1999-2000

BEAR LAKE MONITORING DATA SUMMARY

Prepared for:

BEAR LAKE REGIONAL COMMISSION
Fish Haven, Idaho

Prepared by:

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Logan, Utah

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INTRODUCTION

Water quality conditions were monitored in a single mid-lake station on Bear Lake during 1999-2000. The purpose of the Bear Lake monitoring program has been to:

1) Evaluate current water quality conditions in Bear Lake; and

2) Maintain the current water quality database.

Data was collected from the middle station of Bear Lake on 12 dates between July 13, 1999 and June 26, 2000. A map designating the sample location as well as long-term water quality plots are included in Appendix A. Raw data are presented in Appendix B. The following is a summary of the Bear Lake data.

BEAR LAKE WATER QUALITY

Bear Lake was sampled from July 1999 to June 2000. Water samples were collected twice in April, May and June with other months being sampled once. Samples were taken from the middle station (approximately 60 meter depth) at ten meter intervals.

Surface and bottom total phosphorus (TP) concentrations demonstrated similar seasonal patterns as those observed in 1998-1999 (Figure 1). During the 1999 and 2000 sampling period, the average surface total phosphorus concentrations in Bear Lake ranged from 2 to 16 µg/liter having the lowest concentrations (2-3 µg/liter in September 1999 and May-June 2000 with the highest concentrations (16 µg/liter) in November. As in 1998-99 the winter TP levels tended to be elevated above 10 µg/liter while spring and summer levels were near 2-5 µg/liter. The overall pattern was similar to the data observed since 1997.

Surface and bottom orthophosphorous (OP) concentrations were also similar during the 1999-200 monitoring program (Figure 1). There were at times higher concentration of orthophosphate in the hypolimnion of Bear Lake (1-2 µg/liter above epilimnetic levels but the pattern was not as consistent as the data from 1998-99. The elevated levels in the hypolimnion in this monitoring year tended to be during the fall turnover period. Peak concentrations were found on September 27, 1999 (8 µg/liter) and corresponded to concurrent elevated levels of total phosphorous.

Surface total inorganic nitrogen (TIN) concentrations exhibited the most dramatic change of any parameter monitored since the spring of 1997 (Figure 2). The surface and bottom concentrations for these two parameters were almost identical prior to May 1997 when the spring runoff period flushed large quantities of total inorganic nitrogen (NH3+NO3+NO2) into Bear Lake from the Bear Lake marsh. During 1999 and 2000, the TIN levels were also elevated above the pre May 1997 concentrations. Nitrate and ammonia made up the vast majority of the TIN concentrations and therefore, their combined seasonal patterns are reflected in Figure 2. Nitrate nitrogen had a bimodal peak with low concentrations in the summer of 1999 peaking in October at 183 µg/liter and again in April at 240 µg/liter. From late April 2000 until June 2000 the nitrate levels steadily decreased until concentrations were at detection by July. Ammonia was near detection on almost all sample dates except for an increase in January and May 2000 of over 100 µg/liter.

Water transparency, as measured with a secchi disk, ranged from 8.35 meters on June 26, 2000 to a minimum of 2.76 meters in January 2000 (Figure 3). During the summer, fall and winter of 1999 and the spring of 2000, the secchi disk had transparencies greater than 5 meters 70 percent of the time. As in 1998-99 this represented a major decrease from the best year to date (1998) relative to water transparency. This is consistent with the chlorophyll-*a* concentrations which also showed an increase in phytoplankton density in 1999-2000 (Figure 3).

Surface and bottom pH levels were similar to the previous monitoring years (1994-1998), ranging from a low of 8.07 to a high of 8.54 pH units (Figure 4). It is interesting to note that since August 1996 (pH of 8.8), there has seldom been surface pH levels above 8.5. In this monitoring year that pattern remained with only one date above 8.5 The hypolimnetic pH levels demonstrated a steady decline during stratification which corresponded to the increase in ortho phosphate.

As noted last year, the 1995-97 trend toward decreasing hypolimnetic temperatures was abated in 1998-1999. Summer bottom temperatures did not exceed 5°C compared to maximum summer temperatures of 6.0°C in 1996 and 8.0°C in 1995. In 1999, the temperatures in the hypolimnion were again above 5°C (Figure 5). In the summer of 1999, the surface temperatures were also elevated above 20°C. In the summer of 2000, Bear lakes temperatures were similar those observed between 1997 and 1998, which had cooler lake temperatures.

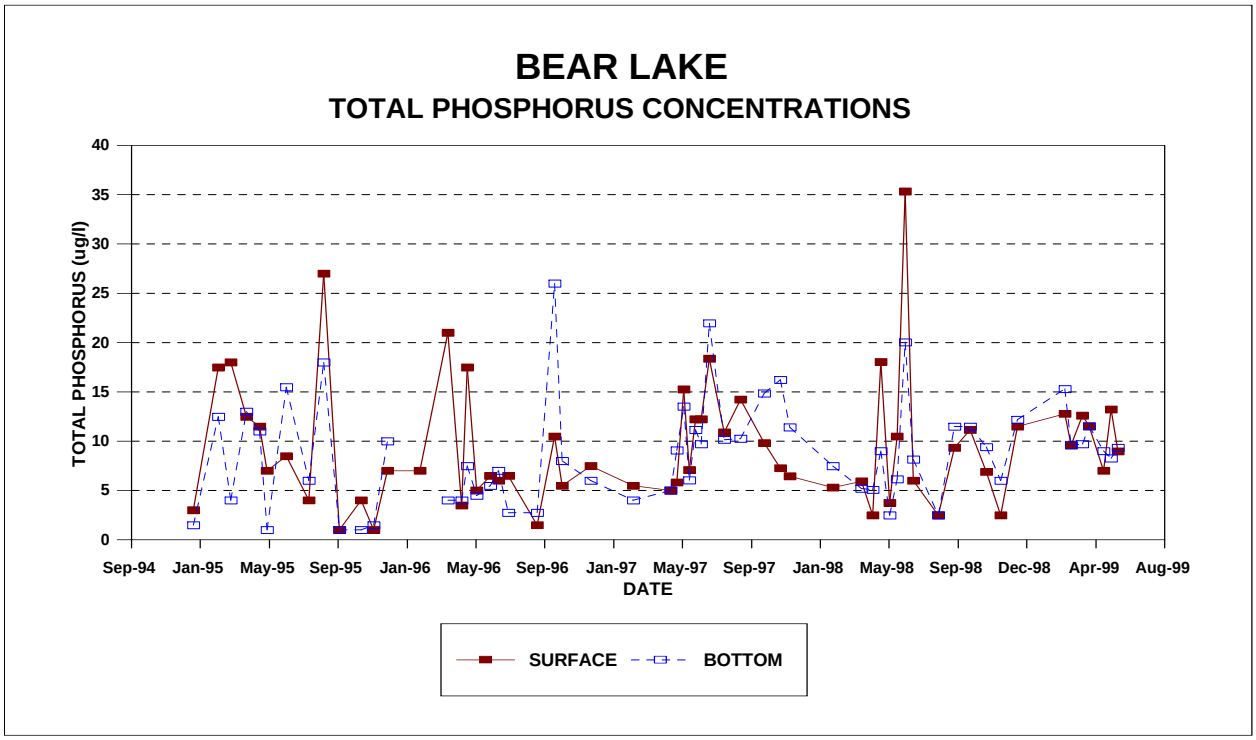
The summer hypolimnetic dissolved oxygen concentrations (Figure 5), which had shown a decreased to a low of 5.9 mg/liter in 1998 improved in both the summer of 1999 and 2000. The summer of 1997 was the best summer on record relative to dissolved oxygen concentrations, (DO levels fell to only 6.9 mg/liter) was surpassed by the summer of 2000. The hypolimnetic dissolved oxygen concentrations fell to only 7.93.

SUMMARY

Plots of the long-term seasonal water quality data and a map of the long-term monitoring location are presented in Appendix A. Tables of raw data for Bear Lake are included in Appendix B.

Recent annual reports have indicated a decreasing trend of both orthophosphate and total phosphorus concentrations. During 1999-2000, total phosphorus has shown a slight reversal in that trend, leveling off at 10 µg/liter and further decreasing to 5 µg/liter . Orthophosphate continued to remain stable at about 4 µg/liter with a few exceptions. Total inorganic nitrogen had major increases in concentrations during the spring and summer of 1999-2000 which was a dontinuation of the observations noted since March 1997. Concentrations were reduced to the detection levels by the late summer of 2000. It is believed that the observed increases have been the result of inputs from the Bear Lake watershed, Bear River, and the continued export of nitrogen from the Bear Lake marsh. Algal biomass were at their highest levels since the early 1980s.

The system is currently calculated to be phosphorus limited 95 % of the time.



