Ministry of Natural Resources
Ontario

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ONTARIO GEOLOGICAL SURVEY

Open File Report 5342

Part I

MULTIDISCIPLINARY FOLLOWUP OF REGIONAL pH PATTERNS IN LAKES NORTH OF LAKE SUPERIOR

DISTRICT OF ALGOMA

by

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1981

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1981: Multidisciplinary Followup of Regional pH Patterns in Lakes North of Lake Superior, District of Algoma, Ontario Geological Survey OFR 5342 Part I, 134 p., 6 Tables, 65 Figures.

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E.G. Pye, Director
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PREFACE

Acid precipitation effects on the environment constitute a complex problem which concerns scientists of many disciplines. Some of these scientists work on the details of the problem within particular lake basins and others, such as those concerned with regional geochemical mapping, are concerned with areas of tens of thousands of square kilometres. From the viewpoint of regional geochemistry, the acid precipitation problem is one which concerns lakes which are likely to become acid in the near future. Lakes which are already acid (i.e. pH less than 5.5) or those in calcareous terrain with a pH greater than 7.0 are of less concern. Unfortunately, pH which is measured as a part of the routine in regional geochemical mapping, is not the only important chemical parameter involved in the acidification of lakes. Hence the need for a follow-up level investigation which could examine relationships between the pH of lakes - as measured in the regional geochemical survey - and the problem of acid precipitation as it is studied by limnologists and other scientists.

A novel approach to the solution of this problem has been adopted here. It involves - 1. the use of a general conceptual model for the selection of a series of study lakes based directly upon the published regional geochemical maps, 2. the standardization of data collected from each of the study lakes and 3. the interpretation of the standarized data in terms of general principles which can be used for the interpretation of patterns on regional geochemical maps outside the small area studied.

To achieve this objective the project was organized as follows. The follow-up study aims were first outlined and a generalized conceptual model was drawn to facilitate the detailed description of the objective. A suitable field area was then selected within which the conceptual model could be implemented. The area was studied by a multidisciplinary team consisting of a director/geochemist, a coordinator/geochemist, a limnologist and a palynologist. The field work was completed during a 15-day period, and a period of several months then elapsed for the working

up of the information obtained from each of the disciplines. The project coordinator then provided the multidisciplinary data base (Part II of this report) and this report was written describing the findings of the research.

All concerned have been surprised at the effectiveness of this approach, which provided a unique multidisciplinary data base for twenty lakes on the basis of only a few days in the field. It is to be expected that the approach adopted here will be used for other follow up investigations aimed at problems of acid precipitation or other applications of regional geochemical data.

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* <u>NOTE</u>: All chapters were read by all four contributers. Resulting comments were incorporated by writers of individual sections who are identified by initials in this table of contents.

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ABSTRACT

It has been evident for several years (e.g. Coker and Shilts 1979) that the problem of acid precipitation environmental effects in the area north of Lake Superior is largely governed by the geological conditions of the Canadian Shield. It is also evident that although regional geochemical mapping has a role to play in the study of acid precipitation effects, a simple pH map of the region does not provide a true picture of the problem although it may be a starting point for more intensive - followup level - studies of the type described in this report.

This report describes geochemical, limnological, palynological and geological investigations which were made concurrently within a 20 km x 100 km sampling strip located west of Wawa, Ontario, within which 20 lakes were studied. The lakes were selected on the basis of the regional geochemical survey pH map of the area and a series of conceptual models drawn to focus effort within a followup study. This report is in two parts; the first describes the research itself and the second the multidisciplinary data base which the project generated from 15 days field work and associated laboratory and data processing activity.

As a result of this study it was concluded that:

1) The pH pattern in the surface waters of the 20 lakes studied is stable and verifiable from year to year even though the absolute pH values differ as much as 0.5 pH units.

2) Regional geochemical patterns for elements in lake sediments below a depth of 20-25 cm are also stable and verifiable from lake to lake.

3) Alkalinity of lake waters is related directly to geological conditions within the lake basin. It is low in granitic areas, medium in areas underlain by sedimentary, or volcanic greenstones and extremely high in areas of carbonate rich glacial deposits.

4) A decrease in pH and alkalinity in surface waters of lakes along the pH gradient in the sampling strip was accompanied - as predicted from theory - by an increase in SO_4.

5) Small lakes at high elevations have the lowest pH within a given area.

6) Amongst softwater (i.e. low total dissolved solids) lakes there are two types, one brown in colour due to humic substances which is less easily acidified than the other type which is clear.

7) Palynological investigations of lake sediment cores confirmed that the Ambrosia rise (1850 - 1890) could be detected in all 20 lakes studied.

8) Preliminary studies of diatom abundance in lake waters in 1980 suggested a significant relationship to lakewater pH. This observation could lead to a paleo- pH index based on lake sediment core material. The procedure was tested out on three cores with promising results.

9) Study of plot of the Clarke abundance (KK values) for chemical elements in lake sediments below 20 cm revealed that each lake has a 'geochemical signature' which is stable with depth.

10) As,Pb,Hg and Zn were found to increase significantly in core segments in post *Ambrosia* time which may, or may not be due to environmental changes due to modern man's activities.

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This report describes geochemical, limnological, palynological and geological investigations which were made concurrently within a 20 km x 100 km sampling strip located west of Wawa, Ontario, within which 20 lakes were studied. The lakes were selected on the basis of the regional geochemical survey pH map of the area and a series of conceptual models drawn to focus effort within a followup study. This report is in two parts; the first describes the research itself and the second the multidisciplinary data base which the project generated from 15 days field work and associated laboratory and data processing activity.

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MULTIDISCIPLINARY FOLLOWUP OF
REGIONAL pH PATTERNS IN LAKES
NORTH OF LAKE SUPERIOR

Chapter I - Introduction and Approach

Introduction

The problem of acid precipitation in Ontario was succinctly described as follows:

> "Some of Ontario's most beautiful lakes - those set among rocky outcrops in insoluble bedrock - are most vulnerable to acidification. In a drainage basin, headwater lakes are the most susceptible because their incoming waters have least exposure to buffering action by soils and sediments. They can become acidic within a few years. Lakes in the middle of a susceptible watershed may last a decade and lakes lying on size-able deposits of glacial sediments can have sufficient buffering capacities to hold out a long time, if not indefinitely." (Annon. 1979 p.5)

Studies by Likens (1976) and Shaw (1979) have demonstrated that acid precipitation, created by the long range transport of air pollutants is falling along the east shore of Lake Superior. Our problem was to design and complete a project which would bridge a gap between the information obtained from regional geochemical surveys on the one hand and the detailed investigation of the acid preciptation problem by limnologists, chemists and their co-workers on the other. Data from a series of regional geochemicl maps of the north shore of Lake Superior (O.G.S. Open File Maps P.1805 to P.1818 (1978), P.1819 to P.1832 (1978), and maps 80016 to 80031 (1979) including maps 80000 to 80015 (1979) provided a general background to the acid precipitation problem (for example the summary investigation by Coker and Shilts (1979). More specifically, a selection of sample points in lakes with low pH (i.e. pH 4.5 to 4.9 and 5.0 to 5.5) and high pH (i.e. 7.5 to 7.9 and 8.0 to 8.5) (Figure 2) provided a convenient focus on the region. In order to sharpen this focus, it was decided to study a strip of country west of Wawa located to include a pH gradient from pH 4.5 in the southwest to over pH 8.0 in the northeast. This orientation was chosen so that the gradient studied would be in the direction of the prevailing wind from the southwest.

Before the field sampling strip was located, the general features of the project were incorporated in a conceptual model which was drawn up and circulated to the research team. This is shown as Figure 3. The conceptual model is 100 km long and 20 km wide. It is located in an area of relatively low relief in the direction of the prevailing wind. The sampling strip is dotted with lakes, 20 of which, identified as A, B,... to T, are selected for study because during the regional geochemical survey (Figure 1 & 2) they were found to lie along a pH gradient. This was established on the basis of the pH of lake water samples taken during the regional geochemical survey when deep grab samples of lake sediment were also collected.

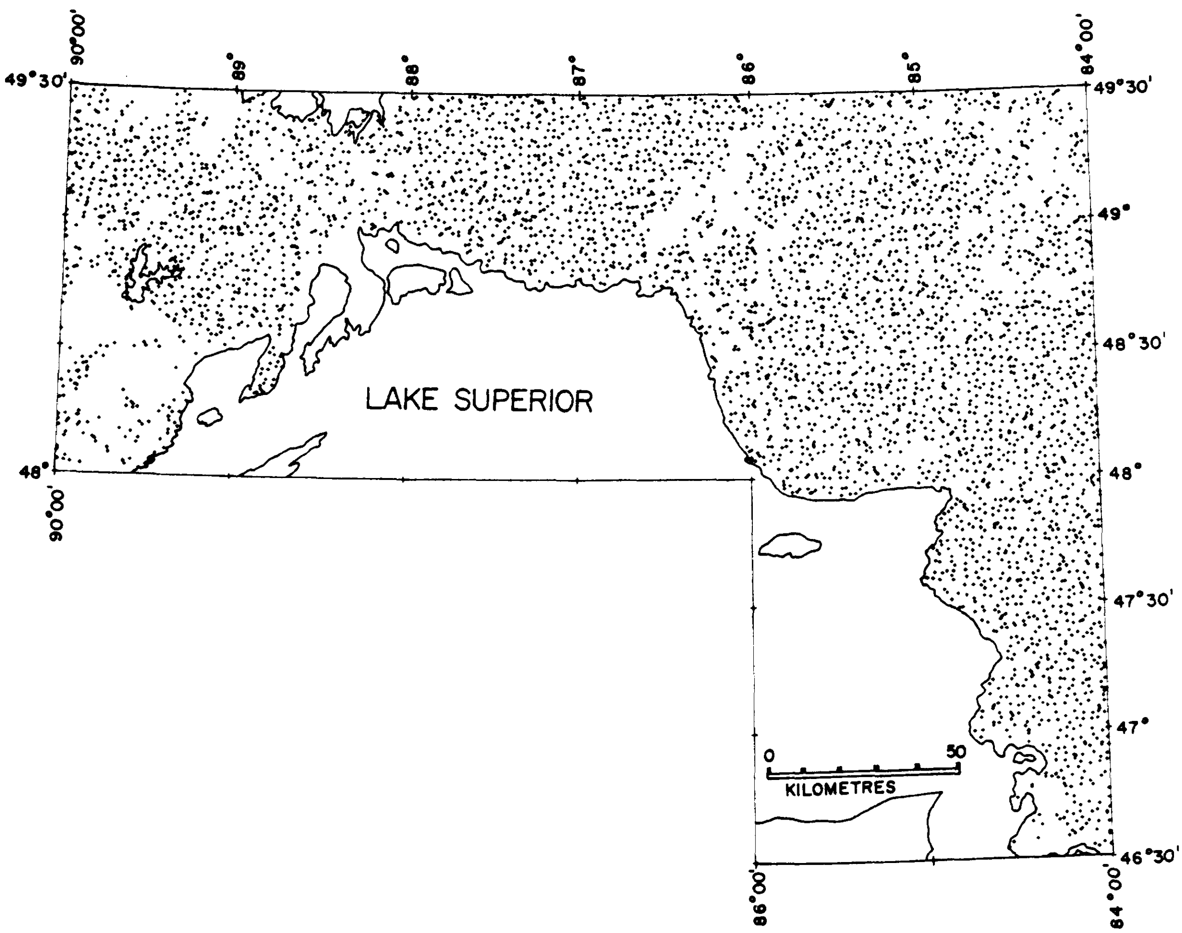

Figure 1 - Plot of lake sampling points included in regional geochemical surveys north of Lake Superior (from Open File Nos. P.1805-18) Sampled lake --------------.

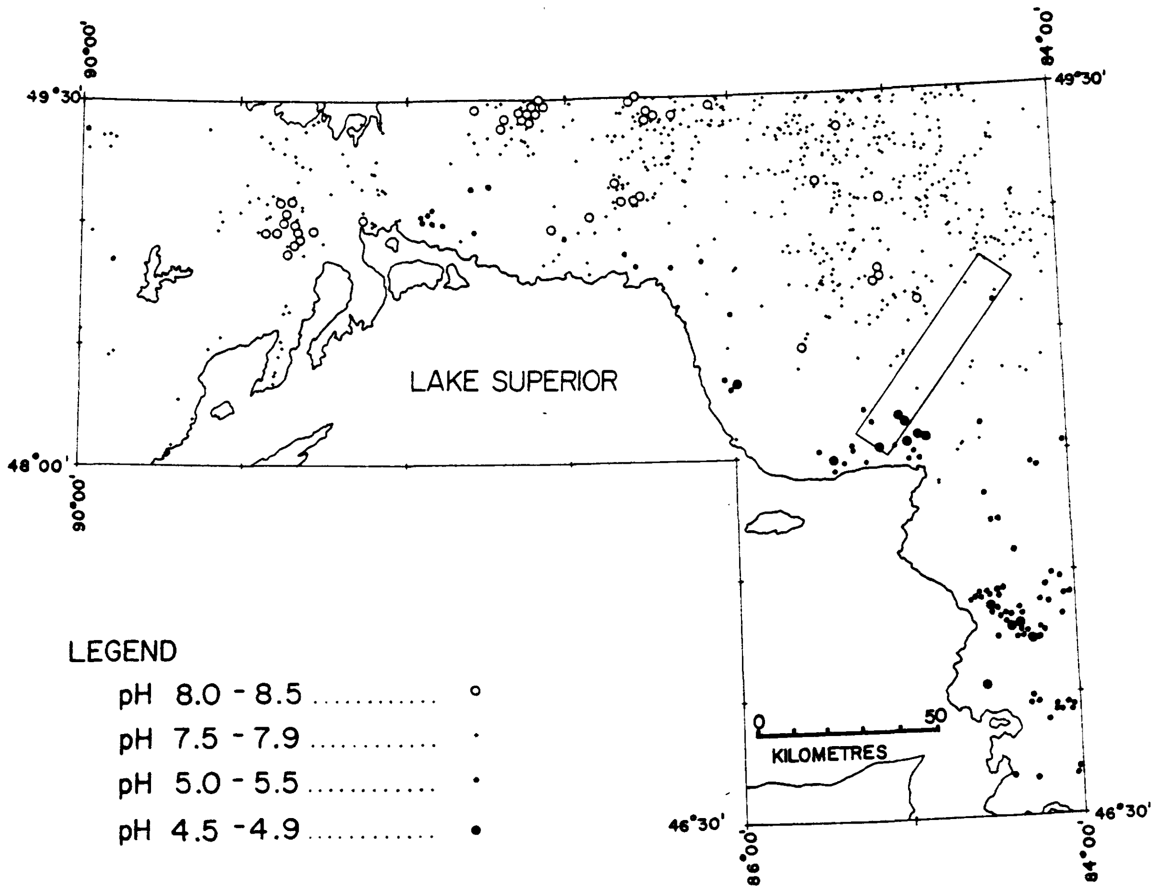

Figure 2 - Patterns for pH in lake waters in 1978 (from Open File Nos. P.1805-18)

Although a preliminary evaluation of the pH pattern north of Lake Superior by Coker and Shilts (1979) suggested that the gradient is controlled at least in part, by the geological substate, it was assumed that the acid rain itself was pervasive throughout the entire sampling strip.

The conceptual model for the pH gradient in surface waters of the 20 lakes of interest within the sampling strip is shown as Figure 4. It is well known that acid precipitation is associated with fallout of particulate matter. Consequently, another conceptual model (Figure 5a) map was drawn to indicate the decrease in fallout of element X present in the airborne particulate matter in lake sediments, although it was considered unlikely that such a pattern would exist in the area chosen for our study. To complete the series it is to be expected that other elements will occur in the lake sediment which are not involved in the acid precipitation and these are indicated by the model in Figure 5b.

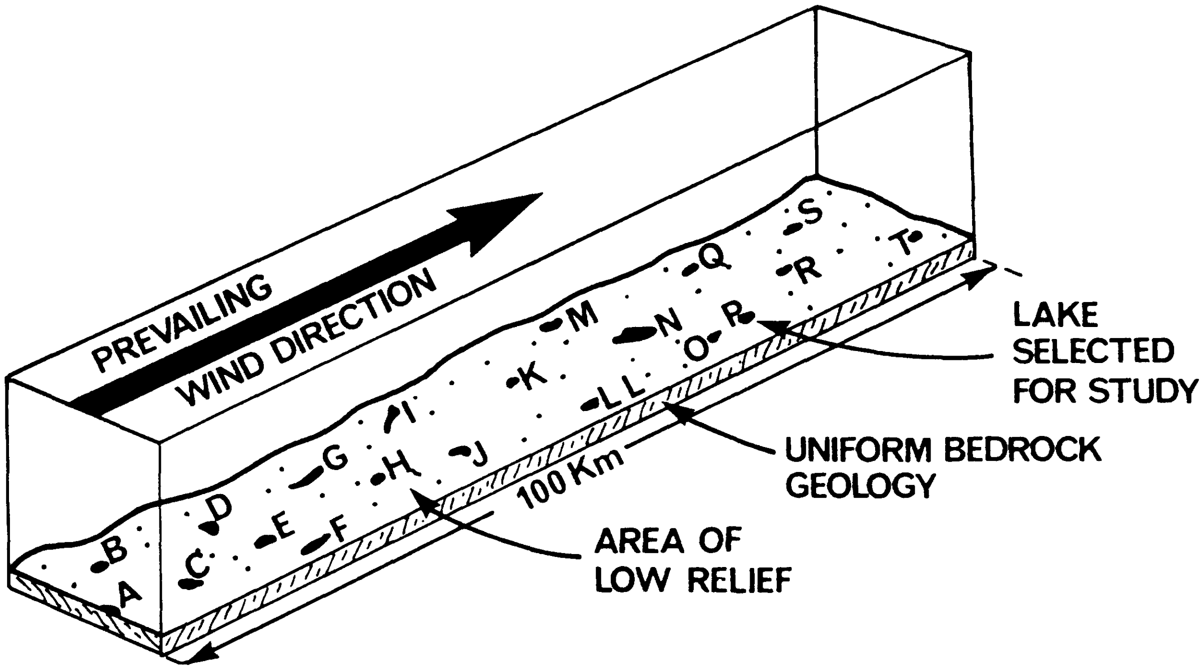

Figure 3 - Conceptual model of a hypothetical sampling strip suitable for acid precipitation studies.

The choice of the members of the multidisciplinary team relates directly to these conceptual models. The choice of the sampling strip and the identification of the 20 lakes within it for study involves the geologists/geochemists. The study of the biota and the lake water chemistry required the services of a limnologist and the detailed study of the lake bottom sediments required a palynologist and a geochemist.

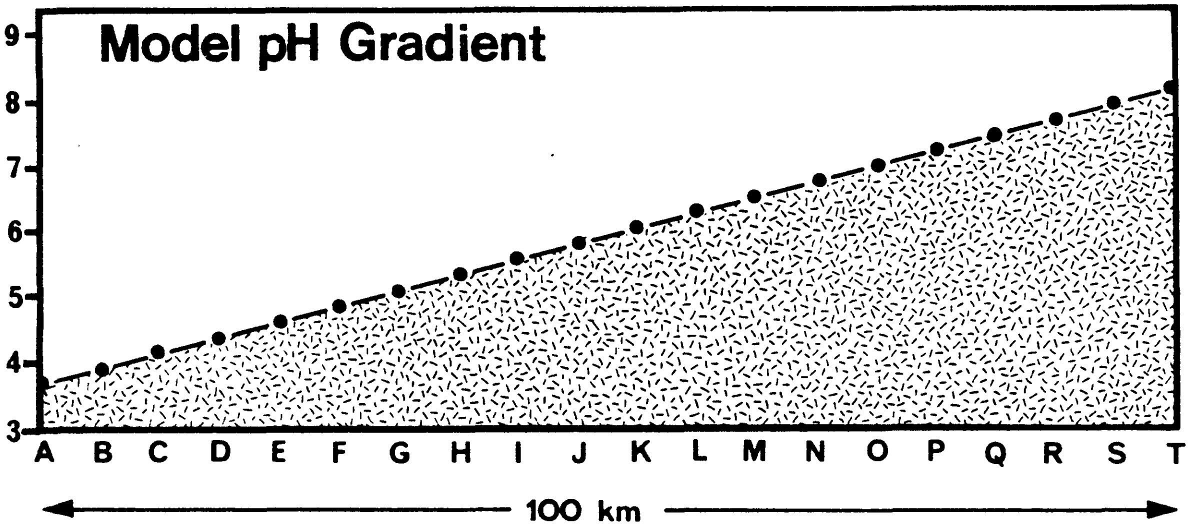

Figure 4 - Model of pH gradient along sampling strip.

When these team members had been identified, the next problem was to choose standardized techniques from each discipline which were suitable for use at the scale envisaged. This would time provide interlocking information of significance in regional geochemistry, limnology, palynology and geochemistry.

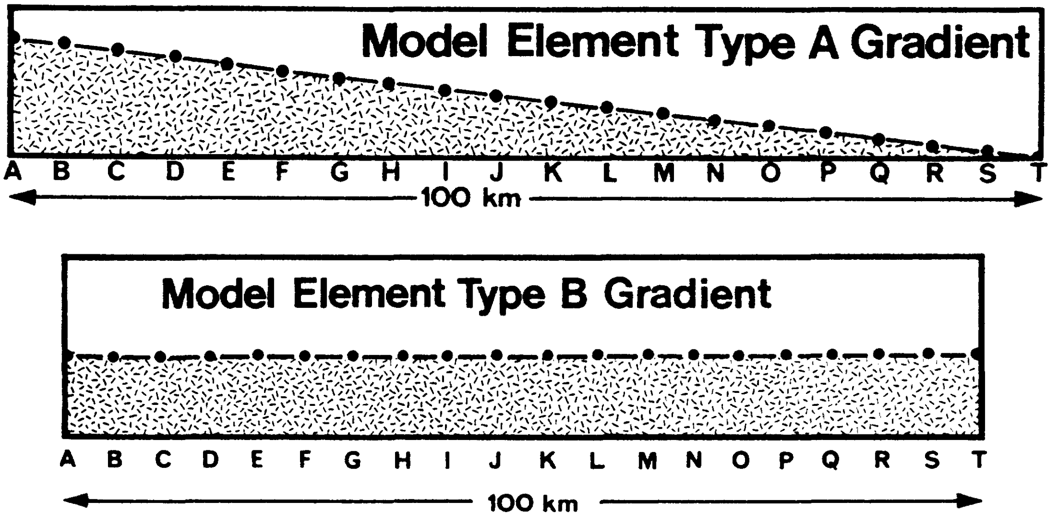

Figure 5 - Models for element abundance gradients, (a) for an element found within acid precipitation; (b) for an element not associated with acid precipitation.

Followed by p. 5a

ACKNOWLEDGEMENTS

This follow up study was funded wholly by the Ontario Ministry of Natural Resources as part of the co-ordinated program of studies into acid precipitation and related effects in Ontario. The regional geochemical survey upon which this follow up study is based was produced as part of the joint funded Federal/Provincial uranium reconnaissance program.

The scientific team responsible for this investigation program are indebted to a large number of individuals for their advise, consultation and material support during the life of the project. The following persons are identified as having given particular assistance to the study.

Dr. P. Dillon and Dr. D. Jefferies of the Ontario Ministry of the Environment provided detailed information on preferred sampling and analytical techniques for lake waters. As a consequence, it is believed that the data presented here is fully compatible with the MOE data collected elsewhere in the Province.

In Wawa, S. Kerr and H. Thomas, fish and wildlife specialists at the district office of the Ministry of Natural Resources provided active support in many ways. In particular, their detailed knowledge of limnological conditions and fish populations was most valuable. Also, they made available local cold storage facilities for the water and lake sediment samples.

Analytical work on the water samples was completed under the direction of Dr. C. Chan of the Geoscience laboratory of the Ontario Geological Survey. Dr. Chan was able to provide very rapid processing of the samples under the most rigorous of quality control conditions.

Support in the form of typing, drafting, data compilation and computer processing was provided by the staff of the Geophysics/Geochemistry Section.

The collective thanks of the investigation team are offered to Roger Barlow, Chief of the Geophysics/Geochemistry Section for giving his full support and continued encouragement throughout the project.

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INPUTS FROM DISCIPLINES

Each of the four scientific disciplines involved in the acid precipitation study was expected to supply information in two ways. Standardized, model wide, data and information would accumulate through doing exactly the same thing at each of the 20 lakes studied. Additional information would be added where required to provide a more complete picture of local conditions at certain lakes. Let us consider the inputs from the methods, discipline by discipline.

1) Limnology (M. Dickman)

Two sets of water observations were planned, one involving surface waters and the other the entire vertical water column. The surface water samples were designed to provide interlake comparisons for pH, alkalinity, calcium and sulphate gradients based on single samples from each of the chosen lakes. Idealized gradients for these data are shown in Figure 6. The rationale for the measurement of pH has already been discussed. Alkalinity is important because it is a measure of the ability of lake waters to buffer the effects of acid precipitation. The curve for this parameter is expected to be similar to that of pH except in the extreme north where calcium carbonate occurs in the surficial material.

Similarly, the gradient for calcium is expected to steepen toward the north. In contrast, the curve for sulphate, like that shown in Figure 5(a), would decrease towards the north owing to declining effects of acid precipitation.

Preceded by p. 5a

The observations from the water column analyses of each lake are generalized in conceptual model Figure 7. These include measurement of colour, transparency (i.e. Secchi depth); the temperature; dissolved oxygen content and the specific conductivity of the water. Each of these measurements is recorded at 1 m intervals to the bottom of the lake. As Shindler et al. (1980) noted, the pattern of lake acidification is influenced by a lack of oxygen below the thermocline of a lake which results in an accumulation of organic matter on the bottom. Consequently, depth profiles for temperature of water and dissolved oxygen were planned for each lake in addition to specific conductivity. Lakes with low specific conductivity usually have low alkalinity and total dissolved solids.

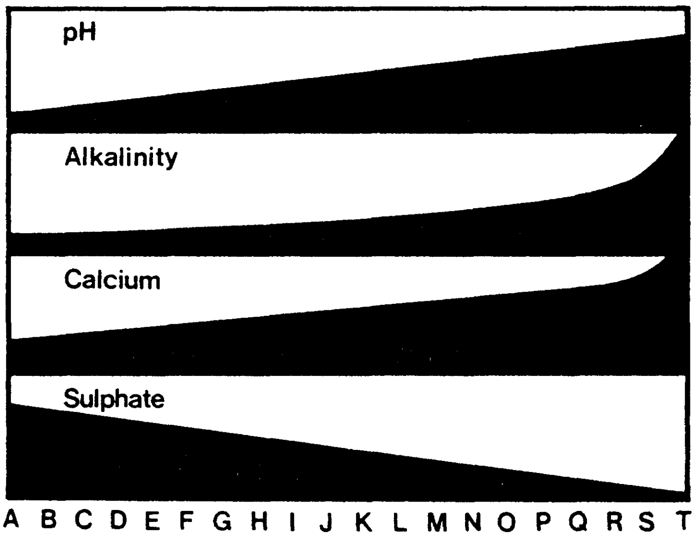

Figure 6 - Gradient models for the four parameters to be measured in surface water samples.

More Detailed Limnological Observations

(i) Diatom Flora - Surveys of the diatom flora from surface sediment samples revealed a significant relationship between diatom species composition and lake water chemistry. (Nygaard 1956, Brigth 1968, Kovio & Ritchie 1978). Recently Froode and Berg (1980) applied this observation to the paleoecological analysis of cores from lakes acidified as a result of anthropogenic events. By employing pH indicator observations of Hustedt (1930) Foged (1947-1948) Foged (1964) Florin (1957) as well as Patrick and Reimer (1966) and (1975), Berg (1978) was able to infer the pH of a given lake from its dominant diatom assemblage once the relationship

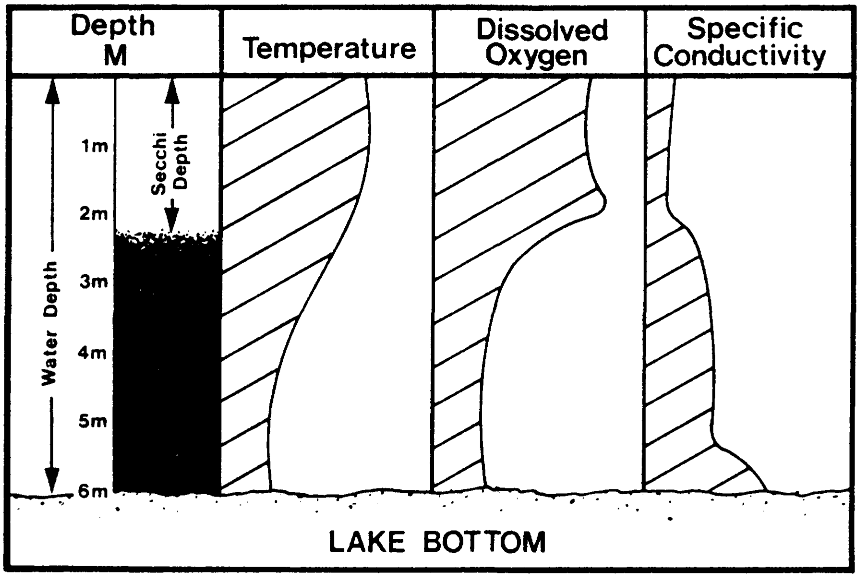

Figure 7 - Gradient models for the parameters to be measured in water column samples.

between the acid indicator species assemblages and the lake pH had been established. Berg was also able to infer the pH of the same lake at previous intervals of time from the last ice age to the present by studying the diatom assemblages in cores taken from the lake. The technique of inferred pH based on diatom assemblages holds great potential because scientists trained in diatom taxonomy and paleoecology can now estimate the rate of lake acidification wherever diatom rich undisturbed lake sediments are available.

For these reasons, it was decided to include an investigation of the diatom flora in the lake surface sediments from the twenty study lakes.

(ii) Higher Aquatic Plants - Higher aquatic plants of acid lakes the world over share certain common characteristics. In these lakes, the macrophytes are generally species poor and their growth rates are suboptimal (Nilssen 1980). Such acid lakes are frequently characterised by the absence of water lilies (Nuphar spp.), pond weeds (Potamogeton spp.) and water milfoils (Myriophyllum spp.). Mosses, especially Drepanocladus, Fontinalis & Sphagnum, as well as, higher plants, Lobelia, Juncus bulbosus and filamentous green algae such as Mougeotia spp. increase in relative abundance as lakes acidify (Gran et al. 1974, Nilssen 1980).

(iii) Fish Population - The alteration of a lake's fish population due to lake acidification affects the species composition of the lake's zooplankton and benthos which in turn will affect the lake's phytoplankton. Thus lake acidification affects the entire food chain.

One of the most striking changes which accompanies lake acidification is the shift in fish composition and abundance (Nilssen 1980). The rapid disappearance of salmonids from acidifying lakes has been documented (Beamish and Harvey 1972, Beamish 1974). Aluminium ions may accumulate on the gill lamellae of fish in acidified lakes until toxic levels are reached (Drescoll et al. 1980). Ultimately the lake is left with a few percids and minnows and even these are not invulnerable to acidification (Almer 1972).

Although it was not planned to take fish inventories during this study, some lakes in the region had been previously investigated by the Ontario Ministry of Natural Resources fish and wildlife personnel. Wherever possible this information is included in our report. As lakes acidify, vertebrate predators disppear (i.e. fish and amphibians) and invertebrate predators such as _Chaoborus_ and _Hetercope saliens_ play a larger and larger role in the lake's predator - prey interactions. This may account for the reduced abundance of Cyclopoid copepods in acid lakes (Nilssen 1980).

Bearing in mind these considertions, it was planned to examine the zooplankton faunas in the lakes chosen for study to discover if they could be used as reliable indicators of acid precipitation effects.

(iv) _Zooplankton_ - Another aspect of the lake biota of interest in acid precipitation studies is the zooplankton. Typically, acid lakes can be characterised by their lack of _Daphnia_. _Daphnia_ is intolerant of low pH (Strom 1926). Pelagic cyclopoids are also rare in acid lakes (Roff and Keviatowaki 1977). Nilssen (1974) has shown that a number of littoral and semi-littoral zone species become more and more prominent as a lake acidifies. Examples being _Bosmina longispina_, _Diaphanosoma brachyurum_, _Scapholeferis muronata_, _Heterocope saliens_ and _Chydorus sphaericus_. The trend was also observed in Canada north of Lake Huron by Sprules (1975), who noted that the small planktonic copepod, _Diaptomus minutus_, increased in relative abundance as pH fell. Simultaneously, total zooplankton density and diversity declined with continued acidification. The latter pattern was also observed by Carter (1971) and Salazkin (1971).

(v) _Phytoplankton_ - In our study, a survey of the phytoplankton from depth integrating samplers taken in each of the twenty lakes on a single date in June was planned in order to determine whether any pH dependent pattern in species composition was a function of lake pH. Only the dominant species from each of the algal divisions were included in these analyses.

2) Geology and Geography of Lake Basins

This study was not directly involved with the details of the geology and geography of the lake basins to be studied. Nevertheless, it was important to include general information of this kind for purposes of comparison. A conceptual map model of a hypothetical lake basin (Figure 8) may be used to describe the parameters of interest. Let us consider Figure 8 in detail:

A - The NTS coordinates at the lake sampling point were needed to tie in our sampling with that carried out previously during the regional geochemical surveys (although no attempts were made to duplicate exactly the location of the regional sampling points in the follow-up study).

B - The elevation of the lake surface above sea level was of particular importance because relationships were expected between lake elevation and lake water chemistry.

C - Lake depth at sampling point. This information provides a general guide to lake conditions. As time did not allow for a bathymetric traverse survey at each lake, it was planned to collect lake water column and sediment core information from the deepest part of lake basins where this was practical.

D - Lake area is of considerable interest in limnology. Estimates of the area of each lake to be included in the sampling plan were made using topographic maps.

E - Lake catchment areas were estimated from the topographic contours on NTS 1:50 000 scale maps. Although such a procedure is clearly a first approximation, the information was considered adequate for the follow-up level study.

F - The bedrock geology of the Canadian Shield which underlies the region north of Lake Superior is often complex with respect to lithology, structure and metamorphism. For purposes of comparison and interpretation of the water chemistry and lake sediment core geochemical data, some control from geology was required. Consequently, regional geological maps, supplemented in some cases by locally derived information, were used to map the rock types within drainage basins.

G - Much of the area enclosed within drainage basins in the region is covered with glacial and glaciofluvial deposits. Unfortunately,information on the nature, thickness and extent of surficial cover in the region is scanty and the mapping of Quaternary deposits in the area is minimal. For this reason, the descriptions of glacial deposits surrounding the lake basins is likely to be a first approximation only.

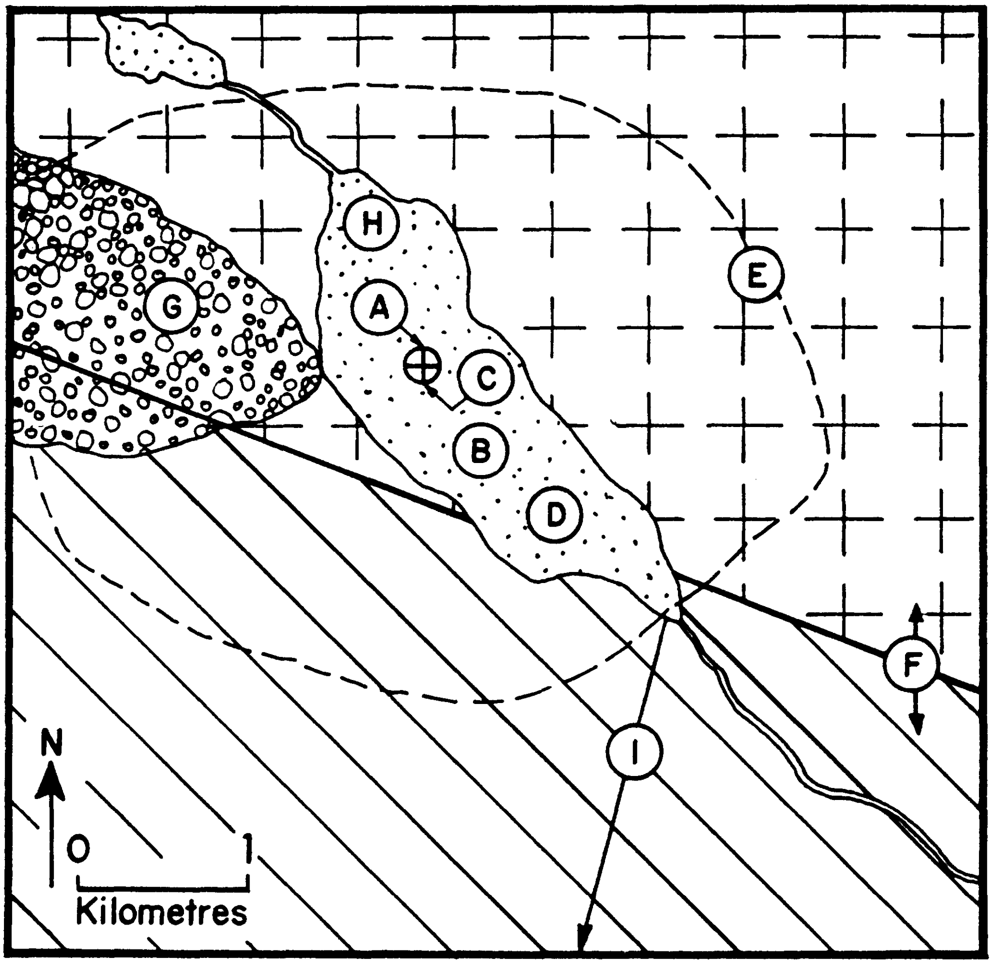

Figure 8 - Conceptual model of a hypothetical lake basin included in the sampling strip including the geological and geographical data required for the follow-up investigation.

NTS coordinates at lake sampling point----------------------A
Elevation of lake above sea level (m)-----------------------B
Lake depth at sampling point--------------------------------C
Lake area---D
Lake catchment area---E
Bedrock Geology (granite/greenstone)------------------------F
Surficial geological features (if mapped)*------------------G
Position of lake in 'Staircase' (here second)---------------H
Distance of lake from margin of Lake Superior---------------I

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* "Surficial geology" included in model but not in data listings in Part II.

H - Many lakes in the region drain into one another by relatively short channels. Such a series of lakes is called a "staircase". In Figure 8, the small lake at the top left of the figure is the "top step" of the staircase and the lake of interest the second step. Location of a lake in a staircase sequence is frequently of considerable importance in relation to acid precipitation. The highest lake in a staircase sequence is often more susceptible to the effect of acid precipitation than those below it even though the variation in relief may be only a few tens of metres.

I - The distance from the margin of Lake Superior in the prevailing (southwest) wind direction is a possible indicator of the intensity of acid precipitation (see Figure 5a).

At the time of planning the follow-up level survey, it was considered that description of the parameters just described would be appropriate as a basis for the interpretation of the geochemical, palynological and limnological investigations. However, it was also realized that more detailed geological information might be required from specific lakes where conditions merited further study.

3) Palynology (J. Terasmae)

The problem of acid precipitation north of Lake Superior has two aspects, one involved with the present state of the lakes (which is included in the limnological investigation) and the other which involves the history of the sedimentation in the lake which is studied by palynology and geochemistry.

The palynology input to the project was planned at two levels. Both levels were to be based on the detailed examination of 50 cm, undisturbed lake sediment cores collected in duplicate from each lake. Previous work in the area had revealed that the sedimentation rate in northern lakes was such that within a 50 cm long undisturbed core a pollen record predating modern man's entry into the area would be preserved.

In order to interpret the geochemical history of a lake sediment core, it is vital to know the sedimentation rate. Palynological investigation of samples collected from 2.5 cm segments of lake sediment cores provides a detailed record of the evolution of plant cover types in the area. More particularly the location of the "Ambrosia pollen rise" marks the place in the core where sedimentation was active as man came into the Great Lakes region. From the viewpoint of the acid precipitation problem, the Ambrosia rise is important because it provides a datum below which changes in pH (and other parameters) in the lake were due only to natural causes and above which the natural changes may be affected by man's activities. Consequently, the first level of the palynology study was to establish the level of the Ambrosia rise in cores collected from each of the 20 lakes (Figure 9).

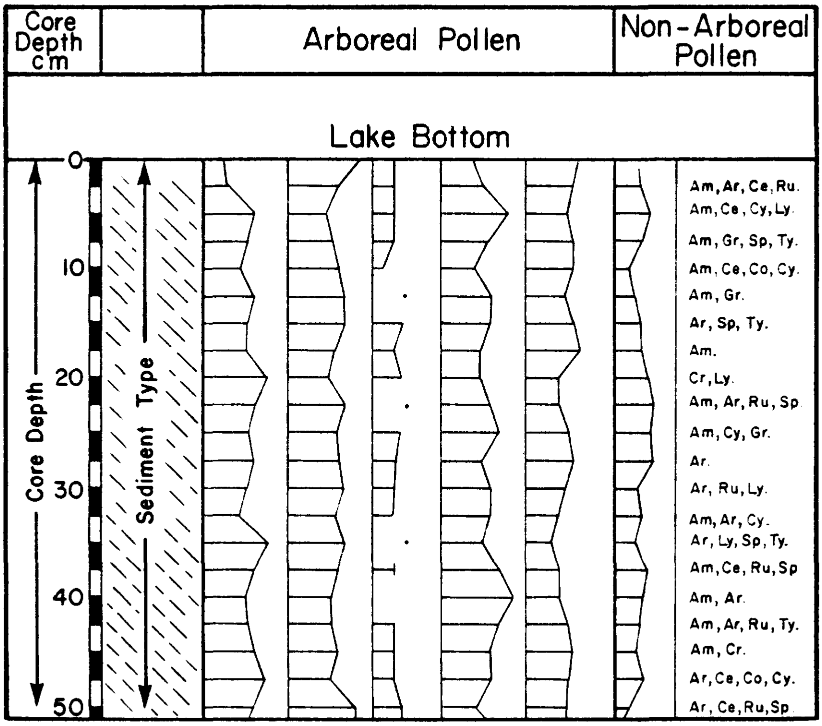


Figure 9 - Conceptual model of lake sediment core data plot showing pollen diagram for arborial and non arborial pollen.

The second level of study was more subtle. Its purpose was to provide a detailed record of fossil pollen down to a depth of 50 cm in order to obtain information on the uniformity of lake sedimentation conditions during the time period involved. In order to achieve this, details of the arboreal and non-arboreal pollen record in each of the 20 segments in each of the 20 cores would be required in order to produce a series of pollen diagrams of the type illustrated in Figure 9. Clearly, very variable pollen diagrams might indicate erratic and nonuniform vegetation conditions in drainage basins whereas gradual change or uniformity of pollen patterns would indicate stable conditions for hundreds of years (using a 50 cm core length). Another use of the lake sediment core samples relates to the limnological investigation. In this case, significant variations in microfossil populations could indicate changes in lake pH as described in a previous section.

4) Geochemistry (J. Fortescue, I. Thomson)

Introduction

In regional geochemical mapping samples of surface water and lake sediment are collected from each lake. (O.G.S. Open File Report 5248 (1978)). The surface water samples are used for pH measurement and the determination of certain trace elements (eg. F and U). The lake sediment samples are collected with a grab sampler which is designed to collect material from below the surface of the sediment column. The sediment samples are oven dried, ground and the fine material used as a basis for chemical anlysis. The chemical tests include a "loss on ignition" and the determination of hot acid soluble elements (usually Cu, Zn, Co, Ni, Mo, Ag, Fe, Mn) as well as, total U using a separate technique. In order to make regional geochemical maps, the data of water pH, L.O.I. of sediment and abundance of elements in waters and sediment are plotted as digits on an underlay showing the rivers, lakes and geology of the area. (See O.G.S. Open File Maps P.1805-1818 (1978)). The map sets are accompanied by a listing of the chemical data and a simple descriptive statistical analysis of each parameter. Regional geochemical data bases of this type are useful in the initial stages of follow-up investigations aimed at the study of the acid precipitation problem for several reasons.

A - Because of the relatively large areas covered and the large number of lakes sampled and the uniformity of the sampling schemes adopted (eg. Figure 1), regional geochemical maps are suitable for the delineation of patterns which can be studied in further detail by follow-up investigations of the type shown as a conceptual model in Figure 3.

B - Because some of the parameters included in regional geochemical mapping (eg. pH determinations) relate directly to the acid precipitation problem, they can be used to further guide the location of sampling sites for follow-up investigations. For example the map (Figure 2) shows the extreme pH values which may be used directly to locate a sampling as described in Chapter 2.

C - Because some of the elements included in the regional geochemical mapping procedure are of interest in relation to the particulate fallout chemistry associated with acid rain (eg. As, Zn) (see model in Figure 5a) an inspection of the patterns on geochemical maps for these elements in relation to the patterns on the pH map may provide clues to the geochemical effects of acid precipitation.

In summary, regional geochemical maps are of considerable importance in the early stages of a follow-up project designed to investigate the problem of acid precipitation based on a conceptual model of the type illustrated in Figure 3. <u>However, once a pH gradient within a sampling strip has been selected for study, the importance of the regional patterns is minimal. It is not until the combined geochemical, limnological, palynological, geological and geographical data base from the follow-up study has been interpreted that general conclusions may be drawn regarding the further interpretation of data and patterns on regional geochemical maps</u>.

Methods

In our follow-up level study, lake water chemistry and geochemistry is described as a part of limnology because of the intimate relationships between the living and non-living components of lake ecosystems. In this section, we are concerned with the study of the geochemistry of the lake sediment cores.

The following parameters were selected for study in the lake sediment cores. For purposes of comparison of sedimentation in space and time all parameters are studied on all segments of all cores.

A - Wet weight: The lake sediment cores were carried undisturbed to the laboratory from the field sampling site. They were then frozen, extruded from sampling tubes and cut into 2.5 cm segments which were weighed immediately.

B - Dry weight: The segment samples were freeze dried and the dry weight recorded.

C - Loss on Ignition: The wet weight, the dry weight and the loss on ignition of the dry material all provide evidence for the uniformity of sediment conditions in the lakes sampled. Such uniformity is desirable if relatively subtle geochemical changes in lake environments due to acid precipitation are to be described. (The palynological investigations also provide evidence of this type indepent from the geochemistry).

D - Element Abundance: In a sample of lake sediment some elements are present in primary mineral particles, some in secondary colloidal materials, and still others in organic matter. The lake sediment itself is a complex mixture of these three components

The main purpose of the study of the geochemistry of the lake sediment cores is to establish if pro and post Ambrosia sedimentation conditions have been uniform in the lakes and, if so, whether there has been any recent change in the cores due to acid precipitation. The choice of elements for inclusion in the followup study was governed by these constraints.

The elements selected fall into the following groups

i) Major constituents of minerals (Primary and/or secondary)

Ca,Mg,Na,K,Al,Fe,Mn (and P,Ti, and Zr as accessory minerals)

ii) Trace elements of rocks and minerals

Sr,Cu,Cr,Ni,Zn,Co,Th,U,V,As,Pb,Hg

iii) Elements likely to be present in particulate matter associated with acid precipitation

Zn(7000)*, A(5,000),V(3,500),Pb(3,500),Cu(2,100),Ni(2,100) Cr(1400) Co(700) and Hg(400).

---

*Estimate for tons of element released into the atmosphere per year by burning of solid fuels (Bertine and Goldberg 1971)

Descriptive Geochemistry of lake sediment cores

Stumm and Baccini (1978) pointed out that the distribution patterns of heavy metals in lake sediment core profiles indicates man's impact on the environment since the beginning of industralization. They also noted that it is more practical to obtain information of this type from sediment cores rather than direct from waters owing to sampling and analytical difficulties. As an example, they quoted information from Tschopp 1977 showing details of heavy metal pollution in sediments in Greifensee after 1928 (Figure 11.)

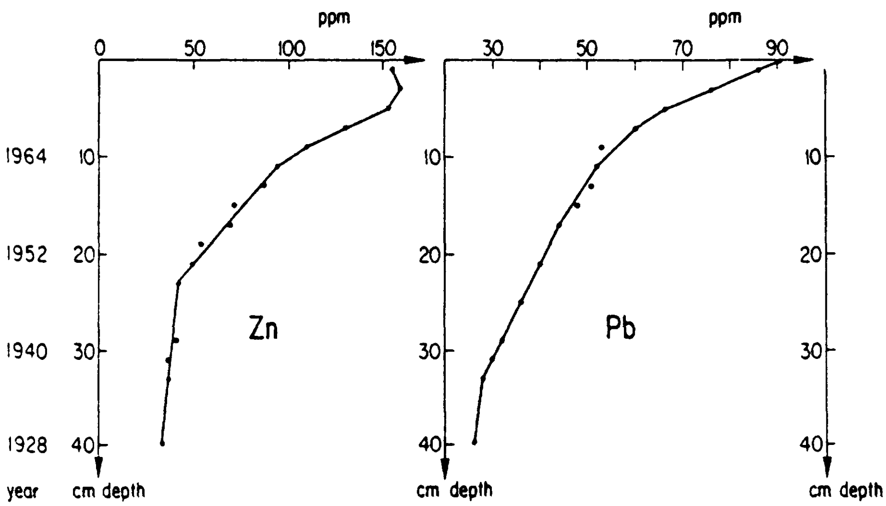


Figure 10 - Sediments as indicators of heavy metal pollution. Zn, and Pb, in Greifensee (Tschopp,1977).

Hence the vertical distribution patterns for individual heavy metals, and related elements, should augment interpretation of pH data regarding inputs of acid precipitation in the region to the north of Lake Superior.

Evidence from regional geochemical surveys based on lake sediments collected from the Canadian Shield (Coker, Hornbrook & Cameron (1979) indicates that the material collected is commonly gyttya with a relatively high organic content (i.e. loss on ignition of between 35% and 60%). The accumulation of sediment material of this type involves intimate mixing and interaction of waters and organic matter often resulting in the extraction of heavy metals by the organic material.

Schnitzer (1980) provided a clear summary of relationships between the complexing power of the three principal components of humic material (i.e. humin humic acid and fulvic aid). He noted that of all the elements tested, Fe^{3+}, forms the most stable complex with fulvic acid at pH 3.0 - pH 5.0 and listed the order of complex stabilities for common ions as follows:

$Fe^{3+}>Al^{3+}>Cu^{2+}>Ni^{2+}>Co^{2+}>Pb^{2+}>Ca^{2+}>Zn^{2+}>Mn^{2+}>Mg^{2+}$.> He noted relatively slight changes between Cu^{2+}, Co^{2+} Ni^{2+} with increasing pH. Försẗner and Wittman (1979) listed the order of adsorption by cation exchange on organic and inorganic substances as follows:-

$Pb>Cu>Ni>Co>Zn>Mn>Ba>Ca>Mg>NH_4>K>Na$

and Mitchell (1964) established the following empirical sequence for the afinity of heavy metals toward clay minerals.

$Pb>Ni>Cu>Zn$

In general it is likely that cation exchange and complexing by the organic and inorganic components of gyttja will enhance the trace element abundance in lake sediments. Thus the chemistry of the sediment material and the supply of individual elements will together define the abundance of elements in core segments prior to the Ambrosia rise. Since then three different processes have been at work. One involves acid precipitation which may mobilize elements already present in lake sediments by a change in the pH. A second involves the mobilization of ions from geological materials within the drainage basin which find their way into the lake and the third involves direct fallout of new material into the lake or its surroundings.

It is concluded that the detection of effects of acid precipitation on the chemical composition of lake sediment may be simple (as indicated in Figure 10) or multielement studies may be required to determine subtle changes in environmental conditions due to acid precipitation. In general the following classes of element behaviour are expected (Figure 11).

Class A pattern (Figure 11) are explained largely on the basis of bedrock, or surficial geology. Generally speaking to the north of Lake Superior the most common rock types are granitic rocks and volcanic, volcaniclastic and sedimentary rocks, (commonly referred to collectively

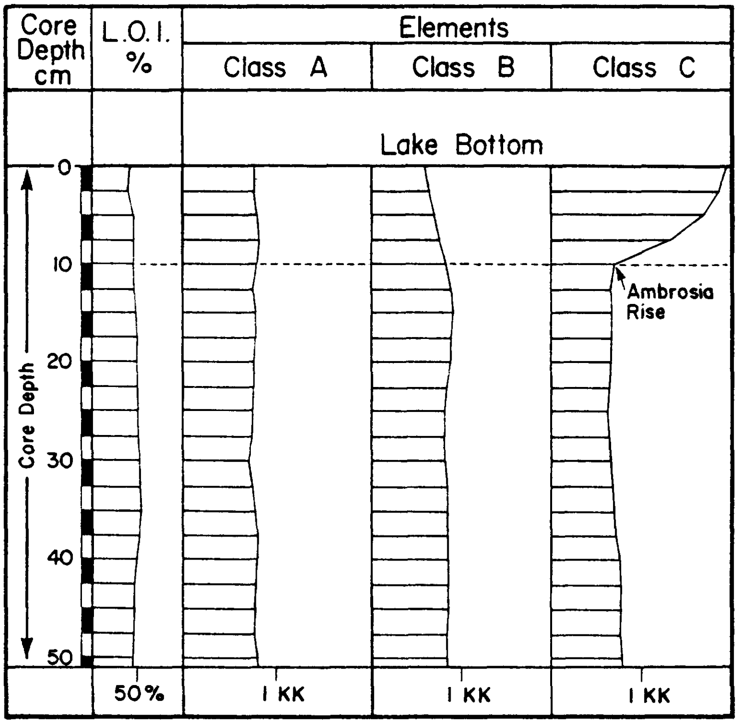


Figure 11 - Conceptual model of lake sediment core data plot showing L.O.I. and class A, B, and C element distributions

Class A - Patterns due to natural processes which have not been significantly affected by acid precipitation or its associated effects

Class B - Patterns due to natural processes which have been affected by acid precipitation or its associated effects

Class C - Patterns which have been modified due to input of elements from the atmosphere in acid precipitation.

as greenstones) with other rocks (e.g. iron formations) found here and there. The glacial action in the area during the Pleistocene tended to blurr these variations and to the north deposits of calcareous drift and varved clays deposited during the formation of glacial Lake Barlow-Ojibway provided ample natural buffering of any effects of acid precipitation in that part of the region.

Notes on the geochemical behaviour of elements selected for study

Calcium - Calcium is low in granitic rocks, higher in greenstones and highest in limestones. In the area to the north of Lake Superior calcium is likely to be low in supply near the lake margin in granitic rocks and higher in areas underlain by greenstones due to mechanical and chemical weathering. Excess calcium is to be expected in areas where significant amount of calcarious drift occur resulting in lake water pH levels above 6.5. Study of the abundance of this element in lake sediment cores in granitic or greenstone terrain where pH of lakes is relatively low may indicate changes in calcium levels in core segments due to natural processes prior to the Ambrosia rise or acid precipitation since then.

Aluminium Iron Manganese and Zinc - Evidence presented by Galloway et.al.(1976) for lakes of pH 4.7 and 6.7 in the Adirondack Mountains showed that in the top 10 cm of cores of the lake with pH 4.7 the content of these four elements was greatly depleted compared with lower down. The lake with pH of 6.7 did not show this effect. The development of this type of pattern along the pH gradient will be looked for during the project.

Magnesium and Strontium - are expected to follow calcium in behaviour except that the patterns are likely to be more subtle for these two elements.

Sodium and Potassium - Some sodium and potassium is likely to be present in primary mineral grains incorporated in the sediments. In secondary minerals and associated materials potassium is expected to be concentrated relative to sodium. The effects of lake water pH on sodium/potassium ratios should be checked.

Phosphorus, Titanium and Zirconium - At low pH these elements are expected to be present in stable minerals which can be used as indicators of uniform sedimentation conditions. At high pH it is to be expected that phosphorus and titanium may enter solution and be accumulated in the gyttja.

Zinc, Arsenic, Vanadium, Lead, Copper, Nickel, Chromium, Cobalt and Mercury - As a group these elements may or may not increase in sediments as a result of acid precipitation. For any one sample the value X(in ppm) for any of these elements is of the form (Fortescue, Thomson and Barlow (1980):-

$$X = x_{geology} + x_{pedology} + x_{ecology} + x_{technology}$$

Where the subscripts refer to the origin of the different contributions to the total value of element x. In acid precipitation studies which involve any of the elements listed above the input from the atmosphere must be several times that contributed by primary minerals (i.e. geology) secondary materials (i.e. pedology) organic matter (ie. ecology). It should be noted that if the sedimentation conditions have been uniform the average values for the abundance of the element in pre Ambrosia sediment may be subtracted from the values for post Ambrosia time to discover if x technology is positive or negative. If it is positive it is likely that element x has been added to the system in precipitation whereas if it is negative it suggests that conditions in the lake have changed (i.e. turned acid) which has dissolved element x out of the sediment material. The interpretation of the sediment core geochemical information must take into consideration these two possibilities. A third possibility is that trace element mobilities are sympathetic and that the bahaviour of one element may mimic that of another with similar chemistry. Tests for this type of behaviour are difficult, or impossible, if ppm values are used. This is because of the complexity of sediment materials. Consequently, a third approach using the KK (Clarke) tramsform has been developed for the interpretation of single and multielement sediment core geochemical data as a component of the followup level project.

The KK(Clarke) transform

The Clarke of an element is the abundance estimate for that element in the Earth's crust. (on a weight percentage basis). If the total abundance of an element is divided by its Clarke the KK (i.e. Clarke of concentration) unit is obtained. (Table 1)

Element	0.01K(ppm)	0.1K(ppm)	K(ppm)
Al	836	8,360	83,600
Fe	633	6,220	62,200
Mn	10.6	106	1,060
K	184	1,840	18,400
Na	227	2,270	22,700
Mg	276.4	2,764	27,640
Ca	466	4,660	46,600
P	11.2	112	1,120
Ti	63.2	632	6,320
Zr	1.62	16.2	162
As	.018	.18	1.8
Co	.29	2.9	29
Cr	1.22	12.2	122
Cu	.68	6.8	68
Hg	.86	8.6*	86*
Ni	.99	9.9	99
Pb	.13	1.3	13
Sr	3.84	38.4	384
Th	.081	.81	8.1
U	.023	.23	2.3
V	1.36	13.6	136
Zn	.76	7.6	76

*ppb

TABLE 1
CLARK VALUES FOR ELEMENTS INCLUDED IN THE FOLLOWUP PROJECT
FROM RONOV AND YAROSKEVSKIY (1972)

When absolute abundance data for one or more elements is transformed (using the appropriate KK factors) it is quite evident from a table of lake sediment core data which elements are below, or near or above average abundance in the Earth's crust. Because the KK transformation normalizes elements to the datum of the Earth's crust abundance it is practical to add, subtract, multiply, or divide, Clarke values and still retain relationships to the abundance in the Earth's crust. Another application in relation to lake sediment cores is in the addition of KK values for elements which are known to behave similarly in the geochemical environment during sedimentation.

For example, abundance data for aluminium, calcium, iron and manganese, (which have very different absolute Clarke abundance values) may be plotted using KK values as a single entity. Similarly, elements such as zinc, arsenic, lead and mercury may be combined to provide information on effects inputs to sediment cores after the data for each element is normalized by subtraction of the mean content values for pre-Ambrosia time.

The sediment core geochemical data for pre- or post-Ambrosia time in the 20 lakes may be displayed on graphs of the type shown on Figure 5 (using KK units). Single, or multiple element plots may be used. This information indicates the relationships between content of elements and space. With respect to time, loss on ignition information plus the vertical distribution patterns of abundance of elements in Clarke units are displayed as shown in Figure 11. These displays are designed to be compared with each other and with information obtained from limnology and palynology.

DISCIPLINE	OBSERVATIONS	PAGE IN DATA FILE (PART II)
LIMNOLOGY		
A) Water Chemistry	Grab Samples pH, alkalinity calcium, sulphate	(Chapter 3)*
	Water Column Temperature, dissolved oxygen, specific conductivity, Secchi depth	6 & 7
B) Study of Lake Biota	Diatoms (higher aquatic plants, Lake fish populations, Zooplankton	4 & 5
GEOLOGY/GEOGRAPHY		
A) Geological Information	Bedrock types underlying the lake basin, surficial deposits	3
B) Georaphic Information	NTS coordinates of lake, lake elevation, catchment area, lake area, lake depth	3
	(Position in lake "staircase" distance from margin of Lake Superior)	3
PALYNOLOGY		
A) Lake Sediment Core Dating	Location of the Ambrosia rise	9
B) Paleo Environments	Arboreal and non-arboreal pollen diagrams	8
GEOCHEMISTRY (Lake Sediment Cores)		
A) General Information	Wet Wt., Dry wt. and loss on ignition of lake sediment core segments	11, 13, 15, 16
B) Element Abundance	Major constituents of rocks Ca, Mg, Na, K, Al, Fe (Mn, P, Ti, Zr)	10, 11, 14, 15
	Trace elements of rocks Sr, Cu, Cr, Ni, Zn, Co, Th, U, V, As, Pb, Hg	12, 13, 16, 17
	Elements associated with fallout from acid precipitation Zn, As, V, Pb, Cu, Ni, Cr, Co, Hg.	12, 13, 16, 17

*This volume

TABLE 2

SUMMARY OF OBSERVATIONS PLANNED DURING THE FOLLOW-UP LEVEL PROJECT

Note: The page numbers in the data file refer to listings of information and data in Part II of this report. The Listing Plan is identical for each lake and the pages in each Lake Data File are coded (i.e. A-1 = Lake A, Page 1) for quick reference. Data file page references in this volume to volume 2 are always of the form "A-1", etc.

SUMMARY

The followup project described here was completed within a field area selected for the study of the acid precipitation problem north of Lake Superior. The general conceptual model of a 100 Km x 20 Km sampling strip suitable for the study of a pH gradient is illustrated on Figure 3. Inputs to the project designed to produce identical sets of observations from each of 20 lakes selected for study are described. The standardised sets of limnological, palynological, geochemical and geological/ geographical information were planned to be supplimented by more detailed information where conditions permit. The standardised and supplimental information collection methods are summarised on Table 2. The integrated planning of the project ensured that data sets would be truly interdisciplinary. This is reflected in Part II where the information and data for each lake from each of the four scientific disciplines is compiled within a single section.

THE ORGANIZATION OF THE REPORT

For convenience the observations and listed data obtained from the project are included in a separate volume which can be consulted independently of this text. Part I contains two further chapters. Chapter 2 provides information on the choice of the sampling strip and details of the methods used to collect the information and data together with general information as an introduction to Part II. The data is interpreted in Chapter 3 with discussions of findings relating to acid precipitation derived from limnology, palynology and geochemistry (sediment cores) being discussed separately and in relation to each other. The report ends with a series of conclusions and suggestions for further research.

