

NOAA Technical Memorandum ERL GLERL-92

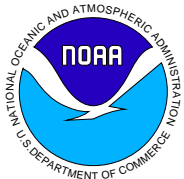


---

**CHEMISTRY, TEMPERATURE, AND SECCHI DISC DATA FOR HATCHERY BAY,  
WESTERN LAKE ERIE**

A.M. Beeton  
R.E. Holland  
T.H. Johengen  
J.R. Hageman

Great Lakes Environmental Research Laboratory  
Ann Arbor, Michigan  
July 1996



UNITED STATES  
DEPARTMENT OF COMMERCE

Mickey Kantor  
Secretary

NATIONAL OCEANIC AND  
ATMOSPHERIC ADMINISTRATION

D. James Baker  
Under Secretary for Oceans  
and Atmosphere/Administrator

Environmental Research  
Laboratories

James L. Rasmussen  
Director

## NOTICE

Mention of a commercial company or product does not constitute an endorsement by the NOAA Environmental Research Laboratories. Use of information from this publication concerning proprietary products or the tests of such products for publicity or advertising purposes is not authorized.

## ACKNOWLEDGEMENTS

This study was supported in part by Michigan Sea Grant (NOAA, U.S. Department of Commerce) under Grant No. NA85AA-DSG045, project R/ER-13, Michigan Sea Grant Contribution No. MICHU-SG-96-200. And by Ohio Sea Grant NA46RG0482, Publication #OHSU-TB-032, Stone Lab Contribution No. 15.

## CONTENTS

	PAGE
ABSTRACT .....	1
1. INTRODUCTION .....	1
2. SAMPLING LOCATION .....	1
3. METHODS .....	2
4. EXPLANATION OF TABLES .....	3
5. REFERENCES .....	3

## TABLES

Table 1.--Physical and chemical data for samples collected during 1983 in Hatchery Bay, western Lake Erie ....	5
Table 2.--Physical and chemical data for samples collected during 1984 in Hatchery Bay, western Lake Erie ....	6
Table 3.--Physical and chemical data for samples collected during 1985 in Hatchery Bay, western Lake Erie ....	7
Table 4.--Physical and chemical data for samples collected during 1986 in Hatchery Bay, western Lake Erie. ...	8
Table 5.-- Physical and chemical data for samples collected during 1987 in Hatchery Bay, western Lake Erie ...	9
Table 6.--Physical and chemical data for samples collected during 1990 in Hatchery Bay, western Lake Erie ..	10
Table 7.--Physical and chemical data for samples collected during 1991 in Hatchery Bay, western Lake Erie ..	11
Table 8.--Physical and chemical data for samples collected during 1992 in Hatchery Bay, western Lake Erie. .	12
Table 9.--Physical and chemical data for samples collected during 1993 in Hatchery Bay, western Lake Erie ..	13
Table 10.--Physical and chemical data for samples collected during 1994 in Hatchery Bay, western Lake Erie	14
Table 11.--Physical and chemical data for samples collected during 1995 in Hatchery Bay, western Lake Erie	15

## FIGURES

Figure 1.--Western Lake Erie, South Bass, and Gibraltar Islands. The dot in Hatchery Bay represents the sampling location. ....	4
---	---

# Chemistry, Temperature, and Secchi Disc Data for Hatchery Bay, Western Lake Erie

A. M. Beeton\*  
R. E. Holland<sup>1</sup>  
T. H. Johengen<sup>2</sup>  
J. R. Hageman<sup>3</sup>

**ABSTRACT.** This technical memorandum presents the sampling and analytical methods, and the resulting data from weekly, year round sampling in Hatchery Bay, western Lake Erie, from 1984 to 1987 and 1990 to 1995. Results are presented in tables. Most of the Secchi disc data are referred to in a paper on diatoms (Holland, 1993). The chemistry data for 1984-87 and 1990-93 are the basis for a paper on nutrient chemistry trends for pre and post zebra mussel invasion (Holland et al., 1995).

## 1.0 INTRODUCTION

Observation of water clarity, measured by Secchi disc, began on August 9, 1983 as part of a sampling program to determine whether plankton diatom populations of the Bass Island region have remained stable since 1963 or whether they reflect an increase in, or reversal of, eutrophication trends. Subsequently, collection of water samples began in 1984 to determine water chemistry. The objective was to correlate diatom abundances with trends in water chemistry. The project "Re-evaluation of the planktonic diatoms of the Bass Island Region of western Lake Erie" was part of the Michigan Sea Grant College Program from 1983 to 1987; this phase of sampling ended October 13, 1987. Subsequently, the water chemistry, Secchi depth measurements, and sampling for diatoms and zooplankton (1990-1995) became part of a collaborative research project among the Michigan Sea Grant College Program, the Great Lakes Environmental Research Laboratory of the National Oceanic and Atmospheric Administration, and the Stone Laboratory of Ohio State University at Put-in-Bay, Ohio.

The sampling program was terminated in 1987 and resumed on April 3, 1990 to determine the possible impact of the zebra mussel, *Dreissena polymorpha*, which became established in western Lake Erie in 1988. Stone Laboratory personnel were involved in the overall sampling program from its inception in 1983. The last sampling occurred September 1, 1995.

The purpose of this report is to make these data available to all potential users. No interpretation is presented. In addition to the two papers cited above, we anticipate publication of a paper on diatoms and water chemistry, and a paper on zooplankton. No diatom or zooplankton data are included in this report.

## 2.0 SAMPLING LOCATION

The sampling station is in Hatchery Bay, also know as Fishery Bay, at 41° 39' 30" N, 82° 49' 23" W (Figure1). This U-shaped embayment is defined by South Bass Island on the west, Gibraltar Island on the

---

\*GLERL Contribution No. 1004

<sup>1</sup>Dept. of Atmospheric, Oceanic, and Space Sciences, The University of Michigan, Ann Arbor, Michigan, 49109-2143

<sup>2</sup>Cooperative Institute for Limnology and Ecosystems Research, University of Michigan, Ann Arbor, Michigan, 49109

<sup>3</sup>Stone Laboratory, The Ohio State University, Put-in-Bay, Ohio 43456-0119.

east, and Alligator Bar on the south. It opens to waters between South and Middle Bass Islands. The bay surface area is about 160,600 m<sup>2</sup>. Depths range from 0.3 m at Alligator Bar to 6.7 m at the bay mouth. These depths and the depth of the sampling station, which averages about 4 m, vary considerably both seasonally and annually, but short term variations, largely due to storm surges and seiches, occur frequently. Water level at Put-in-Bay fluctuates up to 1.5 m (Chandler, 1944). This sampling location was chosen because it was amenable to year round sampling and because Hohn (1969) had conducted a major study of diatoms at this location in the 1960's. During the 1990's, as macrophytes began to proliferate from soft substrates, the station was moved closer to Gibraltar Island where the substrate is rocky. Samples for our research were collected from the dock at the old fish hatchery building, approximately 250 m west of the station, when it was not safe to venture onto the ice. Water depth is 3.5 m at the dock.

Water chemistry at the sampling location was closely similar to that of open water elsewhere in Put-in-Bay (Holland et al., 1995). It was determined that a small sewage outfall away from the sampling site on the south shore of Put-in-Bay had no measurable effect on Hatchery Bay.

Macrophytes were not especially abundant from 1983 to 1987 at the sampling site. Submersed macrophytes became more abundant in the 1990's, presumably in response to increased water clarity after establishment of large populations of the zebra mussel. The macrophytes made sampling difficult, so the sampling site was moved a short distance closer to Gibraltar Island where the bottom is rocky.

