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7-DAY 10-YEAR LOW FLOWS OF STREAMS IN NORTHEASTERN ILLINOIS

by

Krishan P. Singh, Ph. D., P. E., Principal Scientist

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INTRODUCTION

The 7-day 10-year low flows of Illinois streams, for the 1970 conditions with respect to municipal and industrial effluent discharges, were derived and presented in State Water Survey Bulletin 57 (Singh and Stall, 1973). The Bulletin contains 11 maps which show the 7-day 10-year low flows for all rivers and streams in Illinois, together with the effluent discharges and their locations, adjusted for effects of any flow regulation and consumptive use of water. These low flow values have been used by the Illinois Environmental Protection Agency in assessing the desirable effluent standards for discharge from a wastewater treatment facility, depending on the 7-day 10-year low flow in the receiving stream.

Map 2 of Bulletin 57 covers the area drained by the Chicago Sanitary and Ship Canal and the DesPlaines, DuPage, and Fox Rivers. There are three major wastewater treatment plants: Northside, West-Southwest, and Calumet, operated by the MSDGC (Metropolitan Sanitary District of Greater Chicago). Since the mid-1970s the MSDGC has put into operation three new medium-size plants: . Hanover Park, John Egan, and O'Hare. The North Shore Sanitary District (NSSD) is also operating two new wastewater plants. In addition, there have been population shifts with changes in municipal effluent discharges. Many industries have decreased their effluent discharges through recycling and conservation measures. These changes for north-eastern Illinois and similar changes for the rest of the state necessitate the updating of the 7-day 10-year low flows and relevant information for the 1980 or 1981 conditions regarding effluent discharges and any flow regulation.

The information on municipal and industrial effluent discharges was collected from the Illinois Environmental Protection Agency office in Maywood, Illinois, and from various municipalities and industries by correspondence or telephone inquiries. The change in town population from 1970 to 1980 was analyzed with regard to change in effluent flow for purposes of verification and identification of any special circumstances. The daily streamflow data at the streamgaging stations in northeastern Illinois were analyzed to develop values of 7-day lowest flow each year as well as the 7-day 10-year low flow, both with and without effluent contributions. Finally, a map was prepared showing the 7-day 10-year low flows of the various streams and rivers in northeastern Illinois, adjusted for the 1980-81 conditions regarding effluent discharges to the streams and any water withdrawals for industrial uses.

Acknowledgments

This study was jointly supported by the Illinois Environmental Protection Agency and the State Water Survey Division of the Illinois Department of Energy and Natural Resources. James Pendowski of the Illinois Environmental Protection Agency served in a liaison capacity during the course of the study. The staff of the Illinois Environmental Protection Agency in their office at Maywood, Illinois, was very helpful in allowing use of their office and files for analysis of effluent flows. John W. Brother, Jr., supervised the artwork and Kathleen Brown typed the manuscript.

METHODOLOGY

Preparation of Map

A base map was first prepared for northeastern Illinois, covering the areas drained by the Chicago River, DesPlaines River, Chicago Sanitary and Ship Canal, Calumet-Sag Channel, DuPage River, and Fox River, and the area north of the Illinois River to confluence with the Fox River. The drainage area covered by a stream or river system was marked on the 2-degree maps of the U.S. Geological Survey. These maps have a scale of 1 to 250,000 or about 1 inch = 4 miles. Where the contours were not defined well enough to draw the drainage boundary accurately, use was made of the 15-minute USGS quadrangle maps that have a scale of about 1 inch = 1 mile. A base map was then prepared showing the drainage boundary, the stream network, all towns having wastewater treatment plants discharging to the streams, and county lines. The USGS streamgaging stations were located on the base map from the detailed descriptions of the locations published in U.S. Geological Survey Water Supply Papers and Water Resources Data for Illinois.

The locations of wastewater effluent outfalls to streams were obtained from the USGS 7 1/2-minute and 15-minute quadrangle maps, from the Illinois Environmental Protection Agency office in Maywood, from the areawide water quality management plans prepared by the Northeastern Illinois Planning Commission, or in some cases by direct telephone inquiries. Arrows were drawn on the base map to indicate the effluent outfall to a stream. The amounts of wastewater effluents indicated on the map represent the 1980-81 effluents entering the receiving stream during the 7-day 10-year low flow condition.

Dams, regulating structures, and lakes were also located on the base map. The dams, fords, and in-channel impoundments for municipal or industrial water supply were located on the various streams on the basis of the available information in USGS maps, county plat books, highway maps, river basin reports, and similar references. In addition, all large and medium lakes, and some small ones, natural or man-made, were shown on the map because of their significant effect on the 7-day 10-year low flows.

Streams with zero 7-day 10-year low flow were designated first. From the natural low flow versus drainage area graphs, the streams with zero 7-day 10-year low flow were determined and shown as dot-dash lines. Any wastewater effluents entering these intermittent-flow streams were then considered. If the effluent is lost in the dry streambed before reaching the perennial stream, the zero 7-day 10-year low flow stream remains as such. However, if the effluent is not lost entirely, the stream starts with a 7-day 10-year low flow at the outfall equal to the magnitude of the effluent, and this flow is reduced in a downstream direction to the point where the natural 7-day 10-year low flow begins. Here the 7-day 10-year low flow is then equal to the reduced effluent value plus the natural value.

Streams with nonzero 7-day 10-year low flow were mapped next. To natural 7-day 10-year low flows along such streams are added the effluents from wastewater plants to obtain the 7-day 10-year low flows for 1980-81 conditions. Any removal of water from a stream for a municipal supply or industrial use is shown by a decrease in the 7-day 10-year low flow. Symbols used in the low flow map are shown in figure 1.

