Technical Report

WATER RESOURCES SERVICE

POLLUTION CONTROL BRANCH

LAKELSE LAKE WATER

QUALITY STUDY

Department of the Environment,
PROVINCE OF BRITISH COLUMBIA

1976

ABSTRACT

A comprehensive water quality limnology study in Lakelse Lake was completed by the Pollution Control Branch in 1973 - 74. Standard limnological parameters were investigated and reported upon. Overall nutrient concentrations were found to be very low, below levels normally considered potentially dangerous and within the range of values customarily associated with an oligotrophic lake. Shallow mean depth, the absence of a clearly defined thermocline and a high flushing rate - six times yearly - were confirmed as significant physical features. Chlorophyll "a" values ranged between 2 - 4 mg/l, with no evidence of algae blooms during the study period. Plankton populations were found to be low, with greatest representation among the Bacillariophyceae. It is suspected that overall productivity is very low.

TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

LIST OF FIGURES

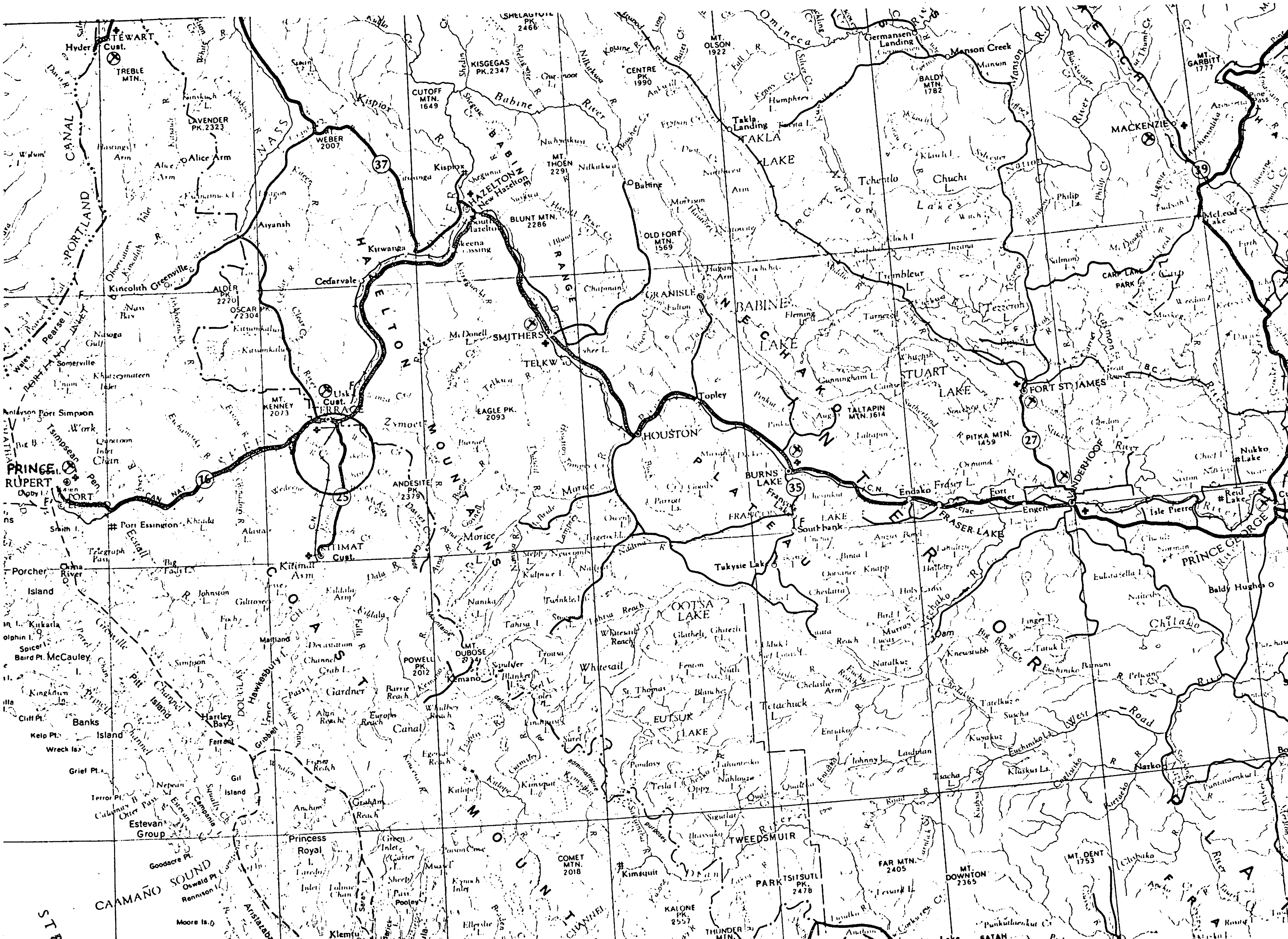
LIST OF TABLES

LAKELSE LAKE

1. INTRODUCTION

Lakelse Lake (Figure 1) is some 70 miles east of the coastal city of Prince Rupert, mid way between the towns of Kitimat and Terrace. Situated on the eastern margins of the Coast Mountain Range, the lake drains into the Skeena River via the Lakelse River. The location and physical characteristics of the lake have resulted in an intensive recreational utilization of the watershed. Populations of steelhead (Salmo gairdnerii), coastal cutthroat (Salmo clarki clarki) and dolly varden (Salvelinus malma) sustain a significant sport fishery. The lake is also important from a commercial fishery standpoint. Between 1962 - 1971 55.9% of the Skeena River escapement of Pink salmon (Oncorhynchus gorbuscha), 2.0% of the sockeye (Oncorhynchus nerka), 8.8% of the chinook (Oncorhynchus tshawytscha) and 36.1% of the coho (Oncorhynchus kisutch) was attributable to the Lakelse Lake watershed.

It is not surprising therefore that this watershed has generated considerable investigation from economic and environmental interests. In 1946, D.F. Alderice completed a B Sc. thesis on the limnetic plankton; T.R. Brett (1950) documented the physical limnology of the lake; V.H. McMahon (1954) studied the abundance and distribution of entomostracan plankton; the Federal Fisheries Service conducted a nutrient sampling programs from 1972 - 1973. Skeena Public Health Unit carried out bacteriological shoreline testing in 1973. In 1973 - 74, the Pollution Control Branch completed a comprehensive physical and chemical water quality study.


STEWART Cust.
Hyder
TREBLE MTN.
LAVENDER PK. 2323
Alice Arm
PORTLAND CANAL
Kincolith
Greenville
ALDER PK. 2220
OSCAR PK 2304
Nass Bay
Somerville
Port Simpson
PRINCE RUPERT
PORT EDWARD
Port Essington
MT. KENNEY 2073
TERRACE
Usk
Cedarvale
Kitwanga
Aiyansh
MT. WEBER 2007
Kispiox
HAZELTON
New Hazelton
South Hazelton
Skeena Crossing
CUTOFF MTN. 1649
KISGEGAS PK. 2347
SHELAGYOTE PK. 2466
MT. THOEN 2291
BLUNT MTN. 2286
Babine
OLD FORT MTN. 1569
CENTRE PK. 1990
MT. OLSON 1922
Takla Landing
TAKLA LAKE
Germansen Landing
Manson Creek
BALDY MTN. 1782
MACKENZIE
MT. GARBITT 1777
McLeod Lake
Tchentlo L.
Chuchi L.
Trembleur L.
GRANISLE
BABINE LAKE
SMITHERS
TELKWA
HOUSTON
Topley
BURNS LAKE
TALTAPIN MTN. 1614
STUART LAKE
FORT ST. JAMES
PITKA MTN. 1459
VANDERHOOF
Endako
Fraser L.
FRASER LAKE
Engen
Fort Fraser
PRINCE GEORGE
Isle Pierre
Reid Lake
Baldy Hughes
EAGLE PK. 2093
ANDESITE PK. 2379
HAZELTON MOUNTAINS
KITIMAT Cust.
Kitimat Arm
Morice L.
Tahtsa L.
OOTSA LAKE
Francois Lake
Tchesinkut L.
Southbank
Tukysie Lake
MT. DUBOSE 2730
POWELL PK. 2012
Kemano
Whitesail L.
EUTSUK LAKE
Tetachuck L.
NECHAKO PLATEAU
Chilako
Kluskus Ls.
Nazko
West Road
COAST MOUNTAINS
Porcher Island
Oona River
Banks Island
Pitt Island
Hartley Bay
DOUGLAS CHANNEL
Gardner Canal
Princess Royal I.
Gil Island
Estevan Group
CAAMAÑO SOUND
Goodacre Pt.
Moore Is.
COMET MTN. 2018
Kimsquit
TWEEDSMUIR PARK
TSITSUTL PK. 2478
KALONE PK. 2557
THUNDER MTN.
FAR MTN. 2405
MT. DOWNTON 2365
MT. DENT 1753
SATAH
Klemtu
37
16
25
35
27
39

2. POLLUTION CONTROL BRANCH WATER QUALITY STUDY

The expressed purpose of this study, as developed by the North Region Pollution Control Branch in conjunction with Projects and Research personnel from Victoria, was to provide a reference to earlier published studies, and an assessment of the relative eutrophication of the lake. Primary consideration was directed toward nutrients and the algal response to lake nutrient levels.

Based on preliminary sampling sequences in July, 1973, an intensive sampling program was initiated in 1974. Physical and chemical sampling sequences were completed on the following dates:

July 11 - 13, 1973

May 6 - 10, 1974

June 17 - 21, 1974

July 15 - 19, 1974

August 19 - 23, 1974

November 18 - 22, 1974

December 9 - 13, 1974

Eight sampling stations were established (Figure 2). Station co-ordinates, site identification numbers and approximate depth of sampling are provided in Table 1.

Single grab samples were collected at specified depths at each station using a Van Dorn water sampler. Samples were stored in clean, polyplastic containers. Throughout the summer samples were cooled prior to and during shipment. In all instances, samples were shipped direct to Provincial Water Resources Laboratory, where analysis was commenced within 36 hours of sampling time. Bacteriological samples were transferred to the Provincial Bacteriological Laboratory for

analysis within 24 hours.

Physical and chemical analysis was performed according to the "First Edition of a Manual for the Laboratory Analysis of Water and Wastewater." The following parameters were considered:

pH

* temperature (^{o}C)

* dissolved oxygen (mgl^{-1})

total organic carbon (mgl^{-1})

total phosphate (mgl^{-1})

total organic nitrogen (mgl^{-1})

total inorganic nitrogen (mgl^{-1})

specific conductance ($umhoscm^{-1}$)

color (true, TAC)

alkalinity (mgl^{-1})

hardness (mgl^{-1})

suspended solids (mgl^{-1})

dissolved solids (mgl^{-1})

Bacteriological analysis was completed according to techniques described in the 13th edition of Standard Methods. Analysis was restricted to total and fecal coliform, with varying numbers of duplicate samples collected at established sites.

* Field testing for dissolved oxygen was accomplished primarily with a YSI model 54 oxygen meter. However on several occasions, analyses were carried out through standard Winkler titration.

* Temperature profiles were completed using a YSI model 42 SC telethermometer.

Plankton samples were collected during the summer of 1973. A series of vertical hauls were composited at each station, using a #10 Wisconsin net. Near surface horizontal tows across selected areas of the lake were also made. Following preservation in 10% formalin, species identification and estimates of relative abundance were completed, under contract, by S. Brown, University of Victoria.

During 1974, chlorophyll "a" samples were collected every two weeks throughout the summer. Samples were obtained at near surface (one meter) and intermediate depths using a Van Dorn sampler. Water thus collected was temporarily stored in dark polyplastic gallon containers. Duplicate samples were extracted from each container and filtered in the field within four hours through a Sartorius filter (45 micron membrane). Filters were stored at 0°C in a darkened one liter bottle partially filled with silica gel. Frozen filters were subsequently shipped to Provincial Laboratories for analysis according to techniques described in Standard Methods.

