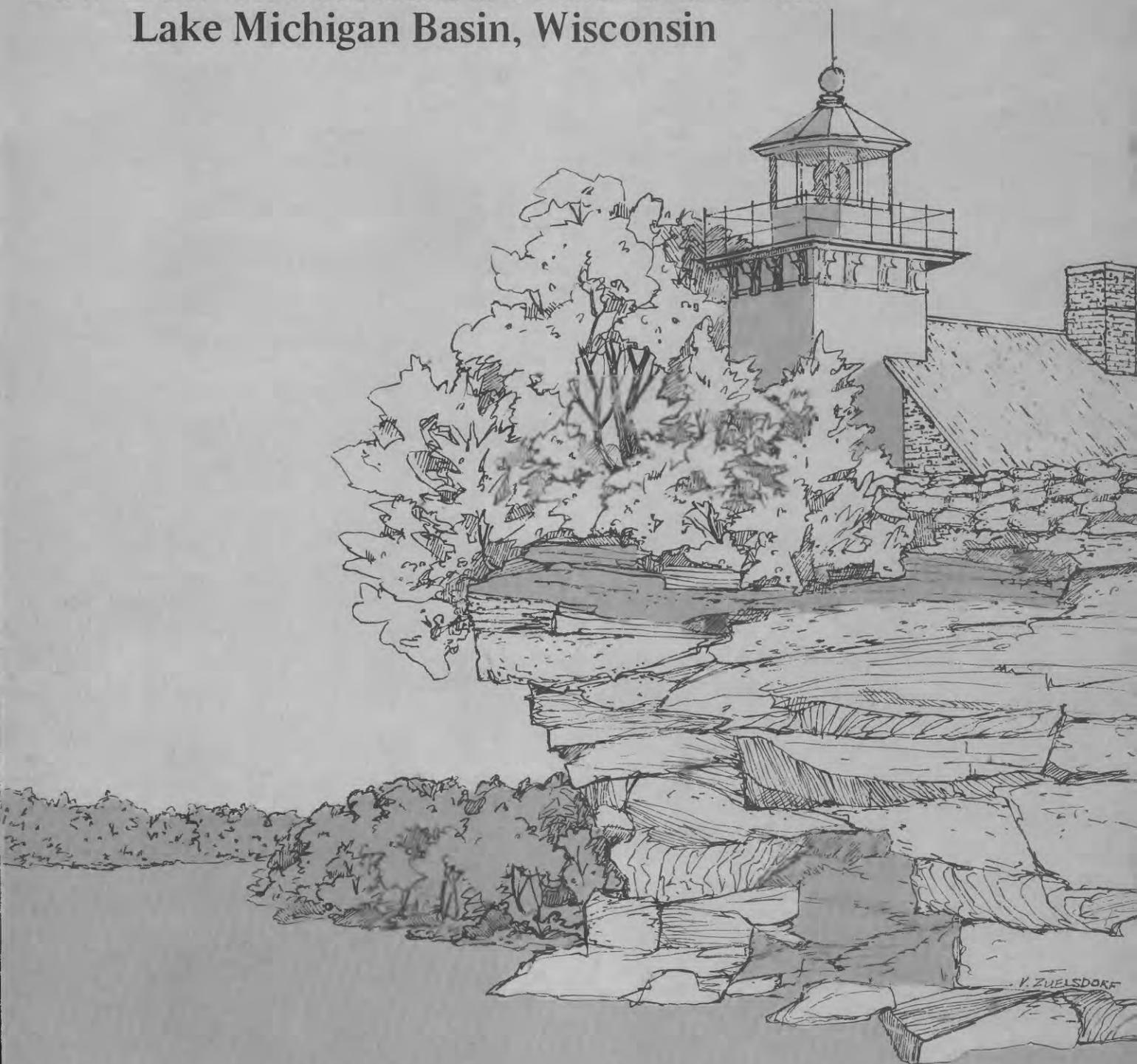
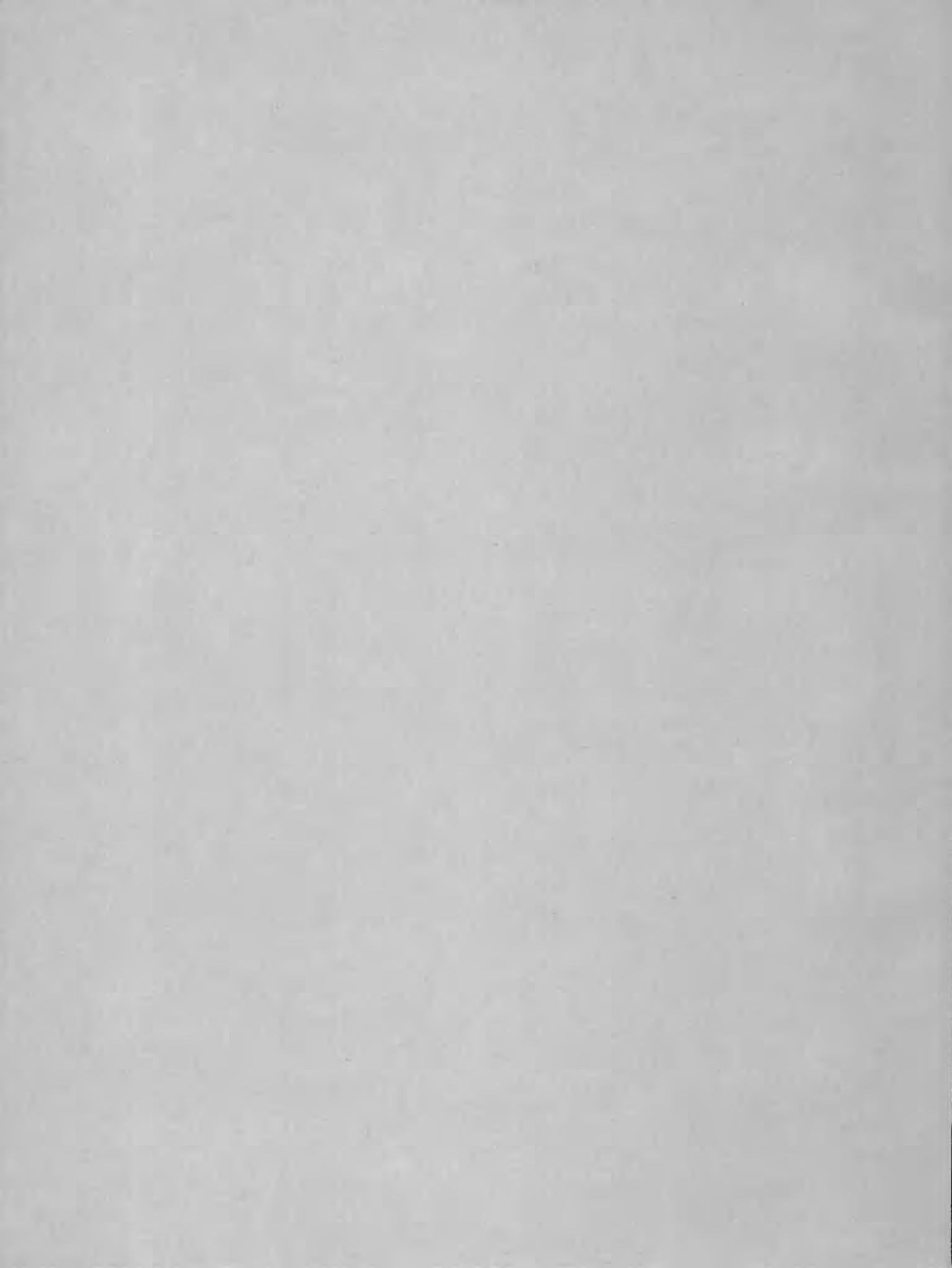


Low-Flow Characteristics of Streams in the Lake Michigan Basin, Wisconsin



PREPARED BY
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

IN COOPERATION WITH
WISCONSIN DEPARTMENT OF NATURAL RESOURCES



Low-Flow Characteristics of Streams in the Lake Michigan Basin, Wisconsin

B.K. HOLMSTROM

U.S. GEOLOGICAL SURVEY
Water Resources Investigations
Open-File Report 81-1193

*Prepared in cooperation with the
Wisconsin Department of Natural Resources*



March 1982



UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, *SECRETARY*

GEOLOGICAL SURVEY

Dallas L. Peck, *Director*

For additional information write to:

U. S. Geological Survey
1815 University Avenue
Madison, Wisconsin 53706

CONTENTS

	<u>Page</u>
Abstract-----	1
Introduction-----	2
Basin description-----	2
Low-flow characteristics-----	4
Analytical techniques-----	4
Gaging stations-----	4
Low-flow partial-record stations-----	8
Miscellaneous sites-----	8
Accuracy-----	9
Gaging stations-----	11
Low-flow partial-record stations-----	11
Miscellaneous sites-----	11
Estimating low-flow characteristics at unged sites-----	11
Streamflow characteristics-----	13
Basin characteristics-----	13
Regression analysis-----	16
Sites without base-flow data-----	17
Sites with some base-flow data-----	17
Verification of regression equations that use base-flow index-----	18
Application of estimating procedures-----	19
Sites without base-flow data-----	19
Sites with some base-flow data-----	20
Comparison of methods-----	22
Summary-----	22
References-----	23

ILLUSTRATIONS

- Plate 1. Locations of gaging stations, low-flow partial-record stations, and miscellaneous sites in the Lake Michigan basin, Wisconsin
2. Base-flow index values for selected stations and sites in the Lake Michigan basin, Wisconsin

	<u>Page</u>
Figure 1. Map showing location of the Lake Michigan basin in Wisconsin-----	3
2. Hydrograph of daily discharge of Kewaunee River near Kewaunee for 1972 climatic year showing annual low-flow periods for various number of days-----	5
3. Low-flow frequency curves of the annual lowest mean discharge for the indicated number of consecutive days at Milwaukee River at Milwaukee-----	6
4. Flow-duration curve showing the percentage of time a given discharge was exceeded for Milwaukee River at Milwaukee-----	7
5. Graph showing method of estimating $Q_{7,2}$ and $Q_{7,10}$ at low-flow partial-record stations-----	9

ILLUSTRATIONS (continued)

	<u>Page</u>
6. Graph showing method of estimating $Q_{7,2}$ and $Q_{7,10}$ at miscellaneous sites-----	10
7. Graph showing low-flow partial-record station with relatively steep relation line and high standard error of estimates----	12

TABLES

Table 1. Low-flow characteristics for sites in the Lake Michigan basin--	25
2. Basin characteristics for low-flow partial-record stations and selected gaging stations in the Lake Michigan basin-----	98
3. Comparison of methods available to estimate low-flow characteristics in the Lake Michigan basin-----	102

CONVERSION TABLE

For readers who prefer metric units, the data may be converted by using the following factors:

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
mile (mi)	1.609	kilometer (km)
foot (ft)	3.048×10^{-1}	meter (m)
inch (in.)	25.4	millimeter (mm)
square mile (mi ²)	2.59	square kilometer (km ²)
cubic foot per second (ft ³ /s)	2.832×10^{-2}	cubic meter per second (m ³ /s)
foot per mile (ft/mi)	1.894×10^{-1}	meter per kilometer (m/km)
cubic foot per second per square mile [(ft ³ /s)/mi ²]	1.094×10^{-2}	cubic meter per second per square kilometer [(m ³ /s)/km ²]
gallon per day (gal/d)	3.786×10^{-3}	cubic meter per day (m ³ /d)
gallon per day per square foot [(gal/d)/ft ²]	3.517×10^{-4}	cubic meter per day per square meter [(m ³ /d)/m ²]

EXPLANATION OF TERMS

Base flow--That part of the streamflow derived from ground water.

Low flow--The minimum stream discharge that occurs within a given time period.

Continuous-record gaging station--A station where continuous streamflow data are collected.

Low-flow partial-record station--A station where eight or more baseflow discharge measurements are made in at least a 2-year period to determine low-flow characteristics.

Miscellaneous site--A site where less than eight base-flow discharge measurements have been made as part of other water-resources investigations or to determine the stream's base-flow characteristics for this report.

Q_{7,2}--The annual minimum 7-day mean flow below which the flow will fall on the average of once in 2 years.

Q_{7,10}--The annual minimum 7-day mean flow below which the flow will fall on the average of once in 10 years.

Q₉₀--The discharge at the 90 percent flow-duration point which is defined as the discharge that is exceeded 90 percent of the time.

Standard error of estimate (SE)--Is a range such that values estimated by a method are within this range at about 67 percent of the sites.

SE_{7,2}--The standard error of estimate for the Q_{7,2} discharge.

SE_{7,10}--The standard error of estimate for the Q_{7,10} discharge.

Low-Flow Characteristics of Streams in the Lake Michigan Basin, Wisconsin

B.K. HOLMSTROM

ABSTRACT

This report describes low-flow characteristics of streams in the Lake Michigan basin where streamflow data have been collected and presents equations for estimating low-flow characteristics at ungaged sites. Estimates of low-flow frequency at 30 continuous-record gaging stations, flow duration at 13 gaging stations, and selected low-flow frequency characteristics at 22 low-flow partial-record stations and 123 miscellaneous sites are given.

Two equations are provided to estimate low-flow characteristics at sites where one base-flow discharge measurement is available. The low-flow characteristics determined are the annual minimum 7-day mean flow below which the flow will fall on an average of once in 2 years ($Q_{7,2}$) and once in 10 years ($Q_{7,10}$). The equations were determined from multiple-regression analyses that related the low-flow characteristics at continuous-record gaging stations and low-flow partial-record stations to basin characteristics.

Drainage area (A) and base-flow index (Bf) were the most significant characteristics in explaining the variation in low flow for sites where one low base-flow measurement (flow durations greater than 80 percent) has been made. The equations and corresponding standard errors of estimate are:

$$Q_{7,2} = 0.780A^{1.08}Bf^{1.15} \qquad SE_{7,2} = 42 \text{ percent}$$

$$Q_{7,10} = 0.262A^{1.22}Bf^{1.30} \qquad SE_{7,10} = 69 \text{ percent}$$

Low-flow characteristics are not well defined in the Lake Michigan basin. Standard errors for low-flow characteristics at gaging stations, low-flow partial-record stations, and miscellaneous sites are much higher than State averages. The standard errors for the regression equations are also very high. This is due in part to the flow of many streams in the basin approaching 0 ft³/s

during low base-flow periods. The graphical regression relation lines are steep for stations on these streams and the resulting standard errors are relatively high.

INTRODUCTION

In recent years, great demand has been placed on water resources in Wisconsin by increased multiple uses such as maintenance of fish and wildlife habitat, irrigation of crops, dilution and assimilation of wastes, production of hydroelectric power, construction of impoundments for real-estate developments, and maintenance of adequate flow for boating. This increased demand requires an accurate determination of water resources during low-flow periods to ensure proper consideration of all users.

This report describes the low-flow characteristics of streams in the Lake Michigan basin in Wisconsin (fig. 1) where streamflow data have been collected and presents equations for estimating low-flow characteristics at ungaged sites. The report presents estimates of the magnitude and frequency of low flows for various sites where streamflow data have been collected.

Low-flow frequency analyses and flow-duration analyses are presented for all current and discontinued continuous-record gaging stations in the basin. Low-flow frequency analyses for 30 gaging stations and flow-duration analyses for 13 gaging stations have been completed through water year 1978. Low-flow frequency data are included in the report for 22 low-flow partial-record stations and for 123 miscellaneous sites.

Previous reports by Gebert (1971), Holmstrom (1979, p. 29-30, 50-52, 54-55, 79-83, 91-93), Skinner and Borman (1973, sheet 3), Field (1975 and 1978), and Hutchinson (1970, p. 30-35) contain preliminary low-flow data for this basin.

This study was done in cooperation with the Wisconsin Department of Natural Resources. The report is part of a series of 12 planned reports to describe low-flow characteristics of the major basins in Wisconsin (fig. 1).

BASIN DESCRIPTION

The Lake Michigan basin is in eastern Wisconsin and borders the western shore of Lake Michigan. The study area consists of several subbasins whose main-stem streams discharge directly into Lake Michigan and into Green Bay. It does not include basins whose main-stem streams discharge into Green Bay from the west and south. The drainage area of the basin is about 3,600 mi² (Skinner and Borman, 1973) or about 6.5 percent of the State.

The Lake Michigan basin is the most populous of the 12 major basins in Wisconsin. The 1970 population was approximately 1,632,000. The largest cities are Milwaukee, Racine, and Kenosha with 1978 populations of 620,162, 92,988, and 80,718 (Wisconsin Legislative Reference Bureau, 1979).

The mean annual precipitation in the basin is 29.0 in., ranging from less than 26 in. in the north to more than 32 in. in the south (Wisconsin Statistical

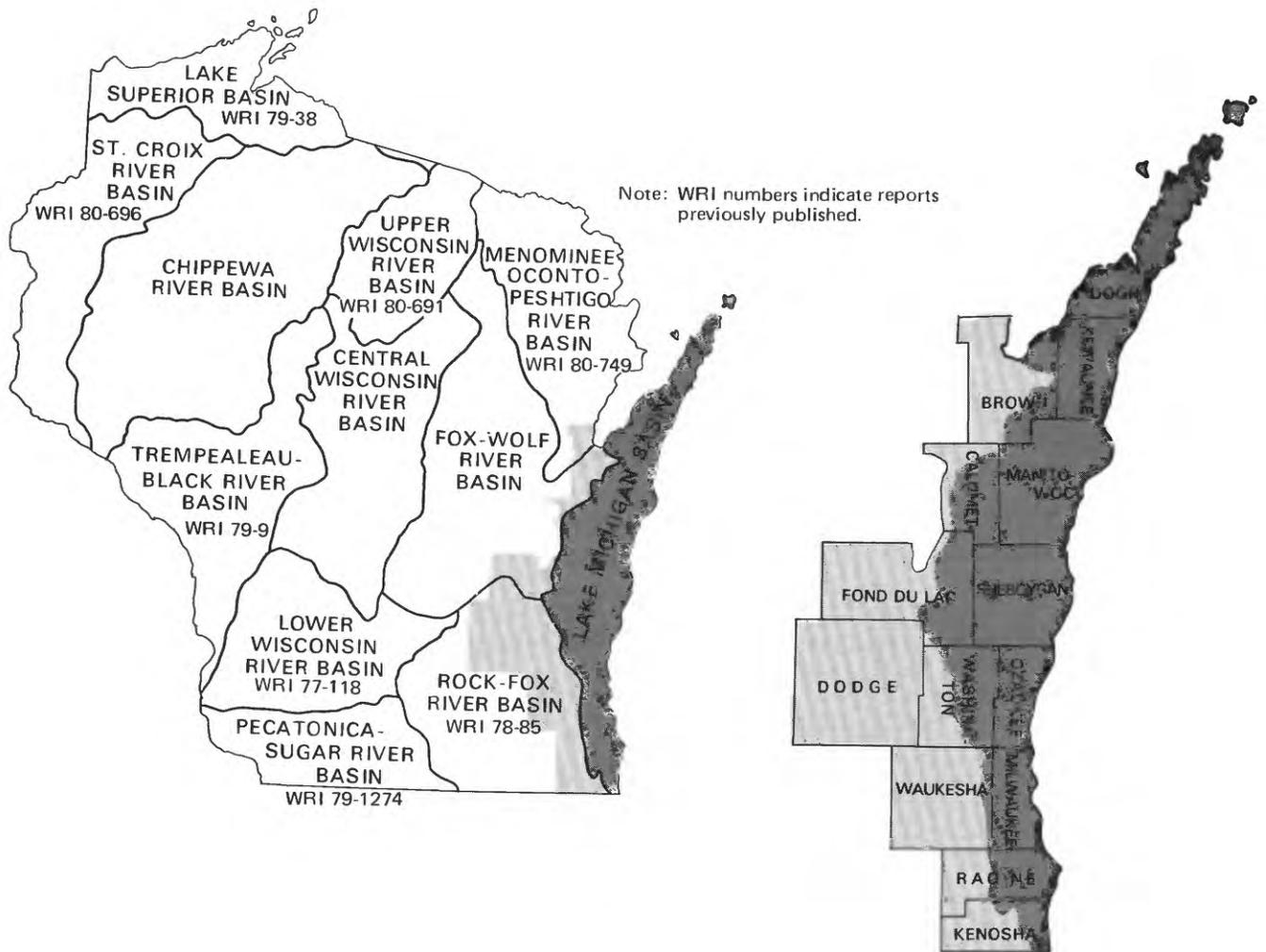


Figure 1. Location of the Lake Michigan basin in Wisconsin.

Reporting Service, 1967, p. 18). Snowfall is 14 to 21 percent of the mean annual precipitation. The mean annual runoff is 7.7 in., the mean annual evapotranspiration is 21.1 in., and net underflow leaving the basin through the ground-water reservoir is 0.2 in. (Skinner and Borman, 1973, sheet 1).

The basin has a rolling topography with moderate relief. The topography is the result of bedrock configuration and glacial deposition and erosion. Prominent landforms include the Kettle Moraine, Niagara Escarpment, and Door Peninsula.

A large percentage of the basin has glacial deposits that contain soils having low permeability. About two-thirds of the basin surface consists of ground moraine primarily made up of clayey silty till. The till of the end moraines in the eastern part of the basin, and the lake deposits, also contain soils having low permeability (Skinner and Borman, 1973, sheet 1). This limits ground-water contribution to many of the streams in the basin during low base-flow periods.

General gradients for major rivers in the basin range from 5 to 9 ft/mi, with an average gradient of about 6 ft/mi. The average gradient of the Milwaukee and Manitowoc Rivers is approximately 5 ft/mi and is 9 ft/mi for the Menomonee River (Skinner and Borman, 1973, sheet 1).

A large percentage of discharge for some of the streams in urban areas is cooling water and waste-water effluent from industrial and municipal sources. Streamflows in the Menomonee River, Kinnickinnic River, Lincoln Creek, Pike River, Root River, and Root River Canal are sustained or supplemented during low-flow periods by industrial and municipal waste waters discharged to the stream (Skinner and Borman, 1973, sheet 3; Field, 1978, p. 4-8; Ruff and others, 1976, p. 31; Hutchinson, 1970, p. 32-35).

LOW-FLOW CHARACTERISTICS

Low flow refers to the low range of stream discharge. A probability of occurrence and a time period can be specified for a more precise definition. Low flow generally is base flow, although a 30-, 60-, or 90-day low flow could contain some direct or storm runoff.

A typical low-flow period is illustrated by the discharge hydrograph (1972 climatic year) for the Kewaunee River near Kewaunee gaging station (fig. 2). The climatic year, which is used for low-flow analyses, is the 12-month period April 1 through March 31 and is designated by the calendar year in which it ends. The annual 90-day low flow for the 1972 climatic year prevailed from July 2 to September 29. Although this was the lowest flow for 90 consecutive days during the year, direct runoff occurred many times. Except for these increases in stream discharge, the remainder of streamflow for the period was predominantly base flow.

Table 1 contains low-flow data for 254 sites. Each site is identified by station number and station name. The site location, drainage area, type of site, and other pertinent data are included. Low-flow data included for each site depend upon the type of site: continuous-record gaging station, low-flow partial-record station, or miscellaneous site. The locations of the sites are shown on plate 1.

Analytical techniques

Low-flow characteristics presented in table 1 were determined by three methods. The method used at a given site depended on the type of flow data available; that is, (1) a continuous record of daily streamflows (continuous-record gaging stations), (2) eight or more base-flow discharge measurements (low-flow partial-record stations), and (3) one to seven discharge measurements (miscellaneous sites).

Gaging stations

Low-flow characteristics of a stream where continuous streamflow records have been collected can be determined by flow-duration analysis and frequency analysis. The two analyses serve different purposes. The flow-duration curve indicates the percentage of time that daily mean flow exceeds a given discharge,

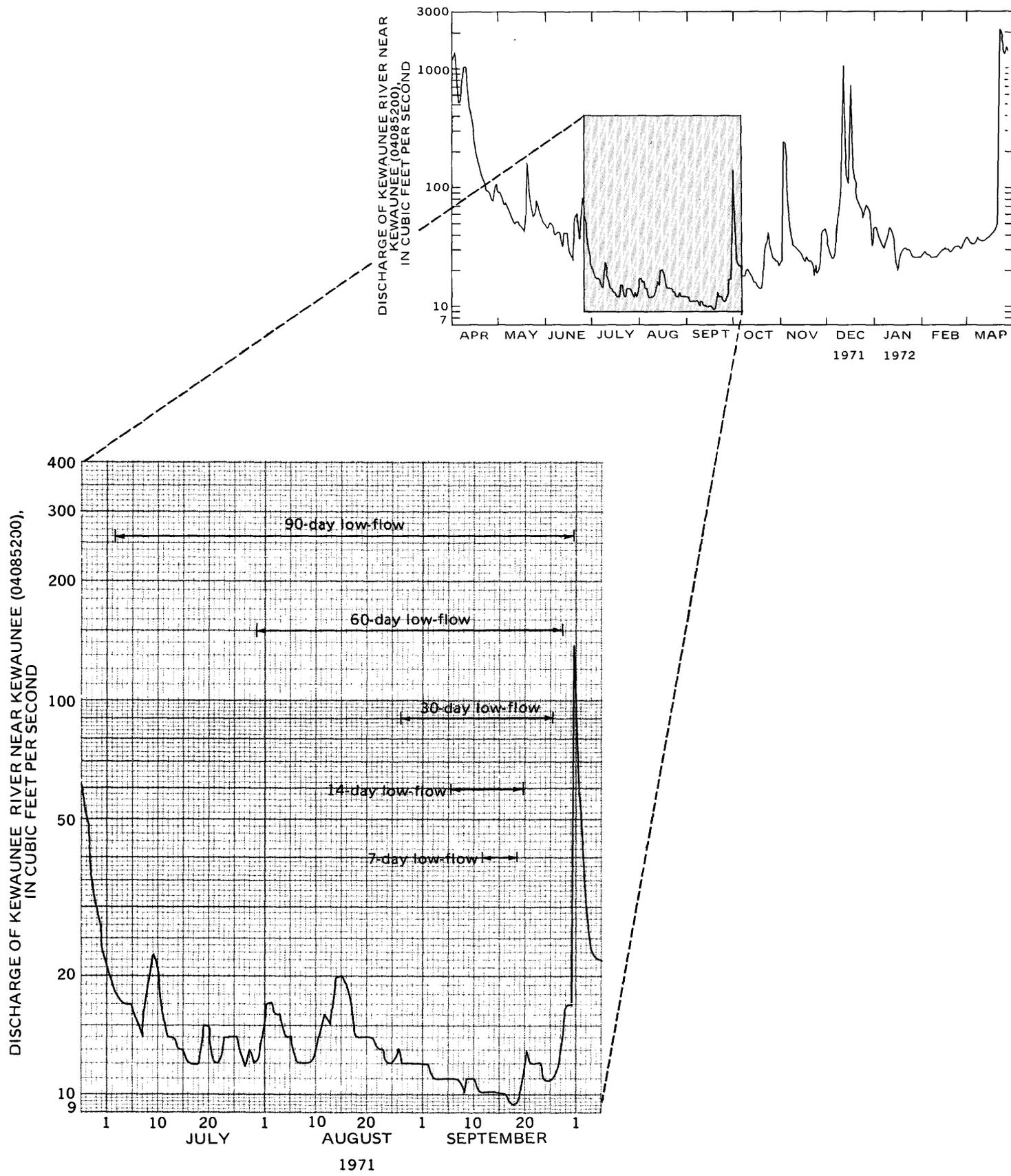


Figure 2. Daily discharge of Kewaunee River near Kewaunee for 1972 climatic year showing annual low-flow periods for various number of days.

and the low-flow frequency curve indicates the probability that an annual minimum 7-day, 14-day, 30-day, 60-day, and 90-day consecutive mean flow will be less than an indicated discharge in any given year. The more generally used analysis for most low-flow applications is the low-flow frequency analysis. In the basin the annual minimum 7-day mean flow below which the flow will fall on the average of once in 2 years ($Q_{7,2}$) is approximately equal to 93 percent flow duration. The $Q_{7,10}$ is about equal to 99.4 percent flow duration.

