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**LAKE VARIATION AND CLIMATE CHANGE STUDY:
ELA LAKES, 1986-1990.**

**III. FIELD OBSERVATIONS, HYDROLOGICAL,
LIGHT, AND TEMPERATURE MEASUREMENTS**

by

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ABSTRACT

Cruikshank, D.R., P. Campbell, S.E.M. Kasian, E.U. Schindler, and G.K. McCullough. 1993. Lake variation and climate change study: ELA lakes, 1986-1990. III. Field observations, hydrological, light, and temperature measurements. Can. Data Rep. Fish. Aquat. Sci. 908: iv + 94 p.

This is the third in a series of reports presenting data collected from 1986 to 1990 on Lake Variation and Climate Change Study lakes in the Experimental Lakes Area (ELA). Lake and stream sampling stations for the physical part of the program are described and lake stage gauges are located. Field observations, including local weather conditions, hydrological, transparency, and temperature measurements for each lake are reported. Methods are documented. Light attenuation profiles from 1983 for L373 are also documented.

Key words: light attenuation; light extinction; temperature; weather; discharge; lake stage; natural variability; climate change; global warming; Experimental Lakes Area.

RÉSUMÉ

Cruikshank, D.R., P. Campbell, S.E.M. Kasian, E.U. Schindler, and G.K. McCullough. 1993. Lake variation and climate change study: ELA lakes, 1986-1990. III. Field observations, hydrological, light, and temperature measurements. Can. Data Rep. Fish. Aquat. Sci. 908: iv + 94 p.

Voici le troisième d'une série de rapports présentant les données recueillies entre 1986 et 1990 lors de l'étude sur la variation des lacs et le changement climatique, qui a été menée dans la Région des Lacs Expérimentaux. On y décrit les stations d'échantillonnage des lacs et des ruisseaux pour le volet physique du programme et on indique l'emplacement des indicateurs de niveau des lacs. On fait également état des observations sur le terrain, y compris des conditions météorologiques locales, des mesures hydrologiques, de transparence et de température pour chaque lac. Les méthodes sont documentées, de même que les profils d'atténuation de la lumière en 1983 pour le lac 373.

Mots-clés: atténuation de la lumière; disparition de la lumière; température; conditions météorologiques; débit; niveau des lacs; variabilité naturelle; changement climatique; réchauffement de la planète; Région de Lacs Expérimentaux.

INTRODUCTION

The Lake Variation and Climate Change Study at ELA commenced in 1986. Campbell (1993) briefly described the study rationale, including lake selection criteria. Following a season of reconnoitre and synoptic surveys in 1986, seven lakes constituting two series were selected. Each series covers a wide range in flushing rates. The lakes in one series (L373, L377, L442) are deep and thermally stratified. The other lake series (L149, L164/L165, L938) are shallow and generally well-mixed. All selected lakes have approximately the same surface area. Different flushing rates were effected simply by varying watershed size. McCullough and Campbell (1993) summarized morphological characteristics of the lakes and watersheds and briefly described the physiography of the study area.

A 10-year sampling program on the seven lakes and their inlets and outlets was initiated in 1987. Most physical, chemical and biological data were collected every two weeks during the open-water season. In this report, the third in this series, field observations, including local weather conditions, hydrological, light, and temperature measurements are presented for the period 1986-1990 (L373 has been a reference lake at the ELA since 1983; previously unpublished light data from 1983 to 1986 are also presented here; Secchi depths and lake temperature profiles from 1983-1986 have been published elsewhere: Cruikshank 1984; Lyng and Cruikshank 1985; Cruikshank 1986; Cruikshank 1987; Cruikshank 1993). Sampling methods are documented. Lake and stream sampling stations for the physical part of the study and lake stage gauges are located. Other reports in this series will include nutrient and major ion chemistry as well as biological data collected from 1986 through 1990.

METHODS

LOCATING SAMPLING STATIONS

The regular sampling program commenced on the ELA Lake Variation and Climate Change Study lakes, including inlets and outlets, in May 1987. At that time, permanent sampling stations were established. Measurements of light, temperature, and Secchi transparency were done at the same station

where water chemistry, phytoplankton, and primary production samples were collected. With one exception, these were single stations located centrally in the pelagic, so as to be at or near the point of maximum depth and in the confluence of all major inlets. In the case of L938, a second station was established in a backwater area in order to investigate potential horizontal heterogeneity of the water mass. In streams, temperature measurements were done at the same location as for chemistry sampling. Inlet stations were located as close as possible to the lake but at an elevation above lake level sufficient to avoid collecting lake backflow water. Outlet stations are in the lake in the vicinity immediately adjacent to and feeding the outflowing stream. Outlet stations were located in the lake rather than in the outlet stream in order to avoid the possibility of any in-stream alteration of the chemical composition of the water actually exiting the lake. Where required, stream stations have been marked with wooden stakes. In 1986, some synoptic survey samples were collected at locations other than those ultimately selected for the regular sampling program; these exceptions are noted in Appendix 1, Table A1.

METEOROLOGICAL, LIGHT, AND TEMPERATURE MEASUREMENTS

Meteorological, light, and temperature measurements were done at two-week intervals throughout the open-water seasons (May-October), 1987-1990. During the last few weeks prior to ice-off, one or two sets of temperature measurements were done at accessible locations. On sample collection days, subjective local weather conditions at each lake site were noted and recorded; these included estimates of cloud cover, wind speed and direction.

Methods for taking stream temperatures and lake temperature profiles have been described elsewhere (for example, Cruikshank 1988). Stream-flow temperatures were recorded to the nearest degree Celsius with a simple alcohol pocket thermometer. Lake temperature profiles from surface to bottom were taken at the permanent sampling station at intervals of 1 meter or less. Flett Research Mark II thermistors were used. Each thermistor was calibrated against a mercury thermometer (accurate to 0.2°C) just prior to the beginning of every field season and after every battery replacement.

Depth of the surface-mixed layer (epilimnion) was defined as the top of the first meter interval which exhibited a temperature change exceeding 1°C. The planar thermocline was defined as the depth of maximum rate of change in water temperature. In cases of shallow lakes, or at overturn in the deep lakes where the epilimnion depth was determined to be at or near the lake's bottom, the planar thermocline was taken to be undefined.

Water clarity was determined with a Secchi disk. Secchi disk visibility was measured on the shady side of the boat using a 20 cm diameter disk divided into black and white quadrants. The depth recorded was the average of the depths at which the disk disappeared and first reappeared. Colour of the water against the white quadrants of the disk at half Secchi depth was also noted and recorded.

Light attenuation as a function of depth was measured with different instruments. From 1983 through 1989, two different light meters were used. They were a LI-COR 185 meter used with a 192S sensor and a LI-COR 188B meter used with a 192SB sensor. In 1990, all light attenuation measurements were made with a LI-COR LI-1000 data logger with a 192SB sensor. The differences between the various meters and sensors have been described in Fee et al. (1991). Light attenuation measurements have been described in Shearer et al. (1985). All light readings were measured on the unshaded side of the boat. The first light reading was taken in the air, holding the sensor as far away as possible from the boat to avoid reflected light. In deep, relatively transparent lakes, subsequent readings were taken just below the lake surface, at 0.5 m, at 1 m, and thereafter, at 1-meter intervals until readings were $\leq 0.5\%$ of that in air. In shallow and/or coloured systems, readings were at 0.5 m intervals from surface to 0.5 m above the bottom or the depth at which transmittance was $\leq 0.5\%$ of that in air.

CALCULATION OF LIGHT ATTENUATION COEFFICIENT

Vertical light attenuation coefficients also known as extinction coefficients (K_d) were computed according to Shearer et al. (1985) or Fee et al. (1991). K_d is defined as the slope of the straight line obtained by regressing the logarithm of light intensity against depth. K_d was calculated with a

computer program written in Turbo Pascal which displayed the data graphically on the computer screen together with the statistically fit straight line (linear regression) relating these variables. Data that obviously deviated from this line were manually identified and excluded from the calculation of K_d . This deletion of anomalous data points reduces the uncertainty sometimes associated with light attenuation readings taken near the air/water interface, particularly when there is significant wave action; as well, it tends to negate the effects of phytoplankton peaks below the surface-mixed layer.

LAKE STAGE AND FLOWS

Lake levels were observed using 1 m enamelled steel staff gauges bolted to vertical bedrock surfaces along the lake shores. All gauges were first installed in September 1986. Because L164 and L165 are connected by a short, shallow channel of flat water, the gauge installed on L165 is a reasonable indicator of L164 water level as well. Gauges have been checked occasionally for vertical movement by comparison with water levels measured down from horizontal lines etched in the bedrock surface in 1986. In the case of Lake 373, since 1989, the staff gauge has been checked at least annually by rod and level survey to a bolt set into bedrock near the staff gauge. The etched lines and the bolt have each been assigned an arbitrary elevation of 10 m. Lake levels reported in Appendix 2 have been corrected for any gauge movement relative to these arbitrary benchmarks, ensuring inter-annual consistency.

Outflowing stream discharges are currently monitored at Lakes 164 and 938. The L164 outlet weir is located 330 m downstream of the lake outlet. The drainage area above the outlet of L164 is 4948 ha; however, flow through the weir drains an additional area of 77 ha downstream of the lake, or a total area of 5025 ha. The weir is of plank construction, and has a 0.76 m head, 150° metal notch with a total capacity of about $3.7 \text{ m}^3 \cdot \text{s}^{-1}$. It was completed in November 1987, and was outfitted on 12 December 1987 with a Leopold-Stevens A71 float-operated water level recorder over a stilling well in the pond about 3 m upstream from the weir. The well is heated in winter months with a propane pilot light; unfortunately, as the pilot has often burned out between inspections, long periods

of winter flow have gone unrecorded. Discharge was computed as described below for L938.

The L938 outlet weir is located on the Berry River 10 m downstream of the lake outlet. Total drainage area discharging through the weir is 12021 ha. The weir is of concrete construction, and has a 0.99 m head, 150° metal notch with a total capacity of over $6 \text{ m}^3 \cdot \text{s}^{-1}$. It was completed on 12 October 1989, and was outfitted on 25 October 1989 with a Leopold-Stevens A71 float-operated water level recorder over a stilling well in the pond about 4 m upstream of the weir. In winter, the float is set outside of the stilling well, in the pond, where flowing water drawn from L938 and Ethelma Lake immediately upstream carries enough heat to maintain an open weir pond through all but the coldest days.

Manual discharge measurements using a handheld Ott Type C-1 current meter have been done on 11 occasions downstream of the L164 outlet weir, and five times below the L938 outlet weir. No significant difference was found between the discharge versus head relationships for the two weirs. The best fit was found to be a pair of regressions between the logarithms of discharge and head that describe two straight line segments which cross at a head of 0.41 m. Data used in determining this relationship ranged fairly evenly from 0.065 to 0.74 m head and from 0.0064 to $3.4 \text{ m}^3 \text{ s}^{-1}$ discharge. The standard deviation of predicted minus observed values using this relationship was 3.5% of the observed discharge ($n = 16$). Tabular summaries for each study lake are in the form of monthly matrices including each of the study years (1987-1990). Summary statistics for each parameter include: monthly means over all years, and an overall mean. For all parameters, values were linearly interpolated for each calendar day between sampling dates. The open-water season was considered to be between the first sampling date in May and the last sampling date of October. Yearly means, therefore, reflect different time intervals, and May and October may not be complete. All means were calculated from actual and interpolated values. Planar thermocline depths were not calculated for the shallow lakes (L149, L165, and L938) where the epilimnion generally extended to the maximum depth. In the cases of depths of the 1% light level and the planar thermocline, the maximum depth of the lake was

used in calculating long-term means whenever the parameter extended beyond the bottom of the lake.

RESULTS

SAMPLING STATION LOCATIONS

Locations of physical/chemical, lake and stream stations, and lake stage gauges are shown in Fig. 1. Bathymetric maps and complete delineation of drainage basins can be found in McCullough and Campbell (1993).

SAMPLING RECORD AND LOCAL WEATHER CONDITIONS

Appendix 1 is a synopsis of the sampling program for the ELA Lake Variation and Climate Change Study lakes from 1986 to 1990. For each study lake, Appendix 1 lists the dates, times, local weather conditions (estimates of wind speed and direction, cloud cover), and field notes indicating deviations from normal sampling locations or protocols. The field notes also indicate whether inlets and outlets were flowing. In 1986, some dates have missing weather conditions but water chemistry samples were taken.

LAKE LEVELS AND STREAM DISCHARGES

Staff board lake level readings are tabulated and graphed in Appendix 2 (Table A2.1, Fig. A2.1).

Mean daily downstream discharges of Lakes 164 and 938 are also reported in Appendix 2 (Tables A2.2 and A2.3, Fig. A2.2). Continuous instantaneous records, for all periods when the recorders were operating satisfactorily, are available in electronic form (contact Greg McCullough, Freshwater Institute, 501 University Crescent, Winnipeg, Manitoba, R3T 2N6). Daily discharge records are also available for the Lake 373 outflow, beginning in 1989, and will be reported in Experimental Lakes Area hydrometeorological data reports beginning with Beaty and Lyng 1993 (in preparation). Continuous instantaneous records are available for Lake 373 (contact Ken Beaty, Freshwater Institute).

LIGHT ATTENUATION

Secchi disk visibility, including colour of the disk at half Secchi depth, is tabulated and graphed in Appendix 3 (Table A3.1, Fig. A3.1). Depth of the photic zone (1% light attenuation, determined photometrically) and vertical light attenuation (K_d) are also tabulated and plotted in Appendix 3 (Table A3.1, Figs. A3.2 and A3.3). The raw, photometrically-determined light profiles are presented in Tables A3.2, A3.3, A3.4, A3.5, A3.6, A3.7, and A3.8.

WATER TEMPERATURE

Stream temperatures and lake temperature profiles are tabulated in Appendix 4 (Tables A4.2, A4.3, A4.4, A4.5, A4.6, A4.7, and A4.8). They are presented graphically in Figs. A4.1 and A4.2, respectively. Epilimnion depths and planar thermocline depths are presented in Table A4.1 and plotted in Fig. A4.3.

SUMMARY

Depth of the photic zone, light attenuation coefficients, Secchi disk depth, lake temperature at one meter, epilimnion depth and planar thermocline depths are summarized in Tables 1, 2, 3, 4, 5, and 6, respectively.

There is a wide range in light attenuation among the seven Lake Variation and Climate Change Study lakes (Table 2). Highest extinction coefficients were observed in the shallow, more humic systems (L164/L165 and L149). There was generally 1% light transmittance to the bottoms of all three shallow lakes (L149, L165, and L938) throughout the open-water season (Table 1). Depth of the photic zone (1% transmittance) in the three deep lakes (L373, L377, and L442) ranged from 9 to 14 meters. Greatest light penetration was observed in the slowest flushing lake in the study series, L373. In the deep, slowly flushing lakes, L373 and L442, some seasonality in transparency was evident. Lowest transparencies were generally recorded in May and October; highest transparencies were observed in mid-summer (Tables 1 and 3). Interannual variation in water transparency appears to have been small; however, in 1989,

transparency in the deep lakes was consistently lower than in other years.

Surface-water temperatures in both shallow and deep lakes exhibited a marked seasonal pattern; without exception, warmest temperatures (21-23°C) were recorded in July (Table 4). Considerable interannual variation in temperature was observed in the months of May and June; June water temperatures were particularly high in 1988, relative to other years. In July and August, there were only very minimal differences at 1 meter, either lake-to-lake or year-to-year. There are, however, obvious differences in mid-summer mixing-depths (Tables 5 and 6); mid-summer thermocline depths were deepest in 1987 and shallowest in 1989. The thermocline in L373, the largest and most transparent of the fully stratified study lakes, was usually about 2 meters deeper than in L377 or L442. The general vertical mixing pattern in the thermally stratified lakes is a gradual and continuous deepening of the mixed layer commencing in June and extending through October. Complete autumnal overturn in the deep study lakes usually occurred in November shortly after our last sampling day in late October.

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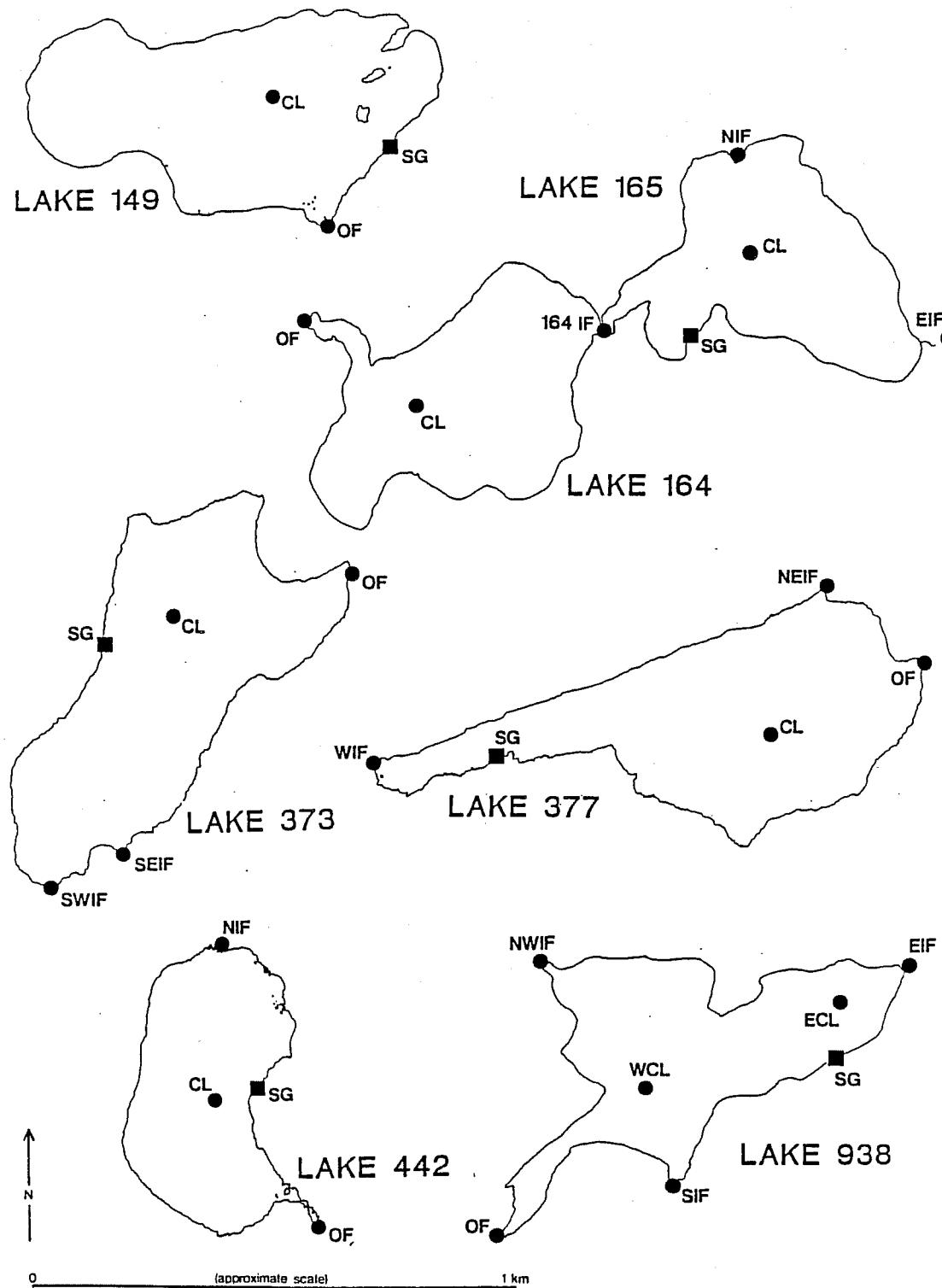


Figure 1. Locations of physical and chemical sampling stations and staff gauges in Lake Variation and Climate Change Study lakes, 1987-1990. (See McCullough and Campbell 1993 for bathymetric maps). Lake and stream stations are described by the suffixes CL = lake centre, IF = inflow, OF = outflow, and may be modified by prefixes derived from the four cardinal points of the compass, i.e. N = north, E = east, S = south, and W = west. Staff gauges are indicated by the letters SG.

Table 1. Monthly summary of the depth of 1% light attenuation (m). ELA Lake Variation and Climate Change Study lakes. Sampling interval was bi-weekly.

Table 2. Monthly summary of vertical light attenuation coefficients (m^{-1}).
 ELA Lake Variation and Climate Change Study lakes. Sampling interval was bi-weekly.

Lake	Year	May	Jun	Jul	Aug	Sep	Oct	Mean
149	1987	0.54	0.69	0.80	0.75	0.62	0.59	0.69
	1988	0.55	0.62	0.62	0.86	0.56	0.67	0.66
	1989	0.49	0.67	0.49	0.81			0.62
	1990	0.47	0.57	0.73	0.69	0.63	0.62	0.62
	MEAN	0.50	0.63	0.66	0.78	0.61	0.61	0.65
164	1987	0.93	1.02	0.94	0.93	1.00	1.28	1.00
	1988	0.97	0.88	0.87	0.86	0.99	0.81	0.90
	1989	0.81	0.86	1.18	1.44	1.17		1.12
	1990	0.77	0.81	1.02	0.89	0.97	1.12	0.93
	MEAN	0.87	0.89	1.00	1.03	1.00	1.05	0.97
165	1987	1.08	0.68	0.80	1.07	1.03	1.02	0.91
	1988	0.99	1.07	1.36	1.10	1.14	1.04	1.12
	1989	0.85	1.21	1.22	1.46	1.34		1.24
	1990	0.97	1.19	1.42	1.08	0.99	1.04	1.13
	MEAN	0.96	1.03	1.20	1.18	1.07	1.04	1.10
373	1983		0.32	0.28	0.30	0.26	0.21	0.29
	1984	0.29	0.26	0.23	0.28	0.31	0.27	0.27
	1985	0.31	0.28	0.28	0.33	0.35		0.31
	1986	0.37	0.34	0.32	0.34	0.34	0.34	
	1987	0.23	0.22	0.29	0.26	0.29	0.33	0.27
	1988	0.31	0.31	0.32	0.25	0.31	0.29	0.30
	1989	0.32	0.32	0.28	0.29			0.30
	1990	0.38	0.29	0.27	0.27	0.23	0.31	0.29
	MEAN	0.32	0.29	0.28	0.29	0.30	0.31	0.29
377	1987	0.43	0.44	0.49	0.38	0.42	0.49	0.44
	1988	0.42	0.45	0.50	0.38	0.38	0.43	0.43
	1989	0.45	0.48	0.49	0.54			0.49
	1990	0.51	0.42	0.47	0.47	0.39	0.42	0.45
	MEAN	0.46	0.45	0.49	0.44	0.40	0.45	0.45
442	1987	0.35	0.39	0.43	0.39	0.40	0.60	0.44
	1988	0.49	0.47	0.41	0.34	0.43	0.42	0.42
	1989	0.59	0.52	0.43	0.40			0.49
	1990	0.61	0.44	0.40	0.45	0.46	0.53	0.48
	MEAN	0.53	0.45	0.42	0.40	0.43	0.56	0.45
938	1987	0.34	0.47	0.55	0.58	0.62	0.52	0.54
	1988	0.51	0.57	0.59	0.55	0.53	0.50	0.55
	1989	0.34	0.45	0.39	0.44	0.45		0.42
	1990	0.41	0.41	0.42	0.49	0.41	0.46	0.43
	MEAN	0.41	0.47	0.49	0.51	0.51	0.49	0.49

Table 3. Monthly summary of Secchi disk depth (m). ELA Lake Variation and Climate Change Study Lakes. Sampling intervals were bi-weekly.

Lake	Year	May	Jun	Jul	Aug	Sep	Oct	Mean
149	1987	3.8	2.3	2.2	2.4	2.3	2.4	2.5
	1988	3.7	2.6	2.3	2.1	2.4	2.8	2.6
	1989	3.7	3.0	2.0	2.4	2.0	2.0	2.4
	1990	2.7	2.4	2.4	2.9	2.9	3.3	2.7
	MEAN	3.4	2.6	2.2	2.5	2.4	2.7	2.6
164	1987	3.4	2.8	2.9	3.4	3.4	2.9	3.1
	1988	2.6	3.0	2.3	2.9	2.7	2.5	2.7
	1989	2.7	3.1	2.4	2.9	2.5	2.3	2.7
	1990	2.2	2.4	2.5	2.5	2.7	2.7	2.5
	MEAN	2.7	2.8	2.5	2.9	2.8	2.7	2.8
165	1987	2.5	2.7	2.8	2.4	2.4	2.7	2.6
	1988	3.0	2.5	2.8	2.4	2.7	2.9	2.7
	1989	2.5	2.5	2.2	2.1	2.4	2.4	2.3
	1990	2.0	2.3	2.2	2.3	2.2	2.4	2.3
	MEAN	2.5	2.5	2.5	2.3	2.4	2.6	2.5
373	1987	7.8	7.8	9.5	8.6	7.7	6.9	8.1
	1988	5.9	7.1	7.4	6.8	6.4	5.6	6.7
	1989	5.8	6.6	5.9	6.9	6.3	6.1	6.3
	1990	5.5	6.1	7.3	8.0	6.6	6.3	6.7
	MEAN	6.3	6.9	7.5	7.6	6.8	6.3	7.0
377	1987	4.8	5.3	6.2	6.3	6.5	5.4	5.8
	1988	5.1	5.8	4.8	5.5	5.7	5.6	5.4
	1989	4.3	4.9	5.1	5.2	5.9	6.0	5.3
	1990	3.9	5.1	5.0	6.0	6.0	5.7	5.3
	MEAN	4.5	5.3	5.3	5.7	6.0	5.7	5.5
442	1987	4.3	4.7	5.6	6.4	6.1	4.2	5.3
	1988	4.7	5.9	5.4	4.6	5.1	4.6	5.1
	1989	4.2	4.5	5.0	4.3	4.5	4.3	4.5
	1990	3.7	5.8	5.9	5.3	4.8	4.2	5.1
	MEAN	4.2	5.2	5.5	5.2	5.1	4.3	5.0
938	1987	5.0	4.7	4.1	3.6	3.3	4.0	4.1
	1988	4.6	4.3	4.1	3.4	3.4	3.1	3.8
	1989	4.8	4.5	5.0	5.0	4.5	4.6	4.7
	1990	3.7	4.1	4.3	4.4	4.4	3.9	4.2
	MEAN	4.4	4.4	4.4	4.1	3.9	3.9	4.2

Table 4. Monthly summary of lake temperature (°C) at a depth of 1 meter.
 ELA Lake Variation and Climate Change Study. Sampling interval was
 bi-weekly.

Lake	Year	May	Jun	Jul	Aug	Sep	Oct	Mean
149	1987	15.0	21.4	22.2	20.4	16.2	9.4	18.5
	1988	16.4	21.9	22.3	21.4	14.6	7.8	18.1
	1989	18.5	17.1	23.9	21.8	17.2	7.9	18.6
	1990	13.4	19.6	23.4	21.2	16.4	7.4	17.5
	MEAN	15.6	20.0	23.0	21.2	16.1	8.0	18.1
164	1987	14.7	20.5	22.9	20.5	16.3	8.4	17.5
	1988	15.8	21.9	22.6	21.5	15.1	9.5	18.4
	1989	17.1	16.4	23.5	21.6	16.9	9.2	18.2
	1990	11.9	18.7	22.9	20.9	16.8	8.9	17.3
	MEAN	14.7	19.4	23.0	21.1	16.3	8.9	17.8
165	1987	13.3	19.9	21.9	20.2	16.1	7.8	16.8
	1988	15.7	21.7	22.1	21.4	14.9	8.9	18.1
	1989	16.8	16.0	23.2	21.0	16.7	8.4	17.8
	1990	12.3	18.9	22.4	20.5	16.6	8.1	17.0
	MEAN	14.4	19.2	22.4	20.8	16.1	8.3	17.4
373	1987	12.5	19.5	21.0	20.7	17.0	9.7	16.9
	1988	13.5	21.8	22.3	22.0	15.7	10.5	18.4
	1989	14.7	16.5	22.4	21.8	17.4	10.6	18.1
	1990	11.1	17.2	21.7	20.7	17.1	10.1	16.8
	MEAN	12.7	18.7	21.9	21.3	16.8	10.2	17.5
377	1987	13.9	19.9	21.4	21.0	17.3	9.5	17.3
	1988	14.4	22.6	23.0	22.0	15.4	10.3	18.7
	1989	15.3	16.7	22.7	22.0	17.2	10.2	18.2
	1990	11.6	17.5	22.1	21.0	17.3	9.7	17.0
	MEAN	13.6	19.2	22.3	21.5	16.8	9.9	17.8
442	1987	13.8	20.1	21.0	20.8	16.6	9.3	17.1
	1988	14.1	22.5	22.8	21.9	15.2	10.2	18.6
	1989	16.5	17.3	22.7	21.9	16.9	8.9	17.4
	1990	11.6	17.6	22.2	20.8	17.1	9.7	17.0
	MEAN	13.7	19.4	22.2	21.3	16.4	9.4	17.5
938	1987	13.7	20.3	22.2	20.7	16.4	7.5	17.1
	1988	15.4	21.9	22.7	22.3	15.4	8.6	18.4
	1989	13.5	16.0	23.2	21.7	17.3	8.9	17.8
	1990	12.8	18.7	22.5	21.0	16.8	7.9	17.2
	MEAN	14.0	19.2	22.6	21.4	16.5	8.1	17.6

Table 5. Monthly summary of epilimnion depths (m). ELA Lake Variation and Climate Change Study lakes. Sampling interval was bi-weekly.

Lake	Year	May	Jun	Jul	Aug	Sep	Oct	Mean
149	1987	4.0	3.1	3.1	4.0	2.6	4.0	3.4
	1988	3.5	3.5	4.0	4.0	4.0	4.0	3.8
	1989	2.5	3.7	2.7	3.8	4.0	4.0	3.5
	1990	4.0	3.7	2.9	3.7	3.9	4.0	3.7
	MEAN	3.6	3.5	3.2	3.9	3.6	4.0	3.6
164	1987	3.7	2.6	1.7	3.8	5.5	7.0	4.0
	1988	2.0	2.5	3.0	3.1	5.6	7.0	3.7
	1989	1.0	2.7	2.0	2.9	4.0	6.9	3.2
	1990	3.8	2.7	2.2	2.7	5.0	7.0	3.8
	MEAN	2.7	2.6	2.2	3.1	5.0	7.0	3.7
165	1987	3.0	2.0	2.7	3.0	4.5	4.5	3.3
	1988	2.3	2.0	2.7	3.6	4.5	4.5	3.2
	1989	2.0	3.4	2.0	2.8	3.5	4.5	3.0
	1990	2.9	1.7	1.7	2.5	4.2	4.5	2.8
	MEAN	2.6	2.3	2.3	3.0	4.2	4.5	3.1
373	1987	6.4	3.6	5.6	7.3	9.1	14.9	7.8
	1988	4.9	3.7	5.6	6.5	9.3	12.3	6.8
	1989	2.9	4.5	4.0	5.4	7.7	11.1	5.8
	1990	6.0	4.4	4.9	6.3	7.8	14.3	7.1
	MEAN	5.3	4.1	5.0	6.4	8.5	13.4	6.9
377	1987	4.8	3.5	4.0	5.3	6.8	11.5	6.0
	1988	2.6	2.7	4.0	4.5	6.8	8.9	4.7
	1989	1.5	3.7	3.0	4.0	5.7	8.3	4.3
	1990	7.4	3.3	3.7	4.5	5.7	9.7	5.5
	MEAN	4.4	3.3	3.7	4.5	6.2	9.8	5.2
442	1987	3.3	2.2	3.5	4.3	6.1	11.5	5.1
	1988	3.3	2.6	3.6	4.5	6.8	9.3	4.8
	1989	1.5	2.8	3.0	3.5	5.0	10.3	4.6
	1990	2.9	3.2	2.9	4.0	5.3	9.0	4.4
	MEAN	2.9	2.7	3.2	4.1	5.8	10.2	4.8
938	1987	5.5	4.0	4.3	5.5	5.5	5.5	5.0
	1988	3.5	3.2	5.0	5.3	5.5	5.5	4.6
	1989	2.8	5.5	4.9	5.4	5.5	5.5	5.1
	1990	4.7	4.5	5.0	5.5	5.5	5.5	5.1
	MEAN	4.1	4.3	4.8	5.4	5.5	5.5	5.0

Table 6. Monthly summary of planar thermocline depths (m). ELA Lake Variation and Climate Change Study lakes. Sampling interval was bi-weekly.

Lake	Year	May	Jun	Jul	Aug	Sep	Oct	Mean
164	1987	4.9	3.2	3.8	5.1	6.3	7.0	5.0
	1988	3.7	4.0	4.5	4.6	6.3	7.0	4.9
	1989	3.0	4.3	2.7	4.0	5.3	7.0	4.3
	1990	4.2	4.1	3.3	4.4	5.5	7.0	4.7
	MEAN	4.0	3.9	3.6	4.5	5.9	7.0	4.7
373	1987	8.6	7.4	7.3	7.9	10.4	16.0	9.6
	1988	6.5	4.9	7.0	7.6	10.2	12.8	7.9
	1989	3.9	6.2	6.1	6.6	8.3	12.2	7.2
	1990	6.6	5.9	6.2	7.3	9.2	14.7	8.1
	MEAN	6.8	6.1	6.6	7.3	9.5	14.2	8.2
377	1987	7.3	5.6	5.8	7.0	7.6	12.1	7.5
	1988	4.4	4.1	5.1	5.7	7.3	9.8	5.9
	1989	3.9	6.2	4.9	5.4	6.7	8.8	6.0
	1990	8.9	4.7	4.6	5.7	6.9	10.2	6.6
	MEAN	6.4	5.2	5.1	5.9	7.1	10.5	6.5
442	1987	6.3	5.8	5.5	5.9	7.3	11.9	7.1
	1988	4.9	3.7	5.1	5.7	7.3	10.2	5.9
	1989	3.0	4.0	3.5	4.5	6.1	10.7	5.5
	1990	3.9	4.5	4.5	5.3	6.3	9.6	5.6
	MEAN	4.7	4.5	4.7	5.3	6.7	10.7	6.1

APPENDIX 1

Sampling record, local weather observations, and miscellaneous field notes,
ELA Lake Variation and Climate Change Study.

Dates are presented in the form of year, month, and day.

Time is presented as Central Daylight Saving Time.

Wind directions are relative to the four cardinal points on the compass,
either alone or in combination:

N = north
E = east
S = south
W = west

All wind speeds are estimates, only, in kilometers per hour.

Cloud cover is an estimate of cloud cover ranging from 0/10 (no clouds) to
10/10 (totally overcast).

Field notes published in this Appendix include those denoting sampling which
was carried out at locations other than the standard sampling stations.

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Table A1.1a. L149 field observations and notes.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1986/07/03	11:55	S	5-10		
1986/09/11	13:50				Lake surface 60 cm below bedrock datum
1986/09/18	14:35				Lake surface 40.8 cm below bedrock datum
1986/10/16	12:25				
1987/04/22	14:00				
1987/05/13	08:30	S	10-15	9/10	
1987/05/27	08:05	SE	10-15	10/10	
1987/06/10	08:40	SE	0-5	2/10	
1987/06/24	10:25	SW	0-5	4/10	
1987/07/08	08:15	SE	5-10	4/10	No outflow
1987/07/22	10:45	SE	0-5	10/10	No outflow
1987/08/05	11:50	E	0-5	3/10	
1987/08/19	10:40	NW	0-5	3/10	No outflow
1987/09/02	10:55		0-5		
1987/09/16	14:10		15-20		No outflow
1987/09/30	13:20	NW	0-5	5/10	No outflow
1987/10/14	13:15	W	20-25	6/10	No outflow
1987/10/29		S	15-20	10/10	Boat inoperable "Lake" sampled near rocks by outlet
1988/04/11	10:45				Ice thickness 0.42 meters
1988/05/04	08:15	NE	10-15		
1988/05/18	08:35	S	10-15	1/10	
1988/06/01	08:25	SW	5-10		
1988/06/15	08:10	NW	0-5	8/10	
1988/06/29	08:10	SE	5-10	0/10	No outflow
1988/07/13	08:25	W	20-25	9/10	
1988/07/27	08:10		0-5	1/10	No outflow
1988/08/10	08:10	S	0-5	0/10	No outflow
1988/08/24	08:30	W	15-20	10/10	No outflow
1988/09/07	15:10	SW	15-20	9/10	No outflow
1988/09/21	14:30		0-5	10/10	Light drizzle, no outflow
1988/10/05	09:40	S	10-15	1/10	Light and primary production collected Oct.4; no outflow
1988/10/19	09:40	NW	15-20	10/10	No outflow

Table A1.1a. Cont'd.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1989/04/18	14:45				
1989/05/17	10:30	W	0-5	8/10	
1989/05/31	11:15	NW	0-5	6/10	No outflow
1989/06/14	10:30	W	0-5	0/10	
1989/06/28	09:10	NE	10-20	2/10	
1989/07/12	09:30	S	0-5	5/10	No outflow
1989/07/26	09:00	N	0-5	7/10	
1989/08/09	08:10		0-5	0/10	
1989/08/23	10:00	S	0-5	1/10	No outflow
1989/09/06	09:30	S	15-20	7/10	No outflow
1989/09/20	10:40	SW	0-5	9/10	
1989/10/04	11:10	W	5-10	0/10	No outflow
1989/10/17	10:10	N	0-5	10/10	No outflow
1990/04/10	15:30	N	> 15	9/10	
1990/05/08					
1990/05/08	09:00	SE	0-5	10/10	
1990/05/22	09:45	SE	20-30	10/10	
1990/06/05	09:15	N	5-15	10/10	
1990/06/19	09:25	NIL		10/10	
1990/07/03	09:05	NW	5-10	/10	
1990/07/17	09:20	SW	15-20	8/10	
1990/07/31	09:35	W	10-15	0/10	
1990/08/14	11:15	NW	10-15	5/10	
1990/08/28	09:10	W	5-10	2/10	
1990/09/11	10:30	SW	0-5	10/10	
1990/09/25	11:00	W	10-15	10/10	
1990/10/09	09:00	W	5-10	0/10	
1990/10/23	09:15		0-5	10/10	Benchmark = 55.5 cm

Table A1.1b. L164 field observations and notes.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1986/06/12	10:30		5-10		
1986/07/03	14:20	SW	> 15	0/10	
1986/09/29	16:00	SW	0-5		
1986/10/16	14:15				
1987/04/22	11:15				See L165 for staff gauge reading
1987/05/13	10:10	SE	30-35	9/10	
1987/05/27	10:30	SE	5-10	10/10	
1987/06/10	09:35	W	0-5		
1987/06/24	09:05	SW	5-10	7/10	
1987/07/08	09:05	NW	0-5	4/10	
1987/07/22	10:00		0-5		
1987/08/05	10:30	SW	15-20	3/10	
1987/08/19	09:30	W	0-5	7/10	
1987/09/02	10:30	SW	15-20	9/10	
1987/09/02	10:30				Composite sample collected at 2 meter depth intervals
1987/09/16	11:20	E	10-15	3/10	
1987/09/30	10:50	NE	10-15	4/10	
1987/10/14	11:10	SW	20-25	4/10	
1987/10/29		SW	10-15	10/10	
1988/05/04	10:10		20	2/10	
1988/05/18	10:45	S	10-20	2/10	
1988/06/01	11:15	S	5-10	0/10	
1988/06/15	10:00		0-5	6/10	
1988/06/29	09:50	SE	10-15	1/10	
1988/07/13	10:10	W	20-25	6/10	
1988/07/27	09:30	E	0-5	0/10	
1988/08/10	09:20	S	5-10	0/10	
1988/08/24	09:40	NW	5-10	10/10	
1988/09/07	10:55	SW	5-10	0/10	
1988/09/21	08:45		0-5	10/10	
1988/10/05	10:00		0-5	1/10	Light drizzle Light profile and primary production sample collected on Oct. 4
1988/10/19	10:20	W	0-5	10/10	
1989/04/18	15:30		> 15		
1989/05/17	09:35	S	5-10	4/10	Ice thickness = 54 cm
1989/05/31					
1989/06/14	09:45		0-5	0/10	
1989/06/28	10:10	SE	25-30	2/10	Light profile done at 15:15
1989/07/12	11:40	E	0-5		
1989/07/26	08:30	E	20-25	3/10	
1989/08/09	09:50	NW	0-5	0/10	
1989/08/23	10:30		0-5	2/10	
1989/09/06	09:40	S	5-10	5/10	
1989/09/20	09:35		0-5	7/10	
1989/10/04	10:40	W	0-5	0/10	
1989/10/17	10:15		0-5	10/10	
1990/04/10	09:45	N	5-10	1/10	
1990/05/09		NE	> 15		
1990/05/08	11:00	NIL		10/10	Benchmark = 36.5 cm; no chemistry
1990/05/22	09:50	SE	5-10	10/10	
1990/06/05	10:30	S	5-10	10/10	Production was done on June 7; cloud = 4/10.
1990/06/19	10:45	SW	0-5	10/10	
1990/07/03	10:20	NE	15-20	10/10	
1990/07/17	10:00	S	5-10	9/10	
1990/07/31	10:00	W	8-15	0/10	
1990/08/14	10:00	NW	10-15	5/10	
1990/08/28	10:50	SW	20-25	6/10	
1990/09/11	11:55	S	0-5	10/10	
1990/09/25	10:55	SW	15-20	3/10	
1990/10/09	11:15	W	5-10	0/10	
1990/10/23	11:00	NE	0-5	10/10	

