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WATER QUALITY ASSESSMENT OF THE TRIBUTARIES TO THE FOX CHAIN OF LAKES

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ABSTRACT

An assessment of the water quality characteristics of the Fox River and four other tributaries to the Fox Chain of Lakes, based on a year long weekly sampling schedule, is presented. The stream waters are typical of the midwestern region, high in alkalinity and hardness. The dissolved oxygen concentrations were never below 5.0 mg/l in the major tributaries. Nippersink Creek showed the highest rate of nitrate transported, 4.54 kg/ha/yr, followed by 3.92 kg/ha/yr for the Fox River at Route 173. The unit nitrate loads transported by all of these streams are considerably less than the average nitrate contribution of 23.53 kg/ha/yr observed for the Kaskaskia River upstream of Shelbyville. The phosphorus concentrations in the Fox River, Sequoit Creek, and Squaw Creek exceeded the Illinois Pollution Control Board's recommended limit all of the time. The total phosphorus transported by the tributaries to the Fox Chain of Lakes appears to be several orders of magnitude higher when compared with the total phosphorus transported by rivers in central Illinois.

INTRODUCTION

The Fox Chain of Lakes, situated in the northeastern corner of the state of Illinois near the Wisconsin state border, is among the few natural glacial lakes in the state. The lakes and their associated shorelands constitute a valuable natural resource that is showing the effects of use and abuse by more and more people. The interconnected bodies of water, their natural shoreline, picturesque beauty, and proximity to Chicago, make the Chain an extremely popular area for swimming, boating, water skiing, fishing, and resort development.

Nuisance algal blooms have been a source of recorded complaints on the Chain for at least the past 35 years. Such protests expressed apprehension regarding the curtailment of bathing, boating, water skiing,

fishing, lowering of property values, cancellation of resort trade, and impairment of the picturesque beauty of the Chain. This report presents an assessment of the physical and chemical water quality characteristics of the tributaries and their impact on the Chain. A comparison of the water quality of the tributaries with the stream standards adopted by the Illinois Pollution Control Board (1972), where applicable, is also presented.

The main inflow into the lake system is the Fox River. Other tributaries of importance are the Sequoit, Nippersink, and Squaw Creeks, and Lily Lake Drain. Figure 1 shows the Fox Chain of Lakes and the tributaries. Watershed areas of these tributaries are given in Table 1. Approximately 75 percent of the Fox River watershed upstream of the Fox Chain lies in the state of Wisconsin. Figure 1 also shows the wastewater treatment plant discharges to these tributaries within Illinois. Table 2 outlines the details of the location, nature of treatment, and the receiving stream for these point source wastewater discharges.

MATERIALS AND METHODS

In order to assess the water quality characteristics, and to estimate the nutrient loads transported by the Fox River and other tributaries to the Fox Chain of Lakes, weekly water samples were obtained at six locations beginning December 4, 1974, and ending on November 26, 1975. Water samples collected from the Fox River at the Illinois Route 173 site, represented the water quality characteristics of the river entering the lake system, and the samples collected at Johnsburg represented the quality of water leaving the lake system. The tributary sampling sites are shown in Figure 1.

Water samples were collected in plastic lined bottles and transported to the laboratory through United Parcel Service. Upon receipt, they were kept refrigerated until all of the chemical analyses were completed. Observations were made for temperature and dissolved oxygen concentrations at the time of sample collection.

The daily flow values for the Fox River at Wilmot (about 2 miles upstream of the Illinois Route 173 sampling site) and for Nippersink Creek were obtained from U. S. Geological Survey water resources data. Temporary wire-weight gages were installed on Sequoit Creek, Squaw Creek, and Lily Lake Drain. Daily stage observations were recorded for these creeks and daily average flows were estimated from stage-discharge relationships developed by the U. S. Geological Survey for these streams. The average daily flow values for the Fox River at Johnsburg were estimated from the flow data developed for the Fox River at McHenry Dam by the Illinois Department of Transportation. The flow at Johnsburg was reduced in proportion to the watershed areas of the Fox River at Johnsburg and McHenry.

