WATER QUALITY UPDATE 1995

PARLBY CREEK - BUFFALO LAKE WATER MANAGEMENT PROJECT

Prepared for:

Buffalo Lake Management Team

Prepared by:

Patricia Mitchell

Water Sciences Branch
Water Management Division
Alberta Environmental Protection

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ACKNOWLEDGMENTS

Samples from Buffalo Lake and Parlby Creek were collected by Mike Bilyk, Brian Jackson and other staff of Monitoring Branch. Morna Hussey analyzed phosphorus and chlorophyll samples. Chemical analyses were conducted by the Alberta Environmental Centre.

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1.0 BACKGROUND

The Parlby Creek - Buffalo Lake Water Management Project is designed to provide agricultural flood control, fish and wildlife habitat enhancement, improved municipal water supplies for Mirror and Alix and higher water levels in Buffalo Lake. The impact on water quality in the project area is an important concern that was addressed in the environmental impact assessment (EIA) for the project. For Buffalo Lake, there is a possibility that aquatic plant growth, especially algae, might increase as the saline lake is flushed with Red Deer River water. Although the EIA determined that this would likely not occur, two other studies on the lake have indicated that the potential is there. Other concerns raised include changes in levels of nutrients, metals, bacteria, turbidity, suspended solids and dissolved oxygen concentrations during the winter.

Various groups within Alberta Environmental Protection have sampled Buffalo Lake, Alix Lake and Parlby Creek since 1981, and staff and students of the University of Alberta have also sampled the lake sporadically since 1973. Although the data base is somewhat inconsistent and patchy, the long period of record will serve well to assess effects of the diversion.

The final year of pre-diversion data-gathering on water quality in Buffalo Lake was conducted in 1995. The focus of this program was on the fertility and salinity of Buffalo Lake and Parlby Creek. The purpose of this report is to bring the water quality information up to date since the last update completed by Dr. J. Shaw in January 1994.

2.0 METHODS

In Buffalo Lake, Main Bay, Secondary Bay and Parlby Bay (Figure 1) were sampled on seven occasions during May - October 1995. Samples were collected by combining tube hauls of water over each lake area; sample water was obtained to the depth of light penetration on the sampling day. Variables measured included major ions and related characteristics, nutrients, carbon fractions, conductivity, pH, Secchi transparency, chlorophyll *a*, dissolved oxygen, temperature, and light. One set of winter samples was collected in the lake in both 1995 and 1996.

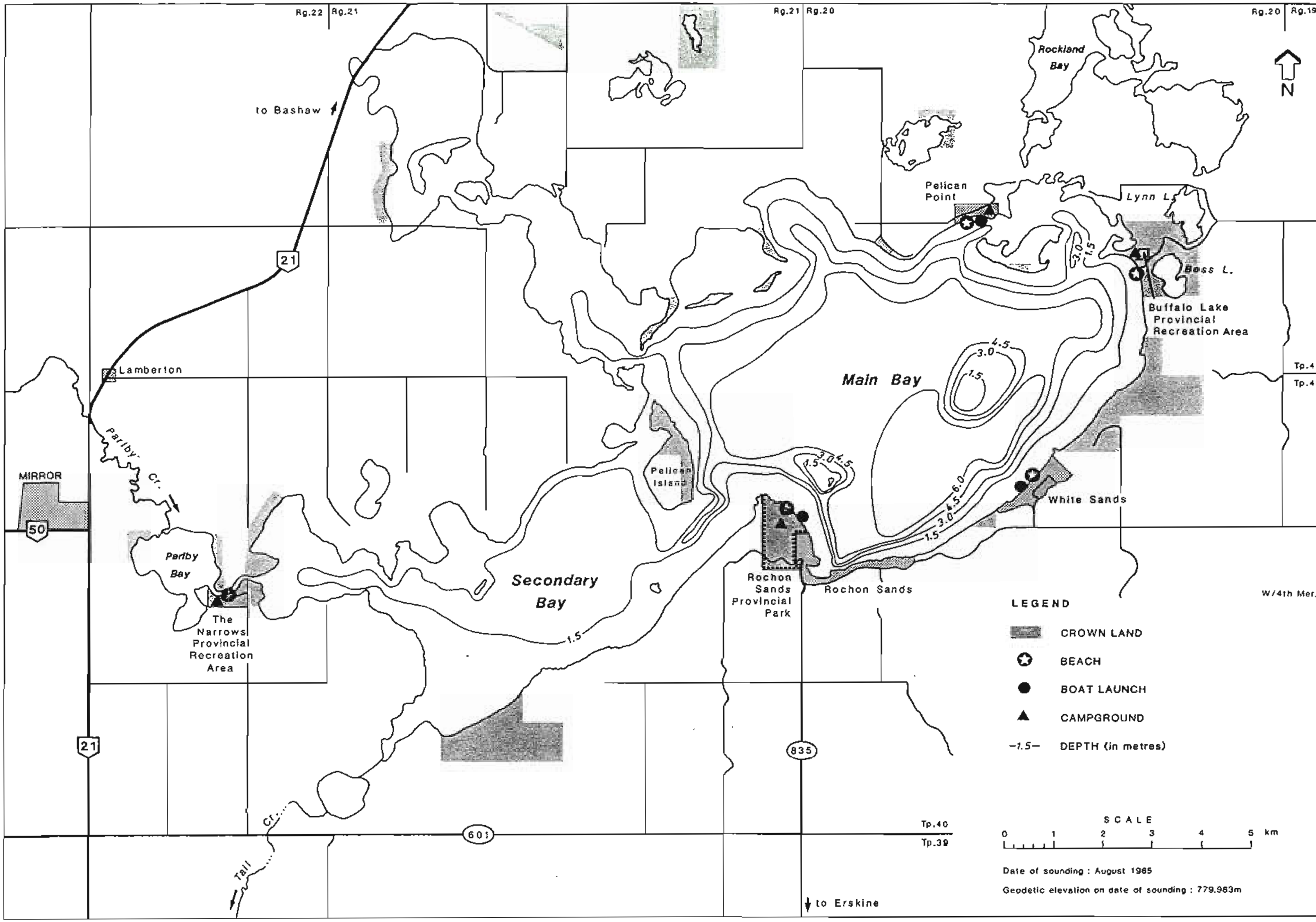


Figure 1. Bathymetric map of Buffalo Lake

As well, Parlby Creek at Highway 21 was sampled approximately monthly over the summer, with additional samples collected in May. Variables measured included major ions and related characteristics, nutrients, carbon fractions, conductivity, pH, transparency, dissolved oxygen, and temperature. Discharge is monitored continuously at this station.

3.0 RESULTS OF THE 1995 MONITORING PROGRAM

The focus of the water quality monitoring program on Buffalo Lake has been primarily on the lake's fertility. Fertility is a measure of the potential for aquatic plant growth, both shoreline vegetation (technically called "macrophytes") and suspended algae. A change in the capacity of the lake to produce plants could lead to nuisance algal blooms, decreased levels of dissolved oxygen in winter (and the threat of fish kills), higher turbidity, and a general decline in recreational water quality. A lake characteristic related to this is salinity, because it has been shown that Buffalo Lake's high salinity depresses the growth of algae. Salinity is indicated by measurements of conductivity or total dissolved solids.

