

**1998-1999**

**BEAR LAKE MONITORING  
DATA SUMMARY**

*Prepared for:*

**BEAR LAKE REGIONAL COMMISSION  
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## INTRODUCTION

Water quality conditions were monitored in a single mid-lake station on Bear Lake during 1998-19989. 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 13 dates between July 30, 1998 and June 8, 1999. The watershed (marsh) monitoring program began on April 4, 1994 and was continued through June 16, 1998. A map designating the sample location as well as long-term water quality plots are included in Appendix A. Raw data is presented in Appendix B. The following is a summary of the Bear Lake data.

## BEAR LAKE WATER QUALITY

Bear Lake was sampled from July 1998 to June 1999. Water samples were collected twice in March, April, and May and once in other months. Samples were taken from the middle station (approximately 60 meter depth) at ten meter intervals.

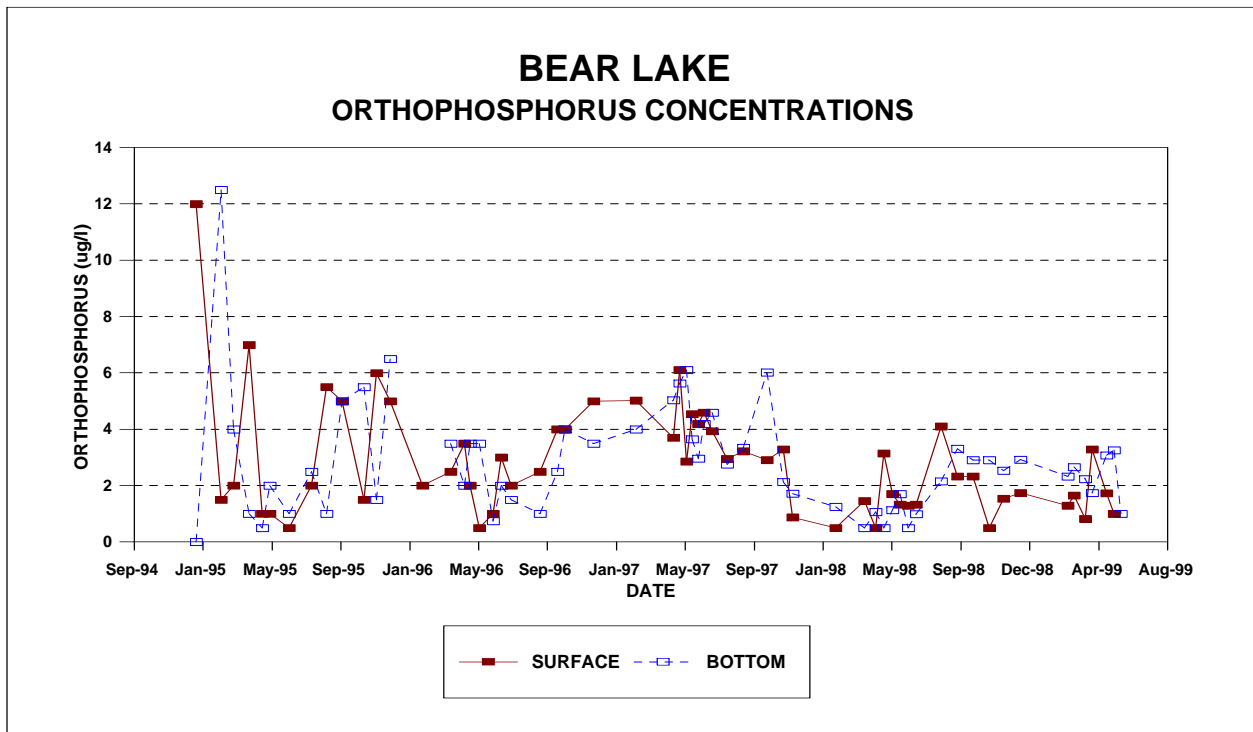
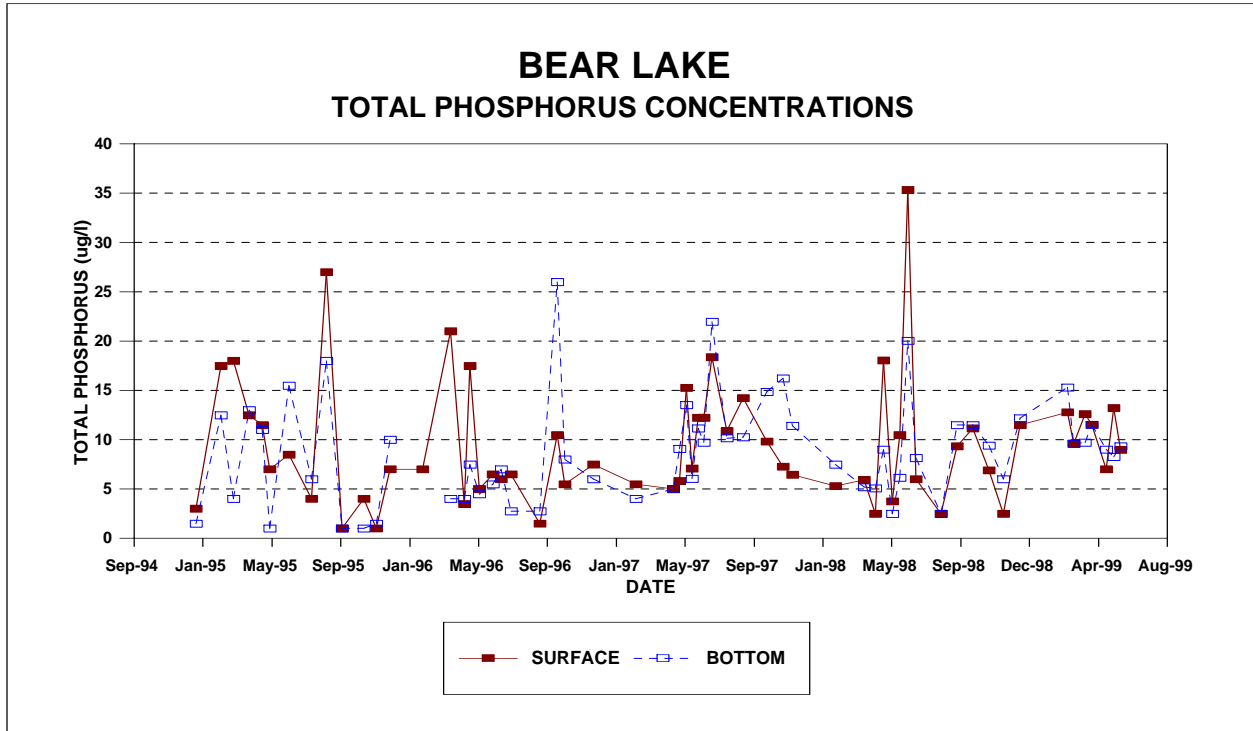
Surface and bottom total phosphorus (TP) concentrations demonstrated almost identical seasonal patterns in 1998-1999 (Figure 1). During the 1998 and 1999 sampling period, the surface total phosphorus concentrations ranged from 3 to 13  $\mu\text{g/liter}$ . From December 1998 until June 1999, the total phosphorus levels were at or above 10  $\mu\text{g/liter}$ . The overall pattern was similar to the data observed in 1997.

Surface and bottom orthophosphorous (OP) concentrations were also similar during the 1998-1999 monitoring program (Figure 1). However, unlike previous years, there was a consistently higher concentration of orthophosphate in the hypolimnion of Bear Lake (1-2  $\mu\text{g/liter}$  above epilimnetic levels). Peak concentrations were found in July 1998 (4  $\mu\text{g/liter}$ ).

Surface total inorganic nitrogen (TIN) concentrations exhibited the most dramatic change of any parameter monitored during 1998 and 1999 (Figure 2). The surface and bottom concentrations for these two parameters were almost identical until the watershed runoff period. During 1998 and 1999, the TIN levels stayed above 100  $\mu\text{g/liter}$  for the majority of dates sampled. Peak concentrations of 390  $\mu\text{g/liter}$  and 338  $\mu\text{g/liter}$  occurred in December 1998 and June 1999, respectively.

