Environment Canada
Environnement Canada

Environmental Conservation

94

THE CHEMICAL and MICROBIOLOGICAL LIMNOLOGY of WOOD LAKE, B.C., 1980

Steve Jasper
and
Colin B.J. Gray

Inland Waters Directorate
Pacific and Yukon Region
Vancouver, B.C.

The Chemical and Microbiological Limnology of Wood Lake, B.C., 1980

Steve Jasper
and
Colin B.J. Gray

National Water Research Institute
Inland Waters Directorate
Pacific and Yukon Region
4160 Marine Drive
West Vancouver, B.C.

April 1982

ABSTRACT

Jasper, S. and C.B.J. Gray. 1982. The chemical and microbiological limnology of Wood Lake, B.C., 1980. Inland Waters Directorate, Vancouver, B.C.

This report describes a small limnological study of Wood Lake, B.C. carried out in 1980 by the National Water Research Institute, Pacific and Yukon Region.

At a mid-lake station the temporal distributions of temperature, light extinction, dissolved oxygen, nutrients, metals, chlorophyll a, ATP, phytoplankton species composition, phosphorus turnover time and alkaline phosphatase activity were determined. In addition, a survey of the spatial distribution of dissolved oxygen and nutrients in the bottom water was completed in September and sediment cores were obtained from the mid-lake station.

On the basis of water clarity, oxygen depletion rates, N to P ratios and phytoplankton biomass and species composition, Wood Lake in 1980 was found to be mildly eutrophic. During the year the dissolved forms of silica, nitrogen and phosphorus were all reduced to very low levels in the epilimnion of the lake by phytoplankton uptake and, in the case of phosphorus, probably by co-precipitation with marl. Dissolved oxygen was reduced to low levels at the sediment-water interface during the fall period. However, there was no evidence for co-release of phosphorus and iron from the sediments. There was no net internal loading of phosphorus between 1980 and 1981.

The sediment, which is rich in organic carbon and phosphorus, did not appear to significantly influence the bottom water concentrations of dissolved oxygen and nutrients in September.

Blue-green algae dominated the phytoplankton throughout the study although a spring diatom population most likely appeared prior to the study period. Evidence from phosphorus turnover times and alkaline phosphatase activities suggests that the annual yield of phytoplankton was ultimately controlled by phosphorus. Both silica and nitrogen, however, were probably responsible for determining the gross composition of the phytoplankton.

RESUME

Jasper, S. et C.B.J. Gray. 1982. La limnologie chimique et microbiologique du lac Wood, C.Br., 1980. Direction générale des eaux intérieures, Vancouver, C.Br.

Ce rapport décrit une petite étude limnologique du lac Wood en C.Br., éffectivée en 1980 par l'Institute nationale des recherches des eaux, Région du Pacifique et du Yukon.

A une station au milieu du lac, la distribution temporelle des températures, l'extinction de lumière, l'oxygène dissout, les substances nutritives, les métaux, la chlorophylle a, l'ATP, la composition des espéces phytoplanctoniques, le temps d'écoulement de phosphore ainsi que l'activité de l'alcaline phosphatase furent determinés. De plus une enquête de la distribution spatiale d'oxygène dissout et des substances nutritives de l'eau près du fond du lac fut completée en septembre et des carrottes de sédiments furent obtenues de la station au milieu du lac.

D'après la clarté de l'eau, le taux d'épuisement d'oxygène, les rapports de N: P ainsi que la biomasse et la composition des espèces phytoplanctoniques, le lac Wood, en 1980, etait légèrement eutrophique. Durant l'année, l'état dissout de silice, d'azote et de phosphore fut réduit à des niveaux très bas dans l'épilimnion du lac par l'absorption des phytoplanctons et dans le cas du phosphore, probablement par la co-précipitation avec la marne. Durant l'autonne, l'oxygène dissout fut réduit à des niveaux très bas au point de contact d'eau et du sédiment. Tontefois, il n'y avait pas d'évidence pour supporter la co-libération du phosphore et du fer provenant des sédiments. Il n'y avait pas de chargement intérieur nette de phosphore entre 1980 et 1981.

Le sédiment qui est riche en carbone et en phosphore organique n'a pas paru influencer, d'un manière significative, les concentrations d'oxygène dissout et les substances nutritives d'eau profonde en septembre.

L'alque vert-bleu dominait le phytoplancton durant toute l'étude, quoique, une population de diatomée de printemps apparue probablement avant le début de l'étude. L'évidence du temps d'écoulement de phosphore et d'activité de l'alcaline phosphatase suggére que la production annuelle de phytoplancton est enfin de compte dirigé par le phosphore. Toutefois, le silice et l'azote furent sans doute à la fois responsable pour déterminer la composition brute de phytoplancton.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1 Objective

A limnological study of Wood Lake, B.C. was conducted during 1980. It was funded, in part, by the Okanagan Basin Implementation Board. Previous studies (e.g. Canada - British Columbia Okanagan Basin Agreement, Technical Supplement V, 1974; Kalamalka - Wood Lake Basin Water Resource Management Study, 1974) have established the eutrophic nature of the lake and several recommendations for improving the water quality have been put forward (Kalamalka - Wood Lake Basin Water Resource Management Study, 1974). The impetus for the present study was the need to assess the present limnology and to investigate several options, including aeration, as methods to improve the lake's trophic condition.

This report summarizes the limnological data gathered during the course of the 1980 study. The water quality trends over the last decade and future management options (including further monitoring) are discussed in a separate report (Gray and Jasper, 1982).

1.2 Acknowledgements

We would like to thank the staff of NWRI Branch, Pacific and Yukon Region, without whom this report would not be possible: Vivian Chamberlain, Ray Kirkland and Kelly Suzuki who collected and analysed much of the data; Eric Marles for coordinating and maintaining field support; and Drs. Ralph Daley, Max Bothwell and Chris Pharo and Ron Wiegand for advice, general assistance and criticism of this report. The special efforts of Eric Michnowski and Gordan Kan of the Water Quality Branch, and John Keays are gratefully acknowledged.

2. SAMPLE COLLECTION

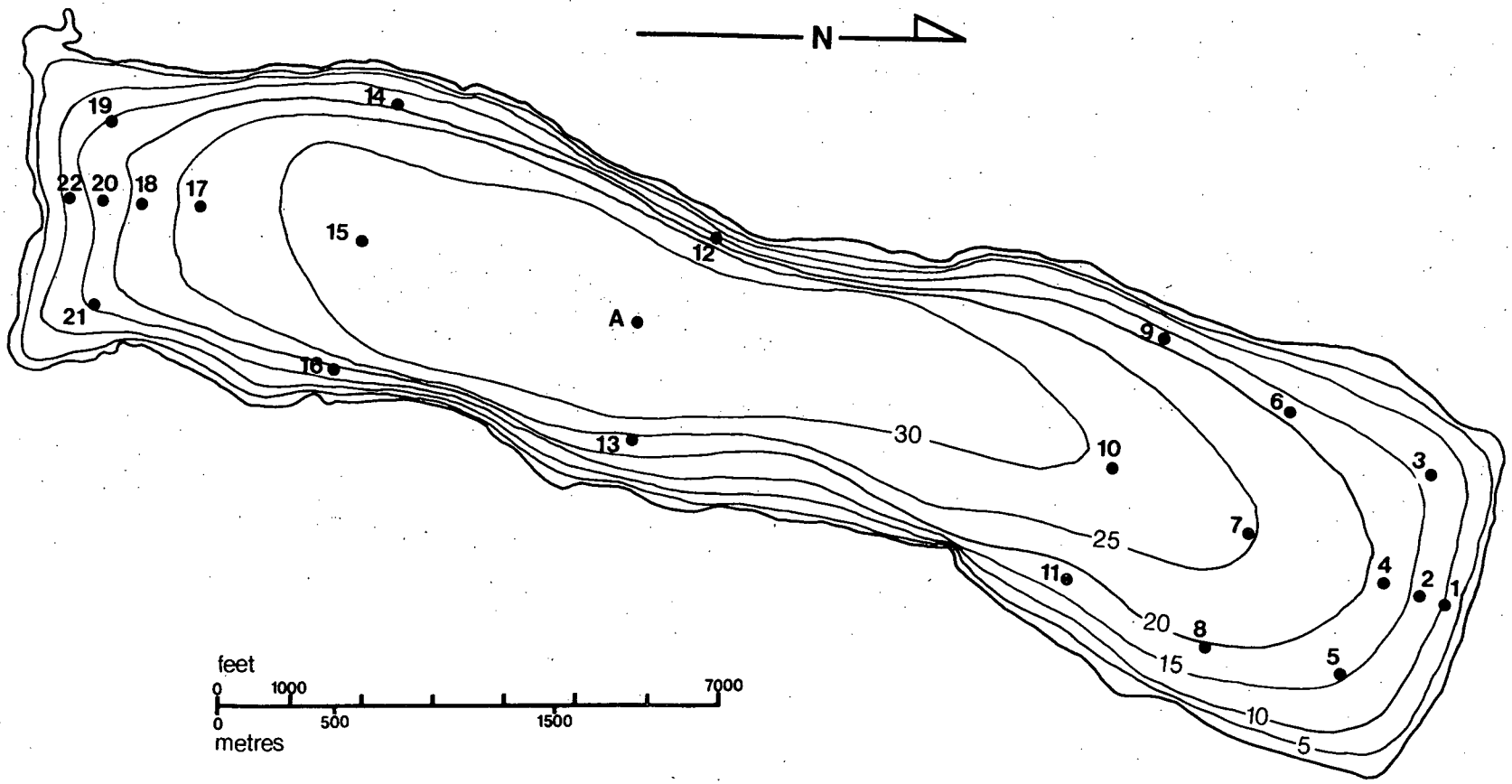
Samples were collected for chemical analyses between April 10, 1980 and March 11, 1981 and for biological analyses between May 29, 1980 and October 21, 1980. Measurements of temperature and light extinction were also gathered between April 10, 1980 and November 11, 1980.

Water samples, from a mid-lake station (Station A, Figure 1), were collected from discrete depths (6 for biology and between 8 and 12 for chemistry) using 8 litre Niskin bottles. The chemistry sampling depths were chosen with reference to the temperature profile. Glass B.O.D. bottles were filled (for oxygen and inorganic carbon analyses) and the water samples then screened through 110 μm nitex mesh to remove zooplankton and placed in plastic bottles. All bottles were kept in cool chests for transportation to the NWRI field laboratory in Vernon, usually within 2 to 4 hours. Sample preparation (filtration, preservation, etc.), most biological analyses and some chemical analyses were performed in the laboratory during the same day. Further chemical analyses were conducted at the NWRI laboratory in West Vancouver and at the Water Quality Branch, Inland Waters Directorate, North Vancouver.

3. ANALYTICAL METHODS

3.1 Physics

A temperature, conductivity, depth sensor (Hydrolab) was used to collect temperature measurements at one metre intervals down to 20 metres and two metre intervals thereafter. Heat content for each 2 metre layer was determined from the temperature and volume of each layer of the lake. The specific areal heat content for the whole lake, expressed as calories per square centimetre, was then obtained from the integral of these individual values divided by the lake's surface area.



contour at 5 metre intervals

Figure 1 Bathymetry of Wood Lake showing sampling stations.

Light penetration of photosynthetically active radiation (PAR) was determined using a Licor quantum sensor. Measurements at one metre intervals, from the surface to 12 metres, were used to determine extinction coefficients by linear regression of the natural log (% surface light) with depth. Extinctions have been converted to 1% light levels, and for ease of comparison to earlier studies, have also been converted to secchi depths using the relationship (Vollenweider, 1974):

$$\text{secchi depth (m)} = \frac{2.2}{\text{extinction (ln units)}}$$

3.2 Chemistry

Samples for nitrogen and phosphorus analyses were filtered through Sartorius cellulose acetate membrane filters with a 0.45 micron nominal pore size (SM 11106). Particulate carbon and nitrogen samples were obtained by collection of the particulates on pre-roasted Whatman GF/F glass fiber filters. Analyses for all other variables were done on unfiltered samples. The subsamples were cooled in a refridgerator and shipped in cooler chests to the Water Quality Branch laboratory in North Vancouver.

Most chemical analyses were accomplished by the methods described in the Water Quality Branch Analytical Methods Manual (IWD, 1981). Soluble reactive phosphorus was analyzed by the stannous chloride reduction method at the NWRI laboratory, whereas the total and dissolved phosphorus were analyzed by the method utilizing ascorbic acid reduction after persulphate digestion at the Water Quality laboratory. Total inorganic carbon (TIC) samples were collected in 100 ml glass reagent bottles and analyzed using the helium headspace analysis technique on a gas chromatograph (Stainton, 1973). Dissolved oxygen (DO) analyses were done on duplicate samples with the azide modified Winkler Technique. The TIC analyses were done within 8 hours of collection, while the DO analyses were accomplished within 24 hours, both in the field laboratory.

3.3 Geochemistry

Sediment cores were collected at station A (Figure 1) with a triple benthos corer (Kemp et al., 1971). The 50 cm core tubes were retrieved with approximately 30 cm of sediment and with the sediment-water interface undisturbed. The cores were extruded vertically on shore within an hour of collection. Core subsamples were frozen in plastic bags and freeze dried within 2 weeks on a Labconco freeze drier.

The carbon analyses were done with a Leco Induction Furnace for samples below 3 cm (Chemex Labs Ltd., North Vancouver) and with a Hewlett-Packard CHN analyzer for the 0 to 3 cm interval (Water Quality Branch, North Vancouver).

Phosphorus concentrations in 1N HCl extracts of treated sediments were measured colourimetrically on ascorbic acid reduced molybdate complexes. Different treatments of three subsamples provided extracts which represented total P, total inorganic P and apatite P. Total P was measured in the 1N HCL extract from roasted sediment (550°C). Total inorganic P was measured in the 1N HCL extract of unroasted sediment. Apatite P was measured in the 1N HCL extract of sediment which had been extracted initially with a citrate-dithionite-bicarbonate buffer and then with 1N NaOH. This fractionation scheme is essentially the method of Williams (1976).

3.4 Biology

Investigations centred around the distribution, composition and nutrient limitation of the phytoplankton.

3.4.1 Phytoplankton biomass

Three independent measures of biomass were obtained; chlorophyll a, adenosine triphosphate (ATP) and total cell volumes.

For chlorophyll a determinations, 25 mL aliquots were filtered through 0.2 µm, 47 mm Nuclepore filters and extracted

in 90% acetone with the aid of a Polytron homogenizer. Each extract was then filtered through a Whatman GF/F filter and analysed using a Turner Designs fluorometer. Readings taken before and after acidification with HCl enabled the estimation of a phaeopigments in addition to chlorophyll a.

ATP was measured following the basic procedure of Holm-Hansen and Booth (1966) except that 25 mL aliquots were filtered through Millipore 0.45 µm instead of glass-fibre filters. The efficiency of ATP extraction was determined by periodic 'spikes' (100 µL) of a stock solution of ATP (1 $mg \cdot L^{-1}$) into replicate extractions. When cool, the extracts were frozen and later analysed using the highly purified luciferin-luciferase enzyme from Dupont (Markham, Ontario) together with an Aminco Chem-glow photometer. The values shown are means of three replicates, with an average standard deviation of 15%.

Total cell volumes were calculated from measurements of cell volumes and abundance of individual species (see below) with the aid of a Hewlett-Packard 9845A computer.

3.4.2 Phytoplankton species composition and abundance

Samples (usually 250 mL) were preserved with Lugol's iodine solution in the field. They were then transported back to Vancouver and enumerated by J. Keays, Powell River, B.C.

The counting procedure generally followed Utermöhl (1958). Samples were shaken and settled in 5 mL or 25 mL settling chambers for approximately 4 hours. They were then checked with a Wild M5 dissecting microscope for random distribution of cells and enumerated using a Wild M40 inverted microscope at 100 X and 400 X magnifications. For each sample over 200 cells were identified and counted. On those occasions where a single species dominated (for example July 18 and 23) as many as five counts were made of that species, on each of two settled aliquots, and the results averaged. For a count of 200 cells of a single species the standard deviation is approximately 15% (Lund et al, 1958).

For each species the dimensions of several cells (filaments or colonies) were determined and volumes calculated assuming standard geometric shapes. When cells from a particular species differed greatly in size then more than one size-class was established.

Estimates of the frequency of heterocysts were determined on those samples that were dominated by heterocystous cyanophytes. 500 cells were examined and the occurrence of heterocysts expressed as a percentage of the total cells.

3.4.3 Phytoplankton nutrient limitation

Several methods to assess nutrient limitation were performed five times during the study.

The ^{32}P uptake procedure followed that outlined by Lean and Rigler (1974). Aliquots of lake water were 'spiked' with carrier free $^{32}P\text{-}PO_4$ to give approximately 30,000 $dpm \cdot mL^{-1}$. The removal of isotope into the particulate phase was followed by 10mL filtrations onto Millipore 0.45μm filters at selected time intervals after 'spiking'. 10mLs of Aquasol-2 (New England Nuclear) were added to both the filters and filtrates and the samples were then shipped back to Vancouver for counting on a Beckman LS 330 liquid scintillation spectrometer.

Estimates of the uptake rate constant, k, for each sample, were obtained graphically from the average of both the filter and filtrate data sets. Turnover times were then calculated from the inverse of the uptake rate constants after first normalizing with respect to ATP.

Alkaline phosphatase determinations followed closely the fluorometric procedure described in Healey and Hendzel (1979). The rate of hydrolysis of o-methyl-fluorescein (MF), by alkaline phosphatase, was determined using a Turner Designs fluorometer (CS 5-60 primary filter, 2A12 and 1% neutral density secondary filters). Rates were converted to alkaline phosphatase activities, normalized with respect to ATP in the sample and expressed as nmole $MF \cdot hr^{-1} \cdot \mu g\ ATP^{-1}$.

The use of unlabelled nutrient uptake to examine nutrient limitation is outlined by Healey and Hendzel (1980). Either phosphorus (KH_2PO_4) or nitrogen (NH_4Cl) was added to the water sample (or 0.45µm filtered control) to give a final concentration of 10µM. The samples (in triplicate) were then incubated in the dark, at lake temperature, for approximately 24 hours. Aliquots were removed at the beginning and end of the incubation and filtered through Sartorius 0.45µm filters. For determination of P the filtrates were placed in 50mL acid-cleaned bottles and a few drops of chloroform added. For N determinations the filtrates were placed into 60mL acid-cleaned glass bottles with ground glass stoppers, ensuring no headspace or bubbles. The bottles were kept in a fridge prior to shipment to West Vancouver and analysis.

Uptake of either P or N was determined from the difference between the average 'zero-time' and '24 hour' measurements. The data was then normalized with respect to ATP and recorded as µmole (PO_4 or NH_4)$\cdot d^{-1} \cdot$µg ATP^{-1}.

4. PHYSICAL MEASUREMENTS

4.1 Temperature

Temperature data are given in Appendix 1. A depth vs. time isopleth of temperature is given in Figure 2 while Table 1 shows surface temperatures and epilimnion depths. Spring overturn and stratification preceded the first sampling in April. Surface temperatures continued to rise until late July reaching a maximum of 23°C. At this time a strong thermocline had been established between 10 and 18 metres. Since the profile on November 20, 1980 showed isothermal conditions from the surface to 18 metres, fall overturn in the lake probably occurred not long afterwards.

The temperature profile during September shows the

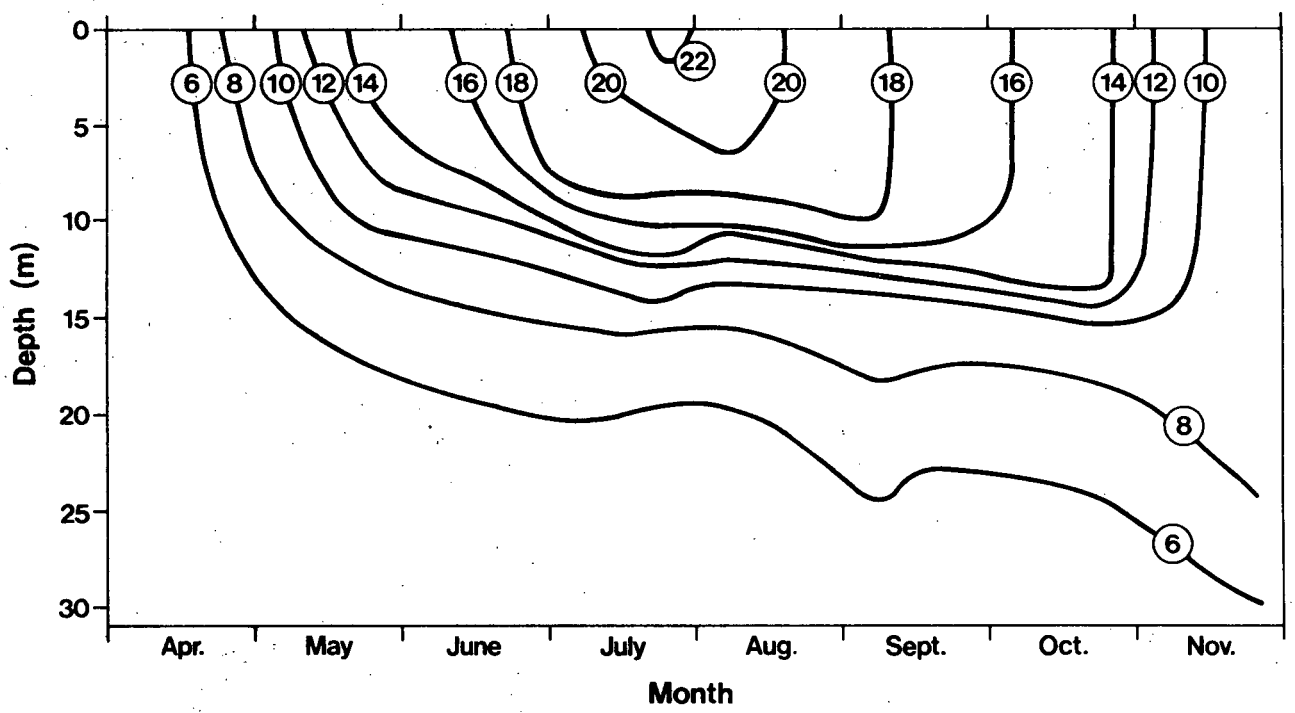


Figure 2 Wood Lake Temperature distribution (^{o}C), 1980.

possible occurrence of internal waves. Despite the fact that our sampling station was located approximately mid-lake, the morphology of the lake is such that this station may not represent the mid-point or 'node' for these internal waves (R. Wiegand, personal communication). Further studies using a mid-lake station should keep this point in mind, for example, when calculating heat budgets or oxygen deficits.

Table 1: Surface Temperatures and Epilimnion Depths of Wood Lake

Date	Surface Temperature (°C)	Epilimnion Depth (m)
10/4/80	4.8	-
26/5/80	14.5	5
3/7/80	19.5	5
18/7/80	20.5	7
23/7/80	23.0	8
6/8/80	21.0	8
3/9/80	18.5	10
16/9/80	18.0	11
21/10/80	13.5	14
20/11/80	8.0	>20

4.2 Heat Budget

The calculated heat contents for the whole lake and for the hypolimnion alone are shown in Table 2. The maximum whole-lake value encountered during the sampling was 28,900 cal•cm^{-2} on July 23. For comparison to earlier studies, the summer heat

income was calculated by subtracting the heat content of the lake at 4°C (8,580 cal•cm^{-2}) from this maximum value. The summer heat income in 1980 (Table 3) was similar to that found in 1972 and 1973, but considerably higher than in 1971. Blanton

Table 2: Heat Contents and Mean Temperatures of Wood Lake.

Date	Whole Lake		Hypolimnion*	
	cal•cm^{-2}	°C	cal•cm^{-2}	°C
26/09/79	28,000	13.0	5,900	6.6
10/04/80	9,700	4.5	4,020	4.5
29/05/80	20,750	9.7	4,770	5.3
23/07/80	28,900	13.5	4,860	5.4
04/09/80	28,000	13.0	5,840	6.5
21/10/80	24,600	11.5	4,790	6.1

* Hypolimnion boundary was 18 m except on 21/10/80 when it was 20 m

Table 3: Comparison of Summer Heat Incomes, 1971 to 1980, for Wood Lake.

Date	cal•cm^{-2}	Investigator
25/08/71	18,100	Blanton (1973)
02/08/72	20,500	B.C. Research (1974)
02/08/73	21,800	B.C. Research (1974)
23/07/80	20,300	This study

(1973) compared the heat budgets of all the Okanagan valley lakes for the summer of 1971 and concluded that the Wood lake value was too low for a lake of its volume. He postulated the existence of large groundwater inflows having temperatures of 10°C and entering the lake in the 10-12 m zone. Since the heat incomes for 1972, 1973 and 1980 are higher and closer to predicted values for a lake the size and location of Wood Lake, it is probable that the maximum heat content in 1971 occurred between monitors. Thus there is no need to postulate a large, cold input of groundwater to Wood Lake. This conclusion was first reached by the Water Investigations Branch (1974).

4.3 Light extinction

Light extinction values, with corresponding 1% light levels and calculated secchi depths, are given in Table 4. The water clarity of Wood Lake in 1980 was fair with a yearly average extinction of 0.361 m^{-1} and a secchi depth of 6.1 m.

Water clarity values throughout the year were not strongly correlated with algal biomass levels. Furthermore, there was only a twofold variation in extinction values despite large changes (over 40X) in surface chlorophyll levels.

To demonstrate the effect of algal biomass alone the results from July 18 and July 23 have been recalculated in Table 5. These were the only two dates that showed strong vertical algal heterogeneity together with light extinction profiles which deviated significantly from the normal exponential pattern. On both dates *Anabaena flos-aquae* dominated the phytoplankton. On July 18 the vertical heterogeneity of the algal bloom resulted in average chlorophyll values for the two intervals, 0 to 5 metres and 5 to 10 metres, differing by a factor of four. Extinction coefficients, however, showed only a twofold change. Conversely, on July 23, a large change in extinction was accompanied by only a small change in average chlorophyll. It is difficult, therefore, to relate historical variations in

Table 4: Light Extinction Parameters for Wood Lake.

Date	Extinction Coefficient (ln units•m^{-1})	1% light Level (m)	Secchi Depth (m)
29/5/80	0.272	16.9	8.1
3/7/80	0.268	17.2	8.2
18/7/80	0.376	12.3	5.9
23/7/80	0.517	8.9	4.3
6/8/80	0.308	15.0	7.1
3/9/80	0.334	13.8	6.6
16/9/80	0.491	9.4	4.5
21/10/80	0.318	14.5	6.9
Average	0.361 (± 0.095)	12.8	6.1

Table 5: Comparison of Wood Lake extinction coefficients and chlorophyll concentrations, July 18th and 23rd, 1980.

Date	Depth interval (m)	Extinction Coefficient (ln units•m^{-1})	Chlorophyll a average (mg•m^{-3})
18/7/80	0 to 5	0.466	25.5
18/7/80	5 to 10	0.222	5.9
23/7/80	0 to 5	0.679	7.7
23/7/80	5 to 10	0.397	5.2

light extinction to variations in algal biomass levels alone. Changes in species composition over the last decade (Gray and Jasper, 1982), for example, could have affected extinction levels as could changes in non-algal turbidity such as that entering the lake surface from stream freshets. For this reason the sizeable increases in water clarity observed over the last few years (Nordin, 1980) are not obviously coupled to decreases in algal concentration.

A further contributing factor is the possible decrease in the number of 'blooms' that have occurred during the summer. Since secchi depth measurements reflect the turbidity in the top few metres only, the occurrence of vertical heterogeneity in algal biomass in the epilimnion may result in larger decreases in secchi depth than expected for the same amount of biomass uniformly distributed in the water column. During a 'bloom' of cyanophytes, much of the biomass may be concentrated in the top few metres (e.g. July 18th). Thus the measured increases in water clarity over the last few years may be reflecting, to some extent, decreases in the frequency of these cyanophyte blooms.

