Appendix

Table A1. Summary of common phytoplankton species occurrence in Lake Michigan during 1983. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance > 0.5% of the total cells or > 0.5% of the total biovolume.

TAXON	MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu m^3/mL$	% OF TOTAL BIOVOLUME
BACILLARIOPHYTA					
Asterionella formosa	206	12.2	0.47	3,475	0.89
Aulacoseira islandica	137	17.9	0.68	16,072	4.11
Aulacoseira italica	357	54.1	2.06	9,797	2.51
Cyclotella comensis	1009	47.9	1.83	2,855	0.73
Cyclotella comta	24	2.5	0.10	6,550	1.68
Cymatopleura solea	5	0.4	0.01	8,144	2.08
Entomoneis ornata	2	0.1	0.00	2,809	0.74
Fragilaria crotonensis	429	37.6	1.43	22,638	5.79
Fragilaria vaucherlae	115	14.1	0.54	6,304	1.61
Stephanodiscus alpinus	22	3.6	0.14	26,586	6.80
Stephanodiscus niagarae	18	0.8	0.03	10,853	2.78
Stephanodiscus transilvanicus	4	0.3	0.01	7,289	1.86
Tabellaria fenestrata	79	6.5	0.25	11,385	2.91
Tabellaria flocculosa	202	23.7	0.90	66,248	16.95
Total			8.45		51.43
CHLOROPHYTA					
Cosmarium sp.	8	0.6	0.02	10,757	2.75
Green coccoid	172	23.0	0.88	1,735	0.44
Monoraphidium contortum	201	53.8	2.05	443	0.11
Oocystis borgei	74	3.2	0.12	2,345	0.60
Stichococcus sp.	481	14.5	0.55	1,143	0.29
Total			3.62		4.20
CHRYSOPHYTA					
Chromulina sp.	1859	524.2	19.90	8,081	2.07
Dinobryon bavaricum	262	29.0	1.11	2,329	0.60
Dinobryon cylindricum	311	27.4	1.04	8,827	2.26
Dinobryon divergens	258	22.2	0.85	3,322	0.85
Dinobryon sociale	916	92.3	3.52	11,124	2.85
Haptophyceae	705	160.4	6.11	1,700	0.43
Ochromonas sp.	1366	345.0	13.15	9,039	2.31
Stylotheca aurea	172	10.3	0.39	3,299	0.84
Unidentified coccoids	540	28.6	1.09	349	0.09
Total			47.24		12.30
COLORLESS FLAGELLATES					
Colorless flagellate	1031	34.7	1.32	2,048	0.52
CRYPTOPHYTA					
Chroomonas norstedtii	202	30.1	1.15	703	0.18
Cryptomonas erosa	34	7.0	0.27	14,074	3.60
Cryptomonas marssonii	25	2.3	0.09	2,193	0.56
Cryptomonas pyrenoidlfera	49	a.9	0.34	4,076	1.04
Rhodomonas minuta	785	252.7	9.63	20,583	5.26
Total			11.47		10.65
CYANOPHYTA					
Anacystis montana	826	123.7	4.72	581	0.15
Coelosphaerium naegelianum	1841	67.9	2.59	447	0.11
Oscillatoria agardhii	344	21.9	0.83	4,298	1.10
Oscillatoria limnetica	2266	220.2	0.39	1,053	0.47
Oscillatoria sp.	399	33.8	1.29	461	0.12
Oscillatoria subbrevis	736	22.9	0.87	900	0.23
Oscillatoria tenuis	409	20.8	0.79	2,537	0.65
Total			19.48		2.83

Table A1(cont). Summary Of common phytoplankton species occurrence In Lake Michigan during 1983. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance > 0.5% of the total cells or ≥ 0.5% of the total biovolume.

TAXON	MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu m^3/mL$	% OF TOTAL BIOVOLUME
PYRROPHYTA					
Ceratium hirundinella	8	0.3	0.01	26,927	6.89
Gymnodinium sp.	25	2.8	0.11	6,922	1.77
Peridinium sp.	8	0.5	0.02	3,418	0.87
Total			0.14		9.53
Total			91.13		91.47

Table A3. Summary of common phytoplankton species occurrence in Lake Michigan during 1985. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common *species were arbitrarily* defined as having an abundance > 0.5% of the total cells or >_ 0.5% of the total biovolume.