### 3.0 METHODS

Sampling was carried out approximately weekly, year round. Measurements of water clarity were made with a Secchi disc, 25 cm in diameter with black and white quadrants and a rope marked in meters. Measurements were made in centimeters by use of a meter stick from the meter mark on the rope to the water surface. Measurements of water temperature (°C) were made in a 1-L water sample with a mercury thermometer. Water for nutrient determinations was collected 1 m below the surface with a 1-L Kemmerer bottle and poured into a 1-L polyethylene bottle for transport to the Stone Laboratory. At the laboratory, 15 mL of water were poured into an acid-cleaned Pyrex tube, which was refrigerated for analysis of total phosphorus. Water for other analyses was filtered through a 0.45 µm H A Millipore filter. The filtrate was split between two chemically clean polyethylene bottles. One filtered sample was frozen for later determination of nitrate-nitrogen, ammonium-nitrogen, and soluble reactive phosphorus. Determination for chloride and silica content were made on the unfrozen samples. The unfrozen samples, the filters for diatom analysis, and field notes were mailed to Ann Arbor, MI weekly. The refrigerated and frozen samples were transported to Ann Arbor periodically.

Chemical analyses were made in the laboratory of the Great Lakes Research Division, University of Michigan, Ann Arbor until 1992. Subsequent analyses were made at the Great Lakes Environmental Research Laboratory, Ann Arbor using the same method. From the time of transition between laboratories until the end of the study, the analyses were performed by the same person.

Ammonium-nitrogen was determined by the phenate method, nitrate-nitrogen by cadmium reduction, soluble reactive phosphorus by the molybdate-ascorbic acid method, and silica was determined using the molybdate-oxalic acid, heteropoly blue method. Chloride was analyzed by the ferric thiocyanate method. These analyses were made on a Technicon Auto Analyzer II using the above techniques as modified by Davis and Simmons (1979). Samples were digested with potassium persulfate in an autoclave for 30 minutes for colorimetric determination of total phosphorus (Menzel and Corwin, 1965).

#### 4.0 EXPLANATION OF TABLES

Data are presented for years 1984, 85, 86, 87, 90, 91, 92, 93, 94, and 95. Sampling dates are given for each week and in Julian days. Concentrations for nitrate and ammonium are mgN/L and  $\mu\text{gN/L}$ , respectively. Concentrations for soluble reactive phosphorus and total phosphorus are  $\mu\text{gP/L}$ . Chloride is reported as mgCl/L. Secchi disc measurements are in meters and water temperature  $^{\circ}\text{C}$ .

Copies of the original field notes are archived at the Stone Laboratory, Ohio State University, Put-in-Bay, Ohio 43456-0119.

#### 5.0 REFERENCES

- Chandler, D.C. Limnological studies of western Lake Erie. IV. Relationship of limnological and climatic factors to the phytoplankton of 1941. *Transactions of the American Microsc. Society* 63:203-236 (1944).
- Davis, C.O., and M.S. Simons. Water chemistry and phytoplankton field and laboratory procedures. Great Lakes Research Division, The University of Michigan, Ann Arbor, Special Report 70 (1979).
- Hohn, M.H. Qualitative and quantitative analyses of plankton diatoms, Bass Island area, Lake Erie, 1938-1965. *Bulletin of the Ohio Biological Survey* 3:1-211 (1969).
- Holland, R.E., T.H. JOHNGEN, and A.M. BEETON. Trends in nutrient concentrations in Hatchery Bay, western Lake Erie before and after *Dreissena polymorpha*. *Canadian Journal of Fisheries and Aquatic Sciences* 52:1202-1209 (1995).
- Holland, R.E. Changes in planktonic diatoms and water transparency in Hatchery Bay, Bass Island area, western Lake Erie since the establishment of the zebra mussel. *Journal of Great Lakes Research* 19:617-624 (1993).
- Menzel, D.W., and N. Corwin. The measurement of total phosphorus in seawater based on the liberation of organically bound fractions by persulfate oxidation. *Limnology and Oceanography* 10:280-281 (1965).

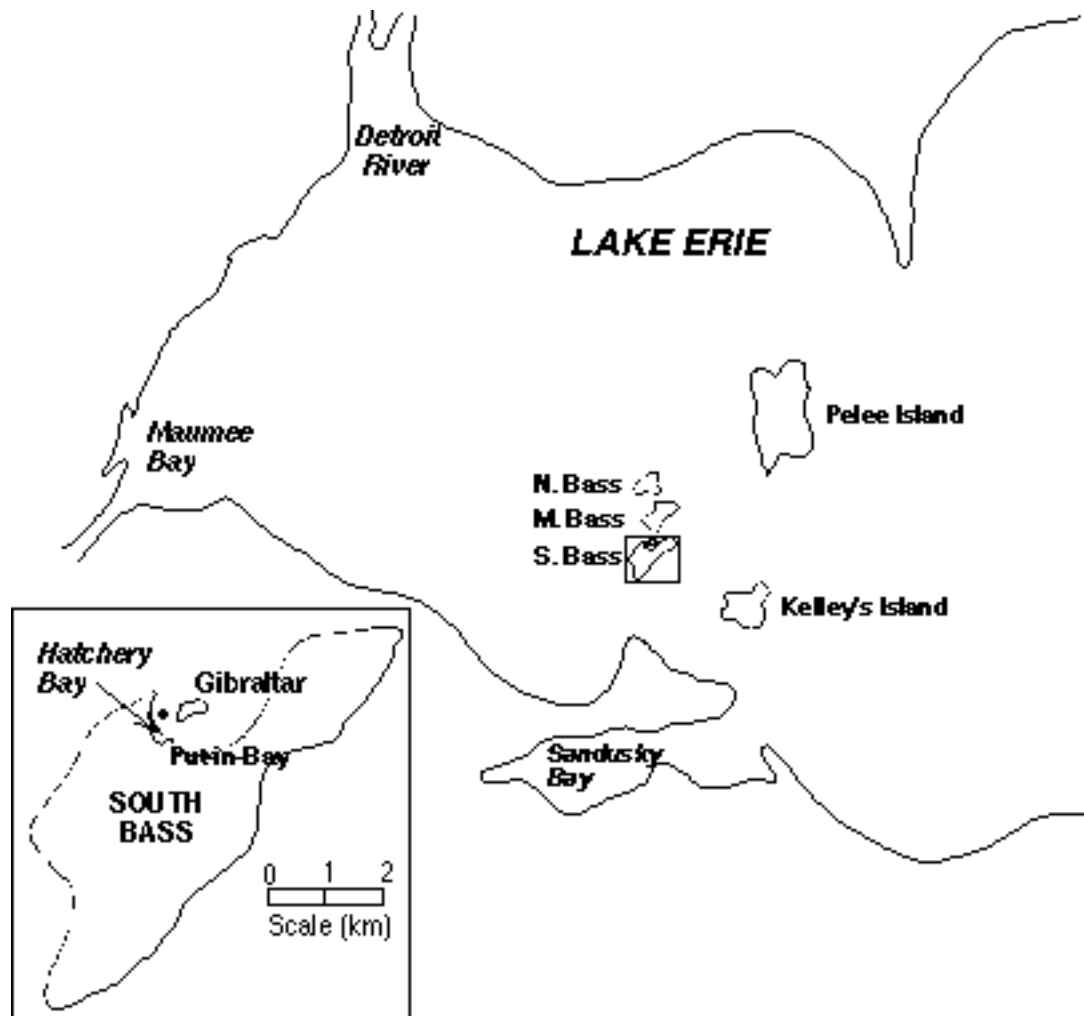


Figure 1.--Western Lake Erie, South Bass, and Gibraltar Islands. The dot in Hatchery Bay represents the sampling location.