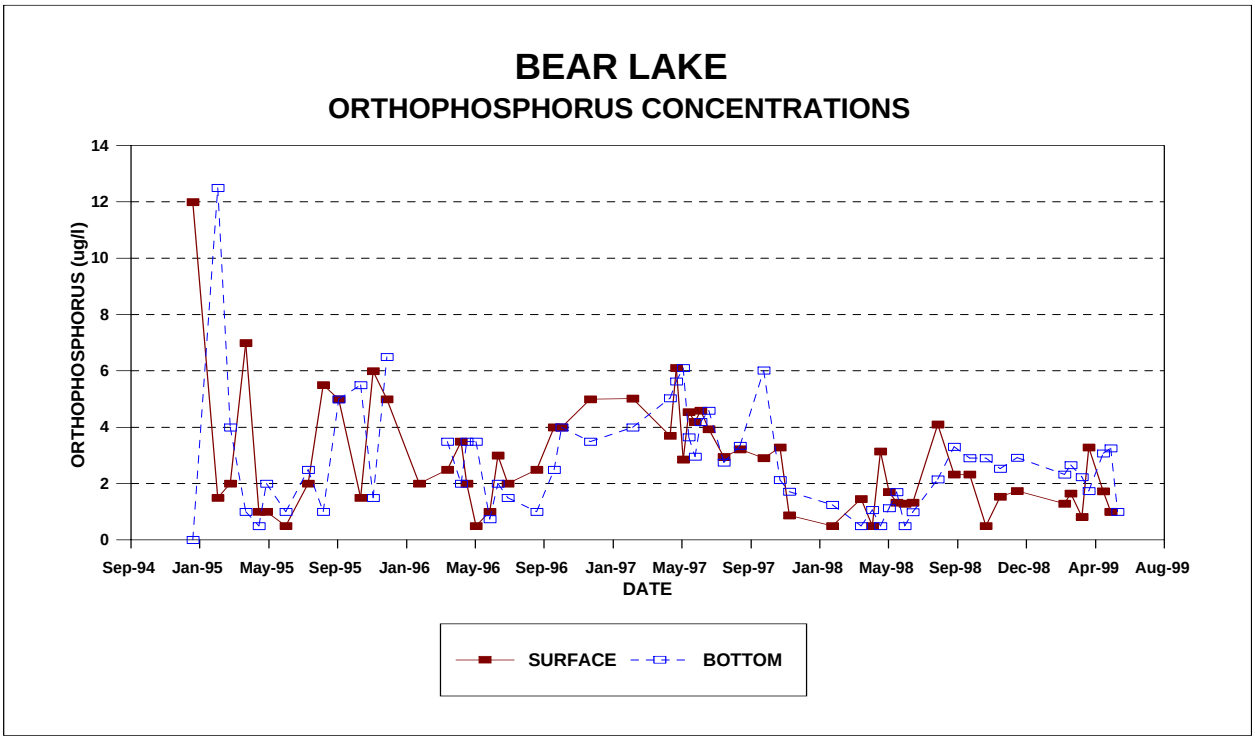


Figure 1. The concentration of total phosphorus (above) and orthophosphorus (below) in the surface and bottom waters of Bear Lake since 1994.

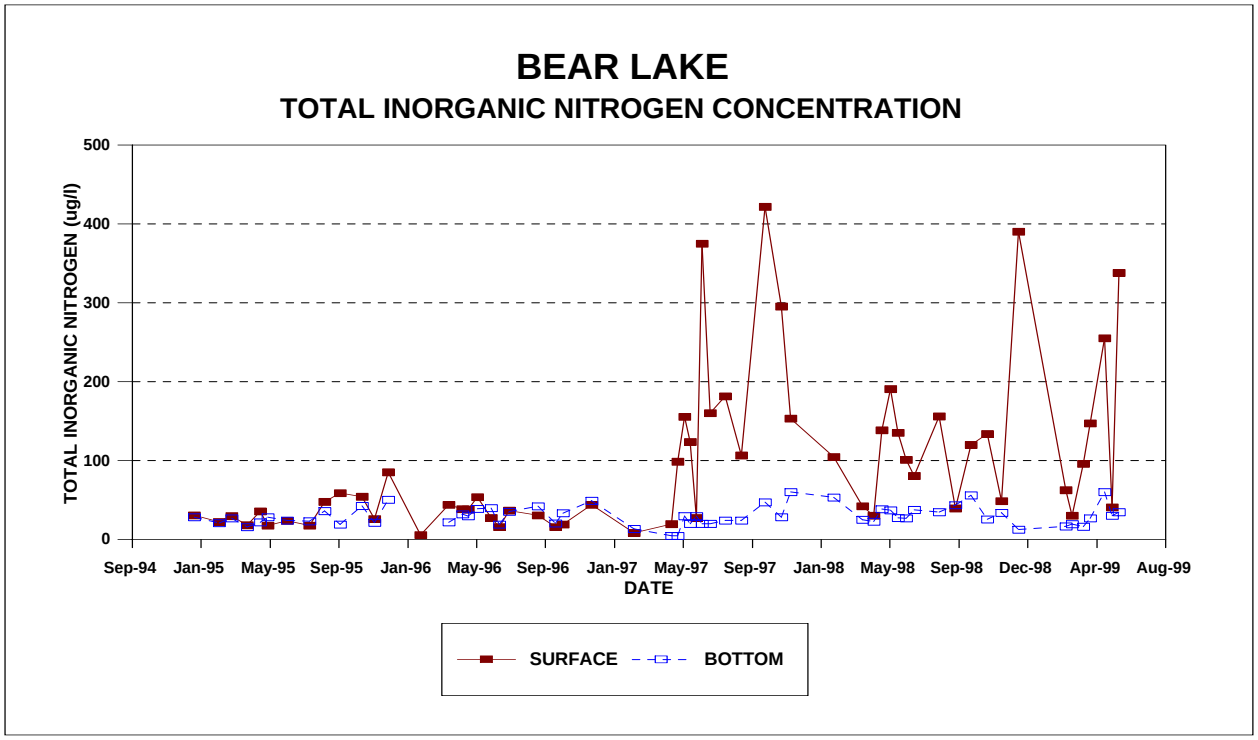
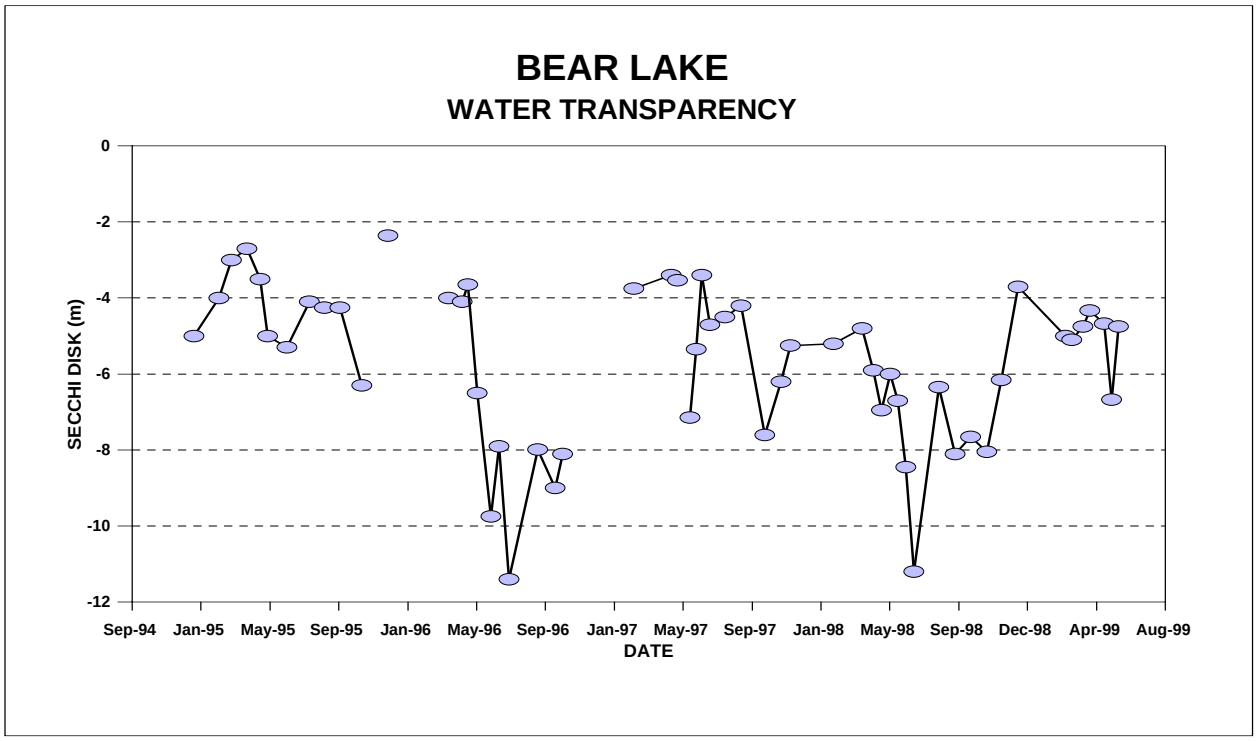


Figure 2. The concentration of total inorganic nitrogen in the surface and bottom waters of Bear Lake since 1994.