TAXON		MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu m^3/mL$	% OF TOTAL BIOVOLUME
BACILLAFUOPBTA						
Asterionella formosa		221	19.3	0.58	6,292	1.19
Aulacoseira islandica		208	41.6	1.25	47,750	9.03
Aulacoseira italica		146	35.4	1.06	8,742	1.65
Cymatopleura solea		4	0.2	0.01	12,094	2.29
Fragilaria crotonensis		157	19.7	0.59	14,937	2.82
Rhizosolenia eriensis		41	4.3	0.13	30,846	5.83
Rhizosolenia longiseta		503	43.4	1.30	41,448	7.83
Stephanodiscus alpinus		27	3.8	0.11	31,299	5.92
Stephanodiscus niagarae		17	2.6	0.08	56,153	10.61
Stephanodiscus transilvanicus		6	1.2	0.04	19,152	3.62
Synedra filiformis		95	6.3	0.19	3,230	0.61
Synedra ulna		33	2.6	0.08	21,410	4.05
Tabellaria flocculosa		133	9.1	0.27	29,739	5.62
	Total			5.70		61.07
CHLOROPHYTA						
Dictyosphaerium ehrenbergianum		565	40.8	1.23	324	0.06
Green coccoid		1145	64.7	1.95	2,377	0.45
Monoraphidium contortum		352	59.0	1.78	658	0.12
	Total			4.95		0.64
CHRYSOPHYTA						
Chromulina sp.		638	231.7	6.97	7,396	1.40
Dinobryon divergens		565	15.1	0.45	3,129	0.59
Dinobryon sociale		524	30.8	0.92	4,596	0.87
Haptophyceae		524	130.0	3.91	2,637	0.50
Monosiga ovata		286	17.0	0.51	2,388	0.45
Ochromonas sp.		2675	851.6	25.61	24,223	4.58
	Total			38.37		8.39
COLORLESS FLAGELLATES						
Colorless flagellate		188	35.3	1.06	1,018	0.19
CRYPTOPHYTA						
Chroomonas acuta		155	22.0	0.66	725	0.14
Chroomonas norstedtii		295	34.9	1.05	1,499	0.28
Cryptomonas erosa		33	10.1	0.30	28,394	5.37
Cryptomonas marssonii		25	2.4	0.07	3,608	0.68
Cryptomonas ovata		25	1.9	0.06	4,586	0.87
Cryptomonas pyrenoidifera		82	12.1	0.36	6,126	1.16
Cryptomonas rostratiformis		12	1.5	0.05	6,516	1.23
Cryptomonas sp.		65	7.5	0.23	3,098	0.59
Rhodomonas lens		139	24.7	0.74	4,929	0.93
Rhodomonas minuta		466	206.1	6.20	22,809	4.31
	Total			9.72		15.55
CYANOPHYTA						
Anabaena sp.		1309	26.2	0.79	3,264	0.62
Anacystis montana		5285	607.0	18.25	6,686	1.26
Coelosphaerium naegelianum		3068	210.9	6.34	1,089	0.21
Oscillatoria limnetica		1530	162.7	4.89	553	0.10
Oscillatoria sp.		843	103.3	3.11	1,878	0.36
	Total			33.38		2.55
PYRROPHYTA						
Ceratium hirundinella		8	0.3	0.01	5,767,	1.09
Gymnodinium helveticum		8	0.4	0.01	5,500	1.04
Gymnodinium sp.		8	0.8	0.03	3,878	0.73
Peridinium sp.		16	2.1	0.06	8,064	1.52
	Total			0.11		4.39
	Total			93.28		92.77

Table A4. summary of common phytoplankton species occurrence in Lake Michigan during 1986. Summary Includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total. cells and % of total biovolume). Common species were arbitrarily defined as having an abundance > 0.5% of the total cells or ≥ 0.5% of the total biovolume.

TAXON		AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu m^3/mL$	% OF TOTAL BIOVOLUME
BACILLARIOPHYTA					
Asterionella formosa		21.0	0.98	7,902	0.66
Aulacoseira islandica		52.2	2.44	48,584	4.07
Aulacoseira italica		47.1	2.20	9,213	0.77
Cyclotella comta		3.1	0.14	10,239	0.86
Cyclotella ocellata		15.3	0.72	945	0.08
Fragilaria crotonensis		18.6	0.87	14,785	1.24
Rhizosolenia longiseta		4.0	0.19	8,813	0.14
Stephanodiscus alpinus		48.4	2.26	423,703	35.52
Stephanodiscus hantzschii		20.8	0.97	2,531	0.21
Stephanodiscus minutulus		11.3	0.53	474	0.04
Stephanodiscus niagarae		6.9	0.32	153,336	12.86
Stephanodiscus sp.		12.7	0.59	594	0.05
Stephanodiscus transilvanicus		17.4	0.81	313,368	26.27
	Total		13.01		83.38
CHLOROPHYTA					
Crucigenia rectangularis		10.1	0.47	7,825	0.66
Dictyosphaerium ehrenbergianum		31.5	1.47	271	0.02
Green coccoid		94.7	4.42	7,101	0.60
Monoraphidium contortum		30.9	1.44	510	0.04
Oocystis pusilla		17.4	0.81	1,642	0.14
Sphaerocystis schroeteri		62.5	2.92	7,279	0.61
	Total		11.54		2.06
CHFUSOPHYTA					
Chromulina sp.		92.2	4.30	7,962	0.67
Chrysophycean coccoids		102.8	4.80	3,020	0.25
Dinobryon divergens		37.0	1.73	5,550	0.47
Dinobryon sociale		13.3	0.62	1,830	0.15
Haptophyceae		197.3	9.21	3,959	0.33
Ochromonas sp.		118.0	5.51	9,200	0.77
Unidentified coccoids		11.2	0.52	191	0.02
	Total		26.69		2.66
COLORLESS FLAGELLATES					
Colorless flagellate	622	91.7	4.28	2,458	0.21
CRYPTOPHYTA					
Chroomonas acuta	245	39.9	1.86	1,605	0.13
Chroomonas norstedtii	90	25.9	1.21	829	0.07
Cryptomonas erosa	61	13.0	0.61	24,866	2.08
Cryptomonas pusilla	117	14.2	0.66	1,209	0.10
Rhodomonas lens	117	31.6	1.47	5,229	0.44
Rhodomonas minuta	368	150.7	7.04	12,044	1.01
	Total		12.85		3.84
CYANOPETYA					
Anabaena flos-aquae	252	12.0	0.56	1,557	0.13
Anacystis montana	1824	91.2	4.26	903	0.08
Anacystis thermalis	237	15.8	0.74	3,110	0.26
Aphanizomenon flos-aquae	1203	46.3	2.16	2,243	0.19
Coelosphaerium naegelianum	1563	129.6	6.05	1,163	0.10
Oscillatoria limnetica	1317	166.6	7.77	3,208	0.27
	Total		21.54		1.02
PYRROPHYTA					
Ceratium hirundinella	8	0.4	0.02	7,608	0.64
Gymnodinium sp.	25	3.1	0.14	11,963	1.00
	Total		0.16		1.64
	Total		90.07		94.81