Chapter II - Choice of field area and Description of Method

Choice of Field area for the followup level investigation

Regional geochemical maps for the area as shown in Figure 1 were used to select the 20 km x 100 km sampling strip for the followup investigation. The area chosen for study lies between the towns of Wawa and White River to the north of Lake Superior (Figure 12). The Sampling strip was selected largely on the basis of the regional geochemical map for lake water pH which was used as a basis for Figure 2. Bearing in mind the constraints of the general conceptual model(Figure 3) and 2) the modelpH gradient (Figure 4) the 20 lakes chosen for study were selected from a total of 124 lakes included in the 1978 regional survey. (Figure 14a) The 20 lakes are identified by the code letters A - T. Some limnological studies were also carried out in a further 7 lakes although details of this data are not covered by this report. The choice of the lakes was based solely on pH considerations in the first instance although

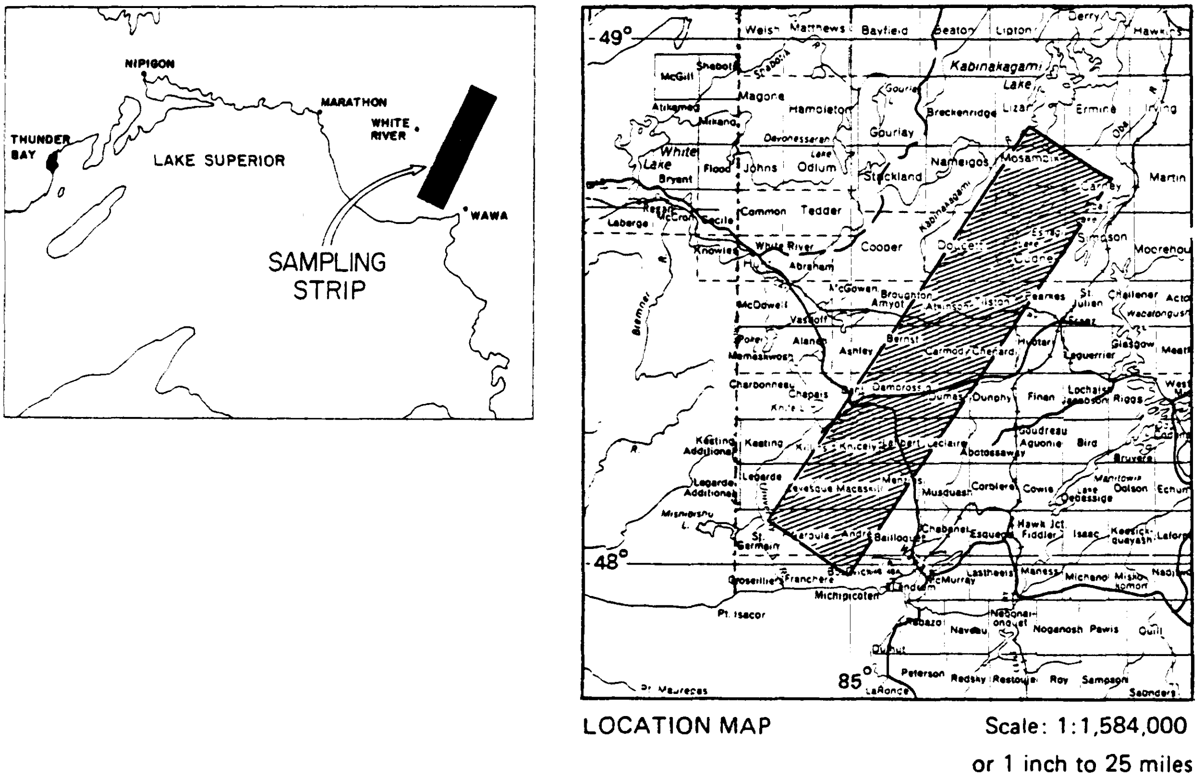


Figure 12 - Location of the sampling strip chosen fo the followup study

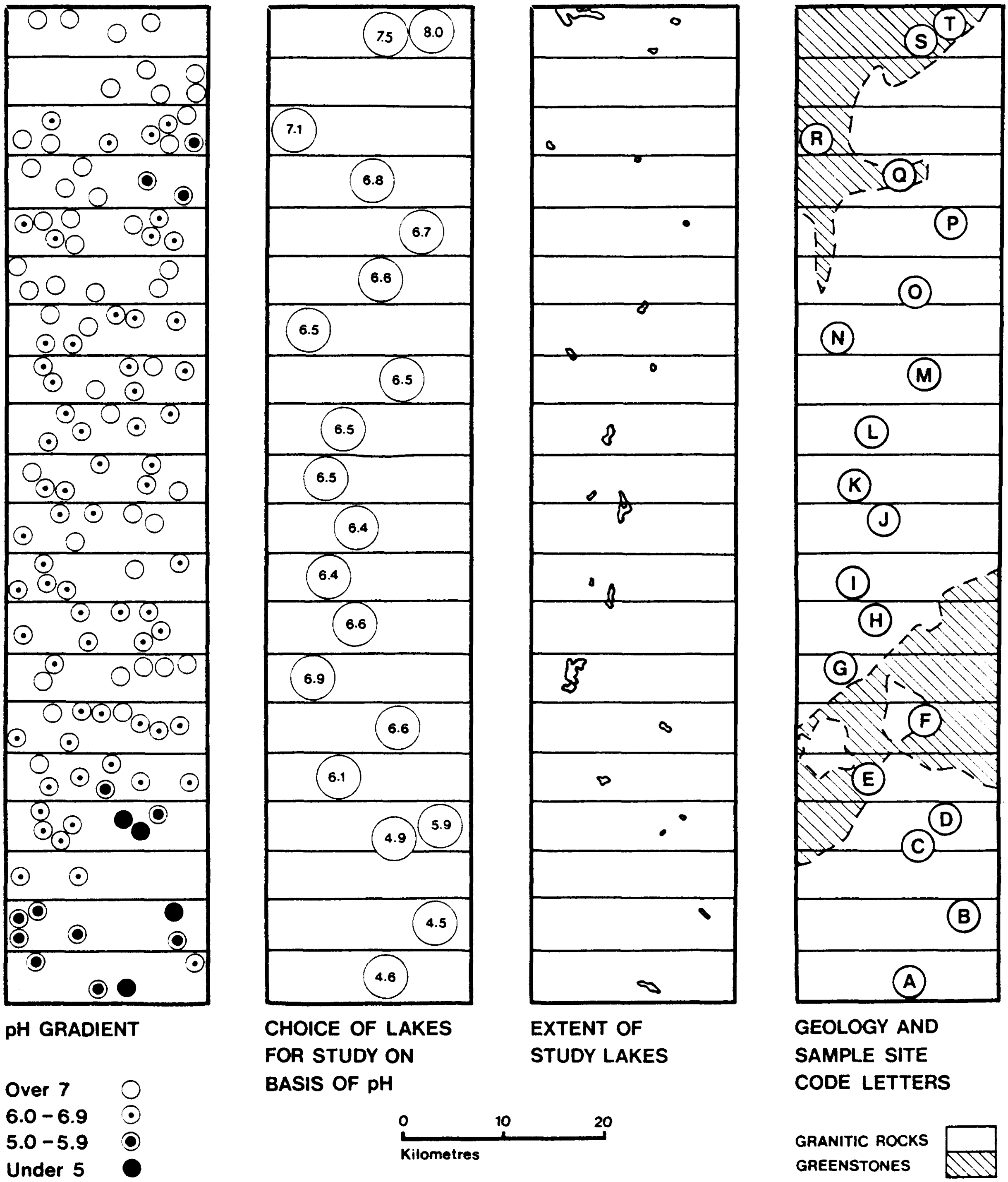


Figure 13 - General information regarding sampling strip chosen for study (1978 data)

topography, geology and geography were also considered (Figure 14). The actual pH gradient in lake waters included in the sampling strip lakes chosen for study is shown on Figure 15. When plotted in this way it can be seen that the pH of some lakes is higher than expected and related to the presence of greenstones in the bedrock (crosshatched area underlying lakes E,F and G and Q,R,S, and T). In the area of lakes Q,R,S and T the geological control of lake pH waters is further complicated by the presence of significant amounts of calcium carbonate (derived from Palaeozoic rocks further north) in the layer of surficial (glacially derived) material.

Once the location of the sampling strip had been decided upon the regional geochemical maps were studied in order to discover if any network geochemical patterns in the area would be likely to interact with those expected due to acid precipitation or fallout of airborn particulate pollution. Regional distribution maps for Cu,Ni,Pb,Zn,Co,Mn,Ag,As,Uand Fe

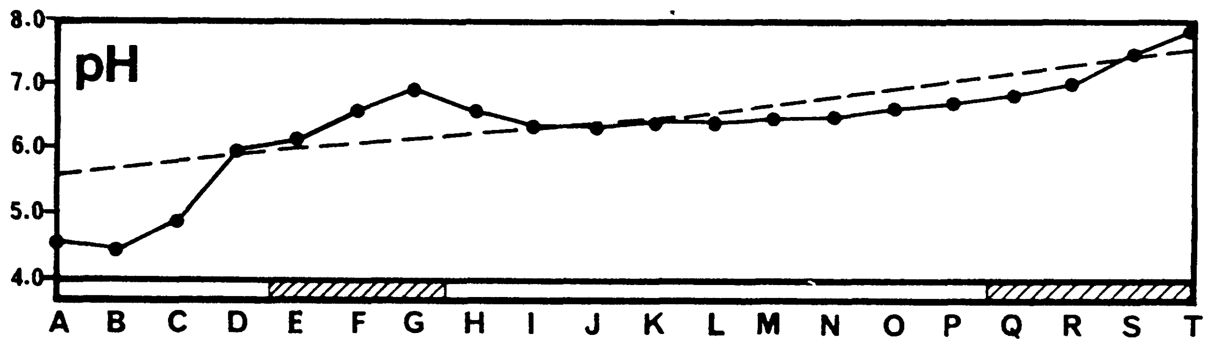
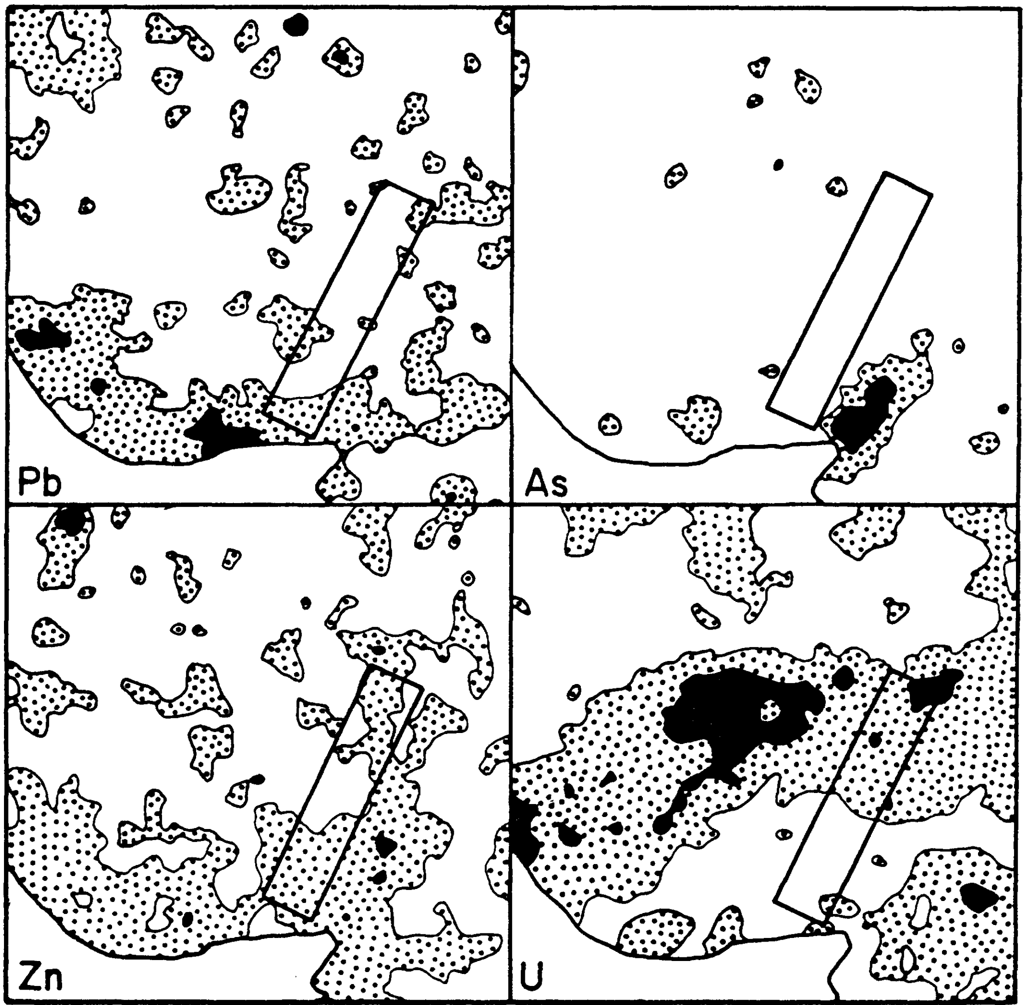
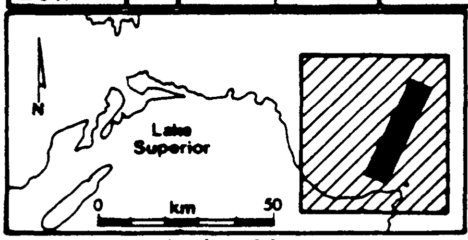


Figure 14 - Plot of the pH gradient along sampling strip (See Figure 4)

were inspected with special attention paid to the patterns for Zn,As, and Pb. These are the elements released into the atmosphere in greatest amount (Bertine and Golberg 1971) which were also included in the 1978 regional geochemical lake sediment survey. Because the sampling technique collected grab samples of lake sediment below the water/sediment interface



		Pb		As		Zn		U	
		ppm	KK	ppm	KK	ppm	KK	ppm	KK
High		13+	1+	7+	3·9+	186+	2·4+	17·2+	7·5+
Medium		6-13	·46-1	1·5-7·0	·8-3·9	96-186	1·3-2·4	2·5-17·2	1·1-7·5
Low		1-6	·08-·46	0·1-1·5	·06-·8	10-96	·13-1·3	0·1-2·5	·04-1·1



Index Map

Figure 15 - Regional geochemical setting of the sampling strip.

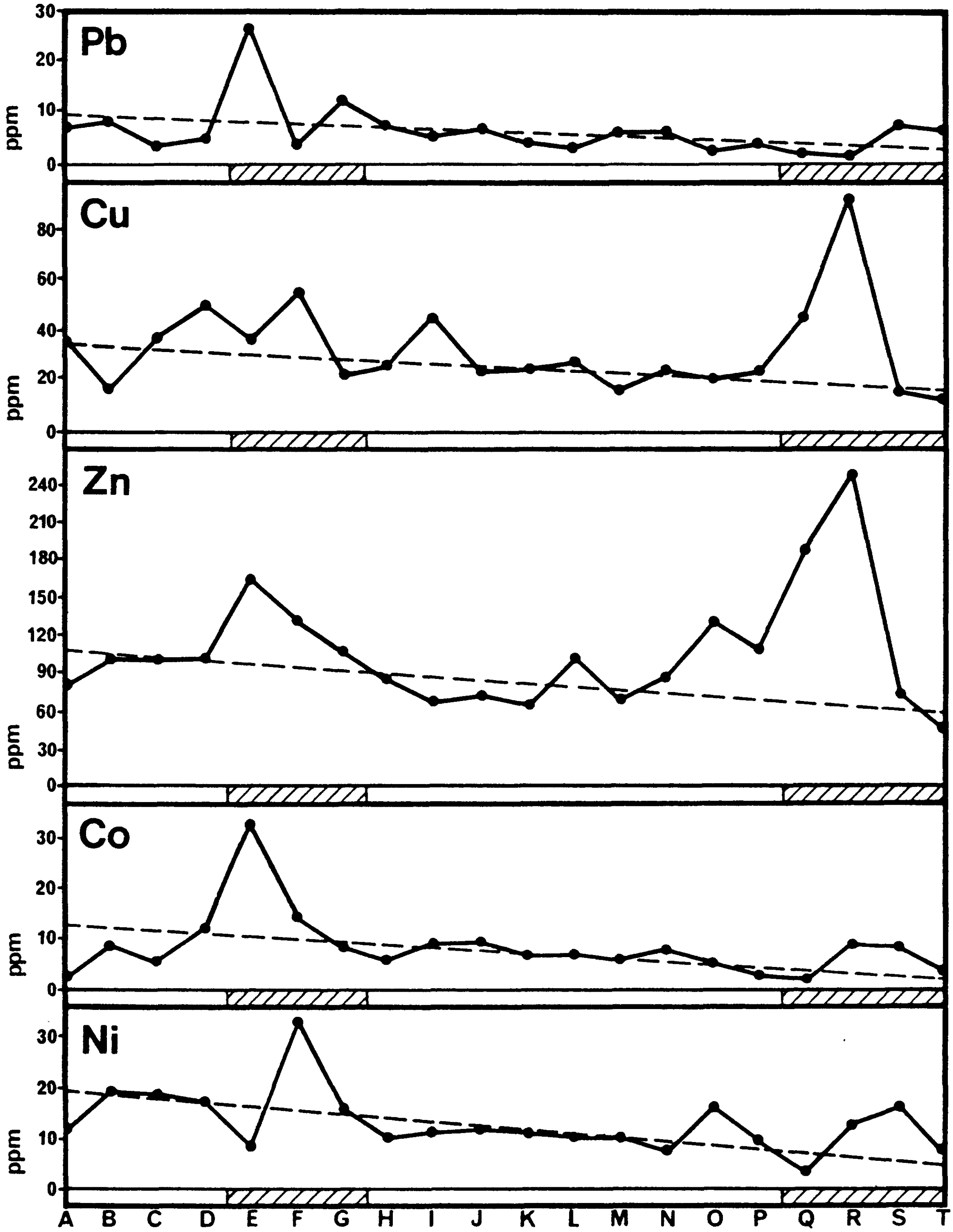


Figure 16 - Geochemical sections for trace element levels determined in grab samples of lake sediment during the 1978 regional geochemical survey

this data may be expected to provide information on the content of elements in sediments laid down prior to the advent of acid rain and particulate pollution.

Regional geochemical patterns for Zn,As,Pb, and U in the sampling strip area are summarized on Figure 15. These data are taken from G.S.C. Open File 746 which forms part of the NGR 1:2,000,000 coloured compilation map series derived from the NGR-URP surveys (see ChapterI) of the region. In general, Pb tends to decrease in the downwind direction; arsenic is relatively low and uniform; Zn is slightly lower in the middle of the

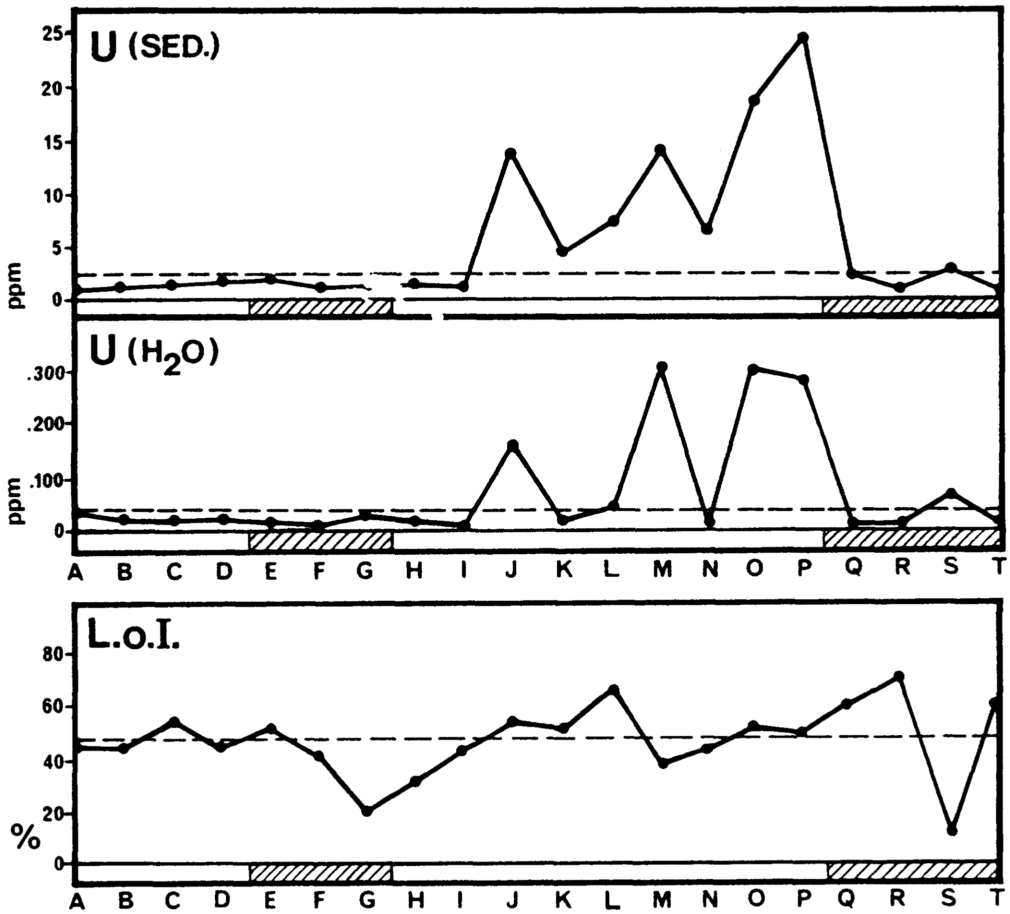


Figure 17 - Geochemical sections for uranium (water and sediment) and L.O.I. in sediment grab samples collected during the 1978 regional geochemical survey.

sampling strip than at the ends; and U (which is not expected to relate to acid precipitation) increases towards the north (Figure 15). It is also of interest to examine gradient geochemical sections (based on the 1978 regional geochemical data) for the 20 lakes of interest (ie A-T). On Figure 16 Geochemical sections for Ni,Co,Zn,Cu and Pb are shown.

As in the case of the pH section (Figure 15) areas underlain by greenstones are distinguished from those underlain by granite by means of crosshatching of the bar below the graphs (see Figure 16). As expected, higher amounts of these elements were found in sediment samples collected over greenstones compares with those taken from lakes underlain by granitic rocks. The dotted lines on Figure 16 indicates a very poorly defined geochemical gradient for Ni,Co,Zn,Cu and Pb along the sampling strip. Clearly any effects due to acid rain and/or pollution would be superimposed on this pattern. To detect such an effect, undisturbed sampling of the lake surface and subsurface sediment material would be required. The grab sampler used during the NGR survey in 1978 was n't designed to collect samples of surface sediment.

An even more striking pattern based on the 1978 regional data is included as Figure 17. This shows the very close relationship between the signatures for uranium in water and in grab samples of lake sediment. This is a good example of the close relationship which exists between the patterns for distribution of trace elements in lake sediments and in the waters which lie above them.

The second plot on Figure 17 is also informative. Although loss on ignition is relatively crude measurement of the chemical composition of a lake sediment it does 10 indicate the amount of organic matter (plus carbonate) in the sediment; 2) provide information on the degree to which the information on lake sediment samples is comparable from lake to lake (i.e. very low L.O.I. values indicate predominately mineral samples compared with very high L.O.I. data which suggests that a sample is almost totally organic) and 30 be used as a guide to $CaCO_3$ content of sediments. Numerical data from the 1978 survey (lakes A - T) is found on Table 3.

Lake	Sample Number	pH	Zn ppm	Cu ppm	Pb ppm	Ni ppm	Co ppm	Ag ppm	Mn ppm	As ppm	Mo ppm	Fe %
A	3216	4.6	80	36	7	12	2	0.1	75	0.5	1	0.45
B	1777	4.5	102	18	8	19	8	0.1	60	0.5	4	0.60
C	3415	4.9	120	56	5	10	10	0.1	70	0.5	1	0.80
D	3365	5.9	100	50	4	16	12	0.1	215	0.5	1	0.70
E	3417	6.1	162	36	27	8	34	0.1	1200	0.5	1	3.60
F	3283	6.6	132	54	4	33	14	0.1	380	0.5	1	1.65
G	3287	6.9	104	22	12	15	8	0.1	370	2.0	1	1.65
H	3113	6.6	84	24	7	10	6	0.1	140	0.5	1	0.90
I	3203	6.4	66	44	5	12	9	0.1	220	0.5	1	1.10
J	1075	6.4	70	22	6	12	9	0.1	110	0.5	1	0.90
K	1073	6.5	62	24	4	11	7	0.1	45	0.5	1	0.40
L	1019	6.5	104	28	3	10	7	0.1	95	0.5	3	0.55
M	3019	6.5	72	18	5	10	5	0.1	90	0.5	1	0.70
N	1025	6.5	82	22	5	8	7	0.1	115	0.5	2	1.05
O	1109	6.6	128	20	3	16	5	0.1	40	0.5	1	0.30
P	1144	6.7	112	24	4	10	3	0.1	30	0.5	1	0.20
Q	1140	6.8	188	44	2	4	2	0.1	30	0.5	1	0.20
R	1114	7.1	245	92	1	13	9	0.1	65	0.5	8	0.45
S	1138	7.5	184	16	4	6	2	0.1	35	0.5	5	0.45
T	1178	8.0	34	12	1	1	3	0.1	785	0.5	5	1.70

Lake	LoI %	U ppm	U-W ppb	F-W ppb	Rx.Tp.	Lk.Ar	S.D.	RIF.	Color
A	46.4	1.8	0.040	40	Gnss	< 1	25'	M	Br-Gn
B	44.2	1.6	0.020	32	Gnss	< 1	6'	M	Br
C	46.0	1.3	0.010	36	Gnss	Pond	35'	M	Br-Gn
D	44.0	1.8	0.010	28	Gnss	Pond	35'	H	Br-Gn
E	52.0	2.2	0.010	34	Gnss	1	150'	M	Br-Gn
F	43.6	1.6	0.010	34	A.Exv	< 1	60'	M	Br-Gn
G	20.4	1.7	0.030	46	Gnss	1-5	20'	M	Br-Gn
H	32.2	1.6	0.020	58	Gnss	< 1	15'	M	Br-Gn
I	47.2	1.4	0.005	58	Gnss	Pond	15'	M	Br-Gn
J	53.6	14.2	0.160	36	Gnss	1-5	30'	M	Br-Gn
K	51.2	4.1	0.020	34	Gnss	Pond	10'	L	Br-Gn
L	67.2	7.3	0.040	44	Dibs	< 1	11'	L	Br
M	39.4	14.1	0.310	40	Gnss	< 1	20'	M	Br-Gn
N	46.8	7.3	0.005	44	Dibs	< 1	27'	L	Br-Gn
O	54.4	19.3	0.310	44	Dibs	< 1	18'	M	Br
P	50.2	26.1	0.290	32	Dibs	Pond	13'	M	Br
Q	63.0	2.5	0.005	34	Gnss	< 1	10'	M	Br
R	72.6	1.1	0.005	28	Dibs	< 1	16'	L	Br-Gn
S	77.0	1.5	0.005	34	B.Exv	< 1	10'	M	Br
T	18.8	1.8	0.110	70	Gnss	< 1	46	L	Br

TABLE 3

NUMERICAL DATA FOR THE 1978 REGIONAL GEOCHEMICAL SURVEY FOR THE 20 LAKES INCLUDED IN THE 1980 FOLLOW-UP STUDY

Notes

LOI = loss on ignition as %of dry weight
Rx.Tp. = rock type underlying lake
Lk.Ar. = lake area
S.D. = sampling depth (sediment)
RIF. = relief

In summary, the regional geochemical data for lake waters and sediment obtained from the region to the north of Lake Superior during the 1978 NGR suveys provided firm information which was used for the choice of the study area for the followup investigation.

Limnology (contributed by M. Dickman)

General Introductory Statement

Over the past decades numerous lakes near Wawa, Ontario, have become acidified (Kerr 1979, 1981). This has been accompanied by a catastrophic decease in the diversity and abundance of game fish in these lakes (Kerr 1981). A causal relationship is generally assumed to exist between the increase in the acidity of a lake and the decrease in its biotic diversity. The acidification rate of glacial lakes is most pronounced in granite and gneiss bedrock basins where carbonate rocks are rare (Rosenquist 1977). The present study was characterized by carbonate poor bedrock at one end of the sampling strip and carbonate rich glacial tills at the other.

The lakes selected for study included a great diversity of lake types. Within the study area, lake water pH values ranged from 4.4 to 8.2 and alkalinity (as $CaCo_3$ alkalinity) ranged from 1 ppm to over 200 ppm. Lakes ranged in elevation from 345 m to 760 mASL and they ranged in size from .019 km^2 to 3.2 km^2. Some lakes selected for study were humic while others clear lake depth also varied between 2 m and 98 m in the study lakes. Some of the lakes had negligible hypolimnetic dissolved oxygen deficits while others were nearly anaerobic at the mud/water interface. Although all the lake basins are uninhabited (or very sparsely populated) some of them have been affected significantly by man's activities. Adjacent roads and logging areas were found near some of the lakes while the watershed areas of others had been burned over at some time in the recent past. None of the lakes, however, could be characterized as culturally eutrophic. Has mentioned previously the geology of the lake basins was often relatively complex both with respect to the bedrock and the layer of till materials. In addition, the climatic gradients, including those associated with acid precipitation, were suspected of being quite complex. Although the study area is located well outside the Wawa iron smelter fume kill area (Gordon and Gorham 1963) the potential for enhanced lake acidification in parts of the sampling strip cannot be ruled out.

Beaver and muskrat activity on some of the lakes was noted. Their activity is important because it frequently affects lake water level and hence the area of the lake's littoral zone. As previously mentioned, none of the lakes were anaerobic at their base at the time of sampling in 1980 although one of the lake D cores was partially laminated suggesting that bioturbation there was minimal. About half the study lakes were thermally stratified, the remainder were so shallow that they were mixing continuously from top to bottom (Figure 18).

The lakes are located in a transition zone between the northern Lake Superior biome and the Boreal forest biome. Terrestial vegetation around the lakes can be classified roughly into three groups according to their arboreal species. (Table 4)

Open areas resulting from fires or logging	Wet areas which are poorly drained	Dry, well drained areas
Mountain ash	Black spruce	White pine (rare)
Aspen, trembling aspen	Cedar (Eastern white)	Red pine (rare)
Alder	Willow	White spruce (common)
Poplar (rare)	Tamarack	Jack pine on sand ridge
White Birch	Alders	Juniper on very dry soil
Yellow Birch	Balsam fir (rare)	Oak (rare)

TABLE 4

TYPES OF TERRESTIAL VEGETATION COMMON WITHIN THE SAMPLING STRIP

To sum up, the study area was chosen because it was characteristic of a large area of Northern Ontario where lakes are presently undergoing rapid acidification. No attempt was made to minimise this natural diversity by choosing lakes of homogeneous type. Instead, a variety of statistical tests were applied to the observations made in the twenty lakes to permit ranking them according to the influence which a variety of these factors has had in determining their biotic composition as well as their water and sediment geochemistry. (see Chapter 3)

This diversity of field conditions suggested the use of factor analysis to determine which of these complex factors were most influential in determining the lake's species composition in terms of its phytoplankton, zooplankton and aquatic plants. This study lies outside the scope of the present report and will be presented separately. Similarly, details of fish stocking history and species composition are also planned for the future.

Description of Limnological Methods

A - Field Surveys A standardized technique for lake water temperature, specific conductivity, and dissolved oxygen was applied from the helicopter which was positioned at the centre of the main basin of each of the lakes sampled. These depth profiles were taken at 1 m intervals. The temperature measurements were made using a Brock University high sensitivity thermister. A model 33 YSI specific conductivity meter and a model 51A YSI dissolved oxygen meter were used for conductivity and dissolved oxygen profiles. These data were plotted for each of the 20 lakes as a function of lake depth. (Figure 18).

B - Lake Water Sampling A 2.5 litre depth integrating water sampler (Brock University Designed) was lowered and raised through the photic zone at a constant rate until full. The photic zone was operationally defined here as twice the Secchi depth. Where the lake, or pond photic zone was coincident with the bottom, the sampler was lowered to within 1/2 m of the lakes's bottom.

The sample from the integrated sampler was transferred to three containers for later processing. One litre was transferred into a plastic bottle for Utermohl sedimentation, 1 litre was transferred to a plastic container for storage at 4°C and shipment to the Ontario Ministry of Natural Resources water chemistry testing laboratory in Toronto and a part of the remaining 0.5 liter was tranferred to a 250 ml glass B.O.D. bottle for field analysis of pH and alkalinity. The remainder was discarded.

In Toronto the water samples were analysed using standard methods for TIP alkalinity and pH,Ca and SO_4 - - using the M.O.E. recommended techniques.

C - Phytoplankton After Lugol's IKI solution (Lind 1959) had been added to the one litre depth integrated sample it was permittted to settle. After 2 days the top 750 ml was siphoned off with a "U" shaped siphon and the remaining sample was transferred to a 250 ml glass B.O.D. bottle. After 24 hours the top 200 ml was siphoned off from the B.O.D. bottle and the remaining concentrate was transferrrd to a labelled vial.

Enumeration was carried out using a Leitz-inverted plankton microscope equipped with Nemarsky and phase contrast optics. Five ml of the concentrate was placed in an Utermohl styled sedimentation tube and after 24 hours the bottom of the entire chamber was scanned at low power in a search for large, rare species. Smaller species were counted at high magnification. A minimum count of 500 cells was carried out on each of two replicates. If the estimates of a species deviated substantially between these two replicate counts, a third replicate was made.

Algae were classified by their relative abundance according to the method of Andrews (1972) by categorizing the algae as dominant where the species was alway numerous within the field of view at 400X magnification (coded as No. 5); abundant where the species were numerous in each field (coded as No. 4); frequent where at least one specimen was found in every two to five fields of view (coded as No. 3); moderate where several specimens were found on the "slide" (coded as No. 2) and rare where only one of two specimens were found on the "slide" (coded as No. 1). A detailed estimate of the absolute algal density was felt to be unwarranted at this stage of the study. The reasons for this are based on cost per unit effort as laid out by Andrews and Lohman (1972).

The following references were used in the algal identification; Bradbury and Winter (1976), Cleve-Euler (1951-1955), Duthie and Sreenivasa (1972), Duthie and Mannada Rani (1967), Foged (1964), Hustedt (1930), Patrick and Reimer (1966 and 1972), Prescott (1962) and Yan (1979).

D - Sediment Diatom Analyses In general the surface sediments of lakes contain a temporally time integrated sample of the seasonal succession of certain thick walled algae including diatoms which settle there (Kovio and Ritchie 1978). Thus suface sediment analysis appears to provide a more representative sample of the total seasonal diatom succession than samples from a series of plankton tows throughout the year.

Sediment diatoms were estimated by the technique of Lohman (1972), who like Kovio and Ritchie (1978) also advocated Andrew's relative abundance technique.

A simple ladle was used to remove the flocculant from the top of the mud/water interface of the Ekman grab sample. This sample was preserved with Lugol's IKI solution and stored in a labelled plastic snap cap vial.

In the laboratory the sample was homogenized using a sonifier at the low end of its output level to avoid breaking up the diatom frustules. A 25 ml aliquot of this homogenate was prepared for diatom analysis according to the procedure of Andrews (1972).

E - Sediment Core Diatoms The lake sediment core which was collected for pallenlo and geochemical investigations was sectioned at 2.5 cm intervals. That segment of each core associated with the Ambrosia horizon was analysed for diatoms according to the procedures described above.

Diatom frustules were concentrated from these sediments and cleaned by acid washing the sediment according to the procedure of Dickman (1975). The concentrate was then placed in Battarbee plates and allowed to settle for twenty-four hours. After two days the water had evaporated and the four diatom-coated cover-slips in the Battarbee plate were removed and monted on glass microscope slides using Hyrax mounting medium (Battarbee, 1973).

Six hundred diatom frustules were counted on one or more of the four replicates slides. The Nygaard omega index (Nygaard, 1956) was calculated according to the formula : (percent of acidobiontic diatom frustules x 5 + percent of acidophilic diatom frustules x 1) divided by the number of acidobiontic and acidophilic taxa. The inferred pH was then estimated from a graph of pH vs. the Nygaard omega index (Merilainen, 1967). The plankton, omega, diatom inferred pH index was calculated as above, with the exception that only planktonic diatoms were included. Thus all benthic diatoms were ignored in calculating the plankton omega value. Diatoms were identified based on keys by Patrick and Reimer (1966), Hustedt (1939) and Cleve Euler (1951-1955). Acidophilic/acidobiontic status was assessed from the autecological descriptions provided by each of the authors listed above.

F - Zooplankton Analysis In order to determine whether the species composition of the Copepods, Cladocera and/or rotifiers changed in a predictable manner along a gradient of pH (4-8) zooplankton samples were collected rom the centre of each of the lakes in the Wawa study. Vertical tows were taken using a Birge-Juday closing net (68 u mesh size). Net phytoplankton were also estimated from these samples. The net was repeatedly towed vertically from the base of the photic zone (estimated at X2 the Secchi depth) to the lakes's surface until the distance towed equalled 10 m (113 litres of water passed through the net during the 10 m tow). The net diameter was 12 cm.

The zooplankton were enumerated by placing one ml of the 20 ml concentrate on a glass depression slide and counting all the individuals of each taxa on the slide. This procedure was repeated after the entire set of twenty samples had been counted. Where the two total zooplankton estimates varied by more than 25% of one another a third and, if necessary, a fourth slide was counted. Zooplankton densities for each taxa are therefore felt to be within 25% of the sample mean. Additional rigor was not felt to be justified for the purposes of this followup level survey because samples at only one point in time and one point in each lake's basin permit only a limited degree of generalization no matter how carefully they are counted.

The methods of De Costa and Janicki (1978) as well as Sprules (1975) were followed in attempting to estimate zooplankton density.

G - Littoral Vegetation In order to determine the presence, or absence, of selected aquatic macrophytes along the shores of each lake, the helicopter flew at low levels around the perimeter of each of the smaller lakes. In addition, inflatable raft sorties on some of the lakes permitted a better estimate of the macrophyte species composition. Nevertheless, these data must be viewed as a first order approximation as only the larger water lilies, rushes, sedges and pond weeds were noted.

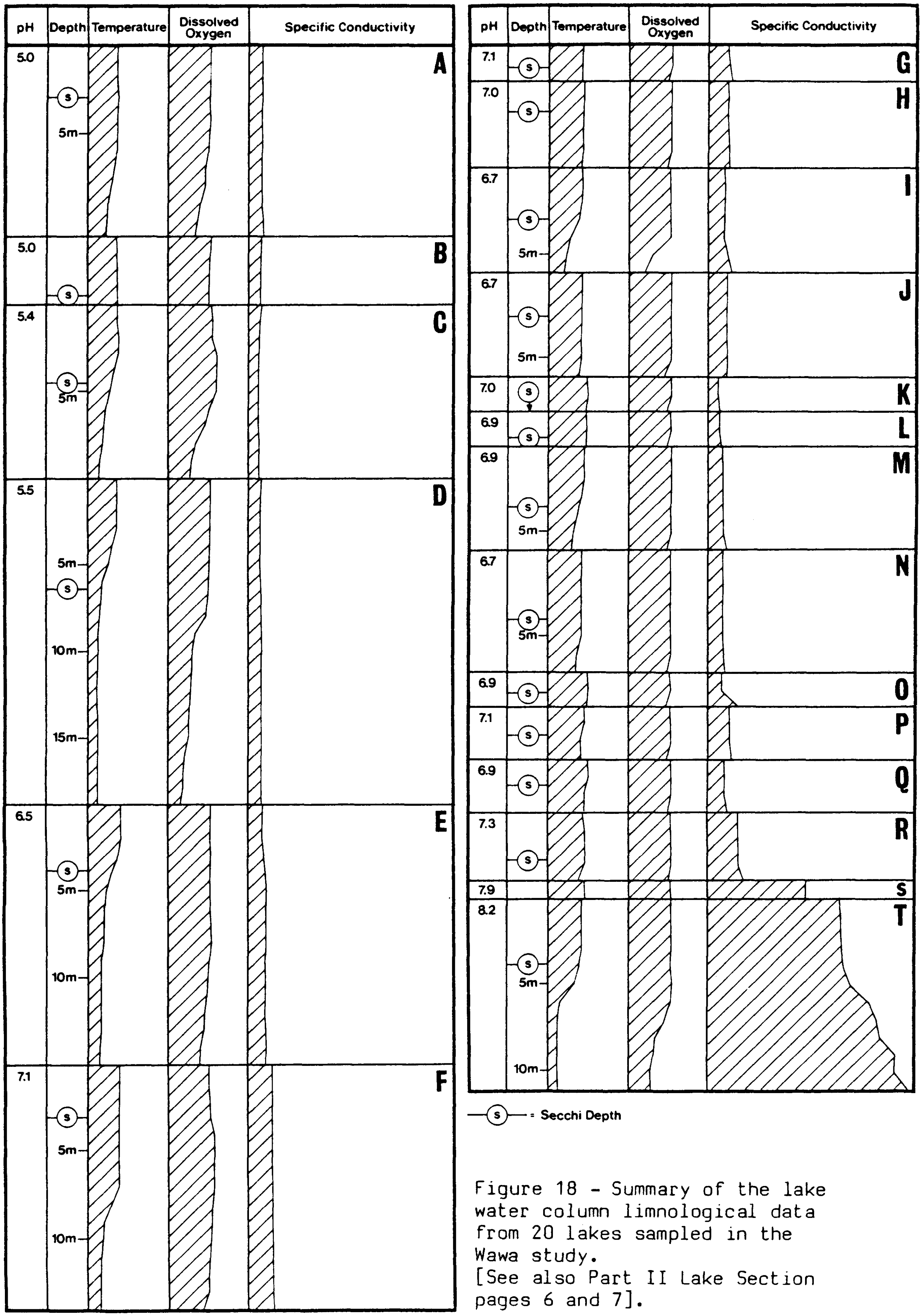


Figure 18 - Summary of the lake water column limnological data from 20 lakes sampled in the Wawa study.
[See also Part II Lake Section pages 6 and 7].

Geology and Geography - J. Fortrescue

The general geological setting of the sampling strip is shown on Figure 13 where it may be seen that the area is underlain largely by granitic rocks which are accompanied by two greenstone areas, one in the north and the other to the south. Relationships between these belts and the pH and regional geochemistry of lakes sampled during the 1978 survey have already been described.

The whole area of the sampling strip is included on O.G.S. Compilation Map No. 2220 at a scale of 1 inch to 4 miles, and 1 inch to 1 mile geological mapping has been completed in the area underlain by lakes A,B and E (Bennett and Thurston 1977). The area including N,O,P,Q,R,S and T was also mapped on a scale of 1 inch to 1 mile by Siragusa (1978). These sources have been used to compile a more complete geological map of the sampling strip than was available previously (Figure 19).

Bedrock Geology of the Sampling Strip

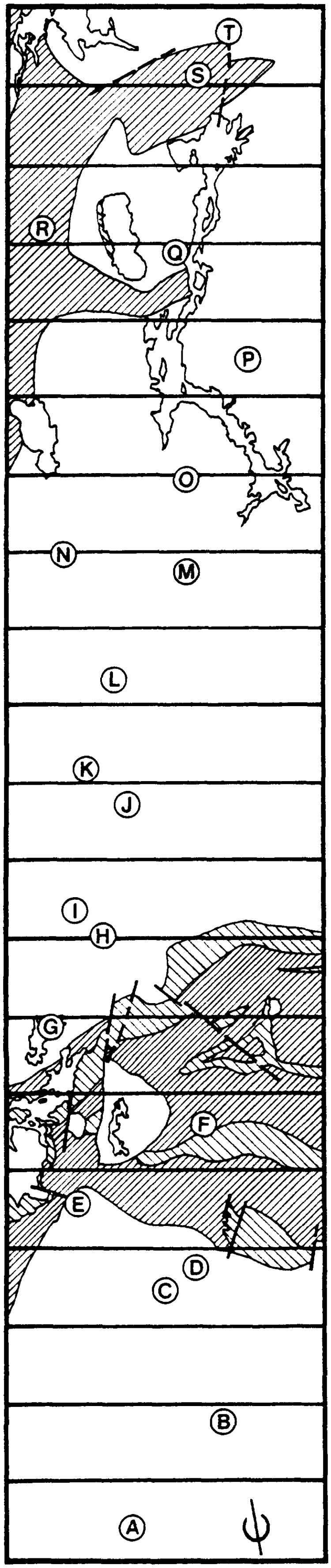
In the south of the area the topography is characterised by ridges and steep sided hills with a relief of some 30-180 m from valley floors in the granitic areas and somewhat less in the areas underlain by greenstones (i.e. around 60 m). Bennett and Thurston (1977) described the belt of greenstones which lies in the vicinity of lakes E,F and G (Figure 19) as follows:-

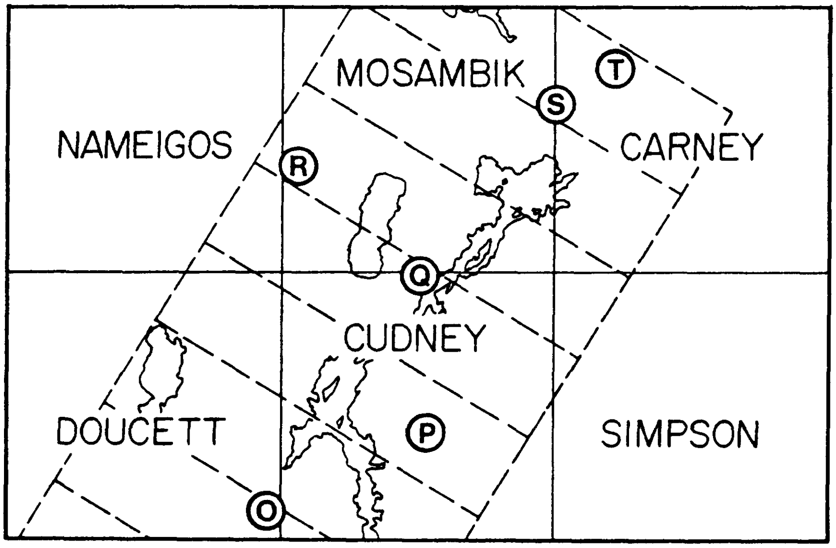
> "A second major metavolcanic-metasedimentary belt, the Mishibishu Lake belt forms an arc which extends from Dog Harbour on the shore of Lake Superior in the east, northwest through Mishibishu Lake and then continues westward to the mouth of the Pukaskwas River for a distance of about 55 km (35 miles). Three stocks of granitic rocks intrude the Mishibishu Lake belt and the average thickness of the belt, including the stocks, is about 16 km (10 miles)."

Two of these stocks occur within the sampling strip and add complexity to the geochemistry of the rocks and surficial deposits of the area. (Figure 19).

Further north the second greenstone area (Figure 19) was escribed by Siragusa (1978) as follows:-

> "Parts of Nameigos and Mosambik Townships and minor areas of Cudney and Carney Townships are underlain by an Early Precambrian belt consisting dominantly of metramorphosed mific flows locally interbedded with pyroclastic units and a few thin





Index to townships in the northern part of the sampling strip.

LEGEND

Geology
- Granite rocks---------------
- Mafic volcanic rocks with interbedded sedimentary and (or) felsic volcanic rocks--
- Greywacke, shale, arkose and quartzite-------------------

Fault-----------------------

Glacial striae--------------

Large Lake-----------------------

Sampled Lake---------------------

Figure 19 - Geology of the 1980 Wawa followup sampling strip including an index to townships in the vicinity of the northern greenstone belt.

felsic metavolcanic units, and, subordinately, of clastic metasediments. The supracrustal rocks were strongly deformed, metamorphesed under upper amphibolite and middle greenschist facies conditions. intruded and partly assimilated by granitic rocks, and, subsequently both the supracrustal and the granitic rocks were intruded by numerous diabase dikes.

The metavolcanic-metasedimentary belt has an unusual 'H-like' shape being formed by two major northwest-trending segments jointed at their midpoints by a relatively short and wide segment trending northeast. For descriptive purposes the two northwest-trending segments and the northeast-trending segment of the belt are hereafter referred to as the northern, the southern and the central belts. respectively (p.5 & 6)."

Lake Q is situated just to the east of the southern belt, lake R is underlain by the central belt and lakes S and T are to the east of the northern belt (Figure 19).

Surficial Geology of the Sampling Strip

Information on the Pleistocene and Recent deposits of the area enclosed by the sampling strip is scanty. In the south (lakes A,B and E) Bennett and Thurston (1977) mention that:-

"A thin blanket of glacial till is the most common surficial deposit in the map-area. It is generally only a few feet thick except on the south slope of some hills where the thickness is probably greater than 15 m (50 feet). The summits of most hills may be covered with only a few inches of till or devoid of cover except for moss and lichen and a few small areas of till confined to depressions in the bedrock.

Most glacial striae were meased in the eastern part of the map-area..... Striae directions range from S10E to S45W with a general trend of about S20W which probably represents the average direction of ice movement.

As the Wisconsin ice sheet withdrew north of the shore of Lake Superior, heavily laden meltwater streams deposited large amounts of silt, sand, and gravel over the map area..... It can be seen that these outwash deposits are particularly widespread in the northeastern part of the map-area and are for the most part restricted to a low, wide valley wich roughly follows the outline of the Kabenung Lake metavolcanic-metasedimentary belt." (p.33-35).

Further north, Siragusa (1978) described the glacial cover as follows:-

"The Quaternary deposits consist primarily of silty to sandy till containing some lime-rich clay and variable proportions of pebbles and boulders. Pebbles of Paleozoic limestone and dolostone are found mixed with the predominantly granitic coarse fraction of the till and erratic boulders are found from hilltop to the water edge. Most of these boulders consist of metavolcanic and granitic rocks of local derivation; subangular boulders of high-grade metasediments containing abundant garnet were noted along the northern shore of a small northwest-trending lake in central Nameigos Township. In local areas of Carney Township the thickness of the till sheet was seen to be 5 m (18 feet) but over most of this township the thickness is probably much more. Deposits of sand are found in local shoreline areas of the main lakes, in two eskers in Carney and Simpson Townships, and in another two in Nameigos and Doucett Townships. Local areas of northern Mosambik Townships are covered by glaciolacustrine deposits of clay, silt, and sand that are a small isolated part of the Ontario clay belt.... formed by glacial Lake Ojibway-Barlow about 9,000 to 10,000 years ago.

Three of the eskers found in the map-area trend northeast and one trends north-northeast; the trend of the glacial striae in five out of the six localities in which they were found is north-northeast, and is north-northwest in the sixth locality. The predominance of northeast and north-northeast trends in the glacial features agrees with the results of Boissonneau's (1966) work on the direction of ice movement in the Cochrane-Hearst area. He observed that the trend of the glacial features is southwest in the western part of the area which includes the present map-area) but southeast in the eastern part of the area, thus indicating a regional fan-shaped ice movement over the Cochrane-Hearst area." (p.36-37).

In general the glacial deposits are thinner in the south and relate in lithological composition to the rocks of the locality in which the basins of lakes occur. Further north the picture is more complex with deeper layers of surficial material, lower relief and contributuions of calcareous material characteristic of the Ontario clay belt. Consequently, the contributions of bedrock material and glacially transported material to lake sediment composition must be expected to vay within the same lake and from lake to lake. However, in spite of this, the mineralogical and chemical composition of lake material within a given, undisturbed, lake sediment core was expected to be constant. In particular pollen and mineral matter plus organic matter should be constant enough within a sediment core to allow for palynological, biological and geochemical interpretation of data obtained form it. Thus the chemical composition of the core as a whole depends upon the contributions made by locally derived bedrock and glacially transported material. However because this is a complex natural homogenization process the exact determination of the relative contributions from these two sources within a single core lies outside the scope of the followup study.

In summary the geological conditions within the sampling strip selected for study are variable with respect the contributions from bedrock and from glacially transported material. Although it was not practical to estimate in detail the contributions from these two sources within a given lake or the general setting and form of the lake basins was known. Hence the role of geology in the interpretation of the lake sediment core data is general and does not relate to the detailed geomorphological conditions of each lake basin.

Description of geological and geographical methods

Geological and geographical information for each of the 20 lake basins studied is included in Part II (pages 2 and 3 of each lake section). Each description commences with an oblique air photograph of a lake plus a paragraph describing its general setting and atributes. Also included is a map (see model Figure 8) showing the extent of the lake basin and the lake itself. Other pertinent information is included in a table alongside the map.

Figure 20 includes a series of reduced maps for each lake basin which provieds a more detailed data set for the lakes than that included on Figure 13C. Figure 20 is designed to be an index to the information included in Part 2 of this report. A discussion of relationships between the lake parameters and the limnological investigations appears in Chapter III. In general the lakes selected for study were representative of those in the sampling strip with respect to lake size and lake basin size.

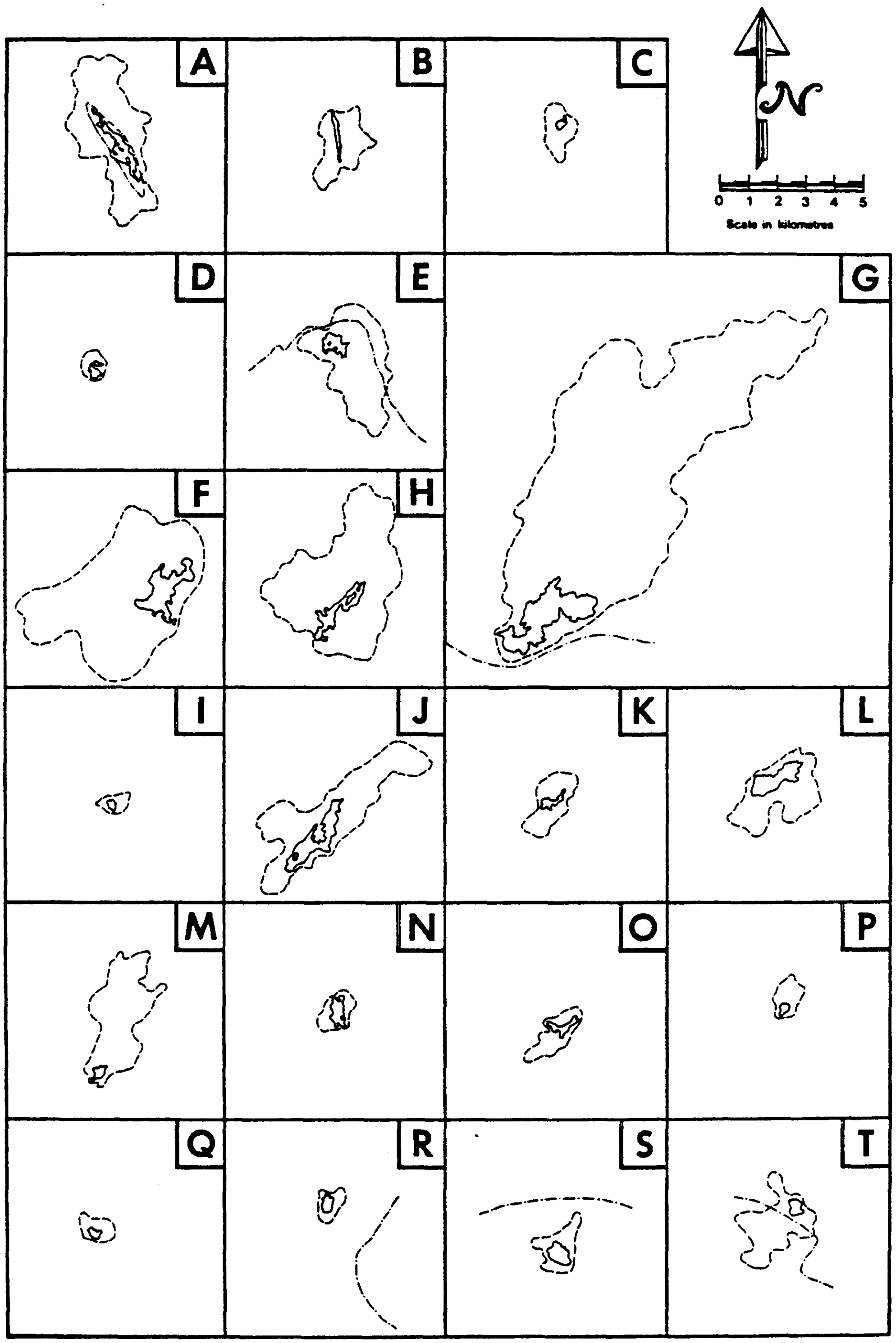


Figure 20 - Relationships between lake size and drainage basin size for the 20 lakes studied during the followup level study (for further details see Part II)

Palynology (Contributed by J. Terasmae)

The collection of lake sediment cores for detailed palynological studies is usually a relatively slow procedure involving bathymetric mapping of the lake prior to the selection of a site for sediment core collection. In this project the procedure was necessarily abreviated because a helicopter was uses for access to all but two of the lakes. Experience gained in quick sediment core sampling by the methods described below is summarised after they are described.

Description of Palynology Methods

A - Field Methods Two kinds of sediment samples were collected from each of the lakes. First, an Ekman Dredge (bucket sampler) sample was taken from the sediment surface to provide a sab-sample at the water/sediment interface for biological study of the modern sediment and to obtain a bulk sample of recent deposition. Second, two adjacent sediment cores were collected with a gravity corer using a 5 cm diameter transparent arylic resin tube about 2 m long.

The Ekman dredge bulk samples were placed in plastic bags and the cores in plastic tubes were sealed with rubber stoppers and vinyl tape. At the field base the plastic tubes were shortened by cutting off the top part because cores did not exceed 1 m in length. This facilitated transport of cores to laboratory storage.

All samples were placed in cold storage in the field because, fortunately, such a facility was available at the field base.

The sediment sampling was carried out mainly from the float of a helicopter by two persons and where possible sampling was completed in the middle part of a lake basin.

B - Laboratory Methods In the laboratory the cores were frozen prior to subsampling, extruded, and cut into 2.5 cm segments. The subsamples were crushed, a small portion removed for palynological analysis and the remainder placed in plastic vials. The samples were then freeze dried and the wet weight, dry weight and vial weight all recorded. All sample vials were properly labelled, packaged and submitted for chemical analysis as described in the section following.

The chemical preparation of the palynological samples, preparation of slides for microscopic examination and counting of pollen followed routine procedures that are well described by Faegri and Iversen (1975) and by Moore and Webb (1978). The data obtained from the slides were plotted in the form of pollen diagrams (see Part II individual lake sections page 8 and 9). General information on the pollen diagrams for each lake is also included in Part II individual lake sections page 9.

Comments on Palynological Methods

Because the choice of lakes for study was based on criteria other than those usually applied for detailed palynological studies of lakes, some comments on the field procedure experience in the followup study may be made. These comments should be of importance in planning future studies of this type including an input from palynology.

In our study coring locations were usually selected after brief aerial observations without prior morphometric data being available on the lake basins. Because of practical difficulties stemming from this procedure it is suggested that in future studies of this type, prior study of air photographs and available limnological information on sampling strips should be made before field sampling commences.

Because of the nature of the project and the relative expense of the helicopter use our sediment coring was in almost all cases completed within 1/2 hour, or less, per lake. The use of a helicopter float as a sampling platform proved most difficult because of the need to keep the motor running during the sampling process. This made communication between samplers almost impossible and the manipulation of a sampler with a total length of over 2 m difficult. On windy days waves can top the float and wet operators and equipment alike. These conditions also increase the likelihood of loosing equipment overboard, or of personnel falling into the water. Another problem is the limited storage space within the helicopter which compounds the problems already described.

In spite of these problems, the helicopter can be used for lake sediment sampling and it has the advantage that small lakes favourable for palynological study can be reached with ease. They could not be visited conveniently by any other means.

Based on the experience at Wawa we suggest that a lake sediment corer be designed and built which is less bulky, suitable for helicopter float use and capable of collecting cores 50 cm in length only. Such a sampler would provide samples suitable for both palynological and geochemical

GEOCHEMISTRY (Sediment cores) - J. Fortescue, I. Thomson

The geochemical study was carried out using the sediment core segment samples which had been dried as described above. The methods selected for chemical analysis were outlined in relation to the conceptual model described previously (Figure 11). Details of the geochemical data for wet weight, dry weight and loss on ignition are listed for cores from each lake in Part II (individual lake sections page 11,13,15 and 17). Element abundance data as parts per million is listed in Part II (on lake section pages 10,11,12 and 13) and in KK units in Part II (pages 14,15,16 and 17). All the chemical data was obtained under a sub-contract awarded to Barringer Research, Rexdale, Ontario.*

Description of Geochemical method

1 - Wet Weight Each 2.5 segment of a lake sediment core was weighed directly after the subsampling procedure was completed (see above).

2 - Dry Weight The 2.5 segment samples were freeze dried and reweighed to obtain the dry weight of the sample. Most dried samples obtained from core segments below 20 cm were over 2 g. Problems were experienced in samples near the surface of many cores where weights of less than 1 g were obtained. (see Part II individual lake sections Page 11,13,15 and 17.) This accounts for the absence of data for some core segments.

3 - Loss on Ignition A 250 mgm portion of the freeze dried cores segment sample was heated to 1,000°C for 3 hours and reweighted when cool in order to estimate loss on ignition. This was listed as a percentage of the freeze dried weight.

4 - Element Abundance

i) Extraction procedure

A 250 mgm portion of the freeze dried lake sediment core segment sample material was digested with 8 ml of concentated nitric acid plus 2 ml of perchloric acid in a 30 ml teflon beaker. A watch glass was used for refluxing until a pale yellow liquid was obtained. The watch glass was then removed and 7.5 ml of hydrofluroric acid was added and this mass evaporated to dryness. The residue was brought into solution with 1 ml of concentrated hydrochloric acid and made up to 25 ml with 0.5N hydrochloric acid. This solution was divided into four parts for chemical analysis as follows:

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* The contractor should be contacted directly for further details of analytical procedures.

ii) Determination Procedures

A The content of Al,Fe,Ca,Mg,Na,K,Ti,P,Mn,Sr,Zr,V,Cr,Ni,Zn and Cu was determined simultaneously in the solution using an ARL QA-137 direct reading emission spectrometer with an ICP torch source. This procedure also determines Ag,Be,Cd,Mo,Pb,Th and Co. In our samples, data for these elements was unsatisfactory except in the case of Th and Co which, although near the detection limit, were detected in most of the samples.

B Pb and Mo were determined using Atomic Absorption techniques. These data were unsatisfactory for Mo which was generally below the limit of detention and in many cases the Pb data was found to be at, or below the detection limit of 5 ppm. Relatively high values for Pb were found in the core segments taken above the <u>Ambrosia</u> horizon in most cores.

C A third aliquot of the solution was used for the determination of U using a fluorescence technique.

D As was determined by hydride generation and heated quartz tube source Atomic Absorption after extraction from the cores segment material with nitric and perchloric acids and solution of the residue in 0.5N hydrochloric acid. A similar extraction procedure was used prior to the determination of Hg by cold vapour Atomic Absorption except that the residue was dissolved in water instead of hydrochloric acid.

The Scope of the Discussion of Sediment Core Geochemistry in this Report

The original intention was to carry out the interpretation of the geochemical data from the lake sediment core segments at two levels of detail, one relating to KK units (as a preliminary overview) followed by a second, more detailed study based statistical analysis of element data in parts per million. Consequently both ppm and KK units are included in the listings for the chemical data in Part II (lake section pages 10-17).

Unfortunately the computer listings for the geochemical data were not available until March 9th 1981 and the deadline for this report was March 31st 1981. Consequently, information on the interpretation of the geochemical data in this report is confined to a discussion of KK values of selected samples from all 20 lakes and all samples from four representative lakes (see Chapter III). A more detailed study of the geochemistry of the lake sediment cores will appear in Part III of this open file report.

Observation	Number of Observations	Mean (KK)	St. Dev.	C/V %
Al	20	.613	.039	6.4
Fe	20	.312	.010	3.2
Mn	20	.369	.021	5.6
K	20	.880	.037	4.2
Na	20	.703	.034	4.8
Mg	20	.227	.070	3.1
Ca	20	.304	.010	3.2
P	20	1.09	.082	4.2
Ti	20	.306	.013	4.2
Zr	20	.548	.033	6.0
As	10	.928	.079	8.5
Co	10	.342	.071	20.7
Cr	20	.356	.068	19.1
Cu	20	.397	.043	10.8
Hg	10	1.260	.159	12.6
Ni	20	.217	.049	22.6
Pb	20	1.79	.038	2.1
Sr	20	.516	.020	3.9
Th	20	1.41	.190	13.4
U	18	.906	.031	3.4
V	20	.344	.014	4.1
Zn	20	1.038	.138	13.3
L.O.I.	20	20.795	5.98	28.7

TABLE 5
STATISTICAL ANALYSIS OF 20 REPLICATES OF A LAKE SEDIMENT CORE REFERENCE STANDARD INCORPORATED AT REGULAR INTERVALS DURING THE PREOCEDURE OF CHEMICAL ANALYSIS USED IN THE WAWA PROJECT. (KK UNITS).

Performance of the Methods of Chemical Analysis

The performance of the analytical methods used for the study of the geochemistry of the lake sediment core segments was examined by incorporating a subsample of a lake sediment reference standard material prior to analysis of each core. In this way values for 20 replicates, of the referance standard, spaced at regular intervals, were obtained from all of the chemical tests.

The data for the referance standard was analysed in two ways, one statistical and the other graphical. The descriptive statistics (Table 5) indicate that the performance of the analytical technique was adequate fro an investigation of the type described here. More specifically, the C/V values were acceptable for all elements except Co,Ni and Cr. Co dta is included in Part II, but is not discussed here. Inspection of data for Ni and Cr indicated that these were suitable for plotting (Figure 21) in spite of the high C/V's for the referance standard. The high C/V for loss

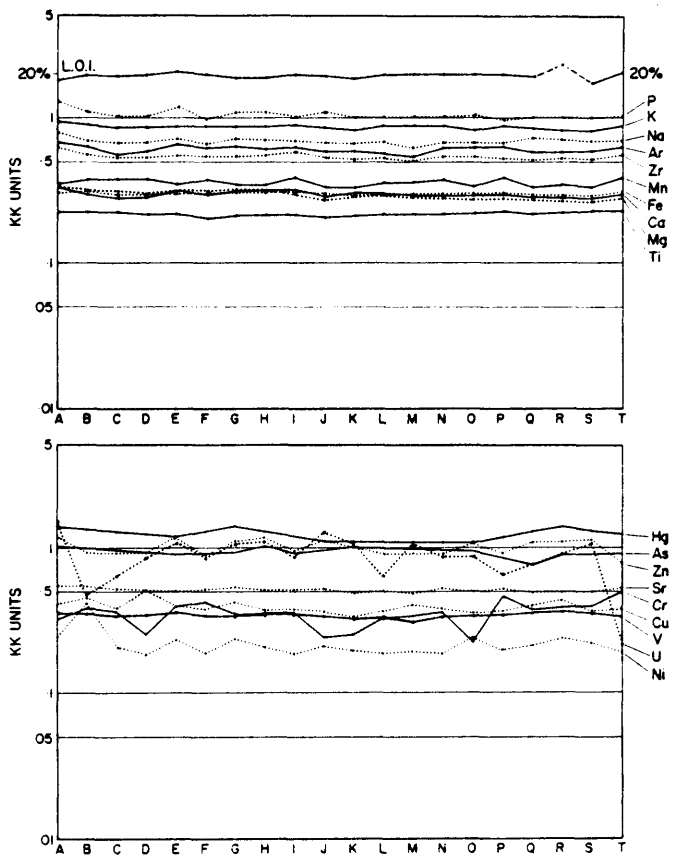

Figure 21 - Plots of the data for the replicate analysis of a reference standard of lake sediment core material. (For further details see text.)

on ignition (Table 5) is almost entirely due to one value which was probably quoted in error. A few* such errors were noticed in the data base in Part II and were omitted during graphical analysis of the data in Chapter III. Such errors could not be checked out by further chemical analysis owing to lack of availability of sample material.