Low-flow frequency and flow-duration analyses were completed for all continuous-record gaging stations that have 10 or more consecutive years of

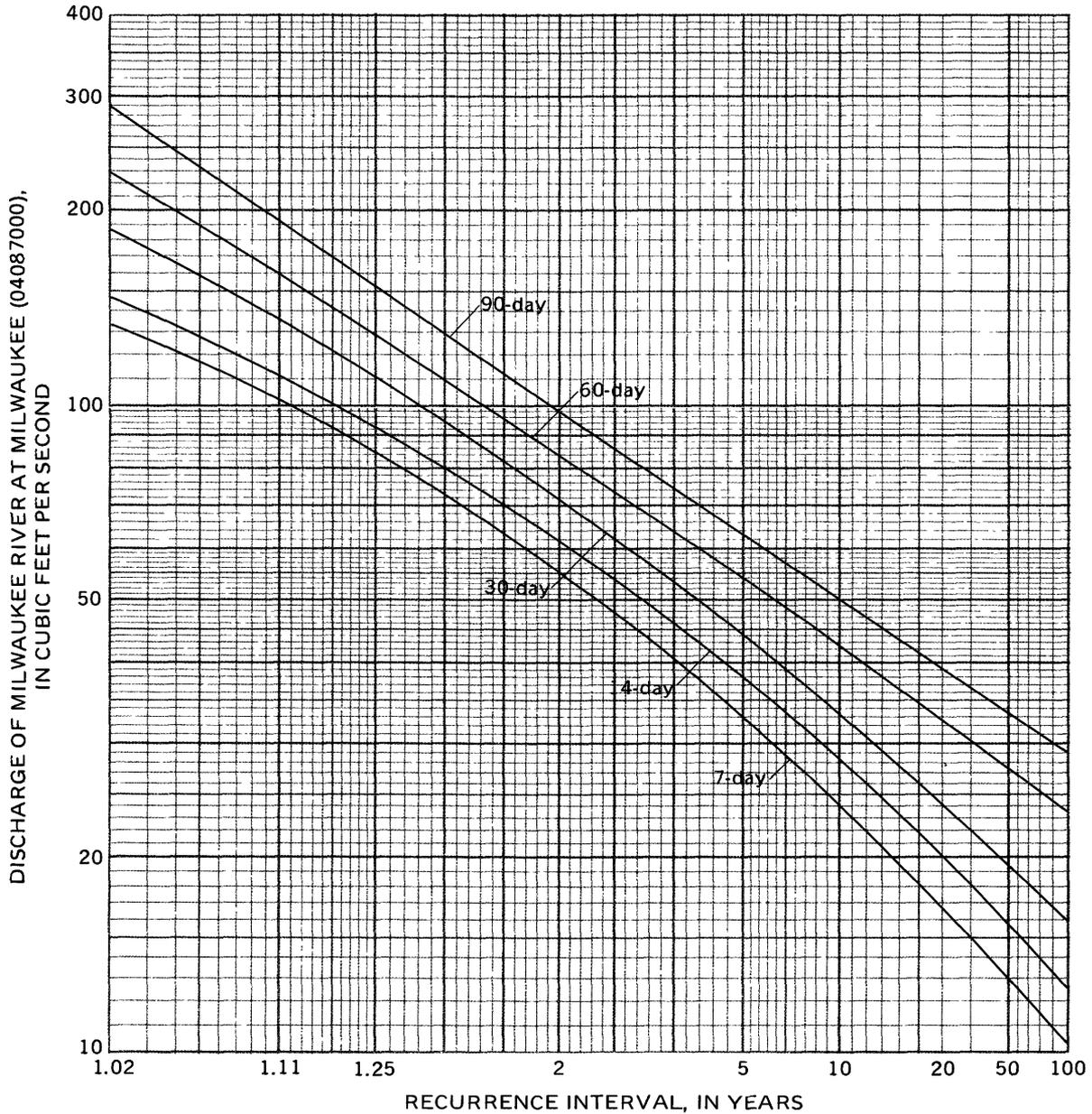


Figure 3. Low-flow frequency curves of the annual lowest mean discharge for the indicated number of consecutive days at Milwaukee River at Milwaukee.

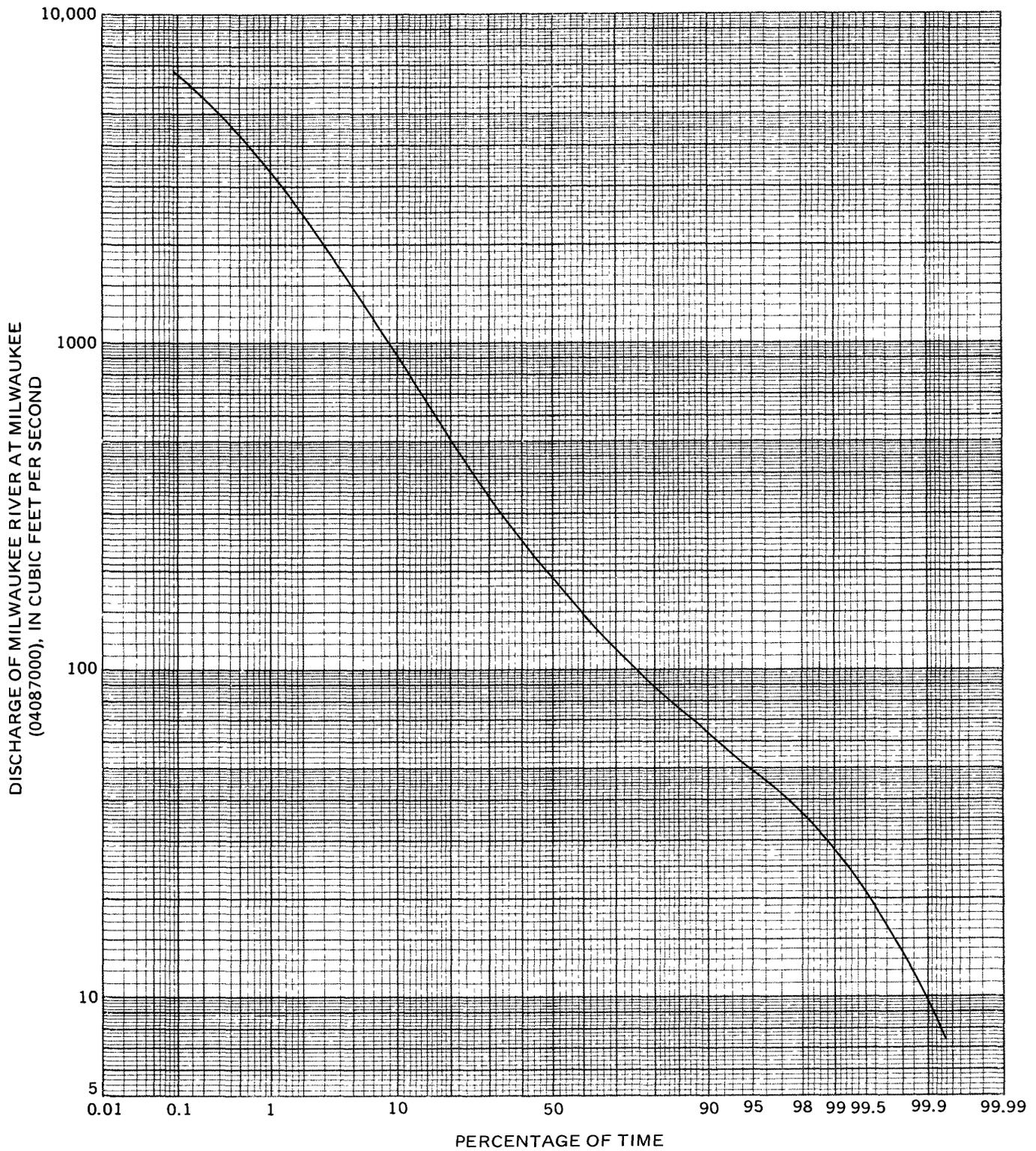


Figure 4. Flow-duration curve showing the percentage of time a given discharge was exceeded for Milwaukee River at Milwaukee.

record (12 stations). Values for the magnitude and frequency of annual low flows for 7, 14, 30, 60, and 90 consecutive days are listed in table 1. Table 1 also lists flow-duration values showing the percentage of time that specified discharges were exceeded.

The low-flow frequency characteristics were determined from the daily discharge records using a log-Pearson Type III probability distribution or a plotting-position analysis (Riggs, 1972, p. 1-8). If results of the two analyses were substantially different, the plotting-position analysis was used. Figure 3 is an example of a low-flow frequency curve for Milwaukee River at Milwaukee, and figure 4 is a flow-duration curve for the same site.

For the 17 gaging stations that have insufficient data for low-flow frequency analysis or flow duration, the low-flow characteristics were determined by a procedure similar to that outlined in the following section for low-flow partial-record stations.

Low-flow partial record stations

Low-flow characteristics determined for low-flow partial-record stations are $Q_{7,2}$ and $Q_{7,10}$. Estimates of $Q_{7,2}$ and $Q_{7,10}$ are presented in table 1 for 22 low-flow partial-record stations. Characteristics were determined from graphical regressions established by plotting 10 to 27 base-flow discharge measurements at low-flow partial-record stations against concurrent discharges at continuous-record gaging stations in the area (Gebert, 1971). A relation line was established through the plotted points. The $Q_{7,2}$ and $Q_{7,10}$ at the continuous-record gaging station then were transferred through the relation line to estimate $Q_{7,2}$ and $Q_{7,10}$ for the partial-record station. Figure 5 is an example of this type of analysis for North Branch Milwaukee River near Cascade.

Miscellaneous sites

Base-flow measurements have been obtained at 202 miscellaneous sites in the basin as part of other water-resources investigations. Low-flow characteristics were estimated for some of these sites (table 1) by one of two methods.

Low-flow characteristics were estimated at 99 sites where at least three base-flow discharge measurements were available and a relationship existed between the measured discharge and the concurrent daily mean discharge at a nearby gaging station. Estimates of $Q_{7,2}$ and $Q_{7,10}$ were made by the same type of analysis that was used for partial-record stations. Figure 6 illustrates this type of analysis for Milwaukee River at West Bend. The slope of the relation line for a miscellaneous site was compared to established relation lines of nearby low-flow partial-record stations and other miscellaneous sites for uniformity. Generally, the relation lines should have approximately the same slope if the factors that influence low flow are uniform for the area. If the relation line at the site being studied was defined by three discharge measurements that had significant scatter, the slope of the line was adjusted to agree more closely with the better established relation line at a low-flow partial-record station.

A second method was used for 24 miscellaneous sites that have less than three discharge measurements and discharge measurements made during low base-flow conditions (flow durations greater than 80 percent). At these sites the

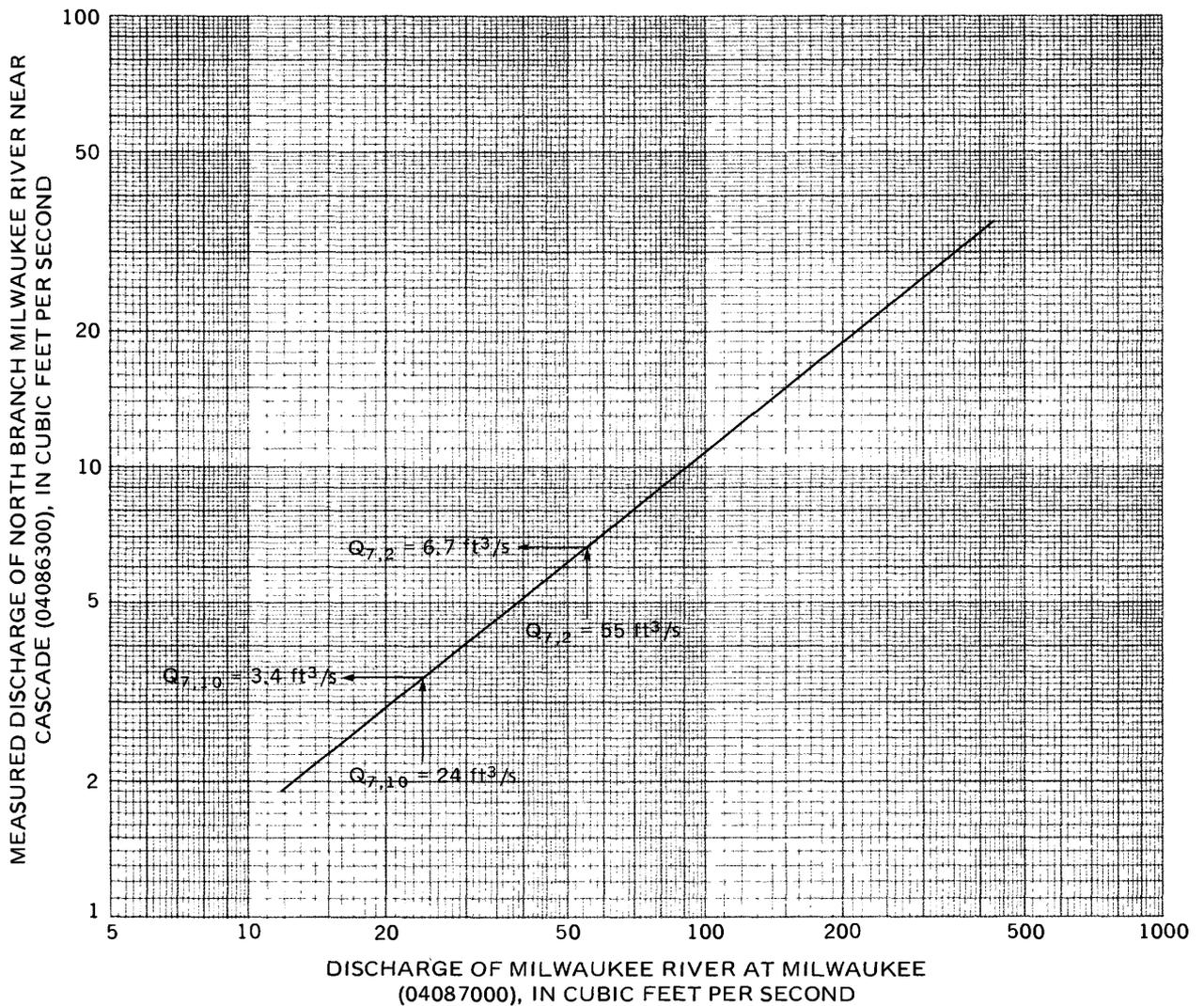


Figure 5. Method of estimating $Q_{7,2}$ and $Q_{7,10}$ at low-flow partial record stations.

low-flow characteristics were estimated by multiple-regression equations and are listed in table 1. The multiple-regression equations used and discussion of their development is presented later in the report.

Low-flow characteristics were not determined at 79 miscellaneous sites for the following reasons: Fewer than three discharge measurements were available and regression equations were not applicable, discharge was predominantly effluent from industrial or sewage-treatment plants, or multiple-regression equations provided estimates that were obviously poor when compared with data from nearby sites. Base-flow discharge measurements are listed for these sites.

Accuracy

The low-flow characteristics in table 1 are estimates of flow expected in the future. Low-flow characteristics, like other streamflow characteristics,

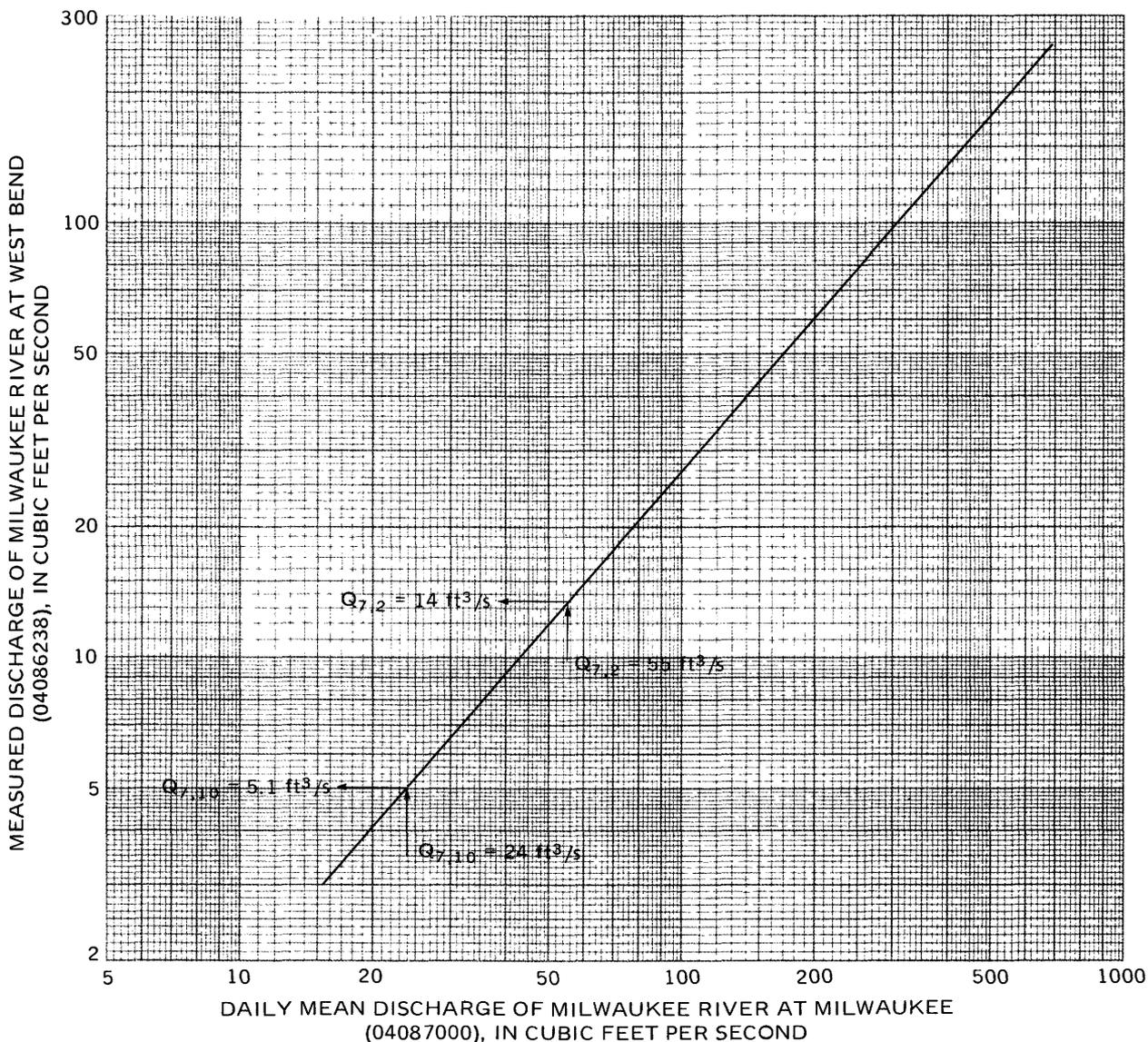


Figure 6. Method of estimating $Q_{7,2}$ and $Q_{7,10}$ at miscellaneous sites.

are only estimates, with their true value being difficult or impossible to determine. The estimates are based on data collected at each site and analyzed by several methods. Each estimate has an error associated with it. The error depends on the amount and kinds of data and on the analytical method. Two major sources of error are the time-sampling error in streamflow records and the error in the analytical method.

The accuracy of the low-flow estimates is approximated by the standard error of estimate (SE). The standard errors associated with the $Q_{7,2}$ ($SE_{7,2}$) and $Q_{7,10}$ ($SE_{7,10}$) are presented in table 1. One standard error above and below an estimate defines a range which should include the true value at 67 percent of the sites.

The methods used to obtain the standard errors are not precise, and the standard errors presented in the table should be used as a guide to indicate only a general level of confidence. In addition, there may be larger errors associated with low-flow estimates that approach $0 \text{ ft}^3/\text{s}$.

Gaging stations

Accuracy of low-flow characteristics at gaging stations was determined by a method described by Hardison and Moss (1972, p. 38). An average $SE_{7,2}$ of 16 percent and $SE_{7,10}$ of 25 percent was determined for the 12 gaging stations in the basin that had 10 or more years of streamflow record.

A common length of record was used to compare the accuracy of low-flow characteristics determined from recorded discharge at gaging stations in the Lake Michigan basin with that from gaging stations throughout the State. This analysis assumed that 10 years of record was available at each gaging station to determine the $Q_{7,10}$ discharge. An $SE_{7,10}$ of 32 percent was determined for the basin as compared with an $SE_{7,10}$ of 16 percent for gaging stations throughout the State. This significant difference indicates that low-flow characteristics generally can be determined with much less accuracy for the Lake Michigan basin.

Low-flow partial-record stations

The accuracy of low-flow characteristics at low-flow partial-record stations was determined by a method developed by Hardison and Moss (1972, p. 28). By this method, an average $SE_{7,10}$ of 70 percent was found for the 17 low-flow partial-record stations in the basin with $Q_{7,10}$ estimates greater than $0.01 \text{ ft}^3/\text{s}$ and an average $SE_{7,10}$ of 35 percent for the 10 stations with $Q_{7,10}$ estimates greater than $0.1 \text{ ft}^3/\text{s}$.

The standard error of low-flow characteristics at low-flow partial-record stations is greater than the State average (29 percent). There are a large percentage of streams in the basin for which the base-flow discharge during low-flow periods approaches $0 \text{ ft}^3/\text{s}$. The graphical regression relation lines for stations on these streams are steep (fig. 7) with the standard errors for low-flow characteristics being relatively large.

Miscellaneous sites

The accuracy of low-flow characteristics was determined for 18 miscellaneous sites with 6 or 7 discharge measurements using the Hardison and Moss method (1972, p. 28). An average $SE_{7,10}$ of 68 percent was determined for these sites.

The average $SE_{7,10}$ at miscellaneous sites with 3 to 5 base-flow discharge measurements was not determined for the Lake Michigan basin. An average $SE_{7,10}$ in excess of 70 percent is to be expected for these sites.

The accuracy of the low-flow characteristics that were determined by multiple-regression equations at 24 miscellaneous sites is an average value for the basin. The accuracy was determined as part of the multiple-regression analysis and is discussed later in the report (p. 11-18).