Table A5. Summary of common phytoplankton species occurrence in Lake Michigan during 1987. Summary includes the maximum population density encountered, *the average* population density *and* biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance > 0.5% of the total cells or ≥ 0.5% of the total biovolume.

TAXON	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUKE $\mu m^3/mL$	% OF TOTAL BIOVOLUME
BACILLARIOPHYTA				
Asterionella formosa	8.0	0.66	4,289	1.61
Aulacoseira islandica	13.4	1.10	9,485	3.56
Aulacoseira italica	20.0	1.64	3,223	1.21
Cyclotella comensis	18.4	1.51	713	0.27
Cyclotella comta	0.5	0.04	1,882	0.71
Cyclotella sp.	16.9	1.39	787	0.30
Cymatopleura solea	0.1	0.00	2,660	1.00
Fragilaria crotonensis	8.1	0.66	5,867	2.20
Nitrschia lauenburgiana	1.7	0.14	10,835	4.06
Rhizosolenia eriensis	1.1	0.09	1,543	0.58
Stephanodiscus alplnus	14.4	1.19	114,648	43.00
Stephanodiscus hantzschii	8.0	0.66	329	0.12
Stephanodiscus minutulus	17.9	1.47	701	0.26
Stephanodiscus niagarae	0.3	0.03	6,992	2.62
Stephanodiscus transilvanicus	0.8	0.07	11,528	4.32
Tabellaria flocculosa	5.1	0.42	4,056	1.52
Total		11.07		67.34
CHLOROPHYTA				
Dictyosphaerium pulchellum	6.1	0.50	266	0.10
Green coccoid	105.4	8.66	5,034	1.89
Monoraphidium contortum	10.3	0.85	90	0.03
Total		10.01		2.02
CHBYSOPHYTA				
Chromulina sp.	25.5	2.10	2,213	0.83
Chrysophycean coccoids	29.5	2.43	746	0.28
Haptophyceae	107.6	8.84	1,620	0.61
Ochromonas sp.	60.1	4.94	4,685	1.76
Total		18.30		3.48
COLORLESS FLAGELLATES				
Colorless flagellate	29.0	2.38	1,043	0.39
CRYPTOPHYTA				
Chroomonas norstedtii	15.8	1.30	421	0.16
Cryptomonas caudata	4.5	0.37	1,406	0.53
Cryptomonas erosa	7.0	0.58	15,478	5.81
Cryptomonas marssonii	2.6	0.22	1,742	0.65
Cryptomonas sp.	18.5	1.52	5,682	2.13
Rhodomonas lens	11.2	0.92	1,602	0.60
Rhodomonas minuta	107.4	8.83	6,368	2.39
Total		13.72		12.27
CYANOPHYTA				
Anacystis montana	108.3	8.90	881	0.33
Aphaniromenon flos-aquae	14.6	1.20	897	0.34
Coelosphaerium naegelianum	141.3	11.61	1,111	0.42
Oscillatoria limnetica	136.8	11.24	1,214	0.46
Oscillatoria sp.	28.3	2.32	484	0.18
Total		35.28		1.72
PYRROPHYTA				
Ceratium hirundinella	0.5	0.04	10,805	4.05
Gymnodinium sp.	2.5	0.20	4,462	1.67
Total		0.25		5.73
Total		91.02		92.94

Table A6. summary of common phytoplankton species occurence in Lake Michigan &ring 1986. Summary Includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance ≥ 0.5% of the total cells or > 0.5% of the total biovolume.