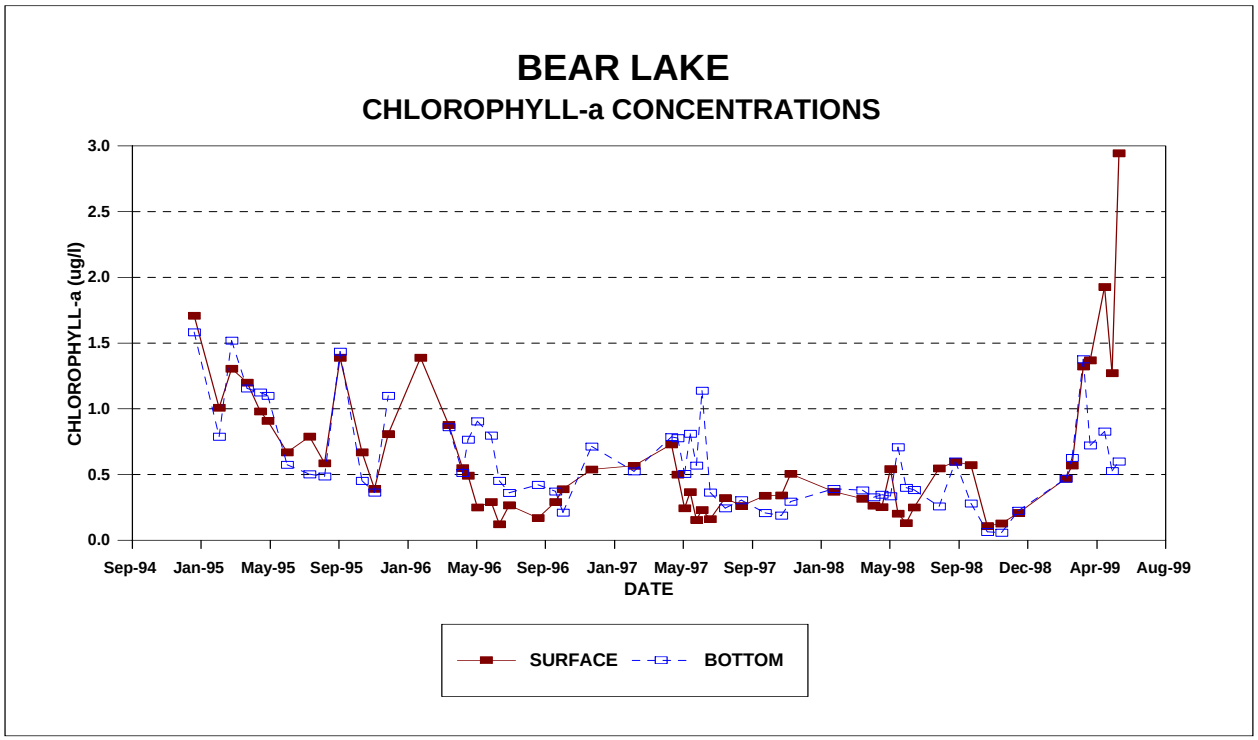


Figure 3. The secchi disk transparency (above) and chlorophyll-a concentrations (below) in the surface and bottom waters of Bear Lake since 1994.

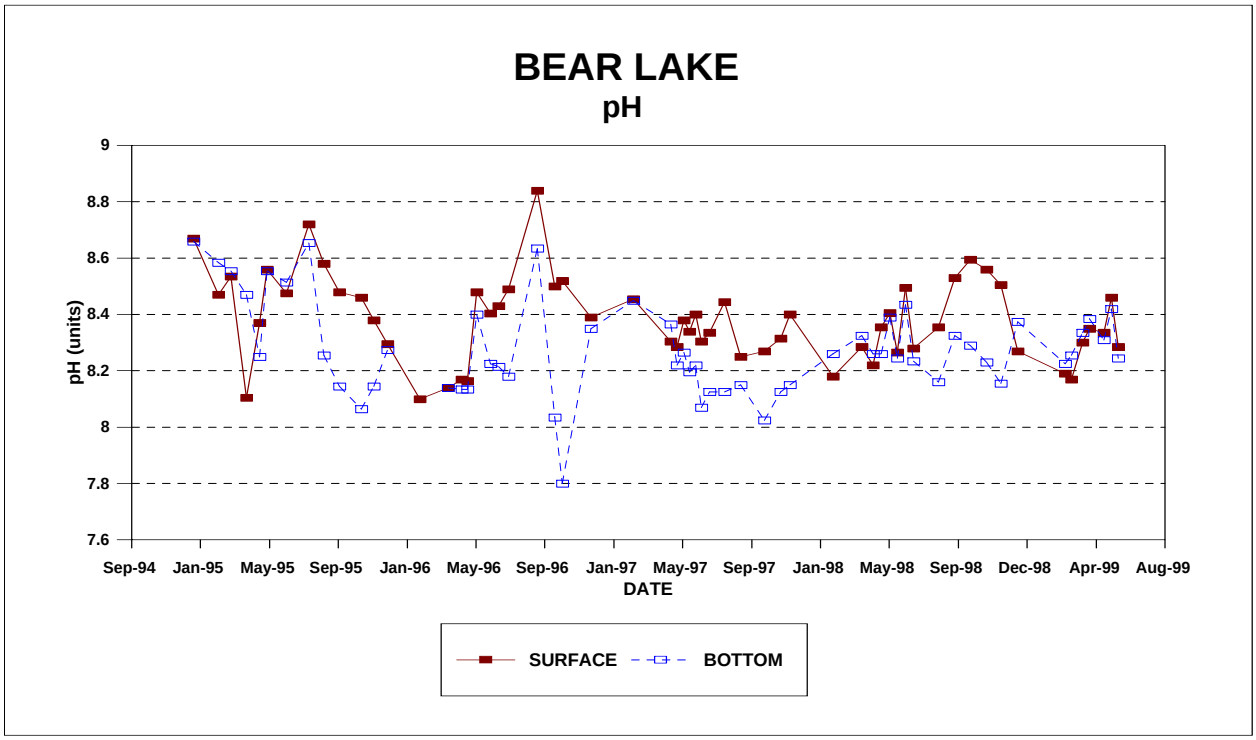
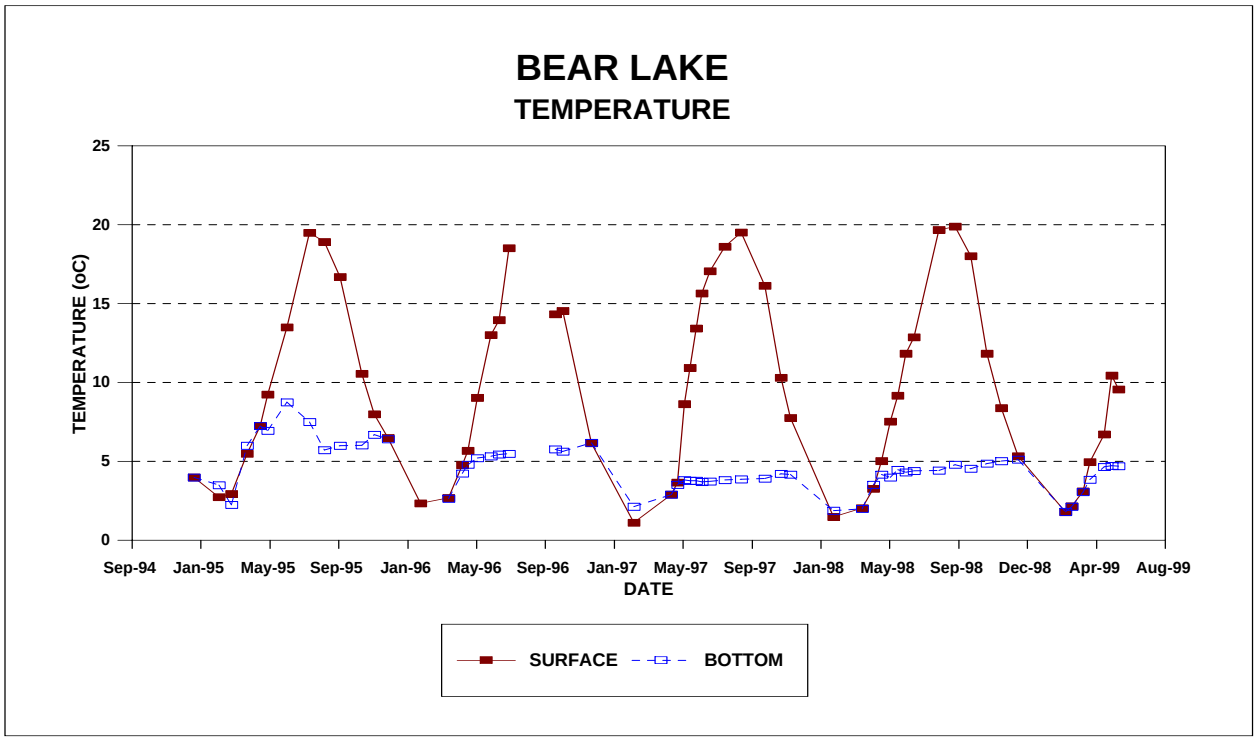


Figure 4. pH in the surface and bottom waters of Bear Lake since 1994.