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* Less than 10.

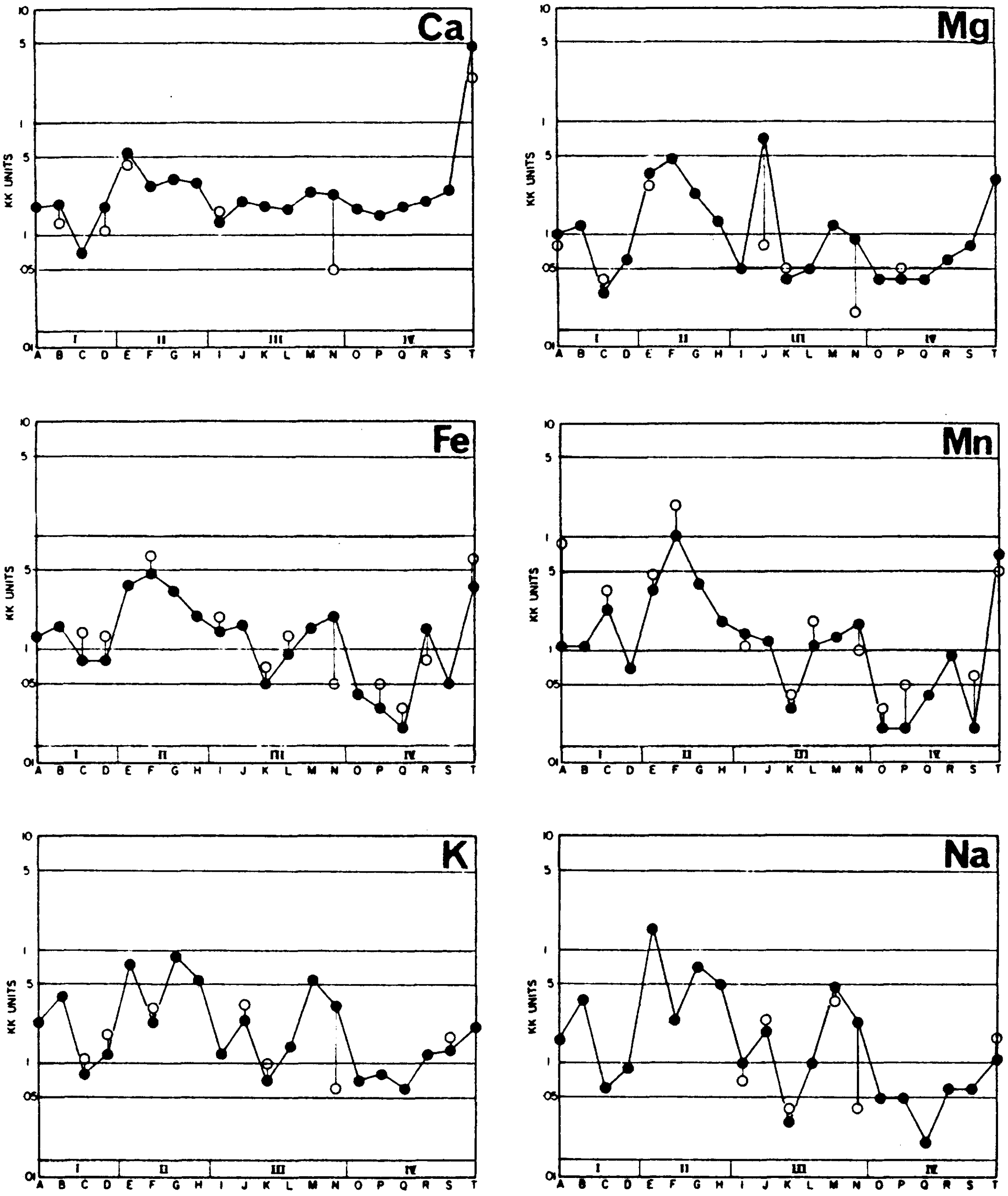


Figure 22a - The abundance of Ca,Mg,Fe,Mn,K and Na is pre and post Ambrosia core segments from each of the 20 lakes in the Wawa sampling strip.

Although the statistical test results listed on Table 5 indicate that the performance of the analytical techniques was remarkably good a further examination of the data is required as an aid to the interpretation of graphed KK values for lake core segments described later on. As expected the precision for the major constituents of rocks (plus Zr)(Figure 21 top) was uniformly good and as the KK diagram indicates the abundance of the elements in the reference standard is between 0.25 KK and 1.25 KK or at, or below, that estimated for the Earth's Crust as a whole for each element. The data for minor constituents (included in the lower part of Figure 21) are less precise but, with the exception of uranium which was found to vary unpredictably in both the standard and the unknowns, the performance of the analytical methods was considered adequate. The most important conclusion to be drawn from Figure 21 is that, in general, the geochemical referance standard data was not inclusive of a significant bias, for one or more elements. In general the loss on ignition data (also plotted on a log scale on Figure 21) was good within less than five percent although the erratic value at R (i.e. in the lake sediment referance standard analysed prior to the unknowns of lake R) is an exception probably due to an error. The KK diagrams in Figure 21 are designed for comparative purposes in relation to the description and interpretation of lake sediment core geochemical data. They are plotted using the same technique as those lake sediment cores in this chapter and the next.

An Overview of the Lake Sediment Geochemical Data

Conceptual models described previously (Figures 4 & 5) and information included in the selection of a sampling strip for study (Figures 17 and 18) provide a background to the examination of the behaviour of particular elements in core segments collected above, as compared with those below, the *Ambrosia* horizon. A study of the lake sediment core data base listed in Part II of this report resulted in the selection of two core segments from each of the 20 lake cores for comparative purposes. These were segment 15 (i.e. 35 cm to 37.5 cm in depth) to represent the pre-*Ambrosia* lake sediment geochemistry and segment 02 (2.5 cm-5.0 cm) to represent the post-*Ambrosia* condition (Figure 22 a,b & c). The plots for 18 elements in the two core segments

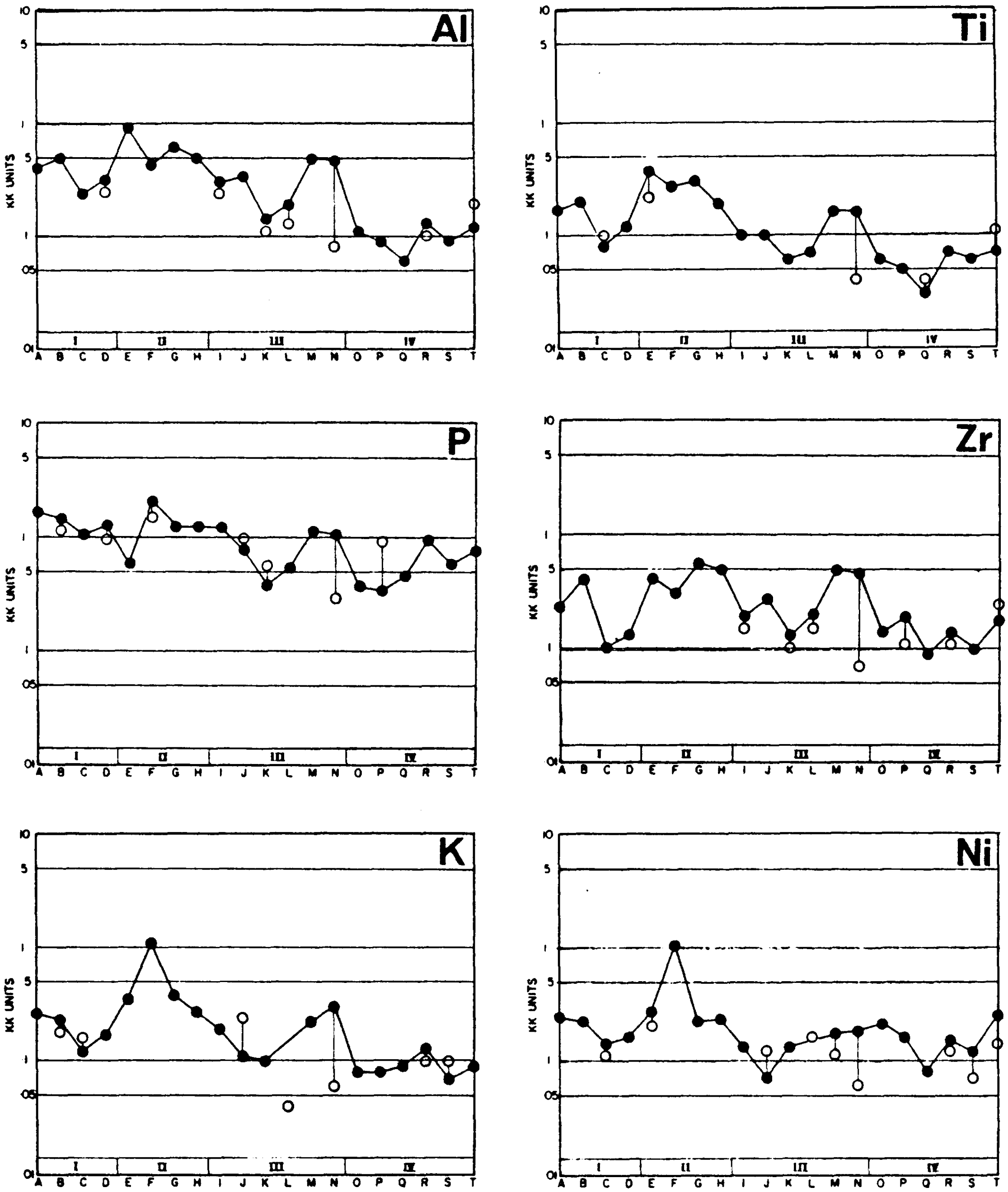


Figure 22b - The abundance of Al,Ti,P,Zr,Cr and Ni in pre and post Ambrosia core segments from each of the 20 lakes in the Wawa sampling strip.

included in Figure 22 are in KK units plotted on a logarithmic scale. (see also Figure 21). The black dots denote data for the 15 (i.e. pre-Ambrosia) segments and the open circles for 02 (post-Ambrosia) segments. In cases where the values for the two samples are coincident only the dot representing the 15 segment is plotted. Where data for samples is missing the line joining values for the lower segments is drawn to join adjacent points where data is available. The lines are drawn as an aid to the identification of the patterns and do not imply that there is a cause and effect relationship between data points. Detailed information on the abundance of particular elements in particular cores is listed in Part II. Where listings include both ppm and KK values for each core segment.

Data for Ca,M,Fe,Mn,K and Na are listed on Figure 22a. The roman numerals at the bottom of the diagrams refer to the bedrock conditions within lake basins. In Group I the lakes are low pH and occur in areas of predominantly granitic bedrock. Greenstones of various types underlie the Group II lake basins and similar rocks underlie lakes in Group IV. Group III lakes are in areas of granitic terrain characterised by relatively high uranium values (Figure 22c). The bedrock conditions in the vicinity of each lake are indicated on Figure 19 and the extent of the lakes themselves on Figure 20. Another factor which affects the geochemistry of the lake sediment cores in Group IV is the presence of significant content of $CaCo_3$ in the glacial drift. This increases rapidly towards the north from lake Q to Lake T (Figure 19).

The pattern for Ca in the lake sediments (Figure 22a) reflects the geological conditions just described. The lakes of Group I have low pH and alkalinity and also low Ca in the sediment cores. Here also the content of Ca in the surface segments of two of the lake cores is significantly lower compared with the pre-Ambrosia segments suggesting that Ca may have been decreasing in supply recently perhaps due to acid precipitation effects. Further north, the calcium increases in the lakes located in the greenstone belt (Group II) decreases slightly over the granitic rocks of Group III and then increases sharply (due to surficial material inputs) in Lake T. The plot for Mg in broadly similar to that for Ca (Figure 22a) except that the data is more variable with a peak value in Lake J. The similiarilty of the plots for K and Na suggest that these elements are to be found in primary minerals, rather than in secondary materials. A significant departure from this pattern would suggest that K was preferentially incorporated in newly formed clay minerals. This is most likely in lake Q where the K content is significantly higher than that for Na.

There is a remarkable similiarity between the plot for Al and for Fr (Figure 22b). Although these elements are somewhat depleted in the post-Ambrosia sediment in general the abundance values are rather close for both pre- and post-Ambrosia. With respect to abundance in the Earth's crust titanium is significantly lower than aluminium in the lake sediment cores along the gradient. This is in contrast to the values for P which is close to the Clarke value in nearly all lake sediment samples. The pattern for Zr is consistantly lower than Earth's crust and my indicate low mobility of the element in the landscape conditions along the sampling strip. Cr and Ni were found to have similar patterns with, as expected, high values in the group II lakes (Figure 22b). The higher values for Cr in lakes M and N is interesting and may relate to local bodies of basic rocks which do not affect the Ni pattern.

Values of V and Cu resemble those for Al and Ti rather than Cr and Ni. It is to be expected that systematic statistical analysis of the geochemical data (to be described in Part III of this report) will reveal subtle relationships between rock type and distribution pattern for these elements. It is interesting that, (as expected from information on Figures 16 and 18), the pattern for U (Figure 22c) is clearly different from all the others so far described. In this case the U values in all the cores in Group III (and lakes O and P as well) are over five times those measured in the lakes from the remainder of the sampling strip. This suggests that either groundwater conditions facilitate drainage of U rich waters into lakes O and P from granitic terrain or the fine material in the superficial layeris relatively rich in this element.

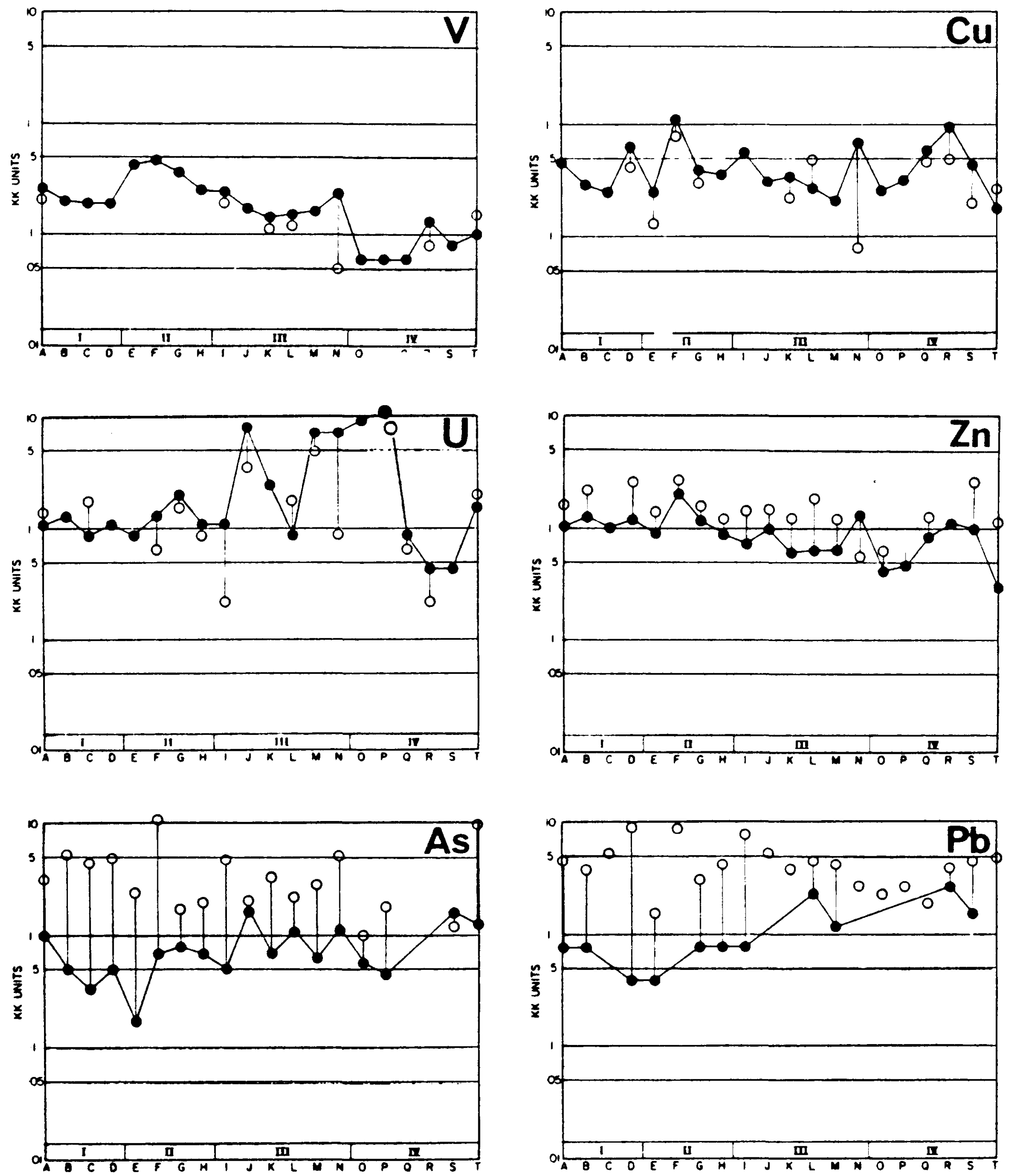


Figure 22c - The abundance of V,Cu,U,Zn,As and Pb in pre and post-Ambrosia core segments from each of the 20 lakes in the Wawa sampling strip.

The data for zinc, lead and arsenic (Figure 22c) is of a different form from that for the other elements so far described because the core surface segments are almost always distinctly higher in these elements compared with the subsurface segments. This is to be expected from the pattern shown on Figure 10 for the Greifensee. Clearly the abundance data for these elements is most likely to have been modified by the acid precipitation along the sampling strip at Wawa.

SUMMARY

This chapter has described how the sampling strip and the 20 lakes within it were selected for the follow up level study. The role of the regional geochemical survey data in the selection process was stressed with referance to geochemical maps and sections.

The limnological methods selected for inclusion in the Wawa study were described and a chart was provided to show variations in water column parameters within each of the 20 lakes selected for study. General information was provided on the geology and geography of the sampling strip supplemented by a map showing the extent of each lake and the general conditions of the basin within which it occurs. After a brief description of the palynological methods, the methods of chemical analysis used for the lake sediment cores were described and general information was provided on the abundance of 18 elements in the lake sediment cores.

Chapter 2 sets the scene for the discussion of information obtained from the Wawa sampling strip in terms of the acid rain problem in Chapter III. Another important function of Chapter II is to provide an introduction to the data base listed in Part II. It should be stressed that the data in Part II is designed to be consulted in parallel with the information in Chapter III.

Chapter III - Discussions and Conclusions

Introduction

The objective of this chapter is to interpret the data and information included in Part II in terms of the problem of acid precipitation in the Wawa area. The interpretations are in two parts followed by a section of general conclusions and suggestion for further work. The first part includes discipline by discipline study of the information as it can be related to the acid precipitation problem. The second part is more general including a multidisciplinary discussion of the 20 lakes included in the sampling strip. It includes suggestions for extrapolation of the lake water chemistry information obtained during the followup study to the regional scale. Conclusions cover both aspects of the discussion.

Limnological Observations in Relation to the Acid Precipitation Problem

A - Lake Water Chemistry I. Thomson

Data for surface water (0 to maximum of 5.0 m depth) water pH, alkalinity (total inflection point), Ca, and SO_4 are presented as Figure 23.

These data confirm the presence of a pH gradient along the sampling strip, with lakes at the southwest end (lakes A to D) abnormally acid (pH 6.0). Alkalinity (as $CaCo_3$), the principal buffering agent in lake waters) and Ca show the same trends as pH, while SO_4 shows evidence of a reverse gradient, with values decreasing from southwest to northeast. The gradients are not smooth, they show pertrubations related to geology similar to those described previously.

The most acid lakes (A to D) occur over granitic rocks in the southwest section of the transect. The pH increases rapidly with associated peaks in alkalinity, Ca and SO_4 in lakes F and G which are located in 'greenstone' terrain (Figure 19). The gradient is poorly developed between lakes H and N which are underlain by granite.

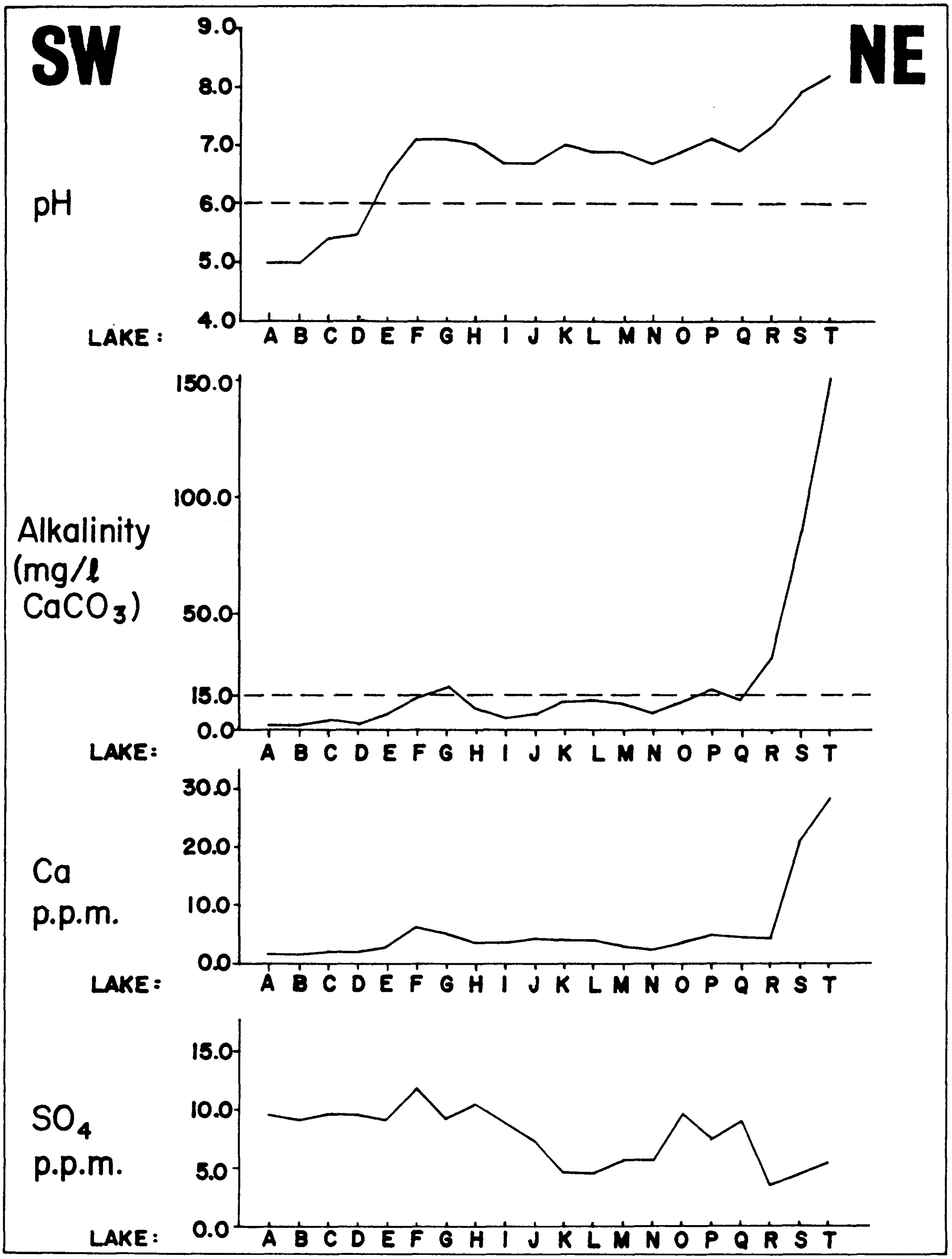


Figure 23 - Variation in surface water chemistry of lakes along the Wawa Sampling Strip.

The SO_4 pattern is considered most significant. The overall trend of decreasing SO_4 values from the southwest to the northeast is thought to reflect the introduction of SO_4 as H_2SO_4 in polluted rain brought in by the prevailing wind. The increase of SO_4 in lakes F and G is considered to reflect, at least in part, natural input from the 'greenstone' rocks which have a higher SO_4 content than the granites. Similarly the rise in alkalinity and Ca in these lakes reflects the natural input from rocks richer in these materials. The increased levels of SO_4 in lakes O,P and Q are more problematic in that there is no clear relationship with greenstone rocks. However it is noteworthy that these lakes lie directly in line with, but quite distant from, the fume kill associated with the Wawa smelter (Gordon and Gorham 1963). In view of the closely defined smelter plume and the character of the windrose at Wawa (Gordon and Gorham 1963) it is thought possible that the elevated SO_4 values relate in part to pollution from this point source.

In evaluating the data the following points are also of significance:-

1 - Lakes A to D have pH values below 6.0 and are thus, by common definition acid lakes

2 - Many of the lakes have alkalinity values below 15.0 mg/l $CaCo_3$. These lakes have very little buffering capacity to mineral acid and hence a high susceptability to acidification. This is the case in lakes A to D where alkalinity is normally low (1.5 to 6.1 mg/l $CaCo_3$) and shows evidence of a loss of buffering capacity due to acidification.

3 - In the northeast, lakes S and T have abnormally high alkalinity and elevated pH values. These lakes are exceptionally well buffered.

The relationship between pH and alkalinity is further displayed in Figure 24. It can be seen that the acid lakes (A to D) have low alkalinity and lie in a separate field in the plot. The neutral lakes show evidence of a weak, positive, linear relationship between alkalinity and pH. Of particular interest are lakes E,I,J and N, which lie off the main trend and display slightly depressed alkalinity and pH. These lakes appear delicately poised with minimal buffering cappacity. Further input of acid precipitation will almost certainly lead to rapid acidification of these lakes.

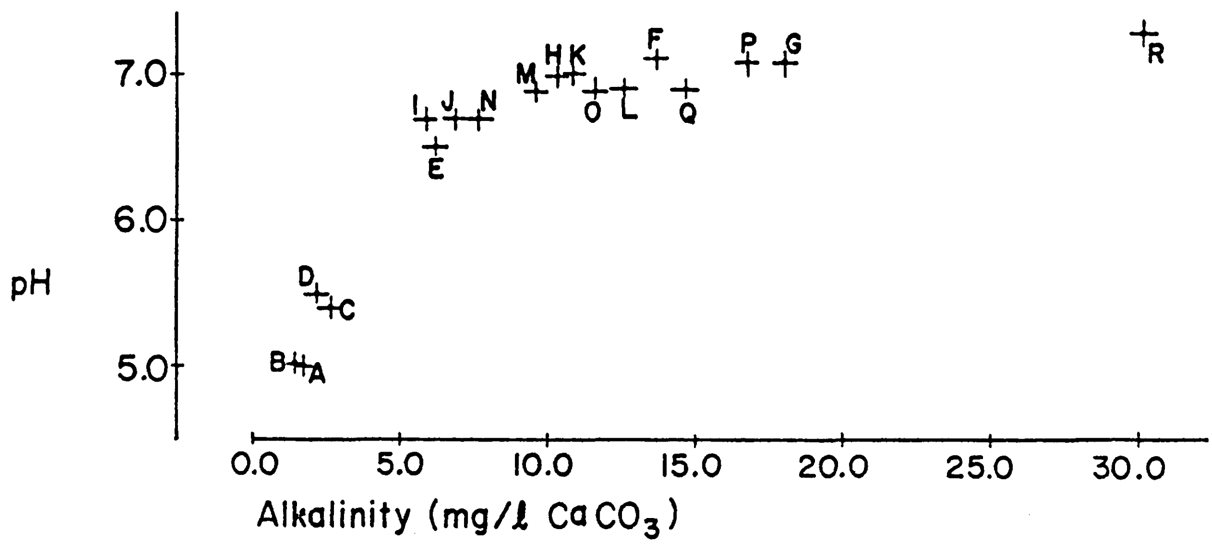
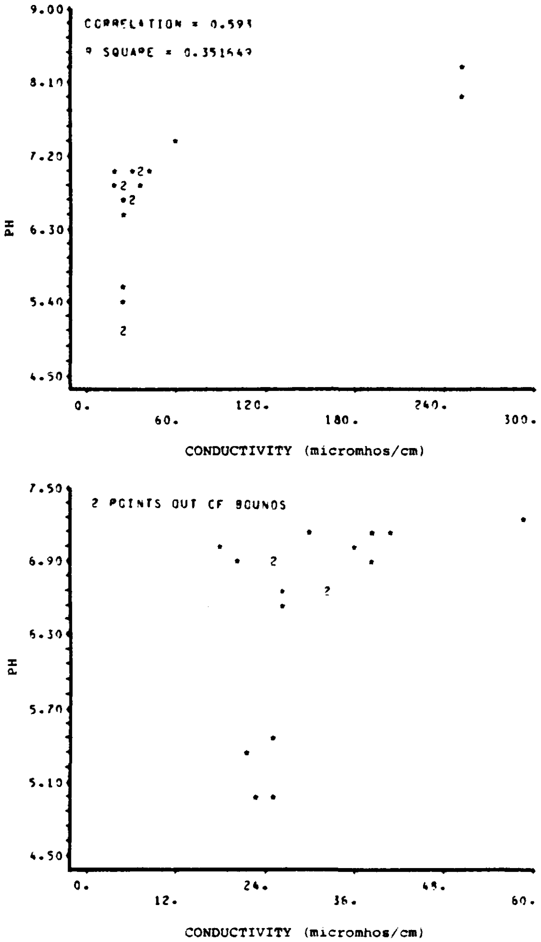
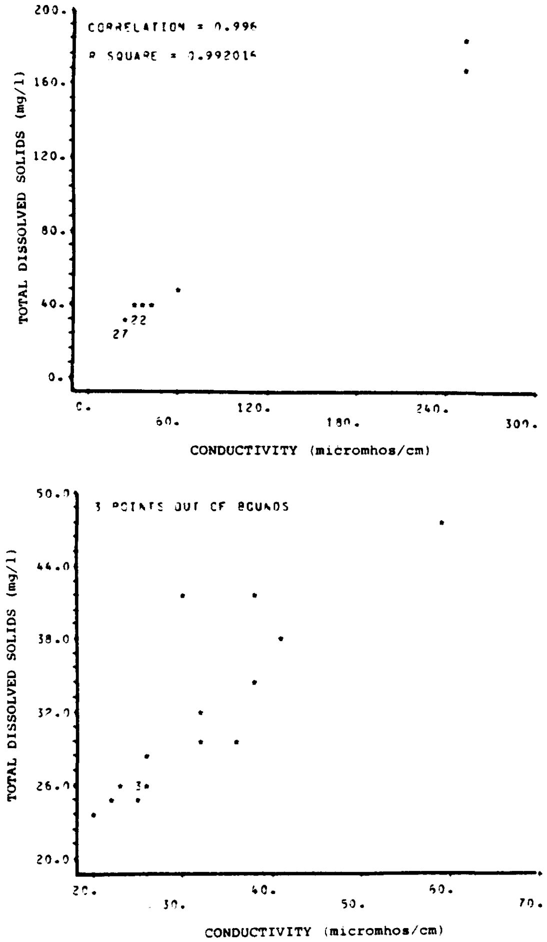


Figure 24 - Relationship between pH and alkalinity (total inflection point) in surface waters of lakes studied in the Wawa Sampling Strip. NOTE: Lake T has high alkalinity which is off scale on this figure (see Figures 27 and 28).

In summary, west of Wawa acid precipitation derived from long range transport of polluted air masses appears to be causing acidification of surface lake waters. The effects of acid precipitation are, however, modified by the combined effects of bedrock and surficial geology in the catchment areas of individual lakes. These two factors influence the primary chemistry of the lakes and hence, their buffering capacity.





Specific Conductivity/Total Dissolved Solids

Figure 25*

Figure 26

Figures 25-43 - Limnological Interpretation of the Water Chemistry Data

The data also show that, in addition to lakes which have already become acid, a large area underlain by granitic rocks is probably characterized by lakes with low buffering capacity. Many of these are probably very

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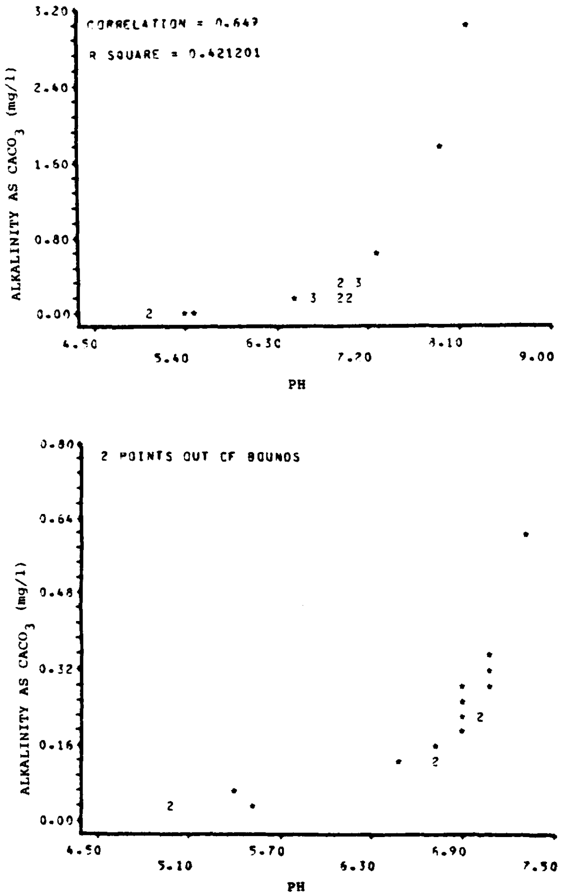
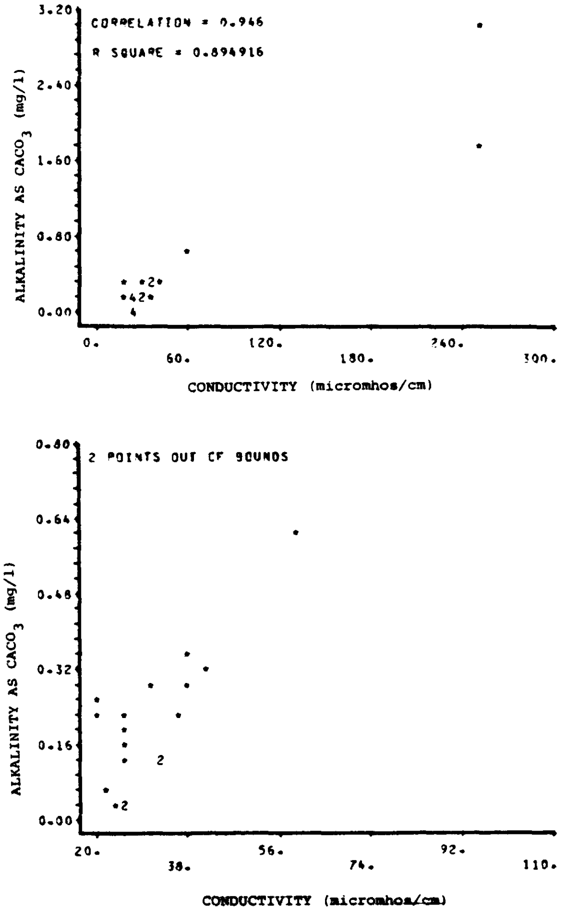
*In Figures 25 - 40 where graphs are paired the upper graph displays all the data points and the lower graph displays all points except for those "Out of Bounds" (i.e. off the expanded scale of the lower figures).



Alkalinity as $CaCO_3$/pH

Figure 27



Alkalinity/Conductivity

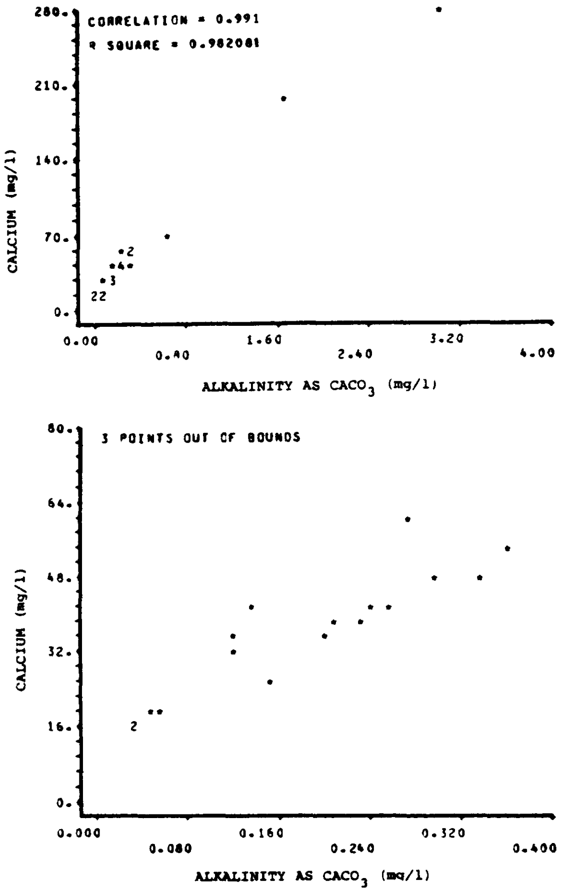
Figure 28

delicately poised, in the manner of the study of lakes E,I,J, and N and are thus likely to become rapidly acidified if exposed to further acid precipitation.

In figures 25 - 32 the upper graph displays all the data points and the lower graph displays all points except for those "out of bounds" (i.e. off the expanded scale of the lower figure).

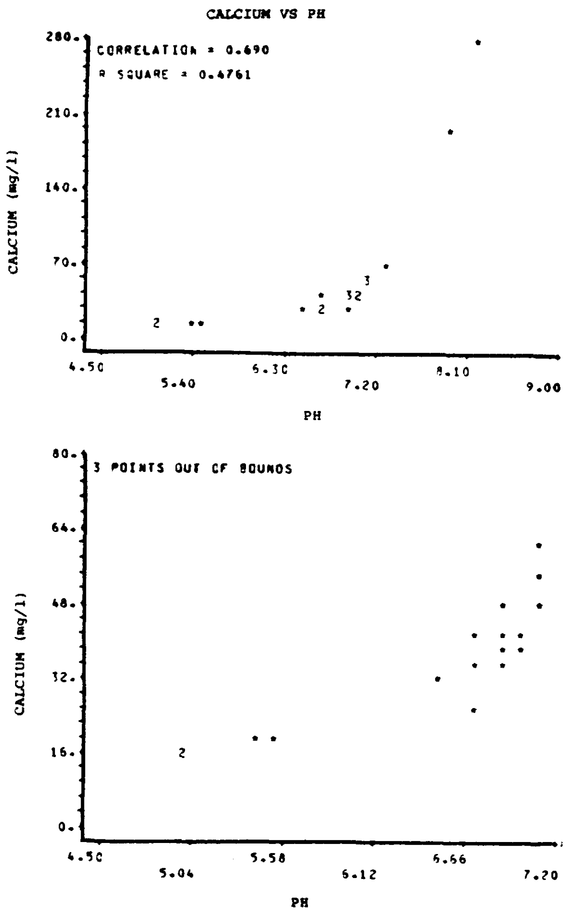
B.-.Lake Water Column Chemistry Data - M. Dickman

Inorganic carbon comprises the major electrolyte in those Wawa study lakes which have a pH above 6.3. Below a pH of 6.3, sulphate ions replace bicarbonate ions as the most abundant cation. For this reason it is not



Calcium/Alkalinity

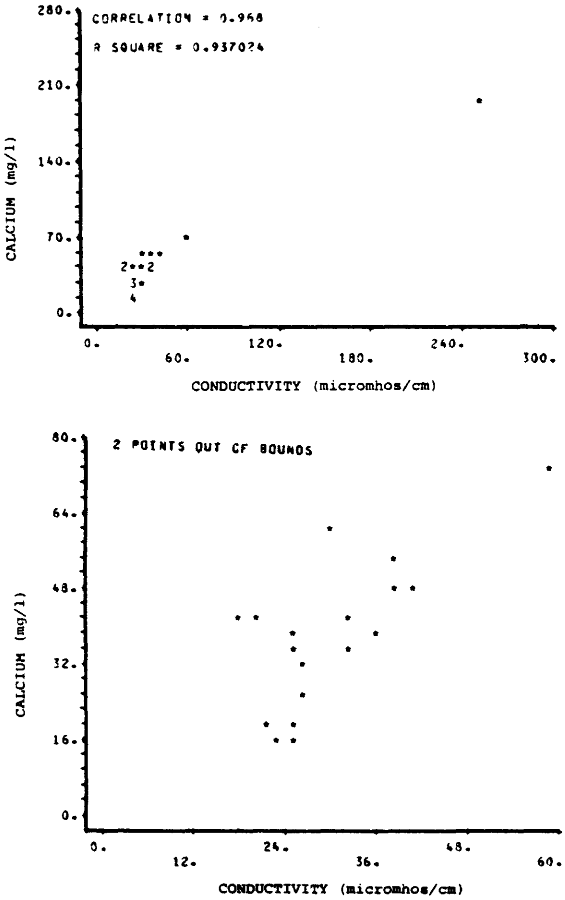
Figure 29



Calcium/pH

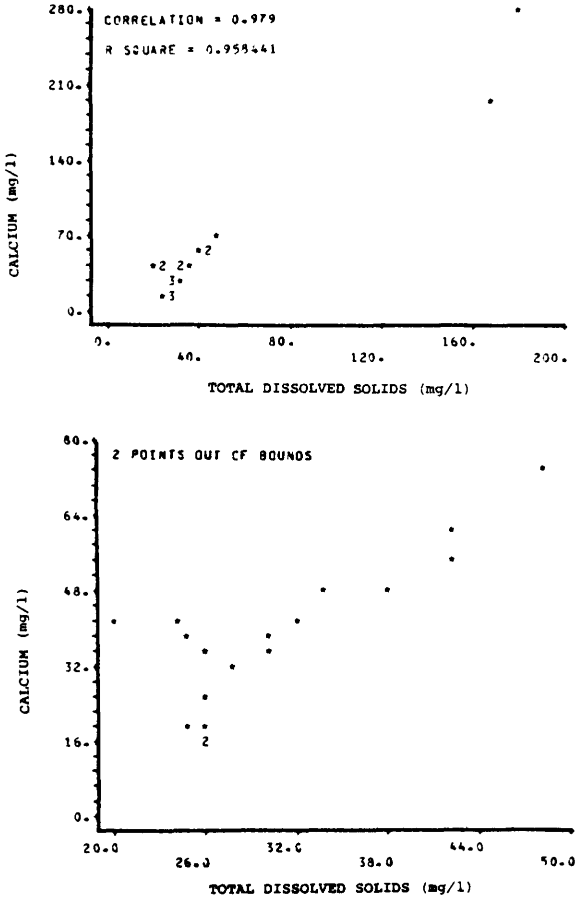
Figure 30

surprising to find an inflexion point at about pH 6.3 in the regression line for lake conductivity vs lake pH (Figure 25). A review of pH dissociation constants for bicarbonate and free CO_2 indicates that at a pH of 6.3 the amount of free CO_2 in the water exceeds the amount of the bicarbonate ion. (Talling 1973). However, as pH increased, the concentration of bicarbonate relative to free CO_2 increases. At a pH of 7.0 nearly 80% of the total inorganic carbon in these lakes is present as



Calcium/Conductivity

Figure 31



Calcium/Total Dissolved Solids

Figure 32

bicarbonate, while free CO_2 accounts for nearly all of the remaining inorganic carbon (Golterman 1969). At a pH of 6.0 this relationship is reversed and free CO_2 accounts for over 72% of the total inorganic carbon while bicarbonate accounts for only 28% (Hutchinson 1957). The crossover point where these two forms of inorganic carbon are roughly equal occurs between a pH of 6.3 and 6.5 (Golterman 1969).

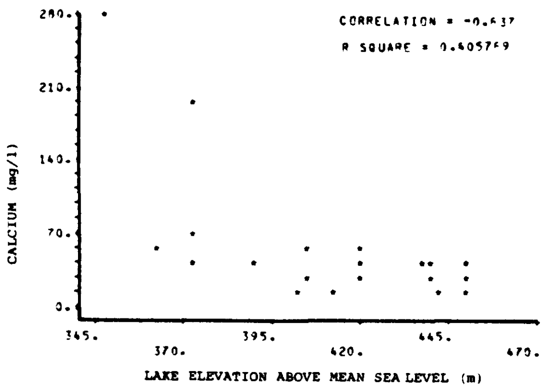
The conductivity/pH relationship between the different lakes in the Wawa study should be divided into two classes: Those lakes above and those lakes whose pH falls below 6.3. Once this is recognized, two linear regressions of pH/ specific conductivity can be generated, one above the pH 6.3 inflexion point and the other below.

Unlike pH, the specific conductivity/total dissolved solids (TDS) relationship was linear over its entire range (Figure 26). It should be noted, however, the TDS was not estimated independently but was generated from a table which permits the calculation of TDS based on lake temperature and specific conductivity information.

Calcium and bicarbonate ions dominated the chemical composition of most of the Wawa soft water study lakes. However, two exceptions to this generalization were found. Lakes below a pH of 6.3 were sulphate and not bicarbonate dominated, while lakes whith a pH above 8.0 were hard water lakes. These lakes had a total hardness exceeding 150 ppm as $CaCO_3$, thus they were carbonate dominated instead of bicarbonate.

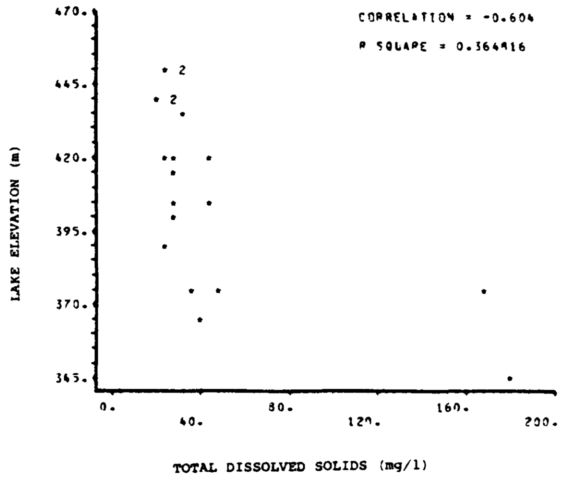
According to Gibbs (1970) the three major mechanisms which control lake conductivity (i.e. lake salinity) are bedrock source, atmospheric precipitation and evaporation-precipitation processes. This latter mechanism was not an important component for the Wawa study lakes as evaporites were never observed. Therefore we have concentrated on the first two mechanisms in attempting to explain the observed ionic relationships in the Wawa study lakes.

Alkalinity refers to the quantity and kinds of compounds which collectively shift the pH to the alkaline side of neutrality (Wetzel 1975). The property of alkalinity is usually imparted by the presence of bicarbonate, carbonates and hydroxides, the CO_2-HCO_3-CO_3=equilibrium system being the major buffering system in fresh waters (Ibid).



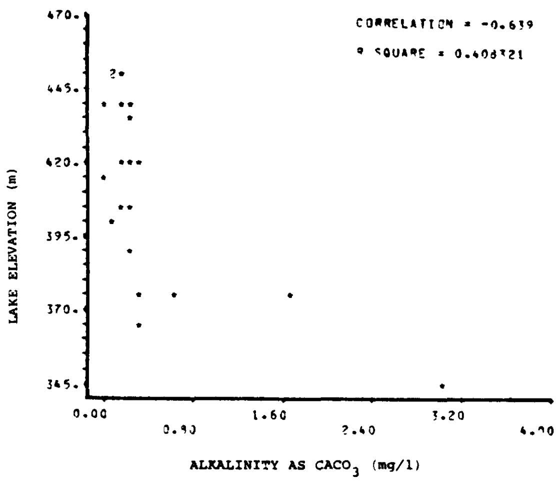
Calcium/Lake Elevation Above Mean Sea Level

Figure 33



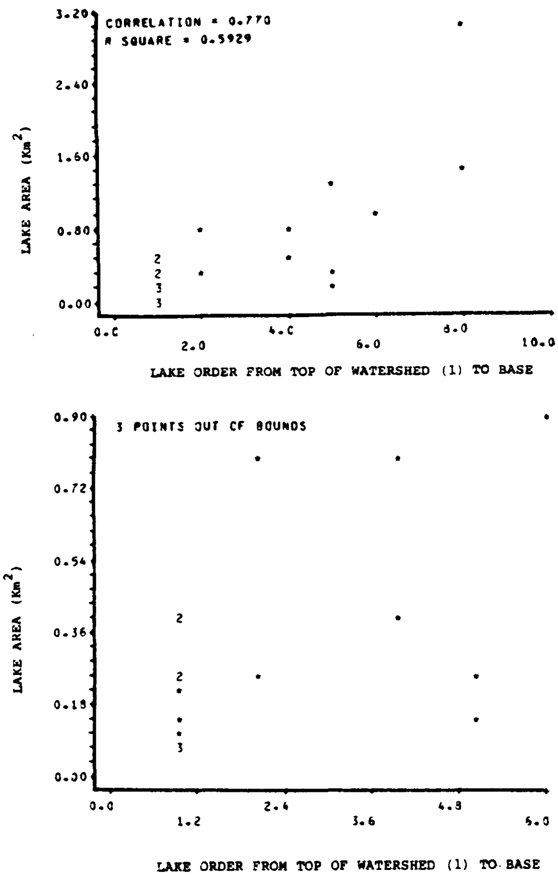
Lake Elevation/Total Dissolved Solids

Figure 34



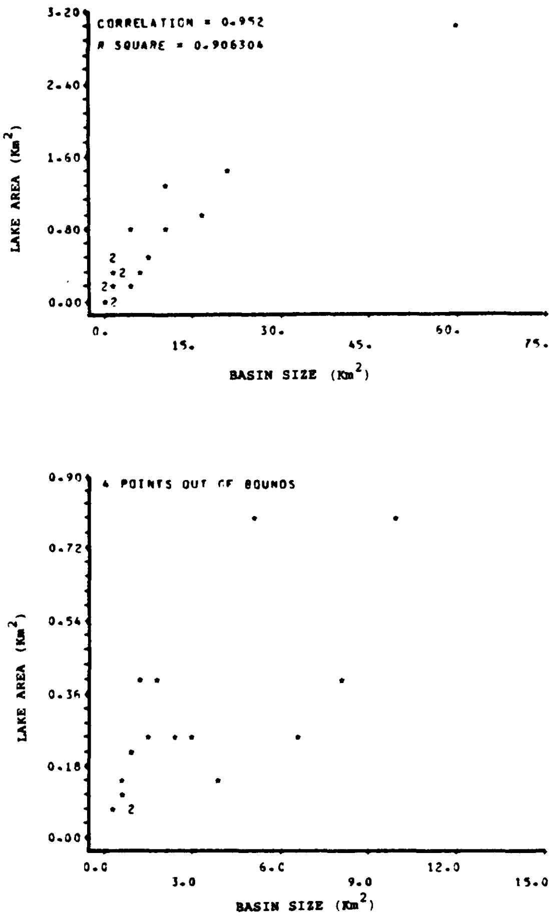
Lake Elevation/Alkalinity

Figure 35



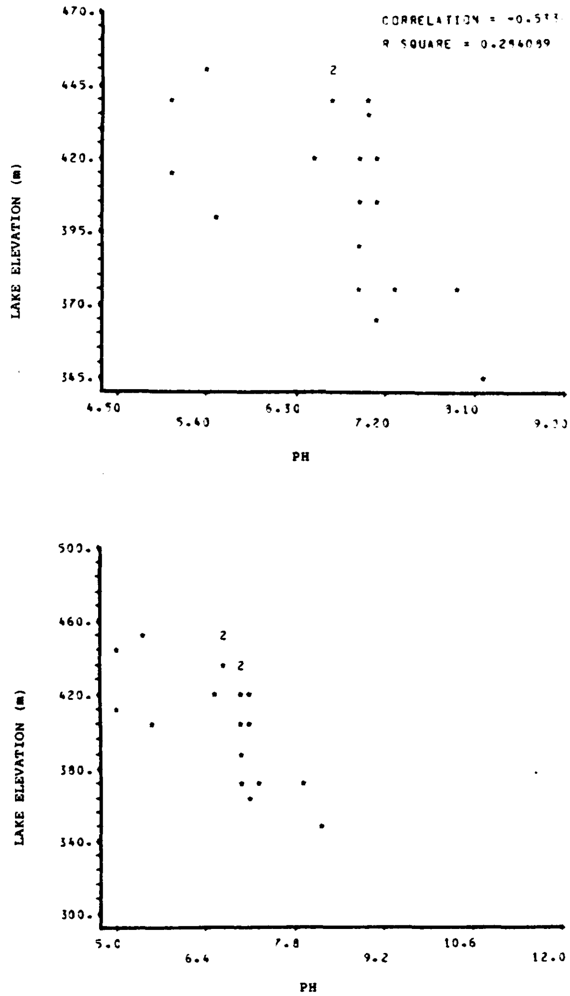
Lake Area/Lake Order in Watershed

Figure 36



Lake Area/Basin Size

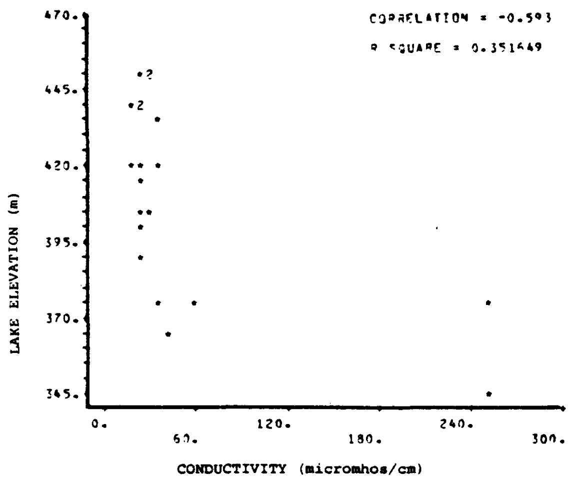
Figure 37



Lake Elevation/pH

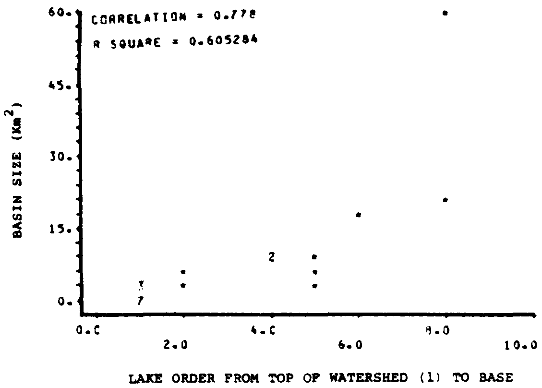
Figure 38

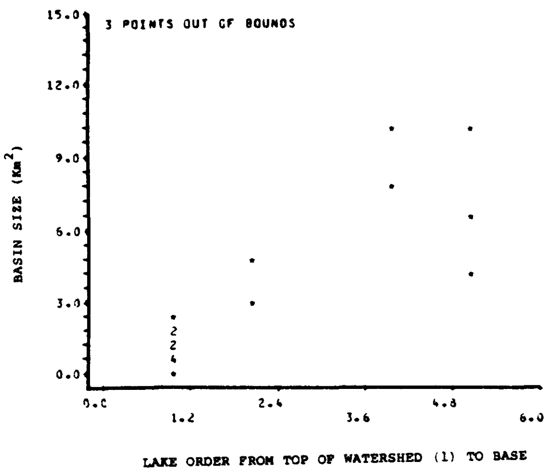
A significant correlation was observed (in the 20 Wawa study lakes) between pH and alkalinity (Figure 27 r=0.65 and $p < 0.01$). As with the case of conductivity and pH, an inflection point occurred in the alkalinity/pH regression at a pH of 6.3 - 6.5 (Figure 27). It was previously noted that sulphate replaced bicarbonate as the major cation at this pH in these lakes.



Specific Conductivity/Lake Elevation

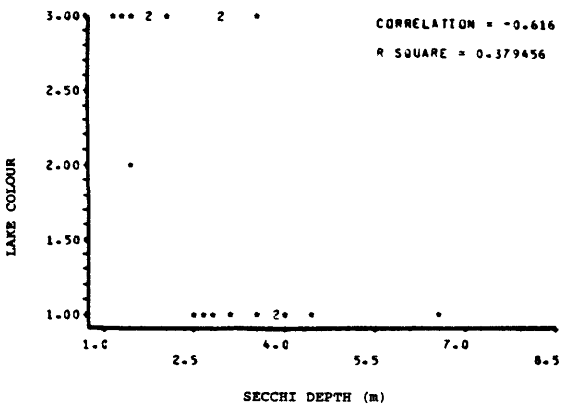
Figure 39





Basin Size/Lake Order from Top of Watershed

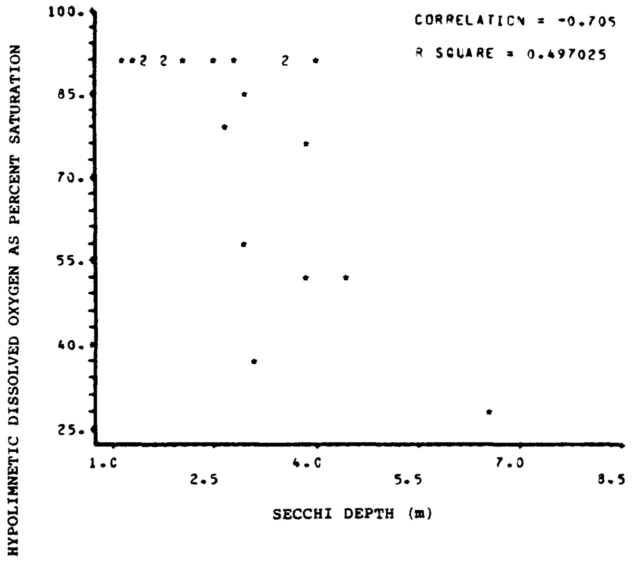
Figure 40



*CLEAR WATER LAKES (0-20 PT colour units) = 1, SLIGHTLY HUMIC LAKES (20-60 PT colour units) = 2, HUMIC LAKES (greater than 60 PT colour units) = 3.

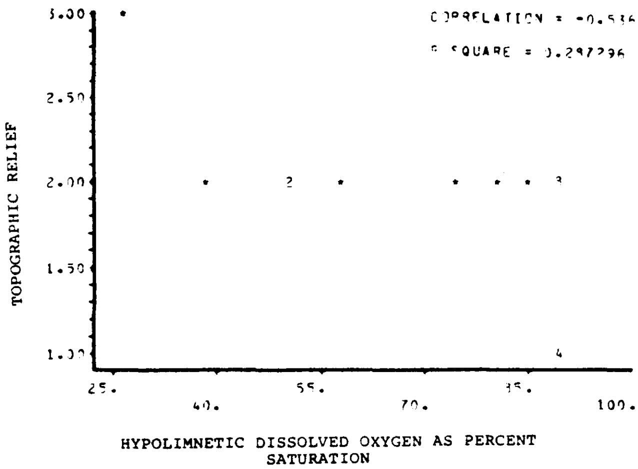
Lake Colour/Secchi Depth

Figure 41



Hypolimnetic Dissolved Oxygen/
Secchi Depth

Figure 42



*STEEP SIDED BASINS=3, MODERATE=2, BASINS WITH MINIMAL RELIEF=1

Topographic Relief/Hypolimnetic
Dissolved Oxygen

Figure 43

Alkalinity was also significantly correlated with calcium concentration (Figure 29) since calcium was the major divalent anion in these lakes. For this reaseon it was not surprising to find that calcium was also significantly correlated with pH (Figure 30, r = 0.69) specific conductivity (Figure 31, r = 0.97) and TDS (Figure 32, r = 0.98).

Special attention was given to the elevation above mean sea level (ASL) of the 20 lakes in the Wawa study area. Those lakes which had no others above them were assigned a rank or order of 1.0, if one lake was located above them their assigned rank was 2.0 etc. Those lakes with the lowest rank were found at the highest elevations (i.e. at the top of the staircase) above mean sea level. Lake elevations ranged from 312 to 444 m ASL (Figure 33). The higher the lake's elevation the lower its calcium, TDS and alkalinity concentrations. (Figures 33, 34 and 35). It was also noted that the lower a lake's rank order the smaller its surface area (Figure 36). The smaller the area of a lake, the smaller the area of its basin (r = 0.95, Figure 37).

Lake elevation was also significantly correlated with pH (Figure 38 r = -0.59). Lake basin size and lake order were also significantly intercorrelated with one another and pH (Figure 40).

The clarity of water in the Wawa study lakes, as indicated by their Secchi Disc transparencies, was a function of two principal factors, 1) light scattering and 2) light absorption. Light scattering was largely a function of suspended particles, principally algae and inorganic matter. Light absorption was principally a function of the content of dissolved coloured substances in the water (e.g. humic substances). A statistically significant (P = less than 0.05) relationship between the relative amount of humic matter in a lake and its Secchi depth (transparency) was found (Figure 41).

In addition, a significant relationship between the Secchi transparency and the amount of dissolved oxygen in the lake's hypolimnion (in June) was found (r = 0.71, Figure 42). This correlation may be an indirect indication of the amount of inorganic particulate material in these lakes. Those lakes with high relative amounts of particulate organic matter would have low Secchi values due to high scattering. The same lakes would also be more likely to have low hypolimnetic oxygen as a result of the decomposition of this organic matter after it had entered the tropholytic zone (Wetzel 1975). For this reaseon a rough relationship exists between a lake's trohic status and its hypolimnetic oxygen deficit (Hutchinson 1957).

Hypolimnetic dissolved oxygen was also correlated with the relative steepness of a lake's watershed (Figure 43). Steep sided basins with a high degree of topographic relief had significantly lower dissolved oxygen in their basins than those lakes with minimal topographic relief. This relationship can be explained in terms of the different surface to volume ratios exhibited by lakes of differing topographic relief. A lake with steep sides, (i.e. high topographic relief) will have a small hypolimnetic volume compared with its surface area. From this it follows that the smaller a lake's hyolimnetic volume, the smaller the amount of oxygen available there for the decomposition of organic matter settling into the lakes's tropholytic zone (cornett and Rigler 1980).

The data in Figures 25 - 43 will be discussed in other sections of this report. The foregoing comments are therefore provided merely as a means of describing the fundamental relationships within the data itself.

Dominant Zooplankton and Phytoplankton

The twenty most abundant taxa in the Wawa study lakes in mid June were chosen for computer plotting. Their plots were organized into five basic pH vs. density response patterns (Figures 44 and 45):

1 - Those species present at high density at low pH and low density at high pH were *Cyclops bicuspidatus*, *Diaptomus minutus*, *Mesocyclops edax*, *Asplanchna vulgaris*, *Kellicotia longispina* and *Dinobryon bavaricum*.

2 - Those species present at low density at low pH and high density at high pH were *Asterionella formossa*, *Ceratium Hirundineila* and *Microcystis aeruginosa* (which failed to appear below a pH of 5.6).

3 - Species present at moderate density over the entire pH range of the Wawa lakes (e.g. eurytypic spp.) were *Bosmina longirostris* and *Polyarthra vulgaris* as well as the eurytypic algae *Melosira* sp. and *Tabellaria fenestrata*.

4 - Species present at low density in lakes of high and low pH and at high density in neutral lakes were the neutral stenotypic zooplankton such as Diaptomid copepodites and the colonial rotifier, *Conochilus* sp. as well as three algal taxa, *Anabaena circinalis*, *Dinobryon divergens* and *Volvox* sp.

5 - Only one taxa, *Holopedium gibberum*, was found at low density in lakes of neutral pH and at high density in lakes of both low and high pH.

