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Investigations of Illinois Surface Waters

CHEMICAL ANALYSIS OF SURFICIAL SEDIMENTS FROM 63 ILLINOIS LAKES, SUMMER 1979

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD,ILLINOIS 62706

CHEMICAL ANALYSIS OF SURFICIAL SEDIMENTS FROM 63 ILLINOIS LAKES, SUMMER 1979

by

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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
STATE OF ILLINOIS
1981

CONVERSION/EQUIVALENCE FACTORS, SYMBOLS and ABBREVIATIONS

ppm (parts per million) = mg/kg
= ug/g
= mg/l

ppb (parts per billion) = ug/kg
ug/l

1000 ug = 1 mg
1000 mg = 1 g
1000 g = 1 kg

>	greater than
<	less than
COD	chemical oxygen demand
CV	coefficient of variation
DF	degrees of freedom
MS	mean square
n	sample size
p	significance probability
r	Pearson correlation coefficient
R^2	in this report is equivalent to r^2 and represents percent variability in Y accounted for by X
SD	standard deviation
$\overline{X}$	mean

Explanatory example of lake code:

Anderson Lake RD-B05-A

- R: denotes lake as oppossed to stream
- D: basin code (D = Illinois River Basin)
- B05: basin segment and sub-segment
- A: letter denoting specific lake within a basin segment

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ACKNOWLEDGEMENTS

The data presented in this report represents the coordinated effort of numerous individuals of the IEPA located throughout the state. The overall lake monitoring effort for 1979 (which included the sediment monitoring reported here) was coordinated by Donna Sefton. Actual field sampling was conducted by crews working out of offices in Marion, Maywood and Springfield, Illinois and under the direction of regional monitoring supervisors R. Hite, R. Schacht and W. Tucker, respectively. Chemical analyses of sediment samples for Kjeldahl-nitrogen, total phosphorus, volatile solids, COD and metals were performed at the IEPA Champaign Laboratory under the direction of Roy Frazier. The IEPA Springfield Laboratory under the direction of John Hurley performed organic pesticide and PCB analyses. Harry Walton was responsible for quality assurance in the field (ultimately developing a field sampling manual), overall maintenance and supply of equipment, and also directed some of the sampling in the central region. Jill Hardin supervised the entry of all field and laboratory lake data into the USEPA STORET System, and was responsible for data retrieval and interfacing with the SAS computer package. Dr. David Schaeffer developed and modified numerous programs for use on the Textronixs desk top computer which were geared specifically for use in analyzing lake data collected summer 1979; the histograms depicted throughout this report were constructed using several of these programs. Many of the individuals mentioned above edited various drafts of this report. Ken Rogers, Ambient Monitoring Unit Manager, originally proposed a need for such a report and provided the necessary logistical support throughout its preparation. Rough and final copies of the draft were typed by Betty Richards and Margaret Kinsall.

SECTION I SUMMARY

1. Two hundred seventy-three sediment samples were collected from 63 Illinois lakes in summer 1979. These samples were analyzed for percent volatile solids, chemical oxygen demand (COD), nutrients, heavy metals and organochlorine compounds.

2. The mean percent volatile solids in Illinois lake sediments averaged 8.8(±2.9)%. The percent volatile solids (and therefore organic carbon) content of Illinois lake sediments were relatively low when contrasted to other studies, primarily due to the high non-volatile suspended solids loading characteristic of most Illinois lakes.

3. The mean (±SD) total Kjeldahl nitrogen concentration in Illinois lakes was 3.7(±2.1) g/kg. Only glacial lakes exhibited concentrations in excess of 5g/kg. When contrasted with results from other studies, Illinois lake sediments as a group contained less total Kjeldahl nitrogen.

4. Percent volatile solids, total Kjeldahl nitrogen, and chemical oxygen demand were all highly correlated, and represent three equivalent methods of assessing organic carbon (C) content. Simple linear equations were developed allowing any two of the three parameters to be estimated from one known value.

5. Kjeldahl nitrogen was also found to be highly correlated with lead and with the ratio of nitrogen to phosphorus (N:P ratio).

6. Organic carbon values were computed from volatile solids. Using these values it was found that the ratio of C:N remained fairly constant for Illinois lake sediments regardless of concentrations. The mean C:N ratio for the 63 Illinois lakes was 14:1. Previous investigators have noted that the ratio of C:N remains fairly constant for lake sediments regardless of concentrations.

7. The mean (±SD) of 273 sediment samples analyzed for total phosphorus was 703 (±476) mg/kg or 0.07% by dry weight. Ninety-four percent of the lakes monitored exhibited mean concentrations between 300 to 900 mg/kg.

8. The mean N:P ratio computed for 273 sediment samples was 5.95 (±3.75) with individual values ranging from 0.5 to 23.4. Since the N:P ratio in plant materials is generally conceded to be in the neighborhood of 7:1, a low ratio of organic nitrogen to total phosphorus in sediments is indicative of a high detrital inorganic P component. Illinois glacial lakes, however, as a group exhibited a mean of 10.3, indicating they contained little inorganic P with respoect to inorganic nitrogen.

9. Most Illinois lakes exhibited fairly low sediment metal concentrations.

   a. The mean (±SD) arsenic concentration in 273 lake sediment samples was 12.0(±14.6) mg/kg. Only 12% of samples exceeded concentrations of 20 mg/kg. The highest detected arsenic concentration found was 110 mg/kg in Lake Murphysboro in Southern Illinois. This value was probably attributable to the historical use of sodium arsenate for weed control.

b. Cadmium was undetected in 124 of 272 samples analyzed. Assuming a concentration of 0.5 mg/Kg (the minimum detectable level) in undetected samples, the highest mean concentration possible was 1.04 mg/kg.

c. Chromium concentrations in 271 sediment samples averaged 21.6(±8.0) mg/kg. Only sediment samples from Skokie Lagoons contained concentrations exceeding 35 mg/kg. Ninety-three percent of all samples analyzed contained between 11 and 33 mg/kg. A strong correlation between iron and chromium indicated a fairly constant ratio of iron to chromium regardless of concentration. In general the ratio of iron to chromium was approximately 1200:1.

d. Most Illinois lakes exhibited mean sediment copper concentrations in the range of 15 to 45 mg/kg. Highest mean lake sediment concentrations (up to 368 mg/kg) were found in municipal water supply reservoirs which had probably been treated with copper sulfate to control algae.

e. Iron concentrations ranged from 0.04 to 55.0 g/kg with a mean (±SD) for 273 samples of 27.1(±89) g/kg. Iron concentrations were correlated with total phosphorus. Such correlations would, however, be improved on a with-in lake basis.

f. Manganese concentrations in 92% of sediment samples analyzed, ranged from 0.5 to 2.5 g/kg. As might be expected from their chemical similarity, manganese and iron concentrations were strongly correlated with a ratio of iron to manganese of 20:1 in most sediment samples. Due to its greater solubility, manganese tended to accumulate relative to iron in surface sediments especially in deeper lake sites with prolonged anoxic conditions.

g. Lead concentrations were highest in sediments from Skokie Lagoons and glacial lakes. Only Skokie Lagoons and glacial lake mean concentrations exceeded 60 mg/kg. The higher concentrations in these sediments were probably attributable to their proximity to the Chicago metropolitan area, and resulted from the atmospheric precipitation of lead and/or urban stormwater runoff.

h. Eighty-five percent of Illinois lakes exhibited a mean sediment mercury concentration of 0.14 mg/kg or less. Skokie Lagoons and glacial lakes evidenced greater mercury concentrations than artifical lakes regardless of geographic location.

i. Mean zinc sediment concentrations in the majority of Illinois lakes were between 60 and 160 mg/kg. Highest sediment zinc concentrations were found in glacial lakes (especially Wolf Lake) and Skokie Lagoons.

j. Zinc and lead sediment concentrations were highly correlated. A ratio of lead to zinc of 1:2 was characteristic of most Illinois lake sediment sampley except for glacial lakes where the ratio was approximately 1:1.

10. Sediment samples were analyzed to determine concentrations of nine chlorinated hydrocarbon pesticides and polychlorinated biphenyls (PCB's).

a. Aldrin and endrin were not detected in any of the 273 sediment samples analyzed (minimum detectable levels were 1 ug/kg). Dieldrin, however, was encountered in more sediment samples than any other pesticide assayed. Dieldrin was detected in 154 (56%) samples; only nineteen samples contained concentrations exceeding 20 ug/kg. Highest concentrations were found in Bloomington, Shabbona, Paradise, Jacksonville, and Highland Silver Lakes, all artifical impoundments with watersheds that are primarily in row crop cultivation.

b. Chlordane, heptachlor and heptachlor epoxide were detected in 34, 25 and 2 percent, respectively, of 266 sediment samples analyzed. Heptachlor was only detected in samples taken from Paradise Lake. Highest heptachlor epoxide concentrations were detected in sediment samples from Lakes Mattoon and Bloomington; however, none exceeded 13 ug/kg. Chlordane concentrations rarely exceeded 20 ug/kg; highest concentrations were found in Lakes Taylorville and Carlinville.

c. Lindane and methoxychlor were not detected in any of 266 sediment samples analyzed. Minimum detectable levels were 1 and 5 ug/kg, respectively.

d. Total DDT was detected in 50 of 266 (19%) samples analyzed. Detected concentrations only exceeded 20 ug/kg in Crystal Lake and Skokie Lagoons.

e. PCB's were only detected in sediments taken from seven of the study lakes. Most detected concentrations were small; the highest concentrations (41 and 56 ug/kg) were found in sediments taken from Lake of the Woods in Central Illinois.

11. An attempt was made to correlate fish flesh pesticide concentrations with sediment concentrations. No simple linear relationships were discerned with the small fish flesh data base available.

CLASSIFICATION OF ILLINOIS LAKE SEDIMENTS: Groupings for each constituent shown are based upon 273 individual sediment samples collected from 63 lakes in summer 1979. Ranges of concentrations displayed and resultant groupings are based on one or two standard deviations from mean.

Constituent	Below Normal	Normal	Elevated	Highly Elevated
Volatile Solids (%)	<5	5-13	13-17	>17
Total Kjeldahl Nitrogen (mg/kg)	<1650	1650-5775	5775-7850	>7850
Total Phosphorus (mg/kg)	<225	225-1175	1175-1650	>1650
COD (mg/kg)	<32500	32500-162000	162000-226500	>226500
N:P Ratio	<2.2	2.2-9.7	9.7-13.5	>13.5
Organic Carbon[1] (mg/kg)	<26500	26500-65550	65550-85100	>85100
C:N Ratio[1]	<11	11-17	17-20	>20
Arsenic (mg/kg)		<27	27-41	>41
Cadmium (mg/kg)		<1.8	1.8-2.6	>2.6
Chromium (mg/kg)	<14	14-30	30-38	>38
Copper (mg/kg)		<100	100-150	>150
Iron (mg/kg)	<18000	18000-36000	36000-45000	>45000
Lead (mg/kg)	<15	15-100	100-150	>150
Manganese (mg/kg)		<3000	3000-3900	>3900
Mercury (mg/kq)		<0.25	0.25-0.40	>0.40
Zinc (mg/kg)	<50	50-175	175-250	>250

[1] Organic carbon values were calculated from % volatile solids data.

SECTION II MONITORING RECOMMENDATIONS

1. Due to the high correlations exhibited between COD, total Kjeldahl nitrogen, and percent volatile solids analyses, it is recommended that two of these parameters be omitted from future lake sediment studies. COD does not appear to have been widely used in other sediment studies. Although determination of volatile solids is a relatively simple procedure, the analysis of sediments for nitrogen is desirable under policies and procedures established by Section 314 of the Clean Water Act, particularly when dredging is conducted in association with lake restoration projects. Kjeldahl nitrogen would therefore be the analysis of choice.

2. Four pesticides (aldrin, endrin, lindane and methoxychlor) were not detected in any sample and unless detection limits are improved and a need exists to establish background levels using these new levels, these four pesticides should be dropped from future ambient lake sediment monitoring studies. Several other parameters were only rarely detected (e.g. PCB's) and then in only low concentrations. Unless there is reason to suspect contamination it might be advisable to delete these parameters from regular routine monitoring, particularly in those lakes where data is already available.

3. Since highest constituent concentrations were generally found in sediments taken at the deepest site within a lake, it is recommended that if only limited sampling can be performed that deeper sites be given higher priority. Extenuating circumstances could favor sampling shallower sites; for example, at a point where a known or suspected discharge is occurring. For purposes of statistical analyses, replicate sampling at designated sites is a necessity and is recommended for all future lake monitoring efforts where sediment samples are collected.

4. Considerably more information could be gained from sediment analyses if coupled with measurement of sediment particle size.

5. A need exists to establish a defined relationship between concentration of toxic contaminants in lake sediments and fish flesh. While it is probably easier to obtain sediment data, unless such a relationship can be established, sediment data is uninformative from a health risk standpoint. Aquisition of fish flesh data is presently preferable for this purpose.

6. Determination of sedimentation rates would be a desirable feature in an intensive lake monitoring study since actual loadings for various constituents could be computed. However, depending on study objectives such an approach may be impractical from a fiscal standpoint.

7. Appreciable changes in sediment chemistry within a lake are not likely to occur on a short term basis; therefore, repetitive annual monitoring of a lake's sediment does not appear justified. However, the sediment data base could most effectively be enlarged if as part of an ambient lake monitoring program sediment samples are taken from previously unmonitored lakes.

8. Since only glacial lakes (with the exception of Skokie Lagoons) were monitored in the Chicago area, it is suggested that artificial lakes in this area be included in future lake monitoring efforts. Such results would enable the Agency to determine if elevated levels of certain constituents in glacial lake sediments is attributable to their proximity to the Chicago area or if these elevated levels are characteristic of glacial lakes in particular.

9. Based on elevated levels of selected organochlorine compounds and mercury in lake sediment, fish flesh monitoring appears warranted in several Illinois lakes. Skokie Lagoons, Crystal Lake and Lake Bloomington fish flesh should be analyzed for potentially elevated levels of organochlorine compounds (particularly dieldrin, DDT, and heptachlor epoxide). Skokie Lagoons and Crystal Lake fish flesh should also be analyzed for potentially elevated mercury levels.

SECTION III INTRODUCTION

Sediment in Lakes

All lakes act as settling basins for materials carried in by tributary streams and for organic matter produced within the lake. Aside from the direct loss of storage capacity resulting from sediment deposition, lake sediments are important for introducing various substances into the overlying water and/or into the aquatic food web. Sediments are not only instrumental in nutrient cycling, but are also potential sources of contaminants such as heavy metals and organic pesticides. Under anaerobic conditions, increases in concentrations of various constituents (e.g., ammonia, iron, manganese) in lake hypolimnia, reflect exchange of constituents between the mud-water interface. It is, therefore, meaningful to analyze lake sediments in order to evaluate their potential to impact overlying water quality. It should also be appreciated that, due to their association with bottom sediments, benthic organisms may ultimately concentrate potentially toxic materials with subsequent bioaccumlation/biomagnification of these contaminants occurring in higher trophic levels such as fish.

EPA Lake Monitoring Programs

Pursuant to mandates of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) and, subsequently, the Clean Water Act of 1977 (P.L. 95-217), the Illinois Environmental Protection Agency in 1977 began extensive water quality investigations of its Illinois lake (lentic) environments. In 1977 the Agency initiated a sampling program on 108 lakes (see Sefton 1978). This program was followed (summer 1978) by an attempt to correlate actual chemical-physical data with multispectral scanner information obtained from the Earth Resources Technology Satellite (LANDSAT). The feasibility of classifying Illinois lakes trophically using LANDSAT data had been demonstrated previously (Boland et al. 1979).

The most comprehensive Illinois lake sampling program to date was initiated on 63 lakes in 1979. Forty-eight lakes were sampled in June and September during the summer use period. Fifteen lakes of varying size, type (e.g., glacial, reservoir), trophic condition, and geographic location were sampled monthly from May through October. Parameter coverage included the collection and analysis of water, phytoplankton, chlorophyll, and surficial sediment samples. In selected lake tributaries water quality samples were collected along with macroinvertebrates and stream sediments. With the exception of sediment chemistry, results of the 15 "intensive" lake monitoring programs were presented in individual lake reports published in 1980 (see listing in Appendix). An additional report (Sefton et al. 1980), which summarized data from all 63 lakes monitored in 1979, included a brief summary of Illinois lake sediment chemistry.

1979 Surficial Sediment Analysis

Few comprehensive evaluations of lake sediment chemistry, however, exist in limnological literature today. Most published results of investigations which include some chemical analysis of lake sediments have been limited in scope numerically, geographically, or in parameter coverage. This report summarizes the distribution and concentration of numerous chemical parameters in surficial lake sediments from 63 Illinois lakes. Primary objectives of the Illinois lake sediment sampling program were to establish an extensive sediment chemistry data base to:

1) facilitate statewide between-lake comparisons;

2) identify potentially toxic contaminants in Illinois lakes and specific areas of contamination;

3) allow long term trend monitoring of individual lakes;

4) aid in the development of monitoring strategies for future lake studies;

5) aid in establishing permit guide lines for lake dredging activities, and

6) fill a void in published records of lake sediment analyses.

SECTION IV - METHODS

Collection and analyses of sediment samples from 63 Illinois lakes during summer 1979 was part of a larger effort of evaluating water quality and trophic status of Illinois lakes. The ultimate objective of this monitoring program was to develop future management strategies for lake enhancement. Aside from sediment analysis, numerous physicochemical water quality and biotic parameters were evaluated; these results are presented in separate lake reports (listed in Appendix Table A).

The Study Lakes

The 63 lakes monitored during the 1979 recreational use period were selected to include as much variability as possible in physiography, morphology, type (e.g., glacial, artificial, backwater), hydrology, and watershed land use characteristics. Since 94% of the lakes in Illinois are artificial impoundments concentrated in the southern two-thirds of the State, most of the lakes sampled were in this category (Sefton et al. 1981). Locations of the 63 lakes sampled in 1979, designated as "intensive" and "non-intensive" are shown in Figure 1. Designations of "intensive" and "non-intensive" are of little significance for this report as sediment samples were generally only taken once during the recreational use period. Morphological and hydrological data for the 63 Illinois lakes monitored are presented in Table 1.

Field collection

Responsibility for field collections was divided between collection crews operating out of regional offices in Marion, Maywood, and Springfield, Illinois. Due to regional priorities and project demands, the number of sediment samples collected was not always uniform between lakes. The actual number of samples taken at each lake and times of sampling are noted in Table 2.

Bottom samples were taken with a Petite Ponar grab sampler and carefully placed in white porcelain pans. The uppermost sediment layer (i.e., 3 to 5 cm) was removed by hand and placed into appropriate containers. Samples to be analyzed for heavy metals, Kjeldahl-nitrogen, volatile solids, total phosphorus, and chemical oxygen demand (COD) were placed in polyethylene bottles. Samples destined for analysis of pesticides and polychlorinated biphenals were placed in specially prepared glass bottles. Samples were placed on ice in the field.

Sample preparation and laboratory procedures

Upon return to the regional field office, sediment samples were allowed to settle and the supernatant decanted prior to freezing (a precaution to avoid breakage due to expansion); samples were then transported in insulated containers to the appropriate IEPA laboratory for analysis.

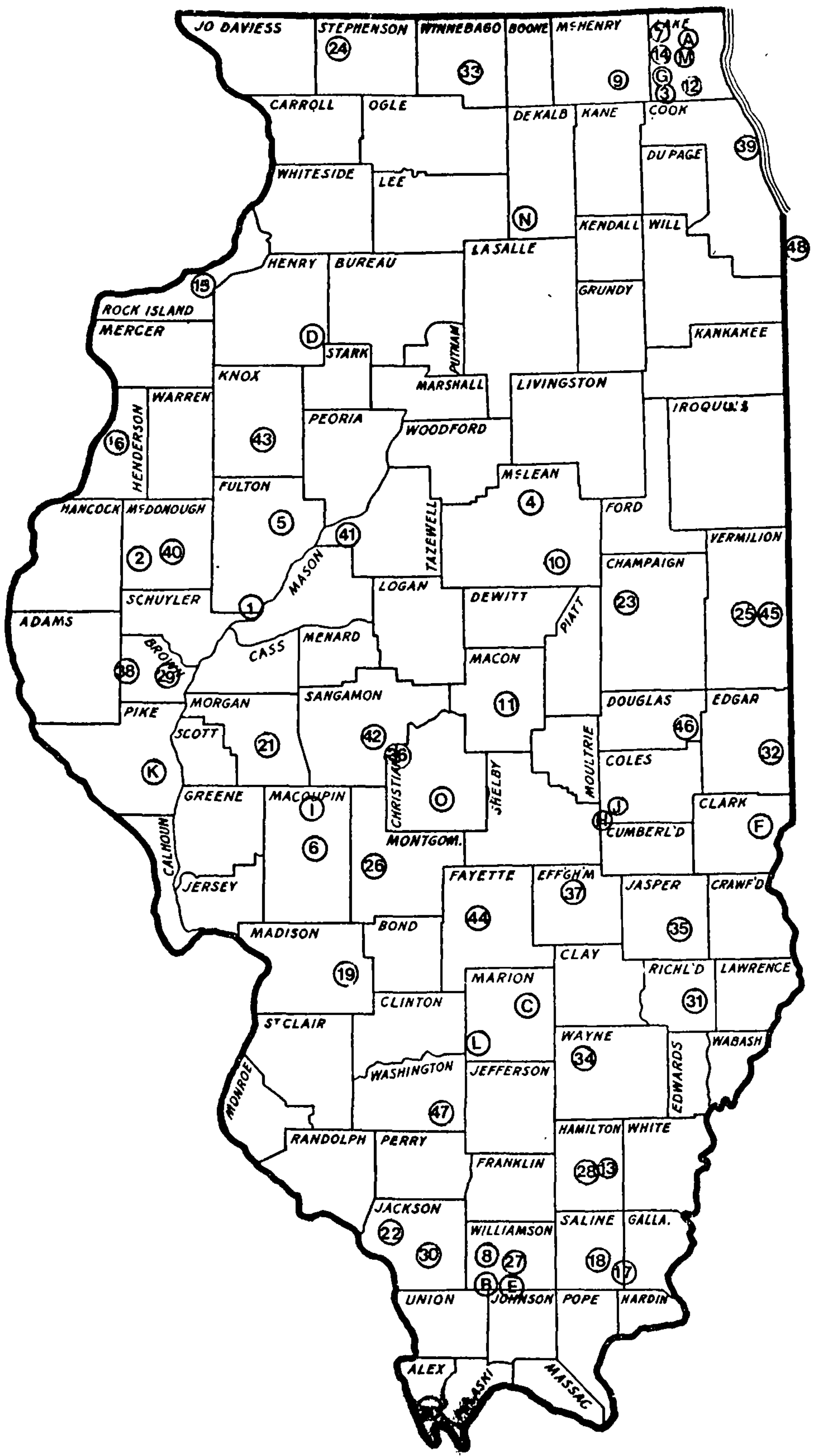

FIGURE 1. Location of 63 Illinois lakes sampled summer 1979. Lakes are identified by letters or numbers as given in Table 1.

Organic pesticides and PCB analyses were performed at the IEPA Springfield Laboratory and remaining analyses at the IEPA Champaign Laboratory.

Frozen sediment samples were thawed and shaken (or hand mixed) to obtain a homogenous sample. The sample was then oven dried at 103°C to a constant weight. Dried samples were ground to a powder, passed through a 1241 micron plastic screen to remove heterogeneous material, and then ground so that particle sizes were less than 100 microns in diameter. Powders prepared in this manner were used for all analyses except mercury which was analyzed using wet samples.

Percent volatile solids was determined on the basis of weight loss of preweighed sample after firing in a muffle furnace for one hour at 600°C. To determine all other sediment constituent concentrations, analyses identical to water procedures were performed once a known (dry weight) amount of sediment was added to a given volume of distilled, deionized water. All results were expressed on the basis of constituent weight per unit of sediment dry weight. Specific methodologies used for determination of each constituent concentration are outlined in Table 3 .

Data Handling and Analysis

Sediment data were entered into the USEPA STORET data storage system. Data analysis was accomplished using programs in STORET and the Statistical Analysis System (SAS Institute 1979). Histograms were prepared by a Textronixs desk top computer and Agency modified programs. To facilitate data handling and statistical analyses, lakes were grouped by geographic location and lake type (see Table 1). Artificial lakes (the majority of lakes studied) were sub-divided into four groups on the basis of location (i.e., north, central, south-central, and south). All glacial lakes studied were located in the northeastern corner of the state. The miscellaneous lake category includes a mixed assortment of lake types (e.g., backwater, quarry, strip-pit, etc.) located throughout the state. These somewhat arbitrary groupings are valuable in that they allow inspection of data for trends (gradients) with respect to geographic location and lake type (i.e. glacial, artificial). Statistics regarding miscellaneous groups may be of questionable value since the diversity of lake types (e.g., backwaters, quarry pit, strip-mine lake, lagoons) is so great. Statistics for this group (i.e., miscellaneous) do, however, emphasize constituent concentrations which might be anticipated in backwater, unusual artificial (strip-mine and quarry lakes) and non-glacial lakes in Illinois. This group does include the extremes; generally both the most pristine and most enriched conditions encountered during this study.

Surficial sediment data presented and discussed in this report were collected as one element of a larger monitoring program designed to assess ambient lake water quality. Aquisition of sediment data along with other monitoring data was a cost effective means of generating baseline data on Illinois lakes. The reader should be aware that the methods used to collect surficial lake sediments were not specifically designed to

Table 1. Morphological and hydrological data for 63 Illinois lakes sampled summer 1979.

Lake Name	County	Surface Area (Acres)	Max. Depth (Ft.)	$\bar{X}$ Depth (Ft.)	Watershed Drainage Area (Acres)	Storage Capacity (Acre-Feet)	Retention Time (Years)	Map Reference Letter/Number
			ARTIFICIAL-NORTH					
Johnson Sauk Trail	Henry	58	26	8	820	435	0.796	C
Lake George	Rock Island	167	58	22.8	4740	3805	1.204	21
Lake Le-Aqua-Na	Stephenson	43	28	10.9	2500	473	0.284	23
Lake Storey	Knox	133	33	13.9	4524	1842	0.773	29
Pierce State Lake	Winnebago	162	36	12.5	8150	2028	0.373	38
Shabbona Lake	DeKalb	319	40	17	12890	5515	0.642	N
			ARTIFICIAL-SOUTH CENTRAL					
Highland Silver Lake	Madison	550	25	10.0	30400	5500	0.518	16
Lake Sara	Effingham	586	52	20.0	7560	11720	-	27
Olney East Fork Reservoir	Richland	935	40	15.0	9982	14000	1.403	35
Raccoon Lake	Marion	925	12	4	30974	4012	0.141	L
Sam Dale State Lake	Wayne	194	18	8.0	4570	1530	0.335	39
Sam Parr State Lake	Jasper	180	23	10.0	3950	1800	0.497	40
Stephen A. Forbes Lake	Marion	525	28	14	13800	7350	0.581	0
Washington County Lake	Washington	295	24	8.9	6800	2625	0.421	48
			ARTIFICIAL-SOUTH					
Crab Orchard Lake	Williamson	6965	30	9.1	109261	63511	0.789	7
Devils Kitchen Lake	Williamson	810	90	36	11700	29200	2.139	B
Dolan Lake	Hamilton	71	18	8.0	1065	570	0.494	11
Glen O. Jones Lake	Saline	105	30	14.5	966	1523	126.200	14
Harrisburg Lake	Saline	209	30	10.0	3456	3000	0.694	15
Kinkaid Lake	Jackson	2750	80	28.7	42336	79000	1.722	18
Lake Murphysboro	Jackson	143	32	14.0	1722	2002	0.193	25
Lake of Egypt	Williamson, Johnson	2300	52	19	17000	42550	2.145	D
Marion Reservoir	Williamson	220	23	14.0	4160	3080	0.635	32
McLeansboro New Reservoir	Hamilton	75	23	10	935	750	0.741	33
			MISCELLANEOUS					
Anderson Lake	Fulton	1364	5	3.5	-	4837	-	1
Gladstone Lake	Henderson	27	25	11.6	82	313	244.531	13
Horseshoe Lake	Alexander	1890	6	3.5	-	6615	-	17
Lake of the Woods	Champaign	26	28	11.2	600	285	0.634	26
Long Lake	Vermilion	57	39	12.1	100	685	0.148	31
Skokie Lagoon	Cook	190	6	2.5	17000	475	3.400	43

Table 1 (cont.)

Lake Name	County	Surface Area (Acres)	Max. Depth (Ft.)	$\bar{X}$ Depth (Ft.)	Watershed Drainage Area(Acres)	Storage Capacity (Acre-Feet)	Retention Time (Years)	Map Reference Letter/Number
			GLACIAL					
Bangs Lake	Lake	297	25	13.8	960	4099	6.405	3
Cedar Lake	Lake	285	40	10	700	2907	6.234	A
Channel Lake	Lake	318	35	13.8	-	4368	-	6
Crystal Lake	McHenry	228	41	13.4	3072	3055	1.492	8
Diamond Lake	Lake	149	24	9.6	400	1430	5.362	10
Fox Lake	Lake	1709	14	5.6	766146	9622	0.063	12
Long Lake	Lake	335	30	13	24636	4389	0.267	H
Round Lake	Lake	215	35	12	500	2472	7.418	M
Wolf Lake	Cook	419	21	6.9	-	2891	-	49
			ARTIFICIAL-CENTRAL					
Argyle Lake	McDonough	95	38	17.5	4200	1664	0.594	2
Canton Lake	Fulton	250	35	14.0	9728	3540	0.546	4
Carlinville Lake	Macoupin	168	15	8.2	16678	1378	0.110	5
Dawson Lake	McLean	150	28	10.4	2830	1564	0.737	9
Lake Bloomington	McLean	635	36	14.5	53520	9208	0.285	19
Lake Decatur	Macon	3093	23	7.2	597497	22750	0.030	20
Lake Jacksonville	Morgan	477	36	12.8	6880	6099	1.182	22
Lake Lou Yaeger	Montgomery	1269	41	10.7	73600	13573	0.332	24
Lake Mattoon	Coles, Shelby, Cumberland	765	35	10	26650	8037	0.376	E
Lake Springfield	Sangamon	4025	40	13.3	165366	53478	0.482	28
Lake Taylorville	Christian	1148	19	7	84032	7914	0.126	F
Lake Vermilion	Vermilion	608	27	7.6	200006	4641	0.025	30
Lincoln Trail Lake	Clark	146	41	12	2100	1805	0.938	G
Mt. Sterling Lake	Brown	26	22	9.3	1152	243	0.316	34
Otter Lake	Macoupin	765	54	21	12992	16065	1.649	I
Paradise Lake	Coles	176	23	8	11580	1320	0.137	J
Paris East Lake	Edgar	163	27	10.2	12800	1661	0.156	36
Paris West Lake	Edgar	57	9	3.3	11264	187	1.990	37
Pittsfield City Lake	Pike	241	34	12	7136	2694	-	K
Sangchris Lake	Christian, Shelby	2165	40	15.1	46720	32846	1.200	41
Siloam Springs Lake	Adams	58	43	16.0	1280	928	1.087	42
Spring Lake	McDonough	277	35	10.4	12928	2881	0.334	44
Spring Lake	Tazewell	1285	11	4.5	4000	5783	2.168	45
Vandalia City Lake	Fayette	660	37	13.7	-	9042	-	46
Walnut Point State Lake	Douglas	59	31	11.5	2560	673	0.315	47

TABLE 3. Summary of 1979 sediment monitored parameters, sample preservation, methods of analysis, reporting units and detection limits.

Parameter	Sample Container	Preservation	Method of Analysis (reference)	Units of Measurement	Detection Limits	Lab Performing Analysis
Total Kjeldahl-N	8 oz. polyethylene	Freezing	Digestion at 370°C using reagent containing mercuric oxide, potassium sulfate, and H_2SO_4 to convert organic nitrogen to ammonia. Determination of ammonia nitrogen by Phenate Method using Technicon AutoAnalyzer.[1]	mg/kg N		Champaign IEPA Lab
Total Phosphorus-P (TP)	8 oz. polyethylene	Freezing	Digestion using H_2SO_4 and autoclave to convert all phosphorus forms to orthophosphate followed by determination using Ascorbic Acid Reduction Method and Technicon Auto-Analyzer.[1]	mg/kg P		Champaign IEPA Lab
Chemical Oxygen Demand (COD)	8 oz. polyethylene	Freezing	An adaptation of acid/dichromate reflux method. Instead of refluxing samples are held at 150°C in an oven for 2 hr. Increase in Cr (III) is determined colorimetrically on Technicon AutoAnalyzer.	COD, mg/kg		Champaign IEPA Lab
Total Mercury (Hg)	8 oz. polyethylene	Freezing	Digestion with H_2SO_4 and potassium persulfate to convert all forms to inorganic Hg, followed by stannous chloride reduction step to convert all inorganic Hg to metallic Hg, then measurement by cold vapor atomic absorption.[1]	mg/kg Hg	0.01 mg/kg	Champaign IEPA Lab
Total Metals:	8 oz. polyethylene	Freezing	Digestion of prepared powder with conc. HNO_3 for 30 minutes at 100°C followed by similar digestion after addition of 6M HCl. Analysis by direct aspiration atomic absorption.			Champaign IEPA Lab
Cadmium (Cd)				mg/kg Cd	0.5 mg/kg	
Chromium (Cr)				mg/kg Cr	1 mg/kg	
Copper (Cu)				mg/kg Cu	1 mg/kg	
Iron (Fe)				mg/kg Fe	50 mg/kg	
Lead (Pb)				mg/kg Pb	5 mg/kg	
Manganese (mn)				mg/kg Mn	5 mg/kg	
Zinc (Zn)				mg/kg Zn	1 mg/kg	
Total Arsenic (As)	8 oz. polyethylene	Freezing	All forms converted to arsine which is then burned in quartz furnace to produce atomic arsenic vapor measured by atomic absorption.	mg/kg As	0.1 mg/kg	Champaign IEPA Lab
Organics:	1 pt. glass	Freezing	Known amount of sediment is slurried with water and extracted with 50:50 methylene chloride-hexane mixture. Extract is dried with N_2SO_4 and concentrated by evaporation. The extract is then run through a florisil cleanup and separation procedure. Fractions are concentrated and analyzed by electron-capture gas chromatography.			Springfield IEPA Lab
Aldrin					1 ug/kg	
Chlordane					5 ug/kg	
DDT (total)					5 ug/kg	
Dieldrin					1 ug/kg	
Endrin					1 ug/kg	
Heptachlor					1 ug/kg	
Heptachlor epoxide					1 ug/kg	
Lindane					1 ug/kg	
Methoxychlor					5 ug/kg	
PCB					10 ug/kg	
Percent Volatile Solids	8 oz. polyethylene	Freezing	Weight loss of dried sample after ignition in muffle furnace at 600°C.	% dry wt.		Champaign IEPA Lab

[1]USEPA, 1974

SECTION V RESULTS

A total of 273 surficial lake sediment samples were collected from 63 Illinois lakes during the period of May 23 through September 5, 1979. The number of individual samples collected at each lake varied, ranging from one sample near the dam in five central Illinois lakes, to replicate or triplicate samples at all sampling sites in other lakes. This variability in collection effort necessitated computation of both constituent means from individual samples and a grand mean from lake means.

In general, the highest sediment parameter concentrations were found in sediments taken from the deeper lake sites. Therefore, lake means computed from results obtained from only one or two samples taken at the deepest site (usually near the dam) would be biased toward the highest concentration expected in a lake. With this in mind, grand means for the 63 lakes computed for concentrations of volatile solids, nutrients, arsenic and eight heavy metals are summarized in Tables 4 and 5. Simple arithmatic means, for these parameters, along with minimum-maximum values and standard deviations for all individual samples are presented in Tables 6 and 7.

To compare levels of volatile solids, total Kjeldahl nitrogen, total phosphorus, organic carbon and heavy metals found in Illinois lake sediments, minimum-maximum values and lake grand means are contrasted with values found in other lakes in Tables 8 and 9. The concentrations, distributions and statistics for each constituent evaluated in Illinois lake sediments are presented by individual parameter in this section.

TABLE 4. Grand mean lake sediment concentrations of selected parameters in 63 Illinois lakes sampled summer 1979. Minimum and maximum values reflect highest and lowest lake means. Sample size within lakes varied.

	n	Mean	Standard Deviation	Minimum	Maximum
Volatile Solids (%)	62	8.83	2.93	0.60	19.86
Total Kjeldahl Nitrogen (mg/kg)	63	3358	1630	245	8180
Total Phosphorus (mg/kg)	63	666	341	280	2842
COD (mg/kg)	63	83347	49816	5250	233000
N:P Ratio	63	5.53	2.95	1.16	16.00
Organic Carbon* (mg/kg)	62	44154	14654	3000	99292
C:N Ratio	62	14.3	2.3	9.5	21.2

*Organic carbon was computed from volatile solids data.

Table 5. Grand mean lake sediment concentrations of eight heavy metals and arsenic in 63 Illinois lakes sampled summer 1979. All concentrations in mg/kg.

	Mean	Standard Deviation	Minimum	Maximum	Minimum Detectable Concentration
Arsenic	11.17	11.78	0.7	63.0	0.1 mg/kg
Cadmium	<0.98		<0.5	4.0	0.5 mg/kg
Chromium	22.5	6.3	3.7	49.5	1.0 mg/kg
Copper	41.3	48.9	5.0	367.5	1.0 mg/kg
Iron	28631	7163	5700	44667	50 mg/kg
Lead	<49.6		<5	183.3	5 mg/kg
Manganese	1313	955	195	6917	5 mg/kg
Mercury	<0.09		<0.04	0.31	0.01 mg/kg
Zinc	111.0	47.8	16.5	403.3	1.0 mg/kg

TABLE 6. Mean concentration and related statistics for eight heavy metals and arsenic from 273 individual sediment samples collected from 63 Illinois lakes, summer 1979. All concentrations in mg/kg.

	n	Mean	Standard Deviation	Minimum	Maximum
Arsenic	273	12.1	14.6	0.5	110.0
Cadmium	272	<1.04	-	<0.5	8.0
Chromium	271	<21.6	-	<1.0	75.0
Copper	273	42.0	56.0	3.0	560
Iron	273	27083	8893	4300	55000
Lead	273	<57	-	<5	250
Manganese	273	1278	1316	170	12000
Mercury	272	<0.10	-	<0.01	2.39*
Zinc	273	112.7	65.6	11.0	750

*This value appears erroneous. See text for explanation.

TABLE 7. Mean concentration and related statistics for selected parameters from 273 individual sediment samples collected from 63 Illinois lakes, summer 1979.

	n	Mean	Standard Deviation	Minimum	Maximum
Volatile Solids (%)	258	9.2	3.9	0.6	28.4*
Total Kjeldahl Nitrogen (mg/kg)	273	3710	2066	200	9400
Total Phosphorus (mg/kg)	273	703	476	160	4930
COD (mg/kg)	273	97156	64682	4000	310000
N:P Ratio	273	5.95	3.75	0.50	23.42
Organic Carbon[1] (mg/kg)	258	46033	19526	3000	141950
C:N Ratio[2]	258	14.0	3.0	6.2	33.8

*Value appears erroneous, see text for explanation.
[1]Organic carbon was computed from volatile solids data.
[2]C:N Ratio is ratio of organic carbon to total Kjeldahl nitrogen.

ORGANIC CARBON AND RELATED CONSTITUENTS

The amount of organic matter in sediment might seem intuitively to be an index of lake trophic state. Unless coupled with knowledge of accumulation rates and origin of sedimented organic matter (i.e., whether autochthonous or allochthonous), however, it would be impractical to attempt a trophic classification based on sediment organic carbon content. Sediment organic carbon data computed for Illinois lakes (Appendix Table C) demonstrates this fact. As a group glacial lake sediments contain relatively high amounts of organic carbon; however, several of these lakes are relatively unproductive. By contrast, many artificial lakes in Illinois which might appear unproductive based on sediment carbon content are relatively high in productivity. These lakes, however, receive a high inorganic load which tends to lower the relative proportional contribution of sedimenting organic matter. In short, the reader is advised that it is not possible to trophically define Illinois lakes on the basis of sediment organic (carbon) content. In fact, in the majority of artificial lakes in Illinois, a low sediment organic carbon content is more a testament to high inorganic (non-volatile solids) loading rather than low in-lake production. Without some knowledge of sedimentation rates and relative percent in-lake organic contribution, sediment organic carbon data have limited value. Such data can, however, be useful in assessing potential oxygen demand and nutrient contributions, and for comparing Illinois lake sediments with other lakes.

TABLE 8. Comparison of organic carbon, total Kjeldahl nitrogen, and total phosphorus concentrations in surficial sediments of 63 Illinois lakes with results from previous studies.

	% Volatile Solids	% Organic Carbon	% Total Nitrogen	% Total Phosphorus	C/N	N/P	Reference
Danish Lakes (approximate range for 6 lakes)	25-40		1.3-2.4	0.3-0.7			Andersen 1971
6 Winconsin Lakes				0.23-1.01			Bortleson and Lee 1974
ELA - 16 Canadian Lakes							
Range	18-62	8-34	0.9-3.5	0.13-0.33	8-14	9.54	Brunskill et al. 1971
$\overline{X}$ (±SD)	44(±14)	20(±0.7)	2.1(±0.8)	0.22(±0.05)	12(±2)		
Bantan Lake (Conneticut)	23		1.13	0.19	12	5.95	Fink 1969
English Lakes							
$\overline{X}$ low fertility	14.6	6.12	0.49		12		Gorham et al. 1974
$\overline{X}$ intermediate fertility	16.2	7.10	0.57		13		
$\overline{X}$ high fertility	17.0	7.72	0.65		12		
Crab Orchard Lake (Illinois	5.0		0.16	0.13			Hite and King 1977
2 Massachusetts Lakes		13.7-27.8		0.13-0.24			Ku et al. 1978
Lake George (New York)		6.4-9.0					Schoettle and Friedman 1974
Lake Kinneret (Israel)		0.8-4.7	0.10-0.24	0.06-0.45		1.5	Serruya 1971 Serruya et al. 1974
Lake Ontario		1.98					Thomas 1976
Lake Huron		1.63					Thomas 1976
Lake Palestine (Indiana)		12.98					Wentsel 1977
Lake Erie		1.90(±1.11)		0.09(±0.04)			Williams et al. 1976
63 Illinois Lakes							
Range of Lake $\overline{X}$ is	0.6-19.9		0.02-0.82	0.03-0.28		1.15-16.0	Present Study
Grand $\overline{X}$(±SD)	8.8(±2.9)		0.33(±0.16)	0.07(±0.03)	13*	5.5(±2.9)	

* Approximated assuming % Organic C = % Volatile Solids/2

TABLE 9. Comparison of various heavy metal concentrations in surficial sediments of 63 Illinois lakes with results from previous studies.

	Manganese	Iron	Cadmium	Copper	Chromium	Lead	Mercury	Zinc	References
3 Danish Lakes		10,000-140,000							Andersen 1971
6 Winconsin Lakes	200-4,000	14,200-102,000							Bortleson and Lee 1974
Dewert Reservoir* (England)			13					1,035	Harding and Whitton 1978
Lake Erie			4	57		106	0.855	280	Kemp et al.1976
2 Massachusetts Lakes	300-700	14,500-37,200							Ku et al. 1978
Wintergreen Lake (Michigan)			0.3-3.7			7-54	0.056-0.158		Mathis and Kevern 1975
Little Center Lake* (Indiana)			394		2,330	450		7530	McIntosh and Bishop 1976
5 Oklahoma Reservoirs Range of Lake X's								46-273	Pita and Hyne 1975
Lake Paijanne (Finland)							0.360(±0.222)		Sarkka et al. 1978
Lake George (New York)	1,700-2,900	42,000-77,000		31-43	37-54			13-29	Schoettle and Friedman 1974
Lake Kinneret	480-1920	18,500-72,500							Serruya 1971
Palestine Lake* (Indiana)			4-969		38-2,106			139-14,032	Wentsel et al. 1977
63 Illinois Lakes Range of Lake $\overline{X}$'s	195-6,916	5,700-44,670	0.5-4.0	5-368	3.7-49.5	5-183	0.004-0.315	17-403	Present Study
Grand $\overline{X}$(±SD)	1,312(±955)	28,631(±7,163)	0.98(±0.67)	41(±49)	22(±6)	50(±34)	0.09(±0.05)	111(±48)	

*Receives known pollutional heavy metal input

In his discussion of total organic content of lake waters, Hutchinson (1957) lists three methods for indirectly determining organic carbon content. These methods were the determination of Kjeldahl nitrogen, measurement of weight loss on ignition (i.e., volatile solids), and assessment of chemical oxygen demand (COD). All three methods were used in this study. If these parameters are valid estimators of organic carbon, interrelations (statistical correlations) should be expected.

To compare Illinois lakes with other lakes for which sediment organic carbon data were available and to determine the organic carbon to total nitrogen ratio in sediments, organic carbon data (in mg/kg C) were generated based on an established relationship of loss on ignition to organic carbon (Gorham et al. 1974). Organic carbon values (Appendix Table C) were computed, assuming an ignition loss to organic carbon ratio of 2.0, by employing the following formula: $C\ mg/kg = \%\ Volatile\ Solids * \frac{160\ mg}{kg} * \frac{1.00}{100\%} * \frac{1}{2.0}$.

Volatile Solids

Percent volatile solids was determined as weight loss of a dried sediment sample (103-105°C) after ignition in a muffle furnace at 550°C. This loss in weight is ascribed to the volatilization of organic matter.

The distribution of percent volatile solids is depicted graphically by lake means in Figure 2. A total of 259 samples were analyzed. The mean concentration (±SD) was 9.17% (±3.94) with values ranging from 0.60 to 28.39% The lowest percentages (0.60) were obtained for duplicate samples collected

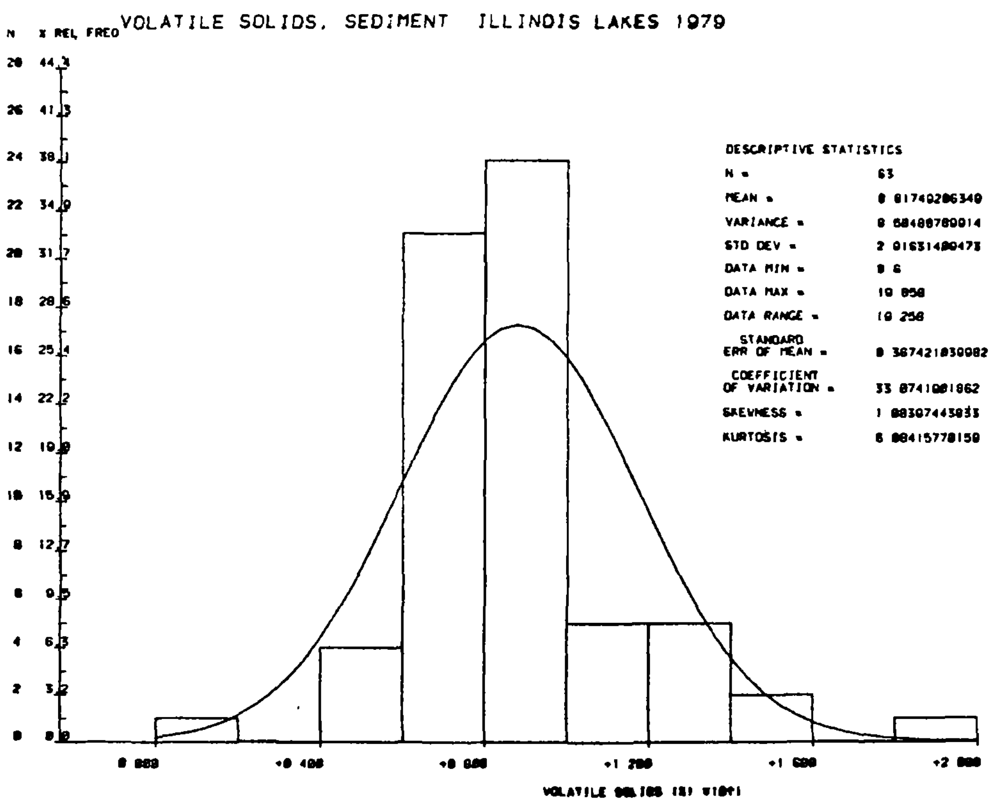

FIGURE 2. Distribution of lake mean volatile solids in sediment samples taken from 63 Illinois lakes, 1979.

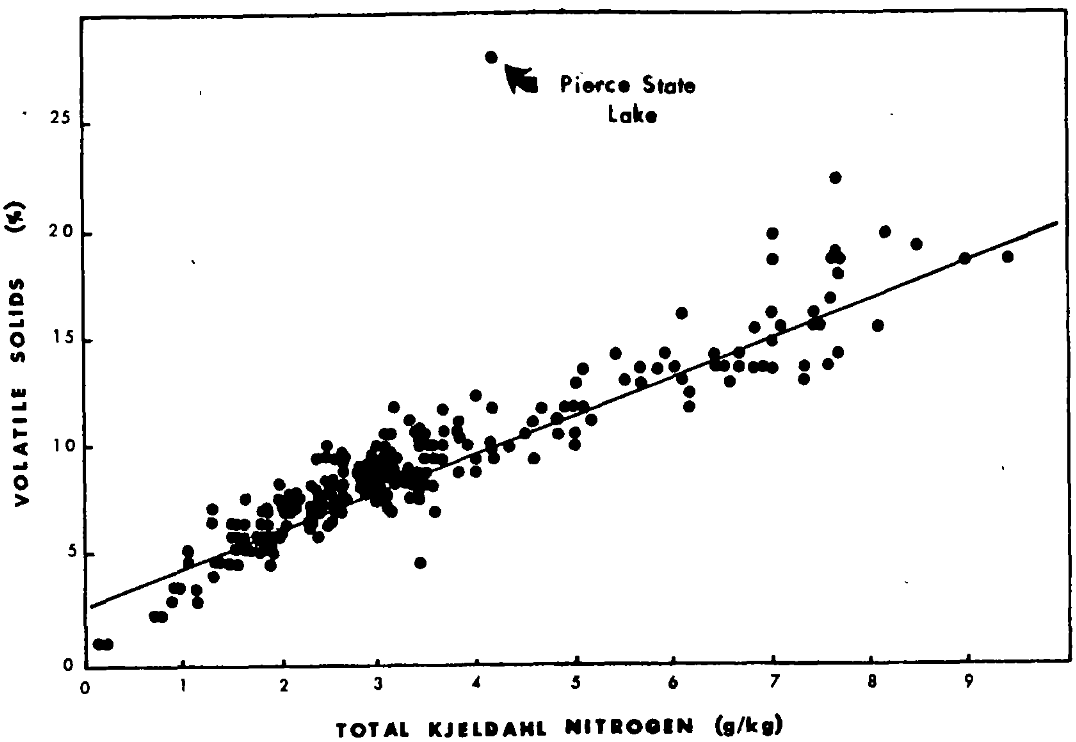

FIGURE 3. Regression of volatile solids and total Kjeldahl nitrogen for 259 sediment samples taken from 63 Illinois lakes, 1979. The equation of the regression line is: Volatile Solids (%) = 0.00189 total Kjeldahl nitrogen (mg/kg) +2.59.