Flows at Streamgaging Stations

The primary data used in this study are the daily flows at 45 USGS gaging stations on streams in northeastern Illinois. These stations are

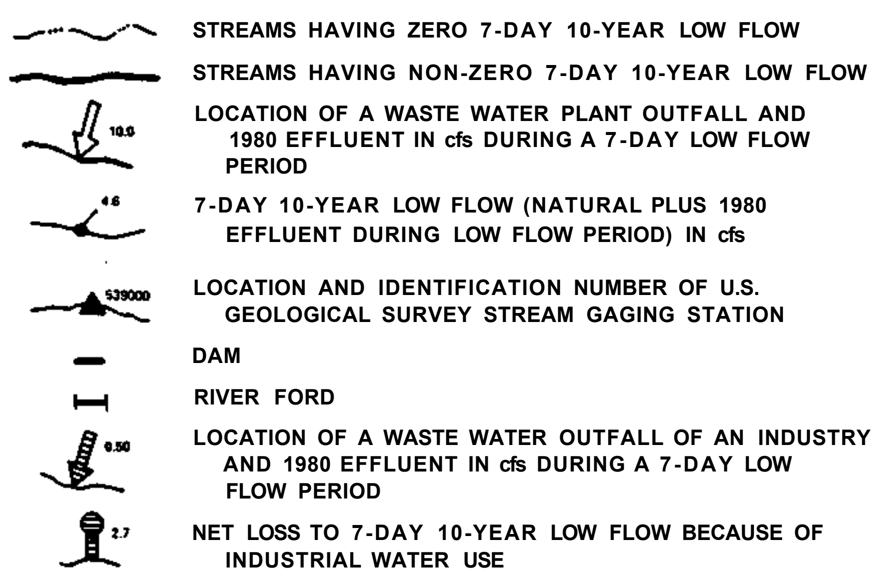

Figure 1. Symbols used in 7-day 10-year low flow map

shown in the 7-day 10-year low flow map for northeastern Illinois, enclosed at the end of this report. Daily flow data were available for an average of 31 years at these stations. The flow data were brought up-to-date to the year 1980 and stored on disks for quick computer processing. The water year selected for low flow analysis was taken to begin April 1 and end March 31 of the following year.

A computer program was written in Fortran to compute the lowest 7-day low flow for each year of the available record at each station, and to print the year, the flow value, and the beginning day of the 7-day period. The computer program also ranks these low flows in ascending order of magnitude. The low flow values at some stations do indicate a trend of increase in low flow when the drainage area upstream of the gaging station is slowly or rapidly urbanizing, and thus discharging more and more wastewater effluents to the stream.

Flows along the Streams

The 7-day 10-year low flows at the gaging stations serve as control points for estimating these low flows along the streams and their tributaries. Other pertinent information is the location of wastewater treatment plant effluents entering the stream and their 7-day low flow effluents. For maximum utility, the 7-day 10-year values need to be estimated at locations near towns., at junctions with medium and major tributaries, at sizable inflows from wastewater treatment plants, and at regulation or control works. The 7-day 10-year low flows were estimated at these various points along the streams, but to avoid overcrowding the map not all of them were shown. The 7-day 10-year low flows along the stream were derived with the use of the following tools, singly or in combination, as dictated by the prevailing conditions in each general area.

Natural Low Flow versus Area Curves. The natural 7-day 10-year low flow versus drainage area curve, applicable to the area under consideration, indicates the maximum drainage area A_o for which the 7-day 10-year low flow is zero. The creeks, streams, and tributaries with drainage area less than A_o are shown by dot-dash lines on the low flow map. When the drainage area equals A_o, the low flow value is shown as 0.00 and the stream is drawn as a solid line downstream which means it is then a perennial-flow stream.

Wastewater Treatment Plant Effluents. If the effluents enter streams that have drainage areas less than A_o, an estimate has to be made of the losses occurring in the intermittent streams to determine whether these effluents would be absorbed before reaching the natural perennial-flow stream. If the effluent additions are small and enter the stream in the upper reach, generally they would be lost in the dry streambed. However, if the effluent additions are considerable, they may contribute to some flow at the stream point with drainage area A_o. The larger the effluent and the closer its point of entrance to the A_o point, the more the flow contributions will increase. Once the stream has nonzero 7-day 10-year low flow, any effluent additions simply increase the 7-day 10-year low flowby the amount of effluent addition.

Water Withdrawals for Offstream Uses. Generally any town or industry pumping water from a stream returns it to the stream after use in the form of effluents from its wastewater treatment plant. Such use does cause a reduction in the 7-day 10-year low flow because the return water is usually less, although the deficit will vary. Adjustments in the 7-day 10-year low flow values are made for these losses where necessary. An example is the loss of 28 cfs from the low flow value in the Chicago Sanitary and Ship Canal because of water use by the Corn Products Company.

Timing of Low Flows in Two Major Branches. When two major branches drain sufficiently large areas before joining together, the 7-day 10-year low flow versus area curves applicable to these branches may be quite different because of hydrologic, geologic, and soil factors. Further, the low flows may not occur during the same month. Under such conditions, the 7-day 10-year low flow below the junction will be much more than a simple addition of 7-day 10-year low flows in the two branches.

For example, the 7-day 10-year low flow for the DesPlaines River at its mouth (just upstream of its junction with the Kankakee River) is 2005 cfs and occurs in December or March. The 7-day 10-year low flow for the Kankakee River is 484 cfs and occurs in September. The 7-day 10-year low flow in the Illinois River (below the junction of the DesPlaines and Kankakee Rivers) occurs in October or January and equals 3143 cfs, which is much greater than the simple addition of 2005 and 484 cfs.

Modification of Low Flows because of Lakes and Pools. In-stream lakes and pools generally reduce the 7-day 10-year low flow. Lakes and pools expose considerable water surface areas to evaporation, thus reducing the natural low flows.