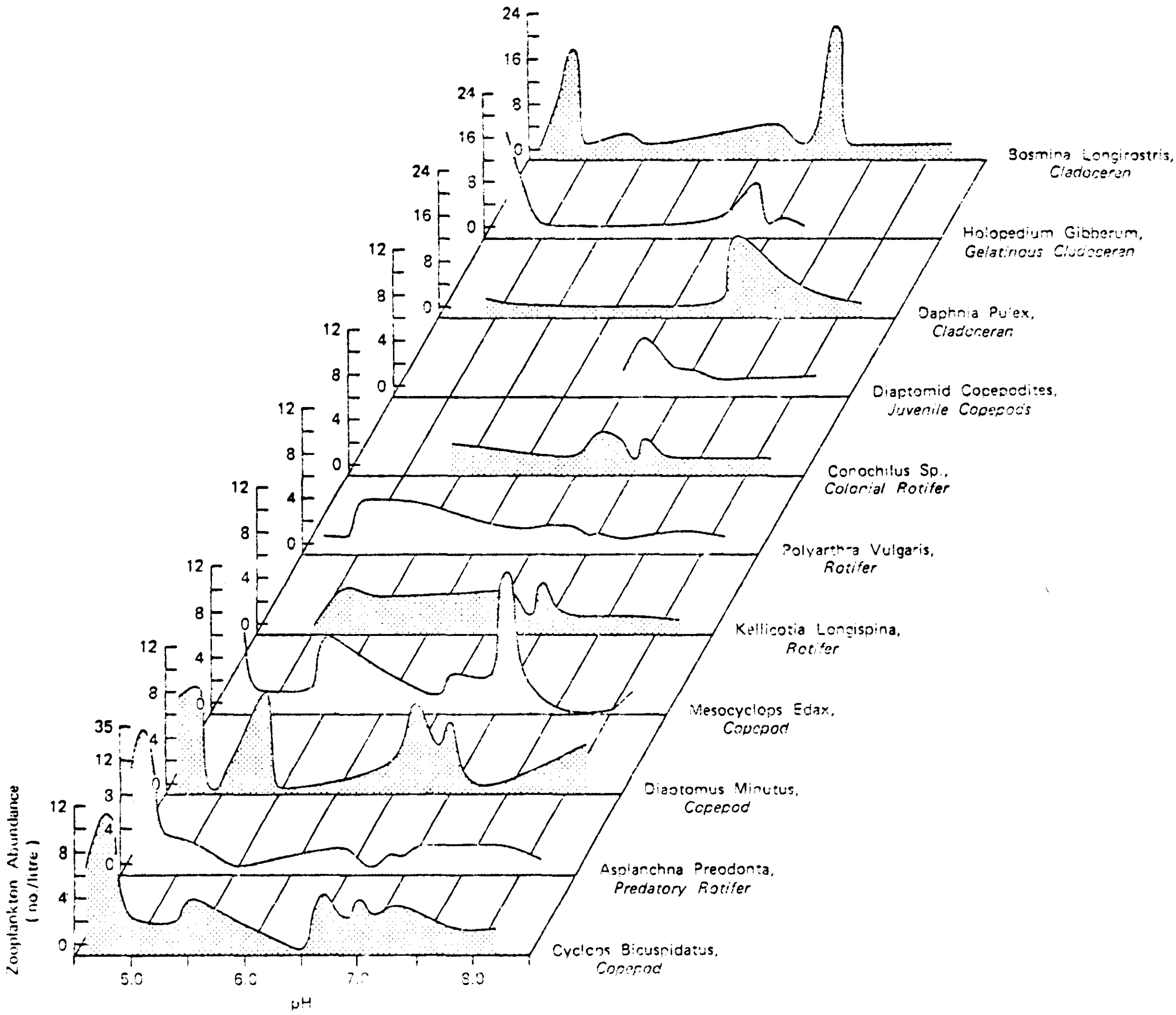


Figure 44 - Density of eleven zooplankton taxa (no/1) in lakes of differing pH, 13-18 June, 1980, near Wawa, Ontario.

Zooplankton Abundance Patterns in the Wawa Study Lakes

Zooplankton densities never exceeded 35 individuals per litre. This density was only attained by the predatory rotifier, (Asplanchna preodonta). The average density was approximately 7 individuals of any one taxa per litre.

When zooplankton density of the eleven commonest species was plotted as a function of lake pH, three patterns were observed.

1 - Four species (Cyclops bicuspidatus, Asplanchna preodonta, Diaptomus minutus and holopedium gibberum) achieved their maximum density below a pH of 5.0 (Figure. 17).

2 - Daphnia, an acid lake intolerant cladoceran species (Strom, 1926 and Sprules 1975) was found at low density (about 2 individuals per litre) between a pH of 4.8 and 6.8. At a pH of 7 (neutral) the Daphnia density suddenly increased to 10/litre (Figure 17). Daphnia pulex was the only Daphnid found at appreciable densities in the Wawa lakes. Two other taxa failed to occur at low pH, Diaptomid copepodites and the colonial rotifer, Conochilus.

3 - Bosmina longirostris was bimodal in its abundance distribution pattern (Figure 17). To a lesser extent Holopedium gibberum and Mesocyclops edax displayed similar bimodal patterns.

Phytoplankton Abundance Patterns in the Wawa Study Lakes

Only nine phytoplankton taxa were abundant over a wide pH range, and only one of these, Dinobryon bavaricum reached its maximum density at low pH. The colonial green alga, Volvox, and the flagellated chrysophyte Dinobryon divergens were absent at both low and high pH. The remaining six species were encountered in all the Wawa study lakes but attained their highest densities in circumneutral lakes. Absolute densities of the phytoplankton were not estimated for the reasons presented by Lohman (1972).

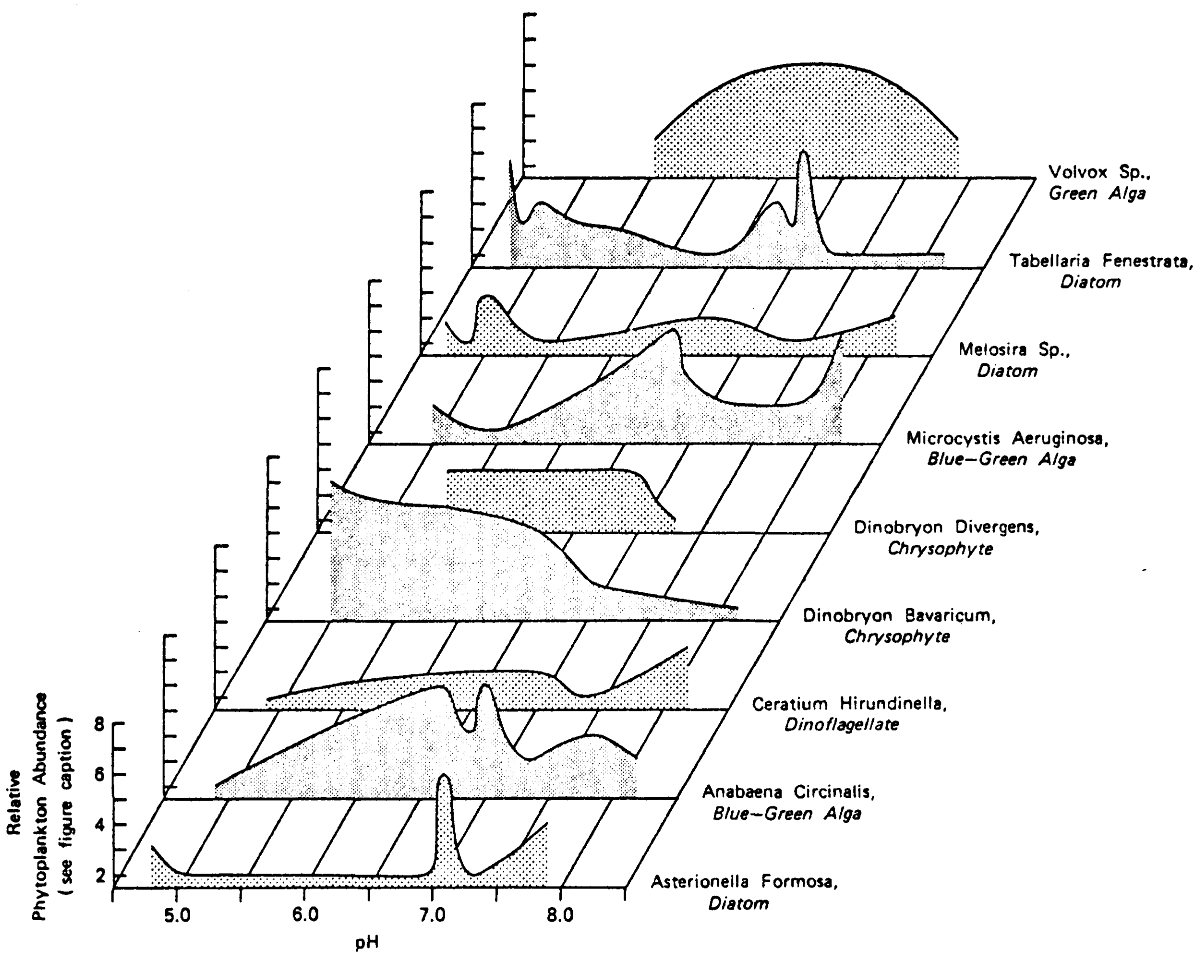


Figure 45 - Relative density of the nine phytoplankton taxa described in the text.

Diatom Inferred pH

Year after year, diatoms growing in a lake die and settle out, accumulating in the lake's sediments. Therefore, it is possible to take a sediment core from a lake and use it to analyse the change in diatom species composition at successively deeper, and hence older, periods in the lake's past. It should also be possible to infer the pH of any lake at different periods (depths) in the lake's past from the ratio of acid loving diatoms (acidophilic species) to acid requiring species (acidobiontic species). To test this hypothesis, lake pH was inferred from the ratio of acidophilic to acidobiontic diatoms in the surface sediments of the twenty Wawa study lakes. These lakes ranged in pH from 4.6 to 8.2, in elevation from 312-444 m above mean sea level, in surface area from 0.03 to 3.0 km^2, in depth from 2 to 42 m and in total inflection point alkalinity from 1 - 180 microequivalents/litre (Table 6).

Diatom Indicators of Lake pH

The percent compositon of acid and alkaline-loving diatom species changes as one travels along the Wawa sampling strip from lakes A to T. (Figure 46). In general the more acidobiontic and acidophilic diatom species in a lake's surface sediments, the lower its pH. However, lakes K and T were obvious exceptions to this generalization. If only the planktonic diatoms were used in the calculations of lake pH from the Nygaard Index, the correlation between lake pH and diatom inferred pH was better than if both benthic and planktonic diatoms were considered together (Figures 47 and 48).

Nygaard Omega vs. Plankton Omega

When the pH was estimated from the 20 study lakes, using the Nygaard omega formula (Nygaard 1956) the diatom inferred pH was consistantly higher than the observed lake pH (Figure 47). When the omega value was calculated by omitting the benthic diatom taxa, a significant correlation (p 0.05) was recorded for the planktonic diatom inferred pH regressed

Lake Name/Lake Number	Approx. Lake Area (Km^2)	Calcium (Ca as ppm)	Nygaard Omega pH	Plankton Omega pH	1980 Lake pH	1980 Field Alk. (ppm) rounded to nearest whole no.	1980 Lab Alkalinity equivalents/litre	Field Surface/Bottom Specific Conductivity (micromhos/cm)	Surface T.D.S. (ppm)	Colour of Water*	Secchi Depth (m)	Depth at Sample Point (m)	Lake Depth (m) Estimated Maximum	Thermocline Depth (m) (Top-bottom of Metalimnion) (NS = not stratified)	Minimum Dissolved Oxygen (% Saturation near Bottom)	Bedrock Type**	Lake Topographic Relief (Low, Moderate, High)	Lake Drainage Basin Area (Km^2)	Lake Order	Lake Area (Km^2)	Sediment Loss on Ignition (As percentage loss)
A/1	<1	1.5	6.2	4.8	5.0	10	34.8	25/27	26	H	3.0	11	13	6-9	5.8	G	M	10	4	0.80	46
B/2	<1	1.5	5.8	4.8	5.0	7	32.5	23/25	26	H	3.5	4	5	N.S.	9.0	G	M	3	2	0.25	44
C/3	<1	1.9	5.9	5.1	5.4	8	52.2	22/23	25	C	4.5	10	15	4-7	5.1	G	M	0.25	1	0.06	45
D/4	Pond	1.9	7.2	6.1	5.5	9	46.4	25/29	26	C	6.5	33	40	4-6	2.7	G	H	0.70	1	0.15	44
E/5	<1	3.1	7.4	7.2	6.5	18	121.8	26.35	28	C	3.8	42	42	3-5	7.5	G	M	8	4	0.40	52
F/6	<1	6.0	6.8	6.3	7.1	18	272.6	30/40	42	H	3.0	14	97	8-11	8.5	A	M	21	8	1.50	44
G/7	1-5	5.4	7.4	7.2	7.1	24	359.6	38/41	42	H	1.3	4.2	6	N.S.	9.0	G	M	60	8	3.00	20
H/8	<1	3.8	7.6	7.6	7.0	22	208.8	36/38	30	H	1.8	4	5	N.S.	9.0	G	M	17	6	0.90	32
I/9	Pond	3.4	6.3	5.0	6.7	13	116.6	32/94	30	C	3.1	6.3	9	3-6	3.8	G	M	0.6	1	0.10	47
J/10	1-5	4.1	6.3	6.0	6.7	16	136.9	32/32	32	C	2.6	6	11	N.S.	8.0	G	M	10	5	1.25	54
K/11	Pond	4.0	4.0	6.2	7.0	21	237.8	18/20	20	C	2.5	2.8	3	N.S.	9.0	G	L	2.25	1	0.25	51
L/12	<1	4.1	5.3	7.1	6.9	23	252.9	20/22	24	S.H.	>1.5	1.5	4	N.S.	9.0	D	L	5	2	0.80	67
M/13	<1	3.4	4.9	6.2	6.9	17	197.2	25/35	26	C	3.5	6.3	9	3-6	9.0	G	M	6.5	5	0.25	39
N/14	<1	2.6	5.0	6.3	6.7	21	150.8	26/32	26	C	4.0	6.8	10	6-7	9.0	D	L	1.25	1	0.40	47
O/15	<1	3.8	5.9	6.6	6.9	21	232.0	25/46	25	H	1.2	1.3	5	N.S.	9.0	D	M	1.50	1	0.25	54
P/16	Pond	4.9	6.6	5.4	7.1	27	334.1	41/46	38	H	1.7	2.8	4	N.S.	9.0	D	M	1.00	1	0.07	50
Q/17	<1	4.7	6.0	6.6	6.9	18	292.3	38/46	34	H	1.5	2.5	5	N.S.	9.0	G	M	0.80	1	0.06	63
R/18	<1	7.4	8.3	8.3	7.3	35	603.1	59/70	48	C	2.8	3.5	6	N.S.	9.0	D	L	0.75	1	0.20	73
S/19	<1	20.2	8.9	9.0	7.9	88	1,711	250/251	167	H	2.0	1.8	20	N.S.	9.0	B	M	1.75	1	0.40	77
T/20	<1	28.2	4.0	7.5	8.2	180	3,028	250/290	180	C	3.8	10.5	4	4-6	5.1	G	M	4.09	5	0.15	18

* Humic (H), Slightly Humic (SH), and Clear (C)
** Gneiss (G), Basic Extrusive (B), Acid Extrusive (A), and Diabasic (D)

TABLE 6

PHYSICAL, CHEMICAL, GEOLOGICAL AND MORPHORMETRIC PARAMETERS FROM THE WAWA STUDY LAKES.

against the observed lake pH (Figure 48). Thus the pH of a lake's surface waters is better reflected by its planktonic diatoms than its benthic diatoms because the benthic diatoms inhabit a portion of the lake where the pH differs substantially from that of the lake's open water environment.

Forty-one percent of the study lakes had a summer pH within one-half a pH unit of the planktonic diatom inferred pH while only 33 % of the study lakes had pH values which fell within half a pH unit of the observed pH. (Figure 47). Nearly three-quarters (74%) of the planktonic inferred pH estimates fell within one pH unit of the observed pH of the twenty study lakes.

Variance Associated with the estimation of pH from Diatom counts

When six hundred frustules were counted for each of two replicate slides, the average pH ranged between ±0.4 pH units of the mean. Although the precision of this estimate can be improved slightly by inceasing the number of frustules to 2,000 per slide, and the number of slides to five (pH = mean ± 0.2 of a pH unit), we feel that the added precision does not warrant the enormous incrase in expended effort. In addition, accuracy may not improve significantly with incrased replication. For this reason, we recommend counting 600 frustules on each of two to three replicate slides.

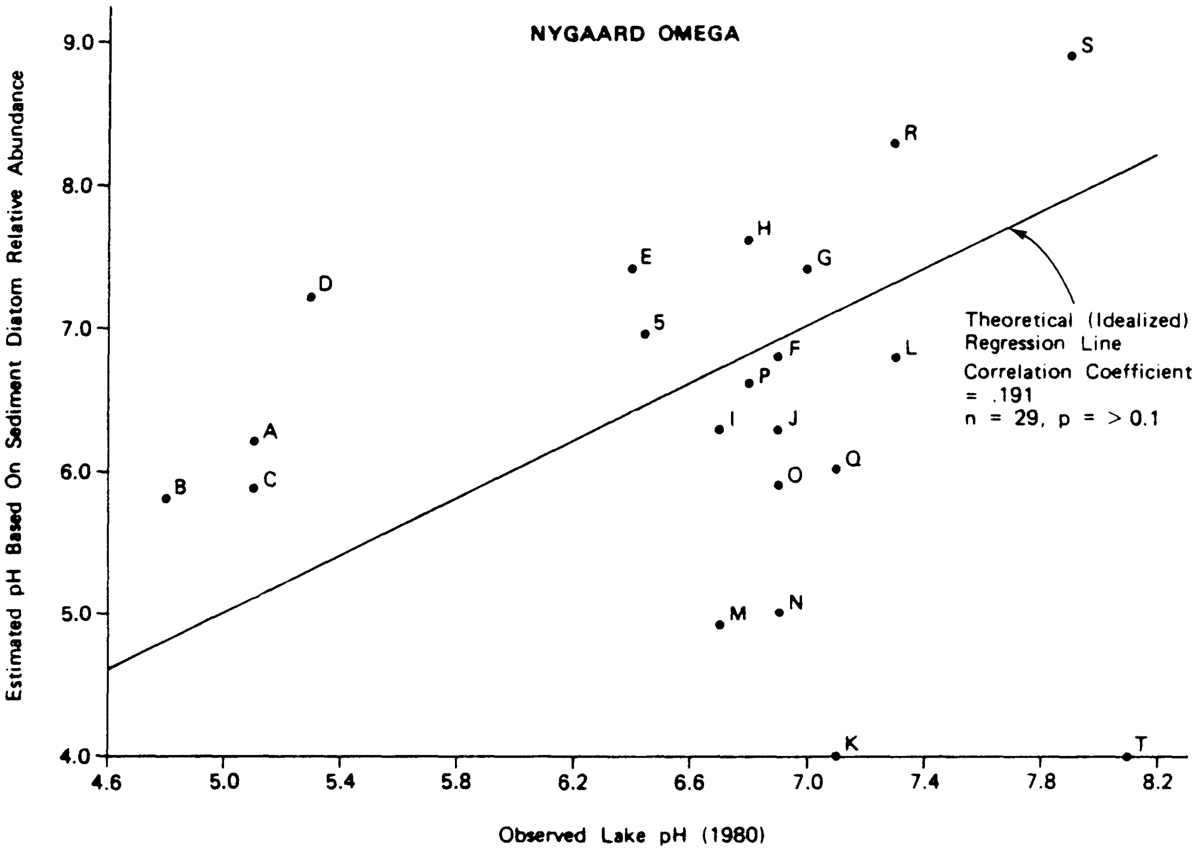


Figure 47 - The relationship between lake surface pH and diatom inferred pH based on surface sediment diatoms: Nygaard Omega

In conclusion, the diatom inferred pH is roughly 75% efficient in estimating the observed summer pH of a lake within one pH unit. The fact that lake pH changes substantially from spring to summer helps explain why the diatom inferred pH is not more precise. However, the annual mean pH of a lake may be estimated by the diatom inferred pH technique if one is willing to recognize that the diatom technique will never give us decimal accuracy.

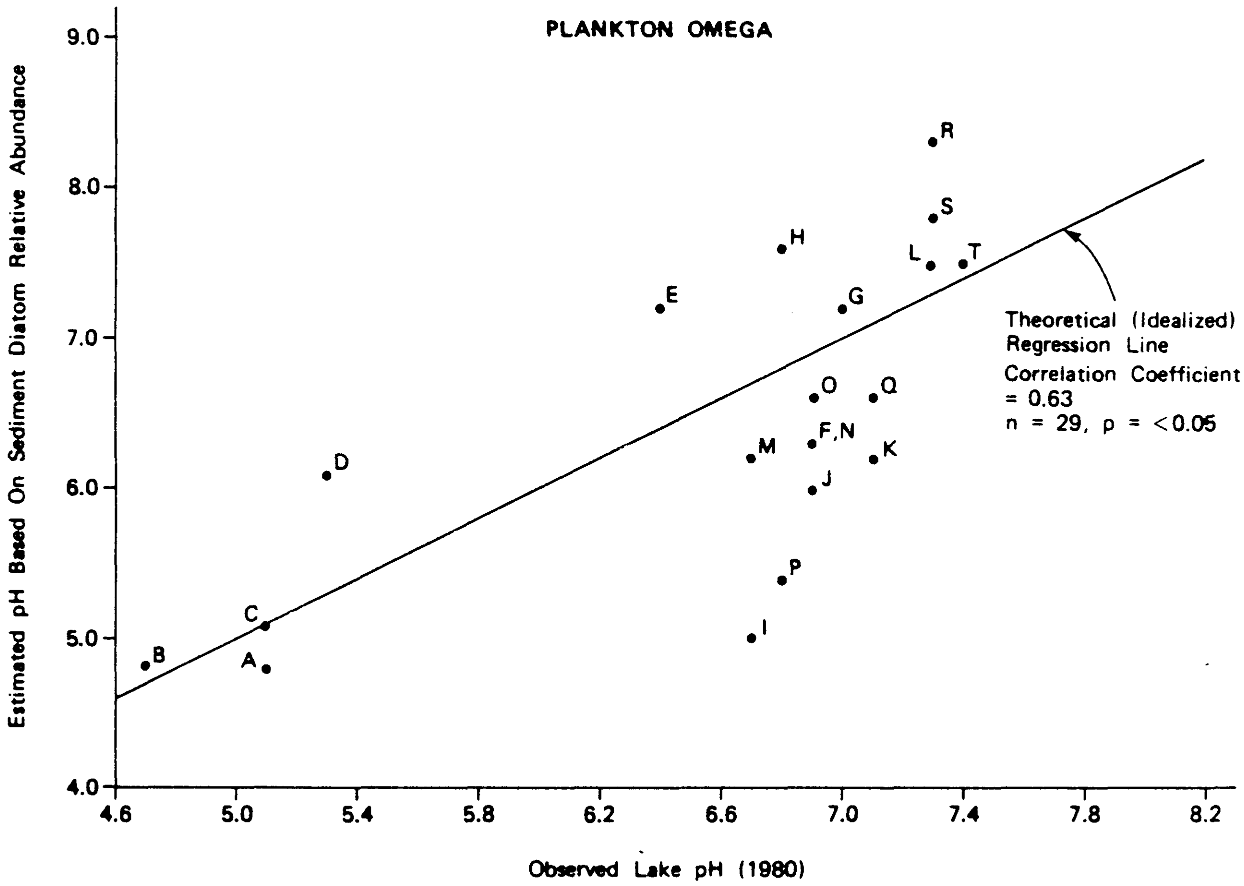


Figure 48 - The relationship between lake surface pH and diatom inferred pH based on surface sediment diatoms: Plankton Omega

What the diatom inferred technique does give us is a way of estimating the pH of a lake 40 t0 50 years ago, before acid rain was a significant problem. From this information, we can estimate how fast any particular lake is acidifying.

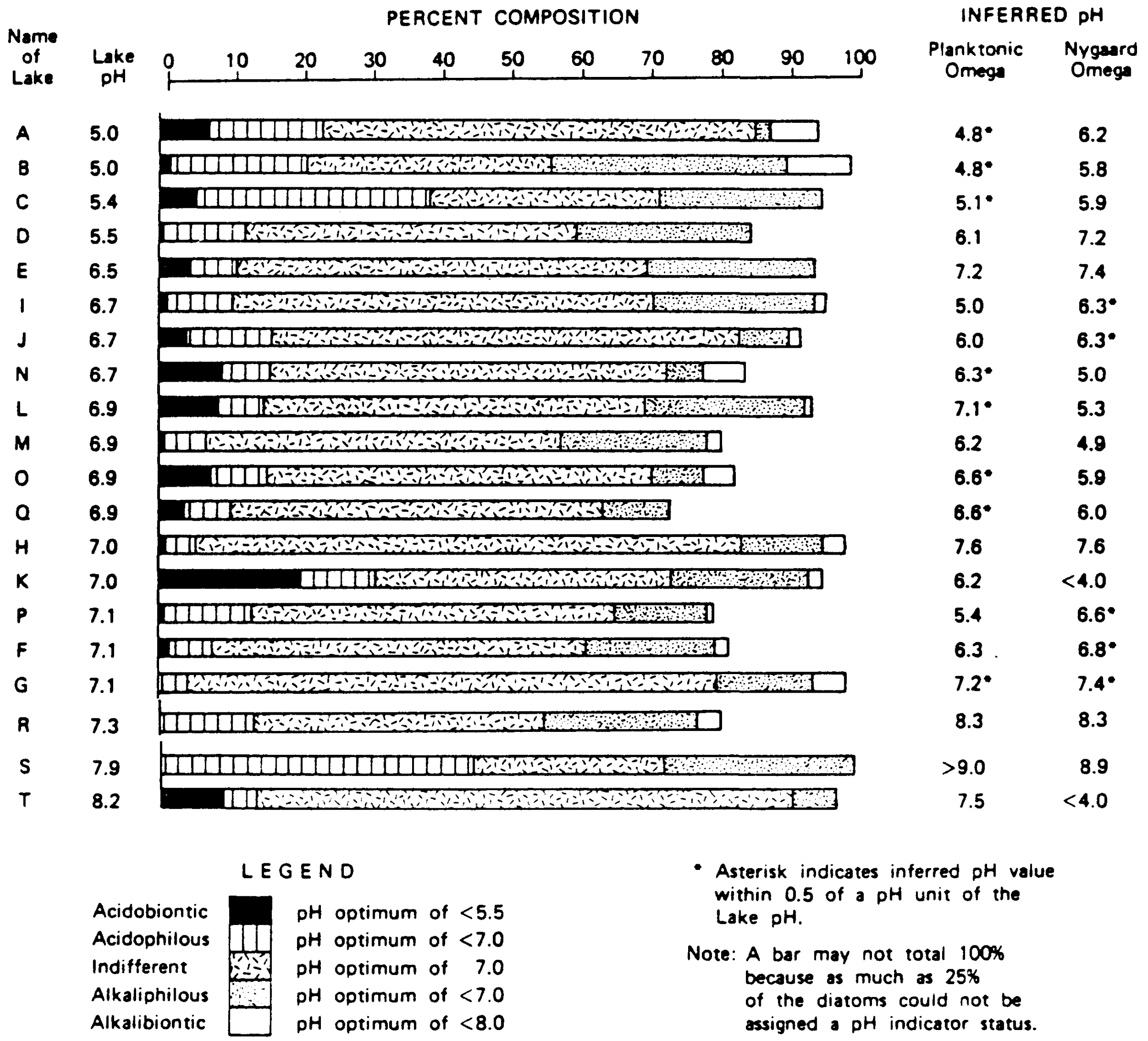


Figure 46 - Wawa Lakes - Percent Composition in Terms of pH Reference

DIATOM INFERRED pH FOR THREE WAWA STUDY LAKES

Three lakes were chosen for diatom analysis on the basis of their location in the 100 km long transect. Lake B was a clearwater, poorly buffered lake at low pH near the start of the transect. Lake F was a humic lake of neutral pH in the central area of the transect and lake T was located furthest from Lake Superior in a carbonate-rich, clay, overburden area.

Cesium-137 data indicated that the top 2 cm of sediment in each of the replicated cores taken from these three lakes represents an age of roughly 10 to 15 years. Thus, it is evident that during the last 10-15 years, only lake B was acidifying. The diatom inferred pH has a precision of approximately 1/2 a pH unit. Therefore, it is not surprising that the diatom inferred pH of Lake B at 0 cm (4.6) is not identical to the pH we observed in the field in 1980 (5.0). In 1978 the observed field pH of the lake was 4.5. The precision of the field pH technique was fairly high (0.1 of a pH unit). However, seasonal variation in pH may exceed 0.5 of a pH unit. The surface sediment diatom inferred pH is based on a composite sample of the average pH of the lake over the last five years. For this reason it reflects long term trends while ignoring or averaging out short term seasonal fluctuations.

Lake B reached its lowest level (pH 4.0 at a depth of 8 cm) roughly 40 years ago (according to Cesium-137 projections). Possibly a forest fire or logging operation caused this decrease in pH at that time. Further work is planned to permit us to pin down the changes in pH as inferred by diatom analysis and the actual changes have been recorded in the lake's watershed.

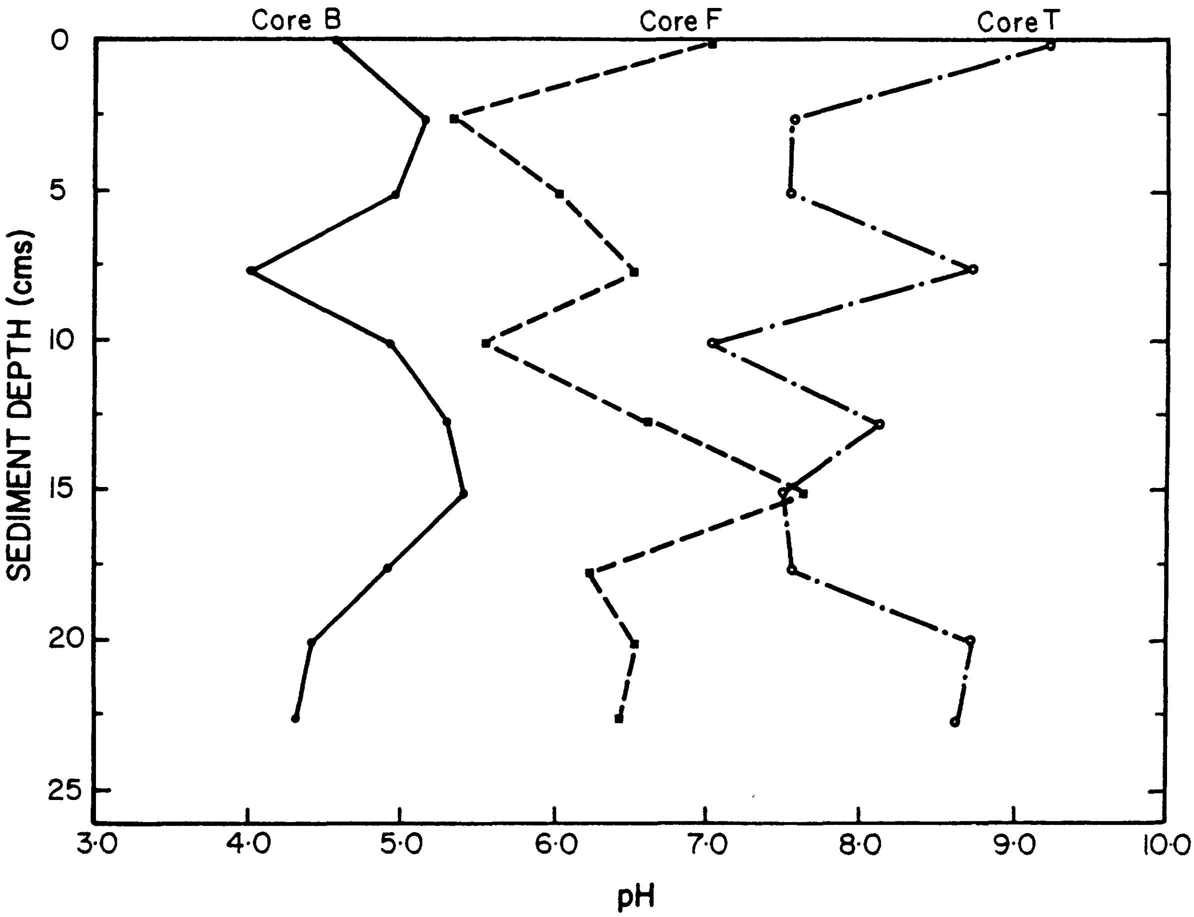


Figure 49 - Sediment Depth/Diatom inferred pH for Lakes B, F and T Wawa Sampling Strip.

The diatom inferred pH of Lake F based on its surface sediments was 6.9 (Figure 49). The observed pH was 7.1 (Part II). Over the last 10-15 years, lake F appears to be becoming less acid. In 1978 the Ontario Geological Survey measured a pH of 6.6 in lake F indicating that its pH has shifted over half a unit in pH in just two years. The diatom inferred pH pattern supports this observation of rapid deacidification. The reasons for this shift and those preceeding it (Figure 49) are not known.

The lowest diatom inferred pH of this humic lake was 5.4 and the highest diatom inferred pH was 7.8. Increases in the amount of Humic matter generated in and around the alke will act to alter its buffering capacity according to recent studies. Further study is clearly needed to better understand the reason for the large shifts in pH over the last 200 years in lake F.

Lake T ranged in diatom inferred pH from a low of 7.0 to a high of 8.8. During the last 10-15 years it appears to be becoming more alkaline. In 1978 its observed summer pH was 8.0 while in 1980 its summer pH was reported as 8.2. The diatom inferred pH at the surface was 8.8 while at 2 cm it was 7.8 confirming the above trend of increasing pH. The fact that even well buffered lakes such as "T" may change 1 - 2 pH units over a 200 year history was unexpected. Classically, these lakes have been thought to be fairly pH stable due to their huge buffering capacity.

To test the hypothesis that major shifts in pH can occur in even a well buffered lake following changes in its watershed (such as droughts or floods or fires) a pH baseline is needed. We feel that the efforts of the Geological Survey of Ontario to establish a pH baseline data bank for over 4,000 Ontario Lakes will prove invaluable to future generations.

CONCLUSIONS

The midsummer phytoplankton and zooplankton standing crop in the low pH, clear water Wawa lakes were only somewhat lower than in the other lakes. The species richness of these clear water, acid lakes (pH = less than 6.0) was significantly lower than the rest of the Wawa study lakes. Thus it can be concluded that these acid lakes exhibit a substantial reduction in the variety of planktonic life forms inhabiting them.

Rotifers never comprised a major fraction of the biomass of the Wawa study lake zooplankton. Even in lakes where the rotifers were numerically dominant, they rarely comprized more than 5% of the total zooplankton biomass. Lakes with low pH, however, had a tendency to have proportionately more rotifer species.

Fishless lakes (e.g. lake B) have been reported to have proportionately more predatory crustaceans than lakes with normal fish assemblages. Future studies will be conducted in such a way that data on fish species composition will be available. Only three of the 20 Wawa study lakes had been previously studied in terms of their fish species.

Zooplankton species composition in the low pH lakes was similiar to that described by Sprules (1975). *Diaptomus minutus* was a common copepod in these lakes as were *Mesocyclops edax*, and *Cyclops* spp. *Bosmina longirostris* was generally the dominant cladoceran.

A significant correlation between surface sediment diatom inferred pH and the observed pH of 20 Wawa study lakes was found, planktonic diatoms were better indicators of lake pH than benthic diatoms.

The significant correlation between observed pH and diatom inferred pH offered the possibility of an indexof paleo pH. This index was employed in extimating the rate of acidification of three of the Wawa study lakes.

PALYNOLOGY - GENERAL DISCUSSION (J. Terasmae)

As a general rule, the fossil pollen found in sediments of small lakes reflects the vegetation in the surrounding area commonly some tens of kilometres in diameter. In addition, some pollen is derived from aquatic vegetation within the lake, near-shore vegetation (for example, muskeg around lake), and also from distant sources.

The bulk of pollen is dispersed by wind, although some pollen is tranported by streams, surface water runoff, and insects. It must be rememberd, furthermore, that plant species vary greatly in terms of their pollen production. Therefore, species with high pollen production (for example, pine) are overrepresented by their percentage in the pollen diagram as compared with their abundance in the vegetation, whereas species with low pollen production are underrepresented by their percentages in the pollen diagram. Because of this, percentages of pollen in a diagram do not necessarily imply egual percentage composition of species in the "parent" vegetation.

The construction of pollen diagrams for this study involved the following basic principles. In each sample, a total of 200-300 tree pollen (arboreal pollen) were counted. This total count comprises the "basic sum," and all percentages in the pollen diagram are calculated with reference to this basic sum, i.e., the total number of tree pollen counted equals 100%. The non-tree pollen (non-arboreal pollen, NAP) counted at the same time is also expressed as a percentage of this basic sum.

The *Ambrosia* (ragweed) pollen found in the top 10-15 cm of lake sediment cores is presumed to be derived from distant sources by atmospheric transport, probably from areas south of Lake Superior. There is no obvious major source of *Ambrosia* pollen in the immediate study area that is forested and has no agriculturally cleared land.

According to Rowe (1959) the study is in the Superior Section (B.9) of the Boreal Forest Region where forests are quite variable, ranging from mixed types with luxuriant shrub undergrowth to floristically poor, single species coniferous types. A relatively stable mixed forest of white spruce (Picea glauca), balsam fir (Abies balsamea), white birch (Betula papyrifera), and aspen (Populus tremuloides) is characteristic of the deep, medium-textured valley soils. On till slopes and the tops of low hills, the same associations of species is found but with the birch more prominent and some black spruce (Picea mariana) also appearing. Here mountain ash (Sorbus decora)is conspicuous as a tall shrub or small tree. The higher, more rocky elevations, and sand and gravel in the valleys bear jack pine (Pinus banksiana) and white birch, with black spruce of poor form. Silts and sands in wet lowlands, where muskeg is common, are characterized by spruce, tamarack (Larix laricina), white cedar (Thuja occidentalis), and other common species of peatland plants.

This forest section has been subject to forest fires apparently throughout postglacial time and fires have favoured an increase in the proportion of aspen, white birch and pine.

Some more southern tree species are present occasionally, including white pine (Pinus strobus), red pine (Pinus resinosa), black ash (Fraxinus nigra), sugar maple (Acer saccharum) and yellow birch (Betula lutea).

The forest cover described above is generally indicated by all pollen diagrams. There are a few pollen grains of southern tree species present in some pollen assembleges, probably derived from the same source areas as the Ambrosia pollen.

Conclusions

From the viewpoint of acid precipitation the palynological investigation was of considerable importance because it enabled us to distinguish between pre and post Ambrosia lake sediment material in all the cores studied. This in combination with data for wet weight, dry weight and loss on ignition led us to postulate a uniform sedimentary situation in the lakes during both pre and post Ambrosia time.

The series of detailed pollen diagrams provide a data base for study of detailed relationships between the pollen deposition and the element depostion in the core material. These relationships will be examined further in Part III of this report.

LAKE SEDIMENT CORE GEOCHEMISTRY by (J.A.C. Fortescue)

Introduction

A full statistical analysis and interpretation of the lake sediment core geochemistry and its relationships to the limnology data will be included in Part III of this report. In this section we are concerned largely with general descriptive geochemistry of the abundance patterns for pH and chemical elements in the cores. To facilitate comparisons of ptterns feom element to element and from core to core KK units are used throughout this section. Full listings of the geochemical data (in both ppm and KK units) are included in Paret II of this report (pages 11-17) for each lake section). The diagrams in this section are drawn from this data with minor changes made in order to facilitate the plotting process.

A - The pH data for Lake Waters

The 20 lakes included in the Wawa study were chosen on the basis of the pH data included in the 1978 regional geochemical survey north of Lake Superior. (OGS Open File No. 5248 & 5249). The first aim of the present

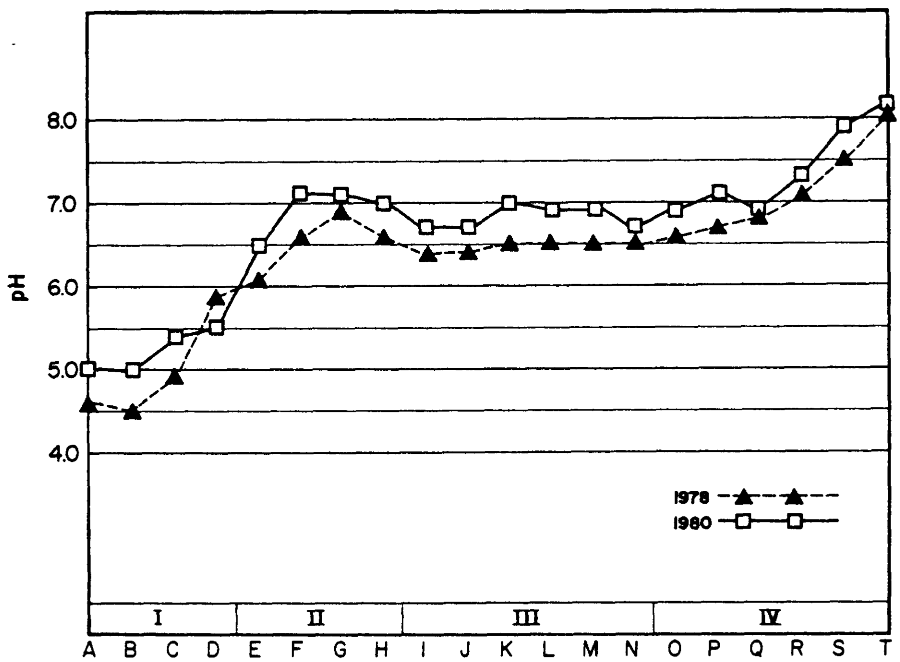


Figure 50 - The pH of lake water samples collected along the Wawa sampling strip in 1978 and 1980.

study was to compare the 1978 and the 1980 lake water pH data in order to detect significant changes in pH during the 2 year period. It was thought that such changes might relate directly to the acid rain problem particularly in lakes with a pH in 1978 below 6.0.

Comparative plots of the two sets of pH data appear as Figure 50. Clearly the pattern of pH values is indentical for the two years although the measured values are (with one exception) higher in 1980 compared with 1978. On the basis of this evidence we conclude that the pH patterns in surface lake waters are stable and verifiable from year to year although the absolute pH value changes with time. Such time changes may be within a season, or between seasons, or a combination of both. We believe that information of this type provides a firm foundation for the discussion of pH patterns obtained in regional geochemical mapping provided that they are synoptic and data is not combined from year to year. The 1980 value for pH in lake D is of interest in relation to the problem of acid rain, because the lower pH occurred in 1980 and not 1978 as in all the other lakes. Perhaps annual measurements of pH of lakes below pH 6 may be used for the detection of acid rain effects on a regional scale.

B - Element Data from Lake Sediments in 1978 and 1980

In the 1978 regional geochemical survey a grab sampler was used to obtain a sample of sediment material below the water sediment interface in each lake. In the 1980 study a more detailed approach was used involving the collection and sectioning of lake sediment cores extending downwards from the lake bottom for 50 cm. Because we found that the content of elements in the pre-*Ambrosia* sediment within each core to be relatively uniform it was decided to compare data for the abundance of copper and uranium obtained during the 1978 survey (see Figure 16 and 17) with that obtained from the 15 segment (32.5-35.0 cm deep) in the 1980 cores (Figure 51).

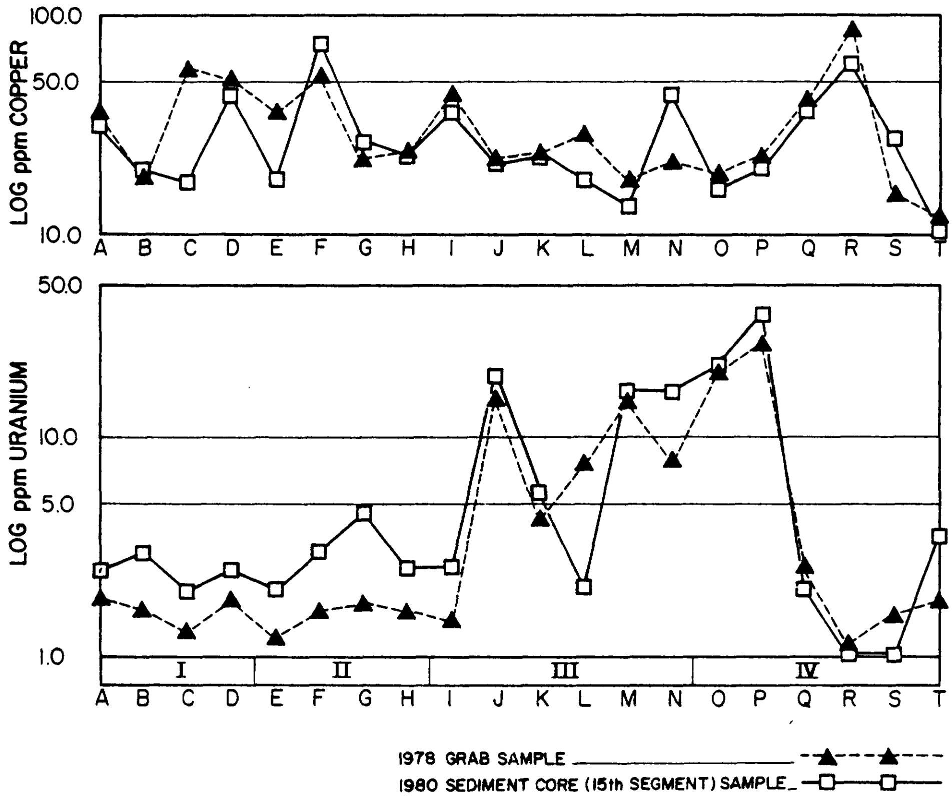


Figure 51 - Copper and uranium content of lake sediments collected from the Wawa sampling strip by different methods in 1978 and 1980.

It is evident from Figure 51 that, in spite of the fact that different samplers were used and that no attempt was made to resample in exactly the same spot in 1980, the two sets of data for the two elements are similar, and the patterns are stable from year to year. Although the data is semi-quantitative and the element comparisons are based on results from different techniques of chemical analysis it should be noted that the uranium content of the most acid lakes (see Figure 50) was found consistantly higher in 1980 compared with 1978.

C - Loss on Ignition Wet Weight and Dry Weight

Loss on ignition, wet (and dry) weights of samples and element abundance may all be used to indicate if sediment conditions have been uniform within a given lake. The general patterns for the surface (Post-*Ambrosia*) and the subsurface (Pre-*Ambrosia*) element content of samples from all 20 lakes was outlined in Chapter II. In Figure 52 the loss on ignition data for the same samples has been plotted in order to indicate the variation of this parameter along the sampling strip. The open dots indicate variations in surface sample loss on ignition data greater than the analytical error to be expected. (see Table 5) It is evident that all cores are organic except for Core E which came from a lake with a sandy bottom and has a low loss on ignition for both pre- and post-*Ambrosia* sample material.

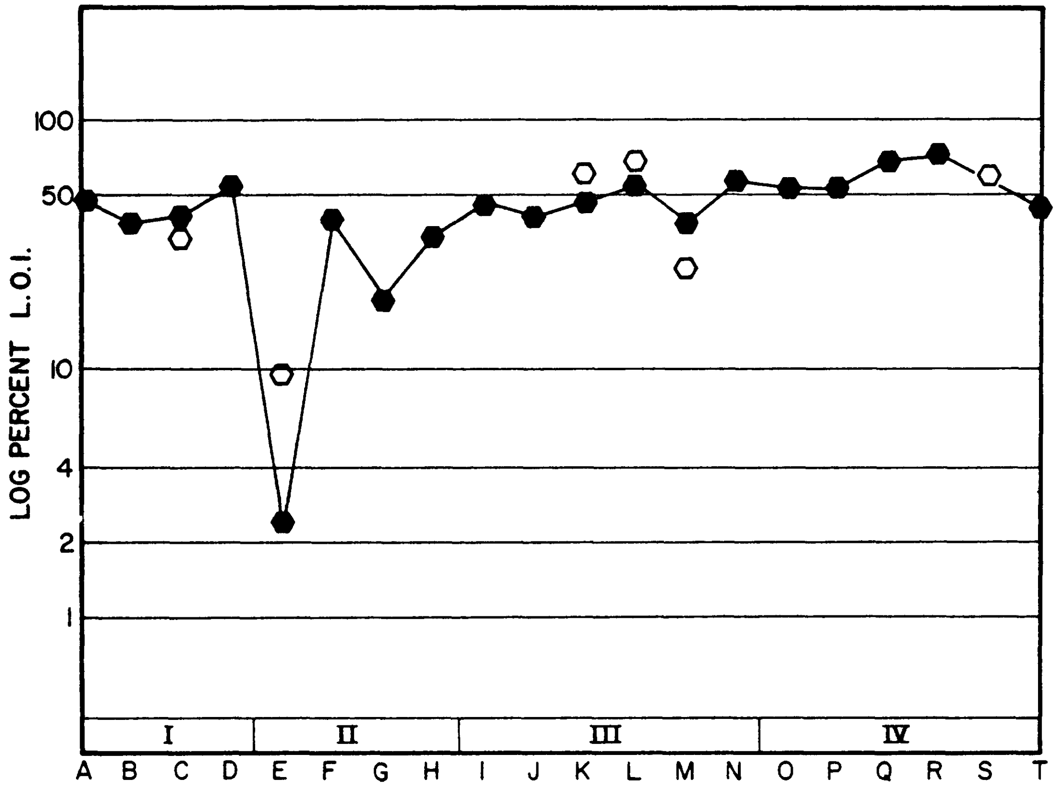


Figure 52 - Percent loss on ignition for 02 and 15 core segments collected along the Wawa sampling strip. (also see Figures 22a, b and c)

On the basis of geological considerations four lake sediment cores were selected for detailed discussion in this section. Cores B_1, F_2, M_1 and T_1 were selected as being representative of the geological regimes (I-IV) along Wawa sampling strip. (see Chapter II).

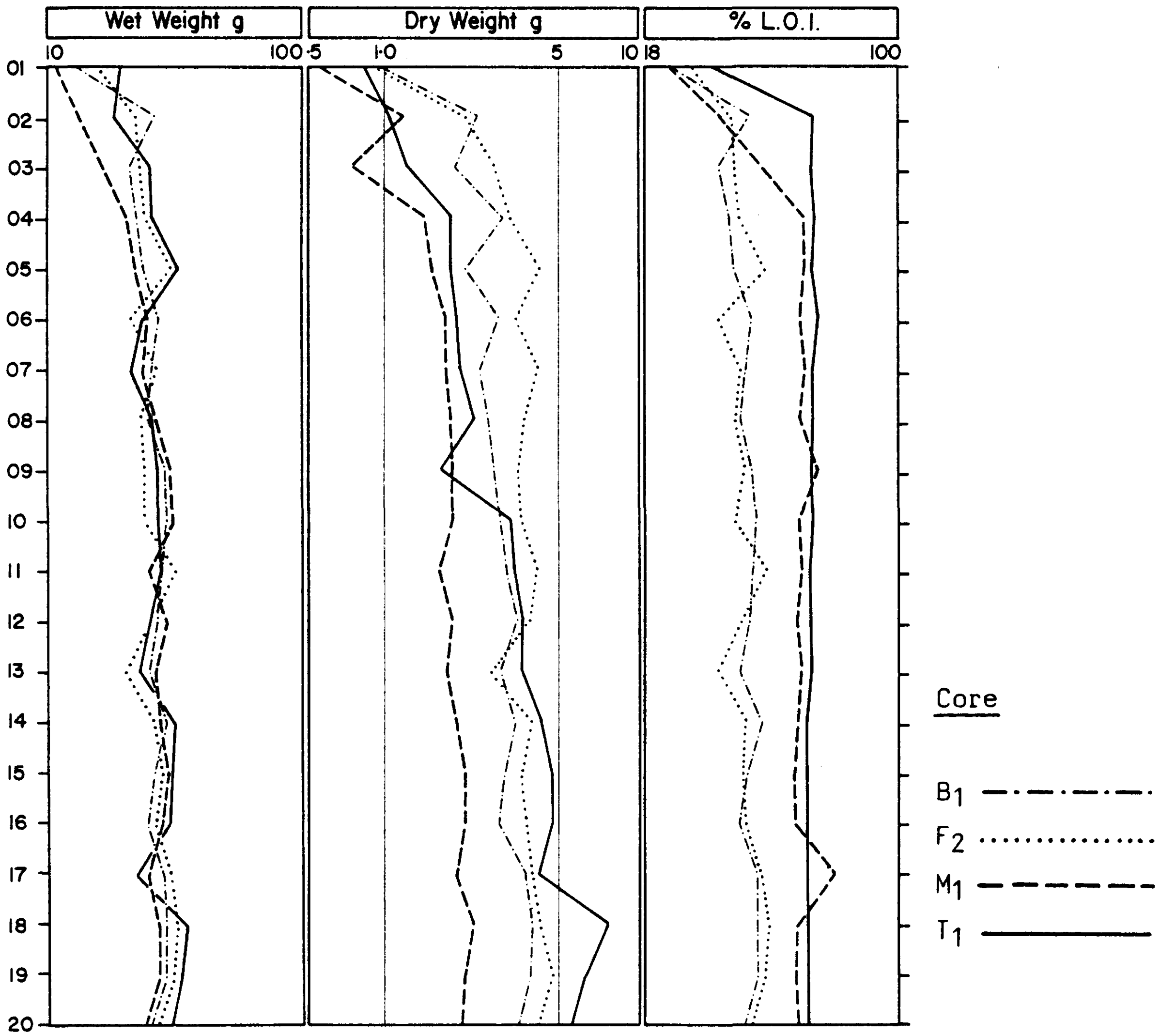


Figure 53 - Wet weight, Dry weight and Loss on Ignition for cores selected for study along the sampling strip.

As expected the wet weight of all the cores was very similar with a slight increase down each core due to compaction. This effect was exaggerated somewhat by the drying process. (Figure 53) The loss on ignition data indicates that, with the exception of core M_1, all segments are similar within a given core below the topmost sample. It was noted that the loss on ignition was consistently higher in the two cores (M & T) from the north, compared with those from the south of the sampling strip.

D - Geochemical Signatures

The geochemical data base for the lake sediment cores is bulky and difficult to interpret in its entirety. Even when only two samples are considered from each core difficulties arise, for example, in Chapter II, three pages of figures were needed to present their chemical data. In order to get around this difficulty "KK signature diagrams" were drawn to provide an overview of the abundance of 20 elements in a single core segment. (Figure 54). These diagrams facilitate comparisons of abundance for many elements from sample to sample and core to core.

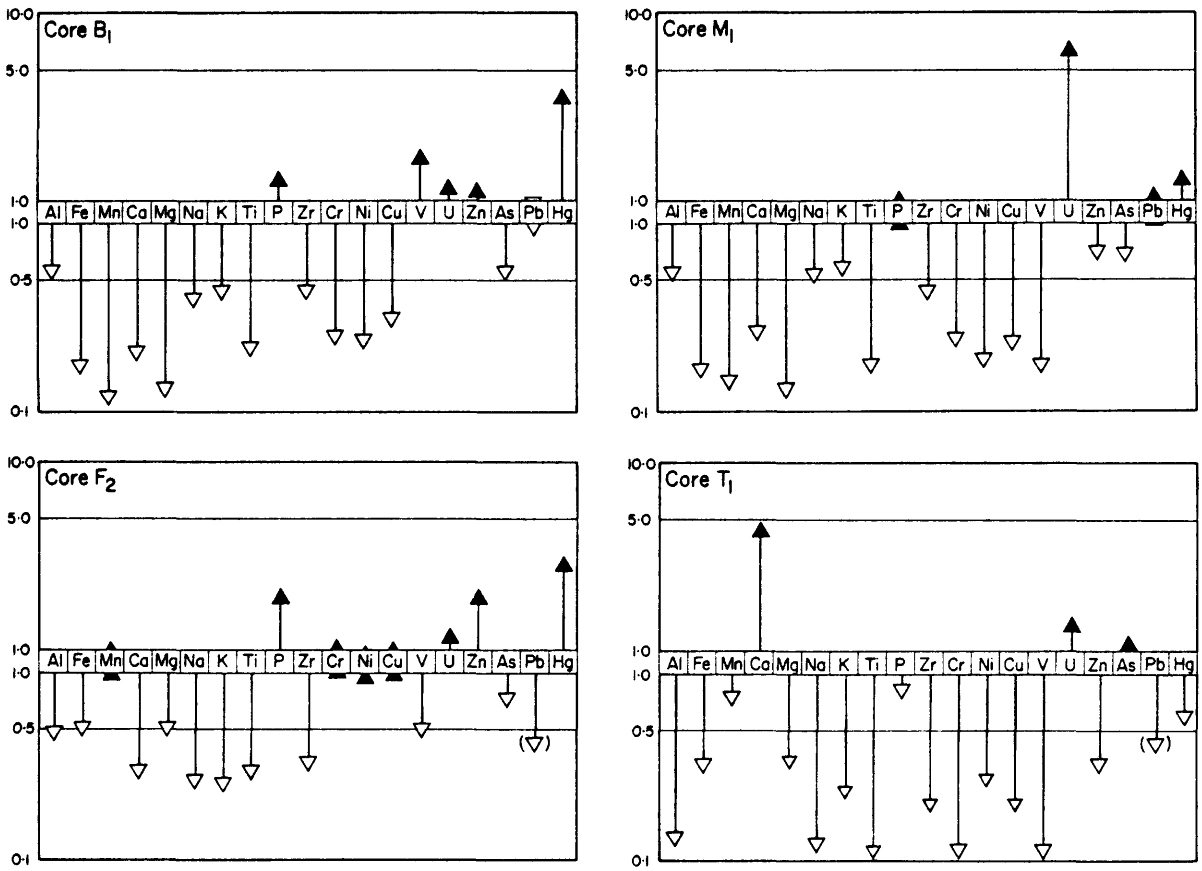


Figure 54 - Geochemical Signatures for Pre-Ambrosia sediment material (segment 15) from lake cores B_1, F_2, M_1, and T_1.

The "signature diagrams" are constructed as follows. All data for the 20 elements is transformed into KK units as described in Chapter I. Then the KK values for each element within a core segment are plotted on a log scale. Experience has shown that two log cycles are adequate for most plots of this type (Figure 54). Visual comparison of element abundance in samples with respect to the Clarke (KK) value is simplified by these diagrams. When all the elements are considered together the result is a "geochemical signature". Such signatures relate to the sum, of the geological limnological and ecological conditions in the lake (and lake basin) and are unique for each lake.

When we consider the geochemical signatures for lakes B,F,M and T (Figure 54) it is apparent that those for lakes B and M (over predominantly granitic terrain) are different from those for F and T (over predominantly basic rocks). More specifically, the KK plots for Al,Fe,Mn,Ca,Mg,Na,K, Ti,Sr,Zr,Cr,Ni and Cu are almost identical in lakes B and M., although

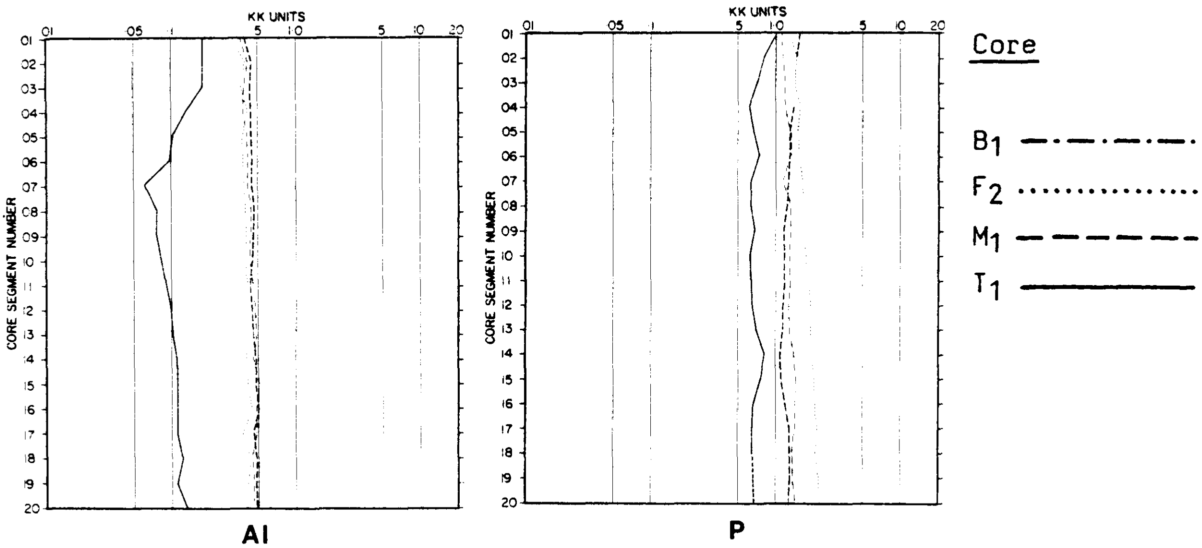


Figure 55 - Vertical distribution patterns for aluminium and phosphorus in four lake sediment cores B_1,F_2,M_1 and T_1.

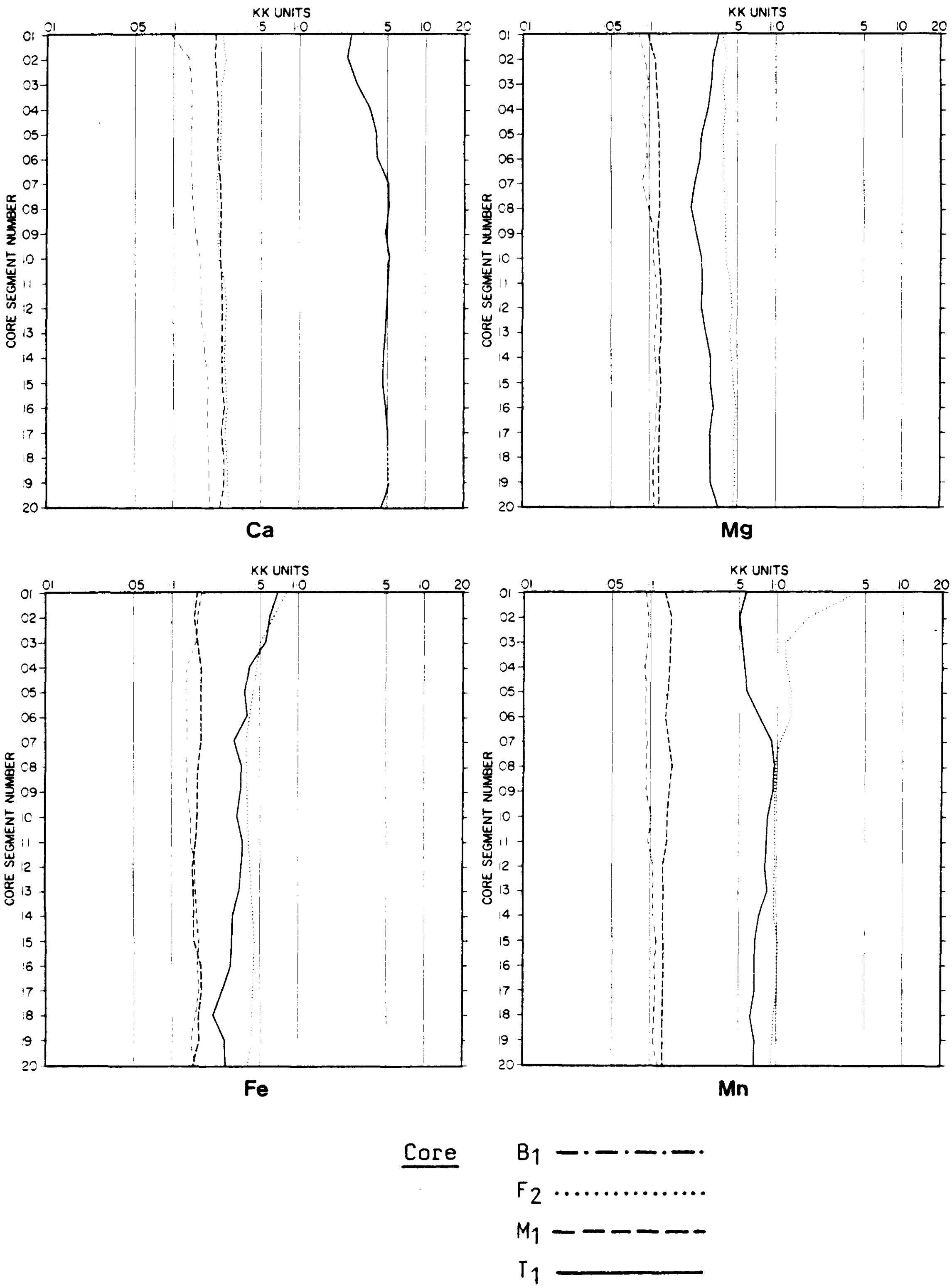


Figure 56 - Vertical Distribution patterns for calcium, magnesium, iron and manganese in lake sediment cores B_1, F_2, M_1 and T_1.

differences are also apparent. For example, V is high in core B compared with core M and U is (as expected from Figure 51) exceptionally high in core M. Variations in Zr,Pb,As and Hg are also of interest-particularly as the signatures on Figure 54 are for the Pre-Ambrosia sample. Consequently, there is a variation in the background level of these elements in the deep core segments which must be taken into account when the post-Ambrosia patterns for the same elements is interpreted.