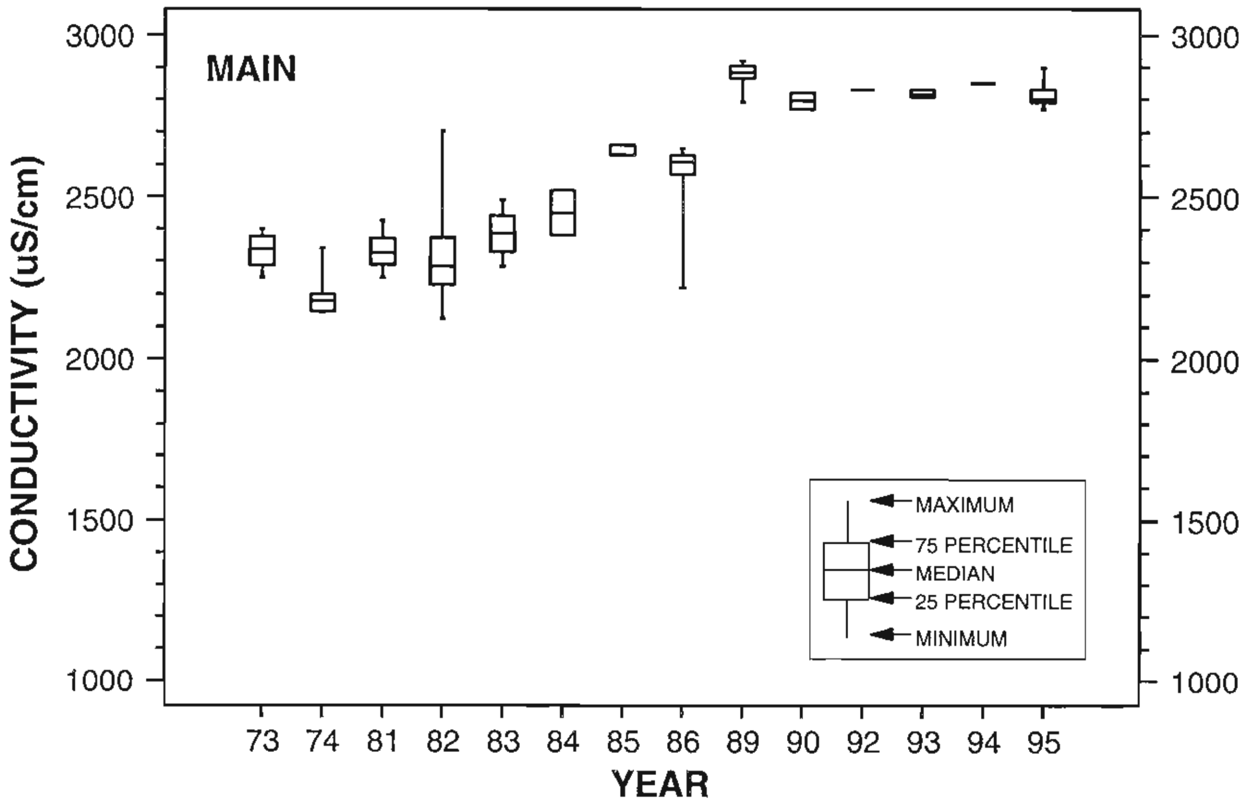
Routine water chemistry for the lake is listed in Table 1. The averages listed for each area are based on the available data since 1986. Parlby Bay has been sampled less frequently than Main Bay and Secondary Bay; Parlby Bay samples are from 1993 and 1995 only. Salinity, as measured by conductivity and total dissolved solids, is highest in Main Bay and lowest in Parlby Bay, with Secondary Bay intermediate in levels. Concentrations of most of the major ions (magnesium, sodium, potassium, sulphate, chloride, bicarbonate, carbonate) follow this pattern, but calcium levels are highest in Parlby Bay. This is likely because the pH is generally lower in Parlby Bay, whereas the high pH in Main and Secondary bays allows calcium (and carbonate) to precipitate out and reduce levels in the water column.

The conductivity of Buffalo Lake has increased since the 1970s (Figure 2), although there has been little increase since 1989. Because of this stability in conductivity over the past six years, the overall rate of increase calculated for 1973 to 1995 is about half of that estimated in the EIA (68 uS/cm per year for Main Bay 1970-1988; EMA 1990). Climatic factors, primarily water inflow and resulting lake volume, largely govern the salinity level for a particular time period. This can be seen by comparing Figure 2 with monthly mean lake levels for 1983-1995 (Figure 3). The declining water level from 1983 to

Table 1. Average concentrations of key water quality characteristics for Buffalo Lake, May-September 1986-1995. Number of samples = 26 for Main, 20 for Secondary, 8 for Parlby Bay.

	MAIN BAY	SECONDARY BAY	PARLBY BAY
pH (range)	9.16 - 9.48	9.00 - 9.48	8.49 - 9.84
Conductivity, uS/cm	2791	2245	704
Total Dissolved Solids, mg/L	1906	1513	435
Iron, mg/L	0.14	0.16	0.04
Calcium, mg/L	5.5	10	24.8
Magnesium, mg/L	83	70	34
Total Hardness, mg/L	359	314	216
Sodium, mg/L	588	454	93
Potassium, mg/L	42.0	34.3	8.6
Fluoride, mg/L	0.28	0.25	0.19
Sulphate, mg/L	474	370	79
Chloride, mg/L	14.6	12.6	7.5
Silica, mg/L	1.0	2.5	5.3
Total Alkalinity, mg/L as $CaCO_3$	1163	937	312
Bicarbonate, mg/L	1020	840	287
Carbonate, mg/L	197	149	45
Total Phosphorus, mg/m^3	68.8	72.3	51.8
Chlorophyll *a*, mg/m^3	10.4	8.6	3.8

1989 resulting in a increasingly smaller lake volume and increasing salinity. The relationship between conductivity and water level is inverse and highly statistically significant ($P<0.0001$, $r^2=0.68$, n=30). In the EIA, it was predicted that salinity levels in the lake will decline by as much as 20% with the initial diversion to increase the water level. The water chemistry of Parlby Creek will resemble that of the Red Deer River when pumping is under way, and presumably the chemistry of Parlby Bay will exhibit more change than other areas of the lake.



