540 | 835 | 663 | 3,130 | 1,820 | 1,320 | 813 | 541 | 770 |
| 9 | 790 | 939 | 573 | 863 | 768 | 602 | 3,070 | 1,880 | 1,210 | 918 | 678 | 718 |
| 10 | 1,090 | 1,480 | 708 | 897 | 765 | 525 | 2,910 | 1,750 | 1,270 | 837 | 680 | 757 |
| 11 | 1,500 | 1,310 | 659 | 863 | 920 | 601 | 2,490 | 1,620 | 891 | 831 | 705 | 543 |
| 12 | 1,010 | 1,090 | 642 | 833 | 519 | 417 | 2,360 | 1,560 | 1,260 | 837 | 779 | 716 |
| 13 | 985 | 833 | 725 | 976 | 712 | 582 | 2,410 | 1,800 | 1,230 | 913 | 841 | 695 |
| 14 | 945 | 1,160 | 768 | 935 | 687 | 657 | 2,490 | 2,270 | 730 | 934 | 640 | 708 |
| 15 | 1,080 | 383 | 718 | 400 | 791 | 682 | 2,660 | 1,920 | 899 | 825 | 465 | 861 |
| 16 | 1,080 | 507 | 729 | 839 | 743 | 689 | 3,380 | 1,870 | 1,160 | 633 | 703 | 873 |
| 17 | 790 | 1,110 | 869 | 879 | 809 | 680 | 3,780 | 1,760 | 936 | 614 | 667 | 783 |
| 18 | 905 | 1,050 | 672 | 916 | 837 | 802 | 4,460 | 1,750 | 1,070 | 774 | 645 | 1,320 |
| 19 | 880 | 1,250 | 748 | 783 | 572 | 577 | 4,920 | 1,720 | 1,120 | 806 | 686 | 1,390 |
| 20 | 865 | 308 | 893 | 959 | 694 | 647 | 5,140 | 1,620 | 1,110 | 858 | 697 | 1,100 |
| 21 | 892 | 764 | 861 | 967 | 744 | 647 | 4,900 | 1,600 | 1,220 | 901 | 584 | 888 |
| 22 | 910 | 713 | 970 | 489 | 711 | 663 | 4,260 | 1,610 | 1,120 | 958 | 565 | 910 |
| 23 | 840 | 1,080 | 1,130 | 917 | 688 | 662 | 3,850 | 1,720 | 1,280 | 635 | 725 | 912 |
| 24 | 509 | 803 | 954 | 860 | 679 | 669 | 3,290 | 1,640 | 1,200 | 639 | 744 | 785 |
| 25 | 755 | 1,030 | 726 | 879 | 879 | 811 | 2,940 | 1,400 | 656 | 849 | 699 | 829 |
| 26 | 735 | 879 | 746 | 937 | 533 | 523 | 2,480 | 1,410 | 949 | 774 | 739 | 944 |
| 27 | 697 | 503 | 914 | 983 | 679 | 654 | 2,220 | 1,250 | 991 | 771 | 793 | 970 |
| 28 | 792 | 711 | 742 | 985 | 771 | 743 | 1,900 | 1,110 | 1,020 | 736 | 547 | 868 |
| 29 | 890 | 851 | 1,010 | 613 | ------- | 915 | 2,020 | 1,110 | 1,210 | 821 | 561 | 742 |
| 30 | 385 | 877 | 953 | 761 | ------- | 989 | 2,670 | 1,520 | 1,110 | 614 | 624 | 850 |
| 31 | 638 | ------- | 973 | 931 | ------- | 1,030 | ------- | 1,560 | ------- | 546 | 705 | ------- |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 1,500 | 385 | 860 | −775 | 571 | 0.299 | 0.34 |
| November | 1,480 | 308 | 877 | +216 | 960 | .503 | .56 |
| December | 1,130 | 387 | 813 | −1,120 | 395 | .207 | .24 |
| January | 1,040 | 400 | 841 | −864 | 518 | .271 | .31 |
| February | 963 | 519 | 744 | −215 | 655 | .343 | .36 |
| March | 1,030 | 417 | 691 | +84 | 722 | .378 | .44 |
| April | 5,140 | 1,580 | 3,070 | +3,150 | 4,290 | 2.25 | 2.51 |
| May | 3,440 | 1,110 | 1,930 | +2,110 | 2,720 | 1.42 | 1.64 |
| June | 1,410 | 656 | 1,130 | +467 | 1,310 | .686 | .77 |
| July | 1,080 | 546 | 800 | −1,120 | 382 | .200 | .23 |
| August | 841 | 465 | 675 | −1,160 | 242 | .127 | .15 |
| September | 1,390 | 543 | 827 | −901 | 479 | .251 | .28 |
| The year | 5,140 | 308 | 1,100 | −128 | 1,100 | .576 | 7.83 |

### SOUTH FORK OF FLAMBEAU RIVER NEAR PHILLIPS, WIS.

LOCATION.—Chain gage in NW¼SW¼ sec. 10, T. 37 N., R. 2 W., half a mile downstream from mouth of Big Elk River and 12 miles west of Phillips.
DRAINAGE AREA.—666 square miles.
RECORDS AVAILABLE.—August 1929 to September 1933.
DISCHARGE.—Maximum during period, 3,000 second-feet Apr. 16 (gage height, 9.20 feet); minimum, 39 second-feet Aug. 31, Sept. 3–5 (gage height, 4.26 feet).
1929–33: Maximum, 4,180 second-feet Apr. 11, 1932 (gage height, 10.50 feet); minimum, that of Aug. 31 and Sept. 3–5, 1933.
REMARKS.—Records fair. Discharge estimated Nov. 10–19. No record Nov. 20 to Apr. 8.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 104 | 168 | ------- | 1,360 | 674 | 186 | 68 | 41 |
| 2 | 104 | 177 | ------- | 1,360 | 622 | 168 | 74 | 41 |
| 3 | 104 | 186 | ------- | 1,430 | 506 | 168 | 65 | 39 |
| 4 | 104 | 186 | ------- | 1,660 | 506 | 168 | 65 | 39 |
| 5 | 104 | 196 | ------- | 1,500 | 484 | 160 | 65 | 39 |
| 6 | 104 | 205 | ------- | 1,360 | 506 | 151 | 65 | 41 |
| 7 | 104 | 205 | ------- | 1,160 | 506 | 151 | 65 | 41 |
| 8 | 98 | 215 | ------- | 969 | 529 | 142 | 65 | 42 |
| 9 | 104 | 236 | 1,660 | 785 | 506 | 142 | 57 | 42 |
| 10 | 104 | 246 | 1,660 | 785 | 462 | 134 | 59 | 44 |
| 11 | 111 | 246 | 1,580 | 729 | 440 | 126 | 59 | 46 |
| 12 | 111 | 246 | 1,580 | 729 | 398 | 118 | 59 | 44 |
| 13 | 111 | 246 | 1,500 | 729 | 378 | 126 | 55 | 44 |
| 14 | 118 | 246 | 1,500 | 674 | 325 | 126 | 46 | 46 |
| 15 | 118 | 246 | 1,360 | 905 | 325 | 118 | 46 | 46 |
| 16 | 118 | 246 | 3,000 | 905 | 310 | 111 | 46 | 48 |
| 17 | 118 | 246 | 2,820 | 844 | 295 | 104 | 44 | 46 |
| 18 | 126 | 246 | 2,300 | 844 | 295 | 111 | 44 | 46 |
| 19 | 126 | 246 | 2,300 | 785 | 282 | 118 | 46 | 51 |
| 20 | 126 | ------- | 2,300 | 785 | 295 | 118 | 44 | 49 |
| 21 | 134 | ------- | 2,390 | 729 | 325 | 111 | 44 | 51 |
| 22 | 126 | ------- | 2,140 | 729 | 282 | 111 | 44 | 49 |
| 23 | 142 | ------- | 1,890 | 674 | 258 | 104 | 44 | 49 |
| 24 | 142 | ------- | 1,730 | 674 | 236 | 104 | 44 | 58 |
| 25 | 142 | ------- | 1,660 | 575 | 215 | 98 | 44 | 60 |
| 26 | 142 | ------- | 1,500 | 575 | 196 | 85 | 44 | 62 |
| 27 | 151 | ------- | 1,160 | 575 | 205 | 79 | 42 | 65 |
| 28 | 151 | ------- | 1,100 | 552 | 196 | 74 | 42 | 72 |
| 29 | 151 | ------- | 969 | 529 | 205 | 68 | 41 | 75 |
| 30 | 160 | ------- | 1,100 | 506 | 205 | 74 | 41 | 75 |
| 31 | 160 | ------- | ------- | 674 | ------- | 74 | 39 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 160 | 98 | 123 | 0.185 | 0.21 |
| November 1–19 | 246 | 168 | 123 | .335 | .24 |
| April 9–30 | 3,000 | 969 | 1,780 | 2.67 | 2.18 |
| May | 1,660 | 506 | 874 | 1.31 | 1.51 |
| June | 674 | 196 | 366 | .550 | .61 |
| July | 186 | 68 | 120 | .180 | .21 |
| August | 74 | 39 | 51.8 | .078 | .09 |
| September | 75 | 39 | 49.7 | .075 | .08 |

### JUMP RIVER AT SHELDON, WIS.

LOCATION.—Chain gage in sec. 26, T. 33 N., R. 5 W., at highway bridge in Sheldon, 11 miles above mouth.

DRAINAGE AREA.—510 square miles.

RECORDS AVAILABLE.—July 1915 to September 1933.

DISCHARGE.—Maximum during year, 7,970 second-feet May 2 (gage height, 8.75 feet); minimum, 18 second-feet Aug. 10, 13–17, 25, 26, Sept. 2–4, 10, 11 (gage height, 2.60 feet).

1915–33: Maximum, 15,600 second-feet Mar. 26, 1920 (gage height, 11.48 feet); minimum (estimated), 14 second-feet Jan. 25–31, 1924. Average, 18 years, 496 second-feet.

REMARKS.—Records good except those for period of ice effect, Nov. 13 to Mar. 31, which are fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 50 | 50 | 48 | 35 | 62 | 62 | 970 | 3,820 | 680 | 74 | 22 | 20 |
| 2 | 55 | 50 | 62 | 35 | 62 | 56 | 4,000 | 6,510 | 461 | 55 | 24 | 18 |
| 3 | 69 | 50 | 56 | 35 | 62 | 50 | 3,470 | 3,470 | 313 | 50 | 26 | 18 |
| 4 | 69 | 62 | 50 | 35 | 62 | 62 | 2,840 | 2,290 | 490 | 42 | 26 | 18 |
| 5 | 50 | 62 | 50 | 35 | 62 | 74 | 2,990 | 1,500 | 490 | 35 | 30 | 22 |
| 6 | 38 | 50 | 50 | 38 | 62 | 74 | 4,970 | 970 | 615 | 35 | 30 | 24 |
| 7 | 35 | 69 | 44 | 42 | 56 | 74 | 4,000 | 648 | 680 | 35 | 26 | 26 |
| 8 | 38 | 80 | 38 | 42 | 50 | 68 | 2,990 | 715 | 930 | 35 | 22 | 22 |
| 9 | 30 | 106 | 38 | 42 | 50 | 62 | 2,990 | 680 | 890 | 35 | 20 | 20 |
| 10 | 38 | 175 | 38 | 38 | 50 | 68 | 2,700 | 615 | 680 | 35 | 18 | 18 |
| 11 | 42 | 236 | 40 | 35 | 56 | 74 | 2,420 | 550 | 550 | 35 | 20 | 18 |
| 12 | 38 | 218 | 42 | 47 | 62 | 82 | 2,040 | 490 | 432 | 35 | 20 | 22 |
| 13 | 35 | 62 | 36 | 42 | 56 | 90 | 1,700 | 550 | 283 | 42 | 18 | 22 |
| 14 | 35 | 50 | 30 | 42 | 50 | 90 | 1,500 | 490 | 218 | 42 | 18 | 22 |
| 15 | 33 | 55 | 26 | 42 | 46 | 90 | 1,500 | 550 | 183 | 42 | 18 | 22 |
| 16 | 30 | 74 | 22 | 38 | 42 | 107 | 1,600 | 680 | 192 | 35 | 18 | 24 |
| 17 | 35 | 84 | 22 | 35 | 42 | 124 | 1,700 | 582 | 183 | 35 | 18 | 30 |
| 18 | 47 | 90 | 22 | 35 | 42 | 198 | 1,700 | 680 | 183 | 35 | 22 | 33 |
| 19 | 55 | 74 | 26 | 42 | 35 | 273 | 1,600 | 750 | 142 | 33 | 22 | 35 |
| 20 | 62 | 69 | 30 | 42 | 38 | 367 | 1,500 | 820 | 142 | 30 | 22 | 30 |
| 21 | 55 | 66 | 30 | 42 | 42 | 461 | 1,310 | 715 | 124 | 28 | 22 | 35 |
| 22 | 50 | 62 | 30 | 52 | 46 | 367 | 1,130 | 582 | 106 | 26 | 22 | 30 |
| 23 | 55 | 56 | 32 | 62 | 50 | 273 | 930 | 490 | 106 | 28 | 22 | 30 |
| 24 | 62 | 50 | 35 | 62 | 62 | 273 | 750 | 376 | 90 | 30 | 22 | 33 |
| 25 | 50 | 50 | 35 | 62 | 74 | 273 | 615 | 323 | 74 | 28 | 18 | 35 |
| 26 | 47 | 50 | 35 | 62 | 74 | 298 | 550 | 264 | 62 | 26 | 18 | 50 |
| 27 | 50 | 44 | 42 | 62 | 74 | 323 | 490 | 236 | 55 | 26 | 22 | 55 |
| 28 | 47 | 38 | 50 | 62 | 68 | 406 | 432 | 273 | 50 | 26 | 22 | 50 |
| 29 | 47 | 36 | 46 | 62 | ------ | 490 | 376 | 490 | 50 | 26 | 24 | 42 |
| 30 | 55 | 35 | 42 | 62 | ------ | 638 | 550 | 280 | 62 | 26 | 26 | 38 |
| 31 | 62 | ------ | 38 | 62 | ------ | 785 | ------ | 890 | ------ | 22 | 22 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 69 | 30 | 47.2 | 0.093 | 0.11 |
| November | 236 | 35 | 75.1 | .147 | .16 |
| December | 62 | 22 | 38.2 | .075 | .09 |
| January | 62 | 35 | 46.1 | .090 | .10 |
| February | 74 | 35 | 54.9 | .108 | .11 |
| March | 785 | 50 | 217 | .425 | .49 |
| April | 4,970 | 376 | 1,880 | 3.69 | 4.12 |
| May | 6,510 | 236 | 1,060 | 2.08 | 2.40 |
| June | 930 | 50 | 317 | .622 | .69 |
| July | 74 | 22 | 35.1 | .069 | .08 |
| August | 30 | 18 | 21.9 | .043 | .05 |
| September | 55 | 18 | 28.7 | .056 | .06 |
| The year | 6,510 | 18 | 317 | .622 | 8.46 |

### RED CEDAR RIVER NEAR COLFAX, WIS.

LOCATION.—Water-stage recorder in sec. 27, T. 30 N., R. 11 W., at highway bridge 3½ miles below Trout Creek and 4½ miles north of Colfax.

DRAINAGE AREA.—1,100 square miles.

RECORDS AVAILABLE.—March 1914 to September 1933.

DISCHARGE.—Maximum during year, 4,700 second-feet Apr. 1 (gage height, 5.44 feet); minimum, 148 second-feet Sept. 23 (gage height, 0.77 foot).

1914–33: Maximum, 7,610 second-feet Mar. 26, 1920 (gage height, 6.95 feet); minimum, 148 second-feet July 24, 1931, and Sept. 23, 1933. Average, 19 years, 756 second-feet.

REMARKS.—Records fair except those for which no gage heights were available, Oct. 8–15, 22, and those for period of ice effect, Nov. 16 to Mar. 23, which are poor. Flow regulated by 4 storage reservoirs upstream.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 270 | 306 | 410 | 346 | 388 | 684 | 4,130 | 569 | 477 | 371 | 287 | 169 |
| 2 | 270 | 325 | 366 | 366 | 366 | 815 | 2,720 | 701 | 441 | 236 | 252 | 221 |
| 3 | 270 | 283 | 366 | 410 | 366 | 815 | 1,840 | 654 | 387 | 236 | 221 | 236 |
| 4 | 270 | 317 | 325 | 434 | 388 | 815 | 1,400 | 590 | 467 | 221 | 221 | 221 |
| 5 | 287 | 366 | 366 | 410 | 306 | 782 | 1,470 | 585 | 621 | 302 | 236 | 252 |
| 6 | 270 | 362 | 366 | 366 | 410 | 716 | 2,150 | 564 | 555 | 207 | 236 | 272 |
| 7 | 252 | 383 | 287 | 410 | 388 | 565 | 1,840 | 716 | 638 | 181 | 236 | 221 |
| 8 | 292 | 386 | 193 | 410 | 306 | 654 | 1,450 | 824 | 782 | 193 | 287 | 207 |
| 9 | 292 | 654 | 306 | 434 | 287 | 623 | 1,540 | 1,050 | 684 | 193 | 236 | 207 |
| 10 | 307 | 619 | 252 | 346 | 252 | 815 | 1,110 | 794 | 623 | 220 | 252 | 207 |
| 11 | 340 | 594 | 221 | 306 | 236 | 748 | 1,190 | 1,000 | 716 | 363 | 236 | 193 |
| 12 | 323 | 467 | 221 | 221 | 325 | 684 | 1,270 | 976 | 565 | 510 | 236 | 193 |
| 13 | 414 | 414 | 252 | 221 | 246 | 748 | 1,030 | 748 | 446 | 458 | 236 | 207 |
| 14 | 340 | 383 | 287 | 325 | 366 | 1,190 | 1,030 | 623 | 379 | 410 | 221 | 207 |
| 15 | 301 | 246 | 221 | 366 | 306 | 1,360 | 1,030 | 623 | 326 | 325 | 236 | 181 |
| 16 | 278 | 321 | 270 | 346 | 366 | 1,030 | 956 | 623 | 327 | 306 | 236 | 221 |
| 17 | 303 | 346 | 287 | 252 | 346 | 1,640 | 815 | 623 | 385 | 306 | 236 | 221 |
| 18 | 252 | 346 | 270 | 366 | 346 | 1,940 | 1,110 | 623 | 377 | 306 | 221 | 247 |
| 19 | 270 | 252 | 252 | 484 | 366 | 1,640 | 956 | 684 | 357 | 252 | 221 | 221 |
| 20 | 325 | 325 | 252 | 565 | 458 | 1,270 | 956 | 486 | 306 | 236 | 221 | 252 |
| 21 | 287 | 410 | 221 | 287 | 434 | 1,030 | 885 | 479 | 287 | 604 | 207 | 221 |
| 22 | 296 | 346 | 207 | 366 | 458 | 1,110 | 748 | 623 | 366 | 510 | 236 | 181 |
| 23 | 306 | 366 | 252 | 484 | 458 | 1,030 | 654 | 623 | 319 | 510 | 221 | 207 |
| 24 | 287 | 325 | 287 | 565 | 565 | 1,110 | 623 | 484 | 324 | 366 | 221 | 193 |
| 25 | 306 | 410 | 325 | 510 | 748 | 1,270 | 623 | 546 | 252 | 346 | 207 | 207 |
| 26 | 410 | 346 | 325 | 594 | 623 | 1,270 | 623 | 623 | 278 | 287 | 221 | 252 |
| 27 | 346 | 325 | 306 | 458 | 684 | 1,190 | 503 | 465 | 252 | 270 | 181 | 276 |
| 28 | 325 | 366 | 325 | 484 | 623 | 1,270 | 565 | 623 | 287 | 252 | 181 | 193 |
| 29 | 270 | 287 | 287 | 410 | ------ | 1,360 | 520 | 623 | 270 | 252 | 221 | 193 |
| 30 | 325 | 325 | 410 | 410 | ------ | 1,880 | 684 | 654 | 207 | 252 | 207 | 193 |
| 31 | 324 | ------ | 410 | 434 | ------ | 4,310 | ------ | 623 | ------ | 236 | 193 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 414 | 252 | 304 | 0.276 | 0.32 |
| November | 654 | 246 | 373 | .339 | .38 |
| December | 410 | 193 | 294 | .267 | .31 |
| January | 594 | 221 | 400 | .364 | .42 |
| February | 748 | 236 | 411 | .374 | .39 |
| March | 4,310 | 565 | 1,170 | 1.06 | 1.22 |
| April | 4,130 | 503 | 1,210 | 1.10 | 1.23 |
| May | 1,050 | 465 | 659 | .599 | .69 |
| June | 782 | 207 | 423 | .385 | .43 |
| July | 604 | 181 | 313 | .285 | .33 |
| August | 287 | 181 | 228 | .207 | .24 |
| September | 276 | 169 | 216 | .196 | .22 |
| The year | 4,310 | 169 | 501 | .455 | 6.18 |

### RED CEDAR RIVER AT MENOMONIE, WIS.

LOCATION.—Water-stage recorder in sec. 26, T. 28 N., R. 13 W., at Menomonie, 900 feet below power house of Northern States Power Co. and 1,000 feet below mouth of Wilson Creek.

DRAINAGE AREA.—1,810 square miles.

RECORDS AVAILABLE.—June 1907 to September 1908; May 1913 to September 1923; March 1925 to September 1933.

DISCHARGE.—Maximum during year, 8,160 second-feet Apr. 1 (gage height, 5.20 feet); minimum, 260 second-feet Apr. 16 (gage height, 1.16 feet).

1907–8, 1913–23, 1925–33: Maximum, 14,000 second-feet Mar. 26, 1920 (gage height, 8.0 feet); minimum, 21 second-feet Dec. 9, 1928 (gage height, 0.65 foot). Average, 18 years (1913–23, 1925–33), 1,190 second-feet.

REMARKS.—Records excellent. Regulation by operation of power plant at Menomonie and at Cedar Falls and by storage in 4 reservoirs upstream.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 569 | 532 | 550 | 713 | 947 | 1,300 | 7,070 | 1,560 | 1,190 | 597 | 532 | 430 |
| 2 | 463 | 532 | 808 | 587 | 649 | 1,400 | 6,050 | 1,330 | 909 | 505 | 522 | 455 |
| 3 | 522 | 541 | 550 | 587 | 560 | 1,720 | 4,250 | 1,060 | 808 | 488 | 522 | 455 |
| 4 | 522 | 960 | 522 | 670 | 597 | 1,500 | 2,910 | 1,090 | 627 | 480 | 488 | 463 |
| 5 | 532 | 532 | 737 | 505 | 541 | 1,510 | 2,510 | 1,010 | 713 | 569 | 430 | 430 |
| 6 | 522 | 541 | 513 | 649 | 472 | 1,360 | 2,610 | 870 | 1,060 | 505 | 422 | 422 |
| 7 | 455 | 670 | 627 | 550 | 541 | 1,320 | 3,220 | 522 | 1,130 | 505 | 422 | 438 |
| 8 | 472 | 761 | 522 | 532 | 522 | 1,590 | 3,010 | 1,050 | 1,220 | 430 | 430 | 438 |
| 9 | 480 | 1,190 | 447 | 550 | 496 | 1,260 | 1,980 | 1,540 | 1,330 | 422 | 438 | 447 |
| 10 | 480 | 986 | 422 | 692 | 578 | 1,250 | 2,510 | 1,620 | 1,280 | 447 | 438 | 463 |
| 11 | 505 | 808 | 430 | 550 | 569 | 1,250 | 1,810 | 1,210 | 858 | 532 | 438 | 463 |
| 12 | 560 | 692 | 422 | 522 | 587 | 986 | 1,900 | 1,750 | 973 | 541 | 447 | 463 |
| 13 | 532 | 692 | 422 | 638 | 522 | 1,060 | 1,900 | 1,230 | 934 | 560 | 438 | 455 |
| 14 | 681 | 713 | 430 | 550 | 541 | 1,140 | 1,650 | 761 | 909 | 560 | 430 | 447 |
| 15 | 560 | 472 | 430 | 455 | 597 | 1,220 | 808 | 1,500 | 713 | 569 | 438 | 488 |
| 16 | 496 | 472 | 430 | 496 | 713 | 2,510 | 587 | 1,220 | 737 | 505 | 430 | 587 |
| 17 | 587 | 430 | 438 | 550 | 638 | 2,320 | 1,250 | 1,120 | 627 | 578 | 488 | 606 |
| 18 | 761 | 415 | 488 | 649 | 627 | 3,220 | 1,280 | 1,130 | 541 | 587 | 430 | 455 |
| 19 | 1,060 | 463 | 488 | 569 | 606 | 3,110 | 1,590 | 1,130 | 560 | 587 | 422 | 532 |
| 20 | 560 | 455 | 488 | 578 | 569 | 3,110 | 1,520 | 858 | 627 | 606 | 415 | 532 |
| 21 | 430 | 496 | 496 | 578 | 649 | 3,110 | 1,310 | 649 | 617 | 578 | 438 | 509 |
| 22 | 438 | 627 | 532 | 737 | 681 | 2,910 | 1,420 | 960 | 702 | 513 | 455 | 486 |
| 23 | 430 | 488 | 617 | 1,040 | 725 | 2,910 | 737 | 934 | 713 | 532 | 447 | 463 |
| 24 | 430 | 560 | 670 | 960 | 737 | 2,140 | 1,380 | 1,050 | 713 | 820 | 430 | 399 |
| 25 | 430 | 463 | 597 | 922 | 909 | 3,010 | 1,130 | 784 | 660 | 606 | 447 | 480 |
| 26 | 438 | 455 | 681 | 617 | 960 | 3,010 | 725 | 896 | 597 | 541 | 430 | 713 |
| 27 | 455 | 455 | 587 | 725 | 1,160 | 2,420 | 922 | 749 | 597 | 569 | 422 | 578 |
| 28 | 480 | 496 | 587 | 713 | 1,280 | 2,610 | 960 | 649 | 597 | 569 | 447 | 513 |
| 29 | 513 | 638 | 587 | 784 | ------ | 2,910 | 784 | 973 | 597 | 578 | 480 | 597 |
| 30 | 472 | 550 | 670 | 692 | ------ | 3,220 | 808 | 692 | 597 | 522 | 480 | 587 |
| 31 | 532 | ------ | 597 | 560 | ------ | 4,140 | ------ | 999 | ------ | 488 | 438 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,060 | 430 | 528 | 0.292 | 0.34 |
| November | 1,190 | 415 | 603 | .333 | .37 |
| December | 808 | 422 | 541 | .299 | .34 |
| January | 1,040 | 455 | 643 | .355 | .41 |
| February | 1,280 | 472 | 678 | .375 | .39 |
| March | 4,140 | 986 | 2,150 | 1.19 | 1.37 |
| April | 7,070 | 587 | 2,020 | 1.12 | 1.25 |
| May | 1,750 | 522 | 1,060 | .586 | .68 |
| June | 1,330 | 541 | 805 | .445 | .50 |
| July | 820 | 422 | 545 | .301 | .35 |
| August | 532 | 415 | 449 | .248 | .29 |
| September | 713 | 399 | 493 | .272 | .30 |
| The year | 7,070 | 399 | 876 | .484 | 6.59 |

### BUFFALO RIVER NEAR TELL, WIS.

LOCATION.—Staff gage in NW¼ sec. 16, T. 22 N., R. 12 W., one-fourth mile north of Tell School and 1 mile northeast of Tell.
DRAINAGE AREA.—398 square miles.
RECORDS AVAILABLE.—October 1932 to September 1933.
DISCHARGE.—Maximum, 1,220 second-feet Apr. 1 (gage height, 5.81 feet); minimum, 59 second-feet Aug. 16 (gage height, 1.99 feet).
REMARKS.—Records fair. Gage-height record furnished by Corps of Engineers, United States Army. Discharge estimated Apr. 2, 3. No record Dec. 1 to Mar. 23.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 161 | 179 | | 1,220 | 386 | 179 | 98 | 108 | 72 |
| 2 | 152 | 188 | | 962 | 348 | 197 | 108 | 134 | 74 |
| 3 | 152 | 179 | | 703 | 291 | 272 | 103 | 134 | 72 |
| 4 | 143 | 188 | | 445 | 253 | 291 | 98 | 125 | 78 |
| 5 | 143 | 197 | | 553 | 206 | 197 | 91 | 108 | 485 |
| 6 | 143 | 206 | | 611 | 224 | 224 | 89 | 101 | 528 |
| 7 | 161 | 224 | | 777 | 215 | 348 | 91 | 81 | 425 |
| 8 | 161 | 272 | | 485 | 272 | 234 | 89 | 74 | 215 |
| 9 | 161 | 348 | | 405 | 310 | 234 | 91 | 72 | 116 |
| 10 | 161 | 329 | | 348 | 291 | 215 | 88 | 69 | 106 |
| 11 | 170 | 272 | | 310 | 253 | 161 | 108 | 70 | 179 |
| 12 | 170 | 253 | | 291 | 253 | 143 | 88 | 74 | 179 |
| 13 | 161 | 234 | | 291 | 253 | 143 | 310 | 70 | 170 |
| 14 | 170 | 224 | | 272 | 234 | 143 | 310 | 68 | 143 |
| 15 | 179 | 161 | | 272 | 234 | 143 | 224 | 62 | 125 |
| 16 | 188 | 161 | | 253 | 224 | 125 | 108 | 59 | 161 |
| 17 | 161 | 179 | | 253 | 206 | 125 | 101 | 143 | 197 |
| 18 | 152 | 206 | | 234 | 197 | 125 | 94 | 143 | 197 |
| 19 | 170 | 253 | | 234 | 253 | 116 | 89 | 143 | 161 |
| 20 | 161 | 253 | | 234 | 234 | 125 | 88 | 98 | 116 |
| 21 | 161 | 197 | | 234 | 215 | 134 | 89 | 78 | 125 |
| 22 | 161 | 234 | | 224 | 179 | 116 | 88 | 74 | 116 |
| 23 | 188 | 234 | | 206 | 170 | 125 | 119 | 70 | 116 |
| 24 | 179 | 253 | 253 | 206 | 170 | 116 | 125 | 69 | 116 |
| 25 | 161 | 253 | | 206 | 161 | 108 | 119 | 70 | 116 |
| 26 | 170 | 234 | | 197 | 170 | 108 | 108 | 68 | 116 |
| 27 | 179 | 197 | | 188 | 170 | 101 | 94 | 64 | 116 |
| 28 | 170 | 215 | | 179 | 161 | 91 | 86 | 68 | 116 |
| 29 | 170 | 272 | | 179 | 197 | 89 | 85 | 72 | 108 |
| 30 | 170 | 253 | | 272 | 188 | 91 | 81 | 66 | 103 |
| 31 | 170 | | | | 253 | | 89 | 70 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 188 | 143 | 164 | 0.412 | 0.48 |
| November | 348 | 161 | 228 | .573 | .64 |
| April | 1,220 | 179 | 375 | .942 | 1.05 |
| May | 386 | 161 | 231 | .580 | .67 |
| June | 348 | 89 | 161 | .405 | .45 |
| July | 310 | 80 | 114 | .286 | .33 |
| August | 143 | 59 | 87.3 | .219 | .25 |
| September | 528 | 72 | 165 | .415 | .46 |

### ZUMBRO RIVER AT ZUMBRO FALLS, MINN.

LOCATION.—Chain gage near east line of sec. 36, T. 110 N., R. 14 W., at Zumbro Falls, 1,500 feet below mouth of Spring Creek.

DRAINAGE AREA.—1,120 square miles.

RECORDS AVAILABLE.—June 1909 to September 1917; April 1929 to September 1933.

DISCHARGE.—Maximum during year, 18,600 second-feet Mar. 31 (gage height, 22.90 feet); minimum, 42 second-feet Oct. 2 (gage height, 4.70 feet).

1909–17, 1929–33: Maximum, that of Mar. 31, 1933; minimum, that of Oct. 2, 1932. Average, 12 years, 423 second-feet.

Maximum stage known, 29.7 feet in April 1888.

REMARKS.—Records fair. Diurnal fluctuation caused by operation of power plant 10½ miles upstream.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 55 | 93 | 100 | 109 | 552 | 2,090 | 5,240 | 336 | 336 | 112 | 128 | 87 |
| 2 | 46 | 91 | 91 | 78 | 518 | 1,320 | 2,040 | 336 | 320 | 109 | 138 | 104 |
| 3 | 95 | 148 | 76 | 72 | 518 | 828 | 1,270 | 290 | 416 | 145 | 119 | 93 |
| 4 | 275 | 230 | 87 | 116 | 588 | 624 | 874 | 290 | 275 | 176 | 114 | 82 |
| 5 | 305 | 124 | 87 | 104 | 1,170 | 518 | 828 | 305 | 305 | 176 | 107 | 112 |
| 6 | 320 | 93 | 87 | 87 | 742 | 552 | 922 | 305 | 245 | 189 | 109 | 93 |
| 7 | 131 | 93 | 72 | 109 | 416 | 518 | 828 | 216 | 260 | 230 | 153 | 166 |
| 8 | 119 | 102 | 82 | 119 | 384 | 518 | 702 | 384 | 336 | 153 | 121 | 93 |
| 9 | 76 | 68 | 80 | 114 | 336 | 450 | 588 | 336 | 305 | 128 | 189 | 89 |
| 10 | 62 | 60 | 93 | 107 | 352 | 450 | 662 | 352 | 305 | 176 | 121 | 119 |
| 11 | 72 | 93 | 89 | 82 | 290 | 450 | 518 | 336 | 202 | 145 | 112 | 131 |
| 12 | 72 | 95 | 80 | 114 | 260 | 384 | 588 | 290 | 150 | 124 | 107 | 112 |
| 13 | 202 | 95 | 82 | 119 | 305 | 484 | 552 | 290 | 171 | 189 | 98 | 100 |
| 14 | 230 | 189 | 74 | 133 | 230 | 518 | 518 | 275 | 126 | 119 | 145 | 93 |
| 15 | 245 | 119 | 89 | 140 | 245 | 450 | 400 | 290 | 124 | 116 | 107 | 91 |
| 16 | 124 | 150 | 104 | 136 | 260 | 416 | 368 | 305 | 114 | 114 | 104 | 320 |
| 17 | 260 | 171 | 87 | 136 | 245 | 336 | 384 | 368 | 109 | 173 | 107 | 119 |
| 18 | 82 | 158 | 112 | 138 | 168 | 320 | 384 | 352 | 102 | 176 | 112 | 87 |
| 19 | 64 | 202 | 72 | 126 | 158 | 400 | 384 | 552 | 158 | 189 | 100 | 62 |
| 20 | 216 | 107 | 76 | 148 | 168 | 518 | 400 | 416 | 124 | 93 | 98 | 116 |
| 21 | 128 | 124 | 87 | 160 | 230 | 450 | 352 | 384 | 171 | 828 | 82 | 107 |
| 22 | 93 | 116 | 91 | 4,470 | 131 | 368 | 368 | 368 | 107 | 124 | 104 | 124 |
| 23 | 305 | 102 | 82 | 10,300 | 345 | 320 | 352 | 368 | 119 | 552 | 150 | 102 |
| 24 | 290 | 95 | 230 | 2,210 | 2,540 | 320 | 352 | 336 | 112 | 202 | 100 | 121 |
| 25 | 133 | 95 | 202 | 1,500 | 6,560 | 320 | 384 | 336 | 98 | 216 | 84 | 89 |
| 26 | 95 | 107 | 91 | 922 | 5,930 | 245 | 352 | 336 | 202 | 202 | 102 | 107 |
| 27 | 82 | 138 | 87 | 662 | 4,540 | 450 | 320 | 320 | 121 | 143 | 93 | 104 |
| 28 | 93 | 84 | 119 | 552 | 3,130 | 828 | 305 | 216 | 112 | 143 | 138 | 100 |
| 29 | 78 | 112 | 100 | 484 | ------- | 1,550 | 290 | 384 | 202 | 216 | 95 | 95 |
| 30 | 89 | 109 | 100 | 518 | ------- | 6,910 | 216 | 400 | 119 | 138 | 87 | 95 |
| 31 | 91 | ------- | 74 | 484 | ------- | 15,700 | ------- | 352 | ------- | 168 | 84 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 320 | 46 | 146 | 0.130 | 0.15 |
| November | 230 | 60 | 119 | .106 | .12 |
| December | 230 | 72 | 96.2 | .086 | .10 |
| January | 10,300 | 72 | 792 | .707 | .82 |
| February | 6,560 | 131 | 1,120 | 1.00 | 1.04 |
| March | 15,700 | 245 | 1,280 | 1.14 | 1.31 |
| April | 5,240 | 216 | 725 | .647 | .72 |
| May | 552 | 216 | 336 | .300 | .35 |
| June | 416 | 98 | 195 | .174 | .19 |
| July | 828 | 93 | 192 | .171 | .20 |
| August | 189 | 82 | 113 | .101 | .12 |
| September | 320 | 62 | 110 | .098 | .11 |
| The year | 15,700 | 46 | 431 | .385 | 5.23 |

### TREMPEALEAU RIVER NEAR TREMPEALEAU, WIS.

LOCATION.—Chain gage in sec. 12, T. 18 N., R. 10 W., 1½ miles southwest of West Prairie School, 5 miles northwest of Trempealeau, and 2.2 miles above junction with Mississippi River.
DRAINAGE AREA.—692 square miles.
RECORDS AVAILABLE.—October 1931 to September 1933.
DISCHARGE.—1931–33: Maximum, 3,600 second-feet Apr. 1, 1933 (gage height, 10.40 feet); minimum, 150 second-feet Sept. 1, 1933 (gage height, 2.90 feet).
REMARKS.—Records fair. Gage-height record furnished by Corps of Engineers, United States Army. No record during winter.

*Discharge, in second-feet, 1931–33*

| Day | Oct. | Nov. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1931-32 | | | | | | | | |
| 1 | 305 | 285 | 2,320 | 375 | 325 | 455 | 265 | 245 |
| 2 | 285 | 285 | 2,140 | 375 | 305 | 375 | 285 | 245 |
| 3 | 265 | 265 | 1,430 | 350 | 305 | 350 | 285 | 235 |
| 4 | 265 | 255 | 950 | 350 | 285 | 400 | 325 | 235 |
| 5 | 265 | 245 | 950 | 400 | 325 | 375 | 285 | 225 |
| 6 | 245 | 255 | 1,070 | 670 | 325 | 350 | 325 | 210 |
| 7 | 285 | 265 | 1,310 | 1,230 | 325 | 325 | 305 | 210 |
| 8 | 485 | 245 | 1,350 | 1,350 | 1,070 | 305 | 265 | 210 |
| 9 | 425 | 245 | 1,430 | 1,920 | 740 | 305 | 235 | 210 |
| 10 | 350 | 265 | 1,470 | 1,870 | 425 | 915 | 225 | 210 |
| 11 | 375 | 305 | 1,190 | 1,190 | 375 | 1,550 | 225 | 210 |
| 12 | 325 | 325 | 1,030 | 705 | 325 | 2,200 | 210 | 210 |
| 13 | 305 | 305 | 1,190 | 575 | 305 | 2,620 | 218 | 225 |
| 14 | 305 | 305 | 1,350 | 545 | 305 | 1,510 | 210 | 235 |
| 15 | 305 | | 1,390 | 485 | 305 | 705 | 210 | 225 |
| 16 | 285 | | 1,310 | 635 | 325 | 545 | 210 | 218 |
| 17 | 285 | 300 | 1,230 | 635 | 305 | 455 | 880 | 210 |
| 18 | 285 | | 1,070 | 545 | 455 | 375 | 705 | 210 |
| 19 | 265 | | 915 | 485 | 775 | 375 | 400 | 218 |
| 20 | 265 | | 775 | 455 | 425 | 325 | 325 | 305 |
| 21 | 255 | | 635 | 375 | 350 | 325 | 265 | 305 |
| 22 | 255 | | 545 | 425 | 325 | 305 | 265 | 265 |
| 23 | 245 | 290 | 455 | 400 | 305 | 305 | 245 | 255 |
| 24 | 255 | | 400 | 375 | 285 | 285 | 235 | 235 |
| 25 | 255 | | 400 | 375 | 375 | 285 | 305 | 235 |
| 26 | 285 | | 400 | 375 | 1,070 | 350 | 425 | 255 |
| 27 | 265 | | 400 | 375 | 1,390 | 375 | 400 | 245 |
| 28 | 265 | 280 | 400 | 375 | 1,470 | 325 | 325 | 225 |
| 29 | 285 | | 400 | 325 | 605 | 325 | 305 | 225 |
| 30 | 285 | | 375 | 325 | 575 | 285 | 285 | 225 |
| 31 | 285 | | | 325 | | 265 | 265 | |

*Discharge, in second-feet, of Trempealeau River near Trempealeau, Wis., 1931–33*—Continued

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1932–33 | | | | | | | | | |
| 1 | 225 | 255 | | 3,600 | 740 | 375 | 210 | 172 | 150 |
| 2 | 225 | 255 | | 2,870 | 845 | 305 | 210 | 188 | 150 |
| 3 | 245 | 255 | | 2,140 | 635 | 285 | 210 | 225 | 158 |
| 4 | 225 | 265 | | 1,470 | 515 | 775 | 202 | 195 | 195 |
| 5 | 218 | 285 | | 1,030 | 350 | 605 | 180 | 180 | 455 |
| 6 | 218 | | | 1,510 | 218 | 357 | 180 | 180 | 485 |
| 7 | 225 | | | 1,470 | 325 | 305 | 172 | 172 | 305 |
| 8 | 218 | | | 1,670 | 400 | 425 | 172 | 172 | 225 |
| 9 | 218 | | | 950 | 485 | 325 | 172 | 165 | 195 |
| 10 | 245 | | | 705 | 455 | 305 | 180 | 165 | 350 |
| 11 | 245 | | | 670 | 425 | 285 | 180 | 158 | 605 |
| 12 | 245 | | | 775 | 375 | 255 | 210 | 158 | 485 |
| 13 | 245 | | | 670 | 485 | 245 | 210 | 150 | 325 |
| 14 | 245 | | | 605 | 485 | 225 | 400 | 150 | 285 |
| 15 | 255 | | | 545 | 400 | 218 | 265 | 150 | 245 |
| 16 | 245 | | | 485 | 350 | 210 | 195 | 150 | 235 |
| 17 | 245 | | | 425 | 325 | 210 | 180 | 172 | 255 |
| 18 | 255 | | | 400 | 305 | 210 | 180 | 180 | 235 |
| 19 | 245 | | | 375 | 325 | 210 | 172 | 180 | 245 |
| 20 | 245 | | | 375 | 775 | 202 | 172 | 202 | 285 |
| 21 | 245 | | | 375 | 485 | 195 | 210 | 172 | 225 |
| 22 | 245 | | | 350 | 455 | 202 | 218 | 165 | 210 |
| 23 | 255 | | | 325 | 350 | 195 | 195 | 158 | 202 |
| 24 | 265 | | 325 | 325 | 400 | 195 | 180 | 158 | 195 |
| 25 | 265 | | | 305 | 635 | 195 | 180 | 172 | 202 |
| 26 | 255 | | | 305 | 375 | 188 | 165 | 165 | 210 |
| 27 | 265 | | | 285 | 305 | 180 | 165 | 158 | 210 |
| 28 | 265 | | | 265 | 285 | 180 | 165 | 158 | 218 |
| 29 | 265 | | | 265 | 325 | 180 | 150 | 150 | 210 |
| 30 | 245 | | | 325 | 455 | 172 | 150 | 150 | 202 |
| 31 | 245 | | | | 515 | | 150 | 150 | |

| Month | Maximum | Minimum | Mean | Month | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|
| 1931–32 | | | | 1932–33 | | | |
| October | 485 | 245 | 294 | October | 265 | 218 | 243 |
| November | 325 | 245 | 283 | November 1–5 | 285 | 255 | 263 |
| April | 2,320 | 375 | 1,010 | April | 3,600 | 265 | 862 |
| May | 1,920 | 325 | 619 | May | 845 | 218 | 445 |
| June | 1,470 | 285 | 503 | June | 775 | 172 | 274 |
| July | 2,620 | 265 | 589 | July | 400 | 158 | 194 |
| August | 880 | 210 | 313 | August | 225 | 150 | 168 |
| September | 305 | 210 | 232 | September | 605 | 150 | 265 |

### BLACK RIVER AT NEILLSVILLE, WIS.

LOCATION.—Chain gage in sec. 15, T. 24 N., R. 2 W., at highway bridge in Neillsville, 1 mile below O'Neill Creek and 1½ miles above Cunningham Creek.

DRAINAGE AREA.—774 square miles.

RECORDS AVAILABLE.—April 1905 to March 1909; December 1913 to September 1933.

DISCHARGE.—Maximum during year, 5,150 second-feet Apr. 6 (gage height, 9.6 feet); minimum, 2 second-feet Aug. 29 to Sept. 3 (gage height, 1.65 feet).

1905–9, 1913–33: Maximum, 37,100 second-feet June 6, 1905 (gage height, 22.4 feet); minimum, that of Aug. 29 to Sept. 3, 1933. Average, 19 years (1914–33), 555 second-feet.

REMARKS.—Records fair except those for periods of ice effect, Nov. 15 to Dec. 24, Dec. 28 to Jan. 24, Jan. 29 to Mar. 15, which are poor.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28 | 45 | 31 | 372 | 240 | 1,100 | 3,190 | 1,860 | 354 | 18 | 11 | 2 |
| 2 | 28 | 45 | 31 | 319 | 199 | 1,230 | 2,890 | 2,260 | 226 | 22 | 12 | 2 |
| 3 | 28 | 39 | 31 | 270 | 186 | 1,160 | 2,350 | 1,860 | 186 | 16 | 16 | 2 |
| 4 | 26 | 49 | 35 | 226 | 199 | 1,160 | 1,940 | 1,290 | 212 | 10 | 13 | 3 |
| 5 | 19 | 58 | 39 | 186 | 212 | 1,040 | 2,100 | 980 | 336 | 10 | 11 | 4 |
| 6 | 19 | 54 | 34 | 162 | 226 | 980 | 4,780 | 516 | 473 | 11 | 19 | 4 |
| 7 | 18 | 74 | 24 | 151 | 226 | 804 | 3,620 | 473 | 1,100 | 12 | 39 | 4 |
| 8 | 16 | 86 | 19 | 140 | 226 | 694 | 2,530 | 748 | 861 | 9 | 39 | 4 |
| 9 | 21 | 140 | 19 | 140 | 199 | 642 | 2,260 | 1,230 | 642 | 7 | 39 | 4 |
| 10 | 28 | 199 | 16 | 140 | 174 | 542 | 4,420 | 1,160 | 473 | 6 | 12 | 4 |
| 11 | 24 | 212 | 16 | 110 | 151 | 495 | 2,990 | 804 | 302 | 7 | 12 | 6 |
| 12 | 28 | 162 | 16 | 79 | 136 | 542 | 2,020 | 591 | 199 | 10 | 12 | 4 |
| 13 | 30 | 130 | 16 | 51 | 123 | 591 | 1,570 | 1,040 | 151 | 9 | 12 | 6 |
| 14 | 28 | 117 | 16 | 41 | 119 | 748 | 1,230 | 1,100 | 151 | 8 | 6 | 5 |
| 15 | 30 | 96 | 16 | 39 | 110 | 1,160 | 920 | 980 | 115 | 10 | 6 | 5 |
| 16 | 34 | 79 | 16 | 44 | 96 | 1,430 | 748 | 668 | 96 | 44 | 5 | 6 |
| 17 | 34 | 59 | 16 | 49 | 89 | 1,860 | 748 | 451 | 79 | 32 | 8 | 7 |
| 18 | 39 | 50 | 16 | 54 | 80 | 2,180 | 668 | 372 | 74 | 21 | 6 | 7 |
| 19 | 37 | 39 | 16 | 65 | 72 | 2,020 | 642 | 354 | 58 | 19 | 6 | 6 |
| 20 | 37 | 32 | 19 | 82 | 65 | 1,570 | 566 | 518 | 58 | 21 | 6 | 6 |
| 21 | 34 | 28 | 28 | 100 | 65 | 1,290 | 542 | 495 | 55 | 19 | 5 | 6 |
| 22 | 37 | 30 | 34 | 240 | 65 | 920 | 518 | 286 | 49 | 17 | 4 | 6 |
| 23 | 39 | 31 | 39 | 410 | 119 | 430 | 473 | 186 | 55 | 15 | 4 | 6 |
| 24 | 51 | 29 | 140 | 495 | 162 | 391 | 354 | 162 | 55 | 13 | 4 | 6 |
| 25 | 51 | 30 | 980 | 591 | 410 | 319 | 319 | 130 | 74 | 17 | 4 | 6 |
| 26 | 49 | 24 | 516 | 980 | 642 | 255 | 270 | 125 | 49 | 13 | 3 | 11 |
| 27 | 45 | 19 | 542 | 668 | 804 | 430 | 226 | 91 | 55 | 12 | 3 | 12 |
| 28 | 45 | 26 | 542 | 430 | 1,040 | 920 | 186 | 125 | 49 | 13 | 3 | 11 |
| 29 | 41 | 26 | 518 | 212 | ------ | 1,230 | 174 | 162 | 31 | 13 | 2 | 9 |
| 30 | 41 | 28 | 473 | 162 | ------ | 2,350 | 473 | 336 | 20 | 15 | 2 | 9 |
| 31 | 51 | ------ | 410 | 162 | ------ | 3,400 | ------ | 336 | ------ | 13 | 2 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 51 | 16 | 33.4 | 0.043 | 0.05 |
| November | 212 | 19 | 67.9 | .088 | .10 |
| December | 980 | 16 | 150 | .194 | .22 |
| January | 980 | 39 | 231 | .298 | .34 |
| February | 1,040 | 65 | 230 | .297 | .31 |
| March | 3,400 | 255 | 1,090 | 1.41 | 1.63 |
| April | 4,780 | 174 | 1,520 | 1.96 | 2.19 |
| May | 2,260 | 91 | 700 | .904 | 1.04 |
| June | 1,100 | 20 | 221 | .286 | .32 |
| July | 44 | 6 | 14.9 | .019 | .02 |
| August | 39 | 2 | 10.5 | .014 | .02 |
| September | 12 | 2 | 5.77 | .007 | .01 |
| The year | 4,780 | 2 | 357 | .461 | 6.25 |

### BLACK RIVER NEAR GALESVILLE, WIS.

LOCATION.—Chain gage on line between secs. 1 and 2, T. 18 N., R. 7 W., 4½ miles southeast of Galesville on State Trunk Highway 35 and 5 miles below mouth of Fleming Creek. Zero of gage is 657.3 feet above mean sea level.

DRAINAGE AREA.—2,120 square miles.

RECORDS AVAILABLE.—December 1931 to September 1933.

DISCHARGE.—Maximum during year, 10,500 second-feet Apr. 2 (gage height, 8.70 feet); minimum, 180 second-feet Dec. 20 (gage height, 2.80 feet).

1931–33: Maximum, 15,100 second-feet Apr. 9 (gage height, 11.4 feet); minimum, that of Dec. 20, 1932.

REMARKS.—Records good except those for period of ice effect, Nov. 16 to Mar. 26, which are fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 355 | 368 | 520 | 452 | 1,300 | 388 | 9,450 | 1,580 | 2,880 | 414 | 301 | 253 |
| 2 | 337 | 394 | 555 | 452 | 1,390 | 355 | 10,300 | 3,650 | 2,360 | 485 | 307 | 271 |
| 3 | 362 | 407 | 520 | 414 | 1,010 | 355 | 7,670 | 5,370 | 1,890 | 407 | 319 | 218 |
| 4 | 349 | 420 | 485 | 452 | 905 | 355 | 6,130 | 4,660 | 1,680 | 301 | 337 | 289 |
| 5 | 349 | 420 | 555 | 625 | 800 | 355 | 4,660 | 3,970 | 1,480 | 355 | 265 | 394 |
| 6 | 343 | 420 | 485 | 520 | 835 | 325 | 5,560 | 3,030 | 1,480 | 394 | 202 | 381 |
| 7 | 394 | 452 | 394 | 485 | 835 | 295 | 7,280 | 2,120 | 1,390 | 355 | 191 | 362 |
| 8 | 331 | 520 | 407 | 452 | 870 | 295 | 9,250 | 2,120 | 1,580 | 319 | 253 | 295 |
| 9 | 349 | 590 | 355 | 420 | 835 | 295 | 6,710 | 3,490 | 1,790 | 295 | 259 | 235 |
| 10 | 355 | 590 | 313 | 407 | 765 | 295 | 5,750 | 5,190 | 1,580 | 313 | 235 | 301 |
| 11 | 374 | 590 | 420 | 394 | 695 | 265 | 5,190 | 5,010 | 1,300 | 295 | 191 | 695 |
| 12 | 343 | 555 | 407 | 452 | 625 | 235 | 6,710 | 4,660 | 1,210 | 271 | 210 | 590 |
| 13 | 388 | 485 | 368 | 394 | 520 | 235 | 5,940 | 3,650 | 1,580 | 452 | 230 | 485 |
| 14 | 368 | 590 | 343 | 394 | 485 | 235 | 4,310 | 3,970 | 1,390 | 420 | 235 | 381 |
| 15 | 381 | 485 | 202 | 420 | 520 | 235 | 3,810 | 4,140 | 1,210 | 349 | 213 | 400 |
| 16 | 331 | 407 | 295 | 485 | 520 | 235 | 2,240 | 3,650 | 940 | 325 | 213 | 452 |
| 17 | 362 | 452 | 331 | 420 | 485 | 235 | 2,480 | 2,610 | 835 | 331 | 800 | 407 |
| 18 | 301 | 452 | 381 | 452 | 355 | 283 | 2,360 | 1,890 | 835 | 259 | 625 | 388 |
| 19 | 374 | 355 | 295 | 407 | 420 | 1,300 | 1,890 | 2,610 | 800 | 247 | 319 | 295 |
| 20 | 388 | 355 | 180 | 485 | 394 | 2,480 | 2,120 | 2,740 | 730 | 259 | 295 | 319 |
| 21 | 388 | 394 | 247 | 368 | 407 | 2,360 | 2,120 | 2,240 | 590 | 355 | 355 | 301 |
| 22 | 381 | 368 | 555 | 940 | 420 | 2,610 | 2,000 | 2,360 | 520 | 381 | 319 | 301 |
| 23 | 394 | 452 | 295 | 905 | 420 | 2,610 | 2,000 | 2,240 | 452 | 295 | 301 | 381 |
| 24 | 420 | 485 | 485 | 1,680 | 420 | 2,360 | 1,890 | 1,790 | 485 | 259 | 295 | 289 |
| 25 | 331 | 485 | 1,130 | 1,680 | 420 | 2,120 | 1,790 | 1,480 | 452 | 277 | 319 | 368 |
| 26 | 388 | 355 | 870 | 1,300 | 420 | 1,050 | 1,580 | 1,480 | 414 | 265 | 259 | 355 |
| 27 | 388 | 343 | 800 | 1,300 | 420 | 1,050 | 1,680 | 1,300 | 414 | 265 | 259 | 355 |
| 28 | 414 | 555 | 870 | 1,300 | 420 | 1,130 | 1,680 | 1,300 | 452 | 271 | 271 | 349 |
| 29 | 414 | 452 | 940 | 1,130 | ------ | 3,030 | 1,480 | 1,300 | 452 | 265 | 253 | 313 |
| 30 | 420 | 420 | 765 | 1,050 | ------ | 5,010 | 1,580 | 1,300 | 414 | 241 | 253 | 355 |
| 31 | 407 | ------ | 660 | 975 | ------ | 6,900 | ------ | 2,240 | ------ | 271 | 253 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 420 | 301 | 370 | 0.175 | 0.20 |
| November | 590 | 343 | 454 | .214 | .24 |
| December | 1,130 | 180 | 498 | .235 | .27 |
| January | 1,680 | 368 | 697 | .329 | .38 |
| February | 1,390 | 355 | 640 | .302 | .31 |
| March | 6,900 | 235 | 1,270 | .599 | .69 |
| April | 10,300 | 1,480 | 4,250 | 2.00 | 2.23 |
| May | 5,370 | 1,300 | 2,880 | 1.36 | 1.57 |
| June | 2,880 | 414 | 1,120 | .528 | .59 |
| July | 485 | 241 | 322 | .152 | .18 |
| August | 800 | 191 | 295 | .139 | .16 |
| September | 695 | 218 | 359 | .169 | .19 |
| The year | 10,300 | 180 | 1,090 | .514 | 7.01 |

### LA CROSSE RIVER NEAR WEST SALEM, WIS.

LOCATION.—Chain gage in sec. 32, T. 17 N., R. 6 W., at highway bridge 2 miles west of West Salem and 6 miles below mouth of Dutch Creek.

DRAINAGE AREA.—412 square miles.

RECORDS AVAILABLE.—December 1913 to September 1933.

DISCHARGE.—Maximum during year, 2,500 second-feet Mar. 31 (gage height, 9.00 feet); minimum, 88 second-feet Jan. 1.

1913–33: Maximum, 4,780 second-feet Sept. 15, 1928 (gage height, 9.8 feet); minimum, 56 second-feet Feb. 20, 1917 (gage height, 2.40 feet). Average, 19 years (1914–33), 306 second-feet.

REMARKS.—Records fair except those for periods of ice effect, Dec. 8 to Mar. 3, Mar. 21–24, which are poor. Slight diurnal fluctuation is caused by operation of power plants a few miles above station.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 216 | 238 | 238 | 124 | 575 | 450 | 1,670 | 328 | 376 | 194 | 194 | 164 |
| 2 | 147 | 227 | 238 | 205 | 654 | 475 | 950 | 328 | 293 | 227 | 184 | 164 |
| 3 | 205 | 227 | 227 | 155 | 500 | 450 | 682 | 328 | 271 | 352 | 194 | 184 |
| 4 | 194 | 227 | 227 | 238 | 194 | 352 | 500 | 282 | 282 | 260 | 205 | 205 |
| 5 | 216 | 238 | 260 | 205 | 155 | 328 | 525 | 260 | 260 | 227 | 194 | 238 |
| 6 | 205 | 164 | 238 | 194 | 139 | 293 | 740 | 260 | 238 | 194 | 194 | 352 |
| 7 | 205 | 260 | 227 | 194 | 155 | 305 | 800 | 238 | 249 | 205 | 194 | 271 |
| 8 | 227 | 260 | 249 | 164 | 155 | 293 | 500 | 293 | 194 | 205 | 205 | 216 |
| 9 | 205 | 328 | 238 | 183 | 147 | 328 | 400 | 352 | 260 | 199 | 184 | 205 |
| 10 | 238 | 328 | 216 | 173 | 147 | 282 | 525 | 305 | 238 | 183 | 173 | 238 |
| 11 | 249 | 293 | 164 | 164 | 147 | 305 | 800 | 282 | 227 | 183 | 173 | 249 |
| 12 | 260 | 271 | 155 | 155 | 147 | 328 | 682 | 282 | 216 | 183 | 164 | 425 |
| 13 | 227 | 260 | 205 | 155 | 155 | 305 | 475 | 305 | 205 | 194 | 155 | 450 |
| 14 | 227 | 260 | 194 | 131 | 139 | 293 | 376 | 305 | 205 | 183 | 155 | 352 |
| 15 | 249 | 238 | 173 | 124 | 147 | 282 | 352 | 282 | 183 | 194 | 155 | 305 |
| 16 | 194 | 282 | 173 | 155 | 139 | 271 | 352 | 271 | 183 | 194 | 164 | 282 |
| 17 | 260 | 249 | 155 | 155 | 139 | 271 | 328 | 260 | 183 | 194 | 173 | 238 |
| 18 | 238 | 260 | 147 | 173 | 155 | 271 | 305 | 271 | 183 | 183 | 328 | 238 |
| 19 | 249 | 282 | 183 | 205 | 155 | 271 | 328 | 282 | 173 | 194 | 282 | 227 |
| 20 | 249 | 155 | 183 | 216 | 205 | 227 | 293 | 400 | 183 | 173 | 205 | 238 |
| 21 | 238 | 293 | 164 | 216 | 249 | 249 | 293 | 475 | 183 | 173 | 194 | 216 |
| 22 | 227 | 260 | 194 | 400 | 282 | 249 | 293 | 376 | 173 | 194 | 205 | 216 |
| 23 | 227 | 249 | 216 | 525 | 328 | 260 | 271 | 293 | 183 | 260 | 184 | 194 |
| 24 | 249 | 194 | 238 | 525 | 352 | 328 | 293 | 400 | 194 | 260 | 184 | 173 |
| 25 | 249 | 249 | 293 | 352 | 425 | 282 | 238 | 682 | 183 | 227 | 184 | 227 |
| 26 | 238 | 305 | 328 | 305 | 425 | 282 | 183 | 500 | 183 | 205 | 184 | 238 |
| 27 | 238 | 205 | 282 | 328 | 475 | 282 | 216 | 328 | 164 | 205 | 164 | 249 |
| 28 | 238 | 249 | 305 | 400 | 500 | 328 | 216 | 282 | 183 | 205 | 173 | 238 |
| 29 | 238 | 249 | 305 | 400 | ------ | 500 | 238 | 376 | 183 | 183 | 184 | 205 |
| 30 | 194 | 238 | 271 | 328 | ------ | 1,900 | 271 | 425 | 183 | 147 | 139 | 227 |
| 31 | 249 | ------ | 271 | 305 | ------ | 2,500 | ------ | 425 | ------ | 183 | 184 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 260 | 147 | 227 | 0.551 | 0.64 |
| November | 328 | 155 | 251 | .609 | .68 |
| December | 328 | 147 | 224 | .544 | .63 |
| January | 525 | 124 | 244 | .592 | .68 |
| February | 654 | 139 | 264 | .641 | .67 |
| March | 2,500 | 227 | 437 | 1.06 | 1.22 |
| April | 1,670 | 183 | 470 | 1.14 | 1.27 |
| May | 682 | 238 | 338 | .820 | .95 |
| June | 376 | 164 | 214 | .519 | .58 |
| July | 352 | 139 | 202 | .490 | .56 |
| August | 328 | 139 | 189 | .459 | .53 |
| September | 450 | 164 | 247 | .600 | .67 |
| The year | 2,500 | 124 | 275 | .667 | 9.08 |

### ROOT RIVER NEAR HOUSTON, MINN.

LOCATION.—Chain gage in sec. 32, T. 104 N., R. 6 W., 1 mile west of Houston and 2½ miles above mouth of South Fork of Root River. Zero of gage is 671.86 feet above mean sea level (1929 adjustment).

DRAINAGE AREA.—1,280 square miles (revised 1932).

RECORDS AVAILABLE.—May 1929 to September 1933. May 1909 to September 1917, 1½ miles downstream.

DISCHARGE.—Maximum during year, 26,600 second-feet Mar. 31 (gage height, 14.07 feet); minimum, 110 second-feet Mar. 19 (gage height, 1.86 feet).

1909–17, 1929–33: Maximum, that of Mar. 31, 1933; minimum, that of Mar. 19, 1933. Average, 12 years, 625 second-feet.

REMARKS.—Records fair. Stage-discharge relation affected by ice Nov. 17 to Dec. 25 and Jan. 2 to Feb. 25. Diurnal fluctuation caused by operation of power plant at Rushford very pronounced during year.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 240 | 320 | 280 | 420 | 1,730 | 1,090 | 22,000 | 442 | 560 | 270 | 352 | 182 |
| 2 | 280 | 320 | 280 | 380 | 1,360 | 890 | 6,470 | 860 | 510 | 1,740 | 352 | 203 |
| 3 | 300 | 320 | 260 | 420 | 580 | 710 | 2,440 | 585 | 488 | 1,270 | 375 | 192 |
| 4 | 280 | 320 | 280 | 400 | 460 | 665 | 1,460 | 488 | 398 | 710 | 310 | 218 |
| 5 | 280 | 320 | 260 | 420 | 460 | 580 | 3,100 | 488 | 398 | 465 | 310 | 585 |
| 6 | 300 | 320 | 260 | 400 | 460 | 540 | 5,540 | 442 | 375 | 375 | 270 | 290 |
| 7 | 280 | 340 | 220 | 380 | 420 | 540 | 2,360 | 375 | 442 | 352 | 290 | 246 |
| 8 | 210 | 440 | 185 | 400 | 360 | 500 | 1,460 | 398 | 398 | 290 | 250 | 234 |
| 9 | 280 | 440 | 206 | 340 | 300 | 440 | 1,090 | 398 | 375 | 250 | 270 | 210 |
| 10 | 280 | 440 | 202 | 400 | 300 | 400 | 1,330 | 465 | 330 | 246 | 250 | 218 |
| 11 | 320 | 440 | 210 | 420 | 300 | 340 | 860 | 510 | 290 | 242 | 218 | 290 |
| 12 | 300 | 400 | 213 | 340 | 300 | 420 | 760 | 535 | 270 | 226 | 234 | 270 |
| 13 | 300 | 380 | 216 | 420 | 260 | 380 | 660 | 488 | 250 | 250 | 186 | 290 |
| 14 | 320 | 380 | 199 | 420 | 240 | 420 | 610 | 442 | 270 | 398 | 222 | 290 |
| 15 | 240 | 340 | 213 | 400 | 260 | 400 | 560 | 442 | 234 | 310 | 210 | 290 |
| 16 | 320 | 320 | 199 | 440 | 240 | 360 | 510 | 420 | 246 | 189 | 250 | 270 |
| 17 | 320 | 340 | 199 | 340 | 220 | 340 | 488 | 420 | 226 | 206 | 330 | 250 |
| 18 | 320 | 340 | 185 | 340 | 260 | 340 | 465 | 442 | 218 | 203 | 250 | 230 |
| 19 | 320 | 320 | 199 | 400 | 300 | 175 | 442 | 488 | 214 | 196 | 226 | 246 |
| 20 | 320 | 380 | 192 | 340 | 340 | 240 | 420 | 1,530 | 210 | 189 | 214 | 231 |
| 21 | 300 | 280 | 202 | 420 | 460 | 380 | 398 | 970 | 203 | 5,260 | 203 | 203 |
| 22 | 300 | 380 | 210 | 2,220 | 460 | 380 | 375 | 860 | 210 | 3,190 | 206 | 206 |
| 23 | 320 | 360 | 216 | 7,160 | 500 | 340 | 352 | 1,090 | 218 | 1,270 | 206 | 206 |
| 24 | 320 | 340 | 213 | 3,050 | 5,100 | 340 | 375 | 660 | 214 | 398 | 196 | 186 |
| 25 | 340 | 340 | 2,960 | 1,240 | 9,180 | 340 | 310 | 488 | 352 | 760 | 214 | 206 |
| 26 | 340 | 260 | 1,240 | 890 | 5,440 | 320 | 310 | 442 | 238 | 635 | 218 | 200 |
| 27 | 300 | 300 | 620 | 845 | 1,940 | 320 | 310 | 420 | 210 | 560 | 192 | 192 |
| 28 | 340 | 340 | 710 | 580 | 1,420 | 340 | 310 | 375 | 210 | 465 | 192 | 214 |
| 29 | 260 | 280 | 540 | 500 | ------ | 580 | 310 | 420 | 186 | 442 | 192 | 214 |
| 30 | 320 | 260 | 540 | 440 | ------ | 7,500 | 330 | 610 | 182 | 398 | 186 | 214 |
| 31 | 340 | ------ | 480 | 400 | ------ | 25,000 | ------ | 660 | ------ | 398 | 200 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 340 | 210 | 300 | 0.234 | 0.27 |
| November | 440 | 260 | 345 | .270 | .30 |
| December | 2,960 | 185 | 400 | .312 | .36 |
| January | 7,160 | 340 | 825 | .645 | .74 |
| February | 9,180 | 220 | 1,200 | .938 | .98 |
| March | 25,000 | 175 | 1,470 | 1.15 | 1.33 |
| April | 22,000 | 310 | 1,880 | 1.47 | 1.64 |
| May | 1,530 | 375 | 569 | .445 | .51 |
| June | 560 | 182 | 298 | .233 | .26 |
| July | 5,260 | 189 | 715 | .559 | .64 |
| August | 375 | 186 | 244 | .191 | .22 |
| September | 585 | 182 | 243 | .190 | .21 |
| The year | 25,000 | 175 | 704 | .550 | 7.46 |

### WISCONSIN RIVER AT WHIRLPOOL RAPIDS, NEAR RHINELANDER, WIS.

LOCATION.—Water-stage recorder in sec. 4, T. 35 N., R. 8 E., at head of Whirlpool Rapids, 1 mile below outlet of Crescent Lake and 10 miles southwest of Rhinelander.

DRAINAGE AREA.—1,160 square miles.

RECORDS AVAILABLE.—September 1915 to September 1933. December 1905 to September 1915 at a station 3 miles upstream.

DISCHARGE.—Maximum mean daily during year (estimated), 3,620 second-feet Apr. 19; minimum (estimated), 211 second-feet Aug. 27 to Sept. 2.

1915–33: Maximum, 5,410 second-feet Apr. 10, 1929 (gage height, 5.70 feet); minimum, 165 second-feet July 7, 1918 (gage height, 0.65 foot). Average, 16 years (1915–26, 1928–33), 1,050 second-feet.

REMARKS.—Records poor. Flow is regulated by 14 reservoirs and 2 power plants above station. Owing to unsatisfactory operation of gage, discharge for periods indicated by braced figures was determined by comparisor with records for Wisconsin River at Merrill.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 383 | 538 | 474 | | | 1,830 | 2,700 | | 624 | | 211 |
| 2 | | 410 | 545 | 649 | 818 | 982 | | 2,700 | 896 | | | 211 |
| 3 | | 410 | 424 | 479 | | | | 2,060 | | | 340 | 396 |
| 4 | | 592 | 475 | 747 | | | | | | | | 390 |
| 5 | 442 | 623 | 613 | 1,000 | | | | 2,700 | | 367 | | 306 |
| 6 | | 602 | 692 | 834 | | | 3,300 | | | | 350 | |
| 7 | | 448 | 737 | 548 | | | | | 1,160 | | | 390 |
| 8 | | 519 | | 645 | 594 | 1,000 | | | | | | |
| 9 | | 436 | 530 | 721 | | | | | | 485 | | |
| 10 | | 729 | | 740 | | | | 1,180 | | 491 | 316 | |
| 11 | 496 | 760 | | 778 | | | 3,170 | | 1,040 | 509 | | |
| 12 | | 760 | | | | | | | 1,150 | 509 | | |
| 13 | | 580 | | 680 | | | 1,900 | | 1,350 | 458 | | 284 |
| 14 | | 577 | 501 | | | | 1,740 | | 1,500 | 271 | | |
| 15 | | 545 | | | 686 | 956 | 1,250 | | 1,150 | 271 | | |
| 16 | | | | | | | 1,500 | 1,430 | 1,040 | | 271 | |
| 17 | | 538 | | 675 | | | 1,350 | | 1,040 | | | |
| 18 | | | | | | | 2,340 | | | | | |
| 19 | 471 | 791 | | | | | 3,620 | | | 450 | | |
| 20 | | 600 | 667 | 895 | | | 2,830 | | | | 270 | 585 |
| 21 | | 418 | | 880 | 854 | 827 | 2,900 | | 800 | 270 | | |
| 22 | | 432 | 580 | 926 | | | 3,180 | | | | 264 | |
| 23 | 494 | 387 | 722 | 880 | | | 3,250 | | | | | |
| 24 | 495 | 656 | 670 | 880 | | | 2,760 | | | | 270 | |
| 25 | 495 | 663 | 664 | | | | 2,640 | 1,120 | | 422 | | |
| 26 | 410 | 498 | 678 | 1,130 | | | 2,340 | | | | | 450 |
| 27 | 418 | 513 | 717 | | 982 | | 2,400 | | 624 | | | |
| 28 | 531 | 368 | 834 | | | 1,830 | 2,000 | | | | 211 | |
| 29 | 468 | 418 | 778 | | | | 2,000 | | | | | |
| 30 | 760 | 365 | 1,080 | 818 | | | 2,700 | 896 | | 340 | | |
| 31 | 432 | | 986 | | | | | | | 340 | | |

| Month | Mean | Per square mile | Run-off in inches | Month | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|---|---|
| October | 478 | 0.412 | 0.48 | May | 1,460 | 1.26 | 1.45 |
| November | 537 | .463 | .52 | June | 947 | .816 | .91 |
| December | 629 | .542 | .62 | July | 418 | .360 | .42 |
| January | 789 | .680 | .78 | August | 283 | .244 | .28 |
| February | 756 | .652 | .68 | September | 410 | .353 | .39 |
| March | 1,110 | .957 | 1.10 | | | | |
| April | 2,680 | 2.31 | 2.58 | The year | 872 | .752 | 10.21 |

### WISCONSIN RIVER AT MERRILL, WIS.

LOCATION.—Water-stage recorder near highway bridge at east end of Merrill, on line between secs. 12 and 13, T. 31 N., R. 6 E., half a mile below mouth of Prairie River.

DRAINAGE AREA.—2,630 square miles.

RECORDS AVAILABLE.—November 1902 to September 1933.

DISCHARGE.—Maximum during year, 11,000 second-feet May 2 (gage height, 8.89 feet); minimum, 561 second-feet Nov. 28 (gage height, 3.28 feet).