When signatures for cores F and T are compared the most important difference is the calcium abundance which is low in lake F and extremely high in core T. This overprints the bedrock geological differences and is due to the calcium carbonate associated with the Barlow-Ojibway sediments. Otherwise the relatively low abundance of Cr,Ni,Cu and V in lake T compared with lake F suggests that the nearby granitic terrain inputs these elements as well as the greenstones. Geochemical signatures for all 20 lakes should be studied as an essential preliminary to further interpretations of the pre-Ambrosia conditions along the sampling strip. The quantification and statistical analysis of geochemical signature lies outside the scope of this report.

In general, we believe that the use of geochemical signature diagrams is an important link in the chain of interpretation of the geochemistry of lake sediments.

E - Vertical distribution of Elements in Lake Sediment Cores

Each element included within the geochemical signature was determined in the 20 sediment core segments from each lake. Vertical plots of this data fall into two groups, one in which the element is of relatively uniform distribution within the whole core and the other in which there is either and increase, or decrease, in content towards the water/sediment inferface. As an example, data for Al and P are plotted on Figure 55. Phosphorus is an element which was found to vary little within a given core. It also has an abundance close to that of its Clarke (Figure 55). Although, there are some relatively slight variations, for example, in core T there is a slight decrease towards the lake bottom. In many ways the data for Al is similar to that for P except that the former is half as abundant as in the earth's crust in three of the cores. In the fourth core (T) there is a lower level of abundance from the lake bottom to the vicinity of the Ambrosia rise and then a gradual increase further down. This suggests, but does not prove, that conditions in the lake were gradually changing (e.g. from basic to acid ?) during pre-Ambrosia time and subsequently the change was reversed. Confirmation of this trend might be obtained from sediment diatom studies to indicate paleo pH of the lake.

The low Al values in core T are paralled by the opposite pattern for Ca (Figure 56). In this case, very high Ca was found in all pre-Ambrosia samples for core T with a decrease subsequently. As in the case of Al and P the Ca content of cores from lakes B,F and M remained almost constant in both pre- and post-Ambrosia time. The content of Mg is relatively high in lakes F (i.e. above basic rocks) and T (as an impurity in the glacially derived carbonates ?) compared with the other two lakes. When the patterns for Fe and Mn are compared (Figure 56) it is seen that these elements are low in lakes located in predominately granitic terrain (i.e. B and M) and high in the lakes in areas underlain by basic rocks. It may be significant that the Fe content of samples in post-Ambrosia samples from lakes F and T are very similar compared to those for manganese where the element increased significantly in lake F and decreased in lake T. These variations may be found statistically significant when the data base for all lakes is examined systematically later on.

Let us now consider vertical distribution patterns for four elements As,Ph,Hg and Zn, which increase in abundance during post-Ambrosia time (Figure 57). The patterns for Hg is interesting because, although the element is relatively uniform in vertical distribution in all four cores (Figure 57), the overall level of this element decreases along the sampling strip from south to north. (Figure 58) It is evident from Figure 58, that there is a regional geochemical gradient for Hg along the sampling strip length of 100 km. Further, the pattern suggests that the increase in the Hg content of the post-Ambrosia sample (open circles on Figure 58) is related to the level of the element in the pre-Ambrosia material and not to fallout from the atmosphere. Thus both pre and post-Ambrosia samples are required to distinguish natural from anthropogenic gradients on the regional scale.

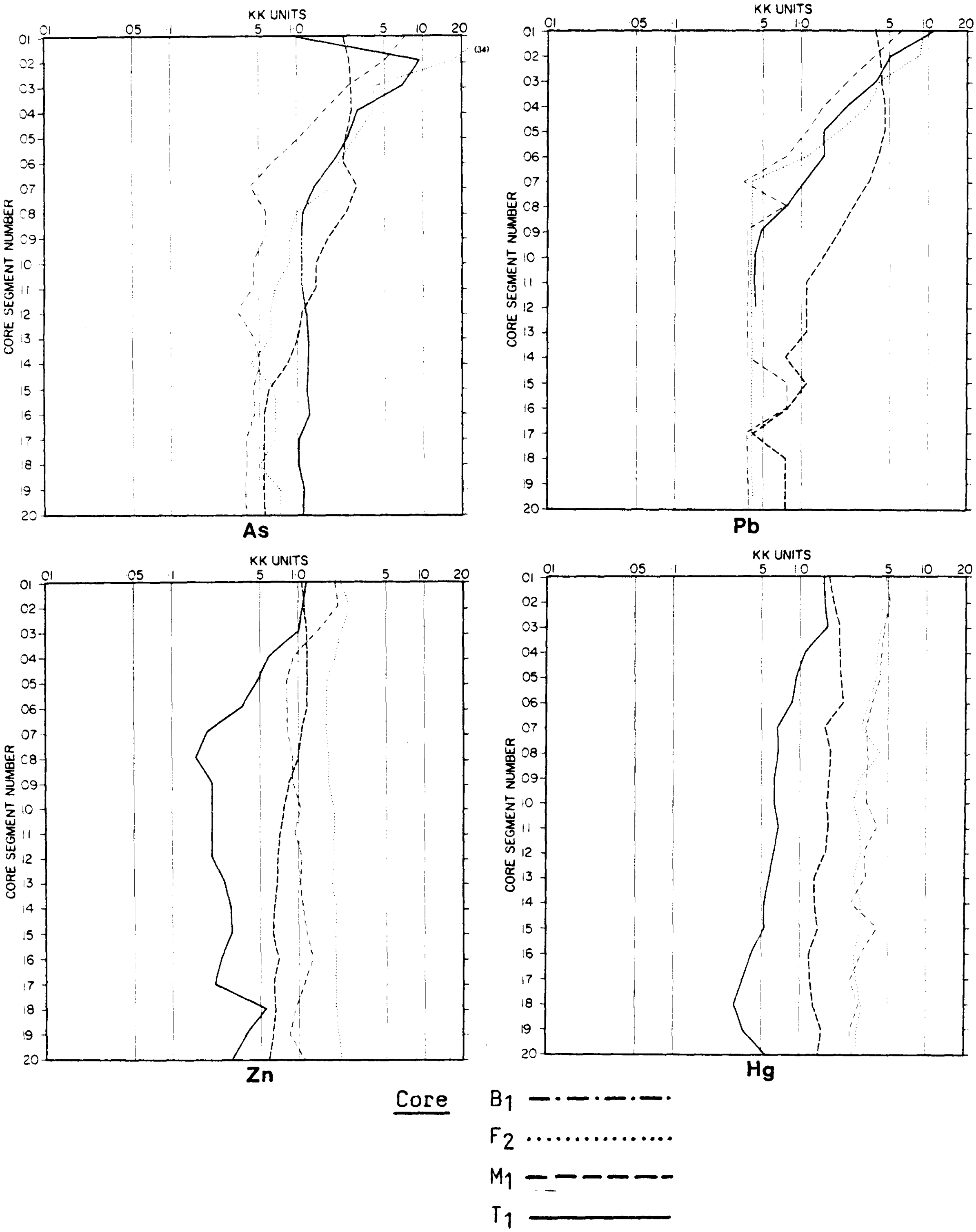


Figure 57 - Vertical distribution patterns for arsenic, lead, zinc and mercury on lake sediment cores B_1, F_2, M_1 and T_1.

The patterns for Zn in the four cores (Figure 57) tend to mimic those for Hg, although, in the case of Zn, the pattern in core T is more complicated and resembles that for Al (Figure 55). When the Zn of pre- and post-Ambrosia samples is examined along the whole sampling strip (Figure 22c) the pattern is seen to be similar to that for Hg, although the slope of the regional gradient is less pronounced. We conclude that

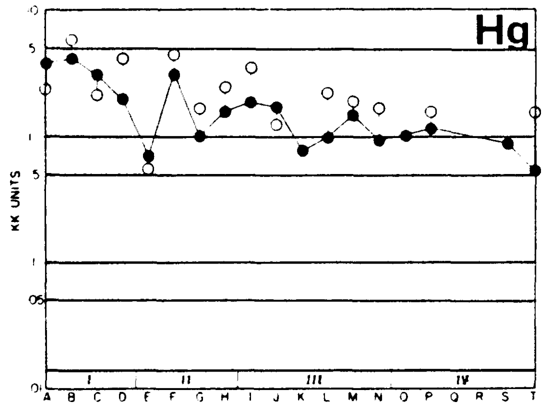


Figure 58 - The abundance of Hg in pre- and post-Ambrosia core segments from each of the 20 lakes in the Wawa sampling strip.

the gradients in the Zn and Hg data are associated with variations in the input of these elements into lakes in both Pre- and Post-Ambrosia time. They are not considered to be due to anthropogenic effects. (see Figures 22c and Figure 58).

The Distribution of Elements in Both Space and Time

The distribution patterns for As and Pb in the 02 and 15 segments of lake sediment cores were plotted on Figure 22c. Inspection of these patterns suggests that the content of these elements has substantially increased in post-Ambrosia time. In general, the abundence of As appears to have been relatively uniform in Pre-Ambrosia time along the sampling strip which is in contrast to Pb which increased slightly from south to north before man's entry into the area.

In order to examine these patterns in more detail a "fingerprint diagram" (Figure 59) was drawn in which the variations in content of As and Pb in space (i.e. along the sampling strip - 100 km) and in time (i.e. down the sediment cores from post-*Ambrosia* to pre-*Ambrosia* time are listed on the same diagram. In order to facilitate interpretation of the data it is divided up into four groups based on bedrock geology as described previously (see Figure 22).

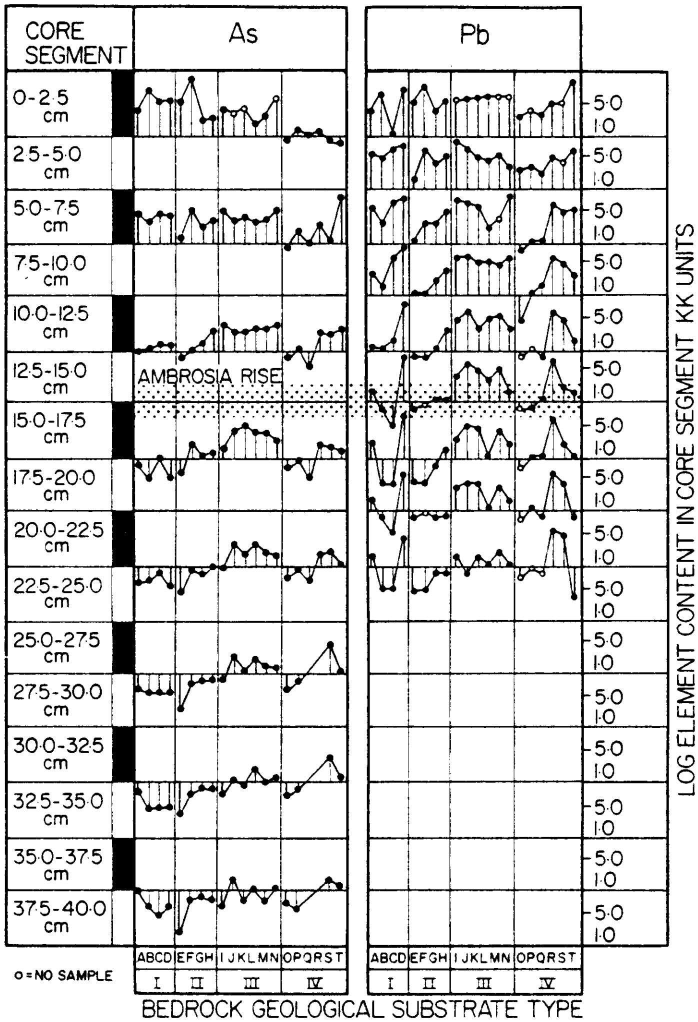


Figure 59 - Fingerprint diagrams for the distribution of As and Pb in the lake sediment cores of the Wawa sampling strip.

The pattern for As on Figure 59 is surprising. During Pre-Ambrosia time the fingerprints for the core segments plotted (i.e. for 5 cm intervals) indicate a gradual increase in As content from the deeper to the more shallow segments. This trend is small in Groups I, II and IV and more marked in the six lakes of Group III. In post-Ambrosia time, the As pattern remains the same in Group I but the content increases dramatically particularly in Lake B. A similar increase was detected in the cores of Group II. In Group III levels of As remained similar to those in the core segments just prior to the Ambrosia rise, whereas, in Group IV the content of As tended to remain the same in both pre- and post-Ambrosia segments with a marked decrease in levels at the top segment, (Figure 59). It is concluded that the As pattern is related to the whole fingerprint diagram and that both pre- and post-Ambrosia lake conditions must be used to explain the variations within one, or all, of the lakes studied.

The fingerprint diagram for lead was drawn using all core segments because the chemical data for Pb was not as complete as that for As. (Figure 59). The Pb content of cores in Group I is reproducible and uniformly low prior to the Ambrosia rise and just after it (Segment 05). It then increases dramatically before decreasing again in the topmost segment. In Group II the level of Pb is seen to be variable in Pre-Ambrosia time and then increases in younger samples. The data for Group III lakes (underlain by granitic rocks) is more variable than that for Groups I or II but the patterns are generally similar and recognizable. (Figure 59). The lakes of Group IV appear to be in two groups with respect to Pb. Lakes O,P and Q are associated with relatively low Pb until the two topmost segments compared with lakes R,S and T which are found to have a consistently higher Pb content in both Pre- and Post-Ambrosia time. This difference may be associated with the increase in glacially derived carbonates in the layer of surficial material.

We conclude that the fingerprint diagram is an excellent means of scanning the abundance of an element within each of 20 sements collected from each of 20 lakes. Experience with As suggests that the patterns for specific elements in pre- and post-Ambrosia time will be detected using data from alternate core segments, and the plot for Pb substantiated this supposition.

The fingerprint diagram focuses attention on the important role of geology in determining the abundance of elements within lake sediments of a given area. It also indicates that inputs of elements vary consistantly within groups of lakes underlain by the same bedrock type.

We conclude that the use of the signature diagrams to locate elements of interest and fingerprint diagrams to indicate both pre- and post-Ambrosia patterns in the data for elements of interest provides a powerful first step towards the description of subtle environmental changes in lakes in the region north of Lake Superior.

INTERPOLATION OF GEOCHEMICAL DATA ON SURFACE WATERS BACK TO THE REGIONAL SCALE (I. Thomson)

Introduction

In this section, an attempt is made to extrapolate back into the regional geochemical data base using information obtained during the follow-up study. The justification for this is seen in the stability and reproducability of the distribution patterns for pH in lake waters between the 1978 reconnaissance and the 1980 follow-up.(Figure 50).

Key Results from the Follow-up Study

The follow-up study has provided field data in support of theoretical and laboratory work which shows that there is a relatively simple relationship between pH, alkalinity and calcium in the lake waters. This is modified by the presence of sulphate in that, at a pH of 6.3 to 6.6, carbonate is displaced by sulphate as the dominant anion in the dilute shield lakes.

The study has further indicated the role of geological substrate in providing carbonate material which gives the alkalinity necessary to buffer lakes at neutral (or slightly alkaline) conditions.

In addition, the follow-up has shown that small headwater lakes tend to be more acid and have less alkalinity than larger lakes lower in a "staircase".

Amongst these findings, the pH/alkalinity/sulphate interrelationship is of most immediate interest because of its relevance to the problems of acid precipitation. Knowledge of areas where alkalinity is low and possibly displaced by sulphate is important since lakes with this characteristic are highly susceptible to acidification; indeed they may already have suffered acidification.

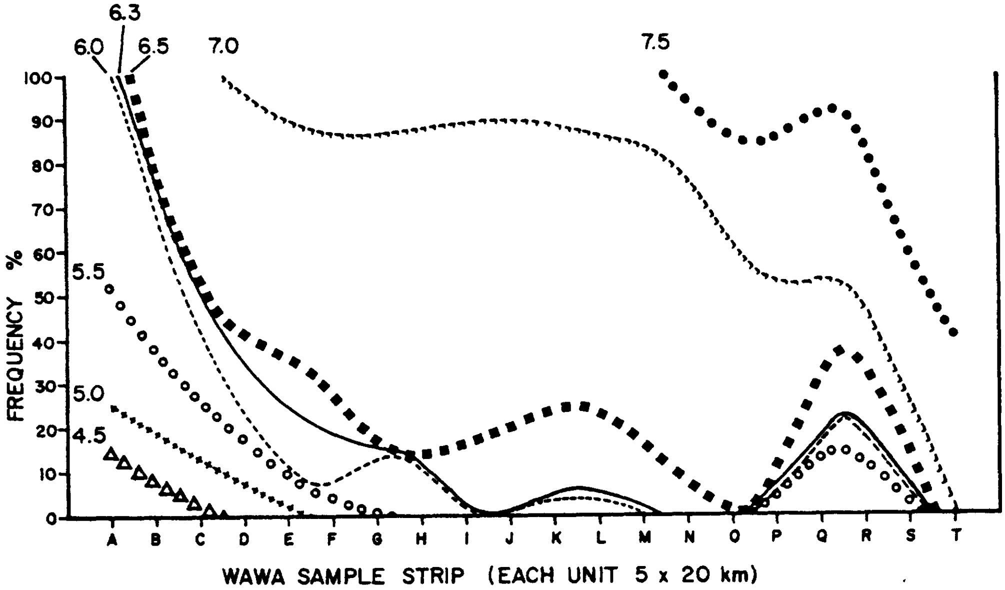


Figure 60 - Frequency of lakes at or below the indicated pH levels along Wawa Sampling Strip.

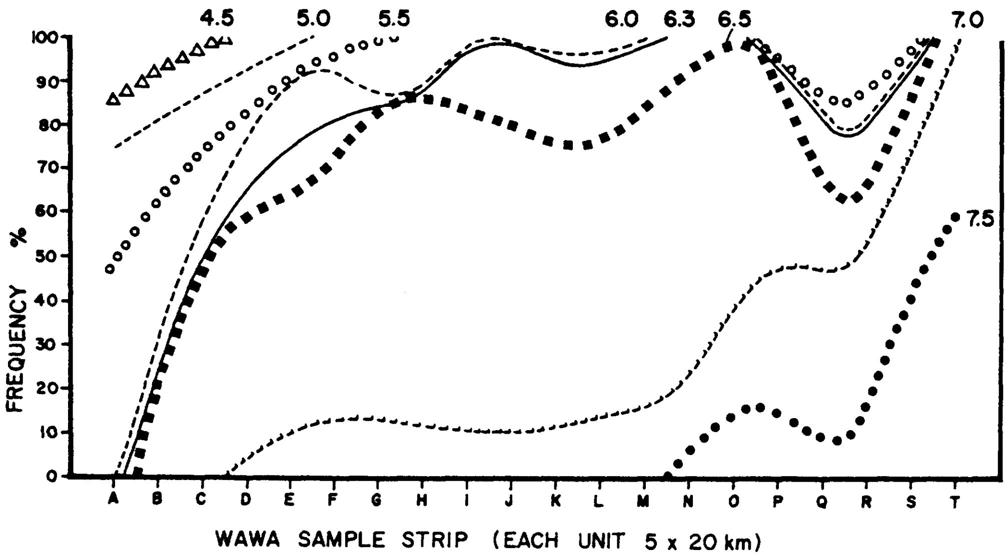


Figure 61 - Frequencey of lakes at or above the indicated pH values along Wawa Sampling Strip.

The Character of the Regional Data Base

Of the critical water parameters, only pH was determined in the (1978) regional survey. However, since the pH/alkalinity/sulphate interrelationship has a critical inflection point at pH 6.3 to 6.6, could this be applied to the regional data?

The regional data base has the following characteristics:

1 - It is based on a grid pattern of sampling.

2 - The lakes are selected for sampling on a random bais controlled by their proximity to the grid network.

3 - There is a bias towards lakes with small catchment areas because of the requirements of the regional geochemical mapping.

4 - The lakes sampled comprise a near random mixture of lakes at different levels in the "staircase" of catchments.

5 - The lakes sampled comprise a near random selection of clear and humic lakes.

The regional data base is thus seen to comprise a near random population representative of all lake types. This variability is probably responsible for the "noise" or scatter in pH values seen in the regional data. Reference to the 1978 survey shows many examples of adjacent lakes on the sample network with different absolute pH values which can be readily attributed to relative position in the "staircase" of lakes within a catchment.

The Working Hypothesis

An alternative approach to interpretation of the data is to recognize that the sample population is near randomly mixed and thus the FREQUENCY with which an event takes place is a significant way of describing the regional character of any part of the data. Thus the frequency of lakes below the critical inflection point of pH 6.3 to 6.6 is descriptive of the increased sensitivity to acidification. Examination of absolute pH values within any area first described on the basis of frequency characteristics may be considered a means of estimating the intensity of acidification.

Application of the Working Hypothesis

This approach was first applied on a trial basis to the Wawa sample strip. The frequency percent of lakes at, or above, and below various pH values was calculated for each 5 km X 20 km segment of the sampling strip (Figures 60 and 61).

A general convergence of information at pH 6.0, 6.3 and 6.5 is noted which separates a large field of more alkaline lakes from a smaller field of more acid lakes. An empirically satisfying optimum is found in the curve at pH 6.3. It is seen that the frequency distribution ranges from 100% below 6.3 over the granite at the southwest end of the stip to 100% above pH 6.3 at the northeast end over the calcareous, carbonate-rich drift.

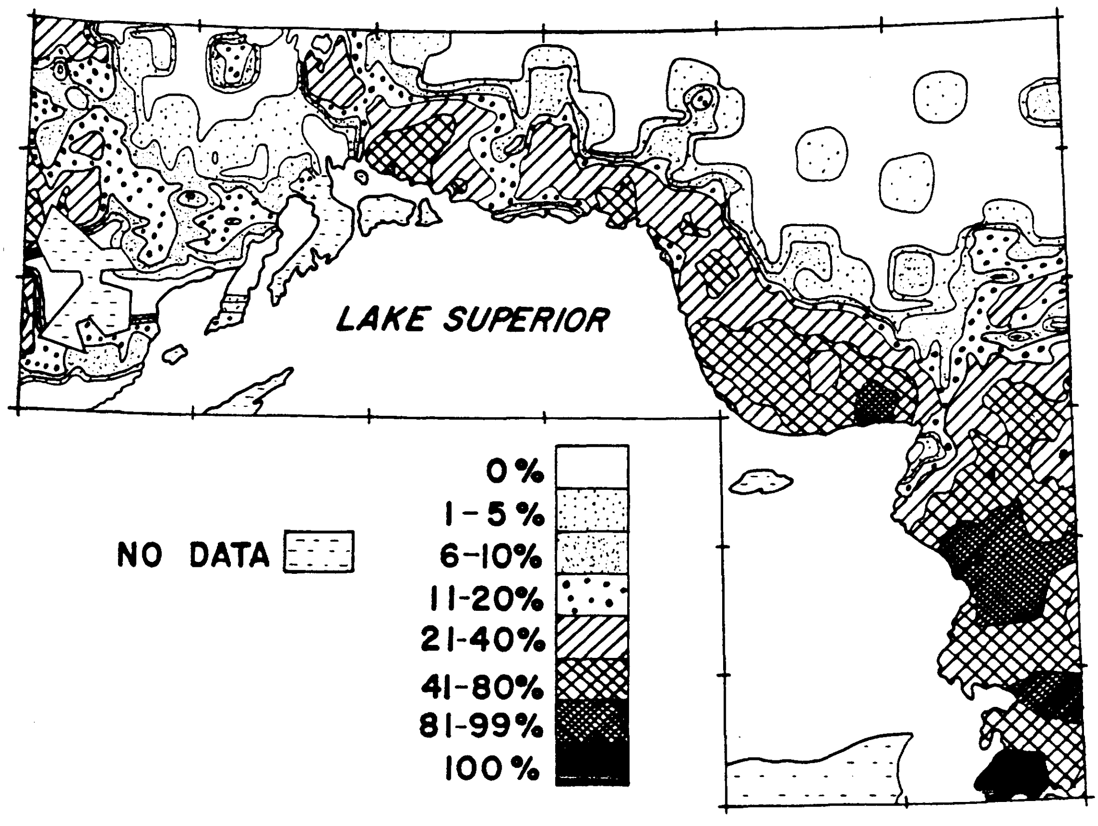


Figure 62 - Frequency of lakes pH 6.3 or below.

In general descriptive terms, it is most interesting to note the similarity in symmetry for the pH 6.3 frequency curve along the sampling strip and the sulphate pattern in the twenty lakes selected for study. (Figure 23). In particular, attention is drawn to the local increase in the frequency of acid (pH 6.3 and below) lakes between 0 and 5 in the same general area where the follow-up revealed increased levels of sulphate in the lakes selected for study. (It should be noted that the follow-up lakes, although enriched in sulphate, all have pH values above 6.3.) This convergence of general chemical distribution patterns appears to further confirm that frequency is indeed a good measure of the regional condition of lake water systems.

The frequency of lakes at or below pH 6.3 was thus determined for the entire regional data base. For this, the frequency of lakes at or below pH 6.3 was computed as a percentage of the total number of lakes within a search area 20 km in diameter. This search area was applied systematically across the region with a 75% overlap between successive search samples. The resulting data were compiled and are presented as a contour plot in Figure 62.

General Descriptive and Evaluation of the Regional Patterns

Examination of Figure 62 reveals numerous small but significant differences between the frequency of acid (pH 6.3 or less) lakes as opposed the absolute pH as shown in Figure 2. The following points are considered most significant at this time:

1 - There is evidence of an increase in the frequency of acid lakes from northwest to southeast around the margin of Lake Superior. This graient shows a general correlation with precipitation (Figure 63) and hence, by inference, exposure to "acid rain".

2 - At the local scale, the highest frequency of acid lakes tends to occur over granitic (felsic igneous) bedrock (Figure 64) where the geology can provide, at best, only minimal quantities of carbonate to lake water systems.

3 - A Local gradient is seen north and east of Sault Ste. Marie with the frequency of acid lakes decreasing with distance from town. It is suggested that this patter may reflect local total, pervasive low level acidification of lakes due to sulphur emissions from the stell mills in the city.

4 - No such clear gradient pattern is noted at Wawa, despite the presence of the sintering plant (a known source of SO_2) with associated fume kill. It is suggested that the availability of carbonate in the greenstone rocks around Wawa provides sufficient buffering capacity to reduce the local impact of sulphur emissions on the lake water systems.

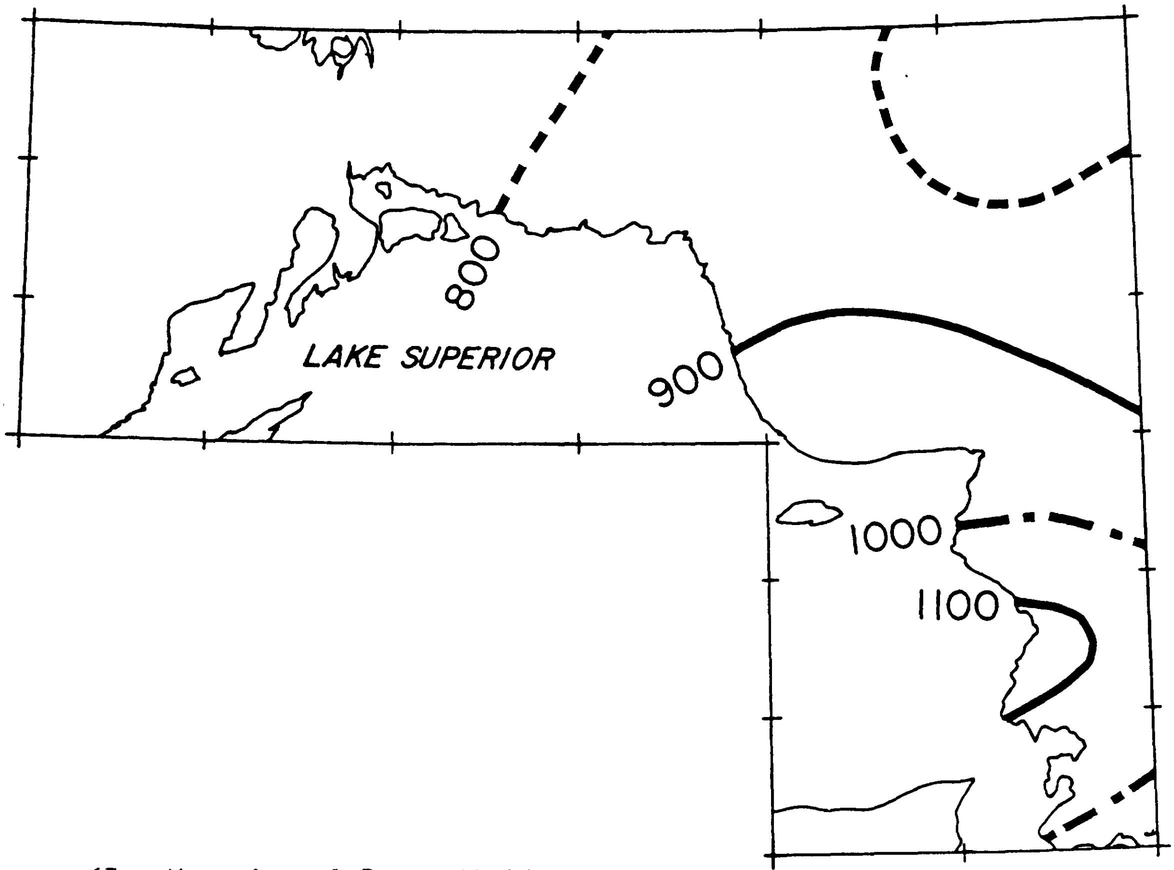


Figure 63 - Mean Annual Precipitation in millimetres.

5 - Large areas along the northern part of the regional survey area are characterized by a low (5% or less) frequency of acid lakes. These areas are underlain largely by calcareous drift in the east and central sections and diabease (a rock type somewhat enriched in Ca and feromagnesium minerals which weather to yield carbonate complexes) in the west. These geological substrates are

considered to provide a high carbonate buffering capacity to the lake water systems. These areas are further characterized by lower annual precipitation rates and hence less exposure to acid rain.

6 - The frequency of acid lakes within the regional survey area is bimodal and positively skewed. The two populations describe dominantly alkaline systems (0 to 5% of lakes pH 6.3 or below) and more dominately acid lake systems (greater than 20% of lakes pH 6.3 or below); the latter population is positively skewed. Using these natural distribution characteristics, it is possible to simplify the data further into alkaline lake water regimes (0 to 5% frequency), acidified lake water regimes (greater than 20% frequency) and transitional regimes (6 to 20% frequency). This information presented in Figure 65.

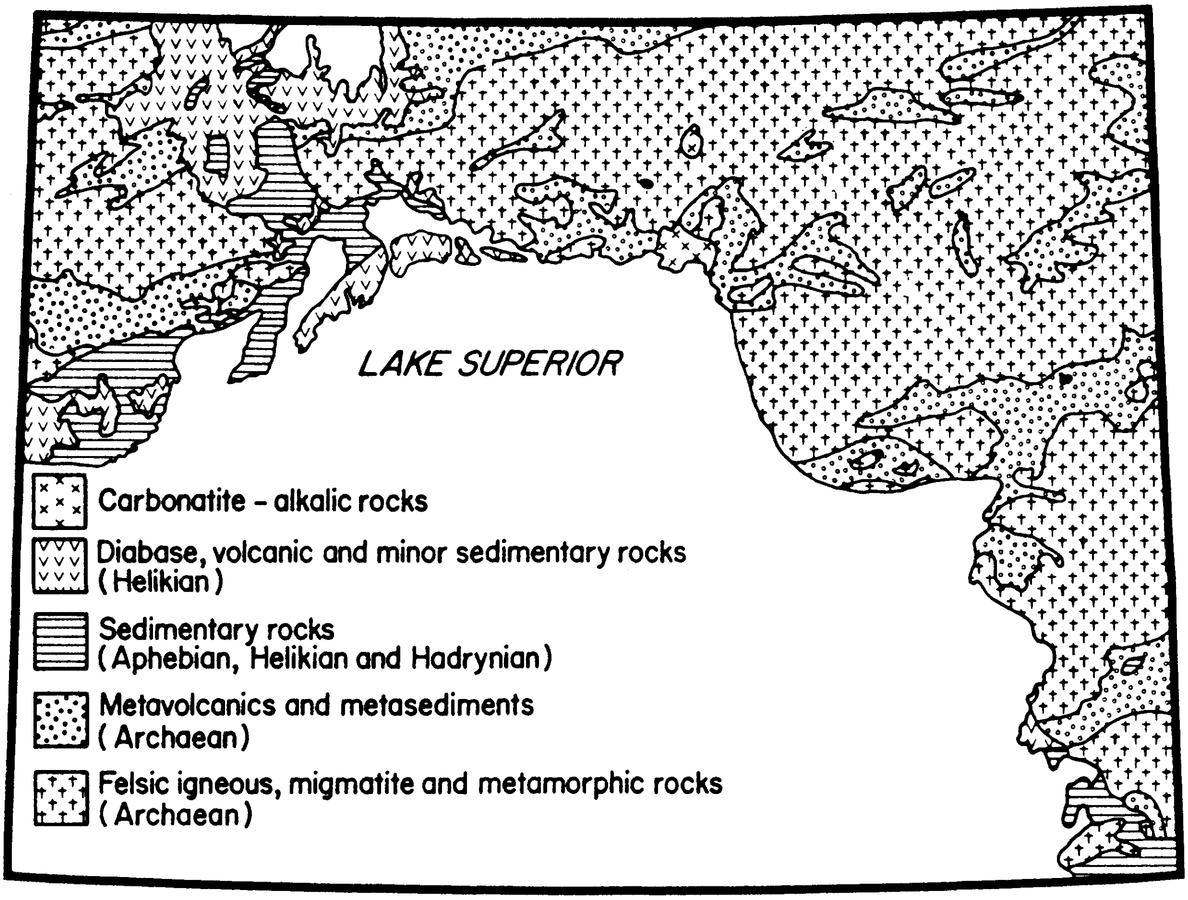


Figure 64 - Sketch Geology

Particular interest lies in the transitional lake water regimes. For much of the area north of Lake Superior, the transitional area is a narrow strip marking the boundary between acidified and alkaline regimes and appears to be controlled by the contact between contrasting geological substrates (the limits of calcareous drift and diabase). HOwever, two large areas of transitional lakes are noted when a strong local control is anticipated: 1) a large area north of Thunder Bay, underlain by greenstones and felsic igneous rocks, b) an area north of Wawa. Further consideration is given to the area north of Wawa.

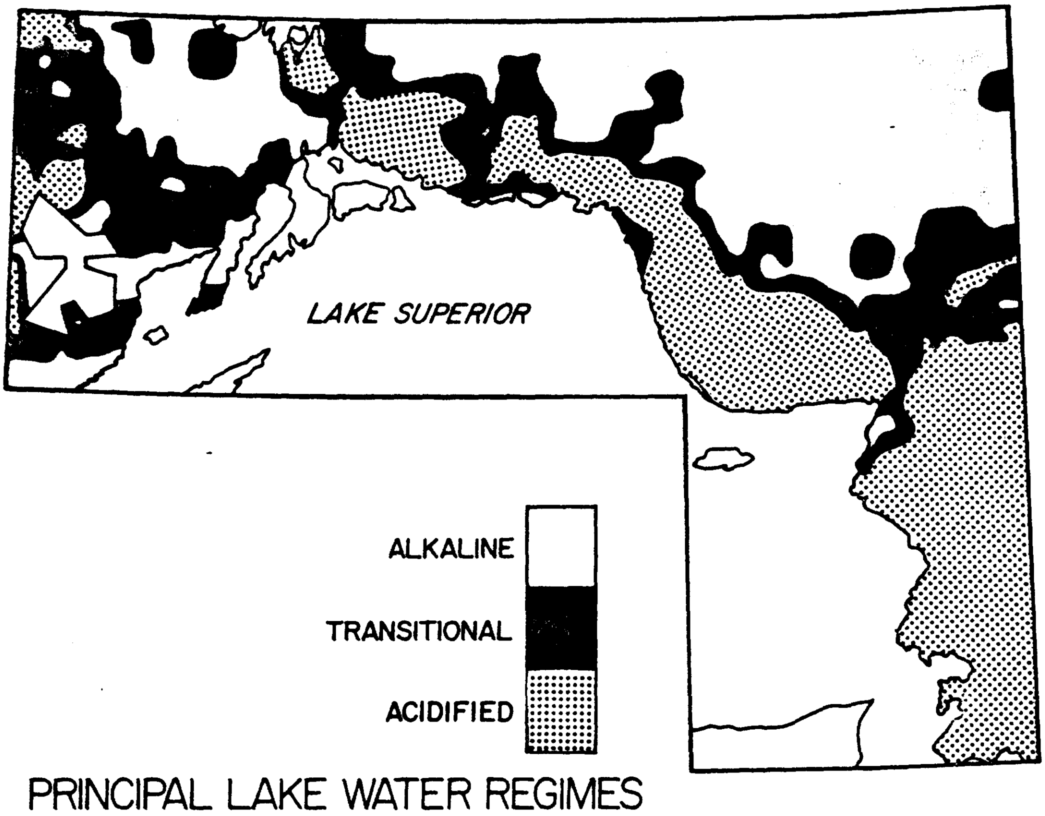


Figure 65 - Principal lake water regimes.

The area of transitional lakes north of Wawa extends southwest-northeast cross-cutting the precipitation pattern and extending into the areas of known "claybelt" country and other calcareous drift cover. The area is, however, down-wind of the Wawa smelter and it is suspected that this area is influenced by the strong local source of sulphur emissions from the sinter plant which overprint the regional pattern.

It is noted that the Wawa follow up strip encroaches on this area of transitional lakes between segments O and S, exactly the section in which high sulphate was recorded in the lakes sampled in detail. This is seen as final confirmation of the strength of the empirical interpolation between the follow up and regional survey data sets.

Conclusion

It is indeed possible to re-evaluate the regional lake water pH in the light of findings made during the follow up study. This is achieved using a working hypothesis based on the character of the regional data base and key indicators found in the follow up. The frequency of lakes at or below the critical pH of 6.3 is used to reclassify the regional data. The resulting map is found to be empirically satisfying, providing a readily interpreted descriptive representation of the condition of lake water systems across the area. A fair measure of complexity is recognized with local features related to the influence of both geological substrate and discrete pollution sources. The frequency map is seen to be subtly, but significantly different from that produced using absolute pH values.

It is concluded that this approach provides a reasonable first approximation of the regional characteristics of lake water systems. It is realized that the procedure is essentially descriptive, and relatively lacking in an absolute quantifiable sense. However, the patterns produced are strong, coherent, interpretable and apparently verifiable.

It is recommended that further consideration be given to the suitability and efficiency of this procedure and that follow up work be carried out to verify the nature of the lake water regimes so identified.

GENERAL CONCLUSIONS

WATER CHEMISTRY AND LIMNOLOGY

1 - The pH gradient pattern in surface waters of the 20 Wawa lakes is stable and verifiable from year to year. This is in spite of the fact that pH observations within a series of 20 lakes may differ as much as 0.5 pH unit between 1978 and 1980. (Figure 50).

We conclude that the measurement of pH in waters used in regional geochemical surveying provides an adequate foundation for the discussion of pH patterns on a regional scale.

2 - The lowest pH values occur in dilute poorly buffered soft water lakes with extremely low alkalinities (less than 10 mg/1 $CaCO_3$) developed on granitic bedrock. The highest pH values occur in well buffered hard water lakes with very high alkalinities (greater than 100 mg/1 $CaCO_3$) developed on a substrata of calcareous drift.(Figure 19 and Figure 23)

3 - A statistically significant interrelationship was found between the pH of surface lake waters, the elevation of the lake surface and the area of the lake. Small lakes at relatively high elevations tend to have the lowest pH within a given area. These tend to be the headwater lakes of individual catchment systems.

4 - Theoretical considerations suggest that in lake waters below a pH of 6.3-6.6 the dominant anion shifts from HCO_3 to SO_4. This shift is accompanied by a decrease in alkalinity. A study of lake water chemistry in the 20 Wawa lakes chosen to include a pH gradient provides support for this supposition, because a decrease in pH of surface waters is accompanied by an increase in SO_4. (Figure 23)

5 - It is concluded that low pH (i.e. softwater) lakes are of two types. One type is characterized by a brown colour due to humic materials in the waters and the other is clear. Information from one clear lake (lake B) suggests that lakes of this type are more easily acidified (by acid precipitation) than the brown humic lakes.

6 - Preliminary close study of diatoms in the 20 lakes along the pH gradient revealed a significant correlation between pH measured in waters in 1980 and inferred pH based on diatom abundance. (Figure 48). This is seen to offer a theroetical basis for a paleo pH index to measure pH in lake sediment cores and preliminary research along these lines in lakes B,F and T was completed successfully. (Figure 49)

7 - Extrapolation of pH data obtained during the followup study back to the regional scale (1978 data) indicated that strong, coherent and interpretable patterns exist in the data which are apparently verifiable from year to year. We conclude that these patterns may be used as a reliable guide to the condition of the lake water system in relation to the problem of acid precipiation. (Figure 65)

GENERAL CONCLUSIONS

REGIONAL GEOCHEMISTRY AND LAKE SEDIMENT CORES

1 - Regional geochemical patterns for chemical elements in lake sediments collected in 1978 and 1980 were stable and verifiable (Figure 51). This is significant because the sampling method and location of sampling points within a given lake were different in 1978 compared with 1980.

2 - Palynological investigations confirmed that the Ambrosia rise could be detected in all sediment cores investigated from the Wawa lakes. It is assumed that in the Wawa area the Ambrosia rise is associated with the time period 1850-1890. More detailed palynological data combined with wet and dry weight data on cores segments and the results from the loss on ignition test indicate that the sedimentation rate in the lakes has not varied in post-Ambrosia time compared to older parts of the cores. (Part II Lake section page 9, Figure 53).

3 - Vertical distribution patterns for most chemical elements studied in the lake sediment cores were found to be relatively uniform from lake bottom to a depth of 50 cm. Exceptions were As,Pb,Hg and Zn which increased significantly in the topmost (ie.e post Ambrosia) parts of the cores. (Figure 57) Consequently, these elements were selected to be of greatest interest with respect to possible anthropogenic effects including acid precipitation. However detailed exampination of the distribution patterns for arsenic and lead in all 20 study lake cores (using "fingerprint" diagrams Figure 59) suggest a natural rather than an anthropogenic explanation for these patterns.

4 - Study of the lake sediment cores using 2.5 cm segments indicated that this approach was too general for the detection of subtle changes in lake sediments during the last 50 years due to acid rain. We conclude that a two stage approach is required 1) to collect undistrubed lake sediment cores in order to discover if conditions are suitable for detailed study (i.e. the presence of layers, or varves in the cores) and 2) a more detailed approach which would allow for study of individual varves.

5 - We conclude that for the purposes of regional geochemical surveying for environmental purposes it is essential to use cores for sampling and study a surface (i.e. Post-Ambrosia) and a subsurface (i.e. Pre-Ambrosia) lake sediment core segment in each core. This is because each lake was found to have a unique "geochemical signature" involving the abundance of both major and minor elements. (Figure 54) Such a signature would be established on the basis of the deep sample and modifications in Post-Ambrosia time would then be apparent.

RECOMMENDATIONS

1 - That a further followup investigation be completed during the summer of 1981 in the region north and east of Lake Superior. This investigation will be based on small, high elevation lakes and be undertaken to focus attention on Post-Ambrosia sediment in relation to limnological conditions. This research would include study of pH/diatom relationships, particularly in relation to ^{137}Cs and ^{210}Pb dating of the upper 30cm of the sediment column. Deep cores would be obtained for combined palynological and geochemical study to discover if the pH of lakes has changed naturally during relatively long periods of Pre-Ambrosia time.

2 - That in future regional geochemical surveys based on lake sediments should involve the routine collection of 50 cm lake sediment cores and that at least one surface and one Pre-Ambrosia (i.e. 35-45 cm deep) core segment be used for chemical analysis. The chemical analysis should include Loss on Ignition and the determination of sufficient elements to obtain a reliable geochemical signature for each lake. The elements As,Pb,Zn NS Hg should be determined in all core samples. This will require the establishment of a new sample collection, storage and processing methods.

3 - In the future, regional geochemical surveys should involve the collection of surface water samples in duplicate. One sample to be used for water chemistry and the other to be stor d for use in biological studies later on. The colour and Secchi depth of all lakes sampled should always be recorded always. Chemical analysis of lakes waters should include determination of alkalinity, Ca, Mg and sulphate in addition to pH.

4 - We recommend that an orientation geochemical survey be carried out in any region selected for regional geochemical surveying. The information from the orientation survey would be used as a basis for finalization of the survey technique to suit local conditions.

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Ministry of Natural Resources
Ontario

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W.T. Foster
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ONTARIO GEOLOGICAL SURVEY

Open File Report 5342

Part II

Information and Data Listings for Lakes Studied

MULTIDISCIPLINARY FOLLOWUP OF REGIONAL pH PATTERNS IN LAKES NORTH OF LAKE SUPERIOR

DISTRICT OF ALGOMA

by

J.A.C. Fortescue, I. Thomson,
M. Dickman, and J. Terasmae

1981

Fortescue, J.A.C., I. Thomson, M. Dickman and J. Terasmae

1981: Multidisciplinary Followup of Regional pH Patterns in Lakes North of Lake Superior, District of Algoma, Ontario Geological Survey OFR 5342 Part II, Information and Data Listings for Lakes Studied, 366 p.

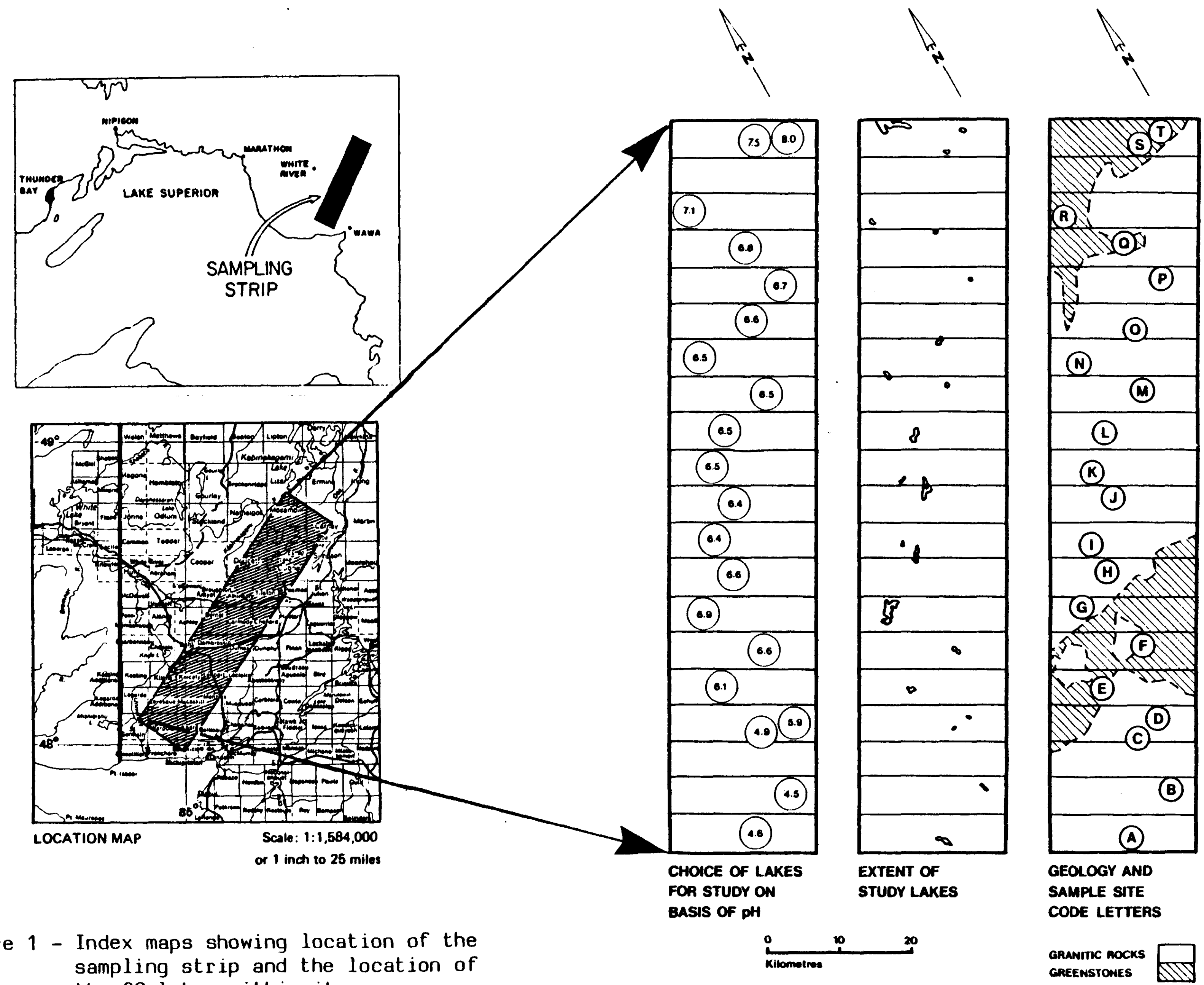

Figure 1 - Index maps showing location of the sampling strip and the location of the 20 lakes within it.

INTRODUCTION

Part II contains information and data listings for geographical, geological, limnological, palynogical and geochemical observations made on 20 lakes studied during the 1980 followup to the north of Lake Superior (Figure 1). Field observations were collected during the period June 9th-21st 1980 and laboratory and data processing activities were completed by mid March 1981. The lakes were selected for study of a pH gradient from pH 4.6 to 8.0 on the basis of data obtained from a regional geochemical survey of the area to the north of Lake Superior during 1978 (O.G.S. Open File No. 5265 and 5266) (Figure 1).

Full details of the multidisciplinary followup study are described in Part I of this report. Part III is planned to include a statistical analysis of the lake sediment core geochemistry combined with other observations taken from this data base.

In this data file all the information obtained from a lake is included in a separate section. All the sections are organized according to the following plan:-

Page	Type of Information
A*- 1	Code Letter (see Figure 1) and pH of lake surface waters (1980).
A - 2	General setting of lake including a photograph and description.
A - 3	Geological/Geographical information concerning lake and basin.
A - 4	Listing of the lake microbiota in lake plankton and sediment.
A - 5	General limnological description of the lake.
A - 6	Listing of the lake water chemistry data.
A - 7	Plot of the lake water chemistry data.
A - 8	Pollen diagram for lake sediment core.
A - 9	Palynology notes and *Ambrosia* rise diagram.
A - 10 to A - 17	Lake sediment core geochemical data (in ppm and KK units)

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* Letter denotes lake "A" code as a example other lakes have similar code (see Figure 1)

THE MULTIDISCIPLINARY TEAM

The Wawa multidisciplinary followup study was designed by J.A.C. Fortescue in response to a request by Dr. I. Thomson, Chief Geochemist, Ontario Geological Survey,which was made in May 1980. The fieldwork was completed by a team including Dr. Thomson, Professors M. Dickman and J. Terasmae (of Brock University, St. Catharines, Ontario) and J.A.C. Fortescue. During the winter of 1980-81, detailed biological analysis of the sample material was carried out at Brock University under the direction of Professor Dickman. Earlier, in the fall of 1980 subsampling and processing of the lake sediment cores for palynological analysis was completed at Brock University under the direction of Professor Terasmae. The same lake sediment core subsamples were used for chemical analysis carried out for the Ontario Geological Survey under contract by Barringer Research of Rexdale, during the winter of 1980-81. Additional data processing of the geochemical data was completed under contract by Mr. R. Frame. The compilation of Part II of the report was completed largely by Mr. D. Wadge and drafting of the figures was carried out by Anna M. Duic.

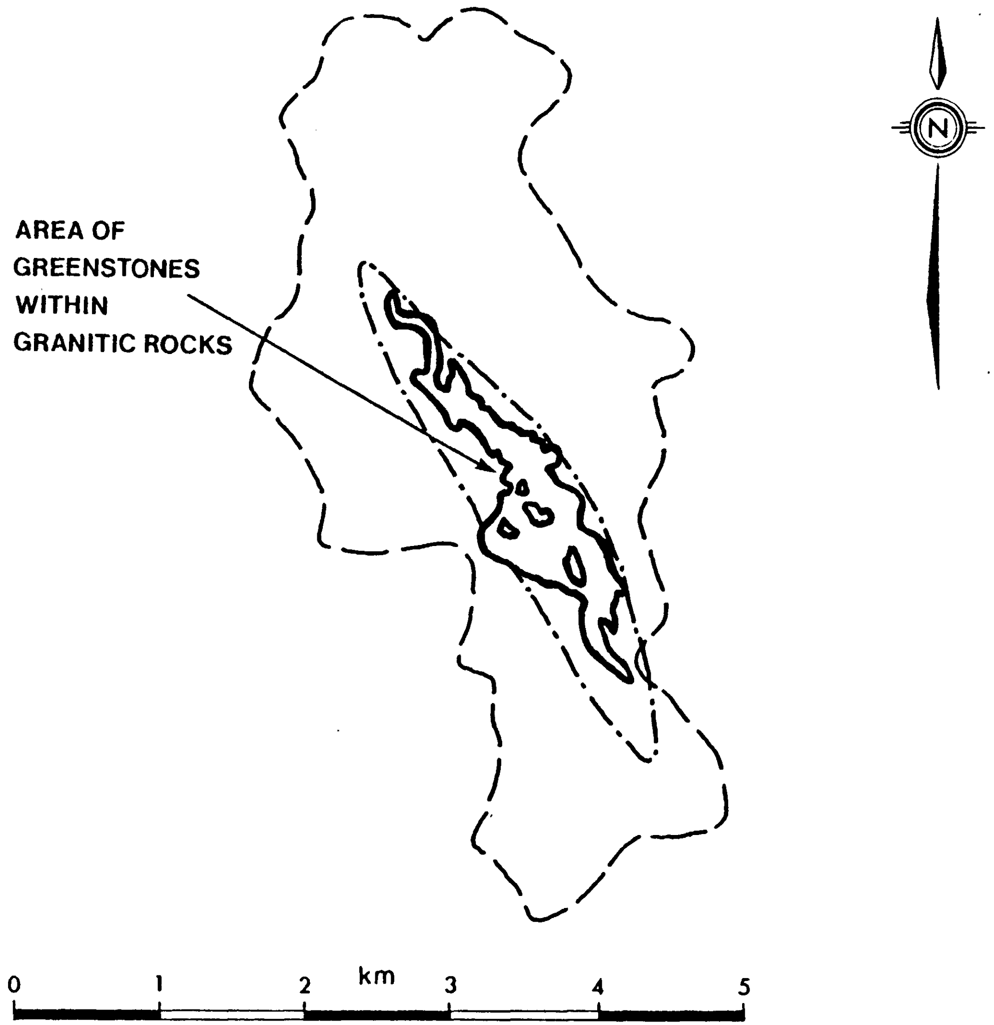
Lake A pH 5·0

GENERAL SETTING

A - 2

GENERAL DESCRIPTION

Lake A is a rock basin and its morphometry is controlled by bedrock structure that trends northwest. It is characterised by a deep trough (>15m) along the east side, and by rock islands and bouldery bottom in the shallow southwestern part. Some muskeg occurs at the north and south ends of the lake and in bays along the west side. Surficial deposits of sand, gravel and till are discontinuous in the rather small watershed of this lake.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-639636/5321138
Elevation of lake above sea level	416 m (1385 ft)
Lake depth at sampling point	11 m
Lake area	.8 sq km
Lake catchment area	10 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	4
Distance from south end of sampling strip	8 km

GEOLOGICAL / GEOGRAPHICAL INFORMATION

LAKE MICROBIOTA

A - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME	DENSITY (No./l)
	Holopedium gibberum	0.3
	Bosmina longirostris	0.9
	Total	1.2

COPEPODS	SPECIES NAME	DENSITY (No./l)
	Cyclops bicuspidatus copepodite	2.6
	Diaptomus minutus	0.7
	Mesocyclops edax	0.9
	Total	4.2

ROTIFERS	SPECIES NAME	DENSITY (No./l)
	Asplanchna preodonta	0.6
	Kellicotia longispina	0.1
	Polyarthra vulgaris	3.8
	Total	4.5

CYANOPHYTA	SPECIES NAME	ABUNDANCE*
	Chroococcus sp.	2
	Microcystis flos aquae	2
	(average)	(2)

BACILLARIOPHYTA	SPECIES NAME	ABUNDANCE
	Asterionella formosa	2
	Melosira sp.	4
	Tabellaria fenestrata	4
	Tabellaria floculosa	2
	(average)	(3)

CHRYSOPHYTA	SPECIES NAME	ABUNDANCE
	Dinobryon sertularia	5
	Mallomonas pseudocoronata	4
	Dinobryon bavaricum	5
	Schizochlamys sp.	2
	(average)	(5)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Semiorbis hemicyclus	16	5	2.9
Cyclotella stelligera	41	4	7.5
Eunotia pectinalis var minor	9	3	1.6
Tabellaria fenestrata	159	4	29.1
Navicula capitata var hungarica	6	2	1.1
Synedra tenera	11	**	2.0
Cyclotella glomerata	42	4	7.7
Eunotia curvata	8	3	1.5
Eunotia tenella	6	3	1.1
Nedium iridis var ampliatum	1	4	.18
Cyclotella comta	17	2	3.1
Tabellaria binalis	15	5	2.7
Fragilaria construens	31	2	5.7
Frustulia rhomboides	11	3	2.0
Fragilaria constricta	15	3	2.7
Eunotia pectinalis	13	3	2.4
Frustulia rhomboides var saxonica	17	3	3.1
Nedium iridis var amphigomphus	1	4	.18
Surirella linearis	1	4	.18
Cymbella minuta var silesica	7	4	1.3
Eunotia fugutiva	1	3	.18
Melosira islandica	44	2	8.0
Navicula cf inflexa	1		.18
Eunotia serra	7	2	1.3
Pinnularia rupestris	3		.55
Pinnularia abaujensis var subundulata	4		.73
Navicula halophica	10		1.8
Eunotia bidentula	2	3	.37
Eunotia sudetica	8	3	1.5
Navicula radiosa var tenella	3		.55
Navicula pupula var capitata	6		1.1
Caloneis sp	1	2	.18
Eunotia ovata	8		1.5
Pinnularia mesolepta	2		.37
Stauroneis anceps	2		.37
Actinella punctata	4		.73
Melosira distans	11	3	2.
Pinnularia biceps	1		.18
Gomphonema angustatum	1	2	.18

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

** Blanks indicate species which had no published autecological information regarding their pH preferences.

The thermocline in Lake A, defined as that depth at which there is more than a one degree centigrade drop in temperature per metre, was deeper (7m) than in any of the other study lakes, with the single exception of Lake F (thermocline at 8m). A deep thermocline is indicative of strong wind mixing and a long fetch.

The dissolved oxygen concentration (58% saturation) was the fourth lowest of the 20 study lakes. The temperature-corrected specific conductivity (22-27 micromhos/cm) was among the lowest. Alkalinity (34.8 micro-equivalents/l), calcium (1.5mg/l), and pH (5.0) were all low as well.

The Secchi transparency for the Wawa study lakes should be viewed as a relative measure of lake clarity and should not be compared with Secchi readings taken from other lakes. This is because Secchi transparency taken from a helicopter is misleading due to the high albedo resulting from propeller-induced water turbulence. The Lake A Secchi value of 3m ± 0.5m was typical of the study lakes. Lakes exceeding this value were typically quite oligotrophic, and those significantly below this value were frequently fairly humic.

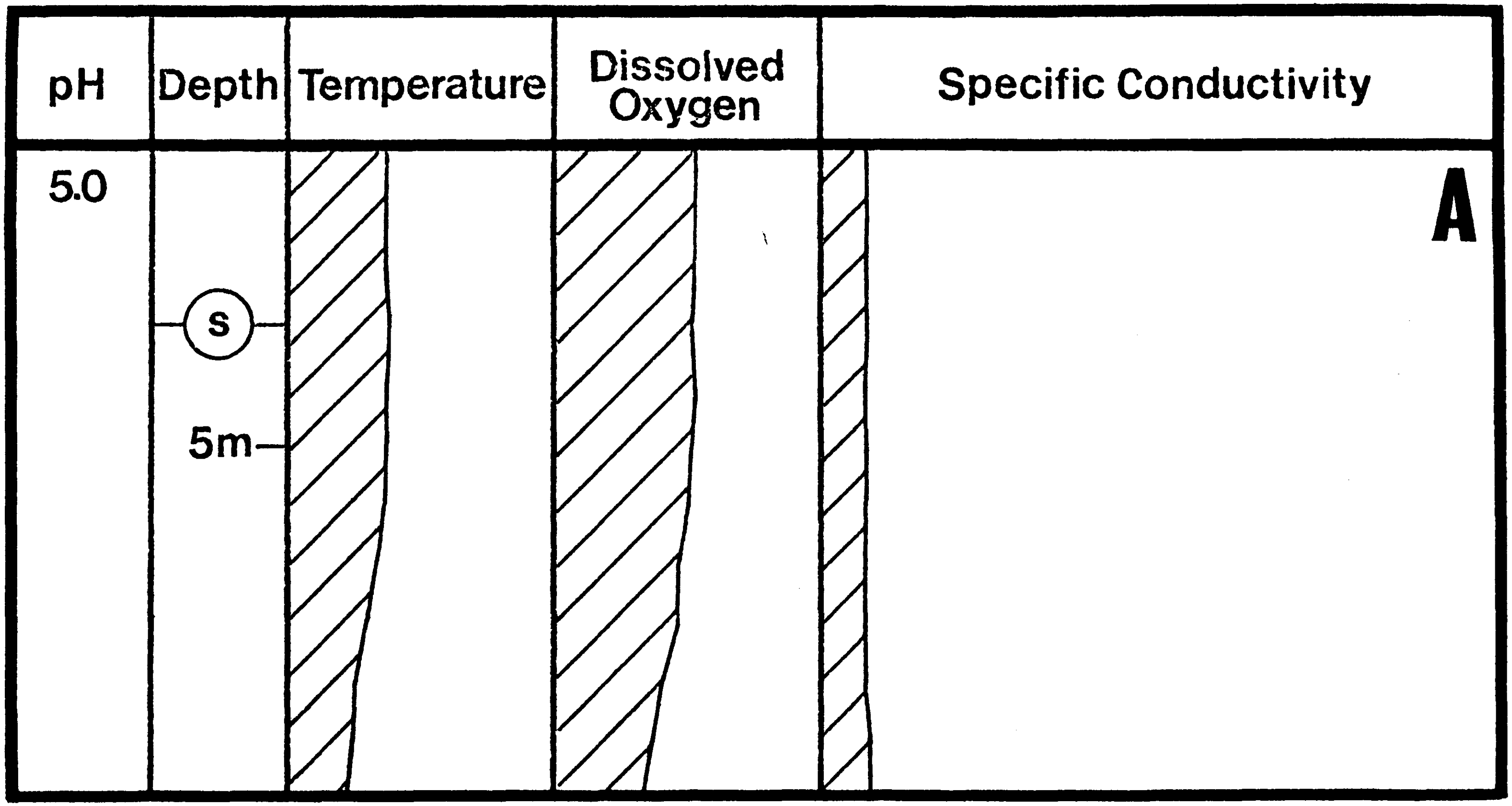
Three of the lakes (A, F, and G) were studied by Natural Resources fisheries personnel. Lake A, which is known as Marjorie Lake, had no fish. (Minnows and larval fishes were not censused, however.) The lack of fish may be explained by the low pH and the associated high loss of heavy metals from the lake's sediment to the water column.