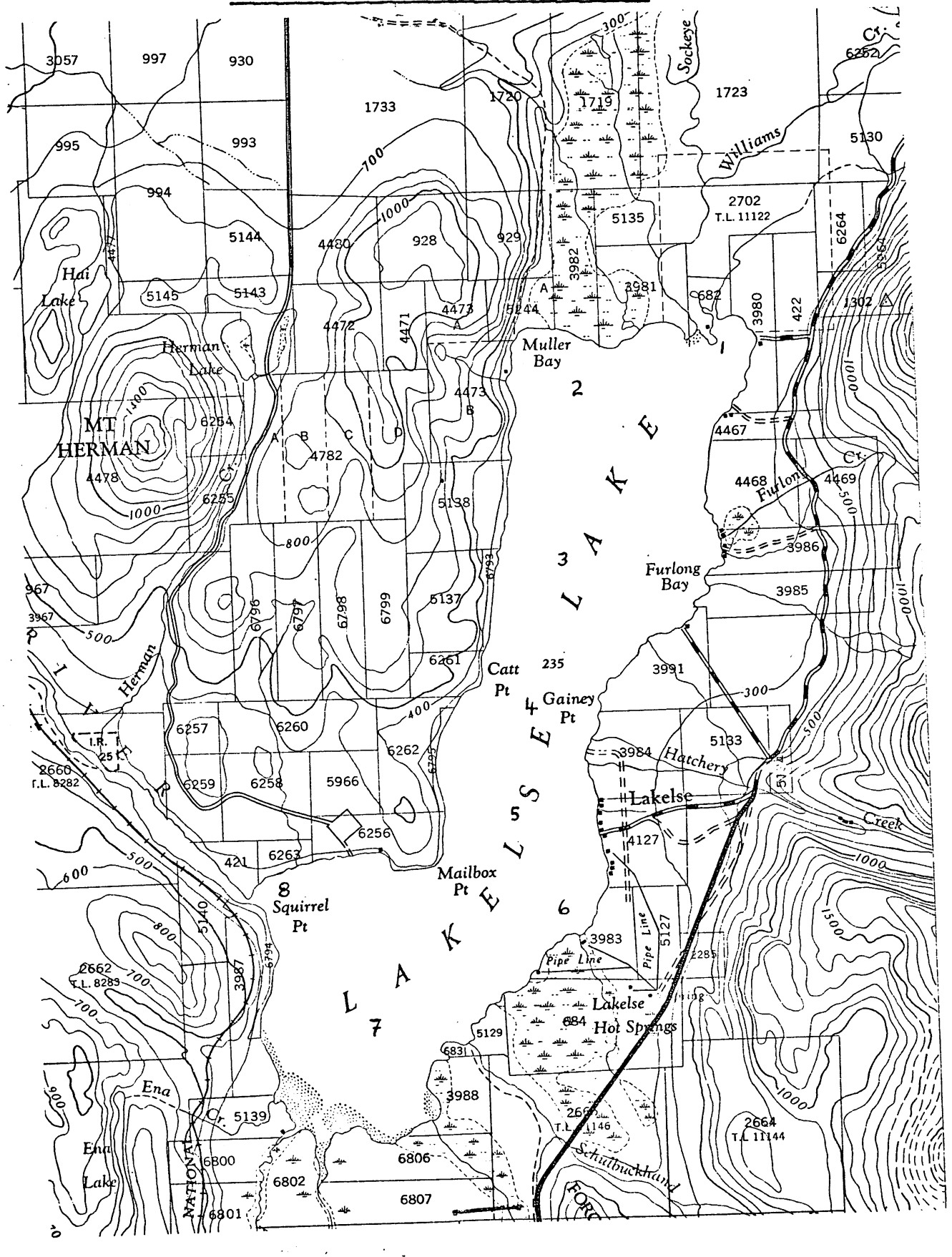
TABLE 1

LAKELSE LAKE SAMPLE STATIONS

STATION	DEPTH OF SAMPLE	SITE NUMBER	LOCATION
#1	Surface Bottom	0400305 0400306	Lat. 54° 24' 35" Long. 128° 31' 35"
#2	Surface Intermediate Bottom	0400307 0400308 0400309	Lat. 54° 24' 03" Long. 128° 32' 53"
#3	Surface Intermediate Bottom	0400310 0400311 0400312	Lat. 54° 23' 05" Long. 128° 33' 10"
#4	Surface Intermediate Bottom	0400313 0400314 0400315	Lat. 54° 22' 20" Long. 128° 33' 20"
#5	Surface Bottom	0400316 0400317	Lat. 54° 22' 20" Long. 128° 33' 20"
#6	Surface	0400318	Lat. 54° 21' 55" Long. 128° 33' 05"
#7	Surface Bottom	0400319 0400320	Lat. 54° 21' 25" Long. 128° 33' 55"
#8	Intermediate	0400321	Lat. 54° 22' 20" Long. 128° 35' 40"

FIGURE 2

LAKELSE LAKE SAMPLE STATION LOCATION



3. PHYSICAL & CHEMICAL LIMNOLOGY

3.1 Lake Morphometry

Depth contours (Brett, 1950) are plotted in Figure 3. Area and volume for each 5 meter interval is provided in Table 2. The lake has an overall area of 14.2 sq. km., with maximum length and width dimensions of 8.7 and 2.4 km respectively. Mean and maximum depths are 7.9 and 32.2 meters. Total volume of the lake is 1.08×10^8 cubic meters. Sinclair (1974) calculated a flushing rate of 58 days (6 times yearly).

3.2 Temperature

Temperature profiles taken at selected stations during the study indicate the absence of a stable thermocline, most probably as a consequence of relative shallowness combined with strong prevailing southwesterly winds.

3.3 Dissolved Oxygen

Although dissolved oxygen values were not taken during every sampling sequence, the few values obtained were within the range of values to be expected in a natural, unpolluted watershed. No areas of serious oxygen depletion were found.

3.4 Turbidity

Turbidity is caused by the presence of suspended particles such as clay, silt or finely divided organic matter, bacteria, plankton and other microscopic organisms. Turbidity, as measured in Jackson Turbidity Units, is an expression of the optical properties of a water sample. Excessive turbidity reduces light penetration into the water, thereby reducing photosynthetic activity. The U.S. Department of the Interior has recommended that turbidities should not exceed 25 JTU in warm water lakes, and 10 JTU in

FIGURE 3

LAKELSE LAKE - DEPTH CONTOURS

TABLE 2

LAKELSE LAKE MORPHOMETRY (Brett, 1950)

Area	14.2	sq. km. (5.5 sq. mi.)
Maximum length	8.7	km. (5.4 mi.)
Maximum width	2.4	km. (1.5 mi.)
Maximum depth	32.2	m. (98ft.)
Mean depth	7.9	m. (24ft.)
Volume	1.08 x 10^8	cu. m. (1.41 x 10^8 cu. yd.)
Shore development	1.83	
Elevation	72.2	m. (220ft.)

Depth (m.)	Area (hectares)	% total surface area	Stratum (m.)	Volume (cu. m. x 10^6)	% total volume
0	1420	100.0	0-5	55.7	51.6
5	808	77.0	5-10	30.4	28.1
10	412	29.1	10-15	15.4	14.3
15	205	14.4	15-20	4.9	4.5
29	52	3.7	20-25	1.4	1.3
25	3	0.2	25-32.2	0.2	0.2
			Total	108.0	

cold water lakes.

Surface and intermediate values averaged between six and seven JTU (Tables 3, 4). Near bottom values (Table 5) were significantly higher, averaging 18. JTU. Physical disruptions due to wave action, particularly in the shallower stations, may have accounted for this. Overall average value (n = 125 samples) was 10. JTU. (Table 6)

3.5 Colour

Apparent water colour is often used in reference to that colour which includes the effects of suspended matter. True colour can be attributed to the presence of dissolved matter in solution after the suspended material has been removed. True colour values in excess of 50 colour units may limit photosynthetic activity. In Lakelse Lake however, colour values were invariably far below this standard - True colour (n = 69 samples) averaged 16. units, TAC colour* (n = 86 samples) averaged 12. units (Table 6).

3.6 Acidity and Alklalinity

Acidity and alkalinity are reciprocal terms, the former produced by substances yielding hydrogen ions, the latter by substances yielding hydroxyl ions.

* Total absorbed color (TAC) represents all visible colour within the absorptive range of 400 - 700 nanometers. Analysis techniques are such that the sample is filtered prior to scanning. Results therefore represent only dissolved material, and will in all probability be slightly lower than true colour values where the sample is centrifuged rather than filtered.

The index of hydrogen ion activity, pH, was initially documented for Lakelse Lake by Brett (1950) as averaging 7.1 $\pm$ 0.2 and 6.6 $\pm$ 0.2 for surface and bottom depths respectively. Present results reveal little variation with depth or throughout the study, with values varying between 7.0 and 7.6 (Tables 3, 4 and 5).

The major buffering action in natural waters is the carbonate system. In addition to reducing fluctuations in pH, an indispensible reservoir is maintained for photosynthetic activity. The buffering capacity is generally expressed as total alkalinity, and measured in equivalents of $Ca\ CO_3$.

Lakelse Lake alkalinity (n = 69 samples) averaged 20.5 mgl^{-1}, with little variation with time and depth (Table 6).

3.7 Hardness

In natural waters, hardness is chiefly attributable to calcium and magnesium ions, although other elements, generally present in trace levels, can be significant contributing factors. Generally biological productivity is directly correlated with hardness. Hardness per se, however, has no biological significance, primarily since production depends upon the specific combination of elements present. In particular, such elements as Zn, Cu, Fe, Pb, etc., while contributing toward hardness, may exert toxic and limiting effects upon productivity.

Lakelse Lake (n = 69 samples) showed an averaged hardness of 19.7 mgl^{-1}, with little variation in time, depth, or from station to station (Table 6).

3.8 Suspended, Dissolved and Total Solids

A number of authors have investigated the relationship of particulate matter to the productivity of a lake. Rawson (1960) considered total dissolved solids to be one of the best indices of the edaphic situation in a lake. Larkin and Northcote (1958) concluded that total dissolved solids were one of a number of significant variables affecting production.

Total dissolved solid average values at surface, intermediate and near bottom depths were 35.2, 38.2 and 39.7 mgl^{-1} respectively (Tables 3, 4 and 5). Overall lake values averaged (n = 86 samples) 37.7 mgl^{-1} (Table 6).

Suspended solid values averaged 6., 3., and 19. mgl^{-1} at surface, intermediate and near bottom depths (Tables 3, 4 and 5). Overall values averaged (n = 86 samples) 9. mgl^{-1} (Table 6).

3.9 Nutrients

Nitrogen and phosphorus are recognized as two of the most important nutrients involved in the production of algae and control of productivity. In most instances sufficient nitrogen concentration is present, with the result that phosphorus becomes the critically limiting factor, as demonstrated by Schindler et al (1971), Fuhs et al (1972) and Schindler (1974). According to Sakamoto (1966) N : P ratios of more than 12:1 generally result in phosphorus being the limiting factor; ratios less than 12:1 find phosphorus becoming less important and other factors increasing in significance. Lakelse Lake ratios are generally greater than 12 (Table 9).

TABLE 3

LAKELSE LAKE - SUMMARY OF SURFACE PHYSICAL & CHEMICAL RESULTS 1973 - 74

	Color (Tac)	Color (True)	pH	(Suspended Solids) Non-Filterable Residue (mgl^{-1})	(Dissolved Solids) Filterable Residue (mgl^{-1})	Specific Conductance (umhos cm^{-1})	Alkalinity (mgl^{-1})	Hardness (mgl^{-1})	Turbidity (JTU)
STATION #1									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	20.	20.	7.5	9.	44.	56.	22.5	20.2	11.
MIN.	3.	5.	7.1	1.	32.	46.	19.5	18.9	1.0
AVG.	12.	14.		4.	38.	50.	20.7	19.4	7.
STATION #2									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	20.	20.	7.4	88.	44.	55.	22.5	19.9	12.
MIN.	3.	10.	7.1	2.	32.	46.	18.5	18.2	1.0
AVG.	12.	16.		22.	38.	50.	20.2	19.1	7.
STATION #3									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	18.	30.	7.4	9.	44.	59.	22.5	20.6	11.
MIN.	2.	10.	7.3	1.	31.	47.	18.9	18.5	0.9
AVG.	11.	18.		3.	41.	51.	20.4	19.3	7.
STATION #4									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	19.	30.	7.5	9.	43.	57.	22.5	20.6	11.
MIN.	5.	5.	7.3	1.	33.	47.	18.5	18.5	0.9
AVG.	12.	18.		3.	38.	51.	20.3	19.4	7.

TABLE 3 CONTINUED

	Color (Tac)	Color (True)	pH	(Suspended Solids) Non-Filterable Residue (mgl^{-1})	(Dissolved Solids) Filterable Residue (mgl^{-1})	Specific Conductance (umhos cm^{-1})	Alkalinity (mgl^{-1})	Hardness (mgl^{-1})	Turbidity (JTU)
STATION #5									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	18.	20.	7.5	7.	48.	58.	22.5	20.5	11.
MIN.	6.	5.	7.3	1.	35.	47.	18.5	18.5	0.9
AVG.	12.	14.		3.	40.	41.	20.2	19.4	7.
STATION #6									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	19.	40.	7.5	8.	49.	58.	22.3	19.6	9.5
MIN.	6.	5.	7.0	1.	31.	47.	16.	17.7	1.0
AVG.	13.	21.		3.	40.	53.	19.0	18.7	5.
STATION #7									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	28.	30.	7.5	9.	50.	66.	26.	21.1	11.
MIN.	5.	5.	7.2	1.	31.	46.	18.5	18.	1.0
AVG.	15.	18.		3.	40.	54.	21.2	19.8	6.
STATION #8									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	22.	30.	7.7	7.	48.	69.	24.6	25.1	11.
MIN.	7.	5.	7.3	1.	37.	51.	20.4	20.1	1.3
AVG.	14.	16.		3.	43.	58.	22.7	21.9	6.
N =	(40)	(32)		(40)	(40)	(40)	(32)	(32)	(24)
AVG. =	12.	17.		6.	35.	45.	20.6	19.6	6.

TABLE 4

LAKELSE LAKE - SUMMARY OF INTERMEDIATE DEPTH PHYSICAL AND CHEMICAL RESULTS 1973 - 74

	Color (Tac)	Color (True)	pH	Suspended Solids (mgl^{-1})	Dissolved Solids (mgl^{-1})	Specific Conductance (umhos cm^{-1})	Alkalinity (mgl^{-1})	Hardness (mgl^{-1})	Turbidity (JTU)
STATION #2									
N	(5)	(4)	(5)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	20.	20.	7.5	9.	41.	54.	21.	19.5	12.
MIN.	3.	10.	7.2	1.	31.	46.	18.5	18.3	1.3
AVG.	12.	16.		3.	37.	50.	19.7	19.0	7.
STATION #3									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	18.	30.	7.5	9.	46.	57.	22.1	20.6	11.
MIN.	2.	10.	7.3	1.	36.	47.	18.5	18.3	1.0
AVG.	6.	18.		3.	39.	51.	20.2	19.4	7.
STATION #4									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	17.	20.	7.6	7.	46.	58.	22.5	20.6	11.
MIN.	6.	5.	7.3	1.	34.	47.	18.5	18.5	1.0
AVG.	12.	14.		3.	41.	51.	20.3	19.3	7.

TABLE 5

LAKELSE LAKE - SUMMARY OF BOTTOM DEPTH PHYSICAL AND CHEMICAL RESULTS - 1973 - 74

	Color (Tac)	Color (True)	pH	Suspended Solids (mgl^{-1})	Dissolved Solids (mgl^{-1})	Specific Conductance (umhos cm^{-1})	Alkalinity (mgl^{-1})	Hardness (mgl^{-1})	Turbidity (JTU)
STATION #1									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	21.	20.	7.4	88.	44.	56.	21.0	20.2	32.
MIN.	3.	10.	7.1	2.	32.	46.	18.5	18.3	3.5
AVG.	12.	16.		22.	37.	50.	19.5	19.2	16.
STATION #2									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	20.	20.	7.5	162.	43.	55.	21.5	20.1	86.
MIN.	2.	10.	7.2	2.	33.	46.	19.0	18.3	3.2
AVG.	12.	16.		49.	37.	50.	20.0	19.1	40.
STATION #3									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	20.	30.	7.4	46.	42.	52.	21.2	20.6	26.
MIN.	2.	10.	7.2	1.0	36.	47.	19.0	18.5	1.3
AVG.	12.	18.		12.	39.	50.	20.0	19.4	13.
STATION #4									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	18.	20.	7.6	105.	45.	57.	22.5	20.6	40.
MIN.	7.	5.	7.3	1.0	32.	47.	18.5	18.5	3.2
AVG.	13.	15.		24.	38.	50.	20.4	19.3	18.