1902–33: Maximum, 45,000 second-feet July 24, 1912 (gage height, 17.5 feet); minimum, about 90 second-feet Sept. 26, 1908 (gage height, 2.45 feet). Average, 25 years (1907–11, 1912–33), 2,600 second-feet.

REMARKS.—Records good except those for periods of ice effect, Dec. 13–17, Feb. 8–13, and those estimated, Nov. 22–24, Jan. 7–30, Feb. 18 to Mar. 9, July 22–26. Flow regulated by 17 reservoirs and 8 power plants above station.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,000 | 920 | 1,000 | 1,260 | 1,520 | 2,200 | 3,790 | 6,840 | 1,440 | 1,740 | 1,390 | 960 |
| 2 | 858 | 960 | 1,000 | 1,390 | 1,850 | 2,300 | 3,790 | 7,100 | 1,700 | 1,340 | 1,560 | 1,000 |
| 3 | 1,010 | 920 | 1,040 | 1,360 | 1,570 | 2,500 | 4,010 | 6,240 | 1,700 | 1,470 | 1,270 | 1,000 |
| 4 | 1,000 | 920 | 1,000 | 1,310 | 1,530 | 2,700 | 4,440 | 4,180 | 1,700 | 1,000 | 1,190 | 807 |
| 5 | 920 | 960 | 979 | 1,360 | 1,420 | 2,900 | 6,120 | 3,610 | 1,700 | 1,640 | 1,220 | 1,000 |
| 6 | 960 | 920 | 1,040 | 1,570 | 1,280 | 2,900 | 5,570 | 2,780 | 1,980 | 2,110 | 1,210 | 1,080 |
| 7 | 1,040 | 888 | 1,000 | 1,400 | 1,360 | 2,600 | 5,020 | 2,130 | 1,520 | 1,440 | 1,280 | 1,080 |
| 8 | 1,000 | 1,000 | 1,080 | 1,400 | 1,360 | 2,400 | 4,790 | 1,760 | 1,860 | 1,530 | 1,320 | 1,040 |
| 9 | 970 | 1,070 | 1,220 | 1,400 | 1,360 | 2,200 | 5,110 | 2,130 | 2,540 | 1,040 | 1,290 | 1,040 |
| 10 | 1,050 | 1,270 | 1,220 | 1,400 | 1,360 | 2,080 | 5,660 | 1,720 | 2,160 | 1,530 | 1,300 | 1,000 |
| 11 | 1,000 | 1,400 | 967 | 1,400 | 1,360 | 1,720 | 5,730 | 1,900 | 2,460 | 1,550 | 1,440 | 886 |
| 12 | 1,000 | 1,090 | 1,120 | 1,400 | 1,410 | 1,680 | 4,910 | 1,970 | 2,250 | 1,420 | 1,320 | 1,040 |
| 13 | 960 | 920 | 1,260 | 1,400 | 1,460 | 1,790 | 4,340 | 1,860 | 1,750 | 1,530 | 1,170 | 1,000 |
| 14 | 1,040 | 1,170 | 1,360 | 1,350 | 1,550 | 2,020 | 5,300 | 1,850 | 1,910 | 1,470 | 1,030 | 1,000 |
| 15 | 1,040 | 1,000 | 1,360 | 1,350 | 1,680 | 2,030 | 5,140 | 2,300 | 2,430 | 1,240 | 1,260 | 1,000 |
| 16 | 929 | 1,050 | 1,410 | 1,350 | 1,680 | 2,490 | 5,850 | 1,780 | 2,260 | 1,000 | 1,310 | 818 |
| 17 | 1,010 | 1,000 | 1,360 | 1,350 | 1,620 | 1,960 | 7,100 | 2,260 | 2,000 | 1,520 | 1,310 | 947 |
| 18 | 1,040 | 1,040 | 1,350 | 1,350 | 1,600 | 1,550 | 6,590 | 3,110 | 1,810 | 1,370 | 1,220 | 850 |
| 19 | 1,040 | 1,000 | 1,360 | 1,350 | 1,700 | 1,620 | 6,840 | 2,310 | 1,740 | 1,410 | 1,230 | 954 |
| 20 | 1,130 | 867 | 1,360 | 1,350 | 1,800 | 1,620 | 6,590 | 2,650 | 1,910 | 1,410 | 1,120 | 1,040 |
| 21 | 1,000 | 920 | 1,310 | 1,350 | 1,850 | 1,620 | 6,340 | 2,840 | 1,480 | 1,410 | 1,130 | 1,000 |
| 22 | 1,040 | 1,000 | 1,220 | 1,350 | 1,900 | 1,570 | 5,970 | 2,520 | 1,790 | 1,500 | 1,220 | 960 |
| 23 | 894 | 1,100 | 1,310 | 1,900 | 1,950 | 1,460 | 5,970 | 2,430 | 1,950 | 1,600 | 1,290 | 912 |
| 24 | 1,000 | 1,100 | 1,310 | 2,500 | 2,000 | 1,570 | 4,430 | 2,060 | 1,920 | 1,600 | 1,080 | 1,080 |
| 25 | 1,040 | 1,120 | 1,360 | 3,000 | 2,000 | 1,500 | 3,160 | 2,000 | 1,610 | 1,600 | 1,080 | 1,040 |
| 26 | 1,040 | 960 | 1,170 | 2,600 | 2,000 | 1,520 | 3,060 | 2,000 | 2,140 | 1,700 | 1,040 | 1,040 |
| 27 | 1,040 | 834 | 1,310 | 2,200 | 2,000 | 1,740 | 2,960 | 1,790 | 1,870 | 1,850 | 850 | 1,040 |
| 28 | 1,040 | 920 | 1,360 | 1,700 | 2,100 | 1,850 | 3,010 | 1,360 | 1,660 | 1,790 | 1,080 | 1,080 |
| 29 | 1,040 | 1,000 | 1,310 | 1,650 | ------- | 2,190 | 3,060 | 1,680 | 1,680 | 1,260 | 1,070 | 1,270 |
| 30 | 900 | 1,000 | 1,360 | 1,600 | ------- | 3,020 | 4,450 | 1,430 | 1,680 | 1,220 | 1,000 | 865 |
| 31 | 755 | ------- | 1,360 | 1,570 | ------- | 4,150 | ------- | 1,320 | ------- | 1,170 | 1,000 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,130 | 755 | 993 | 0.378 | 0.44 |
| November | 1,400 | 834 | 1,010 | .384 | .43 |
| December | 1,410 | 967 | 1,220 | .464 | .53 |
| January | 3,000 | 1,260 | 1,580 | .601 | .69 |
| February | 2,100 | 1,280 | 1,650 | .627 | .65 |
| March | 4,150 | 1,460 | 2,110 | .802 | .92 |
| April | 7,100 | 2,960 | 4,970 | 1.89 | 2.11 |
| May | 7,100 | 1,320 | 2,640 | 1.00 | 1.15 |
| June | 2,540 | 1,440 | 1,890 | .719 | .80 |
| July | 2,110 | 1,000 | 1,470 | .559 | .64 |
| August | 1,560 | 850 | 1,200 | .456 | .53 |
| September | 1,270 | 807 | 994 | .378 | .42 |
| The year | 7,100 | 755 | 1,810 | .688 | 9.31 |

### WISCONSIN RIVER AT KNOWLTON, WIS.

LOCATION.—Water-stage recorder in N½ sec. 29, T. 26 N., R. 7 E., 50 feet below combination railroad and highway bridge at Knowlton and 1½ miles below mouth of Big Eau Pleine River.

DRAINAGE AREA.—4,360 square miles.

RECORDS AVAILABLE.—July 1921 to September 1933.

DISCHARGE.—Maximum during year, 19,500 second-feet Apr. 11 (gage height, 9.98 feet); minimum, 489 second-feet Oct. 10 (gage height, 1.30 feet).

1921–33: Maximum, 49,800 second-feet Apr. 10, 1922 (gage height, 19.5 feet); minimum, 317 second-feet Aug. 8, 1932 (gage height, 0.9 foot). Average, 12 years, 3,890 second-feet.

REMARKS.—Records fair except those for period of ice effect, Nov. 18–28, Dec. 15 to Mar. 31, which are poor. Flow regulated by many storage reservoirs and power plants above station.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 969 | 1,170 | 1,080 | 1,510 | 2,740 | 3,960 | 13,900 | 9,430 | 3,830 | 2,650 | 1,730 | 1,390 |
| 2 | 968 | 1,060 | 960 | 1,670 | 3,330 | 4,140 | 15,700 | 14,800 | 3,650 | 2,080 | 1,800 | 1,480 |
| 3 | 788 | 904 | 1,080 | 1,630 | 2,830 | 4,500 | 12,200 | 14,200 | 3,480 | 1,080 | 2,340 | 1,320 |
| 4 | 1,180 | 867 | 1,090 | 1,570 | 2,750 | 4,860 | 10,400 | 11,400 | 2,890 | 2,570 | 1,430 | 697 |
| 5 | 1,080 | 1,260 | 980 | 1,630 | 2,560 | 5,220 | 8,590 | 8,340 | 3,870 | 1,860 | 1,430 | 886 |
| 6 | 913 | 701 | 1,020 | 1,880 | 2,300 | 5,220 | 11,700 | 6,710 | 6,930 | 1,880 | 1,500 | 1,240 |
| 7 | 1,030 | 1,060 | 1,160 | 1,680 | 2,450 | 4,680 | 16,600 | 5,890 | 4,560 | 2,100 | 922 | 1,480 |
| 8 | 1,120 | 1,730 | 1,210 | 1,680 | 2,450 | 4,320 | 12,700 | 5,320 | 4,280 | 1,580 | 1,660 | 1,330 |
| 9 | 902 | 2,100 | 1,360 | 1,680 | 2,450 | 3,960 | 10,400 | 4,940 | 4,660 | 867 | 1,610 | 1,860 |
| 10 | 827 | 2,810 | 1,300 | 1,680 | 2,450 | 3,740 | 11,100 | 5,320 | 4,370 | 1,790 | 1,620 | 1,160 |
| 11 | 1,150 | 2,570 | 1,490 | 1,680 | 2,450 | 3,100 | 18,300 | 4,660 | 3,560 | 1,680 | 2,180 | 980 |
| 12 | 1,140 | 2,340 | 1,410 | 1,680 | 2,540 | 3,020 | 14,500 | 4,660 | 3,920 | 2,880 | 2,260 | 922 |
| 13 | 941 | 1,660 | 2,100 | 1,680 | 2,630 | 3,220 | 11,100 | 5,320 | 3,920 | 1,860 | 1,580 | 932 |
| 14 | 1,130 | 829 | 1,800 | 1,620 | 2,790 | 3,640 | 9,840 | 6,090 | 3,400 | 2,030 | 1,010 | 1,500 |
| 15 | 1,080 | 1,580 | 2,180 | 1,620 | 3,020 | 3,650 | 8,840 | 5,510 | 2,490 | 1,860 | 1,550 | 1,610 |
| 16 | 940 | 1,430 | 2,260 | 1,620 | 3,020 | 4,480 | 9,090 | 5,510 | 2,730 | 1,780 | 1,730 | 1,800 |
| 17 | 745 | 1,050 | 2,180 | 1,620 | 2,920 | 3,530 | 8,340 | 4,370 | 3,060 | 1,060 | 2,180 | 1,230 |
| 18 | 1,090 | 1,140 | 2,160 | 1,620 | 2,880 | 2,790 | 9,090 | 4,370 | 2,730 | 1,860 | 1,760 | 746 |
| 19 | 1,100 | 1,100 | 2,180 | 1,620 | 3,060 | 2,920 | 9,590 | 5,890 | 2,180 | 1,500 | 1,730 | 1,140 |
| 20 | 1,070 | 950 | 2,180 | 1,620 | 3,240 | 2,920 | 9,340 | 5,700 | 2,890 | 2,030 | 1,200 | 1,370 |
| 21 | 1,070 | 1,010 | 2,100 | 1,620 | 3,330 | 2,920 | 9,340 | 4,010 | 2,970 | 2,420 | 1,210 | 1,430 |
| 22 | 1,190 | 1,100 | 1,950 | 1,620 | 3,420 | 2,830 | 8,590 | 5,320 | 2,890 | 2,420 | 1,500 | 1,460 |
| 23 | 902 | 1,210 | 2,100 | 2,280 | 3,510 | 2,630 | 8,340 | 4,560 | 2,490 | 2,650 | 1,550 | 1,490 |
| 24 | 768 | 1,210 | 2,100 | 3,000 | 3,600 | 2,830 | 7,380 | 4,460 | 2,570 | 1,730 | 1,700 | 1,300 |
| 25 | 1,070 | 1,230 | 2,180 | 3,600 | 3,600 | 2,700 | 6,930 | 3,920 | 2,570 | 2,180 | 2,030 | 913 |
| 26 | 1,100 | 1,060 | 1,870 | 3,120 | 3,600 | 2,740 | 5,700 | 3,920 | 2,030 | 2,260 | 1,620 | 1,110 |
| 27 | 1,190 | 920 | 2,100 | 2,640 | 3,600 | 3,130 | 4,750 | 3,140 | 3,060 | 1,840 | 1,080 | 771 |
| 28 | 1,140 | 1,010 | 2,180 | 2,040 | 3,780 | 3,330 | 4,560 | 3,220 | 2,490 | 2,260 | 832 | 960 |
| 29 | 1,140 | 1,070 | 2,100 | 1,980 | ------- | 3,940 | 3,740 | 3,060 | 2,570 | 2,490 | 1,130 | 1,080 |
| 30 | 940 | 990 | 2,180 | 1,920 | ------- | 5,440 | 5,320 | 3,740 | 2,490 | 1,430 | 1,070 | 1,190 |
| 31 | 701 | ------- | 2,180 | 1,880 | ------- | 7,470 | ------- | 4,460 | ------- | 980 | 1,280 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,190 | 701 | 1,010 | 0.232 | 0.27 |
| November | 2,810 | 701 | 1,300 | .298 | .33 |
| December | 2,260 | 960 | 1,750 | .401 | .46 |
| January | 3,600 | 1,510 | 1,890 | .433 | .50 |
| February | 3,780 | 2,300 | 2,980 | .684 | .71 |
| March | 7,470 | 2,630 | 3,800 | .872 | 1.01 |
| April | 18,300 | 3,740 | 9,870 | 2.26 | 2.52 |
| May | 14,800 | 3,060 | 5,880 | 1.35 | 1.56 |
| June | 6,930 | 2,030 | 3,320 | .761 | .85 |
| July | 2,650 | 867 | 1,890 | .433 | .50 |
| August | 2,340 | 832 | 1,560 | .358 | .41 |
| September | 1,800 | 697 | 1,230 | .282 | .31 |
| The year | 18,300 | 697 | 3,030 | .695 | 9.43 |

### WISCONSIN RIVER NEAR NEKOOSA, WIS.

LOCATION.—Water-stage recorder in sec. 15, T. 21 N., R. 5 E., 1½ miles below Nekoosa. Tenmile Creek enters 4 miles below station.

DRAINAGE AREA.—5,500 square miles.

RECORDS AVAILABLE.—May 1914 to September 1933.

DISCHARGE.—Maximum during year, 22,100 second-feet Apr. 12 (gage height, 9.30 feet); minimum, 140 second-feet Nov. 6 (gage height, −0.60 foot).

1914–33: Maximum, 61,000 second-feet Apr. 12, 1922 (gage height, 16.1 feet); minimum, 140 second-feet Aug. 14–21, Nov. 6, 1932. Average, 19 years, 4,890 second-feet.

REMARKS.—Records good except those for periods of ice effect, Dec. 15–17, 19–22, Feb. 5–14, which are fair. Flow is regulated by many storage reservoirs and power plants above station.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,450 | 1,710 | 1,580 | 1,330 | 2,500 | 3,080 | 13,200 | 9,660 | 4,730 | 2,160 | 1,520 | 1,640 |
| 2 | 551 | 1,640 | 1,580 | 1,030 | 2,360 | 3,750 | 14,500 | 15,300 | 4,160 | 2,230 | 1,640 | 2,010 |
| 3 | 1,360 | 1,450 | 1,640 | 1,890 | 2,580 | 4,260 | 15,100 | 16,100 | 3,850 | 1,740 | 1,780 | 1,640 |
| 4 | 1,390 | 1,450 | 1,070 | 2,030 | 3,080 | 5,120 | 13,700 | 14,800 | 3,670 | 1,110 | 1,930 | 517 |
| 5 | 1,390 | 1,580 | 1,890 | 1,640 | 2,280 | 3,810 | 11,500 | 10,500 | 4,150 | 1,960 | 1,850 | 1,110 |
| 6 | 1,450 | 517 | 2,140 | 1,850 | 2,210 | 4,790 | 12,700 | 7,460 | 6,310 | 2,900 | 1,450 | 1,390 |
| 7 | 1,450 | 1,390 | 1,800 | 2,160 | 3,180 | 4,470 | 16,700 | 7,220 | 5,960 | 2,280 | 1,450 | 1,210 |
| 8 | 1,390 | 1,850 | 1,800 | 1,410 | 3,270 | 4,050 | 17,500 | 7,220 | 4,730 | 2,140 | 1,850 | 1,280 |
| 9 | 642 | 2,660 | 1,890 | 1,180 | 3,270 | 3,850 | 14,500 | 6,500 | 4,580 | 1,640 | 1,850 | 1,390 |
| 10 | 1,300 | 2,820 | 1,580 | 1,520 | 3,270 | 3,650 | 13,000 | 6,980 | 4,470 | 1,580 | 1,850 | 904 |
| 11 | 1,710 | 2,820 | 585 | 1,780 | 3,270 | 2,820 | 16,900 | 7,220 | 4,090 | 1,710 | 1,850 | 1,520 |
| 12 | 1,580 | 3,080 | 2,080 | 1,780 | 2,140 | 1,250 | 19,700 | 6,030 | 3,300 | 1,990 | 2,380 | 1,390 |
| 13 | 1,450 | 2,200 | 1,990 | 1,780 | 3,270 | 2,140 | 15,300 | 7,700 | 4,050 | 1,920 | 1,570 | 1,280 |
| 14 | 1,450 | 1,320 | 1,850 | 2,280 | 3,650 | 2,990 | 12,500 | 7,780 | 3,950 | 2,140 | 1,580 | 1,390 |
| 15 | 1,390 | 1,850 | 1,990 | 1,220 | 3,950 | 2,820 | 11,000 | 7,950 | 3,460 | 2,360 | 1,580 | 1,280 |
| 16 | 634 | 2,580 | 1,990 | 1,460 | 3,460 | 3,850 | 10,500 | 7,460 | 2,740 | 1,640 | 1,710 | 1,450 |
| 17 | 1,320 | 1,850 | 1,990 | 1,920 | 3,080 | 4,050 | 9,200 | 6,030 | 2,900 | 1,580 | 1,710 | 752 |
| 18 | 1,580 | 1,710 | 1,210 | 1,580 | 3,750 | 5,120 | 9,450 | 6,030 | 2,080 | 2,140 | 1,780 | 1,450 |
| 19 | 1,580 | 1,710 | 2,140 | 1,780 | 2,080 | 6,030 | 9,950 | 8,450 | 1,850 | 2,060 | 1,710 | 1,520 |
| 20 | 1,520 | 638 | 2,430 | 1,990 | 3,360 | 5,120 | 10,200 | 7,700 | 2,610 | 1,920 | 1,480 | 1,390 |
| 21 | 1,390 | 1,100 | 2,430 | 1,710 | 3,650 | 4,900 | 10,500 | 6,980 | 2,580 | 5,640 | 1,180 | 1,390 |
| 22 | 1,520 | 1,390 | 2,360 | 1,430 | 3,270 | 4,470 | 11,700 | 5,390 | 2,820 | 4,690 | 1,450 | 1,450 |
| 23 | 964 | 1,580 | 2,280 | 3,210 | 3,080 | 4,260 | 5,960 | 6,260 | 2,740 | 2,200 | 1,710 | 1,390 |
| 24 | 1,340 | 1,080 | 2,300 | 4,580 | 3,820 | 3,850 | 8,700 | 5,680 | 2,280 | 1,580 | 1,710 | 752 |
| 25 | 1,640 | 1,240 | 2,430 | 5,340 | 3,460 | 3,080 | 7,700 | 5,230 | 1,870 | 1,850 | 1,390 | 1,390 |
| 26 | 1,640 | 1,450 | 2,000 | 4,260 | 2,460 | 1,710 | 7,460 | 4,470 | 1,940 | 1,850 | 1,780 | 1,520 |
| 27 | 1,390 | 711 | 3,460 | 3,650 | 2,430 | 1,290 | 6,030 | 4,790 | 2,140 | 1,850 | 1,280 | 1,390 |
| 28 | 1,920 | 1,070 | 2,660 | 3,650 | 3,360 | 2,580 | 5,120 | 3,090 | 2,740 | 1,920 | 1,520 | 1,330 |
| 29 | 770 | 1,540 | 2,210 | 1,570 | | 3,650 | 4,900 | 3,470 | 2,660 | 1,850 | 1,580 | 1,280 |
| 30 | 694 | 1,360 | 2,140 | 1,410 | | 4,260 | 5,010 | 4,360 | 2,230 | 1,190 | 1,710 | 1,280 |
| 31 | 1,130 | | 2,600 | 2,430 | | 8,950 | | 4,730 | | 1,360 | 1,710 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,920 | 551 | 1,320 | 0.240 | 0.28 |
| November | 3,080 | 517 | 1,640 | .298 | .33 |
| December | 3,460 | 585 | 2,000 | .364 | .42 |
| January | 5,340 | 1,030 | 2,160 | .393 | .45 |
| February | 3,950 | 2,080 | 3,020 | .549 | .57 |
| March | 8,950 | 1,250 | 3,870 | .704 | .81 |
| April | 19,700 | 4,900 | 11,300 | 2.05 | 2.29 |
| May | 16,100 | 3,090 | 7,370 | 1.34 | 1.54 |
| June | 6,310 | 1,850 | 3,390 | .616 | .69 |
| July | 5,640 | 1,110 | 2,100 | .382 | .44 |
| August | 2,380 | 1,180 | 1,660 | .302 | .35 |
| September | 2,010 | 517 | 1,320 | .240 | .27 |
| The year | 19,700 | 517 | 3,430 | .624 | 8.44 |

### WISCONSIN RIVER AT MUSCODA, WIS.

LOCATION.—Water-stage recorder in sec. 1, T. 8 N., R. 1 W., at highway bridge half a mile above Eagle Mill Creek and 1 mile north of Muscoda. Zero of gage is 664.3 feet above mean sea level.

DRAINAGE AREA.—10,300 square miles.

RECORDS AVAILABLE.—December 1902 to December 1903; December 1913 to September 1933.

DISCHARGE.—Maximum during year, 30,000 second-feet Apr. 7 (gage height, 6.54 feet); minimum, 2,250 second-feet Dec. 14.

1902–3, 1913–33: Maximum, 72,100 second-feet Apr. 16, 1922 (gage height, 10.60 feet); minimum (estimated), 1,600 second-feet Dec. 20, 1921. Average, 19 years (1914–33), 8,760 second-feet.

Maximum stage known, 11.1 feet during August 1868.

REMARKS.—Records good except those for periods of ice effect Nov. 13–28, Dec. 6 to Mar. 2, Mar. 8–12, 19–25, which are fair. Flow regulated by storage reservoirs and power plants upstream.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3,500 | 3,800 | 3,700 | 3,300 | 6,920 | 7,260 | 18,200 | 12,800 | 10,300 | 5,160 | 4,300 | 3,110 |
| 2 | 3,400 | 3,700 | 3,600 | 3,700 | 7,260 | 7,800 | 12,800 | 12,400 | 10,300 | 7,980 | 4,100 | 3,200 |
| 3 | 3,200 | 3,600 | 3,200 | 3,900 | 5,300 | 6,920 | 14,200 | 11,900 | 9,900 | 8,340 | 4,200 | 3,020 |
| 4 | 3,200 | 3,600 | 3,800 | 3,900 | 6,590 | 6,590 | 15,200 | 10,700 | 9,100 | 7,260 | 4,000 | 3,200 |
| 5 | 3,300 | 3,600 | 4,200 | 3,800 | 5,930 | 6,590 | 16,700 | 11,900 | 8,340 | 7,440 | 4,000 | 3,400 |
| 6 | 3,400 | 3,400 | 4,200 | 3,500 | 4,920 | 6,420 | 22,200 | 17,700 | 9,300 | 5,930 | 3,800 | 3,600 |
| 7 | 3,300 | 3,400 | 3,300 | 3,800 | 4,920 | 6,260 | 27,900 | 23,400 | 9,100 | 5,600 | 3,600 | 3,400 |
| 8 | 2,940 | 3,600 | 2,620 | 3,400 | 3,800 | 5,760 | 24,000 | 19,300 | 9,500 | 5,450 | 4,100 | 3,300 |
| 9 | 3,110 | 4,000 | 2,620 | 3,700 | 3,600 | 5,600 | 19,800 | 19,300 | 9,900 | 5,300 | 4,200 | 3,200 |
| 10 | 3,500 | 4,500 | 2,550 | 3,700 | 4,100 | 5,450 | 24,600 | 16,200 | 10,100 | 5,030 | 3,900 | 3,400 |
| 11 | 3,500 | 4,300 | 2,550 | 3,700 | 3,800 | 5,600 | 29,300 | 13,200 | 10,300 | 5,160 | 4,000 | 3,200 |
| 12 | 3,500 | 4,200 | 2,550 | 2,850 | 3,700 | 5,760 | 25,800 | 13,200 | 9,700 | 4,600 | 3,800 | 3,800 |
| 13 | 3,500 | 4,200 | 2,480 | 3,110 | 3,600 | 6,100 | 22,800 | 14,200 | 9,900 | 4,400 | 3,800 | 3,700 |
| 14 | 3,400 | 4,000 | 2,480 | 3,200 | 3,620 | 6,590 | 23,400 | 14,200 | 9,700 | 4,200 | 3,800 | 3,700 |
| 15 | 3,500 | 3,990 | 2,480 | 3,020 | 3,700 | 6,920 | 22,200 | 13,700 | 9,300 | 4,600 | 3,700 | 3,600 |
| 16 | 3,500 | 4,100 | 2,620 | 3,500 | 3,700 | 7,090 | 23,400 | 11,900 | 9,500 | 4,200 | 3,700 | 3,700 |
| 17 | 3,600 | 4,100 | 2,620 | 3,500 | 3,800 | 6,590 | 27,900 | 14,200 | 9,500 | 4,700 | 3,500 | 3,600 |
| 18 | 3,600 | 3,800 | 2,700 | 3,300 | 4,000 | 5,300 | 22,200 | 14,700 | 8,160 | 3,900 | 3,400 | 3,400 |
| 19 | 3,800 | 3,800 | 2,780 | 3,500 | 3,700 | 6,420 | 16,700 | 14,200 | 6,100 | 4,100 | 3,500 | 3,500 |
| 20 | 3,600 | 3,500 | 3,110 | 3,500 | 4,000 | 5,300 | 15,700 | 19,300 | 8,160 | 4,000 | 3,500 | 3,500 |
| 21 | 3,500 | 3,800 | 3,300 | 3,300 | 4,000 | 7,620 | 12,800 | 21,000 | 8,160 | 3,900 | 3,200 | 3,400 |
| 22 | 3,500 | 3,900 | 3,400 | 3,600 | 3,800 | 7,980 | 11,900 | 18,200 | 5,760 | 4,400 | 3,600 | 3,400 |
| 23 | 3,600 | 3,800 | 3,400 | 4,200 | 4,500 | 7,980 | 15,700 | 14,700 | 5,300 | 4,300 | 3,500 | 3,400 |
| 24 | 3,700 | 3,500 | 3,400 | 4,300 | 5,760 | 7,260 | 15,200 | 14,200 | 4,920 | 4,500 | 3,500 | 3,400 |
| 25 | 3,800 | 3,760 | 4,300 | 4,300 | 6,260 | 8,160 | 13,200 | 12,800 | 3,800 | 5,160 | 3,400 | 3,300 |
| 26 | 3,800 | 3,900 | 4,600 | 5,030 | 6,760 | 8,160 | 13,200 | 11,100 | 4,000 | 6,100 | 3,300 | 3,600 |
| 27 | 3,700 | 3,300 | 4,500 | 4,800 | 8,530 | 7,800 | 11,500 | 12,400 | 4,300 | 5,450 | 3,300 | 3,700 |
| 28 | 3,600 | 3,800 | 4,100 | 4,920 | 8,910 | 8,720 | 11,900 | 11,900 | 4,920 | 4,500 | 3,200 | 3,400 |
| 29 | 3,700 | 4,100 | 3,900 | 5,450 | ------ | 10,700 | 11,900 | 11,900 | 5,450 | 4,160 | 3,400 | 3,500 |
| 30 | 3,700 | 3,800 | 3,800 | 6,590 | ------ | 17,200 | 12,800 | 10,700 | 5,450 | 4,000 | 3,300 | 3,300 |
| 31 | 4,000 | ------ | 3,600 | 6,100 | ------ | 21,600 | ------ | 9,700 | ------ | 3,690 | 3,300 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 4,000 | 2,940 | 3,510 | 0.341 | 0.39 |
| November | 4,500 | 3,300 | 3,830 | .372 | .42 |
| December | 4,600 | 2,480 | 3,310 | .321 | .37 |
| January | 6,590 | 2,850 | 3,950 | .383 | .44 |
| February | 8,910 | 3,600 | 4,980 | .483 | .50 |
| March | 21,600 | 5,300 | 7,730 | .750 | .86 |
| April | 29,300 | 11,500 | 18,500 | 1.80 | 2.01 |
| May | 23,400 | 9,700 | 14,400 | 1.40 | 1.61 |
| June | 10,300 | 3,800 | 7,940 | .771 | .86 |
| July | 8,340 | 3,600 | 5,080 | .493 | .57 |
| August | 4,300 | 3,200 | 3,670 | .356 | .41 |
| September | 3,800 | 3,020 | 3,430 | .333 | .37 |
| The year | 29,300 | 2,480 | 6,690 | .649 | 8.81 |

### TOMAHAWK RIVER AT TOMAHAWK, WIS.

LOCATION.—In sec. 28, T. 35 N., R. 6 E., at Jersey power plant of Wisconsin Public Service Corporation, which took over Wisconsin Valley Electric Co. July 1, 1933, 1 mile north of Tomahawk.

DRAINAGE AREA.—547 square miles.

RECORDS AVAILABLE.—January 1930 to September 1933.

DISCHARGE.—Maximum mean daily during year, 939 second-feet July 15; minimum, 135 second-feet May 7.

1930–33: Maximum mean daily, 1,220 second-feet Sept. 13, 1930; no flow several times in 1931.

REMARKS.—Records good. Records of discharge, computed from power-house records, furnished by Wisconsin Public Service Corporation. Flow completely regulated by four reservoirs operated by Wisconsin Valley Improvement Co. in the interest of power development. Part of table of monthly discharge corrected for storage in all four reservoirs upstream.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 316 | 428 | 312 | 312 | 347 | 531 | 358 | 250 | 331 | 599 | 721 | 639 |
| 2 | 210 | 381 | 285 | 312 | 309 | 594 | 371 | 219 | 323 | 591 | 734 | 807 |
| 3 | 285 | 289 | 292 | 302 | 285 | 582 | 320 | 219 | 317 | 512 | 761 | 822 |
| 4 | 298 | 315 | 338 | 308 | 264 | 574 | 241 | 219 | 315 | 512 | 696 | 804 |
| 5 | 303 | 279 | 312 | 313 | 258 | 545 | 236 | 219 | 317 | 629 | 696 | 599 |
| 6 | 288 | 273 | 312 | 313 | 385 | 531 | 243 | 168 | 317 | 616 | 722 | 573 |
| 7 | 288 | 279 | 301 | 313 | 447 | 520 | 273 | 135 | 384 | 625 | 722 | 561 |
| 8 | 304 | 335 | 303 | 313 | 361 | 492 | 177 | 152 | 331 | 732 | 719 | 555 |
| 9 | 305 | 328 | 312 | 313 | 444 | 465 | 177 | 178 | 315 | 783 | 719 | 555 |
| 10 | 396 | 273 | 312 | 346 | 426 | 483 | 177 | 178 | 368 | 773 | 714 | 555 |
| 11 | 500 | 300 | 301 | 315 | 384 | 492 | 210 | 178 | 358 | 749 | 719 | 552 |
| 12 | 297 | 391 | 288 | 315 | 398 | 453 | 219 | 213 | 337 | 762 | 705 | 533 |
| 13 | 194 | 287 | 288 | 315 | 429 | 477 | 219 | 219 | 303 | 760 | 697 | 513 |
| 14 | 330 | 299 | 302 | 315 | 469 | 465 | 219 | 217 | 275 | 909 | 697 | 491 |
| 15 | 536 | 312 | 319 | 315 | 492 | 474 | 219 | 201 | 274 | 939 | 692 | 491 |
| 16 | 301 | 285 | 319 | 315 | 476 | 444 | 219 | 193 | 331 | 742 | 645 | 521 |
| 17 | 413 | 285 | 319 | 315 | 477 | 355 | 253 | 216 | 325 | 742 | 609 | 596 |
| 18 | 557 | 285 | 319 | 299 | 498 | 295 | 214 | 228 | 314 | 716 | 606 | 584 |
| 19 | 426 | 310 | 319 | 367 | 485 | 328 | 178 | 211 | 296 | 742 | 612 | 504 |
| 20 | 273 | 303 | 319 | 408 | 484 | 328 | 178 | 216 | 312 | 725 | 592 | 491 |
| 21 | 273 | 285 | 319 | 390 | 452 | 328 | 178 | 343 | 318 | 742 | 606 | 472 |
| 22 | 300 | 285 | 302 | 315 | 447 | 287 | 178 | 408 | 318 | 742 | 609 | 457 |
| 23 | 290 | 285 | 296 | 245 | 467 | 256 | 178 | 395 | 292 | 742 | 609 | 458 |
| 24 | 269 | 285 | 371 | 281 | 439 | 244 | 200 | 416 | 287 | 781 | 609 | 465 |
| 25 | 313 | 305 | 302 | 317 | 433 | 244 | 188 | 411 | 312 | 878 | 655 | 522 |
| 26 | 292 | 312 | 267 | 289 | 435 | 266 | 178 | 404 | 300 | 887 | 834 | 513 |
| 27 | 273 | 299 | 244 | 304 | 449 | 285 | 178 | 378 | 352 | 863 | 735 | 475 |
| 28 | 289 | 285 | 312 | 285 | 440 | 254 | 178 | 365 | 442 | 804 | 634 | 435 |
| 29 | 355 | 295 | 312 | 285 | ------- | 258 | 156 | 368 | 426 | 770 | 606 | 390 |
| 30 | 289 | 312 | 312 | 312 | ------- | 278 | 170 | 372 | 533 | 724 | 601 | 395 |
| 31 | 289 | ------- | 312 | 306 | ------- | 326 | ------- | 362 | ------- | 728 | 603 | ------- |

| Month | Observed | | | Gain or loss in storage (millions of cubic feet) | Corrected for storage | | |
|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | | Mean | Per square mile | Run-off in inches |
| October | 557 | 194 | 324 | −126 | 277 | 0.506 | 0.58 |
| November | 428 | 273 | 306 | +165 | 370 | .676 | .75 |
| December | 371 | 244 | 307 | +18 | 314 | .574 | .66 |
| January | 408 | 245 | 315 | +27 | 325 | .594 | .68 |
| February | 498 | 258 | 417 | −448 | 232 | .424 | .44 |
| March | 594 | 244 | 402 | +3 | 403 | .737 | .85 |
| April | 371 | 156 | 216 | +3,380 | 1,520 | 2.78 | 3.10 |
| May | 416 | 135 | 266 | +1,380 | 781 | 1.43 | 1.65 |
| June | 533 | 274 | 334 | +767 | 630 | 1.15 | 1.28 |
| July | 939 | 512 | 736 | −1,140 | 310 | .567 | .65 |
| August | 834 | 592 | 674 | −1,290 | 192 | .351 | .40 |
| September | 822 | 396 | 545 | −568 | 326 | .596 | .66 |
| The year | 939 | 135 | 404 | +2,168 | 473 | .865 | 11.70 |

### RIB RIVER AT RIB FALLS, WIS.

LOCATION.—Chain gage in NW¼ sec. 27, T. 29 N., R. 5 E., at highway bridge in Rib Falls, 6 miles below mouth of Black Creek.
DRAINAGE AREA.—309 square miles.
RECORDS AVAILABLE.—May 1925 to September 1933.
DISCHARGE.—Maximum during year, 3,730 second-feet Apr. 6 (gage height, 6.60 feet); minimum, 8.4 second-feet Dec. 19, 21–23, and Jan. 6.
1925–33: Maximum, 12,500 second-feet Aug. 21, 1926 (gage height, 10.10 feet); minimum (estimated), 3 second-feet Jan. 23, 1930.
REMARKS.—Records good except those for period of ice effect, Nov. 15 to Mar. 29, and those for periods of extremely low water, which are fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | 30 | 14 | 27 | 67 | 382 | 2,330 | 2,830 | 382 | 20 | 14 | 14 |
| 2 | 18 | 30 | 16 | 22 | 56 | 404 | 1,800 | 1,900 | 239 | 22 | 16 | 14 |
| 3 | 18 | 30 | 18 | 18 | 58 | 258 | 1,370 | 1,080 | 174 | 20 | 20 | 14 |
| 4 | 18 | 32 | 27 | 14 | 56 | 360 | 1,010 | 548 | 202 | 20 | 20 | 14 |
| 5 | 18 | 42 | 32 | 14 | 56 | 318 | 1,080 | 474 | 278 | 18 | 18 | 14 |
| 6 | 20 | 45 | 27 | 8.4 | 52 | 174 | 3,110 | 360 | 278 | 18 | 18 | 14 |
| 7 | 20 | 45 | 27 | 11 | 51 | 181 | 2,570 | 318 | 220 | 16 | 18 | 14 |
| 8 | 20 | 49 | 20 | 11 | 52 | 154 | 1,220 | 318 | 167 | 18 | 16 | 14 |
| 9 | 22 | 360 | 14 | 11 | 52 | 147 | 1,220 | 404 | 167 | 18 | 16 | 14 |
| 10 | 27 | 239 | 14 | 13 | 56 | 141 | 3,110 | 382 | 134 | 18 | 14 | 14 |
| 11 | 24 | 128 | 14 | 13 | 52 | 83 | 1,710 | 298 | 110 | 20 | 16 | 14 |
| 12 | 24 | 74 | 11 | 20 | 54 | 78 | 1,080 | 278 | 94 | 20 | 27 | 14 |
| 13 | 27 | 35 | 11 | 20 | 60 | 360 | 950 | 498 | 74 | 20 | 24 | 14 |
| 14 | 24 | 32 | 11 | 18 | 58 | 360 | 830 | 600 | 56 | 18 | 18 | 16 |
| 15 | 27 | 18 | 11 | 16 | 56 | 404 | 770 | 450 | 49 | 18 | 16 | 16 |
| 16 | 30 | 14 | 9.8 | 16 | 65 | 574 | 770 | 339 | 45 | 18 | 20 | 16 |
| 17 | 30 | 14 | 13 | 16 | 60 | 830 | 740 | 278 | 49 | 20 | 22 | 24 |
| 18 | 27 | 16 | 9.1 | 16 | 63 | 523 | 710 | 258 | 45 | 20 | 20 | 22 |
| 19 | 27 | 14 | 8.4 | 14 | 71 | 450 | 654 | 258 | 42 | 20 | 18 | 22 |
| 20 | 27 | 14 | 9.8 | 20 | 63 | 404 | 600 | 298 | 35 | 20 | 18 | 18 |
| 21 | 27 | 13 | 8.4 | 24 | 58 | 258 | 548 | 239 | 38 | 20 | 18 | 18 |
| 22 | 27 | 11 | 8.4 | 116 | 54 | 220 | 450 | 188 | 35 | 27 | 18 | 18 |
| 23 | 27 | 11 | 8.4 | 710 | 58 | 181 | 360 | 134 | 35 | 20 | 16 | 18 |
| 24 | 30 | 11 | 9.8 | 474 | 58 | 147 | 339 | 110 | 30 | 20 | 16 | 18 |
| 25 | 30 | 13 | 278 | 318 | 67 | 181 | 298 | 104 | 27 | 18 | 18 | 18 |
| 26 | 30 | 11 | 32 | 188 | 67 | 181 | 258 | 78 | 24 | 18 | 14 | 24 |
| 27 | 30 | 11 | 38 | 167 | 96 | 188 | 220 | 78 | 24 | 18 | 16 | 27 |
| 28 | 30 | 9.8 | 38 | 128 | 96 | 318 | 188 | 65 | 24 | 18 | 14 | 24 |
| 29 | 30 | 11 | 42 | 110 | ------ | 523 | 167 | 404 | 20 | 16 | 16 | 22 |
| 30 | 27 | 13 | 32 | 88 | ------ | 710 | 627 | 950 | 20 | 14 | 14 | 20 |
| 31 | 30 | ------ | 24 | 69 | ------ | 1,900 | ------ | 654 | ------ | 13 | 14 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 30 | 18 | 25.4 | 0.082 | 0.09 |
| November | 360 | 9.8 | 45.9 | .149 | .17 |
| December | 278 | 8.4 | 27.0 | .087 | .10 |
| January | 710 | 8.4 | 87.4 | .283 | .33 |
| February | 96 | 51 | 61.1 | .198 | .21 |
| March | 1,900 | 78 | 367 | 1.19 | 1.37 |
| April | 3,110 | 167 | 1,040 | 3.37 | 3.76 |
| May | 2,830 | 65 | 489 | 1.58 | 1.82 |
| June | 382 | 20 | 104 | .337 | .38 |
| July | 27 | 13 | 18.8 | .061 | .07 |
| August | 27 | 14 | 17.5 | .057 | .07 |
| September | 27 | 14 | 17.4 | .056 | .06 |
| The year | 3,110 | 8.4 | 191 | .618 | 8.43 |

### YELLOW RIVER AT SPRAGUE, WIS.

LOCATION.—Chain gage in NW¼ sec. 11, T. 19 N., R. 3 E., 1 mile southeast of Sprague and 10 miles above Necedah Dam.

DRAINAGE AREA.—436 square miles.

RECORDS AVAILABLE.—September 1926 to September 1933.

DISCHARGE.—Maximum during year, 1,420 second-feet Apr. 3, 4 (gage height, 13.3 feet); minimum, 5.4 second-feet Sept. 9 (gage height, 2.54 feet).

1927–33: Maximum (estimated), 2,660 second-feet Sept. 17, 1928; minimum, that of Sept. 9, 1933.

REMARKS.—Records poor. Stage-discharge relation affected by ice Nov. 16 to Mar. 30. Discharge interpolated for Sundays and holidays.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 9.8 | 14 | 14 | 26 | 114 | 497 | 764 | 224 | 537 | 37 | 13 | 6.2 |
| 2 | 9.8 | 14 | 13 | 25 | 100 | 601 | 1,090 | 439 | 537 | 38 | 13 | 6.0 |
| 3 | 9.8 | 14 | 13 | 23 | 88 | 579 | 1,420 | 623 | 403 | 38 | 14 | 6.2 |
| 4 | 9.5 | 15 | 14 | 22 | 88 | 601 | 1,420 | 692 | 348 | 36 | 13 | 6.3 |
| 5 | 9.5 | 16 | 15 | 21 | 72 | 469 | 789 | 537 | 292 | 35 | 12 | 6.5 |
| 6 | 9.5 | 16 | 12 | 20 | 55 | 337 | 558 | 439 | 307 | 33 | 12 | 6.5 |
| 7 | 9.5 | 15 | 9.5 | 23 | 46 | 224 | 815 | 373 | 353 | 32 | 11 | 6.2 |
| 8 | 9.2 | 20 | 9.8 | 20 | 38 | 224 | 1,220 | 307 | 337 | 30 | 11 | 5.7 |
| 9 | 9.5 | 24 | 10 | 17 | 34 | 224 | 1,100 | 497 | 292 | 27 | 11 | 5.4 |
| 10 | 9.8 | 27 | 9.8 | 15 | 30 | 143 | 981 | 841 | 237 | 24 | 11 | 7.6 |
| 11 | 11 | 31 | 8.8 | 17 | 30 | 128 | 815 | 1,070 | 224 | 24 | 11 | 9.8 |
| 12 | 11 | 40 | 7.7 | 20 | 30 | 116 | 981 | 1,160 | 212 | 24 | 10 | 9.2 |
| 13 | 11 | 40 | 8.3 | 18 | 30 | 105 | 1,220 | 1,010 | 176 | 27 | 10 | 8.9 |
| 14 | 11 | 40 | 8.3 | 17 | 32 | 100 | 924 | 967 | 154 | 22 | 9.2 | 9.5 |
| 15 | 11 | 32 | 8.0 | 16 | 35 | 110 | 579 | 924 | 143 | 22 | 9.2 | 9.5 |
| 16 | 11 | 26 | 8.3 | 15 | 34 | 123 | 474 | 868 | 114 | 21 | 8.9 | 9.2 |
| 17 | 11 | 23 | 7.7 | 14 | 28 | 165 | 369 | 669 | 96 | 20 | 9.8 | 8.4 |
| 18 | 12 | 22 | 7.6 | 13 | 24 | 188 | 322 | 477 | 87 | 20 | 9.8 | 7.7 |
| 19 | 12 | 22 | 7.4 | 14 | 25 | 176 | 278 | 421 | 78 | 20 | 9.5 | 7.7 |
| 20 | 11 | 21 | 6.8 | 13 | 26 | 165 | 264 | 537 | 71 | 20 | 9.2 | 7.1 |
| 21 | 11 | 20 | 6.8 | 11 | 29 | 188 | 264 | 569 | 65 | 20 | 8.9 | 6.5 |
| 22 | 11 | 19 | 8.0 | 13 | 28 | 176 | 250 | 601 | 58 | 20 | 8.9 | 6.2 |
| 23 | 12 | 18 | 8.0 | 15 | 27 | 165 | 231 | 458 | 55 | 18 | 8.3 | 6.0 |
| 24 | 13 | 18 | 9.5 | 18 | 25 | 114 | 212 | 403 | 52 | 17 | 8.3 | 6.2 |
| 25 | 13 | 17 | 10 | 154 | 24 | 100 | 200 | 517 | 49 | 17 | 8.0 | 6.5 |
| 26 | 15 | 15 | 11 | 337 | 52 | 87 | 176 | 623 | 46 | 16 | 7.7 | 8.0 |
| 27 | 15 | 14 | 12 | 386 | 81 | 74 | 165 | 458 | 46 | 16 | 6.8 | 8.6 |
| 28 | 15 | 14 | 12 | 200 | 307 | 92 | 154 | 361 | 43 | 15 | 6.5 | 8.6 |
| 29 | 14 | 15 | 28 | 182 | ------- | 88 | 143 | 264 | 40 | 14 | 6.5 | 7.7 |
| 30 | 14 | 14 | 27 | 165 | ------- | 200 | 184 | 380 | 37 | 14 | 6.5 | 7.7 |
| 31 | 14 | ------- | 28 | 92 | ------- | 421 | ------- | 497 | ------- | 13 | 6.5 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 15 | 9.2 | 11.4 | 0.026 | 0.03 |
| November | 40 | 14 | 21.2 | .049 | .05 |
| December | 28 | 6.8 | 11.6 | .027 | .03 |
| January | 386 | 11 | 62.6 | .144 | .17 |
| February | 307 | 24 | 54.7 | .125 | .13 |
| March | 601 | 74 | 225 | .516 | .59 |
| April | 1,420 | 143 | 612 | 1.40 | 1.56 |
| May | 1,160 | 224 | 587 | 1.35 | 1.56 |
| June | 537 | 37 | 183 | .420 | .47 |
| July | 38 | 13 | 23.5 | .054 | .06 |
| August | 14 | 6.5 | 9.69 | .022 | .03 |
| September | 9.8 | 5.4 | 7.39 | .017 | .02 |
| The year | 1,420 | 5.4 | 151 | .346 | 4.70 |

### KICKAPOO RIVER AT GAYS MILLS, WIS.

LOCATION.—Chain gage in sec. 28, T. 10 N., R. 4 W., at highway bridge just below dam and power plant of Inter-State Power Co., in Gays Mills, 2 miles below mouth of Tainter Creek.

DRAINAGE AREA.—629 square miles.

RECORDS AVAILABLE.—December 1913 to September 1933.

DISCHARGE.—Maximum during year, 7,350 second-feet Mar. 31 (gage height, 13.96 feet); minimum, 91 second-feet Aug. 31 (gage height, 0.60 foot).

1913–33: Maximum, that of Mar. 31, 1933; minimum, 48 second-feet July 27, 1931 (gage height, 0.51 foot). Average, 19 years (1914–33), 429 second-feet.

REMARKS.—Records poor. Stage-discharge relation affected by ice Dec. 8 to Jan. 26, Feb. 5–26.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 208 | 222 | 222 | 264 | 1,350 | 390 | 6,510 | 406 | 376 | 278 | 236 | 169 |
| 2 | 195 | 222 | 208 | 250 | 1,230 | 334 | 3,700 | 438 | 334 | 3,490 | 195 | 208 |
| 3 | 195 | 195 | 208 | 250 | 1,050 | 334 | 1,290 | 422 | 334 | 2,470 | 195 | 208 |
| 4 | 195 | 222 | 320 | 250 | 454 | 306 | 622 | 376 | 320 | 712 | 208 | 236 |
| 5 | 208 | 236 | 320 | 250 | 278 | 306 | 790 | 320 | 306 | 362 | 195 | 334 |
| 6 | 208 | 222 | 250 | 236 | 264 | 264 | 1,830 | 306 | 306 | 278 | 195 | 306 |
| 7 | 208 | 236 | 222 | 222 | 250 | 264 | 2,310 | 306 | 278 | 264 | 182 | 264 |
| 8 | 208 | 292 | 169 | 222 | 250 | 264 | 1,110 | 376 | 278 | 236 | 195 | 250 |
| 9 | 208 | 486 | 236 | 222 | 250 | 250 | 1,170 | 550 | 292 | 236 | 195 | 195 |
| 10 | 222 | 390 | 169 | 208 | 250 | 250 | 3,400 | 438 | 320 | 222 | 195 | 195 |
| 11 | 236 | 306 | 195 | 195 | 250 | 278 | 4,010 | 362 | 278 | 222 | 195 | 320 |
| 12 | 236 | 278 | 195 | 182 | 250 | 250 | 3,400 | 376 | 250 | 222 | 208 | 568 |
| 13 | 222 | 264 | 208 | 182 | 250 | 264 | 1,230 | 622 | 236 | 222 | 182 | 422 |
| 14 | 222 | 264 | 208 | 182 | 250 | 292 | 550 | 502 | 236 | 236 | 182 | 320 |
| 15 | 222 | 264 | 208 | 182 | 250 | 278 | 438 | 390 | 236 | 264 | 169 | 278 |
| 16 | 208 | 195 | 208 | 195 | 250 | 264 | 422 | 348 | 222 | 222 | 169 | 278 |
| 17 | 208 | 222 | 208 | 195 | 250 | 250 | 406 | 334 | 222 | 195 | 182 | 264 |
| 18 | 208 | 236 | 222 | 208 | 250 | 264 | 362 | 438 | 222 | 208 | 195 | 250 |
| 19 | 195 | 195 | 222 | 222 | 292 | 208 | 348 | 1,780 | 222 | 195 | 222 | 250 |
| 20 | 195 | 195 | 222 | 250 | 306 | 182 | 362 | 1,780 | 208 | 195 | 195 | 236 |
| 21 | 195 | 182 | 222 | 264 | 438 | 195 | 348 | 1,470 | 208 | 195 | 195 | 182 |
| 22 | 208 | 222 | 236 | 292 | 502 | 278 | 334 | 694 | 222 | 292 | 195 | 222 |
| 23 | 222 | 236 | 250 | 422 | 730 | 264 | 292 | 470 | 208 | 406 | 182 | 208 |
| 24 | 222 | 195 | 306 | 454 | 950 | 264 | 306 | 422 | 250 | 278 | 208 | 208 |
| 25 | 236 | 222 | 390 | 320 | 1,230 | 264 | 292 | 376 | 222 | 236 | 222 | 222 |
| 26 | 222 | 182 | 454 | 292 | 1,080 | 250 | 292 | 348 | 222 | 208 | 182 | 222 |
| 27 | 208 | 195 | 406 | 278 | 790 | 250 | 278 | 334 | 222 | 208 | 182 | 250 |
| 28 | 208 | 222 | 362 | 222 | 518 | 362 | 264 | 334 | 222 | 195 | 150 | 278 |
| 29 | 208 | 222 | 334 | 264 | ------ | 1,290 | 250 | 422 | 222 | 195 | 182 | 250 |
| 30 | 182 | 195 | 306 | 250 | ------ | 4,340 | 320 | 676 | 222 | 182 | 195 | 250 |
| 31 | 208 | ------ | 278 | 250 | ------ | 6,990 | ------ | 486 | ------ | 182 | 130 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 236 | 182 | 211 | 0.335 | 0.39 |
| November | 486 | 182 | 240 | .382 | .43 |
| December | 454 | 169 | 257 | .409 | .47 |
| January | 454 | 182 | 248 | .394 | .45 |
| February | 1,350 | 250 | 516 | .820 | .85 |
| March | 6,990 | 182 | 653 | 1.04 | 1.20 |
| April | 6,510 | 250 | 1,240 | 1.97 | 2.20 |
| May | 1,780 | 306 | 545 | .866 | 1.00 |
| June | 376 | 208 | 257 | .409 | .46 |
| July | 3,400 | 182 | 426 | .677 | .78 |
| August | 236 | 130 | 191 | .304 | .35 |
| September | 568 | 169 | 261 | .415 | .46 |
| The year | 6,990 | 130 | 419 | .666 | 9.04 |

65633—35——10

### TURKEY RIVER AT GARBER, IOWA

LOCATION.—Chain gage in sec. 36, T. 92 N., R. 4 W., at highway bridge at Garber, 2,000 feet below mouth of Elk Creek.

DRAINAGE AREA.—1,530 square miles.

RECORDS AVAILABLE.—August 1913 to November 1916; May 1919 to September 1927; November 1932 to September 1933.

DISCHARGE.—Maximum during period, 20,600 second-feet Mar. 30 (gage height, 22.54 feet); minimum, 101 second-feet Sept. 21 (gage height, 3.71 feet).

1913–16, 1919–27, 1932–33: Maximum, about 26,600 second-feet Feb. 23, 1922 (gage height, 28.06 feet); minimum, 88 second-feet Sept. 5–7, 1922.

REMARKS.—Records fair Nov. 29 to July 4; good July 4 to Sept. 30. Slight diurnal fluctuation caused by operation of hydroelectric plant at Elkader.

*Discharge, in second-feet, 1932–33*

| Day | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 231 | 318 | 3,320 | 566 | 17,300 | 469 | 724 | 670 | 175 | 116 |
| 2 | | 218 | 446 | 1,840 | 542 | 5,230 | 517 | 566 | 17,000 | 189 | 110 |
| 3 | | 247 | 517 | 895 | 446 | 2,640 | 493 | 517 | 3,920 | 198 | 114 |
| 4 | | 592 | 517 | | 423 | 1,920 | 446 | 469 | 3,020 | 175 | 116 |
| 5 | | 337 | 517 | | 423 | 1,520 | 401 | 446 | 1,680 | 155 | 138 |
| 6 | | 280 | 566 | | 423 | 1,840 | 379 | 423 | 802 | 186 | 124 |
| 7 | | 218 | 469 | | 446 | 1,760 | 379 | 401 | 648 | 160 | 114 |
| 8 | | 193 | 446 | | 379 | 1,520 | 423 | 379 | 589 | 164 | 119 |
| 9 | | | 469 | | 358 | 1,160 | 493 | 358 | 504 | 170 | 119 |
| 10 | | | 446 | 370 | | 6,110 | 493 | 318 | 477 | 170 | 116 |
| 11 | | | 337 | | 280 | 1,680 | 469 | 318 | 399 | 167 | 116 |
| 12 | | | | | | 1,370 | 1,300 | 280 | 399 | 170 | 115 |
| 13 | | | | | | 1,090 | 1,160 | 247 | 350 | 146 | 128 |
| 14 | | | | | 337 | 895 | 779 | 247 | 283 | 135 | 135 |
| 15 | | 160 | 300 | | 337 | 836 | 779 | 247 | 450 | 135 | 151 |
| 16 | | | | | 337 | 836 | 779 | 247 | 424 | 135 | 167 |
| 17 | | | | 469 | 263 | 724 | 644 | 218 | 399 | 131 | 164 |
| 18 | | | 337 | 517 | 298 | 724 | 566 | 218 | 283 | 133 | 160 |
| 19 | | | 670 | 724 | 318 | 644 | 3,820 | 204 | 283 | 121 | 142 |
| 20 | | | 493 | 1,440 | 263 | 670 | 7,190 | 218 | 262 | 138 | 109 |
| 21 | | | 469 | 1,840 | 298 | 617 | 2,550 | 204 | 283 | 128 | 107 |
| 22 | | | 2,640 | 2,460 | 247 | 592 | 1,600 | 204 | 504 | 121 | 116 |
| 23 | | 318 | 1,840 | 2,190 | 263 | 566 | 1,230 | 204 | 374 | 133 | 116 |
| 24 | | 8,270 | 1,440 | 1,600 | 337 | 592 | 1,160 | 379 | 208 | 124 | 111 |
| 25 | | 9,470 | 1,160 | 1,160 | 280 | 566 | 779 | 231 | 224 | 138 | 114 |
| 26 | | 2,730 | 1,160 | 1,020 | 247 | 493 | 670 | 231 | 205 | 140 | 283 |
| 27 | | 1,520 | 1,090 | 836 | 263 | 517 | 670 | 193 | 186 | 116 | 151 |
| 28 | | 1,230 | 1,020 | 779 | 3,020 | 493 | 670 | 204 | 205 | 116 | 146 |
| 29 | 247 | 836 | 401 | | 10,400 | 469 | 895 | 247 | 205 | 116 | 142 |
| 30 | 280 | 493 | 379 | | 19,800 | 469 | 1,600 | 218 | 205 | 115 | 142 |
| 31 | | 231 | 401 | | 14,600 | | 1,090 | | 164 | 107 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| December | 9,470 | | 957 | 0.625 | 0.72 |
| January | 2,640 | | 656 | .429 | .49 |
| February | 3,320 | | 925 | .605 | .63 |
| March | 19,800 | 247 | 1,840 | 1.20 | 1.38 |
| April | 17,300 | 469 | 1,860 | 1.22 | 1.36 |
| May | 7,190 | 379 | 1,130 | .739 | .85 |
| June | 724 | 193 | 312 | .204 | .23 |
| July | 17,000 | 164 | 1,150 | .752 | .87 |
| August | 198 | 107 | 145 | .095 | .11 |
| September | 283 | 107 | 133 | .087 | .10 |

**MAQUOKETA RIVER BELOW NORTH FORK OF MAQUOKETA RIVER, NEAR MAQUOKETA, IOWA**

LOCATION.—Water-stage recorder in SW¼NE¼ sec. 17, T. 84 N., R. 3 E., at Bridgeport Bridge, 1,200 feet above mouth of Mill Creek and 3 miles northeast of Maquoketa.

DRAINAGE AREA.—1,600 square miles.

RECORDS AVAILABLE.—September 1913 to September 1933.

DISCHARGE.—Maximum during year ending Sept. 30, 1933, 9,130 second-feet May 20 (gage height, 13.5 feet); minimum, 106 second-feet Sept. 8 (gage height, 1.15 feet).

1913–33: Maximum, 21,800 second-feet Mar. 14, 1929; maximum gage height, 22.0 feet Mar. 27, 1916; minimum 39 second-feet Sept. 15, 1931 (gage height, 0.81 foot).

REMARKS.—Records fair except those estimated, which are poor. Gage-height record for 1931–32 furnished by Iowa Electric Co.; results of several discharge measurements furnished by Corps of Engineers, United States Army. Diurnal fluctuations at low water due to operation of power plant above station.

*Discharge, in second-feet, 1930–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1930-31 | | | | | | | | | | | | |
| 1 | 292 | 299 | 306 | [a] 230 | 1,060 | 306 | 207 | 367 | 261 | 207 | 154 | 436 |
| 2 | 271 | 285 | 248 | | 668 | 310 | 177 | 383 | 254 | 195 | 198 | 360 |
| 3 | 306 | 313 | 251 | | 668 | 310 | 207 | 360 | 254 | 177 | 177 | 306 |
| 4 | 295 | 288 | 258 | | 580 | 295 | 207 | 349 | 271 | 183 | 168 | 324 |
| 5 | 254 | 271 | 644 | | 558 | 299 | 216 | 324 | 264 | 207 | 162 | 346 |
| 6 | 288 | 271 | 440 | [a] 280 | 537 | 285 | 548 | 306 | 324 | 192 | 162 | 306 |
| 7 | 472 | 271 | 364 | | 488 | 288 | 716 | 313 | 331 | 195 | 171 | 278 |
| 8 | 460 | 274 | 390 | | 444 | 258 | 716 | 313 | 306 | 192 | 162 | 254 |
| 9 | 440 | 271 | 357 | | 417 | 288 | 692 | 349 | 285 | 165 | 145 | 195 |
| 10 | 398 | 271 | 364 | | 387 | 306 | 496 | 331 | 288 | 165 | 126 | 222 |
| 11 | 353 | 268 | 338 | 288 | 360 | 306 | 456 | 379 | 288 | 174 | 126 | 222 |
| 12 | 288 | 335 | 349 | 288 | 436 | 317 | 444 | 375 | 288 | 243 | 137 | 216 |
| 13 | 292 | 232 | 317 | | 421 | 387 | 413 | 349 | 299 | 301 | 128 | 207 |
| 14 | 302 | 238 | 387 | [a] 280 | 288 | 324 | 379 | 335 | 274 | 623 | 126 | 177 |
| 15 | 241 | 302 | 281 | | 292 | 281 | 379 | 328 | 258 | 353 | 137 | 134 |
| 16 | 422 | 342 | 238 | | 394 | 268 | 349 | 324 | 254 | 274 | 126 | 157 |
| 17 | 456 | 371 | [a] 230 | | 496 | 271 | 540 | 317 | 248 | 243 | 137 | 157 |
| 18 | 452 | 331 | | [a] 300 | 364 | 258 | 436 | 338 | 245 | 213 | 128 | 148 |
| 19 | 342 | 367 | | | 335 | 271 | 371 | 456 | 248 | 207 | 145 | 679 |
| 20 | 324 | 375 | | | 324 | 299 | 504 | 317 | 245 | 457 | 142 | 886 |
| 21 | 292 | 349 | [a] 260 | 1,000 | 317 | 271 | 476 | 288 | 238 | 303 | 131 | 1,370 |
| 22 | 288 | 346 | | 1,700 | 317 | 271 | 537 | 278 | 271 | 210 | 112 | 2,230 |
| 23 | 288 | 357 | | | 310 | 271 | 623 | 271 | 285 | 183 | 154 | 1,290 |
| 24 | 288 | 379 | | | 302 | 281 | 558 | 306 | 254 | 180 | 115 | 861 |
| 25 | 295 | 302 | | [a] 420 | 310 | 274 | 525 | 302 | 248 | 183 | 134 | 4,080 |
| 26 | 271 | 292 | [a] 270 | | 310 | 271 | 468 | 271 | 232 | 177 | 134 | 3,560 |
| 27 | 306 | 278 | | 558 | 306 | 292 | 444 | 281 | 219 | 162 | 262 | [a] 3,000 |
| 28 | 295 | [a] 270 | | 740 | 310 | 278 | 390 | 261 | 216 | 162 | 3,300 | [a] 2,400 |
| 29 | 268 | 500 | | 1,010 | ------- | 292 | 364 | 264 | 210 | 154 | 1,630 | [a] 1,800 |
| 30 | 271 | 306 | [a] 250 | 1,060 | ------- | 295 | 349 | 271 | 201 | 148 | 861 | [a] 1,200 |
| 31 | 278 | ------- | | 1,420 | ------- | 306 | ------- | 278 | ------- | 154 | 516 | ------ |

[a] Estimated.

*Discharge, in second-feet, of Maquoketa River below North Fork of Maquoketa River, near Maquoketa, Iowa, 1930–33*—Continued

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1931–32 | | | | | | | | | | | | |
| 1 | 646 | 425 | 1,190 | 1,060 | | 692 | 1,240 | 764 | 417 | 602 | 317 | 496 |
| 2 | 508 | 425 | 1,210 | 1,060 | e790 | 1,310 | 1,160 | 740 | 602 | 496 | 1,740 | 425 |
| 3 | 448 | 421 | 1,160 | 1,060 | | 1,840 | 1,060 | 692 | 1,440 | 500 | 1,630 | 383 |
| 4 | 429 | 421 | 1,190 | 812 | | 1,470 | 1,010 | 692 | 812 | 1,370 | 788 | 360 |
| 5 | 390 | 417 | 1,010 | 812 | | e800 | 984 | 740 | 836 | 692 | 398 | 360 |
| 6 | 429 | 476 | 1,010 | 1,110 | e730 | e700 | 959 | 764 | 512 | 440 | 390 | 324 |
| 7 | 390 | 417 | 1,030 | 1,010 | 716 | e650 | 1,110 | 764 | 496 | 1,500 | 360 | 324 |
| 8 | 335 | 413 | 861 | 861 | 740 | | 1,950 | 788 | 537 | 1,030 | 364 | 313 |
| 9 | 299 | 421 | 910 | 740 | 740 | e580 | 2,010 | 764 | 602 | 668 | e352 | 302 |
| 10 | 1,290 | 394 | 1,030 | 646 | 716 | | 1,680 | 788 | 558 | 718 | e340 | 310 |
| 11 | 7,820 | 472 | 1,030 | 812 | 861 | e620 | 1,420 | 812 | 508 | 788 | e328 | 306 |
| 12 | 2,290 | 4,400 | 1,310 | 984 | 1,080 | | 1,290 | 764 | 476 | 580 | 317 | 561 |
| 13 | 1,900 | 2,930 | 1,520 | 1,260 | 1,060 | e680 | 1,160 | 740 | 492 | 436 | 288 | 2,370 |
| 14 | 1,470 | 1,950 | 1,470 | 1,580 | 886 | 668 | 1,060 | 692 | 444 | 421 | 285 | 1,190 |
| 15 | 1,130 | 1,790 | 1,310 | 1,950 | 861 | 602 | 959 | 623 | 417 | 402 | 288 | 602 |
| 16 | 959 | 1,630 | 1,160 | 1,680 | 836 | 623 | 886 | 646 | 417 | 379 | 324 | 417 |
| 17 | 788 | 2,470 | 984 | 1,580 | 1,380 | 764 | 836 | 516 | 406 | 357 | 959 | 436 |
| 18 | 602 | 2,690 | 1,010 | 1,420 | 1,680 | 861 | 812 | 580 | 2,820 | 360 | 1,030 | 433 |
| 19 | 602 | 2,010 | 1,010 | 1,210 | 1,580 | 788 | 764 | 472 | e1,600 | 360 | 537 | 433 |
| 20 | 580 | 1,790 | 959 | 1,160 | 1,260 | 716 | 740 | 464 | e900 | 317 | 436 | 398 |
| 21 | 525 | 1,790 | 959 | 1,080 | 1,130 | 646 | 740 | 448 | e850 | 353 | 402 | 468 |
| 22 | 525 | 1,580 | 984 | 1,060 | 984 | 537 | 788 | 448 | e800 | 357 | 349 | 508 |
| 23 | 861 | 4,690 | 984 | 1,060 | 716 | 668 | 788 | 456 | 788 | 295 | 346 | 448 |
| 24 | 1,030 | 5,520 | 1,010 | 959 | 692 | 580 | 740 | 413 | 812 | 306 | 320 | 367 |
| 25 | 537 | 3,760 | 959 | 788 | 692 | 623 | 788 | 421 | 740 | 342 | 328 | 342 |
| 26 | 472 | 2,630 | 959 | 934 | 692 | 7,040 | 788 | 3,560 | 716 | 342 | 342 | 310 |
| 27 | 602 | 1,840 | 1,060 | 1,030 | 668 | 6,770 | 740 | e1,400 | 1,310 | 288 | 324 | 317 |
| 28 | 480 | 1,520 | 959 | 910 | 646 | 3,230 | 740 | e700 | 1,420 | 306 | 2,170 | 271 |
| 29 | 472 | 1,370 | 886 | | 716 | 2,180 | 740 | e600 | 984 | 278 | 1,790 | 264 |
| 30 | 452 | 1,290 | 910 | e830 | ------ | 1,790 | 764 | e500 | 668 | 288 | 934 | 271 |
| 31 | 440 | ------ | 934 | | ------ | 1,420 | ------ | 488 | ------ | 299 | 623 | ------ |
| 1932–33 | | | | | | | | | | | | |
| 1 | 271 | 375 | 349 | 496 | 496 | 440 | 4,730 | 646 | 1,310 | 580 | 409 | 232 |
| 2 | 271 | 331 | 360 | 357 | 379 | 413 | 2,300 | 1,010 | 1,210 | 6,130 | 360 | 245 |
| 3 | 349 | 295 | 364 | 429 | 353 | 394 | 1,520 | 836 | 1,080 | 3,620 | 716 | 251 |
| 4 | 367 | 335 | 364 | 433 | 317 | 349 | 1,260 | 623 | 959 | 1,470 | 448 | 238 |
| 5 | 278 | 295 | 417 | 452 | | 346 | 1,060 | 646 | 1,010 | 1,160 | 421 | 264 |
| 6 | 281 | 299 | 383 | 398 | | 313 | 1,030 | 740 | 836 | 836 | 429 | 324 |
| 7 | 278 | 306 | 342 | 444 | e320 | 292 | 1,130 | 646 | 764 | 623 | 872 | 245 |
| 8 | 292 | 379 | | 383 | | 292 | 1,110 | 740 | 764 | e662 | 558 | 222 |
| 9 | 310 | 364 | | 468 | | 338 | 1,030 | 788 | 692 | e701 | 357 | 264 |
| 10 | 488 | 371 | e340 | 460 | | 328 | 984 | 740 | 623 | 740 | 402 | 264 |
| 11 | 317 | 349 | | 444 | | 328 | 1,420 | 668 | 623 | 580 | 306 | 222 |
| 12 | 299 | 317 | | 436 | | 371 | 1,370 | 788 | 602 | 496 | 313 | 258 |
| 13 | 306 | 317 | | 398 | | 387 | 1,240 | 1,310 | 580 | 464 | 367 | 261 |
| 14 | 295 | 353 | | 364 | | 342 | 1,110 | 1,470 | 488 | 496 | 285 | 383 |
| 15 | 306 | 349 | e320 | 364 | e300 | 299 | 959 | 1,240 | 529 | 444 | 285 | 324 |
| 16 | 306 | 292 | | 387 | | 302 | 788 | 3,710 | 537 | 402 | 349 | 349 |
| 17 | 292 | 254 | | 448 | | 349 | 836 | 2,020 | 476 | 387 | 285 | 302 |
| 18 | 306 | 292 | | 448 | | 402 | 788 | 1,630 | 460 | 402 | 320 | 346 |
| 19 | 306 | 335 | e300 | 861 | e320 | 537 | 716 | 2,730 | 464 | 402 | 226 | 342 |
| 20 | 292 | 278 | | 646 | e340 | 413 | 716 | 7,580 | 464 | 387 | 302 | 258 |
| 21 | 292 | 261 | | 452 | e400 | 335 | 692 | 7,290 | 421 | 398 | 235 | 245 |
| 22 | 313 | 264 | e540 | 580 | e540 | 394 | 602 | 4,420 | 436 | 417 | 342 | 241 |
| 23 | 357 | 313 | 2,060 | 646 | 1,370 | 425 | 580 | 2,630 | 436 | 480 | 278 | 251 |
| 24 | 360 | 320 | 5,450 | 496 | 740 | 508 | 580 | 2,120 | 602 | 425 | 232 | 248 |
| 25 | 367 | 306 | 5,600 | 512 | 740 | 646 | 533 | 1,740 | 496 | 387 | 264 | 264 |
| 26 | 328 | 306 | 2,180 | 480 | 692 | 646 | 504 | 1,580 | 496 | 402 | 285 | 313 |
| 27 | 353 | 278 | 1,680 | 484 | 646 | 1,260 | 488 | 1,420 | 456 | 364 | 313 | 299 |
| 28 | 346 | 278 | 1,210 | 444 | 512 | 1,240 | 580 | 1,240 | 433 | 417 | 278 | 342 |
| 29 | 335 | 328 | 934 | 360 | ------ | 1,110 | 508 | 1,630 | 580 | 324 | 292 | 346 |
| 30 | 310 | 324 | 740 | 353 | ------ | 2,290 | 602 | 1,310 | 580 | 328 | 295 | 295 |
| 31 | 349 | ------ | 602 | 353 | ------ | 4,630 | ------ | 1,210 | ------ | 371 | 310 | ------ |

e Estimated.