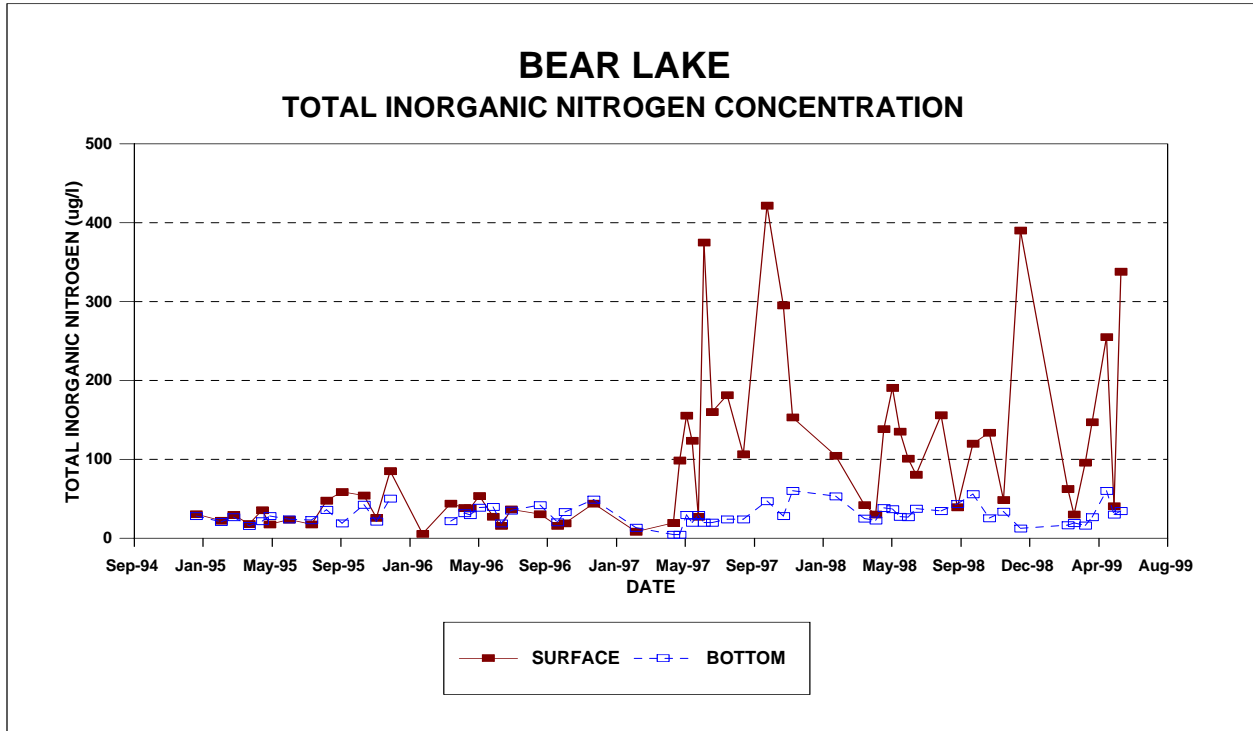
Water transparency, as measured with a secchi disk, ranged from 11.5 meters in June 1998 to a minimum of 3.7 meters in December 1998 (Figure 3). During the summer, fall and winter of 1998 and the spring of 1999, the secchi disk had transparencies greater than 4.5 meters 90 percent of the time. This represented a major decrease from the best year to date (1998) relative to water transparency. This is consistent with the chlorophyll-*a* concentrations which showed an increase in phytoplankton density in 1998-1999 (Figure 3).





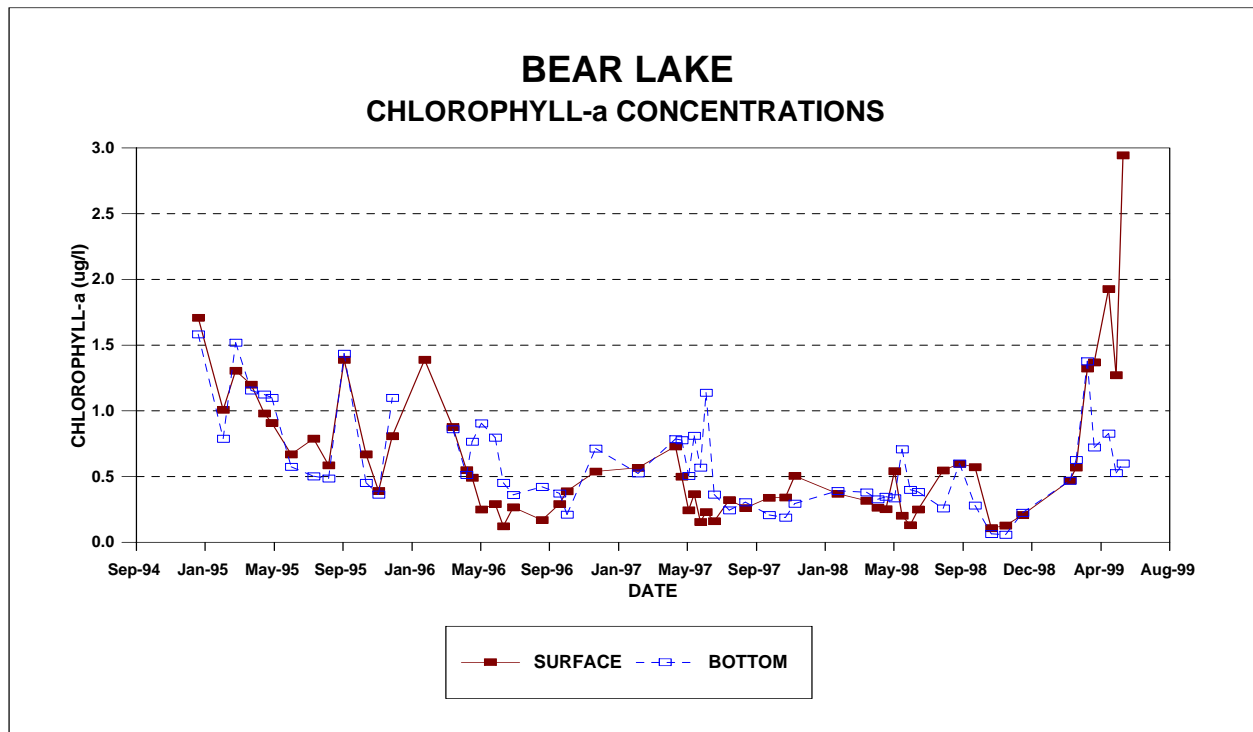
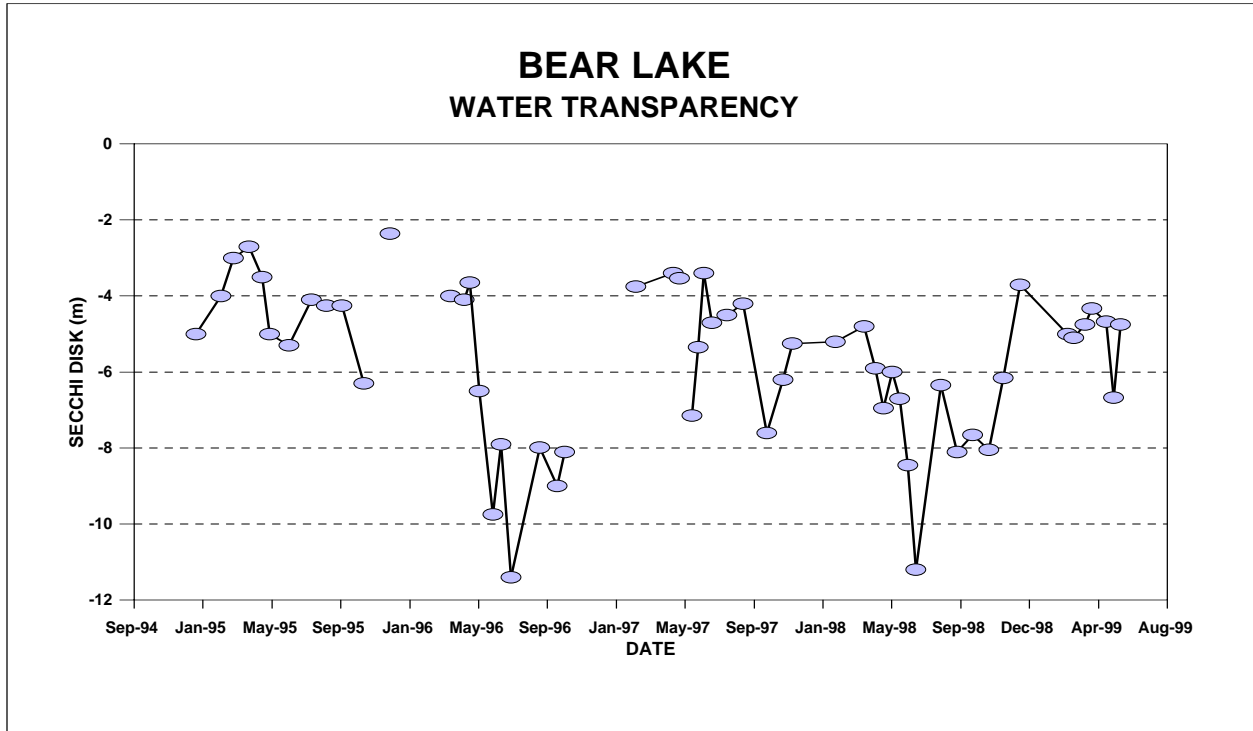
**Figure 1.** The concentration of total phosphorus (above) and orthophosphorus (below) in the surface and bottom waters of Bear Lake since 1994.





