BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
AMENDMENTS TO THE GENERAL USE	)	R18-32
WATER QUALITY STANDARDS	)	Rulemaking – Water
FOR CHLORIDE	)	

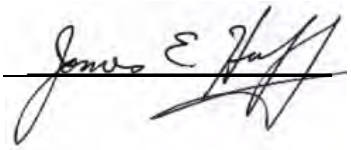
NOTICE OF FILING

To: Don Brown, Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph Street, Suite 11-500
Chicago, IL 60601

PLEASE TAKE NOTICE that I have today electronically filed with the Illinois Pollution Control Board, **HUFF & HUFF'S DOCUMENT PRODUCTION REQUESTED IN THE PRE-FILED QUESTIONS**, a copy of which is attached hereto and herewith served upon you.

Dated: January 22, 2019

Respectfully Submitted:

By: 

James E. Huff, P.E.
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915 Harger Road, Suite 330
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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
AMENDMENTS TO THE GENERAL USE	)	R18-32
WATER QUALITY STANDARDS	)	Rulemaking – Water
FOR CHLORIDE	)	

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

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AMENDMENTS TO THE GENERAL USE	)	R18-32
WATER QUALITY STANDARDS	)	Rulemaking – Water
FOR CHLORIDE	)	

The following documents are attached hereto:

1. List of Chloride Impaired waters in Illinois from the 303(d) list.
2. ISWS Report Bulletin 56, *Quality of Surface Water in Illinois, 1966-1971*
3. USGS Map of Hardness
4. List of organizations contacted seeking support for cold temperature research
5. Corsi, et al, *River chloride trends in snow-affected urban watersheds: increasing concentrations outpace urban growth rate and are common among all seasons* article
6. Tollway's offset program
7. Normalized Tables 1, 2, and 3

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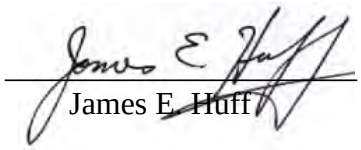
CERTIFICATE OF SERVICE

I, the undersigned, certify that on January 22, 2019, I served electronically the attached HUFF & HUFF'S DOCUMENT PRODUCTION REQUESTED IN THE PRE-FILED QUESTIONS to the participants listed on the attached SERVICE LIST.



James E. Huff

Attachment 1

Chloride Impaired Streams from 303(d) List

Order	Priority	Hydrologic Unit Code	Water Name	Assessment ID	Water Size	Designated Use	Cause
1299	Medium	714010604	Akin Creek	IL_NHG-02	3.24	Aquatic Life	Chloride
1363	Medium	714010603	Casey Fork	IL_NJ-07	17.88	Aquatic Life	Chloride
802	Medium	712000403	Des Plaines River	IL_G-07	10.78	Aquatic Life	Chloride
150	Medium	712000405	Des Plaines River	IL_G-15	3.52	Aquatic Life	Chloride
158	Medium	712000405	Des Plaines River	IL_G-22	4.31	Aquatic Life	Chloride
168	Medium	712000405	Des Plaines River	IL_G-28	9.02	Aquatic Life	Chloride
174	Medium	712000405	Des Plaines River	IL_G-30	5.19	Aquatic Life	Chloride
181	Medium	712000405	Des Plaines River	IL_G-32	6.18	Aquatic Life	Chloride
323	Medium	712000407	Des Plaines River	IL_G-03	8.41	Aquatic Life	Chloride
331	Medium	712000407	Des Plaines River	IL_G-11	9.05	Aquatic Life	Chloride
343	Medium	712000407	Des Plaines River	IL_G-39	11.25	Aquatic Life	Chloride
2781	Low	713001003	Drowning Fork	IL_DGLC-01	18.83	Aquatic Life	Chloride
2665	Low	712000408	Du Page River	IL_GB-11	10.07	Aquatic Life	Chloride
556	Medium	712000611	Fiddle Creek	IL_DTRA-W-C1	2.04	Aquatic Life	Chloride
547	Medium	712000611	Fox River	IL_DT-22	7.86	Aquatic Life	Chloride
931	Medium	712000406	Hickory Creek	IL_GG-04	8.11	Aquatic Life	Chloride
935	Medium	712000406	Hickory Creek	IL_GG-06	12.63	Aquatic Life	Chloride
938	Medium	712000406	Hickory Creek	IL_GG-22	2.25	Aquatic Life	Chloride
1000	Medium	709000602	Huntley Ditch	IL_PQIB-H-C1	0.6	Aquatic Life	Chloride
679	Medium	712000701	Indian Creek	IL_DTZK	7.86	Aquatic Life	Chloride
2121	Medium	712000410	Lacey Creek	IL_GBLC	3.69	Aquatic Life	Chloride
2768	Low	714020101	Lake Fork	IL_OW-01	9.72	Aquatic Life	Chloride
2770	Low	714020101	Lake Fork	IL_OW-02	4.91	Aquatic Life	Chloride
748	Medium	712000304	Little Calumet River South	IL_HB-01	8.68	Aquatic Life	Chloride
2740	Low	713000103	Little Vermilion River	IL_DR-01	3.79	Aquatic Life	Chloride
1089	Medium	712000409	Manhattan Creek	IL_GCA-M-A1	2.53	Aquatic Life	Chloride
1290	Medium	714010604	Middle Fork Big Muddy River	IL_NH-06	12.49	Aquatic Life	Chloride
1293	Medium	714010604	Middle Fork Big Muddy River	IL_NH-07	19.74	Aquatic Life	Chloride
2653	Low	712000301	Middle Fork North Branch Chicago River	IL_HCCC-02	18.57	Aquatic Life	Chloride
2656	Low	712000301	Middle Fork North Branch Chicago River	IL_HCCC-04	3.51	Aquatic Life	Chloride
2647	Low	712000301	North Branch Chicago River	IL_HCC-07	11.9	Aquatic Life	Chloride
1320	Medium	514020404	North Fork Saline River	IL_ATF-05	7.95	Aquatic Life	Chloride
1323	Medium	514020404	North Fork Saline River	IL_ATF-07	5.62	Aquatic Life	Chloride
2717	Low	714010605	Pond Creek	IL_NG-02	23.53	Aquatic Life	Chloride
1117	Medium	712000612	Poplar Creek	IL_DTG-02	15.01	Aquatic Life	Chloride
1175	Medium	512011114	Robinson Creek	IL_BFC-11	0.92	Aquatic Life	Chloride
1783	Medium	512010903	Salt Fork Vermilion River	IL_BPJ-07	3.12	Aquatic Life	Chloride
1589	Medium	713000608	Sangamon River	IL_E-05	13.58	Aquatic Life	Chloride
112	Medium	712000301	Skokie River	IL_HCCD-01	13.47	Aquatic Life	Chloride
117	Medium	712000301	Skokie River	IL_HCCD-09	1.76	Aquatic Life	Chloride
1007	Medium	709000602	South Branch Kishwaukee River-East	IL_PQI-H-C5	4.29	Aquatic Life	Chloride
278	Medium	712000408	Spring Brook	IL_GBKA	1.74	Aquatic Life	Chloride
1168	Medium	512011114	Sugar Creek	IL_BF-01	4.84	Aquatic Life	Chloride
2630	Low	712000302	Thorn Creek	IL_HBD-04	4.32	Aquatic Life	Chloride
859	Medium	712000302	Thorn Creek	IL_HBD-06	2.21	Aquatic Life	Chloride
951	Medium	712000406	Union Ditch	IL_GGC-FN-C1	1.23	Aquatic Life	Chloride
2650	Low	712000301	West Fork North Branch Chicago River	IL_HCCB-05	14.48	Aquatic Life	Chloride

Attachment 2

ISWS Report Bulletin 56, Quality of Surface Water in Illinois

ISWS-73-BUL56

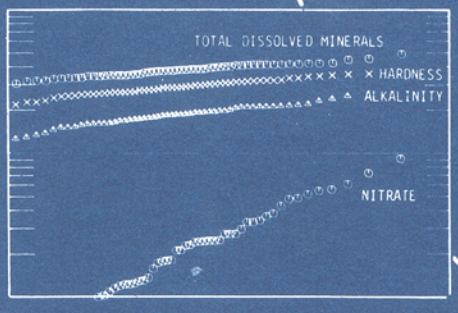
BULLETIN 56

STATE OF ILLINOIS

DEPARTMENT OF REGISTRATION AND EDUCATION

Quality of Surface Water in Illinois, 1966-1971

by ROBERT H. HARMESON, T. E. LARSON, LAUREL M. HENLEY, R. A. SINCLAIR, and J. C. NEILL



ILLINOIS STATE WATER SURVEY

URBANA

1973

BULLETIN 56

Quality of Surface Water in Illinois, 1966-1971

by ROBERT H. HARMESON, T. E. LARSON, LAUREL M. HENLEY,
R. A. SINCLAIR, and J. C. NEILL

Title: Quality of Surface Water in Illinois, 1966-1971.

Abstract: Surface water quality in Illinois has been determined by means of analysis of data from monthly water sampling programs. Sampling programs spanning periods of approximately 5 years have been carried out since 1945. Data for the period 1966-l971 are for 25 streams at 30 sampling locations. Data analyzed to show frequencies of median and extreme values of certain mineral constituents for specific streams and sampling periods provide baseline values for future water quality and water resource studies. Comparisons are drawn between water quality for the same stations in two or more sampling periods and with applicable Illinois Pollution Control Board regulations.

Reference: Harmeson, Robert H., T. E. Larson, Laurel M. Henley, R. A. Sinclair, and J. C. Neill. Quality of Surface Water in Illinois, 1966-1971. Illinois State Water Survey, Urbana, Bulletin 56, 1973.

Indexing Terms: alkalinity, ammonium, boron, cadmium, calcium, chloride, chromium, copper, fluoride, hardness, Illinois streams, iron, lead, lithium, magnesium, manganese, mineral quality, nickel, nitrate, phosphate, potassium, silica, sodium, strontium, sulfate, temperature, total dissolved minerals, turbidity, water quality, zinc.

STATE WATER SURVEY DIVISION
WILLIAM C. ACKERMANN, D.Sc., Chief

URBANA
1973

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CONTENTS

Quality of Surface Water in Illinois, 1966-1971

by Robert H. Harmeson, T. E. Larson, Laurel M. Henley, R. A. Sinclair, and J. C. Neill

ABSTRACT

This publication summarizes data on surface water quality in 25 streams at 30 sampling locations during the 5-year sampling period from 1966 through 1971. Selected data from Water Survey Bulletins 45 and 54 are included in order to make comparisons of water quality during different time periods.

Results of statistical analyses, with graphic summaries, for temperature, turbidity, total dissolved minerals, hardness, alkalinity, nitrate, and manganese are given. Available data on phosphates are included in the statistical analyses. Summaries of these data for each sampling location, arranged alphabetically by stream name, are accompanied by the tabulations of mineral quality for the streams sampled, with available physical data.

The analyses of water quality by statistical means present a representative picture of stream conditions during a particular sampling period. These data can serve as a base for comparison and evaluation of existing quality with man-made standards that are often established arbitrarily or may be based on more or less ideal conditions.

INTRODUCTION

The 1970 census data show a total population for Illinois of 11,113,976 persons. The distribution between urban and rural was 9,229,821 and 1,884,155, respectively. Data from the Illinois Environmental Protection Agency indicate that municipally supplied water from both surface water and groundwater sources was available to over 9,700,000 people. Approximately twice as many people were served from surface sources as from groundwater sources. Average daily water supply pumpage values were about 1.53 and 0.39 billion gallons for municipally supplied surface water and groundwater, respectively. About 49 percent of the state's total population is served by surface water supplies in Cook, Lake, Madison, and St. Clair Counties (43.6 percent in Cook County alone). The average daily pumpage of surface water in these four counties was about 70 percent of the total municipal pumpage and 88.5 percent of the state's surface water pumpage (82 percent of surface water pumpage was used in Cook County). The principal source of surface water for Cook and Lake Counties is Lake Michigan. Madison and St. Clair Counties use the Mississippi River as their single largest source. The population served by municipal groundwater supplies in these four counties represents 7 percent of the state's total population.

The residents of the other 98 counties in Illinois who are served by municipal surface water sources make up 10 percent of the 1970 total state population and were using about 11.5 percent of the total municipally supplied surface water pumpage. In these 98 counties another 21.6 percent of the 1970 population is supplied from municipal groundwater sources.

Because of the quantities of surface water used in Illinois and because of the many ways in which surface water serves the needs of the state's growing population, data on surface water mineral quality are important. Quality data are useful for determining the methods and amount of treatment required to prepare water for specific uses.

The text of this bulletin presents a discussion of the surface water quality data and analyses and an evaluation of the significance of changes in trends of some of the mineral constituents analyzed. The text portion is followed by data summaries for each sampling location, arranged in alphabetical order by stream name.

Acknowledgments

This report was prepared under the general administrative direction of Dr. William C. Ackermann, Chief of the Illinois State Water Survey.

With the exception of samples collected at three stations, all analyses were made by members of the Water Survey's Chemistry Section under the supervision of Laurel M. Henley. Personnel of the Central Illinois Public Service Company collected and analyzed samples at the Meredosia, Hutsonville, and Chester power stations.

We are grateful to the staff of the U.S. Geological Survey for collecting the monthly samples which were submitted to the Water Survey for analysis, and for providing the provisional discharge data computed from gage height readings obtained with sample collections.

Special acknowledgment is made to John W. Brother,

Jr., and William Motherway, Jr., for their skills in preparation of graphic presentation of the data involved, and to Mrs. J. L. Ivens and Mrs. P. A. Motherway for their editorial preparation of the manuscript.

Personnel of the East St. Louis and Interurban Water Company and the Cairo Water Company have continued to assist in this program by providing monthly samples of their respective water supply sources.

Table 1. Station Locations and Sampling Periods

SAMPLING STATION	MAP NUMBER (Fig. 1)	STATION NUMBER (USGS)	SAMPLING PERIOD
Apple River-Hanover	14	50419000	1957-61
Bay Creek-Nebo	77	50513000	1961-66
Bear Creek-Marcelline	74	50495500	1966-71
			1971-76
Beaucoup Creek-Matthews	93	50599000	1961-66
Big Creek-Wetaug	95	50600000	1961-66
Big Muddy River-Murphysboro	107	50599500	1956-61
			1971-76
Big Muddy River-Plumfield	92	50597000	1945-50
Blackberry Creek-Yorkville	208	50551700	1961-66
Blue Grass Creek-Raymond	205	50593600	1961-66
Bon Pas Creek-Browns	87	31378000	1961-66
Cache River-Forman	96	31387500	1956-61
Coon Creek-Riley	20	50438200	1961-66
			1971-76
Crab Orchard Lake-Station 5	108	50478000	1951-56
			1956-61
			1961-64
Crab Orchard Lake-Wolf Creek Bridge	109	50597700	1951-56
			1956-61
			1961-64
Crane Creek-Easton	70	50582500	1961-66
Des Plaines River-Des Plaines	3	50529000	1966-71
			1971-76
Drowning Fork-Bushnell	206	50584400	1961-66
Du Page River-Troy (Shorewood)	6	50540500	1945-50
			1971-76
Edwards River-New Boston	44	50466500	1966-71
			1971-76
Edwards River-Orion	43	50466000	1966-71
Elkhorn Creek-Penrose	22	50444000	1961-66
			1966-71
Embarras River-Camargo	209	30343400	1961-66
			1966-71
			1971-76
Embarras River-Ste. Marie	84	31345500	1956-61
Flat Branch-Taylorville	61	50574500	1961-66
Fox River-Algonquin	2	50550000	1956-61
			1966-71
			1971-76
Fox River-Batavia	4	50551250	1968-71
			1971-76
Fox River-Dayton	30	50552500	1956-61
Green River-Geneseo	26	50447500	1945-50
Hadley Creek-Barry	75	50510000	1956-61
Hayes Creek-Glendale	97	31385000	1961-66
Henderson Creek-Oquawka	47	50469000	1966-71
Illinois River-Meredosia	104	50585500	1955-60
			1960-66
			1966-71
			1971-76
Illinois River-Peoria	102	50560000	1945-50
			1957-61
			1961-66
			1966-71
			1971-76
Indian Creek-Wanda	79	50588000	1945-50
Iroquois River-Iroquois	36	50525000	1950-56
Kankakee River-Momence	34	50520500	1966-71
			1971-76
Kankakee River-Wilmington	32	50527500	1957-61
Kaskaskia River-Cooks Mills	101	50591200	1971-76
Kaskaskia River-New Athens	81	50595000	1945-49
			1957-61
			1961-66
Kaskaskia River-Shelbyville	105	50592000	1956-61
			1961-66
			1966-71
			1971-76
Kaskaskia River-Vandalia	106	50592500	1950-56
			1966-71
Kaskaskia River-Venedy Station	99	50594100	1971-76
Kishwaukee River-Perryville	18	50440000	1966-71
La Moine River-Colmar	73	50584500	1957-61
La Moine River-Ripley	72	50585000	1945-50
Little Wabash River-Carmi	89	31381500	1957-61
			1971-76
Little Wabash River-Effingham	119	30378635	1966-71
			1971-76
Little Wabash River-Wilcox (Clay City)	86	31379500	1950-55
			1971-76
Mackinaw River-Congerville	53	50567500	1966-71
			1971-76
Mackinaw River-Green Valley	103	50568000	1950-56
Macoupin Creek-Kane	78	50587000	1945-50
Marys River-Sparta	94	50595500	1966-71
Mississippi River-Chester	112	70020600	1955-60
			1960-65
			1966-71
			1971-76
Mississippi River-East St. Louis	111	70010000	1958-61
			1961-66
			1966-71
			1971-76
Mississippi River-Keokuk	110	50474500	1950-55
Mississippi River-Thebes	113	70022000	1950-56
North Fork Embarras River-Oblong	85	31346000	1961-66
North Fork Mauvaise Terre Creek-Jacksonville	118	50586000	1966-71
Ohio River-Cairo	114	30612500	1958-61
			1961-66
			1966-71
			1971-76
Ohio River-Metropolis	115	31387000	1950-56
Otter Creek-Palmyra	203	50586800	1961-66
Pecatonica River-Freeport	16	50435500	1966-71
Rock River-Como	23	50443500	1956-61
			1961-66
Saline River-Junction	90	31382500	1945-50
Salt Creek-Greenview	69	50582000	1971-76
Salt Creek-Rowell	65	50578500	1950-56
			1971-76
Sangamon River-Mahomet	59	50571000	1966-71
			1971-76
Sangamon River-Monticello	60	50572000	1956-61
Sangamon River-Oakford	71	50583000	1956-61
			1971-76
Seven Mile Creek-Mt. Vernon	207	50595800	1961-66
			1966-71
Shoal Creek-Breese	82	50594000	1966-71
			1971-76
Skillet Fork-Wayne City	88	31380500	1957-61
			1971-76
South Fork Saline River-Carrier Mills	98	30382100	1971-76
South Fork Sangamon River-Rochester	67	50576000	1966-71
			1971-76
Spoon River-London Mills	49	50569500	1945-50
			1957-61
Vermilion River-Catlin	56	31338500	1950-56
Vermilion River-Danville	58	31339000	1971-76
Vermilion River-Lowell	39	50555500	1957-61
			1966-71
Vermilion River-Pontiac	38	50554500	1957-61
Wabash River-Hutsonville	117	30342000	1955-61
			1962-66
			1966-71
			1971-76
Wabash River-Mt. Carmel	116	31377500	1950-56
Wolf Creek-Beecher City	201	50592300	1961-66
			1966-71

DATA AND ANALYSES

Since the qualities of surface waters are constantly changing, it is almost impossible to establish their 'natural' characteristics. An alternative is to establish the characteristics at some base period and compare subsequent changes with time, from which it is possible to estimate or determine the causes for observed changes.

Sampling

The Illinois State Water Survey, in cooperation with the Champaign District Office of the U.S. Geological Survey and others, has maintained a continuous program of sampling and analysis of surface water sources since 1945. The program has been so arranged that consecutive monthly samples are collected from several locations throughout the state and analyzed for 5-year periods. Sampling periods for all stations do not coincide exactly, and some shifting of dates will be noted throughout this report.

Characteristics of surface water mineral quality at 23 and 44 sampling locations have been reported in Water Survey Bulletins 45 and 54, respectively. This bulletin contains data from 30 sampling locations on 25 streams, and includes comparative data for 14 stations previously reported. Locations of all sampling stations included in the program between 1945 and 1971 are shown in figure 1, identified by map numbers listed in table 1. The table also provides exact sampling dates for each station and the streamgage number used by the U.S. Geological Survey at that location.

Analyses

In Bulletin 54, data summaries and tabulations were given for 16 mineral constituents and 3 physical characteristics. Subsequently, determinations of additional mineral constituents have been added to the routine analyses so that this publication lists tabulations of 26 mineral constituents and 3 physical characteristics (discharge, temperature, turbidity).

Table 2 shows the chemical determinations made for the samples and lists the analytical procedures used. These chemical determinations are routine for surface water samples with the exception of nitrite, which is determined only occasionally and at a very few sampling locations. All of the individual chemical determinations were tabulated, and these tabulations are included along with analyzed data in the data summaries for each sampling station.

Data analyses have been presented in generally the same manner as in Bulletins 45 and 54. For this bulletin relative cumulative frequency polygons are shown for discharge, turbidity, temperature, alkalinity, total hardness, total dissolved minerals, nitrates, and manganese. Values not exceeded for 10, 50, and 90 percent of the time are given in tabular form for alkalinity, hardness, total dissolved minerals, and nitrates, and for phosphates and manganese where these data are available. These tables also show mean values for some parameters.

Where both mean and median values are given and it can be determined that frequency curves are unimodal, the relative values of means and medians give indications of skewness of the data. Mean values exceeding median values indicate the curves are skewed to the right, and mean values less than medians are indicative of curves skewed to the left. Many of the data for mineral parameters of surface water generate unimodal frequency curves, but this is not always true of nitrates, particularly for those streams in which concentrations exceeding 45 mg/l NO_3 are commonly found. It does seem generally true, however, that where mean nitrate concentrations do not exceed about 15 to 20 mg/l there will be few, if any, concentrations in excess of 45 mg/l.

Mineral characteristics chosen for graphic summary were those thought to be most useful to a wide cross section of readers including resource planners, design engineers, and water quality control chemists and engineers. The characteristics are representative of the existing water quality. As such they can well serve as the basis for design of water treatment, can be compared with existing standards for water quality, can serve as a basis for establishing realistic standards, and can be useful in water quality control methods and procedures.

Table 2. Analytical Procedures

Determination	Symbol	Analytical procedure
Iron (total on unfiltered sample)	Fe	Ortho-phenanthroline (colorimetric)
Manganese (total on unfiltered sample)	Mn	Periodate (colorimetric)
Calcium	Ca	EDTA titration (volumetric)
Magnesium	Mg	Calculated
Strontium	Sr	Atomic absorption
Sodium	Na	Atomic absorption
Potassium	K	Atomic absorption
Ammonium	NH_4	Distillation and nesslerization (colorimetric)
Phosphate (soluble inorganic on filtered sample)	PO_4	Bismuth catalyzed PO_4 method (colorimetric)
Phosphate (total inorganic on unfiltered sample)	PO_4	Bismuth catalyzed PO_4 method (colorimetric)
Silica	SiO_2	Molybdate (colorimetric)
Fluoride	F	Specific ion electrode
Boron	B	Curcumin (colorimetric)
Nitrate	NO_3	Chromotropic acid method
Nitrite	NO_2	Diazotization method
Chloride	Cl	Mohr (volumetric)
Sulfate	SO_4	Barium sulfate (gravimetric)
Alkalinity	(as $CaCO_3$)	Methyl orange titration (volumetric)
Hardness	(as $CaCO_3$)	EDTA titration (volumetric)
Total dissolved minerals	TDM	Residue on evaporation
Cadmium	Cd	Atomic absorption
Chromium	Cr	Atomic absorption
Copper	Cu	Atomic absorption
Lead	Pb	Atomic absorption
Lithium	Li	Atomic absorption
Nickel	Ni	Atomic absorption
Zinc	Zn	Atomic absorption

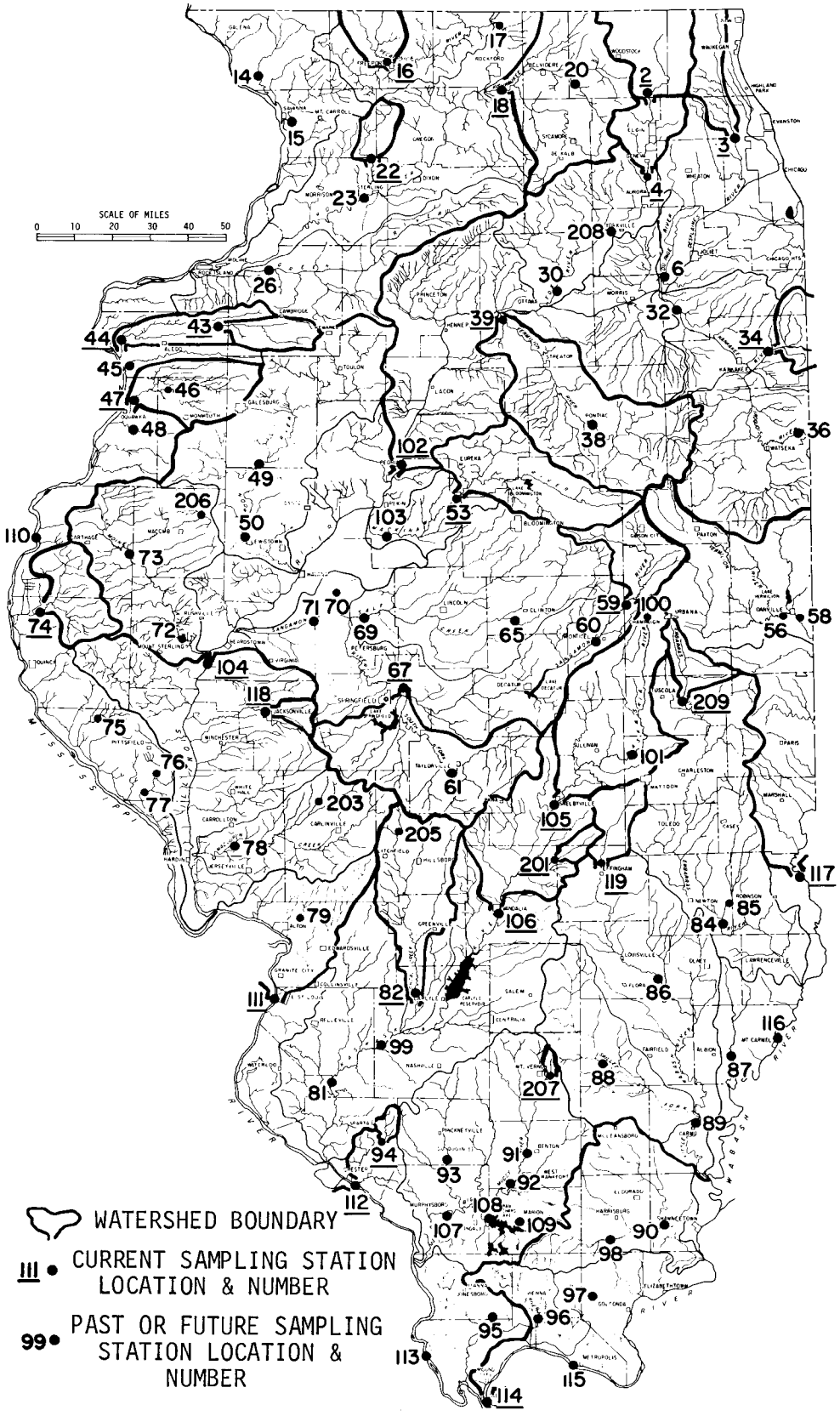


Figure 1. Sampling station locations and watersheds

PHYSICAL AND MINERAL CHARACTERISTICS

The mineral quality of water is usually defined in terms of the degree to which various mineral, or chemical, constituents are dissolved in water. The presence of some minerals can have more importance than that of others, particularly in relation to the intended use of the water, to the methods and costs of treatment required to prepare it for use, and possibly to measures for water quality control. The significance of changes in trends of certain physical and mineral characteristics is discussed and evaluated in this section.

Water Quality Standards

Water quality standards for the state of Illinois have undergone change since the passage of the Environmental Protection Act in 1970. The Illinois Pollution Control Board, one of three state agencies created by the Act, has issued rules and regulations that replace or supersede those of the Illinois Sanitary Water Board quoted in Bulletin 54.

Table 3 gives the maximum chemical values and table 4 gives the maximum river water temperatures as set forth in the Illinois Pollution Control Board regulations under Section 203, General Standards. Additional parts of Section 203 that are pertinent to analyses made by the Survey are reproduced as follows:

> c) Phosphorus as P shall not exceed 0.05 mg/l in any reservoir or lake, or in any stream at the point where it enters any reservoir or lake. [In addition, the Federal Environmental Protection Agency has requested the state to add: "Phosphorus as P shall not exceed 0.1 mg/l in any stream. . . ."]
>
> i) Temperature:
>
> 1) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.
> 2) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.
> 3) The maximum temperature rise above natural temperatures shall not exceed 5°F.
> 4) In addition, the water temperature at representative locations in the main river shall not exceed the maximum limits . . . during more than one percent of the hours in the 12-month period ending with any month. Moreover, at no time shall the water temperature at such locations exceed the maximum limits . . . by more than 3°F.

Except for the Ohio River at Cairo and the Mississippi River at East St. Louis, Cairo, and St. Louis, none of the stations sampled from 1966 to 1971 were located at water supply intake points; hence the General Standards (Section 203) are particularly relevant to most of the data contained in this publication.

With the exception of the Illinois River at Meredosia, the Mississippi River at Chester, and the Wabash River at Hutsonville, where only soluble iron is determined, the data presented here indicate that iron concentrations (unfiltered samples) exceeding 1.0 mg/l were found in surface water samples from 21.7 to 86 percent of the time.

The general standards for copper and for manganese were also exceeded, but less frequently than the iron standard. Concentrations of copper exceeding 0.02 mg/l were found from 1.8 to 32.8 percent of the sampling period, and manganese (unfiltered samples) in excess of 1.0 mg/l from 1.7 to 41.3 percent of the time.

Table 3. Maximum Levels of Chemical Constituents for Illinois Waters *

Constituents	General standards (*mg/l*)	Public and food processing water supply standards (*mg/l*)
Ammonia nitrogen (as N)	1.5	
Arsenic (total)	1.0	0.01
Barium (total)	5.0	1.0
Boron (total)	1.0	
Cadmium (total)	0.05	0.01
Carbon chloroform extract (CCE)		0.2
Chloride	500	250
Chromium (total hexavalent)	0.05	
Chromium (total trivalent)	1.0	
Copper (total)	0.02	
Cyanide	0.025	0.01
Fluoride	1.4	
Iron (total)	1.0	0.3
Lead (total)	0.1	0.05
Manganese (total)	1.0	0.05
Mercury	0.0005	
Methylene blue active substance (MBAS)		0.5
Nickel (total)	1.0	
Nitrates plus nitrites (as N)		10.0
Oil (hexane solubles or equivalent)		0.1
Phenols	0.1	0.001
Selenium (total)	1.0	0.01
Silver (total)	0.005	
Sulfate	500	250
Total dissolved solids	1000	500
Zinc	1.0	

* *Illinois Pollution Control Board Regulations*

Table 4. Maximum Limits of Water Temperatures at Representative Locations on Main Rivers*

(Temperatures in degrees Fahrenheit)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mississippi River (Wisconsin border to Iowa border)	45	45	57	68	78	85	86	86	85	75	65	52
Mississippi River (Iowa border to Alton Lock & Dam)	45	45	57	68	78	86	88	88	86	75	65	52
Mississippi River (South of Alton Lock & Dam)	50	50	60	70	80	87	89	89	87	78	70	57
Ohio River	50	50	60	70	80	87	89	89	87	78	70	57
Wabash River and its tributaries within Illinois	50	50	60	70	80	90	90	90	90	78	70	57
Other waters in Illinois	60	60	60	90	90	90	90	90	90	90	90	60

* *Illinois Pollution Control Board Regulations*

The ammonia-nitrogen standard of 1.5 mg/l was exceeded 5 percent, or more, of the time in the Des Plaines, Fox, Illinois, and Marys Rivers and in Henderson Creek.

Boron, chloride, sulfate, total dissolved minerals, and zinc standards were generally exceeded for only one or two stations for relatively small percentages of time.

Median and High Concentrations

The results of any 5-year sampling program provide comparisons of water quality in various parts of the state. Successive sampling programs on the same stream, or at the same sampling station, point to temporal changes in water quality and may reveal certain cause and effect relationships. Therefore, the data presented here not only may reveal how close the state has come to meeting stream quality standards, but also may serve as a basis of investigation for the need of new standards or for necessary changes in the present standards.

In the 1966 to 1971 sampling period, streamflow variability was lowest in northern streams and highest in those of the south and south-central regions. Hardness and total dissolved mineral median values were generally greater in northern streams, but the variability, as measured by the magnitude of extreme values, of both of these characteristics is greater in southern streams. Median values for hardness ranged between 192 and 457 mg/l, and for total dissolved minerals between 318 and 801 mg/l. Median turbidities ranged from 14 to 260 Jackson turbidity units (Jtu); however, all but the Mississippi, Ohio, and Wabash Rivers, and the Illinois River at Meredosia were below 50 Jtu.

The range of variation of the extreme turbidities was greater for southern, western, and south-central Illinois streams than for those in the northern and central areas. All Illinois streams are rich in iron; median concentrations ranged from 0.6 to 2.9 mg/l (total iron). Apparently much of the iron is carried into the streams via overland runoff since those streams where the greatest variations in turbidity are found are also those with the highest iron concentrations.

Table 5 gives the median and high concentrations of eight parameters for the streams sampled in the 1966 to 1971 period and also in previous 5-year periods.

In Elkhorn Creek there were net increases in median concentrations between 1961 and 1971 for all parameters except soluble inorganic phosphorus which remained at the same median concentration during both 5-year sampling periods.

There were net increases in all median concentrations in the Embarras River with the exception of iron, which declined slightly.

In the Fox River at Algonquin medians for total dissolved minerals, hardness, and chlorides increased slightly from the first to the second sampling period, while those for sulfate, nitrate, iron, and turbidity decreased.

Median concentrations in the Illinois River at Peoria and Meredosia have generally increased with time, with the exception of soluble inorganic phosphorus as measured at Peoria.

Increasing median concentrations were generally found in the Kaskaskia River at Shelbyville and Vandalia, except for soluble inorganic phosphorus at Shelbyville.

Seven Mile Creek and Wolf Creek were the only two streams in which changes in median concentrations did not follow a pattern similar to the findings on other streams. In these two streams, the median concentrations for the latest sampling period for chlorides, sulfates, nitrate, iron, turbidity, and phosphorus were generally significantly lower than in earlier sampling periods.

In the Vermilion River at Lowell, total dissolved minerals, hardness, chloride, nitrate, and turbidity mean concentrations increased in the latest sampling period, while there were slight decreases in median iron and sulfate concentrations.

Intrastate rivers, such as the Mississippi, Ohio, and Wabash have behaved in much the same manner as other streams except Seven Mile and Wolf Creeks. Generally total dissolved minerals, hardness, chlorides, sulfates, and nitrates increased over the past 10 years.

Nutrient Levels

The amount of nutrient nitrogen and phosphorus found in Illinois streams and lakes can be evaluated in a variety of ways. Historically, attention has usually been focused on concentrations of compounds found and on changes, such as fluctuations in mean values, that occurred over periods of time. However, current emphasis on protection, preservation, and enhancement of the environment has focused attention more on the yields, or loads, of mineral compounds found in water resources and their possible effects on water quality.

Therefore, tables 6 and 7 are presented to show values for concentrations and yields. Concentrations are expressed as milligrams per liter (mg/l) and yields as pounds per acre of watershed area per year (lbs/acre/yr).

In table 6, the nitrate concentrations (5-year mean values) are shown to increase with the passage of time, except for the Fox River at Algonquin, Seven Mile Creek at Mt. Vernon, and Wolf Creek at Beecher City. In general, the changes in mean yields follow a pattern similar to the changes in concentrations, but because streamflows are involved in computation of yields, some unusual deviations are apparent.

Although the mean values computed for each year of any of the 5-year sampling periods are not included, the nitrate concentrations and nitrogen yields for the 1970-1971 water year for the Kaskaskia River at Shelbyville and at Vandalia were markedly lower than for the preceding four years. The gates on the new dam at Shelbyville Lake were closed on August 1, 1970. The sampling stations on the

Table 5. Median and High Values of Stream Characteristics

(Mineral constituents in milligrams per liter, turbidity in Jackson turbidity units)

	Total dissolved minerals		Hardness		Chloride		Sulfate		Nitrate		Iron		Soluble phosphorus		Turbidity	
	Median	High	Median	High	Median	High	Median	High	Median	High	Median	High	Median	High	Median	High
Elkhorn Creek near Penrose																
1966–1971	376	424	326	372	12	120	38	60	14.5	28.3	1.6	52.0	0.23	0.92	32	1483
1961–1966	362	772	320	380	10	260	35	61	10.8	24.9	1.1	174.0	0.23	0.83	21	4230
Embarras River near Camargo																
1966–1971	373	481	291	362	19	220	65	101	30.9	68.7	1.3	10.0	0.15	1.52	31	296
1961–1966	340	629	275	394	14	78	63	109	17.6	45.0	1.4	6.3	0.1	1.96	28	126
Fox River at Algonquin																
1966–1971	422	571	332	440	33	410	77	97	4.1	25.0	0.6	2.7	0.3	1.78	18	83
1956–1961	380	548	318	425	19	38	79	104	6.4	17.0	0.8	3.0			24	66
Illinois River at Meredosia																
1966–1971	413	580	275	369	39	68	92	120	24.6	73.8					119	969
1960–l966	380	531	256	378	39	88	95	237	17.2	48.4					118	530
1955–l960	361	449	244	312	33	52	93	118	16.8	33.2					82	
Illinois River at Peoria																
1966–1971	419	603	282	400	46	122	109	143	15.5	28.3	2.1	7.1	0.53	1.55	50	149
1961–1966	407	569	260	400	37	96	109	161	18.7	30.2	2.1	10.0	0.63	3.13	40	169
1957–1961	378	477	265	332	31	51	102	143							37	129
1945–l950	337	484	247	346	26	42	103	154	10.4	21.8	1.9	4.2			30	430
Kaskaskia River at Shelbyville																
1966–1971	427	662	326	418	28	190	71	256	18.0	44.8	1.5	40.0	0.1	0.56	34	242
1961–1966	403	1037	323	588	28	100	70	427	12.9	42.0	1.2	36.0	0.1	0.7	27	1300
1956–1961	409	1257	326	711	26	158	93	614	9.1	27.9	1.3	30.0			25	1600
Kaskaskia River at Vandalia																
1966–1971	422	1262	306	394	40	610	65	114	14.5	38.8	2.0	26.0	0.13	0.36	40	808
1950–l956	346	608	278	357	20	97	54	147	3.9	20.8	1.2	20.5			28	703
Mississippi River at Chester																
1966–1971	312	446	200	280	20	270	79	144	11.1	27.3					264	756
1960–1965	311	425	206	308	26	44	80	137	9.4	37.0					252	3528
1955–l960	291	406	200	320	24	36	71	167	6.7	54.4						
Mississippi River at East St. Louis																
1966–1971	297	389	208	296	19	39	58	128	9.8	20.8	2.9	43.0	0.17	0.53	59	1312
1961–1966	285	368	203	278	16	33	57	124	8.0	16.7	2.8	22.0	0.17	0.47	59	692
1958–l961	279	370	203	308	14	24	56	114	6.1	14.9	3.3	45.0			99	1700
Ohio River at Cairo																
1966–1971	228	325	140	192	21	46	63	110	6.5	14.3	2.3	18.0	0.03	0.26	53	240
1961–1966	187	365	120	191	18	53	53	120	4.3	9.0	1.9	33.0	0.03	1.6	30	566
1958–l961	204	291	133	178	18	41	54	88	3.7	7.4	2.5	19.0			44	400
Seven Mile Creek near Mt. Vernon																
1966–1971	327	1034	192	648	13	19	171	615	1.8	19.7	0.7	15.0	0.03	0.23	17	661
1961–1966	378	1184	215	764	17	30	182	930	2.4	8.1	1.3	43.0	0.03	0.4	23	611
Vermilion River at Lowell																
1966–1971	457	810	364	510	22	64	118	321	31.4	60.4	1.0	58.0	0.36	2.57	24	1820
1957–1961	447	951	358	639	14	61	126	337	11.3	52.9	1.3	8.9			16	375
Wabash River at Hutsonville																
1966–1971	373	489	284	372	25	440	79	116	17.9	90.8					78	758
1962–l966	363	519	274	388	28	46	85	118	10.8	54.4					83	890
1955–1961	341	492	264	372	23	34	76	116	12.9	51.5					82	656
Wolf Creek near Beecher City																
1966–1971	403	3325	262	683	49	1850	58	179	2.3	38.0	0.9	18.0	0.07	0.33	19	1191
1961–1966	591	8160	306	1938	150	4813	63	1043	3.3	13.5	1.6	9.4	0.1	0.4	36	267

Kaskaskia River at Shelbyville and Vandalia are both downstream from the lake. Therefore, the abrupt decrease in nitrate concentrations may be an indication of nitrate removal in the lake by natural processes. However, the same effect is not as apparent for phosphate concentrations and yields (table 7). The lowest phosphate concentrations and yields occurred in the 1969-1970 water year at Shelbyville and in the 1970-1971 year at Vandalia.

Mean phosphate concentrations and phosphorus yields for all watersheds in Illinois have varied differently from nitrogen values in the past 10 years. Without exception, the 5-year mean phosphate concentrations have declined or have remained nearly constant, but yields have increased except for Elkhorn Creek near Penrose and the Kaskaskia River at Shelbyville.

Many discussions of the relative importance of nitrogen and phosphorus to algal production have been published. However, no clear-cut decisions have been made as to which, if either, is the limiting nutrient. For the most part, it seems generally true that phosphorus is accepted as the limiting nutrient largely because it appears easier to control. If phosphorus is accepted as the limiting nutrient, it

Table 6. Mean Nitrate Concentrations in Streams and Nitrogen Yields from Watersheds

	1945-1950	1950-1956	1956-1961	1961-1966	1966-1971
Elkhorn Creek near Penrose					
Nitrate *(mg/l)*				11.4	15.0
Nitrogen *(lbs/acre/yr)*				6.6	5.0
Embarras River near Camargo					
Nitrate *(mg/l)*				19.3	27.4
Nitrogen *(lbs/acre/yr)*				12.3	15.1
Fox River at Algonquin					
Nitrate *(mg/l)*			7.1		5.0
Nitrogen *(lbs/acre/yr)*			3.0		2.5
Illinois River at Meredosia					
Nitrate *(mg/l)*			16.2	18.5	27.1
Nitrogen *(lbs/acre/yr)*			9.1	9.6	17.1
Illinois River at Peoria					
Nitrate *(mg/l)*	11.4		10.7	18.2	16.2
Nitrogen *(lbs/acre/yr)*			7.7	12.2	14.9
Kaskaskia River at New Athens					
Nitrate *(mg/l)*	6.0		4.8	6.5	
Nitrogen *(lbs/acre/yr)*	4.5		2.9	2.8	
Kaskaskia River at Shelbyville					
Nitrate *(mg/l)*			12.0	15.0	19.5
Nitrogen *(lbs/acre/yr)*			8.1	9.4	14.5
Kaskaskia River at Vandalia					
Nitrate *(mg/l)*		6.5			14.5
Nitrogen *(lbs/acre/yr)*		2.4			10.3
Mississippi River at Chester					
Nitrate *(mg/l)*			9.0	10.8	11.7
Nitrogen *(lbs/acre/yr)*			1.5	1.9	2.6
Mississippi River at East St. Louis					
Nitrate *(mg/l)*			6.9	8.7	10.0
Nitrogen *(lbs/acre/yr)*			1.3	1.5	2.0
Ohio River at Cairo					
Nitrate *(mg/l)*			3.8	4.7	6.5
Nitrogen *(lbs/acre/yr)*					6.2
Rock River at Como					
Nitrate *(mg/l)*			6.8	10.4	
Nitrogen *(lbs/acre/yr)*			2.8	5.5	
Seven Mile Creek near Mt. Vernon					
Nitrate *(mg/l)*				2.6	2.6
Nitrogen *(lbs/acre/yr)*				4.4	11.8
Skillet Fork at Wayne City					
Nitrate *(mg/l)*	2.3		2.6		
Nitrogen *(lbs/acre/yr)*	2.0		1.6		
Spoon River at London Mills					
Nitrate *(mg/l)*	7.0		7.2		
Nitrogen *(lbs/acre/yr)*	3.5		5.2		
Vermilion River at Lowell					
Nitrate *(mg/l)*			14.5		29.1
Nitrogen *(lbs/acre/yr)*			4.3		21.3
Wabash River at Hutsonville					
Nitrate *(mg/l)*			14.5	13.2	22.5
Nitrogen *(lbs/acre/yr)*			10.9		19.2
Wolf Creek near Beecher City					
Nitrate *(mg/l)*				4.2	4.0
Nitrogen *(lbs/acre/yr)*				1.9	2.6

Table 7. Mean Dissolved Inorganic Phosphate Concentration and Phosphorus Yields from Watershed

	1961-1966	1966-1971
Elkhorn Creek near Penrose		
Phosphate *(mg/l)*	0.82	0.80
Phosphorus *(lbs/acre/yr)*	0.65	0.39
Embarras River near Camargo		
Phosphate *(mg/l)*	0.71	0.67
Phosphorus *(lbs/acre/yr)*	0.21	0.27
Fox River at Algonquin		
Phosphate *(mg/l)*		1.19
Phosphorus *(lbs/acre/yr)*		0.57
Illinois River at Peoria		
Phosphate *(mg/l)*	2.62	1.91
Phosphorus *(lbs/acre/yr)*	1.8	2.1
Kaskaskia River at New Athens		
Phosphate *(mg/l)*	0.33	
Phosphorus *(lbs/acre/yr)*	0.14	
Kaskaskia River at Shelbyville		
Phosphate *(mg/l)*	0.40	0.36
Phosphorus *(lbs/acre/yr)*	0.23	0.23
Kaskaskia River at Vandalia		
Phosphate *(mg/l)*		0.45
Phosphorus *(lbs/acre/yr)*		0.45
Mississippi River at East St. Louis		
Phosphate *(mg/l)*	0.61	0.60
Phosphorus *(lbs/acre/yr)*	0.12	0.15
Ohio River at Cairo		
Phosphate *(mg/l)*	0.39	0.18
Phosphorus *(lbs/acre/yr)*		0.32
Seven Mile Creek near Mt. Vernon		
Phosphate *(mg/l)*	0.23	0.15
Phosphorus *(lbs/acre/yr)*	0.08	0.93
Vermilion River at Lowell		
Phosphate *(mg/l)*		1.37
Phosphorus *(lbs/acre/yr)*		0.71
Wolf Creek near Beecher City		
Phosphate *(mg/l)*	0.30	0.26
Phosphorus *(lbs/acre/yr)*	0.18	0.23

becomes very difficult to determine the level of control needed or the bad effects which should be avoided. Illinois current regulations limit total phosphorus (P) to 50 micrograms per liter (µg/l) in streams where they enter reservoirs, or within the reservoirs. The U.S. Environmental Protection Agency proposes that this regulation be amended to limit the total phosphorus (P) concentrations in all Illinois waters to a maximum value of 100 µg/l.

Illinois streams have been analyzed for soluble inorganic phosphorus since about 1960, and for total inorganic phosphorus since 1966. Since 1966, the high values of total inorganic phosphorus have ranged from 0.63 mg/l (630 µg/1) to 4.59 mg/l (4590 µg/l), which indicates that none of the streams sampled during the 1966-1971 sampling period could have met the proposed maximum single value standard of 100 µg/l. In fact, median values indicate that the proposed standard was exceeded at least 50 percent of the time in all streams except the Marys River and Seven Mile Creek. In spite of these seeming excessive phosphorus levels in streams, studies made by the Survey's Water Quality Section in Peoria indicate that algal productivity has not recently been a significant water quality factor in Illinois streams.

Algal growth in lakes and man-made reservoirs may have much more significance than in flowing streams. This should be evident from the existing limitation of 50 µg/1 phosphorus for lakes, and for streams tributary to lakes. In addition to this regulation, the literature provides tentative guidelines for permissible loading levels of nitrogen and phosphorus introduced into lakes and reservoirs. For lakes with mean depths up to 5 meters (~ 16 feet), which probably includes most Illinois lakes and reservoirs, typical

guide lines for annual loadings would be 5.93 pounds per acre of lake surface area for nitrogen and 0.625 pounds per acre for phosphorus. If we assume the 1966-1969 data for the Kaskaskia River at Shelbyville to be typical of the actual loadings on Shelbyville Lake, the annual nitrogen loading was about 635 pounds per acre, and annual phosphorus approximately 45.7 pounds per acre. Similarly, if we assume the Vandalia station data to be typical, Carlyle Reservoir annual loadings for the 1966-1971 period were 257 pounds per acre for nitrogen and 46.1 pounds per acre for phosphorus. Lake Decatur is approximately 35 miles downstream from Mahomet on the Sangamon River. The Mahomet data indicate annual loadings for Lake Decatur of 684 pounds per acre nitrogen and 32.8 pounds per acre phosphorus. In these examples of approximate loadings in excess of the tentative guidelines, there are no data available to show that excessive algal growths have occurred because of these nutrient levels.

Two of the most vigorously pursued means of phosphorus control have been banning the use of phosphate detergents in households and the addition of phosphorus removal procedures to waste treatment plants. Both methods evolved from the assumption that the bulk of the phosphorus found in surface waters has its origin in domestic waste water. Table 8 shows the phosphorus loads found in Illinois streams and the estimates of those phosphorus loads originating from waste water treatment plants. Because of the lack of precision in the sewered population values used in preparing table 8, the values are largely of a qualitative nature.

Figure 2 is intended to show relationships between phosphorus found in streams and phosphorus originating from sources other than waste water treatment plants. Phosphorus applied to land is generally thought to be rather tightly bound to the soil particles, so that it is reasonable to assume that sediment washed into streams can carry significant amounts of phosphorus with it. Unfortunately, routine suspended sediment analyses were not made for these samples, and it was necessary to use turbidity measurements as a gross substitute for suspended sediment. No attempt was made to determine any relationship between Jackson turbidity units and milligrams per liter suspended residue. Instead, Jackson turbidity units were converted directly to milligrams per liter in order to calculate what we have called 'turbidity loads in terms of pounds per day.'

Table 8. Phosphorus (P) Yields from Waste Treatment Plants on Watersheds and Observed Mean Phosphorus Loads in Streams during 1966-1971

	Phosphorus yield from waste treatment plants* (*lbs/day*)	Phosphorus load observed at sampling station** (*lbs/day*)
Bear Creek near Marcelline	1.14	1,177
Des Plaines River near Des Plaines	358.0	510
Edwards River near New Boston	79.4	607
Edwards River near Orion	26.8	223
Elkhorn Creek near Penrose	33.4	193
Embarras River near Camargo	26.1	123
Fox River at Algonquin	1,131.0	1,654
Fox River at Batavia	2,042.0	4,490
Henderson Creek near Oquawka	456.0	1,071
Illinois River at Peoria	52,800.0†	59,775
Kankakee River at Momence	390.0†	2,161
Kaskaskia River at Shelbyville	476.0	919
Kaskaskia River at Vandalia	613.0	3,289
Kishwaukee River near Perryville	548.0	1,092
Little Wabash River near Effingham	18.8	332
Mackinaw River near Congerville	67.2	738
Marys River near Sparta	0	37
North Fork Mauvaise Terre Creek near Jacksonville	0	99
Sangamon River at Mahomet	52.2	238
Seven Mile Creek near Mt. Vernon	0	51
Shoal Creek near Breese	208.0	1,755
South Fork Sangamon River near Rochester	226.0	1,767
Vermilion River at Lowell	307.0	2,391
Wolf Creek near Beecher City	0	44

* Per capita load of 3.2 pounds per year assumed, population served by waste treatment plants estimated for 1970 by Illinois Environmental Protection Agency

** 5-year mean values calculated from observed monthly flow measurements and total inorganic phosphate concentrations

† Based on 1965 population estimate of Illinois Sanitary Water Board

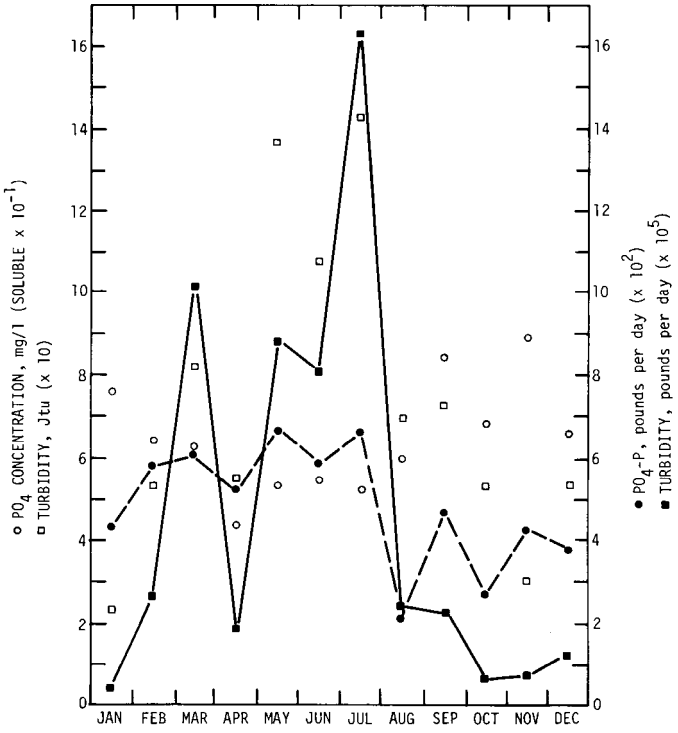


Figure 2. Monthly mean phosphorus and turbidity values, 1966-1971

DATA SUMMARIES

Data for each of the 30 sampling stations are presented on the following pages and include descriptions of the sampling location and watershed area. The physiographic regions are those set forth by the State Geological Survey. Results of statistical analyses of discharge and quality data are summarized and depicted graphically. Tabulations of individual determinations for each year of the collection period are provided. Flow data are from records of the U.S. Geological Survey. Deviations from normal rainfall for periods of collection were obtained from available National Weather Service stations; no attempt was made to provide rainfall data for the large intersectional streams.

These summaries are arranged in alphabetical order by stream names and by station names on the same stream. The tables of data for each station are computer printouts in which all samples are identified by the year, month, and day and by a Survey laboratory number. The number adjacent to the year is the U.S. Geological Survey station location number.

Symbols used in the tabular material for each station are:

CFS = Cubic feet per second
FE = Iron
MN = Manganese
CA = Calcium
MG = Magnesium
SR = Strontium
NA = Sodium
K = Potassium
NH4 = Ammonium
PO4F = Phosphate (filtered)
PO4U = Phosphate (unfiltered)
SIO2 = Silica
F = Fluoride
B = Boron
NO3 = Nitrate
CL = Chloride
SO4 = Sulfate
ALK. = Alkalinity (as $CaCO_3$)
T.H. = Total hardness (as $CaCO_3$)
TMC = Total mineral content
CD = Cadmium
CR = Chromium
CU = Copper
PB = Lead
LI = Lithium
NI = Nickel
ZN = Zinc
TURB. = Turbidity (Jtu)
TEMP. = Degrees Fahrenheit

BEAR CREEK NEAR MARCELLINE

Bear Creek rises in the Galesburg Plain Region near Carthage and flows southward and westerly into the Mississippi River below Marcelline. The gaging station is 2.2 miles northeast of Marcelline, and 12 miles upstream from the mouth of the river. Elevation of gage datum is 504.52 feet above mean sea level. The drainage basin above the gage has an area of 348 square miles.

The tabulation of water quality data is for the period from October 20, 1966, to September 8, 1971. Discharge and some quality data are summarized graphically. The instantaneous discharge values shown were computed by the USGS from gage height readings taken at the time of sampling.

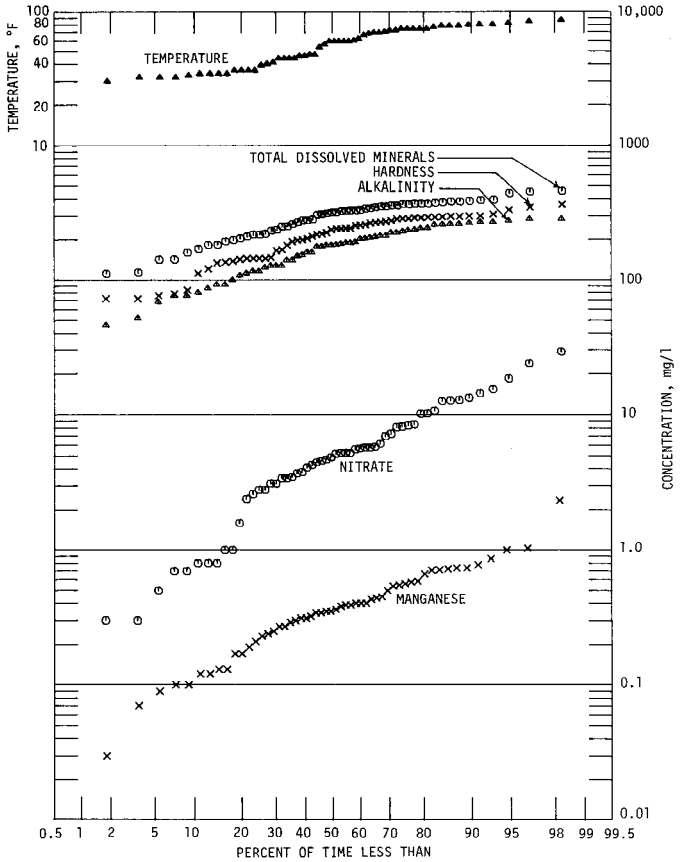
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.18 cfs/sq mi, nor fall below 0.01 cfs/sq mi. The median flow was 0.07 cfs/sq mi and the mean was 1.06 cfs/sq mi.

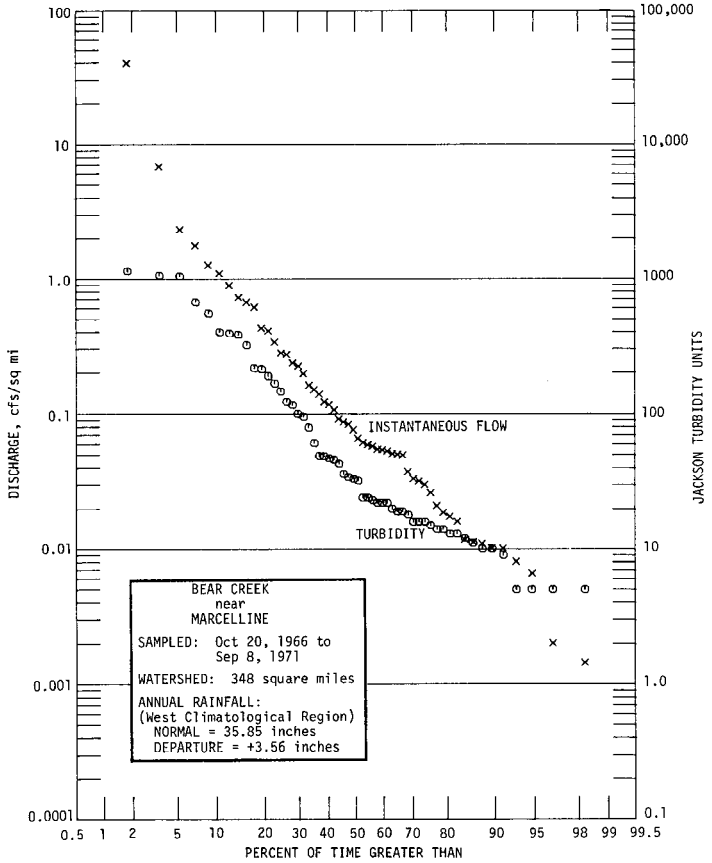
Turbidity was not less than 10 Jtu nor more than 472 Jtu for the central 80 percent of the time. The median value was 32 Jtu and the mean 146 Jtu.

Reported temperatures were over 80 F for 10 percent and over 70 F for 30 percent of the time. They were below 50 F for 43 percent and below 40 F for 23 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	78	181	266
Hardness (as $CaCO_3$)	98	238	300
Total dissolved minerals	164	318	390
Nitrate (NO_3)	0.75	5.05(6.4)	13.9
Total inorganic phosphate (PO_4)	0.1	0.6(0.81)	1.7
Soluble inorganic phosphate (PO_4)	0.0	0.25(0.29)	1.7
Manganese (Mn)	0.11	0.355	0.76





BEAR CREEK NEAR MARCELLINE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	504955															
10-20	170099	0.5	0.7	0.30	69.8	22.0	0.20	11	4.7	T	0.00	0.10	6	0.30	0.20	0.8
11-10	170197	0.7	0.5	0.13	77.8	23.3	0.25	12	5.3	T	0.00	0.00	8	0.20	0.10	0.3
12-14	170458	3.8	9.7	0.10	48.4	14.3	0.21	17	8.2	0.1	0.30	0.80	8	0.40	0.10	4.3
1967	504955															
02-16	170828	308.0	6.8	0.74	21.2	6.0	0.10	7	5.0	T	0.50	2.00	8	0.50	0.10	12.9
03-10	171052	6.5	1.3	0.35	52.0	15.2	0.13	12	5.0	T	0.30	0.60	5	0.30	0.10	4.7
04-06	171176	96.4	2.3	0.17	55.2	15.7	0.16	14	7.1	0.1	0.30	0.70	14	0.30	0.00	10.2
05-16	171541	81.5	1.0	0.07	67.0	18.1	0.18	16	3.8	0.1	0.00	0.20	12	0.20	0.10	7.0
06-06	171628	40.5	1.7	0.17	66.8	16.9	0.21	17	5.3	T	0.50	0.60	10	0.10	0.10	12.8
07-07	172335	11.5	3.2	0.10	55.2	14.2	0.18	11	5.7	T	0.20	0.40	5	0.20	0.10	8.2
08-03	172861	211.0	4.8	0.25	47.6	11.7	0.16	9	4.2	T	0.20	0.60	7	0.20	0.10	5.6
09-12	173178	2.8	1.2	0.86	87.6	21.8	0.21	12	4.1	0.1	0.30	0.50	8	0.30	0.00	5.3
10-03	173356	3.9	0.6	0.38	56.0	14.2	0.16	10	6.9	T	0.20	0.30	4	0.10	0.10	3.1
11-02	173562	802.0	6.7	0.21	36.8	10.2	0.14	11	5.9	0.0	0.70	1.10	14	0.10	0.00	12.7
12-05	173771	52.1	1.1	0.39	74.4	22.0	0.21	25	4.0	0.3	0.00	0.50	10	0.30	0.10	5.2
1968	504955															
02-27	174344	19.1	0.3	0.36	96.8	26.4	0.24	20	3.5	T	0.10	0.50	13	0.20	0.00	5.7
03-21	174345	94.0	0.8	0.12	69.2	20.3	0.19	25	4.0	0.2	0.20	0.30	5	0.20	0.00	1.6
04-30	174626	20.7	1.5	0.67	79.2	23.5	0.23	22	4.3	0.1	0.30	0.50	3	0.20	0.10	1.0
05-29	174978	30.0	3.9	0.39	65.2	19.3	0.17	22	5.5	0.4	0.30	0.50	3	0.20	0.20	8.1
06-06	174979	7.3	1.8	0.23	61.6	21.0	0.17	23	3.9	0.6	0.20	0.30	5	0.20	0.10	1.0
07-09	175477	5.6	1.0	0.27	53.6	18.5	0.22	14	4.3	T	0.30	0.30	7	0.30	0.10	3.7
08-14	175972	18.6	3.3	0.19	39.6	10.5	0.12	9	5.8	0.1	0.20	2.40	10	0.30	0.10	2.8
09-10	176234	3.5	1.0	0.09	86.4	20.4	0.25	11	5.0	0.1	1.00	1.20	8	0.20	0.10	0.5
10-08	176593	6.1	1.2	0.55	70.4	18.5	0.17	13	6.0	0.1	0.00	0.20	9	0.20	0.00	0.7
11-14	176814	3.5	0.7	0.31	84.0	21.4	0.18	15	5.3	0.1	0.30	1.20	9	0.30	0.10	0.7
12-10	177287	23.0	0.8	0.40	67.2	20.9	0.20	19	6.3	1.3	0.50	0.90	12	0.20	0.10	13.4
1969	504955															
02-04	177469	142.0	1.1	0.35	45.6	12.2	0.12	13	4.6	0.5	0.40	0.60	9	0.10	0.10	5.3
03-06	177818	437.0	9.6	0.44	30.4	8.8	0.10	12	4.3	0.5	0.40	0.80	8	0.20	0.10	8.5
04-02	178029	117.0	0.7	0.31	73.6	20.1	0.18	18	2.9	0.2	0.40	0.60	11	0.20	0.10	7.3
05-14	178341	379.0	11.0	0.74	38.8	10.0	0.16	13	4.4	0.5	0.90	2.90	9	0.20	0.10	10.2
06-16	178808	17.7	1.1	0.34	78.4	21.5	0.23	17	4.1	0.1	0.30	0.30	9	0.20	0.00	4.5
07-19	179046	13700.0	23.0	0.43	22.0	4.1	0.05	9	4.3	0.1	0.40	1.70	10	0.20	0.10	2.8
08-04	179399	11.1	2.0	0.72	84.0	22.0	0.24	16	4.8	0.1	0.20	0.30	8	0.30	0.00	0.3
09-22	179822	2.3	1.0	0.73	81.6	20.1	0.20	13	5.0	0.1	0.10	0.20	8	0.20	0.10	0.8
10-01	179825	9.1	4.2	0.58	40.8	10.2	0.09	10	8.6	0.1	0.20	0.70	8	0.20	0.10	5.8
11-05	180190	31.6	1.5	0.12	78.0	22.3	0.19	11	4.7	T	0.40	0.60	6	0.20	0.20	4.6
12-17	180148	17.6	1.6	T	65.6	18.5	0.14	16	2.6	T	0.00	0.10	4	0.20	0.20	0.8
1970	504955															
01-05	180703	10.4	0.6	0.34	97.6	29.3	0.22	26	2.9	0.2	0.00	0.10	5	0.10	0.20	5.3
02-18	180864	26.4	2.2	0.71	79.2	22.5	0.15	20	3.7	0.4	0.00	0.20	8	0.20	0.20	3.8
03-11	181074	48.2	1.6	0.24	72.8	21.5	0.14	44	5.2	0.1	0.10	0.30	4	0.20	0.20	6.2
04-08	181525	148.0	7.1	0.40	61.2	15.9	0.18	16	2.9	0.3	0.10	0.70	8	0.20	0.10	18.4
05-04	181899	29.0	1.6	0.29	70.4	28.2	0.10	12	2.9	0.1	0.40	0.50	6	0.20	0.10	23.8
06-19	182465	77.5	30.0	0.78	35.6	7.8	0.10	10	4.4	0.1	0.20	1.00	5	0.30	0.10	15.5
07-16	183248	19.0	0.3	0.00	75.2	35.1	0.11	11	1.3	0.1	0.30	0.80	10	0.30	0.10	29.0
08-19	183610	2350.0	57.0	2.35	21.6	5.4	0.06	4	4.2	0.1	0.20	3.20	8	0.20	0.10	2.6
09-11	183895	21.5	2.1	0.50	60.8	15.7	0.16	13	5.0	0.1	0.40	0.90	9	0.30	0.10	3.1
10-07	184121	68.0	0.7	0.45	84.0	21.0	0.19	15	3.4	0.1	0.00	0.30	13	0.30	0.10	5.8
11-19	184362	56.0	0.9	0.32	72.8	21.0	0.21	18	3.4	0.3	0.00	0.20	10	0.30	0.10	4.1
12-16	184574	250.0	2.7	0.27	63.2	16.2	0.17	16	4.8	0.3	0.10	0.10	10	0.30	0.10	10.7
1971	504955															
01-07	184781	230.0	20.0	1.00	38.4	9.8	0.11	11	5.8	0.6	0.20	5.50	8	0.30	0.10	8.4
02-04	185089	37.0	0.6	0.40	40.8	10.7	0.12	8	2.3	0.5	0.10	0.10	5	0.20	0.00	3.5
03-16	185309	611.0	20.0	0.54	40.8	10.2	0.15	10	4.4	0.3	0.60	1.20	10	0.20	0.10	14.4
04-06	185537	20.1	1.1	0.56	77.6	24.0	0.20	20	3.0	0.1	0.10	0.40	5	0.20	0.00	3.4
06-22	185996	17.3	10.0	0.13	40.8	10.2	0.11	15	4.8	0.3	0.30	0.80	8	0.30	0.10	5.9
07-13	186278	42.3	11.0	0.59	24.4	5.6	0.06	7	5.0	0.5	0.70	0.90	6	0.30	0.10	4.9
08-19	186506	4.1	6.4	0.03	41.6	9.7	0.10	11	5.4	0.8	1.20	1.50	5	0.30	0.10	2.4
09-08	186640	13.0	12.0	1.03	20.8	4.9	0.08	6	8.0	0.2	0.50	1.20	6	0.30	0.10	3.4

BEAR CREEK NEAR MARCELLINE

DATE	LAB.NO.	CL	SO4	ALK.	T H.	TM C	C D	O R	O J	PB	LI	NI	X	TURB.	TEMP
1966	504955														
10-20	170099	14	32	256	264	314			0.00					5	47.0
11-10	170197	8	35	268	290	343			0.01					5	44.0
12-14	170458	10	47	152	180	268			0.02					211	36.0
1967	504955														
02-16	170828	15	29	52	78	160		0.00	0.02				0.02	166	33.0
03-10	171052	8	62	140	192	278		0.00	0.01				0.02	13	46.0
04-06	171176	11	72	140	202	305		0.00	0.01				0.01	43	66.0
05-16	171541	9	74	180	242	329		0.00	0.00				0.00	24	59.0
06-06	171628	15	69	176	236	342		0.00	0.01				0.05	47	74.0
07-07	172335	9	24	160	196	217		0.00	0.02				0.02	116	72.0
08-03	172861	6	37	128	167	233		0.00	0.02				0.02	95	78.0
09-12	173178	7	47	260	308	371		0.00	0.01				0.01	20	72.0
10-03	173356	7	30	176	198	261		0.00	0.02				0.06	24	69.0
11-02	173562	12	40	92	134	220		0.00	0.01				0.02	145	46.0
12-05	173771	14	99	212	276	397		0.00	0.01				0.02	16	39.0
1968	504955														
02-27	174344	12	96	276	350	452		0.00	0.01				0.01	12	32.0
03-21	174345	16	103	184	256	368		0.00	0.01				0.01	16	44.0
04-30	174626	13	89	236	294	385		0.00	0.01				0.01	34	59.0
05-29	174978	18	72	188	242	348		0.00	0.01				0.04	99	59.0
06-06	174979	17	71	200	240	325		0.00	0.01				0.04	36	78.0
07-09	175477	11	49	182	210	281		0.00	0.01				0.01	14	86.0
08-14	175972	6	16	124	142	169		0.00	0.01				0.03	61	80.0
09-10	176234	7	35	284	300	331		0.00	0.02				0.06	22	68.0
10-08	176593	7	45	224	252	308		0.00	0.02				0.06	22	59.0
11-14	176814	10	49	268	298	361		0.00	0.01				0.03	13	36.0
12-10	177287	20	83	190	254	394		0.00	0.02				0.02	9	32.0
1969	504955														
02-04	177469	11	54	128	164	250		0.00	0.01				0.17	22	34.0
03-06	177818	11	47	80	112	193	0.00	0.00	0.02	<.05		<.05	0.11	214	36.0
04-02	178029	12	84	206	266	372	0.01	0.00	0.01	<.05	0.01	<.05	0.02	15	44.0
05-14	178341	11	46	108	138	204	0.00	0.00	0.03	<.05	0.00	<.05	0.09	547	59.0
06-16	178808	9	52	242	284	354	0.01	0.00	0.01	<.05	0.00	<.05	0.03	19	70.0
07-19	179046	2	21	46	72	111	0.00	0.00	0.07	<.05	0.00	<.05	0.21	1052	60.0
08-04	179399	11	56	264	300	387	0.00	0.00	0.02	<.05	0.00	<.05	0.04	49	76.0
09-22	179822	11	44	259	286	354	0.00	0.00	0.02	<.05	0.00	<.05	0.07	19	74.0
10-01	179825	10	35	116	144	216	0.00	0.00	0.02	<.05	0.00	<.05	0.12	79	69.0
11-05	180190	13	75	228	286	379	0.00	0.00	0.01	<.05	0.00	<.05	0.03	16	53.0
12-17	180148	10	73	180	240	319	0.00	0.00	0.01	<.05	0.00	<.05	0.04	14	30.0
1970	504955														
01-05	180703	16	105	284	364	460	0.00	0.00	0.02	<.05	0.00	<.05	0.01	5	32.0
02-18	180864	13	84	224	290	372	0.00	0.00	0.01	<.05	0.00	<.05	0.01	32	34.0
03-11	181074	48	90	202	270	443	0.00	0.00	0.02	<.05	0.00	<.05	0.02	23	40.0
04-08	181525	17	68	150	218	331	0.00	0.00	0.02	<.05	0.00	<.05	0.02	122	56.0
05-04	181899	17	55	212	292	361	0.00	0.00	0.02	<.05	0.00	<.05	0.02	33	62.0
06-19	182465	11	30	86	121	181	0.00	0.00	0.03	<.05	0.00	<.05	0.03	1040	74.0
07-16	183248	16	50	260	332	384	0.00	0.00	0.02	<.05	0.00	<.05	0.03	5	82.0
08-19	183610	2	0	76	76	114	0.00	0.00	0.03	<.05	0.00	<.05	0.03	1142	74.0
09-11	183895	9	41	188	216	277	0.00	0.00	0.01	<.05	0.00	<.05	0.01	49	74.0
10-07	184121	10	66	244	296	368	0.00	0.00	0.00	<.05	0.00	<.05	0.07	10	
11-19	184362	16	67	208	268	332	0.00	0.00	0.01	<.05	0.00	<.05	0.02	10	41.0
12-16	184574	18	66	160	224	318	0.00	0.00	0.01	<.05	0.00	<.05	0.04	46	36.0
1971	504955														
01-07	184781	11	45	100	136	236	0.00	0.00	0.02	<.05	0.00	<.05	0.04	388	34.0
02-04	185089	7	36	116	146	181	0.00	0.00	0.01	<.05	0.00	<.05	0.02	11	34.0
03-16	185309	18	46	92	144	249	0.00	0.00	0.02	<.05	0.00	<.05	0.04	661	47.0
04-06	185537	13	87	232	292	377	0.00	0.00	0.02	<.05	0.00	<.05	0.02	18	44.0
06-22	185996	13	34	112	144	197	0.00	0.00	0.01	<.05	0.00	<.05	0.00	318	79.0
07-13	186278	6	20	76	84	142	0.00	0.00	0.10	<.05	0.00	<.05	0.00	397	80.0
08-19	186506	11	26	128	144	210	0.00	0.00	0.01	<.05	0.00	<.05	0.01	188	78.0
09-08	186640	7	17	68	72	142	0.00	0.00	0.02	<.05	0.00	<.05	0.01	380	84.0

DES PLAINES RIVER NEAR DES PLAINES

The Des Plaines River rises in Wisconsin near Sturtevant and flows southward into Illinois and through the Wheaton Morainal Region. Below Joliet it converges with the Kankakee River to form the Illinois River. The gaging station is 2.5 miles north of Des Plaines. Elevation of gage datum is 626.31 feet above mean sea level. The drainage basin above the gage has an area of 359 square miles.

The tabulation of water quality data is for the period from October 5, 1966, to August 26, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

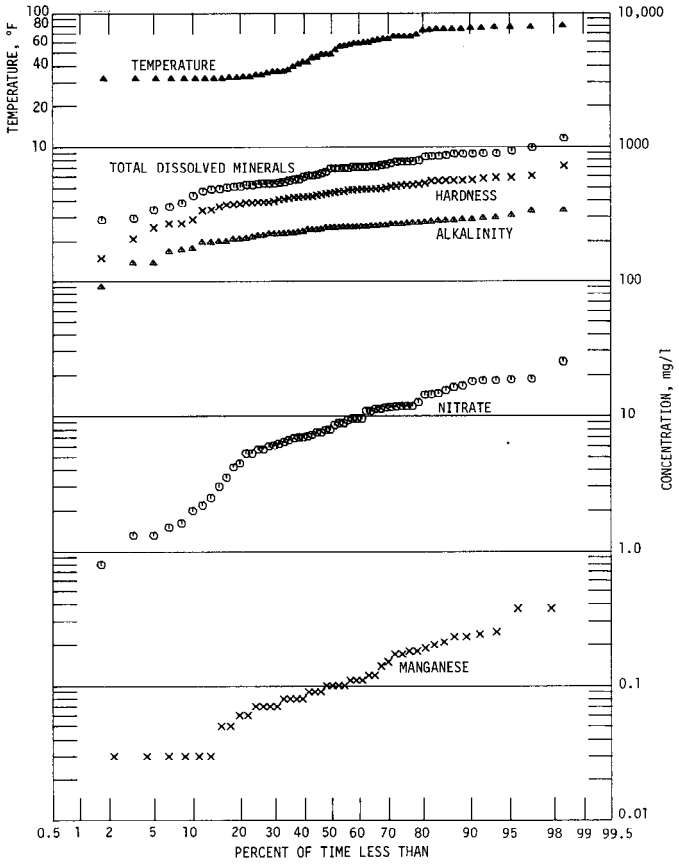
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 2.28 cfs/sq mi, nor fall below 0.05 cfs/sq mi. The median flow was 0.215 cfs/sq mi and the mean was 0.78 cfs/sq mi.

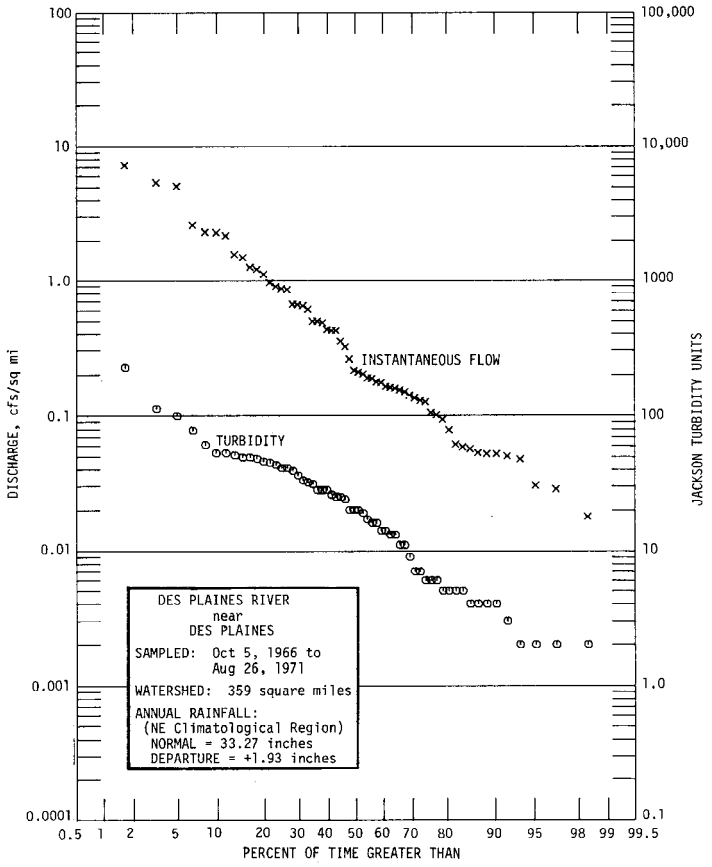
The turbidity was not less than 4 Jtu nor more than 53 Jtu for the central 80 percent of the time. The median value was 20 Jtu and the mean 29 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 22 percent of the time. They were below 50 F for 49 percent and below 40 F for 36 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	176	249	288
Hardness (as $CaCO_3$)	288	457	566
Total dissolved minerals	436	683	883
Nitrate (NO_3)	2.0	8.3(9.1)	18.0
Total inorganic phosphate (PO_4)	0.7	1.9(2.32)	4.9
Soluble inorganic phosphate (PO_4)	0.4	1.6(2.1)	4.5
Manganese (Mn)	0.03	0.10	0.235





DES PLAINES RIVER NEAR DES PLAINES

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505290															
10-05	170103	6.4	0.7	0.09	159.9	76.4	1.50	91	6.7	T	0.80	0.90	3	0.50	0.40	2.2
11-02	170192	10.9	0.6	0.23	128.4	57.4	1.16	82	7.8	T	5.40	5.40	13	0.40	0.50	5.7
12-05	170420	37.6	0.3	0.00	119.6	55.6	0.83	81	7.3	T	3.20	3.30	10	0.30	0.90	9.5
1967	505290															
01-09	170615	33.4	0.3	0.00	132.2	59.7	1.05	75	6.3	3.5	6.40	6.60	5	0.40	0.30	18.3
02-08	170889	92.5	0.2	T	104.0	50.2	0.46	42	4.0	0.1	2.80	2.80	10	0.20	0.10	18.2
03-06	171032	72.4	0.2	0.05	115.2	54.5	0.66	59	5.5	0.1	3.70	3.70	5	0.20	0.20	18.6
04-03	171238	1920.0	2.3	0.03	62.4	27.3	0.14	18	4.1	0.0	0.60	0.70	8	0.20	0.10	18.7
05-02	171429	532.0	1.4	0.07	85.1	38.1	0.25	16	2.8	T	0.20	0.50	4	0.10	0.10	11.3
06-05	171647	63.0	0.8	0.00	107.6	52.4	0.50	22	3.6	T	1.40	1.50	3	0.20	0.20	7.6
07-12	172338	126.0	1.1	0.10	104.4	47.3	0.45	28	3.8	0.1	1.10	1.10	8	0.20	0.20	7.0
08-04	172621	57.6	1.3	0.03	102.4	44.9	0.52	33	4.3	T	1.40	1.60	5	0.30	0.20	4.2
09-05	172950	18.1	0.7	0.15	131.2	62.4	1.13	61	5.6	0.0	2.30	2.40	5	0.40	0.30	3.0
10-04	173244	17.1	1.2	0.17	127.2	58.0	1.05	80	6.8	T	3.60	4.10	8	0.30	0.30	11.3
11-03	173474	219.0	1.5	0.12	87.2	41.4	0.58	48	4.9	T	1.60	2.10	4	0.20	0.20	11.5
12-08	173651	67.4	0.7	0.08	111.6	50.9	0.72	52	4.8	0.2	3.60	4.00	4	0.20	0.20	7.9
1968	505290															
01-02	173908	48.3	0.4	0.00	125.2	60.4	0.75	50	4.3	T	3.60	3.70	2	0.20	0.20	18.0
02-08	174175	233.0	0.4	0.09	90.4	38.5	0.30	32	4.7	0.7	1.50	1.50	6	0.20	0.10	15.4
03-07	174267	50.0	0.3	0.05	104.8	48.3	0.76	58	5.0	2.2	4.50	4.90	4	0.20	0.20	6.9
04-08	174514	178.0	0.8	0.20	107.2	50.8	0.46	37	3.4	0.3	1.70	1.80	2	0.20	0.20	7.0
05-10	174800	56.6	1.0	0.12	114.8	53.9	0.62	45	4.1	0.2	2.60	2.80	1	0.20	0.10	5.3
06-14	175360	28.3	3.2	0.21	117.6	55.1	0.75	58	4.6	0.7	3.90	4.10	5	0.30	0.40	14.6
07-03	175790	310.0	2.6	0.11	87.2	41.3	0.33	24	3.8	0.4	0.30	0.90	13	0.30	0.10	25.0
08-05	176023	58.3	3.9	0.09	107.2	53.0	0.56	39	4.3	0.2	1.40	1.90	7	0.30	0.20	2.0
09-05	176167	44.9	1.1	0.11	116.8	55.4	0.81	61	5.2	0.1	1.90	2.20	3	0.50	0.30	1.5
10-03	176741	46.0	2.2	0.17	104.8	50.6	0.72	50	5.4	0.7	2.10	2.70	5	0.30	0.30	6.1
11-05	176944	21.0	0.3	0.07	128.0	59.8	1.06	73	7.1	0.9	5.50	5.50	5	0.40	0.40	8.0
12-05	177110	238.0	0.8	0.08	102.4	46.7	0.40	31	4.5	0.4	1.20	1.40	8	0.30	0.10	7.1
1969	505290															
01-13	177342	77.3	0.3	0.07	118.0	55.7	0.53	40	3.7	1.7	2.70	2.80	9	0.30	0.20	14.3
02-04	177536	451.0	0.4	T	84.8	42.8	0.28	36	4.4	0.7	0.60	0.70	8	0.30	0.10	16.3
03-04	177759	345.0	0.5	0.03	75.6	35.3	0.27	24	3.5	0.4	0.90	1.00	6	0.20	0.10	10.8
04-01	177991	564.0	0.5	0.07	82.4	40.3	0.25	29	3.0	0.3	0.60	0.70	6	0.20	0.10	16.6
05-13	178142	174.0	1.7	0.18	105.0	49.9	0.42	31	2.8	0.3	2.50	2.50	6	0.20	0.10	6.3
06-02	178662	399.0	2.0	0.11	88.4	39.5	0.31	30	3.8	0.5	1.20	1.60	7	0.20	0.10	9.5
07-02	179010	776.0	6.4	0.10	58.4	25.3	0.17	15	3.5	0.3	0.70	1.00	7	0.20	0.10	8.9
08-05	179428	152.0	2.0	0.10	94.4	43.9	0.33	26	3.6	0.3	1.60	2.10	10	0.30	0.20	5.3
09-04	179692	22.0	3.4	0.37	126.4	59.5	0.82	77	6.5	0.2	3.00	3.10	8	0.40	0.40	2.5
10-08	179898	18.8	0.8	0.18	99.7	43.0	0.91	96	8.3	2.4	5.60	5.80	5	0.40	0.20	3.5
11-06	180074	114.0	0.6	T	109.6	50.5	0.57	46	5.4	0.7	2.80	2.90	8	0.20	0.40	6.5
12-01	180451	62.8	0.2	T	110.4	53.9	0.56	50	5.0	1.0	3.30	3.40	6	0.30	0.20	6.7
1970	505290															
01-13	180576	18.8	0.2	0.08	133.6	65.5	1.00	103	6.8	5.0	8.80	9.00	2	0.40	0.20	11.7
02-02	180905	152.0	0.6	0.03	98.8	46.6	0.60	83	2.7	2.9	3.20	3.20	5	0.30	0.20	7.3
03-02	181008	154.0	0.4	T	84.0	40.5	0.42	44	5.4	2.6	1.90	1.90	6	0.20	0.20	8.6
04-06	181293	824.0	1.8	0.03	77.2	35.9	0.21	32	3.3	0.2	0.40	0.90	2	0.20	0.20	14.4
05-05	181895	433.0	3.8	0.14	90.4	43.7	0.25	30	3.3	0.1	0.50	0.80	3	0.30	0.20	12.5
06-04	182264	2570.0	5.0	T	47.2	21.9	0.11	14	3.3	0.3	0.20	0.50	7	0.20	0.10	9.3
06-30	183190	236.0	5.3	0.00	88.8	41.3	0.25	26	2.9	0.1	0.70	1.00	8	0.30	0.10	8.9
07-29	183503	53.3	1.7	0.23	111.2	50.2	0.62	53	4.0	0.4	1.20	1.80	4	0.30	0.20	1.6
08-31	183602	10.2	2.9	0.37	133.6	61.9	1.15	98	6.8	0.2	1.80	3.00	2	0.60	0.40	0.8
09-30	184072	818.0	2.7	0.08	60.8	28.3	0.21	15	4.3	0.2	0.70	0.70	13	0.30	0.10	11.8
11-02	184396	321.0	0.4	0.00	92.0	43.4	0.34	29	33	0.2	0.50	0.70	8	0.30	0.10	11.6
12-01	184693	304.0	0.3	0.00	96.8	45.4	0.33	27	3.0	0.3	0.80	0.90	6	0.30	0.10	9.5
1971	505290															
01-18	184854	67.0	0.2	0.06	120.8	57.0	0.74	57	4.0	1.1	1.60	1.90	7	0.40	0.20	11.8
02-01	184894	36.0	0.3	0.00	127.2	59.0	0.77	69	4.5	2.1	2.90	2.90	8	0.40	0.30	10.8
02-23	185090	1800.0	1.7	0.06	34.4	15.1	0.11	36	4.8	1.0	0.70	0.70	5	0.20	0.10	7.6
03-23	185419	927.0	1.1	0.03	67.2	29.3	0.18	35	2.9	0.3	0.30	0.50	6	0.20	0.10	11.8
04-29	185652	178.0	0.4	0.00	94.4	44.9	0.41	39	3.0	0.8	0.40	0.60	3	0.30	0.20	5.7
05-24	185945	54.8	1.3	0.24	105.2	53.9	0.66	59	3.7	0.2	1.30	1.30	3	0.40	0.20	4.5
06-24	186202	74.5	2.2	0.19	82.4	37.6	0.49	52	4.2	0.0	1.30	1.30	6	0.40	0.20	6.0
07-30	186397	20.5	1.9	0.25	106.0	51.4	1.08	89	6.1	0.1	1.60	2.20	2	0.40	0.40	1.3
08-26	186638	19.1	0.6	0.10	99.2	42.9	1.30	86	6.7	0.9	1.70	1.80	2	0.50	0.40	1.3

DES PLAINES RIVER NEAR DES PLAINES

DATE	LAB.NO.	CL	SO4	ALK.	TH.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505290														
10-05	170103	100	529	234	714	1152			0.03					19	59.0
11-02	170192	84	371	228	556	884			0.01					20	41.0
12-05	170420	118	304	228	527	842			0.01					5	32.0
1967	505290														
01-09	170615	103	328	264	577	890			0.02					4	32.0
02-08	170889	66	243	206	467	703		0.00	0.01				0.02	4	32.0
03-06	171032	96	270	220	512	770		0.00	0.01				0.02	2	33.0
04-03	171238	33	107	136	268	382		0.00	0.01				0.05	53	55.0
05-02	171429	38	161	196	370	487		0.00	0.01				0.04	25	56.0
06-05	171647	50	226	256	484	650		0.00	0.01				0.03	13	
07-12	172338	41	193	248	455	610		0.00	0.01				0.00	28	77.0
08-04	172621	49	199	250	440	619		0.00	0.01				0.01	20	77.0
09-05	172950	70	335	252	584	859		0.00	0.02				0.01	16	
10-04	173244	87	340	252	556	883		0.00	0.01				0.02	32	66.0
11-03	173474	58	194	196	388	571		0.00	0.02				0.02	28	45.5
12-08	173651	67	251	248	488	706		0.00	0.02				0.01	13	39.0
1968	505290														
01-02	173908	72	260	296	560	785		0.01	0.01				0.01	4	32.0
02-08	174175	56	163	198	384	523		0.00	0.01				0.01	14	33.0
03-07	174267	72	238	240	460	690		0.00	0.02				0.02	5	35.0
04-08	174514	65	205	256	476	634		0.00	0.01				0.02	36	52.0
05-10	174800	63	237	270	508	707		0.01	0.02				0.03	20	62.0
06-14	175360	78	244	288	520	767		0.00	0.02				0.03	112	75.0
07-03	175790	42	140	224	388	500		0.00	0.00				0.03	51	66.0
08-05	176023	57	237	280	486	710		0.00	0.01				0.03	78	76.0
09-05	176167	78	285	268	520	881		0.00	0.01				0.01	17	73.0
10-03	176741	67	227	260	420	686		0.00	0.02				0.02	53	63.0
11-05	176944	93	312	288	566	878		0.05	0.02				0.01	6	48.0
12-05	177110	56	187	250	448	596		0.00	0.02				0.02	11	36.0
1969	505290														
01-13	177342	67	221	294	524	704		0.00	0.02				0.07	4	32.0
02-04	177536	67	152	214	388	535		0.00	0.01				0.02	7	32.0
03-04	177759	42	127	208	334	471	0.00	0.00	0.01	<.05		<.05	0.01	9	36.0
04-01	177991	60	135	224	372	506	0.00	0.00	0.02	<.05	0.00	<.05	0.02	6	37.0
05-13	178142	48	188	272	467	607	0.00	0.00	0.02	<.05	0.00	<.05	0.05	28	58.1
06-02	178662	49	158	232	383	533	0.00	0.00	0.02	<.05	0.00	<.05	0.04	49	61.0
07-02	179010	23	82	166	250	360	0.00	0.00	0.02	<.05	0.00	<.05	0.02	226	68.0
08-05	179428	38	138	276	416	521	0.00	0.00	0.01	<.05	0.01	<.05	0.03	26	76.0
09-04	179692	97	311	282	560	850	0.00	0.00	0.10	<.05	0.01	<.05	0.07	39	74.0
10-08	179898	113	259	226	426	768	0.00	0.00	0.02	<.05	0.01	<.05	0.03	16	63.0
11-06	180074	64	222	254	481	682	0.00	0.00	0.01	<.05	0.00	<.05	0.02	11	42.0
12-01	180451	72	222	270	497	710	0.00	0.00	0.01	<.05	0.00	<.05	0.04	2	34.0
1970	505290														
01-13	180576	132	294	334	603	979	0.00	0.00	0.02	<.05	0.01	<.05	0.04	5	32.5
02-02	180905	126	200	242	438	727	0.00	0.01	0.03	<.05	0.00	<.05	0.03	14	32.5
03-02	181008	72	146	220	376	541	0.00	0.00	0.02	<.05	0.00	<.05	0.02	7	34.0
04-06	181293	62	130	198	340	483	0.00	0.00	0.01	<.05	0.00	<.05	0.03	33	42.0
05-05	181895	57	141	240	406	530	0.00	0.00	0.02	<.05	0.01	<.05	0.02	43	58.0
06-04	182264	23	69	136	208	294	0.00	0.00	0.02	<.05	0.00	<.05	0.01	99	57.0
06-30	183190	41	131	252	392	512	0.00	0.00	0.02	<.05	0.00	<.05	0.02	61	75.0
07-29	183503	73	229	260	484	685	0.00	0.00	0.02	<.05	0.01	<.05	0.01	41	79.0
08-31	183602	124	351	264	588	929	0.00	0.00	0.01	<.05	0.01	<.05	0.01	46	75.0
09-30	184072	26	86	172	268	341	0.00	0.00	0.00	<.05	0.00	<.05	0.03	45	59.0
11-02	184396	50	146	240	408	535	0.00	0.00	0.01	<.05	0.00	<.05	0.03	6	48.0
12-01	184693	45	149	252	428	559	0.00	0.00	0.01	<.05	0.00	<.05	0.01	3	46.0
1971	505290														
01-18	184854	88	205	308	536	733	0.00	0.00	0.00	<.05	0.01	<.05	0.07	2	32.0
02-01	184894	102	225	332	560	845	0.00	0.01	0.02	<.05	0.01	<.05	0.07	5	32.0
02-23	185090	62	50	90	148	285	0.00	0.00	0.01	<.05	0.00	<.05	0.02	41	32.0
03-23	185419	67	88	176	288	436	0.00	0.00	0.02	<.05	0.00	<.05	0.03	24	36.0
04-29	185652	65	158	254	420	569	0.00	0.00	0.01	<.05	0.00	<.05	0.03	2	48.0
05-24	185945	86	203	280	484	687	0.00	0.00	0.01	<.05	0.01	<.05	0.03	31	66.0
06-24	186202	72	151	210	360	549	0.00	0.00	0.01	<.05	0.00	<.05	0.00	49	77.0
07-30	186397	114	233	264	476	769	0.00	0.00	0.02	<.05	0.01	<.05	0.02	48	66.0
08-26	186638	102	236	224	424	750	0.00	0.00	0.01	<.05	0.01	<.05	0.02	25	75.0

EDWARDS RIVER NEAR NEW BOSTON

The Edwards River rises in the Galesburg Plain Region west of Galesburg and flows westward into the Mississippi River. The gaging station is 1.5 miles northeast of New Boston and 5 miles upstream from the mouth of the river. Elevation of gage datum is 529.92 feet above mean sea level. The drainage basin above the gage has an area of 434 square miles.

The tabulation of water quality data is for the period from October 11, 1966, to September 8, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

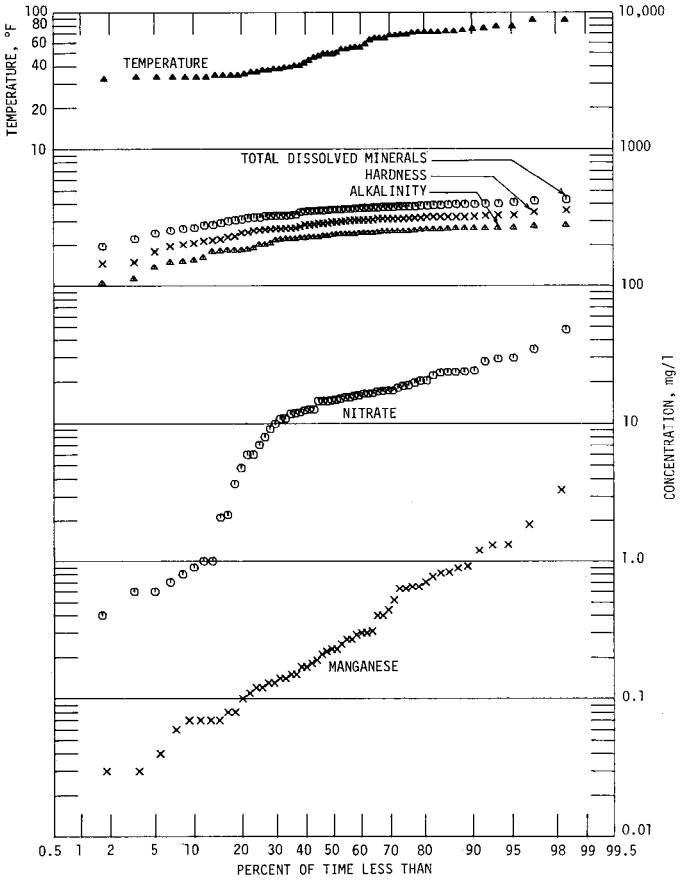
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.03 cfs/sq mi, nor fall below 0.06 cfs/sq mi. The median flow was 0.375 cfs/sq mi and the mean was 0.56 cfs/sq mi.

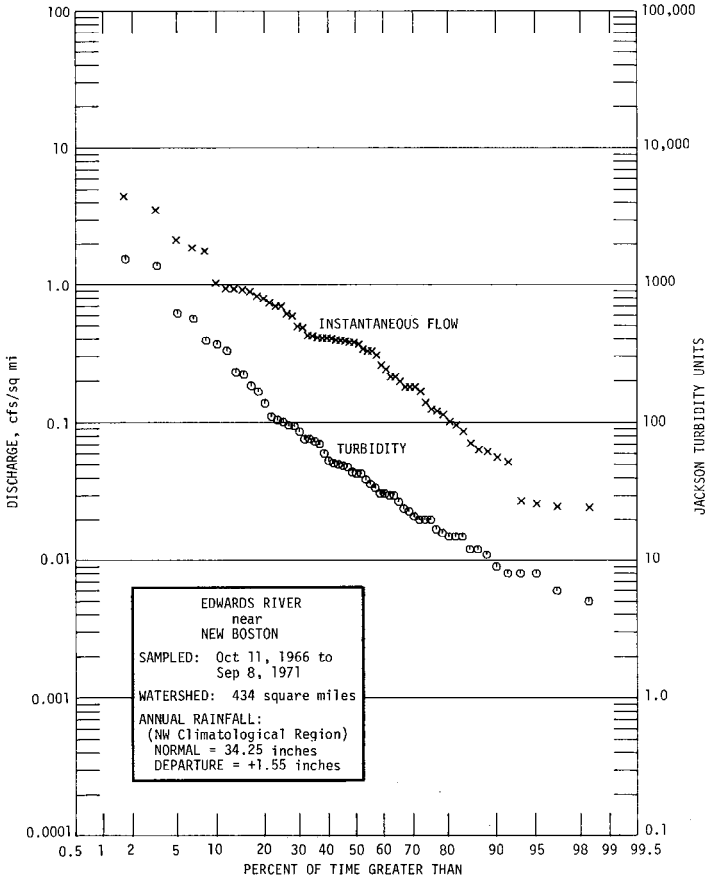
The turbidity was not less than 9 Jtu nor more than 367 Jtu for the central 80 percent of the time. The median value was 43 Jtu and the mean 135 Jtu.