Table 1.--Physical and chemical data for samples collected during 1983 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
83	8	9	221	25.0	.	.	.	.	.	.	1.2
83	8	16	228	27.0	.	.	.	.	.	.	1.0
83	8	23	235	26.0	.	.	.	.	.	.	1.2
83	8	30	242	26.0	.	.	.	.	.	.	1.5
83	9	6	249	27.0	.	.	.	.	.	.	1.2
83	9	13	256	24.0	.	.	.	.	.	.	1.0
83	9	20	263	23.0	.	.	.	.	.	.	0.8
83	9	28	271	20.5	.	.	.	.	.	.	0.9
83	10	4	277	19.0	.	.	.	.	.	.	1.2
83	10	11	284	18.0	.	.	.	.	.	.	1.1
83	10	19	292	15.0	.	.	.	.	.	.	0.5
83	10	25	298	13.0	.	.	.	.	.	.	0.5
83	11	1	305	13.0	.	.	.	.	.	.	0.8
83	11	8	312	11.0	.	.	.	.	.	.	0.8
83	11	16	320	8.0	.	.	.	.	.	.	0.2
83	11	22	326	10.0	.	.	.	.	.	.	0.5
83	11	29	333	9.0	.	.	.	.	.	.	0.3
83	12	6	340	4.0	.	.	.	.	.	.	0.4
83	12	13	347	6.0	.	.	.	.	.	.	0.6
83	12	20	354	2.0	.	.	.	.	.	.	0.3
83	12	27	361	2.0	.	.	.	.	.	.	1.1



Table 2.--Physical and chemical data for samples collected during 1984 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
84	1	3	3	2.5	.	.	.	.	.	.	1.3
84	1	10	10	1.0	.	.	.	.	.	.	1.5
84	1	17	17	0.2	.	.	.	.	.	.	2.0
84	1	24	24	0.9	.	.	.	.	.	.	2.0
84	1	31	31	0.4	.	.	.	.	.	.	2.5
84	2	7	38	2.0	.	.	.	.	.	.	3.3
84	2	14	45	3.0	.	.	.	.	.	.	3.5*
84	2	21	52	2.9	.	.	.	.	.	.	3.5*
84	2	28	59	1.0	0.73	36.0	1.89	12.0	2.0	38.0	0.5
84	3	6	66	2.0	0.77	7.0	1.49	16.2	2.0	21.0	0.9
84	3	13	73	2.0	0.71	15.0	1.30	16.1	1.0	25.0	1.0
84	3	20	80	0.2	0.89	43.0	1.28	17.3	2.0	35.0	1.3
84	3	27	87	0.5	1.08	73.0	1.78	16.4	2.0	37.0	1.1
84	4	3	94	2.3	0.88	87.0	1.07	16.3	6.0	25.0	1.3
84	4	10	101	3.3	2.23	109.0	2.41	19.6	10.0	85.0	0.3
84	4	17	108	6.0	1.50	96.0	1.61	16.4	8.0	43.0	1.0
84	4	19	110	7.3	1.03	32.0	1.24	13.5	3.0	24.0	1.0
84	4	24	115	7.6	0.97	89.0	1.58	14.8	7.0	22.0	0.5
84	5	1	122	9.6	1.76	132.0	2.94	18.8	15.0	96.0	0.1
84	5	8	129	11.0	2.16	108.0	2.76	20.5	20.0	89.0	0.3
84	5	15	136	11.5	1.08	29.0	0.54	16.9	7.0	50.0	0.5
84	5	22	143	5.0	1.20	44.0	0.63	17.3	8.0	24.0	0.5
84	5	29	150	3.5	0.96	29.0	0.22	15.9	4.0	30.0	0.5
84	6	5	157	7.1	0.86	20.0	0.18	14.2	3.0	5.0	1.0
84	6	12	164	20.0	0.98	29.0	0.18	13.0	3.0	10.0	1.5
84	6	19	171	23.1	0.64	29.0	0.21	11.9	3.0	7.0	2.3
84	6	26	178	23.0	0.40	29.0	0.40	11.8	4.0	18.0	1.0
84	7	3	185	24.0	0.61	57.0	0.64	12.9	6.0	10.0	1.3
84	7	11	193	22.0	0.63	44.0	0.88	12.5	4.0	10.0	1.3
84	7	17	199	23.0	0.55	64.0	0.76	12.5	4.0	7.0	1.8
84	7	24	206	24.5	0.43	39.0	0.35	11.8	3.0	10.0	1.8
84	7	31	213	24.1	0.41	38.0	0.29	14.0	3.0	8.0	2.0
84	8	7	220	24.5	0.31	25.0	0.34	13.7	2.0	10.0	2.8
84	8	14	227	25.5	0.22	8.0	0.46	14.6	1.0	8.0	2.3
84	8	21	234	23.1	0.14	20.0	0.36	14.0	2.0	15.0	1.8
84	8	28	241	24.5	0.12	12.0	0.13	13.8	2.0	17.0	1.5
84	9	4	248	22.4	0.07	12.0	0.10	13.5	2.0	21.0	1.3
84	9	11	255	21.4	0.12	9.0	0.06	13.6	2.0	13.0	1.4
84	9	18	262	20.2	0.05	12.0	0.08	14.1	3.0	13.0	1.3
84	9	25	269	21.0	0.06	34.0	0.10	14.2	3.0	24.0	1.3
84	10	2	276	17.3	0.05	34.0	0.07	13.2	8.0	28.0	1.2
84	10	9	283	16.7	0.06	30.0	0.06	11.5	7.0	32.0	1.3
84	10	16	290	17.6	0.18	21.0	0.18	10.6	6.0	23.0	1.5
84	10	23	297	15.2	0.22	27.0	0.10	9.7	6.0	29.0	1.3
84	10	30	304	14.4	0.18	18.0	0.19	11.5	7.0	31.0	1.5
84	11	6	311	11.0	0.26	20.0	0.18	9.2	6.0	29.0	0.8
84	11	14	319	9.0	0.19	25.0	0.25	10.7	6.0	39.0	0.4
84	11	20	325	5.5	0.29	27.0	0.29	11.2	5.0	39.0	0.5
84	11	27	332	7.8	0.27	17.0	0.12	11.0	4.0	28.0	1.0
84	12	4	339	0.8	0.29	15.0	0.66	9.8	5.0	38.0	0.8
84	12	11	346	3.5	0.32	15.0	0.52	10.4	5.0	28.0	0.8
84	12	18	353	4.0	0.42	32.0	0.87	11.1	5.0	31.0	0.8
84	12	26	360	1.0	0.38	10.0	1.03	10.9	8.0	46.0	0.9