*Discharge, in second-feet, of Maquoketa River below North Fork of Maquoketa River near Maquoketa, Iowa, 1930–33*—Continued

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| 1930–31 | | | | | |
| October | 472 | 241 | 325 | 0.203 | 0.23 |
| November | 500 | 232 | 312 | .195 | .22 |
| December | 644 | ---------- | 303 | .189 | .22 |
| January | 1,420 | ---------- | 477 | .298 | .34 |
| February | 1,060 | 288 | 428 | .268 | .28 |
| March | 387 | 258 | 291 | .182 | .21 |
| April | 716 | 177 | 440 | .275 | .31 |
| May | 456 | 261 | 322 | .201 | .23 |
| June | 331 | 201 | 262 | .164 | .18 |
| July | 623 | 148 | 226 | .141 | .16 |
| August | 3,300 | 112 | 332 | .208 | .24 |
| September | 4,080 | 134 | 927 | .579 | .65 |
| The year | 4,080 | 112 | 386 | .241 | 3.27 |
| 1931–32 | | | | | |
| October | 7,820 | 299 | 958 | .599 | .69 |
| November | 5,520 | 394 | 1,740 | 1.09 | 1.22 |
| December | 1,520 | 861 | 1,060 | .663 | .76 |
| January | 1,950 | 646 | 1,070 | .669 | .77 |
| February | 1,680 | 646 | 895 | .559 | .60 |
| March | 7,040 | 537 | 1,340 | .838 | .97 |
| April | 2,010 | 740 | 1,020 | .638 | .71 |
| May | 3,560 | 413 | 750 | .469 | .54 |
| June | 2,820 | 406 | 813 | .508 | .57 |
| July | 1,500 | 278 | 512 | .320 | .37 |
| August | 2,170 | 285 | 626 | .391 | .45 |
| September | 2,370 | 264 | 477 | .298 | .33 |
| The year | 7,820 | 264 | 939 | .587 | 7.98 |
| 1932–33 | | | | | |
| October | 488 | 271 | 320 | .200 | .23 |
| November | 379 | 254 | 315 | .197 | .22 |
| December | 5,600 | ---------- | 905 | .566 | .65 |
| January | 861 | 353 | 460 | .288 | .33 |
| February | 1,370 | ---------- | 434 | .271 | .28 |
| March | 4,630 | 292 | 668 | .418 | .48 |
| April | 4,730 | 488 | 1,060 | .662 | .74 |
| May | 7,580 | 623 | 1,840 | 1.15 | 1.33 |
| June | 1,310 | 421 | 647 | .404 | .45 |
| July | 6,130 | 324 | 816 | .510 | .59 |
| August | 872 | 226 | 359 | .224 | .26 |
| September | 383 | 222 | 281 | .176 | .20 |
| The year | 7,580 | 222 | 679 | .424 | 5.76 |

### ROCK RIVER AT WATERTOWN, WIS.

LOCATION.—Water-stage recorder installed Sept. 26, 1933, on left bank of river 700 feet below Milwaukee Street highway bridge, Watertown, and 1⅛ miles below mouth of Silver Creek. Prior to that date chain gage near center of sec. 4, T. 8 N., R. 15 E., at highway bridge on Milwaukee Street. Datum of water-stage recorder not same as of chain gage.

DRAINAGE AREA.—791 square miles.

RECORDS AVAILABLE.—June 1931 to September 1933.

DISCHARGE.—Maximum during year, 3,250 second-feet May 20 (gage height, 3.81 feet); minimum, 2 second-feet Oct. 7 (gage height, 0.54 foot).

1931–33: Maximum, that of May 20, 1933, minimum, 1 second-foot at times during 1931 and 1932.

REMARKS.—Records fair except those for low stages, which are poor. At low stages the accuracy of mean daily gage height is seriously impaired by fluctuation of stage owing to operation of power plant just above station.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 51 | 24 | 279 | 207 | 288 | 2,040 | 1,120 | 1,440 | 200 | 185 | 107 |
| 2 | 3 | 45 | 53 | 214 | 221 | 261 | 1,810 | 1,310 | 1,310 | 548 | 126 | 221 |
| 3 | 4 | 45 | 48 | 154 | 270 | 236 | 1,690 | 1,380 | 1,240 | 644 | 243 | 214 |
| 4 | 4 | 41 | 32 | 221 | 252 | 207 | 1,690 | 1,240 | 1,180 | 680 | 252 | 200 |
| 5 | 6 | 53 | 45 | 126 | 154 | 214 | 1,690 | 1,310 | 1,120 | 620 | 261 | 306 |
| 6 | 4 | 19 | 56 | 160 | 149 | 143 | 1,690 | 1,310 | 740 | 536 | 160 | 111 |
| 7 | 3 | 45 | 59 | 178 | 143 | 143 | 1,570 | 1,310 | 862 | 408 | 98 | 111 |
| 8 | 4 | 48 | 65 | 126 | 126 | 185 | 1,690 | 1,570 | 740 | 386 | 90 | 111 |
| 9 | 11 | 67 | 56 | 165 | 73 | 70 | 1,690 | 1,690 | 644 | 344 | 149 | 137 |
| 10 | 17 | 73 | 67 | 165 | 81 | 178 | 1,810 | 1,570 | 560 | 236 | 200 | 160 |
| 11 | 20 | 107 | 41 | 132 | 94 | 185 | 1,810 | 1,500 | 476 | 178 | 261 | 279 |
| 12 | 20 | 121 | 40 | 111 | 115 | 185 | 1,690 | 1,440 | 397 | 178 | 229 | 149 |
| 13 | 21 | 132 | 73 | 149 | 137 | 165 | 1,690 | 1,440 | 397 | 137 | 154 | 333 |
| 14 | 20 | 70 | 48 | 165 | 137 | 143 | 1,810 | 1,440 | 376 | 214 | 111 | 160 |
| 15 | 22 | 70 | 41 | 98 | 137 | 132 | 1,920 | 1,380 | 354 | 306 | 90 | 70 |
| 16 | 21 | 41 | 53 | 121 | 132 | 165 | 1,920 | 1,440 | 354 | 354 | 86 | 73 |
| 17 | 26 | 51 | 59 | 121 | 132 | 165 | 1,810 | 1,500 | 193 | 354 | 229 | 41 |
| 18 | 31 | 62 | 16 | 143 | 126 | 126 | 1,810 | 1,440 | 193 | 344 | 149 | 73 |
| 19 | 31 | 56 | 21 | 143 | 121 | 137 | 1,690 | 1,570 | 143 | 408 | 171 | 107 |
| 20 | 8 | 51 | 25 | 90 | 178 | 126 | 1,690 | 3,110 | 154 | 333 | 270 | 53 |
| 21 | 6 | 62 | 38 | 193 | 270 | 70 | 1,570 | 2,730 | 132 | 354 | 185 | 107 |
| 22 | 8 | 62 | 45 | 171 | 185 | 178 | 1,570 | 2,380 | 171 | 306 | 126 | 70 |
| 23 | 10 | 65 | 90 | 185 | 288 | 143 | 1,500 | 2,040 | 86 | 279 | 111 | 59 |
| 24 | 10 | 41 | 81 | 236 | 200 | 154 | 1,440 | 1,810 | 132 | 324 | 160 | 48 |
| 25 | 22 | 45 | 149 | 376 | 288 | 143 | 1,380 | 1,810 | 102 | 178 | 81 | 81 |
| 26 | 25 | 45 | 94 | 261 | 333 | 102 | 1,310 | 1,810 | 154 | 154 | 126 | 102 |
| 27 | 45 | 41 | 229 | 221 | 376 | 207 | 1,240 | 1,810 | 94 | 160 | 137 | 62 |
| 28 | 51 | 36 | 344 | 121 | 376 | 252 | 1,240 | 1,690 | 214 | 185 | 178 | 94 |
| 29 | 59 | 38 | 344 | 165 | ------ | 315 | 1,180 | 1,690 | 160 | 121 | 121 | 81 |
| 30 | 48 | 40 | 236 | 149 | ------ | 1,810 | 1,180 | 1,570 | 229 | 121 | 160 | 111 |
| 31 | 53 | ------ | 261 | 121 | ------ | 2,270 | ------ | 1,500 | ------ | 40 | 132 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 59 | 3 | 19.9 | 0.020 | 0.02 |
| November | 132 | 19 | 57.4 | .059 | .07 |
| December | 344 | 16 | 91.4 | .094 | .11 |
| January | 376 | 90 | 170 | .175 | .20 |
| February | 376 | 73 | 189 | .195 | .20 |
| March | 2,270 | 70 | 293 | .302 | .35 |
| April | 2,040 | 1,180 | 1,630 | 1.68 | 1.87 |
| May | 3,110 | 1,120 | 1,640 | 1.69 | 1.95 |
| June | 1,440 | 86 | 478 | .492 | .55 |
| July | 680 | 40 | 311 | .320 | .37 |
| August | 270 | 81 | 162 | .167 | .19 |
| September | 333 | 41 | 128 | .132 | .15 |
| The year | 3,110 | 3 | 431 | .444 | 6.03 |

### ROCK RIVER AT AFTON, WIS.

LOCATION.—Water-stage recorder on line between secs. 22 and 27, T. 2 N., R. 12 E., at highway bridge in Afton, three-fourths mile above mouth of Bass Creek. Zero of gage is 743.18 feet above mean sea level.

DRAINAGE AREA.—3,190 square miles.

RECORDS AVAILABLE.—February 1914 to September 1933.

DISCHARGE.—Maximum during year, 9,440 second-feet May 18 (gage height, 9.28 feet); minimum, 48 second-feet Mar. 10 (gage height, −0.60 foot).

1914–33: Maximum, 13,000 second-feet Mar. 23, 1929 (gage height, 10.81 feet); minimum, that of Mar. 10, 1933. Average, 19 years, 1,930 second-feet.

REMARKS.—Records good except those for extremely low stages and those for periods of ice effect, Dec. 8–23, Feb. 4–24, which are fair. Regulation by operation of power plants above.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 286 | 388 | 722 | 1,250 | 890 | 1,440 | 4,730 | 3,300 | 6,360 | 1,070 | 934 | 421 |
| 2 | 255 | 375 | 696 | 1,150 | 890 | 1,380 | 4,600 | 4,220 | 5,940 | 1,500 | 739 | 644 |
| 3 | 220 | 401 | 434 | 1,120 | 832 | 1,440 | 5,120 | 4,220 | 5,520 | 1,780 | 1,190 | 379 |
| 4 | 400 | 462 | 369 | 1,260 | 1,140 | 1,440 | 5,660 | 3,980 | 5,250 | 1,560 | 1,070 | 291 |
| 5 | 281 | 392 | 237 | 890 | 890 | 1,320 | 6,080 | 4,340 | 4,990 | 1,500 | 908 | 496 |
| 6 | 270 | 335 | 498 | 776 | 832 | 1,320 | 6,220 | 4,470 | 4,600 | 1,500 | 890 | 420 |
| 7 | 253 | 280 | 495 | 946 | 950 | 1,200 | 6,220 | 4,220 | 4,220 | 1,440 | 832 | 416 |
| 8 | 261 | 401 | 346 | 861 | 1,140 | 1,200 | 6,360 | 5,120 | 3,860 | 1,500 | 847 | 491 |
| 9 | 278 | 749 | 484 | 889 | 832 | 727 | 6,640 | 5,250 | 3,520 | 1,440 | 1,040 | 480 |
| 10 | 367 | 776 | 645 | 776 | 890 | 692 | 6,500 | 4,990 | 3,300 | 1,500 | 1,050 | 420 |
| 11 | 506 | 483 | 196 | 804 | 670 | 950 | 6,220 | 4,990 | 2,990 | 1,380 | 883 | 343 |
| 12 | 282 | 297 | 211 | 1,010 | 832 | 722 | 6,080 | 5,380 | 2,890 | 1,380 | 1,010 | 953 |
| 13 | 404 | 349 | 506 | 950 | 832 | 970 | 6,080 | 5,520 | 2,440 | 1,140 | 890 | 895 |
| 14 | 369 | 292 | 670 | 670 | 722 | 870 | 6,220 | 5,250 | 2,020 | 950 | 958 | 945 |
| 15 | 317 | 755 | 423 | 670 | 890 | 776 | 6,220 | 5,520 | 1,780 | 1,320 | 896 | 887 |
| 16 | 221 | 832 | 443 | 495 | 722 | 722 | 6,220 | 6,920 | 1,700 | 1,260 | 832 | 827 |
| 17 | 249 | 461 | 722 | 465 | 950 | 722 | 6,080 | 8,390 | 1,630 | 1,070 | 776 | 832 |
| 18 | 494 | 498 | 464 | 670 | 722 | 921 | 5,800 | 9,140 | 1,560 | 1,030 | 722 | 832 |
| 19 | 645 | 422 | 211 | 655 | 950 | 1,260 | 5,660 | 9,140 | 1,560 | 1,130 | 658 | 892 |
| 20 | 425 | 373 | 484 | 624 | 890 | 950 | 5,520 | 8,390 | 1,380 | 837 | 676 | 776 |
| 21 | 413 | 241 | 572 | 783 | 1,140 | 310 | 5,250 | 6,920 | 1,140 | 1,010 | 926 | 641 |
| 22 | 393 | 509 | 890 | 705 | 1,140 | 881 | 5,250 | 6,920 | 1,140 | 1,090 | 776 | 541 |
| 23 | 378 | 345 | 890 | 696 | 1,440 | 722 | 4,730 | 7,060 | 1,140 | 1,070 | 601 | 700 |
| 24 | 295 | 339 | 1,600 | 776 | 1,070 | 670 | 4,340 | 7,060 | 950 | 1,200 | 401 | 572 |
| 25 | 493 | 230 | 1,630 | 776 | 1,200 | 670 | 4,340 | 7,060 | 594 | 1,230 | 443 | 312 |
| 26 | 696 | 385 | 1,110 | 696 | 1,140 | 670 | 3,980 | 7,640 | 950 | 1,070 | 439 | 845 |
| 27 | 696 | 435 | 391 | 776 | 1,070 | 722 | 3,750 | 7,640 | 832 | 1,070 | 387 | 776 |
| 28 | 696 | 211 | 611 | 776 | 1,320 | 1,140 | 3,410 | 7,200 | 777 | 941 | 312 | 670 |
| 29 | 647 | 696 | 722 | 645 | ------- | 1,380 | 3,300 | 7,060 | 890 | 670 | 438 | 776 |
| 30 | 330 | 722 | 1,040 | 832 | ------- | 4,600 | 3,300 | 6,780 | 1,200 | 936 | 511 | 527 |
| 31 | 227 | ------- | 1,140 | 722 | ------- | 5,250 | ------- | 6,640 | ------- | 772 | 443 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 696 | 220 | 389 | 0.122 | 0.14 |
| November | 832 | 211 | 448 | .140 | .16 |
| December | 1,630 | 196 | 640 | .201 | .23 |
| January | 1,260 | 465 | 810 | .254 | .29 |
| February | 1,440 | 670 | 964 | .302 | .31 |
| March | 5,250 | 310 | 1,230 | .386 | .44 |
| April | 6,640 | 3,300 | 5,330 | 1.67 | 1.86 |
| May | 9,140 | 3,300 | 6,150 | 1.93 | 2.22 |
| June | 6,360 | 594 | 2,570 | .806 | .90 |
| July | 1,780 | 670 | 1,200 | .376 | .43 |
| August | 1,190 | 312 | 757 | .237 | .27 |
| September | 953 | 291 | 633 | .198 | .22 |
| The year | 9,140 | 196 | 1,760 | .552 | 7.47 |

### ROCK RIVER AT LYNDON, ILL.

LOCATION.—Chain gage in NE¼ sec. 21, T. 20 N., R. 5 E., at highway bridge in Lyndon, 14 miles above Rock Creek. Zero of gage is 584.37 feet above mean sea level (1929 general adjustment).

DRAINAGE AREA.—9,010 square miles.

RECORDS AVAILABLE.—November 1914 to September 1933.

DISCHARGE.—Maximum during year, 26,100 second-feet May 28 (gage height, 13.80 feet); minimum, 1,000 second-feet Dec. 9 during period of ice effect.

1914–33: Maximum, 39,500 second-feet Mar. 28, 1916; maximum gage height, 19.6 feet (backwater from ice) Feb. 16, 1918; minimum, 655 second-feet Sept. 27, 1918 (gage height, 3.72 feet). Average, 18 years (1915–33), 5,840 second-feet.

REMARKS.—Records good. Discharge estimated Nov. 27, Dec. 9–28, Dec. 31 to Jan. 16, and Feb. 5–26. Some diurnal fluctuation at low stages, owing to power plants upstream. About 100 second-feet diverted above gage to Illinois & Mississippi Canal.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,140 | 1,970 | 1,850 | 6,600 | 2,960 | 6,070 | 11,900 | 6,290 | 13,800 | 4,460 | 2,640 | 1,620 |
| 2 | 1,250 | 1,730 | 1,850 | 5,000 | 3,920 | 4,970 | 14,600 | 6,980 | 12,200 | 6,330 | 2,640 | 1,730 |
| 3 | 1,140 | 1,850 | 1,850 | 4,700 | 3,720 | 4,970 | 15,700 | 9,110 | 12,200 | 13,300 | 3,310 | 1,730 |
| 4 | 1,140 | 1,610 | 2,100 | 4,500 | 3,140 | 3,720 | 15,400 | 9,610 | 10,600 | 13,300 | 2,500 | 1,730 |
| 5 | 1,370 | 1,730 | 2,100 | 4,000 | 1,700 | 2,790 | 14,600 | 10,600 | 10,600 | 11,400 | 2,790 | 1,840 |
| 6 | 1,490 | 1,730 | 1,970 | 3,500 | 1,700 | 3,330 | 15,400 | 11,700 | 8,630 | 10,600 | 2,950 | 1,840 |
| 7 | 1,490 | 1,730 | 1,610 | 3,500 | 2,300 | 3,140 | 16,500 | 12,700 | 8,150 | 10,100 | 2,790 | 1,510 |
| 8 | 1,250 | 1,730 | 1,850 | 3,000 | 2,000 | 2,640 | 17,400 | 13,000 | 8,150 | 9,610 | 2,640 | 1,730 |
| 9 | 2,040 | 1,850 | 1,000 | 3,000 | 2,100 | 2,960 | 16,000 | 14,900 | 7,210 | 10,400 | 2,640 | 1,620 |
| 10 | 1,910 | 1,850 | 1,100 | 2,800 | 2,200 | 2,790 | 14,900 | 16,200 | 6,990 | 9,360 | 2,790 | 1,730 |
| 11 | 2,170 | 2,500 | 1,200 | 2,700 | 2,300 | 2,230 | 13,000 | 16,800 | 6,550 | 8,150 | 2,790 | 1,840 |
| 12 | 2,040 | 2,100 | 1,500 | 2,500 | 2,200 | 1,850 | 12,400 | 16,500 | 5,910 | 6,550 | 3,500 | 1,730 |
| 13 | 1,910 | 2,500 | 1,500 | 2,000 | 2,300 | 2,640 | 11,400 | 16,500 | 5,910 | 4,860 | 3,310 | 1,730 |
| 14 | 2,040 | 2,100 | 1,400 | 2,600 | 2,200 | 2,500 | 10,600 | 16,000 | 5,490 | 4,070 | 2,790 | 1,840 |
| 15 | 2,040 | 2,100 | 1,300 | 2,500 | 2,100 | 2,500 | 10,900 | 14,300 | 4,860 | 4,860 | 2,500 | 2,090 |
| 16 | 1,040 | 1,850 | 1,700 | 2,600 | 2,100 | 2,360 | 10,400 | 13,500 | 4,260 | 4,860 | 2,360 | 2,090 |
| 17 | 1,740 | 2,100 | 1,600 | 2,230 | 2,100 | 2,230 | 10,100 | 13,000 | 4,070 | 4,260 | 2,640 | 2,090 |
| 18 | 1,550 | 2,100 | 1,200 | 2,500 | 2,000 | 2,640 | 9,610 | 13,500 | 4,070 | 4,070 | 2,360 | 2,220 |
| 19 | 1,730 | 1,970 | 1,300 | 7,440 | 2,000 | 2,360 | 9,360 | 13,000 | 3,880 | 3,500 | 2,360 | 2,090 |
| 20 | 1,610 | 1,430 | 1,400 | 6,520 | 2,400 | 2,100 | 8,870 | 13,800 | 3,500 | 3,500 | 1,840 | 2,090 |
| 21 | 1,310 | 1,610 | 1,400 | 3,720 | 3,100 | 2,500 | 8,870 | 19,300 | 3,690 | 2,950 | 1,840 | 2,090 |
| 22 | 1,730 | 1,140 | 1,300 | 3,720 | 3,500 | 2,640 | 8,150 | 22,500 | 3,310 | 3,120 | 1,840 | 2,090 |
| 23 | 1,850 | 1,430 | 3,300 | 4,130 | 4,000 | 1,850 | 7,670 | 21,800 | 3,120 | 2,640 | 2,360 | 1,730 |
| 24 | 1,850 | 1,850 | 5,400 | 4,130 | 5,000 | 2,500 | 7,670 | 21,000 | 3,120 | 3,500 | 2,360 | 1,730 |
| 25 | 1,850 | 1,730 | 7,500 | 3,920 | 5,200 | 2,360 | 7,440 | 19,300 | 2,950 | 3,880 | 1,840 | 2,090 |
| 26 | 1,970 | 1,610 | 8,000 | 4,340 | 5,400 | 2,360 | 8,150 | 20,700 | 3,120 | 3,690 | 1,730 | 1,960 |
| 27 | 2,100 | 1,300 | 8,200 | 4,340 | 5,850 | 2,960 | 5,410 | 26,100 | 2,790 | 3,500 | 1,840 | 1,960 |
| 28 | 2,640 | 1,550 | 8,200 | 3,920 | 6,070 | 2,960 | 5,850 | 26,100 | 2,640 | 2,950 | 1,730 | 2,220 |
| 29 | 2,230 | 1,730 | 8,150 | 3,140 | ------- | 3,920 | 5,850 | 22,100 | 3,120 | 2,790 | 1,620 | 2,220 |
| 30 | 2,500 | 1,610 | 7,670 | 3,140 | ------- | 5,630 | 5,850 | 18,000 | 3,880 | 2,640 | 1,840 | 2,360 |
| 31 | 2,360 | ------- | 7,200 | 2,790 | ------- | 9,110 | ------- | 14,900 | ------- | 2,220 | 1,840 | ------- |

| Month | Maximum | Minimum | Mean | Month | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|
| October | 2,640 | 1,040 | 1,760 | May | 26,100 | 6,290 | 15,800 |
| November | 2,500 | 1,140 | 1,800 | June | 13,800 | 2,640 | 5,960 |
| December | 8,200 | 1,000 | 3,150 | July | 13,300 | 2,220 | 5,850 |
| January | 7,440 | 2,000 | 3,730 | August | 3,500 | 1,620 | 2,420 |
| February | 6,070 | 1,700 | 3,060 | September | 2,360 | 1,510 | 1,910 |
| March | 9,110 | 1,850 | 3,210 | | | | |
| April | 17,400 | 5,410 | 11,000 | The year | 26,100 | 1,000 | 4,980 |

### CRAWFISH RIVER AT MILFORD, WIS.

LOCATION.—Chain gage in sec. 4, T. 7 N., R. 14 E., at highway bridge on County Trunk Highway A in Milford, 1 mile below mouth of Rock Creek and 8 miles above mouth.

DRAINAGE AREA.—764 square miles.

RECORDS AVAILABLE.—June 1931 to September 1933.

DISCHARGE.—Maximum during year, 2,580 second-feet Apr. 3 (gage height, 6.44 feet); minimum, 6.0 second-feet Oct. 8 (gage height, 1.14 feet).

1931–33: Maximum, that of Apr. 3; minimum, 6 second-feet Sept. 19, 20, 1932, Oct. 8, 1933.

REMARKS.—Records fair except those for period of ice effect, Nov. 18–29, Dec. 8–26, 31, Jan. 1, 12–14, 17–22, 27–29, Feb. 4–24, Mar. 9–12, 18–25, which are poor.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 | 42 | 23 | 220 | 99 | 336 | 2,060 | 434 | 1,020 | 132 | 64 | 29 |
| 2 | 14 | 34 | 26 | 169 | 115 | 336 | 2,440 | 860 | 860 | 336 | 52 | 30 |
| 3 | 20 | 26 | 30 | 147 | 136 | 312 | 2,580 | 968 | 757 | 312 | 82 | 36 |
| 4 | 79 | 27 | 32 | 136 | 129 | 257 | 2,510 | 1,080 | 655 | 336 | 64 | 32 |
| 5 | 68 | 32 | 50 | 147 | 115 | 235 | 2,250 | 1,140 | 580 | 336 | 51 | 28 |
| 6 | 15 | 22 | 51 | 132 | 102 | 205 | 2,120 | 1,140 | 506 | 307 | 32 | 28 |
| 7 | 9 | 23 | 51 | 108 | 79 | 180 | 2,000 | 1,080 | 409 | 271 | 50 | 36 |
| 8 | 6 | 18 | 31 | 94 | 68 | 165 | 1,930 | 1,260 | 312 | 262 | 70 | 33 |
| 9 | 70 | 26 | 22 | 82 | 57 | 143 | 1,810 | 1,440 | 280 | 205 | 68 | 41 |
| 10 | 105 | 38 | 21 | 75 | 57 | 126 | 1,750 | 1,500 | 298 | 194 | 61 | 44 |
| 11 | 21 | 57 | 18 | 85 | 54 | 108 | 1,930 | 1,560 | 280 | 154 | 91 | 85 |
| 12 | 29 | 91 | 17 | 72 | 57 | 108 | 2,120 | 1,500 | 312 | 175 | 77 | 136 |
| 13 | 23 | 82 | 15 | 61 | 57 | 118 | 2,250 | 1,440 | 240 | 99 | 91 | 165 |
| 14 | 12 | 59 | 15 | 56 | 57 | 162 | 2,120 | 1,440 | 158 | 96 | 57 | 173 |
| 15 | 16 | 70 | 15 | 54 | 57 | 126 | 2,000 | 1,380 | 72 | 172 | 44 | 158 |
| 16 | 26 | 66 | 15 | 46 | 57 | 68 | 1,810 | 1,320 | 105 | 91 | 19 | 126 |
| 17 | 28 | 40 | 15 | 39 | 57 | 105 | 1,500 | 1,200 | 115 | 68 | 64 | 143 |
| 18 | 39 | 36 | 15 | 35 | 57 | 79 | 1,440 | 1,080 | 118 | 56 | 82 | 118 |
| 19 | 18 | 35 | 15 | 40 | 57 | 68 | 1,260 | 1,260 | 112 | 44 | 66 | 85 |
| 20 | 34 | 32 | 15 | 57 | 57 | 57 | 1,080 | 1,870 | 96 | 59 | 42 | 184 |
| 21 | 24 | 30 | 15 | 57 | 57 | 52 | 968 | 2,060 | 102 | 52 | 32 | 72 |
| 22 | 31 | 28 | 15 | 57 | 57 | 52 | 860 | 2,320 | 96 | 70 | 33 | 41 |
| 23 | 34 | 26 | 18 | 50 | 79 | 52 | 680 | 2,320 | 94 | 75 | 35 | 41 |
| 24 | 39 | 24 | 40 | 56 | 136 | 52 | 580 | 2,180 | 105 | 79 | 35 | 44 |
| 25 | 64 | 22 | 79 | 88 | 240 | 57 | 580 | 2,180 | 99 | 75 | 36 | 45 |
| 26 | 46 | 22 | 180 | 64 | 271 | 75 | 434 | 2,120 | 91 | 61 | 32 | 79 |
| 27 | 59 | 22 | 253 | 64 | 294 | 88 | 384 | 1,810 | 77 | 48 | 34 | 68 |
| 28 | 22 | 22 | 271 | 64 | 307 | 132 | 360 | 1,560 | 96 | 38 | 48 | 61 |
| 29 | 68 | 22 | 257 | 64 | ------ | 180 | 307 | 1,380 | 88 | 34 | 38 | 48 |
| 30 | 50 | 23 | 248 | 68 | ------ | 605 | 312 | 1,320 | 94 | 41 | 29 | 39 |
| 31 | 46 | ------ | 240 | 79 | ------ | 1,380 | ------ | 1,200 | ------ | 38 | 30 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 105 | 6 | 36.5 | 0.048 | 0.06 |
| November | 91 | 18 | 36.6 | .048 | .05 |
| December | 271 | 15 | 68.0 | .089 | .10 |
| January | 220 | 35 | 83.8 | .108 | .12 |
| February | 307 | 54 | 106 | .139 | .14 |
| March | 1,380 | 52 | 194 | .254 | .29 |
| April | 2,580 | 307 | 1,480 | 1.94 | 2.16 |
| May | 2,320 | 434 | 1,460 | 1.91 | 2.20 |
| June | 1,020 | 72 | 274 | .359 | .40 |
| July | 336 | 34 | 134 | .175 | .20 |
| August | 91 | 19 | 51.9 | .068 | .08 |
| September | 184 | 28 | 74.9 | .098 | .11 |
| The year | 2,580 | 6 | 334 | .437 | 5.91 |

### YAHARA RIVER NEAR McFARLAND, WIS.

LOCATION.—Chain gage in SW¼ sec. 3, T. 6 N., R. 10 E., at bridge on Federal highway 51, about 400 feet downstream from outlet of Lake Waubesa, 1 mile southwest of McFarland. Zero of gage is 840.2 feet above mean sea level.

DRAINAGE AREA.—337 square miles.

RECORDS AVAILABLE.—September 1930 to September 1933.

DISCHARGE.—Maximum during year, 655 second-feet May 21; minimum, 31 second-feet Oct. 8.

1930–33: Maximum, that of May 21, 1933; minimum, 13 second-feet June 13, 1931.

REMARKS.—Records fair. Stage-discharge relation affected by growth of grass in channel greater part of each summer.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 53 | 75 | 79 | 121 | 119 | 174 | 408 | 430 | 542 | 296 | 104 | 87 |
| 2 | 51 | 73 | 83 | 117 | 142 | 174 | 408 | 475 | 542 | 318 | 100 | 87 |
| 3 | 45 | 73 | 85 | 113 | 142 | 174 | 408 | 475 | 520 | 318 | 113 | 85 |
| 4 | 56 | 79 | 100 | 113 | 142 | 174 | 408 | 475 | 520 | 318 | 106 | 83 |
| 5 | 49 | 75 | 98 | 110 | 142 | 163 | 408 | 452 | 520 | 296 | 94 | 83 |
| 6 | 40 | 79 | 98 | 110 | 119 | 174 | 430 | 452 | 498 | 296 | 96 | 87 |
| 7 | 35 | 83 | 100 | 113 | 142 | 174 | 430 | 452 | 498 | 284 | 119 | 87 |
| 8 | 31 | 87 | 117 | 113 | 142 | 174 | 430 | 498 | 475 | 284 | 132 | 87 |
| 9 | 37 | 96 | 104 | 110 | 132 | 174 | 452 | 498 | 475 | 273 | 132 | 85 |
| 10 | 56 | 113 | 96 | 113 | 142 | 174 | 475 | 475 | 452 | 262 | 142 | 79 |
| 11 | 56 | 113 | 87 | 115 | 132 | 163 | 475 | 475 | 452 | 250 | 142 | 108 |
| 12 | 53 | 108 | 132 | 115 | 132 | 163 | 475 | 475 | 430 | 250 | 142 | 106 |
| 13 | 55 | 96 | 92 | 110 | 121 | 163 | 475 | 475 | 408 | 239 | 142 | 106 |
| 14 | 53 | 87 | 87 | 102 | 119 | 163 | 498 | 452 | 408 | 239 | 121 | 106 |
| 15 | 51 | 96 | 108 | 104 | 121 | 152 | 498 | 452 | 385 | 250 | 121 | 106 |
| 16 | 56 | 45 | 92 | 104 | 119 | 152 | 498 | 452 | 385 | 239 | 121 | 100 |
| 17 | 58 | 92 | 87 | 104 | 119 | 142 | 498 | 452 | 362 | 217 | 117 | 98 |
| 18 | 58 | 85 | 94 | 108 | 119 | 152 | 498 | 452 | 340 | 206 | 121 | 85 |
| 19 | 58 | 56 | 83 | 115 | 121 | 163 | 498 | 498 | 340 | 195 | 121 | 98 |
| 20 | 59 | 100 | 79 | 117 | 117 | 163 | 498 | 610 | 340 | 184 | 119 | 83 |
| 21 | 58 | 48 | 71 | 108 | 117 | 174 | 475 | 655 | 318 | 184 | 117 | 81 |
| 22 | 58 | 56 | 63 | 108 | 110 | 152 | 475 | 632 | 318 | 174 | 108 | 75 |
| 23 | 61 | 77 | 59 | 108 | 132 | 152 | 475 | 632 | 318 | 174 | 106 | 73 |
| 24 | 67 | 67 | 96 | 110 | 152 | 142 | 452 | 610 | 296 | 163 | 110 | 77 |
| 25 | 77 | 100 | 132 | 110 | 163 | 142 | 452 | 610 | 296 | 142 | 108 | 75 |
| 26 | 96 | 152 | 121 | 115 | 184 | 132 | 452 | 588 | 296 | 142 | 110 | 75 |
| 27 | 94 | 92 | 121 | 113 | 184 | 152 | 430 | 588 | 284 | 132 | 108 | 79 |
| 28 | 96 | 83 | 115 | 110 | 184 | 152 | 408 | 588 | 284 | 121 | 96 | 79 |
| 29 | 85 | 75 | 113 | 110 | ------ | 174 | 408 | 588 | 273 | 115 | 94 | 77 |
| 30 | 77 | 75 | 113 | 110 | ------ | 296 | 430 | 588 | 296 | 111 | 89 | 69 |
| 31 | 79 | ------ | 142 | 113 | ------ | 385 | ------ | 565 | ------ | 108 | 87 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 96 | 31 | 59.9 | 0.178 | 0.21 |
| November | 152 | 45 | 84.5 | .251 | .28 |
| December | 142 | 59 | 98.3 | .292 | .34 |
| January | 121 | 102 | 111 | .329 | .38 |
| February | 184 | 110 | 136 | .404 | .42 |
| March | 385 | 132 | 173 | .513 | .59 |
| April | 498 | 408 | 454 | 1.35 | 1.51 |
| May | 655 | 430 | 520 | 1.54 | 1.78 |
| June | 542 | 273 | 396 | 1.18 | 1.32 |
| July | 318 | 108 | 219 | .650 | .75 |
| August | 142 | 87 | 114 | .338 | .39 |
| September | 108 | 69 | 86.9 | .258 | .29 |
| The year | 655 | 31 | 204 | .605 | 8.23 |

### PECATONICA RIVER AT FREEPORT, ILL.

LOCATION.—Chain gage in NW¼ sec. 32, T. 27 N., R. 8 E., at Hancock Avenue Bridge in Freeport, 2 miles above mouth of Yellow Creek. Zero of gage is 739.52 feet above mean sea level.

DRAINAGE AREA.—1,330 square miles.

RECORDS AVAILABLE.—September 1914 to September 1933.

DISCHARGE.—Maximum during year, 8,600 second-feet Apr. 3 (gage height, 17.37 feet); minimum, 124 second-feet Dec. 10 during period of ice effect.

1914–33: Maximum, 18,400 second-feet Mar. 16, 1929 (gage height, 19.76 feet); minimum, that of Dec. 10, 1932. Average, 19 years, 96° second-feet.

REMARKS.—Records fair. Ice effect Dec. 9–22, Jan. 12, and Feb. 5–18.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 255 | 358 | 272 | 1,050 | 340 | 523 | 5,590 | 792 | 1,220 | 561 | 358 | 340 |
| 2 | 238 | 358 | 289 | 792 | 678 | 485 | 7,680 | 2,830 | 987 | 3,410 | 412 | 272 |
| 3 | 255 | 358 | 289 | 678 | 896 | 430 | 8,260 | 3,270 | 842 | 4,120 | 599 | 340 |
| 4 | 289 | 340 | 340 | 658 | 599 | 394 | 6,700 | 2,830 | 768 | 4,560 | 744 | 306 |
| 5 | 289 | 376 | 430 | 599 | 412 | 376 | 4,560 | 1,920 | 744 | 4,670 | 504 | 340 |
| 6 | 306 | 255 | 599 | 542 | 358 | 376 | 3,000 | 1,810 | 700 | 4,670 | 394 | 412 |
| 7 | 289 | 323 | 466 | 485 | 306 | 272 | 1,880 | 1,810 | 658 | 4,120 | 430 | 430 |
| 8 | 272 | 306 | 306 | 485 | 272 | 323 | 1,290 | 2,700 | 599 | 2,460 | 868 | 394 |
| 9 | 238 | 376 | 238 | 466 | 238 | 255 | 987 | 3,180 | 561 | 1,620 | 1,840 | 358 |
| 10 | 323 | 485 | 124 | 430 | 238 | 272 | 842 | 2,660 | 580 | 1,120 | 1,120 | 306 |
| 11 | 376 | 466 | 238 | 430 | 238 | 272 | 896 | 1,920 | 523 | 700 | 542 | 289 |
| 12 | 358 | 412 | 221 | 394 | 238 | 221 | 1,510 | 1,810 | 504 | 580 | 448 | 306 |
| 13 | 358 | 376 | 188 | 358 | 221 | 394 | 1,550 | 2,340 | 485 | 542 | 412 | 323 |
| 14 | 358 | 272 | 188 | 323 | 221 | 376 | 816 | 2,260 | 466 | 542 | 376 | 358 |
| 15 | 272 | 323 | 221 | 340 | 221 | 340 | 722 | 1,810 | 466 | 542 | 358 | 376 |
| 16 | 221 | 238 | 221 | 358 | 221 | 306 | 722 | 1,880 | 448 | 504 | 358 | 448 |
| 17 | 289 | 289 | 212 | 376 | 272 | 289 | 678 | 2,740 | 448 | 504 | 358 | 394 |
| 18 | 289 | 255 | 180 | 358 | 272 | 289 | 618 | 2,150 | 448 | 466 | 358 | 358 |
| 19 | 306 | 289 | 180 | 448 | 376 | 323 | 542 | 2,300 | 430 | 430 | 412 | 340 |
| 20 | 340 | 221 | 272 | 430 | 816 | 306 | 561 | 3,690 | 430 | 430 | 412 | 323 |
| 21 | 358 | 306 | 272 | 448 | 1,550 | 376 | 542 | 4,120 | 412 | 412 | 376 | 340 |
| 22 | 340 | 306 | 221 | 580 | 1,700 | 272 | 485 | 4,280 | 412 | 412 | 323 | 289 |
| 23 | 358 | 340 | 561 | 1,220 | 1,960 | 394 | 485 | 4,560 | 412 | 504 | 323 | 289 |
| 24 | 430 | 306 | 2,260 | 1,260 | 1,840 | 376 | 448 | 4,280 | 412 | 658 | 323 | 306 |
| 25 | 448 | 289 | 3,410 | 956 | 1,580 | 323 | 430 | 3,220 | 430 | 542 | 323 | 485 |
| 26 | 523 | 272 | 3,510 | 448 | 1,220 | 358 | 430 | 2,380 | 448 | 485 | 376 | 700 |
| 27 | 485 | 272 | 3,460 | 430 | 868 | 485 | 412 | 2,030 | 430 | 412 | 466 | 561 |
| 28 | 466 | 255 | 3,570 | 340 | 618 | 2,220 | 394 | 1,580 | 430 | 394 | 323 | 485 |
| 29 | 394 | 272 | 3,690 | 412 | ------ | 2,910 | 394 | 1,510 | 412 | 376 | 289 | 394 |
| 30 | 394 | 340 | 3,000 | 394 | ------ | 3,510 | 412 | 1,550 | 523 | 358 | 340 | 358 |
| 31 | 306 | ------ | 1,700 | 306 | ------ | 4,280 | ------ | 1,510 | ------ | 340 | 358 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 523 | 221 | 336 | 0.253 | 0.29 |
| November | 485 | 221 | 321 | .241 | .27 |
| December | 3,690 | 124 | 1,000 | .752 | .87 |
| January | 1,260 | 306 | 542 | .408 | .47 |
| February | 1,960 | 221 | 670 | .504 | .52 |
| March | 4,280 | 221 | 720 | .541 | .62 |
| April | 8,260 | 394 | 1,790 | 1.35 | 1.51 |
| May | 4,560 | 792 | 2,510 | 1.89 | 2.18 |
| June | 1,220 | 418 | 554 | .417 | .47 |
| July | 4,670 | 340 | 1,340 | 1.01 | 1.16 |
| August | 1,840 | 289 | 488 | .367 | .42 |
| September | 700 | 272 | 374 | .281 | .31 |
| The year | 8,260 | 124 | 891 | .670 | 9.09 |

### SUGAR RIVER NEAR BRODHEAD, WIS.

LOCATION.—Chain gage in sec. 26, T. 2 N., R. 9 E., at highway bridge 2 miles above mouth of Jordan Creek and 2 miles southwest of Brodhead.

DRAINAGE AREA.—529 square miles.

RECORDS AVAILABLE.—February 1914 to September 1933.

DISCHARGE.—Maximum during year, 9,200 second-feet Mar. 31 (gage height, 8.81 feet); minimum, 66 second-feet Oct. 2 (gage height, 0.50 foot).

1914–33: Maximum, about 13,000 second-feet Sept. 13, 1915 (gage height, 11.4 feet); minimum, about 47 second-feet Aug. 26, 1923. Average, 19 years, 368 second-feet.

REMARKS.—Records fair except those for periods of ice effect, Nov. 16, 17, 21–24, Dec. 8 to Jan. 6, Jan. 12, 13, Feb. 4–24, which are poor. Flow slightly regulated by operation of power plant in Brodhead.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 148 | 210 | 172 | 262 | 235 | 235 | 3,080 | 475 | 625 | 373 | 122 | 103 |
| 2 | 109 | 197 | 160 | 248 | 289 | 160 | 2,460 | 1,080 | 509 | 1,580 | 199 | 132 |
| 3 | 172 | 184 | 172 | 235 | 490 | 197 | 1,080 | 1,180 | 407 | 2,540 | 212 | 154 |
| 4 | 172 | 197 | 197 | 222 | 457 | 160 | 712 | 890 | 373 | 1,480 | 262 | 132 |
| 5 | 172 | 210 | 210 | 222 | 457 | 138 | 545 | 668 | 340 | 845 | 249 | 112 |
| 6 | 172 | 160 | 197 | 210 | 457 | 197 | 668 | 845 | 340 | 583 | 212 | 122 |
| 7 | 172 | 197 | 222 | 197 | 457 | 172 | 712 | 800 | 306 | 340 | 212 | 132 |
| 8 | 184 | 248 | 197 | 197 | 457 | 210 | 583 | 1,280 | 306 | 262 | 199 | 132 |
| 9 | 160 | 332 | 172 | 197 | 332 | 148 | 475 | 1,130 | 306 | 306 | 262 | 122 |
| 10 | 210 | 393 | 148 | 210 | 275 | 160 | 509 | 1,280 | 290 | 306 | 275 | 103 |
| 11 | 210 | 318 | 127 | 222 | 248 | 197 | 712 | 845 | 262 | 275 | 249 | 143 |
| 12 | 222 | 222 | 118 | 222 | 248 | 210 | 845 | 845 | 275 | 290 | 249 | 236 |
| 13 | 222 | 210 | 109 | 222 | 262 | 210 | 583 | 1,030 | 290 | 188 | 199 | 224 |
| 14 | 197 | 197 | 109 | 210 | 275 | 197 | 509 | 756 | 224 | 290 | 212 | 176 |
| 15 | 160 | 184 | 127 | 172 | 275 | 184 | 407 | 583 | 224 | 236 | 195 | 176 |
| 16 | 172 | 184 | 148 | 222 | 275 | 184 | 407 | 1,080 | 236 | 262 | 178 | 154 |
| 17 | 184 | 184 | 160 | 197 | 275 | 197 | 373 | 1,130 | 224 | 236 | 160 | 176 |
| 18 | 197 | 172 | 172 | 184 | 275 | 222 | 340 | 985 | 236 | 212 | 143 | 188 |
| 19 | 184 | 172 | 172 | 148 | 303 | 160 | 306 | 1,030 | 306 | 199 | 132 | 199 |
| 20 | 197 | 127 | 172 | 184 | 332 | 109 | 275 | 5,510 | 249 | 143 | 176 | 176 |
| 21 | 184 | 172 | 172 | 172 | 425 | 160 | 290 | 6,830 | 236 | 236 | 199 | 132 |
| 22 | 197 | 172 | 172 | 184 | 490 | 235 | 275 | 2,390 | 236 | 236 | 154 | 143 |
| 23 | 160 | 172 | 197 | 172 | 631 | 210 | 249 | 1,180 | 236 | 199 | 154 | 143 |
| 24 | 210 | 172 | 393 | 425 | 902 | 210 | 249 | 845 | 212 | 236 | 165 | 154 |
| 25 | 222 | 184 | 744 | 490 | 1,120 | 248 | 249 | 625 | 212 | 212 | 165 | 212 |
| 26 | 222 | 127 | 1,030 | 235 | 822 | 235 | 188 | 712 | 224 | 236 | 165 | 212 |
| 27 | 289 | 118 | 1,030 | 222 | 559 | 393 | 275 | 890 | 249 | 236 | 103 | 188 |
| 28 | 210 | 262 | 822 | 160 | 362 | 595 | 143 | 712 | 249 | 224 | 103 | 154 |
| 29 | 210 | 160 | 559 | 172 | ------ | 862 | 188 | 800 | 306 | 212 | 143 | 188 |
| 30 | 210 | 160 | 332 | 197 | ------ | 4,210 | 224 | 756 | 373 | 197 | 165 | 199 |
| 31 | 248 | ------ | 275 | 197 | ------ | 7,970 | ------ | 712 | ------ | 143 | 132 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 289 | 109 | 193 | 0.365 | 0.42 |
| November | 393 | 118 | 200 | .378 | .42 |
| December | 1,030 | 109 | 290 | .548 | .63 |
| January | 490 | 148 | 220 | .416 | .48 |
| February | 1,120 | 235 | 428 | .809 | .84 |
| March | 7,970 | 109 | 612 | 1.16 | 1.34 |
| April | 3,080 | 143 | 597 | 1.13 | 1.26 |
| May | 6,830 | 475 | 1,290 | 2.44 | 2.81 |
| June | 625 | 212 | 295 | .558 | .62 |
| July | 2,540 | 143 | 429 | .811 | .94 |
| August | 275 | 103 | 185 | .350 | .40 |
| September | 236 | 103 | 161 | .304 | .34 |
| The year | 7,970 | 103 | 409 | .773 | 10.50 |

### SOUTH BRANCH OF KISHWAUKEE RIVER AT DE KALB, ILL.

LOCATION.—Chain gage in NE¼ sec. 22, T. 40 N., R. 4 E., at Lincoln Highway bridge in De Kalb. Zero of gage is 835.83 feet above mean sea level.

DRAINAGE AREA.—70 square miles.

RECORDS AVAILABLE.—July 1925 to November 1933 (discontinued).

DISCHARGE.—Maximum during year, 559 second-feet July 2 (gage height, 6.13 feet); minimum, 0.08 second-foot Oct. 1, 2 (gage height, 0.15 foot).

1925–33: Maximum, 960 second feet June 12, 1929 (gage height, 8.84 feet); minimum, 0.01 second-foot July 31, 1930, Oct. 4, 5, 1931.

REMARKS.—Records good except those estimated for periods of ice effect, Dec. 8 to 21, Jan. 1 to 3, 11–15, Feb. 5–23, and Mar. 10–12, and those below 1.0 second-foot, which are poor.

*Daily discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.08 | 3.1 | 0.5 | 18 | 99 | 38 | 127 | 46 | 58 | 145 | 1.7 | 1.1 | 0.2 |
| 2 | .08 | 2.4 | .7 | 17 | 111 | 36 | 127 | 268 | 52 | 559 | 2.1 | 1.1 | .2 |
| 3 | .1 | 2.0 | .7 | 18 | 79 | 32 | 119 | 202 | 43 | 280 | 3.1 | .9 | .2 |
| 4 | 3.1 | 1.8 | 1.8 | 20 | 49 | 29 | 91 | 145 | 43 | 163 | 2.0 | .6 | .2 |
| 5 | .3 | 2.2 | 1.0 | 22 | 41 | 27 | 87 | 127 | 55 | 111 | 1.5 | .5 | .2 |
| 6 | .2 | 1.8 | 2.0 | 17 | 26 | 27 | 154 | 224 | 41 | 83 | .9 | .8 | .2 |
| 7 | .2 | 2.0 | 3.8 | 15 | 29 | 29 | 154 | 182 | 33 | 58 | .9 | .8 | .2 |
| 8 | .1 | 10 | 2.2 | 12 | 19 | 29 | 119 | 316 | 28 | 49 | .8 | .6 | .2 |
| 9 | .2 | 5.7 | 2.2 | 14 | 22 | 16 | 103 | 328 | 23 | 341 | 1.2 | .6 | .2 |
| 10 | 5.2 | 6.6 | 2.6 | 6.5 | 21 | 12 | 91 | 268 | 20 | 119 | 1.1 | .6 | .2 |
| 11 | .7 | 4.6 | 2.6 | 6 | 21 | 12 | 83 | 224 | 18 | 79 | .8 | .7 | .2 |
| 12 | .5 | 5.2 | 2.6 | 6 | 22 | 14 | 76 | 224 | 16 | 55 | .7 | .6 | .2 |
| 13 | .4 | 4.1 | 2 | 6 | 25 | 21 | 65 | 213 | 14 | 43 | .7 | .8 | .2 |
| 14 | .4 | 3.6 | 2.6 | 6.8 | 24 | 38 | 62 | 172 | 13 | 35 | 1.1 | .5 | .2 |
| 15 | .4 | 3.6 | 2.4 | 7.4 | 23 | 34 | 58 | 145 | 12 | 41 | 1.1 | .2 | .2 |
| 16 | .5 | 1.8 | 2.6 | 9.0 | 22 | 29 | 58 | 119 | 11 | 31 | .9 | .2 | .3 |
| 17 | .4 | 2.4 | 3.8 | 9.0 | 22 | 28 | 68 | 103 | 10 | 23 | 1.5 | .2 | .2 |
| 18 | .4 | 2.2 | 4.4 | 15 | 22 | 29 | 72 | 91 | 8.7 | 19 | .9 | .2 | .2 |
| 19 | .4 | 1.8 | 4.4 | 192 | 21 | 49 | 65 | 95 | 6.8 | 16 | .6 | .3 | .2 |
| 20 | .4 | 1.6 | 3.8 | 95 | 26 | 55 | 58 | 111 | 6.0 | 13 | .6 | .2 | .2 |
| 21 | .4 | 1.3 | 5.2 | 58 | 38 | 46 | 52 | 111 | 5.7 | 11 | .5 | .2 | 2.8 |
| 22 | .4 | .9 | 7.2 | 83 | 46 | 36 | 46 | 91 | 4.8 | 9.0 | .4 | .2 | .3 |
| 23 | .6 | 1.1 | 91 | 111 | 91 | 38 | 41 | 76 | 4.5 | 7.4 | .4 | .2 | .3 |
| 24 | .5 | 1.1 | 280 | 83 | 154 | 49 | 41 | 65 | 4.3 | 6.8 | .7 | .2 | .3 |
| 25 | 6.3 | .6 | 292 | 76 | 103 | 58 | 38 | 55 | 4.3 | 5.7 | .4 | .3 | .2 |
| 26 | 8.8 | .7 | 163 | 72 | 68 | 68 | 34 | 127 | 4.5 | 5.1 | .4 | .4 | .3 |
| 27 | 10 | .6 | 103 | 83 | 49 | 127 | 30 | 172 | 3.3 | 4.5 | .4 | .5 | .2 |
| 28 | 6.9 | .5 | 72 | 62 | 43 | 119 | 29 | 127 | 2.6 | 3.8 | .6 | .4 | .2 |
| 29 | 5.5 | .6 | 52 | 58 | ------- | 95 | 29 | 103 | 52 | 3.1 | .4 | .3 | .2 |
| 30 | 4.9 | .5 | 43 | 55 | ------- | 91 | 43 | 79 | 224 | 2.1 | .8 | .2 | .2 |
| 31 | 3.8 | ------- | 21 | 52 | ------- | 99 | ------- | 68 | ------- | 2.0 | 1.1 | ------- | .2 |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| **1932–33** | | | | | |
| October | 10 | 0.08 | 2.01 | 0.029 | 0.03 |
| November | 10 | .5 | 2.55 | .036 | .04 |
| December | 292 | .5 | 38.0 | .543 | .63 |
| January | 192 | 6 | 42.1 | .601 | .69 |
| February | 154 | 19 | 47.0 | .671 | .70 |
| March | 127 | 12 | 45.5 | .650 | .75 |
| April | 154 | 29 | 74.0 | 1.06 | 1.18 |
| May | 328 | 46 | 151 | 2.16 | 2.47 |
| June | 224 | 2.6 | 27.4 | 3.91 | .44 |
| July | 559 | 2.0 | 75.0 | 1.07 | 1.23 |
| August | 3.1 | .4 | .98 | .014 | .02 |
| September | 1.1 | .2 | .48 | .007 | .008 |
| The year | 559 | .08 | 42.3 | 6.04 | 8.19 |
| **1933** | | | | | |
| October | 2.8 | .2 | .3 | .004 | .004 |

NOTE.—Discharge Nov. 1, 2, 4–6, 1933, 0.2 second-foot; Nov. 3, 1933, 0.3 second-foot.

### IOWA RIVER AT MARSHALLTOWN, IOWA

LOCATION.—Chain gage in sec. 23, T. 84 N., R. 18 W., at Third Avenue Bridge, 1 mile north of Marshalltown. Asher Creek, 1 mile above station, and Burnett Creek, 1 mile below, enter from left.

DRAINAGE AREA.—1,500 square miles (revised 1933).

RECORDS AVAILABLE.—May 1915 to September 1927; February to September 1933. February to August 1903 at old dam site 1 mile above present station.

DISCHARGE.—Maximum during period, 16,600 second-feet Apr. 3 (gage height, 15.37 feet); minimum, 32 second-feet Aug. 21 (gage height, 1.96 feet).

1915–27, 1933: Maximum, 42,000 second-feet June 4, 1918 (gage height, 17.74 feet); minimum, about 2 second-feet Nov. 24, 1917. Average, 12 years (1915–27), 706 second-feet.

REMARKS.—Records fair. Slight diurnal fluctuation caused by operation of power plant at Eldora.

*Discharge, in second-feet, 1933*

| Day | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 980 | 160 | 7,620 | 528 | 980 | 206 | 47 | 66 |
| 2 | 980 | 160 | 11,500 | 528 | 980 | 206 | 136 | 64 |
| 3 | 980 | 152 | 15,700 | 528 | 935 | 206 | 102 | 62 |
| 4 | 565 | 152 | 12,700 | 528 | 935 | 196 | 122 | 60 |
| 5 | 327 | 144 | 8,920 | 565 | 765 | 186 | 122 | 57 |
| 6 | 254 | 206 | 6,570 | 1,020 | 765 | 186 | 122 | 54 |
| 7 | [a] 240 | 186 | 5,890 | 1,070 | 725 | 241 | 129 | 55 |
| 8 | [a] 210 | 177 | 4,890 | 1,070 | 685 | 241 | 129 | 57 |
| 9 | [a] 200 | 168 | 4,120 | 1,120 | 645 | 254 | 136 | 55 |
| 10 | [a] 180 | 152 | 4,120 | 1,120 | 358 | 177 | 144 | 53 |
| 11 | [a] 160 | 102 | 4,020 | 1,120 | 327 | 144 | 136 | 59 |
| 12 | [a] 150 | 83 | 3,920 | 1,160 | 282 | 136 | 136 | 54 |
| 13 | | 108 | 3,830 | 1,600 | 268 | 115 | 129 | 102 |
| 14 | | 160 | 3,400 | 1,600 | 254 | 115 | 122 | 108 |
| 15 | [a] 140 | 160 | 2,660 | 1,600 | 229 | 108 | 129 | 108 |
| 16 | | 160 | 2,600 | 1,650 | 206 | 108 | 122 | 115 |
| 17 | [a] 160 | 168 | 2,550 | 1,650 | 186 | 108 | 65 | 108 |
| 18 | [a] 160 | 177 | 2,160 | 2,160 | 152 | 102 | 62 | 108 |
| 19 | [a] 170 | 177 | 2,060 | 2,720 | 115 | 102 | 57 | 102 |
| 20 | [a] 210 | 186 | 1,800 | 3,400 | 108 | 96 | 40 | 96 |
| 21 | 241 | 196 | 1,400 | 2,160 | 115 | 89 | 32 | 96 |
| 22 | 241 | 217 | 1,070 | 2,160 | 115 | 108 | 108 | 89 |
| 23 | 217 | 217 | 1,020 | 2,060 | 144 | 177 | 102 | 89 |
| 24 | 217 | 268 | 980 | 2,060 | 152 | 66 | 96 | 89 |
| 25 | 186 | 297 | 980 | 2,000 | 177 | 62 | 96 | 96 |
| 26 | 168 | 297 | 980 | 1,350 | 177 | 59 | 89 | 96 |
| 27 | 160 | 358 | 565 | 1,070 | 177 | 57 | 83 | 96 |
| 28 | 160 | 645 | 565 | 1,020 | 144 | 54 | 83 | 89 |
| 29 | ------- | 1,070 | 565 | 1,020 | 144 | 50 | 77 | 89 |
| 30 | ------- | 2,380 | 565 | 980 | 136 | 51 | 72 | 89 |
| 31 | ------- | 5,580 | ------- | 980 | ------- | 49 | 72 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| February | 980 | 140 | 288 | 0.192 | 0.20 |
| March | 5,580 | 83 | 473 | .315 | .36 |
| April | 15,700 | 565 | 3,990 | 2.66 | 2.97 |
| May | 3,400 | 528 | 1,410 | .940 | 1.08 |
| June | 980 | 108 | 379 | .253 | .28 |
| July | 254 | 49 | 131 | .087 | .10 |
| August | 144 | 32 | 99.9 | .067 | .08 |
| September | 115 | 53 | 82.0 | .055 | .06 |

[a] Estimated.

### IOWA RIVER AT IOWA CITY, IOWA

LOCATION.—Water-stage recorder in sec. 15, T. 79 N., R. 6 W., 200 feet below Burlington Street highway bridge in Iowa City and 25 feet below hydraulic laboratory of University of Iowa. Zero of gage at elevation 39.00 feet, Iowa City datum, since Oct. 1, 1922 (erroneous date published in Water-Supply Paper 730).

DRAINAGE AREA.—3,140 square miles.

RECORDS AVAILABLE.—June 1903 to July 1906, October 1913 to September 1933.

DISCHARGE.—Maximum during year, 8,700 second-feet Apr. 10 (gage height, 49.02 feet); minimum, 36 second-feet Dec. 9 (gage height, 38.76 feet).

1903–6, 1913–33: Maximum, 36,200 second-feet June 7, 1918 (gage height, 58.45 feet, present datum); practically no flow Sept. 3, 1925, caused by regulation. Average, 23 years (1903–6, 1913–33), 1,560 second-feet.

REMARKS.—Records fair. Considerable diurnal fluctuation occurs at low stages, owing to operation of power plant above station.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 178 | 295 | 605 | 1,430 | 1,300 | 910 | 3,480 | 1,380 | 2,380 | 1,060 | 315 | 131 |
| 2 | 277 | 326 | 700 | 1,060 | 1,450 | 756 | 3,840 | 1,730 | 2,140 | 1,560 | 303 | 158 |
| 3 | 331 | 304 | 775 | 910 | 1,660 | 687 | 4,040 | 1,990 | 1,990 | 1,260 | 345 | 129 |
| 4 | 430 | 241 | 725 | 965 | 1,020 | 725 | 4,040 | 1,920 | 1,920 | 1,160 | 308 | 182 |
| 5 | 290 | 272 | 775 | 965 | 700 | 700 | 4,220 | 1,990 | 2,620 | 910 | 280 | 128 |
| 6 | 300 | 326 | 880 | 995 | 480 | 625 | 4,420 | 2,060 | 2,300 | 793 | 290 | 117 |
| 7 | 259 | 376 | 613 | 1,030 | 875 | 675 | 4,720 | 2,270 | 1,840 | 737 | 481 | 135 |
| 8 | 335 | 475 | 221 | 1,060 | 913 | 650 | 5,560 | 3,120 | 1,700 | 723 | 412 | 130 |
| 9 | 351 | 484 | 83 | 965 | 850 | 625 | 7,720 | 2,620 | 1,590 | 940 | 272 | 126 |
| 10 | 426 | 938 | 138 | 938 | 725 | 550 | 8,700 | 2,460 | 1,480 | 640 | 252 | 211 |
| 11 | 300 | 1,060 | 282 | 930 | 673 | 570 | 8,080 | 2,620 | 1,350 | 640 | 241 | 145 |
| 12 | 331 | 1,200 | 286 | 725 | 675 | 535 | 7,020 | 3,040 | 1,260 | 640 | 264 | 127 |
| 13 | 300 | 1,200 | 364 | 650 | 675 | 560 | 6,320 | 4,220 | 1,160 | 583 | 186 | 112 |
| 14 | 295 | 1,120 | 385 | 610 | 650 | 610 | 5,880 | 3,480 | 1,090 | 549 | 151 | 192 |
| 15 | 261 | 1,080 | 380 | 590 | 625 | 525 | 5,340 | 3,200 | 970 | 497 | 211 | 165 |
| 16 | 250 | 695 | 376 | 625 | 615 | 575 | 4,420 | 3,200 | 910 | 446 | 208 | 189 |
| 17 | 264 | 535 | 349 | 750 | 560 | 595 | 3,300 | 2,950 | 910 | 446 | 208 | 242 |
| 18 | 268 | 675 | 344 | 725 | 560 | 625 | 2,780 | 3,120 | 822 | 407 | 200 | 203 |
| 19 | 272 | 700 | 300 | 775 | 594 | 650 | 2,540 | 3,660 | 793 | 411 | 238 | 173 |
| 20 | 254 | 461 | 315 | 700 | 938 | 605 | 2,300 | 4,220 | 737 | 390 | 205 | 218 |
| 21 | 246 | 484 | 272 | 700 | 938 | 675 | 2,140 | 4,820 | 737 | 374 | 151 | 224 |
| 22 | 300 | 394 | 272 | 775 | 965 | 675 | 1,990 | 5,140 | 710 | 337 | 156 | 158 |
| 23 | 322 | 560 | 916 | 782 | 965 | 675 | 1,920 | 5,660 | 666 | 345 | 192 | 164 |
| 24 | 286 | 600 | 2,080 | 1,260 | 800 | 650 | 1,800 | 6,560 | 629 | 334 | 203 | 166 |
| 25 | 408 | 560 | 2,010 | 2,120 | 812 | 725 | 1,700 | 7,130 | 671 | 347 | 190 | 109 |
| 26 | 358 | 650 | 2,010 | 1,760 | 825 | 825 | 1,590 | 7,130 | 588 | 437 | 170 | 279 |
| 27 | 367 | 570 | 2,240 | 1,460 | 923 | 850 | 1,480 | 6,100 | 588 | 428 | 187 | 151 |
| 28 | 313 | 506 | 2,800 | 1,300 | 1,030 | 910 | 1,450 | 3,480 | 609 | 398 | 113 | 242 |
| 29 | 331 | 525 | 2,970 | 1,180 | ------- | 1,060 | 1,380 | 3,300 | 978 | 386 | 189 | 120 |
| 30 | 286 | 700 | 2,630 | 1,240 | ------- | 1,300 | 1,380 | 3,040 | 1,160 | 325 | 208 | 176 |
| 31 | 259 | ------- | 2,010 | 1,240 | ------- | 2,010 | ------- | 2,620 | ------- | 307 | 178 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 430 | 178 | 305 | 0.097 | 0.11 |
| November | 1,200 | 241 | 610 | .194 | .22 |
| December | 2,970 | 83 | 939 | .299 | .34 |
| January | 2,120 | 590 | 1,010 | .322 | .37 |
| February | 1,660 | 480 | 850 | .271 | .28 |
| March | 2,010 | 525 | 745 | .237 | .27 |
| April | 8,700 | 1,380 | 3,850 | 1.23 | 1.37 |
| May | 7,130 | 1,380 | 3,560 | 1.13 | 1.30 |
| June | 2,620 | 588 | 1,240 | .395 | .44 |
| July | 1,560 | 307 | 606 | .193 | .22 |
| August | 481 | 113 | 236 | .075 | .09 |
| September | 279 | 112 | 167 | .053 | .06 |
| The year | 8,700 | 83 | 1,180 | .376 | 5.07 |

### IOWA RIVER AT WAPELLO, IOWA

LOCATION.—Chain gage in sec. 27, T. 74 N., R. 3 W., at highway bridge half a mile from Wapello and 20 miles above mouth of river.

DRAINAGE AREA.—12,480 square miles.

RECORDS AVAILABLE.—February 1915 to September 1933.

DISCHARGE.—Maximum during year, 62,000 second-feet Apr. 7 (gage height, 15.38 feet); minimum, 840 second-feet Sept. 13 (gage height, −0.45 foot).

1915-33: Maximum, 67,500 second-feet Mar. 19, 1929 (gage height, 16.22 feet); minimum, about 400 second-feet Dec. 15–17, 1916. Average, 18 years, 6,150 second-feet.

REMARKS.—Records fair. Stage-discharge relation affected by ice Dec. 10–22 and Feb. 6–21. Gage-height record and results of several discharge measurements furnished by Mississippi River Power Co.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,950 | 1,810 | 2,300 | 6,270 | 4,950 | 3,760 | 9,990 | 5,870 | 9,110 | 4,430 | 1,550 | 925 |
| 2 | 1,950 | 1,810 | 2,370 | 5,680 | 4,770 | 3,920 | 13,900 | 6,270 | 8,330 | 4,090 | 1,680 | 925 |
| 3 | 1,950 | 1,810 | 2,520 | 4,950 | 4,950 | 3,920 | 15,700 | 8,080 | 7,830 | 4,090 | 1,680 | 925 |
| 4 | 2,090 | 1,810 | 2,670 | 4,430 | 4,950 | 5,130 | 17,700 | 6,910 | 7,130 | 3,600 | 1,950 | 880 |
| 5 | 1,950 | 1,810 | 2,820 | 3,920 | 2,370 | 4,430 | 24,700 | 7,130 | 6,690 | 3,600 | 1,680 | 840 |
| 6 | 1,810 | 1,810 | 2,970 | 4,090 | | 3,920 | 52,900 | 8,330 | 7,590 | 3,440 | 1,550 | 840 |
| 7 | 1,810 | 1,810 | 3,120 | 4,260 | | 3,600 | 60,800 | 8,330 | 6,430 | 3,600 | 1,420 | 840 |
| 8 | 1,810 | 2,230 | 2,970 | 4,260 | | 3,440 | 53,500 | 9,130 | 6,070 | 3,760 | 2,090 | 840 |
| 9 | 1,810 | 2,370 | 1,480 | 4,090 | | 3,280 | 42,600 | 10,300 | 5,680 | 4,260 | 1,810 | 840 |
| 10 | 2,240 | 2,970 | | 3,920 | | 3,280 | 34,200 | 9,700 | 5,490 | 4,950 | 1,620 | 840 |
| 11 | 2,670 | 3,120 | | 3,760 | | 2,970 | 29,100 | 9,990 | 5,130 | 4,600 | 1,480 | 840 |
| 12 | 2,230 | 3,280 | | 2,970 | | 2,670 | 25,700 | 12,200 | 4,950 | 3,760 | 1,420 | 840 |
| 13 | 1,950 | 3,600 | | 3,440 | | 2,670 | 23,300 | 15,400 | 4,600 | 3,280 | 1,300 | 840 |
| 14 | 1,810 | 3,920 | | 3,280 | 2,420 | 2,820 | 20,600 | 17,300 | 4,260 | 2,970 | 1,240 | 925 |
| 15 | 1,810 | 3,760 | | 2,970 | | 2,820 | 17,700 | 15,000 | 4,090 | 3,760 | 1,240 | 970 |
| 16 | 1,810 | 3,360 | 1,460 | 2,970 | | 2,670 | 15,400 | 12,500 | 3,920 | 3,600 | 1,240 | 1,020 |
| 17 | 1,810 | 2,970 | | 2,970 | | 2,670 | 13,200 | 12,500 | 3,920 | 2,670 | 1,300 | 970 |
| 18 | 1,680 | 2,670 | | 3,280 | | 2,670 | 11,600 | 12,500 | 3,600 | 2,370 | 1,180 | 1,020 |
| 19 | 1,680 | 2,370 | | 3,760 | | 2,820 | 9,990 | 11,500 | 3,440 | 2,090 | 1,180 | 1,020 |
| 20 | 1,680 | 2,370 | | 3,600 | | 3,440 | 9,410 | 13,500 | 3,280 | 1,950 | 1,180 | 880 |
| 21 | 1,680 | 2,370 | | 3,280 | | 2,970 | 8,590 | 18,500 | 3,280 | 1,950 | 1,180 | 840 |
| 22 | 1,550 | 2,090 | | 2,970 | 5,680 | 2,970 | 8,080 | 23,300 | 3,120 | 1,950 | 1,070 | 840 |
| 23 | 1,680 | 2,230 | 2,820 | 3,600 | 5,680 | 2,820 | 7,590 | 28,100 | 3,120 | 1,950 | 970 | 840 |
| 24 | 1,810 | 2,230 | 7,360 | 4,090 | 6,070 | 2,670 | 7,130 | 28,600 | 3,120 | 1,950 | 925 | 840 |
| 25 | 1,950 | 2,230 | 13,500 | 3,920 | 4,770 | 2,670 | 6,910 | 26,600 | 3,280 | 1,950 | 1,070 | 880 |
| 26 | 2,090 | 2,230 | 10,600 | 4,700 | 4,260 | 3,120 | 6,480 | 25,200 | 3,280 | 1,810 | 1,070 | 1,240 |
| 27 | 2,090 | 2,370 | 9,130 | 5,490 | 3,920 | 3,600 | 6,270 | 21,100 | 3,120 | 1,810 | 1,070 | 1,550 |
| 28 | 2,090 | 2,520 | 8,330 | 5,870 | 3,760 | 3,600 | 5,870 | 16,500 | 2,970 | 1,810 | 1,020 | 1,300 |
| 29 | 2,010 | 2,520 | 8,590 | 6,070 | ------- | 3,600 | 5,680 | 11,800 | 2,970 | 1,680 | 970 | 1,180 |
| 30 | 1,950 | 2,230 | 9,130 | 6,070 | ------- | 3,760 | 5,870 | 11,800 | 3,120 | 1,620 | 925 | 1,120 |
| 31 | 1,950 | ------- | 7,700 | 5,130 | ------- | 5,310 | -------- | 10,300 | ------- | 1,550 | 925 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 2,670 | 1,550 | 1,910 | 0.153 | 0.18 |
| November | 3,920 | 1,810 | 2,490 | .199 | .22 |
| December | 13,500 | ---------- | 3,850 | .308 | .36 |
| January | 6,270 | 2,970 | 4,200 | .337 | .39 |
| February | 6,070 | ---------- | 3,390 | .272 | .28 |
| March | 5,310 | 2,670 | 3,350 | .268 | .31 |
| April | 60,800 | 5,680 | 19,000 | 1.52 | 1.70 |
| May | 28,600 | 5,870 | 14,000 | 1.12 | 1.29 |
| June | 9,410 | 2,970 | 4,770 | .382 | .43 |
| July | 4,950 | 1,550 | 2,930 | .235 | .27 |
| August | 2,090 | 925 | 1,320 | .106 | .12 |
| September | 1,550 | 840 | 955 | .077 | .09 |
| The year | 60,800 | ---------- | 5,180 | .415 | 5.64 |

### RALSTON CREEK AT IOWA CITY, IOWA

LOCATION.—Water-stage recorder in NE¼ sec. 11, T. 79 N., R. 6 W., at highway bridge on Rochester Road, just outside city limits of Iowa City.
DRAINAGE AREA.—3.0 square miles.
RECORDS AVAILABLE.—October 1932 to September 1933.
DISCHARGE.—Maximum during year, 174 second-feet Dec. 24 (gage height, 3.30 feet); no flow at various times during year.
REMARKS.—Records fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0.3 | 0.3 | 0.5 | 1.1 | [a] 0.1 | 3.2 | 1.8 | 0.7 | 3.5 | 0 |
| 2 | 0 | .3 | .3 | .4 | .5 | [a] .1 | 2.2 | 4.6 | .7 | .7 | .8 |
| 3 | 0.3 | .3 | .6 | .3 | .5 | [a] .2 | 1.6 | 2.9 | .5 | .9 | .1 |
| 4 | .7 | .2 | .8 | .3 | | .4 | 1.7 | 1.3 | .9 | 1.6 | 0 |
| 5 | .1 | .2 | .4 | .2 | | .4 | 3.3 | 5.0 | .8 | .4 | 0 |
| 6 | .1 | .3 | .3 | .3 | | .4 | 2.8 | 3.0 | .6 | .2 | 0 |
| 7 | .1 | .3 | .2 | .3 | | .4 | 1.6 | 7.7 | .4 | .2 | 6.2 |
| 8 | .1 | 2.6 | .1 | .3 | | .3 | 1.5 | 4.8 | .3 | 3.1 | .3 |
| 9 | .3 | 1.3 | .1 | .2 | | .1 | 1.3 | 4.0 | .3 | 1.1 | .3 |
| 10 | 3.1 | 1.0 | .1 | .4 | | .1 | 1.3 | 3.5 | .4 | .4 | .1 |
| 11 | .4 | .7 | | .1 | [a] 0 | .2 | 1.0 | 5.1 | .2 | .3 | .1 |
| 12 | .2 | .4 | | .2 | | .3 | 1.0 | 14.0 | .1 | .3 | 0 |
| 13 | .3 | .4 | | .2 | | .4 | 2.1 | 5.7 | .1 | .1 | 0 |
| 14 | .3 | .4 | | .2 | | .4 | 1.6 | 3.4 | .1 | .1 | 0 |
| 15 | .3 | .4 | [a] 0 | .3 | | .3 | 1.1 | 2.6 | .1 | .1 | 0 |
| 16 | .3 | .3 | | .5 | | .3 | .9 | 2.3 | .1 | .1 | 0 |
| 17 | .2 | .4 | | .2 | | .3 | .9 | 1.8 | .1 | .1 | 0 |
| 18 | .2 | .4 | | 4.5 | | 1.0 | .9 | 2.3 | .1 | .1 | 0 |
| 19 | .1 | .2 | | 1.0 | | 1.0 | .8 | 1.6 | .1 | .1 | 0 |
| 20 | .2 | .3 | .1 | .3 | | .4 | .7 | 6.0 | .1 | 0 | 0 |
| 21 | .1 | .2 | .6 | .6 | | .4 | .7 | 3.7 | .1 | 0 | 0 |
| 22 | .8 | .1 | .7 | .9 | | .9 | .7 | 2.7 | .1 | 0 | 0 |
| 23 | 1.3 | .2 | 33.6 | .5 | | 1.0 | .6 | 2.1 | .1 | .4 | 0 |
| 24 | .3 | .2 | 33.3 | .5 | [a] .1 | .7 | .6 | 1.5 | .1 | 0 | 0 |
| 25 | .7 | .3 | 2.3 | .6 | | 2.4 | .6 | 1.4 | 1.3 | 0 | 0 |
| 26 | .5 | .2 | .9 | .5 | | 1.7 | .5 | 1.9 | .1 | 0 | 0 |
| 27 | .4 | .1 | .8 | .7 | | 1.3 | .4 | 1.2 | .1 | 0 | 0 |
| 28 | .3 | .1 | .6 | .4 | | .9 | .4 | 2.4 | .2 | 0 | 0 |
| 29 | .3 | .1 | .6 | .4 | | 1.3 | .4 | 2.3 | 11.5 | 0 | 0 |
| 30 | .3 | .3 | .6 | .7 | | 4.2 | .7 | 1.1 | 2.4 | 0 | 0 |
| 31 | .3 | | .2 | .8 | | 7.0 | | .9 | | 0 | 0 |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 3.1 | 0 | 0.406 | 0.135 | 0.16 |
| November | 2.6 | .1 | .417 | .139 | .16 |
| December | 33.6 | 0 | 2.50 | .833 | .96 |
| January | 4.5 | .1 | .558 | .186 | .21 |
| February | 1.1 | 0 | .111 | .037 | .04 |
| March | 7.0 | .1 | .932 | .311 | .36 |
| April | 3.3 | .4 | 1.24 | .413 | .46 |
| May | 14.0 | .9 | 3.37 | 1.12 | 1.30 |
| June | 11.5 | .1 | .757 | .252 | .28 |
| July | 3.5 | 0 | .445 | .148 | .17 |
| August | 6.2 | 0 | .255 | .085 | .10 |
| The year | 33.6 | 0 | .926 | .309 | 4.20 |

[a] Estimated because of ice.