Reported temperatures were over 80 F for 5 percent and over 70 F for 25 percent of the time. They were below 50 F for 49 percent and below 40 F for 34 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	154	237	264
Hardness (as $CaCO_3$)	204	296	324
Total dissolved minerals	268	363	399
Nitrate (NO_3)	0.9	14.75(14.2)	24.0
Total inorganic phosphate (PO_4)	0.3	0.7(0.94)	2.2
Soluble inorganic phosphate (PO_4)	0.1	0.4(0.43)	0.8
Manganese (Mn)	0.07	0.23	1.06





EDWARDS RIVER NEAR NEW BOSTON

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	504665															
10-11	170049	10.8	0.1	1.20	73.0	28.2		8		0.1	0.20	0.30	9	0.10	0.10	1.0
11-29	170422	49.0	1.1	0.40	63.2	24.9	0.19	17	6.3	0.1	0.10	0.30	6	0.20	0.20	3.7
12-08	170484	266.0	12.0	0.70	71.8	25.0	0.18	12	5.0	0.1	1.20	1.80	15	0.30	0.10	23.5
1967	504665															
01-12	170656	43.9	0.7	0.31	70.4	27.6	0.15	15	4.8	T	0.60	0.90	13	0.20	0.10	15.4
02-08	170890	54.0	6.5	0.63	81.8	30.9	0.20	16	3.2	T	0.40	0.50	14	0.20	0.10	9.9
03-07	171104	210.0	2.4	0.29	44.8	15.6	0.07	7	6.6	0.1	1.00	1.50	9	0.20	0.00	14.4
04-12	171322	384.0	6.1	0.13	70.8	27.6	0.14	10	2.2	T	0.80	1.20	11	0.20	0.20	18.9
05-19	171543	255.0	4.2	0.04	72.0	28.2	0.15	11	1.4	0.0	0.10	0.40	9	0.30	0.10	17.2
06-15	171905	800.0	4.0	0.65	63.2	22.8	0.11	9	3.0	T	0.60	2.40	12	0.20	0.20	23.5
07-17	172336	104.0	0.5	0.03	74.8	28.6	0.14	10	1.8	0.1	0.20	0.30	11	0.20	0.10	14.5
08-16	172864	71.9	1.9	0.07	75.8	30.3	0.19	11	2.5	T	0.70	0.80	12	0.10	0.10	10.8
09-20	173176	41.6	2.2	0.15	57.6	24.9	0.14	13	4.3	T	0.60	0.90	7	0.20	0.10	2.2
10-18	173360	146.0	15.0	0.44	47.6	18.2	0.11	12	7.5	T	0.60	1.90	6	0.10	0.10	10.9
11-15	173564	320.0	4.5	0.18	76.0	30.3	0.15	11	1.8	0.4	0.20	0.60	8	0.20	0.10	20.4
12-06	173704	164.0	2.4	0.07	78.2	30.8	0.14	12	1.5	0.4	0.30	0.90	14	0.30	0.10	17.1
1968	504665															
01-04	173911	142.0	0.6	0.06	73.6	31.3	0.16	12	1.5	T	0.10	0.40	7	0.20	0.00	18.6
02-01	173955	401.0	24.0	0.77	57.6	21.0	0.12	9	6.1	0.5	0.30	2.20	10	0.10	0.00	15.0
03-22	174349	182.0	4.4	0.17	74.0	28.1	0.17	14	2.6	T	0.40	1.00	10	0.20	0.00	15.4
04-18	174537	168.0	5.3	0.25	74.8	28.5	0.16	13	2.1	T	0.50	2.20	9	0.10	0.10	12.6
05-20	174884	91.8	1.3	0.08	76.8	31.6	0.03	12	1.5	0.1	0.70	0.70	5	0.20	0.10	9.1
06-11	175091	52.4	2.9	0.23	72.8	29.8	0.17	15	2.5	0.1	0.50	0.80	10	0.30	0.10	6.0
07-15	175662	37.3	0.8	0.12	57.6	29.3	0.16	12	2.9	0.6	0.20	0.40	5	0.30	0.10	0.6
08-05	175969	27.7	2.4	0.65	58.4	28.8	0.12	13	3.0	0.1	0.40	0.40	4	0.30	0.00	0.7
09-10	176237	11.3	0.7	0.52	60.0	26.8	0.12	15	3.2	0.5	0.30	0.30	7	0.30	0.00	0.4
10-10	176592	11.9	0.5	0.83	69.6	29.7	0.20	16	5.1	0.1	0.30	0.90	9	0.20	0.10	0.8
11-01	176812	10.7	0.6	0.82	73.6	31.2	0.14	18	4.0	0.2	0.30	0.40	7	0.20	0.10	0.6
12-13	177095	26.8	1.1	0.11	76.8	31.1	0.11	14	3.8	0.2	0.20	0.40	9	0.20	0.10	7.0
1969	504665															
01-09	177306	22.6	0.3	0.27	75.2	30.2	0.17	13	7.4	0.4	0.40	0.50	12	0.20	0.10	17.2
02-17	177473	301.0	1.3	0.63	55.2	19.5	0.11	11	6.5	1.5	0.70	1.00	10	0.20	0.10	4.8
03-13	177816	78.1	1.1	0.92	68.0	25.3	0.13	15	3.7	0.5	0.20	0.40	11	0.20	0.10	6.0
04-28	178032	132.0	14.0	0.89	72.8	30.2	0.14	12	2.2	0.1	0.40	2.00	6	0.20	0.10	12.6
05-15	178345	176.0	4.0	0.17	70.4	27.4	0.15	12	2.6	0.2	0.50	1.00	8	0.20	0.10	16.3
06-05	178806	85.2	2.7	0.12	76.4	29.5	0.13	12	2.3	0.2	0.40	0.70	11	0.20	0.00	12.0
07-09	179050	1930.0	27.0	1.33	36.0	13.1	0.08	7	5.5	0.2	0.60	2.50	11	0.10	0.00	14.7
08-14	179401	214.0	3.2	0.00	76.8	31.3	0.14	12	3.0	T	0.10	0.40	8	0.30	0.00	19.6
09-16	179823	77.9	1.1	0.15	77.0	29.2	0.13	13	3.2	0.1	0.20	0.30	10	0.20	0.10	8.0
10-16	179930	762.0	8.3	0.27	63.2	22.0	0.10	10	5.4	0.1	2.30	3.00	13	0.20	0.10	22.2
11-14	180163	159.0	0.7	T	81.6	31.3	0.13	12	1.9	0.1	0.40	0.50	12	0.30	0.00	16.5
12-09	180415	112.0	1.0	T	79.2	30.3	0.09	14	1.6	0.1	0.10	0.10	11	0.30	0.00	18.0
1970	504665															
01-07	180701	60.1	0.4	0.30	88.8	33.7	0.15	14	1.1	0.2	0.10	0.10	12	0.10	0.00	15.9
02-11	180865	164.0	3.6	0.22	64.8	24.4	0.09	11	5.7	1.0	0.60	1.10	11	0.20	0.10	14.8
03-18	181071	142.0	1.8	0.08	75.2	31.3	0.07	11	1.8	0.2	0.10	0.30	6	0.20	0.10	15.7
04-15	181529	1530.0	6.4	0.30	57.0	20.9	0.12	12	4.0	T	0.60	1.40	4	0.20	0.20	29.8
05-21	181901	920.0	7.8	0.00	62.8	24.2	0.11	9	2.9	0.1	0.30	0.90	7	0.20	0.20	29.3
06-10	182467	446.0	3.6	0.19	74.4	28.8	0.11	10	1.5	0.1	0.00	0.30	7	0.30	0.10	48.0
07-07	183245	169.0	3.2	0.14	78.4	31.1	0.12	10	1.6	0.2	0.30	0.50	14	0.30	0.10	27.9
08-04	183617	78.0	6.2	0.40	71.2	26.9	0.14	11	3.8	0.2	0.40	1.00	11	0.30	0.10	11.7
09-16	184122	395.0	28.0	1.87	53.6	19.0	0.10	10	8.0	0.6	1.00	3.30	7	0.20	0.10	14.5
10-14	184124	342.0	2.2	0.14	82.4	30.0	0.15	10	1.9	T	0.20	0.50	12	0.30	0.10	23.7
11-04	184437	355.0	2.1	0.13	81.6	35.1	0.19	16	1.4	T	0.50	0.70	12	0.40	0.10	34.3
12-21	184668	404.0	0.3	0.07	50.4	21.9	0.05	5	0.7	0.1	0.00	0.30	11	0.20	0.10	11.8
1971	504665															
01-13	184785	177.0	0.7	0.07	74.4	31.7	0.12	11	1.2	0.3	0.00	0.10	11	0.30	0.10	24.0
02-09	185087	176.0	1.7	0.03	49.6	18.5	0.11	10	9.6	2.2	1.00	1.00	8	0.20	0.10	16.4
03-29	185308	300.0	4.7	0.21	76.8	29.3	0.13	10	2.7	0.2	0.40	0.50	10	0.30	0.10	23.3
04-07	185536	184.0	1.5	0.23	77.6	30.8	0.14	10	1.5	0.1	0.10	0.20	9	0.30	0.10	20.2
05-25	185816	170.0	51.0	3.34	65.2	24.2	0.14	10	3.4	0.5	0.50	4.20	10	0.30	0.10	12.4
06-23	185993	92.3	3.4	0.10	68.0	28.8	0.15	14	3.2	0.9	0.40	0.60	7	0.30	0.10	0.9
07-15	186275	174.0	26.0	1.32	38.0	12.9	0.08	8	4.5	T	0.50	1.50	8	0.20	0.00	17.0
08-05	186507	30.7	0.8	0.00	59.2	29.3	0.13	13	2.8	0.1	0.20	0.30	4	0.30	0.10	1.0
09-08	186688	24.5	3.4	0.00	50.4	19.0	0.10	11	8.0	0.5	0.30	0.60	7	0.30	0.10	2.1

EDWARDS RIVER NEAR NEW BOSTON

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB	TEMP
1966	504665														
10-11	170049	7	56	246	298	353									54.0
11-29	170422	11	59	216	258	327			0.01					20	38.0
12-08	170484	11	64	200	282	354			0.00					220	37.0
1967	504665														
01-12	170656	13	68	220	281	357		0.00	0.01				0.01	15	33.0
02-08	170890	11	71	260	331	409			0.01					94	34.0
03-07	171104	7	48	136	176	255		0.00	0.01				0.05	60	35.0
04-12	171322	9	61	220	290	365		0.00	0.01				0.02	110	
05-19	171543	9	60	232	296	363		0.00	0.00				0.04	51	64.0
06-15	171905	8	50	188	255	330		0.00	0.01				0.13	330	78.0
07-17	172336	7	57	252	305	376		0.00	0.01				0.03	9	71.0
08-16	172864	9	54	264	303	375		0.00	0.02				0.02	30	71.0
09-20	173176	10	49	204	246	308		0.00	0.01				0.01	31	67.0
10-18	173360	10	48	154	194	268		0.00	0.01				0.02	367	50.0
11-15	173564	9	61	246	314	379		0.00	0.01				0.00	95	40.0
12-06	173704	8	62	260	322	397		0.00	0.01				0.02	43	39.0
1968	504665														
01-04	173911	9	63	252	312	384		0.00	0.00				0.01	8	33.0
02-01	173955	8	48	180	230	299		0.00	0.01				0.12	388	38.0
03-22	174349	13	67	232	300	363		0.00	0.02				0.03	86	40.0
04-18	174537	10	65	240	304	378		0.00	0.01				0.05	104	64.0
05-20	174884	8	61	268	322	379		0.00	0.00				0.05	24	58.0
06-11	175091	9	57	260	304	391		0.00	0.01				0.03	43	78.0
07-15	175662	8	57	221	264	334		0.00	0.00				0.01	27	87.0
08-05	175969	8	50	236	264	318		0.00	0.01				0.01	53	87.0
09-10	176237	9	52	228	260	305		0.00	0.01				0.02	15	71.0
10-10	176592	12	57	256	296	363		0.00	0.01				0.01	11	49.0
11-01	176812	11	54	276	312	370		0.00	0.01				0.00	12	44.0
12-13	177095	12	62	270	320	381		0.00	0.01				0.05	20	34.0
1969	504665														
01-09	177306	14	74	246	312	399		0.00	0.01				0.01	6	33.0
02-17	177473	12	57	180	218	291	0.00	0.00	0.01	<.05		<.05	0.20	23	34.0
03-13	177816	12	66	228	274	354	0.00	0.00	0.01	<.05		<.05	0.01	17	32.0
04-28	178032	12	62	254	306	360	0.00	0.00	0.01	<.05	0.00	<.05	0.02	184	42.0
05-15	178345	11	65	224	288	358	0.00	0.00	0.01	<.05	0.00	<.05	0.03	49	53.0
06-05	178806	9	61	264	312	390	0.03	0.00	0.01	0.00		<.05	0.04	34	53.0
07-09	179050	6	30	104	144	194	0.00	0.00	0.04	<.05	0.00	<.05	0.05	1372	68.0
08-14	179401	13	57	264	320	392	0.00	0.00	0.02	<.05	0.00	<.05	0.05	50	72.0
09-16	179823	11	60	263	312	384	0.00	0.00	0.02	<.05	0.01	<.05	0.05	16	62.0
10-16	179930	11	56	180	248	329	0.01	0.01	0.01	<.05	0.00	<.05	0.02	137	49.0
11-14	180163	12	63	258	332	400	0.00	0.00	0.01	<.05	0.00	<.05	0.02	8	37.0
12-09	180415	13	61	252	322	399	0.00	0.00	0.00	<.05	0.00	<.05	0.04	12	36.0
1970	504665														
01-07	180701	12	68	280	360	419	0.00	0.00	0.02	<.05	0.00	<.05	0.02	5	33.0
02-11	180865	14	52	200	262	318	0.00	0.00	0.01	<.05	0.00	<.05	0.02	39	34.0
03-18	181071	12	64	240	316	388	0.00	0.00	0.01	<.05	0.00	<.05	0.01	31	36.0
04-15	181529	18	53	150	228	316	0.00	0.00	0.02	<.05	0.00	<.05	0.01	230	49.0
05-21	181901	12	50	178	256	329	0.00	0.00	0.02	<.05	0.00	<.05	0.08	166	72.0
06-10	182467	13	55	224	304	383	0.00	0.00	0.01	<.05	0.00	<.05	0.01	70	68.0
07-07	183245	12	56	248	324	382	0.00	0.00	0.01	<.05	0.00	<.05	0.01	48	71.0
08-04	183617	11	52	240	288	366	0.00	0.00	0.01	<.05	0.00	<.05	0.01	101	70.0
09-16	184122	12	44	160	212	279	0.00	0.00	0.01	<.05	0.00	<.05	0.00	619	64.0
10-14	184124	11	56	252	328	400	0.00	0.00	0.01	<.05	0.00	<.05	0.00	36	55.0
11-04	184437	21	58	264	348	428	0.00	0.00	0.01	<.05	0.00	<.05	0.02	21	46.0
12-21	184668	7	22	184	216	243	0.00	0.00	0.00	<.05	0.00	<.05	0.02	8	
1971	504665														
01-13	184785	13	61	240	316	368	0.00	0.00	0.01	<.05	0.00	<.05	0.06	15	33.0
02-09	185087	15	52	148	200	281	0.00	0.00	0.01	<.05	0.00	<.05	0.01	44	33.0
03-29	185308	11	59	244	312	395	0.00	0.00	0.02	<.05	0.00	<.05	0.78	76	39.0
04-07	185536	13	60	252	320	373	0.00	0.00	0.01	<.05	0.00	<.05	0.02	20	47.0
05-25	185816	10	46	218	262	325	0.00	0.00	0.02	<.05	0.00	<.05	0.00	1540	55.0
06-23	185993	12	57	238	284	348	0.00	0.00	0.02	<.05	0.00	<.05	0.02	73	76.0
07-15	186275	7	30	112	148	220	0.00	0.00	0.02	<.05	0.00	<.05	0.02	564	75.0
08-05	186507	10	54	228	268	329	0.00	0.00	0.01	<.05	0.00	<.05	0.00	30	67.0
09-08	186688	10	41	176	204	262	0.00	0.00	0.01	<.05	0.00	<.05	0.01	76	73.0

EDWARDS RIVER NEAR ORION

The Edwards River rises in the Galesburg Plain Region west of Galesburg and flows westward into the Mississippi River. The gaging station is 5.5 miles south of Orion. Elevation of gage datum is 653.96 feet above mean sea level. The drainage basin above the gage has an area of 163 square miles.

The tabulation of water quality data is for the period from October 11, 1966, to September 7, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

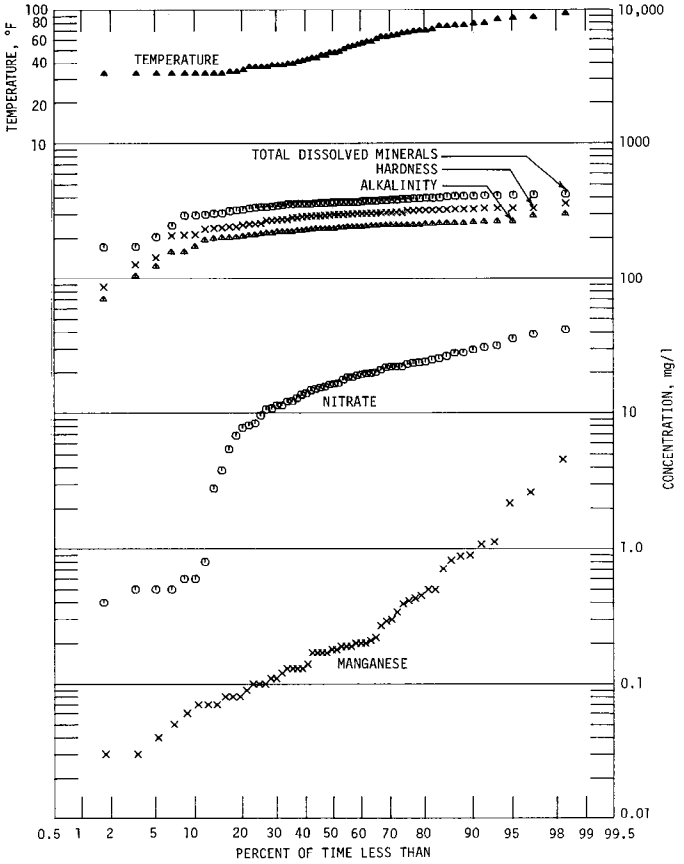
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.3 cfs/sq mi, nor fall below 0.028 cfs/sq mi. The median flow was 0.30 cfs/sq mi and the mean was 0.49 cfs/sq mi.

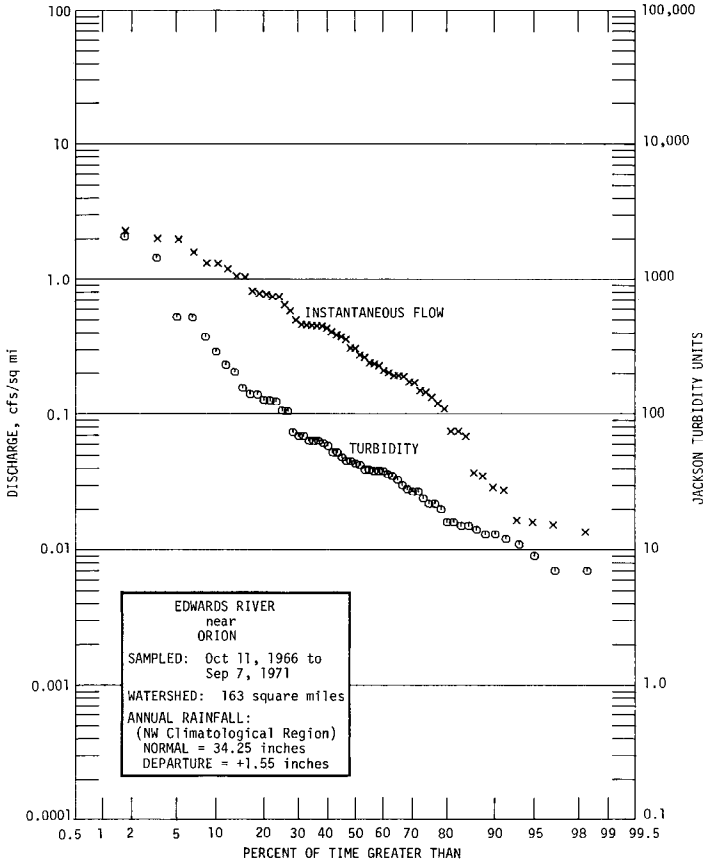
The turbidity was not less than 13 Jtu nor more than 289 Jtu for the central 80 percent of the time. The median value was 43 Jtu and the mean 138 Jtu.

Reported temperatures were over 80 F for 8 percent and over 70 F for 20 percent of the time. They were below 50 F for 52 percent and below 40 F for 35 percent of the time.

The analyses indicated the following:

	Concentration (mg/l) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	172	232	260
Hardness (as $CaCO_3$)	210	296	324
Total dissolved minerals	293	364	404
Nitrate (NO_3)	0.6	16.2(16.4)	29.3
Total inorganic phosphate (PO_4)	0.3	0.7(1.11)	2.5
Soluble inorganic phosphate (PO_4)	0.2	0.4(0.46)	0.8
Manganese (Mn)	0.065	0.18	0.985





EDWARDS RIVER NEAR ORION

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	504660															
10-11	170050	5.7	1.0	0.71	68.0	26.9		20		0.1	0.20	0.40	6	0.30	0.10	0.4
11-30	170485	24.0	9.6	1.12	51.0	20.1	0.12	14	7.4	0.1	1.80	3.10	10	0.50	0.10	16.1
12-09	170487	120.0	1.2	0.12	69.4	27.4	0.16	17	4.0	T	0.70	1.00	13	0.20	0.10	11.3
1967	504660															
01-10	170657	30.6	0.7	0.43	77.6	30.8	0.17	15	2.9	0.1	0.50	0.60	14	0.20	0.10	14.9
02-07	170891	21.4	0.8	0.13	78.4	30.3	0.18	18	2.2	0.1	0.50	1.30	14	0.20	0.10	12.1
03-08	171105	31.1	3.3	0.30	62.8	23.2	0.11	9	4.0	0.1	0.60	1.10	12	0.10	0.10	14.6
04-07	171180	168.0	7.7	0.20	71.6	27.6	0.13	10	1.6	T	0.10	0.60	11	0.20	0.00	27.9
05-15	171534	125.0	1.4	0.08	72.0	28.8	0.15	9	1.3	T	0.70	1.40	8	0.10	0.10	23.1
06-22	171903	320.0	29.0	0.88	60.8	21.5	0.12	8	3.4	0.1	0.20	2.00	10	0.20	0.10	31.7
07-17	172359	44.2	1.2	0.10	71.2	29.8	0.13	10	2.3	T	0.40	0.60	11	0.10	0.10	12.0
08-07	172862	326.0	23.0	2.61	32.0	11.2	0.11	8	4.5	T	0.40	5.00	9	0.10	0.10	8.1
09-21	173175	39.0	0.8	0.17	63.2	27.4	0.16	16	4.3	0.1	0.70	1.30	9	0.30	0.10	8.4
10-20	173363	23.2	3.0	0.17	75.2	28.8	0.16	14	2.9	T	0.70	0.90	8	0.10	0.10	9.6
11-17	173560	132.0	6.3	0.19	74.0	28.1	0.14	11	1.4	T	0.30	1.10	14	0.20	0.10	22.0
12-07	173709	74.6	6.7	0.21	78.0	30.5	0.17	12	1.4	0.1	0.80	1.40	11	0.30	0.00	19.0
1968	504660															
01-17	173914	50.0	2.6	0.05	76.4	30.5	0.14	12	1.2	0.1	0.60	0.70	12	0.10	0.10	19.7
01-31	173958	127.0	6.9	0.22	66.4	25.9	0.13	11	3.2	0.2	0.40	1.10	11	0.20	0.10	19.5
03-22	174348	73.3	3.2	0.10	74.4	27.8	0.14	13	1.5	T	0.50	0.90	11	0.20	0.10	21.0
04-27	174539	74.3	1.8	0.19	72.8	28.3	0.13	11	1.4	T	0.70	1.30	9	0.20	0.00	16.5
05-23	174885	49.6	3.5	0.13	72.8	29.2	0.13	14	1.3	0.1	0.60	0.70	6	0.20	0.10	13.8
06-18	175142	19.4	0.7	0.09	65.6	30.2	0.16	15	1.8	0.1	0.20	0.40	9	0.30	0.10	5.4
07-23	175659	11.1	0.7	0.17	46.4	29.2	0.13	13	12.6	0.1	0.60	0.70	5	0.30	0.10	0.6
08-06	175968	12.1	2.4	0.29	55.6	27.6	0.15	20	3.5	0.4	0.50	0.70	10	0.30	0.20	3.8
09-12	176238	2.2	2.2	0.41	46.4	22.4	0.13	30	3.4	T	0.00	0.30	5	0.30	0.10	0.5
10-08	176590	2.7	0.3	0.04	56.8	25.9	0.14	18	3.0	T	0.20	0.20	5	0.30	0.10	0.5
11-06	176813	2.5	0.5	0.45	64.8	26.8	0.16	32	2.9	0.1	0.20	0.20	5	0.40	0.10	0.5
12-17	177107	4.5	1.5	2.17	77.6	31.1	0.18	25	3.5	0.2	0.20	0.40	10	0.30	0.10	6.8
1969	504660															
01-10	177305	4.7	14.0	0.82	20.8	8.3	0.06	7	9.2	0.2	1.30	6.20	8	0.10	0.10	15.3
02-18	177472	38.2	0.6	0.89	57.6	21.9	0.12	16	4.3	1.2	0.80	0.80	10	0.20	0.10	10.7
03-23	177817	62.8	11.0	1.08	62.4	23.8	0.13	24	4.3	0.8	0.60	2.00	7	0.20	0.10	11.3
04-29	178030	37.2	0.5	0.20	69.2	29.4	0.13	13	1.3	0.1	0.10	0.20	5	0.20	0.10	12.8
05-13	178344	80.8	8.7	0.39	65.6	25.4	0.15	12	2.3	0.2	0.60	0.70	9	0.20	0.10	17.5
06-03	178807	31.1	1.5	0.06	76.0	27.8	0.15	13	1.7	0.3	0.30	1.10	10	0.20	0.00	15.5
08-12	179402	65.8	2.3	0.08	80.8	30.8	0.15	12	2.2	0.2	0.20	0.40	10	0.30	0.10	24.0
09-26	179820	17.7	0.6	0.07	66.7	31.5	0.14	18	2.1	0.1	0.20	1.70	6	0.30	0.10	7.8
10-17	179929	171.0	5.8	0.17	69.2	27.2	0.11	12	2.6	0.1	0.10	0.40	4	0.30	0.10	27.8
11-12	180162	60.9	3.4	0.11	79.2	30.8	0.14	12	1.5	0.2	0.70	1.30	8	0.20	0.10	18.3
12-10	180414	42.5	2.2	0.20	80.8	29.3	0.14	14	1.5	0.1	0.40	0.70	12	0.20	0.10	22.0
1970	504660															
01-20	180907		6.6	0.50	78.8	39.3	0.07	13	2.0	0.5	1.40	2.00	9	0.20	0.10	21.8
02-11	180863		1.5	0.14	74.8	28.6	0.11	14	2.5	0.5	0.50	0.70	11	0.20	0.10	18.3
03-16	181072	32.8	2.3	0.07	77.6	29.7	0.14	14	1.5	0.2	0.20	0.60	6	0.20	0.10	20.0
04-16	181530	372.0	7.9	0.34	68.8	26.4	0.14	11	1.8	0.1	0.90	2.60	5	0.20	0.20	35.5
05-27	181900	212.0	1.1	0.13	72.0	28.3	0.11	10	1.0	0.2	0.20	0.70	7	0.20	0.10	38.5
06-09	182470	193.0	4.3	0.13	74.4	28.3	0.10	10	1.1	0.1	0.20	0.40	11	0.20	0.10	41.3
07-08	183244	73.0	3.9	0.00	78.4	31.2	0.12	11	1.0	0.1	0.20	0.40	12	0.30	0.10	30.7
08-04	183616	34.0	1.0	0.03	72.8	29.7	0.14	12	1.4	0.1	0.10	0.30	9	0.30	0.10	16.2
09-17	183896	256.0	23.0	0.50	53.6	18.5	0.11	9	3.8	0.3	0.90	2.50	8	0.30	0.80	19.2
10-15	184127	95.0	3.6	0.07	82.4	30.0	0.15	10	1.3	0.1	0.30	0.60	13	0.30	0.10	26.3
11-05	184359	105.0	3.9	0.11	82.4	29.8	0.13	11	1.1	0.1	0.30	0.40	11	0.30	0.00	29.3
12-09	184572	70.0	2.9	0.10	78.4	31.3	0.14	12	0.9	0.4	0.30	0.50	11	0.30	0.10	23.4
1971	504660															
01-13	184780	58.0	2.1	0.03	81.6	30.3	0.15	12	1.0	0.1	0.70	1.40	11	0.30	0.10	24.7
02-08	185086	28.0	1.2	0.19	72.0	26.4	0.13	11	5.9	1.0	0.50	0.70	10	0.30	0.10	22.1
03-18	185313	120.0	9.0	0.27	72.0	26.4	0.15	10	1.9	0.1	0.20	0.80	10	0.30	0.10	25.3
04-05	185540	73.0	1.4	0.08	76.0	28.8	0.12	11	1.5	0.1	0.30	0.50	9	0.20	0.10	23.6
05-26	185815	27.5	0.3	0.18	69.6	29.8	0.13	16	1.8	0.6	0.40	0.50	9	0.40	0.10	13.5
06-22	185997	12.1	0.6	0.18	60.8	28.3	0.15	20	1.9	0.3	0.20	0.30	7	0.30	0.10	2.8
07-13	186273	213.0	82.0	4.56	38.4	11.2	0.08	7	3.9	0.1	0.40	4.00	8	0.20	0.10	10.6
08-10	186508	6.0	0.6	0.00	50.4	25.9	0.12	23	2.6	0.1	0.20	0.40	4	0.30	0.10	0.8
09-07	186639	2.6	2.1	0.00	56.0	24.4	0.12	41	4.5	0.1	0.30	0.50	3	0.40	0.20	0.6

EDWARDS RIVER NEAR ORION

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	504660														
10-11	170050	13	53	248	280	345								24	45.0
11-30	170485	12	54	156	209	292			0.01					372	38.0
12-09	170487	12	58	232	286	352			0.02					38	37.0
1967	504660														
01-10	170657	10	65	256	320	379		0.00	0.00				0.01	15	33.0
02-07	170891	13	67	264	320	391		0.00	0.01				0.02	9	33.0
03-08	171105	8	52	200	252	303		0.00	0.01				0.01	45	34.0
04-07	171180	9	57	220	291	347		0.00	0.01				0.03	138	37.0
05-15	171534	9	57	232	298	372		0.00	0.00				0.00	58	56.0
06-22	171903	8	48	172	240	330		0.00	0.00				0.01	520	66.0
07-17	172359	8	56	240	300	359		0.00	0.02				0.02	22	76.0
08-07	172862	7	22	104	126	170		0.00	0.03				0.04	1440	69.0
09-21	173175	12	53	212	270	340		0.00	0.01				0.01	16	67.0
10-20	173363	10	43	256	306	363		0.00	0.01				0.01	69	48.0
11-17	173560	9	58	236	300	381		0.00	0.02				0.01	125	40.0
12-07	173709	12	71	236	320	407		0.00	0.01				0.02	104	39.0
1968	504660														
01-17	173914	9	58	260	316	386		0.00	0.01				0.02	63	33.0
01-31	173958	9	55	216	272	336		0.00	0.00				0.02	124	38.0
03-22	174348	11	60	230	300	361		0.00	0.02				0.03	69	42.0
04-27	174539	9	60	240	298	364		0.00	0.01				0.04	38	64.0
05-23	174885	10	57	248	302	356		0.00	0.00				0.04	73	57.0
06-18	175142	10	51	248	288	360		0.00	0.01				0.01	14	71.0
07-23	175659	11	51	200	236	293		0.00	0.01				0.01	15	86.0
08-06	175968	13	53	224	252	321		0.00	0.01				0.02	45	93.0
09-12	176238	18	53	204	208	313		0.00	0.01				0.02	43	75.0
10-08	176590	7	46	232	248	295		0.00	0.01				0.01	13	60.0
11-06	176813	20	54	252	272	385		0.00	0.01				0.00	11	45.0
12-17	177107	16	71	288	322	415		0.00	0.01				0.01	38	33.0
1969	504660														
01-10	177305	6	33	70	86	171		0.00	0.02				0.03	289	33.0
02-18	177472	13	55	202	234	300	0.00	0.00	0.01	<.05		<.05	0.03	16	34.0
03-23	177817	39	67	192	254	366	0.00	0.00	0.02	<.05		<.05	0.01	204	39.0
04-29	178030	13	58	244	294	352	0.00	0.00	0.01	<.05	0.00	<.05	0.02	7	43.0
05-13	178344	13	60	208	268	333	0.00	0.00	0.01	<.05	0.00	<.05	0.04	137	52.0
06-03	178807	10	62	262	304	395	0.00	0.00	0.01	<.05	0.00	<.05	0.03	22	53.0
08-12	179402	11	54	264	328	407	0.00	0.00	0.01	<.05	0.00	<.05	0.02	35	79.0
09-26	179820	11	57	242	296	367	0.00	0.00	0.01	<.05	0.01	<.05	0.03	7	63.0
10-17	179929	9	63	225	285	376	0.00	0.00	0.02	<.05	0.00	<.05	0.02	105	43.0
11-12	180162	12	59	248	324	404	0.00	0.00	0.00	<.05	0.00	<.05	0.03	61	47.0
12-10	180414	13	57	254	322	389	0.00	0.00	0.01	<.05	0.00	<.05	0.02	42	35.0
1970	504660														
01-20	180907	16	41	298	358	412	0.00	0.00	0.01	<.05	0.00	<.05	0.03	122	33.0
02-11	180863	16	59	232	304	354	0.00	0.00	0.01	<.05	0.00	<.05	0.02	30	33.0
03-16	181072	13	62	240	316	389	0.00	0.00	0.01	<.05	0.00	<.05	0.02	52	37.0
04-16	181530	15	59	196	280	367	0.00	0.00	0.02	<.05	0.00	<.05	0.90	232	50.0
05-27	181900	13	56	210	296	374	0.00	0.00	0.01	<.05	0.00	<.05	0.01	39	62.0
06-09	182470	12	56	220	302	393	0.00	0.00	0.02	<.05	0.00	<.05	0.01	63	69.0
07-08	183244	11	57	244	324	403	0.00	0.00	0.01	<.05	0.00	<.05	0.01	33	75.0
08-04	183616	12	49	248	304	354	0.00	0.00	0.01	<.05	0.00	<.05	0.00	13	68.0
09-17	183896	10	38	156	210	246	0.00	0.00	0.02	<.05	0.00	<.05	0.02	516	62.0
10-15	184127	10	56	252	328	404	0.00	0.00	0.01	<.05	0.00	<.05	0.01	52	54.0
11-05	184359	12	56	248	328	404	0.00	0.00	0.01	<.05	0.00	<.05	0.02	63	47.0
12-09	184572	11	56	248	324	376	0.00	0.00	0.01	<.05	0.00	<.05	0.01	48	38.0
1971	504660														
01-13	184780	12	57	256	328	417	0.00	0.00	0.01	<.05	0.00	<.05	0.03	36	33.0
02-08	185086	14	60	220	288	365	0.00	0.00	0.01	<.05	0.00	<.05	0.02	27	33.0
03-18	185313	13	54	220	288	356	0.00	0.00	0.01	<.05	0.00	<.05	0.04	154	37.0
04-05	185540	12	57	240	308	377	0.00	0.00	0.01	<.05	0.00	<.05	0.02	28	41.0
05-26	185815	14	51	246	296	382	0.00	0.00	0.02	<.05	0.00	<.05	0.01	12	57.0
06-22	185997	15	53	232	268	337	0.00	0.00	0.01	<.05	0.00	<.05	0.01	27	76.0
07-13	186273	7	27	122	142	203	0.00	0.00	0.02	<.05	0.00	<.05	0.01	2080	78.0
08-10	186508	15	48	216	232	319	0.00	0.00	0.01	<.05	0.00	<.05	0.00	20	84.0
09-07	186639	28	63	228	240	365	0.00	0.00	0.01	<.05	0.01	<.05	0.03	39	87.0

ELKHORN CREEK NEAR PENROSE

Elkhorn Creek rises in the Rock River Hills Region near Forreston and flows southward and into the Rock River below Como. The gaging station is located 2 miles northwest of Penrose, and 5 miles upstream from Sugar Creek. Elevation of gage datum is 657.85 feet above mean sea level. The drainage basin located above the gage has an area of 153 square miles.

The tabulation of water quality data is for the period from October 10, 1966, to September 9, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

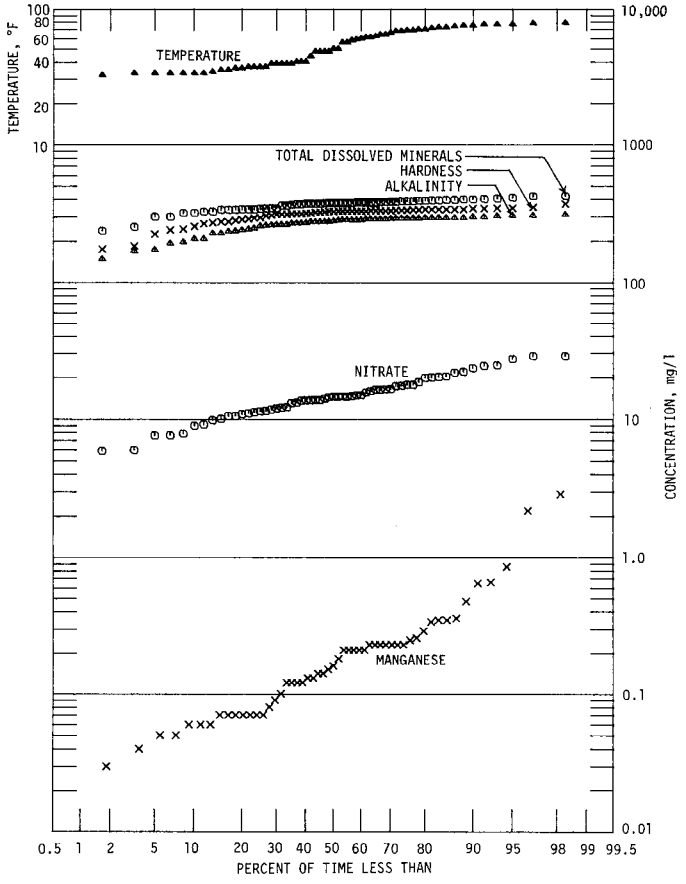
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 0.84 cfs/sq mi, nor fall below 0.20 cfs/sq mi. The median flow was 0.35 cfs/sq mi and the mean was 0.44 cfs/sq mi.

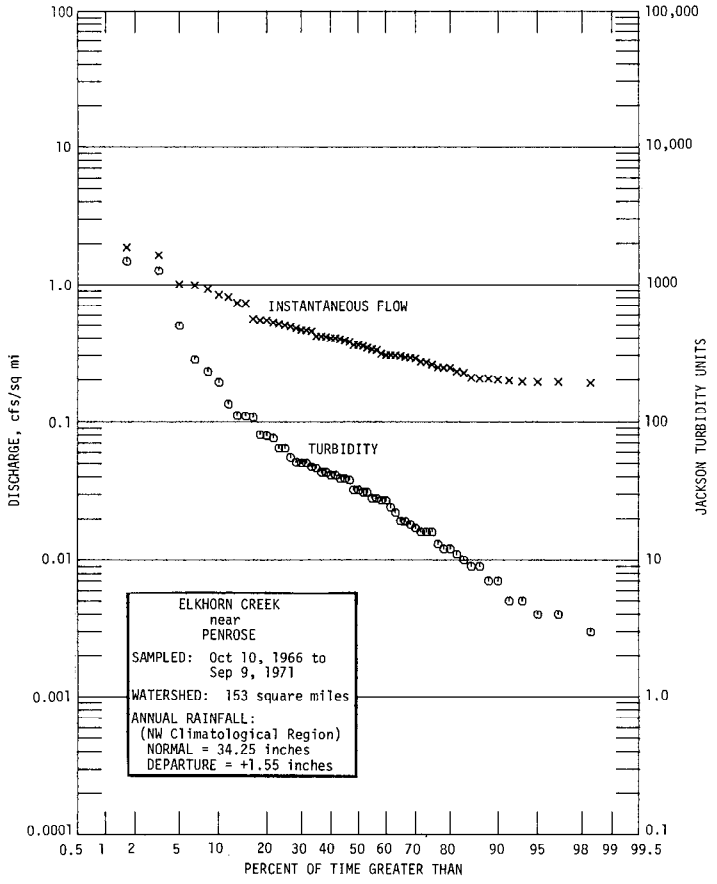
The turbidity was not less than 7 Jtu nor more than 190 Jtu for the central 80 percent of the time. The median value was 32 Jtu and the mean 99 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 22 percent of the time. They were below 50 F for 48 percent and below 40 F for 35 percent of the time.

The analyses indicated the following:

	Concentration (mg/l) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	208	280	300
Hardness (as $CaCO_3$)	256	326	344
Total dissolved minerals	318	376	401
Nitrate (NO_3)	8.9	14.5(15.0)	23.3
Total inorganic phosphate (PO_4)	0.4	1.0(1.38)	3.1
Soluble inorganic phosphate (PO_4)	0.3	0.7(0.80)	1.3
Manganese (Mn)	0.06	0.16	0.565





ELKHORN CREEK NEAR PENROSE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	504440															
10-10	170053	28.9	0.2	0.00	67.0	36.0	0.05	10	1.9	0.0	0.50	0.50	11	0.10	0.00	7.6
11-09	170205	52.0	0.8	0.07	64.2	33.0	0.12	10	2.8	0.0	0.50	0.70	13	0.10	0.00	9.1
12-06	170384	37.2	0.4	0.06	73.6	36.2	0.06	9	2.0	0.2	0.50	0.60	9	0.00	0.00	12.1
1967	504440															
01-10	170618	34.0	0.3	0.06	76.8	38.1	0.12	12	1.7	T	0.90	1.50	15	0.20	0.00	14.3
02-07	170799	46.0	0.6	T	74.8	38.3	0.08	11	2.0	0.1	1.10	1.30	17	0.10	0.00	15.5
03-06	171050	69.9	1.1	0.07	53.2	27.0	0.05	7	6.6	1.6	2.80	3.40	11	0.10	0.00	13.6
04-05	171178	78.5	1.0	0.07	71.2	32.9	0.11	8	1.9	T	0.80	1.20	13	0.30	0.10	17.6
05-16	171535	45.5	1.9	0.06	64.4	35.4	0.08	9	2.1	T	0.90	1.10	4	0.10	0.00	8.9
06-21	171902	62.6	22.0	0.86	60.8	21.5	0.12	10	3.4	0.1	0.30	2.60	12	0.10	0.10	27.2
07-18	172361	250.0	52.0	2.18	41.6	19.2	0.05	8	5.6	T	0.80	3.90	8	0.10	0.10	6.0
08-15	173221	30.9	0.8	0.07	73.0	35.0	0.06	12	1.8	0.4	0.60	0.80	9	0.10	0.00	5.9
09-18	173179	29.4	3.4	0.23	67.2	35.1	0.07	12	2.4	T	0.80	1.70	11	0.10	0.10	11.1
10-16	173358	43.7	0.9	0.13	63.2	31.7	0.11	13	3.7	0.1	1.10	1.60	11	0.10	0.10	10.8
11-13	173565	70.6	2.4	0.05	74.4	35.9	0.09	9	2.1	0.1	0.50	0.60	9	0.30	0.10	16.2
12-11	173707	61.0	1.0	0.08	73.2	35.4	0.11	10	1.9	0.2	0.50	0.50	9	0.10	0.40	16.5
1968	504440															
01-02	173912	50.6	0.5	0.07	68.4	38.3	0.09	12	1.9	0.1	0.70	1.00	13	0.10	0.00	17.4
01-29	173957	151.0	6.4	0.23	39.2	18.5	0.08	6	13.3	2.4	2.70	4.00	11	0.10	0.10	13.5
03-19	174350	128.0	7.3	0.48	61.2	28.1	0.08	13	7.5	1.7	2.10	2.50	8	0.10	0.00	16.3
04-08	174498	47.1	1.5	0.23	74.8	36.4	0.05	11	1.8	0.1	1.00	1.40	9	0.10	0.10	13.7
05-20	174886	44.2	1.1	0.15	72.0	37.0	0.08	12	1.5	0.2	1.00	1.40	6	0.20	0.10	13.1
06-12	175092	45.9	4.5	0.35	63.2	35.6	0.07	8	2.6	0.3	0.50	1.20	5	0.10	0.10	18.5
07-25	175660	45.3	1.0	0.21	71.2	36.6	0.09	11	2.4	0.3	0.60	0.80	11	0.20	0.00	11.3
08-12	175970	29.4	1.4	0.21	70.4	37.1	0.07	11	2.8	0.1	0.60	0.70	9	0.20	0.10	10.0
09-09	176236	29.5	1.0	0.00	67.2	37.0	0.07	12	2.6	0.1	1.30	2.80	9	0.20	0.10	7.6
10-14	176591	34.8	1.1	0.12	61.6	38.4	0.06	12	1.9	T	0.30	0.90	1	0.20	0.00	9.8
10-12	176811	31.5	0.3	0.12	72.0	38.9	0.05	19	1.5	0.1	0.70	0.80	8	0.20	0.10	11.0
12-03	177097	50.0	0.8	0.14	75.2	37.0	0.08	11	2.0	0.2	0.70	0.80	14	0.20	0.10	14.8
1969	504440															
01-14	177309	30.1	0.3	0.12	70.4	37.9	0.09	12	1.6	1.8	1.00	1.00	15	0.20	0.10	14.8
02-10	177470	54.4	0.9	0.25	71.2	33.6	0.15	12	2.2	0.6	0.90	1.20	13	0.20	0.10	14.5
03-05	177815	61.1	2.4	0.29	62.0	30.9	0.14	10	3.8	0.9	1.10	2.10	12	0.20	0.10	10.5
04-02	178031	123.0	2.2	0.35	70.8	33.0	0.10	10	2.4	0.4	1.20	1.30	11	0.20	0.00	20.0
05-15	178340	54.1	7.2	0.34	72.0	36.6	0.12	10	2.0	0.1	1.80	1.90	8	0.10	0.10	11.8
06-04	178812	68.9	1.9	0.04	65.6	36.5	0.05	7	2.4	0.1	0.50	0.70	9	0.10	0.20	12.0
07-16	179049	83.7	3.6	0.07	75.6	37.8	0.12	11	1.8	0.1	0.50	0.70	13	0.20	0.10	19.8
08-20	179434	58.4	2.2	0.13	74.4	37.6	0.09	11	3.1	0.1	0.90	0.90	13	0.20	0.00	14.5
09-12	179570	40.6	3.4	0.09	74.6	37.5	0.07	12	4.4	0.1	0.80	1.00	12	0.20	0.10	14.5
10-14	179931	75.2	3.1	0.21	61.2	29.9	0.06	9	7.3	0.5	1.60	1.60	13	0.20	0.10	13.6
11-14	180169	31.1	1.8	0.00	77.6	38.5	0.06	11	1.4	0.1	0.90	1.10	13	0.20	0.00	11.7
12-09	180417	36.9	0.6	0.03	69.6	37.5	0.06	10	1.3	0.1	0.40	0.50	10	0.20	0.00	14.5
1970	504440															
01-05	180700	39.0	0.5	0.12	64.0	39.3	0.07	12	1.2	0.1	0.60	0.80	12	0.20	0.10	14.6
02-13	180866	43.3	0.7	0.16	86.4	30.3	0.11	14	1.5	0.4	0.20	0.30	12	0.20	0.10	11.4
03-05	181070	153.0	4.4	0.21	60.0	30.5	0.07	8	5.6	0.9	0.70	1.10	7	0.20	0.20	24.3
04-15	181531	85.2	2.0	0.23	70.8	35.9	0.10	13	2.9	0.3	0.80	1.10	6	0.20	0.00	17.6
05-27	181891	112.0	7.1	0.23	74.0	36.4	0.07	9	1.7	0.4	0.50	1.00	7	0.20	0.10	28.3
06-09	182468	142.0	3.8	0.14	73.6	35.1	0.07	8	1.7	0.2	0.20	0.40	5	0.20	0.10	28.3
07-09	183250	76.9	1.8	0.18	74.4	37.5	0.10	9	1.3	T	0.40	0.40	12	0.20	0.10	20.3
08-12	183612	53.5	3.6	0.21	75.2	39.0	0.07	11	1.8	0.1	0.40	3.10	14	0.20	0.10	15.9
10-28	184129	284.0	14.0	0.66	62.4	28.3	0.10	8	6.7	0.4	1.10	2.30	11	0.20	0.10	17.3
11-17	184360	83.6	0.5	0.00	84.0	39.5	0.09	9	1.4	0.2	0.20	0.40	15	0.20	0.10	21.6
12-24	184576	63.0	2.6	0.10	77.6	29.8	0.13	11	1.5	0.1	0.20	0.30	11	0.30	0.00	24.2
1971	504440															
01-11	184784	60.0	0.5	0.07	55.2	37.5	0.07	9	1.0	0.1	0.30	0.30	12	0.30	0.10	20.1
02-02	185085	62.4	0.3	0.05	62.4	31.7	0.07	8	1.2	0.1	0.50	0.60	10	0.20	0.10	21.9
03-16	185314	111.0	9.2	0.36	58.4	26.9	0.11	7	7.2	0.6	1.20	1.90	11	0.20	0.10	23.3
04-07	185539	72.6	0.4	0.00	72.0	35.6	0.08	10	1.5	0.5	0.50	0.50	9	0.20	0.10	7.8
05-23	185814	80.2	51.0	2.88	50.4	23.8	0.10	9	4.4	0.3	0.90	3.20	9	0.20	0.10	16.2
06-18	185994	57.2	9.2	0.65	70.4	38.6	0.04	7	3.3	T	0.60	1.20	10	0.20	0.10	14.0
07-14	186274	40.9	1.9	0.23	71.6	36.9	0.07	12	1.9	0.1	0.50	0.90	10	0.20	0.10	13.7
08-06	186600	37.1	1.6	0.23	72.0	38.1	0.06	11	1.8	T	0.50	6.30	6	0.20	0.10	10.5
09-09	186635	30.5	1.6	0.26	71.2	36.6	0.10	13	3.7	T	0.60	0.90	11	0.20	0.10	13.0

ELKHORN CREEK NEAR PENROSE

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	504440														
10-10	170053	8	33	288	315	371			0.00					4	56.0
11-09	170205	10	32	260	296	345			0.01					17	50.0
12-06	170384	8	34	296	332	381			0.00					5	36.0
1967	504440														
01-10	170618	11	36	288	348	378			0.01					13	33.0
02-07	170799	10	39	292	344	371		0.00	0.01				0.01	11	33.0
03-06	171050	11	28	196	243	299		0.00	0.01				0.01	19	33.0
04-05	171178	10	49	264	313	376		0.00	0.01				0.02	28	39.0
05-16	171535	11	36	272	306	336		0.00	0.07				0.01	4	64.0
06-21	171902	8	48	172	240	318		0.00	0.01				0.00	497	74.0
07-18	172361	7	25	168	183	236		0.00	0.02				0.02	1260	73.0
08-15	173221	12	35	296	326	377		0.00	0.01				0.01	32	70.0
09-18	173179	9	33	276	312	371		0.00	0.01				0.01	55	69.0
10-16	173358	11	38	248	288	340		0.00	0.01				0.02	16	56.0
11-13	173565	11	42	284	333	380		0.00	0.01				0.01	50	44.0
12-11	173707	9	41	284	328	380		0.00	0.01				0.02	19	40.0
1968	504440														
01-02	173912	11	40	280	328	388		0.00	0.01				0.01	22	33.0
01-29	173957	13	37	148	174	253		0.00	0.01				0.01	109	37.0
03-19	174350	21	40	228	268	337		0.00	0.03				0.04	133	48.0
04-08	174498	13	38	292	336	392		0.00	0.01				0.04	32	48.0
05-20	174886	11	40	288	332	382		0.00	0.02				0.05	24	58.0
06-12	175092	7	28	276	304	338		0.00	0.02				0.03	110	66.0
07-25	175660	10	39	291	328	391		0.00	0.01				0.02	27	72.0
08-12	175970	10	36	300	328	367		0.00	0.01				0.01	39	69.0
09-09	176236	12	36	292	320	359		0.00	0.03				0.04	16	60.0
10-14	176591	12	42	276	312	343		0.00	0.01				0.01	43	68.0
10-12	176811	23	38	306	340	406		0.00	0.01				0.00	9	39.0
12-03	177097	12	41	292	340	378		0.00	0.01				0.01	16	39.0
1969	504440														
01-14	177309	13	36	294	332	376		0.00	0.01				0.02	9	33.0
02-10	177470	15	37	282	316	376		0.00	0.01				0.02	18	36.0
03-05	177815	12	33	262	282	327	0.00	0.00	0.01	<.05		<.05	0.01	50	37.0
04-02	178031	15	39	269	312	381	0.00	0.00	0.01	<.05	0.00	<.05	0.03	76	37.0
05-15	178340	12	41	304	330	382	0.00	0.00	0.01	<.05	0.00	<.05	0.04	80	68.0
06-04	178812	10	29	276	314	369	0.00	0.00	0.01	<.05	0.00	<.05	0.05	41	62.0
07-16	179049	13	43	288	344	422	0.00	0.00	0.01	<.05	0.00	<.05	0.03	39	77.0
08-20	179434	14	47	296	340	396	0.00	0.00	0.02	<.05	0.00	<.05	0.04	31	75.0
09-12	179570	11	41	288	340	397	0.00	0.00	0.01	<.05	0.00	<.05	0.04	38	64.0
10-14	179931	13	39	234	276	338	0.00	0.00	0.02	<.05	0.00	<.05	0.02	64	50.0
11-14	180169	14	40	306	352	403	0.00	0.00	0.01	<.05	0.00	<.05	0.03	28	39.0
12-09	180417	11	38	278	328	371	0.00	0.00	0.00	<.05	0.00	<.05	0.05	7	37.0
1970	504440														
01-05	180700	13	41	269	321	361	0.00	0.00	0.02	<.05	0.00	<.05	0.03	10	32.0
02-13	180866	12	60	270	340	396	0.00	0.00	0.02	<.05	0.00	<.05	0.02	12	34.0
03-05	181070	16	43	208	275	344	0.00	0.00	0.01	<.05	0.00	<.05	0.03	79	39.0
04-15	181531	21	45	264	324	400	0.00	0.00	0.02	<.05	0.00	<.05	0.02	46	48.0
05-27	181891	15	47	264	334	397	0.00	0.00	0.01	<.05	0.00	<.05	0.02	107	61.0
06-09	182468	13	42	258	328	387	0.00	0.00	0.02	<.05	0.00	<.05	0.01	64	73.0
07-09	183250	12	40	292	340	415	0.00	0.00	0.01	<.05	0.00	<.05	0.02	27	75.0
08-12	183612	13	36	296	348	380	0.00	0.00	0.02	<.05	0.00	<.05	0.05	51	78.0
10-28	184129	15	36	228	272	336	0.00	0.00	0.01	<.05	0.00	<.05	0.00	277	59.0
11-17	184360	13	42	312	372	424	0.00	0.00	0.01	<.05	0.00	<.05	0.02	5	35.0
12-24	184576	13	57	236	316	370	0.00	0.00	0.01	<.05	0.00	<.05	0.02	31	35.0
1971	504440														
01-11	184784	10	38	240	292	318	0.00	0.00	0.01	<.05	0.00	<.05	0.03	12	33.0
02-02	185085	10	32	244	286	325	0.00	0.00	0.01	<.05	0.00	<.05	0.01	3	40.0
03-16	185314	18	34	208	250	342	0.00	0.00	0.01	<.05	0.00	<.05	0.08	190	40.0
04-07	185539	14	36	284	326	390	0.00	0.00	0.01	<.05	0.00	<.05	0.02	7	48.0
05-23	185814	11	28	192	224	299	0.00	0.00	0.02	<.05	0.00	<.05	0.03	1483	61.0
06-18	185994	11	31	284	334	374	0.00	0.00	0.02	<.05	0.00	<.05	0.02	228	70.0
07-14	186274	12	36	284	330	390	0.00	0.00	0.00	<.05	0.00	<.05	0.03	43	77.0
08-06	186600	12	34	300	336	385	0.00	0.00	0.01	<.05	0.00	<.05	0.00	41	77.0
09-09	186635	15	36	294	328	401	0.00	0.00	0.00	<.05	0.00	<.05	0.02	47	79.0

EMBARRAS RIVER NEAR CAMARGO

The Embarras River rises in the Bloomington Ridged Plain — South Region near Champaign and flows southward through the Springfield Plain and the Mt. Vernon Hills Region, joining the Wabash River south of Lawrenceville. The gaging station is on the downstream side of a bridge on U.S. Route 36, 2.0 miles southwest of Camargo. Elevation of gage datum is 622.30 feet above mean sea level. The drainage basin above the gage has an area of 185 square miles.

The tabulation of water quality data is for the period from October 18, 1966, to September 10, 1971. Discharge and some quality data are summarized graphically. The instantaneous discharges shown were computed by the USGS from gage height readings taken at the time of sampling.

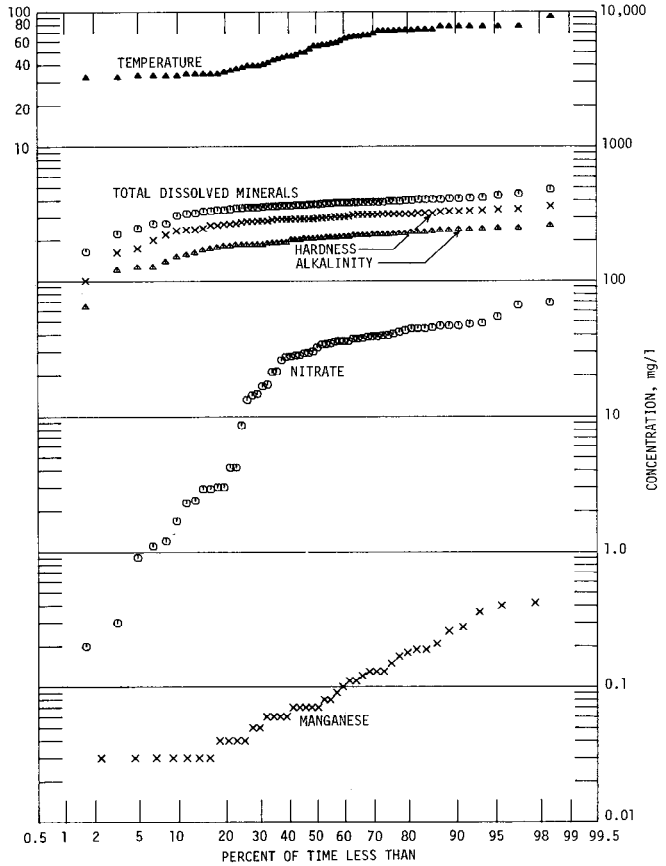
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.5 cfs/sq mi, nor fall below 0.01 cfs/sq mi. The median flow was 0.32 cfs/sq mi and the mean was 0.59 cfs/sq mi.

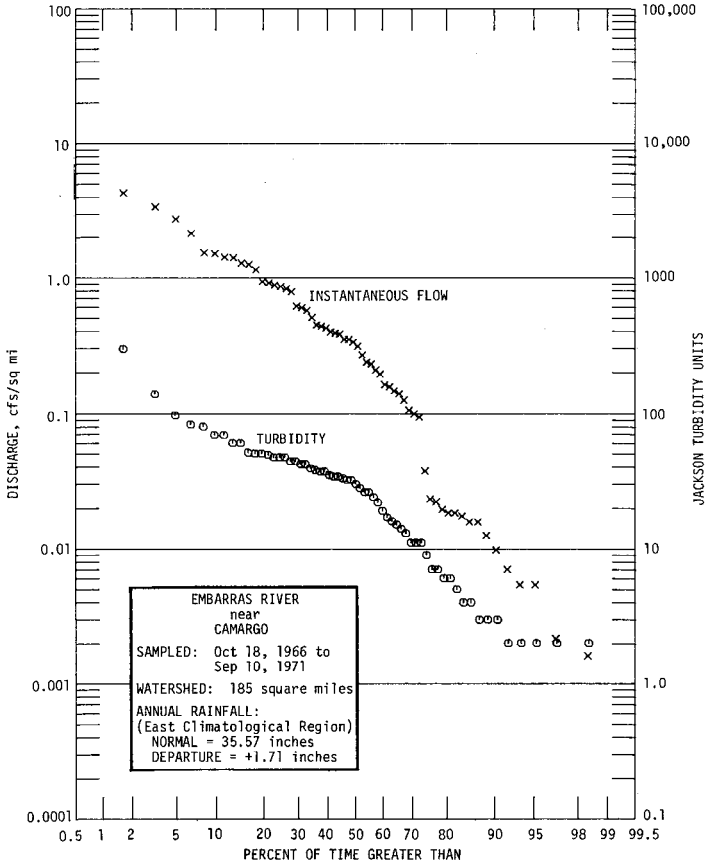
The turbidity was not less than 3 Jtu nor more than 69 Jtu for the central 80 percent of the time. The median value was 30 Jtu and the mean 36 Jtu.

Reported temperatures were over 80 F for 2 percent and over 70 F for 29 percent of the time. They were below 50 F for 45 percent and below 40 F for 29 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	150	205	240
Hardness (as $CaCO_3$)	236	294	330
Total dissolved minerals	308	373	414
Nitrate (NO_3)	1.7	32.1(27.4)	46.3
Total inorganic phosphate (PO_4)	0.3	0.6(0.91)	1.7
Soluble inorganic phosphate (PO_4)	0.1	0.45(0.67)	1.1
Manganese (Mn)	0.03	0.07	0.27





EMBARRAS RIVER NEAR CAMARGO

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	303434															
10-18	170083	3.4	1.5	0.15	64.4	30.4	0.09	31	4.2	0.0	1.60	1.70	6	0.10	0.20	2.9
11-01	170156	1.0	0.3	0.06	68.3	31.8	0.21	28	4.2	0.2	1.10	1.20	4	0.20	0.20	0.9
12-05	170419	258.0	4.7	0.05	48.0	19.6	0.14	6	5.0	T	0.60	0.70	8	0.20	0.10	28.0
1967	303434															
01-16	170619	35.7	0.2	0.00	81.4	31.4	0.13	8	1.0	T	0.40	0.40	7	0.10	0.10	35.7
02-10	170794	236.0	0.1	0.07	68.8	30.5	0.11	6	0.6	0.1	0.50	1.20	8	0.30	0.10	46.3
02-16	170851	153.0	0.4	0.00	69.2	28.1	0.13	6	0.7	0.1	0.20	0.30	8	0.20	0.10	44.4
03-27	171117	231.0	0.3	0.00	68.4	29.1	0.12	6	1.2	0.1	0.20	0.20	6	0.10	0.10	47.8
04-14	171333	105.0	2.0	0.03	70.0	28.1	0.11	10	1.7	0.1	0.40	1.70	2	0.20	0.10	35.6
05-04	171387	64.1	1.2	0.03	69.6	30.8	0.13	8	1.2	0.0	0.10	0.30	6	0.10	0.10	38.5
06-07	171690	110.0	3.1	0.00	76.4	31.5	0.13	7	1.0	T	1.00	1.50	4	0.10	0.10	46.2
07-31	172357	3.2	2.2	0.13	65.6	27.4	0.13	15	2.4	T	0.80	1.10	9	0.10	0.10	0.3
08-10	172654	2.9	7.6	0.42	60.8	27.4	0.12	16	2.8	T	0.90	3.50	6	0.30	0.10	4.2
09-20	173009	0.0	1.9	0.10	62.4	30.3	0. 19	27	1.5	0.2	0.70	1.00	4	0.20	0.20	1.2
10-02	173142	0.3	2.0	0.17	60.8	29.2	0.14	66	3.4	0.1	0.70	0.90	8	0.10	0.40	2.3
11-01	173373	3.4	1.2	0.21	54.4	26.4	0.17	33	4.9	0.8	4.10	4.30	5	0.10	0.10	3.0
12-01	173600	2.9	0.3	0.03	65.2	31.0	0.15	26	3.1	0.1	2.50	2.50	3	0.10	0.10	4.2
1968	303434															
01-12	173830	64.0	0.4	T	72.8	31.7	0.16	9	1.4	0.1	0.00	0.00	9	0.10	0.10	68.7
02-09	174004	393.0	0.5	T	62.0	25.2	0.11	7	1.0	0.1	0.40	0.50	5	0.20	0.10	39.5
03-05	174174	57.2	0.4	0.00	70.4	28.8	0.11	8	1.0	0.1	0.20	0.40	4	0.20	0.10	40.2
04-08	174383	162.0	1.2	T	70.4	27.8	0.12	7	1.7	0.1	0.30	0.40	7	0.20	0.10	65.8
05-03	174598	49.2	1.5	0.04	68.0	30.8	0.14	8	0.8	0.2	0.60	0.80	3	0.10	0.00	33.8
06-07	174994	260.0	1.8	0.07	70.4	28.7	0.17	8	1.0	0.1	0.20	0.30	7	0.10	0.10	53.8
07-08	175361	77.7	2.3	0.19	75.2	31.3	0.14	9	0.8	0.1	0.20	0.70	4	0.20	0.30	48.5
08-06	175784	169.0	5.4	0.03	42.4	16.3	0.08	6	2.8	0.1	1.00	1.20	10	0.20	0.00	14.3
09-13	176187	1.8	1.9	0.11	60.8	33.2	0.13	21	3.0	0.1	0.10	0.30	5	0.20	0.10	3.0
10-11	176470	1.3	1.3	0.13	60.0	31.6	0.11	29	4.7	0.3	0.90	1.10	4	0.20	0.20	0.2
11-13	176727	2.3	0.4	0.12	66.4	33.6	0.14	36	6.1	0.1	4.60	4.70	4	0.20	0.20	1.7
12-06	176962	27.0	0.3	0.04	75.2	31.1	0.11	11	1.8	0.1	0.60	0.60	8	0.20	0.10	21.1
1969	303434															
01-08	177161	30.0	0.2	0.03	70.8	32.8	0.12	9	2.0	0.2	0.40	0.50	9	0.20	0.10	27.2
02-12	177382	628.0	1.3	0.03	56.0	23.3	0.12	7	0.8	0.1	0.10	0.40	7	0.20	0.10	41.5
03-18	177637	80.2	0.6	0.06	60.8	27.7	0.11	9	0.9	0.7	0.50	0.60	3	0.20	0.10	35.6
04-15	177901	506.0	1.7	0.13	56.0	24.3	0.11	8	1.4	0.1	0.20	0.50	7	0.20	0.10	43.0
05-01	178016	172.0	0.2	0.08	76.4	31.5	0.14	10	0.8	0.1	0.40	0.40	7	0.20	0.10	37.5
06-04	178386	38.4	1.2	0.00	79.0	32.1	0.21	16	1.2	0.1	0.90	1.00	6	0.30	0.10	29.3
07-11	178891	145.0	2.1	0.08	66.4	26.8	0.13	8	1.3	0.1	0.50	0.90	11	0.20	0.10	46.3
08-01	179087	17.4	1.9	0.19	41.6	28.2	0.08	9	1.9	0.1	0.40	0.40	4	0.20	0.10	13.3
09-09	179506	1.0	1.9	0.28	37.2	16.8	0.07	14	6.0	0.1	1.00	1.10	7	0.20	0.10	2.9
10-03	179770	6.9	1.4	0.11	64.8	30.8	0.14	15	2.5	0.1	0.90	1.10	5	0.20	0.10	21.4
11-06	179970	82.1	0.3	0.00	80.0	31.7	0.13	7	1.0	0.1	0.00	0.10	6	0.20	0.20	32.1
12-05	180203	72.9	0.1	T	76.0	31.7	0.14	5	0.8	T	0.10	0.10	4	0.20	0.20	37.0
1970	303434															
01-12	180476	25.6	0.2	0.06	84.0	37.1	0.14	10	0.9	0.2	0.50	0.50	1	0.20	0.20	39.0
02-10	180763	93.4	0.1	T	72.8	32.7	0.14	10	1.1	0.1	0.10	0.20	3	0.20	0.10	33.5
03-17	180976	61.2	0.3	T	74.0	32.0	0.10	8	1.0	0.2	0.40	0.50	4	0.20	0.20	34.3
04-14	181238	211.0	1.8	0.00	61.6	25.4	0.11	7	1.4	0.2	0.30	0.50	6	0.20	0.10	29.8
05-20	181727	159.0	1.6	0.00	72.8	31.3	0.13	8	0.9	0.1	0.20	0.40	7	0.20	0.10	44.3
06-15	182135	70.2	1.6	0.06	69.6	31.3	0.11	8	0.7	0.1	0.40	0.60	5	0.20	0.10	38.5
07-07	182504	28.9	1.6	0.07	72.0	32.2	0.13	9	1.4	T	0.40	0.60	4	0.20	0.10	28.2
08-13	183361	4.1	1.4	0.26	72.0	32.2	0.13	19	2.2	0.1	0.90	1.30	10	0.30	0.10	8.6
09-01	183618	0.4	3.5	0.40	56.0	24.4	0.09	17	2.7	0.3	0.90	1.20	9	0.30	0.10	1.1
10-07	183831	4.3	1.8	0.05	79.2	33.7	0.17	21	2.9	0.1	0.80	0.80	8	0.30	0.20	16.7
11-10	184177	18.4	0.7	0.36	70.4	34.2	0.14	11	1.5	0.1	0.50	0.70	4	0.30	0.10	17.2
12-09	184423	23.0	0.1	0.00	77.6	36.6	0.14	11	1.2	0.2	0.50	0.60	4	0.30	0.10	25.8
1971	303434															
01-06	184608	71.3	0.8	0.00	67.2	29.3	0.13	10	1.4	0.2	0.30	0.30	5	0.30	0.10	28.9
02-05	184872	792.0	10.0	0.00	27.2	7.8	0.08	5	4.6	0.6	1.30	1.50	6	0.20	0.10	14.6
03-02	185036	277.0	1.1	0.07	69.6	28.3	0.13	6	1.0	0.1	0.20	0.30	7	0.20	0.10	44.2
04-08	185370	43.8	0.7	0.04	73.6	32.2	0.13	8	1.1	0.1	0.20	0.70	3	0.20	0.10	44.8
05-04	185606	19.5	1.4	0.04	70.4	33.7	0.14	11	1.4	0.3	0.90	1.30	2	0.20	0.10	27.5
06-08	185851	42.3	1.3	0.18	78.0	33.0	0.15	9	1.3	0.1	0.30	0.50	6	0.30	0.10	38.3
07-19	186217	282.0	2.7	0.09	63.2	25.4	0.10	8	2.2	0.2	0.20	0.40	9	0.20	0.10	35.4
08-02	186344	113.0	1.5	0.07	82.4	32.7	0.16	8	0.9	0.1	0.10	0.20	9	0.20	0.10	37.0
09-10	186620	3.6	1.1	0.03	61.6	30.8	0.13	23	2.5	0.1	0.80	1.90	5	0.30	0.10	2.4

EMBARRAS RIVER NEAR CAMARGO

DATE	LAB.NO.	CL	S04	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	303434														
10-18	170083	30	98	204	285	414			0.00					34	52.0
11-01	170156	28	101	236	302	414			0.02					13	45.0
12-05	170419	13	49	120	200	266			0.01					80	39.0
1967	303434														
01-16	170619	17	76	216	332	417			0.01					4	34.0
02-10	170794	14	66	180	297	352		0.00	0.01				0.03	2	35.0
02-16	170851	14	65	184	288	363		0.00	0.00				0.01	2	38.0
03-27	171117	14	64	176	290	353		0.00	0.00				0.00	5	39.0
04-14	171333	19	63	188	290	365		0.00	0.01				0.04	47	65.0
05-04	171387	16	65	200	301	367		0.00	0.02				0.02	24	58.0
06-07	171690	14	62	208	320	382		0.00	0.00				0.00	60	64.0
07-31	172357	18	65	224	277	360		0.00	0.01				0.02	51	77.0
08-10	172654	19	61	210	264	355		0.00	0.01				0.01	138	71.0
09-20	173009	27	64	228	280	389		0.00	0.02				0.02	11	77.0
10-02	173142	63	64	256	272	481		0.00	0.01				0.01	60	71.0
11-01	173373	33	67	204	244	373		0.00	0.01				0.03	32	47.0
12-01	173600	28	88	216	290	399		0.00	0.01				0.03	6	33.0
1968	303434														
01-12	173830	17	67	184	312	395		0.00	0.01				0.02	15	33.0
02-09	174004	15	59	160	258	337		0.00	0.01				0.02	9	33.0
03-05	174174	16	70	184	294	369		0.00	0.00				0.02	14	41.0
04-08	174383	16	39	184	291	356		0.00	0.01				0.04	22	56.0
05-03	174598	17	67	192	296	334		0.00	0.01				0.02	38	65.0
06-07	174994	15	60	190	294	354		0.00	0.01				0.04	49	71.0
07-08	175361	15	61	212	316	406		0.00	0.01				0.02	97	72.0
08-06	175784	9	34	126	173	223		0.00	0.01				0.02	83	73.0
09-13	176187	24	80	224	288	368		0.00	0.01				0.04	50	71.0
10-11	176470	26	76	228	280	366		0.00	0.01				0.01	37	56.0
11-13	176727	34	99	240	304	434		0.00	0.02				0.06	6	39.0
12-06	176962	18	74	220	316	383		0.00	0.03				0.01	3	34.0
1969	303434														
01-08	177161	20	73	216	312	389		0.00	0.01				0.01	2	33.0
02-12	177382	16	54	138	236	308		0.00	0.01				0.02	30	34.0
03-18	177637	19	64	172	266	339	0.00	0.00	0.01	<.05		<.05	0.01	11	49.0
04-15	177901	16	57	150	240	320	0.00	0.00	0.02	<.05		<.05	0.03	47	55.0
05-01	178016	16	80	200	320	401	0.00	0.00	0.02	<.05	0.00	<.05	0.05	2	49.0
06-04	178386	14	66	242	329	406	0.00	0.00	0.02	<.05	0.00	<.05	0.05	19	62.6
07-11	178891	14	55	184	276	379	0.00	0.00	0.07	<.05	0.00	<.05	0.08	47	91.0
08-01	179087	18	44	156	220	267	0.00	0.00	0.02	<.05	0.00	<.05	0.07	39	77.0
09-09	179506	17	39	126	162	245	0.00	0.00	0.01	<.05	0.00	<.05	0.05	42	68.0
10-03	179770	20	66	205	288	381	0.00	0.00	0.01	<.05	0.00	<.05	0.03	26	66.0
11-06	179970	17	71	221	330	394	0.00	0.00	0.02	<.05	0.00	<.05	0.03	7	46.0
12-05	180203	19	68	216	320	393	0.00	0.00	0.01	<.05	0.00	<.05	0.02	2	36.0
1970	303434														
01-12	180476	20	74	244	362	444	0.00	0.00	0.01		0.00	<.05	0.02	4	32.0
02-10	180763	20	66	208	316	386	0.00	0.00	0.01	<.05	0.00	<.05	0.02	3	32.0
03-17	180976	19	69	206	316	384	0.00	0.00	0.62	<.05	0.00	<.05	0.08	7	37.0
04-14	181238	18	55	168	258	331	0.00	0.00	0.03	<.05	0.00	<.05	0.04	50	46.0
05-20	181727	19	62	200	310	371	0.00	0.00	0.02	<.05	0.00	<.05	0.03	42	66.0
06-15	182135	19	61	190	302	379	0.00	0.00	0.01	<.05	0.00	<.05	0.03	44	72.0
07-07	182504	18	64	220	312	384	0.00	0.00	0.01	<.05	0.00	<.05	0.01	37	73.0
08-13	183361	22	66	244	312	373	0.00	0.00	0.03	<.05	0.01	<.05	0.02	33	77.0
09-01	183618	20	47	204	240	318	0.00	0.00	0.01	<.05	0.00	<.05	0.00	69	77.0
10-07	183831	27	89	236	336	418	0.00	0.00	0.01	<.05	0.01	<.05	0.04	35	60.0
11-10	184177	19	75	220	316	386	0.00	0.00	0.00	<.05	0.00	<.05	0.01	11	44.0
12-09	184423	21	69	232	344	382	0.00	0.00	0.01	<.05	0.00	<.05	0.02	3	40.0
1971	303434														
01-06	184608	20	58	192	288	342	0.00	0.00	0.01	<.05	0.01	<.05	0.04	16	34.0
02-05	184872	9	33	64	100	164	0.00	0.00	0.04	<.05	0.00	<.05	0.10	296	34.0
03-02	185036	19	69	184	290	364	0.00	0.00	0.02	<.05	0.00	<.05	0.01	26	43.0
04-08	185370	21	67	208	316	387	0.00	0.00	0.01	<.05	0.00	<.05	0.04	17	57.4
05-04	185606	21	68	220	314	376	0.00	0.00	0.01	<.05	0.00	<.05	0.03	32	55.0
06-08	185851	21	60	228	330	405	0.00	0.00	0.02	<.05	0.00	<.05	0.02	28	73.0
07-19	186217	16	49	180	262	348	0.00	0.00	0.01	<.05	0.00	<.05	0.11	69	71.6
08-02	186344	17	61	240	340	407	0.00	0.00	0.02	<.05	0.00	<.05	0.01	44	77.0
09-10	186620	22	77	212	280	359	0.00	0.00	0.01	<.05	0.00	<.05	0.03	34	77.0

FOX RIVER AT ALGONQUIN

The Fox River rises in Wisconsin above Waukesha, flows southerly into Illinois and through the Wheaton Morainal Region and into the Illinois River. The gaging station is located in Algonquin, 140 feet upstream from Algonquin Dam, and at mile 82.62. Elevation of gage datum is 729.48 feet above mean sea level. The drainage basin above the gage has an area of 1402 square miles.

The tabulation of water quality data is for the period from October 7, 1966, to August 25, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

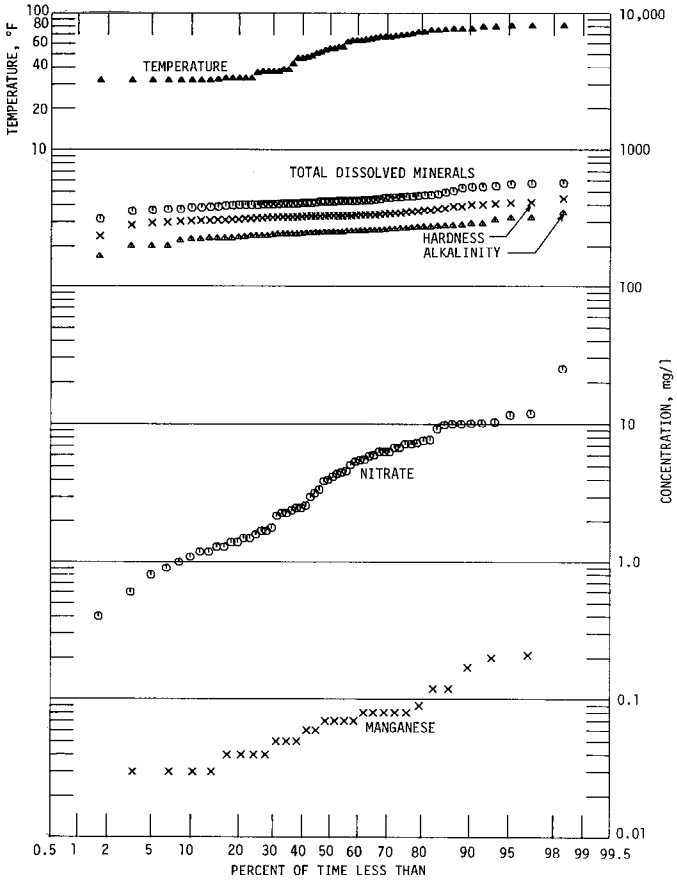
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.25 cfs/sq mi, nor fall below 0.16 cfs/sq mi. The median flow was 0.39 cfs/sq mi and the mean was 0.56 cfs/sq mi.

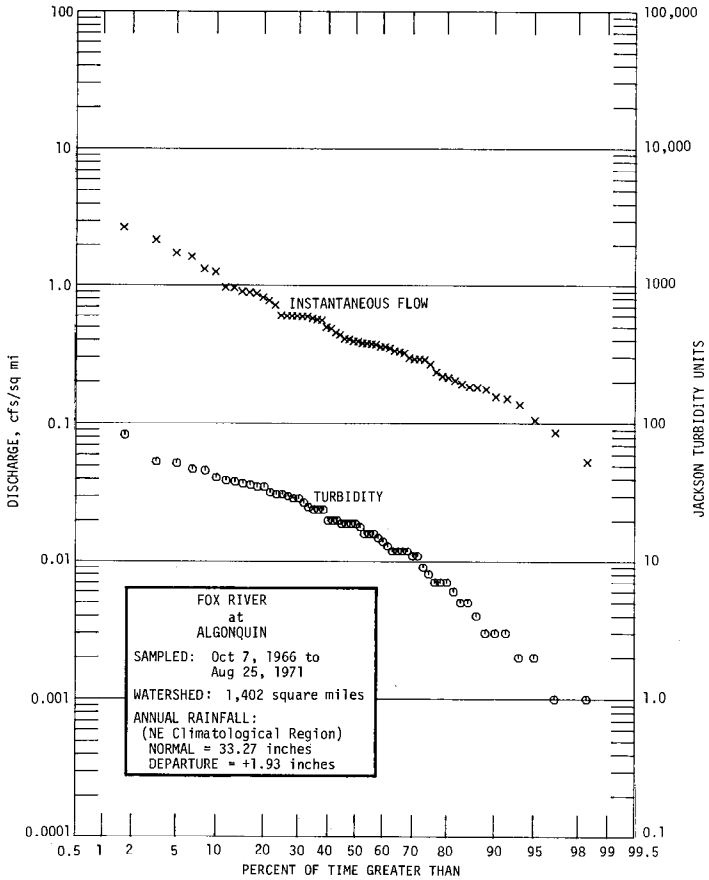
The turbidity was not less than 3 Jtu nor more than 41 Jtu for the central 80 percent of the time. The median value was 19 Jtu and the mean 21 Jtu.

Reported temperatures were over 80 F for 7 percent and over 70 F for 25 percent of the time. They were below 50 F for 43 percent and below 40 F for 34 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	224	252	292
Hardness (as $CaCO_3$)	304	332	398
Total dissolved minerals	380	442	539
Nitrate (NO_3)	1.1	4.1(4.9)	10.1
Total inorganic phosphate (PO_4)	0.6	1.15(1.46)	2.8
Soluble inorganic phosphate (PO_4)	0.4	0.9(1.19)	2.3
Manganese (Mn)	0.03	0.07	0.17





FOX RIVER AT ALGONQUIN

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505500															
10-07	170104	72.9	0.4	0.00	65.6	42.3	0.44	29	3.1	0.0	2.10	3.00	13	0.20	0.10	5.1
11-01	170191	250.0	0.4	0.08	63.0	41.5	0.43	19	3.6	0.0	1.00	1.50	1	0.30	0.30	3.2
12-06	170421	817.0	0.3	0.00	62.4	39.5	0.75	20	4.8	T	0.60	0.70	3	0.30	0.20	4.4
1967	505500															
01-10	170614	280.0	0.2	0.00	84.6	45.5	0.73	22	3.6	0.2	0.60	0.70	5	0.30	0.20	7.2
02-08	170888	520.0	0.2	0.00	79.6	41.2	0.91	22	3.2	0.1	2.00	2.20	4	0.30	0.10	10.0
03-01	171033	488.0	0.1	0.00	89.2	46.1	0.91	23	1.2	0.1	2.50	2.80	10	0.30	0.30	11.9
04-06	171236	2370.0	0.8	0.00	72.0	31.7	0.39	14	2.8	T	0.60	0.90	6	0.20	0.10	9.9
05-02	171430	1330.0	0.8	0.03	63.2	35.0	0.41	16	2.6	0.1	0.40	0.50	2	0.20	0.10	5.5
06-07	171649	213.0	0.6	0.00	69.6	39.5	0.46	15	2.9	T	0.40	0.70	4	0.40	0.10	6.8
07-18	172339	396.0	0.8	0.07	67.2	34.0	0.42	14	2.5	0.9	0.60	0.70	2	0.30	0.10	9.2
08-01	172620	598.0	1.5	0.08	65.6	35.4	0.43	16	3.2	0.1	0.80	1.10	6	0.30	0.10	7.7
09-08	172949	188.0	0.9	0.07	67.2	38.1	0.51	16	2.3	T	1.10	1.20	6	0.30	0.10	0.4
10-05	173242	300.0	1.1	0.00	66.6	37.9	0.39	18	2.7	0.1	0.70	1.00	11	0.30	0.00	4.2
11-06	173473	980.0	0.4	0.00	66.4	39.0	0.43	23	3.0	T	0.80	1.00	2	0.20	0.10	10.1
12-07	173650	764.0	0.3	0.04	66.0	40.7	0.64	20	3.1	1	0.40	0.60	3	0.10	0.10	4.6
1068	505500															
01-04	173909	530.0	0.4	0.00	83.6	43.7	0.53	47	5.5	0.1	4.30	4.60	10	0.20	0.20	25.0
02-01	174176	510.0	0.4	0.05	72.8	37.9	0.59	23	3.8	0.5	1.30	1.40	5	0.20	0.00	5.6
03-06	174268	320.0	0.2	T	76.0	42.3	0.75	23	3.4	0.3	1.20	1.20	4	0.20	0.10	4.0
04-11	174516	393.0	1.2	0.17	76.0	34.2	0.48	19	2.7	0.1	1.00	1.60	2	0.20	0.10	1.7
05-13	174799	440.0	0.4	0.05	68.8	40.9	0.63	23	3.1	0.6	1.10	1.40	6	0.20	0.10	1.7
06-06	175358	551.0	0.6	0.00	72.8	39.4	0.74	20	2.7	0.5	0.90	0.90	4	0.30	0.20	1.3
07-12	175791	1120.0	1.8	0.00	68.8	37.0	0.58	14	3.0	0.1	0.40	0.80	3	0.30	0.10	2.5
08-12	176024	457.0	2.7	0.04	68.8	38.1	0.52	17	3.2	0.2	1.20	2.10	12	0.30	0.10	1.4
09-06	176168	145.0	1.5	0.07	70.4	37.0	0.48	30	3.7	0.7	1.90	2.10	13	0.30	0.10	3.0
09-30	176472	535.0	1.7	0.06	66.4	38.4	0.72	21	3.2	T	1.00	1.40	12	0.30	0.10	1.6
11-07	176942	407.0	0.5	0.06	61.6	39.4	0.50	19	4.0	0.1	0.40	0.90	1	0.30	0.10	2.5
12-03	177112	825.0	0.2	0.12	67.2	39.9	0.63	21	3.5	0.2	0.80	0.90	4	0.30	0.10	2.3
1969	505500															
01-14	177340	555.0	0.1	0.03	89.2	46.5	0.73	36	4.2	2.2	2.30	2.40	9	0.30	0.20	7.2
02-04	177531	1200.0	0.2	T	76.0	38.4	0.52	33	4.4	1.8	1.60	2.10	9	0.30	0.20	10.0
03-06	177758	1240.0	0.3	0.08	69.6	33.6	0.54	20	4.2	1.0	1.20	1.20	6	0.30	0.10	6.0
04-09	177992	1720.0	1.3	0.20	64.8	32.6	0.35	17	2.9	0.1	1.10	1.20	2	0.20	0.30	2.4
05-09	178140	770.0	0.5	0.12	76.6	40.4	0.42	56	4.2	2.0	5.40	5.90	8	0.30	0.20	0.9
06-09	178661	1800.0	0.9	0.00	73.2	34.7	0.15	15	3.5	0.4	0.70	1.10	6	0.20	0.10	10.3
06-30	179009	1320.0	0.9	0.00	70.4	36.0	0.36	25	2.9	0.5	2.40	2.70	3	0.20	0.10	6.8
08-15	179426	398.0	1.2	0.00	75.2	35.1	0.39	17	2.7	0.1	0.80	0.90	10	0.30	0.00	1.5
09-11	179694	366.0	1.2	T	70.8	35.0	0.38	16	2.9	0.1	1.00	1.60	2	0.20	0.10	2.2
10-08	179901	241.0	1.3	0.07	74.8	39.3	0.39	27	3.6	0.6	2.00	2.60	4	0.30	0.10	2.3
11-07	180072	812.0	0.5	T	80.0	40.0	0.49	31	4.2	0.6	2.00	2.30	1	0.30	0.10	3.9
12-09	180452	678.0	0.2	0.00	72.8	42.4	0.58	22	3.4	0.4	1.20	1.30	3	0.30	0.10	1.4
1970	505500															
01-08	180578	450.0	0.2	T	88.8	43.4	0.54	46	3.8	2.1	5.00	5.10	10	0.30	0.10	6.3
02-10	180904	489.0	0.1	0.05	90.4	43.4	0.62	28	3.6	1.1	1.00	1.80	5	0.40	0.10	5.9
03-04	181009	784.0	0.3	0.00	70.4	38.1	0.14	24	3.2	0.2	0.80	1.20	2	0.30	0.10	6.3
04-10	181291	1220.0	0.8	T	64.8	35.6	0.41	17	2.9	0.1	0.70	0.90	3	0.20	0.10	1.2
05-06	181896	812.0	1.7	0.08	73.6	38.5	0.41	19	2.7	0.1	0.40	0.80	4	0.20	0.10	1.5
06-09	182263	2230.0	0.8	T	72.0	34.7	0.31	14	2.6	0.8	0.30	0.50	2	0.30	0.10	6.3
07-07	183189	292.0	1.5	0.08	72.0	37.2	0.34	15	2.3	0.6	0.60	0.70	4	0.30	0.10	3.4
08-12	183501	207.0	1.1	0.00	68.8	39.0	0.41	22	2.8	2.2	1.10	1.30	10	0.30	0.10	1.3
09-02	183603	118.0	1.1	0.00	73.6	41.0	0.38	21	2.5	0.2	1.00	1.20	13	0.30	0.10	0.6
10-07	184073	619.0	0.4	0.03	62.4	36.1	0.42	16	2.9	0.2	0.90	1.00	2	0.30	0.10	1.0
10-30	184395	820.0	0.9	0.04	70.4	38.1	0.36	16	2.8	0.3	0.50	0.60	4	0.30	0.10	2.6
12-03	184694	1060.0	0.4	T	82.4	41.5	0.49	17	2.7	0.1	0.40	0.40	5	0.30	0.10	5.4
1971	505500															
01-04	184852	667.0	0.3	0.04	81.6	44.9	0.62	27	2.6	0.2	0.40	0.80	7	0.30	0.10	7.3
01-29	184893	508.0	0.1	0.00	95.2	49.3	0.66	25	3.1	1.0	0.50	1.00	10	0.40	0.10	7.6
03-03	185092	3680.0	0.5	0.00	54.4	24.4	0.27	13	3.2	0.7	0.50	0.60	7	0.30	0.10	11.6
03-22	185418	2990.0	0.6	0.03	64.8	29.8	0.27	13	2.9	0.5	0.40	0.40	7	0.20	0.10	10.2
05-04	185651	820.0	1.1	0.00	67.2	35.1	0.37	16	2.3	0.2	0.10	0.10	2	0.20	0.10	4.5
05-28	185947	514.0	0.7	0.21	67.2	39.0	0.34	20	2.4	0.1	1.10	1.30	2	0.20	0.10	0.8
06-25	186204	478.0	1.0	0.09	66.4	37.6	0.39	21	2.5	0.8	0.70	0.70	3	0.30	0.10	1.2
08-04	186396	248.0	0.9	0.00	67.2	40.5	0.46	27	3.0	0.2	0.90	1.00	1	0.30	0.10	1.1
08-25	186637	262.0	1.5	0.00	60.0	36.1	0.43	34	3.1	0.6	1.70	2.20	6	0.30	0.10	1.8

FOX RIVER AT ALGONQUIN

DATE	LAB.NO.	CL	S04	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505500														
10-07	170104	40	74	256	338	433			0.00					12	54.0
11-01	170191	27	70	250	328	388			0.01					9	46.0
12-06	170421	28	68	276	318	398			0.01					11	33.0
1967	505500														
01-10	170616	33	91	292	398	502			0.02					15	32.0
02-08	170888	33	94	258	368	459		0.00	0.01				0.03	1	33.0
03-01	171033	35	104	292	412	539		0.00	0.01				0.04		33.0
04-06	171236	22	117	200	310	421		0.00	0.01				0.02	20	50.0
05-02	171430	23	106	200	302	410		0.00	0.02				0.04	24	56.0
06-07	171649	24	94	234	336	425		0.00	0.01				0.01	16	72.0
07-18	172339	20	77	236	308	403		0.00	0.02				0.00	20	74.0
08-01	172620	21	71	232	309	400		0.00	0.03				0.03	53	80.0
09-08	172949	23	69	252	324	411		0.00	0.02				0.02	24	69.0
10-05	173242	25	64	272	322	412		0.00	0.01				0.01	16	65.0
11-06	173473	34	74	244	326	422		0.00	0.01				0.03	5	38.0
12-07	173650	30	92	228	332	407		0.00	0.02				0.03	12	38.0
1968	505500														
01-04	173909	66	96	284	388	571		0.00	0.03				0.06	7	32.0
02-01	174176	35	86	248	338	449		0.00	0.01				0.02	7	33.0
03-06	174268	35	84	274	364	469		0.00	0.02				0.03	3	37.0
04-11	174516	28	77	256	330	423		0.00	0.01				0.04	38	53.0
05-13	174799	33	103	236	340	428		0.00	0.01				0.03	16	63.0
06-06	175358	31	90	252	344	408		0.00	0.01				0.02	24	76.0
07-12	175791	23	87	228	324	380		0.00	0.01				0.02	31	74.0
08-12	176024	28	74	260	328	424		0.00	0.01				0.03	83	75.0
09-06	176168	44	71	244	328	450		0.00	0.01				0.02	39	67.0
09-30	176472	29	77	256	324	408		0.00	0.02				0.02	47	64.0
11-07	176942	30	70	244	316	403		0.00	0.01				0.00	18	46.0
12-03	177112	33	75	260	332	413		0.00	0.01				0.01	6	37.0
1969	505500														
01-14	177340	59	98	320	414	563		0.00	0.03				0.08	2	32.0
02-04	177531	52	93	258	348	490		0.00	0.02				0.02	5	32.0
03-06	177758	33	79	240	312	409	0.00	0.02	0.01	<.05		<.05	0.01	7	37.0
04-09	177992	30	84	224	296	385	0.00	0.00	0.02	<.05	0.00	<.05	0.02	31	56.0
05-09	178140	84	87	268	357	539	0.01	0.00	0.03	<.05	0.00	<.05	0.03	8	62.0
06-09	178661	25	97	228	325	395	0.01	0.00	0.02	<.05	0.00	<.05	0.04	29	62.0
06-30	179009	38	77	244	324	438	0.00	0.00	0.02	<.05	0.00	<.05	0.02	19	80.0
08-15	179426	25	58	268	332	392	0.00	0.00	0.02	<.05	0.00	<.05	0.03	37	79.0
09-11	179694	24	63	248	320	357	0.00	0.00	0.02	<.05	0.01	<.05	0.05	35	70.0
10-08	179901	40	69	282	348	453	0.00	0.00	0.02	<.05	0.01	<.05	0.03	41	66.0
11-07	180072	46	88	260	364	474	0.01	0.00	0.02	<.05	0.00	<.05	0.02	20	47.0
12-09	180452	36	90	262	356	464	0.00	0.00	0.01	<.05	0.00	<.05	0.03	3	33.0
1970	505500														
01-08	180578	69	85	320	400	568	0.00	0.00	0.02	<.05	0.00	<.05	0.03	3	32.5
02-10	180904	45	84	310	404	528	0.00	0.00	0.01	<.05	0.00	<.05	0.02	2	32.0
03-04	181009	39	76	250	332	431	0.00	0.00	0.02	<.05	0.00	<.05	0.02	12	36.0
04-10	181291	33	80	220	308	405	0.00	0.00	0.02	<.05	0.00	<.05	0.01	25	48.0
05-06	181896	33	90	246	342	448	0.00	0.00	0.02	<.05	0.00	<.05	0.03	46	62.0
06-09	182263	25	75	228	322	403	0.00	0.00	0.01	<.05	0.00	<.05	0.02	19	76.0
07-07	183189	25	68	264	336	398	0.00	0.00	0.01	<.05	0.00	<.05	0.00	36	72.0
08-12	183501	33	66	252	332	420	0.00	0.00	0.01	<.05	0.00	<.05	0.00	32	80.0
09-02	183603	34	72	276	352	420	0.00	0.00	0.02	<.05	0.01	<.05	0.00	30	66.0
10-07	184073	27	73	224	304	365	0.00	0.00	0.00	<.05	0.00	<.05	0.01	11	61.0
10-30	184395	27	72	244	332	381	0.00	0.00	0.01	<.05	0.00	<.05	0.04	19	54.0
12-03	184694	28	92	280	376	459	0.00	0.00	0.02	<.05	0.00	<.05	0.02	12	42.0
1971	505500														
01-04	184852	43	92	280	388	469	0.00	0.00	0.01	<.05	0.00	<.05	0.03	4	32.0
01-29	184893	41	92	348	440	546	0.00	0.00	0.02	<.05	0.00	<.05	0.02	1	32.0
03-03	185092	23	53	168	236	315	0.00	0.00	0.01	<.05	0.00	<.05	0.01	13	32.0
03-22	185418	27	65	200	284	370	0.00	0.00	0.02	<.05	0.00	<.05	0.02	14	37.0
05-04	185651	30	73	236	312	370	0.00	0.00	0.02	<.05	0.00	<.05	0.03	27	50.9
05-28	185947	35	74	252	328	398	0.00	0.00	0.02	<.05	0.00	<.05	0.04	19	66.0
06-25	186204	33	69	252	320	423	0.00	0.00	0.00	<.05	0.00	<.05	0.00	29	79.0
08-04	186396	41	61	264	334	423	0.00	0.00	0.01	<.05	0.00	<.05	0.01	35	68.0
08-25	186637	51	62	236	298	432	0.00	0.00	0.02	<.05	0.00	<.05	0.01	52	76.0

FOX RIVER AT BATAVIA

The Fox River rises in Wisconsin above Waukesha, flows southerly into Illinois and through the Wheaton Morainal Region and into the Illinois River. The gaging station is located in Batavia, 1670 feet downstream from the Wilson Avenue Bridge. Elevation of gage datum is 654.00 feet above mean sea level. The drainage basin above the gage has an area of approximately 1662 square miles.

The tabulation of water quality data is for the period from December 5, 1968, to September 10, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

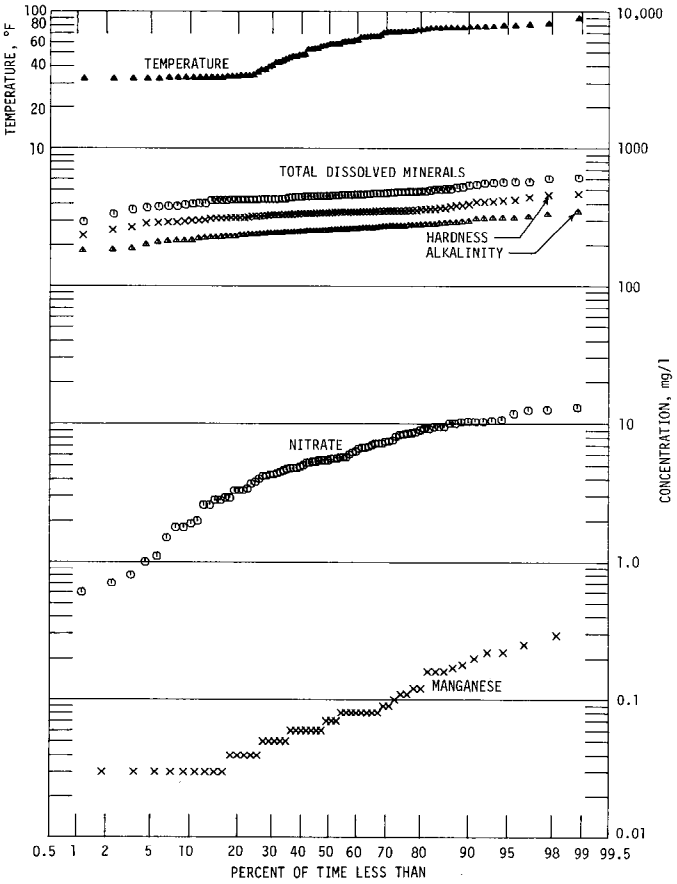
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.87 cfs/sq mi, nor fall below 0.17 cfs/sq mi. The median flow was 0.68 cfs/sq mi.

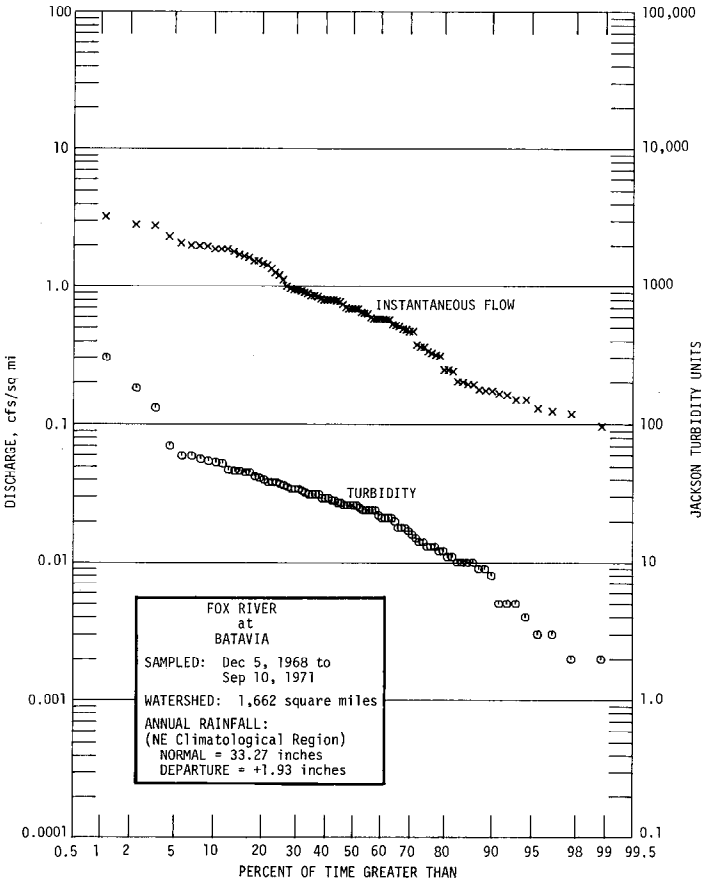
The turbidity was not less than 8 Jtu nor more than 53 Jtu for the central 80 percent of the time. The median value was 26 Jtu and the mean 32 Jtu.

Reported temperatures were over 80 F for 3 percent and over 70 F for 30 percent of the time. They were below 50 F for 40 percent and below 40 F for 29 percent of the time.