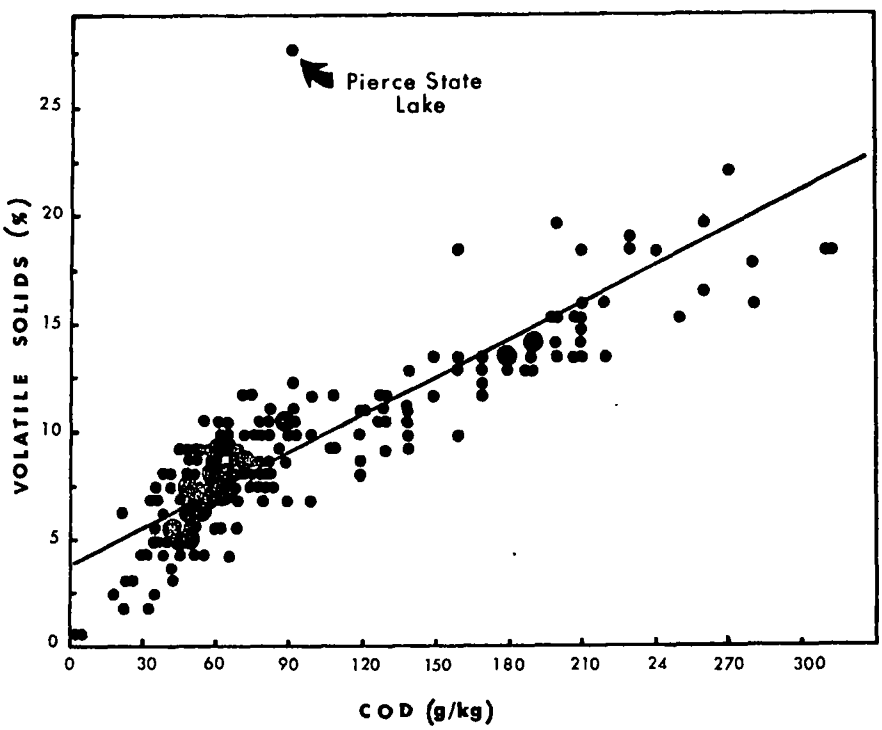

FIGURE 4. Regression of volatile solids and chemical oxygen demand for 259 sediment samples taken from 63 Illinois lakes, 1979. The equation for the regression line is: Volatile solids (%) = 5.47 $*10^{-5}$ COD (mg/kg) + 4.09.

from Gladstone Lake at site 3. Since collections at Site 3 generally reflected conditions at the shallowest sites, it is possible that these sediments contained a high proportion of sand. Unfortunately at Gladstone Lake, sediment samples were not collected at the deepest site where silt, clay and organic content are generally relatively high; therefore, it is not possible to reflect on the relative lack of organic C in Gladstone Lake sediments. It should be noted, however, that Gladstone Lake was a sand quarry and since the drainage basin is relatively small the organic content of the sediment is probably relatively low throughout the lake. On the other end of the scale, however, relatively high percent volatile solids at all sites in a given lake were indicative of the relatively high organic component of sediments collected from Bangs, Round, Horseshoe and Channel Lakes where values typically ranged from 15-22% in most samples. The single highest value was obtained from a sample taken from Site 1 at Pierce State Lake. Considering values obtained for the remaining samples taken at this lake which ranged from 5.2 to 10.4%, the 28.4% result appears erroneous and presumably does not reflect the true range. However, values obtained from Bangs Lake which approach or slightly exceed 20% probably do. Percent volatile solids (and therefore organic carbon) content of Illinois lake sediments were relatively low when contrasted to other studies (see Table 8).

As can be seen from the correlation matrix (Table 10), volatile solids was highly correlated with total Kjeldahl nitrogen and chemical oxygen demand (COD). The single erroneous result (which is noted in Figures 3 and 4) obtained for Pierce State Lake clearly stands out when volatile solids is plotted against either Kjeldahl nitrogen (Figure 3) or COD (Figure 4). This adds indirect evidence to the assumption that this single point is erroneous and should be deleted from the data set.

Table 10. Correlation matrix depicting relationships between COD, total Kjeldahl N, Volatile Solids, and total phosphorus in 273 sediment samples taken from 63 Illinois lakes, 1979. (r=Pearson correlation coefficient, p=level of significance, n=sample size).

	TOTAL KJELDAHL NITROGEN	TOTAL PHOSPHORUS	COD
Volatile Solids	r=0.8906 p=0.0001 n= 259	0.1975 0.0001 259	0.8526 0.0001 259
Total Kjeldahl Nitrogen		0.1713 0.0045 273	0.9331 0.0001 273
Total Phosphorus			0.1639 0.0067 273

Such high correlation coefficients (which would be improved with the deletion of the seeming erroneous result mentioned above) as encountered between volatile solids, COD and Kjeldahl nitrogen suggest that these values represent several methods of approximating a common variable (i.e., organic matter). As a result, it is possible to predict rather accurately two of the three variables after determination of one of the three. Simple linear equations were developed for this purpose and are presented in Table 11. Due to the high degree of correlation evident between these three parameters, it seems advisable to consider omitting two of the three parameters from inclusion in future monitoring efforts. Although determination of volatile solids is a relatively simple procedure, the analysis of sediments for nitrogen is desirable as a result of policies and procedures established by section 314 of the Clean Water Act, particularly when dredging is conducted in association with lake restoration projects. Kjeldahl nitrogen would therefore be the analysis of choice. COD, from a review of literature dealing with sediment analysis, does not appear to be widely employed.

As noted above and in Table 8, the percent volatile solids content of Illinois lake sediments is on the average lower than that found in most previous studies. Sediments from Danish lakes (Andersen 1974), Canadian lakes (Brunskill et al. 1971), and English lakes (Gorham et al. 1974) typically contain more organic carbon than Illinois lakes. These differences can be ascribed primarily to the relatively high non-volatile solids loading characteristic of most Illinois lakes. For some lakes low in-lake organic production may also be a factor. As a group, only sediments from the Great Lakes exhibited a lower percentage carbon content.

Table 11. Regression equations relating COD, total Kjeldahl nitrogen and percent volatile solids for 273 Illinois lake sediment samples collected summer 1979. Probability of obtaining greater "F" values for all analyses was 0.0001.

Dependent Variable (Y)	Independent Variable (X)	Equation Y=(slope)X+(intercept)	R^2
% Volatile Solids	COD (mg/kg)	$Y=(5.48*10^5)X+(4.15)$	0.7410
	Total Kjeldahl N (mg/kg)	$Y=(1.89*10^3)X+(2.59)$	0.8140
COD (mg/kg)	% Volatile Solids	$Y+(1.35*10^4)X+(-3.23*10^4)$	0.7410
	Total Kjeldahl N	$Y+(29.2)X+(-1.12*10^4)$	0.8706
Total Kjeldahl N (mg/kg)	% Volatile Solids	$Y+(432)X+(-467)$	0.8140
	COD (mg/l)	$Y+(2.98*10^{-2})X+(815)$	0.8706

TABLE 12. Mean sediment percent volatile solids by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Glacial (8)	13.15	4.21	6.32	19.86	A
Artificial Central (24)	8.52	1.76	5.78	13.64	B
Artificial North (6)	8.49	2.04	5.52	11.02	B
Artificial South (10)	8.01	1.69	5.94	10.75	B
Artificial South Central (8)	7.92	1.46	6.03	9.80	B
Miscellaneous (6)	7.23	4.14	0.60	13.38	B
Grand $\bar{X}$ (63)	8.83	2.93	0.60	19.86	

*Alpha level=0.05, DF=56, MS=6.118

Total Kjeldahl Nitrogen

Analysis for total Kjeldahl nitrogen measures both ammonia and organic nitrogen. Kjeldahl nitrogen minus ammonia nitrogen is equivalent to organic nitrogen. Due to the relatively low concentration of other inorganic nitrogen forms (i.e., nitrate, nitrite) in sediments, Kjeldahl nitrogen for practical purposes is equivalent to total nitrogen (Andersen 1974).

The distribution of mean lake total Kjeldahl nitrogen concentrations in Illinois lake sediments is depicted graphically in Figure 5. A total of 273 individual lake sediment samples were analyzed. The mean concentration (±SD) was 3.7(±2.1) g/kg. Lowest values were obtained from samples taken at Site 3 in Gladstone Lake; these values are in accord with the low volatile solids values obtained for this lake. Only four lakes (i.e., Bangs, Cedar, Horseshoe, and Channel) exhibited total Kjeldahl nitrogen concentrations in excess of 8.0 g/kg; and except for Horseshoe Lake (an oxbow) and Spring Lake (a reservoir), only glacial lakes exhibited concentrations in excess of 5 g/kg. When contrasted with results from other studies (e.g., Frink 1969, Brunskill et al. 1971, Gorham et al. 1974), Illinois lake sediments as a group contain less total Kjeldahl nitrogen. Seventy-nine percent of Illinois lakes contain 2 to 4 g/kg total Kjeldahl nitrogen in their sediments (Fig. 5).

Aside from correlations of total Kjeldahl nitrogen with COD and volatile solids, which have already been discussed (Table 10), highly significant correlations were found with lead (r=0.7013,p=0.001,n=273) and N:P ratio (r=0.7873, p=0.0001, n=273). Plots depicting these relationships are presented (Figures 7 and 8). Within lakes total Kjeldahl nitrogen and lead concentrations in sediments increased with increased depth of the overlying water column. However, this correlation may be fortuitous since highest lead concentrations were found in lakes surrounding the Chicago area. These lakes were for the most part glacial which as a group exhibited fairly high Kjeldahl nitrogen concentrations. Water quality data for Illinois lakes (Sefton et al. 1981) revealed that glacial lakes exhibited the lowest non-volatile suspended to total suspended solids ratio of any lake group. In general the high organic nitrogen concentrations in glacial lake sediments can be attributed to with-in lake primary production (i.e., phytoplankton) with little non-volatile solids input.

The correlation of Kjeldahl nitrogen with the N:P ratio implies that increases in the ratio are due to increases in the percentage of sediment nitrogen. This is not necessarily expected since increases in the ratio need only reflect increases in nitrogen relative to phosphorus. Generally sediment nitrogen (i.e., organic nitrogen) and sediment phosphorus within a lake increased with depth of overlying water. Thus total phosphorus and Kjeldahl nitrogen should be correlated as well, they were ($r=0.1713$, $p=0.0045$, $n=273$); although the correlation is significant, it is not impressive. One possible explanation is that while both sediment phosphorus and nitrogen tend to increase with depth, phosphorus is also released from sediment under anaerobic conditions which are typically depth dependent.

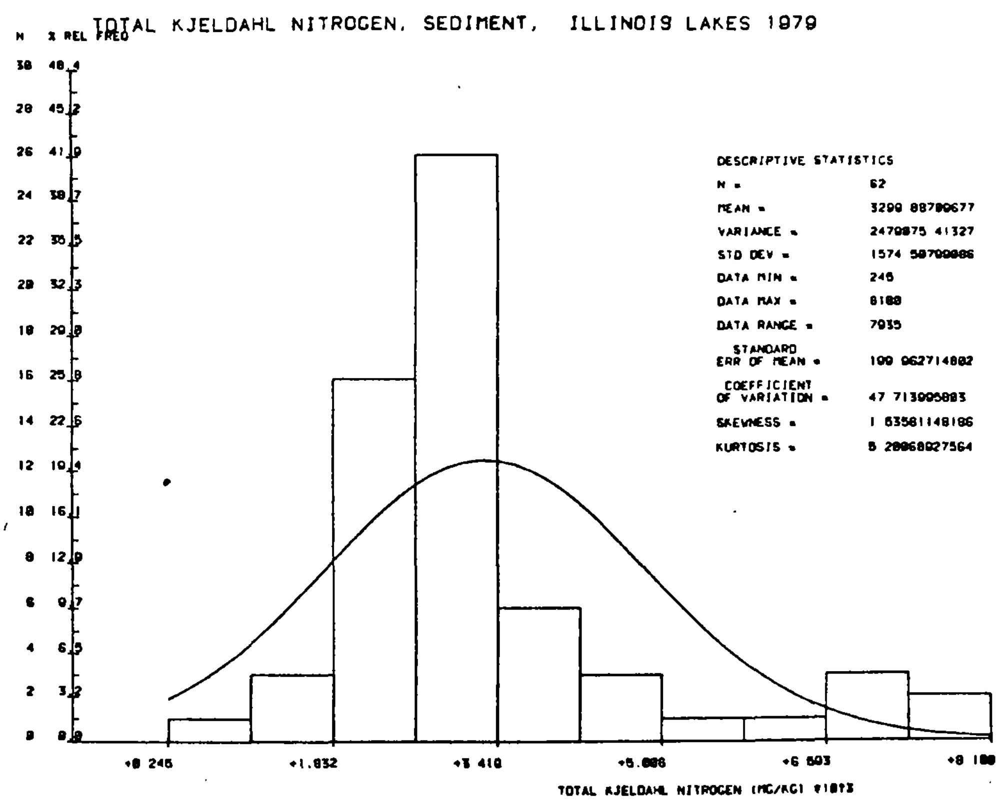

FIGURE 5. Distribution of mean lake total Kjeldahl nitrogen in sediment samples from 63 Illinois lakes, 1979.

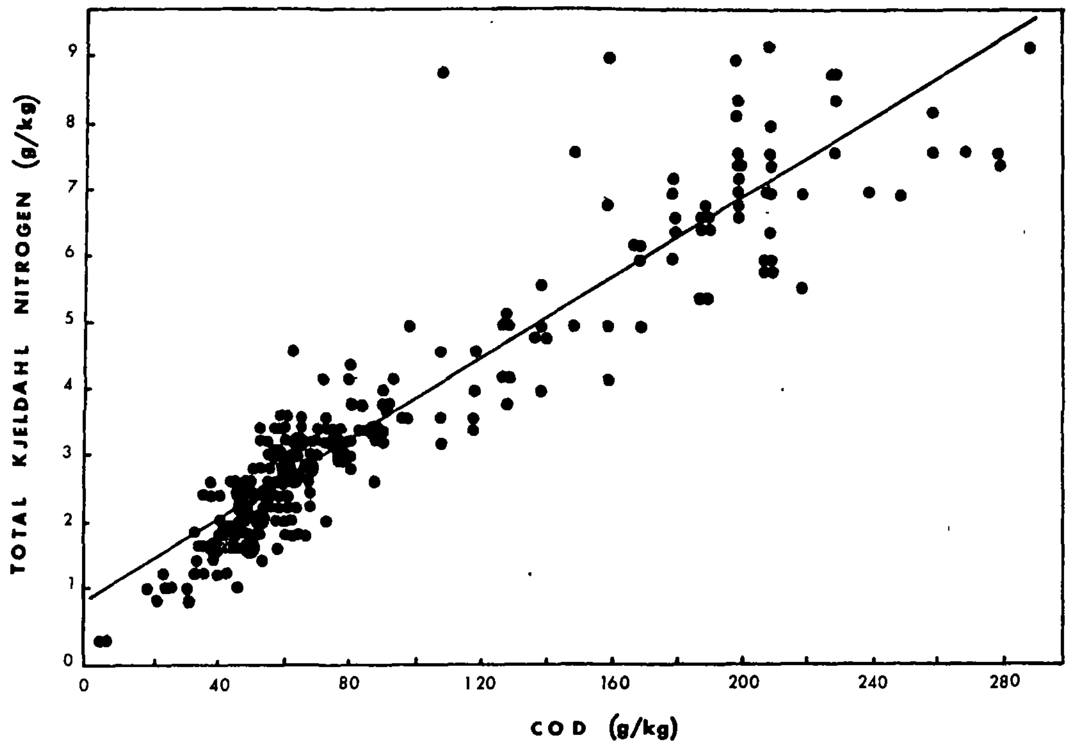

FIGURE 6. Regression of total Kjeldahl nitrogen and chemical oxygen demand (COD) for 273 sediment samples taken from 63 Illinois lakes, 1979. The equation of the regression line is: Total Kjeldahl nitrogen (mg/kg) = 0.0298 COD (mg/kg) + 814.

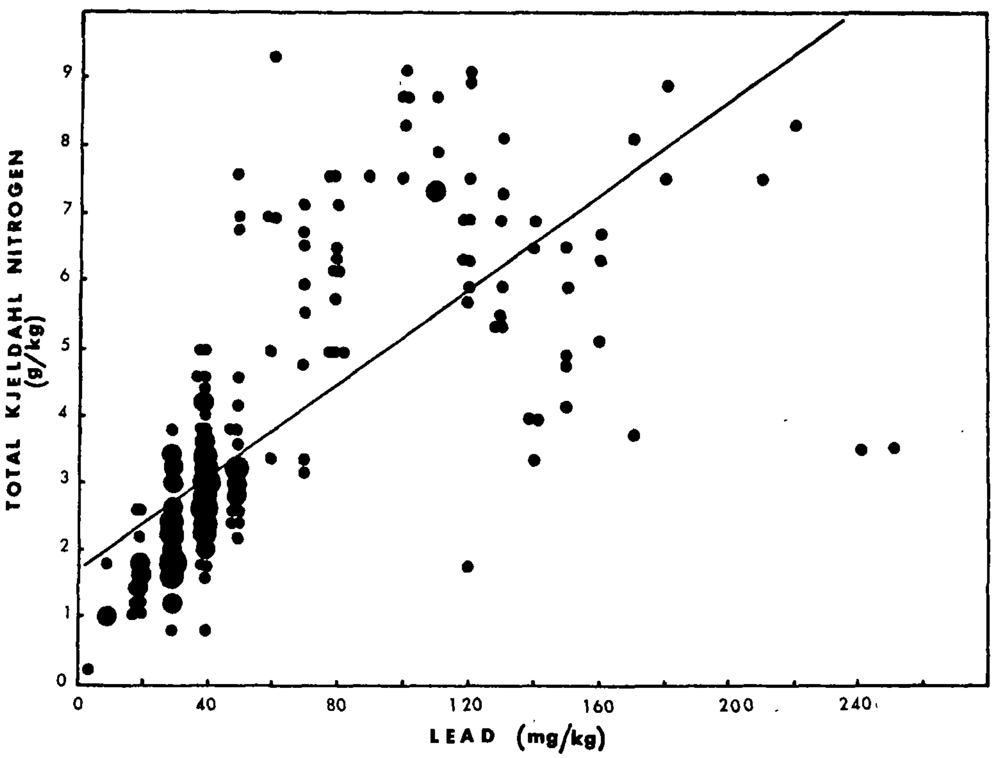

FIGURE 7. Regression of total Kjeldahl nitrogen and lead for 273 sediment samples taken from 63 Illinois lakes, 1979. The equation of the regression line is: Total Kjeldahl nitrogen (mg/kg) = 0.036 lead (mg/kg) + 1.78.

TABLE 13. Mean sediment total Kjeldahl nitrogen concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Glacial (9)	6079	1896	2550	8180	A
Artificial Central (24)	3077	1080	1550	7200	B
Artificial North (6)	2951	929	1550	4400	B
Miscellaneous (6)	2866	1859	245	5767	B
Artificial South Central (8)	2713	792	1917	4200	B
Artificial South (10)	2637	626	1850	3975	B
Grand $\bar{X}$ (63)	3358	1630	245	8180	

*Alpha level=0.05, DF=57, MS=1493400

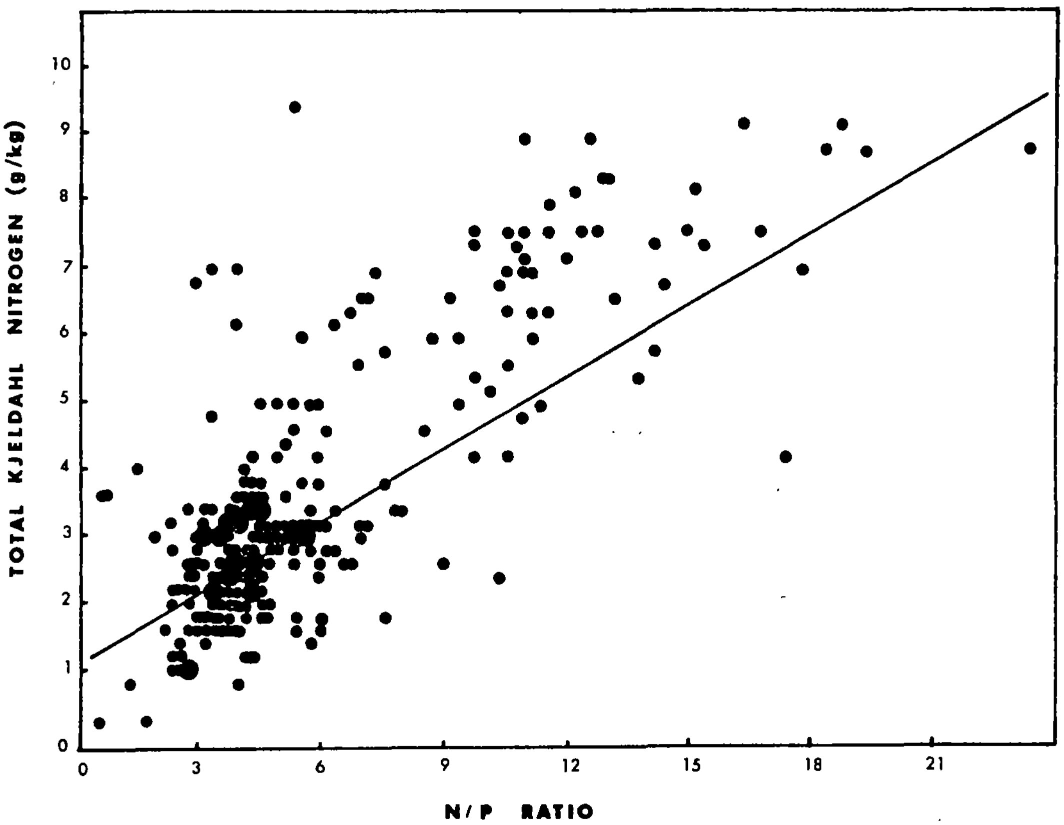

FIGURE 8. Regression of total Kjeldahl nitrogen and N:P ratio for 273 sediment samples taken from 63 Illinois lakes, 1979. The equation of the regression line is: total Kjeldahl nitrogen (mg/kg) = 434 N:P ratio -1126.

COD

Chemical oxygen demand (COD) is a measure of the amount of oxygen required to oxidize"completely all organic matter in a sample to carbon dioxide and water. "Measurement of COD is based on the principle that almost all organic compounds in water can be oxidized to carbon dioxide and water by the action of strong oxidizing agents under acid conditions" (Boyd 1979). A total of 273 sediment samples were analyzed for COD. The mean (±SD) COD concentration was 97(±65) g/kg. Values ranged from 4.0 g/kg at Gladstone Lake (Site 3) to 310 g/kg at Horseshoe and Round Lakes. Since COD was highly significantly correlated with volatile solids ($r=0.85$, $p=0.0001$, $N=273$), changes in COD paralleled changes in volatile solids and Kjeldahl nitrogen. As with Kjeldahl nitrogen and volatile solids, the highest COD concentrations were generally found in glacial lakes (Table 14). The mean lake sediment COD concentration in seventy-four percent of Illinois lakes was between 45 and 95 g/kg (see Figure 9).

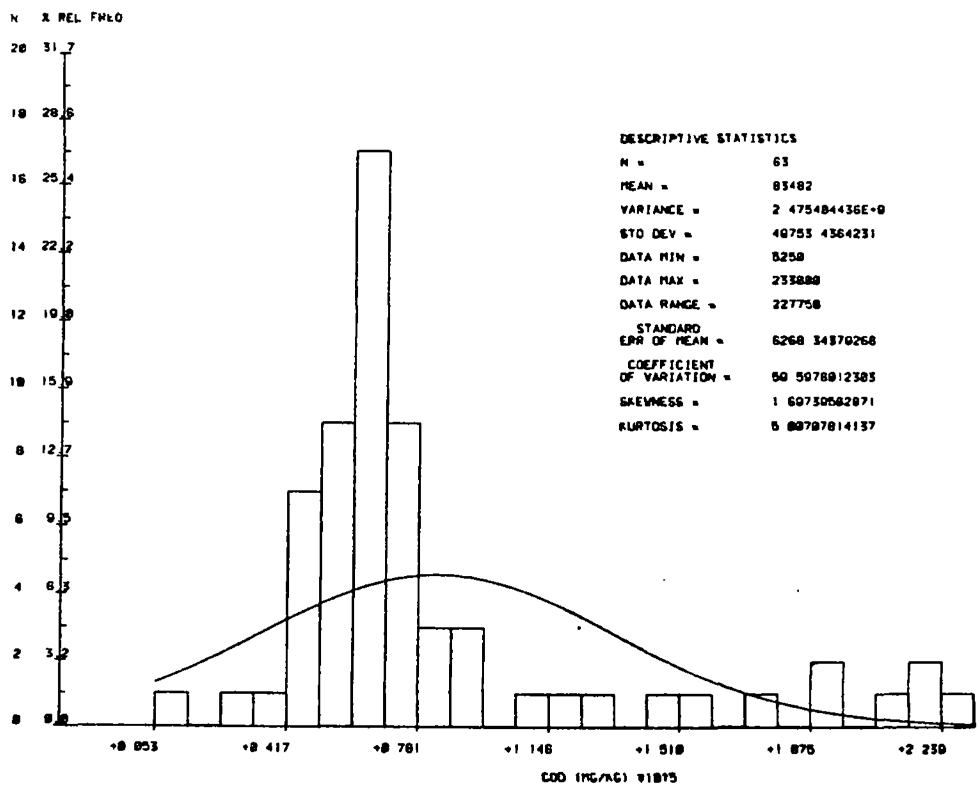

FIGURE 9. Distribution of mean lake chemical oxygen demand (COD) in sediment samples from 63 Illinois lakes, 1979.

TABLE 14. Mean sediment COD concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Glacial	178600	51653	85750	233000	A
Miscellaneous	79847	58151	5250	176667	B
Artificial North	71555	14266	47333	87333	B
Artificial Central	68709	25863	30500	155000	B
Artificial South	62275	13077	45000	88500	B
Artificial South Central	58292	12412	42500	75667	B
Grand $\bar{X}$ (63)	83347	49815	5250	233000	

*Alpha level=0.05, DF=57, MS=430.6

C:N Ratio

Frink (1969) noted in his study of Bantam Lake that despite a tendency for the C:N ratio to decrease somewhat with increasing depth of water, a mean of 12:1 was representative of the sediments of this lake. Gorham et al. (1974) in their study of English lakes also reported that the C:N ratio of sediment samples averaged 12, and there was little difference between productive and unproductive lakes. Sediment data for 16 Canadian lakes (Brunskill et al. 1971) yielded similar results with lake means ranging from 8 to 14 and a grand mean ($\pm$SD) of 12($\pm$2).

In order to calculate C:N ratios for Illinois lake sediment samples, carbon content was approximated using volatile solids data according to the formula presented earlier in this section. The grand mean ($\pm$SD) C:N ratio for 63 Illinois lakes was 14.3($\pm$2.3); individual lake means ranged from 9.5 to 21.2. A significant departure from a ratio of 13 would indicate enrichment with respect to inorganic carbon or nitrogen. Illinois lake data support the generalization of a C:N ratio of 12 to 13 as being representative of lake sediments in most instances.

TOTAL PHOSPHORUS

The fact that P exerts a controlling affect on primary productivity (i.e., trophic status) in most lakes has been well documented. Only recently, however, except for the pioneering efforts of a few researchers (e.g., Mortimer 1941), has serious attention been focused on the possible controlling effects of sediment-phosphorus release on productivity in the overlying water column. Recent evidence (e.g., Andersen 1974, Fillos and Swanson 1975, Theis and McCabe 1978, Wildung et al. 1977) indicates that desorption of phosphorus from lake sediments in some situations may contribute substantial amounts of available phosphorus, equaling or exceeding in magnitude that discharged into the lake from other sources (e.g., watershed runoff, point source discharges, atmospheric precipitation, ground water recharge, etc.). The possibility that sediments may supply nutrients requires careful consideration in the evaluation of possible management strategies. For example, substantial reduction of P in inflowing waters may decrease in-lake production little if sediment contributions are appreciable; in fact, in-lake production could conceivably increase due to a decrease in turbidity likely to occur concomitantly with P control.

The mean (±SD) of 273 sediment samples analyzed for total phosphorus was 703 (±476) mg/kg or 0.07% by dry weight. Values ranged from 160 mg/kg to 4930 mg/kg. Although maximum and minimum values differed by a factor of 30, the vast majority of measurements were clustered about the mean. Mean lake sediment total phosphorus concentrations in 94% of the lakes monitored ranged between 300 to 900 mg/kg (Figure 10). Skokie Lagoons was obviously atypical in regards to total phosphorus concentration; the highest total phosphorus concentration found in sediments from this lake (4930 mg/kg) exceeded by a

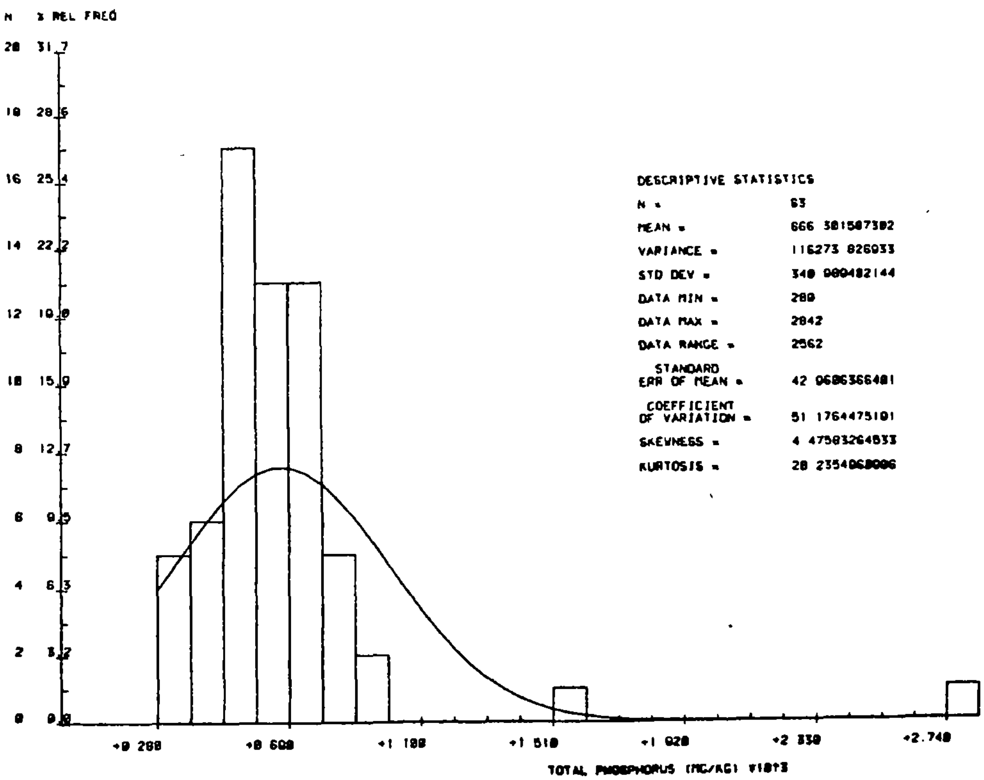

FIGURE 10. Distribution of mean lake total phosphorus in sediment samples from 63 Illinois lakes, 1979.

factor of two the next highest concentration encountered in any other lake. It is also interesting to note that samples from Glen O. Jones Lake (which has in the past been fertilized with super triple phosphate) are represented at both extremes (i.e., 1590 mg/kg at Site 1 and 260 mg/kg at Site 3).

Illinois lake sediment phosphorus concentrations when contrasted with results from other studies are noticeably lower; the mean is 50-65% lower than means obtained in other studies (e.g., Brunskill et al. 1971, Williams et al. 1976, Frink 1969). This low phosphorus concentration does not imply low rates of loading or that substantial amounts of phosphorus are tied up in standing crop biomasses. Water chemistry data (Sefton et al. 1981) suggests that virtually all Illinois lakes are eutrophic (many hypereutrophic) based on total phosphorus concentrations in the water column. The relatively low percentage of total phosphorus in sediments for the most part attests to the high percentage of non-volatile solids relative to phosphorus carried into most Illinois lakes.

TABLE 15. Mean sediment total phosphorus concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Miscellaneous (6)	1055	997	280	2842	A
Artificial South (10)	691	123	447	868	B
Artificial South Central (8)	683	167	475	940	B
Artificial North (6)	650	138	507	870	B
Glacial (9)	615	190	365	984	B
Artificial Central (24)	577	129	320	837	B
Grand $\bar{X}$ (63)	666	341	280	2842	

*Alpha level=0.05, DF=57, MS=106540

TOTAL KJELDAHL NITROGEN TO PHOSPHORUS RATIO

The nitrogen (N) to phosphorus (P) ratio presented in this section is actually the total Kjeldahl nitrogen to total phosphorus ratio. This ratio does not take into account the oxidized inorganic nitrogen forms (i.e., NO_3, NO_2) which may have been present; however, as Andersen (1971) has pointed out the Kjeldahl nitrogen concentration in sediments is practically equivalent to total nitrogen. These values were computed on the basis of percent dry weight; therefore, the reader is advised to use caution when comparing these results to values that may have been determined by other methods (e.g., ratios based on molar concentrations).

The mean N:P ratio computed for 273 sediment samples analyzed for total Kjeldahl nitrogen and total phosphorus was 5.95 ($\pm$3.75) with individual values ranging from 0.50 to 23.42. Since the ratio of N to P in plant material is generally conceded to be in the neighborhood of 7:1 (Round 1966, Serruya et al. 1974, Wetzel 1975), a low ratio of organic nitrogen to total phosphorus in sediments, as pointed out by Serruya et al. (1974), is indicative of a high detrital inorganic P component. Therefore, those lakes with relatively low sediment N:P ratios at all sites (e.g., Skokie Lagoons) would appear to contain relatively high levels of inorganic phosphorus; this is further evidenced by a significant negative correlation between N:P ratio and total phosphorus ($r=-0.26737$, $p=0.0001$, $n=273$). Skokie Lagoons, for example, contain the highest total phosphorus sediment concentrations encountered durirg this monitoring effort. Conversely its N:P ratios are among the lowest. Volatile solids and total Kjeldahl nitrogen values are clustered around their respective grand means. As a consequence, it can be postulated that the high levels of phosphorus found in the sediments are inorganic in nature.

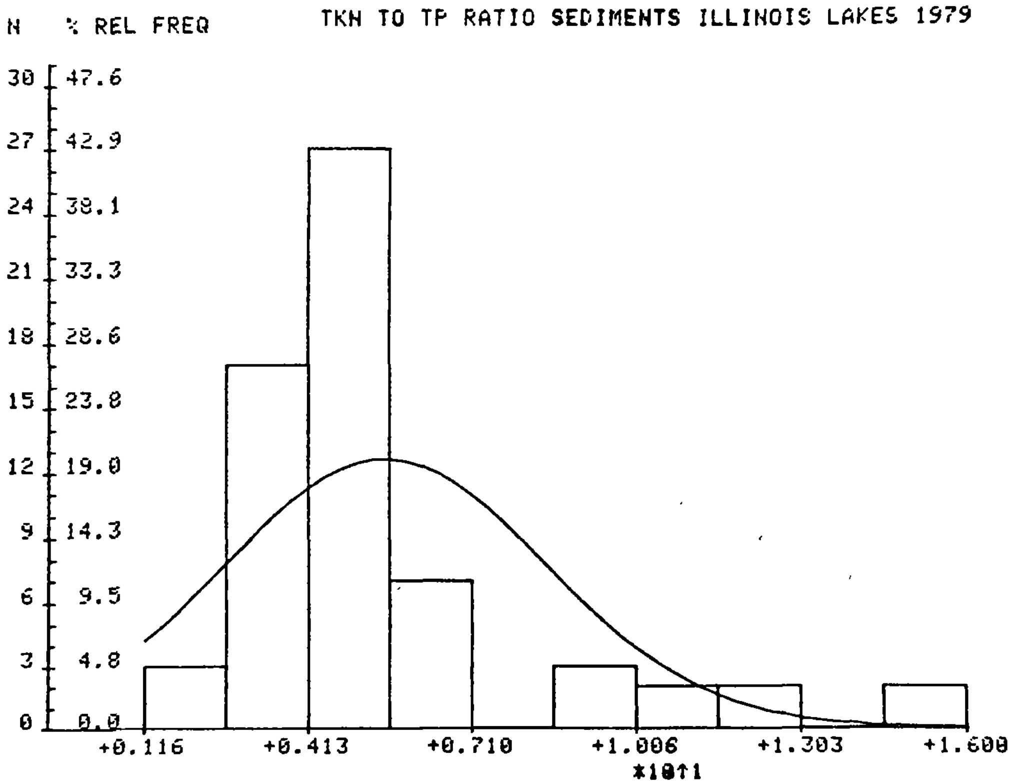

FIGURE 11. Distribution of total Kjeldahl nitrogen to total phosphorus in surficial sediments from 63 Illinois lakes, 1979.

Highest N:P ratios were, with the single exception of Spring Lake in Tazewell County, all found in sediments taken from glacial lakes. Since the N of the N:P ratio in this study is attributable to ammonia and/or organic nitrogen, an N:P ratio which greatly exceeds 7.0 must be attributable to ammonia. Therefore, the ratio of ammonia to inorganic phosphorus in these lakes must be high. It might also be speculated that most of the phosphorus entering these glacial lakes is organic or is assimilated readily into organic matter once it enters the system. There is likewise probably a tendency for inorganic P regenerated in sediments as a result of decomposition to be readily assimilated thus decreasing the potential for inorganic P accumulation. As a group glacial lakes exhibited a mean N:P ratio ($\pm$SD) of 10.4 ($\pm$3.3), which greatly exceeded the mean of any other lake group (Table 16). In general, Illinois lakes except glacial lakes tend to exhibit N:P ratios less than 7.0 indicative of detrital inorganic P accumulation; glacial lakes, however, appear to contain little inorganic P, at least with respect to inorganic N (i.e., ammonia).

TABLE 16. Mean sediment total Kjeldahl nitrogen to total phosphorus ratios by lake type in 63 Illinois lakes sampled summer 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Glacial (9)	10.34	3.25	4.91	16.00	A
Artificial Central (24)	5.56	2.47	3.62	15.68	B
Artificial North (6)	4.53	0.92	3.03	5.51	B
Artificial South (10)	4.10	0.84	2.65	5.59	B
Artificial South Central (8)	4.08	1.04	2.80	6.32	B
Miscellaneous (6)	3.50	1.93	1.16	6.56	B
Grand $\bar{X}$ (63)	5.53	2.95	1.16	16.00	

*Alpha level=0.05, DF=57, MS=4.59

HEAVY METALS AND RELATED TRACE ELEMENTS

Although most trace elements are widely distributed in the environment, extensive use of metals in industry, the burning of fossil fuels, and soil erosion can lead to concentrations greatly exceeding natural (i.e. background) levels. Heavy metals can be highly toxic to aquatic organisms, cumulative in the food web (Hesse and Evans 1972), and may ultimately generate complex changes in the structure and stability of aquatic ecosystems (McFarlane and Franzin 1978). Certain metals (i.e., iron and manganese) are especially mobile in sediments and can substantially influence the bottom water chemistry of lakes (Kemp et al. 1976). The release of heavy metals from sediments may not only adversely affect aquatic organisms, but as pointed out by Barat et al. (1974), may also pose a real danger for man, especially in those lakes which serve as drinking water supplies. The addition of synthetic chelating agents (e.g., nitrilotriacetic acid in detergents) to water enhances the danger of solubilization of heavy metals from sediments (Barat et al., 1974).

Sediment analyses for heavy metals is useful for identifying potentially toxic metals, establishing "background" levels, and determining possible pollutional loadings. Most comprehensive sediment data available for heavy metals considers concentrations in stream sediment not lakes. While studies of metals in lake sediments have been performed (see Table 9), most studies involve assessment of only a few metals and generally involve lakes receiving known pollutional loadings. The analysis of sediments from 63 Illinois lakes for eight heavy metals and arsenic is probably one of the more extensive surficial sediment surveys to date, and constitutes a worthwhile contribution from purely a heuristic standpoint. Grand mean sediment concentrations for eight heavy metals and arsenic are presented in Table 5. A comparison of sediments from Illinois lakes with results from previous studies is presented in Table 9.

Arsenic

Arsenic occurs in trace amounts throughout the biosphere. Soil concentrations range up to 38 mg/kg and average about 5.0 mg/kg in the upper lithosphere (Berry and Wallace 1974). Small quantities occur naturally in waters with concentrations as high as 40 mg/l occurring in some thermal springs. Arsenic has been classified as a metalloid. It occurs primarily as metal arsenides and sulfides which may be released from soils and by weathering of rock into water as arsenic oxides. Arsenic exhibits some chemical characteristics similar to phosphorus and occurs in two common valence states, trivalent and pentavalent. The trivalent is more toxic to mammals (including man), fish, and other aquatic animals than is the pentavalent (McNeely et al. 1979).

Arsenic has been used in medical treatment (e.g., spirochaetal infections) and has many diversified industrial uses (e.g., manufacture of glass, pigmentation in paints, etc.) Arsenicals are used in herbicides, and for many years sodium arsenate was routinely applied to Wisconsin lakes for aquatic plant control (USEPA 1976). Contamination of orchard soils in eastern Washington was so extreme as to be toxic to many plants (Berry and Wallace 1974).

Besides natural weathering processes, arsenic is released into the environment due to its use as a pesticide, in metal smelting and during the combustion of fossil fuels. Since coal is mined extensively in Illinois, it must be considered as a possible pollutional source. Arsenic concentrations in coal range from 5 to 25 mg/kg (Lisk 1972) and coal ash concentrations of 500 to 1000 mg/kg are common (Goldschmidt 1954, Berry and Wallace 1974). Cherry et al. (1979), in assessing the effects of coal ash effluent on invertebrate and vertebrate populations in a swamp drainage system, noted sediment concentrations exceeding 400 mg/kg with overlying water concentrations of 0.10 mg/l. Huang and Liau (1978) in an analysis of sediments from ten Canadian Lakes found concentrations ranging from 2.7 to 13.2 mg/kg.

The mean (±SD) arsenic concentration of 273 lake sediment samples taken from 63 Illinois lakes was 12.0 (±14.6) mg/kg. Values ranged from 0.5 mg/kg found in single samples taken from Gladstone and Kinkaid Lakes to 110 mg/kg found in Lake Murphysboro. Aside from Lake Murphysboro; Diamond, Bangs, Johnson Sauk Trail and Cedar Lakes exhibited relatively high arsenic concentrations in their sediments. The higher concentrations in these lakes were probably due to past use of sodium arsenate for weed control. In general, however, mean lake sediment arsenic concentrations were relatively low, with only 12% of all samples exceeding concentrations of 20 mg/kg (Figure 12).

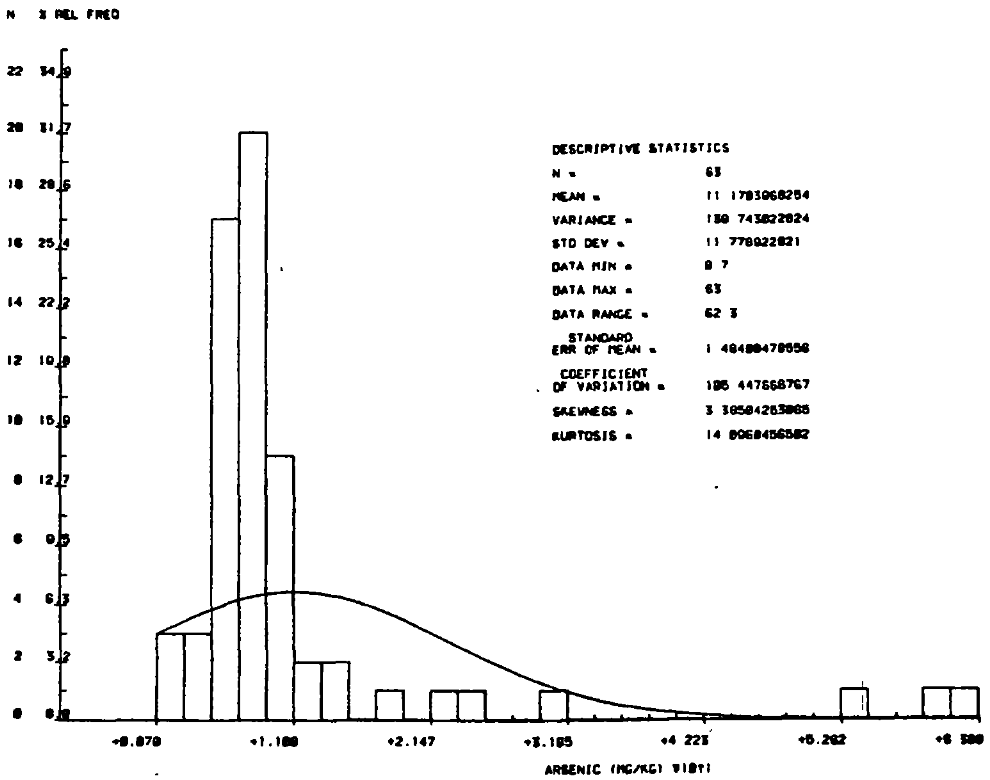

FIGURE 12. Distribution of mean lake arsenic in sediment samples from 63 Illinois lakes, 1979.

High sediment arsenic concentrations were indicative of detectable concentrations in overlying water. The highest detected concentrations in lake water samples were found in Johnson Sauk Trail with a mean of 24 ug/l (Sefton et al. 1981). These concentrations, however, were well below the IPCB (1977) general use standard of 1.0 mg/l. Little published data is available regarding arsenic concentrations in lake sediments; however, considering the average concentration of soils (i.e., approximately 5 mg/kg), Illinois lake sediments appear to be slightly enriched with respect to this element. As noted by Huang and Liau (1978) the clay fraction of soil normally contains more arsenic than non-clay fractions; consequently, enrichment of lake sediments may result (at least partially) from selective erosion of clay particles. Due to its association with clay, one would also expect to find arsenic concentrations in lakes to increase with depth. In the event of dredging as a method of lake restoration, the proper disposition of dredged sediments containing elevated levels of certain potentially toxic materials such as arsenic may pose a problem.

TABLE 17. Mean sediment arsenic concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\overline{X}$	STD DEV	MIN	MAX	GROUPINGS*
Glacial (9)	21.13	22.18	2.6	59.8	A
Artificial South (10)	14.54	17.19	5.9	63.0	A B
Artificial North (6)	9.77	6.09	6.3	21.8	A B
Artificial Central (24)	8.75	3.72	2.5	24.1	B
Artificial South Central (8)	7.43	1.76	5.5	10.9	B
Miscellaneous (6)	6.72	4.22	0.7	13.5	B
Grand $\overline{X}$ (63)	11.17	11.78	0.7	63.0	

*Alpha level=0.05, DF=57, MS=126.5

CADMIUM

Cadmium is a soft, blue-white metallic element with chemical properties similar to lead and zinc. Cadmium is relatively rare in water and occurs in nature chiefly as a sulfide salt most frequently found in association with zinc and lead, although the amount of cadmium found in rock is generally much less than zinc (Hem 1970). Cadmium accumulations in soil near mines and smelters can lead to locally high concentrations in nearby waters (USEPA 1976). Cadmium salts occur in wastes from manufacture of pigments, electroplating plants, and chemical and textile industries. The combustion of fossil fuels releases cadmium to the atmosphere which eventually enters the hydrologic cycle through precipitation.

Cadmium is nonessential biologically and is cumulative and highly toxic to most organisms including man. Elevated cadmium tissue levels in laboratory test animals have been related to hypertension and a reduction in life expectancy (Schroeder and Balassa 1961), and Carroll (1966) has correlated atmospheric cadmium concentrations with hypertension and arteriosclerosis in 28 cities (Berry and Wallace 1974).

The most widely publicized outbreak of cadmium poisoning in man was recorded in Jintsu River Valley, Japan, where approximately one hundred deaths resulted from exposure to high cadmium concentrations in drinking water. Symptomatic of "itai-itai" disease was the occurrence of rheumatic-like conditions with intense pain in bones which lose their rigidity. There is no known mechanism whereby the body maintains cadmium at safe levels. Once absorbed cadmium is stored largely in liver and kidney and excreted at very low rates (USEPA 1976).

Cadmium was undetected in 124 of the 272 samples analyzed; the minimum detectable cadmium concentration in sediment samples was 0.5 mg/kg. Only 6 samples exhibited concentrations greater than 2.0 mg/kg. The highest detected concentration was 8 mg/kg found in a midlake sample taken from Lincoln Trail State Lake. Concentrations of 4 mg/kg were detected in two samples from Skokie Lagoons and in single samples taken from Lake Jacksonville and Pittsfield City Lake. In general, cadmium in Illinois lake sediments was often undetectable and, assuming a concentration of 0.5 mg/kg in those samples where cadmium was undetected, the highest mean concentration possible for the 272 samples collected would be 1.04 mg/kg.

Cadmium concentrations in Illinois lake sediments appear to fall within the range of values found in lake sediments not subject to known pollutional sources (see Table 9). In lakes receiving known pollutional inputs, concentrations are considerably higher. Harding and Whitton (1978) reported a mean sediment cadmium concentration of 13 mg/kg in Derwent Reservoir (England) which was impacted by drainage from an active fluorspar mine. The southern part of the Coeur d'Alene Lake (Idaho) was heavily impacted by mining in the watershed, with sediment cadmium concentrations in some samples approaching 100 mg/kg (Maxfield et al. 1974).

Since concentrations of cadmium were below or near the minimum detectable level in all cases, distribution of points appears discontinuous when data are plotted against another variable. Because of this apparent discontinuous distribution (i.e. low variability), it is difficult to put much faith in results of correlation analysis with other variables. It is interesting to note, however, that highest correlations were with lead (r=0.5321, p=0.0001, n=272) and zinc (r=0.4552, p=0.0001, n=272), the two metals with which cadmium is generally associated in nature. Also, despite the great number of samples in which cadmium was below detectable limits, a comparison of means between lake types (means were determined assuming cadmium concentrations of 0.05 mg/l in undetected samples) indicates that cadmium concentrations in glacial lake sediments are generally higher than in sediments from artificial lakes (Table 18).

Table 18. A comparison of mean sediment cadmium concentration by lake type in 63 Illinois lakes sampled summer 1979. Concentrations in mg/kg.