DETAILS OF LAKE WATER CHEMISTRY

A - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity * (Micromhos/cm)
0		12.5	100	25
1		12.6	100	25
2		12.7	100	25
3	3.0	12.7	97	23
4		12.3	93	22
5		12.3	91	22
6		12.2	90	22
7		11.1	85	22
8		9.8	84	22
9		7.9	75	23
10		7.7	67	26
11		7.4	58	27

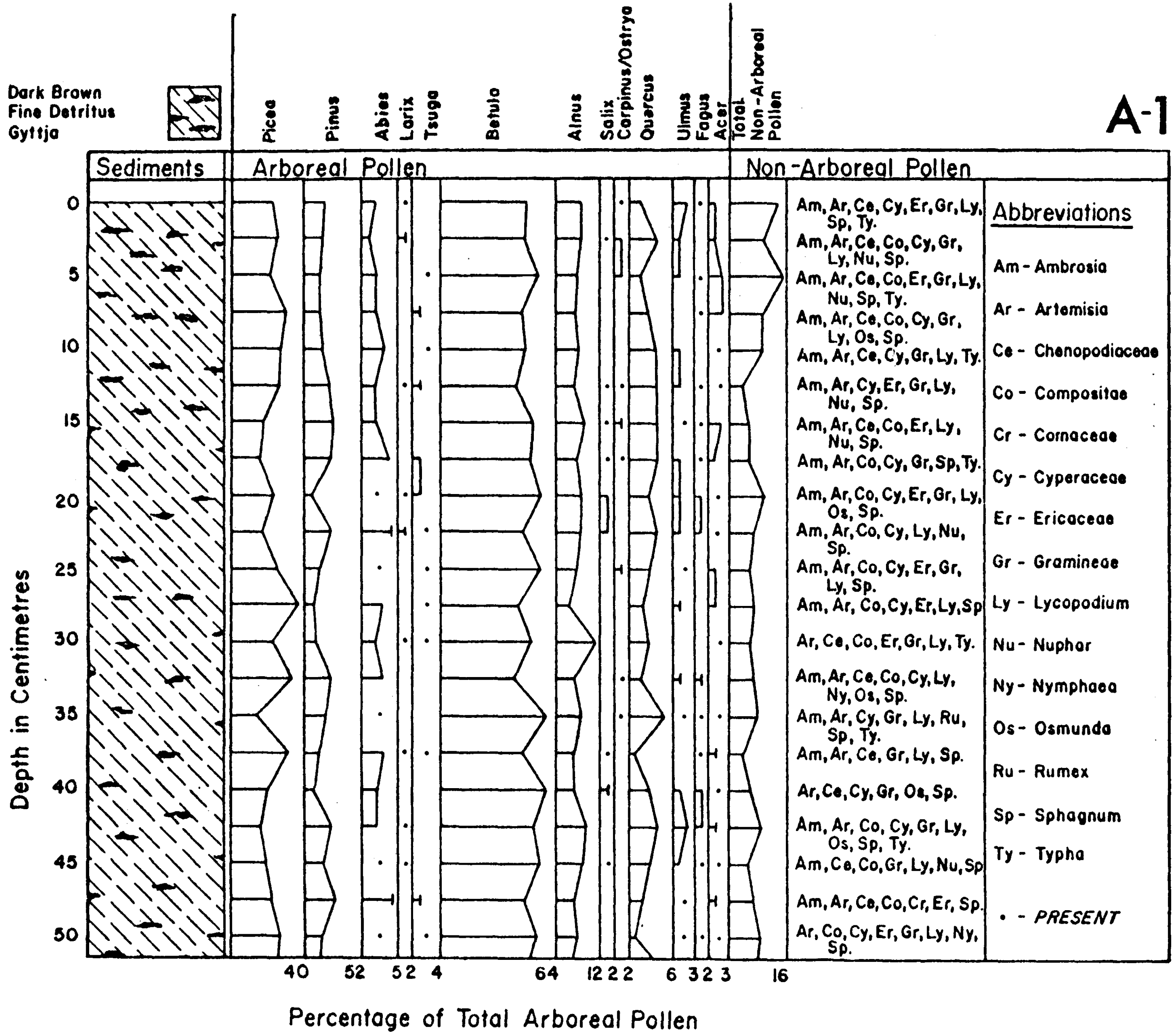
*Specific conductivity data are temperature-corrected (25° C).



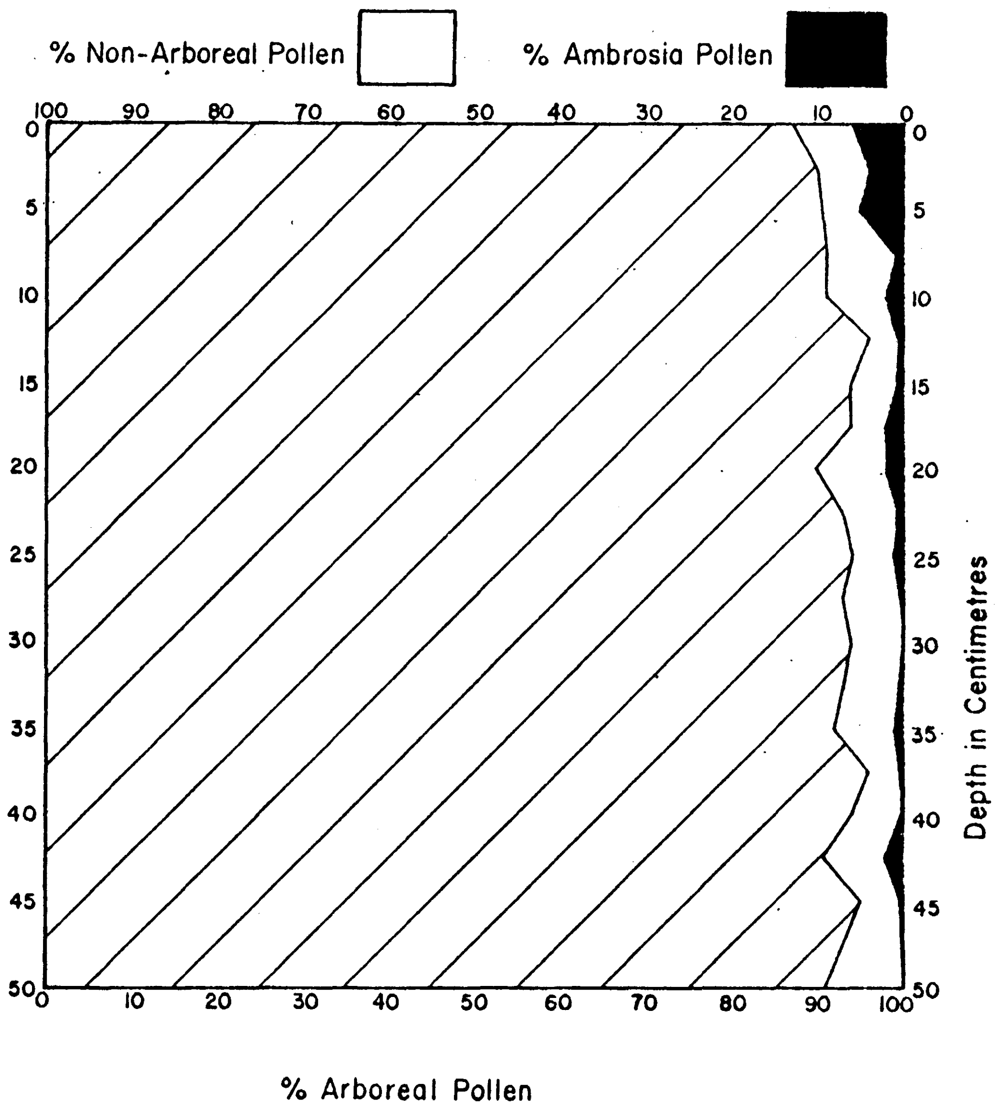
LAKE WATER CHEMISTRY PLOT

A - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE



Pollen percentages reflect rather well the forest surrounding the lake. The relatively high amount of birch pollen probably is due to frequent fires. The small component of oak (Quercus), elm (Ulmus), and beech (Fagus) indicates the presence of "southern" pollen from distant sources. The lack of any significant stratigraphic changes of arboreal pollen is most likely due to some mixing of the soft gyttja sediment. This can also explain the indistinct rise of Ambrosia pollen percentage.



 PALYNOLOGY NOTES

AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
A - 1 - 1	27020.	6913.	94.	4110.	3840.	2226.	7343.	1552.	935.	42.
A - 1 - 2	28590.	7256.	94.	4350.	4070.	2332.	7847.	1625.	954.	42.
A - 1 - 3	29100.	7229.	95.	4500.	4280.	2353.	7840.	1585.	978.	42.
A - 1 - 4	31010.	7363.	98.	4520.	4290.	2495.	8152.	1784.	989.	41.
A - 1 - 5	34450.	7380.	106.	4750.	4490.	2590.	8069.	1912.	1053.	45.
A - 1 - 6	34090.	7279.	104.	4820.	4930.	2606.	7954.	1875.	1047.	48.
A - 1 - 7	33520.	7262.	102.	4800.	4840.	2648.	7854.	1860.	1065.	47.
A - 1 - 8	33380.	7543.	104.	4570.	3750.	2691.	8030.	1899.	1089.	36.
A - 1 - 9	34950.	7637.	108.	4840.	4800.	2632.	8293.	1956.	1076.	45.
A - 1 - 10	34320.	7415.	104.	4740.	4850.	2514.	7830.	1884.	1024.	48.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
A - 2 - 1	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 2	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 3	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 4	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 5	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 6	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 7	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 8	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 9	******	******	*****	******	******	******	******	******	*****	****
A - 2 - 10	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
A - 1 - 11	32160.	7040.	102.	4050.	3960.	2369.	7636.	1788.	929.	38.
A - 1 - 12	31700.	6870.	105.	4060.	4210.	2319.	7582.	1747.	935.	40.
A - 1 - 13	29440.	7023.	112.	4310.	4370.	2440.	7374.	1749.	1002.	41.
A - 1 - 14	33530.	7313.	117.	4380.	4500.	2497.	8038.	1771.	1020.	43.
A - 1 - 15	34170.	7791.	123.	4270.	3600.	2651.	8323.	1868.	1066.	39.
A - 1 - 16	32840.	7518.	119.	4290.	3890.	2519.	7767.	1733.	1016.	39.
A - 1 - 17	33730.	7672.	126.	4460.	4270.	2624.	8300.	1767.	1042.	42.
A - 1 - 18	31060.	7202.	127.	4160.	3960.	2382.	7986.	1761.	965.	39.
A - 1 - 19	30060.	7040.	128.	3990.	3840.	2313.	8038.	1725.	927.	37.
A - 1 - 20	31850.	7518.	134.	4090.	3700.	2410.	8492.	1855.	986.	36.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
A - 1 - 1	23.74	1.75	48.4	A - 2 - 1	*****	*****	****	A - 1 - 11	26.70	2.83	48.7
A - 1 - 2	30.92	3.06	45.8	A - 2 - 2	*****	*****	****	A - 1 - 12	30.33	3.30	46.9
A - 1 - 3	18.77	2.21	45.0	A - 2 - 3	*****	*****	****	A - 1 - 13	27.15	2.69	47.8
A - 1 - 4	26.76	2.45	47.1	A - 2 - 4	*****	*****	****	A - 1 - 14	24.64	2.40	49.8
A - 1 - 5	28.19	2.86	45.8	A - 2 - 5	*****	*****	****	A - 1 - 15	28.54	2.89	46.9
A - 1 - 6	27.29	2.31	43.2	A - 2 - 6	*****	*****	****	A - 1 - 16	21.27	2.16	52.6
A - 1 - 7	25.09	2.34	45.6	A - 2 - 7	*****	*****	****	A - 1 - 17	27.73	2.98	47.5
A - 1 - 8	32.02	3.07	46.8	A - 2 - 8	*****	*****	****	A - 1 - 18	24.17	2.63	48.5
A - 1 - 9	21.18	2.26	45.0	A - 2 - 9	*****	*****	****	A - 1 - 19	29.07	2.97	48.4
A - 1 - 10	24.78	2.34	45.6	A - 2 - 10	*****	*****	****	A - 1 - 20	28.36	3.11	48.5

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
A - 1 - 1	5.5	5.1	27.9	31.5	272.	23.	65.	57.0	****	1.0	26.4	142.
A - 1 - 2	5.8	5.8	28.4	32.3	206.	24.	60.	61.0	****	3.0	28.0	124.
A - 1 - 3	6.7	*****	26.9	30.5	351.	26.	60.	63.1	****	3.5	27.0	105.
A - 1 - 4	4.4	5.6	31.4	30.8	307.	25.	35.	64.6	****	4.0	30.5	79.
A - 1 - 5	1.8	8.5	29.2	99.5	217.	24.	15.	63.3	6.	4.0	33.4	57.
A - 1 - 6	1.4	*****	29.3	98.5	197.	22.	15.	64.5	****	3.0	31.5	53.
A - 1 - 7	1.2	5.6	31.4	36.3	175.	24.	15.	64.5	****	2.5	33.3	54.
A - 1 - 8	1.4	*****	33.1	29.7	264.	25.	15.	63.9	****	2.5	34.7	57.
A - 1 - 9	1.0	10.1	31.6	36.4	239.	24.	15.	63.9	****	2.5	33.6	62.
A - 1 - 10	0.9	8.3	32.0	33.7	298.	23.	15.	61.0	****	2.5	33.1	56.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
A - 2 - 1	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 2	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 3	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 4	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 5	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 6	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 7	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 8	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 9	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
A - 2 - 10	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
A - 1 - 11	1.0	8.5	29.4	27.4	343.	27.	10.	56.2	****	2.5	32.1	63.
A - 1 - 12	1.0	9.5	27.5	27.9	343.	24.	10.	55.5	****	2.0	32.5	89.
A - 1 - 13	1.2	8.7	30.9	31.4	370.	23.	10.	54.4	****	2.5	33.7	96.
A - 1 - 14	1.2	8.3	29.5	30.6	306.	23.	15.	57.9	****	2.5	34.1	80.
A - 1 - 15	1.8	9.1	31.5	31.5	325.	24.	10.	57.6	****	2.5	35.8	78.
A - 1 - 16	1.0	8.4	28.2	30.1	482.	24.	10.	55.2	****	3.0	32.7	72.
A - 1 - 17	1.0	8.2	30.0	30.9	281.	24.	15.	57.8	****	3.0	33.6	69.
A - 1 - 18	0.6	7.0	30.6	31.4	343.	25.	15.	56.4	****	4.5	33.7	63.
A - 1 - 19	1.0	7.1	30.9	31.4	361.	30.	10.	55.4	****	2.0	32.3	62.
A - 1 - 20	1.0	7.8	30.7	33.5	284.	29.	10.	57.8	****	2.0	33.3	81.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
A - 1 - 1	23.74	1.75	48.4	A - 2 - 1	*****	*****	****	A - 1 - 11	26.70	2.83	48.7
A - 1 - 2	30.92	3.06	45.8	A - 2 - 2	*****	*****	****	A - 1 - 12	30.33	3.30	46.9
A - 1 - 3	18.77	2.21	45.0	A - 2 - 3	*****	*****	****	A - 1 - 13	27.15	2.69	47.8
A - 1 - 4	26.76	2.45	47.1	A - 2 - 4	*****	*****	****	A - 1 - 14	24.64	2.40	49.8
A - 1 - 5	28.19	2.86	45.8	A - 2 - 5	*****	*****	****	A - 1 - 15	28.54	2.89	46.9
A - 1 - 6	27.29	2.31	43.2	A - 2 - 6	*****	*****	****	A - 1 - 16	21.27	2.16	52.6
A - 1 - 7	25.09	2.34	45.6	A - 2 - 7	*****	*****	****	A - 1 - 17	27.73	2.98	47.5
A - 1 - 8	32.02	3.07	46.8	A - 2 - 8	*****	*****	****	A - 1 - 18	24.17	2.63	48.5
A - 1 - 9	21.18	2.26	45.0	A - 2 - 9	*****	*****	****	A - 1 - 19	29.07	2.97	48.4
A - 1 - 10	24.78	2.34	45.6	A - 2 - 10	*****	*****	****	A - 1 - 20	28.36	3.11	48.5

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

A - 14

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
A - 1 - 1	0.3232	0.1111	0.0890	0.2234	0.1692	0.0805	0.1576	1.3857	0.1480	0.2574
A - 1 - 2	0.3420	0.1167	0.0887	0.2364	0.1793	0.0844	0.1684	1.4509	0.1509	0.2574
A - 1 - 3	0.3481	0.1162	0.0892	0.2446	0.1885	0.0851	0.1682	1.4152	0.1547	0.2617
A - 1 - 4	0.3709	0.1184	0.0920	0.2457	0.1890	0.0903	0.1749	1.5929	0.1565	0.2500
A - 1 - 5	0.4121	0.1186	0.1003	0.2582	0.1978	0.0937	0.1732	1.7071	0.1666	0.2790
A - 1 - 6	0.4078	0.1170	0.0980	0.2620	0.2172	0.0943	0.1707	1.6741	0.1657	0.2975
A - 1 - 7	0.4010	0.1168	0.0963	0.2609	0.2132	0.0958	0.1685	1.6607	0.1685	0.2926
A - 1 - 8	0.3993	0.1213	0.0983	0.2484	0.1652	0.0974	0.1723	1.6955	0.1723	0.2216
A - 1 - 9	0.4181	0.1228	0.1018	0.2630	0.2115	0.0952	0.1780	1.7464	0.1703	0.2796
A - 1 - 10	0.4105	0.1192	0.0981	0.2576	0.2137	0.0910	0.1680	1.6821	0.1620	0.2957

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
A - 2 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 3	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 6	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 7	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 8	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 9	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
A - 2 - 10	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
A - 1 - 11	0.3847	0.1132	0.0958	0.2201	0.1744	0.0857	0.1639	1.5964	0.1470	0.2358
A - 1 - 12	0.3792	0.1105	0.0990	0.2207	0.1855	0.0839	0.1627	1.5598	0.1480	0.2463
A - 1 - 13	0.3522	0.1129	0.1058	0.2342	0.1925	0.0883	0.1582	1.5616	0.1585	0.2549
A - 1 - 14	0.4011	0.1176	0.1103	0.2380	0.1982	0.0903	0.1725	1.5812	0.1614	0.2673
A - 1 - 15	0.4087	0.1253	0.1163	0.2321	0.1586	0.0959	0.1786	1.6679	0.1687	0.2389
A - 1 - 16	0.3928	0.1209	0.1121	0.2332	0.1714	0.0911	0.1667	1.5473	0.1608	0.2407
A - 1 - 17	0.4035	0.1233	0.1186	0.2424	0.1881	0.0949	0.1781	1.5777	0.1649	0.2586
A - 1 - 18	0.3715	0.1158	0.1199	0.2261	0.1744	0.0862	0.1714	1.5723	0.1528	0.2389
A - 1 - 19	0.3596	0.1132	0.1208	0.2168	0.1692	0.0837	0.1725	1.5402	0.1466	0.2296
A - 1 - 20	0.3810	0.1209	0.1266	0.2223	0.1630	0.0872	0.1822	1.6563	0.1561	0.2210

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
A - 1 - 1	23.74	1.75	48.4	A - 2 - 1	*****	*****	****	A - 1 - 11	26.70	2.83	48.7
A - 1 - 2	30.92	3.06	45.8	A - 2 - 2	*****	*****	****	A - 1 - 12	30.33	3.30	46.9
A - 1 - 3	18.77	2.21	45.0	A - 2 - 3	*****	*****	****	A - 1 - 13	27.15	2.69	47.8
A - 1 - 4	26.76	2.45	47.1	A - 2 - 4	*****	*****	****	A - 1 - 14	24.64	2.40	49.8
A - 1 - 5	28.19	2.86	45.8	A - 2 - 5	*****	*****	****	A - 1 - 15	28.54	2.89	46.9
A - 1 - 6	27.29	2.31	43.2	A - 2 - 6	*****	*****	****	A - 1 - 16	21.27	2.16	52.6
A - 1 - 7	25.09	2.34	45.6	A - 2 - 7	*****	*****	****	A - 1 - 17	27.73	2.98	47.5
A - 1 - 8	32.02	3.07	46.8	A - 2 - 8	*****	*****	****	A - 1 - 18	24.17	2.63	48.5
A - 1 - 9	21.18	2.26	45.0	A - 2 - 9	*****	*****	****	A - 1 - 19	29.07	2.97	48.4
A - 1 - 10	24.78	2.34	45.6	A - 2 - 10	*****	*****	****	A - 1 - 20	28.36	3.11	48.5

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

A - 16

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
A - 1 - 1	3.056	0.1759	0.2286	0.4635	3.1628	0.227	5.000	0.1484	******	0.435	0.1940	1.8737
A - 1 - 2	3.222	0.2000	0.2332	0.4756	2.3953	0.239	4.615	0.1589	******	1.304	0.2057	1.6316
A - 1 - 3	3.722	*******	0.2204	0.4479	4.0814	0.262	4.615	0.1642	******	1.522	0.1986	1.3789
A - 1 - 4	2.444	0.1931	0.2571	0.4522	3.5698	0.248	2.692	0.1684	******	1.739	0.2246	1.0447
A - 1 - 5	1.000	0.2931	0.2393	1.4638	2.5233	0.242	1.154	0.1648	0.741	1.739	0.2460	0.7474
A - 1 - 6	0.778	*******	0.2403	1.4484	2.2907	0.221	1.154	0.1679	******	1.304	0.2317	0.7013
A - 1 - 7	0.667	0.1931	0.2575	0.5338	2.0349	0.238	1.154	0.1681	******	1.087	0.2448	0.7079
A - 1 - 8	0.778	*******	0.2717	0.4365	3.0698	0.247	1.154	0.1665	******	1.087	0.2554	0.7553
A - 1 - 9	0.556	0.3483	0.2594	0.5349	2.7791	0.244	1.154	0.1665	******	1.087	0.2474	0.8132
A - 1 - 10	0.500	0.2862	0.2623	0.4951	3.4651	0.236	1.154	0.1589	******	1.087	0.2430	0.7342

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
A - 2 - 1	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 2	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 3	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 4	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 5	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 6	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 7	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 8	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 9	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******
A - 2 - 10	******	*******	*******	*******	*******	******	******	*********	******	******	*******	*******

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
A - 1 - 11	0.556	0.2931	0.2409	0.4037	3.9884	0.275	0.769	0.1465	******	1.087	0.2363	0.8224
A - 1 - 12	0.556	0.3276	0.2255	0.4104	3.9884	0.246	0.769	0.1446	******	0.870	0.2387	1.1658
A - 1 - 13	0.667	0.3000	0.2536	0.4619	4.3023	0.229	0.769	0.1416	******	1.087	0.2479	1.2671
A - 1 - 14	0.667	0.2862	0.2417	0.4494	3.5581	0.232	1.154	0.1508	******	1.087	0.2511	1.0461
A - 1 - 15	1.000	0.3138	0.2579	0.4634	3.7791	0.243	0.769	0.1501	******	1.087	0.2635	1.0250
A - 1 - 16	0.556	0.2897	0.2311	0.4421	5.6047	0.244	0.769	0.1436	******	1.304	0.2407	0.9487
A - 1 - 17	0.556	0.2828	0.2461	0.4551	3.2674	0.244	1.154	0.1504	******	1.304	0.2474	0.9132
A - 1 - 18	0.333	0.2414	0.2511	0.4622	3.9884	0.254	1.154	0.1469	******	1.957	0.2478	0.8316
A - 1 - 19	0.556	0.2448	0.2530	0.4622	4.1977	0.298	0.769	0.1443	******	0.870	0.2374	0.8092
A - 1 - 20	0.556	0.2690	0.2520	0.4921	3.3023	0.296	0.769	0.1505	******	0.870	0.2451	1.0645

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. X	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. X	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. X
A - 1 - 1	23.74	1.75	48.4	A - 2 - 1	*****	*****	****	A - 1 - 11	26.70	2.83	48.7
A - 1 - 2	30.92	3.06	45.8	A - 2 - 2	*****	*****	****	A - 1 - 12	30.33	3.30	46.9
A - 1 - 3	18.77	2.21	45.0	A - 2 - 3	*****	*****	****	A - 1 - 13	27.15	2.69	47.8
A - 1 - 4	26.76	2.45	47.1	A - 2 - 4	*****	*****	****	A - 1 - 14	24.64	2.40	49.8
A - 1 - 5	28.19	2.86	45.8	A - 2 - 5	*****	*****	****	A - 1 - 15	28.54	2.89	46.9
A - 1 - 6	27.29	2.31	43.2	A - 2 - 6	*****	*****	****	A - 1 - 16	21.27	2.16	52.6
A - 1 - 7	25.09	2.34	45.6	A - 2 - 7	*****	*****	****	A - 1 - 17	27.73	2.98	47.5
A - 1 - 8	32.02	3.07	46.8	A - 2 - 8	*****	*****	****	A - 1 - 18	24.17	2.63	48.5
A - 1 - 9	21.18	2.26	45.0	A - 2 - 9	*****	*****	****	A - 1 - 19	29.07	2.97	48.4
A - 1 - 10	24.78	2.34	45.6	A - 2 - 10	*****	*****	****	A - 1 - 20	28.36	3.11	48.5

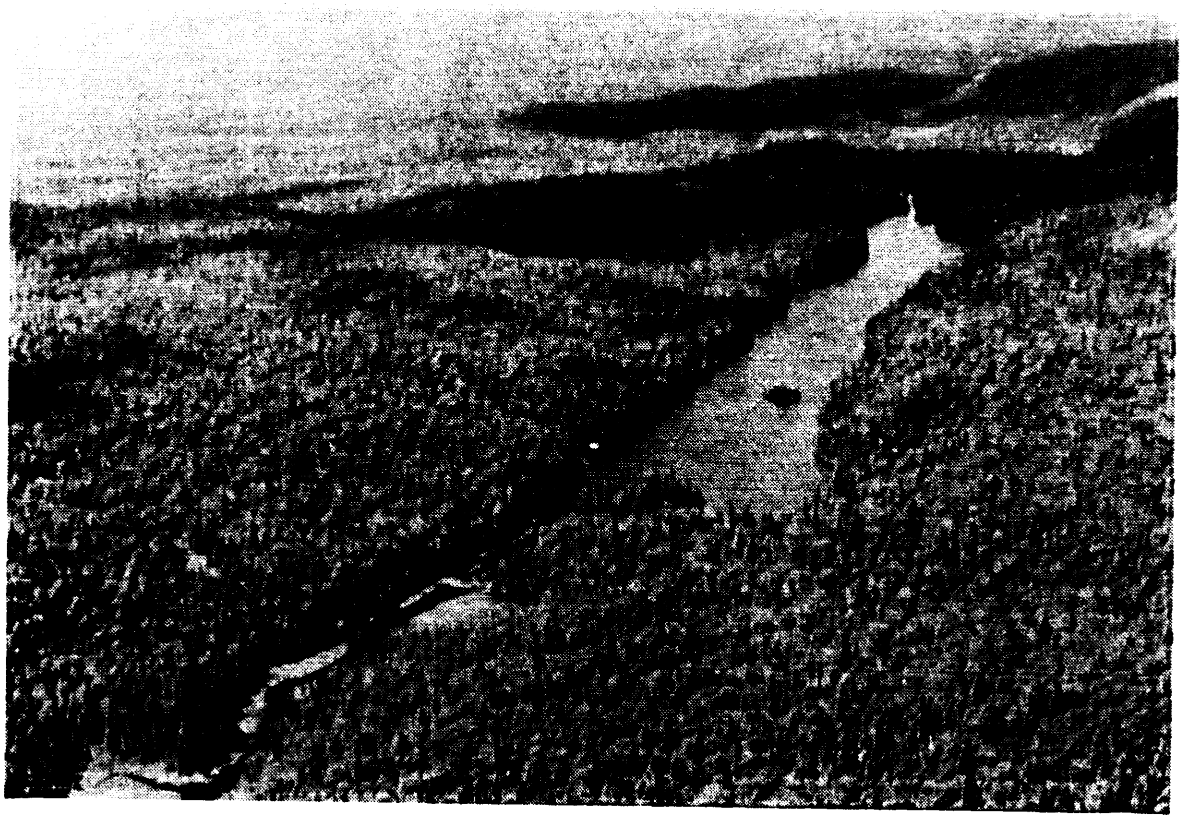
LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake B

pH 5·0

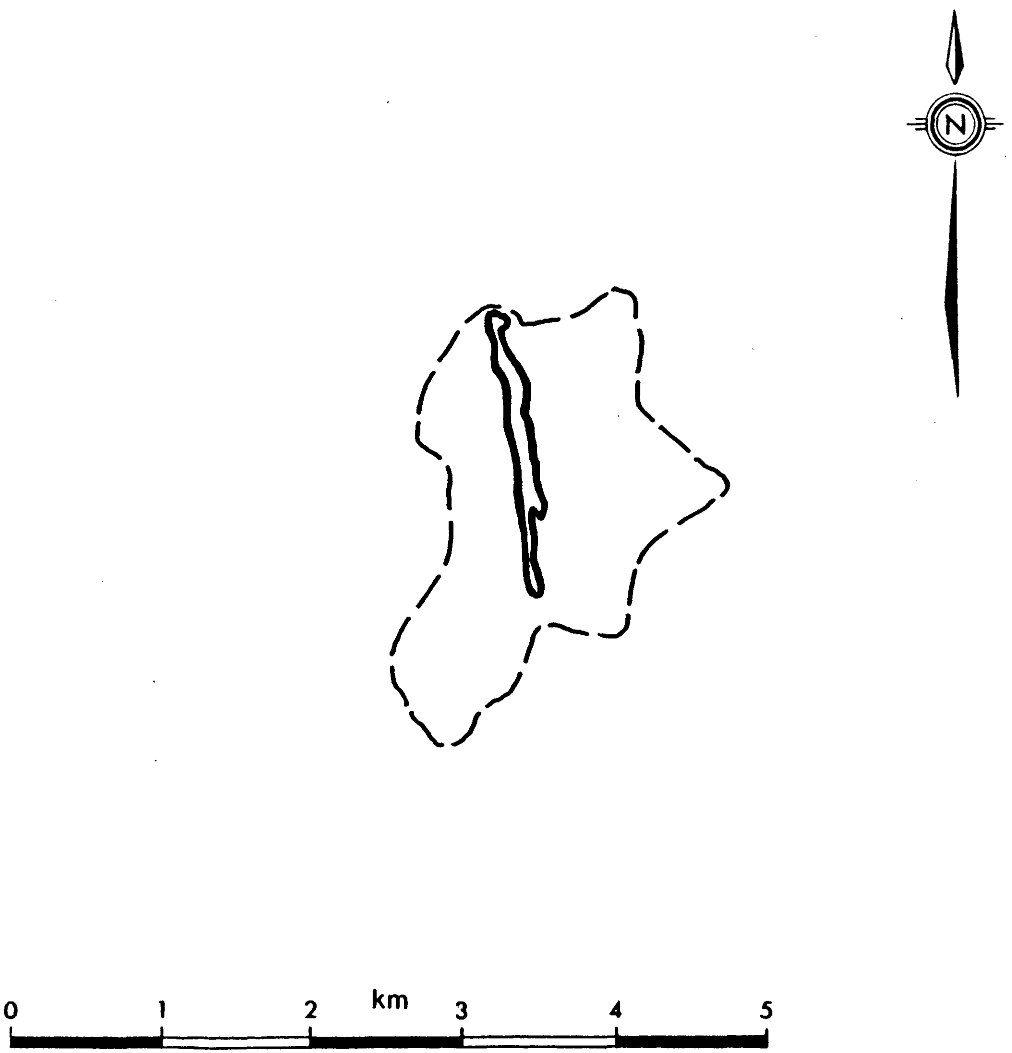
GENERAL SETTING

B - 2



GENERAL DESCRIPTION

Lake B is a narrow, structural rock basin with steep slopes on both sides. Minor muskeg development has occurred at the south end of the lake owing to damming of inflow by beavers. Surficial deposits are present at both ends of the lake, and they are commonly absent on the rock uplands of the watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-647889/5325010
Elevation of lake above sea level	406.5 m (1355 ft)
Lake depth at sampling point	3.8 m
Lake area	.25 sq km
Lake catchment area	3 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	2
Distance from south end of sampling strip	13 km

GEOLOGICAL / GEOGRAPHICAL INFORMATION

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY (No./l)
	Bosmina longirostris		0.5
		Total	0.5

COPEPODS	SPECIES NAME		DENSITY
	Copepodites		1.1
	Cyclops bicuspidatus		0.3
	Diaptomus minutus		0.3
	Mesocyclops edax		0.3
		Total	2.0

ROTIFERS	SPECIES NAME		DENSITY
	Asplanchna preodonta		2.7
	Polyarthra vulgaris		0.4
		Total	3.1

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Microcystis aeruginosa		3
		(Average)	(3)

CRYPTOPHYTA	SPECIES NAME		ABUNDANCE
	Cryptomonas acuta		3
		(Average)	(3)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Fragilaria capucina		3
	Fragilaria construens		2
	Melosira distans		3
	Pinnularia gibba		3
	Stephanodiscus sp.		3
		(Average)	(3)

PYRROPHYTA	SPECIES NAME		ABUNDANCE
	Dinoflagellate cysts		3
		(Average)	(3)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Dinobryon bavaricum		4
	Dinobryon sertularia		4
	Mallomonas Pseudocoronata		2
	Mallomonas sp.		2
		(Average)	(4)

CILIOPHORA	SPECIES NAME		ABUNDANCE
	Vorticella sp.		1
		(Average)	(1)

BRYOPHYTA	SPECIES NAME		ABUNDANCE
	Drepanocladus		4
		(Average)	(4)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Fragilaria brevistriata	27	2	4.8
Navicula hustedtii	12	**	2.1
Cyclotella comta	92	2	16.3
Navicula minima	79	2	14.0
Fragilaria sp	5		.88
Fragilaria pinnata	4	2	.71
Navicula cryptocephala	7	2	1.2
Melosira distans	63	3	11.1
Navicula cf rasgiaca	10	3	1.8
Tabellaria flocculosa	27	3	4.8
Melosira islandica	8	2	1.4
Cyclotella glomerata	38	4	6.7
Melosira distans var alpigena	14	3	2.5
Cymbella minuta var silesica	2	4	.35
Cyclotella Bodanica	25	4	4.4
Pinnularia biceps	4	4	.71
Cyclotella stelligera	24	4	4.3
Navicula vulpina	6	2	1.1
Melosira italica	4	4	.71
Cocconeis pediculus	9	2	1.6
Tabellaria fenestrata	3	4	.53
Navicula pupula var capitata	2	4	.35
Cocconeis placentula var lineata	7	2	1.2
Cyclotella sp	1		.18
Fragillaria leptostauron var dubia	50	2	8.8
Navicula pupula var rectangularis	6	4	1.1
Nitzschia sp	4		.71
Fragilaria construens	20	2	3.5
Caloneis cf bacillaris var thermalis	1	2	.18
Frustulia rhomboides var saxonica	1	3	.18
Pinnularia abaujensis var rostrata	1	4	.18
Synedra amphicephala var austriaca	3		.53
Navicula cf seminulum var hustedtii	2	4	.35
Anomoeoneis serians var brachysira	1	5	.18
Fragilaria construens var binodis	1	2	.18

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

** Blanks indicate species which had no published autecologcial information regarding their pH preferences.

Lake B was so shallow (4-5m) that it failed to stratify. Four other study lakes (G, J, O, and S) were also too shallow to stratify thermally during the summer.

Dissolved oxygen was saturated from top to bottom, as it was in all unstratified study lakes.

Temperature-corrected specific conductivity was among the lowest (23 micromhos/cm) of the lakes, as were alkalinity (32.5mg/l), calcium (1.5mg/l), and pH (5.0).

Secchi depth, lake elevation, lake size, and drainage area were all intermediate for this study lake.

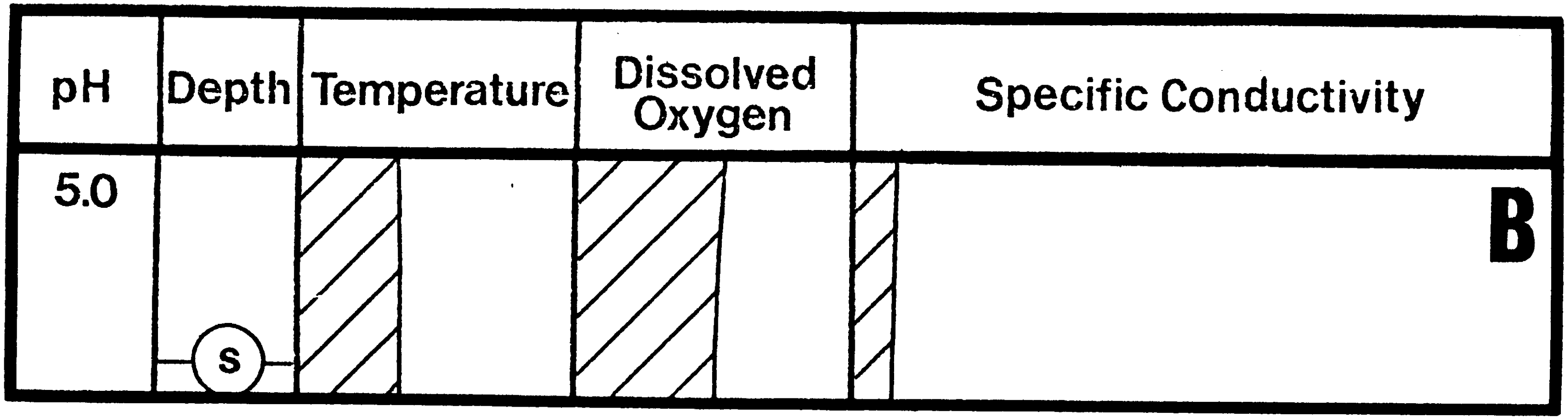
Due to time constraints, it was possible to list only a few of the dominant aquatic plants in each of the lakes. Comments will be included about the dominant aquatic vegetation wherever possible. In Lake B, the entire bottom of the pond (lake) was colonized by the aquatic moss *Drepanocladus*. This moss is one contributor of the humic organics which gave the lake water a yellow-brown colour (Secchi = 3.5m).

DETAILS OF LAKE WATER CHEMISTRY

B - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity * (Micromhos/cm)
0		12.6	100	23
1		12.8	98	23
2		12.8	97	23
3	3.5	12.8	95	23
4		12.8	90	23

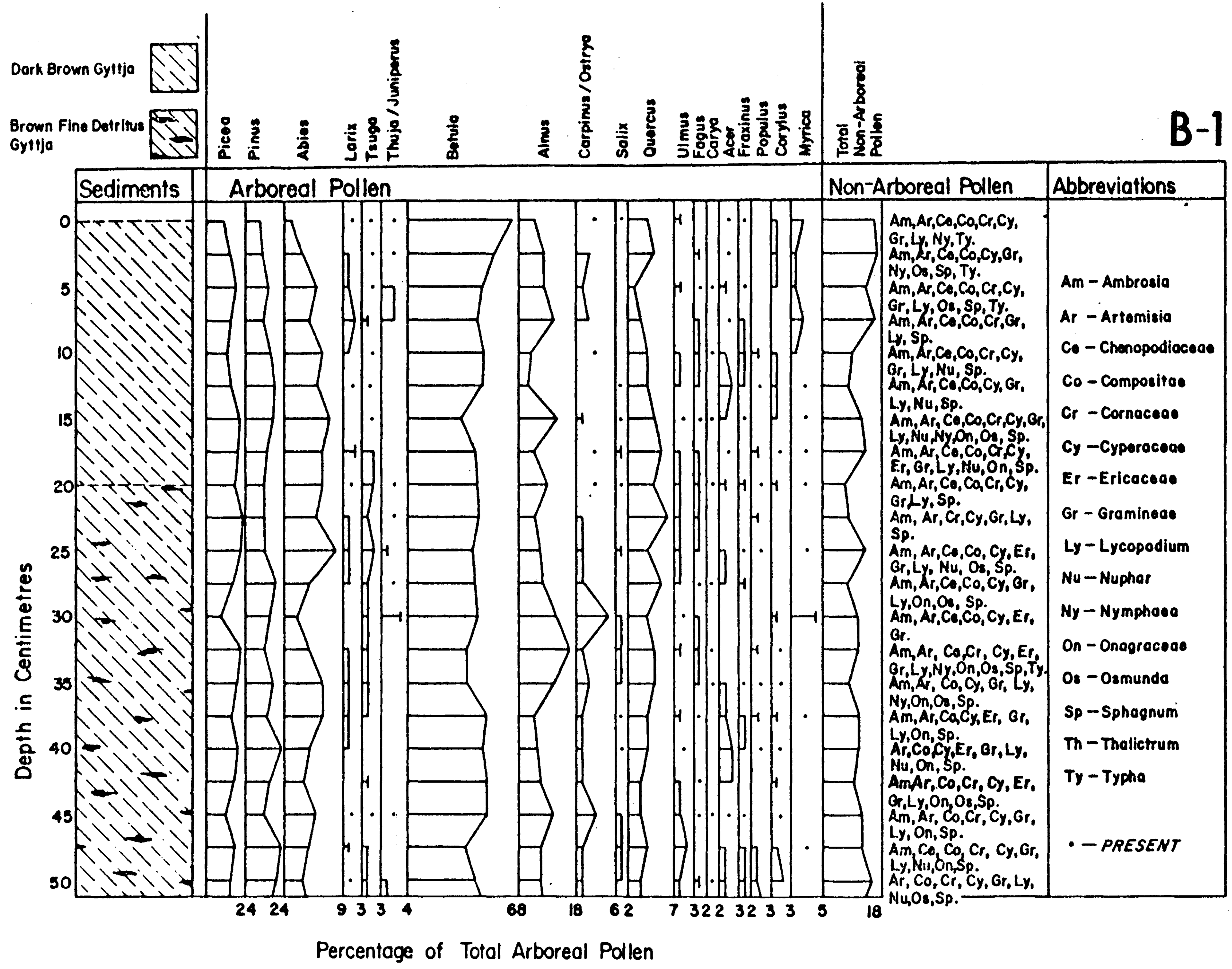
*Specific conductivity data area temperature-corrected (25° C).



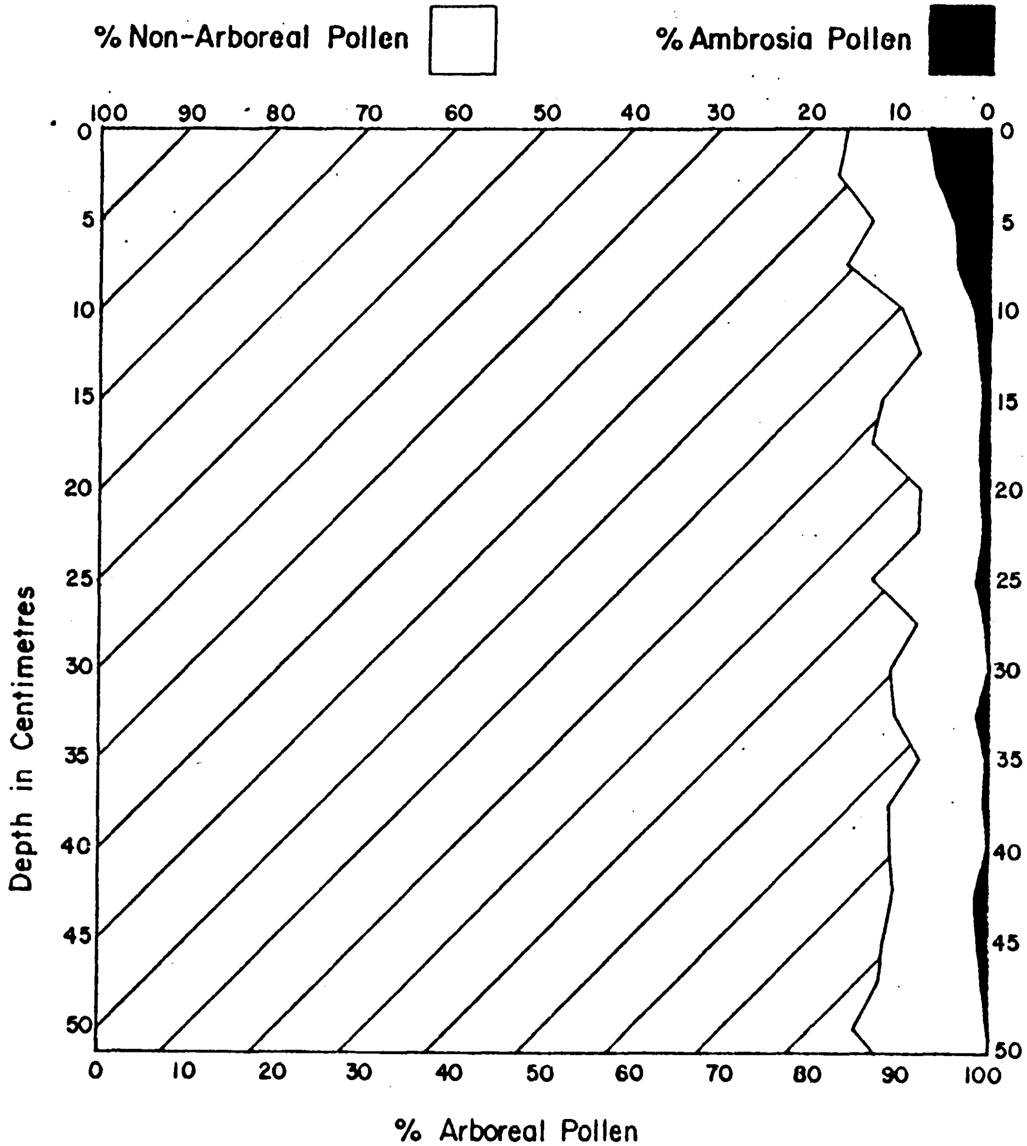
LAKE WATER CHEMISTRY PLOT

B - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE



Regional forest composition is well represented by the pollen diagram. The influx of southern pollen is low. The Ambrosia rise is rather distinct in the top 10 cm of gyttja, suggesting minimal mixing of surface sediment in this lake.



 PALYNOLOGY NOTES

AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
B - 1 - 1	30450.	10730.	96.	5300.	4700.	2260.	4471.	1250.	1076.	44.
B - 1 - 2	35450.	10190.	102.	6630.	6720.	2676.	6066.	1294.	1227.	59.
B - 1 - 3	33370.	9313.	101.	5900.	5660.	2665.	6625.	1336.	1183.	51.
B - 1 - 4	31860.	8117.	94.	5280.	5640.	2457.	6557.	1396.	1109.	52.
B - 1 - 5	34660.	8185.	97.	4820.	5730.	2617.	6602.	1460.	1100.	47.
B - 1 - 6	35550.	8194.	95.	5030.	6290.	2622.	6670.	1480.	1091.	50.
B - 1 - 7	35140.	8591.	98.	5300.	6160.	2439.	6963.	1419.	1077.	46.
B - 1 - 8	37110.	8486.	97.	5350.	6920.	2699.	6927.	1485.	1107.	51.
B - 1 - 9	37110.	8494.	96.	5410.	6720.	2731.	7010.	1489.	1132.	50.
B - 1 - 10	36580.	8976.	111.	5370.	6600.	3067.	7600.	1458.	1099.	47.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
B - 2 - 1	38150.	9835.	119.	5460.	4760.	2729.	6888.	1239.	1338.	45.
B - 2 - 2	58370.	10310.	120.	5270.	4990.	2605.	8411.	1335.	1214.	45.
B - 2 - 3	32830.	9017.	116.	4890.	4380.	2518.	6823.	1385.	1242.	44.
B - 2 - 4	30490.	8760.	117.	4730.	4370.	2487.	7182.	1429.	1189.	41.
B - 2 - 5	33500.	8519.	116.	4280.	4050.	2407.	7599.	1517.	1139.	38.
B - 2 - 6	28590.	7864.	107.	3980.	8110.	2229.	9892.	1493.	1077.	35.
B - 2 - 7	23190.	8074.	110.	4080.	3750.	2410.	6553.	1608.	1141.	35.
B - 2 - 8	32760.	8493.	114.	4250.	4010.	2450.	8128.	1579.	1143.	38.
B - 2 - 9	33690.	8676.	116.	4360.	4060.	2512.	8476.	1625.	1147.	38.
B - 2 - 10	35220.	8776.	117.	4450.	4130.	2574.	8687.	1606.	1178.	40.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
B - 1 - 11	38030.	9097.	102.	5700.	6990.	2973.	7410.	1480.	1143.	54.
B - 1 - 12	39930.	9443.	109.	6230.	7630.	3108.	7811.	1451.	1162.	59.
B - 1 - 13	40310.	9719.	110.	6410.	7630.	3209.	8310.	1466.	1213.	57.
B - 1 - 14	38840.	9890.	111.	6580.	7400.	3107.	8610.	1549.	1238.	60.
B - 1 - 15	41860.	10200.	121.	7120.	8190.	3223.	8937.	1615.	1292.	65.
B - 1 - 16	40590.	9997.	114.	6890.	7970.	3233.	8983.	1580.	1286.	66.
B - 1 - 17	40730.	10120.	120.	6810.	7650.	3246.	9264.	1580.	1295.	61.
B - 1 - 18	38340.	9445.	113.	6430.	7250.	3073.	8929.	1510.	1250.	59.
B - 1 - 19	38720.	9239.	114.	6480.	7470.	2979.	9105.	1551.	1194.	57.
B - 1 - 20	38650.	9504.	119.	6420.	7450.	3076.	9723.	1611.	1198.	57.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
B - 1 - 1	12.43	0.94	****	B - 2 - 1	*****	*****	38.8	B - 1 - 11	27.28	3.06	37.8
B - 1 - 2	26.91	2.34	41.7	B - 2 - 2	*****	*****	37.0	B - 1 - 12	26.49	3.42	38.4
B - 1 - 3	20.24	1.91	40.4	B - 2 - 3	*****	*****	37.2	B - 1 - 13	24.66	2.94	39.0
B - 1 - 4	22.46	2.92	40.8	B - 2 - 4	*****	*****	36.8	B - 1 - 14	29.06	3.33	26.3
B - 1 - 5	23.85	2.15	40.9	B - 2 - 5	*****	*****	38.2	B - 1 - 15	26.35	3.09	38.3
B - 1 - 6	27.58	2.83	42.2	B - 2 - 6	*****	*****	39.0	B - 1 - 16	24.69	2.85	37.3
B - 1 - 7	25.40	2.44	36.8	B - 2 - 7	*****	*****	38.6	B - 1 - 17	28.17	3.57	36.4
B - 1 - 8	24.26	2.52	39.4	B - 2 - 8	*****	*****	39.0	B - 1 - 18	28.52	3.94	37.3
B - 1 - 9	27.88	2.76	38.8	B - 2 - 9	*****	*****	38.8	B - 1 - 19	28.83	3.81	37.9
B - 1 - 10	28.16	2.82	39.2	B - 2 - 10	*****	*****	39.0	B - 1 - 20	25.94	3.51	38.1

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

B - 11

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

B- 12

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
B - 1 - 1	13.6	*****	27.1	23.0	422.	17.	80.	59.6	****	2.0	25.7	153.
B - 1 - 2	9.6	*****	22.2	20.7	438.	20.	50.	80.2	****	2.5	25.3	164.
B - 1 - 3	4.7	*****	25.3	18.2	396.	19.	30.	81.2	6.	2.5	23.1	108.
B - 1 - 4	3.2	*****	22.6	16.2	370.	17.	20.	76.8	****	3.5	20.8	74.
B - 1 - 5	2.0	*****	24.1	18.2	359.	12.	15.	79.8	****	4.0	20.3	62.
B - 1 - 6	1.2	*****	23.5	16.9	325.	15.	10.	82.3	****	3.5	19.1	63.
B - 1 - 7	0.8	*****	27.4	15.7	290.	21.	5.	83.4	****	1.0	20.1	64.
B - 1 - 8	1.0	*****	27.4	19.1	294.	12.	10.	88.4	****	4.0	20.3	70.
B - 1 - 9	1.0	*****	11.4	17.7	290.	15.	5.	89.5	****	3.0	20.8	68.
B - 1 - 10	0.8	*****	24.4	21.7	299.	19.	5.	88.1	****	3.0	21.5	78.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
B - 2 - 1	****	*****	32.4	27.0	*****	21.	55.	81.9	9.	1.5	27.3	197.
B - 2 - 2	****	*****	30.6	21.2	*****	19.	40.	103.7	7.	1.5	24.4	118.
B - 2 - 3	****	*****	26.4	19.2	*****	16.	35.	77.5	****	1.5	22.0	91.
B - 2 - 4	****	*****	25.9	20.0	*****	19.	30.	78.0	****	1.5	21.0	77.
B - 2 - 5	****	*****	25.5	18.8	*****	18.	15.	79.6	****	1.5	19.7	63.
B - 2 - 6	****	*****	12.1	18.4	*****	16.	15.	74.6	****	1.5	18.9	52.
B - 2 - 7	****	*****	27.3	18.7	*****	17.	10.	67.9	****	1.5	20.6	55.
B - 2 - 8	****	*****	26.3	19.5	*****	17.	10.	80.8	6.	1.5	20.7	55.
B - 2 - 9	****	*****	26.8	18.8	*****	17.	****	84.1	6.	1.5	21.4	61.
B - 2 - 10	****	*****	17.5	19.4	*****	19.	****	87.1	****	1.5	21.1	67.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
B - 1 - 11	0.8	*****	25.4	18.4	361.	19.	5.	92.7	****	2.5	22.4	74.
B - 1 - 12	0.8	*****	27.0	17.3	259.	16.	5.	101.2	****	2.5	23.2	86.
B - 1 - 13	0.6	*****	27.7	18.3	286.	17.	5.	104.4	****	2.5	23.9	79.
B - 1 - 14	0.8	11.4	28.0	19.3	219.	20.	5.	102.8	8.	3.0	24.4	86.
B - 1 - 15	0.9	10.3	28.6	19.8	361.	22.	10.	109.6	8.	3.0	27.1	95.
B - 1 - 16	0.8	9.4	28.9	20.0	272.	21.	10.	107.9	8.	4.5	25.8	105.
B - 1 - 17	0.8	9.3	28.7	19.7	224.	22.	5.	109.6	8.	1.5	26.2	86.
B - 1 - 18	0.7	8.8	27.0	19.5	264.	21.	5.	102.2	8.	3.5	24.8	72.
B - 1 - 19	0.7	6.0	28.9	19.6	215.	19.	5.	107.7	6.	2.5	23.2	67.
B - 1 - 20	0.7	9.5	22.3	20.8	237.	21.	5.	105.5	9.	3.0	23.5	85.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
B - 1 - 1	12.43	0.94	****	B - 2 - 1	*****	*****	38.8	B - 1 - 11	27.28	3.06	37.8
B - 1 - 2	26.91	2.34	41.7	B - 2 - 2	*****	*****	37.0	B - 1 - 12	26.49	3.42	38.4
B - 1 - 3	20.24	1.91	40.4	B - 2 - 3	*****	*****	37.2	B - 1 - 13	24.66	2.94	39.0
B - 1 - 4	22.46	2.92	40.8	B - 2 - 4	*****	*****	36.8	B - 1 - 14	29.06	3.33	26.3
B - 1 - 5	23.85	2.15	40.9	B - 2 - 5	*****	*****	38.2	B - 1 - 15	26.35	3.09	38.3
B - 1 - 6	27.58	2.83	42.2	B - 2 - 6	*****	*****	39.0	B - 1 - 16	24.69	2.85	37.3
B - 1 - 7	25.40	2.44	36.8	B - 2 - 7	*****	*****	38.6	B - 1 - 17	28.17	3.57	36.4
B - 1 - 8	24.26	2.52	39.4	B - 2 - 8	*****	*****	39.0	B - 1 - 18	28.52	3.94	37.3
B - 1 - 9	27.88	2.76	38.8	B - 2 - 9	*****	*****	38.8	B - 1 - 19	28.83	3.81	37.9
B - 1 - 10	28.16	2.82	39.2	B - 2 - 10	*****	*****	39.0	B - 1 - 20	25.94	3.51	38.1

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

B - 13

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
B - 1 - 1	0.3642	0.1725	0.0904	0.2880	0.2070	0.0818	0.0959	1.1161	0.1703	0.2735
B - 1 - 2	0.4240	0.1638	0.0958	0.3603	0.2960	0.0968	0.1302	1.1554	0.1941	0.3636
B - 1 - 3	0.3992	0.1497	0.0957	0.3207	0.2493	0.0964	0.1422	1.1929	0.1872	0.3117
B - 1 - 4	0.3811	0.1305	0.0890	0.2870	0.2485	0.0889	0.1407	1.2464	0.1755	0.3179
B - 1 - 5	0.4146	0.1316	0.0910	0.2620	0.2524	0.0947	0.1417	1.3036	0.1741	0.2895
B - 1 - 6	0.4252	0.1317	0.0898	0.2734	0.2771	0.0949	0.1431	1.3214	0.1726	0.3068
B - 1 - 7	0.4203	0.1381	0.0924	0.2880	0.2714	0.0882	0.1494	1.2670	0.1704	0.2827
B - 1 - 8	0.4439	0.1364	0.0914	0.2908	0.3048	0.0976	0.1486	1.3259	0.1752	0.3154
B - 1 - 9	0.4439	0.1366	0.0908	0.2940	0.2960	0.0988	0.1504	1.3295	0.1791	0.3080
B - 1 - 10	0.4376	0.1443	0.1042	0.2918	0.2907	0.1110	0.1631	1.3018	0.1739	0.2926

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
B - 2 - 1	0.4563	0.1581	0.1122	0.2967	0.2097	0.0987	0.1478	1.1062	0.2117	0.2796
B - 2 - 2	0.6982	0.1658	0.1136	0.2864	0.2198	0.0942	0.1805	1.1920	0.1921	0.2796
B - 2 - 3	0.3927	0.1450	0.1096	0.2658	0.1930	0.0911	0.1464	1.2366	0.1965	0.2735
B - 2 - 4	0.3647	0.1408	0.1101	0.2571	0.1925	0.0900	0.1541	1.2759	0.1881	0.2543
B - 2 - 5	0.4007	0.1370	0.1090	0.2326	0.1784	0.0871	0.1631	1.3545	0.1802	0.2327
B - 2 - 6	0.3420	0.1264	0.1006	0.2163	0.3573	0.0806	0.2123	1.3330	0.1704	0.2179
B - 2 - 7	0.2774	0.1298	0.1033	0.2217	0.1652	0.0872	0.1406	1.4357	0.1805	0.2136
B - 2 - 8	0.3919	0.1365	0.1072	0.2310	0.1767	0.0886	0.1744	1.4098	0.1809	0.2370
B - 2 - 9	0.4030	0.1395	0.1094	0.2370	0.1789	0.0909	0.1819	1.4509	0.1815	0.2327
B - 2 - 10	0.4213	0.1411	0.1101	0.2418	0.1819	0.0931	0.1864	1.4339	0.1864	0.2488

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
B - 1 - 11	0.4549	0.1463	0.0962	0.3098	0.3079	0.1076	0.1590	1.3214	0.1809	0.3352
B - 1 - 12	0.4776	0.1518	0.1025	0.3386	0.3361	0.1124	0.1676	1.2955	0.1839	0.3654
B - 1 - 13	0.4822	0.1563	0.1042	0.3484	0.3361	0.1161	0.1783	1.3089	0.1919	0.3543
B - 1 - 14	0.4646	0.1590	0.1042	0.3576	0.3260	0.1124	0.1848	1.3830	0.1959	0.3704
B - 1 - 15	0.5007	0.1640	0.1140	0.3870	0.3608	0.1166	0.1918	1.4420	0.2044	0.4037
B - 1 - 16	0.4855	0.1607	0.1079	0.3745	0.3511	0.1170	0.1928	1.4107	0.2035	0.4043
B - 1 - 17	0.4872	0.1627	0.1130	0.3701	0.3370	0.1174	0.1988	1.4107	0.2049	0.3741
B - 1 - 18	0.4586	0.1518	0.1069	0.3495	0.3194	0.1112	0.1916	1.3482	0.1978	0.3654
B - 1 - 19	0.4632	0.1485	0.1072	0.3522	0.3291	0.1078	0.1954	1.3848	0.1889	0.3531
B - 1 - 20	0.4623	0.1528	0.1119	0.3489	0.3282	0.1113	0.2086	1.4384	0.1896	0.3506

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
B - 1 - 1	12.43	0.94	****	B - 2 - 1	*****	*****	38.8	B - 1 - 11	27.28	3.06	37.8
B - 1 - 2	26.91	2.34	41.7	B - 2 - 2	*****	*****	37.0	B - 1 - 12	26.49	3.42	38.4
B - 1 - 3	20.24	1.91	40.4	B - 2 - 3	*****	*****	37.2	B - 1 - 13	24.66	2.94	39.0
B - 1 - 4	22.46	2.92	40.8	B - 2 - 4	*****	*****	36.8	B - 1 - 14	29.06	3.33	26.3
B - 1 - 5	23.85	2.15	40.9	B - 2 - 5	*****	*****	38.2	B - 1 - 15	26.35	3.09	38.3
B - 1 - 6	27.58	2.83	42.2	B - 2 - 6	*****	*****	39.0	B - 1 - 16	24.69	2.85	37.3
B - 1 - 7	25.40	2.44	36.8	B - 2 - 7	*****	*****	38.6	B - 1 - 17	28.17	3.57	36.4
B - 1 - 8	24.26	2.52	39.4	B - 2 - 8	*****	*****	39.0	B - 1 - 18	28.52	3.94	37.3
B - 1 - 9	27.88	2.76	38.8	B - 2 - 9	*****	*****	38.8	B - 1 - 19	28.83	3.81	37.9
B - 1 - 10	28.16	2.82	39.2	B - 2 - 10	*****	*****	39.0	B - 1 - 20	25.94	3.51	38.1

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
B - 1 - 1	7.556	*******	0.2221	0.3379	4.9070	0.175	6.154	0.1551	******	0.870	0.1890	2.0132
B - 1 - 2	5.333	*******	0.1817	0.3046	5.0930	0.206	3.846	0.2089	******	1.087	0.1862	2.1605
B - 1 - 3	2.611	*******	0.2076	0.2672	4.6047	0.191	2.308	0.2114	0.753	1.087	0.1700	1.4184
B - 1 - 4	1.778	*******	0.1855	0.2381	4.3023	0.169	1.538	0.2000	******	1.522	0.1532	0.9711
B - 1 - 5	1.111	*******	0.1972	0.2679	4.1744	0.124	1.154	0.2078	******	1.739	0.1496	0.8171
B - 1 - 6	0.667	*******	0.1926	0.2481	3.7791	0.151	0.769	0.2142	******	1.522	0.1403	0.8316
B - 1 - 7	0.444	*******	0.2244	0.2309	3.3721	0.213	0.385	0.2173	******	0.435	0.1480	0.8461
B - 1 - 8	0.556	*******	0.2242	0.2813	3.4186	0.123	0.769	0.2303	******	1.739	0.1493	0.9237
B - 1 - 9	0.556	*******	0.0934	0.2597	3.3721	0.154	0.385	0.2331	******	1.304	0.1529	0.9000
B - 1 - 10	0.444	*******	0.2002	0.3196	3.4767	0.192	0.385	0.2293	******	1.304	0.1581	1.0276

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
B - 2 - 1	******	*******	0.2658	0.3974	*******	0.213	4.231	0.2133	1.062	0.652	0.2006	2.5882
B - 2 - 2	******	*******	0.2512	0.3124	*******	0.187	3.077	0.2701	0.840	0.652	0.1796	1.5461
B - 2 - 3	******	*******	0.2167	0.2819	*******	0.163	2.692	0.2019	******	0.652	0.1618	1.1934
B - 2 - 4	******	*******	0.2124	0.2938	*******	0.190	2.308	0.2030	******	0.652	0.1543	1.0092
B - 2 - 5	******	*******	0.2091	0.2771	*******	0.178	1.154	0.2074	******	0.652	0.1451	0.8250
B - 2 - 6	******	*******	0.0989	0.2700	*******	0.163	1.154	0.1944	******	0.652	0.1388	0.6868
B - 2 - 7	******	*******	0.2238	0.2753	*******	0.170	0.769	0.1767	******	0.652	0.1513	0.7263
B - 2 - 8	******	*******	0.2157	0.2869	*******	0.174	0.769	0.2104	0.778	0.652	0.1524	0.7289
B - 2 - 9	******	*******	0.2196	0.2768	*******	0.167	******	0.2190	0.753	0.652	0.1573	0.8026
B - 2 - 10	******	*******	0.1432	0.2851	*******	0.190	******	0.2269	******	0.652	0.1555	0.8855

