EVALUATION OF THE U.S. GEOLOGICAL SURVEY'S GAGING-STATION NETWORK IN ILLINOIS

By Dean M. Mades and Kevin A. Oberg

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PREFACE

The U.S. Geological Survey, in cooperation with several Federal, State, and local agencies, is now in its 83rd year of stream gaging in Illinois. Stream gaging has been described as the process and art of measuring the depths, areas, velocities, and rates of flow in channels. The quality of data obtained from stream gaging and quality of subsequent interpretations of that data are directly related to the quality of stream gaging performed by field technicians and hydrologists.

This report is dedicated to Howard E. Allen, Jr., whose tragic and sudden death on August 6, 1985, occurred after 29 years of direct involvement with stream-gaging activities in Illinois. His efforts as a stream gager, supervisor, reviewer, and teacher were significant contributions to our goal of providing high-quality hydrologic information for the State and the Nation.

D.M.M.

(p. V follows)

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ILLUSTRATIONS

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FACTORS FOR CONVERTING INCH-POUND TO METRIC (SI) UNITS

Multiply inch-pound units	By	To obtain SI units
	Length	
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
cubic foot (ft^3)	0.02832	cubic meter (m^3)
	Flow	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

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ABSTRACT

Data collected at 97 of 176 gaging stations operated during 1983 were used to describe rainfall-runoff processes, to monitor and forecast floods, and to monitor and regulate lake levels, discharge from reservoirs, or discharge of navigable streams. Stream-gaging stations on the Illinois River at Havana, East Branch Du Page River, and interior streams of the Mississippi River floodplain; peak-flow stations on small watersheds; and stage-only stations upstream from unsafe high-hazard dams should be considered for inclusion in future stream-gaging programs.

The accuracy of statistical models for peak-flow and 1-day mean flood-volume characteristics would not be considerably improved if the density of gaging stations and length of record at those gaging stations are increased. Model error masks tradeoffs between accuracy, density, and record length. The large number of streamflow records presently available is sufficient for accurately determining most streamflow characteristics at many gaging stations. tions.

The accuracy of streamflow records reported for stream-gaging stations and peak-flow stations varies widely. The accuracy of streamflow records for 12 stream-gaging stations and 11 peak-flow stations is substantially less than the accuracy of records for the other 143 stream-gaging and peak-flow stations considered.

Based on an evaluation of relative worth, 26 gaging stations are candidates for some type of action if budgetary limitations so demand. A candidate stream-gaging station could be operated during only part of a year, converted to a peak-flow station, or discontinued. Candidate peak-flow stations should be discontinued.

INTRODUCTION

The U.S. Geological Survey maintains the largest gaging-station network in Illinois. A gaging station is a particular site on a stream, channel, lake, or reservoir where systematic observations of stage (water-surface elevation) or discharge are made. A gaging-station network is a collection of continuous-record stations and partial-record stations that is designed to meet the various demands for streamflow information.

Two types of continuous-record stations are referred to in this report. "Stream-gaging stations" are gaging stations instrumented and operated to obtain continuous records of stage and discharge. "Stage-only stations" are instrumented gaging stations where continuous records of only stage are obtained.

Three types of partial-record stations are referred to in this report. "Peak-flow stations" are instrumented and operated to obtain instantaneous peak-discharge data. "Low-flow stations" are noninstrumented sites where measurements of only low discharges are made. "Miscellaneous-measurement stations" are gaging stations where discharge is periodically measured to maintain a stage-discharge relation or to provide auxiliary data for some other activity such as water-quality determinations.

The U.S. Geological Survey is responsible for maintaining a stream-gaging program that provides accurate streamflow information that satisfies the needs of the public. Needs for streamflow information and techniques for determining the accuracy of streamflow information change with time; thus, periodic evaluations of a gaging-station network should be performed. Recognizing these changes in needs and techniques, the U.S. Geological Survey in cooperation with IDOT (Illinois Department of Transportation, Division of Water Resources) initiated an evaluation of the stream-gaging program in 1981.

Purpose and Scope

This report describes the results of a study to determine (1) present and future needs for streamflow data in Illinois, (2) the likelihood of improving statistical models used to estimate selected streamflow characteristics at ungaged sites, (3) the relative accuracy of streamflow data obtained at stream-gaging and peak-flow stations, and (4) the relative worth of each gaging station in the 1983 Illinois stream-gaging program.

A survey was conducted to determine the usage of streamflow data collected at 176 gaging stations operated during the 1983 water year. The survey was also used to determine needs for additional streamflow data. A questionnaire developed for the survey was forwarded to 17 Federal, State, and local organizations involved with water-resources planning for Illinois.

Streamflow data from stream-gaging stations and peak-flow stations were analyzed using the NARI (Network Analysis of Regional Information) technique (Moss and others, 1982). NARI was used to determine the likelihood of improving statistical models for selected streamflow characteristics by collecting additional streamflow data. Regression analyses of streamflow data from gaging stations having 10 or more years of unregulated-flow record were used to develop the statistical models. Gaging stations on streams in predominantly urban areas were excluded from the regression analyses.

The Kalman-filter statistical procedure (Moss and Gilroy, 1980) was used to determine the accuracy of instantaneous discharges determined from a stage-discharge relation, or rating. The rating for each of the 138 stream-gaging stations operated during the 1983 water year was analyzed to determine how the accuracy of streamflow data collected at the gaging station is affected by the frequency of discharge measurements made at the gaging station. The Kalman-filter analysis and NARI provide valuable information about the hydrologic characteristics of presently gaged streams in Illinois.

The relative worth of each gaging station operated during 1983 was determined using a point-rating method (Wahl and Crippen, 1984). The total point rating for a gaging station is based on an evaluation of eight factors that are related to basin and hydrologic characteristics, need for data, and data usage. Selected results from the data-use survey, NARI, and Kalman-filter analysis were used to determine the rating of relative worth.

In general, the authors have attempted to prepare a report that the U.S. Geological Survey and cooperating agencies can use as a planning document. Our intent is to provide the decision makers from these various agencies with sufficient practical information to make informed decisions about the gaging-station network in Illinois.

This report is organized into four sections: The first section is an introduction to the study itself and a discussion of the Illinois stream-gaging program. The second section is a discussion of the methods used to evaluate the stream-gaging program. The section is subdivided into discussions of the data-use survey, the NARI and Kalman-filtering procedures, and the relative-worth method. Results based on application of each of these four methods are discussed in the third section. The complete study is summarized in the final section.

History of the Gaging-Station Network in Illinois

Since 1903, the U.S. Geological Survey has operated about 270 stream-gaging stations for various durations totaling about 7,200 years, an average of 27 years of operation per gaging station. The earliest records of stream-flow were collected by the Sanitary District of Chicago at Des Plaines River at Riverside (05532500) beginning in 1886. Monthly mean discharge was determined by the Sanitary District from 1886 until 1944 when the U.S. Geological Survey assumed responsibility for the gaging station. The U.S. Geological Survey began stream gaging in Illinois in 1903 when E. H. Heilbron, an engineer of the Sanitary District of Chicago, was granted a per-diem appointment to perform the field work at five stream-gaging stations--Des Plaines River near Channahon (05539660), Illinois River at Minooka (05541510), Illinois River at Ottawa (05553500), Illinois River near La Salle (05556000), and Illinois River at Peoria (05560000). These stream-gaging stations were established so that the Sanitary District could determine the effects of diversions from Lake Michigan through the Chicago Sanitary and Ship Canal to the Illinois River. A sixth stream-gaging station, Rock River at Rockton (05437500), was also established in 1903 to determine the potential for hydroelectric-power generation.

The number of stream-gaging stations in Illinois increased steadily from 6 gaging stations in 1903 to 46 gaging stations in 1939 (fig. 1). The stream-gaging stations were primarily operated to determine the frequency, duration,

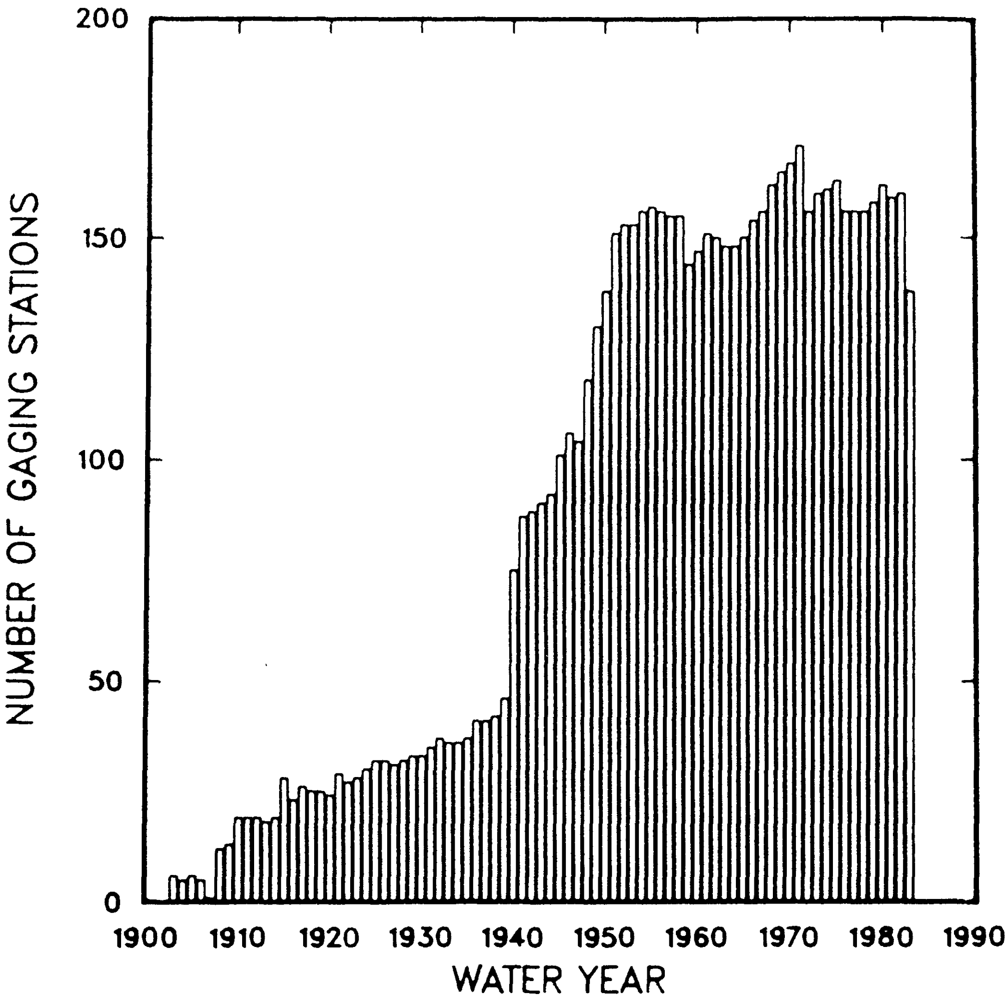


Figure 1.--Number of stream-gaging stations in Illinois.

and magnitude of floods on the State's larger rivers. Widespread flooding in southern Illinois during January and February 1937, and in central Illinois during May 1943 further increased public interest in flood characteristics and led to establishment of the "small-streams" program.

The purpose of the "small-streams" program, initiated in 1947, was to determine the statewide variation of flood characteristics for streams draining watersheds less than 1,000 mi^2 (square miles) in size. This program was responsible for the increase in the number of stream-gaging stations from 46 gaging stations in 1939 to 157 gaging stations in 1955 (fig. 1).

Since 1955, the number of stream-gaging stations has varied from a minimum of 138 gaging stations at present (1983) to a maximum of 171 gaging stations in 1971. The average number of stream-gaging stations maintained during this 28-year period was 156 gaging stations.

Auxiliary networks of partial-record stations are maintained to provide information that augments the information obtained from the stream-gaging station network. Two types of auxiliary networks have been maintained in Illinois. One is composed of peak-flow stations; the other was composed of low-flow stations.

The number of peak-flow stations operated during each water year is shown in figure 2. Less than five peak-flow stations were operated prior to 1955. A program to determine the peak-flow characteristics of streams draining watersheds with drainage areas less than 10 mi^2 was begun in 1955. In 1956, peak-flow data were collected at 51 peak-flow stations, most of which were located in rural areas. The peak-flow station network grew rapidly during the next 6 years and consisted of 185 gaging stations located statewide on both rural and urban watersheds in 1962. After peaking at 209 gaging stations in 1972, the number of gaging stations in the network declined to the 28 presently maintained. Most of the peak-flow stations installed as part of the peak-flow program were operated for about 19 years.

Two networks of low-flow stations have been maintained in Illinois. A statewide network was established in 1961 and maintained until 1974. During this period of time, periodic measurements of low flow were made during 2 to 4 consecutive years at selected low-flow stations. After five to nine measurements were made at a low-flow station, the gaging station was discontinued and another gaging station was established. Low-flow data were collected at 111 gaging stations. The number of low-flow stations operated during each water year is shown in figure 2. Thirty-seven gaging stations were maintained during the first year, 1961. The size of the network peaked in 1963 when 58 low-flow stations were maintained and then gradually decreased to 1 gaging station that was discontinued in 1974.

The second network of low-flow stations was maintained only during the 1981 water year. Discharge measurements made at 22 low-flow stations were used to define the low-flow characteristics of streams in the Kishwaukee River basin in north-central Illinois (Allen and Cowan, 1985).

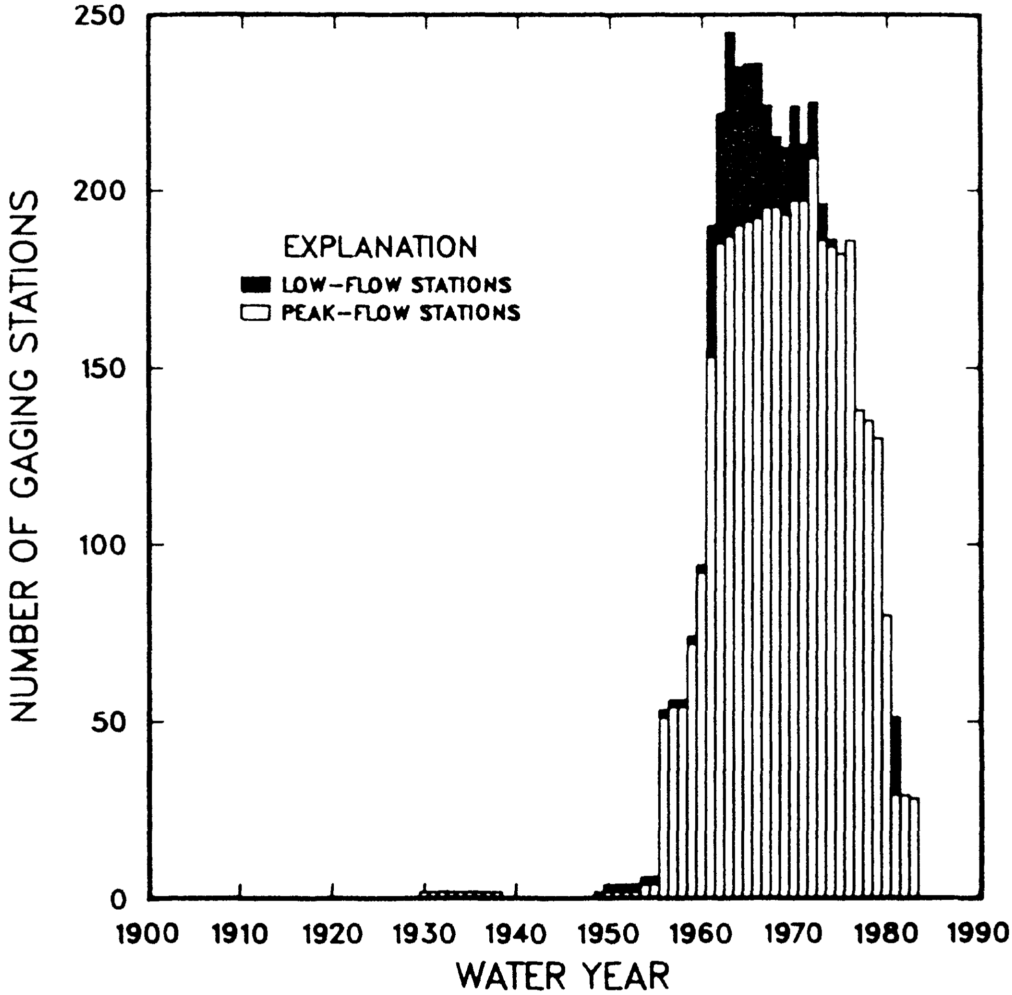


Figure 2.--Number of peak-flow stations and low-flow stations in Illinois.

The present (1983) gaging-station network is composed of 176 gaging stations--138 stream-gaging stations, 8 stage-only stations, 28 peak-flow stations, and 2 miscellaneous-measurement stations. Selected information about each gaging station is shown in table 1. Figure 3 shows the location of each gaging station and a map-index number for reference to information listed in table 1. Most of the stream-gaging stations are located rather uniformly throughout the State; however, 36 stream-gaging stations (map index numbers 55-85, 89, and 93-96) are located in the predominantly urban area of northeastern Illinois. The stream-gaging stations are located on watersheds with drainage areas ranging from 4.46 to 26,028 mi^2; 108 gage flow from drainage areas less than 1,000 mi^2. The 138 stream-gaging stations have been operated for an average duration of 34 years. Two stream-gaging stations, Sangamon River at Monticello (05572000) and Big Muddy River at Plumfield (05597000), have been operated for 76 years, the longest duration of stream-gaging stations established and maintained by the U.S. Geological Survey in Illinois.

Five of the eight stage-only stations are located on streams or lakes in the Fox Chain of Lakes area in northeastern Illinois and have been operated since 1940 or 1941. The three other stage-only stations are located upstream from two large reservoirs in southern Illinois, Carlyle Lake and Rend Lake (fig. 3).

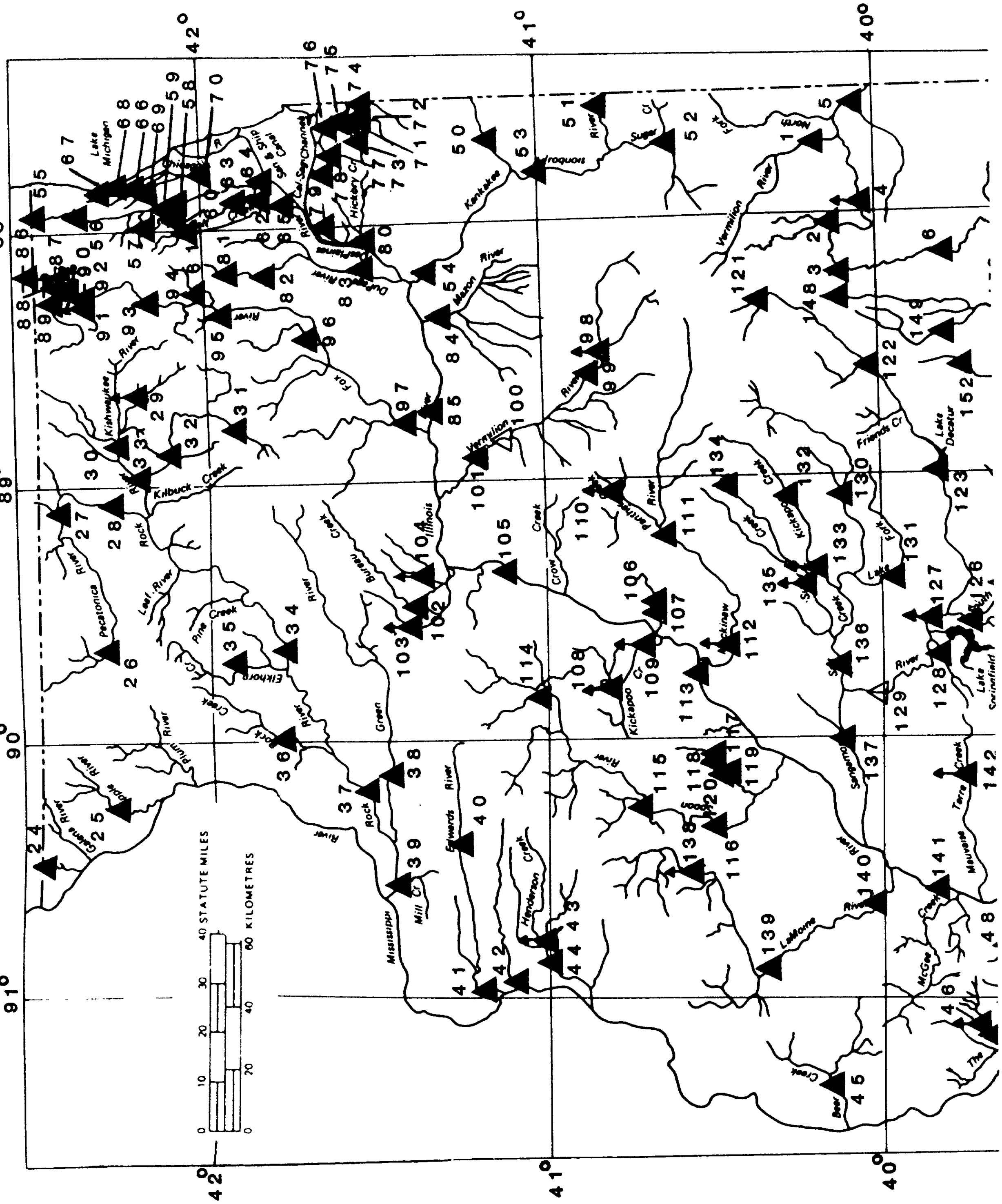
All of the peak-flow stations are located at former stream-gaging stations (table 1). Three of the 28 gaging stations are located on streams with drainage areas greater than 1,000 mi^2. Only one peak-flow station, Boone Creek near McHenry (05549000), is located in northeastern Illinois.

Discharge measurements are made at two miscellaneous-measurement stations, Vermilion River at Streator (05555000) and Sangamon River at Petersburg (05578000), to maintain ratings for flood-forecasting purposes. Both miscellaneous-measurement stations are located at former stream-gaging stations.

Prior Evaluations of the Gaging-Station Network

Annual meetings between the U.S. Geological Survey and agencies that cooperate in funding the stream-gaging program are the single most important means for continually evaluating the streamflow-data needs of those agencies. Problems related to the operation and maintenance of particular gaging stations are also discussed at these meetings. These meetings are particularly useful for identifying short-term needs for stream gaging in Illinois.

Two prior evaluations of the nationwide stream-gaging program were performed by the U.S. Geological Survey to assist in planning for the long-term needs for stream gaging. The objectives of the first formal gaging-station network evaluation (Carter and Benson, 1969) were to define long-term goals of the streamflow-data program in quantitative form, analyze all available streamflow data to determine which goals have already been met, and propose alternate programs and methods to meet goals that had not been met. Results of the evaluation of the Illinois stream-gaging program were presented by Sieber (1970).


42°
41°
40°
88°
89°
90°
91°
Lake Michigan
Kankakee
Iroquois
Sugar Cr
Vermilion River
Mason River
Fox
Illinois
Vermilion
Kishwaukee River
Kilbuck Creek
Rock River
Pecatonica River
Leaf River
Pine Creek
Elkhorn Cr
Plum River
Galena River
Mississippi River
Mill Cr
Edwards River
Henderson Creek
Green River
Crow Creek
Kickapoo Cr
Mackinaw
Sangamon River
LaMoine River
McKee Creek
Mauvaise Terre Creek
Friends Cr
Lake Decatur
Lake Springfield
Beer Creek
Hickory Cr
Sanitary & Ship Canal
DesPlaines River
DuPage River
Bureau Creek
STATUTE MILES
KILOMETRES

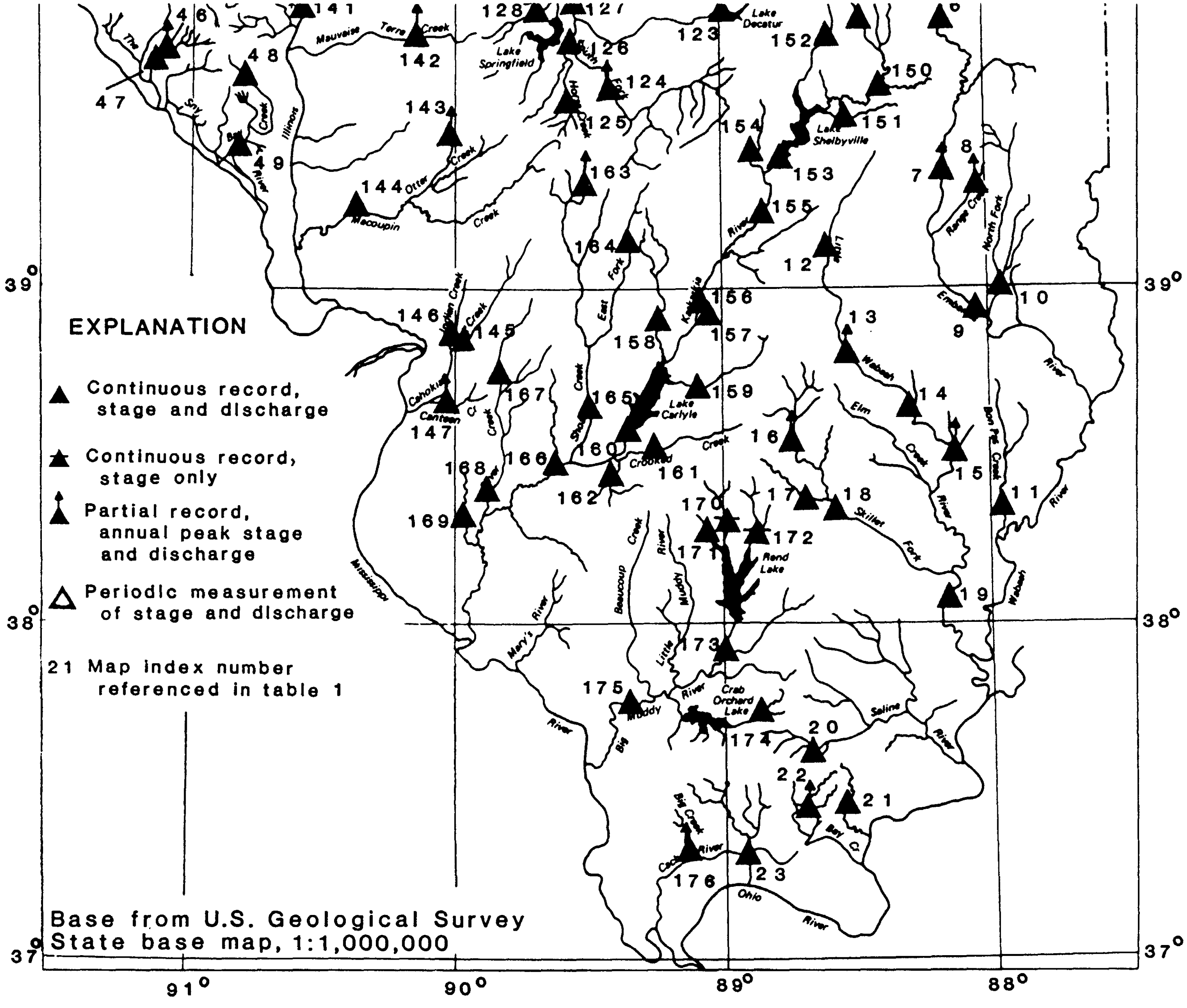


Figure 3.--Location of gaging stations in Illinois during 1983.