Table A1.1c. L165 field observations and notes.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1986/06/12	11:30	W	5-10		
1986/07/03	14:20	SW	> 15	0/10	
1986/09/10	10:30				Lake surface 27.5 cm below bedrock datum
1986/09/30	14:20	W	0-5		Lake surface 27 cm below bedrock datum
1986/10/16	14:15				
1987/04/22	10:25				
1987/05/13	08:50	SE	20-25	6/10	
1987/05/27	08:40	SE	5-10	10/10	
1987/06/10				1/10	
1987/06/24		SW	0-5	4/10	
1987/07/08	07:55	NW	0-5	4/10	Beaver dam on NIF opened
1987/07/22	08:15		0-5	10/10	Raining
1987/08/05	10:00	SW	10-15	3/10	
1987/08/19		W	0-5	7/10	
1987/09/02	09:30		0-5	4/10	
1987/09/16	10:15	S	15-20	3/10	
1987/09/30	10:00	NE	10-15	7/10	
1987/10/14	10:30	W	15-20	6/10	
1987/10/29		SW	10-15	10/10	
1988/05/04	09:30	NW	15	2/10	
1988/05/18	09:00	SE	10-15	3/10	
1988/06/01	09:15	S	0-5	0/10	NIF not flowing
1988/06/15	09:00	NW	0-5	7/10	
1988/06/29	08:40	SE	10-15	2/10	NIF not flowing
1988/07/13	08:40	W	20-25	8/10	
1988/07/27	08:10	E	0-5	0/10	
1988/08/10	08:05	S	0-5	0/10	NIF not flowing
1988/08/24	08:30	NW	0-5	10/10	NIF not flowing
1988/09/07	09:00	NW	5	0/10	NIF not flowing
1988/09/21	09:30		0-5	10/10	
1988/10/05	09:10		0-5	0/10	Light and primary production collected Oct 4; NIF not flowing
1988/10/19	09:25	W	0-5	10/10	NIF not flowing
1989/04/17	16:00				Ice thickness = 64 cm
1989/05/17	08:10	S	10-15	8/10	
1989/05/31	09:20	N	0-5	9/10	
1989/06/14	08:30		0-5	3/10	
1989/06/28	08:40	SE	20-25	3/10	Light profile done at 15:00
1989/07/12	07:50	E	0-5	10/10	
1989/07/26	07:10	N	5-10	1/10	NIF not flowing
1989/08/09	08:20		0-5	0/10	NIF not flowing
1989/08/23	09:00		0-5	0/10	
1989/09/06	08:15		0-5	2/10	NIF not flowing
1989/09/20	08:40		0-5	1/10	NIF not flowing
1989/10/04	09:20	W	0-5	0/10	NIF not flowing
1989/10/17	09:15	N	0-5	10/10	NIF not flowing
1990/04/10	10:30	N	5-10	6/10	
1990/05/01	10:15		> 15		Ice thickness = 60 cm
1990/05/09		NE			No lake chemistry; inflows only
1990/05/08	10:40	SE	5-10	10/10	Benchmark = 27 cm; no chemistry
1990/05/22	09:00	SE	0-5	10/10	
1990/06/05	08:55	S	0-5	10/10	
1990/06/19	09:30	S	0-5	10/10	
1990/07/03	09:30	E	10-15	10/10	
1990/07/17	08:20	S	0-5	6/10	
1990/07/31	09:00	W	8-15	0/10	
1990/08/14	07:40	NW	3-5	0/10	
1990/08/28	09:10	W	15-20	5/10	
1990/09/11	10:45	S	5-10	10/10	
1990/09/25	10:30	S	10-15	3/10	
1990/10/09	10:00	N	5-10	0/10	NIF not flowing
1990/10/23	10:00		NIL	10/10	Oct 22: staff gauge = 228, benchmark = 54.5 cm, NIF not flowing

Table A1.1d. L373 field observations and notes.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1986/06/11	16:00		0-5		
1986/07/02	15:45		0-5		Length of thermistor cable was only 15 m
1986/09/08	14:00				Lake surface 55 cm below bedrock datum; NB: staff gauge installed
1986/10/17	09:45				
1987/04/23	15:30				Discovered staff gauge missing
1987/05/06	10:35	NW	15-20	1/10	Staff gauge not yet re-installed
1987/05/20	10:20	SE	0-5	10/10	First reading re-installed staff gauge, SWIF and OF not flowing
1987/06/01	09:50	N	10-15	5/10	
1987/06/17	10:15	SW	15-20	8/10	SWIF not flowing
1987/07/01	09:45	SE	15-20	9/10	SWIF not flowing
1987/07/15	10:10	SW	0-5	7/10	SWIF not flowing
1987/07/29	09:35	NW	0-5	5/10	SWIF not flowing
1987/08/12	10:00	W	10-15	10/10	
1987/08/26	10:15	S	0-5	5/10	SWIF not flowing
1987/09/09	10:55	N	0-5	3/10	SWIF not flowing
1987/09/09	10:55				Composite sample collected at 2 m depth intervals
1987/09/16	11:30				
1987/09/30	11:30			0/10	SWIF not flowing
1987/10/14	11:15				SWIF not flowing
1987/10/29	11:00	S	0-5		SWIF not flowing
1988/04/12	12:30				Ice thickness 0.44 m
1988/05/11	08:30	NW	20-25	10/10	
1988/05/25	10:15	S	25-30	2/10	
1988/06/08	09:45	NE	25-30	4/10	SWIF not flowing
1988/06/22		N	15-20	1/10	
1988/07/06	09:40	S	5-10	10/10	SWIF not flowing
1988/07/20	09:35	N	0-5	0/10	
1988/08/03	09:55	W	5-10	9/10	SWIF not flowing
1988/08/17	09:45	N	10-15		SWIF not flowing
1988/08/31	10:15	SE	5-10	5/10	SWIF not flowing
1988/09/07	10:40	S	5-10	0/10	SWIF not flowing
1988/09/21	10:20	SE	5-10	10/10	SWIF not flowing
1988/10/05	09:50	S	0-5	2/10	Light and primary production collected Oct 4, SWIF not flowing
1988/10/19	09:25	S	0-5	10/10	SWIF not flowing

Table A1.1d. Cont'd.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1989/04/18	11:15				Ice thickness = 70 cm, SWIF and OF not flowing
1989/05/18		SW	5-10	8/10	
1989/06/01	08:20	S	10-15	7/10	SWIF not flowing
1989/06/15	09:15		0-5	5/10	
1989/06/29	08:30	S		5-10	
1989/07/13	08:20		0-5	0/10	
1989/07/27	09:15	NW	20-25	10/10	SWIF not flowing
1989/08/10	10:20		0-5	0/10	SWIF not flowing
1989/08/24	09:25	S	5-10	2/10	SWIF not flowing
1989/09/07	08:30	S	10-15	1/10	SWIF not flowing
1989/09/21	08:45	NE	0-5	10/10	SWIF not flowing
1989/10/05	09:00	S	0-5	10/10	SWIF not flowing
1989/10/18	09:00		0-5	0/10	SWIF not flowing
1990/04/09	15:00	NW	5-10	1/10	Ice thickness = 62.5 cm
1990/04/30	13:30		10-15		Staff gauge buckled; no lake chemistry; IF'S and OF'S only
1990/05/07					Buckled staff gauge; benchmark = 55.0; no chemistry
1990/05/09	10:00	NE	25-30	10/10	
1990/05/23	09:40	NE	0-5	1/10	
1990/06/06	10:10	S	0-10	0/10	Newly installed staff gauge
1990/06/20	10:30		NIL	10/10	
1990/07/04	09:25	SW	5-10	10/10	
1990/07/18	09:45	NW	0-10	5/10	
1990/08/01	09:00	S	5-7	3/10	
1990/08/15	11:00	S	0-3	3/10	SWIF, SEIF not flowing
1990/08/29	10:10	S	5-10	0/10	SWIF, SEIF not flowing
1990/09/12	09:55	NE	15-25	10/10	SWIF, SEIF, OF not flowing
1990/09/26	10:20	W	20-25	6/10	SWIF, SEIF, OF not flowing
1990/10/10	10:10	SE	25-30	2/10	SWIF, SEIF not flowing
1990/10/24	09:20	NIL		10/10	Benchmark = 78.5 cm, SWIF, SEIF not flowing

Table A1.1e. L377 field observations and notes.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1986/06/11	19:15		0-5		
1986/07/02	18:10		0-5		Length of thermistor cable was only 15 m
1986/09/09	16:15				Lake surface 72 cm below bedrock datum
1986/10/17	08:45				
1987/04/23	17:15				
1987/05/06	13:00	15-20	5-10		
1987/05/20	10:50	S	0-5	10/10	NEIF not flowing
1987/06/01	07:50	NW	15-20	4/10	
1987/06/17	08:00	SW	10-15	8/10	
1987/07/01	07:35	W	0-5	7/10	
1987/07/15	07:45		0-5	4/10	
1987/07/29	08:00		0-5	5/10	NEIF not flowing
1987/08/12	08:30	SW	0-5	10/10	
1987/08/26	08:30	W	10-15	9/10	NEIF not flowing
1987/08/26	08:30				Composite sample collected at 2 m depth intervals
1987/09/09	11:00	W	0-5	3/10	NEIF not flowing
1987/09/16	14:00				NEIF not flowing
1987/09/30	14:00				
1987/10/14					NEIF not flowing
1987/10/29	13:15	W	0-5		NEIF not flowing
1988/04/12	09:10				Ice thickness 0.45 m
1988/05/11	12:10	NE	0-5	10/10	
1988/05/25	08:15	SW	5-10	5/10	
1988/06/08	08:10	E	20-25	4/10	
1988/06/22	08:10	NW	0-5	1/10	
1988/07/06	08:15	SW	5-10	10/10	
1988/07/20	08:00	NE	0-5	1/10	
1988/08/03	07:45	E	5-10	10/10	NEIF not flowing
1988/08/17	08:00	E	10-15	10/10	NEIF not flowing
1988/08/31	08:00	N	0-5	4/10	NEIF not flowing
1988/09/07	08:30		0-5	0/10	NEIF not flowing
1988/09/21	09:00		0-5	10/10	
1988/10/05	11:00	SW	0-5	6/10	Light and primary production collected Oct 4, NEIF no flow
1988/10/19	10:10	SW	0-5	8/10	NEIF not flowing

Table A1.1e. Cont'd.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1989/04/18	09:30				
1989/05/18	07:50	SW	10-15	7/10	Ice depth = 67 cm
1989/06/01	08:15	NW	5-10	2/10	
1989/06/15	10:40		0-5	3/10	
1989/06/29		SW	10-15	10/10	
1989/07/13	07:30		0-5	1/10	
1989/07/27	09:15	NE	10-15	10/10	
1989/08/10			0-5	0/10	NEIF not flowing
1989/08/24	09:50	W	10-15	2/10	
1989/09/07	08:20	SW	5-10	0/10	NEIF not flowing
1989/09/21	09:00	NE	5-10	10/10	NEIF not flowing
1989/10/05	09:00	SW	0-5	10/10	NEIF not flowing
1989/10/18	09:15				NEIF not flowing
1990/04/09	16:30	N	0-5	2/10	
1990/04/30	15:30				No lake chemistry; inflows and outflow, only
1990/05/09					East benchmark = 65 cm; no chemistry
1990/05/09	08:30	NE	25-30	10/10	
1990/05/23	10:30	NE	10	1/10	
1990/06/06	09:45	W	5-10	1/10	
1990/06/20	09:50		NIL	10/10	
1990/07/04	09:25	W	0-5	10/10	
1990/07/18	08:45	S	20-25	5/10	
1990/08/01	09:00	W	0-5	1/10	
1990/08/15	09:45	NW	0-5	0/10	NEIF not flowing
1990/08/29	08:25	SW	5-10	1/10	NEIF not flowing
1990/09/12	08:40	E	20-25	10/10	NEIF not flowing
1990/09/26	09:30	W	10-15	5/10	NEIF not flowing
1990/10/10	10:00	SW	10-15	1/10	NEIF,WIF not flowing
1990/10/24	09:20		NIL	10/10	Oct 22: staff gauge = 305; East BM = 870) NEIF, WIF no flow

Table A1.1f. L442 field observations and notes.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1986/06/11	14:40	SE	0-5		
1986/07/02	13:05	S	0-5	0/10	Length of thermistor cable was only 15 m
1986/09/09	13:15				Lake surface 85.5 cm below bedrock datum
1986/10/17	10:30				Lake centre not sampled this date
1987/04/23	13:30				
1987/05/06	10:00		5-10	0/10	
1987/05/20	08:15	SE	0-5	10/10	
1987/06/03	07:45	W	10-15	4/10	
1987/06/17	08:00	S	15-20	9/10	
1987/07/01	08:40	SE	5-10	8/10	NIF not flowing
1987/07/15	08:10	W	0-5	4/10	NIF not flowing
1987/07/29	07:55	N	0-5	1/10	NIF not flowing
1987/08/12	08:30	W	10-15	10/10	
1987/08/26	08:20	SE	0-5	8/10	NIF not flowing
1987/09/09	10:00	NW	5-10	8/10	NIF not flowing
1987/09/16	09:15				NIF not flowing
1987/09/30	09:00				NIF not flowing
1987/10/14	08:45				NIF not flowing
1987/10/29	08:45	S	0-5		NIF not flowing
1988/04/12	14:15				Ice thickness 0.48 m
1988/05/11	10:40	NW	10-15	10/10	
1988/05/25	08:25	SE	5-10	7/10	
1988/06/08	08:00	S	15-20	5/10	
1988/06/22	08:20	N	10-15	0/10	NIF not flowing
1988/07/06			0-5	10/10	Raining
1988/07/20	07:45		0-5	0/10	
1988/08/03	08:00	S	0-5	10/10	
1988/08/17	08:10	N	10-15	10/10	
1988/08/31	08:25	S	10-15	4/10	
1988/09/07	12:15	S	10-15	0/10	NIF not flowing
1988/09/21	11:45	SW	5-10	10/10	
1988/10/05	08:30		0-5	0/10	Light and primary production collected Oct 4; NIF no flow
1988/10/19	08:30	N	0-5	5/10	Water level was below bottom of staff gauge; NIF no flow

Table A1.1f. Cont'd.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1989/04/18	12:30				
1989/05/18	08:30	S	5-10	7/10	Ice thickness = 68 cm, NIF no flow
1989/06/01	08:00	W	0-5	1/10	
1989/06/15	09:10		0-5	4/10	
1989/06/29	09:00	S	20-25	9/10	
1989/07/13	08:15	NE	5-10	0/10	
1989/07/27	08:00	N	15-20	10/10	
1989/08/10	11:20	E	0-5	0/10	NIF not flowing
1989/08/24	09:10	S	10-15	1/10	OF not flowing
1989/09/07	09:40	SW	20-25	3/10	NIF not flowing
1989/09/21	09:40	NE	0-5	9/10	NIF not flowing
1989/10/05	10:00	S	10-15	10/10	NIF not flowing
1989/10/18	11:00	NW	0-5	0/10	NIF not flowing
1989/10/31	09:10	W	10-15	10/10	NIF not flowing
1990/04/09	13:15	NW	0-5	1/10	Ice thickness = 62 cm
1990/04/30	12:45				No lake chemistry; inflow and outflow only
1990/05/07				10/10	Benchmark = 107.5 cm; no chemistry
1990/05/09	08:10	N	25-30	10/10	
1990/05/23	09:15	NE	0-5		
1990/06/06	08:25	NW	20-25	9/10	
1990/06/20	09:40	NIL		10/10	
1990/07/04	09:30	NW	0-5	9/10	
1990/07/18	09:20	NW	5-10	7/10	
1990/08/01	09:30	SW	5-10	2/10	
1990/08/15	08:30	NIL		0/10	Conductivity profile done this day
					NIF not flowing
1990/08/29	09:25	S	0-5	0/10	NIF not flowing
1990/09/12	08:30	NE	10-15	10/10	NIF not flowing
1990/09/26	09:00	SW	5-10	3/10	NIF not flowing
1990/10/10	11:00	S	10-15	2/10	NIF not flowing
1990/10/24	09:30	NE	5-10	10/10	Oct 22: staff gauge = 234; benchmark = 104.0 cm

Table A1.1g. L938W field observations and notes.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1986/06/12	17:15	W	10-15		
1986/07/03	09:30	S	0-5		
1986/09/11	09:50				Lake surface 127.5 cm below bedrock datum
1986/09/18	10:00				Lake surface 58.5 cm below bedrock datum
1986/10/16	10:15				
1986/10/16	10:15				
1987/04/22	14:50				
1987/05/13	09:50	SW	15-20	10/10	Raining
1987/05/27	10:55	SE	0-5	10/10	
1987/06/10	13:50	SW	10-15	6/10	
1987/06/24	08:05	SW	0-5	4/10	
1987/07/08			0-5	4/10	
1987/07/22	09:15	SE	10-15	10/10	
1987/08/05	08:45	S	0-5	1/10	EIF, SIF not flowing
1987/08/19	08:40		0-5	8/10	
1987/09/02	08:50		0-5		EIF, SIF not flowing
1987/09/16	15:15	E	15-20	2/10	EIF, SIF not flowing
1987/09/30	14:10	NW	0-5	7/10	Water level below bottom of staff gauge; EIF, SIF no flow
1987/10/14	14:15	E	0-5	6/10	SIF no flow
1987/10/29	13:20	S	15-20	10/10	SIF no flow
1988/04/11	11:30				Ice thickness 0.43 m
1988/05/04	09:30	E	5-10		
1988/05/18	10:15	W	15-20	0/10	
1988/06/01	09:30	SW	0-5	0/10	
1988/06/15	09:25		0-5	6/10	
1988/06/29	09:25	SE	0-5	0/10	
1988/07/13		W	5-10	7/10	
1988/07/27	09:05	E	0-5	1/10	
1988/08/10	09:50	W	5-10	0/10	
1988/08/10	09:50	W	5-10	0/10	
1988/08/24	10:15	W	15-20	6/10	
1988/09/07	14:00	SW	10-15	0/10	SIF, EIF not flowing
1988/09/21	12:40		0-5	10/10	Light drizzle, SIF not flowing
1988/10/05	10:20	SW	15-20	1/10	Light and primary production collected Oct. 4; SIF, NWIF no flow
	10:20	NW	5-10	10/10	EIF, SIF not flowing

Table A1.1g. Cont'd.

Date	Time	Wind dir	Wind speed	Cloud cover	Field notes
1989/04/18	15:30				
1989/05/17	08:30	W	0-5	8/10	
1989/05/31	09:15	N	0-5	8/10	
1989/06/14	08:45		0-5	0/10	
1989/06/28	08:00	E	5-10	9/10	
1989/07/12	08:30	E	0-5	10/10	
1989/07/26		NW		9/10	
1989/08/09	10:00		0-5	0/10	
1989/08/23	10:20	S	5-10	0/10	
1989/09/06	09:45				
1989/09/20	09:15	W	0-5	5/10	
1989/10/04	09:30	S	0-5	0/10	
1989/10/17	09:30	N	0-5	9/10	NWIF not flowing
1990/04/10	16:30	N	> 15	8/10	
1990/05/01	13:30				
1990/05/08	10:35	SE	0-5	10/10	
1990/05/22	10:00	S	5-10	10/10	
1990/06/05	08:40		NIL	10/10	
1990/06/19	09:20		NIL	10/10	
1990/07/03	08:15	NE	0-8	10/10	
1990/07/31	09:25	S	5-8	0/10	
1990/08/14	09:45	N	10-15	3/10	
1990/08/28	09:40	S	3-5	5/10	SIF not flowing
1990/09/11	09:00	SW	5-10	10/10	SIF, EIF not flowing
1990/09/25	09:45	NW	5	4/10	SIF, EIF not flowing
1990/10/09	10:20	SW	5-10	0/10	SIF, EIF not flowing
1990/10/23	10:30		NIL	10/10	Benchmark = 133 cm, SIF, EIF not flowing

APPENDIX 2

Lake stage and outlet discharge data. Lake Variation and Climate Change Study Lakes, 1986-1990.

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Table A2.1. Lake levels. Time is Central Standard. Units: metres, measured relative to arbitrary, independent benchmarks.

LAKE 149			LAKE 165			LAKE 373		
DATE	TIME	LEVEL	DATE	TIME	LEVEL	DATE	TIME	LEVEL
11 Sep 86		9.400	10 Sep 86		9.725	08 Sep 86		8.959
18 Sep 86 14:40		9.406	30 Sep 86 10:10		9.730	17 Oct 86		8.947
16 Oct 86		9.434	16 Oct 86		9.725			
22 Apr 87		9.361	22 Apr 87 10:25		9.740	20 May 87 10:20		8.953
13 May 87 14:00		9.303	13 May 87 08:50		9.705	01 Jun 87 09:50		9.092
27 May 87 08:05		9.344	27 May 87 08:40		9.785	17 Jun 87 10:15		9.002
10 Jun 87 08:40		9.326	10 Jun 87		9.788	15 Jul 87 10:10		8.952
24 Jun 87 10:25		9.303	24 Jun 87		9.853	29 Jul 87 09:35		8.947
08 Jul 87 08:15		9.272	08 Jul 87 07:55		9.898	12 Aug 87 10:00		8.972
22 Jul 87 10:45		9.274	22 Jul 87 08:15		9.924	26 Aug 87 10:15		8.932
05 Aug 87 11:50		9.239	05 Aug 87 10:00		9.906	16 Sep 87 11:30		8.882
19 Aug 87 10:40		9.244	19 Aug 87		9.931	30 Sep 87 11:30		8.857
02 Sep 87 10:55		9.191	02 Sep 87 09:30		9.930	14 Oct 87 11:15		8.832
16 Sep 87 14:10		9.175	16 Sep 87 10:15		9.934	29 Oct 87 11:00		8.815
30 Sep 87 13:20		9.150	30 Sep 87 10:00		9.927			
14 Oct 87 13:15		9.151	14 Oct 87 10:30		9.921			
			29 Oct 87		9.901			
04 May 88 08:15		9.262	04 May 88 09:30		9.926	11 May 88 08:30		8.995
18 May 88 08:35		9.229	18 May 88 09:00		9.904	25 May 88 10:15		8.989
01 Jun 88 08:25		9.225	01 Jun 88 09:15		9.886	08 Jun 88 09:45		8.949
15 Jun 88 08:10		9.197	15 Jun 88 09:00		9.888	22 Jun 88		8.942
29 Jun 88 08:10		9.152	29 Jun 88 08:40		9.830	06 Jul 88 09:40		8.941
13 Jul 88 08:25		9.213	13 Jul 88 08:40		9.902	20 Jul 88 09:35		9.011
27 Jul 88 08:10		9.165	27 Jul 88 08:10		9.852	03 Aug 88 09:55		8.999
10 Aug 88 08:10		9.140	10 Aug 88 08:05		9.756	17 Aug 88 09:45		8.952
24 Aug 88 08:30		9.110	24 Aug 88 08:30		9.612	31 Aug 88 10:15		8.933
07 Sep 88 15:10		9.082	07 Sep 88 09:00		9.572	07 Sep 88 10:40		8.892
21 Sep 88 14:30		9.087	21 Sep 88 09:30		9.613	21 Sep 88 10:20		8.905
05 Oct 88 09:40		9.065	05 Oct 88 09:10		9.609	05 Oct 88 09:50		8.871
19 Oct 88 09:40		9.049	19 Oct 88 09:25		9.601	19 Oct 88 09:25		8.851
17 May 89 10:30		9.354	17 May 89 08:10		9.732	18 May 89		9.089
31 May 89 11:15		9.367	14 Jun 89 08:30		9.850	01 Jun 89 08:20		9.060
14 Jun 89 10:30		9.449	28 Jun 89 08:40		9.771	15 Jun 89 09:15		9.081
28 Jun 89 09:10		9.479	12 Jul 89 07:50		9.757	29 Jun 89 08:30		9.062
12 Jul 89 09:30		9.521	09 Aug 89 08:20		9.644	13 Jul 89 08:20		9.075
26 Jul 89 09:00		9.485	23 Aug 89 09:00		9.691	27 Jul 89 09:15		8.992
09 Aug 89 08:10		9.493	06 Sep 89 08:15		9.602	10 Aug 89 10:20		8.969
23 Aug 89 10:00		9.523	20 Sep 89 08:40		9.534	24 Aug 89 09:25		8.949
06 Sep 89 09:30		9.481	04 Oct 89 09:20		9.494	29 Aug 89		8.936
20 Sep 89 10:40		9.467	17 Oct 89 09:15		9.508	07 Sep 89 08:30		8.909
04 Oct 89 11:10		9.412				21 Sep 89 08:45		8.868
17 Oct 89 10:10		9.422				05 Oct 89 09:00		8.826
						05 Oct 89 09:00		8.826
						18 Oct 89 09:00		8.833
08 May 90 09:00		9.538	08 May 90 10:40		9.735	09 May 90 10:00		8.952
22 May 90 09:45		9.538	22 May 90 09:00		9.723	23 May 90 09:40		8.944
05 Jun 90 09:15		9.548	05 Jun 90 08:55		9.687	06 Jun 90 10:10		8.950
19 Jun 90 09:25		9.606	19 Jun 90 09:30		9.799	20 Jun 90 10:30		9.001
03 Jul 90 09:05		9.650	03 Jul 90 09:30		9.763	04 Jul 90 09:25		8.990
17 Jul 90 09:20		9.654	17 Jul 90 08:20		9.685	18 Jul 90 09:45		8.932
31 Jul 90 09:35		9.620	31 Jul 90 09:00		9.619	01 Aug 90 09:00		8.894
14 Aug 90 11:15		9.556	14 Aug 90 07:40		9.537	15 Aug 90 11:00		8.842
28 Aug 90 09:10		9.538	28 Aug 90 09:10		9.519	29 Aug 90 10:10		8.826
11 Sep 90 10:30		9.490	11 Sep 90 10:45		9.477	12 Sep 90 09:55		8.773
25 Sep 90 11:00		9.483	25 Sep 90 10:30		9.480	26 Sep 90 10:20		8.766
09 Oct 90 09:00		9.465	09 Oct 90 10:00		9.471	10 Oct 90 10:10		8.753
23 Oct 90 09:15		9.445	23 Oct 90 10:00		9.441	24 Oct 90 09:20		8.726

Table A2.1. Cont'd.

LAKE 377			LAKE 442			LAKE 938		
DATE	TIME	LEVEL	DATE	TIME	LEVEL	DATE	TIME	LEVEL
09 Sep 86		9.280	09 Sep 86		9.145	11 Sep 86		8.725
17 Oct 86		9.229				18 Sep 86	10:00	8.658
						16 Oct 86		8.776
23 Apr 87 17:15		9.442	23 Apr 87 13:30		9.210	22 Apr 87 14:50		9.294
06 May 87 13:00		9.396	06 May 87 10:00		9.171	13 May 87 09:50		9.127
20 May 87 10:50		9.353	20 May 87 08:15		9.140	27 May 87 10:55		9.152
01 Jun 87 07:50		9.374	03 Jun 87 07:45		9.183	10 Jun 87 13:50		8.974
17 Jun 87 08:00		9.359	17 Jun 87 08:00		9.200	24 Jun 87 08:05		8.854
01 Jul 87 07:35		9.349	15 Jul 87 08:10		9.099	22 Jul 87 09:15		8.637
15 Jul 87 07:45		9.335	29 Jul 87 07:55		9.043	05 Aug 87 08:45		8.572
29 Jul 87 08:00		9.304	12 Aug 87 08:30		9.017	19 Aug 87 08:40		8.598
12 Aug 87 08:30		9.324	26 Aug 87 08:20		8.951	02 Sep 87 08:50		8.537
26 Aug 87 08:30		9.277	16 Sep 87 09:15		8.878	16 Sep 87 15:15		8.526
16 Sep 87 14:00		9.189	30 Sep 87 09:00		8.841	30 Sep 87 14:10		8.512
30 Sep 87 14:00		9.120	14 Oct 87 08:45		8.822	14 Oct 87 14:15		8.787
14 Oct 87		9.073	29 Oct 87 08:45		8.811	29 Oct 87 13:20		8.818
29 Oct 87 13:15		9.055						
11 May 88 12:10		9.405	11 May 88 10:40		9.157	04 May 88 09:30		8.860
25 May 88 08:15		9.384	25 May 88 08:25		9.145	18 May 88 10:15		8.816
08 Jun 88 08:10		9.359	08 Jun 88 08:00		9.089	01 Jun 88 09:30		8.806
22 Jun 88 08:10		9.357	22 Jun 88 08:20		9.062	15 Jun 88 09:25		8.788
06 Jul 88 08:15		9.357	06 Jul 88		8.999	29 Jun 88 09:25		8.776
20 Jul 88 08:00		9.435	20 Jul 88 07:45		9.013	13 Jul 88		8.837
03 Aug 88 07:45		9.381	03 Aug 88 08:00		9.019	27 Jul 88 09:05		8.806
17 Aug 88 08:00		9.339	17 Aug 88 08:10		8.933	10 Aug 88 09:50		8.770
31 Aug 88 08:00		9.293	31 Aug 88 08:25		8.895	07 Sep 88 14:00		8.674
07 Sep 88 08:30		9.249	07 Sep 88 12:15		8.852	21 Sep 88 12:40		8.642
21 Sep 88 09:00		9.223	21 Sep 88 11:45		8.815	05 Oct 88 10:20		8.577
05 Oct 88 11:00		9.171	05 Oct 88 08:30		8.746	19 Oct 88 10:20		8.527
19 Oct 88 10:10		9.134	19 Oct 88 08:30		8.702			
18 May 89 07:50		9.585	18 May 89 08:30		9.192	17 May 89 08:30		9.376
29 Jun 89		9.559	01 Jun 89 08:00		9.171	31 May 89 09:15		9.388
13 Jul 89 07:30		9.565	15 Jun 89 09:10		9.209	14 Jun 89 08:45		9.462
27 Jul 89 09:15		9.461	29 Jun 89 09:00		9.211	28 Jun 89 08:00		9.447
10 Aug 89		9.393	13 Jul 89 08:15		9.183	12 Jul 89 08:30		9.440
24 Aug 89 09:50		9.369	27 Jul 89 08:00		9.105	26 Jul 89		9.306
29 Aug 89		9.339	10 Aug 89 11:20		9.095	09 Aug 89 10:00		9.176
07 Sep 89 08:20		9.315	24 Aug 89 09:10		9.173	23 Aug 89 10:20		9.112
21 Sep 89 09:00		9.277	29 Aug 89		9.044	06 Sep 89 09:45		8.920
05 Oct 89 09:00		9.201	07 Sep 89 09:40		9.002	20 Sep 89 09:15		8.860
18 Oct 89 09:15		9.177	05 Oct 89 10:00		8.862	27 Sep 89		8.799
						04 Oct 89 09:30		8.635
						09 Oct 89 16:20		8.590
						17 Oct 89 09:30		8.555
						25 Oct 89 15:51		8.536
09 May 90 08:30		9.337	09 May 90 08:10		8.934	30 Apr 90		8.870
23 May 90 10:30		9.361	23 May 90 09:15		8.984	07 May 90		8.872
06 Jun 90 09:45		9.379	06 Jun 90 08:25		9.092	08 May 90 10:35		8.874
20 Jun 90 09:50		9.479	20 Jun 90 09:40		9.188	22 May 90 10:00		8.852
04 Jul 90 09:25		9.585	04 Jul 90 09:30		9.165	05 Jun 90 08:40		8.960
18 Jul 90 08:45		9.537	18 Jul 90 09:20		9.158	19 Jun 90 09:20		9.171
01 Aug 90 09:00		9.447	01 Aug 90 09:30		9.130	17 Jul 90 11:20		9.320
15 Aug 90 09:45		9.363	15 Aug 90 08:30		9.070	31 Jul 90 09:25		9.236
29 Aug 90 08:25		9.323	29 Aug 90 09:25		9.058	14 Aug 90 09:45		9.112
12 Sep 90 08:40		9.265	12 Sep 90 08:30		9.016	28 Aug 90 09:40		8.978
26 Sep 90 09:30		9.205	26 Sep 90 09:00		9.008	11 Sep 90 09:00		8.839
10 Oct 90 10:00		9.178	10 Oct 90 11:00		8.982	25 Sep 90 09:45		8.788
24 Oct 90 09:20		9.130	24 Oct 90 09:30		8.960	09 Oct 90 10:20		8.715
						23 Oct 90 10:30		8.666

Table A2.2. a) Mean daily discharge at Lake 164 outlet weir, 1987. A = manual observation, non-recorded value.
E = estimated value. Units: cubic metres/second.

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1													1
2													2
3													3
4													4
5													5
6													6
7													7
8													8
9													9
10													10
11													11
12													12
13													13
14													14
15													15
16													16
17													17
18													
19													0.0524
20													0.0524
21													0.0521
22													0.0497
23													0.0506
24													0.0647
25													0.0812
26													0.0822
27													0.0805
28													0.0767
29													0.0733
30													0.0712
31													0.0660
MEAN													0.0723
													MEAN

Table A2.2. b) Mean daily discharge at Lake 164 outlet Weir, 1988. A = manual observation, non-recorded value.
E = estimated value. Units: cubic metres/second.

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	0.0839 E		0.0506	0.4646	0.1429	0.1004	0.1668	0.0065	0.0017	0.0028			1
2	0.0807 E		0.0504	0.4419	0.2518	0.0966	0.1576	0.0037	0.0014	0.0032			2
3	0.0777 E		0.0502	0.4199	0.2388	0.0961	0.1455	0.0019	0.0022	0.0038			3
4	0.0747 E		0.0662	0.3948	0.2007	0.0937	0.1419	0.0011	0.0025				4
5	0.0718 E		0.0931	0.3638	0.1756	0.0941	0.1363	0.0007	0.0022				5
6	0.0689 E		0.1059	0.3401	0.1582	0.1277	0.1372	0.0006	0.0017				6
7	0.0661 E		0.1267	0.3312	0.1434	0.7084	0.1346	0.0005	0.0013				7
8	0.0634 E		0.1720	0.3326	0.1262	0.9695	0.1189	0.0004	0.0010				8
9	0.0608 E		0.2402	0.3123	0.1064	0.9272	0.1177	0.0004	0.0009				9
10	0.0582 E		0.2801	0.2802	0.1022	0.8837	0.1214	0.0007	0.0011				10
11	0.0557 E		0.3299	0.2733	0.0956	0.8236	0.1137	0.0013	0.0014				11
12	0.0532 E		0.3871	0.2761	0.0937	0.7576	0.1141	0.0013	0.0013				12
13	0.0508 E		0.3992	0.2924	0.0835	0.7523	0.1108	0.0008	0.0014				13
14	0.0485 E		0.5976	0.2691	0.1288	0.6673	0.1057	0.0005	0.0015				14
15	0.0463 E		0.6350	0.2410	0.2997	0.6344	0.1067	0.0005	0.0014				15
16	0.0441 E		0.6654	0.2288	0.2765	0.5678	0.1003	0.0016	0.0017				16
17	0.0420 E		0.7061	0.2254	0.2184	0.5181	0.0917	0.0019	0.0020				17
18	0.0400 A	0.0534	0.6674	0.2137	0.2112	0.4833	0.0799	0.0015	0.0020				18
19	0.1273 A	0.0532	0.6144	0.2131	0.1896	0.4645	0.0777	0.0043	0.0014				19
20	0.1268 E	0.0530	0.6008	0.2529	0.1694	0.4269	0.0735	0.0032	0.0011				20
21	0.1231 E	0.0528	0.5757	0.2636	0.1497	0.3933	0.0642	0.0021	0.0012				21
22	0.1192 E	0.0526	0.5677	0.2743	0.1365	0.3511	0.0612	0.0027	0.0009				22
23	0.1153 E	0.0524	0.5748	0.2502	0.1218	0.3102	0.0567	0.0039	0.0023				23
24	0.1115 E	0.0522	0.5547	0.2244	0.1228	0.3195	0.0522	0.0033	0.0016				24
25	0.1078 E	0.0520	0.5445	0.2073	0.1135	0.2974	0.0500	0.0027	0.0013				25
26	0.1042 E	0.0518	0.5521	0.1935	0.1133	0.2711	0.0471	0.0022	0.0012				26
27	0.1006 E	0.0516	0.5448	0.1848	0.1133	0.2598	0.0446	0.0021	0.0020				27
28	0.0971 E	0.0514	0.5203	0.1993	0.1091	0.2380	0.0300	0.0021	0.0022				28
29	0.0937 E	0.0512	0.4994	0.2032	0.1029	0.2153	0.0190	0.0023	0.0021				29
30	0.0903 E	0.0510	0.4808	0.1848	0.1030	0.1878	0.0116	0.0021	0.0021				30
31	0.0871 E	0.0508		0.1541		0.1790	0.0095						31
MEAN			0.4084	0.2744	0.1533	0.4263	0.0903	0.0020	0.0016				MEAN

Table A2.2. c) Mean daily discharge at Lake 164 outlet Weir, 1989. A = manual observation, non-recorded value.
E = estimated value. Units: cubic metres/second.

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1				0.0678	2.2293	0.3415		0.1111	0.1092	0.0085	0.0064	0.0124	1
2				0.0585	2.0162	0.3328		0.1082	0.1100	0.0068	0.0065	0.0129	2
3				0.0531	1.8107	0.3060	0.5992	0.2027	0.1035	0.0062	0.0064	0.0125	3
4				0.0639	1.6796	0.2731	0.5489	0.2126	0.0963	0.0057	0.0070	0.0120	4
5				0.0745	1.7506	0.2471	0.6037	0.2041	0.0923	0.0068	0.0088	0.0126	5
6				0.0796	1.7070	0.2382	0.8066	0.1834	0.0900		0.0092	0.0122	6
7				0.0823	1.6170	0.4182	0.8507	0.1641	0.0841		0.0099	0.0124	7
8				0.0929	1.4943	0.5079	0.7578	0.1506	0.0777		0.0117	0.0124	8
9				0.1108	1.3663	0.4917	0.6937	0.1356	0.0734		0.0136		9
10				0.1101	1.2699	0.4439	0.6375	0.1190	0.0697		0.0137		10
11				0.1043	1.1626	0.3868	0.5901	0.1052	0.0703		0.0141		11
12				0.1021	1.0519	0.5564	0.5639	0.0950	0.0717		0.0138		12
13				0.1063	0.9579	1.0684	0.5341	0.0848	0.0685		0.0147		13
14				0.1059	0.8801	1.2731	0.4864	0.0746	0.0639		0.0159		14
15				0.1093	0.8040	1.1257	0.4454	0.0694	0.0598		0.0172		15
16				0.1181	0.7229	0.9772	0.4193	0.0648	0.0549		0.0167		16
17				0.1998	0.6517	0.8770	0.3888		0.0500		0.0161		17
18				0.2518	0.6133	0.8242	0.3575		0.0444		0.0155		18
19				0.3225	0.5909	0.7467	0.3252		0.0376		0.0152		19
20				0.3829	0.5847	0.7021	0.2978		0.0329		0.0156		20
21				0.4554	0.5525	0.7032	0.2689		0.0295		0.0148		21
22				0.7253	0.5114	0.7033	0.2450		0.0247		0.0140		22
23				1.4976	0.4754	0.6691	0.2108		0.0184		0.0141		23
24				1.9579	0.4504	0.6367	0.1966	0.2283	0.0150		0.0137		24
25				2.6803	0.5200	0.6185	0.1735	0.1965	0.0129		0.0137		25
26				2.9096	0.5411	0.6355	0.1642	0.1776	0.0112	0.0068	0.0130		26
27				2.9964	0.5186	0.6230	0.1513	0.1547	0.0103	0.0065	0.0130		27
28				2.9581	0.4856	0.6031	0.1295	0.1421	0.0093	0.0059	0.0130		28
29				2.7551	0.4506		0.1264	0.1351	0.0091	0.0062	0.0125		29
30				0.0662	0.4129		0.1232	0.1245	0.0093	0.0064	0.0121		30
31				0.0670	0.3777		0.1192	0.1151		0.0065			31
MEAN				0.7999	0.9760	0.6178 E	0.4200 E		0.0537		0.0127		MEAN

Table A2.2. d) Mean daily discharge at Lake 164 outlet weir, 1990. A = manual observation, non-recorded value.
E = estimated value. Units: cubic metres/second.

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY	
1	0.0323 E	0.0345 E			0.3743	0.1729	0.8083	0.1627	0.0331	0.0050	0.0043	0.0133	1	
2	0.0324 E	0.0345 E			0.3809	0.1860	0.7132	0.1393	0.0280	0.0048	0.0043	0.0136	2	
3	0.0325 E	0.0346 E	0.1197		0.3716	0.2272	0.6461	0.1274	0.0277	0.0043	0.0042	0.0137	3	
4	0.0326 E	0.0347 E	0.1202		0.3697	0.2367	0.6007	0.1105	0.0319	0.0043	0.0043	0.0136	4	
5	0.0326 E	0.0348 E	0.1235		0.3581	0.2338	0.6043	0.1058	0.0278	0.0044	0.0043	0.0132	5	
6	0.0327 E	0.0349 E	0.1240		0.3448	0.2299	0.5512	0.1028	0.0286	0.0050	0.0041	0.0134	6	
7	0.0328 E	0.0349 E	0.1208		0.3447	0.2173	0.5741	0.0936	0.0214	0.0049	0.0041	0.0131	7	
8	0.0329 E	0.0350 E	0.1200		0.3607	0.2236	0.6724	0.0897	0.0158	0.0047	0.0043	0.0125	8	
9	0.0329 E	0.0351 E	0.1193		0.3472	0.2340	0.7263	0.0924	0.0139	0.0036	0.0043	0.0124	9	
10	0.0330 E	0.0352 A	0.1251		0.3367	0.2301	0.7075	0.0902	0.0106	0.0039	0.0044	0.0121	10	
11	0.0331 E			0.1238	0.3258	0.2171	0.6519	0.0828	0.0116	0.0041	0.0043	0.0128	11	
12	0.0332 E			0.1214	0.3122	0.2500	0.6003	0.0810	0.0151	0.0035	0.0043	0.0126	12	
13	0.0332 E			0.1214	0.3146	0.2661	0.5580	0.0793	0.0135	0.0028	0.0043	0.0126	13	
14	0.0333 E			0.1270	0.3296	0.2896	0.5186	0.0779	0.0113	0.0025	0.0043	0.0133	14	
15	0.0334 E			0.1316	0.3259	0.2771	0.4719	0.0694	0.0100	0.0020	0.0042	0.0139	15	
16	0.0335 E			0.1352	0.3245	0.2694	0.4206	0.0767	0.0112	0.0021	0.0041	0.0145	16	
17	0.0312 A	0.0335 E		0.1345	0.3247	0.3695	0.3910	0.0835	0.0088	0.0022	0.0039	0.0146	17	
18	0.0313 E	0.0336 E		0.1342	0.3226	0.7323	0.3747	0.0800	0.0035	0.0027	0.0034	0.0147	18	
19	0.0314 E	0.0337 E		0.1461	0.3066	0.8878	0.3480	0.0765	0.0034	0.0033	0.0035	0.0135	19	
20	0.0315 E	0.0338 E		0.1580	0.2845	0.9878	0.3306	0.0697	0.0034	0.0036	0.0036	0.0120	20	
21	0.0315 E	0.0339 E		0.1611	0.2652	1.2542	0.3046	0.0651	0.0045	0.0035	0.0038		21	
22	0.0316 E	0.0339 E		0.1654	0.2497	1.5457	0.2699	0.0589	0.0056	0.0032	0.0043		22	
23	0.0317 E	0.0340 E		0.1770	0.2384	1.6113	0.2454	0.0669	0.0067	0.0029	0.0043		23	
24	0.0317 E	0.0341 E		0.1925	0.2420	1.4686	0.2308	0.0656	0.0057	0.0027	0.0043		24	
25	0.0318 E	0.0342 E		0.2071	0.2441	1.3774	0.2259	0.0565	0.0062	0.0030	0.0044		25	
26	0.0319 E	0.0342 E		0.2159	0.2422	1.3610	0.2146	0.0541	0.0066	0.0035	0.0055		26	
27	0.0320 E	0.0343 E		0.2199	0.2407	1.1889	0.2061	0.0462	0.0053	0.0038	0.0083		27	
28	0.0320 E	0.0344 E		0.2358	0.2319	1.0639	0.2400	0.0419	0.0056	0.0041	0.0092		28	
29	0.0321 E				0.2926	0.2203	0.9962	0.2279	0.0369	0.0066	0.0038	0.0100		29
30	0.0322 E				0.3371	0.2056	0.9398	0.2066	0.0343	0.0065	0.0040	0.0107		30
31	0.0323 E					0.1885		0.1816	0.0356		0.0041			31
MEAN				0.0334 E		0.1583 E	0.3009	0.6515	0.4459	0.0791	0.0130	0.0036	0.0049	MEAN

Table A2.3. a) Mean daily discharge at Lake 938 outlet weir, 1989. A = manual observation, non-recorded value.
E = estimated value. Units: cubic metres/second.