TABLE 5 CONTINUED

	Color (Tac)	Color (True)	pH	Suspended Solids (mgl^{-1})	Dissolved Solids (mgl^{-1})	Specific Conductance ($\mu mhos\ cm^{-1}$)	Alkalinity (mgl^{-1})	Hardness (mgl^{-1})	Turbidity (JTU)
STATION #5									
N	(5)	(4)	(6)	(5)	(5)	(5)	(4)	(4)	(3)
MAX.	19.	20.	7.6	46.	42.	53.	21.0	20.6	24.
MIN.	6.	5.	7.3	1.	33.	47.	18.5	18.5	1.0
AVG.	13.	14.		11.	37.	50.	19.8	19.6	12.
STATION #7									
N	(6)	(5)	(7)	(6)	(5)	(6)	(5)	(5)	(4)
MAX.	47.	40.	7.5	13.	90.	86.	41.1	41.4	11.
MIN.	6.	5.	7.3	1.	33.	46.	18.5	18.3	0.8
AVG.	20.	23.		5.	50.	59.	24.8	24.3	6.

TABLE 6

LAKELSE LAKE - OVERALL SUMMARY OF PHYSICAL AND CHEMICAL RESULTS - 1973 - 74

	Color (Tac)	Color (True)	Suspended Solids (Non-Filterable Residue) (mgl^{-1})	Dissolved Solids (Filterable Residue) (mgl^{-1})	Specific Conductance (umhos cm^{-1})	Alkalinity (mgl^{-1})	Hardness (mgl^{-1})	Turbidity (JTU)
SURFACE								
N	(40)	(32)	(40)	(40)	(40)	(32)	(32)	(24)
AVG.	12.	16.	6.	35.	45.	20.6	19.6	6.
INTERMEDIATE								
N	(15)	(12)	(15)	(15)	(15)	(12)	(12)	(9)
AVG.	12.	16.	3.	38.	50.	20.0	19.2	7.
BOTTOM								
N	(31)	(25)	(31)	(31)	(36)	(25)	(25)	(19)
AVG.	13.	17.	19.	40.	51.	20.7	20.2	18.
N	(86)	(69)	(86)	(86)	(91)	(69)	(69)	(52)
AVG.	13.	16.	9.	38.	49.	20.5	19.7	10.

3.9.1 Nitrogen

Nitrogen, in its various forms, passes through a rather complex cycle within a given ecosystem (Figure 4).

Generally lake concentrations of ammonia range from 0.05 - 0.20 mgl^{-1}. (Hutchinson, 1957). In the spring and fall, maximum concentrations are likely to occur as a result of overturn. Nitrification and assimilation by various organisms is felt to create summer minimum values, at least in surface waters. The ammonification of organic nitrogen and release of absorbed ammonia through the reduction of bottom sediments has been known to create summer maximums in deeper waters.

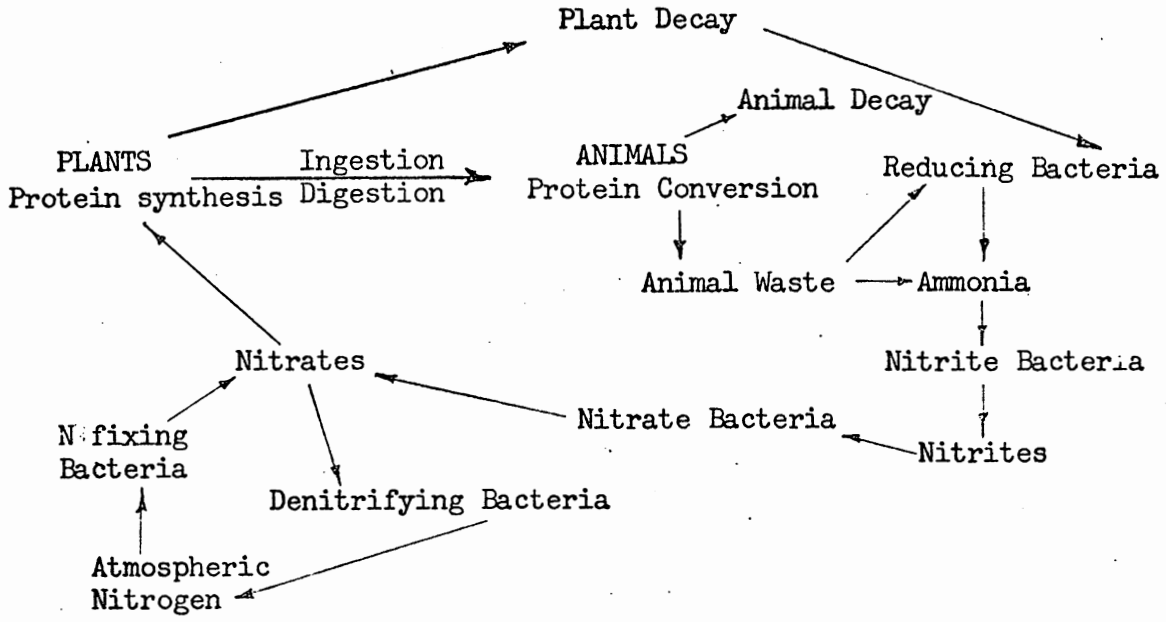
Lakelse Lake generally follows this pattern, except for a summer maximum at depth. Unstable stratification and summer circulation patterns are most probably operative in this regard. Ammonia levels were generally undetectable (less than 0.02 mgl^{-1}). Maximum value (0.06 mgl^{-1}) was recorded at station #7 on December 10, 1974.

In most lake systems, surface nitrate concentrations are generally at a minimum during the summer due to assimilation by phytoplankton and photosynthetic activity. In the spring and fall the nitrification of ammonia to nitrate takes place by chemautotrophic bacteria, using NH_4 and NO_2 as an energy source. Nitrate values correspondingly maximize at this time.

During the summer, nitrate values in Lakelse Lake were very low. In July nitrate concentrations were detectable only at station #3 and #4 (0.04 and 0.06 mgl^{-1} respectively). In August, no detectable concentrations were

FIGURE 4

NITROGEN CYCLE*



* Boughey, 1968.

present. The highest nitrate concentrations, as anticipated, were recorded in May and December. In the spring sequence, station #1 (Bottom), #2 (Surface, Intermediate, Bottom) and #3 (Intermediate) provided a maximum value of 0.10 mgl^{-1}. In December values reached were slightly more than one half those recorded for May.

Total inorganic nitrogen (NH_4, NO_2 + NO_3) concentrations in Lakelse Lake are presented in Table 7. Values are considerably below the minimum levels of inorganic nitrogen (0.3 mgl^{-1}) suggested by Sawyer (1945) as likely to create algae blooms.

Although organic nitrogen comprises the largest component of total nitrogen, no definitive patterns with depth are discernible, a probable consequence of unstable stratification and summer circulatory patterns.

3.9.2 Phosphorus

Sawyer (1945) suggested that if levels of inorganic phosphorus exceed 0.015 mgl^{-1}, algae blooms can normally be expected. The arbitrary value of 0.010 mgl^{-1} has been adopted by the U.S. Department of the Interior as the minimum standard.

Average Lakelse Lake phosphorus concentration in 1974 was .016 mgl^{-1} or 16. mg m^{-3}. If August 1973 values are included, average concentrations are reduced to .015 mgl^{-1} or 15. mg m^{-3}, virtually the same as the theoretical minimum. Total concentrations ranged from .003 - .219 mgl^{-1} (Table 8). As with the nitrogen model, minimum values were recorded during the summer months whereas maximum values occurred after the summer productivity period. It is most probable that elevated fall values reflect not

only the effects of summer productivity, but the influx of additional nutrients due to abnormally high rainfall in October. Generally values at any one depth were fairly uniform. Surface values were lower than intermediate and near bottom depth, a probable consequence of phosphorus incorporation into biological systems and gradual settling of seston. Nutrient release from bottom sediments, accelerated by water agitation from wind action, is considered to be responsible for significantly higher near bottom values.

3.9.3. Nutrient Input

Measurement of nutrient (phosphorus) input requires consideration of numerous variables, including streams and rivers, industrial and domestic waste discharges, precipitation, groundwater, and internal loading from sediments. Understandably measurement of the total phosphorus budget is extremely difficult and time consuming. In some instances, as, for example, with groundwater and sediment input, determinations may not be possible. In Lakelse Lake a third incalculable variable, input from residential development, presents additional complications. Any attempts to determine total nutrient input based upon available data must therefore be interpreted with caution.

Sinclair (1974) calculated nutrient input at two separate sources, the hot spring canal and the inflowing streams. The combined total for these two sources was 0.039 g m^{-2}, with the hot spring accounting for 0.02 g m^{-2}.

In the present study, attempts were made to further investigate this latter source.

TABLE 7

LAKELSE LAKE - TOTAL INORGANIC NITROGEN (NH_4, NO_2 & NO_3) RESULTS - 1973 - 74

mgl^{-1}

STATION	August 9/1973	May 8/1974	June 19/1974	July 16/1974	August 20/1974	November 20/1974	December 10/1974
#1 - SURFACE	0.02	0.05	0.02	0.013	∠ 0.02	A	0.054
BOTTOM	0.02	0.06	0.035	∠ 0.02	∠ 0.02	A	0.052
#2 - SURFACE	0.02	0.05	0.02	∠ 0.02	∠ 0.02	A	0.058
INTERMEDIATE	0.02	0.05	0.03	∠ 0.02	∠ 0.02	A	0.059
BOTTOM	0.03	0.05	0.02	∠ 0.02	∠ 0.02	A	0.053
#3 - SURFACE	0.02	0.05	0.02	∠ 0.02	∠ 0.02	A	0.051
INTERMEDIATE	0.03	0.05	0.02	0.02	∠ 0.02	A	0.051
BOTTOM	0.02	0.04	0.03	0.03	∠ 0.02	A	0.054
#4 - SURFACE	0.02	0.04	0.025	0.02	∠ 0.02	A	0.05
INTERMEDIATE	0.03	0.04	0.025	0.02	∠ 0.02	A	0.056
BOTTOM	0.02	0.04	0.025	∠ 0.02	∠ 0.02	A	0.044
#5 - SURFACE	0.03	0.04	0.037	∠ 0.02	∠ 0.02	A	0.05
BOTTOM	0.02	0.04	0.02	∠ 0.02	∠ 0.02	A	0.045
#6 - SURFACE	0.03	0.04	0.02	∠ 0.02	∠ 0.02	A	0.10
#7 - SURFACE	0.02	0.05	0.02	0.02	∠ 0.05	A	0.059
BOTTOM	0.02	0.055	∠ 0.02	∠ 0.02	∠ 0.02	A	0.047
#8 - ALL DEPTHS	0.10 (Surface)	0.03 (Int.)	0.02 (Int.)	∠ 0.02 (Int.)	∠ 0.02 (Int.)	A	0.045 (Surface)
AVERAGE	0.03	0.05	0.02	0.02	0.02	-	0.055

Average values marked by (*) asteriak indicate the usage of at least one value marked - "less than".

Total average = .03 mgl^{-1}

TABLE 8

LAKELSE LAKE - TOTAL PHOSPHORUS RESULTS - 1973 - 74

mgl^{-1}

STATION	August 9/1973	May 8/1974	June 19/1974	July 16/1974	August 20/1974	November 20/1974	December 10/1974
# 1 - SURFACE	0.006	0.011	0.004	0.006	0.007	0.022	0.018
BOTTOM	0.006	0.008	0.015	0.006	0.007	0.023	0.108
# 2 - SURFACE	0.005	0.007	0.004	0.005	0.004	0.023	0.018
INTERMEDIATE	0.005	0.008	0.007	0.005	0.005	0.022	0.017
BOTTOM	0.005	0.009	0.011	0.013	0.005	0.219	0.096
# 3 - SURFACE	0.006	0.008	0.003	0.003	0.005	0.023	0.018
INTERMEDIATE	0.005	0.007	0.005	0.004	0.004	0.022	0.018
BOTTOM	0.005	0.022	0.005	0.005	0.005	0.022	0.069
# 4 - SURFACE	0.006	0.007	0.004	0.003	0.005	0.022	0.017
INTERMEDIATE	0.007	0.007	0.006	0.004	0.005	0.022	0.017
BOTTOM	0.007	0.007	0.013	0.005	0.006	0.022	0.152
# 5 - SURFACE	0.006	0.007	0.004	0.004	0.005	0.022	0.017
BOTTOM	0.006	0.007	0.004	0.004	0.005	0.022	0.071
# 6 - SURFACE	0.064	0.007	0.003	0.004	0.005	0.019	0.014
# 7 - SURFACE	0.007	0.007	0.004	0.003	0.005	0.022	0.016
BOTTOM	0.006	0.031	0.005	0.003	0.006	0.022	0.025
# 8 - ALL DEPTHS	0.007 (Surface)	0.009 (Int.)	0.005 (Int.)	0.004 (Int.)	0.006 (Int.)	0.020 (Int.)	0.016 (Surface)
AVERAGE	0.009	0.010	0.006	0.005	0.005	0.034	0.042

TABLE 9

LAKELSE LAKE - NUTRIENT - CHLOROPHYLL "a" RELATIONSHIPS

STATION	Total Nitrogen (May 9/1974) At Overturn mgl^{-1}	Total Phosphorus (May 9/1974) At Overturn mgl^{-1}	N:P Ratio At Overturn	Average Summer Chlorophyll μgl^{-1}
#1 - SURFACE	.14	.011	12.7	2.7
BOTTOM	.12	.008	15.0	
#2 - SURFACE	.14	.007	20.0	2.5
INTERMEDIATE	.17	.008	21.2	
BOTTOM	.21	.009	23.3	
#3 - SURFACE	.12	.008	15.0	2.4
INTERMEDIATE	.16	.007	22.9	
BOTTOM	.11	.022	5.0	
#4 - SURFACE	.10	.007	14.3	2.6
INTERMEDIATE	.11	.007	15.7	
BOTTOM	.12	.007	17.1	
#5 - SURFACE	.13	.006	21.7	2.5
BOTTOM	.12	.007	17.1	
#6 - SURFACE	.19	.007	27.1	2.5
#7 - SURFACE	.14	.007	20.0	2.5
BOTTOM	.13	.031	4.2	
#8 - SURFACE	.13	.009	14.4	2.6
AVERAGE	.14	.010	16.9	2.4

Unfortunately problems arose in determining accurate flow measurements. The analysis results from the Skoglund sewage discharge (Table 10), the nutrient hot spring (Table 11) and the hot spring canal (Table 12) are included herein for information only, with no interpretation of results intended.