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





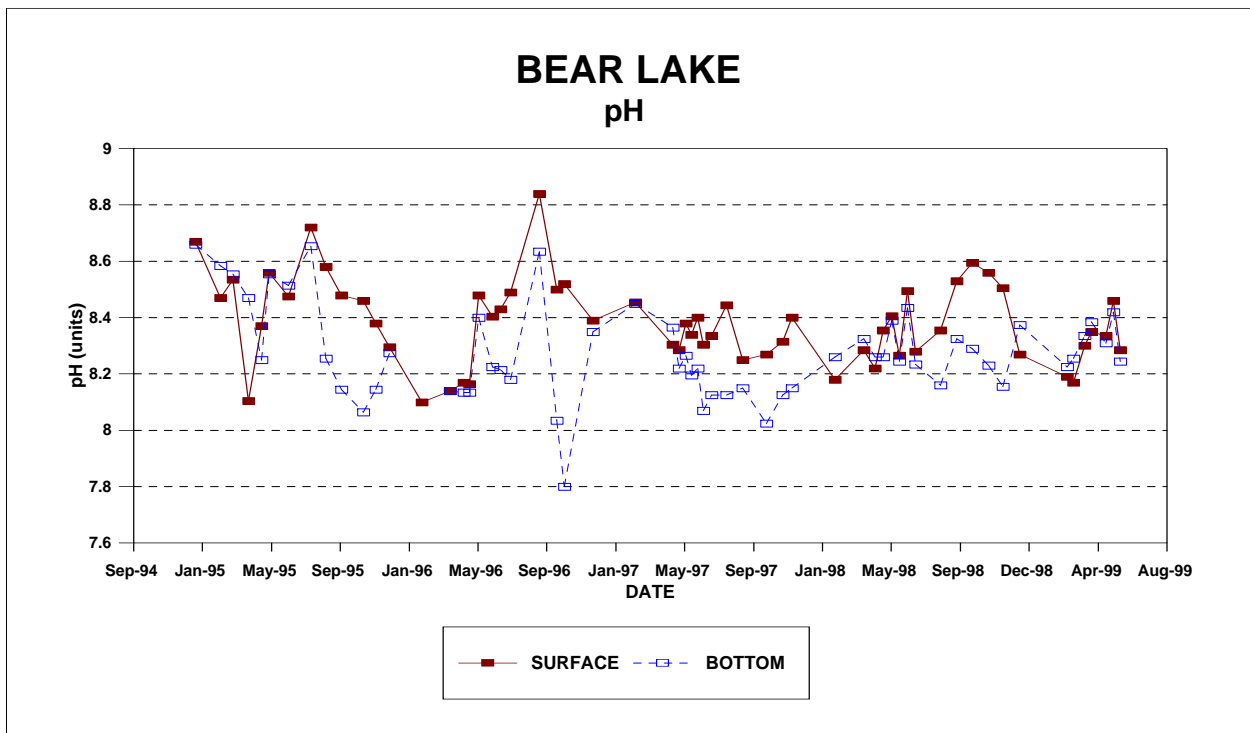
**Figure 3.** The secchi disk transparency (above) and chlorophyll-a concentrations (below) in the surface and bottom waters of Bear Lake since 1994.



Surface and bottom pH levels were similar to the previous monitoring years (1994-1998), ranging from a low of 8.2 to a high of 8.6 pH units (Figure 4). It is interesting to note that since August 1996 (pH of 8.8), there had been a steady decline in surface pH. pH values since that date have remained below 8.6, and the pattern continued through the 1998-1999 monitoring period.

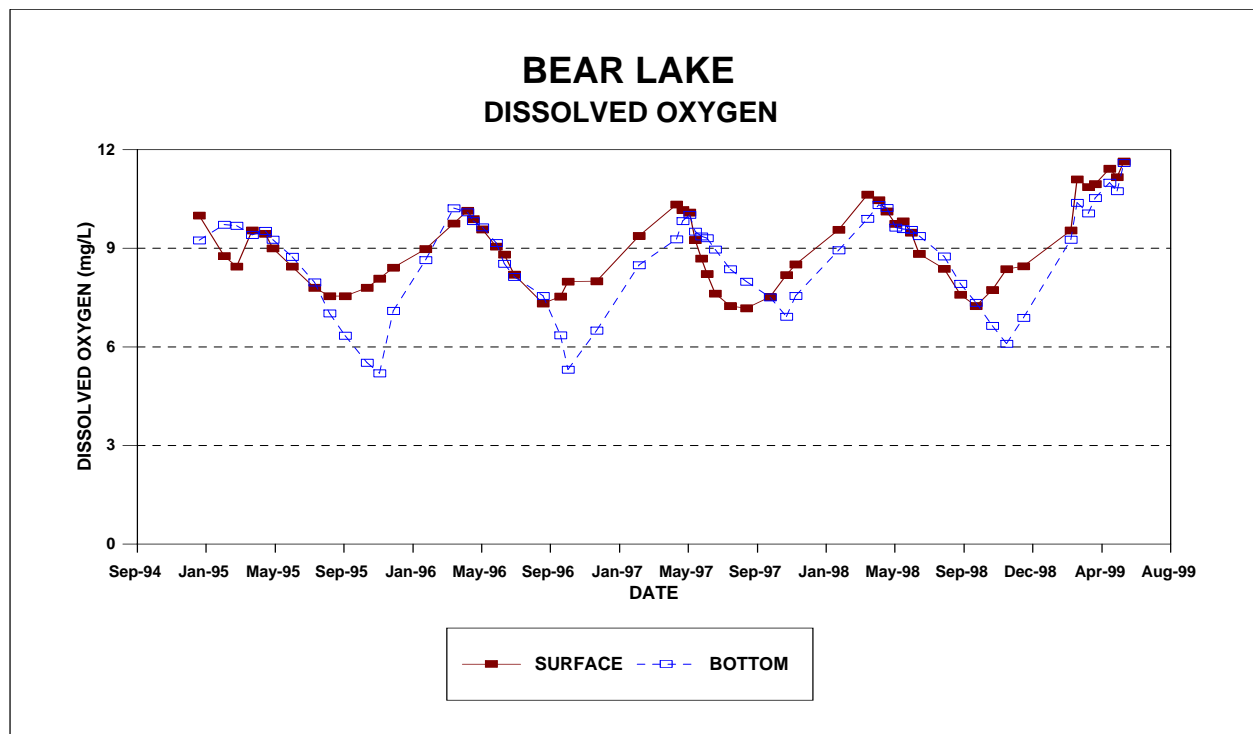
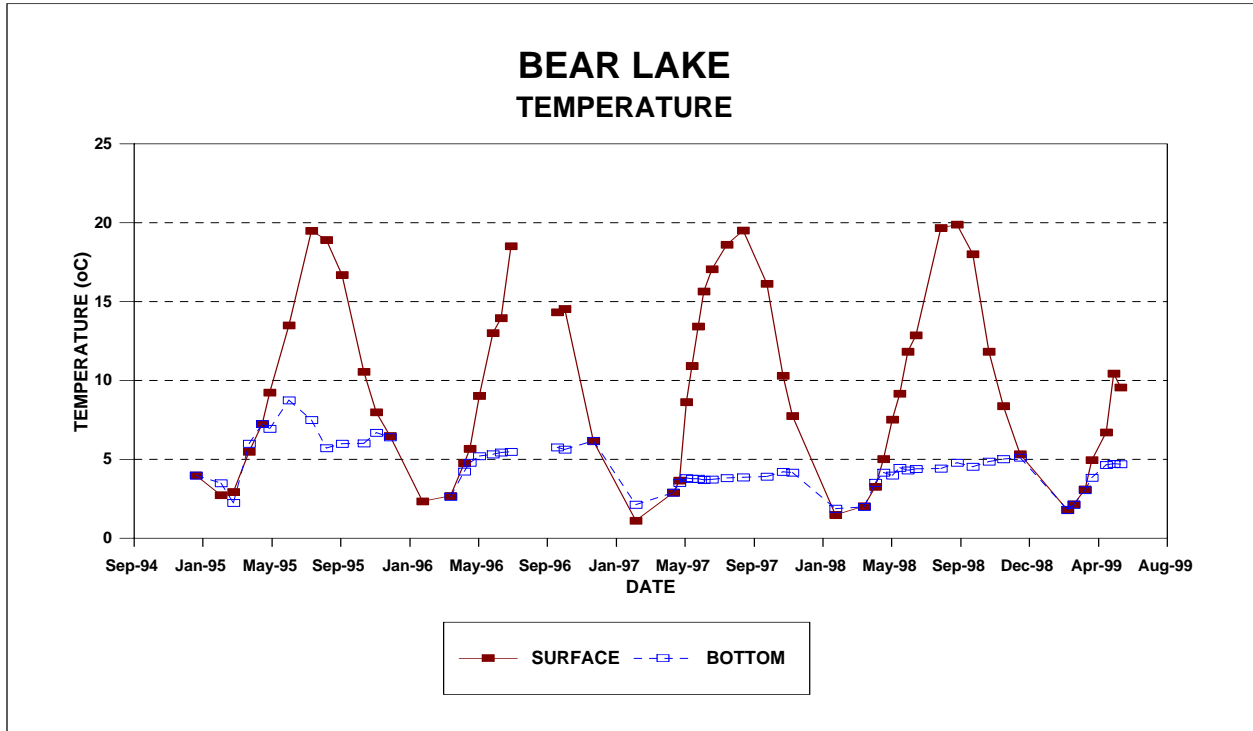
The 1995-97 trend toward decreasing hypolimnetic temperatures was abated in 1998-1999. Summer bottom temperatures did not exceed 5°C compared to maximum summer temperatures of 6.0°C in 1996 and 8.0°C in 1995 (Figure 5). These temperatures appear to have stabilized as the elevations of Bear Lake have reached a maximum.