Quantitative goals for accuracy were specified for four types of data use as follows: (1) Definition of current streamflow conditions, (2) determination of long-term trends in streamflow, (3) description of the hydrologic environment of stream channels and drainage basins, and (4) development of regional information-transfer techniques. The goal for the first three types of data use was to collect data as accurately as possible with the present stream-gaging methods. The goal for the fourth type of data use was expressed in terms of equivalent years of record.

The concept of equivalent-year accuracy was proposed by Hardison (1971) as a means of removing the areal variability of the standard error of prediction of a streamflow characteristic for an ungaged site. Hardison (1971, p. C231) presented equations for expressing the accuracy of prediction in terms of equivalent years of record. Sieber (1970) proposed collecting streamflow data until streamflow characteristics for ungaged watersheds in Illinois could be estimated with an accuracy equivalent to 10 years of record for small streams (drainage area less than 500 mi^2) and 25 years of record for principal streams (drainage area greater than 500 mi^2).

Sieber (1970, p. 25-32) offered several proposals that were implemented to various degrees after water year 1971. All but 1 of the 26 stream-gaging stations proposed for operation to identify long-term trends have remained in operation. Seven of the 43 stream-gaging stations on small streams that Sieber proposed discontinuing have been discontinued; 21 were converted to peak-flow stations. Ten of those peak-flow stations are still operated. Only 1 of the 11 stream-gaging stations on principal streams that were proposed for discontinuation was discontinued. Two of the 11 stream-gaging stations on principal streams where stream gaging was proposed were activated but have subsequently been discontinued.

The U.S. Geological Survey began another evaluation of the nationwide stream-gaging program in 1982 (Fontaine and others, 1984). The evaluation will take 5 years to complete; approximately 20 percent of the program will be analyzed during each year. The objective of the evaluation is to define and document the most cost-effective means of furnishing streamflow information. The approach used to meet this objective consists of three steps as follows: (1) Identify the principal uses of streamflow data collected at stream-gaging stations; (2) evaluate less costly alternative methods, such as flow-routing techniques, for furnishing streamflow data; and (3) define strategies for operating the network that minimize the average error of streamflow data for a given operating budget. Results of the evaluation of the Illinois stream-gaging program are presented by Mades and Oberg (1984).

The third step of the approach is a cost analysis based on an accounting of actual costs related to stream-gaging activities and an analysis of the stability of the stage-discharge relation at a stream-gaging station. The methods are a unique approach to define tradeoffs between dollars and accuracy of streamflow records. Selected results of the stage-discharge relation stability analysis published by Mades and Oberg (1984) are presented in the Kalman-filter section of this report.

Acknowledgments

The authors acknowledge the following agencies for their cooperation in identifying the uses of data collected at the gaging stations in the Illinois stream-gaging program:

U.S. Army Corps of Engineers, Chicago District,

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U.S. Army Corps of Engineers, St. Louis District,

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U.S. Environmental Protection Agency, Region V,

U.S. Fish and Wildlife Service, Carbondale office,

U.S. Fish and Wildlife Service, Rock Island office,

Federal Emergency Management Agency, Region V,

National Weather Service, Chicago Forecast Center,

National Weather Service, Ohio River Forecast Center,

Water Resources Center, University of Illinois,

Illinois Department of Transportation, Division of Water Resources,

Illinois Environmental Protection Agency,

Illinois Department of Energy and Natural Resources, Natural History Survey Division,

Illinois Department of Energy and Natural Resources, State Water Survey Division, Champaign and Peoria offices,

Metropolitan Sanitary District of Greater Chicago, and

Northeastern Illinois Planning Commission.

METHODS OF STUDY

Data-Use Survey

Streamflow data collected by the U.S. Geological Survey in Illinois is provided to the public in several ways. Daily mean discharge, peak flow, and miscellaneous measurements of discharge are published annually in the U.S. Geological Survey's water-data report series. Daily mean discharge and peak flow are also stored on the U.S. Geological Survey's WATSTORE (National Water Data and Retrieval System) Daily Values File and Peak Flow File (Hutchinson, 1975). Data stored on these files are accessible by a number of Federal and State agencies. The general public may also request retrievals of the information stored in the files. Although many of the possible users of Illinois streamflow data are readily identifiable, the specific usages of the data are not.

A survey of data usage was performed during January 1982. The survey was conducted by mailing a questionnaire to Federal, State, and local organizations that are involved with water-resources planning in Illinois. Several of these organizations participated in funding the 1983 stream-gaging program. The organizations selected for the data-use survey are a sample of public agencies that have particular streamflow-data needs and are fiscally responsible, to variable degrees, for the Illinois stream-gaging program.

The questionnaire was composed of two parts. The first part was used to identify the principal uses and importance of streamflow data collected at each gaging station. Participants in the survey were asked to specifically describe the uses of data and to identify in which of three general-purpose categories the specific uses could be categorized. General purpose was categorized as follows: Current purpose (usage related to site-specific management activities); planning and design (usage related to local or regional planning activities); and determination of long-term trends. Three classifications of importance (very, marginal, and non-) were provided for a responder to describe how important the data from a gaging station are to the mission of his organization.

The second part of the questionnaire was used to determine the present and future needs for streamflow information. Participants in the survey were also asked whether those needs were being met with the present stream-gaging program.

Network Analysis of Regional Information

Information about streamflow can be determined in two ways. Networks of gaging stations can be operated for the purpose of collecting site-specific records of streamflow. Second, information-transfer techniques can be used to infer characteristics of streamflow at ungaged sites based on records of streamflow at gaged sites. Information-transfer techniques are needed because it is not economically feasible to collect streamflow data at every site where data are needed. Statistical models based on multiple-regression analysis are a commonly used information-transfer technique.

NARI (Network Analysis of Regional Information) is a technique that is used to evaluate the accuracy of regression models used to estimate streamflow characteristics at ungaged sites in a specified region. Several computer procedures are used to analyze tradeoffs between the accuracy of a regression model, the number of gaging stations that are considered in the regression analysis, and the length of record available for each of those gaging stations.

The theoretical bases of the NARI procedure are discussed in detail by Moss and Karlinger (1974). Moss and others (1982) discuss several changes to the original procedure and also discuss the computer procedures used to analyze the regression equations. A summary of the theoretical bases of NARI and a brief description of the NARI procedure follow.

Theoretical Basis

Multiple regression provides a mathematical equation of the relation between a single dependent variable and several independent variables. A measure of the accuracy of the defined relation, the standard error of estimate, is also provided by multiple regression. The general form of a regression model, the relation derived by logarithmic multiple-regression analysis, is

$$Y = 10^{b_0} X_1^{b_1} X_2^{b_2} \ldots X_k^{b_k}, \quad (1)$$

where Y is an estimate of the dependent variable;

$X_1, X_2, \ldots, X_k$ are independent variables; and

$b_0, b_1, b_2, \ldots, b_k$ are model parameters that are determined by multiple-regression analysis.

Dependent variables considered in this report are streamflow characteristics such as mean annual discharge and annual peak discharge having a recurrence interval of 50 years. Independent variables are basin characteristics that describe the drainage basin upstream from a gaging station or an ungaged site for which an estimate of a streamflow characteristic is being made. Drainage area and channel slope are commonly used basin characteristics.

The observed standard error (of estimate) associated with a regression analysis, S_o, is a measure of the predictive accuracy of the regression relation. S_o is only an estimate of the true accuracy of the regression estimates. It is highly probable that another value of S_o would be obtained if another set of gaging stations or another period of record were used in the regression analysis.

Observed standard error may be partitioned into time-sampling error, space-sampling error, and model error (Moss, 1979). Time-sampling errors are a function of harmonic mean record length, NY. Space-sampling errors are a function of the number of gaging stations used in the regresssion analysis, n, adjusted for lost degrees of freedom in the regression analysis. Model error, γ, is the error in the regression that exists even though there are no errors in the model parameters $b_0, b_1, b_2, \ldots, b_k$ of equation 1.

The harmonic mean record length, NY, is defined by

$$NY = n\left[\sum_{i=1}^{n}(m_i^{-1})\right]^{-1} \quad (2)$$

where n is the number of gaging stations used in the regression analysis, and

m_i is the number of years of record at the ith gaging station.

The adjusted number of gaging stations, NB, is defined by

$$NB = n-k+1 \qquad (3)$$

where k is the number of independent variables used in the regression analysis. The adjustment to n is necessary to correct for lost degrees of freedom in the regression analysis (Moss and others, 1982).

Moss and Karlinger (1974) combined a regression simulator and a multisite streamflow generator to derive a distribution of observed standard error conditioned on values of average interstation correlation coefficient, R_c; coefficient of variation, C_v; and γ, NB, and NY. Bayes' theorem (Benjamin and Cornell, 1970, p. 64) was used to determine the averaged probability distribution of true standard error, S_t, conditioned on values of S_o, NB, and NY. The term "averaged" is used to indicate that all possible combinations of R_c, C_v, and γ were considered in the computation of $P(S_t|S_o,NB,NY)$, the conditional probability distribution of S_t.

Statements about the reliability of a regression model are made in terms of the probability that the true accuracy of the model is less than a stated value of S_t. A mathematical expression for this reliability is

$$P(S_t \leq S_t^{\alpha} | S_o,NB,NY) = \alpha \qquad (4)$$

where α is a level of reliability, or confidence level,

S_t^{α} is a stated value of true standard error, and

P(...) is the probability that the mathematical expression enclosed by parentheses will occur.

Analytical Procedure

The NARI procedure consists of three steps as follows: (1) Selection and calculation of streamflow characteristics, (2) multiple-regression analysis, and (3) calculation of the probability distribution of true standard error. Gaging stations on streams with discharge that is affected by regulation or diversion were excluded from analysis.

Streamflow characteristics considered in this study reflect a wide range of streamflow conditions. Low-flow characteristics are represented by the annual minimum 7-day mean flows having recurrence intervals of 2 years ($M_{7,2}$) and 10 years ($M_{7,10}$). These low-flow characteristics are discharges below which the annual minimum 7-day average will fall at time intervals averaging 2 years and 10 years in length, respectively. Typical streamflow conditions are represented by the mean annual, or average, discharge (Q_a). High-flow characteristics are represented by annual peak floods and annual maximum 1-day mean flood volumes corresponding to recurrence intervals of 2, 10, 50, and 100 years. Peak-flow characteristics, P_2, P_{10}, P_{50}, and P_{100}, are annual maximum (instantaneous) discharges that are exceeded on the average of once each 2, 10, 50, and 100 years, respectively. Flood-volume characteristics, $V_{1,2}$, $V_{1,10}$, $V_{1,50}$, and $V_{1,100}$, are annual maximum 1-day mean (daily) discharges with recurrence intervals as defined for the peak-flow characteristics.

Low-flow and flood-volume characteristics were based on streamflow records collected prior to 1981. The characteristics were computed using computer procedures that mathematically fit the three-parameter Pearson Type III probability distribution to the logarithms of discharge (Meeks, 1984). Graphical interpretations of the fitted log-Pearson Type III frequency curves (Riggs, 1972, p. 6) were performed when warranted to ensure that accurate estimates of low-flow characteristics were calculated.

Peak-flow characteristic values published by Curtis (1977) and Allen and Bejcek (1979) were used to develop statistical models for peak-flow characteristics. These values are based on streamflow records collected prior to 1976. Several gaging stations that were not considered in these previous studies because of insufficient record length were considered in this study if at least 10 years of record collected prior to 1981 existed. Peak-flow characteristics for those gaging stations were computed using computer procedures based on U.S. Water Resources Council guidelines for flood-frequency analysis (Kirby, 1981).

The second step of the NARI procedure is to develop statistical models for estimating streamflow characteristics at ungaged sites. The State was first divided into a number of homogeneous regions; each region is a cluster of watersheds that are expected to have similar hydrologic characteristics. Streamflow and basin characteristics for gaging stations located within a specified homogeneous region were then used in a multiple-regression analysis to determine a regression model for each streamflow characteristic.

The SAS[1] (Statistical Analysis System) procedure STEPWISE was used to perform multiple-regression analyses (SAS Institute, 1982). "Best-fit" regression models, similar in form to equation 1, were determined by using MAXR (maximum R^2 improvement) technique in the STEPWISE procedure. R^2, the coefficient of determination, is a measure between 0.0 and 1.0 that indicates how well the statistical model explains the total variation of the dependent variable. R^2 is the square of the correlation between observed and predicted values of the dependent variable. A value of 1.0 indicates the model explains all of the variation of the observed values of the dependent variable; a value of 0.0 indicates none of the observed variation is explained by the model.

Four basin characteristics were considered in the multiple-regression analyses of the streamflow characteristics. Practical limitations of time precluded consideration of a large number of basin characteristics. Basin-characteristic data considered in the regression analyses are available in the WATSTORE streamflow/basin characteristics file (Dempster, 1983).

Drainage area (A), in square miles, is measured on topographic maps on which the basin boundary upstream from a gaging station has been delineated.

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[1] Use of SAS in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

Main-channel slope (S_c) was used as a simple index of the slope of a drainage basin. S_c is the average slope, in feet per mile, of the main channel between points 10 and 85 percent of the distance upstream from a gaging station to the basin divide. Main-channel length, extended to the divide, is first measured on a topographic map. Elevations at the 10- and 85-percent points are determined from contours shown on the map.

Mean annual precipitation (P_a), in inches, is a measure of the amount of water supplied to a basin and of total runoff. Values of P_a were determined from a map showing isohyets that are based on precipitation data collected from 1901 through 1944 (Changnon, 1958).

The maximum 24-hour precipitation expected to be exceeded on the average of once each 2 years ($I_{2,24}$) was selected as an index of precipitation intensity. Values of $I_{2,24}$, in inches, were determined from a map developed by the U.S. Weather Bureau (Hershfield, 1961).

The third step of the NARI procedure is to calculate a conditional probability distribution of true standard error, $P(S_t\ S_o, NB, NY)$, for each regression model. This step is repeated for each regression model developed in the previous step of the NARI procedure. The computer procedure BBPOSPRI (Moss and others, 1982) was used to calculate joint probabilities of coefficients of variation, C_v, and interstation correlation coefficients, R_c, based on the streamflow records for the gaging stations used in the regression analyses. Values of R_c were adjusted for the non-concurrence of streamflow records; values of C_v were adjusted for the probability of occurrence of zero flow (Moss and others, 1982, p. 7). A second computer procedure, MODLVALU, was used to calculate the conditional probability distribution of S_t for the present level of information (NB and NY) based on the joint probabilities of C_v, R_c, and γ, and S_o. MODLVALU also calculates the S_t related to alternative levels of information (NB* and NY*). The asterisk (*) indicates a value different than the value associated with the regression analysis.

Kalman-Filter Analysis of Uncertainty

Moss and Gilroy (1980) proposed that the uncertainty in streamflow data collected at stream-gaging stations be used to measure the effectiveness of a stream-gaging program. Uncertainty is defined as the variance of the percentage errors of estimation of instantaneous discharges; it varies with the annual number of times discharge is measured at a stream-gaging station.

Fontaine and others (1984) describe a mathematical procedure that is used to perform a cost analysis of the operation of the stream-gaging program. The procedure, called "The Traveling Hydrographer," attempts to allocate a predefined budget among stream-gaging stations in a way that minimizes total uncertainty (maximizes effectiveness). Mades and Oberg (1984) describe the results of such an analysis of the Illinois stream-gaging program.

The procedures used to perform the uncertainty analysis and cost analysis are collectively referred to as K-CERA (Kalman-Filtering for Cost-Effective Resource Allocation). Results of a K-CERA analysis are of marginal use to decision makers who must develop plans for future stream-gaging programs in Illinois. The cost analysis is a study of the operation, or implementation, of a program. However, the analysis of uncertainty does provide valuable information about the hydrologic characteristics of the presently gaged streams in Illinois. Such information should be considered when developing future stream-gaging programs.

The following section is a brief description of the procedures used to determine the uncertainty of streamflow records. The procedures are described in greater detail by Moss and Gilroy (1980).

Theoretical Basis

The uncertainty of a streamflow estimate depends on how that estimate is obtained. Uncertainty is derived from three sources as follows: (1) Error related to uncertainties in the stage-discharge relation (rating curve) that relates discharge to primary correlative data, such as stage, collected at the stream-gaging station; (2) error related to methods for reconstructing streamflow records based on auxiliary correlative data such as streamflow records for a nearby gaging station; and (3) error related to periods when no primary and auxiliary correlative data are available for estimating discharge.

Uncertainty, the total variance of percentage errors of estimation, is the sum of the weighted variances of percentage errors related to each source. The weighting factor is the fraction of time each source of error is expected to occur. Total variance is expressed by

$$V_t = (\varepsilon_f)(V_f) + (\varepsilon_r)(V_r) + (\varepsilon_e)(V_e) \tag{5}$$

with

$$1 = \varepsilon_f + \varepsilon_r + \varepsilon_e ,$$

where V_t is the expected total variance of the percentage errors of estimation,

V_f is the variance of the percentage errors related to estimation of streamflow based on a stage-discharge relation,

V_r is the variance of the percentage errors related to reconstruction of streamflow record based on auxiliary correlative data,

V_e is the variance of the percentage error of estimation when no correlative data are available, and

ε_f, ε_r, ε_e are the fractions of time that V_f, V_r, and V_e, respectively, are expected to occur.

Individual components of V_t (equation 5) are related to several channel and streamflow characteristics; the annual frequency of visits to a gaging station, N_v; the annual frequency of discharge measurements at a gaging station, N_m; and the frequency of equipment malfunctions at a gaging station.

Mades and Oberg (1984) present equations for calculating the individual components of equation 5. Fractions of time (ε_f, ε_r, and ε_e) are based on N_v and the frequency of equipment malfunctions. Note that the plus (+) signs in their equations 8 and 9 (Mades and Oberg, 1984, p. 31) should be minus (-) signs. V_f is related to the stability of the long-term stage-discharge relation, a channel characteristic, and to N_m. V_r and V_e are related to the variability of streamflow at a gaging station; V_r is also related to the interstation correlation of streamflow at the gaging station with streamflow at nearby gaging stations.

A long-term rating curve is defined by determining a "best-fit" line through pairs of measured discharge and concurrent stage that are plotted on logarithmic graph paper. The long-term rating curve can be a single line or several lines. Deviations of observed discharge from the rating, or residuals, are defined by

$$z(t) = \log[q_m(t)] - \log[q_r(t)] \quad , \qquad (6)$$

where t is time,

z is the residual,

q_m is the measured discharge, and

q_r is the discharge determined from the long-term rating curve.

The variance of the residuals, Var[z(t)], is affected by the stability of the rating curve and the error of making a discharge measurement. The variance of the error related to the stability of the rating curve, or process variance, p, is defined by

$$p = \mathrm{Var}[z(t)] - r \quad , \qquad (7)$$

where r is the variance of the percentage error of making a discharge measurement.

Moss and Gilroy (1980) describe how V_f is calculated by using a Kalman filter (Gelb, 1974) and the site-specific parameters p, r, and ρ, the 1-day autocorrelation coefficient of z(t). The Kalman filter uses these three parameters to determine V_f as a function of N_m. The variance of error derived from using the stage-discharge rating is proportional to p. Less stable stage-discharge ratings have larger values of p which result in greater uncertainty (error). The 1-day autocorrelation coefficient, ρ, affects the rate at which V_f decreases as N_m increases. The coefficient ranges in value from 0.0 to 1.0. Increasing values of ρ cause a greater rate of decrease in V_f as measurement frequency increases.

The seasonally averaged coefficient of variation, $\overline{C}_v$, squared is used as an estimate of the variance of error when no correlative data are available, V_e. Such use is based on the assumption that when no correlative data are available, the expected value of discharge for the period of missing data can be used as an estimate of discharge. The coefficient of variation, C_v, varies seasonally and since the times of equipment failures cannot be anticipated, a seasonally averaged value of C_v is used (Fontaine and others, 1984, p. 25). $\overline{C}_v$, in percent, is defined by

$$\overline{C}_v = 100\left(1/365 \sum_{i=1}^{365} (s_i/\mu_i)^2\right)^{1/2}, \quad (8)$$

where s_i is the square root of the variance of daily discharges for the ith day of the year, and

μ_i is the expected value of discharge on the ith day of the year.

Reconstructed streamflow records based on the correlation of discharge at a stream-gaging station of interest with discharge at a nearby gaging station have a variance of errors that is less than $\overline{C}_v^2$. The fraction of variance at the primary stream-gaging station that is explained by data from a nearby stream-gaging station is equal to ρ_c^2, the cross correlation of streamflow at the two gaging stations, squared. The fraction of unexplained variance is $(1-\rho_c^2)$. The variance of errors of reconstructed streamflow record, V_r, is defined by

$$V_r = (1-\rho_c^2)\overline{C}_v^2. \quad (9)$$

Site parameters p, ρ, ρ_c, and $\overline{C}_v$, and statistics for frequency of equipment malfunction are used to calculate an uncertainty function for each gaging station. This function is the relation of standard error of percentage errors, S_p, to annual frequency of discharge measurements, N_m. S_p is the square root of the expected total variance of percentage errors, V_t, and is referred to as the standard error of instantaneous discharge.

Analytical Procedure

The KFAU procedure consists of five steps as follows: (1) Determination of long-term rating curves, (2) analyses of time series of residuals, (3) evaluation of past equipment performance to determine the frequency of equipment malfunctions that resulted in lost primary correlative data, (4) calculation of hydrologic parameters $\overline{C}_v$ and ρ_c, and (5) calculation of uncertainty functions. Effects that missing correlative data have on uncertainty were excluded from consideration in this study; therefore, only the procedures used in the first, second, and fifth steps are briefly described.

The SAS nonlinear optimization algorithm, PROC NLIN, was used in the first step to determine the long-term rating based on concurrent measurements of discharge, q_m, and gage height made since 1970. The measurements used are representative of present stream-channel conditions. Measurements significantly affected by ice cover were excluded from the analysis of uncertainty.

Each rating has the form

$$\log q_r = b_1 + b_3 \log (g - b_2) , \quad (10)$$

where $\log q_r$ is the common logarithm of the long-term rating discharge,

g is the gage height observed during the discharge measurement, and

b_1, b_2, and b_3 are parameters calculated by PROC NLIN.

PROC NLIN computes values of b_1, b_2, and b_3 that minimize the sum of the squared residuals, $(\log q_m - \log q_r)^2$.

The time series of residuals computed for the long-term rating were then analyzed to determine the process variance, p, and 1-day autocorrelation coefficient, ρ. The variance of percentage measurement errors, r, was assumed to be 12.25 percent squared and is equivalent to a 3.5-percent standard error.

Computer procedure MARVAR (E. J. Gilroy and W. O. Thomas, U.S. Geological Survey, written commun., 1983) was used to calculate the uncertainty functions based on p, ρ, r, and N_m. MARVAR is based on computational procedures discussed by Moss and Gilroy (1980).

Relative-Worth Analysis

Many gaging-station networks are a combination of several networks that are operated for different objectives and funded by different sources. NARI and K-CERA are not intended to address the many diverse needs for data. NARI deals with the design of a network that is operated primarily to define regional hydrology. K-CERA deals with the design of operating strategies for maintaining an existing network. Wahl and Crippen (1984) proposed an objective method for simultaneously evaluating all gaging stations in a network. This method, referred to as relative-worth analysis, is applicable for evaluating gaging stations for discontinuance and for evaluating ungaged sites where gaging stations might be installed.

Relative-worth analysis is a three-step procedure. The first step is to compile the following information for each gaging station: Site characteristics (such as length of record, quality of data, and drainage-basin size), need for information, and use of the data that are collected. The second step is to assign point values to a number of factors selected for assessing the relative worth of gaging stations in a multiple-purpose network. The third step is to identify ungaged sites where stream gaging is needed and currently gaged sites that can be discontinued, based primarily on the point values assigned in the second step.

The rating factors and corresponding point values considered in this study were modified from the criteria developed jointly by the California Department of Water Resources and the U.S. Geological Survey (Wahl and Crippen, 1984). A list of factors and range in point values for each factor are shown in table 2.

The maximum rating possible is 67 points. Factors related to site characteristics and data use may constitute as much as 40 and 45 percent, respectively, of the maximum rating. The remaining 15 percent, or 10 points, of the maximum rating is related to the apparent need for data as indicated by the diversity of interest in the data (factor 2).

Selected results from the data-use survey, network analysis of regional information, and Kalman-filter analysis of uncertainty were compiled for use in the second step of the relative-worth analysis. The total rating of relative worth is the sum of rating points assigned to each factor. Table 3 is a list of guidelines for assigning point values to each factor.

Several guidelines in table 3 require additional explanation. The rating of "data accuracy" was based on the standard error of instantaneous discharge, S_p, for nine measurements per year, assuming there is no lost record at the gaged site. S_p is the value of the uncertainty function described in the KFAU section of this report. Point ratings for the accuracy of data collected at peak-flow, stage-only, and miscellaneous-measurement stations were based on qualitative evaluations of accuracy by field personnel.