TAXON	MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME µm³/mL	% OF TOTAL BIOVOLUME
BACILLARIOPHYTA					
Asterlonella formosa	301	59.9	2.90	39,120	10.02
Aulacoselra granulata	78	7.0	0.34	5,266	1.35
Aulacoselra lslandica	236	29.4	1.42	15,622	4.00
Aulacoselra italica	214	32.1	1.55	8,711	2.23
Cyclotella comensis	242	31.9	1.54	1,628	0.42
Cyclotella comta	40	2.9	0.14	9,336	2.39
Cyclotella sp.	125	20.2	0.98	1,154	0.30
Cyclotella stelligera	127	10.5	0.51	413	0.11
Fragilaria crotonensis	368	33.5	1.62	25,440	6.52
Fragllaria inter-media	87	4.3	0.21	2,890	0.74
Rhizosolenia eriensis	15	2.3	0.11	6,845	1.75
Stephanodiscus alpinus	27	4.8	0.23	35,040	a.97
Stephanodiscus hantzschli	121	14.2	0.69	1,432	0.37
Stephanodiscus niagarae	69	2.7	0.13	37,103	9.50
Stephanodiscus sp.	162	20.3	0.98	844	0.22
Stephanodiscus transilvanicus	11	0.4	0.02	5,120	1.31
Tabellaria flocculosa	35	6.9	0.33	29,546	7.56
Total			13.71		57.74
CHLOROPHYTA					
Green coccoid	556	127.8	6.19	5,333	1.37
Green filament	785	31.3	1.52	8,044	2.06
Monoraphidium convolutum	614	57.0	2.76	205	0.05
Monoraphidium minutum	180	13.3	0.64	121	0.03
Oocystis sp.	147	17.9	0.87	508	0.13
Sphaerocystis schroeteri	196	13.4	0.65	1,360	0.35
Total			12.63		3.99
CHRYSOPBYTA					
Chromulina sp.	106	30.9	1.49	1,604	0.41
Dinobryon bavaricum	229	16.3	0.79	886	0.23
Dinobryon divergens	98	10.9	0.53	2,144	0.55
Dinobryon sociale	172	22.6	1.10	1,665	0.43
Haptophyceae	466	175.8	8.52	2,808	0.72
Monosiga ovata	154	17.7	0.86	935	0.24
Ochromcnas sp.	368	125.9	6.10	8,211	2.10
Pseudokephyrion conicum	25	1.4	0.07	3,816	0.90
Pseudokephyrion millerense	139	21.3	1.32	379	0.10
Total			20.77		5.75
COLORLESS FLAGELLATES					
Colorless flagellate	237	11.3	0.55	202	0.05
CRYPTOPHYTA					
Cryptomonas erosa	57	14.6	0.71	20,860	5.34
Cryptomonas marssonii	26	4.5	0.22	2,481	0.64
Cryptomonas ovata	13	2.1	0.10	3,630	0.93
Cryptomonas reflexa	20	2.1	0.10	2,419	0.62
Cryptomonas sp.	65	16.1	0.78	3,370	0.86
Rhodomonas lens	111	25.3	1.23	4,045	1.04
Rhodomonas minuta	442	153.8	7.45	7,555	1.93
Total			10.59		11.36
CYANOPRYTA					
Anacystis montana	1325	392.6	19.02	2,583	0.66
Coelosphaerium naegelianum	1432	149.4	7.24	3,572	0.91
Oscillatoria limnetica	450	56.3	2.73	1,136	0.29
Oscillatorla sp.	481	57.9	2.80	1,000	0.26
Total			31.78		2.12

Table A6(cont). Summary of common phytoplankton species occurrence in Lake Michigan during 1988. Summary Includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily &fined as having an abundance ≥ 0.5% of the total cells or > 0.5% of the total bl-1-.

TAXON	MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL. CELLS	MEAN BIOVOLUME µm³/mL	% OF TOTAL BIOVOLUME
PYRROPHYTA					
Ceratium hirundinella	16	0.9	0.04	17,463	4.47
Gymnodinium sp.	25	5.2	0.25	15,721	4.03
Peridinium sp.	16	2.3	0.11	18,371	4.70
Total			0.40		13.20
Total			90.44		94.21

Table A7. Summary of common phytoplankton species occurrence in Lake Michigan *during* 1989. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% *of* total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance ≥ 0.5% of the total cells or ≥ 0.5% of the total biovolume.