Laketype (n)	$\overline{X}$	STD DEV	MIN	MAX
Artificial North (6)	< 0.74		< 0.50	1.00
Artificial Central (24)	< 1.05		< 0.50	4.00
Artificial South Central (8)	< 0.60		< 0.50	1.00
Artificial South (10)	< 0.59		< 0.50	0.75
Glacial (9)	1.66	0.36	1.00	2.00
Miscellaneous (6)	< 1.08		< 0.50	2.33
Grand X (63)	< 0.98		< 0.50	4.00

Chromium

Chromium is an amphoteric metal whose most common oxidation states are +2, +3, and +6. The trivalent and hexavalent forms are of major environmental concern. Because of its low solubility, the trivalent form is rarely found in waters with a pH greater than 5, and when added to most natural waters, is slowly oxidized to the hexavalent form (McNeely et al. 1979). Chromium has many industrial uses. The hexavalent form is used in metal plating, anodizing of aluminum, and in the manufacture of stainless steel, ceramics, paper, and paint. Trivalent chromium is used in photography, in textile dyeing, and in ceramic and glass industries. Chromium is also added to cooling tower waters to inhibit corrosion.

Chromium concentrations in soil range from 5 to 3000 mg/kg with 6 mg/kg a representative value (Allaway 1968). Soil chemistry of chromium is little understood with oxides of chromium being very insoluble and thus unavailable to plants. However, it is known that absorption of chromium is increased after sewage waste application (Lisk 1972). Concentrations of chromium in coal range from 5 to 60 mg/kg (Berry and Wallace 1974), and as such, the burning of fossil fuels presents another pathway whereby considerable quantities of chromium may be added to the biosphere.

Trivalent chromium is an essential metal for mammals. Deficiencies reduce insulin activation and are known to cause glucose intolerance in humans (USEPA 1976). Hexavalent chromium is toxic to humans. It is irritating and corrosive to the mucous membranes and is a known carcinogen. Both the trivalent and hexavalent ions are toxic to plants. Irrigational waters high in chromium have resulted in reduced crop yields. The toxicity of chromium to aquatic life varies from species to species and is dependent on oxidation state, pH, and temperature (McNeely et al. 1979).

Chromium concentrations in 271 sediment samples taken from 63 Illinois lakes in 1979 exhibited little variability in concentration. The mean ($\pm$SD) of 271 sediment samples was 21.6 ($\pm$8.0) mg/kg with a coefficient of variation of 36.9%. Individual sample concentrations ranged from 1 to 75 mg/kg. Only four samples exceeded a concentration of 35 mg/kg; all were taken from Site 1 and 2 in Skokie Lagoons. Ninety-three percent of all samples analyzed contained chromium at levels between 11 and 33 mg/kg. A histogram depicting the distribution of lake means is presented in Figure 13. The range in lake means was 3.7 to 49.5 mg/kg with a grand mean ($\pm$SD)of 22.5 (6.3) mg/kg. Very little published data (see Table 9) is available concerning chromium concentrations in lake sediments; however, Illinois lake sediments probably contain what would be considered normal levels for eutrophic lakes.

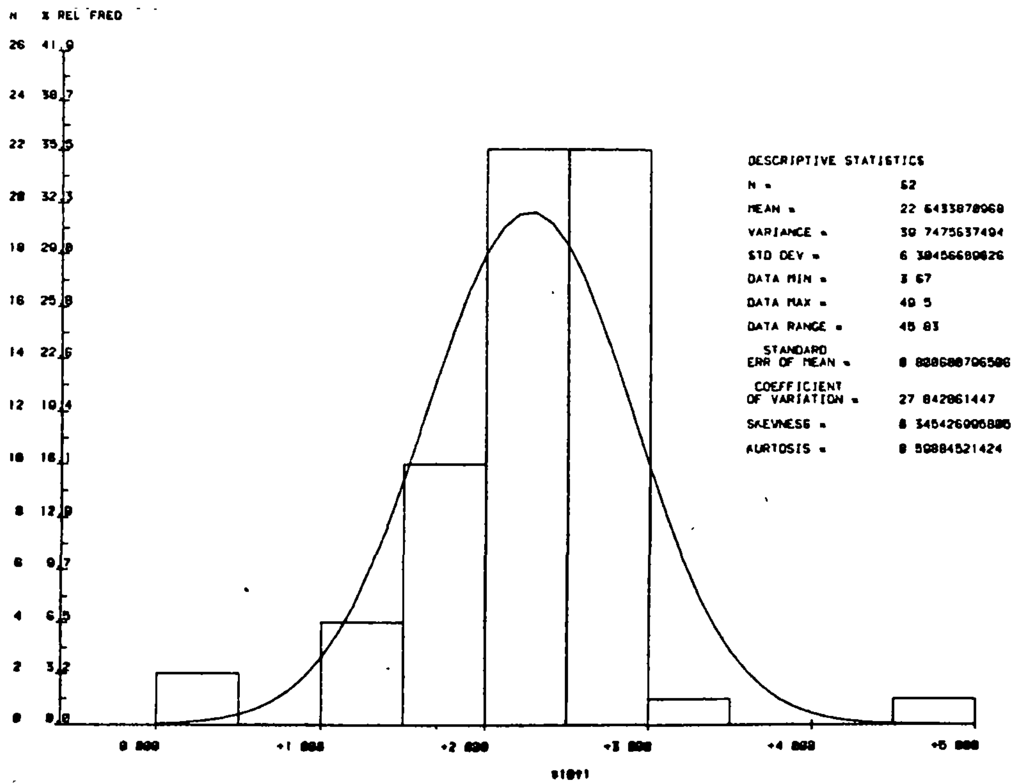

FIGURE 13. Distribution of mean lake chromium in sediment samples from 63 Illinois lakes, 1979.

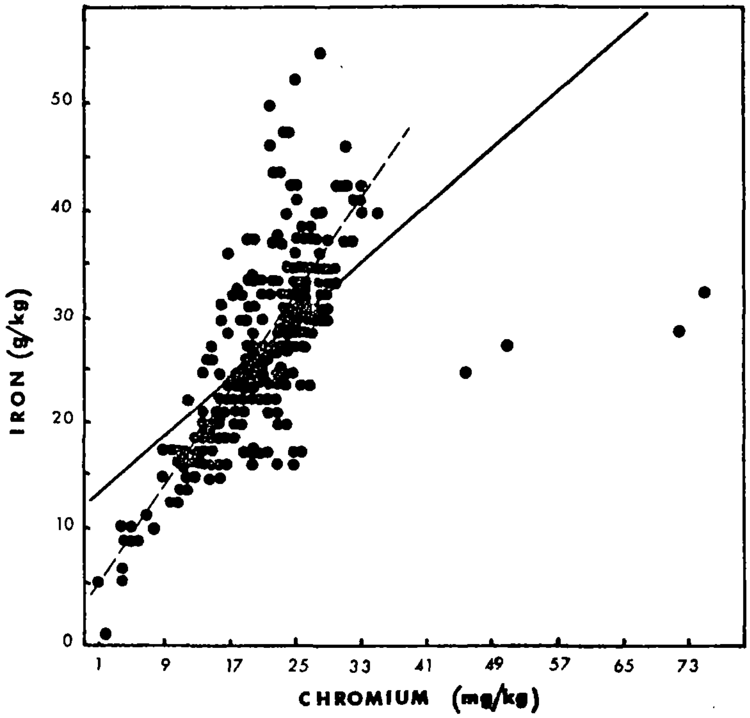

FIGURE 14. Regression of iron and chromium for 273 sediment samples taken from 63 Illinois lakes, 1979. The equation of the solid regression line is: Iron (mg/kg) = 685 Chromium (mg/kg) + 12373. The dashed regression line was computed after omitting Skokie Lagoons sediment samples (i.e., all Chromium values greater than 40 mg/kg); the equation of this regression line is: Iron (mg/kg) = 1119 Chromium (mg/kg) + 3644.

A correlation of iron with chromium (Figure 14) indicates that the ratio of iron to chromium is fairly constant for all lakes studied with only one notable exception; i.e., Skokie Lagoons. Since the correlation of iron and chromium does indicate that a rather constant ratio exists between the two, for whatever reason, it is possible that this ratio could be used in order to assess relative differential rates of input. A significant departure from the expected ratio of iron to chromium (i.e., approximately 1000:1) indicates enrichment above natural levels with respect to one of the metals. In the case of Skokie Lagoons, it appears that these sediments contain roughly twice as much chromium as would be anticipated given the known iron concentration; the implication being that this lake receives an unexpectedly high input of chromium.

Inspection of chromium summary statistics by lake type and geographical location indicates very little difference between groups (Table 19). Glacial lakes as a group do exhibit somewhat smaller sediment concentrations; however, the grand mean is fairly indicative of chromium concentrations to be expected in Illinois lake sediments regardless of type or geographic location.

TABLE 19. Mean sediment chromium concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\overline{X}$	STD DEV	MIN	MAX	GROUPINGS*
Artificial Central (24)	25.8	1.96	20.1	24.5	A
Miscellaneous (6)	25.1	14.75	4.0	49.5	A B
Artificial North (6)	22.6	2.69	19.5	32.0	A B C
Artificial South Central (8)	21.2	4.41	14.6	27.0	A B C
Artificial South (10)	20.0	3.02	13.3	25.3	B C
Glacial (9)	16.3	5.60	3.7	22.7	C
Grand $\overline{X}$ (63)	22.5	6.31	3.7	49.5	

*Alpha level=0.05, DF=57, MS=4.59

Copper

Although generally present in only trace amounts, copper is a common heavy metal constituent of most natural waters. High concentrations of copper may occur in mine drainage and in some industrial effluents. Copper has been mined and used extensively since prehistoric times. It is used in electrical products, coins, electroplating, and in industrial processes such as gas works, coke ovens, and gas scrubbing in steel plants. It is often alloyed with other metals to form bronzes and brasses (USEPA 1976). Copper sulfate has also been routinely applied to surface waters in order to control noxious algal blooms. Application of copper sulfate leads to initially elevated water concentrations; however, due to its solubility, pre-treatment levels in water are readily reestablished, with the bulk of the applied copper transported to the sediments.

Copper is an essential micronutrient for plants and animals. In plants, it plays a vital role in chlorophyll synthesis and is a constituent of several enzymes. In animals, copper is important in invertebrate blood chemistry (i.e., hemocyanin) and in hemoglobin synthesis. Like most metallic micronutrients, relatively high concentrations are toxic. Toxicity varies with oxidation state and a number of physicochemical parameters (i.e., temperature, hardness, alkalinity and turbidity). Doudoroff and Katz (1953) have reviewed the literature in regards to toxic effects on fish and concluded that concentrations below 0.025 mg/l in water are tolerable for most fish species. Concentrations normally encountered in nature are not toxic to humans.

Not much data are available regarding copper concentrations in lake sediments; however, Patrick and Loutit (1976, 1978) have demonstrated that heavy metals (e.g., Ca, Cd, Cu, Mn, Fe, Pb and Zn) in sediments can be passed along successive trophic levels (e.g., from heterotrophic bacteria to tubificids to fish). Therefore, despite low solubilities, metals in sediments may be transported through the food web. The toxicity of copper in solution is controlled largely by pH and hardness (Wagemann and Barica 1979); increases in hardness and pH decrease toxicity (Howarth and Sprague 1978). For example, at pH 5 and 6, ionic copper is practically the only form in solution, but at pH 8 and 9 it is virtually absent, with the less toxic hydroxides and carbonates most common above neutral pH's. Without digressing too far, the point can be made that maintenance of certain pH's is desirable and becomes a major concern in view of recent interest in the acid rain phenomenon.

Copper concentrations in individual Illinois lake sediment samples ranged from 3 to 560 mg/kg. The mean (+SD) of 273 samples was 42 (+56) mg/kg. Highest copper concentrations were found in Marion, Paris East and Long Lakes; they exhibited mean lake sediment concentrations of 368, 150 and 144 mg/kg, respectively. Lakes exhibiting the highest mean concentrations generally serve as municipal water supplies, and thus the presence of elevated sediment copper concentrations is probably attributable to the use of copper sulfate to control algae. Most Illinois lakes (76%) exhibited mean sediment copper concentrations in the range of 15 to 45 mg/kg (Figure 15).

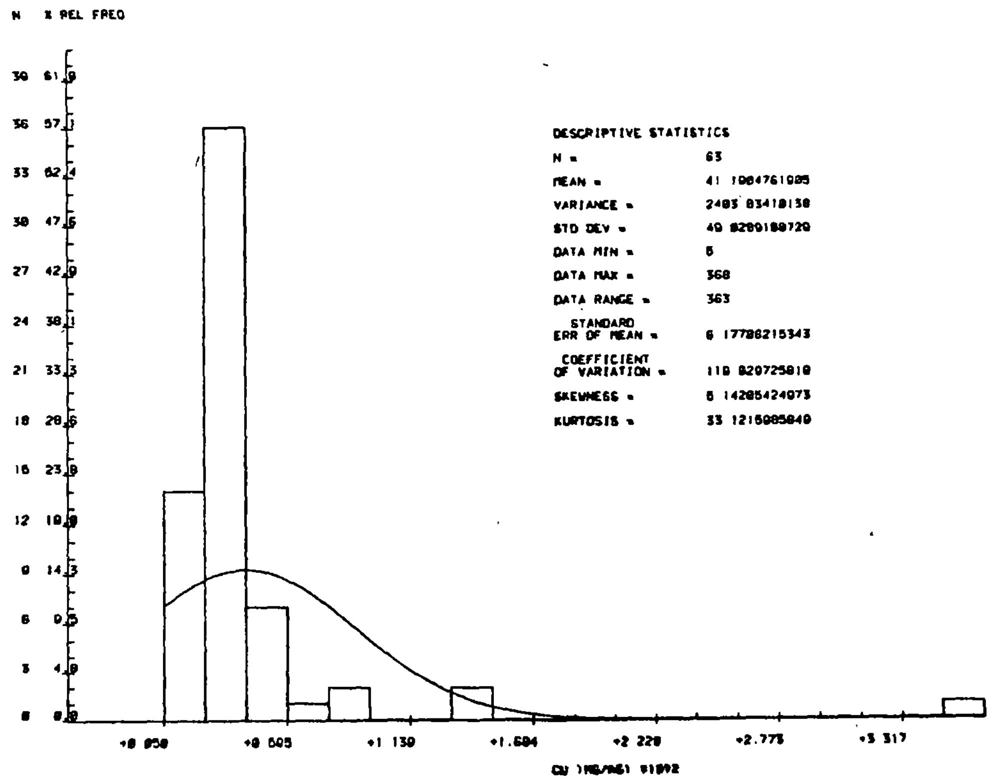

FIGURE 15. Distribution of mean lake copper in sediment samples from 63 Illinois lakes, 1979.

Inspection of lake means by type and location of lake is not too informative (Table 20). The range in values is fairly high for artificial central, artificial south, and glacial lakes and is reflective of selective copper sulfate application throughout the State. The mean for artificial north lakes of 25.4 mg/kg is probably representative of expected concentrations in the majority of Illinois lakes not receiving exceptional anthropogenic inputs (e.g., sewage discharges or applications of $CuSO_4$ for algae control). Due to the relative hardness and alkaline pH's characteristic of most Illinois lakes, sediment copper concentrations would not appear to present a problem with regards to toxicity. The grand mean sediment copper concentration is comparable to means found in Lake George (Schoettle and Friedman 1974) and Lake Erie (Kemp et al. 1976) (Table 9).

TABLE 20. Mean sediment copper concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 2979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Artificial South (10)	62.9	109.0	12.7	367.5	A
Glacial (9)	43.2	38.0	24.2	144.2	A
Artificial Central (24)	42.5	28.1	23.9	150.0	A
Miscellaneous (6)	34.2	20.6	5.0	58.5	A
Artificial South Central (8)	25.6	12.3	14.5	48.7	A
Artificial North (6)	25.4	5.3	21.2	34.5	A
Grand $\bar{X}$	41.3	48.9	5.0	367.5	

*Alpha level=0.05, DF=57, MS=2456

Iron and Manganese

Iron and manganese are essential micronutrients, but under certain conditions can limit photosynthetic productivity. Both are toxic at high concentrations (Warnick and Bell 1969, McKee and Wolf 1963). The biogeochemistry of iron and manganese in water is governed almost entirely by spatial and seasonal variations in oxidation-reduction states (redox potential), regulated by photosynthetic and bacterial metabolism. At low pH and redox potentials, ferrous and manganous ions diffuse readily from sediments and accumulate in the anaerobic, hypolimnetic waters of eutrophic lakes (Wetzel 1975). Ionic iron concentrations are extremely low in oxygenated water while manganese is only somewhat more soluble (manganous ion concentrations above 1 mg/l are rarely encountered). Although manganese and iron are closely related in behavior, there are some differences in their aqueous chemistries (Hem 1970). Both ions, for example, tend to increase in concentration as the redox potential decreases. However, when the redox potential drops below 100 mv, ferrous sulfide begins to form and is precipitated out of solution while manganese sulfide is much more soluble. Therefore, toward the end of summer stratification one might expect to find high concentrations of manganese relative to iron in solution in anaerobic hypolimnia or bottom water (Wetzel 1975).

Iron

Iron concentrations in 273 Illinois lake sediment samples ranged from 0.04 to 55 g/kg with a mean (±SD) of 27.1 (±8.9) g/kg. As can be seen in Figure 16, mean lake concentrations were fairly well spread over this distribution. It is interesting to note that of all the parameters monitored, this is the only one that revealed a left-skewed distribution. The lowest concentrations from individual samples were detected in samples taken at Crystal and Gladstone Lakes. As a group, glacial lakes (e.g. Crystal, Channel, Long, Wolf, Fox, etc.) were generally low in sediment iron (Table 21). Interestingly, Devils Kitchen Lake, an artificial lake in Southern Illinois (which in many respects limnologically resembles a glacial lake) exhibited the highest sediment iron concentrations found during this study.

Other lake sediment studies (Wildung et al. 1977, Howeler 1972, Fillos and Swanson 1975, Bortleson and Lee 1974) have demonstrated a positive linear relationship between sediment total phosphorus and total iron within individual lakes. When iron was regressed against total phosphorus for all sediment samples analyzed during this study, the relationship proved

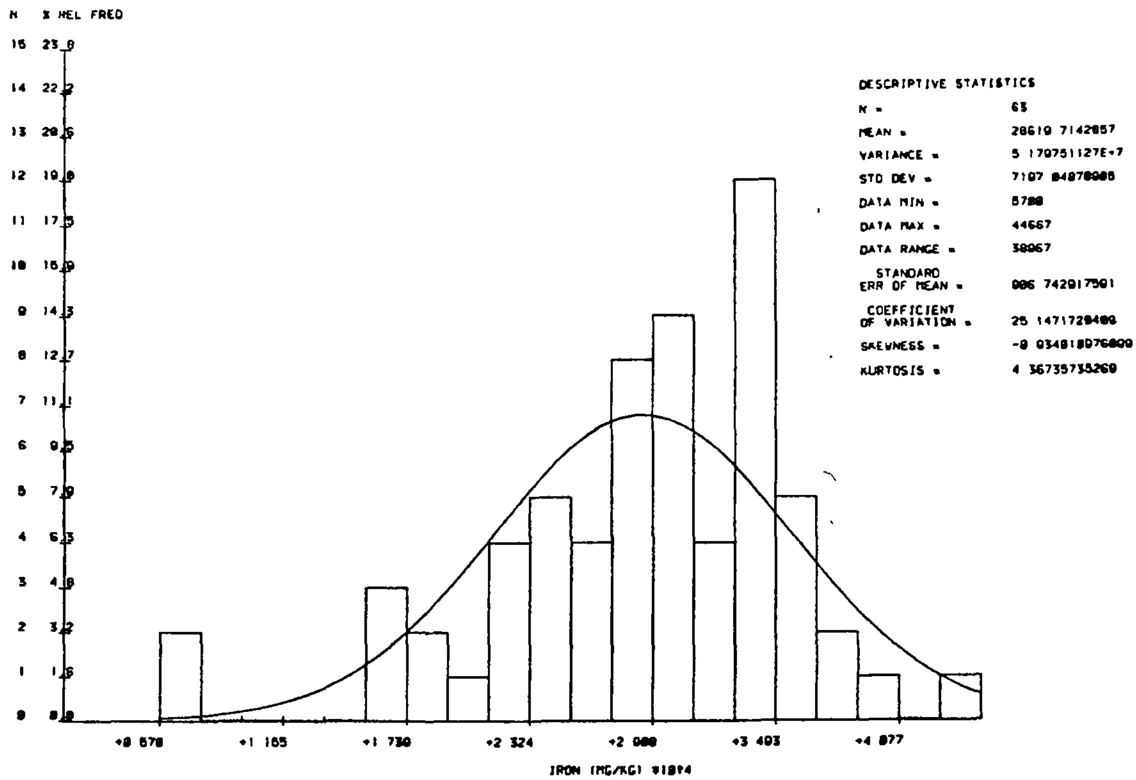

FIGURE 16. Distribution of mean lake iron in sediment samples from 63 Illinois lakes, 1979.

TABLE 21. Mean sediment iron concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Artificial South (10)	33033	5564	24415	44667	A
Artificial Central (24)	31507	4416	18000	39000	A
Artificial South Central (8)	28958	5502	22250	36000	A
Miscellaneous(6)	26870	10828	5700	36500	A
Artificial North (6)	26866	3142	24360	32000	A
Glacial (9)	18134	4795	7733	23552	B
Grand $\bar{X}$ (63)	28631	7163	5700	44667	

*Alpha level=0.05, DF=57, MS=30860000

significant but the correlation coefficient was low (i.e., r=0.22388, p=0.0002 n=273). Not enough samples were taken from an individual lake to warrant a single within lake analysis; however, when correlations were attempted within lake groups (Table 22), correlations were improved for some lake groups over that obtained for all data.

The lack of satisfactory correlations, particularly in the miscellaneous lake group, still does not imply that the relationship of iron to phosphorus did not exist within individual lakes in these groups. All that can be said is that lakes within these groups were probably not similar enough to permit lumping of data for these two parameters. In general it would appear that at least in the majority of Illinois lakes the expected relationship of iron to phosphorus within lakes will be found. In order for a linear relationship to exist within a given lake, the ratio of iron to phosphorus must remain relatively constant within lakes of similar type and from similar geographical areas with similar geologies. It was possible to demonstrate this relationship by grouping lakes. The lack of a significant correlation in the miscellaneous group may be attributable solely to the extreme differences between lakes in the group. In the majority of Illinois lakes sampled, the ratio of total iron to total phosphorus generally approached or exceeded 40:1; whereas, in two of the lakes in the miscellaneous group, Skokie Lagoons and Gladstone, the ratios were 12:1 and 5:1 respectively.

In summary, it can be said that in the majority of Illinois lake sediments, total phosphorus and total iron concentrations are related. The relationship is generally ascribed to the binding of phosphorus to iron. "The relationship of phosphorus, iron, and manganese in lake sediments is not fully understood, although there is a general agreement from consideration of solubility-product relationships that chemical interaction of phosphate should occur with Fe, Al, and Ca compounds. Phosphate has a strong tendency to interact with ferric iron to form a "mixed" ferric hydroxo-phosphate precipitate" (Bortleson and Lee 1974).

Table 22. Correlations of total iron and total phosphorus by lake type in sediment samples collected from 63 Illinois lakes, summer 1979.

Lake type	Pearson Regression Coefficient (r)	Significance Probability (p)	Sample size (n)
Glacial	0.61324	0.0001	68
North-artificial	0.50088	0.0014	38
Central-artificial	0.36605	0.0016	72
South Central-artificial	0.68646	0.0001	31
South-artificial	0.53633	0.0002	44
Miscellaneous	0.24256	0.3028	20
All lakes combined	0.22388	0.0002	273

Manganese

Manganese, an element whose aquatic chemistry is similar to iron, generally exhibited greater variation and considerably lower concentrations than iron. The mean (±SD) concentration of 273 samples taken was 1.3(±1.5) g/kg. Minimun - maximum manganese values, ranging from 0.17 to 14.0 g/kg, differed by a factor of 80. As can be seen from Figure 17, the majority (92%) of Illinois lakes exhibited mean sediment manganese concentrations in the range 0.5 to 2.5 g/kg. Inspection of the raw data (Appendix Table O) for sediment manganese concentrations reveals that with few exceptions high sediment manganese concentrations (2000 mg/kg) were found in samples taken at Site 1 in the various lakes. The most extreme values (8000 mg/kg) were all found in sediments taken from Devils Kitchen Lake (at Sites 1 and 2).

As mentioned above, the aquatic chemistries of iron (Fe) and manganese (Mn) are similar; and as noted by Bortleson and Lee (1974) their "close chemical similarity... is reflected geologically in their common association in rocks of all kinds." With this in mind and in the absence of significant artificial inputs of either metal, a close correlation between the two metals in sediments might be anticipated. Such a relationship was found for the lake sediments analyzed (Figure 18; r=0.56837, p=0.0001, n=273).

Kemp et al. (1976) termed manganese (along with sulfur and iron) a "mobile" element since this element in vertical sediment cores was subject to dissolution and migration into interstitial waters. The surface enrichment of sediments with Mn (and Fe), as postulated by Kemp et al (1976), is

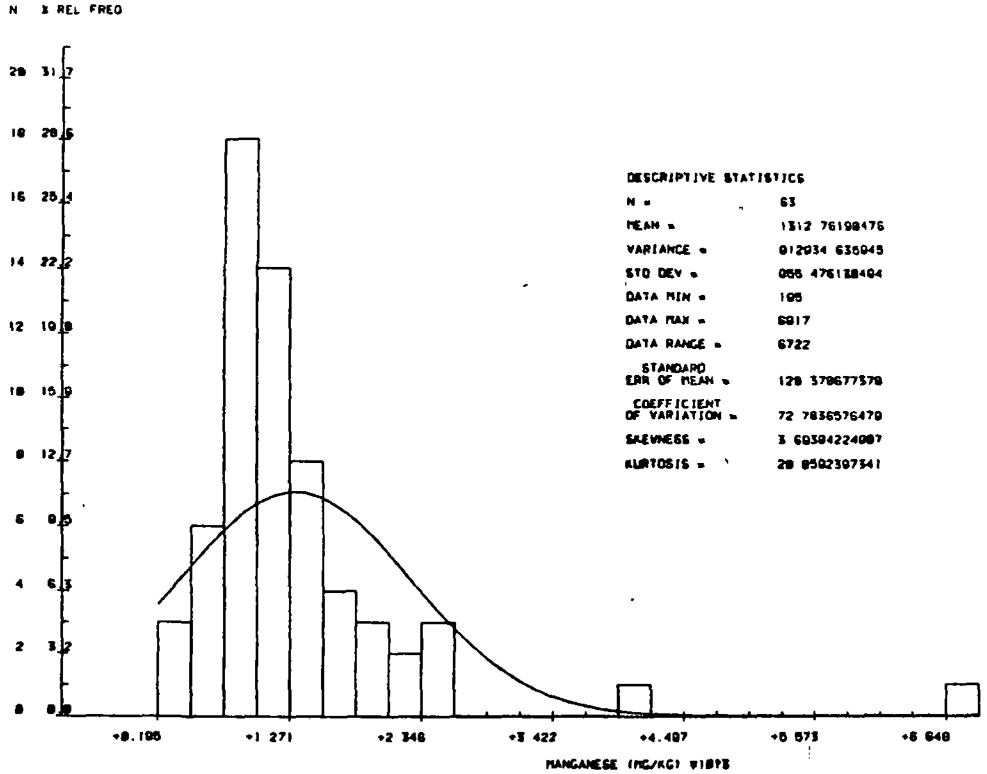

FIGURE 17. Distribution of mean lake manganese in sediment samples from 63 Illinois lakes, 1979.

TABLE 23. Mean sediment manganese concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE(n)	$\overline{X}$	STD DEV	MIN	MAX	GROUPINGS*
Artificial South (10)	2655	1703	1173	6917	A
Artificial South Central (8)	1593	473	900	2450	B
Artificial Central (24)	1092	341	400	1800	B C
Artificial North (6)	978	247	608	1200	B C
Miscellaneous (6)	797	357	195	1237	B C
Glacial (9)	727	139	418	840	C
Grand $\overline{X}$ (63)	1313	955	195	6917	

*Alpha level=0.05, DF=57, MS=551283

in Illinois lake sediments attributable to the upward migration of soluble Mn (and Fe) under reducing conditions in sediment interstitial water. Surface accumulation of Fe and Mn results from oxidation and eventual precipitation of the metals. Unlike Kemp et al. (1976), who ascribed a lack of surface enrichment in the western basin of Lake Erie to the existance of an anoxic hypolimnion which allowed Mn to migrate into hypolimnetic waters with eventual precipitation elsewhere, greatest surface enrichment in Illinois lakes occurred at those sites which exhibited anoxic bottom water conditions. Due to the physical structure of artificial reservoirs, where water is typically released over a spillway, and the general lack of outflow during hypolimnetic reoxygenation, Mn in solution will tend to precipitate near the dam (Site 1) in most reservoirs. No doubt substantial amounts of Mn could be lost from Devils Kitchen Lake if hypolimnetic water were released from this reservoir; however, this is not the case. It should be noted that Devils Kitchen Lake was one of the few lakes studied that exhibited anoxic conditions in the hypolimnion throughout most of the study; this no doubt accounts for the extreme enrichment of these surficial lake sediments with Mn (and Fe).

The tendency toward a curvilinear trend in iron versus manganese concentrations seen in Figure 18, may be attributable to the greater mobility of Mn with respect to Fe, since iron can be lost through the precipitation of FeS while Mn remains in solution. In other words the extreme right data points in Figure 17 were attributable to sediments collected at sites where anoxic bottom water conditions prevailed for a considerable period during the study. A plot of data collected from sites where aerobic bottom water conditions persisted may well reveal a more linear trend.

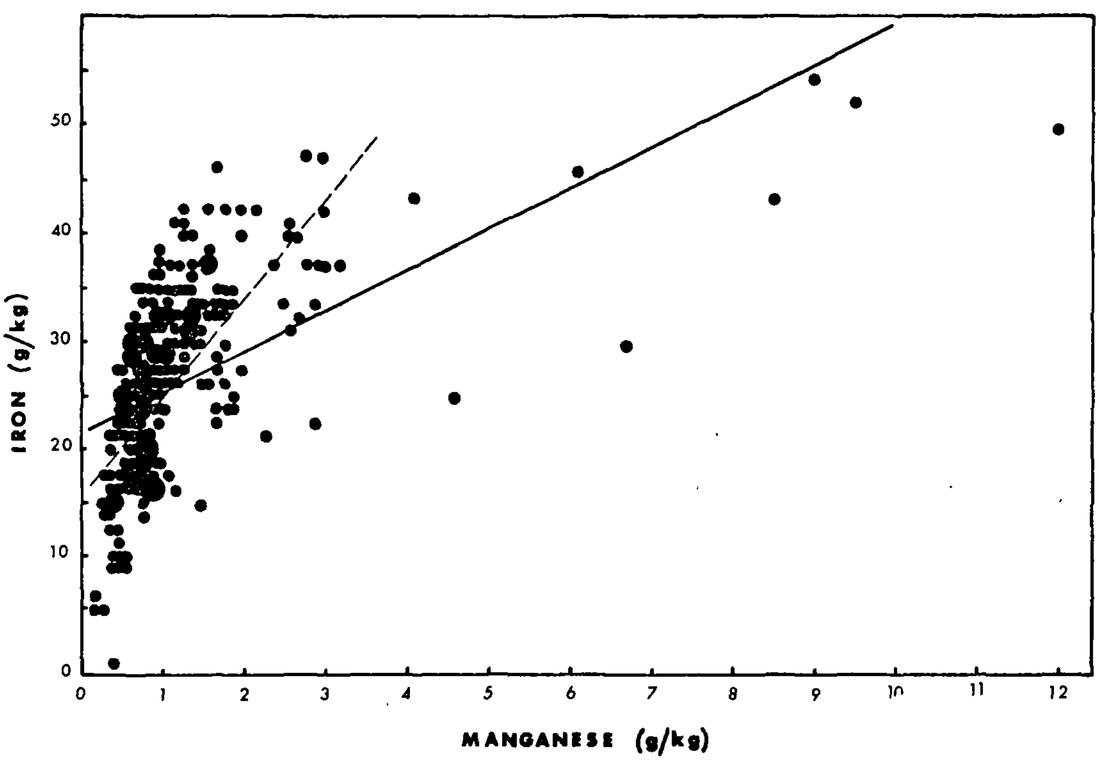

FIGURE 18. Regression of iron and manganese for 273 sediment samples taken from 63 Illinois lakes, 1979. The equation of the solid regression line is: Iron (mg/kg) = 3.85 Manganese (mg/kg) + 22161. The dashed regression line was computed after omitting all values from manganese greater than 3500 mg/kg; the equation of this regression line is: Iron (mg/kg) = 8.96 Manganese (mg/kg) + 16900.

Lead

Lead is not an essential biological element; it is toxic and accumulates in animal tissues. The degree of toxicity, as with other trace metals, is dependent on numerous water quality parameters (i.e., hardness, alkalinity, pH, etc.). Compared with other trace metals, lead toxicity to plants is relatively low with the potential toxicity further mediated by the ability of soils to reduce lead availability (McNeely et al. 1979). The toxic effect of lead concentration on aquatic organisms is highly variable and species dependent (USEPA 1976). In humans the extent and effect of lead toxicity is age dependent, with young children in particular susceptible to neurological impairment.

Due to its low solubility, lead concentrations in water are generally not great. Lead enters the aquatic environment through natural sources chiefly by the weathering of its sulfide ores. Input from anthropogenic sources, however, clearly exceeds natural sources. Major inputs result from combustion of leaded fuels, ore smelting and refining, storage battery production, and municipal waste discharges. Lead salts are used in printing and dyeing, photography, engraving, and the manufacture of explosives (McNeely et al. 1979). In agricultural areas, which would include a large proportion of the watersheds in this study, soil would constitute a significant source of lead. According to Berry and Wallace (1974) the soil in rural areas of the United States contains a background concentration of lead similar to the average lead content of the earth's crust, 10-15 mg/kg.

The mean ($\pm$SD) lead concentation found in 273 sediment samples taken during this study was 57 ($\pm$43) mg/kg with individual values ranging from 3 (Site 3, Gladstone Lake) to 250 mg/kg (Site 2, Skokie Lagoons). Mean lake sediment concentrations ranged from 5 to 183 mg/kg in Gladstone and Bangs Lake, respectively.

Inspection of the data (see Figure 19, Table 24) reveals the greatest dichotomy in sediment samples found during this study. All glacial lakes exhibited mean concentrations of 69 mg/kg or greater; and with the single exception of Skokie Lagoons ($\overline{X}$=152 mg/kg), no other non-glacial lake sediment mean exceeded 60 mg/kg. While values greater than 60 mg/kg would be atypical of artificial lakes, the higher values found in the glacial lakes studied as well as in Skokie Lagoons may be attributable to the proximity of all these lakes to the Chicago metroplex. It would appear that the elevated levels of lead are anthropogenic rather than natural. In the absence of significant atmospheric precipitation and urban street runoff containing lead, a sediment lead content in the range of 20 to 50 mg/kg appears typical of Illinois lakes. This range is somewhat lower than other lakes not receiving known discharges (Table 9). Even the glacial lake mean is in the range of values published for apparently noncontaminated lakes. While it appears obvious that the northern glacial lakes and Skokie Lagoons are in particular impacted by anthropogenic sources of lead, sediment lead concentrations pose no problem in regards to toxicity. The widespread use of unleaded fuels without concomitant increases in other pollutional sources should lead to a reduction in sediment concentrations since this metal is not mobile.

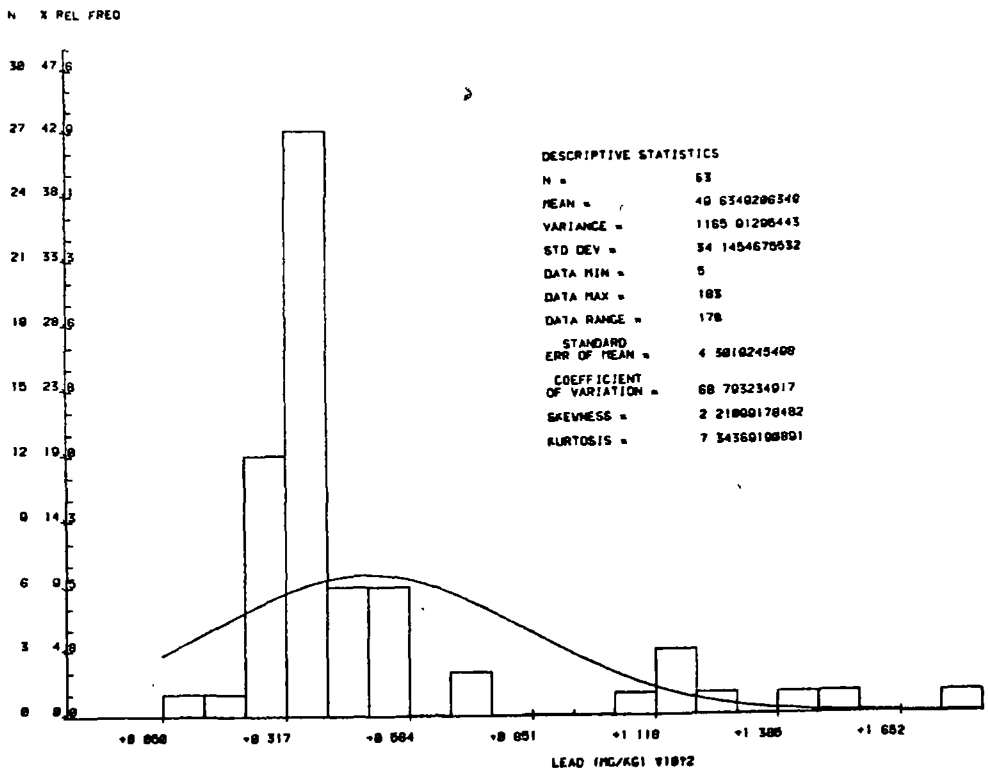

FIGURE 19. Distribution of mean lake lead in sediment samples from 63 Illinois lakes, 1979.

TABLE 24. Mean sediment lead concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\overline{X}$	STD DEV	MIN	MAX	GROUPINGS*
Glacial (9)	115.8	34.6	69.4	183.3	A
Miscellaneous (6)	54.4	50.5	5.0	151.7	B
Artificial South (10)	38.3	6.1	27.5	50.0	B
Artificial South Central (8)	37.5	9.3	25.0	50.0	B
Artificial Central (24)	36.6	7.0	20.0	50.0	B
Artificial North (6)	32.9	6.0	23.3	40.0	B
Grand $\overline{X}$	49.6	34.1	5.0	183.3	

*Alpha level=0.05, DF=57, MS=431

Mercury

Mercury is a biologically nonessential trace metal; the majority of U. S. waters contain less than 0.1 ug/l total mercury (USEPA 1976). Historically, because of its toxic effects, mercury was used as a pesticide; however, its use in recent years has been restricted. The major anthropogenic inputs now result from various commercial and industrial processes (e.g., manufacture of paints and mercury switches, dental work, chlorine gas production).

Mercury compounds are highly toxic to animals, particularly the methylated forms which can be produced by microorganisms from the less toxic inorganic forms of mercury. Aquatic organisms are capable of removing mercury directly from water as well as from food. Due to its low elimination rate, mercury is concentrated in body tissues with concentration factors in fish more than 10,000 times greater than concentrations in water (USEPA 1976). The most widely publicized cases involving mercury poisoning generally involve the ingestion of contaminated aquatic food organisms (e.g., the Minamata incident, reduced hatchability of osprey eggs) or the ingestion of seed dressed with methylmercury (NIPH 1971).

In Illinois lake sediments, mercury concentrations ranged from 0.00 to 2.4 mg/kg, the mean (±SD) of 272 samples was 0.100 (±0.155) mg/kg. The 0.000 mg/kg concentration was found in a sample taken at Site 2 in Lake Mattoon. Gladstone Lake sediment samples contained only 0.004 mg/kg; all remaining lake sediment samples exhibited Hg concentrations of 0.03 mg/kg or greater. Eighty-five percent of all Illinois lakes had a mean mercury sediment concentration in the range of 0.04 to 0.14 mg/kg (see Figure 20).

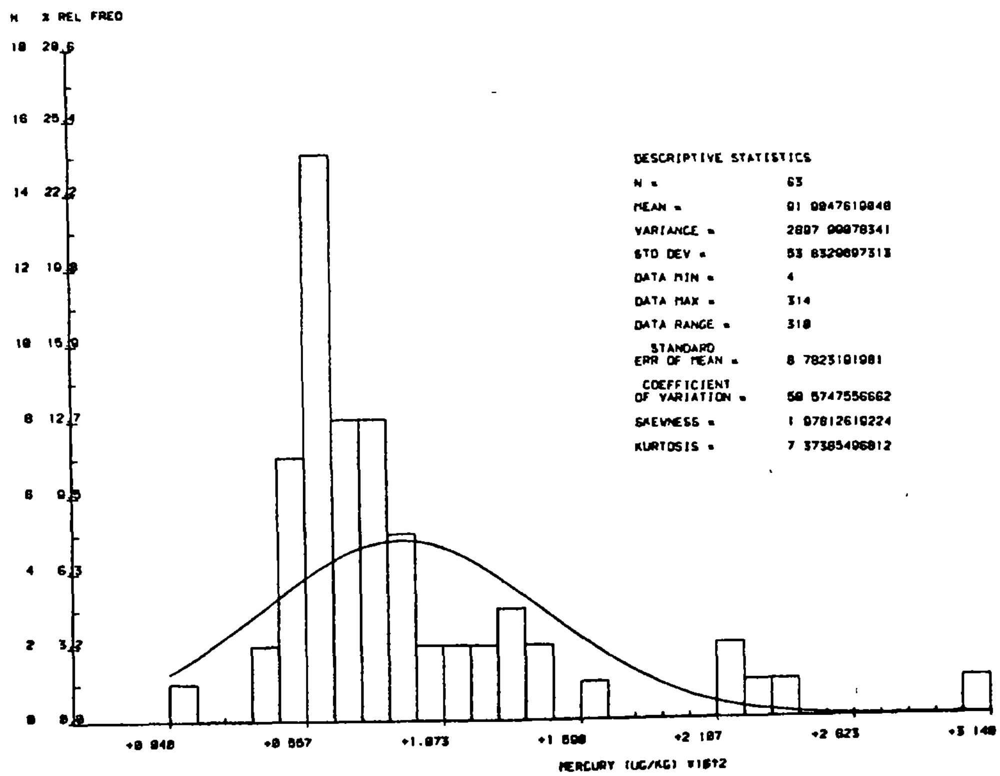

FIGURE 20. Distribution of mean lake mercury in sediment samples from 63 Illinois lakes, 1979.

As a group, glacial lakes tended to exhibit higher mercury concentrations than other Illinois lakes. The highest concentration of 2.4 mg/kg was detected in a sample taken from Round Lake at Site 1; the concentration of the duplicate sample at this site, however, was considerably lower (0.13 mg/kg). It would appear that the higher value is erroneous. This would then make the 0.50 mg/kg concentration found in replicate samples taken at Site 3 in Crystal Lake the highest found. Replicate samples taken at Site 2 in Skokie Lagoons contained 0.49 mg/kg Hg, approaching the highest encountered during this study. Excluding the mean lake sediment concentration obtained for Round Lake, the highest mean mercury concentration was found in Bangs Lake ($\bar{X}$=0.228) followed by Crystal Lake ($\bar{X}$=0.213). The lakes with highest concentrations were located near the Chicago metropolitan area.

By deleting the 2.4 mg/kg value from the data set, the grand mean sediment mercury concentration is reduced from 0.092 mg/kg to 0.086 mg/kg. This in effect would eliminate the extreme right bar from the histogram in Figure 20. There remains a single group of lake means (i.e., Skokie Lagoons and three glacial lakes) which is distinctly set apart from the remaining lakes. It is believed that the elevated mercury concentrations found in these lakes is again attributable to their proximity to the Chicago metropolitan area. These lakes exhibit mean sediment concentrations approximately two to four times that which would be typical of the majority of Illinois lakes.

Very little data is available to indicate at what level mercury can be tolerated in surficial sediments without resulting in significant accumulations in higher trophic levels such as fish. It is known that sediments are important in that most of the biological methylation (by microorganisms) in lakes is assumed to take place in the surficial sediments (Jernelov 1970). Studies have determined that soluble methylmercury compounds are taken up and biomagnified in aquatic food webs. The background mercury concentration of lake sediments is generally regarded to be in the range of 10 to 100 ug/kg dry weight (Sarkka et al. 1978). The majority of Illinois lakes sampled exhibited means within this range, albeit in the upper end of the range. Obviously a few lakes (particularly Skokie Lagoons and glacial lakes in general - Table 25) exceeded what would be considered background levels; these exceptions, however, while they do denote anthropogenic loadings, do not appear extreme.

TABLE 25. Mean sediment mercury concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Glacial (9)	0.158	0.081	0.062	0.315	A
Miscellaneous (6)	0.120	0.092	0.004	0.233	A B
Artificial South (10)	0.089	0.027	0.047	0.136	B C
Artificial South Central (8)	0.085	0.028	0.062	0.145	B C
Artificial Central (24)	0.072	0.023	0.047	0.145	C
Artificial North (6)	0.061	0.018	0.043	0.095	C
Grand $\bar{X}$	0.092	0.054	0.004	0.315	

*Alpha level=0.05, DF=57, MS=0.002

Zinc

Zinc is a biologically essential trace metal, and a necessary component of certain plant and animal enzymes. It is generally found in nature as a sulfide associated with other metals such as lead, copper, cadmium, and iron. Industrially, zinc is important in galvanizing, in the preparation of alloys for die casting, in brass and bronze alloys, and in certain chemical products (e.g., paints, fertilizers, pesticides).

Zinc is relatively non-toxic to man, with public drinking water concentrations limited on an aesthetic basis. Zinc, however, is acutely and chronically toxic to aquatic organisms, especially fish (McNeely et al. 1979). The degree of toxicity is determined by a number of parameters including pH, DO, hardness, temperature, and alkalinity. The lithosphere averages approximately 30 ppm zinc with zinc contents of soils generally in the range of 10 to 300 mg/kg (Berry and Wallace 1974).

Zinc concentrations in Illinois lake sediments exhibited fairly low variability between lakes. Iron and chromium were the only heavy metals which exhibited lower coefficients of variation (33 and 37%, respectively, contrasted with a C.V. of 58% fo Zn). The mean (±SD) of 273 sediment samples was 113 (±66) mg/kg, with individual sample concentrations ranging from 11 to 750 mg/kg in Gladstone Lake (Site 3) and Skokie Lagoons (Site 2), respectively. The highest mean lake sediment zinc concentration was 403 mg/kg found in Skokie Lagoons. Wolf Lake, a glacial lake near Chicago, had the next highest mean lake concentration at 205 mg/kg. Except for Gladstone Lake and Skokie Lagoons, all Illinois lakes exhibited a mean sediment zinc concentration between 40 and 220 mg/kg. Eighty-five percent of all lake means were between 60 and 160 mg/kg (Figure 21).

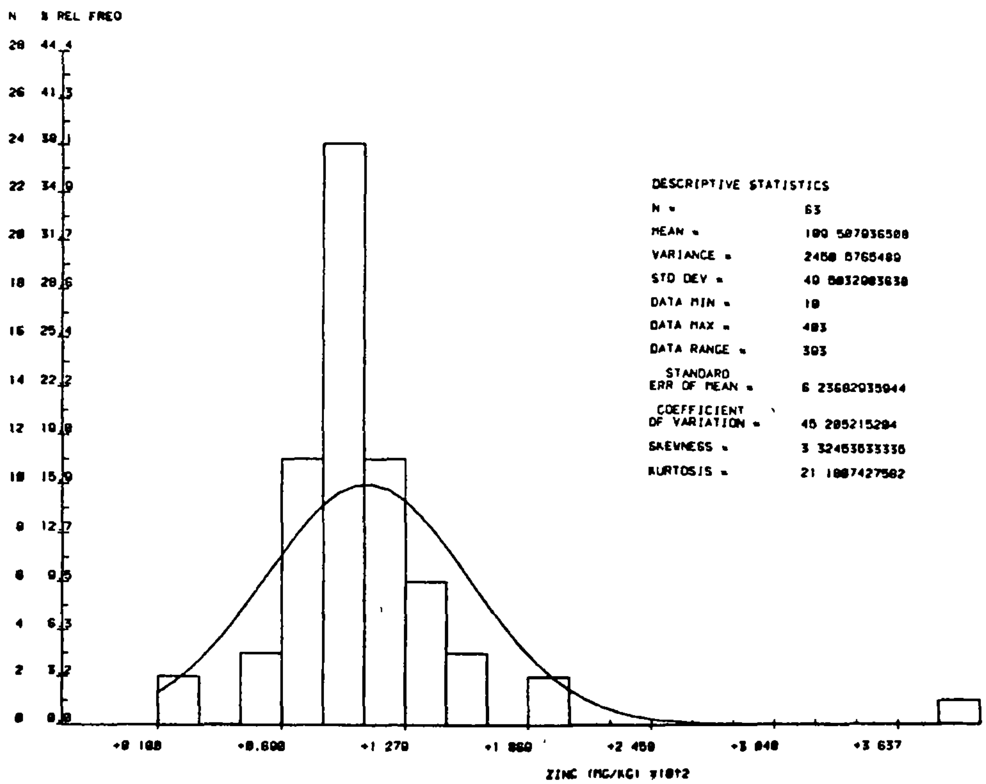

FIGURE 21. Distribution of mean lake zinc in sediment samples from 63 Illinois lakes, 1979.

Zinc concentrations in Illinois lake sediments were generally equal to or less than concentrations encountered in essentially uncontaminated lacustrine sediments (Table 9). Industrialization has increased the atmospheric burden of zinc and thus through precipitation/fallout the background level of zinc in lake sediments compared to pre-industrial days; however, these elevations are relatively small when contrasted to that which can occur as a result of mining activities and/or direct input from industrial discharges. The elevated levels noted for Skokie Lagoons and the slightly elevated mean for glacial lakes (Table 26) is again attributable to their proximity to the Chicago area. Typically, Illinois lake sediments can be expected to contain between 50-175 ug/kg zinc by dry weight.

Zinc concentrations (as well as concentrations of arsenic, lead and cadmium) were highly correlated with organic matter (i.e., COD, volatile solids, and total Kjeldahl nitrogen). The relationship of zinc to volatile solids is depicted in Figure 22. Although the correlation coefficient was low ($r=0.2676$, $n=259$, $p=0.0001$) a trend of concomitantly increasing zinc and volatile solids (i.e., organic matter) is readily apparent particularly when the more deviant zinc values (i.e., >200 mg/kg) are deleted. The concomitant increases are expected within lakes and are generally ascribed to the binding of metals to organic matter and/or clay. The fact that such a relationship was found statewide indicates the existance of a fairly constant ratio of zinc to organic matter. It is most probable, however, that the true direct relationship exists between clay and zinc, and that differences in concentration from lake to lake are a reflection of differential rates of erosion and differing lake morphologies (e.g., retention time).

TABLE 26. Mean sediment zinc concentration (mg/kg) by lake type in 63 Illinois lakes sampled in 1979. Duncan's multiple range test was used to compare lake type means, and groupings were determined. Means with same letter are not significantly different.