ESTIMATING LOW-FLOW CHARACTERISTICS AT UNGAGED SITES

A method is needed to transfer low-flow characteristics from gaged sites to ungaged sites because it is impossible to obtain actual streamflow data for all

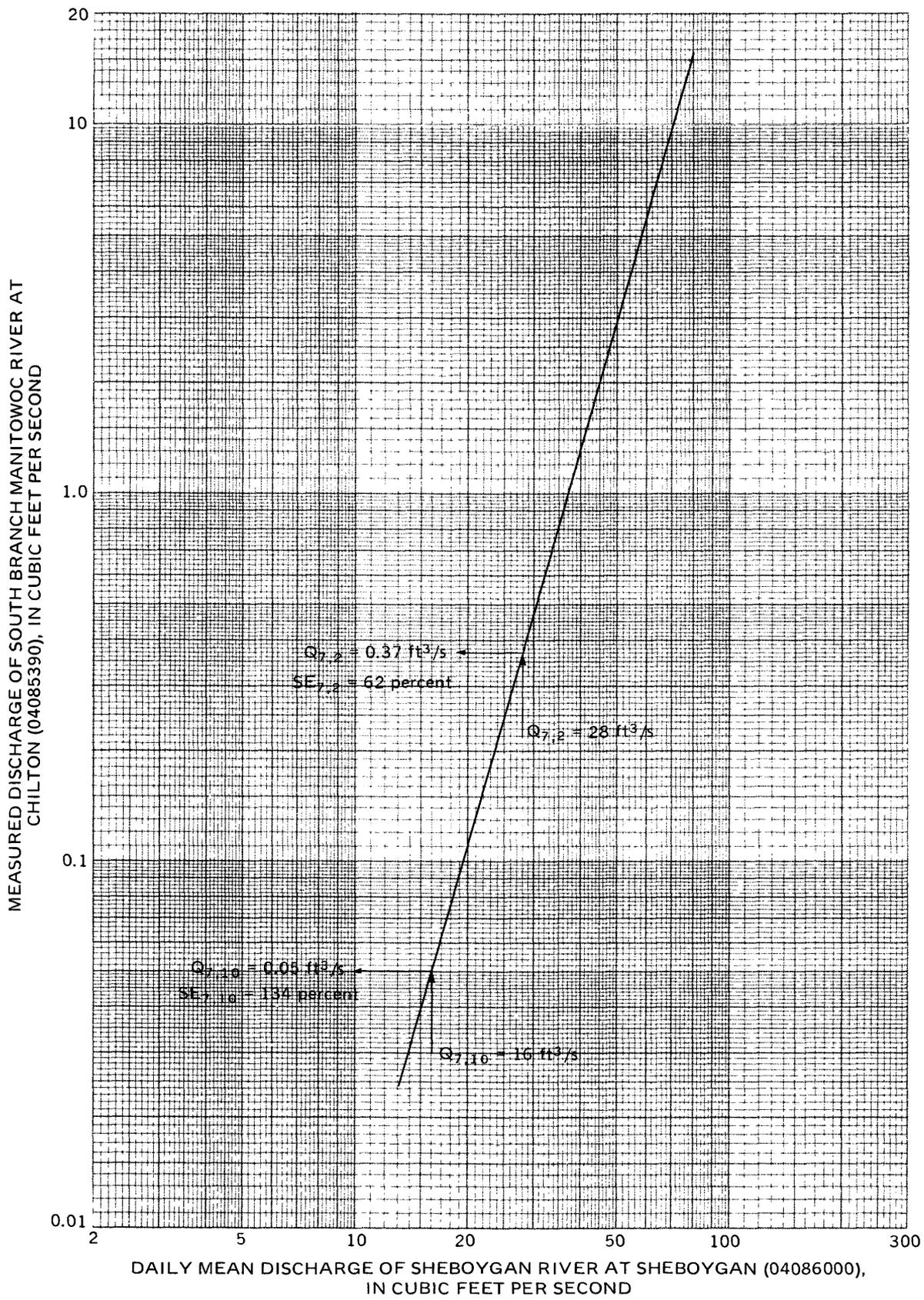


Figure 7. Low-flow partial-record station with relatively steep relation line and high standard error of estimates.

sites of interest. The most practical transfer method relates low-flow characteristics to topographic, climatic, and aquifer characteristics of the drainage basin by multiple-regression analysis. Characteristics used and equations determined from the multiple-regression analysis are discussed in the following paragraphs. The method is outlined in detail by Thomas and Benson (1970).

Streamflow characteristics

Streamflow characteristics that were studied are the $Q_{7,2}$ and $Q_{7,10}$. These characteristics are widely used to describe low flow. The multiple-regression analyses included these characteristics for 31 sites (eight gaging stations, 10 low-flow partial-record stations, and 13 miscellaneous sites with six or seven discharge measurements) with $Q_{7,10}$ values larger than $0.1 \text{ ft}^3/\text{s}$. Stations with a substantial amount of effluent added to the streamflow were not included in the analyses. The streamflow characteristics are the dependent variables in the multiple-regression analyses.

Basin characteristics

Differences in streamflow for various locations and times are caused by the differences in precipitation patterns and runoff characteristics. Climatic, topographic, and aquifer features are basin characteristics that were quantified to explain the variation in low flow. These indices are the independent variables in the multiple-regression analysis. The following list of basin characteristics contains a brief discussion of their effect on low flow and how the indices were determined.

Drainage area (A).--Size of the drainage area is one of the most significant characteristics in explaining differing streamflow between sites. The drainage area of a stream is that area, measured in a horizontal plane, that is enclosed by a drainage divide. Drainage areas, in square miles, were computed from U.S. Geological Survey topographic maps. Most drainage-area data for this study were obtained from Holmstrom (1972, 17a-19h).

Main-channel slope (S).--Main-channel slope (Benson, 1962 and 1964) is a characteristic that relates to differences in streamflow for different basins. The index of slope used in this analysis is the average slope, in feet per mile, between points 10 percent and 85 percent of the distance upstream from the gaged site to the drainage-basin divide.

Main-channel length (L).--Main-channel length is another landform characteristic that indicates basin shape in conjunction with drainage area of the basin. In estimating ground-water runoff to the stream, L can be viewed as describing the length of the vertical cross-sectional area of the porous aquifer material through which the flow occurs. Channel length, in miles, was obtained from the U.S. Geological Survey topographic maps by measuring the total indicated blue-line length.

Basin storage (Bs).--Basin storage is the area occupied by lakes and marshes and is expressed as a percentage of the total drainage area of the site. Variations in streamflow can be caused by retention and release of water from basin storage. For some streams, runoff is delayed by storage, but total runoff is not reduced; whereas, on other streams prolonged retention allows increased

evapotranspiration that results in decreased runoff. Essentially, the basin storage index is used in the analysis to reflect the effect of evapotranspiration on low flow.

The basin storage area was obtained from U.S. Geological Survey topographic maps. A value of 1.00 percent was added to all values of basin storage to avoid problems of using zero in the regression analysis.

Forest cover (F).--Forests affect streamflow in several ways. Their major influences on low flow relate to transpiration and interception of precipitation before it reaches the ground.

The forest-cover index used in this analysis is the percentage of drainage area covered by forests as shown on U.S. Geological Survey topographic maps. A value of 1.00 percent was added to all values of forest cover to avoid problems of using zero in the regression analysis.

Mean annual precipitation (P).--Mean annual precipitation of a basin expresses the amount of water available for potential runoff. The precipitation that infiltrates the soil and passes through the unsaturated zone to the aquifers is the source of base flow for a stream. The mean annual precipitation, in inches, for each basin was computed from an isohyetal map determined from precipitation recorded at U.S. Weather Service stations (Wisconsin Statistical Reporting Service, 1967, p. 18).

A constant value of 20 in. was subtracted from each value for use in the regression analysis. This reduction provides constants and exponents in the regression equation that are more manageable.

Soil-infiltration rate (I).--Soil permeability influences the amount of direct runoff from precipitation and the amount of water that infiltrates the soil. The permeability used is an average rate for the basin under average soil and moisture conditions.

Soil types and average permeability, in inches per hour, for each basin were determined from maps by Skinner and Borman (1973, sheet 1).

Mean annual snowfall (Sn).--Mean annual snowfall, like mean annual precipitation, is an indicator of water available for runoff. For each basin an average mean annual snowfall, in inches, was determined from an isohyetal map determined from snowfall recorded during 1930-59 (Wisconsin Statistical Reporting Service, 1970, p. 1) and average snowfall values from National Weather Service weather stations in the basin (Wisconsin Crop Reporting Service, 1961). A constant of 20 in. was subtracted from each value to provide more manageable constants and exponents in the equations.

Base-flow index (Bf).--A discharge measurement of a stream during base-flow conditions is an indicator of its low-flow potential. Base-flow measurements provide considerable information about the characteristics of aquifers that discharge to the stream. To use base-flow measurements, it is necessary to relate them to a nearby continuous-record gaging station because measurements are obtained at various flow durations. To evaluate the technique and develop the necessary relationships for this study, sites were selected that had discharge measurements previously obtained for other low-flow investigations.

The base-flow index values were determined by the equation:

$$Bf = \frac{Q_m Q_{90}}{A Q_r}$$

where:

Bf = base-flow index for low-flow partial-record station or miscellaneous site, in cubic feet per second per square mile;

Q_m = measured discharge at low-flow partial-record station or miscellaneous site, in cubic feet per second;

A = drainage area at low-flow partial-record station or miscellaneous site, in square miles;

Q₉₀ = 90 percent flow-duration discharge at the correlating continuous-record gaging station, in cubic feet per second; and

Q_r = discharge recorded at the continuous-record gaging station the day that Q_m was made at the low-flow partial-record station or miscellaneous site, in cubic feet per second.

In effect the measured discharge (Q_m) is converted to a unit discharge by dividing the value by the drainage area (A). This value is then adjusted to the 90 percent flow duration by multiplying it by the ratio of that day's Q₉₀/Q_r at the continuous-recording gaging station.

Plate 2 shows the location of 86 sites with base-flow index values, their respective drainage-area outlines, and their computed base-flow index values. This plate can be used to estimate base-flow index values for sites where low-flow estimates are required and streamflow data are not available.

Hydraulic conductivity (K).--Hydraulic conductivity of an aquifer is the volume of water at the existing kinematic viscosity that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. Average values of hydraulic conductivity were estimated for the drift in the basin; they are:

	Hydraulic conductivity [(gal/d)/ft ²]
Lake deposits (clay, silt, and sand).....	1
Ground moraine (till; consists of clay, silt, sand, pebbles, cobbles, and boulders).....	10
End moraine (till; includes some minor ice-contact stratified drift).....	100
Outwash and ice-contact deposits (sand, sand and gravel).....	2,500

Average values of hydraulic conductivity were obtained for each of the subbasins by the following procedures: (1) Outline subbasin divide on glacial geology map (Skinner and Borman, 1973, sheet 1), (2) determine the subbasin area for each of the drift types, (3) multiply these subareas by the hydraulic conductivity values assigned to the drift, and (4) divide the sum of these products by the sum of the subareas.

Drift thickness (H).--Drift is an aquifer that stores water for release to streams in the basin. The thickness of drift ranges from less than 50 ft in Door County to 350 ft in end moraines and bedrock lows in the southern two-thirds of the basin. An average drift thickness, in feet, for each subbasin was determined from the glacial geology and drift thickness map by Skinner and Borman (1973, sheet 1).

Transmissivity (T).--The water-transmitting capability of an aquifer is expressed in terms of transmissivity. Values of transmissivity were obtained by the product of hydraulic conductivity and drift thickness.

Values for these basin characteristics for low-flow partial-record stations and selected miscellaneous sites and gaging stations in the basin are listed in table 2.

Additional basin characteristics (grassland, brush, bare soil, cropland, and urban area) were determined using Landsat imagery in an attempt to improve the multiple-regression equations. The addition of basin characteristics using Landsat imagery had improved standard errors for low-flow regression equations in the lower Wisconsin River basin (Allord and Scarpace, 1979). However, tested results showed that the addition of characteristics determined from Landsat imagery did not improve standard errors of the regression equations for this basin, and Landsat basin characteristics were not added to table 2.

Regression analysis

Multiple-regression analysis was used to determine the relationship between the low-flow characteristics (dependent variables) and the basin characteristics (independent variables). The analysis provides an equation, or series of equations, relating the dependent to the independent variables. This analysis defined mathematical equations of the form:

$$Q_T = a A^{b_1} B^{b_2} C^{b_3} \dots N^{b_n},$$

where:

Q_T is a 7-day low-flow characteristic having a T-year recurrence interval, in cubic feet per second;

a is a regression constant defined by the regression analysis;

ABC.....N are drainage-basin characteristics; and

$b_1 b_2 b_3 \dots b_n$ are regression coefficients defined by regression analysis.

The analysis also defined the standard error of estimate (SE) of the dependent variables and the statistical significance of each variable in the equation.

The standard error of estimate is a measure of the accuracy of the regression relationships. It describes the error between the defined relationship and the data included in the analysis. Sixty-seven percent of the estimates made by the regression equations should be within one standard error of the true value.

Step-backward regression analyses were done by digital computer through the use of procedures outlined by Thomas and Benson (1970, p. 26-31). The equations with the lowest standard error of estimate with all variables significant at the 95 percent confidence level were selected as the best equations for prediction.

Two separate sets of analyses were done to develop prediction equations. One analysis included all basin characteristics except for base-flow index. These equations had extremely high standard errors of estimate and are not given. The other analysis contained all basin characteristics, including the base-flow index. These equations are applicable for sites with one or two base-flow discharge measurements. The equations are applicable for sites with drainage areas less than 165 mi².

Sites without base-flow data

Regression equations which did not incorporate a factor for base flow had extremely high standard error of estimates (SE_{7,2} = 320 percent and SE_{7,10} = 330 percent) and are not included in the report.

Sites with some base-flow data

Two equations were selected from the analyses for sites with some base-flow data (one or two base-flow discharge measurements) available. The equations and their respective standard errors of estimate are:

<u>Equation</u>	<u>Standard error</u>	
$Q_{7,2} = 0.780A^{1.08}Bf^{1.15}$	$SE_{7,2} = 42$ percent	(1)
$Q_{7,10} = 0.262A^{1.22}Bf^{1.30}$	$SE_{7,10} = 69$ percent	(2)

$Q_{7,2}$ is the 7-day, 2-year low flow, in cubic feet per second;

$Q_{7,10}$ is the 7-day, 10-year low flow, in cubic feet per second;

A is the drainage area, in square miles; and

Bf is the base-flow index, in cubic feet per second per square mile.

Equations 1 and 2 should provide estimates of $Q_{7,2}$ and $Q_{7,10}$ at approximately the SE indicated, for sites where one or two base-flow discharge measurements have been made during low base-flow periods (flow durations greater than 80 percent). For sites without streamflow data and not on small tributaries, equations 1 and 2 can be used for the following conditions:

1. For ungaged sites that are located in an area where the degree of uniformity among Bf values is high (approximately ± 0.15), as shown on plate 2.
2. For ungaged sites that are located within the indicated subbasins on plate 2.

If these conditions exist, values of Bf can be estimated from plate 2 and equations 1 and 2 can be used.

Equations 1 and 2 are applicable for use at sites with drainage areas less than 165 mi².

Verification of regression equations
that use base-flow index

To test the validity of equations 1 and 2 for other flow conditions and time periods, the following comparison was done using all low-flow partial-record and miscellaneous stations for which low-flow characteristics were determined. Periods selected for analyses were: a low base-flow period (flow durations greater than 80 percent); a medium base-flow period (flow durations 60 to 80 percent); and a high base-flow period (flow durations less than 60 percent). Values of Bf were computed as outlined previously. Substituting these new values of Bf into equations 1 and 2, estimates of $Q_{7,2}$ and $Q_{7,10}$ were determined for these stations. When compared to the $Q_{7,2}$ and $Q_{7,10}$ values listed in table 1, the following SE's were determined for the estimated low-flow characteristics.

Regression analysis equations	SE from regression analysis	SE using various flow conditions to determine Bf		
		Low base flow	Medium base flow	High base flow
Equation 1	42 percent	51 percent	200 percent	250 percent
Equation 2	69 percent	67 percent	160 percent	250 percent

As illustrated, equations 1 and 2 provide results fairly close to the SE from the regression analysis for low base-flow conditions. For medium and high base-flow conditions the SE using equations 1 and 2 were much greater than the SE predicted by the regression analysis. Therefore, equations 1 and 2 should only be used for stations with discharge measurements made during low base-flow periods.

Application of estimating procedures

Sites without base-flow data

Low-flow characteristics at an ungauged site may be computed as follows:

1. If the conditions listed on page 18 are met, use steps 2 through 4 and equations 1 and 2 (page 17) to determine the low-flow characteristics at ungauged sites.
2. Compute drainage area as indicated on page 13.
3. Determine base-flow index from plate 2.
4. Substitute these values into equations 1 and 2 and solve for the low-flow characteristics.

For ungauged sites in regions where the degree of uniformity of base-flow index values is high, Bf can be estimated from plate 2 and equations 1 and 2 can be used to determine the low-flow characteristics. For example, to determine the low-flow characteristics for East Twin River at County Trunk J near Stangelville the applicable equations are:

$$Q_{7,2} = 0.780A^{1.08}Bf^{1.15} \quad (1)$$

$$Q_{7,10} = 0.262A^{1.22}Bf^{1.30} \quad (2)$$

Drainage area was determined as outlined on page 13 and is 29.8 mi².

The base-flow index is determined from plate 2 and is a weighted average based on drainage area:

$$Bf = \frac{A_1 Bf_1 + A_2 Bf_2}{A_1 + A_2}$$

where: A_1 = drainage area at station 04085230 = 8.67 mi²,

Bf_1 = base-flow index at station 04085230 = 0.035,

A_2 = intervening drainage area between site of interest and station 04085230 = 21.1 mi², and

Bf_2 = base-flow index for intervening area between site of interest and station 04085230 = 0.15.

$$BF = \frac{A_1 Bf_1 + A_2 Bf_2}{A_1 + A_2}$$

$$Bf = \frac{8.67(0.035) + 21.1 (0.15)}{8.67 + 21.1}$$

$$Bf = \frac{0.30 + 3.2}{29.8}$$

$$Bf = 0.12$$

Substituting these values into their respective equations:

$$\begin{aligned} Q_{7,2} &= 0.780A^{1.08}Bf^{1.15} \\ &= 0.780(29.8)^{1.08}(0.12)^{1.15} \\ &= 0.780(39.1)(0.087) \\ &= 2.7 \text{ ft}^3/\text{s} \end{aligned}$$

$$\begin{aligned} Q_{7,10} &= 0.262A^{1.22}Bf^{1.30} \\ &= 0.262(29.8)^{1.22}(0.12)^{1.30} \\ &= 0.262(62.9)(0.064) \\ &= 1.1 \text{ ft}^3/\text{s} \end{aligned}$$

And, if conditions listed on page 18 are not met, a discharge measurement at low base-flow conditions is needed at the site.

Sites with some base-flow data

Computation of the low-flow characteristics at sites with low base-flow measurements available is made as follows:

1. Determine from plate 1 and table 1 the type of streamflow data that are available.
2. If the streamflow measurements were made during low base-flow conditions (discharge is lower than the 80 percent flow-duration discharge at nearby gaging stations), the BF should be determined as outlined on pages 14 and 15.
3. Compute drainage area as outlined on page 13.
4. Substitute values determined in steps 3 and 4 into equations 1 and 2.

To determine low-flow characteristics at sites using a single streamflow measurement, the following procedure at the site, West Branch Milwaukee River near Campbellsport (station 04086130), is used as an example.

The applicable equations are:

$$Q_{7,2} = 0.780A^{1.08}Bf^{1.15} \quad (1)$$

$$Q_{7,10} = 0.262A^{1.22}Bf^{1.30} \quad (2)$$

Drainage area (A) obtained from table 1, page 64, is 27.4 mi².

Following the same general procedure indicated on pages 14 and 15, a Bf value was determined by the equation:

$$Bf = \frac{Q_m Q_{90}}{A Q_r}$$

where: Q_m is the measured discharge, 2.83 ft³/s, of West Branch Milwaukee River near Campbellsport on October 3, 1968;

A is the drainage area, 27.4 mi², of West Branch Milwaukee River near Campbellsport;

Q_r is the recorded discharge at a nearby continuous-record gaging station. Referring to plate 1, station 04086150, Milwaukee River at Kewaskum is the closest unregulated gaging station. From U.S. Geological Survey, 1971, the daily mean discharge for October 3, 1968, was 12 ft³/s, which is at the 82 percent flow duration (table 1, p. 64); and the

Q_{90} for Milwaukee River at Kewaskum is 8.3 ft³/s, obtained from table 1.

Substituting these values in the equation:

$$\begin{aligned} Bf &= \frac{Q_m Q_{90}}{A Q_r} \\ &= \frac{(2.83)(8.3)}{(27.4)(12)} \\ &= 0.071 \end{aligned}$$

The low-flow characteristics then can be determined by substituting these values in their respective equations.

$$\begin{aligned}Q_{7,2} &= 0.780A^{1.08}Bf^{1.15} \\ &= 0.780(27.4)^{1.08}(0.071)^{1.15} \\ &= 0.780(35.7)(0.048) \\ &= 1.3 \text{ ft}^3/\text{s}\end{aligned}$$

$$\begin{aligned}Q_{7,10} &= 0.262A^{1.22}Bf^{1.30} \\ &= 0.262(27.4)^{1.22}(0.071)^{1.30} \\ &= 0.262(56.8)(0.032) \\ &= 0.48 \text{ ft}^3/\text{s}\end{aligned}$$

COMPARISON OF METHODS

Table 3 compares the methods available and provides: type of data required; number of sites where required data are available; time required to collect data; analytical method used to determine the low-flow characteristics; and standard error of estimate associated with the method. If a high degree of reliability is required of low-flow characteristics and sufficient time is available for data collection, a gaging station or low-flow partial-record station can be operated. If less reliability is acceptable at a site or if time and money are limited, three base-flow discharge measurements can be obtained or the regression equations may be sufficient.

SUMMARY

Low-flow characteristics were determined at 30 gaging stations, 22 low-flow partial-record stations, and 123 miscellaneous sites.

The method used in estimating the low-flow characteristics was dependent on the amount of discharge data available at the site. The low-flow characteristics at gaging stations having 10 or more years of record were determined by a log-Pearson Type III frequency analysis or plotting-position analysis. At low-flow partial-record stations (eight or more discharge measurements) or miscellaneous sites with three or more discharge measurements, a graphical regression was used to determine the $Q_{7,2}$ and $Q_{7,10}$. Multiple-regression equations were developed to determine the low-flow characteristics at miscellaneous sites with one or two discharge measurements made at low base-flow conditions (flow durations greater than 80 percent). The standard error of estimate of the 7-day, 10-year low flow ($SE_{7,10}$) ranged from 25 to 70 percent,

depending on the type of data available. The methods used to determine the standard errors are not precise and are only a relative guide to indicate a general level of confidence.

The multiple-regression equations developed can be used to determine low-flow characteristics only at sites with one low base-flow discharge measurement. The equations developed for sites with no discharge measurements available are not useful because of the high standard errors. The most significant characteristics in explaining the variation in low flow were drainage area and base-flow index.

Low-flow characteristics determined in the Lake Michigan basin for all methods have higher standard errors of estimate than other basins in the State. The reasons for the large errors are complex and not easily identified. Some of the factors that probably contributed are: the basin is long and narrow with a wide range in climatic and geographic characteristics as compared to other basins; low flows may be affected by urbanization and the basin is the most heavily urbanized basin in the State; the discharges are very low or near 0 ft³/s for many streams due to low soil permeabilities, which makes it difficult to determine low-flow characteristics accurately; and the flow system is complex due to the presence of Lake Michigan altering ground-water flow patterns.

REFERENCES

- Allord, G. J., and Scarpace, F. L., 1979, Improving streamflow estimates through the use of Landsat: Proceedings, 5th Annual William T. Pecora Symposium, Sioux Falls, South Dakota.
- Benson, M. A., 1962, Factors influencing the occurrence of floods in a humid region of diverse terrain: U.S. Geological Survey Water-Supply Paper 1580-B, 64 p.
- _____, 1964, Factors affecting the occurrence of floods in the Southwest: U.S. Geological Survey Water-Supply Paper 1580-D, 72 p.
- Field, S. J., 1975, Low-flow study of the Pike River basin, Racine and Kenosha Counties, Wisconsin: U.S. Geological Survey Open-File Report 75-653, 10 p.
- Gebert, W. A., 1971, Low-flow frequency of Wisconsin streams: U.S. Geological Survey Hydrologic Investigations Atlas HA-390.
- Hardison, C. H., and Moss, M. E., 1972, Accuracy of low-flow characteristics estimated by correlation of base-flow measurements: U.S. Geological Survey Water-Supply Paper 1542-B, 55 p.
- Holmstrom, B. K., 1972, Drainage-area data for Wisconsin streams: U.S. Geological Survey open-file report, 74 p.

- 1979, Low-characteristics of Wisconsin streams at sewage-treatment plants and industrial plants: U.S. Geological Survey Water-Resources Investigations 79-31, 123 p.
- Hutchinson, R. D., 1970, Water resources of Racine and Kenosha Counties, southeastern Wisconsin: U.S. Geological Survey Water-Supply Paper 1878, 63 p.
- Riggs, H. C., 1972, Low-flow investigations: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 4, Chapter B1, 18 p.
- Ruff, J., Anderson, G., Bode, J., Hausmann, S., Moe, T. A., Liebenstein, L., Schuettpelz, D., and Schultz, J., 1976, Southeastern Wisconsin River basins: Wisconsin Department of Natural Resources River Basin Report, 136 p.
- Skinner, E. L., and Borman, R. G., 1973, Water resources of Wisconsin-Lake Michigan basin: U.S. Geological Survey Hydrologic Investigations Atlas HA-432.
- Thomas, D. M., and Benson, M. A., 1970, Generalization of streamflow characteristics from drainage-basin characteristics: U.S. Geological Survey Water-Supply Paper 1975, 55 p.
- U.S. Geological Survey, 1971, Water resources data for Wisconsin, 1969: U.S. Geological Survey Annual Report, 253 p.
- Wisconsin Crop Reporting Service, 1961, Wisconsin climatological data: Madison, Wisconsin Department of Agriculture, 166 p.
- Wisconsin Legislative Reference Bureau, 1979, The State of Wisconsin 1979-80 Blue Book: Madison, Department of Administration, Document Sales and Distribution, 987 p.
- Wisconsin Statistical Reporting Service, 1967, Wisconsin weather: Madison, Wisconsin Statistical Reporting Service, 31 p.
- 1970, Snow and frost in Wisconsin: Madison, Wisconsin Statistical Reporting Service, 28 p.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin

04085140 Lake Michigan tributary near Champion, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, T. 24 N., R. 21 E., Brown County, at County Trunk A, 4.9 mi west of Champion.
Drainage area.--12.4 mi². Tributary to.--Lake Michigan.
Type of site.--Miscellaneous site.
Discharge measurement.--Oct. 4, 1968, 0.04 ft³/s.
Low-flow frequency.--Q_{7,2} = 0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.
Basis of estimate.--Used multiple-regression equations 1 and 2.
Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085143 Lake Michigan tributary near Dyckesville, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, T. 25 N., R. 22 E., Brown County, at State Highway 57, 1.2 mi southwest of Dyckesville.
Drainage area.--5.19 mi². Tributary to.--Lake Michigan.
Type of site.--Miscellaneous site.
Discharge measurement.--Oct. 4, 1968, 0.04 ft³/s.
Low-flow frequency.--Q_{7,2} = 0.02 ft³/s, Q_{7,10} = <0.01 ft³/s.
Basis of estimate.--Used multiple-regression equations 1 and 2.
Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085146 Red River near Dyckesville, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 8, T. 25 N., R. 23 E., Kewaunee County, at County Trunk A, 2.0 mi northeast of Dyckesville.
Drainage area.--12.8 mi². Tributary to.--Lake Michigan.
Type of site.--Miscellaneous site.
Discharge measurement.--Oct. 3, 1968, 0.06 ft³/s.
Low-flow frequency.--Q_{7,2} = 0.02 ft³/s, Q_{7,10} = <0.01 ft³/s.
Basis of estimate.--Used multiple-regression equations 1 and 2.
Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085147 Red River near Dyckesville, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, T. 25 N., R. 23 E., Kewaunee County, at State Highway 57, 1.9 mi northeast of Dyckesville.
Drainage area.--13.7 mi². Tributary to.--Lake Michigan.
Type of site.--Miscellaneous site.
Discharge measurement.--Oct. 3, 1968, 0.08 ft³/s.
Low-flow frequency.--Q_{7,2} = 0.03 ft³/s, Q_{7,10} = <0.01 ft³/s.
Basis of estimate.--Used multiple-regression equations 1 and 2.
Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085150 Renard Creek near Brussels, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, T. 26 N., R 23 E., Door County, at town road, 4.2 mi southwest of Brussels.