5. CHEMICAL MEASUREMENTS

A complete list of chemical measurements is given in Appendices 2 and 3.

5.1 Distributions with depth and time

Figures 3 to 6 show the seasonal changes of several chemical parameters for the mid-lake station. These figures are drawn to show vertical mixing during fall overturn, which is assumed to have occurred at the end of November. Data from the last 1980 monitor, October 16 are used to calculate the fall overturn concentrations.

5.1.1 Dissolved oxygen

Dissolved oxygen decreased with depth in the hypolimnion during the stratified period, almost disappearing near the sediment-water interface during September and October (Figure 3). This depletion is probably due to respiration. In contrast, elevated oxygen concentrations occurred in the epilimnion and upper mesolimnion in April, May and July, presumably as a result of photosynthesis. The concentration at fall overturn was 7.1 $mg \cdot L^{-1}$. Although the sampling in winter was very limited, no indication of oxygen depletion was found in 1981. This was due to the absence of continuous ice cover in 1981. Previous winter samplings through ice, for instance in 1972 (Koshinsky & Stockner, 1972), showed considerable depletion near the bottom (< 2 $mg \cdot L^{-1}$).

5.1.2 Phosphorus

Total phosphorus (TP) at the start of the 1980 growing season was 85 $\mu g \cdot L^{-1}$ compared to approximately 80 $\mu g \cdot L^{-1}$ in 1981. In April, most of this TP was in the dissolved form (DP, Figure 4) of which over 85% was soluble reactive P (SRP). Particulate phosphorus (PP) generally varied between 5 and 15 $\mu g \cdot L^{-1}$. At these levels it contributed only a small percentage to the spring epilimnion TP, but over half to the summer and fall totals.

DP and its major constituent, SRP, both decreased during spring and summer in the epilimnion due to algal uptake. At the same time, increases occurred in the hypolimnion through phytoplankton sedimentation and regeneration together with the possible release of P from the sediments (see Section 5.2 below). SRP concentrations remained very low (1 to 2 $\mu g \cdot L^{-1}$) in the epilimnion from July through October; these levels are suggestive of possible phytoplankton P limitation.

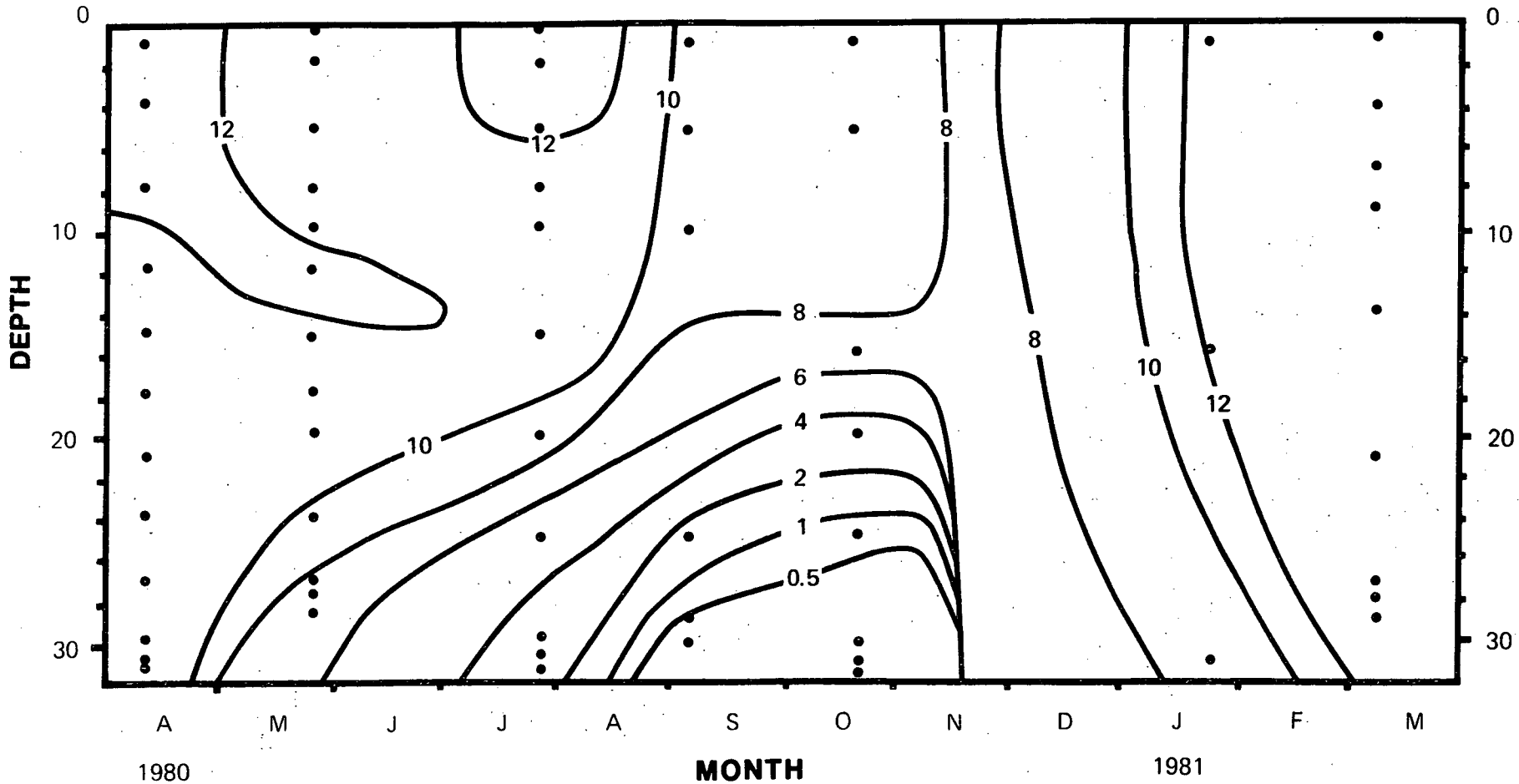


Figure 3 Time-depth diagram of dissolved oxygen concentrations ($mg \cdot L^{-1}$) in Wood Lake, 1980.

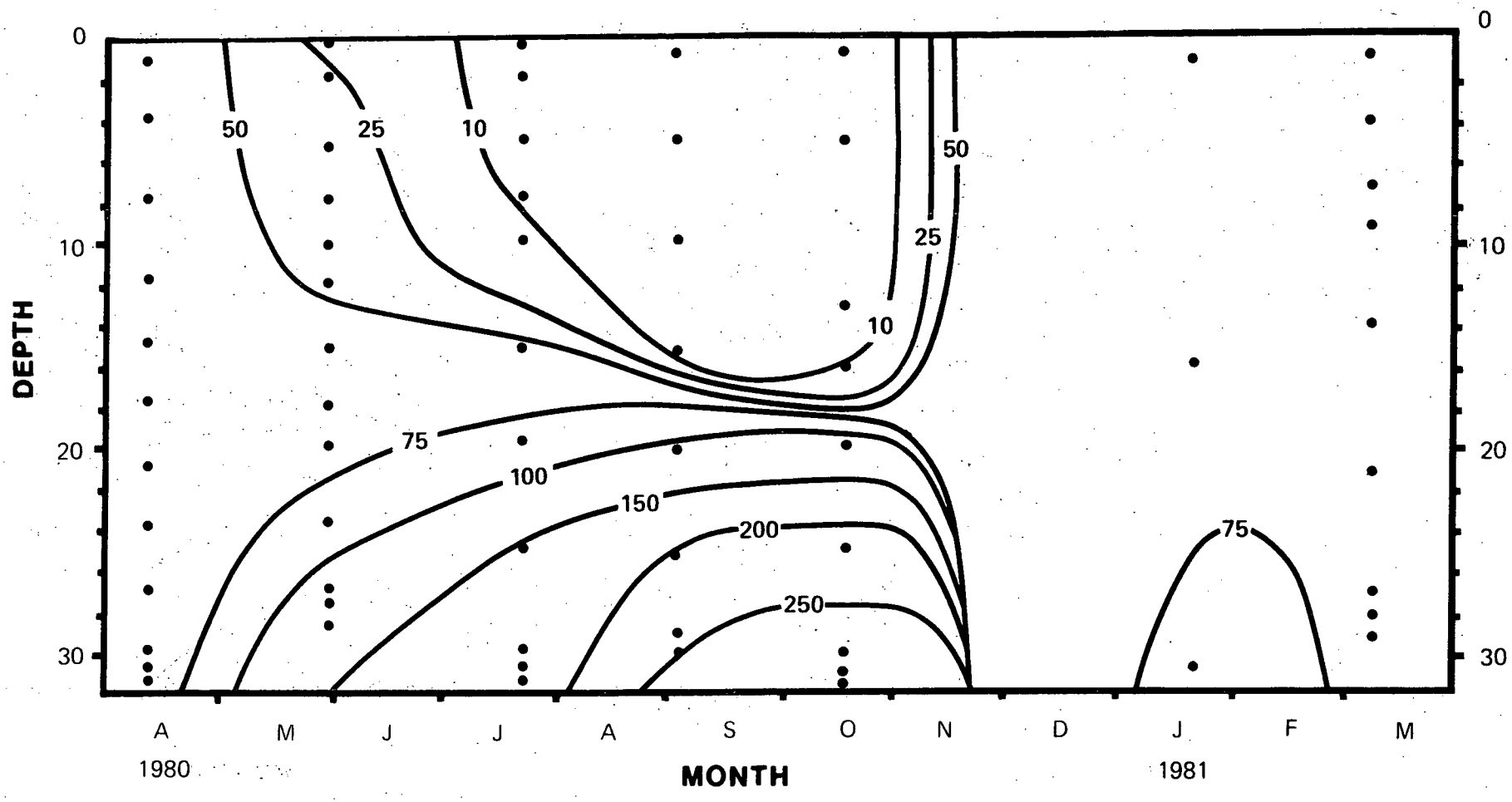


Figure 4 Time-depth diagram of dissolved phosphorus concentrations ($\mu gP \cdot L^{-1}$) in Wood Lake, 1980.

At fall overturn the concentration of DP was calculated to be 57 $\mu g \cdot L^{-1}$. In January 1981, however, the average concentration had increased to 71$\mu g \cdot L^{-1}$, a level similar to the 74$\mu g \cdot L^{-1}$ found in April 1980.

5.1.3 Nitrogen

The total nitrogen (TN) concentration at the start of the growing season was 570 $\mu g \cdot L^{-1}$ with the majority, 86%, in the dissolved form. Almost 40% of this dissolved nitrogen was inorganic (DIN), primarily nitrate. During the growing season nitrate decreased rapidly in the epilimnion to undetectable levels, remaining low until fall overturn except for occasional near surface increases in July and early September (Figure 5). In the hypolimnion, by contrast, there was an initial increase to maximum levels in July followed by a very strong depletion near the sediment-water interface in September and October. This seasonal pattern was presumably due to oxidation of regenerated ammonium to nitrate followed by denitrification of nitrate when anoxic conditions developed. The concentration of DIN at fall overturn was calculated to be 64 $\mu g \cdot L^{-1}$.

Ammonium concentrations were always low (<10 $\mu g \cdot L^{-1}$) in the epilimnion, but two episodes of ammonium build-up occurred in the hypolimnion (Figure 6). The first accumulation, in late May, occurred throughout the hypo- and mesolimnion and was presumably due to regeneration from decaying phytoplankton, grazing by zooplankton, or both. During July, this accumulation was oxidized to nitrate. When the oxygen was depleted and denitrification of nitrate commenced the release of ammonium from the sediments again accelerated (concentrations reached 500 $\mu g \cdot L^{-1}$ by mid-October). Ammonium concentrations did not rise appreciably above 22 m, presumably as a result of active oxidation to nitrate above this depth. The ammonia concentration at fall overturn was calculated to be 40 $\mu g \cdot L^{-1}$.

At the pH and temperature conditions of the bottom waters,

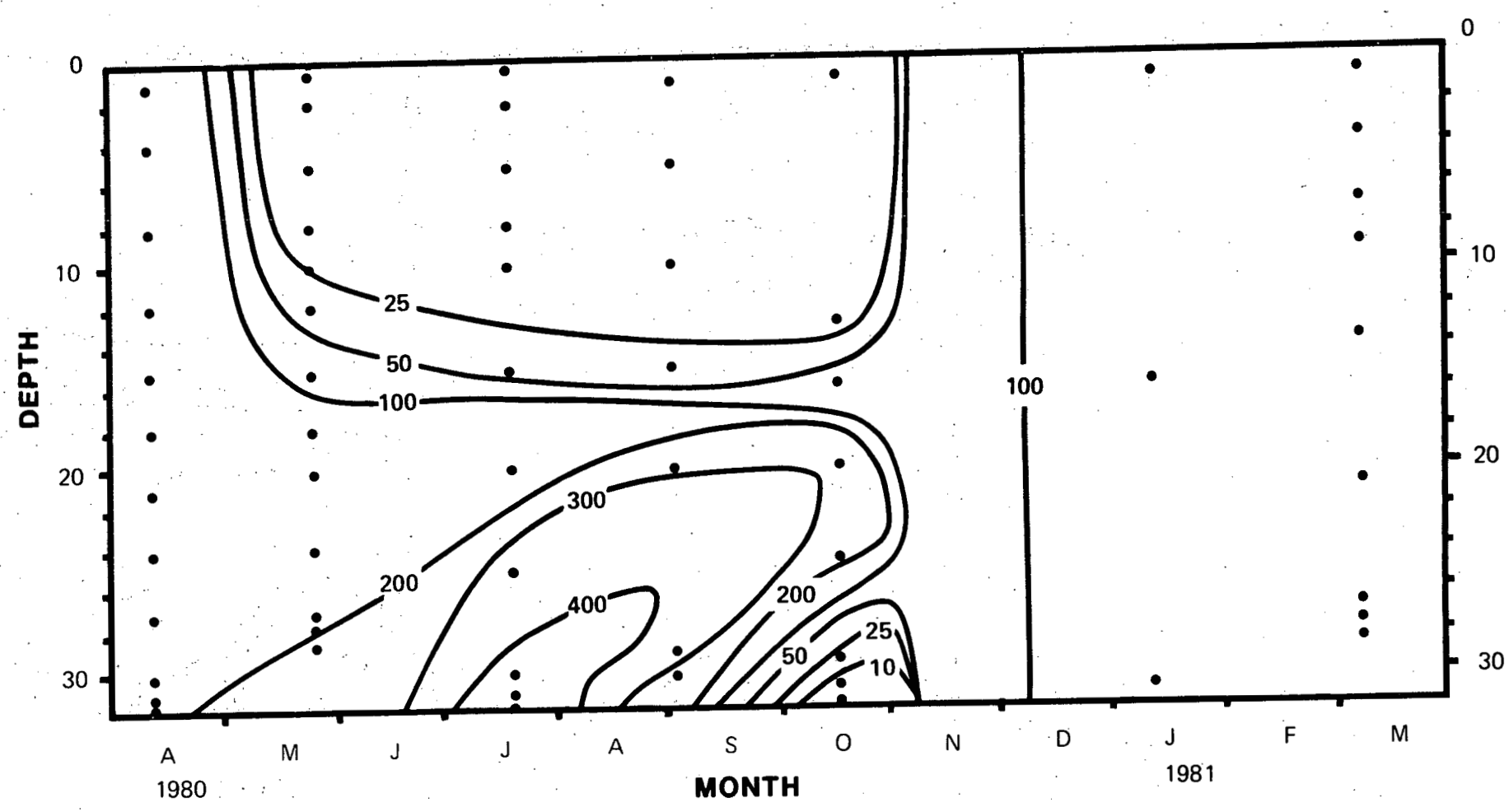


Figure 5 Time-depth diagram of nitrate plus nitrite concentrations ($\mu gN \cdot L^{-1}$) in Wood Lake, 1980.

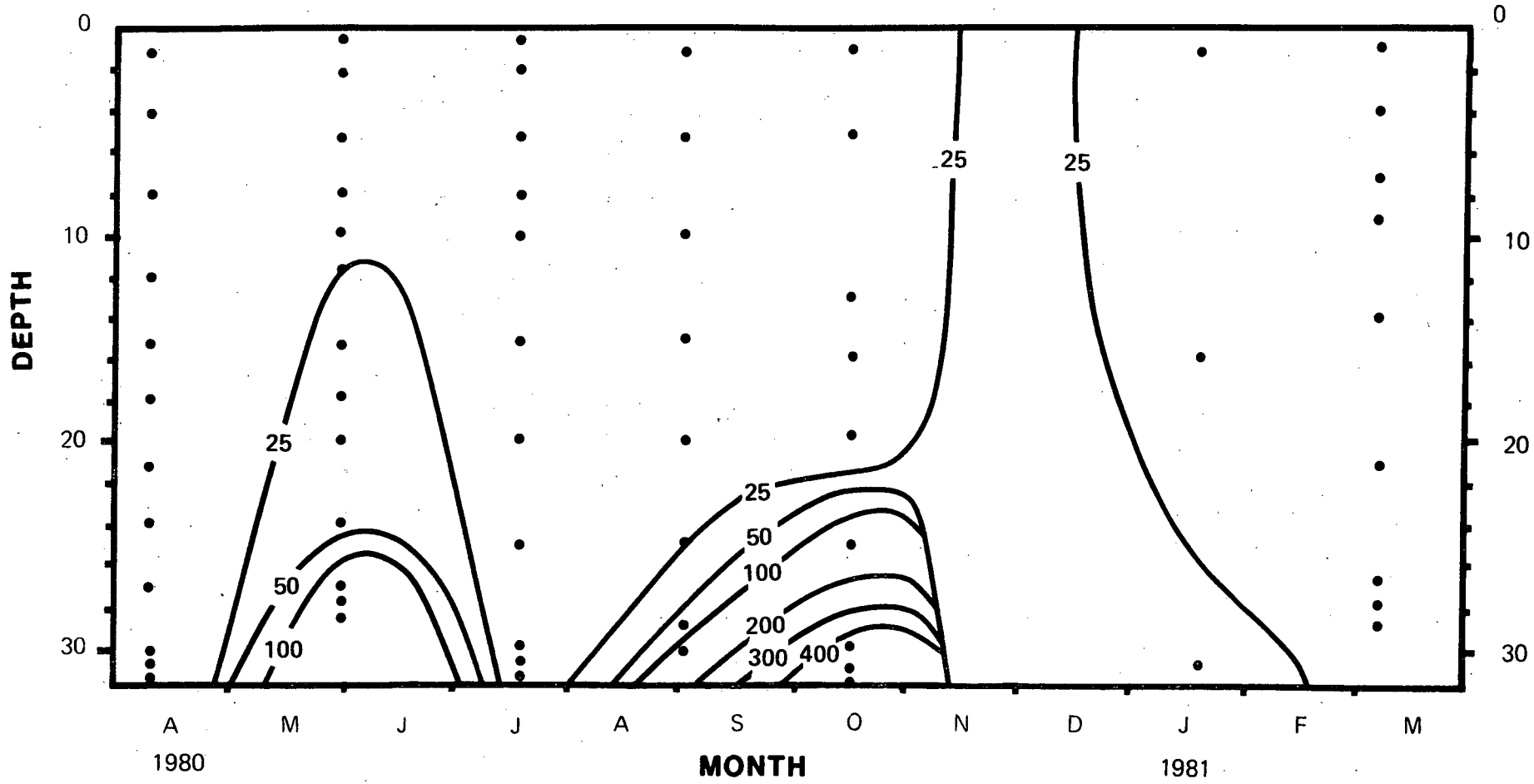


Figure 6 Time-depth diagram of ammonium concentrations ($\mu gN \cdot L^{-1}$) in Wood Lake, 1980.

the amount of ammonia gas in solution, at maximum, is calculated to be less than 5 $\mu g \cdot L^{-1}$, or 1% of the total ammonium ion. This concentration is well below the fish toxicity level of 20 $\mu g \cdot L^{-1}$ (Thurston et al., 1979). In fact the low oxygen concentrations would be more 'toxic' than the ammonia.

Nitrite concentrations only occasionally exceeded 5 $\mu g \cdot L^{-1}$, with the maximum concentration was 43 $\mu g \cdot L^{-1}$. The highest levels were observed in late May and mid-October in zones of intense ammonium oxidation. These oxidation zones were at the bottom in May and 5 m above the bottom in October. Two lesser accumulations occurred at 15 m in late May and on the bottom during late summer. The May occurrence may have been due to nitrate uptake and reduction by phytoplankton while the summer increase was probably the result of activity by denitrifying bacteria.

Dissolved organic nitrogen began the growing season at 300 $\mu g \cdot L^{-1}$ and increased to almost 400 $\mu g \cdot L^{-1}$ in the epilimnion by mid-summer. Hypolimnion concentrations over the same period increased from 300 to 350 $\mu g \cdot L^{-1}$.

Particulate nitrogen (PN) concentrations were highest in the epilimnion. The maximum occurred in April at 88 $\mu g \cdot L^{-1}$. Similar concentrations were observed all summer except during late May when average epilimnion concentrations dropped to 34 $\mu g \cdot L^{-1}$. These concentrations are surprisingly low for a productive lake (Stadelmann et al., 1974). Examination of the dissolved nitrogen components, however, suggests that higher levels, around 200 $\mu g \cdot L^{-1}$, may have occurred between the April and May samplings.

The ratio of TN to TP, in April, was around 7 and increased slightly, in May, to 11. The ratio of the biologically available components, DIN to SRP, however, started the growing season at 3 and dropped to 0.4 in the epilimnion by May. Ratios of less than 10 for the biologically available N and P components are considered to favour the appearance of nitrogen fixing algae and are not unusual for a productive lake.

5.1.4 Dissolved iron and manganese

Iron was generally below 30 $\mu g \cdot L^{-1}$. This level is low enough to suggest the possibility of iron deficiency for some phytoplankton species. Manganese, however, showed marked increases near the lake bottom between April (4 $\mu g \cdot L^{-1}$) and May (430 $\mu g \cdot L^{-1}$); the maximum concentration observed was 700 $\mu g \cdot L^{-1}$. Presumably, the redox potentials at the sediment - water interface were not low enough to reduce iron from the insoluble ferric to the soluble ferrous form, but were low enough to reduce manganese to its soluble form. Phosphate associated with iron oxide minerals in the sediment is usually released together with iron when these minerals are reduced. Consequently, the lack of increase in iron suggests that there was no release of phosphate from this sediment fraction in 1980. However, the appearance of manganese in the hypolimnion suggests that the threshold for phosphate release by this process, is fairly close.

5.1.5 Silica

Dissolved reactive silica started the growing season at a concentration of 2.3 $mg \cdot L^{-1}$ and was rapidly depleted in the epilimnion, by diatom uptake, to 0.3 $mg \cdot L^{-1}$ in May. Concentrations slowly increased from May to October in both the hypo- and epilimnion, reaching maxima of 4.2 and 1.4 $mg \cdot L^{-1}$, respectively. The fall overturn concentration was calculated to be 2.1 $mg \cdot L^{-1}$. By mid-January, 1981 the epilimnetic concentration had risen to 3.2 $mg \cdot L^{-1}$ only to fall again to 2.3 $mg \cdot L^{-1}$ in early March, 1981. This late winter decrease suggests that diatom growth and sedimentation begins very early in the spring, especially if there is no ice cover.

5.2 Horizontal variation of bottom water chemistry

This sampling program, in early September, attempted to determine whether the sediment strongly influences the concentrations of oxygen and nutrients in the overlying water masses. Water was sampled 1 metre above the bottom at 23 locations (see Figure 1); water depths ranged between 10 and 31 metres.

Strong depletion of oxygen occurred everywhere in the basin below the 25 m depth, (Figure 7). Near shore depletions were not observed even near macrophyte beds (eg station 21).

SRP distributions were the mirror image of dissolved oxygen, in that strong accumulations were observed below 25 m (Figure 8). The highest concentrations were approximately 250 $\mu g \cdot L^{-1}$. When all the September nearbottom data are plotted against depth, the resultant "profile" is essentially the same as the measured depth profile at station A for the same date (Figure 4).

Ammonium followed a similar pattern to SRP except for two stations (4 and 17) which showed very low concentrations for their depth (Figure 9). The highest concentrations were observed in the south central sector of the basin.

Nitrate plus nitrite distributions one metre off the bottom were more complicated than the previous components (Figure 10). Concentrations increased with the depth of the water column down to about 25 m; the maximum observed was 470 $\mu g \cdot L^{-1}$ at the south end of the lake (station 17). Below the 25 m depth, concentrations decreased, with the southern half of the lake showing the most depletion (levels of 200 $\mu g \cdot L^{-1}$).

In general the concentration of bottom water chemicals reflect their absolute depth rather than their location 1 metre above the sediment. This does not rule out sediment influences on the overlying water, however, because algal uptake and physical mixing may mask changes at the shallower depths. It does, however, simplify the calculation of budgets since the

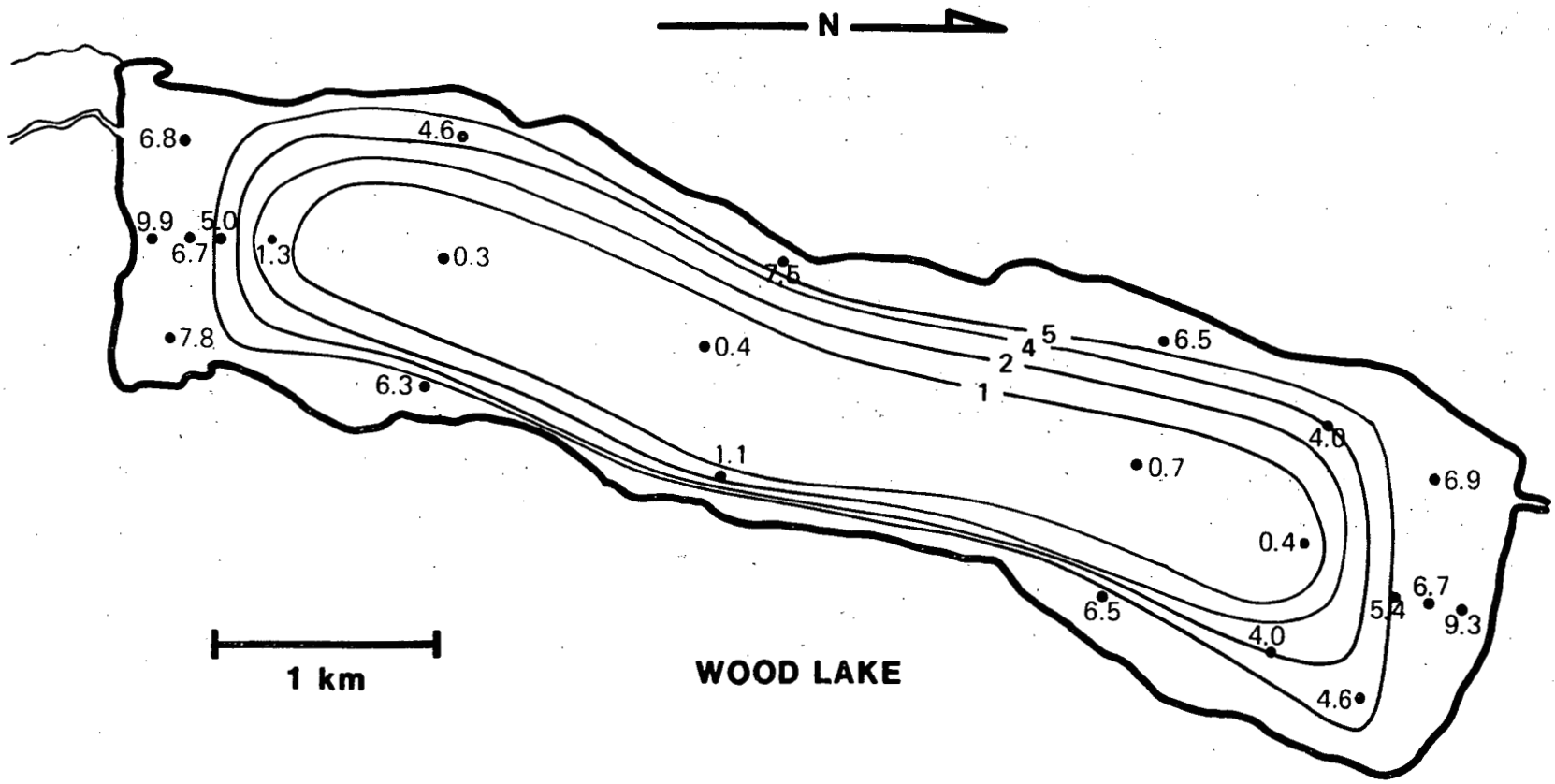


Figure 7 Bottom water survey - dissolved oxygen concentrations ($mg \cdot L^{-1}$) in Wood Lake, September 1980.