LAKE TYPE (n)	$\bar{X}$	STD DEV	MIN	MAX	GROUPINGS*
Miscellaneous (6)	156.2	130.9	16.5	403.3	A
Glacial (9)	135.6	40.9	86.7	205.8	A B
Artificial Central (24)	111.8	19.6	85.0	166.6	B C
Artificial North (6)	99.9	15.2	80.5	125.0	B C
Artificial South (10)	87.5	12.6	62.3	107.5	C
Artificial South Central (8)	84.9	17.0	57.8	110.0	C
Grand $\bar{X}$ (63)	111.0	47.8	16.5	403.3	

*Alpha level=0.05, DF=57, MS=1974

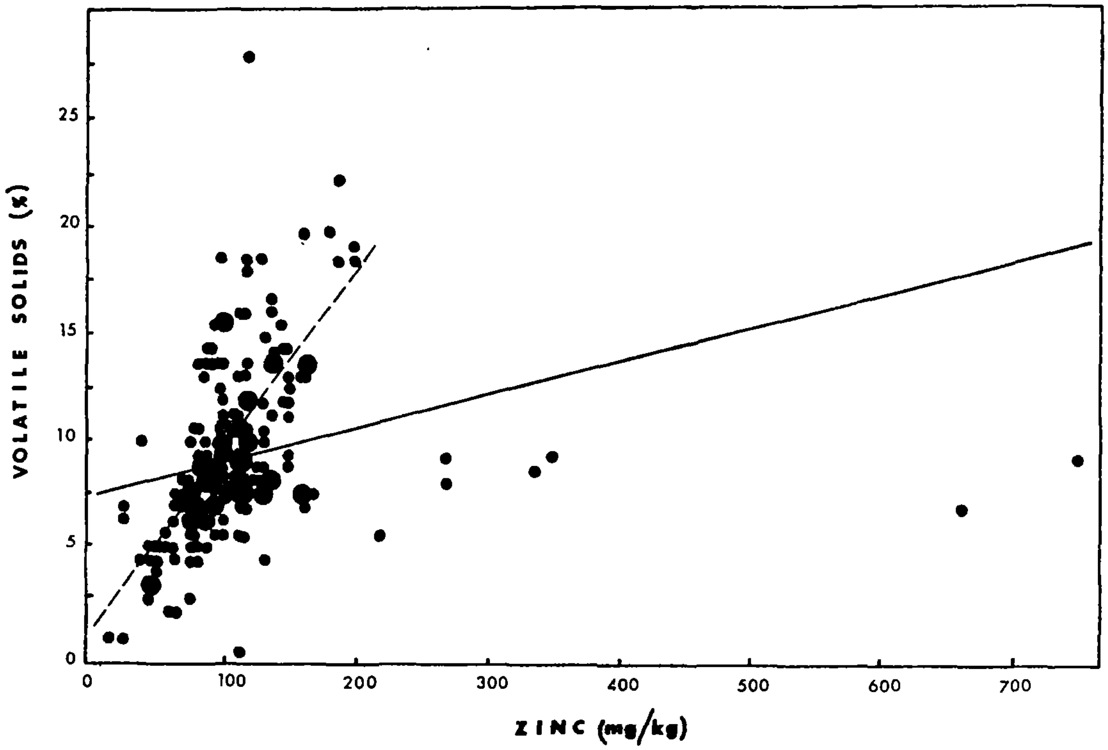

FIGURE 22. Regression of volatile solids and zinc for 259 sediment samples taken from 63 Illinois lakes, 1979. The equation of the solid regression line is: Volatile solids (%) = 0.0158 Zinc (mg/kg) + 7.45. The dashed regression line was computed after omitting all zinc values greater than 200 mg/kg (i.e., sediment samples from Wolf Lake and Skokie Lagoons); the equation of this regression line is: Volatile solids (%) = 0.0766 Zinc (mg/kg) + 1.28.

Lead:Zinc Ratio

Zinc and lead concentrations were highly correlated, and is not surprising considering their common geologic occurrence; this relationship is depicted in Figure 23. The more extreme zinc concentrations (i.e., 7200 mg/kg) were attributable to sediments taken from Wolf Lake and Skokie Lagoons. Except for sediments from Skokie Lagoons, only individual sediment samples from glacial lakes contained more than 70 mg/kg lead. Assuming, as was speculated earlier, that lead in glacial lakes is in part attributable to atmospheric fallout or urban runoff associated with the highly industralized and urbanized Chicago metropolitan area, one might anticipate a rather constant ratio of lead to zinc to typify Illinois lakes. Omission of galcial lake data would give an approximate ratio of lead to zinc of 1:2. The ratio of lead to zinc in glacial lakes is roughly 1:1. Actually Wolf Lake and Skokie Lagoons data points fall on a line corresponding to a lead to zinc ratio of 1:2.

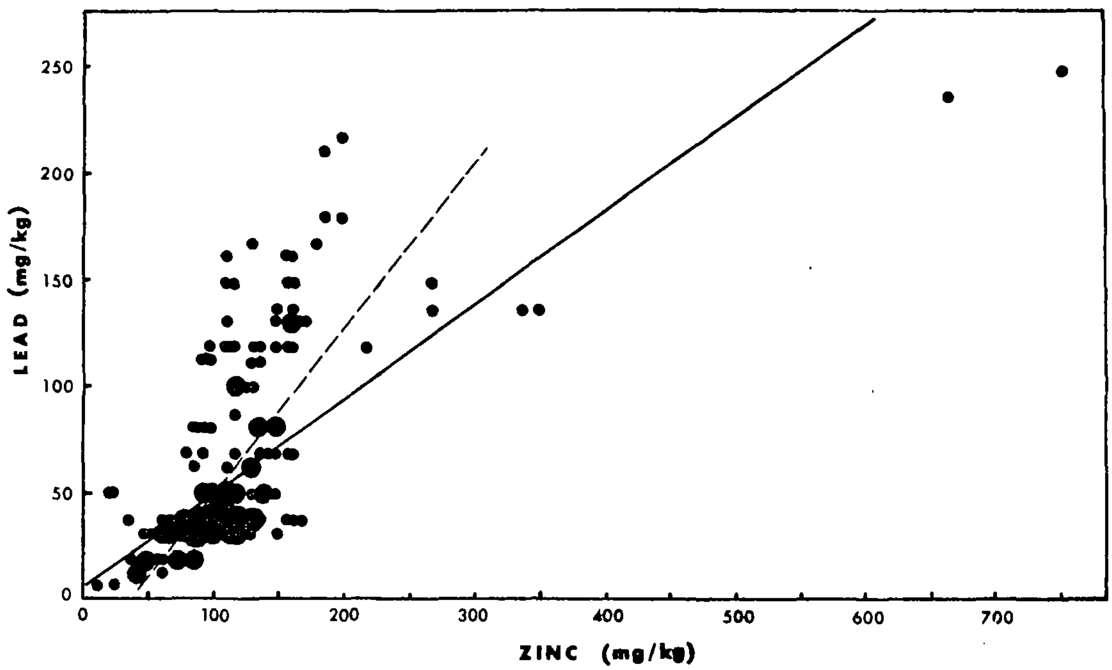

FIGURE 23. Regression of lead and zinc for 273 sediment samples taken from 63 Illinois lakes, 1979. The equation of the solid regression line is: Lead (mg/kg) = 0.448 Zinc (mg/kg) + 6.8. The dashed regression line was computed after omitting Skokie Lagoons sediment samples (i.e., all zinc values greater than 300 mg/kg); the equation of the regression line is: Lead (mg/kg) = 0.750 Zinc (mg/kg) - 24.55.

CHLORINATED HYDROCARBON COMPOUNDS

Chlorinated hydrocarbon pesticides and other similar compounds present a somewhat unique problem in aquatic systems due to their potential for biomagnification in the food web. Virtually undetectable concentrations in water can be accumulated by organisms and passed along successive trophic levels. The organisms of lower trophic levels are consumed as food by organisms at the next trophic level; the food organism is metabolized and excreted but the pesticides are retained (McCaull and Crossland 1974). Organochlorine compounds are relatively insoluble in water but highly soluble in lipids where they are retained and accumulated. Due to the potential of these compounds for bioaccumulation, the complexities of aquatic food webs, and the long term persistence of pesticides in the environment, minute and often undetectable water and sediment concentrations may ultimately pose a threat to aquatic life. As will become apparent for organochlorine compound data presented for Illinois lake sediments, low sediment concentrations do not infer commensurately low levels in aquatic organisms (see fish flesh concentrations vs. sediment concentrations). It is presently impossible to state, based on sediment analysis alone, that acceptably low levels of pesticides are present in the majority of Illinois lakes and reservoirs. The data presented here do, however, serve as a broad data base for future studies. Should relationships be developed whereby sediment concentrations can be used to project what levels will be reached in certain trophic levels, the data base generated during this study will prove particularly valuable.

Sediment samples were analyzed to determine concentrations of nine chlorinated hydrocarbon pesticides and polychlorinated biphenyls (PCB's). Grand lake mean data for sediments from 63 Illinois lakes are presented in Table 5.

Aldrin/Dieldrin/Endrin

Aldrin, because of its rapid conversion to dieldrin and its potential for bioaccumulation and carcinogenicity, has been banned for use as an insecticide in the United States by the U.S. Environmental Protection Agency (Metcalf and Sanborn 1975). Aldrin is metabolically converted via expoxidation to dieldrin by aquatic organisms (USEPA 1976). Metcalf and Sanborn (1975) found dieldrin to be slightly more water soluble than aldrin and therefore to exhibit slightly lower bioaccumulations in fish. Residue accumulation of aldrin and its epoxide is well documented, with concentration factors of up to 100,000 reported for fish taken from Lake Michigan (USEPA 1976).

Endrin is the endo, endo-isomer of dieldrin and is less persistent in the aquatic environment than is dieldrin. Despite the fact that endrin is highly water-insoluble, it was accumulated (i.e., bioconcentrated) in the micro-ecosystems of Metcalf and Sanborn (1975) to a large degree. They reported water concentrations of 1-2 ug/l toxic to Daphnia, mosquito larvae, and fish. Jensen and Gaufin (1966) reported levels of 0.035 ug/l toxic to the stonefly naiad, Acroneuria pacifica. The U. S. Environmental Protection Agency has suspended the use and production of dieldrin (USEPA 1976).

Aldrin and endrin were not detected in any of the 273 sediment samples analyzed for these compounds. The minimum detectable level for both of these constituents and dieldrin was 1 ug/kg (i.e., 1 ppb). Dieldrin, however, was encountered in more sediment samples than any other pesticide assayed during this study. Dieldrin was detected in 154 of the 273 samples (i.e., 58%). The highest detected concentration was 87 ug/kg found in a Lake Bloomington sediment sample. Only 19 sediment samples, however, contained concentrations in excess of 20 ug/kg. Highest concentrations were found in Bloomington, Shabbona, Paradise, Jacksonville, and Highland Silver Lakes, all artificial impoundments with watersheds that are primarily in row crop cultivation. The mean sediment concentration for Illinois lakes was approximately 6 ug/kg.

Chlordane/Heptachlor/Heptachlor Epoxide

Chlordane is a chlorinated hydrocarbon insecticide which acts as either a stomach poison for leaf eating insects or contact poison for household or soil inhabiting pests. Technical chlordane is a mixture of numerous compounds. Velsicol Chemical Corporation, now the only manufacturer of this insecticide, has subsequently standardized the percentage of fractional components of technical chlordane. Trans- and cis-chlordane compose approximately 25 and 20 percent, respectively, and chlordane and heptachlor compose 22 and 10 percent, respectively (Musselman 1979). Heptachlor epoxide and oxychlordane are degradation products which have been found to accumulate in fish tissue at high levels (Musselman 1979), as has the parent material which concentrates by a factor of 1,000 to 3,000 in fish and in invertebrates by twice this amount. Published acute toxicity values for these compounds range from 5 to 3,000 ug/l (USEPA 1976). Chlordane and its derivatives have been shown to cause cancer in mice and have been implicated in egg-shell thinning particularly in fish-eating raptors, most notably the osprey and bald eagle (Musselman 1979). In short, chlordane and its derivatives are highly persistent chemicals which have been found to bioaccumulate in aquatic food webs, thus necessitating the desirability of maintaining environment levels at a minimum.

Heptachlor was detected in only 6 sediment samples, all of which were taken from Paradise Lake. Concentrations of heptachlor in Paradise Lake sediments ranged from 1.1 ug/kg (barely above the minimum detectable level of 1.0 ug/kg) to 5.7 ug/kg. Heptachlor was not detected in a single sediment sample from the remaining 62 Illinois lakes.

Heptachlor epoxide was detected in 25% (67 of 266) of the sediment samples analyzed. Only two samples contained concentrations in excess of 7 ug/kg; these were single samples taken from Mattoon and Bloomington which contained 12 and 13 ug/kg, respectively.

Alpha and gamma chlordane were detected in 90 of 266 (34%) lake sediment samples analyzed. Detected concentrations rarely exceeded 20 ug/kg; highest concentrations of 52 and 45 ug/kg were found in sediment samples taken from Lake Taylorville and Carlinville Lake, respectively. Chlordane and its derivatives have been widely used for agricultural and non-agricultural uses. The USEPA has determined that all agricultural uses will be phased out by September, 1982 (Musselman 1979). As, a result, surficial sediment concentrations should steadily decrease in those lake sediments derived from watersheds with a high degree of row crop cultivation.

Lindane/Methoxychlor

Lindane (an addition product of benzene and chlorine reacting in direct sunlight) and methoxychlor (one of the more water soluble chlorinated insecticides) were not detected in any sediment sample analyzed. The minimum detectable levels of lindane and methoxychlor were 1 and 5 ug/kg, respectively.

Total DDT

Because of its persistence (and eventual degradation to the more stable DDE) and high potential for bioaccumulation, DDT has been banned for use as an insecticide by both the USEPA and Illinois EPA (Metcalf and Sanborn 1975). DDT is also considered a potential human carcinogen (USEPA 1976). Residue accumulations in fish of up to two million times that of water have been reported; as a result, USEPA has recommended that concentrations in water should not exceed 0.001 ug/l.

Total DDT was detected in 50 of 266 (19%) samples analyzed. The minimum detectable level was 5 ug/kg. Detected concentrations exceeded 20 ug/kg in only two lakes studied (i.e., Crystal Lake and Skokie Lagoons). The highest concentration of 102 ug/kg was found in Crystal Lake at Site 1.

Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) are compounds produced by chlorination of biphenyls; the degree of chlorination determines their chemical properties. PCBs are highly stable, non-flammable compounds which are extremely resistant to heat (USEPA 1976). Due to their heat resistant properties PCBs are well suited to a multitude of industrial applications. The five most common uses prior to 1970 were for dielectric fluids in capacitors, plasticiser applications, transformer fluids, heat transfer fluids, and hydraulic fluids and lubricants (Sport Fisheries Institute 1977). Monsanto was the sole producer of PCBs in the United States and marketed the product under the trade name AROCLOR. Monsanto voluntarily restricted sales in 1971 to only "closed systems" applications (i.e., electrical capacitors and transformers) (Sport Fisheries Institute 1977). The toxic substances act of 1976 (PL 94-469) prohibited manufacture of PCBs after December 31, 1978 and prohibited processing and distribution after July 30, 1979 (USEPA 1976).

World attention was focused on potential toxic effects of PCBs when 29 deaths occurred among 1291 patients treated for the accidental ingestion of PCBs contaminated rice in Yusho, Japan in 1968. Concentrations of PCBs in the contaminated rice oil averaged 2,500 ppm which was well above the recommended 5 ppm set for fish flesh by the FDA. It was later found that the contaminated rice oil also contained 5 ppm chlorinated dibenzofurans which are estimated to be at least 200 times more toxic than PCBs; as a result, it was difficult to attribute toxic effects of rice oil to PCBs alone (SFI 1977). PCBs cause skin lesions and increase liver enzyme activitiy which may have a secondary effect on reproduction. They bioaccumulate in the food web and collect in the fatty tissues of man and other animals (USEPA 1976).

PCBs were detected in only 14 (or 5%) of the sediment samples analyzed. The 14 sediment samples in which PCBs were detected came from seven of the study lakes: Bangs, Diamond, Skokie Lagoons, Long, Round, Marion Reservoir, and Lake of the Woods. Detected concentrations for individual samples are presented in Table 27. The four glacial lakes (Bangs, Diamond, Long and Round) and Skokie Lagoons are all located near the Chicago metropolitan area; therefore, considering the high degree of industrialization occurring there, slight traces of PCBs in sediments are not surprising. Traces of PCBs in sediments from Marion Reservoir (a municipal water supply) and Lake of the Woods (a recreational lake located near Champaign) are not easily explained. All detected concentrations were small; several just barely exceeded the minimum detectable level of 10 ug/kg. Due to the low number of samples in which PCBs were detected, no attempts were made to correlate this parameter with others. Likewise a comparison of means by lake type was not attempted; however, it does appear that glacial lakes as a group would exhibit a higher mean.

TABLE 27. Concentrations of PCB's (ug/kg sediment dry weight) detected in sediment samples collected from Illinois lakes.

Lake	Site	1		2		3	
	Replicate	A	B	A	B	A	B
Bangs		12	ND	ND	ND	12	ND
Diamond		ND	ND	12	ND	ND	ND
Skokie Lagoons		12	43	26	42	18	ND
Long		13	ND	ND	ND	ND	ND
Round		17	ND	ND	ND	ND	ND
Marion		18	22	*	*	ND	ND
Lake of the Woods		*	*	41	56	*	*

ND = not detected * = no sample taken

EFFECTS OF MORPHOLOGICAL VARIABLES ON SEDIMENT CHEMISTRY

Most previous sediment studies on individual lakes (e.g., Frink 1969, Thomas and Jaquet 1975, Pita and Hyne 1975) have demonstrated a trend in increasing concentrations of numerous constituents (e.g., organic carbon, total phosphorus, chromium, copper, iron, manganese) in a downlake direction in reservoirs (toward the dam) or toward the center of glacial lakes. Whether glacial or artificial, these increases are apparently depth dependent. It is generally believed that increases in many of these substances are attributable to the binding of these substances to clay or organic particles in suspension. Similar constituent increases within lakes were specifically noted in several of the intensive lake reports (Appendix Table A). The extent to which clay particles and/or organic particles and associated constituents settle out should be, in part, a function of lake morphology. It was anticipated that correlations between certain parameters and lake morphometric data were likely. Since the extent of settling is a function of time, it was further anticipated that retention time would be an important morphometric variable which might affect sediment constituent concentrations particularly at the deeper sites (i.e., Site 1).

Mean Site 1 sediment values for all constituents were computed for each lake; these were regressed against mean lake morphometric data (e.g., surface area, retention time, mean depth) to detect simple linear relationships. A partial correlation matrix is presented (Table 28) for regression of morphological variables against mean sediment constituent concentrations at Site 1. Since not all lakes were sampled at Site 1 and since complete morphological data were not available for all 63 Illinois lakes monitored, sample size varied. As is apparent from Table 28, retention time was the single most important morphological variable accounting for variance in sediment constituent concentrations. Notably, organic carbon (i.e., total Kjeldahl nitrogen, COD, and volatile solids), lead, and mercury concentrations were strongly correlated with retention time; however, these relationships (as are all those demonstrated by regression analysis) are not necessarily cause and effect relationships. In fact, the lead to retention time relationship may be largely fortuitous. Highest sediment lead concentrations may be attributable largely to atmospheric fallout (implicated also in Kemp et al's 1975 study of Lake Erie) in lakes surrounding the Chicago area. With the exception of Skokie Lagoons, only glacial lakes were sampled in the Chicago area, and since as a group glacial lakes exhibited typically greater retention times (i.e., mean retention time for glacial lakes was 3.89 years contrasted to a grand mean for all lakes of 1.39 years), it was not clear, for glacial lakes, whether retention time or location exerted the greater effect.

TABLE 28. Partial correlation matrix presenting only the most significant (p≤0.0050) correlations between morphological factors and mean constituent concentration in Site 1 sediments (r=correlation coefficient, p=significance level, n=sample size).

	Surface Area	Maximum Depth	$\bar{X}$ Depth	Drainage Area	Storage Capacity	Retention Time
VOLATILE SOLIDS						r=0.4182 p=0.0000 n= 52
TOTAL KJELDAHL NITROGEN						0.5745 0.0001 53
TOTAL PHOSPHORUS		-0.4159 0.0011 59				
COD						0.6748 0.0001 53
LEAD						0.7518 0.0001 53
COPPER						
IRON						-0.3790 0.0051 53
MERCURY						0.6433 0.0001 53
ZINC						0.4211 0.0017 53
MANGANESE		0.6396 0.0001 59	0.6701 0.0001 59		0.5196 0.0001 59	
ARSENIC						
CADMIUM						
CHROMIUM						
C:N RATIO		0.4419 0.0005 58	0.3763 0.0036 58		0.3628 0.0051 58	

FISH FLESH CONCENTRATIONS VS. SEDIMENT CONCENTRATIONS

While considerable research has been conducted on the possible toxic effects of elevated levels of various constituents in water, little work has been done connecting sediment concentrations to possible toxic effects. Quite often certain constituents which are potentially toxic will not be detected in overlying water since they are not readily soluble. It might ultimately prove to be true that if in-water concentrations are low or undetectable, there is little need to be concerned with sediment concentrations; however, this has not yet been demonstrated. It is known that plants can accumulate substances from soil, and that organisms living in association with sediments can accumulate substances from sediments as well. Very little data exists which relates surficial lake sediment constituent concentrations to concentrations in biota. Typically, biomagnification factors are expressed by contrasting water concentrations with concentrations in fish flesh. Since there was some recent fish flesh data available for twelve of the lakes monitored during this study, an attempt was made to ascertain any relationship which might exist between sediment concentrations and fish flesh concentrations for selected parameters.

The results of fish flesh analysis for selected pesticides and mercury are presented in Table 29. The fish flesh data and the short methods description which follows were excerpted from "Volume I, Illinois Water Quality Inventory Report: 1978-1978" (IEPA 1980). Fish flesh samples (i.e., filets) were analyzed for ten pesticides (i.e., dieldrin, DDT, PCBs, aldrin, endrin, methoxychlor, heptachlor, heptachlor epoxide, chlordane, and lindane) and mercury by one of two labs (Illinois Dept. of Public Health or Illinois Dept. of Agriculture). Only values greater than detection limits are reported in Table 29. In general detection limits for all compounds were 0.01 ppm.

Mean sediment concentrations of DDT, dieldrin, chlordane, mercury, heptachlor epoxide and PCBs for the twelve study lakes for which there is fish flesh data available are presented in Table 29. Since the species of fish analyzed for pesticides and mercury varied between lakes, data analysis was restricted to one of three common species of fish: channel catfish, carp or buffalo. Since pesticide concentrations tended to be higher in catfish, a comparison was attempted between pesticide concentrations in channel catfish with respective pesticide concentrations in sediments. If channel catfish data were not available, carp (first choice) or buffalo (second choice) concentrations were used. Pearson correlation coefficients were generated for fish versus respective sediment constituent concentrations. The same data were then ranked from lowest to highest and Spearman coefficients computed based on these ranks. The results of these analyses are presented in Table 30. As is apparent, no significant correlations (Pearson or Spearman) were found relating sediment concentrations to fish flesh concentrations. It should be reiterated that little fish flesh data were available. While the approach taken here is admittedly simplistic, it does not seem unrealistic to believe that a correlation might be expected. The lack of sufficient fish data from a common species detracts from the analysis. It should also be pointed out that much of the sediment data comes from samples taken at depths and under conditions (i.e., anaerobic) which would deter fish from feeding in these areas. Perhaps littoral sediments would be better suited for such an analysis. Without the establishment of defined relationships

TABLE 29 Selected fish flesh data for 12 Illinois lakes.

Lake Name	Date	Species (n)	$\bar{X}$ Weight (±SD)	$\bar{X}$ Length (±SD)	Total DDT	Dieldrin	Chlordane	Hg	Heptachlor Epoxide	PCB's	Lab Performing Analysis
Vermilion	1978	Largemouth Bass			0.03	00.04	0.2				Illinois Dept. Public Health (IDPH)
		Carp			0.29	0.30	0.9*				
		Channel Catfish			0.45	0.37*	1.7*				
	9/05/79	Sediment $\bar{X}$ (2)			12	12	11.5	0.06	1 15	<10	IEPA
Lincoln Trail	7/25/79	Largemouth Bass (5)	0.81(0.18)			0.01	0.01	0 42			Illinois Dept. of Agriculture (IDOA)
		Redear Sunfish (5)	0.43(0.10)			0.01	0.01	1.10*			
		Channel Catfish (5)	1.03(0 42)			0.04	0.03	0.18			
	10/25/79	Redear Sunfish (5)	0.80(0.14)					0 07			IDOA
		Redear Sunfish (5)	0.57(0.07)					0 04			
		Redear Sunfish (5)	0 81(0 14)					0.07			
		Bluegill (7)	0.25(0.12)					0.12			
		Bluegill (7)	0.26(0.11)					0.10			
	7/31/79	Sediment $\bar{X}$ (3)			<5	2.8	<5	0.06	<1.00	<10	IEPA
Lake Mattoon	7/20/79	Carp (5)	2.44(1.09)			0.08	0.07	0.15			IDOA
		Carp (5)	1.87(1.10)			0.07	0.08	0.08			
		Largemouth Bass (5)	1.68(0.87)			0.05	0.05	0.17			
	6/05/79	Sediment $\bar{X}$ (6)			<5	15.6	17.5	0.06	4.02	<10	IEPA
Lake Paradise	7/20/79	Carp (5)	1.01(0.23)			0.21	0.18	0.12			IDOA
		Carp (5)	1.15(0.34)			0.20	0.12	0.26			
		Largemouth Bass (5)	2.60(0.17)			0.08	0.05	0 23			
		Channel Catfish (2)	0.77(0.04)			0.26	0.16	0 13			
	5/23/79	Sediment $\bar{X}$ (6)			<5	32.2	15.8	0.15	5.07	<10	IEPA
Canton Lake	5/17/78	Carp (5)	4.57(1.32)			0.07	0.16	0.25	0.05		IDOA
		Carp (5)	4.47(2.64)			0.06	0.13	0.30	0.05		
		Channel Catfish (2)	4.12(0.88)			0.25	0.40	0.38	0 10		
		Largemouth Bass (3)	3.42(1.36)								
	8/23/79	Sediment $\bar{X}$ (2)			<5	7.2	6.0	0.08	<1.00	<10	IEPA
Carlinville Lake	5/24/78	Largemouth Bass (3)	2.83(0.25)			0.08	0.22	0.27			IDOA
		White Crappie (5)	0.69(0 05)			0.04	0.03	0.14			
		Drum (5)	0 30(0.13)			0.03	0.06	0.07			
		Gizzard Shad (4)	0.14(0.05)			0.25	0.73*	0.03			
		Channel Catfish (6)	0.84(0 13)			0.01	0.06	0.05			
		Bluegill (12)	0.20(0.06)			0.03	0.07	0.10			
	8/28/79	Sediment $\bar{X}$ (1)			8.2	20.0	45.0	0.12	3.20	<10	
Lake Decatur	1978	Shorthead Redhorse			0.11	0.04	0.2				IDPH
		Freshwater Drum				0.03	0.3				
		Channel Catfish			0.67	0.24	2.0*				
		Carp			0.24	0.04	0.5*				
		Highfin Carpsucker			0.19	0.11	0.5*				
		Golden Redhorse			0.17	0.03	0.3*				
	8/20/79	Sediment $\bar{X}$ (2)			5	16.5	10.4	0.06	2.00	<10	
Lake Sangchris	10/13/78	Largemouth Bass (3)		18.0(0.9)		0.3	0.02	0.13			IDOA
		Channel Catfish (3)		17.7(2.8)		0.10	0.43	0.06			
		Carp (3)		18.0(2 0)		0.02	0.02	0.08			
		Carp (3)		18.2(3.3)		0.01	0.01	0.07			
	10/11/79	Carp (6)	2.87(0.59)			0.02		0.04	0.01		
		Carp (5)	2.35(0.35)			0.01		0 03			
		Largemouth Bass (5)	3.20(0.34)			0.04		0.07	0 01		
		Channel Catfish (2)	0.73(0.31)			0.12		0 06	0.03		
	8/21/79	Sediment $\bar{X}$ (3)			5	8.6	10.3	0.05	1.27	<10	
Lake Taylorville	8/20/79	Bigmouth Buffalo (5)	2.59(1 49)			0.20	0.51*	0.05			IDOA
		Bigmouth Buffalo (5)	3.04(0.45)			0.12	0.52*	0.05			
	8/26/79	Sediment $\bar{X}$ (3)			8.6	9.5	30.1	0.06	2.60	<10	
Lake Springfield	9/-/78	Buffalo				0.17	0.74*	0.10			IDOA
		Carp				0.02	0.10	0.08			
		Channel Catfish				0.34*	1.39*	0.07			
		White Crappie				0.04	0.12	0.09			
		Yellow Bass				0.04	0.02	0.11			
		Freshwater Drum				0.04	0.09	0.10			
		Largemouth Bass				0.12	0.40*	0 13			
		White Bass				0.15	0.39*	0.06			
		Gizzard Shad				0.14	0.45*	0.09			
		Flathead Catfish				1.60*	6.70*	0.08			
	8/28/79	Largemouth Bass (5)	2.00(0.21)			0.03	0.05	0.05			IDOA
		Freshwater Drum (5)	1.07(0.56)			0.01	0.01	0.10			
		Carp (5)	1.97(0 79)			0.02	0.05	0.06			
		Channel Catfish (5)	1.66(0.76)			0.26	0.90*	0.04			
		Carp (5)	2.81(0.65)			0.03	0.06	0.05			
		Bigmouth Buffalo (5)	17.50(10 61)			0.75*	1.54*	0.06			
	8/22/79	Sediment $\bar{X}$ (1)			<5	20.0	13.0	0.08	<1.00	<10	IEPA
Lake Vandalia	6/15/79	Carp (5)	2.45(0.78)			0.02	0.08	0.07			IDOA
	8/28/79	Sediment $\bar{X}$ (2)			<5	1.4	5.7	0.08	<1 00	<10	IEPA
Channel Lake	8/28/79	Largemouth Bass (5)	2.55(0 79)								IDPH
		Channel Catfish (5)	2.71(0.71)							0.4	
		Carp (5)	4.25(0.66)							0.2	
		Quillback Carpsucker (1)								0.3	
	6/06/79	Sediment $\bar{X}$ (6)			<5	<1.0	<5.0	0.16	<1.00	<10	IEPA

between sediment concentrations and fish flesh concentrations, analysis of fish flesh data for pesticide concentrations from a health standpoint would appear to be the analysis of choice. Unless there is a need to establish background sediment concentrations for selected lakes or to pinpoint possible contaminated sediment areas in a lake, any further monitoring for pesticides on a regular basis (e.g., as part of a yearly ambient monitoring program) of the lake sediments monitored during this study would not appear justified.

TABLE 30. Correlations between respective mean constituent concentrations in fish flesh and surficial lake sediments from 12 Illinois lakes sampled summer 1979.

Constituent	Pearson Coefficient Significance probability Sample size	Spearman Coefficient Significance probability Sample size
DDT	-0.1796 0.5766 12	0.1341 0.6779 12
Dieldrin	0.2534 0.4269 12	0.1863 0.5621 12
Chlordane	0.2452 0.4425 12	0.5406 0.0695 12
Heptachlor epoxide	-0.2675 0.4006 12	-0.2230 0.4861 12
PCBs (below detection in all sediment samples)	0.0000 1.0000 12	0.0000 1.0000 12
Mercury	-0.0699 0.8291 12	0.0588 0.8559 12

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APPENDIX

APPENDIX TABLE A. List of recent IEPA lake reports.

Boland, D.H.P., D.J. Schaeffer, D.F. Sefton, R.P. Clarke, and R.J. Blackwell. 1979. Trophic Classification of Selected Illinois Water Bodies: Lake Classification through Amalgamation of LANDSAT Multispectral Scanner and Contact-Sensed Data. EPA-600/3-79-123. Environmental Monitoring Systems Laboratory, USEPA, Las Vegas, Nevada. 225 p.

Hite, R.L., M.H. Kelly, and M.M. King. 1980. Limnology of Devil's Kitchen Lake, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois Environmental Protection Agency; Marion, Illinois. 99 p.

Hite, R.L., M.H. Kelly, and M.M. King. 1980. Limnology of Mattoon Lake, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois Environmental Protection Agency; Marion, Illinois. 79 p.

Hite, R.L., M.H. Kelly, and M.M. King. 1980. Limnology of Lake of Egypt, May-October, 1979. Monitoring Unit: Division of Water Pollution Control; Illinois Environmental Protection Agency; Marion, Illinois. 99 p.

Hite, R.L., M.H. Kelly, and M.M. King. 1980. Limnology of Paradise Lake, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois Environmental Protection Agency; Marion, Illinois. 81 p.

Hite, R.L., M.H. Kelly, and M.M. King. 1980. Limnology of Raccoon Lake, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois Environmental Protection Agency; Marion, Illinois. 80 p.

Hite, R.L., M.H. Kelly, and M.M. King. 1980. Limnology of Stephen A. Forbes Lake, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois Environmental Protection Agency; Marion, Illinois. 76 p.

Illinois Environmental Protection Agency. 1980. Limnology of Cedar Lake, Lake County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA; Springfield, Illinois. 68 p.

Illinois Environmental Protection Agency. 1980. Limnology of Johnson Sauk Trail Lake, Henry County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA, Springfield, Illinois. 61 p.

Illinois Environmental Protection Agency. 1980. Limnology of Lake Taylorville, Christian County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA, Springfield, Illinois. 80 p.

Illinois Environmental Protection Agency. 1980. Limnology of Lincoln Trail Lake, Clark County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA, Springfield, Illinois. 85 p.

Illinois Environmental Protection Agency. 1980. Limnology of Long Lake, Lake County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA; Springfield, Illinois. 75 p.

Illinois Environmental Protection Agency. 1980. Limnology of Otter Lake, Macoupin County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA; Springfield, Illinois. 80 p.

Illinois Environmental Protection Agency. 1980. Limnology of Pittsfield City Lake, Pike County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA; Springfield, Illinois. 87 p.

Illinois Environmental Protection Agency. 1980. Limnology of Round Lake, Lake County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA; Springfield, Illinois. 67 p.

Illinois Environmental Protection Agency. 1980. Limnology of Shabbona Lake, DeKalb County, Illinois, May-October, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA; Springfield, Illinois. 65 p.

Sefton, D.F. 1978. Assessment and Classification of Illinois Lakes, Vols. I and II. 208 Water Quality Management Planning Program Staff Report. Illinois Environmental Protection Agency; Springfield, Illinois.

Sefton, D.F. 197c. Clean Lakes Strategy for Illinois. 208 Water Quality Management Planning Program Staff Report. Illinois Environmental Protection Agency; Springfield, Illinois. 55 p.

Sefton, D.F., M.H. Kelly, and M. Meyer. 1980. Limnology of 63 Illinois lakes, 1979. Monitoring Unit; Division of Water Pollution Control; Illinois EPA. Springfield, Illinois. 247 p.

APPENDIX TABLE B. Volatile solids concentrations (%) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. A period (.) denotes a missing value. Listing is in order of increasing value.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
STEPHEN A FORBES LAKE	1	.	OTTER LAKE	1	7.20	SKOKIE LAGOONS	2	9.40
LAKE DECATUR	1	.	SKOKIE LAGOONS	3	7.20	WOLF LAKE	3	9.40
DEVILS KITCHEN LAKE	1	.	RACCOON LAKE	2	7.20	LAKE LOU YAEGER	1	9.50
CEDAR LAKE	3	.	SANGCHRIS LAKE	3	7.30	PARIS EAST AND WEST LAKE	1	9.60
CEDAR LAKE	3	.	MCLEANSBORO NEW RESERVOIR	3	7.30	LAKE JACKSONVILLE	1	9.60
CEDAR LAKE	1	.	LAKE LE-AQUA-NA	3	7.30	SKOKIE LAGOONS	1	9.60
CEDAR LAKE	1	.	LAKE OF EGYPT	2	7.40	SAM DALE STATE LAKE	1	9.70
CEDAR LAKE	2	.	ANDERSON LAKE	1	7.40	LAKE SHABBONA	2	9.70
CEDAR LAKE	2	.	DAWSON LAKE	2	7.40	SAM PARR LAKE	1	9.80
CEDAR LAKE	1	.	LAKE TAYLORVILLE	1	7.40	DEVILS KITCHEN LAKE	3	9.80
CEDAR LAKE	1	.	GLEN O JONES LAKE	1	7.50	LAKE SHABBONA	3	9.90
CEDAR LAKE	3	.	LAKE OF EGYPT	2	7.50	HARRISBURG LAKE	1	10.00
CEDAR LAKE	3	.	RACCOON LAKE	2	7.50	LAKE SHABBONA	3	10.00
CEDAR LAKE	2	.	SAM DALE STATE LAKE	3	7.60	PARIS EAST AND WEST LAKE	1	10.19
CEDAR LAKE	2	.	MCLEANSBORO NEW RESERVOIR	3	7.60	DAWSON LAKE	1	10.19
GLADSTONE LAKE	3	0.60	WASHINGTON COUNTY LAKE	1	7.60	LAKE STOREY	1	10.19
GLADSTONE LAKE	3	0.60	CRAB ORCHARD LAKE	1	7.60	CRYSTAL LAKE	2	10.19
LONG LAKE	2	1.70	PIERCE STATE LAKE	2	7.60	ROUND LAKE	2	10.19
WOLF LAKE	2	1.90	LAKE VERMILION	1	7.70	PARADISE LAKE	1	10.39
PITTSFIELD CITY LAKE	3	2.30	ANDERSON LAKE	1	7.70	PARADISE LAKE	2	10.39
LONG LAKE	2	2.50	JOHNSON SAUK TRAIL LAKE	1	7.70	PIERCE STATE LAKE	1	10.39
LAKE OF EGYPT	3	3.40	LAKE LE-AQUA-NA	1	7.70	CRYSTAL LAKE	2	10.39
PITTSFIELD CITY LAKE	3	3.40	LAKE SPRINGFIELD	1	7.77	SAM DALE STATE LAKE	1	10.50
PITTSFIELD CITY LAKE	3	3.40	LAKE BLOOMINGTON	3	7.80	LAKE SHABBONA	3	10.50
LAKE OF EGYPT	3	3.60	PITTSFIELD CITY LAKE	2	7.80	LAKE SARA	1	10.59
GLEN O JONES LAKE	3	4.20	SANGCHRIS LAKE	1	7.80	LAKE STOREY	1	10.59
PITTSFIELD CITY LAKE	1	4.20	KINKAID LAKE	1	7.80	CRYSTAL LAKE	1	10.59
HIGHLAND SILVER LAKE	3	4.20	JOHNSON SAUK TRAIL LAKE	1	7.80	MARION RESERVOIR	3	10.69
LAKE SHABBONA	1	4.30	LAKE OF EGYPT	1	7.90	LAKE SHABBONA	1	10.69
SANGCHRIS LAKE	2	4.40	LAKE VERMILION	1	7.90	LAKE SHABBONA	3	10.79
LAKE GEORGE	3	4.40	LAKE MATTOON	2	7.90	LAKE SHABBONA	1	11.00
HIGHLAND SILVER LAKE	3	4.50	SPRING LAKE	1	7.90	CRYSTAL LAKE	1	11.00
LAKE GEORGE	3	4.70	PITTSFIELD CITY LAKE	2	7.90	LONG LAKE	2	11.19
LAKE SHABBONA	1	4.70	DAWSON LAKE	3	7.90	STEPHEN A FORBES LAKE	1	11.29
DOLAN LAKE	3	4.80	WASHINGTON COUNTY LAKE	1	7.90	DEVILS KITCHEN LAKE	2	11.39
DOLAN LAKE	3	4.90	CRAB ORCHARD LAKE	1	7.90	LAKE MURPHYSBORO	1	11.59
GLEN O JONES LAKE	3	4.90	DAWSON LAKE	2	8.00	LONG LAKE	3	11.59
OLNEY EAST FORK RESERVOIR	1	5.00	LAKE OF THE WOODS	2	8.00	DEVILS KITCHEN LAKE	2	11.69
OLNEY EAST FORK RESERVOIR	1	5.00	LAKE BLOOMINGTON	1	8.10	JOHNSON SAUK TRAIL LAKE	2	11.69
OTTER LAKE	3	5.20	RACCOON LAKE	1	8.10	LONG LAKE	2	11.69
PIERCE STATE LAKE	3	5.20	SPRING LAKE	1	8.20	LAKE MURPHYSBORO	1	11.79
CRAB ORCHARD LAKE	3	5.30	CANTON LAKE	1	8.20	PARADISE LAKE	1	11.89
CRAB ORCHARD LAKE	3	5.40	LAKE OF THE WOODS	2	8.20	WALNUT POINT STATE LAKE	1	12.09
LONG LAKE	3	5.50	RACCOON LAKE	1	8.20	DEVILS KITCHEN LAKE	1	12.50
PITTSFIELD CITY LAKE	2	5.50	SAM DALE STATE LAKE	3	8.30	LONG LAKE	3	12.66
LAKE GEORGE	2	5.50	LAKE BLOOMINGTON	2	8.30	LONG LAKE	3	12.96
PIERCE STATE LAKE	3	5.53	WOLF LAKE	3	8.30	DIAMOND LAKE	1	13.00
WASHINGTON COUNTY LAKE	3	5.60	LINCOLN TRAIL STATE LAKE	2	8.40	DIAMOND LAKE	3	13.00
PITTSFIELD CITY LAKE	2	5.70	LAKE MATTOON	1	8.40	FOX LAKE	3	13.29
WOLF LAKE	2	5.70	MT STERLING LAKE	1	8.40	LONG LAKE	1	13.29
LAKE GEORGE	1	5.70	PITTSFIELD CITY LAKE	1	8.40	DIAMOND LAKE	1	13.39
RACCOON LAKE	3	5.70	PITTSFIELD CITY LAKE	1	8.40	SPRING LAKE	1	13.50
HARRISBURG LAKE	3	5.80	DAWSON LAKE	1	8.40	DIAMOND LAKE	2	13.69
LONG LAKE	3	5.80	DEVILS KITCHEN LAKE	3	8.40	ROUND LAKE	1	13.69
RACCOON LAKE	3	5.80	LAKE SARA	1	8.50	LONG LAKE	1	13.69
JOHNSON SAUK TRAIL LAKE	3	5.80	CARLINVILLE LAKE	1	8.50	LONG LAKE	3	13.69
LAKE SHABBONA	2	5.80	DAWSON LAKE	3	8.50	SPRING LAKE	1	13.79
OTTER LAKE	2	6.00	LAKE MATTOON	1	8.60	DIAMOND LAKE	2	13.79
SILOAM SPRINGS LAKE	1	6.00	SKOKIE LAGOONS	1	8.60	FOX LAKE	1	13.79
WASHINGTON COUNTY LAKE	3	6.00	STEPHEN A FORBES LAKE	2	8.70	ROUND LAKE	1	13.79
HARRISBURG LAKE	3	6.10	STEPHEN A FORBES LAKE	2	8.70	LONG LAKE	1	13.79
LINCOLN TRAIL STATE LAKE	3	6.10	HIGHLAND SILVER LAKE	1	8.70	DIAMOND LAKE	3	13.89
LAKE LE-AQUA-NA	2	6.10	LAKE LE-AQUA-NA	1	8.70	FOX LAKE	1	13.89
HORSESHOE LAKE	3	6.20	LAKE MATTOON	2	8.80	FOX LAKE	3	13.89
HORSESHOE LAKE	3	6.30	ARGYLE LAKE	1	8.80	ROUND LAKE	1	14.19
LAKE GEORGE	2	6.30	LAKE DECATUR	1	8.80	ROUND LAKE	1	14.19
CRYSTAL LAKE	3	6.40	MARION RESERVOIR	1	8.80	FOX LAKE	2	14.59
LAKE GEORGE	1	6.50	LAKE MURPHYSBORO	3	8.80	FOX LAKE	2	14.59
LAKE LE-AQUA-NA	3	6.50	DOLAN LAKE	1	8.90	LONG LAKE	1	14.59
SILOAM SPRINGS LAKE	1	6.60	LAKE MURPHYSBORO	3	8.90	HORSESHOE LAKE	1	14.69
PITTSFIELD CITY LAKE	1	6.60	LAKE SHABBONA	2	8.90	CHANNEL LAKE	2	15.59
SKOKIE LAGOONS	3	6.60	PARADISE LAKE	2	9.00	CHANNEL LAKE	1	15.69
JOHNSON SAUK TRAIL LAKE	3	6.60	ARGYLE LAKE	1	9.00	CHANNEL LAKE	1	15.69
LAKE LE-AQUA-NA	2	6.60	MT STERLING LAKE	1	9.00	CHANNEL LAKE	2	15.69
PARADISE LAKE	3	6.70	PIERCE STATE LAKE	2	9.00	HORSESHOE LAKE	1	15.79
LAKE TAYLORVILLE	3	6.70	LAKE BLOOMINGTON	2	9.07	ROUND LAKE	2	16.00
LAKE TAYLORVILLE	2	6.70	LINCOLN TRAIL STATE LAKE	1	9.10	CHANNEL LAKE	3	16.09
STEPHEN A FORBES LAKE	3	6.80	MCLEANSBORO NEW RESERVOIR	1	9.10	CHANNEL LAKE	3	16.09
STEPHEN A FORBES LAKE	3	6.80	MARION RESERVOIR	3	9.10	ROUND LAKE	2	16.89
LAKE MATTOON	3	6.90	VANDALIA CITY LAKE	1	9.10	ROUND LAKE	2	18.19
CRYSTAL LAKE	3	6.90	JOHNSON SAUK TRAIL LAKE	2	9.10	HORSESHOE LAKE	2	18.59
OLNEY EAST FORK RESERVOIR	3	6.93	LAKE SHABBONA	2	9.10	HORSESHOE LAKE	2	18.69
LAKE MATTOON	3	7.00	LAKE BLOOMINGTON	1	9.20	ROUND LAKE	3	18.69
KINKAID LAKE	3	7.00	HIGHLAND SILVER LAKE	1	9.20	ROUND LAKE	3	18.69
PARADISE LAKE	3	7.10	VANDALIA CITY LAKE	1	9.20	BANGS LAKE	1	18.89
SKOKIE LAGOONS	2	7.10	CANTON LAKE	1	9.30	BANGS LAKE	3	18.89
KINKAID LAKE	1	7.10	MCLEANSBORO NEW RESERVOIR	1	9.30	BANGS LAKE	3	19.39
GLEN O JONES LAKE	1	7.17	MARION RESERVOIR	1	9.30	BANGS LAKE	1	19.79
LAKE OF EGYPT	1	7.20	KINKAID LAKE	3	9.30	BANGS LAKE	2	20.00
OLNEY EAST FORK RESERVOIR	3	7.20	DOLAN LAKE	1	9.40	BANGS LAKE	2	22.19
LAKE BLOOMINGTON	3	7.20	HARRISBURG LAKE	1	9.40	PIERCE STATE LAKE	1	28.39