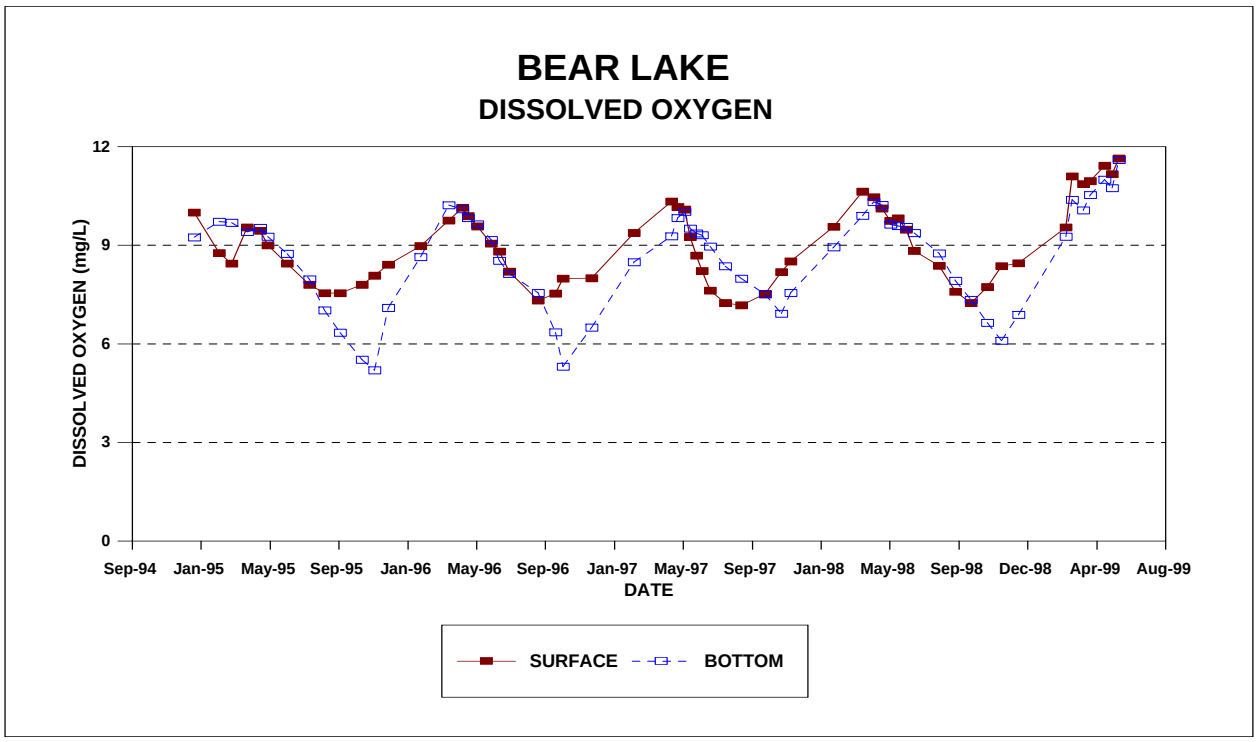


Figure 5. Temperature (above) and dissolved oxygen concentrations (below) in the surface and bottom waters of Bear Lake since 1994.

RECOMMENDATIONS

1. The Bear Lake monitoring program appears to be sensitive in its ability to detect changes in the physical and chemical water quality conditions in Bear Lake and should be continued. Sampling of the marsh sites (Causeway, Lifton, Stewart Dam and the Outlet) was discontinued in July 1998. Additional funding should be found in order that this program can monitor both the lake and marsh sample sites. Annual nutrient loading for Bear lake needs to be determined. (See 4 below)

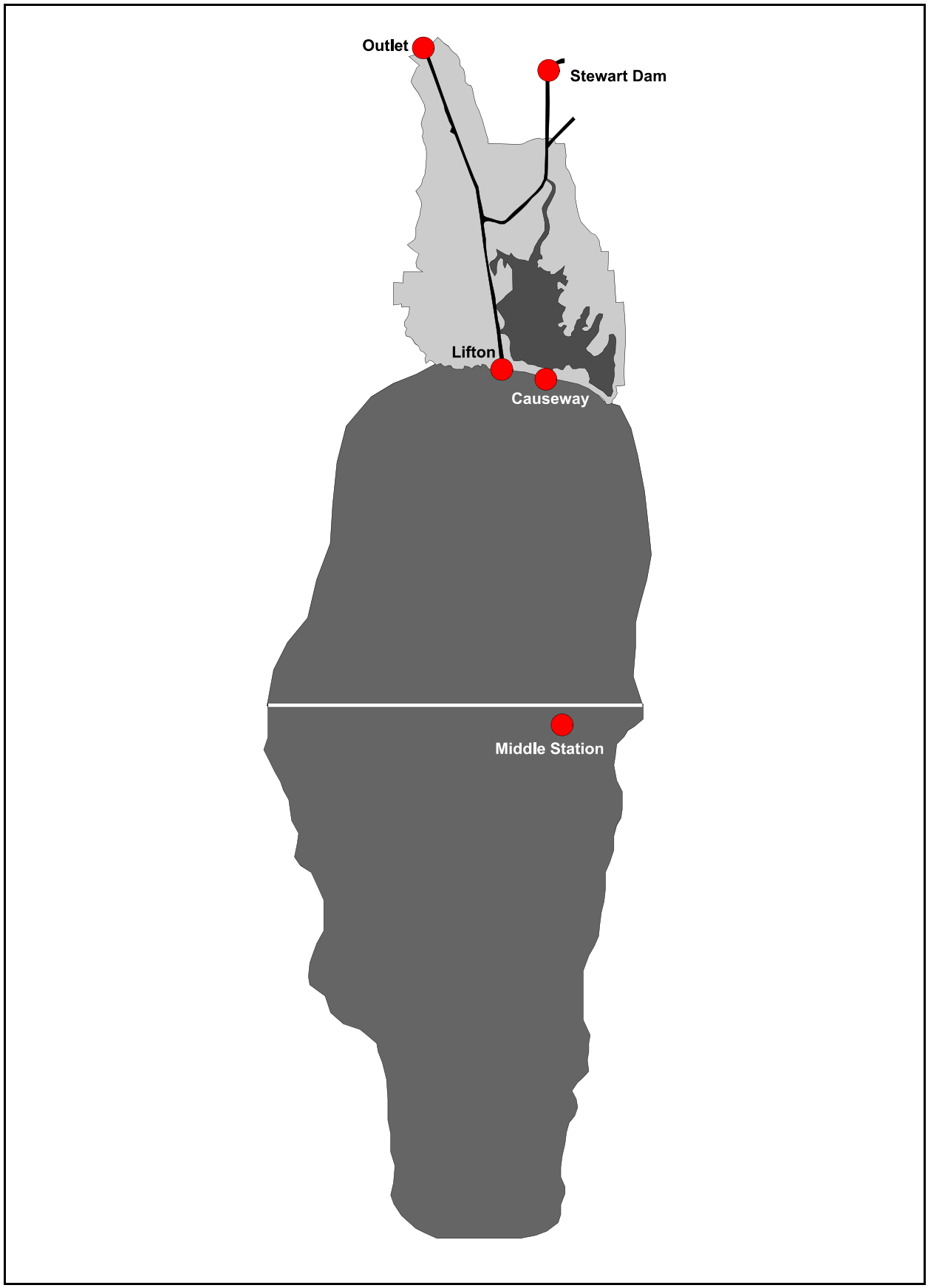
2. During 1997, 1998 and 1999 a large pulse of nitrogen entered Bear Lake. This nutrient input is stimulating the primary producers (algae) in the system. Because orthophosphate continues to decline in the lake, the physical precipitation process appears to be a dominate mechanism in effecting algal growth. Research is needed to define the relationship between Bear River inflowing water including sediments, calcium and phosphorus and Bear Lake. It is recommended that the Bear Lake Regional Commission support finding funding for research in this area. In addition, the response of the other trophic levels (Zooplankton and fish should be investigated to determine the impacts to these organisms (both positive and/or negative)

3. A relationship appears to exist between summer hypolimnetic temperature, dissolved oxygen, lake volume (elevation) and Bear River inflow. Further effort should be undertaken to define these relationships and determine the mechanism for the dissolved oxygen losses in the lake.

4. During the technical exchange at Bear Lake in the spring of 1998, it was suggested that a detailed hydrologic budget be conducted on the lake. It is recommended that the Bear Lake Regional Commission take the lead on this task and link a nutrient budget to this effort. A detailed nutrient budget is needed for the lake. The information exchange proposed for March 2000 may be a good place to start that process.