\* Secchi disc on bottom

Table 3.--Physical and chemical data for samples collected during 1985 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
85	1	2	2	4.0	0.42	63.0	1.15	11.8	6.0	32.0	0.5
85	1	8	8	3.0	0.42	40.0	0.66	11.9	5.0	52.0	0.5
85	1	15	15	2.0	1.20	56.0	1.16	16.7	10.0	42.0	0.5
85	1	22	22	2.0	0.80	113.0	1.15	14.3	8.0	28.0	1.0
85	1	29	29	2.0	0.46	54.0	1.58	13.1	6.0	20.0	1.8
85	2	5	36	1.0	0.85	45.0	1.77	18.4	5.0	48.0	1.5
85	2	12	43	2.0	0.74	126.0	2.00	14.1	5.0	26.0	1.8*
85	2	19	50	4.5	0.40	85.0	1.38	10.6	13.0	43.0	3.5
85	2	26	57	3.0	0.36	18.0	1.27	9.1	7.0	17.0	3.8*
85	3	5	65	3.0	0.41	57.0	1.41	11.7	6.0	36.0	1.3
85	3	12	72	3.5	0.41	101.0	1.44	15.0	6.0	101.0	0.3
85	3	19	79	3.0	1.28	226.0	2.25	24.7	14.0	76.0	0.4
85	3	26	86	6.0	0.82	81.0	1.42	20.6	8.0	37.0	0.9
85	4	2	92	7.0	1.17	80.0	1.62	20.3	7.0	103.0	0.4
85	4	9	99	7.0	1.52	99.0	2.13	18.6	11.0	168.0	0.3
85	4	16	106	10.0	1.13	70.0	1.88	14.1	9.0	83.0	0.5
85	4	23	113	16.0	1.31	29.0	1.55	16.6	7.0	52.0	0.8
85	4	30	120	16.0	0.97	30.0	1.13	17.0	7.0	40.0	0.9
85	5	7	127	17.0	0.77	91.0	1.00	16.7	6.0	42.0	0.8
85	5	14	134	16.0	0.75	31.0	0.22	16.9	4.0	144.0	1.3
85	5	21	141	16.0	0.95	33.0	0.20	15.3	4.0	46.0	0.5
85	5	28	148	18.0	1.01	31.0	0.20	15.4	4.0	43.0	0.5
85	6	4	155	18.0	0.88	19.0	0.27	14.2	4.0	40.0	0.5
85	6	11	162	19.5	0.68	22.0	0.38	13.9	4.0	46.0	0.5
85	6	18	169	19.0	0.62	41.0	0.58	13.3	5.0	45.0	0.5
85	6	25	176	22.0	0.66	55.0	0.61	14.1	6.0	43.0	1.0
85	7	2	183	22.0	0.48	55.0	0.43	13.0	4.0	30.0	1.2
85	7	9	190	24.0	0.40	39.0	0.30	13.5	4.0	27.0	1.8
85	7	16	197	26.0	0.36	55.0	0.45	13.2	4.0	29.0	1.6
85	7	23	204	24.0	0.22	33.0	0.68	12.2	3.0	27.0	1.5
85	7	30	211	26.0	0.16	22.0	0.30	11.9	3.0	25.0	1.5
85	8	6	218	23.0	0.16	44.0	0.25	11.6	4.0	24.0	1.5
85	8	13	225	25.0	0.12	61.0	0.34	11.1	4.0	27.0	1.5
85	8	20	232	23.0	0.04	31.0	0.13	11.1	4.0	24.0	1.5
85	8	27	239	24.0	0.04	53.0	0.14	11.2	4.0	37.0	1.3
85	9	3	246	24.0	0.04	41.0	0.13	11.7	4.0	37.0	1.2
85	9	10	253	24.0	0.03	34.0	0.15	12.2	4.0	36.0	0.8
85	9	17	260	22.0	0.04	36.0	0.11	11.3	4.0	36.0	1.0
85	9	24	267	21.0	0.16	62.0	0.33	9.8	7.0	49.0	2.0
85	10	1	274	18.0	0.11	27.0	0.12	10.4	5.0	31.0	1.3
85	10	8	281	16.0	0.07	31.0	0.21	12.2	7.0	39.0	1.2
85	10	15	288	16.0	0.16	50.0	0.54	11.4	6.0	46.0	1.2
85	10	22	295	14.0	0.22	54.0	0.13	10.9	6.0	32.0	1.3
85	10	29	302	13.0	0.13	31.0	0.17	12.7	7.0	51.0	0.8
85	11	5	309	12.5	0.19	123.0	1.92	12.6	13.0	76.0	0.5
85	11	12	316	11.0	0.36	92.0	0.73	13.1	10.0	21.0	0.8
85	11	19	323	11.0	0.33	141.0	0.80	11.5	12.0	41.0	0.9
85	11	26	330	7.0	0.43	65.0	1.25	12.0	8.0	34.0	0.7
85	12	3	337	4.0	0.54	59.0	1.73	11.4	7.0	130.0	0.3
85	12	10	344	4.0	0.61	55.0	1.56	11.9	8.0	38.0	0.6
85	12	18	352	0.5	1.27	119.0	2.40	16.2	12.0	44.0	0.6
85	12	24	358	0.0	1.16	83.0	2.50	15.3	12.0	41.0	0.5
85	12	31	365	0.5	0.83	85.0	2.31	13.8	8.0	26.0	0.8

\* Secchi disc on bottom

Table 4.--Physical and chemical data for samples collected during 1986 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
86	1	7	7	1.0	0.61	107.0	2.25	13.5	5.0	23.0	1.5
86	1	14	14	1.0	0.78	110.0	2.35	13.3	22.0	73.0	1.4
86	1	21	21	0.5	0.95	110.0	2.46	14.4	12.0	23.0	2.0
86	1	28	28	0.5	1.10	89.0	2.55	15.7	8.0	26.0	1.5
86	2	4	35	0.5	0.84	110.0	2.15	12.2	10.0	28.0	2.2
86	2	11	42	0.5	0.76	125.0	2.00	14.6	9.0	26.0	2.0
86	2	18	49	0.5	0.52	67.0	1.46	12.1	7.0	13.0	3.0
86	2	26	57	1.0	0.52	19.0	1.13	13.3	5.0	10.0	3.0
86	3	4	63	1.0	0.44	13.0	1.04	13.7	4.0	14.0	3.0
86	3	11	70	4.0	0.45	48.0	0.80	12.2	6.0	10.0	3.0
86	3	18	77	6.0	0.48	35.0	0.69	13.0	4.0	12.0	2.3
86	3	25	84	7.5	1.38	42.0	1.41	19.6	4.0	46.0	0.8
86	4	1	91	10.0	1.24	44.0	1.16	20.4	4.0	40.0	0.8
86	4	9	99	10.0	0.58	31.0	0.80	12.6	5.0	13.0	0.5
86	4	15	105	11.0	0.92	27.0	0.61	16.3	4.0	13.0	0.6
86	4	22	112	10.0	0.54	17.0	0.28	12.3	4.0	19.0	0.5
86	4	29	119	13.0	0.56	23.0	0.07	12.5	2.0	17.0	1.3
86	5	6	126	15.0	0.69	42.0	0.09	13.2	5.0	22.0	1.0
86	5	13	133	15.0	0.60	26.0	0.07	12.3	4.0	21.0	1.3
86	5	20	140	16.0	0.47	23.0	0.09	13.0	4.0	22.0	1.4
86	5	27	147	17.0	0.35	57.0	0.19	11.7	4.0	28.0	1.3
86	6	3	154	20.5	0.39	32.0	0.21	12.1	5.0	25.0	1.3
86	6	10	161	24.0	0.30	17.0	0.29	11.8	4.0	31.0	1.0
86	6	17	168	23.0	0.28	30.0	0.53	12.6	5.0	38.0	0.8
86	6	24	175	23.0	0.36	19.0	0.72	12.9	3.0	36.0	0.7
86	7	1	182	25.0	0.46	87.0	0.30	14.9	5.0	33.0	1.3
86	7	8	189	25.0	0.50	50.0	0.25	14.2	5.0	33.0	2.0
86	7	15	196	25.0	0.40	50.0	0.47	12.3	4.0	27.0	2.0
86	7	22	203	27.0	0.41	17.0	0.34	12.5	3.0	22.0	2.0
86	7	29	210	27.0	0.32	14.0	0.52	12.7	3.0	30.0	1.3
86	8	5	217	27.0	0.15	15.0	0.39	13.3	4.0	26.0	1.3
86	8	12	224	24.5	0.23	12.0	0.40	13.3	3.0	26.0	1.0
86	8	19	231	25.0	0.14	17.0	0.29	13.5	3.0	41.0	0.8
86	8	26	238	25.0	0.15	21.0	0.25	12.7	3.0	36.0	1.0
86	9	2	245	25.0	0.04	18.0	0.25	12.2	3.0	38.0	1.0
86	9	9	252	22.0	0.03	43.0	0.26	12.6	5.0	50.0	0.8
86	9	16	259	20.0	0.01	17.0	0.25	12.3	4.0	48.0	0.9
86	9	23	266	20.0	0.14	44.0	0.94	12.3	5.0	40.0	1.0
86	9	30	273	20.0	0.09	95.0	0.39	11.7	5.0	32.0	1.2
86	10	7	280	18.0	0.20	68.0	1.16	9.6	6.0	26.0	0.7
86	10	14	287	15.0	0.29	25.0	1.70	11.4	5.0	33.0	0.8
86	10	21	294	13.0	0.30	20.0	1.27	10.3	5.0	30.0	0.8
86	10	28	301	14.0	0.32	29.0	1.12	9.8	5.0	28.0	1.0
86	11	4	308	12.0	0.31	17.0	0.88	10.1	4.0	37.0	0.8
86	11	12	316	12.0	0.34	10.0	0.41	11.4	4.0	30.0	0.8
86	11	18	322	10.0	0.59	245.0	0.56	15.3	7.0	54.0	0.5
86	11	25	329	9.0	0.47	32.0	0.68	12.8	6.0	33.0	0.7
86	12	2	336	7.0	0.62	37.0	0.68	13.3	5.0	41.0	0.4
86	12	9	343	9.0	0.54	103.0	0.66	12.8	6.0	38.0	0.5
86	12	16	350	11.0	0.69	35.0	0.69	14.0	6.0	85.0	0.6
86	12	23	357	7.0	0.80	44.0	0.86	14.5	6.0	42.0	0.6
86	12	30	364	1.5	0.73	29.0	0.78	13.0	5.0	31.0	0.9