An example showing the effect of natural lakes on the 7-day 10-year low flow is the upper part of the Fox River Basin in Illinois (figure 2). This part has a flat low-lying terrain abounding in lakes, swamps, marshes, and sloughs. Included in this area are the Fox Chain of Lakes with a combined water surface of 13 square miles. The principal lakes in the chain are: Pistakee, Nippersink, Fox, Petite, Channel, and Catherine. There are two dams in the area: the McHenry and Algonquin Dams. The

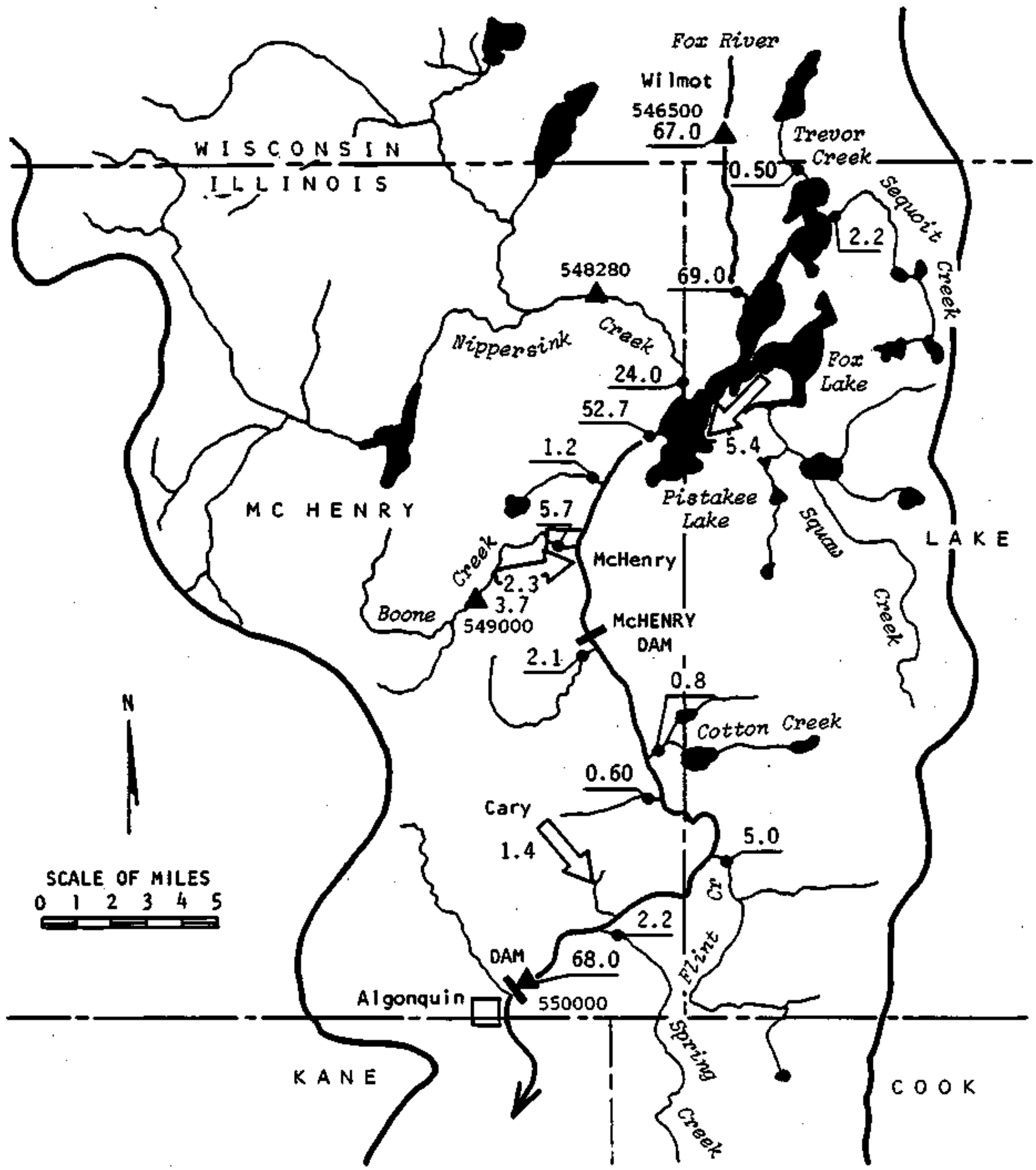

Figure 2. 7-day 10-year low flows in the upper Fox River Basin

McHenry Dam creates a pool extending upstream to the Pistakee Lake outlet. The surface area of the pool is 403 acres. The Algonquin Dam creates a 16.34-mile long pool extending upstream to the McHenry Dam, and the pool has a surface area of 849 acres. Gates at the McHenry Dam are operated to maintain the water level in the Chain of Lakes for recreational purposes.

On the main river, at the upper and lower end of the area, the USGS operates two gaging stations, one at Wilmot, Wisconsin, and the other at Algonquin, Illinois; the respective drainage areas at these stations are 880 and 1402 square miles. Nippersink Creek is the major tributary, draining a total of 234 square miles. There is a gaging station near Spring Grove and another on Boone Creek near McHenry. The 7-day 10-year low flows at Wilmot and Algonquin, adjusted for 1980 effluent discharge conditions, are 67 and 68 cfs, respectively. The various tributaries, groundwater accretion, and wastewater effluents from Wilmot to Algonquin add 55.4 cfs of flow to the 7-day 10-year low flow as shown below.