NOTE.—Practically no flow during September.

### CEDAR RIVER AT JANESVILLE, IOWA

LOCATION.—Chain gage in sec. 35, T. 91 N., R. 14 W., at highway bridge in Janesville, 3 miles above junction with Shellrock River.

DRAINAGE AREA.—1,660 square miles.

RECORDS AVAILABLE.—April 1905 to September 1906; May 1915 to September 1927; November 1932 to September 1933.

DISCHARGE.—Maximum during period, 27,700 second-feet Apr. 1 (gage height, 15.43 feet); minimum, 52 second-feet Aug. 21 (gage height, 1.10 feet).

1905–6, 1915–27, 1932–33: Maximum, that of Apr. 1, 1933; minimum, 28 second-feet Oct. 21, 1922.

Average, 12 years (1915–27), 673 second-feet.

REMARKS.—Records fair except those estimated, which are poor. Diurnal fluctuations during low-water periods owing to operation of power plant at Waverly, 9 miles above station.

*Discharge, in second-feet, 1932–33*

| Day | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 168 | 1,140 | 825 | 1,660 | 26,600 | 345 | 78 | 196 | 156 | 128 |
| 2 | | 191 | 605 | 900 | 1,570 | 25,200 | 375 | 118 | 825 | 156 | 81 |
| 3 | | 164 | 640 | 620 | 1,480 | 13,400 | 468 | 84 | 980 | 177 | 152 |
| 4 | | 191 | 470 | 500 | 825 | 5,440 | 502 | 470 | 1,140 | 173 | 122 |
| 5 | | 191 | 468 | | 825 | 3,310 | 535 | 375 | 980 | 177 | 118 |
| 6 | | 168 | 468 | | 712 | 2,650 | 535 | 263 | 862 | 147 | 125 |
| 7 | | 168 | 345 | | 712 | 2,540 | 470 | 468 | 535 | 173 | 132 |
| 8 | | | 309 | | 570 | 2,980 | 297 | 321 | 375 | 181 | 132 |
| 9 | | a 160 | 333 | | 605 | 2,340 | 321 | 321 | 375 | 186 | 152 |
| 10 | | | 375 | a 320 | 470 | 1,480 | 502 | 210 | 274 | 177 | 132 |
| 11 | | | 375 | | 502 | 1,220 | 712 | 205 | 297 | 168 | 114 |
| 12 | | | 405 | | 535 | 1,060 | 825 | 236 | 291 | 160 | 125 |
| 13 | | a 150 | 375 | | 570 | 940 | 750 | 375 | 220 | 135 | 164 |
| 14 | 470 | | 470 | | 535 | 825 | 640 | 283 | 252 | 122 | 205 |
| 15 | 220 | | 280 | | 502 | 788 | 640 | 191 | 205 | 128 | 168 |
| 16 | 375 | | 274 | | 470 | 675 | 502 | 210 | 210 | 173 | 168 |
| 17 | a 300 | | 268 | a 340 | 405 | 605 | 470 | 215 | 173 | 160 | 173 |
| 18 | a 250 | | 303 | a 340 | 375 | 640 | 405 | 168 | 210 | 215 | 160 |
| 19 | a 240 | a 170 | 246 | a 350 | 470 | 605 | 980 | 156 | 196 | 181 | 160 |
| 20 | | | 321 | a 360 | 258 | 605 | 2,760 | 186 | 210 | 220 | 101 |
| 21 | a 220 | | 280 | a 380 | 220 | 605 | 1,220 | 181 | 196 | 54 | 111 |
| 22 | | 345 | 825 | a 400 | 280 | 470 | 1,140 | 177 | 210 | 181 | 118 |
| 23 | 220 | 375 | 1,750 | a 400 | 268 | 405 | 1,060 | 220 | 201 | 135 | 191 |
| 24 | 327 | 980 | a 3,000 | a 450 | 236 | 375 | 900 | 156 | 147 | 139 | 152 |
| 25 | 177 | 2,980 | a 2,600 | a 500 | 321 | 470 | 675 | 173 | 147 | 135 | 132 |
| 26 | 297 | 1,840 | a 1,900 | a 1,950 | 375 | 535 | 605 | 147 | 164 | 122 | 181 |
| 27 | 210 | 1,570 | 1,220 | a 3,150 | 315 | 470 | 570 | 181 | 181 | 122 | 128 |
| 28 | 327 | 980 | 712 | 2,980 | 405 | 375 | 405 | 210 | 177 | 122 | 132 |
| 29 | 201 | 940 | 468 | | 1,220 | 375 | 321 | 173 | 173 | 132 | 101 |
| 30 | 241 | 750 | 788 | | 4,140 | 375 | 315 | 160 | 160 | 125 | 118 |
| 31 | | 940 | 1,140 | | 7,390 | | 375 | | 152 | 122 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| November 14–30 | | | 266 | 0.160 | 0.10 |
| December | 2,980 | | 490 | .295 | .34 |
| January | 3,000 | 246 | 747 | .450 | .52 |
| February | 3,150 | | 653 | .393 | .41 |
| March | 7,390 | 220 | 943 | .568 | .65 |
| April | 26,600 | 375 | 3,280 | 1.98 | 2.21 |
| May | 2,760 | 297 | 665 | .401 | .46 |
| June | 470 | 78 | 224 | .135 | .15 |
| July | 1,140 | 147 | 346 | .208 | .24 |
| August | 220 | 54 | 153 | .092 | .11 |
| September | 205 | 81 | 139 | .084 | .09 |

a Discharge estimated.

### CEDAR RIVER AT CEDAR RAPIDS, IOWA

LOCATION.—Water-stage recorder in sec. 28, T. 83 N., R. 7 W., in central part of Cedar Rapids, 1,000 feet above Eighth Avenue Bridge and half a mile below dam.

DRAINAGE AREA.—6,640 square miles.

RECORDS AVAILABLE.—February 1903 to September 1933.

DISCHARGE.—Maximum during year ending Sept. 30, 1933, 64,800 second-feet Apr. 4 (gage height, 18.6 feet); minimum, 456 second-feet July 18 (gage height, 2.52 feet).

1903–33: Maximum, 72,000 second-feet Mar. 19, 1929 (gage height, 20.1 feet); minimum, 190 second-feet Sept. 9, 1921. Average, 30 years, 3,100 second-feet.

Flood of June 1851 reached a stage of about 20 feet (discharge of about 65,000 second-feet as previously published was probably low).

REMARKS.—Records good except those for estimated periods and for periods of extreme high and low water, which are fair. Gage-height record for 1928–32 furnished by Iowa Electric Co. and R. S. Toogood. Results of several discharge measurements furnished by Corps of Engineers, United States Army. Considerable diurnal fluctuation during low-water periods caused by operation of power plant half a mile above station.

*Discharge, in second-feet, of Cedar River at Cedar Rapids, Iowa, 1927–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1927–28 | | | | | | | | | | | | |
| 1 | 2,300 | 1,600 | 1,390 | | | 4,450 | 2,830 | 2,730 | 1,500 | 2,130 | 1,190 | 14,000 |
| 2 | 3,040 | 1,550 | 1,080 | | | 5,350 | 2,660 | 2,440 | 1,450 | 2,040 | 1,210 | 11,200 |
| 3 | 3,120 | 1,530 | 819 | [a] 1,800 | [a] 1,280 | 5,650 | 2,580 | 2,350 | 1,390 | 1,960 | 1,530 | 9,780 |
| 4 | 3,510 | 1,530 | 660 | | | 5,650 | 2,480 | 2,240 | 1,370 | 2,480 | 2,370 | 9,780 |
| 5 | 4,600 | 1,530 | 670 | | | 5,350 | 2,680 | 2,190 | 1,370 | 2,480 | 4,450 | 8,470 |
| 6 | 5,650 | 1,450 | 830 | 1,580 | 1,340 | 4,300 | 3,150 | 2,280 | 1,180 | 2,210 | 4,900 | 7,200 |
| 7 | 5,650 | 1,470 | | 1,510 | 5,200 | 3,730 | 3,840 | 2,150 | 1,240 | 2,240 | 5,650 | 5,700 |
| 8 | 4,900 | 1,470 | [a] 850 | 1,320 | 5,500 | 3,480 | 4,020 | 2,190 | 1,300 | 2,190 | 6,420 | 5,350 |
| 9 | 4,300 | 1,480 | | 1,470 | 5,500 | 4,750 | 4,160 | 2,280 | 1,480 | 3,280 | 6,890 | 5,050 |
| 10 | 3,870 | 1,430 | | 1,370 | 5,700 | 5,050 | 4,300 | 2,370 | 1,340 | 2,600 | 5,960 | 4,900 |
| 11 | 3,650 | 1,480 | | 1,360 | 7,040 | 6,270 | 4,020 | 2,300 | 1,310 | 2,060 | 4,600 | 7,360 |
| 12 | 3,650 | 1,450 | | 1,420 | 14,300 | 6,420 | 3,810 | 2,190 | 1,070 | 1,960 | 3,760 | 6,580 |
| 13 | 3,310 | 1,470 | | 1,420 | 12,100 | 9,120 | 3,510 | 1,960 | 1,370 | 2,860 | 3,280 | 5,700 |
| 14 | 3,010 | 1,500 | | 1,550 | 9,780 | 8,790 | 3,530 | 1,810 | 1,040 | 2,000 | 2,880 | 5,200 |
| 15 | 2,780 | 1,980 | | 1,650 | 8,790 | 9,120 | 3,730 | 1,760 | 1,240 | 1,550 | 2,580 | 5,500 |
| 16 | 2,630 | 2,020 | [a] 1,000 | 1,830 | 9,120 | 8,470 | 4,020 | 1,880 | 1,210 | 1,530 | 2,370 | 5,650 |
| 17 | 2,480 | 1,940 | | 1,870 | 8,790 | 6,420 | 4,160 | 1,960 | 1,390 | 1,450 | 2,730 | 5,960 |
| 18 | 2,460 | 1,580 | | | 8,470 | 5,650 | 4,160 | 2,830 | 1,370 | 1,740 | 2,830 | 6,580 |
| 19 | 2,320 | 1,480 | | [a] 1,700 | 6,580 | 4,750 | 4,450 | 4,160 | 1,700 | 2,280 | 2,370 | 6,580 |
| 20 | 2,260 | 1,450 | | | 4,450 | 4,160 | 4,600 | 2,810 | 2,390 | 4,160 | 2,510 | 5,960 |
| 21 | 2,260 | 1,370 | | | 2,910 | 3,560 | 4,600 | 2,660 | 3,090 | 3,790 | 3,840 | 5,050 |
| 22 | 2,260 | 1,420 | | | | 3,390 | 5,050 | 2,580 | 3,450 | 2,780 | 3,370 | 4,300 |
| 23 | 2,150 | 1,450 | | | | 3,230 | 5,350 | 2,420 | 3,450 | 2,300 | 3,840 | 3,870 |
| 24 | 1,980 | 1,450 | | | [a] 2,800 | 3,180 | 5,200 | 2,350 | 3,700 | 2,000 | 4,450 | 3,650 |
| 25 | 1,880 | 1,450 | | | | 3,120 | 4,750 | 2,320 | 3,670 | 1,720 | 4,900 | 3,340 |
| 26 | 1,770 | 1,430 | [a] 1,300 | [a] 1,620 | | 3,200 | 4,160 | 2,170 | 3,230 | 1,580 | 6,420 | 3,090 |
| 27 | 1,760 | 1,480 | | | 2,730 | 3,390 | 4,160 | 2,020 | 2,600 | 1,550 | 8,470 | 2,940 |
| 28 | 1,680 | 1,450 | | | 3,260 | 3,260 | 3,370 | 1,790 | 2,370 | 1,550 | 17,100 | 2,780 |
| 29 | 1,700 | 1,450 | | | 3,790 | 3,120 | 3,200 | 1,770 | 2,300 | 1,470 | 28,500 | 2,700 |
| 30 | 1,580 | 1,400 | | | | 2,990 | 2,960 | 1,630 | 2,210 | 1,320 | 24,100 | 2,600 |
| 31 | 1,600 | ------- | | | | 2,860 | ------- | 1,500 | ------- | 1,300 | 18,300 | ------ |

[a] Estimated.

*Discharge, in second-feet, of Cedar River at Cedar Rapids, Iowa, 1927–33*—Contd.

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1928–29 | | | | | | | | | | | | |
| 1 | 2,480 | 4,450 | 4,900 | [a] 3,850 | | 3,420 | 7,200 | 19,100 | 4,300 | 3,070 | 1,630 | 1,260 |
| 2 | 2,420 | 4,750 | 4,750 | | | 3,730 | 7,040 | 14,400 | 4,600 | 2,440 | 2,730 | 1,220 |
| 3 | 2,280 | 7,200 | 5,050 | | [a] 2,500 | 3,810 | 6,890 | 10,800 | 4,750 | 2,210 | 2,600 | 1,140 |
| 4 | 2,260 | 8,470 | 5,350 | [a] 2,650 | | 3,870 | 7,670 | 8,790 | 4,450 | 2,190 | 2,390 | 1,180 |
| 5 | 2,730 | 8,790 | 4,900 | | | 4,020 | 7,990 | 7,360 | 4,020 | 2,040 | 2,600 | 1,280 |
| 6 | 2,560 | 8,470 | 4,450 | | | 4,450 | 8,150 | 6,420 | 3,730 | 2,210 | 2,730 | 1,220 |
| 7 | 2,350 | 7,510 | 3,700 | [a] 2,300 | | 5,500 | 9,780 | 5,650 | 3,480 | 2,130 | 2,530 | 1,080 |
| 8 | 2,300 | 6,890 | 3,230 | | | 5,350 | 12,900 | 5,500 | 3,150 | 1,980 | 2,370 | 1,180 |
| 9 | 2,280 | 7,040 | 3,510 | | | 5,650 | 14,800 | 5,050 | 2,990 | 1,900 | 2,260 | 1,150 |
| 10 | 2,130 | 7,200 | 3,200 | | [a] 2,450 | 5,700 | 14,400 | 4,900 | 2,830 | 1,880 | 2,260 | 1,390 |
| 11 | 2,080 | 7,510 | 3,480 | [a] 2,550 | | 5,350 | 13,700 | 4,900 | 2,730 | 1,720 | 2,370 | 1,450 |
| 12 | 2,260 | 7,830 | 4,160 | | | 7,670 | 11,500 | 5,350 | 2,830 | 1,740 | 2,130 | 1,390 |
| 13 | 2,730 | 7,510 | 5,050 | | | 14,400 | 9,780 | 5,960 | 2,940 | 1,850 | 2,060 | 1,450 |
| 14 | 2,530 | 6,890 | 6,270 | | | 21,900 | 9,780 | 6,740 | 2,630 | 2,080 | 1,850 | 1,370 |
| 15 | 2,260 | 6,580 | 7,200 | | | 32,100 | 10,800 | 7,830 | 2,510 | 2,910 | 1,370 | 1,370 |
| 16 | 2,240 | 6,120 | 7,830 | | | 31,700 | 11,200 | 7,360 | 2,580 | 3,510 | 1,370 | 1,370 |
| 17 | 2,600 | 6,890 | 7,990 | | | 40,900 | 10,100 | 6,420 | 2,530 | 3,390 | 1,370 | 1,370 |
| 18 | 4,600 | 9,120 | 7,830 | | | 66,200 | 8,790 | 5,650 | 2,530 | 3,230 | 1,360 | 1,370 |
| 19 | 5,050 | 9,120 | 7,360 | | | 67,200 | 7,990 | 5,200 | 2,390 | 2,700 | 1,310 | 1,370 |
| 20 | 6,420 | 9,120 | 6,120 | | [a] 2,350 | 54,200 | 7,510 | 4,900 | 2,300 | 2,480 | 1,280 | 1,370 |
| 21 | 7,990 | 8,470 | 5,200 | [a] 2,800 | | 39,000 | 7,040 | 4,600 | 2,130 | 2,320 | 1,300 | 1,220 |
| 22 | 8,790 | 7,830 | 4,020 | | | 29,900 | 6,420 | 4,300 | 2,110 | 2,150 | 1,260 | 1,220 |
| 23 | 8,790 | 7,040 | 3,790 | | | 25,000 | 6,120 | 4,300 | 2,060 | 1,940 | 1,220 | 1,160 |
| 24 | 7,830 | 6,420 | 3,310 | | | 19,900 | 5,700 | 4,160 | 2,000 | 1,830 | 1,310 | 1,190 |
| 25 | 6,420 | 5,700 | 3,280 | | | 14,000 | 6,270 | 4,020 | 1,810 | 1,810 | 1,240 | 1,190 |
| 26 | 5,200 | 5,500 | 3,870 | | | 11,800 | 6,580 | 3,790 | 1,920 | 1,810 | 1,260 | 1,160 |
| 27 | 4,750 | 5,200 | 4,600 | | [a] 2,900 | 10,500 | 6,890 | 3,760 | 2,020 | 1,770 | 1,250 | 1,150 |
| 28 | 4,750 | 4,900 | 5,200 | | | 9,120 | 8,790 | 3,790 | 1,700 | 1,740 | 1,250 | 1,140 |
| 29 | 4,450 | 4,750 | 5,500 | [a] 2,650 | | 8,150 | 13,300 | 3,760 | 2,020 | 1,620 | 1,240 | 1,190 |
| 30 | 4,160 | 4,750 | 5,200 | | | 7,830 | 20,300 | 4,020 | 1,980 | 1,580 | 1,220 | 1,280 |
| 31 | 4,450 | | 4,600 | | | 7,510 | | 4,300 | | 1,480 | 1,420 | |
| 1929–30 | | | | | | | | | | | | |
| 1 | 1,310 | 1,080 | [a] 550 | | | 4,160 | 1,600 | 1,920 | 1,630 | 2,660 | 1,480 | 902 |
| 2 | 1,300 | 1,080 | | | | 3,230 | 1,530 | 2,210 | 1,620 | 2,530 | 1,420 | 830 |
| 3 | 1,310 | 1,080 | | | | 2,240 | 1,500 | 2,130 | 1,560 | 2,420 | 1,400 | 866 |
| 4 | 1,310 | 1,370 | | | | 2,060 | 1,530 | 1,830 | 1,560 | 2,370 | 1,310 | 830 |
| 5 | 1,190 | 1,370 | | [a] 750 | [a] 700 | 3,180 | 1,560 | 2,060 | 1,880 | 2,880 | 1,280 | 786 |
| 6 | 1,260 | 1,370 | [a] 450 | | | 2,960 | 1,450 | 2,040 | 2,020 | 3,010 | 1,300 | 775 |
| 7 | 1,260 | 1,370 | | | | 2,420 | 1,450 | 2,320 | 2,240 | 3,280 | 1,260 | 842 |
| 8 | 1,280 | 1,220 | | | | 2,240 | 1,320 | 2,660 | 2,390 | 3,340 | 1,360 | 808 |
| 9 | 1,280 | 1,220 | | | [a] 850 | 2,390 | 1,600 | 3,180 | 2,560 | 3,180 | 1,320 | 786 |
| 10 | 1,260 | 1,080 | | | | 2,240 | 1,340 | 3,730 | 2,510 | 3,200 | 1,280 | 775 |
| 11 | 1,150 | 1,370 | | [a] 800 | [a] 1,020 | 2,130 | 1,310 | 3,370 | 2,370 | 2,810 | 1,280 | 704 |
| 12 | 1,220 | 1,370 | | | | 1,920 | 1,390 | 3,200 | 2,260 | 2,810 | 1,160 | 704 |
| 13 | 1,120 | 1,370 | | | 1,220 | 1,900 | 1,140 | 3,760 | 2,170 | 2,780 | 1,220 | 683 |
| 14 | 1,120 | 1,220 | [a] 550 | | 1,220 | 1,880 | 1,250 | 4,300 | 2,420 | 2,680 | 1,190 | 652 |
| 15 | 1,090 | 1,530 | | | 1,220 | 1,700 | 1,370 | 4,020 | 4,900 | 2,510 | 1,190 | 620 |
| 16 | 1,140 | 1,700 | | | 1,220 | 1,680 | 1,500 | 3,590 | 6,580 | 2,420 | 1,180 | 610 |
| 17 | 1,520 | 1,560 | | | 1,220 | 1,700 | 1,620 | 3,370 | 6,890 | 2,300 | 1,190 | 725 |
| 18 | 1,370 | 1,530 | | | 1,220 | 1,830 | 1,650 | 3,200 | 6,890 | 2,020 | 1,160 | 771 |
| 19 | 1,370 | 1,220 | [a] 600 | | 1,880 | 1,870 | 1,650 | 3,010 | 6,740 | 1,870 | 1,110 | 794 |
| 20 | 1,080 | 1,530 | | | 3,530 | 2,040 | 2,170 | 2,860 | 6,120 | 1,760 | 1,090 | 794 |
| 21 | 1,080 | 1,080 | | | 5,650 | 2,040 | 2,760 | 2,580 | 4,900 | 1,790 | 1,070 | 694 |
| 22 | 1,080 | 1,080 | [a] 700 | [a] 700 | 9,780 | 2,060 | 3,010 | 2,830 | 5,350 | 1,720 | 1,040 | 620 |
| 23 | 1,220 | 1,220 | | | 10,800 | 2,040 | 3,280 | 3,590 | 5,200 | 1,620 | 1,070 | 683 |
| 24 | 1,080 | 1,080 | | | 12,200 | 1,870 | 3,340 | 3,040 | 4,450 | 1,580 | 1,070 | 683 |
| 25 | 1,080 | 1,080 | | | 11,200 | 1,960 | 3,010 | 2,730 | 4,450 | 1,550 | 1,030 | 782 |
| 26 | 1,080 | 1,220 | [a] 600 | | 8,790 | 1,790 | 2,700 | 2,480 | 3,670 | 1,510 | 1,050 | 992 |
| 27 | 1,080 | 1,370 | | | 6,120 | 1,700 | 2,440 | 2,300 | 3,260 | 1,510 | 1,020 | 1,050 |
| 28 | 950 | 1,370 | | | 5,050 | 1,680 | 2,300 | 2,170 | 2,940 | 1,770 | 989 | 1,010 |
| 29 | 950 | 1,080 | | | | 1,630 | 2,170 | 2,020 | 3,040 | 1,870 | 963 | 828 |
| 30 | 1,080 | 1,080 | [a] 700 | | | 1,560 | 2,130 | 1,870 | 2,780 | 1,810 | 976 | 828 |
| 31 | 1,220 | | | | | 1,510 | | 1,770 | | 1,630 | 854 | |

[a] Estimated.

*Discharge, in second-feet, of Cedar River at Cedar Rapids, Iowa, 1927–33*—Contd.

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1930–31 | | | | | | | | | | | | |
| 1 | 817 | 694 | 806 | | 1,120 | 992 | 992 | 1,030 | 704 | 630 | 488 | 472 |
| 2 | 782 | 748 | 736 | | 1,140 | 1,050 | 878 | 965 | 725 | 620 | 504 | 662 |
| 3 | 610 | 771 | 725 | | 1,090 | 1,010 | 952 | 940 | 694 | 620 | 504 | 992 |
| 4 | 714 | 736 | 662 | | 1,160 | 1,020 | 1,070 | 852 | 672 | 620 | 504 | 1,330 |
| 5 | 771 | 748 | 725 | | 1,280 | 965 | 1,330 | 878 | 672 | 641 | 512 | 1,160 |
| 6 | 771 | 683 | 725 | | 1,300 | 940 | 1,490 | 840 | 725 | 590 | 530 | 890 |
| 7 | 940 | 760 | 748 | [a] 400 | 1,240 | 952 | 1,540 | 828 | 662 | 570 | 504 | 817 |
| 8 | 928 | 782 | 760 | | 1,220 | 878 | 1,600 | 806 | 641 | 570 | 488 | 630 |
| 9 | 928 | 704 | 782 | | 1,160 | 890 | 1,560 | 840 | 620 | 600 | 472 | 560 |
| 10 | 915 | 672 | 869 | | 1,140 | 902 | 1,500 | 902 | 600 | 630 | 464 | 580 |
| 11 | 902 | 662 | 902 | | 878 | 902 | 1,330 | 978 | 540 | 652 | 440 | 540 |
| 12 | 835 | 714 | 928 | | 1,120 | 852 | 1,220 | 890 | 550 | 794 | 426 | 540 |
| 13 | 840 | 714 | 940 | | 1,160 | 852 | 1,100 | 915 | 630 | 1,610 | 412 | 540 |
| 14 | 840 | 620 | 865 | | 915 | 878 | 1,010 | 902 | 560 | 1,010 | 405 | 488 |
| 15 | 852 | 771 | 928 | | 940 | 878 | 1,010 | 940 | 560 | 704 | 398 | 472 |
| 16 | 940 | 828 | 662 | [a] 360 | 1,020 | 828 | 1,130 | 890 | 520 | 610 | 398 | 464 |
| 17 | 965 | 865 | 662 | | 1,300 | 817 | 1,380 | 828 | 550 | 540 | 391 | 456 |
| 18 | 890 | 852 | 520 | | 1,180 | 840 | 1,280 | 1,030 | 550 | 504 | 391 | 464 |
| 19 | 878 | 782 | [a] 450 | | 1,120 | 794 | 1,450 | 840 | 520 | 550 | 405 | 817 |
| 20 | 865 | 928 | | | 965 | 771 | 1,670 | 794 | 504 | 590 | 426 | 760 |
| 21 | 840 | 992 | [a] 400 | [a] 400 | 992 | 760 | 1,770 | 683 | 504 | 520 | 405 | 1,060 |
| 22 | 828 | 1,140 | | | 978 | 771 | 1,610 | 725 | 504 | 472 | 391 | 1,220 |
| 23 | 828 | 1,010 | | | 928 | 760 | 1,470 | 652 | 512 | 472 | 384 | 1,320 |
| 24 | 736 | 1,030 | | | 978 | 794 | 1,420 | 704 | 512 | 472 | 384 | 1,220 |
| 25 | 748 | 878 | | [a] 500 | 1,010 | 782 | 1,270 | 683 | 620 | 472 | 377 | 2,000 |
| 26 | 748 | 704 | [a] 460 | | 1,020 | 782 | 1,240 | 672 | 890 | 480 | 370 | 3,020 |
| 27 | 782 | 630 | | 600 | 1,050 | 771 | 1,270 | 662 | 890 | 480 | 384 | 2,830 |
| 28 | 817 | 630 | | 641 | 1,030 | 590 | 1,140 | 662 | 806 | 480 | 426 | 2,830 |
| 29 | 782 | 600 | | 890 | ------- | 965 | 1,140 | 662 | 748 | 472 | 405 | 2,860 |
| 30 | 806 | 704 | [a] 400 | 978 | ------- | 992 | 1,020 | 662 | 714 | 472 | 391 | 2,490 |
| 31 | 794 | ------- | | 992 | ------- | 865 | ------- | 662 | ------- | 472 | 391 | ------ |
| 1931–32 | | | | | | | | | | | | |
| 1 | 2,160 | 828 | 7,820 | 4,430 | [a] 2,150 | 6,560 | 16,700 | 3,490 | 2,860 | 5,030 | 1,690 | 2,590 |
| 2 | 1,940 | 878 | 6,250 | 5,030 | | 7,500 | 18,600 | 3,520 | 2,800 | 4,430 | 1,710 | 2,340 |
| 3 | 1,670 | 865 | 5,630 | 5,480 | | 8,790 | 17,100 | 3,410 | 2,690 | 4,130 | 1,580 | 2,040 |
| 4 | 1,600 | 794 | 5,030 | 5,180 | | 10,800 | 14,000 | 3,270 | 2,670 | 3,840 | 1,560 | 1,670 |
| 5 | 1,490 | 840 | 4,580 | 5,180 | [a] 1,900 | [a] 10,000 | 11,200 | 3,130 | 2,670 | 3,580 | 1,540 | 1,500 |
| 6 | 1,450 | 771 | 4,280 | 4,730 | | [a] 9,200 | 9,750 | 3,240 | 2,570 | 3,190 | 1,450 | 1,450 |
| 7 | 1,430 | 782 | 3,840 | 4,130 | | [a] 8,500 | 9,450 | 4,130 | 2,690 | 3,160 | 1,300 | 1,470 |
| 8 | 1,220 | 760 | 3,610 | 3,070 | | [a] 6,000 | 9,780 | 4,580 | 3,350 | 3,100 | 1,400 | 1,350 |
| 9 | 1,220 | 782 | 3,380 | 2,940 | | 3,550 | 9,780 | 5,480 | 3,580 | 3,190 | 1,270 | 1,250 |
| 10 | 1,490 | 771 | 3,070 | 2,770 | [a] 2,350 | 2,720 | 10,100 | 7,020 | 4,280 | 3,580 | 1,280 | 1,240 |
| 11 | 2,020 | 806 | 3,550 | 2,000 | | 2,990 | 10,100 | 8,140 | 4,580 | 3,210 | 1,600 | 1,190 |
| 12 | 2,180 | 1,850 | 4,280 | 2,300 | | 3,270 | 9,120 | 8,790 | 4,280 | 3,380 | 1,560 | 1,560 |
| 13 | 2,200 | 2,040 | 5,030 | 3,050 | [a] 2,700 | 3,550 | 7,500 | 8,460 | 3,980 | 4,280 | 1,540 | 1,790 |
| 14 | 2,160 | 2,070 | 5,480 | 3,720 | | 3,270 | 6,400 | 6,400 | 3,580 | 4,580 | 1,470 | 1,520 |
| 15 | 1,960 | 2,460 | 5,480 | 5,030 | | 3,840 | 5,630 | 4,730 | 3,300 | 4,280 | 2,070 | 1,350 |
| 16 | 1,630 | 2,370 | 4,880 | 6,560 | | 4,730 | 5,330 | 4,430 | 3,240 | 3,700 | 2,300 | 1,350 |
| 17 | 1,560 | 2,390 | 4,730 | 6,560 | [a] 3,050 | 4,430 | 4,880 | 4,280 | 3,380 | 3,270 | 3,050 | 1,380 |
| 18 | 1,220 | 3,070 | 4,430 | 5,330 | | 4,730 | 4,580 | 5,030 | 5,780 | 2,890 | 2,220 | 1,330 |
| 19 | 1,470 | 3,520 | 4,130 | 5,030 | | 5,030 | 4,280 | 4,480 | 6,560 | 2,460 | 1,850 | 1,270 |
| 20 | 1,240 | 4,280 | 3,980 | 5,330 | [a] 3,500 | 4,580 | 4,130 | 4,880 | 6,870 | 2,180 | 1,710 | 1,400 |
| 21 | 1,180 | 4,580 | 3,840 | 4,880 | | 4,580 | 3,980 | 3,980 | 8,790 | 2,090 | 1,540 | 1,610 |
| 22 | 1,180 | 4,280 | 3,840 | [a] 4,700 | | 4,580 | 3,700 | 3,550 | 12,500 | 2,090 | 1,490 | 1,450 |
| 23 | 1,120 | 5,940 | 3,980 | | 3,550 | 3,980 | 3,490 | 3,270 | 17,100 | 1,900 | 1,370 | 1,420 |
| 24 | 992 | 7,500 | 4,130 | | 3,840 | 4,430 | 3,470 | 3,020 | 13,300 | 1,810 | 1,330 | 1,300 |
| 25 | 992 | 7,820 | 4,130 | [a] 4,100 | 4,130 | 5,030 | 3,350 | 2,690 | 7,980 | 1,770 | 1,330 | 1,280 |
| 26 | 1,050 | 9,120 | 4,280 | | 3,840 | 6,870 | 3,270 | 2,640 | 6,870 | 1,770 | 1,270 | 1,160 |
| 27 | 915 | 11,800 | 4,280 | | 4,130 | 4,730 | 3,190 | 2,540 | 7,020 | 1,650 | 1,250 | 1,140 |
| 28 | 1,120 | 16,300 | 4,280 | [a] 3,700 | 4,730 | 7,340 | 3,130 | 2,570 | 5,940 | 1,610 | 1,600 | 1,090 |
| 29 | 915 | 15,600 | 3,980 | | 5,030 | 9,120 | 3,270 | 3,160 | 5,480 | 1,630 | 2,040 | 1,090 |
| 30 | 890 | 11,200 | 3,840 | [a] 2,850 | ------- | 11,800 | 3,380 | 3,270 | 5,480 | 1,810 | 2,040 | 1,060 |
| 31 | 852 | ------- | 3,980 | | ------- | 14,000 | ------- | 3,330 | ------- | 1,670 | 2,300 | ------ |

[a] Estimated.

*Discharge, in second-feet, of Cedar River at Cedar Rapids, Iowa, 1927–33*—Contd.

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1932–33 | | | | | | | | | | | | |
| 1 | 1,050 | 978 | 1,240 | 2,440 | 2,880 | 3,440 | 9,450 | 2,320 | 3,470 | 1,280 | 928 | 580 |
| 2 | 1,070 | 978 | 1,330 | 1,730 | 2,770 | 5,030 | 17,800 | 3,020 | 2,960 | 1,220 | 890 | 652 |
| 3 | 1,050 | 965 | 1,450 | 1,790 | 2,070 | 3,380 | 50,800 | 2,800 | 2,800 | 1,250 | 992 | 641 |
| 4 | 1,020 | 1,010 | 1,710 | 1,960 | 1,650 | 4,130 | 63,300 | 2,940 | 2,690 | 1,960 | 840 | 580 |
| 5 | 1,010 | 1,010 | 1,560 | 2,090 | 1,470 | 3,780 | 49,400 | 2,990 | 2,540 | 2,340 | 828 | 620 |
| 6 | 1,030 | 978 | 1,380 | 1,900 | 1,270 | 2,200 | 31,200 | 2,960 | 2,460 | 2,500 | 828 | 570 |
| 7 | 978 | 1,050 | 1,350 | 1,790 | [a] 1,100 | 2,090 | 19,900 | 3,100 | 2,540 | 2,420 | 782 | 570 |
| 8 | 978 | 1,120 | 1,370 | 1,650 | [a] 1,100 | 2,040 | 14,400 | 3,640 | 2,570 | 2,990 | 794 | 641 |
| 9 | 978 | 1,370 | 1,270 | 1,730 | [a] 1,000 | 1,850 | 11,800 | 3,470 | 2,340 | 2,720 | 794 | 630 |
| 10 | 1,020 | 1,520 | 878 | 1,500 | [a] 1,000 | 1,630 | 10,800 | 3,470 | 2,180 | 1,940 | 806 | 590 |
| 11 | 1,020 | 1,690 | | 1,710 | | 1,300 | 10,100 | 3,780 | 2,020 | 1,610 | 782 | 610 |
| 12 | 1,020 | | | 1,480 | | 1,580 | 8,790 | 5,940 | 1,830 | 1,450 | 805 | 600 |
| 13 | 992 | | | 1,130 | | 1,450 | 7,660 | 5,180 | 1,630 | 1,280 | 600 | 652 |
| 14 | 1,010 | | | 1,370 | | 1,600 | 6,870 | 4,730 | 1,670 | 1,070 | 600 | 771 |
| 15 | 1,020 | [a] 900 | | 1,070 | | 1,540 | 6,100 | 4,280 | 1,450 | 1,070 | 641 | 760 |
| 16 | 952 | | [a] 850 | 1,200 | [a] 900 | 1,500 | 5,630 | 4,280 | 1,540 | 978 | 620 | 725 |
| 17 | 1,010 | 978 | | 1,490 | | 1,520 | 5,030 | 3,840 | 1,580 | 806 | 772 | 641 |
| 18 | 978 | 1,100 | | 1,190 | | 1,620 | 4,730 | 3,550 | 1,300 | 865 | 641 | 683 |
| 19 | 978 | 1,420 | | 1,180 | | 1,770 | 4,130 | 5,330 | 1,280 | 978 | 580 | 704 |
| 20 | 952 | 1,100 | | 1,180 | | 1,620 | 3,980 | 8,460 | 1,280 | 704 | 570 | 610 |
| 21 | 952 | 1,300 | [a] 900 | 1,180 | [a] 1,000 | 1,560 | 3,640 | 10,100 | 1,220 | 954 | 725 | 590 |
| 22 | 1,030 | 878 | [a] 1,000 | 1,300 | [a] 1,100 | 1,220 | 3,330 | 12,600 | 1,130 | 952 | 748 | 610 |
| 23 | 1,030 | 915 | 1,520 | 1,420 | [a] 1,400 | 1,370 | 3,160 | 11,800 | 1,160 | 1,070 | 736 | 590 |
| 24 | 992 | 1,250 | 2,520 | 1,940 | 1,790 | 1,520 | 2,990 | 9,450 | 1,140 | 1,020 | 736 | 590 |
| 25 | 1,020 | 1,300 | [a] 3,610 | 2,960 | 1,790 | 1,580 | 2,860 | 7,340 | 1,300 | 940 | 600 | 610 |
| 26 | 1,030 | 1,580 | [a] 4,700 | 3,980 | 1,940 | 1,490 | 2,620 | 6,100 | 1,380 | 828 | 580 | 852 |
| 27 | 1,020 | 1,320 | 5,780 | 4,430 | 1,920 | 1,710 | 2,500 | 5,180 | 1,100 | 902 | 714 | 620 |
| 28 | 1,030 | 1,090 | 6,250 | 4,580 | 2,180 | 1,790 | 2,490 | 4,580 | 1,130 | 915 | 652 | 641 |
| 29 | 928 | 1,010 | 6,100 | 3,440 | ------- | 1,790 | 2,390 | 4,430 | 1,250 | 782 | 570 | 630 |
| 30 | 940 | 1,190 | 4,730 | 2,860 | ------- | 3,050 | 2,390 | 4,130 | 1,070 | 978 | 600 | 694 |
| 31 | 978 | ------- | 3,840 | 2,620 | ------- | 6,720 | ------- | 3,700 | ------- | 794 | 600 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| 1927–28 | | | | | |
| October | 5,650 | 1,580 | 2,910 | 0.438 | 0.50 |
| November | 2,020 | 1,370 | 1,520 | .229 | .26 |
| December | ------- | 660 | 1,070 | .161 | .19 |
| January | ------- | ------- | 1,620 | .244 | .28 |
| February | 14,300 | ------- | 5,030 | .758 | .82 |
| March | 9,120 | 2,860 | 4,910 | .739 | .85 |
| April | 5,350 | 2,480 | 3,850 | .580 | .65 |
| May | 4,160 | 1,500 | 2,260 | .340 | .39 |
| June | 3,700 | 1,040 | 1,930 | .291 | .32 |
| July | 4,160 | 1,300 | 2,150 | .324 | .37 |
| August | 28,500 | 1,190 | 6,250 | .941 | 1.08 |
| September | 14,000 | 2,600 | 5,890 | .887 | .99 |
| The year | 28,500 | 660 | 3,270 | .492 | 6.70 |
| 1928–29 | | | | | |
| October | 8,790 | 2,080 | 4,000 | .602 | .69 |
| November | 9,120 | 4,450 | 6,930 | 1.04 | 1.16 |
| December | 7,990 | 3,200 | 5,000 | .753 | .87 |
| January | ------- | ------- | 2,720 | .410 | .47 |
| February | ------- | ------- | 2,470 | .372 | .39 |
| March | 67,200 | 3,420 | 18,400 | 2.77 | 3.19 |
| April | 20,300 | 5,700 | 9,510 | 1.43 | 1.60 |
| May | 19,100 | 3,760 | 6,230 | .938 | 1.08 |
| June | 4,750 | 1,700 | 2,800 | .422 | .47 |
| July | 3,510 | 1,480 | 2,180 | .328 | .38 |
| August | 2,730 | 1,220 | 1,760 | .265 | .31 |
| September | 1,450 | 1,080 | 1,260 | .190 | .21 |
| The year | 67,200 | 1,080 | 5,300 | .798 | 10.82 |

[a] Estimated.

*Discharge, in second-feet, of Cedar River at Cedar Rapids, Iowa, 1927–33*—Contd.

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| 1929–30 | | | | | |
| October | 1,530 | 950 | 1,190 | 0.179 | 0.21 |
| November | 1,700 | 1,080 | 1,280 | .193 | .22 |
| December | | | 566 | .085 | .10 |
| January | | | 727 | .110 | .13 |
| February | 12,200 | | 3,270 | .492 | .51 |
| March | 4,160 | 1,510 | 2,120 | .319 | .37 |
| April | 3,340 | 1,140 | 1,900 | .286 | .32 |
| May | 4,300 | 1,770 | 2,780 | .419 | .48 |
| June | 6,890 | 1,560 | 3,580 | .539 | .60 |
| July | 3,340 | 1,510 | 2,300 | .346 | .40 |
| August | 1,480 | 854 | 1,170 | .176 | .20 |
| September | 1,050 | 610 | 781 | .118 | .13 |
| The year | 12,200 | | 1,790 | .270 | 3.67 |
| 1930–31 | | | | | |
| October | 965 | 610 | 830 | .125 | .14 |
| November | 1,140 | 600 | 778 | .117 | .13 |
| December | 940 | | 627 | .094 | .11 |
| January | 992 | | 471 | .071 | .08 |
| February | 1,300 | 878 | 1,090 | .164 | .17 |
| March | 1,050 | 590 | 866 | .130 | .15 |
| April | 1,770 | 878 | 1,290 | .194 | .22 |
| May | 1,030 | 662 | 817 | .123 | .14 |
| June | 890 | 504 | 630 | .095 | .11 |
| July | 1,610 | 472 | 610 | .092 | .11 |
| August | 530 | 370 | 431 | .065 | .07 |
| September | 3,020 | 456 | 1,150 | .173 | .19 |
| The year | 3,020 | | 795 | .120 | 1.62 |
| 1931–32 | | | | | |
| October | 2,200 | 852 | 1,440 | .217 | .25 |
| November | 16,300 | 760 | 4,240 | .638 | .71 |
| December | 7,820 | 3,070 | 4,450 | .670 | .77 |
| January | 6,560 | 2,000 | 4,230 | .637 | .73 |
| February | 5,030 | | 2,960 | .446 | .48 |
| March | 14,000 | 2,720 | 6,140 | .925 | 1.07 |
| April | 18,600 | 3,130 | 7,420 | 1.12 | 1.25 |
| May | 8,790 | 2,540 | 4,380 | .660 | .76 |
| June | 17,100 | 2,570 | 5,540 | .834 | .93 |
| July | 5,030 | 1,610 | 2,940 | .443 | .51 |
| August | 3,050 | 1,250 | 1,670 | .252 | .29 |
| September | 2,590 | 1,060 | 1,450 | .218 | .24 |
| The year | 18,600 | 760 | 3,900 | .587 | 7.99 |
| 1932–33 | | | | | |
| October | 1,070 | 928 | 1,000 | .151 | .17 |
| November | 1,690 | | 1,120 | .169 | .19 |
| December | 6,250 | | 2,030 | .306 | .35 |
| January | 4,580 | 1,070 | 2,010 | .303 | .35 |
| February | 2,880 | | 1,370 | .206 | .21 |
| March | 6,720 | 1,220 | 2,220 | .334 | .39 |
| April | 63,300 | 2,390 | 12,300 | 1.85 | 2.06 |
| May | 12,600 | 2,320 | 5,140 | .774 | .89 |
| June | 3,470 | 1,070 | 1,800 | .271 | .30 |
| July | 2,990 | 704 | 1,340 | .202 | .23 |
| August | 992 | 570 | 721 | .109 | .13 |
| September | 852 | 570 | 642 | .097 | .11 |
| The year | 63,300 | | 2,640 | .398 | 5.38 |

### SHELL ROCK RIVER NEAR CLARKSVILLE, IOWA

LOCATION.—Chain gage in T. 92 N., R. 16 W., at highway bridge 1¼ miles northwest of Clarksville and 25 miles above junction with Cedar River.

DRAINAGE AREA.—1,660 square miles.

RECORDS AVAILABLE.—May 1915 to September 1927; November 1932 to September 1933.

DISCHARGE.—Maximum during period, 19,800 second-feet Mar. 31 (gage height, 16.7 feet); minimum, 41 second-feet Aug. 18, 26 (gage height, 0.60 foot).

1915–27, 1932–33: Maximum, that of Mar. 31, 1933; minimum, that of Aug. 18, 26, 1933. Average, 12 years (1915–27), 595 second-feet.

REMARKS.—Records fair. Diurnal fluctuations during low water owing to operation of power plant at Greene, 10 miles upstream.

*Discharge, in second-feet, 1932–33*

| Day | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 92 | | a 500 | | 14,100 | 670 | 585 | 192 | 79 | 59 |
| 2 | | 82 | | a 800 | | 10,500 | 640 | 530 | 1,100 | 81 | 61 |
| 3 | | 123 | | a 550 | a 280 | 8,020 | 612 | 503 | 955 | 88 | 123 |
| 4 | | 81 | | | | 6,400 | 730 | 612 | 825 | 81 | 57 |
| 5 | | 84 | | a 230 | | 5,020 | 640 | 890 | 503 | 61 | 70 |
| 6 | | 82 | | | | 4,780 | 640 | 640 | 423 | 86 | 72 |
| 7 | | | | | | 4,110 | 530 | 558 | 323 | 70 | 70 |
| 8 | | | a 120 | a 150 | | 3,580 | 1,160 | 423 | 228 | 74 | 66 |
| 9 | | | | | a 240 | 3,160 | 955 | 348 | 236 | 81 | 64 |
| 10 | | | | | | 2,960 | 825 | 323 | 182 | 67 | 70 |
| 11 | | | | | | 2,680 | 760 | 314 | 160 | 76 | 56 |
| 12 | | | | | 220 | 2,400 | 760 | 196 | 192 | 74 | 57 |
| 13 | | a 80 | | | 295 | 2,140 | 890 | 164 | 123 | 74 | 81 |
| 14 | | | | | 318 | 1,960 | 760 | 224 | 114 | 61 | 84 |
| 15 | | | | | 236 | 1,800 | 730 | 182 | 100 | 61 | 59 |
| 16 | a 300 | | | a 100 | 220 | 1,630 | 612 | 128 | 114 | 77 | 92 |
| 17 | a 190 | | | | 200 | 1,470 | 558 | 200 | 100 | 64 | 64 |
| 18 | a 180 | | | | 323 | 1,320 | 558 | 171 | 96 | 70 | 82 |
| 19 | a 180 | | a 140 | | 304 | 1,240 | 1,160 | 142 | 100 | 70 | 64 |
| 20 | a 160 | | | | 267 | 1,160 | 3,360 | 111 | 84 | 64 | 64 |
| 21 | a 100 | a 70 | | | 318 | 1,100 | 1,630 | 171 | 92 | 61 | 56 |
| 22 | a 150 | | a 450 | | 200 | 955 | 1,630 | 131 | 96 | 74 | 56 |
| 23 | a 140 | | a 900 | a 150 | 96 | 760 | 1,550 | 96 | 94 | 77 | 60 |
| 24 | a 140 | a 600 | a 950 | a 220 | 164 | 825 | 1,320 | 145 | 84 | 64 | 56 |
| 25 | 121 | a 1,000 | a 700 | a 500 | 192 | 760 | 1,160 | 140 | 106 | 66 | 54 |
| 26 | a 110 | a 400 | a 600 | a 520 | 208 | 760 | 1,020 | 96 | 100 | 61 | 88 |
| 27 | a 110 | a 200 | a 550 | a 500 | 224 | 670 | 890 | 88 | 84 | 67 | 64 |
| 28 | a 180 | a 200 | a 450 | a 400 | 423 | 700 | 825 | 109 | 145 | 64 | 74 |
| 29 | a 110 | a 150 | a 250 | ------ | 3,060 | 612 | 825 | 81 | 88 | 64 | 66 |
| 30 | a 100 | a 130 | a 250 | ------ | 9,160 | 670 | 530 | 82 | 84 | 61 | 61 |
| 31 | ------ | a 130 | a 420 | ------ | 16,800 | ------ | 640 | ------ | 67 | 66 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| November 16–30 | ------ | ------ | 151 | 0.091 | 0.05 |
| December | ------ | ------ | 151 | .091 | .10 |
| January | 950 | ------ | 263 | .158 | .18 |
| February | 800 | ------ | 237 | .143 | .15 |
| March | 16,800 | 96 | 1,160 | .699 | .81 |
| April | 14,100 | 612 | 2,940 | 1.77 | 1.98 |
| May | 3,360 | 530 | 954 | .575 | .66 |
| June | 890 | 81 | 279 | .168 | .19 |
| July | 1,100 | 67 | 232 | .140 | .16 |
| August | 88 | 61 | 70.5 | .042 | .05 |
| September | 123 | 54 | 68.3 | .041 | .05 |

a Discharge estimated.

### LIME CREEK AT MASON CITY, IOWA

LOCATION.—Wire-weight gage in sec. 3, T. 97 N., R. 20 W., at highway bridge in Mason City.
DRAINAGE AREA.—535 square miles.
RECORDS AVAILABLE.—December 1932 to September 1933.
DISCHARGE.—Maximum during period (estimated), 9,400 second-feet Mar. 30 (gage height, 22.15 feet); little or no flow Aug. 30 to Sept. 1.
REMARKS.—Records fair. Some regulation caused by American Beet Sugar Co.'s plant several miles upstream.

*Discharge, in second-feet, 1932–33*

| Day | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ------ | 26 | 463 | 76 | 6,600 | 133 | 86 | 33 | 13 | a 1 |
| 2 | ------ | 24 | 178 | 70 | 4,540 | 144 | 68 | 382 | 13 | 4.5 |
| 3 | ------ | 37 | 133 | 70 | 3,300 | 144 | 81 | 308 | 14 | 10 |
| 4 | ------ | 24 | a 112 | 66 | 2,670 | 128 | 114 | 144 | 19 | 11 |
| 5 | ------ | 36 | a 93 | 65 | 2,340 | 110 | 88 | 104 | 15 | 9 |
| 6 | 30 | 26 | a 68 | 66 | 2,100 | 114 | 77 | 66 | 13 | 11 |
| 7 | 31 | 31 | a 57 | 68 | 1,920 | 104 | 63 | 58 | 13 | 12 |
| 8 | 29 | 26 | a 30 | 71 | 1,470 | 166 | 68 | 37 | 12 | 12 |
| 9 | 28 | 26 | a 23 | 71 | 1,220 | 155 | 48 | 29 | 12 | 7.5 |
| 10 | 28 | 37 | a 19 | 54 | 1,170 | 144 | 51 | 29 | 13 | 6.5 |
| 11 | a 24 | 26 | a 18 | 65 | 1,020 | 144 | 34 | 29 | 13 | 7.5 |
| 12 | 21 | a 25 | a 18 | 63 | a 892 | 144 | 33 | 34 | 12 | 10 |
| 13 | a 21 | a 25 | a 18 | 74 | 765 | 144 | 27 | 29 | 12 | 27 |
| 14 | a 21 | a 25 | a 19 | 84 | 645 | 116 | 27 | 21 | 14 | 16 |
| 15 | a 21 | a 30 | 20 | 32 | 568 | 112 | 30 | 21 | 13 | 15 |
| 16 | a 20 | a 30 | 19 | 62 | 430 | 96 | 30 | 18 | 14 | 18 |
| 17 | a 19 | 29 | 20 | 73 | 430 | 96 | 30 | 18 | 15 | 16 |
| 18 | a 18 | 28 | 23 | 83 | 367 | 82 | 27 | 13 | 14 | 12 |
| 19 | 18 | 24 | 23 | 21 | 337 | 59 | 30 | 29 | 12 | 19 |
| 20 | 26 | 23 | 23 | a 24 | 308 | 214 | 24 | 15 | 12 | 15 |
| 21 | 25 | 26 | 32 | 26 | 266 | 253 | 18 | 13 | 12 | 9 |
| 22 | 19 | a 228 | 32 | 35 | 240 | 240 | 16 | 14 | 11 | 13 |
| 23 | 26 | 430 | 51 | 41 | 214 | 240 | 22 | 26 | 12 | 13 |
| 24 | 42 | 463 | 104 | 41 | 202 | 227 | 24 | 21 | 12 | 6.5 |
| 25 | 99 | 532 | 93 | 38 | 190 | 227 | 12 | 34 | 22 | 9 |
| 26 | 57 | 398 | 91 | 46 | 166 | 190 | 14 | 36 | 12 | 22 |
| 27 | 42 | 190 | 83 | 48 | 144 | 155 | 32 | 16 | 2.5 | 14 |
| 28 | 42 | 108 | 76 | 50 | 144 | 120 | 21 | 16 | 4.5 | 14 |
| 29 | 40 | 91 | ------ | 337 | 125 | a 108 | 14 | 14 | 3.5 | 14 |
| 30 | 32 | 88 | ------ | 6,510 | 131 | 96 | 12 | 14 | a 1 | 9 |
| 31 | a 32 | 190 | ------ | 7,500 | ------ | 86 | ------ | 14 | a 1 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| December 6–31 | 99 | ------ | 31.2 | 0.058 | 0.06 |
| January | 532 | ------ | 107 | .200 | .23 |
| February | 463 | ------ | 69.0 | .129 | .13 |
| March | 7,500 | 21 | 514 | .961 | 1.11 |
| April | 6,600 | 125 | 1,160 | 2.17 | 2.42 |
| May | 253 | 59 | 145 | .271 | .31 |
| June | 114 | 12 | 40.7 | .076 | .08 |
| July | 382 | 13 | 52.7 | .099 | .11 |
| August | 22 | ------ | 11.7 | .022 | .03 |
| September | 22 | ------ | 12.1 | .023 | .03 |

a Estimated or interpolated.

### SKUNK RIVER NEAR AMES, IOWA

LOCATION.—Water-stage recorder in sec. 23, T. 84 N., R. 24 W., at site of old county highway bridge 2½ miles north of Ames, 3½ miles below Feigley Branch, and 5 miles above mouth of Squaw Creek.

DRAINAGE AREA.—320 square miles.

RECORDS AVAILABLE.—July 1920 to August 1927; March to September 1933.

DISCHARGE.—Maximum during period, 1,990 second-feet Apr. 1 (gage height, 6.47 feet); minimum, 0.1 second-foot Aug. 29.

1920–27, 1933: Maximum, about 3,540 second-feet Sept. 17, 1921 (gage height, 9.2 feet); minimum, that of Aug. 29, 1933.

REMARKS.—Records fair except those for periods of extremely low water in August and September, which are poor.

*Discharge, in second-feet, 1933*

| Day | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | | 1,920 | 90 | 70 | 17 | 12 | 0.8 |
| 2 | | 1,360 | 92 | 64 | 20 | 13 | 6.5 |
| 3 | | 778 | 92 | 60 | 25 | 15 | 15 |
| 4 | | 533 | 90 | 60 | 15 | 12 | 17 |
| 5 | | 494 | 90 | 58 | 9.2 | 9.8 | 11 |
| 6 | | 494 | 108 | 54 | 6.5 | 15 | 8.2 |
| 7 | | 438 | 128 | 48 | 5.3 | 38 | 10 |
| 8 | | 368 | 138 | 42 | 5.3 | 29 | 7.0 |
| 9 | | 318 | 135 | 38 | 11 | 20 | 4.9 |
| 10 | | 318 | 122 | 35 | 6.5 | 22 | 3.3 |
| 11 | | 351 | 113 | 31 | 4.9 | 19 | 2.9 |
| 12 | | 286 | 128 | 28 | 4.5 | 13 | 4.9 |
| 13 | | 242 | 159 | 25 | 4.1 | 9.8 | 44 |
| 14 | | 214 | 172 | 24 | 3.3 | 7.6 | 40 |
| 15 | | 200 | 154 | 22 | 2.3 | 5.7 | 24 |
| 16 | | 187 | 154 | 19 | 1.8 | 5.3 | 21 |
| 17 | | 166 | 133 | 17 | 1.5 | 4.9 | 18 |
| 18 | | 154 | 122 | 16 | 1.3 | 3.7 | 16 |
| 19 | | 140 | 169 | 13 | .8 | 3.3 | 14 |
| 20 | | 138 | 573 | 11 | 1.8 | 2.0 | 11 |
| 21 | | 135 | 533 | 11 | 121 | 2.5 | 8.7 |
| 22 | | 124 | 318 | 10 | 302 | 5.3 | 8.7 |
| 23 | | 113 | 242 | 9.8 | 166 | 8.2 | 8.2 |
| 24 | | 111 | 187 | 11 | 88 | 6.1 | 8.2 |
| 25 | | 108 | 144 | 13 | 58 | 4.1 | 9.2 |
| 26 | | 104 | 126 | 28 | 46 | 2.3 | 10 |
| 27 | | 90 | 111 | 21 | 35 | 1.3 | 11 |
| 28 | | 86 | 98 | 14 | 27 | .8 | 9.2 |
| 29 | | 84 | 94 | 11 | 22 | .1 | 7.0 |
| 30 | | 90 | 86 | 9.2 | 18 | .6 | 6.1 |
| 31 | 1,330 | | 77 | | 16 | .8 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| April | 1,920 | 84 | 338 | 1.06 | 1.18 |
| May | 573 | 77 | 161 | .503 | .58 |
| June | 70 | 9.2 | 29.1 | .091 | .10 |
| July | 302 | .8 | 33.7 | .105 | .12 |
| August | 38 | .1 | 9.43 | .029 | .03 |
| September | 44 | .8 | 12.2 | .038 | .04 |

### SKUNK RIVER AT COPPOCK, IOWA

LOCATION.—Chain gage in sec. 1, T. 73 N., R. 8 W., at highway bridge an eighth of a mile above Chicago, Burlington & Quincy Railroad bridge at Coppock and a quarter of a mile above junction with Crooked Creek.

DRAINAGE AREA.—2,890 square miles.

RECORDS AVAILABLE.—October 1913 to September 1933.

DISCHARGE.—Maximum during year, 10,100 second-feet May 26 (gage height, 13.98 feet); minimum, 67 second-feet Sept. 10–12 (gage height, 2.40 feet).

1913–33: Maximum, 25,200 second-feet June 15, 1930 (gage height, 22.13 feet); minimum (estimated), 20 second-feet during parts of December 1930 and January 1931. Average, 17 years (1914–16, 1918–33), 1,480 second-feet.

REMARKS.—Records fair. Stage-discharge relation affected by ice Dec. 9–21, Jan. 13, and Feb. 6–18. Gage-height record and results of several discharge measurements furnished by Mississippi River Power Co.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 289 | 240 | 518 | 1,390 | 812 | 563 | 5,260 | 978 | 2,260 | 759 | 225 | 91 |
| 2 | 272 | 225 | 563 | 1,090 | 866 | 540 | 4,740 | 1,040 | 1,910 | 610 | 211 | 100 |
| 3 | 272 | 225 | 563 | 978 | 1,210 | 518 | 4,340 | 1,210 | 1,770 | 454 | 358 | 91 |
| 4 | 323 | 225 | 658 | 866 | 978 | 474 | 3,620 | 1,090 | 1,640 | 358 | 184 | 87 |
| 5 | 340 | 197 | 658 | 866 | 812 | 454 | 3,530 | 1,700 | 1,450 | 434 | 134 | 83 |
| 6 | 272 | 197 | 610 | 866 | | 454 | 4,060 | 3,040 | 1,330 | 395 | 119 | 83 |
| 7 | 272 | 225 | 563 | 866 | | 434 | 3,700 | 3,880 | 1,270 | 358 | 1,910 | 78 |
| 8 | 256 | 658 | 454 | 759 | | 434 | 2,960 | 3,880 | 1,210 | 340 | 395 | 77 |
| 9 | 289 | 1,450 | | 708 | | 434 | 2,800 | 2,490 | 1,150 | 323 | 211 | 69 |
| 10 | 563 | 1,390 | | 759 | | 395 | 2,340 | 2,120 | 978 | 306 | 171 | 67 |
| 11 | 376 | 1,580 | | 610 | | 358 | 2,120 | 2,560 | 922 | 272 | 158 | 67 |
| 12 | 376 | 1,210 | | 540 | 450 | 340 | 2,720 | 6,860 | 866 | 272 | 146 | 67 |
| 13 | 289 | 1,040 | | 580 | | 323 | 2,340 | 8,260 | 812 | 272 | 146 | 75 |
| 14 | 272 | 922 | | 610 | | 358 | 2,050 | 8,000 | 759 | 240 | 123 | 102 |
| 15 | 256 | 866 | 250 | 658 | | 395 | 1,910 | 4,740 | 658 | 358 | 123 | 98 |
| 16 | 240 | 812 | | 708 | | 414 | 1,700 | 3,200 | 658 | 306 | 119 | 92 |
| 17 | 225 | 708 | | 658 | | 358 | 1,580 | 4,540 | 610 | 184 | 110 | 80 |
| 18 | 225 | 496 | | 866 | | 395 | 1,450 | 4,060 | 563 | 171 | 110 | 73 |
| 19 | 225 | 474 | | 1,040 | 708 | 395 | 1,390 | 3,700 | 563 | 171 | 108 | 146 |
| 20 | 225 | 474 | | 812 | 866 | 414 | 1,330 | 5,910 | 540 | 171 | 108 | 121 |
| 21 | 197 | 496 | | 812 | 1,090 | 454 | 1,270 | 6,860 | 496 | 171 | 108 | 100 |
| 22 | 211 | 474 | 395 | 922 | 1,150 | 496 | 1,150 | 8,400 | 474 | 171 | 108 | 89 |
| 23 | 240 | 563 | 1,090 | 978 | 1,150 | 434 | 1,090 | 8,000 | 454 | 158 | 104 | 91 |
| 24 | 272 | 563 | 3,780 | 1,840 | 1,330 | 434 | 1,040 | 8,950 | 414 | 146 | 102 | 87 |
| 25 | 289 | 563 | 4,840 | 2,190 | 978 | 563 | 978 | 9,960 | 395 | 146 | 100 | 83 |
| 26 | 306 | 563 | 3,620 | 1,700 | 812 | 708 | 922 | 9,960 | 395 | 395 | 98 | 708 |
| 27 | 414 | 518 | 3,200 | 1,330 | 759 | 759 | 922 | 8,950 | 395 | 358 | 100 | 759 |
| 28 | 323 | 454 | 3,360 | 1,150 | 610 | 759 | 866 | 8,400 | 395 | 336 | 110 | 272 |
| 29 | 289 | 563 | 3,280 | 978 | ------- | 866 | 812 | 6,380 | 4,150 | 256 | 110 | 158 |
| 30 | 272 | 496 | 2,050 | 866 | ------- | 978 | 866 | 3,120 | 1,450 | 211 | 83 | 134 |
| 31 | 256 | ------- | 1,640 | 812 | ------- | 5,580 | ------- | 2,720 | ------- | 197 | 92 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 563 | 197 | 288 | 0.100 | 0.12 |
| November | 1,580 | 197 | 629 | .218 | .24 |
| December | 4,840 | ---------- | 1,130 | .391 | .45 |
| January | 2,190 | 540 | 962 | .333 | .38 |
| February | 1,330 | ---------- | 714 | .247 | .26 |
| March | 5,580 | 323 | 661 | .229 | .26 |
| April | 5,260 | 812 | 2,200 | .761 | .85 |
| May | 9,960 | 978 | 5,000 | 1.73 | 1.99 |
| June | 4,150 | 395 | 1,030 | .356 | .40 |
| July | 759 | 146 | 299 | .103 | .12 |
| August | 1,910 | 83 | 203 | .070 | .08 |
| September | 759 | 67 | 141 | .049 | .05 |
| The year | 9,960 | 67 | 1,110 | .384 | 5.20 |

### SKUNK RIVER AT AUGUSTA, IOWA

LOCATION.—Chain gage in sec. 26, T. 69 N., R. 4 W., at highway bridge a third of a mile from Augusta post office and 12.2 miles above mouth. Zero of gage is 528.55 feet, Memphis datum.

DRAINAGE AREA.—4,290 square miles.

RECORDS AVAILABLE.—September to November 1913; May 1915 to September 1933.

DISCHARGE.—Maximum during year, 19,200 second-feet May 13 (gage height, 14.9 feet); minimum, 62 second-feet Sept. 14 (gage height, 1.45 feet).

1913, 1915–33: Maximum, 44,500 second-feet June 17, 1930 (gage height, 22.55 feet); minimum (estimated), 20 second-feet Dec. 30, 1930. Average, 18 years (1915–33), 2,220 second-feet.

REMARKS.—Records fair. Slight regulation at low stages. Discharge estimated because of ice effect Dec. 11–21, Jan. 2–16, and Feb. 5–19. Gage-height record and results of several discharge measurements furnished by Mississippi River Power Co.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 370 | 398 | 695 | 5,840 | 1,320 | 875 | 10,600 | 1,440 | 3,740 | 5,280 | 370 | 140 |
| 2 | 370 | 370 | 658 | | 1,260 | 828 | 9,700 | 1,500 | 3,180 | 3,320 | 398 | 160 |
| 3 | 370 | 370 | 658 | | 1,320 | 828 | 7,600 | 1,380 | 2,760 | 1,320 | 425 | 160 |
| 4 | 425 | 345 | 780 | | 695 | 695 | 6,120 | 1,700 | 2,350 | 928 | 398 | 122 |
| 5 | 398 | 320 | 738 | | | 695 | 5,000 | 2,220 | 2,090 | 738 | 425 | 180 |
| 6 | 425 | 345 | 875 | | | 695 | 5,000 | 4,440 | 1,960 | 620 | 320 | 122 |
| 7 | 425 | 370 | 828 | | | 620 | 5,840 | 5,560 | 1,830 | 620 | 485 | 122 |
| 8 | 398 | 1,140 | 928 | | | 620 | 5,280 | 5,980 | 1,700 | 585 | 7,600 | 122 |
| 9 | 398 | 2,760 | 295 | 1,970 | | 658 | 4,440 | 7,300 | 1,500 | 620 | 2,220 | 105 |
| 10 | 980 | 2,900 | 295 | | | 620 | 3,600 | 4,440 | 1,440 | 485 | 780 | 75 |
| 11 | 1,320 | 2,220 | | | 510 | 550 | 3,320 | 14,900 | 1,260 | 550 | 455 | 105 |
| 12 | 1,090 | 1,960 | | | | 518 | 2,760 | 13,400 | 1,140 | 485 | 270 | 122 |
| 13 | 738 | 1,700 | | | | 550 | 3,320 | 19,200 | 1,040 | 425 | 295 | 75 |
| 14 | 550 | 1,380 | | | | 550 | 3,320 | 17,300 | 980 | 425 | 270 | 62 |
| 15 | 455 | 1,260 | | | | 550 | 3,460 | 14,500 | 875 | 248 | 202 | 90 |
| 16 | 425 | 1,140 | 270 | | | 518 | 2,760 | 8,050 | 780 | 695 | 320 | 90 |
| 17 | 398 | 980 | | 1,380 | | 585 | 2,480 | 6,400 | 695 | 455 | 202 | 122 |
| 18 | 370 | 928 | | 1,040 | | 585 | 2,350 | 7,450 | 695 | 345 | 225 | 105 |
| 19 | 370 | 1,040 | | 8,800 | | 620 | 2,090 | 6,260 | 695 | 295 | 180 | 90 |
| 20 | 345 | 738 | | 4,440 | 780 | 658 | 1,960 | 5,280 | 620 | 320 | 180 | 160 |
| 21 | 345 | 485 | | 2,220 | 980 | 695 | 1,830 | 8,200 | 585 | 320 | 160 | 180 |
| 22 | 295 | 585 | 370 | 1,960 | 1,200 | 695 | 1,700 | 9,850 | 585 | 248 | 202 | 180 |
| 23 | 295 | 620 | 780 | 2,220 | 1,260 | 658 | 1,500 | 11,400 | 550 | 248 | 180 | 140 |
| 24 | 320 | 695 | 7,150 | 1,960 | 1,320 | 738 | 1,380 | 10,500 | 518 | 295 | 180 | 122 |
| 25 | 345 | 780 | 17,100 | 2,480 | 1,260 | 780 | 1,380 | 10,800 | 485 | 270 | 180 | 105 |
| 26 | 518 | 620 | 16,200 | 3,040 | 1,700 | 1,090 | 1,380 | 13,200 | 550 | 320 | 180 | 160 |
| 27 | 518 | 658 | 14,700 | 2,480 | 1,200 | 1,260 | 1,260 | 12,600 | 485 | 270 | 180 | 7,600 |
| 28 | 550 | 518 | 11,900 | 2,090 | 1,090 | 1,260 | 1,200 | 11,100 | 485 | 485 | 225 | 4,720 |
| 29 | 550 | 585 | 11,000 | 1,700 | ------- | 1,200 | 1,140 | 10,300 | 10,200 | 345 | 180 | 3,180 |
| 30 | 455 | 620 | 10,600 | 1,500 | ------- | 1,260 | 1,140 | 8,500 | 13,400 | 345 | 160 | 980 |
| 31 | 425 | ------- | 7,900 | 1,320 | ------- | 5,560 | ------- | 4,720 | ------- | 370 | 180 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,320 | 295 | 491 | 0.114 | 0.13 |
| November | 2,900 | 320 | 961 | .224 | .25 |
| December | 17,100 | ---------- | 3,470 | .809 | .93 |
| January | 8,800 | ---------- | 2,390 | .557 | .64 |
| February | 1,700 | ---------- | 823 | .192 | .20 |
| March | 5,560 | 518 | 904 | .211 | .24 |
| April | 10,600 | 1,140 | 3,500 | .816 | .91 |
| May | 19,200 | 1,380 | 8,380 | 1.95 | 2.25 |
| June | 13,400 | 485 | 1,970 | .459 | .51 |
| July | 5,280 | 248 | 719 | .168 | .19 |
| August | 7,600 | 160 | 582 | .136 | .16 |
| September | 7,600 | 62 | 656 | .153 | .17 |
| The year | 19,200 | 62 | 2,080 | .485 | 6.58 |

### DES MOINES RIVER NEAR JACKSON, MINN.

LOCATION.—Chain gage in sec. 28, T. 103 N., R. 35 W., 8 miles northwest of Jackson. (Present gage not referred to previous datum.)