Sinclair presents the conclusion that nutrient input from residential shoreline development is significantly operative in Lakelse Lake. Although the magnitude of this input is difficult to calculate, examination of the development pattern reveals that the majority of residences are located in areas unsuitable for sewage disposal. High water table, close proximity to the lakeshore, and unsuitable soil conditions ensure that virtually the entire phosphorus load enters the lake unaltered.

TABLE 10

WATER QUALITY ANALYSIS SKOGLUND'S RESORT
EFFLUENT DISCHARGE - 1973 - 74 - 75

	June 4/1975	July 10/1975	July 16/1975
NITROGEN (TOTAL)	8.04 mgl^{-1}	16.0 mgl^{-1}	14.05 mgl^{-1}
NITROGEN (DISSOLVED NITRATE)	0.03	0.02	0.02
*NITROGEN (DISSOLVED NITRITE)	0.01	0.02	0.03
NITROGEN (AMMONIA)		12.5	11.3
NITROGEN (ORGANIC)		3.5	2.7
PHOSPHORUS (TOTAL)	1.40 mgl^{-1}	2.80 mgl^{-1}	2.18 mgl^{-1}
PHOSPHORUS (ORTHOPHOSPHATE)	0.70	2.01	1.41
MAGNESIUM (DISSOLVED)		0.8 mgl^{-1}	
CALCIUM (DISSOLVED)		11.0	
pH	7.0	6.6	
RESIDUE (NON-FILTERABLE, 105°C)		53. mgl^{-1}	
RESIDUE (FILTERABLE, 105°C)		160.	
HARDNESS (TOTAL $CaCO_3$)		30.8 mgl^{-1}	
SPECIFIC CONDUCTANCE		310 umhos cm^{-1}	325 umhos cm^{-1}

TABLE 11

WATER QUALITY ANALYSIS OF THE HOTSPRINGS MAIN POOL,
AT SKOGLUND'S RESORT July 10, 1975 13:05 Hours

NITROGEN		PHOSPHORUS	
TOTAL NITROGEN	0.2 mgl^{-1}	TOTAL PHOSPHORUS	0.008 mgl^{-1}
ORGANIC NITROGEN	0.2	ORTHOPHOSPHATE	
KJELDAHL NITROGEN	0.2	PHOSPHORUS	0.003
DISSOLVED NITRATE	< 0.02		
DISSOLVED NITRITE	< 0.02		
AMMONIA NITROGEN	< 0.005		
CALCIUM (DISSOLVED)	72. mgl^{-1}		
MAGNESIUM (DISSOLVED)	0.07		
MAGNESIUM (TOTAL)	0.08		
POTASSIUM (DISSOLVED)	7.3		
SODIUM (DISSOLVED)	284.		
COPPER (TOTAL)	0.001 mgl^{-1}		
IRON (TOTAL)	0.2		
LEAD (TOTAL)	0.001		
MANGANESE (TOTAL)	0.03		
NICKEL (TOTAL)	0.01		
ZINC (TOTAL)	0.005		
CHLORIDE (DISSOLVED)	205. mgl^{-1}		
FLUORIDE (DISSOLVED)	5.26		
SULPHATE (DISSOLVED)	498.		
pH	8.3		
FILTERABLE RESIDUE (105°C)	1186. mgl^{-1}		
NON-FILTERABLE RESIDUE (105°C)	3. mgl^{-1}		
ALKALINITY (TOTAL)	20.1 mgl^{-1}		
HARDNESS (TOTAL Ca CO_3)	180. mgl^{-1}		
CONDUCTIVITY	1760. umhos cm^{-1}		
COMPARABLE DILUTION CONDUCTIVITY	2140. umhos cm^{-1}		

TABLE 11

WATER QUALITY ANALYSIS OF THE HOTSPRINGS MAIN POOL,
AT SKOGLUND'S RESORT July 10, 1975 13:05 Hours

NITROGEN		PHOSPHORUS	
TOTAL NITROGEN	0.2 mgl^{-1}	TOTAL PHOSPHORUS	0.008 mgl^{-1}
ORGANIC NITROGEN	0.2	ORTHOPHOSPHATE PHOSPHORUS	0.003
KJELDAHL NITROGEN	0.2		
DISSOLVED NITRATE	< 0.02		
DISSOLVED NITRITE	< 0.02		
AMMONIA NITROGEN	< 0.005		
CALCIUM (DISSOLVED)	72. mgl^{-1}		
MAGNESIUM (DISSOLVED)	0.07		
MAGNESIUM (TOTAL)	0.08		
POTASSIUM (DISSOLVED)	7.3		
SODIUM (DISSOLVED)	284.		
COPPER (TOTAL)	0.001 mgl^{-1}		
IRON (TOTAL)	0.2		
LEAD (TOTAL)	0.001		
MANGANESE (TOTAL)	0.03		
NICKEL (TOTAL)	0.01		
ZINC (TOTAL)	0.005		
CHLORIDE (DISSOLVED)	205. mgl^{-1}		
FLUORIDE (DISSOLVED)	5.26		
SULPHATE (DISSOLVED)	498.		
pH	8.3		
FILTERABLE RESIDUE (105°C)	1186. mgl^{-1}		
NON-FILTERABLE RESIDUE (105°C)	3. mgl^{-1}		
ALKALINITY (TOTAL)	20.1 mgl^{-1}		
HARDNESS (TOTAL Ca CO_3)	180. mgl^{-1}		
CONDUCTIVITY	1760. umhos cm^{-1}		
COMPARABLE DILUTION CONDUCTIVITY	2140. umhos cm^{-1}		

TABLE 12

WATER QUALITY ANALYSIS SKOGLUNDS HOTSPRINGS CANAL

	CANAL 100 YARDS DOWNSTREAM OF DISCHARGE			CANAL MIDWAY			CANAL AT OUTLET TO LAKE		
	June 4	July 10 1975	July 16	June 4	July 10 1975	July 16	June 4	July 10 1975	July 16
NITROGEN (TOTAL)	0.41mgl^{-1}	1.01 mgl^{-1}	0.27 mgl^{-1}		0.90 mgl^{-1}	0.26 mgl^{-1}	0.11mgl^{-1}	0.50mgl^{-1}	0.36
NITROGEN (DISSOLVED NO_3)	0.06	0.02	0.02		0.02	0.02	0.02	0.03	0.02
NITROGEN (DISSOLVED NO_2)	<0.005	0.02	<0.005		0.02	<0.005	<0.005	<0.005	<0.005
NITROGEN (AMMONIA)		0.33	0.051		0.340	0.048		0.176	0.103
NITROGEN (ORGANIC)		0.68	0.20		0.54	0.19		0.29	0.24
NITROGEN (KJELDAHL)	0.35	1.01	0.25		0.88	0.24	0.09	0.47	0.34
PHOSPHORUS (TOTAL)	0.049	0.096	0.040		0.092	0.025	0.014	0.045	0.035
PHOSPHORUS (ORTHOPHOSPHATE)	0.012	0.025	0.004		0.029	0.004	<0.003	0.015	0.005
MAGNESIUM (DISSOLVED)		0.52	0.47		0.49	0.47		0.51	0.47
CALCIUM (DISSOLVED)		17.4	16.1		17.2	17.1		16.4	16.4
pH	7.0	6.4	6.8		6.4	6.9	7.5	6.5	6.8
RESIDUE (NON-FILTERABLE 105°C)		42.	15.		11.	7.		5.	
RESIDUE (FILTERABLE 105°C)		262.	234.		252.	248.	84.	236.	
HARDNESS (TOTAL $CaCO_3$)		45.6	42.1		45.0	44.6		43.0	42.9
SPECIFIC CONDUCTANCE (umhos cm^{-1})	315.	401.	365.		392.	388.		379.	380.

3.10. Organic and Inorganic Carbon

Organic carbon, being incorporated into tissue of living (or once living) material, is temporarily removed from the dynamic chemistry of a water system until such time as bacteria populations are able to recycle. Inorganic carbon on the other hand, is freely represented by CO_2, HCO_3, $CO_3^{=}$ ions in addition to H_2CO_3. Within a normal aquatic environment (pH range 6.5 - 7.5) the majority of inorganic carbon is present on dissociated carbonate ions.

Lakelse Lake organic carbon values ranged from trace levels to a maximum of 12. mgl^{-1}. Values increased slightly with depth until maximizing at near bottom depths. Summer values were generally reduced slightly. Elevated November and December values were felt to be partially attributable to hydrologic conditions.

Inorganic carbon levels ranged from 1. to 6. mgl^{-1}. No significant differences with depth were evident. Maximum values were however, recorded during summer periods, reflecting in part the effects of biological productivity.

4. ALGAE

4.1 Algae Response to Nutrient Levels

In recent years considerable attention has been directed toward the application of nutrient models to predict eutrophic response within a lake system (Vollenweider, 1968; Schindler and Nighswander, 1970; Vollenweider and Dillon, 1974; Dillon, 1975). Dillon and Rigler (1975) presented a complex model incorporating not only phosphorus loading and

mean depth, but also hydraulic flushing rates and phosphorus retention coefficients in sediments. This model would appear to be applicable to Lakelse Lake with its high flushing rate. However due to its late publication date, it was not possible to collect data on all the required variables. Analysis of applicable data did, however, confirm the overwhelming significance of the high flushing rate.

4.2 Phosphorus - Chlorophyll Relationship

Patalas (1972) investigated phosphorus and chlorophyll "a" relationships ultimately confirming Sakamoto's (1966) findings that chlorophyll concentration is a function of phosphorus concentration. Dillon and Rigler (1974) subsequently (based upon Sakamoto's work) presented a predictive relationship suitable for estimating the average summer chlorophyll "a" concentration in lakes with spring N:P ratios greater than 12:1.

$$\log_{10} (\text{chl a}) = 1.449 \log_{10} (P) - 1.136$$

Average spring Lakelse Lake values for phosphorus were calculated at .01 mgl^{-1}. Near bottom values were however, largely instrumental in elevating this figure somewhat.

Applying this value to Sakomoto's equation, an anticipated average summer chlorophyll "a" concentration is calculated at 2.06 μgl^{-1}. Actual average value, as determined over the entire summer sampling period, was 2.4 μgl^{-1}.

It is readily apparent that the low nutrient levels in Lakelse Lake are not conducive to the production of substantial algae populations. The range of chlorophyll "a" values between 2 - 4 μgl^{-1} falls within the lowest level classification advocated by Dillon and Rigler (1975) as maximum permissible concentrations (Table 13).

TABLE 13

DEVELOPMENT CAPACITY OF LAKES

Maximum Permissible Average Summer Chlorophyll "a" concentration

LEVEL 1 - 2 mg m^{-3}; for lakes to be used primarily for body contact water recreation, and where it is desirable to maintain hypolimnetic concentrations of oxygen in excess of 5 mg $liter^{-1}$ to preserve cold water fisheries. The lake will be extremely clear with a mean Secchi disc visibility of 5 m and will be very unproductive. (Note - the Secchi disc visibility may be lower in brown water (dystrophic lakes).

LEVEL 2 - 5 mg m^{-3}; for lakes to be used for water recreation but where the preservation of cold water fisheries is not imperative. The lake will be moderately productive and correspondingly less clear, with a mean Secchi disc visibility of 2 - 5 m.

LEVEL 3 - 10 mg m^{-3}. for lakes where body-contact recreation is of little importance, but emphasis is placed on fisheries (bass, walleye, pickerel, pike, muskelunge, bluegill, yellow perch). Hypolimnetic oxygen depletion will be common. Secchi disc depths will be low (1 - 2 m), and there is a danger of winterkill of fish in shallow lakes.

LEVEL 4 - 25 mg m^{-3}; suitable only for warmwater fisheries. Secchi disc depth 1.5 m, hypolimnetic oxygen depletion beginning early in summer, considerable danger of winterkill of fish except in deep lakes.

5. IDENTIFICATION AND ESTIMATES OF ABUNDANCE OF NET PLANKTON ORGANISMS SAMPLED FROM LAKELSE LAKE*

5.1 Description of Samples

Vertical and horizontal net plankton samples were taken from Lakelse Lake on July 13, 1973 by Ableson and Drinnan. These samples, collected with a No. 10 Wisconsin net, are listed in Table 14 according to their original labels.

5.2 Specimen Identification and Counting Procedures

Standard reference texts were used for identification of zooplankton (Pennak 1953; Edmondson 1959; Wilson 1959) and phytoplankton organisms (Tiffany & Britton 1952; Prescott 1962). Diatoms were identified from incinerated Hyrax mounts using Cleve-Euler (1951 - 1953), Tiffany and Britton (1952), and Patrick and Reimer (1966) as main references. Mr. Owen Kennedy (F.R.B., Nanaimo) kindly identified the dominant copepod species.

The most abundant taxa were identified to species where possible, and other less common organisms were identified to genera. No attempt was made to enumerate copepod stages or to indicate sex, and all immature copepods were grouped under the term, nauplii.

Sample counts were made using 5 ml counting chambers, Lugol's solution, and inverted microscope. One 5 ml chamber was prepared for each sample bottle. Counts were made of all individuals occurring in 20 random microscope fields at a magnification of 187.5 X. Since the samples were hauls of an unknown field sampling duration or volume, numbers/unit volume were not calculated.

* Basic text for this presentation was extracted from the report prepared by S. Brown, University of Victoria, under contract to Pollution Control Branch.

However, the following information is included to facilitate presenting the data in other units of measure if required: area of one microscope field at a magnification of 187.5 X = 1.3070 mm^2; area of 20 microscope fields = 26.140 mm^2; and area of the 5 ml chamber = 471.44 mm^2.

Counts for each sample are given here as number/20 fields and as percentages of the total count in 20 fields.

5.3 Results

In considering the analysis of plankton samples, caution must be exercised in the interpretation of data primarily due to the limited number of samples collected on a single occasion.

A complete species list for all samples is given in Table 15. Counts for horizontal hauls are given in Table 16, and those for vertical hauls in Table 17. In Table 18, numbers and percentage abundance of phytoplankton and zooplankton components of each sample are summarized.