Guidelines for "length of record" reflect the accuracy of streamflow characteristics and potential for determining long-term trends. The standard error of estimate of a particular streamflow characteristic is inversely related to the number of years of record (Benson and Carter, 1973). The rate of decrease of standard error decreases appreciably after 25 years of record are collected. Therefore, the point value for this factor decreases until the record length exceeds 25 years. Record lengths exceeding 25-40 years are potentially more useful for indicating trends in streamflow. Therefore, the point value for "length of record" increases with record length that exceeds 25 years.

"Correlation efficiency" is a measure of the value of a gaging station as a base for estimating discharge at other sites by means of correlation. Wahl and Crippen (1984) indicate that the point rating for this factor is related to both the length of record at the gaging station and the interstation correlation of streamflow at the gaging station with streamflow at several nearby gaging stations. A gaging station with extensive record that is highly correlated with records at five nearby gaging stations has greater value for "correlation efficiency" than one with long-term record that is poorly correlated with records of nearby gaging stations. Point ratings for this factor were based on values of interstation correlation coefficients published by Mades and Oberg (1984, p. 70). Point ratings for peak-flow, miscellaneous-measurement, and stage-only stations were estimated.

"Diversity of interest" is a measure of the multiplicity of uses of streamflow data collected at a gaging station. This factor also serves as an indicator of the apparent need for streamflow information at a site. A gaging station that satisfies a variety of needs for a number of agencies has greater relative worth than another gaging station that satisfies a limited number of needs for only one agency.

Several factors that may be important are omitted from consideration in the relative-worth analysis. The existing and potential beneficial uses of water may influence the ranking of one gaging station's worth relative to another. Numerous beneficial uses of regional importance imply a greater need for stream gaging than do a few beneficial uses of local importance. The value of water also may influence a ranking of relative worth. Gaging stations on streams where water is diverted or regulated for required irrigation, power production, or water supplies may be ranked higher than gaging stations where streamflow has a lower economic value. Cost of operating a gaging station was also excluded from consideration.

The set of factors and guidelines listed in tables 2 and 3 can be modified or expanded. The method is flexible and somewhat subjective; however, it is believed to be a practical method for evaluating the relative worth of individual gaging stations in a network that is maintained for multiple purposes.

EVALUATION OF THE GAGING-STATION NETWORK

Four methods were used to satisfy the four objectives of this gaging-station network evaluation. A survey was conducted to determine the present and future needs for streamflow data. The NARI (Network Analysis of Regional Information) procedure was used to evaluate the sufficiency of existing streamflow data for developing statistical models that are used to transfer information from gaged to ungaged sites. The KFAU (Kalman-Filter Analysis of Uncertainty) procedure was used to determine the relative accuracy of streamflow data collected at stream-gaging stations. Relative-worth analysis was used to evaluate the essentialness of each gaging station relative to other gaging stations in the network. Results based on each method are discussed in the next four sections of the report.

Data-Use Survey Results

The survey of data use was conducted by mailing a questionnaire to 24 offices of 17 organizations listed in table 4. Six of these organizations (three Federal, two State, and one public) participated in funding the 1983 stream-gaging program. Responses to the questionnaire were received from 19 offices of 7 Federal, 4 State, and 2 local organizations (table 4).

Responses to the data-use survey are presented in table 5. This information was compiled from responses to the first part of the questionnaire. Three categories (current purpose, planning and design, and determination of long-term trends) are used to describe the purpose for operating a gaging station. Current purposes imply an immediate use of streamflow information for some type of management or decision-making need. Planning and design implies a need for information on statistical characteristics of streamflow at any site on any stream. Long-term trend determination implies a need for an indefinite amount of streamflow information that is used for planning purposes. Codes described in the headnote of table 5 indicate the specific usage of data collected at each gaging station. Codes in the right-most column indicate a measure of need for the streamflow data.

The network is composed of gaging stations that are operated for single and multiple purposes. There are 39 gaging stations that are operated for an expressed single purpose (18 for current purposes, 18 for planning and design, and 3 for determining long-term trends). Data from 83 gaging stations serve all three purposes for one or more agencies. All combinations of two of the three purposes are served by data collected at 48 gaging stations. No indication of purpose was given for six gaging stations.

The specific usage of streamflow data can be categorized in general as use to determine the quantity of water and use to determine the quality of water. Data collected at 36 gaging stations are used only to determine the rate or amount of streamflow. Streamflow data collected at 19 gaging stations are used only to determine quality of water. Characteristics of water quantity and water quality are determined from data collected at 104 gaging stations. No indication of specific use was given for 17 gaging stations.

The specific usages of streamflow data collected to determine water quantity are related to (1) describing rainfall-runoff processes, (2) monitoring and forecasting floods, and (3) monitoring and regulating lake levels, discharge from reservoirs, or discharge of navigable-stream reaches. Data collected at 97 gaging stations are used in all three ways. Another 28 gaging stations provide data that are used only to describe rainfall-runoff processes; 15 other gaging stations provide data used only to monitor and regulate lake levels or discharge.

In response to the second part of the questionnaire, respondents identified streamflow characteristics that are used the most to accomplish their organizations' missions. Responses listed in table 6 indicate that daily discharge and characteristics related to high-streamflow conditions were used the most by the greatest number of agencies queried in the data-use survey. At least 9 of the 15 agencies that responded selected one or more of these characteristics with the exception of flood-stage hydrographs. Only five agencies selected monthly- and annual-mean discharges as characteristics used the most. Characteristics related to flow duration and low-flow volume were selected by six agencies.

The responses listed in tables 5 and 6 indicate the diverse need for and usage of streamflow data for Illinois streams. Responses listed in table 5 indicate that most of the organizations that participated in funding the stream-gaging program need data related to high-streamflow conditions. However, responses listed in table 6 indicate that low-flow data are needed as well.

Several respondents identified areas of the State where additional streamflow data are needed. These needs included stream-gaging stations at Illinois River at Havana, East Branch Du Page River, and interior streams in the Mississippi River floodplain. Other streamflow-data needs included stage-only stations located upstream from unsafe, high-hazard dams and additional peak-flow stations on small watersheds.

Changes to the gaging-station network have been made since the completion of the data-use survey. Stream gaging was initiated at Chicago Sanitary and Ship Canal at Romeoville (05536995) and Illinois River at Havana (05570500) during the 1984 water year.

Results of Network Evaluation of Regional Information

The first step of the NARI procedure is to calculate streamflow characteristics for each gaging station considered. Peak-flow characteristics were determined for each of the 256 gaging stations listed in table 7. Peak-flow characteristics are based on 10 or more years of record collected through the 1975 or 1980 water year as indicated in the table. The characteristics for 241 gaging stations were published by Curtis (1977) or Allen and Bejcek (1979) and are referred to as "discharges from individual station frequency curves" in table 1 of their reports. Peak-flow characteristics based on data collected prior to the 1981 water year were calculated for 15 additional gaging stations. Average discharge, flood-volume characteristics, and low-flow characteristics were calculated for 156 stream-gaging stations where continuous records of streamflow were available. These characteristics are based on 10 or more years of record collected through the 1980 water year. Several gaging stations, such as Salt Fork near Homer (03338000) and Hadley Creek near Barry (05502020), were operated as peak-flow stations for awhile and may have a longer record of peak discharge than of continuous discharge.

The second step of the NARI procedure is to determine regression models for estimating streamflow characteristics at ungaged sites. Statistical models were developed for 15 regions within the State. The regions (fig. 4) were delineated based on hydrologic, climatologic, and physiographic factors, and number of gaging stations with sufficient record length.

Values for streamflow and basin characteristics were grouped into data sets based on the region in which the gaging station is located and, in some instances, drainage area. Each data set is identified by a data-set index (table 7). Data for gaging stations located in regions 1-4, 6-12, and 15 were grouped into data sets identified by a region number (fig. 4). Gaging stations in regions 5, 13, and 14 were grouped into two sets based on drainage area (A). This approach was used because there were enough gaging stations to adequately determine regression models for large and small watersheds within these regions. Data for gaging stations in the Rock River basin, region 5, were grouped into data set 5a if A exceeded 500 mi^2, or data set 5b if A was less than 500 mi^2. Data for gaging stations in the Sangamon River basin, region 13, were grouped into data set 13a if A exceeded 300 mi^2 or data set 13b if A was less than 300 mi^2. Data for gaging stations in the Kaskaskia River basin, region 14, were grouped into data set 14a if A exceeded 400 mi^2 or data set 14b if A was less than 400 mi^2.

Regression models for determining seven selected streamflow characteristics are listed in table 8. Drainage area and slope were the only basin characteristics that were consistently significant in the regression analyses. The regression models listed in table 8 are based on a very limited statistical analyses of streamflow and basin characteristics. These models are not intended for use as prediction equations in planning studies. Standard errors of estimate related to these models are believed to be adequate indicators of accuracy that can be effectively utilized in subsequent steps of the NARI procedure.

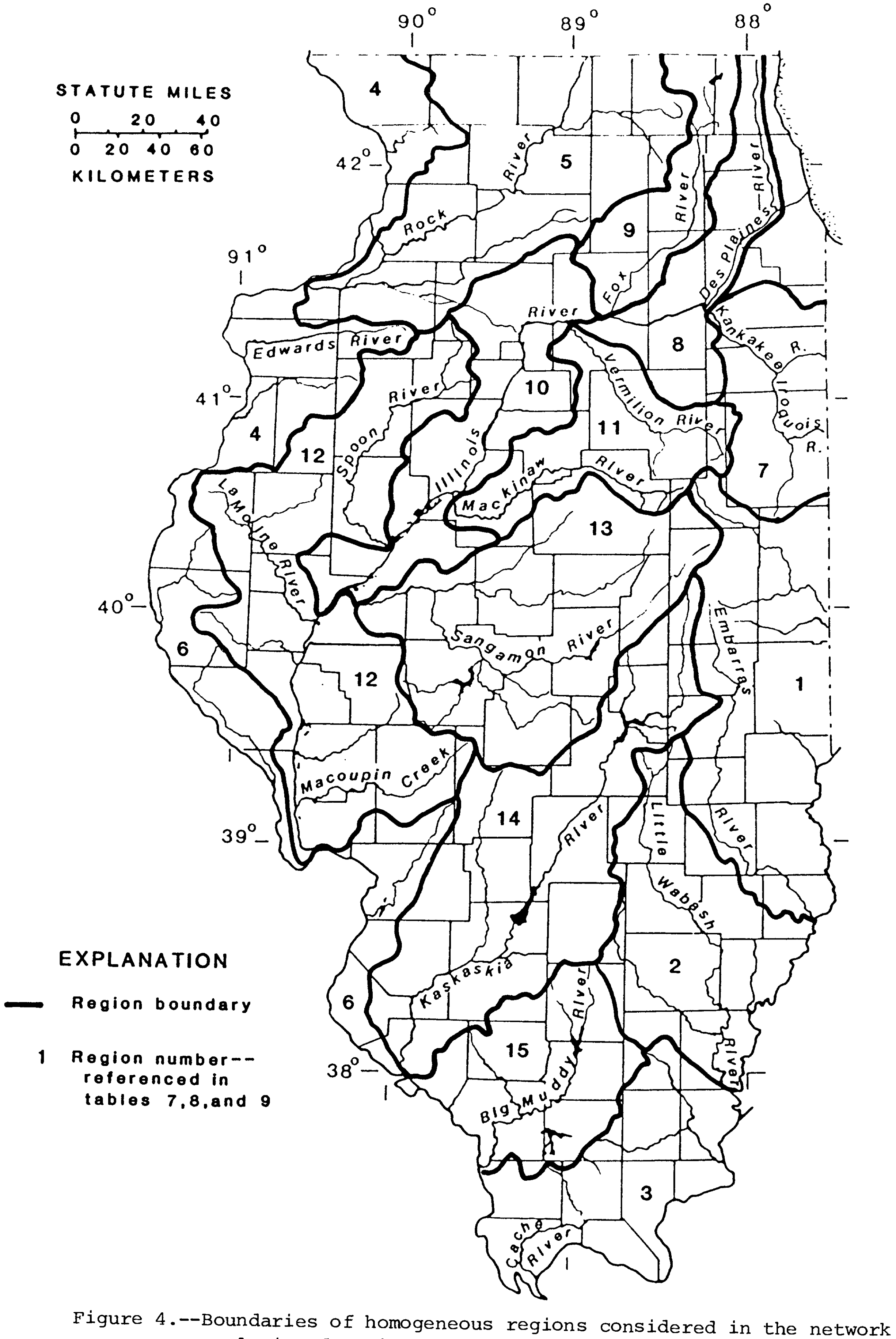

Figure 4.--Boundaries of homogeneous regions considered in the network analysis of regional information.

The most accurate models are those for estimating average discharge. Observed standard errors range from 5.5 percent for region 7, the Kankakee River and Iroquois River drainages, to 18 percent for the smaller watersheds in the Rock River basin (data set 5b). Regions 8 and 9 were combined to provide a sufficiently large number of stream-gaging stations with continuous records of unregulated streamflow for the regression analysis.

The least accurate models are those for estimating 7-day mean low-flow characteristics, $M_{7,2}$ and $M_{7,10}$. The frequent occurrence of no flow at many stream-gaging stations in the southern half of Illinois necessitated combining several of the regions delineated in figure 4 into larger regions. The regions were combined in a manner such that at least seven stream-gaging stations with non-zero $M_{7,2}$ or $M_{7,10}$ were available for regression analysis. No reasonable models could be developed for estimating $M_{7,2}$ in three areas of the State and $M_{7,10}$ in nine areas of the State (table 8). Standard errors and regression coefficients are not shown for those areas. Observed standard errors for $M_{7,2}$ range from 33 percent for the larger watersheds in the Rock River basin (data set 5a) to 670 percent for the Sangamon River basin (region 13).

As a group, the regression models for 1-day mean flood-volume characteristics are slightly more accurate than the models for peak discharge (table 8). Observed standard errors range from 12 percent for $V_{1,10}$ for the larger watersheds in the Kaskaskia River basin (data set 14a) to 60 percent for $V_{1,50}$ for the rural watersheds in the Fox River and Des Plaines River basins (regions 8 and 9). Observed standard errors for peak-discharge characteristics range from 10 percent for P_{10} for the larger watersheds in the Sangamon River basin (data set 13a) to 69 percent for P_{50} for the smaller watersheds in the Rock River basin (data set 5b).

The third step of the NARI procedure is to calculate conditional probability distributions of true standard error, S_t, for alternative levels of information in each region. Probability distributions were calculated using the previously described computer procedure, MODLVALU. Two graphs are used to illustrate these probability distributions. Figure 5 illustrates the results for 50-year peak discharge, P_{50}, from watersheds draining more than 300 mi^2 in the Sangamon River basin (data set 13a). The curves in figure 5a show the various combinations of record length, NY, and gaging-station density, NB, that would result in equivalent levels of accuracy in a regression analysis of 50-year peak discharge. A confidence level, α, of 0.50 was selected to draw the curves in figure 5a, thus the curves indicate constant values of median true standard error.

The solid circle in figure 5a indicates the present level of information. Streamflow records from 10 gaging stations were used to determine a regression model with one independent variable; thus, NB is 10 (table 8). The harmonic mean record length, NY, for the 10 gaging stations is 39 years. The present median S_t, or true standard error associated with a confidence level of 50 percent, is 19 percent. Figure 5a also shows that a significant amount of additional stream gaging is needed to reduce the median S_t from 19 to 16 percent. For example, one alternative level of information resulting in a median S_t of 16 percent is an NB and NY of 20 gaging stations and 50 years of record, respectively.

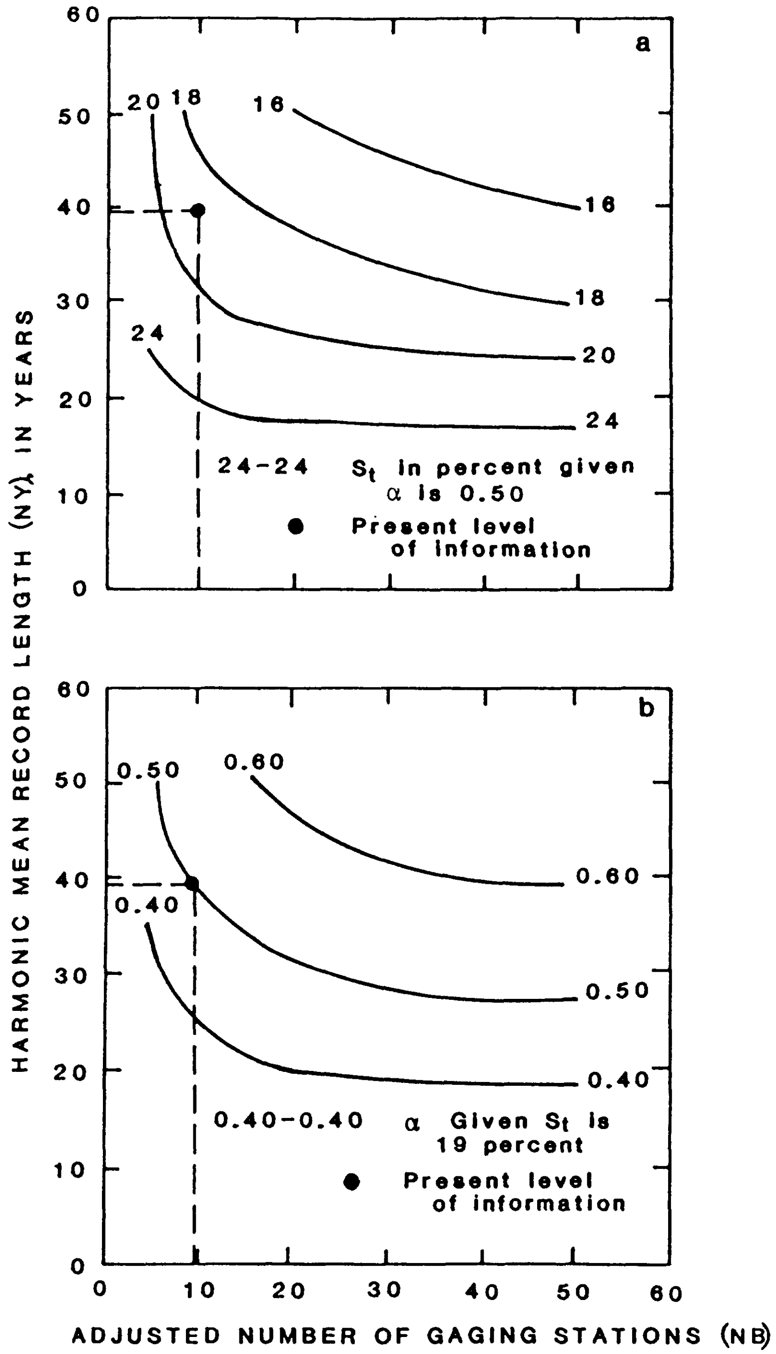

Figure 5.--Lines of (a) equal median S_t and (b) equal confidence level, α, for analysis of 50-year peak discharge from larger watersheds in the Sangamon River basin.

The conditional probability function can also be illustrated in a second graph. Figure 5b shows curves of constant confidence level, or reliability, associated with a stated true standard error of 19 percent. Each curve indicates the probability of achieving this stated reliability. The graph indicates that the probability of S_t not exceeding 19 percent can be increased from the present level of 50 percent to a more reliable level of 60 percent by increasing NY and NB to 46 years and 20 gaging stations, respectively.

The NARI procedure is used to evaluate how alternative levels of information are expected to affect the accuracy of regression models. Results that could be shown in a series of graphs similar to figure 5 are listed in table 9. These results indicate how the median S_t of regression models for P_{50} and $V_{1,50}$ are expected to change in response to three alternative network configurations, or levels of information. Observed standard error and median S_t for the present level of information, NB and NY, are also listed for comparative purposes. Alternative level number 1 represents an increase of five gaging stations in each region and continued operation of all gaging stations until the harmonic mean record length equals the indicated NY years of record. Alternative 2 represents a 5-year increase of harmonic mean record length from continued operation of only the present NB gaging stations in each region. The third alternative level of information is a combination of the first and second alternatives.

Comparison of the S_t for the present network to S_t* for each alternative level of information indicates that the accuracies of the regression models for peak-discharge and flood-volume characteristics are not expected to significantly improve with additional stream-gaging activity. The maximum reduction in median S_t from the present S_t for the 50-year peak-discharge models (table 9) is 6 percent for watersheds draining more than 400 mi^2 in the Kaskaskia River basin (data set 14a). This reduction in S_t is related to alternative 3 in which NB is increased from 6 to 20 gaging stations, and NY is increased from 20 to 30 years. Alternatives 1 and 2 result in reductions of only 1 and 2 percent, respectively. Similar results are presented in table 9 for the 1-day mean 50-year flood-volume models.

Based on the results of the NARI, the accuracy of regression models for peak-flow and 1-day mean flood-volume characteristics would not be considerably improved by increasing the density of gaging stations and the harmonic-mean record length of gaging stations in the 15 regions studied. However, the accuracy of estimates of these streamflow characteristics at gaged locations will continue to improve as additional streamflow records are collected, although the rate of increase in accuracy will decrease as the length of record increases. Future multiple-regression analyses of these streamflow characteristics based on additional streamflow records would probably result in different values for model parameters; however, the true standard errors of the models are not expected to significantly decrease.

The relative insensitivity of S_t to changes in NB and NY is due to two factors. The major factor is that model error dominates time- and space-sampling errors. Model error includes errors of incomplete and incorrect formulation of model structure and errors in the measurements of independent variables. Results for the statistically significant low-flow models (table 8) are not presented in table 9 because model error is so large that it masks tradeoffs between S_t, NB, and NY.

The second factor is the large number of streamflow records available for statistical analyses. The present level of information listed in table 9 indicates that 13 of the 18 data sets considered in the peak-flow analyses have harmonic mean record lengths exceeding 19 years, and those NY's are primarily based on streamflow records collected prior to 1976. All but 2 of the 17 data sets considered in the flood-volume analyses have NY's that exceed 19 years. Results listed in table 9 indicate that the rate of increase in reliability of streamflow characteristics slows considerably as record length increases beyond 20 years.

Results of Kalman-Filter Analysis of Uncertainty

The end product of the KFAU (Kalman-Filter Analysis of Uncertainty) is an uncertainty function for each stream-gaging station. An uncertainty function is the relation of the standard error of percentage deviations in instantaneous discharge from a long-term rating, S_p, to the annual number of discharge measurements made at a gaging station. Mades and Oberg (1984) describe the application of the KFAU procedure to the 138 stream-gaging stations listed in table 1. Peak-flow, stage-only, and miscellaneous-measurement stations were not analyzed. Values for process variance, p; 1-day autocorrelation coefficient, ρ; and number of measurements analyzed are listed in table 7 of the report by Mades and Oberg (1984, p. 78).

Results of the KFAU indicate that the stability of stage-discharge relations for the 138 stream-gaging stations operated in 1983 varies widely. The stability of these ratings is indicated by standard errors (table 10) that are based on the assumption that the percentage of missing stage record at a stream-gaging station is zero. These standard errors are believed to be reasonable indicators of the apparent accuracy of daily discharges reported for each stream-gaging station. Standard errors for the present measurement frequency, nine measurements per year, range from 1.2 to 71 percent (table 10). Values of S_p are less than 5.1 percent at 21 stream-gaging stations, between 5.1 and 15 percent at 53 gaging stations, between 15 and 30 percent at 48 gaging stations, and exceed 30 percent at 16 gaging stations.

Results of the Kalman-filter analysis are also useful for determining how a change in the frequency at which a rating is "verified" with current-meter measurements is expected to influence the accuracy of the streamflow record. Standard errors for frequencies of 5 and 13 measurements per year are also listed in table 10. The intervals of time between measurements for these frequencies are 10 and 4 weeks, respectively; the present interval is 6 weeks.

The amount of decrease in S_p as measurement frequency increases is indicative of how persistent a shift in a stage-discharge relation is. Weller Creek at Des Plaines (05530000) has a very unstable rating as indicated by an S_p of 57 percent (table 10). The insensitivity of S_p to measurement frequency at this stream-gaging station indicates that shifts in its rating are also quite random and not well correlated with time. A moderate increase in the frequency of measurements made at this stream-gaging station would not be expected to significantly improve the accuracy of its streamflow records.

Uncertainty functions with high standard errors are indicative of stream-gaging stations where the streamflow records are expected to have fair to poor accuracy. Increased measurement frequency could improve the accuracy of streamflow records at many of the stream-gaging stations with high standard errors. Lusk Creek near Eddyville (03384450) and Bay Creek at Pittsfield (05512500) are two stream-gaging stations where a moderate increase in measurement frequency would be expected to improve the accuracy of streamflow records.

Standard errors listed in table 10 are more representative of low to medium discharges. Most of the discharge measurements used to calculate the uncertainty functions were made during low- to medium-flow conditions (Mades and Oberg, 1984, p. 46). The low range of many stage-discharge relations frequently shifts because of transient changes in streambed geometry, intermittent debris jams, or seasonal aquatic growth. Small shifts in the lower portion of ratings for stream-gaging stations on small streams may result in a large percentage deviation of measured discharge from "rated" discharge, although the absolute difference between these discharges is small. Kalman filtering was not used to evaluate the stability of the high end of the ratings because long intervals of time (more than 80 days) between measurements of high flow preclude accurate determination of the 1-day autocorrelation coefficient for a time series of high-flow rating residuals.

The accuracy of high discharges was evaluated qualitatively because the prevalent data-use survey response for data usage was related to high-flow conditions. Field-office personnel assessed the accuracy of high discharges at 138 stream-gaging stations and 28 peak-flow stations. Their assessments are listed in table 10. Stage-only stations and miscellaneous-measurement stations were excluded from assessment. High-flow accuracies range from excellent at 16 gaging stations to poor at 1 gaging station, East Bureau Creek near Bureau (05557500). High-flow accuracies at 109, or 66 percent, of the 166 gaging stations assessed were good; 40 accuracies were fair. High-flow records for 17 peak-flow stations and 109 stream-gaging stations were rated excellent or good.