Summer hypolimnetic dissolved oxygen concentrations (Figure 5), which had shown a steady improvement during 1995 to 1998, decreased to a low of 5.9 mg/liter. The summer of 1997 was the best summer on record, in which levels fell to only 6.9 mg/liter. The cause for the reversal in hypolimnetic dissolved oxygen depletions is unknown at this time.



**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.



## 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 1997-1999, total phosphorus has shown a slight reversal in that trend, leveling off at 10 µg/liter. Orthophosphate continued to decline. Total inorganic nitrogen had major increases in concentrations during the spring and summer of 1998 which continued into 1999. It is believed that the observed increase is the result of inputs from the Bear Lake watershed, Bear River, and the continued export of nitrogen from the Bear Lake marsh. Algal biomass was at its highest levels since the early 1980s.

The system is currently calculated to be phosphorus limited.

## RECOMMENDATIONS

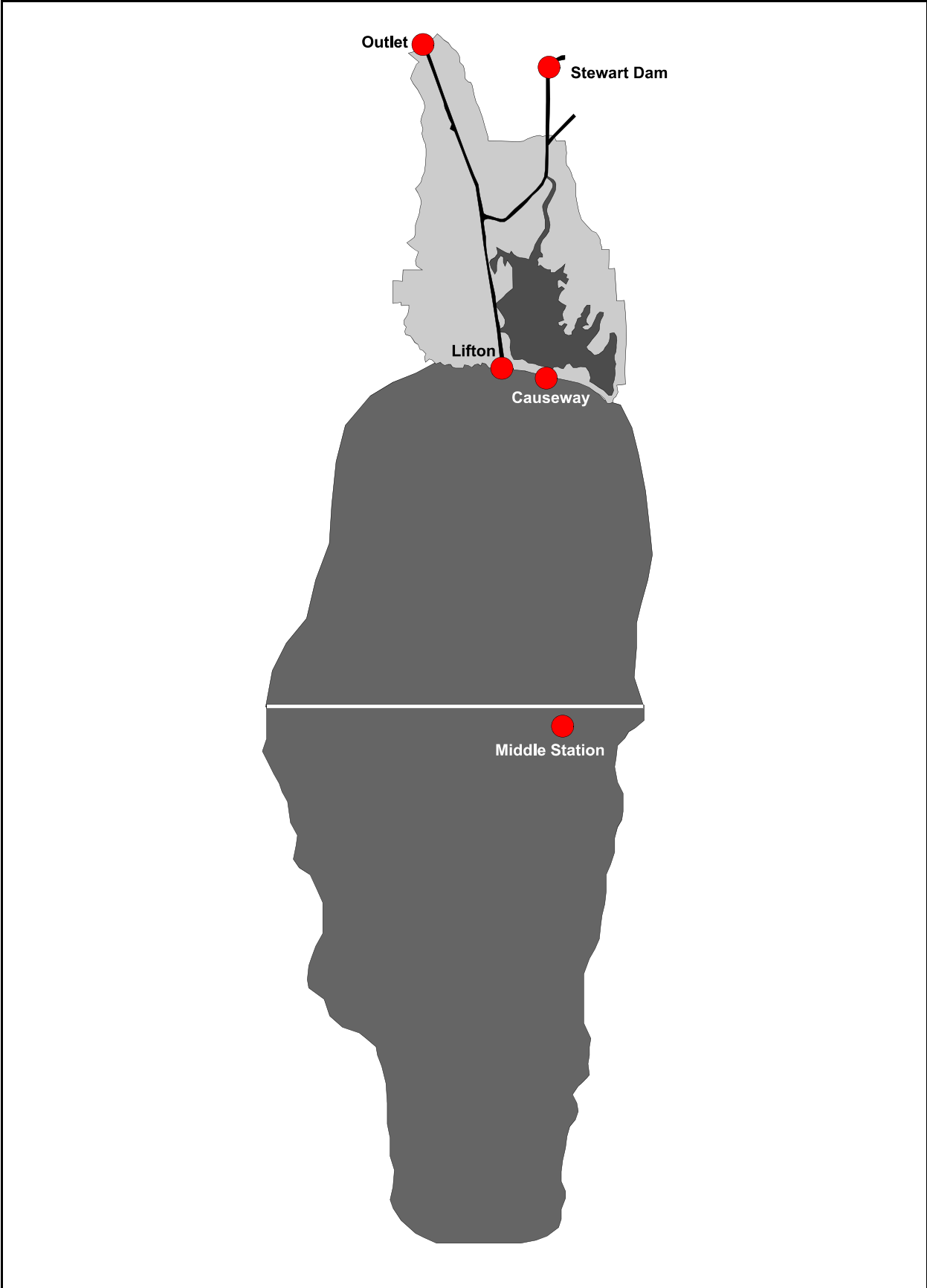
1. The Bear Lake monitoring program appears to be sensitive in its ability to detect changes in the physical and chemical water quality conditions in Bear Lake and should be continued at its present level. Sampling of the marsh sites (Causeway, Lifton, Stewart Dam and the Outlet) was discontinued in July 1998. Additional funding should be found in order that this program monitor both the lake and marsh sample sites.
2. During 1997, 1998 and 1999 a large pulse of nitrogen entered Bear Lake. This nutrient input did stimulate 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.
3. A relationship appears to exist between summer hypolimnetic temperature, dissolved oxygen and lake elevation. 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.