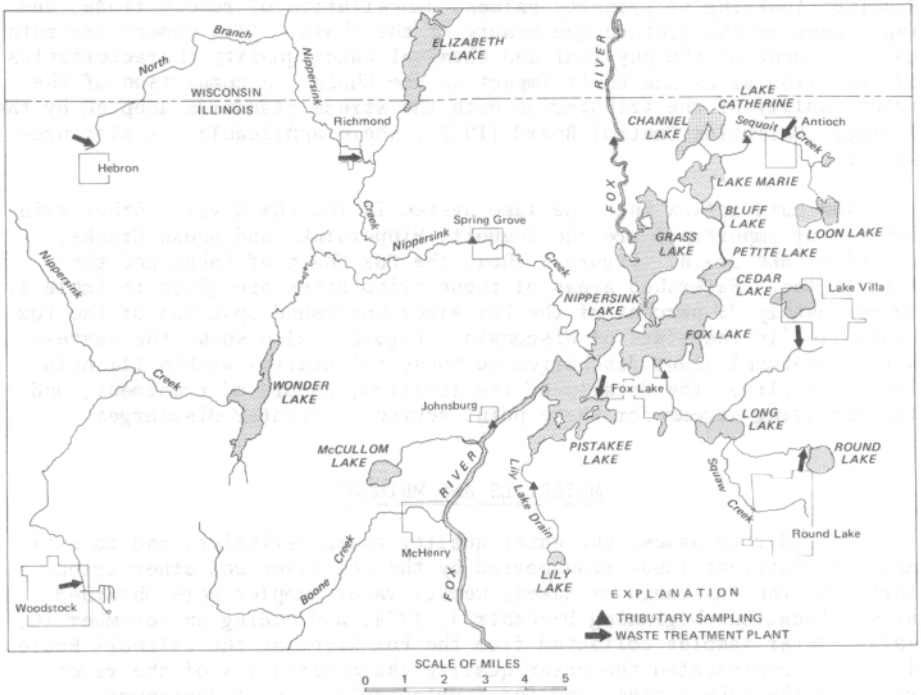

FIGURE 1. -- Fox Chain of Lakes and its tributaries.

Chemical analyses on water samples were performed to determine turbidity, pH, alkalinity, hardness, nitrate-N, Kjeldahl-N, ammonia-N, total silica, total iron, chloride, sulfate, total solids, total dissolved solids, suspended solids, total phosphorus, dissolved orthophosphorus, and algal growth potential. The analyses were made according to the procedures outlined in Table 3. Results of determinations are expressed as milligrams per liter (mg/l) except in the case of temperature, turbidity, and pH. Temperature is expressed in Celsius units, turbidity in formazin turbidity units, and pH is dimensionless.

WATER QUALITY

Temperature

The means and ranges of values of temperature and other water quality parameters observed over a period of a year for the Fox River at Illinois Route 173, Lily Lake Drain, Nippersink Creek, Sequoit Creek, Squaw Creek, and the Fox River at Johnsburg are shown in Tables 4 through 9. The observed temperatures in the streams ranged from 0°C in winter to 27.5°C in summer. Because there are no industrial thermal discharges to any of the tributaries, the variations in water

TABLE 1. Watershed Areas of Fox River and Other Tributaries

	Watershed area *(square kilometers)*
Fox River at Wilmot	2,248
Fox River at Johnsburg	3,067
Fox River at McHenry	3,245
Lily Lake Drain at Lincoln Road	12.3
Nippersink Creek at Spring Grove	500
Sequoit Creek at Highview Drive	27.8
Squaw Creek at Rollins Road	110