TAXON	MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME µm³/mL	% OF TOTAL BIOVOLUME
BACILLABIOPHYTA					
Aulacoseira islandica	46	5.0	0.15	3,072	0.75
Cyclotella comensis	129	34.1	1.04	1,099	0.27
Cyclotella comta	10	1.3	0.04	4,066	0.99
Fragilaria crotonensis	116	16.7	0.51	7,572	1.85
Rhizosolenia eriensis	31	1.8	0.05	5,686	1.39
Rhizosolenia sp.	41	2.7	0.08	6,991	1.70
Stephanodiscus alpinus	12	1.3	0.04	6,044	1.47
Stephanodiscus niagarae	2	0.2	0.01	2,768	0.67
Stephanodiscus transilvanicus	2	0.2	0.00	2,572	0.63
Tabellaria flocculosa	37	4.8	0.15	9,746	2.38
Total			2.07		12.09
CHLOROPHYTA					
Chlamydomonas sp.	147	25.1	0.76	3,919	0.96
Coelast- microporum	458	13.9	0.42	3,722	0.91
Cosmarium sp.	33	1.2	0.04	7,789	1.90
Green coccoid	1440	384.6	11.70	32,150	7.84
Monoraphidium minutum	360	96.3	2.93	746	0.18
Oocystis borgei	147	16.3	0.50	6,944	1.69
Occystis crassa	393	14.6	0.45	8,449	2.06
Oocystis gigas v. incrassata	33	4.5	0.14	18,704	4.56
Oocystis solitaria	278	28.5	0.87	4,740	1.16
Staurast- sp.	16	0.5	0.02	2,068	0.50
Total			17.82		21.75
CHBYSOPHYTA					
Chromulina sp.	57	17.9	0.54	4,769	1.16
Chrysococcus sp.	180	32.2	0.98	8,491	2.07
Chrysosphaerella rodlei	164	5.2	0.16	3,680	0.90
Dinobryon divergens	262	36.3	1.11	13,365	3.26
Dinobryon sociale	278	23.3	0.71	3,798	0.93
Haptophyceae	1473	345.8	10.52	5,825	1.42
Mallomonas sp.	25	3.5	0.11	13,537	3.30
Monosiga ovata	262	27.5	0.84	3,693	0.90
Ochromonas sp.	229	54.5	1.66	16,626	4.05
Total			16.62		17.99
COLORLESS FLAGELLATES					
Colorless flagellate	180	24.7	0.75	1,532	0.37
CBYPTOPHYTA					
Cryptomonas erosa	131	20.2	0.61	51,835	12.64
Cryptomonas marssonii	23	1.7	0.05	2,096	0.51
Cryptomonas ovata	41	2.0	0.06	3,154	0.77
Cryptomonas phaseolus	98	12.0	0.37	5,698	1.39
Cryptomonas tenuis	98	5.5	0.17	2,916	0.71
Rhodomonas minuta	704	201.1	6.12	18,643	4.54
Total			7.38		20.56

Table A7(cont). Summary of common phytoplankton species occurrence in Lake Michigan during 1989. Summary Includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance > 0.5% of the total cells or ≥ 0.5% of the total biovolume.

TAXON	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu m^3/mL$	% OF TOTAL BIOVOLUME
CYANOPWTA				
Anabaena sp.	26.3	0.80	3,575	0.87
Anacystis montana	929.8	28.29	12,224	2.98
Aphanizomenon flos-aquae	31.9	0.97	6,828	1.66
Chroococcus sp.	19.6	0.60	2,735	0.67
Coelosphaerium dubium	25.8	0.78	365	0.09
Coelosphaerium naegelianum	158.8	4.83	3,892	0.95
Coelosphaerium sp.	49.6	1.51	701	0.17
Dactylococcopsis Smithii	25.8	0.78	100	0.02
Gomphosphaeria aponina	25.8	0.78	1,688	0.41
Oscillatoria limnetica	144.5	4.40	993	0.24
Oscillatoria prolifica	26.0	0.19	461	0.11
Synechococcus sp.	94.0	2.86	5,601	1.37
Total		47.40		9.55
PYRROPHYTA				
Ceratium hirundinella	0.1	0.00	3,642	0.89
Glenodinium quadridens	0.5	0.02	2,062	0.50
Peridinium sp.	5.1	0.16	28,931	7.05
Total		0.17		8.44
Total		92.21		90.75

Table A8. summary of common phytoplankton species occurrence in Lake Michigan during 1990. Summary Includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance $\geq$ 0.5% of the total cells or $\geq$ 0.5% of the total biovolume.

TAXON		MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu m^3/mL$	% OF TOTAL BIOVOLUME
BACILLARIOPHYTA						
Aulacoseira islandica		77	10.2	0.45	10,368	2.17
Aulacoseira italica		91	13.9	0.61	3,955	0.03
Cyclotella comensis		104	25.1	1.10	3,589	0.75
Cyclotella comta		96	5.9	0.26	16,307	3.43
Cyclotella michiganiana		147	22.5	0.99	2,547	0.53
Cyclotella ocellata		214	13.8	0.61	1,312	0.27
Fragilaria crotonensis		182	25.9	1.14	18,290	3.82
Nitzschia lauenburgiana		5	0.3	0.01	2,930	0.61
Rhizosolenia eriensis		82	9.5	0.42	42,203	8.82
Stephanodiscus alpinus		64	5.9	0.26	29,366	6.14
Stephanodiscus niagarae		7	0.5	0.02	5,203	1.10
Stephanodiscus transilvanicus		41	5.8	0.25	77,949	16.30
Tabellaria flocculosa		33	4.2	0.18	11,003	2.30
	Total			6.29		47.00
CHLOROPHYTA						
Chlamydomonas sp.		82	19.9	0.87	1,534	0.32
Gloeocystis planktonica		123	10.1	0.44	2,047	0.60
Green coccoid		115	25.1	1.10	2,658	0.56
Monoraphidium minutum		85	13.7	0.60	137	0.03
Oocystis borgei		69	13.9	0.61	946	0.20
	Total			3.62		1.70
CBRYSOPHYTA						
Chromulina sp.		131	28.8	1.26	6,618	1.38
Dinobryon divergens		491	31.9	1.40	5,580	1.17
Dinobryon sociale		254	26.5	1.16	3,722	0.78
Haptophyceae		385	172.1	7.54	7,084	1.48
Monosiga ovata		65	11.8	0.52	1,211	0.25
Ochromonas sp.		237	44.1	1.93	9,739	2.04
	Total			13.81		7.10
COLORLESS FLAGELLATES						
Colorless flagellate		65	22.2	0.97	2,453	0.51
CRYPTOPHYTA						
Cryptomonas caudata		49	12.9	0.56	5,585	1.17
Cryptomonas erosa		46	10.2	0.45	21,958	4.59
Cryptomonas marssonii		49	16.4	0.72	17,693	3.70
Cryptomonas phaseolus		57	16.7	0.73	10,770	2.25
Cryptomonas pusilla		49	11.8	0.52	1,670	0.35
Rhodomonas minuta		745	157.7	6.91	20,067	4.20
	Total			9.08		16.26
CYANOPBYTA						
Anabaena circinalis		540	15.2	0.67	7,193	1.50
Anacystis montana		2103	717.0	31.41	9,033	2.06
cllroococcus sp.		49	12.7	0.56	855	0.18
Coelosphaerium naegelianum		491	46.6	2.04	1,613	0.34
Oscillatoria llmnetica		458	43.9	1.92	468	0.10
Oscillatoria sp.		2921	262.7	11.51	4,961	1.04
Synechococcus sp.		818	160.4	7.02	8,655	1.81
	Total			55.12		7.02
PYRROPHYTA						
Ceratium hirundinella		8	0.6	0.02	38,401	0.03
Gymnodinium helveticum		3	0.2	0.01	2,841	0.59
Peridinium sp.		41	4.2	0.19	11,322	2.37
	Total			0.22		10.99
	Total			89.91		90.66