Contributions from Tributaries and Effluents, Wilmot to Algonquin, in cfs

Trevor Creek at Channel Lake Outlet	0.5
Sequoit Creek	2.2
Fox Lake and Round Lake (effluents)	5.4
Nippersink Creek	24.0
Fox River (groundwater accretion)	2.0
Total at Pistakee Lake outlet	34.1
Unnamed Creek	1.2
Boone Creek	5.7
McHenry (effluent)	2.3
Unnamed Creek	2.1
Cotton Creek	0.8
Unnamed Creek	0.6
Flint Creek	5.0
Cary (effluent)	1.4
Spring Creek	2.2
Total to Algonquin	55.4

The losses in the Fox Chain of Lakes and the two pools created by the McHenry and Algonquin Dams are 67.0 + 55.4 - 68.0, or 54.4 cfs. Lowest 7-day flows usually occur during September or late August. Allowing a 3 cfs loss per square mile of lake surface area, the evaporation loss from the two pools created by the Algonquin and McHenry Dams equals 5.9 or 6 cfs. Thus, the 7-day 10-year low flow in the Fox River at the outlet of Pistakee Lake is 68.0 - [(55.4 - 34.1) - 6.0], or 52.7 cfs. Losses in the Fox Chain of Lakes are 67.0 + 34.1 - 52.7, or 48.4 cfs. For a water surface area of 13 square miles, the loss amounts to 3.7 cfs per square mile. This is higher than the 3 cfs for the pool areas created by the in-channel dams because of more wind effects in the lake area and some inhibition of groundwater accretion. Low flow analyses for Algonquin to the mouth of the Fox River and the losses from the pools created by 10 in-channel dams downstream of the Algonquin Dam indicate that the loss of 3 cfs per square mile of water surface area from such pools is satisfactory.

Flow Regulation for Navigation. Flows in the waterways of the Metropolitan Sanitary District of Greater Chicago (MSDGC) and in the Illinois River are regulated through a series of locks and dams for navigation purposes. The observed losses are attributed to evaporation, leakage, and storage because of regulation. Because all these losses are proportional to water surface area, the distribution of losses along the river is found by the use of the lake, river, and backwater surface areas at different points along the river.

Groundwater Accretion to Low Flow. A stream becomes a gaining stream when groundwater flows into the stream. The amount of this accretion has been shown (Singh, 1968) to be related to the depth of streambed incision or entrenchment. The amount of this gain is estimated from the low flow data at gaging stations along a major stream, streambed conditions, existence of permeable deposits, and other pertinent factors.

Streams in Urbanizing Basins. For streams with a rapidly urbanizing drainage area, the lowest 7-day flows each year exhibit a pronounced upward trend with time. As an example, consider the lowest 7-day flows observed in the Salt Creek at Western Springs (station 05-531500, drainage area 114 square miles) during the years 1946 - 1980, plotted in figure 3. The lowest 7-day curve typifies the trend and yields a 7-day 10-year low flow of 36.0 cfs for the 1980 conditions of inflows to Salt Creek above the gaging station. Various inflows above the gaging station for the years 1940, 1950, 1960, 1970, and 1980 are given below.

Inflows above Station 05-531500, *Salt Creek at Western Springs*

Source	**Inflows (cfs)**				
	1940	**1950**	**1960**	**1970**	**1980**
John Egan Plant	-	-	-	-	19.5
Elk Grove Devon	-	-	-	-	0.1
Springbrook		0.03	0.42	0.80	1.5
Wood Dale			0.36	1.1	1.7
Addison	0.08	0.08	0.88	3.8	5.5
Salt Creek S.D.	1.1	1.4	3.4	4.6	2.8
Elmhurst	1.9	2.6	4.8	7.3	10.4
Oakbrook Terrace				0.12	-
Oak Brook			0.09	1.6	-
TOTAL	3.08	4.11	9.95	19.32	41.5

The total inflow in 1980 was 41.5 cfs and the 7-day 10-year low flow is 36.0 cfs. Thus, the loss in stream channel amounts to 41.5 - 36.0, or 5.5 cfs. Most of the communities in the basin depend on wells for their water supply. Water pumped from the ground or supplied from Lake Michigan is discharged as wastewater effluent. In the southern part of the basin, the glacial drift is thin, and the basal sand and gravel, though too thin