TABLE 2. Details of Point Source Wastewater Discharges

Wastewater treatment plant	Design capacity *(mgd)*	Type of treatment	Receiving stream
Hebron	0.11	Imhoff tank and trickling filter lagoons	Nippersink Cr.
Richmond	0.375	Imhoff tank, 4-stage bio-disc, and chlorination	Nippersink Cr.
Woodstock (north side)	3.50	Conventional activated sludge, phosphorus removal, chlorination	Nippersink Cr.
Woodstock Die Casting Co.		pH adjustment, upflow clarification using polyelectrolytes, and dual media filtration	Nippersink Cr.
Lake Villa	0.30	Activated sludge and chlorination	Eagle Cr.-Squaw Cr.
Round Lake Sanitary Dist.	1.6	Trickling filter, lagoons, and chlorination	Squaw Cr.
Antioch	1.0	Activated sludge, mixed media filtration, and chlorination	Sequoit Cr.
Fox Lake	0.72	Trickling filter and chlorination	Myers Bay-Pistakee Lake

Note: The Hebron Wastewater Treatment Plant (owned and operated by the city of Hebron) is designed to handle trade wastes from a meat-packing operation that processes 200 head of cattle per day.

TABLE 3. Analytical Procedures

Turbidity	Nephelometric method, using Turner Fluorometer, Model 110; Formazin was used as a standard
pH	Glass electrode method using Leeds and Northrup 7401 and later Beckman 4500
Alkalinity	Potentiometric method
Hardness	EDTA titrimetric method
Nitrate-N	Chromatropic method (West, 1966)
Kjeldahl-N	Kjeldahl digestion and ammonium determined by phenate method
Ammonium-N	Phenate method
Total silica	Molybdosilicate method
Total iron	Phenonthroline method
Chloride	Argentometric method
Sulfate	Turbidimetric method
Total dissolved solids	Residue on filtration and evaporation at 103 to 105°C
Total phosphorus	Sample was digested with sulfuric-nitric acids mixture and determined by ascorbic acid method
Dissolved orthophosphorus	Ascorbic acid method after filtration through 0.45 µm filter paper

Note: Unless otherwise stated all the methods used were according to *Standard Methods* (American Public Health Association, 1971)

temperature are solely due to natural causes. The Illinois Pollution Control Board stipulated that water temperatures in general should not exceed 15.5°C in the months of December through March and 32.2°C in the months of April through November. These regulations were met by all the streams considered here.

Dissolved Oxygen

The Illinois Pollution Control Board (1972) mandates that the DO in the state's waters shall not be less than 6.0 mg/l during at least 16 hours of any 24-hour period, nor less than 5.0 mg/l at any time.

The DO concentrations observed in the Fox River upstream of the Fox Chain of Lakes were never less than 5.0 mg/l. The DO concentration in the Fox River at Johnsburg was found to be less than 5.0 mg/l only 4 percent of the time. Lily Lake Drain, which drains a relatively small area of 12.30 square kilometers of marshland, showed the lowest oxygen concentration recorded. The lowest observed DO concentration in Sequoit and Squaw Creeks was 3.0 mg/l. The sampling stations on these two creeks were in close proximity to municipal waste treatment plants.

TABLE 4. Water Quality Characteristics, Fox River at Route 173 (Concentrations in mg/l)

Parameters	Number of analyses	Mean	Range
Temperature (°C)	51	13.8	0.0-27.0
Dissolved oxygen	49	10.9	5.0-15.0
Turbidity (FTU)	50	10.7	2.6-22.0
pH	52		7.75-8.59
Alkalinity	52	223	120-286
Hardness	53	305	136-386
Nitrate-N	52	1.17	0.07-4.51
Kjeldahl-N	52	1.27	0.21-4.08
Ammonia-N	52	0.22	0.00-0.88
Total silica	52	5.46	0.00-10.97
Total iron	52	0.92	0.08-4.35
Chloride	53	38	21-55
Sulfate	53	56	38-89
Total solids	52	447	294-527
Total dissolved solids	53	408	242-502
Suspended solids	52	38	0-126
Total phosphorus	53	0.24	0.11-0.79
Dissolved orthophosphorus	53	0.11	0.00-0.30

TABLE 5. Water Quality Characteristics, Lily Lake Drain (Concentrations in mg/l)