APPENDIX TABLE C. Organic carbon (computed from volatile solids data) concentrations (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. A period (.) denotes a missing value. Listing is arranged alphabetically in order of increasing value.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
CEDAR LAKE	1	.	OTTER LAKE	1	35995	SKOKIE LAGOONS	2	46995
CEDAR LAKE	1	.	RACCOON LAKE	2	35995	WOLF LAKE	3	46995
CEDAR LAKE	1	.	SKOKIE LAGOONS	3	35995	LAKE LOU YAEGER	1	47500
CEDAR LAKE	1	.	LAKE LE-AQUA-NA	3	36495	LAKE JACKSONVILLE	1	47995
CEDAR LAKE	2	.	MCLEANSBORO NEW RESERVOIR	3	36495	PARIS EAST AND WEST LAKE	1	47995
CEDAR LAKE	2	.	SANGCHRIS LAKE	3	36495	SKOKIE LAGOONS	1	47995
CEDAR LAKE	2	.	ANDERSON LAKE	1	36995	LAKE SHABBONA	2	48495
CEDAR LAKE	2	.	DAWSON LAKE	2	36995	SAM DALE STATE LAKE	1	48495
CEDAR LAKE	3	.	LAKE OF EGYPT	2	36995	DEVILS KITCHEN LAKE	3	48995
CEDAR LAKE	3	.	LAKE TAYLORVILLE	1	36995	LAKE SHABBONA	3	48995
CEDAR LAKE	3	.	GLEN O JONES LAKE	1	37500	SAM PARR LAKE	1	48995
CEDAR LAKE	3	.	LAKE OF EGYPT	2	37500	HARRISBURG LAKE	1	50000
DEVILS KITCHEN LAKE	1	.	RACCOON LAKE	2	37500	LAKE SHABBONA	3	50000
LAKE DECATUR	1	.	CRAB ORCHARD LAKE	1	37995	CRYSTAL LAKE	2	50950
STEPHEN A FORBES LAKE	1	.	MCLEANSBORO NEW RESERVOIR	3	37995	DAWSON LAKE	1	50950
GLADSTONE LAKE	3	2999	PIERCE STATE LAKE	2	37995	LAKE STOREY	1	50950
GLADSTONE LAKE	3	2999	SAM DALE STATE LAKE	3	37995	PARIS EAST AND WEST LAKE	1	50950
LONG LAKE	2	8495	WASHINGTON COUNTY LAKE	1	37995	ROUND LAKE	2	50950
WOLF LAKE	2	9495	ANDERSON LAKE	1	38495	CRYSTAL LAKE	2	51950
PITTSFIELD CITY LAKE	3	11495	JOHNSON SAUK TRAIL LAKE	1	38495	PARADISE LAKE	1	51950
LONG LAKE	2	12500	LAKE LE-AQUA-NA	1	38495	PARADISE LAKE	2	51950
LAKE OF EGYPT	3	16995	LAKE VERMILION	1	38495	PIERCE STATE LAKE	1	51950
PITTSFIELD CITY LAKE	3	16995	LAKE SPRINGFIELD	1	38845	LAKE SHABBONA	3	52500
PITTSFIELD CITY LAKE	3	16995	JOHNSON SAUK TRAIL LAKE	1	38995	SAM DALE STATE LAKE	1	52500
LAKE OF EGYPT	3	17995	KINKAID LAKE	1	38995	CRYSTAL LAKE	1	52950
GLEN O JONES LAKE	3	20995	LAKE BLOOMINGTON	3	38995	LAKE SARA	1	52950
HIGHLAND SILVER LAKE	3	20995	PITTSFIELD CITY LAKE	2	38995	LAKE STOREY	1	52950
PITTSFIELD CITY LAKE	1	20995	SANGCHRIS LAKE	1	38995	LAKE SHABBONA	1	53450
LAKE SHABBONA	1	21495	CRAB ORCHARD LAKE	1	39495	MARION RESERVOIR	3	53450
LAKE GEORGE	3	21995	DAWSON LAKE	3	39495	LAKE SHABBONA	3	53950
SANGCHRIS LAKE	2	21995	LAKE MATTOON	2	39495	CRYSTAL LAKE	1	55000
HIGHLAND SILVER LAKE	3	22500	LAKE OF EGYPT	1	39495	LAKE SHABBONA	1	55000
LAKE GEORGE	3	23495	LAKE VERMILION	1	39495	LONG LAKE	2	55950
LAKE SHABBONA	1	23495	PITTSFIELD CITY LAKE	2	39495	STEPHEN A FORBES LAKE	1	56450
DOLAN LAKE	3	23995	SPRING LAKE	1	39495	DEVILS KITCHEN LAKE	2	56950
DOLAN LAKE	3	24495	WASHINGTON COUNTY LAKE	1	39495	LAKE MURPHYSBORO	1	57950
GLEN O JONES LAKE	3	24495	DAWSON LAKE	2	40000	LONG LAKE	3	57950
OLNEY EAST FORK RESERVOIR	1	25000	LAKE OF THE WOODS	2	40000	DEVILS KITCHEN LAKE	2	58450
OLNEY EAST FORK RESERVOIR	1	25000	LAKE BLOOMINGTON	1	40495	JOHNSON SAUK TRAIL LAKE	2	58450
OTTER LAKE	3	25995	RACCOON LAKE	1	40495	LONG LAKE	2	58450
PIERCE STATE LAKE	3	25995	CANTON LAKE	1	40995	LAKE MURPHYSBORO	1	58950
CRAB ORCHARD LAKE	3	26495	LAKE OF THE WOODS	2	40995	PARADISE LAKE	1	59450
CRAB ORCHARD LAKE	3	26995	RACCOON LAKE	1	40995	WALNUT POINT STATE LAKE	1	60450
LAKE GEORGE	2	27500	SPRING LAKE	1	40995	DEVILS KITCHEN LAKE	1	62500
LONG LAKE	3	27500	LAKE BLOOMINGTON	2	41495	LONG LAKE	3	63300
PITTSFIELD CITY LAKE	2	27500	SAM DALE STATE LAKE	3	41495	LONG LAKE	3	64800
PIERCE STATE LAKE	3	27645	WOLF LAKE	3	41495	DIAMOND LAKE	1	65000
WASHINGTON COUNTY LAKE	3	27995	DAWSON LAKE	1	41995	DIAMOND LAKE	3	65000
LAKE GEORGE	1	28495	DEVILS KITCHEN LAKE	3	41995	FOX LAKE	3	66450
PITTSFIELD CITY LAKE	2	28495	LAKE MATTOON	1	41995	LONG LAKE	1	66450
RACCOON LAKE	3	28495	LINCOLN TRAIL STATE LAKE	1	41995	DIAMOND LAKE	1	66950
WOLF LAKE	2	28495	MT STERLING LAKE	1	41995	SPRING LAKE	1	67500
HARRISBURG LAKE	3	28995	PITTSFIELD CITY LAKE	1	41995	DIAMOND LAKE	2	68450
JOHNSON SAUK TRAIL LAKE	3	28995	PITTSFIELD CITY LAKE	1	41995	LONG LAKE	1	68450
LAKE SHABBONA	2	28995	CARLINVILLE LAKE	1	42500	LONG LAKE	3	68450
LONG LAKE	3	28995	DAWSON LAKE	3	42500	ROUND LAKE	1	68450
RACCOON LAKE	3	28995	LAKE SARA	1	42500	DIAMOND LAKE	2	68950
OTTER LAKE	2	30000	LAKE MATTOON	1	42995	FOX LAKE	1	68950
SILOAM SPRINGS LAKE	1	30000	SKOKIE LAGOONS	1	42995	LONG LAKE	1	68950
WASHINGTON COUNTY LAKE	3	30000	HIGHLAND SILVER LAKE	1	43495	ROUND LAKE	1	68950
HARRISBURG LAKE	3	30495	LAKE LE-AQUA-NA	1	43495	SPRING LAKE	1	68950
LAKE LE-AQUA-NA	2	30495	STEPHEN A FORBES LAKE	2	43495	DIAMOND LAKE	3	69450
LINCOLN TRAIL STATE LAKE	3	30495	STEPHEN A FORBES LAKE	2	43495	FOX LAKE	1	69450
HORSESHOE LAKE	3	30995	ARGYLE LAKE	1	43995	FOX LAKE	3	69450
HORSESHOE LAKE	3	31495	LAKE DECATUR	1	43995	ROUND LAKE	1	70950
LAKE GEORGE	2	31495	LAKE MATTOON	2	43995	ROUND LAKE	1	70950
CRYSTAL LAKE	3	31995	LAKE MURPHYSBORO	3	43995	FOX LAKE	2	72500
LAKE GEORGE	1	32500	MARION RESERVOIR	1	43995	FOX LAKE	2	72500
LAKE LE-AQUA-NA	3	32500	DOLAN LAKE	1	44495	LONG LAKE	1	72950
JOHNSON SAUK TRAIL LAKE	3	32995	LAKE MURPHYSBORO	3	44495	HORSESHOE LAKE	1	73450
LAKE LE-AQUA-NA	2	32995	LAKE SHABBONA	2	44495	CHANNEL LAKE	2	77950
PITTSFIELD CITY LAKE	1	32995	ARGYLE LAKE	1	45000	CHANNEL LAKE	1	78450
SILOAM SPRINGS LAKE	1	32995	MT STERLING LAKE	1	45000	CHANNEL LAKE	1	78450
SKOKIE LAGOONS	3	32995	PARADISE LAKE	2	45000	CHANNEL LAKE	2	78450
LAKE TAYLORVILLE	2	33495	PIERCE STATE LAKE	2	45000	HORSESHOE LAKE	1	78950
LAKE TAYLORVILLE	3	33495	LAKE BLOOMINGTON	2	45345	ROUND LAKE	2	80000
PARADISE LAKE	3	33495	JOHNSON SAUK TRAIL LAKE	2	45495	CHANNEL LAKE	3	80450
STEPHEN A FORBES LAKE	3	33995	LAKE SHABBONA	2	45495	CHANNEL LAKE	3	80450
STEPHEN A FORBES LAKE	3	33995	LINCOLN TRAIL STATE LAKE	1	45495	ROUND LAKE	2	84450
CRYSTAL LAKE	3	34495	MARION RESERVOIR	3	45495	ROUND LAKE	2	90950
LAKE MATTOON	3	34495	MCLEANSBORO NEW RESERVOIR	1	45495	HORSESHOE LAKE	2	92950
OLNEY EAST FORK RESERVOIR	3	34645	VANDALIA CITY LAKE	1	45495	HORSESHOE LAKE	2	93450
KINKAID LAKE	3	35000	HIGHLAND SILVER LAKE	1	45995	ROUND LAKE	3	93450
LAKE MATTOON	3	35000	LAKE BLOOMINGTON	1	45995	ROUND LAKE	3	93450
KINKAID LAKE	1	35495	VANDALIA CITY LAKE	1	45995	BANGS LAKE	1	94450
PARADISE LAKE	3	35495	CANTON LAKE	1	46495	BANGS LAKE	3	94450
SKOKIE LAGOONS	2	35495	KINKAID LAKE	3	46495	BANGS LAKE	3	96950
GLEN O JONES LAKE	1	35845	MARION RESERVOIR	1	46495	BANGS LAKE	1	98950
LAKE BLOOMINGTON	3	35995	MCLEANSBORO NEW RESERVOIR	1	46495	BANGS LAKE	2	100000
LAKE OF EGYPT	1	35995	DOLAN LAKE	1	46995	BANGS LAKE	2	110950
OLNEY EAST FORK RESERVOIR	3	35995	HARRISBURG LAKE	1	46995	PIERCE STATE LAKE	1	141950

APPENDIX TABLE D. Total Kjeldahl nitrogen concentrations (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	230	LAKE LE-AQUA-NA	3	2600	SPRING LAKE	1	3600
GLADSTONE LAKE	3	290	LAKE MATTOON	3	2600	HARRISBURG LAKE	1	3700
LONG LAKE	2	710	LAKE TAYLORVILLE	1	2600	LAKE SHABBONA	3	3700
WOLF LAKE	2	890	LAKE TAYLORVILLE	2	2600	PARADISE LAKE	1	3700
PITTSFIELD CITY LAKE	3	930	LAKE VERMILION	1	2600	PIERCE STATE LAKE	1	3700
PITTSFIELD CITY LAKE	3	1000	MT STERLING LAKE	1	2600	CRYSTAL LAKE	1	3800
PITTSFIELD CITY LAKE	3	1000	PITTSFIELD CITY LAKE	1	2600	LAKE SHABBONA	3	3800
HIGHLAND SILVER LAKE	3	1100	SANGCHRIS LAKE	3	2600	PIERCE STATE LAKE	2	3800
LAKE GEORGE	3	1100	ANDERSON LAKE	1	2700	STEPHEN A FORBES LAKE	1	3800
LAKE OF EGYPT	3	1200	CANTON LAKE	1	2700	DAWSON LAKE	1	3900
LONG LAKE	2	1200	HIGHLAND SILVER LAKE	1	2700	STEPHEN A FORBES LAKE	1	3900
KINKAID LAKE	1	1300	LAKE SHABBONA	2	2700	DEVILS KITCHEN LAKE	1	4000
LAKE OF EGYPT	3	1300	LAKE SPRINGFIELD	1	2700	SKOKIE LAGOONS	1	4000
SILOAM SPRINGS LAKE	1	1300	LINCOLN TRAIL STATE LAKE	1	2700	SKOKIE LAGOONS	1	4000
HIGHLAND SILVER LAKE	3	1400	MCLEANSBORO NEW RESERVOIR	3	2700	JOHNSON SAUK TRAIL LAKE	2	4200
LAKE GEORGE	3	1400	PITTSFIELD CITY LAKE	1	2700	PIERCE STATE LAKE	1	4200
GLEN O JONES LAKE	3	1500	LAKE DECATUR	1	2800	ROUND LAKE	2	4200
LAKE GEORGE	2	1600	LAKE MURPHYSBORO	3	2800	SAM PARR LAKE	1	4200
LAKE GEORGE	2	1600	LAKE SARA	1	2800	WOLF LAKE	3	4200
LAKE SHABBONA	1	1600	MT STERLING LAKE	1	2800	LAKE STOREY	1	4300
LINCOLN TRAIL STATE LAKE	3	1600	RACCOON LAKE	1	2800	LAKE STOREY	1	4500
LONG LAKE	3	1600	ANDERSON LAKE	1	2900	LAKE BLOOMINGTON	2	4570
OLNEY EAST FORK RESERVOIR	1	1600	ARGYLE LAKE	1	2900	LAKE SHABBONA	1	4570
OLNEY EAST FORK RESERVOIR	1	1600	CARLINVILLE LAKE	1	2900	LAKE MURPHYSBORO	1	4700
GLEN O JONES LAKE	3	1700	CRAB ORCHARD LAKE	1	2900	CRYSTAL LAKE	2	4800
KINKAID LAKE	1	1700	LAKE MATTOON	1	2900	LONG LAKE	2	4800
RACCOON LAKE	3	1700	LAKE OF THE WOODS	2	2900	CRYSTAL LAKE	2	5000
WASHINGTON COUNTY LAKE	3	1700	MARION RESERVOIR	1	2900	LAKE MURPHYSBORO	1	5000
WASHINGTON COUNTY LAKE	3	1700	LAKE MATTOON	1	2950	LAKE SHABBONA	1	5000
CRAB ORCHARD LAKE	3	1800	DAWSON LAKE	2	3000	WALNUT POINT STATE LAKE	1	5000
DOLAN LAKE	3	1800	DAWSON LAKE	3	3000	LONG LAKE	3	5040
DOLAN LAKE	3	1800	DOLAN LAKE	1	3000	LONG LAKE	3	5100
LAKE GEORGE	1	1800	HARRISBURG LAKE	1	3000	LONG LAKE	3	5100
LAKE GEORGE	1	1800	LAKE BLOOMINGTON	3	3000	CRYSTAL LAKE	1	5200
LONG LAKE	3	1800	LAKE LOU YAEGER	1	3000	ROUND LAKE	1	5400
RACCOON LAKE	3	1800	OTTER LAKE	1	3000	DIAMOND LAKE	3	5500
SILOAM SPRINGS LAKE	1	1800	PITTSFIELD CITY LAKE	1	3000	LONG LAKE	1	5700
WOLF LAKE	2	1800	VANDALIA CITY LAKE	1	3000	ROUND LAKE	1	5700
PIERCE STATE LAKE	3	1880	LAKE JACKSONVILLE	1	3060	DIAMOND LAKE	3	5800
CRAB ORCHARD LAKE	3	1900	ARGYLE LAKE	1	3100	FOX LAKE	2	5900
HARRISBURG LAKE	3	1900	DAWSON LAKE	2	3100	LONG LAKE	1	6000
HARRISBURG LAKE	3	1900	DOLAN LAKE	1	3100	CEDAR LAKE	1	6100
OTTER LAKE	3	1900	GLEN O JONES LAKE	1	3100	CHANNEL LAKE	3	6100
PIERCE STATE LAKE	3	1900	LAKE DECATUR	1	3100	DIAMOND LAKE	1	6100
SANGCHRIS LAKE	2	1900	LAKE LE-AQUA-NA	1	3100	LONG LAKE	3	6190
STEPHEN A FORBES LAKE	3	1900	LAKE SHABBONA	3	3100	LONG LAKE	2	6200
STEPHEN A FORBES LAKE	3	1900	MCLEANSBORO NEW RESERVOIR	1	3100	DIAMOND LAKE	2	6400
DEVILS KITCHEN LAKE	3	2000	SAM DALE STATE LAKE	1	3100	ROUND LAKE	1	6400
JOHNSON SAUK TRAIL LAKE	3	2000	SAM DALE STATE LAKE	3	3100	LONG LAKE	1	6500
LAKE OF EGYPT	1	2000	STEPHEN A FORBES LAKE	2	3100	ROUND LAKE	1	6500
LAKE SHABBONA	1	2000	VANDALIA CITY LAKE	1	3100	DIAMOND LAKE	1	6600
OLNEY EAST FORK RESERVOIR	3	2070	GLEN O JONES LAKE	1	3170	CEDAR LAKE	2	6700
HORSESHOE LAKE	3	2100	DAWSON LAKE	1	3200	FOX LAKE	1	6700
JOHNSON SAUK TRAIL LAKE	3	2100	DEVILS KITCHEN LAKE	2	3200	LONG LAKE	1	6700
LAKE OF EGYPT	2	2100	JOHNSON SAUK TRAIL LAKE	2	3200	HORSESHOE LAKE	1	6800
LAKE SHABBONA	2	2100	LAKE BLOOMINGTON	1	3200	SPRING LAKE	1	6800
PITTSFIELD CITY LAKE	2	2100	LAKE BLOOMINGTON	1	3200	DIAMOND LAKE	2	6900
JOHNSON SAUK TRAIL LAKE	1	2200	LAKE MATTOON	2	3200	BANGS LAKE	1	7000
JOHNSON SAUK TRAIL LAKE	1	2200	LAKE OF THE WOODS	2	3200	CHANNEL LAKE	3	7000
LAKE BLOOMINGTON	3	2200	LAKE SARA	1	3200	FOX LAKE	1	7000
LAKE MATTOON	3	2200	MARION RESERVOIR	3	3200	HORSESHOE LAKE	1	7000
LAKE OF EGYPT	2	2200	MCLEANSBORO NEW RESERVOIR	1	3200	HORSESHOE LAKE	2	7000
PARADISE LAKE	3	2200	SAM DALE STATE LAKE	3	3200	CEDAR LAKE	2	7100
WASHINGTON COUNTY LAKE	1	2200	SKOKIE LAGOONS	3	3200	CHANNEL LAKE	2	7100
HORSESHOE LAKE	3	2300	CANTON LAKE	1	3300	FOX LAKE	3	7300
KINKAID LAKE	3	2300	DEVILS KITCHEN LAKE	1	3300	FOX LAKE	3	7300
LAKE LE-AQUA-NA	2	2300	DEVILS KITCHEN LAKE	2	3300	ROUND LAKE	2	7400
LAKE OF EGYPT	1	2300	LAKE MATTOON	2	3300	CEDAR LAKE	1	7500
LAKE TAYLORVILLE	3	2300	LAKE SHABBONA	2	3300	CHANNEL LAKE	1	7500
OTTER LAKE	2	2300	PARADISE LAKE	2	3300	CHANNEL LAKE	1	7500
PARADISE LAKE	3	2300	PIERCE STATE LAKE	2	3300	ROUND LAKE	2	7600
KINKAID LAKE	3	2400	STEPHEN A FORBES LAKE	2	3300	SPRING LAKE	1	7600
OLNEY EAST FORK RESERVOIR	3	2400	DAWSON LAKE	3	3400	ROUND LAKE	2	7690
PITTSFIELD CITY LAKE	2	2400	LAKE BLOOMINGTON	2	3400	BANGS LAKE	2	7700
RACCOON LAKE	2	2400	LAKE MURPHYSBORO	3	3400	BANGS LAKE	3	7700
WASHINGTON COUNTY LAKE	1	2400	LAKE SHABBONA	3	3400	FOX LAKE	2	7700
LAKE LE-AQUA-NA	2	2440	MARION RESERVOIR	3	3400	ROUND LAKE	3	7700
CRAB ORCHARD LAKE	1	2500	PARADISE LAKE	2	3400	ROUND LAKE	3	7700
CRYSTAL LAKE	3	2500	PITTSFIELD CITY LAKE	1	3400	CHANNEL LAKE	2	8100
DEVILS KITCHEN LAKE	3	2500	SAM DALE STATE LAKE	1	3400	CEDAR LAKE	1	8160
LAKE LE-AQUA-NA	3	2500	SKOKIE LAGOONS	3	3400	BANGS LAKE	2	8200
LINCOLN TRAIL STATE LAKE	2	2500	SPRING LAKE	1	3400	BANGS LAKE	3	8500
MARION RESERVOIR	1	2500	WOLF LAKE	3	3400	CEDAR LAKE	2	8500
MCLEANSBORO NEW RESERVOIR	3	2500	LAKE LE-AQUA-NA	1	3500	CEDAR LAKE	3	8800
PITTSFIELD CITY LAKE	2	2500	PARADISE LAKE	1	3500	CEDAR LAKE	3	8900
PITTSFIELD CITY LAKE	2	2500	PARIS EAST AND WEST LAKE	1	3500	CEDAR LAKE	3	8900
RACCOON LAKE	2	2500	PARIS EAST AND WEST LAKE	1	3500	BANGS LAKE	1	9000
SANGCHRIS LAKE	1	2500	RACCOON LAKE	1	3500	CEDAR LAKE	1	9100
LAKE VERMILION	1	2590	LAKE SHABBONA	2	3600	CEDAR LAKE	2	9200
CRYSTAL LAKE	3	2600	SKOKIE LAGOONS	2	3600	CEDAR LAKE	3	9200
HIGHLAND SILVER LAKE	1	2600	SKOKIE LAGOONS	2	3600	HORSESHOE LAKE	2	9400

APPENDIX TABLE E. Chemical oxygen demand (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979 Listing is arranged alphabetically in order of increasing concentration.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	4000	CRAB ORCHARD LAKE	1	60000	PARADISE LAKE	1	89000
GLADSTONE LAKE	3	6500	DOLAN LAKE	1	60000	CRYSTAL LAKE	3	90000
PITTSFIELD CITY LAKE	3	21000	MARION RESERVOIR	1	60000	MARION RESERVOIR	3	90000
WOLF LAKE	2	22000	PARADISE LAKE	3	60000	STEPHEN A FORBES LAKE	1	92000
SILOAM SPRINGS LAKE	1	25000	VANDALIA CITY LAKE	1	60000	DEVILS KITCHEN LAKE	1	93000
PITTSFIELD CITY LAKE	3	27000	LAKE BLOOMINGTON	2	61000	DEVILS KITCHEN LAKE	1	93000
PITTSFIELD CITY LAKE	3	27000	OTTER LAKE	1	61000	PARIS EAST AND WEST LAKE	1	93000
HIGHLAND SILVER LAKE	3	32000	RACCOON LAKE	1	61000	DAWSON LAKE	1	94000
LONG LAKE	2	33000	ANDERSON LAKE	1	62000	LAKE SHABBONA	3	94000
HIGHLAND SILVER LAKE	3	34000	ANDERSON LAKE	1	62000	PIERCE STATE LAKE	1	95000
KINKAID LAKE	1	36000	ARGYLE LAKE	1	62000	LAKE MURPHYSBORO	1	100000
SILOAM SPRINGS LAKE	1	36000	CANTON LAKE	1	62000	LAKE SHABBONA	2	100000
OLNEY EAST FORK RESERVOIR	1	37000	HARRISBURG LAKE	1	62000	SKOKIE LAGOONS	2	100000
LAKE GEORGE	2	38000	LAKE MATTOON	1	62000	CEDAR LAKE	3	110000
LONG LAKE	2	38000	LAKE MATTOON	1	62000	JOHNSON SAUK TRAIL LAKE	2	110000
PITTSFIELD CITY LAKE	2	38000	MCLEANSBORO NEW RESERVOIR	3	62000	LAKE MURPHYSBORO	1	110000
LINCOLN TRAIL STATE LAKE	3	39000	RACCOON LAKE	1	62000	SKOKIE LAGOONS	2	110000
RACCOON LAKE	3	40000	RACCOON LAKE	3	62000	LAKE SHABBONA	1	120000
LAKE GEORGE	3	41000	DAWSON LAKE	2	63000	LAKE SHABBONA	3	120000
OLNEY EAST FORK RESERVOIR	1	41000	DAWSON LAKE	2	63000	SKOKIE LAGOONS	1	120000
PITTSFIELD CITY LAKE	1	41000	DEVILS KITCHEN LAKE	3	63000	WOLF LAKE	3	120000
PITTSFIELD CITY LAKE	2	41000	LAKE BLOOMINGTON	3	63000	CRYSTAL LAKE	1	130000
CRAB ORCHARD LAKE	3	42000	LAKE LOU YAEGER	1	63000	CRYSTAL LAKE	1	130000
LAKE OF EGYPT	3	42000	LAKE OF EGYPT	2	63000	JOHNSON SAUK TRAIL LAKE	2	130000
PITTSFIELD CITY LAKE	2	43000	LAKE SPRINGFIELD	1	63000	LAKE SHABBONA	1	130000
PITTSFIELD CITY LAKE	2	43000	PARADISE LAKE	3	63000	WALNUT POINT STATE LAKE	1	130000
DOLAN LAKE	3	44000	SAM DALE STATE LAKE	1	63000	WOLF LAKE	3	130000
LAKE OF EGYPT	3	44000	SAM DALE STATE LAKE	3	63000	CRYSTAL LAKE	2	140000
WASHINGTON COUNTY LAKE	3	44000	SPRING LAKE	1	63000	CRYSTAL LAKE	2	140000
CRAB ORCHARD LAKE	3	45000	SPRING LAKE	1	63000	LONG LAKE	1	140000
KINKAID LAKE	1	45000	GLEN O JONES LAKE	1	64000	LONG LAKE	2	140000
LAKE GEORGE	1	45000	LAKE BLOOMINGTON	2	64000	SKOKIE LAGOONS	1	140000
PIERCE STATE LAKE	3	45000	LAKE OF EGYPT	2	64000	LONG LAKE	3	150000
DOLAN LAKE	3	46000	LAKE SHABBONA	2	64000	SPRING LAKE	1	150000
LAKE GEORGE	3	47000	LAKE TAYLORVILLE	1	64000	BANGS LAKE	1	160000
LAKE SHABBONA	1	47000	STEPHEN A FORBES LAKE	3	64000	LONG LAKE	3	160000
LONG LAKE	3	47000	VANDALIA CITY LAKE	1	64000	ROUND LAKE	2	160000
HARRISBURG LAKE	3	48000	LAKE SHABBONA	2	66000	SPRING LAKE	1	160000
HIGHLAND SILVER LAKE	1	48000	LAKE VERMILION	1	66000	DIAMOND LAKE	1	170000
PIERCE STATE LAKE	3	48000	MT STERLING LAKE	1	66000	LONG LAKE	2	170000
PITTSFIELD CITY LAKE	1	48000	ARGYLE LAKE	1	67000	LONG LAKE	3	170000
KINKAID LAKE	3	49000	LAKE BLOOMINGTON	1	67000	LONG LAKE	3	170000
WASHINGTON COUNTY LAKE	3	49000	LAKE MATTOON	2	67000	FOX LAKE	1	180000
HORSESHOE LAKE	3	50000	PIERCE STATE LAKE	1	67000	FOX LAKE	1	180000
HORSESHOE LAKE	3	50000	SANGCHRIS LAKE	2	67000	FOX LAKE	3	180000
JOHNSON SAUK TRAIL LAKE	1	50000	DAWSON LAKE	3	68000	LONG LAKE	1	180000
KINKAID LAKE	3	50000	MARION RESERVOIR	3	68000	LONG LAKE	1	180000
LAKE SHABBONA	1	50000	MCLEANSBORO NEW RESERVOIR	1	68000	DIAMOND LAKE	1	190000
LONG LAKE	3	50000	MCLEANSBORO NEW RESERVOIR	1	68000	DIAMOND LAKE	2	190000
RACCOON LAKE	2	50000	SAM DALE STATE LAKE	1	68000	DIAMOND LAKE	2	190000
GLEN O JONES LAKE	3	51000	LAKE BLOOMINGTON	1	69000	DIAMOND LAKE	3	190000
HARRISBURG LAKE	3	51000	LAKE DECATUR	1	69000	LONG LAKE	1	190000
LINCOLN TRAIL STATE LAKE	2	51000	LAKE LE-AQUA-NA	2	69000	ROUND LAKE	1	190000
OTTER LAKE	3	51000	LAKE VERMILION	1	69000	ROUND LAKE	1	190000
SANGCHRIS LAKE	1	51000	SAM DALE STATE LAKE	3	70000	BANGS LAKE	1	200000
CANTON LAKE	1	52000	LAKE JACKSONVILLE	1	71000	CEDAR LAKE	1	200000
CARLINVILLE LAKE	1	52000	LAKE MURPHYSBORO	3	71000	CEDAR LAKE	1	200000
WASHINGTON COUNTY LAKE	1	52000	LAKE OF EGYPT	1	71000	CEDAR LAKE	1	200000
JOHNSON SAUK TRAIL LAKE	1	53000	MT STERLING LAKE	1	71000	CEDAR LAKE	2	200000
RACCOON LAKE	2	53000	WOLF LAKE	2	71000	CEDAR LAKE	2	200000
SANGCHRIS LAKE	3	53000	LAKE DECATUR	1	73000	CHANNEL LAKE	1	200000
GLEN O JONES LAKE	3	54000	LAKE MURPHYSBORO	3	73000	FOX LAKE	2	200000
JOHNSON SAUK TRAIL LAKE	3	54000	PARADISE LAKE	1	74000	FOX LAKE	3	200000
LAKE GEORGE	1	54000	SAM PARR LAKE	1	74000	HORSESHOE LAKE	1	200000
OLNEY EAST FORK RESERVOIR	3	54000	LAKE LE-AQUA-NA	1	75000	BANGS LAKE	3	210000
STEPHEN A FORBES LAKE	3	54000	LAKE MATTOON	2	75000	CEDAR LAKE	1	210000
WASHINGTON COUNTY LAKE	1	54000	LAKE OF EGYPT	1	76000	CEDAR LAKE	2	210000
LAKE MATTOON	3	55000	DAWSON LAKE	3	77000	CEDAR LAKE	2	210000
LAKE MATTOON	3	55000	STEPHEN A FORBES LAKE	2	77000	CHANNEL LAKE	1	210000
MARION RESERVOIR	1	55000	DEVILS KITCHEN LAKE	2	78000	CHANNEL LAKE	2	210000
OLNEY EAST FORK RESERVOIR	3	55000	PIERCE STATE LAKE	2	78000	CHANNEL LAKE	3	210000
DEVILS KITCHEN LAKE	3	56000	HARRISBURG LAKE	1	79000	DIAMOND LAKE	3	210000
HIGHLAND SILVER LAKE	1	56000	LAKE OF THE WOODS	2	79000	FOX LAKE	2	210000
LAKE SARA	1	56000	LAKE SHABBONA	3	79000	HORSESHOE LAKE	1	210000
LAKE TAYLORVILLE	2	56000	PARADISE LAKE	2	79000	ROUND LAKE	1	210000
LINCOLN TRAIL STATE LAKE	1	56000	SKOKIE LAGOONS	3	79000	CHANNEL LAKE	3	220000
PITTSFIELD CITY LAKE	1	56000	PARADISE LAKE	2	80000	ROUND LAKE	1	220000
CRAB ORCHARD LAKE	1	57000	LAKE BLOOMINGTON	3	81000	BANGS LAKE	3	230000
DOLAN LAKE	1	57000	STEPHEN A FORBES LAKE	2	81000	CEDAR LAKE	3	230000
GLEN O JONES LAKE	1	57000	DEVILS KITCHEN LAKE	2	82000	CEDAR LAKE	3	230000
LAKE LE-AQUA-NA	2	57000	LAKE LE-AQUA-NA	1	82000	ROUND LAKE	3	230000
OTTER LAKE	2	57000	PIERCE STATE LAKE	2	82000	HORSESHOE LAKE	2	240000
CRYSTAL LAKE	3	58000	DAWSON LAKE	1	83000	CHANNEL LAKE	2	250000
LAKE LE-AQUA-NA	3	58000	LAKE OF THE WOODS	2	83000	BANGS LAKE	2	260000
LAKE LE-AQUA-NA	3	58000	LAKE STOREY	1	83000	ROUND LAKE	2	260000
LAKE SARA	1	58000	LAKE STOREY	1	83000	BANGS LAKE	2	270000
JOHNSON SAUK TRAIL LAKE	3	59000	SKOKIE LAGOONS	3	85000	ROUND LAKE	2	280000
LAKE GEORGE	2	59000	STEPHEN A FORBES LAKE	1	86000	ROUND LAKE	2	280000
LAKE TAYLORVILLE	3	59000	PARIS EAST AND WEST LAKE	1	87000	CEDAR LAKE	3	290000
MCLEANSBORO NEW RESERVOIR	3	59000	LAKE SHABBONA	2	89000	HORSESHOE LAKE	2	310000
PITTSFIELD CITY LAKE	1	59000	LAKE SHABBONA	3	89000	ROUND LAKE	3	310000

APPENDIX TABLE F Organic carbon to total Kjeldahl nitrogen ratio (C:N ratio) in 273 sediment samples taken from 63 Illinois lakes, summer 1979 A period (.) denotes a missing value Listing is arranged alphabetically in order of increasing value

LAKE NAME	SITE	VALUE
CEDAR LAKE	1	.
CEDAR LAKE	1	.
CEDAR LAKE	1	.
CEDAR LAKE	1	.
CEDAR LAKE	2	.
CEDAR LAKE	2	.
CEDAR LAKE	2	.
CEDAR LAKE	2	.
CEDAR LAKE	3	.
CEDAR LAKE	3	.
CEDAR LAKE	3	.
CEDAR LAKE	3	.
DEVILS KITCHEN LAKE	1	.
LAKE DECATUR	1	.
STEPHEN A FORBES LAKE	1	.
PITTSFIELD CITY LAKE	1	6.17
SPRING LAKE	1	8.38
FOX LAKE	3	9.10
FOX LAKE	2	9.42
LONG LAKE	2	9.43
FOX LAKE	3	9.51
CHANNEL LAKE	2	9.69
DIAMOND LAKE	1	9.85
SKOKIE LAGOONS	2	9.86
FOX LAKE	1	9.92
LAKE BLOOMINGTON	2	9.92
HORSESHOE LAKE	2	9.94
DIAMOND LAKE	2	9.99
SPRING LAKE	1	10.14
CRYSTAL LAKE	2	10.19
LONG LAKE	3	10.23
FOX LAKE	1	10.29
SKOKIE LAGOONS	3	10.31
GLADSTONE LAKE	3	10.34
LONG LAKE	2	10.42
CHANNEL LAKE	1	10.46
CHANNEL LAKE	1	10.46
HORSESHOE LAKE	1	10.49
BANGS LAKE	1	10.49
ROUND LAKE	1	10.53
CRYSTAL LAKE	1	10.58
SKOKIE LAGOONS	3	10.59
LONG LAKE	1	10.61
LAKE SHABBONA	1	10.69
DIAMOND LAKE	2	10.70
SKOKIE LAGOONS	1	10.75
ROUND LAKE	2	10.81
CRYSTAL LAKE	2	10.82
LONG LAKE	1	10.89
SPRING LAKE	1	10.97
DIAMOND LAKE	1	10.98
CHANNEL LAKE	2	10.98
ROUND LAKE	1	11.09
ROUND LAKE	2	11.11
WOLF LAKE	3	11.19
GLEN O JONES LAKE	1	11.31
LONG LAKE	3	11.36
BANGS LAKE	3	11.41
LONG LAKE	1	11.41
CHANNEL LAKE	3	11.49
PIERCE STATE LAKE	2	11.51
SANGCHRIS LAKE	2	11.58
LAKE MURPHYSBORO	1	11.59
HORSESHOE LAKE	1	11.61
DAWSON LAKE	3	11.62
LONG LAKE	2	11.66
LONG LAKE	1	11.66
SAM PARR LAKE	1	11.67
RACCOON LAKE	1	11.71
LAKE SHABBONA	1	11.75
LAKE STOREY	1	11.77
DIAMOND LAKE	3	11.82
ROUND LAKE	2	11.83
PIERCE STATE LAKE	2	11.84
LAKE STOREY	1	11.85
WOLF LAKE	2	11.87
PITTSFIELD CITY LAKE	2	11.87
DAWSON LAKE	2	11.93
LONG LAKE	2	11.96
LAKE MATTOON	2	11.97
DIAMOND LAKE	3	11.97
OTTER LAKE	1	12.00
SKOKIE LAGOONS	1	12.00
LAKE SHABBONA	1	12.04
SPRING LAKE	1	12.06
WALNUT POINT STATE LAKE	1	12.09
ROUND LAKE	1	12.10
GLEN O JONES LAKE	1	12.10
ROUND LAKE	2	12.13
ROUND LAKE	3	12.14
ROUND LAKE	3	12.14
BANGS LAKE	2	12.20
LAKE BLOOMINGTON	2	12.20
WOLF LAKE	3	12.20
SAM DALE STATE LAKE	3	12.26
BANGS LAKE	3	12.27
FOX LAKE	2	12.29
PITTSFIELD CITY LAKE	3	12.36
LAKE LE-AQUA-NA	1	12.42
CANTON LAKE	1	12.42
LAKE LE-AQUA-NA	1	12.43
LAKE MURPHYSBORO	1	12.54
LAKE BLOOMINGTON	1	12.65
PITTSFIELD CITY LAKE	1	12.69
HARRISBURG LAKE	1	12.70
ANDERSON LAKE	1	12.76
CRYSTAL LAKE	3	12.80
LAKE OF THE WOODS	2	12.81
LONG LAKE	3	12.86
LAKE TAYLORVILLE	2	12.88
LAKE MURPHYSBORO	3	12.94
SAM DALE STATE LAKE	3	12.97
LAKE BLOOMINGTON	3	13.00
LAKE LE-AQUA-NA	3	13.00
OTTER LAKE	2	13.04
SKOKIE LAGOONS	2	13.05
DAWSON LAKE	1	13.06
PITTSFIELD CITY LAKE	2	13.10
DAWSON LAKE	1	13.12
ROUND LAKE	1	13.14
STEPHEN A FORBES LAKE	2	13.18
CHANNEL LAKE	3	13.19
LAKE SHABBONA	3	13.24
LAKE LE-AQUA-NA	2	13.26
CRYSTAL LAKE	3	13.27
LAKE MATTOON	3	13.27
HORSESHOE LAKE	2	13.28
DOLAN LAKE	3	13.33
DAWSON LAKE	2	13.33
LONG LAKE	3	13.42
LAKE SHABBONA	1	13.43
LAKE SHABBONA	2	13.47
HORSESHOE LAKE	3	13.48
LAKE SHABBONA	2	13.48
LAKE LE-AQUA-NA	2	13.52
DOLAN LAKE	3	13.61
CRAB ORCHARD LAKE	1	13.62
PARADISE LAKE	2	13.64
OTTER LAKE	3	13.68
PIERCE STATE LAKE	3	13.68
PARIS EAST AND WEST LAKE	1	13.71
LAKE MATTOON	2	13.75
LAKE OF THE WOODS	2	13.79
LAKE SHABBONA	2	13.81
LAKE OF EGYPT	3	13.84
JOHNSON SAUK TRAIL LAKE	2	13.92
CRYSTAL LAKE	1	13.93
CRAB ORCHARD LAKE	3	13.94
GLEN O JONES LAKE	3	14.00
PITTSFIELD CITY LAKE	1	14.00
STEPHEN A FORBES LAKE	2	14.03
LAKE LE-AQUA-NA	3	14.04
SANGCHRIS LAKE	3	14.04
PIERCE STATE LAKE	1	14.04
MCLEANSBORO NEW RESERVOIR	3	14.07
BANGS LAKE	1	14.14
LAKE OF EGYPT	3	14.16
DAWSON LAKE	3	14.17
LAKE DECATUR	1	14.19
LAKE SHABBONA	3	14.20
JOHNSON SAUK TRAIL LAKE	2	14.22
MARION RESERVOIR	3	14.22
MCLEANSBORO NEW RESERVOIR	1	14.22
LAKE TAYLORVILLE	1	14.23
LAKE MATTOON	1	14.24
ANDERSON LAKE	1	14.26
SAM DALE STATE LAKE	1	14.26
LAKE BLOOMINGTON	1	14.37
LAKE SPRINGFIELD	1	14.39
GLEN O JONES LAKE	1	14.41
BANGS LAKE	1	14.41
RACCOON LAKE	1	14.46
JOHNSON SAUK TRAIL LAKE	3	14.50
ARGYLE LAKE	1	14.52
PARIS EAST AND WEST LAKE	1	14.56
LAKE TAYLORVILLE	3	14.56
MCLEANSBORO NEW RESERVOIR	3	14.60
CARLINVILLE LAKE	1	14.66
VANDALIA CITY LAKE	1	14.68
PIERCE STATE LAKE	3	14.70
LAKE MATTOON	1	14.83
DOLAN LAKE	1	14.83
PARADISE LAKE	1	14.84
STEPHEN A FORBES LAKE	1	14.86
LAKE VERMILION	1	14.86
CRAB ORCHARD LAKE	3	15.00
GLADSTONE LAKE	3	15.00
HORSESHOE LAKE	3	15.00
OLNEY EAST FORK RESERVOIR	3	15.00
RACCOON LAKE	2	15.00
MCLEANSBORO NEW RESERVOIR	1	15.00
RACCOON LAKE	2	15.00
DOLAN LAKE	1	15.16
ARGYLE LAKE	1	15.17
MARION RESERVOIR	1	15.17
LAKE SARA	1	15.18
LAKE VERMILION	1	15.19
CRAB ORCHARD LAKE	1	15.20
KINKAID LAKE	3	15.22
PARADISE LAKE	3	15.22
HARRISBURG LAKE	3	15.26
LONG LAKE	3	15.28
PARADISE LAKE	2	15.28
VANDALIA CITY LAKE	1	15.33
PARADISE LAKE	3	15.43
LAKE SHABBONA	3	15.44
PITTSFIELD CITY LAKE	1	15.55
PITTSFIELD CITY LAKE	2	15.60
SANGCHRIS LAKE	1	15.60
DEVILS KITCHEN LAKE	1	15.63
OLNEY EAST FORK RESERVOIR	1	15.63
OLNEY EAST FORK RESERVOIR	1	15.63
LAKE JACKSONVILLE	1	15.68
LAKE GEORGE	3	15.71
JOHNSON SAUK TRAIL LAKE	3	15.71
MARION RESERVOIR	3	15.72
PITTSFIELD CITY LAKE	2	15.80
LAKE GEORGE	1	15.83
RACCOON LAKE	3	15.83
WOLF LAKE	2	15.83
LAKE LOU YAEGER	1	15.83
LAKE MURPHYSBORO	3	15.89
LAKE MATTOON	3	15.91
HARRISBURG LAKE	3	16.05
PARADISE LAKE	1	16.07
HIGHLAND SILVER LAKE	3	16.07
MT STERLING LAKE	1	16.07
HIGHLAND SILVER LAKE	1	16.11
LAKE SHABBONA	3	16.13
MT STERLING LAKE	1	16.15
LAKE BLOOMINGTON	3	16.36
WASHINGTON COUNTY LAKE	1	16.46
WASHINGTON COUNTY LAKE	3	16.47
LAKE SARA	1	16.55
HARRISBURG LAKE	1	16.67
OLNEY EAST FORK RESERVOIR	3	16.74
LINCOLN TRAIL STATE LAKE	2	16.80
LAKE SHABBONA	2	16.85
LINCOLN TRAIL STATE LAKE	1	16.85
SAM DALE STATE LAKE	1	16.94
PITTSFIELD CITY LAKE	3	16.99
PITTSFIELD CITY LAKE	3	16.99
LAKE OF EGYPT	2	17.05
RACCOON LAKE	3	17.06
LAKE OF EGYPT	1	17.17
LAKE GEORGE	2	17.19
CANTON LAKE	1	17.22
DEVILS KITCHEN LAKE	2	17.26
WASHINGTON COUNTY LAKE	1	17.27
JOHNSON SAUK TRAIL LAKE	1	17.50
LAKE OF EGYPT	2	17.62
WASHINGTON COUNTY LAKE	3	17.65
HIGHLAND SILVER LAKE	1	17.69
JOHNSON SAUK TRAIL LAKE	1	17.72
STEPHEN A FORBES LAKE	3	17.89
STEPHEN A FORBES LAKE	3	17.89
LAKE OF EGYPT	1	18.00
LAKE GEORGE	1	18.06
LONG LAKE	3	18.12
DEVILS KITCHEN LAKE	2	18.27
SILOAM SPRINGS LAKE	1	18.33
MARION RESERVOIR	1	18.60
LINCOLN TRAIL STATE LAKE	3	19.06
HIGHLAND SILVER LAKE	3	19.09
KINKAID LAKE	3	19.37
DEVILS KITCHEN LAKE	3	19.60
LAKE GEORGE	2	19.68
DEVILS KITCHEN LAKE	3	21.00
LAKE GEORGE	3	21.36
KINKAID LAKE	1	22.94
SILOAM SPRINGS LAKE	1	23.08
KINKAID LAKE	1	27.30
PIERCE STATE LAKE	1	33.80

APPENDIX TABLE G. Total phosphorus concentrations (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	160	OLNEY EAST FORK RESERVOIR	3	535	LAKE SHABBONA	3	710
WOLF LAKE	2	200	LAKE BLOOMINGTON	2	536	RACCOON LAKE	2	710
CRYSTAL LAKE	3	240	CEDAR LAKE	1	537	BANGS LAKE	2	720
ROUND LAKE	2	240	LAKE VERMILION	1	537	DEVILS KITCHEN LAKE	3	730
SANGCHRIS LAKE	2	250	CEDAR LAKE	1	540	LAKE MATTOON	1	730
GLEN O JONES LAKE	3	260	LAKE BLOOMINGTON	1	540	LAKE SHABBONA	3	730
LAKE OF EGYPT	3	270	LAKE BLOOMINGTON	1	540	PITTSFIELD CITY LAKE	1	730
GLEN O JONES LAKE	3	280	OTTER LAKE	1	540	SPRING LAKE	1	740
CRYSTAL LAKE	3	290	ROUND LAKE	1	540	LAKE SHABBONA	1	743
LAKE OF EGYPT	3	300	DAWSON LAKE	3	550	LAKE MURPHYSBORO	3	750
LINCOLN TRAIL STATE LAKE	3	300	PITTSFIELD CITY LAKE	2	550	LAKE MURPHYSBORO	3	750
SILOAM SPRINGS LAKE	1	310	RACCOON LAKE	3	550	CHANNEL LAKE	1	760
HARRISBURG LAKE	3	320	ROUND LAKE	1	550	FOX LAKE	2	770
SILOAM SPRINGS LAKE	1	330	CEDAR LAKE	2	560	KINKAID LAKE	1	770
PITTSFIELD CITY LAKE	3	340	LAKE BLOOMINGTON	3	560	PITTSFIELD CITY LAKE	1	770
PITTSFIELD CITY LAKE	3	360	LAKE DECATUR	1	560	LAKE MATTOON	1	777
PITTSFIELD CITY LAKE	3	360	LAKE GEORGE	1	560	KINKAID LAKE	3	780
CEDAR LAKE	3	380	LAKE GEORGE	2	560	PARADISE LAKE	1	790
SANGCHRIS LAKE	3	380	ROUND LAKE	1	560	PARIS EAST AND WEST LAKE	1	790
LONG LAKE	3	390	STEPHEN A FORBES LAKE	3	560	PARIS EAST AND WEST LAKE	1	790
CEDAR LAKE	2	400	LAKE JACKSONVILLE	1	562	ROUND LAKE	3	790
DIAMOND LAKE	3	400	LAKE DECATUR	1	570	SPRING LAKE	1	790
GLADSTONE LAKE	3	400	LAKE LE-AQUA-NA	2	570	PARADISE LAKE	2	810
WOLF LAKE	3	400	LAKE LOU YAEGER	1	570	ANDERSON LAKE	1	820
DIAMOND LAKE	3	410	LAKE MATTOON	3	570	CEDAR LAKE	1	820
LINCOLN TRAIL STATE LAKE	1	410	PITTSFIELD CITY LAKE	2	570	DEVILS KITCHEN LAKE	2	820
LINCOLN TRAIL STATE LAKE	2	410	ROUND LAKE	1	570	HARRISBURG LAKE	1	820
LONG LAKE	3	410	CRAB ORCHARD LAKE	3	580	KINKAID LAKE	3	820
OLNEY EAST FORK RESERVOIR	1	410	DEVILS KITCHEN LAKE	3	580	LAKE MATTOON	2	820
OTTER LAKE	3	410	LAKE BLOOMINGTON	2	580	LAKE SHABBONA	1	820
SANGCHRIS LAKE	1	410	LAKE TAYLORVILLE	1	580	LONG LAKE	1	820
JOHNSON SAUK TRAIL LAKE	3	420	LAKE VERMILION	1	580	PARADISE LAKE	3	820
LAKE GEORGE	3	420	MCLEANSBORO NEW RESERVOIR	3	580	LAKE SHABBONA	2	830
WOLF LAKE	3	420	PITTSFIELD CITY LAKE	2	580	PARADISE LAKE	2	830
PIERCE STATE LAKE	3	426	WASHINGTON COUNTY LAKE	1	580	STEPHEN A FORBES LAKE	1	830
HARRISBURG LAKE	3	430	CANTON LAKE	1	590	CRAB ORCHARD LAKE	1	840
JOHNSON SAUK TRAIL LAKE	2	430	CRAB ORCHARD LAKE	3	590	LAKE TAYLORVILLE	2	850
OLNEY EAST FORK RESERVOIR	1	430	CARLINVILLE LAKE	1	600	MCLEANSBORO NEW RESERVOIR	1	850
PIERCE STATE LAKE	3	430	DIAMOND LAKE	2	600	MCLEANSBORO NEW RESERVOIR	1	850
CRYSTAL LAKE	2	440	MARION RESERVOIR	1	600	STEPHEN A FORBES LAKE	2	850
CRYSTAL LAKE	2	440	PITTSFIELD CITY LAKE	2	600	STEPHEN A FORBES LAKE	2	850
DAWSON LAKE	2	440	ROUND LAKE	3	600	DEVILS KITCHEN LAKE	2	860
DOLAN LAKE	3	440	FOX LAKE	3	610	LAKE SHABBONA	3	860
LAKE SARA	1	440	LAKE OF EGYPT	2	610	LAKE STOREY	1	860
MARION RESERVOIR	3	440	PIERCE STATE LAKE	2	610	PARADISE LAKE	3	860
WOLF LAKE	2	440	WASHINGTON COUNTY LAKE	1	610	LAKE LE-AQUA-NA	1	870
DOLAN LAKE	3	450	BANGS LAKE	1	620	LAKE MURPHYSBORO	1	870
HIGHLAND SILVER LAKE	3	450	SAM DALE STATE LAKE	3	620	PIERCE STATE LAKE	1	870
JOHNSON SAUK TRAIL LAKE	2	450	SAM DALE STATE LAKE	3	620	STEPHEN A FORBES LAKE	1	870
MCLEANSBORO NEW RESERVOIR	3	450	ROUND LAKE	2	621	HIGHLAND SILVER LAKE	1	880
SPRING LAKE	1	450	LAKE SPRINGFIELD	1	622	LAKE LE-AQUA-NA	1	880
STEPHEN A FORBES LAKE	3	450	JOHNSON SAUK TRAIL LAKE	1	630	LAKE MURPHYSBORO	1	880
WASHINGTON COUNTY LAKE	3	450	LAKE LE-AQUA-NA	2	630	LAKE STOREY	1	880
CEDAR LAKE	3	460	PIERCE STATE LAKE	2	630	DOLAN LAKE	1	900
HIGHLAND SILVER LAKE	3	460	PITTSFIELD CITY LAKE	1	630	HORSESHOE LAKE	3	910
JOHNSON SAUK TRAIL LAKE	3	460	LAKE MATTOON	3	640	HORSESHOE LAKE	3	910
LAKE OF THE WOODS	2	460	OLNEY EAST FORK RESERVOIR	3	640	PARADISE LAKE	1	910
WASHINGTON COUNTY LAKE	3	460	VANDALIA CITY LAKE	1	640	FOX LAKE	1	930
LAKE GEORGE	2	470	VANDALIA CITY LAKE	1	640	HARRISBURG LAKE	1	930
LAKE OF THE WOODS	2	470	ARGYLE LAKE	1	650	CRAB ORCHARD LAKE	1	940
SPRING LAKE	1	470	BANGS LAKE	3	650	DEVILS KITCHEN LAKE	1	940
CEDAR LAKE	3	480	CEDAR LAKE	2	650	LONG LAKE	1	940
MT STERLING LAKE	1	480	CHANNEL LAKE	2	650	SAM PARR LAKE	1	940
RACCOON LAKE	3	480	CHANNEL LAKE	3	650	FOX LAKE	1	950
ROUND LAKE	2	480	DAWSON LAKE	1	650	DOLAN LAKE	1	960
CEDAR LAKE	3	490	JOHNSON SAUK TRAIL LAKE	1	650	LONG LAKE	3	960
LAKE BLOOMINGTON	3	490	LAKE LE-AQUA-NA	3	650	LONG LAKE	3	964
LAKE OF EGYPT	1	490	ANDERSON LAKE	1	660	LONG LAKE	1	970
MT STERLING LAKE	1	490	BANGS LAKE	3	660	HIGHLAND SILVER LAKE	1	990
LAKE OF EGYPT	1	500	DIAMOND LAKE	2	660	SAM DALE STATE LAKE	1	1000
LAKE SHABBONA	1	500	FOX LAKE	3	660	LONG LAKE	3	1010
LAKE SHABBONA	1	500	LAKE MATTOON	2	660	SAM DALE STATE LAKE	1	1030
LAKE SHABBONA	2	500	BANGS LAKE	2	670	SKOKIE LAGOONS	3	1030
CEDAR LAKE	2	510	CANTON LAKE	1	670	LONG LAKE	1	1070
CRYSTAL LAKE	1	510	LAKE LE-AQUA-NA	3	670	LONG LAKE	3	1080
LAKE OF EGYPT	2	510	LAKE SHABBONA	3	670	RACCOON LAKE	1	1110
LAKE SARA	1	510	MARION RESERVOIR	1	670	RACCOON LAKE	1	1130
LONG LAKE	2	510	DEVILS KITCHEN LAKE	1	680	SKOKIE LAGOONS	3	1230
ROUND LAKE	2	510	LAKE SHABBONA	2	680	GLEN O JONES LAKE	1	1340
KINKAID LAKE	1	520	RACCOON LAKE	2	680	LONG LAKE	2	1430
LAKE GEORGE	3	520	DAWSON LAKE	1	690	LONG LAKE	2	1530
LONG LAKE	2	520	LAKE TAYLORVILLE	3	690	GLEN O JONES LAKE	1	1590
MARION RESERVOIR	3	520	CHANNEL LAKE	1	700	HORSESHOE LAKE	2	1720
ARGYLE LAKE	1	530	CHANNEL LAKE	2	700	HORSESHOE LAKE	2	1740
CEDAR LAKE	1	530	DIAMOND LAKE	1	700	HORSESHOE LAKE	1	2070
DAWSON LAKE	2	530	FOX LAKE	2	700	HORSESHOE LAKE	1	2280
DAWSON LAKE	3	530	PIERCE STATE LAKE	1	700	SKOKIE LAGOONS	1	2520
LAKE GEORGE	1	530	BANGS LAKE	1	710	SKOKIE LAGOONS	1	2550
OTTER LAKE	2	530	DIAMOND LAKE	1	710	SKOKIE LAGOONS	2	4790
WALNUT POINT STATE LAKE	1	530	LAKE SHABBONA	2	710	SKOKIE LAGOONS	2	4930