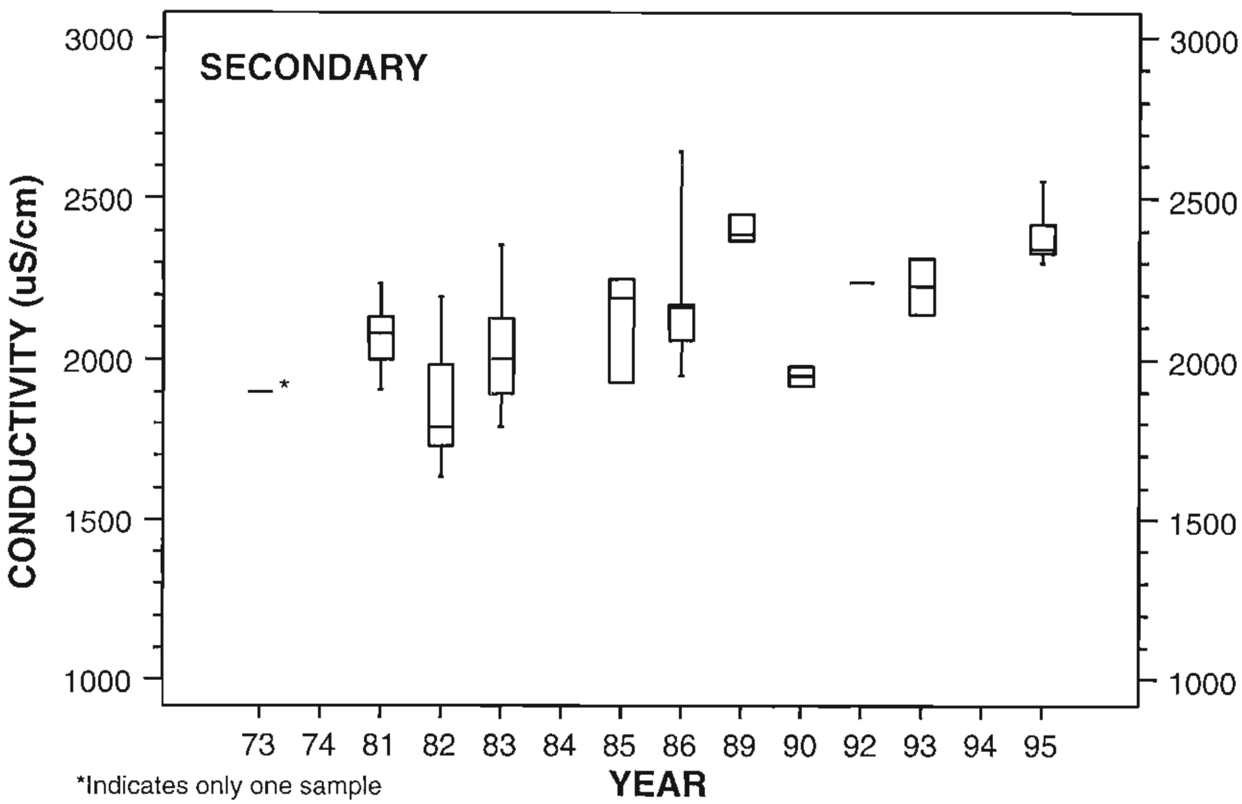
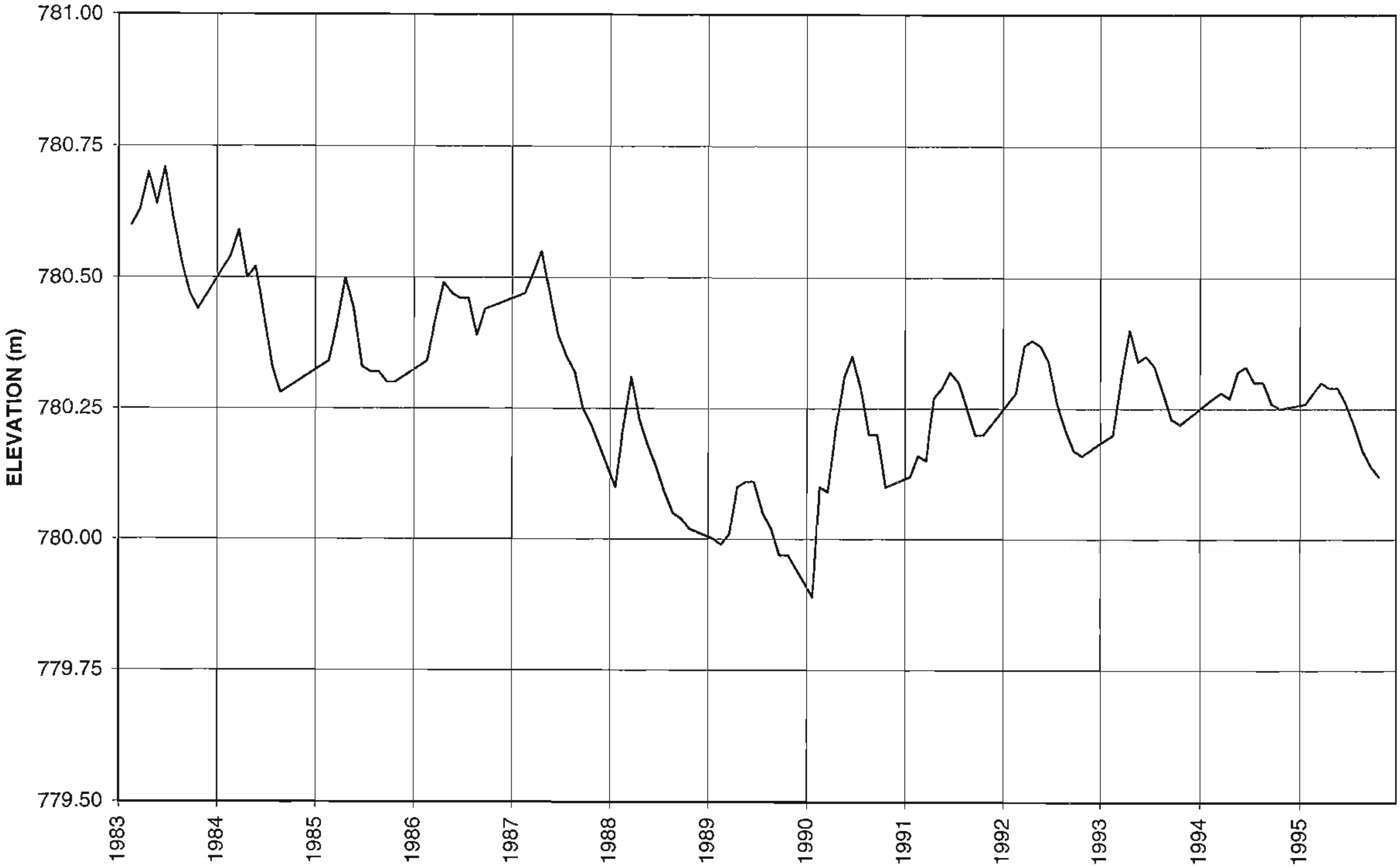


Figure 2. Conductivity in Buffalo Lake, April to September, 1973 to 1995.

Figure 3. BUFFALO LAKE NEAR ERSKINE - 05CD005
MONTHLY MEAN LAKE LEVELS



The pH levels recorded in both Main Bay and Secondary Bay exceed Canadian Water Quality Guidelines for protection of freshwater aquatic life (Canadian Council of Resource and Environment Ministers 1987). This generally means that only species adapted to highly alkaline water will be present in the lake, or that freshwater species will only be able to reproduce by moving into areas of the lake where pH is lower. The pH of the Red Deer River is much lower (usually around 8.2 in the summer, range 7.9 to 8.6 pH units), but the pH of Main and Secondary bays may not change much after the water level of the lake is raised, because the lake is so well buffered.

Important indicators of fertility that were measured during 1995 (and in previous studies) were levels of the nutrient phosphorus and the amount of algae in the water (as indicated by its chlorophyll *a* content). In most lakes, the greenness of the water is directly related to the amount of phosphorus present, because phosphorus is usually the nutrient in shortest supply. Thus, algae suspended in the water grow in proportion to the amount of phosphorus present. This is also true for rooted aquatic vegetation, but these plants can take nutrients from the bottom sediment, which is often rich in phosphorus, nitrogen and other nutrients. Along with water clarity or transparency (called Secchi depth), the measurement of phosphorus and chlorophyll *a* concentrations in lake water provides a simple, straightforward way to assess the lake water quality for recreation.

Table 2 presents average levels of nutrients, Secchi transparency, chlorophyll *a* and conductivity in Buffalo Lake and Parlby Creek during May through September, 1995. Phosphorus concentrations are fairly similar in the three areas of Buffalo Lake, especially dissolved phosphorus. The highest phosphorus concentrations were observed in Parlby Creek; nutrient concentrations in creeks are often higher than in lakes.

Concentrations of chlorophyll *a* show a gradient from west to east. This is the reverse of what might be expected if salinity were the only factor affecting the amount of suspended algae produced for the amount of phosphorus present. One would expect the highest chlorophyll concentrations in Parlby Bay, because salinity is lowest. The most likely explanation for this is that most of aquatic plant growth in the bay is in the form of macrophytes rather than algae. It has been observed on other lakes that in shallow protected areas, the water can be very clear, but with prolific macrophyte growth over the bottom, while the main part of the lake is green with algae. This may also explain why chlorophyll *a* levels in Secondary Bay are lower than those in Main Bay; macrophyte growth in Secondary Bay is also luxuriant.

Table 2. Average concentrations for trophic indicators and other water quality variables in Buffalo Lake and Parlby Creek, May-September 1995. Units are mg/m^3 except as indicated otherwise, number of samples = 5.

	MAIN BAY	SECONDARY BAY	PARLBY BAY	PARLBY CREEK
Total Phosphorus	65.5	75.0	59.2	115
Dissolved Phosphorus	35.1	29.9	31.1	88.7
Total Nitrogen	2599	2881	1771	1635
Ammonia Nitrogen	27	25	27	26
Nitrate + Nitrite - N	3	1	3	3
Chlorophyll *a*	10.5	6.6	4.2	3.6
Secchi Depth, m	2.0	1.2	bottom	--
Conductivity, uS/cm	2818	2400	735	819

Nitrogen levels are also similar in Main Bay and Secondary Bay, while total nitrogen is somewhat lower in Parlby Bay. Most of the total nitrogen measured is in the organic form.