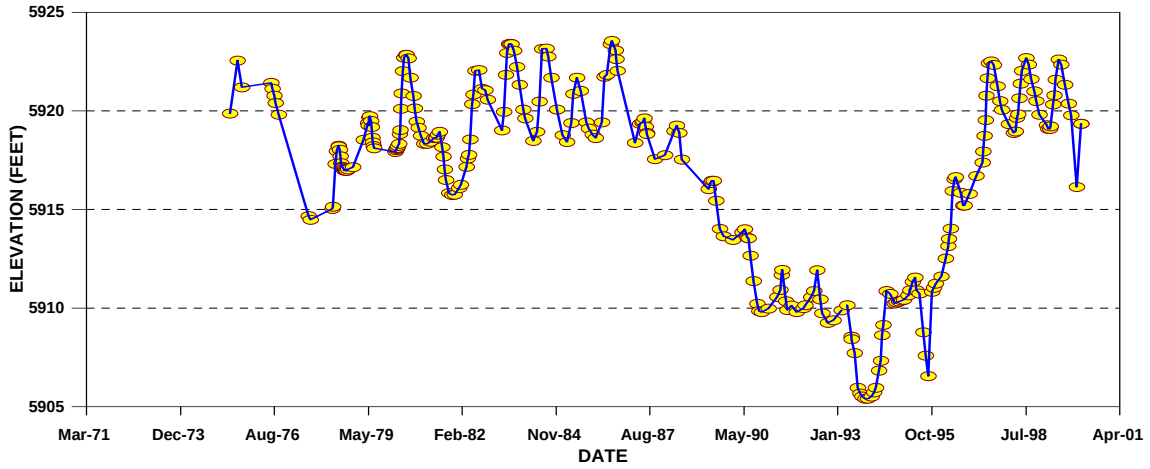
APPENDIX A

Graphs of Long-term Water Quality Data Monitoring Locations

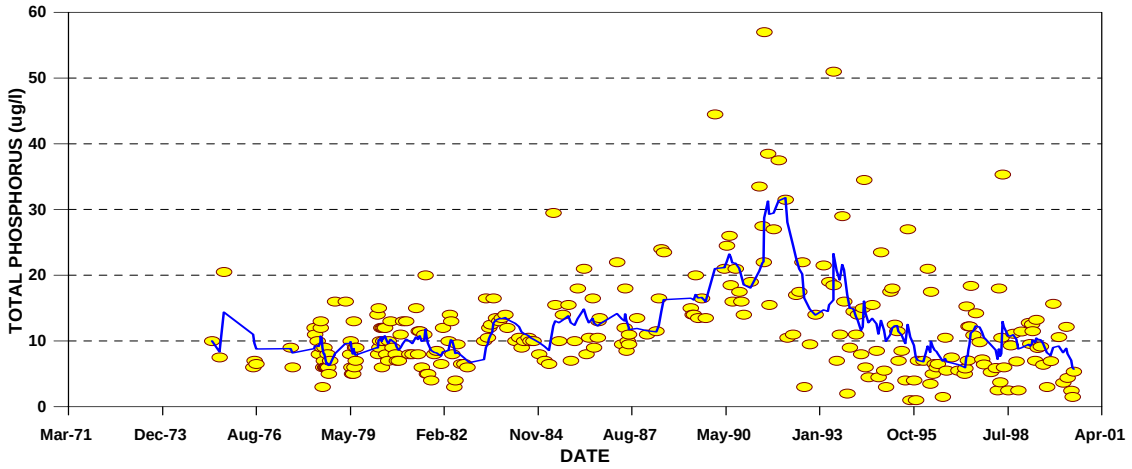

Outlet
Stewart Dam
Lifton
Causeway
Middle Station

BEAR LAKE

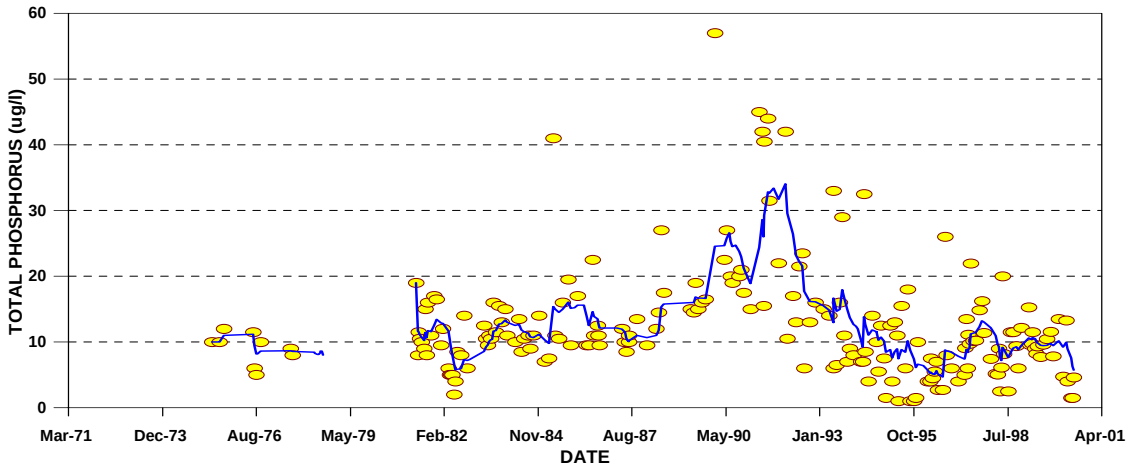
SURFACE ELEVATIONS



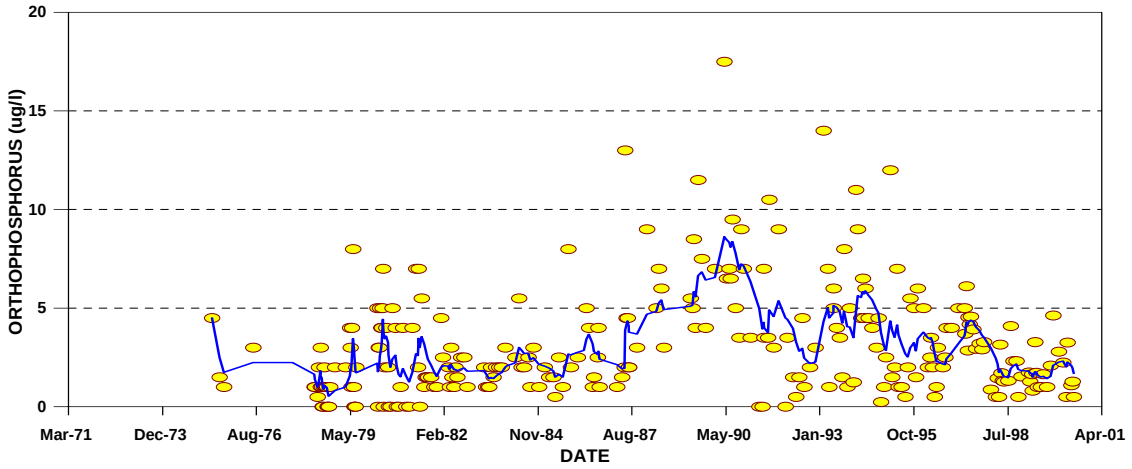
AVERAGE SURFACE CONCENTRATION
TOTAL PHOSPHORUS



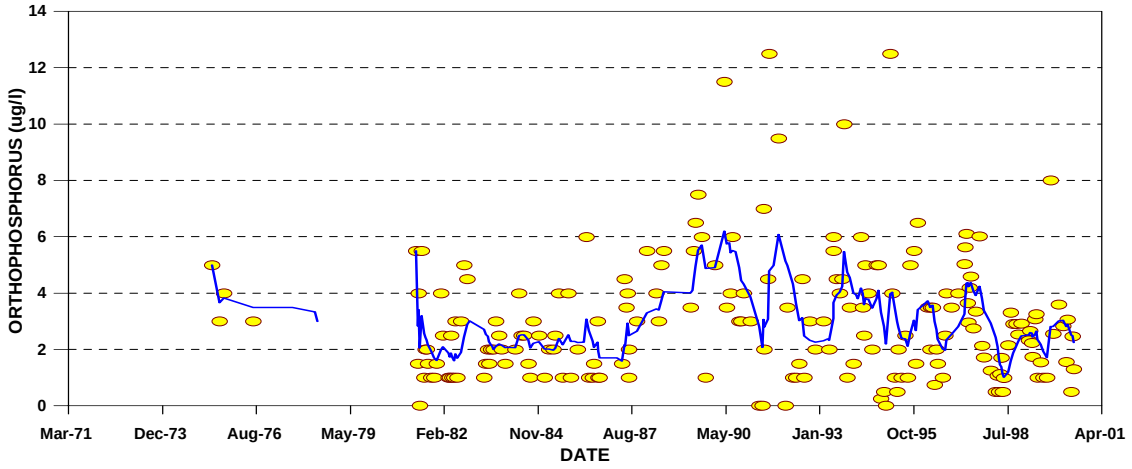
AVERAGE BOTTOM CONCENTRATION
TOTAL PHOSPHORUS



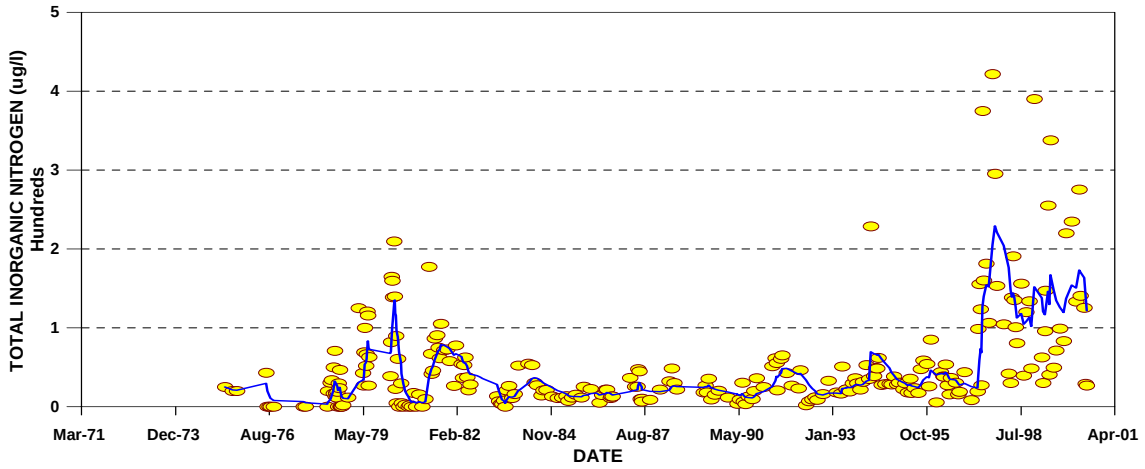
AVERAGE SURFACE CONCENTRATION
ORTHOPHOSPHORUS