Drainage area.--6.0 mi². Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.52 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.27 ft³/s, Q_{7,10} = 0.08 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085152 Renard Creek tributary near Brussels, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, T. 26 N., R. 23 E., Door County, at town road, 4.4 mi southwest of Brussels.

Drainage area.--0.42 mi². Tributary to.--Renard Creek.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.33 ft³/s.

Low-flow frequency.--Additional discharge measurements should be obtained to determine low-flow characteristics.

04085154 Renard Creek near Brussels, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T. 26 N., R. 23 E., Door County, at mouth, 5.1 mi southwest of Brussels.

Drainage area.--7.88 mi². Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.57 ft³/s.

Low-flow frequency.--Additional discharge measurements should be obtained to determine low-flow characteristics.

04085156 Sugar Creek near Brussels, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, T. 27 N., R. 23 E., Door County, at County Trunk N, 4.0 mi northwest of Brussels.

Drainage area.--13.3 mi². Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.42 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.20 ft³/s, Q_{7,10} = 0.06 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085158 Keyes Creek near Little Sturgeon, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T. 27 N., R. 24 E., Door County, at County Trunk C, 1.4 mi south of Little Sturgeon.

Drainage area.--14.4 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 1, 1968, 0.52 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085160 Fish Creek at Fish Creek, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, T. 31 N., R. 27 E., Door County, at State Highway 42, 0.4 mi east of Fish Creek.

Drainage area.--11.3 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in area were greater than Q_{7,2} discharge.

Accuracy.--Not applicable.

04085163 Heins Creek near Baileys Harbor, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, T. 30 N. R. 27 E., Door County, at County Trunk EE, 2.2 mi west of Baileys Harbor.

Drainage area.--4.48 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0.87 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085165 Heins Creek near Jacksonport, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, T. 29 N., R. 28 E., Door County, at State Highway 57, 3.2 mi northeast of Jacksonport.

Drainage area.--14.5 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0.07 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085168 Hibbard Creek near Jacksonport, Wis.

Location--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, T. 29 N., R. 27 E., Door County, at town road, 1.8 mi northwest of Jacksonport.

Drainage area--9.53 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 2, 1968, 1.94 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04085170 Hibbard Creek at Jacksonport, Wis.

Location--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, T. 29 N., R. 27 E., Door County, at State Highway 57, at mouth, 0.8 mi northeast of Jacksonport.

Drainage area--16.4 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Minimum discharge measured--0.46 ft³/s, Sept. 16, 1976.

Low-flow frequency--Q_{7,2} = 1.1 ft³/s, Q_{7,10} = 0.54 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 12 measurements made during the period 1968-76.

Accuracy--SE_{7,2} = 80 percent, SE_{7,10} = 80 percent.

04085171 Logan Creek near Jacksonport, Wis.

Location--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, T. 28 N., R. 27 E., Door County, at State Highway 57, 2.2 mi southwest of Jacksonport.

Drainage area--14.7 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 2, 1968, 0.80 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04085172 Whitefish Bay Creek near Jacksonport, Wis.

Location--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, T. 28 N., R. 27 E., Door County, at Clark Lake Road, 4.1 mi south of Jacksonport.

Drainage area--18.6 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 2, 1968, 0.62 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040851723 Maple Creek at Valmy, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, T. 28 N., R. 27 E., Door County, at culvert on State Highway 57, 0.3 mi west of Valmy.

Drainage area.--5.82 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 1, 1976, 0 ft³/s; Oct. 15, 1976, 0 ft³/s; Nov. 1, 1976, 0 ft³/s; Nov. 16, 1976, 0 ft³/s; Nov. 28, 1976, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 5 discharge measurements.

Accuracy.--Not applicable.

040851725 Maple Creek at Valmy, Wis.

Location.--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, T. 28 N., R. 27 E., Door County, at town road, 1.0 mi south of Valmy.

Drainage area.--6.85 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0 ft³/s, Oct. 2, 1968; Nov. 14, 1973; Oct. 23, 1975; and July 12, 1976.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 6 discharge measurements made during the period 1968-76.

Accuracy.--Not applicable.

04085173 Shivering Sands Creek near Valmy, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, T. 28 N., R. 27 E., Door County, at County Trunk T, 3.5 mi southeast of Valmy.

Drainage area.--12.8 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 1.10 ft³/s.

Low-flow frequency.--Additional measurements should be made to determine low-flow characteristics.

04085174 Lilly Bay Creek near Sturgeon Bay, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, T. 28 N., R. 26 E., Door County, at County Trunk T, 4.6 mi east of Sturgeon Bay.

Drainage area.--20.4 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0.20 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085175 Lilly Bay Creek near Valmy, Wis.

Location.--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 6, T. 27 N., R. 27 E., Door County, at County Trunk T, 4.0 mi south of Valmy.

Drainage area.--21.5 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0.42 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085176 Woodard Creek near Maplewood, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, T. 26 N., R. 26 E., Door County, at town road, 6.9 mi east of Maplewood.

Drainage area.--2.39 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.03 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Used graphical regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085177 Schuyler Creek near Forestville, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, T. 26 N., R. 26 E., Door County, at mouth, 6.4 mi east of Forestville.

Drainage area.--3.13 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.09 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.04 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085178 Bear Creek near Forestville, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, T. 26 N., R. 26 E., Door County, at mouth, 6.2 mi east of Forestville.

Drainage area.--4.50 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.96 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085179 Stony Creek near Maplewood, Wis.

Location--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, T. 26 N., R. 25 E., Door County, at town road, 2.4 mi southeast of Maplewood.

Drainage area--12.6 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 3, 1968, 0.20 ft³/s.

Low-flow frequency--Q_{7,2} = 0.09 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate--Used multiple-regression equations 1 and 2.

Accuracy--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085180 Stony Creek near Algoma, Wis.

Location--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 5, T. 25 N., R. 26 E., Kewaunee County, at mouth, 5.5 mi northeast of Algoma.

Drainage area--24.2 mi².

Tributary to--Lake Michigan.

Type of site--Low-flow partial-record station.

Minimum discharge measured--0.07 ft³/s, July 13, 1976.

Low-flow frequency--Q_{7,2} = 0.19 ft³/s, Q_{7,10} = 0.05 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 13 discharge measurements made during the period 1968-77.

Accuracy--SE_{7,2} = 101 percent, SE_{7,10} = 102 percent.

04085184 Ahnapee River near Kolberg, Wis.

Location--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, T. 26 N., R. 24 E., Door County, at County Trunk H, 2.1 mi northeast of Kolberg.

Drainage area--21.7 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 3, 1968, 4.16 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04085186 Ahnapee River at Forestville, Wis.

Location--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, T. 26 N., R. 25 E., Door County, at County Trunk J, 0.3 mi west of Forestville.

Drainage area--32.0 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Minimum discharge measured--1.71 ft³/s, Sept. 16, 1976.

Low-flow frequency--Q_{7,2} = 1.8 ft³/s, Q_{7,10} = 0.90 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 7 discharge measurements made during the period 1968-76.

Accuracy--SE_{7,2} = 38 percent, SE_{7,10} = 54 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085190 Silver Creek near Algoma, Wis.

Location--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 19, T. 25 N., R. 25 E., Kewaunee County, at County Trunk D, 3.5 mi northwest of Algoma.

Drainage area--58.2 mi².

Tributary to--Ahnapee River.

Type of site--Low-flow partial-record station.

Minimum discharge measured--0 ft³/s, Aug. 12, 1970, July 13, 1976, and Sept. 15, 1976.

Low-flow frequency--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 13 discharge measurements made during the period 1968-77.

Accuracy--Not applicable.

040851906 Silver Creek near Algoma, Wis.

Location--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 28, T. 25 N., R. 25 E., Kewaunee County, at bridge on town road, 1.7 mi west of post office in Algoma.

Drainage area--63.1 mi².

Tributary to--Ahnapee River.

Type of site--Miscellaneous site.

Discharge measurements--Oct. 22, 1975, 4.80 ft³/s; July 13, 1976, 0.08 ft³/s; Sept. 15, 1976, 0.16 ft³/s; July 26, 1977, 0.06 ft³/s.

Low-flow frequency--Q_{7,2} = 0.08 ft³/s, Q_{7,10} = 0.01 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 4 discharge measurements.

Accuracy--Not applicable.

04085192 Lake Michigan tributary at Alaska, Wis.

Location--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, T. 24 N., R. 25 E., Kewaunee County, at bridge on town road, 1.0 mi east of Alaska.

Drainage area--1.22 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Minimum discharge measured--0 ft³/s, July 14, 1976 and Sept. 15, 1976.

Low-flow frequency--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 6 discharge measurements made during the period 1972-76.

Accuracy--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085193 Kewaunee River tributary near Luxemburg, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, T. 24 N., R. 23 E., Kewaunee County, at town road, 2.9 mi northwest of Luxemburg.

Drainage area.--10.6 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 3, 1968, 0.04 ft³/s; Aug. 31, 1971, no flow; Oct. 19, 1972, 0.39 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 3 discharge measurements.

Accuracy.--Not applicable.

040851931 Kewaunee River tributary near Luxemburg, Wis.

Location.--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, T. 24 N., R. 23 E., Kewaunee County, at County Trunk K, 3.5 mi north of Luxemburg.

Drainage area.--13.2 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 31, 1971, no flow; Oct. 19, 1972, 0.61 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in area were greater than Q_{7,2} discharge.

Accuracy.--Not applicable.

040851933 Kewaunee River near Luxemburg, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, T. 25 N., R. 23 E., Kewaunee County, at County Trunk K, 3.5 mi north of Luxemburg.

Drainage area.--20.8 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 31, 1971, <0.01 ft³/s; Oct. 19, 1972, 1.97 ft³/s.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

040851936 Kewaunee River tributary near Luxemburg, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T. 25 N., R. 23 E., Kewaunee County, at County Trunk A, 3.7 mi north of Luxemburg.

Drainage area.--2.84 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 31, 1971, <0.01 ft³/s; Oct. 19, 1972, 0.97 ft³/s.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040851939 Kewaunee River tributary near Luxemburg, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, T. 25 N., R. 23 E., Kewaunee County, at County Trunk K, 3.5 mi north of Luxemburg.

Drainage area.--5.96 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 1, 1971, 0.082 ft³/s; Oct. 17, 1972, 1.40 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.04 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

040851943 Kewaunee River near Luxemburg, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, T. 24 N., R. 23 E., Kewaunee County, just upstream from School Creek, near bridge on town road, 2.5 mi northeast of Luxemburg.

Drainage area.--31.5 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 1, 1971, 0.367 ft³/s; Oct. 18, 1972, 5.01 ft³/s; July 13, 1976, 0.325 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.18 ft³/s, Q_{7,10} = 0.06 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 3 discharge measurements.

Accuracy.--Not applicable.

040851947 School Creek near Luxemburg, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T. 24 N., R. 23 E., Kewaunee County, on State Highway 54, 2.0 mi west of Luxemburg.

Drainage area.--14.6 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 31, 1971, no flow; Oct. 20, 1972, 0.52 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in area were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

040851950 School Creek near Luxemburg, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, T. 24 N., R. 23 E., Kewaunee County, at County Trunk A, 1.2 mi north of Luxemburg.

Drainage area.--23.8 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 3, 1968, 0.14 ft³/s; Aug. 31, 1971, no flow; Oct. 20, 1972, 1.02 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 3 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040851952 School Creek near Luxemburg, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T. 24 N., R. 23 E., Kewaunee County, at bridge on town road, 2.0 mi northeast of Luxemburg.

Drainage area.--24.9 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 22, 1975, 0.92 ft³/s; July 13, 1976, 0.09 ft³/s; Sept. 15, 1976, 0.05 ft³/s; July 26, 1977, 0.12 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.05 ft³/s, Q_{7,10} = 0.01 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 4 discharge measurements.

Accuracy.--Not applicable.

0408519550 Luxemburg Creek at Luxemburg, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 22, T. 24 N., R. 23 E., Kewaunee County, at bridge on town road, 0.7 mi northeast of Luxemburg.

Drainage area.--2.78 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.15 ft³/s, Sept. 15, 1976.

Low-flow frequency.--No estimate possible, large percentage of discharge is effluent.

Remarks.--Seven discharge measurements were made during 1972-76.

040851957 Luxemburg Creek near Luxemburg, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, T. 24 N., R. 23 E., Kewaunee County, at bridge on town road, 1.6 mi northeast of Luxemburg.

Drainage area.--3.76 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 31, 1971, <0.01 ft³/s; Oct. 18, 1972, 0.79 ft³/s.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--One observation of discharge <0.01 ft³ when flows at nearby gaging stations were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

040851958 Kewaunee River near Casco, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 13, T. 24 N., R. 23 E., Kewaunee County, at bridge on State Highway 54, 2.1 mi west of Casco.

Drainage area.--65.6 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 22, 1975, 6.40 ft³/s; July 14, 1976, 0.66 ft³/s; July 26, 1977, 0.77 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.81 ft³/s, Q_{7,10} = 0.35 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River at Kewaunee using 3 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040851959 Kewaunee River near Luxemburg, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, T. 24 N., R. 24 E., Kewaunee County, at bridge on town road, 3.1 mi east of Luxemburg.

Drainage area.--67.2 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 19, 1972, 10.0 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

040851960 Casco Creek near Casco, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, T. 25 N., R. 24 E., Kewaunee County, on town road, 3.3 mi north of Casco.

Drainage area.--4.56 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 1, 1971, 0.32 ft³/s; Oct. 19, 1972, 2.96 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.20 ft³/s, Q_{7,10} = 0.06 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

040851967 Casco Creek at Casco, Wis.

Location.--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, T. 24 N., R. 24 E., Kewaunee County, at bridge on County Trunk E, at Casco.

Drainage area.--10.1 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.56 ft³/s, Sept. 15, 1976.

Low-flow frequency.--Q_{7,2} = 0.60 ft³/s, Q_{7,10} = 0.26 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 6 discharge measurements made during the period 1972-76.

Accuracy.--SE_{7,2} = 41 percent, SE_{7,10} = 58 percent.

040851970 Casco Creek near Casco, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, T. 24 N., R. 24 E., Kewaunee County, at town road, 1.2 mi southwest of Casco.

Drainage area.--15.0 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 1, 1971, 4.11 ft³/s; Oct. 18, 1972, 6.18 ft³/s; July 13, 1976, 1.48 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.85 ft³/s, Q_{7,10} = 0.50 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 3 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040851975 Scarboro Creek near Luxemburg, Wis.

Location.--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 9, T. 23 N., R. 23 E., Kewaunee County, at town road, 4.2 mi south of Luxemburg.

Drainage area.--11.8 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 31, 1971, 0.861 ft³/s; Oct. 18, 1977, 1.42 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.61 ft³/s, Q_{7,10} = 0.20 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

040851980 Scarboro Creek near Luxemburg, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, T. 24 N., R. 23 E., Kewaunee County, at town road, 2.7 mi southeast of Luxemburg.

Drainage area.--16.1 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 3, 1968, 1.21 ft³/s; Aug. 31, 1971, 1.28 ft³/s; Oct. 18, 1972, 2.60 ft³/s.

Low-flow frequency.--Q_{7,2} = 1.0 ft³/s, Q_{7,10} = 0.76 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 3 discharge measurements.

Accuracy.--Not applicable.

040851983 Scarboro Creek near Luxemburg, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, T. 24 N., R. 23 E., Kewaunee County, at County Trunk A, 3.1 mi southeast of Luxemburg.

Drainage area.--20.0 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 1, 1971, 2.32 ft³/s; Oct. 18, 1972, 4.78 ft³/s; July 13, 1976, 2.28 ft³/s.

Low-flow frequency.--Q_{7,2} = 1.9 ft³/s, Q_{7,10} = 1.4 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 3 discharge measurements.

Accuracy.--Not applicable.

040851987 Little Scarboro Creek near Luxemburg, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, T. 24 N., R. 24 E., Kewaunee County, at County Trunk A, 4.2 mi southeast of Luxemburg.

Drainage area.--0.86 mi².

Tributary to.--Kewaunee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 1, 1971, 1.44 ft³/s; Oct. 17, 1972, 2.55 ft³/s; July 13, 1976, 1.46 ft³/s.

Low-flow frequency.--Q_{7,2} = 1.2 ft³/s, Q_{7,10} = 1.0 ft³/s.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040851990 Kewaunee River near Luxemburg, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, T. 24 N., R. 24 E., Kewaunee County, at County Trunk C, 5.1 mi east of Luxemburg.

Drainage area.--112 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 1, 1971, 10.8 ft³/s; Oct. 17, 1972, 32.6 ft³/s; July 13, 1976, 11.8 ft³/s.

Low-flow frequency.--Q_{7,2} = 8.6 ft³/s, Q_{7,10} = 6.0 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 3 discharge measurements.

Accuracy.--Not applicable.

04085200 Kewaunee River near Kewaunee, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, T. 23 N., R. 24 E., Kewaunee County, at County Trunk F, 2.3 mi west of Kewaunee.

Drainage area.--127 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--September 1964 to October 1978. No winter records for years 1965 and 1966. Annual maximum, water years 1958-65.

Average discharge.--12 years, 80.4 ft³/s.

Extremes.--Maximum discharge, 6,500 ft³/s Mar. 30, 1960; minimum discharge, 4.0 ft³/s Nov. 22, 1977, result of freezeup.

Period of consecutive days	Magnitude and frequency of annual low flow of discharge, in cubic feet per second, for indicated recurrence interval, in years			
	2	5	10	20
7	10	7.9	6.9	6.4
14	11	8.2	7.4	6.8
30	12	9.1	8.0	7.4
60	14	11	9.3	8.3
90	17	12	9.9	8.7

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
		640	310	170	80	49	36
Percent ft ³ /s	60	70	80	90	95	98	99.9
	23	19	15	13	11	9.4	7.0

Accuracy.--SE_{7,2} = 10 percent, SE_{7,10} = 11 percent.

04085230 East Twin River near Ellisville, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T. 23 N., R. 23 E., Kewaunee County, at County Trunk F, 1.7 mi east of Ellisville.

Drainage area.--8.67 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 0.33 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.17 ft³/s, Q_{7,10} = 0.05 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085240 East Twin River near Tisch Mills, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, T. 22 N., R. 24 E., Kewaunee County, at County Trunk G, 3.3 mi northeast of Tisch Mills.

Drainage area.--45.8 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 6.25 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085244 East Twin River near Tisch Mills, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, T. 22 N., R. 24 E., Kewaunee County, at bridge on town road, 1.2 mi northeast of Tisch Mills.

Drainage area.--49.7 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--3.22 ft³/s, Sept. 15, 1976.

Low-flow frequency.--Q_{7,2} = 3.1 ft³/s, Q_{7,10} = 1.9 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 6 discharge measurements made in the period 1972-76.

Accuracy.--SE_{7,2} = 16 percent, SE_{7,10} = 20 percent.

04085250 East Twin River tributary near Stangelville, Wis.

Location.--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 24, T. 22 N., R. 23 E., Kewaunee County, at State Highway 163, 2.8 mi southeast of Stangelville.

Drainage area.--7.43 mi².

Tributary to.--East Twin River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 0.24 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.12 ft³/s, Q_{7,10} = 0.03 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085270 Jambo Creek near Mishicot, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, T. 21 N., R. 23 E., Manitowoc County, 2.5 mi northwest of Mishicot.

Drainage area.--19.3 mi².

Tributary to.--East Twin River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0.46 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085280 East Twin River at Mishicot, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, T. 20 N., R. 24 E., Manitowoc County, at State Highway 147, at Mishicot.

Drainage area.--110 mi². Tributary to.--Lake Michigan.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--6.02 ft³/s, Aug. 12, 1970.

Low-flow frequency.--Q_{7,2} = 7.4 ft³/s, Q_{7,10} = 4.4 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 39 discharge measurements and daily mean flows (from gaging station located just downstream from low-flow partial-record station) recorded during the period 1968-78.

Accuracy.--SE_{7,2} = 22 percent, SE_{7,10} = 23 percent.

04085281 East Twin River at Mishicot, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, T. 20 N., R. 24 E., Manitowoc County, 500 ft downstream from State Highway 147, at Mishicot.

Drainage area.--110 mi². Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--July 1972 to September 1978. Low-flow partial-record station located just upstream from gaging station October 1968 to July 1976.

Average discharge.--6 years, 76.3 ft³/s.

Extremes.--Maximum discharge, 3,090 ft³/s, May 28, 1973; minimum discharge, 5.0 ft³/s, Sept. 13 and 14, 1976.

Low-flow frequency.--Q_{7,2} = 7.4 ft³/s, Q_{7,10} = 4.4 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 39 daily mean flows and discharge measurements made during the period 1968-78.

Accuracy.--SE_{7,2} = 22 percent, SE_{7,10} = 23 percent.

Remarks.--Occasional regulation caused by recreation dam 0.3 mi upstream.

04085300 Neshota River tributary near Denmark, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, T. 22 N., R. 22 E., Brown County, at U.S. Highway 141, 3.8 mi northwest of Denmark.

Drainage area.--4.31 mi². Tributary to.--Neshota River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 24, 1962, 0 ft³/s; Nov. 8, 1963, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Two observations of 0 ft³/s discharge when flows at gaging stations in the area were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085306 Neshota River near Denmark, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 22 N., R. 22 E., Brown County, at bridge on River Road, 1.4 mi northeast of Denmark.

Drainage area.--39.2 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--1.06 ft³/s, July 13, 1976.

Low-flow frequency.--Q_{7,2} = 0.85 ft³/s, Q_{7,10} = 0.57 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 6 discharge measurements made during the period 1968-76.

Accuracy.--SE_{7,2} = 21 percent, SE_{7,10} = 29 percent.

04085308 Neshota River tributary near Denmark, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, T. 22 N., R. 22 E., Brown County, at mouth, 1.4 mi northeast of Denmark.

Drainage area.--1.47 mi².

Tributary to.--Neshota River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 1.18 ft³/s.

Low-flow frequency.--No estimate possible, large percentage of discharge is effluent.

04085309 Neshota River near Denmark, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, T. 22 N., R. 22 E., Brown County, just downstream from unnamed tributary, 1.4 mi northeast of Denmark.

Drainage area.--40.7 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 4, 1968, 2.50 ft³/s; Oct. 11, 1972, 5.71 ft³/s.

Low-flow frequency.--No estimate possible, large percentage of discharge is effluent.

04085314 Buck Creek near Cooperstown, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, T. 22 N., R. 23 E., Kewaunee County, at town road, 2.4 mi northeast of Cooperstown.

Drainage area.--20.1 mi².

Tributary to.--West Twin River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 0.30 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.15 ft³/s, Q_{7,10} = 0.04 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085322 Devils River near Denmark, Wis.

Location--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, T. 21 N., R. 22 E., Manitowoc County, at County Trunk T, 2.7 mi south of Denmark.

Drainage area--29.6 mi².

Tributary to--West Twin River.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 2, 1968, 1.17 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04085324 Tributary to West Twin River tributary at Maribel, Wis.

Location--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 21 N., R. 22 E., Manitowoc County, at bridge on County Trunk A, at Maribel.

Drainage area--0.66 mi².

Tributary to--West Twin River tributary.

Type of site--Miscellaneous site.

Discharge measurements--Oct. 11, 1972, 0 ft³/s; Aug. 2, 1973, 0 ft³/s; Oct. 21, 1975, 0 ft³/s; July 13, 1976, 0 ft³/s.

Low-flow frequency--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 4 observations of no flow.

Accuracy--Not applicable.

04085326 West Twin River tributary at Kellnersville, Wis.

Location--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, T. 20 N., R. 23 E., Manitowoc County, at bridge on County Trunk H, at Kellnersville.

Drainage area--2.70 mi².

Tributary to--West Twin River.

Type of site--Miscellaneous site.

Discharge measurements--Oct. 11, 1972, 0 ft³/s; Aug. 2, 1973, 0 ft³/s; Oct. 21, 1975, 0 ft³/s; July 13, 1976, 0 ft³/s.

Low-flow frequency--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 4 observations of no flow.

Accuracy--Not applicable.

04085330 West Twin River near Francis Creek, Wis.

Location--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, T. 20 N., R. 24 E., Manitowoc County, at County Trunk Q, 2.3 mi northeast of Francis Creek.

Drainage area--150 mi².

Tributary to--Lake Michigan.

Type of site--Low-flow partial-record station.

Minimum discharge measured--10.5 ft³/s, Aug. 12, 1970.

Low-flow frequency--Q_{7,2} = 11 ft³/s, Q_{7,10} = 7.1 ft³/s.

Basis of estimate--Graphical regression with Kewaunee River near Kewaunee using 12 discharge measurements made during the period 1968-76.

Accuracy--SE_{7,2} = 16 percent, SE_{7,10} = 21 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040853315 West Twin River tributary near Francis Creek, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 24, T. 20 N., R. 23 E., Manitowoc County, at culvert on County Trunk Q, 2.0 mi east of Francis Creek.