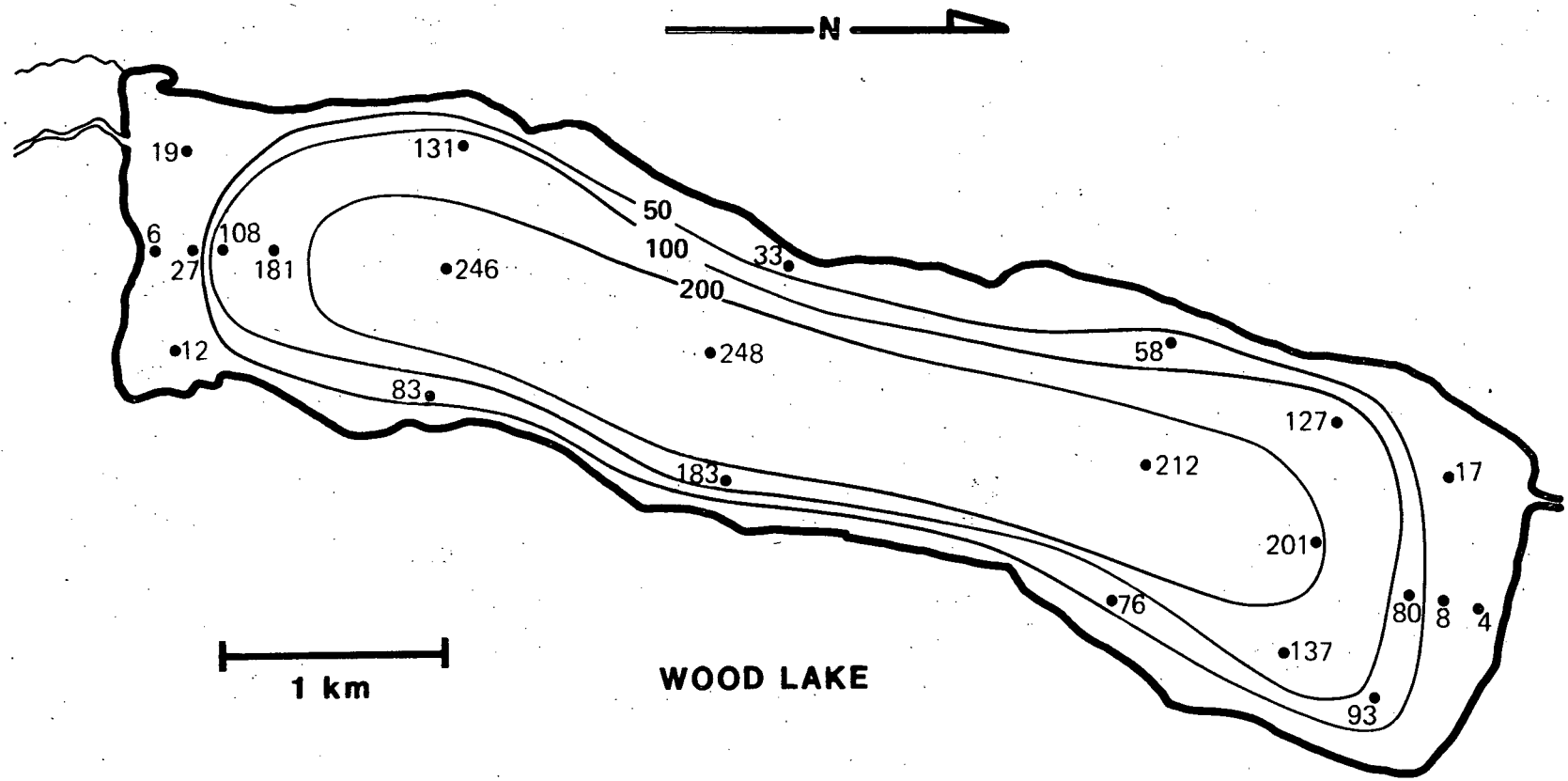


Figure 8 Bottom water survey - soluble reactive phosphorus concentrations ($\mu gP \cdot L^{-1}$) in Wood Lake, September 1980.

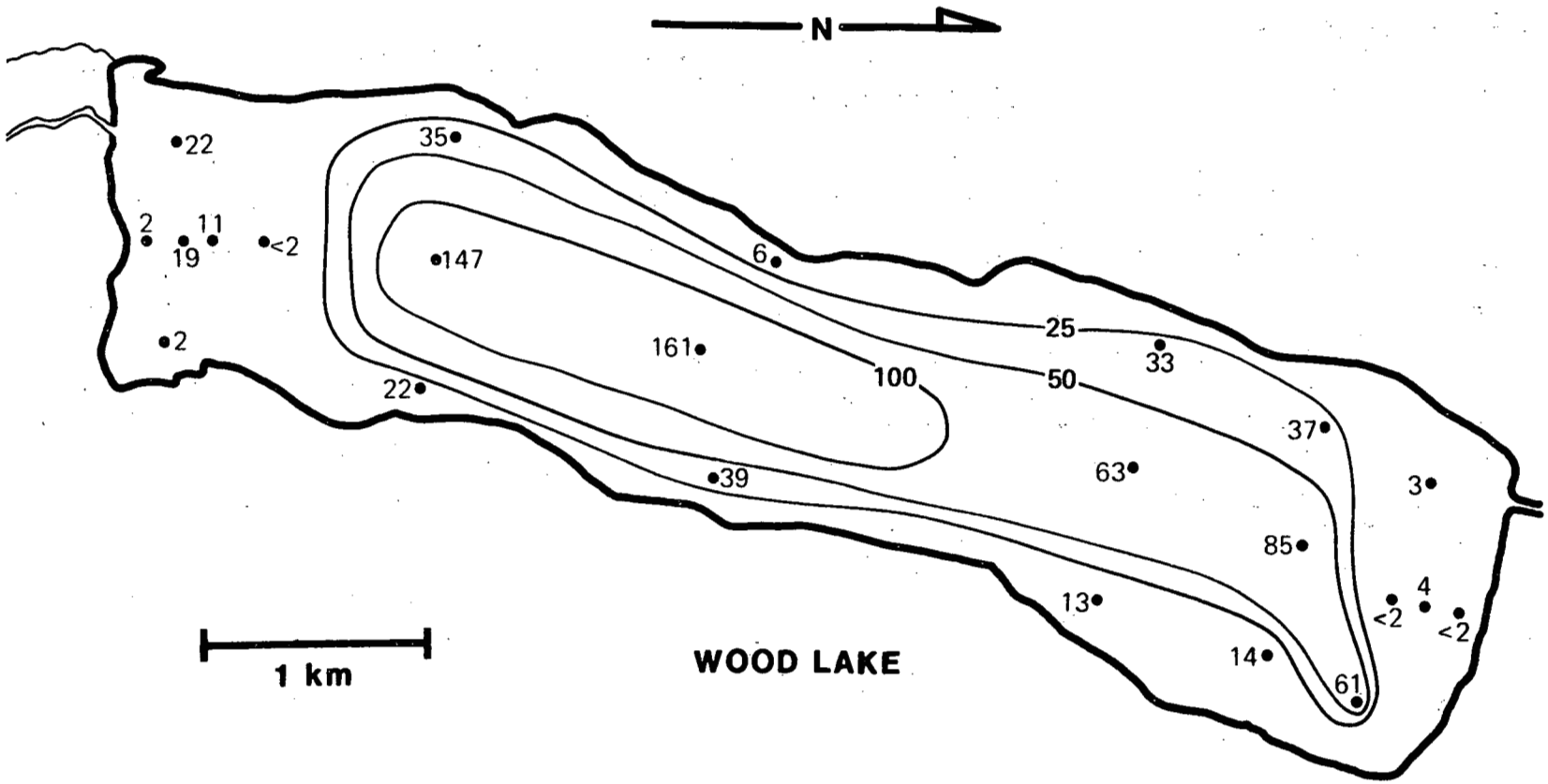


Figure 9 Bottom water survey - ammonium concentrations ($\mu gN \cdot L^{-1}$) in Wood Lake, September, 1980.

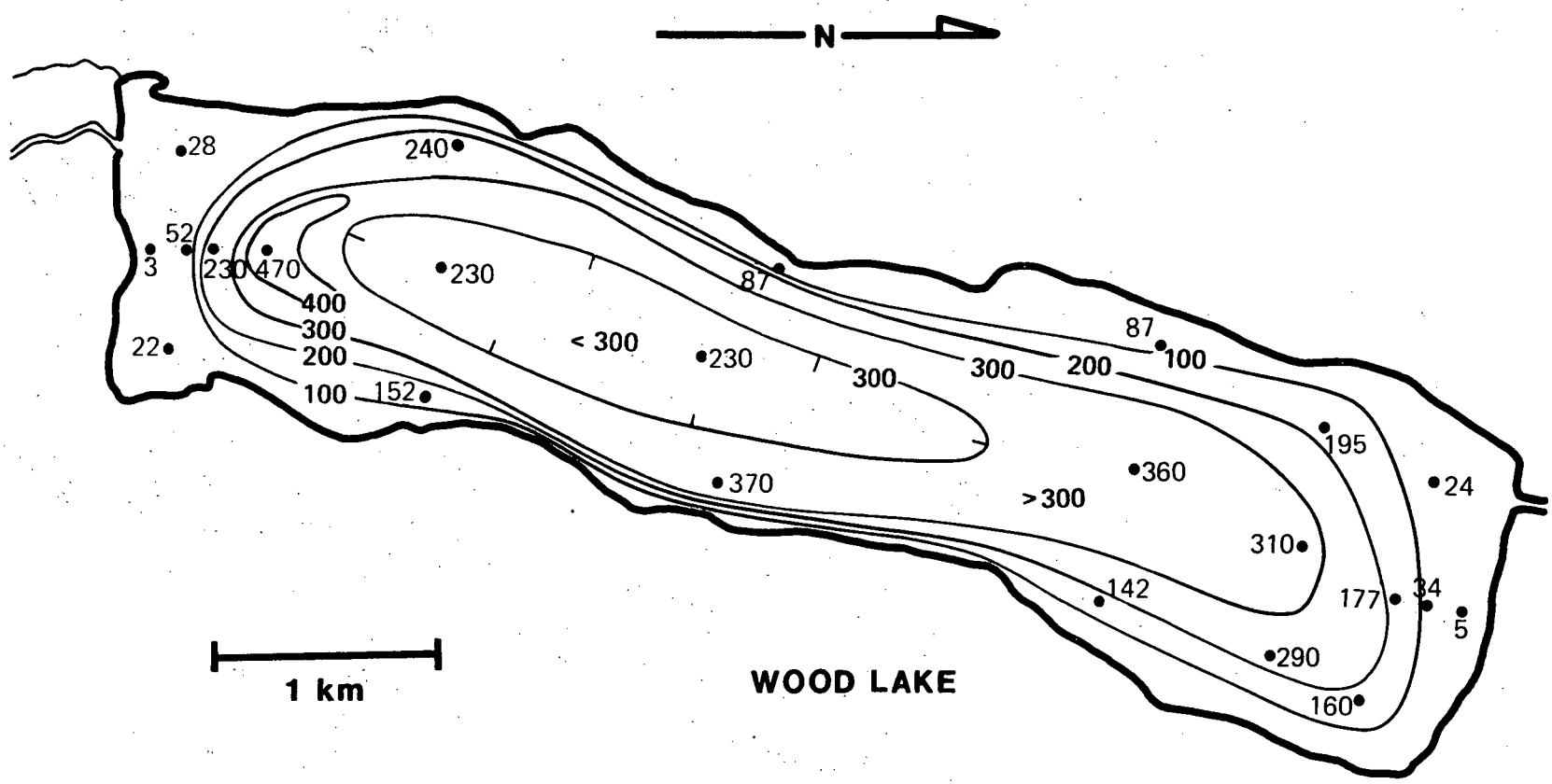


Figure 10 Bottom water survey - nitrate plus nitrite concentrations ($\mu gN \cdot L^{-1}$) in Wood Lake, September 1980.

mid-lake concentrations (Station A) can be extrapolated across the lake.

5.3 Internal Nutrient and Oxygen Contents

Internal contents for nutrients and oxygen were prepared by interpolating between data points and then calculating the content of a constituent in 2 m slices. (This is simpler but not quite as accurate as the volume weighted average method of Edmondson and Lehman, 1981). The volume of each 2 m slice was calculated from a hypsographic curve presented by D.J. Williams (1973) and is summarized in Table 6.

5.3.1 Dissolved Oxygen

The content of dissolved oxygen in the hypolimnion progressively decreased from early April to the end of summer stratification in October (Table 7). The rate of decrease, however, varied between the monitors. The largest decrease, 0.083 $mg \cdot L^{-1}$, occurred between late July and early September when large amounts of blue-green algal sedimentation probably occurred. During the stratified period, the rate averaged 0.054 $mg \cdot L^{-1} \cdot day$ (1.6 $mg \cdot L^{-1} \cdot month$). On an areal basis, the depletion rate was 490 $mg \cdot m^{2} \cdot day^{-1}$ (15$g \cdot m^{-2} \cdot month^{-1}$) for the water beneath the 18 m depth. This rate is within the range for mesotrophic lakes (10-15$g \cdot m^{-2} \cdot month^{-1}$; Hutchinson, 1957).

5.3.2 Phosphorus

The content of total phosphorus (TP) in the water column decreased during spring, remained constant through to fall overturn and then increased in mid-winter (Table 8). The most rapid change occurred between April 10 and May 29 when TP decreased by 26%. A similar pattern was observed with dissolved phosphorus (DP) and soluble reactive phosphorus (SRP).

Table 6: Hypsographic data for Wood Lake.

Depth (m)	Area (Km^2)	Volume of slice ($10^6 m^3$)	Cumulative Volume ($10^6 m^3$)	
0	9.3			
		18.3	18.3	
2	9.0			
		17.7	36.0	
4	8.7			
		17.2	53.2	
6	8.5			
		16.7	69.9	
8	8.25			
		16.2	86.1	
10	7.9			
		15.5	101.6	Z_{V50}=11.7m
12	7.6			
		14.8	116.4	
14	7.2			
		14.0	130.4	
16	6.75			
		13.0	143.4	
18	6.25			
		11.9	155.3	
20	5.6			
		10.5	165.8	$\overline{Z}$=21.5m
22	4.9			
		9.2	175.0	Z_{A50}=23.0m
24	4.3			
		7.9	182.9	
26	3.6			
		6.6	189.5	
28	3.0			
		5.4	194.9	
30	2.4			
		3.9	198.8	
32	1.45			
		0.7	199.5	
33	0			

Table 7: Dissolved oxygen contents and depletion rates in the hypolimnion of Wood Lake.

Date	Z_h (m)	V_h ($10^6 \cdot m^3$)	O_2 (Mg)	Mean O_2 ($mg \cdot L^{-1}$)	Interval Change ($\Delta mg \cdot L^{-1}$)	(Δdays)	Interval Rates ($mg \cdot L^{-1} \cdot d^{-1}$)	($g \cdot m^{-2} \cdot d^{-1}$)
80/04/10	18	56.1	650	11.57				
					-2.30	49	0.047	0.42
80/04/29	18	56.1	520	9.27				
					-2.85	55	0.052	0.47
80/07/23	18	56.1	360	6.42				
					-3.57	43	0.083	0.75
80/09/4	18	56.1	160	2.85				
					-1.49	42	0.035	0.32
80/10/16	20	44.2	60	1.36				
80/04/10 to 80/10/16			-590		-10.21	189	0.054	0.49

Table 8: Phosphorus Contents (Mg), in epilimnion (e), mesolimnion (m) and hypolimnion (h) of Wood Lake. Mesolimnion location (meters) in parentheses.

Date	Total P				Particulate P				Dissolved P				Soluble reactive P			
	e	m	h	total	e	m	h	total	e	m	h	total	e	m	h	total
79/09/26 (12-20)	1.27	3.12	9.53	13.9	0.66	0.15	0.20	1.0	0.61	2.97	9.33	12.9	-	-	-	-
80/04/10 (6-18)	4.48	7.68	4.82	17.0	0.75	1.29	0.79	2.9	3.72	6.37	4.04	14.1	3.2	5.63	3.60	12.4
80/05/29 (6-18)	1.91	4.85	5.77	12.5	0.28	0.61	0.19	1.0	1.63	4.24	5.59	11.5	1.24	3.68	5.07	10.0
80/07/23 (8-18)	1.10	3.48	7.59	12.2	0.57	0.47	0.21	1.25	0.53	3.01	7.38	10.9	0.11	2.68	6.79	9.8
80/09/04 (10-18)	1.43	1.40	10.21	13.0	0.91	0.38	0.37	1.7	0.52	1.02	9.84	11.4	0.17	0.91	9.44	10.5
80/10/21 (14-20)	1.89	2.01	9.18	13.1	1.24	0.24	0.33	1.8	0.64	1.78	8.84	11.3	0.12	1.45	8.69	10.3
81/01/21				15.9				1.3				14.6				14.1
81/03/11				15.7				2.4				13.3				12.7

Particulate phosphorus (PP) was also maximal in early spring but showed a fall peak preceding a mid-winter minimum.

When the water column contents were split into epilimnion, mesolimnion and hypolimnion components, losses from the water column during summer were seen to occur in the epi- and mesolimnion, whereas the hypolimnion generally accumulated TP (mainly as SRP). This accumulation only partly compensated for the losses in the upper two water components, thus there was a loss of phosphorus to the sediments during summer. During late fall and winter, however, part of this loss is recovered by regeneration from the sediments. Consequently the mid-winter water column content is similar to that of the previous spring.

5.3.3 Nitrogen

The content of total nitrogen (TN) in the whole water column remained constant (95 to 114 Mg) even though the contents of the epi-, meso- and hypolimnions fluctuated considerably (Table 9).

Nitrate + nitrite nitrogen (NN) contents reflected the algal uptake of these nutrients and their subsequent release as other nitrogen components. There was also a considerable loss of NN from the hypolimnion between September 9 and October 21 due to denitrification (Figure 11). However, winter regeneration of nitrate from ammonia, dissolved organic N and particulate N more than doubled the NN content between late October and late January.

The ammonia nitrogen (AN) content in the whole water column was highest in autumn and following the spring bloom (see Section 7.1). The majority of the AN occurred in the hypolimnion, except during mid-summer when the rate of oxidation to AN presumably exceeded the rate of hydrolysis from particulate and dissolved organic N. Unlike the other dissolved N components, the hypolimnion content of AN in autumn, 1979 was much higher than that observed in autumn, 1980. The difference may be due to a larger input of sedimenting phytoplankton to the

Table 9: Nitrogen Contents (Mg), in epilimnion (e), mesolimnion (m) and hypolimnion (h) of Wood Lake. Mesolimnion location (meters) in parentheses.

Date	Total N				Particulate N				Dissolved Organic N				ammonium N				Nitrate + Nitrite N			
	e	m	h	total	e	m	h	total	e	m	h	total	e	m	h	total	e	m	h	total
79/09/26 (12-20)	-	-	-	-	-	-	-	-	36.4	18.5	13.0	67.9	0.17	0.05	12.7	12.9	0.51	8.24	10.8	19.6
80/04/10 (6-18)	29.9	51.2	32.6	114	4.66	7.39	4.24	16.3	15.9	26.9	16.9	59.7	0.20	0.43	0.38	1.0	9.35	16.6	10.9	36.9
80/05/29 (6-18)	21.0	38.9	35.3	95.2	1.82	2.54	0.66	5.0	1.7	30.3	19.8	68.8	0.32	1.74	4.09	6.2	0.13	4.02	10.3	14.5
80/07/23 (8-18)	33.4	29.1	37.7	100	4.86	2.44	1.37	8.7	27.4	23.3	19.8	70.5	0.50	0.43	0.08	1.0	0.51	2.74	16.4	19.7
80/09/04 (10-18)	40.7	25.8	39.9	106	6.32	2.74	2.56	11.6	33.2	19.8	17.4	70.4	0.24	0.23	2.54	3.0	0.81	2.99	17.4	21.2
80/10/21 (14-20)	47.7	19.1	29.8	96.6	8.57	1.71	1.44	11.7	39.2	12.4	11.9	63.5	0.16	0.10	7.72	8.0	0.40	4.86	8.46	13.7
81/01/21				95.4				3.7				55.0				2.1				34.7
81/03/11				103				7.6				58.1				0.8				31.8

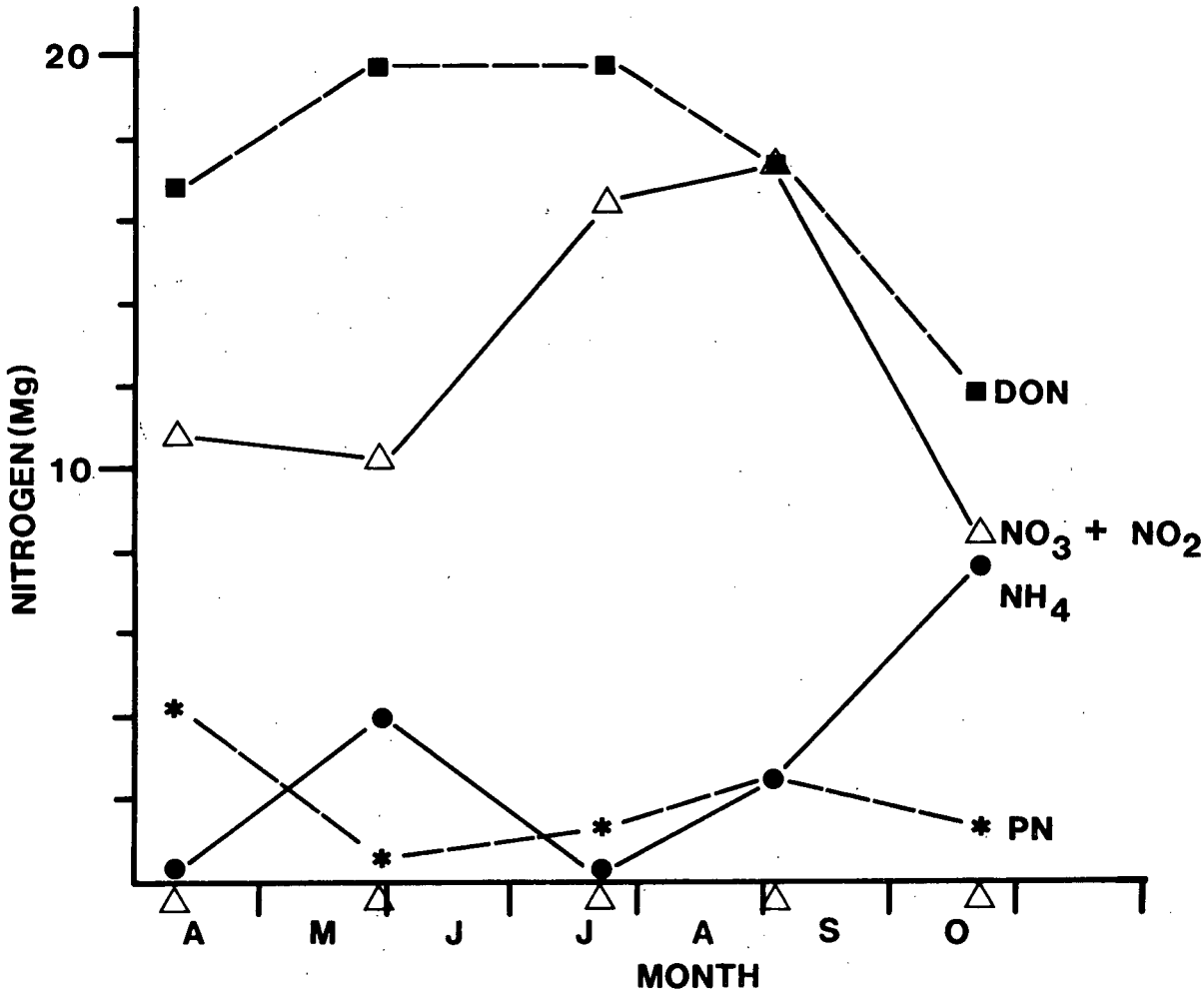


Figure 11 Hypolimnion content of nitrogen components in Wood Lake, 1980.

hypolimnion in the summer of 1979.

The dissolved organic nitrogen (DON) content increased in the epilimnion throughout the growing season while it initially increased and subsequently decreased in the meso- and hypolimnions. The epilimnion increases probably result from the release of cellular N during the growth, scenescence and recycling of phytoplankton. The decreases in the hypolimnion after mid-summer suggest that dentrifying bacteria were utilizing DON using NN as an oxidizing source (Figure 11).

The lake's content of particulate N (PN) was highest in early spring and lowest during early winter and during the period immediately following the spring bloom. Except for early spring the epilimnion contained the most PN.

5.3.4 Chloride, Calcium, Silica and Particulate Carbon

Since chloride is essentially conservative in freshwater systems, annual changes in chloride content reflect the input-output balance of the element and the relative precision of the mass balance calculations. Although not calculated, the input-output balance of chloride was assumed to be a small component of the fluctuations in content because the flushing rate of the lake is very low. The content was found to average 712 $\pm$ 26 Mg (n = 6, Table 10). This 4% variation indicates that the sampling program was adequate.

There was a 20% decrease in the calcium content of the epi- and mesolimnion between the end of May (4600 Mg) and the beginning of September (3800 Mg). A decrease of this magnitude suggests that calcium carbonate precipitation was a significant process and that any further attempts to evaluate nutrient cycles in this lake should include studies of this process.

The spring epilimnion content of silica (Table 10) dropped from 125 to 16 Mg in 6 weeks, presumably as a result of a diatom bloom. The sedimented silica was partially regenerated in the hypolimnion since the silica content increased from 148 to 214

Table 10: Chloride Contents (Mg); Calcium, Silica and Particulate Carbon contents (Mg), and Water Mass Volumes ($10^6 m^3$) in epilimnion (e), mesolimnion (m) and hypolimnion (h) of Wood Lake. Mesolimnion location (meters) in parentheses.

Date	Chloride total	Calcium e	Calcium m	Calcium h	Calcium total	Silica SiO_2 e	Silica SiO_2 m	Silica SiO_2 h	Silica SiO_2 total	Particulate C e	Particulate C m	Particulate C h	Particulate C total	Volumes e	Volumes m	Volumes h
		3450				170					-			116		
79/09/26	-		1790				445					-			38.9	
(12-20)				1490	6730			157	445				-			44.2
		1610				125				29.3				53.2		
80/04/10	717		2800				224				45.1				90.2	
(6-18)				1710	6120			148	497			27.4	102			56.1
		1690				16				20.1				53.2		
80/05/29	675		2890				53				26.1				90.2	
				1800	6370			144	213			10.0	56.2			56.1
		1900				49				52.7				69.9		
80/07/23	-		2200				82				43.9				73.5	
(8-18)				1660	5160			175	306			29.4	126			56.1
		2210				86				51.8				86.1		
80/09/04	725		1560				84				27.2				57.3	
(10-18)				1630	5410			214	384			26.3	105			56.1
		2950				152				69.1				116		
80/10/21	713		1140				76				14.4				38.9	
(14-20)			1430		5530			186	414			15.7	99.2			44.2
81/01/21	751								588				44		199.5	
81/03/11	696				6630				465				702		199.5	

Mg between April and September. Between late January and early March 1981, however, there was a disappearance of 120 Mg of silica from the whole water column suggesting significant diatom growth during that period. The lack of ice cover and resultant higher light levels probably contributed to this early algal growth.