Table A9. Summary of common phytoplankton species occurrence in Lake Michigan during 1991. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance > 0.5% of the total cells or > 0.5% of the total biovolume.

TAXON		MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu m^3/mL$	% OF TOTAL BIOVOLUME
BACILLARIOPHYTA						
Asterionella formosa		37	8.6	0.63	2,811	0.66
Aulacoseira islandica		121	36.9	2.70	83,635	19.59
Aulacoseira italica		126	39.9	2.92	19,298	4.52
Cyclotella comensis		252	32.3	2.36	1,061	0.25
Cyclotella comta		11	0.7	0.05	2,275	0.53
Fragilaria crotonensis		63	5.5	0.40	3,060	0.72
Fragilaria intermedia		23	3.5	0.25	2,163	0.51
Nitzschia lauenburgiana		3	0.4	0.03	3,271	0.77
Stephanodiscus alpinus		46	11.7	0.85	89,026	20.85
Stephanodiscus minutulus		43	9.6	0.70	286	0.07
Stephanodiscus niagarae		16	2.3	0.17	52,961	12.41
Stephanodiscus parvus		77	14.0	1.02	403	0.09
Stephanodiscus transilvanicus		73	11.2	0.82	41,262	9.67
Tabellaria flocculosa		30	4.6	0.33	7,863	1.84
	Total			13.23		72.47
CHLORCPHYTA						
Chlamydomonas sp.		111	16.1	1.17	713	0.17
Green coccold		72	22.3	1.63	1,521	0.36
Monoraphidium minutum		216	25.0	1.82	227	0.05
Oocystis borgei		65	7.2	0.53	712	0.17
Oocystis pusilla		111	16.5	1.20	603	0.14
	Total			6.36		0.88
CHRYSOPHYTA						
Chromulina sp.		101	25.2	1.84	3,741	0.88
chrysococcus sp.		36	8.6	0.63	556	0.13
Haptophyceae		363	133.1	9.71	4,407	1.03
Monosiga ovata		69	11.3	0.83	676	0.16
Ochromonas sp.		82	31.2	2.28	4,637	1.09
	Total			15.29		3.28
COLORLESS FLAGELLATES						
Colorless flagellate		65	14.4	1.05	496	0.12
CRYPTOPHYTA						
Cryptomonas caudata		69	13.8	1.01	3,615	0.85
Cryptomonas erosa		13	5.5	0.40	12,762	2.99
Cryptomonas parapyrenoidifera		10	1.3	0.09	2,214	0.52
Cryptomonas phaseolus		56	12.8	0.93	4,772	1.12
Cryptomonas pusilla		46	11.7	0.85	765	0.18
Rhodomonas minuta		470	173.3	12.65	12,333	2.89
	Total			15.94		0.54
CYANOPHYTA						
Anabaena flos-aquae		157	9.2	0.67	2,923	0.68
Anacystis montana		970	466.5	34.05	5,625	1.32
chroococcus dispersus		118	8.5	0.62	167	0.04
Coelosphaerium naegelianum		327	13.9	1.01	465	0.11
Oscillatoria sp.		88	10.0	0.73	100	0.02
Synechococcus sp.		108	43.0	3.14	2,368	0.55
	Total			40.23		2.73
PYRROPHYTA						
Ceratium hirundinella		3	0.1	0.01	8,173	1.91
Gymnodinium helveticum		7	0.7	0.05	8,973	2.10
Gymnodinium sp.		10	3.2	0.23	3,612	0.85
Peridinium sp.		10	1.0	0.07	7,029	1.65
	Total			0.36		6.51
	Total			92.46		94.53

Table A10. summary of common phytoplankton species occurrence in Lake Michigan during 1992. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance > 0.5% of the total cells or > 0.5% of the total biovolume.