The analyses indicated the following:

	Concentration (mg/l) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	214	255	296
Hardness (as $CaCO_3$)	299	314	392
Total dissolved minerals	395	452	536
Nitrate (NO_3)	1.9	5.5(6.0)	10.3
Total inorganic phosphate (PO_4)	1.1	2.1(2.29)	3.3
Soluble inorganic phosphate (PO_4)	0.8	1.85(1.85)	2.9
Manganese (Mn)	0.03	0.07	0.19





FOX RIVER AT BATAVIA

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1968	505512															
12-05	176945	1040.0	06	0.06	74.8	41.1	0.61	26	4.0	T	1.60	1.60	3	0.30	0.10	9.5
12-12	177109	1320.0	04	0.09	70.4	41.3	0.78	27	4.0	1.0	1.90	1.90	2	0.30	0.10	2.6
12-19	177108	950.0	06	0.08	74.4	40.4	0.73	36	4.3	1.2	2.70	3.20	3	0.30	0.20	4.2
12-26	177180	775.0	02	0.06	88.8	47.2	0.73	35	4.7	1.1	2.40	2.80	5	0.30	0.20	7.2
1969	505512															
01-02	177181	1525.0	09	0.07	85.6	43.3	0.58	30	4.7	0.4	2.30	2.60	8	0.30	0.20	10.3
01-09	177182	1130.0	05	0.07	87.2	46.2	0.64	35	4.7	1.4	2.70	2.80	9	0.30	0.20	9.5
01-16	177339	1420.0	04	0.05	87.2	46.7	0.69	39	4.4	2.0	3.00	4.10	9	0.40	0.20	8.7
01-23	177338	2205.0	10	0.08	63.2	31.6	0.36	29	3.7	1.0	1.50	1.70	8	0.20	0.20	10.2
01-30	177352	2070.0	09	0.09	65.6	32.1	0.28	32	4.3	1.4	2.00	2.10	9	0.20	0.10	9.2
02-06	177405	1320.0	02	0.06	79.2	39.9	0.58	23	4.3	1.2	2.00	2.10	9	0.30	0.20	11.8
02-12	177406	950.0	02	0.04	85.2	42.1	0.61	25	4.2	1.0	2.60	2.60	9	0.30	0.20	10.5
02-20	177534	595.0	02	0.03	85.6	41.3	0.63	40	4.7	1.4	3.70	3.80	8	0.30	0.30	8.5
02-27	177533	775.0	02	0.03	81.6	40.4	0.61	38	4.2	1.6	3.20	3.20	7	0.30	0.20	8.1
03-06	177582	1320.0	09	0.12	75.2	36.0	0.62	27	5.1	0.9	2.20	2.80	5	0.30	0.20	0.7
03-13	177632	1280.0	02	0.03	72.0	36.0	0.50	27	4.3	0.8	2.20	2.30	5	0.30	0.10	6.0
03-20	177768	950.0	03	0.07	76.0	36.5	0.54	29	3.9	0.2	2.30	2.60	2	0.30	0.20	3.7
03-27	177761	1570.0	04	0.00	70.4	35.0	0.40	30	3.2	0.4	1.30	1.80	2	0.20	0.10	5.3
04-03	177795	1980.0	08	0.05	68.8	34.0	0.38	24	3.0	0.3	1.10	1.40	2	0.20	0.10	5.2
04-10	177939	2360.0	13	0.20	70.4	35.5	0.36	21	3.2	0.6	1.10	1.60	3	0.30	0.10	6.3
04-17	177940	2820.0	16	0.22	72.0	34.5	0.40	20	3.2	0.6	1.00	1.60	2	0.30	0.10	7.2
04-24	177976	2410.0	11	0.18	73.6	37.0	0.41	20	3.0	0.4	0.90	1.20	1	0.30	0.10	5.7
05-01	178143	1320.0	09	0.00	69.6	38.9	0.41	24	3.5	0.6	1.70	2.00	1	0.30	0.30	4.7
05-08	178144	1130.0	10	0.03	65.6	37.0	0.41	26	3.6	0.7	1.90	2.30	2	0.30	0.20	3.3
05-15	178145	855.0	05	0.00	72.0	39.9	0.43	28	3.7	1.2	2.20	2.60	4	0.30	0.30	5.4
05-22	178381	1470.0	09	T	75.6	39.8	0.43	29	3.9	1.4	1.80	2.20	6	0.30	0.10	5.6
05-29	178382	805.0	05	0.00	72.8	39.5	0.50	27	3.5	0.2	1.60	1.90	1	0.30	0.10	2.9
06-05	178383	1160.0	12	0.08	70.8	36.8	0.50	31	3.8	1.0	2.20	2.70	3	0.30	0.10	4.5
06-12	178657	3110.0	12	0.00	69.6	34.3	0.35	19	3.4	0.7	0.90	1.40	8	0.20	0.10	8.6
06-19	178658	1130.0	10	0.11	71.8	36.7	0.44	24	3.7	0.4	1.40	1.90	2	0.20	0.10	4.3
06-26	178659	1220.0	08	T	73.2	36.1	0.43	25	3.6	0.6	1.50	2.20	2	0.20	0.10	6.2
07-03	178940	2510.0	10	0.03	73.6	36.1	0.42	20	3.2	0.3	1.50	1.80	10	0.20	0.20	1.8
07-10	178939	2510.0	09	0.16	72.4	32.0	0.42	17	3.4	0.6	1.30	1.60	2	0.20	0.10	5.7
07-17	179004	1650.0	08	T	71.0	33.3	0.41	19	3.6	0.1	1.60	1.90	6	0.20	0.20	6.8
07-24	179005	2670.0	08	0.05	68.8	31.0	0.32	16	3.4	0.5	1.20	1.60	9	0.20	0.10	4.8
07-31	179247	1840.0	10	0.03	70.6	33.5	0.38	26	3.3	1.0	1.40	1.80	10	0.30	0.10	1.8
08-07	179246	840.0	04	0.06	69.6	34.2	0.39	21	3.3	0.5	1.50	1.70	8	0.30	0.10	4.8
08-14	179430	520.0	17	0.12	76.8	36.8	0.47	28	4.4	0.9	2.90	3.30	7	0.30	0.20	4.9
08-21	179431	510.0	11	0.08	75.2	37.1	0.46	27	4.8	0.7	2.40	2.60	11	0.30	0.20	3.4
08-28	179432	273.0	22	T	75.2	37.1	0.44	28	4.3	3.4	2.60	2.90	13	0.30	0.20	1.0
09-04	179429	265.0	15	0.06	74.0	36.3	0.45	32	5.1	0.8	2.80	3.10	14	0.30	0.20	5.3
09-11	179526	405.0	14	T	76.6	37.2	0.46	31	4.9	0.6	2.60	2.80	14	0.30	0.10	5.4
09-18	179695	405.0	14	0.08	72.8	37.6	0.41	37	4.5	0.7	2.80	3.00	14	0.30	0.20	4.8
09-25	179696	332.0	08	T	74.0	37.3	0.45	38	4.8	0.9	3.80	4.20	12	0.30	0.20	5.4
10-02	179797	288.0	11	0.00	75.4	38.9	0.45	35	4.4	0.8	2.40	2.90	11	0.30	0.10	5.6
10-09	179796	247.0	08	0.00	75.2	39.5	0.47	32	4.5	0.6	2.30	2.70	6	0.30	0.10	5.7
10-16	179903	1400.0	38	0.06	75.0	36.2	0.35	28	4.3	0.8	2.20	2.30	3	0.30	0.10	5.6
10-23	179902	1420.0	07	T	76.0	38.3	0.48	27	4.0	0.7	1.90	1.90	3	0.30	0.20	5.4
10-30	179952	1070.0	05	T	79.2	37.6	0.64	29	4.5	1.1	2.30	2.80	3	0.30	0.20	6.6
11-06	179953	950.0	05	T	83.6	39.3	0.57	31	5.0	0.8	2.30	2.40	2	0.30	0.20	6.7
11-13	180073	870.0	03	T	77.6	38.1	0.54	17	3.2	0.1	0.30	0.50	1	0.20	0.10	2.8
11-20	180204	795.0	04	T	72.0	40.5	0.53	32	4.1	0.8	1.90	1.90	1	0.30	0.20	4.4
11-26	180205	1130.0	03	0.00	71.2	40.5	0.54	31	4.6	0.5	2.00	2.10	1	0.40	0.20	2.8
12-04	180206	1050.0	02	T	72.0	42.2	0.58	30	4.3	0.4	1.50	1.50	1	0.40	0.20	1.9
1970	505512															
01-06	180453	550.0	02	T	87.2	46.3	0.67	41	4.4	2.1	4.00	4.10	6	0.40	0.20	7.6
02-05	180902	620.0	05	0.04	94.0	45.4	0.64	52	5.0	2.6	3.90	4.20	9	0.40	0.20	5.0
03-05	180954	1500.0	21	0.00	68.8	31.5	0.23	31	5.4	1.1	1.80	2.10	7	0.30	0.20	12.5
04-09	181239	1550.0	07	0.04	71.6	36.4	0.28	26	2.0	0.2	1.20	1.60	1	0.30	0.10	7.4
05-07	181626	975.0	06	0.00	74.4	39.0	0.41	29	3.6	0.6	1.50	1.50	1	0.30	0.10	7.0
05-15	181907	3300.0	15	0.00	67.6	33.9	0.28	19	2.8	0.6	1.00	1.00	6	0.20	0.10	10.3
05-17	181906	3420.0	11	0.00	73.2	35.6	0.32	19	2.7	0.5	0.90	1.10	6	0.20	0.10	9.0
05-18	181905	3250.0	11	0.00	74.0	36.4	0.36	19	2.9	0.5	0.80	1.20	6	0.20	0.10	8.3
05-20	181904	3100.0	09	0.00	76.0	36.4	0.35	20	3.1	0.6	1.20	1.40	6	0.30	0.10	10.3
06-02	181903	4650.0	11.0	0.29	57.6	27.4	0.22	15	3.1	0.3	0.70	1.30	5	0.20	0.10	10.6
06-03	181902	4600.0	69	0.22	68.4	28.1	0.22	16	3.0	0.6	0.80	1.40	5	0.20	0.10	12.4
06-05	182078	3800.0	28	0.00	66.4	30.3	0.15	15	2.8	0.3	0.70	1.00	4	0.30	0.10	9.5
06-08	182077	3100.0	20	0.16	75.2	33.7	0.30	17	2.6	0.1	0.60	1.20	3	0.30	0.10	8.4
07-13	183187	395.0	06	0.08	75.2	39.9	0.34	27	3.2	1.0	1.40	2.10	2	0.30	0.10	0.6
07-16	183186	335.0	15	0.16	77.6	41.0	0.31	29	4.1	1.2	2.40	13.90	4	0.30	0.20	2.0
07-27	183185	320.0	04	0.06	74.4	40.0	0.31	31	3.4	0.5	1.80	4.10	2	0.30	0.20	0.8
08-06	183309	535.0	17	0.03	73.6	38.9	0.39	30	4.0	0.7	2.00	2.00	10	0.40	0.20	4.3
08-12	183308	285.0	07	0.05	73.6	40.9	0.38	30	3.8	0.4	2.20	2.30	10	0.30	0.20	4.0
08-14	183504	215.0	14	0.05	76.0	41.3	0.39	33	4.1	1.3	1.90	2.30	11	0.40	0.20	2.6
08-18	183500	205.0	14	0.10	74.4	40.9	0.39	39	4.2	0.4	2.30	2.30	9	0.40	0.20	1.1
08-24	183499	195.0	16	0.03	77.6	39.4	0.42	42	4.4	1.2	2.90	2.90	11	0.40	0.20	3.8
08-27	183534	160.0	11	0.03	75.2	41.8	0.42	44	4.8	0.3	2.90	3.50	13	0.40	0.20	1.5
09-24	183766	5350.0	56	0.00	53.6	23.8	0.22	15	3.2	0.3	0.90	1.40	8	0.30	0.10	6.7
09-28	183765	2960.0	18	0.08	71.2	32.7	0.35	18	3.2	0.3	1.00	1.10	10	0.30	0.10	7.2
10-05	184394	1590.0	04	0.04	75.2	38.1	0.40	23	3.0	0.8	0.60	0.60	3	0.30	0.10	5.2
12-04	184393	1300.0	04	0.04	84.8	40.0	0.51	23	3.0	0.6	0.60	0.80	4	0.30	0.10	7.5
1971	505512															
01-11	184691	940.0	01	0.00	96.8	48.3	0.62	37	3.8	1.5	2.60	2.80	7	0.40	0.20	10.0
02-04	184895	940.0	01	0.00	98.4	51.2	0.72	39	4.2	2.8	1.90	2.00	10	0.40	0.20	9.2
03-09	185093	3280.0	05	0.00	62.4	27.4	0.29	18	3.4	0.8	0.70	0.80	7	0.30	0.10	13.0
04-01	185339	2750.0	09	0.00	68.8	31.3	0.30	18	2.9	0.5	0.70	1.00	6	0.20	0.10	10.0
05-06	185653	1340.0	18	0.17	64.0	31.7	0.37	29	3.4	1.3	1.40	1.70	2	0.30	0.10	3.3
06-09	185948	593.0	12	0.25	72.8	39.5	0.39	29	3.5	0.6	1.80	2.40	4	0.30	0.10	4.6
07-22	186281	316.0	12	0.08	71.2	40.0	0.52	32	3.9	0.4	1.60	1.80	1	0.40	0.10	4.2
08-11	186394	292.0	08	0.11	69.2	39.8	0.45	43	3.8	0.2	1.70	1.90	1	0.40	0.20	2.9
09-10	186643	246.0	15	0.00	65.6	39.0	0.45	39	4.0	1.1	2.10	2.20	9	0.50	0.20	3.3

FOX RIVER AT BATAVIA

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1968	505512														
12-05	176945	41	88	264	356	468	0.01	0.00	0.01	<.05		<.05	0.01	13	35.5
12-12	177109	43	82	272	346	459	0.00	0.00	0.01	<.05		<.05	0.02	9	33.5
12-19	177108	54	87	280	352	494	0.01	0.00	0.01	<.05		<.05	0.03	13	32.7
12-26	177180	57	116	306	416	557	0.00	0.00	0.02	<.05		<.05	0.02	10	32.5
1969	505512														
01-02	177181	50	104	288	392	522	0.00	0.00	0.02	<.05		<.05	0.05	21	32.5
01-09	177182	54	101	310	408	542	0.00	0.00	0.01	<.05		<.05	0.04	9	32.0
01-16	177339	63	101	312	410	568	0.01	0.00	0.02	<.05		<.05	0.16	5	32.0
01-23	177338	47	73	210	288	425	0.00	0.00	0.02	<.05		<.05	0.21	26	32.7
01-30	177352	53	79	214	296	450	0.00	0.00	0.02	<.05		<.05	0.11	20	32.2
02-06	177405	50	101	258	362	478	0.00	0.00	0.01	<.05		<.05	0.06	5	32.5
02-12	177406	54	101	284	386	515	0.00	0.00	0.01	<.05		<.05	0.04	5	32.7
02-20	177534	59	99	292	384	555	0.00	0.00	0.01	<.05		<.05	0.04	2	32.5
02-27	177533	56	91	286	370	536	0.00	0.00	0.01	<.05		<.05	0.03	3	33.0
03-06	177582	45	84	258	336	466	0.00	0.00	0.01	<.05		<.05	0.02	21	39.0
03-13	177632	41	80	252	328	443	0.00	0.00	0.01	<.05		<.05	0.03	4	34.0
03-20	177768	44	87	272	340	459	0.00	0.00	0.01	<.05		<.05	0.02	11	47.0
03-27	177761	52	83	240	320	451	0.00	0.00	0.02	<.05		<.05	0.02	18	37.0
04-03	177795	39	78	232	312	429	0.00	0.00	0.01	<.05		<.05	0.03	27	39.5
04-10	177939	36	89	236	322	421	0.00	0.00	0.02	<.05	0.00	<.05	0.02	29	53.0
04-17	177940	35	90	232	322	425	0.00	0.00	0.02	<.05	0.00	<.05	0.02	38	57.0
04-24	177976	34	94	246	336	440	0.00	0.00	0.02	<.05	0.00	<.05	0.02	35	47.0
05-01	178143	38	90	226	334	422	0.00	0.00	0.01	<.05	0.01	<.05	0.03	24	56.0
05-08	178144	41	85	228	316	424	0.00	0.00	0.01	<.05	0.01	<.05	0.03	24	65.0
05-15	178145	44	86	244	344	457	0.00	0.00	0.01	<.05	0.01	<.05	0.02	11	60.5
05-22	178381	44	88	250	352	448	0.01	0.00	0.02	<.05	0.01	<.05	0.09	26	54.5
05-29	178382	38	85	248	344	439	0.01	0.00	0.02	<.05	0.01	<.05	0.03	21	71.0
06-05	178383	45	81	242	328	422	0.01	0.00	0.02	<.05	0.01	<.05	0.06	34	59.5
06-12	178657	29	84	228	314	397	0.00	0.00	0.02	<.05	0.00	<.05	0.01	31	70.0
06-19	178658	35	90	250	330	448	0.00	0.00	0.02	<.05	0.00	<.05	0.01	26	70.0
06-26	178659	37	90	248	331	458	0.00	0.00	0.02	<.05	0.00	<.05	0.01	24	70.5
07-03	178940	28	75	256	332	431	0.00	0.00	0.01	<.05	0.01	<.05	0.05	31	75.0
07-10	178939	26	68	246	312	381	0.00	0.00	0.02	<.05	0.00	<.05	0.05	29	71.0
07-17	179004	28	68	254	314	422	0.00	0.00	0.01	<.05	0.01	<.05	0.03	29	81.0
07-24	179005	24	63	240	299	389	0.00	0.00	0.01	<.05	0.00	<.05	0.04	38	77.0
07-31	179247	30	63	249	314	418	0.00	0.00	0.03	<.05	0.01	<.05	0.06	26	75.0
08-07	179246	31	66	251	314	424	0.00	0.00	0.04	<.05	0.01	<.05	0.05	10	76.0
08-14	179430	38	67	262	343	426	0.00	0.00	0.02	<.05	0.01	<.05	0.07	40	76.5
08-21	179431	38	66	258	340	454	0.00	0.00	0.02	<.05	0.01	<.05	0.04	24	73.0
08-28	179432	39	65	256	340	462	0.00	0.00	0.02	<.05	0.01	<.05	0.07	22	76.0
09-04	179429	47	68	268	342	486	0.00	0.00	0.02	<.05	0.01	<.05	0.05	34	73.0
09-11	179526	44	72	318	344	506	0.00	0.00	0.02	<.05	0.01	<.05	0.06	47	64.0
09-18	179695	51	74	266	336	459	0.00	0.00	0.03	<.05	0.01	<.05	0.06	31	65.0
09-25	179696	53	77	264	338	477	0.00	0.00	0.02	<.05	0.01	<.05	0.05	27	60.0
10-02	179797	51	71	270	348	483	0.00	0.00	0.02	<.05	0.01	<.05	0.05	28	64.5
10-09	179796	46	72	272	350	476	0.00	0.00	0.01	<.05	0.01	<.05	0.05	21	57.0
10-16	179903	45	81	250	336	456	0.00	0.00	0.02	<.05	0.01	<.05	0.04	28	52.0
10-23	179902	44	80	264	363	463	0.00	0.00	0.02	<.05	0.01	<.05	0.04	18	45.0
10-30	179952	46	83	256	352	473	0.00	0.00	0.05	<.05	0.00	<.05	0.03	14	44.0
11-06	179953	48	94	260	370	487	0.00	0.00	0.02	<.05	0.01	<.05	0.03	12	43.0
11-13	180073	28	86	250	350	425	0.00	0.00	0.02	<.05	0.01	<.05	0.03	12	42.0
11-20	180204	54	95	240	346	456	0.00	0.00	0.00	<.05	0.01	<.05	0.02	8	33.5
11-26	180205	48	91	241	344	450	0.00	0.00	0.00	<.05	0.01	<.05	0.02	14	37.0
12-04	180206	49	93	244	353	453	0.00	0.00	0.00	<.05	0.01	<.05	0.01	10	33.0
1970	505512														
01-06	180453	62	94	312	408	566	0.00	0.00	0.01	<.05	0.00	<.05	0.04	2	32.2
02-05	180902	79	99	312	421	605	0.01	0.00	0.02	<.05	0.00	<.05	0.04	10	32.5
03-05	180954	55	76	200	301	442	0.00	0.00	0.02	<.05	0.01	<.05	0.04	42	33.5
04-09	181239	46	95	222	328	446	0.00	0.00	0.01	<.05	0.00	<.05	0.03	17	48.0
05-07	181626	48	95	238	346	448	0.00	0.00	0.02	<.05	0.01	<.05	0.02	18	55.0
05-15	181907	34	80	212	308	395	0.00	0.00	0.02	<.05	0.00	<.05	0.03	38	53.0
05-17	181906	34	84	228	329	428	0.00	0.00	0.02	<.05	0.00	<.05	0.02	33	57.0
05-18	181905	33	84	224	334	423	0.00	0.00	0.02	<.05	0.00	<.05	0.02	32	57.0
05-20	181904	36	86	236	339	427	0.00	0.00	0.02	<.05	0.01	<.05	0.03	25	65.0
06-02	181903	24	56	184	256	335	0.00	0.00	0.02	<.05	0.00	<.05	0.04	301	64.0
06-03	181902	25	63	208	286	372	0.00	0.00	0.02	<.05	0.00	<.05	0.11	181	60.0
06-05	182078	26	67	212	290	378	0.00	0.00	0.03	<.05	0.00	<.05	0.06	70	61.0
06-08	182077	30	75	238	326	422	0.00	0.00	0.02	<.05	0.00	<.05	0.05	46	69.0
07-13	183187	45	78	264	352	454	0.00	0.00	0.01	<.05	0.00	<.05	0.00	26	79.0
07-16	183186	47	78	288	362	478	0.00	0.00	0.02	<.05	0.00	<.05	0.00	56	80.0
07-27	183185	50	80	278	350	466	0.00	0.00	0.02	<.05	0.00	<.05	0.01	36	88.5
08-06	183309	44	73	272	344	449	0.00	0.00	0.02	<.05	0.00	<.05	0.01	45	76.0
08-12	183308	50	76	276	352	466	0.00	0.00	0.01	<.05	0.00	<.05	0.00	52	76.0
08-14	183504	50	77	296	369	500	0.00	0.00	0.02	<.05	0.00	<.05	0.02	59	77.0
08-18	183500	57	79	276	354	483	0.00	0.00	0.02	<.05	0.00	<.05	0.02	45	75.0
08-24	183499	62	78	280	356	503	0.00	0.00	0.02	<.05	0.00	<.05	0.05	54	71.0
08-27	183534	63	82	280	360	505	0.00	0.00	0.03	<.05	0.00	<.05	0.02	53	77.0
09-24	183766	23	49	180	232	293	0.00	0.00	0.02	<.05	0.00	<.05	0.04	130	66.0
09-28	183765	29	71	224	312	381	0.00	0.00	0.01	<.05	0.00	<.05	0.03	34	59.0
10-05	184394	37	83	244	344	421	0.00	0.00	0.01	<.05	0.01	<.05	0.04	15	46.0
12-04	184393	39	91	276	376	464	0.00	0.00	0.01	<.05	0.01	<.05	0.04	16	41.8
1971	505512														
01-11	184691	56	101	332	440	562	0.00	0.00	0.01	<.05	0.01	<.05	0.06	3	32.5
02-04	184895	61	96	348	456	598	0.00	0.01	0.02	<.05	0.01	<.05	0.05	0	32.0
03-09	185093	33	65	188	268	360	0.00	0.00	0.00	<.05	0.00	<.05	0.04	13	33.0
04-01	185339	32	69	220	300	398	0.00	0.00	0.01	<.05	0.00	<.05	0.14	24	46.0
05-06	185653	46	69	236	290	410	0.00	0.00	0.03	<.05	0.00	<.05	0.04	46	52.0
06-09	185948	50	74	260	344	445	0.00	0.00	0.02	<.05	0.00	<.05	0.05	31	70.0
07-22	186281	51	68	270	342	460	0.00	0.00	0.02	<.05	0.01	<.05	0.03	41	74.0
08-11	186394	62	65	272	336	483	0.00	0.00	0.02	<.05	0.01	<.05	0.06	37	79.0
09-10	186643	56	70	260	324	476	0.00	0.00	0.01	<.05	0.00	<.05	0.06	59	72.0

HENDERSON CREEK NEAR OQUAWKA

Henderson Creek rises in the Galesburg Plain Region, north of Galesburg, and flows west and south into the Mississippi River. The gaging station is located 6.5 miles northeast of Oquawka, and 22 miles upstream from the mouth of the river. Elevation of gage datum is 541.21 feet above mean sea level. The drainage basin above the gage has an area of 428 square miles.

The tabulation of water quality data is for the period from October 12, 1966, to September 8, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

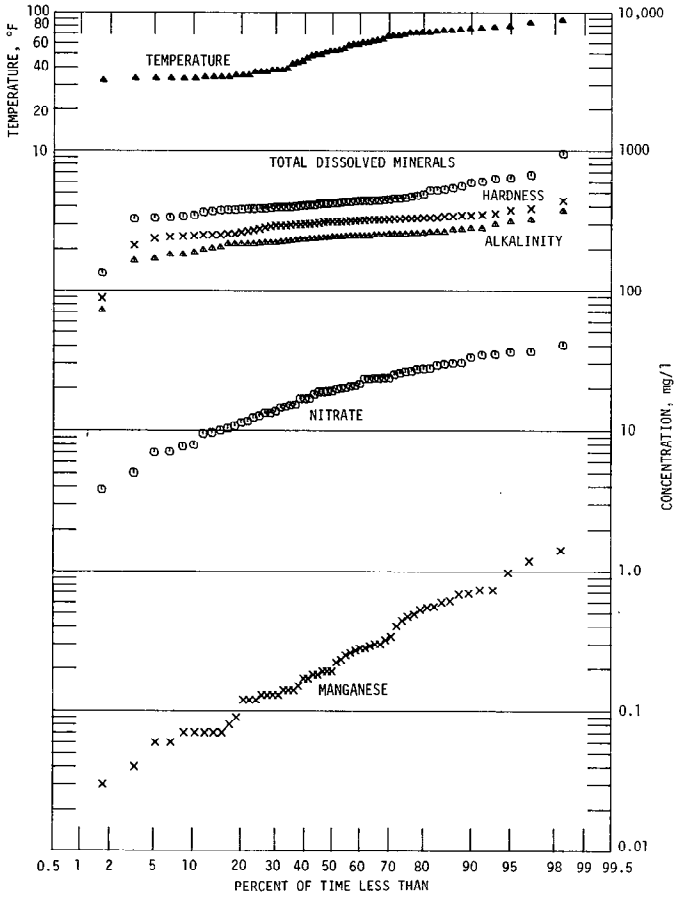
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.45 cfs/sq mi, nor fall below 0.05 cfs/sq mi. The median flow was 0.31 cfs/sq mi and the mean was 0.56 cfs/sq mi.

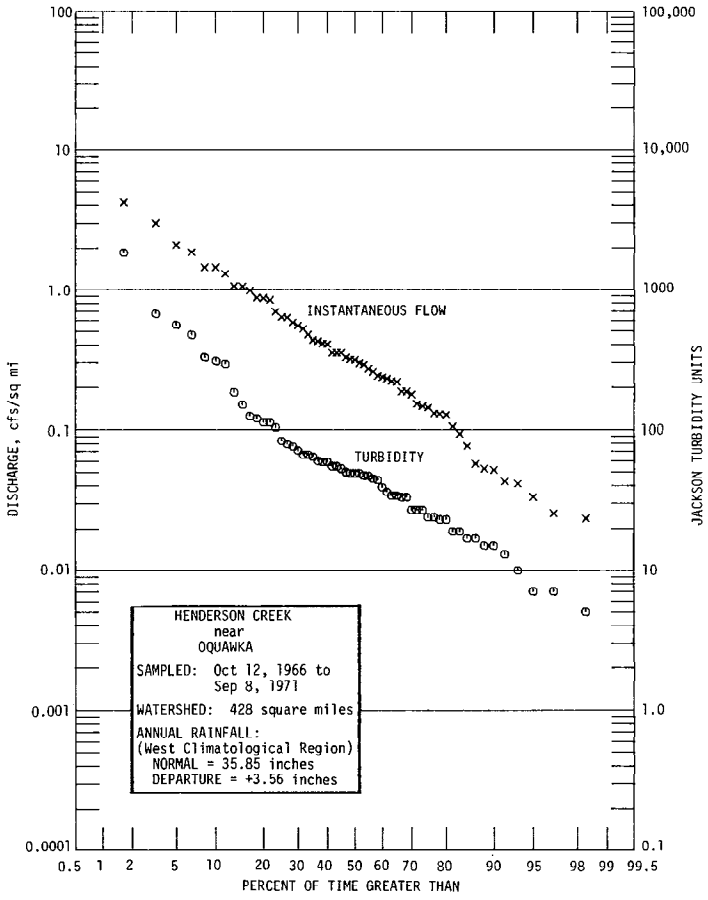
The turbidity was not less than 15 Jtu nor more than 304 Jtu for the central 80 percent of the time. The median value was 49 Jtu and the mean 120 Jtu.

Reported temperatures were over 80 F for 5 percent and over 70 F for 24 percent of the time. They were below 50 F for 46 percent and below 40 F for 34 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	188	244	280
Hardness (as $CaCO_3$)	248	312	344
Total dissolved minerals	345	420	594
Nitrate (NO_3)	7.9	19.0(19.7)	33.1
Total inorganic phosphate (PO_4)	1.0	2.4(3.39)	7.8
Soluble inorganic phosphate (PO_4)	0.6	1.7(2.58)	6.9
Manganese (Mn)	0.07	0.19	0.69





HENDERSON CREEK NEAR OQUAWKA

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	N03
1966	504690															
10-12	170047	10.9	1.2	0.28	83.0	29.9		73		0.3	6.90	7.80	9	0.70	0.40	10.0
11-29	170423	22.6	0.7	0.22	73.5	27.5	0.20	67	7.4	T	10.90	11.50	18	0.70	0.40	13.3
12-08	170486	149.0	10.0	1.18	59.6	25.2	0.19	41	9.3	T	4.70	4.70	11	0.50	0.20	18.8
1967	504690															
01-18	170658	14.2	0.3	0.14	87.2	33.7	0.25	63	8.5	0.1	6.20	6.60	10	0.70	0.40	25.5
02-09	170885	40.0	0.8	0.55	84.4	32.3	0.24	86	6.6	0.3	6.30	7.20	18	0.20	0.50	23.5
03-16	171102	76.4	12.0	0.69	83.2	33.7	0.12	6	3.6	T	0.80	1.40	15	0.10	0.10	3.8
04-11	171323	181.0	3.2	0.19	70.8	30.0	0.26	19	2.7	T	0.60	1.50	12	0.30	0.10	20.0
05-19	171542	247.0	3.1	0.07	69.2	30.4	0.17	16	1.9	0.1	0.80	1.30	9	0.20	0.10	23.3
06-14	172175	621.0	43.0	0.73	62.4	23.5	0.14	11	2.6	0.1	0.70	2.60	6	0.20	0.00	26.4
07-18	172337	98.4	1.7	0.06	74.4	31.3	0.26	29	2.5	T	1.70	1.70	7	0.30	0.10	14.6
08-16	172863	80.0	1.7	0.07	73.6	32.3	0.22	30	3.7	0.1	1.90	2.60	10	0.50	0.20	15.2
09-20	173181	54.1	3.1	0.12	52.0	20.1	0.14	25	8.0	T	2.80	2.80	10	0.10	0.10	9.5
10-19	173361	94.3	2.0	0.13	68.0	26.3	0.17	28	6.2	0.1	2.00	2.20	7	0.10	0.20	13.7
11-16	173563	372.0	1.7	0.12	75.2	32.2	0.14	17	2.0	0.1	0.70	3.30	9	0.10	0.10	27.4
12-06	173703	201.0	1.8	0.07	77.6	32.2	0.20	22	2.0	T	1.20	2.90	13	0.30	0.10	27.6
1968	504690															
01-04	173913	150.0	26	0.06	66.8	29.5	0.15	17	1.7	0.1	0.70	1.30	6	0.20	0.10	27.2
02-01	173984	447.0	69	0.32	69.6	28.8	0.15	14	3.5	0.8	1.20	1.50	6	0.20	0.00	20.5
03-19	174347	268.0	60	0.27	76.8	31.3	0.16	25	3.0	T	1.30	2.00	8	0.20	0.10	18.0
04-17	174538	234.0	22	0.07	74.4	30.7	0.17	18	2.5	0.2	1.30	2.60	9	0.20	0.00	18.9
05-21	174887	103.0	32	0.23	79.2	32.2	0.24	44	3.5	0.6	2.50	2.70	7	0.30	0.00	18.8
06-11	175090	63.0	8.2	0.44	74.0	31.0	0.19	54	4.4	0.2	2.30	3.40	13	0.50	0.40	10.7
07-16	175663	65.2	1.8	0.08	76.8	32.6	0.25	34	3.7	0.2	1.70	1.90	10	0.40	0.20	17.0
08-06	175973	55.2	4.4	0.28	57.6	26.4	0.14	33	6.6	0.2	2.50	4.10	10	0.50	0.20	7.9
09-11	176240	24.5	2.3	0.07	65.2	26.5	0.27	73	9.4	1.8	6.90	7.60	13	0.70	0.40	11.3
10-10	176589	18.4	1.6	T	73.6	31.1	0.39	12	9.7	1.0	8.50	8.60	11	1.00	0.40	16.8
11-07	176808	17.7	1.3	0.26	73.6	30.2	0.27	87	9.3	1.8	10.40	11.00	8	1.10	0.60	16.9
12-17	177106	22.1	0.9	0.40	108.0	40.4	0.39	17	11.0	4.5	10.50	10.60	18	0.90	0.50	5.0
1969	504690															
01-10	177307	32.8	1.3	0.49	88.0	37.4	0.33	63	7.4	3.5	5.60	6.70	16	0.60	0.30	9.6
02-17	177467	100.0	6.1	0.68	60.0	23.3	0.15	16	4.7	1.4	1.40	2.80	11	0.20	0.10	11.6
03-19	177813	93.1	2.2	0.60	69.6	28.7	0.20	31	4.0	0.3	1.90	2.40	10	0.40	0.20	15.1
04-29	178025	123.0	0.5	0.18	73.7	32.7	0.16	30	2.5	0.7	2.40	2.60	5	0.30	0.10	13.3
05-21	178343	134.0	4.8	0.13	78.4	32.2	0.25	33	3.8	0.1	1.70	1.80	10	0.30	0.20	20.1
06-25	178810	450.0	0.9	0.04	64.8	24.9	0.13	17	4.1	0.1	0.90	0.90	10	0.20	0.10	36.0
07-18	179052	1780.0	49.0	1.41	23.2	7.3	0.06	4	4.0	0.4	0.60	4.70	7	0.10	0.00	10.3
08-14	179400	270.0	3.4	0.19	78.4	29.3	0.17	20	3.0	0.3	0.70	1.00	9	0.30	0.10	25.0
09-17	179821	79.8	1.9	0.13	68.4	30.8	0.16	32	4.3	0.1	0.20	1.80	7	0.90	0.20	12.3
10-16	179928	891.0	5.7	0.30	72.8	28.7	0.14	14	3.4	0.2	1.20	1.90	13	0.30	0.20	29.4
11-20	180170	139.0	1.1	0.12	80.8	34.7	0.14	12	2.7	0.3	2.10	2.20	6	0.30	0.10	21.4
12-10	180413	150.0	0.9	0.14	78.4	32.2	0.17	25	2.3	1.2	1.80	2.10	11	0.40	0.10	23.7
1970	504690															
01-07	180702	55.5	0.8	0.30	91.6	38.5	0.20	37	2.7	2.3	3.30	3.50	11	0.20	0.10	23.6
02-11	180906	110.0	1.2	0.00	70.4	30.8	0.14	24	3.2	1.9	2.10	2.50	6	0.30	0.10	19.0
03-24	181073	115.0	0.3	0.09	74.0	32.5	0.12	25	2.5	0.4	1.50	1.60	6	0.30	0.10	14.8
04-15	181526	621.0	10.0	0.47	72.0	30.3	0.16	16	2.4	0.3	0.50	1.70	3	0.30	0.20	28.8
05-26	181897	790.0	28.0	0.98	59.2	22.0	0.13	11	2.8	0.1	0.50	2.70	7	0.20	0.20	34.5
06-11	182469	359.0	4.9	0.17	72.0	34.2	0.12	15	1.9	0.1	0.70	0.80	4	0.30	0.10	40.3
07-07	183246	184.0	4.8	0.15	77.6	31.7	0.16	17	1.7	0.1	0.80	1.20	10	0.40	0.10	36.3
08-05	183613	222.0	17.0	0.53	62.4	27.4	0.16	30	6.0	0.2	4.50	12.80	1	0.40	0.10	19.6
09-16	184123	1270.0	17.0	0.61	61.6	23.0	0.14	12	4.6	0.2	0.80	1.90	13	0.30	0.10	23.5
10-14	184126	370.0	2.8	0.19	83.2	32.2	0.17	15	1.7	0.1	0.70	0.80	12	0.40	0.10	34.8
11-04	184361	295.0	1.6	0.13	82.4	29.8	0.12	10	1.4	0.5	0.10	0.30	11	0.30	0.00	26.1
12-15	184573	418.0	3.7	0.14	82.4	32.7	0.18	15	1.5	0.5	0.70	0.90	12	0.30	0.10	33.1
1971	504690															
02-09	185088	175.0	12	0.25	71.2	27.9	0.20	43	7.1	3.1	1.80	1.80	9	0.30	0.20	20.8
03-16	185311	554.0	23.0	0.73	69.6	26.9	0.15	18	3.7	0.7	0.80	2.30	10	0.30	0.10	30.0
04-07	185535	173.0	10	0.18	77.6	33.7	0.20	27	2.6	0.4	1.60	1.60	8	0.40	0.10	30.1
05-25	185817	126.0	29	0.17	76.0	31.7	0.19	30	3.5	0.2	1.80	1.80	12	0.50	0.20	23.3
06-24	185999	61.2	36	0.29	72.8	31.7	0.19	42	4.6	0.2	1.10	1.10	5	0.50	0.20	12.7
07-14	186271	44.8	21	0.03	56.8	24.9	0.14	38	5.0	0.4	2.70	3.00	7	0.50	0.20	7.0
08-03	186509	133.0	32	0.34	60.8	25.4	0.23	78	6.9	0.2	2.90	3.40	6	0.60	0.30	7.1
09-08	186644	10.0	42	0.56	61.6	24.9	0.35	91	11.0	1.8	5.00	5.90	7	0.90	0.50	7.7

HENDERSON CREEK NEAR OQUAWKA

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	504690														
10-12	170047	80	101	264	330	557								27	52.0
11-29	170423	70	76	236	296	529			0.01					23	38.0
12-08	170486	41	67	188	252	392			0.01					323	37.0
1967	504690														
01-18	170658	67	104	280	356	602		0.00	0.01				0.01	5	33.0
02-09	170885	95	92	274	343	637		0.00	0.02				0.02	13	34.0
03-16	171102	2	27	312	346	383		0.00	0.01				0.05	119	35.0
04-11	171323	21	70	224	300	394		0.00	0.01				0.01	49	
05-19	171542	19	64	216	298	391		0.00	0.03				0.02	64	62.0
06-14	172175	15	51	180	252	338		0.00	0.01				0.00	466	57.0
07-18	172337	35	67	240	314	435		0.00	0.02				0.01	34	71.0
08-16	172863	35	50	244	316	420		0.00	0.02				0.02	27	70.0
09-20	173181	26	50	164	212	327		0.00	0.02				0.01	53	68.0
10-19	173361	30	63	220	278	379		0.00	0.01				0.03	47	48.0
11-16	173563	19	62	248	320	383		0.00	0.01				0.02	50	39.0
12-06	173703	23	66	252	326	438		0.00	0.01				0.01	33	38.0
1968	504690														
01-04	173913	18	61	216	288	369		0.00	0.01				0.01	47	33.0
02-01	173984	18	60	232	292	363		0.00	0.01				0.02	124	37.0
03-19	174347	27	74	244	320	418		0.00	0.03				0.04	83	53.0
04-17	174538	21	68	240	312	403		0.00	0.01				0.03	45	60.0
05-21	174887	41	77	264	330	485		0.00	0.02				0.05	55	60.0
06-11	175090	45	72	264	312	456		0.00	0.01				0.02	150	77.0
07-16	175663	36	79	258	326	447		0.00	0.01				0.05	34	87.0
08-06	175973	41	63	218	252	385		0.00	0.01				0.01	103	83.0
09-11	176240	75	105	230	272	521		0.00	0.02				0.01	59	73.0
10-10	176589	110	128	276	312	673		0.00	0.02				0.01	39	51.0
11-07	176808	84	94	280	308	594		0.00	0.01				0.00	19	44.0
12-17	177106	215	141	372	436	948		0.00	0.02				0.01	15	34.0
1969	504690														
01-10	177307	70	116	320	374	633		0.00	0.01				0.02	24	33.0
02-17	177467	17	56	196	246	345		0.00	0.01				0.02	60	34.0
03-19	177813	32	73	238	292	407	0.00	0.00	0.02	<.05		<.05	0.02	36	43.0
04-29	178025	34	78	248	318	436	0.02	0.00	0.02	<.05	0.01	<.05	0.02	7	42.0
05-21	178343	35	83	255	328	468	0.00	0.00	0.02	<.05	0.01	<.05	0.04	79	54.0
06-25	178810	20	57	201	264	392	0.00	0.00	0.02	<.05	0.00	<.05	0.05	27	71.0
07-18	179052	5	16	72	88	134	0.00	0.00	0.02	<.05	0.00	<.05	0.04	1830	72.0
08-14	179400	22	58	252	316	429	0.00	0.00	0.02	<.05	0.01	<.05	0.02	59	74.0
09-17	179821	33	66	244	297	418	0.00	0.00	0.01	<.05	0.01	<.05	0.03	33	66.0
10-16	179928	19	60	216	300	378	0.00	0.00	0.01	<.05	0.00	<.05	0.02	112	52.0
11-20	180170	31	67	248	344	443	0.00	0.00	0.01	<.05	0.01	<.05	0.03	15	35.0
12-10	180413	28	65	260	328	434	0.00	0.00	0.01	<.05	0.01	<.05	0.02	17	35.0
1970	504690														
01-07	180702	43	79	300	387	521	0.00	0.00	0.02	<.05	0.01	<.05	0.03	10	32.0
02-11	180906	31	68	236	302	402	0.00	0.00	0.01	<.05	0.00	<.05	0.02	19	33.0
03-24	181073	30	70	246	318	428	0.00	0.00	0.02	<.05	0.01	<.05	0.02	7	38.0
04-15	181526	22	63	220	304	399	0.00	0.00	0.02	<.05	0.00	<.05	0.03	183	49.0
05-26	181897	17	47	168	238	334	0.00	0.00	0.02	<.05	0.00	<.05	0.02	668	61.0
06-11	182469	22	59	226	320	408	0.00	0.00	0.02	<.05	0.00	<.05	0.01	76	67.0
07-07	183246	21	61	248	324	414	0.00	0.00	0.01	<.05	0.00	<.05	0.00	71	70.0
08-05	183613	31	67	216	268	387	0.00	0.00	0.02	<.05	0.01	<.05	0.02	304	67.0
09-16	184123	17	52	180	248	331	0.00	0.00	0.02	<.05	0.00	<.05	0.02	291	63.0
10-14	184126	20	57	256	340	421	0.00	0.00	0.01	<.05	0.00	<.05	0.00	49	58.0
11-04	184361	14	56	248	328	389	0.00	0.00	0.01	<.05	0.00	<.05	0.01	23	46.0
12-15	184573	20	60	252	340	431	0.00	0.00	0.01	<.05	0.01	<.05	0.07	44	34.0
1971	504690														
02-09	185088	61	69	220	292	453	0.00	0.00	0.02	<.05	0.01	<.05	1.27	24	33.0
03-16	185311	22	54	204	284	373	0.00	0.00	0.02	<.05	0.00	<.05	0.03	550	37.0
04-07	185535	30	68	256	332	452	0.00	0.00	0.01	<.05	0.01	<.05	0.03	17	49.0
05-25	185817	34	64	258	320	441	0.00	0.00	0.03	<.05	0.01	<.05	0.07	49	58.0
06-24	185999	39	74	256	312	439	0.00	0.00	0.00	<.05	0.01	<.05	0.01	66	75.0
07-14	186271	35	59	216	244	377	0.00	0.00	0.01	<.05	0.01	<.05	0.02	55	76.0
08-03	186509	69	89	228	256	476	0.00	0.00	0.00	<.05	0.02	<.05	0.01	66	73.0
09-08	186644	89	87	232	256	543	0.00	0.00	0.01	<.05	0.01	<.05	0.02	112	78.0

ILLINOIS RIVER AT MEREDOSIA

The Illinois River is an intersectional stream, rising at the junction of the Kankakee and Des Plaines Rivers and flowing through several physiographic regions. The gaging station is located 0.6 mile downstream from the bridge on Illinois Route 104 at mile 70.8. The elevation of the gage datum at Meredosia is 418.00 feet above mean sea level. The drainage basin above the gage includes an area of approximately 25,300 square miles.

The tabulation of water quality data is for the period from October 3, 1966, to September 2, 1971. Discharge and some quality data are shown graphically. The daily mean discharge values shown are those published by the USGS.

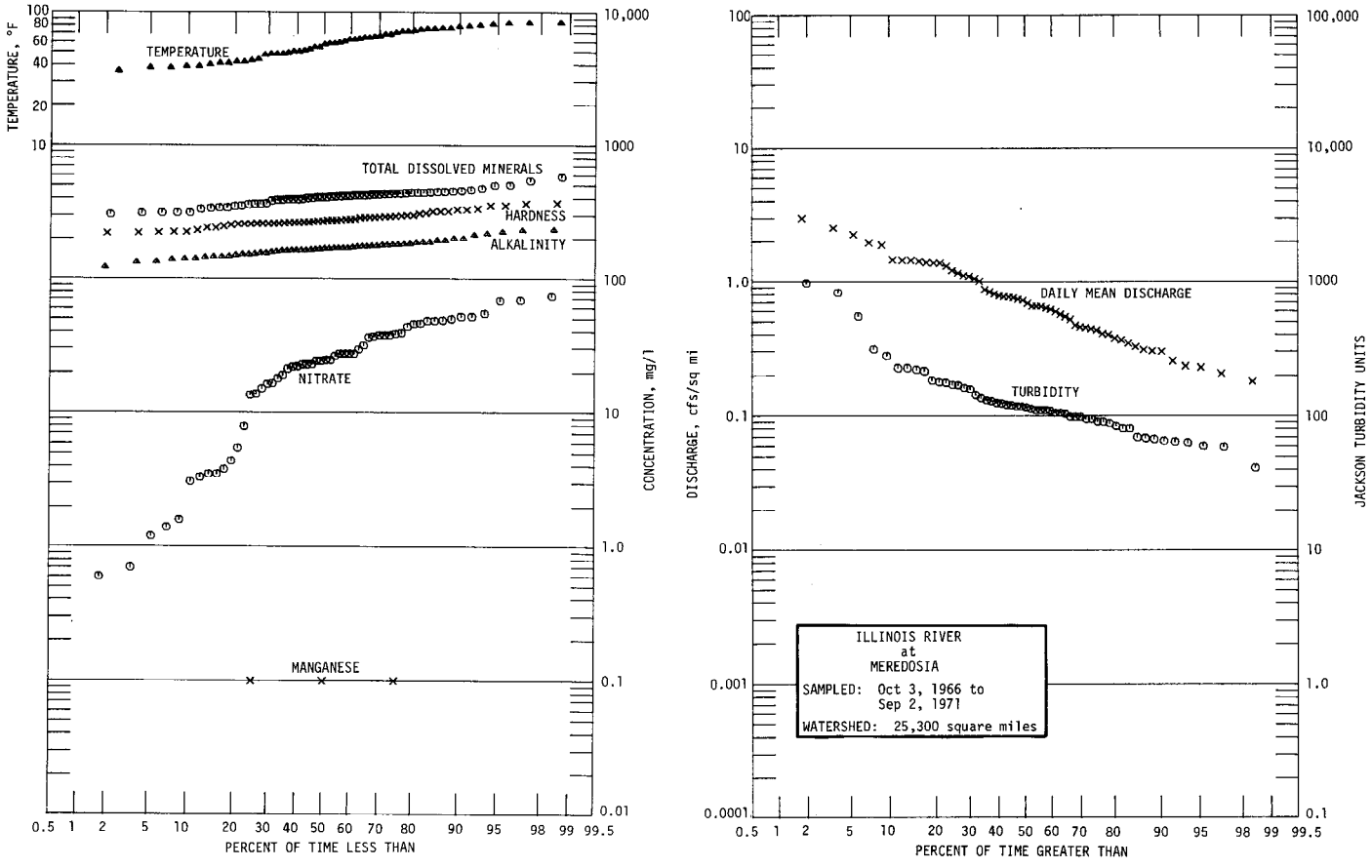
For 80 percent of the time, in the interval between 10 and 90 percent, the daily mean discharge did not exceed 1.46 cfs/sq mi, nor fall below 0.3 cfs/sq mi. The median flow was 0.68 cfs/sq mi and the mean was 0.86 cfs/sq mi.

The turbidity was not less than 64 Jtu nor more than 251 Jtu for the central 80 percent of the time. The median value was 112 Jtu and the mean 160 Jtu.

Reported temperatures were over 80 F for 6 percent and over 70 F for 25 percent of the time. They were below 50 F for 38 percent and below 40 F for 12 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (mean in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	141	169	200
Hardness (as $CaCO_3$)	230	274	332
Total dissolved minerals	333	413	462
Nitrate (NO_3)	3.1	24.4(27.1)	51.5



ILLINOIS RIVER AT MEREDOSIA

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505855															
10-03	940551	4570.0	0.1	0.00	60.8	22.8		42		0.2			10			37.8
10-25	940583	6400.0	0.1	0.00	60.6	23.3		36		0.3			4			1.4
1967	505855															
01-31	940106	14900.0	0.0	0.00	63.4	24.9		37		0.2			11			29.4
03-01	940148	15800.0	0.1	0.10	72.1	28.7		25		0.1			11			37.6
03-27	940205	18200.0	0.1	0.00	68.9	28.3		20		0.2			11			27.3
05-01	940296	36700.0	0.1	0.00	67.3	27.3		17		0.3			2			31.5
06-01	940330	25400.0	0.0	0.00	65.7	28.0		15		0.2			13			24.6
07-05	940398	16300.0	0.1	0.00	67.7	29.8		24		0.3			3			26.3
08-10	940431	13100.0	0.2	0.00	64.6	24.6		25		0.4			15			21.2
09-14	940493	5200.0	0.0	0.00	64.2	24.7		41		0.1			4			22.1
10-03	940541	5750.0	0.3	0.00	58.8	23.5		51		0.1			12			43.5
11-09	940583	27900.0	0.2	0.00	80.8	21.6		12		0.2			12			7.9
12-04	940634	19000.0	0.1	0.00	83.2	29.8		34		0.2			17			68.9
1968	505855															
01-01	940009	35000.0	0.1	0.00	72.0	21.6		23		0.3			12			48.7
02-05	940056	47600.0	0.2	0.00	61.6	16.8		31		0.5			13			73.8
03-04	940167	20200.0	0.1	0.00	79.2	24.5		12		0.2			14			27.3
04-01	940217	19300.0	0.0	0.00	84.8	26.4		11		0.2			6			22.7
05-21	940280	27600.0	0.2	0.00	59.2	17.8		11		0.5			24			24.2
06-06	940309	37000.0	0.0	0.00	74.4	18.2		12		0.1			8			18.1
08-01	940417	13700.0	0.0	0.00	73.6	22.6		4		0.1			14			0.7
09-04	940443	7740.0	0.0	0.00	69.6	19.7		15		0.2			9			16.4
09-30	940513	8690.0	0.0	0.00	71.2	21.1		28		0.2			12			13.6
11-06	940538	7530.0	0.0	0.00	70.4	24.0		28		0.1			11			27.3
12-07	940581	16300.0	0.2	0.00	77.6	22.1		24		0.2			13			37.0
1969	505855															
01-07	940016	11500.0	0.1	0.00	72.0	26.9		32		0.2			14			49.8
02-05	940058	56700.0	0.0	0.00	60.8	16.3		6		0.2			12			1.2
03-05	940117	19200.0	0.0	0.00	80.8	28.3		14		0.2			12			16.6
04-01	940136	36700.0	0.1	0.00	83.2	30.7		4		0.2			17			19.1
05-19	940236	29300.0	0.1	0.00	69.6	28.3		17		0.1			8			48.4
06-05	940272	18500.0	0.2	0.10	65.6	25.9		19		0.2			13			3.5
06-30	940350	21000.0	0.1	0.00	63.2	24.0		14		0.5			8			3.1
08-01	940418	26500.0	0.1	0.00	62.4	24.0		18		0.2			11			0.6
09-03	940482	7560.0	0.1	0.00	62.4	25.9		28		0.2			7			15.1
10-09	940568	590.0	0.1	0.00	68.0	17.3		34		0.1			8			3.3
11-01	940626	15500.0	0.1	0.10	60.0	16.8		4		19.3			14			1.6
12-02	940676	17300.0	0.1	0.00	95.2	17.8		20		0.1			9			37.8
12-29	940036	9470.0	0.0	0.00	84.8	29.3		40		0.2			9			45.6
1970	505855															
02-02	940059	21900.0	2.3	0.00	64.8	23.5		44		0.2			11			46.0
03-04	940132	19600.0	0.0	0.00	82.4	14.4		3		0.8			6			3.5
04-08	940194	35200.0	0.1	0.00	78.4	28.3		28		0.3			8			51.5
04-28	940205	63700.0	0.1	0.00	64.8	23.5		4		0.3			11			13.8
06-05	940290	75400.0	0.1	0.00	58.4	19.2		10		0.2			15			36.3
07-07	940385	36000.0	0.0	0.00	80.0	18.2		19		0.2			11			27.3
08-01	940419	11400.0	0.2	0.00	74.4	21.6		27		0.5			10			24.6
09-11	940506	9160.0	0.0	0.00	72.0	23.0		29		0.3			5			21.8
10-06	940576	49200.0	0.2	0.00	66.4	24.0		4		0.1			11			3.8
10-28	940606	30600.0	0.1	0.00	92.8	29.8		7		0.2			13			24.2
12-02	940695	16300.0	0.0	0.00	92.8	33.1		10		0.2			9			22.9
1971	505855															
01-04	940042	14200.0	0.1	0.00	102.4	27.4		9		0.0			12			39.3
02-01	940094	8210.0	0.3	0.00	86.4	33.6		63		0.2			11			54.6
03-09	940120	34900.0	0.0	0.00	60.0	19.7		39		0.3			13			51.6
04-01	940170	33000.0	0.1		75.2	27.4		40		0.2			9			68.0
05-03	940212	10200.0	0.1	0.00	77.6	31.2		48		0.4			8			48.4
06-03	940281	10900.0	0.1	0.00	76.0	26.4		41		0.2			8			4.4
07-09	940354	11100.0	0.0	0.00	68.0	26.4		36		0.1			6			38.7
08-03	940426	11800.0	0.1	0.00	63.2	24.5		24		0.2			7			22.7
09-02	940464	10100.0	0.1	0.00	65.6	22.6		20		0.1			7			5.5

ILLINOIS RIVER AT MEREDOSIA

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505855														
10-03	940551	41	108	139	259	391								64	63.0
10-25	940583	48	111	146	247	362								98	54.0
1967	505855														
01-31	940106	43	115	150	258	418								176	39.0
03-01	940148	50	101	164	296	462								90	42.0
03-27	940205	31	100	160	288	413								169	54.0
05-01	940296	26	106	162	288	402								545	58.0
06-01	940330	29	94	164	278	400								226	62.0
07-05	940398	31	99	179	288	447								67	75.0
08-10	940431	36	101	156	262	384								226	78.0
09-14	940493	45	103	164	256	425								80	73.0
10-03	940541	43	109	146	242	418								119	62.0
11-09	940583	31	98	179	292	408								157	
12-04	940634	34	108	199	332	502								98	47.0
1968	505855														
01-01	940009	22	80	167	270	341								80	
02-05	960056	26	65	134	224	312								219	
03-04	940167	24	92	181	300	410									59.0
04-01	940217	36	105	176	322	430								170	58.0
05-21	940280	21	65	133	222	313								820	57.0
06-06	940309	23	56	159	262	351								112	75.0
08-01	940417	26	78	172	278	342								124	72.0
09-04	940443	31	89	144	256	359								65	74.0
09-30	940513	48	104	147	266	391								87	65.0
11-06	940538	43	97	166	276	433								60	52.0
12-07	940581	40	94	162	286	419								110	38.0
1969	505855														
01-07	940016	43	95	170	292	440								130	36.0
02-05	940058	31	66	122	220	304								110	43.0
03-05	940117	39	100	187	320	420								135	49.0
04-01	940136	42	103	174	336	424								178	48.0
05-19	940236	33	83	165	290	419								59	68.0
06-05	940272	34	94	177	270	395								310	68.0
06-30	940350	34	85	156	256	426								969	79.0
08-01	940418	28	88	168	254	348								161	
09-03	940482	39	94	170	262	406								83	83.0
10-09	940568	55	89	153	241	391								69	70.0
11-01	940626	25	63	194	218	314								115	50.0
12-02	940676	36	90	193	310	443								117	41.0
12-29	940036	42	114	212	332	498								105	41.0
1970	505855														
02-02	940059	55	93	152	259	441								275	38.0
03-04	940132	49	99	175	265	390								183	44.0
04-08	940194	50	86	183	312	454								214	50.0
04-28	940205	28	71	154	258	339								41	64.0
06-05	940290	22	53	140	224	333								103	66.0
07-07	940385	26	76	182	274	389								123	76.0
08-01	940419	43	87	169	274	439								128	84.0
09-11	940506	43	90	175	274	413								142	82.0
10-06	940576	26	64	170	264	314								110	64.0
10-28	940606	32	82	217	354	433								105	51.0
12-02	940695	34	94	230	367	447								120	48.0
1971	505855														
01-04	940042	39	88	224	368	472								117	40.0
02-01	940094	68	120	232	354	580								94	39.0
03-09	940120	45	73	141	230	366								98	42.0
04-01	940170	48	86	181	300	437									48.0
05-03	940212	52	115	200	322	540								63	60.0
06-03	940281	46	103	186	298	450								90	72.0
07-09	940354	51	91	170	280	430								94	84.0
08-03	940426	46	73	164	260	407								109	76.0
09-02	940464	32	81	188	258	364								68	80.0

ILLINOIS RIVER AT PEORIA

The Illinois River is an intersectional stream, rising at the junction of the Kankakee and Des Plaines Rivers and flowing through several physiographic regions to join the Mississippi near Grafton. The river is not gaged at Peoria. The drainage basin above Peoria has an area of approximately 12,680 square miles. Daily mean discharge values shown graphically are for the Illinois at Kingston Mines, which is downstream from Peoria.

The tabulation of water quality data is for the period from October 3, 1966, to September 2, 1971. Discharge and some quality data are shown graphically. The daily mean discharge values shown were acquired from USGS published records for the gaging station at Kingston Mines through the 1970 water year, and from provisional records for the 1971 water year.

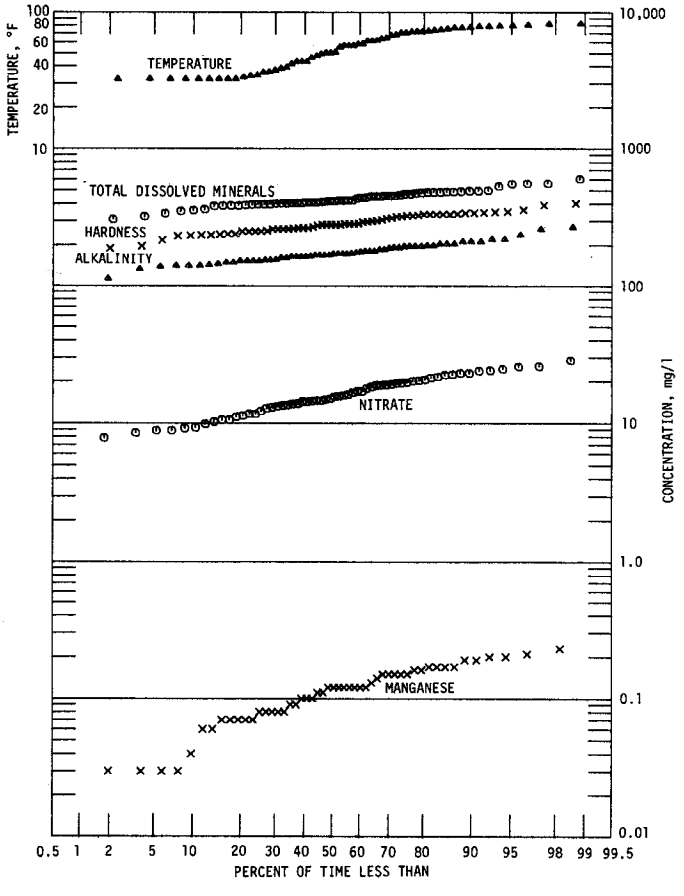
For 80 percent of the time, in the interval between 10 and 90 percent, the daily mean discharge did not exceed 2.56 cfs/sq mi, nor fall below 0.44 cfs/sq mi, The median flow was 0.93 cfs/sq mi and the mean was 1.2 cfs/sq mi.

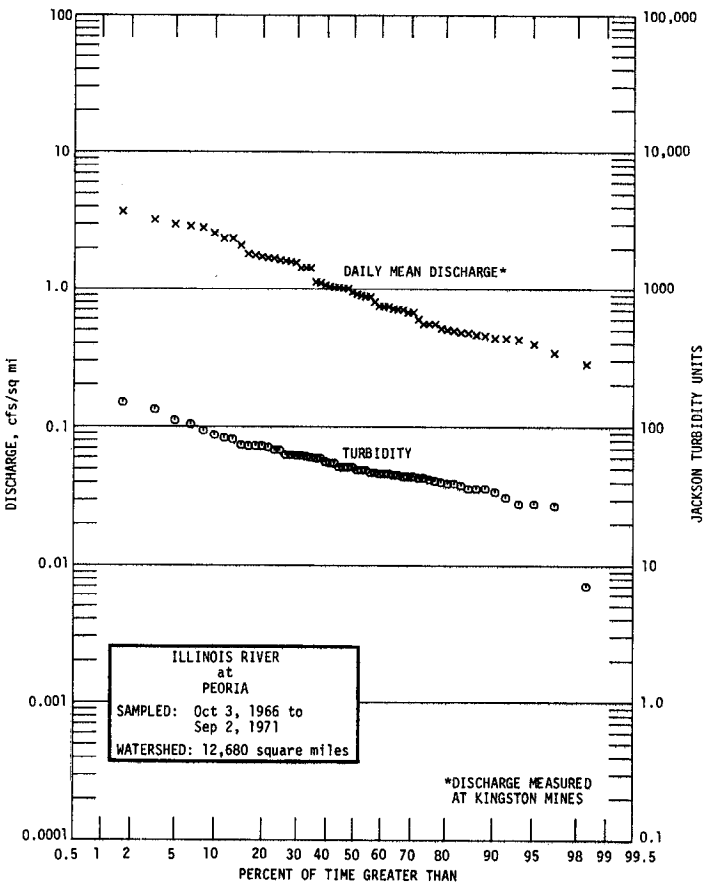
The turbidity was not less than 34 Jtu nor more than 87 Jtu for the central 80 percent of the time. The median value was 50 Jtu and the mean 56 Jtu.

Reported temperatures were over 80 F for 3 percent and over 70 F for 28 percent of the time. They were below 50 F for 40 percent and below 40 F for 28 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	140	172	212
Hardness (as $CaCO_3$)	236	282	342
Total dissolved minerals	362	419	497
Nitrate (NO_3)	9.3	15.5(16.2)	23.8
Total inorganic phosphate (PO_4)	1.1	2.35(2.48)	5.0
Soluble inorganic phosphate (PO_4)	0.8	1.6(1.91)	3.6
Manganese (Mn)	0.04	0.12	0.19





ILLINOIS RIVER AT PEORIA

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505600															
10-03	169970	3580.0	2.4	0.16	62.5	19.5		46		0.2	2.00	2.20	5	1.40	0.30	18.3
11-03	170176	5530.0	1.7	0.10	61.4	20.9	0.26	53	6.6	0.5	2.80	3.20	5	1.40	0.30	14.2
12-01	170337	11100.0	1.3	0.08	70.4	25.4	0.24	41	6.3	1.0	3.20	4.90	9	1.00	0.20	17.8
1967	505600															
01-01	170545	14000.0	1.6	0.03	75.2	27.1	0.22	30	5.3	0.1	3.60	3.60	9	0.80	0.30	24.4
02-06	170776	9370.0	2.8	0.16	76.0	25.4	0.24	42	5.9	5.1	4.70	7.00	10	1.40	0.20	7.8
03-06	171010	18000.0	1.2	0.12	87.2	30.3	0.27	42	3.9	2.9	4.40	5.00	9	0.60	0.20	20.0
04-03	171155	35700.0	2.1	0.00	70.4	25.7	0.19	20	3.5	1.0	1.00	1.30	8	0.40	0.20	28.3
05-02	171375	32500.0	7.1	T	77.8	28.2	0.20	22	3.8	1.0	1.70	2.10	5	0.50	0.20	18.7
06-05	171629	12000.0	1.7	0.09	82.0	31.0	0.27	30	4.6	0.8	0.70	2.60	6	0.50	0.20	16.0
07-03	172050	12800.0	4.3	0.03	70.8	28.1	0.27	29	4.1	0.5	0.80	1.60	5	0.50	0.20	17.0
08-07	172626	9380.0	2.5	0.12	63.0	25.0	0.21	39	5.0	0.3	2.20	2.40	2	1.20	0.20	10.5
09-05	172920	5720.0	1.7	0.07	60.8	24.0	0.19	46	6.1	0.1	2.50	2.60	3	1.20	0.30	11.6
10-02	173112	5000.0	2.2	0.07	56.8	22.0	0.23	45	5.9	1.2	2.60	3.30	5	1.20	0.20	13.7
11-06	173401	22000.0	2.3	0.07	67.2	27.4	0.23	33	4.8	2.3	2.80	3.50	8	0.70	0.10	11.1
12-04	173644	10100.0	2.8	0.07	83.6	32.0	0.25	33	4.2	1.6	2.60	2.90	7	1.00	0.20	19.6
1968	505600															
01-02	173796	23000.0	2.4	0.10	66.4	23.5	0.16	20	3.5	1.1	1.20	1.80	8	0.60	0.10	24.0
02-05	173968	40600.0	4.0	0.15	60.4	21.8	0.24	23	4.5	2.2	1.30	2.00	4	0.80	0.10	18.7
03-04	174230	11100.0	3.6	0.21	89.6	30.9	0.24	33	5.0	3.4	1.40	2.10	9	0.80	0.20	17.0
04-01	174358	13500.0	4.8	0.17	84.0	30.8	0.22	35	4.0	2.1	2.80	3.10	8	0.80	0.20	22.8
05-06	174623	9460.0	2.4	0.19	80.4	31.0	0.27	35	4.1	1.9	0.50	2.30	2	0.70	0.20	11.3
06-03	174936	14200.0	2.5	0.20	72.4	28.1	0.23	29	3.6	1.6	1.70	1.80	3	0.70	0.10	21.5
07-01	175256	36600.0	3.1	0.09	47.2	17.0	0.16	17	3.6	1.1	1.20	1.40	7	0.60	0.10	22.2
08-05	175772	6330.0	1.3	0.12	64.8	24.8	0.24	34	4.7	1.5	1.10	1.40	3	0.80	0.20	12.2
09-03	176132	7000.0	1.6	0.10	65.6	23.3	0.24	30	4.8	0.4	2.50	2.60	8	0.70	0.30	14.2
10-07	176435	5380.0	2.4	0.15	62.8	22.6	0.25	41	5.5	0.9	2.50	2.50	6	0.90	0.30	13.0
11-04	176647	5500.0	1.7	0.00	62.4	22.9	0.23	43	5.7	2.2	3.90	5.30	5	0.90	0.40	13.2
12-02	176882	13000.0	1.6	0.17	66.4	23.8	0.21	38	5.0	2.6	2.40	3.10	5	0.80	0.20	10.5
1969	505600															
01-06	177158	8500.0	2.1	0.17	68.0	26.8	0.20	38	5.0	2.6	1.60	3.60	7	0.50	0.20	13.8
02-03	177353	29800.0	2.3	0.17	58.8	21.2	0.18	30	4.4	2.0	1.50	2.40	8	0.40	0.10	12.8
03-03	177551	8920.0	2.3	0.04	82.4	31.1	0.23	44	4.7	3.8	3.00	3.70	10	0.80	0.20	10.2
04-07	177847	19800.0	1.8	0.06	80.0	32.1	0.25	37	3.7	1.5	1.50	2.30	5	0.70	0.00	21.2
05-05	178040	20700.0	1.3	0.11	77.6	31.6	0.21	26	3.3	0.2	1.00	1.40	4	0.50	0.20	20.2
06-02	178313	11500.0	2.2	0.12	75.2	30.5	0.23	32	3.9	0.9	1.90	2.40	5	0.50	0.20	15.0
07-07	178811	18000.0	4.4	T	69.8	26.8	0.21	27	4.7	0.4	1.90	2.30	7	0.50	0.20	19.0
08-04	179137	20100.0	2.2	0.08	70.0	24.6	0.23	21	3.5	0.1	1.50	2.60	9	0.50	0.20	15.8
09-02	179409	6500.0	1.7	0.00	63.2	24.9	0.23	39	5.8	0.5	1.70	1.70	2	0.80	0.20	8.8
10-06	179756	6000.0	1.6	0.12	59.6	21.8	0.21	42	5.8	0.9	0.10	0.30	4	0.90	0.30	14.4
11-03	179926	7570.0	1.8	0.07	80.0	29.3	0.19	35	5.4	1.5	2.00	2.40	8	0.70	0.20	15.6
12-04	180188	9000.0	2.8	0.08	82.8	31.0	0.27	33	4.5	1.1	4.10	5.80	4	0.70	0.10	19.4
1970	505600															
01-02	180454	7000.0	1.4	0.13	86.4	31.5	0.26	57	5.0	4.2	3.50	4.10	9	1.00	0.10	14.7
02-05	180694	18000.0	1.6	T	72.0	25.4	0.21	89	4.3	5.9	3.80	4.20	7	0.90	0.10	8.5
03-05	180940	13000.0	2.0	T	70.4	25.4	0.15	37	5.0	2.3	2.60	2.90	6	0.60	0.10	13.5
04-02	181125	21500.0	2.1	0.08	79.2	29.8	0.21	42	4.0	3.0	2.90	3.70	2	0.70	0.10	16.6
05-07	181577	37500.0	1.7	0.08	64.8	25.9	0.18	22	3.9	1.0	1.10	1.60	3	0.40	0.00	25.4
06-04	181893	46600.0	2.0	0.06	71.2	25.9	0.15	20	3.4	0.6	0.90	1.10	4	0.50	0.10	22.8
07-02	182492	26600.0	2.1	0.03	66.0	28.1	0.15	20	3.2	0.3	1.10	1120	8	0.40	0.10	23.8
08-06	183255	13200.0	4.0	0.15	61.6	23.3	0.18	34	4.3	1.0	1.50	2.30	5	0.70	0.20	13.4
09-03	183614	5850.0	3.2	0.11	62.4	23.5	0.21	38	4.5	0.1	1.20	1.50	2	0.80	0.20	14.5
10-01	183769	29800.0	1.8	0.00	62.4	25.3	0.16	18	3.4	0.4	1.20	1.20	10	0.50	0.10	20.6
11-05	184145	20300.0	2.3	0.15	83.2	32.2	0.26	26	3.7	0.1	1.40	1.70	8	0.70	0.20	22.3
12-03	184358	12800.0	2.6	0.15	88.0	34.2	0.24	30	3.5	1.4	0.80	0.80	8	0.50	0.20	18.9
1971	505600															
01-07	184609	7030.0	1.9	0.19	96.8	38.6	0.27	40	3.8	3.1	1.60	1.90	7	0.70	0.20	19.3
02-04	184874	4330.0	1.9	0.23	92.8	38.1	0.29	60	5.7	4.7	1.20	3.10	7	0.90	0.30	15.4
03-04	185059	21300.0	2.9	0.00	54.4	10.5	0.13	34	4.4	2.0	1.20	1.30	7	0.40	0.10	14.5
04-01	185317	22500.0	6.8	0.20	82.4	30.8	0.23	38	3.0	1.1	0.80	0.80	7	0.50	0.20	25.7
05-07	185605	8940.0	1.2	0.12	77.6	31.7	0.25	43	4.6	2.2	1.20	1.20	2	0.60	0.20	9.2
06-03	185818	6070.0	1.4	0.12	72.8	29.8	0.25	44	5.2	1.1	1.00	1.00	3	0.70	0.30	11.6
07-01	186073	6225.0	2.6	0.12	65.6	24.4	0.25	46	5.2	1.6	1.60	1.80	2	0.70	0.30	9.8
08-05	186357	11300.0	2.4	0.14	59.2	21.5	0.20	42	4.8	1.1	1.10	1.80	2	0.60	0.20	8.8
09-02	186543	8470.0	1.8	0.03	49.6	17.5	0.19	34	4.1	0.4	0.80	1.00	2	0.60	0.20	9.3

ILLINOIS RIVER AT PEORIA

DATE	LAB.NO.	CL	SO4	ALK.	T.H	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505600														
10-03	169970	46	103	148	236	407								51	55.0
11-03	170176	55	123	140	239	434			0.00					62	36.0
12-01	170337	48	133	152	280	450			0.01					59	32.0
1967	505600														
01-01	170545	39	123	154	299	451		0.00	0.01				0.04	27	32.0
02-06	170776	54	137	176	294	442		0.00	0.01				0.01	44	32.0
03-06	171010	63	143	172	342	497		0.00	0.01				0.04	7	32.0
04-03	171155	40	109	148	286	415		0.00	0.02				0.04	43	56.3
05-02	171375	31	121	172	310	423		0.00	0.01				0.05	60	58.1
06-05	171629	42	134	192	332	451		0.00	0.00				0.00	93	71.6
07-03	172050	22	106	184	292	386		0.00	0.01				0.09	47	76.5
08-07	172626	48	114	152	260	418		0.00	0.02				0.08	55	78.4
09-05	172920	51	112	152	250	391		0.00	0.02				0.03	36	70.2
10-02	173112	49	102	140	232	402		0.00	0.01				0.05	51	61.2
11-06	173401	39	114	168	280	393		0.00	0.01				0.05	55	42.8
12-04	173644	39	I38	204	340	478		0.00	0.03				0.06	81	37.0
1968	505600														
01-02	173796	25	100	154	262	362		0.00	0.02				0.03	73	32.0
02-05	173968	44	91	132	240	357		0.00	0.02				0.07	133	38.3
03-04	174230	42	134	212	348	487		0.00	0.03				0.12	104	33.8
04-01	174358	47	140	196	336	532		0.00	0.02				0.06	110	56.3
05-06	174623	46	128	196	328	475		0.00	0.02				0.05	61	61.7
06-03	174936	38	108	184	296	393		0.00	0.01				0.04	73	71.1
07-01	175256	23	69	112	188	306		0.00	0.01				0.04	87	73.8
08-05	175772	43	102	164	264	403		0.00	0.01				0.03	41	79.2
09-03	176132	38	100	164	260	385		0.00	0.02				0.03	46	71.4
10-07	176435	51	100	156	250	412		0.00	0.02				0.06	62	56.7
11-04	176647	50	105	166	250	438		0.00	0.02				0.05	49	50.2
12-02	176882	45	111	168	264	410		0.00	0.02				0.03	47	41.4
1969	505600														
01-06	177158	56	107	178	280	450		0.00	0.02				0.04	63	32.9
02-03	177353	47	92	142	234	401		0.00	0.02				0.14	51	32.0
03-03	177551	59	133	204	334	493	0.00	0.00	0o01	<.05		<.05	0.04	43	38.8
04-07	177847	58	127	188	332	483	0.00	0.00	0.01	<.05		<.05	0.04	28	50.0
05-05	178040	40	120	194	324	467	0.00	0.00	0.01	<.05	0.01	<.05	0.04	28	67.1
06-02	178313	39	113	198	313	460	0.00	0.00	0.02	<.05	0.01	<.05	0.04	39	68.0
07-07	178811	35	96	172	284	401	0.00	0.00	0.01	<.05	0.01	<.05	0.07	71	76.5
08-04	179137	34	84	168	276	402	0.00	0.00	0.02	<.05	0.00	<.05	0.06	31	76.8
09-02	179409	47	100	168	260	419	0.00	0.00	0.01	<.05	0.01	<.05	0.04	39	77.9
10-06	179756	48	93	152	238	406	0.01	0.00	0.02	<.05	0.01	<.05	0.07	38	69.8
11-03	179926	44	121	198	320	452	0.01	0.00	002	<.05	0.01	<.05	0.04	40	47.5
12-04	180188	45	125	196	334	481	0.00	0.00	0.01	<.05	0.01	<.05	0.09	49	35.6
1970	505600														
01-02	180454	72	143	220	345	554	0.00	0.00	0.01	<.05	0.01	<.05	0.06	36	32.0
02-05	180694	12 2	116	192	284	558	0.00	0.00	0.02	<.05	0.00	<.05	0.10	68	32.0
03-05	180949	55	95	164	280	417	0.00	0.00	0.02	<.05	0.01	<.05	0.09	44	43.0
04-02	181125	62	126	180	320	482	0.00	0.00	0.01	<.05	0.01	<.05	0.06	42	43.0
05-07	181577	34	95	144	268	385	0.00	0.00	0.02	<.05	0.01	<.05	0.05	36	61.0
06-04	181893	31	92	164	284	407	0.00	0.00	0.02	<.05	0.00	<.05	0.03	44	64.0
07-02	182492	29	89	174	280	399	0.00	0.00	0.02	<.05	0.00	<.05	0.02	45	81.0
08-06	183255	43	91	160	250	383	0.00	0.00	0.01	<.05	0.01	<.05	0.12	73	75.2
09-03	183614	45	96	172	252	389	0.00	0.00	0.01	<.05	0.01	<.05	0.13	59	77.9
10-01	183769	25	70	180	260	337	0.00	0.00	0.02	<.05	0.00	<.05	0.06	63	63.5
11-05	184145	35	104	220	340	449	0.00	0.00	0.01	<.05	0.01	<.05	0.04	46	50.0
12-03	184358	40	117	236	360	468	0.00	0.00	0.01	<.05	0.01	<.05	0.31	68	46.0
1971	505600														
01-07	184609	55	135	260	400	555	0.00	0.00	0.01	<.05	0.01	<.05	0.14	49	32.0
02-04	184874	78	134	268	388	603	0.00	0.00	0.02	<.05	0.01	<.05	0.25	46	34.0
03-04	185059	56	71	140	216	350	0.00	0.00	0.02	<.05	0.00	<.05	0.08	83	
04-01	185317	58	101	212	332	491	0.00	0.00	0.02	<.05	0.00	<.05	0.12	149	48.9
05-07	185605	57	120	212	324	484	0.00	0.00	0.02	<.05	0o01	<.05	0.06	34	57.9
06-03	185818	60	112	204	304	482	0.00	0.00	0.01	<.05	0.01	<.05	0.03	45	72.0
07-01	186073	58	100	180	264	419	0.00	0.00	0.01	<.05	0.01	<.05	0.05	56	81.9
08-05	186357	50	83	160	236	394	0.00	0.00	0.02	<.05	0.01	<.05	0.13	74	73.6
09-02	186543	40	65	138	196	321	0.00	0.00	0.01	<.05	0.00	<.05	0.03	51	79.5

KANKAKEE RIVER AT MOMENCE

The Kankakee River rises in Indiana and flows westerly into Illinois in the Kankakee Plain Region. It joins with the Des Plaines River northwest of Wilmington to form the Illinois River. The gaging station is located in Momence 0.2 mile downstream from the bridge on Illinois Routes 1 and 17. Elevation of gage datum is 609.18 feet above mean sea level. The drainage basin above the gage has an area of approximately 2340 square miles.

The tabulation of water quality data is for the period from October 13, 1966, to September 16, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

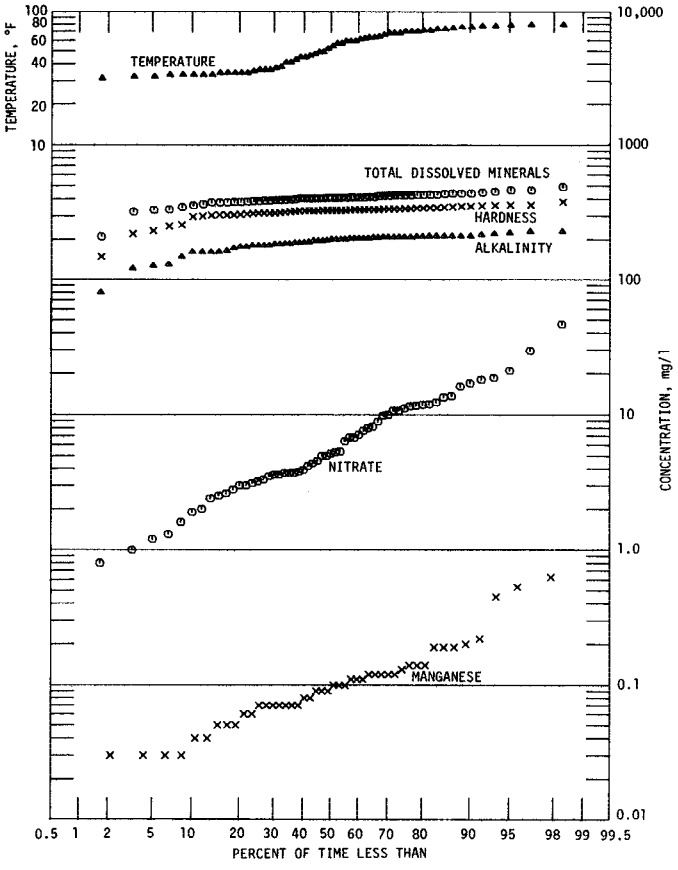
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.88 cfs/sq mi, nor fall below 0.30 cfs,/sq mi. The median flow was 0.815 cfs/sq mi and the mean was 0.96 cfs/sq mi.

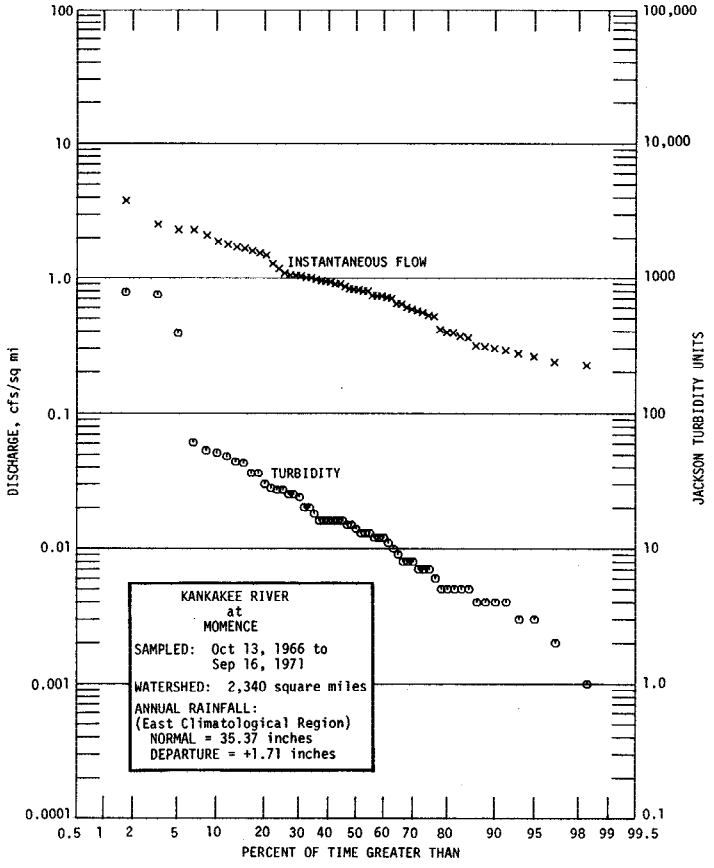
The turbidity was not less than 4 Jtu nor more than 51 Jtu for the central 80 percent of the time. The median value was 14 Jtu and the mean 49 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 25 percent of the time. They were below 50 F for 47 percent and below 40 F for 32 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	160	200	212
Hardness (as $CaCO_3$)	295	328	352
Total dissolved minerals	357	405	440
Nitrate (NO_3)	1.9	5.2(7.9)	17.0
Total inorganic phosphate (PO_4)	0.1	0.3(0.53)	1.1
Soluble inorganic phosphate (PO_4)	0.0	0.15(0.26)	0.5
Manganese (Mn)	0.035	0.095	0.21





KANKAKEE RIVER AT MOMENCE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SE	NA	K	NH4	PO4F	PO4U	S1O2	F	B	NO3
1966	505205															
10-13	170138	553.0	0.2	0.00	78.4	24.1	0.13	11	2.3	0.0	0.20	0.20	6	0.10	0.10	1.3
11-08	170189	638.0	0.8	0.12	88.4	28.5	0.09	12	1.9	0.0	0.20	0.30	10	0.20	0.10	1.6
12-06	170381	2420.0	0.8	0.05	94.4	24.5	0.14	10	2.7	0.7	0.10	0.10	10	0.20	0.00	7.6
1967	505205															
01-18	170644	2000.0	0.8	0.00	104.4	28.7	0.16	8	2.4	0.1	0.10	0.30	13	0.20	0.10	5.4
02-14	170830	2330.0	1.2	0.04	88.2	25.5	0.13	12	2.1	0.1	0.50	0.80	11	0.10	0.10	8.2
03-08	171029	2970.0	0.3	T	88.8	26.9	0.13	8	3.0	0.1	0.20	0.20	10	0.10	0.10	9.8
04-26	171334	5880.0	1.0	0.07	81.2	25.1	0.09	10	3.5	0.0	0.30	0.40	9	0.20	0.00	10.7
05-03	171376	5340.0	1.5	0.11	80.8	24.3	0.12	7	2.4	0.1	0.20	0.30	9	0.20	0.10	10.0
06-19	171783	2090.0	3.2	0.22	84.0	24.4	0.14	7	2.3	0.1	0.30	0.80	9	0.10	0.00	11.6
07-12	172072	1200.0	1.5	0.03	88.0	28.3	0.16	10	2.1	T	1.60	2.30	8	0.20	0.10	3.7
08-07	172505	729.0	0.9	0.03	86.0	26.8	0.14	9	2.5	T	0.20	0.50	10	0.10	0.10	3.2
09-19	173008	523.0	0.7	0.07	84.8	28.3	0.11	10	1.8	0.1	0.50	0.60	9	0.10	0.10	1.9
10-06	173165	607.0	1.0	0.07	86.4	27.3	0.15	12	2.3	0.1	0.20	0.30	9	0.10	0.10	2.6
11-13	173418	2100.0	1.9	0.10	96.0	29.3	0.16	10	2.4	0.1	0.20	0.40	11	0.20	0.00	11.9
12-06	173599	1640.0	0.6	0.05	81.6	22.4	0.14	7	1.8	0.6	0.20	0.50	10	0.10	0.10	4.6
1968	505205															
01-18	173844	1700.0	0.4	0.07	88.8	26.9	0.14	10	1.8	0.1	0.00	0.10	10	0.10	0.00	5.2
01-31	173928	4870.0	3.7	0.12	68.8	20.6	0.11	10	2.9	0.2	0.00	0.30	9	0.20	0.10	17.0
03-08	174231	2210.0	0.9	0.07	91.2	26.9	0.14	10	2.2	0.3	0.10	0.20	10	0.10	0.00	4.2
04-03	174366	2720.0	0.8	0.03	88.4	26.6	0.15	8	2.2	0.1	0.10	0.10	7	0.20	0.10	5.0
05-16	174784	1670.0	2.7	0.12	85.6	26.9	0.21	9	2.2	0.1	0.10	0.60	5	0.10	0.10	3.6
06-10	174995	1320.0	2.0	0.07	86.4	26.3	0.14	9	1.8	0.1	0.20	0.30	10	0.20	0.10	3.3
07-11	175489	3720.0	2.2	0.10	81.6	24.3	0.13	8	2.2	0.1	0.10	0.30	10	0.20	0.10	3.8
09-27	176330	1360.0	1.4	0.10	86.4	27.2	0.10	10	2.9	T	3.00	5.80	11	0.20	0.10	5.3
10-16	176543	838.0	0.2	0.19	80.8	24.8	0.22	2	2.4	T	0.10	0.30	7	0.20	0.10	3.0
11-07	176663	857.0	0.7	0.12	90.4	27.7	0.15	10	2.0	0.2	0.40	0.60	9	0.20	0.10	1.0
12-04	176941	2330.0	1.0	0.08	92.0	27.7	0.10	10	4.0	0.2	0.20	1.10	11	0.20	0.10	13.7
1969	505205															
01-10	177184	5350.0	0.4	0.12	94.0	28.0	0.12	9	3.0	0.2	0.20	0.20	11	0.20	0.10	10.7
02-17	177414	3450.0	0 5	0.09	88.4	26.0	0.15	9	2.1	0.1	0.10	0.20	10	0.10	0.10	5.0
03-04	177638	2450.0	0.5	0.09	92.8	27.7	0.25	11	1.8	0.2	0.40	0.50	7	0.20	0.10	21.0
04-08	177870	3580.0	1.3	0.11	85.6	25.8	0.14	11	2.4	0.1	0.10	0.20	7	0.20	0.10	13.3
05-13	178158	4390.0	0.6	0.06	73.6	31.7	0.14	8	1.1	0.1	0.40	0.80	5	0.20	0.10	46.3
06-06	178518	2410.0	3.1	0.19	82.4	27.4	0.11	10	2.4	0.1	0.70	1.30	4	0.10	0.10	2.5
07-17	178952	1720.0	1.7	0.14	82.8	26.0	0.12	9	2.1	0.2	0.80	0.80	11	0.20	0.10	4.4
08-08	179253	1280.0	2.4	0.11	85.6	27.8	0.14	11	2.8	0.1	0.40	0.70	11	0.20	0.10	3.7
09-03	179444	695.0	0.4	0.00	84.8	29.3	0.14	10	2.8	T	0.20	0.20	9	0.10	0.10	2.4
10-07	179837	671.0	1.1	0.05	84.2	28.2	0.12	12	2.8	0.1	0.10	0.10	10	0.20	0.10	3.7
11-19	180093	1710.0	1.4	T	88.8	31.0	0.16	12	3.5	0.2	0.10	0.30	7	0.20	0.10	8.9
12-01	180168	1860.0	0.6	T	94.8	28.6	0.13	8	2.0	0.1	0.30	0.40	11	0.20	0.10	6.4
1970	505205															
01-21	180548	1500.0	0.4	0.13	88.8	28.8	0.13	11	1.6	0.2	0.10	0.20	3	0.20	0.10	3.6
02-12	180760	3900.0	0.6	0.00	87.6	25.2	0.12	10	2.0	0.2	0.10	0.10	8	0.20	0.10	6.8
03-05	180953	2110.0	1.7	0.00	79.2	27.8	0.12	9	2.6	0.1	0.10	0.40	8	0.30	0.10	18.5
04-13	181294	4180.0	0.9	0.00	81.2	25.7	0.12	8	2.6	0.3	0.10	0.20	6	0.20	0.10	12.3
05-15	181668	8810.0	26.0	0.53	38.4	12.6	0.07	5	2.7	0.2	0.10	1.40	8	0.20	0.10	18.0
06-22	182239	2260.0	3.9	0.19	79.2	25.9	0.10	8	2.3	0.1	0.10	0.50	5	0.20	0.10	11.8
07-28	183028	1480.0	1.8	0.00	85.6	26.8	0.13	8	1.6	0.2	0.10	0.10	10	0.20	0.00	3.0
08-13	183505	905.0	2.3	0.00	85.6	28.8	0.12	18	1.7	0.2	0.00	0.30	9	0.20	0.10	1.2
09-24	183698	1910.0	4.1	0.03	81.6	27.4	0.13	10	3.0	0.1	0.40	0.60	11	0.30	0.10	11.1
10-22	184143	2530.0	1.5	0.09	94.4	29.3	0.13	8	2.1	0.1	0.00	0.20	10	0.20	0.10	8.0
11-19	184246	1900.0	0.6	0.07	92.0	29.8	0.16	8	1.7	0:1	0.10	0.20	11	0.20	0.10	6.8
12-11	184446	1860.0	0.4	0.06	92.8	27.4	0.12	10	1.9	0.1	0.10	0.10	9	0.30	0.10	7.1
1971	505205															
01-21	184746		0.7	0.08	96.8	28.8	0.13	12	2.0	0.1	0.00	0.20	9	0.30	0.10	3.5
02-11	184915	2160.0	0.8	0.00	62.4	18.6	0.10	10	5.4	0.7	0.20	0.30	7	0.20	0.10	11.5
03-15	185184	4000.0	25.0	0.45	56.0	19.6	0.12	8	3.7	0.4	0.20	1.20	8	0.20	0.10	29.4
04-19	185450	1920.0	1.2	0.14	91.2	26.4	0.14	9	1.9	T	0.00	0.10	5	0.20	0.10	2.8
05-17	185713	1230.0	2.3	0.20	88.8	26.9	0.12	11	2.1	0.1	0.10	0.50	8	0.20	0.10	3.9
06-08	185867	1410.0	17.0	0.63	67.2	20.1	0.10	7	2.6	0.3	0.20	1.00	9	0.20	0.10	16.1
07-15	186282	913.0	2.4	0.14	87.6	27.6	0.12	10	1.9	0.0	0.10	0.20	10	0.20	0.10	0.8
08-11	186393	717.0	1.1	0.04	81.6	26.4	0.11	10	2.0	0.0	0.10	0.10	7	0.20	0.10	2.0
09-16	186653	960.0	2.5	0.00	89.2	27.1	0.13	10	1.8	0.4	0.10	0.10	10	0.20	0.10	3.1

KANKAKEE RIVER AT MOMENCE

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505205														
10-13	170138	16	115	196	295	375			0.01					5	59.0
11-08	170189	13	126	208	338	407			0.00					8	49.0
12-06	170381	17	152	176	336	464			0.00					24	35.0
1967	505205														
01-18	170644	15	152	212	378	487			0.02					6	33.0
02-14	170830	19	136	180	325	425		0.01	0.01				0.02	16	34.0
03-08	171029	15	143	172	332	410		0.00	0.01				0.01	4	34.0
04-26	171334	21	128	160	306	376		0.00	0.01				0.03	5	45.0
05-03	171376	14	127	160	302	366		0.00	0.01				0.02	16	52.0
06-19	171783	13	114	180	310	386		0.00	0.04				0.03	51	73.0
07-12	172072	13	122	204	336	403		0.00	0.01				0.04	20	78.0
08-07	172505	14	115	216	325	391		0.00	0.01				0.02	11	70.0
09-19	173008	13	116	208	328	408		0.00	0.01				0.01	7	71.0
10-06	173165	17	119	206	328	421		0.00	0.01				0.05	9	63.0
11-13	173418	16	157	188	360	440		0.00	0.08				0.04	15	33.0
12-06	173599	13	118	164	296	357		0.00	0.01				0.01	5	38.0
1968	505205														
01-18	173844	23	130	200	332	425		0.00	0.01				0.02	5	33.0
01-31	173928	15	118	126	256	347		0.00	0.02				0.02	43	36.0
03-08	174231	15	133	196	338	409		0.00	0.02				0.02	12	34.0
04-03	174366	15	128	190	330	404		0.00	0.01				0.01	8	46.0
05-16	174784	12	121	198	324	383		0.00	0.02				0.02	36	62.0
06-10	174995	15	114	204	324	377		0.00	0.00				0.02	25	74.0
07-11	175489	14	111	184	304	395		0.00	0.01				0.03	13	73.0
09-27	176330	15	125	200	328	407		0.00	0.02				0.02	10	63.0
10-16	176543	12	108	192	304	389		0.00	0.01				0.02	8	68.0
11-07	176663	14	121	228	340	425		0.00	0.01				0.01	5	47.0
12-04	176941	18	144	184	344	421		0.00	0.01				0.00	12	33.0
1969	505205														
01-10	177184	17	133	208	350	445		0.00	0.01				0.01	2	31.0
02-17	177414	16	128	204	328	405		0.00	0.01				0.01	4	34.0
03-04	177638	25	115	210	346	453	0.00	0.00	0.01	<.05		<.05	0.01	16	36.0
04-08	177870	21	136	180	320	410	0.00	0.00	0.03	<.05		<.05	0.02	16	49.0
05-13	178158	17	71	206	314	403	0.00	0.00	0.01	<.05	0.00	<.05	0.03	7	57.0
06-06	178518	16	118	208	318	428	0.01	0.00	0.02	<.05	0.00	<.05	0.03	48	61.0
07-17	178952	14	109	196	314	393	0.00	0.00	0.01	<.05	0.00	<.05	0.03	20	71.0
08-08	179253	17	113	204	328	397	0.00	0.00	0.02	<.05	0.01	<.05	0.04	27	75.0
09-03	179444	16	108	212	332	385	0.00	0.00	0.02	<.05	0.00	<.05	0.03	3	77.0
10-07	179837	17	115	210	326	402	0.02	0.00	0.01	<.05	0.01	<.05	0.06	14	66.0
11-19	180093	20	144	186	349	428	0.00	0.00	0.01	<.05	0.01	<.05	0.03	15	41.0
12-01	180168	18	139	204	354	434	0.00	0.00	0.01	<.05	0.00	<.05	0.03	1	37.0
1970	505205														
01-21	180548	17	121	208	340	424	0.00	0.00	0.01	<.05	0.00	<.05	0.02	13	32.9
02-12	180760	20	120	186	322	402	0.00	0.00	0.02	<.05	0.00	<.05	0.03	3	32.0
03-05	180953	19	130	160	312	389	0.01	0.00	0.03	<.05	0.00	<.05	0.03	25	45.0
04-13	181294	18	125	160	308	379	0.00	0.00	0.02	<.05	0.00	<.05	0.02	12	57.0
05-15	181668	10	51	80	148	210	0.00	0.00	0.03	<.05	0.00	<.05	0.03	780	59.0
06-22	182239	16	108	176	304	392	0.00	0.00	0.02	<.05		<.05	0.02	53	68.0
07-28	183028	14	112	212	328	404	0.00	0.00	0.02	<.05	0.00	<.05	0.01	30	77.0
08-13	183505	29	110	220	332	430	0.00	0.00	0.01	<.05	0.00	<.05	0.02	27	75.0
09-24	183698	18	115	180	316	407	0.00	0.00	0.02	<.05	0.00	<.05	0.03	61	70.0
10-22	184143	17	135	200	356	440	0.00	0.00	0.01	<.05	0.00	<.05	0.01	16	54.0
11-19	184246	17	129	208	352	428	0.00	0.00	0.02	<.05	0.01	<.05	0.01	7	43.0
12-11	184446	18	125	188	344	411	0.00	0.00	0.01	<.05	0.01	<.05	0.02	4	36.0
1971	505205														
01-21	184746	18	126	228	360	464	0.00	0.00	0.00	<.05	0.01	<.05	0.03	4	34.0
02-11	184915	17	86	128	232	330	0.00	0.00	0.02	<.05	0.01	<.05	0.03	13	32.0
03-15	185184	17	83	120	220	320	0.00	0.00	0.01	<.05	0.00	<.05	0.02	744	41.0
04-19	185450	17	120	212	336	411	0.00	0.00	0.02	<.05	0.00	<.05	0.02	16	64.0
05-17	185713	18	116	224	332	420	0.00	0.00	0.03	<.05	0.00	<.05	0.04	28	59.0
06-08	185867	13	87	148	250	332	0.00	0.00	0.02	<.05	0.00	<.05	0.03	385	70.0
07-15	186282	16	115	212	332	405	0.00	0.00	0.02	<.05	0.00	<.05	0.03	44	78.8
08-11	186393	17	107	200	312	380	0.00	0.00	0.01	<.05	0.01	<.05	0.01	18	78.8
09-16	186653	16	120	212	334	439	0.00	0.00	0.20	<.05	0.00	<.05	0.04	36	68.0

KASKASKIA RIVER AT SHELBYVILLE

The Kaskaskia River rises in the Bloomington Ridged Plain — South, west of Champaign, and flows southwesterly through the Springfield Plain Region to its junction with the Mississippi River below New Athens. The gaging station at Shelbyville is located 700 feet downstream from the Shelbyville Lake dam. Elevation of the gage datum is 535.78 feet above mean sea level. The drainage basin above the gage has an area of approximately 1030 square miles.

The tabulation of water quality data is for the period from October 12, 1966, to September 13, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

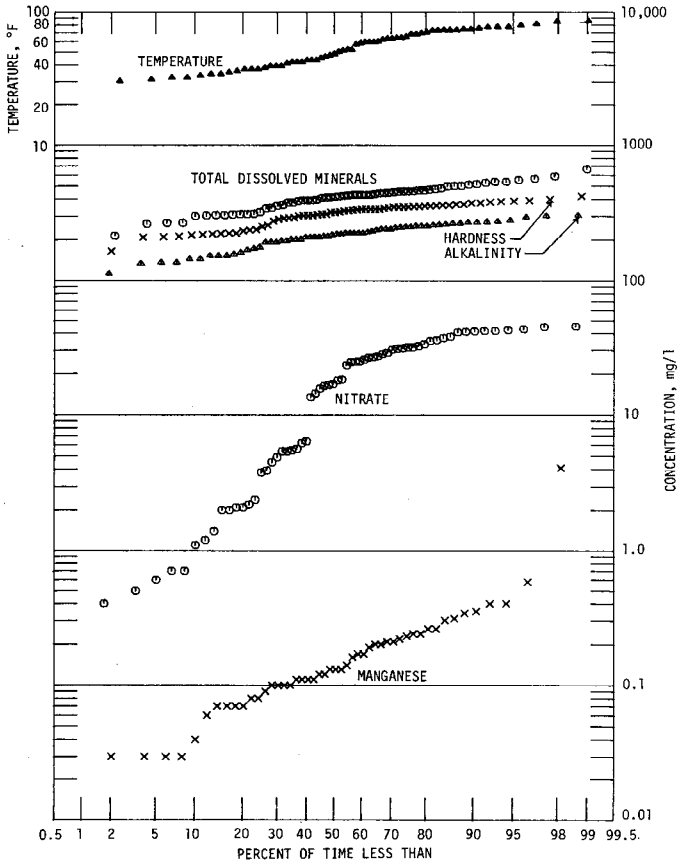
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 2.02 cfs/sq mi, nor fall below 0.01 cfs/sq mi. The median flow was 0.225 cfs/sq mi and the mean was 0.695 cfs/sq mi.