Particulate carbon (PC) contents had generally the same seasonal pattern as PN (Table 10). The peak content, however, occurred in mid-summer as opposed to the spring peak of PN. The majority of PC occurred in the epi- and mesolimnions and is probably associated with autochthonous production of plankton and detritus.

6. GEOCHEMICAL MEASUREMENTS

6.1 Carbon

Total carbon (TC), and its major constituent, organic carbon (OC), decreased dramatically in the top two cm of the core and then more gradually to the 6 cm depth (Figure 12). The levels of inorganic carbon (IC), however, remained reasonably constant. The 6-7 cm interval showed elevated amounts of IC comprising approximately 35% of the TC; although the other sections of the core were dark grey to black, this section was observed to have a light grey band which could indicate enrichment with calcite. Below 7 cm the OC levels increased, slightly, whereas IC levels decreased.

The large decreases in OC from the sediment-water interface to the bottom of the core cannot be entirely due to increased sedimentation of organic matter relative to detrital mineral matter. An unknown amount of sedimentary OC is converted through time to carbon dioxide, methane and dissolved organic carbon which are lost to the overlying waters. These losses are most intense in the top few cm of a sediment column.

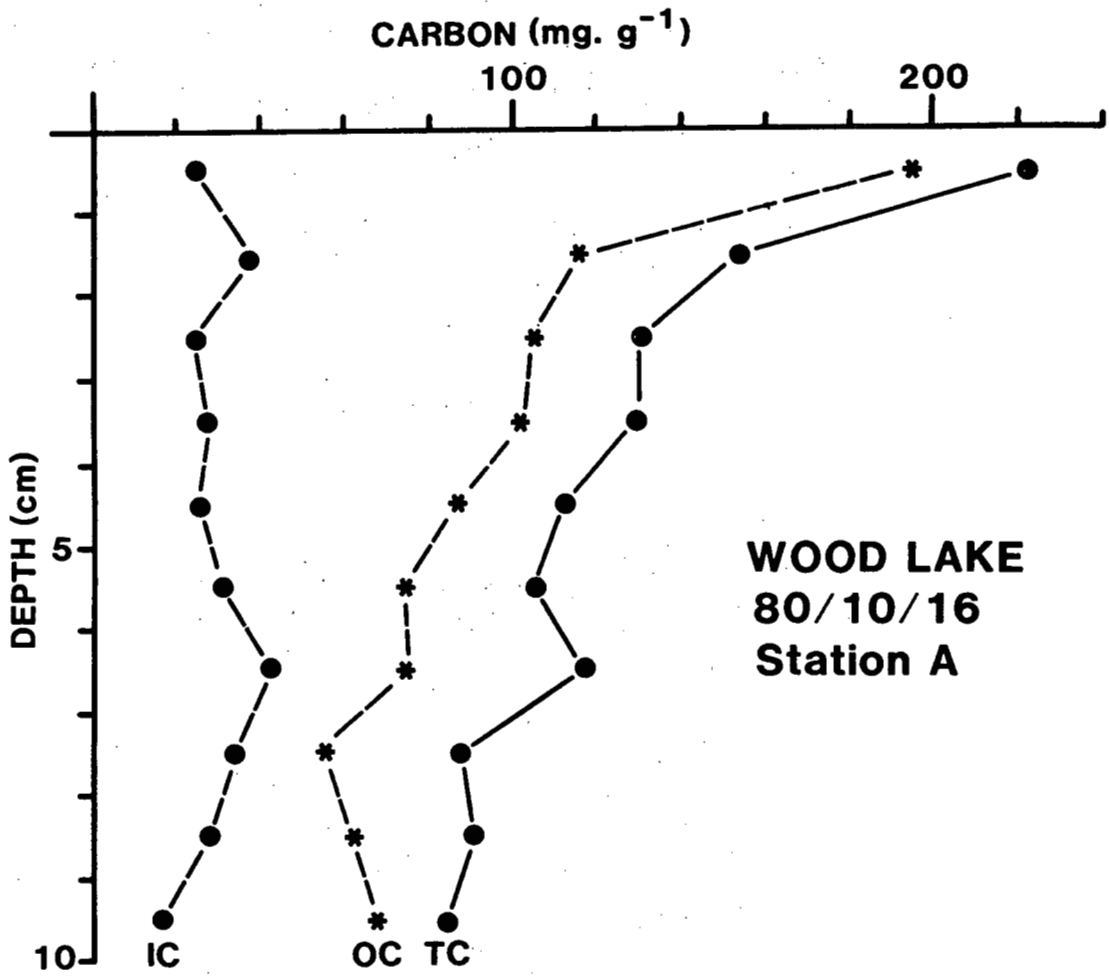


Figure 12 Total (TC), organic (OC), and inorganic carbon (IC) concentrations in the sediment profile of Wood Lake.

The elevated IC concentrations at 6 cm may be recording an episode of increased calcium carbonate precipitation from the water column.

6.2 Phosphorus

The sedimentary phosphorus was fractionated analytically into organic P (OP), apatite P (AP) and non-apatite inorganic P (NAIP) components. OP decreased from 1.4 $mg \cdot g^{-1}$ at the surface to approximately 0.35 $mg \cdot g^{-1}$ at 7 cm and remained fairly constant below this depth (Figure 13). AP levels doubled from the surface to the 5 cm depth, then remained unchanged (at about 0.38 $mg \cdot g^{-1}$) down to 18 cm. NAIP, at the surface, was almost as high as OP and decreased in a similar fashion to constant levels of around 0.25 $mg \cdot g^{-1}$, below 5 cm.

The total P(TP) content of the surface cm, 2.9 $mg \cdot g^{-1}$, is higher than reported previously for any of the Okanagan Lakes (Williams, J.D.H. 1973). This value is also higher than the TP content of suspended sediments entering the lake via Vernon Creek in late April, 1981 (1.48 $mg \cdot g^{-1}$ TP and 0.95 $mg \cdot g^{-1}$ AP, unpublished data). The fact that typical stream suspended sediments entering the lake have a lower phosphorus content than the lake sediments suggests that the biological uptake of dissolved phosphorus in the epilimnion and its eventual sedimentation in organic form is an important process in the phosphorus budget of the lake.

The increase in relative concentration of AP with depth in the top 3 cm may be due to losses of the organic matter in this layer rather than a decrease in the input of AP to the lake in recent years.

The very large increase of NAIP from 5 cm to the surface probably reflects the movement of phosphate in the pore waters to the sediment-water interface (Carignan and Flett, 1981) as opposed to significant increases in sedimentation.

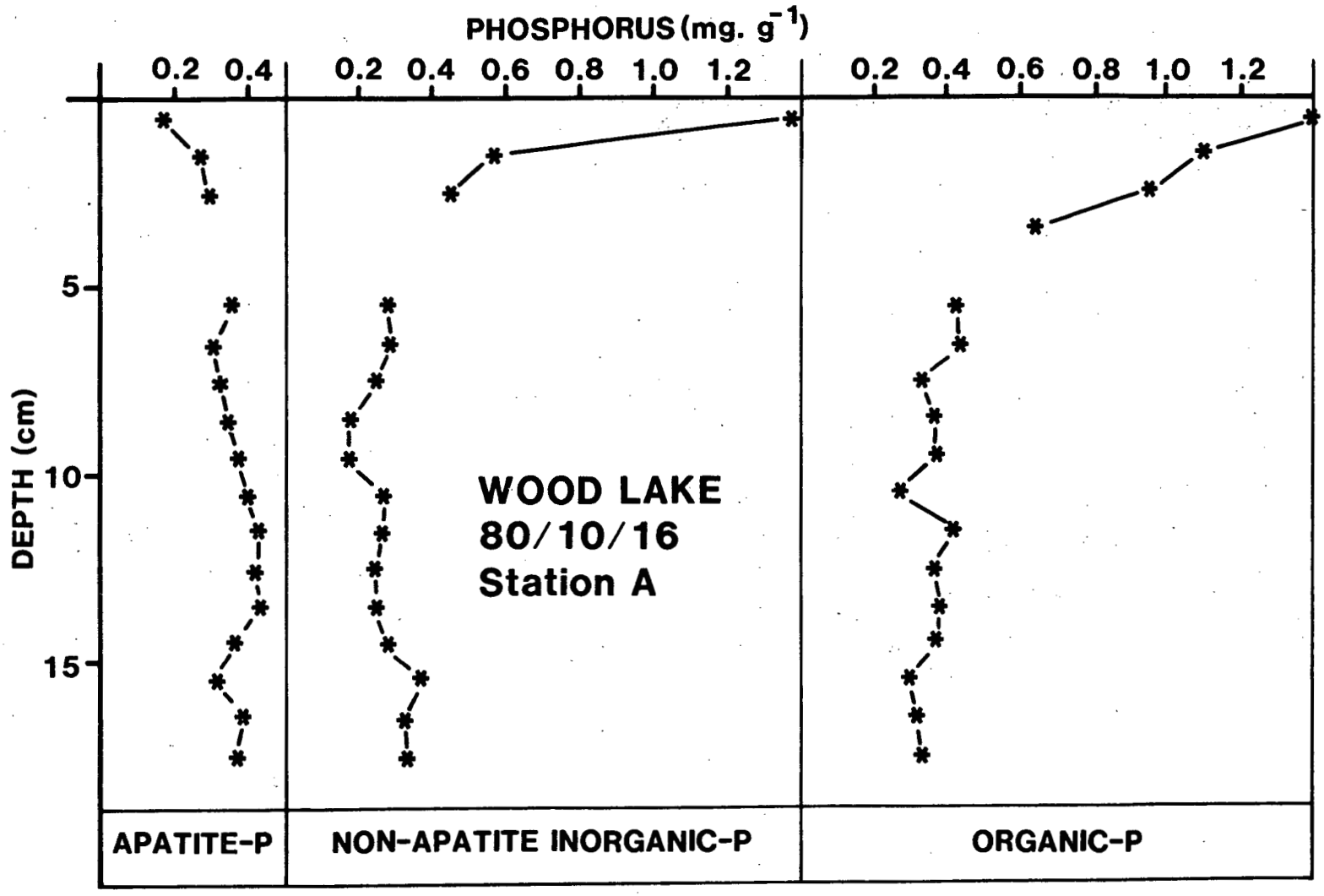


Figure 13 Concentrations of phosphorus fractions in the sediment profile of Wood Lake.

7. BIOLOGICAL MEASUREMENTS

7.1 Phytoplankton biomass

Table 11 lists all the measurements of chlorophyll a, a phaeopigments, ATP and total cell volumes. The integral and average epilimnion values for each date are given in Table 12.

In late May, when the study began, biomass levels were generally very low (Figures 14 and 15) and remained low until mid-July when a bloom was recorded (maximum chlorophyll a, 38.9 $mg \cdot m^{-3}$; cell volume, 8.1 $mL \cdot m^{-3}$). In August the biomass returned to lower levels but increased somewhat in mid-September and October (average ATP 0.5 - 0.8 $mg \cdot m^{-3}$; cell volumes 1 - 3.5 $mL \cdot m^{-3}$).

Although the late start of the field sampling prevented measurement of the spring phytoplankton bloom, indirect evidence that it occurred comes from changes in the nutrient profiles (especially silica, Table 10) and from previous data (Buchanan and Kirk, 1974; B.C. Water Investigations Branch, unpublished data). The annual average epilimnion chlorophyll a value of 5.5 $mg \cdot m^{-3}$ should therefore be regarded as a minimum. Although inclusion of the spring data would raise this average, an examination of historical data suggests that the change would be small.

The fall increases in ATP and total cell volumes (see Table 11 and Figure 14 and 15) were not accompanied by significant changes in chlorophyll a. One possible explanation is a change in chlorophyll a content per cell resulting from a change in species composition (Berman and Pollinger, 1974). In fact, a shift in the dominant species of phytoplankton did occur during the month of September (see below).

Table 11: Wood Lake Phytoplankton Biomass Measurements at specific depths

Date	Depth (m)	Chlorophyll a ($mg \cdot m^{-3}$)	a phaeopigments ($mg \cdot m^{-3}$)	ATP ($mg \cdot m^{-3}$)	Total Volume ($mL \cdot m^{-3}$)	Dominant phytoplankton (by volume)
29/5/80	0.5	1.96	0.74	0.26	0.26	Chlorophytes
	2	1.89	0.35	0.21	-	-
	5	2.16	0.77	0.28	0.36	Chlorophytes
	10	1.98	0.75	0.24	-	-
	15	0.91	0.41	0.12	-	-
	20	0.64	0.33	0.16	-	-
3/7/80	0.5	0.91	0.27	0.25	0.02	Cyanophytes
	2	1.06	0.20	-	-	-
	5	1.22	0.20	0.19	0.03	Cyanophytes
	10	1.11	0.22	-	-	-
	15	1.09	0.35	-	-	-
	20	1.33	0.41	0.24	-	-
18/7/80	0.5	38.9	0.87	-	8.14	Cyanophyte: -
	2	28.4	1.80	-	4.73	Anabaena
	5	10.0	1.30	-	0.90	flos-aquae
	10	1.7	0.40	-	0.06	"
	15	0.83	0.29	-	-	-
	20	0.40	0.30	-	-	-
23/7/80	0.5	7.42	0.44	-	0.63	Cyanophyte: -
	2	7.88	0.38	-	0.40	Anabaena
	5	7.70	0.77	-	-	flos-aquae
	10	2.66	0.47	-	-	-
	15	1.39	0.33	-	-	-
	20	0.66	0.25	-	-	-

Table 11: Wood Lake Phytoplankton Biomass Measurements (cont'd)

Date	Depth (m)	Chlorophyll a ($mg \cdot m^{-3}$)	a phaeopigments ($mg \cdot m^{-3}$)	ATP ($mg \cdot m^{-3}$)	Total Volume ($mL \cdot m^{-3}$)	Dominant phytoplankton (by volume)
6/8/80	0.5	2.90	0.87	0.45	0.09	Cyanophytes
	2	3.25	0.71	0.45	-	
	5	3.42	0.83	0.39	0.06	Cyanophytes
	10	2.00	0.81	0.34	-	-
	15	1.50	0.55	0.33	-	-
	20	1.25	0.37	0.17	-	-
3/9/80	0.5	3.03	0.92	0.27	0.10	Cyanophytes
	2	3.51	1.06	0.22	-	-
	5	3.62	0.96	0.24	0.12	Cyanophytes
	10	3.79	1.12	0.25	-	-
	15	1.21	0.78	0.27	-	-
	20	0.34	0.42	0.15	-	-
16/9/80	0.5	3.25	0.63	0.89	1.37	Cyanophyte: -
	2	3.67	0.77	0.73	-	Lyngbya
	5	4.17	0.97	0.70	0.95	"
	10	3.67	0.67	0.81	1.48	"
	15	1.10	0.59	0.62	-	-
	20	0.51	0.48	0.53	-	-
21/10/80	0.5	3.02	0.86	0.61	1.26	Cyanophyte: -
	2	3.30	0.83	0.59	3.45	Lyngbya
	5	3.34	0.74	0.55*	-	-
	10	3.34	0.69	0.51	-	-
	15	2.08	0.62	0.48	-	-
	20	0.96	0.56	0.19	-	-

* Interpolated Value

Table 12: Wood Lake Phytoplankton biomass measurements; epilimnion integrals ($mg \cdot m^{-2}$) and averages ($mg \cdot m^{-3}$). Average values in parentheses.

Date	Epilimnion depth (m)	Chlorophyll a	a Phaeopigments	ATP
29/5/80	5	9.9 (2.0)	2.9 (0.6)	1.22 (0.24)
3/7/80	5	5.4 (1.1)	1.1 (0.2)	1.10 (0.22)
18/7/80	7	144.2 (20.6)	9.3 (1.3)	-
23/7/80	8	57.1 (7.1)	4.6 (0.6)	-
6/8/80	8	25.1 (3.1)	6.4 (0.8)	3.29 (0.41)
3/9/80	10	35.6 (3.6)	10.2 (1.0)	2.42 (0.24)
16/9/80	11	41.6 (3.8)	8.7 (0.8)	8.37 (0.76)
21/10/80	20	44.3 (3.2)	10.3 (0.7)	7.55 (0.54)

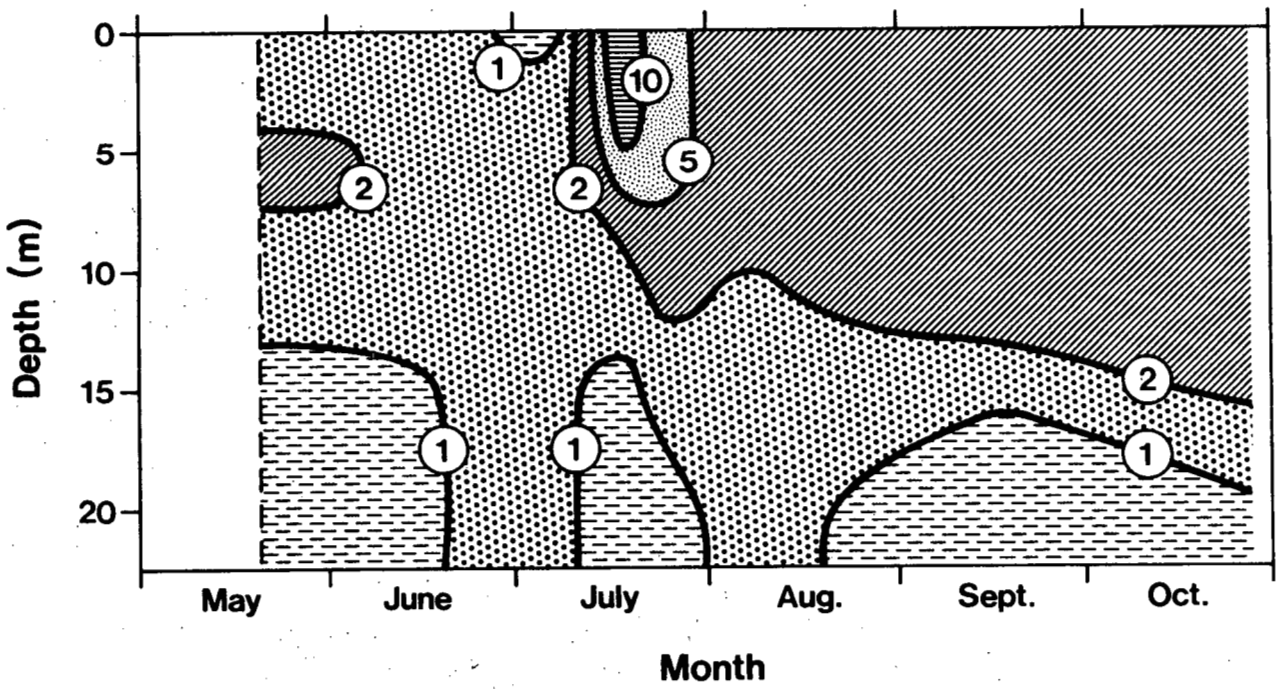


Figure 14 Time-depth diagram of chlorophyll a concentrations ($mg \cdot m^{-3}$) in Wood Lake, 1980.

7.2 Phytoplankton species composition and volumes

A list of the phytoplankton species identified in Wood Lake, 1980, together with cell volumes and counts, is given in Appendix 4. The computed volumes of the major groups, for each sampling date, are shown in Table 13 and plotted, with time, in Figure 15.

Except for late May, when chlorophytes were the main constituent, cyanophytes clearly dominated throughout the study period (Figures 15 and 16). The only major bloom, during July, was almost a pure culture of the heterocystous blue-green *Anabaena flos-aquae* (95% by volume). This species persisted throughout the summer until replaced, in mid-September, by another blue-green, the non-heterocystous *Lyngbya*. Also, at this time, a small population of chlorophytes and chrysophytes appeared. Few diatoms were seen during the study period although indirect evidence, such as silica depletion during April and May (Table 10), strongly suggests that they bloomed in spring.

Determining the composition of the phytoplankton from cell numbers rather than volumes is misleading because of large variations in cell sizes (see Appendix 4). On most sampling dates the very small cyanobacteria (about 0.5 μm^3 per cell) numerically dominated the population, but their contribution to the total cell volume was also very small. For example on September 16 the cyanobacteria comprised 99% of the cells, but only 4% of the total biomass. In addition, identification and counting of these minute phytoplankton is very difficult using the standard 'settling' method; epifluorescence microscopy (Hobbie et al, 1977) is needed to obtain accurate numbers and sizes.

Table 13: Wood Lake Phytoplankton Volumes

Date	Depth (m)	Total Volume ($mL \cdot m^{-3}$)	Volume ($mL \cdot m^{-3}$)					
			Cyano-phyte	Chloro-phyte	Diatom	Chryso-phyceae	Crypto-phyte	Others
29/5/80	0.5	0.26	0.01	0.24	0.01	0	0	0.008
	5.0	0.36	0.008	0.35	0.007	0.001	0	0.002
3/7/80	0.5	0.02	0.02	0.001	0.001	0	0	0.002
	5.0	0.03	0.02	0.004	0.001	0.001	0	0.003
18/7/80	0.5	8.14	8.13	0.001	0.002	0	0	0.003
	2.0	4.73	4.71	0.005	0.002	0	0	0.003
	5.0	0.90	0.88	0.006	0.004	0	0.001	0.004
	10.0	0.06	0.05	0	0.002	0	0.002	0.003
23/7/80	0.5	0.63	0.61	0.02	0	0	0.002	0.007
	5.0	0.40	0.38	0.003	0.003	0	0.002	0.005
6/8/80	0.5	0.09	0.06	0.006	0	0.01	0.004	0
	5.0	0.06	0.05	0	0	0.003	0.009	0.004
3/9/80	0.5	0.10	0.08	0.009	0.001	0	0.005	0.004
	5.0	0.12	0.10	0.004	0.006	0.002	0.002	0.003
16/9/80	0.5	1.37	1.30	0.03	0.003	0.03	0.003	0.006
	5.0	0.95	0.83	0.05	0.003	0.04	0.006	0.02
	10.0	1.48	1.30	0.12	0.006	0.01	0.01	0.03
21/10/80	0.5	1.26	1.09	0.11	0.008	0.01	0.006	0.04
	2.0	3.45	3.31	0.04	0.03	0.04	0.006	0.02

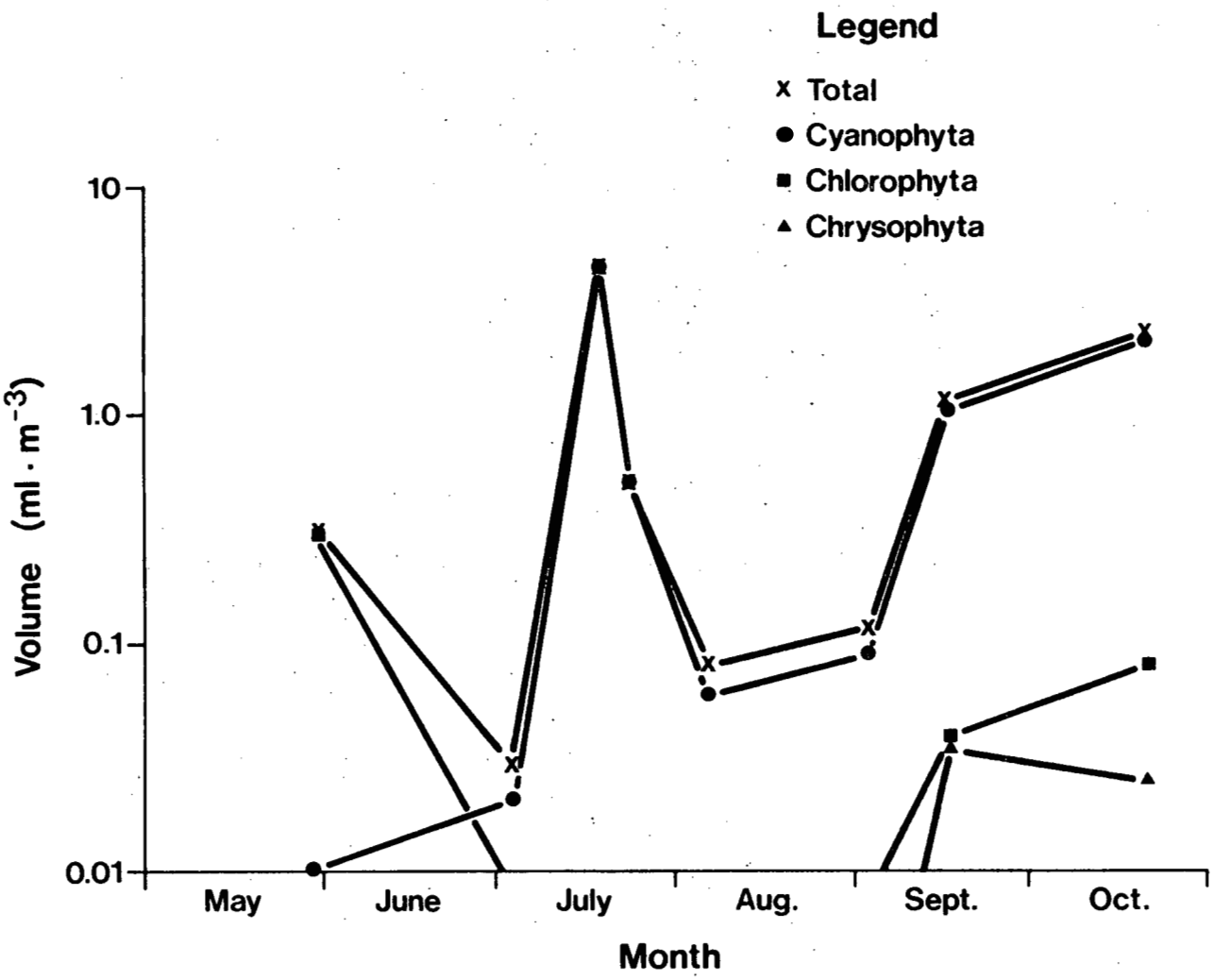


Figure 15 Phytoplankton volumes, average 0.5 to 5 metre values in Wood Lake, 1980.