TAXON		MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME. µm³/mL	% OF TOTAL BIOVOLUME
BACILLAIUOPHYTA						
Aulacoseira islandica		215	61.0	2.69	139,635	22.06
Aulacoseira italica		151	50.0	2.20	23,738	3.75
Cyclotella comensis		493	49.8	2.19	1,675	0.26
Cyclotella comta		13	1.8	0.08	4,818	0.76
Fragilaria crotonensis		280	50.7	2.23	35,740	5.65
Stephanodiscus alpinus		113	12.0	0.53	97,503	15.41
Stephanodiscus niagarae		11	1.5	0.07	27,613	4.36
Stephanodiscus parvus		121	17.7	0.78	468	0.07
Stephanodiscus transilvanicus		82	20.4	0.90	40,130	6.34
Tabellaria flocculosa		55	6.0	0.26	13,743	2.17
	Total			11.92		60.84
CHLOROPHYTA						
Chlamydomonas sp.		65	26.0	1.14	1,450	0.23
Gloeocystis gigas		223	10.1	0.45	3,861	0.61
Green coccoid		118	27.7	1.22	1,755	0.28
Monoraphidium contorturn		154	19.0	0.84	269	0.04
Oocystis pusilla		124	16.3	0.72	579	0.09
	Total			4.36		1.25
CHRYSOPHYTA						
Chromulina sp.		82	31.5	1.38	4,710	0.74
Chrysococcus sp		95	20.6	0.91	1,474	0.23
Haptophyceae		589	200.6	8.83	5,062	0.80
Monosiga wata		57	11.5	0.50	766	0.12
Ochromonas sp.		155	64.2	2.82	11,122	1.76
	Total			14.45		3.66
COLORLESS FLAGELLATES						
Colorless flagellate		205	22.8	1.00	529	0.08
CRYPTOPHYTA						
Cryptomonas caudata		59	16.5	0.73	5,145	0.81
Cryptomonas erosa		57	10.0	0.44	25,883	4.09
Cryptomonas phaseolus		59	16.9	0.74	7,069	1.12
Cryptomonas pusilla		43	13.3	0.59	1,470	0.23
Cryptomonas pyrenoidifera		56	15.5	0.68	12,714	2.01
Rhodomonas lens		131	15.0	0.66	2,497	0.39
Rhodomonas minuta		638	267.8	11.79	21,412	3.38
	Total			15.62		12.04
CYANOPHYTA						
Anacystis montana		1972	606.3	26.68	6,189	0.98
Chroococcus dispersus		458	23.4	1.03	331	0.05
Chroococcus sp.		565	30.9	1.36	634	0.10
Coelosphaerium naegelianum		704	67.7	2.98	957	0.15
Oscillatoria limnetica		389	17.7	0.78	278	0.04
Oscillatoria sp.		347	52.5	2.31	704	0.11
Synechococcus sp.		867	202.9	8.93	11,575	1.83
	Total			44.07		3.27
PYRROPHYTA						
Ceratium hirundinella		10	0.8	0.04	58,728	9.28
Gymnodinium sp.		13	3.6	0.16	10,779	1.70
	Total			0.19		10.98
	Total			91.62		92.12

Table All. Changes made to the phytoplankton data base for this report to accomodate changes in species identifications. Decisions were based on recounts between years and discussions between Dr. Paul Bertram, Dr. Kit Yung and Dr. Joe Makarewicz. NIR= Not included in the report. Unless stated otherwise, changes were not made in the permanent data base; that is the changes discussed below were only made for the report.

I. Picoplankton (Since 1989) are defined as

A. Unicellular Cyanobacteria

B. Either spherical or rod shape

C. Size less than or equal to 2 μm

D. Colonials with indiviual cells less than 2 μm

E. Decision: Based on discussion with P. Bertram. All picoplankton will not be considered in our report, but will be included in the electronic data base. For the report, the following decisions were made with individual species:

1. Anacystis marina = picoplankton sphere (size .50-1.5 μm)-NIR*

2. *Coccochloris peniocysts* = picoplankton rods (size l-2 μm)-NIR*

3. *Anacystis incerta* adopted in 1989 = colonial picoplankton (colony=20μm; indiv.=<2 μm)-NIR*

4. *Gleocapsa* (l-2 μm=indiv.)-NIR . *Memo of 21 Dec. 93

5. *Anacystis cyanea* (average=2.2 μm sphere- NIR (Phone call with Paul Bertam)

6. *Agmenellum quadruplicatum* (1.5 μm sphere)-NIR

7. *Aphanocupsa delicatissima* (0.7 μm sphere)-NIR

8. *Aphanotheca clathrata* (1.7 X .6 μm ovoid)-NIR

9. *Microcystis elachista* (1.9 X 1.4 μm ovoid)-NIR

10. *Microcystis aeruginosa (1.2 μm) - NIR*

11 .*Microcystis* sp. - (2.0 μm) - NIR

II. *Melosira*

A. *Melosira varians* and *Melosira undulata* are unchanged as to nomenclature.

B. All other *Melosira* will change to the genus *Aulacoseira* (Letter- from Kit Yung).

III. *Stephanodiscus suhtransilvanicus* is changed & combined with *Stephanodiscus transylvanicus* (Letter of 1/94 from Kit Yung)