There are 23 gaging stations where the apparent accuracy of streamflow records is much less than the accuracy determined for the other 143 stream-gaging and peak-flow stations in the network. Table 11 is a list of 12 stream-gaging stations with standard errors that are at least 10 percent higher than standard errors at stream-gaging stations with similar average discharges. Also listed in table 11 are 11 peak-flow stations with high-flow ratings that were rated fair or poor. Field personnel for the U.S. Geological Survey should determine if the control, the physical element or combination of elements that control the rating, at these 23 gaging stations can be improved by some economical means. Agencies that participate in funding these gaging stations should critically evaluate the need for streamflow data at these sites.

Several alternatives should be considered for each gaging station where more accurate records of streamflow are critically needed and economical improvements in the control cannot be made. First, the frequency of measurement at the stream-gaging stations could be increased if the uncertainty functions indicate improved accuracy is possible. Second, the gaging station could be relocated to a nearby site with a more stable control if such an alternative site exists.

The high standard errors listed in table 10 are also indicative of the need for a formal low-flow program. A program for stream gaging low-flow conditions, similar to the program operated from 1961 to 1974, is needed to ensure that accurate records of low-flow data are available for future planning purposes. Standard errors listed in table 10 could be used to select candidate correlative sites. This would ensure that measurements of discharge at low-flow stations would be correlated with accurate continuous records of low flow.

Relative-Worth Analysis Results

The relative worth of 176 gaging stations operated in 1983 was evaluated on the basis of eight factors listed in table 2. Guidelines for assigning points for those factors are listed in table 3. Points for factor 1A, mean annual unmeasured flow, and factor 1D, length of record, were based on information listed in table 1. Gaging-station locations were plotted on a hydrologic unit map of Illinois (Seaber, Kapinos, and Knapp, 1984) to determine points for factor 1B, areal coverage. Standard errors related to nine measurements per year (table 10) were used to assign points for factor 1C, data accuracy. One point was subtracted if the accuracy of high flows was assessed as fair or poor. Points for correlation efficiency, factor 1E, were based on correlation coefficients, ρ_c and R2, published by Mades and Oberg (1984, p. 70-75). Correlation efficiency was rated excellent if the coefficient exceeded 0.94, average if the coefficient was between 0.80 and 0.94, or poor if less than 0.80. Points for correlation efficiency at peak-flow, miscellaneous-measurement, and stage-only stations were estimated on the basis of correlation efficiencies at nearby stream-gaging stations.

Responses to the data-use survey (table 5) were used to assign points for factors 2-4. Diversity of interest, factor 2, was based on the specific uses of streamflow data collected at a gaging station. Higher point ratings for factor 2 were assigned to gaging stations that provide data used by multiple agencies for multiple specific uses.

The point rating of factor 3, use of data for planning purposes, was based on the size of gaged area (factor 2B), essentialness of data, and categorization of purpose (table 5). Higher point ratings for factor 3 were assigned to gaging stations with an areal factor of 4 or more and with data that are very essential for purposes related to both planning and design, and long-term trend determination.

The point rating of factor 4, use of data for management purposes, was based on the need for data, categorization of purpose, and number of management-related specific uses. Higher point ratings for factor 4 were assigned to gaging stations that provide data that are needed very much for multiple current-purpose type specific uses.

The relative worth of each gaging station is indicated by its total point rating in table 12. Higher total ratings indicate a greater relative worth. Total point ratings range from 14 for East Fork Shoal Creek near Coffeen (05593900) to 63 for Rock River near Joslin (05446500) and Sangamon River near Oakford (05583000). The two stream-gaging stations with the highest rating are gaging stations where there are very apparent needs for data; where data are used for planning and operational purposes; and where accurate, long-term records of discharge from larger watersheds exist. The total rating for site characteristics (factors 1A to 1E) at both stream-gaging stations is 23 points, compared to 5 points for the stream-gaging station with the lowest rating. The low rating for East Fork Shoal Creek near Coffeen is due to three factors: (1) It has poor site characteristics, (2) there is little apparent need for data at this site, and (3) there is a rather limited purpose for maintaining the gaging station.

A histogram of total point ratings for the 176 gaging stations in the 1983 Illinois gaging-station network is shown in figure 6. Table 13 is a list of 17 stream-gaging stations and 9 peak-flow stations with total point ratings less than 26 points. The low total point ratings for these gaging stations are due to one or a combination of two reasons--little apparent need for the data collected and no current use (for management purposes) of that data.

The gaging stations listed in table 13 would be likely "candidates" for some kind of action if budgetary limitations so demand. Several alternative types of action could be considered for a candidate stream-gaging station. The gaging station could be operated during only part of the year to collect streamflow data that are most pertinent to the intended use of the data. The gaging station could be converted to a peak-flow station. The qualitative evaluation of accuracy of high flow (table 10) should be considered before implementing this alternative. Finally, the stream-gaging station could be discontinued.

The peak-flow stations listed in table 13 are candidates for discontinuance. Five peak-flow stations (03344500, 05502020, 05584400, 05586000, and 05593600) should be moved to locations where peak flows can be determined more accurately or discontinued because the accuracy of peak discharge reported for these gaging stations is only fair (table 10).

SUMMARY

Four methods were used to satisfy the objectives of this study. A survey was conducted to determine the present usage of data and future needs. Present needs are reflected in the present usage of streamflow data. NARI (Network Analysis of Regional Information) was used to evaluate the need for additional stream gaging to improve the accuracy of regression models used to transfer streamflow information from gaged to ungaged sites. KFAU (Kalman-Filter Analysis of Uncertainty) was used to determine the accuracy of streamflow data collected at stream-gaging stations. The accuracy of high flows was qualitatively assessed because the KFAU results are more indicative of low- to average-flow conditions. Relative-worth analysis was used to evaluate the need for each gaging station relative to other gaging stations in the network. A rating of worth based on site characteristics, streamflow-data accuracy, need for data, and data usage was determined for each gaging station.

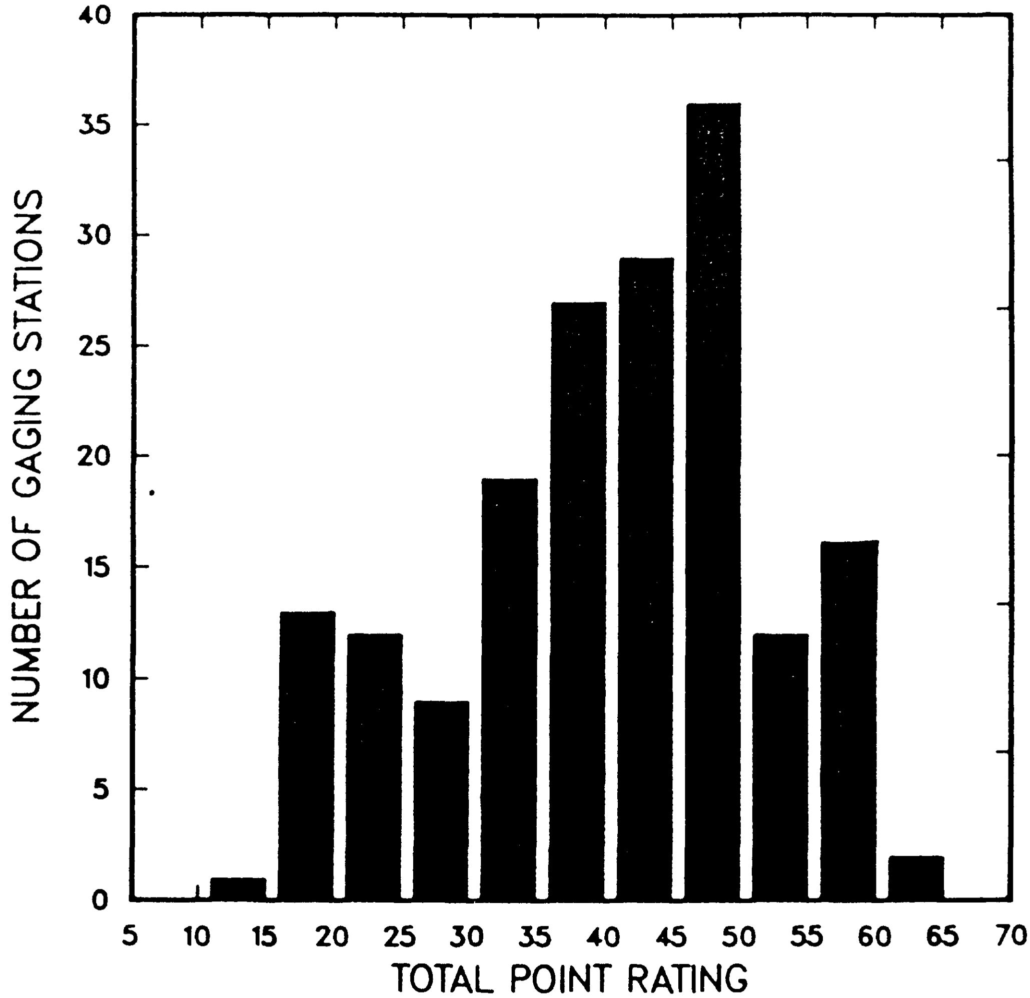

Figure 6.--Histogram of total point ratings for gaging stations in the 1983 Illinois gaging-station network.

The survey of data usage and need was conducted by mailing a questionnaire to 24 offices of 17 organizations; 6 of the organizations participated in funding the 1983 stream-gaging program. Responses were received from 19 offices of 7 Federal, 4 State, and 2 public organizations.

The network is presently composed of gaging stations operated for single and multiple purposes. There are 39 gaging stations that are operated for an expressed single purpose (18 for current planning, 18 for planning and design, and 3 for determining long-term trends). Data from 83 gaging stations serve all three purposes; 48 gaging stations provide data that serve two of the three purposes.

The specific usage of streamflow data can be generally categorized as use to determine water quantity and use to determine water quality. Data collected at 36 gaging stations are used only to determine water quantity; 19 gaging stations provide data that are used only to determine water quality. Characteristics of both water quantity and water quality were determined from data collected at 104 of the 176 gaging stations operated during 1983. Data collected at 97 gaging stations are used to (1) describe rainfall-runoff processes; (2) monitor and forecast floods; and (3) monitor and regulate lake level, discharge from reservoirs, or discharge of navigable streams.

Several respondents identified areas of the State where additional streamflow data are needed. These needs included stream-gaging stations on the Illinois River at Havana, East Branch Du Page River, and interior streams of the Mississippi River floodplain. Other needs included stage-only stations located upstream from unsafe high-hazard dams and additional peak-flow stations on small watersheds.

The NARI procedure consists of three steps: (1) Selection and calculation of streamflow characteristics, (2) multiple-regression analyses, and (3) calculation of the probability distribution of true standard error of a regression model. Streamflow characteristics were calculated for each of 256 gaging stations that had at least 10 years of unregulated-flow record. Gaging stations in predominantly urban areas of the State were excluded from analysis. The streamflow characteristics considered were annual minimum 7-day mean flows having recurrence intervals of 2 years and 10 years; average (annual) discharge; annual maximum 1-day mean flood volumes having recurrence intervals of 2, 10, 50, and 100 years; and annual peak discharges having recurrence intervals of 2, 10, 50, and 100 years.

The accuracy of regression models for peak-flow and 1-day mean flood-volume characteristics would not be considerably improved by increasing the density or harmonic mean record length of gaging stations within the State. The relative insensitivity of true standard error to changes in density and record length is due to two factors. Model error, the error due to incomplete and incorrect formulation of model structure and error in measurement of independent variables, is so large that it masks tradeoffs between true standard error, average record length, and number of gaging stations. Second, the large number of streamflow records presently available is sufficient for accurately determining streamflow characteristics at many gaging stations. The rate of increase in reliability (accuracy) of streamflow characteristics lessens considerably as record length increases beyond 20 years.

The KFAU procedure consists of five steps: (1) Determination of long-term stage-discharge relations, (2) analyses of the time series of percentage deviations of measured discharge from a long-term rating, (3) evaluation of past equipment performance to determine the frequency of equipment malfunctions, (4) determination of interstation correlation coefficients and coefficients of variation, and (5) calculation of uncertainty functions. An uncertainty function is the relation of the standard error of percentage deviations, S_p, to the annual number of discharge measurements made at a stream-gaging station. S_p is a direct indication of the stability of a stage-discharge relation and a reasonable indicator of the accuracy of streamflow records reported for a gaging station. The accuracy of high discharges was qualitatively evaluated by field-office personnel because S_p is a measure of the accuracy of low to average discharges.

The accuracy of streamflow records for 23 gaging stations is substantially less than the accuracy of records for the other 143 gaging stations evaluated. S_p at 12 stream-gaging stations is at least 10 percent greater than S_p at stream-gaging stations with similar average discharges. High-flow accuracy at 11 peak-flow stations was rated fair or poor.

Several alternatives should be considered for those gaging stations where more accurate records of streamflow are critically needed and economical improvements in the control of the stage-discharge relation cannot be made. First, the frequency of measurements at the stream-gaging stations could be increased if the uncertainty functions indicate improved accuracy is possible. Second, the gaging station could be relocated to a nearby site with a more stable control if such an alternative site exists.

Results of the data-use survey, NARI, and KFAU were considered in an analysis of the relative worth of each gaging station. Relative-worth analysis is a procedure in which point values are assigned to each of eight factors. The factors are related to quantity of water measured, areal coverage, data accuracy, length of record, correlation efficiency, apparent need for data (as indicated by the diversity of interest in the data), uses of data for planning, and uses of data for management. Comparison of total point ratings for gaging stations in a particular streamflow-data program is a means for evaluating the effectiveness of the program. A total point rating is the sum of point values assigned to each of the eight evaluation factors. A higher total point rating indicates greater relative worth.

Total point ratings for gaging stations in the 1983 Illinois stream-gaging program ranged from 14 to 63 points. Twenty-six gaging stations with total point ratings less than 26 points were identified as "candidates" for some type of action if budgetary limitations so demand. A candidate stream-gaging station could be operated during only part of a year, converted to a peak-flow station, or discontinued. Candidate peak-flow stations should be discontinued. The low ratings for these gaging stations are due to one or a combination of two reasons--little apparent need for the data and no current use of the data that are presently collected.

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TABLES 1 - 13

Table 1.--Selected information about gaging stations in the 1983 Illinois gaging-station network

[Information from Stahl and others (1984) and Fitzgerald and others (1984); mi^2, square mile; ft^3/s, cubic feet per second]

Type of station: Type of gaging station operated during indicated period of record; indicated by D - stream-gaging station, P - peak-flow partial-record station, S - stage-only continuous-record station, and L - low-flow partial-record station.

Period of record: Partial or complete water years during which gaging station was operated.

Average discharge: Computed as the arithmetic mean of the water-year mean discharges for all water years, through water year 1983, that are complete either in annual or compilation reports. Not computed if less than 5 complete water years of record are available.

Map index No.	Station No.	Station name	Drainage area (mi^2)	Type of station	Period of record	Average discharge (ft^3/s)
1	03336645	Middle Fork Vermilion River above Oakwood, Ill.	432	D	1979-	473
2	03336900	Salt Fork near St. Joseph, Ill.	134	D	1959-	114
3	03337000	Boneyard Creek at Urbana, Ill.	4.46	D	1948-	4.45
4	03338000	Salt Fork near Homer, Ill.	340	D	1945-58,	251
				P	1959-	
5	03339000	Vermilion River near Danville, Ill.	1,290	D	1915-21,	962
				D	1928-	
6	03343400	Embarras River near Camargo, Ill.	186	D	1961-	155
7	03344000	Embarras River near Diona, Ill.	919	D	1939-40,	848
				D	1945-47,	
				D	1971-82,	
				P	1983-	
8	03344500	Range Creek near Casey, Ill.	7.61	D	1951-82,	5.82
				P	1983-	
9	03345500	Embarras River at Ste. Marie, Ill.	1,516	D	1910-13,	1,224
				D	1914-	
10	03346000	North Fork Embarras River near Oblong, Ill.	318	D	1941-	256
11	03378000	Bonpas Creek at Browns, Ill.	228	D	1941-	226
12	03378635	Little Wabash River near Effingham, Ill.	240	D	1967-	192
13	03378900	Little Wabash River at Louisville, Ill.	745	D	1966-82,	584
				P	1983-	
14	03379500	Little Wabash River below Clay City, Ill.	1,131	D	1914-	879
15	03379600	Little Wabash River at Blood, Ill.	1,387	S	1973-82,	-
				P	1983-	
16	03380350	Skillet Fork near Iuka, Ill.	208	D	1966-82,	170
				P	1983-	
17	03380475	Horse Creek near Keenes, Ill.	97.2	D	1959-	94.9
18	03380500	Skillet Fork at Wayne City, Ill.	464	D	1908-21,	390
				D	1928-	
19	03381500	Little Wabash River at Carmi, Ill.	3,102	S	1909-13,	2,529
				D	1940-	
20	03382100	South Fork Saline River near Carrier Mills, Ill.	147	D	1966-	162
21	03384450	Lusk Creek near Eddyville, Ill.	42.9	D	1968-	61.1
22	03385000	Hayes Creek at Glendale, Ill.	19.1	D	1950-75,	26.1
				P	1976-	
23	03612000	Cache River at Forman, Ill.	244	D	1923-	300
24	05414820	Sinsinawa River near Menominee, Ill.	39.6	D	1968-	28.0
25	05419000	Apple River near Hanover, Ill.	247	D	1935-	173
26	05435500	Pecatonica River at Freeport, Ill.	1,326	D	1914-	900
27	05437500	Rock River at Rockton, Ill.	6,363	D	1903-09,	3,980
				D	1914-19,	
				D	1940-	
28	05437695	Keith Creek at Eighth Street at Rockford, Ill.	13.4	D	1980-	-
29	05438250	Coon Creek at Riley, Ill.	85.1	D	1962-82,	62.2
				P	1983-	
30	05438500	Kishwaukee River at Belvidere, Ill.	538	D	1940-	347

Table 1.--Selected information about gaging stations in the 1983 Illinois gaging-station network--Continued

Map index No.	Station No.	Station name	Drainage area (mi^2)	Type of station	Period of record	Average discharge (ft^3/s)
31	05439000	South Branch Kishwaukee River at De Kalb, Ill.	77.7	D D	1925-33, 1980-	60.8
32	05439500	South Branch Kishwaukee River near Fairdale, Ill.	387	D	1940-	263
33	05440000	Kishwaukee River near Perryville, Ill.	1,099	D	1940-	713
34	05443500	Rock River at Como, Ill.	8,753	D D P D	1905-06, 1915-71, 1972-77, 1978-	5,189
35	05444000	Elkhorn Creek near Penrose, Ill.	146	D	1940-	97.4
36	05446000	Rock Creek at Morrison, Ill.	164	D P D	1940-58, 1959-71, 1978-	98.8
37	05446500	Rock River near Joslin, Ill.	9,549	D	1940-	6,020
38	05447500	Green River near Geneseo, Ill.	1,003	D	1936-	610
39	05448000	Mill Creek at Milan, Ill.	62.4	D	1940-	43.0
40	05466000	Edwards River near Orion, Ill.	155	D	1941-	107
41	05466500	Edwards River near New Boston, Ill.	445	D	1935-	286
42	05467000	Pope Creek near Keithsburg, Ill.	174	D	1935-	110
43	05468500	Cedar Creek at Little York, Ill.	130	D P	1941-71, 1972-	87.3
44	05469000	Henderson Creek near Oquawka, Ill.	432	D	1935-	288
45	05495500	Bear Creek near Marcelline, Ill.	349	D	1944-	206
46	05502020	Hadley Creek near Barry, Ill.	40.9	D P	1956-66, 1967-	25.4
47	05502040	Hadley Creek at Kinderhook, Ill.	72.7	D	1940-	56.2
48	05512500	Bay Creek at Pittsfield, Ill.	39.4	D	1940-	27.0
49	05513000	Bay Creek at Nebo, Ill.	161	D	1940-	101
50	05520500	Kankakee River at Momence, Ill.	2,294	D D	1905-06, 1915-	1,970
51	05525000	Iroquois River at Iroquois, Ill.	686	D	1945-	549
52	05525500	Sugar Creek at Milford, Ill.	446	D	1948-	361
53	05526000	Iroquois River near Chebanse, Ill.	2,091	D	1923-	1,645
54	05527500	Kankakee River near Wilmington, Ill.	5,150	D	1934-	4,233
55	05527800	Des Plaines River at Russell, Ill.	123	L P D	1961-63, 1962-66, 1967-	97.5
56	05528000	Des Plaines River near Gurnee, Ill.	232	D P D	1946-58, 1960-68, 1969-	175
57	05528500	Buffalo Creek near Wheeling, Ill.	19.6	D	1952-	16.9
58	05529000	Des Plaines River near Des Plaines, Ill.	360	D	1941-	258
59	05529500	McDonald Creek near Mount Prospect, Ill.	7.93	D	1952-	5.91
60	05530000	Weller Creek at Des Plaines, Ill.	13.2	D	1951-	10.8
61	05530990	Salt Creek at Rolling Meadows, Ill.	30.5	D	1974-	28.9
62	05531500	Salt Creek at Western Springs, Ill.	114	D	1946-	109
63	05532000	Addison Creek at Bellwood, Ill.	17.9	D	1950-	14.8
64	05532500	Des Plaines River at Riverside, Ill.	630	D	1944-	471
65	05533000	Flag Creek near Willow Springs, Ill.	16.5	D	1951-	17.6
66	05534500	North Branch Chicago River at Deerfield, Ill.	19.7	D	1952-	14.8
67	05535000	Skokie River at Lake Forest, Ill.	13.0	D	1952-	12.1
68	05535070	Skokie River near Highland Park, Ill.	21.1	D	1967-	22.0
69	05535500	West Fork of North Branch Chicago River at Northbrook, Ill.	11.5	D	1952-	12.7
70	05536000	North Branch Chicago River at Niles, Ill.	100	D	1951-	92.4
71	05536215	Thorn Creek at Glenwood, Ill.	24.7	D	1949-	37.4
72	05536235	Deer Creek near Chicago Heights, Ill.	23.1	D	1948-	17.5
73	05536255	Butterfield Creek at Flossmoor, Ill.	23.5	D	1948-	17.8
74	05536265	Lansing Ditch near Lansing, Ill.	8.84	D	1948-	8.03
75	05536275	Thorn Creek at Thornton, Ill.	104	D	1948-	100

Table 1.--Selected information about gaging stations in the 1983 Illinois gaging-station network--Continued

Map index No.	Station No.	Station name	Drainage area (mi^2)	Type of station	Period of record	Average discharge (ft^3/s)
76	05536290	Little Calumet River at South Holland, Ill.	208	D	1948-	184
77	05536340	Midlothian Creek at Oak Forest, Ill.	12.6	D	1951-	11.3
78	05536500	Tinley Creek near Palos Park, Ill.	11.2	D	1951-	9.69
79	05537500	Long Run near Lemont, Ill.	20.9	D	1951-	16.7
80	05539000	Hickory Creek at Joliet, Ill.	107	D	1945-	86.3
81	05539900	West Branch Du Page River near West Chicago, Ill.	28.5	D	1961-	32.2
82	05540095	West Branch Du Page River near Warrenville, Ill.	90.4	D	1969-	101
83	05540500	Du Page River at Shorewood, Ill.	324	D	1941-	260
84	05542000	Mazon River near Coal City, Ill.	455	D	1940-	334
85	05543500	Illinois River at Marseilles, Ill.	8,259	D	1920-	10,760
86	05547000	Channel Lake near Antioch, Ill.	-	S	1940-	-
87	05547500	Fox Lake near Lake Villa, Ill.	-	S	1940-	-
88	05548000	Nippersink Lake at Fox Lake, Ill.	-	S	1940-	-
89	05548280	Nippersink Creek near Spring Grove, Ill.	192	D	1966-	156
90	05548500	Fox River at Johnsburg, Ill.	-	S	1940-	-
91	05549000	Boone Creek near McHenry, Ill.	15.5	D P	1949-82, 1983-	13.1
92	05549500	Fox River near McHenry, Ill.	-	S	1941-	-
93	05550000	Fox River at Algonquin, Ill.	1,403	D	1916-	841
94	05550500	Poplar Creek at Elgin, Ill.	35.2	D	1951-	23.9
95	05551200	Ferson Creek near St. Charles, Ill.	51.7	D	1961-	40.5
96	05551700	Blackberry Creek near Yorkville, Ill.	70.2	D	1961-	52.1
97	05552500	Fox River at Dayton, Ill.	2,642	D	1915-	1,703
98	05554000	North Fork Vermilion River near Charlotte, Ill.	186	D P	1943-62, 1963-	124
99	05554500	Vermilion River at Pontiac, Ill.	579	D	1943-	391
100	05555000	Vermilion River at Streator, Ill.	1,084	D M	1914-30, 1959-	638
101	05555300	Vermilion River near Leonore, Ill.	1,251	D	1931-	822
102	05556500	Big Bureau Creek at Princeton, Ill.	196	D	1936-	135
103	05557000	West Bureau Creek at Wyanet, Ill.	86.7	D P	1937-66, 1967-	45.0
104	05557500	East Bureau Creek near Bureau, Ill.	99.0	D P	1937-66, 1967-	47.8
105	05558300	Illinois River at Henry, Ill.	13,543	D	1982-	-
106	05560500	Farm Creek at Farmdale, Ill.	27.4	D	1949-	19.5
107	05561500	Fondulac Creek near East Peoria, Ill.	5.54	D	1948-	4.36
108	05563000	Kickapoo Creek near Kickapoo, Ill.	119	D P	1945-62, 1963-	66.7
109	05563500	Kickapoo Creek at Peoria, Ill.	297	D P	1943-71, 1972-	168
110	05567000	Panther Creek near El Paso, Ill.	93.9	D P	1950-60, 1961-	56.1
111	05567500	Mackinaw River near Congerville, Ill.	767	D	1945-	511
112	05568000	Mackinaw River near Green Valley, Ill.	1,089	D P P	1922-56, 1957-58, 1960-	688
113	05568500	Illinois River at Kingston Mines, Ill.	15,819	D	1940-	15,031
114	05568800	Indian Creek near Wyoming, Ill.	62.7	D	1960-	47.2
115	05569500	Spoon River at London Mills, Ill.	1,062	D	1943-	710
116	05570000	Spoon River at Seville, Ill.	1,636	D	1914-	1,054
117	05570350	Big Creek at St. David, Ill.	28.0	D	1972-	28.9
118	05570360	Evelyn Branch near Bryant, Ill.	5.78	D	1972-	5.34
119	05570370	Big Creek near Bryant, Ill.	41.2	D	1972-	41.7
120	05570380	Slug Run near Bryant, Ill.	7.12	D	1975-	5.01
121	05570910	Sangamon River at Fisher, Ill.	240	D	1979-	251
122	05572000	Sangamon River at Monticello, Ill.	550	D	1908-	405
123	05573540	Sangamon River at Route 48 at Decatur, Ill.	938	D	1982-	-