Table 5.-- Physical and chemical data for samples collected during 1987 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
87	1	6	6	2.0	0.56	99.0	0.94	12.1	5.0	23.0	1.8
87	1	13	13	1.0	0.80	60.0	1.27	13.3	5.0	50.0	0.7
87	1	20	20	0.5	0.97	69.0	1.40	13.3	10.0	43.0	0.6
87	1	27	27	1.0	0.96	63.0	1.45	13.6	7.0	41.0	0.8
87	2	3	34	1.0	0.54	40.0	1.50	11.1	6.0	24.0	1.7
87	2	10	41	1.0	0.59	51.0	1.20	12.0	6.0	28.0	0.8
87	2	17	48	1.0	0.66	47.0	1.30	15.5	5.0	32.0	1.6
87	2	24	55	1.0	0.59	29.0	1.20	16.0	5.0	18.0	2.9
87	3	3	62	14.0	0.36	54.0	0.90	11.3	5.0	24.0	2.5
87	3	10	69	12.0	0.47	84.0	0.70	13.1	5.0	39.0	0.5
87	3	17	76	12.0	0.44	37.0	0.70	11.5	5.0	33.0	0.8
87	3	24	83	10.0	0.41	15.0	0.40	12.5	5.0	25.0	1.8
87	3	31	90	5.0	0.45	18.0	0.30	13.9	5.0	47.0	0.7
87	4	7	97	9.0	0.59	33.0	0.30	14.6	5.0	51.0	0.4
87	4	14	104	9.0	0.92	67.0	0.70	15.9	5.0	40.0	0.6
87	4	21	111	11.5	0.81	67.0	0.80	14.3	6.0	34.0	1.0
87	4	28	118	10.5	0.58	32.0	0.80	13.0	5.0	48.0	0.4
87	5	5	125	12.0	0.48	17.0	0.20	14.1	4.0	39.0	0.7
87	5	12	132	14.8	0.50	18.0	0.10	13.5	4.0	35.0	0.7
87	5	19	139	16.0	0.56	19.0	0.20	13.1	4.0	34.0	1.0
87	5	26	146	19.0	0.49	29.0	0.20	12.1	4.0	38.0	1.6
87	6	2	153	21.5	0.38	64.0	0.30	11.4	5.0	29.0	2.3
87	6	9	160	21.0	0.46	44.0	0.70	13.1	5.0	40.0	1.0
87	6	16	167	23.5	0.31	31.0	0.60	12.2	5.0	44.0	1.8
87	6	23	174	23.5	0.32	51.0	0.60	11.1	5.0	27.0	1.5
87	6	30	181	23.0	0.29	34.0	0.60	11.5	5.0	31.0	2.0
87	7	7	188	23.0	0.25	27.0	0.20	11.4	5.0	66.0	2.0
87	7	14	197	24.5	0.21	37.0	0.40	11.9	5.0	41.0	0.8
87	7	21	204	26.5	0.11	37.0	0.40	11.5	5.0	39.0	1.9
87	7	28	211	26.0	0.06	30.0	0.60	11.8	5.0	38.0	2.0
87	8	4	216	27.0	0.06	65.0	1.10	12.2	8.0	46.0	2.1
87	8	11	223	24.5	0.03	13.0	0.20	11.7	6.0	45.0	1.7
87	8	18	230	27.0	0.03	15.0	0.20	11.9	5.0	40.0	1.6
87	8	25	237	25.0	0.03	30.0	0.10	12.3	7.0	49.0	1.8
87	8	31	243	22.0	0.05	30.0	0.10	11.8	8.0	48.0	1.3
87	9	8	251	22.5	0.04	35.0	0.20	11.4	7.0	43.0	2.0
87	9	15	258	20.5	0.09	73.0	0.40	10.1	7.0	34.0	1.5
87	9	22	265	20.5	0.14	64.0	0.40	10.6	7.0	78.0	1.6
87	9	29	272	20.0	0.11	42.0	0.30	10.4	9.0	45.0	2.0
87	10	6	279	15.0	0.10	51.0	0.30	10.9	10.0	50.0	1.4
87	10	13	286	13.5	0.11	35.0	0.50	11.0	8.0	35.0	1.6

Table 6.--Physical and chemical data for samples collected during 1990 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
90	4	3	93	5.9	0.80	81.0	1.00	19.5	2.0	64.0	0.6
90	4	10	100	5.7	1.40	74.0	0.70	16.9	2.0	32.0	1.0
90	4	17	107	5.7	1.20	84.0	0.50	20.7	2.0	59.0	0.4
90	4	24	114	9.2	1.30	104.0	0.10	18.6	4.0	27.0	2.0
90	5	1	121	12.8	0.80	54.0	0.40	14.8	3.0	20.0	1.4
90	5	8	128	13.7	0.90	35.0	0.20	14.6	2.0	16.0	3.3
90	5	15	135	13.7	1.70	103.0	0.50	18.6	3.0	37.0	0.9
90	5	22	142	15.5	1.70	76.0	0.60	17.9	3.0	40.0	1.0
90	5	29	149	16.5	1.30	51.0	0.60	16.8	2.0	36.0	1.0
90	6	5	156	16.6	0.80	47.0	0.80	16.4	3.0	41.0	1.1
90	6	12	163	19.3	1.00	48.0	0.50	16.6	3.0	26.0	1.8
90	6	19	170	23.2	0.90	125.0	0.10	15.7	.	28.0	2.0
90	6	26	177	19.9	1.10	108.0	1.00	15.4	3.0	39.0	1.8
90	7	3	184	23.8	0.90	35.0	1.00	14.6	3.0	51.0	2.3
90	7	10	191	25.0	0.80	39.0	0.60	14.6	2.0	21.0	2.7
90	7	17	198	22.8	0.80	72.0	1.20	14.2	3.0	32.0	2.8
90	7	24	205	23.8	0.80	58.0	0.20	14.0	3.0	28.0	2.8
90	7	31	212	24.3	0.80	61.0	0.20	13.7	3.0	67.0	2.8*
90	8	8	220	22.1	0.70	76.0	0.60	13.7	4.0	21.0	3.4*
90	8	14	226	24.1	0.70	85.0	0.30	14.0	3.0	24.0	4.0
90	8	21	233	23.3	0.60	78.0	0.30	14.4	4.0	27.0	3.2
90	8	28	240	25.0	0.30	14.0	0.60	11.3	4.0	26.0	3.1
90	9	4	247	24.0	0.30	50.0	1.20	12.0	5.0	27.0	4.0*
90	9	11	254	23.9	0.30	37.0	1.50	12.0	5.0	30.0	3.2
90	9	18	261	20.3	0.20	72.0	1.50	11.0	16.0	28.0	4.6*
90	9	25	268	16.8	0.30	55.0	1.40	11.0	13.0	27.0	4.1
90	10	3	275	17.0	0.20	57.0	1.10	12.0	11.0	26.0	3.4*
90	10	9	282	15.5	0.30	60.0	0.70	12.0	11.0	26.0	2.2
90	10	16	289	14.8	0.40	56.0	0.70	12.0	11.0	26.0	3.9
90	10	23	296	12.9	0.40	64.0	0.60	12.0	15.0	28.0	2.0
90	10	30	303	10.5	0.50	61.0	0.70	12.0	17.0	28.0	1.5
90	11	6	309	10.0	0.40	70.0	0.90	12.0	22.0	44.0	0.5
90	11	13	317	7.0	0.60	45.0	1.20	12.0	15.0	35.0	1.0
90	11	21	325	7.2	0.60	52.0	1.60	13.0	14.0	30.0	2.6
90	11	27	331	7.0	0.70	73.0	1.60	12.0	14.0	39.0	1.4
90	12	4	338	5.3	0.60	53.0	3.00	12.0	7.0	60.0	0.4
90	12	11	345	3.9	0.70	57.0	1.30	13.7	7.0	30.0	2.8
90	12	18	352	3.2	0.80	72.0	2.00	14.4	11.0	30.0	1.6
90	12	26	361	0.0	0.70	96.0	1.90	12.8	14.0	39.0	0.5