As in other lakes, Buffalo Lake's water quality varies over the summer. Figure 4 shows examples of seasonal variation with 1995 data for Main Bay, Secondary Bay, Parlby Bay and Parlby Creek. Phosphorus and chlorophyll *a* levels usually peak in late July or August in Main Bay, but the magnitude of this peak varies from year to year. Both weather conditions and the timing of sample collection play a role in this variability. In Secondary Bay, similar high concentrations of phosphorus and chlorophyll *a* have been observed in July and August, but this area of the lake seems to maintain high levels of chlorophyll well into September. The depth of the Secchi disk reading is generally inversely correlated with levels of chlorophyll, because the presence of algae in the water reduces transparency. In a shallow lake like Buffalo, transparency may also be reduced on a very windy day as bottom sediments are stirred up. The chlorophyll *a* concentration in Parlby Bay was quite low through the summer, but increased in October, probably as a result of nutrient release as the aquatic vegetation died off. In Parlby Creek, phosphorus concentrations varied considerably over the sampling season. The phosphorus concentration appeared to vary

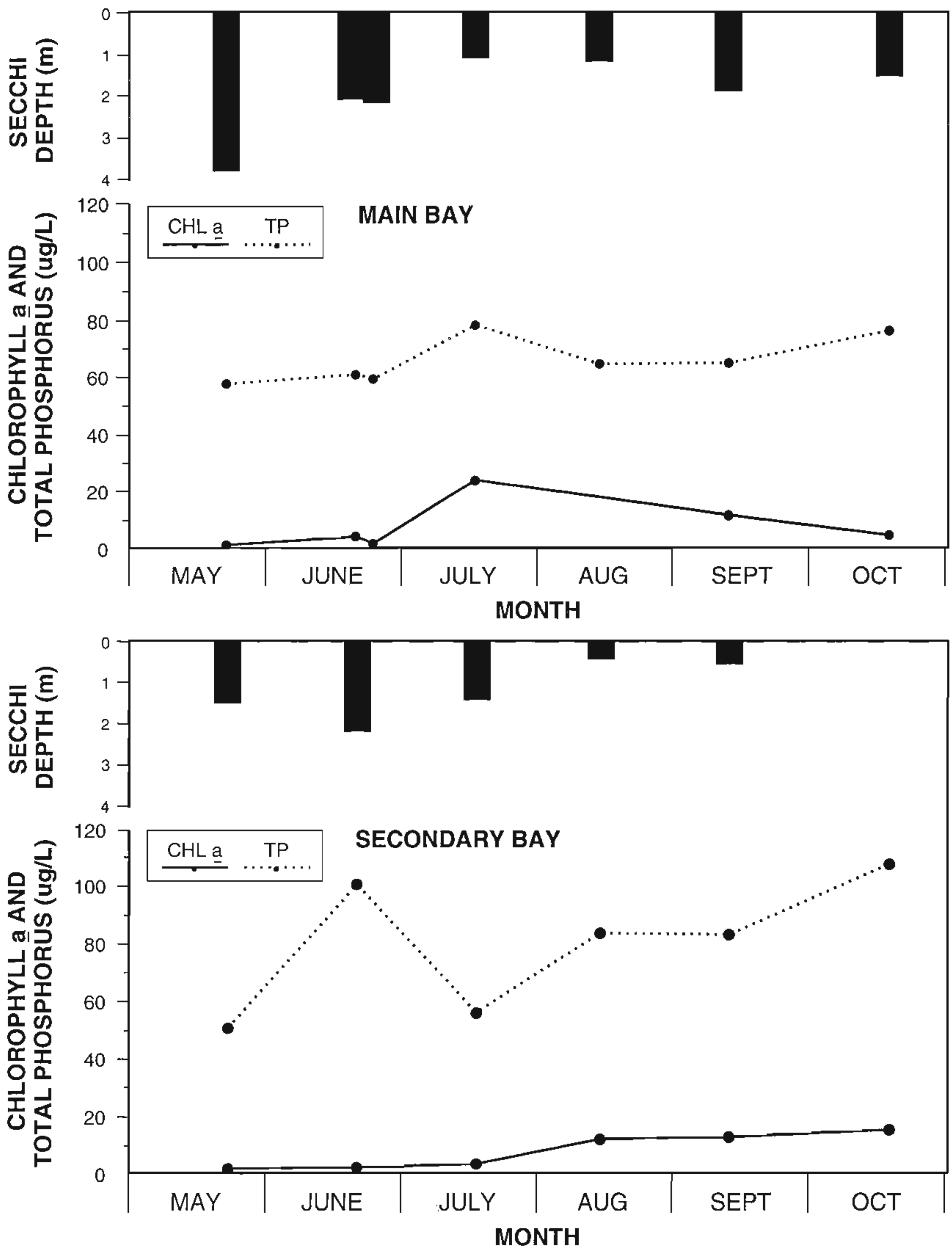
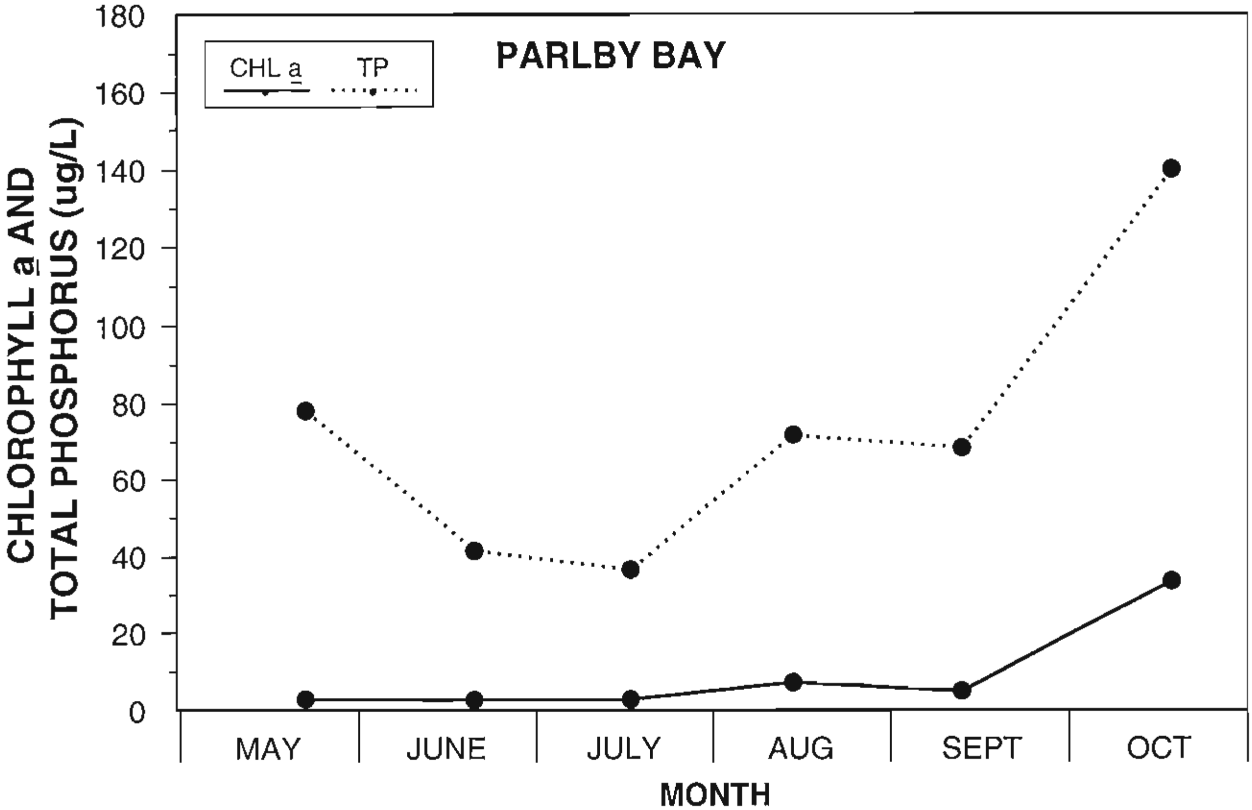
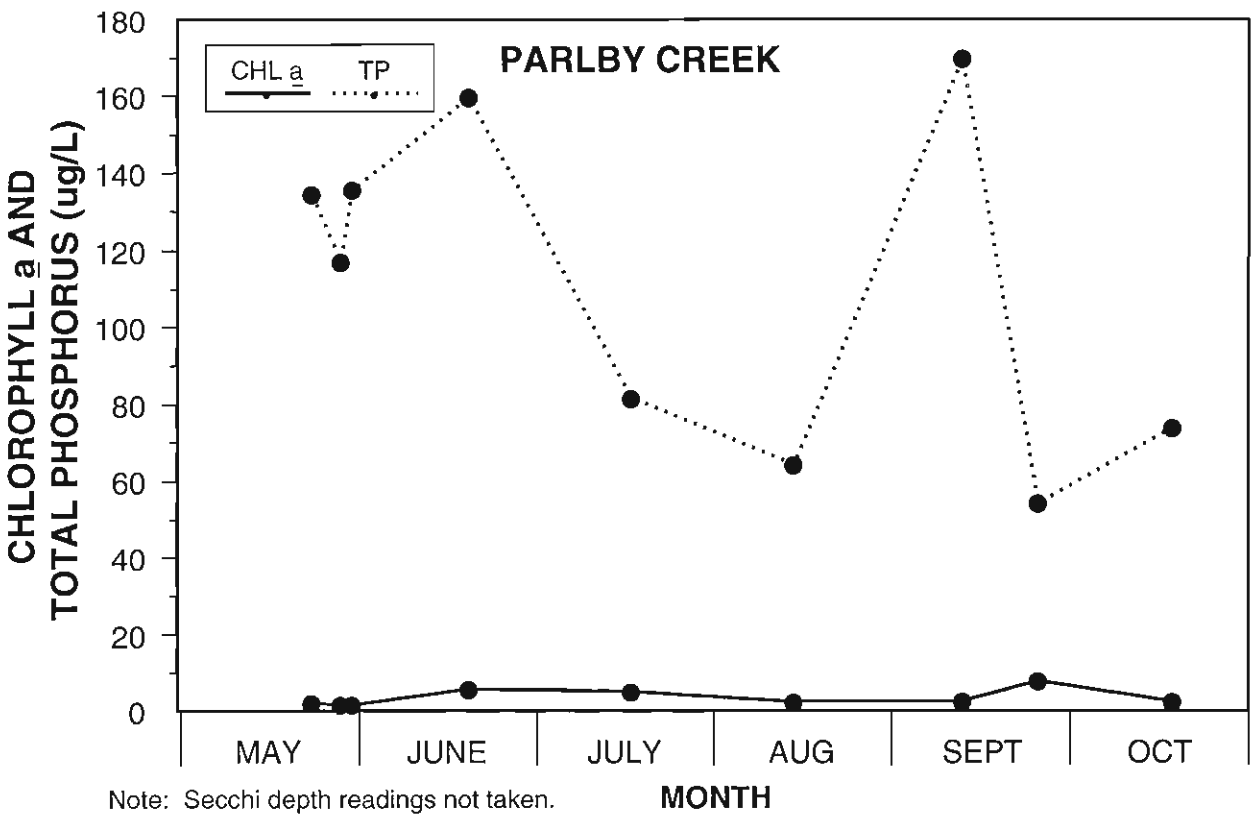