Table 1.--Selected information about gaging stations in the 1983 Illinois gaging-station network--Continued

Map index No.	Station No.	Station name	Drainage area (mi^2)	Type of station	Period of record	Average discharge (ft^3/s)
124	05575500	South Fork Sangamon River at Kincaid, Ill.	562	D	1917-27,	408
				D	1929-30,	
				D	1933,	
				D	1945-61,	
				P	1962-	
125	05575800	Horse Creek at Pawnee, Ill.	52.2	D	1968-	43.3
126	05576000	South Fork Sangamon River near Rochester, Ill.	867	D	1949-	588
127	05576500	Sangamon River at Riverton, Ill.	2,618	D	1908-12,	1,695
				D	1915-27,	
				D	1929-30,	
				D	1932-56,	
				P	1957-	
128	05577500	Spring Creek at Springfield, Ill.	107	D	1948-	66.9
129	05578000	Sangamon River at Petersburg, Ill.	3,063	D	1948-49,	-
				M	1950-51,	
				M	1958-	
130	05578500	Salt Creek near Rowell, Ill.	335	D	1943-	[1]237
131	05579500	Lake Fork near Cornland, Ill.	214	D	1948-	154
132	05580000	Kickapoo Creek at Waynesville, Ill.	227	D	1948-	160
133	05580500	Kickapoo Creek near Lincoln, Ill.	306	D	1945-71,	187
				P	1972-	
134	05580950	Sugar Creek near Bloomington, Ill.	34.4	D	1975-	52.0
135	05581500	Sugar Creek near Hartsburg, Ill.	333	D	1945-71,	197
				P	1972-	
136	05582000	Salt Creek near Greenview, Ill.	1,804	D	1942-	1,290
137	05583000	Sangamon River near Oakford, Ill.	5,093	D	1910-12,	3,335
				D	1914-19,	
				D	1921-22,	
				D	1929-34,	
				D	1940-	
138	05584400	Drowning Fork at Bushnell, Ill.	26.3	D	1961-82,	20.1
				P	1983-	
139	05584500	La Moine River at Colmar, Ill.	655	D	1945-	445
140	05585000	La Moine River at Ripley, Ill.	1,293	D	1921-	802
141	05585500	Illinois River at Meredosia, Ill.	26,028	D	1939-	21,976
142	05586000	North Fork Mauvaise Terre Creek near Jacksonville, Ill.	29.1	D	1950-75,	20.2
				P	1976-	
143	05586500	Hurricane Creek near Roodhouse, Ill.	2.30	D	1951-75,	1.49
				P	1976-	
144	05587000	Macoupin Creek near Kane, Ill.	868	D	1921-34,	535
				D	1940-	
145	05587900	Cahokia Creek at Edwardsville, Ill.	212	D	1969-	144
146	05588000	Indian Creek at Wanda, Ill.	36.7	D	1940-	25.0
147	05589500	Canteen Creek at Caseyville, Ill.	22.6	D	1940-82,	16.8
				P	1983-	
148	05590000	Kaskaskia Ditch at Bondville, Ill.	12.4	D	1949-	10.4
149	05590800	Lake Fork at Atwood, Ill.	149	D	1973-	160
150	05591200	Kaskaskia River at Cooks Mills, Ill.	473	D	1971-	467
151	05591550	Whitley Creek near Allenville, Ill.	34.6	D	1980-	-
152	05591700	West Okaw River near Lovington, Ill.	112	L	1970-73,	-
				D	1980-	
153	05592000	Kaskaskia River at Shelbyville, Ill.	1,054	D	1908-15,	[2]788
				D	1941-	
154	05592050	Robinson Creek near Shelbyville, Ill.	93.1	D	1980-	-
155	05592100	Kaskaskia River near Cowden, Ill.	1,330	D	1970-	1,241

[1] Average discharge based on water years 1943-77, prior to construction of Clinton Reservoir. Average discharge based on water years 1978-83 is 274 ft^3/s.

[2] Average discharge based on water years 1909-12 and 1941-69, prior to construction of Shelbyville Reservoir. Average discharge based on water years 1970-83 is 980 ft^3/s.

Table 1.--Selected information about gaging stations in the 1983 Illinois gaging-station network--Continued

Map index No.	Station No.	Station name	Drainage area (mi^2)	Type of station	Period of record	Average discharge (ft^3/s)
156	05592500	Kaskaskia River at Vandalia, Ill.	1,940	D	1908-	[3]1,412
157	05592600	Hickory Creek near Bluff City, Ill.	77.6	S	1955-	-
158	05592800	Hurricane Creek near Mulberry Grove, Ill.	152	D	1971-	138
159	05592900	East Fork Kaskaskia River near Sandoval, Ill.	113	D	1980-	-
160	05593000	Kaskaskia River at Carlyle, Ill.	2,719	D	1908-15,	[4]1,944
				P	1931-37,	
				D	1938-	
161	05593520	Crooked Creek near Hoffman, Ill.	254	S	1968-74,	181
				D	1975-	
162	05593575	Little Crooked Creek near New Minden, Ill.	84.3	D	1968-	64.0
163	05593600	Blue Grass Creek near Raymond, Ill.	17.3	D	1961-82,	12.2
				P	1983-	
164	05593900	East Fork Shoal Creek near Coffeen, Ill.	55.5	D	1964-	41.1
165	05594000	Shoal Creek near Breese, Ill.	735	D	1910-15,	520
				D	1946-	
166	05594100	Kaskaskia River near Venedy Station, Ill.	4,393	D	1970-	3,648
167	05594450	Silver Creek near Troy, Ill.	154	D	1967-	114
168	05594800	Silver Creek near Freeburg, Ill.	464	D	1971-	329
169	05595200	Richland Creek near Hecker, Ill.	129	D	1970-	98.0
170	05595700	Big Muddy River near Mt. Vernon, Ill.	71.9	S	1965-	-
171	05595730	Rayse Creek near Waltonville, Ill.	88.0	D	1980-	-
172	05595830	Casey Fork at Route 37 near Mt. Vernon, Ill.	87.8	S	1971-	-
173	05597000	Big Muddy River at Plumfield, Ill.	794	D	1908-	[5]699
174	05597500	Crab Orchard Creek near Marion, Ill.	31.7	D	1952-	25.2
175	05599500	Big Muddy River at Murphysboro, Ill.	2,169	D	1917-	[6]1,788
176	05600000	Big Creek near Wetaug, Ill.	32.2	D	1942-71,	36.4
				P	1972-	

[3] Average discharge based on water years 1909-12 and 1915-69, prior to construction of Shelbyville Reservoir. Average discharge based on water years 1970-83 is 1,769 ft^3/s.

[4] Average discharge based on water years 1909-12, 1915, and 1939-66, prior to construction of Carlyle Reservoir. Average discharge based on water years 1968-83 is 2,347 ft^3/s.

[5] Average discharge based on water years 1909, 1912, and 1915-70, prior to construction of Rend Lake. Average discharge based on water years 1971-83 is 674 ft^3/s.

[6] Average discharge based on water years 1931-70, prior to construction of Rend Lake. Average discharge based on water years 1971-83 is 1,888 ft^3/s. Record is fragmentary prior to year 1931.

Table 2.--Summary of evaluation factors and points

[Modified from Wahl and Crippen (1984, p. 6)]

Factor	Point range
1. Site characteristics	
A. Quantity of water (not measured elsewhere)	1 - 3
B. Areal coverage	1 - 6
C. Data accuracy	1 - 8
D. Length of record	2 - 6
E. Correlation efficiency	0 - 4
2. Diversity of interest in data	0 - 10
3. Data uses for planning	0 - 15
4. Data uses for management	0 - 15

Table 3.--Guidelines for assigning point values

[Modified from Wahl and Crippen (1984, p. 8-10)]

Factor	Points
1. Site characteristics	
A. Quantity of water (based on unmeasured flow that reaches the site):	
Mean annual unmeasured flow, in cubic feet per second	
1,000 - or more	3
50 - 1,000	2
0 - 50	1
B. Areal coverage (based on hydrologic unit maps, by State, prepared by the U.S. Geological Survey):	
Outflow from hydrologic region	6
Outflow from hydrologic subregion	5
Outflow from hydrologic accounting unit	4
Outflow from hydrologic cataloging unit	3
Outflow from major part of cataloging unit	2
Outflow from small area	1
C. Data accuracy (based in part on standard error of instantaneous discharge):	
Standard error, in percent	
0 - 5	8
5 - 15	6
15 - 30	4
30 - 50	2
50 - or more	1
D. Length of record, in years	
0 - 5	6
5 - 10	4
10 - 25	2
25 - 40	4
40 - or more	6
E. Correlation efficiency	
Excellent	4
Fair	2
Poor	0

Table 3.--Guidelines for assigning point values--Continued

Factor	Points
2. Diversity of interest in data (based on number of responses to data-use survey and specific uses of data):	
High (More than four different specific uses)	7-10
Moderate (Two to four different specific uses)	4- 6
Low (Less than two different specific uses)	0- 3
3. Data uses for planning (flood control, water rights, water-quality control, water conservation, power, monitoring, fishery, recreation, and others):	
Important to both regional and local planning	10-15
Important to regional planning	8-13
Important to local planning	5-10
No importance or of slight use to local or regional planning	0- 4
4. Data uses for management (flood control, water rights, water-quality control, water conservation, power, monitoring, fishery, recreation, and others):	
Important to several management needs	15
Important to one management need and useful for others	10-15
Useful for several management needs	5-10
Useful for a single management need	0- 5

Table 4.--Organizations surveyed to determine usage of streamflow data

[Asterisk (*) indicates organization responded to data-use survey or participated in funding the 1983 stream-gaging program]

Organization	Responded	Participated in funding
FEDERAL ORGANIZATIONS		
Corps of Engineers:		
Chicago District	*	
Louisville District	*	*
Rock Island District	*	*
St. Louis District	*	*
Environmental Protection Agency, Region V	*	
Federal Emergency Management Agency, Region V	*	
Fish and Wildlife Service:		
Carbondale office	*	
Rock Island office	*	
Illinois Water Resources Center	*	
National Weather Service:		
Chicago Forecast Center	*	
Ohio River Forecast Center	*	
Office of Surface Mining		
Soil Conservation Service	*	
STATE ORGANIZATIONS		
Department of Agriculture, Division of Natural Resources		
Department of Transportation, Divsion of Water Resources:		
Chicago office		
Springfield office	*	*
Environmental Protection Agency	*	
Natural History Survey	*	
State Water Survey:		
Champaign office	*	*
Peoria office	*	
LOCAL ORGANIZATIONS		
Greater Egypt Regional Planning and Development Commission		
Metropolitan Sanitary District of Greater Chicago	*	*
Northeastern Illinois Planning Commission	*	
Southwestern Illinois Metropolitan and Regional Planning Commission		

Table 5.--Selected responses to the data-use survey

[Dash (-) indicates no response]

Agency: Organization whose response is listed in the table; BLO - city of Bloomington; CHI - Chicago District, Corps; DEC - city of Decatur; DWR - Illinois Department of Transportation, Division of Water Resources; FPD - Forest Preserve District of Cook County; IEPA - Illinois Environmental Protection Agency; INHS - Illinois Natural History Survey; LOU - Louisville District, Corps; MSD - Metropolitan Sanitary District of Greater Chicago; NIPC - Northeastern Illinois Planning Commission; NWS - National Weather Service; RI - Rock Island District, Corps; SPR - city of Springfield; STL - St. Louis District, Corps; SWS - Illinois State Water Survey; USDA - U.S. Department of Agriculture, Soil Conservation Service; USEPA - U.S. Environmental Protection Agency, Region V; USGS - U.S. Geological Survey. First agency listed for a gaging station participated in funding the gaging station.

Categorization of purpose: Purpose for operating a gaging station is to collect data that are generally categorized as used for current purposes (CP), planning and design (PD), or long-term trend determination (LT). Appropriate purpose indicated by an "X".

Specific use: Specifically describes what data are used for; BC - sampling biological and chemical quality, C - sampling chemical quality, FF - flood forecasting for operational considerations, IR - determining impacts of reservoir, L - satisfying legal requirements, LM - monitoring impoundment level, OM - monitoring impoundment outflow, QW - monitoring water quality, RO - determining rainfall-runoff relations, RR - regulating a reservoir or navigation pool, SED - determining sediment discharge, SHF - self-help local flood forecasting, and WQR - determining water-quality relations.

Need: Indicates the degree of need for streamflow information; V - needed very much, M - needed marginally, and N - not neeeded.

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
03336645	Middle Fork Vermilion River above Oakwood, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
03336900	Salt Fork near St. Joseph, Ill.	SWS	-	X	-	SED,WQR	V
		IEPA	X	X	-	C	V
03337000	Boneyard Creek at Urbana, Ill.	SWS	X	-	X	RO	V
03338000	Salt Fork near Homer, Ill.	LOU	-	-	-	-	N
		INHS	-	-	-	-	V
03339000	Vermilion River near Danville, Ill.	SWS	-	X	X	WQR	V
		IEPA	X	X	-	BC	V
		USEPA	-	-	-	QW	V
03343400	Embarras River near Camargo, Ill.	SWS	-	X	-	-	M
03344000	Embarras River near Diona, Ill.	LOU	-	X	X	RR	M
		IEPA	X	X	-	C	V
03344500	Range Creek near Casey, Ill.	SWS	-	X	-	-	M
03345500	Embarras River at Ste. Marie, Ill.	SWS	-	X	X	SED	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
03346000	North Fork Embarras River near Oblong, Ill.	DWR	-	-	X	RO	V
		USDA	-	X	-	RO	M
03378000	Bonpas Creek at Browns, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
03378635	Little Wabash River near Effingham, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
03378900	Little Wabash River at Louisville, Ill.	LOU	-	-	X	RR	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
03379500	Little Wabash River below Clay City, Ill.	SWS	-	X	X	WQR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
03379600	Little Wabash River at Blood, Ill.	LOU	-	-	X	RR	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
03380350	Skillet Fork near Iuka, Ill.	LOU	-	-	X	RR	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
03380475	Horse Creek near Keenes, Ill.	SWS	-	X	-	-	M
03380500	Skillet Fork at Wayne City, Ill.	LOU	-	-	X	FF	V
		IEPA	X	X	-	C	V
		USGS	X	-	X	RO	V
03381500	Little Wabash River at Carmi, Ill.	DWR	X	-	X	FF,RO	V
		LOU	X	-	X	FF	V
03382100	South Fork Saline River near Carrier Mills, Ill.	LOU	-	-	X	-	M
		IEPA	X	X	-	BC	V
		USEPA	-	-	-	QW	V
03384450	Lusk Creek near Eddyville, Ill.	DWR	-	-	X	RO	V
		IEPA	X	X	-	BC	V
		USEPA	-	-	-	QW	V
03385000	Hayes Creek at Glendale, Ill.	LOU	-	-	-	-	N
03612000	Cache River at Forman, Ill.	LOU	-	-	X	-	M
		IEPA	X	X	-	C	V
		USDA	-	X	X	RO	M
05414820	Sinsinawa River near Menominee, Ill.	DWR	-	-	X	RO	M
05419000	Apple River near Hanover, Ill.	RI	X	-	-	FF,RO,RR	V
05435500	Pecatonica River at Freeport, Ill.	SWS	-	X	X	SED,WQR	V
		RI	X	-	-	FF,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		USGS	X	-	X	RO	V
05437500	Rock River at Rockton, Ill.	RI	X	-	-	FF,RO,RR	V
		INHS	-	-	-	QW	M
05437695	Keith Creek at Eighth Street at Rockford, Ill.	RI	-	X	-	-	N

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
05438250	Coon Creek at Riley, Ill.	SWS	-	X	-	WQR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		RI	X	-	-	FF,RR	V
05438500	Kishwaukee River at Belvidere, Ill.	DWR	X	-	X	FF,RO	V
		RI	X	-	-	FF,RR	V
		NWS	X	-	-	FF,RO	V
05439000	South Branch Kishwaukee River at De Kalb, Ill.	RI	-	X	-	-	N
05439500	South Branch Kishwaukee River near Fairdale, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		NWS	X	-	-	FF,RO	V
05440000	Kishwaukee River near Perryville, Ill.	DWR	X	-	X	FF,RO	V
		RI	X	-	-	FF,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		NWS	X	-	-	FF,RO	V
05443500	Rock River at Como, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05444000	Elkhorn Creek near Penrose, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05446000	Rock Creek at Morrison, Ill.	RI	X	-	-	FF,RO,RR	V
05446500	Rock River near Joslin, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
		USGS	-	X	X	BC,SED,WQR	V
05447500	Green River near Geneseo, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
05448000	Mill Creek at Milan, Ill.	RI	X	-	X	FF,RO	V
05466000	Edwards River near Orion, Ill.	SWS	-	X	-	SED	V
05466500	Edwards River near New Boston, Ill.	DWR	X	-	X	FF,RO	V
05467000	Pope Creek near Keithsburg, Ill.	RI	X	-	-	FF,RO,RR	V
05468500	Cedar Creek at Little York, Ill.	DWR	X	-	X	FF,RO	V
05469000	Henderson Creek near Oquawka, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		USDA	-	X	-	IR	M
05495500	Bear Creek near Marcelline, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
05502020	Hadley Creek near Barry, Ill.	RI	-	X	-	RO	V
05502040	Hadley Creek at Kinderhook, Ill.	RI	-	X	-	RO	V
05512500	Bay Creek at Pittsfield, Ill.	RI	-	X	-	RO	M
		USDA	-	X	-	RO,IR	M
05513000	Bay Creek at Nebo, Ill.	RI	-	X	-	RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05520500	Kankakee River at Momence, Ill.	SWS	-	X	X	SED,WQR	V
		RI	X	-	-	FF,RR	V
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
		INHS	-	-	-	QW	M
05525000	Iroquois River at Iroquois, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
05525500	Sugar Creek at Milford, Ill.	RI	-	X	-	RO	M
		IEPA	X	X	-	C	V
05526000	Iroquois River near Chebanse, Ill.	DWR	X	X	X	FF,RO	V
		RI	X	-	-	FF,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		NWS	X	-	-	FF,RO	V
05527500	Kankakee River near Wilmington, Ill.	SWS	-	X	X	SED,WQR, BC,ORG,QW	V
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
		INHS	-	-	-	QW,BC	V
		NIPC	-	X	X	BC,QW,RO, WQR	V
05527800	Des Plaines River at Russell, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05528000	Des Plaines River near Gurnee, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		NWS	X	-	-	FF,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05528500	Buffalo Creek near Wheeling, Ill.	DWR	X	-	X	FF,RO	V
		USDA	-	X	-	RO	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
05529000	Des Plaines River near Des Plaines, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		NWS	X	-	-	FF,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05529500	McDonald Creek near Mount Prospect, Ill.	DWR	X	-	X	FF,RO	V
		USDA	-	X	-	RO	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05530000	Weller Creek at Des Plaines, Ill.	DWR	X	-	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05530990	Salt Creek at Rolling Meadows, Ill.	DWR	X	-	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		USDA	-	X	X	IR,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05531500	Salt Creek at Western Springs, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	BC	V
		USEPA	-	-	-	QW	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
		USDA	-	X	-	IR,RO	V
05532000	Addison Creek at Bellwood, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		USDA	-	X	-	IR,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05532500	Des Plaines River at Riverside, Ill.	SWS	-	X	-	SED,WQR,BC, ORG,QW	V
		INHS	-	-	-	QW	M
		RI	X	-	-	FF,RR	V
		NIPC	-	X	X	BC,QW,RO, WQR	V
05533000	Flag Creek near Willow Springs, Ill.	DWR	-	-	X	RO	M
		NWS	X	-	-	FF,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose			Specific use	Need
			CP	PD	LT		
05534500	North Branch Chicago River at Deerfield, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		NWS	X	-	-	FF,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
		CHI	-	X	-	FF	V
05535000	Skokie River at Lake Forest, Ill.	DWR	-	-	X	RO	M
		NWS	X	-	-	FF,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05535070	Skokie River near Highland Park, Ill.	FPD[1]	-	-	-	-	-
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05535500	West Fork of North Branch Chicago River at Northbrook, Ill.	DWR	-	-	X	RO	M
		NWS	X	-	-	FF,RO	V
		USDA	-	X	-	IR,RO	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05536000	North Branch Chicago River at Niles, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	BC	V
		USEPA	X		X	QW	V
		INHS	-	-	-	QW	V
		NIPC	-	X	X	BC,QW,RO, WQR	V
05536215	Thorn Creek at Glenwood, Ill.	DWR	X	-	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		USDA	-	X	-	IR,RO	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05536235	Deer Creek near Chicago Heights, Ill.	DWR	X	-	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		USDA	-	X	-	IR,RO	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05536255	Butterfield Creek at Flossmoor, Ill.	DWR	X	-	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		USDA	-	X	-	IR,RO	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V

[1] Agency did not participate in survey of data use.

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
05536265	Lansing Ditch near Lansing, Ill.	DWR	X	-	X	FF,RO	V
		USDA	-	X	-	IR,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05536275	Thorn Creek at Thornton, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		NWS	X	-	-	FF,RO	V
		USDA	-	X	-	IR,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05536290	Little Calumet River at South Holland, Ill.	DWR	X	-	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		USDA	-	X	-	IR,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05536340	Midlothian Creek at Oak Forest, Ill.	DWR	X	X	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		USDA	-	X	-	IR,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05536500	Tinley Creek near Palos Park, Ill.	DWR	X	X	X	FF,RO	V
		USDA	-	X	-	IR,RO	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05537500	Long Run near Lemont, Ill.	DWR	-	-	X	RO	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05539000	Hickory Creek at Joliet, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
		CHI	-	X	-	FF	V
05539900	West Branch Du Page River near West Chicago, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05540095	West Branch Du Page River near Warrenville, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
05540500	Du Page River at Shorewood, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05542000	Mazon River near Coal City, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
05543500	Illinois River at Marseilles, Ill.	USGS	-	X	X	BC,SED,WQR	V
		RI	X	-	-	FF,RR	V
		INHS	-	-	-	QW	V
		USEPA	-	-	-	QW	V
05547000	Channel Lake near Antioch, Ill.	DWR	X	X	-	FF,RO	V
05547500	Fox Lake near Lake Villa, Ill.	DWR	X	X	-	FF,RO	V
05548000	Nippersink Lake at Fox Lake, Ill.	DWR	X	X	-	FF,RO	V
05548280	Nippersink Creek near Spring Grove, Ill.	DWR	X	X	X	FF,RO,RR, OM	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05548500	Fox River at Johnsburg, Ill.	DWR	X	X	-	FF,RO,RM, LM	V
05549000	Boone Creek near McHenry, Ill.	SWS	-	X	-	-	N
05549500	Fox River near McHenry, Ill.	DWR	X	X	-	FF,RO,RM, LM	V
05550000	Fox River at Algonquin, Ill.	SWS	-	X	X	SED,WQR,BC, ORG,QW	V
		IEPA	X	X	-	C	V
		RI	X	-	-	FF,RO,RR	V
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05550500	Poplar Creek at Elgin, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		USDA	-	X	-	RO	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05551200	Ferson Creek near St. Charles, Ill.	SWS	-	X	-	SED	M
		INHS	-	X	X	BC,QW,WQR	M
		NIPC	-	X	X	BC,QW,RO, WQR	V
05551700	Blackberry Creek near Yorkville, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
05552500	Fox River at Dayton, Ill.	DWR	X	X	X	FF,RO	V
		RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
		NWS	X	-		FF,RO	V
05554000	North Fork Vermilion River near Charlotte, Ill.	RI	-	X	-	FF,RO,SHF	V
05554500	Vermilion River at Pontiac, Ill.	DWR	X	X	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		RI	X	-	-	FF,RO,RR	V
05555000	Vermilion River at Streator, Ill.	RI	X	-	-	FF,RO,RR	V
05555300	Vermilion River near Leonore, Ill.	SWS	-	X	X	SED,WQR,BC, ORG,QW	V
		RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05556500	Big Bureau Creek at Princeton, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
05557000	West Bureau Creek at Wyanet, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05557500	East Bureau Creek near Bureau, Ill.	RI	X	-	-	FF,RO,RR	V
05558300	Illinois River at Henry, Ill.	RI	X	-	-	FF,RO,RR	V
		INHS	-	-	-	QW	V
05560500	Farm Creek at Farmdale, Ill.	RI	X	-	-	FF,RO,RR	V
05561500	Fondulac Creek near East Peoria, Ill.	RI	X	-	-	FF,RO,RR	V
05563000	Kickapoo Creek near Kickapoo, Ill.	RI	X	-	-	FF,RO,RR	V
05563500	Kickapoo Creek at Peoria, Ill.	RI	X	-	-	FF,RO,RR	V
05567000	Panther Creek near El Paso, Ill.	RI	-	X	-	RO	M
05567500	Mackinaw River near Congerville, Ill.	SWS	-	X	-	SED,WQR,BC, ORG,QW	V
		RI	X	-	-	FF,RO,RR	V
05568000	Mackinaw River near Green Valley, Ill.	RI	X	-	-	FF,RO,RR	V
05568500	Illinois River at Kingston Mines, Ill.	DWR	-	-	X	RO	M
		RI	X	-	-	FF,RO,RR	V
		INHS	-	-	-	QW	V
05568800	Indian Creek near Wyoming, Ill.	SWS	-	X	-	SED,WQR,BC, ORG,QW	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	-	V
05569500	Spoon River at London Mills, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	-	V

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
05570000	Spoon River at Seville, Ill.	DWR	X	-	X	FF,RO	V
		RI	X	-	-	FF,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	-	V
		NWS	X	-	-	QW	V
05570350	Big Creek at St. David, Ill.	MSD	-	X	X	WQR,L,C	V
05570360	Evelyn Branch near Bryant, Ill.	MSD	-	X	X	WQR,L,C	V
05570370	Big Creek near Bryant, Ill.	MSD	-	X	X	WQR,L,C	V
05570380	Slug Run near Bryant, Ill.	MSD	-	X	X	SED,WQR,C	M
		USEPA	-	-	-	QW	V
05570910	Sangamon River at Fisher, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		USDA	-	X	X	RO,SED	V
05572000	Sangamon River at Monticello, Ill.	SWS	-	X	X	SED,WQR	V
		USDA	-	X	X	RO,SED	V
		RI	X	-	-	FF,RR	V
		USGS	X	-	X	RO	V
05573540	Sangamon River at Route 48 at Decatur, Ill.	DEC[1]	-	-	-	-	-
05575500	South Fork Sangamon River at Kincaid, Ill.	RI	X	-	-	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05575800	Horse Creek at Pawnee, Ill.	SPR[1]	-	-	-	-	-
05576000	South Fork Sangamon River near Rochester, Ill.	RI	X	-	-	FF,RO,RR	V
05576500	Sangamon River at Riverton, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	BC	V
		USEPA	X		X	QW	V
		INHS	-	X	X	BC,QW,WQR	M
05577500	Spring Creek at Springfield, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
05578000	Sangamon River at Petersburg, Ill.	RI	X	-	-	FF,RO,RR	V
05578500	Salt Creek near Rowell, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	X		X	QW	V
05579500	Lake Fork near Cornland, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05580000	Kickapoo Creek at Waynesville, Ill.	RI	-	X	-	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V

[1] Agency did not participate in survey of data use.