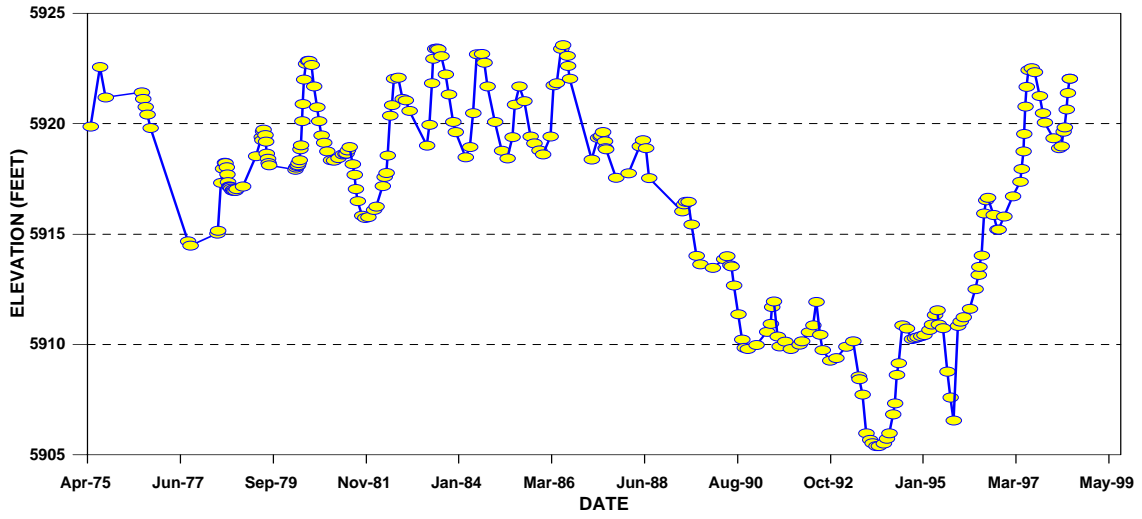


**APPENDIX A**

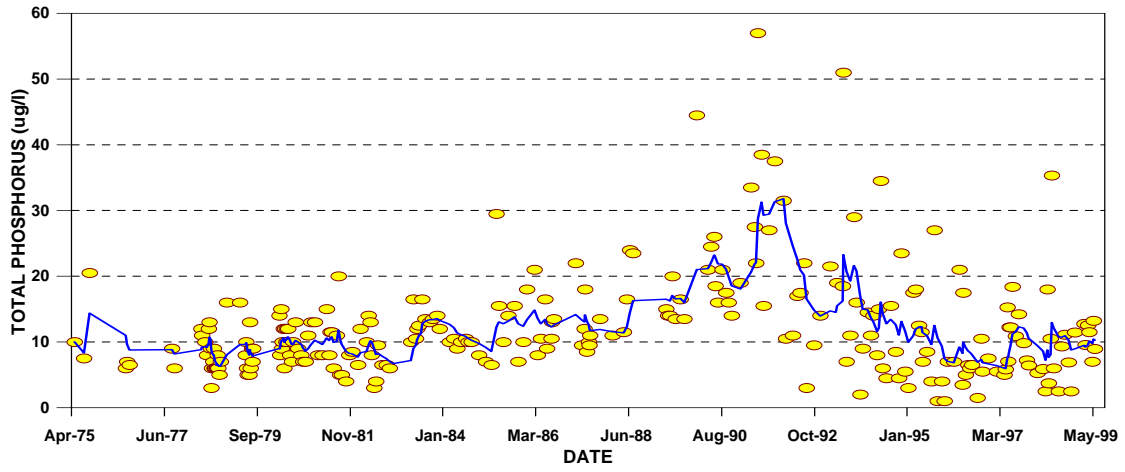
***Graphs of Long-term Water Quality Data  
Monitoring Locations***