\* Secchi disc on bottom

Table 7.--Physical and chemical data for samples collected during 1991 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
91	1	2	2	0.5	0.90	90.0	2.30	14.0	10.0	30.0	1.5
91	1	8	8	0.8	0.90	95.0	2.20	14.0	13.0	28.0	2.7
91	1	15	15	1.2	0.80	80.0	2.10	13.0	7.0	26.0	2.6
91	1	23	23	0.3	0.80	91.0	2.10	13.0	10.0	28.0	2.4
91	1	29	29	.	1.20	119.0	2.60	16.0	22.0	37.0	1.0
91	2	5	36	2.2	0.70	138.0	2.00	24.0	22.0	35.0	1.0
91	2	12	43	2.2	1.00	130.0	2.10	19.0	21.0	34.0	2.5
91	2	19	50	1.2	0.70	112.0	1.90	18.0	8.0	32.0	2.4
91	2	29	60	0.7	1.00	138.0	2.20	19.0	14.0	33.0	2.5
91	3	5	64	2.0	1.40	181.0	2.70	20.0	23.0	35.0	1.0
91	3	12	71	1.4	0.80	119.0	1.70	14.0	19.0	27.0	1.2
91	3	19	78	3.8	0.70	86.0	1.20	15.8	7.0	28.0	1.5
91	3	26	85	5.2	0.70	91.0	1.00	15.6	10.0	31.0	1.1
91	4	2	92	7.2	1.10	146.0	1.80	19.7	3.0	42.0	0.9
91	4	9	99	9.6	0.80	81.0	0.90	16.6	3.0	19.0	2.2
91	4	16	106	9.5	0.60	183.0	0.80	16.1	3.0	33.0	0.7
91	4	23	113	10.0	0.60	103.0	1.00	14.4	4.0	42.0	0.5
91	4	30	120	11.4	0.70	46.0	1.30	14.3	2.0	80.0	0.3
91	5	7	127	.	0.80	25.0	1.00	15.0	3.0	32.0	1.0
91	5	14	134	16.4	0.80	22.0	0.80	15.0	2.0	19.0	1.9
91	5	21	141	17.6	0.70	55.0	0.80	15.0	2.0	15.0	3.3
91	5	28	148	22.8	0.60	31.0	0.30	15.0	2.0	18.0	4.4
91	6	4	155	21.4	0.70	22.0	0.50	15.0	2.0	18.0	2.2
91	6	18	169	25.0	0.60	12.0	0.70	15.0	2.0	19.0	3.0
91	6	25	176	24.7	0.60	11.0	1.10	15.0	2.0	35.0	3.2
91	7	2	183	25.1	0.40	43.0	1.10	15.0	2.0	25.0	3.8
91	7	9	190	26.4	0.30	15.0	0.40	15.6	.	26.0	3.7*
91	7	16	197	25.0	1.40	.	0.50	14.9	2.0	27.0	3.0*
91	7	24	205	26.8	1.40	.	0.90	15.6	5.0	40.0	3.3
91	7	30	211	24.2	1.20	.	1.30	15.1	1.0	61.0	2.9*
91	8	6	218	25.0	0.80	.	0.80	15.1	4.0	53.0	3.5
91	8	13	225	25.3	0.50	.	0.80	13.8	5.0	20.0	3.8
91	8	20	232	22.0	0.80	.	1.10	13.4	10.0	52.0	2.0
91	8	27	239	24.0	0.80	.	1.00	12.3	3.0	54.0	4.4
91	9	3	246	23.7	0.50	.	1.10	11.4	7.0	50.0	2.7
91	9	10	253	23.7	0.40	.	1.20	10.7	4.0	38.0	3.1*
91	9	18	261	22.8	0.60	.	1.20	11.5	6.0	31.0	3.8*
91	9	24	267	18.4	0.70	.	1.40	12.6	10.0	46.0	3.7
91	10	1	274	16.8	0.80	.	0.70	12.6	5.0	63.0	4.3
91	10	8	281	14.0	0.80	.	0.80	12.7	4.0	50.0	2.5
91	10	15	288	12.7	0.70	.	0.20	13.2	3.0	30.0	1.9
91	10	22	295	13.0	0.70	.	0.20	13.0	8.0	29.0	3.8
91	10	29	302	15.0	0.80	.	0.30	12.4	3.0	34.0	1.2
91	11	5	309	6.6	1.00	.	0.60	10.8	14.0	37.0	1.0
91	11	12	316	5.3	0.21	55.0	0.50	12.0	5.0	59.0	2.2
91	11	19	323	7.8	0.34	204.0	0.50	12.9	9.0	25.0	5.3
91	11	27	331	4.6	0.29	62.0	0.70	12.0	8.0	33.0	1.4
91	12	3	337	5.0	0.38	88.0	0.90	12.3	4.0	37.0	0.8
91	12	10	344	3.9	0.41	64.0	1.00	12.2	3.0	42.0	2.4
91	12	17	351	2.2	0.37	52.0	1.20	10.8	6.0	49.0	0.6
91	12	24	358	1.9	0.42	77.0	1.20	11.6	9.0	65.0	0.5
91	12	31	365	1.1	0.52	75.0	1.50	11.0	6.0	46.0	0.6