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1											0.2428	0.1191	1
2											0.2359	0.1205	2
3											0.2232	0.1210	3
4											0.2138	0.1218	4
5											0.2153	0.1218	5
6											0.2088	0.1213	6
7											0.1996	0.1209	7
8											0.1941	0.1205	8
9											0.1921	0.1285	9
10											0.1846	0.1300	10
11											0.1781	0.1291	11
12											0.1676	0.1274	12
13											0.1644	0.1266	13
14											0.1623	0.1256	14
15											0.1582	0.1236	15
16											0.1561		16
17											0.1579		17
18											0.1547		18
19											0.1510		19
20											0.1480		20
21											0.1428		21
22											0.1383		22
23											0.1350		23
24											0.1309		24
25											0.1287		25
26											0.0347	0.1259	26
27											0.1103	0.1234	27
28											0.1818	0.1214	28
29											0.2276	0.1191	29
30											0.2447	0.1177	30
31											0.2469		31
MEAN											0.1664		MEAN

Table A2.3. b) Mean daily discharge at Lake 938 outlet weir, 1990. A = manual observation, non-recorded value.
E = estimated value. Units: cubic metres/second.

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	0.1807	0.2106	0.2638	0.3353	0.3303	1.4042	0.8284	0.4123	0.1686	0.0534	0.0150	0.0150	1
2	0.1745	0.2081	0.2633	0.3349	0.3726	1.4009	0.7964	0.4030	0.1625	0.0527	0.0149	0.0149	2
3	0.1830	0.2075	0.2636	0.3339	0.4126	1.4219	0.7850	0.3897	0.1576	0.0502	0.0150	0.0150	3
4	0.1867	0.2072	0.2630	0.3335	0.4281	1.4449	0.7673	0.3830	0.1509	0.0482	0.0150	0.0150	4
5	0.1879	0.2066	0.2619	0.3310	0.4467	1.4450	0.7466	0.3703	0.1425	0.0458	0.0148	0.0148	5
6	0.1876	0.2033	0.2611	0.3285	0.4677	1.4278	0.7364	0.3607	0.1370	0.0432	0.0151	0.0151	6
7	0.1867	0.1994	0.2586	0.3269	0.4814	1.4846	0.7287	0.3454	0.1298	0.0403	0.0152	0.0152	7
8	0.1862	0.1978	0.2587	0.3273	0.5080	1.5287	0.7136	0.3319	0.1233	0.0380	0.0152	0.0152	8
9	0.1865	0.1966	0.2580	0.3296	0.5420	1.5117	0.6979	0.3191	0.1183	0.0368	0.0152	0.0152	9
10	0.1870	0.1946	0.2568	0.3290	0.5612	1.4876	0.6747	0.3022	0.1125	0.0354	0.0152	0.0152	10
11	0.1870	0.1935	0.2544	0.3260	0.5744	1.4594	0.6526	0.2889	0.1061	0.0329	0.0152	0.0152	11
12	0.1921	0.1956	0.2518	0.3231	0.6112	1.4268	0.6341	0.2759	0.1011	0.0301	0.0153	0.0153	12
13	0.1931	0.2029	0.2495	0.3266	0.6288	1.3966	0.6175	0.2623	0.0980	0.0280	0.0153	0.0153	13
14	0.1884	0.2078	0.2523	0.3408	0.6333	1.3621	0.5995	0.2526	0.0964	0.0262	0.0153	0.0153	14
15	0.1849	0.2356	0.2574	0.3446	0.6354	1.3340	0.5831	0.2406	0.0933	0.0246	0.0153	0.0153	15
16	0.1824	0.2711	0.2633	0.3498	0.6382	1.2966	0.5734	0.2267	0.0906	0.0232	0.0152	0.0152	16
17	0.1809	0.2800	0.2635	0.3580	0.7018	1.3007	0.5663	0.2141	0.0867	0.0219	0.0152	0.0152	17
18	0.1636	0.1935	0.2799	0.2607	0.3626	0.7934	1.2843	0.5516	0.2152	0.0821	0.0203	0.0152	18
19	0.1630	0.1953	0.2783	0.2613	0.3611	0.8308	1.2466	0.5357	0.2136	0.0773	0.0183	0.0152	19
20	0.1619	0.1989	0.2779	0.3579	0.9044	1.2063	0.5180	0.2069	0.0738	0.0172	0.0152	0.0152	20
21	0.1628	0.2046	0.2787	0.2656	0.3548	1.0264	1.1747	0.5045	0.2124	0.0702	0.0180	0.0152	21
22	0.1650	0.2126	0.2817	0.2720	0.3565	1.2399	1.1428	0.4943	0.2246	0.0664	0.0172	0.0151	22
23	0.1673	0.2116	0.2802	0.2841	0.3621	1.3177	1.1110	0.4860	0.2171	0.0628	0.0161	0.0150	23
24	0.1743	0.2119	0.2776	0.2938	0.3634	1.3328	1.0607	0.4805	0.2087	0.0613	0.0169	0.0149	24
25	0.1760	0.2121	0.2742	0.2994	0.3621	1.3470	1.0078	0.4703	0.2028	0.0590	0.0172	0.0149	25
26	0.1784	0.2115	0.2706	0.3058	0.3603	1.3943	0.9788	0.4602	0.1957	0.0568	0.0171	0.0148	26
27	0.1810	0.2116	0.2683	0.2973	0.3584	1.3946	0.9436	0.4497	0.1897	0.0601	0.0169	0.0146	27
28	0.1811	0.2119	0.2664	0.3040	0.3545	1.3989	0.9375	0.4470	0.1842	0.0593	0.0168	0.0141	28
29	0.1813		0.2641	0.3203	0.3488	1.4146	0.9181	0.4364	0.1778	0.0572	0.0165	0.0135	29
30	0.1815		0.2630	0.3300	0.3423	1.4113	0.8911	0.4301	0.1720	0.0558	0.0159	0.0133	30
31	0.1746		0.2649		0.3361		0.8580	0.4213		0.0542		0.0135	
MEAN	0.1940	0.2401	0.2719	0.3439	0.8260	1.2547	0.5931	0.2666	0.0959	0.0285	0.0149	MEAN	

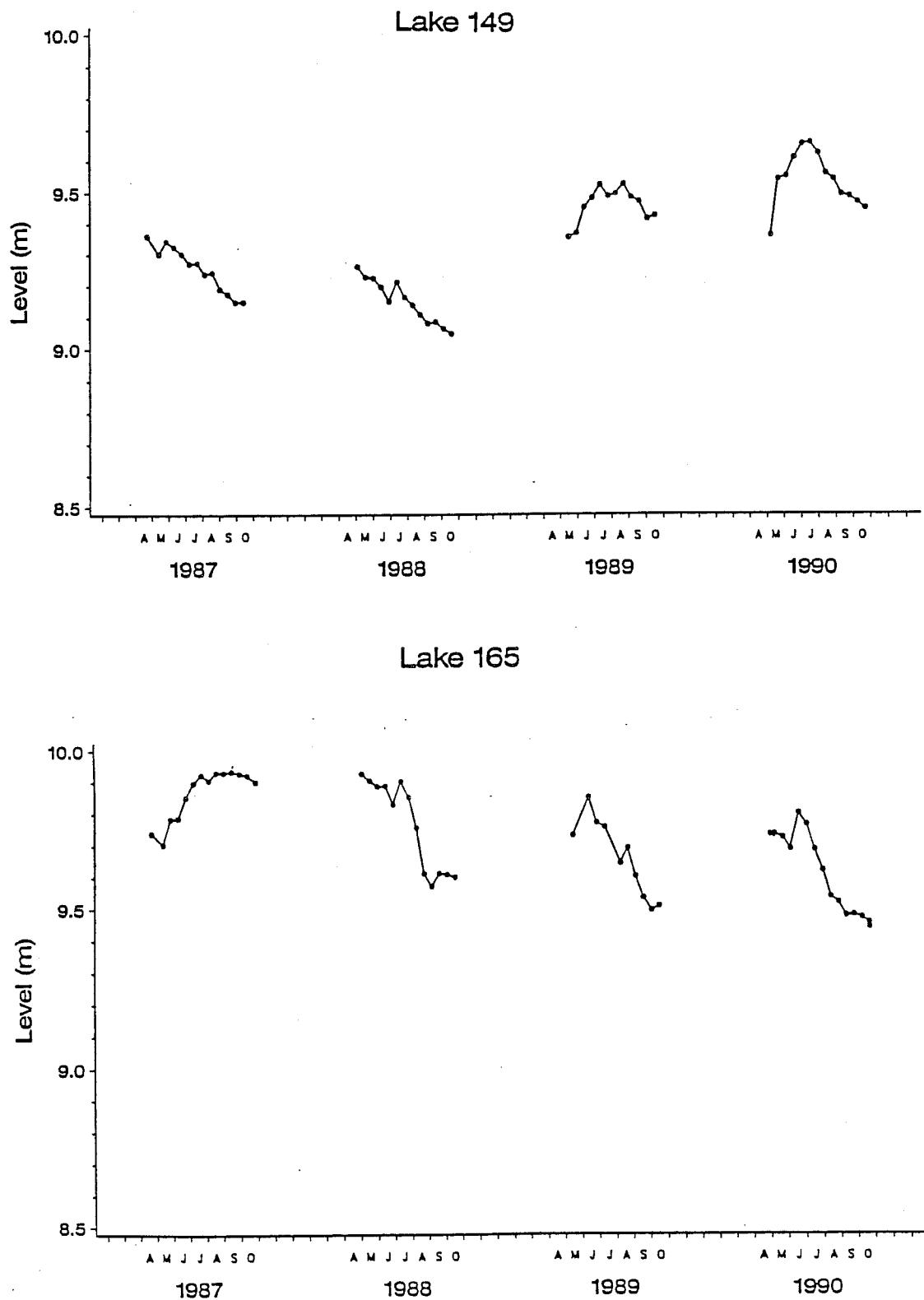


Fig. A2.1a. Lake levels, L149 and L165, 1987-1990.

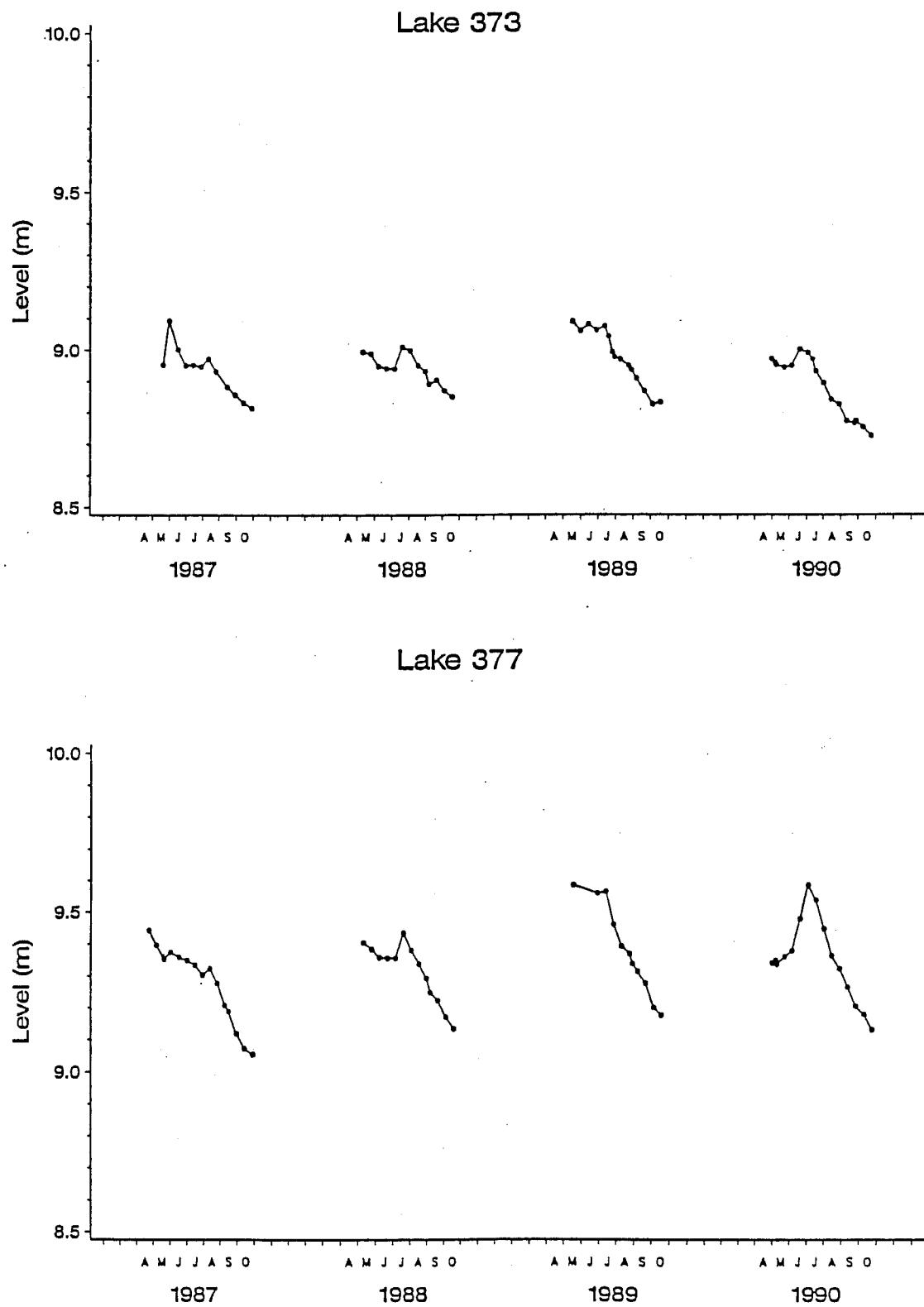


Fig. A2.1b. Lake levels, L373 and L377, 1987-1990.

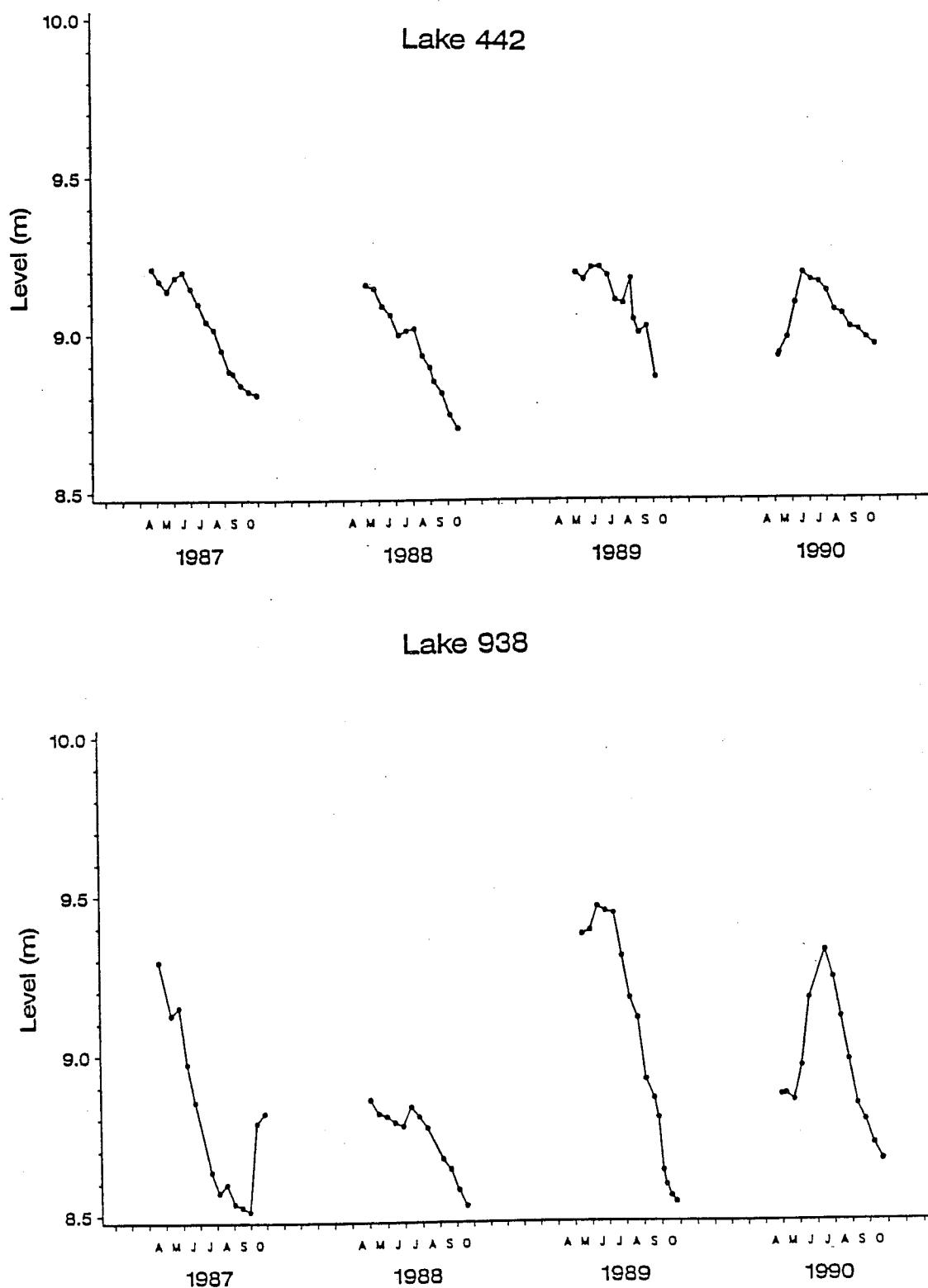


Fig. A2.1c. Lake levels, L442 and L938, 1987-1990.

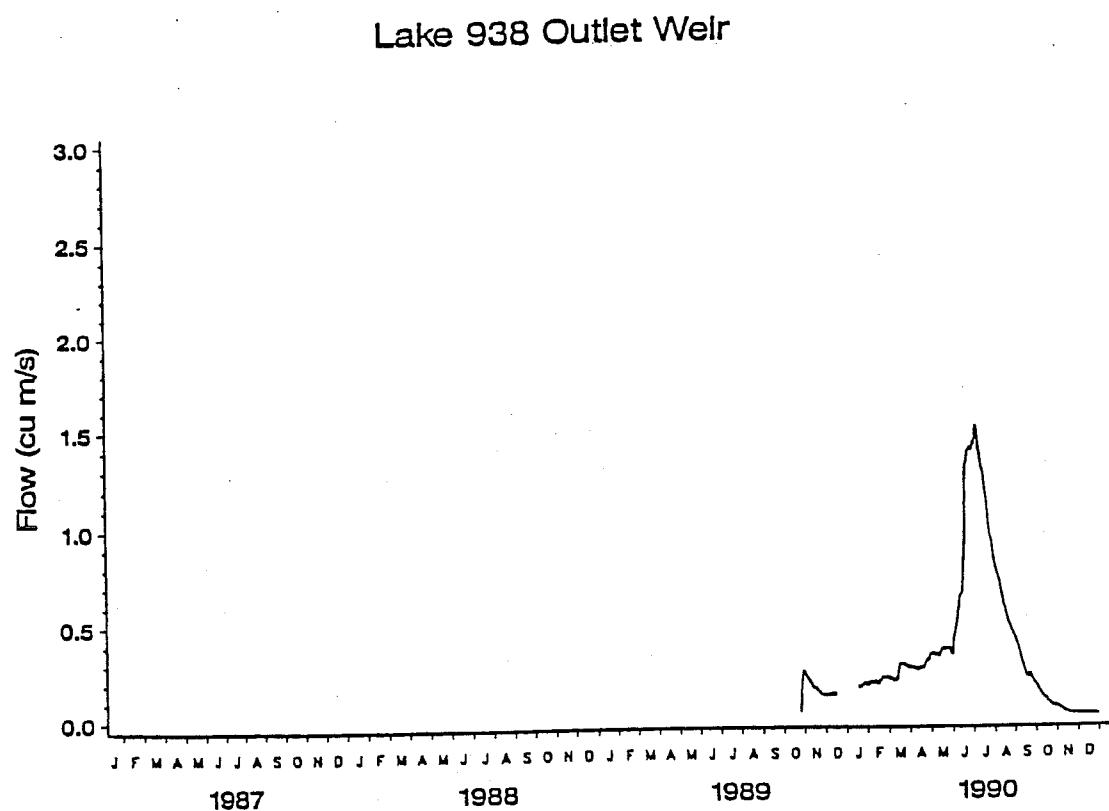
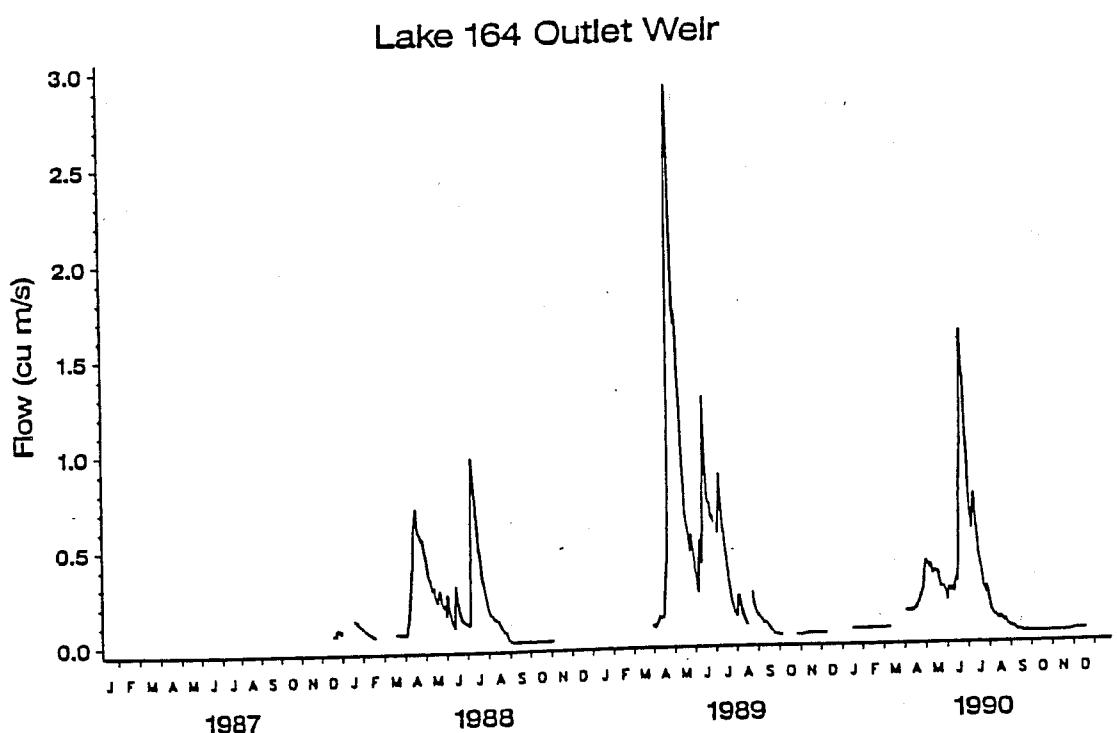


Fig. A2.2. Mean daily discharge at L164 and L938 outlet weir.

APPENDIX 3

In situ light measurements, ELA Lake Variation and Climate Change Study lakes,
1987-1990 (1983-1990 for L373).

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Table A3.1a. L149 Secchi depth, water colour, depth of 1% light transmittance (1% LT), and vertical attenuation coefficients (Kd). (NT = not taken, EMZ = exceeds lake's maximum depth).

Date	Secchi (m)	Water colour	Kd (m ⁻¹)	1% LT (m)	Date	Secchi (m)	Water colour	Kd (m ⁻¹)	1% LT (m)
1986/06/12.	NT	Pale yellow			1989/04/18	NT	Pale yellow/white	0.50	EMZ
1986/07/03	2.5	Pale yellow			1989/05/17	3.8	Yellow/white/turbid	0.47	EMZ
1986/09/11					1989/05/31	3.7	Pale yellow		
1986/09/18					1989/06/14	3.0	Yellow brown	0.84	EMZ
1986/10/16	NT				1989/06/28	2.4	Turbid/yellow/brown		
1987/04/22	4.0	Yellow			1989/07/12	1.8	Pea soup green		
1987/05/13	3.9	Pale green			1989/07/26	2.9	Pale green yellow		
1987/05/27	3.8	Yellow/green	0.52	EMZ	1989/08/09	2.6	Yellow orange	0.69	EMZ
1987/06/10	2.3	Pale green	0.66	EMZ	1989/08/23	2.3	Yellow brown		
1987/06/24	2.0	Light olive green			1989/09/06	2.2	Turbid yellow		
1987/07/08	2.2	Yellow/white	0.82	EMZ	1989/09/20	1.9	Yellow brown		
1987/07/22	2.3	Cloudy green/white			1989/10/04	1.9	Brown		
1987/08/05	2.5	Muddy yellow	0.76	EMZ	1989/10/17	1.8			
1987/08/19	2.4	Cloudy/green/white	0.78	EMZ	1990/04/10	NT			
1987/09/02	2.3	Pale green	0.64	EMZ	1990/05/08	NT	White/yellow/turbid	0.38	EMZ
1987/09/16	2.4	Turbid	0.63	EMZ	1990/05/08	3.1	Pale yellow	0.51	EMZ
1987/09/30	2.0	Turbid	0.57	EMZ	1990/05/22	2.5	Pale yellow	0.48	EMZ
1987/10/14	2.8	Turbid	0.61	EMZ	1990/06/05	2.5	Turbid yellow	0.61	EMZ
1987/10/29	NT				1990/06/19	2.4	Light brown	0.66	EMZ
1988/04/11	NT				1990/07/03	2.4	Yellow	0.78	EMZ
1988/05/04	3.9	Pale yellow/green			1990/07/17	2.1	Yellow brown	0.74	EMZ
1988/05/18	3.8	Light green	0.46	EMZ	1990/07/31	3.0	Turbid yellow	0.73	EMZ
1988/06/01	3.5	Pale green	0.66	EMZ	1990/08/14	2.8	Pale yellow	0.61	EMZ
1988/06/15	2.2	Light green	0.61	EMZ	1990/08/28	3.0	Turbid yellow	0.58	EMZ
1988/06/29	2.5	Light green	0.59	EMZ	1990/09/11	2.9	Brown green	0.70	EMZ
1988/07/13	2.2	Yellow	0.47	EMZ	1990/09/25	2.7		0.70	EMZ
1988/07/27	2.1	Yellow	0.82	EMZ	1990/10/09	NT		0.70	EMZ
1988/08/10	2.1	Brown	0.90	EMZ	1990/10/23	3.6	Dirty pale green	0.44	
1988/08/24	2.0	Yellow	0.89	EMZ					
1988/09/07	2.1	Yellow	0.47	EMZ					
1988/09/21	2.5	White/turbid							
1988/10/05	2.9	Yellow/brown	0.69	EMZ					
1988/10/19	2.7	Yellow							

Table A3.1b. L164 Secchi depth, water colour, depth of 1% light transmittance (1% LT), and vertical attenuation coefficients (Kd). (NT = not taken, EMZ = exceeds lake's maximum depth).

Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)	Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)
1986/06/12	NT	Pale orange			1989/04/17	NT			
1986/07/03	3.9	Pale orange			1989/05/17	2.7	Amber	0.98	5.0
1986/09/29	NT				1989/05/31	2.7	Dark orange	0.64	5.5
1986/10/16	NT				1989/06/14	3.3	Orange brown	0.91	5.5
1987/04/22	2.5	Orange/brown			1989/06/28	3.1	Orange	0.93	4.5
1987/05/13	2.3	Dark yellow			1989/07/12	1.8	Yellow orange		
1987/05/27	4.2	Orange/yellow	0.92	4.0	1989/07/26	2.8	Yellow orange	1.51	3.0
1987/06/10	3.1	Orange/yellow			1989/08/09	2.6	Orange	1.47	3.0
1987/06/24	2.3	Orange			1989/08/23	3.3	Red brown	1.10	4.0
1987/07/08	3.0	Light orange			1989/09/06	2.9	Red brown		
1987/07/22	2.7	Orange			1989/09/20	2.0	Red brown		
1987/08/05	3.9	Yellow/orange			1989/10/04	2.5	Red brown		
1987/08/19	3.0	Orange			1989/10/17	2.1	Red brown		
1987/09/02	3.4	Orange			1990/04/10	NT			
1987/09/16	3.3	Orange	0.97	6.0	1990/05/08	2.0	Orange	0.84	5.0
1987/09/30	3.4	Orange	0.95	6.0	1990/05/22	2.4	Orange	0.71	5.5
1987/10/14	3.0	Orange	1.14	5.0	1990/06/05	2.1	Dark orange	0.85	5.0
1987/10/29	2.4	Orange/brown	1.40	5.0	1990/06/19	2.5	Rusty brown	0.71	5.5
1988/05/04	1.1	Yellow			1990/07/03	2.6	Orange	1.05	4.5
1988/05/18	2.5	Orange			1990/07/17	2.3	Dark orange	1.03	4.0
1988/06/01	3.0	Brown	0.79		1990/07/31	2.8	Brown/orange	0.98	4.5
1988/06/15	2.9	Orange	0.90		1990/08/14	2.1	Brown	0.90	4.5
1988/06/29	3.1	Orange	0.94		1990/08/28	2.8	Orange	0.83	5.0
1988/07/13	1.7	Red/brown	0.72		1990/09/11	3.0	Orange	0.85	4.5
1988/07/27	2.7	Red/brown	1.01		1990/09/25	2.3	Orange	1.13	3.5
1988/08/10	3.3	Red/brown	1.14	4.0	1990/10/09	3.0	Orange	1.26	4.0
1988/08/24	2.6	Red/brown	0.50	4.0	1990/10/23	2.2	Orange brown	0.86	4.5
1988/09/07	3.0	Red/brown	1.05	4.0					
1988/09/21	2.5	Rusty orange							
1988/10/05	2.8	Rusty white	0.95	4.5					
1988/10/19	2.3	Rusty orange	0.58	4.0					

Table A3.1c. L165 Secchi depth, water colour, depth of 1% light transmittance (1% LT), and vertical attenuation coefficients (Kd). (NT = not taken, EMZ = exceeds lake's maximum depth).

Date	Secchi (m)	Water colour	K_d (m ⁻¹)	1% LT (m)	Date	Secchi (m)	Water colour	K_d (m ⁻¹)	1% LT (m)
1986/06/12	NT				1989/04/17	NT			
1986/07/03	3.1	Yellow/orange			1989/05/17	2.4	Orange	0.87	EMZ
1986/09/10	NT				1989/05/31	2.6	Brown	0.82	EMZ
1986/09/30					1989/06/14	2.0	Orange brown	1.37	3.5
1986/10/16					1989/06/28	2.4	Orange	1.23	3.5
1987/04/22	2.8	Orange/brown			1989/07/12	1.8	Orange brown	1.26	3.5
1987/05/13	2.6	Orange			1989/07/26	2.5	Yellow orange		
1987/05/27	2.4	Orange/yellow	0.52	EMZ	1989/08/09	2.2	Yellow orange	1.08	EMZ
1987/06/10	3.0	Orange/yellow	0.66	EMZ	1989/08/23	1.9	Dark yellow	1.95	3.0
1987/06/24	2.4	Orange			1989/09/06	2.3	Red brown	1.21	EMZ
1987/07/08	2.8	Orange	0.82	EMZ	1989/09/20	2.4	Red brown		
1987/07/22	2.8	Orange			1989/10/04	2.5	Red brown		
1987/08/05	3.0	Orange	0.76	EMZ	1989/10/17	2.3	Red brown		
1987/08/19	1.8	Orange	0.78	EMZ	1990/04/10	NT			
1987/09/02	2.5	Orange	0.64	EMZ	1990/05/01	NT			
1987/09/16	2.3	Brown	0.63	EMZ	1990/05/08	1.9	Orange	1.04	EMZ
1987/09/30	2.4	Orange	0.57	EMZ	1990/05/22	2.0	Orange	0.90	4.0
1987/10/14	2.8	Orange	0.61	EMZ	1990/06/05	2.1	Dark orange	1.10	EMZ
1987/10/29	2.6	Orange			1990/06/19	2.5	Rusty brown	1.29	4.0
1988/05/04	3.5	Orange			1990/07/03	2.5	Orange	1.13	3.5
1988/05/18	2.9	Orange	0.46	EMZ	1990/07/17	2.2	Dark orange	1.68	3.0
1988/06/01	2.7	Brown	0.66	EMZ	1990/07/31	1.8	Brown/orange	1.31	3.5
1988/06/15	2.4	Orange	0.61	EMZ	1990/08/14	2.1	Brown	1.05	3.5
1988/06/29	2.5	Orange	0.59	EMZ	1990/08/28	3.0	Orange	0.98	3.5
1988/07/13	2.9	Red/brown	0.47	EMZ	1990/09/11	2.2	Orange	0.87	EMZ
1988/07/27	2.8	Red/brown	0.82	EMZ	1990/09/25	2.0	Orange	1.12	4.0
1988/08/10	2.9	Red/brown	0.90	EMZ	1990/10/09	2.5	Orange brown	1.20	3.5
1988/08/24	1.8	Red/brown	0.89	EMZ	1990/10/23	2.4	Brown orange	0.75	EMZ
1988/09/07	2.2	Red/brown	0.47	EMZ					
1988/09/21	3.1	Orange/brown							
1988/10/05	3.0	Rusty mango yellow	0.69	EMZ					
1988/10/19	2.8	Rusty orange							

Table A3.1d. L373 Secchi depth, water colour, depth of 1% light transmittance (1% LT), and vertical attenuation coefficients (Kd). (NT = not taken, EMZ = exceeds lake's maximum depth).

Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)	Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)
1983/06/07					1988/04/12	NT			
1983/07/05	0.33	13.0	0.33	13.0	1988/05/11	4.8	Pale green	0.31	13.0
1983/08/02	0.30	16.0	0.24	15.0	1988/05/25	6.5	Pale yellow	0.30	13.0
1983/08/04	0.24	14.0	0.30	14.0	1988/06/08	7.0	Pale	0.33	15.0
1983/08/30	0.32	14.0	0.32	14.0	1988/06/22	7.0	Pale green	0.28	16.0
1983/10/04	0.20	16.0	0.20	16.0	1988/07/06	8.0	Pale/clear	0.36	16.0
1984/05/21	0.30	13.0	0.30	13.0	1988/07/20	6.8	Pale green	0.30	15.0
1984/06/18	0.26	16.0	0.26	16.0	1988/08/03	7.5	Green	0.32	14.0
1984/07/16	0.22	15.0	0.22	15.0	1988/08/17	6.3	Pale green	0.22	15.0
1984/08/13	0.28	15.0	0.28	15.0	1988/08/31	7.0	Fluorescent green	0.23	15.0
1984/09/11	0.33	13.0	0.33	13.0	1988/09/07	6.9	Pale green/yellow	0.32	14.0
1984/10/16	0.25	15.0	0.25	15.0	1988/09/21	6.2	Fluorescent green	0.33	14.0
1985/05/29	0.31	13.0	0.31	13.0	1988/10/05	5.4	Pale white/blue	0.28	15.0
1985/06/26	0.26	14.0	0.26	14.0	1988/10/19	6.0	Pale blue/yellow		
1985/07/24	0.28	14.0	0.28	14.0	1989/04/18	NT			
1985/08/21	0.34	13.0	0.34	13.0	1989/05/18	5.6	Pale green	0.32	14.0
1985/09/25	0.35	12.0	0.35	12.0	1989/06/01	6.0	Pale green	0.33	12.5
1986/05/28	0.37	12.0	0.37	12.0	1989/06/15	7.5	Bright green	0.32	14.0
1986/06/11	NT		0.31	11.0	1989/06/29	5.8	Lime green	0.30	14.0
1986/07/02	8.3	Pale green	0.33	13.0	1989/07/13	6.1	Lime green	0.33	13.5
1986/07/22			0.34	13.0	1989/07/27	5.6	Fluorescent green	0.21	14.5
1986/08/19			0.34	12.0	1989/08/10	7.0	Green	0.33	14.0
1986/09/10			0.34	12.0	1989/08/24	7.2	Lime green		
1986/10/17	NT		0.34	13.0	1989/09/07	7.0	Pale green		
1986/10/22			0.34	13.0	1989/09/21	5.6	Pale blue/green		
					1989/10/05	5.8	Pale blue/white		
					1989/10/18	6.6	Clear		
1987/04/23	NT				1990/04/09	NT			
1987/05/06	6.4	Pale green	0.27	12.0	1990/04/30	NT			
1987/05/20	8.2	Blue/green	0.19	14.0	1990/05/09	4.5	Pale green	0.40	12.0
1987/06/01	8.6	Light green			1990/05/23	6.0	Lime green	0.37	12.0
1987/06/17	6.8	Pale blue/green			1990/06/06	5.5	Lime green	0.35	13.0
1987/07/01	9.2	Pale green	0.26	16.0	1990/06/20	6.3	Lime green	0.24	14.0
1987/07/15	9.7	Blue/white	0.30	13.0	1990/07/04	7.0	Bright green	0.30	15.0
1987/07/29	9.6	Lime green	0.30	9.5	1990/07/18	7.3	Pale green	0.24	15.0
1987/08/12	8.0	Green	0.23	16.0	1990/08/01	7.8	Fluorescent green	0.29	15.0
1987/08/26	9.0	Blue/white	0.28	18.0	1990/08/15	7.9	Pale green	0.27	16.0
1987/09/09	NT				1990/08/29	8.3	Pale green	0.27	15.0
1987/09/16	7.2	Pale green	0.28	15.5	1990/09/12	6.2	Green blue	0.21	16.0
1987/09/30	8.0	Pale blue/white	0.31	15.0	1990/09/26	6.4	Blue	0.24	16.0
1987/10/14	7.3	Pale green			1990/10/10	6.8	Fluorescent green	0.31	14.0
1987/10/29	5.4	Pale green	0.34	12.0	1990/10/24	5.4	Fluorescent green	0.33	13.0

Table A3.1e. L377 Secchi depth, water colour, depth of 1% light transmittance (1% LT), and vertical attenuation coefficients (Kd). (NT = not taken, EMZ = exceeds lake's maximum depth).

Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)	Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)
1986/06/11	NT	Very pale yellow			1989/04/18	NT	Yellow	0.38	9.0
1986/07/02	5.9				1989/05/18	3.9	Pale lime green	0.52	9.0
1986/09/09	NT				1989/06/01	4.8	Lime green	0.51	9.5
1986/10/17	NT				1989/06/15	5.0	Lime green	0.38	10.0
1987/04/23	NT	Yellow			1989/06/29	5.0	Yellow	0.61	8.0
1987/05/06	4.6	Pale yellow/green	0.40	10.0	1989/07/13	5.8	Lime green	0.39	10.0
1987/05/20	5.5	Medium dark yellow	0.47	9.0	1989/07/27	4.2	Green	0.55	8.5
1987/06/01	3.3	Yellow/green	0.42	9.0	1989/08/10	5.6	Green	0.60	7.0
1987/06/17	5.8	Pale yellow/green	0.51	12.0	1989/09/07	5.8	Green yellow		
1987/07/01	6.6	Green	0.48	9.0	1989/09/21	6.1	Bright green		
1987/07/15	5.6	Bright yellow/green	0.33	11.0	1989/10/05	5.9	Bright green		
1987/07/29	6.8	Blue/yellow/green	0.40	9.0	1989/10/18	6.3	Pale yellow/green		
1987/08/12	5.6	Pale green			1990/04/09	NT			
1987/08/26	6.8	Yellow/green	0.43	10.0	1990/04/30	NT			
1987/09/09	NT	Pale yellow/blue/green	0.41	10.0	1990/05/09	2.5	Lime green	0.47	8.0
1987/09/16	6.6	Lime green			1990/05/23	4.5	Yellow	0.54	8.5
1987/09/30	6.1	Green/yellow	0.56	7.0	1990/06/06	5.3	Lemon yellow	0.46	11.5
1987/10/14	5.7				1990/06/20	5.3	Pale yellow	0.36	
1987/10/29	4.4				1990/07/04	4.3	Pale green	0.49	10.0
1988/04/12	NT	Yellow			1990/07/18	5.0	Gold	0.47	9.0
1988/05/11	4.5	Light green	0.43	9.5	1990/08/01	6.2	Yellow green	0.47	10.0
1988/05/25	5.4	Light green	0.41	10.0	1990/08/15	5.8	Pale yellow	0.47	10.0
1988/06/08	5.8	Pale yellow	0.48	9.0	1990/08/29	6.2	Green	0.48	9.0
1988/06/22	6.2	Light green			1990/09/12	5.5	Fluorescent green	0.35	11.0
1988/07/06	4.6	Yellow	0.54	9.0	1990/09/26	6.5	Fluorescent green	0.41	9.5
1988/07/20	4.7	Green	0.38	9.0	1990/10/10	5.5	Yellow green	0.45	9.5
1988/08/03	5.2	Green	0.40	9.0	1990/10/24	5.8	Lime	0.37	11.0
1988/08/17	5.8	Light green	0.35	9.0					
1988/08/31	5.2	Bright green/yellow	0.52	9.0					
1988/09/07	6.1	Yellow	0.25	11.0					
1988/09/21	5.5	Pale white/green	0.46	9.5					
1988/10/05	5.8	Pale yellow/green							
1988/10/19	5.4								

Table A3.1f. L442 Secchi depth, water colour, depth of 1% light transmittance (1% LT), and vertical attenuation coefficients (Kd). (NT = not taken, EMZ = exceeds lake's maximum depth).

Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)	Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)
1986/06/11	NT	Pale yellow			1989/04/18	NT	Pale yellow/turbid	0.59	7.0
1986/07/02	4.9	Pale yellow			1989/05/18	3.9	Turbid/white/yellow	0.60	6.0
1986/09/09					1989/06/01	4.5	Yellow	0.49	9.0
1986/10/17	NT				1989/06/15	4.8	Yellow	0.00	0.0
1987/04/23	NT				1989/06/29	3.8	Yellow green	0.52	9.0
1987/05/06	4.4	Pale green			1989/07/13	5.6	Yellow	0.28	10.0
1987/05/20	4.0	Yellow/green	0.35	7.0	1989/07/27	4.9	Lime green	0.46	9.0
1987/06/01	5.3	Lime green	0.36	8.0	1989/08/10	4.3	Yellow		
1987/06/17	4.3	Yellow			1989/08/24	4.0	Pale (clear)		
1987/07/01	5.0	Yellow	0.43	10.0	1989/09/07	5.0	Yellow green		
1987/07/15	5.4	Yellow	0.46	8.0	1989/09/21	4.1			
1987/07/29	6.3	Green			1989/10/05	NT			
1987/08/12	6.4	Yellow/green	0.34	10.0	1989/10/18	4.4	Dirty yellow/white		
1987/08/26	6.4	Yellow/green	0.45	9.0	1989/10/31	NT			
1987/09/09	NT				1990/04/09	NT			
1987/09/16	6.0	Lime green	0.32	10.0	1990/04/30	NT			
1987/09/30	6.1	Pale blue/white	0.55	8.0	1990/05/09	3.0	Yellow	0.54	9.0
1987/10/14	3.9	Turbid/yellow/white	0.59	6.0	1990/05/23	3.9	Yellow	0.67	7.0
1987/10/29	3.2	Dirty yellow	0.66	6.0	1990/06/06	4.8	Pale yellow	0.51	9.0
					1990/06/20	6.1	Green	0.37	10.0
1988/04/12	NT				1990/07/04	7.9	Clear yellow	0.41	11.0
1988/05/11	3.6	Yellow/green	0.44	9.0	1990/07/18	4.9	Lime green	0.37	10.0
1988/05/25	5.1	Pale green	0.51	8.0	1990/08/01	5.1	Lemon yellow	0.44	10.0
1988/06/08	6.4	Pale yellow	0.51	9.0	1990/08/15	5.6	Yellow green	0.44	10.0
1988/06/22	5.8	Light green	0.44	9.0	1990/08/29	5.1	Yellow	0.49	10.0
1988/07/06	4.2	Pale green	0.36	6.0	1990/09/12	4.6	Pale lime green	0.41	11.0
1988/07/20	6.5	Light green	0.47	9.0	1990/09/26	5.0	Pale lime green	0.51	9.0
1988/08/03	5.2	Green	0.37	10.0	1990/10/10	4.5	Yellow green	0.53	8.0
1988/08/17	4.1	Pale green	0.30	12.0	1990/10/24	3.4	Pale yellow green	0.55	7.5
1988/08/31	4.8	Yellow/green	0.38	11.0					
1988/09/07	5.7	Bright green/yellow	0.47	10.0					
1988/09/21	4.8	Green	0.42	10.0					
1988/10/05	4.8	Blue/white/turbid	0.42	10.0					
1988/10/19	0.0	Pale yellow/green							

Table A3.1g. 1986 Secchi depth, water colour, depth of 1% light transmittance (1% LT), and vertical attenuation coefficients (Kd). (NT = not taken, EMZ = exceeds lake's maximum depth).

Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)	Date	Secchi (m)	Water colour	Kd (m)	1% LT (m)
1986/06/12	NT				1989/04/18	NT			
1986/07/03					1989/05/17	4.7	Orange	0.32	EMZ
1986/09/11					1989/05/31	4.8	Brown	0.35	EMZ
1986/09/18	NT				1989/06/14	4.2	Orange brown	0.55	EMZ
1986/10/16					1989/06/28	4.6	Orange	0.37	EMZ
1987/04/22	4.4	Yellow/green			1989/07/12	5.0	Orange brown	0.39	EMZ
1987/05/13	4.2	Lime green			1989/07/26	5.1	Yellow orange	0.41	EMZ
1987/05/27	5.5	Yellow	0.32	EMZ	1989/08/09	4.4	Yellow orange	0.48	EMZ
1987/06/10	4.5	Pale yellow	0.48	EMZ	1989/08/23	5.6	Dark yellow	0.44	EMZ
1987/06/24	4.8	Pale yellow/green			1989/09/06	4.8	Red brown	0.42	EMZ
1987/07/08	4.3	Pale yellow/blue	0.50	EMZ	1989/09/20	4.2	Red brown	0.41	EMZ
1987/07/22	3.9	Pale yellow/white			1989/10/04	4.5	Red brown	0.41	EMZ
1987/08/05	3.8	Yellow/green	0.65	EMZ	1989/10/17	4.8	Red brown	0.41	EMZ
1987/08/19	3.5	Pale cloudy yellow	0.48	EMZ	1990/04/10	NT			
1987/09/02	3.4	Pale green	0.67	EMZ	1990/05/01	NT			
1987/09/16	3.2	Yellow	0.66	EMZ	1990/05/08	3.5	Orange	0.42	EMZ
1987/09/30	NT		0.48	EMZ	1990/05/22	3.8	Orange	0.39	EMZ
1987/10/14	3.8	Yellow/green	0.56	EMZ	1990/06/05	3.5	Dark orange	0.46	EMZ
1987/10/29	4.8	Yellow/green			1990/06/19	4.7	Rusty brown	0.41	EMZ
1988/05/04	4.2	Pale white/yellow			1990/07/03	4.0	Orange	0.27	EMZ
1988/05/18	4.5	Light green	0.54	EMZ	1990/07/17	4.2	Dark orange	0.43	EMZ
1988/06/01	5.1	Pale green	0.48	EMZ	1990/07/31	5.0	Brown/orange	0.60	EMZ
1988/06/15	4.0	Light green	0.56	EMZ	1990/08/14	3.9	Brown	0.52	EMZ
1988/06/29	4.2	Light green	0.66	EMZ	1990/08/28	4.7	Orange	0.39	EMZ
1988/07/13	NT		0.61	EMZ	1990/09/11	4.0	Orange	0.39	EMZ
1988/07/27	4.1	Yellow	0.53	EMZ	1990/09/25	4.8	Orange	0.43	EMZ
1988/08/10	2.8	Yellow	0.67	EMZ	1990/10/09	4.0	Orange brown	0.51	EMZ
1988/08/24	3.8	Yellow	0.42	EMZ	1990/10/23	3.5	Brown orange	0.39	EMZ
1988/09/07	3.5	Fluorescent green	0.56	EMZ					
1988/09/21	3.3	Yellow/green							
1988/10/05	3.1	Yellow	0.49	EMZ					
1988/10/19	3.0	Yellow							

Table A3.2a. L149 light attenuation profiles for 1987 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 27	Jun 10	Jul 08	Aug 05	Aug 19	Sep 02	Sep 16	Sep 30	Oct 14
Air	143.3	623.1	2835.8	1660.5	783.6	746.3	1007.5	914.2	1138.1
0.5	87.0	364.0	1750.0	1225.0	450.0	410.0	590.0	450.0	600.0
1.0	60.0	212.0	1100.0	800.0	300.0	250.0	330.0	360.0	425.0
2.0	26.0	110.0	460.0	350.0	135.0	145.0	155.0	220.0	260.0
3.0	21.0		215.0	175.0	62.5	69.0	94.5	115.0	125.0
3.5						41.0			
4.0	1.8	58.4	130.0	90.0	56.0		58.0	80.0	88.5

Table A3.2b. L149 light attenuation profiles for 1988 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Oct 05
Air	522.4	765.0	186.6	783.6	253.7	447.8	585.8	93.3	544.8	451.5
0.5	295.0	650.0	140.0	450.0	165.0	450.0	425.0	55.5	210.0	410.0
1.0	215.0	530.0	87.0	300.0	89.0	260.0	210.0	42.5	140.0	290.0
1.5									100.0	
2.0	125.0	225.0	47.5	145.0	63.0	115.0	79.0	17.5	82.0	145.0
2.5									68.0	
3.0	86.5	143.0	26.3	91.5	35.0	45.0	35.0	13.5	65.0	72.0
3.5								12.5		
4.0	50.0	115.0		55.0	30.0					

Table A3.2c. L149 light attenuation profiles for 1989 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 17	May 31	Jun 28	Jul 12	Aug 09	Aug 23
Air	111.9	2574.6	1791.0	858.2	1082.1	1716.4
0.5	68.0	1800.0	1000.0	210.0	680.0	750.0
1.0	43.0	1200.0	650.0	185.0	150.0	395.0
1.5					51.0	
2.0	26.0	710.0	260.0	14.0	10.0	185.0
3.0	13.0	470.0	120.0			100.0
3.5		320.0	71.0			
4.0					10.5	

Table A3.2d. L149 light attenuation profiles for 1990 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 08	May 22	Jun 05	Jun 19	Jul 03	Jul 17	Jul 31	Aug 14	Aug 28	Sep 11	Sep 25	Oct 09	Oct 23
Air	119.3	283.6	26.8	169.3	145.3	838.8	1035.8	1388.1	267.1	262.3	868.7	626.9	79.5
0.5		253.0	20.5	80.7	70.1	680.4	727.0	966.9	188.7	77.1	628.0	380.0	41.0
1.0	48.9	196.0	16.1	68.5	65.8	315.6	336.0	713.4	113.7	75.5	425.0	305.0	20.9
1.5		144.0	13.7	41.3	44.5	165.8	277.7		74.9	53.5	324.2	191.0	13.5
2.0	30.5	103.0	10.0	29.3	31.8	115.4	183.5	377.7	57.2	46.3	212.6	149.0	8.5
2.5		81.0	8.3	26.8	26.5	86.7	113.8	217.1	43.1	30.3	140.8	102.0	
3.0	20.8	68.0	6.6	19.7	19.1	79.1	80.5	173.8	32.8	23.3	114.5	72.0	
3.5	15.2	55.0	4.8	12.7	11.3	33.8	59.2	118.0	23.3	17.8	73.4	54.0	
4.0		43.0	3.8	8.9	6.5	21.7	38.2	90.3	14.7	11.6	23.4		

Table A3.3a. L164 light attenuation profiles for 1987 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 27	Jun 24	Jul 08	Jul 22	Aug 05	Aug 19	Sep 02	Sep 16	Sep 30	Oct 14
Air	291.0	1902.9	820.0	320.9	305.9	820.9	783.6	932.8	709.0	746.3
0.5	110.0	800.0	360.0	130.0	128.0	400.0	320.0	430.0	370.0	480.0
1.0	60.0	430.0	63.0	75.0	62.5	175.0	225.0	325.0	185.0	165.0
2.0	22.5	105.0	21.5	31.0	20.0	60.0	75.5	100.0	41.0	50.5
3.0	9.2	42.0	8.8	11.0	8.1	27.5	29.5	38.0	12.5	18.0
4.0	3.8	16.0	3.2		3.6	12.0	11.5	17.5	6.1	2.2
5.0	1.2	5.3	1.3		1.5	4.5	4.6	6.7	1.0	0.8
6.0		1.3				1.0	1.7	1.8		

Table A3.3b. L164 light attenuation profiles for 1988 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 04	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Oct 05	Oct 19
Air	440.3	820.9	1007.5	1119.4	858.2	895.5	783.6	858.2	820.9	173.9	335.8
0.5	320.0	570.0	435.0	420.0	470.0	340.0	370.0	370.0	380.0	73.0	100.0
1.0	150.0	320.0	180.0	300.0	170.0	170.0	175.0	125.0	250.0	38.0	
1.5					97.0		130.0		130.0		56.0
2.0	54.0	163.0	69.0	120.0	83.0	67.0	56.0	76.0	75.0	12.0	
2.5						36.0			52.0		18.0
3.0	5.6	59.0	31.5	44.0	28.5	21.0	25.5	29.0	32.0		4.8
4.0	3.2	32.0	11.5	18.5							2.0
5.0	2.2	12.5	4.8	7.4							0.8
6.0	0.7			1.3							0.4

Table A3.3c. L164 light attenuation profiles for 1989 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 17	May 31	Jun 14	Jun 28	Aug 09	Aug 23	Sep 06
Air	839.6	417.9	1182.8	1134.3	1544.8	1791.0	723.9
0.5	420.0	150.0	799.0	529.0	780.0	650.0	320.0
1.0	270.0	87.0	465.0	272.0	491.0	390.0	185.0
2.0	180.0	49.0	175.0	103.0	108.0	75.0	41.0
3.0	120.0	29.5	71.3	42.3	8.9		20.3
4.0	40.5	14.0	29.1	15.5			9.5
5.0	5.8		6.6				
6.0	2.4	2.9		2.2			

Table A3.3d. L164 light attenuation profiles for 1990 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Table A3.4a. L165 light attenuation profiles for 1987 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 27	Jun 24	Jul 08	Jul 22	Aug 05	Aug 19	Sep 02	Sep 16	Sep 30	Oct 14
Air	130.6	2164.2	462.7	25.4	686.6	335.8	880.6	783.6	157.1	858.2
0.5	38.0	75.0	40.0	10.0	275.0	135.0	300.0	340.0	71.5	235.0
1.0	27.0	26.5	17.5	5.7	185.0	45.0	125.0	230.0	36.0	230.0
2.0	8.4	18.0	12.5	1.8	67.0	19.5	31.5	68.0	13.4	68.0
3.0	2.8	10.5	8.3		19.5	6.8	19.5	22.0	6.0	23.5
4.0	0.8	3.1	2.3		4.0	1.9	5.5	7.5	2.4	7.4
4.5		1.4			1.3			2.5	1.4	

Table A3.4b. L165 light attenuation profiles for 1988 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 04	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Oct 05	Oct 19
Air	626.9	574.6	485.1	858.2	250.0	477.6	529.9	526.1	537.3	155.2	529.9
0.5	255.0	430.0	275.0	280.0	73.0	180.0	175.0	190.0	220.0	67.0	96.0
1.0	160.0	225.0	145.0	140.0	31.5	93.0	85.0	10.7	105.0	36.0	28.0
1.5						51.0		4.2	56.0	13.7	15.0
2.0	52.0	76.0	42.5	45.0	9.6	36.0	46.0		29.0	5.6	
2.5						19.5				3.9	
3.0	20.5	33.5	11.9	12.5			17.5				
4.0	8.3	13.0	5.8								
4.5			2.2								

Table A3.4c. L165 light attenuation profiles for 1989 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 17	May 31	Jun 14	Jun 28	Jul 12	Aug 09	Aug 23	Sep 06
Air	238.8	395.5	1179.1	774.6	142.5	1444.0	1492.5	276.1
0.5	93.5	190.0	602.0	325.0	79.5	763.0	450.0	73.0
1.0	87.5	130.0	390.0	146.0	38.9	424.0	170.0	28.5
1.5	57.0						30.0	16.3
2.0	33.5	52.0	85.1	45.8	10.9	145.0		8.5
2.5	20.0							4.4
3.0	14.5	25.0	25.3	12.4	3.1	48.5		
3.5	10.5					28.2		
4.0	5.3	8.3	3.5	3.1	0.7			

Table A3.4d. L165 light attenuation profiles for 1990 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 08	May 22	Jun 05	Jun 19	Jul 03	Jul 17	Jul 31	Aug 14	Aug 28	Sep 11	Sep 25	Oct 09	Oct 23
Air	180.8	489.4	988.8	236.3	191.1	747.8	827.6	519.2	1288.1	160.8	797.8	761.2	87.2
0.5	90.6	201.7	591.1	167.7	57.1	255.4	362.9	233.1	889.8	45.5	297.9	250.7	41.8
1.0	45.1	174.6	364.0	78.9	26.4	186.6	225.5	90.7	345.4	41.2	169.7	184.2	20.3
1.5	22.2	82.4	159.7	46.3	22.4	98.3	145.8	36.6	196.7	19.5	99.9	97.5	13.7
2.0	13.9	42.1	103.7	21.1	13.9	45.6	76.1	21.0	115.4	17.8	58.6	58.1	9.2
2.5	8.6	30.4	63.6	10.6	7.4	18.7	38.4	12.2	75.3	11.3	30.8	29.4	6.5
3.0	5.1	20.0	39.1	5.7	3.3	7.6	19.8	7.6	48.0	6.8	20.7	17.6	4.8
3.5	3.2	13.7	19.9	3.5	1.8	2.9	8.7	3.8	25.0	4.0	9.7	9.6	3.0
4.0	2.0	9.0	10.8	1.8	0.9	1.5	3.9			2.6	6.8	2.1	

Table A3.5a. L373 light attenuation profiles for 1983 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	Jun 07	Jul 05	Aug 02	Aug 04	Aug 30	Oct 04
Air	3428.6	3857.1	600.8	604.5	946.4	282.1
0.5	2750.0	2250.0	460.0	450.0	835.0	165.0
1.0	2100.0	1950.0	390.0	375.0	725.0	137.0
2.0	1250.0	1575.0	290.0	280.0	545.0	110.0
3.0	1000.0	1350.0	240.0	225.0	415.0	96.5
4.0	665.0	1050.0	195.0	168.0	275.0	79.2
5.0	540.0	810.0	150.0	122.0	205.0	66.0
6.0	350.0	565.0	118.0	90.0	155.0	52.5
7.0	278.0	450.0	92.0	65.5	115.0	41.9
8.0	208.0	295.0	70.9	49.0	78.9	33.2
9.0	132.0	216.0	52.9	37.0	62.0	26.9
10.0	101.0	155.0	38.8	27.4	47.0	20.5
11.0	73.0	109.0	28.4	19.4	29.0	15.5
12.0	52.0	85.0	20.9	14.2	21.6	11.2
13.0	37.2	55.0	14.7	10.0	15.4	7.8
14.0	26.5	43.6	10.2	6.7	11.1	5.6
15.0	17.9	31.5	7.2	4.6	8.1	3.9
16.0	12.0	21.0	4.4	3.0	4.6	2.7
17.0	9.2	14.2	2.7	1.7		
18.0				0.9		1.5

Table A3.5b. L373 light attenuation profiles for 1984 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 21	Jun 18	Jul 16	Aug 13	Sep 11	Oct 16
Air	325.0	818.0	450.0	1210.0	855.0	515.0
0.5	190.0	545.0	300.0	900.0	630.0	250.0
1.0	140.0	420.0	215.0	737.0	470.0	190.0
2.0	100.0	305.0	157.0	562.0	310.0	150.0
3.0	81.0	239.0	130.0	425.0	205.0	116.0
4.0	61.5	192.0	109.0	330.0	142.0	89.0
5.0	46.5	151.0	88.0	248.0	108.0	70.0
6.0	32.5	124.0	70.0	192.0	78.0	53.0
7.0	23.0	94.0	55.0	143.0	60.0	40.5
8.0	17.0	70.0	43.0	108.0	45.0	31.0
9.0	12.7	54.0	32.0	81.0	33.0	24.5
10.0	9.5	41.0	24.5	58.0	23.0	19.4
11.0	7.1	31.0	18.6	43.0	16.0	15.9
12.0	5.2	24.0	14.4	32.0	10.7	11.9
13.0	3.8	17.5	10.7	22.5	8.0	8.9
14.0	2.7	13.9	7.7	17.1	5.6	6.3
15.0		10.5	5.4	12.0	4.1	4.4
16.0		8.1	3.7	8.3	3.2	
17.0		6.3	2.4	5.4		
18.0			1.5	3.4		

Table A3.5c. L373 light attenuation profiles for 1985 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 29	Jun 26	Jul 24	Aug 21	Sep 25
Air	88.0	144.0	481.0	1320.0	1830.0
0.5	53.0	98.0	421.0	960.0	750.0
1.0	38.0	72.0	319.0	750.0	650.0
2.0	25.0	49.0	219.0	530.0	460.0
3.0	18.6	39.0	170.0	318.0	280.0
4.0	13.8	30.9	135.0	236.0	230.0
5.0	10.0	24.3	101.0	183.0	140.0
6.0	7.6	18.4	76.0	126.0	110.0
7.0	5.9	13.9	56.0	96.0	80.0
8.0	4.3	10.5	31.6	71.9	50.0
9.0	3.2	7.7	23.9	50.4	35.0
10.0	2.3	5.7	17.8	32.5	25.0
11.0	1.6	4.2	13.2	23.8	19.0
12.0	1.2	3.0	9.5	17.4	13.0
13.0	0.8	2.1	7.2	11.9	9.5
14.0	0.6	1.5	5.0	9.4	6.6
15.0	0.4	1.0	3.3	6.6	4.4
16.0	0.3	0.8	2.2		2.8
17.0		0.5			

Table A3.5d. L373 light attenuation profiles for 1986 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 28	Jul 22	Aug 19	Sep 10	Oct 22
Air	1150.0	960.0	800.0	740.0	164.0
0.5	860.0	840.0	633.0	547.0	127.0
1.0	620.0	624.0	529.0	408.0	81.0
2.0	450.0	400.0	330.0	255.0	52.0
3.0	312.0	290.0	240.0	166.0	37.5
4.0	223.0	200.0	181.0	121.0	24.9
5.0	150.0	155.0	138.0	83.0	18.1
6.0	112.0	110.0	88.0	60.8	12.7
7.0	79.5	83.0	66.0	43.7	9.1
8.0	54.5	58.7	46.0	31.5	6.5
9.0	37.6	39.9	31.0	22.6	4.7
10.0	25.2	28.9	25.0	15.8	3.5
11.0	16.6	19.5	16.6	10.6	2.4
12.0	10.5	14.2	11.5	7.8	1.8
13.0	7.2	9.7	8.1	4.8	1.4
14.0	5.2	6.9	5.6	3.4	0.9
15.0	3.6	4.6	3.8		

Table A3.5e. L373 light attenuation profiles for 1987 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 20	Jun 01	Jul 01	Jul 15	Jul 29	Aug 12	Aug 26	Sep 16	Sep 30	Oct 29
Air	317.2	261.2	231.3	410.5	2164.2	119.4	1100.0	679.1	716.4	114.1
0.5	180.0	170.0	130.0	225.0	1800.0	82.5	900.0	500.0	530.0	77.0
1.0	145.0	130.0	85.0	178.0	1500.0	67.0	750.0	350.0	440.0	55.0
2.0	118.0	130.0	84.0	145.0	875.0	49.5	600.0	220.0	300.0	39.0
3.0	93.0	120.0	74.8	96.0	600.0	41.5	425.0	200.0	210.0	28.0
4.0	75.0	120.0	65.6	65.0	560.0	33.0	325.0	160.0	160.0	20.7
5.0	54.0	85.0	48.5	52.0	400.0	26.0	250.0	105.0	125.0	14.7
6.0	40.2	67.0	38.0	44.0	300.0	20.0	190.0	83.0	85.0	10.4
7.0	29.0	65.0	28.8	19.0	165.0	16.5	110.0	65.0	67.0	7.4
8.0	19.9	45.0	16.9		67.0	12.4	95.0	50.0	50.0	5.1
9.0	14.1	32.0	15.5		45.0	9.1	75.0	40.0	39.0	3.5
10.0	8.8	30.0	12.4		10.0	6.5	34.0	32.0	30.0	2.4
11.0	6.4	27.0				5.0	25.0			
12.0	3.5	25.0				3.4	16.0			
13.0	2.3	19.0					10.5			
14.0	1.5	11.0					8.5			
15.0	1.3						7.5			
16.0							4.9			
17.0							3.2			
18.0							1.8			

Table A3.5f. L373 light attenuation profiles for 1988 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 11	May 25	Jun 08	Jun 22	Jul 06	Jul 20	Aug 03	Aug 17	Aug 31	Sep 07	Sep 21	Oct 05
Air	67.2	709.0	1305.9	1007.4	108.2	1119.4	820.9	246.2	559.7	850.9	134.3	388.0
0.5	60.5	500.0	1300.0	750.0	115.0	910.0	620.0	215.0	320.0	805.0	120.0	320.0
1.0	45.0	390.0	1150.0	730.0	98.5	820.0	500.0	140.0	310.0	775.0	95.0	250.0
2.0	33.5	360.0	860.0	500.0	105.0	580.0	320.0	110.0	240.0	510.0	61.5	215.0
3.0	25.3	245.0	610.0	420.0	110.0	400.0	240.0	88.0	180.0	420.0	46.0	180.0
4.0	18.0	185.0	430.0	330.0	110.0	300.0	185.0	72.5	150.0	275.0	35.0	155.0
5.0	13.5	135.0	320.0	260.0	90.0	245.0	165.0	58.5	135.0	220.0	27.0	105.0
6.0	9.8	100.0	235.0	180.0	69.0	170.0	125.0	45.0	86.0	160.0	21.5	58.0
7.0	7.0	71.0	145.0	125.0	54.0	135.0	105.0	36.5	85.0	115.0	13.0	44.0
8.0	4.8	44.0	110.0	113.0	32.0	89.0	67.0	31.0	50.0	76.0	10.0	30.0
9.0	3.2	31.0	80.5	75.0	20.0	74.5	38.0	23.0	49.0	55.0	6.8	28.0
10.0	2.2	22.5	65.5	55.5	13.5	47.0	28.0	16.0	39.0	47.0	4.4	24.0
11.0			44.0	49.0	8.1	40.0	26.0	11.5	28.0	32.0	3.0	16.0
12.0			35.0	33.0			12.5	7.9	14.5	18.0	2.9	12.0
13.0			21.5	25.5			10.0	5.4	10.5	13.0	2.3	8.3
14.0			17.0	22.5			7.7		7.5	8.9		5.5
15.0			12.5	18.5			5.2		5.2	6.2		3.8
16.0			7.6	15.0					3.6	4.1		
										3.0		
										1.8		
										1.3		

Table A3.5g. L373 light attenuation profiles for 1989 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 18	Jun 01	Jul 15	Jun 29	Jul 13	Jul 27	Aug 10
Air	250.0	841.8	1044.8	533.6	582.1	261.1	634.3
0.5	238.8	640.0	1025.0	512.0	430.0	225.0	558.0
1.0	200.0	525.0	850.0	410.0	390.0	170.0	420.0
2.0	170.0	334.0	660.0	275.0	230.0	76.0	272.0
3.0	160.0	259.0	400.0	180.0	180.0	62.0	218.0
4.0	100.0	176.0	310.0	140.0	130.0	55.0	150.0
5.0	70.0	129.0	210.0	117.0	92.0	41.0	102.0
6.0	50.0	94.0	150.0	90.0	64.0	34.0	76.0
7.0	40.0	66.0	120.0	68.0	50.0	26.5	62.6
8.0	35.0	52.5	81.5	49.5	36.0	18.0	40.6
9.0	22.5	40.6	70.0	34.4	24.0	11.6	27.2
10.0	15.0	24.2	45.0	22.6	17.5	7.4	18.0
11.0	12.5	16.8	34.5	13.4			
12.0		10.8	24.5	11.8			
13.0			7.0				

Table A3.5h. L373 light attenuation profiles for 1990 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 09	May 23	Jun 06	Jun 20	Jul 04	Jul 18	Aug 01	Aug 15	Aug 29	Sep 12	Sep 26	Oct 10	Oct 24
Air	586.3	1103.0	1091.7	135.8	1072.3	1049.2	994.7	1311.9	907.5	190.6	383.1	549.6	29.8
0.5	392.7							903.4	941.3	123.8	292.7	325.0	27.3
1.0	381.2	975.0	895.7	84.6	1006.0	727.7	750.0	827.9	519.2	95.2	205.2	223.9	21.2
2.0	297.9	719.0	712.7	60.9	808.2	702.0	480.7	668.2	420.8	83.5	162.4	176.5	13.4
3.0	321.1	428.0	457.0	49.5	496.6	502.6	392.9	475.2	329.5	68.2	129.7	116.8	9.0
4.0	255.5	325.3	317.9	40.4	403.5	451.8	287.8	377.4	200.2	54.9	98.3	89.8	7.0
5.0	195.5	230.6	214.5	31.3	311.4	374.4	212.3	323.5	187.1	45.3	79.4	61.5	5.5
6.0	140.7	164.5	153.8	25.3	248.0	268.8	167.5	241.9	139.1	35.4	65.3	43.5	3.6
7.0	93.1	110.3	112.2	19.7	184.6	224.2	119.0	185.6	107.5	28.9	52.2	34.4	2.4
8.0	60.4	73.1	78.1	14.8	132.2	163.9	91.8	143.6	78.6	21.1	37.3	25.3	2.0
9.0	39.5	50.6	57.1	11.4	95.4	128.0	67.8	110.3	58.8	16.0	30.1	19.0	1.4
10.0	28.4	29.6	40.7	8.6	71.3	99.4	51.2	82.9	39.1	11.6	21.9	14.2	1.0
11.0	18.3	18.3	27.3	6.4	52.3	95.8	36.2	58.3	29.2	8.5	15.6	11.2	0.7
12.0	11.3	10.9	17.5	4.6	37.6	37.4	26.9	45.0	20.8	6.2	11.2	8.2	0.5
13.0	7.8	6.6	11.3	2.4	25.6	26.3	19.2	32.5	14.9	4.3	7.9	5.1	0.4
14.0	5.3		7.2	1.6	14.3	20.0	12.2	22.0	9.8	3.0	5.4	3.0	
15.0	3.4		4.7	1.0	8.4	10.2	7.2	14.5	6.2	1.8	3.6		
16.0	2.3			0.6	4.4	4.9	3.8	8.1		1.0	2.3		

Table A3.6a. L377 light attenuation profiles for 1987 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 20	Jun 01	Jun 17	Jul 15	Jul 29	Aug 12	Aug 26	Sep 16	Sep 30	Oct 29
Air	212.7	167.9	507.5	1791.0	488.6	131.3	175.4	626.8	462.6	250.0
0.1	190.0	94.0	245.0	350.0	480.0	63.0	87.0	420.0	330.0	115.0
1.0	150.0	73.5	185.0	290.0	310.0	43.5	65.0	370.0	220.0	95.0
2.0	65.0	51.3	130.0	460.0	185.0	35.0	44.0	250.0	125.0	47.0
3.0	41.0	30.7	89.0	260.0	110.0	31.5	34.0	150.0	100.0	26.0
4.0	30.0	20.1	59.0	215.0	73.0	25.0	24.0	105.0	75.0	14.0
5.0	20.0	12.0	39.0	205.0	47.0	21.0	16.5	70.0	43.0	7.8
6.0	13.5	7.1	25.3	185.0	27.5	16.5	11.0	44.0	28.0	4.5
7.0	8.6	4.7	15.6	35.5	17.0	10.7	6.8	29.0	16.0	2.7
8.0	5.5	2.9	10.0	20.0	11.5	6.9	4.5	18.0	12.5	1.7
9.0	4.0	1.7	6.7	12.5	6.5	4.3	2.6	10.5	8.2	1.0
10.0	2.9	1.2	3.8	8.6	3.9	2.5	1.3	5.5	3.9	0.6
11.0	2.0		2.4	3.2	2.5	1.3				
12.0	1.3		1.5	1.8	1.3	0.8				

Table A3.6b. L377 light attenuation profiles for 1988 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Table A3.6c. L377 light attenuation profiles for 1989 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24
Air	298.5	865.6	1096.8	179.1	336.5	201.4	463.4	410.4
0.5	185.0	600.0	1029.0	145.0	258.0	116.0	333.0	320.0
1.0	125.0	550.0	830.0	83.0	175.0	110.0	237.0	210.0
2.0	100.0	320.0	510.0	57.0	86.0	67.0	133.0	110.0
3.0	85.5	165.0	300.0	43.0	38.0	44.5	74.6	60.0
4.0	55.5	115.0	170.0	30.0	26.0	34.5	50.5	35.0
5.0	40.0	74.0	102.0	19.3	13.4	22.0	27.6	
6.0	21.0	36.0	67.1	12.1	7.0	11.6	16.1	
7.0	11.5	24.1	38.3	8.6	4.2	6.9	8.9	
8.0	6.7	13.2	23.5	5.5	2.4	4.2	5.3	
9.0	3.9	7.3	13.3	3.3	1.6		2.8	
10.0	2.2	4.2		7.9	2.2			1.7
11.0				5.0	1.3			
12.0				2.8				
13.0				1.8				
14.0				1.2				
15.0				0.7				

Table A3.6d. L377 light attenuation profiles for 1990 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 09	May 23	Jun 06	Jun 20	Jul 04	Jul 18	Aug 01	Aug 15	Aug 29	Sep 12	Sep 26	Oct 10	Oct 24
Air	220.9	1551.4	970.9	87.6	361.7	1019.4	1318.6	1007.4	1002.0	118.3	534.4	817.9	40.1
0.5		1090.0					1151.0		855.7	60.0	323.6	398.3	21.7
1.0	62.6		884.0	45.0	186.6	537.0	798.7	815.9	739.1	39.8	186.8	247.7	12.7
2.0	36.7	660.0	618.5	33.4	135.2	311.9	416.3	425.5	332.4	37.2	120.2	132.0	9.6
3.0	21.3	366.0	260.2	24.0	74.0	209.3	216.3	270.7	229.8	28.5	66.3	92.0	6.9
4.0	13.1	233.0	234.7	15.3	42.3	133.6	146.8	169.5	123.4	22.1	38.6	50.1	4.7
5.0	8.5	141.0	141.9	11.2	25.5	81.1	90.2	106.9	89.0	14.8	30.6	34.7	3.2
6.0	5.4	83.0	86.0	7.8	16.4	45.9	57.6	64.5	57.8	10.0	19.1	22.1	2.1
7.0	3.4	45.0	57.5	5.3	10.7	30.4	35.6	42.1	32.2	7.0	14.2	16.0	1.5
8.0	2.0	25.0	34.0	4.0	7.2	17.6	23.0	25.1	20.1	4.7	10.9	9.6	1.0
9.0	1.2	6.0	22.0	2.7	5.2	11.7	14.3	16.5	11.8	2.6	6.6	6.0	0.7
10.0			13.5	1.7	3.5	7.0	9.0	9.8	7.1	1.6	3.4		0.5
11.0			8.1	1.0	2.3	4.9	5.7	5.8	4.5	1.0			
12.0			4.9	0.6		3.2			2.5	0.6			
13.0			0.4			2.2							

Table A3.7a. L442 light attenuation profiles for 1987 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 20	Jun 03	Jul 01	Jul 15	Aug 12	Aug 26	Sep 16	Sep 30	Oct 14	Oct 29
Air	123.1	197.8	182.8	447.8	104.5	604.5	313.4	395.5	503.7	178.3
0.5	68.0	110.0	105.0	275.0	60.0	340.0	190.0	280.0	90.0	90.0
1.0	55.0	80.0	67.0	145.0	46.0	260.0	130.0	220.0	60.0	56.0
2.0	39.0	47.0	75.0	120.0	29.0	210.0	72.0	120.0	31.0	23.0
3.0	27.0	40.0	53.0	70.0	22.5	120.0	51.0	75.0	16.0	11.6
4.0	19.5	28.5	37.0	50.0	16.0	75.0	37.0	41.0	10.5	5.9
5.0	8.4	19.0	24.5	27.0	11.0	52.0	34.0	27.0	7.5	3.0
6.0	2.7	11.2	14.3	13.0	7.4	31.0	19.0	14.0		1.8
7.0	1.1	4.7	8.9	11.0	5.7	19.0	14.0	9.1		1.0
8.0		2.5	5.5	7.0	4.2	12.0	8.0	4.3		0.5
9.0		1.3	3.3	4.5	2.2	7.0	4.5	2.2		0.3
10.0			2.0	2.5	1.3		2.8	1.8		0.2
11.0				1.8						

Table A3.7b. L442 light attenuation profiles for 1988 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 11	May 25	Jun 08	Jun 22	Jul 06	Jul 20	Aug 03	Aug 17	Aug 31	Sep 07	Sep 21	Oct 05
Air	153.0	350.8	932.8	783.5	23.8	511.1	143.2	76.1	358.2	1050.0	212.6	529.8
0.5	140.0	270.0	750.0	500.0	21.5	520.0	82.5	55.0	285.0	970.1	120.0	330.0
1.0	99.0	240.0	580.0	340.0	13.0	410.0	64.0	37.0	185.0	760.0	90.0	202.0
2.0	60.0	145.0	330.0	225.0	9.0	255.0	32.5	29.0	150.0	530.0	63.5	158.0
3.0	40.0	74.0	185.0	155.0	7.0	130.0	25.5	20.0	115.0	310.0	37.0	81.0
4.0	27.5	45.0	110.0	92.0	4.6	84.0	19.5	16.0	66.5	195.0	24.5	58.0
5.0	17.0	32.0	56.0	77.0	3.0	63.5	13.5	11.5	44.0	130.0	17.0	34.0
6.0	10.5	19.0	37.0	38.5	2.0	40.5	9.0	8.2	32.5	105.0	11.5	23.0
7.0	6.0	9.8	23.0	25.5		22.6	5.9	5.2	21.0	54.0	7.3	14.3
8.0	3.4	5.5	16.0	16.6		19.0	3.9	4.1	13.0	33.0	4.7	13.9
9.0	1.8	2.9	9.7					3.0	7.6	19.5	3.0	10.4
10.0		1.5	5.5					2.2	4.7	11.5	1.8	4.0
11.0										6.7		1.9
12.0										2.9		0.7
13.0										0.4		0.3

Table A3.7c. L442 light attenuation profiles for 1989 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 18	Jun 01	Jun 15	Jul 13	Jul 27	Aug 10
Air	1940.3	1604.4	858.2	626.8	32.3	701.4
0.5	1150.0	950.0	670.0	500.0	15.7	540.0
1.0	825.0	600.0	530.0	390.0	13.6	275.0
2.0	370.0	380.0	235.0	211.0	12.3	187.0
3.0	235.0	200.0	145.0	124.0	9.5	139.0
4.0	120.0	100.0	72.5	66.5	6.7	79.6
5.0	68.0	45.0	51.0	36.8	4.5	49.3
6.0	39.0	20.0	30.0	26.5	2.5	30.2
7.0	20.5	5.8	18.5	15.4		18.9
8.0	13.0		12.5	9.1		11.5
9.0	8.0		6.7	5.8		7.4
10.0	4.5		3.7	4.0		4.8
11.0				2.7		

Table A3.7d. L442 light attenuation profiles for 1990 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 09	May 23	Jun 06	Jul 04	Aug 01	Aug 15	Aug 29	Sep 12	Sep 26	Oct 10	Oct 24
Air	164.1	892.5	892.5	1500.0	897.7	960.4	772.3	146.6	567.1	788.0	70.2
0.5		650.9		1350.0							
1.0	100.9	470.5	737.2	960.0	641.8	574.4	632.0	90.0	730.0	346.0	25.5
1.5	68.9		570.2								
2.0	62.3	313.0		510.0	232.9	317.8	298.7	51.0	430.0	208.0	14.2
2.5	39.9		326.2								
3.0	30.7	171.6		343.0	196.7	163.3	186.8	41.0	190.0	124.0	8.8
3.5	25.0		146.4								
4.0	18.7	81.3		206.0	118.3	124.7	114.2	30.0	75.0	72.0	4.9
4.5	13.3		110.4								
5.0	10.7	42.9		133.0	75.3	77.5	70.3	21.0	70.0	41.0	2.8
6.0	6.2	18.9	70.4	88.0	48.5	49.6	40.9	14.0	38.0	24.0	1.6
7.0	3.6	10.1	48.3	59.0	32.2	31.8	25.0	8.0	27.0	15.0	0.9
8.0	2.1	5.2	22.6	43.0	21.4	21.1	15.7	5.0	13.0	9.0	0.5
9.0	1.3	3.0	14.6	27.0	13.6	13.4	9.9	3.2	9.0	5.1	0.3
10.0	0.8		7.7	20.0	9.1	8.4	6.0	2.3	5.8	3.2	0.2
11.0				12.0	6.1	5.6	3.6	1.3	3.4		0.1
12.0				7.5				0.5	1.8		
13.0									0.8		

Table A3.8a. L938 light attenuation profiles for 1987 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 27	Jun 10	Jul 08	Aug 05	Aug 19	Sep 02	Sep 16	Sep 30	Oct 14
Air	103.0	488.8	514.9	727.6	211.1	492.5	783.6	507.5	626.9
0.5	61.0	335.0	320.0	600.0	100.0	340.0	660.0	320.0	310.0
1.0	42.0	253.0	230.0	475.0	63.0	220.0	530.0	230.0	275.0
2.0	25.0	150.0	150.0	245.0	41.0	100.0	285.0	135.0	165.0
3.0	21.5	97.0	85.0	130.0	24.0	55.0	130.0	89.0	93.5
4.0	15.1	63.0	52.0	63.0	12.0	29.0	75.5	53.5	51.0
5.0	10.7		31.0			19.0	21.0	38.0	32.5
6.0	4.0								

Table A3.8b. L938 light attenuation profiles for 1988 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Oct 05
Air	731.3	1007.5	932.8	1194.0	1343.3	932.8	783.6	1044.8	520.0	330.6
0.5	525.0	900.0	750.0	960.0	1050.0	645.0	720.0	650.0	330.0	245.0
1.0	400.0	800.0	555.0	880.0	720.0	480.0	550.0	350.0	290.0	142.0
1.5							390.0		225.0	
2.0	215.0	500.0	350.0	440.0	400.0	350.0	275.0	200.0	134.0	81.0
2.5							195.0		110.0	
3.0	135.0	320.0	197.0	215.0	225.0	195.0	135.0	150.0	87.0	51.0
3.5							105.0		67.0	
4.0	76.0	190.0	103.0	125.0	115.0	100.0		52.0	51.0	32.0
4.5							57.0			22.0
5.0	40.0	56.0	56.0	86.0	65.0	42.0			11.5	

Table A3.8c. L938 light attenuation profiles for 1989 ($\mu\text{Em}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 17	May 31	Jun 14	Jun 28	Jul 12	Aug 09	Aug 23	Sep 06
Air	410.4	1940.3	1097.0	671.6	158.2	1007.5	1903.0	895.0
0.5	225.0	1600.0	960.0	550.0	108.0	900.0	1250.0	570.0
1.0	160.0	1200.0	731.0	410.0	75.0	625.0	950.0	410.0
2.0	110.0	900.0	355.0	295.0	51.5	400.0	600.0	245.0
3.0	85.0	600.0	215.0	205.0	34.0	250.0	375.0	175.0
4.0	60.0	330.0	130.0	135.0	22.6	185.0	235.0	105.0
5.0		185.0	73.4	72.0	15.8	89.0	135.0	66.0
6.0		115.0	43.6	44.0	7.3		95.0	
6.5				20.0	3.6			

Table A3.8d. L938 light attenuation profiles for 1990 ($\mu\text{m}^{-2}\cdot\text{s}^{-1}$).