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose			Specific use	Need
			CP	PD	LT		
05580500	Kickapoo Creek near Lincoln, Ill.	DWR	-	-	-	-	M
		IEPA	X	X	-	C	V
05580950	Sugar Creek near Bloomington, Ill.	BLO[1]	-	-	-	-	-
05581500	Sugar Creek near Hartsburg, Ill.	DWR	-	-	-	-	N
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05582000	Salt Creek near Greenview, Ill.	SWS	-	X	-	SED,WQR	V
		RI	X	-	-	FF,RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05583000	Sangamon River near Oakford, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	BC	V
		USEPA	X		X	QW	V
		USGS	-	X	X	BC,SED,WQR	V
05584400	Drowning Fork at Bushnell, Ill.	SWS	-	X	-	-	N
05584500	La Moine River at Colmar, Ill.	RI	X	-	-	FF,RO,RR	V
		IEPA	X	X	-	C	V
05585000	La Moine River at Ripley, Ill.	SWS	-	X	X	SED,WQR,BC, ORG,WQR	V
		RI	X	-	-	FF,RR	V
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
05585500	Illinois River at Meredosia, Ill.	RI	X	-	-	FF,RO,RR	V
		INHS	-	-	-	QW	V
05586000	North Fork Mauvaise Terre Creek near Jacksonville, Ill.	DWR	-	-	-	-	N
05586500	Hurricane Creek near Roodhouse, Ill.	STL	X	X	-	RO,RR	V
05587000	Macoupin Creek near Kane, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	C	V
		NWS	X	-	-	FF,RO	V
05587900	Cahokia Creek at Edwardsville, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05588000	Indian Creek at Wanda, Ill.	SWS	-	X	-	-	N
05589500	Canteen Creek at Caseyville, Ill.	SWS	-	X	-	RO	M
		USDA	-	X	-	SED	M
05590000	Kaskaskia Ditch at Bondville, Ill.	SWS	-	X	-	-	N
05590800	Lake Fork at Atwood, Ill.	DWR	-	-	X	RO	M

[1] Agency did not participate in survey of data use.

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose CP	PD	LT	Specific use	Need
05591200	Kaskaskia River at Cooks Mills, Ill.	STL	X	-	-	RR	V
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
		INHS	-	X	X	WQR	V
05591550	Whitley Creek near Allenville, Ill.	STL	X	-	-	RR	V
		INHS	-	-	-	WQR	M
05591700	West Okaw River near Lovington, Ill.	STL	X	-	-	RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		INHS	-	-	-	SED	M
05592000	Kaskaskia River at Shelbyville, Ill.	STL	X	-	-	RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		INHS	-	-	-	-	M
05592050	Robinson Creek near Shelbyville, Ill.	STL	X	-	-	RR	V
05592100	Kaskaskia River near Cowden, Ill.	STL	X	-	-	RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05592500	Kaskaskia River at Vandalia, Ill.	STL	X	-	-	RR	V
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
05592600	Hickory Creek near Bluff City, Ill.	STL	X	-	-	RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05592800	Hurricane Creek near Mulberry Grove, Ill.	STL	X	-	-	RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05592900	East Fork Kaskaskia River near Sandoval, Ill.	STL	X	X	X	RR	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05593000	Kaskaskia River at Carlyle, Ill.	STL	X	-	-	RR	V
		IEPA	X	X	-	C	V
05593520	Crooked Creek near Hoffman, Ill.	DWR	-	-	X	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05593575	Little Crooked Creek near New Minden, Ill.	DWR	-	-	X	RO	M
05593600	Blue Grass Creek near Raymond, Ill.	SWS	-	X	-	-	N
05593900	East Fork Shoal Creek near Coffeen, Ill.	SWS	-	X	-	-	M
05594000	Shoal Creek near Breese, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		NWS	X	-	-	FF,RO	V
05594100	Kaskaskia River near Venedy Station, Ill.	DWR	X	-	X	FF,RO	V
		NWS	X	-	-	FF,RO	V
		USEPA	-	-	-	QW	V
		USGS	-	X	X	BC,SED,WQR	V

Table 5.--Selected responses to the data-use survey--Continued

Station No.	Station name	Agency	Categorization of purpose			Specific use	Need
			CP	PD	LT		
05594450	Silver Creek near Troy, Ill.	DWR	X	-	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05594800	Silver Creek near Freeburg, Ill.	STL	-	-	X	-	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05595200	Richland Creek near Hecker, Ill.	STL	-	X	-	RO	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05595700	Big Muddy River near Mt. Vernon, Ill.	STL	-	-	X	-	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05595730	Rayse Creek near Waltonville, Ill.	STL	-	-	X	-	M
		IEPA	X	X		C	V
		USEPA	-	-	-	QW	V
05595830	Casey Fork at Route 37 near Mt. Vernon, Ill.	STL	-	-	X	-	M
		IEPA	X	X	-	BC	V
		USEPA	X	-	X	QW	V
05597000	Big Muddy River at Plumfield, Ill.	STL	-	-	X	-	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05597500	Crab Orchard Creek near Marion, Ill.	DWR	X	X	X	FF,RO	V
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
05599500	Big Muddy River at Murphysboro, Ill.	STL	-	-	X	-	M
		IEPA	X	X	-	C	V
		USEPA	-	-	-	QW	V
		USGS	-	X	X	BC,SED,WQR	V
05600000	Big Creek near Wetaug, Ill.	DWR	-	-	-	-	-
		NWS	X	-	-	FF,RO	V

Table 6.--Streamflow characteristics most used by various agencies in Illinois

[Characteristic that is used the most is indicated by an "X"]

Agency[1]	Mean discharge[2]			Daily stage	Annual peak discharge	Annual peak stage	Flow duration[3]	Flood hydrographs		Flow volume[4]	
	Daily	Monthly	Annual					Discharge	Stage	High	Low
CHI	X	-	-	X	X	X	-	X	X	X	-
DWR	-	-	-	X	X	X	-	X	X	-	-
FEMA	-	-	-	-	X	-	-	-	-	-	-
FWS	X	-	-	X	-	-	X	-	-	X	X
IEPA	X	X	X	-	-	-	X	-	-	-	-
INHS	X	-	-	X	-	-	X	-	-	-	-
LOU	X	-	-	-	X	X	-	X	-	-	-
MSD	X	X	X	-	-	-	-	X	X	X	-
NIPC	X	-	-	-	-	-	-	X	-	X	X
NWS	X	-	-	X	X	X	-	X	X	X	X
RI	X	X	X	X	X	X	X	X	X	X	X
STL	X	-	-	X	X	X	X	X	-	X	-
SWS	X	X	X	X	X	X	X	X	-	X	X
USDA	-	-	-	-	X	X	-	X	-	X	-
USEPA	X	X	X	X	X	X	X	X	X	X	X

[1] Agency whose response is listed in the table; CHI - Chicago District, Corps; DWR - Illinois Department of Transportation, Division of Water Resources; FEMA - Federal Emergency Management Agency; FWS - U.S. Fish and Wildlife Service; IEPA - Illinois Environmental Protection Agency; INHS - Illinois Natural History Survey; LOU - Louisville District, Corps; MSD - Metropolitan Sanitary District of Greater Chicago; NIPC - Northeastern Illinois Planning Commission; NWS - National Weather Service; RI - Rock Island District, Corps; STL - St. Louis District, Corps; SWS - Illinois State Water Survey; USDA - U.S. Department of Agriculture, Soil Conservation Service; and USEPA - U.S. Environmental Protection Agency.

[2] Average value for indicated period of time.

[3] Percentage of days during the period of record with discharge that equaled or exceeded an indicated discharge.

[4] Volume of discharge during a given period of time; "high" indicates the annual maximum volume and "low" indicates the annual minimum volume.

Table 7.--Gaging stations used in the network analysis of regional information for the Illinois stream-gaging program

[Footnotes are at end of table]

Data-set index: Reference number for regions delineated in figure 4 that identifies general location of gaging station. Gaging stations in regions 5, 13, and 14 are grouped into two sets based on drainage area; denoted by "a", above a selected drainage area, and by "b", below a selected drainage area. Drainage areas selected for regions 5, 13, and 14 are 500, 300, and 400 mi^2, respectively.

Years of record: First number is the number of years of record, through 1975, used to calculate peak-flow characteristics (Curtis, 1977, p. 61-69) unless indicated otherwise; second number is the number of years of record, through 1980, used to calculate average discharge, high-flow characteristics, and low-flow characteristics. Dash (-) indicates that less than 10 years of continuous record of streamflow was available.

Station No.	Station name	Data-set index	Years of record
03336100	Big Four Ditch Tributary near Paxton, Ill.	1	20, -
03336500	Bluegrass Creek at Potomac, Ill.	1	26,22
03336900	Salt Fork near St. Joseph, Ill.	1	17,22
03337500	Saline Branch at Urbana, Ill.	1	39,22
03338000	Salt Fork near Homer, Ill.	1	30,14
03338100	Salt Fork Tributary near Catlin, Ill.	1	17, -
03338500	Vermilion River near Catlin, Ill.	1	19,19
03338800	North Fork Vermilion River Tributary near Danville, Ill.	1	20, -
03339000	Vermilion River near Danville, Ill.	1	53,59
03341700	Big Creek Tributary near Dudley, Ill.	1	15, -
03341900	Raccoon Creek Tributary near Annapolis, Ill.	1	20, -
03343400	Embarras River near Camargo, Ill.	1	15,20
03344000	Embarras River near Diona, Ill.	1	11,13
03344250	Embarras River Tributary near Greenup, Ill.	1	20, -
03344425	Muddy Creek Tributary at Woodbury, Ill.	1	16, -
03344500	Range Creek near Casey, Ill.	1	25,30
03345500	Embarras River at Ste. Marie, Ill.	1	64,69
03346000	North Fork Embarras River near Oblong, Ill.	1	35,40
03378000	Bonpas Creek at Browns, Ill.	2	35,40
03378635	Little Wabash River near Effingham, Ill.	2	[1]14,14
03378650	Second Creek Tributary at Keptown, Ill.	2	17, -
03378900	Little Wabash River at Louisville, Ill.	2	10,15
03378980	Little Wabash River Tributary at Clay City, Ill.	2	17, -
03379500	Little Wabash River below Clay City, Ill.	2	61,66
03379650	Madden Creek near West Salem, Ill.	2	20, -

Table 7.--Gaging stations used in the network analysis of regional information for the Illinois stream-gaging program--Continued

Station No.	Station name	Data-set index	Years of record
03380300	Dums Creek Tributary near Iuka, Ill.	2	20, -
03380350	Skillet Fork near Iuka, Ill.	2	10,15
03380400	Horse Creek Tributary near Cartter, Ill.	2	12, -
03380450	White Feather Creek near Marlow, Ill.	2	20, -
03380475	Horse Creek near Keenes, Ill.	2	16,21
03380500	Skillet Fork at Wayne City, Ill.	2	58,63
03381500	Little Wabash River at Carmi, Ill.	2	36,41
03381600	Little Wabash River Tributary near New Haven, Ill.	2	16, -
03382025	Little Saline Creek Tributary near Goreville, Ill.	3	17, -
03382100	South Fork Saline River near Carrier Mills, Ill.	3	10,15
03382170	Brushy Creek near Harco, Ill.	3	[1]12,12
03382510	Eagle Creek near Equality, Ill.	3	[1]14,14
03382520	Black Branch Tributary near Junction, Ill.	3	13, -
03384450	Lusk Creek near Eddyville, Ill.	3	[1]13,13
03385000	Hayes Creek at Glendale, Ill.	3	26,26
03385500	Lake Glendale Inlet near Dixon Springs, Ill.	3	21, -
03612000	Cache River at Forman, Ill.	3	53,56
03612200	Q Ditch Tributary near Choat, Ill.	3	20, -
03614000	Hess Bayou Tributary near Mound City, Ill.	3	14, -
05414820	Sinsinawa River near Menominee, Ill.	4	[1]14,13
05418750	South Fork Apple River near Nora, Ill.	4	15, -
05418800	Mill Creek Tributary near Scales Mound, Ill.	4	20, -
05419000	Apple River near Hanover, Ill.	4	41,46
05420000	Plum River below Carroll Creek near Savanna, Ill.	4	35,37
05435000	Cedar Creek near Winslow, Ill.	5b	24,20
05435500	Pecatonica River at Freeport, Ill.	5a	62,66
05435650	Lost Creek Tributary near Shannon, Ill.	5b	15, -
05436900	Otter Creek Tributary near Durand, Ill.	5b	15, -
05437000	Pecatonica River at Shirland, Ill.	5a	32,19
05437500	Rock River at Rockton, Ill.	5a	46,48
05437600	Rock River Tributary near Rockton, Ill.	5b	15, -
05437950	Kishwaukee River near Huntley, Ill.	5b	11, -
05438250	Coon Creek at Riley, Ill.	5b	14,19
05438300	Lawrence Creek Tributary near Harvard, Ill.	5b	15, -
05438390	Piscasaw Creek below Mokeler Creek near Capron, Ill.	5b	[1]10, -

Table 7.--Gaging stations used in the network analysis of regional information for the Illinois stream-gaging program--Continued

Station No.	Station name	Data-set index	Years of record
05438500	Kishwaukee River at Belvidere, Ill.	5a	36,41
05438850	Middle Branch of South Branch Kishwaukee River near Malta, Ill.	5b	20, -
05439500	South Branch Kishwaukee River near Fairdale, Ill.	5b	36,41
95439550	South Branch Kishwaukee River Tributary near Irene, Ill.	5b	17, -
05440000	Kishwaukee River near Perryville, Ill.	5a	36,41
05440500	Killbuck Creek near Monroe Center, Ill.	5b	36,32
05440650	Stillman Creek Tributary near Holcomb, Ill.	5b	17, -
05440900	Leaf River Tributary near Forreston, Ill.	5b	20, -
05441000	Leaf River at Leaf River, Ill.	5b	36,19
05441500	Rock River at Oregon, Ill.	5a	10,10
05442000	Kyte River near Flagg Center, Ill.	5b	12,12
05443500	Rock River at Como, Ill.	5a	61,60
05444000	Elkhorn Creek near Penrose, Ill.	5b	36,41
05444100	Spring Creek Tributary near Coleta, Ill.	5b	14, -
05445500	Rock Creek near Morrison, Ill.	5b	32,16
05446500	Rock River near Joslin, Ill.	5a	36,41
05446950	Green River Tributary near Amboy, Ill.	5b	15, -
05447000	Green River at Amboy, Ill.	5b	36,19
05447050	Green River Tributary No. 2 near Ohio, Ill.	5b	14, -
05447350	Mud Creek Tributary near Atkinson, Ill.	5b	15, -
05447500	Green River near Geneseo, Ill.	5a	39,44
05448000	Mill Creek at Milan, Ill.	5b	36,39
05448050	Sand Creek near Milan, Ill.	4	20, -
05466000	Edwards River near Orion, Ill.	4	35,40
05466500	Edwards River near New Boston, Ill.	4	41,46
05467000	Pope Creek near Keithsburg, Ill.	4	41,46
05467500	Henderson Creek near Little York, Ill.	4	34,18
05468000	North Henderson Creek near Seaton, Ill.	4	11,11
05468500	Cedar Creek at Little York, Ill.	4	35,31
05469000	Henderson Creek near Oquawka, Ill.	4	41,46
05469500	South Henderson Creek at Biggsville, Ill.	4	36,32
05469750	Ellison Creek Tributary near Roseville, Ill.	4	20, -
05495200	Little Creek near Breckenridge, Ill.	6	20, -
05495500	Bear Creek near Marcelline, Ill.	6	32,36
05496900	Homan Creek Tributary near Quincy, Ill.	6	20, -

Table 7.--Gaging stations used in the network analysis of regional information for the Illinois stream-gaging program--Continued

Station No.	Station name	Data-set index	Years of record
05501500	Burton Creek Tributary near Burton, Ill.	6	14, -
05502020	Hadley Creek near Barry, Ill.	6	19,11
05502040	Hadley Creek at Kinderhook, Ill.	6	36,41
05502120	Kiser Creek Tributary near Barry, Ill.	6	20, -
05512500	Bay Creek at Pittsfield, Ill.	6	36,41
05513000	Bay Creek at Nebo, Ill.	6	36,41
05513200	Salt Spring Creek near Gilead, Ill.	6	20, -
05520500	Kankakee River at Momence, Ill.	7	61,65
05525000	Iroquois River at Iroquois, Ill.	7	31,36
05525050	Eastburn Hollow near Sheldon, Ill.	7	17, -
05525500	Sugar Creek at Milford, Ill.	7	27,32
05526000	Iroquois River near Chebanse, Ill.	7	52,57
05526150	Kankakee River Tributary near Bourbonnais, Ill.	7	20, -
05526500	Terry Creek near Custer Park, Ill.	7	26,26
05527000	Kankakee River at Custer Park, Ill.	7	[2]18,18
05527050	Prairie Creek near Frankfort, Ill.	7	17, -
05527500	Kankakee River near Wilmington, Ill.	7	61,65
05527800	Des Plaines River at Russell, Ill.	8	15,13
05527840	Des Plaines at Wadsworth, Ill.	8	14, -
05527870	Mill Creek at Wedges Corner, Ill.	8	[1]16, -
05527900	North Mill Creek at Hickory Corners, Ill.	8	[3]16, -
05527950	Mill Creek at Old Mill Creek, Ill.	8	[3]16, -
05528000	Des Plaines River near Gurnee, Ill.	8	29,25
05528150	Indian Creek at Diamond Lake, Ill.	8	[3]17, -
05528200	Hawthorn Drainage Ditch near Mundelein, Ill.	8	[1]16, -
05528360	Aptakisic Creek at Aptakisic, Ill.	8	[3]16, -
05529000	Des Plaines River near Des Plaines, Ill.	8	35,40
05537500	Long Run near Lemont, Ill.	8	25,29
05539000	Hickory Creek at Joliet, Ill.	8	34,36
05539950	Klein Creek at Carol Stream, Ill.	8	15, -
05540110	Ferry Creek at Warrenville, Ill.	8	[3]16, -
05540140	East Branch Du Page River near Bloomingdale, Ill.	8	15, -
05540500	Du Page River at Shorewood, Ill.	8	35,40
05541750	Mazon River Tributary near Gardner, Ill.	7	17, -
05542000	Mazon River near Coal City, Ill.	7	36,41

Table 7.--Gaging stations used in the network analysis of regional information for the Illinois stream-gaging program--Continued

Station No.	Station name	Data-set index	Years of record
05549700	Mutton Creek at Island Lake, Ill.	9	[3]16, -
05549900	Fox River Tributary near Cary, Ill.	9	20, -
05550300	Tyler Creek at Elgin, Ill.	9	[3]14, -
05550450	Poplar Creek near Ontarioville, Ill.	9	15, -
05550500	Poplar Creek at Elgin, Ill.	9	24,29
05551030	Brewster Creek at Valley View, Ill.	9	[3]15, -
05551050	Norton Creek near Wayne, Ill.	9	[3]15, -
05551060	Norton Creek near St. Charles, Ill.	9	[3]15, -
05551200	Ferson Creek near St. Charles, Ill.	9	[3]16,19
05551520	Indian Creek near North Aurora, Ill.	9	[3]16, -
05551620	Blackberry Creek near Kaneville, Ill.	9	[3]14, -
05551650	Lake Run Tributary near Batavia, Ill.	9	15, -
05551700	Blackberry Creek near Yorkville, Ill.	9	15,20
05551800	Fox River Tributary No. 2 near Fox, Ill.	9	15, -
05551900	East Branch Big Rock Creek near Big Rock, Ill.	9	[3]12, -
05551930	Welch Creek near Big Rock, Ill.	9	[3]12, -
05554000	North Fork Vermilion River near Charlotte, Ill.	11	33,20
05554500	Vermilion River at Pontiac, Ill.	11	34,38
05554600	Mud Creek Tributary near Odell, Ill.	11	17, -
05555000	Vermilion River at Streator, Ill.	11	15,15
05555400	Vermilion River Tributary at Lowell, Ill.	11	20, -
05555500	Vermilion River at Lowell, Ill.	11	[4]41,40
05555775	Vermilion Creek Tributary at Meriden, Ill.	11	13, -
05556500	Big Bureau Creek at Princeton, Ill.	10	39,44
05557000	West Bureau Creek at Wyanet, Ill.	10	39,30
05557100	West Bureau Creek Tributary near Wyanet, Ill.	10	20, -
05557500	East Bureau Creek near Bureau, Ill.	10	38,30
05558000	Big Bureau Creek at Bureau, Ill.	10	11,11
05558050	Coffee Creek Tributary near Florid, Ill.	10	20, -
05558075	Coffee Creek Tributary near Hennepin, Ill.	10	20, -
05558500	Crow Creek (West) near Henry, Ill.	10	26,22
05559000	Gimlet Creek at Sparland, Ill.	10	28,24
05559500	Crow Creek near Washburn, Ill.	10	31,27
05561000	Ackerman Creek at Farmdale, Ill.	10	22,26
05563000	Kickapoo Creek near Kickapoo, Ill.	10	31,18

Table 7.--Gaging stations used in the network analysis of regional information for the Illinois stream-gaging program--Continued

Station No.	Station name	Data-set index	Years of record
05563100	Kickapoo Creek Tributary near Kickapoo, Ill.	10	20, -
05563500	Kickapoo Creek at Peoria, Ill.	10	33,29
05564400	Money Creek near Towanda, Ill.	11	18,22
05564500	Money Creek above Lake Bloomington, Ill.	11	25,25
05565000	Hickory Creek above Lake Bloomington, Ill.	11	20,20
05566000	East Branch Panther Creek near Gridley, Ill.	11	23,11
05566500	East Branch Panther Creek at El Paso, Ill.	11	26,31
05567000	Panther Creek near El Paso, Ill.	11	26,11
05567500	Mackinaw River near Congerville, Ill.	11	31,36
05567800	Indian Creek Tributary near Hopedale, Ill.	11	12, -
05568000	Mackinaw River near Green Valley, Ill.	11	53,35
05568800	Indian Creek near Wyoming, Ill.	12	16,21
05568850	Forman Creek Tributary near Victoria, Ill.	12	15, -
05569500	Spoon River at London Mills, Ill.	12	33,38
05569825	Cedar Creek Tributary at St. Augustine, Ill.	12	20, -
05570000	Spoon River at Seville, Ill.	12	59,65
05571000	Sangamon River at Mahomet, Ill.	13a	28,30
05572000	Sangamon River at Monticello, Ill.	13a	67,70
05572100	Wildcat Creek Tributary near Monticello, Ill.	13b	20, -
05572450	Friends Creek at Argenta, Ill.	13b	[1]14,14
05574000	South Fork Sangamon River near Nokomis, Ill.	13b	25,24
05574500	Flat Branch near Taylorville, Ill.	13b	26,31
05575500	South Fork Sangamon River at Kincaid, Ill.	13a	54,31
05575800	Horse Creek at Pawnee, Ill.	13b	[1]13,13
05576000	South Fork Sangamon River near Rochester, Ill.	13a	26,31
05576500	Sangamon River at Riverton, Ill.	13a	63,46
05577500	Spring Creek at Springfield, Ill.	13b	28,31
05577700	Sangamon River Tributary at Andrew, Ill.	13b	20, -
05578500	Salt Creek near Rowell, Ill.	13a	38,38
05579500	Lake Fork near Cornland, Ill.	13b	28,32
05579750	Kickapoo Creek Tributary at Heyworth, Ill.	13b	18, -
05580000	Kickapoo Creek at Waynesville, Ill.	13b	28,32
05580500	Kickapoo Creek near Lincoln, Ill.	13a	31,27
05581500	Sugar Creek near Hartsburg, Ill.	13a	31,27
05582000	Salt Creek near Greenview, Ill.	13a	34,39

Table 7.--Gaging stations used in the network analysis of regional information for the Illinois stream-gaging program--Continued