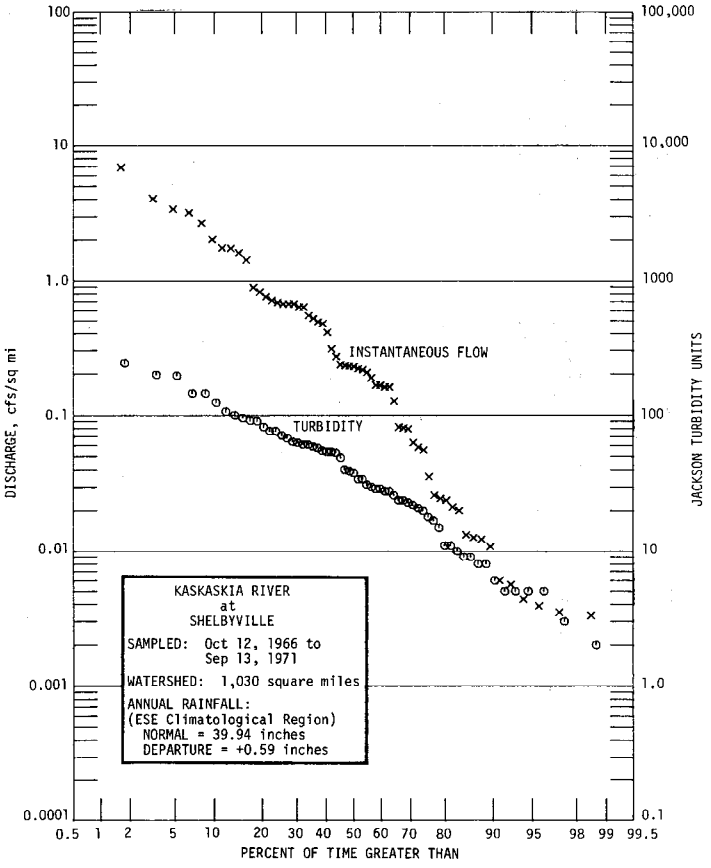
The turbidity was not less than 5 Jtu nor more than 124 Jtu for the central 80 percent of the time. The median value was 34 Jtu and the mean 52 Jtu.

Reported temperatures were over 80 F for 5 percent and over 70 F for 24 percent of the time. They were below 50 F for 43 percent and below 40 F for 25 percent of the time.

The analyses indicated the following :

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	144	222	270
Hardness (as $CaCO_3$)	218	327	380
Total dissolved minerals	301	426	534
Nitrate (NO_3)	1 .1	17.9(19.5)	41.5
Total inorganic phosphate (PO_4)	0 .2	0.6(0.63)	1 .1
Soluble inorganic phosphate (PO_4)	0 .1	0.3(0.36)	0 .7
Manganese (Mn)	0.04	0.13	0.35





KASKASKIA RIVER AT SHELBYVILLE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505920															
10-12	170043	5.8	0.6	0.24	79.6	26.1	0.19	47	3.6	T	0.00	0.00	4	0.30	0.30	2.1
11-15	170292	36.8	0.6	0.00	99.2	32.7	0.30	74	4.8	T	0.70	1.00	8	0.30	0.40	0.6
11-29	170338	504.0	40.0	0.03	55.6	19.3	0.19	28	5.9	0.0	0.90	1.00	9	0.10	0.30	16.8
12-19	170461	1460.0	3.6	0.13	80.8	34.7	0.17	13	1.6	T	0.30	0.80	11	0.40	0.20	44.8
1967	505920															
01-18	170647	240.0	0.1	0.00	98.0	37.3	0.18	21	1.4	0.1	0.60	0.60	9	0.20	0.10	27.9
01-25	170728	222.0	3.0	0.07	83.2	34.7	0.21	26	1.2	T	0.60	1.10	4	0.30	0.00	31.3
02-17	170852	780.0	0.7	T	82.4	29.2	0.15	13	1.0	0.1	0.30	0.60	9	0.20	0.10	41.7
03-22	171101	3280.0	6.4	0.19	53.2	21.8	0.11	9	2.7	0.1	0.60	1.10	9	0.10	0.00	41.5
04-06	171181	691.0	0.3	T	77.2	33.8	0.14	13	1.1	0.2	0.30	0.80	2	0.30	0.10	42.8
05-09	171402	3490.0	4.9	0.00	54.0	23.7	0.12	10	1.8	0.0	0.10	0.80	11	0.10	0.10	42.3
06-16	171781	734.0	4.3	0.10	77.2	30.8	0.16	14	1.5	0.1	0.50	0.90	6	0.20	0.10	44.5
07-13	172174	170.0	1.4	T	83.2	35.1	0.18	19	1.5	0.2	0.30	0.50	7	0.30	0.10	26.4
08-10	173217	193.0	3.5	0.10	57.2	22.5	0.14	24	3.3	0.1	0.40	0.70	1	0.10	0.20	3.9
09-27	173077	13.6	3.8	0.35	81.6	32.1	0.22	46	2.4	T	0.10	0.40	3	0.20	0.40	2.0
10-16	173254	22.0	11.0	0.40	83.2	29.2	0.22	64	3.2	T	0.20	0.80	5	0.30	0.10	2.2
10-30	173410	12.6	1.8	0.17	84.0	29.3	0.22	60	4.1	0.1	0.60	1.10	6	0.20	0.40	0.7
12-01	173713	64.8	1.0	0.00	91.2	35.1	0.25	48	2.9	0.1	0.20	0.30	9	0.30	0.20	5.5
1968	505920															
01-23	173903	1800.0	4.4	0.13	50.4	20.6	0.10	10	2.2	T	0.20	0.40	5	0.10	0.10	24.3
02-06	173954	7050.0	3.4	0.03	40.0	15.6	0.08	6	2.2	0.1	0.20	0.60	4	0.10	0.00	23.0
03-07	174232	276.0	0.4	T	80.0	32.7	0.15	15	0.9	0.2	0.50	0.60	4	0.20	0.10	32.0
04-05	174431	915.0	6.9	0.20	68.8	29.3	0.12	11	2.5	0.3	0.70	1.10	6	0.20	0.00	34.8
05-06	174642	234.0	1.0	0.06	82.0	34.9	0.16	18	1.0	0.1	0.30	0.60	1	0.30	0.00	24.4
06-07	175018	2080.0	3.5	0.07	73.2	30.5	0.10	10	1.1	0.1	0.20	0.80	9	0.30	0.10	41.0
07-16	175532	236.0	3.5	0.09	82.0	34.8	0.17	15	1.1	0.3	0.30	0.40	8	0.30	0.10	36.8
08-06	175800	166.0	2.7	0.17	80.0	33.2	0.16	19	2.7	0.1	0.30	0.60	10	0.30	0.10	16.5
09-25	176326	25.5	3.0	0.26	80.0	36.0	0.25	32	2.3	0.1	0.30	0.90	4	0.30	0.10	0.7
10-02	176542	20.6	2.1	0.24	91.2	37.0	0.22	39	2.8	0.0	0.20	0.40	6	0.40	0.20	0.4
11-08	176666	24.6	0.6	0.13	95.2	28.7	0.23	65	4.1	T	0.70	0.70	3	0.40	0.40	1.4
12-06	176961	211.0	1.1	0.12	70.8	27.5	0.16	29	3.3	0.2	0.80	1.40	8	0.20	0.10	15.6
1969	505920															
01-08	177160	237.0	0.4	0.11	94.0	37.2	0.19	25	1.7	0.1	0.40	0.50	8	0.30	0.10	30.0
02-12	177381	4140.0	5.6	0.12	52.0	20.9	0.12	10	1.8	0.1	0.30	1.20	7	0.20	0.20	35.5
03-17	177636	316.0	0.5	0.03	74.0	32.3	0.14	18	0.9	0.1	0.40	0.40	4	0.20	0.10	33.0
04-16	177902	2750.0	4.2	0.20	64.8	27.2	0.12	14	1.7	0.1	0.20	0.70	8	0.20	0.10	41.3
05-16	178146	487.0	0.9	0.07	72.0	31.0	0.18	17	1.3	0.1	0.70	0.70	5	0.40	0.10	37.5
06-06	178385	225.0	1.3	0.11	67.2	29.3	0.19	8	1.0	0.2	0.60	0.80	7	0.20	0.10	25.4
07-10	178892	652.0	4.2	0.16	57.2	23.1	0.11	12	2.4	0.2	1.70	1.90	8	0.40	0.10	13.5
08-05	179222	84.0	2.0	0.34	54.4	29.3	0.12	16	2.2	0.3	0.20	1.10	6	0.30	0.10	5.4
09-11	179545	26.9	3.4	0.31	68.8	31.0	0.18	37	3.2	0.1	0.10	0.40	3	0.60	0.20	3.8
10-06	179771	165.0	1.5	0.11	87.6	32.7	0.16	22	2.4	0.1	0.20	0.50	7	0.30	0.10	14.3
11-04	179971	691.0	0.8	0.10	89.2	34.4	0.14	14	1.8	0.1	0.30	0.40	5	0:20	0.10	26.2
12-03	180161	691.0	0.6	0.04	86.8	35.9	0.40	12	0.8	0.1	0.20	0.20	5	0.30	0.10	30.5
1970	505920															
01-14	180504	170.0	0.1	0.10	97.2	42.7	0.14	21	1.0	T	0.30	0.40	5	0.40	0.10	28.5
02-18	180789	419.0	2.4	T	90.4	35.6	0.15	22	1.5	0.2	0.30	0.60	6	0.20	0.10	24.7
03-19	181018	535.0	0.4	T	83.2	36.6	0.14	14	1.4	0.1	0.20	0.20	5	0.20	0.10	31.3
04-15	181296	850.0	1.2	0.03	72.0	33.7	0.13	10	1.5	0.2	0.20	0.40	3	0.20	0.10	26.8
05-27	181762	705.0	5.6	0.40	84.8	34.7	0.12	12	1.2	0.2	0.30	0.70	5	0.20	0.10	30.8
06-12	182049	652.0	1.3	0.11	80.8	33.7	0.12	11	0.9	0.1	0.30	0.40	4	0.30	0.10	40.5
07-24	182699	130.0	2.8	0.26	82.8	34.4	0.14	17	1.4	0.1	0.20	0.60	4	0.30	0.10	17.8
08-11	183307	3.4	3.8	0.00	66.4	32.7	0.14	20	1.9	0.2	0.10	0.40	5	0.30	0.10	5.4
09-10	183600	4.5	4.8	0.58	65.6	33.2	0.14	24	1.6	0.2	0.00	0.50	6	0.30	0.10	1.2
10-08	183830	3.6	4.7	0.22	69.6	30.8	0.15	23	2.7	0.2	0.00	0.20	5	0.40	0.10	1.1
11-05	184145	4.0	3.5	0.23	85.6	30.0	0.17	32	3.1	1.2	0.10	0.50	4	0.40	0.10	2.4
12-04	184407	13.0	1.5	0.14	84.8	30.3	0.14	32	3.4	0.1	0.10	0.20	4	0.30	0.20	2.0
1971	505920															
01-07	184610	11.2	0.5	0.00	92.0	31.7	0.16	35	3.8	0.1	0.10	0.20	3	0.40	0.20	2.1
02-01	184873	6.2	0.2	0.00	99.2	33.2	0.20	37	4.0	0.1	0.20	0.20	2	0.40	0.20	4.5
03-04	185065	566.0	1.1	0.08	72.8	24.9	0.3	25	4.6	0.2	0.50	0.80	3	0.30	0.10	6.2
04-12	185383	57.2	1.0	0.07	56.0	19.6	0.10	14	3.3	0.2	0.60	0.80	5	0.20	0.10	16.3
05-05	185607	60.2	1.3	0.08	56.0	20.6	0.08	11	3.0	0.8	0.50	0.60	4	0.20	0.10	5.6
06-04	185826	81.9	0.6	0.21	55.2	20.9	0.11	12	3.1	0.3	0.60	0.60	3	0.30	0.10	18.1
07-21	186272	1790.0	0.3	0.30	47.6	21.7	0.07	11	2.4	0.4	0.00	0.10	3	0.20	0.10	6.4
08-04	186356	1660.0	0.1	0.21	48.0	22.4	0.08	10	2.9	0.1	0.10	0.10	3	0.20	0.10	4.9
09-13	186619	82.7	0.6	4.10	58.0	25.7	0.13	12	2.5	2.3	1.40	1.50	6	0.30	0.10	0.5

KASKASKIA RIVER AT SHELBYVILLE

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505920														
10-12	170043	40	182	168	306	516			0.01					49	59.5
11-15	170292	54	256	216	382	662		0.00	0.00				0.00	26	45.0
11-29	170338	30	85	136	218	343			0.01					194	42.0
12-19	170461	25	70	272	344	462		0.00	0.001				0.02	59	39.0
1967	505920														
01-18	170647	39	91	264	398	498			0.01					5	33.0
01-25	170728	42	86	236	350	474		0.01	0.01				0.01	55	43.0
02-17	170852	22	73	224	326	427		0.00	0.01				0.01	10	37.0
03-22	171101	17	47	132	222	311		0.00	0.01				0.01	144	42.0
04-06	171181	24	67	224	332	428		0.00	0.01				0.02	5	63.0
05-09	171402	16	41	144	232	298		0.00	0.01				0.03	100	52.0
06-16	171781	27	55	220	320	423		0.00	0.01				0.02	95	79.0
07-13	172174	28	65	264	352	443		0.00	0.01				0.02	2	62.0
08-10	173217	30	72	172	235	340		0.00	0.01				0.02	71	73.0
09-27	173077	48	110	252	336	468		0.00	0.01				0.01	76	59.0
10-16	173254	31	218	200	328	566		0.00	0.07				0.08	242	58.0
10-30	173410	23	188	240	330	536		0.00	0.01				0.02	28	43.0
12-01	173713	55	134	252	372	525		0.00	0.01				0.01	24	34.0
1968	505920														
01-23	173903	18	40	152	210	262		0.00	0.01				0.03	90	30.0
02-06	173954	1 0	34	112	164	213		0.00	0.01				0.02	82	32.0
03-07	174232	25	60	240	334	406		0.00	0.02				0.02	15	41.0
04-05	174431	21	51	200	292	356		0.00	0.02				0.02	124	47.0
05-06	174642	28	79	240	348	427		0.00	0.01				0.04	24	59.0
06-07	175018	18	51	212	308	375		0.00	0.01				0.04	68	74.0
07-16	175532	21	69	252	348	453		0.00	0.01				0.05	39	77.0
08-06	175800	28	60	268	336	410		0.00	0.02				0.02	53	85.0
09-25	176326	42	63	292	348	455		0.00	0.01				0.02	61	74.0
10-02	176542	40	119	298	380	534		0.00	0.01				0.02	38	65.0
11-08	176666	36	189	256	356	585		0.00	0.01				0.00	11	46.0
12-06	176961	34	87	196	290	412		0.00	0.02				0.01	18	38.0
1969	505920														
01-08	177160	38	97	276	388	499		0.00	0.01				0.01	5	31.0
02-12	177381	17	46	136	216	301		0.00	0.02				0.02	198	35.0
03-17	177636	30	68	226	318	428		0.00	0.26				0.06	9	42.0
04-16	177902	22	59	192	274	376	0.00	0.00	0.02	<.05		<.05	0.02	91	51.0
05-16	178146	30	66	208	307	418	0.00	0.00	0.05	<.05		<.05	0.06	23	69.0
06-06	178385	16	62	192	288	361	0.00	0.00	0.04	<.05		<.05	0.06	31	68.0
07-10	178892	17	50	176	238	321	0.00	0.00	0.02	<.05		<.05	0.06	106	81.0
08-05	179222	22	49	196	256	309	0.00	0.00	0.02	<.05		<.05	0.04	29	84.0
09-11	179545	32	129	200	299	414	0.00	0.00	0.05	<.05	0.00	<.05	0.08	61	68.0
10-06	179771	26	98	249	353	434	0.00	0.00	0.01	<.05	0.00	<.05	0.11	30	64.0
11-04	179971	26	62	270	364	426	0.00	0.00	0.02	<.05	0.00	<.05	0.03	17	48.0
12-03	180161	24	66	258	364	445	0.00	0.00	0.01	<.05	0.00	<.05	0.02	6	37.0
1970	505920														
01-14	180504	32	80	302	418	510	0.00	0.00	0.01	<.05	0.00	<.05	0.02	3	36.0
02-18	180789	31	84	260	372	482	0.00	0.00	0.01	<.05	0.00	<.05	0.04	40	34.0
03-19	181018	25	79	246	358	442	0.00	0.00	0.03	<.05	0.00	<.05	0.03	8	39.0
04-15	181296	22	61	220	318	395	0.00	0.00	0.02	<.05	0.00	<.05	0.02	29	52.0
05-27	181762	23	72	248	354	447	0.00	0.00	0.10	<.05	0.00	<.05	0.04	144	72.0
06-12	182049	23	64	230	340	429	0.00	0.00	0.06	<.05	0.00	<.05	0.04	34	72.0
07-24	182699	26	72	268	348	455	0.00	0.00	0.01	<.05	0.00	<.05	0.01	58	77.0
08-11	183307	28	90	224	300	390	0.00	0.00	0.01	<.05	0.00	<.05	0.02	63	77.0
09-10	183600	29	101	208	300	386	0.00	0.00	0.12	<.05	0.00	<.05	0.06	76	73.0
10-08	183830	28	100	208	300	391	0.00	0.00	0.00	<.05	0.00	<.05	0.02	54	64.0
11-05	184145	31	146	212	336	463	0.00	0.00	0.01	<.05	0.00	<.05	0.01	64	50.0
12-04	184407	28	152	208	336	454	0.00	0.00	0.03	<.05	0.00	<.05	0.02	28	43.0
1971	505920														
01-07	184610	31	162	224	360	496	0.00	0.00	0.01	<.05	0.00	<.05	0.02	8	32.0
02-01	184873	38	164	244	384	551	0.00	0.00	0.09	<.05	0.01	<.05	0.10	5	37.0
03-04	185065	27	112	192	284	392	0.00	0,00	0.02	<.05	0.00	<.05	0.01	34	39.0
04-12	185383	21	68	144	220	306	0.00	0.00	0.01	<.05	0.00	<.05	0.02	21	57.0
05-05	185607	20	60	152	224	304	0.00	0.00	0.01	<,05	0.00	<.05	0.01	20	59.0
06-04	185826	20	56	156	224	308	0.00	0.00	0.01	<.05	0.00	<.05	0.02	22	63.0
07-21	186272	18	46	152	208	267	0.00	0.00	0.02	<.05	0.00	<.05	0.02	9	73.0
08-04	186356	18	49	160	212	266	0.00	0.00	0.01	<.05	0.00	<.05	0.02	11	75.0
09-13	186610	19	30	224	250	303	0.00	0.00	0.01	<.05	0.00	<.05	0.03	54	69.8

KASKASKIA RIVER AT VANDALIA

The Kaskaskia River rises in the Bloomington Ridged Plain — South Region, west of Champaign, and flows southwesterly through the Springfield Plain Region to the junction with the Mississippi River below New Athens. The gaging station at Vandalia is located on the right bank at the upstream side of the Gallatin Street Bridge. Elevation of gage datum is 453.30 feet above mean sea level. The drainage basin above the gage has an area of approximately 1980 square miles.

The tabulation of water quality data is for the period from October 10, 1966, to September 10, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

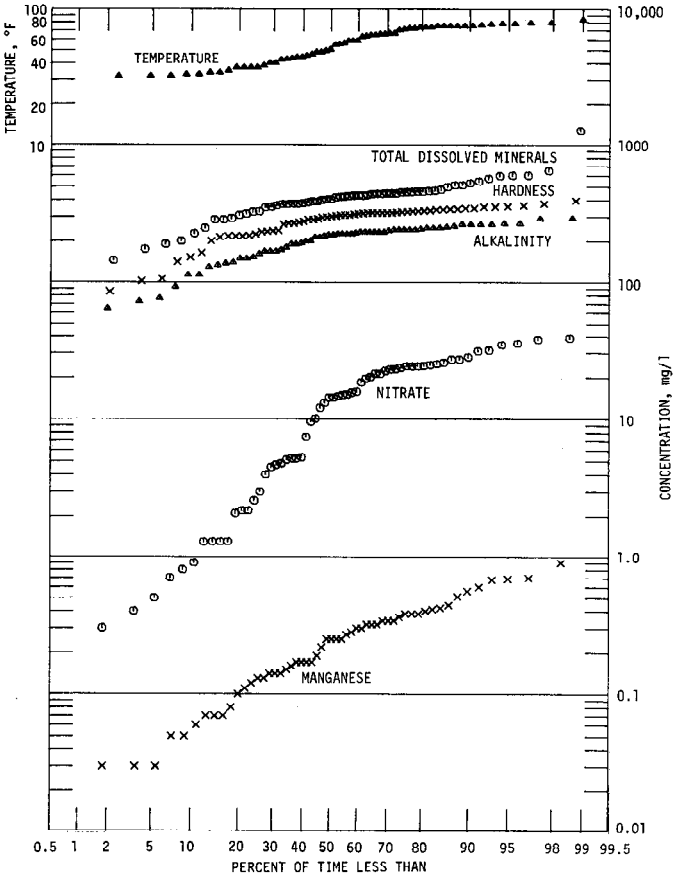
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 2.49 cfs/sq mi, nor fall below 0.03 cfs/sq mi. The median flow was 0.355 cfs/sq mi and the mean was 0.87 cfs/sq mi.

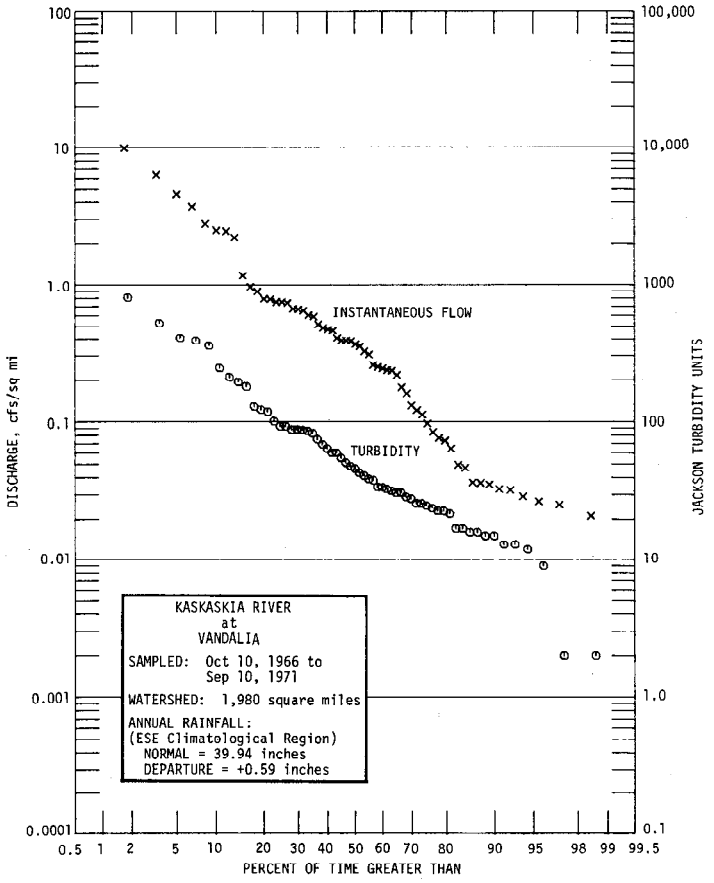
The turbidity was not less than 13 Jtu nor more than 245 Jtu for the central 80 percent of the time. The median value was 42 Jtu and the mean 94 Jtu.

Reported temperatures were over 80 F for 2 percent and over 70 F for 33 percent of the time. They were below 50 F for 41 percent and below 40 F for 21 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	112	224	264
Hardness (as $CaCO_3$)	164	306	352
Total dissolved minerals	247	422	569
Nitrate (NO_3)	0.9	14.5(14.5)	31 .0
Total inorganic phosphate (PO_4)	0.3	0.7(0.82)	1.6
Soluble inorganic phosphate (PO_4)	0.2	0.4(0.45)	0.8
Manganese (Mn)	0.055	0.25	0.58





KASKASKIA RIVER AT VANDALIA

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505925															
10-10	170041	64.4	1.1	0.34	64.8	24.9	0.32	76	3.9	T	0.20	0.30	6	0.30	0.20	0.4
11-11	170199	693.0	6.7	0.70	83.6	34.9	1.20	329	6.5	T	0.20	0.60	9	0.30	0.10	4.7
12-15	170448	9080.0	5.6	0.05	41.2	14.8	0.16	9	3.6	T	0.20	0.30	11	0.40	0.10	22.9
1967	505925															
01-17	170648	316.0	0.5	0.13	92.8	33.9	0.22	36	1.8	T	0.20	0.50	10	1.10	0.10	24.0
02-14	170850	1770.0	2.4	0.34	72.8	29.7	0.15	19	1.7	0.1	1.00	1.10	9	0.30	0.10	34.4
03-17	171068	1550.0	3.1	0.16	76.8	30.8	0.19	21	1.6	0.1	0.60	0.60	9	0.30	0.00	37.9
06-14	171223	765.0	2.0	0.07	75.6	31.5	0.20	26	1.8	0.0	0.20	0.60	5	0.20	0.10	23.5
05-17	171556	5510.0	2.9	0.03	56.0	22.4	0.14	16	1.8	0.1	0.70	0.70	8	0.10	0.10	24.9
06-08	171658	1280.0	3.3	0.03	78.4	32.2	0.18	18	1.8	0.1	0.90	1.40	6	0.10	0.10	38.9
07-21	172306	432.0	4.5	0.25	52.8	24.7	0.18	36	2.6	0.4	0.20	0.50	4	0.10	0.10	3.0
08-10	172655	1320.0	8.3	0.27	25.2	9.5	0.12	23	3.9	0.1	0.20	0.70	6	0.10	0.10	5.1
09-20	173088	65.4	1.6	0.44	80.0	29.8	0.20	33	2.5	0.1	0.60	1.00	6	0.10	0.10	2.2
10-13	173286	57.8	1.4	0.51	76.0	30.2	0.24	54	2.5	T	0.70	0.80	8	0.10	0.00	5.2
11-13	173536	167.0	1.1	0.12	73.0	30.1	0.29	84	3.6	0.1	0.70	0.80	9	0.10	0.20	4.0
12-11	173675	4940.0	6.2	0.17	56.2	23.3	0.17	30	3.2	0.4	1.10	2.50	11	0.20	0.00	24.0
1968	505925															
01-17	173906	800.0	0.9	0.00	77.6	30.3	0.23	49	1.9	0.1	0.20	0.20	5	0.10	0.10	24.5
02-05	174158	12500.0	6.1	0.07	34.4	13.1	0.07	9	3.0	0.2	0.60	0.70	5	0.10	0.00	15.5
03-06	174329	505.0	0.7	0.10	79.2	32.7	0.19	28	1.7	0.3	0.40	0.40	9	0.20	0.00	22.7
04-12	174602	1310.0	4.4	0.17	77.6	29.8	0.19	23	1.7	0.3	0.40	1.10	3	0.30	0.10	24.0
05-03	174904	481.0	1.2	0.08	77.6	34.5	0.18	27	1.3	0.7	0.50	0.70	6	0.20	0.00	14.6
06-17	175196	929.0	6.1	0.38	77.6	31.6	0.17	20	1.5	0.1	0.20	0.40	8	0.20	0.10	28.0
07-08	175565	602.0	2.5	0.17	82.4	33.6	0.17	15	1.2	0.1	0.30	0.50	8	0.30	0.20	35.2
08-15	176020	956.0	11.0	0.40	56.0	23.0	0.13	13	2.4	0.1	0.30	1.50	9	0.20	0.10	14.3
09-10	176264	72.6	1.4	0.32	74.4	33.6	0.18	25	2.7	0.6	0.80	1.50	8	0.20	0.10	0.5
10-18	176597	50.2	1.4	0.38	81.6	33.1	0.22	36	2.6	0.4	0.70	0.90	3	0.20	0.10	1.3
11-08	176748	72.0	2.0	0.42	85.6	31.6	0.28	82	6.6	0.6	0.60	1.10	7	0.20	0.10	1.3
12-10	177090	240.0	0.8	0.11	76.0	20.7	0.23	51	3.3	0.4	0.80	1.90	9	0.20	0.10	12.0
1969	505925															
01-31	177375	19500.0	15.0	0.38	26.4	9.7	0.07	15	2.9	0.2	0.60	1.80	6	0.20	0.10	13.1
02-18	177484	1910.0	3.9	0.05	66.4	26.8	0.13	21	1.6	0.2	0.40	0 90	8	0.20	0.10	31.0
03-12	177672	637.0	0.7	0.13	74.4	32.6	0.21	32	1.2	0.1	0.30	0.30	6	0.20	0.10	25.5
04-10	178011	4890.0	21.0	0.90	51.2	21.4	0.14	25	2.5	0.1	0.30	1.80	7	0.20	0.10	15.1
05-20	178253	722.0	0.9	0.03	76.8	32.6	0.23	37	1.7	0.7	0.50	0.60	4	0.30	0.20	19.5
06-11	178608	465.0	2.6	0.15	63.2	31.6	0.15	20	1.9	0.2	0.70	2.10	5	0.30	0.10	14.9
07-16	179111	1190.0	4.1	0.25	64.8	25.7	0.16	18	2.4	0.1	0.40	1.20	10	0.30	0.10	21.3
08-05	179340	152.0	1.9	0.41	64.8	29.8	0.16	26	2.2	0.1	0.40	0.50	5	0.30	0.10	0.3
09-15	179645	70.2	1.8	0.22	56.0	20.3	0.13	23	8.6	0.0	0.60	0.80	8	0.30	0.00	2.2
10-14	179916	7300.0	8.3	0.25	24.4	5.8	0.08	12	5.3	0.1	0.60	1.50	4	0.20	0.20	4.8
11-07	180019	762.0	1.5	0.19	86.4	33.7	0.15	21	2.5	T	0.30	0.50	7	0.30	0.20	18.4
12-10	180338	911.0	1.0	0.06	75.2	31.7	0.12	25	2.2	0.1	0.40	0.50	8	0.30	0.10	21.2
1970	505925															
01-15	180733	259.0	0.3	0.16	93.2	39.3	0.25	59	1.5	0.2	0.10	0.20	7	0.30	0.10	20.2
02-10	180732	1460.0	1.9	T	76.0	31.3	0.18	28	2.2	0.2	0.40	0.70	7	0.30	0.10	22.2
03-16	181110	1020.0	1.2	0.00	84.0	34.7	0.15	24	1.1	0.1	0.30	0.30	6	0.20	0.10	26.9
04-06	181288	1480.0	1.8	0.14	76.8	33.2	0.19	28	1.2	0.2	0.40	0.70	5	0.20	0.10	24.3
05-08	181760	4370.0	4.2	0.25	50.0	22.1	0.09	10	1.7	0.7	0.40	0.50	5	0.20	0.10	0.8
06-11	182269	1160.0	2.0	0.07	72.0	30.8	0.13	18	1.3	0.1	0.30	0.60	9	0.20	0.10	31.5
07-07	183425	767.0	3.6	0.30	87.2	34.7	0.19	17	1.2	0.1	0.40	0.40	10	0.30	0.10	27.0
08-12	183423	93.0	1.7	0.00	68.8	27.4	0.13	24	2.1	0.2	0.30	0.40	10	0.30	0.10	2.6
09-10	183639	41.7	1.4	0.56	74.4	29.8	0.16	25	2.0	0.3	0.70	0.90	10	0.30	0.10	0.9
10-07	183890	53.0	1.4	0.60	65.6	25.4	0.26	49	3.9	0.3	0.50	0.60	10	0.30	0.10	1.3
11-12	184276	97.1	0.7	0.30	81.6	32.2	0.36	81	2.9	0.2	0.30	0.40	7	0.20	0.10	2.1
12-03	184489	127.0	1.0	0.36	82.4	32.7	0.47	104	3.3	0.3	0.20	0.40	7	0.30	0.10	
1971	505925															
01-06	184809	222.0	4.0	0.32	68.8	30.3	0.39	104	4.1	0.5	0.40	1.20	6	0.30	0.10	5.3
02-11	184964	490.0	3.6	0.32	48.8	19.0	0.21	50	4.3	0.5	0.30	0.50	7	0.20	0.10	7.4
03-17	185261	1480.0	26.0	0.14	52.8	19.5	0.16	25	3.3	0.2	0.90	1.60	6	0.30	0.10	15.7
06-06	185528	350.0	2.8	0.34	73.6	27.4	0.21	41	3.0	0.3	0.60	1.00	6	0.20	0.10	9.6
05-10	185780	462.0	13.0	0.69	52.8	20.9	0.17	39	3.5	0.3	0.40	0.80	8	0.20	0.10	10.1
06-03	186003	192.0	1.7	0.17	73.6	28.3	0.20	32	2.6	0.2	0.30	0.40	7	0.30	0.10	14.3
07-15	186335	2320.0	15.0	0.68	37.6	16.1	0.06	12	2.6	0.3	0.00	0.80	5	0.20	0.10	4.5
08-19	186500	1570.0	3.0	0.28	48.8	22.9	0.11	11	2.9	0.1	0.20	0.30	4	0.20	0.10	5.2
09-10	186642	145.0	1.3	0.00	63.2	27.9	0.13	19	3.4	0.1	0.50	0.70	4	0.30	0.10	0.7

KASKASKIA RIVER AT VANDALIA

DATE	LAB.NO.	CL	SO4	ALK.	TH.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505925														
10-10	170041	104	90	168	264	508			0.01					29	72.0
11-11	170199	610	73	132	352	1262			0.01					101	48.0
12-15	170448	17	34	112	164	247			0.01					122	37.0
1967	505925														
01-17	170648	59	85	256	371	524			0.01					2	33.0
02-14	170850	35	64	198	303	400		0.00	0.01				0.01	38	38.0
03-17	171068	34	73	200	318	426		0.00	0.01				0.02	39	44.0
04-14	171223	31	71	232	318	445		0.00	0.01				0.02	43	63.0
05-17	171556	24	49	160	232	327		0.00	0.03				0.01	93	58.0
06-08	171658	31	64	220	328	419		0.00	0.00				0.00	55	72.0
07-21	172304	59	46	172	233	350		0.00	0.01				0.01	75	75.0
08-10	172655	33	27	72	102	189		0.00	0.04				0.05	245	75.0
09-20	173088	40	68	264	322	444		0.00	0.01				0.06	25	70.0
10-13	173286	78	66	248	314	494		0.00	0.01				0.01	28	55.0
11-13	173536	99	79	240	306	542		0.00	0.01				0.01	16	40.0
12-11	173675	49	61	148	236	373		0.00	0.02				0.01	119	44.0
1968	505925														
01-17	173906	79	65	232	318	464		0.00	0.01				0.01	15	32.0
02-05	174158	11	34	92	140	200		0.00	0.01				0.02	129	42.5
03-06	174329	44	65	248	332	437		0.00	0.01				0.00	13	42.0
04-12	174602	34	81	216	316	420		0.00	0.01				0.05	88	58.0
05-03	174904	39	76	252	336	430		0.00	0.00				0.03	22	66.0
06-17	175194	33	51	240	324	428		0.00	0.01				0.01	180	73.0
07-08	175565	23	56	264	344	442		0.00	0.01				0.02	51	78.0
08-15	176020	23	38	180	234	284		0.00	0.02				0.03	194	75.0
09-10	176264	32	54	268	324	426		0.00	0.02				0.00	23	66.0
10-18	176597	46	68	288	340	455		0.00	0.02				0.01	48	62.0
11-08	176748	123	114	248	344	600		0.00	0.02				0.02	34	48.0
12-10	177090	77	89	224	312	508		0.00	0.02				0.00	15	34.0
1969	505925														
01-31	177375	15	35	76	106	174		0.00	0.02				0.01	388	40.0
02-18	177484	34	61	192	276	388	0.00	0.00	0.01	<.05		<.05	0.02	64	35.0
03-12	177672	49	77	232	320	450	0.00	0.00	0.01	<.05		<.05	0.00	9	37.0
04-10	178011	40	59	152	216	314	0.00	0.00	0.02	<.05	0.00	<.05	0.01	528	58.0
05-20	178253	58	69	232	326	471	0.00	0.00	0.02	<.05	0.00	<.05	0.02	17	64.0
06-11	178608	33	63	212	288	368	0.00	0.00	0.01	<.05	0.00	<.05	0.01	86	78.0
07-16	179111	24	58	190	267	369	0.00	0.00	0.02	<.05	0.00	<.05	0.03	88	83.0
08-05	179340	40	52	240	284	376	0.00	0.00	0.01	<.05	0.00	<.05	0.03	26	75.0
09-15	179645	27	45	190	223	308	0.00	0.00	0.01	<.05	0.00	<.05	0.04	32	71.0
10-14	179916	10	27	64	85	144	0.00	0.00	0.03	<.05	0.00	<.05	0.02	210	56.0
11-07	180019	34	69	264	354	439	0.01	0.00	0.01	<.05	0.00	<.05	0.02	23	50.0
12-10	180338	41	69	224	318	444	0.00	0.00	0.01	<.05	0.00	<.05	0.04	16	37.0
1970	505925														
01-15	180733	95	79	292	394	599	0.00	0.00	0.01	<.05	0.00	<.05	0.04	2	32.0
02-10	180732	48	84	212	318	463	0.00	0.00	0.02	<.05	0.00	<.05	0.04	26	34.0
03-16	181110	43	82	232	352	459	0.00	0.00	0.01	<.05	0.00	<.05	0.02	17	37.0
04-06	181288	49	80	224	328	456	0.00	0.00	0.01	<.05	0.00	<.05	0.01	31	49.0
05-08	181760	21	65	138	216	290	0.00	0.00	0.02	<.05	0.00	<.05	0.02	83	65.0
06-11	182269	30	59	224	306	403	0.00	0.00	0.01	<.05	0.00	<.05	0.01	41	73.0
07-07	183425	30	55	264	360	413	0.00	0.00	0.01	<.05	0.00	<.05	0.01	69	77.0
08-12	183423	32	48	236	284	362	0.00	0.00	0.01	<.05	0.00	<.05	0.01	24	73.0
09-10	183639	33	42	268	308	373	0.00	0.00	0.01	<.05	0.00	<.05	0.01	33	75.0
10-07	183890	84	42	220	268	396	0.00	0.00	0.00	<.05	0.00	<.05	0.01	31	65.0
11-12	184276	136	71	244	336	569	0.00	0.00	0.01	<.05	0.01	<.05	0.03	12	46.0
12-03	184489	174	75	240	340	648	0.00	0.00	0.01	<.05	0.01	<.05	0.07	13	54.0
1971	505925														
01-06	184809	174	96	168	296	594	0.00	0.00	0.02	<.05	0.01	<.05	0.04	87	32.0
02-11	184964	86	56	128	200	386	0.00	0.00	0.03	<.05	0.00	<.05	0.05	93	33.0
03-17	185261	34	71	136	212	323	0.00	0.00	0.01	<.05	0.00	<.05	0.02	808	45.0
04-06	185528	63	72	228	296	455	0.00	0.00	0.02	<.05	0.00	<.05	0.03	60	43.0
05-10	185780	58	70	148	218	381	0.00	0.00	0.02	<.05	0.00	<.05	0.03	355	64.0
06-03	186003	43	62	232	300	425	0.00	0.00	0.02	<.05	0.00	<.05	0.02	46	78.8
07-15	186335	20	30	112	152	226	0.00	0.00	0.00	<.05	0.00	<.05	0.00	404	75.0
08-19	186500	19	41	168	216	285	0.00	0.00	0.01	<.05	0.00	<.05	0.00	60	76.1
09-10	186642	29	37	240	272	352	0.00	0.00	0.01	<.05	0.00	<.05	0.02	34	79.0

KISHWAUKEE RIVER NEAR PERRYVILLE

The Kishwaukee River rises in McHenry County near Woodstock in the Wheaton Morainal Region and flows generally westward to its junction with the Rock River below Rockford in the Rock River Hills Region. The gaging station is located 2 miles southwest of Perryville. Elevation of gage datum is 692.13 feet above mean sea level. The drainage basin above the gage has an area of approximately 1090 square miles.

The tabulation of water quality data is for the period from October 12, 1966, to August 31, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

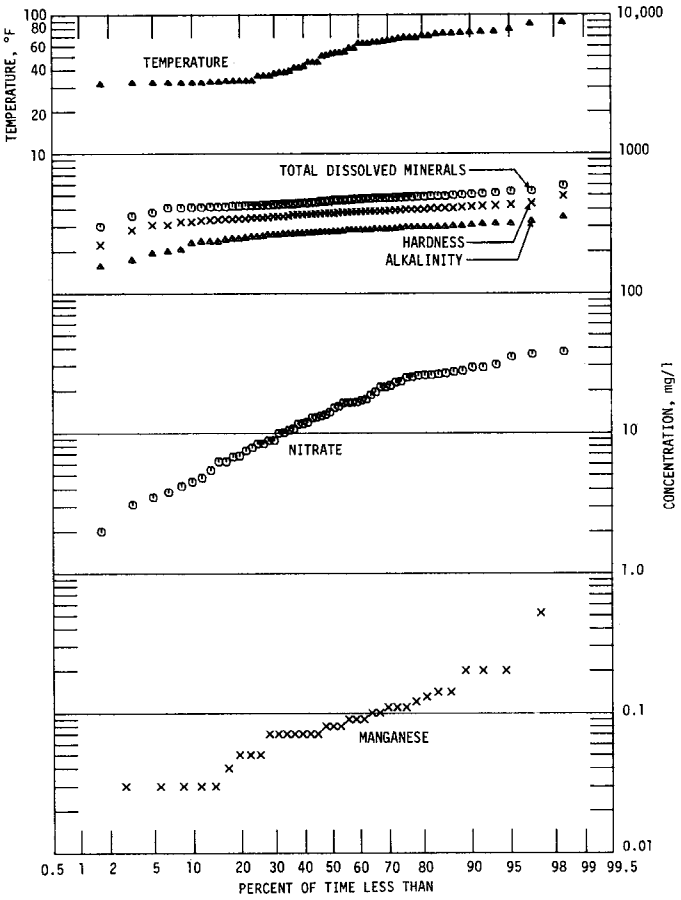
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.61 cfs/sq mi, nor fall below 0.15 cfs/sq mi. The median flow was 0.35 cfs/sq mi and the mean was 0.56 cfs,/sq mi.

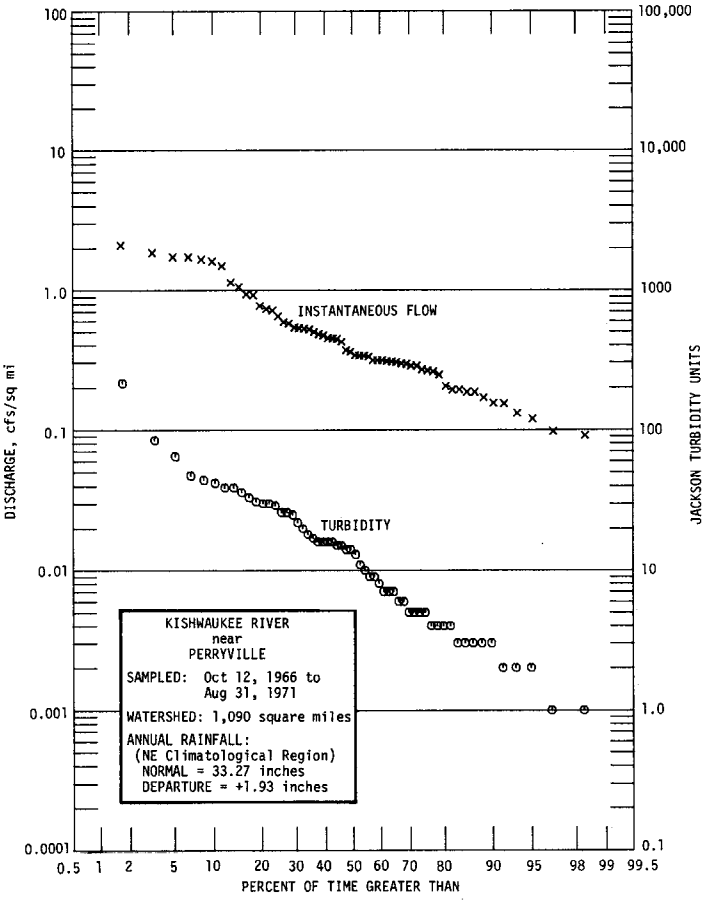
The turbidity was not less than 3 Jtu nor more than 42 Jtu for the central 80 percent of the time. The median value was 13.5 Jtu and the mean 20 Jtu.

Reported temperatures were over 80 F for 3 percent and over 70 F for 17 percent of the time. They were below 50 F for 45 percent and below 40 F for 35 percent of the time.

The analyses indicated the following :

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	228	272	304
Hardness (as $CaCO_3$)	320	372	413
Total dissolved minerals	409	456	505
Nitrate (NO_3)	4.5	14.4(15.7)	28.8
Total inorganic phosphate (PO_4)	0.1	0.4(0.98)	0.9
Soluble inorganic phosphate (PO_4)	0.2	0.7(0.69)	1 .0
Manganese (Mn)	0.03	0.08	0.20





KISHWAUKEE RIVER NEAR PERRYVILLE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	S IO2	F	B	NO3
1966	504400															
10-12	170055	99.0	0.3	0.00	73.0	36.7	0.14	19	2.5	0.0	0.60	0.60	6	0.10	0.10	3.5
11-07	170203	129.0	0.4	0.00	82.4	38.5	0.16	20	3.4	0.0	0.70	2.30	8	0.20	0.10	6.2
12-08	170382	514.0	1.2	0.00	77.6	33.7	0.15	16	3.2	0.3	0.60	0.60	15	0.10	0.10	6.7
1967	504400															
01-12	170616	209.0	0.2	0.00	94.6	40.6	0.17	18	2.8	0.4	0.50	0.60	9	0.10	0.10	8.8
02-09	170797	202.0	0.2	0.03	96.0	38.1	0.19	12	1.8	T	0.00	0.10	9	0.10	0.20	34.4
03-08	171049	316.0	0.2	0.00	82.8	36.4	0.15	17	2.8	0.1	2.00	2.10	10	0.40	0.10	17.0
04-06	171237	2270.0	1.5	0.00	82.4	32.7	0.12	8	2.5	0.1	0.70	1.00	10	0.10	0.00	35.9
05-04	171431	1020.0	0.6	0.00	89.6	37.3	0.13	11	1.9	0.1	0.30	0.40	4	0.20	0.10	23.1
06-08	171648	490.0	1.3	0.05	80.0	37.1	0.14	13	2.6	T	1.20	1.20	6	0.10	0.10	9.9
07-13	172340	364.0	0.6	0.03	88.4	37.2	0.17	11	2.2	0.1	0.50	0.60	6	0.20	0.10	2.0
08-02	172622	320.0	0.8	0.07	84.2	37.2	0.19	12	2.4	T	0.70	0.70	5	0.10	0.10	4.2
09-06	172951	166.0	0.6	0.05	78.4	39.0	0.17	17	2.3	0.1	0.70	0.80	4	0.10	0.10	4.8
10-04	173241	167.0	0.7	0.08	81.6	39.0	0.14	18	2.6	T	0.80	1.20	5	0.10	0.00	6.8
11-08	173475	572.0	0.3	0.05	95.0	42.8	0.15	12	3.2	0.1	0.50	0.60	11	0.10	0.10	16.3
12-07	173649	364.0	0.4	0.00	90.0	38.8	0.16	16	2.2	0.1	0.70	2.20	9	0.20	0.10	11.5
1968	504400															
01-04	173905	308.0	0.2	0.00	97.6	42.4	0.19	18	2.5	0.1	0.60	0.80	10	0.10	0.10	25.4
02-13	174177	398.0	0.3	0.04	113.6	50.1	0.18	16	2.8	0.7	0.80	0.90	9	0.20	0.00	17.3
03-07	174269	221.0	0.2	0.07	77.6	35.1	0.16	16	2.1	0.7	1.20	1.20	5	0.20	0.30	8.3
04-04	174515	487.0	0.6	0.00	89.4	40.1	0.20	14	2.0	0.2	0.80	1.10	3	0.10	0.10	10.6
05-14	174798	290.0	0.4	0.03	82.8	39.3	0.15	16	2.3	0.2	0.90	1.20	1	0.20	0.00	7.4
06-05	175359	328.0	0.7	0.07	88.8	38.5	0.16	16	2.1	0.1	1.00	1.30	3	0.20	0.10	4.5
07-10	175792	390.0	1.8	0.07	92.0	40.4	0.17	15	2.0	0.1	0.20	0.80	11	0.20	0.10	22.8
08-08	176021	280.0	2.0	0.20	76.8	37.1	0.12	15	3.1	0.2	0.70	2.00	11	0.20	0.10	7.8
09-04	176169	332.0	0.6	0.10	84.8	38.1	0.21	18	3.3	0.0	0.20	0.60	9	0.30	0.10	10.0
10-01	176473	462.0	1.1	0.00	92.8	41.8	0.13	12	1.8	0.1	0.50	0.60	9	0.20	0.10	12.7
11-08	176943	284.0	0.2	0.10	89.2	40.1	0.16	16	2.8	0.1	0.80	0.90	4	0.20	0.10	8.3
12-04	177111	795.0	0.6	0.09	101.6	42.3	0.16	12	2.4	0.2	0.80	0.80	10	0.20	0.10	13.9
1969	504400															
01-16	177341	338.0	0.4	0.07	88.0	39.9	0.24	17	2.5	0.9	1.00	1.30	12	0.20	0.10	16.3
02-12	177532	577.0	0.5	T	87.2	38.9	0.17	17	3.0	0.7	0.80	1.00	11	0.20	0.10	11.6
03-14	177757	582.0	0.5	0.20	87.2	39.4	0.15	17	2.5	0.3	0.90	1.00	8	0.30	0.10	11.8
04-04	177990	1880.0	8.1	0.52	75.6	31.9	0.13	13	3.3	0.5	0.80	2.10	8	0.20	0.10	25.5
05-08	178141	638.0	1.1	0.07	83.2	38.4	0.18	13	2.0	1.2	1.10	3.00	5	0.20	0.00	21.5
06-05	178660	777.0	1.0	0.00	88.0	38.9	0.18	13	2.0	0.2	0.80	1.90	8	0.20	0.10	27.0
07-10	179011	1140.0	1.9	0.07	95.2	38.5	0.27	11	1.6	0.1	0.40	1.00	11	0.20	0.10	24.6
08-20	179427	338.0	1.0	0.09	86.4	38.1	0.14	14	2.6	0.1	0.50	0.70	6	0.20	0.10	8.8
09-17	179693	201.0	1.3	0.11	80.8	39.8	0.14	19	2.9	0.1	0.90	1.00	7	0.20	0.10	6.2
10-03	179900	184.0	0.6	0.09	75.6	39.8	0.11	18	2.7	0.1	0.70	0.90	1	0.20	0.10	5.4
11-05	180075	1000.0	2.4	0.14	95.2	36.1	0.15	13	3.7	0.2	1.00	1.80	10	0.20	0.10	28.8
12-04	180450	327.0	0.2	0.00	94.4	42.2	0.15	16	1.7	0.2	0.80	0.90	6	0.20	0.10	24.8
1970	504400															
01-06	180577	210.0	0.2	0.00	101.2	45.1	0.16	17	2.0	0.3	0.90	1.00	8	0.30	0.10	15.0
02-11	180903	366.0	0.2	0.00	88.8	39.3	0.15	20	2.6	0.7	1.00	1.20	4	0.20	0.10	16.5
03-06	181010	1760.0	1.7	T	75.2	32.2	0.10	9	3.2	0.4	0.90	1.10	5	0.20	0.10	37.3
04-03	181292	840.0	0.2	0.00	86.4	38.1	0.11	16	1.5	0.1	0.20	0.30	5	0.20	0.10	18.5
05-08	181894	564.0	0.5	0.00	86.4	41.0	0.12	14	1.8	0.1	0.40	0.40	1	0.20	0.10	16.2
06-11	182262	1230.0	2.5	0.08	88.0	37.1	0.16	10	2.0	0.5	0.20	0.60	6	0.20	0.10	27.4
07-01	183188	543.0	0.7	0.00	88.0	39.4	0.10	11	1.8	T	0.40	0.40	9	0.20	0.10	19.5
07-29	183502	484.0	1.9	0.13	68.8	32.1	0.11	15	2.6	0.9	0.80	1.00	10	0.30	0.10	21.0
09-10	183601	706.0	2.3	0.00	82.4	33.6	0.14	13	3.0	0.4	1.10	1.10	13	0.30	0.00	15.4
10-02	184071	1630.0	0.3	0.03	91.2	42.0	0.16	12	1.9	0.1	0.60	0.70	9	0.30	0.10	30.3
10-29	184397	1810.0	2.4	0.08	78.4	32.2	0.14	11	3.4	0.2	0.90	1.10	10	0.30	0.10	28.8
12-09	184692	624.0	0.3	0.00	95.2	39.5	0.16	13	1.9	0.1	0.60	0.60	8	0.30	0.20	26.0
1971	504400															
01-06	184853	337.0	0.1	0.00	92.8	40.0	0.17	15	1.3	0.2	0.40	0.80	8	0.30	0.10	25.6
01-28	184892	308.0	0.3	0.00	99.2	42.0	0.17	19	1.8	0.4	0.90	0.90	8	0.30	0.10	21.1
02-25	185091	1880.0	3.4	0.14	54.4	20.6	0.09	14	4.0	0.9	0.80	0.90	7	0.30	0.10	13.4
03-24	185417	2020.0	2.4	0.03	68.0	26.9	0.09	9	2.5	0.3	0.40	0.70	8	0.20	0.10	26.4
04-29	185650	520.0	0.2	0.00	76.4	38.3	0.16	14	1.8	0.1	0.10	0.10	2	0.20	0.10	12.8
05-26	185946	357.0	0.6	0.11	77.6	36.6	0.12	17	2.6	0.3	0.50	0.60	5	0.30	0.10	13.1
06-23	186203	265.0	1.5	0.11	72.0	38.1	0.12	21	2.3	0.0	0.50	0.70	10	0.30	0.10	10.4
07-28	186395	142.0	0.7	0.12	71.6	38.3	0.13	24	2.7	0.1	0.30	0.40	3	0.30	0.20	3.8
08-31	186636	106.0	0.5	0.00	64.0	35.1	0.15	22	3.1	0.4	0.40	0.50	6	0.30	0.10	3.1

KISHWAUKEE RIVER NEAR PERRYVILLE

DATE	LAB.NO.	CL	SO4	ALK.	TH.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	504400														
10-12	170055	24	67	276	333	424			0.00					4	53.0
11-07	170203	26	77	284	364	461			0.01					4	53.0
12-08	170382	25	99	232	332	431			0.00					16	36.0
1967	504400														
01-12	170616	24	103	292	403	508			0.02					4	33.0
02-09	170797	23	91	272	396	487		0.00	0.01				0.00	2	33.0
03-08	171049	25	91	248	356	461		0.00	0.01				0.02	1	33.0
04-06	171237	18	102	204	340	410		0.00	0.02				0.02	36	51.0
05-04	171431	20	107	244	377	476		0.00	0.00				0.01	20	
06-08	171648	18	87	260	352	423		0.00	0.00				0.02	26	67.0
07-13	172340	19	85	272	374	415		0.00	0.01				0.02	5	68.0
08-02	172622	19	44	264	363	433		0.00	0.01				0.02	11	74.5
09-06	172951	27	77	268	356	444		0.00	0.02				0.02	16	63.0
10-04	173241	25	82	260	364	440		0.00	0.02				0.02	9	62.0
11-08	173475	20	109	284	413	488		0.00	0.01				0.02	5	38.0
12-07	173649	21	95	280	384	474		0.00	0.02				0.02	2	41.0
1968	504400														
01-04	173905	31	98	304	418	530		0.00	0.01				0.02	6	32.5
02-13	174177	28	124	348	490	583		0.00	0.01				0.01	7	32.5
03-07	174269	22	75	260	338	413		0.00	0.02				0.10	3	33.0
04-04	174515	23	96	280	388	474		0.00	0.01				0.04	13	45.0
05-14	174798	21	86	272	368	438		0.01	0.01				0.04	9	63.0
06-05	175359	26	88	280	380	432		0.00	0.02				0.03	18	78.0
07-10	175792	26	87	284	396	489		0.00	0.01				0.02	30	68.0
08-08	176021	23	78	274	344	433		0.00	0.01				0.03	42	70.0
09-04	176169	29	73	286	368	443		0.00	0.01				0.03	15	73.0
10-01	176473	19	84	312	404	479		0.00	0.01				0.00	22	66.0
11-08	176943	26	78	300	388	462		0.00	0.02				0.00	6	41.0
12-04	177111	24	100	310	428	487		0.00	0.02				0.02	7	39.0
1969	504400														
01-16	177341	25	83	292	384	480		0.00	0.01				0.11	5	31.5
02-12	177532	24	92	288	378	472		0.00	0.01				0.05	7	32.0
03-14	177757	24	106	296	380	484	0.01	0.00	0.03	<.05		<.05	0.08	5	33.0
04-04	177990	27	71	232	320	430	0.00	0.00	0.02	<.05	0.00	<.05	0.01	213	45.0
05-08	178141	23	81	266	366	440	0.01	0.00	0.01	<.05	0.00	<.05	0.12	16	64.0
06-05	178660	22	80	270	380	475	0.01	0.00	0.02	<.05	0.00	<.05	0.04	16	57.0
07-10	179011	22	80	296	396	505	0.01	0.00	0.03	<.05	0.00	<.05	0.06	26	70.0
08-20	179427	18	76	292	372	461	0.00	0.00	0.02	<.05	0.00	<.05	0.03	15	74.0
09-17	179693	25	77	280	365	452	0.00	0.00	0.02	<.05	0.00	<.05	0.04	14	62.0
10-03	179900	29	75	273	352	422	0.00	0.00	0.02	<.05	0.00	<.05	0.04	8	62.0
11-05	180075	26	80	266	386	482	0.00	0.00	0.03	<.05	0.00	<.05	0.04	44	42.0
12-04	180450	28	90	300	409	503	0.00	0.00	0.00	<.05	0.00	<.05	0.04	1	32.0
1970	504400														
01-06	180577	28	94	324	438	533	0.00	0.00	0.02	<.05	0.00	<.05	0.03	3	32.0
02-11	180903	34	84	280	383	491	0.00	0.00	0.01	<.05	0.00	<.05	0.04	2	32.0
03-06	181010	25	78	198	320	407	0.00	0.00	0.02	<.05	0.00	<.05	0.03	31	38.0
04-03	181292	34	97	252	372	466	0.00	0.00	0.01	<.05	0.00	<.05	0.02	3	45.0
05-08	181894	26	89	268	384	467	0.00	0.01	0.00	<.05	0.00	<.05	0.04	10	65.0
06-11	182262	24	91	254	372	449	0.00	0.00	0.01	<.05	0.00	<.05	0.01	29	73.0
07-01	183188	21	83	280	384	451	0.00	0.00	0.01	<.05	0.00	<.05	0.01	14	85.0
07-29	183502	22	68	232	304	377	0.00	0.00	0.01	<.05	0.00	<.05	0.03	30	87.0
09-10	183601	24	84	240	344	409	0.00	0.00	0.02	<.05	0.00	<.05	0.03	39	68.0
10-02	184071	25	80	292	400	499	0.00	0.00	0.00	<.05	0.00	<.05	0.02	4	57.2
10-29	184397	24	64	228	328	419	0.00	0.00	0.01	<.05	0.00	<.05	0.02	47	52.0
12-09	184692	25	79	292	400	465	0.00	0.00	0.02	<.05	0.00	<.05	0.01	3	36.0
1971	504400														
01-06	184853	27	77	284	396	471	0.00	0.00	0.00	<.05	0.00	<.05	0.08	0	32.0
01-28	184892	32	83	312	420	517	0.00	0.00	0.02	<.05	0.01	<.05	0.08	3	32.0
02-25	185091	28	47	156	220	298	0.00	0.00	0.02	<.05	0.00	<.05	0.04	84	36.0
03-24	185417	21	57	192	280	356	0.00	0.00	0.01	<.05	0.00	<.05	0.04	64	37.0
04-29	185650	26	76	264	348	427	0.00	0.00	0.01	<.05	0.00	<.05	0.03	7	50.0
05-26	185946	28	68	264	344	419	0.00	0.00	0.01	<.05	0.00	<.05	0.03	33	53.6
06-23	186203	33	72	252	336	427	0.00	0.00	0.01	<.05	0.00	<.05	0.00	39	73.4
07-28	186395	35	64	172	336	413	0.00	0.00	0.02	<.05	0.00	<.05	0.02	25	72.5
08-31	186636	32	63	244	304	406	0.00	0.00	0.00	<.05	0.00	<.05	0.02	17	75.2

LITTLE WABASH RIVER NEAR EFFINGHAM

The Little Wabash River rises in the Springfield Plain Region southwest of Mattoon and flows in a generally southerly direction through the Springfield Plain and into the Mt. Vernon Hills Region. The gaging station is located 2.2 miles southwest of Effingham. Elevation of gage datum is 501.10 feet above mean sea level. The drainage basin above the gage has an area of approximately 240 square miles.

The tabulation of water quality data is for the period from September 21, 1966, to August 12, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

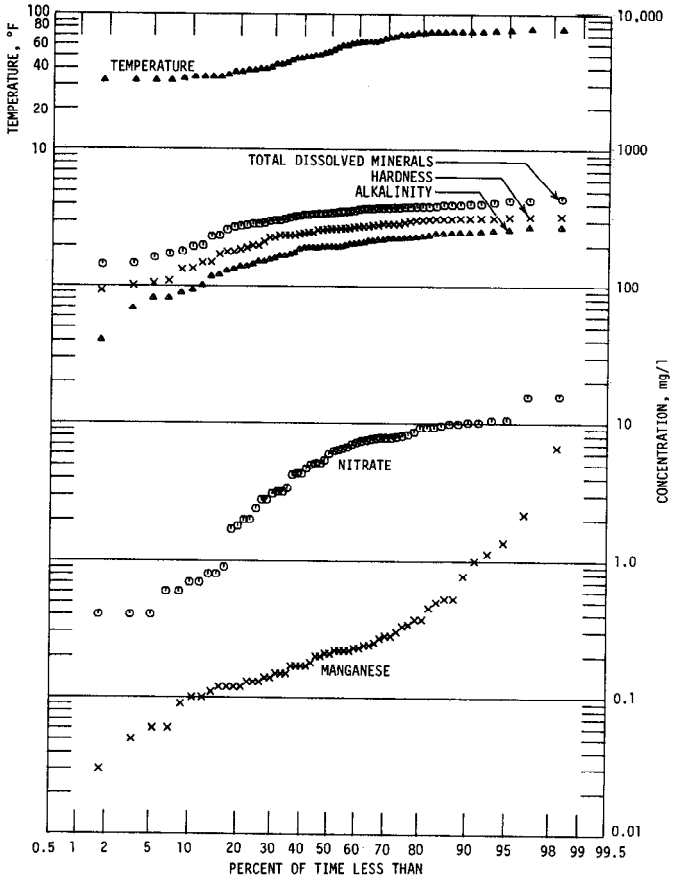
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 0.94 cfs,/sq mi, nor fall below 0.025 cfs/sq mi. The median flow was 0.15 cfs/sq mi and the mean was 0.69 cfs/sq mi.

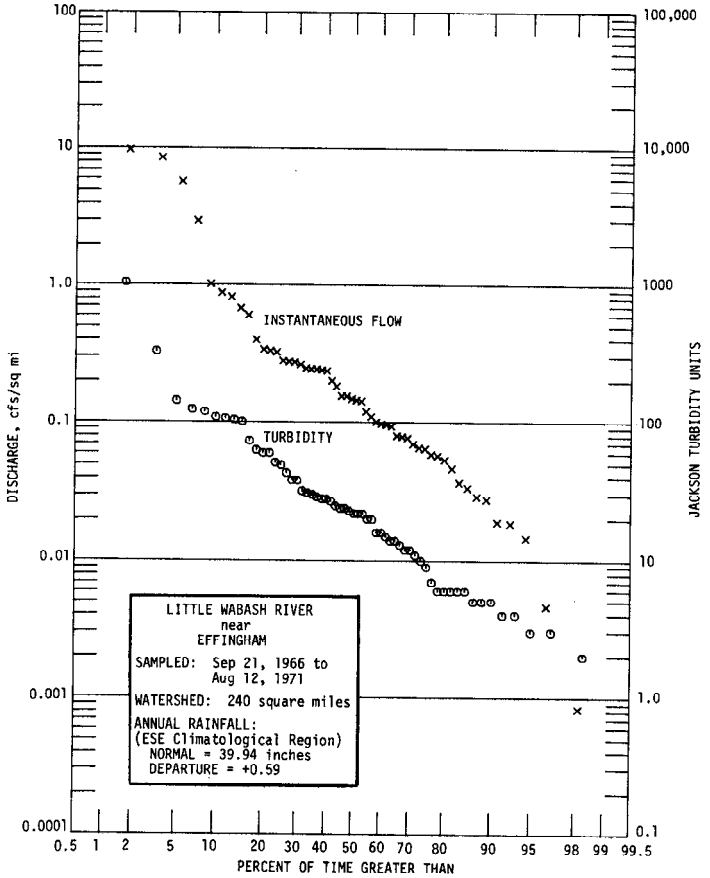
The turbidity was not less than 5 Jtu nor more than 109 Jtu for the central 80 percent of the time. The median value was 22 Jtu and the mean 54 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 27 percent of the time. They were below 50 F for 45 percent and below 40 F for 27 percent of the time.

The analyses indicated the following :

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	92	196	248
Hardness (as $CaCO_3$)	134	264	314
Total dissolved minerals	196	344	402
Nitrate (NO_3)	0.7	6.0(5.7)	10.1
Total inorganic phosphate (PO_4)	0.1	0.4(0.48)	1.0
Soluble inorganic phosphate (PO_4)	0.0	0.2(0.24)	0.5
Manganese (Mn)	0.095	0.21	0.89





LITTLE WABASH RIVER NEAR EFFINGHAM

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	303786															
09-21	169876	37.3	5.7	0.33	28.8	7.8		14		0.1	0.80	0.90	7	0.10	0.10	3.4
10-17	170084	1.1	0.9	1.13	61.2	20.3	0.11	14	4.5	T	0.30	0.30	9	0.20	0.10	1.8
11-15	170291	13.7	0.9	0.15	46.0	17.3	0.17	14	6.0	0.1	0.50	0.50	8	0.00	0.10	2.4
12-19	170462		1.0	0.17	69.0	25.5	0.23	24	3.2	T	0.50	0.50	9	0.20	0.10	9.6
1967	303786															
01-17	170649	18.8	0.4	0.37	78.6	30.4	0.18	21	3.0	T	0.00	0.20	9	0.10	0.10	7.8
02-15	170849	59.1	0.6	0.17	74.4	29.8	0.20	19	3.3	0.1	0.70	1.10	10	0.10	0.10	10.6
03-17	171067	79.4	0.7	0.12	63.2	25.4	0.20	19	2.5	0.2	0.30	0.40	13	0.30	0.00	10.1
04-05	171225	66.9	0.5	0.03	62.8	26.4	0.18	20	2.9	0.0	0.30	0.40	6	0.10	0.10	7.9
05-29	171612	161.0	1.6	0.00	57.6	23.9	0.13	17	3.6	0.2	0.20	0.50	1	0.10	0.10	3.2
06-21	171884		2.2	0.13	70.2	25.7	0.12	12	1.7	T	0.20	0.40	6	0.10	0.10	8.2
07-20	172305	15.7	0.7	0.34	78.4	28.3	0.16	14	2.9	0.2	0.10	0.20	8	0.10	0.10	0.8
08-10	172658	56.3	5.7	0.24	26.0	8.5	0.07	10	5.0	T	0.40	0.90	6	0.10	0.00	5.1
09-20	173085	0.0	0.9	1.00	80.8	29.8	0.17	15	2.6	T	0.10	0.40	7	0.10	0.00	0.6
10-13	173282	22.9	1.7	6.64	32.8	12.2	0.10	9	4.3	0.1	0.20	0.50	7	0.10	0.00	6.0
11-01	173533	3.5	1.2	0.00	70.4	27.4	0.15	18	5.6	T	0.30	0.40	9	0.10	0.10	5.1
12-04	173671	2030.0	7.1	0.27	36.0	14.9	0.12	14	4.4	0.1	0.40	1.80	5	0.10	0.00	8.0
1968	303786															
01-03	173794		0.4	0.20	68.0	25.9	0.17	18	2.8	T	0.00	0.10	3	0.20	0.10	10.5
01-31	174157	2310.0	4.3	0.14	34.4	11.7	0.11	12	3.8	0.2	0.50	0.60	5	0.10	0.00	9.9
03-06	174327	28.8	0.4	0.17	73.6	28.6	0.17	18	2.4	0.1	0.20	0.50	8	0.10	0.00	7.7
04-12	174586	57.5	1.0	0.15	64.4	24.2	0.16	17	2.5	0.1	0.30	0.50	5	0.20	0.00	5.0
05-03	174913	23.1	0.6	0.22	75.2	31.3	0.17	20	2.5	T	0.30	0.50	2	0.20	0.00	0.4
06-05	175792	80.9	1.5	0.10	63.2	24.8	0.20	17	2.1	0.1	0.00	0.40	7	0.20	0.10	10.1
07-08	175563	8.1	1.2	0.23	75.2	31.1	0.21	15	3.0	0.1	0.10	0.40	7	0.20	0.10	0.4
08-13	176019	43.8	2.4	0.22	45.6	20.2	0.21	20	3.1	0.1	0.00	1.60	4	0.20	0.00	4.3
09-10	176263	26.4	1.4	2.20	26.4	10.2	0.07	8	4.2	0.8	0.20	0.70	3	0.10	0.10	0.7
11-08	176750	0.0	0.5	0.28	37.6	13.6	0.08	9	4.0	0.1	0.30	1.20	2	0.20	0.10	0.9
12-10	177093	4.6	0.6	0.28	76.4	29.9	0.14	19	4.2	0.2	0.90	1.00	11	0.20	0.10	6.7
1969	303786															
01-13	177373	18.4	0.2	0.25	74.0	31.4	0.21	26	2.7	0.6	0.20	0.30	7	0.20	0.00	3.1
02-05	177370	196.0	1.7	0.14	54.4	22.4	0.18	20	2.5	0.2	0.40	0.40	7	0.20	0.00	9.2
03-12	177668	37.2	0.3	0.23	66.4	25.8	0.17	22	2.4	0.1	0.20	0.60	6	0.20	0.10	8.6
04-08	178013	19.2	1.7	0.15	51.2	20.4	0.14	18	2.9	0.2	0.20	0.30	7	0.20	0.10	6.5
05-20	178252	34.4	1.1	0.17	67.2	29.2	0.19	20	2.5	0.1	0.30	0.30	3	0.20	0.10	4.7
06-11	178612	15.4	1.4	0.13	60.8	23.3	0.15	20	2.8	0.2	0.20	0.40	5	0.20	0.00	4.3
07-09	179109	1360.0	26.0	1.36	24.0	7.8	0.05	10	3.3	0.3	0.40	2.00	6	0.20	0.00	7.6
08-04	179338	6.7	0.7	0.30	64.8	25.4	0.17	17	3.5	0.2	0.00	0.10	8	0.20	0.10	0.4
09-15	179644	4.5	0.8	0.45	61.6	20.1	0.12	13	5.8	0.2	0.30	0.30	8	0.20	0.10	0.8
10-27	179917	66.0	0.6	0.12	68.0	28.3	0.17	19	3.9	0.1	0.10	0.20	3	0.20	0.10	7.5
11-07	180021	48.0	0.4	0.12	64.8	24.9	0.16	21	4.0	0.1	0.20	0.30	2	0.20	0.10	5.4
12-10	180349	77.5	0.7	0.00	55.6	21.8	0.15	20	4.3	0.1	0.60	0.70	4	0.20	0.10	7.0
1970	303786															
01-16	180735	34.9	0.3	0.18	73.6	30.8	0.20	28	3.0	0.1	0.00	0.00	4	0.20	0.10	6.3
02-10	180736	14.1	0.6	0.06	58.4	24.0	0.19	22	3.4	0.2	0.20	0.20	5	0.20	0.10	9.2
03-16	181112	58.0	0.4	0.06	68.0	30.0	0.17	23	2.2	0.1	0.00	0.00	5	0.20	0.10	7.8
04-07	181287	95.0	0.6	0.10	64.4	27.6	0.21	24	2.8	0.1	0.60	0.80	1	0.20	0.10	7.8
05-01	181528	709.0	10.0	0.53	44.0	17.0	0.12	14	4.1	0.1	0.50	1.00	4	0.20	0.20	7.4
06-05	182105	210.0	4.1	0.22	42.0	16.3	0.09	15	5.2	0.3	0.20	0.60	5	0.20	0.10	15.7
07-08	183428	16.6	1.0	0.37	76.0	27.9	0.20	16	2.0	T	0.10	0.20	7	0.30	0.10	2.8
08-11	183422	7.0	0.8	0.50	60.0	24.0	0.17	18	2.3	0.1	0.10	0.20	6	0.30	0.10	2.0
09-09	183641	24.0	1.6	0.09	41.6	18.5	0.23	22	2.4	0.1	0.20	0.20	5	0.20	0.00	1.7
10-07	183892	0.2	0.8	0.53	57.6	22.5	0.16	14	5.4	0.1	0.10	0.20	10	0.30	0.10	2.8
11-12	184275	11.2	0.4	0.12	74.4	30.8	0.16	23	4.2	0.1	0.10	0.10	4	0.20	0.10	0.7
12-03	184492	12.8	0.7	0.22	78.4	32.2	0.15	20	2.9	0.2	0.10	0.10	5	0.30	0.10	2.0
1971	303786															
01-06	184808	35.6	1.8	0.11	48.0	19.5	0.14	17	5.0	0.6	0.30	0.50	6	0.30	0.10	9.3
02-12	184966	62.8	0.3	0.05	63.2	25.9	0.15	19	3.3	0.4	0.10	0.10	6	0.30	0.10	4.2
03-17	185258	144.0	2.5	0.13	56.8	23.0	0.16	19	2.9	0.5	0.20	0.30	6	0.30	0.00	9.9
04-06	185532	65.2	0.3	0.21	65.6	30.3	0.16	19	2.1	0.2	0.10	0.40	2	0.20	0.00	3.2
05-10	185782	58.1	1.3	0.21	64.8	25.9	0.15	17	3.2	0.3	0.30	0.50	8	0.20	0.10	15.8
06-03	186004	22.3	0.8	0.20	68.0	26.9	0.17	21	2.5	0.1	0.10	0.10	6	0.20	0.10	7.2
07-15	186334	242.0	4.2	0.24	49.6	18.5	0.20	19	2.9	T	0.10	0.50	5	0.20	0.10	6.4
08-12	186503	8.8	1.0	0.78	76.8	29.3	0.14	16	2.7	0.2	0.20	0.20	5	0.20	0.10	0.6

LITTLE WABASH RIVER NEAR EFFINGHAM

DATE	LAB.NO.	CL	SO4	ALK.	TH.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	303786														
09-21	169876	9	38	80	104	162								120	62.0
10-17	170084	13	43	208	236	311			0.00					24	56.0
11-15	170291	10	50	152	186	235			0.01					32	45.0
12-19	170462	31	105	200	277	402			0.01					14	38.0
1967	303786														
01-17	170649	26	84	236	321	427			0.01					3	33.0
02-15	170849	24	81	220	308	396		0.00	0.00				0.01	5	42.0
03-17	171067	29	70	176	262	340		0.00	0.01				0.03	6	39.0
04-05	171225	27	71	192	266	353		0.00	0.01				0.02	13	58.0
05-29	171612	17	59	192	242	319		0.00	0.03				0.01	60	58.0
06-21	171884	29	55	224	281	378		0.00	0.01				0.01	49	74.0
07-20	172305	14	57	244	312	376		0.00	0.01				0.00	22	74.0
08-10	172658	11	37	80	100	173		0.00	0.02				0.02	144	72.0
09-20	173085	17	55	272	324	397		0.00	0.01				0.01	28	70.0
10-13	173282	6	17	120	132	179		0.00	0.01				0.01	109	52.0
11-01	173533	18	65	234	288	385		0.00	0.01				0.04	20	51.0
12-04	173671	28	38	100	148	231		0.00	0.02				0.04	124	38.0
1968	303786														
01-03	173794	23	66	216	276	359		0.00	0.01				0.02	12	32.0
01-31	174157	23	33	88	134	200		0.00	0.01				0.02	104	40.0
03-06	174327	19	75	226	301	383		0.00	0.01				0.00	6	42.0
04-12	174586	20	68	196	260	340		0.00	0.01				0.01	22	62.0
05-03	174913	17	130	244	316	442		0.00	0.01				0.03	16	66.0
06-05	175792	27	49	196	260	325		0.00	0.01				0.01	30	70.0
07-08	175563	22	54	260	316	371		0.00	0.01				0.01	28	77.0
08-13	176019	42	45	138	192	281		0.00	0.00				0.02	73	72.0
09-10	176263	5	17	92	108	146		0.00	0.02				0.00	43	60.0
11-08	176750	6	30	140	150	196		0.00	0.00				0.00	9	47.0
12-10	177093	21	82	246	314	414		0.00	0.01				0.00	11	34.0
1969	303786														
01-13	177373	37	71	248	314	403		0.00	0.01				0.01	4	32.0
02-05	177370	29	56	168	228	305		0.00	0.01				0.00	31	37.0
03-12	177668	27	78	206	272	380		0.00	0.01				0.02	2	34.0
04-08	178013	25	59	156	212	286	0.00	0.00	0.02	<.05	0.00	<.05	0.01	25	54.0
05-20	178252	21	66	228	288	366	0.00	0.00	0.02	<.05	0.00	<.05	0.02	14	62.0
06-11	178612	32	49	192	248	337	0.00	0.00	0.01	<.05	0.00	<.05	0.01	63	73.0
07-09	179109	10	27	68	92	144	0.00	0.00	0.03	<.05	0.00	<.05	0.06	1040	75.0
08-04	179338	21	49	219	266	341	0.00	0.00	0.01	<.05	0.00	<.05	0.06	15	74.0
09-15	179644	16	44	40	236	305	0.00	0.00	0.01	<.05	0.00	<.05	0.02	16	67.0
10-27	179917	28	55	224	286	371	0.00	0.00	0.01	<.05	0.00	<.05	0.02	6	49.0
11-07	180021	36	52	196	264	357	0.00	0.00	0.02	<.05	0.00	<.05	0.02	3	48.0
12-10	180349	34	59	160	228	334	0.00	0.00	0.01	<.05	0.00	<.05	0.02	12	37.0
1970	303786														
01-16	180735	41	78	230	310	429	0.00	0.00	0.02	<.05	0.00	<.05	0.03	4	32.0
02-10	180736	38	63	172	244	334	0.00	0.00	0.02	<.05	0.00	<.05	0.03	10	34.0
03-16	181112	36	72	210	293	385	0.00	0.00	0.02	<.05	0.00	<.05	0.02	5	35.0
04-07	181287	34	73	196	274	377	0.00	0.00	0.02	<.05	0.00	<.05	0.01	23	47.0
05-01	181528	17	45	132	180	259	0.00	0.00	0.04	<.05	0.00	<.05	0.03	328	65.0
06-05	182105	20	54	116	172	276	0.00	0.00	0.03	<.05	0.00	<.05	0.02	101	61.0
07-08	183428	22	54	252	304	352	0.00	0.00	0.01	<.05	0.00	<.05	0.00	24	73.0
08-11	183422	25	45	204	248	328	0.00	0.00	0.01	<.05	0.00	<.05	0.00	20	73.0
09-09	183641	44	41	128	180	272	0.00	0.00	0.00	<.05	0.00	<.05	0.01	29	74.0
10-07	183892	19	44	188	236	301	0.00	0.00	0.00	<.05	0.00	<.05	0.01	22	62.0
11-12	184275	22	78	248	312	382	0.00	0.00	0.01	<.05	0.00	<.05	0.03	6	48.0
12-03	184492	19	83	256	328	397	0.00	0.00	0.01	<.05	0.00	<.05	0.02	7	49.0
1971	303786														
01-06	184808	18	68	144	200	288	0.00	0.00	0.04	<.05	0.00	<.05	0.04	51	32.0
02-12	184966	26	55	196	264	348	0.00	0.00	0.02	<.05	0.00	<.05	0.07	5	34.0
03-17	185258	32	57	168	236	344	0.00	0.00	0.02	<.05	0.00	<.05	0.03	60	43.0
04-06	185532	25	75	224	288	376	0.00	0.00	0.02	<.05	0.00	<.05	0.02	6	39.0
05-10	185782	21	69	192	268	376	0.00	0.00	0.02	<.05	0.00	<.05	0.02	38	63.0
06-03	186004	33	58	216	280	370	0.00	0.00	0.01	<.05	0.00	<.05	0.02	27	70.7
07-15	186334	36	38	152	200	292	0.00	0.00	0.01	<.05	0.00	<.05	0.02	107	75.2
08-12	186503	21	51	272	312	386	0.00	0.00	0.00	<.05	0.00	<.05	0.00	38	77.0

MACKINAW RIIVER NEAR CONGERVILLE

The Mackinaw River rises in the Bloomington Ridged Plain — North Region, west of Sibley in Ford County, and flows generally westward into the Illinois River, below Pekin. The gaging station is located 2 miles northwest of Congerville, on the downstream side.of the bridge on U.S. Route 150. Elevation of gage datum is 607.01 feet above mean sea level. The drainage basin above the gage has an area of approximately 764 square miles.

The tabulation of water quality data is for the period from October 4, 1966, to September 3, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

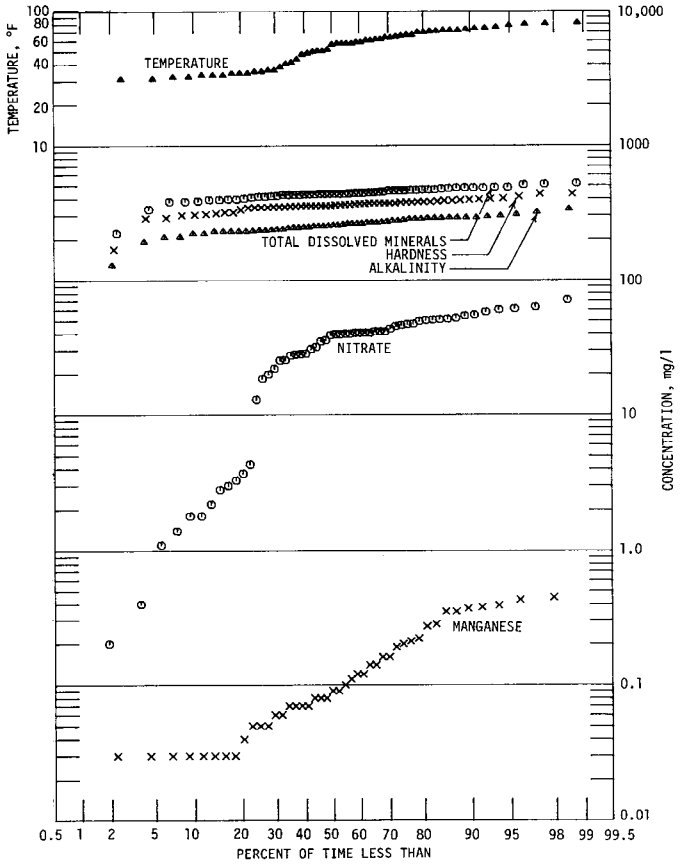
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.39 cfs/sq mi, nor fall below 0.02 cfs/sq mi. The median flow was 0.33 cfs/sq mi and the mean was 0.86 cfs/sq mi.

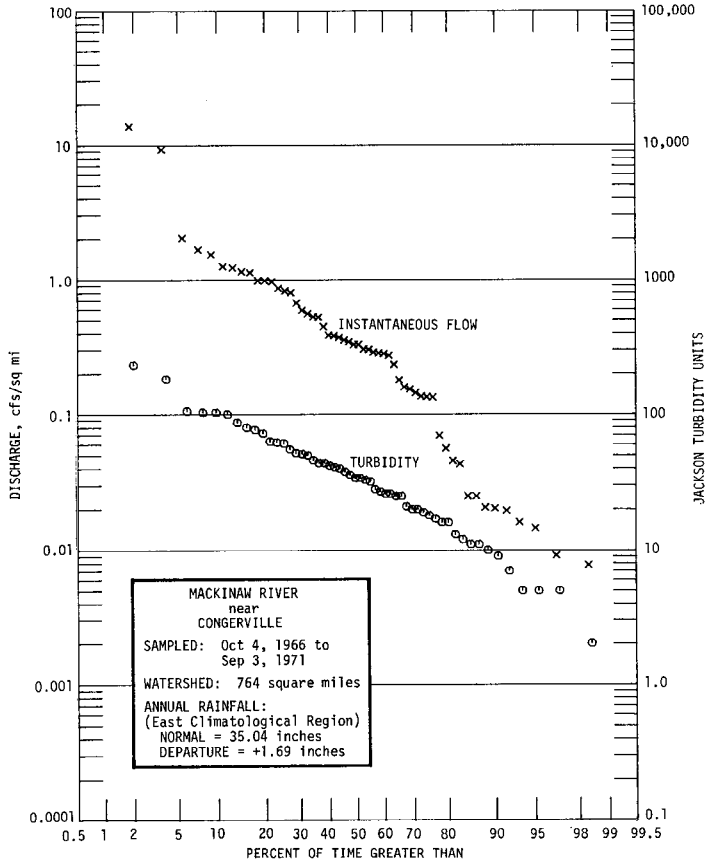
The turbidity was not less than 8 Jtu nor more than 101.5 Jtu for the central 80 percent of the time. The median value was 33.5 Jtu and the mean 44 Jtu.

Reported temperatures were over 80 F for 4 percent and over 70 F for 25 percent of the time. They were below 50 F for 37 percent and below 40 F for 26 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	220	254	290
Hardness (as $CaCO_3$)	305	357	394
Total dissolved minerals	385	434	478
Nitrate (NO_3)	1.8	39.45(32.7)	59.15
Total inorganic phosphate (PO_4)	0.2	0.4(0.51)	0.9
Soluble inorganic phosphate (PO_4)	0.1	0.2(0.27)	0.6
Manganese (Mn)	0.03	0.09	0.375





MACKINAW RIVER NEAR CONGERVILLE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505675															
10-04	170046	5.9	2.1	0.43	74.0	35.4		24		0.3	0.00	0.30	3	0.20	0.10	0.2
11-11	170204	34.7	1.5	0.27	70.4	32.7	0.16	32	6.6	T	0.90	1.30	8	0.20	0.10	2.8
12-13	170440	425.0	1.3	0.03	89.7	35.1	0.19	10	3.8	T	0.30	0.40	10	0.30	0.10	45.2
1967	505675															
01-10	170562	100.0	0.4	0.07	94.2	37.9	0.11	16	3.1	0.7	0.00	0.30	9	0.10	0.10	28.0
02.09	170795	136.0	0.4	0.03	94.4	40.0	0.14	15	2.8	0.1	1.20	1.40	13	0.20	0.20	12.8
03-07	171031	403.0	1.1	0.03	84.5	35.3	0.14	9	1.7	T	0.30	0.50	8	0.30	0.10	39.4
04-14	171222	877.0	3.4	0.10	82.0	34.4	0.13	9	1.6	0.1	0.70	0.80	8	0.20	0.10	39.7
05-16	171812	940.0	1.8	0.03	84.8	36.1	0.12	8	1.3	T	0.20	0.70	7	0.10	0.10	54.8
06-15	171932	208.0	1.3	0.00	85.6	39.4	0.12	12	1.7	T	0.60	0.90	9	0.20	0.20	40.3
07-06	172042	121.0	0.6	0.03	86.0	39.3	0.16	12	1.5	0.1	0.30	0.40	6	0.30	0.20	40.3
08-03	172481	101.0	1.1	0.07	82.4	35.1	0.12	10	2.4	T	0.30	0.50	9	0.10	0.10	18.4
09-01	172918	15.8	1.5	0.22	72.8	39.5	0.18	17	2.4	0.1	0.10	0.40	4	0.10	0.20	1.8
10-02	173357	12.3	2.1	0.20	72.8	39.5	0.17	38	3.3	0.2	0.40	0.60	1	0.10	0.10	3.3
11-01	173561	1170.0	5.1	0.19	83.2	33.6	0.14	9	2.4	T	0.40	0.70	14	0.10	0.10	40.4
12-04	173705	453.0	0.5	0.04	85.6	39.0	0.14	10	1.5	T	0.20	0.50	5	0.10	0.10	22.0
1968	505675															
01-08	173917	250.0	0.4	0.00	82.4	36.6	0.14	9	1.1	T	0.10	0.20	5	0.10	0.10	46.0
03-07	174346	216.0	2.4	0.07	76.8	30.3	0.11	10	1.4	0.3	0.30	0.40	9	0.10	0.00	43.3
04-02	174497	294.0	0.4	0.05	77.6	38.5	0.18	9	1.0	0.1	0.10	0.30	1	0.20	0.10	50.8
05-01	174627	262.0	0.4	T	84.0	38.1	0.13	10	1.0	0.1	0.20	0.30	1	0.20	0.00	35.5
06-03	175141	749.0	2.9	0.05	84.8	37.9	0.15	9	1.0	0.2	0.20	0.20	7	0.20	0.20	50.0
07-02	175428	1270.0	4.7	0.16	84.0	34.5	0.14	8	1.5	0.2	0.40	0.40	10	0.20	0.20	60.0
08-01	175775	116.0	1.9	T	82.4	38.4	0.17	11	1.7	0.1	0.20	0.70	7	0.20	0.00	27.5
09-05	176239	33.0	1.6	0.35	59.2	38.4	0.13	18	2.5	0.1	0.30	0.50	4	0.20	0.10	1.4
10-01	176596	19.1	2.4	0.28	75.2	39.9	0.24	19	6.1	0.1	0.40	0.50	9	0.20	0.10	3.7
11-01	176809	11.1	0.4	0.07	89.6	41.8	0.16	21	3.3	0.1	0.30	0.40	6	0.20	0.10	2.2
12-04	177096	103.0	0.8	0.09	84.8	37.5	0.12	15	3.0	0.5	0.70	0.70	8	0.20	0.10	25.3
1969	505675															
01-08	177310	250.0	0.5	0.00	78.4	41.8	0.16	13	1.7	2.5	0.50	0.60	9	0.20	0.10	40.2
02-03	177648	627.0	2.1	0.11	76.8	30.2	0.12	11	1.7	0.2	0.00	0.20	8	0.20	0.10	34.8
04-09	178033	859.0	2.9	0.14	79.2	36.6	0.16	8	1.0	T	0.30	0.80	6	0.20	0.10	28.2
05-06	178342	340.0	1.5	0.05	84.0	37.1	0.16	11	1.1	0.1	0.10	0.30	4	0.20	0.10	52.0
06-03	178809	201.0	0.7	T	89.6	37.1	0.13	10	1.5	0.2	0.30	0.80	9	0.20	0.10	53.8
07-16	179047	283.0	3.9	0.12	90.8	38.5	0.14	10	2.0	1.1	0.20	0.60	9	0.20	0.10	51.0
09-03	179503	15.0	7.0	0.45	71.2	40.5	0.16	20	3.1	0.1	0.10	0.40	2	0.30	0.20	1.1
09-09	179549	19.2	4.8	0.38	63.2	30.1	0.12	25	4.2	0.1	0.70	1.00	5	0.20	0.10	3.0
10-08	179824	7.0	2.2	0.37	75.2	39.0	0.14	21	3.6	0.1	0.10	0.50	3	0.20	0.10	1.8
11-26	180191	510.0	1.2	0.09	80.4	36.8	0.11	9	2.0	0.1	0.20	0.20	3	0.20	0.10	46.5
12-12	180416	219.0	0.2	0.00	86.4	39.9	0.09	11	1.3	0.1	0.10	0.10	4	0.20	0.10	30.5
1970	505675															
02-18	180908		0.9	0.06	80.0	35.4	0.10	12	2.6	0.6	0.30	0.40	4	0.20	0.10	27.8
03-13	181075	215.0	0.3	T	84.0	39.5	0.10	11	1.2	0.2	0.10	0.20	7	0.20	0.10	39.5
04-29	181532	956.0	2.3	0.06	85.6	37.1	0.15	8	1.2	0.1	0.30	0.50	4	0.20	0.00	61.0
05-28	181892	656.0	2.0	0.08	87.2	37.8	0.13	9	0.8	0.8	0.10	0.20	4	0.20	0.00	63.0
06-04	182466	1560.0	4.0	0.12	86.4	34.7	0.10	7	1.4	0.3	0.00	0.10	6	0.20	0.10	71.3
07-09	183247	230.0	1.8	0.00	90.4	40.4	0.12	9	1.3	0.2	0.10	0.40	7	0.20	0.10	49.1
08-10	183615	399.0	4.0	0.14	68.0	28.8	0.11	8	2.2	0.2	0.30	0.60	9	0.30	0.10	38.9
09-23	183897	7100.0	9.3	0.16	41.6	15.6	0.09	4	3.8	0.1	0.50	0.90	9	0.20	0.10	25.5
10-26	184125	61.0.0	0.8	0.03	99.2	40.0	0.16	8	1.1	0.3	0.10	0.30	9	0.30	0.10	50.4
12-31	184577	270.0	0.1	0.00	100.8	43.9	0.18	10	1.0	0.1	0.00	0.40	6	0.30	0.10	46.8
1971	505675															
01-19	184786	10400.0	0.2	0.08	100.0	44.4	0.16	11	1.4	0.3	0.20	0.70	6	0.30	0.10	41.1
02-25	185084	750.0	12.0	0.39	72.8	28.8	0.10	8	3.2	0.3	0.50	2.00	7	0.20	0.10	39.7
03-25	185310	736.0	2.2	0.03	92.0	37.6	0.13	7	1.0	0.2	0.10	0.20	6	0.30	0.10	57.7
04-13	185538	231.0	T	0.00	81.6	39.0	0.15	9	1.4	0.2	0.10	0.20	3	0.20	0.10	41.3
05-21	185859	179.0	2.4	0.08	90.4	39.5	0.16	11	1.8	0.1	0.20	0.30	7	0.30	0.10	31.8
06-07	185998	102.0	2.8	0.21	76.8	36.1	0.09	11	1.9	0.2	0.50	0.60	8	0.30	0.10	19.9
07-01	186276	53.2	5.0	0.35	82.4	35.6	0.11	9	1.5	0.1	0.20	0.30	9	0.30	0.10	41.1
08-11	186505	42.8	0.7	0.00	62.4	36.1	0.12	16	1.6	0.2	0.10	0.20	3	0.20	0.10	4.3
09-03	186689	15.6	3.0	0.03	72.4	41.7	0.17	17	2.6	0.7	0.00	0.30	2	0.30	0.10	0.4

MACKINAW RIVER NEAR CONGERVILLE

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505675														
10-04	170046	37	56	272	330	417								42	51.0
11-11	170204	40	52	272	310	401			0.01					34	31.0
12-13	170440	19	84	242	368	463			0.01					26	34.0
1967	505675														
01-10	170562	27	83	280	391	479			0.01					10	31.0
02-09	170795	25	106	280	400	507		0.00	0.01				0.02	5	32.0
03-07	171031	17	85	244	356	447		0.00	0.01				0.01	25	32.0
04-14	171222	17	76	228	346	433		0.00	0.01				0.02	62	58.0
05-16	171812	16	75	228	360	445		0.00	0.02				0.10	36	58.0
06-15	171932	23	78	260	376	463		0.00	0.01				0.02	26	60.0
07-06	172042	20	82	264	376	459		0.00	0.01				0.02	9	71.0
08-03	172481	18	65	264	350	426		0.00	0.01				0.01	20	75.0
09-01	172918	23	60	280	344	426		0.00	0.01				0.01	32	57.0
10-02	173357	59	74	288	344	476		0.00	0.01				0.00	50	66.0
11-01	173561	17	73	232	346	429		0.00	0.02				0.01	100	49.0
12-04	173705	18	79	256	374	424		0.00	0.01				0.02	11	36.0
1968	505675														
01-08	173917	15	77	240	356	436		0.00	0.01				0.01	13	33.0
03-07	174346	17	69	206	316	379		0.00	0.02				0.04	51	43.0
04-02	174497	17	76	230	352	430		0.00	0.01				0.03	7	50.0
05-01	174627	18	80	252	366	432		0.00	0.01				0.02	12	66.0
06-03	175141	17	70	245	368	439		0.00	0.01				0.02	44	70.0
07-02	175428	15	66	236	352	426		0.00	0.01				0.02	103	69.0
08-01	175775	19	71	268	364	430		0.00	0.01				0.04	33	71.0
09-05	176239	25	65	284	306	389		0.00	0.01				0.00	34	73.0
10-01	176596	23	73	288	352	427		0.00	0.01				0.00	28	65.0
11-01	176809	28	71	332	396	454		0.00	0.00				0.00	11	57.0
12-04	177096	25	80	266	366	441		0.00	0.02				0.03	17	38.0
1969	505675														
01-08	177310	23	80	248	368	454		0.00	0.01				0.01	19	33.0
02-03	177648	17	69	220	316	411		0.00	0.01				0.38	38	34.0
04-09	178033	16	76	228	348	381	0.00	0.00	0.01	<.05	0.00	<.05	0.05	55	57.0
05-06	178342	19	78	248	362	439	0.01	0.00	0.01	<.05	0.00	<.05	0.04	16	61.0
06-03	178809	17	79	264	376	480	0.00	0.00	0.00	<.05	0.00	<.05	0.03	21	57.0
07-16	179047	19	74	260	385	478	0.00	0.00	0.02	<.05	0.00	<.05	0.04	87	80.0
09-03	179503	23	59	286	344	427	0.00	0.00	0.02	<.05	0.00	<.05	0.04	52	72.0
09-09	179549	41	47	236	284	378	0.00	0.00	0.03	<.05	0.00	<.05	0.02	103	64.0
10-08	179824	26	56	296	348	390	0.00	0.00	0.02	<.05	0.00	<.05	0.05	41	48.0
11-26	180191	19	72	228	352	416	0.00	0.00	0.01	<.05	0.00	<.05	0.03	18	47.0
12-12	180416	23	81	260	380	469	0.00	0.00	0.00	<.05	0.00	<.05	0.04		35.0
1970	505675														
02-18	180908	22	73	242	345	437	0.00	0.00	0.01	<.05	0.00	<.05	0.01	16	35.0
03-13	181075	20	79	250	372	455	0.00	0.00	0.02	<.05	0.00	<.05	0.02	5	36.0
04-29	181532	19	76	228	366	463	0.00	0.00	0.02	<.05	0.00	<.05	0.01	46	50.0
05-28	181892	20	75	234	372	457	0.00	0.00	0.01	<.05	0.00	<.05	0.01	77	60.0
06-04	182466	18	67	220	358	455	0.00	0.00	0.01	<.05	0.00	<.05	0.01	72	61.0
07-09	183247	19	74	276	392	476	0.00	0.00	0.00	<.05	0.00	<.05	0.01	27	70.0
08-10	183615	15	51	192	288	333	0.00	0.00	0.01	<.05	0.00	<.05	0.00	80	69.0
09-23	183897	9	29	128	168	222	0.00	0.00	0.01	<.05	0.00	<.05	0.00	183	63.0
10-26	184125	17	64	292	412	478	0.00	0.00	0.00	<.05	0.00	<.05	0.01	20	56.0
12-31	184577	21	78	304	432	516	0.00	0.00	0.01	<.05	0.00	<.05	0.01	0	34.0
1971	505675														
01-19	184786	20	77	316	432	504	0.00	0.00	0.01	<.05	0.00	<.05	0.04	2	33.0
0225	185084	20	63	208	300	406	0.00	0.00	0.02	<.05	0.00	<.05	0.01	234	41.0
03-25	185310	18	70	260	384	474	0.00	0.00	0.02	<.05	0.00	<.05	0.01	40	40.0
04-13	185538	19	77	252	364	432	0.00	0.00	0.02	<.05	0.00	<.05	0.03	5	63.0
05-21	185859	22	75	286	388	441	0.00	0.00	0.01	<.05	0.00	<.05	0.02	44	71.0
06-07	185998	13	39	288	340	392	0.00	0.00	0.01	<.05	0.00	<.05	0.03	61	79.0
07-01	186276	15	60	248	352	431	0.00	0.00	0.00	<.05	0.00	<.05	0.02	105	77.0
08-11	186505	24	71	232	304	394	0.00	0.00	0.00	<.05	0.00	<.05	0.00	25	74.0
09-03	186689	21	68	288	352	413	0.00	0.00	0.01	<.05	0.00	<.05	0.01	63	81.0

MARYS RIVER NEAR SPARTA

The Marys River rises in the Mt. Vernon Hills Region near Sparta and flows southerly into the Mississippi River below Chester. The gaging station is 3.2 miles southeast of Sparta, on the downstream side of the bridge on Illinois Route 154. Elevation of gage datum is 431.60 feet above mean sea level. The drainage basin above the gage has an area of approximately 17.8 square miles.

The tabulation of water quality data is for the period from December 16, 1966, to June 2, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

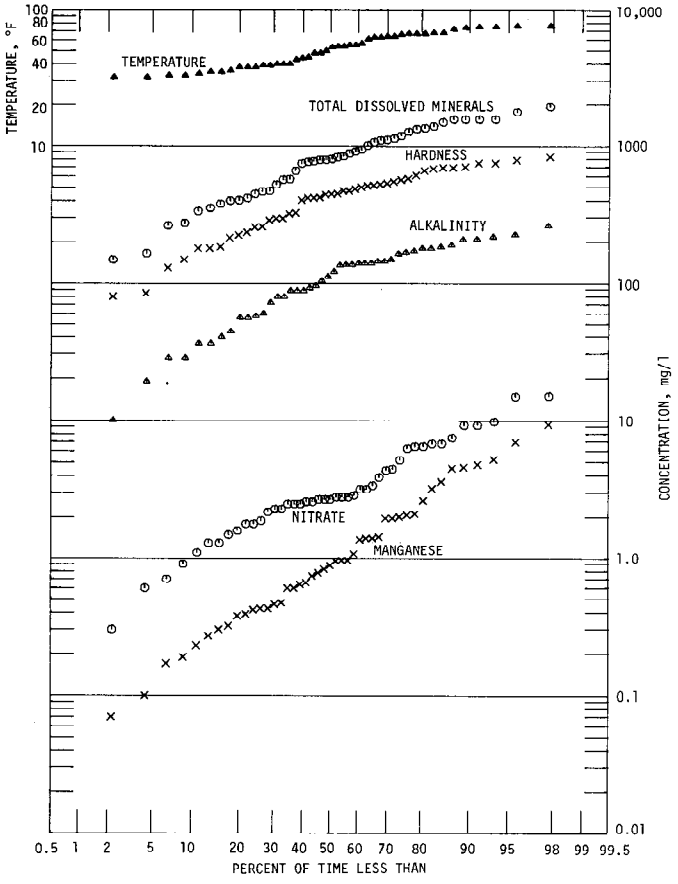
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 2.77 cfs./sq mi, nor fall below 0.01 cfs/sq mi. The median flow was 0.07 cfs/sq mi and the mean was 0.97 cfs/sq mi.