Bacillariophyceae (diatoms) were by far the most dominant life form, comprising a total percentage composition in near surface horizontal tows of 54.5% (Table 16) and in vertical hauls of 46.2% (Table 17). Of the species identified, Tabellaria flocculosa and T. fenestrata comprised a total percentage (horizontal) of 38.0%. The former ranged from a low of 4.9% between stations #2 & 3 to a maximum of 41.0% between stations #5 & 6. T. fenestrata maximized near the outlet of the lake. T. flocculosa was generally numerically dominant. Vertical distributions of these species appeared to reciprocate each other. Only at station #5 were both species

represented in large number at the same time.

Other diatoms present, albeit in lesser numbers, were Asterionella formosa, Cyclotella bodanica, Cyclotella stelligera, Synedra rumpens, S. ulna, Cocconeis placenticla, Rhopalodia gibba, Epithemia turgida, Naviciula radiosa, Surirella elegans, Ceratoneis arcus, Achnanthes flexella, Eunotic maior, and unidentified Nitzschia sp. and Frustulia sp. In total 41 separate species were identified.

Copepods comprised 11.9% of the horizontal plankton samples and 17.6% of the vertical hauls. Cyclops bicuspidatus comprised 9.5% of the horizontal hauls, while Epischura nevadensis represented 2.4%. Immature nauplii comprised 12.9%. Both of the above species showed a moderately uniform distribution over the deeper portions of the lake. Maximum values were reached at station #1 and minimum values at station #8. Unlike McMahon's study (1949 - 1952) no C. serrulatus were identified.

The dominant Cladoceran species was Bosmina coregoni, comprising 1.3% of horizontal hauls and 2.3% of the vertical collections. Maximum values of 7.0% were recorded at station #1.

Rotatoria were represented in significant numbers in both horizontal and vertical collections. Kellicottia congispina and Conochilus unicornis were the most abundant while Polyarthra euryptera and Collotheca sp. were present in lower numbers.

Various species of algae were also collected, albeit in small numbers never exceeding 2.0% at any one station. The green algae Fragilaria viresecens, F.

crotonensis, and F. construens were included in this group.

The relative percentage occurance of phytoplankton and zooplankton is presented in Table 18. In general, phytoplankton comprised a larger proportion in the southern end of the lake i.e.,

Station # 1 - zooplankton - 85%
phytoplankton - 14%

Station # 8 - zooplankton - 31%
phytoplankton - 68%

TABLE 14

LIST OF VERTICAL AND HORIZONTAL NET PLANKTON SAMPLES TAKEN FROM LAKELSE LAKE ON JULY 13, 1973 BY ABLESON AND DRINNAN

HORIZONTAL HAULS

1. Between Stations 1 and 2
2. Between Stations 2 and 3 (Bottle 1 and 2)[1]
3. Between Stations 3 and 4
4. Between Stations 4 and 5
5. Between Stations 5 and 6
6. Between Stations 5 and 7
7. Between Stations 7 and 8
8. Between Stations 8 and Lakelse River

VERTICAL HAULS

1. Station 1, 10 Vertical Hauls, Depth 3 m
2. Station 2, 5 Vertical Hauls, Depth 25 m
3. Station 3, 5 Vertical Hauls, Depth 10 m
4. Station 4, 5 Vertical Hauls, Depth 5 m
5. Station 5, 5 Vertical Hauls, Depth 5 m
6. Station 8, 5 Vertical Hauls, Depth 5 m

1. Bottles 1 and 2 were combined for counting purposes.

TABLE 15

SPECIMENS IDENTIFIED FROM VERTICAL AND HORIZONTAL NET SAMPLES COLLECTED FROM LAKELSE LAKE

PHYTOPLANKTON

Achnanthes flexella
Achnanthes lanceolata
Achnanthes minutissima
Anomoeneis sp.
Aphanizomenon (?) sp.
Asterionella formosa

Campylodiscus noricus
Ceratoneis arcus
Closterium sp.
Cocconeis placentula
Cyclotella bodanica
Cyclotella stelligera
Cymbella ventricosa
Cymbella spp.

Diatoma sp.
Diatomella sp.
Dinobryon divergens
Diploneis oblongella
Diploneis sp.

Eunotia maior
Eunotia spp.

Fragilaria construens
Fragilaria crotonensis
Fragilaria pinnata
Fragilaria virescens
Fragilaria spp.
Frustulia rhomboides

Gomphonema olivaceum
Gomphonema spp.
Gyrosigma spencerii

Hantzschia amphioxus

Melosira distans
Melosira italica
Melosira undulata (?)
Melosira varians
Melosira sp.

Navicula americana
Navicula bacillum
Navicula pseudoscutiformis
Navicula pupula
Navicula radiosa
Navicula radiosa v. tenella
Nitzschia acicularis
Nitzschia lorenziana
Nitzschia vermicularis
Nitzschia spp.

Oscillatoria sp.

Rhoicosphenia curvata
Rhopalodia gibba

Spirogyra sp.
Stauroneis phoenicenteron
Surirella elegans
Surirella (Flexuosae) sp.
Surirella guatemalensis
Surirella lapponica
Surirella (Ocellatae) sp.
Surirella robusta
Synedra radians
Synedra rumpens
Synedra ulna

Tabellaria fenestrata
Tabellaria flocculosa
Tetracyclus sp.

ZOOPLANKTON

Actinosphaerium sp.
Arcella sp.
Bosmina coregoni
Bosmina longirostris
Chydorus sp.
Collotheca (?) sp.
Conochilus unicornis
Cyclops bicuspidatus thomasi

Daphnia sp.
Difflugia sp.
Epischura nevadensis
Holopedium gibberum
Kellicottia longispina
nauplii (Copepoda)
Pleosoma (?) sp.
Polyarthra euryptera

TABLE 16

SPECIES COUNTS (N) AND PERCENTAGE ABUNDANCES OF INDIVIDUALS COUNTED IN HORIZONTAL PLANKTON HAULS FROM LAKELSE LAKE

The last column on the right represents total counts and percentages for all 8 samples

STATION	1 - 2		2 - 3		3 - 4		4 - 5		5 - 6	
Species	N	%	N	%	N	%	N	%	N	%
Tabellaria flocculosa	112	22.1	15	4.9	120	23.7	127	20.9	207	50.0
Tabellaria fenestrata	60	11.9	34	11.1	25	4.9	81	13.3	39	7.7
nauplii (Cipepoda)	45	8.9	53	17.3	90	17.8	81	13.3	69	13.7
Asterionella formosa	33	6.5	13	4.3	60	11.8	91	14.9	27	5.4
Kellicottia longispina	76	15.0	64	20.9	76	15.0	35	5.8	62	12.3
Cyclops bicuspidatus thomasi	54	10.7	52	17.0	74	14.6	90	14.8	39	7.7
Conochilus unicornis	15	3.0	30	9.8	28	5.5	22	3.6	19	3.8
Epischura nevadensis	15	3.0	12	3.9	16	3.2	12	2.0	20	4.0
Dinobryon divergens							16	2.6		
Synedra rumpens	34	6.7	8	2.6			7	1.2		
Rosmina coregoni	17	3.4	10	3.3	7	1.4	6	1.0	7	1.4
Aphanizomenon (?) sp.	1	0.2			1	0.2	5	0.8	4	0.8
Cyclotella bodanica	8	1.6	1	0.3	3	0.6	4	0.7		
Cyclotella stelligera	14	2.8	2	0.7	5	1.0	3	0.5		
Spirogyra sp.	3	0.6					2	0.3	6	1.2
Collotheca (?) sp.	4	0.8			1	0.2	3	0.5	3	0.6
Synedra ulna	4	0.8					6	1.0	2	0.4
Fragilaria crotonensis										
Polyarthra euryptera	4	0.8	2	0.7			3	0.5	1	0.2
Camptodiocus noricus							1	0.2		
Fragilaria construens							11	1.8		
Navicula radiosa							1	0.2		
Surirella sp.			1	0.3						
Fragilaria virescens	7	1.4								

TABLE 16 CONTINUED

STATION	1 - 2		2 - 3		3 - 4		4 - 5		5 - 6	
Species	N	%	N	%	N	%	N	%	N	%
Holopedium gibberum			5	1.6	1	0.2				
Cocconeis placentula			1	0.3						
Cymbella sp.			2	0.7						
Eunotia maior							1	0.2		
Nitzschia sp.			1	0.3						
Surirella (Flexuosae) sp.							1	0.2		
Closterium sp.										
Achranthes flexella										
Frustulia sp.										
Difflugia sp.										
Oscillateria sp.										
Ceratoneis arcus										
TOTAL	506		306		507		609		505	

TABLE 16 CONTINUED

STATION	5 - 7		7 - 8		8 - LR		Total	
Species	N	%	N	%	N	%	N	%
Tabellaria flocculosa	201	26.5	109	15.3	274	35.0	1165	24.8
Tabellaria fenestrata	103	13.6	95	13.3	178	22.7	615	13.1
nauplii (Copepoda)	104	13.7	104	14.6	58	7.4	604	12.9
Asterionella formosa	66	8.7	165	23.1	112	14.3	567	12.1
Koilicottia longispina	70	9.2	31	4.3	37	4.7	451	9.6
Cyclops bicuspidatus thomasi	67	8.8	49	6.9	21	2.7	446	9.5
Conochilus unicornis	11	1.5	29	4.1	13	1.7	167	3.6
Epischura nevadensis	16	2.1	13	1.8	7	0.9	111	2.4
Dinobryon divergens	59	7.8	21	2.9	15	1.9	111	2.4
Synedra rumpens	18	2.4	12	1.7	8	1.0	87	1.9
Bosmina coregoni	5	0.7	5	0.7	6	0.8	63	1.3
Anhanizomenon (?) sp.	6	0.8	18	2.5	13	1.7	48	1.0
Cyclotella bodanica	10	1.3	5	0.7	10	1.3	41	0.9
Cyclotella stelligera	5	0.7	3	0.4	2	0.3	34	0.7
Spirogyra sp.	4	0.5	7	1.0	10	1.3	32	0.7
Coelothaca (?) sp.	6	0.8	1	0.1	3	0.4	21	0.5
Synedra ulna	1	0.1	6	0.8	1	0.1	20	0.4
Fragilaria crotononsis			19	2.7			19	0.4
Polyarthra euryptera	4	0.5	2	0.3			16	0.3
Campylodiscus noricus			9	1.3	4	0.5	14	0.3
Fragilaria construens							11	0.2
Navicula radiosa	1	0.1	3	0.4	3	0.4	8	0.2
Surirella sp.			3	0.4	4	0.5	8	0.2
Fragilaria virescens							7	0.2
Holopedium gibberum	1	0.1					7	0.2

TABLE 16 CONTINUED

STATION	5 - 7		7 - 8		8 - LR		Total	
Species	N	%	N	%	N	%	N	%
Cocconeis placentula			3	0.42	1	0.1	5	0.11
Cymbella sp.							2	0.04
Eunotia maior					1	0.1	2	0.04
Nitzschia sp.							1	0.02
Surirella (Flexuosae) sp.							1	0.02
Closterium sp.	1	0.1					1	0.02
Achnanthes flexella			1	0.1			1	0.02
Frustulia sp.			1	0.1			1	0.02
Difflugia sp.					1	0.1	1	0.02
Oscillatoria sp.					1	0.1	1	0.02
Ceratoneis arcus					1	0.1	1	0.02
TOTAL	759		714		784		4690	

TABLE 17

SPECIES COUNTS (N) AND PERCENTAGE ABUNDANCES OF INDIVIDUALS COUNTED IN VERTICAL PLANKTON HAULS FROM LAKELSE LAKE

The last column on the right represents total counts and percentages for all 6 samples

STATION	1		2		3		4		5		8		Total	
Species	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Tabellaria fenestrata	13	10.2	8	3.5	45	21.4	12	9.2	61	29.1	44	27.9	183	17.2
Tabellaria flocculosa	2	1.6	50	21.7	19	9.0	28	21.5	56	26.7	11	7.0	166	15.6
nauplii (Copepoda)	22	17.2	31	13.5	37	17.6	23	17.7	21	10.0	8	5.1	142	13.3
Cyclops bicuspidatus thomasi	32	25.0	34	14.8	35	16.7	11	8.5	21	10.0	5	3.2	138	12.9
Kellicottia longispina	4	3.1	31	13.5	16	7.6	20	15.4	9	4.3	14	8.9	94	8.8
Conochilus unicornis	19	14.8	23	10.0	23	11.0	13	10.0	9	4.3	6	3.8	93	8.7
Asterionella formosa			21	9.1	13	6.2	4	3.1	9	4.3	44	27.9	91	8.5
Epischura nevadensis	21	16.4	9	3.9	8	3.8	3	2.3	9	4.3			50	4.7
Bosmina coregoni	9	7.0	5	2.2	4	1.9	2	1.5			4	2.5	24	2.3
Cyclotella bodanica	1	0.8	10	4.4	6	2.9	2	1.5	5	2.4			24	2.3
Cyclotella stelligera	2	1.6	1	0.4			5	3.9	2	1.0	1	0.6	11	1.0
Placoma (?) sp.											12	7.6	12	1.1
Synedra rumpens							3	2.3	5	2.4			8	0.8
Collotheca (?) sp.	1	0.8			1	0.5	2	1.5			1	0.6	5	0.5
Holopedium gibberum	1	0.8	2	0.9	2	1.0							5	0.5
Synedra ulna							2	1.5			3	1.9	5	0.5
Spirogyra sp.			3	1.3									3	0.3
Campylodiscus noricus									1	0.5	1	0.6	2	0.2
Cocconeis placentula			1	0.4							1	0.6	2	0.2
Polyarthra curvipera	1	0.8											1	0.1
Closterium sp.			1	0.4									1	0.1
Rhopalodia gibba					1	0.5							1	0.1
Epithemia turgida									1	0.5			1	0.1
Navicula radiosa									1	0.5			1	0.1
Suirella elegans											1	0.6	1	0.1
Frustulia sp.											1	0.6	1	0.1
Aphanizomenon (?) sp.											1	0.6	1	0.1
TOTAL	128		230		210		130		210		158		1066	

TABLE 18

SUMMARY OF PHYTOPLANKTON AND ZOOPLANKTON COLLECTIONS

Horizontal Hauls

Station	1-2		2-3		3-4		4-5		5-6		5-7		7-8		8-LR	
	N	% Total	N	% Total	N	% Total	N	% Total	N	% Total	N	% Total	N	% Total	N	% Total
Zooplankton	230	45.5	228	74.5	293	57.8	252	41.4	220	43.6	284	37.4	234	32.8	146	18.6
Phytoplankton	276	54.5	78	25.5	214	42.2	357	58.6	285	56.4	475	62.6	480	67.2	638	81.4
TOTAL	506		306		507		609		505		759		714		784	

Vertical Hauls

Station	1		2		3		4		5		8	
	N	% Total	N	% Total	N	% Total	N	% Total	N	% Total	N	% Total
Zooplankton	110	85.9	135	58.7	126	60.0	74	56.9	69	32.9	50	31.6
Phytoplankton	18	14.1	95	41.3	84	40.0	56	43.1	141	67.1	108	68.4
TOTAL	128		230		210		130		210		158	

6. BACTERIOLOGICAL ANALYSIS OF LAKELSE LAKE

Preliminary sampling sequences in 1973 indicated an area of significantly elevated bacterial populations in the vicinity of the hotspring canal. In 1974 however, following the completed installation of a submerged outfall line into the lake, elevated values in this area dropped substantially, to the extent that concentrations throughout the lake were uniform. All samples collected in 1974 were well below the logarithmic average of 240 MPN $(100\ ml)^{-1}$ and as such are considered to pose no health hazard.