RECORDS AVAILABLE.—August 1930 to September 1933. May 1909 to December 1913 at a site 8 miles downstream.

DISCHARGE.—Maximum recorded during period, 1,600 second-feet Mar. 29 (gage height, 6.80 feet); minimum, 0.8 second-foot Oct. 3, 4, and 6 (gage height, 0.70 foot).

1909–13, 1930–33: Maximum, 1,690 second-feet June 29, 1909 (gage height, 10.00 feet); no flow at times in 1931.

REMARKS.—Records good except those for period of ice effect, Mar. 1–26, which are poor. No record Nov. 2 to Feb. 28.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.2 | 2.4 | 104 | 330 | 62 | 28 | 9.0 | 10 | 285 |
| 2 | 1.2 | | 72 | 205 | 61 | 72 | 53 | 20 | 187 |
| 3 | .8 | | 37 | 139 | 55 | 733 | 42 | 20 | 224 |
| 4 | .8 | | 74 | 110 | 51 | 162 | 36 | 19 | 146 |
| 5 | 1.0 | | 40 | 97 | 49 | 132 | 29 | 18 | 97 |
| 6 | .8 | | 23 | 90 | 46 | 110 | 20 | 23 | 79 |
| 7 | 1.2 | | 42 | 65 | 42 | 84 | 18 | 19 | 61 |
| 8 | 1.2 | | | 55 | 53 | 63 | 11 | 18 | 47 |
| 9 | 1.2 | | | 53 | 70 | 59 | 9.0 | 15 | 44 |
| 10 | 1.2 | | | 49 | 69 | 55 | 7.2 | 13 | 36 |
| 11 | 1.2 | | 30 | 46 | 60 | 49 | 5.7 | 10 | 34 |
| 12 | 1.6 | | | 47 | 55 | 42 | 4.1 | 10 | 36 |
| 13 | 2.0 | | | 47 | 51 | 37 | 4.1 | 5.7 | 34 |
| 14 | 2.0 | | | 46 | 49 | 26 | 3.7 | 4.9 | 34 |
| 15 | 2.4 | | 40 | 44 | 44 | 20 | 3.2 | 4.1 | 32 |
| 16 | 2.4 | | 40 | 42 | 39 | 15 | 2.8 | 4.1 | 39 |
| 17 | 2.4 | | 82 | 42 | 34 | 12 | 2.3 | 3.7 | 42 |
| 18 | 2.8 | | 53 | 44 | 31 | 9.0 | 1.9 | 3.7 | 39 |
| 19 | 3.5 | | | 44 | 36 | 5.7 | 1.7 | 3.7 | 36 |
| 20 | 4.2 | | | 44 | 51 | 5.4 | 1.7 | 2.8 | 40 |
| 21 | 4.9 | | 40 | 42 | 34 | 5.2 | 1.6 | 2.3 | 25 |
| 22 | 5.6 | | | 42 | 34 | 4.9 | 1.4 | 2.3 | 23 |
| 23 | 6.3 | | | 44 | 32 | 5.3 | 110 | 2.8 | 20 |
| 24 | 6.3 | | | 43 | 40 | 5.7 | 90 | 2.8 | 19 |
| 25 | 4.2 | | | 41 | 57 | 4.9 | 79 | 2.3 | 18 |
| 26 | 2.8 | | 72 | 42 | 55 | 4.9 | 70 | 2.1 | 18 |
| 27 | 3.5 | | 77 | 40 | 51 | 4.1 | 61 | 2.3 | 22 |
| 28 | 2.6 | | 170 | 40 | 40 | 3.2 | 39 | 1.9 | 15 |
| 29 | 2.4 | | 1,600 | 39 | 37 | 2.8 | 29 | 1.7 | 14 |
| 30 | 3.5 | | 906 | 61 | 34 | 2.3 | 14 | 1.7 | 14 |
| 31 | 3.2 | | 603 | | 29 | | 9.0 | 1.5 | |

| Month | Maximum | Minimum | Mean | Month | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|
| October | 6.3 | 0.8 | 2.59 | June | 733 | 2.3 | 58.7 |
| March | 1,600 | 23 | 146 | July | 110 | 1.4 | 24.8 |
| April | 330 | 39 | 69.1 | August | 23 | 1.5 | 8.11 |
| May | 70 | 29 | 46.8 | September | 285 | 14 | 58.7 |

### DES MOINES RIVER AT DES MOINES, IOWA

LOCATION.—Water-stage recorder in sec. 2, T. 78 N., R. 24 W., at Walnut Street Bridge in Des Moines, one-fourth mile below dam of Des Moines Electric Co. and one-third mile above mouth of Raccoon River. Zero of gage is 773.74 feet above mean sea level.

DRAINAGE AREA.—6,180 square miles.

RECORDS AVAILABLE.—October 1902 to August 1903; October 1914 to September 1927; October 1932 to September 1933. May 1905 to July 1906 at Interurban Bridge, near Highland Park, 5 miles upstream.

DISCHARGE.—Maximum during year, 35,100 second-feet Apr. 4 (gage height, 16.1 feet); minimum, 128 second-feet Sept. 3–5 (gage height, 0.64 foot).

1914–27, 1933: Maximum, about 41,500 second-feet June 7, 1918 (gage height, 16.5 feet); zero flow has occurred at times since construction of dam above gage. Average, 13 years (1915–27, 1932–33), 2,040 second-feet.

Maximum stage known, about 23 feet in May 1903 (caused by backwater from Raccoon River, discharge not determined).

REMARKS.—Records fair. Considerable diurnal fluctuation during low water caused by operation of power plant above station. Gage-height record furnished by United States Weather Bureau.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 349 | 283 | 483 | 460 | 1,390 | 743 | a 16,800 | 1,440 | 950 | 172 | 406 | 144 |
| 2 | 319 | 295 | 489 | 460 | 1,290 | 798 | 26,400 | 1,290 | 864 | 190 | 367 | 130 |
| 3 | 315 | 269 | 502 | 444 | 918 | 906 | a 34,400 | 1,240 | 775 | 177 | 332 | 128 |
| 4 | 319 | 311 | 459 | 427 | 830 | 1,070 | a 34,000 | 1,190 | 683 | 204 | 303 | 128 |
| 5 | 315 | 247 | 514 | 406 | 532 | 1,080 | a 24,500 | 1,190 | 661 | 577 | 272 | 128 |
| 6 | 279 | 247 | 539 | 372 | 460 | 1,050 | a 18,000 | 1,240 | 633 | 1,110 | 241 | a 610 |
| 7 | 276 | 349 | | 367 | | 959 | a 14,400 | 1,240 | 598 | 1,130 | 258 | 1,070 |
| 8 | 283 | 471 | | 367 | | 915 | a 11,900 | 1,190 | 578 | 1,020 | 279 | 1,110 |
| 9 | 254 | 565 | | 363 | | 847 | 10,200 | 1,240 | 640 | 830 | 387 | 942 |
| 10 | 247 | 552 | | 363 | | 743 | 8,040 | 1,240 | 585 | 572 | 396 | 790 |
| 11 | 234 | 539 | | 319 | | 598 | 6,450 | 1,290 | 539 | 449 | 401 | 640 |
| 12 | 241 | 526 | | 315 | | 489 | 5,630 | a 2,100 | 495 | 432 | 449 | 578 |
| 13 | 228 | 578 | | 315 | | 612 | 4,880 | a 4,010 | 444 | 382 | 422 | 532 |
| 14 | 225 | 578 | a 190 | 315 | | 775 | 4,350 | a 4,520 | 406 | 336 | 382 | 782 |
| 15 | 172 | 502 | | 319 | a 250 | 790 | 3,850 | a 2,230 | 372 | 303 | 332 | 647 |
| 16 | 209 | 307 | | 315 | | 775 | 3,450 | 1,390 | 341 | 272 | 283 | 612 |
| 17 | 241 | 432 | | 221 | | 775 | 3,140 | 1,340 | 332 | 244 | 251 | 539 |
| 18 | 225 | 466 | | | | 743 | 2,640 | 1,290 | 315 | 231 | 218 | 471 |
| 19 | 234 | 432 | | | | 798 | 2,430 | 1,240 | 307 | 215 | 218 | 406 |
| 20 | 218 | 438 | | | | 790 | 2,230 | 6,920 | 299 | 193 | 190 | 349 |
| 21 | 184 | 495 | 172 | a 550 | | 728 | 2,160 | 6,240 | 283 | 435 | 193 | 327 |
| 22 | 234 | 489 | 174 | | 367 | 598 | 1,970 | 6,030 | 265 | 837 | 207 | 315 |
| 23 | 265 | 508 | 195 | | 396 | 585 | 1,850 | 4,520 | 261 | 1,060 | 332 | 311 |
| 24 | 307 | 444 | 465 | 1,760 | 416 | 698 | 1,730 | 3,070 | 228 | 1,290 | 422 | 279 |
| 25 | 291 | 489 | 743 | 4,610 | 432 | 751 | 1,610 | 2,230 | 299 | 1,240 | 349 | 274 |
| 26 | 319 | 432 | 654 | 4,520 | 466 | 814 | 1,560 | 1,850 | 354 | 1,040 | 269 | 323 |
| 27 | 336 | 354 | 619 | 3,690 | 526 | 906 | 1,440 | 1,610 | 258 | 806 | 215 | 319 |
| 28 | 319 | 392 | 713 | 2,710 | 558 | 1,010 | 1,340 | 1,390 | 225 | 626 | 193 | 295 |
| 29 | 295 | 471 | 713 | 2,040 | ------ | 1,290 | 1,290 | 1,290 | 209 | 578 | 172 | 291 |
| 30 | 283 | 444 | 654 | 1,440 | ------ | 3,220 | 1,290 | 1,120 | 190 | 552 | 164 | 295 |
| 31 | 287 | ------ | 526 | 1,340 | ------ | 9,330 | ------ | 1,030 | ------ | 466 | 151 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 349 | 172 | 268 | 0.043 | 0.05 |
| November | 578 | 247 | 430 | .070 | .08 |
| December | 743 | ---------- | 365 | .059 | .07 |
| January | 4,610 | ---------- | 1,020 | .165 | .19 |
| February | 1,390 | ---------- | 440 | .071 | .07 |
| March | 9,330 | 489 | 1,170 | .189 | .22 |
| April | 34,400 | 1,290 | 8,460 | 1.37 | 1.53 |
| May | 6,920 | 1,030 | 2,230 | .361 | .42 |
| June | 950 | 190 | 446 | .072 | .08 |
| July | 1,290 | 172 | 580 | .094 | .11 |
| August | 449 | 151 | 292 | .047 | .05 |
| September | 1,110 | 128 | 459 | .074 | .08 |
| The year | 34,400 | 128 | 1,340 | .217 | 2.95 |

a Estimated.

### DES MOINES RIVER NEAR TRACY, IOWA

LOCATION.—Chain gage in sec. 19, T. 75 N., R. 17 W., at highway bridge in Bellefontaine, near Tracy, 3 miles above mouth of Cedar Creek and 6 miles below mouth of English Creek. Zero of gage is 671.78 feet above mean sea level.

DRAINAGE AREA.—12,400 square miles.

RECORDS AVAILABLE.—March 1920 to September 1927; March to September 1933.

DISCHARGE.—Maximum during period, 38,600 second-feet Apr. 7 (gage height, 16.5 feet); minimum not determined.

1920–27, 1933: Maximum, that of Apr. 7, 1933.

Maximum stage since 1851, about 25 feet May 31, 1903 (discharge, about 100,000 second-feet).

REMARKS.—Records fair. Discharge estimated for periods of no gage height record, July 8–14 and Sept. 1–30. Gage-height record furnished by United States Weather Bureau.

*Discharge, in second-feet, 1933*

| Day | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | 1,670 | 17,000 | 2,800 | 2,350 | 785 | 980 | |
| 2 | 1,800 | 18,600 | 3,120 | 2,210 | 695 | 880 | |
| 3 | 1,800 | 21,400 | 2,960 | 2,070 | 605 | 785 | 528 |
| 4 | 1,800 | 26,700 | 2,800 | 1,930 | 605 | 695 | |
| 5 | 1,800 | 31,400 | 2,800 | 1,800 | 605 | 695 | |
| 6 | 1,800 | 37,200 | 3,440 | 1,670 | 605 | 695 | |
| 7 | 1,930 | 38,600 | 4,130 | 1,540 | 980 | 605 | |
| 8 | 1,930 | 34,600 | 3,610 | 1,420 | | 520 | 908 |
| 9 | 1,800 | 22,400 | 3,280 | 1,420 | | 695 | |
| 10 | 1,540 | 16,100 | 2,960 | 1,300 | | 695 | |
| 11 | 1,420 | 13,400 | 2,960 | 1,420 | 1,140 | 880 | |
| 12 | 1,420 | 11,200 | 3,120 | 1,190 | | 1,080 | |
| 13 | 1,300 | 9,920 | 7,320 | 1,080 | | 1,190 | 964 |
| 14 | 1,190 | 8,700 | 6,880 | 1,080 | | 1,080 | |
| 15 | 1,300 | 7,100 | 4,670 | 980 | 980 | 980 | |
| 16 | 1,300 | 6,880 | 3,780 | 980 | 880 | 880 | |
| 17 | 1,300 | 6,240 | 3,440 | 880 | 785 | 785 | |
| 18 | 1,300 | 5,830 | 3,120 | 785 | 785 | 785 | 966 |
| 19 | 1,300 | 5,240 | 2,960 | 785 | 695 | 695 | |
| 20 | 1,300 | 4,860 | 2,800 | 785 | 605 | 695 | |
| 21 | 1,300 | 4,490 | 8,460 | 880 | 605 | 695 | |
| 22 | 1,300 | 4,130 | 9,920 | 695 | 695 | 605 | |
| 23 | 1,190 | 3,950 | 10,400 | 695 | 1,190 | 605 | 1,420 |
| 24 | 1,190 | 3,610 | 8,940 | 785 | 1,930 | 695 | |
| 25 | 1,300 | 3,440 | 7,320 | 695 | 2,210 | 695 | |
| 26 | 1,540 | 3,280 | 5,430 | 695 | 2,070 | 695 | |
| 27 | 1,670 | 3,120 | 4,490 | 880 | 1,800 | 695 | |
| 28 | 1,800 | 2,960 | 3,780 | 785 | 1,670 | 785 | 1,490 |
| 29 | 1,930 | 2,960 | 3,440 | 695 | 1,540 | 520 | |
| 30 | 2,350 | 2,800 | 3,120 | 785 | 1,190 | 440 | |
| 31 | 8,940 | | 2,650 | | 1,080 | 440 | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| March | 8,940 | 1,190 | 1,790 | 0.144 | 0.17 |
| April | 38,600 | 2,800 | 12,600 | 1.02 | 1.14 |
| May | 10,400 | 2,650 | 4,540 | .366 | .42 |
| June | 2,350 | 695 | 1,180 | .095 | .11 |
| July | | 605 | 1,080 | .087 | .10 |
| August | 1,190 | 440 | 747 | .060 | .07 |
| September | | | 1,050 | .085 | .09 |

### DES MOINES RIVER AT ELDON, IOWA

LOCATION.—Chain gage on highway bridge in Eldon, Wapello County, about 1 mile above Soap Creek.

DRAINAGE AREA.—13,300 square miles.

RECORDS AVAILABLE.—October 1930 to September 1933; comparable records at Ottumwa, March 1917 to September 1927; January 1929 to September 1930.

DISCHARGE.—Maximum during year, 35,400 second-feet Apr. 8 (gage height, 14.68 feet); minimum, 61 second-feet July 23 (gage height, 1.10 feet).

1917–27, 1929–33: Maximum, 58,700 second-feet June 11, 1917 (gage height, at Ottumwa, 16.5 feet); minimum, that of July 23, 1933.

Maximum since 1850 and probably in the last century occurred on May 31, 1903, and is estimated at 100,000 second-feet.

REMARKS.—Records good except those for periods of ice effect, which are fair. Power plants above gage cause some diurnal fluctuation at low stages.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 896 | 663 | 1,270 | 1,390 | 3,070 | 1,640 | 18,300 | 3,070 | 2,760 | 621 | 1,450 | 478 |
| 2 | 846 | 555 | 1,450 | 1,050 | 3,070 | 1,770 | 18,300 | 3,070 | 2,610 | 663 | 1,270 | 752 |
| 3 | 896 | 663 | 1,450 | 1,220 | 2,910 | 2,040 | 18,300 | 3,390 | 2,320 | 555 | 1,100 | 327 |
| 4 | 1,100 | 708 | 1,510 | 1,330 | 2,610 | 1,900 | 21,900 | 3,070 | 2,320 | 540 | 896 | 358 |
| 5 | 752 | 708 | 1,390 | 1,640 | 1,100 | 2,040 | 24,900 | 4,230 | 2,180 | 500 | 752 | 532 |
| 6 | 752 | 708 | 1,580 | 1,640 | [a]1,000 | 2,320 | 28,500 | 6,080 | 2,040 | 463 | 799 | 296 |
| 7 | 752 | 799 | 1,580 | 1,700 | [a] 400 | 2,040 | 32,800 | 5,700 | 1,770 | 532 | 799 | 352 |
| 8 | 752 | 1,770 | 708 | 1,770 | [a] 370 | 2,040 | 35,000 | 4,410 | 1,770 | 1.100 | 663 | 327 |
| 9 | 799 | 2,040 | [a] 450 | 1,900 | [a] 370 | 1,900 | 29,000 | 3,890 | 1,640 | 1.330 | 708 | 945 |
| 10 | 998 | 2,460 | [a] 400 | 1,580 | [a] 370 | 1,900 | 16,700 | 3,550 | 1,580 | 1.330 | 579 | 1,160 |
| 11 | 799 | 2,320 | [a] 370 | [a]1,220 | [a] 370 | 1,580 | 13,000 | 3,720 | 1,510 | 1.450 | 799 | 1,220 |
| 12 | 752 | 1,770 | [a] 370 | [a] 940 | [a] 440 | 1,580 | 11,000 | 7,930 | 1,510 | 1.270 | 896 | 1,100 |
| 13 | 752 | 1,640 | [a] 370 | [a] 820 | [a] 550 | 1,450 | 9,540 | 7,930 | 1,330 | 1.050 | 1,100 | 1,050 |
| 14 | 799 | 1,580 | [a] 370 | [a] 780 | [a] 660 | 1,330 | 8,600 | 9,060 | 1,270 | 846 | 1,220 | 945 |
| 15 | 752 | 1,580 | [a] 370 | 997 | [a] 630 | 1,330 | 7,710 | 6,270 | 1,160 | 799 | 1,100 | 846 |
| 16 | 752 | 1,330 | [a] 370 | 1,450 | [a] 700 | 1,510 | 7,080 | 4,770 | 1,160 | 708 | 896 | 846 |
| 17 | 752 | 1,450 | [a] 370 | 1,390 | [a]1,150 | 1,580 | 6,470 | 4,060 | 1,050 | 846 | 1,160 | 896 |
| 18 | 663 | 1,330 | [a] 370 | 1,450 | [a]1,550 | 1,580 | 5,890 | 3,550 | 998 | 799 | 571 | 998 |
| 19 | 621 | 1,330 | [a] 380 | 1,220 | [a]1,820 | 1,510 | 4,770 | 3,390 | 945 | 663 | 621 | 1,220 |
| 20 | 846 | 1,330 | [a] 420 | 1,270 | [a]2,050 | 1,640 | 4,950 | 3,230 | 896 | 663 | 708 | 846 |
| 21 | 621 | 708 | [a] 520 | 1,270 | [a]2,250 | 1,700 | 4,590 | 3,390 | 846 | 708 | 708 | 752 |
| 22 | 540 | 1,100 | [a]1,000 | 1,330 | 2,460 | 1,640 | 4,410 | 10,000 | 896 | 352 | 516 | 579 |
| 23 | 621 | 1,100 | 1,900 | 1,900 | 3,070 | 1,510 | 4,060 | 9,540 | 752 | 64 | 463 | 579 |
| 24 | 799 | 1,390 | 4,590 | 2,040 | 1,770 | 1,510 | 3,890 | 8,830 | 799 | 1.640 | 426 | 579 |
| 25 | 799 | 1,390 | 9,780 | 2,910 | 2,180 | 1,700 | 3,550 | 7,710 | 752 | 2.040 | 532 | 441 |
| 26 | 945 | 1,510 | 11,300 | 3,550 | 2,760 | 1,700 | 3,550 | 6,270 | 708 | 2.320 | 621 | 5,320 |
| 27 | 998 | 1,160 | 6,670 | 7,710 | 2,460 | 2,180 | 3,230 | 4,950 | 663 | 2.320 | 708 | 2,320 |
| 28 | 846 | 998 | 4,230 | 6,670 | 2,040 | 2,320 | 3,230 | 4,410 | 896 | 1.900 | 663 | 1,100 |
| 29 | 945 | 1,050 | 3,230 | 5,320 | ------- | 2,040 | 2,910 | 3,890 | 1,100 | 1.770 | 621 | 896 |
| 30 | 846 | 1,330 | 2,760 | 4,410 | ------- | 3,550 | 3,230 | 3,390 | 799 | 1.510 | 500 | 708 |
| 31 | 896 | ------- | 2,180 | 3,720 | ------- | 11,800 | -------- | 3,230 | ------- | 1.450 | 508 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,100 | 540 | 803 | 0.060 | 0.07 |
| November | 2,460 | 555 | 1,280 | .096 | .11 |
| December | 11,300 | ---------- | 2,060 | .155 | .18 |
| January | 7,710 | ---------- | 2,180 | .164 | .19 |
| February | 3,070 | ---------- | 1,580 | .119 | .12 |
| March | 11,800 | 1,330 | 2,140 | .161 | .18 |
| April | 35,000 | 2,910 | 12,000 | .902 | 1.00 |
| May | 10,000 | 3,070 | 5,160 | .388 | .45 |
| June | 2,760 | 663 | 1,370 | .103 | .11 |
| July | 2,320 | 64 | 1,060 | .080 | .09 |
| August | 1,450 | 426 | 786 | .059 | .07 |
| September | 5,320 | 296 | 959 | .072 | .08 |
| The year | 35,000 | 64 | 2,610 | .196 | 2.65 |

[a] Estimated because of ice.

### DES MOINES RIVER AT KEOSAUQUA, IOWA

LOCATION.—Chain gage in sec. 36, T. 69 N., R. 10 W., at county bridge in Keosauqua, one-fourth mile above old dam site and Government locks. No important tributary enters Des Moines River for several miles above or below.

DRAINAGE AREA.—13,900 square miles.

RECORDS AVAILABLE.—May 1903 to July 1906; April 1910 to September 1933.

DISCHARGE.—Maximum during year, 33,300 second-feet Apr. 8 (gage height, 11.15 feet); minimun, 150 second-feet July 24 (gage height, —0.35 foot).

1903–6, 1910–33: Maximum, about 97,000 second-feet June 1, 1903 (gage height, 27.85 feet); minimum, 115 second-feet Sept. 20, 1931 (gage height, —0.4 foot). Average, 17 years (1915–17, 1918–33), 4,890 second-feet.

Flood of June 1, 1851, reached a stage of about 24 feet (discharge, about 80,000 second-feet).

REMARKS.—Records fair. Some diurnal fluctuation caused by operation of power plant at Ottumwa.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 990 | 1,080 | 1,460 | 2,170 | 4,000 | 2,280 | 20,100 | 3,290 | 3,290 | 753 | 1,460 | 402 |
| 2 | 990 | 617 | 1,360 | 1,750 | 3,290 | 1,960 | 19,800 | 3,290 | 2,720 | 680 | 1,460 | 447 |
| 3 | 908 | 617 | 1,460 | 1,550 | 3,290 | 1,960 | 18,800 | 3,060 | 2,610 | 617 | 1,460 | 1,080 |
| 4 | 990 | 554 | 1,550 | 1,750 | 3,060 | 2,170 | 20,400 | 3,290 | 2,390 | 554 | 908 | 447 |
| 5 | 1,170 | 554 | 1,750 | 1,650 | 1,960 | 2,060 | 23,100 | 3,060 | 2,170 | 554 | 826 | 357 |
| 6 | 1,260 | 753 | 1,550 | 1,960 | 753 | 1,960 | 26,900 | 9,590 | 2,060 | 502 | 617 | 402 |
| 7 | 908 | 680 | [a] 1,280 | 1,960 | [a] 630 | 2,390 | 30,100 | 6,810 | 1,860 | 502 | 1,080 | 195 |
| 8 | 826 | 2,280 | [a] 1,000 | 1,960 | [a] 470 | 2,390 | 33,300 | 7,350 | 1,750 | 502 | 753 | 251 |
| 9 | 753 | 3,290 | [a] 750 | 1,960 | [a] 400 | 2,170 | 31,900 | 4,740 | 1,650 | 1,170 | 617 | 195 |
| 10 | 1,550 | 2,170 | [a] 600 | 2,170 | [a] 400 | 1,960 | 22,400 | 4,240 | 1,360 | 1,360 | 680 | 826 |
| 11 | 1,550 | 2,610 | [a] 520 | 1,750 | [a] 400 | 2,170 | 15,600 | 7,620 | 1,460 | 1,260 | 502 | 1,360 |
| 12 | 1,170 | 2,500 | [a] 470 | 1,360 | [a] 440 | 1,750 | 13,400 | 11,900 | 1,460 | 1,360 | 680 | 1,260 |
| 13 | 908 | 1,960 | [a] 460 | [a]1,130 | [a] 650 | 1,750 | 11,300 | 14,000 | 1,260 | 1,170 | 826 | 1,0[illegible]0 |
| 14 | 680 | 1,750 | [a] 450 | [a]1,020 | [a] 730 | 1,650 | 10,200 | 11,300 | 1,170 | 1,080 | 990 | 9[illegible]0 |
| 15 | 680 | 1,360 | [a] 450 | [a]1,080 | [a] 790 | 1,460 | 9,300 | 9,020 | 1,170 | 826 | 1,170 | 9[illegible]8 |
| 16 | 753 | 1,170 | [a] 440 | 1,170 | [a] 830 | 1,360 | 8,460 | 6,280 | 1,080 | 680 | 908 | 826 |
| 17 | 753 | 1,170 | [a] 440 | 1,750 | [a]1,000 | 1,650 | 7,350 | 5,500 | 990 | 447 | 680 | 826 |
| 18 | 680 | 1,080 | [a] 440 | 1,750 | [a]1,300 | 1,650 | 6,810 | 4,000 | 908 | 753 | 1,360 | 908 |
| 19 | 753 | 1,360 | [a] 440 | 3,290 | [a]1,800 | 1,650 | 6,280 | 3,760 | 826 | 617 | 554 | 1,170 |
| 20 | 617 | 2,170 | [a] 480 | 1,960 | [a]2,200 | 1,650 | 5,760 | 3,760 | 826 | 617 | 554 | 1,080 |
| 21 | 1,170 | 1,960 | [a] 610 | 1,750 | [a]2,300 | 1,860 | 5,240 | 3,290 | 826 | 617 | 554 | 908 |
| 22 | 554 | 1,960 | [a] 1,000 | 2,830 | [a]2,400 | 1,750 | 4,740 | 9,020 | 826 | 617 | 680 | 753 |
| 23 | 680 | 1,550 | 1,650 | 1,960 | [a]2,450 | 1,860 | 4,490 | [a]10,800 | 826 | 357 | 502 | 617 |
| 24 | 554 | 1,260 | 5,240 | 2,500 | [a]2,500 | 1,750 | 4,000 | [a] 9,400 | 753 | 150 | 554 | 680 |
| 25 | 826 | 1,750 | 11,300 | 2,500 | 2,500 | 1,550 | 4,000 | [a] 8,300 | 753 | 1,650 | 402 | 617 |
| 26 | 826 | 1,360 | 15,000 | 3,290 | 2,830 | 2,170 | 3,760 | 7,350 | 680 | 1,860 | 554 | 680 |
| 27 | 990 | 1,550 | 9,020 | 5,760 | 3,060 | 1,960 | 3,760 | 6,280 | 617 | 2,170 | 680 | 9,590 |
| 28 | 826 | 1,550 | 6,020 | 7,900 | 2,830 | 2,610 | 3,290 | 4,490 | 617 | 2,060 | 680 | 3,760 |
| 29 | 990 | 1,170 | 3,520 | 6,280 | ------- | 2,830 | 3,290 | 4,490 | 2,170 | 1,750 | 617 | 1,360 |
| 30 | 908 | 1,170 | 3,520 | 5,500 | ------- | 4,000 | 3,290 | 4,490 | 1,460 | 1,750 | 680 | 1,080 |
| 31 | 826 | ------- | 3,290 | 4,490 | ------- | 13,100 | ------- | 3,290 | ------- | 1,460 | 357 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,550 | 554 | 904 | 0.065 | 0.07 |
| November | 3,290 | 554 | 1,500 | .108 | .12 |
| December | 15,000 | ---------- | 2,500 | .180 | .21 |
| January | 7,900 | ---------- | 2,580 | .186 | .21 |
| February | 4,000 | ---------- | 1,760 | .127 | .13 |
| March | 13,100 | 1,360 | 2,370 | .170 | .20 |
| April | 33,300 | 3,290 | 12,700 | .914 | 1.02 |
| May | 14,000 | 3,060 | 6,360 | .458 | .53 |
| June | 3,290 | 617 | 1,420 | .102 | .11 |
| July | 2,170 | 150 | 982 | .071 | .08 |
| August | 1,460 | 357 | 785 | .056 | .06 |
| September | 9,590 | 195 | 1,170 | .084 | .09 |
| The year | 33,300 | 150 | 2,910 | .209 | 2.83 |

[a] Estimated.

### HERON LAKE OUTLET NEAR HERON LAKE, MINN.

LOCATION.—Staff gage on line between secs. 15 and 22, T. 104 N., R. 37 W., 3 miles east of Heron Lake.
DRAINAGE AREA.—492 square miles.
RECORDS AVAILABLE.—August 1930 to September 1933.
DISCHARGE.—Maximum during year, 53 second-feet Apr. 5 (gage height, 1.28 feet); no flow for long periods.
1930–33: Maximum, about 500 second-feet during estimated period Apr. 1–8, 1932; no flow for several periods during 1931 and 1933.
REMARKS.—Records poor.

*Discharge, in second-feet, 1932–33*

| Day | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | 0.1 | 7.6 | 28 | 14 | 5.6 | 4.0 | 11 |
| 2 | .1 | 7.1 | 26 | 20 | 5.0 | 11 | 12 |
| 3 | .1 | 6.6 | 22 | 28 | 4.3 | 11 | 12 |
| 4 | .1 | 1.8 | 22 | 20 | 3.8 | 10 | 11 |
| 5 | 0 | 53 | 22 | 11 | 3.3 | 8.5 | 10 |
| 6 | 0 | 2.0 | 21 | 12 | 3.5 | 8.8 | 10 |
| 7 | 0 | 3.8 | 24 | 18 | 2.9 | 9.2 | 9.2 |
| 8 | 0 | 6.6 | 28 | 24 | 2.4 | 11 | 8.5 |
| 9 | 0 | 7.2 | 27 | 17 | 2.6 | 11 | 7.0 |
| 10 | 0 | 7.7 | 26 | 15 | 2.9 | 9.2 | 7.8 |
| 11 | 0.1 | 10 | 22 | 12 | 3.1 | 7.0 | 8.5 |
| 12 | 1.5 | 17 | 21 | 8.5 | 3.3 | 7.0 | 7.7 |
| 13 | 4.0 | 15 | 21 | 7.7 | 3.5 | 6.6 | 7.0 |
| 14 | 6.2 | 17 | 18 | 7.7 | 3.1 | 6.2 | 7.7 |
| 15 | 8.1 | 18 | 16 | 7.0 | 2.9 | 5.7 | 15 |
| 16 | 8.1 | 19 | 15 | 6.2 | 2.8 | 4.0 | 17 |
| 17 | 11 | 20 | 16 | 5.1 | 2.7 | 4.0 | 16 |
| 18 | 12 | 21 | 20 | 5.2 | 2.6 | 3.5 | 16 |
| 19 | 14 | 23 | 20 | 5.4 | 2.4 | 3.5 | 11 |
| 20 | 18 | 27 | 24 | 5.1 | 1.6 | 3.5 | 10 |
| 21 | 24 | 27 | 23 | 5.7 | 1.8 | 3.5 | 8.5 |
| 22 | 26 | 27 | 22 | 5.9 | 1.5 | 3.5 | 7.7 |
| 23 | 30 | 27 | 16 | 5.1 | 2.8 | 3.5 | 7.0 |
| 24 | 34 | 28 | 9.2 | 5.4 | 4.0 | 4.0 | 6.6 |
| 25 | 36 | 27 | 7.7 | 5.6 | 4.0 | 4.6 | 6.2 |
| 26 | 32 | 26 | 5.9 | 5.7 | 4.0 | 5.1 | 2.4 |
| 27 | 27 | 24 | 5.9 | 5.9 | 4.0 | 5.7 | 1.3 |
| 28 | 22 | 24 | 6.0 | 5.7 | 3.5 | 6.2 | 1.1 |
| 29 | 18 | 23 | 6.2 | 5.9 | 3.5 | 5.7 | .8 |
| 30 | 13 | 26 | 8.1 | 6.2 | 3.5 | 5.1 | .8 |
| 31 | 8.5 | ------ | 9.2 | ------ | 3.5 | 5.1 | ------ |

| Month | Maximum | Minimum | Mean | Month | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|
| March | 36 | 0 | 11.4 | August | 11 | 3.5 | 6.35 |
| April | 53 | 1.8 | 18.3 | September | 17 | .8 | 8.56 |
| May | 28 | 5.9 | 18.0 | | | | |
| June | 28 | 5.1 | 10.2 | The year | 53 | 0 | 6.36 |
| July | 5.6 | 1.5 | 3.24 | | | | |

NOTE—No flow during months omitted.

### TUTTLE LAKE NEAR CEYLON, MINN.

LOCATION.—Staff gage above dam at outlet of Tuttle Lake, 7 miles southeast of Ceylon. Zero of gage is 2.0 feet below crest of dam at outlet.

RECORDS AVAILABLE.—July 1930 to September 1933.

EXTREMES.—Maximum stage during year, 3.99 feet Apr. 4, 6, and 8; minimum, 1.70 feet Oct. 15–17.

1930–33: Maximum stage, that of Apr. 4, 6, and 8, 1933; minimum, 0.00 feet several times in September 1931.

REMARKS.—Owing to placing of flash boards and fish screen on crest of dam, there was no fixed relation between pool stage and discharge over dam this year. The following discharge measurements were made:

| Date | Gage height (feet) | | Discharge (sec.-ft.) |
|---|---|---|---|
| | Above dam | Below dam | |
| 1933: | | | |
| May 16 | 2.34 | 1.72 | 31.5 |
| Aug. 23 | 2.14 | .58 | [a].05 |

[a] Estimated leakage through dam.

*Daily gage heights, in feet, 1932–33*

| Day | Oct. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.82 | ------- | 3.67 | 3.62 | 2.98 | 2.48 | 2.20 | 2.20 |
| 2 | 1.80 | ------- | 3.77 | 3.60 | 3.02 | 2.60 | 2.28 | 2.22 |
| 3 | 1.80 | ------- | 3.87 | 3.48 | 3.00 | 2.58 | 2.24 | 2.32 |
| 4 | 1.82 | ------- | 3.99 | 3.56 | 2.98 | 2.54 | 2.18 | 2.32 |
| 5 | 1.84 | ------- | 3.95 | 3.52 | 2.94 | 2.52 | 2.16 | 2.28 |
| 6 | 1.84 | ------- | 3.99 | 3.48 | 2.92 | 2.52 | 2.22 | 2.34 |
| 7 | 1.86 | ------- | 3.97 | 3.46 | 2.80 | 2.50 | 2.20 | 2.32 |
| 8 | 1.86 | ------- | 3.99 | 3.48 | 2.96 | 2.52 | 2.18 | 2.30 |
| 9 | 1.82 | ------- | 3.91 | 3.52 | 2.94 | 2.48 | 2.16 | 2.30 |
| 10 | 1.80 | ------- | 3.87 | 3.54 | 2.92 | 2.46 | 2.18 | 2.38 |
| 11 | 1.78 | ------- | 3.83 | 3.50 | 2.80 | 2.42 | 2.18 | 2.34 |
| 12 | 1.76 | ------- | 3.89 | 3.48 | 2.78 | 2.42 | 2.16 | 2.32 |
| 13 | 1.74 | ------- | 3.81 | 3.46 | 2.74 | 2.40 | 2.16 | 2.32 |
| 14 | 1.72 | ------- | 3.77 | 3.48 | 2.70 | 2.38 | 2.14 | 2.28 |
| 15 | 1.70 | ------- | 3.73 | 3.40 | 2.68 | 2.36 | 2.10 | 2.28 |
| 16 | 1.70 | ------- | 3.73 | 3.34 | 2.66 | 2.30 | 2.16 | 2.26 |
| 17 | 1.70 | ------- | 3.63 | 3.32 | 2.60 | 2.22 | 2.24 | 2.30 |
| 18 | 1.72 | ------- | 3.71 | 3.30 | 2.56 | 2.24 | 2.20 | 2.24 |
| 19 | 1.72 | ------- | 3.67 | 3.38 | 2.50 | 2.22 | 2.16 | 2.20 |
| 20 | 1.74 | ------- | 3.65 | 3.30 | 2.44 | 2.22 | 2.22 | 2.22 |
| 21 | 1.74 | ------- | 3.63 | 3.24 | 2.54 | 2.20 | 2.16 | 2.18 |
| 22 | 1.74 | ------- | 3.61 | 3.18 | 2.52 | 2.36 | 2.12 | 2.20 |
| 23 | 1.76 | ------- | 3.57 | 2.88 | 2.50 | 2.38 | 2.14 | 2.20 |
| 24 | 1.76 | ------- | 3.58 | 3.06 | 2.56 | 2.48 | 2.16 | 2.18 |
| 25 | 1.74 | ------- | 3.56 | 3.12 | 2.52 | 2.36 | 2.14 | 2.18 |
| 26 | 1.74 | ------- | 3.54 | 3.12 | 2.48 | 2.32 | 2.10 | 2.20 |
| 27 | 1.74 | ------- | 3.50 | 3.10 | 2.44 | 2.30 | 2.08 | 2.10 |
| 28 | 1.72 | ------- | 3.48 | 3.04 | 2.44 | 2.26 | 2.06 | 2.14 |
| 29 | 1.72 | ------- | 3.50 | 3.06 | 2.44 | 2.22 | 2.04 | 2.08 |
| 30 | 1.76 | ------- | 3.64 | 3.06 | 2.42 | 2.18 | 2.02 | 2.12 |
| 31 | 1.76 | 3.30 | ------- | 3.06 | ------- | 2.18 | 1.98 | ------- |

### RACCOON RIVER AT VAN METER, IOWA

LOCATION.—Chain gage in SW¼ sec. 22, T. 78 N., R. 27 W., at highway bridge one-third mile from railroad station at Van Meter, 1 mile below junction of North and South Raccoon Rivers, and 30 miles above junction of Raccoon and Des Moines Rivers. Zero of gage is 841.12 feet above mean sea level.

DRAINAGE AREA.—3,410 square miles.

RECORDS AVAILABLE.—April 1915 to November 1927; October 1932 to July 1933.

DISCHARGE.—Maximum during period, 7,420 second-feet Apr. 5 (gage height 10.0 feet); minimum, 35 second-feet June 28 (gage height, 1.5 feet).

1915–27, 1932–33: Maximum, 40,000 second-feet Sept. 20, 1926 (gage height, 18.96 feet); minimum (estimated), 28 second-feet Oct. 22, 1918 (gage height, 1.56 feet).

REMARKS.—Records fair. Observations discontinued during the winter and for period July 8 to Sept. 30. Gage-height record furnished by United States Weather Bureau.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 372 | 331 | 416 | | 981 | 731 | 4,130 | 755 | 755 | 72 |
| 2 | 372 | 293 | 462 | | 853 | 563 | 4,570 | 818 | 694 | 92 |
| 3 | 372 | 258 | 416 | | 791 | 511 | 6,250 | 818 | 526 | 92 |
| 4 | 331 | 258 | 511 | | 731 | 462 | 6,129 | 694 | 476 | 92 |
| 5 | 293 | 293 | 511 | | | 462 | 7,420 | 755 | 428 | 92 |
| 6 | 258 | 331 | 462 | | | 462 | 4,570 | 755 | 383 | 72 |
| 7 | 225 | 331 | 462 | | | 511 | 3,800 | 694 | 341 | 92 |
| 8 | 225 | 462 | | | | 462 | 3,200 | 694 | 341 | |
| 9 | 225 | 563 | | | | 416 | 2,810 | 635 | 301 | |
| 10 | 225 | 563 | | | | 462 | 2,450 | 755 | 301 | |
| 11 | 195 | 462 | | | | 416 | 1,920 | 818 | 263 | |
| 12 | 195 | 462 | | | | 372 | 1,840 | 884 | 263 | |
| 13 | 195 | 416 | | | | 331 | 1,760 | 1,160 | 263 | |
| 14 | 225 | 416 | | | | 293 | 1,680 | 1,020 | 263 | |
| 15 | 225 | | | | | 331 | 1,520 | 884 | 228 | |
| 16 | 225 | | | | | 331 | 1,440 | 818 | 228 | |
| 17 | 225 | | | | | 372 | 1,370 | 755 | 196 | |
| 18 | 195 | | | | | 331 | 1,300 | 755 | 166 | |
| 19 | 225 | | | | | 331 | 1,160 | 755 | 166 | |
| 20 | 195 | | | | | 331 | 1,090 | 635 | 139 | |
| 21 | 225 | | | | | 331 | 1,090 | 3,300 | 139 | |
| 22 | 225 | | | 1,190 | | 293 | 1,020 | 3,600 | 139 | |
| 23 | 293 | | | 1,050 | | 372 | 884 | 3,600 | 114 | |
| 24 | 293 | | | 981 | | 372 | 818 | 2,630 | 92 | |
| 25 | 293 | | 981 | 4,910 | | 416 | 755 | 1,920 | 92 | |
| 26 | 293 | | 916 | 2,360 | | 791 | 694 | 1,680 | 72 | |
| 27 | 331 | | 791 | 1,860 | | 916 | 694 | 1,520 | 53 | |
| 28 | 331 | | 731 | 1,700 | | 1,120 | 755 | 1,160 | 35 | |
| 29 | 293 | | 563 | 1,540 | | 1,470 | 755 | 1,020 | 53 | |
| 30 | 293 | | 563 | 1,470 | | 1,620 | 755 | 951 | 53 | |
| 31 | 293 | | | 1,120 | | 4,570 | | 818 | | |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 372 | 195 | 263 | 0.077 | 0.09 |
| November 1–14 | | | 388 | .114 | .06 |
| January 22–31 | | | 820 | .534 | .20 |
| February 1–4 | | | 839 | .246 | .04 |
| March | 4,570 | 293 | 669 | .196 | .23 |
| April | 7,420 | 694 | 2,290 | .672 | .75 |
| May | 3,600 | 635 | 1,230 | .361 | .42 |
| June | 755 | 35 | 252 | .074 | .08 |
| July 1–7 | | | 86.3 | .025 | .01 |

### FOX RIVER AT WAYLAND, MO.

LOCATION.—Chain gage in NW¼ sec. 31, T. 65 N., R. 6 W., at bridge on State highway 4, three-quarters of a mile west of Wayland.

DRAINAGE AREA.—400 square miles.

RECORDS AVAILABLE.—October 1929 to September 1933; February 1922 to September 1929 at site 2 miles upstream.

DISCHARGE.—Maximum during year, 25,000 second-feet June 29 (gage height, 21.53 feet); minimum, 1.0 second-foot Aug. 23, Sept. 22, 23, 25; minimum gage height, 2.30 feet Sept. 22, 23, 25.

1930–33: Maximum, that of June 29, 1933; no flow Sept. 10, 13, 23, 1930.

REMARKS.—Records good except those below 10 second-feet, those estimated, Oct. 15, Nov. 14, Jan. 15, Mar. 18, Aug. 21, Sept. 15–17, affected by ice, Nov. 28, Dec. 8–21, Feb. 5–20, which are poor.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.6 | 10 | 16 | 156 | 73 | 41 | 3,850 | 58 | 64 | 299 | 3.8 | 2.1 |
| 2 | 4.6 | 8 | 15 | 84 | 73 | 37 | 700 | 73 | 46 | 125 | 4.4 | 2.2 |
| 3 | 4.4 | 8 | 51 | 73 | 67 | 35 | 353 | 59 | 38 | 84 | 156 | 3.4 |
| 4 | 5 | 8 | 101 | 73 | 47 | 35 | 217 | 56 | 33 | 55 | 61 | 2.9 |
| 5 | 7 | 8 | 46 | 78 | 40 | 30 | 203 | 282 | 26 | 44 | 36 | 2.7 |
| 6 | 5 | 8 | 31 | 73 | 31 | 29 | 189 | 1,100 | 23 | 36 | 9 | 2.5 |
| 7 | 5 | 8 | 56 | 73 | 23 | 36 | 282 | 371 | 19 | 32 | 15 | 2.4 |
| 8 | 6 | 1,150 | 40 | 60 | 16 | 38 | 189 | 335 | 16 | 32 | 78 | 2.4 |
| 9 | 8 | 1,100 | 23 | 60 | 16 | 26 | 144 | 300 | 16 | 36 | 38 | 2.3 |
| 10 | 505 | 282 | 16 | 62 | 16 | 22 | 119 | 265 | 12 | 30 | 62 | 2.0 |
| 11 | 353 | 137 | 10 | 51 | 10 | 19 | 95 | 3,040 | 10 | 27 | 39 | 1.8 |
| 12 | 84 | 73 | 10 | 42 | 10 | 20 | 89 | 5,820 | 11 | 22 | 22 | 1.7 |
| 13 | 47 | 51 | 5 | 41 | 10 | 25 | 84 | 4,720 | 8 | 20 | 9 | 1.6 |
| 14 | 36 | 49 | 5 | 44 | 10 | 23 | 299 | 1,380 | 5 | 18 | 4.8 | 1.4 |
| 15 | 27 | 47 | 5 | 43 | 10 | 23 | 1,290 | 505 | 4.6 | 26 | 2.9 | 1.4 |
| 16 | 18 | 23 | 5 | 42 | 10 | 19 | 353 | 282 | 4.6 | 9 | 2.5 | 1.4 |
| 17 | 15 | 22 | 5 | 46 | 10 | 16 | 353 | 232 | 4.6 | 8 | 2.2 | 1.4 |
| 18 | 12 | 24 | 5 | 407 | 16 | 52 | 217 | 156 | 6 | 6 | 2.0 | 1.4 |
| 19 | 10 | 23 | 5 | 4,760 | 49 | 89 | 144 | 156 | 5 | 6 | 1.8 | 1.2 |
| 20 | 8 | 23 | 5 | 882 | 150 | 54 | 119 | 150 | 4.6 | 6 | 1.8 | 1.2 |
| 21 | 8 | 28 | 5 | 407 | 217 | 44 | 101 | 150 | 4.6 | 5 | 1.4 | 1.2 |
| 22 | 7 | 38 | 40 | 744 | 203 | 36 | 89 | 317 | 4.4 | 5 | 1.1 | 1.0 |
| 23 | 6 | 20 | 788 | 465 | 156 | 40 | 78 | 119 | 4.4 | 4.8 | 1.0 | 1.0 |
| 24 | 7 | 9 | 3,510 | 248 | 150 | 45 | 68 | 95 | 4.6 | 4.6 | 1.1 | 1.1 |
| 25 | 8 | 12 | 3,510 | 189 | 95 | 485 | 64 | 84 | 6 | 15 | 1.7 | 1.0 |
| 26 | 12 | 20 | 3,710 | 137 | 73 | 656 | 59 | 150 | 9 | 18 | 2.0 | 6 |
| 27 | 49 | 16 | 465 | 131 | 53 | 282 | 54 | 131 | 3.0 | 18 | 2.7 | 882 |
| 28 | 31 | 16 | 248 | 107 | 45 | 163 | 48 | 265 | 49 | 10 | 2.5 | 834 |
| 29 | 22 | 17 | 163 | 78 | ------ | 125 | 49 | 131 | 14,700 | 6 | 2.4 | 137 |
| 30 | 16 | 12 | 156 | 68 | ------ | 119 | 52 | 89 | 7,000 | 3.6 | 2.4 | 39 |
| 31 | 12 | ------ | 156 | 73 | ------ | 546 | ------ | 73 | ---------- | 3.4 | 2.2 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off | |
|---|---|---|---|---|---|---|
| | | | | | Inches | Acre-feet |
| October | 505 | 4.4 | 43.3 | 0.108 | 0.12 | 2,660 |
| November | 1,150 | 8 | 108 | .270 | .30 | 6,430 |
| December | 3,710 | 5 | 426 | 1.06 | 1.22 | 26,200 |
| January | 4,760 | 41 | 316 | .790 | .91 | 19,400 |
| February | 217 | 10 | 60.0 | .150 | .16 | 3,330 |
| March | 656 | 16 | 104 | .260 | .30 | 6,400 |
| April | 3,850 | 48 | 332 | .830 | .93 | 19,800 |
| May | 5,820 | 56 | 676 | 1.69 | 1.95 | 41,600 |
| June | 14,700 | 3.0 | 738 | 1.84 | 2.05 | 43,900 |
| July | 299 | 3.4 | 32.7 | .082 | .09 | 2,010 |
| August | 156 | 1.0 | 18.4 | .046 | .05 | 1,130 |
| September | 882 | 1.0 | 64.8 | .162 | .18 | 3,860 |
| The year | 14,700 | 1.0 | 244 | .610 | 8.26 | 177,000 |

### NORTH FABIUS RIVER AT MONTICELLO, MO.

LOCATION.—Chain gage in SE¼ sec. 6, T. 61 N., R. 7 W., at bridge on State highway 96, 1 mile south of Monticello. Zero of gage is about 541.8 feet above mean sea level.

DRAINAGE AREA.—452 square miles.

RECORDS AVAILABLE.—February 1922 to September 1933.

DISCHARGE.—Maximum during year, 17,400 second-feet June 30 (gage height, 30.8 feet); minimum, 2.9 second-feet Sept. 11, 21; minimum gage height, 2.14 feet Sept. 21, 24.

1922–33: Maximum, that of June 30, 1933; minimum, 1 second-foot July 9, 1922; minimum gage height, 0.50 foot Aug. 10, 1926. Average, 10 years (1923–33), 336 second-feet.

REMARKS.—Records fair. Stage-discharge relation affected by ice Nov. 17-19, 28–30, Dec. 8–21, Feb. 5–21.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10 | 8 | 44 | 84 | 112 | 67 | 1,430 | 33 | 138 | 4,200 | 8 | 10 |
| 2 | 7 | 6 | 44 | 87 | 106 | 58 | 630 | 60 | 58 | 392 | 11 | 7 |
| 3 | 7 | 5 | 44 | 92 | 72 | 49 | 335 | 49 | 44 | 109 | 29 | 7 |
| 4 | 7 | 5 | 61 | 95 | 49 | 45 | 212 | 60 | 35 | 91 | 112 | 6 |
| 5 | 9 | 3.9 | 95 | 101 | 31 | 44 | 114 | 138 | 29 | 60 | 38 | 6 |
| 6 | 8 | 6 | 101 | 98 | 24 | 45 | 122 | 1,260 | 25 | 49 | 18 | 6 |
| 7 | 8 | 5 | 108 | 79 | 18 | 60 | 212 | 728 | 25 | 40 | 18 | 4.2 |
| 8 | 8 | 2,230 | 84 | 61 | 18 | 75 | 114 | 898 | 16 | 40 | 12 | 3.7 |
| 9 | 38 | 1,710 | 59 | 55 | 18 | 78 | 130 | 297 | 16 | 37 | 45 | 3.3 |
| 10 | 828 | 570 | 39 | 55 | 18 | 29 | 106 | 230 | 16 | 42 | 58 | 3.1 |
| 11 | 762 | 316 | 31 | 52 | 18 | 35 | 85 | 3,790 | 14 | 33 | 138 | 2.9 |
| 12 | 192 | 146 | 18 | 41 | 18 | 37 | 70 | 6,140 | 16 | 28 | 38 | 14 |
| 13 | 63 | 130 | 18 | 41 | 18 | 49 | 58 | 7,950 | 12 | 22 | 21 | 4.2 |
| 14 | 33 | 114 | 13 | 55 | 18 | 51 | 2,230 | 1,400 | 9 | 19 | 10 | 3.5 |
| 15 | 22 | 95 | 13 | 48 | 18 | 44 | 1,620 | 590 | 10 | 16 | 8 | 3.9 |
| 16 | 18 | 48 | 13 | 44 | 18 | 32 | 470 | 297 | 10 | 14 | 5 | 8 |
| 17 | 14 | 48 | 13 | 46 | 24 | 35 | 450 | 174 | 10 | 13 | 5 | 5 |
| 18 | 9 | 39 | 13 | 76 | 31 | 122 | 230 | 138 | 9 | 12 | 5 | 3.5 |
| 19 | 9 | 31 | 13 | 5,580 | 48 | 183 | 174 | 122 | 9 | 11 | 5 | 4.2 |
| 20 | 5 | 28 | 13 | 1,100 | 84 | 122 | 138 | 103 | 8 | 10 | 19 | 3.3 |
| 21 | 5 | 25 | 39 | 470 | 259 | 72 | 106 | 1,860 | 8 | 9 | 14 | 2.9 |
| 22 | 6 | 25 | 72 | 946 | 530 | 54 | 85 | 946 | 7 | 8 | 16 | 3.3 |
| 23 | 6 | 30 | 1,830 | 570 | 550 | 58 | 70 | 392 | 8 | 8 | 37 | 3.3 |
| 24 | 6 | 36 | 6,000 | 316 | 392 | 70 | 65 | 192 | 8 | 65 | 20 | 3.1 |
| 25 | 8 | 44 | 8,220 | 212 | 164 | 56 | 60 | 146 | 9 | 83 | 11 | 3.5 |
| 26 | 16 | 36 | 1,450 | 183 | 130 | 1,430 | 56 | 652 | 8 | 32 | 6 | 4.6 |
| 27 | 38 | 30 | 430 | 114 | 88 | 652 | 40 | 335 | 6 | 16 | 8 | 914 |
| 28 | 32 | 31 | 316 | 97 | 78 | 316 | 35 | 354 | 10 | 12 | 7 | 430 |
| 29 | 19 | 31 | 240 | 100 | ------ | 202 | 29 | 674 | 9,220 | 8 | 6 | 278 |
| 30 | 14 | 39 | 183 | 112 | ------ | 230 | 25 | 354 | 13,600 | 8 | 35 | 52 |
| 31 | 10 | ------ | 316 | 114 | ------ | 1,540 | ------ | 146 | ------ | 6 | 16 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off | |
|---|---|---|---|---|---|---|
| | | | | | Inches | Acre-feet |
| October | 828 | 5 | 71.5 | 0.158 | 0.18 | 4,400 |
| November | 2,230 | 3.9 | 196 | .434 | .48 | 11,700 |
| December | 8,220 | 13 | 643 | 1.42 | 1.64 | 39,500 |
| January | 5,580 | 41 | 359 | .794 | .92 | 22,100 |
| February | 550 | 18 | 105 | .232 | .24 | 5,830 |
| March | 1,540 | 29 | 192 | .425 | .49 | 11,800 |
| April | 2,230 | 25 | 317 | .701 | .78 | 18,900 |
| May | 7,950 | 33 | 984 | 2.18 | 2.51 | 60,500 |
| June | 13,600 | 6 | 780 | 1.73 | 1.93 | 46,400 |
| July | 4,200 | 6 | 177 | .392 | .45 | 10,900 |
| August | 138 | 5 | 25.2 | .056 | .06 | 1,550 |
| September | 914 | 2.9 | 60.1 | .133 | .15 | 3,580 |
| The year | 13,600 | 2.9 | 327 | .723 | 9.83 | 237,000 |

### NORTH FABIUS RIVER AT TAYLOR, MO.

LOCATION.—Chain gage in NE¼SE¼ sec. 2, T. 59 N., R. 6 W., at bridge on State highway 61 at Taylor. Zero of gage is about 470.0 feet above mean sea level.
DRAINAGE AREA.—930 square miles.
RECORDS AVAILABLE.—April 1930 to September 1933.
DISCHARGE.—Maximum during year, 30,300 second-feet June 30 (gage height, 22.85 feet); minimum, 11 second-feet Sept. 25 (gage height, 2.12 feet).
1930–33: Maximum, that of June 30, 1933; minimum, 4.5 second-feet Sept. 13, 1930.
Maximum stage known, 23.5 feet Nov. 19, 1928.
REMARKS.—Records good.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 29 | 63 | 89 | 378 | 301 | 233 | 3,320 | 150 | 261 | 26,400 | 31 | 29 |
| 2 | 29 | 56 | 95 | 355 | 257 | 209 | 1,500 | 172 | 213 | 7,330 | 33 | 36 |
| 3 | 26 | 53 | 261 | 332 | 233 | 186 | 890 | 186 | 161 | 730 | 422 | 33 |
| 4 | 26 | 49 | 229 | 301 | 136 | 179 | 678 | 241 | 126 | 545 | 133 | 31 |
| 5 | 25 | 43 | 182 | 233 | 130 | 172 | 445 | 355 | 113 | 2'5 | 51 | 26 |
| 6 | 24 | 40 | 161 | 202 | 136 | 157 | 422 | 1,420 | 98 | 175 | 54 | 24 |
| 7 | 25 | 38 | 147 | 217 | 143 | 172 | 400 | 1,500 | 84 | 140 | 107 | 22 |
| 8 | 25 | 678 | 113 | 233 | 150 | 194 | 378 | 1,500 | 70 | 126 | 133 | 18 |
| 9 | 92 | 1,900 | 89 | 217 | 150 | 209 | 355 | 1,420 | 61 | 119 | 161 | 16 |
| 10 | 890 | 2,550 | 70 | 179 | 130 | 217 | 332 | 890 | 58 | 113 | 1,900 | 16 |
| 11 | 1,580 | 825 | 65 | 150 | 92 | 209 | 292 | 545 | 54 | 101 | 245 | 16 |
| 12 | 1,500 | 422 | 61 | 143 | 86 | 209 | 241 | 7,240 | 161 | 95 | 186 | 31 |
| 13 | 890 | 306 | 70 | 136 | 81 | 202 | 209 | 11,300 | 79 | 89 | 133 | 26 |
| 14 | 265 | 253 | 61 | 123 | 81 | 164 | 332 | 13,400 | 51 | 70 | 70 | 39 |
| 15 | 179 | 190 | 58 | 130 | 86 | 143 | 622 | 7,720 | 42 | 54 | 45 | 31 |
| 16 | 130 | 161 | 54 | 136 | 81 | 136 | 1,340 | 1,420 | 39 | 48 | 33 | 18 |
| 17 | 92 | 133 | 54 | 150 | 86 | 130 | 2,720 | 825 | 36 | 45 | 29 | 16 |
| 18 | 77 | 147 | 51 | 1,340 | 86 | 150 | 732 | 470 | 31 | 42 | 22 | 15 |
| 19 | 60 | 190 | 48 | 4,510 | 202 | 249 | 622 | 378 | 29 | 39 | 22 | 20 |
| 20 | 43 | 168 | 45 | 4,130 | 445 | 292 | 445 | 332 | 26 | 33 | 22 | 20 |
| 21 | 46 | 126 | 39 | 3,500 | 622 | 310 | 355 | 2,460 | 25 | 31 | 20 | 16 |
| 22 | 43 | 101 | 51 | 1,820 | 732 | 257 | 301 | 2,220 | 24 | 31 | 22 | 13 |
| 23 | 40 | 126 | 1,340 | 1,420 | 705 | 209 | 249 | 1,340 | 24 | 33 | 24 | 13 |
| 24 | 38 | 133 | 7,600 | 825 | 732 | 257 | 233 | 622 | 26 | 48 | 175 | 13 |
| 25 | 43 | 119 | 9,970 | 650 | 495 | 355 | 217 | 595 | 26 | 89 | 126 | 11 |
| 26 | 56 | 101 | 11,000 | 570 | 378 | 1,740 | 194 | 5,580 | 24 | 79 | 74 | 18 |
| 27 | 194 | 95 | 3,860 | 445 | 292 | 2,300 | 179 | 1,260 | 23 | 70 | 36 | 45 |
| 28 | 172 | 74 | 2,380 | 378 | 249 | 960 | 172 | 890 | 22 | 61 | 29 | 760 |
| 29 | 164 | 70 | 705 | 332 | ------ | 650 | 164 | 595 | 7,480 | 45 | 33 | 378 |
| 30 | 86 | 74 | 520 | 310 | ------ | 495 | 157 | 445 | 14,900 | 36 | 33 | 241 |
| 31 | 81 | ------ | 400 | 310 | ------ | 1,260 | ------ | 355 | ------ | 29 | 31 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off | |
|---|---|---|---|---|---|---|
| | | | | | Inches | Acre-feet |
| October | 1,580 | 24 | 225 | 0.242 | 0.28 | 13,800 |
| November | 2,550 | 38 | 309 | .332 | .37 | 18,400 |
| December | 11,000 | 39 | 1,290 | 1.39 | 1.60 | 79,300 |
| January | 4,510 | 123 | 779 | .838 | .97 | 47,900 |
| February | 732 | 81 | 261 | .281 | .29 | 14,500 |
| March | 2,300 | 130 | 407 | .438 | .50 | 25,000 |
| April | 3,320 | 157 | 617 | .663 | .74 | 36,700 |
| May | 13,400 | 150 | 2,190 | 2.35 | 2.71 | 135,000 |
| June | 14,900 | 22 | 812 | .873 | .97 | 48,300 |
| July | 26,400 | 29 | 1,200 | 1.29 | 1.49 | 73,800 |
| August | 1,900 | 20 | 143 | .154 | .18 | 8,790 |
| September | 760 | 11 | 66.4 | .071 | .08 | 3,950 |
| The year | 26,400 | 11 | 697 | .749 | 10.18 | 505,000 |

### MIDDLE FABIUS RIVER NEAR BARING, MO.

LOCATION.—Chain gage in NW¼NW¼ sec. 26, T. 64 N., R. 12 W., at bridge on State highway 15, 6 miles north of Baring. Zero of gage is about 679.1 feet above mean sea level.

DRAINAGE AREA.—156 square miles.

RECORDS AVAILABLE.—April 1930 to September 1933.

DISCHARGE.—Maximum recorded during year, 7,730 second-feet June 29 (gage height, 24.23 feet); minimum, 0.8 second-foot June 15; minimum gage height, 2.02 feet June 15, Sept. 9, 19.

1930–33: Maximum, that of June 29, 1933; no flow for many days during 1930 and 1931.

REMARKS.—Records fair but fragmentary, as gage was not read on many days. Stage-discharge relation affected by ice Nov. 25–29, Dec. 10, 13, 20, 22, Jan. 14, Feb. 6, 11, 13, 16–18, 20; discharge estimated.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.6 | | 11 | | | 42 | 280 | 34 | 14 | 71 | 20 | 4.0 |
| 2 | | 6 | | | | | 134 | 26 | | | 9 | 4.0 |
| 3 | | | 13 | | 38 | 36 | 101 | | 9 | | 476 | |
| 4 | 2.0 | 6 | | | | 32 | | | | | | |
| 5 | 1.6 | 7 | | | | | | 176 | | | 17 | |
| 6 | | | 14 | 31 | 20 | 34 | 117 | 620 | 7 | | | |
| 7 | | 8 | | 29 | | 57 | | | | 16 | 11 | 1.3 |
| 8 | | 1,520 | | | | | 76 | 448 | | 29 | | 1.3 |
| 9 | | | | 20 | | | | 202 | | | 48 | 1.1 |
| 10 | 755 | | 3 | | | 32 | 51 | | | 16 | 61 | |
| 11 | 163 | | | | 6 | 26 | | 1,850 | | | 17 | 1.3 |
| 12 | | | | | | | | 4,280 | | 14 | 11 | 1.4 |
| 13 | 21 | | 3 | | 6 | 38 | 34 | 2,280 | 3.4 | | | 1.4 |
| 14 | 15 | | | 13 | | | 241 | | 1.4 | | | |
| 15 | | 26 | | | | | 1,730 | | .8 | | | 2.0 |
| 16 | | | | | 6 | | | | 1.2 | | | |
| 17 | | | | | 6 | 25 | 122 | 71 | 1.2 | | | |
| 18 | | | | 228 | 6 | | | 53 | | 8 | 2.9 | 1.3 |
| 19 | 4.7 | 16 | | 3,660 | | | 61 | 40 | 1.2 | | 11 | 1.1 |
| 20 | 5 | | 3 | 860 | 60 | | 57 | 32 | | | | 1.3 |
| 21 | 5 | | | | 267 | | | | 1.4 | 8 | 202 | 1.3 |
| 22 | 5 | | 8 | | | 57 | | 134 | | 8 | 54 | 2.3 |
| 23 | | | 406 | 267 | 254 | 53 | | 139 | | | 18 | |
| 24 | 6 | | 2,700 | 134 | | 51 | 34 | | | 62 | | |
| 25 | 27 | 13 | | | 91 | 845 | | 34 | | | 8 | 1.6 |
| 26 | | 13 | | 96 | | | | 49 | 1.0 | | | 1.8 |
| 27 | 23 | | 176 | | 47 | 254 | 25 | 42 | | | | 4.0 |
| 28 | 16 | 10 | | 71 | 38 | 128 | 24 | | 40 | 7 | 4.9 | 23 |
| 29 | 12 | 6 | | | | 176 | | 55 | 7,400 | | 8 | 27 |
| 30 | | | 176 | | | 189 | | | 546 | | | 7 |
| 31 | 16 | | | 59 | | 560 | | 20 | | | | |

### NORTH FORK OF SOUTH FABIUS RIVER AT EDINA, MO.

LOCATION.—Chain gage in SE¼NE¼ sec. 13, T. 62 N., R. 12 E., at bridge on State highway 15 at Edina. Zero of gage is 719.1 feet above mean sea level.
DRAINAGE AREA.—72 square miles.
RECORDS AVAILABLE.—April 1930 to September 1933.
DISCHARGE.—Maximum recorded during year, 13,300 second-feet June 29 (gage height, 14.64 feet); no flow on many days.
1930–33: Maximum, that of June 29, 1933; no flow on many days.
REMARKS.—Records fair but fragmentary, as gage was not read on many days. Stage-discharge relation affected by ice Nov. 26, 28, Dec. 10, Feb. 4, 11, 15; discharge estimated.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | 127 | | | | | 0.1 |
| 2 | | | | | | | 59 | | | | | |
| 3 | | | 19 | | | | | | | | | |
| 4 | 0.6 | | | | 4.0 | 3.9 | | | | | | |
| 5 | | 6 | | | | | | | | | 19 | |
| 6 | | | | | | | | | 3.2 | | | .1 |
| 7 | .2 | | | | | | | | | 8 | | .2 |
| 8 | | 520 | | | | | 18 | 296 | | | | 0 |
| 9 | | 800 | | | | | | | | | 8 | 0 |
| 10 | 720 | | 10 | | | | 13 | 19 | | 6 | 6 | |
| 11 | 346 | | | | .5 | | | 760 | | | | 0 |
| 12 | | 49 | | | | | | 1,220 | | | | 0 |
| 13 | | | | | | 4.2 | | 1,300 | | | | 0 |
| 14 | | | | 3.6 | | | 215 | | .7 | | | 0 |
| 15 | | | | | 1.5 | | 610 | | | | | 0 |
| 16 | | | | 2.4 | | | | | | | | 0 |
| 17 | | | | | | | 56 | | | | | 0 |
| 18 | | | | | | 2.4 | | | | | .2 | |
| 19 | | | | 890 | | | | | | | | 0 |
| 20 | | | | | | | | 86 | | | | 0 |
| 21 | 6 | | | 99 | | | | | | | | 0 |
| 22 | | 32 | | | | | | 80 | | | | 0 |
| 23 | | | 206 | | | 7 | | | | | | |
| 24 | | | 1,000 | | | | | | | 2.2 | 4.8 | 0 |
| 25 | | | 1,300 | | | | | | | | | |
| 26 | 14 | 4.0 | | | | | | 46 | | | 4.5 | 0 |
| 27 | | | 80 | | | | | | | | | 0 |
| 28 | | 2.5 | | | | | | 18 | | | | |
| 29 | | | | | | 40 | 2.7 | | 10,600 | 19 | 0 | |
| 30 | | | | | | | | | 1,220 | | | |
| 31 | | | 30 | | | | | | | | | |

### SALT RIVER NEAR SHELBINA, MO.

LOCATION.—In SW¼NE¼ sec. 17, T. 57 N., R. 10 W., at bridge on State highway 15, 3 miles north of Shelbina. Zero of gage is 663.3 feet (revised) above mean sea level.

DRAINAGE AREA.—481 square miles.

RECORDS AVAILABLE.—April 1930 to September 1933.

DISCHARGE.—Maximum recorded during year, 16,000 second-feet July 1 (gage height, 22.62 feet).

1930–33: Maximum, that of July 1, 1933; minimum, 0.1 second-foot Aug. 2, 1930.

Maximum stage known, 23.5 feet in June 1928 (discharge, 18,000 second-feet).

REMARKS.—Records good but fragmentary, as gage was not read on many days. Discharge computed only for days when gage was read above 5.00 feet.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | 15,600 | |
| 2 | | | | | | | 1,100 | | | 6,820 | |
| 3 | | | | | | | [a]452 | | | 2,760 | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | 706 | [a]26 | | |
| 7 | | | | | | | | | | | |
| 8 | | 992 | | | | | | | | | |
| 9 | | 1,920 | | | | | | | | | |
| 10 | 1,140 | 2,150 | | | | | | | | | [a]100 |
| 11 | 2,030 | | | | | | | | | | |
| 12 | | | | | | | | 2,670 | | | |
| 13 | | | | | | | | 4,240 | | | |
| 14 | | | | | | | | 5,490 | | | |
| 15 | | | | | | | 1,210 | 3,120 | | | |
| 16 | | | | | | | 1,690 | 742 | | | |
| 17 | | | | | | | 1,030 | | | | |
| 18 | | | | 1,070 | | | | | | | |
| 19 | | | | 1,800 | | | | | | | |
| 20 | | | | | 706 | | | | | | |
| 21 | | | | 2,980 | | | | 850 | | | |
| 22 | | | | | | | | 1,100 | | | |
| 23 | | | 1,960 | 850 | | | | 706 | | | |
| 24 | | | 2,940 | | | | | | | | |
| 25 | | | 6,500 | | | | | | | | |
| 26 | | | | | | | | 1,760 | | | |
| 27 | | | 4,970 | | | 1,840 | | 958 | | | |
| 28 | | [a]37 | 1,880 | | | | | | | | |
| 29 | | | [a]402 | | | | | | 1,250 | | |
| 30 | | | | | | | | | 10,000 | | |
| 31 | | | | | | 1,210 | | | | | |

[a] Result of discharge measurement.

### SALT RIVER NEAR HUNNEWELL, MO.

LOCATION.—Chain gage in SW¼NW¼ sec. 10, T. 56 N., R. 9 W., half a mile below Black Creek and 2 miles west of Hunnewell. Zero of gage is about 615.6 feet (revised) above mean sea level.

DRAINAGE AREA.—626 square miles.

RECORDS AVAILABLE.—April 1930 to September 1933.

DISCHARGE.—Maximum during year, 15,400 second-feet July 1 (gage height, 21.20 feet); minimum, 1.3 second-feet Sept. 26; minimum gage height, 2.08 feet Oct. 7–9.

1930–33: Maximum, that of July 1, 1933; minimum, 0.2 second-foot Nov. 4–6, 8, 13, 1930.

Maximum stage known, about 21.8 feet, date unknown.