APPENDIX TABLE H Total Kjeldahl nitrogen to total phosphorus ratio (N:P ratio) in 273 sediment samples from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	0.50	LAKE LE-AQUA-NA	1	4.02	DAWSON LAKE	2	5.66
SKOKIE LAGOONS	2	0.73	LAKE MATTOON	2	4.02	MT STERLING LAKE	1	5.71
SKOKIE LAGOONS	2	0.75	CANTON LAKE	1	4.03	LAKE MURPHYSBORO	1	5.75
LONG LAKE	2	1.39	LAKE LE-AQUA-NA	2	4.04	GLEN O JONES LAKE	3	5.77
SKOKIE LAGOONS	1	1.57	LONG LAKE	2	4.05	LAKE BLOOMINGTON	2	5.86
SKOKIE LAGOONS	1	1.59	LAKE MATTOON	3	4.06	LAKE BLOOMINGTON	1	5.93
GLADSTONE LAKE	3	1.81	PARADISE LAKE	1	4.07	LAKE BLOOMINGTON	1	5.93
GLEN O JONES LAKE	1	1.95	HORSESHOE LAKE	2	4.07	HARRISBURG LAKE	3	5.94
KINKAID LAKE	1	2.21	PARADISE LAKE	2	4.07	MCLEANSBORO NEW RESERVOIR	3	6.00
HORSESHOE LAKE	3	2.31	DOLAN LAKE	3	4.09	PIERCE STATE LAKE	1	6.00
LONG LAKE	2	2.31	WOLF LAKE	2	4.09	PIERCE STATE LAKE	2	6.03
GLEN O JONES LAKE	1	2.37	PARADISE LAKE	2	4.10	GLEN O JONES LAKE	3	6.07
HIGHLAND SILVER LAKE	2	2.39	MARION RESERVOIR	1	4.17	LAKE SHABBONA	1	6.10
RACCOON LAKE	1	2.48	SILOAM SPRINGS LAKE	1	4.19	LINCOLN TRAIL STATE LAKE	2	6.10
KINKAID LAKE	1	2.50	LAKE SHABBONA	2	4.20	SANGCHRIS LAKE	1	6.10
HORSESHOE LAKE	3	2.53	PITTSFIELD CITY LAKE	2	4.21	LAKE SHABBONA	1	6.15
PARADISE LAKE	3	2.56	STEPHEN A FORBES LAKE	3	4.22	MARION RESERVOIR	3	6.15
LAKE GEORGE	3	2.62	PIERCE STATE LAKE	1	4.25	LAKE OF THE WOODS	2	6.17
LAKE GEORGE	3	2.69	DEVILS KITCHEN LAKE	1	4.26	LAKE SARA	1	6.27
HIGHLAND SILVER LAKE	1	2.73	PITTSFIELD CITY LAKE	1	4.29	LAKE SARA	1	6.36
PITTSFIELD CITY LAKE	3	2.74	DEVILS KITCHEN LAKE	3	4.31	DAWSON LAKE	3	6.42
DEVILS KITCHEN LAKE	3	2.74	MCLEANSBORO NEW RESERVOIR	3	4.31	LONG LAKE	3	6.42
SKOKIE LAGOONS	3	2.76	PITTSFIELD CITY LAKE	2	4.31	LINCOLN TRAIL STATE LAKE	1	6.59
PITTSFIELD CITY LAKE	3	2.78	LAKE OF EGYPT	2	4.31	LONG LAKE	1	6.70
PITTSFIELD CITY LAKE	3	2.78	MARION RESERVOIR	1	4.33	SANGCHRIS LAKE	3	6.84
PARADISE LAKE	3	2.80	LAKE OF EGYPT	3	4.33	LONG LAKE	1	6.95
LAKE GEORGE	2	2.86	LAKE SHABBONA	2	4.34	LAKE OF THE WOODS	2	6.96
KINKAID LAKE	3	2.93	OTTER LAKE	2	4.34	DAWSON LAKE	2	7.05
KINKAID LAKE	3	2.95	LAKE SPRINGFIELD	1	4.34	JOHNSON SAUK TRAIL LAKE	2	7.11
HIGHLAND SILVER LAKE	1	2.95	STEPHEN A FORBES LAKE	1	4.37	LONG LAKE	1	7.13
CRAB ORCHARD LAKE	1	2.98	ANDERSON LAKE	1	4.39	FOX LAKE	1	7.20
HORSESHOE LAKE	1	2.98	PIERCE STATE LAKE	3	4.41	FOX LAKE	1	7.37
PITTSFIELD CITY LAKE	1	3.03	PITTSFIELD CITY LAKE	1	4.42	CRYSTAL LAKE	1	7.60
CRAB ORCHARD LAKE	3	3.05	HARRISBURG LAKE	3	4.42	SANGCHRIS LAKE	2	7.60
LAKE TAYLORVILLE	2	3.06	LAKE SHABBONA	3	4.42	FOX LAKE	2	7.66
CRAB ORCHARD LAKE	1	3.09	PIERCE STATE LAKE	3	4.42	MARION RESERVOIR	3	7.73
RACCOON LAKE	3	3.09	PARADISE LAKE	1	4.43	WOLF LAKE	3	8.10
SAM DALE STATE LAKE	1	3.10	PARIS EAST AND WEST LAKE	1	4.43	LAKE BLOOMINGTON	2	8.53
SKOKIE LAGOONS	3	3.11	PARIS EAST AND WEST LAKE	1	4.43	DIAMOND LAKE	1	8.71
HIGHLAND SILVER LAKE	3	3.11	LAKE OF EGYPT	3	4.44	CRYSTAL LAKE	3	8.97
DOLAN LAKE	1	3.13	SAM PARR LAKE	1	4.47	DIAMOND LAKE	1	9.30
RACCOON LAKE	1	3.15	LAKE TAYLORVILLE	1	4.48	CHANNEL LAKE	3	9.38
LAKE SHABBONA	1	3.20	LAKE VERMILION	1	4.48	WALNUT POINT STATE LAKE	1	9.43
LAKE GEORGE	1	3.21	LAKE BLOOMINGTON	3	4.49	ROUND LAKE	3	9.75
HARRISBURG LAKE	1	3.23	HARRISBURG LAKE	1	4.51	JOHNSON SAUK TRAIL LAKE	2	9.77
CRAB ORCHARD LAKE	3	3.28	LAKE MURPHYSBORO	3	4.53	ROUND LAKE	1	9.82
ANDERSON LAKE	1	3.29	PITTSFIELD CITY LAKE	2	4.55	CHANNEL LAKE	1	9.87
SAM DALE STATE LAKE	1	3.30	SPRING LAKE	1	4.56	CRYSTAL LAKE	1	10.20
LAKE TAYLORVILLE	3	3.33	JOHNSON SAUK TRAIL LAKE	3	4.57	CRYSTAL LAKE	3	10.42
LONG LAKE	2	3.36	SPRING LAKE	1	4.59	DIAMOND LAKE	2	10.45
RACCOON LAKE	2	3.38	LONG LAKE	1	4.62	WOLF LAKE	3	10.50
HORSESHOE LAKE	1	3.38	LAKE SHABBONA	[illegible]	4.63	ROUND LAKE	1	10.56
JOHNSON SAUK TRAIL LAKE	1	3.38	OTTER LAKE	3	4.63	CHANNEL LAKE	3	10.61
STEPHEN A FORBES LAKE	3	3.39	LAKE SHABBONA	2	4.65	DIAMOND LAKE	2	10.67
LAKE GEORGE	1	3.40	LAKE SHABBONA	3	4.66	BANGS LAKE	2	10.69
LAKE GEORGE	2	3.40	LONG LAKE	3	4.67	CHANNEL LAKE	1	10.71
LAKE OF EGYPT	2	3.44	VANDALIA CITY LAKE	1	4.69	CRYSTAL LAKE	2	10.91
DOLAN LAKE	1	3.44	LAKE OF EGYPT	1	4.69	CHANNEL LAKE	2	10.92
JOHNSON SAUK TRAIL LAKE	1	3.49	STEPHEN A FORBES LAKE	1	4.70	FOX LAKE	2	11.00
PITTSFIELD CITY LAKE	2	3.50	JOHNSON SAUK TRAIL LAKE	3	4.76	FOX LAKE	3	11.06
LAKE LE-AQUA-NA	1	3.52	ARGYLE LAKE	1	4.77	CEDAR LAKE	1	11.10
PITTSFIELD CITY LAKE	1	3.56	LAKE VERMILION	1	4.82	ROUND LAKE	1	11.23
MCLEANSBORO NEW RESERVOIR	1	3.65	CARLINVILLE LAKE	1	4.83	BANGS LAKE	1	11.29
STEPHEN A FORBES LAKE	2	3.65	VANDALIA CITY LAKE	1	4.84	CEDAR LAKE	1	11.30
RACCOON LAKE	2	3.68	LAKE MATTOON	2	4.85	CRYSTAL LAKE	2	11.36
WASHINGTON COUNTY LAKE	3	3.70	DEVILS KITCHEN LAKE	1	4.85	CHANNEL LAKE	2	11.57
OLNEY EAST FORK RESERVOIR	1	3.72	LAKE DECATUR	1	4.91	ROUND LAKE	1	11.61
LAKE LE-AQUA-NA	3	3.73	DAWSON LAKE	1	4.92	BANGS LAKE	3	11.67
LAKE MURPHYSBORO	3	3.73	LAKE STOREY	1	5.00	FOX LAKE	3	11.97
OLNEY EAST FORK RESERVOIR	3	3.75	SAM DALE STATE LAKE	3	5.00	BANGS LAKE	2	12.24
RACCOON LAKE	3	3.75	LONG LAKE	3	5.05	ROUND LAKE	2	12.38
MCLEANSBORO NEW RESERVOIR	1	3.76	LAKE STOREY	1	5.11	BANGS LAKE	1	12.68
WASHINGTON COUNTY LAKE	3	3.78	SAM DALE STATE LAKE	3	5.16	ROUND LAKE	3	12.83
WASHINGTON COUNTY LAKE	1	3.79	LAKE SHABBONA	3	5.21	BANGS LAKE	3	13.08
LAKE MATTOON	1	3.80	LAKE LOU YAEGER	1	5.26	CEDAR LAKE	2	13.08
DEVILS KITCHEN LAKE	2	3.84	LONG LAKE	3	5.31	CEDAR LAKE	2	13.14
LAKE MATTOON	3	3.86	LINCOLN TRAIL STATE LAKE	3	5.33	DIAMOND LAKE	3	13.75
OLNEY EAST FORK RESERVOIR	3	3.87	LAKE MURPHYSBORO	1	5.34	DIAMOND LAKE	3	14.15
LAKE LE-AQUA-NA	2	3.87	LAKE BLOOMINGTON	3	5.36	CEDAR LAKE	1	14.15
STEPHEN A FORBES LAKE	2	3.88	HORSESHOE LAKE	2	5.40	SPRING LAKE	1	14.47
DEVILS KITCHEN LAKE	2	3.90	PIERCE STATE LAKE	2	5.41	ROUND LAKE	2	14.90
LONG LAKE	3	3.90	MT STERLING LAKE	1	5.42	CEDAR LAKE	1	15.20
OLNEY EAST FORK RESERVOIR	1	3.90	LAKE JACKSONVILLE	1	5.44	ROUND LAKE	2	15.42
WASHINGTON COUNTY LAKE	1	3.93	DAWSON LAKE	3	5.45	CEDAR LAKE	2	16.43
LAKE SHABBONA	2	3.97	SILOAM SPRINGS LAKE	1	5.45	SPRING LAKE	1	16.89
LAKE MATTOON	1	3.97	ARGYLE LAKE	1	5.47	ROUND LAKE	2	17.50
DOLAN LAKE	3	4.00	LAKE DECATUR	1	5.54	CEDAR LAKE	2	17.75
LAKE LE-AQUA-NA	3	4.00	OTTER LAKE	1	5.56	CEDAR LAKE	3	18.33
LAKE OF EGYPT	1	4.00	CANTON LAKE	1	5.59	CEDAR LAKE	3	18.78
LAKE SHABBONA	1	4.00	LONG LAKE	1	5.61	CEDAR LAKE	3	19.35
WOLF LAKE	2	4.00	DAWSON LAKE	1	5.65	CEDAR LAKE	3	23.42

APPENDIX TABLE I. Arsenic concentrations (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979 Listing is arranged alphabetically in order of increasing concentration.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	0.5	LAKE SHABBONA	2	6.4	SANGCHRIS LAKE	1	9.6
KINKAID LAKE	1	0.5	LINCOLN TRAIL STATE LAKE	3	6.4	SPRING LAKE	1	9.7
GLADSTONE LAKE	3	0.9	OLNEY EAST FORK RESERVOIR	1	6.4	LAKE SPRINGFIELD	1	9.8
CRYSTAL LAKE	3	1.2	LAKE VERMILION	1	6.4	OTTER LAKE	1	9.8
CRYSTAL LAKE	3	1.5	HORSESHOE LAKE	2	6.5	SPRING LAKE	1	9.8
LAKE OF EGYPT	1	1.9	LAKE SHABBONA	3	6.5	LAKE SARA	1	9.9
LAKE OF EGYPT	1	2.1	OLNEY EAST FORK RESERVOIR	1	6.5	ROUND LAKE	3	9.9
ROUND LAKE	2	2.3	WASHINGTON COUNTY LAKE	1	6.5	DOLAN LAKE	1	10.0
SPRING LAKE	1	2.4	WOLF LAKE	2	6.5	LAKE STOREY	1	10.0
SPRING LAKE	1	2.5	LAKE LE-AQUA-NA	2	6.6	CANTON LAKE	1	10.2
LONG LAKE	2	3.0	OLNEY EAST FORK RESERVOIR	3	6.7	DEVILS KITCHEN LAKE	3	10.2
CRYSTAL LAKE	1	3.1	LAKE MATTOON	3	6.7	SAM DALE STATE LAKE	1	10.3
CRYSTAL LAKE	2	3.1	LAKE VERMILION	1	6.7	GLEN O JONES LAKE	1	10.4
HIGHLAND SILVER LAKE	3	3.1	RACCOON LAKE	2	6.7	LAKE OF EGYPT	2	10.4
CRYSTAL LAKE	1	3.2	CHANNEL LAKE	1	6.9	MCLEANSBORO NEW RESERVOIR	1	10.5
CRYSTAL LAKE	2	3.3	LAKE BLOOMINGTON	3	6.9	LAKE STOREY	1	10.6
LONG LAKE	3	3.3	LAKE GEORGE	1	6.9	MCLEANSBORO NEW RESERVOIR	1	10.6
PITTSFIELD CITY LAKE	3	3.4	LAKE LE-AQUA-NA	3	6.9	PITTSFIELD CITY LAKE	2	10.6
HIGHLAND SILVER LAKE	3	3.5	LAKE TAYLORVILLE	3	6.9	ROUND LAKE	2	10.7
LONG LAKE	1	3.6	CHANNEL LAKE	2	7.0	SAM DALE STATE LAKE	1	10.8
FOX LAKE	1	3.7	LAKE SHABBONA	3	7.0	LAKE OF EGYPT	2	10.9
FOX LAKE	1	3.7	PIERCE STATE LAKE	2	7.0	DEVILS KITCHEN LAKE	1	11.0
GLEN O JONES LAKE	3	3.7	OLNEY EAST FORK RESERVOIR	3	7.1	LAKE JACKSONVILLE	1	11.0
HORSESHOE LAKE	3	3.7	OTTER LAKE	2	7.1	CRAB ORCHARD LAKE	1	11.1
LONG LAKE	2	3.7	LAKE GEORGE	1	7.2	KINKAID LAKE	1	11.1
PIERCE STATE LAKE	3	3.7	LAKE MATTOON	2	7.2	ROUND LAKE	1	11.1
PITTSFIELD CITY LAKE	3	3.7	MT STERLING LAKE	1	7.2	PITTSFIELD CITY LAKE	1	11.2
PITTSFIELD CITY LAKE	3	3.7	PIERCE STATE LAKE	1	7.2	PITTSFIELD CITY LAKE	2	11.3
SKOKIE LAGOONS	1	3.7	SKOKIE LAGOONS	2	7.2	ROUND LAKE	1	11.4
GLEN O JONES LAKE	3	3.9	HORSESHOE LAKE	2	7.3	ROUND LAKE	3	11.7
HORSESHOE LAKE	3	3.9	LAKE SHABBONA	2	7.3	LAKE SARA	1	11.9
LONG LAKE	1	3.9	MCLEANSBORO NEW RESERVOIR	3	7.3	PITTSFIELD CITY LAKE	2	11.9
SKOKIE LAGOONS	1	3.9	CARLINVILLE LAKE	1	7.4	ROUND LAKE	1	11.9
DOLAN LAKE	3	4.0	DAWSON LAKE	1	7.4	CANTON LAKE	1	12.0
DOLAN LAKE	3	4.0	LAKE GEORGE	2	7.4	CRAB ORCHARD LAKE	1	12.0
STEPHEN A FORBES LAKE	3	4.0	MT STERLING LAKE	1	7.4	MARION RESERVOIR	1	12.0
WASHINGTON COUNTY LAKE	3	4.0	PARADISE LAKE	2	7.4	ROUND LAKE	2	12.0
LONG LAKE	3	4.0	WASHINGTON COUNTY LAKE	1	7.4	PITTSFIELD CITY LAKE	2	12.3
LONG LAKE	1	4.1	LONG LAKE	3	7.6	KINKAID LAKE	3	12.6
OTTER LAKE	3	4.1	PARADISE LAKE	2	7.6	LAKE OF THE WOODS	2	13.0
LONG LAKE	3	4.2	LAKE MATTOON	1	7.7	PITTSFIELD CITY LAKE	1	13.0
SKOKIE LAGOONS	3	4.2	LAKE MATTOON	2	7.7	ROUND LAKE	1	13.0
STEPHEN A FORBES LAKE	3	4.2	SANGCHRIS LAKE	3	7.8	LAKE OF THE WOODS	2	14.0
WASHINGTON COUNTY LAKE	3	4.2	LAKE SHABBONA	3	7.9	PITTSFIELD CITY LAKE	1	14.0
PARADISE LAKE	3	4.3	LAKE TAYLORVILLE	1	7.9	ROUND LAKE	2	14.0
SKOKIE LAGOONS	3	4.4	MARION RESERVOIR	3	7.9	DEVILS KITCHEN LAKE	2	15.0
FOX LAKE	3	4.5	WALNUT POINT STATE LAKE	1	7.9	KINKAID LAKE	3	15.0
PIERCE STATE LAKE	3	4.5	LAKE BLOOMINGTON	2	8.0	MARION RESERVOIR	1	15.0
LONG LAKE	1	4.6	LAKE SHABBONA	2	8.0	PITTSFIELD CITY LAKE	1	15.0
LONG LAKE	2	4.6	PARADISE LAKE	1	8.0	DEVILS KITCHEN LAKE	2	16.0
LONG LAKE	3	4.6	DAWSON LAKE	1	8.1	HARRISBURG LAKE	1	16.0
PARADISE LAKE	3	4.6	GLEN O JONES LAKE	1	8.1	JOHNSON SAUK TRAIL LAKE	3	16.0
LONG LAKE	2	4.7	HIGHLAND SILVER LAKE	1	8.1	JOHNSON SAUK TRAIL LAKE	3	17.0
SANGCHRIS LAKE	2	4.7	LAKE MATTOON	1	8.1	HARRISBURG LAKE	1	18.0
LAKE GEORGE	3	4.8	PIERCE STATE LAKE	2	8.1	WOLF LAKE	2	18.0
JOHNSON SAUK TRAIL LAKE	2	4.9	HIGHLAND SILVER LAKE	1	8.2	DEVILS KITCHEN LAKE	1	20.0
LAKE OF EGYPT	3	4.9	LAKE SHABBONA	1	8.2	JOHNSON SAUK TRAIL LAKE	1	21.0
LAKE SHABBONA	1	5.0	STEPHEN A FORBES LAKE	2	8.2	LAKE MURPHYSBORO	3	22.0
RACCOON LAKE	3	5.0	ARGYLE LAKE	1	8.3	LINCOLN TRAIL STATE LAKE	2	22.0
DAWSON LAKE	2	5.1	LAKE LE-AQUA-NA	1	8.3	WOLF LAKE	3	22.0
FOX LAKE	2	5.1	LAKE TAYLORVILLE	2	8.3	CEDAR LAKE	2	23.0
RACCOON LAKE	3	5.1	ANDERSON LAKE	1	8.4	WOLF LAKE	3	23.0
SAM DALE STATE LAKE	3	5.1	ANDERSON LAKE	1	8.4	LAKE MURPHYSBORO	3	24.0
DAWSON LAKE	3	5.2	LAKE LE-AQUA-NA	1	8.4	CEDAR LAKE	3	25.0
LAKE OF EGYPT	3	5.2	PARIS EAST AND WEST LAKE	1	8.4	JOHNSON SAUK TRAIL LAKE	1	27.0
LAKE SHABBONA	1	5.2	LAKE SHABBONA	1	8.5	CEDAR LAKE	3	28.0
DAWSON LAKE	3	5.3	ARGYLE LAKE	1	8.5	CEDAR LAKE	2	29.0
SAM DALE STATE LAKE	3	5.3	LAKE BLOOMINGTON	1	8.6	CEDAR LAKE	1	30.0
LAKE LE-AQUA-NA	3	5.4	LAKE BLOOMINGTON	3	8.6	CEDAR LAKE	1	30.0
LAKE SHABBONA	2	5.4	LAKE DECATUR	1	8.6	CEDAR LAKE	2	30.0
FOX LAKE	2	5.5	PARADISE LAKE	1	8.6	CEDAR LAKE	2	30.0
HARRISBURG LAKE	3	5.6	PARIS EAST AND WEST LAKE	1	8.6	CEDAR LAKE	1	31.0
LAKE GEORGE	2	5.6	PIERCE STATE LAKE	1	8.6	CEDAR LAKE	3	31.0
SKOKIE LAGOONS	2	5.6	STEPHEN A FORBES LAKE	2	8.6	CEDAR LAKE	1	33.0
LAKE GEORGE	3	5.7	LAKE LOU YAEGER	1	8.7	BANGS LAKE	1	34.0
FOX LAKE	3	5.8	SILOAM SPRINGS LAKE	1	8.7	CEDAR LAKE	3	40.0
HARRISBURG LAKE	3	5.8	SILOAM SPRINGS LAKE	1	8.7	LINCOLN TRAIL STATE LAKE	1	44.0
CRAB ORCHARD LAKE	3	5.9	VANDALIA CITY LAKE	1	8.7	JOHNSON SAUK TRAIL LAKE	2	45.0
LAKE SHABBONA	3	5.9	MARION RESERVOIR	3	8.8	DIAMOND LAKE	1	46.0
LONG LAKE	3	5.9	SAM PARR LAKE	1	8.8	BANGS LAKE	1	47.0
CHANNEL LAKE	1	6.0	STEPHEN A FORBES LAKE	1	8.9	DIAMOND LAKE	1	50.0
CHANNEL LAKE	2	5.1	VANDALIA CITY LAKE	1	8.9	DIAMOND LAKE	2	50.0
CHANNEL LAKE	3	6.1	LAKE BLOOMINGTON	2	8.9	DIAMOND LAKE	2	51.C
CHANNEL LAKE	3	6.1	LAKE DECATUR	1	9.0	BANGS LAKE	2	55.0
DAWSON LAKE	2	6.1	RACCOON LAKE	1	9.0	BANGS LAKE	2	58.0
LAKE LE-AQUA-NA	2	6.1	RACCOON LAKE	1	9.0	BANGS LAKE	3	64.0
RACCOON LAKE	2	6.2	HORSESHOE LAKE	1	9.1	BANGS LAKE	3	69.0
CRAB ORCHARD LAKE	3	6.3	STEPHEN A FORBES LAKE	1	9.1	DIAMOND LAKE	3	79.0
HORSESHOE LAKE	1	6.3	DEVILS KITCHEN LAKE	3	9.2	DIAMOND LAKE	3	83.0
MCLEANSBORO NEW RESERVOIR	3	6.3	LAKE BLOOMINGTON	1	9.3	LAKE MURPHYSBORO	1	96.0
LAKE MATTOON	3	6.4	DOLAN LAKE	1	9.5	LAKE MURPHYSBORO	1	110.0

APPENDIX TABLE J Cadmium concentrations (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration. A period (.) denotes missing value, all values listed as 0.5 mg/kg were actually below minimum detectable level of 0.5 mg/kg.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
KINKAID LAKE	1	.	PIERCE STATE LAKE	2	0.5	LAKE TAYLORVILLE	2	1.0
ARGYLE LAKE	1	0.5	PIERCE STATE LAKE	2	0.5	LAKE TAYLORVILLE	3	1.0
ARGYLE LAKE	1	0.5	PIERCE STATE LAKE	3	0.5	LAKE VERMILION	1	1.0
CANTON LAKE	1	0.5	PIERCE STATE LAKE	3	0.5	LONG LAKE	1	1.0
CANTON LAKE	1	0.5	PITTSFIELD CITY LAKE	1	0.5	LONG LAKE	1	1.0
CRAB ORCHARD LAKE	1	0.5	PITTSFIELD CITY LAKE	1	0.5	LONG LAKE	1	1.0
CRAB ORCHARD LAKE	1	0.5	PITTSFIELD CITY LAKE	1	0.5	LONG LAKE	2	1.0
DEVILS KITCHEN LAKE	1	0.5	PITTSFIELD CITY LAKE	2	0.5	LONG LAKE	2	1.0
DEVILS KITCHEN LAKE	1	0.5	PITTSFIELD CITY LAKE	2	0.5	LONG LAKE	2	1.0
DEVILS KITCHEN LAKE	3	0.5	PITTSFIELD CITY LAKE	2	0.5	LONG LAKE	3	1.0
DOLAN LAKE	1	0.5	PITTSFIELD CITY LAKE	3	0.5	LONG LAKE	3	1.0
DOLAN LAKE	1	0.5	PITTSFIELD CITY LAKE	3	0.5	LONG LAKE	3	1.0
DOLAN LAKE	3	0.5	RACCOON LAKE	1	0.5	LONG LAKE	3	1.0
DOLAN LAKE	3	0.5	RACCOON LAKE	1	0.5	PARADISE LAKE	1	1.0
GLADSTONE LAKE	3	0.5	RACCOON LAKE	2	0.5	PARADISE LAKE	1	1.0
GLADSTONE LAKE	3	0.5	RACCOON LAKE	2	0.5	PARADISE LAKE	2	1.0
GLEN O JONES LAKE	1	0.5	RACCOON LAKE	3	0.5	PARADISE LAKE	2	1.0
GLEN O JONES LAKE	1	0.5	RACCOON LAKE	3	0.5	PARADISE LAKE	3	1.0
GLEN O JONES LAKE	3	0.5	SAM DALE STATE LAKE	1	0.5	PARADISE LAKE	3	1.0
GLEN O JONES LAKE	3	0.5	SAM DALE STATE LAKE	1	0.5	PITTSFIELD CITY LAKE	1	1.0
HARRISBURG LAKE	1	0.5	SAM DALE STATE LAKE	3	0.5	ROUND LAKE	2	1.0
HARRISBURG LAKE	3	0.5	SAM DALE STATE LAKE	3	0.5	SAM PARR LAKE	1	1.0
HARRISBURG LAKE	3	0.5	SILOAM SPRINGS LAKE	1	0.5	SANGCHRIS LAKE	3	1.0
HIGHLAND SILVER LAKE	1	0.5	SILOAM SPRINGS LAKE	1	0.5	SKOKIE LAGOONS	3	1.0
HIGHLAND SILVER LAKE	1	0.5	SPRING LAKE	1	0.5	SKOKIE LAGOONS	3	1.0
HIGHLAND SILVER LAKE	3	0.5	SPRING LAKE	1	0.5	SPRING LAKE	1	1.0
HIGHLAND SILVER LAKE	3	0.5	STEPHEN A FORBES LAKE	3	0.5	SPRING LAKE	1	1.0
HORSESHOE LAKE	3	0.5	STEPHEN A FORBES LAKE	3	0.5	STEPHEN A FORBES LAKE	1	1.0
JOHNSON SAUK TRAIL LAKE	1	0.5	VANDALIA CITY LAKE	1	0.5	STEPHEN A FORBES LAKE	1	1.0
JOHNSON SAUK TRAIL LAKE	1	0.5	VANDALIA CITY LAKE	1	0.5	STEPHEN A FORBES LAKE	2	1.0
JOHNSON SAUK TRAIL LAKE	3	0.5	WASHINGTON COUNTY LAKE	1	0.5	STEPHEN A FORBES LAKE	2	1.0
JOHNSON SAUK TRAIL LAKE	3	0.5	WASHINGTON COUNTY LAKE	1	0.5	WALNUT POINT STATE LAKE	1	1.0
KINKAID LAKE	1	0.5	WASHINGTON COUNTY LAKE	3	0.5	WOLF LAKE	2	1.0
KINKAID LAKE	3	0.5	WASHINGTON COUNTY LAKE	3	0.5	BANGS LAKE	1	2.0
KINKAID LAKE	3	0.5	ANDERSON LAKE	1	1.0	BANGS LAKE	1	2.0
LAKE BLOOMINGTON	1	0.5	ANDERSON LAKE	1	1.0	BANGS LAKE	2	2.0
LAKE BLOOMINGTON	1	0.5	CARLINVILLE LAKE	1	1.0	BANGS LAKE	2	2.0
LAKE BLOOMINGTON	2	0.5	CEDAR LAKE	1	1.0	BANGS LAKE	3	2.0
LAKE DECATUR	1	0.5	CEDAR LAKE	1	1.0	BANGS LAKE	3	2.0
LAKE DECATUR	1	0.5	CEDAR LAKE	1	1.0	CEDAR LAKE	1	2.0
LAKE GEORGE	1	0.5	CEDAR LAKE	2	1.0	CEDAR LAKE	2	2.0
LAKE GEORGE	1	0.5	CHANNEL LAKE	1	1.0	CEDAR LAKE	2	2.0
LAKE GEORGE	2	0.5	CHANNEL LAKE	2	1.0	CEDAR LAKE	2	2.0
LAKE GEORGE	2	0.5	CRAB ORCHARD LAKE	3	1.0	CEDAR LAKE	3	2.0
LAKE GEORGE	3	0.5	CRAB ORCHARD LAKE	3	1.0	CEDAR LAKE	3	2.0
LAKE GEORGE	3	0.5	DAWSON LAKE	1	1.0	CEDAR LAKE	3	2.0
LAKE LE-AQUA-NA	1	0.5	DAWSON LAKE	1	1.0	CEDAR LAKE	3	2.0
LAKE LE-AQUA-NA	2	0.5	DAWSON LAKE	2	1.0	CHANNEL LAKE	1	2.0
LAKE LE-AQUA-NA	2	0.5	DAWSON LAKE	2	1.0	CHANNEL LAKE	2	2.0
LAKE LE-AQUA-NA	3	0.5	DAWSON LAKE	3	1.0	CHANNEL LAKE	3	2.0
LAKE LE-AQUA-NA	3	0.5	DAWSON LAKE	3	1.0	CHANNEL LAKE	3	2.0
LAKE MATTOON	1	0.5	DEVILS KITCHEN LAKE	2	1.0	CRYSTAL LAKE	1	2.0
LAKE MATTOON	1	0.5	DEVILS KITCHEN LAKE	2	1.0	CRYSTAL LAKE	1	2.0
LAKE MATTOON	2	0.5	DEVILS KITCHEN LAKE	3	1.0	CRYSTAL LAKE	2	2.0
LAKE MATTOON	3	0.5	DIAMOND LAKE	1	1.0	CRYSTAL LAKE	2	2.0
LAKE MATTOON	3	0.5	DIAMOND LAKE	1	1.0	CRYSTAL LAKE	3	2.0
LAKE MURPHYSBORO	3	0.5	DIAMOND LAKE	2	1.0	CRYSTAL LAKE	3	2.0
LAKE MURPHYSBORO	3	0.5	DIAMOND LAKE	2	1.0	FOX LAKE	1	2.0
LAKE OF EGYPT	1	0.5	DIAMOND LAKE	3	1.0	FOX LAKE	1	2.0
LAKE OF EGYPT	1	0.5	DIAMOND LAKE	3	1.0	FOX LAKE	2	2.0
LAKE OF EGYPT	2	0.5	FOX LAKE	2	1.0	HORSESHOE LAKE	1	2.0
LAKE OF EGYPT	2	0.5	FOX LAKE	3	1.0	HORSESHOE LAKE	1	2.0
LAKE OF EGYPT	3	0.5	FOX LAKE	3	1.0	HORSESHOE LAKE	2	2.0
LAKE OF EGYPT	3	0.5	HARRISBURG LAKE	1	1.0	JOHNSON SAUK TRAIL LAKE	2	2.0
LAKE OF THE WOODS	2	0.5	HORSESHOE LAKE	2	1.0	LONG LAKE	1	2.0
LAKE OF THE WOODS	?	0.5	HORSESHOE LAKE	3	1.0	LONG LAKE	2	2.0
LAKE SARA	1	0.5	JOHNSON SAUK TRAIL LAKE	2	1.0	LONG LAKE	3	2.0
LAKE SARA	1	0.5	LAKE BLOOMINGTON	2	1.0	OTTER LAKE	1	2.0
LAKE VERMILION	1	0.5	LAKE BLOOMINGTON	3	1.0	OTTER LAKE	3	2.0
LINCOLN TRAIL STATE LAKE	1	0.5	LAKE BLOOMINGTON	3	1.0	PITTSFIELD CITY LAKE	2	2.0
LINCOLN TRAIL STATE LAKE	3	0.5	LAKE LE-AQUA-NA	1	1.0	ROUND LAKE	1	2.0
LONG LAKE	3	0.5	LAKE LOU YAEGER	1	1.0	ROUND LAKE	1	2.0
MARION RESERVOIR	1	0.5	LAKE MATTOON	2	1.0	ROUND LAKE	1	2.0
MARION RESERVOIR	1	0.5	LAKE MURPHYSBORO	1	1.0	ROUND LAKE	1	2.0
MARION RESERVOIR	3	0.5	LAKE MURPHYSBORO	1	1.0	ROUND LAKE	2	2.0
MARION RESERVOIR	3	0.5	LAKE SHABBONA	1	1.0	ROUND LAKE	2	2.0
MCLEANSBORO NEW RESERVOIR	1	0.5	LAKE SHABBONA	1	1.0	ROUND LAKE	2	2.0
MCLEANSBORO NEW RESERVOIR	1	0.5	LAKE SHABBONA	1	1.0	ROUND LAKE	3	2.0
MCLEANSBORO NEW RESERVOIR	3	0.5	LAKE SHABBONA	1	1.0	ROUND LAKE	3	2.0
MCLEANSBORO NEW RESERVOIR	3	0.5	LAKE SHABBONA	2	1.0	SANGCHRIS LAKE	1	2.0
MT STERLING LAKE	1	0.5	LAKE SHABBONA	2	1.0	SANGCHRIS LAKE	2	2.0
MT STERLING LAKE	1	0.5	LAKE SHABBONA	2	1.0	SKOKIE LAGOONS	1	2.0
OLNEY EAST FORK RESERVOIR	1	0.5	LAKE SHABBONA	2	1.0	SKOKIE LAGOONS	1	2.0
OLNEY EAST FORK RESERVOIR	1	0.5	LAKE SHABBONA	3	1.0	WOLF LAKE	2	2.0
OLNEY EAST FORK RESERVOIR	3	0.5	LAKE SHABBONA	3	1.0	WOLF LAKE	3	2.0
OLNEY EAST FORK RESERVOIR	3	0.5	LAKE SHABBONA	3	1.0	WOLF LAKE	3	3.0
OTTER LAKE	2	0.5	LAKE SHABBONA	3	1.0	LAKE JACKSONVILLE	1	4.0
PARIS EAST AND WEST LAKE	1	0.5	LAKE SPRINGFIELD	1	1.0	PITTSFIELD CITY LAKE	3	4.0
PARIS EAST AND WEST LAKE	1	0.5	LAKE STOREY	1	1.0	SKOKIE LAGOONS	2	4.0
PIERCE STATE LAKE	1	0.5	LAKE STOREY	1	1.0	SKOKIE LAGOONS	2	4.0
PIERCE STATE LAKE	1	0.5	LAKE TAYLORVILLE	1	1.0	LINCOLN TRAIL STATE LAKE	2	8.0

APPENDIX TABLE K Chromium concentrations (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration. A period (.) denotes missing value, and all values listed as 1 mg/kg were actually below the minimum detectable value of 1.0 mg/kg

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
CHANNEL LAKE	1	.	PARADISE LAKE	3	19	WOLF LAKE	3	24
PITTSFIELD CITY LAKE	3	.	SPRING LAKE	1	19	DEVILS KITCHEN LAKE	2	25
CRYSTAL LAKE	3	1	STEPHEN A FORBES LAKE	3	19	FOX LAKE	1	25
CRYSTAL LAKE	3	2	LAKE SHABBONA	1	20	FOX LAKE	2	25
CRYSTAL LAKE	1	4	CEDAR LAKE	1	20	HIGHLAND SILVER LAKE	1	25
GLADSTONE LAKE	3	4	CEDAR LAKE	1	20	JOHNSON SAUK TRAIL LAKE	3	25
GLADSTONE LAKE	3	4	CEDAR LAKE	2	20	KINKAID LAKE	3	25
CRYSTAL LAKE	1	5	CEDAR LAKE	2	20	LAKE BLOOMINGTON	2	25
CRYSTAL LAKE	2	5	DEVILS KITCHEN LAKE	3	20	LAKE MURPHYSBORO	1	25
CRYSTAL LAKE	2	5	DIAMOND LAKE	2	20	LAKE OF EGYPT	2	25
LONG LAKE	2	6	FOX LAKE	3	20	LAKE STOREY	1	25
LONG LAKE	2	7	HORSESHOE LAKE	1	20	LAKE VERMILION	1	25
WOLF LAKE	2	8	HORSESHOE LAKE	3	20	LONG LAKE	3	25
GLEN O JONES LAKE	3	9	HORSESHOE LAKE	3	20	LONG LAKE	3	25
ROUND LAKE	3	9	JOHNSON SAUK TRAIL LAKE	2	20	MT STERLING LAKE	1	25
ROUND LAKE	2	10	JOHNSON SAUK TRAIL LAKE	2	20	MT STERLING LAKE	1	25
DIAMOND LAKE	3	11	KINKAID LAKE	3	20	OTTER LAKE	2	25
GLEN O JONES LAKE	3	11	LAKE SARA	1	20	PARIS EAST AND WEST LAKE	1	25
HIGHLAND SILVER LAKE	3	11	LAKE SHABBONA	3	20	PITTSFIELD CITY LAKE	2	25
LAKE OF EGYPT	3	11	LONG LAKE	3	20	RACCOON LAKE	1	25
ROUND LAKE	3	11	MARION RESERVOIR	1	20	SPRING LAKE	1	25
CEDAR LAKE	3	12	MARION RESERVOIR	3	20	LAKE JACKSONVILLE	1	25
CEDAR LAKE	3	12	PIERCE STATE LAKE	3	20	LAKE MATTOON	1	25
CHANNEL LAKE	3	12	SAM DALE STATE LAKE	1	20	ANDERSON LAKE	1	26
DIAMOND LAKE	3	12	SPRING LAKE	1	20	CANTON LAKE	1	26
LAKE OF EGYPT	3	12	WASHINGTON COUNTY LAKE	1	20	DAWSON LAKE	1	26
OLNEY EAST FORK RESERVOIR	1	12	CRAB ORCHARD LAKE	1	21	DAWSON LAKE	2	26
PITTSFIELD CITY LAKE	3	12	DAWSON LAKE	1	21	DOLAN LAKE	1	26
DOLAN LAKE	3	13	DIAMOND LAKE	1	21	LAKE BLOOMINGTON	1	26
HIGHLAND SILVER LAKE	3	13	FOX LAKE	3	21	LAKE DECATUR	1	26
ROUND LAKE	2	14	HORSESHOE LAKE	1	21	LAKE OF EGYPT	2	26
CEDAR LAKE	3	14	LAKE GEORGE	1	21	LAKE SHABBONA	3	26
CEDAR LAKE	3	14	LAKE GEORGE	2	21	LAKE TAYLORVILLE	2	26
CHANNEL LAKE	2	14	LAKE MATTOON	3	21	LONG LAKE	2	26
CHANNEL LAKE	3	14	LONG LAKE	1	21	PARIS EAST AND WEST LAKE	1	26
HARRISBURG LAKE	3	14	LONG LAKE	3	21	PIERCE STATE LAKE	2	26
OLNEY EAST FORK RESERVOIR	1	14	SAM DALE STATE LAKE	3	21	RACCOON LAKE	1	26
ROUND LAKE	1	14	SAM DALE STATE LAKE	3	21	SANGCHRIS LAKE	3	26
ROUND LAKE	2	14	STEPHEN A FORBES LAKE	3	21	SKOKIE LAGOONS	3	26
WASHINGTON COUNTY LAKE	3	14	CEDAR LAKE	2	22	SPRING LAKE	1	26
BANGS LAKE	1	15	CRAB ORCHARD LAKE	1	22	STEPHEN A FORBES LAKE	2	26
BANGS LAKE	3	15	DAWSON LAKE	2	22	VANDALIA CITY LAKE	1	26
BANGS LAKE	3	15	DAWSON LAKE	3	22	WALNUT POINT STATE LAKE	1	26
CHANNEL LAKE	2	15	DEVILS KITCHEN LAKE	1	22	WOLF LAKE	2	26
HARRISBURG LAKE	3	15	FOX LAKE	2	22	LAKE BLOOMINGTON	2	27
LAKE SHABBONA	2	15	LAKE LE-AQUA-NA	2	22	JOHNSON SAUK TRAIL LAKE	1	27
MCLEANSBORO NEW RESERVOIR	3	15	LAKE MURPHYSBORO	3	22	LAKE LE-AQUA-NA	1	27
OLNEY EAST FORK RESERVOIR	3	15	LAKE OF EGYPT	1	22	LAKE MATTOON	2	27
ROUND LAKE	1	15	LONG LAKE	1	22	LAKE OF THE WOODS	2	27
SANGCHRIS LAKE	2	15	LONG LAKE	1	22	PARADISE LAKE	2	27
BANGS LAKE	1	16	PARADISE LAKE	3	22	PITTSFIELD CITY LAKE	2	27
CHANNEL LAKE	1	16	ARGYLE LAKE	1	23	RACCOON LAKE	2	27
DOLAN LAKE	3	16	DEVILS KITCHEN LAKE	1	23	SAM PARR LAKE	1	27
GLEN O JONES LAKE	1	16	DOLAN LAKE	1	23	SILOAM SPRINGS LAKE	1	27
KINKAID LAKE	1	16	FOX LAKE	1	23	SKOKIE LAGOONS	3	27
KINKAID LAKE	1	16	JOHNSON SAUK TRAIL LAKE	3	23	DEVILS KITCHEN LAKE	2	28
LAKE GEORGE	3	16	LAKE GEORGE	1	23	JOHNSON SAUK TRAIL LAKE	1	28
LAKE SHABBONA	1	16	LAKE GEORGE	2	23	LAKE DECATUR	1	28
PITTSFIELD CITY LAKE	3	16	LAKE LE-AQUA-NA	3	23	LAKE LE-AQUA-NA	1	28
RACCOON LAKE	3	16	LAKE MATTOON	2	23	LAKE OF THE WOODS	2	28
ROUND LAKE	1	16	LAKE MATTOON	3	23	OTTER LAKE	1	28
ROUND LAKE	2	16	LAKE OF EGYPT	1	23	PARADISE LAKE	2	28
WASHINGTON COUNTY LAKE	1	16	LAKE SHABBONA	2	23	PIERCE STATE LAKE	2	28
GLEN O JONES LAKE	1	17	LAKE SHABBONA	2	23	SANGCHRIS LAKE	1	28
LAKE GEORGE	3	17	LAKE SHABBONA	3	23	STEPHEN A FORBES LAKE	1	28
LAKE SHABBONA	1	17	LAKE SHABBONA	3	23	STEPHEN A FORBES LAKE	1	28
LINCOLN TRAIL STATE LAKE	3	17	LINCOLN TRAIL STATE LAKE	1	23	ANDERSON LAKE	1	29
PIERCE STATE LAKE	3	17	LONG LAKE	3	23	CARLINVILLE LAKE	1	29
RACCOON LAKE	3	17	MCLEANSBORO NEW RESERVOIR	1	23	LAKE SARA	1	29
OLNEY EAST FORK RESERVOIR	3	17	MCLEANSBORO NEW RESERVOIR	1	23	LONG LAKE	2	29
BANGS LAKE	2	18	OTTER LAKE	3	23	PIERCE STATE LAKE	1	29
BANGS LAKE	2	18	WOLF LAKE	3	23	LAKE SPRINGFIELD	1	29
CEDAR LAKE	1	18	DIAMOND LAKE	1	24	LAKE BLOOMINGTON	1	30
CEDAR LAKE	2	18	HARRISBURG LAKE	1	24	LAKE MURPHYSBORO	1	30
CRAB ORCHARD LAKE	3	18	HARRISBURG LAKE	1	24	LAKE TAYLORVILLE	1	30
DEVILS KITCHEN LAKE	3	18	HIGHLAND SILVER LAKE	1	24	PARADISE LAKE	1	30
DIAMOND LAKE	2	18	LAKE BLOOMINGTON	3	24	PARADISE LAKE	1	30
HORSESHOE LAKE	2	18	LAKE BLOOMINGTON	3	24	PITTSFIELD CITY LAKE	1	31
LAKE LE-AQUA-NA	2	18	LAKE MATTOON	1	24	PITTSFIELD CITY LAKE	1	31
LAKE SHABBONA	1	18	LAKE MURPHYSBORO	3	24	PITTSFIELD CITY LAKE	1	31
LAKE SHABBONA	2	18	LAKE STOREY	1	24	STEPHEN A FORBES LAKE	2	31
ROUND LAKE	1	18	LAKE TAYLORVILLE	3	24	ARGYLE LAKE	1	32
SAM DALE STATE LAKE	1	18	LAKE VERMILION	1	24	LAKE LOU YAEGER	1	32
WASHINGTON COUNTY LAKE	3	18	LINCOLN TRAIL STATE LAKE	2	24	CANTON LAKE	1	33
CEDAR LAKE	1	19	LONG LAKE	1	24	PITTSFIELD CITY LAKE	1	33
CRAB ORCHARD LAKE	3	19	LONG LAKE	3	24	PITTSFIELD CITY LAKE	2	33
DAWSON LAKE	3	19	MARION RESERVOIR	1	24	PITTSFIELD CITY LAKE	2	35
HORSESHOE LAKE	2	19	PIERCE STATE LAKE	1	24	SKOKIE LAGOONS	1	46
LAKE LE-AQUA-NA	3	19	RACCOON LAKE	2	24	SKOKIE LAGOONS	1	51
MARION RESERVOIR	3	19	SILOAM SPRINGS LAKE	1	24	SKOKIE LAGOONS	2	72
MCLEANSBORO NEW RESERVOIR	3	19	VANDALIA CITY LAKE	1	24	SKOKIE LAGOONS	2	75