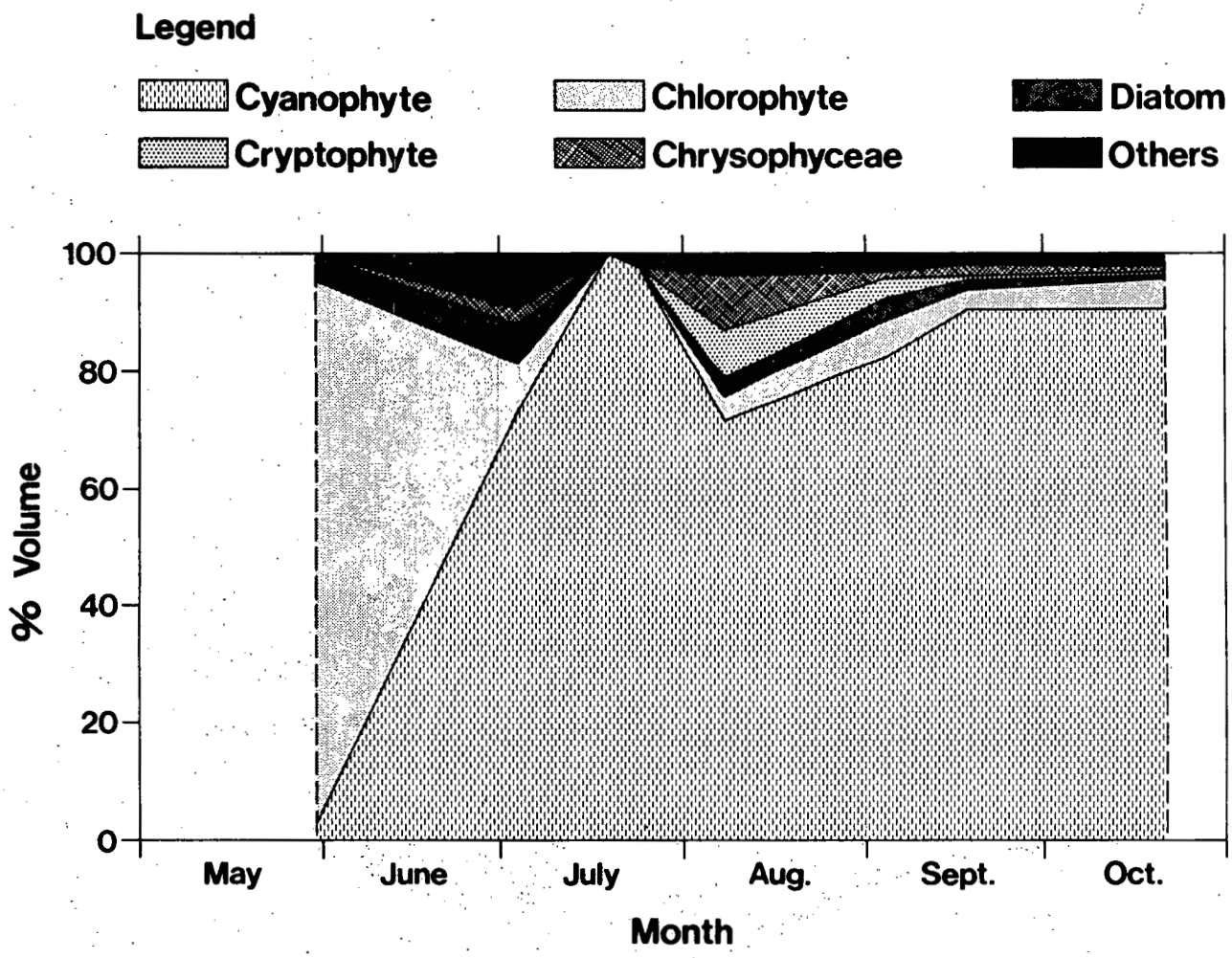


Figure 16 Phytoplankton taxonomic composition, average 0.5 to 5 metre values, in Wood Lake, 1980.

Those populations of blue-green algae capable of utilising molecular nitrogen (N_2) in the absence of nitrate and ammonium characteristically have specialised cells called heterocysts. Thus the dominance of a heterocystous population is indicative of nitrogen limitation of the community as a whole. Heterocysts were only visible in the blue-green populations in late July, at frequencies (as a % of total cells) between 2.2 and 4.4 (see Table 14). These numbers are very close to those found by Kellar and Paerl (1980) in a similar species of blue-green, Anabaena spiroides. They measured heterocyst frequencies between 2.3 and 3.8% at a time when there was significant nitrogen fixation (as measured by the acetylene reduction technique).

Table 14: Wood Lake Cyanophyte Heterocyst Frequency

Date	Depth (m)	% Heterocysts
18/7/80	0.5	3.6
18/7/80	2	3.0
18/7/80	5	4.2
23/7/80	0.5	4.4
23/7/80	2	*
23/7/80	5	2.2

* Not counted

7.3 Phytoplankton nutrient limitation

The results of the various physiological tests are given in Table 15.

7.3.1 ^{32}P uptake

Figure 17 shows epilimnion trends in ^{32}P turnover times, alkaline phosphatase activities and chlorophyll a values for the study period.

Chemical estimates of orthophosphate (P) as SRP are prone to error and may seriously overestimate P when levels are low (Rigler, 1968). ^{32}P turnover times reflect demand for P (Rigler, 1956) and can be used, in a general way, to follow trends in P levels where chemical measurements are unreliable. The turnover times reported here have been normalized with respect to ATP to remove variations due to changes in biomass.

Prior to August the turnover times were very long, suggesting low demand for P (see Figure 17). After the cyanophyte bloom in July, however, the demand increased dramatically (turnover times of a few minutes) and remained high throughout the fall period. These data indicate low ambient P levels from July through October and suggest that the phytoplankton community were probably limited by phosphorus during this period.

7.3.2 Alkaline phosphatase activity

This enzyme is produced by the phytoplankton during conditions of P deficiency (Healey and Hendzel, 1979). Thus high levels of alkaline phosphatase (APase), per unit biomass, are indicative of P limitation.

APase levels were low prior to the bloom in July and very high afterwards (Figure 17). Activity dropped throughout September reaching low levels at the end of October. Thus the

Table 15: Wood Lake Phytoplankton Physiological Measurements

Date	Depth (m)	^{32}P Turnover Time (hrs•µg ATP•L^{-1})	Alkaline Phosphatase (nM MF•hr^{-1}•µg ATP^{-1})	P Uptake (µm PO_4•d^{-1}• µg ATP^{-1})	N Uptake (µM NH_4^+•d^{-1}• µg ATP^{-1})
29/5/80	0.5	1000	-	-	-
	5	1000	-	-	-
	20	1000	-	-	-
3/7/80	0.5	600	11.6	N.S.	N.S.
	5	650	46.8	N.S.	N.S.
	20	1000	46.7	N.S.	N.S.
6/8/80	0.5	0.19	391	0.31	N.S.
	5	0.15	377	0.35	N.S.
	20	1000	724	N.S.	N.S.
3/9/80	0.5	-	169	0.38	N.S.
	5	-	152	N.S.	N.S.
	20	-	168	N.S.	N.S.
16/9/80	0.5	0.66	65.3	N.S.	N.S.
	5	0.67	128	0.17	N.S.
	20	1000	0	N.S.	N.S.
21/10/80	0.5	3.2	48.9	N.S.	N.S.
	5	7.3	77.8	0.21	N.S.
	20	1000	0	N.S	N.S.

N.S. = No Significant Uptake

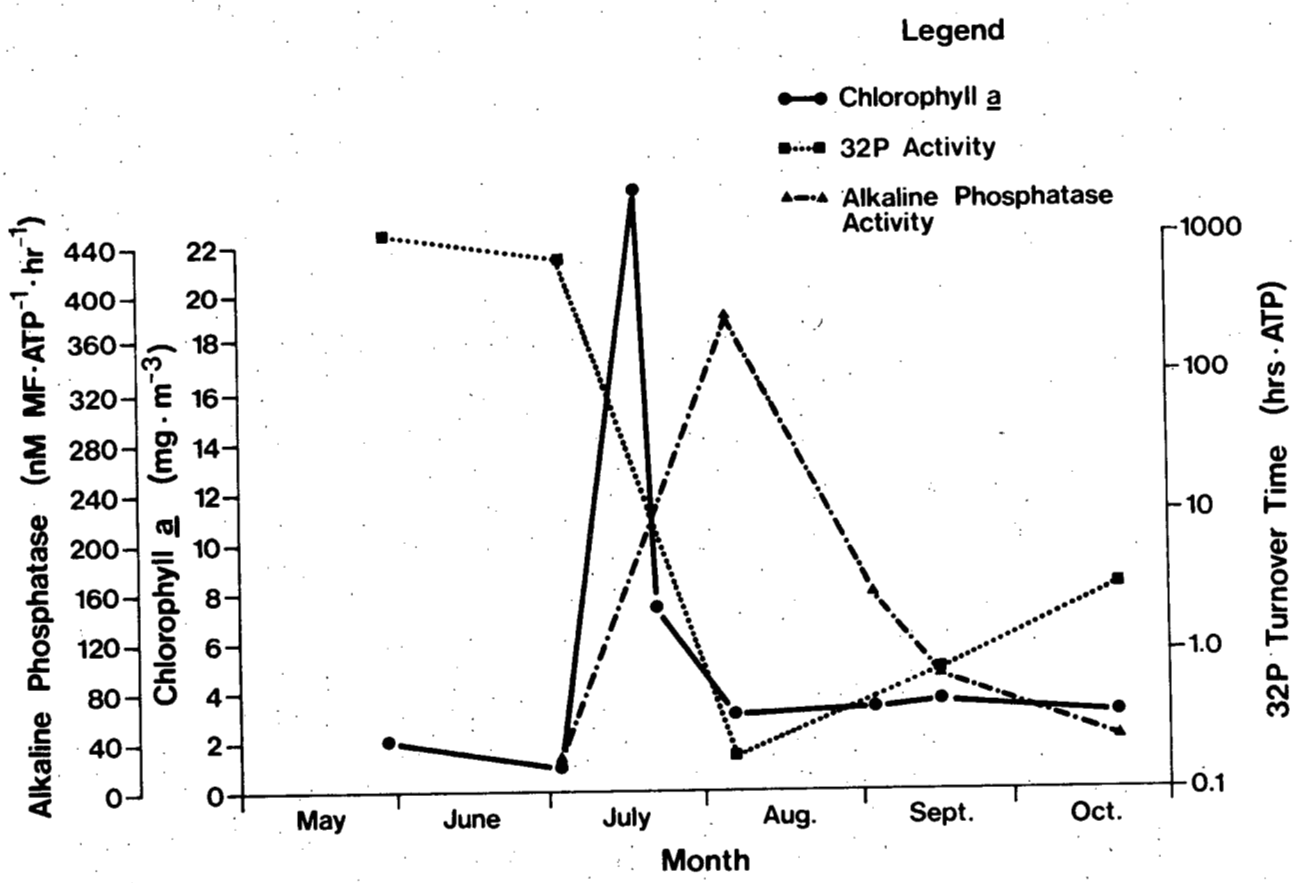


Figure 17 Comparison of phytoplankton biomass and activities, average 0.5 and 5 metre values, in Wood Lake, 1980.

seasonal pattern of APase is similar to that of ^{32}P turnover and reinforces the conclusion of strong P limitation in the epilimnion during August and September.

APase levels in some 20 metre samples, were very high (Table 15), despite very long ^{32}P turnover times and high SRP levels. The explanation for this anomaly is probably related to the fact that high cellular APase levels are not necessarily lowered by the presence of additional P, but are more likely reduced by cell division and growth (Healey, 1973). Thus the 20 metre populations may have sedimented down from the surface layers to the lake without sufficient time to divide and deplete their cellular APase reserves.

7.3.3 Unlabelled N & P uptake

The sensitivity of both of these measurements is dependent not only on the degree of nutrient starvation of the phytoplankton but also on their absolute biomass. If biomass levels are low enough, net nutrient uptake over 24 hours may be undetectable even during severe nutrient limitation. For this reason lack of measured nutrient uptake is not necessarily indicative of nutrient sufficiency.

The measurements of unlabelled orthophosphate (P) and ammonium (N) uptake are given in Table 15. The only significant P uptake within the epilimnion occurred during August and in sporadic samples thereafter. This reinforces the earlier observations of P limitation after July. At no time was a significant uptake of N measured. For the reason stated above this does not rule out N limitation at any time during the study. Indeed, one would have expected to see N uptake during early July given the very low epilimnion N:P ratios and the presence of heterocystous blue-greens at that time. However biomass levels were also very low reducing the sensitivity of the method.

8. CONCLUSIONS

Wood Lake, during 1980, became strongly stratified with a well defined epilimnion and thermocline. The maximum heat content was consistent with the lake's size and location and was comparable to several other study years. Hence the existence of a cold groundwater input suggested previously, is not substantiated.

Light extinction levels were characteristic of a mesotrophic lake. However, these extinction measurements did not correlate well with chlorophyll a levels making it difficult to relate historical changes in biomass levels to corresponding changes in water clarity. Changes in the species composition and bloom frequency of algae and variations in non-algal turbidity appear to have been the major complicating factors.

Dissolved oxygen concentrations throughout the year decreased in the hypolimnion at rates typical of a mesotrophic lake. Low levels were observed at the sediment-water interface during the fall. However, due to the absence of ice cover no winter oxygen depletion was observed in 1980.

Dissolved phosphorus concentrations at the start of the growing season were high relative to the other two major nutrients, nitrogen and silica. Despite this fact, DP levels were driven to very low levels in the epilimnion during summer and fall by algal uptake and probably also by co-precipitation with marl. There was a net loss of phosphorus from the water column to the sediments during the summer resulting in high concentrations of organic P in the surface layers of the sediment.

There was no net internal loading of phosphorus observed during 1980. This conclusion was based on similar springtime DP concentrations in 1980 and 1981, and was substantiated by the absence of elevated iron concentrations in the hypolimnion during the year. However, the high concentrations of the reduced form of manganese in the bottom waters suggests that the

threshold for release of iron, and thus phosphorus from the sediments, is close to being reached. Thus further inputs of organic material to the hypolimnion may reduce redox potentials sufficiently to promote this P release (internal loading).

The ratio of biologically avaliable nitrogen to phosphorus in the spring was indicative of an eutrophic lake. During the growing season dissolved nitrogen levels in the epilimnion were reduced to very low levels. Regeneration of this nitrogen in the hypolimnion occurred initially as nitrate but, with decreasing oxygen concentrations and denitrification of nitrate, resulted eventually in ammonium. This hypolimnetic ammonium did not reach levels normally thought to be toxic to fish.

Dissolved silica concentrations in the epilimnion were reduced to low levels early in the growing season, presumably by diatom uptake. Furthermore, reductions in this nutrient from mid-January 1981 to March 1981, suggests that diatom growth can occur in winter or early spring.

The concentrations of near-sediment bottom water chemicals in September, throughout the lake, seemed to correlate with the absolute water column depth not proximity to the sediments. Thus the sediment did not appear to significantly affect the chemistry of the overlying water masses.

Phytoplankton biomass levels in the euphotic zone, measured by chlorophyll a, ATP and cell volumes, were indicative of a mesotrophic to mildly eutrophic lake. Blue-green algae dominated the phytoplankton (on a cell volume basis) throughout the study period. However, the rapid depletions of silica in the epilimnion during the spring strongly suggests an early diatom bloom. The blue-greens consisted of a heterocystous, bloom-forming species, *Anabaena flos-aquae*, in July and a non-heterocystous species, *Lyngbya sp.*, throughout the remainder of the growing season. The use of cell numbers rather than volumes to determine phytoplankton composition in Wood Lake is not recommended because of the large variation in cell sizes that occur.

Of the three major phytoplankton nutrients it appears that phosphorus (P) ultimately controls the annual yield of biomass. This is evidenced by low epilimnetic P concentrations in midsummer coupled with low P turnover times and high alkaline phosphatase activities. Low levels of dissolved nitrogen and dissolved silica, however, are probably responsible for determining the gross composition of the phytoplankton. Thus the early depletion of silica probably limits the size of the spring diatom bloom whereas the depletion of dissolved nitrogen leads to the appearance of nitrogen fixing blue-green algae. Relative increases in either silica or nitrogen in future may thus select for the more aesthetically desirable phytoplankters, without significantly affecting the total annual algal yields.

On the basis of water clarity, oxygen depletion rates, N to P ratios and phytoplankton biomass and species composition, Wood Lake, in 1980, would be classed as mildly eutrophic. However, normal interannual variability may modify the magnitude and distribution of some of these parameters. Without a long-term data base it is difficult to establish whether 1980 was an average year. For example, the water inflow to the lake, in 1980, was low relative to previous years (Gray and Jasper, 1982) and no ice cover developed.

Further studies, if undertaken, should include measurements of water clarity, oxygen, nutrients, phytoplankton biomass and composition, frequency of blue-green blooms and determination of net phosphorus internal loading, if it occurs. The use of correct sampling methodologies is important, namely, two or more sampling stations to correct for internal waves, an early spring sampling to determine the starting nutrient supplies prior to algal uptake and growth, and a sampling routine with sufficient frequency to monitor the phytoplankton. A monitor strategy for Wood Lake is included in a companion report from this study (Gray and Jasper, 1982).

REFERENCES

Berman, T., and U. Pollingher. 1974. Annual and seasonal variations of phytoplankton, chlorophyll, and photosynthesis in Lake Kinneret. Limnol. Oceanogr. 19(1): 31-54.

Blanton, J.O. 1973. Some comparisons in thermal structure of Lakes Wood, Kalamalka, Okanagan, Skaha and Osoyoos, B.C. J. Fish. Res. Board Can. 30: 917-925.

B.C. Research. 1974. Water quality of the Kalamalka-Wood Lake basin. Vancuver. 163 pp.

Buchanan, R.J., and N.M.F. Kirk. 1974. Natural phytoplankton communities in lakes of the Kalamalka - Wood Lake drainage basin. B.C. Water Resources Service, Dept. of Lands, Forests and Water Resources, Victoria, British Columbia.

Canada-British Columbia Okanagan Basin Agreement. 1974. The limnology of the major Okanagan Basin lakes. Technical supplement V to the Final Report, published by the office of the Study Director, box 458, Penticton, B.C. 261 pp.

Carignan, R., and R.J. Flett. 1981. Postdepositional mobility of phosphorus in lake sediments. Limnol. Oceanogr. 26 (2): 361-366.

Edmondson, W.T., and J.T. Lehman. 1981. The effect of changes in the nutrient income on the condition of Lake Washington. Limnol. Oceanogr. 26 (1): 1-29.

Gray, C.B.J., and S. Jasper. 1982. Limnological trends in Wood Lake, B.C. (1971-1981) with some implications for lake management. Inland Waters Directorate, Pacific and Yukon Region, Vancouver, B.C.

Healey, F.P. 1973. Characteristics of phosphorus deficiency in Anabaena. J. Phycol. 9: 383-394.

Healey, F.P., and L.L. Hendzel. 1979. Fluorometric measurement of alkaline phosphatase activity in algae. Fresh. Biol. 9: 429-439.

Healey, F.P., and L.L. Hendzel. 1980. Physiological indicators of nutrient deficiency in lake phytoplankton. Can. J. Fish. Aquat. Sci. 37: 442-453.

Hobbie, J.E., R.J. Daley, and S. Jasper. 1977. Use of nuclepore filters for counting bacteria by fluorescence microscopy. Appl. Environ. Microbiol. 33: 1225-1228.

Holm-Hansen, O., and C.R. Booth. 1966. The measurement of adenosine triphosphate in the ocean and its ecological significance. Limnol. Oceanogr. 11: 510-519.

Hutchinson, G.E. 1957. A treatise on limnology. Volume I. J. Wiley, New York.

Inland Waters Directorate. 1981. Analytical methods manual. Water Quality Branch.

Kalamalka-Wood Lake Basin Water Resource Management Study. 1974. Published by the Water Investigations Branch, British Columbia Water Resources Service, Department of Lands, Forests and Water Resources, Parliament Buildings, Victoria, British Columbia. 208 pp.

Keller, P.E., and H.W. Paerl. 1980. Physiological adaptations in response to environmental stress during an N_2 - fixing Anabaena bloom. Appl. Environ. Microbiol. 40: 587-595.

Kemp, A.L.W., H.A. Savile, C.B. Gray, and A. Mudrochova. 1971. A simple corer and a method for sampling the mud-water interface. Limnol. Oceanogr. 16 (4): 689-694.

Koshinsky, G.D., and J.G. Stockner. 1972. Some winter observations of nutrient levels in the Ellison-Wood Lakes system 10-14 February, 1972. Interim data report prepared by F.R.B. for the Canada-B.C. Okanagan Basin Study. 5 pp.

Lean, D.R.S, and F.H. Rigler. 1974. A test of the hypothesis that abiotic phosphate complexing influences phosphorus kinetics in epilimnetic lake water. Limnol. Oceanogr. 19(5): 784-788.

Lund, J.W.G., C. Kipling, and E.D. LeCren. 1958. The inverted microscope method of estimating algal numbers and the statistical basis of estimations by counting. Hydrobiologia 11: 143-170.

Nordin, R.N. 1980. Strategies for maintaining water quality in two British Columbia lakes. Can. Water. Res. Jour. 5: 90-101.

Rigler, F.H. 1956. A tracer study of the phosphorus cycle in lake water. Ecology. 37: 550-562.

Rigler, F.H. 1968. Further observations inconsistent with the hypothesis that the molybdenum blue method measures orthophosphate in lake water. Limnol. Oceanogr. 13(1): 7-13.

Stadelmann, P., J.E. Moore, and E. Pickett. 1974. Primary production in relation to temperature structure, biomass concentration, and light conditions at an inshore and offshore station in Lake Ontario. J. Fish. Res. Board Can. 31: 1215-1232.

Stainton, M.P. 1973. A syringe gas-stripping procedure for gas-chromatographic determination of dissolved inorganic and organic carbon in fresh water and carbonates in sediments. J. Fish. Res. Board Can. 30: 1441-1445.

Thurston, R.V., R.C. Russo, C.M. Fetterolf, T.A. Edsall, Y.M. Barber (Eds.) 1979. A review of the EPA Red Book: Quality criteria for water. American Fisheries society, Bethesda, Maryland. 313 pp.

Utermöhl, H. 1958. Zur vervollkommung der quantitative phytoplankton methodik. Mitteilungen Internationale Vereinigung für Theoretische und Angewandte Limnologie 9: 1-38.

Vollenweider, R.A. 1974. A manual on methods for measuring primary production in aquatic environments. 2nd ed. IBP Handbook 12. 225 pp.

Williams, D.J. 1973. General limnology of the Okanagan mainstem lakes. Okanagan Basin Study Committee Preliminary Report no. 19. 14 pp.

Williams, J.D.H. 1973. Phosphorus in the sediments of the Okanagan mainstem lakes. Task 121 report to Canada-B.C. Okanagan Basin Study. 75 pp.

Williams, J.D.H., J.M. Jaquet, and R.L. Thomas. 1976. Forms of phosphorus in the surficial sediments of Lake Erie. J. Fish. Res. Board Canada. 33: 413-429.

Appendix 1

Wood Lake Temperature Data (°C) from Station A

DEPTH (Metres)	26/9/79	10/4/80	29/5/80	3/7/80	18/7/80	23/7/80
0	19.0	5	14.5	19.8	20.5	23.0
1		4.8	14.5	19.8	20.2	22.5
2	19.1	4.6	14.5	19.8	20.0	22.0
3		4.5	14.5	19.8	20.0	21.0
4		4.5	14.25	19.8	19.8	20.5
5	19.1	4.5		19.5	19.7	20.0
6		4.5	14.0	19.0	19.6	19.5
7		4.5		18.5	19.5	19.4
8		4.5	12.5	17.5	19.0	19.1
9		4.5	11.75	15.8	18.3	17.2
10	17.6	4.5	11.0	15.0	17.0	17.0
11			10.0			14.5
12		4.5	9.0	11.0	11.7	12.1
13			8.0			10.3
14		4.5	7.5	8.5	9.7	9.0
15	7.8	4.5	7.0			8.5
16		4.5	6.75	7.25	8.0	7.5
17						7.0
18		4.5	6.0	6.5	7.0	6.5
19						6.3
20	6.9	4.5	5.7	6.3	6.1	5.6
22		4.5		5.8		5.5
24		4.5	5.1	5.5	5.8	5.2
26		4.5		5.5		5.0
28		4.5	5.0	5.3		5.0
30	5.5	4.4				5.0

Appendix 1 (cont.)

Wood Lake Temperature Data (°C) from Station A

DEPTH (Metres)	6/8/80	4/9/80	16/9/80	16/10/80	21/10/80	20/11/80	11/3/81
0	21.0	18.1	17.8	14.3	13.5	8.5	3.5
1	21.0		17.8	14.3	13.5	8.5	3.2
2	20.9	18.1	17.8	14.3	13.5	8.5	3.2
3	20.9		17.8	14.3	13.5	8.5	3.2
4	20.9	18.1	17.8	14.3	13.5	8.5	3.2
5	20.9		17.8	14.3	13.5	8.5	3.2
6	20.9	18.1	17.7	14.3	13.5	8.5	3.2
7	20.8		17.7	14.3	13.5	8.5	3.1
8	20.6	18.0	17.6	14.3	13.5	8.5	3.1
9	18.0	18.0	17.6	14.3	13.5	8.5	3.1
10	16.7	18.0	17.5	14.3	13.5	8.5	3.1
11	13.2	16.0	17.5	14.3	13.5	8.5	3.1
12	11.9	13.0	14.5	14.3	13.5	8.5	3.1
13	10.6	11.2	12.0	14.3	13.5	8.5	3.2
14	9.6	10.5	10.2	14.3	13.5	8.5	3.2
15	8.6	9.0	9.3	11.7	11.0	8.5	3.2
16	7.8		8.5	9.5	9.5	8.5	3.2
17	6.8	7.5	8.2	8.5	8.5	8.5	3.1
18	6.6		7.8	7.7	7.9	8.5	3.1
19	6.2	6.8	7.5	7.5	7.5	8.4	3.1
20	6.0		6.6	7.0	7.0	8.3	3.1
22	5.6	6.2	6.3	6.3	6.7	8.3	3.1
24	5.4	5.9	5.6	6.0	6.0	8.0	3.1
26	5.4	5.7	5.6	5.6	5.7	7.6	3.1
28	5.3	5.5	5.4	5.5	5.5	7.0	3.1
30	5.2	5.5	5.4	5.5	5.5	5.8	3.1

Appendix 2

Wood Lake Chemical Data from Station A

PARAMETER	SYMBOL	UNITS
Depth	Z	Meters
Temperature	°C	Degrees Centigrade
Specific Conductivity	C_{25}	Micro Seimens/Centimeter
Turbidity	Turb	Jackson Turbidity Units
pH	pH	pH
Total Alkalinity	T Alk	Milligrams/Liter Ca CO_3
Phenolphthalein Alk	P Alk	Milligrams/Liter Ca CO_3
Total Inorganic Carbon	TIC	Milligrams/Liter C
Total Nitrogen	TN	Micrograms/Liter N
Particulate Nitrogen	PN	Micrograms/Liter N
Total Dissolved Nitrogen	TDN	Micrograms/Liter N
Nitrate plus Nitrite	N+N	Micrograms/Liter N
Nitrate Nitrogen	NO_3	Micrograms/Liter N
Nitrite Nitrogen	NO_2	Micrograms/Liter N
Ammonium Nitrogen	AN	Micrograms/Liter N
Dissolved Inorganic Nitrogen	DIN	Micrograms/Liter N
Dissolved Organic Nitrogen	DON	Micrograms/Liter N
Total Phosphorus	TP	Micrograms/Liter P
Particulate Phosphorus	PP	Micrograms/Liter P
Dissolved Phosphorus	DP	Micrograms/Liter P
Soluble Reactive Phosphorus	SRP	Micrograms/Liter P
Reactive Silica	SiO_2	Milligrams/Liter SiO_2
Particulate Carbon	PC	Milligrams/Liter C
Iron	Fe	Micrograms/Liter Fe
Manganese	Mn	Micrograms/Liter Mn
Dissolved Oxygen	DO	Milligrams/Liter O
Calcium (by Titration)	Ca	Milligrams/Liter Ca
Calcium Direct (by A.A.)	Ca D	Milligrams/Liter Ca
Magnesium (by Calc.)	Mg	Milligrams/Liter Mg
Magnesium Direct (by A.A.)	Mg D	Milligrams/Liter Mg

Appendix 2 (cont)

Wood Lake Chemical Data from Station A

PARAMETER	SYMBOL	UNITS
Sodium	Na	Milligrams/Liter Na
Potassium	K	Milligrams/Liter K
Sulphate	SO_4	Milligrams/Liter SO_4
Chloride	Cl	Milligrams/Liter Cl
Fluoride	F	Micrograms/Liter F
(Field Measurement)	(F)	
(Lab Measurement)	(L)	