Drainage area.--2.43 mi².

Tributary to.--West Twin River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.065 ft³/s, July 13, 1976.

Low-flow frequency.--No estimate possible, measured discharge predominantly effluent.

04085334 West Twin River tributary near Rockwood, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, T. 20 N., R. 23 E., Manitowoc County, at culvert on town road, 1.4 mi northeast of Rockwood.

Drainage area.--4.88 mi².

Tributary to.--West Twin River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.16 ft³/s, July 12, 1976.

Low-flow frequency.--Q_{7,2} = 0.27 ft³/s, Q_{7,10} = 0.16 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 7 discharge measurements made during the period 1972-77.

Accuracy.--SE_{7,2} = 55 percent, SE_{7,10} = 78 percent.

04085335 West Twin River at Shoto, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, T. 20 N., R. 24 E., Manitowoc County, at County Trunk B, at Shoto.

Drainage area.--165 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--13.7 ft³/s, July 12, 1976.

Low-flow frequency.--Q_{7,2} = 12 ft³/s, Q_{7,10} = 9.2 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 6 discharge measurements made during the period 1968-76.

Accuracy.--SE_{7,2} = 14 percent, SE_{7,10} = 18 percent.

04085386 South Branch Manitowoc River at Chilton, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T. 18 N., R. 19 E., Calumet County, just downstream from dam, at Chilton.

Drainage area.--74.7 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Sept. 24, 1920, 2.06 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085390 South Branch Manitowoc River near Chilton, Wis.

Location--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, T. 18 N., R. 20 E., Calumet County, at town road, 1.1 mi northeast of Chilton.

Drainage area--76.8 mi².

Tributary to--Lake Michigan.

Type of site--Low-flow partial-record station.

Minimum discharge measured--0.27 ft³/s, Oct. 1, 1976.

Low-flow frequency--Q_{7,2} = 0.37 ft³/s, Q_{7,10} = 0.05 ft³/s.

Basis of estimate--Graphical regression with Sheboygan River at Sheboygan using 11 discharge measurements made during the period 1968-77.

Accuracy--SE_{7,2} = 62 percent, SE_{7,10} = 134 percent.

04085392 Jordon Creek at New Holstein, Wis.

Location--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, T. 17 N., R. 20 E., Calumet County, at sewage-treatment plant, in New Holstein.

Drainage area--3.30 mi².

Tributary to--Pine Creek.

Type of site--Miscellaneous site.

Minimum discharge measured--0 ft³/s, Aug. 12, 1975, Oct. 1, 1976.

Low-flow frequency--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy--Not applicable.

04085396 South Branch Manitowoc River near Collins, Wis.

Location--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, T. 18 N., R. 20 E., Calumet County, at town road, 5.4 mi southwest of Collins.

Drainage area--114 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Minimum discharge measured--5.28 ft³/s, Oct. 5, 1968.

Low-flow frequency--Q_{7,2} = 2.5 ft³/s, Q_{7,10} = 1.1 ft³/s.

Basis of estimate--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements and observations of flow during the period 1968-74.

Accuracy--SE_{7,2} = 36 percent, SE_{7,10} = 57 percent.

04085400 Killsnake River near Chilton, Wis.

Location--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, T. 18 N., R. 20 E., Calumet County, at town road, 2.4 mi northeast of Chilton.

Drainage area--29.4 mi².

Tributary to--South Branch Manitowoc River.

Type of site--Low-flow partial-record station.

Minimum discharge measured--0.20 ft³/s, Oct. 10, 1963.

Low-flow frequency--Q_{7,2} = 0.21 ft³/s, Q_{7,10} = 0.06 ft³/s.

Basis of estimate--Graphical regression with Sheboygan River at Sheboygan using 23 discharge measurements made during the period 1963-77.

Accuracy--SE_{7,2} = 140 percent, SE_{7,10} = 140 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085401 Killsnake river near Chilton, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 4, T. 18 N., R. 20 E., Calumet County, at bridge on County Trunk F, 3.4 mi northeast of Chilton.

Drainage area.--32.8 mi².

Tributary to.--Manitowoc River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1974, 1.95 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

040854015 Killsnake River near Chilton, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, T. 18 N., R. 20 E., Calumet County, 15 ft upstream from mouth, 5.7 mi east of Chilton.

Drainage area.--45.2 mi².

Tributary to.--Manitowoc River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 4, 1974, 1.41 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085402 South Branch Manitowoc River near Chilton, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, T. 18 N., R. 20 E., Calumet County, 750 ft below mouth of Killsnake River, 5.9 mi east of Chilton.

Drainage area.--186 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 4, 1974, 12.5 ft³/s; Oct. 18, 1974, 15.5 ft³/s; Oct. 28, 1974, 14.1 ft³/s.

Low-flow frequency.--Q_{7,2} = 3.2 ft³/s, Q_{7,10} = 1.4 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 3 discharge measurements.

Accuracy.--Not applicable.

040854027 North Branch Manitowoc River near Hilbert, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, T. 19 N., R. 20 E., Calumet County, 0.4 mi upstream from confluence with Spring 6, 2.3 mi northeast of Hilbert.

Drainage area.--29.1 mi².

Tributary to.--Manitowoc River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 28, 1974, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in the area were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085403 Spring Creek at Brillion, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, T. 20 N., R. 20 E., Calumet County, at sewage-treatment plant, 0.3 mi downstream from State Highway 114, at Brillion.

Drainage area.--8.17 mi².

Tributary to.--North Branch Manitowoc River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.44 ft³/s, Sept. 30, 1976.

Low-flow frequency.--No estimate possible, discharge is predominantly effluent.

Remarks.--Six discharge measurements were made during the period 1972-76.

040854034 Spring Creek near Hilbert, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, T. 19 N., R. 20 E., Calumet County, 0.1 mi above mouth, 2.2 mi northeast of Hilbert.

Drainage area.--22.2 mi².

Tributary to.--North Branch Manitowoc River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 28, 1974, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in the area were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

04085404 North Branch Manitowoc River tributary at Hilbert, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 6, T. 19 N., R. 20 E., Calumet County, at culvert on Irish Road, 0.9 mi east of Hilbert.

Drainage area.--5.30 mi².

Tributary to.--North Branch Manitowoc River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0 ft³/s, ponded conditions--unable to measure velocity, Sept. 30, 1976.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

Remarks.--Six discharge measurements were made during the period 1972-76.

040854045 North Branch Manitowoc River tributary near Hilbert, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, T. 19 N., R. 20 E., Calumet County, 0.2 mi above mouth, 2.0 mi east of Hilbert.

Drainage area.--13.6 mi².

Tributary to.--North Branch Manitowoc River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 28, 1974, 0.30 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085407 Manitowoc River at Collins, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, T. 19 N., R. 21 E., Manitowoc County, at bridge on town road, 0.5 mi southwest of Collins.

Drainage area.--280 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--10.6 ft³/s, Oct. 3, 1974.

Low-flow frequency.--Q_{7,2} = 4.1 ft³/s, Q_{7,10} = 1.8 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made in 1974.

Accuracy.--SE_{7,2} = 84 percent, SE_{7,10} = 140 percent.

04085408 Mud Creek at Reedsville, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 2, T. 19 N., R. 21 E., Manitowoc County, just upstream from sewage-treatment plant, at Reedsville.

Drainage area.--32.2 mi².

Tributary to.--Manitowoc River.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 13, 1975, 0.42 ft³/s; Sept. 30, 1976, 0.12 ft³/s; July 13, 1977, 0.14 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.11 ft³/s, Q_{7,10} = 0.04 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 3 discharge measurements.

Accuracy.--Not applicable.

04085410 Mud Creek near Reedsville, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T. 19 N., R. 21 E., Manitowoc County, at town road, 1.0 mi south of Reedsville.

Drainage area.--42.0 mi².

Tributary to.--Manitowoc River.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--0.26 ft³/s, July 13, 1977.

Low-flow frequency.--Q_{7,2} = 0.32 ft³/s, Q_{7,10} = 0.12 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 12 discharge measurements made during the period 1968-77.

Accuracy.--SE_{7,2} = 22 percent, SE_{7,10} = 33 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040854106 Tributary to tributary to Manitowoc River tributary at St. Nazianz, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, T. 18 N., R. 21 E., Manitowoc County, at sewage-treatment plant, at St. Nazianz.

Drainage area.--0.35 mi². Tributary to.--Tributary to Manitowoc River tributary.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.02 ft³/s, Aug. 13, 1975.

Low-flow frequency.--Q_{7,2} = 0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

040854108 Manitowoc River tributary at Valders, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, T. 19 N., R. 22 E., Manitowoc County, at sewage-treatment plant, in Valders.

Drainage area.--5.06 mi². Tributary to.--Manitowoc River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0 ft³/s, Aug. 1, 1973, Sept. 4, 1974, Aug. 13, 1975, Aug. 12, 1976, and Oct. 1, 1976.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 7 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

04085415 Manitowoc River near Clark Mills, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, T. 19 N., R. 23 E., Manitowoc County, at town road, 3.3 mi northeast of Clark Mills.

Drainage area.--410 mi². Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 24.3 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085419 Branch River tributary near Whitelaw, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, T. 19 N., R. 22 E., Manitowoc County, at town road, 0.75 mi west of Whitelaw.

Drainage area.--1.31 mi². Tributary to.--Branch River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0 ft³/s (ponded, no measurable velocity), Sept. 5, 1974.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085420 Branch River near Cato, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 20 N., R. 22 E., Manitowoc County, at town road, 3.3 mi north of Cato.

Drainage area.--78.8 mi².

Tributary to.--Manitowoc River.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--2.81 ft³/s, July 13, 1977.

Low-flow frequency.--Q_{7,2} = 3.3 ft³/s, Q_{7,10} = 2.1 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 12 discharge measurements made during the period 1968-77.

Accuracy.--SE_{7,2} = 20 percent, SE_{7,10} = 27 percent.

040854228 Branch River near Branch, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, T. 20 N., R. 23 E., Manitowoc County, at bridge on town road, 1.7 mi northwest of Branch.

Drainage area.--95.6 mi².

Tributary to.--Manitowoc River.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 5, 1974, 7.15 ft³/s; Aug. 14, 1975, 4.01 ft³/s; Sept. 30, 1976, 4.41 ft³/s; July 13, 1977, 3.68 ft³/s.

Low-flow frequency.--Q_{7,2} = 4.3 ft³/s, Q_{7,10} = 3.1 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 4 discharge measurements.

Accuracy.--Not applicable.

04085423 Branch River tributary near Whitelaw, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, T. 20 N., R. 22 E., Manitowoc County, at culvert on County Trunk H, 1.8 mi northeast of Whitelaw.

Drainage area.--0.95 mi².

Tributary to.--Branch River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 18, 1972, 0.03 ft³/s; Oct. 11, 1972, 0 ft³/s; Aug. 1, 1973, 0.12 ft³/s; Nov. 13, 1973, 0.24 ft³/s; Sept. 5, 1974, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 5 discharge measurements.

Accuracy.--Not applicable.

040854245 Branch River at Branch, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, T. 19 N., R. 23 E., Manitowoc County, at town road, 0.3 mi south of Branch.

Drainage area.--106 mi².

Tributary to.--Manitowoc River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--6.76 ft³/s, Aug. 14, 1975.

Low-flow frequency.--Q_{7,2} = 5.6 ft³/s, Q_{7,10} = 3.5 ft³/s.

Basis of estimate.--Graphical regression with Kewaunee River near Kewaunee using 6 discharge measurements made during the period 1972-76.

Accuracy.--SE_{7,2} = 26 percent, SE_{7,10} = 37 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085427 Manitowoc River at Manitowoc, Wis.

Location.--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, T. 19 N., R. 23 E., Manitowoc County, on right bank 300 ft upstream from bridge on County Trunk JJ, just west of the Manitowoc city limits, 6.6 mi upstream from mouth.

Drainage area.--526 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--July 1972 to September 1978.

Average discharge.--6 years, 314 ft³/s.

Extremes.--Maximum discharge, 4,010 ft³/s Mar. 27, 1976; minimum discharge, 10 ft³/s Nov. 7, 1976 (result of freezeup).

Low-flow frequency.--Q_{7,2} = 14 ft³/s, Q_{7,10} = 7.1 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 37 daily mean discharges recorded during the period 1972-78.

Accuracy.--SE_{7,2} = 44 percent, SE_{7,10} = 44 percent.

04085435 Silver Creek near Manitowoc, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, T. 18 N., R. 23 E., Manitowoc County, at town road, 2.6 mi southwest of downtown Manitowoc.

Drainage area.--21.2 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.11 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.04 ft³/s, Q_{7,10} = 0.01 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04085438 Pine Creek at Newton, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 18 N., R. 23 E., Manitowoc County, at bridge on County Trunk C, 1.0 mi northeast of Newton.

Drainage area.--6.60 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.02 ft³/s, Aug. 14, 1975.

Low-flow frequency.--Q_{7,2} = 0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

04085440 Point Creek near Newton, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, T. 17 N., R. 23 E., Manitowoc County, at County Trunk LS, 2.3 mi southeast of Newton.

Drainage area.--18.7 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.76 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040854423 Centerville Creek at Centerville, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, T. 17 N., R. 23 E., Manitowoc County, at railroad bridge at Cleveland.
Drainage area.--3.12 mi². Tributary to.--Lake Michigan.
Type of site.--Miscellaneous site.
Discharge measurements.--Sept. 24, 1974, 0.080 ft³/s; Aug. 13, 1975, 0 ft³/s; Aug. 12, 1976, 0.005 ft³/s;
 Sept. 29, 1976, 0.117 ft³/s; July 13, 1977, 0.13 ft³/s.
Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.
Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 5 discharge measurements.
Accuracy.--Not applicable.

040854445 Sevenmile Creek at Haven, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, T. 16 N., R. 23 E., Sheboygan County, at bridge on County Trunk LS, 0.4 mi northeast of Haven.
Drainage area.--5.60 mi². Tributary to.--Lake Michigan.
Type of site.--Miscellaneous site.
Minimum discharge measured.--0 ft³/s, Aug. 13, 1975.
Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.
Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.
Accuracy.--Not applicable.

040854453 Lake Michigan River tributary near Sheboygan, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, T. 16 N., R. 23 E., Sheboygan County, at bridge on County Trunk LS, 3.0 mi northwest of post office, at Sheboygan.
Drainage area.--0.86 mi². Tributary to.--Lake Michigan.
Type of site.--Miscellaneous site.
Discharge measurements.--Sept. 24, 1974, 0 ft³/s; Aug. 13, 1975, 0 ft³/s; Aug. 12, 1976, 0 ft³/s;
 Sept. 29, 1976, 0 ft³/s.
Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.
Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 4 discharge measurements.
Accuracy.--Not applicable.

04085450 Pigeon River near Howards Grove, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, T. 17 N., R. 22 E., Manitowoc County, at town road, 3.9 mi north of Howards Grove.
Drainage area.--18.5 mi². Tributary to.--Lake Michigan.
Type of site.--Miscellaneous site.
Discharge measurement.--Oct. 2, 1968, 0.72 ft³/s.
Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085455 Meeme River near Cleveland, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, T. 17 N., R. 22 E., Manitowoc County, at town road, 3.1 mi west of Cleveland.

Drainage area.--19.0 mi².

Tributary to.--Pigeon River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 1.74 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085457 Pigeon River at Howards Grove, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, T. 16 N., R. 22 E., Sheboygan County, at bridge on County Trunk A, 1.0 mi north of Howards Grove.

Drainage area.--46.4 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--May 7, 1958, 3.44 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085458 Pigeon River at Howards Grove, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, T. 16 N., R. 22 E., Sheboygan County, at sewage-treatment plant, 0.2 mi east of State Highway 32, at Howards Grove.

Drainage area.--48.7 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--1.68 ft³/s, Aug. 13, 1975.

Low-flow frequency.--Q_{7,2} = 0.21 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--SE_{7,2} = 150 percent, SE_{7,10} = 380 percent.

04085459 Fisher Creek tributary near Franklin, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, T. 16 N., R. 22 E., Sheboygan County, at bridge on County Trunk A, 1.3 mi east of Franklin.

Drainage area.--1.65 mi².

Tributary to.--Fisher Creek.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.03 ft³/s, Aug. 13, 1975.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085460 Pigeon River near Howards Grove, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, T. 15 N., R. 23 E., Sheboygan County, at town road, 2.4 mi southeast of Howards Grove.

Drainage area.--65.0 mi².

Tributary to.--Lake Michigan.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--0.20 ft³/s, Aug. 30, 1970.

Low-flow frequency.--Q_{7,2} = 0.30 ft³/s, Q_{7,10} = 0.03 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 14 discharge measurements made during the period 1968-77.

Accuracy.--SE_{7,2} = 75 percent, SE_{7,10} = 160 percent.

04085462 Pigeon River tributary near Kohler, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T. 15 N., R. 22 E., Sheboygan County, at bridge on town road, 0.2 mi north of County Trunk O, 1.5 mi northwest of Kohler.

Drainage area.--4.57 mi².

Tributary to.--Pigeon River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 18, 1972, 0.02 ft³/s; July 12, 1973, too small to measure; Aug. 21, 1973, no flow; Sept. 24, 1974, no flow; Aug. 12, 1975, some ponded, mostly dry.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 5 discharge measurements.

Accuracy.--Not applicable.

040854635 Pigeon River near Sheboygan, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 18, T. 15 N., R. 23 E., Sheboygan County, at bridge on County Trunk Y, 3.4 mi northwest of post office in Sheboygan.

Drainage area.--73.7 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--July 25, 1958, 0.30 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.30 ft³/s, Q_{7,10} = 0.09 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085480 Sheboygan River near Fond du Lac, Wis.

Location.--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, T. 16 N., R. 19 E., Fond du Lac County, at County Trunk W, 10.2 mi east of downtown Fond du Lac.

Drainage area.--27.4 mi².

Tributary to.--Lake Michigan.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--0 ft³/s, July 29, 1965.

Low-flow frequency.--Q_{7,2} = 0.13 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 15 discharge measurements made during the period 1962-77.

Accuracy.--SE_{7,2} = 56 percent, SE_{7,10} = 95 percent.

040854801 Sheboygan River tributary at Mt. Calvary, Wis.

Location.--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, T. 16 N., R. 19 E., Fond du Lac County, at bridge on County Trunk W, at Mt. Calvary.

Drainage area.--12.7 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 19, 1972, 0 ft³/s; July 13, 1973, 0 ft³/s; Nov. 15, 1973, 3.95 ft³/s; Sept. 25, 1974, 0.18 ft³/s; Aug. 11, 1975, 0.20 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 5 discharge measurements.

Accuracy.--Not applicable.

04085482 Sheboygan River at St. Cloud, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, T. 16 N., R. 19 E., Fond du Lac County, at bridge on town road, 0.1 mi east of County Trunk G, 0.5 mi south of St. Cloud.

Drainage area.--73.0 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.77 ft³/s, Aug. 11, 1975.

Low-flow frequency.--Q_{7,2} = 0.40 ft³/s, Q_{7,10} = 0.12 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--SE_{7,2} = 73 percent, SE_{7,10} = 74 percent.

04085494 Sheboygan River near Elkhart Lake, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T. 16 N., R. 20 E., Sheboygan County, at County Trunk SR, at dam, 1.7 mi northwest of Elkhart.

Drainage area.--133 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 0 ft³/s.

Low-flow frequency.--No estimate possible.

Remarks.--Observed discharge of 0 ft³/s occurred when gates of dam just upstream were temporarily closed.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085497 Sheboygan River at Kiel, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 30, T. 17 N., R. 21 E., Manitowoc County, at bridge on State Highway 32, at Kiel.

Drainage area.--153 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.63 ft³/s, July 12, 1973.

Low-flow frequency.--Q_{7,2} = 1.5 ft³/s, Q_{7,10} = 0.72 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--SE_{7,2} = 75 percent, SE_{7,10} = 76 percent.

04085600 Sheboygan River near Howards Grove, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, T. 16 N., R. 21 E., Sheboygan County, at County Trunk MM, 5.5 mi northwest of Howards Grove.

Drainage area.--185 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 7.75 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085700 Sheboygan River tributary near Plymouth, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T. 15 N., R. 21 E., Sheboygan County, at County Trunk J, 3.5 mi northeast of Plymouth.

Drainage area.--6.51 mi².

Tributary to.--Sheboygan River.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--0.78 ft³/s, Aug. 14, 1964.

Low-flow frequency.--Q_{7,2} = 1.1 ft³/s, Q_{7,10} = 0.81 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 27 discharge measurements made during the period 1961-67.

Accuracy.--SE_{7,2} = 21 percent, SE_{7,10} = 23 percent.

04085748 Mullet River at Greenbush, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T. 15 N., R. 20 E., Sheboygan County, at bridge on State Highway 23, at Greenbush.

Drainage area.--24.4 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--1.15 ft³/s, Aug. 11, 1975.

Low-flow frequency.--Q_{7,2} = 0.46 ft³/s, Q_{7,10} = 0.17 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 7 discharge measurements made during the period 1972-77.

Accuracy.--SE_{7,2} = 60 percent, SE_{7,10} = 130 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085750 Mullet River at Glenbeulah, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, T. 15 N., R. 20 E., Sheboygan County, at County Trunk A, 0.4 mi southwest of Glenbeulah.

Drainage area.--29.7 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 0.80 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085751 Mullet River at Glenbeulah, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, T. 15 N., R. 20 E., Sheboygan County, at bridge on County Trunk P, at Glenbeulah.

Drainage area.--30.0 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--1.65 ft³/s, July 13, 1973.

Low-flow frequency.--Q_{7,2} = 0.62 ft³/s, Q_{7,10} = 0.23 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--SE_{7,2} = 84 percent, SE_{7,10} = 180 percent.

04085770 Mullet River at Plymouth, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, T. 15 N., R. 21 E., Sheboygan County, at bridge on State Highway 67, at Plymouth.

Drainage area.--53.0 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 8.72 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085771 Mullet River near Plymouth, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, T. 15 N., R. 21 E., Sheboygan County, at bridge on County Trunk PP, 1.0 mi south of State Highway 23, in Plymouth.

Drainage area.--55.1 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--12.7 ft³/s, July 18, 1972.

Low-flow frequency.--Q_{7,2} = 6.2 ft³/s, Q_{7,10} = 2.9 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--SE_{7,2} = 41 percent, SE_{7,10} = 75 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085772 Mullet River tributary near Plymouth, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, T. 15 N., R. 21 E., Sheboygan County, at culvert on County Trunk PP, 1.5 mi southeast of Plymouth.

Drainage area.--1.31 mi².

Tributary to.--Mullet River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.04 ft³/s, Aug. 20, 1973.

Low-flow frequency.--Q_{7,2} = 0.05 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

04085774 Mullet River tributary near Plymouth, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, T. 15 N., R. 21 E., Sheboygan County, at Gilson Manufacturing Co., just northwest of the junction of State Highway 57 and County Trunk PP, 2.5 mi southeast of Plymouth.

Drainage area.--0.13 mi².

Tributary to.--Mullet River.

Type of site.--Miscellaneous site.

Discharge measurement.--July 18, 1972, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at nearby gaging stations were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

04085778 Mullet River at Sheboygan Falls, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, T. 15 N., R. 22 E., Sheboygan County, at bridge on County Trunk PP, on southwest side of Sheboygan Falls.

Drainage area.--78.2 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--13.9 ft³/s, Aug. 13, 1975.

Low-flow frequency.--Q_{7,2} = 9.8 ft³/s, Q_{7,10} = 5.6 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--SE_{7,2} = 55 percent, SE_{7,10} = 99 percent.

04085796 Onion River near Waldo, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, T. 14 N., R. 21 E., Sheboygan County, at bridge on County Trunk V, 2.5 mi northwest of Waldo.

Drainage area.--17.2 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Discharge measurement.--Sept. 5, 1958, 5.13 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085800 Onion River near Waldo, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T. 14 N., R. 21 E., Sheboygan County, at County Trunk AC, 1.4 mi northwest of Waldo.

Drainage area.--20.7 mi².

Tributary to.--Sheboygan River.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--6.24 ft³/s, Aug. 13, 1970.

Low-flow frequency.--Q_{7,2} = 6.2 ft³/s, Q_{7,10} = 4.0 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 14 discharge measurements made during the period 1968-77.

Accuracy.--SE_{7,2} = 14 percent, SE_{7,10} = 23 percent.

04085801 Onion River at Waldo, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, T. 14 N., R. 21 E., Sheboygan County, at sewage-treatment plant, 1.0 mi east of Waldo.

Drainage area.--26.9 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Discharge measurement.--Sept. 24, 1974, 14.9 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04085810 Onion River at Hingham, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 31, T. 14 N., R. 22 E., Sheboygan County, at bridge on County Trunk I, at Hingham.

Drainage area.--36.2 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--5.62 ft³/s, Aug. 12, 1975.

Low-flow frequency.--Q_{7,2} = 4.7 ft³/s, Q_{7,10} = 3.2 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 14 discharge measurements and daily mean discharges from gaging station just downstream (A=37.2 mi²) during the period 1972-79.

Accuracy.--SE_{7,2} = 19 percent, SE_{7,10} = 29 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085813 Onion River at Hingham, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, T. 14 N., R. 22 E., Ozaukee County, on right bank 150 ft north of County Trunk W, 0.8 mi east of Hingham.

Drainage area.--37.2 mi².

Tributary to.--Sheboygan River.

Type of site.--Gaging station.

Period of record.--October 1978 to September 1979.

Extremes.--Maximum discharge, 600 ft³/s Mar. 30, 1979; minimum discharge, 9.6 ft³/s Oct. 30, 1978, and Sept. 19, 1979.

Low-flow frequency.--Q_{7,2} = 4.7 ft³/s, Q_{7,10} = 3.2 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 14 daily mean discharges and discharge measurements made upstream at 04085810 (A=36.2 mi²) during the period 1972-79.

Accuracy.--SE_{7,2} = 19 percent, SE_{7,10} = 29 percent.