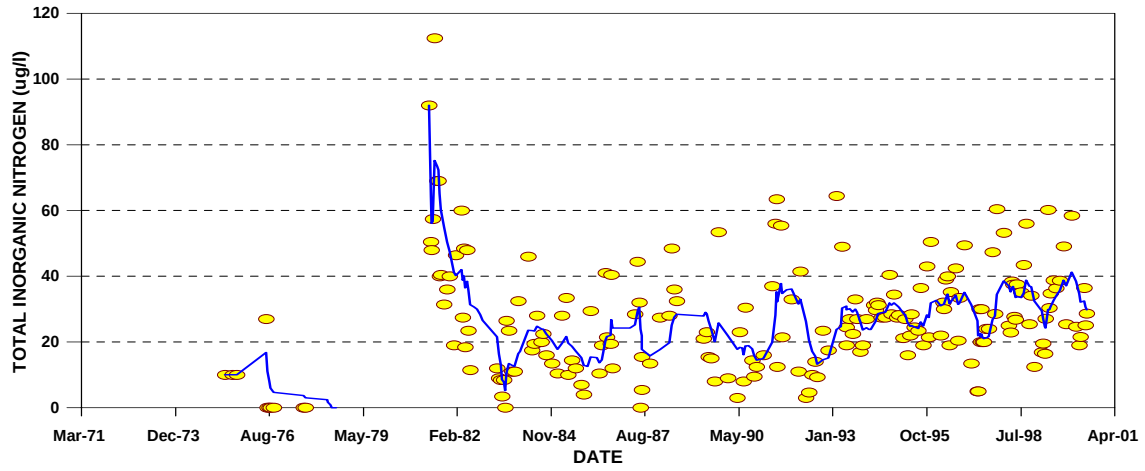
AVERAGE BOTTOM CONCENTRATION
ORTHOPHOSPHORUS



AVERAGE SURFACE CONCENTRATION
TOTAL INORGANIC NITROGEN

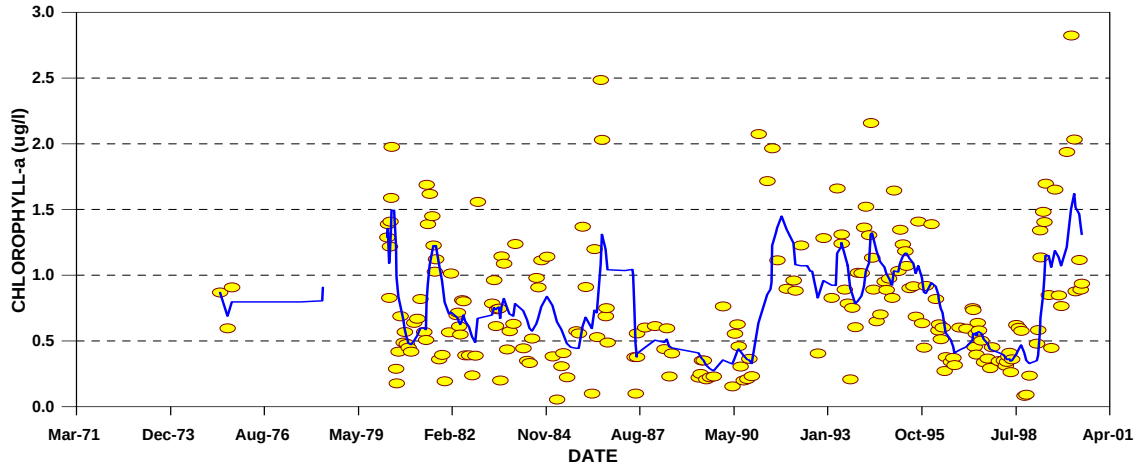


AVERAGE BOTTOM CONCENTRATION
TOTAL INORGANIC NITROGEN



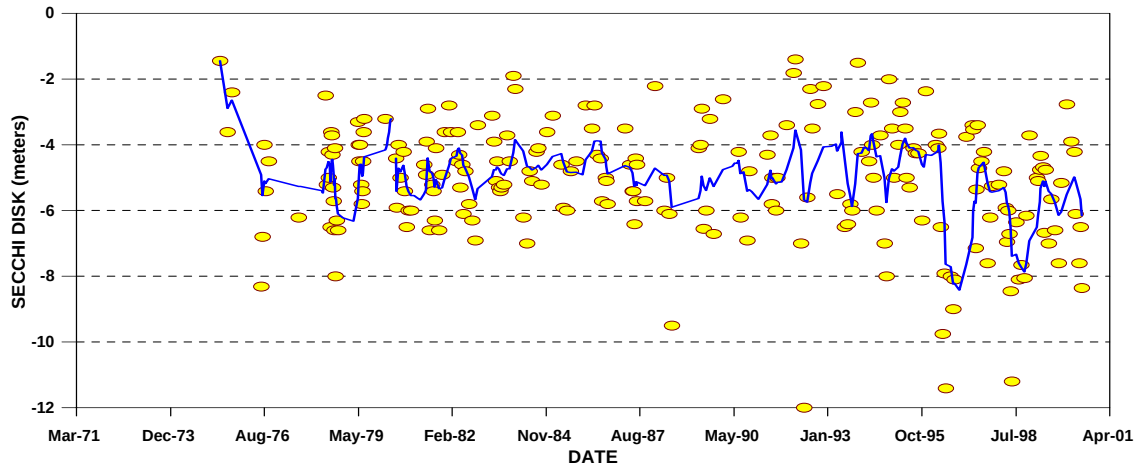
AVERAGE CONCENTRATIONS

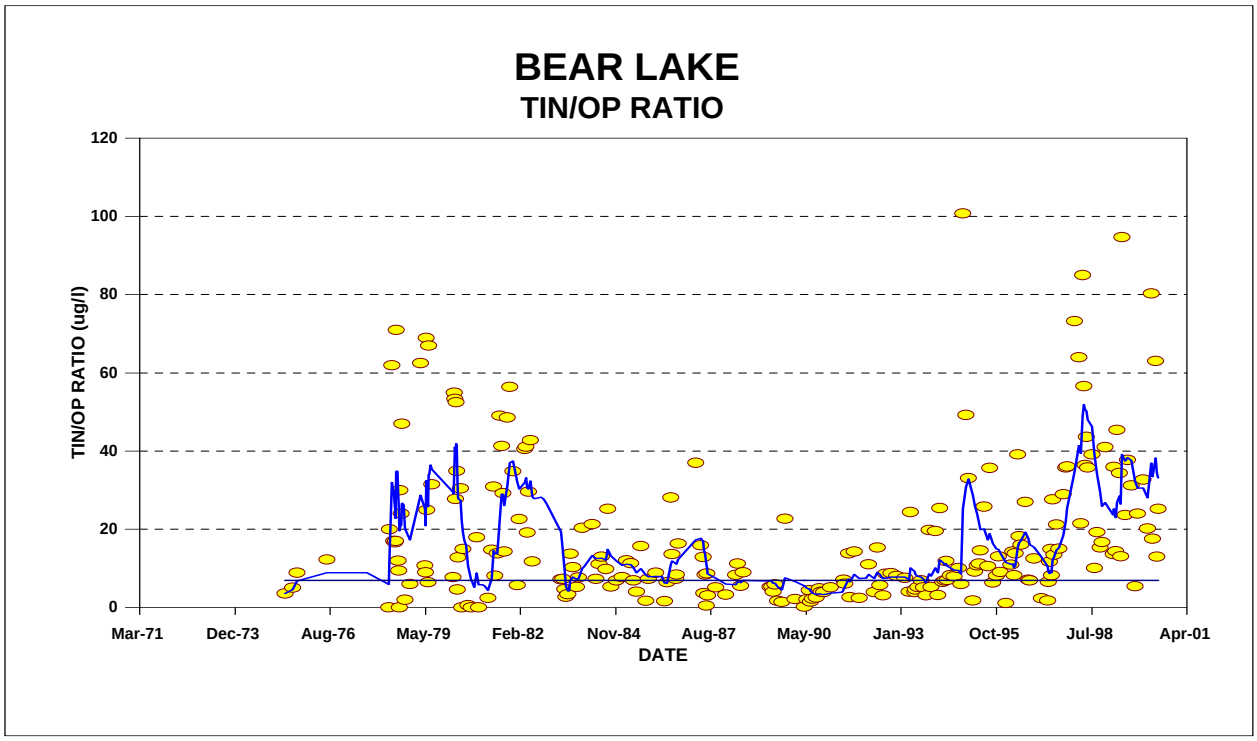
CHLOROPHYLL-a



AVERAGE WATER TRANSPARENCY

SECCHI DISK




BEAR LAKE
TIN/OP RATIO
TIN/OP RATIO (ug/l)
120
100
80
60
40
20
0
Mar-71
Dec-73
Aug-76
May-79
Feb-82
Nov-84
Aug-87
May-90
Jan-93
Oct-95
Jul-98
Apr-01
DATE