Station No.	Station name	Data-set index	Years of record
05582200	Cabiness Creek Tributary near Petersburg, Ill.	13b	20, -
05583000	Sangamon River near Oakford, Ill.	13a	58,53
05584400	Drowning Fork at Bushnell, Ill.	12	15,20
05584450	Wigwam Hollow Creek near Macomb, Ill.	12	15, -
05584500	La Moine River at Colmar, Ill.	12	31,36
05585000	La Moine River at Ripley, Ill.	12	55,59
05585220	Indian Creek Tributary near Sinclair, Ill.	12	20, -
05585700	Dry Fork Tributary near Mount Sterling, Ill.	12	20, -
05586000	North Fork Mauvaise Terre Creek near Jacksonville, Ill.	12	26,25
05586200	Illinois River Tributary at Florence, Ill.	12	20, -
05586350	Little Sandy Creek Tributary near Murrayville, Ill.	12	12, -
05586500	Hurricane Creek near Roodhouse, Ill.	12	25,25
05586800	Otter Creek near Palmyra, Ill.	12	16,21
05586850	Bear Creek Tributary near Reeders, Ill.	12	20, -
05587000	Macoupin Creek near Kane, Ill.	12	48,52
05587850	Cahokia Creek Tributary No. 2 near Carpenter, Ill.	6	20, -
05587900	Cahokia Creek at Edwardsville, Ill.	6	[1]12,11
05588000	Indian Creek at Wanda, Ill.	6	35,40
05589500	Canteen Creek at Caseyville, Ill.	6	37,41
05590000	Kaskaskia Ditch at Bondville, Ill.	14b	30,31
05590400	Kaskaskia River near Pesotum, Ill.	14b	11,15
05590500	Kaskaskia River at Ficklin, Ill.	14b	11,10
05591200	Kaskaskia River at Cooks Mills, Ill.	14a	[1]10,10
05591500	Asa Creek at Sullivan, Ill.	14b	25,30
05591750	Stringtown Branch Tributary near Lake City, Ill.	14b	15, -
05592000	Kaskaskia River at Shelbyville, Ill.	14a	34,33
05592025	Mud Creek Tributary near Tower Hill, Ill.	14b	20, -
05592300	Wolf Creek near Beecher City, Ill.	14b	17,21
05592500	Kaskaskia River at Vandalia, Ill.	14a	59,59
05592700	Hurricane Creek Tributary near Witt, Ill.	14b	20, -
05592800	Hurricane Creek near Mulberry Grove, Ill.	14b	[1]10,10
05593000	Kaskaskia River at Carlyle, Ill.	14a	44,34
05593575	Little Crooked Creek near New Minden, Ill.	14b	[1]13,13
05593600	Blue Grass Creek near Raymond, Ill.	14b	15,20
05593700	Blue Grass Creek Tributary near Raymond, Ill.	14b	13, -

Table 7.--Gaging stations used in the network analysis of regional information for the Illinois stream-gaging program--Continued

Station No.	Station name	Data-set index	Years of record
05593900	East Fork Shoal Creek near Coffeen, Ill.	14b	12,17
05594000	Shoal Creek near Breese, Ill.	14a	35,37
05594200	Williams Creek near Cordes, Ill.	14b	17, -
05594330	Mud Creek near Marissa, Ill.	14b	[1]10,10
05594450	Silver Creek near Troy, Ill.	14b	[1]14,14
05594800	Silver Creek near Freeburg, Ill.	14a	[1]11,10
05595000	Kaskaskia River at New Athens, Ill.	14a	46,43
05595200	Richland Creek near Hecker, Ill.	14b	[1]11,11
05595500	Marys River near Sparta, Ill.	15	23,22
05595510	Lick Branch near Eden, Ill.	15	14, -
05595800	Sevenmile Creek near Mt. Vernon, Ill.	15	15,20
05596000	Big Muddy River near Benton, Ill.	15	25,25
05596100	Andy Creek Tributary at Valier, Ill.	15	17, -
05597000	Big Muddy River at Plumfield, Ill.	15	60,58
05597500	Crab Orchard Creek near Marion, Ill.	15	24,29
05599000	Beaucoup Creek near Matthews, Ill.	15	30,35
05599500	Big Muddy River at Murphysboro, Ill.	15	43,40
05599560	Clay Lick Creek near Makanda, Ill.	15	16, -
05599640	Green Creek Tributary near Jonesboro, Ill.	15	20, -
05599800	Orchard Creek near Fayville, Ill.	15	12, -
05600000	Big Creek near Wetaug, Ill.	3	34,31

[1] Peak-flow characteristics based on record collected through 1980.

[2] Peak-flow characteristics based on record collected through 1933.

[3] Peak-flow characteristics published by Allen and Bejcek (1979, p. 34-47).

[4] Streamflow characteristics based on record collected through 1971 prior to gage being moved.

Table 8.--Regression models for determining selected streamflow characteristics

$$[Y = (10)^{b_0}(A)^{b_1}(Sc)^{b_2}]$$

Y: Streamflow characteristic average discharge, Q_a; 10-year peak discharge, P_{10}; 50-year peak discharge, P_{50}; 1-day 10-year flood volume, $V_{1,10}$; 1-day 50-year flood volume, $V_{1,50}$; 7-day 2-year low flow, $M_{7,2}$; or 7-day 10-year low flow, $M_{7,10}$. All discharges in cubic feet per second.

A: Drainage area, in square miles. S_c: Channel slope, in feet per mile.

b_0, b_1, b_2: Model parameters determined from multiple regression analysis.

Data-set index: Reference number for regions delineated in figure 4 that identifies area of State that statistical model is applicable to. Several regions were combined so that a reasonable number of gaging stations could be used in the statistical analyses.

Number of stations: N is the number of gaging stations used in the regression analysis; NB is the adjusted number of gaging stations (eq. 3).

Observed standard error, S_o, is expressed in common logarithm units ($\log_{10}$) and in percent. Asterisk (*) indicates that no reasonable statistical model could be determined.

Data-set index	Regression coefficients			Number of gaging stations		Observed standard error	
	(b_0)	(b_1)	(b_2)	N	NB	$\log_{10}$	percent
			AVERAGE DISCHARGE (Q_a)				
1	-0.11	1.0	-	11	11	0.028	6.5
2	.056	.95	-	8	8	.033	7.6
3	-.56	1.2	0.32	7	6	.033	7.6
4	-.34	1.0	.095	11	10	.026	6.0
5a	-.11	.97	-	9	9	.029	6.7
5b	-.45	1.1	-	10	10	.076	18
6	-.062	.94	-	8	8	.034	7.8
7	-.11	1.0	-	8	8	.024	5.5
8,9	-.13	1.0	-	9	9	.027	6.2
10	-.24	1.0	-	10	10	.056	13
11	-.19	.99	-	12	12	.026	6.0
12	-.15	.98	-	10	10	.026	6.0
13a	-.14	.99	-	10	10	.033	7.6
13b	-.16	1.0	-	7	7	.060	14
14a	.019	.95	-	7	7	.025	12
14b	-.13	1.0	-	12	12	.063	15
15	-.19	1.0	-	7	7	.026	6.0

Table 8.--Regression models for determining selected streamflow characteristics--Continued

Data-set index	Regression coefficients			Number of gaging stations		Observed standard error	
	(b_0)	(b_1)	(b_2)	N	NB	$\log_{10}$	percent
10-YEAR PEAK DISCHARGE (P_{10})							
1	2.0	0.74	0.43	18	17	0.13	31
2	2.7	.55	-	15	15	.13	31
3	1.6	.82	.65	12	11	.20	49
4	1.6	.79	.56	15	14	.14	33
5a	1.6	.77	.41	9	8	.046	11
5b	1.0	.94	.83	24	23	.24	60
6	2.9	.55	-	14	14	.14	33
7	1.2	.89	.79	12	11	.22	54
8	.97	.99	.67	16	15	.20	49
9	.65	.84	.97	16	15	.15	36
10	2.6	.59	-	14	14	.14	33
11	2.4	.57	-	16	16	.16	38
12	1.2	.90	.87	18	17	.088	20
13a	2.1	.68	.23	10	9	.044	10
13b	2.6	.57	-	11	11	.17	41
14a	2.2	.71	-	7	7	.11	26
14b	1.8	.81	.61	17	16	.21	51
15	2.8	.52	-	12	12	.17	41
50-YEAR PEAK DISCHARGE (P_{50})							
1	2.1	0.74	0.47	18	17	0.15	36
2	2.9	.55	-	15	15	.15	36
3	1.8	.79	.59	12	11	.23	57
4	1.8	.77	.56	15	14	.18	43
5a	1.7	.77	.47	9	8	.061	14
5b	1.0	.98	.96	24	23	.27	69
6	3.1	.54	-	14	14	.15	36
7	1.4	.89	.87	12	11	.23	57
8	1.1	.99	.69	16	15	.21	51
9	1.2	.72	.79	16	15	.17	41
10	2.8	.58	-	14	14	.16	38
11	2.6	.55	-	16	16	.18	43
12	1.4	.92	.92	18	17	.099	23
13a	2.7	.56	-	10	10	.058	13
13b	2.8	.58	-	11	11	.18	43
14a	1.1	1.0	1.2	7	6	.093	22
14b	1.9	.83	.65	17	16	.21	51
15	2.9	.52	-	12	12	.18	43

Table 8.--Regression models for determining selected streamflow characteristics--Continued

Data-set index	Regression coefficients			Number of gaging stations		Observed standard error	
	(b_0)	(b_1)	(b_2)	N	NB	$\log_{10}$	percent
			1-DAY 10-YEAR FLOOD VOLUME $(V_{1,10})$				
1	1.5	0.86	0.45	11	10	0.10	23
2	2.6	.57	-	8	8	.16	38
3	2.1	.75	-	7	7	.18	43
4	1.2	.92	.45	11	10	.057	13
5a	1.5	.81	.46	9	8	.091	21
5b	1.6	.88	-	10	10	.15	36
6	2.2	.73	-	8	8	.073	17
7	1.8	.72	-	8	8	.22	54
8,9	1.8	.70	-	9	9	.18	43
10	1.7	.88	-	10	10	.062	14
11	1.7	.83	-	12	12	.085	20
12	.83	1.1	.67	10	9	.11	26
13a	2.2	.68	-	10	10	.053	12
13b	2.3	.60	-	7	7	.082	19
14a	1.4	.88	.67	7	6	.051	12
14b	1.7	.96	-	12	12	.12	28
15	4.5	-	-1.3	7	7	.091	21
			1-DAY 50-YEAR FLOOD VOLUME $(V_{1,50})$				
1	2.2	.72	-	11	11	.13	31
2	2.6	.63	-	8	8	.21	51
3	2.3	.73	-	7	7	.20	49
4	1.1	1.0	.51	11	10	.079	18
5a	1.5	.81	.46	9	8	.091	21
5b	1.8	.87	-	10	10	.18	43
6	2.5	.68	-	8	8	.11	26
7	2.2	.64	-	8	8	.21	51
8,9	2.2	.64	-	9	9	.24	60
10	2.0	.79	-	10	10	.12	28
11	2.1	.77	-	12	12	.17	41
12	.96	1.1	.71	10	9	.12	28
13a	2.4	.65	-	10	10	.091	21
13b	2.8	.48	-	7	7	.094	22
14a	1.3	.96	.80	7	6	.068	16
14b	1.4	1.1	.38	12	11	.10	23
15	4.7	-	-1.3	7	7	.17	41

Table 8.--Regression models for determining selected streamflow characteristics--Continued

Data-set index	Regression coefficients (b_0)	(b_1)	(b_2)	Number of gaging stations N	NB	Observed standard error log_{10}	percent
			7-DAY 2-YEAR LOW FLOW ($M_{7,2}$)				
1	-4.1	1.9	-	11	11	0.65	290
2,3,15	-	-	-	22	-	*	*
4	-1.8	1.1	-	11	11	.58	220
5a	-1.5	1.2	-	9	9	.14	33
5b	-3.1	1.9	-	10	10	.34	92
6,12	-	-	-	18	-	*	*
7	-2.3	1.3	-	8	8	.67	310
8,9	-3.1	1.7	-	9	9	.71	370
10,11	-4.8	2.0	-	22	22	.79	510
13	-5.7	2.4	-	17	17	.85	670
14	-	-	-	19	-	*	*
			7-DAY 10-YEAR LOW FLOW ($M_{7,10}$)				
1	-	-	-	11	-	*	*
2,3,15	-	-	-	22	-	*	*
4	-	-	-	11	-	*	*
5a	-2.0	1.3	-	9	9	0.17	41
5b	-3.2	1.8	-	10	10	.46	140
6,12	-	-	-	18	-	*	*
7	-	-	-	8	-	*	*
8,9	-	-	-	9	-	*	*
10,11	-	-	-	22	-	*	*
13	-	-	-	17	-	*	*
14	-	-	-	19	-	*	*

Table 9.--Median true standard error for selected peak discharge and flood volume regression models

Level of information: Any combination of NB and NY. Asterisk (*) indicates values of NB, NY, and related S_t that differ from the present level.

Data-set index: Reference number shown in figure 5 that identifies area of State that statistical model is applicable to. Several regions were combined so that a reasonable number of gaging stations could be used in the statistical analyses.

NB: Adjusted number of gaging stations (eq. 3).

NY: Harmonic-mean record length, in years (eq. 2).

S_o, S_t: Observed standard error and median true standard error, in percent.

Data-set index	Present level of information				Alternative levels of information								
					No. 1			No. 2			No. 3		
	NB	NY	S_o	S_t	NB*	NY*	S_t*	NB*	NY*	S_t*	NB*	NY*	S_t*
50-YEAR PEAK DISCHARGE (P_{50})													
1	17	23	36	36	22	23	35	17	28	35	30	40	32
2	15	21	36	39	20	21	39	15	26	38	30	30	36
3	11	18	57	68	16	18	67	11	23	67	20	30	64
4	14	22	43	48	19	22	47	14	27	47	30	30	45
5a	8	28	14	19	13	28	19	8	33	19	20	40	16
5b	23	18	69	74	28	18	74	23	23	73	30	30	71
6	14	25	36	35	19	25	34	14	30	34	20	40	31
7	11	28	57	70	16	28	68	11	33	69	20	40	65
8	15	18	51	59	20	18	58	15	23	58	30	30	55
9	15	17	41	44	20	17	43	15	22	42	30	30	39
10	14	25	38	33	19	25	32	14	30	32	20	40	29
11	16	22	43	47	21	22	47	16	27	46	30	30	44
12	17	24	23	23	21	24	23	17	29	21	30	40	18
13a	10	39	13	19	15	39	18	10	44	18	20	50	16
13b	11	21	43	46	16	21	45	11	26	45	20	30	42
14a	6	20	22	33	11	20	31	6	25	31	20	30	27
14b	16	16	51	57	21	16	56	16	21	55	30	30	52
15	12	21	43	48	17	21	47	12	26	47	20	30	45

Table 9.--Median true standard error for selected peak discharge and flood volume regression models--Continued

Data-set index	Present level of information				Alternative levels of information								
					No. 1			No. 2			No. 3		
	NB	NY	S_o	S_t	NB*	NY*	S_t*	NB*	NY*	S_t*	NB*	NY*	S_t*
1-DAY 50-YEAR FLOOD VOLUME ($V_{1,50}$)													
1	11	23	31	33	16	23	32	11	28	31	20	30	30
2	8	24	51	67	13	24	65	8	29	66	20	40	61
3	7	18	49	69	12	18	66	7	23	68	20	30	62
4	10	26	18	22	15	26	21	10	31	21	20	40	18
5a	8	30	21	27	13	30	26	8	40	26	20	40	24
5b	10	22	43	51	15	22	50	10	27	50	20	30	47
6	8	24	26	30	13	24	29	8	29	29	20	30	26
7	8	35	51	71	13	35	68	8	40	70	20	50	65
8,9	9	25	60	78	14	25	76	9	30	77	20	40	72
10	10	23	28	30	15	23	30	10	28	29	20	30	27
11	12	21	41	46	17	21	45	12	26	45	20	30	43
12	9	30	28	30	14	30	29	9	35	29	20	40	26
13a	10	36	21	24	15	36	23	10	41	23	20	50	21
13b	7	22	22	30	12	22	29	7	27	29	20	40	23
14a	6	21	16	29	11	21	28	6	26	28	20	30	24
14b	11	14	23	29	16	14	28	11	19	27	20	30	22
15	7	29	41	55	12	29	53	7	34	55	20	40	49

Table 10.--Apparent accuracy of discharges reported for stream-gaging stations and peak-flow stations in Illinois

Standard error: Standard error of percentage deviations of instantaneous low to medium discharges from a long-term stage-discharge relation. Percentages shown are values of uncertainty function for 5, 9, and 13 discharge measurements per year assuming percentage of lost record is zero. No values shown for peak-flow stations.

Accuracy of high flow: Qualitative evaluation by field personnel of accuracy of high flows reported for a gaging station; E - excellent, G - good, F - fair, and P - poor.

Station No.	Station name	Standard error, in percent, for given number of measurements			Accuracy of high flow
		5	9	13	
03336645	Middle Fork Vermilion River above Oakwood, Ill.	22	20	19	G
03336900	Salt Fork near St. Joseph, Ill.	9.8	7.4	6.2	G
03337000	Boneyard Creek at Urbana, Ill.	32	27	23	F
03338000	Salt Fork near Homer, Ill.	-	-	-	G
03339000	Vermilion River near Danville, Ill.	6.0	5.1	4.4	G
03343400	Embarras River near Camargo, Ill.	20	15	13	G
03344000	Embarras River near Diona, Ill.	-	-	-	G
03344500	Range Creek near Casey, Ill.	-	-	-	F
03345500	Embarras River at Ste. Marie, Ill.	7.6	6.2	5.3	G
03346000	North Fork Embarras River near Oblong, Ill.	23	17	14	G
03378000	Bonpas Creek at Browns, Ill.	29	26	24	G
03378635	Little Wabash River near Effingham, Ill.	32	26	22	F
03378900	Little Wabash River at Louisville, Ill.	-	-	-	G
03379500	Little Wabash River below Clay City, Ill.	10	8.5	7.3	G
03379600	Little Wabash River at Blood, Ill.	-	-	-	G
03380350	Skillet Fork near Iuka, Ill.	-	-	-	G
03380475	Horse Creek near Keenes, Ill.	37	30	25	G
03380500	Skillet Fork at Wayne City, Ill.	23	19	17	G
03381500	Little Wabash River at Carmi, Ill.	10	8.4	7.2	G
03382100	South Fork Saline River near Carrier Mills, Ill.	9.3	7.6	6.5	G

Table 10.--Apparent accuracy of discharges reported for stream-gaging stations and peak-flow stations in Illinois--Continued

Station No.	Station name	Standard error, in percent, for given number of measurements			Accuracy of high flow
		5	9	13	
03384450	Lusk Creek near Eddyville, Ill.	61	55	49	G
03385000	Hayes Creek at Glendale, Ill.	-	-	-	G
03612000	Cache River at Forman, Ill.	47	39	33	G
05414820	Sinsinawa River near Menominee, Ill.	8.9	7.0	5.9	G
05419000	Apple River near Hanover, Ill.	8.1	7.1	6.4	E
05435500	Pecatonica River at Freeport, Ill.	4.1	3.4	3.0	E
05437500	Rock River at Rockton, Ill.	2.4	2.0	1.7	E
05437695	Keith Creek at Eighth Street at Rockford, Ill.	18	14	12	F
05438250	Coon Creek at Riley, Ill.	-	-	-	E
05438500	Kishwaukee River at Belvidere, Ill.	5.0	3.9	3.3	E
05439000	South Branch Kishwaukee River at De Kalb, Ill.	8.6	6.8	5.8	E
05439500	South Branch Kishwaukee River near Fairdale, Ill.	6.2	4.8	4.0	G
05440000	Kishwaukee River near Perryville, Ill.	6.0	4.7	3.9	E
05443500	Rock River at Como, Ill.	2.3	1.9	1.6	E
05444000	Elkhorn Creek near Penrose, Ill.	7.1	5.3	4.5	G
05446000	Rock Creek at Morrison, Ill.	8.3	7.2	6.4	E
05446500	Rock River near Joslin, Ill.	1.2	1.2	1.1	E
05447500	Green River near Geneseo, Ill.	5.4	4.2	3.5	F
05448000	Mill Creek at Milan, Ill.	36	26	22	F
05466000	Edwards River near Orion, Ill.	14	11	9.0	G
05466500	Edwards River near New Boston, Ill.	12	8.9	7.4	G
05467000	Pope Creek near Keithsburg, Ill.	20	15	12	G
05468500	Cedar Creek at Little York, Ill.	-	-	-	G
05469000	Henderson Creek near Oquawka, Ill.	8.5	7.0	6.1	G
05495500	Bear Creek near Marcelline, Ill.	21	16	14	F
05502020	Hadley Creek near Barry, Ill.	-	-	-	F
05502040	Hadley Creek at Kinderhook, Ill.	67	48	39	F
05512500	Bay Creek at Pittsfield, Ill.	70	51	42	G
05513000	Bay Creek at Nebo, Ill.	38	28	23	G
05520500	Kankakee River at Momence, Ill.	3.5	3.1	2.8	G

Table 10.--Apparent accuracy of discharges reported for stream-gaging stations and peak-flow stations in Illinois--Continued

Station No.	Station name	Standard error, in percent, for given number of measurements 5	9	13	Accuracy of high flow
05525000	Iroquois River at Iroquois, Ill.	5.3	4.9	4.5	G
05525500	Sugar Creek at Milford, Ill.	32	24	20	G
05526000	Iroquois River near Chebanse, Ill.	4.7	3.9	3.4	G
05527500	Kankakee River near Wilmington, Ill.	5.7	4.7	4.0	F
05527800	Des Plaines River at Russell, Ill.	15	12	10	G
05528000	Des Plaines River near Gurnee, Ill.	11	8.5	7.2	G
05528500	Buffalo Creek near Wheeling, Ill.	32	25	21	E
05529000	Des Plaines River near Des Plaines, Ill.	14	12	10	E
05529500	McDonald Creek near Mount Prospect, Ill.	23	19	16	G
05530000	Weller Creek at Des Plaines, Ill.	58	57	57	G
05530990	Salt Creek at Rolling Meadows, Ill.	30	23	19	F
05531500	Salt Creek at Western Springs, Ill.	10	7.5	6.3	G
05532000	Addison Creek at Bellwood, Ill.	18	14	12	G
05532500	Des Plaines River at Riverside, Ill.	5.5	4.9	4.4	E
05533000	Flag Creek near Willow Springs, Ill.	22	16	14	E
05534500	North Branch Chicago River at Deerfield, Ill.	48	35	29	G
05535000	Skokie River at Lake Forest, Ill.	16	14	13	G
05535070	Skokie River near Highland Park, Ill.	27	20	17	E
05535500	West Fork of North Branch Chicago River at Northbrook, Ill.	16	12	10	G
05536000	North Branch Chicago River at Niles, Ill.	24	24	23	E
05536215	Thorn Creek at Glenwood, Ill.	10	7.8	6.5	F
05536235	Deer Creek near Chicago Heights, Ill.	39	32	28	G
05536255	Butterfield Creek at Flossmoor, Ill.	30	24	20	G
05536265	Lansing Ditch near Lansing, Ill.	13	11	9.2	F
05536275	Thorn Creek at Thornton, Ill.	16	13	12	G
05536290	Little Calumet River at South Holland, Ill.	11	11	11	G
05536340	Midlothian Creek at Oak Forest, Ill.	24	21	19	F
05536500	Tinley Creek near Palos Park, Ill.	35	27	22	F
05537500	Long Run near Lemont, Ill.	36	28	24	G
05539000	Hickory Creek at Joliet, Ill.	10	8.0	6.7	F

Table 10.--Apparent accuracy of discharges reported for stream-gaging stations and peak-flow stations in Illinois--Continued

Station No.	Station name	Standard error, in percent, for given number of measurements: 5	9	13	Accuracy of high flow
05539900	West Branch Du Page River near West Chicago, Ill.	21	16	13	G
05540095	West Branch Du Page River near Warrenville, Ill.	13	11	9.4	F
05540500	Du Page River at Shorewood, Ill.	3.1	2.5	2.1	G
05542000	Mazon River near Coal City, Ill.	20	15	12	G
05543500	Illinois River at Marseilles, Ill.	3.0	2.6	2.4	G
05548280	Nippersink Creek near Spring Grove, Ill.	4.1	3.2	2.7	G
05549000	Boone Creek near McHenry, Ill.	-	-	-	G
05550000	Fox River at Algonquin, Ill.	2.8	2.4	2.1	E
05550500	Poplar Creek at Elgin, Ill.	23	17	14	F
05551200	Ferson Creek near St. Charles, Ill.	16	12	10	G
05551700	Blackberry Creek near Yorkville, Ill.	11	8.0	6.7	G
05552500	Fox River at Dayton, Ill.	4.8	4.0	3.4	G
05554000	North Fork Vermilion River near Charlotte, Ill.	-	-	-	G
05554500	Vermilion River at Pontiac, Ill.	13	11	9.5	F
05555300	Vermilion River near Leonore, Ill.	9.3	7.4	6.3	G
05556500	Big Bureau Creek at Princeton, Ill.	36	27	22	G
05557000	West Bureau Creek at Wyanet, Ill.	-	-	-	G
05557500	East Bureau Creek near Bureau, Ill.	-	-	-	P
05558300	Illinois River at Henry, Ill.	16	14	12	G
05560500	Farm Creek at Farmdale, Ill.	95	71	58	G
05561500	Fondulac Creek near East Peoria, Ill.	19	15	13	F
05563000	Kickapoo Creek near Kickapoo, Ill.	-	-	-	F
05563500	Kickapoo Creek at Peoria, Ill.	-	-	-	F
05567000	Panther Creek near El Paso, Ill.	-	-	-	G
05567500	Mackinaw River near Congerville, Ill.	20	16	13	G
05568000	Mackinaw River near Green Valley, Ill.	-	-	-	G
05568500	Illinois River at Kingston Mines, Ill.	8.3	6.7	5.7	G
05568800	Indian Creek near Wyoming, Ill.	26	19	16	F
05569500	Spoon River at London Mills, Ill.	7.5	6.3	5.4	G
05570000	Spoon River at Seville, Ill.	7.0	5.9	5.1	G