04085820 Tributary to Onion River tributary at Belgium, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, T. 12 N., R. 22 E., Ozaukee County, at culvert on Park Street, at Belgium.

Drainage area.--0.23 mi².

Tributary to.--Onion River tributary.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 23, 1974, 0.89 ft³/s; Aug. 12, 1975, 0.50 ft³/s; Aug. 9, 1976, 0.23 ft³/s; Sept. 29, 1976, 0.17 ft³/s; July 11, 1977, 0.12 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

04085830 Onion River at Gibbsville, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, T. 14 N., R. 22 E., Sheboygan County, at bridge on County Trunk 00, just east of Gibbsville.

Drainage area.--82.0 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--8.38 ft³/s, July 12, 1977.

Low-flow frequency.--Q_{7,2} = 7.2 ft³/s, Q_{7,10} = 4.7 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 7 discharge measurements made during the period 1972-77.

Accuracy.--SE_{7,2} = 44 percent, SE_{7,10} = 80 percent.

04085840 Onion River tributary near Gibbsville, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, T. 14 N., R. 21 E., Sheboygan County, at bridge on County Trunk I, 2.6 mi northwest of Gibbsville.

Drainage area.--1.67 mi².

Tributary to.--Onion River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 20, 1972, 0.09 ft³/s; July 23, 1973, 0.03 ft³/s; Aug. 21, 1973, 0.12 ft³/s; Aug. 13, 1975, 0.02 ft³/s; Aug. 10, 1976, 0.04 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 5 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04085845 Onion River near Sheboygan Falls, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, T. 14 N., R. 22 E., Sheboygan County, at country road bridge, at village of Ourtown, 2.3 mi south of Sheboygan Falls.

Drainage area.--94.1 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site and gaging station.

Period of record.--Miscellaneous measurements (7), 1972-77. Gaging station, October 1978 to September 1979.

Extremes.--Maximum discharge, 2,350 ft³/s Mar. 24, 1979; minimum observed, 5.58 ft³/s Aug. 13, 1975.

Low-flow frequency.--Q_{7,2} = 6.8 ft³/s, Q_{7,10} = 4.4 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 13 daily mean discharges and discharge measurements made during the period 1972-79.

Accuracy.--SE_{7,2} = 37 percent, SE_{7,10} = 38 percent.

04085950 Onion River at Sheboygan Falls, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, T. 15 N., R. 22 E., Sheboygan County, at County Trunk EE, 0.6 mi southeast of Sheboygan Falls.

Drainage area.--98.0 mi².

Tributary to.--Sheboygan River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 9.28 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086000 Sheboygan River at Sheboygan, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, T. 15 N., R. 23 E., Sheboygan County, 0.7 mi upstream from State Highway 28, 2.7 mi southwest of Sheboygan.

Drainage area.--418 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--June 1916 to September 1924, October 1950 to September 1978.

Average discharge.--36 years, 237 ft³/s.

Extremes.--Maximum discharge, 7,680 ft³/s Mar. 22, 1975; minimum observed, about 1 ft³/s caused by shutdown of powerplants.

Period of consecutive days	Magnitude and frequency of annual low flow of discharge, in cubic feet per second, for indicated recurrence interval, in years					
	2	5	10	20	50	100
7	28	20	16	13	11	9.2
14	31	22	18	15	12	9.9
30	36	26	21	18	14	12
60	40	30	25	21	18	16
90	47	34	28	24	20	17

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
		1,690	960	560	270	180	127
Percent ft ³ /s	60	70	80	90	95	98	99.9
	70	54	42	33	27	21	9.2

Accuracy.--SE_{7,2} = 7 percent, SE_{7,10} = 11 percent.

Remarks.--Diurnal fluctuation caused by numerous powerplants upstream from station.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040860048 Black River at Oostburg, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, T. 13 N., R. 22 E., Sheboygan County, 0.1 mi west of County Trunk A, 0.5 mi north of Oostburg.

Drainage area.--0.40 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--July 11, 1973, 0 ft³/s; Aug. 21, 1973, 0 ft³/s; Sept. 24, 1974, 0 ft³/s; Aug. 13, 1975, 0 ft³/s; Aug. 10, 1976, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 5 discharge measurements.

Accuracy.--Not applicable.

04086005 Black River near Oostburg, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 32, T. 14 N., R. 23 E., Sheboygan County, at County Trunk KK, 2.1 mi northeast of Oostburg.

Drainage area.--5.38 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 4, 1968, 0.24 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086008 Black River tributary near Sheboygan, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, T. 14 N., R. 23 E., Sheboygan County, at bridge on County Trunk KK, 2.0 mi south of Sheboygan.

Drainage area.--1.62 mi².

Tributary to.--Black River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.02 ft³/s, Aug. 13, 1975.

Low-flow frequency.--Q_{7,2} = 0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 7 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

04086009 Black River near Sheboygan, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, T. 14 N., R. 23 E., Sheboygan County, at bridge on town road, at town of Wilson sewage-treatment plant, 2.9 mi southeast of State Highway 28 and U.S. Highway 191 intersection in Sheboygan.

Drainage area.--15.7 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0 ft³/s, 6 observations of no flow during the period 1972-76.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Sheboygan River at Sheboygan using 6 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086011 Barr Creek tributary at Cedar Grove, Wis.

Location.--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 24, T. 13 N., R. 23 E., Sheboygan County, at sewage-treatment plant, 0.7 mi northeast of Cedar Grove.

Drainage area.--0.82 mi².

Tributary to.--Barr Creek.

Type of site.--Miscellaneous site.

Discharge measurements.--July 10, 1973, 0.44 ft³/s; Aug. 22, 1973, 0.22 ft³/s; Sept. 23, 1974, 0.40 ft³/s; Aug. 12, 1975, 0.34 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

04086013 Sucker Creek near Lake Church, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T. 12 N., R. 22 E., Ozaukee County, at bridge on country road, 1.0 mi south of Lake Church.

Drainage area.--6.35 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.02 ft³/s, Aug. 21, 1975.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 6 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

04086014 Lake Michigan tributary (Knellsville Ditch) near Knellsville, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, T. 11 N., R. 22 E., Ozaukee County, at country road bridge, 0.7 mi southeast of Knellsville.

Drainage area.--1.85 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--<0.01 ft³/s, Aug. 23, 1973 and Aug. 9, 1976.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 6 discharge measurements made during the period 1972-76.

Accuracy.--Not applicable.

040860146 Sauk Creek tributary near Random Lake, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, T. 12 N., R. 21 E., Ozaukee County, at culvert on country road, 2.4 mi southeast of Random Lake.

Drainage area.--2.68 mi².

Tributary to.--Sauk Creek.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 23, 1974, 0.25 ft³/s; Aug. 12, 1975, 0.13 ft³/s; Aug. 10, 1976, 0.11 ft³/s; Sept. 29, 1976, 0.06 ft³/s; July 11, 1977, 0.05 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.02 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 5 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086015 Sauk Creek near Belgium, Wis.

Location--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, T. 12 N., R. 22 E., Ozaukee County, at bridge on country road, 1.5 mi southwest of Belgium.

Drainage area--17.9 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Minimum discharge measured--0 ft³/s, Aug. 9, 1976.

Low-flow frequency--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate--Graphical regression with Milwaukee River at Milwaukee using 6 discharge measurements made during the period 1975-76.

Accuracy--Not applicable.

04086020 Sauk Creek at Port Washington, Wis.

Location--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, T. 11 N., R. 22 E., Ozaukee County, at town road, 1.8 mi north of Port Washington.

Drainage area--27.4 mi².

Tributary to--Lake Michigan.

Type of site--Low-flow partial-record station.

Minimum discharge measured--0 ft³/s, 7 observations of no flow during the period 1962-76.

Low-flow frequency--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate--Graphical regression with Milwaukee River at Milwaukee using 13 discharge measurements made during the period 1962-76.

Accuracy--Not applicable.

04086024 Sauk Creek at Port Washington, Wis.

Location--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 28, T. 11 N., R. 22 E., Ozaukee County, at bridge on State Highway 33, in Port Washington.

Drainage area--32.6 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurement--Sept. 30, 1976, 0.65 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04086096 Milwaukee River tributary at Waucousta, Wis.

Location--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, T. 14 N., R. 19 E., Fond du Lac County, at U.S. Highway 45, at Waucousta.

Drainage area--14.9 mi².

Tributary to--Milwaukee River.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 3, 1968, 0.52 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086100 Milwaukee River at Campbellsport, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, T. 13 N., R. 19 E., Fond du Lac County, at private road, 0.7 mi northeast of Campbellsport.

Drainage area.--51.4 mi².

Tributary to.--Lake Michigan.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--0 ft³/s, Oct. 10, 1963.

Low-flow frequency.--Q_{7,2} = 0.23 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 12 discharge measurements made during the period 1962-68.

Accuracy.--SE_{7,2} = 61 percent, SE_{7,10} = 62 percent.

04086130 West Branch Milwaukee River near Campbellsport, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, T. 13 N., R. 18 E., Fond du Lac County, at State Highway 67, 2.7 mi west of Campbellsport.

Drainage area.--27.4 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 2.83 ft³/s.

Low-flow frequency.--Q_{7,2} = 1.3 ft³/s, Q_{7,10} = 0.48 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04086150 Milwaukee River at Kewaskum, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, T. 12 N., R. 19 E., Washington County, at dam 0.25 mi downstream from State Highway 28, at Kewaskum.

Drainage area.--138 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--April 1968 to September 1978.

Average discharge.--10 years, 87.3 ft³/s.

Extremes.--Maximum discharge, 3,040 ft³/s Mar. 22, 1975; minimum observed, 1.1 ft³/s Aug. 25-28, 1970.

Period of consecutive days	Magnitude and frequency of annual low flow of discharge, in cubic feet per second, for indicated recurrence interval, in years		
	2	5	10
7	7.6	2.7	1.4
14	8.9	3.1	1.6
30	10	3.9	2.2
60	14	5.0	2.7
90	16	5.8	3.6

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
	530	350	230	120	73	50	37
Percent ft ³ /s	60	70	80	90	95	98	99.9
	27	19	13	8.3	5.0	3.3	1.3

Accuracy.--SE_{7,2} = 27 percent, SE_{7,10} = 53 percent.

Remarks.--Occasional affect from small dam 50 ft upstream when clearing ice or debris from dam piers.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086158 Watercross Creek near Dundee, Wis.

Location.--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, T. 14 N., R. 20 E., Sheboygan County, at bridge on State Highway 67, 4.4 mi northeast of Dundee.

Drainage area.--12.9 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurement.--Nov. 2, 1956, 2.82 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086170 East Branch Milwaukee River at Dundee, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, T. 14 N., R. 19 E., Fond du Lac County, at County Trunk F, at Dundee.

Drainage area.--26.3 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 4.26 ft³/s.

Low-flow frequency.--Q_{7,2} = 2.6 ft³/s, Q_{7,10} = 1.0 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04086177 East Branch Milwaukee River near Dundee, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T. 13 N., R. 19 E., Fond du Lac County, at bridge on County Trunk SS, 2.3 mi south of Dundee.

Drainage area.--36.2 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 26, 1972, 7.90 ft³/s; June 14, 1973, 25.4 ft³/s; Aug. 15, 1973, 8.52 ft³/s; Oct. 10, 1975, 7.15 ft³/s; Sept. 28, 1976, 5.51 ft³/s.

Low-flow frequency.--Q_{7,2} = 4.2 ft³/s, Q_{7,10} = 1.2 ft³/s.

Basis of estimate.--Graphical regression with East Branch Milwaukee River using 5 discharge measurements.

Accuracy.--SE_{7,2} = 37 percent, SE_{7,10} = 42 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086200 East Branch Milwaukee River at New Fane, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, T. 13 N., R. 19 E., Fond du Lac County, at County Trunk S, 0.4 mi southwest of New Fane.

Drainage area.--54.1 mi².

Tributary to.--Milwaukee River.

Type of site.--Gaging station.

Period of record.--April 1968 to September 1978.

Average discharge.--10 years, 30.9 ft³/s.

Extremes.--Maximum discharge, 743 ft³/s Mar. 24, 1975; minimum daily, 0.76 ft³/s Sept. 16, 1971

Period of consecutive days	Magnitude and frequency of annual low flow of discharge, in cubic feet per second, for indicated recurrence interval, in years		
	2	5	10
7	5.9	2.6	1.5
14	6.2	2.9	1.8
30	6.6	3.3	2.3
60	7.9	4.2	3.2
90	8.6	4.9	3.7

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
148	105	73	44	30	23	18	
Percent ft ³ /s	60	70	80	90	95	98	99.9
15	12	8.8	6.2	4.9	3.6	1.3	

Accuracy.--SE_{7,2} = 23 percent, SE_{7,10} = 40 percent.

04086210 Milwaukee River near Kewaskum, Wis.

Location.--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, T. 12 N., R. 19 E., Washington County, at County Trunk H, 2.4 mi southeast of Kewaskum.

Drainage area.--215 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 26.3 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086237 Milwaukee River at West Bend, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, T. 11 N., R. 19 E., Washington County, at bridge on city street, at West Bend.

Drainage area.--236 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--July 26, 1972, 44.9 ft³/s; June 14, 1973, 175 ft³/s; Aug. 14, 1973, 48.7 ft³/s; Oct. 10, 1975, 35.7 ft³/s; Sept. 30, 1976, 18.9 ft³/s.

Low-flow frequency.--Q_{7,2} = 14 ft³/s, Q_{7,10} = 5.1 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 5 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086240 Milwaukee River near West Bend, Wis.

Location--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 13, T. 11 N., R. 19 E., Washington County, at dam, 1.1 mi northeast of downtown West Bend.

Drainage area--238 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 3, 1968, 29.0 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04086249 Milwaukee River tributary near West Bend, Wis.

Location--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, T. 11 N., R. 20 E., Washington County, at bridge on country road, 2.2 mi southeast of post office in West Bend.

Drainage area--7.96 mi².

Tributary to--Milwaukee River.

Type of site--Miscellaneous site.

Discharge measurement--July 25, 1968, 0.5 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04086266 Milwaukee River near Newburg, Wis.

Location--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, T. 11 N., R. 20 E., Washington County, at bridge on State Highway 33, 1.6 mi southwest of Newburg.

Drainage area--260 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurements--Sept. 30, 1976, 24.4 ft³/s; Nov. 18, 1976, 30.6 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04086270 Milwaukee River at Newburg, Wis.

Location--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, T. 11 N., R. 20 E., Washington County, at County Trunk MY, at Newburg.

Drainage area--265 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurements--Oct. 3, 1968, 50.9 ft³/s; June 14, 1973, 192 ft³/s; Aug. 14, 1973, 58.3 ft³/s; Oct. 10, 1975, 43.1 ft³/s; Sept. 28, 1976, 25.3 ft³/s.

Low-flow frequency--Q_{7,2} = 21 ft³/s, Q_{7,10} = 8.9 ft³/s.

Basis of estimate--Graphical regression with Milwaukee River at Milwaukee using 5 discharge measurements.

Accuracy--SE_{7,2} = 15 percent, SE_{7,10} = 26 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086278 North Branch Milwaukee River at Cascade, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, T. 14 N., R. 21 E., Sheboygan County, at bridge on State Highway 28, at Cascade.

Drainage area.--7.48 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 10, 1975, 7.21 ft³/s; Sept. 28, 1976, 6.22 ft³/s; July 11, 1977, 4.35 ft³/s.

Low-flow frequency.--Q_{7,2} = 4.2 ft³/s, Q_{7,10} = 2.2 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 3 discharge measurements.

Accuracy.--Not applicable.

04086280 North Branch Milwaukee River tributary at Adell, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, T. 13 N., R. 21 E., Sheboygan County, at bridge on County Trunk W, 1.0 mi north of Adell.

Drainage area.--4.23 mi².

Tributary to.--North Branch Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 26, 1972, 0.88 ft³/s; Aug. 15, 1973, 0.76 ft³/s; Oct. 10, 1975, 0.46 ft³/s; Sept. 28, 1976, 0.08 ft³/s; July 11, 1977, 0.45 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.08 ft³/s, Q_{7,10} = 0.01 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 5 discharge measurements.

Accuracy.--Not applicable.

04086285 North Branch Milwaukee River near Cascade, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, T. 14 N., R. 21 E., Sheboygan County, at town road, 1.3 mi southwest of Cascade.

Drainage area.--19.5 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 6.74 ft³/s.

Low-flow frequency.--Q_{7,2} = 4.3 ft³/s, Q_{7,10} = 1.8 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086278 North Branch Milwaukee River at Cascade, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, T. 14 N., R. 21 E., Sheboygan County, at bridge on State Highway 28, at Cascade.

Drainage area.--7.48 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 10, 1975, 7.21 ft³/s; Sept. 28, 1976, 6.22 ft³/s; July 11, 1977, 4.35 ft³/s.

Low-flow frequency.--Q_{7,2} = 4.2 ft³/s, Q_{7,10} = 2.2 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 3 discharge measurements.

Accuracy.--Not applicable.

04086280 North Branch Milwaukee River tributary at Adell, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, T. 13 N., R. 21 E., Sheboygan County, at bridge on County Trunk W, 1.0 mi north of Adell.

Drainage area.--4.23 mi².

Tributary to.--North Branch Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 26, 1972, 0.88 ft³/s; Aug. 15, 1973, 0.76 ft³/s; Oct. 10, 1975, 0.46 ft³/s; Sept. 28, 1976, 0.08 ft³/s; July 11, 1977, 0.45 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.08 ft³/s, Q_{7,10} = 0.01 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 5 discharge measurements.

Accuracy.--Not applicable.

04086285 North Branch Milwaukee River near Cascade, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, T. 14 N., R. 21 E., Sheboygan County, at town road, 1.3 mi southwest of Cascade.

Drainage area.--19.5 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 6.74 ft³/s.

Low-flow frequency.--Q_{7,2} = 4.3 ft³/s, Q_{7,10} = 1.8 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086300 North Branch Milwaukee River near Cascade, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, T. 13 N., R. 21 E., Sheboygan County, at County Trunk A, 4.1 mi south of Cascade.

Drainage area.--34.2 mi².

Tributary to.--Milwaukee River.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--7.34 ft³/s, Aug. 13, 1964.

Low-flow frequency.--Q_{7,2} = 6.7 ft³/s, Q_{7,10} = 3.4 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 14 discharge measurements made during the period 1962-77.

Accuracy.--SE_{7,2} = 22 percent, SE_{7,10} = 25 percent.

04086319 Silver Creek at Random Lake, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, T. 13 N., R. 21 E., Sheboygan County, at bridge on State Highway 144, 0.7 mi northwest of Random Lake.

Drainage area.--11.7 mi².

Tributary to.--North Branch Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 26, 1972, 1.98 ft³/s; June 14, 1973, 6.04 ft³/s; Aug. 15, 1973, 0.58 ft³/s; Oct. 10, 1975, 0.74 ft³/s; Sept. 29, 1976, 0.40 ft³/s.

Low-flow frequency.-Q_{7,2} = 0.30 ft³/s, Q_{7,10} = 0.10 ft³/s.

Basis of estimate.-Graphical regression with Milwaukee River at Milwaukee using 5 discharge measurements.

Accuracy.-Not applicable.

04086340 North Branch Milwaukee River near Fillmore, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, T. 12 N., R. 20 E., Washington County, at County Trunk M, 1.1 mi south of Fillmore.

Drainage area.--148 mi².

Tributary to.--Milwaukee River.

Type of site.--Gaging station.

Period of record.--April 1968 to September 1978.

Average discharge.-10 years, 94.4 ft³/s.

Extremes.--Maximum discharge, 3,100 ft³/s Mar. 22, 1975; minimum discharge, 3.0 ft³/s Aug. 17, 18, 1970.

Period of consecutive days	Magnitude and frequency of annual low flow of consecutive days		
	Discharge, in cubic feet per second, for indicated recurrence interval, in years	2	5
7	16	9.0	6.4
14	17	10	7.4
30	20	12	8.4
60	23	14	10
90	26	17	15

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
	440	310	225	134	89	67	52
Percent ft ³ /s	60	70	80	90	95	98	99.9
	42	34	27	19	16	13	4.9

Accuracy.--SE_{7,2} = 18 percent, SE_{7,10} = 32 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086360 Milwaukee River at Waubeka, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, T. 12 N., R. 21 E., Ozaukee County, at County Trunk I, at Waubeka.

Drainage area.--432 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--March 1968 to September 1978.

Average discharge.--10 years, 293 ft³/s.

Extremes.--Maximum discharge, 6,990 ft³/s Mar. 23, 1975; minimum discharge, 19 ft³/s Aug. 18, 1970.

Period of consecutive days	Magnitude and frequency of annual low flow of discharge, in cubic feet per second, for indicated recurrence interval, in years		
	2	5	10
7	46	28	22
14	53	32	26
30	59	36	30
60	72	48	38
90	80	56	46

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
	1,480	1,020	720	410	265	200	159
Percent ft ³ /s	60	70	80	90	95	98	99.9
	123	98	76	56	47	37	22

Accuracy.--SE_{7,2} = 16 percent, SE_{7,10} = 22 percent.

04086404 Milwaukee River at Saukville, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, T. 11 N., R. 21 E., Ozaukee County, at bridge on State Highway 33, at Saukville.

Drainage area.--457 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--June 14, 1973, 306 ft³/s; Aug. 14, 1973, 118 ft³/s; Oct. 11, 1975, 78.9 ft³/s; Sept. 28, 1976, 60.2 ft³/s.

Low-flow frequency.--Q_{7,2} = 46 ft³/s, Q_{7,10} = 22 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 4 discharge measurements.

Accuracy.--SE_{7,2} = 14 percent, SE_{7,10} = 24 percent.

04086405 Milwaukee River at Saukville, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, T. 11 N., R. 21 E., Ozaukee County, 50 ft upstream from sewage plant, at Saukville.

Drainage area.--461 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 72.4 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086415 Milwaukee River at Grafton, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 25, T. 10 N., R. 21 E., Ozaukee County, just upstream from sewage-treatment plant, at Grafton.

Drainage area.--476 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 14, 1973, 121 ft³/s; Oct. 11, 1975, 80.9 ft³/s; Sept. 27, 1976, 46.9 ft³/s.

Low-flow frequency.--Q_{7,2} = 46 ft³/s, Q_{7,10} = 22 ft³/s.

Basis of estimate.--Graphical regression with Milwaukee River at Milwaukee using 3 discharge measurements.

Accuracy.--Not applicable.

04086420 Cedar Creek near West Bend, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, T. 11 N., R. 19 E., Washington County, at bridge on County Trunk NN, 4.4 mi southwest of West Bend.

Drainage area.--10.3 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 1.29 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086425 Cedar Creek near Slinger, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, T. 10 N., R. 19 E., Washington County, at bridge on town road, 2.9 mi northeast of Slinger.

Drainage area.--13.9 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0.82 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086440 Cedar Creek tributary at Jackson, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, T. 10 N., R. 20 E., Washington County, at bridge on State Highway 60, 0.4 mi west of Jackson.

Drainage area.--1.46 mi².

Tributary to.--Cedar Creek.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0.56 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086460 Cedar Creek near Jackson, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, T. 10 N., R. 20 E., Washington County, at bridge on State Highway 60, 1.2 mi east of Jackson.

Drainage area.--53.6 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--7.29 ft³/s, Sept. 17, 1968.

Low-flow frequency.--Q_{7,2} = 3.8 ft³/s, Q_{7,10} = 1.0 ft³/s.

Basis of estimate.--Graphical regression with Cedar Creek near Cedarburg using 7 discharge measurements made during the period 1968-76.

Accuracy.--SE_{7,2} = 24 percent, SE_{7,10} = 55 percent.

04086465 Cedar Creek tributary near Jackson, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, T. 10 N., R. 20 E., Washington County, at town road, 1.1 mi north of Jackson.

Drainage area.--4.06 mi².

Tributary to.--Cedar Creek.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 0.26 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086470 Cedar Creek tributary near Jackson, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T. 10 N., R. 20 E., Washington County, at bridge on State Highway 60, 4.9 mi east of Jackson.

Drainage area.--5.57 mi².

Tributary to.--Cedar Creek.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1968, 9.33 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086475 Cedar Creek near Jackson, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, T. 10 N., R. 20 E., Washington County, at bridge on County Trunk M, 4.7 mi northeast of Jackson.

Drainage area.--84.3 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 17, 1968, 8.67 ft³/s; Oct. 2, 1968, 11.5 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086485 Cedar Creek tributary near Jackson, Wis.

Location.--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, T. 10 N., R. 20 E., Washington County, at bridge on town road, 5.0 mi northeast of Jackson.

Drainage area.--13.8 mi².

Tributary to.--Cedar Creek.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 10, 1975, 1.38 ft³/s; Sept. 27, 1976, 0.55 ft³/s; July 11, 1977, 0.38 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.19 ft³/s, Q_{7,10} = 0.04 ft³/s.

Basis of estimate.--Graphical regression with Cedar Creek near Cedarburg using 3 discharge measurements.

Accuracy.--Not applicable.

04086490 Cedar Creek near Cedarburg, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, T. 10 N., R. 21 E., Ozaukee County, at bridge on State Highway 143, 3.6 mi northwest of Cedarburg.

Drainage area.--112 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurement.--Sept. 17, 1968, 9.92 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04086500 Cedar Creek near Cedarburg, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, T. 10 N., R. 21 E., Ozaukee County, at State Highway 60, 1.9 mi north of Cedarburg.

Drainage area.--120 mi².

Tributary to.--Milwaukee River.

Type of site.--Gaging station.

Period of record.--August 1930 to September 1970; July 1973 to September 1978.

Average discharge.--45 years, 66.4 ft³/s.