Appendix 2 (cont.)
Monitor Date: 1979/09/26

Z	TN	PN	TDN	N+N	NO_3	NO_2	AN	DIN	DON
2.0			365.0	2.0			1.0	3.0	362.0
5.0			365.0	1.0			3.0	4.0	361.0
10.0			360.0	5.0			1.0	6.0	354.0
15.0			425.0	80.0			1.0	81.0	344.0
20.0			710.0	365.0			1.0	366.0	344.0
29.0			910.0	167.5			502.5	670.0	240.0
31.0			997.5	35.5			680.0	715.5	282.0

Monitor Date: 1980/04/10

Z	TN	PN	TDN	N+N	NO_3	NO_2	AN	DIN	DON
1.0	559.0	89.0	470.0	171.0	170.0	1.0	4.0	175.0	294.0
4.0			485.0	179.0	178.0	1.0	4.0	183.0	301.0
8.0	569.0	84.0	485.0	180.0	179.0	1.0	2.0	182.0	302.0
12.0			490.0	185.0	184.0	1.0	4.0	189.0	300.0
15.0	566.0	81.0	485.0	185.0	183.0	2.0	9.0	194.0	289.0
18.0			500.0	193.0	191.0	2.0	6.0	199.0	299.0
21.0	580.0	70.0	510.0	193.0	191.0	2.0	6.0	199.0	309.0
24.0			500.0	195.0	193.0	2.0	7.0	202.0	296.0
27.0	591.0	81.0	510.0	198.0	196.0	2.0	9.0	207.0	301.0
30.0			505.0	193.0	191.0	2.0	5.0	198.0	305.0
31.0	574.0	79.0	495.0	194.0	192.0	2.0	6.0	200.0	293.0
31.5			505.0	194.0	192.0	2.0	8.0	202.0	301.0

Monitor Date: 1980/05/29

Z	TN	PN	TDN	N+N	NO_3	NO_2	AN	DIN	DON
.5	411.0	36.0	375.0	2.0	1.0	1.0	9.0	11.0	363.0
2.0	396.0	31.0	365.0	4.0	3.0	1.0	8.0	12.0	352.0
5.0	386.0	36.0	350.0	1.0	0.0	1.0	2.0	3.0	346.0
8.0	391.0	41.0	350.0	2.0	0.0	2.0	7.0	9.0	339.0
10.0	403.0	33.0	370.0	18.0	16.0	2.0	13.0	31.0	337.0
12.0	441.0	33.0	408.0	39.0	35.0	4.0	27.0	66.0	338.0
15.0	470.0	12.0	458.0	89.0	83.0	6.0	29.0	118.0	334.0
18.0	483.0	15.0	468.0	112.0	111.0	1.0	28.0	140.0	327.0
20.0	530.0	12.0	518.0	162.0	161.0	1.0	27.0	189.0	328.0
24.0	624.0	9.0	615.0	200.0	194.0	6.0	49.0	249.0	360.0
27.0	747.0	13.0	734.0	220.0	180.0	40.0	140.0	360.0	334.0
27.5			775.0	210.0	167.0	43.0	148.0	358.0	374.0
28.5	778.0	13.0	765.0	210.0	206.0	4.0	152.0	362.0	399.0

Monitor Date: 1980/07/23

Z	TN	PN	TDN	N+N	NO_3	NO_2	AN	DIN	DON
.5	532.0	112.0	420.0	2.0	0.0	2.0	4.0	5.0	413.0
2.0	500.0	55.0	445.0	18.0	16.0	2.0	10.0	28.0	415.0
5.0	471.0	71.0	400.0	3.0	1.0	2.0	8.0	11.0	387.0
8.0	413.0	58.0	355.0	2.0	0.0	2.0	3.0	4.0	349.0
10.0	373.0	43.0	330.0	2.0	0.0	2.0	3.0	5.0	323.0
15.0	379.0	19.0	360.0	47.0	45.0	2.0	10.0	57.0	301.0
20.0	555.0	30.0	525.0	190.0	189.0	1.0	1.0	191.0	333.0
25.0	760.0	25.0	735.0	360.0	359.0	1.0	1.0	361.0	373.0
30.0	799.0	14.0	785.0	420.0	419.0	1.0	1.0	421.0	363.0
31.0	805.0	15.0	790.0	420.0	419.0	1.0	2.0	422.0	367.0
31.5	814.0	19.0	795.0	420.0	419.0	1.0	1.0	421.0	373.0

Monitor Date: 1980/09/04

Z	TN	PN	TDN	N+N	NO_3	NO_2	AN	DIN	DON
1.0	532.0	77.0	455.0	17.0	16.0	1.0	2.0	19.0	435.0
5.0	446.0	71.0	395.0	6.0	5.0	1.0	1.0	7.0	9.8
10.0	443.0	73.0	370.0	6.0	5.0	1.0	7.0	13.0	9.6
15.0	414.0	29.0	385.0	36.0	35.0	1.0	1.0	37.0	7.9
20.0	657.0	67.0	590.0	280.0	279.0	1.0	10.0	290.0	
25.0	753.0	23.0	730.0	390.0	389.0	1.0	32.0	422.0	1.7
29.0	821.0	41.0	780.0	370.0	369.0	1.0	92.0	462.0	.4
30.0	772.0	47.0	725.0	220.0	213.0	7.0	170.0	390.0	.4

Monitor Date: 1980/10/16

Z	TN	PN	TDN	N+N	NO_3	NO_2	AN	DIN	DON
1.0	402.0	67.0	335.0	3.0	2.0	1.0	1.0	4.0	330.0
5.0		82.0		2.0	1.0	1.0	1.0	3.0	
13.0	418.0	68.0	350.0	3.0	2.0	1.0	2.0	5.0	344.0
16.0	440.0	50.0	390.0	65.0	64.0	1.0	3.0	68.0	321.0
20.0	609.0	24.0	585.0	280.0	279.0	1.0	2.0	282.0	302.0
25.0		37.0		240.0	201.0	39.0	115.0	355.0	
30.0	739.0	34.0	705.0	24.0	23.0	1.0	440.0	464.0	240.0
31.0	747.0	37.0	710.0	11.0	6.0	5.0	450.0	461.0	244.0
31.5	755.0	35.0	720.0	13.0	8.0	5.0	500.0	513.0	202.0

Monitor Date: 1981/01/21

Z	TN	PN	TDN	N+N	NO_3	NO_2	AN	DIN	DON
1.0	481.0	21.0	460.0	170.0	169.0	1.0	5.0	175.0	285.0
16.0	460.0	15.0	445.0	172.0	171.0	1.0	7.0	179.0	266.0
31.0	532.0	24.0	508.0	189.0	188.0	1.0	34.0	223.0	285.0

Monitor Date: 1981/03/11

Z	TN	PN	TDN	N+N	NO_3	NO_2	AN	DIN	DON
1.0	574.0	34.0	540.0	161.0	159.0	2.0	14.0	175.0	365.0
4.0	466.0	41.0	425.0	158.0	156.0	2.0	1.0	159.0	266.0
7.0	763.0	38.0	485.0	161.0	157.0	4.0	2.0	163.0	322.0
9.0	460.0	35.0	425.0	159.0	158.0	1.0	1.0	160.0	265.0
14.0	499.0	39.0	460.0	159.0	157.0	2.0	2.0	161.0	299.0
21.0	488.0	38.0	450.0	158.0	156.0	2.0	6.0	164.0	286.0
27.0	458.0	38.0	420.0	161.0	160.0	1.0	7.0	168.0	252.0
28.0	459.0	39.0	420.0	161.0	160.0	1.0	3.0	164.0	256.0
28.5	454.0	44.0	410.0	159.0	158.0	1.0	2.0	161.0	249.0

Monitor Date: 1979/09/26

Z	TP	PP	DP	SRP	SiO_2	PC	Fe	Mn	DO
2.0	12.0	6.0	6.0		1.7				9.7
5.0	11.0	6.0	5.0		1.6				9.7
10.0	13.0	8.0	5.0		1.7				9.1
15.0	28.0	2.0	26.0		2.0				5.7
20.0	138.0	2.0	136.0		2.8				4.2
29.0	278.0	6.0	272.0		4.1				.6
31.0	305.0	9.0	296.0		4.5				.2

Monitor Date: 1980/04/10

Z	TP	PP	DP	SRP	SiO_2	PC	Fe	Mn	DO
1.0	83.0	13.0	70.0	59.0	2.3	569.0	1.	1.	12.2
4.0	85.0	15.0	70.0	61.0	2.4		32.	2.	12.2
8.0	85.0	15.0	70.0	61.0	2.4	509.0	5.	1.	12.1
12.0	85.0	13.0	72.0	64.0	2.5		5.	1.	11.8
15.0	85.0	15.0	70.0	62.0	2.5	489.0		1.	11.9
18.0	86.0	14.0	72.0	63.0	2.6		1.	1.	11.6
21.0	85.0	14.0	71.0	63.0	2.6	477.0	4.	1.	11.8
24.0	86.0	12.0	74.0	65.0	2.7		6.	2.	11.6
27.0	88.0	16.0	72.0	65.0	2.7	511.0	6.	0.	11.7
30.0	86.0	16.0	70.0	65.0	2.6		60.	2.	11.4
31.0	84.0	13.0	71.0	64.0	2.6	479.0	2.	2.	11.6
31.5	85.0	14.0	71.0	64.0	2.6		3.	4.	11.5

Monitor Date: 1980/05/29

Z	TP	PP	DP	SRP	SiO_2	PC	Fe	Mn	DO
.5	35.0	11.0	24.0	24.0	.3	379.0	11.	13.	11.4
2.0	35.0	1.0	34.0	23.0	.3	378.0	20.	13.	11.3
5.0	37.0	7.0	30.0	23.0	.3	376.0	15.	13.	11.3
8.0	40.0	5.0	35.0	28.0	.3	382.0	22.	17.	11.7
10.0	58.0	17.0	41.0	37.0	.4	342.0	17.	15.	11.9
12.0	54.0	5.0	49.0	43.0	.5	314.0	16.	15.	12.2
15.0	62.0	3.0	59.0	52.0	.9	171.0	27.	23.	11.9
18.0	66.0	5.0	61.0	54.0	1.1	174.0	10.	31.	11.8
20.0	73.0	2.0	71.0	62.0	1.8	179.0	20.	31.	11.1
24.0	92.0	2.0	90.0	85.0	2.5	184.0	15.	110.	9.5
27.0	150.0	5.0	145.0	127.0	3.8	168.0	24.	350.	6.6
27.5	150.0	5.0	145.0	131.0	3.7		32.	400.	6.5
28.5	150.0	5.0	145.0	134.0	3.8	181.0	40.	430.	6.3

Monitor Date: 1980/07/23

Z	TP	PP	DP	SRP	SiO_2	PC	Fe	Mn	DO
.5	12.0	6.0	6.0	2.0	.7	1210.0	4.	20.	12.4
2.0	14.0	6.0	8.0	1.5	.7	707.0			13.2
5.0	18.0	11.0	7.0	1.0	.7	629.0			12.1
8.0	17.0	8.0	9.0	2.5	.7	717.0			10.7
10.0	23.0	7.0	16.0	12.0	.8	660.0			10.9
15.0	66.0	6.0	60.0	55.0	1.3	516.0			11.4
20.0	99.0	4.0	95.0	94.0	2.2	570.0			9.1
25.0	155.0	3.0	152.0	141.0	3.6	615.0			5.1
30.0	182.0	3.0	179.0	165.0	4.3	274.0			2.8
31.0	190.0	10.0	180.0	168.0	4.3	309.0			3.1
31.5	187.0	5.0	182.0	169.0	4.4	375.0	1.	550.	2.6

Monitor Date: 1980/09/04

Z	TP	PP	DP	SRP	SiO_2	PC	Fe	Mn	DO
1.0	17.0	11.0	6.0	2.0	1.0	630.0	3.	1.	9.8
5.0	16.0	10.0	6.0	2.0	1.0	581.0			9.8
10.0	17.0	11.0	6.0	2.0	1.0	604.0			9.6
15.0	10.0	4.0	6.0	10.0	1.5	354.0			7.9
20.0	123.0	6.0	117.0	116.0	2.8	695.0			
25.0	219.0	9.0	210.0	198.0	4.4	291.0			1.7
29.0	248.0	4.0	244.0	232.0	4.9	349.0			.4
30.0	272.0	6.0	266.0	255.0	5.2	367.0	1.	80.	.4

Monitor Date: 1980/10/16

Z	TP	PP	DP	SRP	SiO_2	PC	Fe	Mn	DO
1.0	15.0	10.0	5.0	1.0	1.3	496.0	7.	1.	9.4
5.0	17.0	11.0	6.0	1.0	1.3	714.0	14.	1.	9.4
13.0	16.0	11.0	5.0	1.0	1.3	509.0	28.	1.	10.0
16.0	17.0	5.0	12.0	4.0	1.9	420.0	2.	1.	6.6
20.0	128.0	6.0	122.0	111.0	2.3	229.0	2.	1.	3.6
25.0	220.0	8.0	212.0	212.0	4.7	349.0	29.	90.	.6
30.0	270.0	9.0	261.0	259.0	5.3	497.0	1.	410.	.2
31.0	272.0	5.0	267.0	266.0	5.4	488.0	5.	700.	.1
31.5	272.0	6.0	266.0	268.0	5.5	502.0	5.	570.	.2

Monitor Date: 1981/01/21

Z	TP	PP	DP	SRP	SiO_2	PC	Fe	Mn	DO
1.0	79.0	7.0	72.0	70.0	2.5	213.0			12.2
16.0	78.0	5.0	73.0	70.0	3.2	183.0			12.1
31.0	88.0	10.0	78.0	74.0	3.2	230.0			9.4

Monitor Date: 1981/03/11

Z	TP	PP	DP	SRP	SiO_2	PC	Fe	Mn	DO
1.0	75.0	9.0	66.0	63.0	2.3	338.0			13.1
4.0	86.0	18.0	68.0	63.0	2.3	373.0			12.6
7.0	79.0	11.0	68.0	63.0	2.3	345.0			13.1
9.0	75.0	9.0	66.0	64.0	2.4	318.0			12.5
14.0	79.0	13.0	66.0	64.0	2.3	361.0			12.4
21.0	80.0	13.0	67.0	64.0	2.4	347.0			12.5
27.0	76.0	10.0	66.0	64.0	2.3	356.0			12.5
28.0	76.0	10.0	66.0	65.0	2.3	356.0			12.5
28.5	79.0	12.0	67.0	65.0	2.3	410.0			12.4

Monitor Date: 1979/09/26

Z	°C(F)	C25	Turb	pH(F)	pH(L)	°C(L)	T Alk	P Alk	TIC(F)
2.0	19.1	312.0	1.8	8.8	8.6	18.9	137.	5.5	27.2
5.0	19.1	312.0	1.5	8.8	8.6	19.1	137.	6.0	27.0
10.0	17.6	313.0	1.6	8.8	8.3	18.8	137.	0.0	28.5
15.0	7.8	323.0	.8	8.0	8.0	18.8	142.	0.0	31.1
20.0	6.9	328.0	.8	7.7	7.9	18.9	142.	0.0	31.7
29.0	5.6	332.0	3.9	7.4	7.6	19.6	144.	0.0	33.7
31.0	5.5	331.0	4.2	7.2	7.5	19.6	146.	0.0	34.4

Monitor Date: 1980/04/10

Z	°C(F)	C25	Turb	pH(F)	pH(L)	°C(L)	T Alk	P Alk	TIC(F)
1.0	4.8	327.0	.7	8.1	8.3	20.6	143.	0.0	30.8
4.0	4.5	330.0	.7		8.3	20.8	144.	0.0	31.2
8.0	4.5	329.0	.6	8.1	8.3	20.7	143.	0.0	29.5
12.0	4.5	329.0	.7		8.3	20.7	144.	0.0	29.3
15.0	4.5	329.0	.7	8.1	8.3	20.7	144.	0.0	30.1
18.0	4.5	329.0	.6		8.3	20.7	144.	0.0	30.2
21.0	4.5	328.0	.5	8.1	8.2	20.9	143.	0.0	30.4
24.0	4.5	329.0	.6		8.2	21.1	145.	0.0	30.3
27.0	4.5	329.0	.7	8.0	8.2	21.0	143.	0.0	29.5
30.0	4.4	329.0	.6		8.2	21.0	144.	0.0	30.5
31.0	4.4	329.0	.7	8.0	8.2	21.0	144.	0.0	31.2
31.5	4.3	329.0	.8		8.2	21.0	144.	0.0	29.7

Monitor Date: 1980/05/29

Z	°C(F)	C25	Turb	pH(F)	pH(L)	°C(L)	T Alk	P Alk	TIC(F)
.5	14.5	323.0	.5	8.6	8.7	19.8	146.	5.6	33.5
2.0	14.5	321.0	.6	8.7	8.7	19.7	146.	4.6	33.1
5.0	14.1	324.0	.6	8.7	8.6	19.6	146.	4.7	33.0
8.0	12.5	321.0	.6	8.6	8.7	19.6	146.	4.8	31.4
10.0	11.0	326.0	.7	8.5	8.5	19.8	146.	1.9	31.4
12.0	9.0	326.0	.5	8.4	8.4	20.0	148.	1.2	32.8
15.0	7.0	321.0	.6	8.1	8.3	20.4	146.	0.0	35.1
18.0	6.0	319.0	.5	8.1	8.2	19.8	146.	0.0	33.1
20.0	5.7	329.0	.5	8.0	8.2	19.6	145.	0.0	33.5
24.0	5.0	313.0	.7	7.9	8.0	19.5	146.	0.0	36.0
27.0	5.0	328.0	.6	7.7	8.1	19.6	146.	0.0	35.8
27.5	5.0	324.0	.8	7.6	8.2	19.7	145.	0.0	36.1
28.5	5.0	327.0	.6	7.9	7.9	19.9	146.	0.0	36.6

Monitor Date: 1980/07/23

Z	°C(F)	C25	Turb	pH(F)	pH(L)	°C(L)	T Alk	P Alk	TIC(F)
.5	23.0	298.0	1.0	9.0	8.4	12.8	125.	1.4	34.7
2.0	22.0	291.0	.9	9.1	8.4	13.9	135.	.7	32.3
5.0	20.0	328.0	.8	9.0	8.3	13.1	142.	0.0	32.8
8.0	19.1	310.0	.5	9.0	8.4	13.4	142.	1.1	33.7
10.0	17.0	344.0	.6	8.7	8.4	14.3	143.	.6	34.2
15.0	8.5	329.0	.4	8.3	8.2	13.8	147.	0.0	37.0
20.0	5.6	342.0	.7	7.9	8.2	14.6	150.	0.0	39.0
25.0	5.1	332.0	.7	7.7	8.3	15.2	145.	0.0	41.0
30.0	5.0	339.0	1.5	7.7	8.2	15.6	149.	0.0	41.6
31.0	5.0	322.0	1.0	7.9	8.2	16.6	146.	0.0	41.6
31.5	5.0	321.0	1.0	7.7	8.0	16.6	148.	0.0	41.3

Monitor Date: 1980/09/04

Z	°C(F)	C25	Turb	pH(F)	pH(L)	°C(L)	T Alk	P Alk	TIC(F)
1.0	18.1	296.0	.7	9.0	8.7		137.	5.0	29.9
5.0	18.1	304.0	.8	8.9	8.7		137.	5.9	28.1
10.0	18.0	305.0	.6	8.9	8.6		137.	4.6	25.4
15.0	9.0	329.0	.4	8.4	8.0		149.	0.0	30.5
25.0	5.8	343.0	.8	8.5	7.7		153.	0.0	32.3
29.0	5.5	337.0	1.0	8.0	7.9		152.	0.0	32.7
30.0	5.5	335.0	1.6	7.8	7.6		154.	0.0	32.1

Monitor Date: 1980/10/16

Z	°C(F)	C25	Turb	pH(F)	pH(L)	°C(L)	T Alk	P Alk	TIC(F)
1.0	14.3	314.0	.4	8.7			137.	6.2	26.1
5.0	14.3	316.0	.4	8.7			139.	5.8	27.0
13.0	14.3	315.0	.4	8.7			138.	6.4	27.1
16.0	9.5	329.0	.3	8.3			147.	0.0	30.4
20.0	7.0	345.0	.3	8.0			151.	0.0	32.7
25.0	5.8	347.0	.9	8.1			153.	0.0	35.1
30.0	5.5	349.0	3.0	7.6			155.	0.0	36.1
31.0		348.0	3.0	7.7			156.	0.0	36.6
31.5		348.0	2.5	7.6			155.	0.0	36.1

Monitor Date: 1981/01/21

Z	°C(F)	C25	Turb	pH(F)	pH(L)	°C(L)	T Alk	P Alk	TIC(F)
1.0	2.4	325.0	.2						
16.0	2.9	319.0	.2						
31.0	3.4	328.0	.3						

Monitor Date: 1981/03/11

Z	°C(F)	C25	Turb	pH(F)	pH(L)	°C(L)	T Alk	P Alk	TIC(F)
1.0	3.2	334.0	.5		8.1	19.3	144.	0.0	
4.0	3.2	333.0	.5		8.0	19.1	143.	0.0	
7.0	3.1	334.0	.5		8.0	19.4	144.	0.0	
9.0	3.1	335.0	.4		8.1	19.2	142.	0.0	
14.0	3.2	333.0	.5		8.0	19.3	145.	0.0	
21.0	3.1	333.0	.4		8.0	19.1	145.	0.0	
27.0	3.1	332.0	.4		8.0	19.3	143.	0.0	
28.0	3.1	333.0	.4		8.1	19.2	144.	0.0	
28.5	3.1	339.0	.4		8.0	19.6	142.	0.0	

Monitor Date: 1979/09/26

Z	Ca	Ca D	Mg	Mg D	Na	K	SO_4	CL	F
2.0	34.0		13.4				25.0		
5.0	34.0		13.4				24.0		
10.0	34.0		13.6				24.0		
15.0	32.8		15.3				26.0		
20.0	34.1		15.0				25.0		
29.0	33.2		15.6				25.0		
31.0	34.6		14.4				25.0		

Monitor Date: 1980/04/10

Z	Ca	Ca D	Mg	Mg D	Na	K	SO_4	CL	F
1.0	30.7	31.	15.4	15.	16.4	3.5	25.0	3.6	300.
4.0	29.8	30.	15.9	17.	16.5	3.6	25.0	3.6	290.
8.0	31.4	30.	15.0	16.	16.4	3.5	26.0	3.6	290.
12.0	30.7	31.	15.4	15.	16.4	3.5	25.0	3.6	290.
15.0	31.4	31.	15.2	15.	16.5	3.5	25.0	3.6	290.
18.0	30.6	31.	15.4	15.	16.5	3.5	25.0	3.6	290.
21.0	30.6	30.	15.4	16.	16.5	3.5	25.0	3.6	290.
24.0	30.0	31.	15.6	16.	16.5	3.5	24.0	3.6	290.
27.0	30.5	31.	15.5	15.	16.5	3.5	25.0	3.5	290.
30.0	30.8	30.	15.3	15.	16.5	3.5	25.0	3.6	290.
31.0	31.2	30.	15.1	15.	16.5	3.5	25.0	3.5	290.
31.5	30.9	30.	15.3	15.	16.6	3.5	25.0	3.6	290.

Monitor Date: 1980/05/29

Z	Ca	Ca D	Mg	Mg D	Na	K	SO_4	CL	F
.5	32.6	33.	15.2	16.	15.9	3.4	26.0	3.4	280.
2.0	33.1	31.	13.2	16.	16.0	3.6	26.0	3.4	290.
5.0	31.9	32.	15.1	16.	16.0	3.5	26.0	3.4	290.
8.0	36.6	32.	11.8	16.	16.2	3.5	25.0	3.4	290.
10.0	30.7	32.	15.9	16.	16.2	3.5	26.5	3.5	285.
12.0	32.6	32.	15.0	16.	16.1	3.5	25.5	3.4	285.
15.0	31.1	32.	15.4	16.	16.0	3.5	25.5	3.3	280.
18.0	31.5	32.	15.4	16.	16.0	3.5	25.5	3.3	280.
20.0	30.7	32.	16.1	16.	15.9	3.5	25.5	3.3	295.
24.0	31.9	32.	15.4	16.	16.0	3.6	25.0	3.3	280.
27.0	31.5	32.	15.9	16.	15.8	3.6	25.5	3.5	290.
27.5	32.7	32.	15.1	16.	15.8	3.6	25.0	3.5	285.
28.5	31.9	32.	15.6	16.	15.8	3.6	25.0	3.5	290.

Monitor Date: 1980/07/23

Z	Ca	Ca D	Mg	Mg D	Na	K	SO_4	CL	F
.5	25.6	25.	16.5	18.			24.5		
2.0	25.3		16.7				25.0		
5.0	27.6	28.	17.0	18.			25.0		
8.0	29.4		16.4				25.0		
10.0	30.7	30.	15.9	18.			25.0		
15.0	30.5		15.5				25.0		
20.0	30.2	30.	16.7	18.			24.5		
25.0	30.8		15.6				25.0		
30.0	32.1	29.	16.0	18.			24.5		
31.0	30.6		15.9				24.5		
31.5	30.5	28.	16.5	18.			24.5		

Monitor Date: 1980/09/04

Z	Ca	Ca D	Mg	Mg D	Na	K	SO_4	CL	F
1.0		25.		18.			27.5	3.7	
5.0							24.5	3.7	
10.0							24.0	3.6	
15.0							23.0	3.6	
25.0							25.5	3.6	
29.0		30.		18.			24.0	3.7	
30.0							23.5	3.6	

Monitor Date: 1980/10/16

Z	Ca	Ca D	Mg	Mg D	Na	K	SO_4	CL	F
1.0		25.		16.	16.6	3.7	27.0	3.6	
5.0		25.		16.	16.6	3.7	28.0	3.6	
13.0		26.		16.	16.5	3.6	26.5	3.6	
16.0		29.		16.	16.4	3.6	27.5	3.5	
20.0		31.		16.	16.3	3.6	25.5	3.5	
25.0		33.		16.	16.3	3.7	25.0	3.6	
30.0		33.		16.	16.3	3.8	25.0	3.6	
31.0		33.		16.	16.3	3.7	26.5	3.7	
31.5		32.		16.	16.3	3.7	24.5	3.6	

Monitor Date: 1981/01/21

Z	Ca	Ca D	Mg	Mg D	Na	K	SO_4	CL	F
1.0								3.7	
16.0								3.8	
31.0								3.8	

Monitor Date: 1981/03/11

Z	Ca	Ca D	Mg	Mg D	Na	K	SO_4	CL	F
1.0	30.7		15.4		16.2	3.5	24.0	3.4	280.
4.0	34.6		13.0		16.2	3.5	25.0	3.5	300.
7.0	31.8		14.7		16.3	3.5	24.5	3.5	270.
9.0	33.5		13.2		16.3	3.5	24.0	3.5	300.
14.0	32.5		14.4		16.3	3.5	24.5	3.5	310.
21.0	35.2		12.7		16.3	3.5	24.5	3.5	310.
27.0	35.1		12.7		16.3	3.5	24.5	3.5	310.
28.0	34.7		13.0		16.3	3.5	24.5	3.5	320.
28.5	34.7		13.0		16.3	3.5	24.0	3.5	320.