APPENDIX TABLE L Copper concentrations (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	3	LAKE SHABBONA	3	24	ANDERSON LAKE	1	34
GLADSTONE LAKE	3	7	LONG LAKE	2	24	ARGYLE LAKE	1	34
GLEN D JONES LAKE	3	8	SPRING LAKE	1	24	BANGS LAKE	1	34
WOLF LAKE	2	8	SPRING LAKE	1	24	BANGS LAKE	2	34
GLEN D JONES LAKE	3	9	CHANNEL LAKE	2	25	BANGS LAKE	3	34
HIGHLAND SILVER LAKE	3	9	FOX LAKE	3	25	CEDAR LAKE	2	34
LAKE OF EGYPT	3	10	LAKE MATTOON	2	25	LAKE DECATUR	1	34
HIGHLAND SILVER LAKE	3	11	PIERCE STATE LAKE	2	25	LAKE DECATUR	1	34
DOLAN LAKE	3	12	DAWSON LAKE	2	26	LAKE JACKSONVILLE	1	34
LAKE OF EGYPT	3	12	DAWSON LAKE	2	26	LAKE OF EGYPT	2	34
PIERCE STATE LAKE	3	12	DAWSON LAKE	3	26	LAKE STOREY	1	34
WASHINGTON COUNTY LAKE	3	12	FOX LAKE	3	26	MT STERLING LAKE	1	34
OLNEY EAST FORK RESERVOIR	1	13	HARRISBURG LAKE	1	26	ROUND LAKE	2	34
OLNEY EAST FORK RESERVOIR	1	13	HIGHLAND SILVER LAKE	1	26	SANGCHRIS LAKE	1	34
WASHINGTON COUNTY LAKE	3	13	HIGHLAND SILVER LAKE	1	26	LAKE LOU YAEGER	1	35
CRYSTAL LAKE	3	14	KINKAID LAKE	3	26	LAKE STOREY	1	35
DOLAN LAKE	3	14	LAKE MURPHYSBORO	3	26	ROUND LAKE	1	35
LAKE GEORGE	3	14	LAKE TAYLORVILLE	3	26	BANGS LAKE	2	36
LAKE SHABBONA	2	14	LONG LAKE	3	26	BANGS LAKE	3	36
PIERCE STATE LAKE	3	14	PARADISE LAKE	2	26	CANTON LAKE	1	36
PITTSFIELD CITY LAKE	3	14	PIERCE STATE LAKE	2	26	CEDAR LAKE	1	36
WASHINGTON COUNTY LAKE	1	14	STEPHEN A FORBES LAKE	1	26	ROUND LAKE	1	36
CRAB ORCHARD LAKE	3	15	STEPHEN A FORBES LAKE	1	26	CEDAR LAKE	1	37
KINKAID LAKE	1	15	STEPHEN A FORBES LAKE	2	26	CEDAR LAKE	1	37
OLNEY EAST FORK RESERVOIR	3	15	CEDAR LAKE	2	27	LAKE OF EGYPT	2	37
CRAB ORCHARD LAKE	3	16	CHANNEL LAKE	3	27	SKOKIE LAGOONS	3	37
HARRISBURG LAKE	3	16	CHANNEL LAKE	3	27	SKOKIE LAGOONS	3	37
PITTSFIELD CITY LAKE	3	16	DIAMOND LAKE	3	27	WOLF LAKE	3	37
PITTSFIELD CITY LAKE	3	16	DIAMOND LAKE	3	27	CEDAR LAKE	3	38
GLEN D JONES LAKE	1	17	LAKE LE-AQUA-NA	3	27	PITTSFIELD CITY LAKE	1	38
GLEN D JONES LAKE	1	17	OTTER LAKE	2	27	CRYSTAL LAKE	2	39
HARRISBURG LAKE	3	17	PIERCE STATE LAKE	1	27	DIAMOND LAKE	1	40
KINKAID LAKE	1	17	PIERCE STATE LAKE	1	27	DIAMOND LAKE	1	40
ROUND LAKE	2	17	RACCOON LAKE	3	27	WOLF LAKE	3	40
SAM DALE STATE LAKE	3	17	ROUND LAKE	2	27	DIAMOND LAKE	2	41
SAM DALE STATE LAKE	3	17	BANGS LAKE	1	28	LAKE BLOOMINGTON	2	41
STEPHEN A FORBES LAKE	3	17	CEDAR LAKE	3	28	VANDALIA CITY LAKE	1	42
OLNEY EAST FORK RESERVOIR	3	18	CEDAR LAKE	3	28	CARLINVILLE LAKE	1	43
DEVILS KITCHEN LAKE	3	18	DAWSON LAKE	3	28	DIAMOND LAKE	2	43
HORSESHOE LAKE	3	18	DEVILS KITCHEN LAKE	2	28	VANDALIA CITY LAKE	1	43
LAKE SHABBONA	2	18	FOX LAKE	2	28	OTTER LAKE	1	44
CRYSTAL LAKE	3	19	HARRISBURG LAKE	1	28	CEDAR LAKE	1	45
HORSESHOE LAKE	3	19	LAKE LE-AQUA-NA	1	28	LAKE SARA	1	45
LAKE GEORGE	3	19	LAKE MURPHYSBORO	1	28	LAKE BLOOMINGTON	3	47
PARADISE LAKE	3	19	LINCOLN TRAIL STATE LAKE	1	28	PITTSFIELD CITY LAKE	2	47
SAM DALE STATE LAKE	1	19	LINCOLN TRAIL STATE LAKE	2	28	CRYSTAL LAKE	1	49
SAM DALE STATE LAKE	1	19	PARADISE LAKE	1	28	LAKE OF EGYPT	1	49
SANGCHRIS LAKE	2	19	DAWSON LAKE	1	29	LAKE BLOOMINGTON	1	50
WASHINGTON COUNTY LAKE	1	19	DEVILS KITCHEN LAKE	2	29	RACCOON LAKE	2	50
LAKE LE-AQUA-NA	2	20	HORSESHOE LAKE	1	29	RACCOON LAKE	2	50
LINCOLN TRAIL STATE LAKE	3	20	LAKE MATTOON	2	29	LAKE BLOOMINGTON	1	54
PARADISE LAKE	3	20	PARADISE LAKE	1	29	LAKE OF THE WOODS	2	54
LAKE LE-AQUA-NA	2	21	ROUND LAKE	3	29	PITTSFIELD CITY LAKE	1	54
CRAB ORCHARD LAKE	1	21	SILOAM SPRINGS LAKE	1	29	PITTSFIELD CITY LAKE	2	55
CHANNEL LAKE	1	22	CRYSTAL LAKE	2	30	SKOKIE LAGOONS	1	56
CHANNEL LAKE	1	22	DAWSON LAKE	1	30	LAKE BLOOMINGTON	2	58
CHANNEL LAKE	2	22	FOX LAKE	1	30	SKOKIE LAGOONS	1	58
CRAB ORCHARD LAKE	1	22	FOX LAKE	1	30	LAKE BLOOMINGTON	3	60
DEVILS KITCHEN LAKE	1	22	FOX LAKE	2	30	LAKE OF EGYPT	1	60
DEVILS KITCHEN LAKE	3	22	HORSESHOE LAKE	1	30	LAKE OF THE WOODS	2	60
KINKAID LAKE	3	22	HORSESHOE LAKE	2	30	RACCOON LAKE	1	60
LAKE LE-AQUA-NA	3	22	JOHNSON SAUK TRAIL LAKE	2	30	PITTSFIELD CITY LAKE	1	61
LAKE MATTOON	3	22	LAKE LE-AQUA-NA	1	30	PITTSFIELD CITY LAKE	2	64
LAKE MATTOON	3	22	LAKE SARA	1	30	PITTSFIELD CITY LAKE	2	64
LAKE SHABBONA	1	22	LONG LAKE	2	30	MCLEANSBORO NEW RESERVOIR	3	74
LAKE SHABBONA	1	22	RACCOON LAKE	3	30	RACCOON LAKE	1	75
LAKE SHABBONA	1	22	ROUND LAKE	3	30	LAKE SPRINGFIELD	1	77
LAKE SHABBONA	2	22	SAM PARR LAKE	1	30	SKOKIE LAGOONS	2	80
LAKE SHABBONA	2	22	CEDAR LAKE	2	31	SKOKIE LAGOONS	2	83
LAKE SHABBONA	3	22	CEDAR LAKE	3	31	MCLEANSBORO NEW RESERVOIR	3	85
LAKE SHABBONA	3	22	JOHNSON SAUK TRAIL LAKE	1	31	MCLEANSBORO NEW RESERVOIR	1	88
LAKE MATTOON	1	23	LAKE VERMILION	1	31	SPRING LAKE	1	89
DEVILS KITCHEN LAKE	1	23	LAKE VERMILION	1	31	MCLEANSBORO NEW RESERVOIR	1	93
LAKE GEORGE	1	23	MT STERLING LAKE	1	31	SPRING LAKE	1	94
LAKE GEORGE	1	23	ROUND LAKE	1	31	LONG LAKE	1	140
LAKE MATTOON	1	23	SANGCHRIS LAKE	3	31	PARIS EAST AND WEST LAKE	1	140
LAKE SHABBONA	1	23	ARGYLE LAKE	1	32	PITTSFIELD CITY LAKE	1	140
LONG LAKE	3	23	HORSESHOE LAKE	2	32	LONG LAKE	2	150
OTTER LAKE	3	23	JOHNSON SAUK TRAIL LAKE	1	32	LONG LAKE	3	150
PARADISE LAKE	2	23	JOHNSON SAUK TRAIL LAKE	2	32	LONG LAKE	3	157
STEPHEN A FORBES LAKE	2	23	LAKE MURPHYSBORO	1	32	LONG LAKE	3	160
STEPHEN A FORBES LAKE	3	23	LAKE TAYLORVILLE	2	32	LONG LAKE	3	160
CRYSTAL LAKE	1	24	ROUND LAKE	2	32	PARIS EAST AND WEST LAKE	1	160
DOLAN LAKE	1	24	WOLF LAKE	2	32	LONG LAKE	1	170
DOLAN LAKE	1	24	CANTON LAKE	1	33	MARION RESERVOIR	3	170
JOHNSON SAUK TRAIL LAKE	3	24	CEDAR LAKE	2	33	LONG LAKE	1	190
JOHNSON SAUK TRAIL LAKE	3	24	LAKE TAYLORVILLE	1	33	MARION RESERVOIR	3	190
LAKE GEORGE	2	24	ROUND LAKE	1	33	LONG LAKE	1	200
LAKE GEORGE	2	24	SILOAM SPRINGS LAKE	1	33	LONG LAKE	2	280
LAKE MURPHYSBORO	3	24	WALNUT POINT STATE LAKE	1	33	MARION RESERVOIR	1	550
LAKE SHABBONA	3	24	ANDERSON LAKE	1	34	MARION RESERVOIR	1	560

APPENDIX TABLE M. Lead concentratons (mg/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979 All values listed as 5 mg/kg were actually below the minimum detectable concentration of 5 mg/kg. Listing is arranged alphabetically in order of increasing concentration

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	5	CRAB ORCHARD LAKE	1	40	HORSESHOE LAKE	1	50
GLADSTONE LAKE	3	5	DAWSON LAKE	1	40	LAKE BLOOMINGTON	1	50
PITTSFIELD CITY LAKE	2	10	DAWSON LAKE	1	40	LAKE LOU YAEGER	1	50
PITTSFIELD CITY LAKE	3	10	DAWSON LAKE	2	40	LAKE MURPHYSBORO	1	50
PITTSFIELD CITY LAKE	3	10	DAWSON LAKE	2	40	LAKE MURPHYSBORO	3	50
SANGCHRIS LAKE	2	10	DEVILS KITCHEN LAKE	1	40	LAKE OF EGYPT	1	50
GLEN D JONES LAKE	3	20	DOLAN LAKE	1	40	LAKE OF THE WOODS	2	50
GLEN D JONES LAKE	3	20	GLEN D JONES LAKE	1	40	LAKE OF THE WOODS	2	50
HIGHLAND SILVER LAKE	3	20	HARRISBURG LAKE	3	40	LAKE SARA	1	50
HIGHLAND SILVER LAKE	3	20	HIGHLAND SILVER LAKE	1	40	LINCOLN TRAIL STATE LAKE	1	50
LAKE GEORGE	1	20	HIGHLAND SILVER LAKE	1	40	MCLEANSBORO NEW RESERVOIR	1	50
LAKE GEORGE	2	20	JOHNSON SAUK TRAIL LAKE	1	40	RACCOON LAKE	1	50
LAKE GEORGE	3	20	JOHNSON SAUK TRAIL LAKE	2	40	RACCOON LAKE	2	50
LAKE GEORGE	3	20	JOHNSON SAUK TRAIL LAKE	2	40	SAM PARR LAKE	1	50
LAKE LE-AQUA-NA	2	20	KINKAID LAKE	3	40	SPRING LAKE	1	50
LAKE LE-AQUA-NA	3	20	KINKAID LAKE	3	40	SPRING LAKE	1	50
LAKE OF EGYPT	3	20	LAKE BLOOMINGTON	1	40	STEPHEN A FORBES LAKE	1	50
LAKE SHABBONA	2	20	LAKE BLOOMINGTON	2	40	STEPHEN A FORBES LAKE	1	50
OLNEY EAST FORK RESERVOIR	1	20	LAKE BLOOMINGTON	3	40	FOX LAKE	1	60
OTTER LAKE	3	20	LAKE BLOOMINGTON	3	40	HORSESHOE LAKE	2	60
SILOAM SPRINGS LAKE	1	20	LAKE DECATUR	1	40	HORSESHOE LAKE	2	60
SILOAM SPRINGS LAKE	1	20	LAKE DECATUR	1	40	LAKE MURPHYSBORO	1	60
WASHINGTON COUNTY LAKE	3	20	LAKE LE-AQUA-NA	3	40	RACCOON LAKE	1	60
WASHINGTON COUNTY LAKE	3	20	LAKE MATTOON	1	40	FOX LAKE	1	70
ARGYLE LAKE	1	30	LAKE MATTOON	1	40	FOX LAKE	3	70
ARGYLE LAKE	1	30	LAKE MATTOON	2	40	HORSESHOE LAKE	1	70
CRAB ORCHARD LAKE	3	30	LAKE MATTOON	2	40	LONG LAKE	1	70
CRAB ORCHARD LAKE	3	30	LAKE MURPHYSBORO	3	40	LONG LAKE	1	70
DAWSON LAKE	3	30	LAKE OF EGYPT	1	40	LONG LAKE	2	70
DAWSON LAKE	3	30	LAKE OF EGYPT	2	40	SKOKIE LAGOONS	3	70
DEVILS KITCHEN LAKE	3	30	LAKE OF EGYPT	2	40	SKOKIE LAGOONS	3	70
DEVILS KITCHEN LAKE	3	30	LAKE SARA	1	40	FOX LAKE	2	80
DOLAN LAKE	3	30	LAKE SHABBONA	1	40	FOX LAKE	2	80
DOLAN LAKE	3	30	LAKE SHABBONA	1	40	FOX LAKE	3	80
GLEN D JONES LAKE	1	30	LAKE SHABBONA	2	40	LONG LAKE	1	80
HARRISBURG LAKE	3	30	LAKE SHABBONA	2	40	LONG LAKE	1	80
HORSESHOE LAKE	3	30	LAKE SHABBONA	2	40	LONG LAKE	2	80
HORSESHOE LAKE	3	30	LAKE SHABBONA	3	40	LONG LAKE	3	80
JOHNSON SAUK TRAIL LAKE	1	30	LAKE SHABBONA	3	40	LONG LAKE	3	80
JOHNSON SAUK TRAIL LAKE	3	30	LAKE SHABBONA	3	40	LONG LAKE	3	80
JOHNSON SAUK TRAIL LAKE	3	30	LAKE SPRINGFIELD	1	40	ROUND LAKE	3	80
KINKAID LAKE	1	30	LAKE STOREY	1	40	LONG LAKE	3	83
KINKAID LAKE	1	30	LAKE STOREY	1	40	ROUND LAKE	2	90
LAKE GEORGE	1	30	LAKE TAYLORVILLE	1	40	CEDAR LAKE	2	100
LAKE GEORGE	2	30	LAKE VERMILION	1	40	CEDAR LAKE	3	100
LAKE LE-AQUA-NA	1	30	LAKE VERMILION	1	40	CEDAR LAKE	3	100
LAKE LE-AQUA-NA	1	30	LINCOLN TRAIL STATE LAKE	2	40	CEDAR LAKE	3	100
LAKE LE-AQUA-NA	2	30	MARION RESERVOIR	1	40	ROUND LAKE	3	100
LAKE MATTOON	3	30	MARION RESERVOIR	1	40	CEDAR LAKE	3	110
LAKE MATTOON	3	30	MCLEANSBORO NEW RESERVOIR	1	40	CHANNEL LAKE	1	110
LAKE OF EGYPT	3	30	MCLEANSBORO NEW RESERVOIR	3	40	CHANNEL LAKE	1	110
LAKE SHABBONA	1	30	MCLEANSBORO NEW RESERVOIR	3	40	CHANNEL LAKE	2	110
LAKE SHABBONA	1	30	OTTER LAKE	1	40	ROUND LAKE	2	110
LAKE SHABBONA	3	30	PARADISE LAKE	1	40	CEDAR LAKE	1	120
LAKE TAYLORVILLE	2	30	PARADISE LAKE	1	40	CEDAR LAKE	2	120
LAKE TAYLORVILLE	3	30	PARADISE LAKE	2	40	CHANNEL LAKE	2	120
LINCOLN TRAIL STATE LAKE	3	30	PARADISE LAKE	3	40	CHANNEL LAKE	3	120
LONG LAKE	2	30	PARADISE LAKE	3	40	CHANNEL LAKE	3	120
LONG LAKE	2	30	PARIS EAST AND WEST LAKE	1	40	DIAMOND LAKE	3	120
LONG LAKE	3	30	PARIS EAST AND WEST LAKE	1	40	ROUND LAKE	1	120
LONG LAKE	3	30	PIERCE STATE LAKE	1	40	ROUND LAKE	1	120
MARION RESERVOIR	3	30	PIERCE STATE LAKE	1	40	ROUND LAKE	2	120
MARION RESERVOIR	3	30	PIERCE STATE LAKE	2	40	WOLF LAKE	2	120
MT STERLING LAKE	1	30	PITTSFIELD CITY LAKE	1	40	CEDAR LAKE	1	130
MT STERLING LAKE	1	30	PITTSFIELD CITY LAKE	1	40	CEDAR LAKE	1	130
OLNEY EAST FORK RESERVOIR	1	30	PITTSFIELD CITY LAKE	1	40	CEDAR LAKE	1	130
OLNEY EAST FORK RESERVOIR	3	30	PITTSFIELD CITY LAKE	1	40	CEDAR LAKE	2	130
OTTER LAKE	2	30	PITTSFIELD CITY LAKE	2	40	DIAMOND LAKE	3	130
PARADISE LAKE	2	30	PITTSFIELD CITY LAKE	2	40	ROUND LAKE	1	130
PIERCE STATE LAKE	2	30	PITTSFIELD CITY LAKE	2	40	ROUND LAKE	1	130
PIERCE STATE LAKE	3	30	RACCOON LAKE	2	40	BANGS LAKE	1	140
PIERCE STATE LAKE	3	30	RACCOON LAKE	3	40	CEDAR LAKE	2	140
PITTSFIELD CITY LAKE	2	30	RACCOON LAKE	3	40	SKOKIE LAGOONS	1	140
SAM DALE STATE LAKE	3	30	ROUND LAKE	2	40	SKOKIE LAGOONS	1	140
SAM DALE STATE LAKE	3	30	SAM DALE STATE LAKE	1	40	WOLF LAKE	3	140
SANGCHRIS LAKE	1	30	SAM DALE STATE LAKE	1	40	CRYSTAL LAKE	2	150
SANGCHRIS LAKE	3	30	SPRING LAKE	1	40	CRYSTAL LAKE	2	150
SPRING LAKE	1	30	STEPHEN A FORBES LAKE	2	40	DIAMOND LAKE	1	150
STEPHEN A FORBES LAKE	3	30	STEPHEN A FORBES LAKE	2	40	DIAMOND LAKE	1	150
STEPHEN A FORBES LAKE	3	30	VANDALIA CITY LAKE	1	40	WOLF LAKE	3	150
WASHINGTON COUNTY LAKE	1	30	VANDALIA CITY LAKE	1	40	CRYSTAL LAKE	1	160
WASHINGTON COUNTY LAKE	1	30	WALNUT POINT STATE LAKE	1	40	DIAMOND LAKE	2	160
LAKE JACKSONVILLE	1	33	WOLF LAKE	2	40	DIAMOND LAKE	2	160
OLNEY EAST FORK RESERVOIR	3	33	CRYSTAL LAKE	3	50	BANGS LAKE	2	170
LAKE BLOOMINGTON	2	36	CRYSTAL LAKE	3	50	CRYSTAL LAKE	1	170
ANDERSON LAKE	1	40	DEVILS KITCHEN LAKE	1	50	BANGS LAKE	1	180
ANDERSON LAKE	1	40	DEVILS KITCHEN LAKE	2	50	BANGS LAKE	2	180
CANTON LAKE	1	40	DEVILS KITCHEN LAKE	2	50	BANGS LAKE	3	210
CANTON LAKE	1	40	DOLAN LAKE	1	50	BANGS LAKE	3	220
CARLINVILLE LAKE	1	40	HARRISBURG LAKE	1	50	SKOKIE LAGOONS	2	240
CRAB ORCHARD LAKE	1	40	HARRISBURG LAKE	1	50	SKOKIE LAGOONS	2	250

APPENDIX TABLE N. Iron concentrations (mg/kg) in 273 sediment samples from 63 Illinois lakes, summer 1979 Listing is arranged alphabetically in order of increasing concentration.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
CRYSTAL LAKE	3	4300	CRAB ORCHARD LAKE	3	24000	LAKE BLOOMINGTON	1	31000
GLADSTONE LAKE	3	4600	DAWSON LAKE	3	24000	LAKE BLOOMINGTON	2	31000
CRYSTAL LAKE	3	4700	DIAMOND LAKE	1	24000	LAKE MATTOON	2	31000
GLADSTONE LAKE	3	6800	DIAMOND LAKE	2	24000	LAKE STOREY	1	31000
CRYSTAL LAKE	1	9000	DIAMOND LAKE	2	24000	LAKE VERMILION	1	31000
CRYSTAL LAKE	2	9300	HORSESHOE LAKE	3	24000	PIERCE STATE LAKE	1	31000
LONG LAKE	2	9300	HORSESHOE LAKE	3	24000	PIERCE STATE LAKE	2	31000
CRYSTAL LAKE	2	9500	LAKE SHABBONA	2	24000	SANGCHRIS LAKE	3	31000
CRYSTAL LAKE	1	9600	LAKE SHABBONA	3	24000	WASHINGTON COUNTY LAKE	1	31000
WOLF LAKE	2	9800	LINCOLN TRAIL STATE LAKE	3	24000	CRAB ORCHARD LAKE	1	32000
LONG LAKE	2	11000	RACCOON LAKE	2	24000	DAWSON LAKE	1	32000
HIGHLAND SILVER LAKE	3	13000	SKOKIE LAGOONS	3	24000	HORSESHOE LAKE	2	32000
ROUND LAKE	2	13000	SKOKIE LAGOONS	3	24000	LAKE DECATUR	1	32000
CHANNEL LAKE	1	14000	STEPHEN A FORBES LAKE	3	24000	LAKE TAYLORVILLE	2	32000
LAKE OF EGYPT	3	14000	CEDAR LAKE	1	25000	PARIS EAST AND WEST LAKE	1	32000
PITTSFIELD CITY LAKE	3	14000	CEDAR LAKE	1	25000	SKOKIE LAGOONS	2	32000
CHANNEL LAKE	3	15000	CEDAR LAKE	3	25000	VANDALIA CITY LAKE	1	32000
GLEN O JONES LAKE	3	15000	DIAMOND LAKE	1	25000	CARLINVILLE LAKE	1	33000
HIGHLAND SILVER LAKE	3	15000	HARRISBURG LAKE	3	25000	DEVILS KITCHEN LAKE	3	33000
PITTSFIELD CITY LAKE	3	15000	KINKAID LAKE	1	25000	HORSESHOE LAKE	1	33000
PITTSFIELD CITY LAKE	3	15000	LAKE MATTOON	3	25000	HORSESHOE LAKE	2	33000
SANGCHRIS LAKE	2	15000	LAKE MATTOON	3	25000	LAKE DECATUR	1	33000
CEDAR LAKE	3	16000	LAKE SHABBONA	1	25000	LAKE STOREY	1	33000
CEDAR LAKE	3	16000	LONG LAKE	3	25000	SAM DALE STATE LAKE	1	33000
CHANNEL LAKE	1	16000	LONG LAKE	3	25000	SILOAM SPRINGS LAKE	1	33000
CHANNEL LAKE	2	16000	SKOKIE LAGOONS	1	25000	SPRING LAKE	1	33000
CHANNEL LAKE	2	16000	DAWSON LAKE	2	26000	WALNUT POINT STATE LAKE	1	33000
CHANNEL LAKE	3	16000	DAWSON LAKE	3	26000	CRAB ORCHARD LAKE	1	34000
FOX LAKE	1	16000	HARRISBURG LAKE	3	26000	DEVILS KITCHEN LAKE	3	34000
FOX LAKE	1	16000	JOHNSON SAUK TRAIL LAKE	2	26000	DOLAN LAKE	1	34000
FOX LAKE	3	16000	LAKE GEORGE	1	26000	LAKE BLOOMINGTON	1	34000
GLEN O JONES LAKE	3	16000	LAKE GEORGE	1	26000	LAKE SARA	1	34000
LAKE OF EGYPT	3	16000	LAKE SHABBONA	2	26000	LAKE TAYLORVILLE	1	34000
PIERCE STATE LAKE	3	16000	LAKE SHABBONA	3	26000	LINCOLN TRAIL STATE LAKE	1	34000
CEDAR LAKE	3	17000	LAKE SHABBONA	3	26000	RACCOON LAKE	1	34000
CEDAR LAKE	3	17000	LONG LAKE	1	26000	RACCOON LAKE	1	34000
DIAMOND LAKE	3	17000	LONG LAKE	3	26000	SAM DALE STATE LAKE	1	34000
DIAMOND LAKE	3	17000	MCLEANSBORO NEW RESERVOIR	3	26000	SANGCHRIS LAKE	1	34000
FOX LAKE	2	17000	SAM DALE STATE LAKE	3	26000	SPRING LAKE	1	34000
FOX LAKE	3	17000	LAKE SHABBONA	1	26330	LAKE JACKSONVILLE	1	34660
LAKE SHABBONA	2	17000	LONG LAKE	3	26330	LAKE SPRINGFIELD	1	34660
PIERCE STATE LAKE	3	17000	CEDAR LAKE	2	27000	CANTON LAKE	1	35000
ROUND LAKE	3	17000	DAWSON LAKE	2	27000	JOHNSON SAUK TRAIL LAKE	1	35000
ROUND LAKE	3	17000	LAKE TAYLORVILLE	3	27000	LINCOLN TRAIL STATE LAKE	2	35000
FOX LAKE	2	18000	LONG LAKE	1	27000	LONG LAKE	3	35000
ROUND LAKE	1	18000	LONG LAKE	1	27000	OTTER LAKE	1	35000
SPRING LAKE	1	18000	OLNEY EAST FORK RESERVOIR	3	27000	PARADISE LAKE	1	35000
SPRING LAKE	1	18000	SAM DALE STATE LAKE	3	27000	PARADISE LAKE	1	35000
WOLF LAKE	2	18000	JOHNSON SAUK TRAIL LAKE	3	28000	SAM PARR LAKE	1	35000
BANGS LAKE	1	19000	JOHNSON SAUK TRAIL LAKE	3	28000	SILOAM SPRINGS LAKE	1	35000
DOLAN LAKE	3	19000	LAKE BLOOMINGTON	3	28000	VANDALIA CITY LAKE	1	35000
DOLAN LAKE	3	19000	LAKE GEORGE	2	28000	GLEN O JONES LAKE	1	36000
ROUND LAKE	1	19000	LAKE GEORGE	2	28000	LAKE OF THE WOODS	2	36000
ROUND LAKE	1	19000	LAKE MURPHYSBORO	3	28000	PITTSFIELD CITY LAKE	2	36000
ROUND LAKE	2	19000	LAKE SHABBONA	2	28000	ARGYLE LAKE	1	37000
WASHINGTON COUNTY LAKE	3	19000	LONG LAKE	2	28000	JOHNSON SAUK TRAIL LAKE	1	37000
WASHINGTON COUNTY LAKE	3	19000	LONG LAKE	3	28000	LAKE OF THE WOODS	2	37000
ROUND LAKE	2	19330	MT STERLING LAKE	1	28000	MARION RESERVOIR	1	37000
PARADISE LAKE	3	19400	MT STERLING LAKE	1	28000	MCLEANSBORO NEW RESERVOIR	1	37000
BANGS LAKE	3	20000	SKOKIE LAGOONS	1	28000	MCLEANSBORO NEW RESERVOIR	1	37000
BANGS LAKE	3	20000	OLNEY EAST FORK RESERVOIR	3	28330	DOLAN LAKE	1	38000
LAKE SHABBONA	1	20000	LAKE BLOOMINGTON	3	29000	KINKAID LAKE	3	38000
ROUND LAKE	1	20000	LAKE MATTOON	2	29000	LAKE LOU YAEGER	1	38000
ROUND LAKE	2	20000	LAKE MURPHYSBORO	3	29000	LAKE SARA	1	38000
WOLF LAKE	3	20000	LAKE SHABBONA	3	29000	STEPHEN A FORBES LAKE	2	38000
WOLF LAKE	3	20000	MARION RESERVOIR	3	29000	STEPHEN A FORBES LAKE	2	38000
BANGS LAKE	1	21000	OTTER LAKE	2	29000	LAKE OF EGYPT	2	39000
LAKE GEORGE	3	21000	PARADISE LAKE	2	29000	PITTSFIELD CITY LAKE	2	39000
LAKE LE-AQUA-NA	2	21000	PIERCE STATE LAKE	1	29000	CANTON LAKE	1	40000
LAKE LE-AQUA-NA	3	21000	PIERCE STATE LAKE	2	29000	MARION RESERVOIR	1	40000
LAKE SHABBONA	1	21000	RACCOON LAKE	2	29000	PITTSFIELD CITY LAKE	2	40000
OLNEY EAST FORK RESERVOIR	1	21000	SKOKIE LAGOONS	2	29000	STEPHEN A FORBES LAKE	1	40000
OTTER LAKE	3	21000	LAKE MATTOON	1	29660	STEPHEN A FORBES LAKE	1	40000
PARADISE LAKE	3	21000	LAKE VERMILION	1	29660	ARGYLE LAKE	1	41000
RACCOON LAKE	3	21000	DAWSON LAKE	1	30000	LAKE MURPHYSBORO	1	41000
RACCOON LAKE	3	21000	HIGHLAND SILVER LAKE	1	30000	PITTSFIELD CITY LAKE	2	41000
BANGS LAKE	2	22000	KINKAID LAKE	1	30000	KINKAID LAKE	3	42000
LAKE LE-AQUA-NA	3	22000	LAKE BLOOMINGTON	2	30000	LAKE MURPHYSBORO	1	42000
LONG LAKE	1	22000	LAKE LE-AQUA-NA	1	30000	LAKE OF EGYPT	2	42000
OLNEY EAST FORK RESERVOIR	1	22000	LAKE LE-AQUA-NA	1	30000	PITTSFIELD CITY LAKE	1	42000
STEPHEN A FORBES LAKE	3	22000	LAKE MATTOON	1	30000	PITTSFIELD CITY LAKE	1	43000
BANGS LAKE	2	23000	LONG LAKE	2	30000	PITTSFIELD CITY LAKE	1	43000
JOHNSON SAUK TRAIL LAKE	2	23000	MARION RESERVOIR	3	30000	DEVILS KITCHEN LAKE	1	44000
LAKE GEORGE	3	23000	MCLEANSBORO NEW RESERVOIR	3	30000	LAKE OF EGYPT	1	44000
LAKE LE-AQUA-NA	2	23000	PARADISE LAKE	2	30000	LAKE OF EGYPT	1	46000
WASHINGTON COUNTY LAKE	1	23000	PARIS EAST AND WEST LAKE	1	30000	PITTSFIELD CITY LAKE	1	46000
CEDAR LAKE	1	24000	GLEN O JONES LAKE	1	30660	HARRISBURG LAKE	1	47000
CEDAR LAKE	1	24000	ANDERSON LAKE	1	31000	HARRISBURG LAKE	1	48000
CEDAR LAKE	2	24000	ANDERSON LAKE	1	31000	DEVILS KITCHEN LAKE	1	50000
CEDAR LAKE	2	24000	HIGHLAND SILVER LAKE	1	31000	DEVILS KITCHEN LAKE	2	52000
CRAB ORCHARD LAKE	3	24000	HORSESHOE LAKE	1	31000	DEVILS KITCHEN LAKE	2	55000

APPENDIX TABLE O. Manganese concentrations (mg/kg) in 273 sediment samples from 63 Illinois lakes, summer 1979 Listing is arranged alphabetically in order of increasing concentration.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	170	DIAMOND LAKE	2	760	GLEN O JONES LAKE	3	1200
GLADSTONE LAKE	3	220	ROUND LAKE	2	767	JOHNSON SAUK TRAIL LAKE	1	1200
CRYSTAL LAKE	3	340	LAKE LE-AQUA-NA	1	770	JOHNSON SAUK TRAIL LAKE	3	1200
HIGHLAND SILVER LAKE	3	340	LAKE SHABBONA	3	770	LAKE SHABBONA	2	1200
CRYSTAL LAKE	3	360	ROUND LAKE	1	770	LAKE STOREY	1	1200
HIGHLAND SILVER LAKE	3	360	ROUND LAKE	2	770	LAKE STOREY	1	1200
LAKE OF EGYPT	3	360	BANGS LAKE	3	780	LAKE MATTOON	1	1233
PARADISE LAKE	3	360	CEDAR LAKE	2	780	DAWSON LAKE	1	1300
PITTSFIELD CITY LAKE	3	370	RACCOON LAKE	3	780	LAKE JACKSONVILLE	1	1300
PARADISE LAKE	3	380	BANGS LAKE	2	790	LINCOLN TRAIL STATE LAKE	2	1300
SPRING LAKE	1	400	CHANNEL LAKE	1	790	PIERCE STATE LAKE	1	1300
SPRING LAKE	1	400	FOX LAKE	3	790	PITTSFIELD CITY LAKE	1	1300
LAKE OF EGYPT	3	420	LAKE BLOOMINGTON	1	790	PITTSFIELD CITY LAKE	2	1300
PITTSFIELD CITY LAKE	3	420	LAKE VERMILION	1	790	PITTSFIELD CITY LAKE	2	1300
PITTSFIELD CITY LAKE	3	420	STEPHEN A FORBES LAKE	3	790	SAM DALE STATE LAKE	1	1300
SANGCHRIS LAKE	2	430	CEDAR LAKE	1	800	CANTON LAKE	1	1400
CRYSTAL LAKE	2	440	CEDAR LAKE	1	800	DEVILS KITCHEN LAKE	3	1400
CRYSTAL LAKE	1	450	PARADISE LAKE	1	800	HIGHLAND SILVER LAKE	1	1400
CRYSTAL LAKE	1	460	CEDAR LAKE	1	810	HORSESHOE LAKE	1	1400
CRYSTAL LAKE	2	460	CHANNEL LAKE	3	810	HORSESHOE LAKE	2	1400
LONG LAKE	2	460	FOX LAKE	3	810	LAKE SPRINGFIELD	1	1400
OTTER LAKE	3	470	LAKE BLOOMINGTON	1	810	LINCOLN TRAIL STATE LAKE	1	1400
LAKE LE-AQUA-NA	2	500	STEPHEN A FORBES LAKE	3	810	PIERCE STATE LAKE	2	1400
PIERCE STATE LAKE	3	520	WOLF LAKE	3	810	PITTSFIELD CITY LAKE	2	1400
LAKE LE-AQUA-NA	2	527	LAKE BLOOMINGTON	2	820	STEPHEN A FORBES LAKE	2	1400
ROUND LAKE	2	530	LAKE SHABBONA	1	820	WALNUT POINT STATE LAKE	1	1400
LONG LAKE	2	540	FOX LAKE	2	830	GLEN O JONES LAKE	3	1500
SKOKIE LAGOONS	1	540	LONG LAKE	3	830	HIGHLAND SILVER LAKE	1	1500
LAKE LE-AQUA-NA	3	550	CEDAR LAKE	1	833	LAKE MATTOON	1	1500
SKOKIE LAGOONS	3	550	CHANNEL LAKE	3	840	MCLEANSBORO NEW RESERVOIR	3	1500
WOLF LAKE	2	550	LAKE GEORGE	1	840	PIERCE STATE LAKE	1	1500
LONG LAKE	3	560	LAKE GEORGE	1	840	SAM DALE STATE LAKE	1	1500
SKOKIE LAGOONS	1	560	PARADISE LAKE	1	840	SANGCHRIS LAKE	1	1500
SKOKIE LAGOONS	3	560	WOLF LAKE	3	840	DOLAN LAKE	1	1600
LAKE LE-AQUA-NA	3	570	CEDAR LAKE	2	850	LAKE LOU YAEGER	1	1600
LONG LAKE	3	573	CHANNEL LAKE	1	850	PITTSFIELD CITY LAKE	1	1600
CEDAR LAKE	3	580	CHANNEL LAKE	2	850	PITTSFIELD CITY LAKE	2	1600
LAKE GEORGE	3	580	FOX LAKE	2	850	SAM DALE STATE LAKE	1	1600
LONG LAKE	1	580	BANGS LAKE	1	860	SAM DALE STATE LAKE	3	1600
MT STERLING LAKE	1	580	ANDERSON LAKE	1	870	STEPHEN A FORBES LAKE	2	1600
MT STERLING LAKE	1	580	ANDERSON LAKE	1	870	VANDALIA CITY LAKE	1	1600
HORSESHOE LAKE	3	590	CHANNEL LAKE	2	870	DOLAN LAKE	1	1700
PIERCE STATE LAKE	3	600	LAKE SHABBONA	1	870	HORSESHOE LAKE	1	1700
WASHINGTON COUNTY LAKE	3	620	CEDAR LAKE	2	880	HORSESHOE LAKE	2	1700
CEDAR LAKE	3	630	FOX LAKE	1	880	LAKE MURPHYSBORO	3	1700
HORSESHOE LAKE	3	630	FOX LAKE	1	880	LAKE SHABBONA	2	1700
CEDAR LAKE	3	640	LAKE SHABBONA	2	890	LAKE SHABBONA	2	1700
LONG LAKE	3	643	LAKE TAYLORVILLE	1	920	PITTSFIELD CITY LAKE	1	1700
LONG LAKE	2	650	SILOAM SPRINGS LAKE	1	920	VANDALIA CITY LAKE	1	1700
MARION RESERVOIR	3	650	LAKE DECATUR	1	950	WASHINGTON COUNTY LAKE	1	1700
MARION RESERVOIR	3	650	LAKE SHABBONA	3	950	LAKE SHABBONA	1	1767
CEDAR LAKE	3	660	LAKE SHABBONA	3	950	LAKE OF EGYPT	2	1800
LONG LAKE	2	660	LONG LAKE	3	950	MCLEANSBORO NEW RESERVOIR	3	1800
PARADISE LAKE	2	660	JOHNSON SAUK TRAIL LAKE	2	960	OTTER LAKE	1	1800
LAKE GEORGE	2	680	OTTER LAKE	2	960	RACCOON LAKE	1	1800
SANGCHRIS LAKE	3	680	DOLAN LAKE	3	970	SPRING LAKE	1	1800
WASHINGTON COUNTY LAKE	3	680	JOHNSON SAUK TRAIL LAKE	3	970	SPRING LAKE	1	1800
LONG LAKE	1	690	LAKE OF THE WOODS	2	970	CRAB ORCHARD LAKE	3	1900
ROUND LAKE	2	690	JOHNSON SAUK TRAIL LAKE	2	980	CRAB ORCHARD LAKE	3	1900
ROUND LAKE	3	690	CARLINVILLE LAKE	1	990	LAKE SHABBONA	1	1900
DIAMOND LAKE	3	700	DAWSON LAKE	3	990	RACCOON LAKE	1	1900
LAKE BLOOMINGTON	2	700	DOLAN LAKE	3	990	SAM PARR LAKE	1	1900
RACCOON LAKE	3	700	GLEN O JONES LAKE	1	990	LAKE MURPHYSBORO	3	2000
ROUND LAKE	1	700	LAKE DECATUR	1	990	PITTSFIELD CITY LAKE	1	2000
BANGS LAKE	1	710	LAKE OF THE WOODS	2	990	STEPHEN A FORBES LAKE	1	2000
SKOKIE LAGOONS	2	710	SILOAM SPRINGS LAKE	1	990	KINKAID LAKE	3	2200
LAKE SHABBONA	3	720	CEDAR LAKE	2	1000	OLNEY EAST FORK RESERVOIR	1	2300
PARADISE LAKE	2	720	GLEN O JONES LAKE	1	1000	LAKE SARA	1	2400
ROUND LAKE	3	720	HARRISBURG LAKE	3	1000	LAKE SARA	1	2500
BANGS LAKE	2	730	LAKE MATTOON	2	1000	LAKE MURPHYSBORO	1	2600
DIAMOND LAKE	2	730	LAKE MATTOON	2	1000	STEPHEN A FORBES LAKE	1	2600
DIAMOND LAKE	3	730	LAKE OF EGYPT	2	1000	WASHINGTON COUNTY LAKE	1	2600
LAKE GEORGE	3	730	RACCOON LAKE	2	1000	CRAB ORCHARD LAKE	1	2700
LAKE LE-AQUA-NA	1	730	DAWSON LAKE	1	1100	MARION RESERVOIR	1	2700
LONG LAKE	3	730	DAWSON LAKE	2	1100	HARRISBURG LAKE	1	2800
ROUND LAKE	1	730	DAWSON LAKE	3	1100	MARION RESERVOIR	1	2800
DIAMOND LAKE	1	740	DEVILS KITCHEN LAKE	3	1100	CRAB ORCHARD LAKE	1	2900
LAKE BLOOMINGTON	3	740	HARRISBURG LAKE	3	1100	OLNEY EAST FORK RESERVOIR	1	2900
LAKE MATTOON	3	740	JOHNSON SAUK TRAIL LAKE	1	1100	HARRISBURG LAKE	1	3000
LAKE TAYLORVILLE	3	740	LAKE TAYLORVILLE	2	1100	KINKAID LAKE	3	3000
LONG LAKE	1	740	OLNEY EAST FORK RESERVOIR	3	1100	LAKE MURPHYSBORO	1	3000
SKOKIE LAGOONS	2	740	OLNEY EAST FORK RESERVOIR	3	1100	MCLEANSBORO NEW RESERVOIR	1	3000
BANGS LAKE	3	750	PARIS EAST AND WEST LAKE	1	1100	MCLEANSBORO NEW RESERVOIR	1	3200
LAKE BLOOMINGTON	3	750	PARIS EAST AND WEST LAKE	1	1100	LAKE OF EGYPT	1	4100
LAKE GEORGE	2	750	PIERCE STATE LAKE	2	1100	KINKAID LAKE	1	4600
LAKE MATTOON	3	750	RACCOON LAKE	2	1100	LAKE OF EGYPT	1	6100
LINCOLN TRAIL STATE LAKE	3	750	WOLF LAKE	2	1100	KINKAID LAKE	1	6700
LONG LAKE	1	750	ARGYLE LAKE	1	1200	DEVILS KITCHEN LAKE	1	8500
ROUND LAKE	1	750	ARGYLE LAKE	1	1200	DEVILS KITCHEN LAKE	2	9000
LAKE VERMILION	1	757	CANTON LAKE	1	1200	DEVILS KITCHEN LAKE	2	9500
DIAMOND LAKE	1	760	DAWSON LAKE	2	1200	DEVILS KITCHEN LAKE	1	12000

APPENDIX TABLE P Mercury concentrations (mg/kg) in 273 sediment samples from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration. A period (.) denotes missing value

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
DEVILS KITCHEN LAKE	1	.	PITTSFIELD CITY LAKE	2	0.060	LAKE SHABBONA	1	0.090
LAKE MATTOON	2	0.000	ROUND LAKE	1	0.060	LAKE SHABBONA	3	0.090
GLADSTONE LAKE	3	0.004	SANGCHRIS LAKE	1	0.060	LAKE STOREY	1	0.090
GLADSTONE LAKE	3	0.004	SILOAM SPRINGS LAKE	1	0.060	LONG LAKE	1	0.090
WOLF LAKE	2	0.020	SKOKIE LAGOONS	3	0.060	MARION RESERVOIR	3	0.090
LAKE GEORGE	3	0.030	SKOKIE LAGOONS	3	0.060	MCLEANSBORO NEW RESERVOIR	1	0.090
LAKE MURPHYSBORO	1	0.030	SPRING LAKE	1	0.060	OLNEY EAST FORK RESERVOIR	3	0.090
LAKE SHABBONA	2	0.030	STEPHEN A FORBES LAKE	3	0.060	RACCOON LAKE	2	0.090
LONG LAKE	2	0.030	WASHINGTON COUNTY LAKE	3	0.060	ROUND LAKE	2	0.090
LONG LAKE	2	0.030	WASHINGTON COUNTY LAKE	3	0.060	SPRING LAKE	1	0.090
PITTSFIELD CITY LAKE	3	0.030	CEDAR LAKE	1	0.067	WASHINGTON COUNTY LAKE	1	0.090
PITTSFIELD CITY LAKE	3	0.030	CANTON LAKE	1	0.070	ARGYLE LAKE	1	0.100
PITTSFIELD CITY LAKE	3	0.030	CEDAR LAKE	2	0.070	CRAB ORCHARD LAKE	1	0.100
DOLAN LAKE	3	0.040	CEDAR LAKE	3	0.070	DIAMOND LAKE	1	0.100
DOLAN LAKE	3	0.040	CRAB ORCHARD LAKE	3	0.070	DIAMOND LAKE	2	0.100
GLEN O JONES LAKE	3	0.040	CRAB ORCHARD LAKE	3	0.070	LAKE STOREY	1	0.100
HIGHLAND SILVER LAKE	3	0.040	CRYSTAL LAKE	1	0.070	LONG LAKE	3	0.100
HIGHLAND SILVER LAKE	3	0.040	CRYSTAL LAKE	2	0.070	MARION RESERVOIR	3	0.100
JOHNSON SAUK TRAIL LAKE	3	0.040	DIAMOND LAKE	3	0.070	MCLEANSBORO NEW RESERVOIR	1	0.100
JOHNSON SAUK TRAIL LAKE	3	0.040	HARRISBURG LAKE	3	0.070	PARADISE LAKE	2	0.100
LAKE GEORGE	1	0.040	JOHNSON SAUK TRAIL LAKE	1	0.070	STEPHEN A FORBES LAKE	1	0.100
LAKE GEORGE	3	0.040	LAKE LE-AQUA-NA	1	0.070	STEPHEN A FORBES LAKE	1	0.100
LAKE SHABBONA	1	0.040	LAKE MATTOON	1	0.070	STEPHEN A FORBES LAKE	2	0.100
LAKE SHABBONA	1	0.040	LAKE MATTOON	3	0.070	DEVILS KITCHEN LAKE	3	0.110
LONG LAKE	3	0.040	LAKE OF EGYPT	1	0.070	FOX LAKE	1	0.110
PIERCE STATE LAKE	3	0.040	LAKE OF EGYPT	2	0.070	FOX LAKE	2	0.110
PIERCE STATE LAKE	3	0.040	LAKE OF EGYPT	3	0.070	FOX LAKE	3	0.110
SANGCHRIS LAKE	2	0.040	LAKE OF EGYPT	3	0.070	FOX LAKE	3	0.110
SANGCHRIS LAKE	3	0.040	LAKE SHABBONA	2	0.070	GLEN O JONES LAKE	1	0.110
LAKE BLOOMINGTON	2	0.047	LAKE SHABBONA	3	0.070	HARRISBURG LAKE	1	0.110
CEDAR LAKE	1	0.050	LAKE TAYLORVILLE	1	0.070	KINKAID LAKE	3	0.110
DAWSON LAKE	2	0.050	LINCOLN TRAIL STATE LAKE	1	0.070	KINKAID LAKE	3	0.110
GLEN O JONES LAKE	3	0.050	LONG LAKE	3	0.070	LAKE SARA	1	0.110
JOHNSON SAUK TRAIL LAKE	2	0.050	MT STERLING LAKE	1	0.070	LONG LAKE	2	0.110
LAKE BLOOMINGTON	1	0.050	PARIS EAST AND WEST LAKE	1	0.070	SKOKIE LAGOONS	1	0.110
LAKE BLOOMINGTON	3	0.050	PARIS EAST AND WEST LAKE	1	0.070	LONG LAKE	3	0.115
LAKE BLOOMINGTON	3	0.050	PIERCE STATE LAKE	2	0.070	ROUND LAKE	2	0.117
LAKE DECATUR	1	0.050	PITTSFIELD CITY LAKE	1	0.070	CARLINVILLE LAKE	1	0.120
LAKE GEORGE	1	0.050	RACCOON LAKE	1	0.070	KINKAID LAKE	1	0.120
LAKE GEORGE	2	0.050	RACCOON LAKE	1	0.070	KINKAID LAKE	1	0.120
LAKE GEORGE	2	0.050	RACCOON LAKE	2	0.070	LONG LAKE	3	0.120
LAKE LE-AQUA-NA	2	0.050	ROUND LAKE	2	0.070	PARADISE LAKE	1	0.120
LAKE LE-AQUA-NA	2	0.050	ROUND LAKE	3	0.070	SAM DALE STATE LAKE	1	0.120
LAKE LE-AQUA-NA	3	0.050	SAM PARR LAKE	1	0.070	FOX LAKE	2	0.130
LAKE LE-AQUA-NA	3	0.050	SILOAM SPRINGS LAKE	1	0.070	LONG LAKE	2	0.130
LAKE MURPHYSBORO	1	0.050	SPRING LAKE	1	0.070	MARION RESERVOIR	1	0.130
LAKE MURPHYSBORO	3	0.050	STEPHEN A FORBES LAKE	3	0.070	ROUND LAKE	1	0.130
LAKE OF EGYPT	2	0.050	WOLF LAKE	2	0.070	BANGS LAKE	3	0.140
LAKE SHABBONA	2	0.050	CANTON LAKE	1	0.080	CEDAR LAKE	1	0.140
LAKE TAYLORVILLE	3	0.050	CEDAR LAKE	2	0.080	DEVILS KITCHEN LAKE	2	0.140
LINCOLN TRAIL STATE LAKE	2	0.050	CRYSTAL LAKE	1	0.080	HARRISBURG LAKE	1	0.140
LONG LAKE	3	0.050	GLEN O JONES LAKE	1	0.080	HORSESHOE LAKE	1	0.140
OLNEY EAST FORK RESERVOIR	1	0.050	HIGHLAND SILVER LAKE	1	0.080	LONG LAKE	1	0.140
OTTER LAKE	3	0.050	HORSESHOE LAKE	3	0.080	LONG LAKE	1	0.140
PIERCE STATE LAKE	1	0.050	HORSESHOE LAKE	3	0.080	MARION RESERVOIR	1	0.140
PITTSFIELD CITY LAKE	2	0.050	LAKE LE-AQUA-NA	1	0.080	PARADISE LAKE	2	0.140
RACCOON LAKE	3	0.050	LAKE LOU YAEGER	1	0.080	CEDAR LAKE	3	0.150
RACCOON LAKE	3	0.050	LAKE MATTOON	2	0.080	CHANNEL LAKE	1	0.150
ROUND LAKE	1	0.050	LAKE SHABBONA	1	0.080	CHANNEL LAKE	3	0.150
LAKE VERMILION	1	0.053	LAKE SHABBONA	2	0.080	DEVILS KITCHEN LAKE	2	0.150
LAKE MATTOON	1	0.057	LAKE SHABBONA	3	0.080	HORSESHOE LAKE	1	0.150
CRYSTAL LAKE	2	0.060	LONG LAKE	1	0.080	SAM DALE STATE LAKE	1	0.150
DAWSON LAKE	1	0.060	MCLEANSBORO NEW RESERVOIR	3	0.080	CHANNEL LAKE	2	0.160
DAWSON LAKE	1	0.060	MCLEANSBORO NEW RESERVOIR	3	0.080	CHANNEL LAKE	3	0.160
DAWSON LAKE	2	0.060	OLNEY EAST FORK RESERVOIR	3	0.080	HORSESHOE LAKE	2	0.160
DAWSON LAKE	3	0.060	PARADISE LAKE	1	0.080	CEDAR LAKE	1	0.170
DAWSON LAKE	3	0.060	ROUND LAKE	2	0.080	CEDAR LAKE	2	0.170
DIAMOND LAKE	1	0.060	ROUND LAKE	3	0.080	CHANNEL LAKE	1	0.170
JOHNSON SAUK TRAIL LAKE	1	0.060	SAM DALE STATE LAKE	3	0.080	FOX LAKE	1	0.170
JOHNSON SAUK TRAIL LAKE	2	0.060	SAM DALE STATE LAKE	3	0.080	HORSESHOE LAKE	2	0.170
LAKE BLOOMINGTON	1	0.060	SPRING LAKE	1	0.080	PARADISE LAKE	3	0.170
LAKE BLOOMINGTON	2	0.060	STEPHEN A FORBES LAKE	2	0.080	CEDAR LAKE	3	0.180
LAKE DECATUR	1	0.060	VANDALIA CITY LAKE	1	0.080	LAKE SARA	1	0.180
LAKE JACKSONVILLE	1	0.060	VANDALIA CITY LAKE	1	0.080	BANGS LAKE	3	0.190
LAKE MATTOON	3	0.060	WALNUT POINT STATE LAKE	1	0.080	DEVILS KITCHEN LAKE	1	0.190
LAKE MURPHYSBORO	3	0.060	WASHINGTON COUNTY LAKE	1	0.080	SKOKIE LAGOONS	1	0.190
LAKE SHABBONA	3	0.060	WOLF LAKE	3	0.080	BANGS LAKE	1	0.200
LAKE TAYLORVILLE	2	0.060	WOLF LAKE	3	0.080	CHANNEL LAKE	2	0.200
LAKE VERMILION	1	0.060	LAKE SPRINGFIELD	1	0.083	LAKE OF THE WOODS	2	0.210
LINCOLN TRAIL STATE LAKE	3	0.060	ANDERSON LAKE	1	0.090	CEDAR LAKE	3	0.220
MT STERLING LAKE	1	0.060	ANDERSON LAKE	1	0.090	LAKE OF THE WOODS	2	0.220
OLNEY EAST FORK RESERVOIR	1	0.060	ARGYLE LAKE	1	0.090	CEDAR LAKE	2	0.230
OTTER LAKE	1	0.060	CRAB ORCHARD LAKE	1	0.090	BANGS LAKE	2	0.260
OTTER LAKE	2	0.060	DEVILS KITCHEN LAKE	3	0.090	PARADISE LAKE	3	0.260
PIERCE STATE LAKE	1	0.060	DIAMOND LAKE	2	0.090	BANGS LAKE	1	0.280
PIERCE STATE LAKE	2	0.060	DIAMOND LAKE	3	0.090	BANGS LAKE	2	0.300
PITTSFIELD CITY LAKE	1	0.060	DOLAN LAKE	1	0.090	SKOKIE LAGOONS	2	0.490
PITTSFIELD CITY LAKE	1	0.060	DOLAN LAKE	1	0.090	SKOKIE LAGOONS	2	0.490
PITTSFIELD CITY LAKE	1	0.060	HARRISBURG LAKE	3	0.090	CRYSTAL LAKE	3	0.500
PITTSFIELD CITY LAKE	2	0.060	HIGHLAND SILVER LAKE	1	0.090	CRYSTAL LAKE	3	0.500
PITTSFIELD CITY LAKE	2	0.060	LAKE OF EGYPT	1	0.090	ROUND LAKE	1	2.399