\* Secchi disc on bottom

Table 8.--Physical and chemical data for samples collected during 1992 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
92	1	7	7	2.4	0.41	26.0	1.70	10.0	2.0	21.0	1.1
92	1	14	14	1.3	0.72	122.0	2.10	13.0	10.0	136.0	0.3
92	1	21	21	2.2	0.96	137.0	2.50	15.6	9.0	32.0	0.6
92	1	29	29	1.8	0.86	129.0	2.50	15.2	10.0	30.0	0.7
92	2	4	35	2.3	0.72	112.0	2.20	14.0	8.0	22.0	1.1
92	2	11	42	2.0	0.54	82.0	1.80	12.4	7.0	22.0	2.8
92	2	18	49	2.7	0.72	68.0	1.50	14.1	3.0	18.0	3.5*
92	2	25	56	2.0	0.54	68.0	2.10	15.1	3.0	16.0	2.0
92	3	3	63	2.6	0.74	56.0	1.00	16.9	3.0	34.0	1.0
92	3	11	71	2.9	0.64	73.0	2.90	14.4	5.0	81.0	0.3
92	3	17	77	2.3	1.01	109.0	1.90	19.8	4.0	31.0	1.0
92	3	24	84	3.9	0.68	94.0	1.60	16.3	4.0	18.0	2.7
92	3	31	91	4.3	0.70	71.0	1.30	14.1	3.0	22.0	3.9
92	4	7	98	7.4	1.32	77.0	1.50	18.0	12.0	42.0	3.4*
92	4	14	105	5.7	1.10	37.0	1.00	17.1	3.0	13.0	4.1
92	4	21	112	9.0	0.73	24.0	1.00	15.7	2.0	9.0	4.7*
92	4	28	119	10.1	0.99	63.0	1.30	18.8	3.0	51.0	2.6
92	5	5	126	11.1	0.90	26.0	0.80	15.1	3.0	38.0	3.9*
92	5	12	133	12.1	0.86	21.0	0.50	13.5	3.0	17.0	5.0
92	5	19	140	15.0	0.91	20.0	0.40	14.7	2.0	42.0	3.3
92	5	26	147	15.8	1.46	33.0	0.60	17.2	3.0	15.0	3.6
92	6	2	154	18.9	1.40	28.0	0.30	17.0	2.0	20.0	3.5
92	6	9	161	19.3	1.06	16.0	0.20	14.8	3.0	15.0	2.8
92	6	16	168	19.0	0.87	24.0	0.50	13.9	3.0	20.0	1.3
92	6	23	175	18.7	0.82	16.0	0.70	13.8	2.0	26.0	3.6
92	6	30	182	21.0	0.92	32.0	0.80	15.3	3.0	13.0	4.7
92	7	7	189	22.0	1.06	27.0	1.50	16.4	6.0	35.0	2.8
92	7	14	196	22.5	1.30	100.0	1.80	17.1	12.0	32.0	4.3
92	7	21	203	22.6	0.37	58.0	0.90	10.5	8.0	36.0	3.0
92	7	28	210	22.3	0.36	51.0	1.00	9.9	6.0	18.0	3.8
92	8	4	217	21.8	0.41	64.0	1.30	10.1	8.0	22.0	2.7
92	8	11	224	24.1	1.60	35.0	1.30	13.8	3.0	39.0	2.4
92	8	18	231	21.4	1.15	65.0	1.40	13.1	7.0	34.0	2.9
92	8	25	238	22.8	0.63	26.0	1.50	13.4	3.0	22.0	4.2
92	9	1	245	21.5	0.70	62.0	1.00	11.9	5.0	28.0	4.1*
92	9	8	252	21.4	0.68	43.0	0.80	11.9	5.0	25.0	2.9
92	9	15	259	20.2	0.52	26.0	0.40	11.8	3.0	17.0	4.4
92	9	22	266	20.0	0.61	60.0	0.90	11.7	8.0	34.0	1.8
92	9	30	274	16.5	0.55	35.0	0.40	12.3	9.0	25.0	3.9
92	10	6	280	16.0	0.61	48.0	1.10	12.6	9.0	32.0	3.7
92	10	13	287	13.5	0.52	47.0	0.90	12.4	11.0	32.0	1.5
92	10	20	294	9.8	0.49	60.0	1.50	13.3	10.0	30.0	2.3
92	10	27	301	12.1	0.49	31.0	1.50	13.8	8.0	37.0	3.8
92	11	3	308	11.0	0.53	48.0	1.40	12.8	9.0	33.0	1.7
92	11	10	315	7.8	0.51	40.0	1.20	12.2	7.0	27.0	2.7
92	11	17	322	5.2	0.66	49.0	1.90	13.0	11.0	33.0	1.6
92	12	2	337	4.7	0.58	44.0	2.10	13.4	6.0	42.0	1.6
92	12	8	343	2.9	0.89	53.0	2.60	14.4	13.0	59.0	0.7
92	12	15	350	3.4	0.95	46.0	2.60	14.3	16.0	40.0	1.6
92	12	23	358	3.1	0.79	45.0	2.60	12.8	14.0	50.0	1.2
92	12	29	364	1.7	1.20	89.0	3.60	14.8	26.0	57.0	0.7

\* Secchi disc on bottom

Table 9.--Physical and chemical data for samples collected during 1993 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
93	1	5	5	1.5	0.82	81.0	2.80	13.3	13.0	49.0	0.7
93	1	12	12	1.9	1.10	117.0	3.30	14.8	18.0	80.0	0.4
93	1	20	20	1.1	1.19	108.0	2.10	14.5	28.0	50.0	0.8
93	1	26	26	0.5	1.02	105.0	2.50	15.4	22.0	56.0	0.6
93	2	3	34	.	0.73	95.0	2.30	14.4	8.0	28.0	1.0
93	2	9	40	.	0.89	112.0	2.60	14.7	10.0	35.0	1.5
93	2	16	47	0.3	0.76	88.0	2.30	14.8	8.0	45.0	0.9
93	2	23	54	0.2	0.67	74.0	2.00	14.4	5.0	24.0	1.2
93	3	2	61	1.3	0.62	71.0	1.90	14.5	4.0	40.0	2.1
93	3	9	68	.	0.63	73.0	1.90	14.5	5.0	188.0	2.4
93	3	17	76	1.4	0.61	77.0	1.80	14.5	5.0	32.0	1.6
93	3	23	82	1.2	0.64	74.0	1.90	14.5	5.0	20.0	2.7
93	4	6	96	.	0.71	81.0	1.30	14.6	2.0	27.0	1.0
93	4	13	103	6.2	0.88	220.0	0.90	20.6	5.0	26.0	2.1
93	4	20	110	.	1.08	192.0	0.87	18.8	17.0	64.0	1.5
93	4	27	117	7.3	1.06	145.0	0.85	16.7	12.0	64.0	1.0
93	5	4	124	.	0.54	38.0	0.83	15.5	2.0	14.0	4.8
93	5	11	131	14.9	0.55	49.0	0.82	15.3	2.0	12.0	4.0
93	5	19	139	13.8	1.19	30.0	0.72	16.4	1.0	21.0	1.2
93	5	25	145	15.1	1.27	81.0	0.48	16.9	3.0	34.0	1.0
93	6	1	152	.	1.65	63.0	0.28	18.6	3.0	29.0	2.5
93	6	15	166	19.0	0.84	32.0	0.55	11.4	2.0	20.0	3.1
93	6	22	173	22.4	1.06	66.0	0.55	13.0	2.0	19.0	2.8
93	6	29	180	20.9	0.89	85.0	1.00	12.0	3.0	25.0	2.8
93	7	6	187	25.1	0.53	53.0	0.92	11.5	2.0	28.0	2.7
93	6	13	194	25.3	0.73	46.0	0.55	12.3	3.0	31.0	2.1
93	7	20	201	25.3	0.84	59.0	0.57	12.3	8.0	27.0	3.6
93	7	27	208	25.2	0.79	54.0	0.47	12.2	4.0	27.0	4.2
93	8	2	215	23.8	0.50	44.0	0.88	11.7	8.0	32.0	3.9
93	8	10	222	22.6	0.48	27.0	0.62	11.7	2.0	.	3.5
93	8	17	229	24.7	0.29	33.0	0.60	11.7	1.0	23.0	3.7
93	8	24	236	24.2	0.34	63.0	1.21	13.1	4.0	26.0	3.7
93	8	31	243	25.7	0.22	29.0	2.25	11.4	1.0	25.0	3.3
93	9	7	250	23.7	0.27	52.0	2.00	11.5	5.0	25.0	4.3
93	9	14	257	22.0	0.28	57.0	1.80	11.3	8.0	28.0	3.8
93	9	21	264	18.6	0.29	27.0	1.70	11.2	6.0	30.0	3.7
93	9	28	271	16.0	0.20	41.0	1.59	11.0	6.0	37.0	1.2
93	10	5	278	15.0	0.32	44.0	1.33	11.1	10.0	36.0	2.3
93	10	12	285	12.7	0.32	49.0	1.28	11.0	9.0	37.0	2.3
93	10	19	292	12.9	0.26	26.0	0.90	12.3	3.0	31.0	2.9
93	10	26	299	12.8	0.32	40.0	1.30	12.3	7.0	29.0	2.7
93	11	2	306	8.2	0.33	44.0	1.67	11.6	13.0	35.0	1.7
93	11	9	313	6.5	0.33	48.0	1.64	11.3	12.0	34.0	2.5
93	11	16	320	7.6	0.37	45.0	1.45	9.4	14.0	26.0	2.3
93	11	23	327	5.7	0.37	44.0	1.66	11.0	10.0	24.0	2.3
93	12	1	335	.	0.34	40.0	1.39	9.4	6.0	15.0	4.4
93	12	7	341	4.1	0.35	35.0	1.39	10.0	7.0	25.0	1.0
93	12	14	348	3.9	0.36	35.0	1.58	10.8	7.0	24.0	2.1
93	12	22	356	2.9	0.37	37.0	1.54	10.0	6.0	24.0	1.4
93	12	28	363	0.1	0.44	50.0	1.74	11.6	11.0	36.0	0.6