APPENDIX B

Raw Data

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
Dissolved Oxygen (mg/liter)											
07/13/99	7.56	8.07	9.51	8.46	8.45	8.25	7.54	7.82	8.99	8.35	8.26
08/09/99	6.97	7.05	9.3	8.23	7.94	7.74	6.74	7.01	8.77	7.84	7.71
09/15/99	7.17	7.32	8.58	6.85	6.65	6.61	5.87	7.25	7.72	6.63	7.01
10/27/99	8.12	8.46	8.38	8.15	8.13	8.13	8.05	8.29	8.27	8.13	8.20
11/23/99	8.47	8.31	8.29	8.1	6.7	4.9	4.45	8.39	8.20	5.80	7.03
01/19/00	10.04	9.86	9.71	9.58	9.42	9.47	9.28	9.95	9.65	9.45	9.62
03/06/00	10.33	10.18	9.96	10.06	9.88	9.95	9.51	10.26	10.01	9.92	9.98
04/12/00	10.33	10.09	10.02	9.82	10.02	9.95	9.46	10.21	9.92	9.99	9.96
04/24/00	10.3	10.33	10.34	10.21	10.18	9.98	9.42	10.32	10.28	10.08	10.11
05/30/00	8.31	8.33	9.49	8.78	8.79	8.66	8.09	8.32	9.14	8.73	8.64
06/14/00	7.94	7.91	9.37	8.78	8.56	8.57	8.05	7.93	9.08	8.57	8.45
06/26/00	7.67	7.83	9.81	9.56	8.64	8.25	6.35	7.75	9.69	8.45	8.30
Temperature (°C)											
07/13/99	19.77	16.92	9.64	6.36	5.41	4.99	4.92	18.35	8.00	5.20	9.72
08/09/99	21.79	20.64	9.45	6.17	5.31	4.98	4.95	21.22	7.81	5.15	10.47
09/15/99	18.35	17.59	9.37	6.5	5.22	5.1	5.06	17.97	7.94	5.16	9.60
10/27/99	11.7	11.57	10.05	6.13	5.63	5.31	5.22	11.64	8.09	5.47	7.94
11/23/99	8.26	8.01	7.97	7.92	6.72	5.5	5.37	8.14	7.95	6.11	7.11
01/19/00	3.08	3.04	3.06	3.06	3.11	3.15	3.29	3.06	3.06	3.13	3.11
03/06/00	2.71	2.64	2.63	2.63	2.62	2.63	2.68	2.68	2.63	2.63	2.65
04/12/00	5.93	5.3	4.55	4.17	3.95	3.87	3.91	5.62	4.36	3.91	4.53
04/24/00	6.52	5.52	5.18	4.35	4.05	3.93	3.93	6.02	4.77	3.99	4.78
05/30/00	14.11	12.72	8.88	5.44	4.74	4.54	4.44	13.42	7.16	4.64	7.84
06/14/00	16.17	14.99	8.74	5.51	4.68	4.52	4.59	15.58	7.13	4.60	8.46
06/26/00	18.3	16.45	7.85	5.79	4.72	4.46	4.41	17.38	6.82	4.59	8.85
pH (SU)											
07/13/99	8.38	8.39	8.33	8.21	8.14	8.11	8.08	8.39	8.27	8.13	8.23
08/09/99	8.39	8.33	8.33	8.21	8.19	8.18	8.15	8.36	8.27	8.19	8.25
09/15/99	8.4	8.39	8.29	8.17	8.15	8.14	8.1	8.40	8.23	8.15	8.23
10/27/99	8.43	8.46	8.38	8.15	8.13	8.13	8.05	8.45	8.27	8.13	8.25
11/23/99	8.07	8.11	8.13	8.14	8.01	7.83	7.79	8.09	8.14	7.92	8.01
01/19/00	8.51	8.49	8.48	8.49	8.49	8.49	8.48	8.50	8.49	8.49	8.49
03/06/00	8.14	8.26	8.32	8.35	8.38	8.42	8.42	8.20	8.34	8.40	8.33
04/12/00	8.27	8.27	8.26	8.25	8.24	8.24	8.22	8.27	8.26	8.24	8.25
04/24/00	8.22	8.23	8.22	8.22	8.22	8.21	8.19	8.23	8.22	8.22	8.22
05/30/00	8.34	8.41	8.43	8.39	8.37	8.37	8.37	8.38	8.41	8.37	8.38
06/14/00	8.47	8.52	8.51	8.44	8.41	8.41	8.39	8.50	8.48	8.41	8.45
06/26/00	8.54	8.56	8.54	8.49	8.43	8.41	8.37	8.55	8.52	8.42	8.48

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
Conductivity (umho/cm)											
07/13/99	689	684	676	678	679	697	681	686.50	677.00	688.00	683.43
08/09/99	704	704	695	695	696	696	699	704.00	695.00	696.00	698.43
09/15/99	693	692	690	692	691	691	693	692.50	691.00	691.00	691.71
10/27/99	685	687	690	693	690	691	694	686.00	691.50	690.50	690.00
11/23/99	695	694	695	697	699	703	703	694.50	696.00	701.00	698.00
01/19/00	686	684	685	686	686	686	687	685.00	685.50	686.00	685.71
03/06/00	675	676	678	678	678	677	677	675.50	678.00	677.50	677.00
04/12/00	697	694	694	695	695	695	695	695.50	694.50	695.00	695.00
04/24/00	692	693	692	692	690	692	692	692.50	692.00	691.00	691.86
05/30/00	714	709	705	706	703	703	703	711.50	705.50	703.00	706.14
06/14/00	711	712	703	702	700	699	700	711.50	702.50	699.50	703.86
06/26/00	732	729	717	717	714	715	717	730.50	717.00	714.50	720.14
Secchi disk transparency (meters)											
07/13/99	-7										
08/09/99	-5.65										
09/15/99	-6.6										
10/27/99	-7.6										
11/23/99	-5.15										
01/19/00	-2.76										
03/06/00	-3.9										
04/12/00	-4.2										
04/24/00	-6.1										
05/30/00	-7.6										
06/14/00	-6.5										
06/26/00	-8.35										
Turbidity (ntu)											
07/13/99	0.63	0.8	0.76	0.87	0.81	0.6	2.3	0.72	0.82	0.71	0.97
08/09/99	0.81	1	0.82	0.71	0.79	1.4	2.5	0.91	0.77	1.10	1.15
09/15/99	0.67		0.8	0.8	1.2	1.4	2.4	0.67	0.80	1.30	1.21
10/27/99	0.73	0.7	0.8	2.1	2.5	3.6	19	0.72	1.45	3.05	4.20
11/23/99	3.1	0.85	0.9	0.85	0.9	1	6.5	1.98	0.88	0.95	2.01
01/19/00	2.1	1.7	1.9	1.9	1.8	2.3	6.4	1.90	1.90	2.05	2.59
03/06/00	1.5	1.4	1.4	1.4	1.6	1.7	3.4	1.45	1.40	1.65	1.77
04/12/00	0.8	1.3	1.4	1.2	1.4	1.7	6	1.05	1.30	1.55	1.97
04/24/00	0.75	0.85	0.8	0.95	0.85	1.8	3.4	0.80	0.88	1.33	1.34
05/30/00	0.53	0.6	0.75	1.3	1.4	1.8	5.9	0.57	1.03	1.60	1.75
06/14/00	1.1	1	1	1.3	1.5	1.1	6.6	1.05	1.15	1.30	1.94
06/26/00	0.6	0.7	1	1.1	1.3	1.5	33	0.65	1.05	1.40	5.60