Depth (m)	May 08	May 22	Jun 05	Jun 19	Jul 03	Jul 17	Jul 31	Aug 14	Aug 28	Sep 11	Sep 25	Oct 09	Oct 23
Air	139.9	363.7	96.3	126.4	65.3	1357.5	839.6	828.4	284.3	50.4	820.9	876.8	92.7
0.5		254.7	70.2	93.1	96.3	939.0	796.9	985.6	220.0	28.8		513.4	66.7
1.0	60.8	203.0	55.5	64.8	69.7	906.7	675.8	702.1	175.2	28.2	650.0	349.9	45.9
1.5		155.2		46.9	51.6	720.6	360.0	462.9	126.9			245.2	34.6
2.0	33.2	126.4	45.3	41.7	44.1	669.7	252.1	314.1	100.1	18.1	330.0	214.0	27.0
2.5		105.2	29.9	34.5	41.3	457.0	198.6	274.7	91.8	15.9		165.1	22.9
3.0	20.4	88.3	21.8	28.2	34.8	400.5	151.8	213.3	79.3	12.3	220.0	122.6	20.1
3.5		75.8	17.6	22.1	30.8	298.7	136.7	169.8	65.6	10.2		100.6	16.2
4.0	14.1	66.6	15.8	18.7	25.3	254.5	100.6	131.0	51.0	8.3	140.0	70.7	13.7
4.5		56.7	12.2	14.5	19.3	203.7	84.5	97.2	39.1	7.3		58.7	10.9
5.0	9.2	44.8	10.1	11.8	13.8	144.9	65.7	79.8	29.2	5.6	86.0	47.7	9.8
5.5		7.4			4.8	9.4	24.8		68.8			4.4	

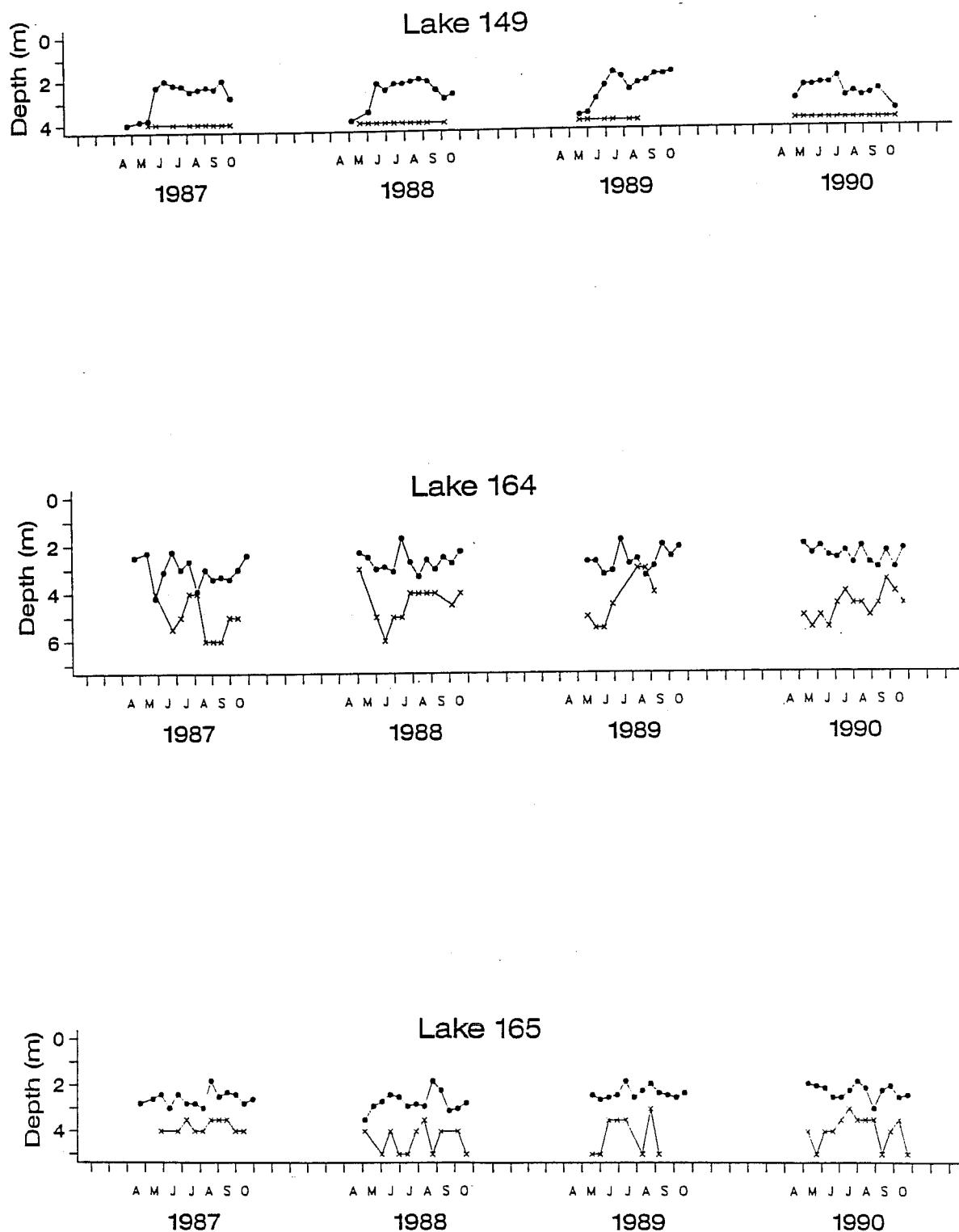


Fig. A3.1a. Secchi disk depth (•) and depth of 1% light transmittance (x), L149, L164, and L165, 1987-1990. Data points at maximum depth indicate light transmittance $\pm 1\%$

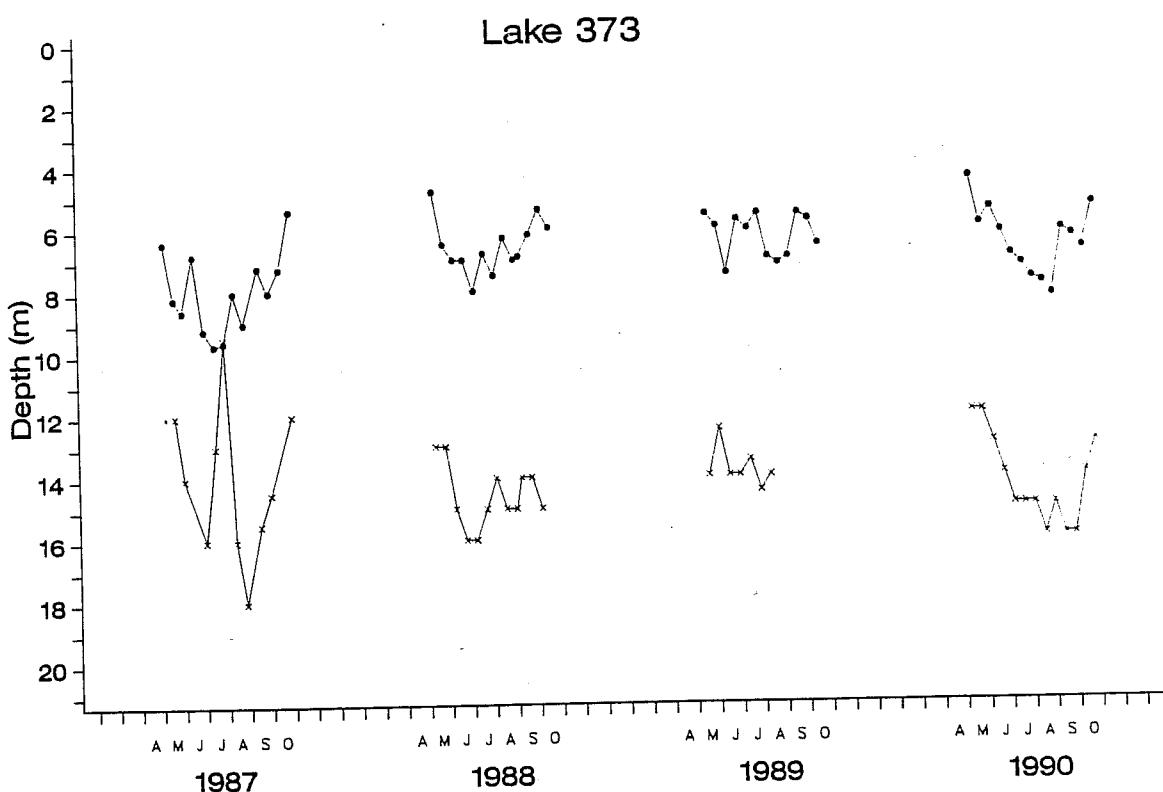
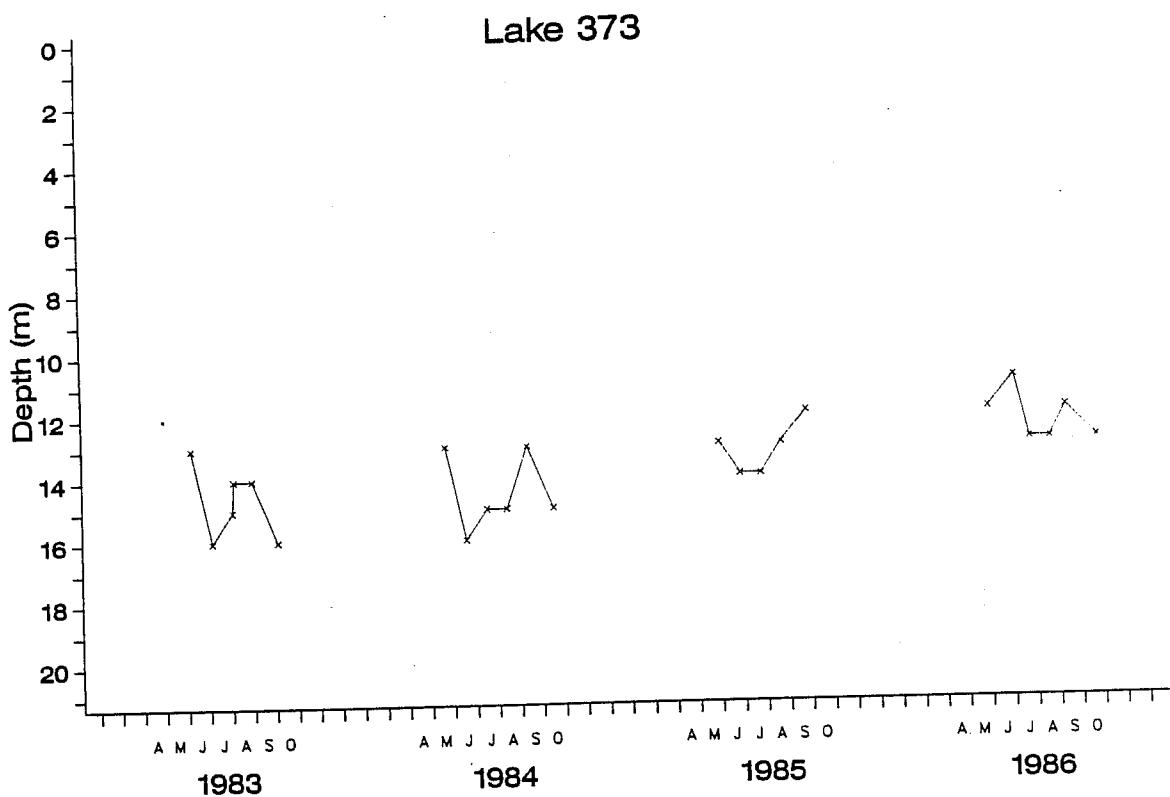


Fig. A3.1b. Secchi disk depth (•) and depth of 1% light transmittance (x), L373, 1983-1990.

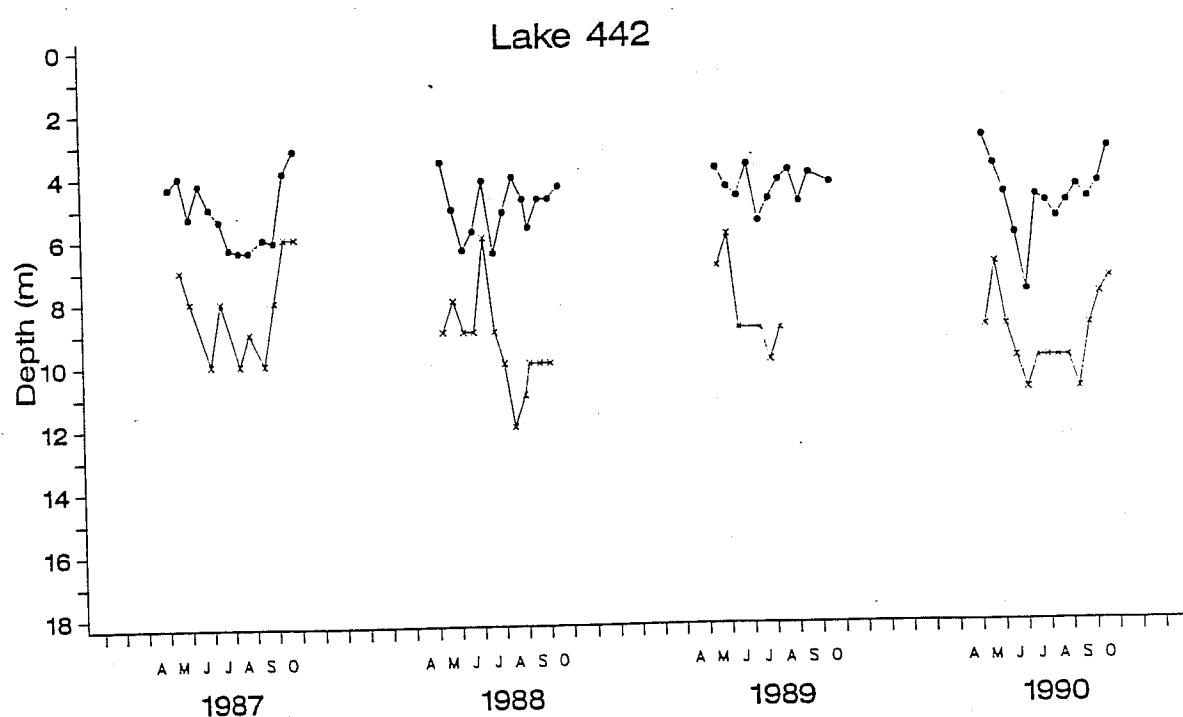
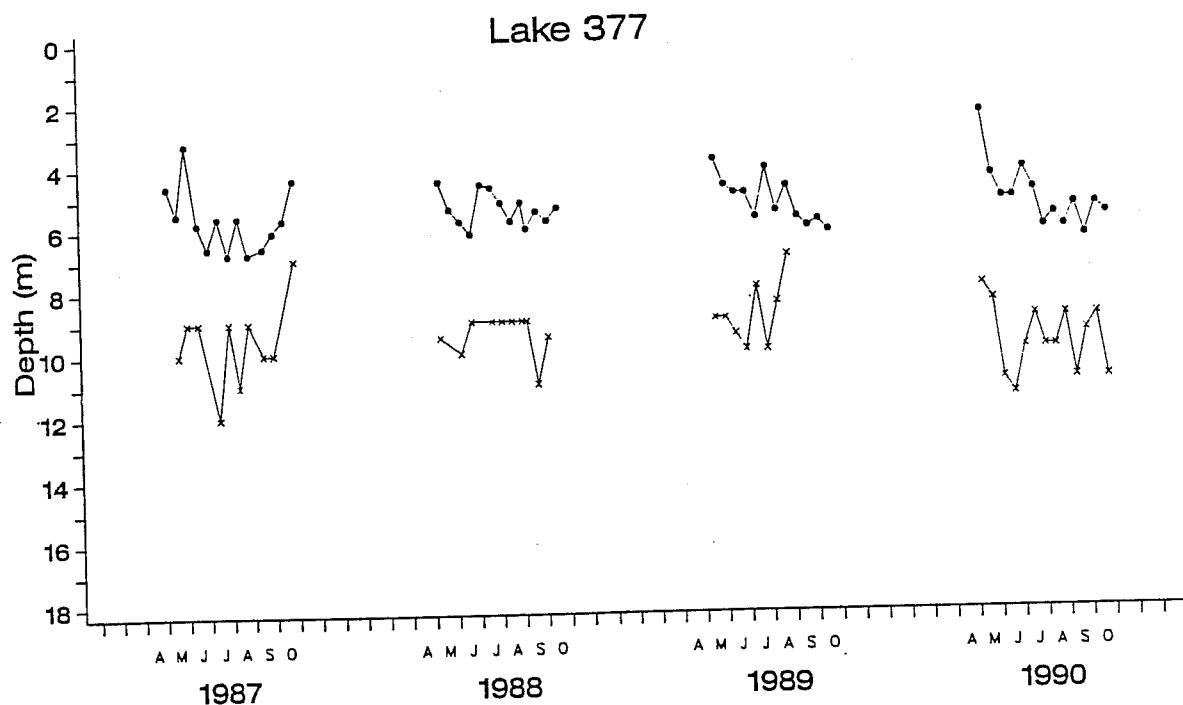


Fig. A3.1c. Secchi disk depth (·) and depth of 1% light transmittance (x), L377 and L442, 1987-1990.

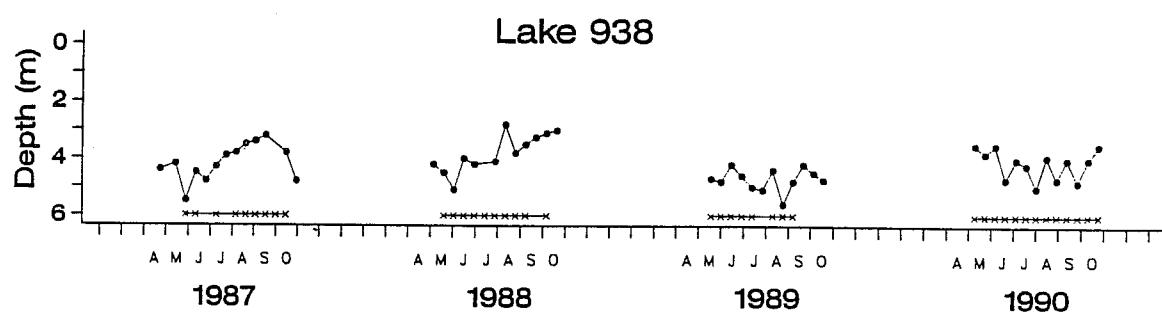
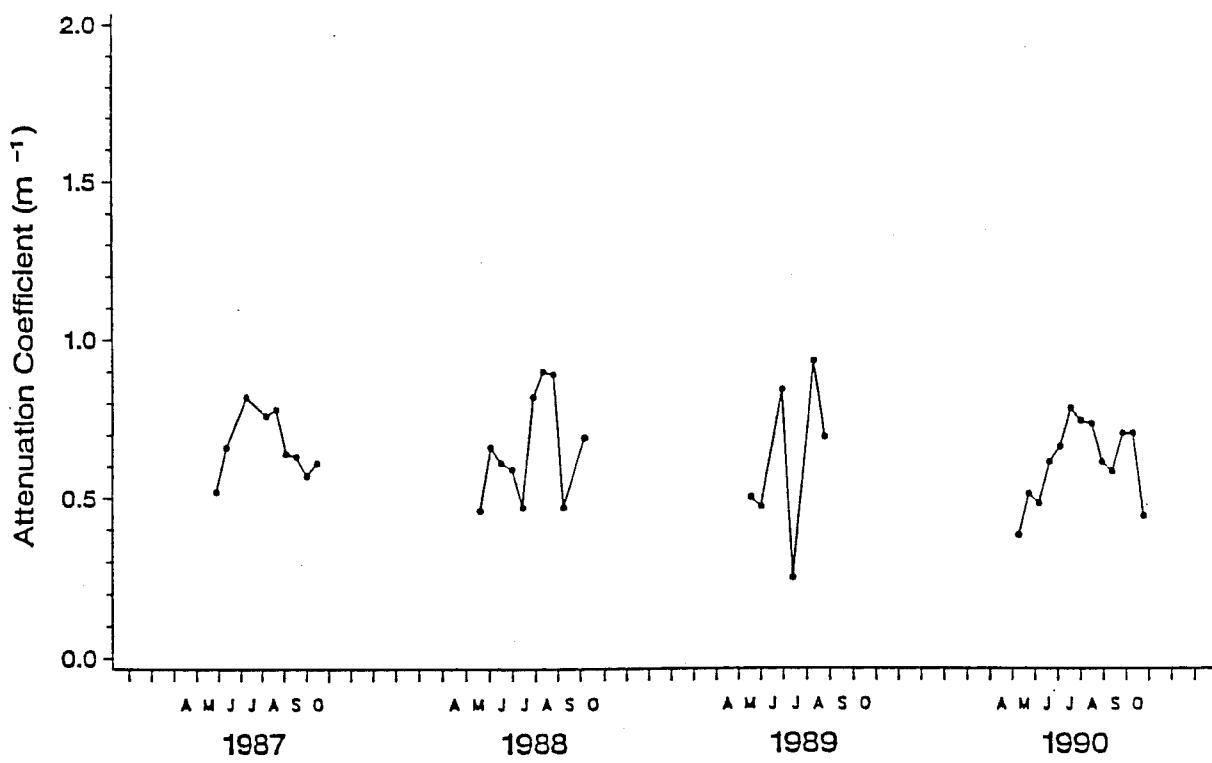


Fig. A3.1d. Secchi disk depth (•) and depth of 1% light transmittance (x), L938, 1987-1990. Data points at maximum depth indicate light transmittance $\geq 1\%$.

Lake 149



Lake 164

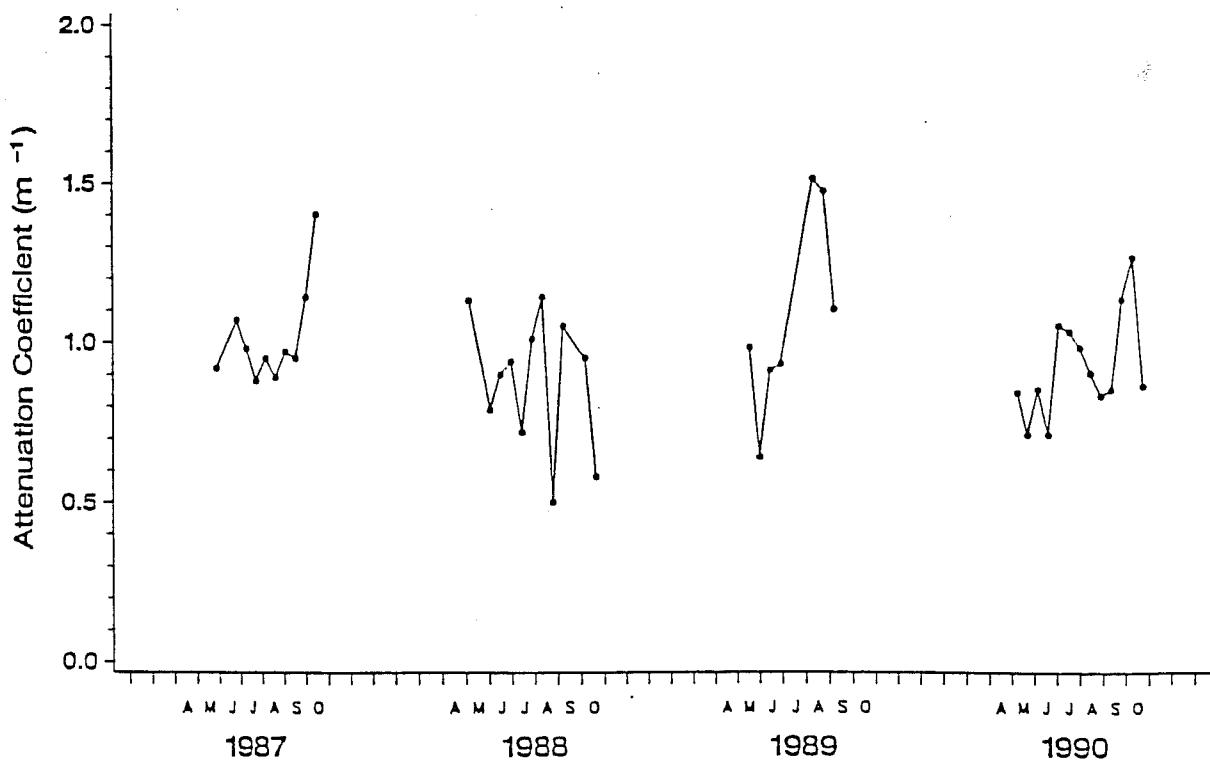


Fig. A3.2a. Vertical light attenuation coefficients (Kd) L149 and L164, 1987-1990.

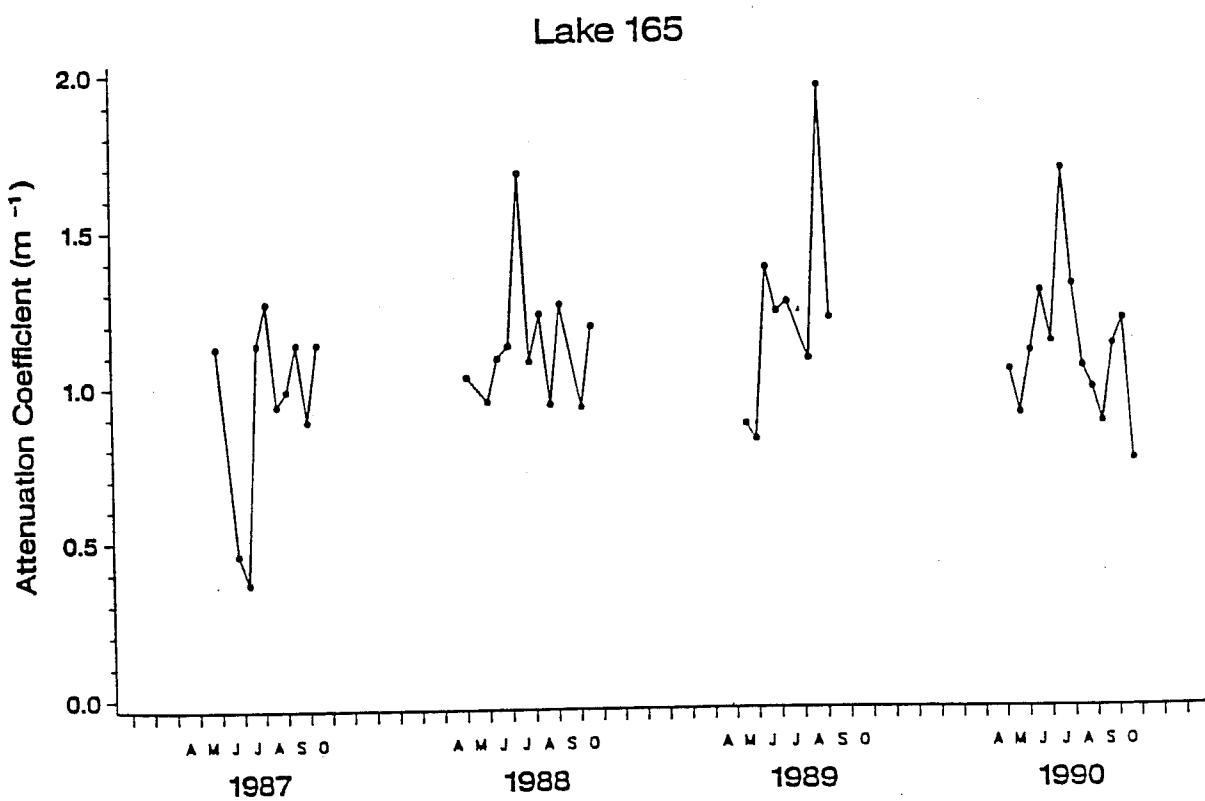
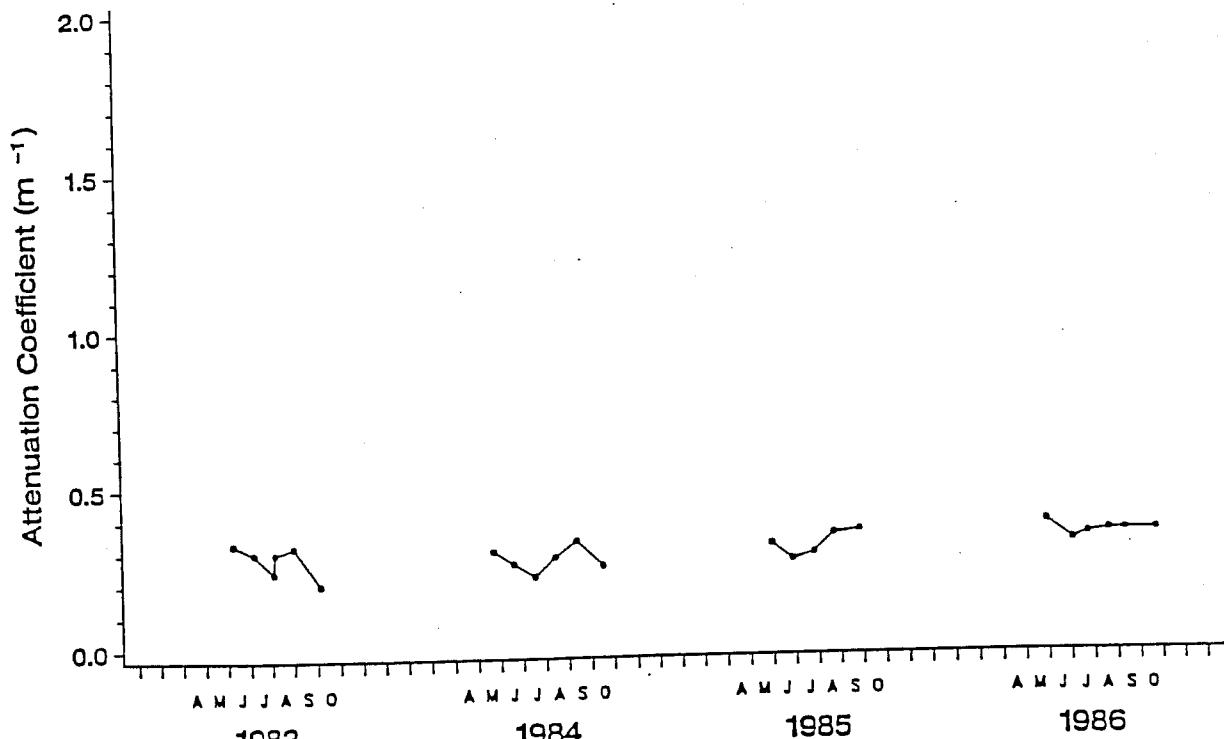
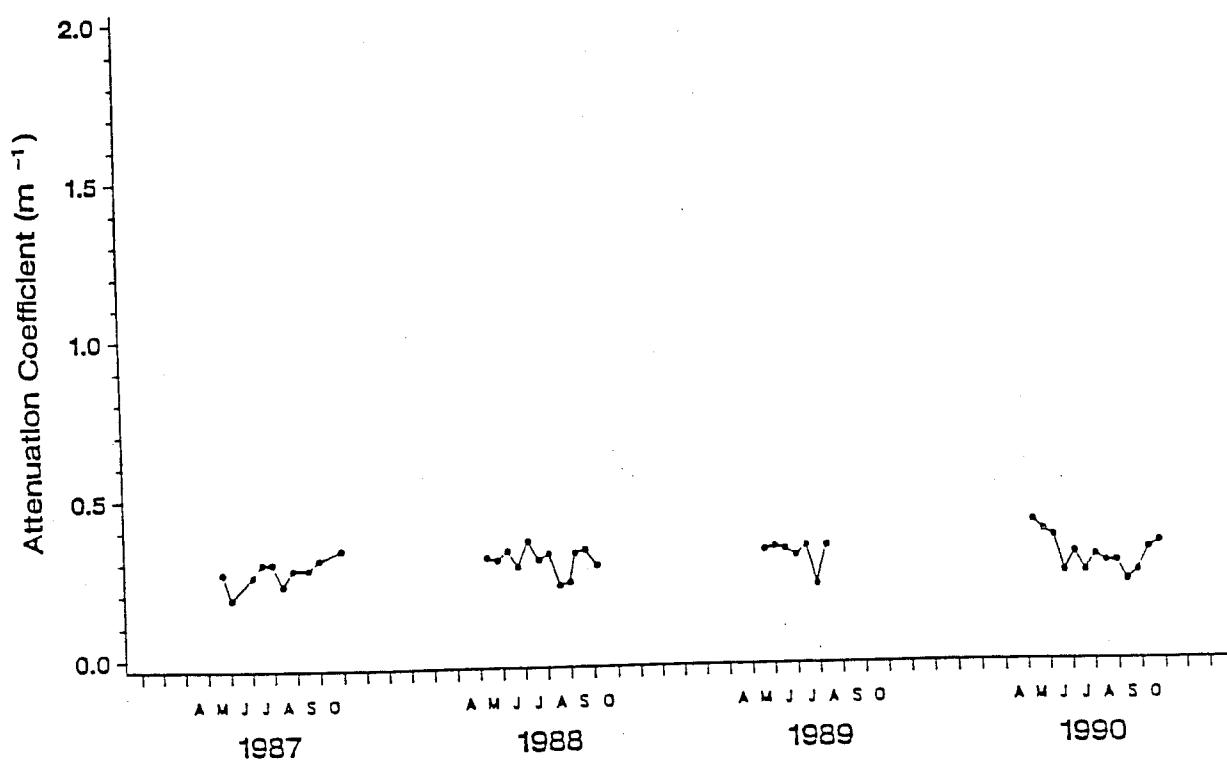


Fig. A3.2b. Vertical light attenuation coefficients (K_d) L165, 1987-1990.

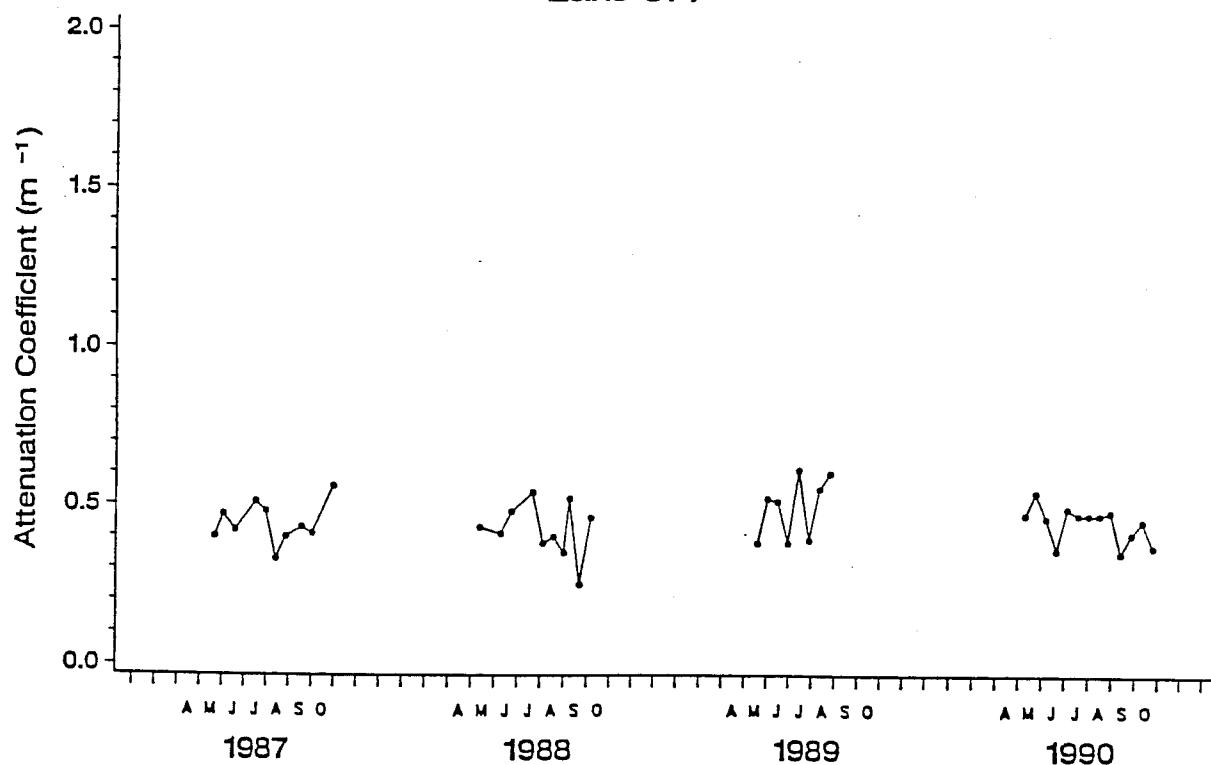
Lake 373



Lake 373

Fig. A3.2c. Vertical light attenuation coefficients (K_d) L373, 1983-1990.

Lake 377



Lake 442

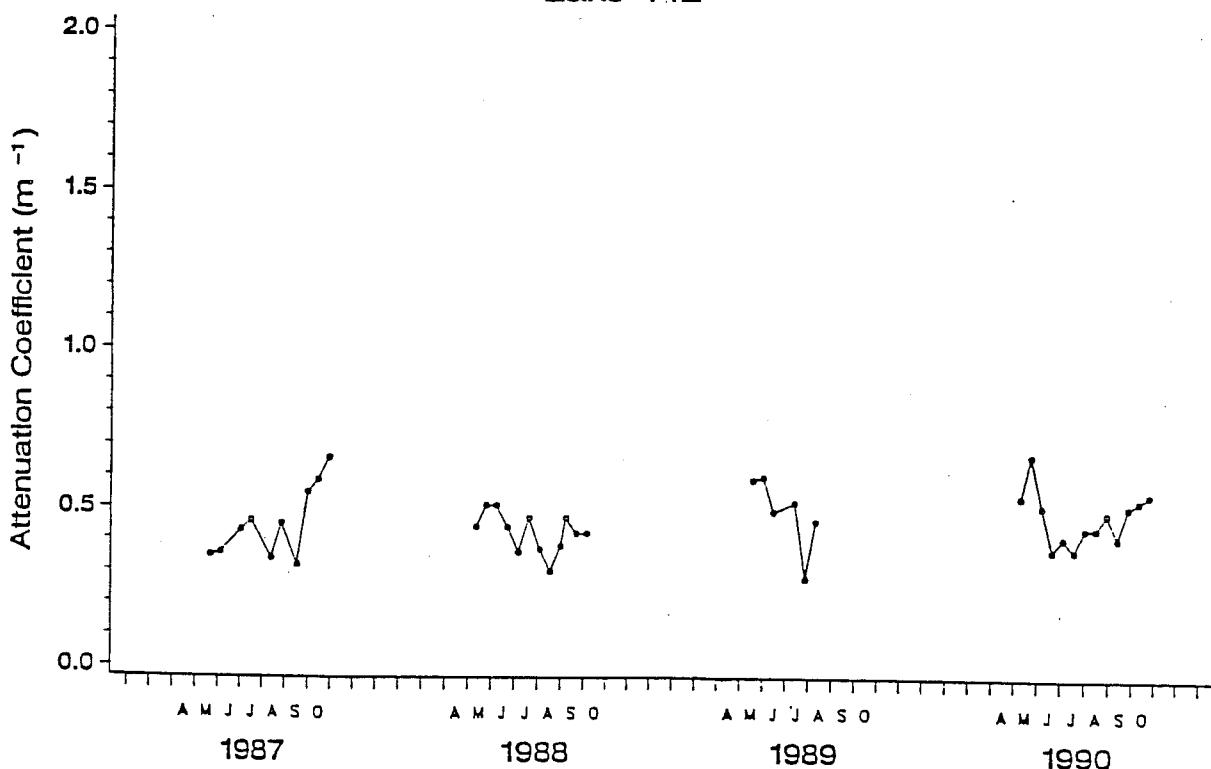


Fig. A3.2d. Vertical light attenuation coefficients (Kd) L377 and L442, 1987-1990.