Parameters	Number of analyses	Mean	Range
Temperature (°C)	52	12.8	0.0-26.0
Dissolved oxygen	51	8.9	2.0-15.0
Turbidity (FTU)	50	8.4	2.3-20.0
pH	53		7.93-8.62
Alkalinity	53	257	160-311
Hardness	53	336	136-447
Nitrate-N	52	0.63	0.06-2.70
Kjeldahl-N	52	1.29	0.19-2.64
Ammonia-N	52	0.43	0.03-13.00
Total silica	51	6.67	0.00-12.36
Total iron	52	0.78	0.18-5.96
Chloride	53	12	0-38
Sulfate	53	61	39-97
Total solids	52	443	354-584
Total dissolved solids	53	414	292-510
Suspended solids	52	29	0-182
Total phosphorus	53	0.10	0.0-0.63
Dissolved orthophosphorus	53	0.05	0.0-0.51

TABLE 6. Water Quality Characteristics, Nippersink Creek (Concentrations in mg/l)

Parameters	Number of analyses	Mean	Range
Temperature (°C)	52	12.9	0.0-26.0
Dissolved oxygen	49	10.1	5.0-15.0
Turbidity (FTU)	50	11.1	2.3-54.0
pH	52		7.89-8.70
Alkalinity	52	234	142-329
Hardness	53	313	136-457
Nitrate-N	52	1.54	0.16-2.91
Kjeldahl-N	52	1.14	0.31-3.59
Ammonia-N	52	0.29	0.02-2.46
Total silica	52	7.04	0.0-13.20
Total iron	51	1.61	0.22-23.33
Chloride	53	30	17-62
Sulfate	53	59	36-87
Total solids	51	451	342-626
Total dissolved solids	53	409	270-480
Suspended solids	51	43	0-246
Total phosphorus	53	0.25	0.0-1.78
Dissolved orthophosphorus	53	0.16	0.0-1.51

TABLE 7. Water Quality Characteristics, Sequoit Creek (Concentrations in mg/l)

Parameters	Number of analyses	Mean	Range
Temperature (°C)	51	12.5	0.0-25.0
Dissolved oxygen	50	8.2	3.0-15.0
Turbidity (FTU)	49	15.9	4.2-196.0
pH	53		7.82-8.47
Alkalinity	53	210	138-349
Hardness	53	261	115-386
Nitrate-N	52	1.03	0.32-4.68
Kjeldahl-N	51	3.46	0.42-16.70
Ammonia-N	52	2.16	0.05-11.10
Total silica	51	9.53	0.00-20.90
Total iron	51	1.64	0.07-27.08
Chloride	53	60	33-126
Sulfate	53	71	34-148
Total solids	51	488	308-1092
Total dissolved solids	52	442	290-678
Suspended solids	51	49	0-770
Total phosphorus	52	1.27	0.25-3.06
Dissolved orthophosphorus	51	1.09	0.0-2.76

TABLE 8. Water Quality Characteristics, Squaw Creek
(Concentrations in mg/l)

Parameters	Number of analyses	Mean	Range
Temperature (°C)	51	13.5	0.0-27.5
Dissolved oxygen	50	10.1	3.0-16.0
Turbidity (FTU)	50	10.4	3.4-31.0
pH	53		7.98-8.75
Alkalinity	53	201	133-262
Hardness	53	289	102-413
Nitrate-N	52	0.92	0.04-2.37
Kjeldahl-N	52	2.49	0.5-9.89
Ammonia-N	52	1.11	0.03-3.65
Total silica	52	3.77	0.0-9.09
Total iron	52	0.66	0.09-4.28
Chloride	53	36	27-46
Sulfate	53	81	28-114
Total solids	52	449	392-510
Total dissolved solids	53	423	348-490
Suspended solids	52	27	0.0-72.0
Total phosphorus	53	0.83	0.21-1.94
Dissolved orthophosphorus	53	0.67	0.0-1.46