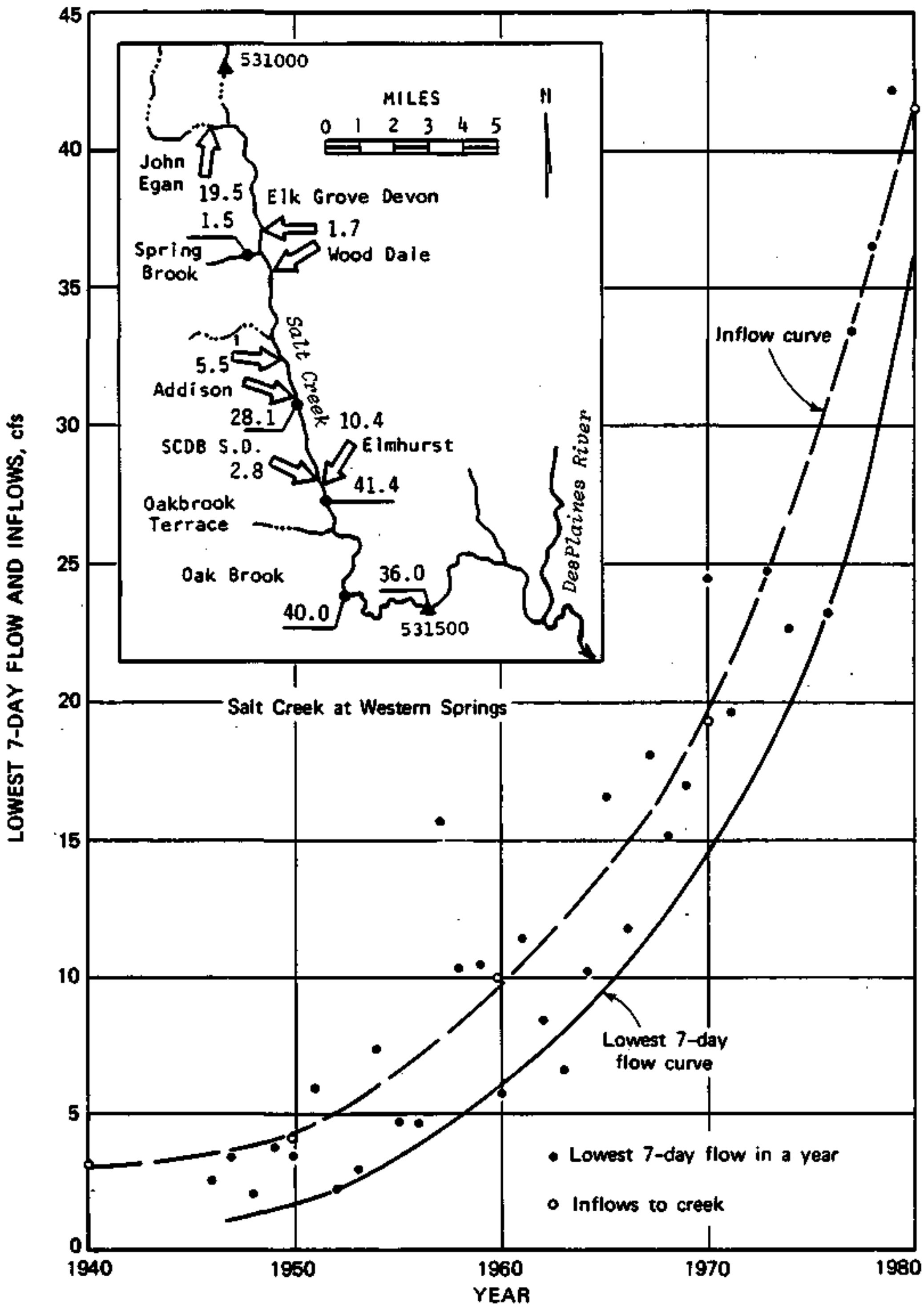

Figure 3. Lowest 7-day flows and inflows to the Salt Creek

to be used as an aquifer, do provide a hydraulic connection between the Salt Creek bed and the dolomite aquifer underlying the sand and gravel. This relationship is a critical factor in groundwater recharge in the southern part of the basin. The entire reach of the Salt Creek south and east of Elmhurst is regarded as an area of potential recharge to the shallow aquifers.

Favorable conditions for induced recharge exist in the general area near gaging station 05-531500 because of an extensive cone of depression caused by groundwater pumping. Induced recharge from the streambed reduces streamflow; this effect will be more pronounced at low flow than at high flow. From a study (Spieker, 1970) of seepage runs made by the U.S. Geological Survey in 1965 and 1966, the losses of streamflow from induced recharge were determined for the various reaches. These losses were used in determining the 7-day 10-year low flows upstream of the gaging station.

Wastewater Treatment Plants

The monthly operation reports from various towns, cities, and industries are on file in the Illinois Environmental Protection Office in Maywood, Illinois. These reports contain information on the amount of water in gallons per day leaving the plant after treatment, any wastewater bypassed during rains in the case of combined sewer systems, and quality parameters such as BOD and concentrations of suspended solids. The information from these reports varies in quality but it helps to promote an understanding of the variability of the effluent.

The effluent records were inspected and analyzed to derive the 7-day low effluent flow in the year 1980 or 1981. Many municipal and industrial wastewater treatment plants were contacted by phone or by letter not only to fill in the missing information but also to verify the information collected from the files. The change in town population from 1970 to 1980 was analyzed with regard to change in effluent flows for purposes of ascertaining any special cases and reasons thereof.

The locations of wastewater effluent outfalls to receiving streams were obtained from the USGS quadrangle maps, the Illinois Environmental Protection Agency office in Maywood, area-wide water quality management plans prepared by the Northeastern Illinois Planning Commission (NIPC), or in some cases by direct telephone inquiries.

MSDGC Waterways

The Metropolitan Sanitary District of Greater Chicago, MSDGC, has three major sewage treatment works: Northside, West-Southwest, and Calumet, which discharge to the North Shore Channel, Chicago Sanitary and Ship Canal, and Calumet-Sag Channel, respectively, of the MSDGC waterways. These waterways serve a dual purpose. They provide open drainage for effluents from sewage treatment works serving Greater Chicago, and navigation facilities both ways for shipping from Lake Michigan to the Mississippi River via the Illinois River. The water levels in these waterways are controlled primarily for navigation which requires wide and deep waterways.

In the past about 1700 cfs of Lake Michigan water was used by municipalities for water supply. After deductions for storm runoff, pumpage, and lockage and leakage, the remainder allowable diversion or discretionary diversion has been used by the MSDGC to dilute wastewater effluents in the waterways during certain periods. At the present, the discretionary diversion is 320 cfs averaged over the year but most of it is used during the summer months of July, August, and September. For the period January 1, 1979 to December 31, 1981, the MSDGC (1982) has given the following lowest 7-day diversions from Lake Michigan.

Location	7-day period	Low flow (cfs)
1. North Shore Channel at Sheridan Road	March 1-7, 1979	1
2. Chicago River at Outer Drive	January 1-7, 1979	25
3. Calumet River at O'Brien Lock	March 4-10, 1979	20

The northside sewage treatment work (STW) discharges its effluent to the North Shore Channel which joins the North Branch Chicago River about 3 miles downstream. The North Branch Chicago River meets the Chicago River, which carries Lake Michigan water coming through the lock facilities at Chicago Harbor. From this junction to Damen Avenue the channel is known as the South Branch Chicago River. Downstream from Damen Avenue to Lockport, it is named the Chicago Sanitary and Ship Canal. The largest MSDGC sewage treatment work, West-Southwest, discharges its effluent to this waterway. The canal is joined by the Calumet-Sag Channel from the east, which carries Lake Michigan water passing through the Calumet River and the O'Brien Lock and Dam, water from the Grand Calumet and Little Calumet Rivers, and the effluent from the Calumet STW, the third major MSDGC sewage treatment work. Downstream of the Lockport Lock and Dam, the Chicago Sanitary and Ship Canal joins the DesPlaines River, which later combines with the Kankakee River to form the Illinois River.