Figure 4a. Secchi depth and concentrations of total phosphorus and chlorophyll a in Buffalo Lake Main Bay and Secondary Bay, 1995.





Note: Secchi depth readings not taken.

Figure 4b. Concentrations of total phosphorus and chlorophyll a in Parlby Bay and Parlby Creek, 1995.

more with conductivity than with flow rate. In late September, a sample was collected during the time the pumps for the diversion were being tested. Even though the sample was collected after Red Deer River water had passed through ponds, structures and joined with Parlby Creek, nutrient concentrations and salinity were lowest of all of the samples collected from the creek that summer.

Figure 5 shows summer average values for Secchi depths and levels of phosphorus and chlorophyll *a* for the 10 years of data in Main Bay and seven years of data in Secondary Bay. Although the data for Main Bay vary considerably from year to year, there does not appear to be a trend toward increasing levels of chlorophyll *a*. As well, the chlorophyll data from Main Bay for 1973-74 averaged 7.9 mg/m^3 chlorophyll *a*, which falls into the range observed for 1983-1995. For total phosphorus, there appears to be a slight increase in levels since the early 1980s, but there are too many data gaps to test the data statistically. This slight increase in TP is not apparent for Secondary Bay.

The present trophic status of Buffalo Lake is compared with that of other central Alberta lakes in Figure 6. The data are not strictly comparable, because average values for lakes from different years were used to make up the graph. However, the graph serves to show generally how Buffalo Lake compares to other lakes in terms of its productivity level. Based on the average chlorophyll concentration for the three lake areas since 1983, Buffalo Main Bay and Secondary Bay are mildly eutrophic, and Parlby Bay is mesotrophic. These categories mean that Buffalo Lake has reasonably good water quality for much of the summer, even though the water may appear green at times and aquatic vegetation is abundant, particularly in Secondary and Parlby bays.

The possibility of winter kill due to low concentrations of dissolved oxygen was identified as an issue to be addressed during studies to assess the impact of the diversion. Lake surface to bottom measurements of temperature and dissolved oxygen concentrations have been made occasionally in both summer and winter over the past 20 years. Figure 7 shows examples of these "profiles" of dissolved oxygen and temperature in Buffalo Lake for winter and summer. The winter profiles for Main Bay, in February of 1988 and 1995 indicate surprisingly high levels of dissolved oxygen to a depth of 5 m, after which there was some degree of depletion. In March 1996, levels were somewhat lower, but concentrations throughout most of the water column would pose no problem for overwintering fish