APPENDIX TABLE Q Zinc concentrations (mg/kg) in 273 sediment samples from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
GLADSTONE LAKE	3	11	DAWSON LAKE	3	92	HARRISBURG LAKE	1	120
GLADSTONE LAKE	3	22	HORSESHOE LAKE	3	92	JOHNSON SAUK TRAIL LAKE	1	120
CRYSTAL LAKE	3	23	HORSESHOE LAKE	3	92	LAKE BLOOMINGTON	1	120
CRYSTAL LAKE	3	27	LAKE TAYLORVILLE	3	92	LAKE DECATUR	1	120
GLEN D JONES LAKE	3	38	KINKAID LAKE	3	93	LAKE LE-AQUA-NA	1	120
ROUND LAKE	2	39	MCLEANSBORO NEW RESERVOIR	1	93	LAKE MURPHYSBORO	1	120
LAKE OF EGYPT	3	42	PARADISE LAKE	3	93	LAKE STOREY	1	120
PITTSFIELD CITY LAKE	3	42	FOX LAKE	2	94	LINCOLN TRAIL STATE LAKE	2	120
PITTSFIELD CITY LAKE	3	44	FOX LAKE	2	94	LONG LAKE	1	120
PITTSFIELD CITY LAKE	3	44	JOHNSON SAUK TRAIL LAKE	3	94	OTTER LAKE	1	120
GLEN D JONES LAKE	3	45	LAKE MURPHYSBORO	3	94	PARADISE LAKE	1	120
HIGHLAND SILVER LAKE	3	48	LAKE MATTOON	1	95	PARADISE LAKE	1	120
LAKE OF EGYPT	3	49	CHANNEL LAKE	1	95	PARIS EAST AND WEST LAKE	1	120
OLNEY EAST FORK RESERVOIR	1	49	DEVILS KITCHEN LAKE	1	95	PIERCE STATE LAKE	1	120
OLNEY EAST FORK RESERVOIR	1	49	DAWSON LAKE	2	96	PIERCE STATE LAKE	2	120
HIGHLAND SILVER LAKE	3	53	LAKE SARA	1	96	PIERCE STATE LAKE	2	120
DOLAN LAKE	3	54	MCLEANSBORO NEW RESERVOIR	1	96	PITTSFIELD CITY LAKE	1	120
DOLAN LAKE	3	54	MARION RESERVOIR	1	97	PITTSFIELD CITY LAKE	1	120
WASHINGTON COUNTY LAKE	3	57	SPRING LAKE	1	97	PITTSFIELD CITY LAKE	2	120
PIERCE STATE LAKE	3	62	SPRING LAKE	1	97	PITTSFIELD CITY LAKE	2	120
LAKE GEORGE	3	63	VANDALIA CITY LAKE	1	98	ROUND LAKE	2	120
LONG LAKE	2	63	CHANNEL LAKE	1	99	ROUND LAKE	3	120
OLNEY EAST FORK RESERVOIR	3	63	LAKE JACKSONVILLE	1	99	WALNUT POINT STATE LAKE	1	120
SANGCHRIS LAKE	2	63	LAKE MATTOON	2	99	ARGYLE LAKE	1	130
WASHINGTON COUNTY LAKE	2	63	LAKE OF EGYPT	2	99	CEDAR LAKE	2	130
WOLF LAKE	2	63	LAKE SHABBONA	3	99	CEDAR LAKE	3	130
KINKAID LAKE	1	64	OTTER LAKE	2	99	CEDAR LAKE	3	130
WASHINGTON COUNTY LAKE	1	66	RACCOON LAKE	2	99	CRYSTAL LAKE	1	130
HARRISBURG LAKE	3	69	ROUND LAKE	3	99	HORSESHOE LAKE	1	130
LAKE SHABBONA	2	69	CHANNEL LAKE	2	100	HORSESHOE LAKE	2	130
PIERCE STATE LAKE	3	70	CHANNEL LAKE	2	100	HORSESHOE LAKE	2	130
OLNEY EAST FORK RESERVOIR	3	70	DAWSON LAKE	1	100	JOHNSON SAUK TRAIL LAKE	1	130
HARRISBURG LAKE	3	72	DEVILS KITCHEN LAKE	1	100	LAKE DECATUR	1	130
KINKAID LAKE	1	72	JOHNSON SAUK TRAIL LAKE	2	100	LAKE MURPHYSBORO	1	130
MCLEANSBORO NEW RESERVOIR	3	72	LAKE BLOOMINGTON	3	100	LAKE STOREY	1	130
STEPHEN A FORBES LAKE	3	72	LAKE OF EGYPT	2	100	LAKE TAYLORVILLE	1	130
DEVILS KITCHEN LAKE	3	73	LAKE SARA	1	100	LAKE VERMILION	1	130
LAKE GEORGE	3	73	LAKE SHABBONA	1	100	PITTSFIELD CITY LAKE	1	130
RACCOON LAKE	3	73	LAKE SHABBONA	2	100	PITTSFIELD CITY LAKE	1	130
RACCOON LAKE	3	73	LAKE SHABBONA	3	100	SANGCHRIS LAKE	1	130
LONG LAKE	2	74	LAKE SHABBONA	3	100	CANTON LAKE	1	140
SAM DALE STATE LAKE	1	75	PARIS EAST AND WEST LAKE	1	100	DEVILS KITCHEN LAKE	2	140
LAKE LE-AQUA-NA	2	76	PITTSFIELD CITY LAKE	2	100	LAKE OF THE WOODS	2	140
LINCOLN TRAIL STATE LAKE	3	76	SPRING LAKE	1	100	LAKE OF THE WOODS	2	140
LAKE LE-AQUA-NA	3	77	STEPHEN A FORBES LAKE	1	100	LONG LAKE	1	140
SAM DALE STATE LAKE	3	77	STEPHEN A FORBES LAKE	2	100	LONG LAKE	1	140
STEPHEN A FORBES LAKE	3	77	CHANNEL LAKE	3	110	LONG LAKE	1	140
SAM DALE STATE LAKE	3	78	CRYSTAL LAKE	1	110	LONG LAKE	3	140
LAKE SHABBONA	1	80	CRYSTAL LAKE	2	110	ROUND LAKE	1	140
LAKE SHABBONA	1	80	DAWSON LAKE	1	110	ROUND LAKE	2	140
MARION RESERVOIR	3	80	DIAMOND LAKE	3	110	ROUND LAKE	2	140
MARION RESERVOIR	3	80	DOLAN LAKE	1	110	HORSESHOE LAKE	1	145
GLEN D JONES LAKE	1	80	HIGHLAND SILVER LAKE	1	110	ARGYLE LAKE	1	150
OTTER LAKE	3	81	HIGHLAND SILVER LAKE	1	110	CEDAR LAKE	2	150
SAM DALE STATE LAKE	1	82	JOHNSON SAUK TRAIL LAKE	2	110	LAKE LOU YAEGER	1	150
SILOAM SPRINGS LAKE	1	82	KINKAID LAKE	3	110	LONG LAKE	2	150
FOX LAKE	3	83	LAKE BLOOMINGTON	1	110	LONG LAKE	2	150
PARADISE LAKE	3	84	LAKE BLOOMINGTON	2	110	LONG LAKE	3	150
CRAB ORCHARD LAKE	3	85	LAKE BLOOMINGTON	2	110	LONG LAKE	3	150
FOX LAKE	3	85	LAKE BLOOMINGTON	3	110	LONG LAKE	3	150
LAKE GEORGE	1	85	LAKE LE-AQUA-NA	1	110	ROUND LAKE	1	150
LAKE LE-AQUA-NA	3	85	LAKE MATTOON	2	110	ROUND LAKE	1	150
LAKE MATTOON	3	85	LAKE OF EGYPT	1	110	ANDERSON LAKE	1	160
LONG LAKE	3	85	LAKE OF EGYPT	1	110	ANDERSON LAKE	1	160
MCLEANSBORO NEW RESERVOIR	3	85	LAKE SHABBONA	1	110	BANGS LAKE	1	160
LAKE LE-AQUA-NA	2	86	LAKE SHABBONA	3	110	CEDAR LAKE	1	160
CRAB ORCHARD LAKE	1	86	LAKE TAYLORVILLE	2	110	CEDAR LAKE	1	160
GLEN D JONES LAKE	1	86	LINCOLN TRAIL STATE LAKE	1	110	CEDAR LAKE	2	160
LAKE GEORGE	1	86	LONG LAKE	3	110	CEDAR LAKE	2	160
LAKE MATTOON	3	86	PARADISE LAKE	2	110	DIAMOND LAKE	1	160
LAKE MURPHYSBORO	3	86	PARADISE LAKE	2	110	DIAMOND LAKE	1	160
DEVILS KITCHEN LAKE	3	87	PIERCE STATE LAKE	1	110	DIAMOND LAKE	2	160
RACCOON LAKE	2	87	PITTSFIELD CITY LAKE	2	110	DIAMOND LAKE	2	160
CRAB ORCHARD LAKE	1	88	RACCOON LAKE	1	110	ROUND LAKE	1	160
LAKE GEORGE	2	88	RACCOON LAKE	1	110	SKOKIE LAGOONS	3	160
LAKE GEORGE	2	88	SAM PARR LAKE	1	110	SKOKIE LAGOONS	3	160
LAKE SHABBONA	2	88	SANGCHRIS LAKE	3	110	CEDAR LAKE	1	167
LAKE SHABBONA	2	88	SPRING LAKE	1	110	LAKE SPRINGFIELD	1	167
MT STERLING LAKE	1	88	STEPHEN A FORBES LAKE	1	110	CEDAR LAKE	1	170
SILOAM SPRINGS LAKE	1	88	STEPHEN A FORBES LAKE	2	110	BANGS LAKE	2	180
WASHINGTON COUNTY LAKE	1	88	VANDALIA CITY LAKE	1	110	BANGS LAKE	2	190
CRAB ORCHARD LAKE	3	89	LAKE VERMILION	1	117	BANGS LAKE	3	190
DAWSON LAKE	3	89	CANTON LAKE	1	120	BANGS LAKE	1	200
FOX LAKE	1	89	CARLINVILLE LAKE	1	120	BANGS LAKE	3	200
LAKE MATTOON	1	89	CEDAR LAKE	3	120	WOLF LAKE	2	220
MARION RESERVOIR	1	89	CEDAR LAKE	3	120	WOLF LAKE	3	270
DOLAN LAKE	1	91	CHANNEL LAKE	3	120	WOLF LAKE	3	270
FOX LAKE	1	91	CRYSTAL LAKE	2	120	SKOKIE LAGOONS	1	340
JOHNSON SAUK TRAIL LAKE	3	91	DEVILS KITCHEN LAKE	2	120	SKOKIE LAGOONS	1	350
MT STERLING LAKE	1	91	DIAMOND LAKE	3	120	SKOKIE LAGOONS	2	660
DAWSON LAKE	2	92	HARRISBURG LAKE	1	120	SKOKIE LAGOONS	2	750

APPENDIX TABLE R Total DDT concentrations (ug/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration. A period (.) denotes missing value, and all values listed as 5.0 ug/kg were actually below the minimum detectable level of 1.00 ug/kg.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
LAKE BLOOMINGTON	3	.	LAKE BLOOMINGTON	1	5.0	PITTSFIELD CITY LAKE	2	5.0
MT STERLING LAKE	1	.	LAKE BLOOMINGTON	3	5.0	PITTSFIELD CITY LAKE	3	5.0
PARIS EAST AND WEST LAKE	1	.	LAKE DECATUR	1	5.0	PITTSFIELD CITY LAKE	3	5.0
PARIS EAST AND WEST LAKE	1	.	LAKE DECATUR	1	5.0	PITTSFIELD CITY LAKE	3	5.0
PITTSFIELD CITY LAKE	2	.	LAKE GEORGE	1	5.0	RACCOON LAKE	1	5.0
PITTSFIELD CITY LAKE	2	.	LAKE GEORGE	1	5.0	RACCOON LAKE	1	5.0
SILOAM SPRINGS LAKE	1	.	LAKE GEORGE	2	5.0	RACCOON LAKE	2	5.0
ANDERSON LAKE	1	5.0	LAKE GEORGE	2	5.0	ROUND LAKE	1	5.0
ANDERSON LAKE	1	5.0	LAKE GEORGE	3	5.0	ROUND LAKE	1	5.0
ARGYLE LAKE	1	5.0	LAKE GEORGE	3	5.0	ROUND LAKE	2	5.0
ARGYLE LAKE	1	5.0	LAKE JACKSONVILLE	1	5.0	ROUND LAKE	2	5.0
BANGS LAKE	1	5.0	LAKE LE-AQUA-NA	1	5.0	ROUND LAKE	3	5.0
BANGS LAKE	1	5.0	LAKE LE-AQUA-NA	1	5.0	SAM DALE STATE LAKE	1	5.0
BANGS LAKE	2	5.0	LAKE LE-AQUA-NA	2	5.0	SAM DALE STATE LAKE	1	5.0
BANGS LAKE	2	5.0	LAKE LE-AQUA-NA	3	5.0	SAM DALE STATE LAKE	3	5.0
BANGS LAKE	3	5.0	LAKE LOU YAEGER	1	5.0	SAM DALE STATE LAKE	3	5.0
CANTON LAKE	1	5.0	LAKE MATTOON	1	5.0	SAM PARR LAKE	1	5.0
CANTON LAKE	1	5.0	LAKE MATTOON	1	5.0	SANGCHRIS LAKE	1	5.0
CEDAR LAKE	1	5.0	LAKE MATTOON	2	5.0	SANGCHRIS LAKE	2	5.0
CEDAR LAKE	1	5.0	LAKE MATTOON	2	5.0	SANGCHRIS LAKE	3	5.0
CEDAR LAKE	2	5.0	LAKE MATTOON	3	5.0	SILOAM SPRINGS LAKE	1	5.0
CEDAR LAKE	2	5.0	LAKE MATTOON	3	5.0	SPRING LAKE	1	5.0
CEDAR LAKE	2	5.0	LAKE MURPHYSBORO	1	5.0	SPRING LAKE	1	5.0
CEDAR LAKE	2	5.0	LAKE MURPHYSBORO	1	5.0	SPRING LAKE	1	5.0
CEDAR LAKE	3	5.0	LAKE MURPHYSBORO	3	5.0	STEPHEN A FORBES LAKE	1	5.0
CEDAR LAKE	3	5.0	LAKE MURPHYSBORO	3	5.0	STEPHEN A FORBES LAKE	1	5.0
CEDAR LAKE	3	5.0	LAKE OF EGYPT	1	5.0	STEPHEN A FORBES LAKE	2	5.0
CHANNEL LAKE	1	5.0	LAKE OF EGYPT	1	5.0	STEPHEN A FORBES LAKE	2	5.0
CHANNEL LAKE	1	5.0	LAKE OF EGYPT	2	5.0	STEPHEN A FORBES LAKE	3	5.0
CHANNEL LAKE	2	5.0	LAKE OF EGYPT	3	5.0	STEPHEN A FORBES LAKE	3	5.0
CHANNEL LAKE	2	5.0	LAKE OF EGYPT	3	5.0	VANDALIA CITY LAKE	1	5.0
CHANNEL LAKE	3	5.0	LAKE OF THE WOODS	2	5.0	VANDALIA CITY LAKE	1	5.0
CHANNEL LAKE	3	5.0	LAKE OF THE WOODS	2	5.0	WALNUT POINT STATE LAKE	1	5.0
CRAB ORCHARD LAKE	1	5.0	LAKE SARA	1	5.0	WASHINGTON COUNTY LAKE	1	5.0
CRAB ORCHARD LAKE	1	5.0	LAKE SARA	1	5.0	WASHINGTON COUNTY LAKE	1	5.0
CRAB ORCHARD LAKE	3	5.0	LAKE SHABBONA	1	5.0	WASHINGTON COUNTY LAKE	3	5.0
CRAB ORCHARD LAKE	3	5.0	LAKE SHABBONA	1	5.0	WASHINGTON COUNTY LAKE	3	5.0
CRYSTAL LAKE	3	5.0	LAKE SHABBONA	1	5.0	WOLF LAKE	2	5.0
CRYSTAL LAKE	3	5.0	LAKE SHABBONA	1	5.0	WOLF LAKE	2	5.0
DAWSON LAKE	1	5.0	LAKE SHABBONA	2	5.0	WOLF LAKE	3	5.0
DAWSON LAKE	2	5.0	LAKE SHABBONA	2	5.0	WOLF LAKE	3	5.0
DAWSON LAKE	2	5.0	LAKE SHABBONA	3	5.0	LAKE BLOOMINGTON	1	5.2
DAWSON LAKE	3	5.0	LAKE SPRINGFIELD	1	5.0	CEDAR LAKE	1	5.3
DAWSON LAKE	3	5.0	LAKE STOREY	1	5.0	LAKE LE-AQUA-NA	2	5.3
DEVILS KITCHEN LAKE	1	5.0	LAKE STOREY	1	5.0	LAKE SHABBONA	3	5.5
DEVILS KITCHEN LAKE	2	5.0	LAKE TAYLORVILLE	2	5.0	RACCOON LAKE	3	5.8
DEVILS KITCHEN LAKE	2	5.0	LINCOLN TRAIL STATE LAKE	1	5.0	ROUND LAKE	3	5.8
DEVILS KITCHEN LAKE	3	5.0	LINCOLN TRAIL STATE LAKE	2	5.0	RACCOON LAKE	2	5.9
DEVILS KITCHEN LAKE	3	5.0	LINCOLN TRAIL STATE LAKE	3	5.0	DIAMOND LAKE	3	6.0
DIAMOND LAKE	1	5.0	LONG LAKE	1	5.0	LAKE LE-AQUA-NA	3	6.1
DIAMOND LAKE	1	5.0	LONG LAKE	1	5.0	PITTSFIELD CITY LAKE	1	6.2
DIAMOND LAKE	2	5.0	LONG LAKE	1	5.0	PITTSFIELD CITY LAKE	1	6.2
DIAMOND LAKE	2	5.0	LONG LAKE	1	5.0	LAKE BLOOMINGTON	2	6.3
DOLAN LAKE	1	5.0	LONG LAKE	2	5.0	DIAMOND LAKE	3	6.5
DOLAN LAKE	1	5.0	LONG LAKE	2	5.0	HIGHLAND SILVER LAKE	1	6.5
DOLAN LAKE	3	5.0	LONG LAKE	2	5.0	DAWSON LAKE	1	6.6
DOLAN LAKE	3	5.0	LONG LAKE	2	5.0	LAKE SHABBONA	2	6.7
FOX LAKE	1	5.0	LONG LAKE	3	5.0	LAKE TAYLORVILLE	3	6.7
FOX LAKE	1	5.0	LONG LAKE	3	5.0	BANGS LAKE	3	6.8
FOX LAKE	2	5.0	LONG LAKE	3	5.0	RACCOON LAKE	3	6.9
FOX LAKE	2	5.0	LONG LAKE	3	5.0	LAKE SHABBONA	2	7.1
FOX LAKE	3	5.0	LONG LAKE	3	5.0	ROUND LAKE	1	7.1
FOX LAKE	3	5.0	LONG LAKE	3	5.0	CARLINVILLE LAKE	1	8.2
GLADSTONE LAKE	3	5.0	MARION RESERVOIR	1	5.0	LAKE BLOOMINGTON	2	8.2
GLADSTONE LAKE	3	5.0	MARION RESERVOIR	1	5.0	LAKE OF EGYPT	2	8.4
GLEN O JONES LAKE	1	5.0	MARION RESERVOIR	3	5.0	PITTSFIELD CITY LAKE	1	8.7
GLEN O JONES LAKE	1	5.0	MARION RESERVOIR	3	5.0	ROUND LAKE	2	8.7
GLEN O JONES LAKE	3	5.0	MCLEANSBORO NEW RESERVOIR	1	5.0	LAKE SHABBONA	3	8.8
GLEN O JONES LAKE	3	5.0	MCLEANSBORO NEW RESERVOIR	1	5.0	CEDAR LAKE	1	9.1
HARRISBURG LAKE	1	5.0	MCLEANSBORO NEW RESERVOIR	3	5.0	LAKE SHABBONA	3	9.3
HARRISBURG LAKE	1	5.0	MCLEANSBORO NEW RESERVOIR	3	5.0	ROUND LAKE	2	9.5
HARRISBURG LAKE	3	5.0	MT STERLING LAKE	1	5.0	HIGHLAND SILVER LAKE	1	9.8
HARRISBURG LAKE	3	5.0	OLNEY EAST FORK RESERVOIR	1	5.0	CEDAR LAKE	3	10.0
HIGHLAND SILVER LAKE	3	5.0	OLNEY EAST FORK RESERVOIR	1	5.0	DEVILS KITCHEN LAKE	1	10.0
HIGHLAND SILVER LAKE	3	5.0	OLNEY EAST FORK RESERVOIR	3	5.0	SPRING LAKE	1	11.0
HORSESHOE LAKE	1	5.0	OLNEY EAST FORK RESERVOIR	3	5.0	LAKE VERMILION	1	12.0
HORSESHOE LAKE	1	5.0	OTTER LAKE	1	5.0	LAKE VERMILION	1	12.0
HORSESHOE LAKE	2	5.0	OTTER LAKE	2	5.0	LAKE TAYLORVILLE	1	14.0
HORSESHOE LAKE	2	5.0	OTTER LAKE	3	5.0	ROUND LAKE	1	14.0
HORSESHOE LAKE	3	5.0	PARADISE LAKE	1	5.0	PITTSFIELD CITY LAKE	2	15.0
HORSESHOE LAKE	3	5.0	PARADISE LAKE	1	5.0	SKOKIE LAGOONS	3	16.0
JOHNSON SAUK TRAIL LAKE	1	5.0	PARADISE LAKE	2	5.0	SKOKIE LAGOONS	3	16.0
JOHNSON SAUK TRAIL LAKE	1	5.0	PARADISE LAKE	2	5.0	PITTSFIELD CITY LAKE	1	18.0
JOHNSON SAUK TRAIL LAKE	2	5.0	PARADISE LAKE	3	5.0	SKOKIE LAGOONS	1	31.0
JOHNSON SAUK TRAIL LAKE	2	5.0	PARADISE LAKE	3	5.0	CRYSTAL LAKE	2	37.0
JOHNSON SAUK TRAIL LAKE	3	5.0	PIERCE STATE LAKE	1	5.0	SKOKIE LAGOONS	1	39.0
JOHNSON SAUK TRAIL LAKE	3	5.0	PIERCE STATE LAKE	1	5.0	SKOKIE LAGOONS	2	52.0
KINKAID LAKE	1	5.0	PIERCE STATE LAKE	2	5.0	CRYSTAL LAKE	1	54.0
KINKAID LAKE	1	5.0	PIERCE STATE LAKE	2	5.0	SKOKIE LAGOONS	2	65.0
KINKAID LAKE	3	5.0	PIERCE STATE LAKE	3	5.0	CRYSTAL LAKE	2	78.0
KINKAID LAKE	3	5.0	PIERCE STATE LAKE	3	5.0	CRYSTAL LAKE	1	102.0

APPENDIX TABLE S Dieldrin concentrations (ug/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979 Listing is arranged alphabetically in order of increasing concentration. A period (.) denotes missing value, and all values listed as 1.0 ug/kg were actually below the minimum detectable level of 1.0 ug/kg.

LAKE NAME	SITE	VALUE
LAKE BLOOMINGTON	3	.
MT STERLING LAKE	1	.
PARIS EAST AND WEST LAKE	1	.
PARIS EAST AND WEST LAKE	1	.
PITTSFIELD CITY LAKE	2	.
PITTSFIELD CITY LAKE	2	.
SILOAM SPRINGS LAKE	1	.
BANGS LAKE	1	1.0
BANGS LAKE	2	1.0
BANGS LAKE	3	1.0
BANGS LAKE	3	1.0
CEDAR LAKE	1	1.0
CEDAR LAKE	1	1.0
CEDAR LAKE	1	1.0
CEDAR LAKE	2	1.0
CEDAR LAKE	2	1.0
CEDAR LAKE	2	1.0
CEDAR LAKE	2	1.0
CEDAR LAKE	3	1.0
CEDAR LAKE	3	1.0
CHANNEL LAKE	1	1.0
CHANNEL LAKE	1	1.0
CHANNEL LAKE	2	1.0
CHANNEL LAKE	2	1.0
CHANNEL LAKE	3	1.0
CHANNEL LAKE	3	1.0
CRAB ORCHARD LAKE	1	1.0
CRAB ORCHARD LAKE	1	1.0
CRYSTAL LAKE	1	1.0
CRYSTAL LAKE	1	1.0
CRYSTAL LAKE	2	1.0
CRYSTAL LAKE	2	1.0
CRYSTAL LAKE	3	1.0
CRYSTAL LAKE	3	1.0
DEVILS KITCHEN LAKE	2	1.0
DEVILS KITCHEN LAKE	3	1.0
DEVILS KITCHEN LAKE	3	1.0
DIAMOND LAKE	1	1.0
DIAMOND LAKE	2	1.0
DIAMOND LAKE	2	1.0
DIAMOND LAKE	3	1.0
DIAMOND LAKE	3	1.0
DOLAN LAKE	1	1.0
DOLAN LAKE	1	1.0
DOLAN LAKE	3	1.0
DOLAN LAKE	3	1.0
FOX LAKE	1	1.0
FOX LAKE	1	1.0
FOX LAKE	2	1.0
FOX LAKE	2	1.0
FOX LAKE	3	1.0
GLADSTONE LAKE	3	1.0
GLADSTONE LAKE	3	1.0
GLEN O JONES LAKE	1	1.0
GLEN O JONES LAKE	1	1.0
GLEN O JONES LAKE	3	1.0
GLEN O JONES LAKE	3	1.0
HARRISBURG LAKE	1	1.0
HORSESHOE LAKE	2	1.0
HORSESHOE LAKE	2	1.0
HORSESHOE LAKE	3	1.0
HORSESHOE LAKE	3	1.0
JOHNSON SAUK TRAIL LAKE	1	1.0
JOHNSON SAUK TRAIL LAKE	1	1.0
JOHNSON SAUK TRAIL LAKE	2	1.0
JOHNSON SAUK TRAIL LAKE	2	1.0
JOHNSON SAUK TRAIL LAKE	3	1.0
JOHNSON SAUK TRAIL LAKE	3	1.0
KINKAID LAKE	1	1.0
LAKE LE-AQUA-NA	3	1.0
LAKE LE-AQUA-NA	3	1.0
LAKE MURPHYSBORO	3	1.0
LAKE MURPHYSBORO	3	1.0
LAKE OF EGYPT	1	1.0
LAKE OF EGYPT	2	1.0
LAKE OF EGYPT	2	1.0
LAKE OF EGYPT	3	1.0
LAKE OF EGYPT	3	1.0
LAKE SARA	1	1.0
LONG LAKE	1	1.0
LONG LAKE	1	1.0
LONG LAKE	2	1.0
LONG LAKE	2	1.0
LONG LAKE	2	1.0
LONG LAKE	3	1.0
LONG LAKE	3	1.0
LONG LAKE	3	1.0
LONG LAKE	3	1.0
MARION RESERVOIR	1	1.0
MARION RESERVOIR	1	1.0
MARION RESERVOIR	3	1.0
MARION RESERVOIR	3	1.0
MCLEANSBORO NEW RESERVOIR	1	1.0
MCLEANSBORO NEW RESERVOIR	1	1.0
MCLEANSBORO NEW RESERVOIR	3	1.0
MCLEANSBORO NEW RESERVOIR	3	1.0
OLNEY EAST FORK RESERVOIR	1	1.0
PITTSFIELD CITY LAKE	2	1.0
RACCOON LAKE	1	1.0
ROUND LAKE	1	1.0
ROUND LAKE	2	1.0
ROUND LAKE	2	1.0
ROUND LAKE	3	1.0
ROUND LAKE	3	1.0
SAM DALE STATE LAKE	1	1.0
SAM DALE STATE LAKE	3	1.0
SAM DALE STATE LAKE	3	1.0
SKOKIE LAGOONS	1	1.0
SKOKIE LAGOONS	1	1.0
SKOKIE LAGOONS	2	1.0
SKOKIE LAGOONS	3	1.0
SKOKIE LAGOONS	3	1.0
SPRING LAKE	1	1.0
SPRING LAKE	1	1.0
WASHINGTON COUNTY LAKE	1	1.0
WASHINGTON COUNTY LAKE	1	1.0
WOLF LAKE	2	1.0
WOLF LAKE	2	1.0
WOLF LAKE	3	1.0
BANGS LAKE	2	1.1
DIAMOND LAKE	1	1.1
KINKAID LAKE	3	1.1
LAKE SARA	1	1.1
STEPHEN A FORBES LAKE	3	1.1
CEDAR LAKE	3	1.2
CEDAR LAKE	3	1.2
CRAB ORCHARD LAKE	3	1.2
HARRISBURG LAKE	3	1.2
HARRISBURG LAKE	3	1.2
LAKE MURPHYSBORO	1	1.2
LAKE OF EGYPT	1	1.2
LINCOLN TRAIL STATE LAKE	2	1.2
LONG LAKE	2	1.2
LONG LAKE	3	1.2
OLNEY EAST FORK RESERVOIR	1	1.2
PITTSFIELD CITY LAKE	3	1.2
RACCOON LAKE	2	1.2
SAM DALE STATE LAKE	1	1.2
CEDAR LAKE	1	1.3
LONG LAKE	3	1.3
ROUND LAKE	1	1.3
VANDALIA CITY LAKE	1	1.3
KINKAID LAKE	3	1.4
LAKE MURPHYSBORO	1	1.4
LONG LAKE	1	1.4
HORSESHOE LAKE	1	1.5
KINKAID LAKE	1	1.5
LAKE TAYLORVILLE	2	1.5
ROUND LAKE	1	1.5
VANDALIA CITY LAKE	1	1.5
HARRISBURG LAKE	1	1.6
LAKE OF THE WOODS	2	1.6
RACCOON LAKE	1	1.6
ROUND LAKE	2	1.6
BANGS LAKE	1	1.7
HORSESHOE LAKE	1	1.7
PITTSFIELD CITY LAKE	1	1.7
PITTSFIELD CITY LAKE	1	1.7
SKOKIE LAGOONS	2	1.7
ANDERSON LAKE	1	1.8
FOX LAKE	3	1.8
ROUND LAKE	2	1.8
SILOAM SPRINGS LAKE	1	1.8
WOLF LAKE	3	1.8
ANDERSON LAKE	1	1.9
CRAB ORCHARD LAKE	3	2.0
STEPHEN A FORBES LAKE	2	2.0
LAKE LE-AQUA-NA	2	2.2
OLNEY EAST FORK RESERVOIR	3	2.4
DAWSON LAKE	2	2.5
DEVILS KITCHEN LAKE	1	2.5
LAKE LE-AQUA-NA	2	2.5
OLNEY EAST FORK RESERVOIR	3	2.5
RACCOON LAKE	2	2.5
WASHINGTON COUNTY LAKE	3	2.5
ARGYLE LAKE	1	2.6
RACCOON LAKE	3	2.6
SPRING LAKE	1	2.6
DEVILS KITCHEN LAKE	2	2.7
SANGCHRIS LAKE	2	2.7
WASHINGTON COUNTY LAKE	3	2.7
LAKE GEORGE	3	3.2
LINCOLN TRAIL STATE LAKE	3	3.2
STEPHEN A FORBES LAKE	1	3.2
STEPHEN A FORBES LAKE	1	3.2
LAKE GEORGE	3	3.3
OTTER LAKE	1	3.3
PITTSFIELD CITY LAKE	2	3.3
LONG LAKE	1	3.4
DAWSON LAKE	3	3.6
PIERCE STATE LAKE	2	3.6
SAM PARR LAKE	1	3.6
PIERCE STATE LAKE	3	3.7
PITTSFIELD CITY LAKE	3	3.9
DAWSON LAKE	3	4.0
PIERCE STATE LAKE	3	4.0
LINCOLN TRAIL STATE LAKE	1	4.1
MT STERLING LAKE	1	4.1
PIERCE STATE LAKE	1	4.1
RACCOON LAKE	3	4.1
PARADISE LAKE	2	4.2
PIERCE STATE LAKE	1	4.3
PITTSFIELD CITY LAKE	1	4.6
ROUND LAKE	1	4.6
WALNUT POINT STATE LAKE	1	4.8
LAKE OF THE WOODS	2	5.1
ARGYLE LAKE	1	5.5
CANTON LAKE	1	5.7
STEPHEN A FORBES LAKE	2	5.8
LAKE GEORGE	2	5.9
DAWSON LAKE	2	6.1
OTTER LAKE	3	6.1
PITTSFIELD CITY LAKE	1	6.1
LAKE LOU YAEGER	1	6.3
LAKE LE-AQUA-NA	1	6.4
STEPHEN A FORBES LAKE	3	6.4
SPRING LAKE	1	6.6
LAKE GEORGE	2	6.8
PIERCE STATE LAKE	2	7.2
LAKE MATTOON	1	7.5
LAKE TAYLORVILLE	3	7.9
LAKE LE-AQUA-NA	1	8.5
DEVILS KITCHEN LAKE	1	8.7
CANTON LAKE	1	8.8
LAKE STOREY	1	8.9
LAKE SHABBONA	1	9.0
OTTER LAKE	2	9.2
HIGHLAND SILVER LAKE	3	9.7
DAWSON LAKE	1	9.8
LAKE STOREY	1	9.9
LAKE MATTOON	2	10.0
LAKE GEORGE	1	11.0
LAKE SHABBONA	3	11.0
SANGCHRIS LAKE	3	11.0
LAKE MATTOON	3	12.0
LAKE SHABBONA	1	12.0
LAKE VERMILION	1	12.0
LAKE VERMILION	1	12.0
SANGCHRIS LAKE	1	12.0
LAKE SHABBONA	2	13.0
PITTSFIELD CITY LAKE	3	13.0
HIGHLAND SILVER LAKE	3	14.0
LAKE SHABBONA	1	14.0
LAKE DECATUR	1	15.0
LAKE GEORGE	1	16.0
LAKE SHABBONA	3	16.0
LAKE SHABBONA	2	17.0
LAKE DECATUR	1	18.0
LAKE SHABBONA	1	18.0
LAKE MATTOON	3	19.0
LAKE TAYLORVILLE	1	19.0
CARLINVILLE LAKE	1	20.0
LAKE MATTOON	1	20.0
LAKE SPRINGFIELD	1	20.0
HIGHLAND SILVER LAKE	1	24.0
LAKE MATTOON	2	25.0
DAWSON LAKE	1	29.0
LAKE SHABBONA	3	30.0
PARADISE LAKE	1	31.0
PARADISE LAKE	3	31.0
LAKE BLOOMINGTON	1	32.0
PARADISE LAKE	3	32.0
LAKE BLOOMINGTON	3	34.0
HIGHLAND SILVER LAKE	1	35.0
LAKE SHABBONA	2	38.0
LAKE JACKSONVILLE	1	39.0
LAKE SHABBONA	3	41.0
PARADISE LAKE	1	44.0
LAKE BLOOMINGTON	2	51.0
PARADISE LAKE	2	51.0
LAKE BLOOMINGTON	1	55.0
LAKE SHABBONA	2	68.0
LAKE BLOOMINGTON	2	87.0

APPENDIX TABLE T. Heptachlor epoxide concentrations (ug/kg) in 273 sediment samples taken from 63 Illinois lakes, summer 1979. Listing is arranged alphabetically in order of increasing concentration. A period (.) denotes missing value, and all values listed as 1.00 ug/kg were actually below the minimum detectable level of 1.00 ug/kg.

LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE	LAKE NAME	SITE	VALUE
LAKE BLOOMINGTON	3	.	LAKE GEORGE	2	1.00	SAM DALE STATE LAKE	3	1.00
MT STERLING LAKE	1	.	LAKE GEORGE	3	1.00	SAM DALE STATE LAKE	3	1.00
PARIS EAST AND WEST LAKE	1	.	LAKE GEORGE	3	1.00	SAM PARR LAKE	1	1.00
PARIS EAST AND WEST LAKE	1	.	LAKE LE-AQUA-NA	1	1.00	SANGCHRIS LAKE	2	1.00
PITTSFIELD CITY LAKE	2	.	LAKE LE-AQUA-NA	1	1.00	SILOAM SPRINGS LAKE	1	1.00
PITTSFIELD CITY LAKE	2	.	LAKE LE-AQUA-NA	2	1.00	SKOKIE LAGOONS	1	1.00
SILOAM SPRINGS LAKE	1	.	LAKE LE-AQUA-NA	2	1.00	SKOKIE LAGOONS	3	1.00
ANDERSON LAKE	1	1.00	LAKE LE-AQUA-NA	3	1.00	SPRING LAKE	1	1.00
ARGYLE LAKE	1	1.00	LAKE LE-AQUA-NA	3	1.00	SPRING LAKE	1	1.00
BANGS LAKE	1	1.00	LAKE MURPHYSBORO	1	1.00	SPRING LAKE	1	1.00
BANGS LAKE	1	1.00	LAKE MURPHYSBORO	1	1.00	SPRING LAKE	1	1.00
BANGS LAKE	2	1.00	LAKE MURPHYSBORO	3	1.00	STEPHEN A FORBES LAKE	1	1.00
BANGS LAKE	2	1.00	LAKE MURPHYSBORO	3	1.00	STEPHEN A FORBES LAKE	2	1.00
BANGS LAKE	3	1.00	LAKE OF EGYPT	1	1.00	VANDALIA CITY LAKE	1	1.00
BANGS LAKE	3	1.00	LAKE OF EGYPT	2	1.00	VANDALIA CITY LAKE	1	1.00
CANTON LAKE	1	1.00	LAKE OF EGYPT	2	1.00	WALNUT POINT STATE LAKE	1	1.00
CANTON LAKE	1	1.00	LAKE OF EGYPT	3	1.00	WASHINGTON COUNTY LAKE	1	1.00
CEDAR LAKE	1	1.00	LAKE OF EGYPT	3	1.00	WASHINGTON COUNTY LAKE	1	1.00
CEDAR LAKE	1	1.00	LAKE OF THE WOODS	2	1.00	WASHINGTON COUNTY LAKE	3	1.00
CEDAR LAKE	2	1.00	LAKE OF THE WOODS	2	1.00	WASHINGTON COUNTY LAKE	3	1.00
CEDAR LAKE	2	1.00	LAKE SARA	1	1.00	WOLF LAKE	2	1.00
CEDAR LAKE	2	1.00	LAKE SARA	1	1.00	WOLF LAKE	2	1.00
CEDAR LAKE	2	1.00	LAKE SHABBONA	1	1.00	WOLF LAKE	3	1.00
CEDAR LAKE	3	1.00	LAKE SHABBONA	1	1.00	WOLF LAKE	3	1.00
CEDAR LAKE	3	1.00	LAKE SHABBONA	1	1.00	CEDAR LAKE	1	1.10
CEDAR LAKE	3	1.00	LAKE SHABBONA	1	1.00	CEDAR LAKE	1	1.10
CHANNEL LAKE	1	1.00	LAKE SHABBONA	2	1.00	DIAMOND LAKE	3	1.10
CHANNEL LAKE	1	1.00	LAKE SHABBONA	2	1.00	DIAMOND LAKE	3	1.10
CHANNEL LAKE	2	1.00	LAKE SHABBONA	3	1.00	LAKE LOU YAEGER	1	1.10
CHANNEL LAKE	2	1.00	LAKE SHABBONA	3	1.00	LAKE VERMILION	1	1.10
CHANNEL LAKE	3	1.00	LAKE SPRINGFIELD	1	1.00	SANGCHRIS LAKE	1	1.10
CHANNEL LAKE	3	1.00	LAKE STOREY	1	1.00	LAKE VERMILION	1	1.20
CRAB ORCHARD LAKE	1	1.00	LAKE STOREY	1	1.00	PITTSFIELD CITY LAKE	1	1.20
CRAB ORCHARD LAKE	1	1.00	LAKE TAYLORVILLE	2	1.00	STEPHEN A FORBES LAKE	1	1.20
CRAB ORCHARD LAKE	3	1.00	LINCOLN TRAIL STATE LAKE	1	1.00	RACCOON LAKE	3	1.30
CRAB ORCHARD LAKE	3	1.00	LINCOLN TRAIL STATE LAKE	2	1.00	ROUND LAKE	1	1.30
CRYSTAL LAKE	1	1.00	LINCOLN TRAIL STATE LAKE	3	1.00	STEPHEN A FORBES LAKE	2	1.30
CRYSTAL LAKE	1	1.00	LONG LAKE	1	1.00	DIAMOND LAKE	2	1.40
CRYSTAL LAKE	2	1.00	LONG LAKE	1	1.00	LAKE MATTOON	1	1.40
CRYSTAL LAKE	2	1.00	LONG LAKE	1	1.00	ANDERSON LAKE	1	1.50
CRYSTAL LAKE	3	1.00	LONG LAKE	2	1.00	LAKE SHABBONA	2	1.50
CRYSTAL LAKE	3	1.00	LONG LAKE	2	1.00	ROUND LAKE	1	1.50
DAWSON LAKE	1	1.00	LONG LAKE	2	1.00	HARRISBURG LAKE	1	1.70
DAWSON LAKE	2	1.00	LONG LAKE	2	1.00	HIGHLAND SILVER LAKE	3	1.70
DAWSON LAKE	2	1.00	LONG LAKE	3	1.00	SANGCHRIS LAKE	3	1.70
DAWSON LAKE	3	1.00	LONG LAKE	3	1.00	LAKE SHABBONA	2	1.80
DAWSON LAKE	3	1.00	LONG LAKE	3	1.00	LONG LAKE	1	1.80
DEVILS KITCHEN LAKE	1	1.00	LONG LAKE	3	1.00	ROUND LAKE	2	1.80
DEVILS KITCHEN LAKE	2	1.00	LONG LAKE	3	1.00	STEPHEN A FORBES LAKE	3	1.80
DEVILS KITCHEN LAKE	2	1.00	LONG LAKE	3	1.00	LAKE DECATUR	1	1.90
DEVILS KITCHEN LAKE	3	1.00	MARION RESERVOIR	1	1.00	PITTSFIELD CITY LAKE	2	1.90
DEVILS KITCHEN LAKE	3	1.00	MARION RESERVOIR	1	1.00	CEDAR LAKE	3	2.00
DIAMOND LAKE	1	1.00	MARION RESERVOIR	3	1.00	HIGHLAND SILVER LAKE	3	2.00
DIAMOND LAKE	1	1.00	MARION RESERVOIR	3	1.00	LAKE BLOOMINGTON	3	2.00
DIAMOND LAKE	2	1.00	MCLEANSBORO NEW RESERVOIR	1	1.00	LAKE GEORGE	1	2.00
DOLAN LAKE	1	1.00	MCLEANSBORO NEW RESERVOIR	1	1.00	LAKE MATTOON	2	2.00
DOLAN LAKE	1	1.00	MCLEANSBORO NEW RESERVOIR	3	1.00	LAKE SHABBONA	3	2.00
DOLAN LAKE	3	1.00	MCLEANSBORO NEW RESERVOIR	3	1.00	LAKE DECATUR	1	2.10
DOLAN LAKE	3	1.00	MT STERLING LAKE	1	1.00	LAKE GEORGE	1	2.10
FOX LAKE	1	1.00	OLNEY EAST FORK RESERVOIR	1	1.00	OTTER LAKE	3	2.10
FOX LAKE	1	1.00	OLNEY EAST FORK RESERVOIR	1	1.00	OTTER LAKE	2	2.20
FOX LAKE	2	1.00	OLNEY EAST FORK RESERVOIR	3	1.00	SKOKIE LAGOONS	1	2.20
FOX LAKE	2	1.00	OLNEY EAST FORK RESERVOIR	3	1.00	LAKE BLOOMINGTON	1	2.30
FOX LAKE	3	1.00	OTTER LAKE	1	1.00	FOX LAKE	3	2.40
GLADSTONE LAKE	3	1.00	PARADISE LAKE	2	1.00	LAKE TAYLORVILLE	3	2.50
GLADSTONE LAKE	3	1.00	PIERCE STATE LAKE	1	1.00	LAKE BLOOMINGTON	2	2.60
GLEN O JONES LAKE	1	1.00	PIERCE STATE LAKE	1	1.00	LAKE MATTOON	2	2.60
GLEN O JONES LAKE	1	1.00	PIERCE STATE LAKE	2	1.00	LAKE MATTOON	3	2.60
GLEN O JONES LAKE	3	1.00	PIERCE STATE LAKE	2	1.00	DEVILS KITCHEN LAKE	1	2.70
GLEN O JONES LAKE	3	1.00	PIERCE STATE LAKE	3	1.00	LAKE SHABBONA	3	2.80
HARRISBURG LAKE	1	1.00	PIERCE STATE LAKE	3	1.00	SKOKIE LAGOONS	2	2.80
HARRISBURG LAKE	3	1.00	PITTSFIELD CITY LAKE	1	1.00	ARGYLE LAKE	1	3.10
HARRISBURG LAKE	3	1.00	PITTSFIELD CITY LAKE	1	1.00	CARLINVILLE LAKE	1	3.20
HORSESHOE LAKE	1	1.00	PITTSFIELD CITY LAKE	1	1.00	LAKE MATTOON	3	3.50
HORSESHOE LAKE	1	1.00	PITTSFIELD CITY LAKE	2	1.00	SKOKIE LAGOONS	2	3.50
HORSESHOE LAKE	2	1.00	PITTSFIELD CITY LAKE	3	1.00	HIGHLAND SILVER LAKE	1	3.60
HORSESHOE LAKE	2	1.00	PITTSFIELD CITY LAKE	3	1.00	DAWSON LAKE	1	3.70
HORSESHOE LAKE	3	1.00	PITTSFIELD CITY LAKE	3	1.00	ROUND LAKE	1	3.70
HORSESHOE LAKE	3	1.00	RACCOON LAKE	1	1.00	STEPHEN A FORBES LAKE	3	3.70
JOHNSON SAUK TRAIL LAKE	1	1.00	RACCOON LAKE	1	1.00	LAKE JACKSONVILLE	1	4.30
JOHNSON SAUK TRAIL LAKE	1	1.00	RACCOON LAKE	2	1.00	LAKE TAYLORVILLE	1	4.30
JOHNSON SAUK TRAIL LAKE	2	1.00	RACCOON LAKE	2	1.00	PARADISE LAKE	1	5.40
JOHNSON SAUK TRAIL LAKE	2	1.00	RACCOON LAKE	3	1.00	PARADISE LAKE	3	5.50
JOHNSON SAUK TRAIL LAKE	3	1.00	ROUND LAKE	1	1.00	HIGHLAND SILVER LAKE	1	5.70
JOHNSON SAUK TRAIL LAKE	3	1.00	ROUND LAKE	1	1.00	PARADISE LAKE	3	5.70
KINKAID LAKE	1	1.00	ROUND LAKE	1	1.00	LAKE OF EGYPT	1	6.00
KINKAID LAKE	1	1.00	ROUND LAKE	2	1.00	PARADISE LAKE	2	6.00
KINKAID LAKE	3	1.00	ROUND LAKE	3	1.00	SKOKIE LAGOONS	3	6.30
KINKAID LAKE	3	1.00	ROUND LAKE	3	1.00	PARADISE LAKE	1	6.80
LAKE BLOOMINGTON	1	1.00	SAM DALE STATE LAKE	1	1.00	LAKE MATTOON	1	12.00
LAKE GEORGE	2	1.00	SAM DALE STATE LAKE	1	1.00	LAKE BLOOMINGTON	2	13.00