Table 10.--Physical and chemical data for samples collected during 1994 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
94	1	5	5	0.0	0.40	58.9	1.66	10.8	3.2	18.0	2.2
94	1	14	14	0.0	0.44	62.5	1.60	10.9	3.8	21.0	2.7
94	2	1	32	0.0	0.40	63.7	1.54	10.5	1.8	16.0	3.9*
94	2	9	40	0.0	0.60	35.4	1.42	12.1	0.9	14.0	2.2
94	2	16	47	0.0	0.47	26.7	0.86	12.5	1.2	21.0	1.2
94	2	22	53	0.0	0.36	83.2	1.28	10.1	1.0	19.0	4.0*
94	3	1	60	0.0	0.53	77.7	1.32	17.2	1.1	11.0	2.0
94	3	15	74	.	0.57	58.9	0.89	17.5	1.7	18.0	1.7
94	3	22	81	0.0	0.65	71.6	0.72	19.0	1.7	43.0	0.9
94	3	29	88	3.0	0.65	69.2	1.12	17.6	1.9	10.0	3.0
94	4	7	97	3.8	0.44	65.0	0.70	16.6	2.8	27.0	0.8
94	4	13	103	5.0	0.45	31.0	0.67	14.8	1.3	10.0	4.4
94	4	19	109	8.9	0.55	55.9	0.85	14.8	2.5	19.0	1.2
94	4	26	116	11.3	0.52	35.2	0.79	15.8	1.1	12.0	3.5
94	5	3	123	9.9	0.52	28.5	0.54	13.8	1.5	11.0	2.4
94	5	10	130	12.4	1.26	24.3	0.93	14.4	1.9	18.0	2.0
94	5	17	137	12.3	1.03	22.5	0.54	14.4	1.7	29.0	0.9
94	5	24	144	16.3	0.84	22.5	.	.	2.2	14.0	3.3
94	6	1	152	17.6	1.30	37.1	0.33	16.4	1.9	16.7	1.6
94	6	7	158	20.0	1.00	13.4	0.33	15.6	2.1	17.6	3.3
94	6	14	165	20.5	.	.	.	.	.	14.9	2.7
94	6	21	172	24.4	0.70	13.4	.	.	1.3	15.9	3.3
94	6	28	179	21.6	0.60	48.1	.	.	2.3	19.2	4.3
94	7	6	187	23.6	0.70	50.4	.	.	3.7	26.0	3.2
94	7	12	193	24.1	0.60	92.1	1.48	14.1	8.3	26.8	3.0
94	7	19	200	24.9	0.30	30.2	0.47	12.4	1.7	15.6	4.2
94	7	26	207	25.1	0.40	30.2	0.47	12.9	1.9	17.7	4.0
94	8	2	214	25.2	0.30	42.9	0.43	12.1	1.1	17.3	4.4
94	8	9	221	23.3	0.30	67.8	1.25	11.2	5.9	18.1	3.1
94	8	16	228	22.1	0.30	44.1	1.32	11.4	4.7	212.0	4.6
94	8	23	235	22.5	0.20	67.2	1.47	12.4	2.6	19.6	4.1
94	8	30	242	22.9	0.10	70.7	1.60	13.1	2.2	19.2	4.0*
94	9	7	250	21.1	0.20	46.4	1.45	10.8	2.6	20.7	3.1
94	9	13	256	21.0	0.13	16.4	1.07	11.6	1.5	22.4	4.2*
94	9	20	263	21.3	0.16	32.8	1.94	10.7	2.7	15.5	3.8
94	9	27	270	20.2	0.20	43.1	1.83	10.8	4.3	22.4	4.0
94	10	4	277	16.6	0.19	44.3	2.07	12.0	4.2	22.4	2.9*
94	10	11	284	15.0	0.21	35.2	1.94	11.5	7.0	22.4	3.8*
94	10	19	292	14.5	0.18	22.5	0.77	12.0	1.4	13.9	4.1*
94	11	8	312	10.3	0.24	51.6	.	.	5.5	24.0	1.3
94	11	14	318	10.7	0.26	58.7	1.24	12.2	6.2	10.7	2.1
94	11	24	328	7.0	0.35	34.2	1.62	10.6	4.8	19.1	0.5
94	12	8	342	5.1	0.31	39.3	.	.	7.0	14.7	1.1
94	12	14	348	3.9	0.39	46.8	.	.	7.2	11.6	1.4
94	12	21	355	3.8	0.42	57.5	.	.	7.2	11.4	1.0

\* Secchi disc on bottom

Table 11.--Physical and chemical data for samples collected during 1995 in Hatchery Bay, western Lake Erie.

Year	Month	Day	Julian Day	Temp (°C)	Nitrate (mgN/L)	Ammon (µgN/L)	Silica (mgSiO <sub>2</sub> /L)	Chloride (mgCl/L)	SRP (µgP/L)	Total P (µgP/L)	Secchi (M)
95	1	4	4	1.1	0.45	68.1	1.88	12.1	8.0	17.9	0.7
95	1	11	11	1.7	0.46	63.1	1.96	12.2	15.0	12.1	2.7
95	1	18	18	1.5	0.42	70.0	1.71	10.8	5.0	11.4	4.0
95	1	25	25	1.0	0.46	65.6	1.71	11.7	6.6	10.0	2.8
95	2	1	32	2.1	0.58	71.3	1.79	14.5	6.6	9.3	3.0
95	2	8	39	1.4	0.69	70.6	1.82	15.1	6.4	8.1	3.0
95	2	14	45	.	0.56	54.3	1.59	14.1	3.6	7.4	3.0
95	3	1	60	1.4	0.87	19.8	1.05	17.3	1.8	8.6	1.8
95	3	7	66	0.9	0.81	42.4	0.82	16.3	1.2	8.2	2.6
95	3	14	73	2.0	0.71	32.4	0.86	15.3	1.2	5.4	3.1
95	3	21	80	3.9	1.01	31.1	0.55	17.3	1.0	14.0	0.8
95	3	31	90	5.0	1.22	42.4	0.32	18.6	2.4	11.6	1.1
95	4	6	96	5.0	1.14	57.5	0.41	17.9	1.8	15.1	0.6
95	4	12	102	5.6	1.39	40.3	0.68	19.2	1.8	7.7	1.8
95	4	19	109	8.0	0.94	37.0	1.32	15.4	1.8	19.6	0.7
95	4	26	116	9.8	0.92	36.4	1.36	14.8	2.8	12.0	1.5
95	5	3	123	12.0	1.29	38.1	1.32	18.9	5.8	10.9	2.3
95	5	9	129	11.0	1.61	15.8	1.09	17.2	2.2	8.7	2.4
95	5	16	136	15.0	1.27	18.0	1.39	17.3	1.4	14.0	1.5
95	5	30	150	17.6	0.47	20.3	0.65	13.3	1.2	10.5	2.2
95	6	6	157	20.4	0.96	12.4	0.46	15.3	1.4	6.8	4.9
95	6	13	164	20.4	0.63	16.4	0.52	14.0	1.1	6.1	4.2
95	6	20	171	25.0	0.65	15.8	0.76	14.8	1.3	10.4	3.3
95	6	27	178	24.0	0.37	15.2	0.96	13.4	0.7	13.8	3.8*
95	7	5	186	23.5	0.69	27.0	1.29	14.0	3.7	10.0	2.6
95	7	11	192	27.0	0.50	18.2	0.86	14.7	5.9	16.1	3.5
95	7	18	199	25.0	0.51	58.0	0.78	14.0	9.3	21.6	1.7
95	7	25	206	26.0	0.45	23.1	1.42	14.6	6.4	22.3	4.1
95	8	1	213	26.0	0.38	39.7	1.18	14.9	3.8	18.8	4.1
95	8	8	220	25.0	0.38	84.5	0.98	14.1	7.4	25.7	5.1
95	8	15	227	27.5	0.27	49.7	0.72	11.9	4.3	18.0	4.8
95	8	22	234	26.0	0.33	53.8	0.91	12.6	5.4	24.4	2.7
95	9	1	244	25.0	0.26	42.2	1.78	11.9	7.1	32.9	2.0
95	9	12	255	14.5	0.14	18.2	2.58	13.5	10.1	62.6	1.6

\* Secchi disc on bottom