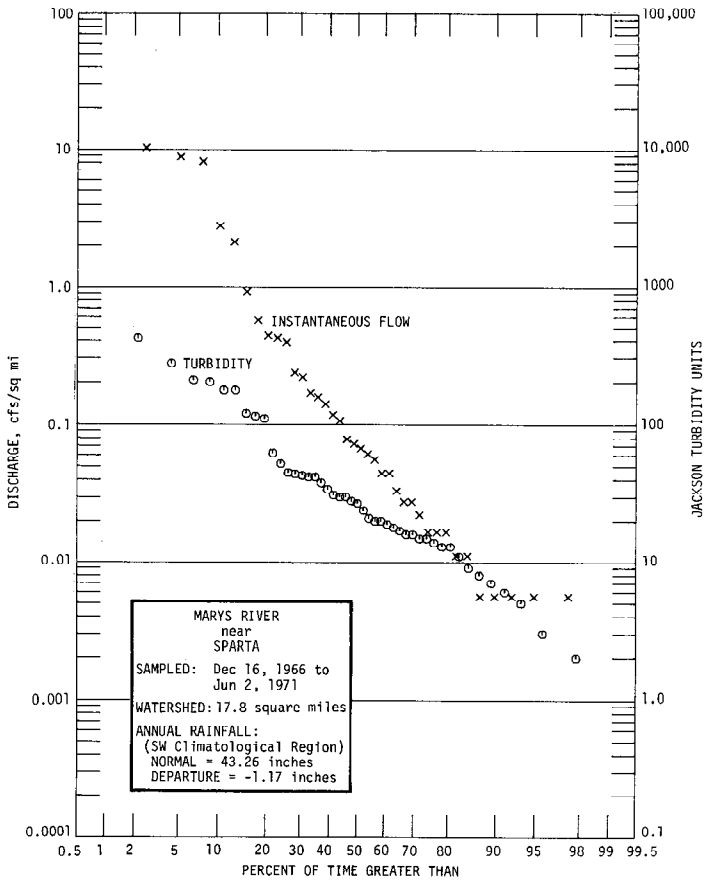
The turbidity was not less than 6 Jtu nor more than 187 Jtu for the central 80 percent of the time. The median value was 27 Jtu and the mean 58 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 13 percent of the time. They were below 50 F for 46 percent and below 40 F for 28 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	32	117	209
Hardness (as $CaCO_3$)	164	444	722
Total dissolved minerals	305	801	1554
Nitrate (NO_3)	1.0	2.7(4.0)	9.2
Total inorganic phosphate (PO_4)	0.0	0.2(0.49)	1.24
Soluble inorganic phosphate (PO_4)	0.0	0.1(0.24)	0.6
Manganese (Mn)	0.21	0.88	4.69





MARYS RIVER NEAR SPARTA

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505955															
12-16	170181	0.0	3.9	0.27	39.0	12.4	0.11	21	5.6	0.1	0.30	0.30	11	0.30	0.10	3.2
1967	505955															
02-21	170952	0.0	1.3	0.42	104.0	51.2	0.24	68	5.7	0.1	0.20	0.30	7	0.20	0.10	2.5
03-09	171130	7.0	1.6	0.19	56.0	28.3	0.17	42	3.9	T	2.10	3.50	9	0.10	0.10	6.3
04-06	171342	0.2	0.5	0.23	147.2	78.4	0.34	106	5.8	0.1	0.10	0.10	4	0.30	0.00	1.8
05-16	171510	7.5	3.0	0.64	61.2	25.7	0.17	46	3.6	0.1	0.10	0.80	13	0.30	0.00	3.9
06-05	171887	0.1	0.9	0.47	120.0	56.2	0.29	74	5.4	T	0.10	0.30	5	0.30	0.00	2.7
07-26	172632	0.0	0.8	1.38	72.0	28.3	0.17	35	5.7	T	0.20	0.20	3	0.30	0.10	2.8
08-08	172657	0.3	1.7	0.43	55.8	18.5	0.13	29	3.3	0.1	0.10	0.20	11	0.20	0.10	3.2
09-12	173087	0.0	0.6	0.10	61.2	20.3	0.19	27	6.7	T	0.10	0.20	4	0.20	0.10	1.3
10-12	173283	0.0	0.9	0.60	46.3	15.7	0.18	60	8.9	0.1	0.20	0.20	8	0.30	0.10	1.3
11-08	173537	0.1	0.6	0.17	95.6	44.1	0.24	70	8.9	T	0.00	0.10	10	0.30	0.10	2.3
12-14	173793	158.0	7.1	0.38	21.2	6.6	0.12	15	5.0	0.4	0.00	2.40	4	0.10	0.10	4.4
1968	505955															
01-05	173841	0.8	96.0	6.96	184.0	90.2	0.50	198	4.6	0.2	0.00	0.20	30	0.50	0.20	2.9
02-15	174161	1.4	18.0	4.79	164.8	81.5	0.41	155	4.0	0.5	0.00	0.00	8	0.60	0.10	2.5
03-11	174326	1.2	17.0	4.53	165.6	90.2	0.44	177	3.6	0.5	0.10	0.60	7	0.50	0.10	2.5
04-18	174600	3.9	1.6	1.41	93.6	45.8	0.27	72	3.6	0.2	0.10	0.70	6	0.40	0.10	1.8
05-22	174907	0.5	1.0	2.12	124.0	52.2	0.31	108	3.8	0.6	1.00	1.20	6	0.30	0.10	1.5
06-19	175191	0.0	0.4	1.44	92.8	41.8	0.26	68	4.3	T	0.10	0.10	8	0.40	0.10	0.3
11-07	176747	0.1	2.0	0.60	50.4	23.8	0.11	35	17.1	0.2	0.60	1.10	11	0.20	0.10	3.4
12-18	177092	0.3	1.0	2.64	154.4	71.5	0.43	145	6.0	3.0	0.00	0.20	13	0.30	0.10	1.6
1969	505955															
01-17	177377	49.8	125.0	9.32	105.6	61.3	0.41	183	5.9	0.3	0.20	1.30	14	0.20	0.30	6.8
02-19	177481	4.2	63.0	5.22	137.6	76.9	0.47	190	3.9	0.4	0.10	0.20	13	0.30	0.10	2.7
03-11	177667	3.0	8.0	1.41	93.2	45.5	0.30	92	3.3	0.8	0.10	0.10	8	0.20	0.10	2.8
04-11	178014	10.2	3.0	1.08	68.0	30.6	0.21	61	3.7	0.2	0.20	0.40	11	0.20	0.10	2.3
05-22	178250	2.8	0.9	3.62	112.8	49.1	0.42	16	5.2	6.6	0.20	0.20	13	0.40	0.20	0.6
06-17	178613	0.8	3.1	3.23	81.6	28.3	0.27	112	5.8	1.0	0.10	0.20	9	0.20	0.10	6.8
07-23	179110	38.1	6.8	0.83	47.2	15.1	0.15	35	2.9	7.5	0.00	0.40	11	0.40	0.00	0.9
08-18	179336	0.0	0.2	0.95	124.8	48.3	0.33	102	4.2	3.1	0.00	0.00	9	0.30	0.10	9.2
09-10	179646	2.1	1.1	4.59	124.3	34.0	0.63	24	11.0	24.0	1.90	2.40	10	0.40	0.40	1.9
10-21	179915	0.2	0.8	0.74	104.2	44.0	0.22	80	7.6	0.3	0.10	0.20	7	0.20	0.20	2.6
11-13	180020	0.1	0.4	0.32	148.8	77.5	0.28	99	7.3	0.1	0.00	0.00	13	0.20	0.10	0.7
12-02	180339	0.4	0.4	0.07	153.6	77.1	0.30	123	5.6	0.7	0.10	0.10	7	0.20	0.10	2.8
1970	505955															
01-22	180734	1.1	0.5	0.78	125.6	61.4	0.30	110	3.9	0.5	0.00	0.00	10	0.20	0.10	5.2
02-19	180879	16.6	2.0	0.30	43.6	18.2	0.08	31	4.2	0.1	0.00	0.10	4	0.10	0.20	6.5
03-03	181108	183.0	7.4	0.46	32.8	11.4	0.10	27	4.4	1.2	0.20	0.50	5	0.10	0.20	9.8
04-14	181533	7.8	1.6	0.66	64.8	30.8	0.20	65	4.6	7.0	0.40	0.40	4	0.20	0.00	9.2
05-20	181759	0.6	1.2	2.08	137.6	56.5	0.41	179	5.6	8.6	0.10	0.20	6	0.30	0.10	14.8
06-08	182106	1.9	1.1	1.97	168.0	46.5	0.71	309	9.0	27.0	0.00	0.00	5	0.40	0.10	15.0
12-03	184491	0.1	1.0	0.43	74.4	33.7	0.21	47	7.9	0.1	0.10	0.10	10	0.30	0.10	1.1
1971	505955															
01-12	184813	0.3	0.9	0.96	104.0	50.7	0.33	89	6.7	0.2	0.00	0.10	7	0.30	0.10	6.5
02-22	185265	146.0	10.0	0.39	21.6	7.3	0.05	13	3.9	0.2	0.40	0.80	6	0.20	0.00	7.5
03-02	185262	2.5	1.0	0.96	123.2	58.5	0.41	131	4.9	15.4	0.90	1.10	9	0.30	0.10	2.6
04-02	185531	1.0	0.7	1.97	169.6	78.3	0.59	195	4.6	32.0	0.00	0.10	4	0.30	0.20	4.5
05-04	185781	1.3	1.2	0.88	106.0	57.3	0.28	88	3.7	0.1	0.10	0.30	4	0.30	0.10	2.2
06-02	186005	0.5	2.2	2.02	99.2	47.8	0.20	79	4.1	0.4	0.10	0.10	8	0.30	0.10	2.7

MARYS RIVER NEAR SPARTA

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	B	LI	NI	M	TURB.	TEMP
1966	505955														
12-16	170181	9	112	72	148	274			0.01					114	38.0
1967	505955														
02-21	170952	15	452	140	470	794		0.00	0.01				0.01	15	40.0
03-09	171130	11	273	56	256	469		0.00	0.01				0.02	31	44.0
04-06	171342	23	641	218	690	1179		0.00	0.01				0.03	18	72.0
05-16	171510	13	256	80	258	467		0.00	0.01				0.01	45	54.0
06-05	171887	21	445	210	530	882		0.00	0.01				0.01	20	67.0
07-26	172632	13	164	190	296	447		0.00	0.02				0.01	28	75.0
08-08	172657	10	150	122	215	399		0.00	0.01				0.02	16	76.0
09-12	173087	14	123	148	236	354		0.00	0.01				0.01	13	61.0
10-12	173283	20	119	96	180	420		0.00	0.01				0.01	17	50.0
11-08	173537	17	378	172	420	747		0.00	0.02				0.02	9	40.0
12-14	173793	4	76	28	80	149		0.00	0.02				0.05	119	38.0
1968	505955														
01-05	173841	41	1174	10	830	1772		0.01	0.02				0.01	206	32.0
02-15	174161	39	946	40	746	1483		0.00	0.01				0.62	201	36.0
03-11	174326	41	992	60	784	1557		0.00	0.02				0.35	109	43.0
04-18	174600	21	446	112	422	768		0.00	0.01				0.05	43	66.0
05-22	174907	30	549	144	524	1005		0.00	0.01				0.09	24	56.6
06-19	175191	17	309	208	404	659		0.00	0.01				0.01	21	74.0
11-07	176747	17	202	88	224	403		0.00	0.02				0.02	27	48.0
12-18	177092	39	713	168	680	1327		0.00	0.01				0.12	16	35.0
1969	505955														
01-17	177377	48	1102	140	516	1551		0.01	0.03				2.00	417	33.0
02-19	177481	39	1088	80	660	1558		0.01	0.03				1.60	174	39.0
03-11	177667	24	491	88	420	828	0.00	0.00	0.01	<.05		<.05	0.13	42	38.0
04-11	178014	18	315	88	296	571	0.00	0.00	0.02	<.05	0.00	<.05	0.04	34	63.0
05-22	178250	37	719	28	484	1097	0.01	0.00	0.05	<.05	0.02	0.12	0.64	5	64.0
06-17	178613	35	526	19	320	794	0.00	0.00	0.06	<.05	0.03	0.11	0.57	11	67.0
07-23	179110	9	232	36	180	380	0.00	0.00	0.01	<.05	0.01	<.05	0.11	52	75.0
08-18	179336	29	507	180	510	938	0.00	0.00	0.01	<.05	0.01	<.05	0.03	15	76.0
09-10	179646	34	914	0	450	1388	0.00	0.00	0.03	<.05	0.31	<.05	0.70	3	64.0
10-21	179915	23	438	135	441	801	0.00	0.00	0.02	<.05	0.00	<.05	0.03	7	55.0
11-13	180020	21	585	262	690	1125	0.00	0.00	0.02	<.05	0.00	<.05	0.03	6	48.0
12-02	180339	31	676	226	700	1266	0.00	0.00	0.01	<.05	0.00	<.05	0.02	2	40.0
1970	505955														
01-22	180734	34	564	180	566	1059	0.00	0.00	0.01	<.05	0.00	<.05	0.07	8	32.0
02-19	180879	13	172	58	184	336	0.00	0.00	0.02	<.05	0.00	<.05	0.02	38	39.0
03-03	181108	13	120	44	129	264	0.00	0.00	0.03	<.05	0.00	<.05	0.05	174	53.0
04-14	181533	22	306	92	288	574	0.00	0.00	0.02	<.05	0.00	<.05	0.02	42	55.0
05-20	181759	51	778	104	576	1339	0.00	0.00	0.02	<.05	0.01	<.05	0.09	30	67.0
06-08	182106	93	1198	56	610	1949	0.00	0.00	0.03	<.05	0.03	<.05	0.02	30	68.0
12-03	184491	16	259	136	324	523	0.00	0.00	0.01	<.05	0.00	<.05	0.06	14	54.0
1971	505955														
01-12	184813	30	447	144	468	840	0.00	0.00	0.01	<.05	0.00	<.05	0.03	19	33.0
02-22	185265	7	66	36	84	165	0.00	0.00	0.02	<.05	0.00	<.05	0.04	272	35.0
03-02	185262	33	658	136	548	1092	0.00	0.00	0.01	<.05	0.01	<.05	0.04	20	34.0
04-02	185531	52	966	140	745	1550	0.00	0.00	0.02	<.05	0.01	<.05	0.06	13	45.0
05-04	185781	25	483	164	500	907	0.00	0.00	0.02	<.05	0.00	<.05	0.02	44	63.0
06-02	186005	21	384	184	444	772	0.00	0.00	0.01	<.05	0.00	<.05	0.02	62	68.0

MISSISSIPPI RIVER AT CHESTER

The Mississippi River is intersectional and flows along the entire western border of the state. The gaging station at Chester is located 8.1 miles downstream from the Kaskaskia River, and elevation of the gage datum is 341.05 feet above mean sea level. The drainage basin above the gage has an area of approximately 712,600 square miles.

The tabulation of water quality data is for the period from August 8, 1966, to September 1, 1971. Discharge and some quality data are shown graphically. The mean daily discharge values shown were taken from published USGS records for 1966 to 1970 and from provisional records in 1971.

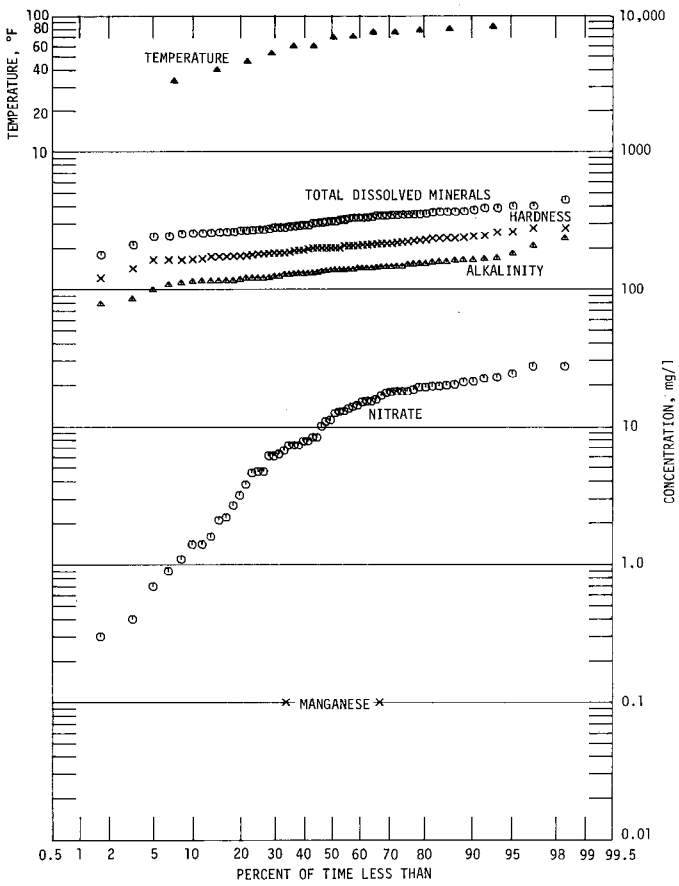
For 80 percent of the time, in the interval between 10 and 90 percent, the mean daily flow did not exceed 0.53 cfs/sq mi, nor fall below 0.13 cfs/sq mi. The median flow was 0.235 cfs/sq mi and the mean was 0.282 cfs/sq mi.

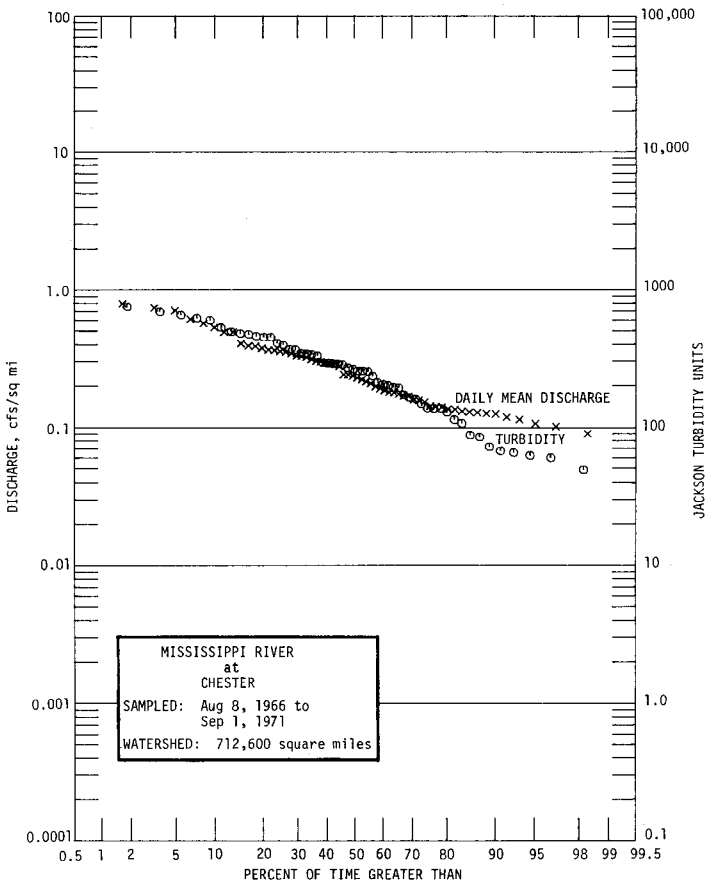
The turbidity was not less than 70 Jtu nor more than 564 Jtu for the central 80 percent of the time. The median value was 260 Jtu and the mean 291 Jtu.

Reported temperatures were over 80 F for 7 percent and over 70 F for 36 percent of the time. They were below 50 F for 21 percent and below 40 F for 7 percent of the time.

The analyses indicated the following :

	Concentration (*mg/l*) not exceeded for indicated percent of time (mean in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	114	138	164
Hardness (as $CaCO_3$)	165	200	244
Total dissolved minerals	255	312	377
Nitrate (NO_3)	1.4	11.9(11.7)	21.2





MISSISSIPPI RIVER AT CHESTER

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	700206															
08-08	400407	91000.0	0.1	0.00	52.8	17.1		33		0.2			12			7.8
09-06	400441	97300.0	0.1	0.00	52.0	16.8		34		0.3			11			12.9
10-03	400547	64200.0	0.1	0.00	61.2	18.0		43		0.2			11			14.0
11-01	400587	75800.0	0.1	0.00	53.1	18.5		41		0.3			6			3.8
12-01	400629	96400.0	0.3	0.00	55.0	18.0		47		0.3			10			21.2
1967	700206															
01-01	400017	72600.0	0.0	0.00	60.6	21.0		23		0.2			13			14.4
02-01	400102	119000.0	0.1	0.00	46.7	17.6		25		0.2			16			18.1
03-06	400145	84600.0	0.0	0.00	51.9	19.3		20		0.1			7			1.4
04-01	400212	210000.0	0.3	0.00	45.6	13.0		17		0.3			20			18.1
05-01	400302	289000.0	0.2	0.00	45.2	15.1		16		0.2			6			20.2
06-05	400336	232000.0	0.2	0.00	48.3	15.1		30		0.1			15			15.4
07-01	400408	527000.0	0.2	0.00	45.9	13.0		12		0.3			11			15.4
08-01	400423	197000.0	0.1	0.00	44.8	13.1		23		0.2			13			12.6
09-07	400490	81400.0	0.0	0.00	56.0	18.3		45		0.2			3			7.3
10-01	400537	100000.0	0.2	0.00	47.6	13.6		38		0.1			16			1.1
11-01	400576	158000.0	0.2	0.00	52.0	13.0		29		0.2			9			4.7
12-01	400642	113000.0	0.1	0.00	56.0	14.4		28		0.2			13			19.7
1968	700206															
01-01	400011	148000.0	0.1	0.00	70.4	14.4		22		0.2			10			22.4
03-03	400164	102000.0	0.1	0.00	68.0	21.6		16		0.2			10			1.4
04-01	400225	140000.0	0.0	0.00	66.4	10.1		19		2.1			13			2.1
05-01	400261	206000.0	0.2	0.00	56.0	14.4		20		0.3			14			10.2
06-03	400302	277000.0	0.2	0.00	55.2	8.2		14		0.2			9			7.3
07-01	400343	212000.0	0.2	0.00	49.6	12.0		9		0.2			12			6.7
08-01	400388	214000.0	0.2	0.00	54.4	7.2		16		0.1			15			4.7
09-03	400437	89400.0	0.1	0.00	66.4	11.5		27		0.6			14			7.3
10-01	400517	136000.0	0.1	0.00	53.6	12.0		19		0.2			8			1.6
11-01	400529	171000.0	0.0	0.00	54.4	15.4		16		0.1			13			19.7
12-01	400574	230000.0	0.1	0.00	57.6	11.5		24		0.2			17			20.0
1969	700206															
01-01	400013	243000.0	0.1	0.00	65.6	19.2		20		0.2			9			21.1
02-01	400049	379000.0	0.1	0.00	36.0	7.2		14		0.2			20			15.1
03-01	400114	220000.0	0.1	0.00	50.4	13.0		15		0.2			14			13.6
04-01	400144	351000.0	0.0	0.00	56.0	12.5		1		0.3			11			6.1
05-01	400227	501000.0	0.2	0.00	43.2	15.8		7		0.2			9			18.1
06-01	400269	254000.0	0.2	0.10	52.0	14.9		20		0.2			15			15.9
07-08	400358	562000.0	0.1	0.00	49.6	12.0		17		0.2			11			18.6
08-01	400422	259000.0	0.1	0.10	80.0	19.2		16		0.2			17			2.7
09-01	400479	127000.0	0.1	0.00	74.4	22.6		23		0.2			11			8.4
10-01	400554	120000.0	0.0	0.00	57.6	13.0		27		0.1			13			0.4
11-01	400630	162000.0	0.1	0.00	60.8	15.4		32		0.1			10			0.3
12-01	400680	124000.0	0.1	0.00	65.6	15.8		32		0.2			8			7.9
1970	700206															
02-13	400064	101000.0	0.1	0.00	64.0	18.7		34		1.0			8			2.2
03-01	400127	112000.0	0.0	0.00	75.2	7.7		37		0.2			12			27.3
04-01	400189	168000.0	0.1	0.00	49.6	14.4		17		0.3			12			17.6
05-01	400213	350000.0	0.1	0.00	54.4	7.2		11		0.3			17			19.3
06-01	400285	275000.0	0.1	0.00	54.4	15.8		21		0.2			11			24.2
07-01	400389	206000.0	0.0	0.00	59.2	16.8		29		0.3			9			19.3
08-04	400423	128000.0	0.0	0.00	66.4	15.4		27		0.2			5			6.3
09-01	400502	90200.0	0.1	0.00	60.8	11.5		28		0.3			8			11.0
10-01	400582	434000.0	0.0	0.00	56.8	17.3		11		0.1			14			3.2
11-01	400612	250000.0	0.0	0.00	64.8	14.9		14		0.1			10			17.9
12-01	400690	153000.0	0.1	0.00	67.2	16.3		24		0.2			11			8.4
1971	700206															
01-01	400046	109000.0	0.1	0.00	70.4	15.4		13		0.2			18			0.9
02-01	400086	93400.0	0.1	0.00	69.6	21.6		28		0.3			17			16.9
03-01	400115	406000.0	0.1	0.00	36.8	12.0		13		0.5			23			27.3
04-01	400178	267000.0	0.1	0.00	56.8	19.2		13		0.3			13			22.7
05-03	400213	258000.0	0.1	0.00	48.0	13.4		14		0.5			12			6.1
06-07	400278	235000.0	0.1	0.00	51.2	13.4		22		0.5			14			4.6
07-01	400347	171000.0	0.3	0.00	57.6	17.3		10		0.2			15			0.7
08-01	400423	132000.0	0.1	0.00	61.6	13.4		36		0.1			7			13.0
09-01	400471	91800.0	0.1	0.00	62.4	22.1		44		0.1			12			11.2

MISSISSIPPI RIVER AT CHESTER

DATE	LAB.NO.	CL	S04	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	700206														
08-08	400407	20	104	135	200	352								255	83.0
09-06	400441	18	96	142	200	343								107	
10-03	400547	21	137	142	226	389								331	
11-01	400587	21	122	146	210	370								65	
12-01	400629	23	116	145	208	365								62	53.0
1967	700206														
01-01	400017	19	93	164	234	346								85	
02-01	400102	27	66	130	186	282								193	
03-06	400145	25	72	147	208	306								657	
04-01	400212	13	59	116	164	262									
05-01	400302	14	65	118	178	260								210	
06-05	400336	25	80	128	180	290								495	
07-01	400408	11	45	124	164	241								290	76.0
08-01	400423	17	78	108	164	267								340	
09-07	400490	21	123	154	210	362								49	
10-01	400537	21	111	114	174	312								479	69.0
11-01	400576	19	84	129	184	281									
12-01	400642	19	81	142	200	322									
1968	700206														
01-01	400011	19	74	164	236	330								161	40.0
03-03	400164	20	101	166	260	377									60.0
04-01	400225	21	83	137	208	335									
05-01	400261	16	77	138	200	287								368	
06-03	400302	14	64	115	172	254								286	
07-01	400343	14	58	115	174	267								345	78.0
08-01	400388	14	64	116	166	272								366	80.0
09-03	400437	19	106	136	214	336								129	76.0
10-01	400517	20	79	120	184	271								165	
11-01	400529	15	65	132	200	301								409	
12-01	400574	17	84	121	192	292								137	
1969	700206														
01-01	400013	20	82	162	244	345								264	
02-01	400049	14	43	78	120	178								284	
03-01	400114	18	63	115	180	255								396	
04-01	400144	16	54	120	192	255								452	
05-01	400227	14	48	111	173	244									
06-01	400269	16	67	144	191	292								341	
07-08	400358	13	62	120	173	269								756	
08-01	400422	12	67	235	278	344								270	
09-01	400479	11	106	208	278	388								60	
10-01	400554	21	99	130	197	331								234	
11-01	400630	23	104	146	215	319								201	
12-01	400680	26	104	159	228	354								148	
1970	700206														
02-13	400064	33	95	168	236	400								72	
03-01	400127	27	91	153	219	348								195	
04-01	400189	20	65	120	183	275								691	
05-01	400213	26	47	99	165	262								288	
06-01	400285	20	73	131	200	329								528	
07-01	400389	18	85	154	216	350								137	
08-04	400423	23	103	147	229	367								88	
09-01	400502	19	100	130	199	352								293	
10-01	400582	20	76	139	213	310								138	
11-01	400612	21	74	142	223	305								172	
12-01	400690	21	95	157	234	350								256	46.0
1971	700206														
01-01	400046	23	83	158	239	331								472	
02-01	400086	21	101	182	262	402								67	
03-01	400115	16	44	85	141	210								599	33.0
04-01	400178	23	61	139	220	312								456	
05-03	400213	20	59	124	175	258								114	60.0
06-07	400278	16	80	128	182	281								452	70.0
07-01	400347	19	77	138	215	288								253	
08-01	400423	23	110	138	208	365								621	
09-01	400471	27	144	152	246	446								204	

MISSISSIPPI RIVER AT EAST ST. LOUIS

The Mississippi River is intersectional and forms the entire western border of the state. The gaging station is located downstream of the west pier of Eads Bridge in St. Louis, Missouri. Elevation of gage datum is 379.94 feet above mean sea level. The drainage basin above the gage has an area of approximately 701,000 square miles.

All samples were collected by personnel of the East St. Louis and Interurban Water Company in East St. Louis.

The tabulation of water quality data is for the period from October 3, 1966, to September 21, 1971. Discharge and some quality data are shown graphically. The mean daily discharge values shown were taken from published records of the USGS from 1966 to 1970 and from provisional records in 1971.

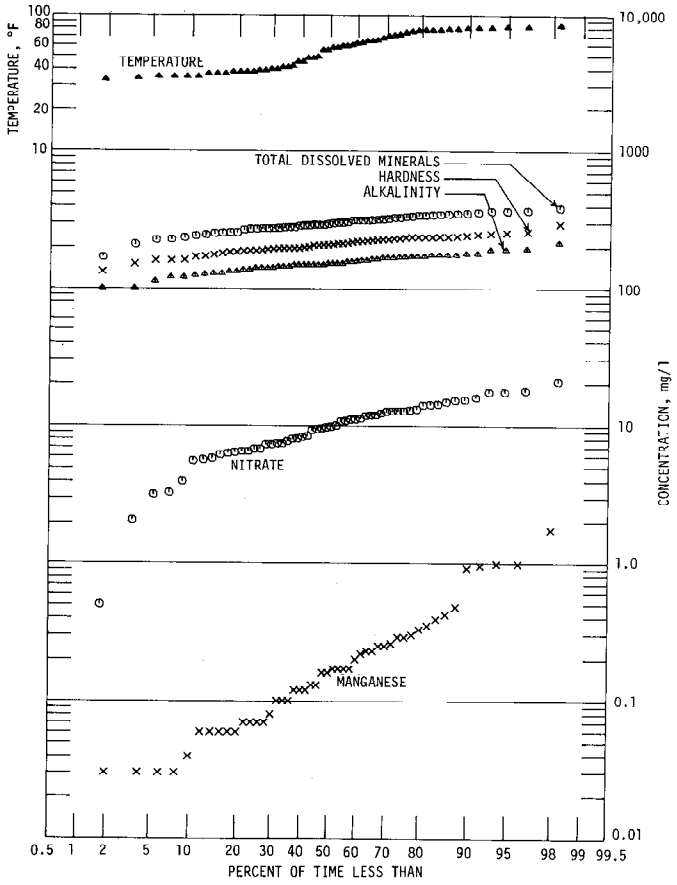
For 80 percent of the time, in the interval between 10 and 90 percent, the mean daily flow did not exceed 0.535 cfs/sq mi, nor fall below 0.105 cfs/sq mi. The median flow was 0.21 cfs/sq mi and the mean was 0.271 cfs/sq mi.

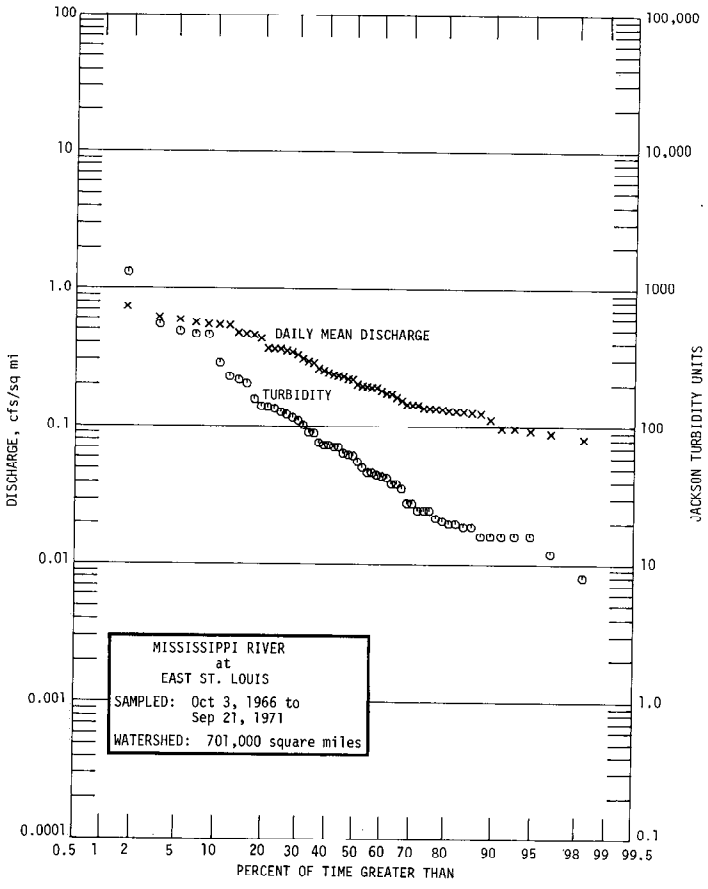
The turbidity was not less than 16 Jtu nor more than 368 Jtu for the central 80 percent of the time. The median value was 59 Jtu and the mean 127 Jtu.

Reported temperatures were over 80 F for 9 percent and over 70 F for 29 percent of the time. They were below 50 F for 45 percent and below 40 F for 27 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	122	152	180
Hardness (as $CaCO_3$)	165	209	246
Total dissolved minerals	239	297	357
Nitrate (NO_3)	4.8	9.8(10.0)	15.7
Total inorganic phosphate (PO_4)	0.6	0.95(1.36)	2.0
Soluble inorganic phosphate (PO_4)	0.3	0.5(0.59)	1.2
Manganese (Mn)	0.04	0.16	0.92





MISSISSIPPI RIVER AT EAST ST. LOUIS

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	700100															
10-03	170022	68400.0	1.0	0.06	58.5	17.3		43		T	0.40	0.60	7	0.30	0.10	2.1
12-12	170483	100000.0	3.8	0.29	47.2	18.5	0.14	21	4.5	0.1	1.20	1.80	5	0.40	0.20	11.2
12-19	170509	91100.0	1.8	0.03	53.0	18.9	0.14	19	4.0	T	0.50	0.80	5	0.30	0.10	7.3
1967	700100															
01-06	170620	57300.0	1.2	0.04	60.8	23.5	0.17	20	3.8	T	1.00	1.40	7	0.30	0.10	14.3
01-12	170646	65600.0	1.0	0.00	57.2	21.8	0 14	19	3.9	0.4	0.50	0.70	7	0.30	0.10	9.3
01-30	170818	90300.0	2.1	0.12	52.0	20.1	0.12	19	3.7	0.2	0.90	1 40	9	0.40	0.20	9.9
02-08	170886	94300.0	2.9	0.12	49.6	19.9	0.11	19	3.8	T	1.50	2.30	9	0.40	0.10	12.6
03-10	171106	88700.0	1.1	T	55.6	21.8	0.12	20	5.0	0.1	1.10	1.30	11	0.30	0.10	16.0
04-19	171332	388000.0	4.5	0.23	38.4	13.1	0.10	11	3.8	0.1	0.50	0.90	5	0.30	0.10	13.1
05-04	171439	316000.0	8.7	0.35	49.6	18.4	0.11	12	3.8	0.1	0.30	0.90	7	0.30	0.00	11.9
06-28	172048	513000.0	43.0	1.76	50.0	15.3	0.13	13	3.6	T	0.40	3.50	11	0.10	0.00	12.2
07-26	172358	164000.0	2.8	0.07	48.0	17.0	0.13	13	3.4	0.1	0.40	0.80	6	0.30	0.10	5.6
08-09	172866	133000.0	2.1	0.10	42.4	13.2	0.14	11	3.1	T	0.30	0.80	7	0.10	0.10	6.3
10-24	173362	101000.0	0.7	0.92	46.8	16.3	0.22	29	4.8	0.1	0.80	0.90	4	0.30	0.10	3.2
10-30	173375	126000.0	1.1	0.10	46.4	17.5	0.14	21	4.2	0.1	0.70	1.00	2	0.50	0.10	7.4
11-27	173553	119000.0	0.9	0.03	61.6	24.9	0.15	20	3.5	0.1	0.70	0.80	6	0.20	0.10	20.8
12-04	173653	151000.0	2.9	0.13	58.0	22.3	0.16	19	3.6	0.7	1.60	1.90	5	0.10	0.10	11.1
1068	700100															
01-15	173837	68400.0	0.7	0.07	64.0	24.4	0.15	19	2.9	0.1	0.50	0.60	3	0.10	0.10	14.0
02-07	173995	228000.0	7.8	0.26	47.2	16.5	0.12	20	4.1	0.7	0.70	1.50	6	0.20	0.00	10.0
03-15	174293	107000.0	1.4	0.16	52.0	22.0	0.12	19	3.5	0.2	0.40	0.90	2	0.20	0.00	3.3
04-11	174469	140000.0	3.6	0.22	55.2	21.0	0.12	19	3.0	T	0.90	1.70	3	0.30	0.10	14.8
05-13	174725	136000.0	1.1	0.10	48.0	18.5	0.13	15	2.9	0.1	0.80	1.10	1	0.20	0.00	6.4
06-03	175048	252000.0	3.7	0.17	42.8	15.8	0.12	13	2.5	0.1	0.50	0.90	3	0.20	0.10	12.7
07-03	175339	238000 0	9.3	0.33	40.8	14.1	0.08	13	3.5	0.1	0.70	6.10	4	0.20	0.00	15.3
08-09	175860	202000.0	6.6	0.20	33.6	11.7	0.08	10	3.0	0.1	0.30	0.90	7	0.20	0.10	6.2
09-13	176244	113000.0	1.3	0.12	48.8	18.0	0.11	14	3.7	0.1	0.90	1.80	3	0.20	0.10	4.0
10-09	176489	120000.0	3.8	0.23	44.0	17.0	0.08	15	3.5	0.1	0.60	1.00	8	0.20	0.10	8.3
11-13	176807	153000.0	3.7	0.17	49.6	17.5	0.08	13	2.8	0.2	0.50	1.10	12	0.20	0.10	10.7
12-16	177088	161000.0	1.1	0.08	59.2	22.4	0.13	18	4.0	0.5	1.20	1.60	11	0.30	0.10	10.8
1969	700100															
02-10	177413	321000.0	23.0	0.99	40.8	14.3	0.61	16	4.2	0.8	0.30	1.30	8	0.20	0.10	9.4
03-13	177641	180000.0	2.3	0.17	48.8	18.0	0.11	16	4.8	1.1	1.20	1.30	10	0.20	0.10	8.1
04-16	177945	372000.0	5.4	0.42	55.6	21.2	0.13	15	3.2	T	0.40	1.50	9	0.20	0.10	17.5
06-30	178985	406000.0	12.0	0.48	54.8	18.7	0.12	11	3.4	0.1	0.40	1 80	7	0.20	0.10	14.2
07-24	179075	376000.0	8.2	0.03	52.4	18.8	0.11	12	3.3	0.3	0.80	1.10	9	0.20	0.10	12.7
08-29	179602	133000.0	2.3	0.07	61.6	20.6	0.26	33	4.7	0.1	0.40	0.70	5	0.30	0.10	5.8
11-04	179972	168000.0	2.9	0.17	58.4	21.5	0.13	19	3.8	0.1	0.30	0.70	3	0.20	0.10	7.4
12-17	180366	95000.0	0.8	T	55.2	24.3	0.09	20	2.6	0.1	0.60	1.60	2	0.30	0.10	6.8
1970	700100															
01-23	180655	62800.0	0.6	T	62.4	23.5	0.13	25	2.9	1.0	0.50	0.70	7	0.30	0.10	6.8
02-13	180790	93500.0	1.3	0.00	59.6	21.3	0.17	24	3.3	1.6	1.20	1.50	8	0.30	0.10	7.7
03-20	181026	135000.0	2.8	0.06	51.2	19.1	0.03	15	4.6	0.9	0.70	0.90	8	0.20	0.10	11.1
04-22	181330	428000.0	27.0	0.99	44.8	14.1	0.08	11	2.6	0.1	0.40	2.20	6	0.20	0.20	11.9
05-14	181655	299000.0	6.6	0.39	58.4	22.3	0.11	14	2.8	0.1	0.40	1.20	6	0.30	0.10	17.5
07-22	182688	99800.0	1.1	0.06	57.6	22.5	0.18	25	3.5	0.1	0.50	0.70	2	0.30	0.10	8.4
08-31	183619	86800.0	3.6	0.00	50.0	17.3	0.18	30	4.2	0.1	0.30	0.50	5	0.40	0.10	17.9
09-16	183604	175000.0	6.1	0.16	50.4	19.9	0.12	18	3.3	0.1	0.50	8.20	4	0.40	0.10	6.5
10-29	184106	244000.0	6.2	0.29	60.8	22.5	0.17	16	3.3	0.1	0.40	0.70	7	0.30	0.10	11.8
11-25	184299	198000.0	3.7	0.13	57.6	20.6	0.13	14	2.8	0.3	0.40	0.80	10	0.30	0.10	12.9
1971	700100															
01-27	184804	78900.0	1.1	0.06	73.6	27.4	0.19	22	3.0	0.7	0.30	0.60	11	0.30	0.10	12.7
02-26	185062	375000.0	13.0	0.03	44.8	15.6	0.09	15	5.0	1.2	0.60	1.60	8	0.30	0.10	9.6
03-18	185267	329000.0	6.2	0.25	53.6	19.0	0.17	15	3.8	0.2	0.50	0.90	9	0.30	0.10	8.0
04-02	185382	253000.0	5.6	0.25	60.0	20.1	0.14	15	3.2	0.6	0.60	0.80	10	0.20	0.10	15.4
05-14	185703	213000.0	3.7	0.30	45.6	17.0	0.17	14	2.9	0.3	0.30	0.60	4	0.30	0.10	6 5
06-17	185937	252000.0	19.0	0.96	51.6	15.3	0.17	26	4.2	0.1	0.30	1.40	6	0.30	0.10	7.3
07-22	186294	158000.0	4.2	0.06	50.4	17.5	0.13	18	3.4	0.1	0.40	0.60	8	0.30	0.10	9.7
08-11	186398	95000.0	1.2	0.07	56.8	19.6	0.21	27	3.6	0.2	0.40	0.60	2	0.40	0.10	5.7
09-21	186696	89800.0	1.4	0.00	54.4	20.4	0.29	46	3.8	0.2	0.30	0.30	4	0.40	0.10	0.5

MISSISSIPPI RIVER AT EAST ST. LOUIS

DATE	LAB.NO.	CL	S04	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	700100														
10-03	170022	17	128	152	217	353								16	61.9
12-12	170483	21	60	132	194	291			0.01					71	41.0
12-19	170509	22	65	136	210	295			0.01					47	42.0
1967	700100														
01-06	170620	24	76	170	248	361		0.00	0.01				0.02	16	35.0
01-12	170646	21	64	176	232	334			0.01					25	35.0
01-30	170818	19	53	192	212	317		0.00	0.01				0.02	43	38.0
02-08	170886	21	51	148	206	300		0.00	0.02				0.02	36	37.0
03-10	171106	25	64	152	228	343		0.00	0.01				0.02	16	38.0
04-19	171332	14	56	100	150	227		0.00	0.01				0.04	133	60.0
05-04	171439	15	62	128	200	272		0.00	0.01				0.03	138	57.0
06-28	172048	13	48	168	188	278		0.00	0.01				0.05	1312	74.0
07-26	172358	14	55	136	190	267		0.00	0.01				0.01	51	78.0
08-09	172866	10	42	120	160	226		0.00	0.02				0.01	47	80.0
10-24	173362	15	60	140	184	290		0.00	0.02				0.01	21	59.0
10-30	173375	20	56	140	188	276		0.00	0.01				0.03	39	55.0
11-27	173553	18	75	180	256	369		0.00	0.02				0.02	22	45.0
12-04	173653	19	66	172	236	329		0.00	0.03				0.02	73	39.0
1968	700100														
01-15	173837	19	69	192	260	321		0.00	0.01				0.02	16	34.0
02-07	173995	21	55	132	186	274		0.00	0.01				0.02	201	40.0
03-15	174293	19	60	170	220	302		0.00	0.02				0.02	39	41.0
04-11	174469	22	66	156	224	314		0.00	0.02				0.10	73	57.0
05-13	174725	17	52	148	196	280		0.00	0.02				0.02	28	64.0
06-03	175048	12	43	126	172	243		0.00	0.01				0.02	64	67.0
07-03	175339	13	39	112	160	210		0.00	0.02				0.01	214	76.0
08-09	175860	10	33	100	132	169		0.00	0.01				0.01	226	82.0
09-13	176244	17	49	140	196	235		0.00	0.02				0.00	20	72.0
10-09	176489	14	67	148	180	255		0.00	0.02				0.02	71	65.0
11-13	176807	13	48	168	196	274		0.00	0.01				0.00	76	49.0
12-16	177088	20	70	176	240	347		0.00	0.02				0.01	19	38.0
1969	700100														
02-10	177413	18	49	120	161	256		0.00	0.01				0.02	479	35.0
03-13	177641	18	49	152	196	281	0.00	0.00	0.01	<.05		<.05	0.02	45	38.0
04-16	177945	21	58	168	226	328	0.00	0.00	0.02	<.05	0.00	<.05	0.01	121	55.0
06-30	178985	13	53	156	214	302	0.00	0.00	0.01	<.05	0.00	<.05	0.00	453	77.0
07-24	179075	14	48	148	208	288	0.00	0.00	0.01	<.05	0.00	<.05	0.05	126	82.0
08-29	179602	15	106	164	238	345	0.00	0.00	0.02	<.05	0.02	<.05	0.07	25	79.0
11-04	179972	17	73	172	234	324	0.00	0.00	0.02	<.05	0.01	<.05	0.02	62	48.0
12-17	180366	21	65	180	238	342	0.00	0.00	0.01	<.05	0.00	<.05	0.04	16	37.0
1970	700100														
01-23	180655	24	65	196	252	354	0.00	0.00	0.02	<.05	0.00	<.05	0.03	8	33.0
02-13	180790	39	65	172	236	371	0.00	0.00	0.02	<.05	0.01	<.05	0.05	25	35.0
03-20	181026	20	51	144	206	291	0.00	0.00	0.02	<.05	0.00	<.05	0.02	44	40.0
04-22	181330	16	47	124	170	245	0.00	0.00	0.01	<.05	0.00	<.05	0.01	540	64.0
05-14	181655	20	64	158	237	315	0.00	0.00	0.02	<.05	0.00	<.05	0.02	155	70.0
07-22	182688	20	85	176	236	349	0.00	0.00	0.01	<.05	0.01	<.05	0.01	19	81.0
08-31	183619	16	94	140	196	314	0.00	0.00	0.01	<.05	0.01	<.05	0.00	56	84.0
09-16	183604	21	56	152	208	273	0.00	0.00	0.02	<.05	0.00	<.05	0.01	110	78.0
10-29	184106	16	65	176	244	314	0.00	0.00	0.01	<.05	0.01	<.05	0.01	102	59.0
11-25	184299	17	55	168	228	304	0.00	0.00	0.01	<.05	0.00	<.05	0.04	63	39.0
1971	700100														
01-27	184804	23	80	216	296	389	0.00	0.00	0.03	<.05	0.01	<.05	0.04	20	37.0
02-26	185062	21	43	128	176	251	0.00	0.00	0.04	<.05	0.00	<.05	0.02	283	
03-18	185267	21	50	160	212	287	0.00	0.00	0.19	<.05	0.00	0.53	0.18	136	45.0
04-02	185382	24	53	168	232	320	0.00	0.00	0.07	<.05	0.00	<.05	0.04	90	48.0
05-14	185703	17	50	144	184	253	0.00	0.00	0.20	<.05	0.00	<.05	0.04	89	62.0
06-17	185937	15	73	148	192	288	0.00	0.00	0.20	<.05	0.01	<.05	0.04	458	78.0
07-22	186294	17	58	144	198	272	0.00	0.00	0.01	<.05	0.01	<.05	0.01	115	81.0
08-11	186398	21	80	166	222	336	0.00	0.00	0.17	<.05	0.01	<.05	0.02	12	79.0
09-21	186696	20	127	160	220	370	0.00	0.00	0.06	<.05	0.02	<.05	0.02	28	71.0

NORTH FORK MAUVAISE TERRE CREEK NEAR JACKSONVILLE

The North Fork of Mauvaise Terre Creek rises in the Springfield Plain Region near Jacksonville and flows westerly into the Illinois River below Meredosia. The gaging station is 6 miles east of Jacksonville and 2.5 miles north of Arnold. Elevation of gage datum is 579.27 feet above mean sea level. The drainage basin above the gage has an area of approximately 30 square miles.

The tabulation of water quality data is for the period from October 18, 1966, to August 5, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

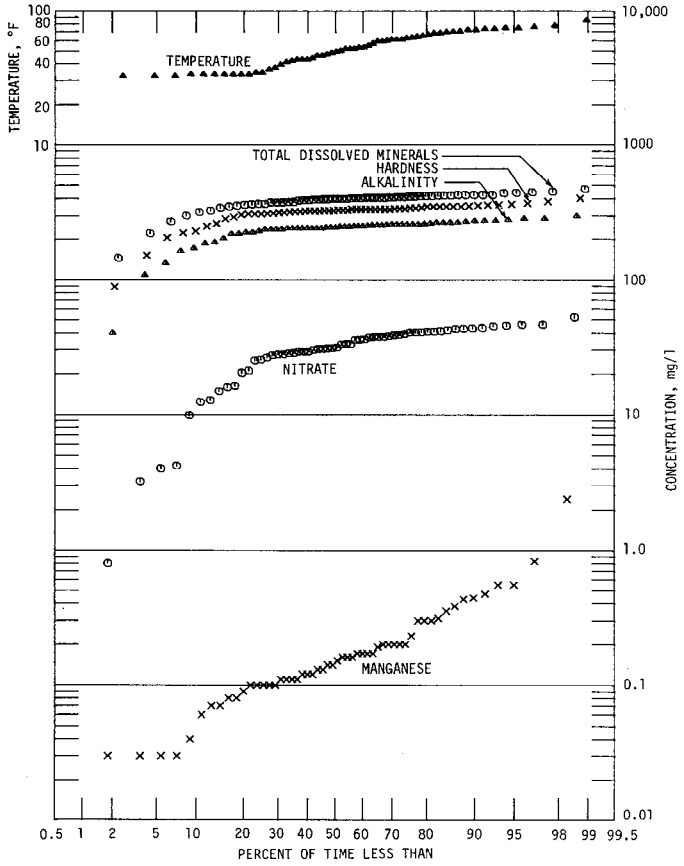
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 2.85 cfs/sq mi, nor fall below 0.05 cfs/sq mi. The median flow was 0.39 cfs/sq mi and the mean was 1.23 cfs/sq mi.

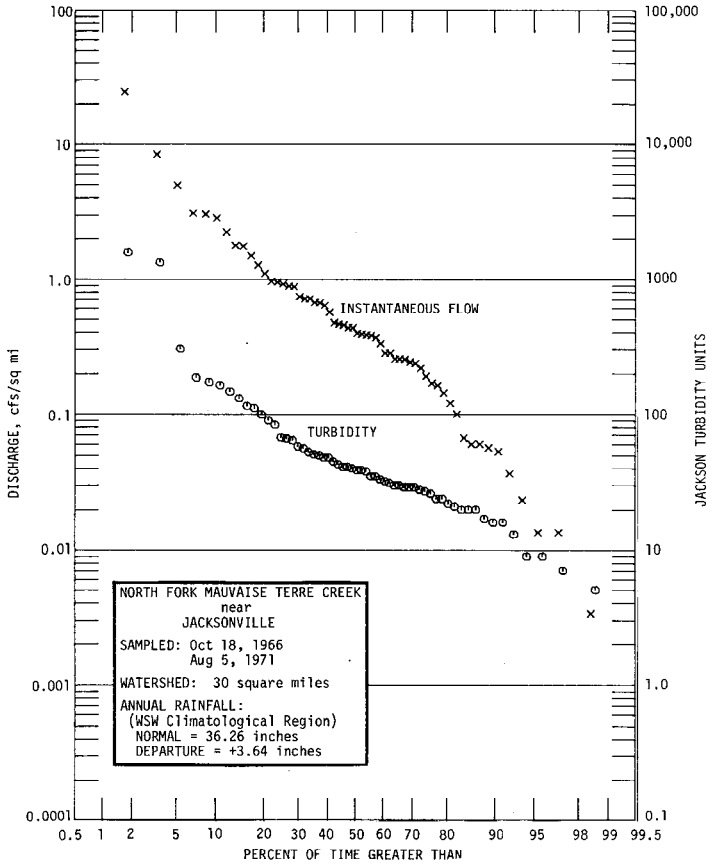
The turbidity was not less than 16 Jtu nor more than 163 Jtu for the central 80 percent of the time. The median value was 39 Jtu and the mean 102 Jtu.

Reported temperatures were over 80 F for 2 percent and over 70 F for 17 percent of the time. They were below 50 F for 43 percent and below 40 F for 25 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	184	246	272
Hardness (as $CaCO_3$)	249	328	356
Total dissolved minerals	326	399	423
Nitrate (NO_3)	12.4	32.8(30.9)	43.5
Total inorganic phosphate (PO_4)	0.2	0.5(0.73)	1.8
Soluble inorganic phosphate (PO_4)	0.0	0.3(0.35)	0.6
Manganese (Mn)	0.05	0.15	0.46





NORTH FORK MAUVAISE TERRE CREEK NEAR JACKSONVILLE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4J	SIO2	F	B	NO3
1966	505860															
10-18	170100	0.4	1.9	0.16	50.8	23.2	0.08	9	10.3	0.0	0.60	0.60	12	0.10	0.10	4.2
11-09	170198	0.4	3.5	0.83	69.8	33.1	0.18	12	6.5	T	0.40	0.40	12	0.30	0.00	3.2
12-07	170418	92.4	64.0	2.40	37.0	14.1	0.12	5	10.4	0.0	1.70	4.30	11	0.10	0.10	16.3
1967	505860															
01-10	170568	4.3	0.7	0.10	82.2	38.2	0.12	10	1.8	0.1	0.00	0.20	11	0.30	0.10	25.3
02-15	170829	27.6	0.6	0.11	71.2	34.5	0.12	9	1.6	T	0.20	2.00	10	0.10	0.10	31.0
03-09	171053	8.4	0.5	0.10	73.4	34.8	0.13	9	1.5	0.1	0.40	0.90	7	0.30	0.00	24.9
04-11	171209	13.0	1.8	0.17	74.0	36.8	0.14	10	1.1	T	0.50	0.50	8	0.30	0.10	30.3
05-01	171378	9.9	3.5	0.30	74.0	36.8	0.14	7	1.4	0.0	0.10	0.60	10	0.10	0.10	29.1
06-05	171630	28.9	2.9	0.08	74.8	35.9	0.17	8	1.5	0.1	0.30	0.60	9	0.10	0.00	45.4
07-24	172357	90.9	4.6	0.04	70.0	32.5	0.13	9	3.2	0.1	0.50	0.80	13	0.20	0.00	26.2
08-07	172652	21.2	3.1	0.17	80.0	36.1	0.16	10	1.8	0.1	0.30	0.70	7	0.30	0.10	33.1
09-19	173016	1.8	1.0	0.10	73.6	36.1	0.16	11	2.4	T	0.30	0.70	10	0.20	0.10	12.4
10-03	173158	1.7	1.6	0.31	68.0	37.6	0.17	11	1.8	T	0.40	1.30	6	0.20	0.20	9.8
10-30	173372	66.4	10.0	0.47	73.6	34.7	0.15	10	2.6	T	0.50	1.80	8	0.20	0.00	30.8
12-07	173610	148.0	1.8	0.03	64.8	29.8	0.14	8	2.5	0.1	0.40	0.80	12	0.10	0.00	38.0
1968	505860															
01-11	173829	13.0	1.0	0.07	77.6	37.6	0.16	9	1.0	0.1	0.00	0.20	11	0.30	0.10	37.5
02-14	174014	26.5	1.5	0.03	74.8	35.4	0.11	9	1.0	0.2	0.30	0.40	5	0.20	0.00	41.8
03-04	174190	7.5	1.4	0.13	74.0	35.9	0.12	9	0.8	0.1	0.40	0.50	8	0.20	0.00	38.4
04-01	174367	11.8	1.1	0.10	73.6	36.1	0.15	9	0.9	0.1	0.30	0.40	9	0.10	0.10	37.5
05-06	174655	7.6	0.8	0.03	70.4	36.1	0.16	9	0.7	0.1	0.00	0.30	6	0.20	0.10	30.5
06-10	175005	21.2	3.9	0.20	73.6	36.1	0.17	10	0.8	0.2	0.20	0.30	8	0.30	0.00	43.0
07-11	175415	11.7	2.8	0.12	73.6	36.0	0.15	9	1.3	0.1	0.20	0.70	11	0.40	0.10	37.5
08-05	175783	11.5	8.2	0.35	28.4	37.0	0.21	9	1.5	0.4	0.40	0.60	12	0.30	0.00	32.8
09-09	176143	0.1	3.5	0.20	65.2	35.4	0.14	12	3.3	0.2	0.90	1.00	5	0.30	0.00	4.0
10-11	176488	2.0	1.7	0.00	70.8	36.7	0.14	10	2.4	0.1	0.30	0.50	8	0.30	0.00	20.2
11-04	176665	4.9	1.1	0.19	80.0	36.0	0.14	10	1.7	0.1	0.40	0.40	11	0.30	0.00	27.3
12-09	176977	19.8	1.4	0.17	78.4	37.9	0.13	10	1.1	0.1	0.20	0.50	12	0.30	0.10	40.5
1969	505860															
01-14	177273	14.1	1.2	0.16	75.2	37.9	0.17	9	1.4	0.1	0.10	0.40	10	0.30	0.00	39.4
02-10	177380	85.4	6.1	0.20	58.0	28.0	0.12	8	1.3	0.2	0.40	2.80	9	0.20	0.10	35.7
03-17	177663	37.6	1.2	0.07	69.6	34.5	0.14	10	1.1	0.1	0.10	0.30	8	0.30	0.10	37.0
04-07	177871	52.2	1.2	0.09	70.4	35.0	0.14	10	1.0	T	0.10	0.30	9	0.30	0.00	43.5
05-17	178058	26.3	1.3	0.17	70.4	35.5	0.15	10	0.7	0.1	0.00	0.20	8	0.30	0.00	45.0
06-09	178429	7.6	3.5	0.14	70.4	35.6	0.15	10	0.9	0.3	0.30	0.60	10	0.30	0.10	38.8
07-21	178976	28.3	5.5	0.30	76.0	34.7	0.16	10	1.1	0.1	0.20	0.50	12	0.40	0.00	46.0
08-19	179302	3.0	4.0	0.30	72.4	33.9	0.14	12	3.9	0.2	0.20	0.70	11	0.30	0.10	21.0
09-08	179507	1.1	4.6	0.55	54.0	27.8	0.11	14	9.3	0.6	0.40	1.10	9	0.30	0.10	12.8
10-14	179838	252.0	2.5	T	53.0	23.3	0.08	11	3.8	0.1	0.40	0.40	14	0.20	0.10	29.0
11-04	179936	18.9	1.8	0.12	77.6	37.6	0.14	9	9.1	0.1	3.10	3.30	10	0.30	0.10	14.9
12-02	180179	11.4	1.5	0.13	78.0	35.4	0.13	9	1.2	0.1	0.60	0.70	8	0.30	0.10	27.8
1970	505860															
01-13	180507	7.2	0.3	0.23	78.8	38.3	0.08	10	0.9	0.1	0.10	0.10	10	0.30	0.10	36.0
02-11	180776	8.4	0.8	0.16	74.8	36.4	0.14	10	1.0	0.2	0.10	0.30	8	0.30	0.10	33.0
03-03	180914	44.5	3.6	0.20	71.2	33.7	0.11	9	2.8	0.1	0.20	0.50	5	0.30	0.10	35.3
04-07	181177	32.9	1.5	0.06	74.0	35.9	0.11	9	0.6	0.1	0.00	0.10	4	0.30	0.10	40.6
05-01	181535	723.0	27.0	0.55	22.4	7.8	0.06	4	2.5	0.3	0.00	2.50	5	0.20	0.20	27.7
06-09	182102	52.8	6.0	0.11	73.2	34.9	0.12	8	0.7	0.1	0.00	0.30	5	0.30	0.10	52.0
07-06	182506	11.0	1.4	0.08	69.6	37.6	0.12	8	0.9	0.6	0.20	0.30	6	0.40	0.10	41.0
08-17	183507	0.7	2.9	0.15	67.2	35.0	0.16	11	2.0	0.1	0.40	0.50	8	0.30	0.20	16.0
09-23	183675	20.0	8.9	0.00	68.8	32.2	0.11	10	8.0	0.5	1.10	1.60	13	0.30	0.10	28.2
10-13	183857	3.6	3.2	0.20	80.8	40.5	0.16	9	1.5	0.1	0.20	0.30	11	0.40	0.10	40.9
11-10	184210	13.6	1.2	0.10	80.8	38.6	0.15	9	1.4	0.1	0.10	0.10	11	0.40	0.10	41.2
12-08	184440	5.7	0.4	0.14	80.0	38.1	0.16	9	0.8	0.1	0.00	0.00	10	0.40	0.10	40.4
1971	505860															
01-06	184582	16.8	1.0	0.12	86.4	40.0	0.14	10	1.3	0.1	0.10	0.20	10	0.30	0.10	43.1
02-02	184883	5.1	0.2	0.03	88.0	43.9	0.16	10	0.7	0.1	0.10	0.20	7	0.40	0.10	46.0
03-02	185061	22.1	0.9	0.11	79.2	37.1	0.14	9	0.9	0.1	0.20	0.30	9	0.30	0.10	43.0
04-13	185403	6.5	1.1	0.38	61.6	37.6	0.14	9	1.1	0.1	0.00	0.10	2	0.30	0.00	28.4
05-12	185689	13.8	7.5	0.43	65.6	31.3	0.17	12	5.7	0.4	0.80	1.20	9	0.30	0.10	30.0
06-01	185796	7.0	5.5	0.44	76.0	37.0	0.15	10	1.1	0.3	0.30	0.70	9	0.40	0.10	30.6
07-06	186124	1.8	1.7	0.00	28.8	32.1	0.04	13	3.2	1.3	0.30	0.40	5	0.50	0.10	0.8
08-05	186365	1.6	1.2	0.11	72.8	35.6	0.12	10	2.0	0.1	0.20	0.30	6	0.40	0.10	29.0

NORTH FORK MAUVAISE TERRE CREEK NEAR JACKSONVILLE

DATE	LAB.NO.	CL	S04	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505860														
10-18	170100	8	58	170	222	298			0.00					39	50.0
11-09	170198	12	61	276	310	366			0.01					43	59.0
12-07	170418	11	39	108	150	220			0.02					1320	49.4
1967	505860														
01-10	170568	12	68	272	362	418			0.01					32	33.0
02-15	170829	13	62	236	319	388		0.00	0.01				0.02	20	43.0
03-09	171053	12	51	240	326	385		0.00	0.01				0.01	13	46.0
04-11	171209	11	61	248	336	407		0.00	0.01				0.03	24	33.0
05-01	171378	11	64	256	336	403		0.00	0.00				0.02	58	66.0
06-05	171630	12	60	240	334	401		0.00	0.00				0.01	9	65.0
07-24	172357	10	52	228	308	373		0.00	0.01				0.03	64	73.0
08-07	172652	12	58	268	348	439		0.00	0.00				0.01	48	74.0
09-19	173016	14	60	260	332	404		0.00	0.01				0.02	20	70.0
10-03	173158	12	57	256	324	377		0.00	0.01				0.01	39	61.0
10-30	173372	11	60	248	326	405		0.00	0.01				0.03	301	42.0
12-07	173610	12	52	200	284	361		0.00	0.02				0.02	41	44.0
1968	505860														
01-11	173829	8	62	256	348	413		0.00	0.01				0.02	28	33.0
02-14	174014	10	56	240	332	387		0.00	0.02				0.02	38	33.0
03-04	174190	13	61	244	332	403		0.00	0.00				0.01	35	33.0
04-01	174367	12	62	246	332	415		0.00	0.01				0.02	16	43.0
05-06	174655	11	58	240	324	359		0.00	0.01				0.05	20	53.0
06-10	175005	11	58	246	332	395		0.00	0.01				0.01	99	72.0
07-11	175415	12	57	246	332	398		0.00	0.01				0.02	51	74.0
08-05	175783	11	58	264	348	415		0.00	0.01				0.02	172	73.0
09-09	176143	14	65	254	308	366		0.00	0.01				0.02	83	60.0
10-11	176488	12	56	256	328	354		0.00	0.01				0.00	41	52.0
11-04	176665	13	65	272	348	435		0.00	0.01				0.00	22	47.0
12-09	176977	12	62	264	352	413		0.00	0.01				0.00	30	33.0
1969	505860														
01-14	177273	13	61	258	344	418		0.00	0.00				0.02	29	32.0
02-10	177380	9	43	188	260	326		0.00	0.01				0.02	115	34.0
03-17	177663	13	55	244	316	397	0.00	0.00	0.01	<.05		<.05	0.01	45	41.0
04-07	177871	13	59	240	320	398	0.00	0.00	0.01	<.05		<.05	0.02	30	48.0
05-17	178058	15	56	240	322	411	0.00	0.00	0.01	<.05	0.00	<.05	0.01	31	53.0
06-09	178429	11	58	236	322	376	0.01	0.00	0.01	<.05	0.00	<.05	0.03	67	62.6
07-21	178976	11	52	252	332	422	0.00	0.00	0.01	<.05	0.00	<.05	0.03	131	84.0
08-19	179302	13	58	248	320	410	0.00	0.00	0.01	<.05	0.00	<.05	0.03	53	77.0
09-08	179507	17	58	184	249	348	0.00	0.00	0.02	<.05	0.00	<.05	0.07	110	68.0
10-14	179838	12	45	161	228	318	0.01	0.00	0.03	<.05	0.00	<.05	0.11	66	59.0
11-04	179936	10	77	252	348	420	0.00	0.00	0.01	<.05	0.00	<.05	0.02	26	52.0
12-02	180179	12	59	251	340	399	0.00	0.00	0.01	<.05	0.00	<.05	0.02	33	39.0
1970	505860														
01-13	180507	12	61	256	354	423	0.00	0.00	0.01	<.05	0.00	<.05	0.03	9	32.0
02-11	180776	14	59	244	336	397	0.00	0.00	0.01	<.05	0.00	<.05	0.04	17	34.0
03-03	180914	15	62	224	316	399	0.00	0.00	0.01	<.05	0.00	<.05	0.02	90	46.0
04-07	181177	14	56	236	332	406	0.00	0.00	0.01	<.05	0.00	<.05	0.02	29	43.0
05-01	181535	6	19	40	88	143	0.00	0.01	0.02	<.05	0.00	<.05	0.03	1570	61.0
06-09	182102	13	51	218	326	403	0.00	0.00	0.01	<.05	0.00	<.05	0.01	50	61.0
07-06	182506	12	52	240	328	391	0.00	0.00	0.02	<.05	0.00	<.05	0.01	29	72.0
08-17	183507	14	53	240	312	341	0.00	0.00	0.02	<.05	0.00	<.05	0.01	48	75.0
09-23	183675	16	56	224	304	373	0.00	0.00	0.01	<.05	0.00	<.05	0.01	163	64.0
10-13	183857	13	51	284	368	423	0.00	0.00	0.00	<.05	0.00	<.05	0.01	56	63.0
11-10	184210	13	57	272	360	442	0.00	0.00	0.01	<.05	0.00	<.05	0.01	24	52.0
12-08	184440	12	54	264	356	417	0.00	0.00	0.01	<.05	0.00	<.05	0.02	7	36.0
1971	505860														
01-06	184582	15	62	284	380	447	0.00	0.00	0.01	<.05	0.00	<.05	0.08	16	32.0
02-02	184883	14	63	296	400	467	0.00	0.00	0.01	<.05	0.00	<.05	0.04	5	33.0
03-02	185061	14	57	256	350	421	0.00	0.00	0.01	<.05	0.00	<.05	0.01	21	37.0
04-13	185403	13	56	236	308	374	0.00	0.00	0.01	<.05	0.00	<.05	0.02	27	55.0
05-12	185689	21	57	216	292	392	0.00	0.00	0.02	<.05	0.00	<.05	0.03	186	57.0
06-01	185196	15	48	264	342	422	0.00	0.00	0.03	<.05	0.00	<.05	0.02	147	68.0
07-06	186124	25	62	132	204	271	0.00	0.00	0.00	<.05	0.00	<.05	0.01	40	69.0
08-05	186365	23	50	252	328	393	0.00	0.00	0.01	<.05	0.00	<.05	0.05	35	69.8

OHIO RIVER AT CAIRO

The Ohio River is an intersectional stream rising in Pennsylvania and flowing along the southeastern border of Illinois. The drainage area at Cairo is approximately 203,900 square miles.

Samples were collected by personnel of the Cairo Water Company. The stream is not gaged at Cairo, therefore the discharge data shown are from the record for the gaging station upstream from Cairo at Metropolis.

The tabulation of water quality data is for the period from October 24, 1966, to September 20, 1971. Discharge and some quality data are shown graphically. The mean daily discharge values shown were taken from published records of the USGS from 1966 to 1970 and from provisional records in 1971.

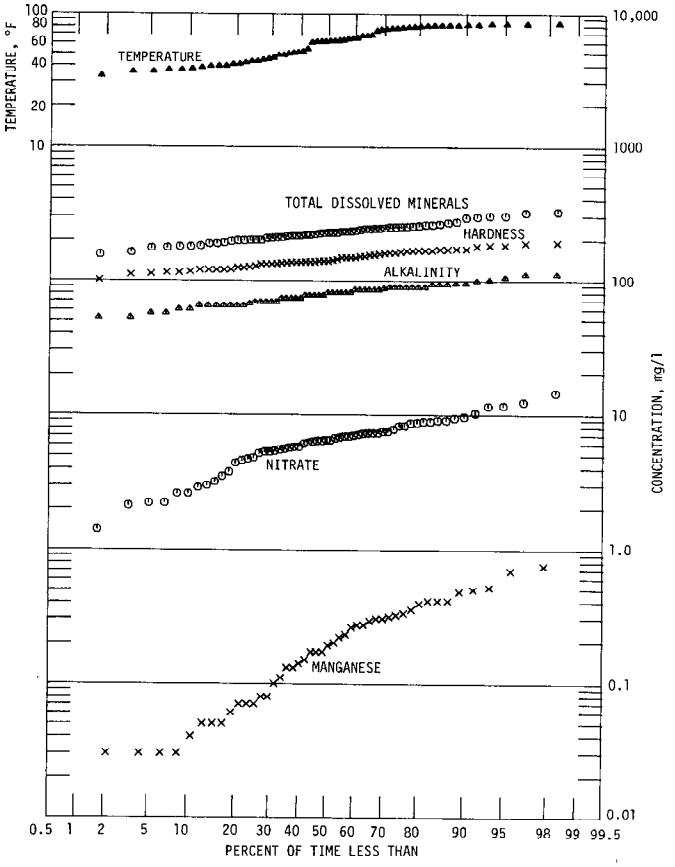
For 80 percent of the time, in the interval between 10 and 90 percent, the mean daily flow did not exceed 2.96 cfs/sq mi, nor fall below 0.48 cfs/sq mi. The median flow was 0.97 cfs/sq mi and the mean was 1.28 cfs/sq mi.

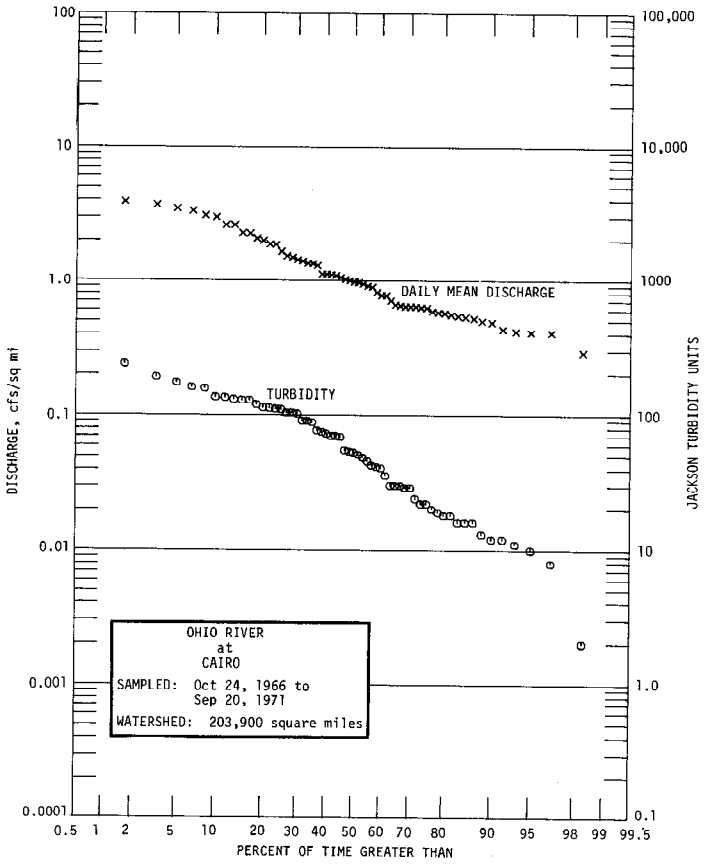
The turbidity was not less than 12 Jtu nor more than 134 Jtu for the central 80 percent of the time. The median value was 53 Jtu and the mean 68 Jtu.

Reported temperatures were over 80 F for 18 percent and over 70 F for 33 percent of the time. They were below 50 F for 35 percent and below 40 F for 17 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	60	80	94
Hardness (as $CaCO_3$)	116	140	172
Total dissolved minerals	178	228	293
Nitrate (NO_3)	2.6	6.5(6.5)	9.6
Total inorganic phosphate (PO_4)	0.1	0.5(0.68)	1.6
Soluble inorganic phosphate (PO_4)	0.0	0.1(0.18)	0.4
Manganese (Mn)	0.035	0.18	0.49





OHIO RIVER AT CAIRO

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	306125															
10-24	170143	108000.0	0.7	0.00	38.8	8.7	0.21	23	2.7	0.1	0.00	0.00	3	0.30	0.10	1.4
11-05	170424	117000.0	1.5	0.32	54.5	11.6	0.22	29	5.0	T	0.10	0.50	7	0.10	0.10	4.7
1967	306125															
01-11	170563	338000.0	18.0	0.75	48.3	10.1	0.14	12	3.1	T	0.80	1.60	8	0.20	0.10	9.0
01-24	170730	127000.0	0.2	0.04	39.4	9.7	0.19	12	2.1	T	0.20	0.60	7	0.10	0.10	7.2
02-20	170884	197000.0	1.7	0.08	50.4	13.7	0.27	20	2.4	0.1	0.50	1.10	7	0.20	0.20	12.3
03-20	171103	786000.0	9.0	0.26	31.2	8.8	0.13	8	2.6	T	0.20	0.70	7	0.10	0.00	7.8
04-24	171438	206000.0	2.3	0.00	47.2	12.2	0.21	15	2.1	T	0.00	0.40	4	0.30	0.10	8.6
05-25	171588	744000.0	5.3	0.13	32.8	7.8	0.13	8	2.5	0.1	0.30	1.10	6	0.20	0.00	7.1
06-21	171931	106000.0	0.5	0.00	37.6	9.2	0.13	10	2.1	0.1	0.00	0.50	3	0.30	0.20	6.5
07-24	172328	143000.0	2.2	0.11	32.4	8.5	0.15	9	2.0	T	0.10	0.30	4	0.10	0.10	3.8
08-22	172865	120000.0	1.5	0.07	32.8	7.3	0.18	14	1.9	0.1	0.60	0.90	3	0.10	0.10	3.5
09-26	173177	83600.0	0.6	0.00	32.4	7.1	0.11	14	1.9	T	0.10	0.20	4	0.10	0.20	2.6
10-26	173387	133000.0	1.5	0.15	38.4	9.7	0.19	21	3.8	T	0.10	0.40	2	0.20	0.00	5.3
12-04	173652	380000.0	9.1	0.48	39.2	9.7	0.21	24	3.4	T	0.20	1.40	5	0.30	0.10	3.0
12-26	173799	622000.0	5.8	0.27	40.0	10.8	0.16	13	3.5	0.2	0.20	2.30	6	0.30	0.10	10.2
1968	306125															
01-23	173901	272000.0	2.0	0.14	41.6	10.7	0.18	21	2.0	0.5	0.20	0.40	6	0.20	0.10	6.2
02-19	174099	263000.0	9.8	0.20	46.8	12.4	0.15	12	3.0	0.2	0.10	0.90	7	0.10	0.00	11.5
03-27	174357	673000.0	9.2	0.41	34.4	8.3	0.11	13	2.1	0.3	0.60	1.30	7	0.20	0.20	5.3
05-02	174786	184000.0	1.3	0.00	45.6	11.7	0.13	14	2.0	T	0.10	0.60	3	0.10	0.00	7.5
05-27	174900	420000.0	6.8	0.39	47.2	12.8	0.19	21	2.0	T	0.20	1.00	4	0.20	0.00	8.8
06-24	175362	129000.0	1.0	0.07	45.2	11.4	0.18	12	2.1	0.0	0.10	0.60	3	0.20	0.10	7.3
08-13	176086	181000.0	11.0	0.41	46.4	13.1	0.23	16	3.1	0.1	0.10	0.80	3	0.30	0.10	7.0
09-24	176331	59000.0	0.1	0.05	39.2	10.2	0.17	17	2.5	0.2	0.10	0.20	2	0.20	0.10	4.8
10-21	176612	98700.0	1.3	0.00	33.6	8.8	0.14	15	2.0	0.2	0.10	0.30	3	0.30	0.10	2.6
11-29	176939	202000.0	5.0	0.30	48.8	12.2	0.20	30	4.0	0.4	0.30	0.90	10	0.30	0.10	6.9
1969	306125															
01-13	177282	129000.0	5.4	0.31	47.2	13.1	0.23	17	2.7	0.5	0.40	1.20	7	0.20	0.10	8.8
01-27	177359	457000.0	7.3	0.35	39.2	10.2	0.18	14	2.8	0.4	0.30	1.30	6	0.10	0.10	7.3
02-24	177529	274000.0	5.8	0.23	46.4	12.6	0.17	12	2.2	0.2	0.30	0.90	7	0.20	0.00	9.0
03-24	177760	131000.0	3.7	0.29	46.4	12.2	0.17	17	2.2	0.1	0.20	0.50	2	0.20	0.10	4.4
04-28	178034	463000.0	2.3	0.17	38.4	10.7	0.17	10	1.9	0.1	0.40	0.50	6	0.20	0.10	6.7
05-26	178346	286000.0	2.2	0.17	42.4	11.2	0.18	15	2.4	0.1	0.30	0.30	5	0.20	0.10	7.5
06-23	178789	165000.0	1.8	0.05	41.8	10.6	0.19	15	2.9	0.2	0.40	0.60	2	0.30	0.00	14.3
07-30	179286	157000.0	0.5	0.03	42.4	11.2	0.20	21	3.0	0.2	0.10	0.10	2	0.30	0.00	5.7
08-25	179375	213000.0	2.0	0.10	52.8	14.2	0.24	26	4.0	0.2	0.20	0.60	2	0.40	0.10	6.8
09-22	179642	82900.0	0.8	0.00	34.4	8.5	0.13	16	2.9	0.2	0.10	0.30	2	0.20	0.10	3.2
10-27	179910	101000.0	1.1	0.07	37.2	10.2	0.12	15	3.0	0.1	0.20	0.40	5	0.20	0.10	6.3
11-24	180149	226000.0	4.6	0.22	54.0	14.0	0.34	30	4.0	0.5	0.10	0.10	4	0.30	0.10	8.2
1970	306125															
01-07	180632	699000.0	12.0	0.03	39.2	8.8	0.17	16	2.2	0.8	0.20	1.60	5	0.20	0.10	4.6
01-26	180617	191000.0	4.5	T	38.8	9.5	0.13	16	2.0	0.5	0.10	0.50	6	0.20	0.10	5.2
02-24	180867	530000.0	9.2	0.41	36.0	8.8	0.17	12	2.2	0.3	0.10	0.10	6	0.20	0.10	6.1
03-30	181107	381000.0	7.0	0.30	38.0	10.5	0.13	13	1.9	0.2	0.10	0.60	4	0.20	0.20	6.9
04-27	181491	532000.0	6.1	0.33	36.0	10.2	0.14	12	2.4	0.1	0.10	2.30	2	0.20	0.10	7.3
05-26	181815	222000.0	1.5	0.06	46.0	12.4	0.18	12	2.2	T	0.10	0.20	6	0.20	0.10	9.4
06-29	182447	129000.0	1.6	T	44.8	11.2	0.15	16	2.5	0.2	0.00	0.10	2	0.20	0.10	6.5
07-28	183243	126000.0	3.3	0.00	40.8	9.7	0.16	17	2.0	0.1	0.00	0.00	2	0.30	0.00	2.9
08-31	183620	88000.0	1.1	0.00	33.6	8.8	0.13	17	2.1	0.1	0.00	0.20	1	0.30	0.10	2.1
09-28	183709	84600.0	0.5	0.00	35.2	8.8	0.15	17	2.3	T	0.30	0.40	2	0.30	0.10	2.2
10-29	184107	116000.0	1.5	0.03	50.4	13.1	0.23	29	3.3	0.1	0.00	0.10	4	0.40	0.10	9.6
11-23	184300	226000.0	3.7	0.17	44.0	11.2	0.16	21	3.0	0.1	0.10	0.50	7	0.30	0.10	6.4
1971	306125															
01-04	184560	306000.0	12.0	0.69	34.4	9.2	0.14	11	2.8	0.2	0.10	1.00	6	0.30	0.00	5.8
01-25	184782	313000.0	6.2	0.19	39.2	9.2	0.16	11	2.2	0.3	0.10	0.30	6	0.20	0.10	6.4
02-22	184985	604000.0	13.0	0.05	34.4	8.3	0.12	14	2.4	0.4	0.10	1.00	5	0.30	0.10	5.8
03-22	185266	405000.0	6.5	0.27	43.2	11.7	0.20	13	2.3	0.8	0.20	0.70	6	0.20	0.10	11.4
04-21	185491	110000.0	0.9	0.08	44.8	12.7	0.20	16	2.0	0.2	0.00	0.10	4	0.30	0.10	5.5
05-25	185769	292000.0	11.0	0.50	35.2	9.7	0.16	11	2.2	0.1	0.10	0.70	6	0.20	0.10	5.4
06-21	185949	195000.0	7.3	0.52	41.6	10.7	0.19	17	2.5	0.1	0.20	2.80	3	0.20	0.10	8.7
07-26	186293	113000.0	2.1	0.03	41.6	10.7	0.19	16	2.7	0.1	0.10	0.20	4	0.30	0.10	8.2
08-23	186504	157000.0	2.3	0.13	29.6	6.3	0.10	11	1.9	0.1	0.00	0.30	3	0.20	0.10	2.2
09-20	186697	224000.0	5.2	0.00	38.4	8.8	0.19	18	3.4	0.1	0.10	0.50	4	0.30	0.10	5.6

OHIO RIVER AT CAIRO

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	306125														
10-24	170143	35	66	66	133	220			0.02					12	60.8
11-05	170424	39	100	80	183	319			0.01					69	53.6
1967	306125														
01-11	170563	20	61	92	162	239			0.02					127	39.2
01-24	170730	19	50	80	138	200		0.00	0.01				0.02	22	42.8
02-20	170884	28	86	92	182	293		0.00	0.01				0.01	49	33.1
03-20	171103	11	51	52	114	175		0.00	0.01				0.02	77	44.0
04-24	171438	24	74	88	168	265		0.00	0.01				0.03	51	61.7
05-25	171588	10	47	68	114	189		0.00	0.01				0.02	88	62.6
06-21	171931	12	43	84	132	192		0.00	0.01				0.01	13	80.6
07-24	172328	11	38	76	116	178		0.00	0.02				0.05	30	79.7
08-22	172865	16	25	66	112	156		0.00	0.06				0.05	16	77.0
09-26	173177	17	45	66	110	176		0.00	0.01				0.01	11	73.4
10-26	173387	27	75	64	136	250		0.00	0.01				0.01	36	60.8
12-04	173652	38	75	52	138	244		0.00	0.01				0.02	134	49.1
12-26	173799	20	60	80	144	209		0.00	0.02				0.05	104	42.8
1968	306125														
01-23	173901	23	63	84	148	234		0.00	0.01				0.03	46	39.2
02-19	174099	21	60	94	168	236		0.00	0.02				0.04	109	38.3
03-27	174357	15	61	60	120	207		0.00	0.02				0.04	156	48.2
05-02	174786	18	72	92	162	253		0.00	0.01				0.02	20	64.4
05-27	176900	26	90	84	170	271		0.00	0.01				0.03	112	67.1
06-24	175362	15	59	104	160	251		0.00	0.02				0.02	18	78.8
08-13	176086	23	77	110	170	260		0.00	0.01				0.04	119	82.4
09-24	176331	27	55	88	140	215		0.00	0.01				0.02	12	76.1
10-21	176612	20	47	76	120	201		0.00	0.02				0.01	18	67.1
11-29	176939	42	96	76	172	298		0.00	0.03				0.00	102	50.2
1969	306125														
01-13	177282	25	82	94	172	275		0.00	0.02				0.04	90	35.6
01-27	177359	21	55	80	140	219		0.00	0.02				0.07	133	37.4
02-24	177529	20	66	100	168	254		0.00	0.01				0.02	70	36.6
03-24	177760	24	69	110	166	246		0.00	0.01				0.01	55	50.0
04-28	178034	15	52	88	140	226	0.00	0.00	0.03	<.05	0.00	<.05	0.04	70	59.9
05-26	178346	19	73	84	152	229	0.00	0.00	0.03	<.05	0.00	<.05	0.04	30	68.0
06-23	178789	18	65	86	148	232	0.00	0.00	0.02	<.05	0.00	<.05	0.03	24	77.0
07-30	179286	32	77	76	152	260	0.00	0.00	0.02	<.05	0.00	<.05	0.03	8	82.4
08-25	179375	40	103	88	190	303	0.00	0.00	0.02	<.05	0.00	<.05	0.04	29	80.2
09-22	179642	21	51	56	121	178	0.00	0.00	0.02	<.05	0.00	<.05	0.06	10	75.6
10-27	179910	21	48	76	135	210	0.00	0.00	0.03	<.05	0.00	<.05	0.03	19	60.6
11-24	180149	46	98	88	192	325	0.00	0.00	0.01	<.05	0.00	<.05	0.05	53	48.0
1970	306125														
01-07	180632	23	67	64	134	228	0.00	0.00	0.02	<.05	0.00	<.05	0.10	159	36.7
01-26	180617	22	65	72	136	221	0.00	0.00	0.03	<.05	0.00	<.05	0.05	75	35.4
02-24	180867	20	63	60	126	199	0.00	0.00	0.02	<.05	0.00	<.05	0.06	127	40.5
03-30	181107	20	63	72	138	228	0.00	0.00	0.03	<.05	0.00	<.05	0.05	110	45.0
04-27	181491	17	64	64	132	216	0.00	0.00	0.03	<.05	0.00	<.05	0.02	113	61.3
05-26	181815	18	63	98	166	242	0.00	0.00	0.03	<.05	0.00	<.05	0.02	30	74.8
06-29	182447	31	62	84	158	256	0.00	0.00	0.04	<.05	0.00	<.05	0.01	29	79.3
07-28	183243	24	63	80	142	218	0.00	0.00	0.02	<.05	0.00	<.05	0.03	43	82.0
08-31	183620	24	69	56	120	199	0.00	0.00	0.01	<.05	0.01	<.05	0.06	16	83.0
09-28	183709	26	56	68	124	195	0.00	0.00	0.02	<.05	0.00	<.05	0.01	2	81.0
10-29	184107	38	110	72	180	303	0.00	0.00	0.01	<.05	0.01	<.05	0.35	22	64.0
11-23	184300	29	87	64	156	245	0.00	0.00	0.01	<.05	0.00	<.05	0.04	54	51.0
1971	306125														
01-04	184560	13	54	64	124	181	0.00	0.00	0.01	<.05	0.00	<.05	0.06	190	42.0
01-25	184782	14	61	72	136	189	0.00	0.00	0.02	<.05	0.00	<.05	0.04	90	39.0
02-22	184985	19	55	68	120	208	0.00	0.00	0.04	<.05	0.00	<.05	0.04	240	41.0
03-22	185266	19	62	88	156	216	0.00	0.00	0.01	<.05	0.00	<.05	0.04	104	45.9
04-21	185491	23	77	88	164	253	0.00	0.00	0.01	<.05	0.00	<.05	0.02	16	61.5
05-25	185769	14	64	68	128	201	0.00	0.00	0.03	<.05	0.00	<.05	0.03	129	64.9
06-21	185949	22	70	80	148	243	0.00	0.00	0.02	<.05	0.00	<.05	0.05	172	81.1
07-26	186293	20	67	84	148	232	0.00	0.00	0.00	<.05	0.00	<.05	0.00	42	80.6
08-23	186504	13	36	68	100	162	0.00	0.00	0.01	<.05	0.00	<.05	0.00	41	80.6
09-20	186697	22	69	72	132	225	0.00	0.00	0.01	<.05	0.00	<.05	0.02	73	77.2

PECATONICA RIVER AT FREEPORT

The Pecatonica River rises in southwestern Wisconsin, west of Dodgeville, and flows southeasterly into the Rock River Hills Region of Illinois and then easterly to its confluence with the Rock River near Rockton. The gaging station at Freeport is located 0.3 mile upstream from the Stephenson Street Bridge. Elevation of gage datum is 743.18 feet above mean sea level. The drainage basin above the gage has an area of approximately 1330 square miles.

The tabulation of water quality data is for the period from October 11, 1966, to September 9, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

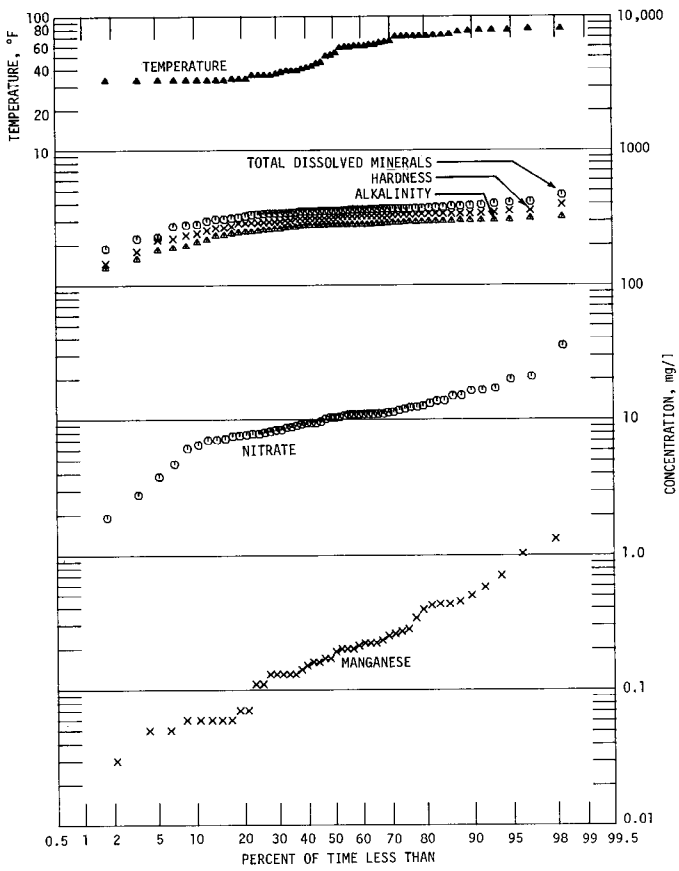
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 0.95 cfs/sq mi, nor fall below 0.26 cfs/sq mi. The median flow was 0.42 cfs/sq mi and the mean was 0.497 cfs/sq mi.