Appendix 3

Wood Lake Chemical Data from Bottom Water Survey, September, 1980

Day/Time	Stn #	Z (m)	TDN (µg/l)	N+N (µg/l)	NO_3 (µg/l)	NO_2 (µg/l)	NH_4 (µg/l)	DIN (µg/l)	DON (µg/l)
05/1120	1	9	355	5	4	1	1	6	349
05/1110	2	13	360	34	33	1	4	38	322
05/1045	3	13.5	370	24	23	1	3	27	343
05/1055	4	17	500	177	176	1	5	182	318
05/1105	5	16	565	160	159	1	61	221	344
05/1035	6	17.5	565	195	194	1	37	232	333
05/1030	7	24.5	750	310	309	1	85	395	355
05/1020	8	18.5	625	290	289	1	14	304	321
04	9	16	450	87	86	1	35	122	328
04	10	27	770	360	358	2	63	423	347
04	11	18	490	142	141	1	13	155	335
04	12	17	435	87	85	2	6	93	342
05/1005	13	24	740	370	369	1	39	409	331
05/0945	14	18	590	240	239	1	35	275	315
05/0935	15	28.5	750	230	229	1	147	377	373
05/0954	16	18	495	152	151	1	22	174	321
05/0920	17	25	785	470	468	2	1	471	314
05/0905	18	20	580	230	229	1	11	241	339
05/0848	19	15	380	28	27	1	22	50	330
05/0840	20	15	400	52	51	1	19	71	329
05/0830	21	15.5	375	22	20	2	2	24	351
05/0836	22	10	360	3	1	2	2	5	355

Appendix 3 (cont)

Wood Lake Chemical Data from Bottom Water Survey, September, 1980.

Day/Time	Stn #	Z (m)	C25 (µs/cm)	Turb (JTU)	TP (µg/l)	PP (µg/l)	DP (µg/l)	SRP (µg/l)	DO (mg/l)
05/1120	1	9	308	.52	15	9	6	4	9.3
05/1110	2	13	324	.54	23	10	13	8	6.7
05/1045	3	13.5	329	.28	24	11	13	17	6.9
05/1055	4	17	326	.26	97	8	89	80	5.4
05/1105	5	16	331	.48	122	20	102	93	4.6
05/1035	6	17.5	330	.41	150	14	136	127	4.0
05/1030	7	24.5	337	.67	141	5	136	201	0.4
05/1020	8	18.5	333	.23	154	11	143	137	4.0
04	9	16	304	.64	70	10	60	58	6.5
04	10	27	342	.83	239	7	232	212	0.7
04	11	18	335	.24	206	5	201	76	6.5
04	12	17	317	.47	42	7	35	33	7.5
05/1005	13	24	337	.31	105	7	98	183	1.1
05/0945	14	18	328	.39	138	7	131	131	4.6
05/0935	15	28.5	343	1.30	163	5	158	246	0.3
05/0954	16	18	328	.38	91	0	91	83	6.3
05/0920	17	25	332	.23	191	2	189	181	1.3
05/0905	18	20	330	.53	120	7	113	108	5.0
05/0848	19	15	332	.57	31	10	21	19	6.8
05/0840	20	15	331	.47	40	11	29	27	6.7
05/0830	21	15.5	325	.62	18	10	8	12	7.8
05/0836	22	10	307	.68	16	9	7	6	9.9

Appendix 4

Wood Lake Phytoplankton species list, cell counts and volumes from Station A

Appendix 4 (cont): Phytoplankton species list and species volumes for Wood Lake, 1980.

	VOLUME (μm^3 per cell; except where noted)
CYANOPHYTA	
Anabaena flos aquae	65.5
Anacystis	210/colony
Aphanizomenon	15910/mm
Cyanobacteria	0.52
Dactylococcopsis	60
Lyngbya	13000/mm
Unknown species (filamentous) size 1	12570/mm
Unknown species (filamentous) size 2	44250/mm
Unknown species (filamentous) size 3	73650/mm
Unknown species (Rivulariaceae)	1697
CHLOROPHYTA	
Actinastrum	33.8
Closterium size 1	92.4
Closterium size 2	960
Echinosphaerella	524
Eudorina	17152/colony
Oocystis size 1	1390
Oocystis size 2	5800
Oocystis size 3	904/colony
Sphaerocystis	450/colony
Staurastrum	24000
Unknown species (biflagellate) size 1	45
Unknown species (biflagellate) size 2	92
Unknown species (biflagellate) size 3	603
Unknown species (biflagellate) size 4	1002
Unknown species (4 flagellae) size 1	715
Unknown species (4 flagellae) size 2	14142
Unknown species size 1	152
Unknown species size 2	2828
DIATOM	
Achnanthes	32.8
Asterionella size 1	876
Asterionella size 2	1860
Cocconeis	240
Cyclotella size 1	2613
Cyclotella size 2	18857
Cyclotella size 3	41428
Cymbella	500
Fragilaria species	714
Fragilaria crotonensis	343
Melosira granulata	1060
Navicula	913
Synedra size 1	127.5
Synedra size 2	866
Tabellaria species	115
Tabellaria fenestrata	2571

Appendix 4 (cont): Phytoplankton Species List and species values for Wood Lake, 1980.

	VOLUME (μm^3 per cell; except where noted)
CHRYSOPHYCEAE	
Chrysococcus size 1	65.5
Chrysococcus size 2	221
Dinobryon	65.5
Mallomonas coronata	523
Mallomonas species size 1	90.6
Mallomonas species size 2	418
Mallomonas species size 3	1150
Mallomonas species size 4	5800
Syncrypta	1072/colony
Synura	920
Unknown species	65.5
CRYPTOPHYTA	
Chroomonas acuta	10.2
PYRRHOPHYTA	
Ceratium hirundinella	8100
Cystodinium	7241

WOOD LAKE ALGAL VOLUMES 29/5/80 0.5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	3.5	3066
CYMBELLA spp	DIATOM		.1	50
FRAGILARIA	DIATOM		2.7	1927.8
SYNEDRA	DIATOM	SIZE# 1	.2	25.5
SYNEDRA	DIATOM	SIZE# 2	.4	346.4
CYCLOTELLA sp.	DIATOM	SIZE# 2	.1	1885.7
CYCLOTELLA sp.	DIATOM	SIZE# 3	.1	4142.8
ANABAENA flos aquae	CYANOPHYTE		.8	52.4
APHANIZOMENON	CYANOPHYTE		.51	8114.1
CYANOBACTERIA	CYANOPHYTE		4800	2496
EUDORINA	CHLOROPHYTE		7	120064
OOCYSTIS	CHLOROPHYTE	SIZE# 1	25	34750
OOCYSTIS	CHLOROPHYTE	SIZE# 2	3	17400
OOCYSTIS sp.	CHLOROPHYTE	SIZE# 3	14	12656
SPHAEROCYSTIS	CHLOROPHYTE		38	17100
STAURASTRUM	CHLOROPHYTE		1.04	24960
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 1	1	45
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	.2	18.4
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 3	14	8442
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	5	5010
CHROOMONAS acuta	CRYPTOPHYTE		10	102
CERATIUM hirundinella	PYRRHOPHYTE		.02	162
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	10	335
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	1.2	135.6
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	.2	104.76
UNKNOWN	UNIDENTIFIED		.1	90.5
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.6	160.8
	TOTALS		4939	263643

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	EUDORINA	120064	45.54
2	OOCYSTIS	64806	24.58
3	STAURASTRUM	24960	9.46
4	SPHAEROCYSTIS	17100	6.48
5	UNKNOWN sp. Biflagellate	13515.4	5.12
6	APHANIZOMENON	8114.1	3.07
7	CYCLOTELLA sp.	6028.5	2.28
8	ASTERIONELLA	3066	1.16
9	CYANOBACTERIA	2496	.94
10	FRAGILARIA	1927.8	.73

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	4800	97.19
2	OOCYSTIS	42	.85
3	SPHAEROCYSTIS	38	.76
4	UNKNOWN sp. Biflagellate	20.2	.4
5	UNKNOWN spherical cells	11.4	.23
6	CHROOMONAS acuta	10	.2
7	EUDORINA	7	.14
8	ASTERIONELLA	3.5	.07
9	FRAGILARIA	2.7	.05
10	STAURASTRUM	1.04	.02

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CHLOROPHYTE	240445.4	91.2
2	DIATOM	11444.2	4.34
3	CYANOPHYTE	10662.5	4.04
4	UNIDENTIFIED	826.66	.31
5	PYRRHOPHYTE	162	.06
6	CRYPTOPHYTE	102	.03

WOOD LAKE ALGAL VOLUMES 29/5/80 5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	2.6	2277.6
ASTERIONELLA	DIATOM	SIZE# 2	.1	186
FRAGILARIA	DIATOM		1.1	785.4
SYNEDRA	DIATOM	SIZE# 1	.3	38.25
SYNEDRA	DIATOM	SIZE# 2	1.4	1212.4
TABELLARIA fenestrata	DIATOM		.1	257.1
CYCLOTELLA sp.	DIATOM	SIZE# 2	.1	1885.7
ANABAENA flos aquae	CYANOPHYTE		1.2	78.6
APHANIZOMENON	CYANOPHYTE		.38	6045.8
CYANOBACTERIA	CYANOPHYTE		3400	1768
EUDORINA	CHLOROPHYTE		11	188672
OOCYSTIS	CHLOROPHYTE	SIZE# 1	28	38920
OOCYSTIS	CHLOROPHYTE	SIZE# 2	2.2	12760
OOCYSTIS sp.	CHLOROPHYTE	SIZE# 3	18	16272
SPHAEROCYSTIS	CHLOROPHYTE		96	43200
STAURASTRUM	CHLOROPHYTE		1.4	33600
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 1	1.4	63
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	.4	36.8
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 3	17	10251
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	3	3006
CHRYSOCOCCUS	CHRYSOPHYTE	SIZE# 1	20	1310
CHROOMONAS acuta	CRYPTOPHYTE		10	102
CERATIUM hirundinella	PYRRHOPHYTE		.02	162
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	40	1340
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	2.8	316.4
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	.4	107.2
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.4	107.2
	TOTALS		3659	364760

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	EUDORINA	188672	51.72
2	OOCYSTIS	67952	18.62
3	SPHAEROCYSTIS	43200	11.84
4	STAURASTRUM	33600	9.21
5	UNKNOWN sp. Biflagellate	13356.8	3.66
6	APHANIZOMENON	6045.8	1.65
7	ASTERIONELLA	2463.6	.67
8	CYCLOTELLA sp.	1885.7	.51
9	CYANOBACTERIA	1768	.48
10	UNKNOWN spherical cells	1763.6	.48

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	3400	92.91
2	SPHAEROCYSTIS	96	2.62
3	OOCYSTIS	48.2	1.31
4	UNKNOWN spherical cells	43.2	1.18
5	UNKNOWN sp. Biflagellate	21.8	.59
6	CHRYSOCOCCUS	20	.54
7	EUDORINA	11	.3
8	CHROOMONAS acuta	10	.27
9	ASTERIONELLA	2.7	.07
10	SYNEDRA	1.7	.04

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CHLOROPHYTE	346780.8	95.07
2	CYANOPHYTE	7892.4	2.16
3	DIATOM	6642.45	1.82
4	UNIDENTIFIED	1870.8	.51
5	CHRYSOPHYTE	1310	.35
6	PYRRHOPHYTE	162	.04
7	CRYPTOPHYTE	102	.02

WOOD LAKE ALGAL VOLUMES 3/7/80 .5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	.2	175.2
ASTERIONELLA	DIATOM	SIZE# 2	.7	1302
SYNEDRA	DIATOM	SIZE# 1	.1	12.75
ANABAENA flos aquae	CYANOPHYTE		48.2	3157.1
APHANIZOMENON	CYANOPHYTE		.1	1591
ANACYSTIS	CYANOPHYTE		13	2730
CYANOBACTERIA	CYANOPHYTE		8000	4160
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.2	278
OOCYSTIS sp.	CHLOROPHYTE	SIZE# 3	.2	180.8
SPHAEROCYSTIS	CHLOROPHYTE		.4	180
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 3	.4	241.2
UNKNOWN sp.	CHLOROPHYTE		.8	121.6
CERATIUM hirundinella	PYRRHOPHYTE		.02	162
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	20	670
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	1	113
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	.2	53.6
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	.8	419.04
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	1	268
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	.1	125
	TOTALS		8087	15940

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	CYANOBACTERIA	4160	26.09
2	ANABAENA flos aquae	3157.1	19.8
3	ANACYSTIS	2730	17.12
4	APHANIZOMENON	1591	9.98
5	ASTERIONELLA	1477.2	9.26
6	UNKNOWN spherical cells	1255.64	7.87
7	OOCYSTIS	458.8	2.87
8	UNKNOWN ciliate	393	2.46
9	UNKNOWN sp. Biflagellate	241.2	1.51
10	SPHAEROCYSTIS	180	1.12

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	8000	98.91
2	ANABAENA flos aquae	48.2	.59
3	UNKNOWN spherical cells	22	.27
4	ANACYSTIS	13	.16
5	UNKNOWN ciliate	1.1	.01
6	ASTERIONELLA	.9	.01
7	UNKNOWN sp.	.8	0
8	UNKNOWN sp. Biflagellate	.4	0
9	SPHAEROCYSTIS	.4	0
10	OOCYSTIS	.4	0

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	11638.1	73.01
2	UNIDENTIFIED	1648.64	10.34
3	DIATOM	1489.95	9.34
4	CHLOROPHYTE	1001.6	6.28

5	PYRRHOPHYTE	162	1.01

WOOD LAKE ALGAL VOLUMES 2/7/80 5.0 M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	.4	350.4
ASTERIONELLA	DIATOM	SIZE# 2	.4	744
ANABAENA flos aquae	CYANOPHYTE		183	11986.5
APHANIZOMENON	CYANOPHYTE		.14	2227.4
ANACYSTIS	CYANOPHYTE		16	3360
DACTYLOCOCCOPSIS	CYANOPHYTE		1.2	72
CYANOBACTERIA	CYANOPHYTE		11200	5824
EUDORINA	CHLOROPHYTE		.2	3430.4
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.1	139
SPHAEROCYSTIS	CHLOROPHYTE		.1	45
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 3	.04	24.12
CHRYSOCOCCUS	CHRYSOPHYTE	SIZE# 1	20	1310
CHROOMONAS acuta	CRYPTOPHYTE		20	204
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	40	1340
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	2.4	271.2
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	2	536
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	.4	209.52
UNKNOWN	UNIDENTIFIED		.2	181
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.2	53.6
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	.1	125
	TOTALS		11487	32433

RANK	SPECIES BY VOLUME	cu.micr/ml	%
1	ANABAENA flos aquae	11986.5	36.95
2	CYANOBACTERIA	5824	17.95
3	EUDORINA	3430.4	10.57
4	ANACYSTIS	3360	10.35
5	UNKNOWN spherical cells	2356.72	7.26
6	APHANIZOMENON	2227.4	6.86
7	CHRYSOCOCCUS	1310	4.03
8	ASTERIONELLA	1094.4	3.37
9	CHROOMONAS acuta	204	.62
10	UNKNOWN	181	.55

RANK	SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	11200	97.5
2	ANABAENA flos aquae	183	1.59
3	UNKNOWN spherical cells	44.8	.39
4	CHROOMONAS acuta	20	.17
5	CHRYSOCOCCUS	20	.17
6	ANACYSTIS	16	.13
7	DACTYLOCOCCOPSIS	1.2	.01
8	ASTERIONELLA	.8	0
9	UNKNOWN ciliate	.3	0
10	UNKNOWN	.2	0

RANK	GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	23469.9	72.36
2	CHLOROPHYTE	3638.52	11.21
3	UNIDENTIFIED	2716.32	8.37

4	CHRYSOPHYTE	1310	4.03
5	DIATOM	1094.4	3.37
6	CRYPTOPHYTE	204	.62

WOOD LAKE ALGAL VOLUMES 12/7/80 0.5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	2.2	1927.2
SYNEDRA	DIATOM	SIZE# 1	1.4	178.5
ANABAENA flos aquae	CYANOPHYTE		124000	8122000
APHANIZOMENON	CYANOPHYTE		.22	3500.2
ANACYSTIS	CYANOPHYTE		23	4830
UNKNOWN sp. Rivulariaceae	CYANOPHYTE		.08	135.76
CYANOBACTERIA	CYANOPHYTE		8500	4420
SPHAEROCYSTIS	CHLOROPHYTE		.1	45
STAURASTRUM	CHLOROPHYTE		.04	960
CHROOMONAS acuta	CRYPTOPHYTE		40	408
CERATIUM hirundinella	PYRRHOPHYTE		.04	324
RAPHIDIOPSIS	UNIDENTIFIED		1.2	27
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	80	2680
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.4	107.2
	TOTALS		132649	8141543

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	ANABAENA flos aquae	8122000	99.75
2	ANACYSTIS	4830	.05
3	CYANOBACTERIA	4420	.05
4	APHANIZOMENON	3500.2	.04
5	UNKNOWN spherical cells	2680	.03
6	ASTERIONELLA	1927.2	.02
7	STAURASTRUM	960	.01
8	CHROOMONAS acuta	408	0
9	CERATIUM hirundinella	324	0
10	SYNEDRA	178.5	0

	RANK SPECIES BY CELLS	cells/ml	%
1	ANABAENA flos aquae	124000	93.48
2	CYANOBACTERIA	8500	6.4
3	UNKNOWN spherical cells	80	.06
4	CHROOMONAS acuta	40	.03
5	ANACYSTIS	23	.01
6	ASTERIONELLA	2.2	0
7	SYNEDRA	1.4	0
8	RAPHIDIOPSIS	1.2	0
9	UNKNOWN ciliate	.4	0
10	APHANIZOMENON	.22	0

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	8134885.96	99.91
2	UNIDENTIFIED	2814.2	.03
3	DIATOM	2105.7	.02
4	CHLOROPHYTE	1005	.01
5	CRYPTOPHYTE	408	0
6	PYRRHOPHYTE	324	0

WOOD ALGAL VOLUMES 10/7/80 2M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	2.2	1927.2
FRAGILARIA crotonensis	DIATOM		.6	205.8
ANABAENA flos aquae	CYANOPHYTE		71400	4676700
APHANIZOMENON	CYANOPHYTE		2.08	33092.8
ANACYSTIS	CYANOPHYTE		3	630
DACTYLOCOCCOPSIS	CYANOPHYTE		10.2	612
UNKNOWN sp. Rivulariaceae	CYANOPHYTE		.2	339.4
CYANOBACTERIA	CYANOPHYTE		10000	5200
STAURASTRUM	CHLOROPHYTE		.2	4800
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 3	.08	48.24
CHROOMONAS acuta	CRYPTOPHYTE		70	714
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	40	1340
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	10	1130
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.2	53.6
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	.12	150
	TOTALS		81539	4726943

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	ANABAENA flos aquae	4676700	98.93
2	APHANIZOMENON	33092.8	.7
3	CYANOBACTERIA	5200	.11
4	STAURASTRUM	4800	.1
5	UNKNOWN spherical cells	2470	.05
6	ASTERIONELLA	1927.2	.04
7	CHROOMONAS acuta	714	.01
8	ANACYSTIS	630	.01
9	DACTYLOCOCCOPSIS	612	.01
10	UNKNOWN sp. Rivulariaceae	339.4	0

	RANK SPECIES BY CELLS	cells/ml	%
1	ANABAENA flos aquae	71400	87.56
2	CYANOBACTERIA	10000	12.26
3	CHROOMONAS acuta	70	.08
4	UNKNOWN spherical cells	50	.06
5	DACTYLOCOCCOPSIS	10.2	.01
6	ANACYSTIS	3	0
7	ASTERIONELLA	2.2	0
8	APHANIZOMENON	2.08	0
9	FRAGILARIA crotonensis	.6	0
10	UNKNOWN ciliate	.32	0

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	4716574.2	99.78
2	CHLOROPHYTE	4848.24	.1
3	UNIDENTIFIED	2673.6	.05
4	DIATOM	2133	.04
5	CRYPTOPHYTE	714	.01

WOOD LAKE ALGAL VOLUMES 18/7/80 5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	1.2	1051.2
FRAGILARIA	DIATOM		3.7	2641.8
FRAGILARIA crotonensis	DIATOM		.1	34.3
ANABAENA flos aquae	CYANOPHYTE		13000	851500
APHANIZOMENON	CYANOPHYTE		.22	3500.2
DACTYLOCOCCOPSIS	CYANOPHYTE		2.4	144
UNKNOWN sp. Rivulariaceae	CYANOPHYTE		2.8	4751.6
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 1	.21	2639.7
CYANOBACTERIA	CYANOPHYTE		40000	20800
STAURASTRUM	CHLOROPHYTE		.24	5760
CHROOMONAS acuta	CRYPTOPHYTE		140	1428
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	120	4020
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	.8	214.4
UNKNOWN	UNIDENTIFIED		.04	36.2
	TOTALS		53272	898521

RANK	SPECIES BY VOLUME	cu.micr/ml	%
1	ANABAENA flos aquae	851500	94.76
2	CYANOBACTERIA	20800	2.31
3	STAURASTRUM	5760	.64
4	UNKNOWN sp. Rivulariaceae	4751.6	.52
5	UNKNOWN spherical cells	4234.4	.47
6	APHANIZOMENON	3500.2	.38
7	FRAGILARIA	2641.8	.29
8	UNKNOWN sp. filamentous	2639.7	.29
9	CHROOMONAS acuta	1428	.15
10	ASTERIONELLA	1051.2	.11

RANK	SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	40000	75.08
2	ANABAENA flos aquae	13000	24.4
3	CHROOMONAS acuta	140	.26
4	UNKNOWN spherical cells	120.8	.22
5	FRAGILARIA	3.7	0
6	UNKNOWN sp. Rivulariaceae	2.8	0
7	DACTYLOCOCCOPSIS	2.4	0
8	ASTERIONELLA	1.2	0
9	STAURASTRUM	.24	0
10	APHANIZOMENON	.22	0

RANK	GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	883335.5	98.3
2	CHLOROPHYTE	5760	.64
3	UNIDENTIFIED	4270.6	.47
4	DIATOM	3727.3	.41
5	CRYPTOPHYTE	1428	.15

WOOD LAKE ALGAL VOLUMES 12/7/80 10M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	2.5	2190
SYNEDRA	DIATOM	SIZE# 1	.1	12.75
ANABAENA flos aquae	CYANOPHYTE		525	34387.5
APHANIZOMENON	CYANOPHYTE		.05	795.5
ANACYSTIS	CYANOPHYTE		.8	168
DACTYLOCOCCOPSIS	CYANOPHYTE		1.2	72
CYANOBACTERIA	CYANOPHYTE		23000	11960
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.2	278
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	.8	73.6
CHROOMONAS acuta	CRYPTOPHYTE		180	1836
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	80	2680
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	.8	90.4
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	.4	107.2
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	.12	62.856
UNKNOWN	UNIDENTIFIED		.08	72.4
	TOTALS		23792	54786

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	ANABAENA flos aquae	34387.5	62.76
2	CYANOBACTERIA	11960	21.83
3	UNKNOWN spherical cells	2940.456	5.36
4	ASTERIONELLA	2190	3.99
5	CHROOMONAS acuta	1836	3.35
6	APHANIZOMENON	795.5	1.45
7	OOCYSTIS	278	.5
8	ANACYSTIS	168	.3
9	UNKNOWN sp. Biflagellate	73.6	.13
10	UNKNOWN	72.4	.13

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	23000	96.67
2	ANABAENA flos aquae	525	2.2
3	CHROOMONAS acuta	180	.75
4	UNKNOWN spherical cells	81.32	.34
5	ASTERIONELLA	2.5	.01
6	DACTYLOCOCCOPSIS	1.2	0
7	UNKNOWN sp. Biflagellate	.8	0
8	ANACYSTIS	.8	0
9	OOCYSTIS	.2	0
10	SYNEDRA	.1	0

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	47383	86.48
2	UNIDENTIFIED	3012.856	5.49
3	DIATOM	2202.75	4.02
4	CRYPTOPHYTE	1836	3.35
5	CHLOROPHYTE	351.6	.64

WOOD LAKE ALGAL VOLUMES 22/7/80 0.5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	.2	175.2
FRAGILARIA crotonensis	DIATOM		.1	34.3
SYNEDRA	DIATOM	SIZE# 1	.4	51
ANABAENA flos aquae	CYANOPHYTE		8900	582950
APHANIZOMENON	CYANOPHYTE		.41	6523.1
ANACYSTIS	CYANOPHYTE		.8	168
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 2	.33	14602.5
CYANOBACTERIA	CYANOPHYTE		6000	3120
OOCYSTIS	CHLOROPHYTE	SIZE# 1	11	15290
CHROOMONAS acuta	CRYPTOPHYTE		240	2448
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	120	4020
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	20	2260
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	2	536
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.8	214.4
	TOTALS		15296	632393

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	ANABAENA flos aquae	582950	92.18
2	OOCYSTIS	15290	2.41
3	UNKNOWN sp. filamentous	14602.5	2.3
4	UNKNOWN spherical cells	6816	1.07
5	APHANIZOMENON	6523.1	1.03
6	CYANOBACTERIA	3120	.49
7	CHROOMONAS acuta	2448	.38
8	UNKNOWN ciliate	214.4	.03
9	ASTERIONELLA	175.2	.02
10	ANACYSTIS	168	.02

	RANK SPECIES BY CELLS	cells/ml	%
1	ANABAENA flos aquae	8900	58.18
2	CYANOBACTERIA	6000	39.22
3	CHROOMONAS acuta	240	1.56
4	UNKNOWN spherical cells	142	.92
5	OOCYSTIS	11	.07
6	UNKNOWN ciliate	.8	0
7	ANACYSTIS	.8	0
8	APHANIZOMENON	.41	0
9	SYNEDRA	.4	0
10	UNKNOWN sp. filamentous	.33	0

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	607363.6	96.04
2	CHLOROPHYTE	15290	2.41
3	UNIDENTIFIED	7030.4	1.11
4	CRYPTOPHYTE	2448	.38
5	DIATOM	260.5	.04

WOOD LAKE ALGAL VOLUMES 23/7/80 5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	.1	87.6
ASTERIONELLA	DIATOM	SIZE# 2	1.2	2232
SYNEDRA	DIATOM	SIZE# 1	2.2	280.5
ANABAENA flos aquae	CYANOPHYTE		5600	366800
APHANIZOMENON	CYANOPHYTE		.15	2386.5
CYANOBACTERIA	CYANOPHYTE		26000	13520
OOCYSTIS	CHLOROPHYTE	SIZE# 1	1.2	1668
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	10	920
CHROOMONAS acuta	CRYPTOPHYTE		210	2142
CERATIUM hirundinella	PYRRHOPHYTE		.08	648
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	40	1340
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	20	2260
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	5	1340
UNKNOWN	UNIDENTIFIED		.1	90.5
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.4	107.2
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	.2	250
	TOTALS		31891	396072

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	ANABAENA flos aquae	366800	92.6
2	CYANOBACTERIA	13520	3.41
3	UNKNOWN spherical cells	4940	1.24
4	APHANIZOMENON	2386.5	.6
5	ASTERIONELLA	2319.6	.58
6	CHROOMONAS acuta	2142	.54
7	OOCYSTIS	1668	.42
8	UNKNOWN sp. Biflagellate	920	.23
9	CERATIUM hirundinella	648	.16
10	UNKNOWN ciliate	357.2	.09

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	26000	81.52
2	ANABAENA flos aquae	5600	17.56
3	CHROOMONAS acuta	210	.65
4	UNKNOWN spherical cells	65	.2
5	UNKNOWN sp. Biflagellate	10	.03
6	SYNEDRA	2.2	0
7	ASTERIONELLA	1.3	0
8	OOCYSTIS	1.2	0
9	UNKNOWN ciliate	.6	0
10	APHANIZOMENON	.15	0

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	382706.5	96.62
2	UNIDENTIFIED	5387.7	1.36
3	DIATOM	2600.1	.65
4	CHLOROPHYTE	2588	.65
5	CRYPTOPHYTE	2142	.54
6	PYRRHOPHYTE	648	.16