Illinois River

Flow in the Illinois River is regulated through a series of locks and dams for navigational purposes. Below Lockport, there is one lock and dam on the DesPlaines River at Brandon Road and two locks at Dresden Island and

Marseilles on the Illinois River. The 7-day 10-year low flow at Marseilles is estimated as 3200 cfs. The 7-day 10-year low flow at the beginning of the Illinois River has been determined as 3143 cfs from a study of concurrent flows at the following gaging stations:

05-527500	Kankakee River near Wilmington
05-532500	DesPlaines River at Riverside
05-537000	Chicago Sanitary and Ship Canal at Lockport
05-539000	Hickory Creek at Joliet
05-540500	DuPage River at Shorewood
05-542000	Mazon River near Coal City
05-543500	Illinois River at Marseilles

The groundwater accretion to flow during 7-day 10-year low flow conditions in the reach above Marseilles is estimated as 2.25 cfs per mile on the basis of balancing the inflows from the tributaries and the flows in the Illinois River. Some values of 7-day 10-year low flows along the Illinois River are given below.

River Mile	Location	7-day 10-year low flow, cfs
271.5	Dresden Island Lock and Dam	3143
268.3	Downstream of Aux Sable Creek	3150
263.2	Downstream of Mazon River	3162
258.0	0.6 mi downstream of Grist Island Light	3175
252.0	0.2 mi upstream of Spring Brook Light	3188
246.6	Marseilles gaging station	3200
242.0	0.5 mi upstream of Bulls Island Bend Light	3196
240.0	0.2 mi downstream of Scherer Island	3193
239.0	0.7 mi downstream of Fox River	3563

Miscellaneous

Some other assumptions have been made in deriving the 7-day 10-year low flows of the streams in northeastern Illinois.

1. Effluents from any wastewater treatment plants serving schools have not been considered because these will be practically zero during school closures of one, two, or more weeks. Therefore, these are not shown on the 7-day 10-year low flow map.
2. Effluents from wastewater plants serving small trailer parks or recreational areas have not been considered because such flows are not only small but also transitory and seasonal. In intermittent streams, all such effluents would be lost before reaching the perennial stream. For similar reasons, effluents in the range of 0.03 mgd or less from small communities or industries are not considered.
3. The 7-day 10-year low flows for the 1980 condition of effluents may need adjustment in later years with increases in effluent flows because of increased population. The impact of such increases may be greater in streams having small natural low flows.

LOW FLOW MAP FOR NORTHEASTERN ILLINOIS

The 7-day 10-year low flows, $Q_{7,10}$, for northeastern Illinois streams, as developed from this study, are shown in the map (in pocket). The beginning numbers 05 from the 8-digit station numbers as given in table 1 are dropped in the map because all 45 gaging stations in northeastern Illinois have 05 as the first and second digits. The $0_{7,10}$ values for the 45 gaging stations as well as the corresponding effluents from various MSDGC, municipal, and industrial wastewater treatment plants are listed in table 1, for both 1970 and 1980 conditions of effluent discharges. The figures for 1970 conditions are the same as given by Singh and Stall (1973). The information given in the table explains major changes in 7-day 10-year, $Q_{7,10}$, low flows because of corresponding changes in the effluent flows.

Table 1. Northeastern Illinois: 7-Day 10-Year Low Flows at Gaging Stations Adjusted for 1970 and 1980 Conditions of Effluents from Sewage Treatment Plants

USGS No.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
	CHICAGO RIVER				
	Great Lakes Naval Tr Center, STP			--	1.3
05 535000	Skokie River at Lake Forest	0.30	1.3		
05 535070	Skokie River near Highland Park	0.60	1.6		
	NSSD Clavey Road, STP			15.2	6.3
05 534500	N. Br. Chicago River at Deerfield	0.00	0.00		
	Riverwood, STP			--	0.11
	Deerfield, STP			3.1	2.3
05 535500	W F of N. Br. Chicago River at Northbrook	2.2	1.4		
05 536000	N. Br. Chicago River at Niles	16.5	7.6		
	Wilmette Harbor intake	1.0	20.0		
	MSDGC Northside, STP			370	380
	PGMC (Proctor & Gamble Mfg. Co.)			1.2	1.1
	CCA (Container Corp. of America)			0.75	1.6
	Chicago Harbor intake	25.0	27.0		
	DES PLAINES RIVER				
05 527800	Des Plaines River at Russell	0.20	0.00		
	Lindenhurst San. Dist., STP			0.71	0.06
	Grayslake, STP			--	0.43
	Grandwood Park LCDPW, STP			0.25	--
	AHC (Anchor Hocking Corporation)			--	0.09
	NSSD Waukegan, STP			17.3	--
	NSSD Gurnee, STP			13.9	--
05 528000	Des Plaines River near Gurnee	32.0	0.05		
	Gages Lake, STP			--	0.46
	Libertyville, STP			2.9	2.5
	Mundelein, STP			3.7	2.5

Table 1. Continued

USGS No.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
	New Century LCDPW, STP			0.93	--
	Sylvan Lake, STP			0.20	0.07
	Ela TWP LCDPW, STP			0.05	--
	Vernon Hills, STP			--	0.11
	Des Plaines LCDPW, STP			2.2	--
	Chevy Chase UC, STP			0.05	--
	Lake Zurich, NE STP			0.50	--
	Buffalo Grove, STP			--	0.23
05 528500	Buffalo Creek near Wheeling	0.00	0.21		
05 529000	Des Plaines River near Des Plaines	40.9	4.3		
05 529500	McDonald Creek near Mt. Prospect	0.00	0.00		
05 530000	Weller Creek at Des Plaines	0.00	0.00		
	UOC (Union Oil Company)			0.74	--
	O.M. Home Park, STP			0.15	--
	MSDGC O'Hare, STP			31.2	--
	T.A. Home Park, STP			0.10	--
05 530500	Willow Creek near Park Ridge	31.0	0.00		
	O'Hare Aviation, STP			2.4	--
05 531000	Salt Creek near Arlington Heights	0.00	0.00		
	MSDGC John Egan, STP			19.5	--
	Elk Grove Devon, STP			0.08	--
	Roselle, STP			0.73	0.84
	Bloomingdale, STP			--	0.15
	Itasca, STP			1.3	0.40
	Wood Dale, North STP			1.3	1.1
	Wood Dale, South STP			0.42	--
	Addison, North STP			2.0	3.8
	Addison, South STP			3.5	--
	Salt Creek San. Dist., STP			2.8	4.6
	Elmhurst, STP			10.4	7.3