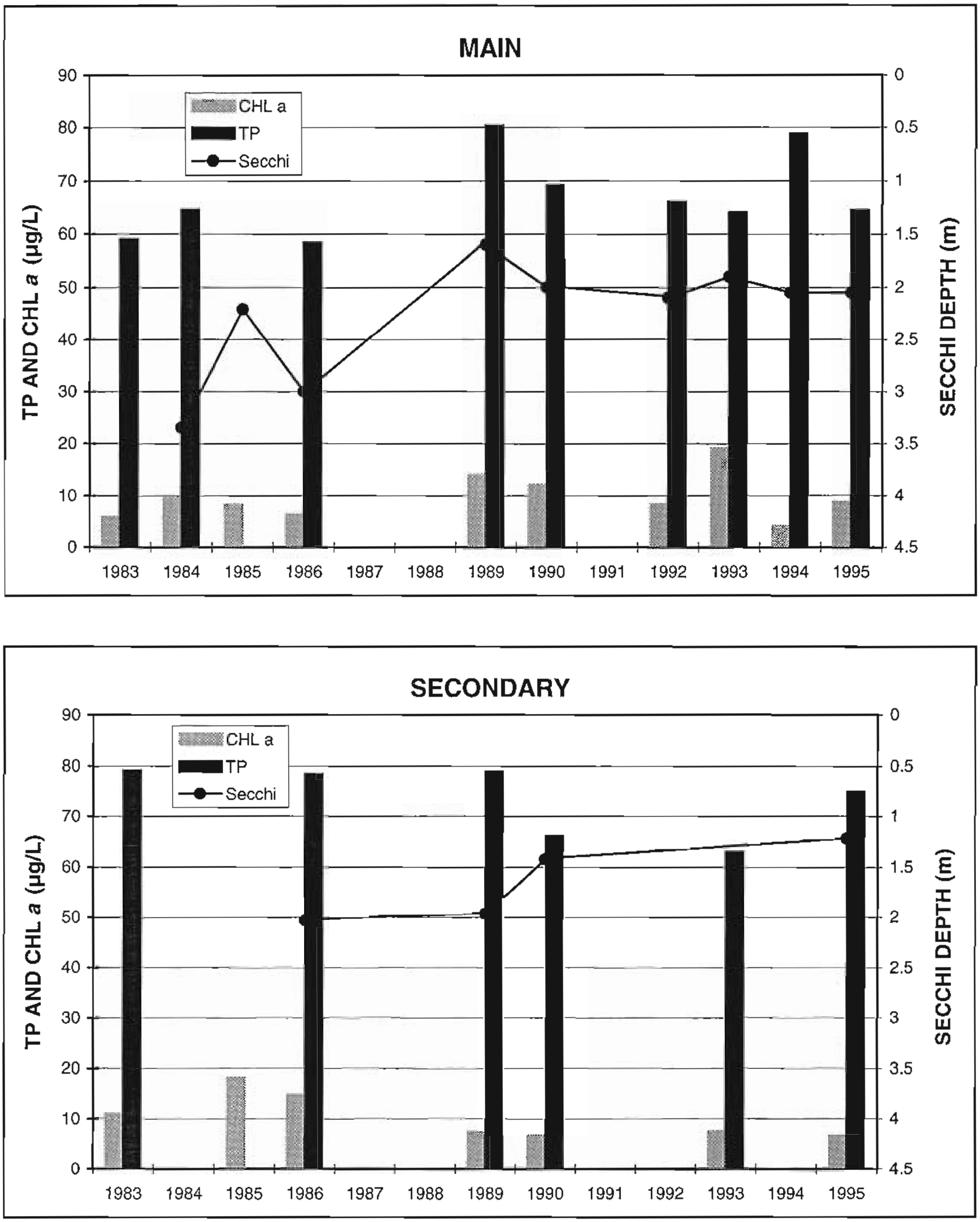


Figure 5. Average open-water Secchi depth and concentrations of chlorophyll *a* and total phosphorus in Buffalo Lake.

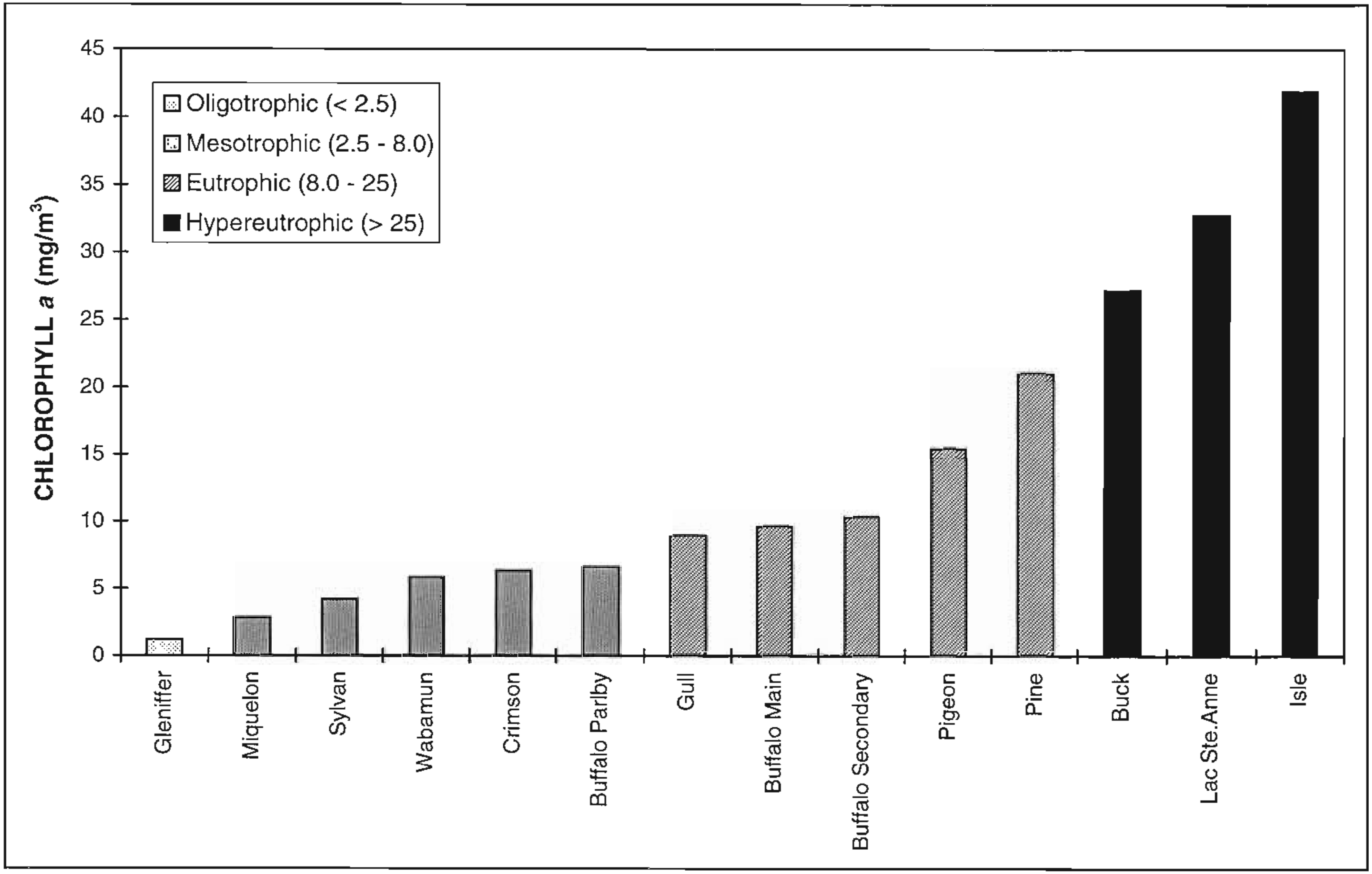


Figure 6. Average summer concentrations of chlorophyll *a* in Buffalo Lake and other south-central Alberta lakes. Values for lakes based on all available data since 1983.

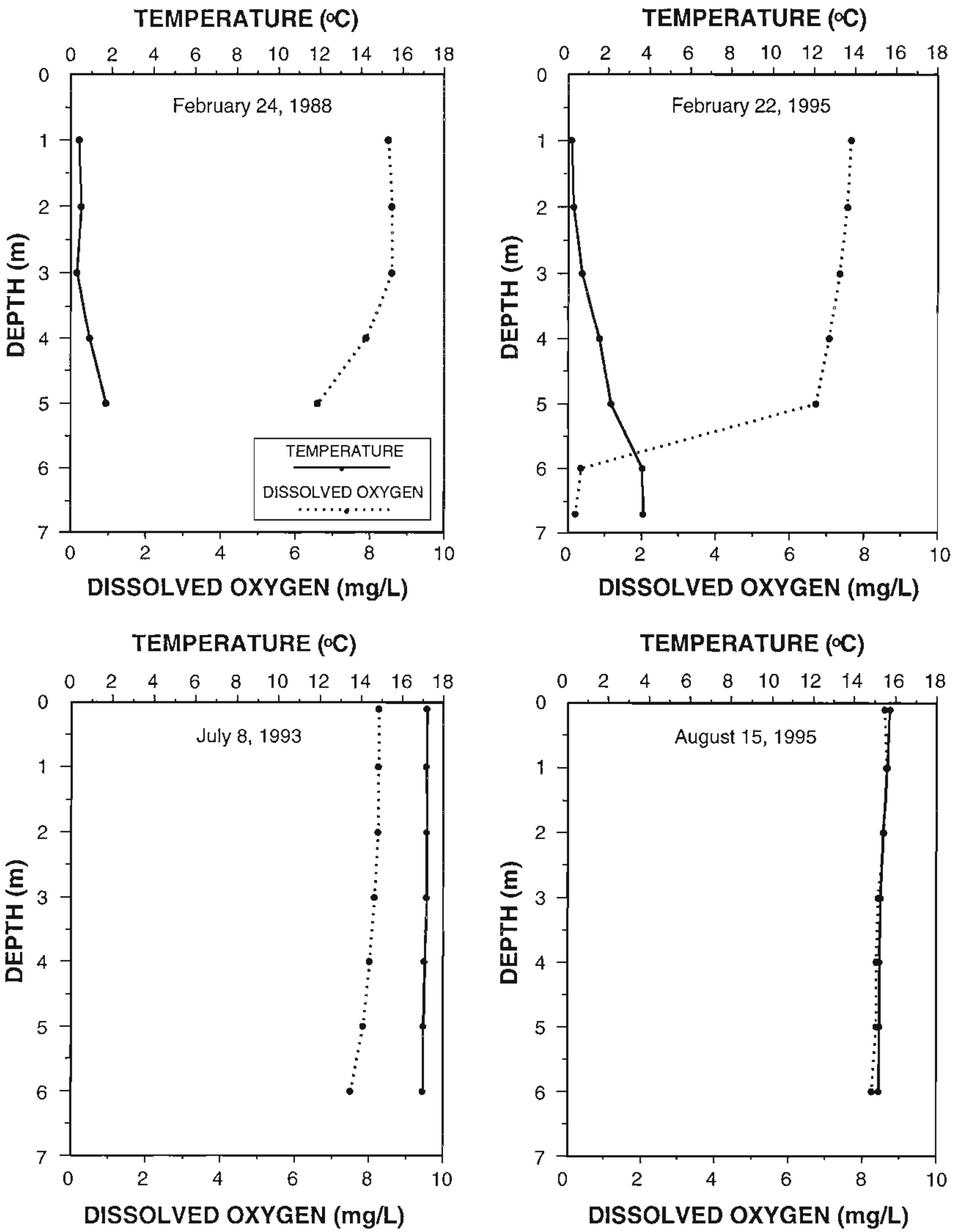


Figure 7a. Vertical profiles of temperature and dissolved oxygen in Buffalo Lake Main Bay, 1988, 1993 and 1995.