Extremes.--Maximum discharge, about 3,600 ft³/s Mar. 30, 1960; minimum discharge, 0.20 ft³/s Aug. 9-12, 1936

Period of consecutive days	Magnitude and frequency of annual low flow of consecutive days					
	Discharge, in cubic feet per second, for indicated recurrence interval, in years					
	2	5	10	20	50	100
7	5.3	2.3	1.4	0.88	0.50	0.33
14	6.4	2.9	1.8	1.1	0.62	0.41
30	7.7	3.7	2.3	1.6	0.95	0.67
60	8.9	4.6	3.2	2.3	1.6	1.2
90	10	5.6	4.1	3.2	2.4	2.0

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
		450	255	150	78	50	35
Percent ft ³ /s	60	70	80	90	95	98	99.9
	18	13	9.6	6.2	4.5	2.8	0.53

Accuracy.--SE_{7,2} = 13 percent, SE_{7,10} = 26 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04086600 Milwaukee River near Cedarburg, Wis.

Location--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, T. 10 N., R. 22 E., Ozaukee County, at County Trunk C, 2.6 mi southeast of Cedarburg.

Drainage area--607 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurements--Oct. 3, 1968, 82.2 ft³/s; Nov. 12, 1976, 60.8 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04086800 Milwaukee River at Brown Deer, Wis.

Location--NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, T. 8 N., R. 21 E., Milwaukee County, at Brown Deer Road, at Brown Deer.

Drainage area--656 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 3, 1968, 95.1 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

04086950 Lincoln Creek at Milwaukee, Wis.

Location--SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 31, T. 8 N., R. 22 E., Milwaukee County, at Villard Avenue, 5.1 mi northwest of City Hall, at Milwaukee

Drainage area--21.5 mi².

Tributary to--Milwaukee River.

Type of site--Miscellaneous site.

Discharge measurement--Oct. 3, 1968, 9.93 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087000 Milwaukee River at Milwaukee, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 5, T. 7 N., R. 22 E., Milwaukee County, 2,000 ft downstream from Port Washington Road in Estabrook Park, at Milwaukee.

Drainage area.--696 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--April 1914 to September 1978.

Average discharge.--64 years, 400 ft³/s.

Extremes.--Maximum discharge, 15,000 ft³/s Mar. 20, 1918, Aug. 6, 1924; minimum discharge, no flow Sept. 8, 1943.

Period of consecutive days	Magnitude and frequency of annual low flow of discharge, in cubic feet per second, for indicated recurrence interval, in years					
	2	5	10	20	50	100
7	55	33	24	19	13	10
14	62	38	28	22	16	13
30	72	44	33	26	20	16
60	85	55	43	35	28	24
90	97	63	50	42	34	29

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
		2,400	1,460	900	505	340	250
Percent ft ³ /s	60	70	80	90	95	98	99.9
	144	113	89	64	48	36	9.6

Accuracy.--SE_{7,2} = 7 percent, SE_{7,10} = 13 percent.

Remarks.--Occasional regulation caused by recreation dam approximately 1,200 ft upstream.

04087014 Menomonee River at Germantown, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, T. 9 N., R. 20 E., Washington County, at bridge on Freistadt Road, 0.9 mi northwest of Germantown.

Drainage area.--11.3 mi².

Tributary to.--Milwaukee River.

Type of site.--Miscellaneous site.

Discharge measurements.--June 13, 1973, 2.69 ft³/s; Aug. 14, 1973, 0.30 ft³/s; Oct. 10, 1975, no flow; Sept. 27, 1976, ponded.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 4 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087018 Menomonee River near Germantown, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, T. 9 N., R. 20 E., Washington County, at Mequon Road, 1.2 mi upstream from mouth of Willow Creek.

Drainage area.--19.0 mi².

Tributary to.--Milwaukee River.

Type of site.--Gaging station.

Period of record.--December 1974 to September 1977.

Extremes.--Maximum discharge, 325 ft³/s Mar. 22, 1975; minimum discharge, 1.1 ft³/s Oct. 1, 2, 1976.

Low-flow frequency.--Q_{7,2} = 1.8 ft³/s, Q_{7,10} = 0.61 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 22 daily mean discharges during the period 1974-77.

Accuracy.--SE_{7,2} = 27 percent, SE_{7,10} = 34 percent.

Remarks.--Low flow affected by effluent from sewage-treatment plant 0.6 mi upstream.

04087019 Jefferson Park Drainageway at Germantown, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, T. 9 N., R. 20 E., Washington County, 0.25 mi north of junction of Donges Bay Road and South Division Road, at Germantown.

Drainage area.--1.82 mi².

Tributary to.--Menomonee River.

Type of site.--Gaging station.

Period of record.--June 1976 to September 1978 (discontinued).

Extremes.--Maximum discharge, 200 ft³/s May 13, 1978; minimum discharge, no flow many days during 1977.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Had 94 recorded values of no flow during the period 1976-78.

Accuracy.--Not applicable.

04087020 Menomonee River at Menomonee Falls, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T. 9 N., R. 20 E., Washington County, at County Trunk Q, 1.2 mi northwest of Menomonee Falls.

Drainage area.--30.7 mi².

Tributary to.--Milwaukee River.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--1.51 ft³/s, Aug. 11, 1962.

Low-flow frequency.--Q_{7,2} = 2.0 ft³/s, Q_{7,10} = 0.62 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 14 discharge measurements made during the period 1962-73.

Accuracy.--SE_{7,2} = 25 percent, SE_{7,10} = 43 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087030 Menomonee River at Menomonee Falls, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, T. 8 N., R. 20 E., Waukesha County, at Pilgrim Road, 0.8 mi downstream from dam in Menomonee Falls.

Drainage area.--34.7 mi².

Tributary to.--Milwaukee River.

Type of site.--Gaging station.

Period of record.--November 1974 to September 1977.

Extremes.--Maximum discharge, 527 ft³/s Mar. 22, 1975; minimum discharge, 1.2 ft³/s Sept. 13, Oct. 2, 1976.

Low-flow frequency.--Q_{7,2} = 2.1 ft³/s, Q_{7,10} = 0.65 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 22 daily mean discharges during the period 1974-77.

Accuracy.--SE_{7,2} = 27 percent, SE_{7,10} = 34 percent.

Remarks.--Occasional regulation caused by dam in Menomonee Falls, about 1.0 mi upstream.

04087040 Menomonee River at Butler, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, T. 8 N., R. 20 E., Waukesha County, at bridge on 124th Street, 0.7 mi north of post office, in Butler.

Drainage area.--60.6 mi².

Tributary to.--Milwaukee River.

Type of site.--Gaging station.

Period of record.--November 1974 to September 1978.

Extremes.--Maximum discharge, 2,430 ft³/s May 13, 1978; minimum discharge, 2.6 ft³/s Aug. 8, 1976.

Low-flow frequency.--Q_{7,2} = 3.9 ft³/s, Q_{7,10} = 1.2 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 25 daily mean discharges during the period 1974-78.

Accuracy.--SE_{7,2} = 18 percent, SE_{7,10} = 33 percent.

04087050 Little Menomonee River near Freistadt, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, T. 9 N., R. 21 E., Ozaukee County, at Donges Bay Road, 2.0 mi south of Freistadt.

Drainage area.--8.00 mi².

Tributary to.--Menomonee River.

Type of site.--Gaging station.

Period of record.--October 1958 to December 1974, annual maximum. August 1961 to October 1968, low-flow partial-record station with periodic base-flow discharge measurements. December 1974 to September 1978, gaging station.

Extremes.--Maximum discharge, 360 ft³/s Apr. 21, 1973; minimum discharge, no flow Dec. 31, 1976 to Feb. 10, 1977.

Low-flow frequency.--Q_{7,2} = not determined, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Had 42 recorded values of no flow during the period 1961-78.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087060 Noyes Creek at Milwaukee, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, T. 8 N., R. 21 E., Milwaukee County, at 91st Street, 1,000 ft upstream from mouth, at Milwaukee.

Drainage area.--1.94 mi².

Tributary to.--Little Menomonee River.

Type of site.--Gaging station.

Period of record.--December 1974 to September 1978.

Extremes.--Maximum discharge, 322 ft³/s July 2, 1978; minimum discharge, no flow on all or part of many days during 1977 winter period.

Low-flow frequency.--Q_{7,2} = not determined, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Had 40 recorded values of no flow during the period 1974-78.

Accuracy.--Not applicable.

04087070 Little Menomonee River at Milwaukee, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, T. 8 N., R. 21 E., Milwaukee County, at U.S. Highway 41, 1.5 mi upstream from Menomonee River, at Milwaukee.

Drainage area.--19.7 mi².

Tributary to.--Menomonee River.

Type of site.--Gaging station.

Period of record.--November 1974 to September 1977.

Extremes.--Maximum discharge, 467 ft³/s Mar. 4, 1976; minimum discharge, no flow Dec. 31, 1976, to Feb. 8, 1977.

Low-flow frequency.--Q_{7,2} = not determined, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Had 40 recorded values of no flow during the period 1974-77.

Accuracy.--Not applicable.

04087088 Underwood Creek at Wauwatosa, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T. 7 N., R. 21 E., Milwaukee County, at U.S. Highway 45, on right bank, just downstream from Chicago, Milwaukee, St. Paul, and Pacific Railroad bridge, 0.8 mi upstream from mouth, at Wauwatosa.

Drainage area.--18.2 mi².

Tributary to.--Menomonee River.

Type of site.--Gaging station.

Period of record.--December 1974 to September 1978.

Extremes.--Maximum discharge, 540 ft³/s Feb. 24, 1975; minimum discharge, no flow on all or part of many days during 1977 winter period.

Low-flow frequency.--Q_{7,2} = not determined, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Had 16 recorded values of no flow during the period 1974-78.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087119 Honey Creek at Wauwatosa, Wis.

Location.--NW¹/₄NW¹/₄ sec. 27, T. 7 N., R. 21 E., Milwaukee County, on right bank in Honey Creek Parkway, 260 ft upstream from Menomonee River, at Wauwatosa.

Drainage area.--10.3 mi².

Tributary to.--Menomonee River.

Type of site.--Gaging station.

Period of record.--December 1974 to September 1978.

Extremes.--Maximum discharge, 1,140 ft³/s July 18, 1977; minimum discharge, 0.02 ft³/s Jan. 16-19, 1977.

Low-flow frequency.--Q_{7,2} = 0.31 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 29 daily mean discharges during the period 1974-78.

Accuracy.--SE_{7,2} = 56 percent, SE_{7,10} = 120 percent.

04087120 Menomonee River at Wauwatosa, Wis.

Location.--NE¹/₄NW¹/₄ sec. 27, T. 7 N., R. 21 E., Milwaukee County, at 70th Street bridge, 800 ft downstream from Honey Creek, at Wauwatosa.

Drainage area.--123 mi².

Tributary to.--Milwaukee River.

Type of site.--Gaging station.

Period of record.--October 1961 to September 1978.

Average discharge.--17 years, 88.0 ft³/s.

Extremes.--Maximum discharge, 13,500 ft³/s Apr. 21, 1973 on basis of slope-area measurement of peak flow; minimum discharge, 2.8 ft³/s Jan. 18, 1964.

Period of consecutive days	Magnitude and frequency of annual low flow of consecutive days			
	Discharge, in cubic feet per second, for indicated recurrence interval, in years			
	2	5	10	20
7	9.8	5.2	3.5	2.5
14	11	5.5	3.9	3.0
30	13	6.7	4.9	3.9
60	18	8.6	5.9	4.3
90	23	11	7.0	5.0

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
	620	345	199	102	65	45	33
Percent ft ³ /s	60	70	80	90	95	98	99.9
	26	20	14	9.6	7.4	5.5	2.9

Accuracy.--SE_{7,2} = 15 percent, SE_{7,10} = 25 percent.

Remarks.--Low flow affected by three sewage-treatment plants upstream.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087125 Schoonmaker Creek at Wauwatosa, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 7 N., R. 21 E., Milwaukee County, at Vilet Street, 0.6 mi upstream from mouth, at Wauwatosa.

Drainage area.--1.94 mi².

Tributary to.--Menomonee River.

Type of site.--Gaging station.

Period of record.--December 1974 to September 1978.

Extremes.--Maximum discharge, 433 ft³/s July 17, 1977; minimum discharge, no flow many days during each year.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Had numerous recorded values of no flow during the period 1974-78.

Accuracy.--Not applicable.

04087130 Hawley Road Storm Sewer at Milwaukee, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 26, T. 7 N., R. 21 E., Milwaukee County, at Hawley Road, at mouth, at Milwaukee.

Drainage area.--1.83 mi².

Tributary to.--Menomonee River.

Type of site.--Gaging station.

Period of record.--May 1975 to September 1977.

Extremes.--Maximum discharge, about 145 ft³/s June 4, 1975; minimum discharge, 0.01 ft³/s many days each year.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Had numerous recorded discharges of 0 ft³/s during the period 1975-77.

Accuracy.--Not applicable.

04087150 Kinnickinnic River at Milwaukee, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, T. 6 N., R. 21 E., Milwaukee County, at S. 27th Street (U.S. Highway 41), 0.2 mi northwest of Pulaski High School, at Milwaukee.

Drainage area.--17.4 mi².

Tributary to.--Milwaukee River.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--6.18 ft³/s, June 25, 1963.

Low-flow frequency.--Q_{7,2} = 6.4 ft³/s, Q_{7,10} = 3.8 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 13 discharge measurements made during the period 1962-76 and 15 daily mean discharges at gaging station downstream (A = 20.4 mi²) during the period 1976-78.

Accuracy.--SE_{7,2} = 41 percent, SE_{7,10} = 49 percent.

Remarks.--Discharge during low-flow periods is supplemented by effluent. Therefore, low-flow estimates do not reflect only natural base flow from the ground-water aquifer.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087160 Kinnickinnic River at Milwaukee, Wis.

Location.--SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 8, T. 6 N., R. 22 E., Milwaukee County, on left bank 50 ft upstream from bridge on 7th Street, 0.3 mi west of intersection of Chicago and Northwestern Railroad and Interstate Highway 94, at Milwaukee.

Drainage area.--20.4 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--September 1976 to September 1978.

Extremes.--Maximum discharge, 4,790 ft³/s July 18, 1977; minimum discharge, 3.2 ft³/s Feb. 5, 1978, result of freezeup.

Low-flow frequency.--Q_{7,2} = 6.4 ft³/s, Q_{7,10} = 3.8 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 15 daily mean discharges during the period 1976-78 and 13 discharge measurements made upstream at low-flow partial-record station 04087150 Kinnickinnic River at Milwaukee (A = 17.4 mi²) made during the period 1962-76.

Accuracy.--SE_{7,2} = 41 percent, SE_{7,10} = 45 percent.

Remarks.--Discharge during low-flow periods is supplemented by effluent. Low-flow estimates include effluent discharge and do not reflect only natural base flow from the ground-water aquifer.

04087200 Oak Creek near South Milwaukee, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, T. 5 N., R. 22 E., Milwaukee County, at Nicholson Road, 2.6 mi southwest of South Milwaukee.

Drainage area.--13.8 mi².

Tributary to.--Lake Michigan.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--0 ft³/s, 7 observations of no flow during the period 1961-67.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Menomonee River at Wauwatosa using 19 discharge measurements made during the period 1961-67.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087204 Oak Creek at South Milwaukee, Wis.

Location.--SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, T. 5 N., R. 22 E., Milwaukee County, at 15th Avenue, 1.1 mi northwest of downtown South Milwaukee.

Drainage area.--25.0 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--October 1963 to September 1978.

Average discharge.--15 years, 21.2 ft³/s.

Extremes.--Maximum discharge, 1,020 ft³/s Sept. 13, 1978; minimum discharge, no flow Jan. 8-13, 15-18, 27-31, Feb. 6-8, 1977.

Period of consecutive days	Magnitude and frequency of annual low flow discharge, in cubic feet per second, for indicated recurrence interval, in years		
	2	5	10
7	1.6	0.70	0.19
14	1.7	0.72	0.21
30	2.2	0.92	0.29
60	3.3	1.5	0.87
90	3.8	2.0	1.3

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
		190	91	41	19	12	8.2
Percent ft ³ /s	60	70	80	90	95	98	99.9
	4.2	3.2	2.4	1.6	1.2	0.89	0

Accuracy.--Unable to determine accuracy, low-flow characteristics determined by plotting position analyses.

Remarks.--Low flows may occasionally be affected by construction and activity at gravel pit upstream.

04087209 Lake Michigan tributary at Wind Point, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, T. 4 N., R. 23 E., Racine County, at culvert on road to sewage-treatment plant, 0.8 mi west of Wind Point.

Drainage area.--1.02 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--July 24, 1972, 2.14 ft³/s; June 12, 1973, 2.75 ft³/s; Aug. 13, 1973, 0.43 ft³/s; Sept. 18, 1975, 0.05 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.08 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 4 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087215 Root River near Hales Corners, Wis.

Location--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, T. 6 N., R. 21 E., Milwaukee County, at bridge on College Avenue, 1.5 mi east of Hales Corners.

Drainage area--15.9 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Discharge measurements--Nov. 13, 1963, 0.63 ft³/s; May 28, 1964, 1.38 ft³/s; July 7, 1964, 0.37 ft³/s.

Low-flow frequency--Q_{7,2} = 1.2 ft³/s, Q_{7,10} = 0.19 ft³/s.

Basis of estimate--Graphical regression with Root River near Franklin using 3 discharge measurements.

Accuracy--Not applicable.

04087216 Tributary to Root River tributary near Hales Corners, Wis.

Location--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, T. 6 N., R. 20 E., Waukesha County, at bridge on County Trunk HH, 2.6 mi west of Hales Corners.

Drainage area--2.68 mi².

Tributary to--Root River tributary No. 1.

Type of site--Miscellaneous site.

Discharge measurements--July 25, 1972, 0.054 ft³/s; June 13, 1973, 0.254 ft³/s; Aug. 13, 1973, 0 ft³/s; Sept. 18, 1975, 0 ft³/s; Oct. 4, 1976, 0 ft³/s.

Low-flow frequency--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate--Graphical regression with Root River near Franklin using 5 discharge measurements.

Accuracy--Not applicable.

040872162 Tributary to Root River tributary near Muskego, Wis.

Location--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T. 5 N., R. 20 E., Waukesha County, at bridge on State Highway 24, 2.5 mi northeast of Muskego.

Drainage area--3.07 mi².

Tributary to--Root River tributary No. 1.

Type of site--Miscellaneous site.

Discharge measurements--July 25, 1972, 0.10 ft³/s; June 13, 1973, 0.55 ft³/s; Aug. 13, 1973, 0.04 ft³/s; Sept. 18, 1975, 0.02 ft³/s; Oct. 4, 1976, 0.02 ft³/s.

Low-flow frequency--Q_{7,2} = 0.02 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate--Graphical regression with Root River near Franklin using 5 discharge measurements.

Accuracy--Not applicable.

040872167 Tributary to Root River tributary near Hales Corners, Wis.

Location--SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, T. 5 N., R. 21 E., Milwaukee County, at bridge on County Trunk J, 2.0 mi south of Hales Corners.

Drainage area--6.67 mi².

Tributary to--Root River tributary No. 1.

Type of site--Miscellaneous site.

Discharge measurements--July 25, 1972, 0.35 ft³/s; June 13, 1973, 1.78 ft³/s; Aug. 13, 1973, 0.11 ft³/s; Sept. 18, 1975, 0.46 ft³/s; Oct. 4, 1976, 0.28 ft³/s.

Low-flow frequency--Q_{7,2} = 0.03 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate--Graphical regression with Root River near Franklin using 5 discharge measurements.

Accuracy--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040872168 Tributary to Root River tributary near Hales Corners, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, T. 5 N., R. 21 E., Milwaukee County, at bridge on County Trunk 00, 2.0 mi south of Hales Corners.

Drainage area.--6.74 mi².

Tributary to.--Root River tributary No. 1.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 2, 1951, 0.11 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

040872174 Tributary to Root River tributary near Hales Corners, Wis.

Location.--NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 8, T. 5 N., R. 21 E., Milwaukee County, at bridge on U.S. Highway 45, 1.6 mi south of Hales Corners.

Drainage area.--8.41 mi².

Tributary to.--Root River tributary No. 1.

Type of site.--Miscellaneous site.

Discharge measurements.--May 28, 1964, 0.63 ft³/s; July 7, 1964, 0.37 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04087220 Root River near Franklin, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 5 N., R. 21 E., Milwaukee County, 400 ft upstream from State Highway 100, 2.4 mi southeast of Franklin.

Drainage area.--49.2 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--October 1963 to September 1978.

Average discharge.--15 years, 43.6 ft³/s.

Extremes.--Maximum discharge, 3,700 ft³/s Apr. 21, 1973; minimum discharge, 0.38 ft³/s Aug. 10, 1971.

Period of consecutive days	Magnitude and frequency of annual low flow of discharge, in cubic feet per second, for indicated recurrence interval, in years			
	2	5	10	20
7	3.6	2.1	1.6	1.3
14	4.1	2.6	2.0	1.7
30	5.0	3.1	2.5	2.1
60	6.4	3.6	2.7	2.2
90	8.1	4.4	3.1	2.3

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
		340	164	87	44	30	21
Percent ft ³ /s	60	70	80	90	95	98	99.9
	12	8.2	5.6	3.7	2.7	2.0	0.85

Accuracy.--SE_{7,2} = 17 percent, SE_{7,10} = 22 percent.

Remarks.--Flow affected by urbanization in the drainage basin.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087224 East Branch Root River Canal near Sturtevant, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, T. 3 N., R. 21 E., Racine County, at County Trunk C, 4.2 mi northwest of Sturtevant.

Drainage area.--5.51 mi².

Tributary to.--Root River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 3, 1968, 0.17 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04087226 East Branch Root River Canal near Caledonia, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T. 4 N., R. 21 E., Racine County, at bridge on County Trunk K, 3.2 mi southwest of Caledonia.

Drainage area.--14.8 mi².

Tributary to.--Root River.

Type of site.--Miscellaneous site.

Discharge measurements.--Nov. 13, 1963, 0.003 ft³/s; May 28, 1964, 1.36 ft³/s; July 1, 1964, 0.48 ft³/s; July 7, 1964, 0.41 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.04 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Root River Canal near Franklin using 4 discharge measurements.

Accuracy.--Not applicable.

04087227 West Branch Root River Canal at Union Grove, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, T. 3 N., R. 21 E., Racine County, at culvert on 67th Drive, 1.0 mi east of Union Grove.

Drainage area.--3.94 mi².

Tributary to.--Root River Canal.

Type of site.--Miscellaneous site.

Discharge measurements.--July 24, 1972, 0.70 ft³/s; June 12, 1973, 3.05 ft³/s; Aug. 13, 1973, 0.38 ft³/s; Sept. 18, 1975, 0.99 ft³/s; Oct. 4, 1976, 1.11 ft³/s.

Low-flow frequency.--Unable to define relationship, additional discharge measurements are required.

04087228 West Branch Root River Canal near Union Grove, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, T. 3 N., R. 21 E., Racine County, at bridge on County Trunk C, 2.4 mi northeast of Union Grove.

Drainage area.--8.32 mi².

Tributary to.--Root River Canal.

Type of site.--Miscellaneous site.

Discharge measurement.--Nov. 14, 1963, 0.87 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics. Large percentage of discharge may be effluent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087229 West Branch Root River Canal near Union Grove, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 10, T. 3 N., R. 21 E., Racine County, at bridge on State Highway 20, 3.8 mi northeast of Union Grove.

Drainage area.--14.0 mi².

Tributary to.--Root River Canal.

Type of site.--Miscellaneous site.

Discharge measurement.--Nov. 14, 1963, 0.93 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics. Large percentage of discharge may be effluent.

040872301 West Branch Root River Canal tributary near North Cape, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, T. 4 N., R. 21 E., Racine County, at culvert on Twomile Road, 3.3 mi southeast of North Cape.

Drainage area.--4.69 mi².

Tributary to.--West Branch Root River Canal.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 18, 1975, 0.07 ft³/s; Oct. 4, 1976, 0.10 ft³/s; Sept. 6, 1978, 0.45 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.06 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate.--Graphical regression with Root River Canal near Franklin using 3 discharge measurements.

Accuracy.--Not applicable.

040872305 West Branch Root River Canal near Franksville, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, T. 4 N., R. 21 E., Racine County, at bridge on Twomile Road, 2.3 mi west of Franksville.

Drainage area.--29.4 mi².

Tributary to.--Racine County.

Type of site.--Miscellaneous site.

Discharge measurements.--Aug. 15, 1963, 1.00 ft³/s; Nov. 14, 1963, 1.28 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics. Large percentage of discharge may be effluent.

04087231 West Branch Root River Canal near Franksville, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, T. 4 N., R. 21 E., Racine County, at bridge on Threemile Road, 3.9 mi west of Franksville.

Drainage area.--31.3 mi².

Tributary to.--Root River Canal.

Type of site.--Miscellaneous site.

Discharge measurements.--Nov. 14, 1963, 1.48 ft³/s; May 28, 1964, 2.67 ft³/s; July 1, 1964, 2.16 ft³/s; July 7, 1964, 1.23 ft³/s.

Low-flow frequency.--Unable to determine relationship, additional discharge measurements are required. Large percentage of discharge may be effluent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040872315 West Branch Root River Canal near Caledonia, Wis.

Location--SW¹/₄SW¹/₄ sec. 23, T. 4 N., R. 21 E., Racine County, at bridge on County Trunk K, 3.6 mi southwest of Caledonia.

Drainage area--38.2 mi².

Tributary to--Root River Canal.

Type of site--Miscellaneous site.

Discharge measurements--Aug. 15, 1963, 1.06 ft³/s; Nov. 14, 1963, 1.22 ft³/s.

Low-flow frequency--Additional discharge measurements should be made to determine low-flow characteristics. Large percentage of discharge may be effluent.

04087233 Root River Canal near Franklin, Wis.

Location--SE¹/₄SE¹/₄ sec. 10, T. 4 N., R. 21 E., Racine County, at County Trunk G, 5.5 mi southeast of Franklin.

Drainage area--57.0 mi².

Tributary to--Root River.

Type of site--Gaging station.

Period of record--October 1963 to September 1978.

Average discharge--15 years, 44.0 ft³/s.

Extremes--Maximum discharge, 1,440 ft³/s Mar. 4, 1974; minimum discharge, 0.40 ft³/s Dec. 19, 1963, result of freezeup.