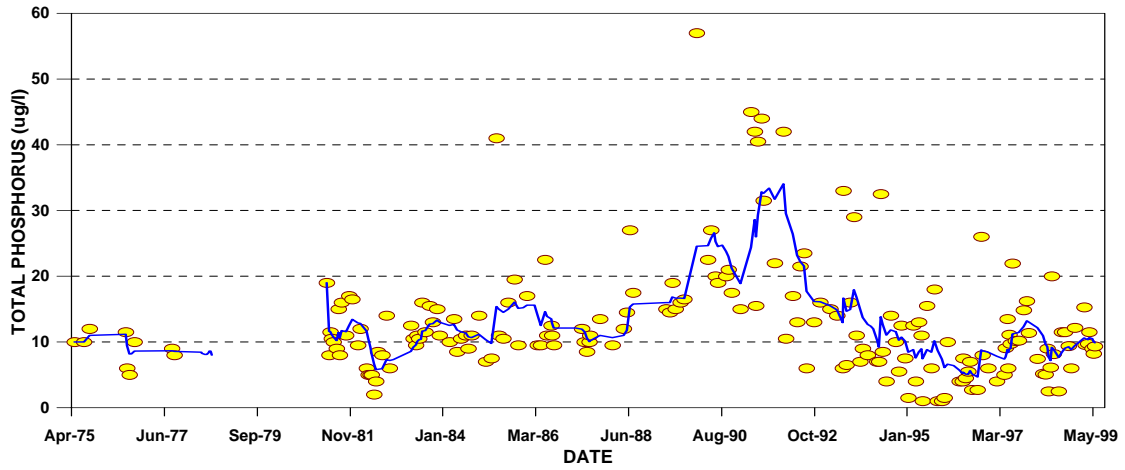
# BEAR LAKE SURFACE ELEVATIONS



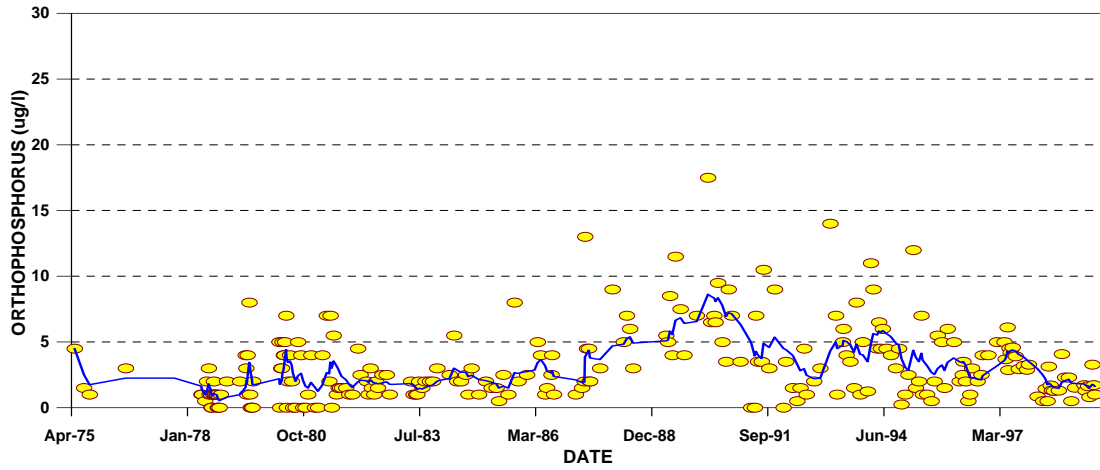
## AVERAGE SURFACE CONCENTRATION TOTAL PHOSPHORUS



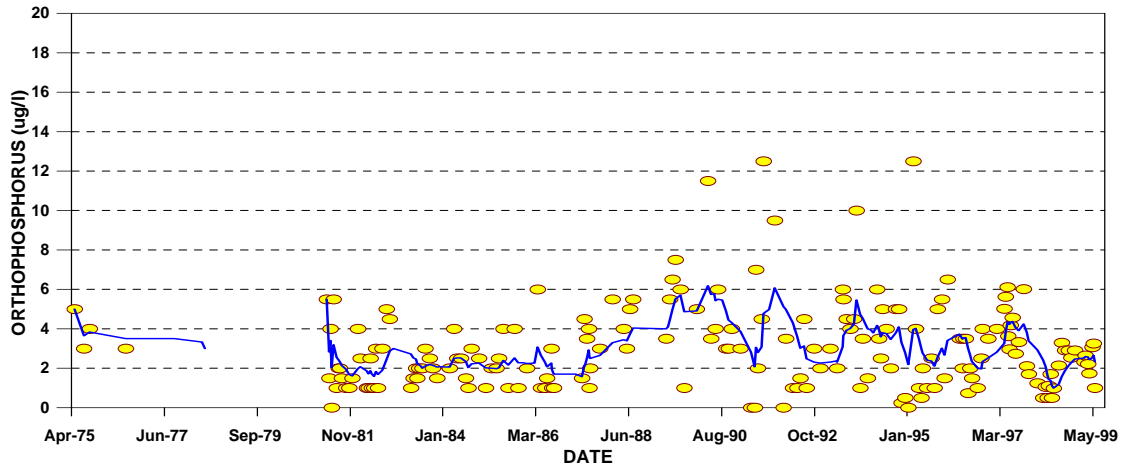
## AVERAGE BOTTOM CONCENTRATION TOTAL PHOSPHORUS



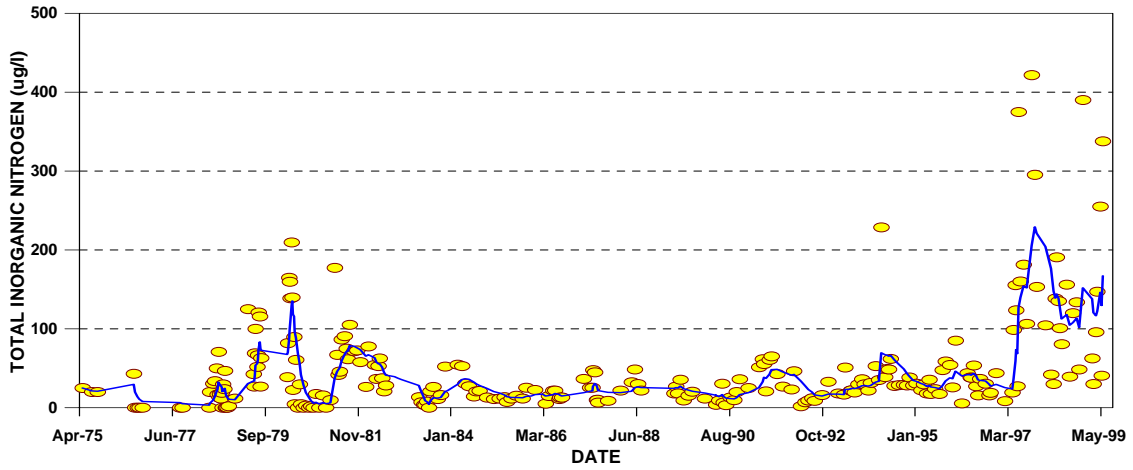
## AVERAGE SURFACE CONCENTRATION ORTHOPHOSPHORUS



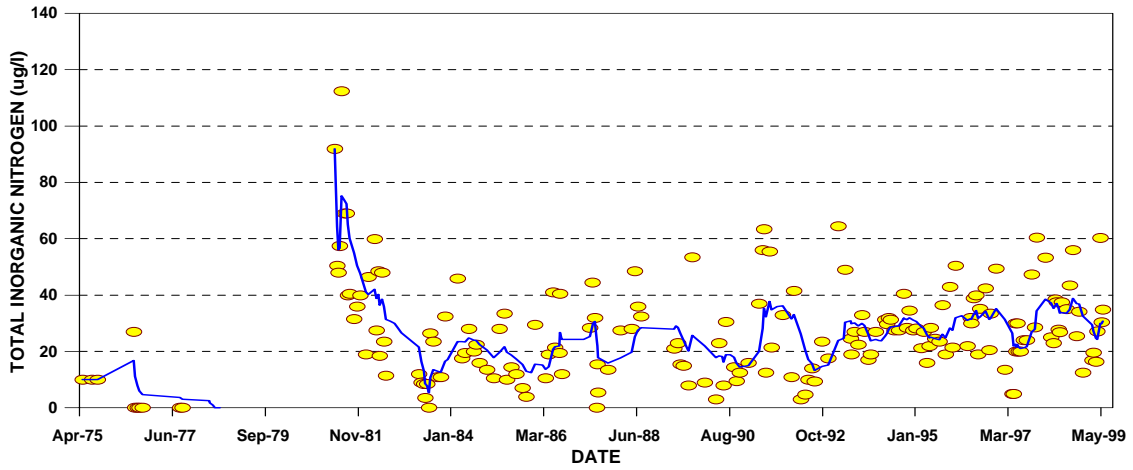
## AVERAGE BOTTOM CONCENTRATION ORTHOPHOSPHORUS



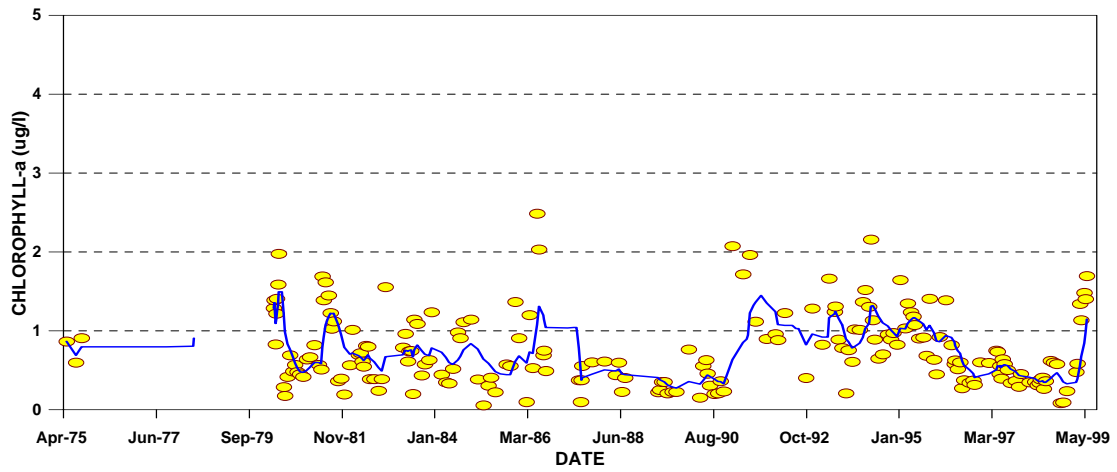
## AVERAGE SURFACE CONCENTRATION TOTAL INORGANIC NITROGEN



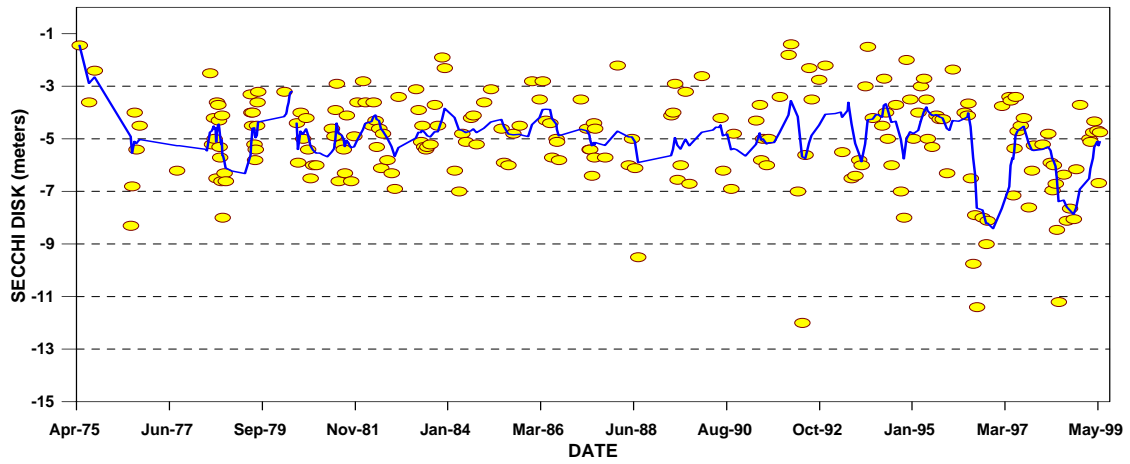
## AVERAGE BOTTOM CONCENTRATION TOTAL INORGANIC NITROGEN



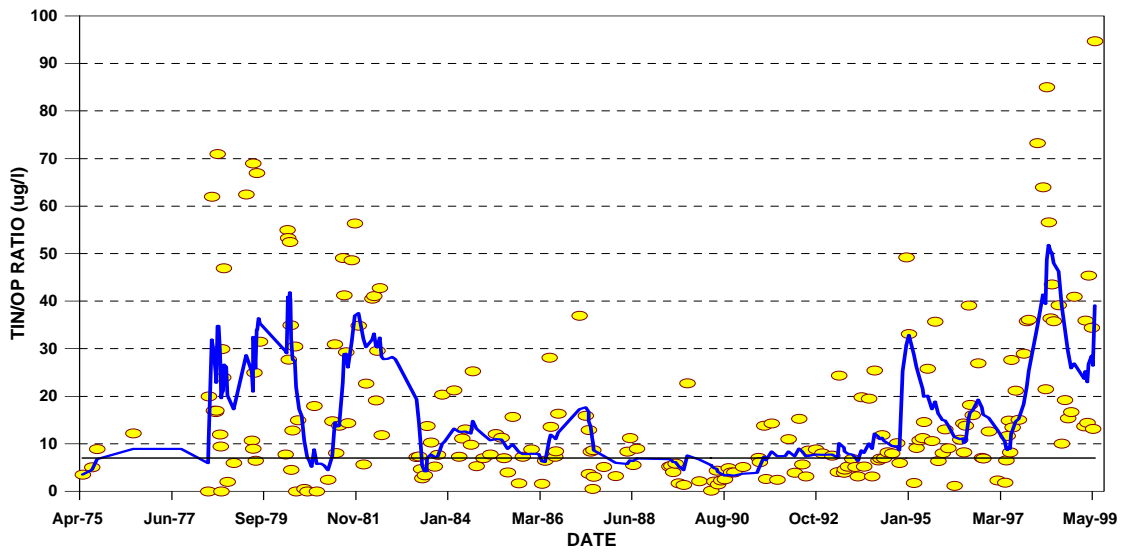
## AVERAGE CONCENTRATIONS CHLOROPHYLL-a



## AVERAGE WATER TRANSPARENCY SECCHI DISK



# BEAR LAKE TIN/OP RATIO





## ***APPENDIX B***

### ***Raw Data***

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
<b>Dissolved Oxygen (mg/liter)</b>											
07/30/98	6.8	9.35	9.35	8.69	8.4	7.76	6.49	8.08	9.02	8.08	8.12
08/27/98	7.1	7.13	9.12	7.61	8.26	7.27	6.82	7.12	8.37	7.77	7.62
09/23/98	7.46	7.31	8.62	6.65	6.95	6.91	5.44	7.39	7.64	6.93	7.05
10/22/98	8.31	7.87	7.89	6.72	6.48	6.25	4.83	8.09	7.31	6.37	6.91
11/16/98	8.75	8.58	8.51	8.49	6	5.7	4.93	8.67	8.50	5.85	7.28
12/15/98	8.37	8.16	8.16	8.18	7.98	7.89	7.99	8.27	8.17	7.94	8.10
03/08/99	10.9	10.77	10.65	10.59	10.67	10.55	10.5	10.84	10.62	10.61	10.66
03/19/99	10.85	11.9	10.41	10.26	10.2	10.16	10.11	11.38	10.34	10.18	10.56
04/07/99	10.46	10.28	9.97	9.99	10	9.92	9.6	10.37	9.98	9.96	10.03
04/19/99	11.5	11.6	11.66	11.36	11.2	11.02	11.08	11.55	11.51	11.11	11.35
05/14/99	11.27	11.34	11.24	11.17	10.96	10.82	10.84	11.31	11.21	10.89	11.09
05/27/99	10.59	11.5	11.35	10.92	10.79	10.45	10.18	11.05	11.14	10.62	10.83
06/08/99	10.47	14.04	14.06	13.69	12.89	12.29	12.3	12.26	13.88	12.59	12.82
<b>Temperature (°C)</b>											
07/30/98	22.16	17.2	8.42	5.13	4.55	4.33	4.3	19.68	6.78	4.44	9.44
08/27/98	20.22	19.57	11.2	6.81	5.2	4.4	4.35	19.90	9.01	4.80	10.25
09/23/98	18.33	17.7	10.72	6.34	4.71	4.4	4.42	18.02	8.53	4.56	9.52
10/22/98	11.87	11.82	10.04	5.81	5.09	4.64	4.53	11.85	7.92	4.87	7.69
11/16/98	8.48	8.32	8.28	8.23	5.14	4.91	4.64	8.40	8.26	5.03	6.86
12/15/98	5.41	5.28	5.28	5.28	5.27	4.99	4.81	5.35	5.28	5.13	5.19
03/08/99	1.81	1.8	1.78	1.79	1.81	1.82	1.84	1.81	1.79	1.82	1.81
03/19/99	2.25	2.1	2.11	2.11	2.13	2.16	2.3	2.18	2.11	2.15	2.17
04/07/99	3.19	3.03	3.05	3.04	3.04	3.09	3.34	3.11	3.05	3.07	3.11
04/19/99	5.67	4.25	4.09	3.98	3.88	3.82	3.79	4.96	4.04	3.85	4.21
05/14/99	7.41	6.06	5.89	5.27	4.97	4.38	4.34	6.74	5.58	4.68	5.47
05/27/99	12.75	8.15	5.95	5.37	5.01	4.47	4.4	10.45	5.66	4.74	6.59