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
B - 1 - 11	0.444	*******	0.2081	0.2713	4.1977	0.195	0.385	0.2414	******	1.087	0.1651	0.9684
B - 1 - 12	0.444	*******	0.2214	0.2538	3.0116	0.160	0.385	0.2635	******	1.087	0.1706	1.1250
B - 1 - 13	0.333	*******	0.2268	0.2696	3.3256	0.176	0.385	0.2719	******	1.087	0.1761	1.0421
B - 1 - 14	0.444	0.3931	0.2298	0.2838	2.5465	0.202	0.385	0.2677	0.988	1.304	0.1791	1.1289
B - 1 - 15	0.500	0.3552	0.2347	0.2918	4.1977	0.217	0.769	0.2854	0.963	1.304	0.1993	1.2447
B - 1 - 16	0.444	0.3241	0.2366	0.2943	3.1628	0.210	0.769	0.2810	0.951	1.957	0.1897	1.3803
B - 1 - 17	0.444	0.3207	0.2352	0.2903	2.6047	0.218	0.385	0.2854	0.975	0.652	0.1928	1.1368
B - 1 - 18	0.389	0.3034	0.2216	0.2871	3.0698	0.216	0.385	0.2661	0.963	1.522	0.1824	0.9513
B - 1 - 19	0.389	0.2069	0.2366	0.2875	2.5000	0.196	0.385	0.2805	0.778	1.087	0.1705	0.8803
B - 1 - 20	0.389	0.3276	0.1830	0.3054	2.7558	0.212	0.385	0.2747	1.049	1.304	0.1725	1.1132

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
B - 1 - 1	12.43	0.94	****	B - 2 - 1	*****	*****	38.8	B - 1 - 11	27.28	3.06	37.8
B - 1 - 2	26.91	2.34	41.7	B - 2 - 2	*****	*****	37.0	B - 1 - 12	26.49	3.42	38.4
B - 1 - 3	20.24	1.91	40.4	B - 2 - 3	*****	*****	37.2	B - 1 - 13	24.66	2.94	39.0
B - 1 - 4	22.46	2.92	40.8	B - 2 - 4	*****	*****	36.8	B - 1 - 14	29.06	3.33	26.3
B - 1 - 5	23.85	2.15	40.9	B - 2 - 5	*****	*****	38.2	B - 1 - 15	26.35	3.09	38.3
B - 1 - 6	27.58	2.83	42.2	B - 2 - 6	*****	*****	39.0	B - 1 - 16	24.69	2.85	37.3
B - 1 - 7	25.40	2.44	36.8	B - 2 - 7	*****	*****	38.6	B - 1 - 17	28.17	3.57	36.4
B - 1 - 8	24.26	2.52	39.4	B - 2 - 8	*****	*****	39.0	B - 1 - 18	28.52	3.94	37.3
B - 1 - 9	27.88	2.76	38.8	B - 2 - 9	*****	*****	38.8	B - 1 - 19	28.83	3.81	37.9
B - 1 - 10	28.16	2.82	39.2	B - 2 - 10	*****	*****	39.0	B - 1 - 20	25.94	3.51	38.1

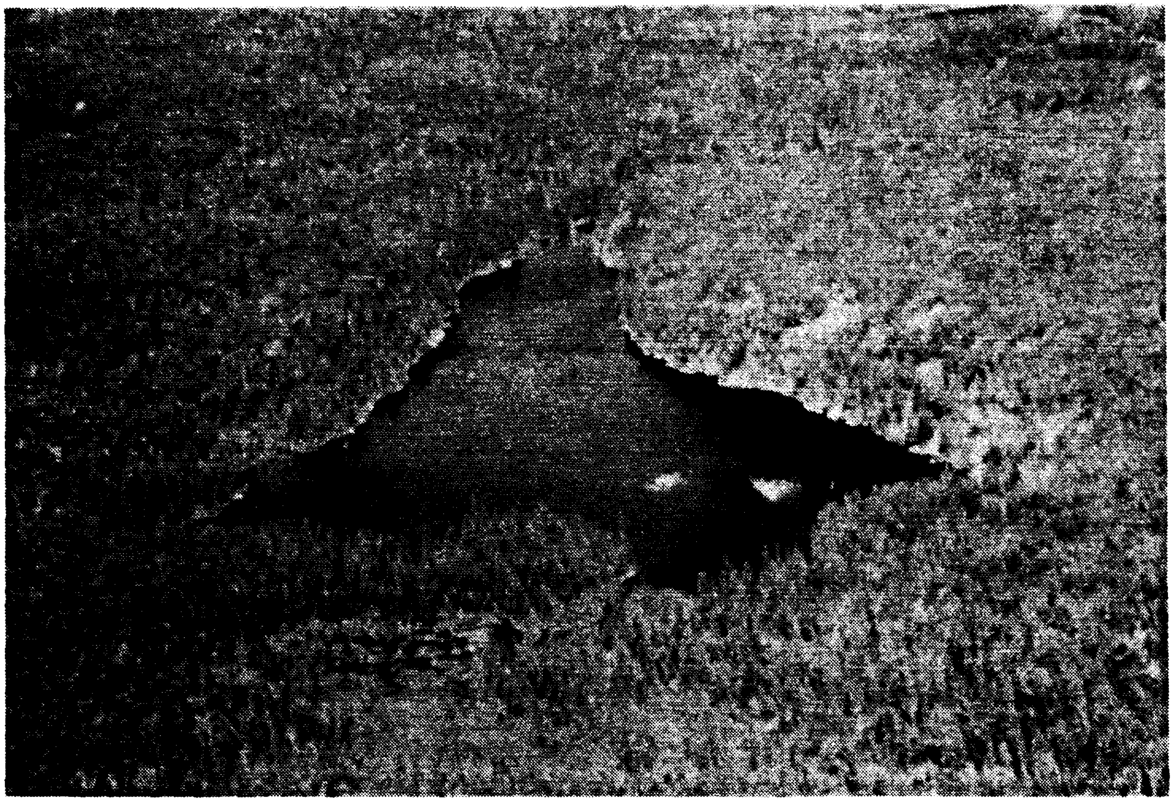
LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake C

pH 5·4

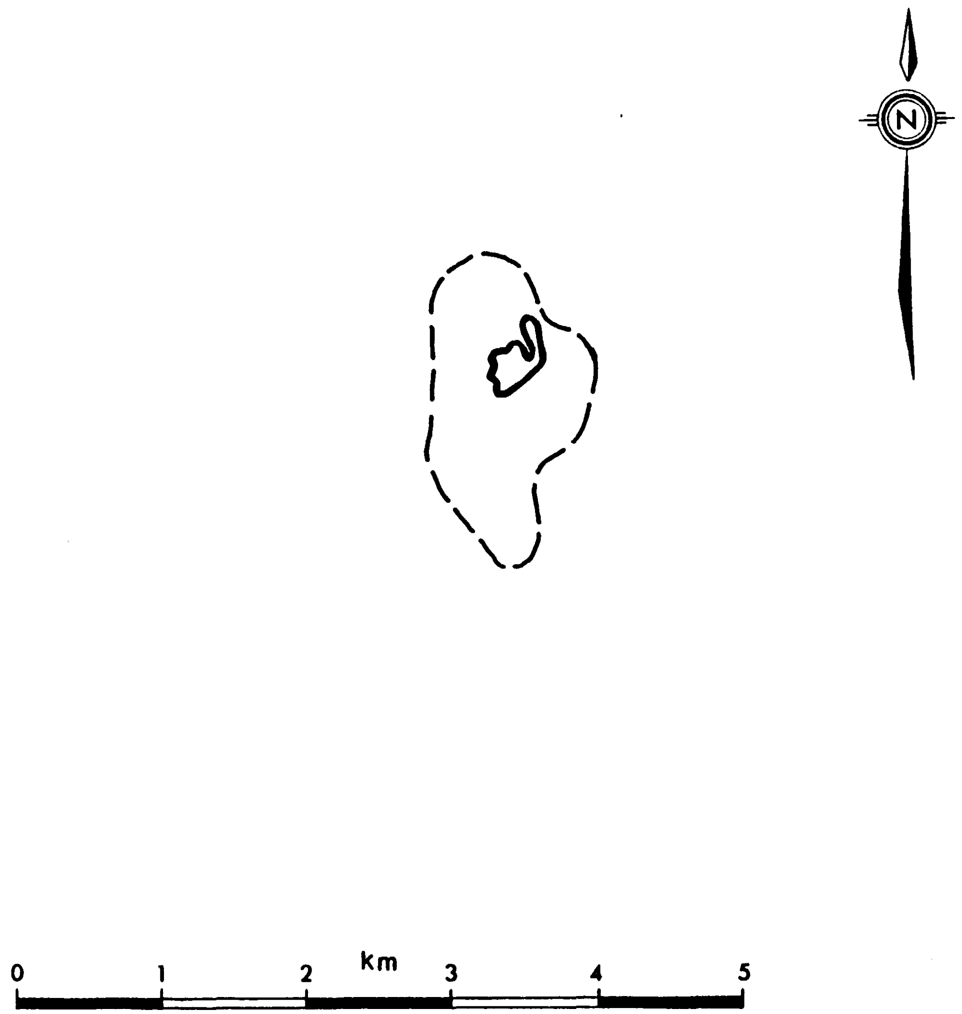
GENERAL SETTING

C - 2



GENERAL DESCRIPTION

Lake C is a small rock basin with generally steep slopes to a rocky shore. Some peat is beginning to develop in a narrow bay of the lake. Surficial deposits are essentially absent in the very small watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-608937/5467778
Elevation of lake above sea level	402 m (1340 ft)
Lake depth at sampling point	10 m
Lake area	.1 sq km
Lake catchment area	3 sq. km
Bedrock geology under lake basin	granite
Position of lake in staircase	3
Distance from south end of sampling strip	25 km

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY (No./l)
	Holopedium gibberum		0.2
	Bosmina longirostris		2.2
	Daphnia galeata mendota		0.1
	Daphnia pulex		0.1
		Total	2.6

COPEPODS	SPECIES NAME		DENSITY (No./l)
	Copepodites		1.9
	Cyclops bicuspidatus		0.2
	Diaptomus minutus		8.1
	Mesocyclops edax		1.2
		Total	11.4

ROTIFERS	SPECIES NAME		DENSITY (No./l)
	Conochilus sp.		2.1
	Asplanchna priodonta		1.1
	Kellicotia longispina		3.2
	Syncheata sp.		0.7
		Total	7.1

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Anabaena circinalis		3
	Aphanocapsa grevillei		3
	Coelosphaerium kutzinghiana		2
	Microcystis aeruginosa		2
	Microcystis flosaquae		2
		(Average)	(2)

CHLOROPHYTA	SPECIES NAME		ABUNDANCE
	Gloeocystis gigas		3
	Staurastrum sp.		2
		(Average)	(3)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Neidium sp.		2
	Melosira sp.		2
	Stephanodiscus sp.		2
	Tabellaria fenestrata		3
		(Average)	(2)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Chrysosphaerella longispina		2
	Dinobryon bavaricum		4
	Dinobryon divergens		4
		(Average)	(4)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Pinnularia biceps	1	4	.13
Stauroneis cf ignorata	1	2	.13
Eunotia pectinalis var minor	3	3	.38
Eunotia incisa	5	4	.64
Eunotia ovata	2	**	..26
Cymbella microcephala	3	4	.38
Pinnularia cf substomatophora	2	4	.26
Melosira sp	2		.26
Surirella biserata	1	4	.13
Cymbella lunata	2		.26
Fragillaria constricta	5	3	.64
Anomoeoneis serians	2	5	.26
Eunotia curvata	1	3	.13
Surirella robusta	2	4	.26
Stauroneis fluminea	1	4	.13
Pleurosigma delicatulum	1		.13
Nedium affine var ceylonicum	1		.13
Cyclotella glomerata	57	4	7.3
Cyclotella comta	113	2	14.5
Melosira distans	181	3	23.2
Fragilaria leptostauron	11	2	1.4
Tabellaria fenestrata	70	4	9.0
Eunotia pectinalis	2	3	.26
Eunotia vanheurckii	8		1.0
Melosira distans var alpigena	36	3	4.6
Fragilaria constricta f stricta	4	3	.51
Melosira islandica	36	2	4.6
Cyclotella stelligera	90	4	11.5
Achnanthes saxonica	2		.26
Frustulia rhomboides var saxonica	5	4	.64
Tabellaria flocculosa	10	3	1.3
Eunotia cf flexuosa	2	3	.26
Asterionella ralfsii	8	2	1.
Navicula subtilissima	7	3	.90
Eunotia cf perpusilla	4	5	.51
Tabellaria binalis	19	5	2.4
Anomoeoneis serians var brachysira	9	5	1.2
Fragilaria sp	5		.64
Cyclotella bodanica	6	4	.77
Pinnularia braunii var amphicephala	2	4	.26
Actinella punctata	6	5	.77
Navicula capitata var hungarica	4	2	.51
Nedium iridis var amphigomphus	4	4	.51
Eunotia serra	3	3	.38
Synedra tenera	2		.26
Eunotia elegans	6	5	.77
Navicula gottlandica	5	4	.64
Eunotia vanheurckii var intermedia	3		.38
Cymbella minuta var silesiaca	5	4	.64
Frustulia rhomboides	3	4	.38
Navicula cf pellicuolsa	2		.26
Eunotia tenella	4	3	.51
Tetracyclus lacustris	4	3	.51

*pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidolphilous
4-Indifferent
5-Acidoniontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake C was more properly referred to as a pond, as it had the smallest drainage basin of any of the study lakes (0.25 km^2) and the smallest area (0.06 km^2). The lake was thermally stratified at 5m and was next to the clearest (Secchi = 4.5m) of the Wawa study lakes. Only D was clearer. Lake C was also quite steep-sided.

Dissolved oxygen (D.O.) fell to 51% saturation near the bottom, and only lakes D and I had lower hypolimnetic D.O.'s.

Temperature-corrected specific conductivity (17-22 microhos/cm) was among the lowest observed, only Lakes A and B being lower. Calcium (1.9 mg/l), pH (5.4), and alkalinity were among the lowest of the 20 study lakes.

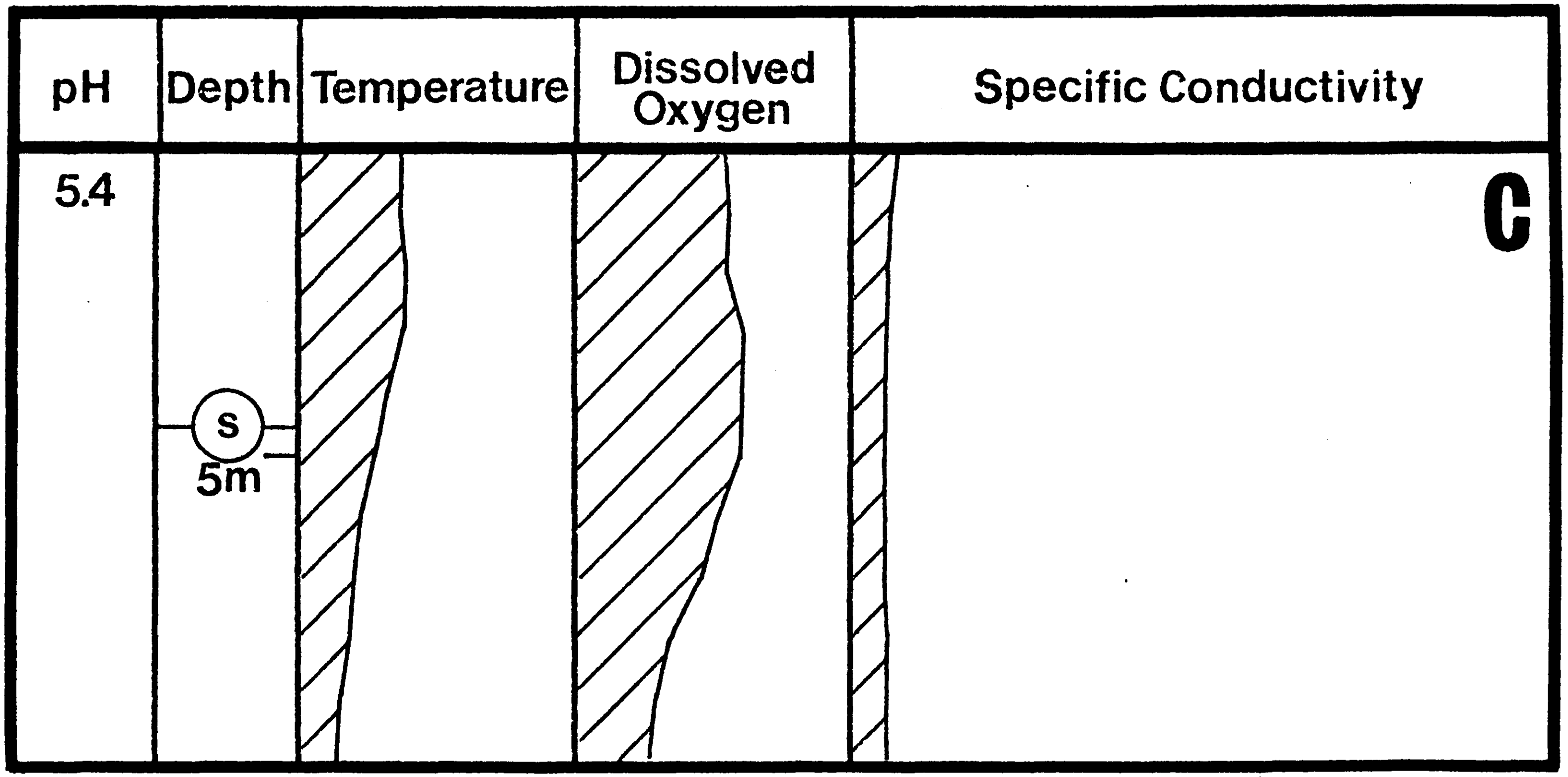
Lake C was located at a higher elevation (402m, AMSL) than any of the other 20 study lakes. The species richness (number of species observed in the plankton samples) was among the highest of the study lakes. Diatom diversity (the variety of diatoms in the surface sediment samples) was also higher than for all but a few of the study lakes. This may be due to the large littoral area extending across the bottom of this pond and contributing to a high degree of habitat diversity.

DETAILS OF LAKE WATER CHEMISTRY

C - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		12.4	100	22
1		12.2	104	20
2		13.4	105	19
3		13.0	118	19
4	4.5	11.6	111	18
5		9.5	111	18
6		7.5	96	17
7		6.5	86	17
8		6.1	67	18
9		5.6	59	19
10		5.4	51	20

*Specific conductivity data are temperature-corrected (25° C).



LAKE WATER CHEMISTRY PLOT

C - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE

C - 8

NO CORE

NO CORE

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
C - 1 - 1	22590.	6105.	377.	2000.	1960.	1177.	3997.	1272.	561.	22.
C - 1 - 2	21660.	8401.	364.	2020.	1640.	1222.	3916.	1160.	600.	19.
C - 1 - 3	18880.	8124.	347.	2270.	1520.	1188.	3587.	1074.	629.	19.
C - 1 - 4	17760.	7383.	351.	2240.	1420.	1135.	3483.	1061.	615.	19.
C - 1 - 5	17640.	5617.	293.	1740.	1260.	1049.	2905.	1123.	545.	16.
C - 1 - 6	23110.	5583.	281.	2100.	1920.	1207.	2721.	1221.	619.	20.
C - 1 - 7	24710.	5496.	321.	2160.	1900.	1252.	2914.	1319.	651.	20.
C - 1 - 8	22900.	5305.	375.	1770.	1430.	1148.	3258.	1303.	593.	17.
C - 1 - 9	21860.	4984.	372.	1620.	1510.	1060.	3354.	1221.	535.	17.
C - 1 - 10	21220.	5097.	368.	1500.	1280.	980.	3434.	1269.	519.	15.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
C - 2 - 1	18550.	10810.	235.	2620.	2800.	1535.	4505.	1038.	689.	21.
C - 2 - 2	17980.	7959.	178.	2360.	1420.	1365.	4131.	1006.	694.	20.
C - 2 - 3	17950.	8048.	189.	2010.	1340.	1209.	3769.	1011.	635.	19.
C - 2 - 4	14020.	6407.	183.	1830.	1100.	1159.	3421.	1058.	598.	16.
C - 2 - 5	14920.	5872.	187.	1830.	1190.	1271.	3214.	1144.	638.	16.
C - 2 - 6	20690.	6344.	214.	2030.	1510.	1368.	3597.	1238.	678.	19.
C - 2 - 7	18380.	5882.	219.	1950.	1440.	1333.	3524.	1299.	684.	20.
C - 2 - 8	14230.	5814.	223.	1830.	1580.	1309.	2625.	1323.	679.	19.
C - 2 - 9	15120.	5851.	227.	1740.	1580.	1271.	2866.	1370.	663.	19.
C - 2 - 10	31100.	7575.	236.	2320.	1830.	1511.	3929.	1582.	750.	26.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
C - 1 - 11	20520.	6027.	341.	1620.	1410.	1014.	3451.	1270.	528.	16.
C - 1 - 12	19920.	4699.	291.	1790.	2180.	878.	3250.	1220.	458.	15.
C - 1 - 13	20770.	4854.	266.	1500.	1680.	913.	3130.	1207.	475.	16.
C - 1 - 14	19710.	4966.	265.	1500.	1430.	974.	3434.	1193.	479.	16.
C - 1 - 15	19830.	4889.	249.	1460.	1470.	942.	3274.	1169.	495.	16.
C - 1 - 16	20080.	5045.	284.	1450.	1450.	966.	3756.	1189.	502.	16.
C - 1 - 17	20750.	4785.	279.	1410.	1510.	886.	3676.	1137.	476.	15.
C - 1 - 18	21010.	4984.	317.	1410.	1400.	942.	4318.	1110.	476.	15.
C - 1 - 19	******	******	*****	******	******	******	******	******	*****	****
C - 1 - 20	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
C - 1 - 1	11.22	0.50	****	C - 2 - 1	*****	*****	45.0	C - 1 - 11	31.98	4.51	42.7
C - 1 - 2	17.51	0.59	****	C - 2 - 2	*****	*****	33.4	C - 1 - 12	23.01	2.09	42.5
C - 1 - 3	25.13	1.61	36.6	C - 2 - 3	*****	*****	32.6	C - 1 - 13	31.23	4.07	44.4
C - 1 - 4	23.10	1.35	37.5	C - 2 - 4	*****	*****	30.4	C - 1 - 14	21.49	2.57	41.1
C - 1 - 5	25.40	1.80	31.2	C - 2 - 5	*****	*****	30.2	C - 1 - 15	31.10	3.63	40.6
C - 1 - 6	28.36	2.96	29.8	C - 2 - 6	*****	*****	31.2	C - 1 - 16	31.26	2.94	43.5
C - 1 - 7	24.78	2.08	33.2	C - 2 - 7	*****	*****	33.0	C - 1 - 17	34.02	4.19	41.5
C - 1 - 8	30.62	1.41	44.0	C - 2 - 8	*****	*****	31.2	C - 1 - 18	31.11	3.88	42.7
C - 1 - 9	27.06	2.33	42.4	C - 2 - 9	*****	*****	31.8	C - 1 - 19	*****	*****	****
C - 1 - 10	32.57	3.22	44.2	C - 2 - 10	*****	*****	28.0	C - 1 - 20	*****	*****	****

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
C - 1 - 1	7.9	11.4	16.7	22.4	113.	11.	15.	28.7	****	2.5	30.2	60.
C - 1 - 2	7.9	14.0	19.6	20.1	193.	11.	70.	30.1	****	4.0	28.6	85.
C - 1 - 3	6.7	16.0	17.4	16.8	281.	12.	75.	30.1	****	3.0	23.7	73.
C - 1 - 4	3.6	13.4	15.2	16.1	246.	11.	65.	29.1	****	3.0	24.1	62.
C - 1 - 5	2.4	10.9	15.2	12.6	202.	21.	20.	22.9	****	2.0	19.8	36.
C - 1 - 6	2.4	6.8	18.9	15.5	184.	10.	5.	24.9	****	2.0	19.9	31.
C - 1 - 7	1.9	8.7	20.0	18.2	193.	9.	5.	25.5	****	3.5	20.7	31.
C - 1 - 8	2.1	9.7	18.7	19.3	298.	11.	5.	24.8	****	3.5	28.2	44.
C - 1 - 9	1.4	8.9	16.0	18.7	228.	11.	5.	24.2	****	2.5	35.2	63.
C - 1 - 10	1.3	11.8	16.4	19.0	184.	12.	5.	23.6	6.	2.0	31.1	83.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
C - 2 - 1	****	*****	23.9	20.4	*****	14.	135.	39.5	****	0.5	25.9	137.
C - 2 - 2	****	6.5	19.5	19.2	*****	13.	85.	35.0	****	1.0	25.0	141.
C - 2 - 3	****	6.6	18.4	15.4	*****	10.	35.	31.4	****	1.0	21.9	64.
C - 2 - 4	****	6.3	16.7	15.1	*****	10.	30.	25.9	****	1.0	20.5	45.
C - 2 - 5	****	*****	18.8	16.7	*****	13.	20.	25.6	****	1.0	21.3	36.
C - 2 - 6	****	8.6	21.4	19.0	*****	13.	10.	29.2	8.	1.0	26.4	44.
C - 2 - 7	****	8.8	22.8	20.8	*****	14.	15.	25.2	8.	1.0	30.5	74.
C - 2 - 8	****	10.8	22.9	22.3	*****	13.	5.	21.5	9.	1.5	32.9	79.
C - 2 - 9	****	9.9	25.1	24.5	*****	14.	5.	20.4	8.	2.0	35.9	83.
C - 2 - 10	****	14.9	27.3	26.6	*****	15.	10.	30.0	12.	2.0	37.6	83.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
C - 1 - 11	3.8	12.5	15.8	18.7	211.	16.	25.	24.7	****	3.0	29.5	93.
C - 1 - 12	0.8	11.0	14.8	23.5	140.	17.	****	21.8	6.	2.0	26.8	133.
C - 1 - 13	0.8	11.0	15.2	17.8	149.	13.	5.	22.4	****	2.0	25.8	72.
C - 1 - 14	0.6	13.8	15.0	16.5	202.	16.	5.	21.3	7.	2.0	27.2	88.
C - 1 - 15	0.6	12.9	14.6	17.2	264.	14.	****	21.9	****	2.0	25.2	77.
C - 1 - 16	0.6	10.9	16.5	17.3	264.	12.	****	23.1	****	3.5	24.9	79.
C - 1 - 17	0.6	9.9	14.9	18.8	219.	20.	****	21.0	****	3.0	25.0	57.
C - 1 - 18	0.7	12.7	15.7	19.4	281.	13.	****	21.4	****	4.0	26.9	100.
C - 1 - 19	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
C - 1 - 20	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
C - 1 - 1	11.22	0.50	****	C - 2 - 1	*****	*****	45.0	C - 1 - 11	31.98	4.51	42.7
C - 1 - 2	17.51	0.59	****	C - 2 - 2	*****	*****	33.4	C - 1 - 12	23.01	2.09	42.5
C - 1 - 3	25.13	1.61	36.6	C - 2 - 3	*****	*****	32.6	C - 1 - 13	31.23	4.07	44.4
C - 1 - 4	23.10	1.35	37.5	C - 2 - 4	*****	*****	30.4	C - 1 - 14	21.49	2.57	41.1
C - 1 - 5	25.40	1.80	31.2	C - 2 - 5	*****	*****	30.2	C - 1 - 15	31.10	3.63	40.6
C - 1 - 6	28.36	2.96	29.8	C - 2 - 6	*****	*****	31.2	C - 1 - 16	31.26	2.94	43.5
C - 1 - 7	24.78	2.08	33.2	C - 2 - 7	*****	*****	33.0	C - 1 - 17	34.02	4.19	41.5
C - 1 - 8	30.62	1.41	44.0	C - 2 - 8	*****	*****	31.2	C - 1 - 18	31.11	3.88	42.7
C - 1 - 9	27.06	2.33	42.4	C - 2 - 9	*****	*****	31.8	C - 1 - 19	*****	*****	****
C - 1 - 10	32.57	3.22	44.2	C - 2 - 10	*****	*****	28.0	C - 1 - 20	*****	*****	****

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

C - 13

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
C - 1 - 1	0.2702	0.0982	0.3552	0.1087	0.0863	0.0426	0.0858	1.1357	0.0888	0.1364
C - 1 - 2	0.2591	0.1351	0.3433	0.1098	0.0722	0.0442	0.0840	1.0357	0.0950	0.1173
C - 1 - 3	0.2258	0.1306	0.3274	0.1234	0.0670	0.0430	0.0770	0.9589	0.0994	0.1179
C - 1 - 4	0.2124	0.1187	0.3308	0.1217	0.0626	0.0411	0.0747	0.9473	0.0972	0.1148
C - 1 - 5	0.2110	0.0903	0.2761	0.0946	0.0555	0.0380	0.0623	1.0027	0.0862	0.0975
C - 1 - 6	0.2764	0.0898	0.2651	0.1141	0.0846	0.0437	0.0584	1.0902	0.0979	0.1222
C - 1 - 7	0.2956	0.0884	0.3029	0.1174	0.0837	0.0453	0.0625	1.1777	0.1030	0.1259
C - 1 - 8	0.2739	0.0853	0.3540	0.0962	0.0630	0.0415	0.0699	1.1634	0.0938	0.1049
C - 1 - 9	0.2615	0.0801	0.3508	0.0880	0.0665	0.0384	0.0720	1.0902	0.0847	0.1019
C - 1 - 10	0.2538	0.0819	0.3468	0.0815	0.0564	0.0355	0.0737	1.1330	0.0821	0.0938

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
C - 2 - 1	0.2219	0.1738	0.2212	0.1424	0.1233	0.0555	0.0967	0.9268	0.1090	0.1290
C - 2 - 2	0.2151	0.1280	0.1679	0.1283	0.0626	0.0494	0.0886	0.8982	0.1097	0.1222
C - 2 - 3	0.2147	0.1294	0.1779	0.1092	0.0590	0.0437	0.0809	0.9027	0.1005	0.1142
C - 2 - 4	0.1677	0.1030	0.1729	0.0995	0.0485	0.0419	0.0734	0.9446	0.0945	0.0994
C - 2 - 5	0.1785	0.0944	0.1768	0.0995	0.0524	0.0460	0.0690	1.0214	0.1009	0.1000
C - 2 - 6	0.2475	0.1020	0.2018	0.1103	0.0665	0.0495	0.0772	1.1054	0.1073	0.1198
C - 2 - 7	0.2199	0.0946	0.2063	0.1060	0.0634	0.0482	0.0756	1.1598	0.1082	0.1247
C - 2 - 8	0.1702	0.0935	0.2100	0.0995	0.0696	0.0474	0.0563	1.1812	0.1074	0.1154
C - 2 - 9	0.1809	0.0941	0.2140	0.0946	0.0696	0.0460	0.0615	1.2232	0.1049	0.1167
C - 2 - 10	0.3720	0.1218	0.2230	0.1261	0.0806	0.0547	0.0843	1.4125	0.1187	0.1599

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
C - 1 - 11	0.2455	0.0969	0.3216	0.0880	0.0621	0.0367	0.0741	1.1339	0.0835	0.0988
C - 1 - 12	0.2383	0.0755	0.2749	0.0973	0.0960	0.0318	0.0697	1.0893	0.0725	0.0914
C - 1 - 13	0.2484	0.0780	0.2510	0.0815	0.0740	0.0330	0.0672	1.0777	0.0752	0.1000
C - 1 - 14	0.2358	0.0798	0.2500	0.0815	0.0630	0.0353	0.0737	1.0652	0.0757	0.0975
C - 1 - 15	0.2372	0.0786	0.2351	0.0793	0.0648	0.0341	0.0703	1.0437	0.0784	0.0957
C - 1 - 16	0.2402	0.0811	0.2675	0.0788	0.0639	0.0350	0.0806	1.0616	0.0794	0.1000
C - 1 - 17	0.2482	0.0769	0.2631	0.0766	0.0665	0.0321	0.0789	1.0152	0.0753	0.0914
C - 1 - 18	0.2513	0.0801	0.2990	0.0766	0.0617	0.0341	0.0927	0.9911	0.0753	0.0938
C - 1 - 19	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
C - 1 - 20	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
C - 1 - 1	11.22	0.50	****	C - 2 - 1	*****	*****	45.0	C - 1 - 11	31.98	4.51	42.7
C - 1 - 2	17.51	0.59	****	C - 2 - 2	*****	*****	33.4	C - 1 - 12	23.01	2.09	42.5
C - 1 - 3	25.13	1.61	36.6	C - 2 - 3	*****	*****	32.6	C - 1 - 13	31.23	4.07	44.4
C - 1 - 4	23.10	1.35	37.5	C - 2 - 4	*****	*****	30.4	C - 1 - 14	21.49	2.57	41.1
C - 1 - 5	25.40	1.80	31.2	C - 2 - 5	*****	*****	30.2	C - 1 - 15	31.10	3.63	40.6
C - 1 - 6	28.36	2.96	29.8	C - 2 - 6	*****	*****	31.2	C - 1 - 16	31.26	2.94	43.5
C - 1 - 7	24.78	2.08	33.2	C - 2 - 7	*****	*****	33.0	C - 1 - 17	34.02	4.19	41.5
C - 1 - 8	30.62	1.41	44.0	C - 2 - 8	*****	*****	31.2	C - 1 - 18	31.11	3.88	42.7
C - 1 - 9	27.06	2.33	42.4	C - 2 - 9	*****	*****	31.8	C - 1 - 19	*****	*****	****
C - 1 - 10	32.57	3.22	44.2	C - 2 - 10	*****	*****	28.0	C - 1 - 20	*****	*****	****

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

C - 15

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

C - 16

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
C - 1 - 1	4.389	0.3931	0.1366	0.3288	1.3140	0.111	1.154	0.0748	******	1.087	0.2218	0.7947
C - 1 - 2	4.389	0.4828	0.1607	0.2956	2.2442	0.112	5.385	0.0784	******	1.739	0.2103	1.1158
C - 1 - 3	3.722	0.5517	0.1428	0.2465	3.2674	0.124	5.769	0.0784	******	1.304	0.1746	0.9592
C - 1 - 4	2.000	0.4621	0.1243	0.2368	2.8605	0.108	5.000	0.0758	******	1.304	0.1769	0.8158
C - 1 - 5	1.333	0.3759	0.1249	0.1851	2.3488	0.207	1.538	0.0596	******	0.870	0.1457	0.4711
C - 1 - 6	1.333	0.2345	0.1549	0.2279	2.1395	0.104	0.385	0.0649	******	0.870	0.1467	0.4105
C - 1 - 7	1.056	0.3000	0.1642	0.2675	2.2442	0.095	0.385	0.0664	******	1.522	0.1519	0.4132
C - 1 - 8	1.167	0.3345	0.1534	0.2844	3.4651	0.114	0.385	0.0645	******	1.522	0.2073	0.5750
C - 1 - 9	0.778	0.3069	0.1309	0.2747	2.6512	0.110	0.385	0.0630	******	1.087	0.2586	0.8329
C - 1 - 10	0.722	0.4069	0.1344	0.2788	2.1395	0.123	0.385	0.0616	0.753	0.870	0.2287	1.0908

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
C - 2 - 1	******	*******	0.1957	0.2993	*******	0.138	10.385	0.1029	******	0.217	0.1901	1.7961
C - 2 - 2	******	0.2241	0.1602	0.2822	*******	0.130	6.538	0.0911	******	0.435	0.1838	1.8513
C - 2 - 3	******	0.2276	0.1511	0.2265	*******	0.096	2.692	0.0817	******	0.435	0.1607	0.8447
C - 2 - 4	******	0.2172	0.1371	0.2213	*******	0.105	2.308	0.0673	******	0.435	0.1510	0.5868
C - 2 - 5	******	*******	0.1544	0.2451	*******	0.127	1.538	0.0668	******	0.435	0.1568	0.4750
C - 2 - 6	******	0.2966	0.1753	0.2788	*******	0.129	0.769	0.0761	1.037	0.435	0.1938	0.5724
C - 2 - 7	******	0.3034	0.1869	0.3060	*******	0.136	1.154	0.0655	0.975	0.435	0.2243	0.9750
C - 2 - 8	******	0.3724	0.1880	0.3281	*******	0.133	0.385	0.0560	1.062	0.652	0.2420	1.0382
C - 2 - 9	******	0.3414	0.2053	0.3604	*******	0.144	0.385	0.0532	0.951	0.870	0.2643	1.0868
C - 2 - 10	******	0.5138	0.2238	0.3909	*******	0.155	0.769	0.0782	1.457	0.870	0.2763	1.0855

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
C - 1 - 11	2.111	0.4310	0.1294	0.2756	2.4535	0.157	1.923	0.0643	******	1.304	0.2168	1.2224
C - 1 - 12	0.444	0.3793	0.1216	0.3450	1.6279	0.170	******	0.0567	0.753	0.870	0.1971	1.7539
C - 1 - 13	0.444	0.3793	0.1243	0.2618	1.7326	0.133	0.385	0.0583	******	0.870	0.1896	0.9447
C - 1 - 14	0.333	0.4759	0.1228	0.2432	2.3488	0.160	0.385	0.0554	0.877	0.870	0.2001	1.1526
C - 1 - 15	0.333	0.4448	0.1194	0.2529	3.0698	0.137	******	0.0571	******	0.870	0.1854	1.0118
C - 1 - 16	0.333	0.3759	0.1349	0.2546	3.0698	0.124	******	0.0601	******	1.522	0.1829	1.0434
C - 1 - 17	0.333	0.3414	0.1224	0.2765	2.5465	0.197	******	0.0548	******	1.304	0.1841	0.7539
C - 1 - 18	0.389	0.4379	0.1288	0.2860	3.2674	0.128	******	0.0556	******	1.739	0.1977	1.3211
C - 1 - 19	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
C - 1 - 20	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******

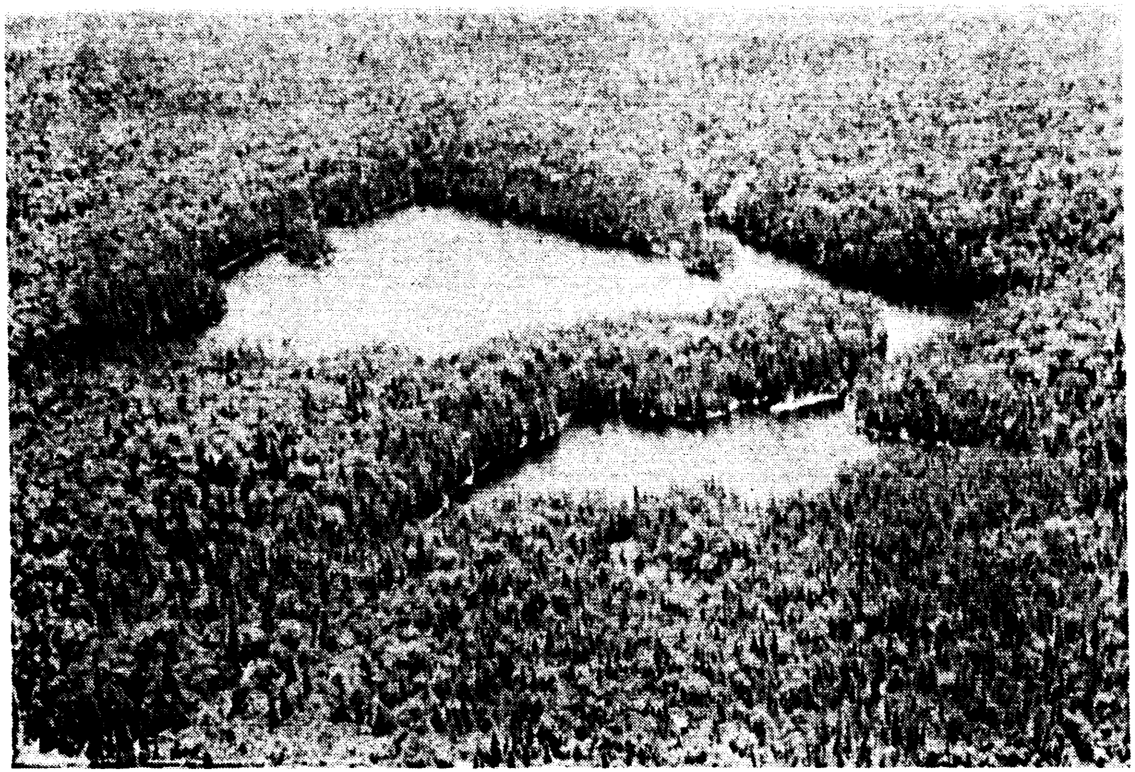
SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
C - 1 - 1	11.22	0.50	****	C - 2 - 1	*****	*****	45.0	C - 1 - 11	31.98	4.51	42.7
C - 1 - 2	17.51	0.59	****	C - 2 - 2	*****	*****	33.4	C - 1 - 12	23.01	2.09	42.5
C - 1 - 3	25.13	1.61	36.6	C - 2 - 3	*****	*****	32.6	C - 1 - 13	31.23	4.07	44.4
C - 1 - 4	23.10	1.35	37.5	C - 2 - 4	*****	*****	30.4	C - 1 - 14	21.49	2.57	41.1
C - 1 - 5	25.40	1.80	31.2	C - 2 - 5	*****	*****	30.2	C - 1 - 15	31.10	3.63	40.6
C - 1 - 6	28.36	2.96	29.8	C - 2 - 6	*****	*****	31.2	C - 1 - 16	31.26	2.94	43.5
C - 1 - 7	24.78	2.08	33.2	C - 2 - 7	*****	*****	33.0	C - 1 - 17	34.02	4.19	41.5
C - 1 - 8	30.62	1.41	44.0	C - 2 - 8	*****	*****	31.2	C - 1 - 18	31.11	3.88	42.7
C - 1 - 9	27.06	2.33	42.4	C - 2 - 9	*****	*****	31.8	C - 1 - 19	*****	*****	****
C - 1 - 10	32.57	3.22	44.2	C - 2 - 10	*****	*****	28.0	C - 1 - 20	*****	*****	****

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake D

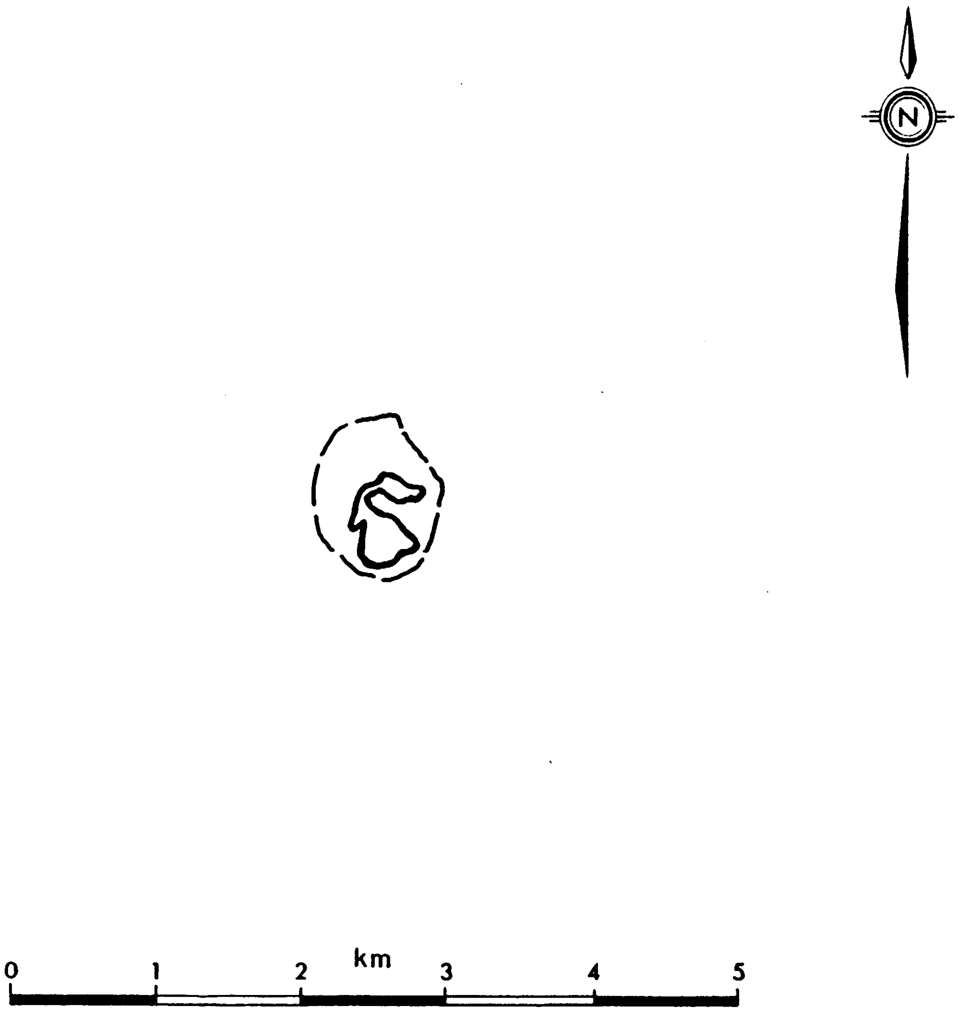
pH 5·5

GENERAL SETTING



GENERAL DESCRIPTION

Lake D is a small, deep, "hook-shaped" rock basin with an extremely small watershed. It has a rocky shore and surficial deposits are apparently absent. Laminated sediment was noted at the top of one core taken in the smaller basin of this lake.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-607610/5479988
Elevation of lake above sea level	396 m (1320 ft)
Lake depth at sampling point	20 m
Lake area	.15 sq km
Lake catchment area	.7 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	1
Distance from south end of sampling strip	25 km

GEOLOGICAL / GEOGRAPHICAL INFROMATION

LAKE MICROBIOTA

D - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY (No./l)
	Holopedium gibberum		0.1
	Bosmina longirostris		0.8
		Total	0.9

COPEPODS	SPECIES NAME		DENSITY (No./l)
	Copepodites		3.0
	Cyclops bicuspidatus		1.1
	Diaptomus minutus		0.5
	Mesocyclops edax		6.2
		Total	10.8

ROTIFERS	SPECIES NAME		DENSITY (No./l)
	Asplanchna preodonta		0.3
	Kellicotia longispina		2.4
	Polyarthra vulgaris		3.7
		Total	6.4

CHLOROPHYTA	SPECIES NAME		ABUNDANCE*
	Closterium sp.		2
	Volvox sp.		3
		(Average)	(3)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Tabellaria fenestrata		3
		(Average)	(3)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Dinobryon divergens		4
	Dinobryon sertularia		5
		(Average)	(5)

INSECTA	SPECIES NAME		DENSITY (No./l)
	Chaoborus		0.1
		Total	0.1

* Abundance codes are explained in the test
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Navicula radiosa var parva	8	4	1.3
Cyclotella glomerata	158	4	24.9
Cyclotella comta	152	2	23.9
Tabellaria fenestrata	34	4	3.4
Tetracyclus lacustris	16	3	2.5
Melosira distans	22	3	3.5
Gomphonema cf consector	1	**	.16
Navicula subtilissima	1	4	.16
Cyclotella stelligera	76	4	12.0
Tabellaria flocculosa	16	3	2.5
Navicula sp	1		.16
Cyclotella bodanica	35	4	5.5
Eunotia tenella	2	3	.31
Pinnularia substomatophora	2	3	.31
Eunotia serra var diadema	1	2	.16
Eunotia pectinalis	3	3	.47
Fragilaria brevistriata	1	2	.16
Anomoeoneis serians var acuta	4	5	.63
Frustulia rhomboides var saxonica	1	3	.16
Eunotia curvata	6	3	.94
Navicula sp	1		.16
Frustulia rhomboides	1	3	.16
Eunotia pectinalis var minor	1	4	.16
Eunotia rostellata	2		.31
Eunotia sp	1		.16
Cymbella minuta var silesiaca	1	4	.16
Nedium iridis	1	4	.16
Frustulia rhomboides var capitata	1	3	.16
Surirella biserata	1	4	.16
Synedra minuscula	1		.16
Pinnularia abaujensis var subundulata	1	4	.16

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

The hypolimnetic dissolved oxygen in Lake D was lower than in any of the other study lakes (27% saturation). In fact, one of its basins was actually anaerobic at the mud-water interface, and the core from this site was laminated, indicating a lack of bioturbation.

Temperature-corrected specific conductivity (22-27 micromhos/cm) was low, as were the calcium (1.9mg/l), alkalinity (46.4 microequivalents/l), and pH (5.5).

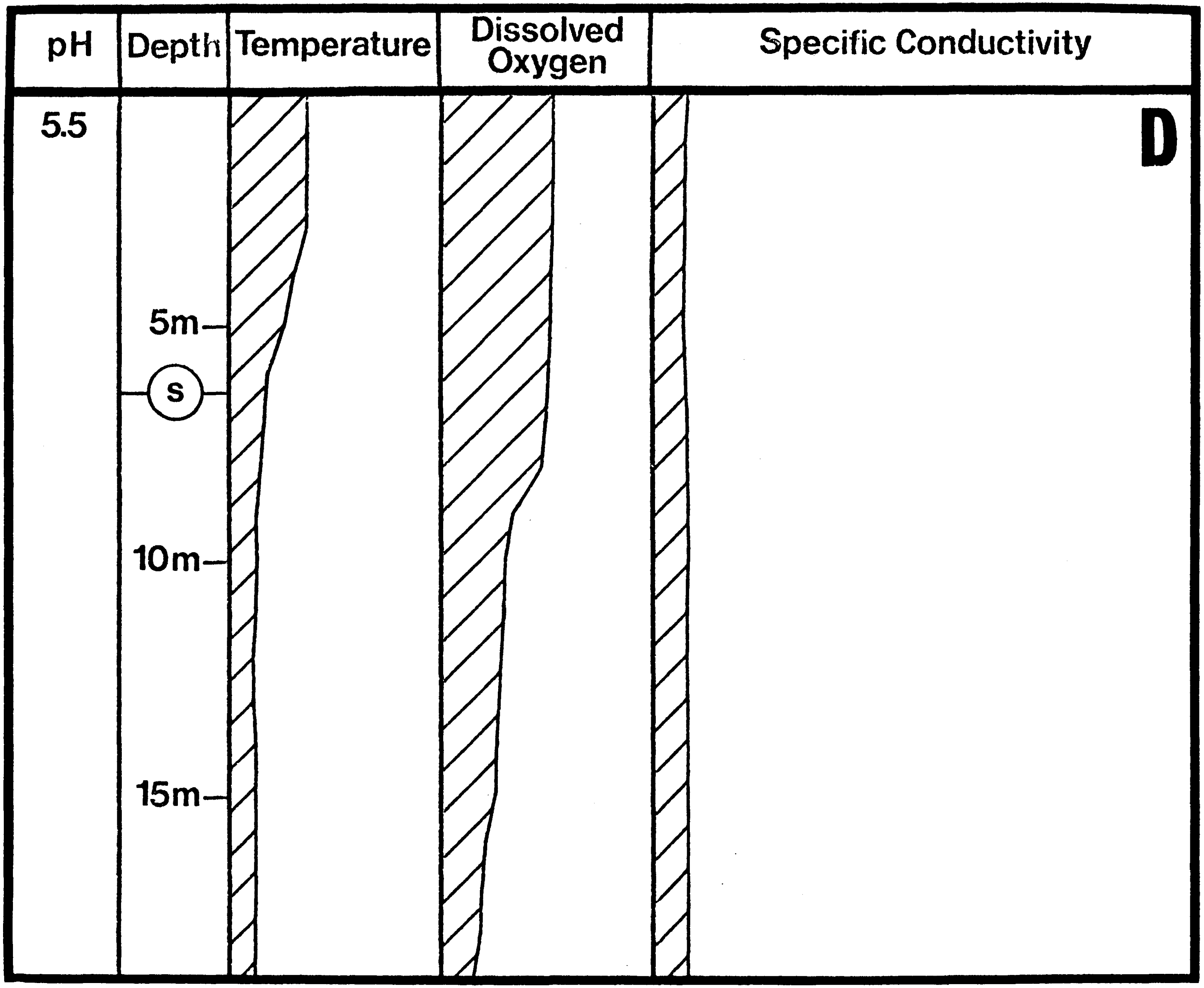
Lake D was a first-order lake (uppermost in its drainage system), and it displayed the clearest waters of any of the 20 study lakes (Secchi = 6.5m). Planktonic species richness was lower in this lake than in any of the others. It is possible that the lack of dissolved oxygen in its hypolimnion was in part responsible for this impoverished planktonic diversity. This steep-sided basin had no littoral zone and hence macrophytes were negligible.

DETAILS OF LAKE WATER CHEMISTRY

D - 6

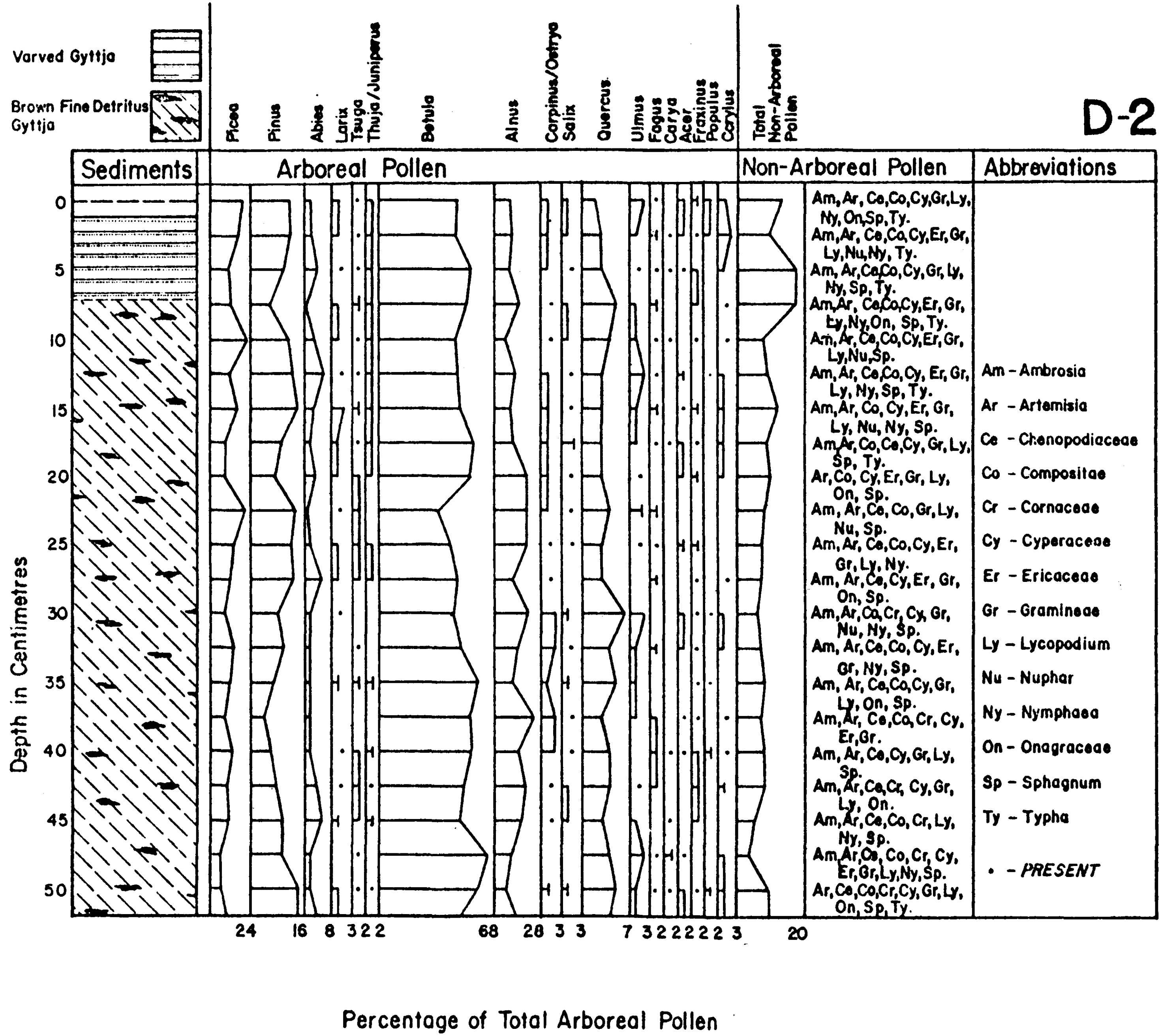
Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		12.2	100	25
1		12.4	100	25
2		12.4	100	25
3		12.4	99	23
4		10.4	95	23
5		9.2	97	22
6	6.5	6.6	94	25
7		6.1	87	25
8		5.2	82	25
9		4.6	63	25
10		4.5	59	24
11		4.4	57	24
12		4.3	52	26
13		4.2	51	27
14		4.2	48	
15		4.2	44	
16		4.2	43	
17		4.2	38	
18		4.2	32	
19		4.2	32	
20		4.2	27	

*Specific conductivity data are temperature-corrected (25° C).

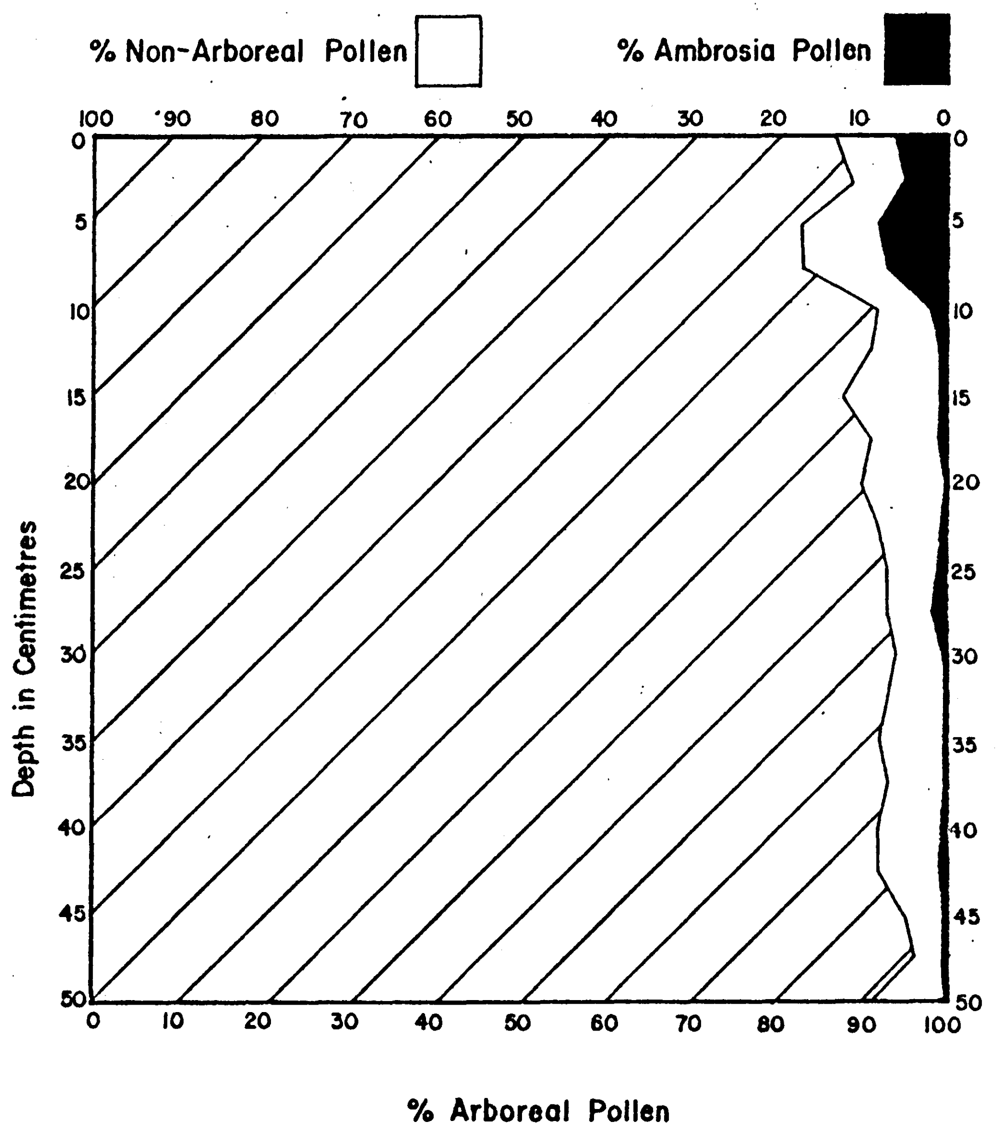


LAKE WATER CHEMISTRY PLOT

D - 7


D-2
Varved Gyttja
Brown Fine Detritus Gyttja
Sediments
Arboreal Pollen
Non-Arboreal Pollen
Abbreviations
Picea
Pinus
Abies
Larix
Tsuga
Thuja/Juniperus
Betula
Alnus
Carpinus/Ostrya
Salix
Quercus
Ulmus
Fagus
Carya
Acer
Fraxinus
Populus
Corylus
Total Non-Arboreal Pollen
Depth in Centimetres
0
5
10
15
20
25
30
35
40
45
50
24 16 8 3 2 2 68 28 3 3 7 3 2 2 2 2 2 3 20
Am, Ar, Ce, Co, Cy, Gr, Ly, Ny, On, Sp, Ty.
Am, Ar, Ce, Co, Cy, Er, Gr, Ly, Nu, Ny, Ty.
Am, Ar, Ce, Co, Cy, Gr, Ly, Ny, Sp, Ty.
Am, Ar, Ce, Co, Cy, Er, Gr, Ly, Ny, On, Sp, Ty.
Am, Ar, Ce, Co, Cy, Er, Gr, Ly, Nu, Sp.
Am, Ar, Ce, Co, Cy, Er, Gr, Ly, Ny, Sp, Ty.
Am, Ar, Co, Cy, Er, Gr, Ly, Nu, Ny, Sp.
Am, Ar, Co, Ce, Cy, Gr, Ly, Sp, Ty.
Ar, Co, Cy, Er, Gr, Ly, On, Sp.
Am, Ar, Ce, Co, Gr, Ly, Nu, Sp.
Am, Ar, Ce, Co, Cy, Er, Gr, Ly, Ny.
Am, Ar, Ce, Cy, Er, Gr, On, Sp.
Am, Ar, Ca, Cr, Cy, Gr, Nu, Ny, Sp.
Am, Ar, Ce, Co, Cy, Er, Gr, Ny, Sp.
Am, Ar, Ce, Co, Cy, Gr, Ly, On, Sp.
Am, Ar, Ce, Co, Cr, Cy, Er, Gr.
Am, Ar, Ce, Cy, Gr, Ly, Sp.
Am, Ar, Ce, Cr, Cy, Gr, Ly, On.
Am, Ar, Ce, Co, Cr, Ly, Ny, Sp.
Am, Ar, Ce, Co, Cr, Cy, Er, Gr, Ly, Ny, Sp.
Ar, Ce, Co, Cr, Cy, Gr, Ly, On, Sp, Ty.
Am - Ambrosia
Ar - Artemisia
Ce - Chenopodiaceae
Co - Compositae
Cr - Cornaceae
Cy - Cyperaceae
Er - Ericaceae
Gr - Gramineae
Ly - Lycopodium
Nu - Nuphar
Ny - Nymphaea
On - Onagraceae
Sp - Sphagnum
Ty - Typha
• - PRESENT
Percentage of Total Arboreal Pollen

The pollen diagram reflects regional forest vegetation, with a small influx of southern pollen. There is no mixing of bottom sediment as indicated by the sharp *Ambrosia* rise in the top 10 cm of gyttja.