REMARKS.—Records fair. Stage-discharge relation affected by ice Dec. 11–22, Feb. 5–20.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14 | 29 | 29 | 222 | 174 | 137 | 2,200 | 69 | 164 | 11,300 | 20 | 9 |
| 2 | 8 | 20 | 25 | 192 | 174 | 121 | 1,800 | 82 | 106 | 10,200 | 16 | 8 |
| 3 | 6 | 16 | 25 | 174 | 174 | 110 | 632 | 66 | 69 | 5,100 | 14 | 8 |
| 4 | 6 | 14 | 43 | 137 | 155 | 103 | 400 | 92 | 54 | 560 | 328 | 6 |
| 5 | 4.5 | 11 | 89 | 114 | 92 | 85 | 306 | 146 | 48 | 242 | 284 | 6 |
| 6 | 4.5 | 11 | 121 | 106 | 75 | 75 | 284 | 400 | 37 | 146 | 75 | 6 |
| 7 | 3.2 | 11 | 85 | 96 | 45 | 137 | 376 | 828 | 32 | 99 | 45 | 5 |
| 8 | 3.2 | 22 | 66 | 124 | 45 | 328 | 352 | 748 | 28 | 82 | 38 | 5 |
| 9 | 3.2 | 1,660 | 32 | 106 | 34 | 328 | 284 | 400 | 25 | 400 | 38 | 4.0 |
| 10 | 5 | 2,350 | 21 | 89 | 26 | 222 | 212 | 252 | 21 | 183 | 29 | 3.5 |
| 11 | 1,760 | 1,850 | 14 | 89 | 20 | 155 | 174 | 183 | 21 | 99 | 38 | 3.5 |
| 12 | 2,300 | 596 | 9 | 78 | 20 | 121 | 137 | 3,910 | 19 | 60 | 99 | 2.9 |
| 13 | 1,320 | 232 | 9 | 72 | 20 | 110 | 117 | 5,170 | 13 | 45 | 117 | 2.9 |
| 14 | 524 | 146 | 6 | 51 | 20 | 121 | 146 | 5,920 | 10 | 38 | 60 | 2.6 |
| 15 | 183 | 121 | 6 | 51 | 20 | 106 | 708 | 5,240 | 10 | 38 | 34 | 2.0 |
| 16 | 99 | 96 | 4 | 48 | 20 | 103 | 1,520 | 2,610 | 21 | 32 | 25 | 2.6 |
| 17 | 75 | 48 | 4 | 48 | 20 | 92 | 2,000 | 560 | 18 | 26 | 15 | 3.5 |
| 18 | 34 | 60 | 4 | 48 | 20 | 92 | 916 | 284 | 13 | 22 | 11 | 3.2 |
| 19 | 20 | 60 | 4 | 51 | 20 | 202 | 428 | 202 | 13 | 22 | 8 | 3.2 |
| 20 | 18 | 48 | 4 | 2,870 | 110 | 192 | 306 | 146 | 10 | 22 | 10 | 2.6 |
| 21 | 14 | 38 | 4 | 4,180 | 1,000 | 192 | 232 | 352 | 10 | 20 | 10 | 2.0 |
| 22 | 8 | 36 | 6 | 2,950 | 916 | 183 | 174 | 1,050 | 8 | 19 | 24 | 1.5 |
| 23 | 14 | 57 | 1,050 | 1,280 | 632 | 164 | 146 | 748 | 8 | 16 | 16 | 1.5 |
| 24 | 12 | 48 | 4,670 | 748 | 488 | 128 | 128 | 560 | 8 | 22 | 10 | 1.5 |
| 25 | 12 | 48 | 6,400 | 400 | 376 | 456 | 121 | 352 | 8 | 24 | 10 | 1.5 |
| 26 | 10 | 48 | 8,080 | 306 | 284 | 828 | 110 | 5,400 | 8 | 20 | 32 | 1.3 |
| 27 | 10 | 36 | 7,360 | 268 | 212 | 2,000 | 99 | 2,000 | 8 | 19 | 25 | 1.5 |
| 28 | 121 | 36 | 4,040 | 222 | 174 | 1,660 | 92 | 828 | 8 | 16 | 25 | 1.5 |
| 29 | 92 | 29 | 708 | 202 | ------- | 632 | 89 | 400 | 328 | 19 | 15 | 1.5 |
| 30 | 69 | 29 | 400 | 183 | ------- | 352 | 75 | 284 | 2,100 | 24 | 10 | 1.5 |
| 31 | 41 | ------- | 263 | 164 | ------- | 828 | ------- | 202 | ------- | 20 | 10 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off | |
|---|---|---|---|---|---|---|
| | | | | | Inches | Acre-feet |
| October | 2,300 | 3.2 | 219 | 0.350 | 0 40 | 13,500 |
| November | 2,350 | 11 | 260 | .415 | .46 | 15,500 |
| December | 8,080 | 4 | 1,080 | 1.73 | 1 99 | 66,400 |
| January | 4,180 | 48 | 506 | .808 | .93 | 31,100 |
| February | 1,000 | 20 | 192 | .307 | .32 | 10,700 |
| March | 2,000 | 75 | 334 | .534 | .62 | 20,500 |
| April | 2,200 | 75 | 485 | .775 | .86 | 28,900 |
| May | 5,920 | 66 | 1,270 | 2.03 | 2.34 | 78,100 |
| June | 2,100 | 8 | 108 | .173 | .19 | 6,430 |
| July | 11,300 | 16 | 933 | 1.49 | 1.72 | 57,400 |
| August | 328 | 8 | 48.1 | .077 | .09 | 2,960 |
| September | 9 | 1.3 | 3.49 | .0056 | .006 | .208 |
| The year | 11,300 | 1.3 | 459 | .773 | 9.93 | 332,000 |

### SALT RIVER NEAR NEW LONDON, MO.

LOCATION.—Chain gage in NE¼NW¼ sec. 36, T. 56 N., R. 5 W., at bridge on State highway 61, 2 miles north of New London. Zero of gage is about 476.9 feet above mean sea level.

DRAINAGE AREA.—2,480 square miles.

RECORDS AVAILABLE.—February 1922 to September 1933.

DISCHARGE.—Maximum during year, 32,400 second-feet May 14 (gage height, 21.72 feet); minimum, 7 second-feet Sept. 11, 16–19, 21–26, 30.

1922–33: Maximum, 58,700 second-feet June 21, 1928 (gage height, 28.8 feet); minimum, 5 second-feet Aug. 21, 24, Sept. 4, 6, Nov. 14, 1930. Average, 11 years, 1,670 second-feet.

REMARKS.—Records good except those for periods of ice effect, Dec. 8–22, 5–21, which are poor. Discharge estimated Aug. 18, Sept. 18, 22, 24, 25.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 157 | 132 | 65 | 1,210 | 456 | 630 | 10,900 | 234 | 1,010 | 3 580 | 45 | 33 |
| 2 | 91 | 118 | 65 | 814 | 430 | 456 | 7,890 | 306 | 752 | 9,780 | 37 | 37 |
| 3 | 79 | 91 | 60 | 630 | 430 | 379 | 5,140 | 540 | 570 | 12.100 | 33 | 25 |
| 4 | 73 | 67 | 88 | 540 | 430 | 306 | 2,810 | 404 | 456 | 7,480 | 194 | 19 |
| 5 | 53 | 57 | 82 | 484 | 306 | 260 | 1,790 | 456 | 354 | 1.350 | 1,070 | 16 |
| 6 | 39 | 67 | 82 | 404 | 260 | 251 | 1,490 | 1,420 | 306 | 570 | 690 | 13 |
| 7 | 31 | 50 | 82 | 354 | 216 | 297 | 1,860 | 2,480 | 256 | 354 | 379 | 13 |
| 8 | 31 | 50 | 97 | 330 | 173 | 4,180 | 1,860 | 3,980 | 225 | 220 | 229 | 13 |
| 9 | 23 | 45 | 67 | 297 | 132 | 3,320 | 1,490 | 3,490 | 190 | 219 | 108 | 10 |
| 10 | 35 | 29 | 67 | 288 | 97 | 1,790 | 1,140 | 1,570 | 165 | 186 | 100 | 8 |
| 11 | 31 | 2,730 | 67 | 260 | 97 | 1,070 | 878 | 1,140 | 148 | 511 | 144 | 7 |
| 12 | 690 | 2,240 | 43 | 251 | 67 | 752 | 721 | 20,000 | 132 | 274 | 484 | 8 |
| 13 | 2,730 | 1,070 | 43 | 225 | 67 | 600 | 570 | 31,100 | 104 | 177 | 511 | 8 |
| 14 | 1,860 | 570 | 23 | 207 | 43 | 484 | 511 | 31,400 | 140 | 144 | 238 | 8 |
| 15 | 1,140 | 330 | 23 | 199 | 43 | 404 | 430 | 16,400 | 404 | 122 | 212 | 8 |
| 16 | 511 | 247 | 23 | 181 | 43 | 379 | 878 | 7,760 | 216 | 88 | 169 | 7 |
| 17 | 297 | 203 | 23 | 173 | 43 | 330 | 3,490 | 4,580 | 132 | 70 | 108 | 7 |
| 18 | 190 | 169 | 23 | 181 | 43 | 306 | 3,980 | 2,020 | 111 | 60 | 104 | 7 |
| 19 | 132 | 128 | 23 | 484 | 43 | 2,400 | 2,570 | 1,350 | 111 | 50 | 100 | 7 |
| 20 | 91 | 114 | 23 | 7,760 | 97 | 1,070 | 1,570 | 942 | 91 | 50 | 88 | 8 |
| 21 | 67 | 100 | 23 | 5,700 | 260 | 630 | 1,070 | 878 | 73 | 41 | 45 | 7 |
| 22 | 53 | 94 | 23 | 7,350 | 1,940 | 540 | 814 | 2,240 | 62 | 37 | 33 | 7 |
| 23 | 48 | 88 | 10.100 | 6,570 | 1,710 | 600 | 690 | 8,600 | 57 | 33 | 25 | 7 |
| 24 | 43 | 76 | 22,800 | 3,580 | 1,420 | 1,280 | 570 | 4,690 | 48 | 33 | 22 | 7 |
| 25 | 73 | 82 | 28,600 | 2,020 | 1,140 | 5,030 | 484 | 2,090 | 48 | 29 | 19 | 7 |
| 26 | 57 | 88 | 24.900 | 1,350 | 1,940 | 6,570 | 430 | 8,160 | 43 | 25 | 16 | 7 |
| 27 | 48 | 82 | 13,500 | 1,010 | 1,490 | 4,350 | 354 | 26,600 | 39 | 22 | 16 | 13 |
| 28 | 39 | 82 | 10,400 | 814 | 942 | 3,680 | 330 | 16,600 | 35 | 10 | 25 | 13 |
| 29 | 39 | 76 | 4,280 | 660 | ------- | 2,730 | 288 | 5,250 | 48 | 33 | 22 | 10 |
| 30 | 39 | 70 | 1,860 | 570 | ------- | 2,020 | 260 | 2,090 | 242 | 100 | 41 | 7 |
| 31 | 132 | ------- | 1,140 | 511 | ------- | 3,490 | ------- | 1,350 | ------- | 50 | 37 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off | |
|---|---|---|---|---|---|---|
| | | | | | Inches | Acre-feet |
| October | 2,730 | 23 | 288 | 0.116 | 0.13 | 17,700 |
| November | 2,730 | 29 | 312 | .126 | .14 | 18,600 |
| December | 28,600 | 23 | 3,830 | 1.54 | 1.78 | 236,000 |
| January | 7,760 | 173 | 1,460 | .589 | .68 | 89,800 |
| February | 1,940 | 43 | 513 | .207 | .22 | 28,500 |
| March | 6,570 | 251 | 1,630 | .657 | .76 | 100,000 |
| April | 10,900 | 260 | 1,910 | .770 | .86 | 114,000 |
| May | 31,400 | 234 | 6,780 | 2.73 | 3.15 | 417,000 |
| June | 1,010 | 35 | 219 | .088 | .10 | 13,000 |
| July | 12,100 | 10 | 1,220 | .491 | .57 | 75,000 |
| August | 1,070 | 16 | 172 | .069 | .08 | 10,600 |
| September | 37 | 7 | 11.6 | .0047 | .005 | 690 |
| The year | 31,400 | 7 | 1,550 | .625 | 8.47 | 1,120,000 |

### CROOKED CREEK NEAR SHELBINA, MO.

LOCATION.—Chain gage in NW¼SW¼ sec. 33, T. 56 N., R. 10 W., at bridge on State highway 15, 6 miles south of Shelbina. Zero of gage is 669.6 feet above mean sea level.

DRAINAGE AREA.—70 square miles.

RECORDS AVAILABLE.—April 1930 to September 1933.

DISCHARGE.—Maximum recorded during year, 2,160 second-feet May 26, 1933 (gage height, 11.88 feet); no flow on many days.

1930–33: Maximum, that of May 26, 1933; no flow on many days.

Maximum stage known, about 13 feet, date unknown.

REMARKS.—Records fair but fragmentary, as gage was not read on many days. Discharge estimated during periods of ice effect, Nov. 29, 30, Feb. 10, 13.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | Ju'y | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.9 | | | | 10 | | 522 | 12 | | 12 | | 0.1 |
| 2 | | | | | | 2.6 | | | | | | |
| 3 | .7 | | | 3.9 | | | 32 | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | 1.2 | 2.4 | | | | | | | | |
| 6 | | | | | | | | | 2.1 | | | 0 |
| 7 | | 1.0 | | 2.6 | | | | | | | | |
| 8 | | | | | | | | | | | 0.4 | 0 |
| 9 | | | | | | | | | | | .9 | 0 |
| 10 | 10 | 12 | | | 2.0 | | | | | | .7 | |
| 11 | 128 | | | | | | | 6 | | | .6 | 0 |
| 12 | | | | | | | | | .3 | 1.6 | | |
| 13 | | | | | 2.0 | 6 | | 1,670 | | | | 0 |
| 14 | | | 1.2 | | | | 15 | | | | | |
| 15 | 1.9 | | | | | | | | 1.0 | | | |
| 16 | | | | | | | | | | | | |
| 17 | | 1.6 | | | | | | | | .1 | | 0 |
| 18 | 1.2 | 1.0 | | | | 3.0 | | | | | | 0 |
| 19 | | 1.9 | | | | | | | | | .5 | 0 |
| 20 | | | | | | | | 5 | | | .1 | |
| 21 | .7 | | .9 | 44 | | | | | .2 | | | |
| 22 | 1.6 | 1.2 | 1.0 | | | | | | | | | |
| 23 | | | 1,020 | | | 4.3 | | | | | | |
| 24 | | | 1,930 | | | | 4.3 | | | 5 | | 0 |
| 25 | | | | 7 | 12 | 223 | | | | | | |
| 26 | | | | | | | | 2,160 | | | .1 | |
| 27 | | | | | | | | 929 | | | | 0 |
| 28 | 1.2 | | 17 | | | | | | | | .1 | |
| 29 | | .5 | | | | | | | | | | 0 |
| 30 | | 2.0 | | 6 | | | | | | | .1 | |
| 31 | 1.2 | | 7 | | | | | | | | | |

### DAVIS CREEK NEAR MEXICO, MO.

LOCATION.—Chain gage in NE¼SE¼ sec. 21, T. 51 N., R. 9 W., at bridge on State highway 22, 2 miles northwest of Mexico. Zero of gage is about 728.8 feet above mean sea level.

DRAINAGE AREA.—59 square miles.

RECORDS AVAILABLE.—April 1930 to September 1933.

DISCHARGE.—Maximum recorded during year, 2,380 second-feet May 12 (gage height, 13.50 feet); no flow on many days.

1930–33: Maximum, 2,820 second-feet May 19, 1931 (gage height, 14.40 feet); no flow on many days each year.

Maximum stage known, about 17 feet, date unknown.

REMARKS.—Records fair but fragmentary, as gage was not read on many days. Discharge estimated during periods of ice effect, Nov. 25, Dec. 21, Jan. 21, Feb. 18, 20.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0.1 | 0.2 | | 8 | | 460 | 4.2 | | 0.2 | | 0 |
| 2 | | .1 | | | 21 | | | 1.5 | | | | 0 |
| 3 | 0.1 | | .1 | | 7 | | 43 | | 2.8 | .1 | 34 | |
| 4 | .1 | .1 | | | | | | | | | 10 | |
| 5 | .1 | .1 | | | | | | 1.7 | 1.5 | .1 | | 0 |
| 6 | | | | 0.6 | | 12 | 41 | 3.6 | | .1 | | 0 |
| 7 | .1 | .1 | | | | 230 | 28 | | .7 | .2 | | 0 |
| 8 | .1 | .1 | | | | 51 | 16 | 63 | .6 | | | |
| 9 | | | | .4 | | 29 | | | .8 | | .3 | 0 |
| 10 | .1 | | | | | | | | .6 | .1 | | |
| 11 | .1 | | | | | 6 | 4.6 | 308 | | .1 | 1.8 | |
| 12 | | | | .4 | | | | 2,020 | .6 | | | 0 |
| 13 | .1 | | | | | | | 478 | | .1 | | 0 |
| 14 | .1 | | | | | 6 | 2.7 | | 2.3 | | .2 | |
| 15 | .1 | | | | 1.1 | 3.4 | 3.3 | | .8 | .1 | | |
| 16 | | | | .4 | | 1.8 | | 36 | | | .2 | |
| 17 | .1 | | | | | | | 20 | .3 | .1 | | |
| 18 | | | | 59 | 2.0 | 1.6 | 20 | | | | | |
| 19 | | .2 | | | | | 10 | | | | | 0 |
| 20 | | | | 32 | 2.0 | | 5 | 1.8 | | .1 | | |
| 21 | | | .2 | | | | | 102 | .2 | .1 | | |
| 22 | .1 | .1 | | | | 1.1 | | 370 | | 0 | | 0 |
| 23 | | .1 | 514 | 43 | 4.4 | 1.4 | | | .2 | | | 0 |
| 24 | .1 | | | | | 1.1 | 4.6 | 26 | .2 | 4.7 | | |
| 25 | .1 | 0 | | 23 | 47 | 266 | 3.0 | 29 | | | 0 | 0 |
| 26 | .3 | | | | | | | 1,130 | .2 | | 0 | |
| 27 | .2 | | 6 | | 12 | 20 | | 72 | | .2 | | 9 |
| 28 | | .1 | 4.4 | | | | | | .2 | | 0 | 4.7 |
| 29 | | | | | | 7 | .9 | 26 | | .1 | | .6 |
| 30 | | | 2.3 | | | 308 | | | .3 | | | .3 |
| 31 | .1 | | | | | 102 | | .6 | | .1 | .1 | |

### CUIVRE RIVER NEAR TROY, MO.

LOCATION.—Chain gage in SE¼ sec. 14, T. 49 N., R. 1 W., at bridge on State highway 61, 2 miles north of Troy. Zero of gage is 450.4 feet above mean sea level.

DRAINAGE AREA.—903 square miles.

RECORDS AVAILABLE.—February 1922 to September 1933.

DISCHARGE.—Maximum during year, 22,800 second-feet May 13 (gage height, 24.22 feet); minimum, 2.9 second-feet Sept. 22.

1922–33: Maximum, about 52,600 second-feet May 18, 1929 (gage height, 25.75 feet at former location); minimum, 0.3 second-foot Aug. 2–9, 1930. Average, 11 years, 781 second-feet.

REMARKS.—Records fair except those for periods of ice effect, Dec. 12–22, Feb. 7–11, which are poor.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 | 28 | 30 | 166 | 312 | 257 | 6,990 | 494 | 168 | 12 | 4.0 | 5 |
| 2 | 13 | 26 | 28 | 158 | 376 | 209 | 2,600 | 1,140 | 147 | 9 | 3.6 | 6 |
| 3 | 14 | 23 | 26 | 142 | 268 | 183 | 1,540 | 714 | 124 | 8 | 180 | 4.2 |
| 4 | 16 | 22 | 33 | 135 | 228 | 166 | 955 | 376 | 103 | 7 | 147 | 4.6 |
| 5 | 14 | 18 | 79 | 120 | 192 | 150 | 752 | 289 | 93 | 6 | 87 | 4.2 |
| 6 | 13 | 16 | 69 | 105 | 192 | 402 | 1,440 | 460 | 87 | 7 | 60 | 3.4 |
| 7 | 16 | 19 | 65 | 105 | 166 | 6,900 | 1,340 | 430 | 75 | 7 | 38 | 3.8 |
| 8 | 12 | 20 | 60 | 105 | 166 | 3,060 | 790 | 5,280 | 71 | 6 | 27 | 3.4 |
| 9 | 11 | 22 | 52 | 98 | 150 | 1,140 | 600 | 1,340 | 69 | 11 | 17 | 3.4 |
| 10 | 14 | 23 | 47 | 92 | 135 | 676 | 460 | 790 | 45 | 9 | 15 | 3.8 |
| 11 | 12 | 25 | 47 | 79 | 135 | 430 | 376 | 402 | 48 | 7 | 12 | 3.4 |
| 12 | 11 | 18 | 35 | 79 | 135 | 337 | 300 | 9,600 | 52 | 7 | 17 | 3.8 |
| 13 | 10 | 16 | 26 | 69 | 128 | 312 | 257 | 20,500 | 45 | 6 | 11 | 4.6 |
| 14 | 11 | 15 | 26 | 67 | 142 | 278 | 237 | 12,100 | 27 | 5 | 9 | 41 |
| 15 | 9 | 20 | 26 | 65 | 166 | 247 | 237 | 6,640 | 41 | 4.6 | 8 | 11 |
| 16 | 9 | 23 | 19 | 63 | 135 | 218 | 3,200 | 2,790 | 24 | 6 | 6 | 7 |
| 17 | 8 | 25 | 19 | 65 | 142 | 192 | 1,540 | 1,290 | 20 | 5 | 4.6 | 4.6 |
| 18 | 7 | 22 | 19 | 72 | 158 | 192 | 752 | 752 | 14 | 7 | 5 | 4.2 |
| 19 | 5 | 25 | 19 | 8,000 | 166 | 350 | 494 | 528 | 17 | 7 | 4.6 | 4.4 |
| 20 | 4.4 | 20 | 19 | 1,960 | 183 | 494 | 376 | 281 | 12 | 5 | 4.6 | 3.4 |
| 21 | 3.8 | 25 | 19 | 910 | 218 | 430 | 337 | 6,040 | 20 | 4.6 | 5 | 3.2 |
| 22 | 4.4 | 35 | 19 | 11,600 | 192 | 268 | 289 | 955 | 17 | 6 | 4.6 | 2.9 |
| 23 | 4.8 | 33 | 4,880 | 2,020 | 183 | 247 | 268 | 752 | 14 | 5 | 6 | 5 |
| 24 | 4.0 | 34 | 15,400 | 955 | 174 | 289 | 247 | 350 | 15 | 7 | 7 | 4.6 |
| 25 | 15 | 35 | 4,400 | 1,240 | 1,290 | 3,340 | 228 | 460 | 15 | 7 | 4.6 | 4.2 |
| 26 | 218 | 35 | 1,240 | 910 | 752 | 1,590 | 209 | 955 | 17 | 5 | 3.4 | 4.4 |
| 27 | 105 | 35 | 600 | 562 | 430 | 830 | 183 | 1,000 | 14 | 6 | 4.2 | 56 |
| 28 | 86 | 30 | 494 | 430 | 324 | 528 | 166 | 714 | 12 | 4.6 | 4.6 | 255 |
| 29 | 60 | 23 | 300 | 350 | ------ | 376 | 402 | 460 | 14 | 4.2 | 3.8 | 111 |
| 30 | 49 | 31 | 237 | 312 | ------ | 6,210 | 402 | 255 | 11 | 3.4 | 6 | 60 |
| 31 | 37 | ------ | 228 | 278 | ------ | 6,720 | ------ | 204 | ------ | 4.2 | 4.6 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off | |
|---|---|---|---|---|---|---|
| | | | | | Inches | Acre-feet |
| October | 218 | 3.8 | 26.2 | 0.029 | 0.03 | 1,610 |
| November | 35 | 15 | 24.7 | .027 | .03 | 1,470 |
| December | 15,400 | 19 | 921 | 1.02 | 1.18 | 56,600 |
| January | 11,600 | 63 | 1,010 | 1.12 | 1.29 | 62,100 |
| February | 1,290 | 128 | 258 | .286 | .30 | 14,300 |
| March | 6,900 | 150 | 1,190 | 1.32 | 1.52 | 73,200 |
| April | 6,990 | 166 | 932 | 1.03 | 1.15 | 55,500 |
| May | 20,500 | 204 | 2,530 | 2.80 | 3.23 | 156,000 |
| June | 168 | 11 | 47.7 | .053 | .06 | 2,840 |
| July | 12 | 3.4 | 6.41 | .007 | .01 | 394 |
| August | 180 | 3.4 | 23.0 | .025 | .03 | 1,410 |
| September | 255 | 2.9 | 21.2 | .023 | .03 | 1,260 |
| The year | 20,500 | 2.9 | 589 | .652 | 8.86 | 427,000 |

### DES PLAINES RIVER AT LEMONT, ILL.

LOCATION.—Chain gage in NW¼ sec. 20, T. 37 N., R. 11 E., at Stephens Street Bridge, one-quarter mile north of Lemont and 8 miles above confluence with Chicago Sanitary Canal. Zero of gage is 584.10 feet above mean sea level.

DRAINAGE AREA.—705 square miles.

RECORDS AVAILABLE.—November 1914 to September 1933.

DISCHARGE.—Maximum during year, 4,850 second-feet May 9 (gage height, 6.23 feet); minimum, 2.1 second-feet Oct. 21 (gage height, 2.46 feet).

1915–33: Maximum, 5,520 second-feet Mar. 18, 1919; no flow on various dates, 1919, 1925, and 1932. Average, 18 years, 431 second-feet (not including overflow into Chicago Sanitary Canal).

REMARKS.—Records fair. During high water part of flow spills into Chicago Sanitary Canal 7 miles above gage. This overflow, in second-feet, during the year (not included in the table of daily and monthly discharge) was as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Apr. 1 | 85 | May 4 | 335 | May 9 | 2,480 | May 14 | 1,110 |
| Apr. 2 | 105 | May 5 | 2 | May 10 | 2,270 | May 15 | 540 |
| Apr. 3 | 10 | May 6 | 240 | May 11 | 2,155 | May 16 | 125 |
| May 2 | 625 | May 7 | 450 | May 12 | 1,910 | May 17 | 5 |
| May 3 | 1,135 | May 8 | 1,400 | May 13 | 1,585 | | |

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.0 | 16 | 25 | 374 | 424 | 975 | 2,170 | 383 | 800 | 239 | 30 | 11 |
| 2 | 9.0 | 12 | 28 | 327 | 512 | 915 | 2,170 | 915 | 745 | 1,090 | 44 | 7.5 |
| 3 | 11 | 18 | 30 | 260 | 449 | 800 | 2,030 | 2,170 | 657 | 1,090 | 75 | 7.5 |
| 4 | 23 | 16 | 28 | 219 | 530 | 690 | 1,900 | 3,750 | 582 | 800 | 60 | 11 |
| 5 | 28 | 23 | 34 | 184 | 572 | 562 | 1,660 | 3,280 | 494 | 668 | 44 | 11 |
| 6 | 11 | 20 | 28 | 155 | 530 | 485 | 1,660 | 2,870 | 467 | 540 | 30 | 14 |
| 7 | 7.5 | 9.0 | 34 | 135 | 280 | 366 | 1,560 | 2,680 | 399 | 415 | 18 | 11 |
| 8 | 14 | 12 | 52 | 130 | 135 | 327 | 1,470 | 4,000 | 335 | 432 | 28 | 11 |
| 9 | 18 | 30 | 37 | 135 | 119 | 260 | 1,470 | 4,850 | 303 | 342 | 23 | 11 |
| 10 | 30 | 64 | 28 | 140 | 135 | 239 | 1,380 | 4,850 | 273 | 246 | 30 | 14 |
| 11 | 48 | 48 | 25 | 135 | 119 | 212 | 1,300 | 4,270 | 246 | 195 | 23 | 18 |
| 12 | 40 | 25 | 34 | 145 | 114 | 201 | 1,380 | 4,000 | 195 | 161 | 12 | 14 |
| 13 | 48 | 14 | 25 | 150 | 109 | 189 | 1,470 | 3,750 | 161 | 130 | 11 | 11 |
| 14 | 30 | 6.0 | 20 | 124 | 99 | 206 | 1,470 | 3,510 | 150 | 114 | 9.0 | 11 |
| 15 | 18 | 6.0 | 25 | 130 | 89 | 266 | 1,380 | 2,870 | 124 | 124 | 7.5 | 11 |
| 16 | 11 | 14 | 23 | 124 | 71 | 296 | 1,380 | 2,330 | 114 | 124 | 7.5 | 9.0 |
| 17 | 9.0 | 30 | 25 | 119 | 130 | 266 | 1,300 | 1,900 | 104 | 109 | 7.5 | 14 |
| 18 | 23 | 64 | 23 | 140 | 135 | 226 | 1,300 | 1,470 | 84 | 89 | 11 | 16 |
| 19 | 16 | 56 | 30 | 280 | 130 | 239 | 1,230 | 1,380 | 75 | 75 | 12 | 14 |
| 20 | 7.5 | 37 | 37 | 503 | 109 | 266 | 1,170 | 1,470 | 67 | 67 | 11 | 14 |
| 21 | 3.0 | 30 | 34 | 604 | 135 | 342 | 975 | 1,780 | 52 | 60 | 7.5 | 12 |
| 22 | 9.0 | 25 | 30 | 723 | 467 | 415 | 915 | 1,470 | 44 | 60 | 7.5 | 14 |
| 23 | 20 | 37 | 56 | 745 | 1,090 | 449 | 734 | 1,300 | 37 | 44 | 7.5 | 11 |
| 24 | 34 | 30 | 172 | 723 | 1,170 | 512 | 582 | 1,230 | 37 | 30 | 11 | 14 |
| 25 | 60 | 28 | 288 | 646 | 1,090 | 593 | 503 | 1,230 | 37 | 25 | 14 | 14 |
| 26 | 75 | 30 | 374 | 562 | 1,090 | 582 | 415 | 1,236 | 30 | 23 | 12 | 34 |
| 27 | 71 | 34 | 456 | 494 | 1,090 | 657 | 374 | 1,170 | 25 | 20 | 11 | 89 |
| 28 | 71 | 28 | 458 | 449 | 1,030 | 745 | 319 | 1,170 | 37 | 16 | 11 | 71 |
| 29 | 64 | 34 | 449 | 407 | ------ | 855 | 335 | 1,030 | 71 | 16 | 14 | 40 |
| 30 | 52 | 28 | 440 | 366 | ------ | 1,170 | 350 | 975 | 114 | 20 | 14 | 34 |
| 31 | 34 | ------ | 467 | 342 | ------ | 1,470 | ------ | 915 | ------ | 25 | 14 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 75 | 3.0 | 29.1 | 0.041 | 0.05 |
| November | 64 | 6.0 | 27.5 | .039 | .04 |
| December | 467 | 20 | 123 | .174 | .20 |
| January | 745 | 119 | 322 | .457 | .53 |
| February | 1,170 | 71 | 427 | .606 | .63 |
| March | 1,470 | 189 | 509 | .722 | .83 |
| April | 2,170 | 319 | 1,210 | ---------- | ---------- |
| May | 4,850 | 383 | 2,260 | ---------- | ---------- |
| June | 800 | 25 | 229 | .325 | .36 |
| July | 1,090 | 16 | 238 | .338 | .39 |
| August | 75 | 7.5 | 19.9 | .028 | .03 |
| September | 89 | 7.5 | 19.1 | .027 | .03 |
| The year | 4,850 | 3.0 | 453 | ---------- | ---------- |

### ILLINOIS RIVER AT MORRIS, ILL.

LOCATION.—Chain gage in NE¼ sec. 9, T. 33 N., R. 7 E., at highway bridge in Morris, 10 miles below mouth of Kankakee River. Zero of gage is 478.97 feet above mean sea level.

RECORDS AVAILABLE.—October 1919 to September 1933. January 1903 to December 1904 at station near Monooka.

DISCHARGE.—Maximum during year, 62,300 second-feet Apr. 2 (gage height, 19.1 feet); minimum, 7,320 second-feet Mar. 10 (gage height, 5.6 feet).

1919–33: Maximum, that of Apr. 2, 1933, minimum, 5,120 second-feet Aug. 21, 1929 (gage height, 3.9 feet). Average, 14 years, 13,500 second-feet.

A stage of 26.2 feet occurred in 1831.

REMARKS.—Records good. Discharge estimated Dec. 17–22 and Feb. 10–19 because of ice effect. Discharge includes flow diverted from Lake Michigan by Chicago Sanitary Canal. Gage-height record furnished by United States Weather Bureau.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 9,820 | 10,200 | 10,200 | 15,100 | 14,000 | 17,200 | 37,300 | 18,100 | 14,600 | 11,800 | 10,500 | 9,780 |
| 2 | 9,820 | 10,200 | 10,300 | 14,000 | 16,600 | 14,300 | 62,300 | 21,400 | 14,600 | 11,800 | 10,300 | 9,780 |
| 3 | 9,820 | 9,150 | 10,200 | 13,400 | 16,600 | 13,700 | 50,000 | 23,900 | 13,400 | 12,600 | 11,800 | 9,780 |
| 4 | 9,990 | 9,650 | 10,200 | 13,200 | 15,400 | 14,600 | 40,800 | 24,800 | 13,400 | 11,800 | 10,800 | 9,530 |
| 5 | 10,200 | 9,990 | 10,200 | 12,900 | 13,200 | 13,200 | 34,600 | 24,200 | 13,400 | 12,600 | 10,500 | 9,530 |
| 6 | 9,820 | 10,300 | 9,990 | 12,600 | 9,530 | 11,800 | 25,800 | 26,400 | 12,900 | 11,800 | 10,500 | 9,530 |
| 7 | 9,990 | 9,990 | 10,700 | 12,400 | 9,530 | 9,780 | 31,300 | 27,400 | 12,900 | 12,100 | 10,800 | 9,280 |
| 8 | 9,480 | 9,990 | 10,900 | 11,800 | 11,600 | 12,100 | 28,400 | 28,400 | 12,400 | 11,800 | 10,300 | 10,300 |
| 9 | 9,650 | 10,300 | 10,300 | 10,800 | 12,100 | 8,780 | 28,100 | 32,100 | 12,400 | 11,100 | 9,030 | 9,530 |
| 10 | 9,820 | 9,990 | 10,900 | 11,100 | 9,780 | 7,320 | 19,600 | 32,100 | 11,800 | 10,800 | 8,780 | 9,530 |
| 11 | 10,700 | 10,300 | 10,700 | 10,500 | 9,280 | 11,300 | 20,200 | 31,300 | 11,600 | 9,280 | 9,780 | 9,530 |
| 12 | 9,650 | 10,500 | 10,500 | 10,500 | 9,530 | 10,500 | 21,700 | 45,700 | 11,300 | 11,300 | 10,000 | 9,030 |
| 13 | 9,650 | 10,500 | 10,500 | 8,530 | 9,780 | 9,780 | 21,100 | 52,000 | 11,600 | 10,500 | 9,780 | 10,000 |
| 14 | 9,820 | 10,700 | 10,200 | 10,500 | 9,780 | 12,600 | 20,800 | 55,500 | 10,800 | 10,300 | 9,780 | 10,800 |
| 15 | 9,480 | 10,500 | 10,200 | 9,780 | 10,300 | 11,300 | 21,100 | 53,300 | 11,800 | 10,300 | 9,530 | 9,780 |
| 16 | 9,820 | 10,900 | 10,200 | 9,530 | 10,000 | 11,800 | 19,600 | 46,900 | 11,800 | 10,300 | 9,530 | 10,000 |
| 17 | 9,990 | 10,700 | 10,200 | 9,530 | 9,780 | 11,300 | 20,500 | 40,300 | 11,300 | 10,300 | 10,000 | 10,000 |
| 18 | 9,820 | 9,150 | 10,300 | 9,530 | 10,000 | 12,400 | 25,800 | 34,600 | 11,300 | 10,300 | 10,300 | 10,000 |
| 19 | 9,820 | 9,650 | 9,990 | 12,600 | 9,780 | 14,800 | 25,800 | 28,400 | 11,300 | 10,300 | 9,780 | 9,280 |
| 20 | 9,820 | 9,990 | 9,480 | 15,700 | 9,530 | 20,200 | 26,700 | 25,800 | 11,100 | 10,300 | 9,780 | 9,280 |
| 21 | 9,820 | 10,200 | 9,480 | 15,700 | 11,300 | 25,400 | 24,200 | 25,800 | 11,100 | 10,500 | 9,780 | 9,280 |
| 22 | 9,820 | 10,200 | 9,310 | 16,000 | 12,400 | 25,400 | 22,000 | 24,500 | 11,100 | 10,000 | 9,780 | 9,280 |
| 23 | 9,650 | 10,200 | 9,820 | 16,600 | 16,900 | 24,500 | 20,000 | 21,700 | 10,500 | 10,000 | 10,000 | 9,530 |
| 24 | 9,990 | 10,200 | 15,400 | 16,000 | 20,200 | 23,300 | 19,300 | 19,300 | 10,000 | 10,000 | 10,000 | 9,530 |
| 25 | 9,990 | 10,200 | 23,900 | 15,400 | 20,500 | 21,400 | 18,700 | 17,200 | 9,780 | 10,000 | 10,000 | 9,280 |
| 26 | 10,500 | 9,990 | 23,000 | 16,000 | 14,000 | 23,300 | 17,200 | 17,200 | 9,780 | 10,000 | 10,300 | 9,280 |
| 27 | 10,200 | 10,200 | 21,700 | 14,000 | 14,300 | 22,600 | 16,900 | 16,000 | 9,030 | 9,530 | 10,000 | 12,400 |
| 28 | 9,990 | 10,200 | 21,100 | 15,100 | 16,000 | 23,300 | 16,000 | 15,700 | 11,600 | 10,000 | 10,000 | 10,000 |
| 29 | 9,990 | 10,200 | 19,000 | 14,800 | ------- | 22,600 | 16,300 | 15,400 | 10,000 | 9,780 | 10,300 | 13,200 |
| 30 | 10,300 | 10,200 | 17,200 | 14,600 | ------- | 21,700 | 16,000 | 15,700 | 12,400 | 9,780 | 10,000 | 13,200 |
| 31 | 10,500 | ------- | 16,000 | 14,600 | ------- | 20,800 | ------- | 14,800 | ------- | 9,780 | 9,780 | ------- |

| Month | Maximum | Minimum | Mean | Month | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|
| October | 10,700 | 9,480 | 9,930 | May | 55,500 | 14,800 | 28,300 |
| November | 10,900 | 9,150 | 10,100 | June | 14,600 | 9,030 | 11,700 |
| December | 23,900 | 9,310 | 12,600 | July | 12,600 | 9,280 | 10,700 |
| January | 16,600 | 8,530 | 13,000 | August | 11,800 | 8,780 | 10,000 |
| February | 20,500 | 9,280 | 12,600 | September | 13,200 | 9,030 | 9,980 |
| March | 25,400 | 7,320 | 16,200 | | | | |
| April | 62,300 | 16,000 | 25,600 | The year | 62,300 | 7,320 | 14,200 |

### ILLINOIS RIVER AT PEORIA, ILL.

LOCATION.—Staff gage in NW¼ sec. 2, T. 8 N., R. 8 E., at foot of Grant Street, Peoria, 4½ miles above mouth of Kickapoo Creek. Zero of gage is 428.92 feet above mean sea level.

RECORDS AVAILABLE.—March 1910 to September 1933; March 1903 to July 1906 for station 3½ miles downstream.

DISCHARGE.—Maximum, 52,900 second-feet May 18 (gage height, 25.6 feet); minimum, 9,100 second-feet Oct. 8 (gage height, 9.20 feet).

1910–33: Maximum, 58,300 second-feet Oct. 9, 1926 (gage height, 25.05 feet); minimum, about 7,250 second-feet Dec. 11, 1916, to Jan. 10, 1917.

Average, 23 years (1910–33), 16,800 second-feet.

Maximum stage known, 26.6 feet in 1844.

REMARKS.—Records good. Discharge estimated because of ice effect Dec. 15–22 and Feb. 10–12. Gage-height record furnished by Corps of Engineers, United States Army. Discharge determined on basis of slope as obtained by use of an auxiliary gage on highway bridge at Pekin, 9.3 miles downstream.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 9,300 | 10,700 | 11,000 | 23,200 | 18,600 | 23,300 | 28,200 | 27,000 | 31,400 | 15,800 | 11,700 | 10,400 |
| 2 | 9,890 | 10,500 | 10,500 | 23,400 | 21,600 | 23,800 | 31,300 | 26,500 | 29,800 | 14,900 | 11,600 | 10,000 |
| 3 | 9,660 | 11,100 | 11,200 | 23,600 | 21,700 | 23,300 | 37,300 | 28,200 | 30,200 | 15,300 | 12,200 | 10,000 |
| 4 | 10,600 | 10,800 | 10,200 | 23,000 | 22,000 | 22,800 | 40,400 | 29,000 | 30,100 | 15,700 | 12,000 | 10,400 |
| 5 | 10,400 | 10,800 | 11,300 | 22,700 | 21,400 | 22,100 | 41,500 | 30,600 | 29,000 | 15,800 | 12,000 | 10,200 |
| 6 | 10,100 | 10,600 | 11,100 | 22,500 | 20,000 | 22,100 | 43,000 | 28,900 | 28,300 | 15,800 | 11,500 | 9,960 |
| 7 | 9,650 | 11,000 | 11,800 | 20,200 | 20,200 | 22,100 | 44,000 | 30,900 | 27,700 | 15,300 | 11,100 | 10,100 |
| 8 | 9,100 | 10,900 | 11,400 | 19,400 | 19,800 | 20,600 | 43,100 | 31,300 | 26,100 | 15,800 | 11,800 | 10,100 |
| 9 | 9,650 | 9,610 | 10,900 | 20,700 | 17,800 | 20,600 | 43,700 | 33,000 | 27,000 | 15,700 | 11,500 | 10,000 |
| 10 | 10,500 | 10,700 | 11,400 | 17,300 | 16,000 | 20,700 | 42,500 | 34,800 | 25,300 | 16,100 | 11,600 | 10,400 |
| 11 | 10,100 | 10,600 | 11,400 | 20,400 | 15,000 | 18,500 | 39,100 | 37,000 | 25,000 | 15,700 | 12,000 | 10,100 |
| 12 | 10,600 | 11,300 | 10,900 | 19,500 | 14,500 | 18,300 | 39,300 | 37,700 | 25,000 | 14,900 | 11,900 | 10,300 |
| 13 | 10,400 | 11,100 | 11,100 | 18,300 | 14,200 | 18,600 | 35,800 | 38,900 | 23,500 | 14,900 | 11,700 | 10,100 |
| 14 | 10,500 | 10,600 | 10,700 | 18,700 | 14,000 | 18,800 | 39,800 | 40,300 | 22,200 | 14,900 | 11,300 | 10,200 |
| 15 | 10,300 | 12,600 | 10,600 | 16,600 | 13,800 | 18,100 | 37,500 | 46,900 | 21,000 | 14,400 | 11,200 | 9,830 |
| 16 | 10,400 | 11,800 | 10,500 | 17,000 | 13,600 | 17,700 | 35,000 | 49,600 | 20,300 | 14,600 | 10,900 | 9,640 |
| 17 | 10,600 | 11,500 | 10,500 | 17,300 | 13,600 | 18,000 | 34,300 | 51,300 | 20,000 | 13,900 | 11,200 | 9,660 |
| 18 | 10,500 | 11,800 | 10,400 | 16,800 | 13,600 | 18,400 | 33,000 | 52,100 | 20,200 | 13,700 | 11,400 | 9,580 |
| 19 | 10,100 | 12,000 | 10,300 | 14,800 | 13,600 | 18,800 | 34,000 | 51,300 | 19,400 | 13,800 | 11,300 | 9,550 |
| 20 | 10,000 | 10,800 | 10,200 | 17,400 | 13,700 | 18,500 | 33,700 | 47,700 | 18,500 | 13,600 | 11,200 | 9,970 |
| 21 | 10,300 | 11,800 | 10,200 | 17,400 | 13,800 | 18,100 | 34,200 | 47,000 | 18,300 | 13,100 | 10,700 | 9,970 |
| 22 | 10,200 | 11,300 | 10,200 | 17,200 | 14,000 | 20,700 | 34,600 | 44,000 | 18,300 | 13,000 | 10,900 | 9,970 |
| 23 | 10,400 | 11,500 | 10,200 | 18,800 | 17,400 | 22,800 | 32,200 | 42,100 | 17,500 | 12,600 | 10,800 | 9,970 |
| 24 | 10,100 | 11,200 | 10,500 | 21,000 | 18,700 | 23,100 | 32,100 | 40,700 | 17,000 | 13,200 | 10,800 | 10,100 |
| 25 | 10,400 | 11,000 | 12,700 | 21,200 | 20,400 | 24,300 | 31,600 | 38,400 | 15,800 | 12,600 | 10,500 | 9,550 |
| 26 | 10,400 | 12,300 | 17,000 | 21,200 | 23,200 | 26,300 | 30,800 | 33,900 | 16,100 | 12,700 | 10,700 | 9,550 |
| 27 | 10,500 | 11,200 | 20,800 | 22,300 | 23,700 | 25,400 | 29,100 | 36,000 | 15,600 | 12,100 | 10,700 | 10,400 |
| 28 | 10,500 | 11,000 | 22,800 | 21,200 | 24,100 | 26,100 | 27,400 | 35,000 | 15,100 | 12,000 | 10,500 | 10,300 |
| 29 | 9,590 | 10,800 | 23,800 | 20,900 | ------- | 26,900 | 28,700 | 33,300 | 14,900 | 11,600 | 10,600 | 10,900 |
| 30 | 10,900 | 11,200 | 24,400 | 21,400 | ------- | 27,200 | 27,700 | 32,500 | 15,100 | 11,600 | 10,700 | 11,200 |
| 31 | 11,300 | ------- | 24,800 | 21,700 | ------- | 28,400 | ------- | 32,000 | ------- | 11,800 | 10,500 | ------- |

| Month | Maximum | Minimum | Mean | Month | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|
| October | 11,300 | 9,100 | 10,200 | May | 52,100 | 26,500 | 37,700 |
| November | 12,600 | 9,610 | 11,100 | June | 31,400 | 14,900 | 22,100 |
| December | 24,800 | 10,200 | 13,100 | July | 16,100 | 11,600 | 14,100 |
| January | 23,600 | 14,800 | 19,900 | August | 12,200 | 10,500 | 11,200 |
| February | 24,100 | 13,600 | 17,600 | September | 11,200 | 9,550 | 10,100 |
| March | 28,400 | 17,700 | 21,800 | | | | |
| April | 44,000 | 27,400 | 35,500 | The year | 52,100 | 9,100 | 18,700 |

### ILLINOIS RIVER AT BEARDSTOWN, ILL.

LOCATION.—Staff gage in NE¼ sec. 15, T. 18 N., R. 12 W., at highway bridge on State Street, Beardstown, 9½ miles below mouth of Sangamon River. Zero of gage is 420.33 feet above mean sea level.

RECORDS AVAILABLE.—October 1920 to September 1933.

DISCHARGE.—Maximum during year, 90,800 second-feet May 23 (gage height, 25.5 feet); minimum, 10,800 second-feet Oct. 1–10, Sept. 10–13, 18–26 (gage height, 7.9 feet).

1920–33: Maximum, 105,000 second-feet Oct. 9, 1926; maximum gage height, 26.25 feet Oct. 12, 1926; minimum discharge, 9,550 second-feet Dec. 31, 1930, Jan. 1, 1931 (gage height, 7.5 feet). Average, 13 years, 24,800 second-feet.

Maximum known, about 115,000 second-feet Apr. 4, 1904.

REMARKS.—Records good. Discharge estimated because of ice effect Dec. 16–22. Gage-height record furnished by United States Weather Bureau.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10,800 | 11,800 | 11,800 | 28,500 | 29,700 | 26,600 | 39,800 | 42,900 | 79,800 | 21,000 | 13,400 | 11,400 |
| 2 | 10,800 | 11,800 | 11,800 | 28,500 | 29,700 | 27,000 | 42,900 | 42,400 | 76,600 | 20,600 | 13,100 | 11,400 |
| 3 | 10,800 | 11,800 | 11,800 | 28,100 | 29,700 | 27,000 | 46,600 | 43,400 | 73,900 | 19,900 | 13,100 | 11,400 |
| 4 | 10,800 | 11,800 | 11,800 | 27,800 | 29,300 | 27,400 | 50,400 | 43,400 | 70,600 | 19,200 | 13,100 | 11,400 |
| 5 | 10,800 | 11,400 | 12,100 | 27,400 | 28,500 | 27,400 | 55,000 | 43,400 | 67,400 | 18,500 | 13,100 | 11,400 |
| 6 | 10,800 | 11,400 | 12,100 | 27,000 | 27,800 | 27,000 | 58,700 | 43,400 | 64,100 | 17,800 | 13,100 | 11,100 |
| 7 | 10,800 | 11,400 | 12,100 | 26,600 | 27,800 | 27,400 | 61,400 | 43,400 | 60,900 | 17,800 | 12,800 | 11,100 |
| 8 | 10,800 | 11,800 | 12,100 | 26,300 | 25,200 | 27,000 | 63,600 | 43,800 | 58,200 | 17,500 | 12,800 | 11,100 |
| 9 | 10,800 | 11,800 | 12,100 | 25,900 | 22,400 | 26,600 | 64,700 | 44,200 | 55,000 | 18,200 | 12,800 | 11,100 |
| 10 | 10,800 | 11,400 | 12,100 | 25,200 | 19,900 | 26,300 | 65,800 | 44,700 | 51,900 | 17,800 | 13,700 | 10,800 |
| 11 | 11,100 | 11,400 | 12,100 | 24,800 | 19,600 | 25,500 | 65,800 | 45,600 | 49,400 | 17,800 | 13,700 | 10,800 |
| 12 | 11,400 | 11,400 | 11,800 | 24,100 | 19,200 | 25,200 | 65,200 | 48,000 | 47,000 | 17,500 | 13,400 | 10,800 |
| 13 | 11,400 | 11,800 | 11,100 | 23,800 | 19,200 | 24,400 | 64,100 | 53,000 | 45,200 | 17,100 | 13,100 | 10,800 |
| 14 | 11,400 | 11,800 | 11,800 | 23,000 | 19,600 | 24,100 | 63,600 | 58,200 | 42,900 | 17,100 | 12,800 | 11,100 |
| 15 | 11,400 | 11,800 | 11,800 | 22,400 | 19,900 | 23,400 | 62,000 | 64,700 | 40,200 | 16,800 | 12,400 | 11,100 |
| 16 | 11,100 | 11,800 | 11,800 | 22,000 | 20,200 | 22,700 | 60,400 | 70,100 | 38,400 | 16,800 | 12,400 | 11,100 |
| 17 | 11,100 | 12,100 | 11,800 | 21,600 | 19,900 | 22,400 | 59,300 | 74,900 | 36,200 | 16,400 | 12,400 | 11,100 |
| 18 | 11,100 | 12,100 | 11,800 | 21,300 | 19,900 | 22,400 | 58,200 | 78,700 | 34,100 | 16,100 | 12,100 | 10,800 |
| 19 | 11,100 | 12,100 | 11,800 | 21,600 | 20,600 | 22,700 | 57,100 | 82,000 | 32,400 | 15,800 | 12,100 | 10,800 |
| 20 | 11,100 | 12,100 | 11,800 | 23,400 | 22,700 | 23,000 | 56,000 | 84,700 | 30,400 | 15,800 | 12,100 | 10,800 |
| 21 | 11,100 | 12,100 | 11,800 | 24,400 | 24,100 | 23,400 | 55,000 | 87,400 | 28,900 | 15,400 | 12,100 | 10,800 |
| 22 | 11,100 | 12,100 | 11,800 | 25,500 | 24,800 | 24,800 | 54,000 | 89,600 | 27,800 | 15,400 | 11,800 | 10,800 |
| 23 | 11,100 | 12,100 | 13,700 | 27,800 | 25,200 | 26,600 | 53,000 | 90,800 | 26,300 | 14,700 | 11,800 | 10,800 |
| 24 | 11,100 | 12,100 | 19,600 | 28,500 | 25,500 | 27,800 | 51,900 | 90,200 | 25,200 | 14,700 | 11,800 | 10,800 |
| 25 | 11,100 | 12,100 | 23,000 | 28,900 | 25,500 | 28,900 | 50,400 | 89,600 | 24,100 | 15,100 | 11,800 | 10,800 |
| 26 | 11,800 | 12,100 | 25,200 | 29,300 | 25,900 | 30,400 | 49,400 | 89,000 | 23,400 | 14,700 | 11,400 | 10,800 |
| 27 | 11,800 | 12,100 | 27,400 | 29,300 | 25,900 | 31,600 | 48,000 | 88,500 | 22,400 | 14,400 | 11,400 | 11,800 |
| 28 | 11,800 | 12,100 | 28,900 | 29,700 | 26,300 | 33,200 | 46,600 | 87,400 | 21,600 | 14,100 | 11,400 | 12,800 |
| 29 | 11,400 | 12,100 | 30,100 | 30,100 | ------- | 34,500 | 45,200 | 85,700 | 21,000 | 13,700 | 11,400 | 13,100 |
| 30 | 11,400 | 12,100 | 29,700 | 30,100 | ------- | 35,300 | 43,800 | 84,100 | 21,300 | 13,400 | 11,400 | 13,400 |
| 31 | 11,400 | ------- | 29,300 | 30,100 | ------- | 36,600 | ------- | 82,000 | ------- | 13,400 | 11,400 | ------- |

| Month | Maximum | Minimum | Mean | Month | Maximum | Minimum | Mean |
|---|---|---|---|---|---|---|---|
| October | 11,800 | 10,800 | 11,100 | May | 90,800 | 42,400 | 66,400 |
| November | 12,100 | 11,400 | 11,900 | June | 79,800 | 21,000 | 43,200 |
| December | 30,100 | 11,100 | 15,700 | July | 21,000 | 13,400 | 16,600 |
| January | 30,100 | 21,300 | 26,200 | August | 13,700 | 11,400 | 12,400 |
| February | 29,700 | 19,200 | 24,100 | September | 13,400 | 10,800 | 11,200 |
| March | 36,600 | 22,400 | 27,100 | | | | |
| April | 65,800 | 39,800 | 55,300 | The year | 90,800 | 10,800 | 26,800 |

### SPRING CREEK AT JOLIET, ILL.

LOCATION.—Chain gage in SE¼ sec. 10, T. 35 N., R. 10 E., at Benton Street Bridge, in Joliet, half a mile above mouth.
DRAINAGE AREA.—19.7 square miles.
RECORDS AVAILABLE.—July 1925 to November 1933 (discontinued).
DISCHARGE.—Maximum during year, 240 second-feet July 8 (gage height, 2.54 feet); minimum, 0.8 second-foot June 10.
1925–33: Maximum, 1,070 second-feet June 11, 1926 (gage height, 6.5 feet); minimum, 0.8 second-foot June 10, 1933.
REMARKS.—Records fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.7 | 3.7 | 3.1 | 6.6 | 27 | 12 | 230 | 13 | 4.8 | 7.7 | 4.6 | 4.6 | 14 | 5.4 |
| 2 | 2.7 | 3.3 | 3.3 | 5.7 | 17 | 12 | 136 | 39 | 4.5 | 33 | 4.1 | 5.7 | 6.4 | 5.1 |
| 3 | 3.1 | 3.3 | 3.3 | 4.5 | 12 | 9.3 | 88 | 29 | 4.2 | 7.3 | 4.9 | 5.7 | 4.6 | 5.4 |
| 4 | 4.0 | 3.7 | 3.3 | 4.2 | 14 | 7.7 | 56 | 22 | 4.0 | 6.0 | 7.4 | 4.9 | 3.8 | 5.4 |
| 5 | 4.0 | 3.3 | 3.3 | 4.5 | 10 | 6.6 | 50 | 45 | 2.7 | 7.7 | 5.7 | 5.4 | 3.6 | 5.4 |
| 6 | 4.0 | 3.7 | 3.7 | 3.1 | 6.6 | 6.3 | 71 | 47 | 2.3 | 5.1 | 4.3 | 5.7 | 3.8 | 4.9 |
| 7 | 4.0 | 4.0 | 4.2 | 3.5 | 15 | 5.7 | 52 | 32 | 1.7 | 4.5 | 4.1 | 5.1 | 3.2 | 5.1 |
| 8 | 3.7 | 4.2 | 4.2 | 3.5 | 13 | 5.1 | 32 | 143 | 1.4 | 84 | 4.3 | 6.0 | 4.6 | 4.9 |
| 9 | 5.1 | 7.3 | 3.7 | 2.7 | 8.5 | 4.5 | 25 | 77 | 1.0 | 97 | 4.1 | 5.4 | 4.9 | 4.9 |
| 10 | 11 | 6.0 | 3.1 | 3.1 | 6.0 | 5.4 | 19 | 77 | .9 | 20 | 4.6 | 4.9 | 4.1 | 4.6 |
| 11 | 12 | 4.8 | 2.9 | 2.7 | 4.0 | 3.1 | 15 | 81 | 1.4 | 5.4 | 4.1 | 4.3 | 4.6 | 4.9 |
| 12 | 9.3 | 4.0 | 2.9 | 4.0 | 3.1 | 2.7 | 12 | 95 | 1.3 | 4.9 | 3.6 | 3.8 | 4.6 | 4.9 |
| 13 | 7.0 | 3.5 | 2.9 | 3.3 | 2.7 | 13 | 9.3 | 99 | 1.2 | 4.9 | 4.1 | 3.6 | 4.6 | 3.8 |
| 14 | 5.1 | 3.5 | 2.9 | 3.5 | 2.3 | 25 | 12 | 62 | 1.2 | 5.4 | 3.6 | 3.6 | 4.6 | 3.4 |
| 15 | 3.5 | 4.2 | 2.9 | 3.5 | 2.3 | 15 | 8.5 | 37 | 1.3 | 4.3 | 3.4 | 4.1 | 4.6 | 3.8 |
| 16 | 3.5 | 4.5 | 2.9 | 2.7 | 2.3 | 13 | 14 | 27 | 1.2 | 4.3 | 3.2 | 3.8 | 8.6 | 3.2 |
| 17 | 3.7 | 4.0 | 2.9 | 2.3 | 2.5 | 12 | 66 | 19 | 1.3 | 3.8 | 3.4 | 3.4 | 7.8 | 2.6 |
| 18 | 4.5 | 3.7 | 2.9 | 5.1 | 2.7 | 28 | 42 | 15 | 2.7 | 3.8 | 3.4 | 3.6 | 6.4 | 2.6 |
| 19 | 4.8 | 3.5 | 2.7 | 62 | 3.7 | 29 | 26 | 23 | 4.0 | 3.4 | 3.2 | 3.6 | 5.1 | 3.0 |
| 20 | 4.2 | 3.7 | 2.7 | 41 | 6.3 | 47 | 19 | 36 | 4.2 | 3.4 | 3.8 | 3.6 | 4.1 | 3.8 |
| 21 | 3.5 | 3.5 | 2.7 | 33 | 8.9 | 40 | 15 | 25 | 4.8 | 3.4 | 4.1 | 4.6 | 70 | ------ |
| 22 | 3.7 | 3.5 | 3.1 | 60 | 12 | 38 | 12 | 19 | 4.0 | 4.3 | 3.8 | 5.4 | 36 | ------ |
| 23 | 4.2 | 3.5 | 88 | 28 | 52 | 28 | 9.7 | 14 | 4.8 | 4.9 | 3.4 | 5.7 | 20 | ------ |
| 24 | 3.1 | 3.5 | 72 | 21 | 47 | 22 | 8.5 | 11 | 7.7 | 5.7 | 3.8 | 4.6 | 12 | ------ |
| 25 | 8.1 | 3.5 | 47 | 22 | 48 | 36 | 8.1 | 7.7 | 3.3 | 6.2 | 3.4 | 4.6 | 9.4 | ------ |
| 26 | 12 | 3.3 | 22 | 16 | 31 | 89 | 5.4 | 15 | 2.7 | 6.0 | 3.4 | 4.6 | 8.6 | ------ |
| 27 | 3.5 | 3.3 | 21 | 19 | 19 | 47 | 4.5 | 8.9 | 2.3 | 6.0 | 3.8 | 7.4 | 8.6 | ------ |
| 28 | 2.3 | 3.5 | 21 | 15 | 15 | 28 | 4.0 | 7.7 | 4.5 | 6.0 | 4.1 | 5.1 | 7.0 | ------ |
| 29 | 3.5 | 3.7 | 9.7 | 12 | ------ | 20 | 3.1 | 6.6 | 20 | 5.7 | 3.8 | 3.2 | 6.7 | ------ |
| 30 | 3.3 | 3.5 | 8.1 | 11 | ------ | 19 | 11 | 4.8 | 3.5 | 5.1 | 3.6 | 4.6 | 6.4 | ------ |
| 31 | 3.7 | ------ | 7.7 | 9.3 | ------ | 77 | ------ | 4.5 | ------ | 4.6 | 4.1 | ------ | 5.7 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| 1932–33 | | | | | |
| October | 12 | 2.7 | 4.93 | 0.250 | 0.29 |
| November | 7.3 | 3.3 | 3.89 | .197 | .22 |
| December | 88 | 2.7 | 11.8 | .599 | .69 |
| January | 62 | 2.3 | 13.5 | .685 | .79 |
| February | 52 | 2.3 | 14.1 | .716 | .75 |
| March | 89 | 2.7 | 22.8 | 1.16 | 1.34 |
| April | 230 | 3.1 | 35.5 | 1.80 | 2.01 |
| May | 143 | 4.5 | 36.8 | 1.87 | 2.16 |
| June | 20 | .9 | 3.50 | 1.78 | .20 |
| July | 97 | 3.4 | 12.1 | .614 | .71 |
| August | 7.4 | 3.2 | 4.04 | .205 | .24 |
| September | 7.4 | 3.2 | 4.69 | .238 | .27 |
| The year | 230 | .9 | 14.0 | .711 | 9.67 |
| 1933 | | | | | |
| October | 70 | 3.2 | 9.63 | .489 | .56 |
| November 1–20 | 5.4 | 2.6 | 4.36 | .221 | .16 |

### KANKAKEE RIVER AT DAVIS, IND.

LOCATION.—Chain gage in sec. 13, T. 34 N., R. 3 W., at highway bridge on U.S. Route 30, 4 miles east of Hanna, Knox County.

DRAINAGE AREA.—510 square miles.

RECORDS AVAILABLE.—April 1931 to September 1933. Records July 1925 to September 1927 published by Indiana Department of Conservation.

DISCHARGE.—Maximum during year, 1,290 second-feet May 12, 1933 (gage height, 9.43 feet); minimum, 228 second-feet Oct. 1–3 (gage height, 3.4 feet). 1931–33: Maximum, that of May 12, 1933; minimum, 228 second-feet at times during 1932.

REMARKS.—Records good.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 228 | 363 | 331 | 600 | 548 | 531 | 1,030 | 780 | 548 | 582 | 331 | 270 |
| 2 | 228 | 347 | 331 | 582 | 582 | 514 | 1,130 | 1,030 | 548 | 906 | 331 | 270 |
| 3 | 228 | 331 | 331 | 565 | 531 | 497 | 1,030 | 1,110 | 531 | 888 | 363 | 270 |
| 4 | 242 | 315 | 331 | 531 | 514 | 480 | 942 | 996 | 531 | 708 | 363 | 270 |
| 5 | 270 | 331 | 331 | 514 | 497 | 463 | 870 | 1,150 | 514 | 582 | 347 | 256 |
| 6 | 256 | 315 | 347 | 514 | 480 | 463 | 906 | 1,170 | 514 | 582 | 331 | 256 |
| 7 | 256 | 315 | 412 | 497 | 463 | 463 | 1,010 | 1,170 | 497 | 480 | 331 | 256 |
| 8 | 256 | 331 | 480 | 480 | 446 | 446 | 978 | 1,190 | 480 | 480 | 315 | 256 |
| 9 | 242 | 379 | 497 | 480 | 425 | 429 | 924 | 1,230 | 463 | 480 | 315 | 256 |
| 10 | 270 | 395 | 400 | 463 | 400 | 429 | 852 | 1,210 | 463 | 463 | 331 | 256 |
| 11 | 300 | 379 | 375 | 446 | 400 | 429 | 888 | 1,250 | 446 | 463 | 331 | 256 |
| 12 | 315 | 363 | 375 | 446 | 400 | 429 | 870 | 1,290 | 446 | 429 | 315 | 300 |
| 13 | 300 | 347 | 350 | 429 | 400 | 429 | 816 | 1,190 | 429 | 412 | 315 | 285 |
| 14 | 285 | 347 | 350 | 429 | 400 | 852 | 762 | 1,170 | 412 | 412 | 300 | 285 |
| 15 | 285 | 347 | 350 | 429 | 400 | 816 | 780 | 1,090 | 412 | 412 | 300 | 285 |
| 16 | 270 | 347 | 350 | 429 | 400 | 690 | 762 | 1,050 | 412 | 395 | 300 | 285 |
| 17 | 270 | 347 | 350 | 429 | 400 | 636 | 870 | 1,010 | 412 | 379 | 300 | 270 |
| 18 | 270 | 347 | 350 | 429 | 412 | 618 | 1,130 | 942 | 412 | 379 | 300 | 270 |
| 19 | 270 | 347 | 350 | 582 | 446 | 672 | 1,090 | 942 | 412 | 363 | 285 | 270 |
| 20 | 256 | 331 | 350 | 672 | 480 | 708 | 996 | 1,030 | 395 | 363 | 300 | 285 |
| 21 | 256 | 331 | 375 | 654 | 480 | 942 | 906 | 942 | 395 | 363 | 285 | 285 |
| 22 | 270 | 331 | 429 | 636 | 548 | 870 | 834 | 870 | 395 | 347 | 285 | 256 |
| 23 | 270 | 331 | 497 | 600 | 618 | 798 | 780 | 798 | 363 | 412 | 285 | 270 |
| 24 | 270 | 331 | 960 | 582 | 618 | 744 | 744 | 744 | 363 | 446 | 285 | 270 |
| 25 | 270 | 331 | 1,090 | 548 | 672 | 708 | 708 | 708 | 363 | 395 | 285 | 256 |
| 26 | 463 | 331 | 996 | 565 | 654 | 690 | 672 | 690 | 363 | 379 | 270 | 270 |
| 27 | 480 | 331 | 834 | 565 | 582 | 798 | 636 | 690 | 363 | 363 | 270 | 446 |
| 28 | 395 | 331 | 798 | 565 | 548 | 762 | 618 | 654 | 363 | 363 | 285 | 412 |
| 29 | 379 | 331 | 726 | 531 | ------ | 708 | 600 | 636 | 363 | 347 | 270 | 395 |
| 30 | 347 | 331 | 672 | 514 | ------ | 672 | 618 | 600 | 582 | 347 | 270 | 331 |
| 31 | 347 | ------ | 672 | 514 | ------ | 672 | ------ | 582 | ------ | 331 | 270 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 480 | 228 | 292 | 0.573 | 0.66 |
| November | 395 | 315 | 341 | .669 | .75 |
| December | 1,090 | 331 | 496 | .973 | 1.12 |
| January | 672 | 429 | 523 | 1.03 | 1.19 |
| February | 672 | 400 | 491 | .963 | 1.00 |
| March | 942 | 429 | 624 | 1.22 | 1.41 |
| April | 1,130 | 600 | 858 | 1.68 | 1.87 |
| May | 1,290 | 582 | 965 | 1.89 | 2.18 |
| June | 582 | 363 | 440 | .863 | .96 |
| July | 906 | 331 | 463 | .908 | 1.05 |
| August | 363 | 270 | 305 | .598 | .69 |
| September | 446 | 256 | 287 | .563 | .63 |
| The year | 1,290 | 228 | 508 | .996 | 13.51 |

### KANKAKEE RIVER AT SHELBY, IND.

LOCATION.—Chain gage in sec. 33, T. 32 N., R. 8 W., at highway bridge 1 mile south of Shelby, Lake County.

DRAINAGE AREA.—1,760 square miles.

RECORDS AVAILABLE.—April 1930 to September 1933. Records November 1922 to September 1927 published by the Indiana Department of Conservation.

DISCHARGE.—Maximum during year, 4,480 second-feet May 13 (gage height, 9.39 feet); minimum, 545 second-feet Oct. 1–3, Sept. 10, 11; minimum gage height, 1.58 feet Oct. 2.

1930–33: Maximum, that of May 13, 1933; minimum, 522 second-feet in August and September 1932.

REMARKS.—Records good except those for periods of ice and drift effect, Dec. 10–24, Dec. 29 to Jan. 15, Feb. 7–19, Mar. 5–9, Mar. 27 to Apr. 3, May 15 to June 1, which are fair.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 545 | 1,000 | 1,000 | 2,800 | 2,000 | 2,100 | 3,100 | 2,900 | 2,300 | 1,170 | 776 | 621 |
| 2 | 545 | 1,000 | 1,000 | 2,650 | 2,050 | 1,950 | 3,500 | 3,070 | 2,200 | 1,260 | 742 | 594 |
| 3 | 545 | 1,000 | 1,000 | 2,500 | 2,050 | 1,850 | 3,800 | 3,190 | 2,050 | 1,660 | 965 | 594 |
| 4 | 569 | 1,000 | 1,040 | 2,350 | 2,000 | 1,760 | 4,070 | 3,310 | 1,950 | 1,800 | 965 | 594 |
| 5 | 569 | 1,000 | 1,040 | 2,200 | 1,850 | 1,650 | 4,070 | 3,430 | 1,900 | 1,850 | 965 | 621 |
| 6 | 594 | 965 | 1,000 | 2,050 | 1,710 | 1,600 | 4,070 | 3,620 | 1,800 | 1,660 | 885 | 594 |
| 7 | 594 | 925 | 1,170 | 1,900 | 1,550 | 1,550 | 4,000 | 3,740 | 1,710 | 1,480 | 847 | 569 |
| 8 | 569 | 965 | 1,350 | 1,800 | 1,450 | 1,500 | 4,000 | 3,940 | 1,660 | 1,300 | 847 | 569 |
| 9 | 569 | 1,000 | 1,530 | 1,700 | 1,350 | 1,500 | 3,940 | 4,070 | 1,620 | 1,260 | 811 | 569 |
| 10 | 621 | 1,080 | 1,300 | 1,650 | 1,300 | 1,480 | 3,880 | 4,130 | 1,580 | 1,260 | 847 | 545 |
| 11 | 679 | 1,120 | 1,200 | 1,600 | 1,300 | 1,480 | 3,940 | 4,270 | 1,480 | 1,220 | 847 | 545 |
| 12 | 710 | 1,120 | 1,200 | 1,600 | 1,300 | 1,400 | 4,070 | 4,340 | 1,440 | 1,120 | 811 | 594 |
| 13 | 776 | 1,120 | 1,200 | 1,550 | 1,300 | 1,440 | 4,200 | 4,480 | 1,400 | 1,080 | 776 | 621 |
| 14 | 776 | 1,040 | 1,150 | 1,550 | 1,300 | 1,760 | 4,200 | 4,410 | 1,350 | 1,040 | 776 | 649 |
| 15 | 742 | 1,000 | 1,150 | 1,550 | 1,300 | 2,250 | 4,130 | 4,400 | 1,300 | 1,000 | 742 | 649 |
| 16 | 710 | 1,040 | 1,100 | 1,530 | 1,300 | 2,300 | 4,000 | 4,350 | 1,300 | 1,000 | 742 | 649 |
| 17 | 710 | 1,000 | 1,050 | 1,530 | 1,300 | 2,460 | 4,000 | 4,200 | 1,260 | 965 | 710 | 621 |
| 18 | 679 | 1,000 | 1,050 | 1,530 | 1,300 | 2,560 | 4,070 | 4,150 | 1,260 | 965 | 710 | 594 |
| 19 | 679 | 1,040 | 1,050 | 1,660 | 1,400 | 2,730 | 4,130 | 4,100 | 1,220 | 925 | 710 | 594 |
| 20 | 679 | 1,000 | 1,050 | 2,000 | 1,620 | 2,780 | 4,130 | 4,050 | 1,170 | 885 | 710 | 594 |
| 21 | 649 | 1,000 | 1,000 | 2,150 | 1,710 | 3,130 | 4,070 | 4,000 | 1,170 | 885 | 679 | 594 |
| 22 | 649 | 1,000 | 1,000 | 2,300 | 1,900 | 3,250 | 3,940 | 3,900 | 1,080 | 847 | 679 | 594 |
| 23 | 649 | 1,000 | 1,200 | 2,300 | 2,050 | 3,250 | 3,940 | 3,800 | 1,080 | 847 | 679 | 594 |
| 24 | 649 | 1,000 | 2,000 | 2,200 | 2,100 | 3,250 | 3,880 | 3,650 | 1,080 | 925 | 649 | 594 |
| 25 | 649 | 1,000 | 3,310 | 2,150 | 1,710 | 3,310 | 3,810 | 3,500 | 1,040 | 965 | 649 | 594 |
| 26 | 742 | 1,040 | 3,250 | 2,050 | 2,250 | 3,250 | 3,740 | 3,300 | 1,040 | 925 | 649 | 621 |
| 27 | 925 | 1,040 | 3,250 | 2,050 | 2,250 | 3,200 | 3,490 | 3,100 | 965 | 885 | 621 | 710 |
| 28 | 1,080 | 1,040 | 3,250 | 2,050 | 2,250 | 3,100 | 3,310 | 2,900 | 965 | 885 | 621 | 925 |
| 29 | 1,170 | 1,040 | 3,100 | 2,050 | ------ | 2,900 | 3,010 | 2,700 | 1,000 | 811 | 649 | 1,040 |
| 30 | 1,080 | 1,000 | 3,000 | 2,000 | ------ | 2,800 | 2,950 | 2,500 | 1,000 | 811 | 621 | 1,000 |
| 31 | 1,040 | ------ | 2,900 | 1,950 | ------ | 2,800 | ------ | 2,400 | ------ | 811 | 621 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,170 | 545 | 714 | 0.406 | 0.47 |
| November | 1,120 | 925 | 1,020 | .580 | .65 |
| December | 3,310 | 1,000 | 1,610 | .915 | 1.05 |
| January | 2,800 | 1,530 | 1,970 | 1.12 | 1.29 |
| February | 2,250 | 1,300 | 1,680 | .955 | .99 |
| March | 3,310 | 1,400 | 2,330 | 1.32 | 1.52 |
| April | 4,200 | 2,950 | 3,850 | 2.19 | 2.44 |
| May | 4,480 | 2,400 | 3,670 | 2.09 | 2.41 |
| June | 2,300 | 965 | 1,410 | .801 | .89 |
| July | 1,850 | 811 | 1,110 | .631 | .73 |
| August | 965 | 621 | 752 | .427 | .49 |
| September | 1,040 | 545 | 641 | .364 | .41 |
| The year | 4,480 | 545 | 1,730 | .983 | 13.34 |

### KANKAKEE RIVER AT MOMENCE, ILL.

LOCATION.—Chain gage in NE¼ sec. 24, T. 31 N., R. 13 E., at highway bridge in Momence, 1½ miles above Tower Creek. Zero of gage is 610.33 feet above mean sea level.