7. TROPHIC LEVEL

Historically Lakelse Lake has been classified as eutrophic, primarily on the basis of physical features such as mean depth and dissolved oxygen concentration. While it is well established that many lakes with mean depths less than 10 meters are rich in nutrients, and characterized by high productivity levels, (Rawson, 1955), Lakelse Lake does not follow this classical pattern. In actual fact nutrient levels in this system are very low, generally within the range of values normally encountered within an oligotrophic lake. Reference to Table 19 shows the comparative trophic levels and water quality of a number of lakes in British Columbia. From the criteria of total phosphorus, total nitrogen, organic carbon, inorganic carbon and chlorophyll "a", Lakelse Lake is undeniably at a low level of productivity. While the lake is relatively shallow, and subject to considerable enrichment, the very high flushing rate appears to be effectively preventing an excessive accumulation of nutrients. As such, it is incorrect to catagorize Lakelse Lake as eutrophic.

8. SUMMARY

Lakelse Lake is a relatively shallow (mean depth 7.9 meters), warm temperature lake. The lake supports significant salmonoid populations, providing both recreational and commercial fishery. Extensive recreational activity is augmented by substantial residential development. Thermal stratification is poorly defined throughtout the summer months, due primarily to strong prevailing wind action. Overall nutrient concentrations are very low, below levels normally considered potentially dangerous. Relatively short water retention (flushing rate 6 times yearly) appears to be effectively preventing extensive nutrient buildup. Nutrient levels in this study are slightly lower than an earlier Federal Study, reflecting in part the differences in sampling locations. Total nitrogen, total phosphorus, total organic carbon and total inorganic carbon levels were within the range of values customarily associated with an oligotrophic lake. Extensive sampling for chlorophyll "a" revealed that algae populations were present in low numbers. Limited plankton sampling indicated similarly low levels. It is suspected that overall productivity is low.

D.H.G. Ableson,
REGIONAL BIOLOGIST.
Pollution Control Branch,
North Region

April 30, 1976

TABLE 19

COMPARISON OF WATER CHEMISTRY OF VARIOUS BRITISH COLUMBIA LAKES

	Lakelse Lake 1974	Kathlyn[1] Lake 1973	Okanagan[2] Lake 1970 - 71	Wood[2] Lake 1970 - 71	Kalamalka[2] Lake 1970 - 71
Color (Tac)	13.				
Color (True)	16.				
Suspended Solids	9.				
Dissolved Solids	38.				
Specific Conductance	49.	51.			
Alkalinity (Total)	20.4	20.1			
Hardness (Total	19.7	18.8			
Turbidity	10.	6.6			
pH	7.1 - 7.6	6.6 - 7.6			
Total Phosphorus	.016	.035	.03	.25	.01
Ortho Phsophorus	< .003	.009			
Total Nitrogen	.14	.40	.21	.49	.13
Organic Nitrogen	.07	.30			
Ammonia Nitrogen	.01	.10			
NO_2/NO_3 Nitrogen	.03	<.02			
Organic Carbon	4.	8.2	8.9	11.7	7.5
Inorganic Carbon	4.	5.2	23.6	30.4	34.
Average Chlorophyll "a"	2.4 $\mu g l^{-1}$		5.	50.	2.5
		Eutrophic	Oligotrophic	Eutrophic	Oligotrophic

(1) Buchanan, et al, 1974.
(2) Northcote, et al, 1974.

9. LIST OF REFERENCES

Alderice, D.F. 1946. A study of the limnetic net plankton of Lakelse Lake B.C. B.A. thesis, Department of Zoology, University of B.C.

Boughey, A.S. 1961. Ecology of Populations. Colleir - McMillan. Toronto.

Brett, J.R. 1950. The physical limnology of Lakelse Lake, B.C. J. Fish. Res. Bd Canada. 8: 82 - 102.

Buchanan, R.J., and B.R. Baillie. 1974. Investigation of the Condition of Kathlyn Lake, with Suggestions for Rehabilitation. Water Investigation Branch, B.C. Government.

Cleve-Euler, A. 1951-53. Die Diatomein Non Schiveden and Finnland. Bibliotheca Phycologia (1968 Reprint), Tiel 1 - 5, 1104pp.

Dillon, P.J. 1975. The phosphorus budget of Cameron Lake, Ontario : The importance of flushing rate to the degree of eutrophy of lakes. Limnol. Oceanogr. 20 : 28 - 39.

Dillon, P.J. and F.H. Rigler. 1975. A simple method for predicting the capacity of a lake for development based on lake trophic status. J Fish. Res. Bd Canada. 32 : 1519 - 1531.

Edmondson, W.T. (ed) 1959. Freshwater Biology, 2nd edition. H.B. Ward and G.C. Whipple. John Wiley & Sons, N.Y. 1248pp.

Fuhs, G.W., S.W. Demmeric, E. Canelli, M. Chen. 1972. Characteristics of phosphorus limited plankton algae. p. 113 - 134. In G.E. Likens (ed) Nutrients and Eutrophication. Limnol. Oceanogr. Spec. Symp. No. 1.

Hutchinson, G.E. 1957. A Treatice on Limnology. V. 1 Wiley. 1015pp.

Larkin, P.A. and T.G. Northcote. 1958. Factors in lake typology in B.C., Canada. Limnol. 13 : 252 - 263.

Laboratory Manual for the Chemical Analysis of Waters, Wastewaters and Biological Tissue. 1973. Environmental Laboratory, Department of Water Resources, Province of B.C.

McMahon, V.H. 1954. The abundance and distribution of eutomostracan plankton at Lakelse Lake, B.C., 1949 - 1952. J. Fish. Res. Bd Canada. 11 : 470 - 499.

Northcote, T.G., and J.G. Stockner. 1974. Recent Limnological Studies of Okanagan Basin Lakes and their Contribution to Comprehensive Water Resources Planning. J. Fish. Res. Bd. Canada. 31 : 955 - 976.

Patallas, K. 1972. Crustacean plankton and the eutrophication of St Lawrence Great Lakes. J. Fish. Res. Bd. Canada. 29 : 1451 - 1462.

Patrick, R., and C.W. Reimer. 1966. Diatoms of the U.S., Exclusive of Alaska and Hawaii. Vol. 1. Academy of Natural Sciences of Philadelphia. Monographs. No. 13, 688pp.

Pennak, R.W. 1953. Freshwater Invertebrates of the U.S. Ronald Press Co. N.Y. 769 pp.

Prescott, G.W. 1962. Algae of the Western Great Lakes Area (Rev. Ed.) Wm. C. Brown Co. Iowa. 977 pp.

Rawson, D.S. 1955. Morphometry as a dominant factor in the productivity of large lakes. Limnol. 12 : 164 - 175.

Rawson, D.S. 1960. A limnological comparison of twelve large lakes in Northern Saskatchewan. Limnol. Oceanogr. 5 : 195 - 211.

Sakamoto, M. 1966. Primary production by phytoplankton communities in some Japanese lakes and its dependance upon lake depth. Arch. Hydrobiol. 62 : 1 - 28.

Sawyer, C.N. 1947. Fertilization of lakes by agricultural and urban drainage. New England Water Works Assoc. 61 : 109 - 127.

Schindler, D.W., and J.E. Nighswander. 1970. Nutrient supply and production in Clear Lake, eastern Ontario. J. Fish. Res. Bd. 27 : 2009 - 2036.

Schindler, D.W., F.A.J. Armstrong, S.K. Holmgrer, and G.J. Brinskill. 1971. Eutrophication of Lake 227, Experimental Lakes Area, Northwestern Ontario, by the addition of phosphate and nitrate. J. Fish. Res. Bd. Canada. 28 : 1763 - 1782.

Schindler, D.W. 1974. Eutrophication and recovery in experimental lakes : implications for lake management. Science 184 : 897 - 898.

Sinclair, W.F. 1974. The Case of Lakelse Lake. Fisheries and Marine Service Publ. 196 pp.

Standard Methods for the Examination of Water and Wastewater. 13th ed. 1971. American Public Health Assoc.

Tiffany, L.H. and M.E. Bretton. 1952. The Algae of Illinois. Hafner Pub. Co., N.Y. 407 pp.

Volleweider, R.A. 1968. The Scientific basis of lake and stream eutrophication, with particular reference to phosphorus and nitrogen as eutrophication factors. Tech. Rep. OECD. Daris. DAS / CSI 68, 27 : 1 - 182.

Volleweider, R.A., and P.J. Dillon. 1974. The application of the phosphorus loading concept to eutrophication research. NRCC NO. 13690.

Water Quality Criteria. 1968. U.S. Department of the Interior.

Wilson, M.S. 1959. Key to Freshwater Calanoid Copepods of Washington (mimeograph).

APPENDICES

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400305

Station #1 Surface

Y	Date M	D	Time H M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	09	1200	0		.02		.03	.05	.006	.006				7.4		
73	07	12	1130	0										13.			
73	07	13	1215	0								9.7					
74	05	08	0815	0	.01	.04	.09	.10*	.14	.011	.011			5.	7.5		
74	06	19	1000	0	<.005	.02	<.01	<.01	.02	.004	.004		1.0		7.4	42.	1.
74	07	16	1050	0	.013	<.02	.08	.09	.09	<.003	.006	10.0		10.	7.4	32.*	2.
74	08	20	1030	0	<.005	<.02	.04	.04	.04	<.003	.007				7.5	38.*	2.
74	11	20	1000	0							.022		11.			36.	9.
74	12	10	1050	0	.024	.03	.13	.15	.18	<.003	.018		7.8		7.1	44.*	6.

Site Number 0400306

Station #1 Bottom

Y	Date M	D	Time H M	Depth (ft.)													
73	07	09	1215	16		.02		.07	.09		.006				7.2		
73	07	13	1220	10								9.5					
74	05	08	0820	13	.01	.05	.06	.07*	.12		.008				7.3		
74	06	19	1000	16	.005	.03	<.01	<.01	.04		.015	10.7	3.5		7.2	36.	8.
74	07	16	1055	16	<.005	<.02	<.01	<.01	<.01	<.003	.006	9.8			7.2	32.*	2.
74	08	20	1030	17	.005	<.02	.14	.14	.14	<.003	.007				7.4	39.*	3.
74	11	20	1005	10							.023		12.			36.	9.
74	12	10	1055	18	.022	.03	.32	.34	.37	<.003	.108		32.		7.1	44.*	88.

* Calculated Value

LAKELSH LAKE WATER QUALITY TEST RESULTS

Site Number 0400305

Station #1 Surface

Date Y	M	D	Time H	M	Depth (ft.)	Color (Pac)	Color (True)	Specific Conductance (umho cm^{-1})	Total Alkalinity (meq^{-1})	Total Hardness (meq^{-1})	Organic Carbon ($mg\,l^{-1}$)	Inorganic Carbon (meq^{-1})	Chlorophyll "a"* ($\mu g\,l^{-1}$)	Temperature @ Sampling (°C)
73	07	09	1200		0						2.			15.5
74	05	08	0815		0						5.			7.
74	05	09	1000		9								2.4 (M)	
74	06	19	1000		0	11.		58.	22.5		3.	4.	2.1 (M)	10.
74	06	19	1000		16								2.1 (M)	
74	07	16	1050		0	9.	10.	49.	19.5	18.9	3.	3.		
74	07	18	1135		0								2.7 (M)	
74	07	18	1135		15								2.6 (M)	
74	08	06	1020		0								2.4 (M)	
74	08	20	1030		0	3.	5.	50.	19.7	19.3	1.	5.		
74	08	21	0915		0								3.6 (M)	
74	08	21	0915		9								2.0 (M)	
74	11	20	1000		0	15.	20.	48.		19.2	5.			5.
74	12	10	1050		0	20.	20.	56.	1.0	20.2	4.	5.		

Site Number 0400306

Station #1 Bottom

Date Y	M	D	Time H	M	Depth (ft.)	Color (Pac)	Color (True)	Specific Conductance (umho cm^{-1})	Total Alkalinity (meq^{-1})	Total Hardness (meq^{-1})	Organic Carbon ($mg\,l^{-1}$)	Inorganic Carbon (meq^{-1})	Chlorophyll "a"* ($\mu g\,l^{-1}$)	Temperature @ Sampling (°C)
73	07	09	1215		16						2.			15.
73	07	13	1220		10									14.
74	05	08	0820		13						2.			6.5
74	06	19	1000		16	3.5		48.			3.	3.		10.
74	07	16	1055		16		15.	46.	18.5	18.3	<1.	4.		
74	08	20	1030		17		10.	50.	19.7	19.0	1.	5.		
74	11	20	1005		10	12.	20.	48.		19.2	5.			5.
74	12	10	1055		18	32.	20.	56.	21.0	20.2	12.	5.		