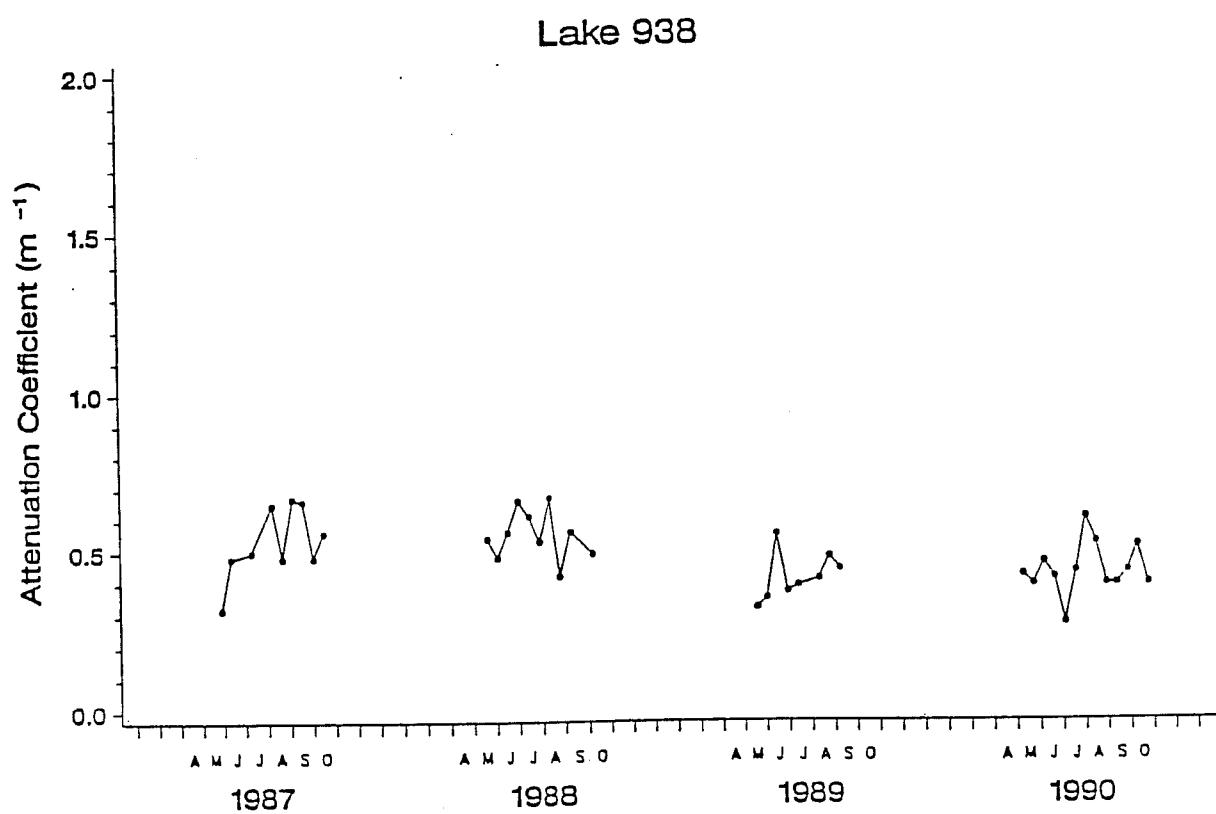


Fig. A3.2e. Vertical light attenuation coefficients (Kd) L938, 1987-1990.

APPENDIX 4

Temperature data, ELA Lake Variation and Climate Change Study lakes 1986-1990

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Table A4.1a. Depths of the epilimnion (EPL) and planar thermocline (PLT) in Lakes 149, 164, 165, and 938, 1987-1990. Lakes 149, 165, and 938 are too shallow to develop true planar thermoclines (ND = thermocline not defined).

	L149		L164		L165		L938	
	EPI depth (m)	PLT depth (m)						
1987/04/22	4.0	ND	4.0	4.5	4.5	ND	5.5	ND
1987/05/13	4.0	ND	4.0	5.5	4.5	ND	5.5	ND
1987/05/27	4.0	ND			2.0	2.5	5.5	ND
1987/06/10	3.0	3.5	3.0	3.5	2.0	3.5	5.5	ND
1987/06/24	3.0	3.5	2.0	2.5	2.0	2.5	2.0	3.5
1987/07/08	2.0	2.5	1.0	3.5	1.0	3.5	3.0	3.5
1987/07/22	4.0	ND			4.5	ND	5.5	ND
1987/08/05	4.0	ND	3.0	4.5	2.0	3.5	5.5	ND
1987/08/19	4.0	ND	4.0	5.5	3.0	3.5	5.5	ND
1987/09/02	4.0	ND	5.0	5.5	4.5	ND	5.5	ND
1987/09/16	1.0	1.5	5.0	6.5	4.5	ND	5.5	ND
1987/09/30	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1987/10/14	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1987/10/29			7.0	ND	4.5	ND	5.5	ND
1988/05/04	4.0	ND	1.0	1.5	2.0	2.5	2.0	2.5
1988/05/18	4.0	ND	3.0	4.5	3.0	3.5	5.5	ND
1988/06/01	2.0	2.5	1.0	4.5	1.0	1.5	1.0	2.5
1988/06/15	4.0	ND	3.0	3.5	2.0	3.5	3.0	4.5
1988/06/29	4.0	ND	3.0	4.5	3.0	3.5	5.5	ND
1988/07/13	4.0	ND	3.0	4.5	3.0	3.5	5.5	ND
1988/07/27	4.0	ND	3.0	4.5	2.0	3.5	4.0	4.5
1988/08/10	4.0	ND	3.0	4.5	3.0	3.5	5.5	ND
1988/08/24	4.0	ND	3.0	4.5	4.5	ND	5.5	ND
1988/09/07	4.0	ND	4.0	5.5	4.5	ND	5.5	ND
1988/09/21	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1988/10/05	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1988/10/19	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1989/04/18	4.0	ND			1.0	2.5	0.5	0.5
1989/04/17	1.0	2.5	1.0	1.5	3.0	3.5	0.5	0.5
1989/05/31	4.0	ND	1.0	4.5	4.5	ND	5.5	ND
1989/06/14	4.0	ND	4.0	5.5	2.0	2.5	5.5	ND
1989/06/28	3.0	3.5	2.0	2.5	2.0	2.5	5.5	ND
1989/07/12	3.0	3.5	2.0	2.5	2.0	2.5	5.5	ND
1989/07/26	2.0	3.5	2.0	3.0	3.0	3.5	4.0	4.5
1989/08/09	4.0	ND	3.0	3.5	3.0	3.5	5.5	ND
1989/08/23	4.0	ND	3.0	4.5	2.0	2.5	5.5	ND
1989/09/06	4.0	ND	3.0	4.5	4.5	ND	5.5	ND
1989/09/20	4.0	ND	4.0	5.5	4.5	ND	5.5	ND
1989/10/04	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1989/10/17	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1990/04/10	4.0	ND			4.5	ND	5.5	ND
1990/05/08	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1990/05/22	4.0	ND	7.0	ND	2.0	2.5	4.0	4.5
1990/06/05	4.0	ND	2.0	2.5	3.0		5.5	ND
1990/06/19	4.0	ND	4.0	4.5	1.0		4.0	4.5
1990/07/03	2.0		2.0	4.5	1.0		4.0	4.5
1990/07/17	3.0		2.0	2.5	2.0		5.5	ND
1990/07/31	4.0	ND	2.0	3.5	2.0		5.5	ND
1990/08/14	4.0	ND	3.0	4.0	3.0		5.5	ND
1990/08/28	3.0		3.0	4.5	2.0		5.5	ND
1990/09/11	4.0	ND	2.0	4.5	4.5	ND	5.5	ND
1990/09/25	4.0	ND	4.0	4.5	4.5	ND	5.5	ND
1990/10/09	4.0	ND	7.0	ND	4.5	ND	5.5	ND
1990/10/23	4.0	ND	7.0	ND	4.5	ND	5.5	ND

Table A4.1b. Depths of the epilimnion (EPI) and planar thermocline (PLT) in Lakes 373, 377 and 442. (ND = thermocline not defined).

	L373		L377		L442
	EPI depth (m)	PLT depth (m)	EPI depth (m)	PLT depth (m)	EPI depth (m)
1987/04/23	20.5	ND	18.0	ND	18.0
1987/05/06	7.0	7.5	5.0	8.5	3.0
1987/05/20	7.0	8.5	5.0	6.5	4.0
1987/06/01	4.0	10.5	4.0	7.5	2.0
1987/06/17	3.0	6.0	3.0	4.5	2.0
1987/07/01			4.0	5.5	5.5
1987/07/15	6.0	7.5	4.0	5.5	4.0
1987/07/29	6.0	7.5	4.0	6.5	3.0
1987/08/12	7.0	7.5	5.0	7.5	4.0
1987/08/26	8.0	8.5	6.0	6.5	5.0
1987/09/16	9.0	10.5	7.0	7.5	6.0
1987/09/30	10.0	11.5	7.0	8.5	7.0
1987/10/14	14.0	15.5	10.0	10.5	10.0
1987/10/29	20.5	ND	18.0	ND	18.0
					ND
1988/04/12	20.5	ND	18.0	ND	18.0
1988/05/11	5.0	5.5	2.0	4.5	4.0
1988/05/25	5.0	7.5	3.0	4.5	3.0
1988/06/08	3.0	3.5	2.0	3.5	2.0
1988/06/22	4.0	5.5	3.0	4.5	3.0
1988/07/06	5.0	6.5	4.0	4.5	3.0
1988/07/20	6.0	7.5	4.0	5.5	4.0
1988/08/03	6.0	7.0	4.0	5.5	4.0
1988/08/17	6.0	7.5	4.0	5.5	4.0
1988/08/31	8.0	8.5	6.0	6.5	6.0
1988/09/07	8.0	9.5	6.0	6.5	6.0
1988/09/21	10.0	10.5	7.0	7.5	7.0
1988/10/05	12.0	12.5	9.0	9.5	9.0
1988/10/19	13.0	13.5	9.0	10.5	10.0
					11.5
1989/04/18	20.5	ND	18.0	ND	18.0
1989/05/18	2.0	2.5		2.5	1.0
1989/06/01	4.0	5.5	2.0	5.5	2.0
1989/06/15	5.0	6.5	5.0	6.5	3.0
1989/06/29	4.0	6.5	3.0	6.5	3.0
1989/07/13	4.0	5.5	3.0	4.5	3.0
1989/07/27	4.0	6.5	3.0	4.5	3.0
1989/08/10	5.0	6.5	4.0	5.5	3.0
1989/08/24	6.0	6.5	4.0	5.5	4.0
1989/09/07	7.0	7.5	5.0	5.5	4.0
1989/09/21	8.0	8.5	6.0	7.5	5.5
1989/10/15	10.0	11.5	8.0	8.5	7.0
1989/10/18	13.0	13.5	9.0	9.5	9.0
					9.5
					18.0
					ND
1990/04/09	20.5	ND	18.0	ND	18.0
1990/05/09	8.0	8.5	18.0	ND	4.0
1990/05/23	5.0	5.5	2.0	4.5	2.0
1990/06/06	5.0	6.5	4.0	4.5	4.0
1990/06/20	4.0	5.5	3.0	5.0	3.0
1990/07/04	4.0	5.5	3.0	4.5	2.0
1990/07/18	5.0	6.5	4.0	4.5	3.0
1990/08/01	6.0	6.5	4.0	5.0	4.0
1990/08/15	6.0	7.5	5.0	5.5	4.0
1990/08/29	7.0	7.5	4.0	6.5	4.0
1990/09/12	7.0	8.5	5.0	6.5	5.0
1990/09/26	9.0	10.5	7.0	7.5	6.0
1990/10/10	12.0	12.5	9.0	9.5	8.0
1990/10/24	20.5	ND	12.0	12.5	8.5
					12.5

Table A4.2a. L149 lake and stream temperatures ($^{\circ}\text{C}$) for 1987 (NT = temperature not taken, NF = no flow, OF = outflow).

Depth (m)	Apr 04	Apr 22	May 13	May 27	Jun 10	Jun 24	Jul 07	Jul 21	Aug 05	Aug 19	Sep 02	Sep 16	Sep 30	Oct 14
0.0		11.2	15.8	14.4	19.1	25.5	23.3	20.6	22.7	20.2	16.7	17.6	13.5	6.1
1.0		11.2	15.7	14.3	19.1	25.5	23.3	20.6	22.7	20.2	16.6	17.5	13.4	6.0
2.0		11.0	15.6	14.3	18.9	25.4	23.3	20.5	22.7	19.9	16.6	16.3	13.3	6.0
3.0		10.9	15.6	13.4	18.5	24.8	21.3	20.2	22.3	19.6	16.4	16.2	12.7	5.9
4.0		10.1	15.0	12.8	17.3	22.2	20.4	18.9	21.6	19.6	16.2	16.2	13.8	7.3
4.2		9.3		12.5	16.1	21.4			21.1					
4.5														
OF	4.9	12.0	NT	NT	NT	24.0	NF	NF	21.0	NT	15.9	NF	NF	NF

Table A4.2b. L149 lake and stream temperatures ($^{\circ}\text{C}$) for 1988 (NT = temperature not taken, NF = no flow, OF = outflow).

Depth (m)	May 04	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Sep 22	Oct 05	Oct 19
0.0	14.0	14.1	24.3	21.3	20.0	21.4	24.3	23.0	19.6	18.3	12.5	7.9	7.1
1.0	14.1	14.0	24.4	21.5	20.2	21.4	24.5	22.9	19.6	18.0	12.6	7.9	7.1
2.0	14.1	14.0	23.5	21.5	20.2	21.4	24.4	22.9	19.6	17.9	12.6	7.9	7.1
3.0	13.8	14.0	21.5	21.5	20.1	21.3	24.0	22.7	19.4	17.8	12.6	7.6	7.1
4.0	10.9	12.6	17.9	20.3	20.0	20.4	22.4	21.8	19.5	17.7	13.9	7.4	7.1
4.2											14.2		
4.5													
OF	11.5	13.0	24.0	16.0	NF	20.0	NF	NT	NF	NF	NF	NF	NF

Table A4.2c. L149 lake and stream temperatures ($^{\circ}\text{C}$) for 1989 (NT = temperature not taken, NF = no flow, OF = outflow).

Depth (m)	Apr 18	May 17	May 31	Jun 14	Jun 28	Jul 12	Jul 26	Aug 09	Aug 23	Sep 06	Sep 20	Oct 04	Oct 17
0.0	0.8	20.3	16.8	15.7	19.6	23.2	26.4	22.2	21.2	19.6	17.4	9.0	5.9
1.0	4.1	20.2	16.7	15.4	19.9	23.3	26.5	22.0	21.1	19.6	17.3	8.9	5.9
2.0	4.2	17.2	16.4	15.2	20.0	23.3	26.6	21.6	20.7	19.6	17.3	8.9	5.9
3.0	4.2	12.8	15.6	15.0	20.0	23.2	25.0	21.3	20.5	19.4	17.0	8.8	5.9
4.0	4.5	10.8	14.8	15.0	18.5	21.3	22.8	20.6	20.2	18.9	16.7	8.5	5.9
4.2		10.3		14.9	18.2	20.1		20.0	19.4	18.4	16.7		5.9
4.5													
OF	NT	NF	NF	NT	17.0	NF	25.0	NT	NF	NF	16.0	NF	NF

Table A4.2d. L149 lake and stream temperatures ($^{\circ}\text{C}$) for 1990 (NT = temperature not taken, NF = no flow, OF = outflow).

Depth (m)	Apr 10	May 08	May 22	Jun 05	Jun 19	Jul 03	Jul 17	Jul 31	Aug 14	Aug 28	Sep 11	Sep 25	Oct 09	Oct 23
0.0	2.6	11.0	14.1	16.1	20.8	24.2	23.5	22.2	20.5	21.5	18.4	13.0	7.9	4.6
1.0	4.0	11.0	14.1	16.4	20.8	24.4	23.5	22.2	20.5	21.6	18.5	12.8	7.9	4.6
2.0	4.3	11.0	14.1	16.2	20.2	24.5	23.5	22.2	20.5	21.6	18.5	12.7	7.9	4.4
3.0	4.3	10.9	14.1	15.6	19.6	21.8	23.1	22.1	20.5	21.6	18.5	12.6	7.8	4.4
4.0	4.6	10.8	13.2	15.2	18.7	19.8	20.9	21.6	20.4	20.4	18.2	12.6	8.7	5.7
4.2	4.8	9.6	12.8		17.0		19.1	19.7	20.1	19.4	18.2		8.9	
4.5						18.9								
OF	NT	9.0	15.0	15.0	20.0	22.0	24.0	21.0	20.5	20.0	17.0	NT	6.0	NT

Table A4.3a. L164 lake and stream temperatures (°C) for 1987 (NT = temperature not taken, NF = no flow, OF = outflow, IF = inflow).

Depth (m)	Apr 22	May 13	May 27	Jun 10	Jun 24	Jul 08	Jul 22	Aug 05	Aug 19	Sep 02	Sep 16	Sep 30	Oct 14	Oct 29
0.0	8.4	13.4		17.9	24.2	22.7		22.5	20.2	17.1	17.1	13.8	8.1	4.3
1.0	8.3	13.3		17.8	24.4	22.9		22.5	20.2	17.1	17.0	14.0	8.1	4.3
2.0	8.2	13.3		17.6	24.3	21.4		22.5	20.2	17.1	16.9	14.0	8.1	4.3
3.0	8.1	13.3		17.0	19.0	20.0		22.4	20.2	17.1	16.6	14.0	8.1	4.3
4.0	7.9	13.3		14.2	15.7	16.6		18.5	19.5	17.1	16.5	14.0	8.1	4.3
5.0	6.5	11.6		12.0	12.8	13.4		14.3	16.0	17.0	16.3	14.0	8.1	4.3
6.0	5.4	8.1		10.8	11.1	11.7		12.0	12.4	13.5	14.5	14.0	8.1	4.3
7.0	5.2	7.3		10.1	9.8	10.7		11.3	10.9	11.0	11.7	13.9	8.1	4.3
7.2				9.6		10.9		11.1	10.9	10.7	11.6	12.9		4.5
IF	NT	NT	14.0	18.0	24.0	22.0	19.0	22.0	18.5	16.0	NT	NT	8.0	NT
OF	9.2	NT	15.0	18.0	24.0	23.0	20.0	22.0	19.0	16.0	17.0	NT	NT	NT

Table A4.3b. L164 lake and stream temperatures (°C) for 1988 (NT = temperature not taken, NF = no flow, OF = outflow, IF = inflow).

Depth (m)	May 04	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Sep 22	Oct 05	Oct 19
0.0	11.7	13.8	26.2	21.1	20.3	22.3	24.1	22.7	20.0	17.4	13.6	10.1	8.0
1.0	11.5	13.6	25.4	21.0	20.4	22.3	24.2	22.8	20.1	17.4	13.7	10.2	8.2
2.0	9.9	13.4	20.9	20.8	20.4	22.3	24.1	22.8	20.1	17.3	13.7	10.1	8.2
3.0	8.5	13.2	18.1	19.8	20.4	22.3	23.1	22.7	20.1	17.2	13.7	10.1	8.2
4.0	7.4	12.0	15.7	14.4	17.2	18.8	19.1	18.5	18.2	17.0	13.7	10.1	8.2
5.0	6.2	7.5	10.8	10.5	11.2	12.8	12.8	13.1	13.6	15.6	13.7	10.1	8.2
6.0	5.5	5.8	8.4	7.6	8.1	9.5	9.5	9.7	9.9	11.1	13.7	10.1	8.1
7.0	5.0	5.3	6.6	7.0	7.7	7.6	7.9	8.1	8.8	10.0	11.5	10.1	8.3
7.2	5.0		7.2			7.8	8.1						
IF	11.0	15.0	25.0	21.0	20.0	21.0	24.0	23.0	20.0	NT	12.5	8.0	7.0
OF	11.0	15.0	25.0	21.0	21.0	23.0	24.0	24.0	19.0	NT	11.5	5.0	5.0

Table A4.3c. L164 lake and stream temperatures ($^{\circ}\text{C}$) for 1989 (NT = temperature not taken, NF = no flow, OF = outflow, IF = inflow).

Depth (m)	May 17	May 31	Jun 14	Jun 28	Jul 12	Jul 26	Aug 09	Aug 23	Sep 06	Sep 20	Oct 04	Oct 17
0.0	18.9	15.6	15.1	19.4	22.8	26.1	21.9	21.7	19.5	16.3	10.1	7.3
1.0	18.9	15.2	14.8	19.4	22.8	26.1	21.4	21.3	19.5	16.4	10.2	7.3
2.0	13.5	14.1	14.4	19.4	22.6	26.1	21.3	21.0	19.3	16.4	10.2	7.3
3.0	8.3	13.4	14.2	15.8	18.4	20.5	20.9	20.6	19.3	16.4	10.2	7.3
4.0	6.4	9.7	14.2	14.3	14.8	14.9	15.6	17.7	18.2	15.9	10.2	7.3
5.0	5.7	5.9	11.0	11.0	11.3	11.0	11.8	12.5	13.2	13.8	10.2	7.3
6.0	5.1	5.5	6.1	7.7	7.6	8.9	9.2	9.9	10.1	10.3	10.2	7.2
7.0	5.1	4.5	5.6	6.8	7.2	9.2	8.2	9.5	8.6	9.2	10.0	7.2
7.2				6.8								
IF	18.0	14.5	16.0	18.5	22.0	26.0	21.0	23.0	18.0	NT	10.0	5.0
OF	19.0	14.0	16.0	19.0	24.0	25.0	20.5	23.0	NT	16.0	9.0	5.0

Table A4.3d. L164 lake and stream temperatures ($^{\circ}\text{C}$) for 1990 (NT = temperature not taken, NF = no flow, OF = outflow, IF = inflow).

Depth (m)	Apr 10	May 08	May 22	Jun 05	Jun 19	Jul 03	Jul 17	Jul 31	Aug 14	Aug 28	Sep 11	Sep 25	Oct 09	Oct 23
0.0	1.3	8.4	13.2	15.2	20.0	23.9	22.8	21.9	20.0	21.7	18.6	13.7	9.9	5.8
1.0	3.6	8.4	13.1	15.3	19.9	23.9	22.8	21.9	20.0	21.7	18.7	13.6	9.8	5.8
2.0	3.7	8.4	13.0	14.5	19.5	23.8	22.8	21.7	20.0	20.9	18.7	13.5	9.7	5.8
3.0	3.8	8.4	11.7	14.3	18.1	18.4	20.6	21.0	19.9	19.6	18.7	13.4	9.7	5.8
4.0	3.8	8.4	10.6	14.0	15.3	16.3	16.1	17.0	18.2	18.3	18.6	13.3	9.7	5.8
5.0	3.8	8.3	9.5	10.7	12.3	12.7	13.2	13.0	13.0	14.4	14.7	13.3	9.6	5.8
6.0	4.1	7.4	8.7	8.4	9.7	11.0	11.0	10.6	10.4	10.7	11.7	13.1	9.6	5.8
7.0	4.5	6.4	8.0	8.2	8.9	10.1	9.8	9.3	9.8	10.3	10.7	11.0	9.6	5.7
7.2														
IF	4.0	9.0	13.0	15.0	19.0	23.0	21.0	22.0	19.0	21.0	NT	13.0	6.0	NT
OF	4.0	8.0	12.5	15.0	19.0	23.0	22.0	22.0	20.0	20.0	NT	13.0	5.0	NT

Table A4.4a. L165 lake and stream temperatures ($^{\circ}\text{C}$) for 1987 (NT = temperature not taken, NF = no flow, OF = L164 IF, NIF = north inflow, EIF = east inflow).

Depth (m)	Apr 22	May 13	May 22	Jun 10	Jun 24	Jul 08	Jul 22	Aug 05	Aug 19	Sep 02	Sep 16	Sep 30	Oct 14	Oct 29
0.0	9.1	14.7	12.1	17.9	24.1	22.9	20.4	22.3	19.0	16.8	16.9	13.9	7.5	3.6
1.0	9.0	14.7	12.0	17.7	24.1	23.0	20.4	22.3	20.0	16.6	16.8	14.0	7.4	3.6
2.0	8.9	14.6	11.8	17.5	23.7	20.4	20.4	22.4	20.0	16.8	16.6	14.0	7.4	3.6
3.0	8.6	14.4	10.2	16.0	18.6	18.8	20.1	22.2	19.9	16.7	16.3	13.9	7.3	3.6
4.0	8.2	13.8	9.6	13.2	14.1	16.1	19.5	20.8	18.3	16.8	16.0	13.9	7.3	3.6
4.5	8.0	13.2	9.3	12.1	13.2	14.8		17.0	16.9	16.6	15.9	14.2	7.3	3.6
NIF	6.0	12.0	11.0	10.8	16.0	15.0	14.0	16.0	11.0	12.0	12.5	12.0	4.0	1.5
EIF	9.0	14.0	13.0	17.0	14.0	19.0	18.0	12.0	16.5	13.5	15.5	9.0	5.0	3.5

Table A4.4b. L165 lake and stream temperatures ($^{\circ}\text{C}$) for 1988 (NT = temperature not taken, NF = no flow, OF = L164 IF, NIF = north inflow, EIF = east inflow).

Depth (m)	May 04	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Sep 22	Oct 05	Oct 19
0.0	11.9	13.7	24.6	21.0	20.4	21.7	23.5	22.4	20.0	17.1	13.5	9.5	7.8
1.0	11.9	13.6	24.6	21.0	20.4	21.7	23.5	22.7	20.1	17.2	13.6	9.5	7.7
2.0	11.5	13.5	19.4	21.0	20.4	21.6	23.8	22.7	20.1	17.2	13.6	9.5	7.7
3.0	9.8	13.4	16.9	18.0	20.4	20.7	21.4	22.5	20.1	17.2	13.6	9.4	7.7
4.0	8.6	11.6	13.8	13.9	15.6	17.2	17.5	17.7	20.1	17.0	13.6	9.4	7.7
4.5	7.7	11.0	12.9	13.0	14.3	15.6	16.1	16.4	19.4	16.7	13.8	9.9	8.3
NIF	6.0	8.0	NT	10.0	NF	16.0	20.0	NF	NF	NF	8.0	NF	NF
EIF	11.0	13.0	24.0	18.0	17.0	22.0	23.0	21.0	18.0	15.0	10.0	4.0	4.0

Table A4.4c. L165 lake and stream temperatures ($^{\circ}\text{C}$) for 1989 (NT = temperature not taken, NF = no flow, OF = L164 IF, NIF = north inflow, EIF = east inflow).

Depth (m)	May 17	May 31	Jun 14	Jun 28	Jul 12	Jul 26	Aug 09	Aug 23	Sep 06	Sep 20	Oct 04	Oct 17
0.0	18.2	15.1	14.1	19.1	21.8	26.4	20.7	20.4	19.1	16.3	9.0	6.8
1.0	18.2	15.3	14.2	19.2	22.0	26.5	20.7	20.5	19.2	16.4	9.2	6.8
2.0	14.3	14.5	14.2	19.0	22.1	25.8	20.7	20.2	19.2	16.4	9.3	6.8
3.0	9.2	13.5	14.0	15.2	17.8	19.1	20.0	19.8	15.9	16.4	9.3	6.8
4.0	7.0	10.1	13.1	12.6	13.5	14.7	15.7	15.9	17.5	16.4	9.3	6.8
4.5		10.2	11.5	12.3	12.9	14.7	14.3		16.8	15.9	9.4	7.1
NIF	12.0	15.0	9.0	13.0	14.0	NT	NF	13.0	NF	NF	NF	NF
EIF	15.0	16.0	16.0	16.0	22.0	24.0	19.5	21.0	18.0	14.0	5.0	3.0

Table A4.4d. L165 lake and stream temperatures ($^{\circ}\text{C}$) for 1990 (NT = temperature not taken, NF = no flow, OF = L164 IF, NIF = north inflow, EIF = east inflow).

Depth (m)	Apr 10	May 08	May 22	Jun 05	Jun 19	Jul 03	Jul 17	Jul 31	Aug 14	Aug 28	Sep 11	Sep 25	Oct 09	Oct 23
0.0	0.0	8.9	13.3	16.1	19.8	23.6	22.1	21.0	19.6	21.5	18.4	13.5	8.9	5.1
1.0	2.8	9.0	13.2	16.1	19.8	23.7	22.3	21.0	19.7	21.5	18.6	13.3	8.9	5.0
2.0	3.7	9.0	13.0	15.6	18.3	20.6	22.4	21.0	19.7	21.2	18.7	13.2	8.8	5.0
3.0	4.2	9.0	11.9	15.1	16.7	16.2	17.9	19.4	19.7	19.5	18.7	13.2	8.8	5.0
4.0	4.3	9.0	10.8	12.4	14.6	14.1	14.6	14.2	16.5	17.3	18.3	13.2	8.8	5.3
4.5	4.6	8.8	10.6	12.2	13.8	13.7	14.1		16.8	18.1				
NIF	0.0	6.0	7.0	8.0	10.0	17.5	16.0	14.0	16.0	13.0	NT	10.0	NF	NF
EIF	3.0	8.0	10.0	15.0	19.0	21.5	16.0	20.0	21.0	18.5	NT	12.0	4.0	4.0

Table A4.5a. L373 lake and stream temperatures ($^{\circ}\text{C}$) for 1987 (NT = temperature not taken, NF = no flow, OF = outflow, SWIF = southwest inflow).

Depth (m)	Apr 04	Apr 23	May 06	May 20	Jun 01	Jun 17	Jul 01	Jul 15	Jul 29	Aug 12	Aug 26	Sep 16	Sep 30	Oct 14	Oct 29
0.0	NT	8.3	11.5	11.7	15.8	21.3	NT	19.8	23.5	21.3	19.0	17.5	14.5	9.3	6.3
1.0	NT	8.3	11.5	11.7	15.9	21.1	NT	19.8	23.4	21.3	19.0	17.4	14.7	9.4	6.3
2.0	NT	8.2	11.4	11.6	15.9	21.1	NT	19.8	23.1	21.4	19.0	17.2	14.7	9.4	6.3
3.0	NT	7.9	11.3	11.6	15.8	20.8	NT	19.7	22.6	21.4	19.0	17.1	14.7	9.3	6.3
4.0	NT	7.8	11.2	11.6	15.7	18.8	NT	19.7	21.9	21.4	19.0	17.1	14.7	9.3	6.3
5.0	NT	7.6	10.7	11.6	13.6	18.0	NT	19.7	21.4	21.4	19.0	16.9	14.7	9.3	6.3
6.0	NT	7.2	10.1	11.6	12.8	15.8	NT	19.6	20.9	21.4	19.0	16.8	14.7	9.3	6.3
7.0	NT	6.9	9.1	11.3	12.1	13.6	NT	19.5	19.7	21.1	19.0	16.8	14.7	9.3	6.3
8.0	NT	6.6	7.8	9.2	11.6	12.6	NT	17.3	16.5	17.6	18.9	16.7	14.7	9.3	6.3
9.0	NT	5.6	7.0	6.4	10.6	11.1	NT	14.6	13.7	14.4	15.2	16.3	14.7	9.3	6.3
10.0	NT	5.4	6.6	5.5	10.6	9.1	NT	12.4	11.4	12.1	12.6	14.0	14.4	9.3	6.3
11.0	NT	5.3	6.0	4.8	7.1	8.0	NT	10.7	9.9	10.3	10.6	11.4	12.7	9.3	6.3
12.0	NT	4.9	5.6	4.3	6.2	6.9	NT	8.9	8.9	8.6	9.1	9.0	9.5	9.3	6.3
13.0	NT	4.7	5.1	4.0	5.8	6.3	NT	8.0	8.0	7.3	8.0	7.8	8.2	9.2	6.3
14.0	NT	4.5	4.9	3.8	5.4	5.8	NT	7.2	7.2	6.7	7.1	7.0	7.2	9.0	6.3
15.0	NT	4.4	4.7	3.5	5.1	5.6	NT	6.6	6.6	6.4	6.5	6.3	6.7	7.9	6.3
16.0	NT	4.4	4.5	3.3	4.9	5.4	NT	6.1	6.1	6.2	6.0	6.4	6.3	6.3	6.3
17.0	NT	4.3	4.4	3.2	4.7	5.2	NT	5.8	5.8	5.9	5.9	5.7	6.0	5.9	6.3
18.0	NT	4.2	4.4	3.2	4.7	5.1	NT	5.6	5.6	5.7	5.8	5.5	5.8	5.7	6.2
19.0	NT	4.2	4.3	3.1	4.6	5.0	NT	5.5	5.4	5.6	5.7	5.4	5.6	5.6	6.2
20.0	NT	4.2	4.3	3.1	4.5	4.9	NT	5.4	5.3	5.4	5.7	5.4	5.5	5.5	6.2
20.5	NT	4.2	4.3	3.0	4.6	4.9	NT	5.3	5.3	5.5	5.7	5.4	5.5	5.4	5.9
SWIF	-1.1	3.0	8.0	NF	9.0	NF	NF	NF	NF	16.0	NF	NF	NF	NF	NF
OF	6.8	12.0	12.0	NF	16.5	NT	20.0	20.0	NT	NT	18.0	NT	14.0	8.0	6.0

Table A4.5b. L373 lake and stream temperatures ($^{\circ}\text{C}$) for 1988 (NT = temperature not taken, NF = no flow, OF = outflow, SWIF = southwest inflow).

Depth (m)	Apr 12	May 11	May 25	Jun 08	Jun 22	Jul 06	Jul 20	Aug 03	Aug 17	Aug 31	Sep 07	Sep 21	Oct 05	Oct 19
0.0	0.6	10.9	14.0	22.2	22.2	22.5	21.8	23.6	22.7	18.5	17.7	14.4	11.0	9.5
1.0	2.2	10.9	14.0	22.3	22.3	22.5	21.8	23.5	22.7	18.7	17.8	14.4	11.0	9.5
2.0	2.7	10.9	13.9	22.4	22.2	22.5	21.8	23.5	22.7	18.7	17.8	14.4	11.0	9.5
3.0	3.3	10.9	13.8	22.4	22.2	22.4	21.8	23.5	22.7	18.7	17.8	14.4	11.1	9.6
4.0	3.5	10.6	13.7	17.8	21.8	21.8	21.8	23.5	22.7	18.7	17.8	14.4	11.1	9.6
5.0	3.7	10.5	13.2	16.1	20.4	21.3	21.8	23.5	22.8	18.7	17.7	14.4	11.1	9.6
6.0	3.8	8.9	11.6	14.5	15.5	19.4	20.8	23.1	22.8	18.7	17.7	14.4	11.1	9.6
7.0	3.8	7.5	9.9	11.5	13.7	15.1	17.3	19.1	20.2	18.7	17.7	14.4	11.1	9.6
8.0	3.8	6.7	7.6	9.6	10.7	12.2	13.3	15.1	16.0	18.4	17.6	14.2	11.1	9.6
9.0	3.8	6.3	6.8	8.4	10.5	10.4	10.5	12.4	12.3	13.0	15.9	13.9	11.1	9.6
10.0	3.8	6.1	6.3	7.4	8.2	9.0	8.9	10.6	10.4	11.2	10.8	13.7	11.1	9.6
11.0	3.8	5.9	6.0	6.8	7.3	7.8	7.8	9.1	8.9	9.2	9.4	9.4	11.0	9.5
12.0	3.8	5.8	5.7	6.4	6.5	6.9	7.2	8.3	7.9	8.2	7.9	8.1	10.1	9.5
13.0	3.9	5.7	5.5	6.1	6.1	6.4	6.5	7.5	7.1	7.5	7.1	7.3	7.8	9.1
14.0	3.9	5.5	5.4	5.8	5.9	6.0	6.2	7.1	6.6	7.0	6.6	6.8	6.9	7.7
15.0	3.9	5.4	5.2	5.7	5.7	5.9	6.8	6.3	6.6	6.6	6.2	6.4	6.5	6.7
16.0	3.9	5.3	5.2	5.5	5.5	5.5	5.7	6.4	6.1	6.3	5.9	6.1	6.1	6.3
17.0	3.9	5.1	5.1	5.3	5.4	5.4	5.5	6.2	5.9	6.1	5.7	5.9	5.8	6.1
18.0	4.0	5.0	5.0	5.2	5.2	5.3	5.4	6.0	5.7	5.9	5.5	5.7	5.7	5.9
19.0	4.1	4.9	4.9	5.1	5.1	5.1	5.2	5.9	5.7	5.8	5.4	5.6	5.6	5.8
20.0	4.1	4.9	4.8	5.2	5.1	5.1	5.1	5.7	5.5	5.7	5.3	5.5	5.5	5.7
20.5	4.2	4.8	4.9	5.2			5.1	5.1	5.8	5.6	5.7	5.2	5.5	5.7
SWIF	NT	2.0	5.0	NF	22.0	NF	12.0	NF						
OF	NT	NT	15.0	NT	NT	22.0	23.0	NT	NT	18.0	17.5	13.5	11.0	8.5

Table A4.5c. L373 lake and stream temperatures ($^{\circ}\text{C}$) for 1989 (NT = temperature not taken, NF = no flow, OF = outflow, SWIF = southwest inflow).

Depth (m)	Apr 18	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Sep 21	Oct 05	Oct 18
0.0	0.3	14.9	14.6	15.6	19.3	22.2	24.0	22.5	21.0	19.4	16.3	11.6	8.7
1.0	1.7	14.7	14.6	15.7	19.3	22.3	24.1	22.3	21.1	19.5	16.4	11.6	8.6
2.0	3.2	13.7	14.2	15.2	19.3	22.3	24.2	22.3	21.1	19.5	16.4	11.5	8.5
3.0	3.3	9.5	13.9	14.8	19.3	22.3	24.4	22.1	21.1	19.5	16.4	11.5	8.5
4.0	3.3	8.2	13.0	14.6	18.7	22.1	24.5	21.9	21.0	19.4	16.5	11.4	8.5
5.0	3.3	7.1	11.7	14.5	16.4	19.1	21.0	21.9	20.9	19.4	16.5	11.4	8.5
6.0	3.3	6.6	9.1	12.9	14.3	15.7	17.2	19.6	19.9	19.2	16.5	11.4	8.5
7.0	3.3	6.4	8.0	9.6	11.2	12.6	13.3	14.3	15.6	18.4	16.5	11.4	8.5
8.0	3.3	5.8	7.3	8.1	9.0	10.2	10.7	12.1	12.2	13.0	15.8	11.4	8.5
9.0	3.3	5.5	6.7	7.2	7.8	8.6	9.2	10.2	10.1	10.6	11.5	11.4	8.5
10.0	3.3	5.2	6.2	6.3	7.0	7.5	8.3	8.7	8.7	9.2	8.8	10.8	8.5
11.0	3.3	4.9	5.8	5.9	6.5	6.8	7.3	7.6	7.5	8.1	7.8	9.1	8.5
12.0	3.3	4.7	5.3	5.6	5.9	6.1	6.5	6.9	6.7	7.5	6.9	6.9	8.3
13.0	3.4	4.7	5.0	5.2	5.4	5.8	6.0	6.3	6.2	6.7	6.4	6.2	8.3
14.0	3.4	4.6	4.8	4.6	5.1	5.4	5.7	6.1	5.8	6.2	5.9	5.9	6.2
15.0	3.4	4.5	4.5	4.5	4.8	5.2	5.4	5.8	5.3	5.8	5.6	5.5	5.5
16.0	3.5	4.3	4.3	4.3	4.6	5.0	5.1	5.5	5.1	5.7	5.3	5.2	5.5
17.0	3.6	4.3	4.2	4.3	4.4	4.8	4.8	5.2	4.9	5.3	5.1	5.0	5.3
18.0	3.7	4.2	4.1	4.3	4.4	4.7	4.7	5.2	4.8	5.2	5.0	4.8	5.2
19.0	3.7	4.2	4.1	4.3	4.4	4.6	4.7	5.2	4.7	5.1	4.9	4.7	5.1
20.0	3.8	4.2	4.1	4.2	4.3	4.7	4.7	5.1	4.7	5.0	4.8	4.7	5.1
20.5	3.9	4.4	4.1	4.2	4.5			5.1	5.3	4.8	5.2	4.9	4.7
SWIF	NF	5.0	NF	10.0	9.0	11.0	NF						
OF	NF	15.0	15.0	14.0	19.0	21.0	23.5	23.0	21.0	NT	16.0	11.0	5.0

Table A4.5d. L373 lake and stream temperatures ($^{\circ}\text{C}$) for 1990 (NT = temperature not taken, NF = no flow, OF = outflow, SWIF = southwest inflow, SEIF = southeast inflow).

Depth (m)	Apr 09	May 09	May 23	Jun 06	Jun 20	Jul 04	Jul 18	Aug 01	Aug 15	Aug 29	Sep 12	Sep 26	Oct 10	Oct 24
0.0	1.5	7.2	12.9	14.5	18.7	21.9	21.5	21.6	20.5	20.2	18.3	14.5	10.6	7.5
1.0	4.1	7.2	12.7	14.5	18.4	21.9	21.7	21.6	20.5	20.4	18.4	14.4	10.6	7.5
2.0	4.2	7.2	12.4	14.4	18.4	21.9	21.7	21.6	20.2	20.4	18.5	14.4	10.6	7.5
3.0	4.2	7.2	12.1	14.4	18.4	21.9	21.7	21.6	20.2	20.4	18.6	14.4	10.6	7.5
4.0	4.2	7.2	11.2	14.3	18.2	21.6	21.6	21.6	20.2	20.5	18.6	14.4	10.6	7.5
5.0	4.2	7.2	10.3	14.2	16.2	18.6	21.6	21.5	20.1	20.5	18.6	14.4	10.6	7.5
6.0	4.2	7.1	9.1	12.5	14.0	15.4	17.1	20.5	20.0	20.2	18.7	14.4	10.6	7.4
7.0	4.2	7.1	8.5	10.5	11.8	12.9	12.2	15.7	18.8	19.3	18.7	14.2	10.6	7.4
8.0	4.2	7.1	7.8	8.7	9.8	11.0	9.8	12.5	13.8	15.4	17.1	14.2	10.6	7.4
9.0	4.1	5.7	7.3	7.9	8.8	9.4	9.3	10.6	11.5	12.3	13.6	14.1	10.6	7.4
10.0	4.1	5.4	6.8	7.1	7.9	8.1	8.3	9.4	9.9	10.5	11.0	12.1	10.6	7.4
11.0	4.1	5.2	6.3	6.6	7.3	6.7	7.5	8.6	8.8	9.1	9.4	9.7	10.6	7.4
12.0	4.0	5.0	6.0	6.1	6.7	6.2	6.7	7.7	7.8	8.4	8.2	10.2	7.4	
13.0	4.0	4.9	5.6	5.8	6.2	5.9	6.2	7.0	7.2	7.1	7.2	8.2	7.3	
14.0	4.0	4.8	5.3	5.4	5.7	5.6	5.9	6.6	6.6	6.7	6.4	6.6	7.2	7.3
15.0	4.0	4.8	5.1	5.2	5.5	5.3	5.5	6.0	6.2	6.4	6.0	6.3	6.8	7.3
16.0	4.1	4.7	4.9	5.1	5.3	5.0	5.2	5.7	5.8	6.0	5.7	6.0	6.2	6.7
17.0	4.1	4.7	4.8	5.0	5.2	4.9	5.1	5.5	5.6	5.7	5.5	5.7	5.9	6.2
18.0	4.1	4.6	4.8	4.9	5.1	4.8	5.1	5.4	5.3	5.5	5.3	5.4	5.8	5.8
19.0	4.2	4.6	4.8	4.9	5.0	4.8	4.9	5.3	5.3	5.4	5.3	5.3	5.6	5.3
20.0	4.2	4.6	4.8	4.9	5.0		4.9	5.2	5.2	5.3	5.2	5.2	5.5	5.3
20.5	4.3	4.8	4.9	5.1			4.9		5.2	5.2	5.2	5.2	5.5	5.3
SWIF	NT	2.5	2.0	5.0	7.0	12.0	11.0	13.0	NF	NF	NF	NF	NF	NF
SEIF	NT	2.5	7.0	8.0	10.0	15.0	13.0	16.0	NF	NF	NF	NF	NF	NF
OF	NT	7.0	6.0	15.0	18.0	21.0	20.0	20.0	21.0	19.0	NF	NF	10.0	7.0

Table A4.6a. L377 lake and stream temperatures ($^{\circ}\text{C}$) for 1987 (NT = temperature not taken, NF = no flow, OF = outflow, WIF = west inflow, NEIF = northeast inflow).