06/08/99	10.27	8.88	5.79	4.95	4.78	4.66	4.65	9.58	5.37	4.72	6.28
<b>pH (SU)</b>											
07/30/98	8.35	8.36	8.28	8.2	8.18	8.14	8.06	8.36	8.24	8.16	8.22
08/27/98	8.52	8.54	8.5	8.35	8.36	8.29	8.25	8.53	8.43	8.33	8.40
09/23/98	8.58	8.61	8.55	8.35	8.3	8.28	8.18	8.60	8.45	8.29	8.41
10/22/98	8.57	8.55	8.45	8.26	8.24	8.22	8.13	8.56	8.36	8.23	8.35
11/16/98	8.51	8.5	8.49	8.49	8.17	8.14	8.09	8.51	8.49	8.16	8.34
12/15/98	8.22	8.32	8.34	8.36	8.37	8.38	8.41	8.27	8.35	8.38	8.34
03/08/99	8.16	8.22	8.22	8.22	8.22	8.23	8.23	8.19	8.22	8.23	8.21
03/19/99	8.14	8.2	8.22	8.24	8.25	8.26	8.26	8.17	8.23	8.26	8.22
04/07/99	8.3	8.3	8.31	8.32	8.33	8.34	8.34	8.30	8.32	8.34	8.32
04/19/99	8.35	8.35	8.36	8.37	8.38	8.39	8.4	8.35	8.37	8.39	8.37
05/14/99	8.34	8.33	8.32	8.32	8.31	8.31	8.3	8.34	8.32	8.31	8.32
05/27/99	8.44	8.48	8.47	8.44	8.43	8.41	8.4	8.46	8.46	8.42	8.44
06/08/99	8.28	8.29	8.28	8.26	8.25	8.24	8.24	8.29	8.27	8.25	8.26

	DEPTH (meters)						AVERAGES				
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
<b>Conductivity (umho/cm)</b>											
07/30/98	749	742	742	743	743	744	746	746	743	744	744
08/27/98	753	752	746	750	748	749	749	753	748	749	750
09/23/98	758	757	755	762	763	761	763	758	759	762	760
10/22/98	766	766	771	775	775	774	777	766	773	775	772
11/16/98	766	768	767	767	778	778	778	767	767	778	772
12/15/98	773	772	770	769	768	769	768	773	770	769	770
03/08/99	676	674	674	674	676	675	675	675	674	676	675
03/19/99	676	676	677	677	677	677	678	676	677	677	677
04/07/99	691	692	691	691	691	692	692	692	691	692	691
04/19/99	682	680	681	680	679	680	681	681	681	680	680
05/14/99	702	703	703	703	705	706	704	703	703	706	704
05/27/99	705	702	700	700	700	700	700	704	700	700	701
06/08/99	717	716	716	717	717	716	716	717	717	717	716

**Secchi disk transparency (meters)**

07/30/98	-6.35
08/27/98	-8.1
09/23/98	-7.65
10/22/98	-8.05
11/16/98	-6.15
12/15/98	-3.7
03/08/99	-5
03/19/99	-5.1
04/07/99	-4.75
04/19/99	-4.33
05/14/99	-4.67
05/27/99	-6.67
06/08/99	-4.75

**Turbidity (ntu)**

07/30/98											
08/27/98	0.54	0.85	0.5	0.8	0.88	1.1	12	0.70	0.65	0.99	2.38
09/23/98	0.64	0.84	0.77	1.4	0.65	0.7	25	0.74	1.09	0.68	4.29
10/22/98	0.85	0.8	1.5	2	2	2.5	11	0.83	1.75	2.25	2.95
11/16/98	0.95	1	0.75	2.1	1.6	1.5	8.9	0.98	1.43	1.55	2.40
12/15/98	1.7	1.6	1.6	1.6	2.4	4	21	1.65	1.60	3.20	4.84
03/08/99	1.2	0.9	1	1.5	1.3	1.3	3.3	1.05	1.25	1.30	1.50
03/19/99	1.2	0.94	1	0.98	1	1.3	2.5	1.07	0.99	1.15	1.27
04/07/99	1	0.95	1.1	1.2	1.2	1.3	6	0.98	1.15	1.25	1.82
04/19/99	1	1	1	1	1.2	1.8	2.5	1.00	1.00	1.50	1.36
05/14/99	0.85	0.7	0.75	1.2	1.8	2.4	4	0.78	0.98	2.10	1.67
05/27/99	0.4	0.7	0.55	0.55	0.95	1.4	4.5	0.55	0.55	1.18	1.29
06/08/99	0.84	0.94	0.71	0.63	1	1.5	3.1	0.89	0.67	1.25	1.25