* All chlorophyll "a" values entered on Pollution Control Branch data base under surface site identification number

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400307

Station #2 Surface

Y	Date M	Date D	Time H M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	09	1300	0		.02		.02	.04		.005				7.3		
73	07	12	1200	0										13.			
73	07	13	1325	0								9.8					
74	05	08	0825	0	<.005	.05	.09	.09*	.14		.007			7.	7.4		
74	06	19	1010	0	<.005	.02	.01	.01	.03		.004		1.0		7.5	42.	<1.
74	07	16	1110	0	<.005	<.02*	.05	.05	.05	<.003	.005	10.1		12.	7.4	31.*	1.
74	08	20	1230	0	<.005	<.02*	.30	.30	.30	<.003	.004				7.4	36.*	1.
74	11	20	1010	0							.023		12.			38.	9.
74	12	10	1110	0	.028	.03	.11	.14	.17	<.003	.018		7.4		7.2	41.*	5.

Site Number 0400308

Station #2 Intermediate

Y	Date M	Date D	Time H M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	09	1320	33		.02		.03	.05		.005				7.3		
74	05	08	0835	30	<.01	.05	.12	.12*	.17		.008				7.5		
74	06	19	1010	25	<.005	.03	<.01	<.01	.03		.007	10.5			7.3	40.	1.
74	07	16	1115	26	<.005	<.02*	<.01	<.01	<.01	<.003	.005	9.9			7.4	31.*	1.
74	08	20	1230	30	<.005	<.02*	.03	.03	.03	<.003	.005				7.4	37.*	1.
74	11	20	1020	25							.022					36.	9.
74	12	10	1115	15	.019	.04	.04	.06	.10	<.003	.017				7.2	41.*	5.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400307

Station #2 Surface

Y	Date M	Date D	Time H M	Depth (ft.)	Color (Tac)	Color (True)	Specific Conductance (umho cm^{-1})	Total Alkalinity (mgl^{-1})	Total Hardness (mgl^{-1})	Organic Carbon (mgl^{-1})	Inorganic Carbon (mgl^{-1})	Chlorophyll "a" (μgl^{-1})	Temperature @ Sampling (°C)
73	07	09	1300	0						2.			14.
74	05	08	0825	0						3.			7.
74	05	09	1100	36								3.2 (M)	
74	05	09	1610	0								3.0 (M)	
74	06	19	1010	0	12.		58.	22.5		4.	3.	2.1 (M)	12.5
74	06	19	1010	49								2.2 (M)	
74	07	16	1110	0	6.	15.	47.	18.5	18.3	2.	3.		
74	07	18	1205	0								2.7 (M)	
74	07	18	1205	32								2.1 (M)	
74	08	06	1030	0								2.1	
74	08	20	1230	0	3.	10.	48.	19.4	18.9	< 1.	6.		
74	08	21	0930	0								2.5 (M)	
74	09	21	0930	30								2.2 (M)	
74	11	20	1010	0	17.	20.	48.		19.2	7.			5.
74	12	10	1110	0	20.	20.	52.	20.5	19.9	5.	4.		

Site Number 0400308

Station #3 Intermediate

Y	Date M	Date D	Time H M	Depth (ft.)	Color (Tac)	Color (True)	Specific Conductance (umho cm^{-1})	Total Alkalinity (mgl^{-1})	Total Hardness (mgl^{-1})	Organic Carbon (mgl^{-1})	Inorganic Carbon (mgl^{-1})	Chlorophyll "a" (μgl^{-1})	Temperature @ Sampling (°C)
73	07	09	1320	33						2.			13.3
74	05	08	0835	30						2.			
74	06	19	1010	25	12.		54.			3.	4.		11.0
74	07	16	1115	26	7.	15.	46.	18.5	18.3	2.	3.		
74	08	20	1230	30	3.	10.	49.	19.3	18.9	< 1.	6.		
74	11	20	1020	25	17.	20.	48.		19.2	5.			5.
74	12	10	1115	15	20.	20.	51.	19.8	19.5	4.	4.		

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400309
Station #2 Bottom

Y	Date M	Date D	Time H M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-2})	Suspended Solids (mgl^{-1})
73	07	09	1200	76		.03*		.02	.05		.005				7.2		
74	05	08	1245	65	< .01	.05	.16	.16*	.21		.009	9.6			7.5		
74	06	19	1010	49	< .005	.02	.03	.03	.05		.011	10.8	3.2		7.4	38.	6.
74	07	16	1120	49	< .005	< .02*	.01	.01	.01	< .003	.013	10.2			7.5	33.*	7.
74	08	20	1230	65	< .005	< .02*	< .01	< .01	< .01	< .003	.005				7.4	34.*	2.
74	11	20	1030	55							.219		86.			36.	162.
74	12	10	1105	30	.023	.03	.18	.20	.23	< .003	.096		32.		7.2	43.*	67.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number				0400309	Color (Tac)	Color (True)	Specific Conductance	Total Alkalinity	Total Hardness	Organic Carbon	Inorganic Carbon	Chlorophyll "a"	Temperature @ Sampling
Station #2				Bottom									
Y	Date M	D	Time H M	Depth (Ft.)			($\mu mho\ cm^{-1}$)	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(μgl^{-1})	(°C)
73	07	09	1200	76						2.			12.1
74	05	08	1245	65						4.			
74	06	19	1010	49	12.		55.			3.	3.		11.
74	07	16	1120	49	8.	15.	46.	19.0	18.3	2.	3.		
74	08	20	1230	65	2.	10.	49.	19.1	18.9	< 1.	6.		
74	11	20	1030	55	17.	20.	48.		19.2	10.			5.
74	12	10	1105	30	20.	20.	51.	20.5	20.1	8.	4.		

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400310

Station #3 Surface

Y	Date M	Date D	Time H	Time M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	09	1530		0		.02		.05	.07		.006	10.4		13.	7.4		
74	05	08	0900		0	< .01	.05	.07	.07*	.12		.008			7.	7.4		
74	06	19	1045		0	< .005	.02	< .01	< .01	.02		.003		0.9		7.4	42.	1.
74	07	16	1130		0	< .005	.02*	.09	.09	.11	< .003	.003	10.1		10.	7.3	31.*	1.
74	08	20	1320		0	< .005	< .02*	.04	.04	.04	< .003	.005				7.4	35.*	1.
74	11	20	1035		0							.023		11.			36.	9.
74	12	10	1135		0	.021	.03	.11	.13	.16	< .003	.018		7.6		7.3	44.*	4.

Site Number 0400311

Station #3 Intermediate

Y	Date M	Date D	Time H	Time M	Depth (ft.)													
73	07	09	1530		16		.03		.04	.07		.005				7.3		
73	07	13	1435		16								10.2					
74	05	08	0915		25	< .005	.05	.11	.11*	.16		.007				7.5		
74	06	19	1025		29			< .01	< .01	.02		.005						
74	06	19	1045		17	< .005	.02						10.9	1.0		7.4	40.	1.
74	07	16	1135		18	< .005	.02*	.07	.07	.09	< .003	.004	9.9			7.4	37.*	1.
74	08	20	1320		25	< .005	< .025	.05	.05	.05	< .003	.004				7.4	37.*	1.
74	11	20	1040		15							.022		11.			36.	9.
74	12	10	1145		10	.021	.03	.02	.04	.07	< .003	.018		7.9		7.3	46.*	4.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400310 Station #3 Surface					Color (Tac)	Color (True)	Specific Conductance	Total Alkalinity	Total Hardness	Organic Carbon	Inorganic Carbon	Chlorophyll "a"	Temperature & Sampling
Y	Date M	D	Time H M	Depth (ft.)			($\mu mho\ cm^{-1}$)	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(μgl^{-1})	(°C)
73	07	09	1530	0						2.			14.
74	05	08	0900	0						2.			
74	05	09	1545	0								2.9 (M)	
74	05	09	1550	0								3.1 (M)	7.
74	06	19	1025	29								1.9 (M)	
74	06	19	1045	0	11.		59.	22.5		4.		2.0 (M)	12.
74	06	19	1045	18								2.0	
74	07	16	1130	0	7.	10.	47.	19.0	18.5	< 1.			
74	07	18	1215	0								2.1 (M)	
74	07	18	1215	32								2.6 (M)	
74	08	06	1040	0								2.2	
74	08	20	1320	0	2.	10.	49.	18.9	18.8	1.			
74	08	21	0925	0								2.8 (M)	
74	08	21	0925	21								2.4	
74	11	20	1035	0	15.	30.	48.		19.4	5.			5.
74	12	10	1135	0	18.	20.	53.	21.2	20.6	4.			

Site Number 0400311 Station #3 Intermediate													
Y	Date M	D	Time H M	Depth (ft.)									
73	07	09	1530	16						2.			14.
74	05	08	0915	25						3.			
74	06	19	1045	17	13.	15.	56.	22.1		4.	3.		11.5
74	07	16	1135	18	5.	10.	47.	18.5	18.3	2.	3.		
74	08	20	1320	25	2.	30.	49.	19.0	19.4	< 1.	6.		5.
74	11	20	1040	15	18.	15.	48.		19.2	5.			
74	12	10	1145	10	17.		53.	21.0	20.6	4.	4.		

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400312
Station #3 Bottom

Y	Date M	D	Time H	M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	09	1600		33		.02		.04	.06		.005				7.3		
73	07	13	1440		30								9.8					
74	05	08	0930		45	<.01	.04	.07	.04*	.11		.022				7.4		
74	06	19	1045		29	<.005	.03	<.01	<.01	.03		.005	10.8	1.3		7.4	40.	1.
74	07	16	1140		29	<.005	.03*	.05	.05	.08	<.003	.005	10.2			7.2	38.*	2.
74	08	20	1320		50	<.005	<.02*	<.01	<.01	<.01	<.003	.005				7.4	36.*	2.
74	11	20	1050		30	.024	.03					.022		12.			38.	9.
74	12	10	1140		21			.10	.12	.15	<.003	.069		26.		7.3	42.*	46.

* Calculated Value

11
2.2

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400312 Station #3 Bottom					Color (Tac)	Color (True)	Specific Conductance	Total Alkalinity	Total Hardness	Organic Carbon	Inorganic Carbon	Chlorophyll "a"	Temperature @ Sampling
Date Y	M	D	Time H M	Depth (Ft.)			($\mu mho\ cm^{-1}$)	($mg l^{-1}$)	($mg l^{-1}$)	($mg l^{-1}$)	($mg l^{-1}$)	($\mu g l^{-1}$)	(°C)
73	07	09	1600	33						2.			14.
74	05	08	0930	45						9.			
74	06	19	1045	29	12.		52.	20.5		3.	3.		11.
74	07	16	1140	29	6.	10.	47.	19.0	18.5	2.	3.		
74	08	20	1320	50	2.	10.	48.	19.1	19.2	1.	3.		
74	11	20	1050	30	12.	30.	48.		19.4	5.			5.
74	12	10	1140	21	26.	20.	52.	21.2	20.6	12.	4.		

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400313

Station #4 Surface

Date Y	M	D	Time H	M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	11	1350		0		.02		< .01	.02		.006	10.6		13.	7.4		
74	05	08	0940		0	< .01	.04	.06	.06*	.10		.007			6.5	7.4		
74	06	19	1115		0	.005	.02	.04	.05	.07		.004	10.3	0.9		7.5	40.	1.
74	07	16	1200		0	< .005	.02*	(.01	< .01	.02	< .003	.003			11.	7.4	37.*	1.
74	08	21	0945		0	< .005	< .02*	.06	.06	.06	< .003	.005				7.4	33.*	1.
74	11	20	1100		0							.022		11.			36.	9.
74	12	10	1150		0	.02	.03	.04	.06	.09	< .003	.017		8.4		7.3	43.*	5.

Site Number 0400314

Station #4 Intermediate

Date Y	M	D	Time H	M	Depth (ft.)													
73	07	11	1340		10		.03		< .01	.03		.007				7.5		
74	05	08	1000		18	< .01	.04	.07	.07*	.11		.007				7.6		
74	06	19	1115		15	.005	.02	.05	.06	.06	.08	.006	10.8	1.0		7.5	42.	1.
74	07	16	1210		15	< .005	.02*	< .01	< .01	.02	< .003	.004				7.4	37.*	1.
74	08	21	0945		17	< .005	< .02*	.14	.14	.14	< .003	.005				7.5	33.*	1.
74	11	20	1110		13							.022		11.			38.	
74	12	10	1200		8	.026	.03	.05	.08	.11	< .003	.017		8.2		7.3	42.*	4.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400313
Station #4 Surface

Date Y	M	D	Time H M	Depth (ft.)	Color (Tac)	Color (True)	Specific Conductance (umho cm^{-1})	Total Alkalinity (mgl^{-1})	Total Hardness (mgl^{-1})	Organic Carbon (mgl^{-1})	Inorganic Carbon (mgl^{-1})	Chlorophyll "a" (μgl^{-1})	Temperature of Sampling (°C)
73	07	11	1350	0						4.			14.5
74	05	08	0940	0						4.			7.
74	05	09	1515	18								2.3 (M)	
74	05	09	1535	0								3.0 (M)	
74	06	19	1115	0	12.		57.	22.5		3.		2.2 (M)	13.5
74	06	19	1115	15							4.	1.8 (M)	
74	07	16	1200	0	7.	15.	47.	18.5	18.5	2.	3.		
74	07	18	1230	0	5.			19.3	19.1	< 1.		2.3 (M)	
74	07	18	1230	14								2.1 (M)	
74	08	06	1055	0								3.7 (M)	
74	08	21	0945	0		5.	49.				5.	3.7 (M)	17.
74	08	21	0945	18								2.6	
74	11	20	1100	0	19.	30.	48.		19.2	5.			5.
74	12	10	1150	0	19.	20.	52.	20.8	20.6	4.	4.		

Site Number 0400314
Station #4 Intermediate

Date Y	M	D	Time H M	Depth (ft.)									
73	07	11	1340	10						4.			14.
74	05	08	1000	18						1.			
74	06	19	1115	15	12.		58.	22.5		4.	3.		13.
74	07	16	1210	15	9.	10.	47.	18.5	18.5	2.	3.		
74	08	21	0945	17	6.	5.	49.	19.3	18.9	< 1.	6.		17.
74	11	20	1110	13	15.	20.	48.		19.2	4.			5.
74	12	10	1200	8	17.	20.	52.	21.	20.6	4.	4.		