Depth (m)	Apr 04	Apr 23	May 06	May 20	Jun 03	Jun 17	Jul 01	Jul 15	Jul 29	Aug 12	Aug 26	Sep 09	Sep 16	Sep 30	Oct 14	Oct 1
0.0	NT	9.1	12.7	13.7	16.3	21.6	20.2	20.1	24.0	21.8	19.1	NT	17.7	15.1	9.2	5.8
1.0	NT	9.0	12.6	13.7	16.3	21.7	20.5	20.2	24.0	21.8	19.1	NT	17.6	15.1	9.1	5.8
2.0	NT	8.9	12.5	13.6	16.3	21.1	20.6	20.2	24.0	21.8	19.1	NT	17.4	15.0	9.1	5.8
3.0	NT	8.0	12.0	13.6	16.3	20.5	20.6	20.2	23.5	21.8	19.1	NT	17.3	14.9	9.1	5.8
4.0	NT	7.4	11.0	13.6	16.0	18.1	20.7	20.2	22.9	21.9	19.1	NT	17.1	14.9	9.1	5.8
5.0	NT	7.0	10.1	13.2	13.4	15.1	20.6	18.7	22.3	21.9	19.1	NT	17.1	14.8	9.1	5.8
6.0	NT	6.4	8.9	11.0	11.7	12.5	17.3	14.7	21.2	18.6	19.1	NT	16.9	14.8	9.1	5.8
7.0	NT	5.9	7.2	8.0	10.5	10.0	13.6	11.7	17.6	14.5	14.4	NT	16.5	14.8	9.1	5.8
8.0	NT	5.0	6.9	6.7	7.7	8.2	11.3	9.5	13.9	10.2	11.2	NT	11.4	12.8	9.0	5.8
9.0	NT	4.7	5.2	6.0	6.7	6.3	9.1	7.5	10.9	8.4	8.2	NT	8.3	8.9	9.0	5.8
10.0	NT	4.6	5.0	5.5	6.0	5.6	7.6	6.7	7.8	7.2	6.8	NT	7.2	7.5	9.0	5.8
11.0	NT	4.5	5.0	5.3	5.6	5.0	6.8	5.9	6.8	6.4	6.1	NT	6.3	6.6	6.6	5.8
12.0	NT	4.5	4.9	5.2	5.3	4.7	6.1	5.4	6.2	5.8	5.7	NT	5.7	6.0	5.5	5.8
13.0	NT	4.4	4.8	4.9	5.2	4.4	5.6	5.3	5.6	5.6	5.4	NT	5.3	5.7	5.3	5.7
14.0	NT	4.4	4.7	4.8	5.0	4.3	5.4	5.1	5.3	5.3	5.2	NT	5.1	5.4	5.1	5.7
15.0	NT	4.3	4.7	4.8	4.9	4.2	5.2	4.9	5.1	5.2	5.1	NT	5.0	5.2	4.9	5.6
16.0	NT	4.3	4.7	4.7	4.8	4.2	5.0	4.8	5.0	5.1	5.1	NT	4.9	5.0	4.8	5.0
17.0	NT	4.3	4.7	4.7	4.7	4.1	4.9	4.7	4.9	5.0	4.9	NT	4.9	5.0	4.8	4.9
18.0	NT	4.3	4.7	4.7	4.7	4.1	4.9	4.7	4.8	5.0	5.0	NT	4.8	4.9	4.7	4.8
18.5	NT	4.2	4.7	4.7	4.7	4.1	4.9	4.8	4.8	4.8	4.9	NT				
WIF	4.8	8.5	10.0	12.0	NT	22.0	20.0	19.0	18.0	21.0	18.0	17.0	18.0	14.0	8.0	5.0
NEIF	0.0	6.5	6.0	NF	NT	14.0	10.0	NT	NF	13.0	NF	NF	NF	NF	NF	NF
OF	4.6	9.5	13.0	NT	NT	22.0	21.0	20.0	19.0	21.0	18.0	16.0	17.5	15.0	9.0	6.0

Table A4.6b. L377 lake and stream temperatures ($^{\circ}\text{C}$) for 1988 (NT = temperature not taken, NF = no flow, OF = outflow, WIF = west inflow, NEIF = northeast inflow).

Depth (m)	Apr 12	May 11	May 25	Jun 08	Jun 22	Jul 06	Jul 20	Aug 03	Aug 17	Aug 31	Sep 07	Sep 21	Oct 05	Oct 19
0.0	1.5	12.3	14.4	22.9	23.2	23.1	22.5	23.6	22.9	17.5	17.7	14.1	10.9	9.1
1.0	2.9	12.3	14.6	23.0	23.2	23.3	22.5	23.6	23.1	18.0	17.7	14.0	10.9	9.2
2.0	3.2	12.3	14.6	22.9	23.2	23.3	22.5	23.6	23.2	18.1	17.7	13.9	10.9	9.3
3.0	3.5	11.1	14.5	19.6	23.1	23.3	22.5	23.7	23.2	18.1	17.7	13.8	10.9	9.3
4.0	3.6	9.5	12.6	15.8	19.3	22.5	22.1	23.6	23.2	18.1	17.7	13.7	10.9	9.3
5.0	3.7	7.5	8.8	12.1	14.0	17.0	20.2	21.7	21.6	18.2	17.8	13.8	10.9	9.3
6.0	3.7	6.6	7.0	10.0	10.7	12.1	14.7	15.6	15.6	18.0	17.8	13.8	10.9	9.4
7.0	3.7	5.8	6.3	8.1	9.0	9.3	11.2	10.9	11.8	13.0	14.1	13.8	10.8	9.4
8.0	3.7	5.2	5.6	6.7	7.0	8.1	8.7	8.5	8.5	9.3	10.9	10.4	10.8	9.4
9.0	3.7	4.9	5.1	6.0	6.1	6.9	6.8	7.2	6.8	7.5	8.0	7.7	10.2	9.4
10.0	3.7	4.6	4.7	5.5	5.4	6.1	6.3	6.1	5.9	6.2	6.3	6.3	6.5	8.0
11.0	3.8	4.5	4.4	5.0	5.0	5.4	5.8	5.5	5.2	5.5	5.5	5.3	5.8	6.2
12.0	3.8	4.4	4.3	4.8	4.7	5.0	5.4	5.1	4.8	5.1	5.1	4.9	5.2	5.6
13.0	3.8	4.3	4.2	4.6	4.6	4.7	5.1	4.8	4.6	4.8	4.7	4.7	4.9	5.2
14.0	3.8	4.2	4.1	4.5	4.5	4.5	4.7	4.6	4.4	4.6	4.6	4.6	4.8	5.0
15.0	3.9	4.2	4.1	4.5	4.4	4.5	4.6	4.4	4.3	4.5	4.5	4.4	4.7	4.8
16.0	3.9	4.2	4.1	4.4	4.4	4.5	4.7	4.4	4.3	4.5	4.4	4.4	4.5	4.7
17.0	4.0	4.2	4.1	4.4	4.4	4.4	4.6	4.4	4.3	4.4	4.3	4.4	4.4	4.6
18.0	4.0	4.3	4.2	4.7	4.5	4.5	4.5	4.4	4.3	4.4	4.2	4.5	4.5	4.6
18.5	4.3													
WIF	NT	8.0	15.0	19.0	22.0	22.0	22.0	23.0	21.0	18.0	16.0	12.0	10.0	8.0
NEIF	NT	4.0	5.0	21.0	15.0	14.0	13.0	18.0	17.0	NF	NF	9.0	NF	NF
OF	NT	12.0	14.0	22.0	23.0	23.0	22.5	23.0	23.0	18.0	17.0	13.0	12.0	9.0

Table A4.6c. L377 lake and stream temperatures ($^{\circ}\text{C}$) for 1989 (NT = temperature not taken, NF = no flow, OF = outflow, WIF = west inflow, NEIF = northeast inflow).

Depth (m)	Apr 18	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Sep 21	Oct 05	Oct 18
0.0	0.2	16.2	14.6	16.5	19.6	22.0	24.7	22.0	21.5	19.5	15.8	11.1	8.0
1.0	1.9	15.9	14.6	15.9	19.7	22.2	24.8	22.1	21.5	19.5	16.1	11.2	8.0
2.0	2.7	12.5	14.5	15.2	19.7	22.2	24.9	22.1	21.5	19.5	16.2	11.2	8.0
3.0	2.9	8.8	13.2	14.8	19.7	22.2	25.0	22.1	21.0	19.5	16.2	11.2	8.0
4.0	3.0	7.0	12.5	14.6	17.2	19.2	21.3	21.8	20.8	19.5	16.2	11.2	8.0
5.0	3.0	6.1	10.8	13.8	14.7	15.5	16.4	17.8	19.1	19.1	16.3	11.2	8.0
6.0	3.0	5.5	8.0	10.8	11.7	12.1	12.5	13.4	13.7	14.8	15.8	11.2	8.0
7.0	3.0	4.9	5.9	7.5	8.3	9.6	10.0	10.7	10.5	11.0	13.3	11.2	8.0
8.0	3.1	4.5	5.2	5.9	6.5	7.3	7.7	8.2	8.5	8.1	9.1	11.0	7.9
9.0	3.1	4.2	4.7	5.0	5.7	6.1	6.6	6.8	7.0	6.7	7.7	7.3	7.9
10.0	3.1	4.2	4.5	4.6	5.4	5.4	5.7	6.0	5.7	5.6	6.8	6.4	6.5
11.0	3.1	4.1	4.3	4.3	4.8	5.0	5.3	5.5	5.2	5.0	5.7	5.9	5.3
12.0	3.2	4.0	4.2	4.2	4.5	4.8	4.9	5.2	4.8	4.6	5.3	5.2	4.9
13.0	3.3	4.0	4.1	4.1	4.4	4.6	4.8	4.9	4.6	4.5	5.1	4.9	4.6
14.0	3.4	3.9	4.1	4.0	4.3	4.5	4.7	4.8	4.5	4.4	4.9	4.8	4.6
15.0	3.5	3.9	4.0	3.9	4.3	4.4	4.6	4.7	4.4	4.4	4.7	4.5	4.4
16.0	3.5	3.9	3.9	3.9	4.2	4.5	4.5	4.7	4.4	4.3	4.6	4.4	4.3
17.0	3.6	3.8	3.9	3.9	4.1	4.4	4.4	4.6	4.3	4.2	4.5	4.4	4.3
18.0		3.8	3.9	3.8	4.1	4.3	4.4	4.5	4.3	4.2	4.5	4.4	4.3
18.5		3.9		3.9	4.2	4.5		4.3	4.2		4.5	4.4	
WIF	NT	12.0	14.0	16.0	18.0	21.0	23.0	23.0	19.0	18.0	16.0	10.0	6.5
NEIF	NT	10.0	8.0	10.0	12.0	14.0	17.0	NF	16.0	NF	NF	NF	NF
OF	NT	15.0	15.0	16.0	19.0	22.0	24.0	23.0	20.0	NT	16.0	10.0	7.5

Table A4.6d. L377 lake and stream temperatures ($^{\circ}\text{C}$) for 1990 (NT = temperature not taken, NF = no flow, OF = outflow, WIF = west inflow, NEIF = northeast inflow).

Depth (m)	Apr 09	May 09	May 23	Jun 06	Jun 20	Jul 04	Jul 18	Aug 01	Aug 15	Aug 29	Sep 12	Sep 26	Oct 10	Oct 24
0.0	1.6	7.5	13.6	14.9	18.6	22.0	22.1	22.1	20.4	20.8	18.6	14.3	10.1	6.7
1.0	4.2	7.5	13.3	14.9	18.8	22.0	22.2	22.1	20.4	21.0	18.8	14.3	10.1	6.9
2.0	4.2	7.4	12.9	14.9	18.8	22.1	22.2	22.1	20.5	21.0	18.8	14.3	10.1	6.8
3.0	4.1	7.4	11.5	14.8	18.6	22.1	22.2	22.1	20.4	20.9	18.8	14.3	10.1	6.8
4.0	4.1	7.3	10.4	14.4	17.3	19.1	22.2	22.1	20.4	20.9	18.8	14.3	10.1	6.8
5.0	4.1	7.3	8.8	11.1	14.2	15.0	16.3	17.5	19.5	19.5	18.9	14.3	10.1	6.8
6.0	4.1	7.3	7.7	9.1	11.1	12.3	13.2	13.1	14.8	15.6	16.7	14.1	10.1	6.8
7.0	4.0	6.8	7.3	8.1	9.3	10.4	9.8	10.5	11.6	11.3	12.1	13.8	10.1	6.8
8.0	4.0	5.8	6.9	7.1	8.0	7.9	8.6	8.6	9.7	8.8	10.0	10.0	10.1	6.8
9.0	4.0	5.3	6.2	6.1	7.1	7.0	7.7	7.3	8.1	7.7	8.4	8.4	9.8	6.8
10.0	4.0	5.2	5.6	5.6	6.5	6.4	7.1	6.6	7.3	6.7	7.3	7.1	7.3	6.8
11.0	4.0	5.0	5.4	5.3	5.9	5.8	6.4	5.8	6.5	5.9	6.5	6.3	6.3	6.8
12.0	4.1	4.9	5.1	5.0	5.5	5.5	5.9	5.5	6.0	5.5	6.1	6.0	5.8	6.8
13.0	4.1	4.9	5.0	4.9	5.2	5.2	6.1	5.2	5.7	5.2	5.7	5.7	5.7	5.7
14.0	4.1	4.8	4.9	4.8	5.0	5.1	5.5	5.0	5.3	5.1	5.6	5.6	5.5	5.3
15.0	4.0	4.8	4.8	4.7	4.9	5.0	5.4	4.9	5.2	5.0	5.5	5.4	5.2	5.1
16.0	4.1	4.7	4.8	4.7	4.9	5.0	5.3	4.8	5.1	4.9	5.2	5.1	5.0	
17.0	4.1	4.7	4.7	4.6	4.8	4.9	5.1	4.7	5.0	4.8	5.1	4.9	5.0	
18.0	4.2	4.6	4.7	4.6	4.8	4.8	5.1	4.7	4.9	4.7	5.1	5.1	4.8	4.9
18.5					4.8	4.9	5.2	4.6			5.0			
WIF	2.5	6.0	13.0	15.0	18.0	20.0	21.0	22.0	22.0	22.0	18.0	13.0	NF	NF
NEIF	0.5	2.0	7.0	8.0	11.0	13.0	13.0	14.0	NF	NF	NF	NF	NF	NF
OF	3.5	7.0	14.0	14.0	18.0	21.0	21.0	22.0	21.0	22.0	18.0	14.0	4.5	NT

Table A4.7a. L442 lake and stream temperatures (°C) for 1987 (NT = temperature not taken, NF = no flow, OF = outflow, NIF = north inflow).

Depth (m)	Apr 23	May 06	May 20	Jun 03	Jun 17	Jul 01	Jul 15	Jul 29	Aug 12	Aug 26	Sep 16	Sep 30	Oct 14	Oct 29
0.0	8.2	12.4	13.6	16.9	22.1	NT	18.9	24.0	21.4	18.9	16.8	14.3	8.8	6.0
1.0	8.2	12.3	13.6	17.0	22.1	NT	19.1	24.0	21.4	18.9	16.8	14.3	8.8	6.0
2.0	8.1	12.3	13.6	17.0	21.7	NT	19.2	24.0	21.5	18.9	16.8	14.3	8.8	5.9
3.0	7.7	11.9	13.6	15.0	19.7	NT	19.2	23.2	21.5	18.9	16.8	14.4	8.8	5.9
4.0	6.7	10.8	13.7	13.3	17.0	NT	19.3	22.2	21.5	18.9	16.7	14.4	8.8	5.9
5.0	6.6	9.4	12.3	12.4	15.0	NT	19.3	21.0	21.5	18.9	16.5	14.4	8.8	5.8
6.0	6.3	8.7	8.6	10.8	11.3	NT	17.0	18.5	20.1	16.3	16.3	14.4	8.7	5.8
7.0	5.6	8.5	7.0	7.9	9.3	NT	13.0	14.1	15.7	12.3	13.5	14.3	8.7	5.8
8.0	5.1	5.6	6.1	6.5	7.4	NT	10.3	10.9	11.9	9.5	9.8	10.6	8.7	5.8
9.0	4.7	5.1	5.4	5.8	6.4	NT	8.4	8.5	9.4	7.9	7.9	8.4	8.7	5.8
10.0	4.4	4.8	5.0	5.2	5.7	NT	7.0	7.5	8.1	7.0	6.9	7.1	8.6	5.8
11.0	4.2	4.6	4.6	4.8	5.3	NT	6.0	6.7	6.9	6.0	6.0	6.1	6.2	5.8
12.0	3.9	4.4	4.4	4.5	5.0	NT	5.4	5.8	6.3	5.4	5.5	5.7	5.6	5.8
13.0	3.9	4.3	4.3	4.4	4.8	NT	5.0	5.8	5.9	5.1	5.1	5.3	5.4	5.7
14.0	3.8	4.2	4.3	4.2	4.8	NT	4.8	5.2	5.5	5.0	5.0	5.1	5.2	5.3
15.0	3.8	4.2	4.3	4.2	4.7	NT	4.7	5.0	5.3	4.9	4.9	5.0	5.0	5.0
16.0	3.8	4.2	4.3	4.2	4.6	NT	4.6	4.9	5.1	4.9	4.8	4.9	4.9	4.9
17.0	3.8	4.2	4.3	4.1	4.5	NT	4.6	4.8	5.1	4.9	4.8	4.9	4.9	4.9
18.0	3.9	4.2	4.3	4.1	4.5	NT	4.6	4.8	4.9	4.8	4.7	4.8	4.8	4.8
18.5					4.3	4.8	5.1	NT	4.8	5.1				
NIF	12.5	10.0	9.0	10.0	19.0	NF	NF	NF	16.0	NF	NF	NF	NF	NF
OF	11.0	12.0	NT	12.5	22.0	19.0	19.0	23.0	NT	18.0	NT	NT	3.0	NF

Table A4.7b. L442 lake and stream temperatures (°C) for 1988 (NT = temperature not taken, NF = no flow, OF = outflow, NIF = north inflow).

Depth (m)	Apr 12	May 11	May 25	Jun 08	Jun 22	Jul 06	Jul 20	Aug 03	Aug 17	Aug 31	Sep 07	Sep 21	Oct 05	Oct 19
0.0	0.5	11.5	14.4	23.4	22.7	23.3	22.0	23.6	22.9	17.9	17.6	13.9	10.9	9.0
1.0	2.2	11.6	14.5	23.4	22.8	23.4	22.0	23.6	22.9	18.0	17.5	13.9	10.8	9.1
2.0	2.6	11.6	14.5	23.4	22.7	23.3	22.0	23.6	23.0	18.1	17.5	13.9	10.8	9.1
3.0	3.0	11.6	14.4	19.1	22.2	22.4	22.0	23.6	23.0	18.2	17.4	13.9	10.8	9.2
4.0	3.1	10.6	13.0	16.2	19.6	20.4	21.5	23.3	23.1	18.2	17.3	13.9	10.8	9.2
5.0	3.3	7.6	10.9	13.7	13.7	15.8	17.6	18.9	20.5	18.2	17.3	13.9	10.7	9.2
6.0	3.3	6.6	7.7	11.0	11.2	12.0	13.0	14.2	15.6	17.8	17.2	13.9	10.7	9.2
7.0	3.3	6.1	6.5	8.4	9.1	9.8	10.4	10.9	12.1	12.8	12.3	13.9	10.7	9.2
8.0	3.4	5.7	5.9	7.0	7.5	8.7	7.7	8.9	10.0	10.5	9.9	10.4	10.7	9.2
9.0	3.5	5.4	5.5	6.2	6.6	7.9	6.7	7.6	8.4	8.7	7.8	8.3	10.5	9.1
10.0	3.5	5.1	5.3	5.8	5.9	6.7	6.0	6.7	7.4	7.8	6.7	7.2	7.4	8.7
11.0	3.6	4.9	5.0	5.4	5.5	6.1	5.6	6.1	6.7	6.9	6.0	6.3	6.6	7.4
12.0	3.6	4.7	4.7	5.1	5.2	5.7	5.2	5.7	6.2	6.2	5.4	5.8	5.9	6.1
13.0	3.6	4.6	4.6	4.9	5.1	5.3	5.0	5.5	5.8	5.9	5.0	5.5	5.5	5.9
14.0	3.6	4.6	4.5	4.8	5.1	5.1	5.2	5.3	5.6	5.7	4.9	5.2	5.3	5.6
15.0	3.7	4.5	4.5	4.7	5.0	5.1	4.7	5.1	5.6	5.5	4.8	5.2	5.2	5.5
16.0	3.7	4.5	4.4	4.6	4.8	5.0	4.7	5.0	5.5	5.4	4.7	5.1	5.1	5.4
17.0	3.8	4.4	4.3	4.6	4.7	4.9	4.7	5.0	5.4	5.3	4.7	5.0	5.1	5.3
18.0	3.8	4.5	4.3	4.6		5.1	4.7	5.0	5.7	5.2	4.6	5.0	5.0	
18.5														
NIF	NT	9.0	11.0	14.5	NF	17.0	15.0	18.0	NT	12.0	NF	10.0	NF	NF
OF	NT	10.5	14.0	22.5	22.0	22.5	20.0	22.0	NF	16.0	16.0	NT	6.5	4.5

Table A4.7c. L442 lake and stream temperatures ($^{\circ}\text{C}$) for 1989 (NT = temperature not taken, NF = no flow, OF = outflow, NIF = north inflow, NIF = north inflow).

Depth (m)	Apr 18	May 18	Jun 01	Jun 15	Jun 29	Jul 13	Jul 27	Aug 10	Aug 24	Sep 07	Sep 21	Oct 05	Oct 18	Oct 31
0.0	0.4	17.3	15.7	16.6	19.8	22.3	24.3	23.1	20.8	19.7	18.3	10.9	7.7	7.6
1.0	1.7	17.2	15.7	16.5	19.9	22.5	24.4	22.5	20.9	19.7	18.4	10.9	7.7	7.5
2.0	2.6	13.4	15.0	15.8	19.9	22.5	24.3	22.3	21.0	19.7	18.4	10.9	7.7	7.5
3.0	2.7	9.0	13.6	15.2	19.8	21.9	24.3	22.0	20.8	19.7	18.4	10.9	7.6	7.5
4.0	2.7	7.4	9.6	13.3	14.4	16.4	17.1	20.4	20.3	19.3	18.4	10.9	7.6	7.5
5.0	2.8	6.4	7.6	8.6	10.6	12.0	12.5	14.6	14.8	16.4	18.2	10.9	7.6	7.5
6.0	2.8	5.5	6.0	7.0	8.2	9.2	9.2	11.2	11.0	11.8	13.9	10.6	7.6	7.5
7.0	2.9	4.9	4.9	6.0	7.0	7.6	7.5	9.0	9.0	8.6	11.0	10.5	7.6	7.4
8.0	2.9	4.7	4.6	5.4	6.3	6.9	6.6	7.8	7.3	7.4	9.6	8.0	7.6	7.3
9.0	3.0	4.5	4.5	5.1	5.7	5.8	5.9	6.8	6.5	6.6	8.7	6.9	7.6	7.2
10.0	3.1	4.4	4.4	4.8	5.2	5.3	5.3	6.3	5.9	6.0	8.0	6.0	5.8	6.7
11.0	3.2	4.3	4.2	4.6	4.9	4.9	4.9	5.9	5.4	5.7	7.5	5.4	5.2	6.1
12.0	3.3	4.1	4.0	4.4	4.7	4.8	4.7	5.5	5.0	5.2	7.2	5.1	5.0	5.4
13.0	3.3	4.0	4.0	4.3	4.6	4.7	4.5	5.3	4.9	5.0	6.8	4.9	4.8	5.1
14.0	3.3	4.0	4.0	4.2	4.5	4.6	4.4	5.2	4.7	4.8	6.8	4.8	4.7	5.0
15.0	3.4	3.9	3.9	4.2	4.4	4.3	4.4	5.1	4.7	4.7	6.7	4.7	4.6	5.0
16.0	3.5	3.9	3.9	4.1	4.3	4.3	4.3	5.0	4.5	4.7	6.6	4.7	4.6	4.9
17.0	3.6	3.9	3.9	4.1	4.3	4.2	4.2	4.9	4.5	4.6	6.6	4.7	4.5	4.9
18.0		4.0	3.9	4.2	4.4	4.4	4.3	5.3	4.7	4.6	6.7	4.6	4.6	5.0
18.5	NIF	NF	14.5	NT	14.0	16.0	17.0	22.0	NF	17.0	NF	NF	NF	NF
OF	NT	18.0	16.0	16.0	18.0	23.5	23.0	23.0	NF	NF	NF	NF	NF	NF

Table A4.7d. L442 lake and stream temperatures ($^{\circ}\text{C}$) for 1990 (NT = temperature not taken, NF = no flow, OF = outflow, NIF = north inflow).

Depth (m)	Apr 09	May 09	May 23	Jun 06	Jun 20	Jul 04	Jul 18	Aug 01	Aug 15	Aug 29	Sep 12	Sep 26	Oct 10	Oct 24
0.0	2.3	7.8	13.4	14.7	18.8	22.3	22.2	22.0	19.9	20.7	18.5	14.2	10.2	6.7
1.0	4.8	7.8	13.1	14.7	18.9	22.4	22.3	22.1	20.1	20.8	18.5	14.1	10.2	6.8
2.0	4.6	7.8	13.0	14.7	18.8	22.4	22.3	22.1	20.1	20.8	18.5	14.1	10.2	6.8
3.0	4.5	7.8	11.5	14.6	18.5	21.1	22.3	22.1	20.1	20.8	18.6	14.0	10.1	6.8
4.0	4.4	7.7	8.3	14.3	16.2	17.6	20.2	21.6	20.1	20.3	18.6	14.0	10.1	6.8
5.0	4.4	6.0	8.0	9.9	12.4	13.7	15.1	16.1	17.9	18.6	18.6	13.9	10.1	6.8
6.0	4.3	5.4	7.0	7.8	9.7	10.1	11.5	12.5	12.6	14.3	14.5	13.8	10.1	6.8
7.0	4.2	5.1	6.2	6.8	8.0	7.8	8.9	9.7	10.1	10.8	11.3	12.5	10.1	6.8
8.0	4.1	4.9	5.6	6.1	7.0	6.7	7.8	7.8	8.3	8.9	8.7	9.2	10.1	6.8
9.0	4.1	4.8	5.3	5.7	6.3	5.9	6.8	6.8	7.3	7.7	7.4	7.7	7.9	6.8
10.0	4.1	4.6	5.0	5.2	5.9	5.5	6.2	6.1	6.5	7.0	6.7	6.7	6.9	6.8
11.0	4.1	4.5	4.8	5.1	5.5	5.2	5.8	5.6	6.1	6.4	6.1	5.8	6.2	6.7
12.0	4.1	4.5	4.6	4.9	5.2	5.0	5.5	5.3	5.7	6.0	5.5	5.4	5.5	6.5
13.0	4.1	4.4	4.5	4.8	5.0	4.8	5.2	5.1	5.4	5.6	5.2	5.2	5.3	5.4
14.0	4.2	4.4	4.5	4.8	5.0	4.7	5.1	4.9	5.2	5.4	5.1	5.1	5.2	5.1
15.0	4.1	4.3	4.4	4.7	4.9	4.6	4.9	4.8	5.0	5.1	5.0	5.0	5.1	5.0
16.0	4.2	4.3	4.4	4.6	4.8	4.6	4.9	4.7	4.9	5.1	5.0	5.0	5.0	5.0
17.0	4.2	4.2	4.3	4.6	4.7	4.5	4.8	4.7	4.9	5.0	4.9	4.9	5.0	4.9
18.0		4.2	4.2	4.7	4.8	4.5	4.8	4.7	4.9	5.0	4.8	4.9	4.9	4.9
18.5	NIF	NT	2.0	11.0	11.0	14.0	17.5	16.0	17.0	NF	NF	NF	NF	NF
OF	3.0	7.0	12.5	14.0	17.5	NT	21.0	21.5	18.0	18.5	16.5	12.0	4.0	0.0

Table A4.8a. L938 lake and stream temperatures ($^{\circ}\text{C}$) for 1987 (NT = temperature not taken, NF = no flow, OF = outflow).

Depth (m)	Apr 04		May 13		May 27		Jun 10		Jun 24		Jul 07		Jul 22	
	W	E	W	E	W	E	W	E	W	E	W	E	W	E
0.0	NT	NT	13.9	14.2	13.9	NT	18.4	18.9	23.6	NT	23.2	NT	20.8	20.7
1.0	NT	NT	13.7	14.1	13.4	NT	18.3	18.6	24.0	NT	23.2	NT	20.8	20.7
2.0	NT	NT	13.7	14.0	13.2	NT	18.2	18.5	24.0	NT	23.0	NT	20.8	20.7
3.0	NT	NT	13.4	14.0	12.6	NT	17.6	17.9	22.9	NT	22.1	NT	20.7	20.5
3.5	NT	NT	12.4	14.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4.0	NT	NT	11.8	12.5	12.3	NT	16.8	20.2	NT	21.0	NT	20.2	NT	NT
5.0	NT	NT	11.4	NT	11.6	NT	NT	17.8	NT	20.0	NT	19.9	NT	NT
5.5	NT	NT	NT	NT	11.3	NT	NT	16.8	NT	NT	NT	19.2	NT	NT
6.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
NWIF	4.7	NT	9.5	NT	12.0	NT	NT	22.0	NT	20.0	NT	NT	NT	NT
EIF	1.2	NT	NT	15.0	NT	NT	NT	20.0	NT	22.0	NT	NT	NT	NT
SIF	1.9	NT	NT	12.0	NT	NT	NT	17.0	NT	20.7	NT	NT	NT	NT
OF	2.1	NT	12.5	NT	14.0	NT	NT	23.5	NT	20.8	NT	NT	NT	NT

Depth (m)	Aug 05		Aug 19		Sep 02		Sep 16		Sep 30		Oct 14		Oct 29	
	W	E	W	E	W	E	W	E	W	E	W	E	W	E
0.0	22.4	NT	20.5	20.2	16.9	NT	17.4	17.5	14.2	14.1	6.9	6.9	3.5	3.3
1.0	22.7	NT	20.6	20.1	17.0	NT	17.4	17.4	14.0	14.0	6.9	6.9	3.3	3.3
2.0	22.7	NT	20.5	20.1	17.1	NT	17.3	17.4	13.9	13.9	6.9	6.8	3.3	3.3
3.0	22.7	NT	20.5	20.7	17.1	NT	16.6	17.2	13.8	13.1	6.8	6.8	3.3	4.9
3.5	22.6	NT	NT	NT	NT	NT	NT	NT	NT	NT	6.8	6.8	3.3	3.3
4.0	NT	20.4	NT	17.1	NT	16.5	NT	13.8	NT	6.8	6.8	4.1	NT	NT
5.0	NT	20.1	NT	17.1	NT	16.4	NT	14.5	NT	6.8	6.8	4.0	NF	NF
5.5	NT	NT	NT	17.2	NT	16.4	NT	NT	NT	NT	NT	NT	NT	NT
6.0	NT	NT	NT	NT	NT	NT								
NWIF	21.0	NT	NT	12.0	NT	15.0	NT	NT	NT	NT	NT	3.5	3.5	3.5
EIF	NF	NT	NT	NF	NT	NF	NF	NF	NF	6.0	6.0	4.0	4.0	NF
SIF	NF	NT	NT	NF	NT	NF	NF	NF	NF	NF	NF	NF	NF	NF
OF	21.0	NT	NT	16.0	NT	18.0	NT	13.0	NT	6.5	6.5	3.5	3.5	3.5

Table A4.8b. L938 lake and stream temperatures ($^{\circ}\text{C}$) for 1988 (NT = temperature not taken, NF = no flow, OF = outflow, NWIF = northwest inflow, SIF = south inflow, EIF = east inflow).

Depth (m)	May 04		May 18		Jun 01		Jun 15		Jun 29		Jul 27			
	W	E	W	E	W	E	W	E	W	E	W	E		
0.0	12.1	12.4	14.0	14.2	23.2	23.3	22.2	NT	21.0	20.9	22.0	22.0	24.4	24.6
1.0	12.1	12.4	13.8	14.1	22.7	23.1	22.2	NT	21.1	21.0	22.1	22.0	24.2	24.5
2.0	11.9	12.4	13.3	14.8	20.8	20.6	22.2	NT	21.1	21.0	22.1	22.0	24.0	24.4
3.0	9.4	9.5	12.8	14.5	18.5	19.5	21.9	NT	21.1	21.0	22.0	21.9	23.9	23.8
3.25	8.3	7.8	12.0	16.5	20.7	NT	21.1	21.1	20.9	21.0	21.5	21.9	23.5	23.5
4.0	7.0	11.0	14.9	18.0	NT	20.8	NT	20.8	NT	NT	21.5	21.9	21.6	21.6
5.0	6.6	10.0	14.1	16.7	NT	19.2	NT	19.2	NT	NT	21.0	21.0	21.0	21.0
6.0	NT	NT	NT	NT										
NWIF	8.5	NT	18.0	21.0	NT	20.0	20.0	20.0	NT	21.0	21.0	20.0	20.0	20.0
EIF	3.0	9.0	17.0	14.0	NT	14.0	14.0	14.0	NT	17.0	17.0	21.5	21.5	21.5
SIF	12.0	13.0	22.0	17.0	17.0	NT	16.0	16.0	16.0	NT	19.0	19.0	17.5	17.5
OF	11.5	15.0	23.0	21.0	NT	20.0	20.0	20.0	NT	22.0	22.0	24.0	24.0	24.0

Depth (m)	Aug 10		Aug 24		Sep 07		Sep 21		Oct 05		Oct 19		
	W	E	W	E	W	E	W	E	W	E	W	E	
0.0	23.8	23.6	20.8	20.5	18.6	13.5	12.6	8.9	8.9	7.4	7.1	7.1	7.1
1.0	23.8	23.6	20.8	20.5	18.3	13.6	13.3	9.1	8.9	7.5	7.2	7.2	7.2
2.0	23.7	23.6	20.8	20.4	18.0	13.6	13.4	9.0	8.9	7.4	7.2	7.2	7.2
3.0	23.6	23.5	20.7	20.4	17.6	13.6	14.4	8.9	8.9	7.3	7.2	7.2	7.2
3.5	20.6	NT	NT	NT	NT	13.5	NT	NT	NT	7.3	7.3	7.3	7.3
4.0	23.5	20.7	17.6	13.8	NT	8.9	8.9	8.9	8.9	7.3	7.3	7.3	7.3
5.0	23.2	20.7	17.6	14.4	NT	8.9	8.9	8.9	8.9	7.3	7.3	7.3	7.3
5.5	22.8	20.6	17.9	NT	NT	NT	NT	NT	NT	7.3	7.3	7.3	7.3
6.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	7.3	7.3	7.3	7.3
NWIF	22.0	19.0	NT	12.0	NT	NT	NT	NT	6.0	6.0	6.0	6.0	6.0
SIF	19.0	18.0	NF	9.0	4.0	4.0	4.0	4.0	NF	NF	NF	NF	NF
EIF	18.0	15.0	NF	NT	NT	NT	NT	NT	NF	NF	NF	NF	NF
OF	23.5	20.0	NT	13.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0

Table A4.8c. L938 lake and stream temperatures (°C) for 1989 (NT = temperature not taken, NF = no flow, OF = outflow, NWIF = northwest inflow, SIF = south inflow, EIF = east inflow).

Depth (m)	Apr 18		May 17		May 31		Jun 14		Jun 28		Jul 12		Jul 26	
	W	E	W	E	W	E	W	E	W	E	W	E	W	E
0.0	0.1	0.1	14.5	14.5	14.2	14.3	15.0	14.3	19.2	19.5	22.3	22.2	25.9	26.1
1.0	2.2	1.9	12.9	13.6	14.1	14.2	14.6	14.4	19.3		22.4	22.3	25.9	26.1
2.0	2.7	3.0	12.6	12.8	13.9	13.9	14.4	14.2	19.3		22.4	22.4	25.9	26.1
3.0	3.6	4.2	12.3	12.3	13.7	13.8	14.3	14.2	19.4		22.4	22.4	25.5	25.9
3.5		4.4		10.8		12.5			13.3			20.6		24.4
4.0	4.0		11.9		13.2		14.2		19.3		22.4		25.4	
5.0			9.9		12.8		14.2		18.3		22.2		23.6	
5.5	4.1													
6.0			8.1		12.4		14.2		16.0		18.3		20.3	
6.5	4.7		7.5		11.3		13.8		15.2		16.7		19.3	
NWIF	NT		8.5		14.0		14.0		17.0		20.5		22.0	
SIF	NF		18.0		14.5		12.0		15.5		20.0		22.0	
EIF	NF		NT		11.5		12.0		14.0		17.0		23.0	
OF	NT		15.0		NT		14.0		19.0		22.0		25.0	

Depth (m)	Aug 09		Aug 23		Sep 06		Sep 20		Oct 04		Oct 18			
	W	E	W	E	W	E	W	E	W	E	W	E	W	E
0.0	21.8	22.9	21.6	21.6	19.6	19.4	17.3	17.2	10.1	9.6	6.9	6.5		
1.0	21.8	22.6	21.3	21.5	19.5	19.5	17.2	17.1	10.1	9.5	6.8	6.6		
2.0	21.8	22.3	21.2	21.4	19.5	19.5	17.3	17.1	10.1	9.5	6.8	6.5		
3.0	21.8	22.2	21.0	20.6	19.3	19.4	17.2	17.2	10.0	11.3	6.8	8.0		
3.5		22.1		20.5										
4.0	21.5		20.8		19.1		17.0		10.1		6.8			
5.0	21.5		20.5		19.0		16.8		10.0		6.8			
6.0	21.2		20.0		19.0		16.6		10.9		8.0			
6.5		19.4												
NWIF	21.0		21.5		19.0		15.5		11.0		NF			
SIF	18.0		19.0		17.0		13.0		5.0		4.0			
EIF	23.0		14.5		14.0		12.0		4.0		2.5			
OF	21.0		21.5		19.0		15.5		8.5		6.0			

Table A4.8d. L938 lake and stream temperatures (°C) for 1990 (NT = temperature not taken, NF = no flow, OF = outflow, NWIF = northwest inflow, SIF = south inflow, EIF = east inflow).