TABLE 9. Water Quality Characteristics, Fox River at Johnsburg
(Concentrations in mg/l)

Parameters	Number of analyses	Mean	Range
Temperature (°C)	51	13.0	0.0-27.5
Dissolved oxygen	50	11.7	4.0-20.0
Turbidity (FTU)	50	12.9	2.4-28.0
pH	53		7.98-8.72
Alkalinity	53	211	138-302
Hardness	53	286	88-393
Nitrate-N	52	0.86	0.02-2.39
Kjeldahl-N	52	1.54	0.11-3.44
Ammonia-N	52	0.29	0.01-2.50
Total silica	52	3.91	0.0-9.83
Total iron	52	0.79	0.08-5.16
Chloride	53	35	20-63
Sulfate	53	54	37-72
Total solids	52	418	302-493
Total dissolved solids	53	386	266-460
Suspended solids	52	33	0-88
Total phosphorus	53	0.27	0.07-1.77
Dissolved orthophosphorus	53	0.13	0.0-1.47

With the exception of the Fox River upstream of the lakes and Nippersink Creek, observed DO concentrations were on several occasions less than 5 mg/1. In Sequoit Creek and Lily Lake Drain, 10 percent of the observations were less than 5 mg/1. The average DO concentrations were high in all of the streams and each of them exhibited a high degree of supersaturation.

Turbidity

The mean turbidity values measured in the tributaries to the Fox Chain of Lakes ranged from 8.4 to 15.9 FTU which are much less than the values determined by the Water Survey for the Spoon River in central Illinois. Turbidity in the Spoon River, measured at five different sites over a period of 2 years, ranged from 147 to 3470 FTU. The Spoon River is unimpounded along its entire length, whereas in the Fox River, Squaw Creek, and Nippersink Creek impoundments exist upstream of the sampling sites. Lily Lake Drain's small watershed is an undisturbed area and Sequoit Creek drains a small but mostly urban area.

pH, Alkalinity, and Hardness

Because pH values are logarithm of reciprocals of hydrogen ion concentrations, arithmetic means of pH values were not computed and only the ranges of values observed are shown in Tables 4 through 9. The pH values for all the streams ranged between 7.75 and 8.75 which are within the range stipulated by the Illinois Pollution Control Board.

The alkalinity and hardness values observed in the Fox River and other tributaries are typical of surface waters in the midwest. The mean alkalinity values observed in these streams varied from 201 to 257 mg/1 which compare well with the mean values of 222 to 265 mg/1 for the Spoon River at five locations. Hardness values ranged from 261 to 336 mg/1 in the Fox River and other tributaries, whereas mean hardness values varied from 332 to 346 mg/1 at five of the Spoon River sampling sites.

Nitrogen

The concerns for nitrogen as a contaminant in water bodies are twofold. First, because of adverse physiological effects on infants and because the traditional water treatment processes have no effect on the removal of nitrate, concentrations of nitrate plus nitrite as nitrogen are limited to 10 mg/1 in public water supplies. Second, a concentration in excess of 0.3 mg/1 is considered sufficient to stimulate nuisance algal blooms (Sawyer, 1974). The Illinois Pollution Control Board stipulates that ammonia nitrogen and nitrate plus nitrite as nitrogen should not exceed 1.5 and 10.0 mg/1, respectively.

The range of values of nitrate observed in the Fox River was 0.02 to 4.51 mg/1. In the streams, the overall range was 0.02 to 4.68 mg/1.

The range of nitrate concentrations in other streams in Illinois was more extensive: 0.0 to 11.8 mg/l in the Spoon River, 0.05 to 16.98 mg/l in Six Mile Creek near Bloomington, and 3.70 to 10.17 mg/l in the Middle Fork Vermilion River. The ammonia concentrations in Sequoit and Squaw Creeks were much higher than in the other streams in the area. This is mainly because of the closeness of municipal waste treatment discharges to the water sampling sites in these two creeks. The Illinois Pollution Control Board ammonia standard was found to be violated about 40 percent of the time in these two creeks.