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400315																	
Station #4 Bottom					Ammonia Nitrogen	NO_2/NO_3 Nitrogen	Organic Nitrogen	Total Kjeldahl Nitrogen	Total Nitrogen	Dissolved Phosphorus	Total Phosphorus	Dissolved Oxygen	Turbidity	Extinction Depth	pH	Dissolved Solids	Suspended Solids
Y	Date M	D	Time H	M	Depth (ft.)	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(JTU)	(ft.)		(mgl^{-1})	(mgl^{-1})
73	07	11	1330		15		.02		<.01	.02		.007				7.4		
73	07	13	1530		30								10.					
74	05	08	1010		30	<.005	.04	.08	.08*	.12		.007	10.4			7.6		
74	06	19	1115		26	.005	.02	.05	.06	.08		.013		3.2		7.5	44.	5.
74	07	16	1220		26	<.005	.02*	.05	.05	.07	<.003	.005				7.4	33.*	1.
74	08	21	0940		33	<.005	<.02*	.18	.18	.18	<.003	.006	9.9			7.4	32.*	2.
74	11	20	1115		25							.022		11.			38.	7.
74	12	10	1155		15	.014	.03	.21	.22	.25	<.003	.152		40.		7.3	45.*	105.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number			0400315		Color (Tac)	Color (True)	Specific Conductance	Total Alkalinity	Total Hardness	Organic Carbon	Inorganic Carbon	Chlorophyll "a"	Temperature @ Sampling
Station #4			Bottom										
Y	Date M	D	Time H M	Depth (ft.)			(umho cm^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(μgl^{-1})	(°C)
73	07	11	1330	15						4.			14.
74	05	08	1010	30									
74	06	19	1115	26	13.		57.	22.5		4.	3.		13.
74	07	16	1220	26	7.	15.	47.	18.5	18.5	2.	3.		
74	08	21	0940	33	9.	5.	48.	19.3	18.9	< 1.	6.		17.
74	11	20	1115	25	16.	20.	48.		19.3	4.			5.
74	12	10	1155	15	18.	20.	52.	21.1	20.6	7.	4.		

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400316

Station #5 Surface

Y	Date M	Date D	Time H M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	11	1400	0		.03		.05	.08		.006	10.2		13.	7.4		
74	05	08	1030	0	< .005	.04	.09	.09*	.13		.007			6.5	7.5		
74	06	19	1145	0	.007	.03	.02	.03	.06		.004		0.9		7.5	42.	1.
74	07	16	1230	0	< .005	< .02*	< .01	< .01	< .01	< .003	.004	9.9		10.	7.4	35.*	1.
74	08	21	1005	0	< .005	< .02*	.12	.12	.12	< .003	.005				7.4	35.*	1.
74	11	20	1120	0							.022		11.			40.	7.
74	12	10	1205	0	.02	.03	.06	.08	.11	< .003	.017		8.3		7.3	48.*	6.

Site Number 0400317

Station #5 Bottom

Y	Date M	Date D	Time H M	Depth (ft.)													
73	07	11	1415	16		.02		.05	.07		.006	10.1			7.4		
74	05	08	1040	30	< .01	.04	.08	.08*	.12		.007				7.6		
74	06	19	1145	20	< .005	.02	< .01	< .01	.02		.004	11.1	1.0		7.4	38.	1.
74	07	16	1235	21	< .005	< .02*	< .01	< .01	< .01	< .003	.004	9.8			7.4	33.*	1.
74	08	21	1010	25	< .005	< .02*	.18	.18	.18	< .003	.005				7.4	33.*	1.
74	11	20	1125	15							.022		11.			40.	8.
74	12	10	1210	10	.015	.03	.17	.18	.21	< .003	.071		24.		7.3	42.*	46.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400316

Station #5 Surface

Y	Date M	D	Time H M	Depth (ft.)	Color (Tac)	Color (True)	Specific Conductance (umho cm^{-1})	Total Alkalinity (mgl^{-1})	Total Hardness (mgl^{-1})	Organic Carbon (mgl^{-1})	Inorganic Carbon (mgl^{-1})	Chlorophyll "a" (μgl^{-1})	Temperature ° Sampling (°C)
73	07	11	1400	0						4.			14.
74	05	08	1030	10									7.
74	05	09	1440	15								2.9 (M)	
74	05	09	1455	0						5.		2.2 (M)	
74	06	19	1145	0	12.		58.	22.5		3.	4.	2.2 (M)	13.
74	06	19	1145	21								2.7 (M)	
74	07	16	1230	0	8.	15.	47.	18.5	18.5	3.	3.		
74	07	18	1255	0								2.6 (M)	
74	07	18	1255	10								2.4 (M)	
74	08	06	1105	0								2.7 (M)	
74	08	21	1005	0	6.	<5.	48.	19.3	19.1	4.	1.	2.3	17.
74	08	21	1010	12								2.9 (M)	
74	11	20	1120	0	18.	20.	49.		19.5	3.			4.5
74	12	10	1205	0	18.	15.	52.	20.5	20.5	4.	4.		

Site Number 0400317

Station #5 Bottom

Y	Date M	D	Time H M	Depth (ft.)									
73	07	11	1415	16						4.			14.
74	05	08	1040	30						<1.			
74	06	19	1145	20	12.		52.	20.3		3.	3.		8.5
74	07	16	1235	21	8.	10.	47.	18.5	18.5	3.	3.		
74	08	21	1010	25	6.	5.	48.	19.3	18.9	4.	1.		17.
74	11	20	1125	15	18.	20.	50.		20.2	4.			4.
74	12	10	1210	10	19.	20.	53.	21.0	20.6	6.	4.		

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400318

Station #6 Surface

Y	Date M	Date D	Time H M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	11	1345	0		.03		.39	.42		.064	10.1			7.0		
74	05	08	1100	0	< .01	.04	.15	.15*	.19		.007			6.5	7.3		
74	06	19	1155	0	< .005	.02	.27	.27	.29		.003	10.1	1.0		7.5	42.	1.
74	07	16	1310	0	< .005	< .02*	< .01	< .01	< .01	< .003	.004			10.	7.4	31.*	1.
74	08	21	1045	0	< .005	< .02*	.01	.01	.01	< .003	.005				7.4	33.*	1.
74	11	20	1130	0							.019		9.5			46.	8.
74	12	10	1215	0	.03	.07	.10	.13	.20	< .003	.014		4.5		7.0	49.*	3.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400318 Station #6 Surface					Color (Pac)	Color (True)	Specific Conductance	Total Alkalinity	Total Hardness	Organic Carbon	Inorganic Carbon	Chlorophyll "a"*	Temperature @ Sampling
Y	Date M	D	Time H M	Depth (ft.)			($\mu mho\ cm^{-1}$)	($meq\ l^{-1}$)	($mg\ l^{-1}$)	($mg\ l^{-1}$)	($mg\ l^{-1}$)	($\mu g\ l^{-1}$)	(°C)
73	07 11		1345	0						7.			14.
74	05 08		1100	0						4.			8.
74	05 09		1420	8								3.2 (M)	
74	06 19		1155	0	12.		58.	22.3		4.	3.	2.0	14.
74	06 19		1155	11								2.0 (M)	
74	07 16		1310	0	9.	10.	47.	18.5	18.5	3.	3.	2.4 (M)	
74	07 18		1330	12								2.7 (M)	
74	08 06		1200	0								2.3	
74	08 21		1045	0	6.	5.	49.	19.3	18.9	5.	1.	2.4	16.
74	08 21		1045	9								2.8	
74	11 20		1130	0	18.	30.	57.		19.6	4.			4.
74	12 10		1215	0	32.	40.	55.	16.	17.7	6.	4.		

LAKEISE LAKE WATER QUALITY TEST RESULTS

Site Number 0400319

Station #7 Surface

Y	Date M	Date D	Time H	Time M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	11	1115		0		.02		.02	.04		.007	10.0		13.	7.4		
74	05	08	1110		0	< .01	.05	.09	.09*	.14		.007			6.5	7.5		
74	06	19	1210		0	< .005	.02	.29	.29	.31		.004	10.9	1.0		7.5	50.	1.
74	07	16	1255		0	< .005	.02*	< .01	< .01	.02	< .003	.003			9.5	7.5	31.*	1.
74	08	21	1030		0	< .005	< .05*	.20	.20	.20	< .003	.005				7.4	35.*	1.
74	11	20	1135		0							.022		11.			42.	9.
74	12	10	1220		0	.029	.03	.07	.10	.13	< .003	.016		6.4		7.2	43.*	3.

Site Number 0400320

Station #7 Bottom

Y	Date M	Date D	Time H	Time M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	11	1130		10		.02		.03	.05		.006	10.0			7.5		
74	05	08	1115		15	.005	.05	.07	.08	.13		.031				7.4		
74	06	19	1210		10	< .005	< .02	.15	.15	.15		.005	10.3	0.8		7.5	48.	2.
74	07	16	1300		10	< .005	< .02*	< .01	< .01	< .01	< .003	.003				7.4	53.	1.
74	08	21	1035		10	< .005	< .02*	.04	.04	.04	< .003	.006				7.4	34.	2.
74	11	20	1140		10							.022		11.			44.	8.
74	12	10	1225		13	.017	.03	.17	.19	.22	< .003	.025		11.		7.3	53.	13.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400319 / Station #7 Surface					Color (Tac)	Color (True)	Specific Conductance	Total Alkalinity	Total Hardness	Organic Carbon	Inorganic Carbon	Chlorophyll "a" *	Temperature @ Sampling
Y	Date M	D	Time H M	Depth (ft.)			(μmho cm^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(mgl^{-1})	(μgl^{-1})	(°C)
73	07	11	1115	0						3.			14.
74	05	03	1110	0						3.			8.
74	05	09	1410	5								3.0 (M)	
74	06	19	1210	5								2.2 (M)	
74	06	19	1210	0	12.		66.			4.	4.		14.
74	07	16	1255	0	9.		46.	18.5	18.0	3.	3.		
74	07	18	1320	0								2.4 (M)	
74	08	05	1145	0								2.4 (M)	
74	08	21	1030	0	5.		49.	19.3	19.1	4.	1.		15.
74	08	21	1035	0								2.4 (M)	
74	11	20	1135	0	19.		54.		20.9	3.			4.5
74	12	10	1220	0	28.		55.	21.0	21.1	5.	4.		

Site Number 0400320 / Station #7 Bottom													
Y	Date M	D	Time H M	Depth (ft.)									
73	07	11	1130	10						4.			15.
74	05	03	1115	15						2.			
74	06	19	1210	10	12.		62.	24.3		4.	4.		14.
74	07	16	1300	10	8.	10.	46.	18.5	18.3	3.	3.		
74	08	21	1035	10	6.	5.	49.	19.3	19.1	3.	2.		15.
74	11	20	1140	10	20.	30.	53.		21.4	4.			5.
74	12	10	1225	13	26.	30.	55.	20.7	21.1	7.			

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400321

Station #8 All Depths

Y	Date M	Date D	Time H M	Depth (ft.)	Ammonia Nitrogen (mgl^{-1})	NO_2/NO_3 Nitrogen (mgl^{-1})	Organic Nitrogen (mgl^{-1})	Total Kjeldahl Nitrogen (mgl^{-1})	Total Nitrogen (mgl^{-1})	Dissolved Phosphorus (mgl^{-1})	Total Phosphorus (mgl^{-1})	Dissolved Oxygen (mgl^{-1})	Turbidity (JTU)	Extinction Depth (ft.)	pH	Dissolved Solids (mgl^{-1})	Suspended Solids (mgl^{-1})
73	07	11	1230	0		.10		.01	.11		.007	10.5		13.5	7.5		
74	05	08	1125	15	<.01	.03	.10	.10	.13		.009						
74	06	19	1220	13	<.005	.02	.10	.10	.12		.005	10.0	1.3		7.5		
74	06	19	1310	0								9.7					
74	07	16	1245	13	<.005	<.02	<.01	<.01	<.01	<.003	.004			9.5	7.6	46.*	2.
74	07	18	1310	9											7.7	37.	1.
74	08	21	1025	10	<.005	<.02	.19	.19	.19	<.003	.006				7.5	41.*	1.
74	11	20	1155	0							.020		11.			44.	7.
74	12	10	1235	0	.015	.03	.12	.13	.16	<.003	.016		6.8		7.3	48.*	4.

* Calculated Value

LAKELSE LAKE WATER QUALITY TEST RESULTS

Site Number 0400321
Station #8 Surface

Y	Date M	Date D	Time H M	Depth (ft.)	Color (Tac)	Color (True)	Specific Conductance (umho cm^{-1})	Total Alkalinity (mgl^{-1})	Total Hardness (mgl^{-1})	Organic Carbon (mgl^{-1})	Inorganic Carbon (mgl^{-1})	Chlorophyll "a"* (μgl^{-1})	Temperature @ Sampling (°C)
73	07	11	1230	4						3.			14.2
74	05	08	1125	15						4.			9.
74	05	09	1140	10								2.6 (M)	
74	05	09	1340	0								3.3 (M)	
74	06	19	1220	13	12.		69.	22.8		4.	3.	2.0 (M)	14.
74	07	16	1245	13	10.	10.	55.	23.0	21.8	3.			
74	07	18	1310	0								2.4 (M)	
74	07	18	1310	9								2.7 (M)	
74	08	06	1130	0								2.9 (M)	
74	08	21	1025	0								2.6	
74	08	21	1025	10	7.	5.	59.	24.6	25.1	4.	2.		15.
74	11	20	1155	0	18.	30.	51.	20.1		4.			4.5
74	12	10	1235	0	22.	20.	55.	20.4	20.7	4.	4.		

LAKELSE LAKE TEMPERATURE PROFILES

July 9, 1973		June 19, 1974	
Station # 2		Station # 2	
Depth (meters)	Temperature (°C)	Depth (meters)	Temperature (°C)
1	14	1	12.5
2	14	2	12.0
3	14	3	11.5
4	14	4	11.5
5	14	5	11.5
6	13.8	6	11.5
7	13.5	7	11.4
8	13.5	8	11.5
9	13.5	9	11.4
10	13.3	10	11.4
11	13.5	11	11.3
12	13.5	12	11.2
13	13.5	13	11.2
14	13.3	14	11.1
15	12.9	15	11.0
16	12.7	16	11.0
17	12.5	17	11.0
18	12.3	18	11.0
19	12.2	19	11.0
20	12.1	20	11.0
21	12.0		
22	11.8		
23	11.8		
24			