Depth (m)	Apr 10		May 08		May 22		Jun 05		Jun 19		Jul 03		Jul 17	
	W	E	W	E	W	E	W	E	W	E	W	E	W	E
0.0	1.2	NT	10.4	10.0	13.7	13.7	16.0	16.1	19.6	19.7	22.8	22.6	22.8	22.6
1.0	3.3	NT	10.3	10.0	13.5	13.5	16.1	16.1	19.6	19.7	22.9	22.7	22.8	22.7
2.0	3.8	NT	10.2	10.0	13.1	13.4	15.8	15.9	19.2	19.2	22.8	22.3	22.8	22.7
3.0	4.0	NT	10.1	9.6	12.5	13.2	15.3	15.7	18.6	18.7	22.3	21.9	22.6	22.6
3.5		NT	10.1					14.8		18.2		21.2		21.8
4.0	4.2	NT	9.8		12.1		14.8		18.1		21.5		22.4	
5.0	4.4	NT			10.9		14.3		17.0		19.2		21.7	
5.5	4.5	NT	8.0		10.6		13.3		15.8				19.0	
6.0		NT									16.9			
6.5		NT												
NWIF	3.5	NT	8.0		9.0		11.5		17.0		22.0		NT	
SIF	2.5	NT	10.0		13.0		13.5		19.0		23.0		NT	
EIF	NF	NT	2.0		7.0		8.5		14.0		18.0		17.0	
OF	4.0	NT	9.0		12.0		14.5		18.0		23.0		NT	

Depth (m)	Jul 31		Aug 14		Aug 28		Sep 11		Sep 25		Oct 09		Oct 23	
	W	E	W	E	W	E	W	E	W	E	W	E	W	E
0.0	21.3	22.0	20.5	20.3	21.1	21.4	19.0	18.9	13.8	13.3	8.5	8.6	4.7	4.8
1.0	21.5	22.1	20.5	20.4	21.4	21.6	19.0	18.9	13.4	13.2	8.6	8.5	4.7	4.8
2.0	21.5	22.1	20.5	20.3	21.5	21.7	19.0	18.9	13.2	13.1	8.6	8.4	4.7	4.8
3.0	21.6	22.1	20.5	20.3	21.5	21.7	19.0	19.1	13.1	14.3	8.6	8.3	4.7	4.8
3.5		21.7		20.4		21.7								
4.0	21.5		20.5		21.2		19.0		13.1		8.5		4.7	
5.0	21.4		20.4		20.7		18.8		13.1		8.6		4.8	
5.5			20.2		19.9		18.9		13.4		8.6		5.4	
6.0		20.4												
6.5														
NWIF	20.0		20.0		22.0		18.0		14.0		9.0		6.0	
SIF	16.0		16.5		NF		NF		NF		NF		NF	
EIF	20.0		25.5		16.0		NF		NF		NF		NF	
OF	20.0		20.0		22.0		18.5		13.5		8.0		6.0	

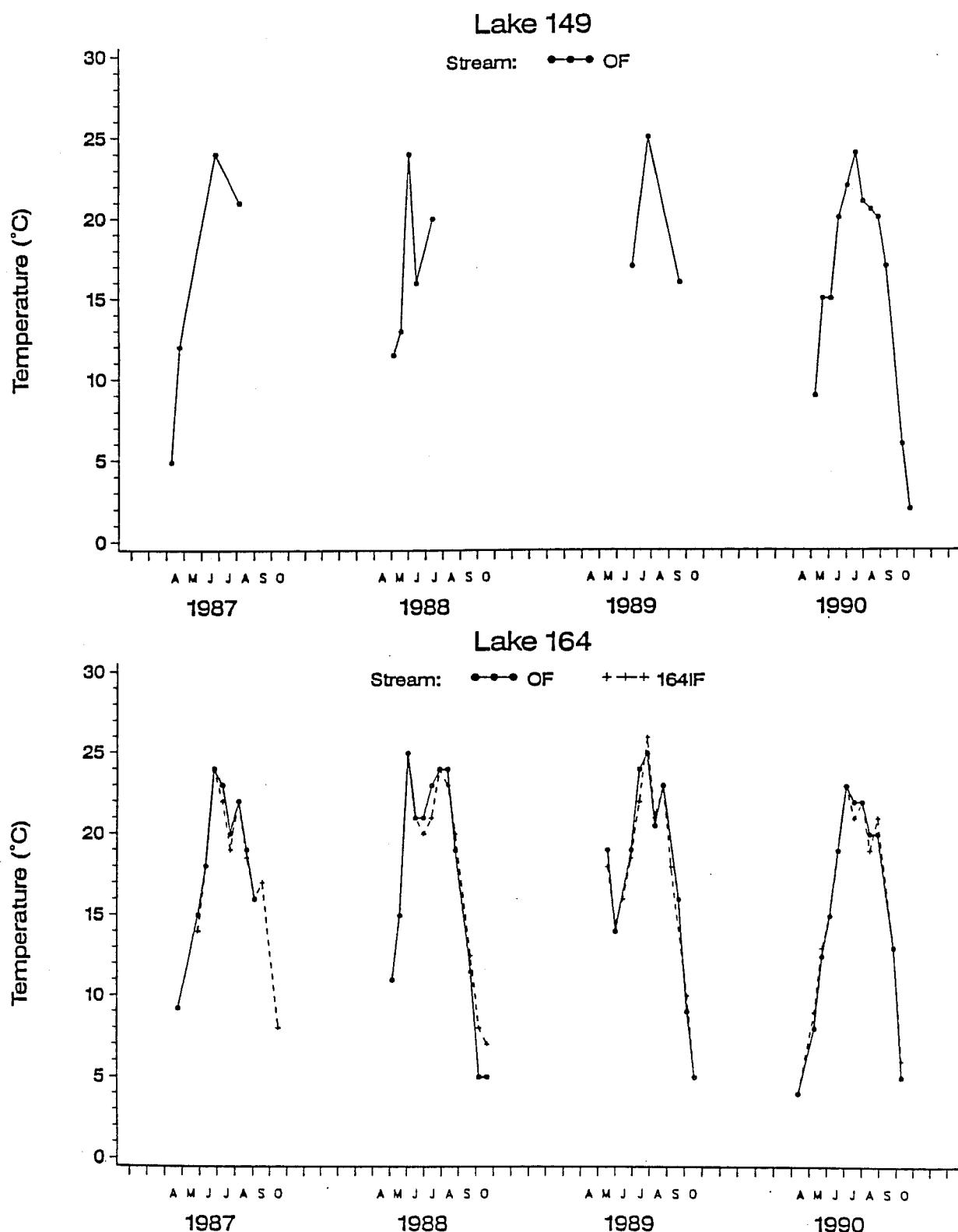


Fig. A4.1a. Inflow and outflow temperatures, L149 and L164, 1987-1990.

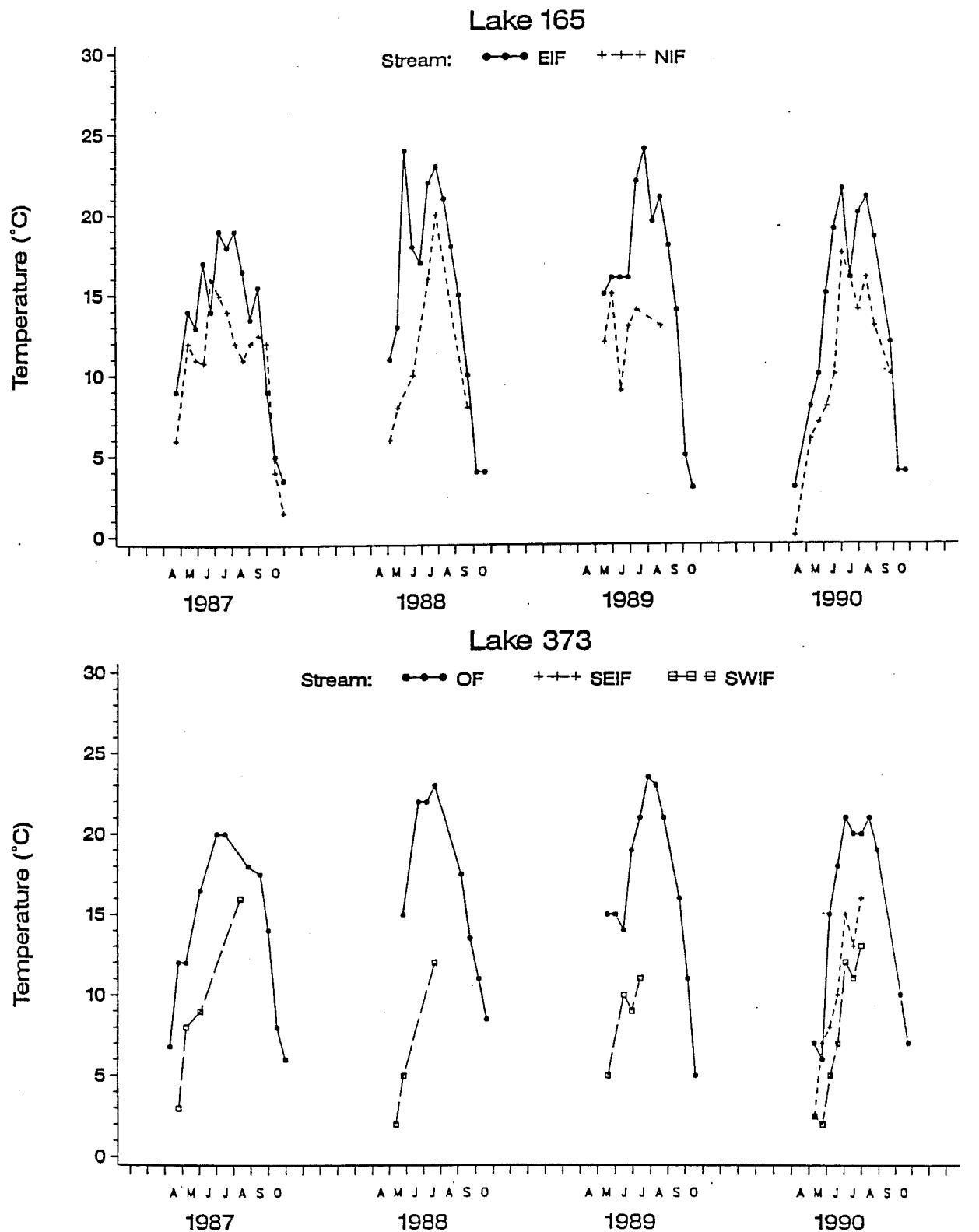


Fig. A4.1b. Inflow and outflow temperatures, L165 and L373, 1987-1990.

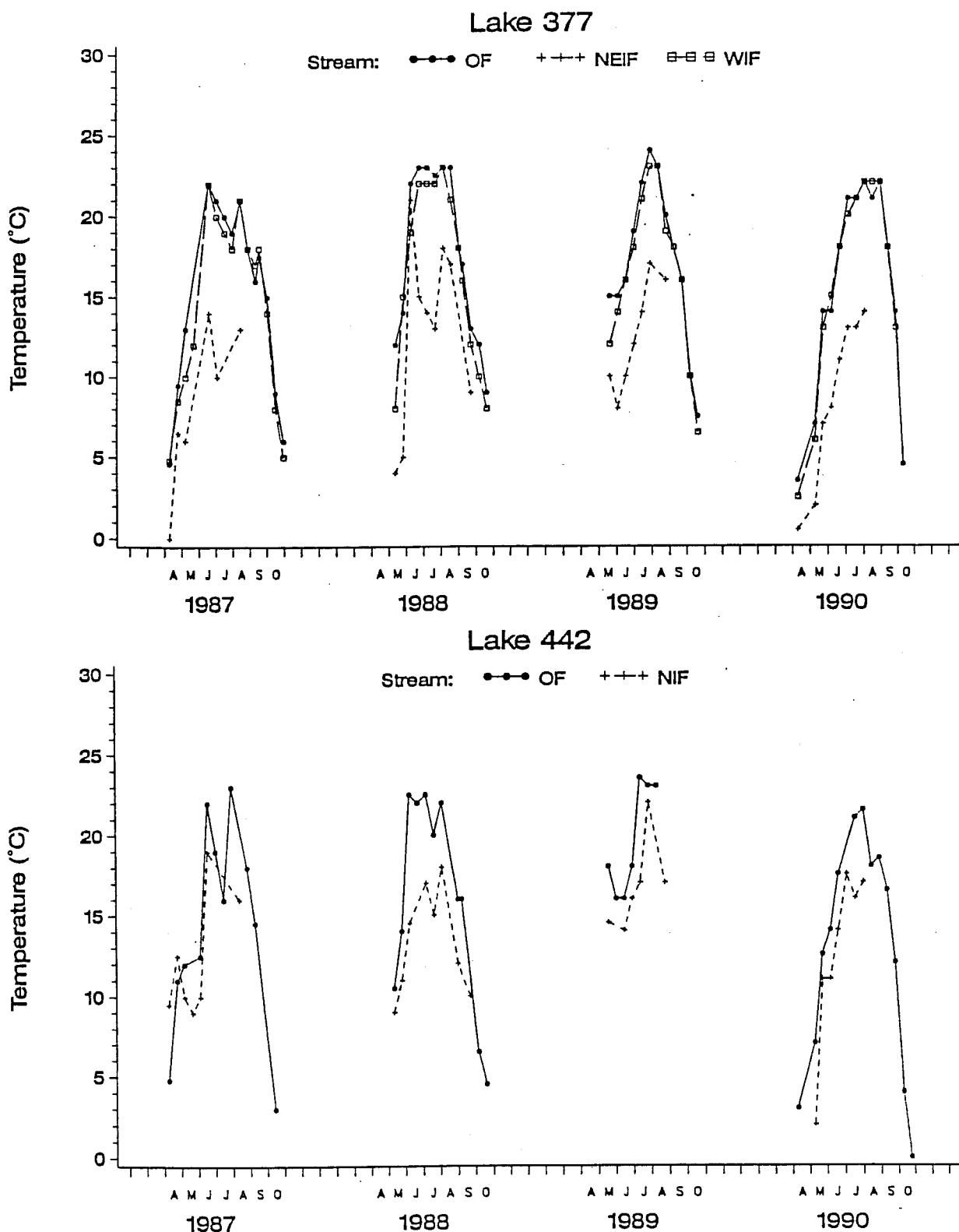


Fig. A4.1c. Inflow and outflow temperatures, L377 and L442, 1987-1990.

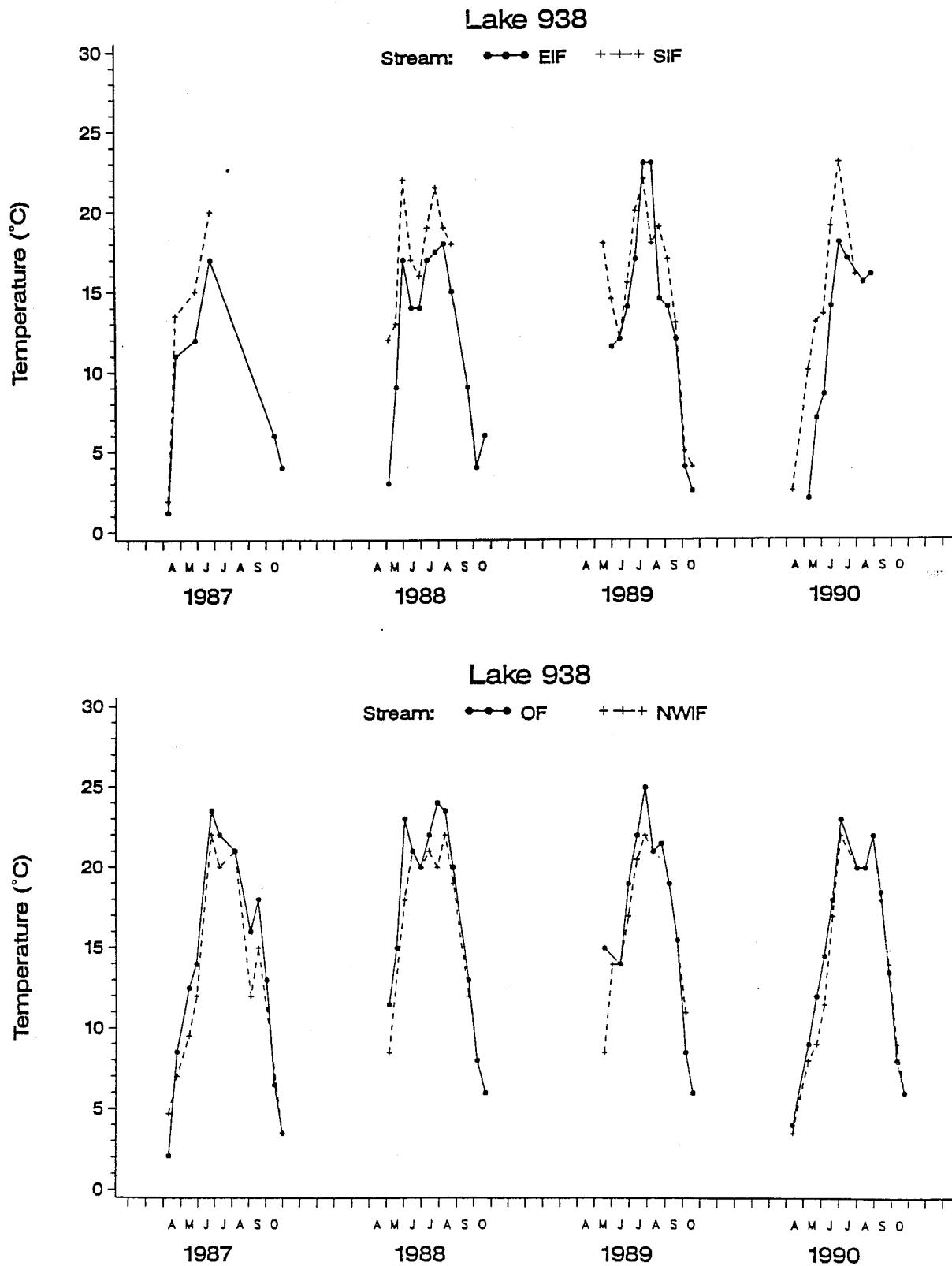


Fig. A4.1d. Inflow and outflow temperatures, L938, 1987-1990.

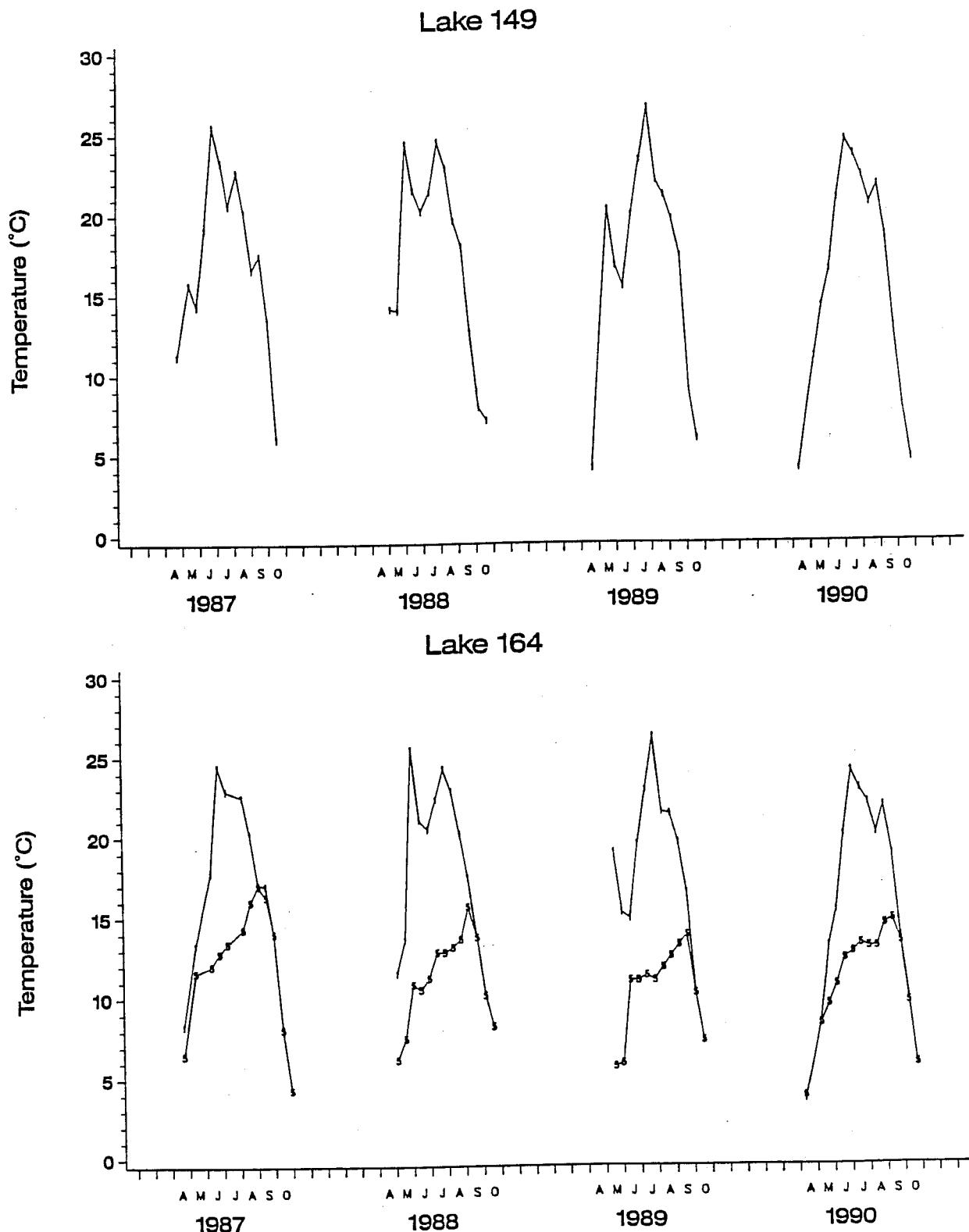


Fig. A4.2a. Water column temperatures, L149 and L164, 1987-1990.
(1 = 1 m, 5 = 5 m)

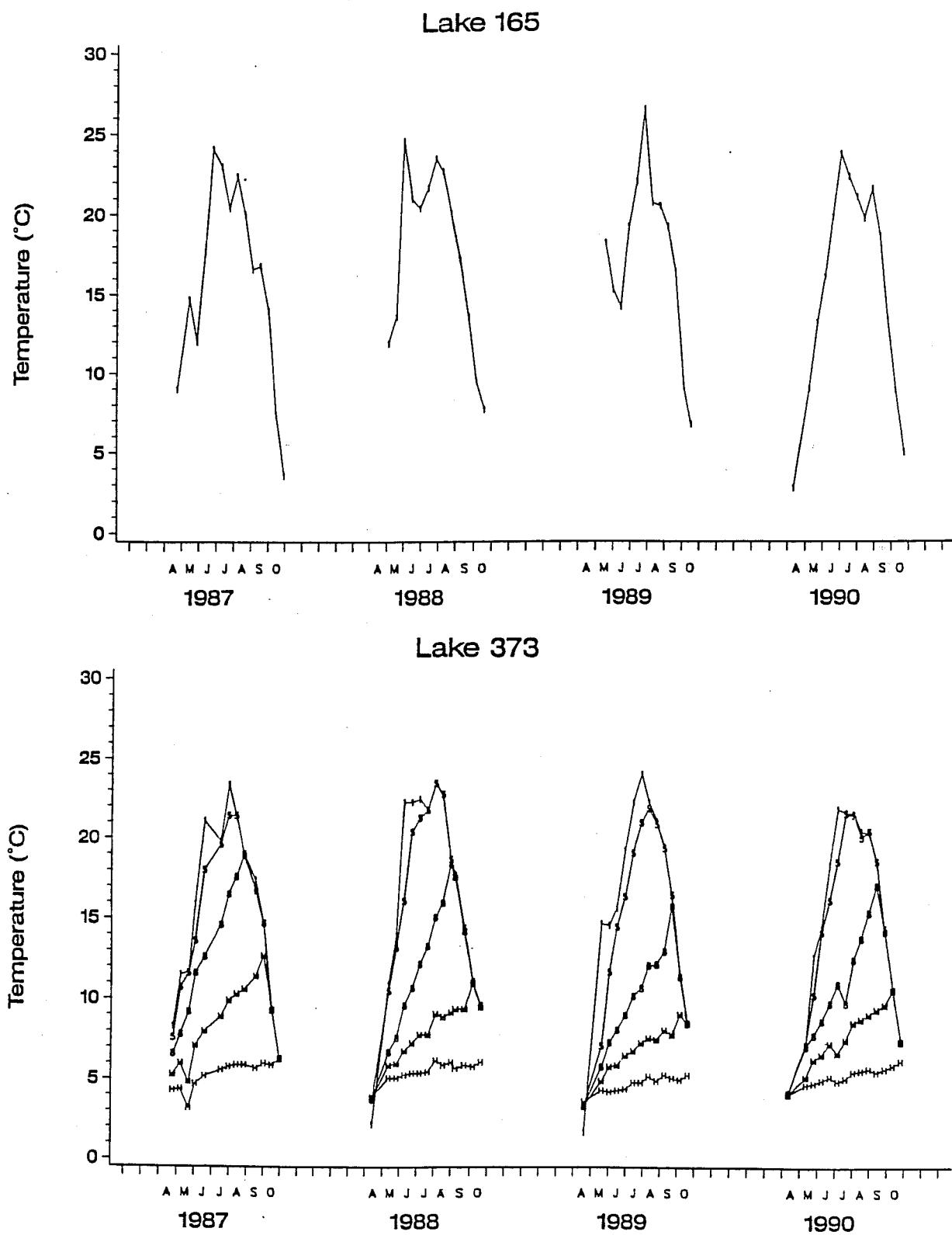


Fig. A4.2b. Water column temperatures, L165 and L373, 1987-1990.
(1 = 1 m, 5 = 5 m, 8 = 8 m, M = 11 m, H = 17 m)

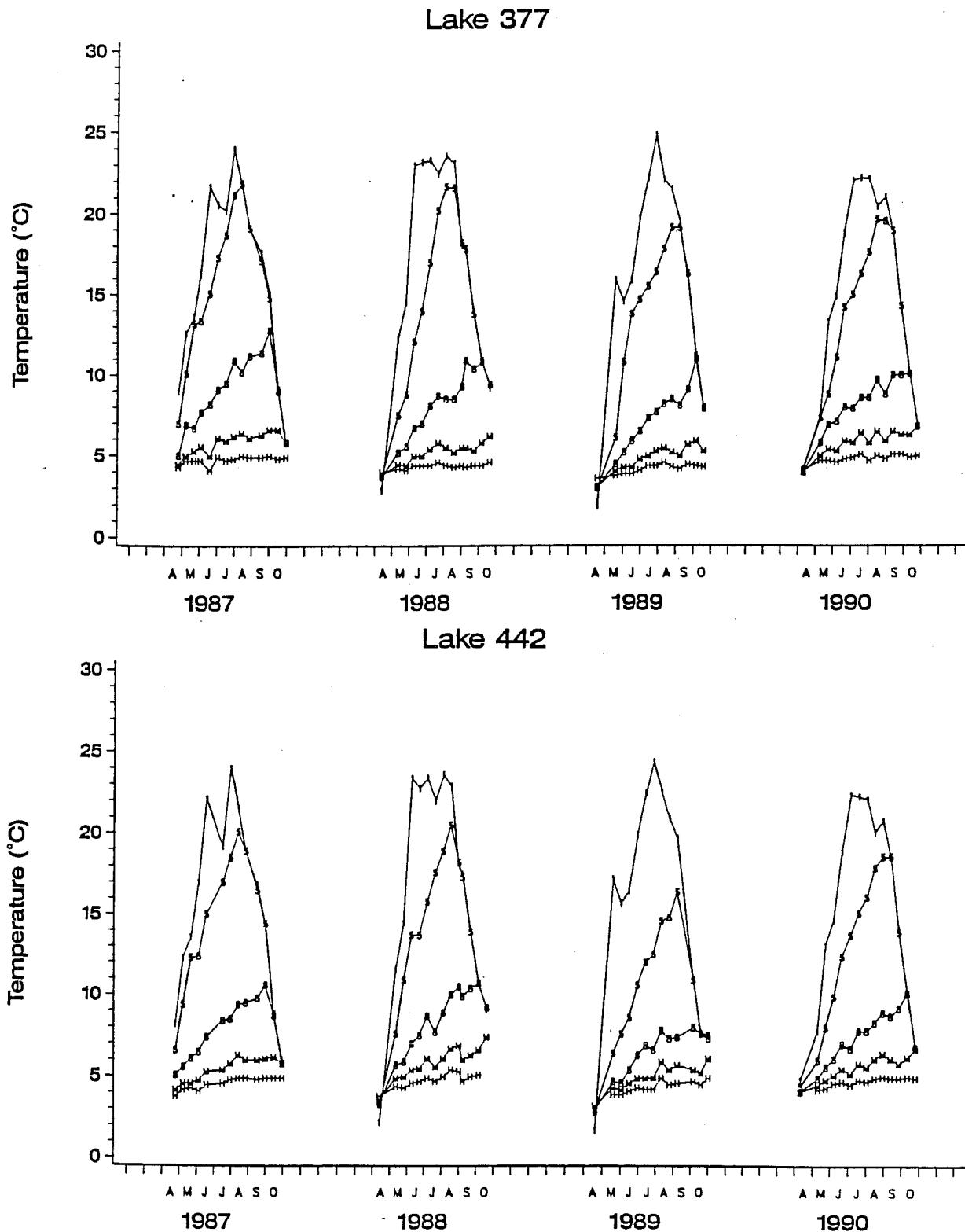


Fig. A4.2c. Water column temperatures, L377 and L442, 1987-1990.
 (1 = 1 m, 5 = 5 m, 8 = 8 m, M = 11 m, H = 17 m)

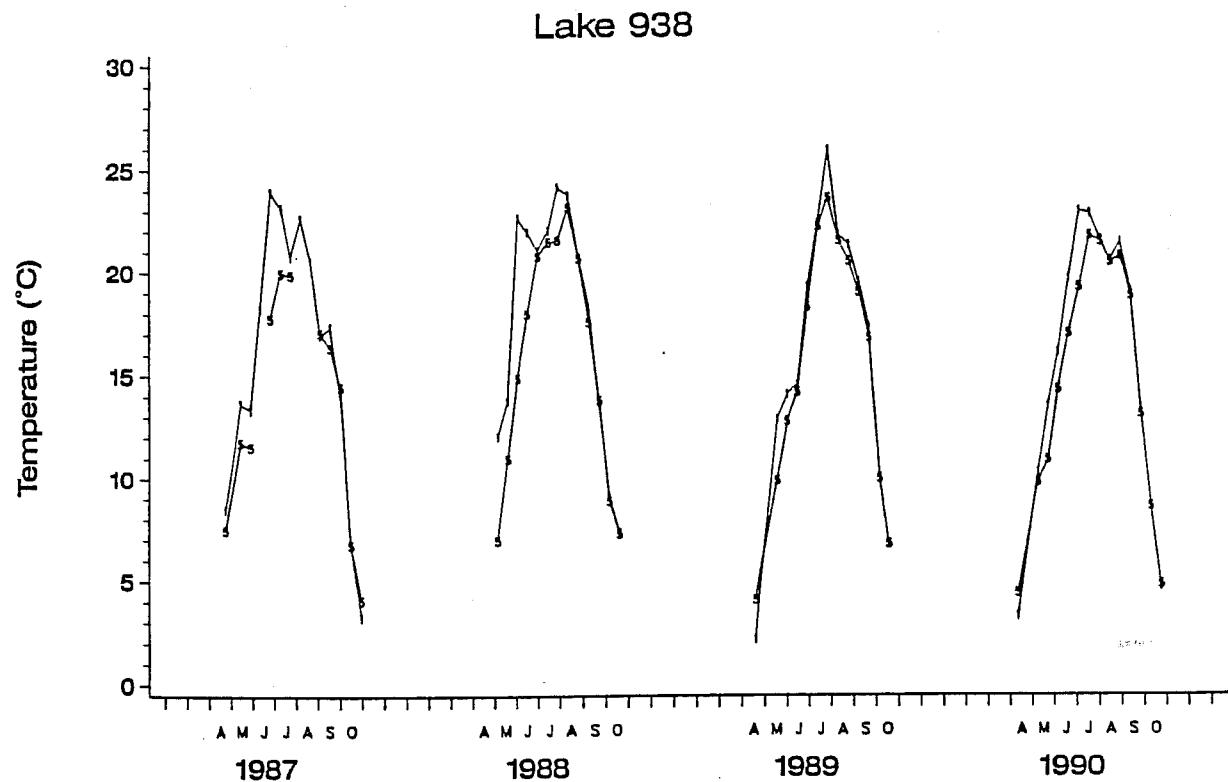


Fig. A4.2d. Water column temperatures, L938, 1987-1990.
(1 = 1 m, 5 = 5 m)

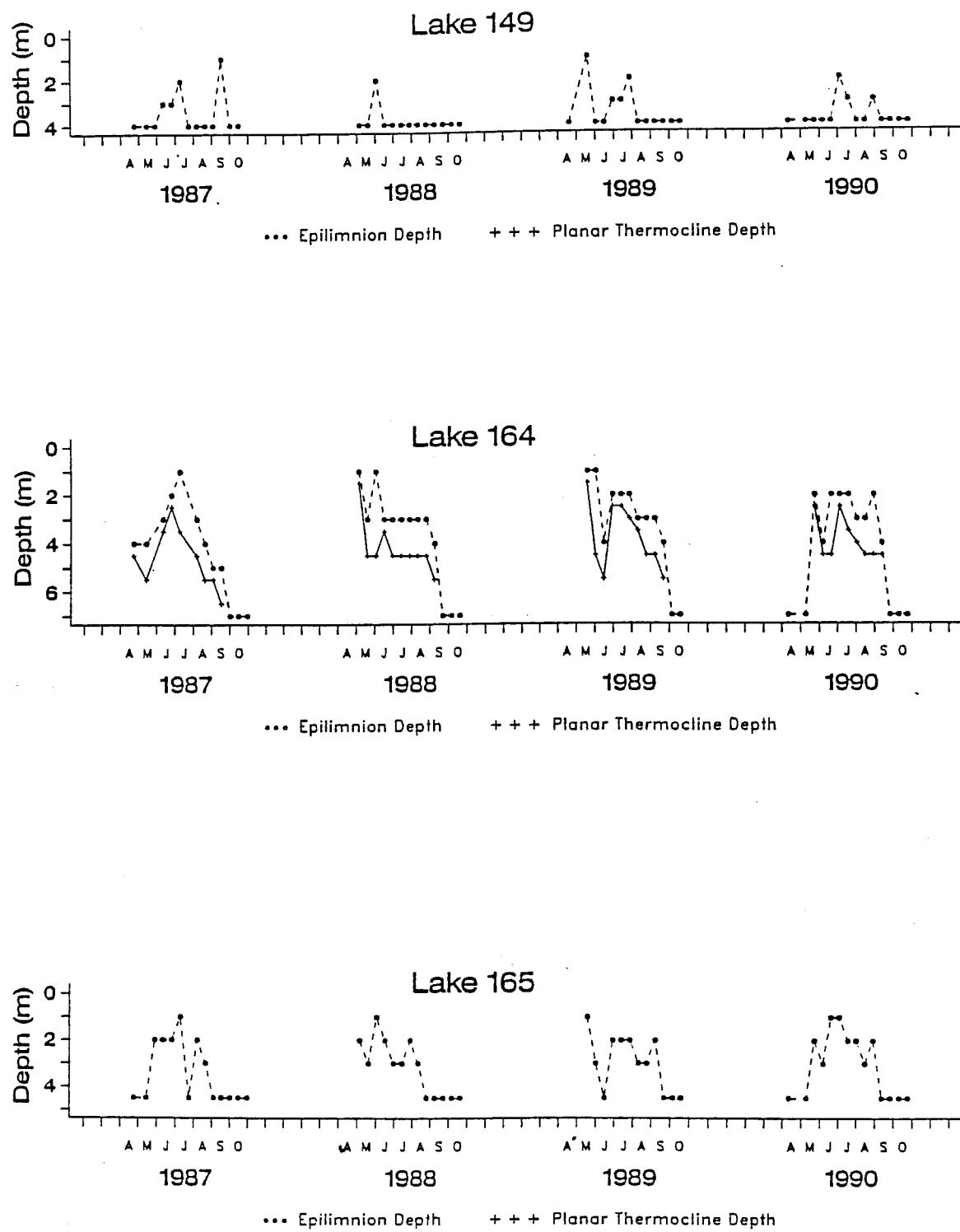


Fig. A4.3a. Epilimnion and planar thermocline depth for L149, L164, and L165, 1987-1990.

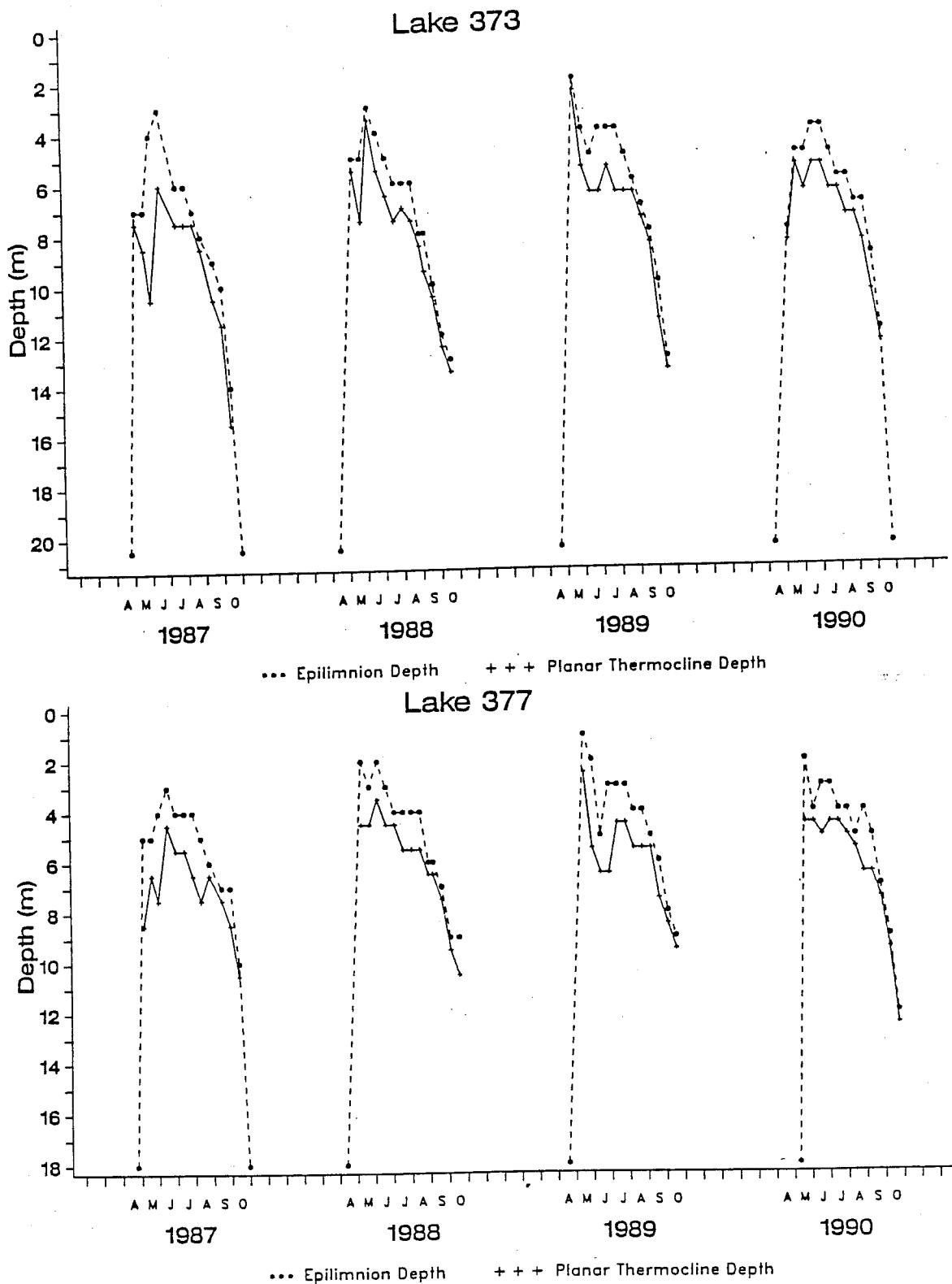


Fig. A4.3b. Epilimnion and planar thermocline depth for L373 and L377, 1987-1990.

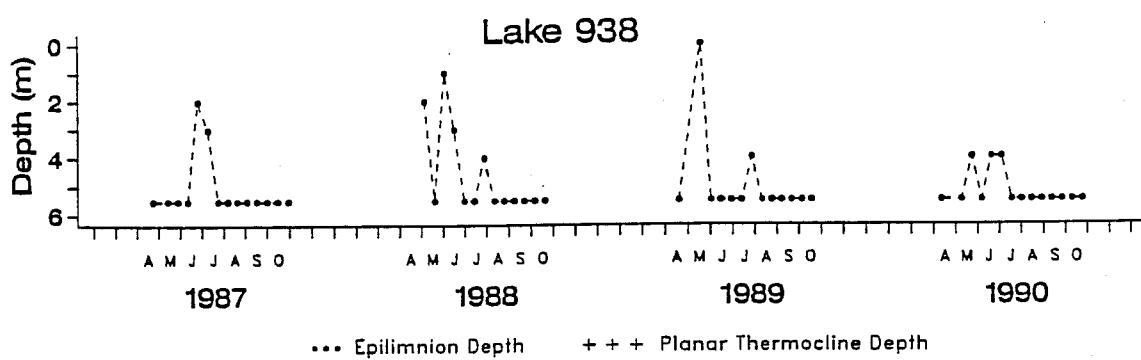
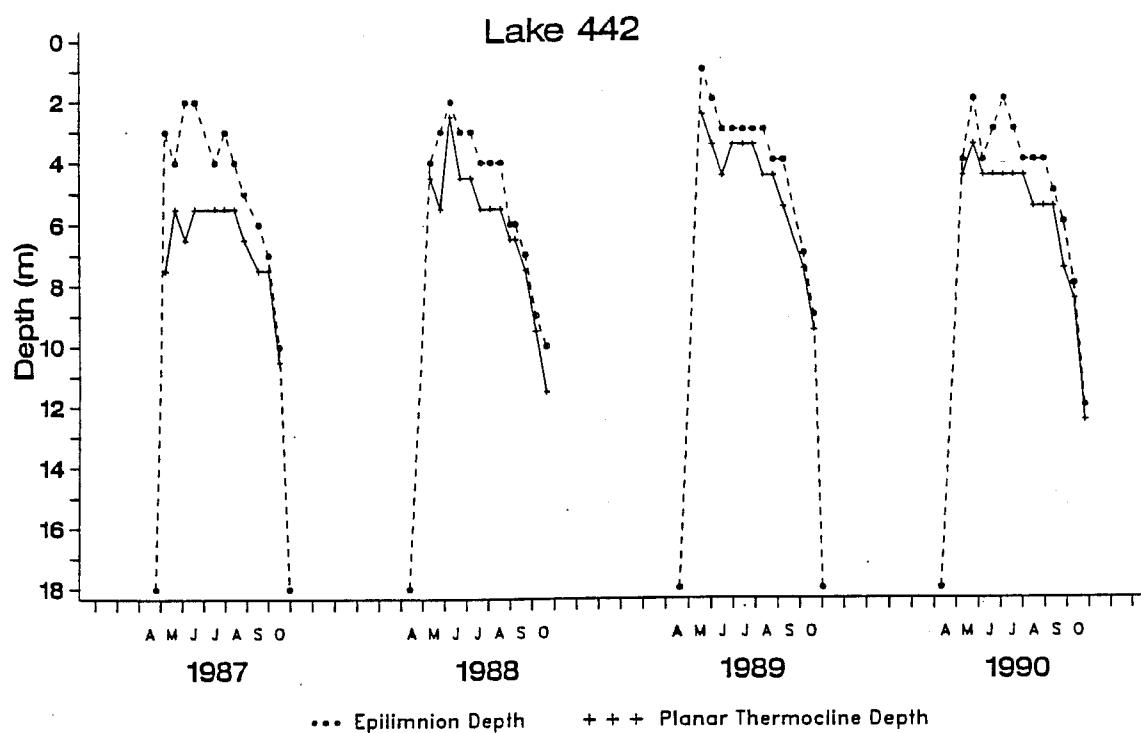


Fig. A4.3c. Epilimnion and planar thermocline depth for L442 and L938, 1987-1990.