Table 1. Continued

USGS No.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
05 531500	Salt Creek at Western Springs	36.0	14.0		
	Bensenville, STP			2.6	3.1
05 532000	Addison Creek at Bellwood	2.9	1.8		
05 532500	Des Plaines River at Riverside	113	18.4		
	Hinsdale San. Dist., STP			9.0	3.7
05 533000	Flag Creek near Willow Springs	7.4	2.5		
	Brookhaven, STP			--	1.8
	Marionbrook DPCDPW, STP			5.0	--
	ANL (Argonne National Laboratory)			0.90	0.45
05 533500	Des Plaines River at Lemont	128	24.8		
	Citizens Utility, STP			0.20	--
	Romeoville, STP #1			1.3	1.1
	Romeoville, STP #2			0.76	--
	Lewis University, STP			0.10	--
	CHICAGO SANITARY & SHIP CANAL				
	CWE (Commonwealth Edison, Fisk)			-1.3	--
	CWE (Comm. Ed., Crawford)			-2.3	--
	CWE (Comm. Ed., Ridgeland)			-0.4	--
	MSDGC West-Southwest, STP			1002	1014
	CPC (Corn Products Company)			-28.0	-28.0
	NACC (North American Can Corp.)			0.06	--
	USSC (U.S. Steel Corporation)			-5.7	--
	II (Interlake Incorporated)			-1.4	-1.1
	WSD (Wisconsin Steel Division)			--	-1.6
	RSC (Republic Steel Corporation)			-0.05	--
	ACC (Allied Chemical Corporation)			-0.50	--
	O'Brien Lock & Dam	20.0	30.0		
	MSDGC Calumet, STP			265	210
	II (Interlake Incorporated)			-2.0	-2.5

Table 1. Continued

USGS No.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
05 536195	Little Calumet River at Munster	5.7	5.7		
	Lansing, STP			3.2	3.9
05 536265	Lansing Ditch near Lansing	0.20	--		
05 536270	North Creek near Lansing	1.0	0.05		
	Ridgeview Subdivision, STP			--	0.20
	Crete, STP			--	0.43
	Park Forest South, STP			1.4	--
	East Chicago Heights, STP			--	3.1
05 536235	Deer Creek near Chicago Heights	0.30	3.0		
	CTC (Caterpillar Tractor Company)			0.10	--
	SCC (Stauffer Chemical Company)			--	0.60
05 536210	Thorn Creek near Chicago Heights	0.30	0.50		
	Bloom Township S.D., STP			11.6	11.7
05 536215	Thorn Creek at Glenwood	14.0	14.0		
	Matteson, STP			--	0.60
	Olympia Fields, STP			--	0.43
	Flossmoor, STP			--	1.1
05 536255	Butterfield Creek at Flossmoor	0.00	1.0		
	Homewood, STP			3.4	2.8
05 536275	Thorn Creek at Thornton	19.6	21.3		
	Thornton, STP			0.31	0.31
05 536290	L. Calumet River at South Holland	31.6	34.0		
	Hazel Crest, STP			--	0.80
05 536340	Midlothian Creek at Oak Forest	0.00	0.00		
	CORC (Clark Oil & Refining Corp.)			-4.5	-3.3
	Westhaven, STP			--	0.31
05 536500	Tinley Creek near Palos Park	0.00	0.00		
	Lemont, STP			1.1	0.64
	UOC (Union Oil Company)			-0.50	-0.50
	CEW (Comm. Ed., Will County)			-3.2	--

Table 1. Continued

USGS No.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
	Chickshaw Hills UC, STP			0.25	--
	Derby Meadows, STP			0.50	--
	Lockport Heights, STP			0.10	--
05 537500	Long Run near Lemont	0.30	0.00		
	TI (Texaco Inc., closed 1981)			--	-7.7
	Bonnie Brae, STP			0.17	0.43
	Lockport, STP			2.1	1.0
05 537000	Chicago Sanitary & Ship Canal at Lockport	1700	1700		
	DES PLAINES RIVER, Lockport to confluence with Kankakee River				
	GAFC (G.A.F. Corporation)			0.65	--
	USSC (U.S. Steel Corporation)			0.25	--
	Sauk Trails, STP			0.15	--
	Prestwick UC, STP			0.46	--
	Arbury Hills, STP			0.20	0.14
	Frankfort, STP			1.2	0.29
	Mokena, STP			0.40	0.19
	New Lenox, North STP			0.46	0.28
	Orland Park, STP			--	0.40
05 539000	Hickory Creek at Joliet	3.0	1.9		
	Preston, STP			0.20	0.15
	Joliet, East STP			18.6	17.7
	Brandon Lock & Dam	1889	1815		
	Rockdale, STP (to I.M. Canal)			0.50	0.64
	CEW (Commonwealth Edison, Joliet)			-2.7	--
	OCC (Olin Chemicals Corporation)			1.5	2.2
	CTC (Caterpillar Tractor Company)			1.0	1.0
	Joliet, West STP			2.8	--
	AmCC (Amoco Chemical Corporation)			1.0	1.0