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
<b>Ammonia (<math>\mu\text{g/liter}</math>)</b>											
07/30/98	10	10	10	10	10	10	24	10	10	10	12
08/27/98	10	25	10	21	10	23	10	18	16	17	16
09/23/98	24.3	25.3	24.3	23.3	23.3	24.3	25.3	25	24	24	24
10/22/98	10	10	10	10	10	10	10	10	10	10	10
11/16/98	10	10	10	10	10	10	10	10	10	10	10
12/15/98	24	21	21	21	10	10	10	23	21	10	17
03/08/99	10	10	10	10	10	10	10	10	10	10	10
03/19/99	22	10	10	10	10	10	31	16	10	10	15
04/07/99	45	10	10	10	10	10	10	28	10	10	15
04/19/99	20	20	20	20	20	20	20	20	20	20	20
05/14/99	20	20	20	20	20	74	20	20	20	47	28
05/27/99	20	20	20	20	20	20	20	20	20	20	20
06/08/99	20	20	20	20	20	20	20	20	20	20	20
<b>Nitrate (<math>\mu\text{g/liter}</math>)</b>											
07/30/98	225	66	2	12	17	31	67	145	7	24	60
08/27/98	40	1	1	1	14	37	42	21	1	25	19
09/23/98	180.4	8.2	6.7	6.7	18.0	43.3	68.6	94	7	31	47
10/22/98	6.26	240	5.19	1.56	10.04	18.28	50.9	123	3	14	47
11/16/98	65.61	9.69	6.85	13.84	17.97	27.86	48.7	38	10	23	27
12/15/98	722.75	10.64	8.23	4.66	1.81	1.9	5.73	367	6	2	108
03/08/99	96.18	7.74	7.54	6.07	6.43	6.43	8.19	52	7	6	20
03/19/99	18.28	9.22	10.42	10.42	8.93	9.26	263.61	14	10	9	47
04/07/99	119.6	15.45	4.62	1.41	1.49	9.3	1.41	68	3	5	22
04/19/99	227.5	25.67	5.92	9.34	6.37	6	4.81	127	8	6	41
05/14/99	421.9	46.61	7.54	10.88	13.75	11.67	11.98	234	9	13	75
05/27/99	18.8	21.1	10.7	2.2	2.0	16.7	13.6	20	6	9	12
06/08/99	627.0	7.7	5.5	9.5	12.7	15.0	20.0	317	8	14	100
<b>Nitrite (<math>\mu\text{g/liter}</math>)</b>											
07/30/98	1	1	1	1	1	1	1	1	1	1	1
08/27/98	1	1	1	1	2	2	2	1	1	2	1
09/23/98	1.3	1.0	1.0	1.1	1.6	1.6	2.5	1	1	2	1
10/22/98	0.86	1.19	0.77	0.94	1.27	1.43	1.27	1	1	1	1
11/16/98	1.19	0.86	0.77	0.86	1.19	1.35	1.35	1	1	1	1
12/15/98	1.67	0.85	0.77	0.77	0.69	0.6	0.77	1	1	1	1
03/08/99	0.65	0.65	0.48	0.48	0.48	0.48	0.57	1	0	0	1
03/19/99	0.57	0.65	0.57	0.57	0.57	0.57	1.15	1	1	1	1
04/07/99	1.09	1.17	1.09	1.09	1.01	1.09	1.09	1	1	1	1
04/19/99	1.01	1.01	1.09	1.01	1.01	1.01	1.09	1	1	1	1
05/14/99	1.44	0.71	0.63	0.55	0.71	0.47	0.55	1	1	1	1
05/27/99	1.0	0.9	0.8	0.8	1.0	1.1	0.9	1	1	1	1
06/08/99	0.8	0.8	1.0	0.9	1.2	0.8	0.9	1	1	1	1

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
<b>Total phosphorus (<math>\mu\text{g/liter}</math>)</b>											
07/30/98	3	3	3	3	3	3	29	3	3	3	6
08/27/98	9	10	10	10	11	12	24	9	10	12	12
09/23/98	12.6	9.7	9.7	12.6	11.9	11.2	35.7	11	11	12	15
10/22/98	7.98	5.81	7.26	9.43	9.43	9.43	15.94	7	8	9	9
11/16/98	2.5	2.5	12.83	2.5	6.39	5.68	16.41	3	8	6	7
12/15/98	9.69	13.28	11.13	11.84	12.56	11.84	26.89	11	11	12	14
03/08/99	14.24	11.37	14.24	14.24	17.83	12.81	16.4	13	14	15	14
03/19/99	10.32	8.88	9.60	8.16	9.60	9.60	11.75	10	9	10	10
04/07/99	9.74	15.47	11.89	10.46	9.74	9.74	13.32	13	11	10	11
04/19/99	11.18	11.89	11.18	11.18	11.89	11.18	15.47	12	11	12	12
05/14/99	7.74	6.31	7.74	6.31	10.3	7.74	22.67	7	7	9	10
05/27/99	17.5	9.0	9.7	7.6	7.6	9.0	11.8	13	9	8	10
06/08/99	8.3	9.7	7.6	9.0	8.3	10.4	10.4	9	8	9	9
<b>Orthophosphorus (<math>\mu\text{g/liter}</math>)</b>											
07/30/98	1	2	1	2	2	2	3	1	2	2	2
08/27/98	3.1	5.1	3.5	3.5	3.5	3.1	3.5	4	4	3	4
09/23/98	2.9	1.7	2.9	2.5	2.5	3.3	10.7	2	3	3	4
10/22/98	2.91	1.74	2.91	2.52	2.52	3.3	10.71	2	3	3	4
11/16/98	0.5	0.5	0.5	1.16	2.74	2.34	8.28	1	1	3	2
12/15/98	1.54	1.54	1.93	1.54	2.33	3.51	9.04	2	2	3	3
03/08/99	1.94	1.55	1.94	1.94	2.33	2.33	3.5	2	2	2	2
03/19/99	1.29	1.29	1.68	2.07	2.47	2.86	0.5	1	2	3	2
04/07/99	1.46	1.85	1.85	3.41	2.24	2.24	5.36	2	3	2	3
04/19/99	1.15	0.5	0.5	1.55	1.55	1.94	2.34	1	1	2	1
05/14/99	4.46	2.1	2.1	2.5	2.89	3.28	3.68	3	2	3	3
05/27/99	1	2.47	1	1	2.87	3.66	5.62	2	1	3	3
06/08/99	1	1	1	1	1	1	2.91	1	1	1	1
<b>Total suspended solids (mg/liter)</b>											
07/30/98	1	2	1	1	1	1	25	1.7	0.5	0.5	4.4
08/27/98	1	1	1	1	1	1	14	0.5	0.5	0.8	2.5
09/23/98	1	2	2	5	2	1	28	1.0	3.2	1.7	5.6
10/22/98	0.5	1.28	1.32	0.5	1.64	1.96	8.16	0.9	0.9	1.8	2.2
11/16/98	1.22	1.68	1.64	1.12	0.5	2.88	11.4	1.5	1.4	1.7	2.9
12/15/98	0.5	0.5	1.24	1.67	1.64	3.24	11.08	0.5	1.5	2.4	2.8
03/08/99	0.5	1.14	0.5	1.12	1.25	0.5	3.33	0.8	0.8	0.9	1.2
03/19/99	1.47	1.7	1.5	1.62	1.73	3.82	1.93	1.6	1.6	2.8	2.0
04/07/99	1.77	1.55	1.55	1.56	1.35	1.98	6.02	1.7	1.6	1.7	2.3
04/19/99	1.15	1.67	0.5	1.83	2	2.76	3.48	1.4	1.2	2.4	1.9
05/14/99											
05/27/99	1.17	2.14	2.18	1.56	1.57	2.92	5.86	1.7	1.9	2.2	2.5
06/08/99	2	3	2	2	2	3	4	2.7	2.3	2.4	2.7

	DEPTH (meters)							AVERAGES			
	0	10	20	30	40	50	60	Epilimnion	Metalimnion	Hypolimnion	ALL
<b><i>Chlorophyll-a (µg/liter)</i></b>											
07/30/98	0.22	0.88	2.06	0.50	0.46	0.06	0.19	0.55	1.28	0.26	0.62
08/27/98	0.52	0.68	0.40	0.64	0.76	0.44	0.76	0.60	0.52	0.60	0.60
09/23/98	0.30	0.84	0.77	0.92	0.42	0.14	0.65	0.57	0.84	0.28	0.58
10/22/98	0.09	0.13	0.1	0.1	0.08	0.05	0.04	0.11	0.10	0.07	0.08
11/16/98	0.14	0.12	0.13	0.1	0.08	0.04	0.05	0.13	0.12	0.06	0.09
12/15/98	0.19	0.23	0.28	0.24	0.22	0.23	0.27	0.21	0.26	0.23	0.24
03/08/99	0.47	0.47	0.47	0.47	0.51	0.43	0.55	0.47	0.47	0.47	0.48
03/19/99	0.55	0.59	0.55	0.51	0.63	0.63	0.63	0.57	0.53	0.63	0.58
04/07/99	1.45	1.2	1.24	1.48	1.59	1.17	1.27	1.33	1.36	1.38	1.34
04/19/99	1.11	1.63	1.27	1.31	0.88	0.57	1.2	1.37	1.29	0.73	1.14
05/14/99	1.63	2.23	2.54	1.73	0.95	0.71	0.6	1.93	2.14	0.83	1.48
05/27/99	0.85	1.7	4.43	1.38	0.67	0.39	0.42	1.28	2.91	0.53	1.41
06/08/99	2.54	3.35	3.15	1.12	0.64	0.57	0.53	2.95	2.13	0.60	1.70