Period of consecutive days	Magnitude and frequency of annual low flow			
	Discharge, in cubic feet per second, for indicated recurrence interval, in years			
	2	5	10	20
7	1.6	0.90	1.64	0.46
14	1.8	1.1	0.74	0.54
30	2.2	1.2	0.85	0.60
60	2.7	1.5	1.1	0.80
90	3.4	1.8	1.2	0.92

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
	380	207	110	51	30	18	10
Percent ft ³ /s	60	70	80	90	95	98	99.9
	6.0	3.9	2.6	1.8	1.2	0.89	0.43

Accuracy--SE_{7,2} = 18 percent, SE_{7,10} = 21 percent.

Remarks--Low flows considerably affected by effluent discharge in upstream portions of basin.

04087234 Root River near Caledonia, Wis.

Location--NE¹/₄NE¹/₄ sec. 34, T. 5 N., R. 21 E., Milwaukee County, at bridge on 60th Street, 4.7 mi northwest of Caledonia.

Drainage area--127 mi².

Tributary to--Lake Michigan.

Type of site--Miscellaneous site.

Minimum discharge measured--1.56 ft³/s, Oct. 10, 1963.

Low-flow frequency--Q_{7,2} = 4.0 ft³/s, Q_{7,10} = 1.7 ft³/s.

Basis of estimate--Graphical regression with Root River at Racine using 5 discharge measurements made during the period 1963-64.

Accuracy--SE_{7,2} = 22 percent, SE_{7,10} = 30 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040872345 Root River near Caledonia, Wis.

Location.--SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, T. 5 N., R. 22 E., Milwaukee County, at bridge on U.S. Highway 41, 2.9 mi northwest of Caledonia.

Drainage area.--134 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 2, 1951, 5.50 ft³/s; Aug. 23, 1955, 2.33 ft³/s; Nov. 18, 1955, 4.44 ft³/s.

Low-flow frequency.--Q_{7,2} = undefined, Q_{7,10} = 1.7 ft³/s.

Basis of estimate.--Graphical regression with Fox River at Wilmot using 3 discharge measurements.

Accuracy.--Not applicable.

04087235 Root River near Caledonia, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 5, T. 4 N., R. 22 E., Racine County, at bridge on State Highway 38, 2.5 mi north of Caledonia.

Drainage area.--150 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--2.6 ft³/s, Nov. 14, 1963.

Low-flow frequency.--Q_{7,2} = 4.1 ft³/s, Q_{7,10} = 1.7 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 6 discharge measurements made during the period 1962-75.

Accuracy.--SE_{7,2} = 20 percent, SE_{7,10} = 25 percent.

04087237 Root River tributary near Franksville, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, T. 5 N., R. 22 E., Milwaukee County, on Milwaukee-Racine County line, 5.9 mi north of Franksville.

Drainage area.--5.96 mi².

Tributary to.--Root River.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 29, 1964, 1.43 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics. Large percentage of discharge may be effluent.

04087238 Hoods Creek near Sturtevant, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, T. 3 N., R. 22 E., Racine County, at bridge on State Highway 20, 2.1 mi northwest of Sturtevant.

Drainage area.--3.38 mi².

Tributary to.--Root River.

Type of site.--Miscellaneous site.

Discharge measurements.--July 24, 1972, 1.38 ft³/s; June 12, 1973, 1.35 ft³/s; Aug. 13, 1973, 0.01 ft³/s; Sept. 18, 1975, 0.02 ft³/s; Oct. 4, 1976, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 5 discharge measurements.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

040872383 Hoods Creek near Sturtevant, Wis.

Location.--NW¹/₄NW¹/₄ sec. 9, T. 3 N., R. 22 E., Racine County, at bridge on County Trunk C, 2.9 mi north of Sturtevant.

Drainage area.--8.84 mi².

Tributary to.--Root River.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 18, 1975, 0.05 ft³/s; Oct. 4, 1976, <0.01 ft³/s; Sept. 6, 1978, 3.04 ft³/s.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 3 discharge measurements.

Accuracy.--Not applicable.

04087239 Hoods Creek near Franksville, Wis.

Location.--NW¹/₄SE¹/₄ sec. 35, T. 4 N., R. 22 E., Racine County, at bridge on State Highway 38, 2.5 mi east of Franksville.

Drainage area.--13.9 mi².

Tributary to.--Root River.

Type of site.--Miscellaneous site.

Discharge measurement.--Nov. 14, 1963, 0.11 ft³/s.

Low-flow frequency.--Additional discharge measurements should be made to determine low-flow characteristics.

04087240 Root River at Racine, Wis.

Location.--NW¹/₄NE¹/₄ sec. 6, T. 3 N., R. 23 E., Racine County, at State Highway 38, 2.7 mi northwest of downtown Racine.

Drainage area.--188 mi².

Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--August 1963 to September 1978.

Average discharge.--15 years, 146 ft³/s.

Extremes.--Maximum discharge, 4,500 ft³/s Mar. 5, 1974; minimum discharge, 0.90 ft³/s Jan. 17, 1977; minimum daily discharge, 1.0 ft³/s July 17, 1977.

Period of consecutive days	Magnitude and frequency of annual low flow of discharge, in cubic feet per second, for indicated recurrence interval, in years			
	2	5	10	20
7	6.1	3.3	2.5	2.0
14	6.8	3.8	2.9	2.4
30	8.0	4.4	3.3	2.7
60	11	5.8	4.4	3.6
90	15	7.4	5.3	4.1

Duration table of daily flow							
Discharge, in cubic feet per second, which was exceeded for indicated percent of time							
Percent ft ³ /s	2	5	10	20	30	40	50
	1,000	640	360	175	110	69	45
Percent ft ³ /s	60	70	80	90	95	98	99.9
	29	20	13	7.0	4.7	2.7	1.4

Accuracy.--SE_{7,2} = 20 percent, SE_{7,10} = 24 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087243 Pike River near Racine, Wis.

Location.--SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, T. 3 N., R. 22 E., Racine County, at culvert on State Highway 20, 4.4 mi west of post office at Racine.

Drainage area.--4.45 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0.03 ft³/s, May 19, 1974.

Low-flow frequency.--Q_{7,2} = 0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 6 discharge measurements made during the period 1972-75.

Accuracy.--Not applicable.

04087244 Pike River tributary at Sturtevant, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, T. 3 N., R. 22 E., Racine County, at culvert on County Trunk H, 0.3 mi north of Sturtevant.

Drainage area.--0.66 mi².

Tributary to.--Pike River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0 ft³/s, 5 observations of no flow made during the period 1973-75.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 6 discharge measurements made during the period 1972-75.

Accuracy.--Not applicable.

04087245 Pike River tributary at Sturtevant, Wis.

Location.--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 22, T. 3 N., R. 22 E., Racine County, at local road, 0.2 mi east of 90th Street, on the Milwaukee Railroad tracks, at Sturtevant.

Drainage area.--1.67 mi².

Tributary to.--Pike River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0 ft³/s, July 17, 1973, and Sept. 19, 1974.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 6 discharge measurements made during the period 1972-75.

Accuracy.--Not applicable.

040872454 Pike River tributary at Sturtevant, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 3 N., R. 22 E., Racine County, at culvert on Stuart Road, 0.3 mi upstream from mouth, at Sturtevant.

Drainage area.--2.21 mi².

Tributary to.--Pike River.

Type of site.--Miscellaneous site.

Discharge measurement.--Sept. 19, 1974, 4.66 ft³/s.

Remarks.--Discharge is primarily effluent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087246 Pike River near Sturtevant, Wis.

Location.--SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 3 N., R. 22 E., Racine County, at bridge on State Highway 11, 1.3 mi east of Sturtevant.

Drainage area.--11.0 mi². Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 21, 1973, 5.16 ft³/s; Sept. 19, 1974, 4.95 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

040872465 Pike River tributary near Sturtevant, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, T. 3 N., R. 22 E., Racine County, at private road, 0.6 mi upstream from mouth, 1.3 mi southeast of Sturtevant.

Drainage area.--1.09 mi². Tributary to.--Pike River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, <0.05 ft³/s (estimate); Sept. 19, 1974, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in area were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

04087247 Pike River tributary near Sturtevant, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, T. 3 N., R. 22 E., Racine County, on County Trunk EA, 1.5 mi south of Sturtevant.

Drainage area.--1.08 mi². Tributary to.--Pike River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, 0.43 ft³/s; Sept. 19, 1974, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in the area were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

04087248 Pike River near Sturtevant, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T. 2 N., R. 22 E., Kenosha County, at bridge on State Highway 31, 3.0 mi southeast of Sturtevant.

Drainage area.--17.9 mi². Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, 6.42 ft³/s; Sept. 19, 1974, 4.97 ft³/s; Sept. 25, 1976, 2.67 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087250 Pike Creek near Kenosha, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, T. 2 N., R. 22 E., Kenosha County, at State Highway 43, 3.9 mi northwest of downtown Kenosha.

Drainage area.--7.25 mi².

Tributary to.--Pike River.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--0 ft³/s, Sept. 19, 1974.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Turtle Creek near Clinton using 26 discharge measurements made during the period 1961-77.

Accuracy.--Not applicable.

04087251 Pike Creek tributary near Somers, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, T. 2 N., R. 22 E., Kenosha County, at bridge on County Trunk EA, 1.7 mi southeast of Somers.

Drainage area.--2.03 mi².

Tributary to.--Pike Creek.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, 0.05 ft³/s; Sept. 19, 1974, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in area were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

04087252 Pike Creek near Somers, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, T. 2 N., R. 22 E., Kenosha County, at bridge on County Trunk E, 1.5 mi east of Somers.

Drainage area.--13.08 mi².

Tributary to.--Pike River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, 0.30 ft³/s; Sept. 19, 1974, 0.04 ft³/s.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087253 Pike Creek tributary at Somers, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, T. 2 N., R. 22 E., Kenosha County, at culvert on Chicago and Milwaukee Railroad, at north edge of Somers.

Drainage area.--0.82 mi².

Tributary to.--Pike River.

Type of site.--Miscellaneous site.

Minimum discharge measured.--0 ft³/s, July 17, 1973, and Sept. 19, 1975.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 6 discharge measurements made during the period 1972-75.

Accuracy.--Not applicable.

04087254 Pike Creek tributary near Somers, Wis.

Location.--NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec 10, T. 2 N., R. 22 E., Kenosha County, at mouth, 1.5 mi east of Somers.

Drainage area.--2.71 mi².

Tributary to.--Pike Creek.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, 0.109 ft³/s; Sept. 19, 1974, 0.02 ft³/s.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

04087255 Pike Creek tributary near Somers, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, T. 2 N., R. 22 E., Kenosha County, at bridge on County Trunk A, 1.7 mi northeast of Somers.

Drainage area.--2.48 mi².

Tributary to.--Pike Creek.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, 0.04 ft³/s; Sept. 19, 1974, 0 ft³/s.

Low-flow frequency.--Q_{7,2} = 0 ft³/s, Q_{7,10} = 0 ft³/s.

Basis of estimate.--One observation of 0 ft³/s discharge when flows at gaging stations in area were greater than the Q_{7,2} discharge.

Accuracy.--Not applicable.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087257 Pike River near Racine, Wis.

Location.--SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, T. 2 N., R. 22 E., Kenosha County, on University of Wisconsin-Parkside campus, on right bank just downstream from unnamed tributary, 1.7 mi downstream from Pike Creek, 6.8 mi southwest of Racine post office, 9 mi upstream from mouth.

Drainage area.--38.5 mi². Tributary to.--Lake Michigan.

Type of site.--Gaging station.

Period of record.--October 1971 to September 1978.

Average discharge.--7 years, 36.3 ft³/s.

Extremes.--Maximum discharge, 1,480 ft³/s Mar. 4, 1976; minimum discharge, 0.35 ft³/s Sept. 28, 1976.

Low-flow frequency.--Q_{7,2} = 3.3 ft³/s, Q_{7,10} = 1.8 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 46 daily mean discharges recorded during the period 1971-78.

Accuracy.--SE_{7,2} = 34 percent, SE_{7,10} = 36 percent.

Remarks.--A substantial amount of discharge during low-flow periods is effluent discharge. Therefore, the discharges used in the low-flow analysis are predominantly effluent and the low-flow estimates do not reflect natural base flow from the ground-water aquifer. Low flows are also affected by occasional regulation of a small recreation dam 1.1 mi upstream.

04087259 Pike River near Kenosha, Wis.

Location.--NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, T. 2 N., R. 22 E., Kenosha County, at bridge on County Trunk G, 4.9 mi north of downtown Kenosha.

Drainage area.--39.8 mi². Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, 5.60 ft³/s; Sept. 20, 1974, 4.73 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

04087260 Pike River near Kenosha, Wis.

Location.--NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, T. 2 N., R. 23 E., Kenosha County, at County Trunk Y, 5.0 mi north of downtown Kenosha.

Drainage area.--40.9 mi². Tributary to.--Lake Michigan.

Type of site.--Low-flow partial-record station.

Minimum discharge measured.--0.01 ft³/s, July 11, 1963.

Low-flow frequency.--Q_{7,2} = 0.15 ft³/s, Q_{7,10} = 0.02 ft³/s.

Basis of estimate.--Graphical regression with Fox River at Wilmot using 16 discharge measurements made during the period 1962-77.

Accuracy.--SE_{7,2} = 150 percent, SE_{7,10} = 150 percent.

Remarks.--Minimum flows observed during period when effluent from upstream sources was minimal.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087261 Pike River near Racine, Wis.

Location.--SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, T. 2 N., R. 23 E., Kenosha County, at bridge on Lathrop Avenue, 4.6 mi north of downtown Kenosha.

Drainage area.--42.2 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 25, 1973, 6.36 ft³/s; Sept. 20, 1974, 4.64 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

04087263 Pike River tributary near Kenosha, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 6, T. 2 N., R. 23 E., Kenosha County, at mouth, 4.5 mi north of downtown Kenosha.

Drainage area.--3.70 mi².

Tributary to.--Pike River.

Type of site.--Miscellaneous site.

Discharge measurements.--Oct. 26, 1973, 0.44 ft³/s; Sept. 20, 1974, 0.02 ft³/s.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Used multiple-regression equations 1 and 2.

Accuracy.--SE_{7,2} = 42 percent, SE_{7,10} = 69 percent.

040872635 Pike River near Kenosha, Wis.

Location.--NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, T. 2 N., R. 23 E., Kenosha County, at bridge on County Trunk A, 4.7 mi north of post office in Kenosha.

Drainage area.--45.9 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Nov. 13, 1963, 2.65 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

04087265 Pike River at Kenosha, Wis.

Location.--NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, T. 2 N., R. 23 E., Kenosha County, at mouth, 1.5 mi north of downtown Kenosha.

Drainage area.--51.6 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurement.--Oct. 1, 1968, 2.99 ft³/s.

Low-flow frequency.--No estimate possible, discharge is primarily effluent.

Table 1.--Low-flow characteristics for sites in the Lake Michigan basin--Continued

04087269 Pike Creek at Kenosha, Wis.

Location.--NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, T. 2 N., R. 22 E., Kenosha County, just upstream from golf course tributary, 1.4 mi northwest of post office in Kenosha.

Drainage area.--2.37 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 19, 1974, 0.05 ft³/s; Sept. 19, 1975, 0.14 ft³/s; Oct. 20, 1977, 0.15 ft³/s; Sept. 6, 1978, 0.27 ft³/s.

Low-flow frequency.--Q_{7,2} = 0.02 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 4 discharge measurements.

Accuracy.--Not applicable.

04087290 Lake Michigan tributary at Carol Beach, Wis.

Location.--SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, T. 1 N., R. 23 E., Kenosha County, at culvert on State Highway 32, at Carol Beach.

Drainage area.--1.97 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 2, 1972, 1.20 ft³/s; July 18, 1973, 0.10 ft³/s; Aug. 8, 1973, 0.02 ft³/s; Sept. 19, 1974, 0.03 ft³/s; Sept. 19, 1975, 0.01 ft³/s.

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 5 discharge measurements.

Accuracy.--Not applicable.

04087298 Pleasant Homes Drainage Course near Carol Beach, Wis.

Location.--SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, T. 1 N., R. 22 E., Kenosha County, at culvert on State Line Road, at Wisconsin-Illinois border, 2.5 mi southwest of Carol Beach.

Drainage area.--0.89 mi².

Tributary to.--Lake Michigan.

Type of site.--Miscellaneous site.

Discharge measurements.--Sept. 2, 1972, 0.377 ft³/s; July 18, 1973, 0.03 ft³/s; Aug. 8, 1973, 0.05 ft³/s (estimate); Sept. 19, 1974, <0.01 ft³/s (estimate); Sept. 19, 1975, <0.02 ft³/s (estimate).

Low-flow frequency.--Q_{7,2} = <0.01 ft³/s, Q_{7,10} = <0.01 ft³/s.

Basis of estimate.--Graphical regression with Root River at Racine using 5 discharge measurements.

Accuracy.--Not applicable.

Table 2.--Basin characteristics for selected sites in the Lake Michigan basin

Station number	Station name	Drainage area (mi ²) A	Main-channel slope (ft/mi) S	Main-channel length (mi) L	Basin storage (percent) Bs	Forest cover (percent) F
04085170	Hibbard Creek at Jacksonport	17.1	11.3	11.4	9.50	30.8
04085180	Stony Creek near Algoma	24.2	5.40	16.6	17.1	22.5
04085186	Annapée River at Forestville	32.0	11.5	12.4	6.0	16.9
04085190	Silver Creek near Algoma	58.2	15.2	9.63	.58	22.4
040851967	Casco Creek at Casco	10.1	10.5	8.74	.79	16.2
04085200	Kewaunee River near Kewaunee	127	10.5	24.3	.43	8.9
04085244	East Twin River near Tisch Mills	49.7	11.9	17.2	6.0	15.7
04085280	East Twin River at Mishicot	110	6.20	26.8	11.4	28.8
04085306	Neshota River near Denmark	39.2	19.4	12.6	.38	5.4
04085330	West Twin River near Francis Creek	150	7.10	23.7	2.29	16.0
04085390	South Branch Manitowoc River near Chilton	76.8	2.62	24.5	7.95	13.0
04085396	South Branch Manitowoc River near Collins	114	4.92	33.9	8.0	12.0
04085400	Killsnake River near Chilton	29.4	9.23	13.9	1.42	5.4
04085410	Mud Creek near Reedsville	42.0	7.40	13.4	24.9	26.9
04085420	Branch River near Cato	78.8	5.60	23.7	2.03	16.6
04085460	Pigeon River near Howards Grove	65.0	9.70	23.5	8.20	17.9
04085480	Sheboygan River near Fond du Lac	27.4	18.6	11.4	4.70	11.5
04085482	Sheboygan River at St. Cloud	73.0	10.2	19.5	9.3	8.2
04085497	Sheboygan River at Kiel	153	1.53	34.9	16.0	15.5
04085700	Sheboygan River tributary near Plymouth	6.51	21.0	4.65	2.54	12.5
04085748	Mullet River at Greenbush	24.4	6.02	15.3	17.0	15.2
04085771	Mullet River near Plymouth	55.1	9.86	28.4	9.0	14.3
04085800	Onion River near Waldo	20.7	12.9	8.91	.66	23.5
04085830	Onion River at Gibbsville	82.0	6.78	30.5	1.6	4.9
04086020	Sauk Creek at Port Washington	31.9	10.7	13.7	.63	6.3
04086100	Milwaukee River at Campbellsport	51.4	4.00	13.4	27.3	17.8
04086150	Milwaukee River at Kewaskum	138	4.70	26.7	12.1	13.1
04086200	East Branch Milwaukee River at New Fame	54.1	3.44	21.7	15.1	27.1
04086300	North Branch Milwaukee River near Cascade	34.2	10.7	9.95	6.39	19.4
04086340	North Branch Milwaukee River near Fillmore	148	4.10	22.2	6.50	14.1
04086460	Cedar Creek near Jackson	53.6	19.4	11.9	7.8	5.0
04086500	Cedar Creek near Cedarburg	120	9.90	26.8	10.7	3.1

Table 2.--Basin characteristics for selected sites in the Lake Michigan basin

Mean annual precipitation (in.) P	Soil infiltration rate (in/h) I	Mean annual snowfall (in.) Sn	Base-flow index [(ft ³ /s)/mi ²] Bf	Hydraulic conductivity [(gal/d)/ft ²] K	Drift thickness (ft) H	Transmissivity [(gal/d)/ft] T
27.5	1.65	41.0	0.143	94.8	50.0	4,740
26.7	.656	43.0	.029	27.0	73.2	1,980
28.2	1.22	42.0	.099	9.65	37.5	362
26.3	.287	43.0	.000	42.4	81.1	3,440
28.2	.578	44.0	.079	10.0	87.5	875
26.5	.296	43.0	.102	141	76.1	10,700
29.2	.996	43.0	.098	1,110	78.2	87,100
27.8	1.23	44.0	.097	854	66.1	56,400
27.2	.125	43.0	.030	75.2	78.9	5,930
28.2	.854	43.0	.089	138	79.0	10,900
29.2	.377	42.0	.008	27.0	65.5	1,790
27.8	.414	43.0	.044	24.8	47.8	1,190
29.0	.284	42.0	.030	40.0	60.5	2,440
29.0	.298	43.0	.007	15.0	72.6	1,120
28.5	.773	43.0	.068	290	68.4	19,800
29.3	.199	39.0	.023	43.0	134	5,710
29.7	.500	37.0	.001	10.0	83.3	833
28.2	.533	41.0	.039	18.0	66.5	1,200
31.5	.614	41.0	.021	25.2	91.9	2,320
29.5	.626	37.0	.198	40.0	121	4,890
29.8	.515	42.0	.037	14.8	42.2	625
29.1	1.19	37.0	.179	33.7	82.3	2,770
29.7	.854	39.0	.386	297	155	46,000
29.1	.284	42.0	.129	50.1	129	6,460
28.8	.138	42.0	.000	87.6	93.2	8,160
29.9	.858	37.0	.012	10.0	75.9	759
30.2	.678	40.0	.060	10.0	82.0	820
30.0	1.80	39.0	.115	218	132	28,800
29.8	.642	38.0	.239	232	199	46,200
29.8	.825	40.1	.128	689	128	88,200
31.6	.693	42.0	.094	625	116	72,500
29.7	.741	40.0	.052	668	128	85,500

Table 2.--Basin characteristics for selected sites in the Lake Michigan basin--Continued

Station number	Station name	Drainage area	Main-channel slope	Main-channel length	Basin storage	Forest cover
		(mi ²) A	(ft/mi) S	(mi) L	(percent) Bs	(percent) F
04087018	Menomonee River at Germantown	19.0	5.88	7.03	3.00	11.5
04087020	Menomonee River at Menomonee Falls	30.7	4.20	9.50	7.25	14.0
04087030	Menomonee River at Menomonee Falls	34.7	6.48	11.9	4.00	11.7
04087040	Menomonee River at Butler	60.6	8.95	19.8	2.50	8.6
04087119	Honey Creek at Wauwatosa	10.3	10.9	10.4	.30	3.3
04087120	Menomonee River at Wauwatosa	123	8.95	27.2	.60	5.0
04087150	Kinnickinnic River at Milwaukee	17.4	31.3	5.97	1.36	7.9
04087200	Oak Creek near South Milwaukee	13.8	10.7	10.0	.43	9.4
04087204	Oak Creek at South Milwaukee	25.0	7.10	11.2	1.92	2.2
04087220	Root River near Franklin	47.2	4.90	16.2	5.52	9.0
04087233	Root River Canal near Franklin	57.0	8.70	15.3	6.71	5.2
04087250	Pike Creek near Kenosha	7.25	8.15	3.7	.97	.4
04087260	Pike River at Kenosha	40.9	7.50	12.3	1.29	4.0

Table 2.--Basin characteristics for selected sites in the Lake Michigan basin--Continued

Mean annual precipitation (in.)	Soil infiltration rate (in/h)	Mean annual snowfall (in.)	Base-flow index [(ft ³ /s)/mi ²]	Hydraulic conductivity [(gal/d)/ft ²]	Drift thickness (ft)	Transmissivity [(gal/d)/ft]
P	I	Sn	Bf	K	H	T
29.5	.455	37.3	.095	643	32.4	20,800
29.5	.603	37.0	.080	734	60.5	44,400
29.6	.475	38.0	.065	655	37.4	24,500
29.4	.486	38.5	.074	403	53.1	21,400
29.9	.500	40.4	.073	54.0	145	7,790
29.5	.521	38.0	.078	241	80.4	19,400
29.7	.718	41.0	.408	52.0	122	6,380
30.5	.533	41.0	.000	43.7	114	4,980
30.3	.593	41.0	.064	54.0	117	6,280
30.0	.500	41.0	.078	68.0	170	11,500
32.2	.660	38.0	.032	89.0	153	13,600
32.2	.956	33.0	.010	70.0	155	10,800
32.2	.755	37.0	.031	41.0	144	5,860

Table 3.--Comparison of methods available to estimate low-flow characteristics in the Lake Michigan basin

Type of site	Type of data	Number of sites with data	Approximate time required to collect data	Analytical method to determine Q _{7,10}	Standard error of 10-year low flow (SE _{7,10})
Gaging station	More than 10 years recorded streamflow	12	More than 10 years	Frequency analysis	25 percent
Gaging station	10 years recorded streamflow	--	10 years	Frequency analysis	32 percent
Low-flow partial-record stations	Eight or more base-flow discharge measurements	17	3-10 years	Graphical regression analysis	170 percent
Miscellaneous measurement sites with drainage areas less than 165 mi ²	One low base-flow discharge measurement (flow duration greater than 80 percent) and drainage area	24	1 day	Multiple-regression analysis	69 percent
Low-flow partial-record stations	Eight or more base-flow discharge measurements	10	3-10 years	Graphical regression analysis	235

1 Standard error was estimated using low-flow partial-record stations with Q_{7,10} values greater than 0.01ft³/s.

2 Standard error was estimated using low-flow partial-record stations with Q_{7,10} values greater than 0.10 ft³/s.