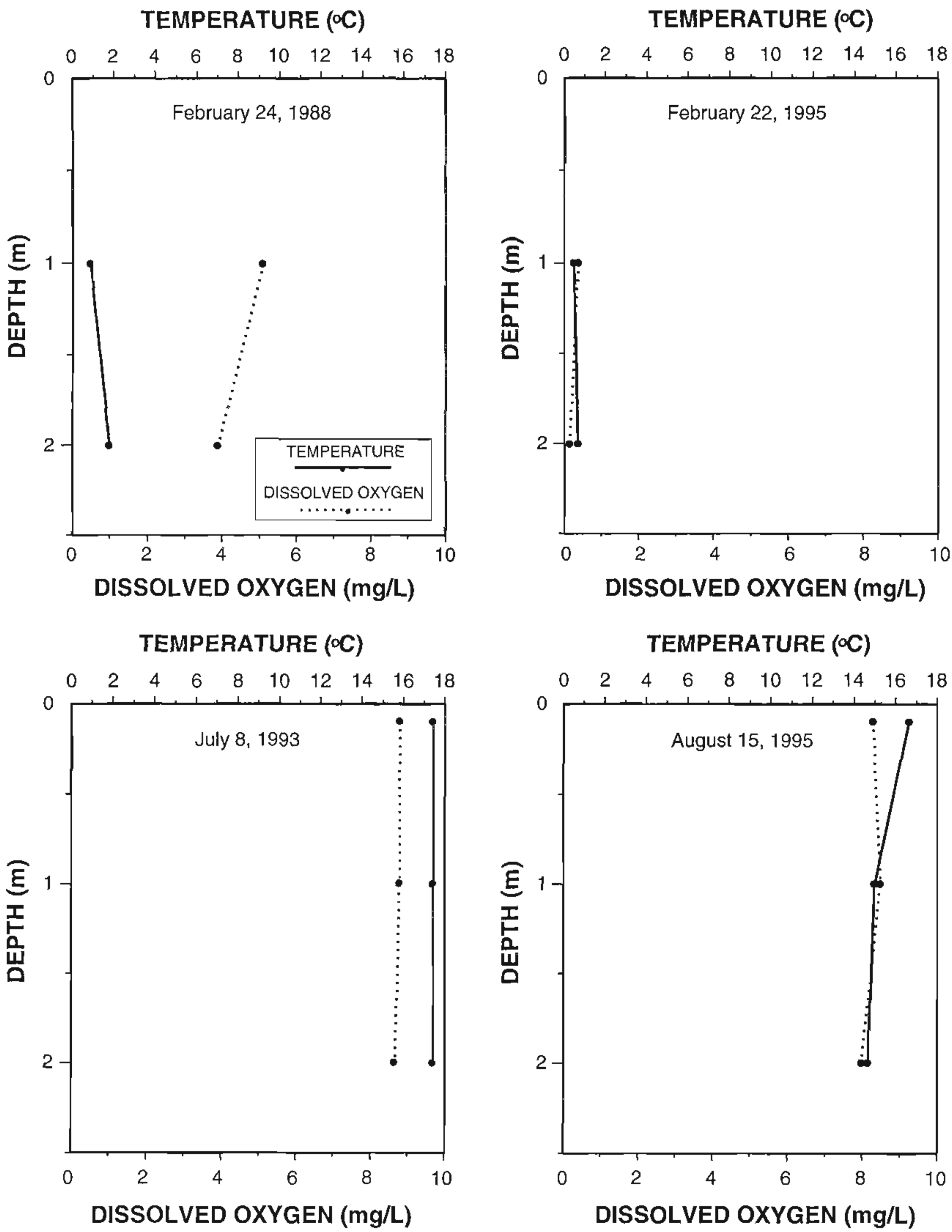


Figure 7b. Vertical profiles of temperature and dissolved oxygen in Buffalo Lake Secondary Bay, 1988, 1993 and 1995.

populations. The temperature was highest near the bottom, which is typical of lakes under ice. The summer profiles for temperature, in July of 1993 and August of 1995, indicate that there was no layering or stratification present. This suggests that the lake mixes completely on windy days throughout the summer. There was little evidence of oxygen depletion, even at the bottom.

In Secondary Bay, which was sampled on the same dates as Main Bay, oxygen was fairly high in February of 1988, but depleted in February of 1995 and March of 1996. In 1995 and 1996, fish would likely have to seek areas with higher levels of dissolved oxygen to survive. The summer profiles indicate complete mixing on windy days, with little evidence of oxygen depletion near the bottom. Parlby Bay has rarely been sampled during the winter. In March 1993, there was less than 1 mg/L dissolved oxygen at the point sampled in the bay. The summer 1995 profiles indicated very high levels of dissolved oxygen during the day (supersaturation) on all sampling dates. It is likely that dissolved oxygen declined to low levels during the night due to respiration by the dense plant cover.

4.0 CONCLUSIONS

Buffalo Lake is a moderately saline, eutrophic lake. There is no apparent trend toward increasing levels of productivity, although salinity levels are higher since the mid-1970s. The main basin has the highest salinity, and tiny Parlby Bay the lowest salinity. The salinity in Main and Secondary bays inhibits the growth of algae to some extent, so the lake's productivity level is lower than if the lake were fresher. Although the diversion of low-saline water from the Red Deer River will likely decrease the lake's salinity level, it has been predicted in the EIA that there will be little impact on recreational water quality. For Main Bay, this is probably true, because conductivity in Secondary Bay is 14% lower than in Main Bay (1995 data), yet there is little difference in the average chlorophyll level between the two areas. The salinity of Secondary Bay would be reduced more than in Main Bay, so there is a greater possibility that chlorophyll levels could increase in Secondary Bay. Parlby Bay would probably come to resemble Red Deer River water, but this would likely not affect aquatic plant populations in the bay.

5.0 REFERENCES

Canadian Council of Resource and Environment Ministers. 1987. Canadian Water Quality Guidelines. Task Force on Water Quality Guidelines.

Environmental Management Associates (EMA). 1990. Parlby Creek - Buffalo Lake Development Project. Buffalo Lake Stabilization Component. Environmental Impact Assessment. Calgary.

Shaw, Jackie. 1994. 1993 Update: Water Quality Monitoring Program for the Parlby Creek-Buffalo Lake Water Management Project. Prep. for the Water Quality Subcommittee of the Buffalo Lake Management Team. Planning Division, Alberta Environmental Protection.