IV. *Oscillatoria* minima is changed to *Oscillatoria* sp. (Letter of 1/94 from Kit Yung)

V. *Gymnodinium* sp.#2 - group "all" *Gymnodinium species* as *Gymnodinium* sp.

VI. *Rhizosolenia Zongiseta* - leave as is (Letter of 1/94 from Kit Yung)

VII. *Melosira subarctica* is to be changed to *Melosira italica* subsp. *subarctica* - Ted, this is a permanent change & should be done in the original data base and species list

VIII. *Mallomonas* sp. stays the same

IX. *Synechococcus* sp. is Cyanophyta not a green

A. Make this change in species list

X. Ovoid unidentified flagellates in UNI should be changed to *Ochromonas* sp. (Letter from Kit 1/94). Species affected:

A.

Unidentified flagellate - ovoid

Unidentified flagellate #01

XI. Spherical unidentified flagellates in UNI should be changed to *Chromulina* sp. ? (Letter from Kit 1/94). Species affected:

A.

Unidentified flagellate

Unidentified flagellate - spherical

Unidentified flagellate #02

Unidentified flagellate #03

Unidentified flagellate #04

Unidentified flagellate #05

Unidentified flagellate #06

Unidentified flagellate #07

Unidentified flagellate #08

Unidentified flagellate #09

Unidentified flagellate #10

Unidentified flagellate #12

Unidentified flagellate #13

Unidentified flagellate #14

Unidentified flagellate #15

Unidentified flagellate #16

Unidentified flagellate #17

Unidentified flagellate #18

Unidentified flagellate #19

Unidentified flagellate #20

Unidentified flagellate #21

Unidentified flagellate #22

Unidentified flagellate #23

Unidentified flagellate #24

Unidentified flagellate #25

Unidentified flagellate #26

Unidentified flagellate #27

Unidentified flagellate #28

Unidentified flagellate #29

Unidentified flagellate #31

Unidentified flagellate #32

Unidentified flagellate #33

Unidentified flagellate #34

Unidentified flagellate #35

Unidentified flagellate #36

Unidentified flagellate #37

Unidentified flagellate #38

Unidentified flagellate #39

Unidentified flagellate #40

Unidentified flagellate #41

Unidentified flagellate #42

Unidentified flagellate #43

Unidentified flagellate #44

Unidentified flagellate #45

Unidentified flagellate #47

Unidentified flagellate #48

Unidentified flagellate #49

Unidentified flagellate #50

Unidentified flagellate #51

Unidentified flagellate #52

Unidentified flagellate #53

Unidentified flagellate #55

Unidentified flagellate (w/spines)

XII. *Staphanodiscuspawus* was not described until late 1984. The name was not used prior to 1985.

XIII. *Cyclotella comensis* var. 1 & C. *comensis* var. 2.

A. Confusion in 1989 samples per letter of Kit Yung (2/94) seemed to have been straightened out. We will combine into *Cyclotella comensis*

XIV. In 1992, Kit Yung (2/94) began to adopt the name "Unidentified Chrysophyte #5" for an alga that resembled algal spore. In recounts it was found in 1989 & 1991.

XV. *Gomphosphaeria lacustris* prior to 1990 & 1991 should be called *Coelosphaerium naegelianum.*

A. Kit Yung re-examined four 1988 Lake Michigan samples with a relatively high *Gomphosphaeria* count. He could only find colonies of *Coelosphaerium naegelianum,* a closely related colonial cyanophyte (2/94 from Kit). Also, prior to *1989 C. naegelianum* is not found but *Gomphosphaeria* is. After 1990 *Gomphosphaeria* is not found while *Coelosphaerium* is.

XVI. Group together Green Coccoid bacilliforms, ovoid and sphere as Green Coccoids

XVII. Colorless flagellates - all #s group together

XVIII. *Stephanodiscus hantzschii* and *Stephanodiscus hantzschii* var. *hantzschii* group together as *S. hantzschii*

XIX. *Cryptomonas erosa* and *Cryptomonas erosa* var. *reflexa* group together as C. *erosa*

XX. Group all varieties of a species into a single species e.g. *S. tenuis* var. 1, *S. tenuis* var. 2 and *S. tenuis* var. 3 simply report as S. *tenuis*

XXI. The *Cyclotella* complex is still confusing. Will call Bertram.

A. Will leave as is. Discussion with P. Bertram and letter of K. Yung (4 March 1994)

XXII. The *Cryptomonas* complex

A. *Cryptomonas pusilla* is changed to *Rhodomonas minuta.* Letter from K. Jung.

B. All other species of *Cryptomonas* are left the same. Discussion between T. Lewis and P. Bertram.

XXIII. *Stephanodiscus minutus* will be changed to *Stephanodiscus minutulus.* Letter from K. Yung 3 1 October 199 1.

XXIV. *Stephanodiscus subtilis* and *S. hantzschia f. tenuis* (fine form) will be combined into *Cyclostephanos tholiformis*. Letter from K. Yung 3 1 October 199 1.