Table 1. Continued

USGS No.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
	SpCC (Stephan Chemical Company)			0.56	1.0
	New Lenox, South STP			0.14	--
	Manhattan, STP			0.42	0.15
	Elwood, STP			0.05	--
	U.S. Ordnance Factory			0.30	--
	ACC (Allied Chemical Corp.)			1.0	--
	MOC (Mobil Oil Corp.)			-10.8	-6.2
	DUPAGE RIVER				
	MSDGC Hanover Park, STP			9.1	2.7
	Roselle Waterbury, STP			0.54	--
	Hanover Park, STP #1			0.28	--
	Bartlett, STP			0.75	0.45
	Hanover Park, STP #2			0.40	--
05 539900	W Br DuPage River near W. Chicago	10.4	3.2		
	Cascade, STP			--	0.11
	Carol Stream, STP			1.6	1.0
	Winfield, STP			1.0	1.0
	West Chicago, STP			3.0	2.0
	OII (Owens Illinois Inc.)			0.08	0.04
	WEC (Western Electric Co.)			--	0.07
	Wheaton, STP			6.8	4.9
05 540095	W Br DuPage River near Warrenville	23.0	13.6		
	Warrenville, STP			--	0.70
	Naperville, STP			--	3.0
	Bloomingdale, South STP			1.7	--
	Glendale Heights, STP			3.6	1.6
	Glen Ellyn Heights DPCDPW, STP			0.15	0.11
	Lombard, STP			4.4	4.7

Table 1. Continued

USGS No.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
	Glen Ellyn-Glenbard, STP			4.6	3.3
	Butterfield, STP			0.25	0.30
	Valley View, STP			0.37	0.30
	Downers Grove SD, STP			11.4	4.0
	Lisle DPCDPW, STP			2.2	1.3
	Woodridge DPCDPW, STP			5.4	1.9
	Bolingbrook, STP			0.74	--
	West Suburban, STP #2			2.2	--
	Naperville-Springbrook, STP			10.2	--
	Plainfield, STP			0.53	0.50
	Farmingdale DPCDPW, STP			0.26	--
	West Suburban, STP #1			1.4	1.0
	Central States UC, STP			0.30	--
	Shorewood, STP			0.50	--
05 540500	DuPage River at Shorewood	78.0	45.0		
	Minooka, STP			0.17	0.06
	Crest Hill, STP (Rock Run Creek)			1.5	0.40
	FOX RIVER				
05 546500	Fox River at Wilmot, Wisconsin	67.0	62.0		
	Antioch, STP			0.97	0.71
	Lake Villa, STP			0.23	0.15
	Round Lake, STP			--	2.1
	TL (Travenol Laboratories)			0.65	--
	Tall Oaks, STP			0.05	--
	Fox Lake & Round Lake, STP			5.4	0.30
	Hebron, STP			0.23	0.11
	HPC (Hebron Packing Company)			--	0.50
	Genoa City, STP			0.11	0.11
	Richmond, STP			0.12	0.14

Table 1. Continued

USGS No.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
	WDC (Woodstock Die Casting)			0.63	1.1
	Woodstock, North STP			1.4	1.4
	Woodstock, South STP			0.39	--
05 548280	Nippersink Creek near Spring Grove	21.6	18.6		
	MCC (Morton Chemical Co.)			1.1	--
	MMC (Modine Manufacturing Co.)			0.12	--
05 549000	Boone Creek near McHenry	3.7	3.7		
	McHenry, STP			2.3	1.1
	Crystal Lake, North STP			0.19	--
	TCI (T-C Industries)			0.11	--
	Wauconda, STP			0.56	0.54
	Island Lake, STP			0.29	--
	Lake Zurich, Northwest STP			0.80	--
	Barrington, STP			2.6	2.2
	QOC (Quaker Oats Company)			--	0.18
	Lake Barrington Homeowners, STP			0.16	--
	Cary, STP			1.4	0.80
	Fox River Grove, STP			0.87	0.74
05 550000	Fox River at Algonquin	68.0	51.0		
	Crystal Lake, STP			3.4	2.5
	Lake in the Hills, STP			0.50	0.39
	Algonquin, STP			0.77	0.50
	Carpentersville, KH STP			0.09	--
	Carpentersville, Main STP			2.3	2.0
	East Dundee, STP			0.47	0.28
	West Dundee, STP			0.76	0.45
	CRC (Chicago Rawhide Company)			0.08	--
	Elgin, North STP			2.9	--
	Elgin, Main STP			17.7	10.8
	ESH (Elgin State Hospital)			0.28	1.0

Table 1. Continued

USGS NO.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
05 550500	Poplar Creek at Elgin	0.50	0.96		
	Valley View, STP			0.10	0.04
	Ferson Creek UC, STP			0.05	--
05 551200	Ferson Creek near St. Charles	0.36	0.23		
	MMIC (Moline Malleable Iron Co.)			--	0.08
	St. Charles, STP			4.6	2.5
	Geneva, STP			2.7	2.5
	Batavia, STP			1.5	3.5
	Mooseheart, STP			0.12	0.11
	Aurora, STP			26.6	20.0
	Oswego, STP			0.31	0.19
	Yorkville, STP			0.80	0.28
	Sugar Grove, STP			0.29	--
	ADI (Armour Dial Incorporated)			0.68	--
05 551700	Blackberry Creek near Yorkville	3.4	2.5		
	Elburn, STP			0.46	0.09
	Plano, STP			0.70	0.42
	Sandwich, STP			0.52	0.72
	Newark, STP			0.08	0.06
	Somonauk, STP			0.14	0.12
	Sheridan, STP			0.08	0.08
	Shabbona, STP			0.06	0.05
	Paw Paw, STP			0.09	0.09
	Earlville, STP			0.12	0.12
05 552500	Fox River at Dayton	236	198		
	ILLINOIS RIVER TO CONFLUENCE WITH FOX RIVER				
05 527500	Kankakee River near Wilmington	480	451		
	CWE (Commonwealth Edison, Dresden)			-23.4	-11.0

Table 1. Concluded

USGS NO.	Streamgaging Station or Sewage Treatment Plant	$Q_{7,10}$ cfs 1980	$Q_{7,10}$ cfs 1970	Effluents, cfs 1980	Effluents, cfs 1970
	Morris, STP			1.2	1.0
	DSW (Dupont Seneca Works)			1.1	--
	Seneca, STP			0.30	0.22
05 543500	Illinois River at Marseilles	3200	3240		
	Marseilles, STP			1.2	0.74
	BWC (Borg Warner Corporation)			1.1	0.79
	Ottawa, STP			2.9	2.3

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