Appendix I.
Buffalo Data 1995

Parlby Creek - Buffalo Lake Water Management Project 1995 DATA										
	MAIN BASIN									
Sampling	**Chlorophyll**	**Total P**	**Secchi**	**TDP**	**NO2+NO3**	**NH3**	**TN**	**COND**	**pH**	**TDS**
Date	mg/m3	mg/m3	m	mg/m3	mg/m3	mg/m3	mg/m3	uS/cm	units	g/m3
23-May-95	1.5	57.7	3.8	41.2	7	43	2357	2830	9.32	1963
21-Jun-95	4.6	61.0	2.1	33.0	2	16	2592	2770	9.29	1952
18-Jul-95	24.0	78.7	1.1	35.4	2	15	2642	2790	9.29	1970
15-Aug-95		64.8	1.2	32.8	2	33	3052	2800	9.32	1972
13-Sep-95	11.9	65.1	1.9	33.3	2	29	2352	2900	9.3	1993
19-Oct-95	5.1	76.6	1.5	39.3	40	53	3790	2860	9.26	2031
average	**9.4**	**67.3**	**1.9**	**35.8**	**9**	**32**	**2798**	**2825**		**1980**
May-Sept.	**10.5**	**65.5**	**2.0**	**35.1**	**3**	**27**	**2599**	**2818**		**1970**
	SECONDARY BAY									
	Chlorophyll	**Total P**	**Secchi**	**TDP**	**NO2+NO3**	**NH3**	**TN**	**COND**	**pH**	**TDS**
	mg/m3	mg/m3	m	mg/m3	mg/m3	mg/m3	mg/m3	uS/cm	units	g/m3
23-May-95	1.9	50.9	1.5	30.2	1	28	2351	2340	9.16	1583
21-Jun-95	2.3	100.6	2.2	28.1	1	25	2301	2330	9.22	1611
18-Jul-95	3.6	56.2	1.4	28.5	1	20	2351	2420	9.3	1675
15-Aug-95	12.3	83.8	0.4	30.3	1	24	5000	2350	9.27	1627
13-Sep-95	13.0	83.3	0.6	32.6	1	27	2401	2560	9.19	1755
19-Oct-95	15.5	107.6		31.7	4	26	3754	2570	9.17	1788
average	**8.1**	**80.4**	**1.2**	**30.2**	**2**	**25**	**3026**	**2428**		**1673**
May-Sept.	**6.6**	**75.0**	**1.2**	**29.9**	**1**	**25**	**2881**	**2400**		**1650**
	PARLBY BAY									
	Chlorophyll	**Total P**	**Secchi**	**TDP**	**NO2+NO3**	**NH3**	**TN**	**COND**	**pH**	**TDS**
	mg/m3	mg/m3	m	mg/m3	mg/m3	mg/m3	mg/m3	uS/cm	units	g/m3
24-May-95	2.9	78.1	0.5	40.8	2	17	1622	820	8.49	506
20-Jun-95	2.8	41.5	0.6	28.3	2	22	1602	712	8.93	446
18-Jul-95	2.9	36.6	0.7	24.3	1	27	1661	660	9.84	414
15-Aug-95	7.4	71.7	0.7	33.8	1	28	2210	764	9.57	488
13-Sep-95	5.1	68.3	0.6	28.5	9	43	1759	720	9.22	438
19-Oct-95	33.6	140	0.7	21.2	4	39	1540	648	8.36	391
average	**9.1**	**72.7**	**0.6**	**29.5**	**3**	**29**	**1732**	**721**		**447**
May-Sept.	**4.2**	**59.2**	**0.6**	**31.1**	**3**	**27**	**1771**	**735**		**458**
	PARLBY CREEK at gauging site									
	Chlorophyll	**Total P**	**Avg. Flow**	**TDP**	**NO2+NO3**	**NH3**	**TN**	**COND**	**pH**	**TDS**
	mg/m3	mg/m3	m3/sec	mg/m3	mg/m3	mg/m3	mg/m3	uS/cm	units	g/m3
24-May-95	2	134.4	0.723	119.2	3	20	1393	785	8.36	477
29-May-95	1.6	117.2	2.51	96.1	3	36	1823	834	8.1	512
31-May-95	1.6	135.6	3	110	3	21	2373	886	7.88	548
20-Jun-95	5.7	159.7	0.315	119.6	1	20	1651	868	8.26	556
18-Jul-95	5.1	81.7	0.063	61.8	3	24	1653	683	9.49	425
15-Aug-95	2.4	64.3	0.181	45.6	2	20	1522	762	8.82	475
13-Sep-95	2.6	169.8	0.006	138.3	3	45	1573	1069	8.49	675
28-Sep-95	7.9	54.4	1.65	18.6	2	21	1092	662	8.65	397
19-Oct-95	2.4	73.8	0.029	33.2	4	24	1384	919	8.55	567
average	**3.5**	**110.1**		**82.5**	**3**	**26**	**1607**	**830**		**515**
May-Sept.	**3.6**	**114.6**		**88.7**	**2.5**	**25.9**	**1635.0**	**819**		**508**

Appendix I.
Buffalo Data 1995

MAIN BASIN									
Sampling	**Ca**	**Mg**	**K**	**Na**	**SO4**	**Cl**	**HCO3**	**CO3**	**T. Alk.**
Date	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3CaCO3
23-May-95	4	88	42.3	605	502	16	1049	189	1176
21-Jun-95	5	84	41.8	593	506	16.4	1043	193	1177
18-Jul-95	5	85	43.2	602	507	16.3	1049	196	1187
15-Aug-95	4	86	43	608	498	16.2	1034	208	1196
13-Sep-95	5	84	44.1	616	506	16.3	1047	207	1203
19-Oct-95	4	86	43.9	616	529	16.7	1082	203	1225
average	**5**	**86**	**43**	**607**	**508**	**16**	**1051**	**199**	**1194**
May-Sept.	**5**	**85**	**43**	**605**	**504**	**16**	**1044**	**199**	**1188**
SECONDARY BAY									
	Ca	**Mg**	**K**	**Na**	**SO4**	**Cl**	**HCO3**	**CO3**	**T. Alk.**
	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3CaCO3
23-May-95	9	74	35.3	479	389	14.2	939	120	971
21-Jun-95	9	74	35.8	481	399	14.8	918	145	995
18-Jul-95	8	77	35.7	507	412	15	908	173	1033
15-Aug-95	9	78	37.1	485	396	14.8	911	159	1013
13-Sep-95	9	77	40.4	534	436	15.6	991	156	1072
19-Oct-95	9	80	39.6	524	452	16.3	1030	160	1112
average	**9**	**77**	**37**	**502**	**414**	**15.1**	**950**	**152**	**1033**
May-Sept.	**9**	**76**	**37**	**497**	**406**	**14.9**	**933**	**151**	**1017**
PARLBY BAY									
	Ca	**Mg**	**K**	**Na**	**SO4**	**Cl**	**HCO3**	**CO3**	**T. Alk.**
	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3CaCO3
24-May-95	56	35	11.8	88	75	9.3	444	13	386
20-Jun-95	32	37	10.3	85	86	8.3	328	26	313
18-Jul-95	18	36	8.5	100	64	8	173	95	299
15-Aug-95	13	34	10.1	128	90	8.5	257	79	343
13-Sep-95	20	37	7.2	95	74	7.2	302	48	328
19-Oct-95	42	36	7.1	53	49	6	386	7	327
average	**30**	**36**	**9**	**92**	**73**	**8**	**315**	**45**	**333**
May-Sept.	**28**	**36**	**10**	**99**	**78**	**8**	**301**	**52**	**334**
PARLBY CREEK at gauging site									
	Ca	**Mg**	**K**	**Na**	**SO4**	**Cl**	**HCO3**	**CO3**	**T. Alk.**
	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3CaCO3
24-May-95	59	32	8.8	82	54	8.7	456	7	386
29-May-95	59	36	12.9	87	70	10.4	480	0	393
31-May-95	62	41	17.1	86	87	11.1	495	0	406
20-Jun-95	77	43	7.5	74	121	5.7	464	0	380
18-Jul-95	18	31	4.6	110	38	7.2	287	74	359
15-Aug-95	42	40	6.7	89	86	7.6	364	26	342
13-Sep-95	51	46	9.4	136	152	11.7	517	15	448
28-Sep-95	33	42	8.9	58	65	5.7	341	17	307
19-Oct-95	59	41	7.4	109	51	9.4	546	22	484
average	**51**	**39**	**9.3**	**92**	**80**	**8.6**	**439**	**18**	**389**
May-Sept.	**50**	**39**	**9.5**	**90**	**84**	**8.5**	**426**	**17**	**378**