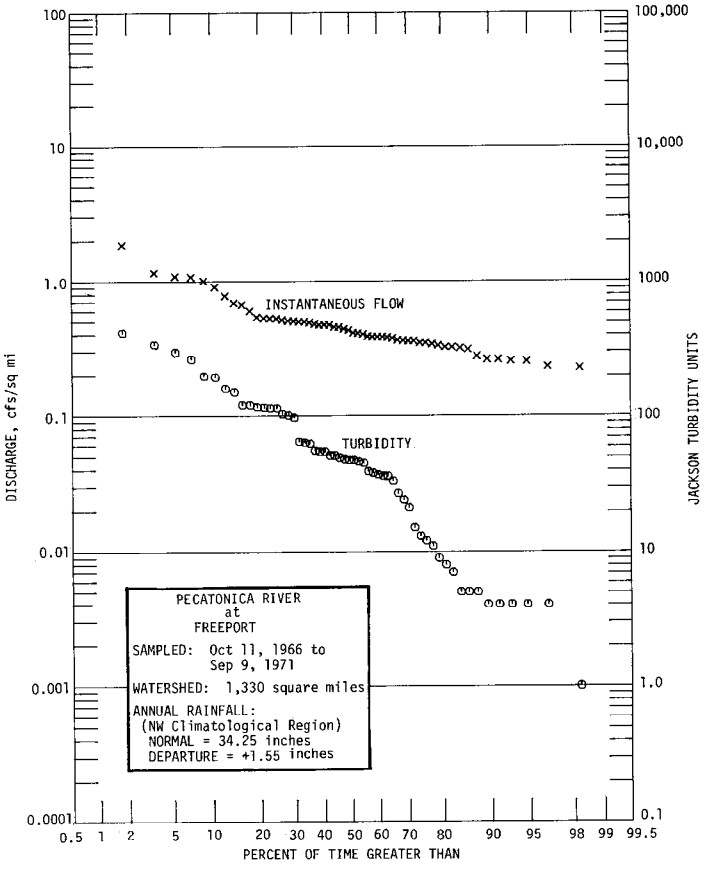
The turbidity was not less than 4 Jtu nor more than 195 Jtu for the central 80 percent of the time. The median value was 47 Jtu and the mean 73 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 25 percent of the time. They were below 50 F for 46 percent and below 40 F for 37 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	208	279	300
Hardness (as $CaCO_3$)	240	318	336
Total dissolved minerals	280	352	385
Nitrate (NO_3)	6.5	10.3(10.7)	16.2
Total inorganic phosphate (PO_4)	0.2	0.8(0.94)	1.8
Soluble inorganic phosphate (PO_4)	0.2	0.4(0.46)	0.7
Manganese (Mn)	0.06	0.19	0.50





PECATONICA RIVER AT FREEPORT

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	504355															
10-11	170054	337.0	1.5	0.21	67.2	38.1		8	2.6	0.0	0.30	0.70	9	0.10	0.10	6.1
11-08	170201	419.0	1.0	0.06	65.2	37.6	0.11	7	2.2	0.2	0.10	0.10	7	0.10	0.10	7.8
12-07	170383	339.0	0.5	0.07	70.4	39.0	0.09	7	2.4	0.2	0.00	0.00	10	0.10	0.00	8.3
1967	504355															
01-11	170617	346.0	0.2	0.00	66.9	34.9	0.06	6	2.1	0.2	0.10	0.10	7	0.10	0.00	10.8
02-08	170798	477.0	0.4	0.05	62.8	32.0	0.06	5	3.9	0.1	0.70	0.80	12	0.10	0.00	11.9
03-07	171051	660.0	0.4	0.03	51.2	27.4	0.02	6	6.6	T	1.60	1.80	9	0.10	0.10	16.3
04-03	171177	1330.0	3.3	0.17	60.4	28.0	0.06	6	4.5	T	0.30	0.40	6	0.10	0.00	10.3
05-18	171533	604.0	2.1	0.05	63.6	34.3	0.05	6	2.7	0.0	0.20	0.40	6	0.10	0.10	8.1
06-19	171904	1440.0	17.0	0.58	61.6	28.8	0.03	5	3.9	0.1	0.50	1.60	7	0.20	0.10	9.6
07-20	172355	625.0	5.4	0.15	56.0	29.9	0.15	5	4.3	T	0.70	1.20	8	0.20	0.10	7.0
08-16	173220	308.0	1.8	0.13	63.8	36.2	0.05	6	2.2	0.3	0.40	0.70	5	0.10	0.10	1.9
09-20	173180	411.0	12.0	0.43	55.2	28.3	0.06	6	6.0	T	0.70	1.70	10	0.10	0.00	7.6
10-18	173359	512.0	1.9	0.13	60.8	33.7	0.05	7	4.8	0.1	0.50	0.80	5	0.10	0.00	8.7
11-15	173559	639.0	1.1	0.06	69.2	36.8	0.07	6	2.1	T	0.30	0.40	5	0.10	0.00	10.8
12-13	173708	585.0	0.6	T	66.0	37.1	0.08	7	2.1	0.1	0.00	0.20	5	0.20	0.10	11.2
1968	504355															
01-03	173910	300.0	0.3	T	62.8	37.8	0.06	6	2.0	0.1	0.20	0.40	10	0.10	0.10	11.3
01-30	173956	700.0	4.4	0.27	50.8	25.9	0.05	6	8.0	1.3	0.20	4.50	6	0.10	0.00	10.9
03-21	174351	627.0	1.4	0.13	63.2	33.7	0.06	8	3.0	0.3	0.40	1.30	7	0.10	0.00	9.2
04-01	174496	427.0	1.5	0.26	65.6	36.1	0.05	6	2.3	0.1	0.40	0.70	2	0.10	0.00	8.0
05-22	174883	498.0	2.1	0.11	66.4	37.5	0.08	7	1.7	0.2	0.70	0.80	4	0.10	0.10	7.8
06-13	175093	478.0	9.6	0.20	65.6	31.3	0.08	13	3.0	0.2	1.00	2.00	13	0.20	0.10	7.5
07-16	175661	450.0	4.8	0.50	62.8	37.3	0.06	6	2.5	0.3	0.40	1.10	10	0.10	0.00	8.8
08-14	175971	511.0	5.4	0.39	58.4	34.7	0.06	4	3.7	0.1	0.70	2.40	8	0.10	0.00	7.1
09-10	176235	572.0	5.1	0.42	60.8	34.0	0.03	3	3.4	0.2	0.60	1.60	8	0.10	0.00	7.7
10-16	176588	540.0	3.7	0.25	69.6	39.4	0.06	6	3.0	0.1	0.30	0.70	9	0.10	0.00	9.3
11-14	176810	474.0	1.7	T	68.0	39.4	0.03	7	1.9	0.1	0.30	0.60	6	0.10	0.10	10.0
12-04	177098	461.0	0.3	0.06	69.6	39.4	0.04	7	2.0	0.1	0.30	0.40	7	0.10	0.10	11.0
1969	504355															
01-16	177308	367.0	0.2	T	68.8	38.4	0.06	7	1.9	0.3	0.70	0.70	10	0.10	0.10	12.3
02-11	177471	680.0	0.5	0.13	70.8	37.2	0.07	23	2.5	0.5	0.20	0.20	10	0.10	0.10	11.0
03-19	177814	884.0	0.5	0.28	60.4	32.8	0.05	7	3.9	0.9	0.50	0.50	9	0.10	0.10	9.0
04-04	178028	1030.0	8.5	0.43	33.6	14.8	0.05	12	2.2	0.3	0.50	1.60	4	0.10	0.10	6.5
05-15	178339	667.0	3.0	0.22	69.6	36.6	0.07	8	2.5	0.1	0.70	1.00	8	0.10	0.00	16.2
06-16	178813	706.0	2.0	0.07	72.8	37.5	0.05	10	1.4	0.1	0.60	0.70	10	0.20	0.00	19.8
07-17	179048	1430.0	10.0	0.71	69.2	35.4	0.04	7	3.8	0.2	0.90	0.90	11	0.10	0.10	10.8
08-19	179433	716.0	2.1	0.22	76.0	39.5	0.05	9	3.1	0.3	0.40	0.60	8	0.20	0.10	7.2
09-12	179548	544.0	3.7	0.13	69.6	39.5	0.07	8	2.6	0.1	0.40	0.70	10	0.20	0.00	16.8
10-17	179932	601.0	1.7	0.11	66.4	38.4	0.03	7	3.3	0.3	0.40	1.00	8	0.10	0.10	9.4
11-13	180164	534.0	0.4	0.22	70.4	38.5	0.04	7	1.5	0.1	0.70	1.80	5	0.10	0.10	10.4
1970	504355															
01-22	180911		0.3	0.06	60.0	16.2	0.06	3	1.1	0.1	0.20	0.30	5	0.20	0.10	4.7
03-05	181085	1530.0	1.6	T	46.0	25.5	0.03	6	5.5	1.2	1.10	1.50	4	0.10	0.20	11.7
05-21	181898	652.0	15.0	1.32	70.4	37.6	0.05	7	3.1	T	0.50	2.10	9	0.10	0.10	13.7
06-10	182464	699.0	15.0	1.03	72.8	38.5	0.07	7	2.8	T	0.50	1.10	12	0.20	0.10	14.9
07-09	183249	482.0	6.0	0.00	68.4	40.1	0.03	6	2.2	T	0.40	0.80	8	0.20	0.00	10.6
08-06	183611	347.0	4.2	0.19	66.4	39.4	0.04	8	2.7	0.4	0.40	0.60	8	0.20	0.10	14.8
09-24	183894	910.0	9.5	0.34	61.6	32.2	0.05	7	4.8	T	1.10	1.50	9	0.20	0.30	10.9
10-28	184128	670.0	2.4	0.17	65.6	38.1	0.07	6	2.7	0.1	0.30	0.90	7	0.20	0.00	9.4
11-23	184438	659.0	0.6	0.06	68.8	37.1	0.07	6	2.3	0.1	0.10	0.10	8	0.20	0.10	10.9
12-24	184575	508.0	2.1	0.16	73.6	39.0	0.08	7	1.8	0.3	0.20	0.50	7	0.20	0.10	12.2
1971	504355															
01-12	184783	461.0	0.1	0.00	74.4	41.5	0.06	7	1.8	0.3	0.20	0.30	9	0.20	0.10	13.1
02-17	185083	505.0	0.1	0.00	70.4	30.3	0.10	10	4.9	3.2	0.70	0.80	11	0.30	0.10	20.7
03-17	185312	2460.0	4.9	0.23	40.0	18.5	0.04	5	5.0	1.2	0.70	1.10	6	0.10	0.10	12.5
04-07	185534	1200.0	1.8	0.14	68.0	34.7	0.11	6	2.0	0.7	0.20	0.90	7	0.20	0.00	13.6
05-12	185813	795.0	2.1	0.20	66.4	37.6	0.04	6	2.0	0.3	0.30	0.60	3	0.20	0.10	2.8
06-17	185995	628.0	2.7	0.20	91.2	40.0	0.15	12	2.2	T	0.20	1.00	12	0.30	0.10	35.2
07-09	186277	509.0	2.9	0.16	67.6	37.8	0.05	7	2.0	0.1	0.30	0.60	9	0.20	0.00	10.3
08-05	186599	439.0	4.9	0.00	68.8	36.1	0.05	7	2.7	0.1	0.50	0.80	8	0.20	0.10	3.8
09-09	186634	427.0	6.2	0.45	65.6	36.1	0.06	7	2.8	T	0.50	0.90	9	0.20	0.10	8.4

PECATONICA RIVER AT FREEPORT

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	504355														
10-11	170054	10	33	292	324	369								54	53.0
11-08	170201	7	29	280	317	352			0.01					15	45.0
12-07	170383	9	32	300	336	362			0.02					5	34.0
1967	504355														
01-11	170617	8	28	276	311	358			0.01					4	33.0
02-08	170798	7	32	244	288	311		0.00	0.01				0.02	12	33.0
03-07	171051	9	29	188	240	280		0.00	0.01				0.01	4	33.0
04-03	171177	8	36	232	266	306		0.00	0.05				0.07	55	39.0
05-18	171533	7	33	260	300	331		0.00	0.00				0.00	51	60.0
06-19	171904	7	27	240	272	324		0.00	0.01				0.02	295	72.0
07-20	172355	7	27	230	263	297		0.00	0.01				0.02	119	71.0
08-16	173220	7	29	280	308	336		0.00	0.01				0.01	47	71.0
09-20	173180	8	33	216	254	306		0.00	0.04				0.04	119	71.0
10-18	173359	10	32	256	290	350		0.00	0.01				0.01	51	50.0
11-15	173559	7	35	284	324	366		0.00	0.01				0.01	13	39.0
12-13	173708	8	33	274	317	351		0.00	0.01				0.01	9	36.0
1968	504355														
01-03	173910	7	32	276	312	350		0.00	0.01				0.05	5	33.0
01-30	173956	10	30	208	233	278		0.00	0.01				0.02	114	34.0
03-21	174351	10	28	256	296	339		0.00	0.01				0.01	21	42.0
04-01	174496	8	29	280	312	341		0.00	0.01				0.03	36	51.0
05-22	174883	8	29	286	320	340		0.00	0.00				0.05	47	58.0
06-13	175093	15	26	248	292	359		0.00	0.01				0.03	263	72.0
07-16	175661	7	29	277	310	365		0.00	0.01				0.03	113	78.0
08-14	175971	9	28	268	288	317		0.00	0.01				0.02	149	73.0
09-10	176235	9	26	260	292	334		0.00	0.01				0.02	102	61.0
10-16	176588	7	35	302	336	361		0.00	0.02				0.06	39	64.0
11-14	176810	7	34	296	332	354		0.00	0.01				0.01	27	37.0
12-04	177098	8	27	300	336	365		0.00	0.01				0.01	4	36.0
1969	504355														
01-16	177308	9	29	292	330	361		0.00	0.01				0.03	5	33.0
02-11	177471	27	37	296	330	403		0.00	0.01				0.08	8	33.0
03-19	177814	10	33	266	286	341	0.00	0.01	0.02	<.05		<.05	0.02	7	33.0
04-04	178028	14	24	134	145	186	0.00	0.00	0.02	<.05	0.00	<.05	0.08	193	36.0
05-15	178339	12	34	300	324	374	0.00	0.00	0.03	<.05	0.00	<.05	0.11	54	65.0
06-16	178813	11	41	284	336	409	0.00	0.00	0.01	<.05	0.00	<.05	0.04	45	60.0
07-17	179048	10	29	316	318	385	0.00	0.00	0.01	<.05	0.00	<.05	0.07	115	70.0
08-19	179433	30	37	276	352	388	0.00	0.00	0.02	<.05	0.00	<.05	0.11	33	78.0
09-12	179548	10	34	295	336	375	0.00	0.00	0.03	<.05	0.00	<.05	0.07	48	63.0
10-17	179932	10	33	282	324	352	0.00	0.00	0.01	<.05	0.00	<.05	0.02	24	44.0
11-13	180164	10	34	290	334	365	0.00	0.00	0.01	<.05	0.00	<.05	0.02	4	41.0
1970	504355														
01-22	180911	4	16	194	216	220	0.00	0.00	0.01	<.05	0.00	<.05	0.02	4	33.0
03-05	181085	11	28	180	220	272	0.00	0.00	0.02	<.05	0.00	<.05	0.03	37	38.0
05-21	181898	12	36	276	330	383	0.00	0.00	0.02	<.05	0.00	<.05	0.07	413	61.0
06-10	182464	11	35	288	340	398	0.00	0.00	0.01	<.05	0.00	<.05	0.02	337	70.0
07-09	183249	10	33	296	336	362	0.00	0.00	0.02	<.05	0.00	<.05	0.06	113	78.0
08-06	183611	11	32	280	328	339	0.00	0.00	0.01	<.05	0.00	<.05	0.08	63	80.0
09-24	183894	11	33	248	286	349	0.00	0.00	0.01	<.05	0.00	<.05	0.04	196	71.0
10-28	184128	9	33	280	320	350	0.00	0.00	0.01	<.05	0.00	<.05	0.02	49	59.0
11-23	184438	10	30	280	324	351	0.00	0.00	0.01	<.05	0.00	<.05	0.01	11	36.0
12-24	184575	10	30	300	344	360	0.00	0.00	0.00	<.05	0.00	<.05	0.05	38	34.0
1971	504355														
01-12	184783	11	32	308	356	366	0.00	0.00	0.01	<.05	0.00	<.05	0.04	0	33.0
02-17	185083	13	51	252	300	383	0.00	0.00	0.02	<.05	0.00	<.05	0.01	1	39.0
03-17	185312	8	22	156	176	225	0.00	0.00	0.01	<.05	0.00	<.05	0.06	96	40.0
04-07	185534	10	34	268	312	352	0.00	0.00	0.01	<.05	0.00	<.05	0.04	36	60.0
05-12	185813	10	31	278	320	343	0.00	0.00	0.01	<.05	0.00	<.05	0.03	46	59.0
06-17	185995	22	75	280	392	462	0.00	0.00	0.02	<.05	0.00	<.05	0.01	64	
07-09	186277	10	29	292	324	367	0.00	0.00	0.01	<.05	0.00	<.05	0.00	62	77.0
08-05	186599	9	30	288	320	370	0.00	0.00	0.01	<.05	0.00	<.05	0.04	100	76.0
09-09	186634	10	30	280	312	371	0.00	0.00	0.00	<.05	0.00	<.05	0.02	159	80.0

SANGAMON RIVER AT MAHOMET

The Sangamon River rises between Bloomington and Gibson City in the Bloomington Ridged Plain — South and flows through that region and into the Springfield Plain. The gaging station at Mahomet is located at the downstream side of the bridge on U.S. Route 150. Elevation of gage datum is 665.11 feet above mean sea level. The drainage basin above the gage has an area of approximately 356 square miles.

The tabulation of water quality data is for the period from October 13, 1966, to September 7, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

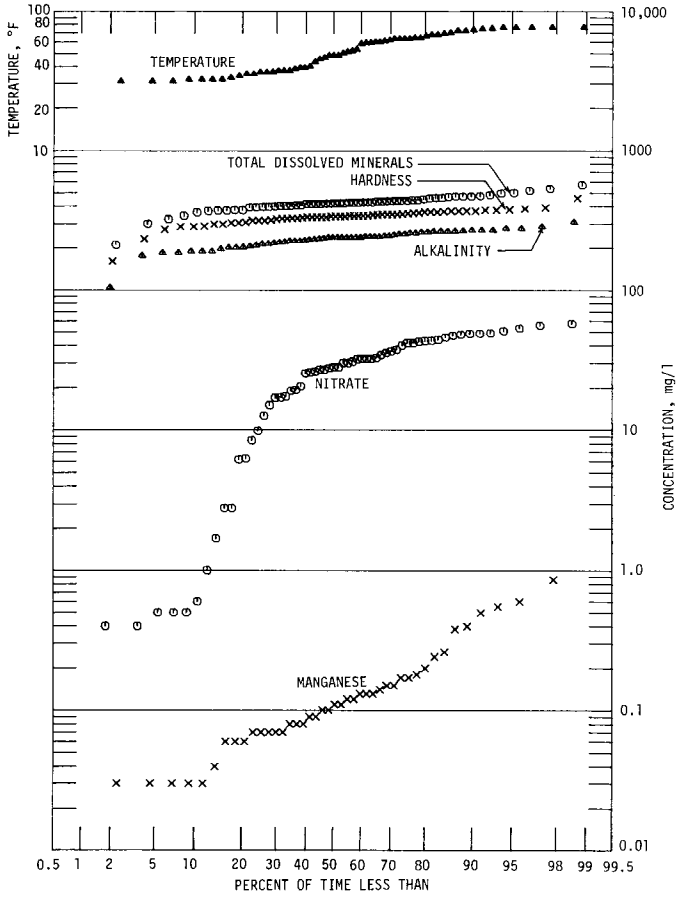
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.35 cfs/sq mi, nor fall below 0.02 cfs/sq mi. The median flow was 0.28 cfs/sq mi and the mean was 0.55 cfs/sq mi.

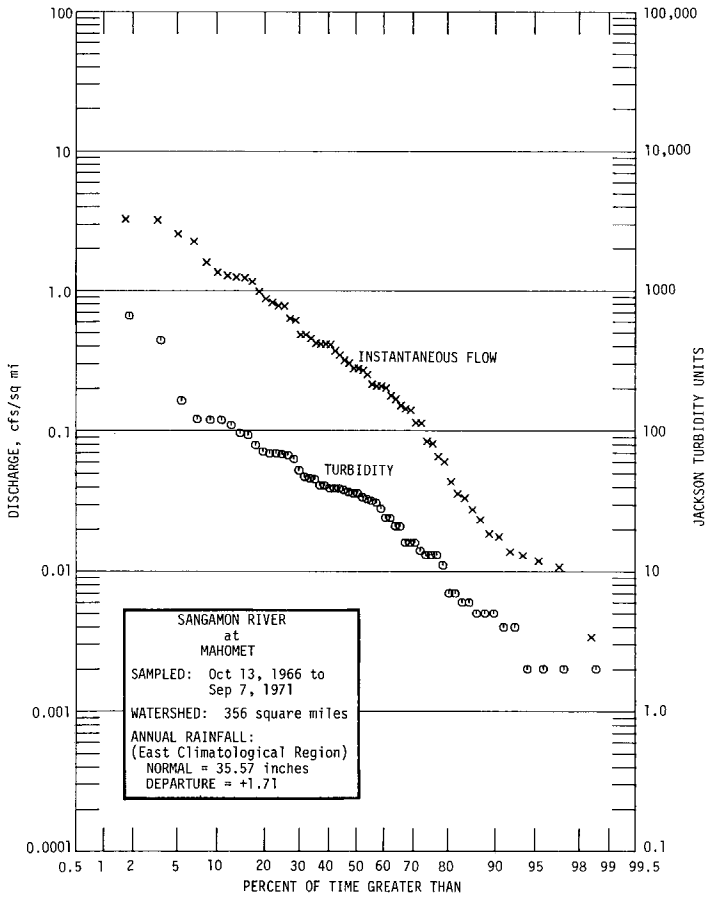
The turbidity was not less than 4 Jtu nor more than 119 Jtu for the central 80 percent of the time. The median value was 34 Jtu and the mean 57 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 17 percent of the time. They were below 50 F for 45 percent and below 40 F for 33 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	188	236	268
Hardness (as $CaCO_3$)	286	338	372
Total dissolved minerals	366	420	478
Nitrate (NO_3)	0.6	28.1(26.9)	48.5
Total inorganic phosphate (PO_4)	0.2	0.5(0.51)	0.8
Soluble inorganic phosphate (PO_4)	0.1	0.2(0.27)	0.5
Manganese (Mn)	0.03	0.11	0.45





SANGAMON RIVER AT MAHOMET

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505710															
10-13	170082	3.8	0.8	0.86	75.2	37.1	0.21	27	3.1	T	0.30	0.30	5	0.30	0.10	1.0
11-01	170157	4.6	1.7	0.38	74.7	35.0	0.27	40	4.6	0.1	0.70	0.80	8	0.30	0.20	0.6
12-16	170460	350.0	0.6	0.04	79.6	33.4	0.14	6	2.8	T	0.10	0.40	10	0.20	0.20	42.8
1967	505710															
01-10	170643	75.7	0.2	T	91.8	36.7	0.16	11	1.5	T	0.40	0.40	8	0.30	0.10	36.3
02-20	170848	482.0	1.3	0.00	77.0	32.4	0.11	8	1.6	T	0.10	0.80	9	0.30	0.10	47.7
03-15	171048	455.0	1.0	0.12	74.4	31.5	0.10	6	1.0	0.1	0.40	0.80	8	0.20	0.10	48.8
04-05	171179	446.0	23.0	0.55	70.8	28.9	0.11	10	1.6	0.1	0.00	0.70	6	0.30	0.10	41.5
05-10	171403	1140.0	6.6	0.17	75.8	30.4	0.12	6	1.3	0.0	0.10	0.70	5	0.20	0.10	57.4
06-19	171782	73.6	1.3	0.06	80.0	35.6	0.16	9	2.1	T	0.50	0.60	8	0.20	0.10	32.6
07-12	172073	28.8	1.3	0.12	73.2	36.4	0.17	14	1.8	0.2	0.20	0.70	4	0.20	0.10	9.9
08-09	173215	15.5	1.8	0.09	66.8	33.2	0.15	17	2.4	T	0.30	0.50	6	0.30	0.10	2.8
09-25	173038	1.2	7.4	0.60	79.2	41.5	0.18	28	2.6	T	0.20	0.70	9	0.10	0.20	2.8
10-20	173307	9.8	7.6	0.26	74.6	36.9	0.27	56	4.9	0.2	0.30	1.00	2	0.10	0.00	1.7
11-15	173426	30.0	0.3	0.00	86.0	36.8	0.21	18	2.4	0.1	0.50	0.50	6	0.20	0.10	17.0
12-21	173753	1160.0	18.0	0.50	39.2	15.1	0.05	7	4.1	T	0.70	2.60	4	0.10	0.10	25.4
1968	505710															
01-23	173904	309.0	0.8	0.00	68.8	27.8	0.11	10	1.7	T	0.10	0.60	5	0.10	0.00	35.2
02-16	174037	290.0	1.2	0.00	75.2	30.8	0.11	8	1.2	0.1	0.50	0.50	6	0.20	0.10	40.0
03-14	174242	73.5	0.5	0.07	76.8	32.2	0.13	10	1.2	0.1	0.60	0.60	5	0.20	0.20	27.0
04-10	174430	564.0	2.2	0.08	71.6	28.6	0.09	7	1.1	0.1	0.30	0.50	7	0.20	0.10	45.6
05-08	174641	95.2	1.2	0.07	76.8	33.7	0.12	9	1.0	0.1	0.30	0.60	3	0.20	0.00	19.0
06-14	175019	160.0	1.5	0.00	79.2	32.7	0.10	9	1.0	0.2	0.10	0.30	5	0.20	0.30	53.2
07-18	175531	71.5	2.0	0.03	74.4	34.5	0.17	9	1.1	T	0.10	0.50	7	0.20	0.10	25.8
08-09	175799	98.2	3.5	0.17	64.8	29.8	0.24	10	2.1	0.0	0.00	0.50	8	0.20	0.10	17.3
09-20	176266	11.9	2.5	0.15	73.6	40.4	0.19	2	2.3	0.1	0.20	0.50	5	0.20	0.20	0.4
10-14	176497	6.3	3.8	0.40	76.8	41.8	0.22	27	3.7	T	0.40	0.80	3	0.20	0.10	0.5
11-12	176726	6.6	0.2	0.15	80.0	40.9	0.25	31	4.4	0.1	0.50	0.50	5	0.20	0.20	0.4
12-06	176940	40.4	0.3	0.03	82.4	34.5	0.12	14	3.0	0.2	0.40	0.80	7	0.20	0.10	20.4
1969	505710															
01-10	177179	62.4	0.3	0.07	85.2	35.8	0.14	13	1.9	0.5	0.40	0.50	8	0.20	0.10	28.0
02-18	177554	148.0	4.0	0.24	80.0	33.6	0.13	12	1.2	0.1	0.60	0.90	7	0.20	0.10	26.1
03-03	177640	88.9	4.6	0.18	69.6	31.6	0.14	12	1.2	0.1	0.20	0.50	3	0.20	0.00	27.0
04-22	177995	902.0	1.5	0.10	67.6	28.0	0.12	7	1.1	0.1	0.20	0.20	6	0.20	0.10	50.5
05-16	178157	273.0	0.5	0.11	80.8	35.8	0.16	12	0.9	0.1	0.30	0.40	6	0.20	0.10	43.8
06-02	178517	131.0	2.2	0.03	73.6	33.9	0.13	10	1.1	0.2	0.20	0.40	5	0.20	0.10	46.8
08-15	179266	12.8	2.4	0.08	60.0	29.8	0.33	14	2.1	0.1	0.40	0.60	8	0.30	0.20	6.2
09-11	179546	4.9	1.1	0.10	70.4	38.1	0.20	39	3.7	0.1	0.80	0.90	8	0.30	0.20	8.5
10-01	179757	4.2	1.3	0.14	70.4	34.4	0.19	29	3.8	0.1	0.00	0.00	1	0.40	0.20	0.5
11-03	179954	112.0	0.7	T	86.8	33.9	0.13	10	1.5	0.1	0.10	0.10	5	0.20	0.10	32.3
12-01	180160	223.0	0.3	T	84.0	36.8	0.13	9	1.3	0.1	0.10	0.10	4	0.20	0.20	42.5
1970	505710															
01-15	180505	50.4	0.1	0.09	89.6	39.5	0.10	14	1.3	0.3	0.40	0.50	6	0.30	0.20	30.0
02-13	180762	50.7	0.2	0.00	83.2	35.1	0.10	15	1.2	0.2	0.30	0.30	6	0.20	0.20	32.0
03-13	180972	107.0	0.2	T	80.8	35.4	0.10	10	1.4	0.1	0.30	0.30	4	0.20	0.20	34.3
04-15	181295	791.0	1.7	0.00	72.4	29.5	0.10	7	1.1	0.1	0.10	0.30	7	0.20	0.10	55.5
05-20	181734	414.0	3.2	0.06	79.6	34.4	0.09	7	0.7	T	0.10	0.30	5	0.20	0.10	48.5
06-08	182079	160.0	2.3	0.07	81.6	35.1	0.12	8	0.9	0.1	0.00	0.20	4	0.20	0.10	43.0
07-17	182622	53.8	3.1	0.13	73.6	36.1	0.14	14	1.4	0.2	0.00	0.20	3	0.30	0.10	16.9
08-07	183223	21.4	3.6	0.00	76.0	36.5	0.12	15	2.1	0.3	0.40	0.50	9	0.30	0.10	6.3
09-04	183609	8.3	1.8	0.13	78.4	40.0	0.20	22	2.7	0.3	0.10	0.40	5	0.30	0.10	0.5
10-08	183828	144.0	6.5	0.20	87.2	36.6	0.15	8	1.2	T	0.20	0.60	7	0.30	0.10	30.8
11-04	184142	276.0	0.3	T	86.4	38.1	0.13	8	0.9	0.1	0.10	0.10	9	0.30	0.00	41.4
12-04	184398	122.0	0.3	0.00	88.8	37.6	0.16	9	0.9	T	0.20	0.20	6	0.30	0.10	32.1
1971	505710															
01-12	184695	98.4	0.1	0.00	88.0	37.1	0.14	10	1.0	0.1	0.20	0.40	6	0.30	0.10	32.2
02-02	184855	23.2	0.1	0.03	108.8	44.9	0.34	29	1.5	0.1	0.30	0.30	5	0.40	0.10	28.1
03-05	185064	217.0	0.8	0.06	83.2	32.2	0.15	7	1.2	0.2	0.20	0.40	7	0.30	0.10	37.3
04-10	185363	146.0	0.8	T	83.2	36.1	0.11	8	1.4	0.1	0.20	0.30	4	0.20	0.10	30.0
05-13	185688	441.0	3.8	0.11	80.8	33.7	0.11	7	1.0	0.1	0.20	0.50	7	0.20	0.10	48.3
06-11	185887	40.0	2.4	0.13	76.8	35.6	0.15	14	1.5	0.5	0.50	0.50	7	0.30	0.10	15.1
07-08	186133	170.0	4.1	0.08	78.0	32.5	0.12	7	1.3	0.1	0.30	0.30	10	0.30	0.10	27.7
08-06	186366	49.5	0.7	0.07	81.6	34.7	0.13	11	1.4	0.1	0.10	0.30	5	0.30	0.10	19.2
09-07	186601	146.0	6.7	0.03	55.6	22.7	0.10	11	3.0	0.1	0.20	0.60	7	0.20	0.10	12.6

SANGAMON RIVER AT MAHOMET

DATE	LAB.NO.	CL	S04	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505710														
10-13	170082	34	102	252	340	459			0.00					13	60.0
11-01	170157	56	96	264	331	517			0.02					47	43.0
12-16	170460	15	76	234	336	413			0.02					14	40.0
1967	505710														
01-10	170643	19	92	256	380	464			0.02					6	33.0
02-20	170848	13	74	200	325	399		0.00	0.01				0.01	24	35.0
03-15	171048	13	69	196	315	393		0.00	0.01				0.01	16	39.0
04-05	171179	15	69	188	296	366		0.00	0.01				0.03	434	63.0
05-10	171403	13	66	200	314	389		0.00	0.00				0.03	109	53.0
06-19	171782	15	77	240	346	424		0.00	0.03				0.03	41	74.0
07-12	172073	21	87	236	332	419		0.00	0.01				0.02	28	69.0
08-09	173215	25	84	236	303	419		0.00	0.01				0.02	39	76.0
09-25	173038	38	91	284	368	498		0.00	0.00				0.01	121	58.0
10-20	173307	73	112	240	338	536		0.00	0.01				0.01	119	48.0
11-15	173426	25	101	260	366	472		0.00	0.01				0.02	2	31.0
12-21	173753	8	40	104	160	209		0.00	0.01				0.04	658	37.0
1968	505710														
01-23	173904	19	73	184	286	370		0.00	0.01				0.02	13	31.0
02-16	174037	13	75	204	314	399		0.00	0.01				0.01	24	36.0
03-14	174242	17	80	216	324	402		0.00	0.04				0.04	13	38.0
04-10	174430	13	67	188	296	357		0.00	0.01				0.03	45	51.0
05-08	174641	16	78	220	330	369		0.00	0.01				0.02	33	62.0
06-14	175019	15	73	202	332	410		0.00	0.01				0.03	34	64.0
07-18	175531	15	70	236	328	416		0.00	0.01				0.02	41	76.0
08-09	175799	14	58	212	284	321		0.00	0.02				0.02	96	75.0
09-20	176266	38	99	256	350	470		0.00	0.01				0.02	39	68.0
10-14	176497	34	100	264	364	434		0.00	0.01				0.02	69	59.0
11-12	176726	40	113	276	368	478		0.00	0.02				0.00	5	37.0
12-06	176940	23	89	236	348	431		0.00	0.01				0.00	6	34.0
1969	505710														
01-10	177179	23	87	240	360	423		0.00	0.02				0.03	7	31.0
02-18	177554	22	80	240	338	422	0.00	0.00	0.01	<.05		<.05	0.01	69	36.0
03-03	177640	21	73	212	304	393	0.00	0.00	0.01	<.05		<.05	0.01	79	35.0
04-22	177995	16	62	184	284	371	0.00	0.00	0.02	<.05	0.00	<.05	0.00	36	51.8
05-16	178157	19	89	222	348	436	0.00	0.00	0.02	<.05	0.00	<.05	0.06	16	60.0
06-02	178517	15	78	222	323	389	0.00	0.00	0.02	<.05	0.00	<.05	0.03	31	59.0
08-15	179266	21	57	208	272	340	0.01	0.00	0.02	<.05	0.00	<.05	0.05	39	76.0
09-11	179546	51	106	244	332	496	0.00	0.00	0.01	<.05	0.01	<.05	0.02	32	63.0
10-01	179757	45	84	217	317	423	0.00	0.00	0.02	<.05	0.00	<.05	0.10	36	63.0
11-03	179954	20	76	236	356	439	0.00	0.00	0.01	<.05	0.00	<.05	0.02	11	48.0
12-01	180160	20	76	224	361	436	0.00	0.00	0.00	<.05	0.00	<.05	0.00	7	39.0
1970	505710														
01-15	180505	23	88	266	386	468	0.00	0.00	0.01	<.05	0.00	<.05	0.02	5	32.0
02-13	180762	28	79	244	352	449	0.00	0.00	0.01	<.05	0.00	<.05	0.03	2	32.0
03-13	180972	22	77	228	347	420	0.00	0.00	0.01	<.05	0.00	<.05	0.02	4	36.0
04-15	181295	18	68	188	302	372	0.00	0.00	0.01	<.05	0.00	<.05	0.01	37	48.0
05-20	181734	17	70	222	340	418	0.00	0.00	0.02	<.05	0.00	<.05	0.04	63	64.0
06-08	182079	19	71	230	348	431	0.00	0.00	0.01	<.05	0.00	<.05	0.01	46	66.0
07-17	182622	26	76	236	332	402	0.00	0.00	0.01	<.05	0.00	<.05	0.01	68	72.0
08-07	183223	18	76	260	340	395	0.00	0.00	0.02	<.05	0.00	<.05	0.01	67	68.0
09-04	183609	31	100	276	360	470	0.00	0.00	0.02	<.05	0.00	<.05	0.01	38	72.0
10-08	183828	16	67	264	368	441	0.00	0.00	0.00	<.05	0.00	<.05	0.01	119	63.0
11-04	184142	17	67	268	372	456	0.00	0.00	0.01	<.05	0.00	<.05	0.03	5	45.0
12-04	184398	18	73	268	376	458	0.00	0.00	0.00	<.05	0.00	<.05	0.03	4	46.0
1971	505710														
01-12	184695	19	73	268	372	435	0.00	0.00	0.02	<.05	0.00	<.05	0.02	2	32.0
02-02	184855	56	95	308	456	568	0.00	0.00	0.00	<.05	0.01	<.05	0.05	2	32.0
03-05	185064	18	66	236	340	420	0.00	0.00	0.01	<.05	0.00	<.05	0.01	16	37.0
04-10	185363	20	72	248	356	440	0.00	0.00	0.01	<.05	0.00	<.05	0.04	21	50.0
05-13	185688	18	62	232	340	410	0.00	0.00	0.02	<.05	0.00	<.05	0.04	71	61.0
06-11	185887	25	73	252	338	410	0.00	0.00	0.02	<.05	0.00	<.05	0.02	52	73.0
07-08	186133	15	56	236	328	399	0.00	0.00	0.00	<.05	0.00	<.05	0.00	93	76.2
08-06	186366	9	69	264	346	410	0.00	0.00	0.01	<.05	0.00	<.05	0.01	21	69.8
09-07	186601	16	51	176	232	297	0.00	0.00	0.01	<.05	0.00	<.05	0.00	163	76.2

SEVEN MILE CREEK NEAR MT. VERNON

Seven Mile Creek rises in the Mt. Vernon Hills Region east of Mt. Vernon and flows south and westerly into the Big Muddy River. The gaging station is 3 miles east of Mt. Vernon on the downstream side of the bridge on Illinois Route 15. Elevation of gage datum is 436.76 feet above mean sea level. The drainage basin above the gage has an area of approximately 21.5 square miles.

The tabulation of water quality data is for the period from October 11, 1966, to June 7, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

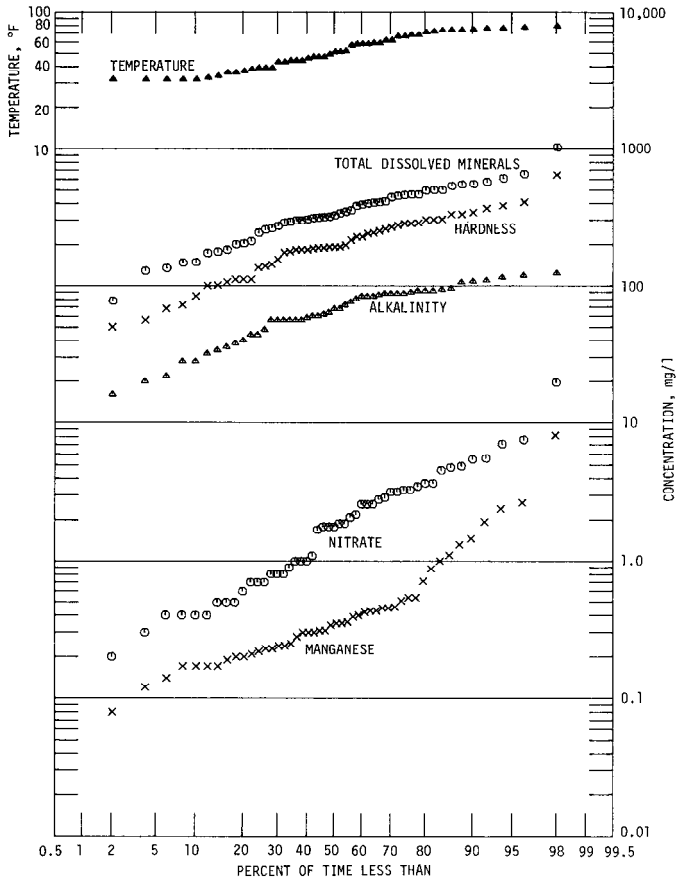
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 3.81 cfs/sq mi, nor fall below 0.01 cfs,/sq mi. The median flow was 0.20 cfs/sq mi and the mean was 2.05 cfs/sq mi.

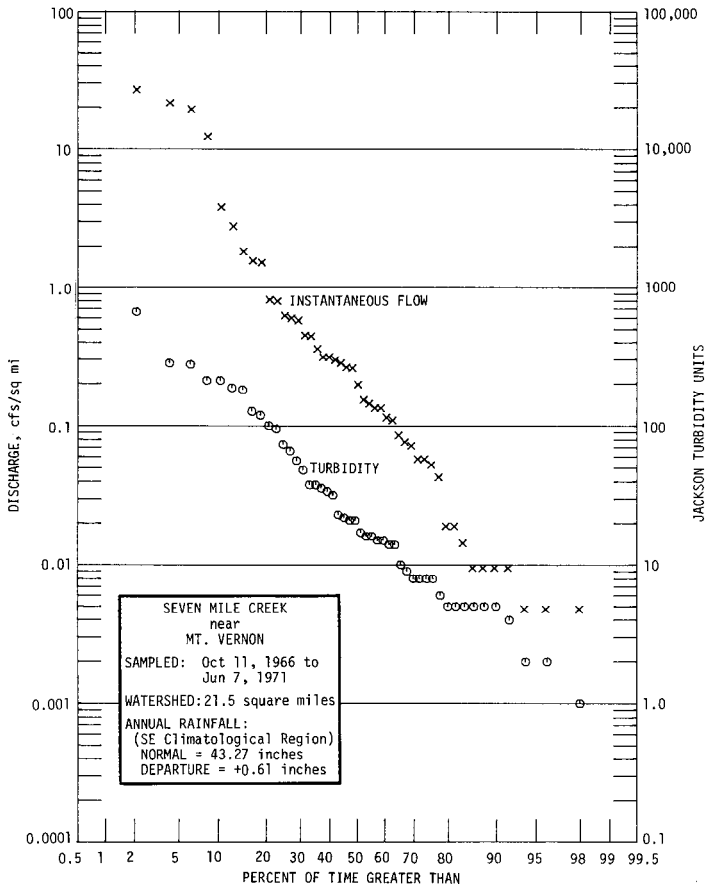
The turbidity was not less than 5 Jtu nor more than 209 Jtu for the central 80 percent of the time. The median value was 19 Jtu and the mean 64 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 20 percent of the time. They were below 50 F for 48 percent and below 40 F for 28 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	28	68	108
Hardness (as $CaCO_3$)	84	192	342
Total dissolved minerals	149	327	556
Nitrate (NO_3)	0.4	1.8(2.6)	5.5
Total inorganic phosphate (PO_4)	0.0	0.2(0.38)	0.8
Soluble inorganic phosphate (PO_4)	0.0	0.1(0.15)	0.4
Manganese (Mn)	0.17	0.34	1.46





SEVEN MILE CREEK NEAR MT. VERNON

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505958															
10-11	170110	0.2	3.0	0.43	39.2	18.8	0.19	19	8.0	0.1	0.10	0.40	5	0.10	0.00	1.8
11-18	170320	0.1	1.0	1.00	74.4	35.8	0.29	34	8.8	0.0	0.00	0.10	12	0.40	0.00	0.4
12-09	170479	33.0	1.9	0.25	25.8	10.3	0.13	14	3.7	0.2	0.60	0.80	12	0.20	0.10	4.8
1967	505958															
01-16	170665	1.8	1.4	0.28	69.2	38.8	0.21	36	2.6	0.1	0.10	0.20	13	0.20	0.10	1.8
02-23	170953	1.5	0.3	0.35	73.6	38.5	0.25	17	2.1	T	0.20	1.40	13	0.30	0.10	0.8
03-17	171132	7.5	0.7	0.22	41.6	22.6	0.13	27	2.0	0.1	0.20	0.20	15	0.10	0.00	3.2
04-14	171343	80.0	4.2	0.88	22.6	10.6	0.05	17	3.0	0.1	0.10	0.60	6	0.30	0.00	5.6
05-01	171511	58.0	15.0	1.32	26.8	11.0	0.13	17	2.0	0.1	0.00	0.70	9	0.10	0.00	3.3
06-15	171886	0.4	2.1	0.23	37.6	15.1	0.13	24	4.3	0.1	0.30	0.60	10	0.10	0.00	3.5
07-21	172303	0.4	0.5	0.31	52.8	23.5	0.19	35	3.2	0.2	0.10	2.20	10	0.20	0.10	0.3
08-01	172482	12.0	3.5	0.19	24.0	9.9	0.10	19	4.2	T	0.20	0.90	11	0.10	0.10	0.4
10-29	173367	2.3	0.5	0.14	63.2	30.7	0.22	37	3.8	0.1	0.20	0.40	8	0.20	0.00	1.0
11-09	173534	3.0	0.4	0.23	60.8	32.2	0.22	37	2.9	T	0.00	0.10	8	0.20	0.10	3.3
12-13	173674	32.0	1.6	0.40	30.4	15.6	0.12	22	3.0	0.1	0.70	0.80	13	0.10	0.00	2.6
1968	505958															
01-16	173902	5.5	0.2	0.12	61.2	32.5	0.20	36	1.9	0.1	0.20	0.20	7	0.10	0.00	1.9
02-08	174159	6.5	0.6	0.45	40.8	21.9	0.14	27	2.1	0.1	0.20	0.30	10	0.10	0.00	1.7
03-20	174325	562.8	5.7	0.17	11.6	5.1	0.05	10	3.3	0.2	0.40	0.80	11	0.10	0.00	19.7
04-19	174585	258.0	12.0	0.71	16.0	6.8	0.05	12	2.7	0.2	0.30	1.00	7	0.20	0.30	2.2
05-17	174905	1.2	0.7	0.31	55.2	27.8	0.16	33	2.3	0.1	0.10	0.20	5	0.20	0.00	0.7
06-07	175789	0.9	0.6	0.17	47.2	23.8	0.18	30	2.5	0.3	0.00	0.20	10	0.10	0.10	4.6
12-06	177091	1.2	0.2	0.17	80.0	40.9	0.21	38	4.0	0.1	0.00	0.00	14	0.10	0.00	3.2
1969	505958															
01-03	177372	6.2	0.4	0.20	55.6	29.4	0.24	31	2.8	0.1	0.20	0.20	12	0.10	0.50	7.6
02-17	177483	6.5	0.2	0.21	50.4	27.7	0.18	31	2.0	0.1	0.00	0.00	11	0.10	0.10	2.6
03-21	177673	5.9	0.3	0.35	59.2	31.1	0.21	36	2.1	0.1	0.10	0.10	8	0.10	0.00	0.8
04-28	178009	13.0	1.8	0.43	31.2	16.1	0.11	20	2.8	0.2	0.10	0.20	11	0.10	0.10	2.1
05-12	178255	3.2	0.6	0.17	42.8	22.1	0.18	27	1.9	0.1	0.20	0.30	11	0.10	0.10	0.2
06-05	178611	0.2	0.6	0.51	58.4	29.8	0.52	38	3.2	0.1	0.10	0.20	8	0.10	0.00	0.7
07-18	179108	5.4	9.6	2.66	40.0	18.7	0.16	26	3.0	0.4	0.00	0.70	14	0.10	0.10	1.0
08-06	179339	0.1	3.0	1.11	44.0	19.9	0.14	30	4.0	0.2	0.10	0.40	10	0.20	0.10	0.5
09-05	179648	0.0	10.0	2.40	26.4	11.2	0.11	16	10.3	0.3	0.70	0.80	5	0.20	0.10	2.8
10-01	179919	0.0	2.1	1.94	42.0	20.4	0.15	24	6.8	0.9	0.00	0.10	3	0.20	0.10	0.5
11-06	180022	2.4	0.6	0.30	67.2	33.2	0.17	34	4.3	T	0.10	0.10	4	0.10	0.10	0.6
12-03	180337	2.8	0.4	0.46	66.4	33.9	0.19	36	1.8	0.1	0.20	0.30	4	0.10	0.10	0.4
1970	505958															
01-05	180737	9.3	0.4	0.45	52.0	27.8	0.15	34	2.7	0.1	0.00	0.10	12	0.10	0.10	1.0
02-05	180738	17.0	1.1	0.30	40.8	20.9	0.14	31	2.1	0.1	0.00	0.10	8	0.10	0.10	1.8
03-09	181113	12.5	0.7	0.42	39.2	20.9	0.13	25	1.6	T	0.00	0.10	6	0.10	0.10	0.8
04-06	181290	9.4	0.6	0.36	39.2	20.9	0.13	24	1.0	0.1	0.10	0.10	11	0.10	0.10	0.7
05-06	181757	4.1	0.7	0.39	40.8	21.4	0.13	25	1.6	0.1	0.00	0.00	7	0.10	0.10	0.4
06-04	182107	451.0	11.0	0.34	8.0	3.4	0.03	6	3.9	0.1	0.30	0.40	4	0.20	0.00	5.5
07-01	183427	0.2	0.7	0.20	52.8	23.4	0.22	31	2.3	0.1	0.00	0.10	11	0.20	0.00	0.9
09-01	183638	2.8	8.7	0.54	17.6	6.8	0.09	10	6.4	0.6	0.40	0.70	5	0.20	0.10	1.9
11-03	184279	0.1	3.8	8.15	24.8	12.2	0.09	11	8.5	0.2	0.30	0.60	9	0.30	0.10	3.7
12-02	184490	0.2	0.2	0.08	143.2	70.7	0.34	59	5.4	0.1	0.00	0.00	13	0.20	0.10	0.5
1971	505958															
01-18	184810	1.6	0.2	0.00	86.4	46.8	0.27	44	3.0	0.1	0.00	0.00	11	0.20	0.10	2.6
02-22	184965	404.0	7.3	0.24	14.4	4.9	0.04	8	3.6	0.1	0.30	0.30	8	0.20	0.00	4.9
03-11	185259	16.6	1.0	0.24	38.4	21.4	0.19	25	2.4	0.2	0.10	0.30	10	0.20	0.10	2.9
04-08	185529	38.3	1.9	0.30	29.6	15.1	0.12	21	2.5	T	0.10	0.30	9	0.10	0.00	3.7
05-05	185783	1.1	0.6	0.54	82.8	43.2	0.23	42	2.5	0.1	0.00	0.10	8	0.20	0.10	7.1
06-07	186000	0.3	1.6	1.46	68.0	32.7	0.19	39	3.1	0.2	0.00	0.10	9	0.20	0.10	1.1

SEVEN MILE CREEK NEAR MT. VERNON

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505958														
10-11	170110	8	170	36	175	293			0.02					66	59.0
11-18	170320	16	312	76	333	551			0.01					17	51.0
12-09	170479	9	69	28	107	178			0.01					73	46.0
1967	505958														
01-16	170665	16	307	56	332	556			0.01					6	33.0
02-23	170953	19	316	80	342	537		0.01	0.01				0.01	2	34.0
03-17	171132	13	171	56	192	348		0.00	0.01				0.03	15	43.0
04-14	171363	6	94	32	100	205		0.00	0.01				0.03	274	66.0
05-01	171511	9	94	40	112	212		0.00	0.00				0.01	661	62.0
06-15	171886	17	119	68	156	274		0.00	0.01				0.02	36	79.0
07-21	172303	16	177	96	228	393		0.00	0.01				0.00	16	73.0
08-01	172482	13	81	44	101	201		0.00	0.02				0.01	119	77.0
10-29	173367	14	245	88	284	445		0.00	0.01				0.04	9	49.0
11-09	173534	15	244	92	284	461		0.00	0.02				0.01	1	44.0
12-13	173674	12	122	48	140	258		0.00	0.01				0.03	32	43.0
1968	505958														
01-16	173902	13	258	84	286	503		0.00	0.01				0.01	5	32.0
02-08	174159	13	170	56	192	305		0.00	0.00				0.01	23	36.0
03-20	174325	5	41	22	50	149		0.00	0.02				0.02	100	47.0
04-19	174585	4	53	34	68	148		0.00	0.02				0.06	281	58.0
05-17	174905	11	216	88	252	400		0.00	0.00				0.02	15	59.0
06-07	175789	13	171	94	216	356		0.00	0.00				0.01	10	72.0
12-06	177091	18	352	62	368	577		0.00	0.01				0.01	5	36.0
1969	505958														
01-03	177372	14	246	56	260	456		0.00	0.01				0.02	8	32.0
02-17	177483	12	236	60	240	404		0.00	0.01				0.02	4	39.0
03-21	177673	14	258	84	276	467		0.00	0.01				0.01	5	44.0
04-28	178009	11	131	56	144	263	0.00	0.00	0.02	<.05	0.00	<.05	0.01	34	58.0
05-12	178255	10	172	68	198	327	0.00	0.00	0.01	<.05	0.00	<.05	0.03	5	58.0
06-05	178611	12	220	107	268	416	0.00	0.00	0.03	<.05	0.00	<.05	0.04	8	68.0
07-18	179108	8	136	88	179	290	0.00	0.00	0.02	<.05	0.00	<.05	0.04	209	76.0
08-06	179339	11	136	90	192	341	0.00	0.00	0.01	<.05	0.00	<.05	0.05	56	74.0
09-05	179648	9	40	84	112	174	0.00	0.00	0.02	<.05	0.00	<.05	0.03	126	74.0
10-01	179919	14	112	110	189	300	0.00	0.00	0.01	<.05	0.00	<.05	0.02	38	66.0
11-06	180022	16	258	86	304	465	0.00	0.00	0.02	<.05	0.00	<.05	0.02	5	44.0
12-03	180337	14	263	92	305	498	0.00	0.00	0.00	<.05	0.00	<.05	0.02	5	38.0
1970	505958														
01-05	180737	18	218	72	244	408	0.00	0.00	0.01	<.05	0.00	<.05	0.02	8	32.0
02-05	180738	14	162	58	188	316	0.00	0.00	0.02	<.05	0.00	<.05	0.04	21	32.0
03-09	181113	13	163	56	184	319	0.00	0.00	0.01	<.05	0.00	<.05	0.03	14	47.0
04-06	181290	11	158	60	184	312	0.00	0.00	0.01	<.05	0.00	<.05	0.00	8	52.0
05-06	181757	12	153	64	190	315	0.00	0.00	0.02	<.05	0.00	<.05	0.02	21	62.0
06-04	182107	3	22	16	84	77	0.00	0.00	0.02	<.05	0.00	<.05	0.03	209	68.0
07-01	183427	11	179	92	228	384	0.00	0.00	0.01	<.05	0.00	<.05	0.01	14	76.0
09-01	183638	10	59	28	72	135	0.00	0.00	0.01	<.05	0.00	<.05	0.01	186	71.0
11-03	184279	6	17	116	112	184	0.00	0.00	0.01	<.05	0.00	<.05	0.01	95	47.0
12-02	184490	14	615	108	648	1034	0.00	0.00	0.02	<.05	0.01	<.05	0.09	2	51.0
1971	505958														
01-18	184810	18	375	88	408	659	0.00	0.00	0.02	<.05	0.00	<.05	0.03	0	32.0
02-22	184965	7	42	20	56	129	0.00	0.00	0.03	<.05	0.00	<.05	0.08	180	39.0
03-11	185259	13	171	44	184	300	0.00	0.00	0.01	<.05	0.00	<.05	0.01	22	39.0
04-08	185529	14	126	38	136	245	0.00	0.00	0.03	<.05	0.00	<.05	0.04	38	37.0
05-05	185783	14	332	120	384	614	0.00	0.00	0.02	<.05	0.00	<.05	0.04	16	57.0
06-07	186000	12	242	124	304	504	0.00	0.01	0.02	<.05	0.00	<.05	0.01	48	74.3

SHOAL CREEK NEAR BREESE

Shoal Creek rises in the Springfield Plain Region in Montgomery County and flows southward to its junction with the Kaskaskia River near Venedy station. The gage is located 1.7 miles east of Breese at the upstream side of the bridge on U.S. Route 50. Elevation of gage datum is 413.97 feet above mean sea level. The drainage basin above the gage has an area of approximately 760 square miles.

The tabulation of water quality data is for the period from October 17, 1966, to September 10, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

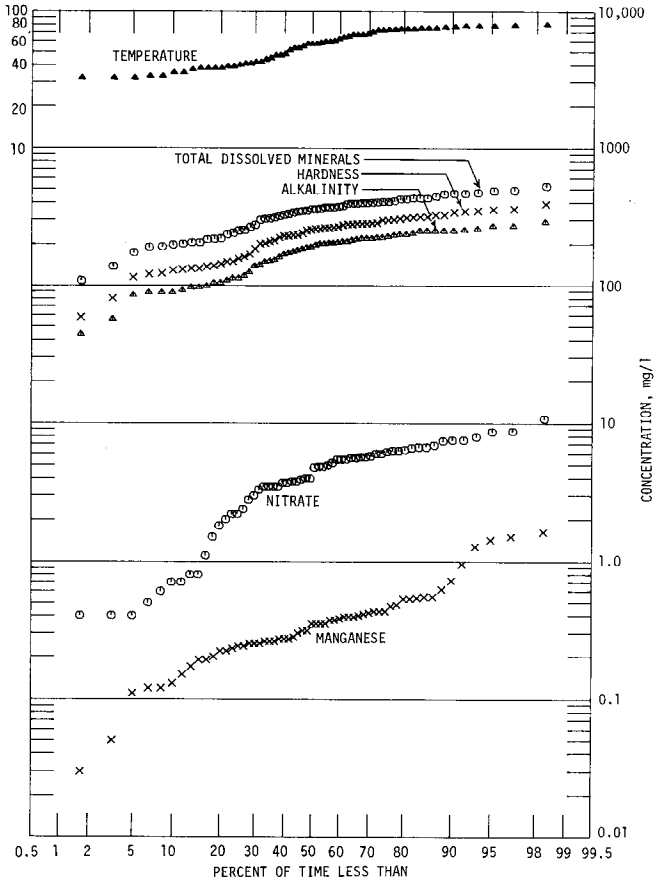
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 2.78 cfs/sq mi, nor fall below 0.04 cfs/sq mi. The median flow was 0.20 cfs/sq mi and the mean was 0.69 cfs,/sq mi.

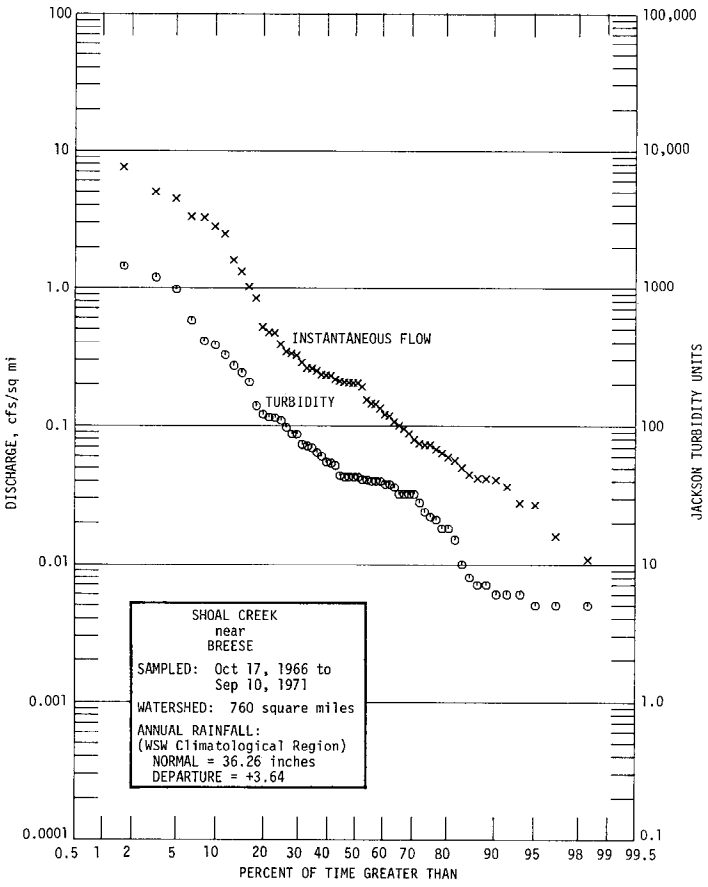
The turbidity was not less than 6 Jtu nor more than 382 Jtu for the central 80 percent of the time. The median value was 43 Jtu and the mean 137 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 28 percent of the time. They were below 50 F for 39 percent and below 40 F for 23 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	88	193	248
Hardness (as $CaCO_3$)	128	256	338
Total dissolved minerals	197	358	465
Nitrate (NO_3)	0.7	4.8(4.3)	7.5
Total inorganic phosphate (PO_4)	0.2	0.5(0.84)	1.9
Soluble inorganic phosphate (PO_4)	0.1	0.25(0.35)	0.6
Manganese (Mn)	0.13	0.35	0.72





SHOAL CREEK NEAR BREESE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505940															
10-17	170111	390.0	9.8	0.17	31.6	11.9	0.06	18	5.9	0.1	0.40	0.60	8	0.10	0.20	5.5
11-14	170321	156.0	2.2	T	42.8	14.9	0.16	20	8.3	0.0	0.50	0.50	10	0.20	0.00	2.4
12-14	170480	2110.0	4.6	0.20	31.6	12.4	0.11	12	5.2	T	0.50	0.90	11	0.30	0.10	5.6
1967	505940															
01-10	170663	81.0	0.4	0.55	85.6	34.2	0.19	32	3.6	T	0.20	0.50	14	0.30	0.10	6.9
02-17	170951	154.0	0.3	0.23	78.0	31.2	0.17	26	4.0	T	0.20	0.50	14	0.10	0.10	7.5
03-14	171131	633.0	8.5	0.31	53.1	23.2	0.14	21	4.4	T	4.10	4.20	7	0.10	0.10	6.6
04-10	171344	359.0	1.6	0.22	54.8	23.2	0.11	22	4.3	T	0.40	0.70	4	0.10	0.00	6.2
05-08	171512	1200.0	20.0	0.95	37.8	15.9	0.11	18	3.5	0.1	0.20	1.90	7	0.20	0.10	4.0
06-20	171885	176.0	2.7	0.12	50.0	18.8	0.13	17	4.4	0.1	0.60	1.10	8	0.20	0.00	5.6
07-25	172363	164.0	3.0	0.13	56.4	19.6	0.13	20	4.6	T	0.60	0.60	7	0.30	0.00	5.0
08-09	172659	294.0	3.3	0.15	37.2	13.4	0.12	13	5.0	T	0.20	0.50	10	0.10	0.00	2.8
09-21	173084	89.0	5.3	0.43	29.2	10.0	0.10	17	7.1	0.1	0.40	0.80	7	0.10	0.10	8.7
10-11	173284	34.0	4.7	0.26	30.4	10.7	0.09	14	6.2	0.1	0.20	0.70	7	0.10	0.10	5.2
11-13	173538	72.0	1.9	0.19	70.4	32.7	0.18	32	5.3	T	0.20	0.70	6	0.30	0.10	2.0
12-06	173672	5710.0	11.0	0.30	19.2	7.8	0.02	13	6.0	0.2	0.60	1.70	6	0.10	0.10	5.5
1968	505940															
01-17	173907	196.0	0.4	0.55	80.0	33.7	0.17	31	3.0	T	0.00	0.40	14	0.20	0.10	7.5
02-07	174160	3370.0	5.4	0.12	36.0	12.6	0.09	12	4.1	0.2	0.40	0.70	8	0.10	0.10	6.4
03-05	174324	91.0	0.6	0.39	80.0	35.3	0.18	32	2.9	0.4	0.20	0.60	13	0.20	0.20	4.9
04-17	174599	158.0	1.8	0.25	71.2	31.7	0.17	27	3.1	0.3	0.40	0.90	5	0.30	0.10	2.2
05-09	174912	55.0	1.9	0.53	83.2	36.1	0.20	38	3.2	0.1	0.50	0.70	4	0.20	0.10	0.7
06-20	175193	195.0	8.5	0.35	39.2	14.1	0.11	15	3.0	0.2	0.20	0.40	8	0.20	0.00	7.9
07-03	175562	60.0	2.2	0.28	62.8	23.1	0.19	24	3.8	0.1	0.20	0.40	10	0.30	0.10	3.9
08-02	176022	188.0	12.0	0.62	30.4	11.2	0.09	14	4.3	0.2	0.60	1.80	7	0.20	0.10	10.8
09-18	176261	21.0	7.3	0.43	65.6	24.3	0.18	27	4.2	0.3	0.10	0.50	2	0.30	0.10	0.4
10-22	176595	12.0	0.9	0.22	60.8	23.8	0.17	35	4.3	T	0.10	0.20	2	0.20	0.10	0.7
11-04	176749	31.0	1.5	0.25	67.2	25.3	0.15	34	4.7	0.1	0.20	0.40	2	0.20	0.10	0.8
12-16	177089	55.0	0.6	0.11	65.6	27.2	0.12	30	4.5	0.2	0.30	0.40	11	0.30	0.10	6.0
1969	50594C															
01-30	177374	3770.0	15.0	0.72	14.4	5.6	0.05	8	3.3	0.4	0.60	5.60	4	0.10	0.00	5.7
02-20	177482	244.0	1.1	0.39	61.6	26.3	0.16	24	3.4	0.3	0.20	0.30	11	0.20	0.10	6.3
03-17	177669	252.0	1.5	0.31	66.4	27.7	0.16	27	3.1	0.2	0.40	0.40	9	0.20	0.10	6.7
04-16	178012	2440.0	9.3	0.38	36.4	13.9	0.09	14	3.7	0.2	0.40	1.40	9	0.20	0.10	6.0
05-21	178254	116.0	2.0	0.42	64.0	28.7	0.21	32	3.0	0.1	0.10	0.80	7	0.20	0.10	3.8
06-12	178609	76.0	2.3	0.27	67.2	27.7	0.16	27	2.4	0.1	0.30	0.70	6	0.20	0.00	0.5
07-29	179107	260.0	2.4	0.37	52.8	19.6	0.14	19	3.4	T	0.20	0.50	10	0.30	0.00	3.7
08-19	179335	31.9	1.8	0.48	72.0	25.4	0.19	29	4.0	0.1	0.00	0.10	7	0.30	0.10	0.8
09-11	179647	51.2	3.5	0.25	49.6	18.5	0.10	28	6.4	0.1	0.60	0.90	6	0.30	0.20	4.0
10-29	179920	154.0	0.8	0.27	68.0	25.9	0.13	23	4.1	0.1	0.10	0.10	13	0.20	0.10	3.5
11-10	180023	108.0	1.6	0.26	74.4	31.3	0.17	30	4.0	0.1	0.20	0.50	5	0.20	0.10	3.5
12-03	180336	109.0	0.7	0.19	71.2	28.8	0.14	30	3.7	0.1	0.30	0.30	4	0.20	0.10	4.9
1970	505940															
01-15	180739	48.1	0.9	0.35	88.8	40.5	0.16	42	2.6	0.1	0.00	0.20	8	0.20	0.10	4.8
02-18	180880	215.0	0.5	0.24	70.0	31.5	0.14	30	3.6	0.2	0.10	0.20	5	0.20	0.10	5.5
03-24	181111	355.0	2.2	0.26	56.0	24.4	0.14	27	3.6	0.4	0.20	0.50	6	0.20	0.10	8.6
04-13	181527	155.0	1.7	0.41	72.0	32.2	0.20	32	3.6	0.1	0.20	0.50	2	0.20	0.10	3.0
05-15	181758	982.0	21.0	1.50	55.2	23.0	0.12	21	3.6	0.2	0.30	1.90	4	0.20	0.20	6.3
06-01	182103	772.0	56.0	1.42	34.4	12.2	0.07	13	3.5	0.1	0.30	1.80	4	0.20	0.10	5.7
07-16	183426	45.0	1.7	0.35	73.6	27.4	0.23	26	2.4	0.1	0.20	0.30	8	0.30	0.20	1.1
08-14	183509	42.6	2.0	0.03	62.4	24.4	0.15	26	4.3	0.1	0.10	0.30	8	0.30	0.10	2.2
09-16	183637	66.1	1.8	0.40	64.0	23.5	0.16	26	2.8	0.0	0.20	0.40	4	0.30	0.10	1.5
10-02	183893	38.1	5.8	0.39	34.4	12.6	0.09	17	6.5	0.4	0.30	0.80	9	0.30	0.10	5.8
11-16	184278	27.6	0.9	0.24	72.0	29.3	0.18	39	4.4	0.1	0.00	0.20	9	0.30	0.20	1.8
12-07	184493	31.6	0.7	0.05	76.0	32.7	0.18	40	4.2	0.2	0.10	0.20	8	0.40	0.20	3.3
1971	505940															
01-07	184812	175.0	2.8	0.27	60.0	26.9	0.17	31	5.8	0.8	0.60	0.70	6	0.30	0.10	7.4
02-23	185264	2470.0	38.0	1.62	33.6	11.7	0.07	10	3.8	1.0	0.40	2.40	5	0.30	0.00	6.7
03-17	185263	1860.0	37.0	1.28	34.4	11.2	0.07	13	4.0	0.3	0.30	2.00	6	0.20	0.00	3.8
04-16	185530	174.0	2.6	0.43	65.6	28.3	0.15	27	3.2	T	0.20	0.60	6	0.30	0.10	3.5
05-05	185785	56.2	1.8	0.54	79.2	35.1	0.19	33	3.2	0.2	0.10	0.60	3	0.30	0.10	0.4
06-07	186001	101.0	3.3	0.35	62.4	25.4	0.16	27	4.5	0.2	0.40	0.50	7	0.30	0.10	3.7
07-15	186337	145.0	4.7	0.37	47.2	16.1	0.11	16	4.4	0.2	0.30	0.50	5	0.30	0.10	3.5
08-05	186502	20.4	1.7	0.47	52.0	19.0	0.11	24	4.0	0.3	0.40	0.40	4	0.30	0.10	0.6
09-10	186641	8.2	1.0	0.53	56.0	21.5	0.17	26	4.0	0.5	0.30	0.40	5	0.30	0.10	0.4

SHOAL CREEK NEAR BREESE

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505940														
10-17	170111	16	39	104	128	197			0.02					120	55.0
11-14	170321	13	69	124	168	275			0.01					44	45.0
12-14	170480	8	47	88	130	190			0.02					138	38.0
1967	505940														
01-10	170663	23	129	252	354	490		0.00	0.01				0.01	5	33.0
02-17	170951	18	123	208	323	427		0.00	0.01				0.01	15	38.0
03-14	171131	14	113	140	228	367		0.00	0.00				0.01	40	53.0
04-10	171344	26	91	168	232	331		0.00	0.01				0.02	36	62.0
05-08	171512	10	69	112	160	251		0.00	0.01				0.02	382	53.0
06-20	171885	12	68	150	202	300		0.00	0.01				0.02	60	78.0
07-25	172363	11	58	184	224	307		0.00	0.01				0.03	55	75.0
08-09	172659	9	44	116	148	216		0.00	0.02				0.01	64	74.0
09-21	173084	10	40	96	114	201		0.00	0.01				0.05	114	72.0
10-11	173284	12	42	88	120	173		0.00	0.01				0.01	109	57.0
11-13	173538	20	118	220	310	433		0.00	0.02				0.04	32	40.0
12-06	173672	8	37	56	80	137		0.00	0.02				0.06	240	42.0
1968	505940														
01-17	173907	17	126	248	338	473		0.00	0.01				0.04	5	32.0
02-07	174160	9	56	96	142	236		0.00	0.01				0.02	97	39.0
03-05	174324	18	126	257	345	463		0.00	0.01				0.01	8	44.0
04-17	174599	16	122	224	308	413		0.00	0.01				0.05	43	58.0
05-09	174912	20	133	268	356	491		0.00	0.01				0.10	41	64.0
06-20	175193	11	55	112	156	253		0.00	0.01				0.02	323	75.0
07-03	175562	16	82	200	252	357		0.00	0.01				0.02	43	74.0
08-02	176022	7	53	92	122	191		0.00	0.01				0.03	269	73.0
09-18	176261	18	59	236	264	348		0.00	0.01				0.00	43	67.0
10-22	176595	24	66	224	250	347		0.00	0.02				0.02	28	57.0
11-04	176749	27	71	248	272	392		0.00	0.00				0.00	24	51.0
12-16	177089	19	110	204	276	394		0.00	0.01				0.02	7	33.0
1969	505940														
01-30	177374	5	23	44	58	108		0.00	0.01				0.02	407	38.0
02-20	177482	17	104	190	262	373	0.00	0.00	0.01	<.05		<.05	0.03	18	37.0
03-17	177669	17	119	196	280	406		0.00	0.01				0.04	22	41.0
04-16	178012	10	66	108	148	241	0.00	0.00	0.03	<.05	0.00	<.05	0.04	206	59.0
05-21	178254	16	108	208	278	397	0.00	0.00	0.02	<.05	0.00	<.05	0.03	38	67.0
06-12	178609	15	94	226	282	402	0.01	0.00	0.01	<.05	0.00	<.05	0.01	86	74.0
07-29	179107	13	64	172	212	310	0.00	0.00	0.01	<.05	0.00	<.05	0.03	73	76.0
08-19	179335	22	75	248	284	401	0.00	0.00	0.03	<.05	0.00	<.05	0.04	21	77.0
09-11	179647	22	82	148	200	318	0.00	0.00	0.02	<.05	0.00	<.05	0.03	54	67.0
10-29	179920	13	87	206	276	369	0.00	0.00	0.01	<.05	0.00	<.05	0.01	7	47.0
11-10	180023	23	98	236	314	426	0.00	0.00	0.02	<.05	0.00	<.05	0.02	10	48.0
12-03	180336	20	110	216	296	407	0.00	0.00	0.00	<.05	0.00	<.05	0.02	6	38.0
1970	505940														
01-15	180739	25	144	288	388	527	0.00	0.00	0.01	<.05	0.00	<.05	0.06	6	32.0
02-18	180880	20	131	214	304	431	0.00	0.00	0.02	<.05	0.00	<.05	0.02	6	35.0
03-24	181111	23	118	138	240	367	0.00	0.00	0.01	<.05	0.00	<.05	0.01	40	42.0
04-13	181527	19	137	220	312	433	0.00	0.00	0.02	<.05	0.00	<.05	0.01	32	57.0
05-15	181758	14	90	160	232	338	0.00	0.00	0.02	<.05	0.00	<.05	0.02	571	70.0
06-01	182103	9	59	98	136	220	0.00	0.00	0.02	<.05	0.00	<.05	0.07	970	68.0
07-16	183426	14	75	240	296	375	0.00	0.00	0.01	<.05	0.00	<.05	0.01	32	78.0
08-14	183509	20	70	220	256	359	0.00	0.00	0.01	<.05	0.00	<.05	0.00	32	75.0
09-16	183637	16	59	232	256	343	0.00	0.00	0.01	<.05	0.00	<.05	0.01	41	72.0
10-02	183893	14	52	104	138	205	0.00	0.00	0.02	<.05	0.00	<.05	0.01	86	65.0
11-16	184278	25	92	248	300	444	0.00	0.00	0.01	<.05	0.00	<.05	0.01	18	39.0
12-07	184493	26	115	248	324	468	0.00	0.00	0.01	<.05	0.00	<.05	0.05	5	41.0
1971	505940														
01-07	184812	23	113	180	260	395	0.00	0.00	0.02	<.05	0.00	<.05	0.04	69	32.0
02-23	185264	8	51	84	132	206	0.00	0.00	0.02	<.05	0.00	<.05	0.04	1184	35.0
03-17	185263	11	57	88	132	219	0.00	0.00	0.02	<.05	0.00	<.05	0.04	1432	47.0
04-16	185530	17	123	200	280	397	0.00	0.00	0.02	<.05	0.00	<.05	0.02	52	59.0
05-05	185785	23	121	268	342	465	0.00	0.00	0.03	<.05	0.00	<.05	0.03	38	60.0
06-07	186001	19	96	188	260	358	0.00	0.00	0.01	<.05	0.00	<.05	0.01	71	78.0
07-15	186337	14	50	152	184	264	0.00	0.00	0.00	<.05	0.00	<.05	0.00	115	78.8
08-05	186502	19	59	176	208	304	0.00	0.00	0.01	<.05	0.00	<.05	0.01	40	73.4
09-10	186641	20	47	204	228	325	0.00	0.00	0.01	<.05	0.00	<.05	0.02	43	79.7

SOUTH FORK SANGAMON RIVER NEAR ROCHESTER

The South Fork of the Sangamon River rises in Christian County west of Pana, in the Springfield Plain Region, and flows north and west to its junction with the Sangamon River east of Springfield. The gaging station is located 1.7 miles southwest of Rochester. Elevation of gage datum is 511.30 feet above mean sea level. The drainage basin above the gage has an area of approximately 869 square miles.

The tabulation of water quality data is for the period from October 17, 1966, to September 8, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

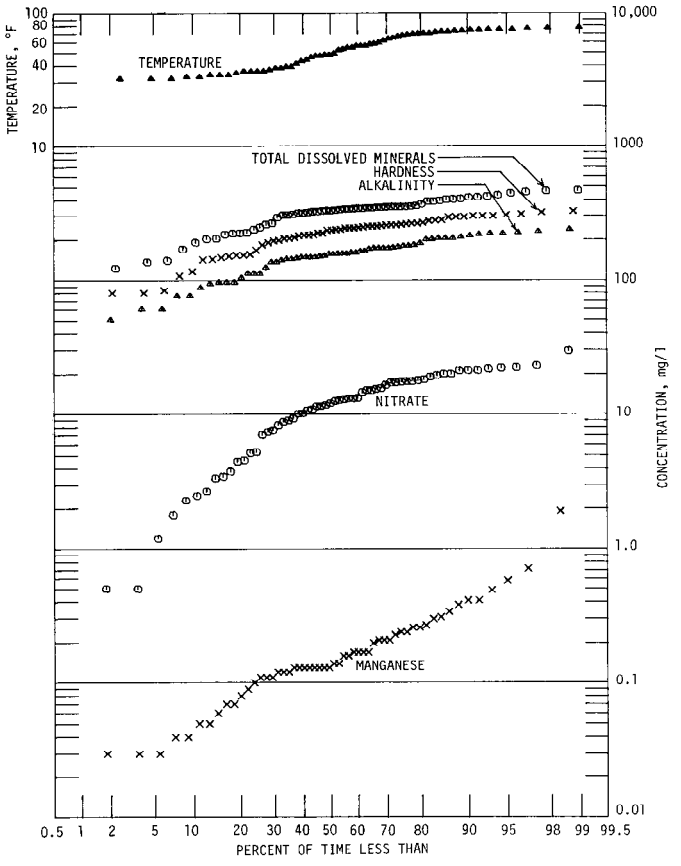
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 3.05 cfs/sq mi, nor fall below 0.03 cfs/sq mi. The median flow was 0.39 cfs/sq mi and the mean was 0.985 cfs/sq mi.

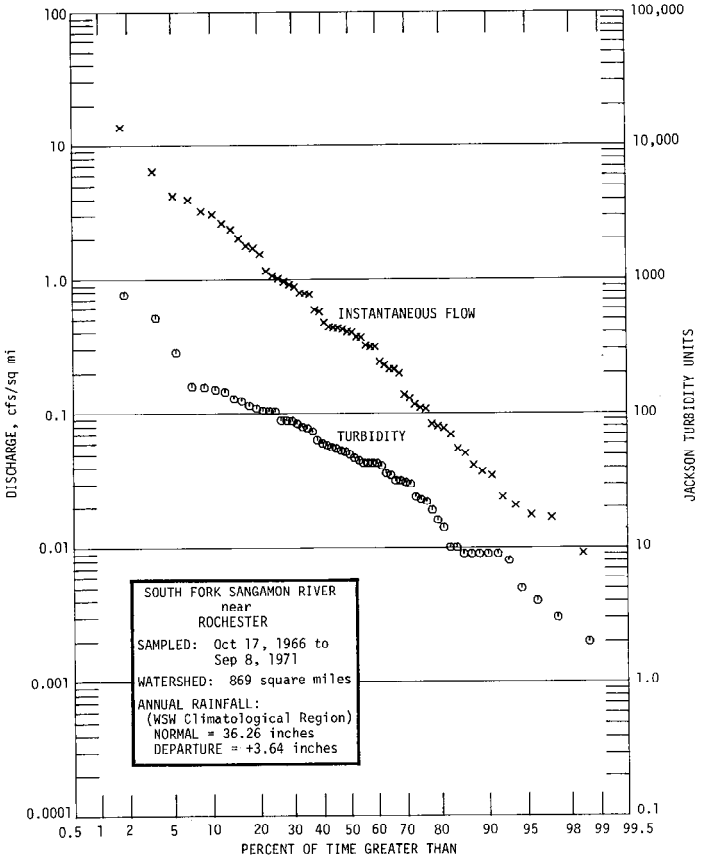
The turbidity was not less than 9 Jtu nor more than 151 Jtu for the central 80 percent of the time. The median value was 46 Jtu and the mean 78 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 21 percent of the time. They were below 50 F for 44 percent and below 40 F for 30 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	88	158	218
Hardness (as $CaCO_3$)	142	241	300
Total dissolved minerals	202	338	422
Nitrate (NO_3)	2.5	12.7(12.4)	21.2
Total inorganic phosphate (PO_4)	0.3	0.6(0.99)	1.2
Soluble inorganic phosphate (PO_4)	0.1	0.3(0.31)	0.6
Manganese (Mn)	0.045	0.14	0.41





SOUTH FORK SANGAMON RIVER NEAR ROCHESTER

DATE	LAB.NO.	CFS	FF	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	R	NO3
1966	505760															
10-17	170101	19.5	0.8	0.17	49.0	19.8	0.14	24	4.7	0.0	0.30	0.30	7	0.30	0.10	2.5
11-15	170290	67.0	2.7	0.24	47.2	19.5	0.19	25	8.8	0.1	0.70	1.20	11	0.10	0.10	4.6
12-13	170459	5160.0	6.0	0.72	28.8	10.9	0.15	10	4.8	0.1	0.30	0.40	13	0.20	0.10	12.8
1967	505760															
01-05	170561	251.0	0.6	0.13	62.6	25.5	0.12	21	2.6	T	0.00	1.00	11	0.10	0.10	17.7
02-13	170831	815.0	1.5	0.07	50.4	21.9	0.12	15	2.2	T	0.60	0.80	19	0.10	0.00	21.0
03-07	171030	931.0	5.7	0.04	44.8	19.0	0.12	17	3.2	0.1	0.90	2.00	7	0.30	0.10	18.2
04-13	171210	296.0	1.2	0.05	60.0	25.9	0.16	19	2.2	0.1	0.30	0.50	8	0.40	0.00	17.5
05-03	171377	256.0	1.8	0.13	58.8	25.0	0.17	22	0.5	T	0.30	0.50	9	0.20	0.00	15.1
06-09	171631	711.0	3.2	0.09	54.8	23.7	0.14	16	2.2	T	0.30	0.80	8	0.10	0.00	22.9
07-28	172360	1380.0	6.1	0.05	38.4	14.6	0.10	13	3.4	0.1	0.30	0.90	6	0.20	0.00	10.7
08-07	172653	618.0	4.3	0.16	42.0	15.3	0.12	16	3.4	T	0.40	1.70	5	0.10	0.10	10.9
09-14	172692	30.2	1.6	0.13	70.0	30.5	0.19	31	2.3	T	0.20	0.80	9	0.20	0.10	3.8
10-12	173255	87.2	1.7	0.17	48.0	21.2	0.15	33	5.8	T	0.10	0.40	8	0.20	0.10	5.2
11-09	173419	776.0	0.7	0.03	49.6	22.4	0.14	18	2.7	T	0.10	0.40	9	0.30	0.00	12.6
12-04	173670	3400.0	4.4	0.17	34.4	15.1	0.12	13	4.9	T	0.50	2.20	6	0.10	0.00	11.5
1968	505760															
01-17	173843	323.0	0.5	0.12	56.0	25.4	0.16	20	3.5	0.9	0.10	0.20	3	0.20	0.00	19.5
02-09	173996	3180.0	3.8	0.04	36.8	15.1	0.09	11	3.0	0.1	0.40	1.00	9	0.20	0.00	17.4
03-18	174277	739.0	0.9	0.12	56.0	23.5	0.17	24	2.5	0.1	0.40	0.60	9	0.20	0.10	15.2
04-25	174559	319.0	1.8	0.20	56.8	25.3	0.15	20	1.9	0.3	0.30	1.60	5	0.20	0.10	13.2
05-21	174785	456.0	0.5	0.16	52.8	22.4	0.17	22	2.7	T	0.50	0.60	7	0.20	0.00	11.6
06-20	175143	1880.0	8.5	0.27	35.2	13.6	0.12	11	2.1	0.1	0.30	0.90	8	0.20	0.10	17.7
07-11	175416	251.0	3.6	0.23	64.8	28.7	0.16	19	1.5	0.1	0.30	0.70	10	0.40	0.10	20.0
08-13	175878	470.0	3.8	0.24	36.8	15.1	0.08	12	3.0	0.1	0.40	0.50	8	0.20	0.10	8.3
09-19	176267	28.0	3.7	0.10	76.0	33.1	0.23	38	3.0	0.1	0.40	0.90	10	0.30	0.10	1.2
10-10	176487	14.2	1.4	0.26	68.8	30.2	0.51	44	4.1	0.2	0.30	0.40	7	0.30	0.10	0.5
11-07	176664	13.6	1.4	0.31	69.6	30.6	0.20	47	4.8	0.1	0.30	0.60	10	0.30	0.10	2.3
12-05	176938	195.0	1.8	0.11	56.4	25.0	0.12	20	4.0	0.4	0.60	0.90	6	0.30	0.10	15.7
1969	505760															
01-15	177229	94.5	0.5	0.12	71.2	32.1	0.22	24	2.4	0.2	0.20	0.40	9	0.30	0.10	18.0
02-06	177360	2470.0	2.5	0.07	36.8	14.6	0.10	11	2.8	0.1	0.50	1.50	8	0.20	0.10	20.0
03-03	177557	630.0	1.0	0.11	51.2	23.3	0.16	21	1.7	0.2	0.40	0.50	8	0.30	0.20	21.2
04-10	177872	1430.0	3.2	0.13	48.8	19.9	0.13	17	2.7	0.4	0.20	0.80	7	0.20	0.10	27.2
05-08	178057	295.0	1.5	0.13	63.6	26.6	0.17	20	1.3	0.1	0.80	0.80	6	0.30	0.20	21.8
06-10	178428	105.0	2.9	0.21	63.6	27.8	0.17	24	2.2	0.1	0.30	0.70	9	0.30	0.10	11.8
07-15	178951	2090.0	3.2	0.13	34.8	13.4	0.08	9	3.3	0.3	0.90	1.00	11	0.30	0.10	13.2
08-21	179301	33.4	2.7	0.58	65.6	27.4	0.17	29	3.5	0.2	0.30	0.50	9	0.40	0.10	1.8
09-10	179508	44.2	2.6	0.38	57.4	25.5	0.14	32	5.1	0.3	0.10	0.40	8	0.30	0.20	2.7
10-16	179839	10900.0	5.8	0.17	22.0	7.1	0.05	12	5.0	0.1	0.10	0.60	7	0.20	0.10	7.1
11-06	179969	343.0	1.0	T	58.4	25.9	0.14	18	2.4	0.1	0.10	0.10	5	0.30	0.10	17.2
12-05	180180	338.0	0.4	T	60.8	24.9	0.13	19	2.8	0.1	0.50	0.60	11	0.30	0.10	14.7
1970	505760															
01-14	180506	112.0	0.7	0.21	72.8	33.4	0.14	26	1.9	0.1	0.10	0.50	8	0.30	0.10	15.5
02-13	180777	346.0	0.7	0.06	56.0	24.0	0.14	23	2.0	0.2	0.20	0.30	8	0.30	0.10	13.3
03-04	180915	855.0	1.6	0.26	60.0	26.1	0.14	22	2.4	0.3	0.10	0.40	5	0.30	0.10	13.0
04-09	181176	635.0	1.7	0.13	54.4	24.0	0.11	18	1.7	0.1	0.00	0.40	4	0.30	0.10	16.6
05-22	181761	379.0	2.2	0.21	60.0	26.4	0.13	18	1.6	0.1	0.20	0.60	6	0.20	0.10	22.2
06-11	182101	1240.0	5.0	0.13	50.4	21.5	0.12	15	2.0	0.1	0.40	0.60	10	0.30	0.10	29.5
07-07	182505	184.0	2.0	0.14	60.8	27.4	0.16	18	1.6	0.1	0.20	0.50	5	0.30	0.10	22.0
08-20	183508	40.9	4.2	0.03	60.8	27.4	0.13	31	3.1	0.1	0.20	0.50	10	0.40	0.10	3.5
09-22	183676	352.0	19.0	T	20.0	7.3	0.05	7	4.3	0.2	0.80	0.80	13	0.20	0.10	4.5
10-14	183861	88.7	4.6	0.41	58.4	25.9	0.17	29	3.9	0.2	0.40	0.80	10	0.40	0.10	9.3
11-12	184209	64.4	1.0	0.14	67.2	30.3	0.20	31	2.6	0.1	0.00	0.10	10	0.40	0.10	10.2
12-07	184439	56.0	0.8	0.08	56.8	24.9	0.16	24	2.3	0.1	0.00	0.20	7	0.40	0.10	7.6
1971	505760															
01-13	184702	62.5	0.7	0.11	70.4	30.3	0.18	29	2.3	0.2	0.00	0.30	7	0.40	0.10	10.1
02-08	184882		37.0	1.91	26.4	10.2	0.07	8	5.2	0.3	0.30	0.80	4	0.30	0.10	7.4
03-01	185060	1620.0	7.0	0.00	44.8	17.5	0.10	13	2.8	0.2	0.30	0.80	8	0.30	0.10	19.1
04-15	185404	172.0	1.6	0.30	61.6	25.9	0.14	20	2.1	0.1	0.10	0.40	6	0.30	0.10	9.0
05-03	185634	7.4	1.5	0.41	69.6	29.8	0.18	28	1.8	0.1	0.20	0.60	1	0.40	0.10	5.3
06-10	185866	172.0	5.1	0.34	52.8	20.9	0.12	15	2.3	1.0	0.40	0.80	10	0.30	0.10	12.1
07-16	186214	2600.0	4.7	T	20.8	6.8	0.05	6	3.3	0.2	0.30	0.60	7	0.20	0.10	3.4
08-02	186364	161.0	1.9	0.03	47.2	19.0	0.11	15	2.5	0.2	0.20	0.30	4	0.30	0.10	8.8
09-08	186603	16.7	2.0	0.49	73.6	29.3	0.17	38	2.9	0.2	0.30	0.50	7	0.40	0.10	0.5

SOUTH FORK SANGAMON RIVER NEAR ROCHESTER

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505760														
10-17	170101	33	69	144	204	324			0.02					19	49.0
11-15	170290	29	70	148	198	305			0.01					43	43.0
12-13	170459	13	38	76	117	190			0.02					159	37.0
1967	505760														
01-05	170561	32	70	172	261	350			0.01					9	33.0
02-13	170831	24	59	140	215	331		0.00	0.01				0.01	5	36.0
03-07	171030	26	64	112	190	307		0.00	0.01				0.01	145	36.0
04-13	171210	27	69	176	256	361		0.00	0.01				0.02	43	56.0
05-03	171377	32	71	172	252	344		0.00	0.02				0.01	36	56.0
06-09	171631	23	63	160	234	331		0.00	0.00				0.01	55	72.0
07-28	172360	15	45	104	156	219		0.00	0.01				0.02	129	68.0
08-07	172653	21	47	124	168	265		0.00	0.01				0.01	83	75.0
09-14	172692	48	84	200	300	422		0.00	0.01				0.01	30	69.0
10-12	173255	45	61	148	207	348		0.00	0.03				0.03	43	53.0
11-09	173419	22	61	148	216	309		0.00	0.01				0.03	9	44.0
12-04	173670	19	53	88	148	225		0.00	0.01				0.03	124	39.0
1968	505760														
01-17	173843	27	66	160	244	336		0.00	0.03				0.07	9	32.0
02-09	173996	14	43	96	154	238		0.00	0.01				0.02	79	34.0
03-18	174277	34	74	152	236	355		0.00	0.02				0.02	22	47.0
04-25	174559	26	67	170	246	338		0.00	0.02				0.04	43	56.0
05-21	174785	27	64	158	224	317		0.00	0.02				0.06	16	58.0
06-20	175143	12	37	96	144	202		0.00	0.05				0.02	283	75.0
07-11	175416	27	71	202	280	390		0.00	0.05				0.07	87	74.0
08-13	175878	15	40	112	154	205		0.00	0.01				0.01	109	76.0
09-19	176267	59	91	236	326	467		0.00	0.01				0.02	73	67.0
10-10	176487	62	92	212	296	459		0.00	0.02				0.02	32	54.0
11-07	176664	69	109	204	300	465		0.00	0.01				0.00	23	47.0
12-05	176938	31	66	164	244	345		0.00	0.02				0.00	31	38.0
1969	505760														
01-15	177229	36	83	218	310	417		0.00	0.00				0.00	3	32.0
02-06	177360	13	46	94	152	224		0.00	0.02				0.06	88	34.0
03-03	177557	31	70	144	224	323		0.00	0.01				0.01	9	39.0
04-10	177872	22	64	136	204	318	0.00	0.00	0.01	<.05		<.05	0.02	88	38.0
05-08	178057	27	70	188	268	355	0.00	0.00	0.05	<.05	0.00	<.05	0.03	56	66.0
06-10	178428	32	73	204	278	395	0.00	0.00	0.02	<.05	0.00	<.05	0.02	47	63.0
07-15	178951	10	41	96	142	223	0.00	0.00	0.02	<.05	0.00	<.05	0.03	63	69.0
08-21	179301	45	73	208	276	407	0.00	0.00	0.04	<.05	0.00	<.05	0.04	50	73.0
09-10	179508	39	03	158	248	357	0.00	0.00	0.02	<.05	0.00	<.05	0.04	53	64.0
10-16	179839	11	34	50	84	140	0.01	0.01	0.04	<.05	0.00	<.05	0.12	151	54.0
11-06	179969	30	68	156	252	338	0.00	0.00	0.01	<.05	0.00	<.05	0.02	8	48.0
12-05	180180	27	70	174	254	349	0.00	0.00	0.01	<.05	0.00	<.05	0.02	2	36.0
1970	505760														
01-16	180506	38	89	220	319	433	0.00	0.00	0.01	<.05	0.00	<.05	0.02	14	32.0
02-13	180777	33	70	150	238	329	0.00	0.00	0.01	<.05	0.00	<.05	0.03	10	34.0
03-04	180915	34	88	146	257	371	0.00	0.00	0.01	<.05	0.00	<.05	0.02	24	46.0
04-00	181176	26	72	148	234	335	0.00	0.00	0.01	<.05	0.00	<.05	0.01	32	52.0
05-22	181761	27	73	172	258	356	0.00	0.00	0.02	<.05	0.00	<.05	0.02	52	72.0
06-11	182101	23	63	136	214	317	0.00	0.00	0.02	<.05	0.00	<.05	0.01	104	74.3
07-07	182505	28	63	182	264	355	0.00	0.00	0.01	<.05	0.00	<.05	0.01	45	75.0
08-20	183508	45	85	180	264	402	0.00	0.00	0.01	<.05	0.00	<.05	0.01	77	70.0
09-22	183676	10	22	60	80	137	0.00	0.00	0.01	<.05	0.00	<.05	0.01	508	70.0
10-14	183861	46	72	164	252	351	0.00	0.00	0.02	<.05	0.00	<.05	0.01	103	61.0
11-12	184209	48	77	204	292	406	0.00	0.00	0.01	<.05	0.00	<.05	0.02	9	48.0
12-07	184439	33	73	172	244	341	0.00	0.00	0.01	<.05	0.00	<.05	0.01	10	36.0
1971	505760														
01-13	184702	40	78	220	300	418	0.00	0.00	0.01	<.05	0.00	<.05	0.02	4	33.0
02-08	184882	11	31	76	108	170	0.00	0.00	0.02	<.05	0.00	<.05	0.02	760	35.0
03-01	185060	22	54	112	184	248	0.00	0.00	0.02	<.05	0.00	<.05	0.02	156	41.0
04-15	185404	30	75	180	260	348	0.00	0.00	0.01	<.05	0.00	<.05	0.02	35	57.0
05-03	185634	41	78	224	296	390	0.00	0.00	0.02	<.05	0.00	<.05	0.04	41	59.0
06-10	185866	23	49	158	218	293	0.00	0.00	0.01	<.05	0.00	<.05	0.02	114	73.0
07-16	186214	7	23	60	80	123	0.00	0.00	0.01	<.05	0.00	<.05	0.00	105	76.0
08-02	186364	21	41	156	196	259	0.00	0.00	0.01	<.05	0.00	<.05	0.02	58	71.0
09-08	186603	52	83	228	304	448	0.00	0.00	0.01	<.05	0.00	<.05	0.00	60	77.0

VERMILION RIVER AT LOWELL

The Vermilion River rises in the Kankakee Plain Region between Gilman and Forrest and flows northwesterly to its junction with the Illinois River. The gaging station is 0.2 miles north of Lowell. Elevation of gage datum is 500.61 feet above mean sea level. The drainage basin above the gage has an area of approximately 1230 square miles.

The tabulation of water quality data is for the period from October 5, 1966, to September 13, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

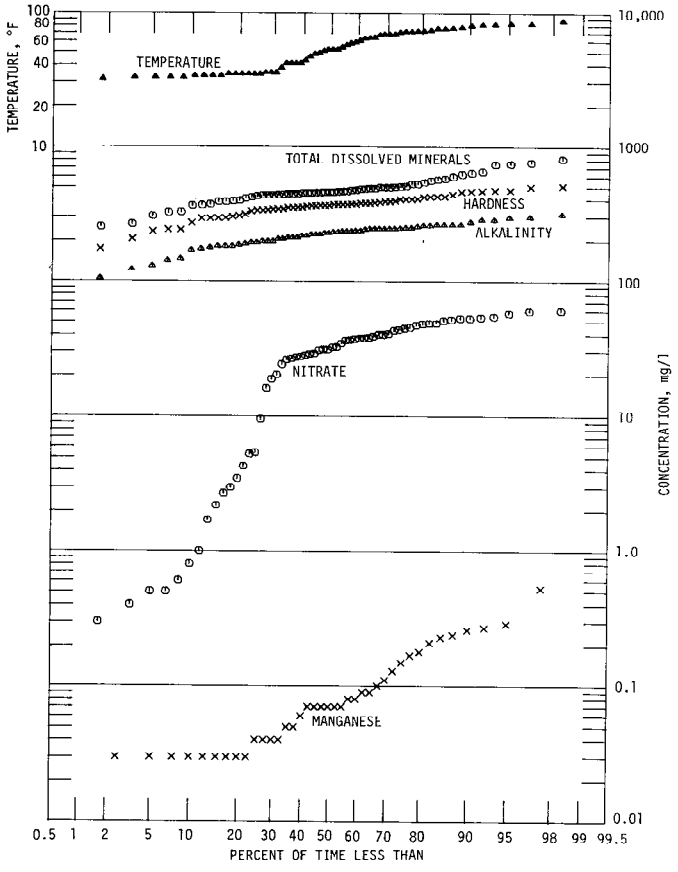
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 1.8 cfs/sq mi, nor fall below 0.01 cfs/sq mi. The median flow was 0.25 cfs/sq mi and the mean was 0.73 cfs/sq mi.

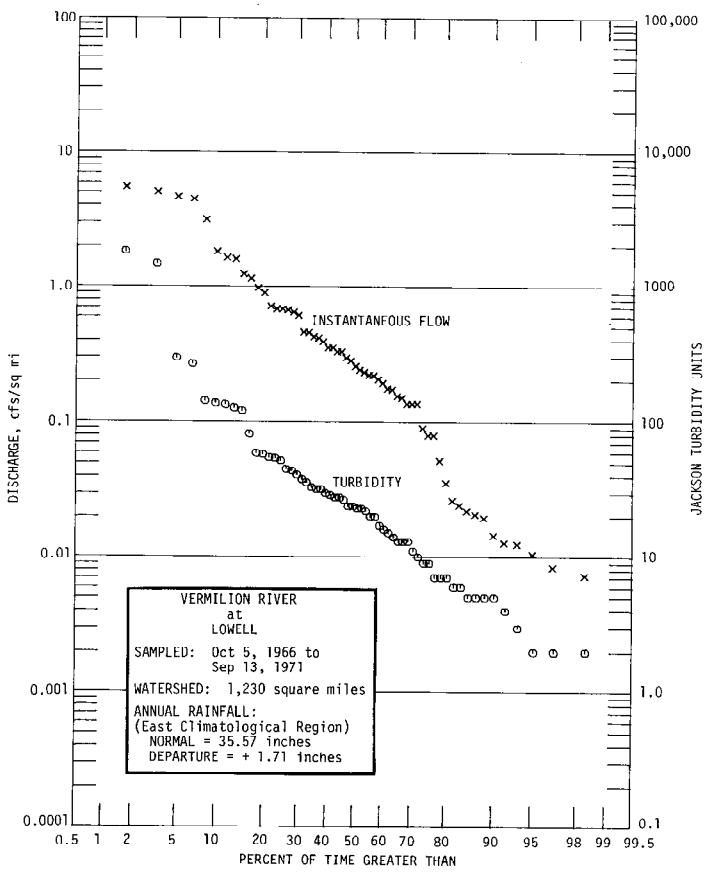
The turbidity was not less than 5 Jtu nor more than 136 Jtu for the central 80 percent of the time. The median value was 23.5 Jtu and the mean 94 Jtu.

Reported temperatures were over 80 F for 8 percent and over 70 F for 27 percent of the time. They were below 50 F for 45 percent and below 40 F for 32 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	168	227	272
Hardness (as $CaCO_3$)	268	366	464
Total dissolved minerals	361	457	640
Nitrate (NO_3)	0.8	31.4(29.1)	52.9
Total inorganic phosphate (PO_4)	0.5	1.5(1.71)	
Soluble inorganic phosphate (PO_4)	0.2	1.1(1.37)	
Manganese (Mn)	0.03	0.07	





VERMILION RIVER AT LOWELL

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505555															
10-05	170044	10.3	1.1	0.24	96.0	53.6		54		0.3	0.20	0.50	0	0.70	0.40	0.5
11-09	170202	97.4	4.1	0.11	109.6	55.6	0.38	69	8.8	T	0.20	0.50	1	0.40	0.50	2.7
12-14	170439	789.0	1.6	0.00	76.8	34.2	0.22	11	3.9	0.1	1.50	1.50	11	0.30	0.10	52.9
1967	505555															
01-17	170645	189.0	0.8	0.00	102.4	44.4	0.24	26	3.9	0.8	2.00	2.00	6	0.30	0.20	26.9
02-10	170796	400.0	0.6	0.00	81.6	40.4	0.19	19	2.5	T	1.90	2.00	11	0.30	0.00	28.0
03-13	171116	522.0	3.0	0.09	81.1	35.8	0.17	17	2.4	T	1.60	2.60	10	0.30	0.20	48.5
04-11	171208	1400.0	0.7	0.03	82.4	37.1	0.17	10	1.2	T	0.70	1.60	7	0.10	0.10	52.8
05-02	171388	3840.0	8.1	0.08	71.2	31.0	0.16	8	1.8	0.0	1.00	1.90	9	0.30	0.10	57.7
06-08	171627	311.0	1.1	0.00	84.0	41.9	0.18	14	2.1	0.1	1.50	1.90	1	0.20	0.20	40.1
07-11	172076	166.0	1.0	0.00	66.4	42.4	0.19	19	2.6	0.7	0.80	1.20	1	0.30	0.20	20.1
08-14	173216	43.9	0.7	0.03	57.2	36.4	0.22	24	5.3	1.0	0.40	0.60	1	0.30	0.20	3.5
09-25	173045	8.9	1.1	0.10	71.6	46.0	0.29	57	7.2	T	0.20	0.50	1	0.30	0.20	1.7
10-10	173243	32.6	0.4	0.07	99.2	53.1	0.37	70	8.2	T	0.30	0.50	1	0.50	0.50	4.3
11-03	173425	2220.0	7.8	0.26	75.2	30.3	0.16	13	2.9	0.5	1.70	2.20	12	0.10	0.10	43.7
12-18	173714	2000.0	1.0	0.23	82.0	38.3	0.17	8	1.5	0.1	0.20	1.60	10	0.30	0.00	53.5
1968	505555															
01-26	173959	560.0	0.8	0.03	82.4	37.6	0.18	15	2.7	0.1	1.50	1.60	7	0.20	0.10	40.8
02-05	174005	5430.0	5.9	0.07	56.8	23.9	0.11	7	2.7	0.2	0.40	0.80	7	0.30	0.00	37.2
03-05	174233	361.0	0.3	T	85.6	39.4	0.20	16	2.0	0.7	1.70	1.80	5	0.20	0.10	38.0
04-02	174432	479.0	0.6	0.07	83.6	40.7	0.18	13	1.7	0.2	1.40	1.70	2	0.20	0.20	43.0
05-14	174726	282.0	1.2	0.03	85.6	40.5	0.21	16	1.8	T	1.80	2.00	1	0.20	0.30	25.8
06-12	175017	507.0	1.7	T	89.6	40.0	0.21	14	1.6	0.1	1.80	2.20	2	0.30	0.20	60.4
07-11	175533	748.0	1.4	0.03	88.8	40.9	0.23	10	1.6	T	0.60	0.60	8	0.30	0.10	48.5
08-14	175908	110.0	0.8	0.04	73.6	43.9	0.23	20	3.8	0.1	1.90	2.00	1	0.30	0.20	3.0
09-17	176265	24.0	4.6	0.00	72.8	47.2	0.37	42	7.5	0.2	1.60	2.80	1	0.40	0.50	0.5
10-14	176.541	15.6	2.4	0.17	86.4	49.7	0.29	46	6.5	0.1	1.10	1.50	1	0.50	0.50	2.2
11-04	176612	12.9	0.4	0.09	111.2	56.4	0.36	65	7.7	0.1	1.40	1.50	1	0.50	0.50	0.6
12-05	176989	166.0	0.4	0.07	76.4	43.0	0.61	25	4.3	0.5	1.30	1.30	3	0.30	0.10	5.3
1969	505555															
01-08	177183	30.0	0.5	T	76.0	35.5	0.17	22	5.0	1.1	1.90	2.20	6	0.30	0.20	28.5
02-17	177555	400.0	0.6	0.07	68.8	28.7	0.10	10	1.3	0.2	0.10	0.20	6	0.20	0.00	34.5
03-03	177639	211.0	0.2	T	75.2	35.0	0.17	13	1.1	0.8	0.10	0.20	3	0.20	0.10	32.4
04-30	178015	556.0	2.4	0.15	88.8	31.6	0.19	13	2.0	0.1	0.20	0.40	6	0.20	0.10	18.6
05-12	178159	1190.0	0.5	0.00	65.6	31.1	0.07	7	0.9	0.1	0.20	0.20	5	0.20	0.10	51.5
06-16	178516	340.0	0.3	0.00	65.6	30.8	0.12	13	0.5	0.1	0.60	0.70	8	0.20	0.10	48.3
07-09	178953	1100.0	2.4	0.07	79.2	34.0	0.13	9	1.5	0.1	0.80	1.10	10	0.30	0.10	36.5
08-19	179329	97.5	1.4	0.13	61.6	35.6	0.17	24	5.2	0.1	2.30	2.30	3	0.40	0.20	5.4
09-02	179445	15.2	1.0	0.00	86.4	45.8	0.26	41	6.0	T	1.60	1.70	1	0.50	0.40	0.4
10-08	179836	17.8	1.6	0.21	81.2	53.6	0.27	63	8.9	0.1	0.80	1.40	0	0.50	0.50	0.3
11-17	180092	183.0	0.7	0.00	90.0	44.4	0.20	23	3.4	0.2	2.50	2.90	2	0.40	0.10	28.9
12-09	80282	234.0	0.4	0.27	89.6	43.9	0.23	19	2.1	0.3	1.90	2.30	0	0.40	0.10	37.7
1970	505555															
01-19	180550	64.2	0.6	0.03	104.0	51.7	0.21	34	3.8	1.8	7.80	8.20	1	0.60	0.10	30.5
02-10	180761	250.0	0.6	0.00	82.8	37.3	0.17	22	3.0	0.8	2.90	3.20	6	0.40	0.0	30.8
03-09	180952	430.0	0.7	0.00	82.4	38.1	0.14	16	2.5	0.1	1.10	1.40	3	0.30	0.0	30.8
04-05	181178	818.0	3.1	0.04	78.4	35.6	0.14	10	1.4	T	1.30	1.80	4	0.30	0.10	59.8
05-19	181733	6730.0	9.8	0.18	56.8	24.0	0.10	7	1.6	0.1	1.00	1.50	7	0.30	0.20	47.0
06-17	182240	6180.0	50.0	0.29	49.6	19.5	0.07	6	2.0	0.1	1.30	1.40	5	0.30	0.10	36.3
07-15	183031	268.0	2.5	0.08	71.2	40.8	0.14	15	1.9	0.4	0.60	1.00	1	0.40	0.10	9.5
08-10	183506	214.0	1.0	0.00	84.8	38.1	0.22	15	1.8	0.1	1.10	1.30	8	0.40	0.00	27.3
09-22	183697	1950.0	8.6	0.00	80.0	31.3	0.15	10	2.7	0.1	1.20	1.50	10	0.30	0.10	39.0
10-19	184144	1510.0	1.3	0.04	92.8	42.0	0.19	10	1.2	0.1	0.60	0.70	9	0.30	0.10	54.6
11-16	184247	872.0	0.3	0.04	96.8	44.4	0.20	11	1.2	0.1	1.30	1.30	9	0.50	0.10	50.9
12-07	184445	431.0	0.2	0.03	96.0	44.9	0.19	14	1.7	T	1.10	1.40	4	0.40	0.10	44.7
1971	505555															
01-18	184747	267.0	0.5	0.05	104.8	49.3	0.22	18	2.1	0.3	0.80	0.90	2	0.40	0.20	45.4
02-08	184900		6.8	0.00	40.0	17.5	0.10	9	6.1	1.1	1.80	2.30	4	0.30	0.10	16.0
03-16	185178	5660.0	58.0	0.53	57.6	21.5	0.14	6	2.2	0.2	0.40	2.00	7	0.30	0.10	40.1
04-20	185451	292.0	0.4	0.03	85.2	43.7	0.18	15	1.8	0.1	0.60	0.60	0	0.30	0.10	37.3
05-10	185649	830.0	1.9	0.00	80.0	41.0	0.19	16	1.9	0.1	0.30	0.40	1	0.30	0.10	23.8
06-14	185907	166.0	2.1	0.06	76.0	39.5	0.17	20	3.4	0.1	7.30	8.00	8	0.60	0.20	26.2
07-12	186283	831.0	4.5	0.00	61.6	27.9	0.14	14	2.9	0.2	3.30	3.80	8	0.40	0.10	32.0
08-09	186392	27.0	0.4	0.03	76.8	43.9	0.22	35	4.1	0.2	1.10	1.40	1	0.50	0.30	1.0
09-13	186652	25.5	1.2	0.05	101.6	53.1	0.33	72	8.5	0.4	1.90	2.00	7	0.80	0.60	0.8

VERMILION RIVER AT LOWELL

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505555														
10-05	170044	47	255	244	460	657								30	58.0
11-09	170202	56	321	260	502	810			0.02					54	46.0
12-14	170439	19	107	180	332	435			0.01					13	34.0
1967	505555														
01-17	170645	31	166	260	438	562			0.02					15	32.0
02-10	170796	24	141	196	370	495		0.00	0.02				0.02	36	32.0
03-13	171116	30	113	188	350	432		0.00	0.01				0.02	45	34.0
04-11	171208	17	120	204	358	481		0.00	0.01				0.04	38	49.0
05-02	171388	15	89	168	305	395		0.00	0.00				0.03	133	52.0
06-08	171627	19	127	228	382	456		0.00	0.00				0.00	20	77.0
07-11	172076	37	134	192	340	441		0.00	0.01				0.01	27	71.0
08-14	173216	25	142	176	292	386		0.00	0.01				0.01	20	72.0
09-25	173045	48	232	180	368	581		0.00	0.08				0.03	32	68.0
10-10	173243	56	304	226	466	742		0.00	0.03				0.02	5	51.0
11-03	173425	16	82	192	312	410		0.00	0.11				0.14	136	41.0
12-18	173714	14	86	232	362	432		0.00	0.01				0.02	28	38.0
1968	505555														
01-26	173959	20	109	216	360	474		0.00	0.01				0.04	7	31.0
02-05	174005	11	61	144	240	302		0.00	0.01				0.02	141	33.0
03-05	174233	19	120	226	376	487		0.00	0.02				0.03	3	33.0
04-02	174432	20	117	228	376	469		0.00	0.01				0.01	13	52.0
05-14	174726	21	124	246	380	465		0.00	0.01				0.01	24	67.0
06-12	175017	18	105	252	388	504		0.00	0.01				0.01	24	73.0
07-11	175533	16	100	256	390	501		0.00	0.01				0.01	28	
08-14	175908	21	144	240	364	458		0.00	0.01				0.03	17	82.0
09-17	176265	38	202	204	376	529		0.00	0.01				0.00	81	71.0
10-14	176541	39	215	260	420	603		0.00	0.12				0.06	55	68.0
11-04	176612	57	267	312	510	744		0.00	0.02				0.01	7	52.0
12-05	176989	35	91	284	368	464		0.00	0.02				0.00	9	34.0
1969	505555														
01-08	177183	28	126	208	336	459		0.00	0.01				0.01	7	32.0
02-17	177555	18	63	208	290	363	0.00	0.00	0.01	<.05		<.05	0.02	13	35.0
03-03	177639	21	103	208	332	441	0.00	0.00	0.01	<.05		<.05	0.01	4	35.0
04-30	178015	22	123	216	352	438	0.00	0.00	0.02	<.05	0.00	<.05	0.04	33	48.0
05-12	178159	14	66	180	292	361	0.00	0.00	0.02	0.05	0.00	<.05	0.03	5	56.0
06-16	178516	21	57	196	290	387	0.01	0.00	0.02	0.05	0.00	<.05	0.03	5	64.0
07-09	178953	16	70	234	338	427	0.00	0.00	0.01	<.05	0.00	<.05	0.03	52	70.0
08-19	179329	22	129	196	300	432	0.00	0.00	0.02	<.05	0.00	<.05	0.03	23	86.0
09-02	179445	42	167	260	404	543	0.00	0.00	0.01	<.05	0.02	<.05	0.04	23	82.0
10-08	179836	53	227	244	423	640	0.00	0.00	0.02	<.05	0.03	<.05	0.06	32	59.0
11-17	180092	28	140	244	407	498	0.00	0.00	0.02	<.05	0.01	<.05	0.02	6	43.0
12-09	180282	28	130	244	404	510	0.00	0.00	0.01	<.05	0.01	<.05	0.02	2	35.0
1970	505555														
01-19	180550	40	169	294	472	627	0.00	0.00	0.01	<.05	0.01	<.05	0.04	14	34.0
02-10	180761	27	117	220	360	452	0.00	0.00	0.02	<.05	0.01	<.05	0.05	6	32.0
03-09	180952	25	117	220	362	443	0.00	0.00	0.03	<.05	0.00	<.05	0.02	9	34.0
04-05	181178	22	95	184	342	449	0.00	0.00	0.01	<.05	0.00	<.05	0.02	59	41.0
05-19	181733	16	56	128	240	321	0.00	0.00	0.02	<.05	0.00	<.05	0.01	293	63.0
06-17	182240	13	45	120	204	262	0.00	0.00	0.02	<.05	0.00	<.05	0.05	1470	72.0
07-15	183031	22	119	232	348	420	0.00	0.00	0.01	<.05	0.00	<.05	0.00	58	76.0
08-10	183506	19	111	244	368	452	0.00	0.00	0.01	<.05	0.01	<.05	0.00	22	75.0
09-22	183697	16	79	220	328	393	0.00	0.00	0.02	<.05	0.01	<.05	0.04	126	68.0
10-19	184144	17	89	244	404	456	0.00	0.00	0.01	<.05	0.01	<.05	0.05	16	54.0
11-16	184247	19	103	272	424	498	0.00	0.00	0.02	<.05	0.01	<.05	0.04	10	41.0
12-07	184445	20	119	256	424	527	0.00	0.00	0.01	<.05	0.01	<.05	0.02	2	34.0
1971	505555														
01-18	184747	25	131	296	464	568	0.00	0.00	0.01	<.05	0.01	<.05	0.03	2	33.0
02-08	184900	15	57	104	172	250	0.00	0.00	0.02	<.05	0.01	<.05	0.04	263	33.0
03-16	185178	14	55	140	232	323	0.00	0.00	0.01	<.05	0.00	<.05	0.02	1820	41.0
04-20	185451	25	121	248	392	488	0.00	0.00	0.01	<.05	0.01	<.05	0.02	5	63.7
05-10	185649	23	115	248	368	449	0.00	0.00	0.01	<.05	0.01	<.05	0.03	29	60.4
06-14	185907	26	111	232	352	450	0.00	0.00	0.01	<.05	0.00	<.05	0.02	44	79.0
07-12	186283	18	78	172	268	368	0.00	0.00	0.02	<.05	0.00	<.05	0.02	120	75.0
08-09	186392	33	159	234	372	490	0.00	0.00	0.02	<.05	0.01	<.05	0.02	11	81.0
09-13	186652	64	251	284	472	762	0.00	0.00	0.02	<.05	0.03	<.05	0.01	41	80.6

WABASH RIVER AT HUTSONVILLE

The Wabash River is an intersectional stream, rising in Indiana and flowing southward along more than one-third of the eastern border of Illinois. Although samples were collected at Hutsonville, Illinois, the nearest gaging station is located at Riverton, Indiana, downstream of the Illinois Central Railroad bridge. Elevation of gage datum is 414.65 feet above mean sea level. The drainage basin above the gage has an area of approximately 13,100 square miles.