DRAINAGE AREA.—2,340 square miles.

RECORDS AVAILABLE.—February 1905 to July 1906; December 1914 to September 1933.

DISCHARGE.—Maximum during year, 6,550 second-feet May 14 (gage height, 4.90 feet); minimum, 551 second-feet Oct. 1–4.

1905–6, 1915–33: Maximum 12,600 second-feet Jan. 22, 1916; minimum, 306 second-feet Sept. 1, 16, 17, 1919 (gage height, 1.37 feet). Average, 18 years (1915–33), 1,800 second-feet.

REMARKS.—Records good except those for Feb. 8–20, which are poor. Backwater from aquatic vegetation Oct. 1 to Dec. 9; from ice Dec. 10–24 and Feb. 8–20.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 551 | 1,040 | 985 | 3,400 | 2,970 | 2,570 | 6,260 | 3,400 | 2,760 | 1,080 | 850 | 663 |
| 2 | 551 | 985 | 985 | 3,400 | 2,970 | 2,390 | 5,700 | 3,400 | 2,570 | 1,260 | 850 | 663 |
| 3 | 551 | 985 | 985 | 3,400 | 2,570 | 2,300 | 5,700 | 3,400 | 2,300 | 1,380 | 1,020 | 663 |
| 4 | 551 | 985 | 985 | 3,180 | 2,570 | 2,120 | 5,700 | 3,400 | 2,210 | 1,520 | 1,080 | 652 |
| 5 | 562 | 985 | 1,040 | 2,970 | 2,570 | 1,960 | 5,700 | 3,640 | 2,120 | 1,660 | 1,080 | 641 |
| 6 | 562 | 985 | 1,040 | 2,760 | 2,390 | 1,880 | 5,700 | 4,120 | 1,960 | 1,660 | 965 | 641 |
| 7 | 573 | 985 | 1,160 | 2,570 | 1,960 | 1,880 | 5,420 | 4,120 | 1,960 | 1,590 | 908 | 620 |
| 8 | 584 | 985 | 1,280 | 2,390 | 1,730 | 1,880 | 5,150 | 4,630 | 1,880 | 1,450 | 908 | 600 |
| 9 | 573 | 1,040 | 1,280 | 2,210 | 1,380 | 1,730 | 5,150 | 5,150 | 1,730 | 1,320 | 908 | 590 |
| 10 | 606 | 1,160 | 1,220 | 2,120 | 1,380 | 1,590 | 4,630 | 5,150 | 1,660 | 1,320 | 908 | 580 |
| 11 | 661 | 1,220 | 1,100 | 2,040 | 1,260 | 1,590 | 4,630 | 6,260 | 1,660 | 1,260 | 908 | 580 |
| 12 | 705 | 1,160 | 1,160 | 1,880 | 1,200 | 1,590 | 4,630 | 6,550 | 1,590 | 1,200 | 908 | 600 |
| 13 | 705 | 1,160 | 1,220 | 1,800 | 1,200 | 1,590 | 4,630 | 6,550 | 1,520 | 1,140 | 908 | 641 |
| 14 | 727 | 1,100 | 1,280 | 1,730 | 1,260 | 1,800 | 4,630 | 6,550 | 1,520 | 1,140 | 850 | 707 |
| 15 | 727 | 1,100 | 1,280 | 1,730 | 1,450 | 2,040 | 4,630 | 6,260 | 1,450 | 1,140 | 850 | 707 |
| 16 | 749 | 1,100 | 1,220 | 1,660 | 1,660 | 2,210 | 4,630 | 5,980 | 1,450 | 1,080 | 800 | 696 |
| 17 | 727 | 1,040 | 1,160 | 1,660 | 1,730 | 2,390 | 5,150 | 5,700 | 1,380 | 1,020 | 800 | 696 |
| 18 | 705 | 1,040 | 1,160 | 1,660 | 1,800 | 2,570 | 5,150 | 5,420 | 1,380 | 1,020 | 800 | 674 |
| 19 | 694 | 1,040 | 1,100 | 2,300 | 1,660 | 2,970 | 5,150 | 5,420 | 1,320 | 1,020 | 800 | 663 |
| 20 | 672 | 985 | 1,100 | 2,570 | 1,520 | 3,880 | 4,890 | 5,150 | 1,260 | 965 | 740 | 663 |
| 21 | 661 | 985 | 985 | 2,570 | 2,210 | 4,120 | 4,630 | 5,150 | 1,200 | 965 | 740 | 600 |
| 22 | 639 | 985 | 928 | 2,570 | 2,120 | 3,880 | 4,630 | 4,890 | 1,200 | 908 | 729 | 620 |
| 23 | 650 | 1,040 | 1,040 | 2,760 | 2,570 | 3,880 | 4,630 | 4,890 | 1,200 | 908 | 729 | 641 |
| 24 | 661 | 1,040 | 1,460 | 2,570 | 2,760 | 3,640 | 4,120 | 4,630 | 1,200 | 965 | 707 | 620 |
| 25 | 672 | 1,040 | 3,400 | 2,570 | 2,760 | 3,880 | 4,120 | 4,630 | 1,140 | 1,020 | 707 | 620 |
| 26 | 760 | 1,040 | 3,400 | 2,570 | 2,660 | 3,880 | 4,120 | 4,370 | 1,140 | 965 | 685 | 663 |
| 27 | 870 | 1,040 | 4,120 | 2,570 | 2,570 | 4,370 | 3,880 | 4,120 | 1,080 | 965 | 685 | 850 |
| 28 | 985 | 985 | 3,400 | 2,570 | 2,570 | 3,880 | 3,880 | 3,880 | 1,080 | 908 | 685 | 908 |
| 29 | 1,040 | 1,040 | 3,880 | 2,390 | ------ | 3,640 | 3,640 | 3,880 | 1,080 | 908 | 685 | 1,020 |
| 30 | 1,040 | 1,040 | 3,640 | 2,390 | ------ | 3,880 | 3,400 | 3,400 | 1,080 | 879 | 685 | 1,020 |
| 31 | 1,100 | ------ | 3,640 | 2,396 | ------ | 4,120 | ------ | 2,970 | ------ | 850 | 674 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 1,100 | 551 | 704 | 0.301 | 0.35 |
| November | 1,220 | 985 | 1,040 | .444 | .50 |
| December | 4,120 | 928 | 1,700 | .726 | .84 |
| January | 3,400 | 1,660 | 2,430 | 1.04 | 1.20 |
| February | 2,970 | 1,200 | 2,050 | .876 | .91 |
| March | 4,370 | 1,590 | 2,780 | 1.19 | 1.37 |
| April | 6,260 | 3,400 | 4,810 | 2.06 | 2.30 |
| May | 6,550 | 2,970 | 4,740 | 2.03 | 2.34 |
| June | 2,760 | 1,080 | 1,540 | .658 | .73 |
| July | 1,660 | 850 | 1,140 | .487 | .56 |
| August | 1,080 | 674 | 824 | .352 | .41 |
| September | 1,020 | 580 | 683 | .292 | .33 |
| The year | 6,550 | 551 | 2,040 | .872 | 11.84 |

### KANKAKEE RIVER AT CUSTER PARK, ILL.

LOCATION.—Chain gage in NW¼ sec. 19, T. 32 N., R. 10 E., at Wabash Railroad bridge in Custer Park, a quarter of a mile above Horse Creek. Zero of gage is 531.27 feet above mean sea level.

DRAINAGE AREA.—4,870 square miles.

RECORDS AVAILABLE.—November 1914 to November 1933 (discontinued).

DISCHARGE.—Maximum during year, 33,700 second-feet May 14 (gage height, 15.32 feet); minimum, 660 second-feet Oct. 7.

1914–33: Maximum, that of May 14, 1933; minimum mean daily, 250 second-feet Nov. 15 and 18, 1914. Average, 18 years (1915–33), 3,540 second-feet.

REMARKS.—Records poor. Small amount of regulation above. Backwater from aquatic vegetation Oct. 1–27 and May 28 to Sept. 28; backwater from ice Dec. 8–26, Feb. 8–24, and Nov. 15, 16.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1931–32 | | | | | | | | | | | | |
| 1 | 735 | 1,390 | 1,500 | 6,230 | 5,630 | 4,230 | 19,900 | 7,130 | 3,970 | 1,280 | 980 | 772 |
| 2 | 735 | 1,340 | 1,500 | 6,530 | 6,530 | 3,970 | 21,600 | 9,590 | 3,510 | 1,280 | 852 | 772 |
| 3 | 735 | 1,280 | 1,500 | 5,630 | 6,230 | 3,510 | 20,800 | 10,500 | 3,310 | 1,340 | 1,120 | 772 |
| 4 | 735 | 1,280 | 1,500 | 5,330 | 5,630 | 3,310 | 19,500 | 10,500 | 2,960 | 1,440 | 1,120 | 810 |
| 5 | 735 | 1,280 | 1,440 | 4,490 | 4,770 | 2,960 | 17,500 | 10,200 | 2,800 | 1,560 | 1,170 | 810 |
| 6 | 735 | 1,280 | 1,500 | 4,230 | 4,490 | 2,960 | 15,700 | 10,800 | 2,640 | 1,680 | 1,220 | 772 |
| 7 | 698 | 1,220 | 1,560 | 3,970 | 3,730 | 2,800 | 14,000 | 10,800 | 2,480 | 1,680 | 1,170 | 772 |
| 8 | 698 | 1,280 | 2,030 | 3,510 | 2,960 | 2,700 | 13,100 | 12,400 | 2,330 | 1,680 | 1,120 | 772 |
| 9 | 735 | 1,340 | 2,030 | 3,310 | 2,030 | 2,600 | 12,100 | 12,800 | 2,180 | 1,560 | 1,120 | 772 |
| 10 | 810 | 1,390 | 1,890 | 3,130 | 2,030 | 2,480 | 11,200 | 13,100 | 2,030 | 1,500 | 1,170 | 735 |
| 11 | 852 | 1,560 | 1,750 | 2,960 | 2,030 | 2,330 | 10,500 | 17,900 | 2,030 | 1,440 | 1,120 | 735 |
| 12 | 810 | 1,680 | 1,680 | 2,800 | 2,030 | 2,180 | 9,900 | 26,700 | 1,890 | 1,390 | 1,070 | 735 |
| 13 | 810 | 1,750 | 1,890 | 2,640 | 2,030 | 1,750 | 9,280 | 32,600 | 1,890 | 1,340 | 1,070 | 772 |
| 14 | 852 | 1,680 | 2,030 | 2,480 | 2,030 | 2,330 | 8,970 | 33,100 | 1,750 | 1,340 | 1,020 | 772 |
| 15 | 980 | 1,680 | 2,030 | 2,480 | 2,030 | 2,480 | 8,970 | 30,100 | 1,750 | 1,220 | 980 | 810 |
| 16 | 895 | 1,560 | 1,890 | 2,330 | 2,180 | 2,960 | 8,970 | 25,300 | 1,750 | 1,220 | 938 | 810 |
| 17 | 895 | 1,500 | 1,890 | 2,330 | 2,180 | 3,130 | 10,500 | 20,800 | 1,680 | 1,220 | 895 | 810 |
| 18 | 895 | 1,440 | 1,750 | 2,330 | 2,330 | 3,970 | 11,200 | 17,100 | 1,620 | 1,220 | 852 | 810 |
| 19 | 852 | 1,390 | 1,680 | 2,960 | 2,180 | 7,130 | 11,800 | 14,700 | 1,620 | 1,220 | 810 | 772 |
| 20 | 852 | 1,390 | 1,680 | 5,050 | 2,180 | 12,100 | 11,200 | 14,000 | 1,620 | 1,170 | 810 | 772 |
| 21 | 810 | 1,440 | 1,620 | 6,230 | 2,640 | 14,700 | 10,200 | 13,400 | 1,560 | 1,170 | 852 | 772 |
| 22 | 852 | 1,560 | 1,560 | 6,830 | 3,510 | 14,700 | 9,590 | 12,400 | 1,500 | 1,120 | 810 | 772 |
| 23 | 772 | 1,500 | 2,030 | 6,530 | 7,130 | 14,000 | 8,970 | 10,800 | 1,440 | 1,120 | 810 | 772 |
| 24 | 772 | 1,440 | 4,230 | 6,230 | 7,130 | 12,800 | 8,350 | 8,970 | 1,390 | 1,120 | 810 | 772 |
| 25 | 895 | 1,390 | 8,350 | 5,630 | 6,530 | 11,500 | 7,730 | 8,040 | 1,440 | 1,120 | 810 | 772 |
| 26 | 938 | 1,390 | 10,200 | 5,050 | 5,930 | 10,800 | 7,130 | 7,130 | 1,440 | 1,120 | 810 | 810 |
| 27 | 980 | 1,560 | 11,200 | 5,050 | 5,330 | 11,800 | 6,530 | 6,530 | 1,390 | 1,120 | 810 | 1,170 |
| 28 | 1,120 | 1,560 | 10,200 | 5,050 | 4,770 | 12,100 | 5,930 | 5,930 | 1,340 | 1,120 | 810 | 2,330 |
| 29 | 1,220 | 1,500 | 8,660 | 5,050 | ------ | 11,500 | 5,330 | 5,630 | 1,280 | 1,120 | 772 | 4,490 |
| 30 | 1,390 | 1,500 | 7,730 | 5,050 | ------ | 10,500 | 5,630 | 4,770 | 1,280 | 1,120 | 772 | 4,770 |
| 31 | 1,440 | ------ | 6,830 | 5,050 | ------ | 10,500 | ------ | 4,490 | ------ | 1,070 | 772 | ------ |

| Day | Oct. | Nov. | Day | Oct. | Nov. | Day | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|
| 1933 | | | 1933 | | | 1933 | | |
| 1 | 3,730 | 1,890 | 11 | 1,620 | 1,280 | 21 | 1,440 | ------ |
| 2 | 3,970 | 1,680 | 12 | 1,500 | 1,340 | 22 | 2,330 | ------ |
| 3 | 5,050 | 1,620 | 13 | 1,500 | 1,280 | 23 | 3,510 | ------ |
| 4 | 4,770 | 1,560 | 14 | 1,440 | 1,280 | 24 | 4,770 | ------ |
| 5 | 3,730 | 1,440 | 15 | 1,340 | 1,280 | 25 | 4,770 | ------ |
| 6 | 2,640 | 1,390 | 16 | 1,340 | 1,280 | 26 | 3,970 | ------ |
| 7 | 2,180 | 1,390 | 17 | 1,280 | 1,280 | 27 | 2,960 | ------ |
| 8 | 1,890 | 1,340 | 18 | 1,280 | 1,120 | 28 | 2,640 | ------ |
| 9 | 1,750 | 1,340 | 19 | 1,280 | 1,170 | 29 | 2,330 | ------ |
| 10 | 1,680 | 1,340 | 20 | 1,280 | 1,340 | 30 | 2,030 | ------ |
| | | | | | | 31 | 2,030 | ------ |

*Discharge, in second-feet, of Kankakee River at Custer Park, Ill., 1932–33*—Continued

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| 1932–33 | | | | | |
| October | 1,440 | 698 | 878 | 0.180 | 0.21 |
| November | 1,750 | 1,220 | 1,450 | .298 | .33 |
| December | 11,200 | 1,440 | 3,460 | .710 | .82 |
| January | 6,830 | 2,330 | 4,400 | .903 | 1.04 |
| February | 7,130 | 2,030 | 3,860 | .793 | .83 |
| March | 14,700 | 1,750 | 6,670 | 1.37 | 1.58 |
| April | 21,600 | 5,330 | 11,400 | 2.34 | 2.61 |
| May | 33,100 | 4,490 | 13,800 | 2.83 | 3.26 |
| June | 3,970 | 1,280 | 2,000 | .411 | .46 |
| July | 1,680 | 1,070 | 1,290 | .265 | .31 |
| August | 1,220 | 772 | 950 | .195 | .22 |
| September | 4,770 | 735 | 1,100 | .226 | .25 |
| The year | 33,100 | 698 | 4,280 | .895 | 11.92 |
| 1933 | | | | | |
| October | 5,050 | 1,280 | 2,520 | .517 | .60 |
| November 1–20 | 1,890 | 1,120 | 1,380 | .283 | .21 |

### IROQUOIS RIVER NEAR CHEBANSE, ILL.

LOCATION.—Chain gage in SW¼ sec. 10, T. 29 N., R. 13 W., at highway bridge 3 miles below Beaver Creek, 4½ miles east of Chebanse, and 6 miles above confluence with Kankakee River. Zero of gage is 598.27 feet above mean sea level.

DRAINAGE AREA.—2,120 square miles.

RECORDS AVAILABLE.—April 1923 to September 1933.

DISCHARGE.—Maximum during year, 27,000 second-feet May 13 (gage height, about 18.1 feet); minimum, 29 second-feet Aug. 23, 28, Sept. 3 (gage height, 0.74 foot).

1923–33: Maximum, that of May 13, 1933; minimum, 12 second-feet Sept. 4, 1925 (gage height, 0.60 foot). Average, 10 years, 1,700 second-feet.

Maximum known, about 34,000 second-feet in spring of 1913 (gage height, about 19.6 feet).

REMARKS.—Records good. Ice effect Dec. 9–22 and Feb. 7–21.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 47 | 216 | 385 | 2,720 | 2,620 | 1,600 | 10,900 | 2,820 | 1,020 | 166 | 60 | 38 |
| 2 | 52 | 198 | 385 | 2,420 | 3,040 | 1,360 | 12,800 | 4,800 | 960 | 166 | 63 | 40 |
| 3 | 52 | 180 | 360 | 2,220 | 3,040 | 1,150 | 12,800 | 6,100 | 900 | 155 | 60 | 35 |
| 4 | 47 | 162 | 360 | 1,860 | 2,620 | 1,080 | 11,800 | 6,100 | 840 | 151 | 98 | 35 |
| 5 | 47 | 144 | 360 | 1,520 | 2,220 | 1,020 | 9,930 | 5,970 | 780 | 163 | 113 | 38 |
| 6 | 47 | 135 | 360 | 1,440 | 1,770 | 960 | 8,280 | 5,840 | 725 | 155 | 143 | 40 |
| 7 | 42 | 131 | 435 | 1,360 | 1,150 | 900 | 7,440 | 5,970 | 670 | 139 | 151 | 40 |
| 8 | 42 | 131 | 615 | 1,360 | 840 | 780 | 6,750 | 6,470 | 615 | 128 | 120 | 40 |
| 9 | 42 | 153 | 560 | 1,220 | 725 | 780 | 6,230 | 6,100 | 560 | 120 | 105 | 36 |
| 10 | 57 | 238 | 510 | 1,150 | 642 | 698 | 5,450 | 6,100 | 510 | 109 | 105 | 33 |
| 11 | 78 | 385 | 510 | 1,080 | 588 | 670 | 4,930 | 11,700 | 435 | 102 | 109 | 40 |
| 12 | 67 | 435 | 485 | 960 | 510 | 642 | 4,440 | 18,500 | 385 | 91 | 80 | 53 |
| 13 | 70 | 385 | 485 | 840 | 460 | 670 | 3,960 | 25,700 | 360 | 73 | 63 | 53 |
| 14 | 84 | 360 | 460 | 840 | 435 | 725 | 3,600 | 24,200 | 338 | 63 | 70 | 53 |
| 15 | 78 | 338 | 435 | 780 | 410 | 900 | 3,480 | 19,300 | 315 | 56 | 73 | 47 |
| 16 | 64 | 315 | 435 | 780 | 385 | 960 | 3,600 | 16,100 | 292 | 60 | 70 | 38 |
| 17 | 64 | 302 | 435 | 780 | 385 | 1,020 | 4,320 | 12,900 | 270 | 73 | 60 | 36 |
| 18 | 64 | 270 | 410 | 725 | 385 | 1,450 | 5,320 | 9,930 | 257 | 63 | 50 | 50 |
| 19 | 64 | 243 | 385 | 698 | 385 | 5,190 | 5,840 | 8,280 | 248 | 56 | 43 | 50 |
| 20 | 57 | 230 | 385 | 2,520 | 460 | 8,140 | 5,840 | 8,000 | 231 | 63 | 43 | 43 |
| 21 | 57 | 252 | 338 | 3,600 | 780 | 9,030 | 4,680 | 7,580 | 206 | 70 | 40 | 43 |
| 22 | 55 | 302 | 485 | 3,260 | 3,720 | 9,630 | 4,200 | 6,360 | 186 | 63 | 38 | 63 |
| 23 | 52 | 338 | 960 | 3,370 | 3,370 | 8,880 | 3,720 | 4,930 | 178 | 50 | 33 | 56 |
| 24 | 47 | 385 | 2,620 | 3,150 | 3,260 | 7,720 | 3,370 | 3,720 | 178 | 47 | 33 | 53 |
| 25 | 42 | 435 | 4,800 | 2,720 | 2,930 | 6,880 | 2,930 | 2,820 | 155 | 60 | 33 | 60 |
| 26 | 52 | 435 | 6,360 | 2,320 | 2,520 | 6,230 | 2,520 | 2,320 | 178 | 73 | 33 | 66 |
| 27 | 99 | 460 | 6,230 | 2,130 | 2,220 | 6,750 | 2,220 | 2,130 | 182 | 105 | 36 | 1,020 |
| 28 | 158 | 560 | 5,840 | 2,320 | 1,950 | 7,160 | 1,680 | 1,950 | 170 | 105 | 33 | 3,150 |
| 29 | 202 | 485 | 4,320 | 2,620 | ------ | 6,880 | 1,520 | 1,600 | 190 | 102 | 33 | 3,960 |
| 30 | 225 | 410 | 3,600 | 2,620 | ------ | 6,100 | 1,770 | 1,360 | 178 | 91 | 36 | 3,600 |
| 31 | 230 | ------ | 2,930 | 2,620 | ------ | 5,710 | ------ | 1,150 | ------ | 70 | 40 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 230 | 42 | 76.9 | 0.036 | 0.04 |
| November | 560 | 131 | 300 | .142 | .16 |
| December | 6,360 | 338 | 1,520 | .717 | .83 |
| January | 3,600 | 698 | 1,870 | .882 | 1.02 |
| February | 3,720 | 385 | 1,560 | .736 | .77 |
| March | 9,630 | 642 | 3,600 | 1.70 | 1.96 |
| April | 12,800 | 1,520 | 5,540 | 2.61 | 2.91 |
| May | 25,700 | 1,150 | 7,960 | 3.75 | 4.32 |
| June | 1,020 | 155 | 417 | .197 | .22 |
| July | 166 | 47 | 96.4 | .045 | .05 |
| August | 151 | 33 | 66.7 | .031 | .04 |
| September | 3,960 | 33 | 430 | .203 | .23 |
| The year | 25,700 | 33 | 1,960 | .925 | 12.55 |

### FOX RIVER AT ALGONQUIN, ILL.

LOCATION.—Staff gage in NW¼ sec. 34, T. 43 N., R. 8 E., at Chicago Street Bridge in Algonquin, 300 feet above Crystal Lake outlet. Zero of gage is 729.31 feet above mean sea level (revised).

DRAINAGE AREA.—1,340 square miles.

RECORDS AVAILABLE.—October 1915 to September 1933.

DISCHARGE.—Maximum during year, 3,470 second-feet May 14, 15 (gage height, 3.37 feet); minimum, 81 second-feet Oct. 1, 8 (gage-height, 0.82 foot).

1915–33: Maximum, 7,120 second-feet Mar. 31, 1916 (gage height, 5.3 feet); minimum, 47 second-feet Sept. 4–6, 11–13, 1931 (gage height, 0.74 foot). Average, 18 years, 827 second-feet.

REMARKS.—Records fair except those for low water, which are poor. Discharge occasionally regulated at dam 16 miles above gage.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 81 | 325 | 309 | 610 | 550 | 810 | 1,280 | 560 | 2,920 | 376 | 239 | 142 |
| 2 | 115 | 393 | 261 | 580 | 540 | 810 | 1,350 | 810 | 2,920 | 393 | 246 | 142 |
| 3 | 172 | 464 | 261 | 580 | 520 | 810 | 1,500 | 870 | 2,750 | 464 | 276 | 131 |
| 4 | 148 | 446 | 269 | 560 | 520 | 810 | 1,650 | 1,130 | 2,420 | 510 | 309 | 131 |
| 5 | 100 | 393 | 276 | 560 | 520 | 810 | 1,720 | 1,280 | 2,420 | 520 | 309 | 142 |
| 6 | 90 | 376 | 292 | 570 | 520 | 810 | 1,800 | 1,880 | 2,260 | 640 | 276 | 142 |
| 7 | 90 | 376 | 342 | 570 | 520 | 870 | 1,950 | 2,100 | 1,880 | 810 | 226 | 142 |
| 8 | 81 | 359 | 325 | 550 | 520 | 810 | 2,100 | 2,260 | 1,580 | 755 | 219 | 142 |
| 9 | 115 | 359 | 342 | 540 | 446 | 810 | 2,100 | 2,580 | 1,500 | 755 | 226 | 142 |
| 10 | 154 | 376 | 276 | 410 | 376 | 610 | 2,260 | 2,920 | 1,500 | 680 | 239 | 142 |
| 11 | 160 | 376 | 232 | 376 | 359 | 482 | 2,580 | 3,100 | 1,350 | 650 | 261 | 142 |
| 12 | 160 | 376 | 232 | 205 | 342 | 482 | 2,580 | 3,280 | 1,350 | 640 | 254 | 142 |
| 13 | 160 | 359 | 226 | 376 | 342 | 500 | 2,420 | 3,470 | 995 | 620 | 232 | 154 |
| 14 | 160 | 350 | 226 | 358 | 333 | 520 | 2,420 | 3,470 | 930 | 610 | 232 | 154 |
| 15 | 131 | 393 | 219 | 340 | 333 | 500 | 2,420 | 3,470 | 810 | 580 | 232 | 126 |
| 16 | 137 | 419 | 205 | 322 | 333 | 491 | 2,260 | 3,470 | 650 | 570 | 226 | 110 |
| 17 | 154 | 446 | 178 | 304 | 333 | 491 | 2,260 | 3,280 | 620 | 560 | 226 | 110 |
| 18 | 160 | 600 | 160 | 286 | 333 | 500 | 2,100 | 2,920 | 580 | 520 | 219 | 120 |
| 19 | 131 | 630 | 148 | 269 | 333 | 464 | 1,950 | 2,920 | 428 | 491 | 212 | 137 |
| 20 | 131 | 620 | 142 | 428 | 333 | 419 | 1,880 | 3,100 | 376 | 428 | 205 | 154 |
| 21 | 178 | 473 | 154 | 500 | 350 | 292 | 1,800 | 3,100 | 325 | 491 | 205 | 154 |
| 22 | 185 | 473 | 166 | 530 | 376 | 317 | 1,800 | 3,100 | 285 | 446 | 192 | 160 |
| 23 | 185 | 473 | 219 | 620 | 482 | 325 | 1,580 | 2,920 | 265 | 446 | 192 | 160 |
| 24 | 205 | 455 | 510 | 570 | 540 | 376 | 1,500 | 2,920 | 261 | 428 | 178 | 105 |
| 25 | 205 | 419 | 560 | 660 | 700 | 384 | 1,350 | 2,750 | 261 | 410 | 178 | 110 |
| 26 | 219 | 393 | 600 | 660 | 755 | 580 | 1,200 | 2,920 | 254 | 384 | 178 | 120 |
| 27 | 246 | 393 | 630 | 660 | 810 | 580 | 995 | 3,100 | 219 | 350 | 166 | 192 |
| 28 | 246 | 376 | 660 | 640 | 810 | 600 | 930 | 3,100 | 219 | 276 | 166 | 205 |
| 29 | 261 | 350 | 680 | 620 | ------ | 610 | 755 | 3,100 | 232 | 276 | 166 | 205 |
| 30 | 261 | 325 | 680 | 620 | ------ | 640 | 640 | 3,100 | 359 | 261 | 166 | 172 |
| 31 | 292 | ------ | 640 | 590 | ------ | 700 | ------ | 3,100 | ------ | 254 | 154 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 292 | 81 | 165 | 0.123 | 0.14 |
| November | 630 | 325 | 419 | .313 | .35 |
| December | 680 | 142 | 336 | .251 | .29 |
| January | 660 | 205 | 499 | .372 | .43 |
| February | 810 | 333 | 472 | .352 | .37 |
| March | 870 | 292 | 588 | .439 | .51 |
| April | 2,580 | 640 | 1,770 | 1.32 | 1.47 |
| May | 3,470 | 560 | 2,650 | 1.98 | 2.28 |
| June | 2,920 | 219 | 1,100 | .821 | .92 |
| July | 810 | 254 | 500 | .373 | .43 |
| August | 309 | 154 | 220 | .164 | .19 |
| September | 205 | 105 | 144 | .107 | .12 |
| The year | 3,470 | 81 | 739 | .551 | 7.50 |

### FOX RIVER AT ALGONQUIN, ILL.

LOCATION.—Staff gage in NW¼ sec. 34, T. 43 N., R. 8 E., at Chicago Street Bridge in Algonquin, 300 feet above Crystal Lake outlet. Zero of gage is 729.31 feet above mean sea level (revised).

DRAINAGE AREA.—1,340 square miles.

RECORDS AVAILABLE.—October 1915 to September 1933.

DISCHARGE.—Maximum during year, 3,470 second-feet May 14, 15 (gage height, 3.37 feet); minimum, 81 second-feet Oct. 1, 8 (gage-height, 0.82 foot).

1915–33: Maximum, 7,120 second-feet Mar. 31, 1916 (gage height, 5.3 feet); minimum, 47 second-feet Sept. 4–6, 11–13, 1931 (gage height, 0.74 foot). Average, 18 years, 827 second-feet.

REMARKS.—Records fair except those for low water, which are poor. Discharge occasionally regulated at dam 16 miles above gage.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 81 | 325 | 309 | 610 | 550 | 810 | 1,280 | 560 | 2,920 | 376 | 239 | 142 |
| 2 | 115 | 393 | 261 | 580 | 540 | 810 | 1,350 | 810 | 2,920 | 393 | 246 | 142 |
| 3 | 172 | 464 | 261 | 580 | 520 | 810 | 1,500 | 870 | 2,750 | 464 | 276 | 131 |
| 4 | 148 | 446 | 269 | 560 | 520 | 810 | 1,650 | 1,130 | 2,420 | 510 | 309 | 131 |
| 5 | 100 | 393 | 276 | 560 | 520 | 810 | 1,720 | 1,280 | 2,420 | 520 | 309 | 142 |
| 6 | 90 | 376 | 292 | 570 | 520 | 810 | 1,800 | 1,880 | 2,260 | 640 | 276 | 142 |
| 7 | 90 | 376 | 342 | 570 | 520 | 870 | 1,950 | 2,100 | 1,880 | 810 | 226 | 142 |
| 8 | 81 | 359 | 325 | 550 | 520 | 810 | 2,100 | 2,260 | 1,580 | 755 | 219 | 142 |
| 9 | 115 | 359 | 342 | 540 | 446 | 810 | 2,100 | 2,580 | 1,500 | 755 | 226 | 142 |
| 10 | 154 | 376 | 276 | 410 | 376 | 610 | 2,260 | 2,920 | 1,500 | 680 | 239 | 142 |
| 11 | 160 | 376 | 232 | 376 | 359 | 482 | 2,580 | 3,100 | 1,350 | 650 | 261 | 142 |
| 12 | 160 | 376 | 232 | 205 | 342 | 482 | 2,580 | 3,280 | 1,350 | 640 | 254 | 142 |
| 13 | 160 | 359 | 226 | 376 | 342 | 500 | 2,420 | 3,470 | 995 | 620 | 232 | 154 |
| 14 | 160 | 350 | 226 | 358 | 333 | 520 | 2,420 | 3,470 | 930 | 610 | 232 | 154 |
| 15 | 131 | 393 | 219 | 340 | 333 | 500 | 2,420 | 3,470 | 810 | 580 | 232 | 126 |
| 16 | 137 | 419 | 205 | 322 | 333 | 491 | 2,260 | 3,470 | 650 | 570 | 226 | 110 |
| 17 | 154 | 446 | 178 | 304 | 333 | 491 | 2,260 | 3,280 | 620 | 560 | 226 | 110 |
| 18 | 160 | 600 | 160 | 286 | 333 | 500 | 2,100 | 2,920 | 580 | 520 | 219 | 120 |
| 19 | 131 | 630 | 148 | 269 | 333 | 464 | 1,950 | 2,920 | 428 | 491 | 212 | 137 |
| 20 | 131 | 620 | 142 | 428 | 333 | 419 | 1,880 | 3,100 | 376 | 428 | 205 | 154 |
| 21 | 178 | 473 | 154 | 500 | 350 | 292 | 1,800 | 3,100 | 325 | 401 | 205 | 154 |
| 22 | 185 | 473 | 166 | 530 | 376 | 317 | 1,800 | 3,100 | 285 | 446 | 192 | 160 |
| 23 | 185 | 473 | 219 | 620 | 482 | 325 | 1,580 | 2,920 | 265 | 446 | 192 | 160 |
| 24 | 205 | 455 | 510 | 570 | 540 | 376 | 1,500 | 2,920 | 261 | 428 | 178 | 105 |
| 25 | 205 | 419 | 560 | 660 | 700 | 384 | 1,350 | 2,750 | 261 | 410 | 178 | 110 |
| 26 | 219 | 393 | 600 | 660 | 755 | 580 | 1,200 | 2,920 | 254 | 384 | 178 | 120 |
| 27 | 246 | 393 | 630 | 660 | 810 | 580 | 995 | 3,100 | 219 | 350 | 166 | 192 |
| 28 | 246 | 376 | 660 | 640 | 810 | 600 | 930 | 3,100 | 219 | 276 | 166 | 205 |
| 29 | 261 | 350 | 680 | 620 | ------ | 610 | 755 | 3,100 | 232 | 276 | 166 | 205 |
| 30 | 261 | 325 | 680 | 620 | ------ | 640 | 640 | 3,100 | 359 | 261 | 166 | 172 |
| 31 | 292 | ------ | 640 | 590 | ------ | 700 | ------ | 3,100 | ------ | 254 | 154 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 292 | 81 | 165 | 0.123 | 0.14 |
| November | 630 | 325 | 419 | .313 | .35 |
| December | 680 | 142 | 336 | .251 | .29 |
| January | 660 | 205 | 499 | .372 | .43 |
| February | 810 | 333 | 472 | .352 | .37 |
| March | 870 | 292 | 588 | .439 | .51 |
| April | 2,580 | 640 | 1,770 | 1.32 | 1.47 |
| May | 3,470 | 560 | 2,650 | 1.98 | 2.28 |
| June | 2,920 | 219 | 1,100 | .821 | .92 |
| July | 810 | 254 | 500 | .373 | .43 |
| August | 309 | 154 | 220 | .164 | .19 |
| September | 205 | 105 | 144 | .107 | .12 |
| The year | 3,470 | 81 | 739 | .551 | 7.50 |

### FOX RIVER AT DAYTON, ILL.

LOCATION.—Float gages above and below dam in SE¼ sec. 29, T. 34 N., R. 4 E., at plant of North Counties Hydroelectric Co., in Dayton, 6 miles above mouth of river.

DRAINAGE AREA.—2,570 square miles.

RECORDS AVAILABLE.—April 1925 to September 1933.

DISCHARGE.—1925–33: Maximum mean daily, 14,300 second-feet Apr. 1, 1929; minimum, 151 second-feet Aug. 17, 1931. Average, 17 years (1915-24, average for station at Wedron increased by drainage area ratio, and 1925–33), 1,560 second-feet.

REMARKS.—Records fair. Daily discharge computed from electrical output of power plant and flow over dam. Records collected by North Counties Hydroelectric Co., under general supervision of United States Geological Survey, in connection with a Federal Power Commission project.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 222 | 281 | 492 | 566 | 1,540 | 1,890 | 7,190 | 1,510 | 4,100 | 1,650 | 375 | 321 |
| 2 | 243 | 412 | 442 | 866 | 1,800 | 1,770 | 4,710 | 4,810 | 4,040 | 1,630 | 440 | 266 |
| 3 | 199 | 413 | 511 | 1,020 | 1,550 | 1,520 | 4,040 | 4,060 | 3,920 | 3,430 | 473 | 268 |
| 4 | 300 | 647 | 477 | 1,290 | 1,170 | 1,400 | 3,720 | 3,480 | 3,470 | 2,560 | 403 | 244 |
| 5 | 375 | 564 | 390 | 1,010 | 354 | 1,340 | 3,710 | 3,420 | 3,340 | 1,870 | 471 | 201 |
| 6 | 301 | 515 | 441 | 976 | 729 | 1,330 | 5,080 | 4,700 | 3,180 | 1,600 | 416 | 184 |
| 7 | 243 | 508 | 511 | 1,040 | 974 | 1,350 | 4,710 | 4,740 | 2,960 | 1,380 | 364 | 244 |
| 8 | 281 | 599 | 443 | 800 | 497 | 1,330 | 4,380 | 6,740 | 2,810 | 1,380 | 388 | 267 |
| 9 | 281 | 748 | 222 | 820 | 543 | 1,100 | 4,040 | 8,080 | 2,680 | 1,400 | 439 | 262 |
| 10 | 350 | 706 | 301 | 913 | 761 | 660 | 4,060 | 7,640 | 2,390 | 1,370 | 433 | 244 |
| 11 | 301 | 732 | 374 | 792 | 687 | 960 | 4,060 | 7,650 | 2,150 | 1,220 | 345 | 201 |
| 12 | 390 | 517 | 402 | 368 | 731 | 875 | 4,020 | 7,640 | 1,850 | 1,020 | 438 | 201 |
| 13 | 331 | 511 | 268 | 483 | 642 | 1,030 | 3,900 | 8,620 | 1,690 | 961 | 414 | 200 |
| 14 | 389 | 536 | 427 | 612 | 756 | 1,370 | 3,730 | 7,190 | 1,470 | 988 | 333 | 283 |
| 15 | 301 | 514 | 413 | 483 | 824 | 1,350 | 3,710 | 6,770 | 1,330 | 1,000 | 348 | 282 |
| 16 | 319 | 557 | 348 | 797 | 690 | 1,190 | 3,470 | 6,280 | 1,140 | 1,100 | 376 | 302 |
| 17 | 301 | 538 | 244 | 614 | 734 | 1,050 | 3,740 | 5,870 | 979 | 915 | 346 | 267 |
| 18 | 282 | 514 | 223 | 839 | 662 | 1,080 | 3,730 | 5,520 | 904 | 915 | 376 | 223 |
| 19 | 329 | 559 | 301 | 3,740 | 616 | 1,500 | 3,460 | 5,100 | 847 | 831 | 364 | 200 |
| 20 | 390 | 515 | 268 | 3,410 | 640 | 1,680 | 3,180 | 5,880 | 800 | 759 | 322 | 302 |
| 21 | 329 | 537 | 302 | 2,100 | 797 | 1,740 | 2,910 | 6,280 | 664 | 760 | 268 | 266 |
| 22 | 363 | 514 | 347 | 1,830 | 1,390 | 1,290 | 2,690 | 5,470 | 600 | 586 | 303 | 321 |
| 23 | 332 | 644 | 1,470 | 2,140 | 2,150 | 1,030 | 2,580 | 4,920 | 419 | 555 | 282 | 321 |
| 24 | 281 | 602 | 3,080 | 2,140 | 2,600 | 1,210 | 2,280 | 4,740 | 534 | 536 | 329 | 268 |
| 25 | 390 | 514 | 5,320 | 1,890 | 2,480 | 1,370 | 2,200 | 4,400 | 478 | 555 | 363 | 225 |
| 26 | 530 | 599 | 3,150 | 1,860 | 2,130 | 1,500 | 2,000 | 4,730 | 486 | 559 | 304 | 322 |
| 27 | 509 | 444 | 2,100 | 1,810 | 1,910 | 1,680 | 1,880 | 5,490 | 489 | 534 | 283 | 616 |
| 28 | 509 | 433 | 1,880 | 1,860 | 1,950 | 1,910 | 1,830 | 5,100 | 445 | 532 | 244 | 348 |
| 29 | 432 | 672 | 1,550 | 1,710 | ------- | 1,910 | 1,380 | 4,730 | 578 | 487 | 244 | 392 |
| 30 | 392 | 491 | 1,520 | 1,420 | ------- | 1,850 | 1,310 | 4,740 | 631 | 457 | 282 | 320 |
| 31 | 332 | ------- | 1,160 | 1,420 | ------- | 3,100 | ------- | 4,210 | ------- | 361 | 267 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 530 | 199 | 340 | 0.132 | 0.15 |
| November | 748 | 281 | 545 | .212 | .24 |
| December | 5,320 | 222 | 948 | .369 | .43 |
| January | 3,740 | 369 | 1,340 | .521 | .60 |
| February | 2,600 | 354 | 1,150 | .447 | .47 |
| March | 3,100 | 660 | 1,430 | .556 | .64 |
| April | 7,190 | 1,310 | 3,460 | 1.35 | 1.51 |
| May | 8,620 | 1,510 | 5,500 | 2.14 | 2.47 |
| June | 4,100 | 419 | 1,710 | .665 | .74 |
| July | 3,430 | 361 | 1,090 | .424 | .49 |
| August | 473 | 244 | 356 | .139 | .16 |
| September | 616 | 184 | 279 | .108 | .13 |
| The year | 8,620 | 184 | 1,520 | .591 | 8.03 |

### VERMILION RIVER AT LOWELL, ILL.

LOCATION.—Chain gage in SE¼ sec. 8, T. 32 N., R. 2 E., at highway bridge a quarter of a mile northwest of Lowell, La Salle County, and 10 miles above mouth. Zero of gage is 500.90 feet above mean sea level.

DRAINAGE AREA.—1,230 square miles.

RECORDS AVAILABLE.—May 1931 to September 1933.

DISCHARGE.—1931–33: Maximum, 22,200 second-feet May 12, 1933 (gage height, 10.76 feet); minimum, 8.3 second-feet Sept. 12–14, 1931 (gage height, 1.21 feet).

Highest stage known, about 16 feet during an ice jam.

REMARKS.—Records good. Discharge estimated Mar. 7–15, Nov. 18–22, 24, 26–28, Dec. 8–23, 1932, and Jan. 13, Feb. 9–23, 1933, because of ice effect.

*Discharge, in second-feet, 1931–33*

| Day | May | June | July | Aug. | Sept. | Day | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1931 | | | | | | 1931 | | | | | |
| 1 | | 427 | 125 | 94 | 42 | 16 | 472 | 612 | 79 | 29 | 11 |
| 2 | | 505 | 128 | 92 | 33 | 17 | 401 | 505 | 70 | 20 | 22 |
| 3 | | 472 | 188 | 42 | 24 | 18 | 342 | 280 | 61 | 16 | 110 |
| 4 | | 394 | 1,670 | 45 | 35 | 19 | 440 | 540 | 50 | 92 | 235 |
| 5 | | 330 | 1,560 | 33 | 33 | 20 | 2,030 | 420 | 86 | 38 | 135 |
| 6 | | 725 | 970 | 18 | 19 | 21 | 1,670 | 103 | 121 | 18 | 94 |
| 7 | | 2,310 | 650 | 18 | 17 | 22 | 1,560 | 45 | 362 | 16 | 77 |
| 8 | 90 | 2,890 | 540 | 14 | 15 | 23 | 1,350 | 420 | 330 | 18 | 66 |
| 9 | 123 | 1,910 | 310 | 16 | 14 | 24 | 1,060 | 762 | 268 | 18 | 79 |
| 10 | 168 | 1,790 | 225 | 19 | 12 | 25 | 800 | 612 | 180 | 240 | 132 |
| 11 | 375 | 1,350 | 154 | 20 | 9.3 | 26 | 650 | 440 | 83 | 268 | 103 |
| 12 | 650 | 1,250 | 146 | 81 | 8.6 | 27 | 540 | 268 | 101 | 114 | 88 |
| 13 | 762 | 970 | 125 | 74 | 8.3 | 28 | 440 | 215 | 77 | 92 | 81 |
| 14 | 725 | 762 | 114 | 72 | 8.6 | 29 | 388 | 184 | 53 | 92 | 70 |
| 15 | 575 | 688 | 103 | 48 | 9.3 | 30 | 225 | 143 | 38 | 70 | 53 |
| | | | | | | 31 | 414 | | 27 | 48 | |

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1931–32 | | | | | | | | | | | | |
| 1 | 48 | 70 | 970 | 2,310 | 688 | 505 | 1,150 | 650 | 176 | 103 | 42 | 74 |
| 2 | 38 | 66 | 800 | 2,310 | 840 | 650 | 1,100 | 612 | 235 | 88 | 4,290 | 86 |
| 3 | 29 | 61 | 725 | 2,030 | 840 | 800 | 925 | 650 | 414 | 130 | 2,030 | 48 |
| 4 | 31 | 56 | 725 | 1,670 | 762 | 880 | 762 | 800 | 356 | 1,150 | 1,450 | 29 |
| 5 | 31 | 50 | 840 | 1,350 | 650 | 880 | 762 | 840 | 205 | 840 | 1,250 | 21 |
| 6 | 29 | 48 | 800 | 1,790 | 688 | 800 | 688 | 840 | 540 | 725 | 970 | 17 |
| 7 | 38 | 48 | 762 | 2,030 | 688 | 650 | 650 | 1,560 | 650 | 575 | 688 | 15 |
| 8 | 31 | 42 | 650 | 1,670 | 650 | 540 | 612 | 4,690 | 356 | 414 | 408 | 14 |
| 9 | 33 | 42 | 612 | 1,450 | 575 | 575 | 540 | 2,590 | 274 | 310 | 316 | 15 |
| 10 | 26 | 40 | 612 | 1,250 | 650 | 725 | 540 | 1,910 | 196 | 274 | 250 | 15 |
| 11 | 1,910 | 42 | 1,150 | 1,020 | 1,910 | 880 | 505 | 1,450 | 154 | 196 | 505 | 13 |
| 12 | 650 | 304 | 1,910 | 925 | 1,910 | 800 | 505 | 1,200 | 125 | 149 | 304 | 16 |
| 13 | 472 | 925 | 1,560 | 1,450 | 2,890 | 688 | 472 | 1,020 | 123 | 121 | 316 | 61 |
| 14 | 725 | 925 | 1,450 | 1,790 | 2,310 | 612 | 472 | 840 | 114 | 106 | 235 | 29 |
| 15 | 540 | 925 | 1,250 | 3,550 | 1,790 | 612 | 440 | 688 | 114 | 92 | 168 | 21 |
| 16 | 274 | 925 | 1,150 | 3,050 | 1,560 | 575 | 434 | 612 | 128 | 77 | 138 | 17 |
| 17 | 540 | 800 | 1,060 | 2,730 | 1,350 | 505 | 472 | 505 | 112 | 66 | 121 | 14 |
| 18 | 394 | 688 | 1,020 | 2,590 | 1,200 | 472 | 472 | 440 | 375 | 53 | 106 | 15 |
| 19 | 304 | 575 | 925 | 2,310 | 1,060 | 440 | 472 | 414 | 304 | 45 | 90 | 14 |
| 20 | 152 | 725 | 840 | 1,910 | 880 | 440 | 505 | 382 | 230 | 35 | 79 | 13 |
| 21 | 157 | 3,210 | 762 | 1,790 | 840 | 394 | 505 | 356 | 184 | 29 | 68 | 13 |
| 22 | 130 | 4,290 | 762 | 1,670 | 800 | 388 | 540 | 304 | 154 | 27 | 58 | 13 |
| 23 | 128 | 6,010 | 762 | 1,450 | 725 | 394 | 505 | 280 | 138 | 21 | 48 | 12 |
| 24 | 121 | 3,370 | 725 | 1,560 | 650 | 414 | 540 | 256 | 114 | 19 | 42 | 12 |
| 25 | 108 | 2,730 | 688 | 1,350 | 612 | 800 | 650 | 298 | 103 | 18 | 35 | 12 |
| 26 | 99 | 1,910 | 612 | 1,350 | 612 | 2,030 | 650 | 286 | 99 | 17 | 31 | 12 |
| 27 | 90 | 1,560 | 575 | 1,250 | 575 | 2,310 | 650 | 292 | 262 | 21 | 38 | 12 |
| 28 | 83 | 1,450 | 540 | 1,150 | 575 | 2,310 | 612 | 245 | 157 | 17 | 42 | 13 |
| 29 | 77 | 1,200 | 540 | 1,150 | 540 | 2,030 | 612 | 210 | 138 | 14 | 31 | 13 |
| 30 | 77 | 1,100 | 540 | 970 | | 1,790 | 650 | 245 | 125 | 13 | 27 | 12 |
| 31 | 74 | | 612 | 688 | | 1,350 | | 180 | | 13 | 26 | |

*Discharge, in second-feet, of Vermilion River at Lowell, Ill., 1931–33*—Continued

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1932-33 | | | | | | | | | | | | |
| 1 | 11 | 79 | 42 | 925 | 1,250 | 1,450 | 13,700 | 925 | 688 | 132 | 24 | 10 |
| 2 | 11 | 70 | 48 | 800 | 1,560 | 1,150 | 10,500 | 2,170 | 650 | 146 | 27 | 10 |
| 3 | 11 | 61 | 56 | 800 | 1,450 | 1,020 | 7,250 | 2,310 | 612 | 128 | 29 | 11 |
| 4 | 21 | 58 | 63 | 688 | 1,350 | 880 | 6,010 | 1,910 | 575 | 110 | 24 | 11 |
| 5 | 33 | 58 | 66 | 612 | 1,150 | 800 | 5,330 | 1,790 | 540 | 99 | 20 | 10 |
| 6 | 22 | 53 | 70 | 540 | 970 | 725 | 4,890 | 2,730 | 725 | 90 | 31 | 10 |
| 7 | 14 | 48 | 79 | 505 | 800 | 725 | 4,290 | 2,310 | 575 | 81 | 63 | 11 |
| 8 | 13 | 45 | 83 | 472 | 540 | 688 | 3,550 | 2,590 | 440 | 79 | 53 | 11 |
| 9 | 13 | 53 | 19 | 440 | 160 | 650 | 2,890 | 2,590 | 440 | 123 | 56 | 11 |
| 10 | 24 | 48 | 70 | 440 | 286 | 505 | 2,590 | 2,450 | 375 | 90 | 114 | 10 |
| 11 | 50 | 42 | 92 | 420 | 368 | 505 | 2,310 | 10,500 | 362 | 77 | 86 | 10 |
| 12 | 38 | 45 | 117 | 330 | 368 | 505 | 1,910 | 19,700 | 342 | 66 | 56 | 10 |
| 13 | 40 | 42 | 101 | 323 | 362 | 505 | 1,670 | 15,300 | 382 | 56 | 38 | 10 |
| 14 | 35 | 45 | 81 | 323 | 110 | 612 | 1,560 | 13,700 | 342 | 61 | 29 | 12 |
| 15 | 33 | 58 | 74 | 268 | 316 | 540 | 1,350 | 10,200 | 310 | 56 | 22 | 13 |
| 16 | 33 | 50 | 74 | 323 | 280 | 472 | 1,250 | 7,510 | 286 | 48 | 19 | 12 |
| 17 | 29 | 61 | 79 | 292 | 268 | 440 | 1,670 | 5,770 | 262 | 40 | 16 | 11 |
| 18 | 24 | 72 | 81 | 310 | 274 | 725 | 2,310 | 4,690 | 240 | 35 | 15 | 11 |
| 19 | 24 | 53 | 72 | 970 | 235 | 2,310 | 2,450 | 3,730 | 220 | 31 | 14 | 10 |
| 20 | 20 | 26 | 72 | 1,560 | 268 | 2,890 | 2,170 | 3,210 | 200 | 27 | 13 | 9.7 |
| 21 | 16 | 27 | 72 | 1,790 | 388 | 3,370 | 1,790 | 2,450 | 184 | 26 | 12 | 9.3 |
| 22 | 15 | 31 | 72 | 1,910 | 725 | 3,050 | 1,560 | 2,170 | 164 | 24 | 12 | 48 |
| 23 | 18 | 45 | 1,100 | 1,910 | 3,550 | 2,730 | 1,350 | 1,910 | 152 | 20 | 12 | 27 |
| 24 | 18 | 45 | 4,490 | 1,790 | 4,490 | 2,310 | 1,250 | 1,560 | 140 | 19 | 11 | 15 |
| 25 | 29 | 56 | 5,110 | 1,560 | 3,210 | 2,170 | 1,150 | 1,450 | 130 | 20 | 11 | 14 |
| 26 | 58 | 31 | 3,910 | 1,560 | 2,590 | 2,590 | 1,060 | 1,350 | 160 | 17 | 12 | 40 |
| 27 | 77 | 31 | 3,050 | 1,560 | 2,030 | 2,890 | 925 | 1,250 | 188 | 16 | 12 | 1,150 |
| 28 | 86 | 35 | 2,450 | 1,560 | 1,670 | 2,890 | 840 | 1,100 | 154 | 16 | 11 | 2,030 |
| 29 | 101 | 40 | 1,910 | 1,450 | ------ | 2,590 | 800 | 1,020 | 138 | 19 | 11 | 1,350 |
| 30 | 99 | 53 | 1,560 | 1,250 | ------ | 2,310 | 880 | 880 | 143 | 24 | 11 | 880 |
| 31 | 88 | ------ | 1,200 | 1,200 | ------ | 2,890 | ------ | 725 | ------ | 21 | 11 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| 1931 | | | | | |
| May 8–31 | 2,030 | 90 | 677 | 0.550 | 0.49 |
| June | 2,890 | 45 | 744 | .605 | .68 |
| July | 1,670 | 27 | 290 | .236 | .27 |
| August | 268 | 14 | 60.5 | .049 | .06 |
| September | 235 | 8.3 | 54.8 | .045 | .05 |
| 1931-32 | | | | | |
| October | 1,910 | 26 | 240 | 0.195 | 0.22 |
| November | 6,010 | 40 | 1,140 | .927 | 1.03 |
| December | 1,910 | 540 | 869 | .707 | .82 |
| January | 3,550 | 688 | 1,730 | 1.41 | 1.63 |
| February | 2,890 | 540 | 1,030 | .837 | .90 |
| March | 2,310 | 388 | 879 | .715 | .82 |
| April | 1,150 | 434 | 613 | .498 | .56 |
| May | 4,690 | 180 | 827 | .672 | .77 |
| June | 650 | 99 | 222 | .180 | .20 |
| July | 1,150 | 13 | 186 | .151 | .17 |
| August | 4,290 | 26 | 458 | .372 | .43 |
| September | 86 | 12 | 22.4 | .018 | .02 |
| The year | 6,010 | 12 | 684 | .556 | 7.57 |
| 1932-33 | | | | | |
| October | 101 | 11 | 35.6 | 0.029 | 0.03 |
| November | 79 | 26 | 48.7 | .040 | .04 |
| December | 5,110 | 42 | 850 | .691 | .80 |
| January | 1,910 | 268 | 932 | .758 | .87 |
| February | 4,490 | 110 | 1,110 | .902 | .94 |
| March | 3,370 | 440 | 1,540 | 1.25 | 1.44 |
| April | 13,700 | 800 | 3,040 | 2.47 | 2.76 |
| May | 19,700 | 725 | 4,260 | 3.46 | 3.99 |
| June | 725 | 130 | 337 | .274 | .31 |
| July | 146 | 16 | 58.0 | .047 | .05 |
| August | 114 | 11 | 28.2 | .023 | .03 |
| September | 2,030 | 9.3 | 193 | .157 | .18 |
| The year | 19,700 | 9.3 | 1,040 | .846 | 11.44 |

NOTE.—Records for years ending Sept. 30, 1931 and 1932, supersede those published in Water-Supply Paper 730.

### MACKINAW RIVER NEAR GREEN VALLEY, ILL.

LOCATION.—Chain gage in sec. 15, T. 23 N., R. 5 W., at highway bridge on State Route 24, 3 miles north of Green Valley. Prior to Jan. 17, 1933 gage on railroad bridge 255 feet upstream.

DRAINAGE AREA.—1,100 square miles.

RECORDS AVAILABLE.—March 1921 to September 1933.

DISCHARGE.—Maximum during year, 17,000 second-feet May 13 (gage height, 11.73 feet); minimum, 22 second-feet Dec. 19.

1921–33: Maximum, 21,800 second-feet May 19, 1927 (gage height, 14.2 feet); minimum, that of Dec. 19, 1932. Average, 12 years, 775 second-feet.

REMARKS.—Records good. Discharge estimated Dec. 9–19 and Feb. 7–21, because of ice effect.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31 | 37 | 28 | 367 | 686 | 736 | 6,220 | 860 | 980 | 185 | 66 | 37 |
| 2 | 28 | 34 | 29 | 222 | 1,040 | 641 | 7,350 | 2,210 | 860 | 185 | 114 | 37 |
| 3 | 28 | 31 | 34 | 325 | 936 | 601 | 9,170 | 2,210 | 800 | 185 | 161 | 36 |
| 4 | 30 | 31 | 44 | 297 | 686 | 529 | 6,400 | 1,650 | 740 | 193 | 169 | 34 |
| 5 | 28 | 31 | 29 | 257 | 601 | 493 | 3,590 | 1,650 | 680 | 177 | 114 | 34 |
| 6 | 27 | 30 | 30 | 211 | 459 | 459 | 3,370 | 2,000 | 630 | 153 | 90 | 32 |
| 7 | 27 | 30 | 50 | 222 | 325 | 459 | 3,170 | 2,000 | 630 | 145 | 82 | 31 |
| 8 | 26 | 31 | 45 | 200 | 397 | 459 | 2,660 | 2,070 | 580 | 145 | 78 | 30 |
| 9 | 27 | 31 | 42 | 190 | 339 | 427 | 2,350 | 2,350 | 490 | 145 | 75 | 29 |
| 10 | 33 | 31 | 43 | 180 | 459 | 353 | 2,140 | 2,280 | 450 | 145 | 74 | 28 |
| 11 | 31 | 30 | 45 | 169 | 493 | 311 | 1,930 | 5,020 | 410 | 137 | 68 | 28 |
| 12 | 32 | 28 | 61 | 138 | 459 | 339 | 1,720 | 11,000 | 375 | 129 | 63 | 28 |
| 13 | 34 | 28 | 51 | 109 | 397 | 367 | 1,510 | 14,500 | 410 | 129 | 60 | 28 |
| 14 | 33 | 30 | 29 | 148 | 367 | 382 | 1,370 | 9,770 | 340 | 122 | 57 | 39 |
| 15 | 33 | 30 | 23 | 117 | 325 | 339 | 1,300 | 8,870 | 310 | 114 | 54 | 145 |
| 16 | 33 | 31 | 24 | 148 | 339 | 297 | 1,440 | 5,320 | 310 | 106 | 54 | 93 |
| 17 | 31 | 30 | 27 | 143 | 339 | 283 | 2,350 | 5,500 | 285 | 106 | 54 | 63 |
| 18 | 31 | 29 | 25 | 138 | 311 | 397 | 2,500 | 5,020 | 285 | 99 | 54 | 51 |
| 19 | 30 | 29 | 22 | 936 | 297 | 1,610 | 2,350 | 3,700 | 263 | 96 | 51 | 41 |
| 20 | 28 | 29 | 24 | 1,150 | 339 | 2,080 | 2,000 | 4,050 | 243 | 93 | 49 | 36 |
| 21 | 27 | 29 | 26 | 1,200 | 529 | 1,940 | 1,790 | 3,080 | 243 | 93 | 45 | 33 |
| 22 | 27 | 27 | 27 | 1,370 | 1,090 | 1,550 | 1,510 | 3,700 | 225 | 90 | 44 | 32 |
| 23 | 27 | 29 | 1,040 | 1,490 | 1,940 | 1,260 | 1,300 | 2,350 | 209 | 88 | 44 | 32 |
| 24 | 35 | 29 | 2,980 | 1,260 | 1,940 | 1,090 | 1,160 | 2,070 | 209 | 106 | 41 | 31 |
| 25 | 41 | 28 | 2,480 | 1,040 | 1,490 | 1,040 | 1,100 | 1,790 | 201 | 114 | 41 | 40 |
| 26 | 47 | 28 | 1,550 | 936 | 1,310 | 1,550 | 980 | 1,930 | 193 | 87 | 41 | 81 |
| 27 | 111 | 27 | 1,040 | 886 | 1,040 | 2,240 | 860 | 1,720 | 201 | 81 | 39 | 2,280 |
| 28 | 71 | 27 | 736 | 886 | 886 | 2,240 | 800 | 1,370 | 201 | 75 | 41 | 1,790 |
| 29 | 61 | 27 | 565 | 836 | ------- | 1,940 | 740 | 1,300 | 225 | 74 | 39 | 580 |
| 30 | 47 | 28 | 493 | 786 | ------- | 1,610 | 800 | 1,160 | 201 | 72 | 39 | 410 |
| 31 | 41 | ------- | 427 | 736 | ------- | 2,010 | ------- | 1,040 | ------- | 69 | 38 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 111 | 26 | 36.6 | 0.033 | 0.04 |
| November | 37 | 27 | 29.7 | .027 | .03 |
| December | 2,980 | 22 | 389 | .354 | .41 |
| January | 1,490 | 109 | 551 | .501 | .58 |
| February | 1,940 | 297 | 708 | .644 | .67 |
| March | 2,240 | 283 | 969 | .881 | 1.02 |
| April | 9,170 | 740 | 2,530 | 2.30 | 2.57 |
| May | 14,500 | 860 | 3,660 | 3.33 | 3.84 |
| June | 980 | 193 | 406 | .369 | .41 |
| July | 193 | 69 | 121 | .110 | .13 |
| August | 169 | 38 | 65.8 | .060 | .07 |
| September | 2,280 | 28 | 206 | .187 | .21 |
| The year | 14,500 | 22 | 807 | .734 | 9.98 |

### MONEY CREEK AT LAKE BLOOMINGTON, ILL.

LOCATION.—Water-stage recorder in pumping plant above dam in SE¼ sec. 1, T. 25 N., R. 2 E., 2.8 miles above mouth, McLean County. Zero of gage is 700.00 feet above mean sea level.

DRAINAGE AREA.—61 square miles.

RECORDS AVAILABLE.—October 1930 to September 1933.

REMARKS.—Flow regulated by storage in Lake Bloomington (area of lake at level of crest of spillway, 531 acres). Discharge corrected for storage but not for evaporation and seepage. Pumpage record furnished by City of Bloomington. Rainfall record (mean of 3 gages within basin) furnished by the State Water Survey.

*Monthly discharge and rainfall, 1932–33*

| Month | Discharge from spillway (million gallons) | Pumpage (million gallons) | Gain or loss in storage (million gallons) | Corrected for storage [a] | | | | Rainfall (inches) |
|---|---|---|---|---|---|---|---|---|
| | | | | Run-off (million gallons) | Discharge per square mile | | Run-off (inches) | |
| | | | | | Million gallons per day | Second-feet | | |
| October | 0 | 74.4 | −46.0 | 28.4 | 0.015 | 0.023 | 0.03 | 4.61 |
| November | 0 | 69.7 | −67.4 | 2.3 | .001 | .0015 | .002 | 1.01 |
| December | 0 | 75.4 | +359.5 | 434.9 | .230 | .356 | .41 | 3.84 |
| January | 846.7 | 70.2 | +139.8 | 1,056.7 | .559 | .865 | 1.00 | 2.94 |
| February | 1,290.7 | 66.5 | +0 | 1,357.2 | .795 | 1.23 | 1.28 | 1.19 |
| March | 1,995.8 | 68.7 | +97.4 | 2,161.9 | 1.14 | 1.76 | 2.03 | 3.63 |
| April | 3,132.7 | 67.0 | −100.9 | 3,098.8 | 1.69 | 2.61 | 2.91 | 4.43 |
| May | 5,018.7 | 71.0 | −3.6 | 5,086.1 | 2.69 | 4.16 | 4.80 | 7.26 |
| June | 166.3 | 88.3 | −39.8 | 214.8 | .117 | .181 | .20 | .57 |
| July | 0 | 93.3 | −161.6 | −68.3 | −.036 | −.056 | −.06 | .92 |
| August | 0 | 90.9 | −135.3 | −44.4 | −.023 | −.036 | −.04 | 2.20 |
| September | 0 | 83.3 | +9.7 | 93.0 | .051 | .079 | .09 | 4.02 |
| The year | 12,450.9 | 918.7 | +51.8 | 13,421.4 | .603 | .933 | 12.85 | 37.22 |

[a] Figures with minus sign indicate the amount by which the evaporation and seepage from reservoir exceeded the inflow.

### SPOON RIVER AT SEVILLE, ILL.

LOCATION.—Chain gage in SW¼ sec. 24, T. 6 N., R. 1 E., at Toledo, Peoria & Western Railway bridge in Seville. Zero of gage is 467.78 feet above mean sea level.

DRAINAGE AREA.—1,600 square miles.

RECORDS AVAILABLE.—July 1914 to September 1933.

DISCHARGE.—Maximum during year, 17,300 second-feet May 13 (gage height, 24.29 feet); minimum, 24 second-feet Oct. 3.

1914–33: Maximum, 28,900 second-feet Aug. 22, 1924 (gage height, 30.5 feet); minimum, 3.8 second-feet July 31, Aug. 27–29, 1914 (gage height, 1.35 feet). Average, 19 years, 1,040 second-feet.

REMARKS.—Records good. Discharge estimated because of ice Dec. 10–21 and Feb. 8–17.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 41 | 106 | 96 | 960 | 910 | 1,010 | 7,420 | 1,600 | 1,980 | 810 | 224 | 55 |
| 2 | 41 | 71 | 99 | 910 | 960 | 910 | 8,060 | 2,520 | 1,820 | 594 | 154 | 53 |
| 3 | 26 | 57 | 106 | 910 | 960 | 716 | 6,700 | 3,180 | 1,650 | 572 | 670 | 58 |
| 4 | 55 | 94 | 169 | 910 | 860 | 716 | 3,810 | 2,340 | 1,480 | 466 | 433 | 48 |
| 5 | 49 | 122 | 222 | 762 | 762 | 716 | 3,040 | 1,600 | 1,380 | 402 | 238 | 45 |
| 6 | 41 | 106 | 238 | 670 | 762 | 670 | 3,320 | 2,850 | 1,260 | 346 | 198 | 42 |
| 7 | 45 | 102 | 203 | 670 | 584 | 670 | 3,320 | 3,460 | 1,160 | 332 | 466 | 40 |
| 8 | 49 | 127 | 163 | 626 | 716 | 716 | 3,040 | 4,260 | 1,110 | 319 | 584 | 40 |
| 9 | 41 | 124 | 96 | 626 | 584 | 670 | 2,460 | 3,460 | 1,010 | 466 | 292 | 38 |
| 10 | 238 | 206 | 106 | 584 | 584 | 543 | 2,220 | 2,850 | 910 | 466 | 502 | 35 |
| 11 | 584 | 184 | 132 | 522 | 543 | 461 | 1,980 | 10,600 | 810 | 543 | 332 | 35 |
| 12 | 380 | 169 | 119 | 420 | 543 | 522 | 1,760 | 12,600 | 762 | 402 | 332 | 43 |
| 13 | 272 | 149 | 114 | 440 | 543 | 626 | 1,600 | 16,300 | 670 | 346 | 238 | 131 |
| 14 | 197 | 112 | 99 | 482 | 543 | 626 | 1,540 | 13,500 | 626 | 319 | 186 | 332 |
| 15 | 152 | 124 | 86 | 482 | 543 | 543 | 1,600 | 9,220 | 584 | 332 | 138 | 161 |
| 16 | 114 | 152 | 82 | 482 | 502 | 522 | 1,600 | 4,110 | 584 | 319 | 90 | 79 |
| 17 | 96 | 124 | 75 | 482 | 461 | 502 | 1,760 | 7,580 | 543 | 292 | 85 | 66 |
| 18 | 82 | 114 | 75 | 502 | 860 | 716 | 1,980 | 7,740 | 502 | 252 | 96 | 46 |
| 19 | 64 | 109 | 71 | 2,400 | 1,060 | 1,210 | 1,820 | 6,300 | 466 | 224 | 79 | 38 |
| 20 | 51 | 96 | 73 | 4,260 | 1,540 | 1,110 | 1,700 | 4,710 | 433 | 211 | 115 | 36 |
| 21 | 84 | 94 | 75 | 2,520 | 2,220 | 1,010 | 1,430 | 6,860 | 402 | 198 | 71 | 32 |
| 22 | 57 | 116 | 109 | 2,100 | 2,460 | 910 | 1,380 | 5,420 | 402 | 186 | 62 | 37 |
| 23 | 53 | 112 | 5,820 | 1,820 | 2,460 | 860 | 1,210 | 4,410 | 373 | 178 | 64 | 34 |
| 24 | 49 | 124 | 7,820 | 1,540 | 2,040 | 810 | 1,110 | 3,180 | 346 | 186 | 60 | 32 |
| 25 | 89 | 102 | 7,740 | 1,380 | 2,160 | 1,010 | 1,060 | 2,660 | 373 | 211 | 57 | 32 |
| 26 | 255 | 80 | 7,020 | 1,320 | 1,540 | 1,540 | 1,060 | 4,110 | 346 | 191 | 57 | 278 |
| 27 | 324 | 78 | 2,850 | 1,160 | 1,320 | 1,870 | 1,010 | 6,620 | 373 | 151 | 54 | 1,160 |
| 28 | 255 | 102 | 1,820 | 1,110 | 1,110 | 1,650 | 910 | 4,710 | 960 | 129 | 87 | 1,110 |
| 29 | 203 | 114 | 1,480 | 1,010 | ------- | 1,540 | 910 | 3,390 | 626 | 124 | 79 | 502 |
| 30 | 163 | 109 | 1,260 | 960 | ------- | 1,430 | 1,010 | 2,520 | 1,760 | 115 | 70 | 292 |
| 31 | 130 | ------- | 1,110 | 960 | ------- | 1,540 | ------- | 2,100 | ------- | 118 | 62 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 584 | 26 | 138 | 0.086 | 0.10 |
| November | 206 | 57 | 116 | .072 | .08 |
| December | 7,820 | 71 | 1,280 | .800 | .92 |
| January | 4,260 | 420 | 1,090 | .681 | .79 |
| February | 2,460 | 461 | 1,080 | .675 | .70 |
| March | 1,870 | 461 | 914 | .571 | .66 |
| April | 8,060 | 910 | 2,390 | 1.49 | 1.66 |
| May | 16,300 | 1,600 | 5,370 | 3.36 | 3.87 |
| June | 1,980 | 346 | 857 | .536 | .60 |
| July | 810 | 118 | 313 | .196 | .23 |
| August | 670 | 54 | 199 | .124 | .14 |
| September | 1,160 | 32 | 164 | .103 | .11 |
| The year | 16,300 | 26 | 1,160 | .725 | 9.86 |

### SANGAMON RIVER AT MONTICELLO, ILL.

LOCATION.—Chain gage in SW¼ sec. 12, T. 18 N., R. 5 E., at Illinois Central Railroad bridge half a mile west of Monticello.

DRAINAGE AREA.—550 square miles.

RECORDS AVAILABLE.—February 1908 to December 1912; June 1914 to September 1933.

DISCHARGE—Maximum during year, 7,920 second-feet May 12 (gage height, 14.42 feet); minimum, 3.8 second-feet Oct. 25 (gage height, 1.99 feet).

1908–12, 1914–33: Maximum, 15,400 second-feet Oct. 4, 1926 (gage height, 18.4 feet); minimum, 1 second-foot July 31 to Aug. 3, 1914, Aug. 6–10, 13, 27, 28, Sept. 6, 11–14, and 21–23, 1930. Average, 19 years (1914–33), 426 second-feet.