Table 10.--Apparent accuracy of discharges reported for stream-gaging stations and peak-flow stations in Illinois--Continued

Station No.	Station name	Standard error, in percent, for given number of measurements 5	9	13	Accuracy of high flow
05570350	Big Creek at St. David, Ill.	39	29	24	G
05570360	Evelyn Branch near Bryant, Ill.	14	11	9.0	F
05570370	Big Creek near Bryant, Ill.	27	21	18	G
05570380	Slug Run near Bryant, Ill.	23	18	16	G
05570910	Sangamon River at Fisher, Ill.	36	33	31	G
05572000	Sangamon River at Monticello, Ill.	16	14	12	G
05573540	Sangamon River at Route 48 at Decatur, Ill.	52	41	35	F
05575500	South Fork Sangamon River at Kincaid, Ill.	-	-	-	F
05575800	Horse Creek at Pawnee, Ill.	31	23	19	G
05576000	South Fork Sangamon River near Rochester, Ill.	18	15	12	F
05576500	Sangamon River at Riverton, Ill.	-	-	-	G
05577500	Spring Creek at Springfield, Ill.	34	29	25	F
05578500	Salt Creek near Rowell, Ill.	22	17	15	G
05579500	Lake Fork near Cornland, Ill.	30	23	20	G
05580000	Kickapoo Creek at Waynesville, Ill.	12	8.8	7.4	F
05580500	Kickapoo Creek near Lincoln, Ill.	-	-	-	G
05580950	Sugar Creek near Bloomington, Ill.	21	16	13	F
05581500	Sugar Creek near Hartsburg, Ill.	-	-	-	F
05582000	Salt Creek near Greenview, Ill.	6.4	5.1	4.4	G
05583000	Sangamon River near Oakford, Ill.	2.6	2.1	1.9	G
05584400	Drowning Fork at Bushnell, Ill.	-	-	-	F
05584500	La Moine River at Colmar, Ill.	21	16	13	F
05585000	La Moine River at Ripley, Ill.	11	8.5	7.1	G
05585500	Illinois River at Meredosia, Ill.	6.0	5.0	4.3	G
05586000	North Fork Mauvaise Terre Creek near Jacksonville, Ill.	-	-	-	F
05586500	Hurricane Creek near Roodhouse, Ill.	-	-	-	F
05587000	Macoupin Creek near Kane, Ill.	21	16	13	G
05587900	Cahokia Creek at Edwardsville, Ill.	51	42	36	G
05588000	Indian Creek at Wanda, Ill.	58	46	39	G
05589500	Canteen Creek at Caseyville, Ill.	-	-	-	G

Table 10.--Apparent accuracy of discharges reported for stream-gaging stations and peak-flow stations in Illinois--Continued

Station No.	Station name	Standard error, in percent, for given number of measurements: 5	9	13	Accuracy of high flow
05590000	Kaskaskia Ditch at Bondville, Ill.	41	30	25	G
05590800	Lake Fork at Atwood, Ill.	30	24	20	G
05591200	Kaskaskia River at Cooks Mills, Ill.	13	10	9.0	G
05591550	Whitley Creek near Allenville, Ill.	33	25	20	G
05591700	West Okaw River near Lovington, Ill.	40	37	34	G
05592000	Kaskaskia River at Shelbyville, Ill.	22	17	14	G
05592050	Robinson Creek near Shelbyville, Ill.	24	19	16	G
05592100	Kaskaskia River near Cowden, Ill.	9.1	7.4	6.3	G
05592500	Kaskaskia River at Vandalia, Ill.	9.8	7.8	6.6	G
05592800	Hurricane Creek near Mulberry Grove, Ill.	20	15	13	G
05592900	East Fork Kaskaskia River near Sandoval, Ill.	14	11	9.1	G
05593000	Kaskaskia River at Carlyle, Ill.	6.5	5.5	4.8	G
05593520	Crooked Creek near Hoffman, Ill.	26	21	17	F
05593575	Little Crooked Creek near New Minden, Ill.	58	46	39	G
05593600	Blue Grass Creek near Raymond, Ill.	-	-	-	F
05593900	East Fork Shoal Creek near Coffeen, Ill.	89	69	58	G
05594000	Shoal Creek near Breese, Ill.	9.6	8.5	7.5	G
05594100	Kaskaskia River near Venedy Station, Ill.	5.0	4.3	3.8	G
05594450	Silver Creek near Troy, Ill.	34	25	21	G
05594800	Silver Creek near Freeburg, Ill.	23	18	15	G
05595200	Richland Creek near Hecker, Ill.	13	9.9	8.3	G
05595730	Rayse Creek near Waltonville, Ill.	27	24	21	F
05597000	Big Muddy River at Plumfield, Ill.	9.8	9.2	8.5	G
05597500	Crab Orchard Creek near Marion, Ill.	62	44	36	F
05599500	Big Muddy River at Murphysboro, Ill.	14	12	10	G
05600000	Big Creek near Wetaug, Ill.	-	-	-	G

Table 11.--Stream-gaging stations with high standard errors and peak-flow stations with fair or poor ratings

Station No.	Station name
	STREAM-GAGING STATIONS
03384450	Lusk Creek near Eddyville, Ill.
05502040	Hadley Creek near Kinderhook, Ill.
05512500	Bay Creek at Pittsfield, Ill.
05530000	Weller Creek at Des Plaines, Ill.
05560500	Farm Creek at Farmdale, Ill.
05573540	Sangamon River at Route 48 at Decatur, Ill.
05587900	Cahokia Creek at Edwardsville, Ill.
05588000	Indian Creek at Wanda, Ill.
05593575	Little Crooked Creek near New Minden, Ill.
05593900	East Fork Shoal Creek near Coffeen, Ill.
05597500	Crab Orchard Creek near Marion, Ill.
	PEAK-FLOW STATIONS
03344500	Range Creek near Casey, Ill.
05502020	Hadley Creek near Barry, Ill.
05557500	East Bureau Creek near Bureau, Ill.
05563000	Kickapoo Creek near Kickapoo, Ill.
05563500	Kickapoo Creek at Peoria, Ill.
05575500	South Fork Sangamon River at Kincaid, Ill.
05581500	Sugar Creek near Hartsburg, Ill.
05584400	Drowning Fork at Bushnell, Ill.
05586000	North Fork Mauvaise Terre Creek near Jacksonville, Ill.
05586500	Hurricane Creek near Roodhouse, Ill.
05593600	Blue Grass Creek near Raymond, Ill.

Table 12.--Point rating of relative worth for gaging stations in the 1983 Illinois gaging-station network

[Points are assigned to factors listed in table 2 according to guidelines listed in table 3 and described in text]

		Factor								
		1								Total
Station No.	Station name	A	B	C	D	E	2	3	4	point rating
03336645	Middle Fork Vermilion River above Oakwood, Ill.	2	2	4	6	2	5	12	10	43
03336900	Salt Fork near St. Joseph, Ill.	2	2	6	4	2	6	8	10	40
03337000	Boneyard Creek at Urbana, Ill.	1	1	3	4	0	2	8	10	29
03338000	Salt Fork near Homer, Ill.	2	2	6	4	2	0	5	0	21
03339000	Vermilion River near Danville, Ill.	2	3	6	6	2	6	12	10	47
03343400	Embarras River near Camargo, Ill.	2	1	4	2	0	1	6	0	16
03344000	Embarras River near Diona, Ill.	2	1	6	2	0	5	10	10	36
03344500	Range Creek near Casey, Ill.	2	1	4	4	0	1	8	0	20
03345500	Embarras River at Ste. Marie, Ill.	3	2	6	6	0	6	12	10	45
03346000	North Fork Embarras River near Oblong, Ill.	2	2	4	6	0	5	12	0	31
03378000	Bonpas Creek at Browns, Ill.	2	2	4	6	0	5	12	10	41
03378635	Little Wabash River near Effingham, Ill.	2	1	3	2	0	5	12	10	35
03378900	Little Wabash River at Louisville, Ill.	2	1	6	2	0	5	12	10	38
03379500	Little Wabash River below Clay City, Ill.	2	2	6	6	0	6	12	10	44
03379600	Little Wabash River at Blood, Ill.	2	2	6	2	0	5	12	10	39
03380350	Skillet Fork near Iuka, Ill.	2	1	6	2	0	5	12	10	38
03380475	Horse Creek near Keenes, Ill.	2	1	4	2	0	1	8	0	18
03380500	Skillet Fork at Wayne City, Ill.	2	2	4	6	0	6	12	10	42
03381500	Little Wabash River at Carmi, Ill.	3	3	6	6	0	10	8	10	46
03382100	South Fork Saline River near Carrier Mills, Ill.	2	1	6	2	0	5	12	10	38
03384450	Lusk Creek near Eddyville, Ill.	2	1	1	2	0	6	12	10	34
03385000	Hayes Creek at Glendale, Ill.	2	1	6	4	0	0	5	0	18
03612000	Cache River at Forman, Ill.	2	2	2	6	0	5	12	10	39
05414820	Sinsinawa River near Menominee, Ill.	1	1	6	2	0	1	8	0	19
05419000	Apple River near Hanover, Ill.	2	1	6	6	0	4	8	10	37
05435500	Pecatonica River at Freeport, Ill.	2	3	8	6	0	10	12	15	56
05437500	Rock River at Rockton, Ill.	3	4	8	6	2	8	8	10	49
05437695	Keith Creek at Eighth Street at Rockford, Ill.	1	1	6	6	0	0	8	0	22
05438250	Coon Creek at Riley, Ill.	2	1	8	2	0	10	8	15	46
05438500	Kishwaukee River at Belvidere, Ill.	2	2	8	6	2	6	8	15	49
05439000	South Branch Kishwaukee River at De Kalb, Ill.	2	1	6	4	2	0	8	0	23
05439500	South Branch Kishwaukee River near Fairdale, Ill.	2	2	8	6	2	6	12	15	53
05440000	Kishwaukee River near Perryville, Ill.	2	3	8	6	2	10	12	15	58
05443500	Rock River at Como, Ill.	2	5	8	6	2	10	10	15	58
05444000	Elkhorn Creek near Penrose, Ill.	2	1	6	6	0	5	8	10	38
05446000	Rock Creek at Morrison, Ill.	2	1	6	2	0	4	5	10	30
05446500	Rock River near Joslin, Ill.	2	5	8	6	2	10	15	15	63
05447500	Green River near Geneseo, Ill.	2	3	7	6	2	10	12	15	57
05448000	Mill Creek at Milan, Ill.	1	1	3	6	0	4	8	10	33
05466000	Edwards River near Orion, Ill.	2	1	6	6	2	4	8	0	29

Table 12.--Point rating of relative worth for gaging stations in the 1983 Illinois gaging-station network

Station No.	Station name	Factor 1 A	B	C	D	E	2	3	4	Total point rating
05466500	Edwards River near New Boston, Ill.	2	1	6	6	2	4	8	10	39
05467000	Pope Creek near Keithsburg, Ill.	2	1	4	6	2	4	5	10	34
05468500	Cedar Creek at Little York, Ill.	2	1	6	6	0	4	8	10	37
05469000	Henderson Creek near Oquawka, Ill.	2	1	6	6	2	10	8	15	50
05495500	Bear Creek near Marcelline, Ill.	2	2	3	4	2	10	8	15	46
05502020	Hadley Creek near Barry, Ill.	1	1	4	2	2	2	8	0	20
05502040	Hadley Creek at Kinderhook, Ill.	1	1	1	6	2	2	8	0	21
05512500	Bay Creek at Pittsfield, Ill.	1	1	1	6	2	4	8	0	23
05513000	Bay Creek at Nebo, Ill.	2	1	4	6	2	6	8	10	39
05520500	Kankakee River at Momence, Ill.	2	3	8	6	0	10	12	15	56
05525000	Iroquois River at Iroquois, Ill.	2	1	8	4	2	6	8	15	46
05525500	Sugar Creek at Milford, Ill.	2	2	4	4	0	5	8	10	35
05526000	Iroquois River near Chebanse, Ill.	2	3	8	6	2	10	12	15	58
05527500	Kankakee River near Wilmington, Ill.	2	4	7	6	2	10	15	10	56
05527800	Des Plaines River at Russell, Ill.	2	1	6	2	2	10	12	15	50
05528000	Des Plaines River near Gurnee, Ill.	2	1	6	4	2	10	12	15	52
05528500	Buffalo Creek near Wheeling, Ill.	1	1	4	4	2	10	12	10	44
05529000	Des Plaines River near Des Plaines, Ill.	2	2	6	6	2	10	12	15	55
05529500	McDonald Creek near Mount Prospect, Ill.	1	1	4	4	2	10	12	10	44
05530000	Weller Creek at Des Plaines, Ill.	1	1	1	4	0	10	12	15	44
05530990	Salt Creek at Rolling Meadows, Ill.	1	1	3	4	0	10	12	15	46
05531500	Salt Creek at Western Springs, Ill.	2	1	6	4	0	10	12	15	50
05532000	Addison Creek at Bellwood, Ill.	1	1	6	4	2	10	12	15	51
05532500	Des Plaines River at Riverside, Ill.	2	2	8	6	2	10	12	10	52
05533000	Flag Creek near Willow Springs, Ill.	1	1	4	4	2	10	12	10	44
05534500	North Branch Chicago River at Deerfield, Ill.	1	1	2	4	2	10	12	15	47
05535000	Skokie River at Lake Forest, Ill.	1	1	6	4	2	10	12	10	46
05535070	Skokie River near Highland Park, Ill.	1	1	4	2	2	5	12	8	35
05535500	West Fork of North Branch Chicago River at Northbrook, Ill.	1	1	6	4	2	10	12	10	46
05536000	North Branch Chicago River at Niles, Ill.	1	1	4	4	2	10	12	10	44
05536215	Thorn Creek at Glenwood, Ill.	1	1	5	4	2	10	12	15	50
05536235	Deer Creek near Chicago Heights, Ill.	1	1	2	4	2	10	12	15	47
05536255	Butterfield Creek at Flossmoor, Ill.	1	1	4	4	2	10	12	15	49
05536265	Lansing Ditch near Lansing, Ill.	1	1	5	4	2	10	12	10	45
05536275	Thorn Creek at Thornton, Ill.	1	1	6	4	2	10	12	15	51
05536290	Little Calumet River at South Holland, Ill.	2	1	6	4	2	10	12	15	52
05536340	Midlothian Creek at Oak Forest, Ill.	1	1	3	4	2	10	12	15	48
05536500	Tinley Creek near Palos Park, Ill.	1	1	3	4	2	10	12	10	43
05537500	Long Run near Lemont, Ill.	1	1	4	4	2	9	12	0	33
05539000	Hickory Creek at Joliet, Ill.	2	1	5	4	2	10	12	15	51
05539900	West Branch Du Page River near West Chicago, Ill.	1	1	4	2	2	10	12	15	47
05540095	West Branch Du Page River near Warrenville, Ill.	2	1	5	2	2	10	12	15	49
05540500	Du Page River at Shorewood, Ill.	2	2	8	6	2	10	12	15	57
05542000	Mazon River near Coal City, Ill.	2	2	6	6	0	6	8	15	45
05543500	Illinois River at Marseilles, Ill.	3	4	8	6	2	10	15	10	58

Table 12.--Point rating of relative worth for gaging stations in the 1983 Illinois gaging-station network--Continued

Station No.	Station name	Factor 1 A	B	C	D	E	2	3	4	Total point rating
05547000	Channel Lake near Antioch, Ill.	1	1	8	6	2	4	8	10	40
05547500	Fox Lake near Lake Villa, Ill.	1	1	8	6	2	4	8	10	40
05548000	Nippersink Lake at Fox Lake, Ill.	1	1	8	6	2	4	8	10	40
05548280	Nippersink Creek near Spring Grove, Ill.	2	1	8	2	2	10	12	15	52
05548500	Fox River at Johnsburg, Ill.	1	2	8	6	2	4	8	10	41
05549000	Boone Creek near McHenry, Ill.	2	1	6	4	2	0	8	0	23
05549500	Fox River near McHenry, Ill.	1	3	8	6	2	4	8	10	42
05550000	Fox River at Algonquin, Ill.	2	3	8	6	2	10	12	15	58
05550500	Poplar Creek at Elgin, Ill.	1	1	3	4	2	10	12	10	43
05551200	Ferson Creek near St. Charles, Ill.	1	1	6	2	2	9	12	0	33
05551700	Blackberry Creek near Yorkville, Ill.	2	1	6	2	2	6	12	15	46
05552500	Fox River at Dayton, Ill.	3	4	8	6	0	6	15	15	57
05554000	North Fork Vermilion River near Charlotte, Ill.	2	1	6	6	0	4	8	0	27
05554500	Vermilion River at Pontiac, Ill.	2	2	5	6	2	6	12	15	50
05555000	Vermilion River at Streator, Ill.	2	3	6	2	2	4	5	10	34
05555300	Vermilion River near Leonore, Ill.	2	3	6	6	2	10	12	15	56
05556500	Big Bureau Creek at Princeton, Ill.	2	1	4	6	2	6	8	15	44
05557000	West Bureau Creek at Wyanet, Ill.	2	1	6	6	2	10	8	15	50
05557500	East Bureau Creek near Bureau, Ill.	2	1	2	6	2	4	5	10	32
05558300	Illinois River at Henry, Ill.	3	5	6	6	2	6	8	10	46
05560500	Farm Creek at Farmdale, Ill.	1	1	1	4	0	4	0	10	21
05561500	Fondulac Creek near East Peoria, Ill.	1	1	3	4	0	4	0	10	23
05563000	Kickapoo Creek near Kickapoo, Ill.	2	1	4	4	0	4	5	10	30
05563500	Kickapoo Creek at Peoria, Ill.	2	1	4	6	0	4	5	10	32
05567000	Panther Creek near El Paso, Ill.	2	1	6	4	2	1	8	0	24
05567500	Mackinaw River near Congerville, Ill.	2	2	4	4	2	10	8	10	42
05568000	Mackinaw River near Green Valley, Ill.	2	3	6	4	2	4	5	10	36
05568500	Illinois River at Kingston Mines, Ill.	3	5	5	6	2	5	10	10	46
05568800	Indian Creek near Wyoming, Ill.	1	1	3	2	0	10	8	10	35
05569500	Spoon River at London Mills, Ill.	2	2	6	6	2	6	8	15	47
05570000	Spoon River at Seville, Ill.	2	3	6	6	2	10	12	15	56
05570350	Big Creek at St. David, Ill.	1	1	4	2	0	4	12	0	24
05570360	Evelyn Branch near Bryant, Ill.	1	1	5	2	0	4	12	0	25
05570370	Big Creek near Bryant, Ill.	1	1	4	2	0	4	12	0	24
05570380	Slug Run near Bryant, Ill.	1	1	4	4	0	4	12	0	26
05570910	Sangamon River at Fisher, Ill.	2	1	2	6	2	10	12	15	50
05572000	Sangamon River at Monticello, Ill.	2	2	6	6	2	10	12	10	50
05573540	Sangamon River at Route 48 at Decatur, Ill.	2	2	2	6	0	4	8	8	32
05575500	South Fork Sangamon River at Kincaid, Ill.	2	2	4	6	2	6	8	15	45
05575800	Horse Creek at Pawnee, Ill.	1	1	4	2	0	4	8	8	28
05576000	South Fork Sangamon River near Rochester, Ill.	2	3	5	4	2	4	5	10	35
05576500	Sangamon River at Riverton, Ill.	2	3	6	6	2	10	12	15	56
05577500	Spring Creek at Springfield, Ill.	2	1	4	4	0	6	12	15	44
05578000	Sangamon River at Petersburg, Ill.	2	3	6	4	2	4	5	10	36
05578500	Salt Creek near Rowell, Ill.	2	1	3	6	2	6	12	15	47

Table 12.--Point rating of relative worth for gaging stations in the 1983 Illinois gaging-station network--Continued

Station No.	Station name	Factor 1 A	B	C	D	E	2	3	4	Total point rating
05579500	Lake Fork near Cornland, Ill.	2	1	4	4	2	6	12	15	46
05580000	Kickapoo Creek at Waynesville, Ill.	2	1	5	4	2	5	8	10	37
05580500	Kickapoo Creek near Lincoln, Ill.	2	2	6	4	2	2	8	10	36
05580950	Sugar Creek near Bloomington, Ill.	2	1	3	4	0	4	8	8	30
05581500	Sugar Creek near Hartsburg, Ill.	2	2	4	4	2	4	8	10	36
05582000	Salt Creek near Greenview, Ill.	2	3	6	6	2	10	8	15	52
05583000	Sangamon River near Oakford, Ill.	3	4	8	6	2	10	15	15	63
05584400	Drowning Fork at Bushnell, Ill.	2	1	4	2	0	0	8	0	17
05584500	La Moine River at Colmar, Ill.	2	2	3	4	2	6	8	15	42
05585000	La Moine River at Ripley, Ill.	2	3	6	6	2	10	12	15	56
05585500	Illinois River at Meredosia, Ill.	3	5	8	6	2	4	8	10	46
05586000	North Fork Mauvaise Terre Creek near Jacksonville, Ill.	2	1	4	4	0	0	5	0	16
05586500	Hurricane Creek near Roodhouse, Ill.	2	1	4	4	0	4	8	10	33
05587000	Macoupin Creek near Kane, Ill.	2	3	4	6	0	6	12	15	48
05587900	Cahokia Creek at Edwardsville, Ill.	2	2	2	2	0	5	12	10	35
05588000	Indian Creek at Wanda, Ill.	1	1	2	6	0	0	8	0	18
05589500	Canteen Creek at Caseyville, Ill.	2	1	6	6	0	4	8	0	27
05590000	Kaskaskia Ditch at Bondville, Ill.	1	1	2	4	2	0	8	0	18
05590800	Lake Fork at Atwood, Ill.	2	1	4	2	2	1	8	0	20
05591200	Kaskaskia River at Cooks Mills, Ill.	2	1	6	2	2	6	12	15	46
05591550	Whitley Creek near Allenville, Ill.	1	1	4	6	2	4	5	10	33
05591700	West Okaw River near Lovington, Ill.	2	1	2	6	2	6	8	15	42
05592000	Kaskaskia River at Shelbyville, Ill.	2	2	4	4	2	6	8	15	43
05592050	Robinson Creek near Shelbyville, Ill.	2	1	4	6	2	2	5	10	32
05592100	Kaskaskia River near Cowden, Ill.	2	3	6	2	2	6	8	15	44
05592500	Kaskaskia River at Vandalia, Ill.	2	3	6	6	2	6	12	15	52
05592600	Hickory Creek near Bluff City, Ill.	2	1	6	6	0	6	8	15	44
05592800	Hurricane Creek near Mulberry Grove, Ill.	2	1	4	2	0	6	8	15	38
05592900	East Fork Kaskaskia River near Sandoval, Ill.	2	1	6	6	2	6	12	15	50
05593000	Kaskaskia River at Carlyle, Ill.	2	3	6	6	2	6	8	15	48
05593520	Crooked Creek near Hoffman, Ill.	2	1	3	4	0	5	12	10	37
05593575	Little Crooked Creek near New Minden, Ill.	2	1	2	2	0	1	8	0	16
05593600	Blue Grass Creek near Raymond, Ill.	2	1	4	2	0	0	8	0	17
05593900	East Fork Shoal Creek near Coffeen, Ill.	1	1	1	2	0	1	8	0	14
05594000	Shoal Creek near Breese, Ill.	2	3	6	6	0	6	12	15	50
05594100	Kaskaskia River near Venedy Station, Ill.	2	4	8	2	2	10	15	15	58
05594450	Silver Creek near Troy, Ill.	2	1	4	2	0	6	12	15	42
05594800	Silver Creek near Freeburg, Ill.	2	2	4	2	0	5	12	10	37
05595200	Richland Creek near Hecker, Ill.	2	1	6	2	0	5	12	10	38
05595700	Big Muddy River near Mt. Vernon, Ill.	2	1	6	6	0	5	12	10	42
05595730	Rayse Creek near Waltonville, Ill.	2	1	3	6	0	5	12	10	39
05595830	Casey Fork at Route 37 near Mt. Vernon, Ill.	2	1	6	6	0	5	12	10	42
05597000	Big Muddy River at Plumfield, Ill.	2	2	6	6	2	5	12	10	45
05597500	Crab Orchard Creek near Marion, Ill.	1	1	1	4	0	6	12	15	40
05599500	Big Muddy River at Murphysboro, Ill.	3	3	6	6	2	10	12	10	52
05600000	Big Creek near Wetaug, Ill.	2	1	6	6	0	4	8	10	37

Table 13.--Gaging stations in the 1983 Illinois gaging-station network with a low relative-worth rating

Station No.	Station name
	STREAM-GAGING STATIONS
03380475	Horse Creek near Keenes, Ill.
03343400	Embarras River near Camargo, Ill.
05414820	Sinsinawa River near Menominee, Ill.
05437695	Keith Creek at Eighth Street at Rockford, Ill.
05439000	South Branch Kishwaukee River at De Kalb, Ill.
05502040	Hadley Creek at Kinderhook, Ill.
05512500	Bay Creek at Pittsfield, Ill.
05560500	Farm Creek at Farmdale, Ill.
05561500	Fondulac Creek near East Peoria, Ill.
05570350	Big Creek at St. David, Ill.
05570360	Evelyn Branch near Bryant, Ill.
05570370	Big Creek near Bryant, Ill.
05588000	Indian Creek at Wanda, Ill.
05590000	Kaskaskia Ditch at Bondville, Ill.
05590800	Lake Fork at Atwood, Ill.
05593575	Little Crooked Creek near New Minden, Ill.
05593900	East Fork Shoal Creek near Coffeen, Ill.
	PEAK-FLOW STATIONS
03338000	Salt Fork near Homer, Ill.
03344500	Range Creek near Casey, Ill.
03385000	Hayes Creek at Glendale, Ill.
05502020	Hadley Creek near Barry, Ill.
05549000	Boone Creek near McHenry, Ill.
05567000	Panther Creek near El Paso, Ill.
05584400	Drowning Fork at Bushnell, Ill.
05586000	North Fork Mauvaise Terre Creek near Jacksonville, Ill.
05593600	Blue Grass Creek near Raymond, Ill.

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