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
Ammonia (µg/liter)											
07/13/99	20.0	20.0	20.0	20.0	20.0	20.0	41.8	20.0	20.0	20.0	23.1
08/09/99	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
09/15/99	65.8	20.0	20.0	20.0	20.0	20.0	20.0	42.9	20.0	20.0	26.5
10/27/99	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
11/23/99	51.0	20.0	20.0	95.5	20.0	20.0	20.0	35.5	57.8	20.0	35.2
01/19/00	48.5	222.9	50.4	20.0	50.4	50.4	206.1	135.7	35.2	50.4	92.7
03/06/00	52.3	20.0	20.0	20.0	20.0	20.0	20.0	36.2	20.0	20.0	24.6
04/12/00	39.0	30.7	15.0	15.0	15.0	15.0	15.0	34.9	15.0	15.0	20.7
04/24/00	37.0	41.4	15.0	15.0	15.0	15.0	15.0	39.2	15.0	15.0	21.9
05/30/00	112.1	73.0	99.7	45.7	32.2	15.0	15.0	92.6	72.7	23.6	56.1
06/14/00	15.0	31.2	15.0	15.0	15.0	15.0	15.0	23.1	15.0	15.0	17.3
06/26/00	35.0	15.0	15.0	52.3	15.0	15.0	31.0	25.0	33.6	15.0	25.5
Nitrate (µg/liter)											
07/13/99	36.4	21.7	5.3	7.9	13.8	22.2	32.8	29.1	6.6	18.0	20.0
08/09/99	99.4	2.4	2.4	2.4	5.8	25.3	31.8	50.9	2.4	15.5	24.2
09/15/99	100.0	10.8	1.8	1.7	6.5	28.3	35.3	55.4	1.8	17.4	26.3
10/27/99	123.9	2.9	2.9	2.6	36.1	21.1	46.5	63.4	2.7	28.6	33.7
11/23/99	351.5	14.4	2.3	2.2	2.2	6.9	32.5	182.9	2.2	4.5	58.8
01/19/00	191.6	6.0	6.0	6.0	9.6	6.0	6.0	98.8	6.0	7.8	33.0
03/06/00	186.5	7.0	3.5	3.5	3.7	4.8	4.8	96.8	3.5	4.3	30.6
04/12/00	470.2	8.9	3.2	3.4	3.4	3.4	3.3	239.6	3.3	3.4	70.8
04/24/00	187.1	15.3	4.1	6.0	3.7	8.2	16.2	101.2	5.1	5.9	34.4
05/30/00	51.0	13.2	1.1	0.9	11.6	12.1	12.8	32.1	1.0	11.8	14.7
06/14/00	4.7	6.1	5.3	5.3	8.6	9.7	22.4	5.4	5.3	9.1	8.9
06/26/00	1.6	1.4	1.3	3.7	6.0	20.1	33.7	1.5	2.5	13.0	9.7
Nitrite (µg/liter)											
07/13/99	0.79	0.88	0.71	0.71	0.79	0.71	1.04	0.84	0.71	0.75	0.81
08/09/99	0.56	0.56	0.56	0.64	0.89	0.72	0.72	0.56	0.60	0.80	0.66
09/15/99	1.16	1.16	1.16	1.33	1.33	1.25	1.33	1.16	1.25	1.29	1.25
10/27/99	0.15	0.15	0.15	0.39	0.64	0.55	0.64	0.15	0.27	0.60	0.38
11/23/99	2.36	0.89	0.73	0.81	0.81	1.06	1.22	1.63	0.77	0.93	1.13
01/19/00	0.39	0.15	0.15	0.15	0.15	0.47	0.31	0.27	0.15	0.31	0.25
03/06/00	0.78	0.45	0.53	0.45	0.37	0.45	0.45	0.62	0.49	0.41	0.50
04/12/00	1.48	0.90	0.81	0.65	0.65	0.65	0.73	1.19	0.73	0.65	0.84
04/24/00	0.73	0.65	0.65	0.65	0.65	0.73	0.81	0.69	0.65	0.69	0.69
05/30/00	1.07	1.07	0.90	1.07	1.15	1.07	1.07	1.07	0.98	1.11	1.05
06/14/00	0.74	0.82	0.82	0.82	0.99	0.99	1.07	0.78	0.82	0.99	0.89
06/26/00	0.44	0.61	0.69	0.69	0.86	0.61	0.86	0.52	0.69	0.73	0.68

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
Total phosphorus (µg/liter)											
07/13/99	9.5	8.8	8.8	10.2	7.4	8.1	10.2	9.2	9.5	7.7	9.0
08/09/99	6.8	6.1	9.6	7.5	9.6	9.6	11.8	6.4	8.6	9.6	8.7
09/15/99	3.0	3.0	7.6	7.6	11.2	9.7	8.3	3.0	7.6	10.5	7.2
10/27/99	7.7	6.2	6.2	13.4	10.5	12.6	31.9	6.9	9.8	11.6	12.6
11/23/99	24.6	6.8	6.1	6.8	8.2	7.5	10.3	15.7	6.4	7.8	10.0
01/19/00	11.7	9.6	8.8	9.6	9.6	17.5	17.5	10.6	9.2	13.5	12.0
03/06/00	3.00	4.42	6.58	5.14	5.86	3.69	7.30	3.7	5.9	4.8	5.1
04/12/00	16.2	8.2	9.0	9.7	16.2	10.4	14.0	12.2	9.3	13.3	12.0
04/24/00	4.4	4.4	3.7	5.8	3.7	4.4	6.6	4.4	4.8	4.1	4.7
05/30/00	1.5	3.5	1.5	1.5	1.5	1.5	14.2	2.5	1.5	1.5	3.6
06/14/00	1.5	1.5	1.5	1.5	1.5	1.5	3.2	1.5	1.5	1.5	1.7
06/26/00	5.3	5.3	4.6	3.9	4.6	4.6	14.0	5.3	4.3	4.6	6.1
Orthophosphorus (µg/liter)											
07/13/99	1.0	1.0	2.1	2.1	2.1	1.0	3.7	1.0	2.1	1.6	1.9
08/09/99	1.0	2.3	1.0	1.0	1.0	1.0	1.0	1.7	1.0	1.0	1.2
09/15/99	1.0		1.0	1.0	1.0	1.0	5.4	1.0	1.0	1.0	1.7
10/27/99	2.1	2.1	2.9	4.5	5.6	10.4	41.4	2.1	3.7	8.0	9.9
11/23/99	6.7	2.6	2.9	2.6	2.6	2.6	7.8	4.6	2.8	2.6	4.0
01/19/00	3.0	2.6	2.6	3.0	3.4	3.8	8.5	2.8	2.8	3.6	3.9
03/06/00	2.2	2.2	2.6	2.6	3.0	2.6	3.8	2.2	2.6	2.8	2.8
04/12/00	0.5	0.5	1.2	1.6	2.0	1.2	1.2	0.5	1.4	1.6	1.1
04/24/00	3.1	3.5	2.7	4.3	3.1	3.1	3.1	3.3	3.5	3.1	3.2
05/30/00	0.5	1.7	1.7	1.7	0.5	0.5	1.3	1.1	1.7	0.5	1.1
06/14/00	2.1	0.5	2.9	1.7	2.5	2.5	2.5	1.3	2.3	2.5	2.1
06/26/00	0.5	0.5	0.5	4.5	1.3	1.3	1.3	0.5	2.5	1.3	1.4
Total suspended solids (mg/liter)											
07/13/99	1.5	2.0	1.6	1.9	1.9	1.4	3.6	1.7	1.8	1.7	2.0
08/09/99	1.2	1.9	1.3	0.5	0.5	1.6	2.3	1.5	0.9	1.0	1.3
09/15/99	1.1	0.5	1.7	1.7	1.3	1.4	2.7	0.8	1.7	1.3	1.5
10/27/99	0.5	1.3	2.6	2.0	6.0	7.4	32.8	0.9	2.3	6.7	7.5
11/23/99	5.8		2.1	2.5	2.1	2.3	7.5	5.8	2.3	2.2	3.7
01/19/00	0.5	0.5	0.5	0.5	0.5	5.7	1.2	0.5	0.5	3.1	1.4
03/06/00		1.3	1.2	1.7	1.8	1.6	2.5	1.3	1.4	1.7	1.7
04/12/00	0.5	1.1	0.5	0.5	0.5	1.0	5.3	0.8	0.5	0.8	1.3
04/24/00	1.3	0.5	0.5	0.5	0.5	1.0	2.9	0.9	0.5	0.8	1.0
05/30/00	0.5	0.5	0.5	0.5	0.5	0.5	4.0	0.5	0.5	0.5	1.0
06/14/00	0.5	0.5	0.5	0.5	0.5	0.5	4.6	0.5	0.5	0.5	1.1
06/26/00	0.5	1.0	0.5	1.2	1.0	0.5	30.0	0.8	0.9	0.8	5.0

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
Chlorophyll-a (µg/liter)											
07/13/99	0.34	0.71	1.81	1.51	0.71	0.46	0.42	0.52	1.66	0.58	0.85
08/09/99	0.14	0.21	1.23	0.92	0.39	0.11	0.14	0.18	1.08	0.25	0.45
09/15/99	0.51	1.19	1.11	2.40	2.76	3.18	0.42	0.85	1.75	2.97	1.65
10/27/99	0.59	1.22	1.60	0.70	0.35	0.54	0.95	0.91	1.15	0.44	0.85
11/23/99	1.69	0.74	0.82	0.71	0.71	0.41	0.30	1.22	0.77	0.56	0.77
01/19/00	1.81	2.53	1.96	1.82	1.72	1.69	2.04	2.17	1.89	1.71	1.94
03/06/00	2.58	2.89	2.65	3.11	2.84	2.80	2.91	2.73	2.88	2.82	2.83
04/12/00	5.5	3.9	0.8	0.6	1.6	1.2	0.7	4.72	0.67	1.37	2.04
04/24/00	1.1	1.0	1.1	1.0	1.0	0.7	0.4	1.03	1.01	0.84	0.88
05/30/00	0.50	0.61	1.53	2.04	1.03	0.50	1.61	0.56	1.79	0.77	1.12
06/14/00	0.71	0.82	1.96	1.22	0.48	0.45	0.61	0.77	1.59	0.46	0.89
06/26/00	0.32	0.50	1.53	1.16	0.66	0.56	1.82	0.41	1.35	0.61	0.94