REMARKS.—Records good. Ice effect Dec. 13–22 and Feb. 6–17.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.7 | 20 | 24 | 233 | 374 | 295 | 1,760 | 704 | 581 | 98 | 10 | 4.7 |
| 2 | 4.6 | 18 | 21 | 193 | 361 | 273 | 1,970 | 778 | 524 | 80 | 9.9 | 6.5 |
| 3 | 4.4 | 16 | 20 | 243 | 350 | 243 | 2,370 | 660 | 467 | 68 | 13 | 12 |
| 4 | 4.2 | 14 | 25 | 213 | 317 | 233 | 2,150 | 524 | 416 | 59 | 9.9 | 22 |
| 5 | 5.5 | 13 | 23 | 183 | 284 | 213 | 1,830 | 524 | 387 | 53 | 9.2 | 11 |
| 6 | 4.7 | 12 | 27 | 163 | 233 | 203 | 1,440 | 600 | 362 | 50 | 8.5 | 9.6 |
| 7 | 4.4 | 12 | 110 | 154 | 233 | 203 | 1,240 | 752 | 338 | 42 | 8.1 | 8.3 |
| 8 | 4.2 | 11 | 118 | 154 | 223 | 213 | 1,140 | 704 | 314 | 40 | 14 | 7.0 |
| 9 | 4.0 | 14 | 127 | 145 | 213 | 203 | 1,010 | 682 | 278 | 45 | 9.2 | 6.3 |
| 10 | 5.2 | 13 | 110 | 136 | 193 | 173 | 890 | 660 | 243 | 42 | 232 | 5.7 |
| 11 | 6.2 | 13 | 89 | 127 | 183 | 163 | 778 | 4,730 | 232 | 38 | 68 | 5.4 |
| 12 | 5.5 | 20 | 64 | 127 | 173 | 154 | 704 | 7,920 | 210 | 34 | 28 | 4.8 |
| 13 | 5.2 | 22 | 46 | 118 | 173 | 173 | 638 | 7,140 | 188 | 32 | 17 | 4.6 |
| 14 | 4.9 | 20 | 33 | 110 | 173 | 163 | 600 | 5,130 | 166 | 28 | 13 | 5.6 |
| 15 | 4.4 | 18 | 24 | 103 | 163 | 154 | 562 | 3,580 | 146 | 25 | 11 | 5.1 |
| 16 | 4.2 | 22 | 20 | 103 | 163 | 145 | 524 | 2,870 | 146 | 22 | 9.9 | 5.4 |
| 17 | 5.5 | 20 | 16 | 103 | 213 | 127 | 970 | 2,260 | 127 | 20 | 9.2 | 5.4 |
| 18 | 5.5 | 17 | 14 | 103 | 263 | 145 | 1,050 | 1,900 | 119 | 20 | 8.3 | 5.2 |
| 19 | 4.9 | 16 | 14 | 253 | 339 | 4,050 | 1,090 | 1,560 | 112 | 19 | 7.6 | 5.0 |
| 20 | 4.7 | 18 | 13 | 486 | 581 | 4,390 | 970 | 1,440 | 105 | 17 | 7.2 | 4.7 |
| 21 | 4.4 | 19 | 14 | 660 | 600 | 2,480 | 830 | 1,760 | 92 | 16 | 6.7 | 4.5 |
| 22 | 4.2 | 20 | 20 | 682 | 562 | 1,830 | 704 | 2,260 | 86 | 15 | 6.5 | 5.4 |
| 23 | 4.2 | 21 | 163 | 704 | 562 | 1,560 | 600 | 2,740 | 77 | 14 | 6.2 | 6.0 |
| 24 | 3.9 | 24 | 682 | 682 | 524 | 1,340 | 543 | 2,260 | 74 | 15 | 6.0 | 5.7 |
| 25 | 3.8 | 22 | 970 | 581 | 505 | 1,390 | 524 | 1,970 | 86 | 14 | 5.8 | 6.7 |
| 26 | 61 | 17 | 1,010 | 486 | 432 | 1,560 | 467 | 1,690 | 92 | 13 | 5.6 | 68 |
| 27 | 70 | 18 | 682 | 486 | 374 | 1,690 | 416 | 1,290 | 86 | 13 | 5.2 | 581 |
| 28 | 52 | 21 | 416 | 505 | 328 | 1,620 | 374 | 970 | 80 | 12 | 6.2 | 467 |
| 29 | 30 | 26 | 328 | 467 | ------ | 1,620 | 361 | 1,140 | 188 | 12 | 5.7 | 302 |
| 30 | 26 | 28 | 273 | 416 | ------ | 1,500 | 543 | 830 | 127 | 12 | 5.0 | 119 |
| 31 | 25 | ------ | 263 | 387 | ------ | 1,390 | ------ | 660 | ------ | 11 | 4.8 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 70 | 3.8 | 12.3 | 0.022 | 0.03 |
| November | 28 | 11 | 18.2 | .033 | .04 |
| December | 1,010 | 13 | 186 | .338 | .39 |
| January | 704 | 103 | 307 | .558 | .64 |
| February | 600 | 163 | 325 | .591 | .62 |
| March | 4,390 | 127 | 964 | 1.75 | 2.02 |
| April | 2,370 | 361 | 968 | 1.76 | 1.96 |
| May | 7,920 | 524 | 2,020 | 3.67 | 4.23 |
| June | 581 | 74 | 215 | .391 | .44 |
| July | 98 | 11 | 31.6 | .057 | .07 |
| August | 232 | 4.8 | 18.3 | .033 | .04 |
| September | 581 | 4.5 | 57.0 | .104 | .12 |
| The year | 7,920 | 3.8 | 429 | .780 | 10.60 |

### SANGAMON RIVER AT RIVERTON, ILL.

LOCATION.—Chain gage in SW¼ sec. 9, T. 16 N., R. 4 W., at Wabash Railroad bridge in Riverton, 5 miles below mouth of South Fork. Zero of gage is 503.15 feet above mean sea level.

DRAINAGE AREA.—2,560 square miles.

RECORDS AVAILABLE.—February 1908 to December 1912; August 1914 to September 1933.

DISCHARGE.—Maximum during year, 18,700 second-feet May 16 (gage height, 26.05 feet); minimum, 23 second-feet Oct. 21 (gage height, 7.44 feet).

1908–12, 1914–33: Maximum, 30,200 second-feet Oct. 4, 1926 (gage height, 32.0 feet); minimum, 3.0 second-feet Oct. 3–15, 1914 (gage height, 6.9 feet). Average, 19 years (1914–33), 1,820 second-feet.

REMARKS.—Records fair. Ice effect Dec. 11–19 and Feb. 9–12. Some regulation of low-water flow and seasonal storage by municipal reservoir at Decatur.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 34 | 89 | 116 | 1,055 | 2,430 | 2,020 | 9,040 | 1,620 | 6,150 | 376 | 66 | 41 |
| 2 | 26 | 75 | 101 | 1,020 | 1,980 | 1,840 | 11,900 | 1,880 | 5,000 | 354 | 63 | 44 |
| 3 | 23 | 75 | 98 | 925 | 1,750 | 1,700 | 12,700 | 1,930 | 3,930 | 332 | 68 | 44 |
| 4 | 28 | 52 | 112 | 865 | 1,620 | 1,260 | 11,100 | 2,020 | 2,930 | 332 | 78 | 45 |
| 5 | 27 | 43 | 91 | 784 | 1,480 | 1,055 | 9,880 | 2,110 | 2,780 | 290 | 81 | 45 |
| 6 | 25 | 40 | 79 | 708 | 1,570 | 955 | 9,250 | 2,160 | 2,630 | 258 | 75 | 37 |
| 7 | 25 | 36 | 94 | 658 | 1,570 | 925 | 8,830 | 2,200 | 2,430 | 228 | 71 | 37 |
| 8 | 26 | 44 | 178 | 609 | 1,440 | 925 | 8,070 | 2,680 | 2,110 | 208 | 71 | 39 |
| 9 | 25 | 57 | 247 | 585 | 1,300 | 895 | 6,880 | 2,930 | 1,800 | 218 | 68 | 41 |
| 10 | 28 | 67 | 375 | 561 | 1,220 | 838 | 5,780 | 2,780 | 1,480 | 376 | 73 | 42 |
| 11 | 30 | 51 | 419 | 513 | 1,180 | 811 | 4,680 | 3,530 | 1,260 | 290 | 258 | 39 |
| 12 | 29 | 38 | 397 | 490 | 1,260 | 758 | 3,980 | 4,280 | 1,140 | 248 | 228 | 38 |
| 13 | 28 | 29 | 397 | 467 | 1,390 | 733 | 3,330 | 7,030 | 1,055 | 228 | 198 | 35 |
| 14 | 28 | 29 | 375 | 421 | 1,520 | 708 | 2,980 | 12,400 | 895 | 208 | 140 | 39 |
| 15 | 28 | 36 | 289 | 398 | 1,660 | 733 | 2,780 | 17,100 | 811 | 188 | 113 | 51 |
| 16 | 27 | 40 | 158 | 376 | 1,800 | 708 | 2,730 | 18,700 | 708 | 160 | 93 | 68 |
| 17 | 25 | 51 | 96 | 376 | 1,800 | 683 | 3,430 | 18,100 | 683 | 150 | 86 | 70 |
| 18 | 25 | 41 | 77 | 376 | 1,800 | 633 | 4,130 | 16,100 | 658 | 140 | 68 | 53 |
| 19 | 24 | 36 | 70 | 811 | 1,750 | 1,390 | 4,280 | 13,900 | 609 | 122 | 64 | 48 |
| 20 | 24 | 32 | 68 | 1,520 | 1,620 | 1,220 | 4,330 | 11,900 | 561 | 122 | 56 | 31 |
| 21 | 23 | 32 | 67 | 2,290 | 1,620 | 1,880 | 4,180 | 10,600 | 513 | 113 | 55 | 27 |
| 22 | 24 | 38 | 65 | 3,030 | 1,570 | 2,780 | 4,080 | 12,200 | 490 | 106 | 51 | 29 |
| 23 | 26 | 46 | 258 | 3,830 | 1,570 | 3,680 | 3,580 | 13,600 | 467 | 102 | 48 | 34 |
| 24 | 33 | 54 | 746 | 4,080 | 1,700 | 4,180 | 2,930 | 14,200 | 444 | 99 | 44 | 38 |
| 25 | 46 | 54 | 2,350 | 4,380 | 1,800 | 4,620 | 2,480 | 12,400 | 376 | 92 | 42 | 39 |
| 26 | 72 | 48 | 2,380 | 4,620 | 1,930 | 4,760 | 2,200 | 10,800 | 398 | 86 | 41 | 75 |
| 27 | 103 | 40 | 2,380 | 4,620 | 2,200 | 4,620 | 1,980 | 10,100 | 561 | 80 | 42 | 708 |
| 28 | 119 | 45 | 2,380 | 4,440 | 2,160 | 4,380 | 1,800 | 9,760 | 537 | 76 | 42 | 925 |
| 29 | 107 | 60 | 2,290 | 4,080 | ------- | 4,180 | 1,570 | 9,460 | 444 | 76 | 44 | 537 |
| 30 | 84 | 80 | 1,930 | 3,530 | ------- | 3,980 | 1,570 | 8,760 | 398 | 75 | 42 | 444 |
| 31 | 91 | ------- | 1,480 | 2,730 | ------- | 4,560 | ------- | 7,370 | ------- | 70 | 41 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 119 | 23 | 40.8 | 0.016 | 0.02 |
| November | 89 | 29 | 48.6 | .019 | .02 |
| December | 2,380 | 65 | 650 | .254 | .29 |
| January | 4,620 | 376 | 1,780 | .695 | .80 |
| February | 2,430 | 1,180 | 1,670 | .652 | .68 |
| March | 4,760 | 633 | 2,080 | .812 | .94 |
| April | 12,700 | 1,570 | 5,220 | 2.04 | 2.28 |
| May | 18,700 | 1,620 | 8,540 | 3.34 | 3.85 |
| June | 6,150 | 376 | 1,470 | .574 | .64 |
| July | 376 | 70 | 187 | .073 | .08 |
| August | 258 | 41 | 81 | .032 | .04 |
| September | 925 | 27 | 125 | .047 | .05 |
| The year | 18,700 | 23 | 1,830 | .715 | 9.69 |

### SANGAMON RIVER NEAR OAKFORD, ILL.

LOCATION.—Chain gage in sec. 6, T. 19 N., R. 7 W., at highway bridge 3 miles northeast of Oakford and 1¼ miles above Crane Creek. Zero of gage is 458.66 feet above mean sea level (revised).

DRAINAGE AREA.—5,000 square miles.

RECORDS AVAILABLE.—October 1909 to March 1912; August 1914 to June 1919; March 1921 to August 1922; October 1928 to December 1933 (discontinued).

DISCHARGE.—Maximum during year, 30,200 second-feet May 18 (gage height, 18.46 feet); minimum, 135 second-feet Oct. 8 (gage height, 0.65 foot).

1909–12; 1914–19; 1921–22; 1929–33: Maximum, 37,600 second-feet Apr. 14, 1922 (gage height, 19.84 feet); minimum, 85 second-feet Aug. 30, 31, Nov. 27, Dec. 2, 1914.

REMARKS.—Records good except those estimated for periods of ice effect, Dec. 12–22, Feb. 5–19, and those after Oct. 23, 1933, which are poor. Gage-height record furnished by Corps of Engineers, United States Army.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1932-33 | | | | | | | | | | | | |
| 1 | 147 | 290 | 248 | 2,870 | 5,400 | 3,570 | 13,700 | 3,870 | 13,000 | 1,240 | 325 | 242 |
| 2 | 147 | 280 | 248 | 2,300 | 4,850 | 3,370 | 18,100 | 8,110 | 11,200 | 1,080 | 310 | 242 |
| 3 | 147 | 280 | 266 | 2,210 | 4,850 | 3,070 | 22,700 | 7,510 | 9,650 | 930 | 310 | 242 |
| 4 | 160 | 270 | 326 | 2,120 | 3,570 | 2,870 | 24,800 | 5,840 | 8,230 | 860 | 310 | 242 |
| 5 | 168 | 270 | 285 | 2,030 | 3,270 | 2,580 | 22,100 | 5,400 | 6,550 | 790 | 310 | 242 |
| 6 | 147 | 243 | 275 | 1,850 | 2,780 | 2,400 | 19,400 | 5,950 | 6,190 | 730 | 295 | 230 |
| 7 | 168 | 243 | 348 | 1,680 | 2,580 | 2,210 | 18,100 | 5,730 | 5,230 | 670 | 295 | 230 |
| 8 | 135 | 234 | 348 | 1,600 | 2,680 | 2,120 | 16,000 | 6,430 | 4,640 | 610 | 295 | 230 |
| 9 | 154 | 234 | 402 | 1,510 | 2,780 | 2,120 | 14,500 | 6,430 | 4,310 | 670 | 295 | 218 |
| 10 | 160 | 252 | 305 | 1,270 | 2,780 | 1,940 | 13,200 | 6,550 | 3,770 | 640 | 325 | 218 |
| 11 | 182 | 243 | 458 | 1,430 | 2,680 | 1,850 | 12,100 | 7,630 | 3,370 | [a]670 | 325 | 218 |
| 12 | 182 | 243 | 512 | 1,200 | 2,680 | 1,760 | 10,500 | 11,000 | 3,070 | 700 | 310 | 218 |
| 13 | 174 | 225 | 430 | 1,120 | 2,490 | [a]1,800 | 8,610 | 16,400 | 2,970 | 640 | 310 | 205 |
| 14 | 182 | 225 | 402 | 1,120 | 2,400 | 1,850 | 7,270 | 18,100 | 2,670 | 585 | 340 | 205 |
| 15 | 182 | 209 | 348 | 1,050 | 2,120 | 1,940 | 6,430 | 19,400 | 2,370 | 535 | 358 | 218 |
| 16 | 174 | 252 | 348 | 1,050 | 2,210 | 1,600 | 6,070 | 21,800 | 3,170 | 510 | 325 | 218 |
| 17 | 174 | 234 | 315 | 985 | 2,210 | 1,510 | 7,270 | 23,400 | 2,010 | 485 | 310 | 218 |
| 18 | 160 | 209 | 280 | 985 | 2,210 | 1,600 | 8,230 | 30,200 | 1,920 | 460 | 310 | 218 |
| 19 | 160 | 225 | 270 | 3,070 | 2,300 | 5,070 | 8,110 | 28,800 | 1,740 | 438 | 295 | 218 |
| 20 | 147 | 217 | 234 | 4,740 | 3,870 | 9,000 | 7,990 | 25,600 | 1,560 | 415 | 280 | 218 |
| 21 | 147 | 234 | 243 | 5,510 | 4,080 | 10,200 | 7,750 | 25,200 | 1,480 | 395 | 280 | 218 |
| 22 | 141 | 234 | 512 | 6,430 | 4,190 | 10,800 | 7,510 | 25,600 | 1,400 | 395 | 280 | 205 |
| 23 | 141 | 221 | [a]2,060 | 7,510 | 3,870 | 8,110 | 7,030 | 26,500 | 1,240 | 395 | 268 | 205 |
| 24 | 141 | 213 | 4,000 | 7,750 | 3,870 | 7,750 | 6,310 | 27,400 | 1,160 | 375 | 268 | 205 |
| 25 | 141 | 221 | 6,190 | 7,390 | 3,570 | 8,110 | 5,730 | 27,400 | 1,160 | 375 | 255 | 192 |
| 26 | 320 | 221 | 5,950 | 7,390 | 3,370 | 8,870 | 5,180 | 25,200 | 1,040 | 358 | 255 | 218 |
| 27 | 430 | 221 | 5,180 | 7,510 | 3,470 | 9,650 | 4,630 | 24,800 | 1,160 | 340 | 242 | 700 |
| 28 | 512 | 230 | 4,850 | 7,510 | 3,570 | 9,520 | 4,190 | 20,500 | 1,240 | 325 | 242 | 1,320 |
| 29 | 458 | 230 | 4,190 | 7,150 | ------- | 8,870 | 3,970 | 17,300 | 1,320 | 325 | 242 | 1,560 |
| 30 | 370 | 230 | 3,970 | 6,790 | ------- | 8,110 | [a]3,900 | 15,700 | 1,400 | 325 | 242 | 1,240 |
| 31 | 336 | ------- | 3,470 | 6,190 | ------- | 7,990 | ------- | 14,900 | ------- | 325 | 242 | ------- |

| Day | Oct. | Nov. | Dec. | Day | Oct. | Nov. | Dec. | Day | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1933 | | | | 1933 | | | | 1933 | | | |
| 1 | 825 | 585 | 280 | 11 | 358 | 340 | 268 | 21 | 358 | 295 | 295 |
| 2 | 860 | 535 | 268 | 12 | 325 | 325 | 268 | 22 | 700 | 280 | 295 |
| 3 | 860 | 510 | 268 | 13 | 325 | 325 | 268 | 23 | 1,560 | 280 | 280 |
| 4 | 760 | 438 | 268 | 14 | 295 | 325 | 255 | 24 | 2,190 | 280 | 268 |
| 5 | 700 | 438 | 280 | 15 | 280 | 310 | 255 | 25 | 1,830 | 280 | 268 |
| 6 | 560 | 415 | 280 | 16 | 295 | [a]300 | 268 | 26 | 1,480 | 295 | 255 |
| 7 | 485 | 395 | 295 | 17 | 295 | 295 | 280 | 27 | 1,320 | 295 | 242 |
| 8 | 460 | 395 | 280 | 18 | 295 | 295 | 295 | 28 | 1,160 | 280 | 242 |
| 9 | 438 | 358 | 280 | 19 | 325 | 295 | 310 | 29 | 965 | 280 | 255 |
| 10 | 375 | 358 | 280 | 20 | 340 | 295 | 310 | 30 | 860 | 280 | 268 |
| | | | | | | | | 31 | 700 | ------- | 280 |

[a] Estimated or interpolated.

*Discharge, in second-feet, of Sangamon River near Oakford, Ill., 1932–33*—Continued

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 512 | 135 | 206 | 0.041 | 0.05 |
| November | 290 | 209 | 238 | .048 | .05 |
| December | 6,190 | 234 | 1,520 | .304 | .35 |
| January | 7,750 | 985 | 3,660 | .732 | .84 |
| February | 5,400 | 2,120 | 3,240 | .648 | .67 |
| March | 10,800 | 1,510 | 4,910 | .982 | 1.13 |
| April | 24,800 | 3,870 | 10,700 | 2.14 | 2.39 |
| May | 30,200 | 3,870 | 16,600 | 3.32 | 3.83 |
| June | 13,000 | 1,040 | 3,670 | .734 | .82 |
| July | 1,240 | 325 | 567 | .113 | .13 |
| August | 358 | 242 | 292 | .058 | .07 |
| September | 1,560 | 192 | 352 | .070 | .08 |
| The year | 30,200 | 135 | 3,840 | .768 | 10.41 |
| October | 2,190 | 280 | 728 | .146 | .17 |
| November | 585 | 280 | 346 | .069 | .08 |
| December | 310 | 242 | 274 | .055 | .06 |

### SOUTH FORK OF SANGAMON RIVER AT KINCAID, ILL.

LOCATION.—Chain gage in NE ¼ sec. 14, T. 13 N., R. 3 W., at highway bridge 100 feet below railway bridge, 1 mile southeast of Kincaid, and 6 miles below mouth of Bear Creek.

DRAINAGE AREA.—510 square miles.

RECORDS AVAILABLE.—May 1917 to September 1930; August 1931 to November 1933 (discontinued).

DISCHARGE.—Maximum during year, 3,710 second-feet May 17 (gage height, 17.76 feet); minimum, 0.1 second-foot Aug. 24 (gage height, 2.88 feet).

1917–33: Maximum, 11,800 second-feet Mar. 15, 1922 (gage height, 26.6 feet); no flow Aug. 29 and Oct. 6–23, 1922. Average, 14 years (1917–27, 1928–30, 1931–33), 447 second-feet.

REMARKS.—Records fair. Periods of ice effect Dec. 12–22, Feb. 7–17. Discharge estimated Sept. 3–7.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1932-33 | | | | | | | | | | | | |
| 1 | 1.2 | 22 | 57 | 412 | 412 | 550 | 2,310 | 204 | 925 | 52 | 3.5 | 2.1 |
| 2 | 1.2 | 16 | 52 | 345 | 361 | 448 | 2,740 | 218 | 540 | 57 | 3.6 | 2.3 |
| 3 | 1.2 | 14 | 47 | 281 | 321 | 329 | 3,060 | 218 | 353 | 52 | 3.5 | |
| 4 | 1.5 | 14 | 52 | 241 | 281 | 265 | 2,800 | 225 | 289 | 35 | 3.3 | |
| 5 | 2.3 | 21 | 95 | 211 | 249 | 249 | 2,190 | 218 | 412 | 29 | 3.3 | 1.5 |
| 6 | .9 | 19 | 134 | 197 | 225 | 204 | 1,670 | 265 | 493 | 23 | 5.1 | |
| 7 | .5 | 16 | 204 | 190 | 197 | 204 | 1,280 | 369 | 457 | 19 | 6.4 | |
| 8 | .5 | 15 | 265 | 183 | 305 | 233 | 925 | 394 | 281 | 17 | 4.3 | .4 |
| 9 | 1.7 | 14 | 345 | 162 | 337 | 241 | 660 | 430 | 197 | 33 | 4.5 | .3 |
| 10 | 2.5 | 13 | 273 | 148 | 329 | 225 | 560 | 361 | 148 | 66 | 33 | .3 |
| 11 | 3.0 | 14 | 162 | 141 | 281 | 190 | 484 | 439 | 134 | 74 | 31 | .2 |
| 12 | 3.1 | 16 | 141 | 127 | 233 | 162 | 403 | 493 | 127 | 60 | 27 | .2 |
| 13 | 2.8 | 16 | 95 | 107 | 197 | 249 | 337 | 1,190 | 127 | 42 | 21 | .3 |
| 14 | 2.6 | 17 | 77 | 101 | 233 | 190 | 313 | 1,520 | 113 | 29 | 17 | .3 |
| 15 | 2.6 | 17 | 60 | 101 | 225 | 190 | 329 | 2,490 | 101 | 21 | 13 | .5 |
| 16 | 2.5 | 18 | 47 | 95 | 218 | 233 | 530 | 3,120 | 95 | 19 | 7.2 | .5 |
| 17 | 2.2 | 19 | 35 | 95 | 204 | 148 | 1,190 | 3,580 | 74 | 14 | 4.7 | .5 |
| 18 | 2.1 | 18 | 25 | 101 | 197 | 155 | 1,320 | 3,320 | 83 | 12 | 3.0 | .4 |
| 19 | 1.5 | 17 | 24 | 493 | 190 | 176 | 1,320 | 2,610 | 74 | 10 | 2.1 | .3 |
| 20 | 1.1 | 23 | 24 | 1,060 | 176 | 225 | 1,190 | 1,970 | 71 | 9.4 | 1.2 | .2 |
| 21 | .7 | 29 | 27 | 1,190 | 176 | 273 | 965 | 1,520 | 63 | 8.2 | .7 | .2 |
| 22 | .7 | 35 | 29 | 1,470 | 169 | 241 | 845 | 1,470 | 55 | 7.5 | .4 | .2 |
| 23 | .9 | 44 | 66 | 2,930 | 162 | 211 | 448 | 1,970 | 49 | 6.8 | .3 | .2 |
| 24 | 1.4 | 49 | 484 | 3,580 | 162 | 197 | 377 | 2,860 | 47 | 6.6 | .1 | .3 |
| 25 | 1.7 | 57 | 690 | 2,930 | 421 | 377 | 345 | 2,550 | 66 | 6.4 | .1 | .4 |
| 26 | 22 | 95 | 845 | 2,430 | 560 | 540 | 281 | 3,000 | 71 | 5.5 | .2 | 6.2 |
| 27 | 83 | 89 | 885 | 1,870 | 582 | 594 | 273 | 3,520 | 52 | 4.7 | .3 | 148 |
| 28 | 134 | 83 | 725 | 1,620 | 570 | 582 | 265 | 3,000 | 47 | 4.2 | .3 | 190 |
| 29 | 89 | 74 | 550 | 1,140 | ------- | 550 | 241 | 2,430 | 44 | 3.6 | .3 | 176 |
| 30 | 42 | 63 | 377 | 660 | ------- | 530 | 204 | 1,870 | 47 | 3.6 | .4 | 127 |
| 31 | 27 | ------- | 377 | 484 | ------- | 1,140 | ------- | 1,470 | ------- | 3.6 | .8 | ------- |

| Day | Oct. | Nov. | Day | Oct. | Nov. | Day | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|
| 1933 | | | 1933 | | | 1933 | | |
| 1 | 77 | 21 | 11 | 2.8 | 18 | 21 | 49 | 16 |
| 2 | 60 | 18 | 12 | 2.6 | 18 | 22 | 95 | ------- |
| 3 | 49 | 14 | 13 | 2.2 | 18 | 23 | 169 | ------- |
| 4 | 34 | 14 | 14 | 2.0 | 17 | 24 | 176 | ------- |
| 5 | 26 | 15 | 15 | 2.0 | 15 | 25 | 162 | ------- |
| 6 | 17 | 16 | 16 | 4.6 | 13 | 26 | 120 | ------- |
| 7 | 7.1 | 17 | 17 | 14 | 13 | 27 | 77 | ------- |
| 8 | 4.8 | 18 | 18 | 34 | 14 | 28 | 52 | ------- |
| 9 | 4.2 | 18 | 19 | 42 | 14 | 29 | 39 | ------- |
| 10 | 3.6 | 18 | 20 | 44 | 14 | 30 | 30 | ------- |
| | | | | | | 31 | 25 | ------- |

*Discharge, in second-feet, of South Fork of Sangamon River at Kincaid, Ill., 1932–33*—Continued

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| 1932–33 | | | | | |
| October | 134 | 0.5 | 14.2 | 0.028 | 0.03 |
| November | 95 | 13 | 31.9 | .063 | .07 |
| December | 885 | 24 | 234 | .459 | .53 |
| January | 3,580 | 95 | 810 | 1.59 | 1.83 |
| February | 582 | 162 | 285 | .559 | .58 |
| March | 1,140 | 148 | 326 | .639 | .74 |
| April | 3,060 | 204 | 995 | 1.95 | 2.18 |
| May | 3,580 | 204 | 1,590 | 3.12 | 3.60 |
| June | 925 | 44 | 188 | .369 | .41 |
| July | 74 | 3.6 | 23.6 | .046 | .05 |
| August | 33 | .1 | 6.50 | .013 | .01 |
| September | 190 | .2 | 22.2 | .044 | .05 |
| The year | 3,580 | .1 | 379 | .743 | 10.08 |
| 1933 | | | | | |
| October | 176 | 2.0 | 46.0 | .090 | .10 |
| November 1–21 | 21 | 13 | 16.1 | .032 | .02 |

### LA MOINE RIVER AT RIPLEY, ILL.

LOCATION.—Chain gage in NE¼ sec. 33, T. 1 N., R. 2 W., at highway bridge a quarter of a mile east of Ripley. Zero of gage is 431.31 feet above mean sea level.

DRAINAGE AREA.—1,310 square miles.

RECORDS AVAILABLE.—March 1921 to September 1933.

DISCHARGE.—Maximum during year, 7,070 second-feet Dec. 25; maximum gage height, 21.75 feet May 16, during period of backwater; minimum, 22 second-feet Sept. 12 (gage height, 3.03 feet).

1921–33: Maximum, 12,500 second-feet July 25, 1924 (gage height, 25.0 feet); minimum, 8.9 second-feet Sept. 11, 12, 1930. Average, 12 years, 794 second-feet.

Maximum known stage, 26.0 feet, date unknown.

REMARKS.—Records good except those during backwater from Illinois River, Dec. 25–29, Jan. 20–23, Apr. 1–30, May 2, May 12 to June 13, and those above 200 second-feet after June 13, which are poor. Stage-discharge relation affected by ice Dec. 8–22, Feb. 6–18.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 58 | 80 | 68 | 870 | 720 | 425 | 3,600 | 1,620 | 582 | 1,900 | 58 | 44 |
| 2 | 58 | 76 | 64 | 720 | 660 | 402 | 3,320 | 2,500 | 501 | 1,340 | 50 | 41 |
| 3 | 54 | 72 | 64 | 720 | 602 | 379 | 2,550 | 1,900 | 490 | 384 | 82 | 50 |
| 4 | 54 | 72 | 139 | 660 | 471 | 335 | 1,880 | 1,200 | 378 | 236 | 143 | 90 |
| 5 | 54 | 68 | 158 | 630 | 402 | 315 | 1,330 | 1,410 | 360 | 190 | 82 | 50 |
| 6 | 54 | 64 | 158 | 574 | 357 | 335 | 1,430 | 1,940 | 396 | 153 | 74 | 44 |
| 7 | 54 | 64 | 139 | 546 | 335 | 357 | 1,350 | 1,560 | 355 | 134 | 66 | 34 |
| 8 | 54 | 80 | 88 | 496 | 335 | 379 | 1,050 | 1,470 | 467 | 134 | 58 | 32 |
| 9 | 54 | 128 | 68 | 448 | 357 | 357 | 650 | 1,440 | 475 | 1,080 | 134 | 27 |
| 10 | 256 | 238 | 61 | 402 | 335 | 295 | 618 | 1,320 | 312 | 434 | 1,540 | 25 |
| 11 | 960 | 238 | 61 | 379 | 295 | 335 | 332 | 1,810 | 288 | 294 | 710 | 24 |
| 12 | 574 | 152 | 61 | 357 | 275 | 220 | 309 | 3,100 | 644 | 134 | 164 | 22 |
| 13 | 256 | 139 | 58 | 335 | 256 | 238 | 286 | 5,280 | 345 | 118 | 94 | 408 |
| 14 | 152 | 133 | 50 | 315 | 256 | 295 | 263 | 5,430 | 538 | 110 | 70 | 143 |
| 15 | 107 | 128 | 47 | 315 | 256 | 275 | 428 | 5,900 | 360 | 102 | 62 | 176 |
| 16 | 88 | 122 | 41 | 335 | 256 | 238 | 930 | 5,800 | 236 | 98 | 54 | 98 |
| 17 | 76 | 112 | 37 | 379 | 275 | 212 | 1,570 | 5,000 | 220 | 98 | 50 | 58 |
| 18 | 68 | 107 | 39 | 521 | 357 | 295 | 1,470 | 3,320 | 190 | 94 | 50 | 46 |
| 19 | 64 | 98 | 34 | 3,450 | 1,050 | 990 | 1,140 | 2,320 | 190 | 90 | 143 | 39 |
| 20 | 61 | 93 | 33 | 3,690 | 1,650 | 930 | 837 | 1,130 | 153 | 86 | 54 | 33 |
| 21 | 61 | 88 | 32 | 3,980 | 1,840 | 660 | 716 | 3,300 | 143 | 78 | 50 | 29 |
| 22 | 58 | 84 | 122 | 5,300 | 1,650 | 496 | 627 | 3,640 | 143 | 74 | 46 | 31 |
| 23 | 58 | 80 | 840 | 4,420 | 1,410 | 425 | 547 | 3,060 | 143 | 90 | 42 | 98 |
| 24 | 58 | 80 | 1,680 | 2,670 | 1,170 | 496 | 458 | 2,060 | 134 | 890 | 39 | 66 |
| 25 | 93 | 76 | 5,250 | 1,560 | 960 | 1,260 | 455 | 809 | 126 | 434 | 34 | 50 |
| 26 | 139 | 76 | 6,890 | 1,200 | 780 | 2,100 | 448 | 1,120 | 126 | 118 | 32 | 42 |
| 27 | 117 | 72 | 6,500 | 1,020 | 574 | 2,390 | 444 | 1,650 | 118 | 90 | 30 | 190 |
| 28 | 98 | 72 | 6,060 | 990 | 471 | 1,780 | 351 | 1,920 | 118 | 74 | 33 | 220 |
| 29 | 88 | 72 | 4,440 | 870 | ------- | 1,140 | 357 | 2,500 | 254 | 78 | 44 | 176 |
| 30 | 84 | 68 | 1,560 | 720 | ------- | 990 | 688 | 2,460 | 950 | 62 | 66 | 102 |
| 31 | 80 | ------- | 1,140 | 720 | ------- | 2,590 | ------- | 1,500 | ------- | 58 | 58 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 960 | 54 | 132 | 0.101 | 0.12 |
| November | 238 | 64 | 101 | .077 | .09 |
| December | 6,890 | 32 | 1,160 | .885 | 1.02 |
| January | 5,300 | 315 | 1,280 | .977 | 1.13 |
| February | 1,840 | 256 | 655 | .500 | .52 |
| March | 2,590 | 212 | 708 | .540 | .62 |
| April | 3,600 | 263 | 1,010 | .771 | .86 |
| May | 5,900 | 809 | 2,560 | 1.95 | 2.25 |
| June | 950 | 118 | 324 | .247 | .28 |
| July | 1,900 | 58 | 299 | .228 | .26 |
| August | 1,540 | 30 | 136 | .104 | .12 |
| September | 408 | 22 | 82.9 | .063 | .07 |
| The year | 6,890 | 22 | 708 | .540 | 7.34 |

### MACOUPIN CREEK NEAR KANE, ILL.

LOCATION.—Chain gage in SE¼ sec. 11, T. 9 N., R. 12 W., at highway bridge 3½ miles northwest of Kane. Zero of gage is 427.12 feet above mean sea level.
DRAINAGE AREA.—875 square miles.
RECORDS AVAILABLE.—October 1928 to November 1933 (discontinued). March 1921 to September 1928 at Chicago & Alton Railway bridge 2 miles upstream.
DISCHARGE.—Maximum during year, 9,420 second-feet Apr. 2 (gage height, 21.38 feet); minimum, 3.4 second-feet Sept. 13.

1921–33: Maximum, 22,200 second-feet Oct. 4, 1926; maximum gage height at former gage, 24.6 feet Mar. 15, 1922; minimum, 1 second-foot Sept. 29, Oct. 3, 5, 15, 1922. Average, 12 years (1921–33, discharge for station 2 miles upstream increased by drainage-area ratio), 631 second-feet.
REMARKS.—Records good to Oct. 24, 1933, and fair thereafter. Ice effect Dec. 10–22 and Feb. 7–12.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1932-33 | | | | | | | | | | | | |
| 1 | 5.0 | 16 | 12 | 166 | 341 | 276 | 8,840 | 1,100 | 490 | 23 | 11 | 6.5 |
| 2 | 6.0 | 12 | 12 | 166 | 308 | 204 | 9,420 | 700 | 365 | 22 | 89 | 6.5 |
| 3 | 5.0 | 11 | 14 | 148 | 246 | 178 | 8,000 | 230 | 285 | 20 | 42 | 4.1 |
| 4 | 5.0 | 11 | 16 | 148 | 218 | 166 | 4,150 | 170 | 230 | 20 | 32 | 5.1 |
| 5 | 5.5 | 8.5 | 18 | 130 | 166 | 154 | 1,670 | 162 | 208 | 19 | 19 | 4.8 |
| 6 | 5.0 | 8.0 | 20 | 119 | 142 | 191 | 1,580 | 162 | 162 | 17 | 12 | 5.1 |
| 7 | 5.0 | 7.0 | 166 | 119 | 119 | 1,880 | 1,700 | 170 | 128 | 16 | 9.7 | 4.4 |
| 8 | 5.0 | 7.0 | 166 | 102 | 204 | 1,430 | 1,130 | 1,020 | 122 | 16 | 10 | 5.1 |
| 9 | 5.0 | 8.0 | 114 | 102 | 154 | 557 | 775 | 1,760 | 105 | 32 | 9.3 | 4.4 |
| 10 | 8.0 | 6.0 | 66 | 102 | 119 | 308 | 578 | 1,220 | 94 | 20 | 11 | 4.8 |
| 11 | 7.0 | 5.5 | 37 | 86 | 92 | 232 | 490 | 425 | 79 | 17 | 9.7 | 4.4 |
| 12 | 6.0 | 7.0 | 27 | 76 | 66 | 218 | 536 | 1,760 | 74 | 26 | 94 | 5.1 |
| 13 | 5.5 | 7.5 | 17 | 66 | 178 | 218 | 405 | 3,460 | 65 | 21 | 46 | 3.7 |
| 14 | 5.0 | 7.5 | 13 | 71 | 434 | 204 | 305 | 5,220 | 60 | 17 | 34 | 5.4 |
| 15 | 6.0 | 9.5 | 10 | 66 | 494 | 246 | 305 | 6,330 | 56 | 15 | 22 | 11 |
| 16 | 7.0 | 18 | 9.0 | 66 | 474 | 154 | 2,210 | 7,720 | 53 | 13 | 16 | 17 |
| 17 | 4.4 | 16 | 7.0 | 66 | 292 | 142 | 2,860 | 6,600 | 51 | 12 | 12 | 30 |
| 18 | 4.4 | 20 | 7.0 | 86 | 246 | 154 | 2,150 | 4,150 | 49 | 13 | 11 | 23 |
| 19 | 4.4 | 20 | 7.5 | 2,240 | 204 | 875 | 850 | 1,580 | 42 | 13 | 10 | 14 |
| 20 | 4.1 | 19 | 7.5 | 2,820 | 191 | 700 | 557 | 800 | 41 | 12 | 8.9 | 9.7 |
| 21 | 4.1 | 20 | 8.0 | 1,700 | 191 | 358 | 425 | 3,880 | 39 | 13 | 8.1 | 7.6 |
| 22 | 3.8 | 24 | 10 | 4,370 | 178 | 276 | 325 | 2,960 | 36 | 13 | 7.2 | 6.1 |
| 23 | 3.8 | 13 | 875 | 4,310 | 166 | 276 | 245 | 3,880 | 32 | 12 | 6.5 | 6.8 |
| 24 | 3.8 | 13 | 2,540 | 3,960 | 166 | 358 | 215 | 3,560 | 30 | 11 | 6.5 | 5.8 |
| 25 | 18 | 17 | 2,630 | 2,570 | 700 | 1,940 | 192 | 4,050 | 29 | 11 | 6.5 | 5.4 |
| 26 | 92 | 17 | 1,430 | 1,430 | 1,910 | 2,790 | 162 | 4,490 | 27 | 11 | 5.8 | 5.4 |
| 27 | 57 | 18 | 434 | 900 | 950 | 1,550 | 140 | 6,080 | 27 | 11 | 5.8 | 1,400 |
| 28 | 46 | 26 | 261 | 578 | 376 | 700 | 122 | 7,160 | 27 | 11 | 6.8 | 1,130 |
| 29 | 29 | 17 | 204 | 434 | ------ | 434 | 192 | 4,000 | 25 | 11 | 6.6 | 625 |
| 30 | 24 | 14 | 178 | 358 | ------ | 1,580 | 600 | 1,340 | 23 | 9.7 | 6.5 | 140 |
| 31 | 18 | ------ | 178 | 324 | ------ | 4,000 | ------ | 700 | ------ | 10 | 7.6 | ------ |

| Day | Oct. | Nov. | Day | Oct. | Nov. | Day | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|
| 1933 | | | 1933 | | | 1933 | | |
| 1 | 325 | 17 | 11 | 11 | 10 | 21 | 44 | ------ |
| 2 | 178 | 16 | 12 | 9.8 | 9.2 | 22 | 2,060 | ------ |
| 3 | 105 | 16 | 13 | 9.8 | 7.4 | 23 | 1,700 | ------ |
| 4 | 49 | 11 | 14 | 8.9 | 8.0 | 24 | 600 | ------ |
| 5 | 33 | 16 | 15 | 8.6 | 8.0 | 25 | 122 | ------ |
| 6 | 21 | 15 | 16 | 10 | 7.4 | 26 | 70 | ------ |
| 7 | 17 | 15 | 17 | 8.3 | 7.4 | 27 | 46 | ------ |
| 8 | 14 | 13 | 18 | 8.3 | 7.0 | 28 | 35 | ------ |
| 9 | 13 | 12 | 19 | 10 | 7.7 | 29 | 30 | ------ |
| 10 | 12 | 11 | 20 | 12 | 7.4 | 30 | 25 | ------ |
| | | | | | | 31 | 21 | ------ |

*Discharge, in second-feet, of Macoupin Creek near Kane, Ill., 1932–33*—Continued

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| 1932–33 | | | | | |
| October | 92 | 3.8 | 13.2 | 0.015 | 0.02 |
| November | 26 | 5.5 | 13.4 | .015 | .02 |
| December | 2,630 | 7.5 | 306 | .350 | .40 |
| January | 4,370 | 66 | 899 | 1.03 | 1.19 |
| February | 1,910 | 66 | 333 | .381 | .40 |
| March | 4,000 | 142 | 734 | .839 | .97 |
| April | 9,420 | 122 | 1,700 | 1.95 | 2.18 |
| May | 7,720 | 162 | 2,800 | 3.20 | 3.69 |
| June | 490 | 23 | 102 | .116 | .13 |
| July | 32 | 7.7 | 15.7 | .018 | .02 |
| August | 94 | 5.8 | 18.8 | .021 | .02 |
| September | 1,400 | 3.7 | 117 | .134 | .15 |
| The year | 9,420 | 3.7 | 594 | .679 | 9.19 |
| 1933 | | | | | |
| October | 2,060 | 8.3 | 181 | .207 | .24 |
| November 1–20 | 17 | 7.0 | 11.1 | .013 | .01 |

### KASKASKIA RIVER AT VANDALIA, ILL.

LOCATION.—Chain gage in SE¼ sec. 16, T. 6 N., R. 1 E., at Gallatin Street Bridge, Vandalia, 3½ miles above Hickory Creek. Zero of gage is 453.30 feet above mean sea level; datum lowered 2 feet Oct. 1, 1932.

DRAINAGE AREA.—1,980 square miles.

RECORDS AVAILABLE.—February 1908 to December 1912; August 1914 to September 1933.

DISCHARGE.—Maximum during year, 17,500 second-feet May 15 (gage height, 22.65 feet); minimum, 16 second-feet Oct. 3 (gage height, 2.03 feet).

1908–12, 1914–33: Maximum, 20,000 second-feet Oct. 4, 1926; maximum stage, 23.0 feet, former datum, June 5, 1917; minimum, 3.5 second-feet Aug. 22, 1911. Average, 19 years (1914–33), 1,440 second-feet.

REMARKS.—Records fair. Discharge estimated Dec. 8–23, Feb. 10–17, Aug. 30 to Sept. 1.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 | 64 | 85 | 2,380 | 2,300 | 2,500 | 5,980 | 800 | 6,150 | 144 | 46 | 80 |
| 2 | 18 | 63 | 85 | 2,300 | 2,020 | 2,180 | 8,060 | 4,000 | 4,250 | 100 | 43 | 76 |
| 3 | 17 | 62 | 90 | 1,630 | 1,780 | 1,660 | 7,950 | 3,900 | 3,650 | 82 | 56 | 94 |
| 4 | 20 | 61 | 90 | 1,040 | 1,630 | 1,320 | 7,100 | 3,260 | 2,720 | 71 | 54 | 66 |
| 5 | 20 | 60 | 96 | 1,260 | 1,450 | 1,260 | 6,360 | 4,150 | 2,360 | 151 | 50 | 60 |
| 6 | 22 | 60 | 102 | 1,160 | 1,320 | 1,220 | 6,050 | 5,140 | 2,180 | 215 | 48 | 62 |
| 7 | 21 | 57 | 162 | 1,040 | 1,220 | 1,260 | 5,660 | 5,140 | 1,860 | 247 | 46 | 59 |
| 8 | 20 | 53 | | 980 | 1,160 | 1,780 | 5,540 | 4,350 | 1,740 | 263 | 41 | 52 |
| 9 | 20 | 52 | | 890 | 1,100 | 1,780 | 4,700 | 3,120 | 1,820 | 247 | 37 | 49 |
| 10 | 19 | 50 | | 800 | | 1,520 | 3,650 | 2,740 | 1,540 | 215 | 33 | 47 |
| 11 | 19 | 49 | | 740 | | 1,290 | 2,990 | 2,340 | 1,260 | 183 | 30 | 44 |
| 12 | 20 | 46 | 320 | 686 | | 1,100 | 2,460 | 3,900 | 990 | 159 | 28 | 71 |
| 13 | 18 | 45 | | 608 | | 1,040 | 2,260 | 5,660 | 711 | 136 | 42 | 46 |
| 14 | 18 | 44 | | 560 | 1,100 | 1,190 | 2,060 | 9,900 | 687 | 121 | 114 | 71 |
| 15 | 18 | 43 | | 488 | | 1,700 | 2,820 | 16,900 | 615 | 114 | 247 | 100 |
| 16 | 18 | 39 | | 368 | | 2,420 | 5,300 | 14,600 | 571 | 100 | 471 | 136 |
| 17 | 18 | 41 | 170 | 305 | | 2,940 | 6,120 | 12,900 | 531 | 94 | 615 | 100 |
| 18 | 18 | 45 | 170 | 512 | 1,160 | 4,200 | 6,200 | 12,200 | 471 | 88 | 593 | 76 |
| 19 | 18 | 59 | 170 | 1,220 | 1,100 | 4,920 | 5,300 | 11,200 | 411 | 82 | 491 | 55 |
| 20 | 18 | 60 | 170 | 3,170 | 1,070 | 4,980 | 4,810 | 10,900 | 351 | 76 | 391 | 43 |
| 21 | 18 | 60 | 178 | 2,820 | 1,040 | 5,200 | 3,700 | 14,300 | 315 | 76 | 297 | 35 |
| 22 | 18 | 62 | 204 | 4,920 | 1,040 | 3,800 | 3,040 | 13,800 | 279 | 71 | 247 | 32 |
| 23 | 18 | 64 | 326 | 5,540 | 1,010 | 3,260 | 2,860 | 13,300 | 247 | 100 | 231 | 35 |
| 24 | 18 | 64 | 488 | 5,910 | 950 | 3,650 | 2,700 | 13,300 | 263 | 88 | 199 | 32 |
| 25 | 18 | 69 | 860 | 5,910 | 3,040 | 4,650 | 2,580 | 14,100 | 279 | 76 | 167 | 34 |
| 26 | 20 | 69 | 1,360 | 4,980 | 5,840 | 5,660 | 2,380 | 13,300 | 263 | 71 | 151 | 29 |
| 27 | 30 | 80 | 1,940 | 4,100 | 4,600 | 5,660 | 2,220 | 12,700 | 231 | 67 | 135 | 57 |
| 28 | 60 | 80 | 2,540 | 3,700 | 3,260 | 4,200 | 1,940 | 11,800 | 215 | 63 | 107 | 69 |
| 29 | 69 | 80 | 2,540 | 3,300 | ------- | 3,220 | 1,560 | 10,500 | 191 | 57 | 94 | 191 |
| 30 | 69 | 85 | 2,500 | 2,820 | ------- | 4,300 | 1,160 | 9,350 | 167 | 54 | 90 | 263 |
| 31 | 64 | ------- | 2,420 | 2,540 | ------- | 4,860 | ------- | 8,000 | ------- | 52 | 85 | ------- |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 69 | 17 | 25.2 | 0.013 | 0.01 |
| November | 85 | 39 | 58.9 | .030 | .03 |
| December | 2,540 | 85 | 633 | .320 | .37 |
| January | 5,910 | 305 | 2,220 | .112 | 1.29 |
| February | 5,840 | 950 | 1,670 | .843 | .88 |
| March | 5,660 | 1,040 | 2,930 | 1.48 | 1.71 |
| April | 8,060 | 1,160 | 4,180 | 2.11 | 2.35 |
| May | 16,900 | 800 | 8,760 | 4.42 | 5.10 |
| June | 6,150 | 167 | 1,240 | .626 | .70 |
| July | 263 | 52 | 118 | .059 | .07 |
| August | 615 | 28 | 170 | .086 | .10 |
| September | 263 | 29 | 72.1 | .036 | .04 |
| The year | 16,900 | 17 | 1,850 | .934 | 12.65 |

### CENTRALIA RESERVOIR CREEK NEAR CENTRALIA, ILL.

LOCATION.—Water-stage recorder at bridge over outlet of Centralia Reservoir, in NW¼NE¼ sec. 5, T. 1 N., R. 2 E., 1 mile above confluence with Crooked Creek and 7½ miles northeast of Centralia, Marion County.

DRAINAGE AREA.—7 square miles.

RECORDS AVAILABLE.—March 1932 to September 1933.

REMARKS.—Flow regulated by storage in reservoir (area of reservoir at level of crest of spillway 261 acres). Discharge corrected for storage but not for evaporation and seepage. Pumpage record furnished by city of Centralia. Rainfall record (mean of 3 gages within basin) furnished by the State Water Survey.

*Monthly discharge and rainfall, 1932–33*

| Month | Discharge from spillway (million gallons) | Pumpage (million gallons) | Gain or loss in storage (million gallons) | Corrected for storage | | | | Rainfall (inches) |
|---|---|---|---|---|---|---|---|---|
| | | | | Run-off (million gallons) [a] | Discharge per square mile | | Run-off (inches) [a] | |
| | | | | | Million gallons a day [a] | Second-feet [a] | | |
| October | 0 | 41.6 | −45 | −3.4 | −0.016 | −0.025 | −0.03 | 4.14 |
| November | 0 | 39.3 | −29 | 10.3 | .049 | .076 | .08 | 2.27 |
| December | 0 | 39.7 | +161 | 200.7 | .920 | 1.42 | 1.64 | 4.12 |
| January | 0 | 38.6 | +239 | 277.6 | 1.28 | 1.98 | 2.28 | 3.41 |
| February | 0 | 36.4 | −16 | 20.4 | .104 | .161 | .17 | 1.49 |
| March | 120 | 37.2 | +138 | 295.2 | 1.36 | 2.10 | 2.42 | 4.50 |
| April | 390 | 35.7 | −49 | 376.7 | 1.79 | 2.77 | 3.09 | 5.59 |
| May | 563 | 38.7 | −5 | 596.7 | 2.75 | 4.25 | 4.90 | 8.02 |
| June | 0 | 40.9 | −107 | −66.1 | −.315 | −.487 | −.54 | .02 |
| July | 0 | 41.8 | −89 | −47.2 | −.218 | −.337 | −.39 | 2.06 |
| August | 0 | 46.7 | −88 | −41.3 | −.190 | −.294 | −.34 | 1.23 |
| September | 0 | 40.0 | −17 | 23.0 | .110 | .170 | .19 | 3.29 |
| The year | 1,073 | 476.6 | 93 | 1,642.6 | .643 | .995 | 13.47 | 40.14 |

[a] Figures with minus sign indicate the amount by which the evaporation and seepage from the reservoir exceeded the inflow.

### BIG MUDDY RIVER AT PLUMFIELD, ILL.

LOCATION.—Chain gage in southwest corner of sec. 20, T. 7 S., R. 2 E., at State highway bridge on route 149 at Plumfield, 2.6 miles below mouth of Middle Fork.

DRAINAGE AREA.—753 square miles.

RECORDS AVAILABLE.—August 1914 to September 1933. June 1908 to December 1912 at Chicago, Burlington & Quincy Railroad bridge 2.4 miles upstream.

DISCHARGE.—Maximum during year, 12,700 second-feet May 17 (gage height, 27.91 feet); minimum, 0.7 second-foot Aug. 26–27 (gage height, 1.10 feet).

1914–33: Maximum, 16,300 second-feet Feb. 1, 1916 (gage height, 30.2 feet); no flow Aug. 18–26, 1914. Average, 19 years, 762 second-feet.

REMARKS.—Records good. Discharge estimated Nov. 15, 16, 18, Feb. 8, 13.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 26 | 759 | 84 | 5,250 | 1,770 | 319 | 1,940 | 231 | 377 | 1.9 | 6.1 | 1.5 |
| 2 | 24 | 1,020 | 67 | 7,240 | 1,190 | 256 | 4,170 | 769 | 161 | 1.8 | 5.4 | 1.6 |
| 3 | 20 | 1,200 | 58 | 7,690 | 797 | 175 | 5,700 | 1,080 | 79 | 1.4 | 6.9 | 3.0 |
| 4 | 19 | 1,230 | 52 | 6,470 | 494 | 154 | 5,880 | 1,400 | 56 | 1.2 | 61 | 3.0 |
| 5 | 61 | 976 | 48 | 5,970 | 256 | 140 | 5,520 | 1,970 | 41 | 1.1 | 44 | 2.5 |
| 6 | 212 | 466 | 45 | 5,250 | 119 | 133 | 4,800 | 3,160 | 34 | 1.1 | 30 | 5.0 |
| 7 | 115 | 222 | 139 | 4,170 | 292 | 265 | 4,020 | 4,100 | 28 | 1.1 | 10 | 4.6 |
| 8 | 48 | 101 | 596 | 2,980 | 588 | 494 | 3,340 | 4,980 | 26 | 1.0 | 6.1 | 3.0 |
| 9 | 40 | 73 | 916 | 2,420 | 900 | 728 | 2,920 | 5,250 | 30 | 4.6 | 5.0 | 2.1 |
| 10 | 31 | 61 | 1,100 | 1,710 | 963 | 825 | 2,610 | 5,160 | 28 | 18 | 4.1 | 1.5 |
| 11 | 28 | 61 | 991 | 1,150 | 947 | 689 | 2,200 | 4,640 | 20 | 27 | 34 | 1.3 |
| 12 | 38 | 58 | 717 | 755 | 650 | 328 | 1,680 | 4,100 | 15 | 67 | 30 | 1.5 |
| 13 | 33 | 64 | 319 | 377 | 428 | 231 | 1,190 | 3,740 | 9.8 | 56 | 17 | 1.5 |
| 14 | 26 | 61 | 212 | 215 | 239 | 283 | 755 | 6,170 | 7.9 | 54 | 9.5 | 2.0 |
| 15 | 20 | 61 | 174 | 112 | 231 | 516 | 811 | 10,300 | 6.3 | 46 | 6.5 | 85 |
| 16 | 15 | 139 | 156 | 98 | 283 | 783 | 1,500 | 12,500 | 5.9 | 26 | 5.4 | 207 |
| 17 | 12 | 355 | 115 | 91 | 328 | 1,010 | 1,940 | 12,700 | 4.9 | 18 | 5.5 | 119 |
| 18 | 11 | 570 | 84 | 175 | 387 | 947 | 2,710 | 12,200 | 4.1 | 12 | 4.9 | 36 |
| 19 | 10 | 492 | 64 | 637 | 472 | 947 | 3,400 | 11,500 | 3.8 | 8.8 | 3.8 | 20 |
| 20 | 8.7 | 379 | 52 | 1,010 | 516 | 1,100 | 3,540 | 10,400 | 3.7 | 6.7 | 2.5 | 15 |
| 21 | 7.2 | 343 | 48 | 1,330 | 576 | 1,310 | 3,100 | 9,380 | 3.4 | 5.2 | 2.0 | 10 |
| 22 | 6.6 | 297 | 70 | 2,610 | 612 | 1,360 | 2,420 | 8,170 | 3.0 | 4.0 | 1.8 | 6.7 |
| 23 | 5.7 | 308 | 319 | 4,980 | 483 | 1,360 | 1,710 | 6,870 | 2.8 | 3.2 | 1.3 | 5.0 |
| 24 | 5.5 | 308 | 1,320 | 6,670 | 328 | 1,360 | 1,170 | 5,610 | 2.4 | 3.2 | 1.2 | 4.7 |
| 25 | 5.4 | 379 | 3,060 | 6,770 | 347 | 1,450 | 600 | 4,320 | 2.1 | 64 | 1.0 | 4.4 |
| 26 | 7.8 | 557 | 4,850 | 6,570 | 540 | 1,480 | 328 | 3,220 | 3.2 | 207 | .8 | 3.6 |
| 27 | 11 | 453 | 5,570 | 5,970 | 552 | 1,450 | 183 | 2,200 | 2.4 | 91 | .7 | 4.7 |
| 28 | 14 | 319 | 5,490 | 5,160 | 461 | 1,400 | 112 | 1,660 | 2.4 | 36 | 4.4 | 5.7 |
| 29 | 14 | 174 | 4,850 | 4,020 | ------ | 1,190 | 91 | 1,230 | 2.4 | 20 | 3.6 | 4.7 |
| 30 | 16 | 108 | 4,530 | 3,280 | ------ | 797 | 119 | 963 | 2.2 | 12 | 2.0 | 5.5 |
| 31 | 286 | ------ | 5,170 | 2,420 | ------ | 1,210 | ------ | 676 | ------ | 8.6 | 1.8 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 286 | 5.4 | 38.0 | 0.050 | 0.06 |
| November | 1,230 | 58 | 386 | .513 | .57 |
| December | 5,570 | 45 | 1,330 | 1.77 | 2.04 |
| January | 7,690 | 91 | 3,340 | 4.44 | 5.12 |
| February | 1,770 | 119 | 562 | .746 | .78 |
| March | 1,480 | 133 | 796 | 1.06 | 1.22 |
| April | 5,880 | 91 | 2,350 | 3.12 | 3.48 |
| May | 12,700 | 231 | 5,180 | 6.88 | 7.93 |
| June | 377 | 2.1 | 32.3 | .043 | .05 |
| July | 207 | 1.0 | 26.1 | .035 | .04 |
| August | 61 | .7 | 10.3 | .014 | .02 |
| September | 207 | 1.3 | 19.0 | .025 | .03 |
| The year | 12,700 | .7 | 1,180 | 1.57 | 21.34 |

### BIG MUDDY RIVER AT MURPHYSBORO, ILL.

LOCATION.—Water-stage recorder in SE¼ sec. 8, T. 9 S., R. 2 W., at Illinois Central Railroad bridge across mouth of Lewis Creek at Murphysboro, Jackson County. Zero of gage is 335.5 feet above mean sea level (revised; 1929 general adjustment). Prior to July 12, 1933, chain gage on bridge was used.

DRAINAGE AREA.—2,170 square miles.

RECORDS AVAILABLE.—December 1916 to September 1933.

DISCHARGE.—Maximum during year, 23,100 second-feet May 17 (gage height, 33.51 feet); minimum, 12 second-feet Sept. 9.

1917–33: Maximum, not determined; minimum, 1.0 second-foot Aug. 1, 1921. Maximum stage known, 39.6 feet (former datum) Feb. 2, 1916 (discharge, about 28,000 second-feet).

REMARKS.—Records fair; estimates poor. Stage-discharge relation affected by backwater from Mississippi River whenever height on United States Weather Bureau gage at Chester, Ill., exceeds about 15 feet. Discharge for all stages above 2.8 feet and when backwater is present during lower stages, computed on basis of slope as obtained by use of auxiliary chain gage on route 13 bridge, 7,700 feet upstream.

*Discharge, in second-feet, 1932–33*

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 264 | 4,540 | 384 | 11,500 | a 7,600 | 1,760 | 6,490 | 1,400 | 3,880 | 52 | 56 | 39 |
| 2 | 164 | 4,960 | 335 | 10,700 | a 6,600 | 1,310 | 8,360 | 3,810 | 3,040 | 46 | 46 | 30 |
| 3 | 119 | 5,200 | 289 | 9,760 | a 5,600 | 849 | 9,180 | 5,350 | 1,660 | a 41 | 39 | 25 |
| 4 | 107 | 4,310 | 248 | 12,300 | a 4,700 | 616 | 10,400 | 6,450 | 1,480 | a 75 | 38 | 21 |
| 5 | 264 | 3,170 | 221 | 11,500 | 3,350 | 503 | 11,100 | 7,100 | 1,240 | a 100 | 53 | 19 |
| 6 | 974 | 2,850 | 210 | 10,800 | 1,690 | 536 | 10,100 | 9,110 | 1,050 | a 85 | 59 | 16 |
| 7 | 995 | 2,200 | 695 | a 10,300 | 1,340 | 867 | 9,570 | 10,100 | 550 | a 75 | 77 | 15 |
| 8 | 930 | 1,300 | 1,910 | a 9,900 | a 1,710 | 2,410 | 9,480 | 10,600 | 590 | 65 | 70 | 14 |
| 9 | 596 | 680 | 2,140 | 9,480 | 2,260 | 2,040 | 8,550 | 11,100 | 380 | 100 | 56 | 13 |
| 10 | 307 | 503 | 2,240 | 8,540 | 2,150 | 1,530 | 7,910 | 11,000 | 320 | 138 | 46 | 16 |
| 11 | 221 | 362 | 2,050 | 7,500 | 1,700 | 1,630 | 7,000 | 11,000 | 220 | 345 | 43 | 18 |
| 12 | 225 | 352 | a 1,500 | 6,200 | 1,800 | 1,580 | 6,700 | 11,400 | 182 | 240 | 37 | 18 |
| 13 | 214 | 412 | a 1,200 | 4,620 | 1,720 | 1,390 | 5,990 | 11,100 | 89 | 135 | 198 | 19 |
| 14 | 176 | 441 | a 990 | 3,800 | 1,380 | 1,260 | 4,920 | 14,000 | 67 | 119 | 198 | 24 |
| 15 | 140 | 412 | 790 | 2,630 | 1,150 | 1,990 | 7,590 | 17,800 | 71 | 122 | 191 | 35 |
| 16 | 109 | a 440 | 553 | 888 | 849 | 2,170 | 9,570 | 21,200 | 71 | 112 | 135 | 65 |
| 17 | 88 | a 580 | 472 | 438 | 962 | 2,470 | 9,110 | 22,900 | 71 | 98 | 86 | 280 |
| 18 | 48 | 1,240 | 384 | 628 | 1,040 | 2,260 | 10,200 | 21,800 | 70 | 84 | 61 | 370 |
| 19 | 58 | 1,340 | 272 | 2,190 | 1,530 | 3,790 | 10,400 | 20,700 | 66 | 70 | 44 | 256 |
| 20 | 45 | 1,330 | 217 | 3,640 | 1,710 | 3,480 | 8,420 | 19,300 | 64 | 58 | 33 | 158 |
| 21 | 37 | 1,300 | 199 | 3,820 | 1,790 | 4,630 | 9,450 | 17,800 | 59 | 46 | 27 | 100 |
| 22 | 35 | 1,090 | 276 | 6,260 | 1,720 | 5,080 | 8,800 | 19,200 | 57 | 39 | 24 | 67 |
| 23 | 28 | 885 | 867 | 9,590 | 1,740 | 4,450 | 7,950 | 15,000 | 52 | 33 | 20 | 50 |
| 24 | 24 | 848 | 6,160 | 11,400 | 1,440 | 4,420 | 6,600 | 13,600 | 51 | 33 | 17 | 38 |
| 25 | 23 | 1,100 | 9,070 | 12,500 | 1,910 | 4,370 | 5,580 | 12,600 | 54 | 47 | 16 | 33 |
| 26 | 96 | 1,240 | 7,330 | 13,200 | 2,220 | 4,180 | 4,170 | 9,770 | 62 | 40 | 15 | 27 |
| 27 | 146 | 1,090 | 10,800 | 12,000 | 2,180 | 4,020 | 2,880 | 9,770 | 68 | 124 | 13 | 40 |
| 28 | 199 | 1,020 | 10,300 | 12,700 | 2,000 | 3,660 | 1,780 | 8,330 | 66 | 280 | 117 | 78 |
| 29 | 190 | 896 | 9,430 | 10,500 | ------- | 3,180 | 1,020 | 7,190 | 62 | 191 | 84 | 181 |
| 30 | 152 | 472 | 8,780 | 9,560 | ------- | 3,320 | 917 | 6,480 | 56 | 117 | 64 | 202 |
| 31 | 2,100 | ------- | 10,400 | a 8,600 | ------- | 4,040 | ------- | 5,030 | ------- | 77 | 50 | ------ |

| Month | Maximum | Minimum | Mean | Per square mile | Run-off in inches |
|---|---|---|---|---|---|
| October | 2,100 | 23 | 293 | 0.135 | 0.16 |
| November | 5,200 | 352 | 1,550 | .714 | .80 |
| December | 10,800 | 199 | 2,930 | 1.35 | 1.56 |
| January | 13,200 | 438 | 7,980 | 3.68 | 4.24 |
| February | 7,600 | 849 | 2,350 | 1.08 | 1.12 |
| March | 5,080 | 503 | 2,570 | 1.18 | 1.36 |
| April | 11,100 | 917 | 7,340 | 3.38 | 3.77 |
| May | 22,900 | 1,400 | 12,000 | 5.53 | 6.38 |
| June | 3,880 | 51 | 525 | .242 | .27 |
| July | 345 | 33 | 103 | .047 | .05 |
| August | 198 | 13 | 64.9 | .030 | .03 |
| September | 370 | 13 | 75.6 | .035 | .04 |
| The year | 22,900 | 13 | 3,160 | 1.46 | 19.78 |

a Estimated.

## MISCELLANEOUS DISCHARGE MEASUREMENTS

Discharge measurements of streams in the Hudson Bay and upper Mississippi River basins at points other than regular gag'ng stations are listed in the following table:

*Miscellaneous discharge measurements in Hudson Bay and upper Mississippi River drainage basins during the year ending Sept. 30, 1933*

| Date | Stream | Tributary to or diverting from— | Locality | Gage height | Discharge |
|---|---|---|---|---|---|
| | | | | *Feet* | *Sec.-ft.* |
| Sept. 26 | Ottertail River | Red River | Outlet of Many Point Lake, Minn. | | 3.98 |
| 26 | do | do | Outlet of Round Lake, Minn. | | 7.31 |
| 26 | do | do | Outlet of Height of Land Lake, Minn. | | 6.95 |
| 27 | do | do | Outlet of Little Pine Lake, Minn. | | 11.9 |
| 27 | do | do | Inlet to Ottertail Lake, Minn. | | 12.8 |
| Dec. 21 | do | do | Outlet of Ottertail Lake, Minn. | 1,318.2 | 14.1 |
| Sept. 27 | do | do | do | 1,317.8 | 6.13 |
| Dec. 20 | do | do | Just below Dayton Hollow Dam, Minn. | | 201 |
| 20 | do | do | Bridge near Everdell, Minn. | | 65.2 |
| Sept. 26 | Diversion ditch | Ottertail River | Cotton Lake, Minn. | | 1.10 |
| Jan. 6 | Clearwater River | Red Lake River | Plummer, Minn. | | 14.6 |
| Mar. 30 | Souris River | Assiniboine River | Near Estevan, Saskatchewan | 6.25 | 276 |
| Apr. 5 | do | do | do | 4.15 | 94.9 |
| 16 | do | do | Saugstads Bridge, near Minot, N.Dak. | 2.90 | 222 |
| June 9 | do | do | do | 7.42 | 860 |
| Aug. 23 | do | do | do | .79 | 6.37 |
| Mar. 30 | Long Creek | Souris River | Near Estevan, Saskatchewan | 3.41 | 160 |
| Apr. 5 | do | do | do | .82 | 19.7 |
| Mar. 29 | Moose Mountain Creek. | do | Near Oxbow, Saskatchewan | | 910 |
| 29 | do | do | do | | 1,140 |
| 30 | do | do | do | | 518 |
| Apr. 5 | do | do | do | | 26.7 |
| June 2 | Mississippi River | Gulf of Mexico | Aitkin, Minn. | 9.94 | 5,990 |
| Apr. 21 | do | do | Hastings, Minn. | 12.88 | 6,050 |
| June 1 | do | do | do | 15.50 | 12,900 |
| July 3 | do | do | do | 8.16 | 2,150 |
| 25 | do | do | do | 7.52 | 2,240 |
| Aug. 3 | do | do | do | 7.62 | 2,640 |
| 16 | do | do | do | 6.23 | 1,470 |
| 23 | do | do | do | 6.27 | 1,210 |
| 18 | do | do | Clinton, Iowa | [a] 0.16 | 13,900 |
| Oct. 10 | Minnesota River | Mississippi River | Mendota, Minn. | 1.10 | 270 |
| Dec. 29 | do | do | do | 1.30 | 254 |
| Feb. 21 | do | do | do | 1.58 | 298 |
| Mar. 14 | do | do | do | 2.98 | 1,920 |
| Apr. 20 | do | do | do | 3.72 | 2,390 |
| June 2 | do | do | do | 6.40 | 1,060 |
| July 24 | do | do | do | 1.23 | 304 |
| Aug. 17 | do | do | do | 1.03 | 348 |
| Mar. 24 | Zumbro River | do | Bridge on State highway 3 near Kellogg, Minn. | 3.70 | 433 |
| Apr. 5 | do | do | do | 5.95 | 1,470 |
| Dec. 2 | Whitewater River | do | Bridge on State highway 3 at Weaver, Minn. | 3.28 | 82.4 |
| Mar. 24 | do | do | do | 3.39 | 91.8 |
| Apr. 2 | do | do | do | 5.39 | 296 |
| 5 | do | do | do | 6.20 | 416 |
| 14 | do | do | do | 3.88 | 122 |
| Nov. 30 | Bad Axe River | do | Bridge 2 miles above mouth, near Victory, Wis. | 2.84 | 68.5 |
| Mar. 23 | do | do | do | 2.95 | 59.5 |
| Apr. 3 | do | do | do | 8.44 | 94.8 |
| 13 | do | do | do | 6.90 | 101 |
| 25 | do | do | do | 4.28 | 73.9 |

[a] U. S. Weather Bureau gage at Le Claire, Iowa.

*Miscellaneous discharge measurements in Hudson Bay and upper Mississippi River drainage basins during the year ending Sept. 30, 1933*—Continued

| Date | Stream | Tributary to or diverting from— | Locality | Gage height | Discharge |
|---|---|---|---|---|---|
| | | | | *Feet* | *Sec.-ft.* |
| Dec. 1 | Upper Iowa River | Mississippi River | Road between Eitzen and Waukon, Iowa. | | 217 |
| Apr. 25 | do | do | do | | 264 |
| Aug. 18 | Wapsipinicon River. | do | Near McCausland, Iowa | | 260 |
| Mar. 16 | Des Moines River | do | Near Boone, Iowa | | 542 |
| Apr. 5 | do | do | do | [b] 16.93 | 14,400 |
| 8 | do | do | do | [b] 12.30 | 7,910 |
| June 12 | do | do | do | | 359 |
| 22 | do | do | do | | 140 |
| Aug. 25 | do | do | do | [b] 3.88 | 117 |
| Jan. 18 | South Fork of Salt River. | Salt River | Line between SW¼SW¼ sec. 1 and NW¼NW¼ sec. 12, T. 51 N., R. 9 W., 3 miles north of Mexico, Mo. | 1.45 | 3.2 |
| Apr. 3 | do | do | do | 2.58 | 145 |
| Mar. 12 | do | do | do | 10.53 | 2,900 |
| 12 | do | do | do | 11.21 | 3,400 |
| 12 | do | do | do | 11.72 | 3,470 |
| 13 | do | do | do | 11.90 | 3,580 |
| 13 | do | do | do | 10.82 | 2,920 |
| 13 | do | do | do | 9.89 | 2,650 |
| 13 | do | do | do | 9.31 | 2,380 |
| 13 | do | do | do | 8.72 | 2,150 |
| 13 | do | do | do | 8.24 | 2,070 |
| 14 | do | do | do | 7.54 | 1,760 |
| 14 | do | do | do | 6.68 | 1,390 |
| 14 | do | do | do | 5.47 | 950 |
| 14 | do | do | do | 4.57 | 678 |
| June 5 | do | do | do | 1.43 | 6.9 |
| Aug. 11 | do | do | do | 1.44 | 11 |

[b] U. S. Weather Bureau chain gage.

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