Water samples were collected and chemical analyses were performed by personnel of the Central Illinois Public Service Company at Hutsonville.

The tabulation of water quality data is for the period from October 4, 1966, to September 4, 1971. Discharge and some quality data are shown graphically. The mean daily discharge values shown were taken from published records of the USGS from 1966 to 1970, and from provisional records in 1971, and are for the gaging station at Riverton, Indiana.

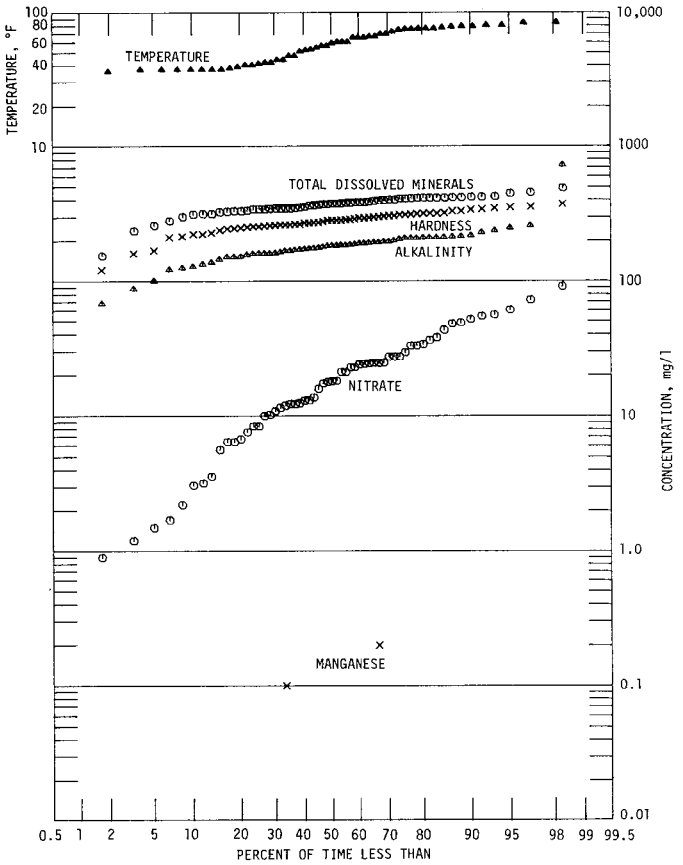
For 80 percent of the time, in the interval between 10 and 90 percent, the mean daily flow did not exceed 2.06 cfs/sq mi, nor fall below 0.18 cfs/sq mi. The median flow was 0.59 cfs/sq mi and the mean was 0.867 cfs/sq mi.

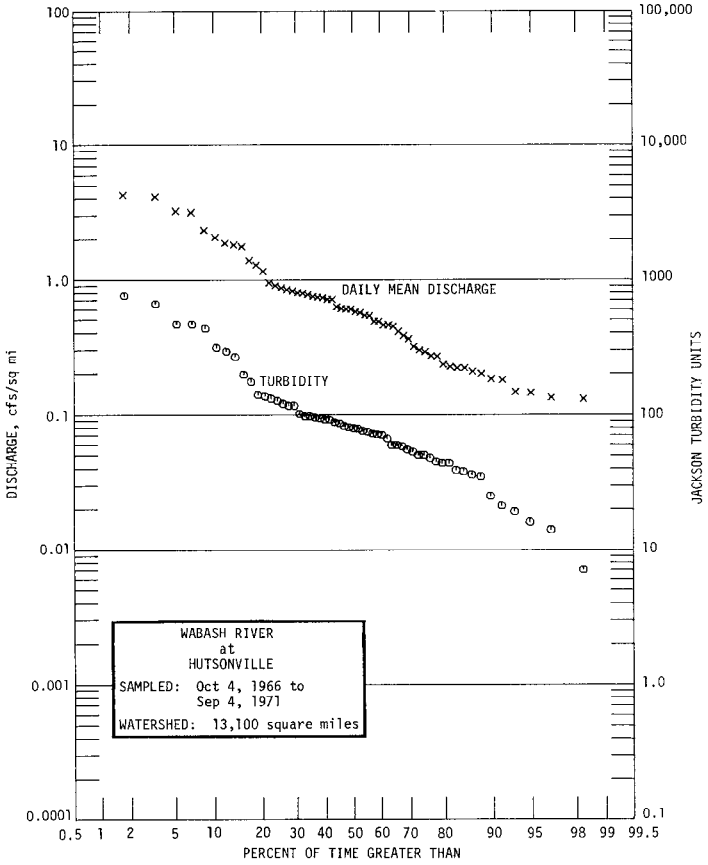
The turbidity was not less than 25 Jtu nor more than 312 Jtu for the central 80 percent of the time. The median value was 79 Jtu and the mean 128 Jtu.

Reported temperatures were over 80 F for 4 percent and over 70 F for 29 percent of the time. They were below 50 F for 37 percent and below 40 F for 19 percent of the time.

The analyses indicated the following :

	Concentration (*mg/l*) not exceeded for indicated percent of time (mean in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	128	183	219
Hardness (as $CaCO_3$)	224	284	338
Total dissolved minerals	314	373	419
Nitrate (NO_3)	3.1	17.9(22.5)	51.6





WABASH RIVER AT HUTSONVILLE

DATE	LAB.NO.	CFS	FE	MN	CA	MG	SR	NA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	303420															
10-04	940550	1690.0	0.1	0.00	72.4	28.1		20		0.6			6			1.7
11-09	940593	1890.0	0.1	0.00	76.4	25.9		33		0.8			2			2.2
12-06	940625	10400.0	0.2	0.00	61.0	17.1		25		0.6			13			54.4
1967	303420															
01-03	940013	9800.0	0.1	0.00	81.2	22.7		6		0.2			12			17.6
02-02	940098	24300.0	0.1	0.00	55.0	18.1		3		0.3			10			15.7
03-07	940150	16600.0	0.0	0.00	71.3	20.2		8		0.2			9			33.9
04-07	940214	23700.0	0.1	0.00	70.5	20.3		8		0.2			10			24.2
05-02	940298	11000.0	0.1	0.00	81.6	25.5		0		0.3			4			29.6
06-04	940332		0.1	0.00	73.6	25.7		13		0.1			11			24.6
07-05	940404	7000.0	0.1	0.00	58.6	25.8		16		0.3			4			10.2
08-07	940428	2870.0	0.1	0.00	63.8	22.1		18		0.2			9			11.5
09-01	940486	1860.0	0.0	0.00	75.0	26.2		26		0.2			9			5.6
11-01	940580	2370.0	0.0	0.00	79.2	20.6		23		0.3			6			1.5
12-01	940632	2690.0	0.1	0.00	92.8	19.2		8		0.3			16			12.2
1968	303420															
01-03	940006	41000.0	0.3	0.00	72.0	15.8		9		0.3			13			36.3
02-01	940051	42200.0	0.3	0.00	42.4	13.0		28		0.2			16			90.8
03-01	940156	7810.0	0.1	0.00	89.6	25.9		8		0.1			3			27.3
04-03	940221	14900.0	0.0	0.20	76.0	20.2		0		0.3			8			22.7
05-08	940265	5340.0	0.2	0.00	80.0	25.4		9		0.1			8			17.2
06-03	940304	30400.0	0.2	0.00	86.4	17.3		13		0.2			8			12.9
07-16	940334	5950.0	0.1	0.00	67.2	20.2		6		0.2			9			33.2
08-01	940384	7870.0	0.1	0.00	77.6	16.8		3		0.3			12			10.9
08-31	940432	4130.0	0.3	0.00	93.6	19.2		3		0.9			15			0.9
10-02	940510	3530.0	0.0	0.00	82.4	23.5		8		0.2			14			6.4
11-01	940535	3040.0	0.0	0.00	84.8	25.9		8		0.1			15			10.0
12-11	940583	6310.0	0.3	0.00	92.0	26.9		9		0.2			13			47.9
1969	303420															
01-09	940018	9600.0	0.1	0.00	80.8	23.5		18		0.2			13			72.4
01-31	940051	53800.0	0.0	0.00	38.4	5.8		2		0.2			14			12.2
03-04	940106	9300.0	0.0	0.00	96.8	21.6		3		0.2			11			17.9
04-07	940146	17900.0	0.3	0.00	84.0	23.0		0		0.2			11			13.0
05-06	940233	10100.0	0.2	0.00	84.0	26.4		3		0.2			12			38.1
06-03	940261	7060.0	0.1	0.00	84.8	25.9		14		0.5			8			24.7
07-01	940360	10700.0	0.1	0.00	79.2	16.3		17		0.2			16			42.9
08-05	940428	5960.0	0.1	0.00	78.4	20.2		9		0.2			9			6.7
09-10	940484	2600.0	0.1	0.00	68.8	21.1		23		0.2			7			7.6
10-08	940557	3890.0	0.0	0.00	84.8	14.4		14		0.2			9			3.2
11-10	940632	9530.0	0.1	0.10	86.4	25.0		16		0.1			13			22.9
12-09	940682	11800.0	0.1	0.00	88.8	14.9		20		0.3			7			33.2
1970	303420															
01-08	940038	2930.0	0.0	0.00	96.0	27.8		17		0.2			9			24.3
01-28	940041	6330.0	0.0	0.00	76.0	20.2		14		0.5			9			8.4
03-04	940129	9240.0	0.1	0.00	80.8	14.9		14		0.3			5			27.3
04-08	940191	22900.0	0.1	0.00	76.8	20.2		8		0.2			10			55.9
05-01	940209	55300.0	0.1	0.00	71.2	12.5		11		0.2			12			48.4
06-05	940287	11300.0	0.1	0.00	77.6	22.1		13		0.2			9			27.3
07-02	940382	5800.0	0.0	0.00	60.8	25.0		19		0.2			3			12.4
08-06	940429	8150.0	0.1	0.00	79.2	15.8		4		0.2			8			13.6
09-04	940513	2330.0	0.0	0.00	84.8	19.2		3		0.3			6			6.4
10-06	940578	4730.0	0.0	0.00	84.0	21.6		0		0.1			9			3.6
11-05	940608	7500.0	0.1	0.00	102.4	22.1		0		0.2			10			1.2
12-01	940692	7370.0	0.0	0.00	94.4	25.0		7		0.3			7			23.9
1971	303420															
01-15	940048	4990.0	0.0	0.00	106.4	20.6		1		0.2			8			24.6
02-04	940089	3500.0	0.1	0.00	97.6	30.7		17		0.2			7			21.1
03-19	940122	27000.0	0.0	0.00	46.4	12.5		22		0.3			15			51.6
04-08	940174	7830.0	0.1	0.00	92.8	20.2		7		0.3			6			3.1
05-14	940216	12300.0	0.0	0.00	70.4	20.2		8		0.5			12			18.1
06-09	940284	10300.0	0.2	0.00	68.8	16.3		27		0.3			24			60.5
07-06	940356	3790.0	0.0	0.00	49.6	24.0		16		0.2			3			8.4
08-06	940429	2870.0	0.1	0.00	62.4	22.1		14		0.1			5			11.9
09-04	940647	1720.0	0.1	0.00	57.6	17.3		30		0.1			8			21.1

WABASH RIVER AT HUTSONVILLE

DATE	LAB.NO.	CL	S04	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	303420														
10-04	940550	31	116	182	294	409								59	69.0
11-09	940593	33	108	212	302	414								66	60.0
12-06	940625	20	81	128	224	329								312	36.0
1967	303420														
01-03	940013	17	97	183	294	378								50	37.0
02-02	940098	16	67	121	212	281								429	39.0
03-07	940150	23	84	144	256	364								264	37.0
04-07	940214	16	78	160	262	346								138	59.0
05-02	940298	19	56	206	310	394								135	60.0
06-04	940332	21	95	184	286	414								86	65.0
07-05	940404	21	90	159	254	340								70	76.0
08-07	940428	23	84	167	250	343								91	80.0
09-01	940486	28	98	208	284	420								21	75.0
11-01	940580	28	99	194	284	383								35	56.0
12-01	940632	26	97	191	312	446								7	42.0
1968	303420														
01-03	940006	15	68	150	246	314								125	37.0
02-01	940051	11	47	88	160	238								119	42.0
03-01	940156	18	94	210	332	412								16	41.0
04-03	940221	21	74	156	274	340								58	56.0
05-08	940265	18	102	186	306	387								80	65.0
06-03	940304	43	91	161	288	380								291	77.0
07-16	940334	14	65	151	252	315								758	74.0
08-01	940384	16	71	171	264	346								172	80.0
08-31	940432	18	72	230	314	384								53	75.0
10-02	940510	28	82	199	304	374								82	72.0
11-01	940535	23	85	214	320	400								39	60.0
12-11	940583	26	87	208	342	422								25	37.0
1969	303420														
01-09	940018	21	79	175	300	419								116	37.0
01-31	940051	9	34	68	120	154								460	38.0
03-04	940106	25	89	208	332	407								38	47.0
04-07	940146	23	83	183	306	397								130	53.0
05-06	940233	24	74	194	318	412								95	66.0
06-03	940261	26	82	219	318	417								74	76.0
07-01	940360	23	69	172	264	393								195	78.0
08-05	940428	17	79	196	278	348								87	79.0
09-10	940484	21	86	188	258	366								91	
10-08	940557	27	77	190	271	346								75	69.0
11-10	940632	31	84	211	318	384								44	40.0
12-09	940682	28	85	179	283	373								48	
1970	303420														
01-08	940038	21	93	250	354	453								19	37.0
01-28	940041	26	79	184	272	370								55	44.0
03-04	940129	25	81	167	263	352								97	54.0
04-08	940191	23	60	163	274	355								93	47.0
05-01	940209	31	53	125	229	317								78	66.0
06-05	940287	23	66	197	284	370									
07-02	940382	23	80	174	254	332								71	
08-06	940429	25	58	170	262	325									
09-04	940513	28	79	177	290	341								36	83.0
10-06	940578	27	72	192	298	346								97	
11-05	940608	31	68	238	346	416								59	52.0
12-01	940692	28	80	216	338	414								50	
1971	303420														
01-15	940048	28	78	723	351	406								44	44.0
02-04	940089	241	104	258	372	489								14	40.0
03-19	940122	185	50	100	168	260								116	37.0
04-08	940174	291	78	210	316	402								72	51.0
05-14	940216	260	77	158	260	368								462	65.0
06-09	940284	199	74	150	240	381								656	79.0
07-06	940356	277	81	133	224	302								45	
08-06	940429	291	72	160	248	333								101	76.0
09-04	940647	440	69	137	216	332								79	84.0

WOLF CREEK NEAR BEECHER CITY

Wolf Creek rises in the Springfield Plain Region south of Stewardson and flows southwesterly into the Kaskaskia River. The gaging station is located 2.2 miles southwest of Beecher City. Elevation of gage datum is 535.48 feet above mean sea level. The drainage basin above the gage has an area of approximately 48 square miles.

The tabulation of water quality data is for the period from October 10, 1966, to August 12, 1971. Discharge and some quality data are shown graphically. The instantaneous discharge values shown were computed by the USGS from gage height measurements taken at the time of sampling.

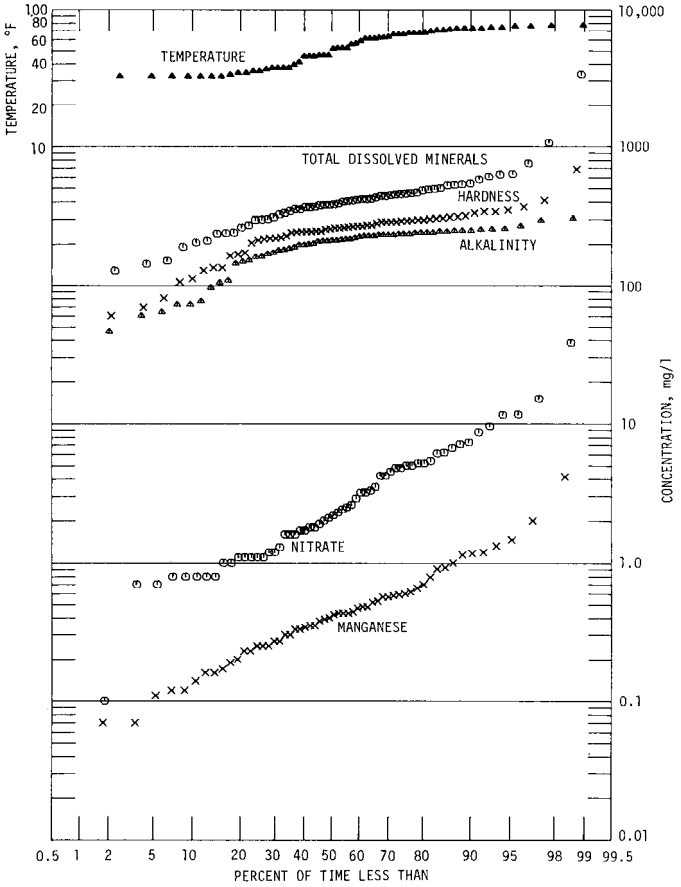
For 80 percent of the time, in the interval between 10 and 90 percent, the instantaneous flow did not exceed 0.94 cfs,/sq mi, nor fall below 0.01 cfs/sq mi. The median flow was 0.10 cfs/sq mi and the mean was 0.42 cfs/sq mi.

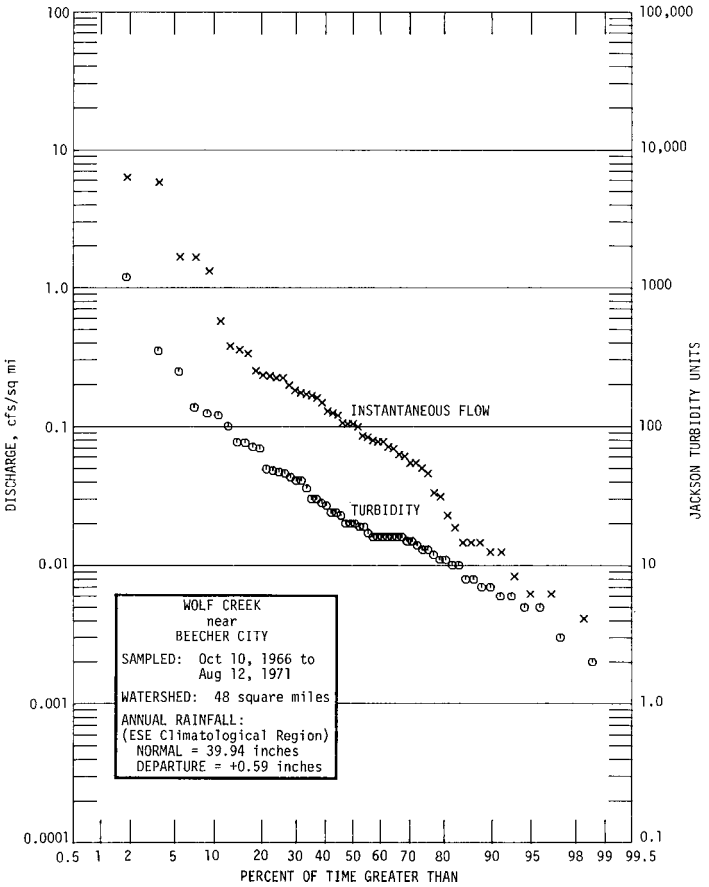
The turbidity was not less than 6 Jtu nor more than 121 Jtu for the central 80 percent of the time. The median value was 19 Jtu and the mean 59 Jtu.

Reported temperatures were never over 80 F and were over 70 F for 22 percent of the time. They were below 50 F for 42 percent and below 40 F for 30 percent of the time.

The analyses indicated the following:

	Concentration (*mg/l*) not exceeded for indicated percent of time (means in parentheses)		
	10%	50%	90%
Alkalinity (as $CaCO_3$)	76	214	252
Hardness (as $CaCO_3$)	128	262	340
Total dissolved minerals	211	403	604
Nitrate (NO_3)	0.8	2.3(4.0)	8.7
Total inorganic phosphate (PO_4)	0.1	0.4(0.49)	1.1
Soluble inorganic phosphate (PO_4)	0.0	0.2(0.26)	0.5
Manganese (Mn)	0.14	0.42	1.18





WOLF CREEK NEAR BEECHER CITY

DATE	LAB.NO.	CFS	FF	MN	CA	MG	SR	MA	K	NH4	PO4F	PO4U	SIO2	F	B	NO3
1966	505923															
10-10	170042	0.7	1.1	0.38	64.0	24.9	0.38	101	5.6	T	0.00	0.00	70	0.10	0.10	1.9
11-11	170200	16.0	1.8	0.19	26.8	9.5	0.10	18	7.4	0.0	1.00	1.10	12	0.20	0.00	7.3
12-15	170447	12.0	0.7	0.58	67.2	24.0	0.29	39	4.0	0.1	0.00	0.00	15	0.30	0.10	5.2
1967	505923															
01-03	170542	3.7	0.3	0.25	72.8	27.4	0.21	47	3.4	0.1	0.20	0.30	14	0.30	0.00	5.4
02-17	170854	5.0	0.7	0.48	71.8	26.0	0.22	40	3.3	0.3	0.50	0.60	13	0.10	0.10	4.5
03-17	171069	8.2	0.7	0.07	67.2	23.0	0.19	36	3.3	0.2	0.70	0.70	9	0.30	0.10	5.0
04-14	171224	9.5	0.9	0.16	60.4	22.0	0.12	31	3.4	T	0.40	0.40	10	0.10	0.00	6.1
05-15	171557	80.0	3.4	0.00	34.8	11.4	0.11	13	4.6	0.1	0.50	0.90	13	0.20	0.00	7.1
06-08	171657	4.8	0.6	0.11	68.0	24.9	0.19	32	3.5	0.1	0.10	0.40	10	0.10	0.10	1.6
07-20	172306	4.1	3.5	0.27	62.4	23.5	0.36	82	4.8	0.1	0.10	0.40	13	0.10	0.10	1.8
08-10	172660	7.1	8.2	0.12	19.2	5.1	0.06	8	4.3	0.1	0.50	1.10	10	0.10	0.10	4.8
09-20	173086	0.0	0.6	2.00	100.0	39.0	0.37	61	4.9	0.1	0.10	0.20	8	0.10	0.10	2.4
10-13	173285	0.2	1.0	1.00	76.8	29.2	0.23	39	5.2	0.2	0.40	0.60	14	0.20	0.00	1.3
11-01	173535	0.3	1.3	1.15	71.2	28.8	0.38	106	7.0	T	0.50	0.70	5	0.10	0.00	1.8
12-04	173673	63.0	5.8	0.23	28.0	10.3	0.09	13	5.1	0.1	0.80	1.80	11	0.20	0.00	11.5
1966	505923															
01-12	173842	11.0	0.5	0.79	80.4	32.0	0.28	61	2.8	0.1	0.00	0.20	14	0.10	0.10	4.2
02-12	174156	8.0	0.6	0.48	76.0	26.0	0.24	51	3.0	0.4	0.50	0.60	16	0.20	0.00	4.2
03-06	174328	3.7	0.6	0.39	69.6	25.8	0.19	38	2.6	0.6	0.40	0.60	10	0.10	0.10	1.7
04-12	174601	7.7	0.6	0.23	66.4	24.4	0.20	33	3.2	0.1	0.20	0.70	4	0.20	0.00	0.8
05-03	174906	2.6	1.1	0.60	68.8	28.2	0.23	41	3.2	0.2	0.00	0.10	6	0.20	0.10	1.0
06-05	175190	6.0	0.9	0.12	62.4	21.9	0.18	27	2.9	0.2	0.10	0.20	12	0.20	0.10	3.2
07-08	175564	0.6	0.8	0.35	56.0	19.5	0.15	19	3.4	0.1	0.10	0.20	10	0.30	0.10	0.8
08-13	175999	2.2	3.2	0.07	41.6	14.6	0.11	15	4.6	0.2	0.40	1.50	12	0.20	0.10	3.2
09-10	176262	0.0	1.0	0.43	64.0	24.3	0.17	23	4.9	0.2	0.30	0.40	10	0.20	0.10	0.8
10-18	176594	0.0	1.2	0.17	65.6	26.4	0.21	27	5.4	0.1	0.30	0.40	12	0.20	0.10	1.2
11-08	176746	0.3	3.1	1.20	73.6	29.2	0.29	67	5.6	0.1	0.50	0.50	15	0.20	0.10	1.7
12-10	177094	1.6	0.9	0.66	76.8	28.7	0.23	55	5.0	0.6	0.30	1.10	14	0.20	0.10	3.5
1969	505923															
01-73	177376	2.6	0.5	1.33	83.2	32.1	0.24	45	3.0	0.7	0.20	0.20	14	0.20	0.10	3.3
02-05	177371	17.0	1.0	0.27	51.6	20.2	0.23	25	3.6	0.4	0.30	0.50	11	0.10	0.00	5.0
03-12	177671	6.2	0.7	0.43	63.2	25.8	0.20	46	3.0	0.1	0.30	0.30	7	0.20	0.10	2.2
04-08	178010	18.0	1.6	0.20	54.4	19.5	0.14	23	3.9	0.1	0.30	0.50	12	0.20	0.10	11.6
05-20	178257	5.0	1.9	0.30	42.8	15.8	0.14	25	4.2	0.3	0.40	0.80	7	0.20	0.20	2.0
06-11	178610	1.1	1.2	0.33	62.4	21.0	0.14	28	3.6	0.2	0.30	0.40	14	0.20	0.10	6.2
07-09	179112	301.0	18.0	0.62	16.0	4.9	0.04	9	4.7	0.3	0.50	1.40	8	0.20	0.10	8.7
08-04	179337	0.4	0.7	0.57	56.4	19.8	0.14	21	4.0	0.1	0.20	0.40	9	0.30	0.10	0.8
09-15	179643	0.0	0.8	1.18	56.0	19.6	0.19	33	8.0	0.1	0.40	0.80	9	0.20	0.20	1.6
10-28	179918	3.4	1.0	0.33	84.8	31.3	0.67	147	4.7	0.2	0.00	0.10	14	0.20	0.10	1.1
11-07	180024	3.0	0.9	0.25	75.6	28.6	0.19	46	4.5	0.1	0.10	0.50	4	0.20	0.10	1.2
12-10	180335	8.7	1.1	0.34	56.0	21.4	0.17	34	5.6	0.2	0.60	0.70	5	0.20	0.10	6.7
1970	505923															
01-16	180740	3.3	0.7	0.91	84.8	33.2	0.16	53	2.8	0.6	0.10	0.30	9	0.20	0.10	2.5
02-10	180741	27.3	0.9	0.30	50.8	18.8	0.14	26	4.0	0.5	0.20	0.40	10	0.20	0.10	9.6
03-16	181109	5.8	0.8	0.52	70.0	28.6	0.15	42	2.7	0.1	0.10	0.10	7	0.20	0.10	0.7
04-06	181289	11.2	0.8	0.35	61.6	24.4	0.14	30	2.6	0.1	0.20	0.30	8	0.20	0.10	2.1
05-01	181534	278.0	11.0	0.53	33.6	10.7	0.09	12	4.8	0.2	0.50	1.90	4	0.20	0.20	5.2
06-05	182104	79.5	4.1	0.14	35.2	11.2	0.09	16	5.4	0.8	0.40	0.60	8	0.20	0.10	38.0
07-08	183424	1.5	0.4	0.42	79.2	28.7	0.41	98	3.0	0.1	0.00	0.10	12	0.30	0.10	0.7
08-12	183421	0.7	0.6	0.44	90.4	34.7	1.19	261	3.6	0.2	0.00	0.10	11	0.30	0.10	1.1
09-10	183640	0.0	1.0	4.14	171.2	62.3	3.40	1005	6.5	0.9	0.00	0.10	11	0.30	0.00	1.0
10-07	183891	0.6	0.9	0.57	61.6	22.0	0.26	56	5.6	0.2	0.20	0.20	12	0.30	0.10	2.3
11-12	184277	2.4	0.2	0.16	69.6	27.9	0.21	47	4.6	0.1	0.20	0.20	10	0.30	0.10	1.1
12-03	184488	2.9	0.6	0.40	72.8	27.9	0.25	51	4.0	0.1	0.10	0.10	9	0.30	0.10	0.8
1971	505923															
01-06	184811	8.4	2.7	0.25	42.4	15.1	0.11	22	5.4	0.5	0.20	0.60	8	0.30	0.10	15.1
02-12	184963	10.7	0.7	0.59	65.6	25.4	0.16	31	3.7	0.5	0.10	0.10	10	0.30	0.10	4.8
03-17	185260	10.7	2.4	0.00	60.8	22.5	0.23	42	3.6	0.5	0.10	0.40	10	0.30	0.10	1.1
04-06	185527	3.8	0.8	0.43	68.8	28.3	0.20	43	2.5	T	0.00	0.10	5	0.20	0.00	0.1
05-10	185784	4.0	2.8	0.93	64.0	24.4	0.20	54	4.7	0.7	0.10	0.30	9	0.30	0.10	2.6
06-03	186002	0.9	1.3	1.47	72.0	27.4	0.20	66	4.0	0.2	0.10	0.10	9	0.30	0.10	1.6
07-15	186336	5.1	6.0	0.47	23.2	5.4	0.08	13	4.0	0.1	0.20	0.70	7	0.30	0.10	2.9
08-12	186501	0.7	1.0	0.70	62.4	21.5	0.11	20	3.4	0.1	0.00	0.10	9	0.30	0.10	1.1

WOLF CREEK NEAR BEECHER CITY

DATE	LAB.NO.	CL	SO4	ALK.	T.H.	TMC	CD	CR	CU	PB	LI	NI	ZN	TURB.	TEMP
1966	505923														
10-10	170042	174	68	178	255	578			0.01					49	55.0
11-11	170200	26	42	76	106	211			0.02					43	45.0
12-15	170447	53	61	212	267	406			0.01					7	37.0
1967	505923														
01-03	170542	58	70	240	294	449			0.01					5	34.0
02-17	170854	52	69	232	286	416		0.00	0.01				0.01	8	34.0
03-17	171069	46	64	208	262	415		0.00	0.01				0.01	2	32.0
04-14	171224	37	55	200	241	364		0.00	0.16				0.25	20	67.0
05-15	171557	18	40	96	134	237		0.00	0.03				0.02	100	58.0
06-08	171657	43	49	236	272	386		0.00	0.00				0.00	16	72.0
07-20	172306	145	42	180	246	524		0.00	0.01				0.00	46	70.0
08-10	172660	10	23	60	69	143		0.00	0.01				0.03	124	71.0
09-20	173086	82	179	244	410	635		0.00	0.01				0.02	30	73.0
10-13	173285	49	91	236	312	480		0.00	0.01				0.01	30	52.0
11-01	173535	170	83	196	296	628		0.00	0.02				0.04	36	52.0
12-04	173673	17	32	72	112	189		0.00	0.03				0.01	138	37.0
1968	505923														
01-12	173842	85	75	268	332	529		0.00	0.01				0.02	5	32.0
02-12	174156	73	68	240	300	460		0.00	0.01				0.01	16	32.0
03-06	174328	42	67	232	280	413		0.00	0.01				0.01	10	39.0
04-12	174601	38	77	224	266	380		0.00	0.01				0.08	14	63.0
05-03	174906	51	56	248	288	403		0.00	0.01				0.02	16	67.0
06-05	175190	31	43	210	246	332		0.00	0.01				0.01	16	73.0
07-08	175564	17	43	198	220	296		0.00	0.01				0.01	20	75.0
08-13	175999	18	29	160	164	238		0.00	0.01				0.03	77	70.0
09-10	176262	21	41	244	260	354		0.00	0.01				0.00	16	61.0
10-18	176594	27	57	240	272	378		0.00	0.01				0.01	47	56.0
11-08	176746	109	53	256	304	538		0.00	0.02				0.01	19	46.0
12-10	177094	88	65	248	310	500		0.00	0.01				0.00	16	33.0
1969	505923														
01-13	177376	55	66	304	340	486		0.00	0.01				0.00	27	32.0
02-05	177371	32	33	172	212	299		0.00	0.01				0.02	20	37.0
03-12	177671	50	79	212	264	419	0.00	0.00	0.01	<.05		<.05	0.01	11	35.0
04-08	178010	26	57	188	216	365	0.00	0.00	0.02	<.05	0.00	<.05	0.01	24	62.0
05-20	178257	26	35	152	172	273	0.00	0.00	0.03	<.05	0.00	<.05	0.02	41	61.0
06-11	178610	29	44	221	242	352	0.00	0.00	0.03	<.05	0.00	<.05	0.05	23	72.0
07-09	179112	7	25	46	60	127	0.00	0.00	0.03	<.05	0.00	<.05	0.04	1191	72.0
08-04	179337	13	37	209	222	301	0.00	0.00	0.01	<.05	0.00	<.05	0.04	13	72.0
09-15	179643	47	85	148	220	342	0.00	0.00	0.02	<.05	0.00	<.05	0.02	15	65.0
10-28	179918	245	56	248	340	753	0.01	0.00	0.01	<.05	0.01	<.05	0.02	7	45.0
11-07	180024	60	59	254	306	455	0.00	0.00	0.02	<.05	0.00	<.05	0.02	3	46.0
12-10	180335	51	65	162	228	376	0.00	0.00	0.01	<.05	0.00	<.05	0.03	24	37.0
1970	505923														
01-16	180740	57	81	294	348	526	0.00	0.00	0.01	<.05	0.00	<.05	0.03	11	32.0
02-10	180741	33	63	144	204	311	0.00	0.00	0.01	<.05	0.00	<.05	0.03	17	35.0
03-16	181109	49	80	228	292	444	0.00	0.00	0.01	<.05	0.00	<.05	0.02	8	36.0
04-06	181289	34	72	196	254	368	0.00	0.00	0.02	<.05	0.00	<.05	0.01	10	52.0
05-01	181534	14	29	104	128	205	0.00	0.00	0.03	<.05	0.00	<.05	0.05	348	65.0
06-05	182104	23	42	64	134	241	0.00	0.00	0.04	<.05	0.00	<.05	0.04	121	65.0
07-08	183424	160	56	252	316	604	0.00	0,00	0.01	<.05	0.00	<.05	0.02	13	75.0
08-12	183421	450	56	228	368	1066	0.00	0.00	0.01	<.05	0.01	<.05	0.01	19	69.0
09-10	183640	1850	62	216	683	3325	0.00	0.00	0.01	<.05	0.03	<.05	0.03	48	67.0
10-07	183891	100	51	168	244	439	0.00	0.00	0.00	<.05	0.00	<.05	0.01	16	62.0
11-12	184277	62	61	232	288	429	0.00	0.00	0.01	<.05	0.00	<.05	0.04	6	46.0
12-03	184488	72	63	236	296	461	0.00	0.00	0.01	<.05	0.00	<.05	0.08	6	51.0
1971	505923														
01-06	184811	28	56	108	168	262	0.00	0.00	0.02	<.05	0.00	< 05	0 06	71	32.0
02-12	184963	37	58	216	268	379	0.00	0.00	0.02	<.05	0.00	< 05	0.03	15	32.0
03-17	185260	53	69	184	244	398	0.00	0.00	0.01	<.05	0.00	< 05	0.02	69	45.0
04-06	185527	52	75	238	288	451	0.00	0.00	0.01	<.05	0.00	< 05	0.02	12	41.0
05-10	185784	71	73	214	260	437	0.00	0.00	0.03	<.05	0.00	< 05	0.03	76	61.0
06-03	186002	94	72	232	292	490	0.00	0.00	0.03	<.05	0.00	< 05	0.02	41	76.1
07-15	186336	14	18	72	80	151	0.00	0.00	0.02	<.05	0.00	< 05	0.03	248	75.2
08-12	186501	17	36	228	244	324	0.00	0.00	0.02	<.05	0.00	< 05	0.00	28	67.1

Attachment 3

USGS Hardness Map

Water Quality Portal (WQP)

Get current and historical USGS and EPA water-quality data at the WQP.

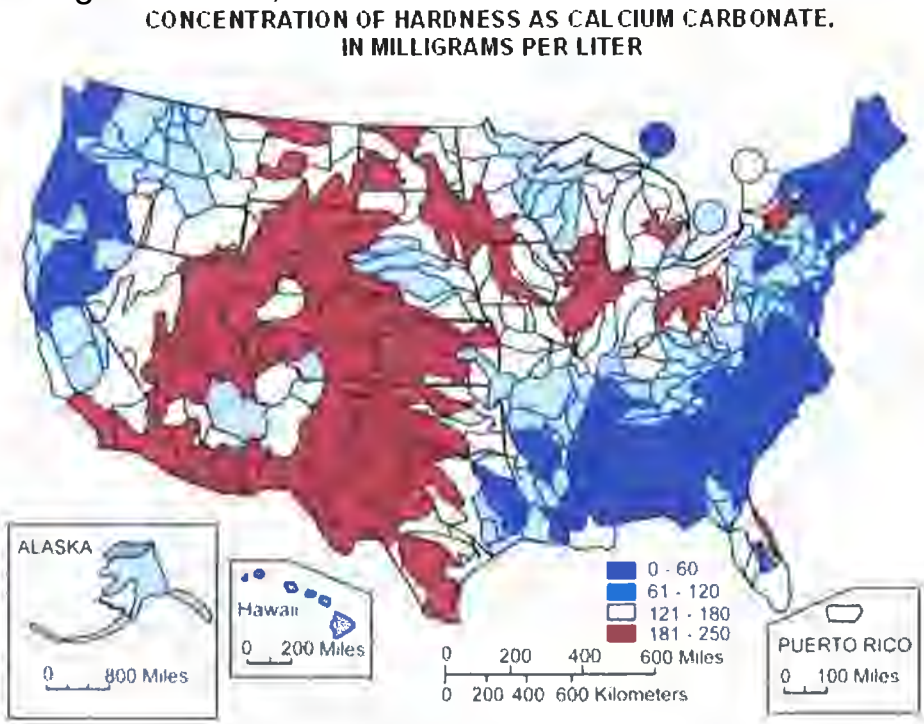
BioData

Get stream ecosystem aquatic bioassessment data from BioData.

For More Data

View a complete list of USGS water-quality data resources.

USGS Water Science Centers are located in each state.



Mean hardness as calcium carbonate at NASQAN water-monitoring sites during the 1975 water year. Colors represent streamflow from the hydrologic-unit area. Mape edited by USEPA, 2005. Modified from Briggs and others, 1977.

Note to Readers:

Water hardness is based on major-ion chemistry concentrations. Major-ion chemistry in ground water is relatively stable and generally does not change over time. Although the map illustrates data from 1975, these data have been found to be accurate and useful in current assessments.

There are, however, several caveats about the nature, use, and interpretations of these data: (1) the data illustrated represent water hardness on a national and regional scale and must be so interpreted; (2) the 1975 data are not designed to be used to make local decisions or decisions on the scale of individual homeowner property; and (3) information that is directly relevant to water hardness and other chemical properties at a home or immediate locale should be provided by the local health agency, local water utility, or by the vendor of a local water-softening system.

Homeowners may refer to the following Web sites for additional information:

- EPA's "Local Drinking Water Information"
- EPA's "Surf Your Watershed"
- American Water Works Association

(From Briggs, J.C., and Ficke, J.F., 1977, Quality of Rivers of the United States, 1975 Water Year -- Based on the National Stream Quality Accounting Network (NASQAN): U.S. Geological Survey Open-File Report 78-200, 436 p.)

Alkalinity

The U.S. Environmental Protection Agency produced a map illustrating the regional patterns of mean annual alkalinity of surface water in the conterminous United States. The map provides a qualitative graphic overview to the sensitivity of surface waters to acidification. The map is based on data from approximately 2,500 streams and lakes and apparent spatial correlations between these data and macrowatershed characteristics, especially land use.

- Map: Total Alkalinity of Surface Waters - A National Map (1.9MB PDF)

Ma… R
(1.9MB PDF)

Attachment 4

List of Organizations Contacted

ATTACHMENT 4-LIST OF ORGANIZATIONS CONTACTED REGARDING THE COLD TEMPERATURE COLD RESEARCH

Abbott Laboratories
AbbVie
Akzo Nobel Surface Chemistry LLC
American Commercial Lines
Citgo Petroleum Corporation
City of Aurora
City of Batavia
City of Chicago
City of Chicago Dept. of Law
City of Crystal Lake
City of Elmhurst
City of Geneva
City of Joliet
City of St. Charles
ComEd
Cook County Dept of Env. Control
DeKalb Sanitary District
Downers Grove Public Works
Downers Grove Sanitary District
DuPage County DOT
DuPage County Public Works
Elk Grove Village
ExxonMobil Joliet Refinery
Fairmount Santrol
Fox Metro Water Reclamation District
Fox River Water Reclamation District
Illinois Department of Transportation
Illinois State Toll Highway Authority
IMTT Illinois
Ingredion
Ingrediron
Kane County Dept. of Environmental Mgmt.
Kane County DOT
KASteel Chemicals Inc.
Lake County Division of Transportation
McHenry County Highway Dept.
MWRDGC
Noramco Chicago
NRG Energy
Salt Institute
Seaways, Inc.

Thompson Coburn LLP
Village of Antioch
Village of Barrington
Village of Bartlett
Village of Bensenville
Village of Carol Stream
Village of Cary
Village of Deerfield
Village of Glen Ellyn
Village of Glenview
Village of Grayslake
Village of Hinsdale
Village of Homer Glen
Village of LaGrange
Village of Lake Barrington
Village of Lake in the Hills
Village of Libertyville
Village of Lisle
Village of Lombard
Village of Maywood
Village of Mokena
Village of Montgomery
Village of Morton Grove
Village of New Lenox
Village of Northbrook
Village of Oak Brook
Village of Orland Park
Village of Romeoville
Village of Round Lake Beach
Village of Skokie
Village of Tinley Park
Village of Villa Park
Village of Wauconda
Village of Westchester
Village of Western Springs
Village of Wheeling
Village of Willowbrook
Village of Wilmette
Village of Winnetka
Village of Woodridge
Will County Division of Transportation

Attachment 5

River Chloride Trends in Snow-Affected Urban Watersheds

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River chloride trends in snow-affected urban watersheds: increasing concentrations outpace urban growth rate and are common among all seasons

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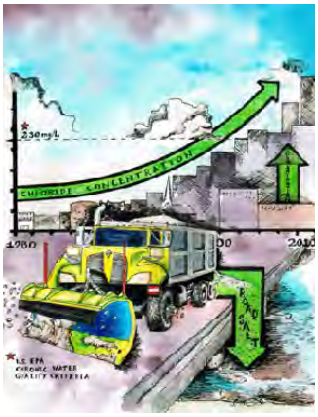
HIGHLIGHTS

- Chloride trends in northern U.S. urban streams are computed.
- The rate of chloride concentration increase outpaced urbanization from 1990 to 2011.
- The greatest chloride concentration increase was during the winter.
- Increasing chloride concentration trends were observed in all seasons.
- Chronic water quality criteria for chloride were exceeded for extended durations.

GRAPHICAL ABSTRACT



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ABSTRACT

Chloride concentrations in northern U.S. included in this study have increased substantially over time with average concentrations approximately doubling from 1990 to 2011, outpacing the rate of urbanization in the northern U.S. Historical data were examined for 30 monitoring sites on 19 streams that had chloride concentration and flow records of 18 to 49 years. Chloride concentrations in most studied streams increased in all seasons (13 of 19 in all seasons; 16 of 19 during winter); maximum concentrations occurred during winter. Increasing concentrations during non-deicing periods suggest that chloride was stored in hydrologic reservoirs, such as the shallow groundwater system, during the winter and slowly released in baseflow throughout the year. Streamflow dependency was also observed with chloride concentrations increasing as streamflow decreased, a result of dilution during rainfall- and snowmelt-induced high-flow periods. The influence of chloride on aquatic life increased with time; 29% of sites studied exceeded the concentration for the USEPA chronic water quality criteria of 230 mg/L by an average of more than 100 individual days per year during 2006–2011. The rapid rate of chloride concentration increase in these streams is likely due to a combination of possible increased road salt application rates, increased baseline concentrations, and greater snowfall in the Midwestern U.S. during the latter portion of the study period.

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1. Introduction

The impact of road salt on aquatic ecosystems continues to increase as urban development and subsequent road salt applications increase with time. Substantial application of road salt in the U.S. began in the 1940s increasing to an annual average of 9.6 million metric tons/yr of NaCl-based road salt in the 1980s and 19.5 million metric tons/yr in the last 5 years reported, ending in 2011 (Kelly and Matos, 2013). Increasing trends in chloride concentrations have been observed in water bodies of the U.S. and attributed, at least in part, to road salt influence. These trends have included rivers (Godwin et al., 2003; Interlandi and Crockett, 2003; Thunqvist, 2004; Kaushal et al., 2005; Kelly et al., 2012a), groundwater (Reisch and Toran, 2013; Kelly, 2008; Perera et al., 2009; Cassanelli and Robbins, 2013), inland lakes (Ramstack et al., 2004; Novotny and Stefan, 2010; Müller and Gächter, 2012), and even water bodies as large as the Laurentian Great Lakes (Chapra et al., 2009, 2012).

Elevated salt concentrations in surface waters can exert an adverse effect on aquatic organisms (Cañedo-Argüelles et al., 2013). The U.S. Environmental Protection Agency (USEPA) ambient water quality criteria for chloride (when associated with sodium) defines the chronic criterion as a 4-day average concentration exceeding 230 mg/L and the acute criterion as a 1-h average concentration exceeding 860 mg/L (U.S. Environmental Protection Agency, 1988). Given the sensitivity of freshwater organisms to chloride, exceedances of these criteria have the potential to affect a substantial number of species (U.S. Environmental Protection Agency, 1988). In a thorough assessment of the environmental impacts of road salt, Environment Canada estimated that 5% of aquatic species would be affected at chloride concentrations of 210 mg/L and 10% of aquatic species would be affected at chloride concentrations of 240 mg/L for chronic exposures (Environment Canada, 2001). Multiple studies have observed chloride concentrations greater than these benchmark concentrations in streams as a result of road salt runoff. These studies have included local (Ruth, 2003; Trowbridge et al., 2010; Allert et al., 2012; Morgan et al., 2012), regional (Kelly et al., 2012b), and national geographic scopes (Corsi et al., 2010).

Urban land cover in the U.S. has also increased over time from an estimated 61,000 km^2 in 1945 to 247,000 km^2 in 2007 (Nickerson et al., 2011). With urban land cover projected to continue increasing (Alig et al., 2004), applications of road salt for deicing impervious surfaces are also likely to increase. Adding to the current and past water quality issues resulting from the salinization of streams, including road salt runoff, an analysis of water quality in the northeastern U.S. predicted that many surface waters in that area of the country would not be potable for human consumption and would become toxic to freshwater life within the next century (Kaushal et al., 2005).

The primary objectives of this study were to define temporal trends in chloride concentrations in the context of chloride dependency on streamflow rates, compare temporal chloride trends among seasons, and compare these trends to changes in urban land cover, aquatic life criteria, and road salt sales patterns. Trend analysis was done using the modern water quality trend modeling technique that controlled for streamflow rate and season to help avoid confounding results due to natural variability (Hirsch et al., 2010).

2. Methods

2.1. Site selection

An initial focus for 14 sites on 3 streams in the Milwaukee metropolitan area was conducted. To assess the broader geographic impact, 11 additional streams in urban areas of the northern U.S. were studied, 4 streams in northern areas with little urban impact were studied, and one stream in an urban area of the southern U.S. was studied as a warm-climate reference.

Sites were initially chosen based on proximity to areas of urban influence in the northern U.S. (Fig. 1, Table 1). Three sites with a low degree of urbanization in northeast Wisconsin and one site in Oregon were included to evaluate non-urban influence, and the Trinity River in Texas was also examined as a non-deicing reference site in an urban area. Second, adequate data availability for modeling was necessary. Most sites had 200 or more chloride observations and 20 or more years of record with no significant gaps in data collection (i.e., larger than 5 years), and sample representation during all seasons throughout the water quality record (Table S1). The exceptions include five sites that had between 151 and 194 observations, and one site that had a 6-yr gap. These sites were included to maintain adequate geographic representation of sites (Table S1). Sites located within or just downstream from large lakes or impoundments were omitted. A continuous record of streamflow data concurrent with the chloride record was required at the selected site or at a nearby site on the same stream. Sites selected in the Milwaukee metropolitan area were chosen from a dense network of available sites in an effort to adequately represent changes in the Milwaukee, Menomonee, and Kinnickinnic Rivers.

2.2. Data sources

Chloride data were obtained from the Milwaukee Metropolitan Sewerage District (MMSD), the Wisconsin Department of Natural Resources (WDNR), and the Water Quality Portal (WQ portal; http://www.waterqualitydata.us/), which includes data from the USGS National Water Information System (NWIS) and EPA STOrage and RETrieval Data Warehouse (STORET). Coordinate bounding boxes were used to query the WQ Portal to locate streams in metropolitan areas of primarily the northern U.S. with sufficient data (Fig. 1). Where data from different sources overlapped at common sites, data were combined except for one site where data from one of the sources were not considered valuable due to many duplicate data points and data differences that called into question analytical results.

If available, streamflow data from the USGS National Water Information System (http://waterdata.usgs.gov/nwis) were retrieved from the same location where chloride samples were collected; otherwise, data from a nearby location(s) on the same stream were scaled by drainage area to estimate streamflow at the chloride sampling location. In two cases, there were data gaps in streamflow that were estimated using an ordinary least squares regression with streamflow data from a nearby site (Meno 70th, $R^2 = 0.65$; Milw Cedarburg, $R^2 = 0.95$).

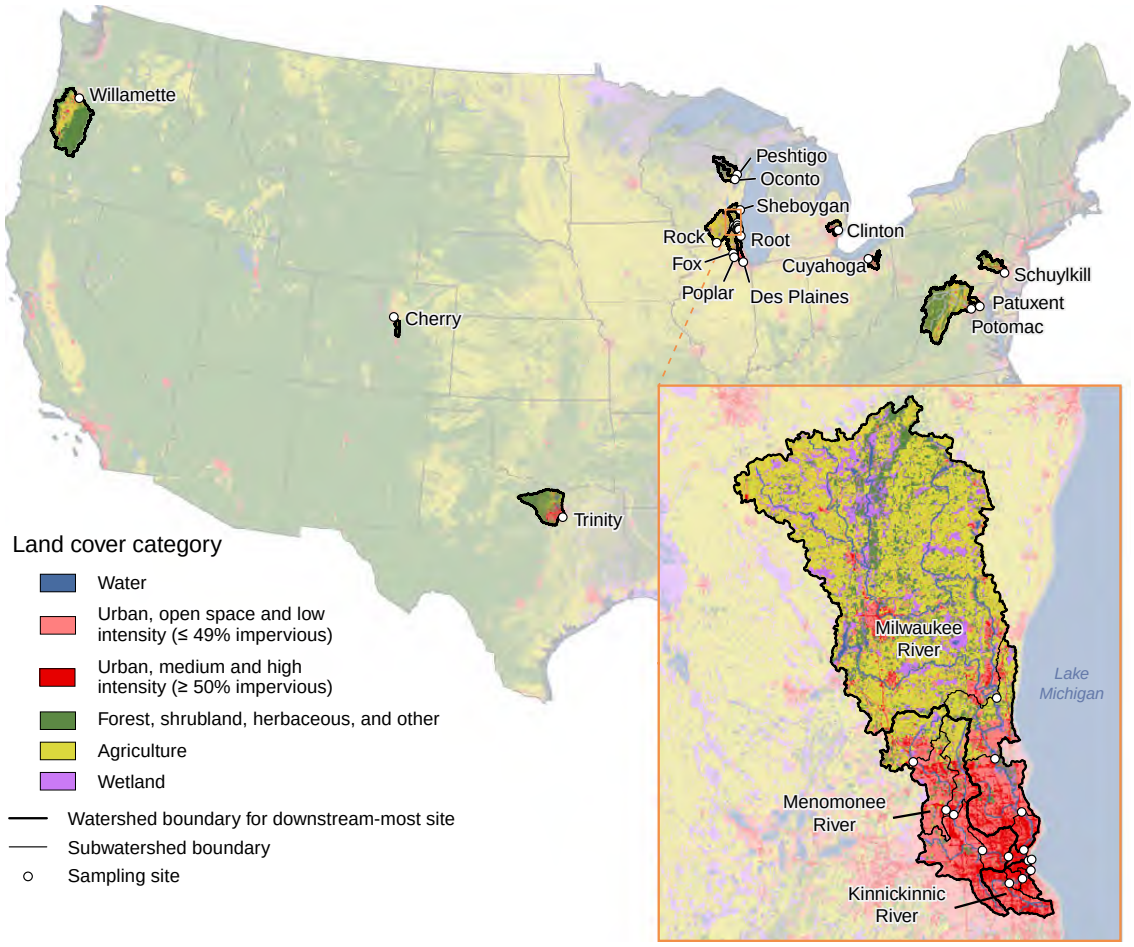
Road salt sales data were compiled from an annual reporting of Historical Statistics for Mineral and Material Commodities in the United States (Kelly and Matos, 2013) and used as a proxy for assessing overall road salt applications in the studied watersheds. Road salt sales were used in place of actual application numbers due to the complicated nature of gathering road salt application data from all municipalities and private applicators on the scale of this study.

Daily snowfall data for eight weather stations in the U.S. were retrieved from the National Climate Data Center (http://www.ncdc.noaa.gov/cdo-web/) for evaluation of snowfall changes throughout the study period (Table S2). Stations were chosen based on proximity of chloride study sites and availability of data during the study period.

Land cover composition and other watershed characteristics were determined from several published GIS datasets and provided in Table 1, and methods are described in Supplemental Information.

2.3. Data analysis

Data analysis included water quality trend modeling, graphical analysis of trends, and exploration of modeling results in comparison to land use, the USEPA water quality criterion, and road salt sales in the U.S.



Base composited from Instituto Nacional de Estadística Geografía e Informática, The Atlas of Canada, and U.S. Geological Survey North American Atlas - Political Boundaries, 1:10,000,000, 2006; U.S. Geological Survey National Land Cover Database 2006, 30-meter resolution, 2011; U.S. Environmental Protection Agency and U.S. Geological Survey National Hydrography Dataset Plus (modified), 1:100,000, 2005. Albers Equal Area Conic USGS CONUS Projection, referenced to North American Datum of 1983.

Fig. 1. Study site locations and watershed characteristics.

2.3.1. Rationale for water quality modeling technique

Chloride concentrations in streams have the potential to vary depending on several factors that all arise from the nature of the contamination sources, transport characteristics, and hydrologic characteristics of a given watershed. Considerations when attempting to understand these influential factors are very similar to those outlined previously describing potentially influential factors in stream nutrient concentrations and fluxes (Hirsch et al., 2010). The primary considerations are as follows: As urban development continues, sources of nonpoint pollution such as road salt application tend to increase as well, so it is logical to expect chloride concentrations in streams to change with time. Given that road salt is applied only during cold-weather periods, seasonal differences in chloride concentrations are also expected. The nature of road salt transport to surface waters causes chloride concentrations to change with streamflow. For example, when road salt melts ice and snow during periods of low streamflow, stream chloride concentrations can become very high, but when road salt runoff periods are coincident with high-streamflow periods resulting from snowmelt or rainfall events, chloride concentrations are likely to be lower due to the larger amounts of water available to dilute the road salt.

Long-term changes in chloride concentrations from road salt can follow a variety of temporal patterns responding to factors such as: the rate of urban development, changes in road salt application practices, long-term storage and release processes from large water bodies and groundwater, and changing climate conditions. Other major sources include treated wastewater as well as fertilizer and livestock, with other minor sources also contributing (Kelly et al., 2012b). These influences led to the use of WRTDS, a data analysis technique that can describe long-term change in a flexible manner (not simply as linear or quadratic time trends) and account for the seasonal- and streamflow-related dependencies which may, themselves, be changing over a period of many years or decades (Hirsch et al., 2010). The WRTDS analysis used here is implemented within the EGRET package (Hirsch and De Cicco, 2014) in the R statistical language (R Development Core Team, 2008).

2.3.2. Modeling water quality changes

The WRTDS method is based on weighted linear regression to estimate daily concentration throughout time, discharge (streamflow), and seasonal dimensions of the data used to calibrate the model. For any given estimation point in the data domain (where the point is defined by year, season and streamflow) the model gives increased weight to values similar in time, streamflow, and season to the estimation point. For example, concentrations of samples collected in year two of a sample period will have little influence on model estimates for year 10, concentrations of samples collected during low flow periods will have little influence on model estimates for high flow, and concentrations of samples collected during summer will have little influence on model estimates for winter periods. Weighting for proximity of the estimation point to the observed data by time (the time distance),

Table 1
Watershed characteristics of study sites.

Site name	Metropolitan			Drainage	Percent land cover in 2006				Percent land cover in 1992[c]		
	State	Area	Short Name	area (km^2)	Urban[a]	Agricultural[a]	Forest/ other[a]	% Impervious[b]	Urban	Agricultural	Forest/ other
Milwaukee River at Pioneer Rd near Cedarburg	WI	Milwaukee	Milw Cedarburg	1555	11.0	56.2	32.8	2.9	9.6	58.5	31.9
Milwaukee River at Brown Deer Rd	WI	Milwaukee	Milw Brown Deer	1674	12.7	54.9	32.4	3.4	11.1	57.4	31.5
Milwaukee River at Estabrook Park	WI	Milwaukee	Milw	1785	17.5	51.4	31.0	5.6	16.0	53.9	30.1
Milwaukee River at Wells St	WI	Milwaukee	Milw Wells	1808	18.5	50.8	30.7	6.3	17.0	53.3	29.8
Milwaukee River at Jones Island at Mouth at Milwaukee	WI	Milwaukee	Milw Jones	2240	29.2	43.8	27.0	11.3	27.1	46.7	26.2
Menomonee River at County Line Road	WI	Milwaukee	Meno County	79	30.1	46.2	23.7	10.0	24.5	53.0	22.4
Menomonee River at 127th St	WI	Milwaukee	Meno 127th	153	52.0	28.5	19.4	17.8	43.0	37.7	19.3
Menomonee River at Hampton Ave	WI	Milwaukee	Meno Hampton	211	51.0	29.6	19.4	18.6	43.3	37.7	19.0
Menomonee River at 70th St Bridge at Wauwatosa	WI	Milwaukee	Meno 70th	318	65.1	20.0	14.9	24.7	59.4	26.1	14.5
Menomonee River at 25th St	WI	Milwaukee	Meno 25th	355	68.6	17.9	13.5	27.9	63.5	23.4	13.1
Kinnickinnic River at S 27th St	WI	Milwaukee	KK 27th	45	99.0	0.0	1.0	49.8	98.8	0.4	0.8
Kinnickinnic River at S 7th St	WI	Milwaukee	KK 7th	53	98.2	0.0	1.8	50.3	98.1	0.4	1.5
Kinnickinnic River at 1st St	WI	Milwaukee	KK 1st	63	98.5	0.0	1.5	50.5	98.4	0.3	1.3
Kinnickinnic River at Jones Island Ferry	WI	Milwaukee	KK Jones	69	98.0	0.0	2.0	51.6	97.8	0.3	1.9
Root River at Racine, WI	WI	Racine	Root	480	29.8	52.7	17.4	10.0	26.0	52.8	21.2
Peshtigo River at Peshtigo, WI	WI	Rural	Peshtigo	2872	4.3	15.5	80.3	0.4	4.6	14.3	81.1
Oconto River near Oconto, WI	WI	Rural	Oconto	2473	4.9	21.8	73.4	0.5	5.2	21.2	73.6
Sheboygan River at Sheboygan, WI	WI	Rural	Sheboygan	1103	8.1	64.7	27.2	2.2	7.7	66.6	25.7
Rock River at Afton, WI	WI	Janesville	Rock	8661	11.3	65.6	23.1	3.2	10.0	66.7	23.3
Willamette River at Portland, OR	OR	Rural	Willamette	28,967	7.3	20.4	72.2	2.6	6.9	20.6	72.4
Des Plaines River at Riverside, IL	IL	Chicago	Des Plaines	1643	63.8	18.8	17.4	27.5	60.0	22.0	18.0
Fox River at Algonquin, IL	IL	Chicago	Fox	3601	24.8	45.2	30.0	7.0	21.8	47.3	31.0
Poplar Creek at Elgin, IL	IL	Chicago	Poplar	92	67.9	7.5	24.6	26.5	62.0	15.0	22.9
Cherry Creek at Denver, CO	CO	Denver	Cherry	1063	21.7	0.6	77.7	6.9	15.9	0.7	83.4
Clinton River at Moravian Drive at Mt. Clemens, MI	MI	Detroit	Clinton	1937	52.3	19.9	27.8	20.0	49.7	23.0	27.3
Cuyahoga River at Independence, OH	OH	Cleveland	Cuyahoga	1836	39.8	17.4	42.8	10.9	34.1	20.7	45.3
Schuylkill River at Philadelphia, PA	PA	Philadelphia	Schuylkill	4888	24.2	29.7	46.1	6.4	18.6	39.1	42.3
Patuxent River near Bowie, MD	MD	Columbia	Patuxent	906	31.9	26.4	41.8	8.7	20.0	44.1	35.9
Potomac River at Chain Bridge, at Washington, DC	DC	Washington, DC	Potomac	29,967	10.1	29.6	60.3	2.1	8.3	32.1	59.6
Trinity River below Dallas, TX	TX	Dallas	Trinity	16,224	22.3	14.4	63.3	7.9	19.3	15.8	64.9

[a] Watershed urban, agriculture, and forest/other percentages for 2006 were determined from the National Land Cover Database 2006 Land Cover dataset (Fry et al., 2011).
[b] Watershed impervious percentages for 2006 were determined from the National Land Cover Database 2006 Percent Developed Imperviousness dataset (Fry et al., 2011).
[c] Watershed urban, agriculture, and forest/other percentages for 1992 were determined from the National Land Cover Database 1992/2001 Retrofit Land Cover Change dataset (Fry et al., 2009).

streamflow (the discharge distance), and season (the seasonal distance) are assigned using a tricube weight function with half-window widths of 10 years, 2 natural log units, and 0.5 years in the time, streamflow, and seasonal dimensions respectively. These values were chosen after experimentation of the smallest values that did not cause unrealistic oscillations. The overall weight on any given observation is the product of the three weights. Estimation by the WRTDS model was performed using measured chloride and corresponding daily streamflow values. This tool has not previously been used to examine chloride trends, but applications using WRTDS have primarily been used for examination of nutrients (Hirsch et al., 2010; Medalie et al., 2012; Green et al., 2014).

2.3.3. Examination of water quality changes

One type of output produced using WRTDS for each of the study locations was graphics showing estimated concentrations for three levels of streamflow (the 10, 50, and 90 percentile points on the daily streamflow frequency distribution), four seasons of the year (centered on February 15 [winter], May 15 [spring], August 15 [summer], and November 15 [fall]), and each year of the period of record. Another type of output is a contour plot of the differences in estimated chloride concentration between the years 1981 and 2010 as a function of time-of-year and streamflow. WRTDS was also used to compute flow-normalized annual chloride concentrations over the period of record. Flow-normalization is a technique that removes the effect of year-to-year variations in streamflow (but not seasonal variations) on average chloride concentrations (Hirsch et al., 2010).

Linear regression was used to explore the response of flow-normalized annual chloride concentrations as well as the number of individual days that these concentrations exceeded the USEPA water quality (exceedance days) to the percent of urban land cover in the watershed. Linear temporal regression was also used to compare the change in national road salt sales in the U.S. to the change in urban land cover in the northern U.S. to coincide with the location of most road salt sales in the U.S. The calculation of expected number of exceedance days was determined using logistic regression based on the output of the WRTDS model for the two periods 1990–1994 and 2006–2010. These dates were chosen based on the inclusion of at least 20 years, while minimizing the number of sites that had to be excluded due to missing data. The non-deicing reference site (Trinity River) and seiche-affected sites (Milw Jones, KK 1st, KK Jones) were not used in these analyses. The period of record did not have sufficient data between 1990 and 2011 for the Clinton, Cuyahoga, and Fox River, so these sites were not included in these analyses. Dates for the Schuylkill and Des Plaines Rivers did not match perfectly, but were near enough to provide an estimate for the later time period. The WRTDS method has been extended here to estimate the daily probability of exceedance of a threshold. Because the WRTDS model provides a conditional mean and conditional variance of concentration for each day as a function of streamflow, time of year, and year (trend) it is possible to compute a conditional probability of

exceedance of the threshold under the assumption that the conditional distribution of concentration is log-normal. Using these results from all of the sites, logistic regressions were fit for each of the two 5-year time periods. These logistic regression models estimate the daily probability of exceedance at a site as a function the square root of the percent of the watershed that was urbanized during that time period. The number of predicted exceedances per year was then determined by summing these probabilities for the year. These calculations were implemented in R using the betareg function. Pseudo R-squared values for both models were approximately 0.83.

3. Results

Three major watersheds cover the bulk of the Milwaukee metropolitan area: the Milwaukee River, the Menomonee River, and the Kinnickinnic River. These three watersheds have all experienced increased chloride concentrations from 1980 to 2010 during winter, spring, summer, and fall (Fig. 2). The greatest increases in chloride concentrations were in watersheds with the greatest urban land cover percentage. Concentrations for the Milwaukee study sites were greatest in the Kinnickinnic River followed by the Menomonee River and then the Milwaukee River (drainage areas of 45, 355, and 1808 km^2, with 99, 68.6, and 18.5% urban land cover respectively).

In addition, chloride concentrations increased with decreasing streamflow for all three of these watersheds in each of the four seasons. The mean chloride concentration in the Milwaukee River exceeded 140 mg/L during winter low flow periods and was approaching 100 mg/L during summer low-flow periods toward the end of the study period. Mean chloride concentrations in the Menomonee and Kinnickinnic Rivers exceeded the USEPA chronic water quality criteria of 230 mg/L during the winter and spring at all three flow rates in the latter years of the study, and exceeded 100 mg/L during summer and fall periods at all three streamflow rates toward the end of the study duration.

Similar four-season graphs illustrating streamflow dependency for all remaining study sites except those impacted by backwater influences from Lake Michigan (hereafter referred to as seiche) are provided in the supporting information (Figs. S1–S25). Chloride concentrations also increased over all four seasons and decreased with streamflow at all of these additional sites except three with a few notable exceptions: Chloride concentrations at the Peshtigo River had increasing trends over the course of the study period, but concentrations did not increase with decreasing flow; concentrations were relatively constant in the Willamette River. Both of these sites have primarily forested land cover and little urban influence. With these watershed conditions, there is likely to be low road salt application and this is confirmed by very low chloride concentrations (less than 10 mg/L). Chloride concentrations in the Kinnickinnic River at 7th St. did not vary substantially with flow, but did have a slightly increasing relation with increasing streamflow during winter due to samples with high concentrations during high flow periods in the winter. Changes in concentrations with respect to streamflow at the southern urban reference site (Trinity River) were not consistent through the study period.

The change in concentration over time at three different locations within the Milwaukee River watershed is another illustration of increasing road salt effect with urban land cover. These three monitoring sites increased in downstream order from 11% to 17.5% to 18.5% urban land cover (Fig. 3, top to bottom panels, respectively; NLCD 2006 (Fry et al., 2011)). Even with these relatively minor differences in urban land cover, the effect on chloride concentration changes from 1981 to 2010 is apparent in the Milwaukee River with the Wells St. results indicating higher concentrations during winter than the two upstream sites. The greatest increase in chloride concentrations occurred during winter low-flow periods at all three sites, with greater changes as urban influence in the watershed increased. Although the greatest concentration increase was seen during these low flow winter events, substantial increases in chloride concentration also occurred during higher flow periods and extended throughout the year.

Flow-normalized concentrations estimated from 1980 to 2010 for 30 selected sites on 19 streams indicated that concentrations increased for the majority of the sites (Fig. 4). For the more urban watersheds, increases in concentration were greatest in winter periods, but summer periods also experienced increasing chloride concentrations. For the less urban watersheds, there were increasing trends over time (winter and summer slopes were similar) and the concentrations during winter were greater than or similar to concentrations during the summer. The magnitude of chloride concentrations as well as the slope of concentration change increased as the impervious land cover in the watershed increased. For example, the highest chloride concentrations and the greatest change (increase) in chloride concentration over this time period were sites with the highest degree of impervious area including those in Milwaukee, Chicago, Detroit, Cleveland, and Racine metropolitan areas (Fig. 4, top three rows, Table 1). Chloride concentrations generally decreased with decreasing impervious area in the bottom four rows of Fig. 4. The two exceptions are the sites in Portland (Willamette River) and Dallas (Trinity River) which show little or no trend in chloride concentration over the study period. Land cover in the Willamette River had 72% forest and natural area in the watershed, road salt was not commonly used in Oregon during the study period, and the climate

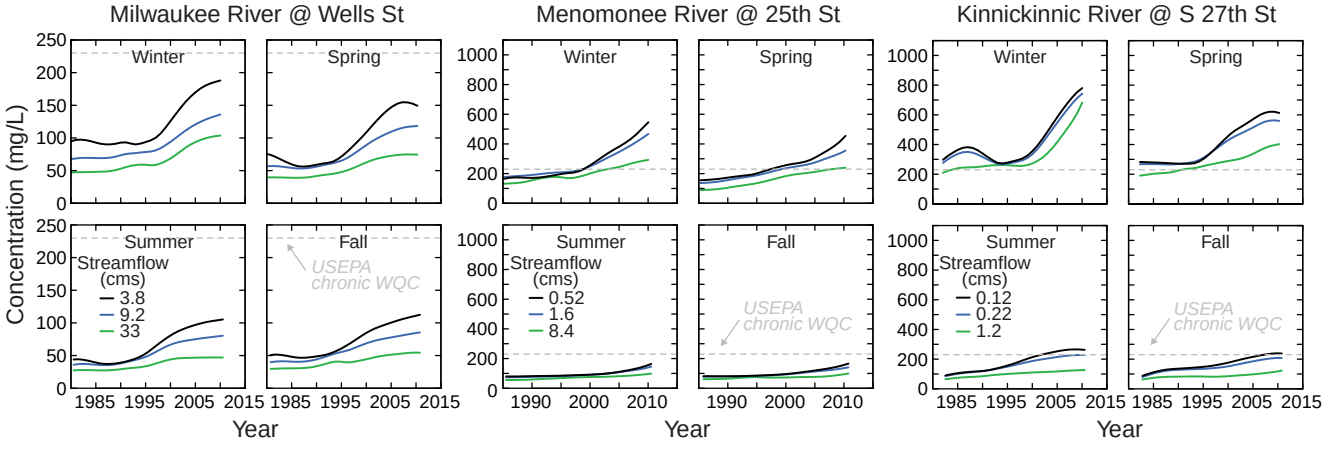


Fig. 2. Chloride concentration estimates at 10, 50, and 90 percentile flow rates from the WRTDS model over time and grouped by season for three Milwaukee streams. Graphs are presented in order of decreasing watershed size and increasing urban land cover from left to right. Streamflow is expressed in cubic meters per second (cms). Dashed line for USEPA chronic water quality criteria represents 230 mg/L.

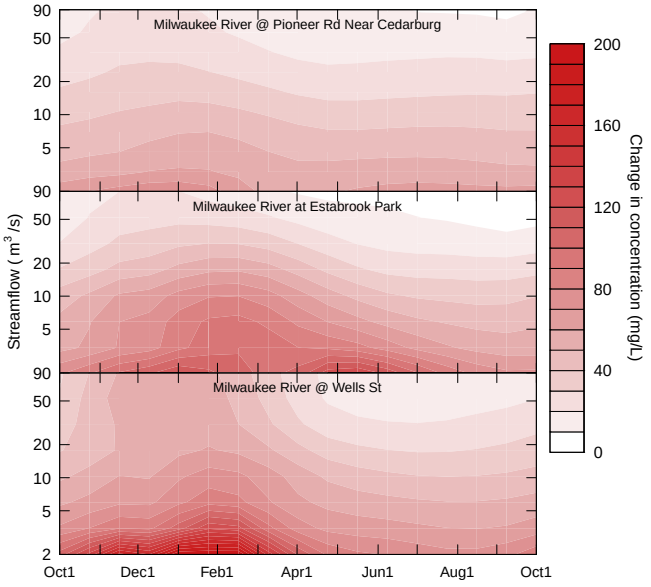


Fig. 3. Contour map of the change in chloride concentration by streamflow and time of year between 1981 and 2010 on the Milwaukee River. Sites are ordered from top to bottom with increasing urban land cover in the watershed. The color legend indicates change in concentration in mg/L.

in the Trinity River is warm enough that road salt application is not common.

Notable differences were observed among sites with low watershed imperviousness in the Midwest U.S. (Rock River; Milwaukee River at Cedarburg, which is upstream from the Milwaukee metropolitan area; and the Sheboygan River) versus those outside of the Midwest (Potomac and Willamette Rivers).

Sites with low imperviousness in the Midwest have higher chloride concentrations, when compared with sites in other areas of the country. Sites with low imperviousness in these different regions also show notable differences in non-urban land cover types; whereas the Midwest sites have large proportions of agricultural land, sites in other regions were dominated by forest and natural areas (Table 1). Concentrations at seiche-affected sites on the Milwaukee and Kinnickinnic Rivers also increased, but the magnitude of these trends was typically muted in comparison with upstream, non-seiche affected sites. Chloride concentrations were lower at study sites with the lowest percent impervious watersheds (less than 0.5%), but increasing trends were still apparent in winter and summer seasons.

Flow-normalized chloride concentration estimates from the WRTDS model were compared with urban land cover in the contributing watershed as 5-yr means for 1990–1994 and 2006–2010 (Fig. 5-A). There was a linear relation between mean concentration and percent urban land cover for both time periods, but regression slopes indicated a change in this relation over time with slopes for these regression equations indicating an increase in chloride concentration of 2.9 and 5.8 mg/L/% urban land cover for the 1990–94 and 2006–10 time periods respectively. Concentrations from 2006 to 2010 were approximately double the concentrations for 1990–1994 for the same percentage of urban land cover.

The logistic models for the probability of water quality criteria exceedance as a function of the square root of the percent of urban land cover in the watershed were significantly different ($p < 0.001$) between the two periods (1990–1994 and 2006–2010; Fig. 5-B). For a watershed with 25% urban area, the expected number of days exceeding 230 mg/L per year increased from 5 to 14, and for a watershed with 90% urban area, it increased from 95 to 231 days per year. An expected value of 17 days exceeding 230 mg/L per year decreased from 50% to 29% urban land cover, and an expected value of 95 exceedance days per year decreased from 95% to 63% urban land cover. About 29% of sites studied exceeded the concentration for the USEPA chronic water quality criteria of 230 mg/L by an average of more than 100 individual days per year during 2006–2011. All regression slopes in Fig. 5 were significant with $p < 0.001$, and R^2 values for all regressions ranged between 0.83 and 0.99. Slopes were significantly different in each of the analyses represented in Fig. 5 ($p < 0.001$ for panels A and B and $p < 0.05$ for panel C).

Beginning in 1987 and ending in 2010, road salt sales in the U.S. increased at an average rate of 3.9%/yr, and urban land cover in the northern part of the U.S. increased at a rate of 2.8%/yr (Fig. 5-C). These trends indicate that road salt usage increased at a rate 40% greater than the increase in urban land cover in the northern U.S. during this period.

4. Discussion

4.1. Temporal trends and relation with land use

Results of the present research indicate that chloride concentrations increased with time in most streams studied in the northern U.S. throughout the study period. While there were trends present in streams with watersheds dominated by urban, agriculture, and forest/natural areas alike, there was a clear increase in concentration as urban land cover (and impervious surfaces) in the watershed increased.

The concentration increase in watersheds with relatively small amounts of urban land use may be influenced by road salt, but may also be a result of other sources such as agricultural runoff which is another potentially important source of chlorides in rural watersheds (Mullaney et al., 2009). Still, the greater winter concentrations suggest that road salt was an important factor in observed trends in the rural watersheds. In contrast with the Midwest sites, which are more highly developed for agriculture, requiring a more extensive road network, the Potomac and Willamette River watersheds have larger percent forest and natural areas (60% and 72% respectively). A detailed watershed-specific investigation would be needed to better understand relative contributions in these rural sites.

The rate of chloride concentration increase outpaced that of urbanization for this study, so urban land cover information alone cannot account for these chloride trends. This changing relation of chloride with urban land cover over time (Fig. 5-A) may be attributed to several potential factors. First, it is possible that more salt was applied per unit urban area during the latter portion of the study period than during the early portion. This appears likely given that road salt sales in the northern U.S. outpaced the rate of increase in urban land cover by 40% during the study period (Fig. 5-C). More salt could be applied per unit area due to three primary reasons: 1) the application rate could have increased as an attempt to maintain more ice-free conditions; 2) the density of impervious area per unit urban area could have increased, thereby increasing the need for road salt, or 3) the difference in weather conditions between the early and latter portions of the study could have warranted different application rates.

Second, the baseline concentrations have been increasing over time due to continued road salt input to the shallow groundwater system and inability of the system to recover to true background concentrations before the next deicing season begins. The result is an increase in baseline concentrations from shallow groundwater discharge to the stream during low flow, as indicated by increasing summer concentrations. Since baseline concentrations increased with time over the course of the study, less additional road salt runoff was needed to reach concentrations of concern in the later years of the study than in the early years, effectively changing the slope of the chloride to urban land cover relation. With baseline concentrations governed by groundwater discharges in many instances, this finding is consistent with other research that has observed elevated chloride concentrations in groundwater which has caused elevated stream concentrations (Kelly, 2008; Eyles et al., 2013).

To explore the possibility of changing weather patterns as potential explanation of increased salt application, snowfall data were examined

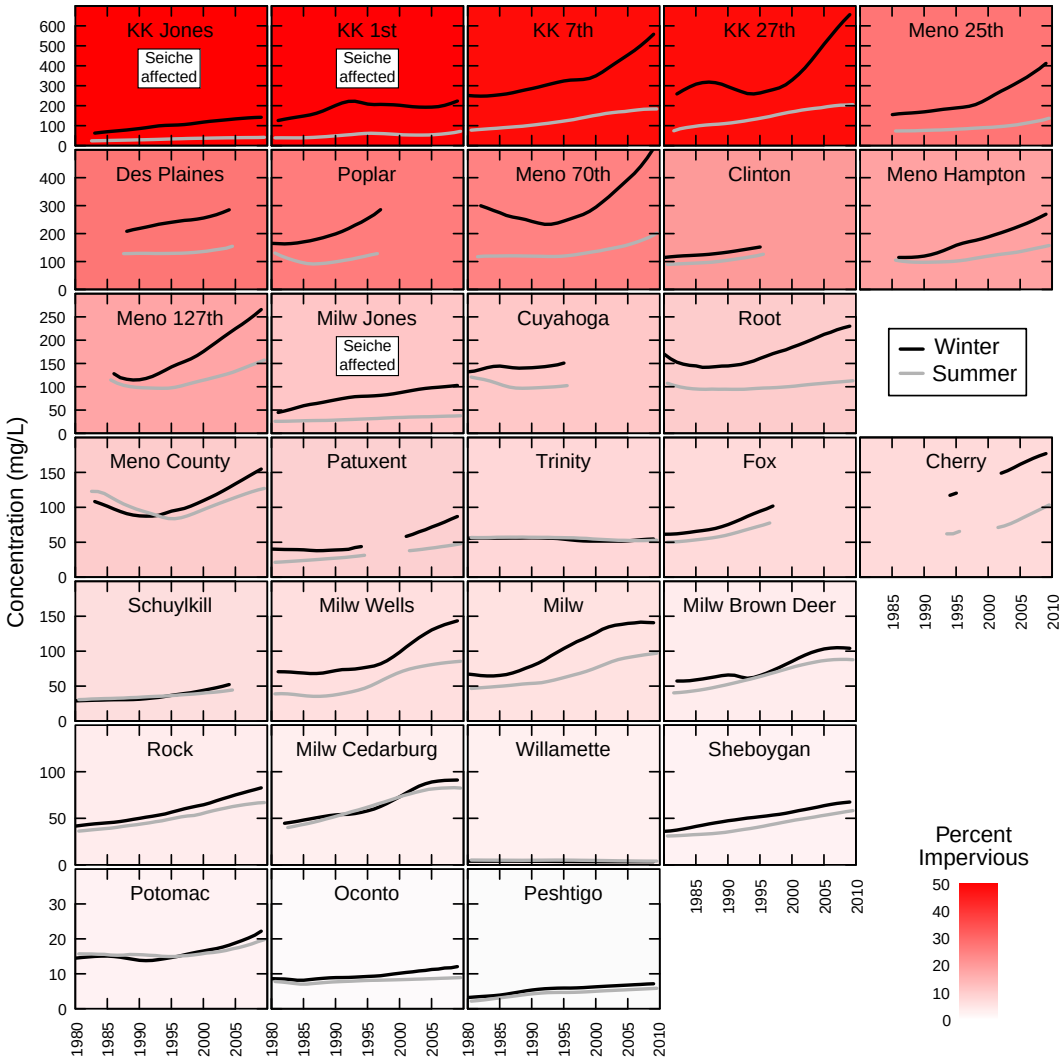


Fig. 4. Winter (black line) and summer (gray line) flow-normalized chloride concentration trends for 30 sites in 19 streams across the United States. The background color represents watershed percent imperviousness as determined using the National Land Cover Database from 2006 (Fry et al., 2011). Sites are ordered by percent imperviousness. Seiche affected is defined by backwater influence from Lake Michigan.

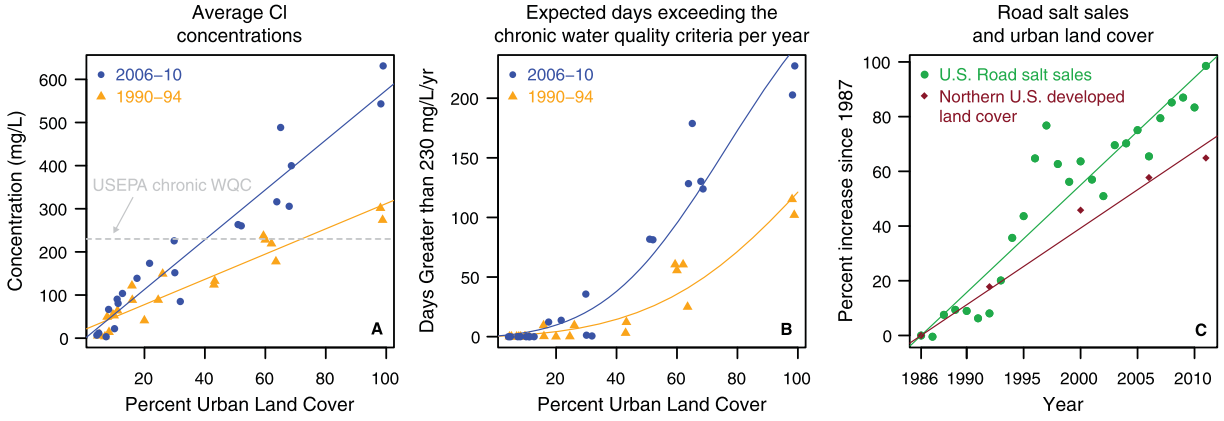


Fig. 5. Average chloride concentration (A) and expected number of individual days per year with concentration exceeding the USEPA chronic water quality criteria of 230 mg/L (B) from modeling results compared to urban land cover percentage in the contributing watershed, and the percent increase in U.S. annual road salt sales compared to the percent increase in urban land cover in the northern U.S. since 1987 (C). Lines (A and C) represent ordinary least squares regression models and curves (B) are based on results of logistic regressions of the probability of daily exceedance as a function of urban land cover. In panel C, U.S. road salt sales are presented as a 5-yr moving average. Dashed line for USEPA chronic water quality criteria represents 230 mg/L (A).

for nine National Weather Service monitoring stations ranging geographically from Washington, D.C., to Denver, Colorado (Table S2, supporting information). For each station, the average total annual snowfall and the average annual number of individual days with snow exceeding 20 mm were computed as a measure of potential for road salt application. An increase in the annual number of days with snow exceeding 20 mm was observed at five stations, and a decrease was observed at four stations. An increase in annual snowfall was observed at six stations, and a decrease was observed at three stations. These data indicated a potentially mixed influence of weather on road salt applications among chloride monitoring sites. Given that 23 of the 30 stream sites were located in the Midwest, the result that data from all four weather stations in the Midwest had increased annual snowfall (average increase of 16%) and days with greater than 20 mm of snow (average increase of 13%) indicated a potential for road salt application increase due to snowfall conditions. In contrast, two of four weather stations in the eastern part of the country had decreased annual snowfall (average overall decrease of 11%) and three of four weather stations had decreased days with greater than 20 mm of snow (average overall decrease of 23%) indicating a potential for road salt application decrease due to snowfall conditions. Snowfall (annual depth and days with greater than 20 mm) in Denver, Colorado decreased by more than 40%. Despite the mixed trends in snow records, stream chloride concentrations increased in each of these three areas of the country, suggesting that increasing baseline concentrations and possible increasing application rates due to factors other than snow cover contribute to the changing relation of chloride with urban land cover over time. Since weather patterns and road salt application methods are locally variable, it would be valuable to extend this study in future research by examining the overall concentrations and the baseline concentrations with respect to precipitation and total salt application on an individual watershed basis.

Given the increasing road salt sales per unit area of urban land cover in the U.S., the increasing baseline chloride concentrations during summer periods, and the difference in snow conditions, it appears multiple factors could plausibly be contributors to the changing relation between average chloride concentrations and urban land cover within the watershed.

4.2. Seasonality

Increasing chloride trends were present all year, including seasons that do not require deicer application; however, the highest concentrations occurred during winter periods. A similar year-round influence has been noted multiple times in previous research (Williams et al., 2000; Kelly, 2008; Perera et al., 2013). This non-deicing season effect has been attributed to salt infiltrating into the shallow groundwater system thereby serving as a "reservoir" of salt that is slowly discharged into streams as baseflow. Relatively slow travel times in the shallow groundwater system could account for the time lag between deicer applications and eventual discharge into the stream.

4.3. Streamflow dependency

Chloride concentrations commonly increased with decreasing streamflow throughout all seasons of the year in most streams studied. The same relation has previously been observed in streams of Illinois (Kelly et al., 2010) and Toronto (Meriano et al., 2009). This behavior can be explained primarily by the factors that govern hydrology throughout the year. During cold-weather months, road salt applications occur during many types of precipitation events. These include a gradient of precipitation forms ranging from purely snowfall events to mixed rainfall and snowfall events to purely rainfall events when freezing temperatures are expected. Precipitation with very little or no liquid precipitation provide little dilution of road salt as it melts snow and ice and eventually drains to nearby streams. These are also low-flow periods, so the stream itself provides little dilution. The combination of these two factors results in high chloride concentrations in the streams. Conversely, during deicing events with greater quantities of liquid precipitation, more dilution of the road salt is provided directly from the precipitation. In addition, when snow is present on the ground, melting is enhanced by contact with rainfall, streamflow is elevated, and dilution potential in the stream is greater. These high-dilution events still have elevated chloride concentrations, but not as high as the low-dilution events.

During non-deicing months, chloride concentrations also decreased with increasing streamflow. Precipitation events again serve to dilute chloride concentrations more than those during low-flow periods that are dominated by groundwater discharge, which is a substantial source of chloride during the non-deicing months.

4.4. Comparison to aquatic toxicity benchmarks

Elevated chloride concentrations resulting from road salt application and runoff in watersheds have potential impacts on aquatic organisms (U.S. Environmental Protection Agency, 1988; Environment Canada, 2001). Increasing trends over time have resulted in increasing exceedances of concentrations that are likely to be harmful to aquatic life. The current research indicates that the relation between urban land cover and the number of daily exceedances of the USEPA chronic water quality criteria concentration of 230 mg/L has changed during the study period (Fig. 5). The number of exceedances for a particular percent of urban land cover was greater during the latter portion of the study as compared to the early portion of the study. As described above for increasing concentrations, an increase in road salt application rates over time, an increase in the baseline concentrations as indicated by summer chloride trends, and changes in snowfall are likely causes of the increased water quality criterion exceedance rate.

Previous research has indicated that degradation of biological integrity is evident beginning below 1% impervious area (Stepenuck et al., 2002; Cuffney et al., 2010; King et al., 2010). Results from the present research are consistent with these findings as chloride concentrations began to increase as soon as urban land cover was present, and concentrations exceeded the chronic water quality criterion beginning at approximately 10% impervious area (approximately 25% urban land cover; Table 1, Fig. 5). A review of road salt effects conducted by Environment Canada concluded that high concentrations of chloride may have immediate or long-term effects on ecosystem populations and that lower concentrations may have adverse effects on community structure, diversity, and productivity (Environment Canada, 2001). Studies reviewed for this Environment Canada effort found that some of the biological components affected included densities of bacteria and algae, drift of stream benthic invertebrates, as well as diversity and community structure of aquatic invertebrates (Evans and Frick, 2001). Other work has determined that elevated chloride concentrations can also influence reproduction of aquatic organisms (Beggel and Geist, 2015). All of this information is primarily based on direct influence from chloride exposures, but indirect exposures caused by mobilization of heavy metals may also have impacts on aquatic organisms (Amrhein et al., 1992; Bäckström et al., 2004; Nelson et al., 2009). These chloride influences are yet another stressor in addition to those commonly thought to impact biological integrity of urban streams such as hydraulic and hydrologic factors, degraded water quality from point and non-point source runoff, and altered habitat and stream channels (Walsh et al., 2005; Steuer et al., 2010).

The multi-season impacts presented in this research suggest the possibility of extended-duration, high-concentration exposure to chloride in urban streams of the northern U.S. This possibility appears credible given that extended-duration (multiple months), high-concentration exposures to chlorides have previously been documented in urban streams receiving road salt runoff (Corsi et al., 2010; Baldwin et al., 2012; Kelly et al., 2012b). Further work to define concentration–duration relations is warranted given that the current USEPA chronic water quality criterion is designed for a 4-day exposure period, and it appears that exposures have

potential to be much longer than 4 days. Longer-duration exposures may result in additional impacts on the full life-cycle of aquatic organisms that may not be evident with common evaluation methods.

4.5. Salt management and alternatives

The nature of salt presence in environmental waters makes this issue very difficult to address with common stormwater management practices that rely most commonly on settling or filtration of particulate matter (Waschbusch, 1999; Greb et al., 2000; Horwatich et al., 2011). Since salt dissolves readily in water, these types of management practices will not remove salt from runoff. The only reliable way to reduce the impact of road salt on receiving streams is to reduce applications. There are a host of techniques that have been identified and documented for reduction of road salt application. For example, many municipalities have salt management plans that include a strategy for minimizing road salt usage. Some of these practices include training programs for most effective use, pre-wetting of granular salt to maximize salt retention on paved surfaces, applicators that are calibrated and vary by groundspeed, anti-icing that reduces bonding between snow and pavement and makes plowing more effective, and more efficient predictions of icing conditions to inform deicing activities (Kramberger and Zerovnik, 2008; Fay et al., 2013). In addition, there are a number of alternative chemicals that have been used. These alternative chemicals commonly include other chloride-containing salts such as magnesium chloride or calcium chloride, organic salts such as calcium magnesium acetate, potassium acetate, or sodium acetate, different variations of salt brines, and organic deicers such as glycols. Unfortunately, none of these options are without potential environmental impact as well. All of these alternative deicers have varying degrees of associated aquatic toxicity (Environment Canada, 2001). In addition, organic chemicals used as deicers have an additional impact from increased biochemical oxygen demand (Corsi et al., 2012) and excessive biofilm growth (Mericas et al., 2014). Still, road salt is more common than the alternatives due to the performance effectiveness and relatively low cost compared to alternatives.

5. Conclusions

The U.S. is an urbanizing nation, and with increasing development, previous data and results from this research indicate that road salt applications, chloride concentrations, and resulting adverse impacts on aquatic organisms in streams are likely to increase along with urban development. This research indicates that chloride concentrations in urban streams of the northern U.S. and resulting water quality criteria exceedances have increased at a greater rate than the rate of urban development. In addition, elevated chloride concentrations in these streams through all seasons have implications on long-term exposures to chloride for aquatic organisms. Results of this research provide verification that chloride concentrations in urban streams continue to increase, influencing the potential for aquatic life in affected streams.

Acknowledgments

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Appendix A. Supplementary data

Methods for the determination of land cover and other watershed characteristics, characteristics of water quality and associated streamflow sites (Table S1), snowfall information at nine National Weather Service Stations (Table S2), WRTDS modeling results during the periods from 1990 to 1994 and 2006 to 2010 for winter and summer periods (Table S3). This material is available free of charge via the Internet at STOTEN TO http://dx.doi.org/10.1016/j.scitotenv.2014.12.012.

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Attachment 6

Tollway's Offset Program

INTERGOVERNMENTAL AGREEMENT BETWEEN
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
AND
THE CITY OF WOOD DALE
FOR
CHLORIDE OFFSET PROGRAM

This INTERGOVERNMENTAL AGREEMENT ("AGREEMENT") is entered into this 13TH day of JUNE, 2017, by and between The Illinois State Toll Highway Authority, an instrumentality and administrative agency of the State of Illinois, hereinafter called the "ILLINOIS TOLLWAY", and The City of Wood Dale, a municipal corporation of the State of Illinois, hereinafter called the "CITY", individually referred to as "PARTY", and collectively referred to as "PARTIES".

WITNESSETH:

WHEREAS, the ILLINOIS TOLLWAY in order to facilitate the free flow of traffic and ensure safety to the motoring public, intends to improve the existing Elgin O'Hare Expressway, extend the expressway from its eastern terminus at Rohlwing Road (Illinois Route 53) to O'Hare International Airport (ORD) to be known entirely as Illinois Route 390, and construct the Western Access connecting the Jane Addams Memorial Tollway (I-90) with the Tri-State Tollway (I-294) (hereinafter sometimes referred to as the Elgin O'Hare Western Access "EOWA"), and included in multiple ILLINOIS TOLLWAY construction contracts. The ILLINOIS TOLLWAY will implement, operate and maintain the mainline improvements as tolled facilities (hereinafter sometimes referred to as "Toll Highway"); and

WHEREAS, highway de-icing practices during winter months commonly use de-icing salts to provide for safe vehicular travel and winter maintenance for the EOWA will require the use of chlorides; and

WHEREAS, studies acknowledged the potential for the addition of chloride concentrations in area streams and as the EOWA project is advancing in implementation, permits for Section 404 and Section 401 of the Clean Water Act (CWA) have been secured from the United States Army Corp of Engineers (USACE) and the Illinois Environmental Protection Agency (IEPA); and

WHEREAS, conditions established within the ILLINOIS TOLLWAY's CWA Section 401 permit require the implementation of a "Chloride Offset Program" (hereinafter called the "PROGRAM") to mitigate for increased chloride loading in the Total Maximum Daily Loading (TMDL) watersheds throughout the EOWA project area; and

WHEREAS, a Memorandum of Understanding (MOU) between the ILLINOIS TOLLWAY and DuPage River Salt Creek Workgroup (DRSCW) was executed October 31, 2013 to outline the PROGRAM, which is attached hereto as "Exhibit A" and incorporated by reference; and

WHEREAS, per the MOU, it was agreed that the entirety of the offset will occur within the impacted areas and be tailored to individual receiving stream segments to the maximum extent possible. As such, local watershed communities and agencies participating in the PROGRAM will be responsible for winter operations on the land surfaces that drain to those segments and are herein referred to as "TIER 1 COMMUNITY" or "TIER 1 COMMUNITIES"; and

WHEREAS, the CITY has been identified as a TIER 1 COMMUNITY and has, in coordination with the DRSCW, conducted a review of their snow and ice operations in an effort to identify areas of operational improvements relating to efficiency gains in winter chloride usage, and per the CITY'S review, it is believed that an effective reduction in chloride usage can be attained, as part of the PROGRAM through the upgrading of equipment utilized for winter operations by the CITY; and

WHEREAS, the PARTIES mutually agree to review winter operation policies and procedures and work in coordination with the DRSCW to monitor the administration and progress of the PROGRAM; and

WHEREAS, the ILLINOIS TOLLWAY by virtue of its powers as set forth in the "Toll Highway Act," 605 ILCS 10/1 *et seq.* is authorized to enter into this AGREEMENT; and

WHEREAS, the CITY by virtue of its powers as set forth in the "Illinois Municipal Code," 65 ILCS 5/1-1-1 *et seq.* is authorized to enter into this AGREEMENT; and

WHEREAS, a cooperative Intergovernmental Agreement is appropriate and such an Agreement is authorized by Article VII, Section 10 of the Illinois Constitution and the "Intergovernmental Cooperation Act", 5 ILCS 220/1 *et seq.*

WHEREAS for recording purposes this AGREEMENT shall be known as #004685.