The nitrate and ammonia loads transported by the Fox River and other streams are shown in Table 10. The nitrogen load transported in terms of kilograms per day was estimated by :

Kilograms per day = flow (cfs) × concentration (mg/l) × 2.44

The means of average daily flows for a 7-day period were used in estimating the load. In the case of Lily Lake Drain, Sequoit Creek, and Squaw Creek, the overall means of flow observations were used on days when flow values could not be estimated for a lack of stage observations. The stage observations for Sequoit Creek were not as regular as those for Lily Lake Drain or Squaw Creek. When a number of stage observations were missing in Sequoit Creek, the flows were estimated from Lily Lake Drain flows adjusted for drainage area and wastewater discharge from Antioch waste treatment plant. Information on kilograms per square kilometer per day (kg/sq km/day) and kilograms per hectare per year (kg/ha/yr) is also shown in Table 10.

The mean nitrate concentration was highest in the Fox River. Presumably this is due to the fertilizer applied to agricultural lands and the self purification of municipal waste discharges in the upper reaches of the Fox River in Wisconsin. The nitrate load transported by the Fox River into the Chain of Lakes is about 2428 kg/day. About 622 kg/day is transported by Nippersink Creek.

TABLE 10. Nitrate and Ammonia-N Transport by Different Streams

Streams	Nitrate			Ammonia-N		
	kg/day	*kg/sq km/day*	*kg/ha/yr*	*kg/day*	*kg/sq km/day*	*kg/ha/yr*
Fox River at Route 173	2428	1.08	3.92	458	0.20	0.74
Lily Lake Drain	6	0.52	1.88	1	0.12	0.43
Nippersink Creek	622	1.24	4.54	130	0.26	0.94
Sequoit Creek	24	0.85	3.11	24	0.89	3.24
Squaw Creek	76	0.69	2.52	96	0.87	3.17
Fox River at Johnsburg	2149	0.69	2.51	631	0.20	0.74

Sequoit and Squaw Creeks, have high mean concentrations of ammonia due mainly to the closeness of the stream sampling sites to waste treatment plants. The mean ammonia concentration in Lily Lake Drain, which drains mostly marshlands, is 0.43 mg/l. This is higher than the mean ammonia concentrations observed in Nippersink Creek and Fox River. However, mean nitrate concentrations in the latter two streams were significantly higher.

For purposes of comparison of nutrient transports by the different streams, unit load factors were considered. Nippersink Creek showed the highest rate of nitrate transported (4.54 kg/ha/yr). This was followed by 3.92 kg/ha/yr for Fox River at the Route 173 site. Unit ammonia-N loads transported by Sequoit and Squaw Creeks were several orders of magnitude higher than for the other streams.

The unit nitrate loads transported by all these streams are considerably less than the average nitrate contribution of 23.53 kg/ha/yr observed on the 2677-square-kilometer drainage area for the Kaskaskia River upstream of Shelbyville (Harmeson and Larson, 1974).

Silica

Concentrations of silica in the Fox River and other tributaries do not appear to be excessive and are within the range cited in the literature (American Public Health Association, 1971). The mean and range of values observed for Sequoit Creek appear to have been influenced to a great extent by the Antioch waste treatment plant. Evans (1968), considering the addition of common ions from domestic use of water, documented that there is nearly a two- to threefold increase in silica concentration in municipal wastewaters compared to the tap waters in their respective locations.

Total Iron

Generally accepted standards for iron in surface water supply sources is 0.3 mg/l or less. The limit is based on aesthetic and taste considerations rather than physiological reasons. The Illinois Pollution Control Board limits the concentration of total iron in streams to 1.0 mg/l.

The mean concentrations of total iron in Nippersink and Sequoit Creeks were found to be higher than the Illinois Pollution Control Board limits. All the other streams had mean total values less than the stipulated limits. On a few occasions, the concentration of iron observed in Nippersink and Sequoit Creeks exceeded 20 mg/l. In all the other creeks, the maximum observed was in the order of 5 mg/l. In Nippersink and Sequoit Creeks, observed iron concentrations exceeded the Illinois Pollution Control Board limit 41 and 31 percent of the time, respectively. In the other streams, the Illinois Pollution Control Board standard was violated about 19 to 30 percent of the time.