WOOD LAKE ALGAL VOLUMES 6/8/80 .5

NAME	GROUP	CELLS /ml	VOLUME cu.micr/ml
FRAGILARIA	DIATOM	.8	571.2
ANABAENA flos aquae	CYANOPHYTE	440	28820
APHANIZOMENON	CYANOPHYTE	1.53	24342.3
ANACYSTIS	CYANOPHYTE	1	210
DACTYLOCOCCOPSIS	CYANOPHYTE	7	420
CYANOBACTERIA	CYANOPHYTE	12000	6240
EUDORINA	CHLOROPHYTE	.12	2058.24
UNKNOWN sp. Biflagellate	CHLOROPHYTE SIZE# 2	67	6164
CHRYSOCOCCUS	CHRYSOPHYTE SIZE# 1	40	2620
UNKNOWN sp. ?DINOBRYON	CHRYSOPHYTE	140	9170
CHROOMONAS acuta	CRYPTOPHYTE	520	5304
RAPHIDIOPSIS	UNIDENTIFIED	10	225
UNKNOWN spherical cells	UNIDENTIFIED SIZE# 2	20	670
UNKNOWN spherical cells	UNIDENTIFIED SIZE# 4	.2	53.6
UNKNOWN spherical cells	UNIDENTIFIED SIZE# 5	.24	125.712
UNKNOWN ciliate	UNIDENTIFIED SIZE# 1	.2	53.6
	TOTALS	13248	87048

RANK	SPECIES BY VOLUME	cu.micr/ml	%
1	ANABAENA flos aquae	28820	33.1
2	APHANIZOMENON	24342.3	27.96
3	UNKNOWN sp. ?DINOBRYON	9170	10.53
4	CYANOBACTERIA	6240	7.16
5	UNKNOWN sp. Biflagellate	6164	7.08
6	CHROOMONAS acuta	5304	6.09
7	CHRYSOCOCCUS	2620	3
8	EUDORINA	2058.24	2.36
9	UNKNOWN spherical cells	849.312	.97
10	FRAGILARIA	571.2	.65

RANK	SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	12000	90.57
2	CHROOMONAS acuta	520	3.92
3	ANABAENA flos aquae	440	3.32
4	UNKNOWN sp. ?DINOBRYON	140	1.05
5	UNKNOWN sp. Biflagellate	67	.5
6	CHRYSOCOCCUS	40	.3
7	UNKNOWN spherical cells	20.44	.15
8	RAPHIDIOPSIS	10	.07
9	DACTYLOCOCCOPSIS	7	.05
10	APHANIZOMENON	1.53	.01

RANK	GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	60032.3	68.96
2	CHRYSOPHYTE	11790	13.54
3	CHLOROPHYTE	8222.24	9.44
4	CRYPTOPHYTE	5304	6.09
5	UNIDENTIFIED	1127.912	1.29
6	DIATOM	571.2	.65

WOOD LAKE ALGAL VOLUMES 6/8/80 5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ACHNANTHES	DIATOM		10	327.6
ANABAENA flos aquae	CYANOPHYTE		83	5436.5
APHANIZOMENON	CYANOPHYTE		.19	3022.9
DACTYLOCOCCOPSIS	CYANOPHYTE		30	1800
UNKNOWN sp. Rivulariaceae	CYANOPHYTE		1	1697
CYANOBACTERIA	CYANOPHYTE		64000	33280
OOCYSTIS	CHLOROPHYTE	SIZE# 2	.08	464
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	3	276
CHRYSOCOCCUS	CHRYSOPHYTE	SIZE# 1	20	1310
UNKNOWN sp. ?DINOBRYON	CHRYSOPHYTE		20	1310
CHROOMONAS acuta	CRYPTOPHYTE		870	8874
RAPHIDIOPSIS	UNIDENTIFIED		30	675
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	80	2680
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	2	226
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	.2	104.76
	TOTALS		65149	61484

RANK	SPECIES BY VOLUME	cu.micr/ml	%
1	CYANOBACTERIA	33280	54.12
2	CHROOMONAS acuta	8874	14.43
3	ANABAENA flos aquae	5436.5	8.84
4	APHANIZOMENON	3022.9	4.91
5	UNKNOWN spherical cells	3010.76	4.89
6	DACTYLOCOCCOPSIS	1800	2.92
7	UNKNOWN sp. Rivulariaceae	1697	2.76
8	UNKNOWN sp. ?DINOBRYON	1310	2.13
9	CHRYSOCOCCUS	1310	2.13
10	RAPHIDIOPSIS	675	1.09

RANK	SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	64000	98.23
2	CHROOMONAS acuta	870	1.33
3	ANABAENA flos aquae	83	.12
4	UNKNOWN spherical cells	82.2	.12
5	RAPHIDIOPSIS	30	.04
6	DACTYLOCOCCOPSIS	30	.04
7	UNKNOWN sp. ?DINOBRYON	20	.03
8	CHRYSOCOCCUS	20	.03
9	ACHNANTHES	10	.01
10	UNKNOWN sp. Biflagellate	3	0

RANK	GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	45236.4	73.57
2	CRYPTOPHYTE	8874	14.43
3	UNIDENTIFIED	3685.76	5.99
4	CHRYSOPHYTE	2620	4.26
5	CHLOROPHYTE	740	1.2
6	DIATOM	327.6	.53

WOOD LAKE ALGAL VOLUMES 3/9/80 .5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
SYNEDRA	DIATOM	SIZE# 1	1.4	178.5
SYNEDRA	DIATOM	SIZE# 2	.2	173.2
CYCLOTELLA sp.	DIATOM	SIZE# 2	.04	754.28
ANABAENA flos aquae	CYANOPHYTE		67	4388.5
APHANIZOMENON	CYANOPHYTE		1.21	19251.1
ANACYSTIS	CYANOPHYTE		.68	142.8
DACTYLOCOCCOPSIS	CYANOPHYTE		258	15480
LYNGBYA	CYANOPHYTE		1.15	14950
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 1	.03	377.1
CYANOBACTERIA	CYANOPHYTE		48000	24960
EUDORINA	CHLOROPHYTE		.24	4116.48
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.8	1112
STAURASTRUM	CHLOROPHYTE		.04	960
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	23	2116
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	.32	320.64
MALLOMONAS coronata	CHRYSOPHYTE		.12	62.76
CHROOMONAS acuta	CRYPTOPHYTE		480	4896
KIRSCHNERIELLA	UNIDENTIFIED		10	176.8
RAPHIDIOPSIS	UNIDENTIFIED		11	247.5
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	80	2680
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	1	268
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	1	523.8
	TOTALS		48937	98135

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	CYANOBACTERIA	24960	25.43
2	APHANIZOMENON	19251.1	19.61
3	DACTYLOCOCCOPSIS	15480	15.77
4	LYNGBYA	14950	15.23
5	CHROOMONAS acuta	4896	4.98
6	ANABAENA flos aquae	4388.5	4.47
7	EUDORINA	4116.48	4.19
8	UNKNOWN spherical cells	3471.8	3.53
9	UNKNOWN sp. Biflagellate	2436.64	2.48
10	OOCYSTIS	1112	1.13

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	48000	98.08
2	CHROOMONAS acuta	480	.98
3	DACTYLOCOCCOPSIS	258	.52
4	UNKNOWN spherical cells	82	.16
5	ANABAENA flos aquae	67	.13
6	UNKNOWN sp. Biflagellate	23.32	.04
7	RAPHIDIOPSIS	11	.02
8	KIRSCHNERIELLA	10	.02
9	SYNEDRA	1.6	0
10	APHANIZOMENON	1.21	0

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	79549.5	81.06

2	CHLOROPHYTE	8625.12	8.78
3	CRYPTOPHYTE	4896	4.98
4	UNIDENTIFIED	3896.1	3.97
5	DIATOM	1105.98	1.12
6	CHRYSOPHYTE	62.76	.06

WOOD LAKE ALGAL VOLUMES 2/9/80 5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	1.6	1401.6
CYMBELLA spp	DIATOM		.2	100
FRAGILARIA	DIATOM		2.9	2070.6
NAVICULA	DIATOM		2.8	2556.4
SYNEDRA	DIATOM	SIZE# 1	1.8	229.5
ANABAENA flos aquae	CYANOPHYTE		50	3275
APHANIZOMENON	CYANOPHYTE		3.7	58867
ANACYSTIS	CYANOPHYTE		2.3	483
DACTYLOCOCCOPSIS	CYANOPHYTE		230	13800
LYNGBYA	CYANOPHYTE		.92	11960
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 1	.01	125.7
CYANOBACTERIA	CYANOPHYTE		24000	12480
EUDORINA	CHLOROPHYTE		.04	686.08
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.12	166.8
STAURASTRUM	CHLOROPHYTE		.12	2880
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	3.2	294.4
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 3	.24	144.72
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	.12	120.24
CHRYSOCOCCUS	CHRYSOPHYTE	SIZE# 2	8	1768
MALLOMONAS coronata	CHRYSOPHYTE		.12	62.76
CHROOMONAS acuta	CRYPTOPHYTE		180	1836
KIRSCHNERIELLA	UNIDENTIFIED		20	353.6
RAPHIDIOPSIS	UNIDENTIFIED		2	45
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 1	10	141.4
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	20	670
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	2	1047.6
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	.2	250
	TOTALS		24542	117815

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	APHANIZOMENON	58867	49.96
2	DACTYLOCOCCOPSIS	13800	11.71
3	CYANOBACTERIA	12480	10.59
4	LYNGBYA	11960	10.15
5	ANABAENA flos aquae	3275	2.77
6	STAURASTRUM	2880	2.44
7	NAVICULA	2556.4	2.16
8	FRAGILARIA	2070.6	1.75
9	UNKNOWN spherical cells	1859	1.57
10	CHROOMONAS acuta	1836	1.55

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	24000	97.78
2	DACTYLOCOCCOPSIS	230	.93
3	CHROOMONAS acuta	180	.73
4	ANABAENA flos aquae	50	.2
5	UNKNOWN spherical cells	32	.13
6	KIRSCHNERIELLA	20	.08
7	CHRYSOCOCCUS	8	.03
8	APHANIZOMENON	3.7	.01
9	UNKNOWN sp. Biflagellate	3.56	.01
10	FRAGILARIA	2.9	.01

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	100990.7	85.71
2	DIATOM	6358.1	5.39
3	CHLOROPHYTE	4292.24	3.64
4	UNIDENTIFIED	2507.6	2.12
5	CRYPTOPHYTE	1836	1.55
6	CHRYSOPHYTE	1830.76	1.55

WOOD ALGAL VOLUMES 16/9/80 .5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ACHNANTHES	DIATOM		10	327.6
ASTERIONELLA	DIATOM	SIZE# 1	.5	438
COCCONEIS	DIATOM		.4	96
CYCLOTELLA sp.	DIATOM	SIZE# 3	.04	1657.12
ANABAENA flos aquae	CYANOPHYTE		100	6550
APHANIZOMENON	CYANOPHYTE		.16	2545.6
ANACYSTIS	CYANOPHYTE		38	7980
DACTYLOCOCCOPSIS	CYANOPHYTE		210	12600
LYNGBYA	CYANOPHYTE		97	1261000
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 1	.06	754.2
CYANOBACTERIA	CYANOPHYTE		16000	8320
ACTINASTRUM	CHLOROPHYTE		1.12	37.8
ECHINOSPHAERELLA	CHLOROPHYTE		.04	20.96
EUDORINA	CHLOROPHYTE		.2	3430.4
STAURASTRUM	CHLOROPHYTE		.32	7680
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 1	1.9	85.5
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	5.1	469.2
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 3	.08	48.24
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	16	16032
UNKNOWN sp. 4 Flagellae	CHLOROPHYTE	SIZE# 1	.4	286
UNKNOWN sp.	CHLOROPHYTE		.12	18.24
CHRYSOCOCCUS	CHRYSOPHYTE	SIZE# 2	1	221
MALLOMONAS coronata	CHRYSOPHYTE		.42	219.66
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 1	.08	7.248
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 2	.12	50.16
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 3	.2	230
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 4	.04	232
UNKNOWN sp. ?DINOBRYON	CHRYSOPHYTE		440	28820
CHROOMONAS acuta	CRYPTOPHYTE		310	3162
KIRSCHNERIELLA	UNIDENTIFIED		20	353.6
RAPHIDIOPSIS	UNIDENTIFIED		2	45
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 1	60	848.4
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	20	670
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	2	226
UNKNOWN	UNIDENTIFIED		.04	36.2
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.08	21.44
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	3	3750
	TOTALS		17340	1369270

RANK	SPECIES BY VOLUME	cu.micr/ml	%
1	LYNGBYA	1261000	92.09
2	UNKNOWN sp. ?DINOBRYON	28820	2.1
3	UNKNOWN sp. Biflagellate	16634.94	1.21
4	DACTYLOCOCCOPSIS	12600	.92
5	CYANOBACTERIA	8320	.6
6	ANACYSTIS	7980	.58
7	STAURASTRUM	7680	.56
8	ANABAENA flos aquae	6550	.47
9	UNKNOWN ciliate	3771.44	.27
10	EUDORINA	3430.4	.25

RANK	SPECIES BY CELLS	cells/ml	%

1	CYANOBACTERIA	16000	92.26
2	UNKNOWN sp. ?DINOBRYON	440	2.53
3	CHROOMONAS acuta	310	1.78
4	DACTYLOCOCCOPSIS	210	1.21
5	ANABAENA flos aquae	100	.57
6	LYNGBYA	97	.55
7	UNKNOWN spherical cells	82	.47
8	ANACYSTIS	38	.21
9	UNKNOWN sp. Biflagellate	23.08	.13
10	KIRSCHNERIELLA	20	.11

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	1299749.8	94.92
2	CHRYSOPHYTE	29780.068	2.17
3	CHLOROPHYTE	28108.34	2.05
4	UNIDENTIFIED	5950.64	.43
5	CRYPTOPHYTE	3162	.23
6	DIATOM	2518.72	.18

WOOD ALGAL VOLUMES 16/9/80 5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	.5	438
SYNEDRA	DIATOM	SIZE# 2	3.4	2944.4
ANABAENA flos aquae	CYANOPHYTE		530	34715
APHANIZOMENON	CYANOPHYTE		.56	8909.6
ANACYSTIS	CYANOPHYTE		18.7	3927
DACTYLOCOCCOPSIS	CYANOPHYTE		53	3180
LYNGBYA	CYANOPHYTE		59	767000
UNKNOWN sp. Rivulariaceae	CYANOPHYTE		.08	135.76
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 1	.11	1382.7
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 2	.02	885
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 3	.1	7365
CYANOBACTERIA	CYANOPHYTE		5900	3068
ACTINASTRUM	CHLOROPHYTE		1.6	54
EUDORINA	CHLOROPHYTE		2.64	45281.28
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.24	333.6
STAURASTRUM	CHLOROPHYTE		.24	5760
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 1	3.4	153
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	4.2	386.4
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 3	.1	60.3
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	1.2	1202.4
MALLOMONAS coronata	CHRYSOPHYTE		1.24	648.52
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 1	.24	21.744
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 2	.12	50.16
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 4	.08	464
UNKNOWN sp. ?DINOBRYON	CHRYSOPHYTE		580	37990
CHROOMONAS acuta	CRYPTOPHYTE		600	6120
KIRSCHNERIELLA	UNIDENTIFIED		40	707.2
RAPHIDIOPSIS	UNIDENTIFIED		19	427.5
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 1	80	1131.2
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	50	1675
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	20	2260
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	1	268
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.04	10.72
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	7	8750
	TOTALS		7978	947705

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	LYNGBYA	767000	80.93
2	EUDORINA	45281.28	4.77
3	UNKNOWN sp. ?DINOBRYON	37990	4
4	ANABAENA flos aquae	34715	3.66
5	UNKNOWN sp. filamentous	9632.7	1.01
6	APHANIZOMENON	8909.6	.94
7	UNKNOWN ciliate	8760.72	.92
8	CHROOMONAS acuta	6120	.64
9	STAURASTRUM	5760	.6
10	UNKNOWN spherical cells	5334.2	.56

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	5900	73.95
2	CHROOMONAS acuta	600	7.52
3	UNKNOWN sp. ?DINOBRYON	580	7.27

4	ANABAENA flos aquae	530	6.64
5	UNKNOWN spherical cells	151	1.89
6	LYNGBYA	59	.73
7	DACTYLOCOCCOPSIS	53	.66
8	KIRSCHNERIELLA	40	.5
9	RAPHIDIOPSIS	19	.23
10	ANACYSTIS	18.7	.23

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	830568.06	87.63
2	CHLOROPHYTE	53230.98	5.61
3	CHRYSOPHYTE	39174.424	4.13
4	UNIDENTIFIED	15229.62	1.6
5	CRYPTOPHYTE	6120	.64
6	DIATOM	3382.4	.35

WOOD LAKE ALGAL VOLUMES 1E/9/80 10M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ACHNANTHES	DIATOM		5	163.8
ASTERIONELLA	DIATOM	SIZE# 1	.5	438
FRAGILARIA	DIATOM		.7	499.8
SYNEDRA	DIATOM	SIZE# 1	.1	12.75
SYNEDRA	DIATOM	SIZE# 2	.1	86.6
CYCLOTELLA sp.	DIATOM	SIZE# 3	.12	4971.36
ANABAENA flos aquae	CYANOPHYTE		30	1965
APHANIZOMENON	CYANOPHYTE		.61	9705.1
ANACYSTIS	CYANOPHYTE		26.2	5502
DACTYLOCOCCOPSIS	CYANOPHYTE		70	4200
LYNGBYA	CYANOPHYTE		89	1157000
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 1	.17	2136.9
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 2	.94	41595
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 3	.23	16939.5
CYANOBACTERIA	CYANOPHYTE		120000	62400
ACTINASTRUM	CHLOROPHYTE		2.4	81
EUDORINA	CHLOROPHYTE		7	120064
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.12	166.8
SPHAEROCYSTIS	CHLOROPHYTE		.04	18
STAURASTRUM	CHLOROPHYTE		.04	960
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 1	4.2	189
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	5	460
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	1.8	1803.6
UNKNOWN sp.	CHLOROPHYTE		.04	6.08
UNKNOWN sp.	CHLOROPHYTE		.04	113.12
MALLOMONAS coronata	CHRYSOPHYTE		.88	460.24
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 1	.48	43.488
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 2	.04	16.72
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 3	.44	506
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 4	.04	232
SYNURA	CHRYSOPHYTE		.2	184
UNKNOWN sp. ?DINOBRYON	CHRYSOPHYTE		196	12838
CHROOMONAS acuta	CRYPTOPHYTE		970	9894
KIRSCHNERIELLA	UNIDENTIFIED		20	353.6
RAPHIDIOPSIS	UNIDENTIFIED		15	337.5
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 1	120	1696.8
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	220	7370
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	1	523.8
UNKNOWN	UNIDENTIFIED		.04	36.2
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	12	15000
	TOTALS		121800	1480970

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	LYNGBYA	1157000	78.12
2	EUDORINA	120064	8.1
3	CYANOBACTERIA	62400	4.21
4	UNKNOWN sp. filamentous	60671.4	4.09
5	UNKNOWN ciliate	15000	1.01
6	UNKNOWN sp. ?DINOBRYON	12838	.86
7	CHROOMONAS acuta	9894	.66
8	APHANIZOMENON	9705.1	.65
9	UNKNOWN spherical cells	9590.6	.64
10	ANACYSTIS	5502	.37

RANK	SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	120000	98.52
2	CHROOMONAS acuta	970	.79
3	UNKNOWN spherical cells	341	.27
4	UNKNOWN sp. ?DINOBRYON	196	.16
5	LYNGBYA	89	.07
6	DACTYLOCOCCOPSIS	70	.05
7	ANABAENA flos aquae	30	.02
8	ANACYSTIS	26.2	.02
9	KIRSCHNERIELLA	20	.01
10	RAPHIDIOPSIS	15	.01

RANK	GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	1301443.5	87.87
2	CHLOROPHYTE	123861.6	8.36
3	UNIDENTIFIED	25317.9	1.7
4	CHRYSOPHYTE	14280.448	.96
5	CRYPTOPHYTE	9894	.66
6	DIATOM	6172.31	.41

WOOD LAKE ALGAL VOLUMES 21/10/80 .5M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	.1	87.6
FRAGILARIA	DIATOM		.1	71.4
SYNEDRA	DIATOM	SIZE# 2	3.6	3117.6
CYCLOTELLA sp.	DIATOM	SIZE# 3	.12	4971.36
ANABAENA flos aquae	CYANOPHYTE		1.3	85.15
APHANIZOMENON	CYANOPHYTE		.12	1909.2
ANACYSTIS	CYANOPHYTE		13.4	2814
DACTYLOCOCCOPSIS	CYANOPHYTE		210	12600
LYNGBYA	CYANOPHYTE		82	1066000
CYANOBACTERIA	CYANOPHYTE		8000	4160
ACTINASTRUM	CHLOROPHYTE		.2	6.75
EUDORINA	CHLOROPHYTE		5.12	87818.24
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.2	278
SPHAEROCYSTIS	CHLOROPHYTE		.08	36
STAURASTRUM	CHLOROPHYTE		.04	960
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 1	21	945
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	24	2208
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	4.3	4308.6
UNKNOWN sp. 4 Flagellae	CHLOROPHYTE	SIZE# 1	18.04	12898.6
UNKNOWN sp. 4 Flagellae	CHLOROPHYTE	SIZE# 2	.04	565.68
CHRYSOCOCCUS	CHRYSOPHYTE	SIZE# 2	6	1326
DINOBRYON sp.	CHRYSOPHYTE		8.1	530.55
MALLOMONAS coronata	CHRYSOPHYTE		.12	62.76
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 1	.12	10.872
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 2	1.04	434.72
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 3	.04	46
SYNCRYPTA	CHRYSOPHYTE		.04	42.88
SYNURA	CHRYSOPHYTE		2	1840
UNKNOWN sp. ?DINOBRYON	CHRYSOPHYTE		110	7205
CHROOMONAS acuta	CRYPTOPHYTE		610	6222
KIRSCHNERIELLA	UNIDENTIFIED		70	1237.6
RAPHIDIOPSIS	UNIDENTIFIED		50	1125
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	272	9112
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	10	1130
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	3.2	857.6
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	17.04	21300
	TOTALS		9543	1258324

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	LYNGBYA	1066000	84.71
2	EUDORINA	87818.24	6.97
3	UNKNOWN ciliate	21300	1.69
4	UNKNOWN sp. 4 Flagellae	13464.28	1.07
5	DACTYLOCOCCOPSIS	12600	1
6	UNKNOWN spherical cells	11099.6	.88
7	UNKNOWN sp. Biflagellate	7461.6	.59
8	UNKNOWN sp. ?DINOBRYON	7205	.57
9	CHROOMONAS acuta	6222	.49
10	CYCLOTELLA sp.	4971.36	.39

	RANK SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	8000	83.82

2	CHROOMONAS acuta	610	6.39
3	UNKNOWN spherical cells	285.2	2.98
4	DACTYLOCOCCOPSIS	210	2.2
5	UNKNOWN sp. ?DINOBRYON	110	1.15
6	LYNGBYA	82	.85
7	KIRSCHNERIELLA	70	.73
8	RAPHIDIOPSIS	50	.52
9	UNKNOWN sp. Biflagellate	49.3	.51
10	UNKNOWN sp. 4 Flagellae	18.08	.18

	RANK GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	1087568.35	86.42
2	CHLOROPHYTE	110024.87	8.74
3	UNIDENTIFIED	34762.2	2.76
4	CHRYSOPHYTE	11498.782	.91
5	DIATOM	8247.96	.65
6	CRYPTOPHYTE	6222	.49

WOOD LAKE ALGAL VOLUMES 21/10/80 2M

NAME	GROUP		CELLS /ml	VOLUME cu.micr/ml
ASTERIONELLA	DIATOM	SIZE# 1	1.4	1226.4
ASTERIONELLA	DIATOM	SIZE# 2	5	9300
FRAGILARIA	DIATOM		4.7	3355.8
SYNEDRA	DIATOM	SIZE# 1	3.6	459
SYNEDRA	DIATOM	SIZE# 2	3.9	3377.4
TABELLARIA sp.	DIATOM		1	115
CYCLOTELLA sp.	DIATOM	SIZE# 1	1	2613
CYCLOTELLA sp.	DIATOM	SIZE# 3	.12	4971.36
APHANIZOMENON	CYANOPHYTE		.24	3818.4
ANACYSTIS	CYANOPHYTE		16	3360
DACTYLOCOCCOPSIS	CYANOPHYTE		207	12420
LYNGBYA	CYANOPHYTE		253	3289000
UNKNOWN sp. filamentous	CYANOPHYTE	SIZE# 1	.14	1759.8
CYANOBACTERIA	CYANOPHYTE		4680	2433.6
ACTINASTRUM	CHLOROPHYTE		.72	24.3
CLOSTERIUM	CHLOROPHYTE	SIZE# 1	.12	11.0832
CLOSTERIUM	CHLOROPHYTE	SIZE# 2	.04	38.4
EUDORINA	CHLOROPHYTE		1.28	21954.56
OOCYSTIS	CHLOROPHYTE	SIZE# 1	.24	333.6
OOCYSTIS	CHLOROPHYTE	SIZE# 2	.04	232
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 1	20	900
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 2	1	92
UNKNOWN sp. Biflagellate	CHLOROPHYTE	SIZE# 4	4	4008
UNKNOWN sp. 4 Flagellae	CHLOROPHYTE	SIZE# 1	20.8	14872
UNKNOWN sp. 4 Flagellae	CHLOROPHYTE	SIZE# 2	.08	1131.36
CHRYSOCOCCUS	CHRYSOPHYTE	SIZE# 2	66	14586
DINOBRYON sp.	CHRYSOPHYTE		2.65	173.575
MALLOMONAS coronata	CHRYSOPHYTE		.08	41.84
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 1	.16	14.496
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 2	.2	83.6
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 3	.12	138
MALLOMONAS sp.	CHRYSOPHYTE	SIZE# 4	.08	464
SYNURA	CHRYSOPHYTE		6.2	5704
UNKNOWN sp. ?DINOBRYON	CHRYSOPHYTE		270	17685
CHROOMONAS acuta	CRYPTOPHYTE		560	5712
KIRSCHNERIELLA	UNIDENTIFIED		280	4950.4
RAPHIDIOPSIS	UNIDENTIFIED		27	607.5
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 2	80	2680
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 3	20	2260
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 4	3	804
UNKNOWN spherical cells	UNIDENTIFIED	SIZE# 5	.4	209.52
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 1	.04	10.72
UNKNOWN ciliate	UNIDENTIFIED	SIZE# 2	7	8750
	TOTALS		6548	3446682

	RANK SPECIES BY VOLUME	cu.micr/ml	%
1	LYNGBYA	3289000	95.42
2	EUDORINA	21954.56	.63
3	UNKNOWN sp. ?DINOBRYON	17685	.51
4	UNKNOWN sp. 4 Flagellae	16003.36	.46
5	CHRYSOCOCCUS	14586	.42
6	DACTYLOCOCCOPSIS	12420	.36
7	ASTERIONELLA	10526.4	.3
8	UNKNOWN ciliate	8760.72	.25

9	CYCLOTELLA sp.	7584.36	.22
10	UNKNOWN spherical cells	5953.52	.17

RANK	SPECIES BY CELLS	cells/ml	%
1	CYANOBACTERIA	4680	71.46
2	CHROOMONAS acuta	560	8.55
3	KIRSCHNERIELLA	280	4.27
4	UNKNOWN sp. ?DINOBRYON	270	4.12
5	LYNGBYA	253	3.86
6	DACTYLOCOCCOPSIS	207	3.16
7	UNKNOWN spherical cells	103.4	1.57
8	CHRYSOCOCCUS	66	1
9	RAPHIDIOPSIS	27	.41
10	UNKNOWN sp. Biflagellate	25	.38

RANK	GROUPS BY VOLUME	cu.micr/ml	%
1	CYANOPHYTE	3312791.8	96.11
2	CHLOROPHYTE	43597.3032	1.26
3	CHRYSOPHYTE	38890.511	1.12
4	DIATOM	25417.96	.73
5	UNIDENTIFIED	20272.14	.58
6	CRYPTOPHYTE	5712	.16