NOW, THEREFORE, in consideration of the aforementioned recitals and the mutual covenants contained herein, the PARTIES hereto agree to the following summary of the responsibilities and participation of each PARTY in the implementation of the PROGRAM.

I. PURPOSE and SCOPE

A. The PROGRAM established a projected increase over existing conditions or baseline for the EOWA of 3,888 tons of salt per year, per a baseline 39.7 tons/lane mile/year application rate. The goal of the offset program will be to reduce salt usage in roadway applications in the project related watersheds by the amount of the increase (3,888 tons per year) plus a margin of safety of 25 percent or a total reduction of 4,860 tons per year.

B. The ILLINOIS TOLLWAY, as part of the PROGRAM, has established a rate reduction goal of 20% from the EOWA's established baseline salt application rate of 39.7 tons/lane mile/year, thereby accounting for 972 tons per year of the 4,860 tons per year of salt required to be reduced, as part of the PROGRAM.

C. The CITY, as part of the PROGRAM and per this AGREEMENT, has established a rate reduction goal of 17.5% from its established baseline application salt application rate of 12.3 tons/lane mile/year, thereby accounting for 204 tons per year of the 4,860 tons per year of salt required to be reduced, as part of the PROGRAM.

D. Both structural and non-structural practices will comprise the PROGRAM to provide the needed improvements in water quality but it is understood that offset reductions can only be accounted for through non-structural practices.

II. STRUCTURAL BEST MANAGEMENT PRACTICES

A. Grass swales, bio-swales, infiltration basins, and other designs will be incorporated by the ILLINOIS TOLLWAY into the EOWA projects in order to minimize the effects of roadway runoff and improve the quality of roadway runoff discharged to receiving waters and/or nearby wetlands.

III. NON-STRUCTURAL BEST MANAGEMENT PRACTICES

A. A salt reduction goal has been established by the ILLINOIS TOLLWAY and DRSCW for the PROGRAM through the analysis of existing conditions, existing practices in the affected watersheds, and planned highway improvements. Offsets will include both the adoption of salt reduction strategies implemented by the ILLINOIS TOLLWAY and providing salt application data to DRSCW, including but not limited to their application rates for each lane mile, as well as financial and other support to other mutually agreed upon partners.

B. The ILLINOIS TOLLWAY recognizes that meeting the objectives of the Total Maximum Daily Loads ("TMDL's") will require reductions in area chloride loading above those set out in the PROGRAM and agrees to review its practices at an agency wide scale and to actively partner with the DRSCW, its members or successors, in working for PROGRAM area chloride reductions beyond the life of the PROGRAM with the goal of meeting the applicable water quality standard.

IV. RESPONSIBILITIES

A. Pursuant to EXHIBIT A, a guideline for monitoring and reporting chloride offsets has been established. Both PARTIES agree that the requirements embodied in Clean Water Act Section 401 certification(s) or Section 404 or NPDES permit(s), are the sole responsibility of the ILLINOIS TOLLWAY, and that the CITY is not responsible in any way for the ILLINOIS TOLLWAY's failure to comply with such requirements.

B. The CITY shall provide the ILLINOIS TOLLWAY a summary raw data report that includes the following data for the most recent winter season for a minimum of five consecutive winter seasons, post equipment purchase and installation; 1) total lane miles maintained, 2) actual road salt usage in tons per lane mile, 3) baseline road salt usage in tons per lane mile, 4) target road salt usage in tons per lane mile, 5) total winter season precipitation events requiring deicing efforts, 6) average precipitation in inches of snow, ice and liquid form of winter season precipitation per precipitation event, 7) duration of each operator deicing efficiency training session and number of operators attending, 8) new equipment installation and new practices implemented and identification and practices planned and 9) the completed DRSCW's Winter Public Agency Deicing Questionnaire.

C. The PARTIES agree that the PROGRAM may require several years of monitoring and reporting from PROGRAM partners.

D. The PARTIES will develop and maintain a guidance document for the PROGRAM which will at minimum detail the methods for calculating the build scenario non-PROGRAM increase, the needed offset, BMP's the monitoring PROGRAM and reporting baseline requirements. The document will be updated by agreement between the PARTIES as the PROGRAM advances.

V. DELIVERABLES

A. The deliverables will be transmitted to the ILLINOIS TOLLWAY, by the CITY and include written reports documenting, as defined in Article IV, Paragraph B. of this AGREEMENT by June 1st pertaining to the preceding winter season.

B. The ILLINOIS TOLLWAY maintains its responsibility to remain compliant with the "Clean Water Act" as determined and administered by the IEPA.

VI. FINANCIAL

A. The ILLINOIS TOLLWAY as sponsor of the PROGRAM will compensate the CITY as outlined in this AGREEMENT and included in the CITY's Request for Equipment and Training "PROPOSAL".

B. The purchase of equipment identified within the CITY's PROPOSAL, as part of the PROGRAM shall be reimbursed by the ILLINOIS TOLLWAY to the CITY.

C. The CITY will be paid based upon its invoice(s) which shall include detailed receipts of purchased items in substantial conformance with the Budget included in the CITY's PROPOSAL.

D. The CITY shall certify in writing, upon presentation of each invoice hereunder, that items as invoiced have been actually purchased and installed and that the CITY is in fact complying with all other provisions of this AGREEMENT. Invoicing shall be sufficiently itemized to permit the ILLINOIS TOLLWAY or its consultant(s) or cooperating governmental unit(s) to verify performance of the work so invoiced.

E. It is mutually agreed that the estimated cost to the ILLINOIS TOLLWAY shall not exceed $139,500 for the term of this AGREEMENT through five consecutive winter seasons, beginning with the first winter season in which purchased equipment has been utilized and use data has been provided to the ILLINOIS TOLLWAY.

VII. GENERAL PROVISIONS

A. It is understood and agreed that this is an AGREEMENT between the City of Wood Dale and the Illinois State Toll Highway Authority.

B. All equipment proposed for purchase and installation, shall be done so prior to the 2018/2019 winter season but efforts will be made for purchases and installations to occur prior to the 2017/2018 winter season.

C. The term of this AGREEMENT shall extend through five consecutive winter seasons in which purchased equipment has been utilized and use data has been provided to the ILLINOIS TOLLWAY.

D. PARTIES agree to collaborate in effort to fulfill applicable goals of the PROGRAM as established in Section IV. of EXHIBIT A. Should the PARTIES mutually agree that the CITY did not operate in a manner demonstrating intent achieve the goal reduction of 17.5% in a PROGRAM year, the ILLINOIS TOLLWAY shall provide written notice to the CITY identifying delinquencies of agreed upon practices. Should the PARTIES mutually agree that the CITY did not operate in a manner in which to achieve the goal reduction of 17.5% for a second year during the term of this AGREEMENT, the ILLINOIS TOLLWAY and shall provide written notice to the CITY identifying delinquencies of agreed upon practices and the CITY shall provide reimbursement to the ILLINOIS TOLLWAY for all payments made by the ILLINOIS TOLLWAY associated with this agreement within 90 days of CITY's receipt of the notice.

E. Equipment purchased under this AGREEMENT by the ILLINOIS TOLLWAY on behalf of the CITY becomes the property and responsibility of the CITY and the CITY shall indemnify, hold harmless and defend the ILLINOIS TOLLWAY, its officials, directors, officers, employees, and agents from and against all liability, claims, suits, demands, proceedings and action, including costs, fees and expense of defense, arising from, growing out of, or related to, any loss, damage, injury, death, or loss or damage to property resulting from, or connected with, the CITY's negligent or willful acts, errors or omissions in its performance under this AGREEMENT, including, but not limited to, use of the equipment described herein. The CITY expressly acknowledges that the ILLINOIS TOLLWAY, through provision of funding, training, and certification under this AGREEMENT, is not intended to be a joint employer of the CITY's employees and agents and does not excerpt control over such persons in their use of the equipment that is the subject of this AGREEMENT.

F. It is understood and agreed that this AGREEMENT constitutes the complete and exclusive statement of the agreement of the PARTIES relative to the subject matter hereof and supersedes all previous oral and written proposals, negotiations, representations or understandings concerning such subject matter.

G. This AGREEMENT may be executed in two (2) or more counterparts, each of which shall be deemed an original and all of which shall be deemed one and the same instrument.

H. Under penalties of perjury, the CITY certifies that its correct Federal Tax Identification number is 36-6008547 and it is doing business as a governmental entity, whose mailing address is The City of Wood Dale, 404 North Wood Dale Road, Wood Dale, Illinois 60143.

I. The PARTIES agree to maintain books and records related to the performance of this AGREEMENT and necessary to support amounts charged to the ILLINOIS TOLLWAY and/or any of the PARTIES under the AGREEMENT for a minimum of five (5) years from the last action on the AGREEMENT. The PARTIES

further agree to cooperate fully with any audit and to make its books and records, and books and records within its custody or control available to the Illinois Attorney General, the Illinois Auditor General, the ILLINOIS TOLLWAY Inspector General, the ILLINOIS TOLLWAY Department of Internal Audit, the ILLINOIS TOLLWAY or any other governmental agency or agent thereof that is authorized to audit or inspect such books and records.

J. The introductory recitals included at the beginning of this AGREEMENT are agreed to and incorporated into this AGREEMENT.

(This section intentionally left blank.)

IN WITNESS THEREOF, the PARTIES have executed this AGREEMENT on the dates indicated.

THE CITY OF WOOD DALE

By: Annunziato Pulice
Nunzio Pulice
Mayor

Attest: Shirley J. Siebert
Shirley J. Siebert
City Clerk

Date: June 1, 2017

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

By: Greg M. Bedalov
Greg M. Bedalov
Executive Director

Date: 6/13/17

Approved as to Form and Constitutionality

Tiffany B. Schafer SAAG 6/9/17
Tiffany B. Schafer
Senior Assistant Attorney General, State of Illinois

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
AND
THE DUPAGE RIVER SALT CREEK WORKGROUP
FOR
CHLORIDE OFFSET PROGRAM

This MEMORANDUM OF UNDERSTANDING (hereinafter referred to as the "MOU") is entered into this 31st day of October AD, 2013, by and between THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY, an instrumentality and administrative agency of the State of Illinois, hereinafter called the "TOLLWAY", and THE DUPAGE RIVER SALT CREEK WORKGROUP, a group of local watershed stakeholders which include sanitary districts, municipalities, counties, forest preserve districts, state and federal agencies, and private environmental organizations of the State of Illinois, hereinafter called the "DRSCW", individually referred to as "PARTY", and collectively referred to as "PARTIES".

WITNESSETH:

WHEREAS, the TOLLWAY recently approved a 15 year Capitol Program, "Move Illinois; *The Illinois Tollway Driving the Future,*" which includes improving the Jane Addams Memorial Tollway (I-90) (hereinafter sometimes referred to as the "Toll Highway"), by reconstructing and widening from the John F. Kennedy Expressway to Interstate Route 39. The contemplated improvements are substantially included in multiple TOLLWAY construction contracts; and

WHEREAS, the TOLLWAY intends to improve the Elgin O'Hare Expressway, extending the expressway from its eastern terminus at Rohlwing Road (Illinois Route 53) to O'Hare International Airport (ORD) and constructing the Western Access connecting the Jane Addams Memorial Tollway (I-90) with the Tri-State Tollway (I-294) (hereinafter sometimes referred to as the Elgin O'Hare Western Access "EOWA"), and included in multiple TOLLWAY construction contract(s). The TOLLWAY will implement, operate and maintain the mainline improvements as tolled facilities (hereinafter sometimes referred to as the "Toll Highway"); and

WHEREAS, because the projects are in such close proximity, strategies for some aspects of environmental mitigation (i.e., water quality enhancements) are being considered collectively by the PARTIES, where feasible and practicable; and

WHEREAS, highway de-icing practices during winter months commonly use de-icing salts to provide for safe vehicular travel and winter maintenance for I-90 and the EOWA will require the use of salts; and

WHEREAS, studies acknowledged the potential for the addition of chloride concentrations in area streams and as the I-90 and EOWA projects are advancing to implementation, applications for Section 404 and Section 401 permits have been submitted to the United States Army Corp of Engineers (USACE) and the Illinois Environmental Protection Agency (IEPA); and

WHEREAS, the enhancement of water quality has been the focus of the DRSCW for many years, and the TOLLWAY in an effort to have the "Cleanest and Greenest" program possible is requesting that a partnership be developed between the PARTIES hereto, and a collaboration with permitting agencies, to achieve chloride offsets and reductions to enhance the water quality throughout the DRSCW's water-sheds affected by I-90 and the EOWA; and

WHEREAS, the waterways receiving storm water and snowmelt runoff from the I-90 and EOWA are on the IEPA's Section 303D List of impaired waters and thus require at a minimum no net increase in chlorides as defined in the "Clean Water Act"; and

WHEREAS, this MOU, for recording purposes shall be known as 002013-22, executed in duplicate, and has been prepared to outline the general understanding between the DRSCW and the TOLLWAY with regard to determine and establish their respective responsibilities toward a proposed "Chloride Offset Program" (hereinafter referred to as the "PROGRAM") and also serve as a basis for developing Intergovernmental Agreements with local watershed communities and agencies in the impacted area; and

WHEREAS the PARTIES agree that the entirety of the offset will occur with the impacted areas and be tailored to individual receiving stream segments to the maximum extent possible. As such local watershed communities and agencies participating in the PROGRAM will be responsible for winter operations on the land surfaces that drain to those segments and are herein referred to as "Tier 1 Communities";

NOW, THEREFORE, in consideration of the aforementioned recitals and the mutual covenants contained herein, the PARTIES hereto agree to the following summary of the responsibilities and participation of each PARTY in the implementation of the PROGRAM.

I. GOAL

A. The goal of the PROGRAM is to offset the increased chloride loadings from I-90 and the EOWA by affecting reductions in the use of winter de-icing salts from existing conditions. The TOLLWAY will reduce chloride applications in a quantifiable manner in support of the 401 Water Quality Certification process for I-90 and the EOWA projects and of local municipalities National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System ("NPDES MS4") permit requirements.

B. The intent is to establish a partnership between the TOLLWAY and governmental bodies to achieve the chloride loading offset.

C. The partners will endeavor to achieve the offsets in communities straddling and or upstream of the I-90 and EOWA, but the TOLLWAY will expand beyond that area if needed to achieve the offset amounts.

D. Both structural and non-structural practices will comprise the PROGRAM to provide the needed improvements in water quality.

II. STRUCTURAL BEST MANAGEMENT PRACTICES

A. Grass swales, bio-swales, infiltration basins, etc. will be incorporated by TOLLWAY into the I-90 and EOWA projects in order to minimize the effects of roadway runoff and improve the quality of roadway runoff discharged to receiving waters and/or nearby wetlands.

III. NON-STRUCTURAL BEST MANAGEMENT PRACTICES

A. A salt reduction goal will be established by the TOLLWAY and DRSCW for the PROGRAM through further analysis of existing conditions, existing practices in the affected watersheds, and planned highway improvements. Offsets will include the adoption of salt reduction strategies (enhanced training, improved materials use, equipment upgrades), implemented by both the TOLLWAY and the Tier 1 communities. All participants will provide documentation on their salt application rates per lane mile, application totals, calibration logs and details on financial and other support to other mutually agreed upon partners.

B. The TOLLWAY recognizes that meeting the objectives of the Total Maximum Daily Loads ("TMDL's") will require reductions in area chloride loading above those set out in the PROGRAM and agrees to review its practices at an agency wide scale and to actively partner with the DRSCW, its members or successors, in working for PROGRAM area chloride reductions beyond the life of the PROGRAM with the goal of meeting the applicable water quality standard.

IV. TOLLWAY AND DRSCW RESPONSIBILITIES

A. Both PARTIES agree that the requirements embodied in Clean Water Act Section 401 certification(s) or Section 404 or NPDES permit(s), are the sole responsibility of the TOLLWAY, and that the DRSCW or participating agencies cannot be held liable in any way for failure to comply with such requirements.

B. The DRSCW will endeavor to unify stakeholders in the project areas with the common goal of improving chloride water quality. It is recognized that participating communities are voluntary agents and neither they nor the DRSCW can be held liable in any way for failure to collaborate in the plan.

C. The DRSCW will determine the baseline conditions through appropriate studies with stakeholders and other environmental evaluation which shall include sampling and analyses, as well as flow evaluation.

D. The DRSCW will determine the opportunities for improving de-icing practices through surveys and interviews with stakeholders.

E. The DRSCW and the TOLLWAY will set priorities, tracking offset progress, and the timeframe for achievement with concurrence from the IEPA.

F. The TOLLWAY will provide ongoing financial assistance supporting capital investments of alternative de-icing methods potentially for municipalities and agencies that are participating in the PROGRAM until such time as the PROGRAM objectives are met.

G. The TOLLWAY with the DRSCW's technical assistance will establish training and certifications for operators that would enhance awareness of best practices for snow and ice management operations.

H. The TOLLWAY with the DRSCW will establish data sites/sources for weather data and other information helpful in managing roadway de-icing.

I. The DRSCW with the support of the TOLLWAY will conduct long term monitoring that records salt usage and stream conditions. Evaluation of future operating conditions will be compared to baseline conditions.

J. The TOLLWAY and the DRSCW will report annually by July 1st to the IEPA the resulting efforts and success of the PROGRAM on an annual basis beginning in July of 2014. Success will be measured primarily by the application rate and totals reported with consideration given to the ambient monitoring system.

K. The TOLLWAY and the DRSCW will collaborate to put in place an ambient monitoring system that will be part of the PROGRAM monitoring and evaluation, and will document pre and post PROGRAM chloride conditions in the receiving streams. A monitoring plan will be developed through input from both PARTIES with the intent of conducting stream monitoring on Addison Creek, Salt Creek mainstem, Spring Brook, Meacham Creek and West Branch mainstem. The pre and post conditions will be synthesized in a report and submitted to IEPA on an annual basis along with other reporting data. The system would assist in evaluating the success of the PROGRAM in meeting the TMLD's goals and will be funded wholly by the TOLLWAY.

L. The PARTIES agree that the PROGRAM may require several years of monitoring and reporting from PROGRAM partners.

M. The PARTIES will develop and maintain a guidance document for the PROGRAM which will at minimum detail the methods for calculating the build scenario non-PROGRAM increase, the needed offset, BMP's the monitoring PROGRAM and reporting baseline requirements. The document will be updated by agreement between the PARTIES as the PROGRAM advances.

V. INTERGOVERNMENTAL AGREEMENTS

A. The TOLLWAY shall use its best efforts to enter into Intergovernmental Agreements prepared by the TOLLWAY and Tier 1 communities based upon this MOU to further determine and establish respective responsibilities toward financial partnerships, information sharing, and training.

B. These Intergovernmental Agreements shall not relieve the TOLLWAY of their responsibility to comply with the "Clean Water Act" as determined and enforced by the IEPA.

VI. FINANCIAL

A. The TOLLWAY will support financial partnerships through an Intergovernmental Agreement requiring cost sharing with a local partner as defined by the PROGRAM.

B. Project requests to the TOLLWAY will be subject to DRSCW and TOLLWAY approvals, to cost effectively promote salt usage reduction.

VII. TERMS OF THE MOU

A. The term of this MOU shall extend until such time that the PROGRAM offset has been achieved reductions have been demonstrated for a minimum of three (3) years. Either PARTY shall have the right to terminate this MOU at any time by providing at least ninety (90) days written notice to the other party in the event either PARTY breaches the terms and conditions of this MOU. At the end of the agreement period this document may be renewed by the mutual consent of the PARTIES.

(This space intentionally left blank)

IN WITNESS THEREOF, the PARTIES have entered into this MOU as of the date written below.

THE DUPAGE RIVER SALT CREEK WORKGROUP

By: _____
David Gorman, President

Date: 10-30-13

Attest: _____
10-30-13
(Please Print Name)

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

By: _____
Kristi Lafleur, Executive Director

Date: 10/31/13

Approved as to Form and Constitutionality

Tiffany I. Bohn, AAG. 10/31/13
Tiffany I. Bohn, Assistant Attorney General, State of Illinois

JMR_MOU_DuPage River Salt Creek Workgroup_I-90 & EOWA

The Illinois Tollway
2700 Ogden Avenue
Downers Grove, Illinois 60515-1703
Phone: 630/241-6800
Fax: 630/241-6100
TTY: 630/241-6898

November 4, 2013

Mr. Stephen McCracken
DuPage River Salt Creek Workgroup
The Conservation Foundation
10 S. 404 Knoch Knolls
Naperville, IL 60565

Re: Memorandum of Understanding between the The Illinois State Toll Highway Authority and the DuPage River Salt Creek Workgroup for Chloride Offset Program.

Dear Mr. McCracken:

Enclosed please find one (1) fully executed Memorandum of Understanding between the Illinois State Toll Highway Authority and The DuPage River Salt Creek Workgroup for Chloride Offset Program on I-90 and the Elgin O'Hare Western Access.

Very truly yours,

Tiffany I. Bohn
Assistant Attorney General

TIB:mw
Enclosure

Illinois Tollway

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

TO: Eileen Cosgriff, CIS

FROM: Tiffany I. Bohn, Assistant Attorney General

DATE: November 4, 2013

SUBJECT: ***Memorandum of Understanding between The DuPage River Salt Creek Workgroup and The Illinois State Toll Highway Authority for Chloride Offset Program.***

Attached please find one (1) fully executed original Memorandum of Understanding between the DuPage River Salt Creek Workgroup and the Illinois State Toll Highway Authority Chloride Offset Program.

This document is transmitted to your attention for the Department's records.

This Memorandum of Understanding does not require a Board Resolution.

TIB:mw
Attachment

cc:
V. Avila
T. Bohn
K. Kell
P. Kovacs
D. Manetti
M. Molliconi
P. Pearn
J. Romano
S. Talaber
B. Wagner
V. Yee
G. Zimmer
R. Zucchero

Activity	Description	Municipal Estimated Grant Cost	Wood Dale Match	Estimated chloride reduction	Schedule
Staff Training	Concentrated small group training on interpreting weather forecasts, developing site specific storm management plans, and reconfiguring operations plans from updated forecasts.		$8,000.00	Cumulative 17.5%	Budgeted Item: Would be implemented this winter.
Purchase of 2.5 Ton Dump with sling host for v-box and anti-icing	This will allow the City to expand it's anti-icing program to cover the entire City and the V-Box would serve the industrial thus decreasing current number of passes required for salting creating less waste.	$139,500.00	170,500.00	Cumulative 17.5%	Budgeted Item for FY 18: Truck would be ordered as soon as confirmation of grant is received.
Total		$139,500.00	$178,500	Cumulative 17.5%	

This process is inter-dependent; one missing link will stop the effectiveness that the organizations involved are looking to accomplish.

Request $139,500.00; City investment $178,500.00

In the event that costs for equipment and training exceed the funds granted the City of Wood Dale, the City of Wood Dale will offset costs to the extent that City funds have available.

Average total salt use (2013-2014 to 2015-2016) 1,166 tons.
Average annual use per street mile (1,166 /95 = 12.3 tons per lane mile annual
Estimated Average Total Reduction is 17.5% or 204 tons

Basin	Lane Miles	Annual Load	17.5% reduction	Basin reduction Target
Salt Creek Main Stem	52.2	642.06	112.3605	667.2
Addison Creek	9.4	115.62	20.2335	207.2
Bensenville Ditch	18.2	223.86	39.1755	228.8
Willow Creek	15.2	186.96	32.718	980

05/25/17 6.3/2

RESOLUTION NO. 21286

Background

It is in the best interest of the Illinois State Toll Highway Authority (the "Tollway") to enter into an Intergovernmental Agreement with the City of Wood Dale in connection with the construction of Illinois Route 390. In order to remain compliant with guidelines established by the Illinois Environmental Protection Agency, the Tollway and the DuPage River Salt Creek Workgroup (DRSCW) established a Chloride Offset Program to minimize chloride usage and enhance water quality throughout the DRSCW's water-sheds affected by Illinois Route 390. The Program is being implemented through partnerships with municipalities within the impacted areas by providing training to identify potential operational improvements, and the upgrading of equipment utilized for winter operations. The City of Wood Dale is an impacted municipality and requests the Illinois Tollway participate in the cost of providing training and purchasing upgraded equipment. The total estimated cost to the Tollway is not to exceed $139,500.

Resolution

The Chief Engineering Officer and the Acting General Counsel are authorized to negotiate and prepare an Intergovernmental Agreement between the Illinois State Tollway Highway Authority and the City of Wood Dale in substantially the form attached to this Resolution. The Chairman or the Executive Director is authorized to execute said agreement and the Chief Financial Officer is authorized to issue warrants in payment thereof.

Approved by: _____
Chairman

INTERGOVERNMENTAL AGREEMENT BETWEEN
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
AND
THE VILLAGE OF BENSENVILLE
FOR
CHLORIDE OFFSET PROGRAM

This INTERGOVERNMENTAL AGREEMENT ("AGREEMENT") is entered into this 26TH day of JUNE, 2017, by and between The Illinois State Toll Highway Authority, an instrumentality and administrative agency of the State of Illinois, hereinafter called the "ILLINOIS TOLLWAY", and The Village of Bensenville, a municipal corporation of the State of Illinois, hereinafter called the "VILLAGE", individually referred to as "PARTY", and collectively referred to as "PARTIES".

WITNESSETH:

WHEREAS, the ILLINOIS TOLLWAY in order to facilitate the free flow of traffic and ensure safety to the motoring public, intends to improve the existing Elgin O'Hare Expressway, extend the expressway from its eastern terminus at Rohlwing Road (Illinois Route 53) to O'Hare International Airport (ORD) to be known entirely as Illinois Route 390, and construct the Western Access connecting the Jane Addams Memorial Tollway (I-90) with the Tri-State Tollway (I-294) (hereinafter sometimes referred to as the Elgin O'Hare Western Access "EOWA"), and included in multiple ILLINOIS TOLLWAY construction contracts. The ILLINOIS TOLLWAY will implement, operate and maintain the mainline improvements as tolled facilities (hereinafter sometimes referred to as "Toll Highway"); and

WHEREAS, highway de-icing practices during winter months commonly use de-icing salts to provide for safe vehicular travel and winter maintenance for the EOWA will require the use of chlorides; and

WHEREAS, studies acknowledged the potential for the addition of chloride concentrations in area streams and as the EOWA project is advancing in implementation, permits for Section 404 and Section 401 of the Clean Water Act (CWA) have been secured from the United States Army Corp of Engineers (USACE) and the Illinois Environmental Protection Agency (IEPA); and

WHEREAS, conditions established within the ILLINOIS TOLLWAY's CWA Section 401 permit require the implementation of a "Chloride Offset Program" (hereinafter called the "PROGRAM") to mitigate for increased chloride loading in the Total Maximum Daily Loading (TMDL) watersheds throughout the EOWA project area; and

WHEREAS, a Memorandum of Understanding (MOU) between the ILLINOIS TOLLWAY and DuPage River Salt Creek Workgroup (DRSCW) was executed October 31, 2013 to outline the PROGRAM, which is attached hereto as "Exhibit A" and incorporated by reference; and

WHEREAS, per the MOU, it was agreed that the entirety of the offset will occur within the impacted areas and be tailored to individual receiving stream segments to the maximum extent possible. As such, local watershed communities and agencies participating in the PROGRAM will be responsible for winter operations on the land surfaces that drain to those segments and are herein referred to as "TIER 1 COMMUNITY" or "TIER 1 COMMUNITIES"; and

WHEREAS, the VILLAGE has been identified as a TIER 1 COMMUNITY and has, in coordination with the DRSCW, conducted a review of their snow and ice operations in an effort to identify areas of operational improvements relating to efficiency gains in winter chloride usage, and per the VILLAGE'S review, it is believed that an effective reduction in chloride usage can be attained, as part of the PROGRAM through the upgrading of equipment utilized for winter operations by the VILLAGE; and

WHEREAS, the PARTIES mutually agree to review winter operation policies and procedures and work in coordination with the DRSCW to monitor the administration and progress of the PROGRAM; and

WHEREAS, the ILLINOIS TOLLWAY by virtue of its powers as set forth in the "Toll Highway Act," 605 ILCS 10/1 *et seq.* is authorized to enter into this AGREEMENT; and

WHEREAS, the VILLAGE by virtue of its powers as set forth in the "Illinois Municipal Code," 65 ILCS 5/1-1-1 *et seq.* is authorized to enter into this AGREEMENT; and

WHEREAS, a cooperative Intergovernmental Agreement is appropriate and such an Agreement is authorized by Article VII, Section 10 of the Illinois Constitution and the "Intergovernmental Cooperation Act", 5 ILCS 220/1 *et seq.*

WHEREAS for recording purposes this AGREEMENT shall be known as #004686.

NOW, THEREFORE, in consideration of the aforementioned recitals and the mutual covenants contained herein, the PARTIES hereto agree to the following summary of the responsibilities and participation of each PARTY in the implementation of the PROGRAM.

I. PURPOSE and SCOPE

A. The PROGRAM established a projected increase over existing conditions or baseline for the EOWA of 3,888 tons of salt per year, per a baseline 39.7 tons/lane mile/year application rate. The goal of the offset program will be to reduce salt usage in roadway applications in the project related watersheds by the amount of the increase (3,888 tons per year) plus a margin of safety of 25 percent or a total reduction of 4,860 tons per year.

B. The ILLINOIS TOLLWAY, as part of the PROGRAM, has established a rate reduction goal of 20% from the EOWA's established baseline salt application rate of 39.7 tons/lane mile/year, thereby accounting for 972 tons per year of the 4,860 tons per year of salt required to be reduced, as part of the PROGRAM.

C. The VILLAGE, as part of the PROGRAM and per this AGREEMENT, has established a rate reduction goal of 17.5% from its established baseline application salt application rate of 12.3 tons/lane mile/year, thereby accounting for 204 tons per year of the 4,860 tons per year of salt required to be reduced, as part of the PROGRAM.

D. Both structural and non-structural practices will comprise the PROGRAM to provide the needed improvements in water quality but it is understood that offset reductions can only be accounted for through non-structural practices.

II. STRUCTURAL BEST MANAGEMENT PRACTICES

A. Grass swales, bio-swales, infiltration basins, and other designs will be incorporated by the ILLINOIS TOLLWAY into the EOWA projects in order to minimize the effects of roadway runoff and improve the quality of roadway runoff discharged to receiving waters and/or nearby wetlands.

III. NON-STRUCTURAL BEST MANAGEMENT PRACTICES

A. A salt reduction goal has been established by the ILLINOIS TOLLWAY and DRSCW for the PROGRAM through the analysis of existing conditions, existing practices in the affected watersheds, and planned highway improvements. Offsets will include both the adoption of salt reduction strategies implemented by the ILLINOIS TOLLWAY and providing salt application data to DRSCW, including but not limited to their application rates for each lane mile, as well as financial and other support to other mutually agreed upon partners.

B. The ILLINOIS TOLLWAY recognizes that meeting the objectives of the Total Maximum Daily Loads ("TMDL's") will require reductions in area chloride loading above those set out in the PROGRAM and agrees to review its practices at an agency wide scale and to actively partner with the DRSCW, its members or successors, in working for PROGRAM area chloride reductions beyond the life of the PROGRAM with the goal of meeting the applicable water quality standard.

IV. RESPONSIBILITIES

A. Pursuant to EXHIBIT A, a guideline for monitoring and reporting chloride offsets has been established. Both PARTIES agree that the requirements embodied in Clean Water Act Section 401 certification(s) or Section 404 or NPDES permit(s), are the sole responsibility of the ILLINOIS TOLLWAY, and that the VILLAGE is not responsible in any way for the ILLINOIS TOLLWAY's failure to comply with such requirements.

B. The VILLAGE shall provide the ILLINOIS TOLLWAY a summary raw data report that includes the following data for the most recent winter season for a minimum of five consecutive winter seasons, post equipment purchase and installation; 1) total lane miles maintained, 2) actual road salt usage in tons per lane mile, 3) baseline road salt usage in tons per lane mile, 4) target road salt usage in tons per lane mile, 5) total winter season precipitation events requiring deicing efforts, 6) average precipitation in inches of snow, ice and liquid form of winter season precipitation per precipitation event, 7) duration of each operator deicing efficiency training session and number of operators attending, 8) new equipment installation and new practices implemented and identification and practices planned and 9) the completed DRSCW's Winter Public Agency Deicing Questionnaire.

C. The PARTIES agree that the PROGRAM may require several years of monitoring and reporting from PROGRAM partners.

D. The PARTIES will develop and maintain a guidance document for the PROGRAM which will at minimum detail the methods for calculating the build scenario non-PROGRAM increase, the needed offset, BMP's the monitoring PROGRAM and reporting baseline requirements. The document will be updated by agreement between the PARTIES as the PROGRAM advances.

V. DELIVERABLES

A. The deliverables will be transmitted to the ILLINOIS TOLLWAY, by the VILLAGE and include written reports documenting, as defined in Article IV,

Paragraph B. of this AGREEMENT by June 1st pertaining to the preceding winter season.

B. The ILLINOIS TOLLWAY maintains its responsibility to remain compliant with the "Clean Water Act" as determined and administered by the IEPA.

VI. FINANCIAL

A. The ILLINOIS TOLLWAY as sponsor of the PROGRAM will compensate the VILLAGE as outlined in this AGREEMENT and included in the VILLAGE's Request for Equipment and Training "PROPOSAL".

B. The purchase of equipment identified within the VILLAGE's PROPOSAL, as part of the PROGRAM shall be reimbursed by the ILLINOIS TOLLWAY to the VILLAGE.

C. The VILLAGE will be paid based upon its invoice(s) which shall include detailed receipts of purchased items in substantial conformance with the Budget included in the VILLAGE's PROPOSAL.

D. The VILLAGE shall certify in writing, upon presentation of each invoice hereunder, that items as invoiced have been actually purchased and installed and that the VILLAGE is in fact complying with all other provisions of this AGREEMENT. Invoicing shall be sufficiently itemized to permit the ILLINOIS TOLLWAY or its consultant(s) or cooperating governmental unit(s) to verify performance of the work so invoiced.

E. It is mutually agreed that the estimated cost to the ILLINOIS TOLLWAY shall not exceed $367,000 for the term of this AGREEMENT through five consecutive winter seasons, beginning with the first winter season in which purchased equipment has been utilized and use data has been provided to the ILLINOIS TOLLWAY.

VII. GENERAL PROVISIONS

A. It is understood and agreed that this is an AGREEMENT between the VILLAGE of Bensenville and the Illinois State Toll Highway Authority.

B. All equipment proposed for purchase and installation, shall be done so prior to the 2018/2019 winter season but efforts will be made for purchases and installations to occur prior to the 2017/2018 winter season.

C. The term of this AGREEMENT shall extend through five consecutive winter seasons in which purchased equipment has been utilized and use data has been provided to the ILLINOIS TOLLWAY.

D. PARTIES agree to collaborate in effort to fulfill applicable goals of the PROGRAM as established in Section IV. of EXHIBIT A. Should the PARTIES mutually agree that the VILLAGE did not operate in a manner demonstrating intent achieve the goal reduction of 17.5% in a PROGRAM year, the ILLINOIS TOLLWAY shall provide written notice to the VILLAGE identifying delinquencies of agreed upon practices. Should the PARTIES mutually agree that the VILLAGE did not operate in a manner in which to achieve the goal reduction of 17.5% for a second year during the term of this AGREEMENT, the ILLINOIS TOLLWAY and shall provide written notice to the VILLAGE identifying delinquencies of agreed upon practices and the VILLAGE shall provide reimbursement to the ILLINOIS TOLLWAY for all payments made by the ILLINOIS TOLLWAY associated with this agreement within 90 days of VILLAGE's receipt of the notice.

E. Equipment purchased under this AGREEMENT by the ILLINOIS TOLLWAY on behalf of the VILLAGE becomes the property and responsibility of the VILLAGE and the VILLAGE shall indemnify, hold harmless and defend the ILLINOIS TOLLWAY, its officials, directors, officers, employees, and agents from and against all liability, claims, suits, demands, proceedings and action, including costs, fees and expense of defense, arising from, growing out of, or related to, any loss, damage, injury, death, or loss or damage to property resulting from, or connected with, the VILLAGE's negligent or willful acts, errors or omissions in its performance under this AGREEMENT, including, but not limited to, use of the equipment described herein. The VILLAGE expressly acknowledges that the ILLINOIS TOLLWAY, through provision of funding, training, and certification under this AGREEMENT, is not intended to be a joint employer of the VILLAGE's employees and agents and does not excerpt control over such persons in their use of the equipment that is the subject of this AGREEMENT.

F. It is understood and agreed that this AGREEMENT constitutes the complete and exclusive statement of the agreement of the PARTIES relative to the subject matter hereof and supersedes all previous oral and written proposals, negotiations, representations or understandings concerning such subject matter.

G. This AGREEMENT may be executed in two (2) or more counterparts, each of which shall be deemed an original and all of which shall be deemed one and the same instrument.

H. Under penalties of perjury, the VILLAGE certifies that its correct Federal Tax Identification number is 36-6005794 and it is doing business as a governmental

entity, whose mailing address is The Village of Bensenville, 12 S. Center Street, Bensenville, Illinois 60106.

I. The PARTIES agree to maintain books and records related to the performance of this AGREEMENT and necessary to support amounts charged to the ILLINOIS TOLLWAY and/or any of the PARTIES under the AGREEMENT for a minimum of five (5) years from the last action on the AGREEMENT. The PARTIES further agree to cooperate fully with any audit and to make its books and records, and books and records within its custody or control available to the Illinois Attorney General, the Illinois Auditor General, the ILLINOIS TOLLWAY Inspector General, the ILLINOIS TOLLWAY Department of Internal Audit, the ILLINOIS TOLLWAY or any other governmental agency or agent thereof that is authorized to audit or inspect such books and records.

J. The introductory recitals included at the beginning of this AGREEMENT are agreed to and incorporated into this AGREEMENT.

(This section intentionally left blank)

IN WITNESS THEREOF, the PARTIES have executed this AGREEMENT on the dates indicated.

THE VILLAGE OF BENSENVILLE

By: _____
Frank DeSimone
Village President

Attest: _____
Nancy Quinn
Village Clerk

Date: 6-8-2017

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

By: _____
Greg M. Bedalov
Executive Director

Date: 6/20/17

By: _____
Michael Colsch
Chief Financial Officer

Date: 6-20-17

By: _____
Elizabeth M.S. Oplawski
Acting General Counsel

Date: 6-19-17

Approved as to Form and Constitutionality

_____ SAAG 6/16/17
Tiffany B. Schafer
Senior Assistant Attorney General, State of Illinois

05/25/17 6.3/3

RESOLUTION NO. 21287

Background

It is in the best interest of the Illinois State Toll Highway Authority (the "Tollway") to enter into an Intergovernmental Agreement with the Village of Bensenville in connection with the construction of Illinois Route 390. In order to remain compliant with guidelines established by the Illinois Environmental Protection Agency, the Tollway and the DuPage River Salt Creek Workgroup (DRSCW) established a Chloride Offset Program to minimize chloride usage and enhance water quality throughout the DRSCW's water-sheds affected by Illinois Route 390. The Program is being implemented through partnerships with municipalities within the impacted areas by providing training to identify potential operational improvements, and the upgrading of equipment utilized for winter operations. The Village of Bensenville is an impacted municipality and requests the Illinois Tollway participate in the cost of providing training and purchasing upgraded equipment. The total estimated cost to the Tollway is not to exceed $367,000.

Resolution

The Chief Engineering Officer and the Acting General Counsel are authorized to negotiate and prepare an Intergovernmental Agreement between the Illinois State Tollway Highway Authority and the Village of Bensenville in substantially the form attached to this Resolution. The Chairman or the Executive Director is authorized to execute said agreement and the Chief Financial Officer is authorized to issue warrants in payment thereof.

Approved by: _____
Chairman

MEMORANDUM

Elgin O'Hare Western Access and I-90 East Widening and Reconstruction: A Framework for Chloride Mitigation

PREPARED FOR: Bryan Wagner/Illinois Tollway

PREPARED BY: Larry Martin/CH2M HILL
Mark Mittag/CH2M HILL
Jim Huff/Huff and Huff

DATE: March 10, 2014

The Elgin O'Hare Western Access (EOWA) and I-90 East Widening and Reconstruction projects (Projects) are major transportation investments in the Chicagoland area located generally west of O'Hare Airport. The projects span various watersheds (see Exhibit 1). Most all the watersheds have water quality impairments ranging from low dissolved oxygen to elevated levels of total suspended solids (TSS), heavy metals, and chlorides from winter road and parking lot deicing operations. Many streams do not meet the Illinois chloride water quality standard of 500 mg/L. Because the chloride standard is exceeded in several locations, the Illinois Environmental Protection Agency (IEPA) has established Total Maximum Daily Loads (TMDLs) for the West Branch DuPage River, Salt Creek, and Addison Creek. Higgins Creek has a TMDL study underway. The allowable chloride loads require that measures be implemented to achieve the load reductions, which will be realized with more efficient winter deicing practices.

In December 2012 and February 2013, the Illinois Tollway submitted applications for Section 404 and Section 401 permits to the U.S. Army Corps of Engineers (USACE) and IEPA for the Projects. During the planning phases of the Projects, and more recently during the permitting processes, water quality has been a topic repeatedly emphasized by regulatory agencies, environmental groups, and individuals. In recent meetings with the IEPA, the agency acknowledged that the planned stormwater best management practices (BMPs) for the Projects would adequately manage the quality of the roadway runoff for TSS and heavy metals. For streams impaired for chlorides, however, IEPA indicated that there will be no net increase in chlorides with the projects to ensure compliance with the applicable regulations.

Program Organization

In response to IEPA's directives, the Illinois Tollway has developed a program for salt reduction in the EOWA project area. The Illinois Tollway has resolved that for this program to be viable it requires collaboration and participation beyond the boundaries of the Illinois Tollway organization. The framework of this program involves a strategic alliance with the DuPage River Salt Creek Workgroup (DRSCW), other strategic watershed groups, and local units of government for advancing salt reduction in streams affected by the project. Moving forward, the Illinois Tollway will administer and manage the overall salt reduction program for the project with guidance and support from the DRSCW. The partnership with the DRSCW will be formalized with a Memorandum of Understanding (MOU). Working arrangements with local units of government will be formalized with the use of an Intergovernmental Agreement (IGA). IGA's will be established with communities that are directly adjacent to the EOWA project and would include Hanover Park, Schaumburg, Roselle, Itasca, Elk Grove Village, Wood Dale, Bensenville, Des Plaines, Mount Prospect, Franklin Park, City of Chicago, North Lake, and Elmhurst. IGA's would also be established with DuPage and Cook counties, and local townships.

It is anticipated that the program duration will be permanent and will be a condition of the 401 Water Quality Certification. The program will be implemented in steps. The initial step involves developing the overall program, which is currently underway with the Illinois Tollway and the DRSCW planning the framework of the program that includes the following elements:

- Establishing baseline conditions (the starting point),
- Developing salt reduction goals, enlisting the municipal partners,
- Aligning the salt reducing practices that best fit community needs,
- Establishing funding needs,
- Developing training workshops, and
- Developing a monitoring and reporting program to measure progress toward stated goals.

The MOU with the DRSCW is be finalized by summer 2013. The IGA process with municipal partners will commence in the fall of 2013 and be completed by mid-2014. Funding levels required to finance the program are currently being developed. Program funding will come from a combination of Illinois Tollway, local communities, and other sources. It is anticipated that the Illlinois Tollway would contribute the majority share. Funding put forth by the Illinois Tollway would be distributed to the local units of government for equipment upgrades and would be administered through the IGA's.

The major Investment in new salt reducing practices is expected in the early years of the program to maximize benefits to water quality. The goal is to have salt reducing practices in place in the east-west corridor (~10 mile section between Gary Avenue on the west to York Road on the east) prior to the opening of new pavement in late 2015. The completion of the east-west corridor is schedule for 2018, and the completion of the Western Access is scheduled for 2025.

Program reporting will occur on an annual basis. Information will be collected on an annual basis to compare usage under the program with the current baseline conditions. Salt usage will be expressed in tons of salt applied in a deicing season per lane-mile. An end-of-season meeting of the communities and the Illinois Tollway may be sponsored to share lessons learned and consider adjustments prior to the next deicing season. Results below expectation will be assessed and adjustment made to the program approach.

Program Work Scope

The salt reduction scope of work is comprised of work tasks that are designed to achieve a "no net increase" in chloride with an added buffer of no less than 25 percent. Based on an assessment of current practices and future requirements, the program objective will be to achieve an annual reduction of 4,860 tons in watersheds affected by the EOWA project. The program consists of two elements:

- Improving current Illinois Tollway deicing practices.
- Expanding salt reduction practices to local communities within the EOWA drainage areas.

Improving Current Illinois Tollway Deicing Practices

An internal review of the Illinois Tollway's deicing practices was initiated in early 2013. In addition to the Illinois Tollway's internal staff expertise, the agency retained the services of an internationally known deicing expert, Dr. Wilfred Nixon, a professor and researcher on highway maintenance and ice engineering at the University of Iowa.

In 2013, Illinois Tollway staff and Dr. Nixon initiated a review of current Tollway winter maintenance practices and policies with the purpose of identifying the potential for more efficient ice control chemicals usage (e.g., salt and others) in winter maintenance activities, while maintaining a very high level of service and safety.

The review of current practices and policies focused on six principle areas of winter maintenance, including:

- Levels of service

- Performance measurement and continuous improvement
- Materials usage
- Equipment selection and operations
- Strategic operations
- Tactical operations

In the review of these practice areas, current salt loadings were obtained, detailed interviews were conducted with Illinois Tollway staff, and salt yard operations and equipment were examined. The following draft recommendations were formulated from the data, interviews, and observations:

- Pre-wetting salt solids on the truck – yields up to a 25 percent reduction in salt use.
- Use salt brine for pre-wetting regularly with periodic strategic use of calcium chloride brine.
- Optimizing salt application rates by considering pavement temperature and weather types may be able to reduce application rates from 500, 300 and 200 pounds per lane-mile to 375, 225, and 150 pounds per lane-mile. Reduction in salt application may require pilot testing to confirm application rate efficiency.
- Use direct liquid application prior to a storm to prevent bonding between the snow/ice and the pavement and reduce total chemical required during a storm event (anti-icing) – yields up to a 75 percent reduction in salt use during these events.
- Other practices that produce effective, but smaller reductions in salt use are the application of tow plows, new plow cutting edges, and communicating reduction methods with other agencies.

The implementation of these practices would be preceded by a review, evaluation, and approval process within the Illinois Tollway organization. As a first step, practices such as pre-wetting salt, using salt brine, adjusting salt application rates, and using direct liquid applications would be evaluated and screened based on performance, compatibility with current practice, etc. Practices that advance from the screening phase would be pilot-tested. Pilot projects would be conducted for at least one winter season, and would be pilot-tested in the region of one maintenance yard. The effectiveness, cost-savings, and comparative performance of each method would be assessed for system-wide usage. Initial pilot-testing is planned for the winter 2013-2014. The practice(s) selected for implementation and their associated reduction of salt in the project area will count towards meeting the goal of not increasing chloride discharge with the project.

Expanding Salt Reducing Practices to Local Communities - Chloride Off-Set Program

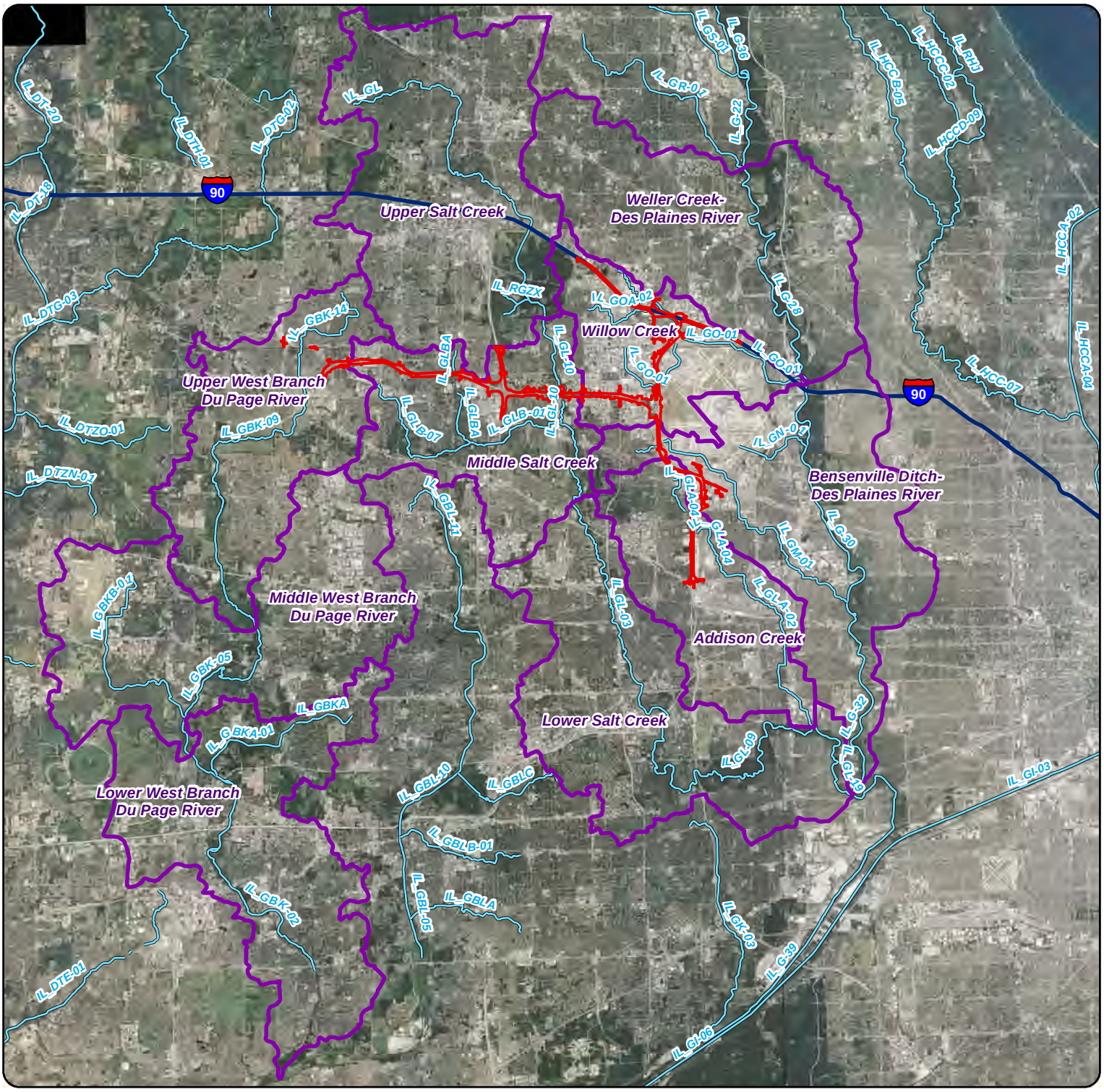
The Illinois Tollway and DRSCW have developed the Chloride Off-Set program to a concept level. It program concept provides the clarity necessary to obtain concurrence from their respective organizations to advance to program implementation. The scope of the program is described as follows.

- **Program facilitation and management.** The Illinois Tollway will manage the implementation of the salt reduction program, and be responsible to the regulatory agencies (i.e., IEPA and USACE) for compliance with the terms and conditions of the Section 404 and 401 permits. The use of IGAs would be used to formalize working arrangements with the DRSCW and local municipalities. The DRSCW will serve as a principal in the development and implementation of the program. Whereas, the DRSCW has long-term established relationships with the stakeholder communities and have been entrusted to provide guidance related to water quality issues, the DRSCW will facilitate the overall integration of the project area's salt reduction program into the water quality initiatives of the stakeholder community.

- **Program funding.** The funding for the program is currently under review. Funding would be directed to training, promotion of alternative deicing practices, and equipment upgrades that would provide greater efficiencies in salt usage. Funding will come from a combination of Illinois Tollway, local municipalities, and other sources. The use of IGAs will be the mechanism to enable partnership of the local communities and the funding arrangements that will affect salt reducing practices. Likely funding scenarios include the Illinois Tollway contributing the majority share, and the local communities and other sources (i.e., state and federal grant monies) comprising the remainder.
- **Assess existing practices.** Surveys and interviews are routinely conducted by the DRSCW with communities in the project area to determine current deicing practices. An additional survey will be conducted as part of this initiative to accurately define current community salt usage. This data will be used to tailor the types of salt reduction practices that would provide the best results for each community.
- **Establish baseline conditions.** The community surveys and interviews will also be used to establish baseline conditions for each potential partner. As an initial task, baseline estimates will be compiled from current practices and records, and in the absence of detailed records, a comparison to peer communities will be estimated. As a follow-on task, the collection of accurate application rates per lane-mile using existing practices will occur in Year One of the program. Standard procedures will be established to determine application rates for each community. Baseline conditions will be recorded as the rate of salt usage per lane-mile (pounds per lane-mile) under standard conditions, and total tons of salt used during the deicing season.
- **Finalize program goals and salt reduction targets.** Based on an assessment of current practices and future requirements, the program objective will be to achieve an annual reduction in tons of salt across the project area. Each partner community will be assigned a target goal wherein the combined targets of the individual communities will add to the program wide target. Individual community targets will be determined based on current practices and reasonably achievable reductions with the use of salt reducing practices.
- **Identify alternative practices best-suited to local communities.** The winter deicing practice surveys and interviews will be used to identify the types of deicing technology needed within each community for additional salt usage efficiency. The current practices will shape the menu of practices recommended for each community. Actual implementation of the new deicing practices would begin implementation in Year Two of the program.
- **Initiate training for more efficient deicing practices.** The DRSCW routinely provides training, workshops, and seminars concerning water quality practices. The organization in conjunction with the Illlinois Tollway will update training for achieving greater efficiencies in deicing practices. Appropriate training on best available deicing technologies and best practices will be shared across the partnering communities. The intent is to provide the best available information to the communities in the project area that result in salt reducing practices. Training would be initiated in Year One of the program.
- **Establish data sites (weather-related information) for managing roadway deicing.** The Illinois Tollway has a system of pavement temperature sensors and subscribes to instantaneous weather data. Data sharing with the municipal partner is contemplated and would aid local communities in making winter storm management decisions.
- **Monitor/report.** Salt use reporting will be a requirement of the program. The Tollway and each community will provide annual usage expressed as tons of salt applied per lane-mile annually. This usage rate combined with the miles of roads in the community will be used to compare progress in salt reduction and overall salt use efficiency. An end-of-season meeting will be hosted by the Illinois Tollway to share lessons learned and consider program adjustments for the next deicing season. Instreaming monitoring is planned to demonstrate that the reduction in salt use is reducing chloride

concentrations in receiving waters. The sampling locations and frequency of sampling is in the planning stages.

- **Reassess program objectives.** An annual assessment of the program will be conducted by the Illinois Tollway and the DRSCW. The program metrics will be evaluated to study trends, and salt reducing practices will be review to determine actual effectiveness compared to theoretical. The assessment will be documented as a report and submitted to regulatory agencies upon request. Results that are below expectations will be addressed with the necessary program revisions that produce the needed outcome



LEGEND

- Full-Build 2040 Footprint
- Watershed Boundary
- River/Stream

Elgin O'Hare Western Access

0 1.5 3 6
Miles

Exhibit 1
Watersheds

MEMORANDUM

Liquid Deicing Options and Evaluation for the Elgin O'Hare Western Access Project

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Illinois Environmental Protection Agency
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Larry Martin/CH2M HILL

DATE: July 16, 2013

As part of a chloride offset program for the Elgin O'Hare Western Access (EOWA) project, winter deicing efficiencies have been evaluated for Illinois Tollway and partnering communities. Technology experts have indicated a move towards using more liquid deicers provides efficiency in salt use. Improved efficiency results in less rock salt use. This memorandum summarizes the technology options most readily applicable to Illinois Tollway and local communities with the goal of estimating salt reduction with the implementation of more widespread use of liquid deicer.

The use of liquid brine through pre-wetting and anti-icing practices was investigated for the EOWA project. Pre-wetting involves applying salt brine directly to the surface of bulk salt solids prior to conventional deicing. The pre-wetting rapidly activates the salt melting process and reduces the degree of bounce-and-scatter of salt off the roadway surface. Anti-icing involves the application of brines or organic products to the roadway surface prior to a snow or ice event to prevent or weaken the bond between the snow or ice and the pavement surface. Preventing a bond to the pavement allows for easier and more efficient snow removal. Both practices provide considerable benefit to snow and ice management agencies.

Types of Brine

Pre-wetting and anti-icing liquid agents can be salt brines, organic agents or byproducts, or combinations of both. The focus of this general investigation involves only the use of salt brine created from bulk rock salt (sodium chloride) and water. It is assumes that brines are 23.3 percent salt by weight. Other common pre-wetting and anti-icing brines include those created from magnesium chloride and calcium chloride salts. Each salt has benefits and drawbacks and is typically appropriate for specific environmental and road conditions; however, rock salt brine is the most widely used and most affordable deicing agent. The Illinois Tollway or local communities may want to augment sodium chloride brines with calcium chloride or other liquids or mixtures based upon weather and travel conditions.

Advantages of Brine for Pre-wetting and Anti-Icing

The advantages of using brine for pre-wetting and anti-icing are listed below and are adapted from the Iowa Department of Transportation's Systems Operation Bureau, Office of Maintenance.

Pre-wetting

- Rock salt can be spread more uniformly and less is wasted on shoulders and ditches, reducing the impact to the environment.
- Materials adhere to the surface because the salt and brine mixture has a thicker consistency.
- Melting begins faster since a liquid has been introduced to the salt. It is important for salt to be in liquid form to prevent snow and ice bonding to pavement.
- Since the brine begins working and diluting as it hits the surface, it will dry much more rapidly, returning the roadway to normal winter driving conditions much sooner.

- Spreading speeds can be increased because more material stays on the roadway.
- Residual salt may remain on the road that will immediately begin working with the next storm.
- When dry materials are pre-wet with brine, the dry material application rate can actually be cut back 20 to 30 percent because more of the material remains on the roadway. In addition, the additional brine speeds the melting action.
- Can be used as a deicer on very thin layers of frost or black ice, but with caution. Salt brine is not recommended for snow pack unless it is treated regularly and frequently with a sufficient quantity of salt brine and or salt brine and rock salt. Brine alone will rapidly dilute and if an insufficient concentration is maintained and may refreeze before it can burrow through the snow or ice pack.

Anti-icing

- Application prior to a storm can help prevent snow and ice from bonding to the pavement and can help keep the roadway wet longer into a storm (or throughout the storm, if a very light precipitation event).
- Makes clean-up quicker and returns roads to normal driving conditions more rapidly.
- Reduces labor hours.
- Reduces wear on ice blades and underbody plows.

For additional information, the Iowa DOT winter maintenance website serves as a comprehensive resource and can be accessed at http://www.iowadot.gov/maintenance/materials.html.

Findings of the Nixon Report

The Illinois Tollway consulted with Dr. Nixon from the University of Iowa on a review of deicing procedures and efficiency opportunities. Dr. Nixon's report explained that approximately 30 percent of the salt spread on the road by conventional deicing methods can be expected to leave the road surface. The pre-wetting of road salt prior to spreading has shown to result in only a 4 percent loss of salt when spread on the center lane of a three lane road at vehicle speeds of 30 to 40 mph, application rates of 400 lb per lane mile, and at pre-wetting rates of 6 gallons per ton of salt applied.

As a result, a potential reduction in salt application by approximately 25 percent can be reasonably expected, meanwhile still maintaining the same level of service. Similar potential salt reductions between 20 and 30 percent have been supported by the Wisconsin Transportation Information Center, the Salt Institute's *Snowfighters Handbook*, the Iowa DOT, and the New Hampshire Department of Environmental Services. Anti-icing reductions were not explicitly stated in the Nixon Report.

Anti-icing efforts are typically more dependent on environmental conditions, road surface conditions, and on the timing of application prior to a storm or ice event. Therefore, salt savings when using anti-icing can vary but can be optimized with extensive operational experience. The *Chloride Reduction Implementation Plan for Dinsmore Brook Watershed, Windham, NH* (February 2011) from the New Hampshire Department of Environmental Services indicates that salt reductions between 10 and 30 percent can be expected when anti-icing.

Estimate of Current Salt Use and Planned Reductions with Pre-Wetting/Anti-Icing Strategies

Pre-wetting and anti-icing options were considered for communities that span the EOWA corridor. Tier 1 communities were designated as those located within the EOWA project footprint or within the USGS watersheds bordering the project footprint. Additional analysis has continued to evaluate the potential salt reduction in each community. These Tier 1 communities are located in watersheds of interest to the DuPage River Salt Creek Workgroup (DRSCW), as well as Des Plaines River watersheds, due to their proximity to the project footprint. Several communities span several watersheds. Consequently, the community salt reduction potential considers all reductions available as long as they are within the DRSCW or Des Plaines River watersheds.

The effectiveness of pre-wetting and anti-icing in the reduction of salt quantities were determined based on total lane miles present within the Tier 1 communities and typical per-lane-mile salt application rates. Total lane miles within Tier 1 communities are summarized in Table 1. Refer to Exhibits 1 and 2, which identify roadways within Tier 1 communities and watershed boundaries.

TABLE 1
Lane Miles per Jurisdiction Spanning EOWA Project Footprint

Jurisdiction[a]	DRSCW Watershed Lane Miles	Des Plaines Watershed Lane Miles	Total Lane Miles	Estimated Salt Usage, ton/yr[b]
Locally-Maintained				
Addison Township	25.4	7.2	32.6	457
Bensenville	57.6	49.2	106.7	1,494
Berkeley	21.7	0.0	21.7	304
Bloomingdale Township	7.2	0.0	7.2	101
Chicago	0.0	208.3	208.3	2,916
Elk Grove Township	14.6	6.5	21.0	295
Elk Grove Village	143.8	110.5	254.3	3,561
Elmhurst	289.1	0.0	289.1	4,047
Franklin Park	0.0	105.7	105.7	1,480
Hanover Park	137.0	0.0	137.0	1,918
Itasca	61.7	0.0	61.7	864
Leyden Township	1.6	44.9	46.6	652
Medinah (Unincorporated)	34.8	0.0	34.8	488
Northlake	57.7	12.3	69.9	979
Roselle	126.6	0.0	126.6	1,773
Schaumburg	246.4	0.0	246.4	3,450
Schaumburg Township	17.9	0.0	17.9	250
Wood Dale	46.9	37.1	84.0	1,176
Locally-Maintained Subtotal	1,289.9	581.6	1,871.5	26,202
DuPage County-Maintained	91.5	27.7	119.1	1,668
Cook County-Maintained	113.7	24.8	138.5	1,939
Total	**1,494**	**634**	**2,129**	**29,808**

[a] IDOT-maintained lane miles are excluded from these quantities. Includes locally-, DuPage Co.-, and Cook Co.-maintained lane miles.

[b] Assumed application rate: 14 tons/lane mile/year.

Note: IDOT-maintained lane miles are excluded from these quantities. Includes locally-, DuPage Co.-, and Cook Co.-maintained lane miles.

Roadway lane mile totals were based on a 2011 (latest available) Illinois Department of Transportation Roadway Data Layer GIS files (http://gis.dot.illinois.gov/gist2/), which also included jurisdictional information. The baseline road salt application rate assumed was 14 tons/lane mile/year, based on a 2007 survey conducted by the DRSCW on the average annual salt application reported by respondents located in within the Salt Creek watershed.

Table 2 indicates the lane miles and an estimate of added salt usage with the Initial Construction Plan (ICP) and the Full-Build phase of the Elgin O'Hare Western Access Project. Freeway/Toll road lane miles were assigned an average road salt application rate of 39.7 ton/lane mile/year based on IDOT and Illinois Tollway system-wide application rates during the 2000/2001 through 2010/2011 winter seasons. As shown in Table 2, the increase over existing conditions or baseline with the ICP is 3,888 tons per year. The goal of the offset program will be to reduce salt usage on roadway in the project related watersheds by the amount of the increase (3.888 tons per year) plus a margin of safety (MOS) of 25 percent or a total reduction of 4,860 tons per year.

TABLE 2
Salt Application Summary for EOWA Project Limits
Estimated Annual Salt Application Rates

Project Stage	Lane miles [a]	Salt Applied, ton/yr [b]	Increase from Baseline Condition, ton/yr
Existing (Baseline) Condition	159	3,959	N/A
Initial Construction Plan (ICP)	264	7,847	3,888
2040 Full Build	293	8,969	5,010

[a] Lane miles include arterial/collector and freeway lane miles located within the project limits.
[b] Considers two different salt application rates depending on the roadway class. Arterial/collector roads are loaded at 14 ton/lane mile/year. Freeways are loaded at 39.7 ton/lane mile/year.

Table 3 expands on the data provided in Table 1 and shows estimates of potential salt reductions with the use of pre-wetting or anti-icing management techniques. Overall, the use of pre-wetting and anti-icing has the potential to reduce salt use in the project watersheds by up to 40 percent or a reduction of approximately 11,900 tons per year. The combined potential of these practices to reduce salt use in the project related watersheds is far greater than the offset target of 4,860 tons per year. While unlikely, if additional offsets are needed, communities further upstream (Tier 2 communities) or downstream (Tier 3 communities) in these watersheds could be approached to achieve further reductions in salt application.

Table 4 is a breakdown of the salt reduction target (4,860 tons per year) distributed by watershed in the project area (see Exhibit 3). The breakdown is proportional to the additional miles of roadway added within each watershed.

TABLE 3
Salt Application Summary by USGS Watershed for Tier 1 Communities
Estimated Annual Salt Application Rates and Potential Reductions With Best Management Practices

USGS Watershed	Lane Miles	Salt Applied, ton/yr	Salt Reduction with Pre-Wetting, ton/yr [a]	Salt Reduction with Anti-Icing, ton/yr [b]	Potential Total Salt Reduction, ton/yr
Des Plaines River Watershed					
Addison Creek	319	4,462	1,116	669	1,785
Bensenville Ditch-Des Plaines River	435	6,085	1,521	913	2,434
Willow Creek	198	2,768	692	415	1,107
Des Plaines River Watershed Sub-total	*952*	*13,315*	*3,329*	*1,997*	*5,326*

TABLE 3
Salt Application Summary by USGS Watershed for Tier 1 Communities
Estimated Annual Salt Application Rates and Potential Reductions With Best Management Practices

USGS Watershed	Lane Miles	Salt Applied, ton/yr	Salt Reduction with Pre-Wetting, ton/yr [a]	Salt Reduction with Anti-Icing, ton/yr [b]	Potential Total Salt Reduction, ton/yr
DRSCW Watershed					
Middle Salt Creek	436	6,106	1,527	916	2,442
Upper West Branch DuPage River	329	4,603	1,151	690	1,841
DRSCW Watershed Sub-total	*756*	*10,709*	*2,678*	*1,606*	*4,283*
Grand Total	**1,717**	**24,024**	**6,007**	**3,603**	**9,609**

Note: IDOT-maintained lane miles are excluded from these quantities. Includes locally-, DuPage Co.-, and Cook Co.-maintained lane miles. Reductions were directly applied to the total annual salt usage based on an application rate of 14 tons salt/lane mile/year.
[a] Expected salt reduction attributed to pre-wetting is between 20 and 30 percent. Reduction assumed: 25 percent
[b] Expected salt reduction attributed to anti-icing is between 10 and 30 percent. Reduction assumed: 15 percent

TABLE 4
Summary by USGS Watershed for the Initial Construction Plan (ICP) EOWA Project
Estimated Annual Salt Application Rates and Increases from Existing Conditions

USGS Watershed	Reduction from Baseline Condition, ton/yr	Target Reduction with MOS, ton/yr [a]	Comparison to Local Offset Potential, ton/yr
Des Plaines River Watershed			
Addison Creek	259	324	1,785
Bensenville Ditch-Des Plaines River	645	806	2,434
Willow Creek	1,761	2,201	1,107
Des Plaines River Watershed Sub-total	*2,665*	*3,331*	*5,326*
DRSCW Watershed			
Middle Salt Creek	1,191	1,489	2,442
Upper West Branch DuPage River	32	40	1,841
DRSCW Watershed Sub-total	*1,223*	*1,529*	*4,283*
Grand Total	**3,888**	**4,860**	**9,609**

[a] Includes a margin of safety (MOS) to have 125 percent of the salt application increase for the Initial Construction Plan (ICP) condition.

Based on the estimate of current salt use in the watershed areas, the ability to offset the increased salt usage for the ICP is clearly achievable with the use of pre-wetting and anti-icing practices. With the project, the overall reduction in salt needed to achieve no net increase as well as the 25 percent margin of safety is 4,860 tons/year. The opportunity within local communities for pre-wetting and anti-icing practices to reduce salt use is far greater than the estimated offset requirement (approximately 10,000 tons/year).

Offsets will be made through a combination of Illinois Tollway reductions and partnership with local communities. For the Des Plaines River and DRSCW watersheds, the offsets available through local communities easily exceed the offset totals needed. If necessary, additional offsets can be achieved from further reductions upstream, from other Illinois Tollway operations not part of the EOWA project, other potential partners, or combinations of these options.

To track improvements in salt usage, both annual tons of salt applied and a typical storm application rate will be tracked to take into account variation in winter conditions from year to year. The implementation of these practices will be applicable to both the Illinois Tollway and local communities. The actual mix of these practices will be determined individually for each entity with the objective of tailoring salt reducing practices that best fit the community needs and yields a substantive reduction in salt use.

Major Equipment Requirements

Equipment options for pre-wetting and anti-icing operations using sodium chloride brine include:

Anti-icing

- Salt storage
- Brine production equipment (if produced onsite)
- Brine storage tank (whether purchased as bulk product or produced onsite)
- Truck-mounted brine storage, trailer brine storage, or combination storage
- Brine applicator

Pre-wetting

- Salt storage
- Brine production equipment (if produced onsite)
- Brine storage tank (whether purchased as bulk product or produced onsite)
- Truck-mounted brine and salt storage
- Brine applicator to salt

References such as the Iowa DOT Systems Operation Bureau, Office of Maintenance have additional information available on typical equipment needs. This source provides a comprehensive description of the equipment requirements and options available for anti-icing or pre-wetting programs.

Additional Ice/Snow Management Items

In addition to retrofitting fleet vehicles and constructing or purchasing brine production equipment to accommodate either anti-icing or pre-wetting practices, the following are recommendations that will further improve ice and snow removal efficiency.

- **Education and training of ice and snow management staff**. Education and training could include a one-day annual conference prior to the winter season to discuss proper operation and maintenance of ice and snow removal technologies, standards of practice, past observations, and potential solutions. This meeting would include regional ice and snow management staff.
- **Information sharing amongst members of the ice and snow management community.** This could include monthly meetings, webinars, or forums during the winter season for members to engage other municipalities or townships on the success of their deicing programs.
- **Equipment calibration program and training.** The offsets program will require that equipment is calibrated regularly and calibration documentation is provided to ensure proper and accurate salt application rates are reported annually.

References

DuPage River Salt Creek Workgroup and CDM. *Chloride Education and Reduction Program, 2010 Deicing Program Survey.* April 2011.

Environmental Impact Statement, Section 3.10: Water Resources and Aquatic Habitats.

Iowa Department of Transportation Office of Maintenance. *Brine Production.* http://www.iowadot.gov/maintenance/materials.html

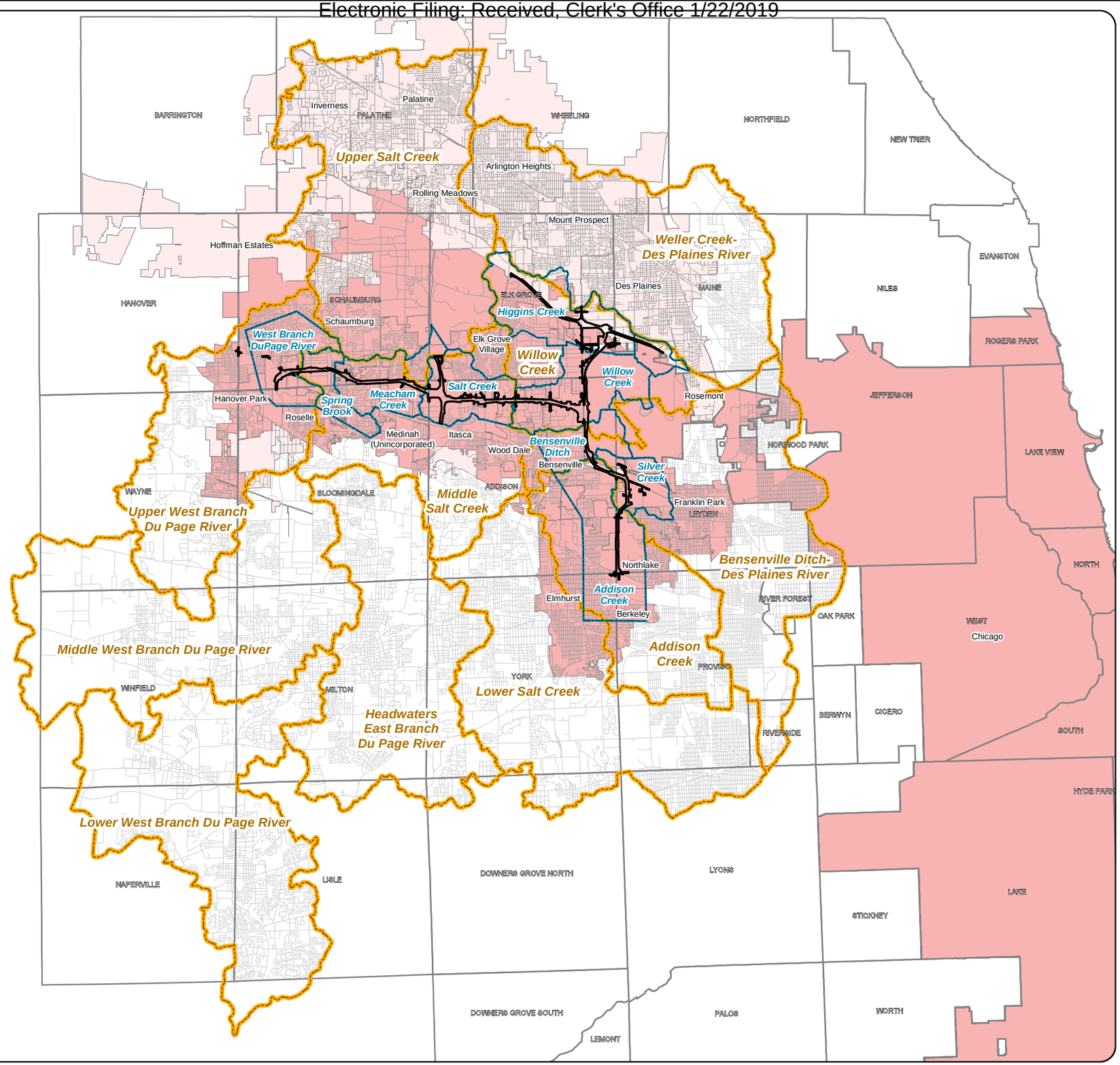
New Hampshire Department of Environmental Services, Watershed Management Bureau. *Chloride Reduction Implementation Plan for Dinsmore Brook Watershed.* Windham, NH. Feb. 2011.

Salt Institute. *The Snowfighters Handbook*, 40th Ed. Alexandria, VA. 2007.

Wisconsin Transportation Information Center. *Wisconsin Transportation Bulletin No. 22*. Madison, WI. Dec. 2005.

P.C. #3

Elgin O'Hare Western Access



LEGEND

- Full-Build 2040 Footprint
- Township Boundary
- Sub-watershed Boundary
- Watershed Boundary

Municipality/Township:

- Tier 1
- Tier 2

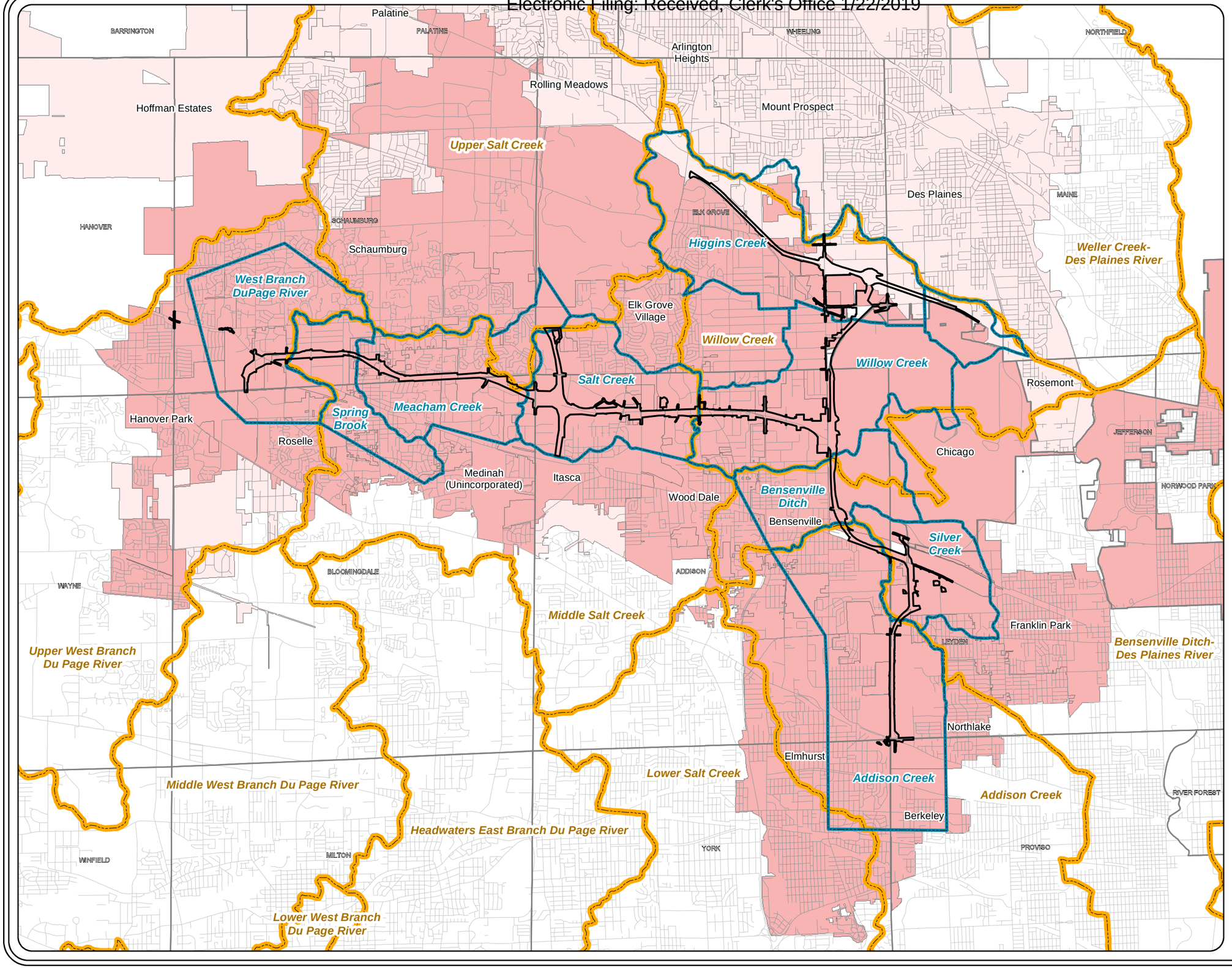
0 7,500 15,000 30,000
Feet

Exhibit 1

Roadways within
Watershed Boundaries

P.C. #3

Elgin O'Hare Western Access



LEGEND

- Full-Build 2040 Footprint
- Township Boundary
- Sub-watershed Boundary
- Watershed Boundary

Municipality/Township:

- Tier 1
- Tier 2

0 3,000 6,000 12,000
Feet

Exhibit 2
Roadways within
Tier 1 Communities

P.C. #3

Elgin O'Hare Western Access

Arlington Heights
Rolling Meadows
Mount Prospect
Hoffman Estates
Weller Creek-Des Plaines River
Upper Salt Creek
Des Plaines
MAINE
ELK GROVE
Schaumburg
HANOVER
SCHAUMBURG
Higgins Creek
West Branch DuPage River
Elk Grove Village
Willow Creek (2,201 ton/yr)
Willow Creek
Salt Creek
Rosemont
Meacham Creek
Spring Brook
Hanover Park
Roselle
Chicago
JEFFERSON
Upper West Branch Du Page River (40 ton/yr)
Medinah (Unincorporated)
Itasca
Bensenville Ditch
Wood Dale
Bensenville
Middle Salt Creek (1,489 ton/yr)
Silver Creek
ADDISON
WAYNE
BLOOMINGDALE
Franklin Park
LEYDEN
Bensenville Ditch-Des Plaines River (806 ton/yr)
Headwaters East Branch Du Page River
Northlake
Middle West Branch Du Page River
Lower Salt Creek
Addison Creek (324 ton/yr)
Addison Creek
YORK
Elmhurst
PROVISO
MILTON
Berkeley
WINFIELD

LEGEND

- Full-Build 2040 Footprint
- Municipality/Township
- Watershed Boundary (Target Salt Reduction)

Sub-watershed Boundary

- Addison Creek
- Bensenville Ditch
- Higgins Creek
- Meacham Creek
- Salt Creek
- Silver Creek
- Spring Brook
- West Branch DuPage River
- Willow Creek

0 3,000 6,000 12,000
Feet

Exhibit 3

Target Salt Reduction by Watersheds

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
AND
THE DUPAGE RIVER SALT CREEK WORKGROUP
FOR
CHLORIDE OFFSET PROGRAM

This MEMORANDUM OF UNDERSTANDING (hereinafter referred to as the "MOU") is entered into this 31st day of October AD, 2013, by and between THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY, an instrumentality and administrative agency of the State of Illinois, hereinafter called the "TOLLWAY", and THE DUPAGE RIVER SALT CREEK WORKGROUP, a group of local watershed stakeholders which include sanitary districts, municipalities, counties, forest preserve districts, state and federal agencies, and private environmental organizations of the State of Illinois, hereinafter called the "DRSCW", individually referred to as "PARTY", and collectively referred to as "PARTIES".

WITNESSETH:

WHEREAS, the TOLLWAY recently approved a 15 year Capitol Program, "Move Illinois; *The Illinois Tollway Driving the Future,*" which includes improving the Jane Addams Memorial Tollway (I-90) (hereinafter sometimes referred to as the "Toll Highway"), by reconstructing and widening from the John F. Kennedy Expressway to Interstate Route 39. The contemplated improvements are substantially included in multiple TOLLWAY construction contracts; and

WHEREAS, the TOLLWAY intends to improve the Elgin O'Hare Expressway, extending the expressway from its eastern terminus at Rohlwing Road (Illinois Route 53) to O'Hare International Airport (ORD) and constructing the Western Access connecting the Jane Addams Memorial Tollway (I-90) with the Tri-State Tollway (I-294) (hereinafter sometimes referred to as the Elgin O'Hare Western Access "EOWA"), and included in multiple TOLLWAY construction contract(s). The TOLLWAY will implement, operate and maintain the mainline improvements as tolled facilities (hereinafter sometimes referred to as the "Toll Highway"); and

WHEREAS, because the projects are in such close proximity, strategies for some aspects of environmental mitigation (i.e., water quality enhancements) are being considered collectively by the PARTIES, where feasible and practicable; and

WHEREAS, highway de-icing practices during winter months commonly use de-icing salts to provide for safe vehicular travel and winter maintenance for I-90 and the EOWA will require the use of salts; and

WHEREAS, studies acknowledged the potential for the addition of chloride concentrations in area streams and as the I-90 and EOWA projects are advancing to implementation, applications for Section 404 and Section 401 permits have been submitted to the United States Army Corp of Engineers (USACE) and the Illinois Environmental Protection Agency (IEPA); and

WHEREAS, the enhancement of water quality has been the focus of the DRSCW for many years, and the TOLLWAY in an effort to have the "Cleanest and Greenest" program possible is requesting that a partnership be developed between the PARTIES hereto, and a collaboration with permitting agencies, to achieve chloride offsets and reductions to enhance the water quality throughout the DRSCW's water-sheds affected by I-90 and the EOWA; and

WHEREAS, the waterways receiving storm water and snowmelt runoff from the I-90 and EOWA are on the IEPA's Section 303D List of impaired waters and thus require at a minimum no net increase in chlorides as defined in the "Clean Water Act"; and

WHEREAS, this MOU, for recording purposes shall be known as 002013-22, executed in duplicate, and has been prepared to outline the general understanding between the DRSCW and the TOLLWAY with regard to determine and establish their respective responsibilities toward a proposed "Chloride Offset Program" (hereinafter referred to as the "PROGRAM") and also serve as a basis for developing Intergovernmental Agreements with local watershed communities and agencies in the impacted area; and

WHEREAS the PARTIES agree that the entirety of the offset will occur with the impacted areas and be tailored to individual receiving stream segments to the maximum extent possible. As such local watershed communities and agencies participating in the PROGRAM will be responsible for winter operations on the land surfaces that drain to those segments and are herein referred to as "Tier 1 Communities";

NOW, THEREFORE, in consideration of the aforementioned recitals and the mutual covenants contained herein, the PARTIES hereto agree to the following summary of the responsibilities and participation of each PARTY in the implementation of the PROGRAM.

I. GOAL

A. The goal of the PROGRAM is to offset the increased chloride loadings from I-90 and the EOWA by affecting reductions in the use of winter de-icing salts from existing conditions. The TOLLWAY will reduce chloride applications in a quantifiable manner in support of the 401 Water Quality Certification process for I-90 and the EOWA projects and of local municipalities National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System ("NPDES MS4") permit requirements.

B. The intent is to establish a partnership between the TOLLWAY and governmental bodies to achieve the chloride loading offset.

C. The partners will endeavor to achieve the offsets in communities straddling and or upstream of the I-90 and EOWA, but the TOLLWAY will expand beyond that area if needed to achieve the offset amounts.

D. Both structural and non-structural practices will comprise the PROGRAM to provide the needed improvements in water quality.

II. STRUCTURAL BEST MANAGEMENT PRACTICES

A. Grass swales, bio-swales, infiltration basins, etc. will be incorporated by TOLLWAY into the I-90 and EOWA projects in order to minimize the effects of roadway runoff and improve the quality of roadway runoff discharged to receiving waters and/or nearby wetlands.

III. NON-STRUCTURAL BEST MANAGEMENT PRACTICES

A. A salt reduction goal will be established by the TOLLWAY and DRSCW for the PROGRAM through further analysis of existing conditions, existing practices in the affected watersheds, and planned highway improvements. Offsets will include the adoption of salt reduction strategies (enhanced training, improved materials use, equipment upgrades), implemented by both the TOLLWAY and the Tier 1 communities. All participants will provide documentation on their salt application rates per lane mile, application totals, calibration logs and details on financial and other support to other mutually agreed upon partners.

B. The TOLLWAY recognizes that meeting the objectives of the Total Maximum Daily Loads ("TMDL's") will require reductions in area chloride loading above those set out in the PROGRAM and agrees to review its practices at an agency wide scale and to actively partner with the DRSCW, its members or successors, in working for PROGRAM area chloride reductions beyond the life of the PROGRAM with the goal of meeting the applicable water quality standard.

IV. TOLLWAY AND DRSCW RESPONSIBILITIES

A. Both PARTIES agree that the requirements embodied in Clean Water Act Section 401 certification(s) or Section 404 or NPDES permit(s), are the sole responsibility of the TOLLWAY, and that the DRSCW or participating agencies cannot be held liable in any way for failure to comply with such requirements.

B. The DRSCW will endeavor to unify stakeholders in the project areas with the common goal of improving chloride water quality. It is recognized that participating communities are voluntary agents and neither they nor the DRSCW can be held liable in any way for failure to collaborate in the plan.

C. The DRSCW will determine the baseline conditions through appropriate studies with stakeholders and other environmental evaluation which shall include sampling and analyses, as well as flow evaluation.

D. The DRSCW will determine the opportunities for improving de-icing practices through surveys and interviews with stakeholders.

E. The DRSCW and the TOLLWAY will set priorities, tracking offset progress, and the timeframe for achievement with concurrence from the IEPA.

F. The TOLLWAY will provide ongoing financial assistance supporting capital investments of alternative de-icing methods potentially for municipalities and agencies that are participating in the PROGRAM until such time as the PROGRAM objectives are met.

G. The TOLLWAY with the DRSCW's technical assistance will establish training and certifications for operators that would enhance awareness of best practices for snow and ice management operations.

H. The TOLLWAY with the DRSCW will establish data sites/sources for weather data and other information helpful in managing roadway de-icing.

I. The DRSCW with the support of the TOLLWAY will conduct long term monitoring that records salt usage and stream conditions. Evaluation of future operating conditions will be compared to baseline conditions.

J. The TOLLWAY and the DRSCW will report annually by July 1st to the IEPA the resulting efforts and success of the PROGRAM on an annual basis beginning in July of 2014. Success will be measured primarily by the application rate and totals reported with consideration given to the ambient monitoring system.

K. The TOLLWAY and the DRSCW will collaborate to put in place an ambient monitoring system that will be part of the PROGRAM monitoring and evaluation, and will document pre and post PROGRAM chloride conditions in the receiving streams. A monitoring plan will be developed through input from both PARTIES with the intent of conducting stream monitoring on Addison Creek, Salt Creek mainstem, Spring Brook, Meacham Creek and West Branch mainstem. The pre and post conditions will be synthesized in a report and submitted to IEPA on an annual basis along with other reporting data. The system would assist in evaluating the success of the PROGRAM in meeting the TMLD's goals and will be funded wholly by the TOLLWAY.

L. The PARTIES agree that the PROGRAM may require several years of monitoring and reporting from PROGRAM partners.

M. The PARTIES will develop and maintain a guidance document for the PROGRAM which will at minimum detail the methods for calculating the build scenario non-PROGRAM increase, the needed offset, BMP's the monitoring PROGRAM and reporting baseline requirements. The document will be updated by agreement between the PARTIES as the PROGRAM advances.

V. INTERGOVERNMENTAL AGREEMENTS

A. The TOLLWAY shall use its best efforts to enter into Intergovernmental Agreements prepared by the TOLLWAY and Tier 1 communities based upon this MOU to further determine and establish respective responsibilities toward financial partnerships, information sharing, and training.

B. These Intergovernmental Agreements shall not relieve the TOLLWAY of their responsibility to comply with the "Clean Water Act" as determined and enforced by the IEPA.

VI. FINANCIAL

A. The TOLLWAY will support financial partnerships through an Intergovernmental Agreement requiring cost sharing with a local partner as defined by the PROGRAM.

B. Project requests to the TOLLWAY will be subject to DRSCW and TOLLWAY approvals, to cost effectively promote salt usage reduction.

VII. TERMS OF THE MOU

A. The term of this MOU shall extend until such time that the PROGRAM offset has been achieved reductions have been demonstrated for a minimum of three (3) years. Either PARTY shall have the right to terminate this MOU at any time by providing at least ninety (90) days written notice to the other party in the event either PARTY breaches the terms and conditions of this MOU. At the end of the agreement period this document may be renewed by the mutual consent of the PARTIES.

(This space intentionally left blank)

IN WITNESS THEREOF, the PARTIES have entered into this MOU as of the date written below.

THE DUPAGE RIVER SALT CREEK WORKGROUP

By: _____
David Gorman, President

Date: 10-30-13

Attest: _____
10-30-13.
(Please Print Name)

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

By: _____
Kristi Lafleur, Executive Director

Date: 10/31/13

Approved as to Form and Constitutionality

Tiffany I. Bohn, AAG. 10/31/13
Tiffany I. Bohn, Assistant Attorney General, State of Illinois

JMR_MOU_DuPage River Salt Creek Workgroup_I-90 & EOWA

Illinois Tollway

The Illinois Tollway
2700 Ogden Avenue
Downers Grove, Illinois 60515-1703
Phone: 630/241-6800
Fax: 630/241-6100
TTY: 630/241-6898

November 4, 2013

Mr. Stephen McCracken
DuPage River Salt Creek Workgroup
The Conservation Foundation
10 S. 404 Knoch Knolls
Naperville, IL 60565

Re: Memorandum of Understanding between the The Illinois State Toll Highway Authority and the DuPage River Salt Creek Workgroup for Chloride Offset Program.

Dear Mr. McCracken:

Enclosed please find one (1) fully executed Memorandum of Understanding between the Illinois State Toll Highway Authority and The DuPage River Salt Creek Workgroup for Chloride Offset Program on I-90 and the Elgin O'Hare Western Access.

Very truly yours,

Tiffany I. Bohn
Assistant Attorney General

TIB:mw
Enclosure

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

TO: Eileen Cosgriff, CIS

FROM: Tiffany I. Bohn, Assistant Attorney General

DATE: November 4, 2013

SUBJECT: ***Memorandum of Understanding between The DuPage River Salt Creek Workgroup and The Illinois State Toll Highway Authority for Chloride Offset Program.***

Attached please find one (1) fully executed original Memorandum of Understanding between the DuPage River Salt Creek Workgroup and the Illinois State Toll Highway Authority Chloride Offset Program.

This document is transmitted to your attention for the Department's records.

This Memorandum of Understanding does not require a Board Resolution.

TIB:mw
Attachment

cc:
V. Avila
T. Bohn
K. Kell
P. Kovacs
D. Manetti
M. Molliconi
P. Pearn
J. Romano
S. Talaber
B. Wagner
V. Yee
G. Zimmer
R. Zucchero

Attachment 7

Normalized Tables 1, 2, and 3

TABLE 1
CHLORIDE GENUS and SPECIES MEAN ACUTE VALUES (GMAV, SMAV) IN MG/L -- NORMALIZED

Rank, R	*Genus species* (Common Name)	Temperature of Toxicity Testing, °C	SMAV	GMAV	Cumulative Probability, P
33	*Anguilla rostrata* (American eel)	23-25	17,160.60	17,161	0.9706
32	*Cambarus sp.* (Crayfish)	23-25	16,203.20	16,203	0.9412
31	*Fundulus kansae* (Plains killifish)	23-25	14,897.10	14,897	0.9118
30	*Libellulidae sp.* (Dragonfly)	23-25	14,843.40	14,843	0.8824
29	*Gasterosteus aculeatus* (Threespine stickleback)	23-25	13,452.60	13,453	0.8529
28	*Leptophlebia cupida* (Mayfly)	10	13,128	13,128	0.8235
27	*Poecilia reticulata* (Guppy)	23-25	11,860	11,860	0.7941
26	*Gambusia affinis* (Mosquitofish)	23-25	9,933.40	9,933	0.7647
25	*Lepomis cyanellus* (Green sunfish)	23-25	9,974.90	9,157	0.7353
	Lepomis macrochirus (Bluegill)	23-25	8,406.5		
24	*Notropis lutrensis* (Red shiner)	23-25	8,971.10	8,971	0.7059
23	*Procloeon fragile* (Mayfly)	10	8,645	8,645	0.6765
22	*Oncorhynchus mykiss* (Rainbow trout)	23-25	8,042.60	8,043	0.6471
21	*Ameiurus melas* (Black bullhead)	23-25	7,442.40	7,442	0.6176
20	*Maccaffertium modesum* (Mayfly)	10	6,828	6,828	0.5882
19	*Pimephales promelas* (Fathead minnow)	23-25	6,515.30	6,515	0.5588
18	*Tubifex tubifex* (Tubificid worm)	23-25	6,218.6	6,219	0.5294
17	*Cyprinella leedsi* (Bannerfin shiner)	23-25	6,111	6,111	0.5000
16	*Chironomus dilutus* (Midge)	23-25	6,072	6,072	0.4706
15	*Rana catesbeiana* (Bullfrog (tadpole))	23-25	5,897	5,897	0.4412
14	*Neocloeon triangulifer* (Mayfly) 1/	10	3,711	5,600	0.4118
	Neocloeon triangulifer (Mayfly) 1/	10	8,450		
13	*Sphaerium simile* (Fingernail clam) 1/	10	5,528	5,528	0.3824
12	*Lumbriculus variegatus* (Aquatic worm)	23-25	5,444	5,444	0.3529
11	*Pseudacris sp.* (Chorus frog)	23-25	4,686	4,686	0.3235
10	*Hyalella azteca* (Amphipod)	23-25	5,077.7	4,583	0.2941
	Hyallela azteca (Amphipod Burlington strain) 1/	10	4,137		
9	*Nephelopsis obscura* (Leech)	23-25	4,369	4,369	0.2647
8	*Diaptomus clavipes* (Copepod)	23-25	3,946.1	3,946	0.2353
7	*Lirceus fontinalis* (Isopod)	23-25	3,890.7	3,891	0.2059
6	*Ceriodaphnia dubia* (Cladoceran) 1/	10	3,876	3,876	0.1765
5	*Gyraulus parvus* (Snail)	23-25	3,727.7	3,728	0.1471
4	*Physa gyrina* (Snail)	23-25	3,350	3,350	0.1176
3	*Villosa delumbis* (Mussel)	23-25	3,821.1	3,086	0.0882
	Villosa iris	23-25	2,491.6		
2	*Daphnia ambigua* (Cladoceran) 2/	10	2,145	3,023	0.0588
	Daphnia pulex 2/	10	2,627		
	Daphnia magna 2/	10	4,905		
1	*Lampsilis fasciola* (Mussel)	23-25	2,907.1	2,835	0.0294
	Lampsilis siliquoidea	23-25	2,764.4		

Sources:
Stephens, 2009
INHS, 2018
NEB, 2018
Jackson and Funk, 2018
GMAV = Genus Mean Acute Value, SMAV = Species Mean Acute Value

Number of Data Points, N = 33
Cumulative Probability, P = R / (N + 1)
1/ Used 10 degree C data
2/ Adjusted to 10 degrees C based on C. dubia results, by multiplying by 1.3

TABLE 2
FINAL ACUTE VALUES AND FINAL CHRONIC VALUES -- NORMALIZED
ILLINOIS WATERWAYS

Rank	GMAV	Type, *Genus species* (Common Name)	Cumulative Probability, P	$Ln(GMAV)^2$	Ln(GMAV)	$P^{1/2}$
4	3,350	*Physa gyrina* (Snail)	0.1176	65.881	8.117	0.343
3	3,086.0	*Villosa delumbis/iris* (Mussel)	0.0882	64.555	8.035	0.297
2	3,023	*Daphnia ambigua/pulex/magna* (Cladoceran)	0.0588	64.225	8.014	0.243
1	2,835	*Lampsilis fasciola/siliquoidea* (Mussel)	0.0294	63.199	7.950	0.171
			Σ P	**Σ ($ln(GMAV)^2$)**	**Σ ln(GMAV)**	**Σ $P^{1/2}$**
			0.294	**257.861**	**32.115**	**1.054**
					$(\Sigma ln(GMAV))^2/4$	**$(\Sigma P^{1/2})^2/4$**
					257.847	**0.278**

$S^2 = [\Sigma (ln(GMAV)^2) - (\Sigma ln(GMAV))^2/4] / [\Sigma P - (\Sigma P^{1/2})^2/4]$

$S^2 = [257.861 - 257.847] / [0.294 - 0.278]$

$S^2 = 0.870$

S = 0.933

$L = [\Sigma ln(GMAV) - S*(\Sigma P^{1/2})] / 4$

L = [32.115 - 0.933*1.054] / 4

L = 7.783

$A = S*(0.05)^{1/2} + L$

A = 0.933*0.05^(1/2) + 7.783

A = 7.992

$FAV = e^A = exp(A)$

FAV = exp(7.992)

FAV = 2,956

FCV = Chronic Toxicity =FAV / ACR

ACR for invertebrates is 3.187

FCV = 928

	Rounded Values
Criterion Max Concentration (CMC) = FAV/2= 1478 mg/L	**1480 mg/L**
Criterion Chronic Concentration (CCC) = FCV= 928 mg/L	**930 mg/L**

TABLE 3

NORMALIZED ACUTE VALUES FOR CHLORIDE TOXICITY TESTING AT 10°C

Testing Completed	**Temperature** (°C)	**Hardness** (mg/L as $CaCO_3$)	**Sulfate** (mg/L)	**Acute Value for Cl** [1/] (mg/L)	**Normalized Acute Value** [2/] (mg/L)
Illinois Natural History Survey (INHS)					
Fingernail clam (*Sphaerium simile*)	10	97	58.5	2,920	5,528
Mayfly (*Neocloeon triangulifer*)	10	97	58.5	1,960	3,711
Amphipod (*Hyalella azteca*) Burlington strain	10	97	58.5	2,185	4,137
New England Bioassay (NEB)					
Ceriodaphnia dubia	10	84	100.8	2,196	3,876
Jackson, J.K.; Funk, D.H. (2018)					
Mayfly *(Neocloeon triangulifer)*	10	97	17.3	4,076	8,450
Mayfly *(Procloeon fragile)*	10	97	17.3	4,170	8,645
Mayfly *(Maccaffertium modesum)*	10	97	17.3	3,294	6,828
Mayfly *(Leptophlebia cupida)*	10	97	17.3	6,333	13,128

NOTES:

1/ AV for Cl calculated from NaCl AV based on percentage Cl in NaCl by molar mass

2/ NAV = AV*[(Hardness from testing conditions in mg/L)$^{0.205797}$]*[(Sulfate from testing conditions in mg/L)$^{-0.07452}$]

NaCl molar mass	58.44	g/mol
Cl molar mass	35.453	g/mol
% Cl	60.67%	