Chloride and Sulfate

The mean chloride concentration of 12 mg/l in Lily Lake Drain was the lowest of all the observed mean values, reflecting the chloride contribution independent of cultural developments. The average concentration in Sequoit Creek, 60 mg/l, was the highest and was influenced by the effluent discharge from the Antioch waste treatment plant. All of the other streams showed average values varying from 30 to 38 mg/l. The mean sulfate concentrations varied in these streams from 54 to 81 mg/l. The observed concentrations of chloride and sulfate in all the streams are well within the Illinois Pollution Control Board limits.

Total Solids, Total Dissolved Solids, and Suspended Solids

The mean values of total solids and total dissolved solids at all six sampling locations for stream quality characteristics are comparable The temporal variations in these two parameters are moderate in all the streams except for one extremely high value observed in Sequoit Creek. The suspended solids concentrations exhibited a wider range of values, varying from 0 to about 250 mg/l, with the exception of one unusually high value of 770 mg/l observed in Sequoit Creek. The dissolved solids concentrations observed in these streams were well within the Illinois Pollution Control Board limit of 1000 mg/l.

Phosphorus

The means and range of values for total phosphorus and dissolved orthophosphorus for the Fox River and other tributaries are shown in Tables 4 through 8. Sequoit Creek exhibited the highest mean, the widest range of values, and the highest of all the minimum values for total phosphorus and dissolved orthophosphorus. These high values were caused by the waste treatment plant at Antioch. The lowest phosphorus concentration was observed for Lily Lake Drain, which is the least affected by human cultural activities. The ratio of means of dissolved orthophosphorus to total phosphorus was the highest in Sequoit Creek at 0.86, followed by 0.81 for Squaw Creek. The ratio was the lowest for the Fox River at Illinois Route 173.

Table 11 shows the flux in kilograms per day (kg/day) and unit load factors expressed as kilograms per hectare per day (kg/ha/day) and kilograms per square kilometers per year (kg/sq km/yr) of total phosphorus and dissolved orthophosphorus at the six stream sampling sites. The unit load factor estimated for the Kaskaskia River at Shelbyville was 0.19 kg/ha/yr (Engelbrecht and Morgan, 1959). The unit load factor for the Spoon River varied from 0.53 kg/ha/yr near the headwaters to 0.29 kg/ha/yr near its confluence with the Illinois River. It decreased gradually in the downstream direction and thus exhibited the dilution effect. The phosphorus transport data

TABLE 11. Phosphorus Transport by Different Streams

Streams	Total phosphorus			Dissolved orthophosphorus		
	kg/day	*kg/sq km/day*	*kg/ha/yr*	*kg/day*	*kg/sq km/day*	*kg/ha/yr*
Fox River at Route 173	538	0.24	0.87	194	0.09	0.31
Lily Lake Drain	1	0.06	0.22	0.2	0.17	0.06
Nippersink Creek	101	0.20	0.74	54	0.11	0.39
Sequoit Creek	28	0.99	3.63	15	0.54	1.96
Squaw Creek	59	0.54	1.97	49	0.44	1.60
Fox River at Johnsburg	496	0.16	0.58	231	0.07	0.27

for the Fox River and other tributaries to the Fox Chain of Lakes, with the exception of Lily Lake Drain, appear to be several orders of magnitude higher when compared with the Kaskaskia River or Spoon River data.

The phosphorus concentrations in the Fox River, Sequoit Creek, and Squaw Creek exceeded the Illinois Pollution Control Board limit all the time. Phosphorus concentrations were less than 0.05 mg/l for Nippersink Creek in only 3 out of the 53 observations over a period of 1 year. Phosphorus concentrations exceeded 0.05 mg/l for Lily Lake Drain in 32 of the 53 observations.

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