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
D - 1 - 1	20540.	23710.	128.	2870.	1300.	1738.	5950.	1933.	947.	24.
D - 1 - 2	10360.	16550.	95.	1740.	910.	1132.	3764.	1507.	635.	14.
D - 1 - 3	22200.	24760.	142.	2780.	1510.	1672.	5890.	2124.	961.	23.
D - 1 - 4	20210.	23550.	128.	2720.	1920.	1631.	5924.	1888.	899.	21.
D - 1 - 5	17460.	23260.	130.	2520.	1360.	1553.	5778.	2077.	911.	21.
D - 1 - 6	24160.	23000.	133.	2370.	1200.	1502.	6113.	2142.	867.	19.
D - 1 - 7	23070.	21760.	132.	2200.	1400.	1452.	6277.	2181.	872.	21.
D - 1 - 8	25940.	21250.	135.	2010.	1240.	1357.	6927.	2300.	839.	20.
D - 1 - 9	29590.	20090.	136.	1660.	1170.	1262.	7576.	2302.	783.	19.
D - 1 - 10	28730.	19200.	135.	1440.	1030.	1185.	7456.	2291.	731.	17.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
D - 2 - 1	19940.	8125.	85.	3390.	2220.	1632.	6148.	1100.	818.	24.
D - 2 - 2	21000.	7789.	81.	3400.	2420.	1702.	5136.	1053.	810.	25.
D - 2 - 3	22710.	7226.	77.	3580.	2420.	1708.	4639.	952.	876.	25.
D - 2 - 4	20030.	6053.	74.	2710.	1720.	1561.	4655.	956.	758.	20.
D - 2 - 5	20680.	5332.	70.	2440.	1680.	1460.	4462.	957.	715.	18.
D - 2 - 6	21640.	4787.	73.	2420.	1630.	1608.	5000.	1003.	769.	19.
D - 2 - 7	22320.	4730.	69.	2630.	2040.	1653.	4976.	929.	773.	21.
D - 2 - 8	22470.	4771.	66.	2750.	2370.	1690.	5136.	950.	782.	22.
D - 2 - 9	24320.	4991.	70.	2540.	1980.	1681.	5746.	1074.	830.	22.
D - 2 - 10	24830.	4967.	72.	2430.	2100.	1653.	6148.	1202.	830.	22.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
D - 2 - 11	20290.	4022.	60.	1940.	1780.	1355.	5490.	1046.	640.	17.
D - 2 - 12	19750.	3958.	58.	1770.	1450.	1338.	5570.	1004.	598.	15.
D - 2 - 13	21280.	4055.	61.	1850.	1570.	1416.	6019.	1039.	626.	17.
D - 2 - 14	23810.	4201.	67.	2070.	2150.	1495.	6950.	1187.	671.	19.
D - 2 - 15	26410.	4722.	79.	2190.	1980.	1709.	8290.	1436.	740.	22.
D - 2 - 16	25530.	4673.	75.	2140.	1640.	1703.	8005.	1313.	751.	20.
D - 2 - 17	25690.	4542.	74.	2190.	1990.	1709.	7967.	1291.	707.	21.
D - 2 - 18	26060.	4510.	78.	2100.	1980.	1788.	9084.	1437.	680.	22.
D - 2 - 19	28120.	4722.	82.	2180.	2020.	1892.	9800.	1644.	716.	22.
D - 2 - 20	31220.	5317.	97.	2370.	2000.	2232.	12440.	2158.	804.	25.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
D - 1 - 1	*****	*****	58.0	D - 2 - 1	20.95	0.83	****	D - 2 - 11	27.34	2.97	46.9
D - 1 - 2	*****	*****	61.8	D - 2 - 2	16.84	0.89	****	D - 2 - 12	22.62	2.50	45.5
D - 1 - 3	*****	*****	60.4	D - 2 - 3	17.86	1.43	51.5	D - 2 - 13	23.10	2.68	46.2
D - 1 - 4	*****	*****	60.4	D - 2 - 4	25.90	2.32	46.0	D - 2 - 14	28.25	3.32	49.6
D - 1 - 5	*****	*****	61.4	D - 2 - 5	21.02	1.82	46.7	D - 2 - 15	22.31	2.45	53.6
D - 1 - 6	*****	*****	61.4	D - 2 - 6	23.57	2.76	45.5	D - 2 - 16	23.99	2.21	52.6
D - 1 - 7	*****	*****	62.0	D - 2 - 7	29.26	3.14	44.0	D - 2 - 17	27.97	3.03	48.6
D - 1 - 8	*****	*****	63.6	D - 2 - 8	19.82	1.95	45.6	D - 2 - 18	24.56	2.46	51.3
D - 1 - 9	*****	*****	65.8	D - 2 - 9	27.35	2.84	49.1	D - 2 - 19	25.16	2.78	53.4
D - 1 - 10	*****	*****	66.8	D - 2 - 10	26.46	2.32	51.6	D - 2 - 20	25.64	2.26	61.6

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

D - 11

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

D - 12

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
D - 1 - 1	****	*****	23.7	49.0	*****	15.	100.	31.9	****	1.5	42.0	174.
D - 1 - 2	****	*****	19.8	38.4	*****	13.	85.	17.0	****	1.0	31.6	144.
D - 1 - 3	****	*****	23.0	52.4	*****	20.	90.	34.8	****	1.5	44.1	180.
D - 1 - 4	****	*****	20.1	116.9	*****	15.	105.	32.3	****	1.0	41.8	163.
D - 1 - 5	****	*****	21.8	51.3	*****	15.	100.	31.2	****	1.0	42.3	165.
D - 1 - 6	****	*****	21.6	51.8	*****	17.	90.	34.7	7.	1.0	41.6	158.
D - 1 - 7	****	*****	21.4	51.5	*****	15.	85.	33.8	****	1.0	41.8	139.
D - 1 - 8	****	*****	24.3	52.2	*****	16.	60.	35.1	8.	1.0	42.6	114.
D - 1 - 9	****	*****	20.3	49.9	*****	14.	45.	35.8	7.	1.0	42.0	116.
D - 1 - 10	****	*****	21.6	50.2	*****	16.	35.	34.5	****	0.5	42.7	109.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
D - 2 - 1	8.5	*****	21.7	29.6	334.	19.	120.	43.4	****	2.5	25.6	198.
D - 2 - 2	8.7	*****	23.7	28.6	361.	17.	120.	39.2	****	3.0	26.0	192.
D - 2 - 3	6.0	*****	20.6	29.6	467.	14.	85.	39.2	****	2.0	25.2	157.
D - 2 - 4	3.4	*****	17.8	26.4	325.	16.	45.	33.2	****	2.5	22.1	117.
D - 2 - 5	2.5	*****	18.2	25.6	308.	12.	20.	32.1	****	2.5	19.8	75.
D - 2 - 6	1.2	7.7	18.0	28.2	259.	12.	10.	31.8	****	3.0	21.8	63.
D - 2 - 7	0.8	5.7	17.0	29.2	155.	11.	10.	31.8	****	5.5	21.6	55.
D - 2 - 8	0.8	*****	17.5	29.3	138.	11.	5.	31.5	****	2.0	22.8	66.
D - 2 - 9	0.8	5.5	18.7	30.1	138.	11.	5.	32.7	****	2.0	25.7	74.
D - 2 - 10	0.9	5.4	19.8	32.1	149.	12.	5.	33.3	****	1.5	27.4	86.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
D - 2 - 11	0.8	*****	15.9	32.8	138.	10.	5.	28.2	****	1.5	19.8	70.
D - 2 - 12	0.9	*****	16.0	32.9	166.	10.	5.	26.3	****	2.5	18.3	70.
D - 2 - 13	0.8	7.5	18.4	57.9	132.	505.	5.	26.6	****	2.0	19.2	122.
D - 2 - 14	0.6	5.6	19.8	40.4	149.	16.	5.	28.1	****	2.5	21.0	100.
D - 2 - 15	0.9	9.0	21.0	43.0	172.	16.	5.	30.1	8.	2.5	26.2	91.
D - 2 - 16	0.8	9.1	19.0	40.2	160.	15.	5.	29.7	7.	2.0	25.3	72.
D - 2 - 17	0.8	7.3	19.7	39.8	177.	14.	5.	30.0	7.	2.0	21.8	71.
D - 2 - 18	0.8	12.9	22.8	43.6	200.	17.	5.	29.4	9.	3.5	23.5	92.
D - 2 - 19	0.9	12.6	24.5	46.5	143.	19.	5.	31.6	10.	3.0	26.8	100.
D - 2 - 20	0.8	15.9	26.1	59.3	155.	22.	5.	33.2	11.	3.5	37.7	119.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
D - 1 - 1	*****	*****	58.0	D - 2 - 1	20.95	0.83	****	D - 2 - 11	27.34	2.97	46.9
D - 1 - 2	*****	*****	61.8	D - 2 - 2	16.84	0.89	****	D - 2 - 12	22.62	2.50	45.5
D - 1 - 3	*****	*****	60.4	D - 2 - 3	17.86	1.43	51.5	D - 2 - 13	23.10	2.68	46.2
D - 1 - 4	*****	*****	60.4	D - 2 - 4	25.90	2.32	46.0	D - 2 - 14	28.25	3.32	49.6
D - 1 - 5	*****	*****	61.4	D - 2 - 5	21.02	1.82	46.7	D - 2 - 15	22.31	2.45	53.6
D - 1 - 6	*****	*****	61.4	D - 2 - 6	23.57	2.76	45.5	D - 2 - 16	23.99	2.21	52.6
D - 1 - 7	*****	*****	62.0	D - 2 - 7	29.26	3.14	44.0	D - 2 - 17	27.97	3.03	48.6
D - 1 - 8	*****	*****	63.6	D - 2 - 8	19.82	1.95	45.6	D - 2 - 18	24.56	2.46	51.3
D - 1 - 9	*****	*****	65.8	D - 2 - 9	27.35	2.84	49.1	D - 2 - 19	25.16	2.78	53.4
D - 1 - 10	*****	*****	66.8	D - 2 - 10	26.46	2.32	51.6	D - 2 - 20	25.64	2.26	61.6

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

D - 13

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
D - 1 - 1	0.2457	0.3812	0.1209	0.1560	0.0573	0.0629	0.1277	1.7259	0.1498	0.1469
D - 1 - 2	0.1239	0.2661	0.0898	0.0946	0.0401	0.0410	0.0808	1.3455	0.1005	0.0864
D - 1 - 3	0.2656	0.3981	0.1335	0.1511	0.0665	0.0605	0.1264	1.8964	0.1521	0.1444
D - 1 - 4	0.2417	0.3786	0.1211	0.1478	0.0846	0.0590	0.1271	1.6857	0.1422	0.1284
D - 1 - 5	0.2089	0.3740	0.1230	0.1370	0.0599	0.0562	0.1240	1.8545	0.1441	0.1284
D - 1 - 6	0.2890	0.3698	0.1257	0.1288	0.0529	0.0543	0.1312	1.9125	0.1372	0.1198
D - 1 - 7	0.2760	0.3498	0.1246	0.1196	0.0617	0.0525	0.1347	1.9473	0.1379	0.1302
D - 1 - 8	0.3103	0.3416	0.1275	0.1092	0.0546	0.0491	0.1486	2.0536	0.1327	0.1216
D - 1 - 9	0.3539	0.3230	0.1284	0.0902	0.0515	0.0457	0.1626	2.0554	0.1239	0.1148
D - 1 - 10	0.3437	0.3087	0.1269	0.0783	0.0454	0.0429	0.1600	2.0455	0.1156	0.1031

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
D - 2 - 1	0.2385	0.1306	0.0800	0.1842	0.0978	0.0590	0.1319	0.9821	0.1294	0.1451
D - 2 - 2	0.2512	0.1252	0.0763	0.1848	0.1066	0.0616	0.1102	0.9402	0.1282	0.1512
D - 2 - 3	0.2717	0.1162	0.0726	0.1946	0.1066	0.0618	0.0995	0.8500	0.1386	0.1549
D - 2 - 4	0.2396	0.0973	0.0695	0.1473	0.0758	0.0565	0.0999	0.8536	0.1200	0.1247
D - 2 - 5	0.2474	0.0857	0.0661	0.1326	0.0740	0.0528	0.0958	0.8545	0.1131	0.1105
D - 2 - 6	0.2589	0.0770	0.0692	0.1315	0.0718	0.0582	0.1073	0.8955	0.1216	0.1167
D - 2 - 7	0.2670	0.0760	0.0646	0.1429	0.0899	0.0598	0.1068	0.8295	0.1223	0.1278
D - 2 - 8	0.2688	0.0767	0.0620	0.1495	0.1044	0.0611	0.1102	0.8482	0.1237	0.1358
D - 2 - 9	0.2909	0.0802	0.0658	0.1380	0.0872	0.0608	0.1233	0.9589	0.1313	0.1377
D - 2 - 10	0.2970	0.0799	0.0680	0.1321	0.0925	0.0598	0.1319	1.0732	0.1313	0.1327

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
D - 2 - 11	0.2427	0.0647	0.0564	0.1054	0.0784	0.0490	0.1178	0.9339	0.1013	0.1074
D - 2 - 12	0.2362	0.0636	0.0544	0.0962	0.0639	0.0484	0.1195	0.8964	0.0946	0.0932
D - 2 - 13	0.2545	0.0652	0.0576	0.1005	0.0692	0.0512	0.1292	0.9277	0.0991	0.1068
D - 2 - 14	0.2848	0.0675	0.0628	0.1125	0.0947	0.0541	0.1491	1.0598	0.1061	0.1198
D - 2 - 15	0.3159	0.0759	0.0748	0.1190	0.0872	0.0618	0.1779	1.2821	0.1171	0.1346
D - 2 - 16	0.3054	0.0751	0.0709	0.1163	0.0722	0.0616	0.1718	1.1723	0.1187	0.1259
D - 2 - 17	0.3073	0.0730	0.0702	0.1190	0.0877	0.0618	0.1710	1.1527	0.1119	0.1296
D - 2 - 18	0.3117	0.0725	0.0732	0.1141	0.0872	0.0647	0.1949	1.2830	0.1075	0.1327
D - 2 - 19	0.3364	0.0759	0.0773	0.1185	0.0890	0.0685	0.2103	1.4679	0.1132	0.1358
D - 2 - 20	0.3734	0.0855	0.0915	0.1288	0.0881	0.0808	0.2670	1.9268	0.1273	0.1549

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
D - 1 - 1	*****	*****	58.0	D - 2 - 1	20.95	0.83	****	D - 2 - 11	27.34	2.97	46.9
D - 1 - 2	*****	*****	61.8	D - 2 - 2	16.84	0.89	****	D - 2 - 12	22.62	2.50	45.5
D - 1 - 3	*****	*****	60.4	D - 2 - 3	17.86	1.43	51.5	D - 2 - 13	23.10	2.68	46.2
D - 1 - 4	*****	*****	60.4	D - 2 - 4	25.90	2.32	46.0	D - 2 - 14	28.25	3.32	49.6
D - 1 - 5	*****	*****	61.4	D - 2 - 5	21.02	1.82	46.7	D - 2 - 15	22.31	2.45	53.6
D - 1 - 6	*****	*****	61.4	D - 2 - 6	23.57	2.76	45.5	D - 2 - 16	23.99	2.21	52.6
D - 1 - 7	*****	*****	62.0	D - 2 - 7	29.26	3.14	44.0	D - 2 - 17	27.97	3.03	48.6
D - 1 - 8	*****	*****	63.6	D - 2 - 8	19.82	1.95	45.6	D - 2 - 18	24.56	2.46	51.3
D - 1 - 9	*****	*****	65.8	D - 2 - 9	27.35	2.84	49.1	D - 2 - 19	25.16	2.78	53.4
D - 1 - 10	*****	*****	66.8	D - 2 - 10	26.46	2.32	51.6	D - 2 - 20	25.64	2.26	61.6

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
D - 1 - 1	******	*******	0.1943	0.7206	*******	0.155	7.692	0.0832	******	0.652	0.3091	2.2829
D - 1 - 2	******	*******	0.1621	0.5647	*******	0.128	6.538	0.0442	******	0.435	0.2322	1.8895
D - 1 - 3	******	*******	0.1889	0.7700	*******	0.205	6.923	0.0907	******	0.652	0.3241	2.3671
D - 1 - 4	******	*******	0.1649	1.7191	*******	0.149	8.077	0.0840	******	0.435	0.3076	2.1487
D - 1 - 5	******	*******	0.1789	0.7547	*******	0.153	7.692	0.0814	******	0.435	0.3110	2.1763
D - 1 - 6	******	*******	0.1768	0.7613	*******	0.168	6.923	0.0904	0.815	0.435	0.3059	2.0724
D - 1 - 7	******	*******	0.1752	0.7579	*******	0.153	6.538	0.0881	******	0.435	0.3075	1.8250
D - 1 - 8	******	*******	0.1995	0.7682	*******	0.160	4.615	0.0914	0.938	0.435	0.3131	1.4987
D - 1 - 9	******	*******	0.1662	0.7343	*******	0.137	3.462	0.0933	0.901	0.435	0.3088	1.5316
D - 1 - 10	******	*******	0.1767	0.7376	*******	0.162	2.692	0.0898	******	0.217	0.3139	1.4342

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
D - 2 - 1	4.722	*******	0.1777	0.4360	3.8837	0.196	9.231	0.1130	******	1.087	0.1879	2.6000
D - 2 - 2	4.833	*******	0.1939	0.4207	4.1977	0.174	9.231	0.1021	******	1.304	0.1914	2.5250
D - 2 - 3	3.333	*******	0.1689	0.4353	5.4302	0.144	6.538	0.1021	******	0.870	0.1853	2.0684
D - 2 - 4	1.889	*******	0.1461	0.3876	3.7791	0.158	3.462	0.0864	******	1.087	0.1622	1.5329
D - 2 - 5	1.389	*******	0.1494	0.3765	3.5814	0.117	1.538	0.0836	******	1.087	0.1454	0.9895
D - 2 - 6	0.667	0.2655	0.1476	0.4150	3.0116	0.119	0.769	0.0829	******	1.304	0.1602	0.8289
D - 2 - 7	0.444	0.1966	0.1395	0.4296	1.8023	0.111	0.769	0.0829	******	2.391	0.1592	0.7276
D - 2 - 8	0.444	*******	0.1431	0.4312	1.6047	0.110	0.385	0.0820	******	0.870	0.1676	0.8684
D - 2 - 9	0.444	0.1897	0.1535	0.4425	1.6047	0.115	0.385	0.0852	******	0.870	0.1887	0.9697
D - 2 - 10	0.500	0.1862	0.1623	0.4715	1.7326	0.119	0.385	0.0867	******	0.652	0.2015	1.1329

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
D - 2 - 11	0.444	*******	0.1307	0.4821	1.6047	0.096	0.385	0.0734	******	0.652	0.1455	0.9158
D - 2 - 12	0.500	*******	0.1314	0.4844	1.9302	0.096	0.385	0.0685	******	1.087	0.1349	0.9171
D - 2 - 13	0.444	0.2586	0.1511	0.8509	1.5349	5.105	0.385	0.0691	******	0.870	0.1410	1.6066
D - 2 - 14	0.333	0.1931	0.1619	0.5941	1.7326	0.162	0.385	0.0730	******	1.087	0.1546	1.3171
D - 2 - 15	0.500	0.3103	0.1725	0.6319	2.0000	0.160	0.385	0.0783	0.951	1.087	0.1924	1.1921
D - 2 - 16	0.444	0.3138	0.1560	0.5916	1.8605	0.146	0.385	0.0773	0.877	0.870	0.1860	0.9474
D - 2 - 17	0.444	0.2517	0.1616	0.5859	2.0581	0.138	0.385	0.0781	0.840	0.870	0.1605	0.9382
D - 2 - 18	0.444	0.4448	0.1867	0.6407	2.3256	0.175	0.385	0.0765	1.074	1.522	0.1729	1.2079
D - 2 - 19	0.500	0.4345	0.2010	0.6843	1.6628	0.191	0.385	0.0823	1.198	1.304	0.1971	1.3171
D - 2 - 20	0.444	0.5483	0.2142	0.8713	1.8023	0.224	0.385	0.0865	1.358	1.522	0.2771	1.5671

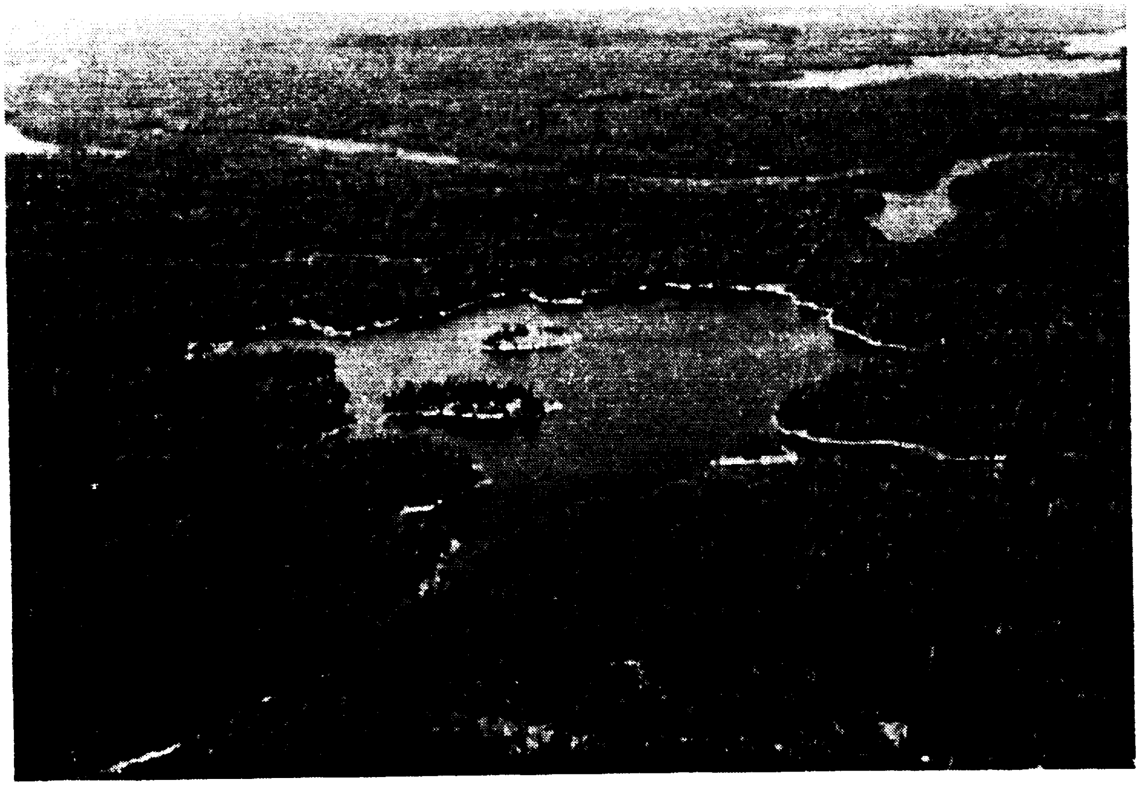
SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. X	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. X	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. X
D - 1 - 1	*****	*****	58.0	D - 2 - 1	20.95	0.83	****	D - 2 - 11	27.34	2.97	46.9
D - 1 - 2	*****	*****	61.8	D - 2 - 2	16.84	0.89	****	D - 2 - 12	22.62	2.50	45.5
D - 1 - 3	*****	*****	60.4	D - 2 - 3	17.86	1.43	51.5	D - 2 - 13	23.10	2.68	46.2
D - 1 - 4	*****	*****	60.4	D - 2 - 4	25.90	2.32	46.0	D - 2 - 14	28.25	3.32	49.6
D - 1 - 5	*****	*****	61.4	D - 2 - 5	21.02	1.82	46.7	D - 2 - 15	22.31	2.45	53.6
D - 1 - 6	*****	*****	61.4	D - 2 - 6	23.57	2.76	45.5	D - 2 - 16	23.99	2.21	52.6
D - 1 - 7	*****	*****	62.0	D - 2 - 7	29.26	3.14	44.0	D - 2 - 17	27.97	3.03	48.6
D - 1 - 8	*****	*****	63.6	D - 2 - 8	19.82	1.95	45.6	D - 2 - 18	24.56	2.46	51.3
D - 1 - 9	*****	*****	65.8	D - 2 - 9	27.35	2.84	49.1	D - 2 - 19	25.16	2.78	53.4
D - 1 - 10	*****	*****	66.8	D - 2 - 10	26.46	2.32	51.6	D - 2 - 20	25.64	2.26	61.6

Lake E

pH 6·5

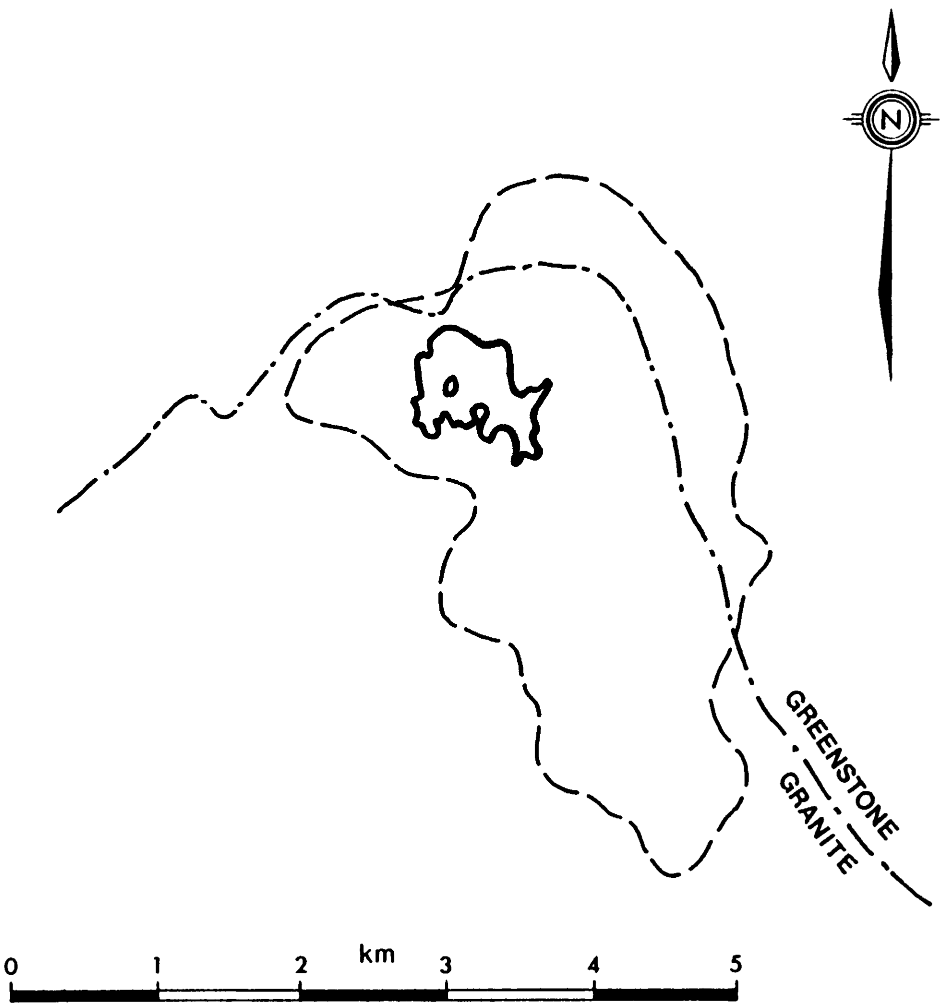
GENERAL SETTING

E - 2



GENERAL DESCRIPTION

Lake E is a rock basin with several bays and rock islands indicating complex morphometry. At least some of the lake bottom is sand and gravel, and discontinuous surficial deposits cover some of the relatively large watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-606160/5466551
Elevation of lake above sea level	412.5 m (1375 ft)
Lake depth at sampling point	20 m
Lake area	.4 sq km
Lake catchment area	8 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	4
Distance from south end of sampling strip	33 km

GEOLOGICAL / GEOGRAPHICAL INFORMATION

E - 3

LAKE MICROBIOTA

E - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY (No./l)
	Holopedium gibberum		0.6
	Daphnia sp.		0.5
		Total	1.1

COPEPODS	SPECIES NAME		DENSITY (No./l)
	Copepodites		0.3
	Cyclops bicuspidatus		0.1
	Diaptomus minutus		1.3
	Diaptomus copepodite		1.2
	Mesocyclops edax		0.6
		Total	3.5

ROTIFERS	SPECIES NAME		DENSITY (No./l)
	Asplanchna preodonta		2.0
	Conochilus sp.		0.4
	Kellicotia longispina		2.8
	Polyarthra vulgaris		1.0
	Alona sp.		0.7
		Total	6.9

CHLOROPHYTA	SPECIES NAME		ABUNDANCE*
	Gloeocystis gigas		3
	Volvox sp.		3
		(Average)	(3)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Asterionella formosa		2
	Tabellaria fenestrata		2
		(Average)	(2)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Dinobryon divergens		3
	Dinobryon sertularia		4
		(Average)	(4)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE(%)
Cyclotella comta	29	2	4.8
Navicula cryptocephala	17	2	2.8
Cyclotella stelligera	146	4	24.2
Navicula capitata var hungarica	24	2	4.0
Cyclotella glomerata	47	4	7.8
Eunotia exigua	12	3	2.0
Tabellaria fenestrata	141	4	23.3
Cyclotella bodanica	17	4	2.8
Pinnularia biceps	1	4	.17
Fragilaria construens	19	2	3.1
Melosira islandica	9	2	1.5
Synedra cf incisa	4	**	.66
Synedra cf incisa var ovata	1		.17
Cymbella minuta var silesica	3	4	.50
Nitzschia palea	15	4	.25
Pinnularia cf hilseana	11		.18
Navicula subhamulata	17	4	2.8
Melosira distans var alpigena	4	3	.66
Melosira distans	21	3	.35
Tabellaria flocculosa	4	3	.66
Anomoeoneis cf serians var brachysira	15	5	2.5
Achnanthes cf marginulata	11		1.8
Eunotia incisa	1	4	.17
Navicula cryptocephala var veneta	1	4	.17
Navicula subtilissima	3	3	.50
Nitzschia kutzingiana	6	2	.99
Navicula laevissima	2	4	.33
Semiorbis hemicyclus	1	5	.17
Pinnularia biceps	1	4	.17
Synedra tenera	2		.33
Eunotia pectinalis var recta	2	3	.33
Navicula gottlandica	5	4	.83
Fragilaria leptostauron	2	2	.33
Cymbella lunata	1	4	.17
Frustulia rhomboides var saxonica	1	4	.17
Eunotia flexuosa	1	3	.17
Surirella robusta	1	4	.17
Anomoeoneis cf styriaca	2	2	.33
Eunotia tenella	1	3	.17
Eunotia arcus f bigens	1	4	.17

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

** Blanks indicate species which had no published autecological information regarding their pH preferences.

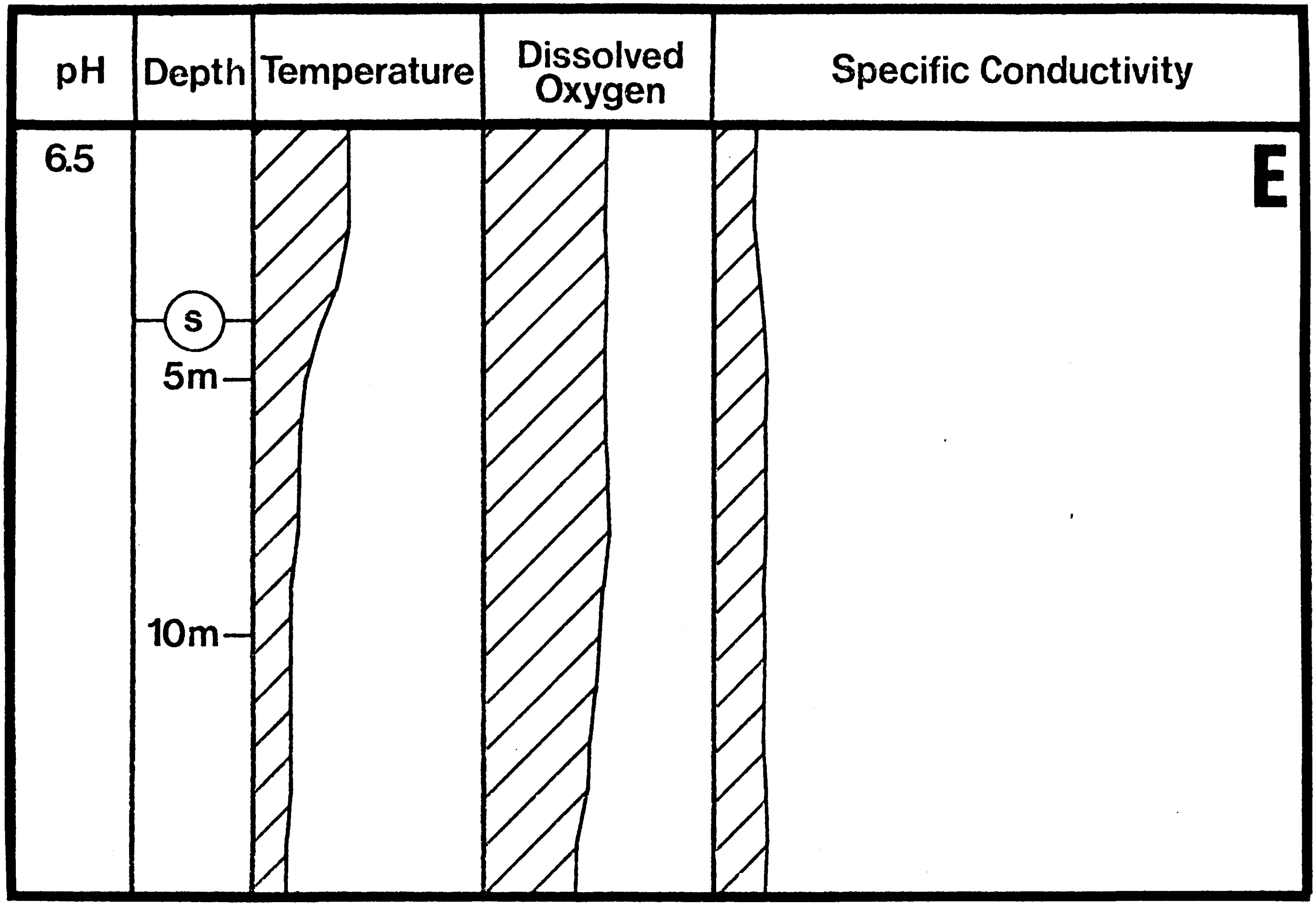
Lake E displayed a shallower thermocline depth than did D (4m vs. 5m), indicating that it was slightly more wind-sheltered than D. Its sediments yielded a 52% loss on ignition, placing this lake among the top six in terms of percentage of loss on ignition. Presumably, this was due to a high level of organic matter in the sediment.

In all other respects, Lake E was rather typical of the circumneutral Wawa study lakes. It displayed a well-oxygenated water column from top to bottom (15m) and an intermediate Secchi (3.8m) and specific conductivity (26-36 micromhos/cm). Calcium (3.1mg/l), pH (6.5), and alkalinity (121 microequivalents/l) were also in the centre of their respective ranges. Like D, Lake E had minimal littoral vegetation.

DETAILS OF LAKE WATER CHEMISTRY

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		13.9	100	26
1		14.2	100	26
2		14.3	100	26
3	3.8	13.1	100	28
4		10.0	99	31
5		7.8	99	36
6		7.0	98	33
7		6.7	103	33
8		6.4	102	33
9		6.0	95	31
10		5.9	89	32
11		5.6	86	32
12		5.6	86	32
13		5.5	84	32
14		5.1	75	33
15		4.9	75	33

*Specific conductivity data are temperature-corrected (25° C).



LAKE WATER CHEMISTRY PLOT

POLLEN DIAGRAM : LAKE SEDIMENT CORE

E - 8

NO CORE

NO CORE

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

E - 10

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
E - 1 - 1	41810.	27590.	1118.	7810.	14640.	5296.	12420.	952.	1318.	47.
E - 1 - 2	70980.	27580.	496.	13030.	32720.	7434.	19880.	719.	1370.	54.
E - 1 - 3	79250.	27610.	413.	13360.	35700.	8872.	23680.	699.	1859.	57.
E - 1 - 4	75910.	27820.	378.	13040.	35620.	8282.	22390.	688.	1900.	54.
E - 1 - 5	75970.	26930.	392.	13350.	33560.	9287.	25460.	740.	2038.	56.
E - 1 - 6	70720.	22470.	357.	13420.	30840.	8363.	23260.	744.	2127.	65.
E - 1 - 7	53410.	20110.	423.	14310.	22820.	8639.	21020.	967.	2465.	117.
E - 1 - 8	60340.	19980.	420.	14270.	22130.	8483.	21340.	1018.	2321.	109.
E - 1 - 9	63470.	19410.	394.	14340.	23990.	8198.	22010.	999.	2346.	104.
E - 1 - 10	61760.	19590.	398.	14550.	23370.	8433.	22060.	962.	2363.	106.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
E - 2 - 1	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 2	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 3	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 4	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 5	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 6	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 7	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 8	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 9	******	******	*****	******	******	******	******	******	*****	****
E - 2 - 10	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
E - 1 - 11	60340.	18810.	361.	14030.	24200.	8224.	22750.	809.	2212.	97.
E - 1 - 12	61390.	18150.	344.	14020.	25200.	7683.	20770.	777.	2188.	92.
E - 1 - 13	68080.	17720.	328.	14770.	29050.	7549.	21910.	683.	2137.	76.
E - 1 - 14	50980.	15070.	282.	11480.	20390.	6439.	17450.	604.	1760.	75.
E - 1 - 15	77260.	22150.	359.	13770.	35270.	9685.	25730.	666.	2349.	66.
E - 1 - 16	******	******	*****	******	******	******	******	******	*****	****
E - 1 - 17	******	******	*****	******	******	******	******	******	*****	****
E - 1 - 18	******	******	*****	******	******	******	******	******	*****	****
E - 1 - 19	******	******	*****	******	******	******	******	******	*****	****
E - 1 - 20	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
E - 1 - 1	14.41	0.87	****	E - 2 - 1	*****	*****	****	E - 1 - 11	23.59	7.06	11.6
E - 1 - 2	15.33	3.68	8.4	E - 2 - 2	*****	*****	****	E - 1 - 12	22.68	6.32	11.0
E - 1 - 3	33.90	15.40	3.6	E - 2 - 3	*****	*****	****	E - 1 - 13	28.96	9.43	9.8
E - 1 - 4	37.28	22.08	7.1	E - 2 - 4	*****	*****	****	E - 1 - 14	29.27	8.54	9.7
E - 1 - 5	40.57	24.16	3.6	E - 2 - 5	*****	*****	****	E - 1 - 15	35.94	20.99	2.4
E - 1 - 6	39.18	21.95	4.3	E - 2 - 6	*****	*****	****	E - 1 - 16	*****	*****	****
E - 1 - 7	21.56	5.30	15.8	E - 2 - 7	*****	*****	****	E - 1 - 17	*****	*****	****
E - 1 - 8	30.04	6.21	15.0	E - 2 - 8	*****	*****	****	E - 1 - 18	*****	*****	****
E - 1 - 9	30.40	6.25	14.7	E - 2 - 9	*****	*****	****	E - 1 - 19	*****	*****	****
E - 1 - 10	27.04	6.00	14.1	E - 2 - 10	*****	*****	****	E - 1 - 20	*****	*****	****

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
E - 1 - 1	8.0	19.9	40.2	14.4	115.	18.	60.	216.1	****	3.0	40.5	155.
E - 1 - 2	4.3	15.8	39.9	9.0	48.	20.	20.	469.0	****	2.0	49.5	106.
E - 1 - 3	2.5	14.8	44.6	8.0	20.	21.	15.	618.4	****	2.0	55.3	92.
E - 1 - 4	2.7	11.3	38.0	10.0	31.	22.	15.	506.0	****	1.5	53.1	94.
E - 1 - 5	1.3	16.8	43.6	8.4	20.	23.	10.	515.2	****	2.0	57.3	94.
E - 1 - 6	0.6	16.4	38.1	14.2	20.	22.	10.	474.8	****	2.0	49.3	102.
E - 1 - 7	1.0	19.5	56.9	26.6	53.	31.	5.	298.9	10.	3.5	57.1	111.
E - 1 - 8	0.8	19.3	53.5	27.9	82.	30.	10.	300.4	10.	3.5	54.2	100.
E - 1 - 9	0.7	15.4	49.2	25.3	59.	28.	5.	342.5	8.	3.5	51.1	92.
E - 1 - 10	0.6	14.4	53.0	25.3	59.	27.	5.	328.4	8.	4.0	52.9	87.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
E - 2 - 1	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 2	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 3	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 4	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 5	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 6	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 7	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 8	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 9	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 2 - 10	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
E - 1 - 11	0.6	14.6	47.8	18.7	70.	27.	5.	354.9	7.	3.5	51.0	76.
E - 1 - 12	0.4	9.2	45.8	20.8	36.	24.	5.	356.4	****	3.5	47.2	76.
E - 1 - 13	0.4	9.9	39.6	17.8	36.	20.	5.	409.4	****	2.0	44.6	71.
E - 1 - 14	0.5	9.0	37.9	17.3	25.	21.	5.	295.3	****	3.5	41.4	56.
E - 1 - 15	0.3	15.8	42.9	17.3	15.	27.	5.	516.5	****	2.0	57.5	68.
E - 1 - 16	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 1 - 17	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 1 - 18	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 1 - 19	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
E - 1 - 20	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
E - 1 - 1	14.41	0.87	****	E - 2 - 1	*****	*****	****	E - 1 - 11	23.59	7.06	11.6
E - 1 - 2	15.33	3.68	8.4	E - 2 - 2	*****	*****	****	E - 1 - 12	22.68	6.32	11.0
E - 1 - 3	33.90	15.40	3.6	E - 2 - 3	*****	*****	****	E - 1 - 13	28.96	9.43	9.8
E - 1 - 4	37.28	22.08	7.1	E - 2 - 4	*****	*****	****	E - 1 - 14	29.27	8.54	9.7
E - 1 - 5	40.57	24.16	3.6	E - 2 - 5	*****	*****	****	E - 1 - 15	35.94	20.99	2.4
E - 1 - 6	39.18	21.95	4.3	E - 2 - 6	*****	*****	****	E - 1 - 16	*****	*****	****
E - 1 - 7	21.56	5.30	15.8	E - 2 - 7	*****	*****	****	E - 1 - 17	*****	*****	****
E - 1 - 8	30.04	6.21	15.0	E - 2 - 8	*****	*****	****	E - 1 - 18	*****	*****	****
E - 1 - 9	30.40	6.25	14.7	E - 2 - 9	*****	*****	****	E - 1 - 19	*****	*****	****
E - 1 - 10	27.04	6.00	14.1	E - 2 - 10	*****	*****	****	E - 1 - 20	*****	*****	****

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
E - 1 - 1	0.5001	0.4436	1.0547	0.4285	0.6449	0.1916	0.2665	0.8500	0.2085	0.2883
E - 1 - 2	0.8490	0.4434	0.4683	0.7082	1.4414	0.2690	0.4266	0.6420	0.2168	0.3333
E - 1 - 3	0.9480	0.4439	0.3892	0.7261	1.5727	0.3210	0.5082	0.6241	0.2941	0.3543
E - 1 - 4	0.9080	0.4473	0.3566	0.7087	1.5692	0.2996	0.4805	0.6143	0.3006	0.3333
E - 1 - 5	0.9087	0.4330	0.3694	0.7255	1.4784	0.3360	0.5464	0.6607	0.3225	0.3444
E - 1 - 6	0.8459	0.3613	0.3371	0.7293	1.3586	0.3026	0.4991	0.6643	0.3366	0.4037
E - 1 - 7	0.6389	0.3233	0.3993	0.7777	1.0053	0.3126	0.4511	0.8634	0.3900	0.7198
E - 1 - 8	0.7218	0.3212	0.3959	0.7755	0.9749	0.3069	0.4579	0.9089	0.3672	0.6716
E - 1 - 9	0.7592	0.3121	0.3715	0.7793	1.0568	0.2966	0.4723	0.8920	0.3712	0.6407
E - 1 - 10	0.7388	0.3150	0.3758	0.7908	1.0295	0.3051	0.4734	0.8589	0.3739	0.6562

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
E - 2 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 3	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 6	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 7	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 8	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 9	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 2 - 10	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TT KK	ZR KK
E - 1 - 11	0.7218	0.3024	0.3407	0.7625	1.0661	0.2975	0.4882	0.7223	0.3500	0.5994
E - 1 - 12	0.7343	0.2918	0.3244	0.7620	1.1101	0.2780	0.4457	0.6937	0.3462	0.5698
E - 1 - 13	0.8144	0.2849	0.3091	0.8027	1.2797	0.2731	0.4702	0.6098	0.3381	0.4716
E - 1 - 14	0.6098	0.2423	0.2660	0.6239	0.8982	0.2330	0.3745	0.5393	0.2785	0.4599
E - 1 - 15	0.9242	0.3561	0.3389	0.7484	1.5537	0.3504	0.5521	0.5946	0.3717	0.4074
E - 1 - 16	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 1 - 17	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 1 - 18	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 1 - 19	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
E - 1 - 20	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
E - 1 - 1	14.41	0.87	****	E - 2 - 1	*****	*****	****	E - 1 - 11	23.59	7.06	11.6
E - 1 - 2	15.33	3.68	8.4	E - 2 - 2	*****	*****	****	E - 1 - 12	22.68	6.32	11.0
E - 1 - 3	33.90	15.40	3.6	E - 2 - 3	*****	*****	****	E - 1 - 13	28.96	9.43	9.8
E - 1 - 4	37.28	22.08	7.1	E - 2 - 4	*****	*****	****	E - 1 - 14	29.27	8.54	9.7
E - 1 - 5	40.57	24.16	3.6	E - 2 - 5	*****	*****	****	E - 1 - 15	35.94	20.99	2.4
E - 1 - 6	39.18	21.95	4.3	E - 2 - 6	*****	*****	****	E - 1 - 16	*****	*****	****
E - 1 - 7	21.56	5.30	15.8	E - 2 - 7	*****	*****	****	E - 1 - 17	*****	*****	****
E - 1 - 8	30.04	6.21	15.0	E - 2 - 8	*****	*****	****	E - 1 - 18	*****	*****	****
E - 1 - 9	30.40	6.25	14.7	E - 2 - 9	*****	*****	****	E - 1 - 19	*****	*****	****
E - 1 - 10	27.04	6.00	14.1	E - 2 - 10	*****	*****	****	E - 1 - 20	*****	*****	****

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

E - 15

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

E - 16

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
E - 1 - 1	4.444	0.6862	0.3293	0.2122	1.3372	0.184	4.615	0.5628	******	1.304	0.2977	2.0355
E - 1 - 2	2.389	0.5448	0.3266	0.1324	0.5581	0.199	1.538	1.2214	******	0.870	0.3637	1.3921
E - 1 - 3	1.389	0.5103	0.3657	0.1174	0.2326	0.216	1.154	1.6104	******	0.870	0.4069	1.2145
E - 1 - 4	1.500	0.3897	0.3113	0.1474	0.3605	0.220	1.154	1.3177	******	0.652	0.3905	1.2408
E - 1 - 5	0.722	0.5793	0.3573	0.1237	0.2326	0.227	0.769	1.3417	******	0.870	0.4213	1.2342
E - 1 - 6	0.333	0.5655	0.3124	0.2085	0.2326	0.222	0.769	1.2365	******	0.870	0.3627	1.3408
E - 1 - 7	0.556	0.6724	0.4666	0.3919	0.6163	0.315	0.385	0.7784	1.185	1.522	0.4201	1.4553
E - 1 - 8	0.444	0.6655	0.4389	0.4096	0.9535	0.306	0.769	0.7823	1.210	1.522	0.3987	1.3092
E - 1 - 9	0.389	0.5310	0.4030	0.3716	0.6860	0.281	0.385	0.8919	0.988	1.522	0.3760	1.2039
E - 1 - 10	0.333	0.4966	0.4342	0.3716	0.6860	0.272	0.385	0.8552	1.000	1.739	0.3886	1.1487

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
E - 2 - 1	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 2	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 3	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 4	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 5	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 6	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 7	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 8	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 9	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 2 - 10	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
E - 1 - 11	0.333	0.5034	0.3916	0.2749	0.8140	0.275	0.385	0.9242	0.852	1.522	0.3749	0.9974
E - 1 - 12	0.222	0.3172	0.3757	0.3057	0.4186	0.240	0.385	0.9281	******	1.522	0.3471	1.0000
E - 1 - 13	0.222	0.3414	0.3249	0.2612	0.4186	0.205	0.385	1.0661	******	0.870	0.3278	0.9276
E - 1 - 14	0.278	0.3103	0.3104	0.2546	0.2907	0.210	0.385	0.7690	******	1.522	0.3047	0.7395
E - 1 - 15	0.167	0.5448	0.3515	0.2543	0.1744	0.272	0.385	1.3451	******	0.870	0.4227	0.8882
E - 1 - 16	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 1 - 17	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 1 - 18	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 1 - 19	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
E - 1 - 20	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
E - 1 - 1	14.41	0.87	****	E - 2 - 1	*****	*****	****	E - 1 - 11	23.59	7.06	11.6
E - 1 - 2	15.33	3.68	8.4	E - 2 - 2	*****	*****	****	E - 1 - 12	22.68	6.32	11.0
E - 1 - 3	33.90	15.40	3.6	E - 2 - 3	*****	*****	****	E - 1 - 13	28.96	9.43	9.8
E - 1 - 4	37.28	22.08	7.1	E - 2 - 4	*****	*****	****	E - 1 - 14	29.27	8.54	9.7
E - 1 - 5	40.57	24.16	3.6	E - 2 - 5	*****	*****	****	E - 1 - 15	35.94	20.99	2.4
E - 1 - 6	39.18	21.95	4.3	E - 2 - 6	*****	*****	****	E - 1 - 16	*****	*****	****
E - 1 - 7	21.56	5.30	15.8	E - 2 - 7	*****	*****	****	E - 1 - 17	*****	*****	****
E - 1 - 8	30.04	6.21	15.0	E - 2 - 8	*****	*****	****	E - 1 - 18	*****	*****	****
E - 1 - 9	30.40	6.25	14.7	E - 2 - 9	*****	*****	****	E - 1 - 19	*****	*****	****
E - 1 - 10	27.04	6.00	14.1	E - 2 - 10	*****	*****	****	E - 1 - 20	*****	*****	****

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake F

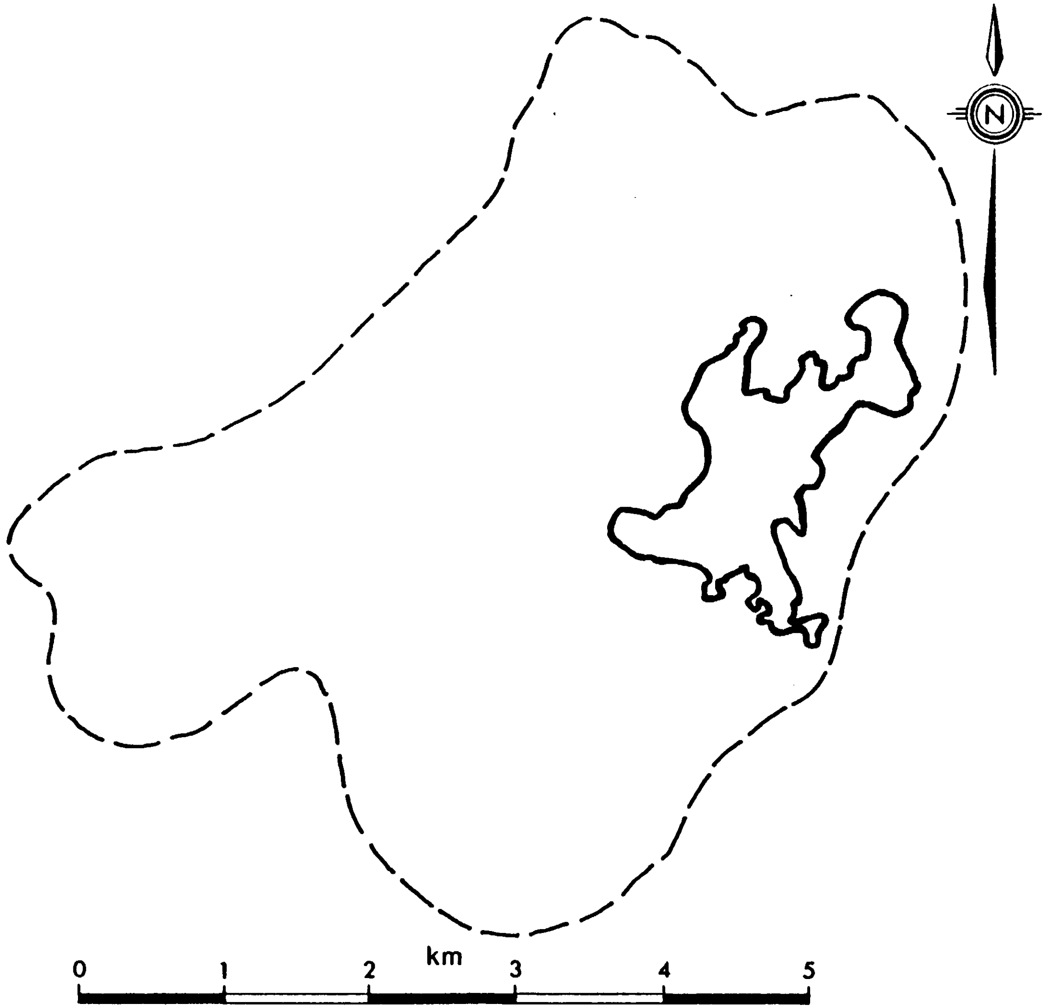
pH 7·1

GENERAL SETTING

F - 2

GENERAL DESCRIPTION

Lake F is a fairly large and deep (~100m) rock basin. The complex morphometry is controlled by bedrock structure and modified by surficial deposits (sand, gravel, and till). Sand, gravel, and bouldery till cover a significant proportion of the rather large watershed. Rock slopes into the lake basin are steep.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-608307/5454337
Elevation of lake above sea level	397.5 m (1325 ft)
Lake depth at sampling point	26 m
Lake area	1.5 sq km
Lake catchment area	21 sq km
Bedrock geology under lake basin	volcanic, sediments
Position of lake in staircase	8
Distance from south end of sampling strip	33 km

GEOLOGICAL / GEOGRAPHICAL INFORMATION

F - 3

LAKE MICROBIOTA

F - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME	DENSITY (No./l)
	Holopedium gibberum	0.6
	Bosmina longirostris	9.0
	Polyphemus sp.	0.1
	Total	9.7

COPEPODS	SPECIES NAME	DENSITY (No./l)
	Copepodites	2.3
	Cyclops bicuspidatus	0.4
	Diaptomus minutus	0.9
	Mesocyclops edax	11.7
	Total	15.3

ROTIFERS	SPECIES NAME	DENSITY (No./l)
	Conochilus sp.	1.8
	Asplanchna preodonta	1.0
	Kellicotia longispina	0.4
	Polyarthra vulgaris	0.9
	Total	4.1

CYANOPHYTA	SPECIES NAME	ABUNDANCE*
	Anabaena circinalis	3
	Coelosphaerium kutzinghiana	3
	(Average)	(3)

CHLOROPHYTA	SPECIES NAME	ABUNDANCE*
	Gloeocystis gigas	3
	Stipitococcus cf. ureolatus	1
	(Average)	(2)

BACILLARIOPHYTA	SPECIES NAME	ABUNDANCE
	Asterionella formosa	4
	Achnanthes sp.	2
	Fragilaria crotonensis	3
	Navicula sp.	3
	Gyrosigma sp.	2
	Tabellaria fenestrata	4
	(Average)	(3)

CHRYSOPHYTA	SPECIES NAME	ABUNDANCE
	Dinobryon divergens	3
	(Average)	(3)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE(%)
Tabellaria fenestrata	155	4	25.9
Cyclotella bodanica	74	4	12.4
Fragilaria crotonensis	76	**	12.7
Navicula notha	28		4.7
Melosira distans	27	3	4.5
Cyclotella stelliera	63		11.0
Cyclotella comta	74	2	12.4
Navicula cryptocephala var venata	19	2	3.2
Cymbella lanceolata	1		.17
Navicula radiosa var tenella	4	4	.67
Asterionella formosa	12	2	2.
Cymatopleura cf solea x palffyi	1	2	.17
Cymbella minuta var silesiaca	8	4	1.3
Navicula latens	2		.33
Cocconeis cf fluviatilis	3		.50
Anomoeneis serians var brachysira	3	5	.50
Nitzschia palea	7	4	1.2
Tabellaria flocculosa	12	3	2.0
Fragilaria construens	6	2	1.
Gomphonema quadripunctatum	1	2	.17
Pinnularia biceps	5	4	.84
Fragilaria construens	1	2	.17
Pinnularia abaujensis	1	4	.17
Navicula tripunctata	3	1	.50
Cymbella lunata	1		.17
Denticula cf tenuis var crassula	1		.17
Fragilaria brevistriata	1	2	.17
Stauroneis fluminea	1		.17
Melosira distans var alpigena	3	3	.50
Stauroneis phoenicenteron	1	4	.17

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake F had the greatest thermocline depth (9m) of any of the study lakes. Such a thermocline depth is generally indicative of a large, open lake unprotected from wind. This lake with an area of 0.4 km^2 had a drainage system including seven other lakes above it. Lakes F and G were the only eighth-order lakes of the 20 study lakes.

In all other respects, Lake F was rather typical of the Wawa study lakes. Its specific conductivity (47-51 micromhos/cm) and alkalinity (272.6 microequivalents/l) were characteristic of the acid-extrusive rock basin, neutral-pH-range Wawa study lakes.

The dissolved oxygen depth profile in Lake F was orthograde, indicating a lack of organic matter decomposing in its hypolimnion. This is generally indicative of an oligotrophic condition. A number of the lake's algal species were oligotrophic indicators, but these same species were also common in the great majority of the study lakes, indicating that nearly all the low-pH and circumneutral Wawa study lakes were oligotrophic.

Lake F was the first lake along the south-to-north transect with a pH above 7 (pH 7.1). The reasons for this pH transition are described in the following sections. In brief, they deal with the intrusion from the north of a calcareous overburden and the presence, in some areas, of a calcareous greenstone bedrock.

Cattails and water star grass dominated the littoral areas. A beaver lodge was also noted at one end of the lake.

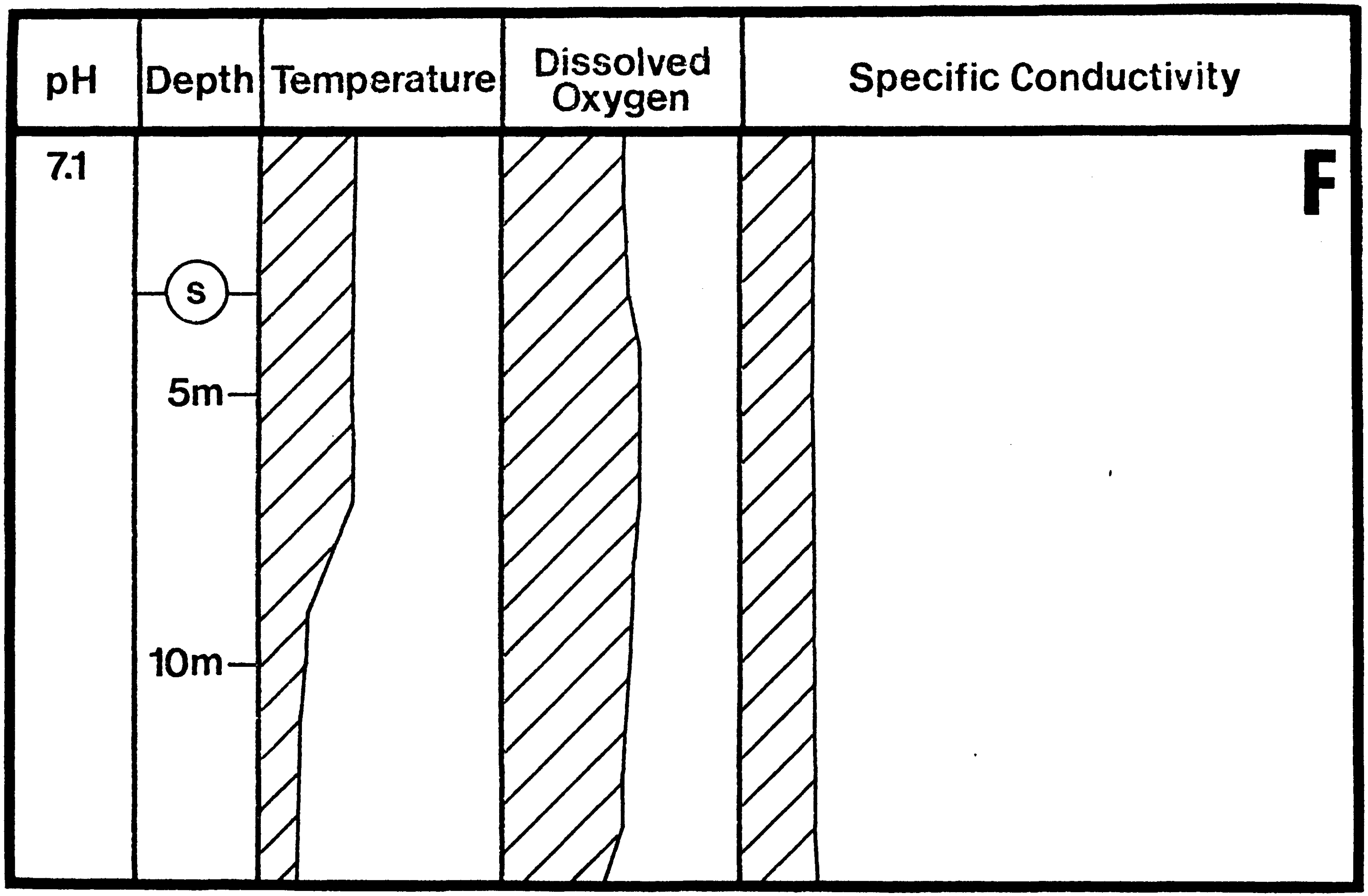
Lake F, also known as McCormick Lake, was inventoried for fish by Wawa Natural Resources personnel. Five species were reported: lake trout, northern pike, white sauger, Lake Chubb, and yellow perch.

DETAILS OF LAKE WATER CHEMISTRY

F - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		13.5	100	49
1		13.5	99	49
2		13.5	100	49
3	3.0	13.5	103	48
4		13.3	110	48
5		13.1	109	48
6		13.0	109	48
7		13.0	110	48
8		12.8	106	48
9		10.1	104	49
10		6.9	103	49
11		6.1	104	47
12		5.8	100	47
13		5.5	97	47
14		5.3	85	51

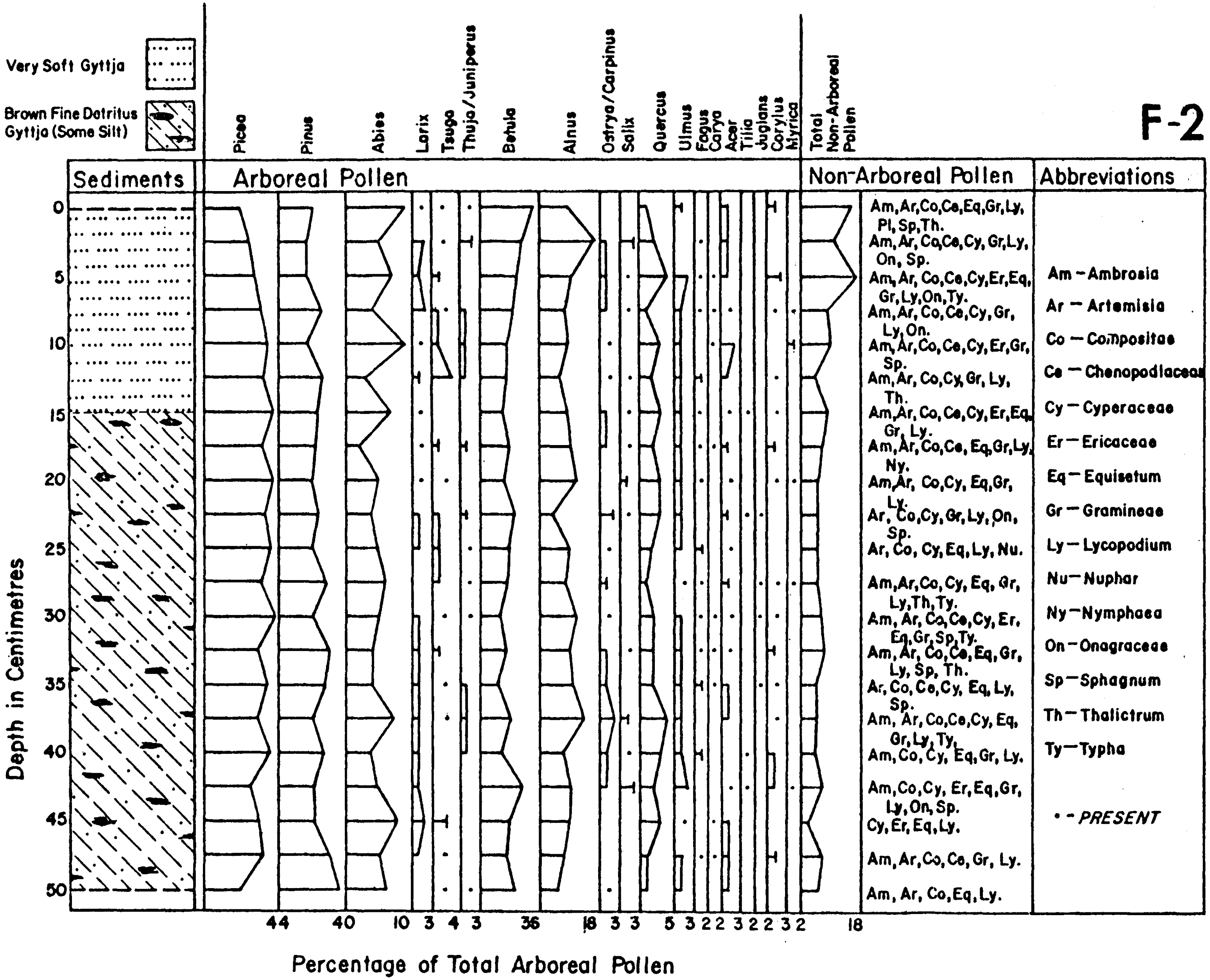
*Specific conductivity data are temperature-corrected (25° C).



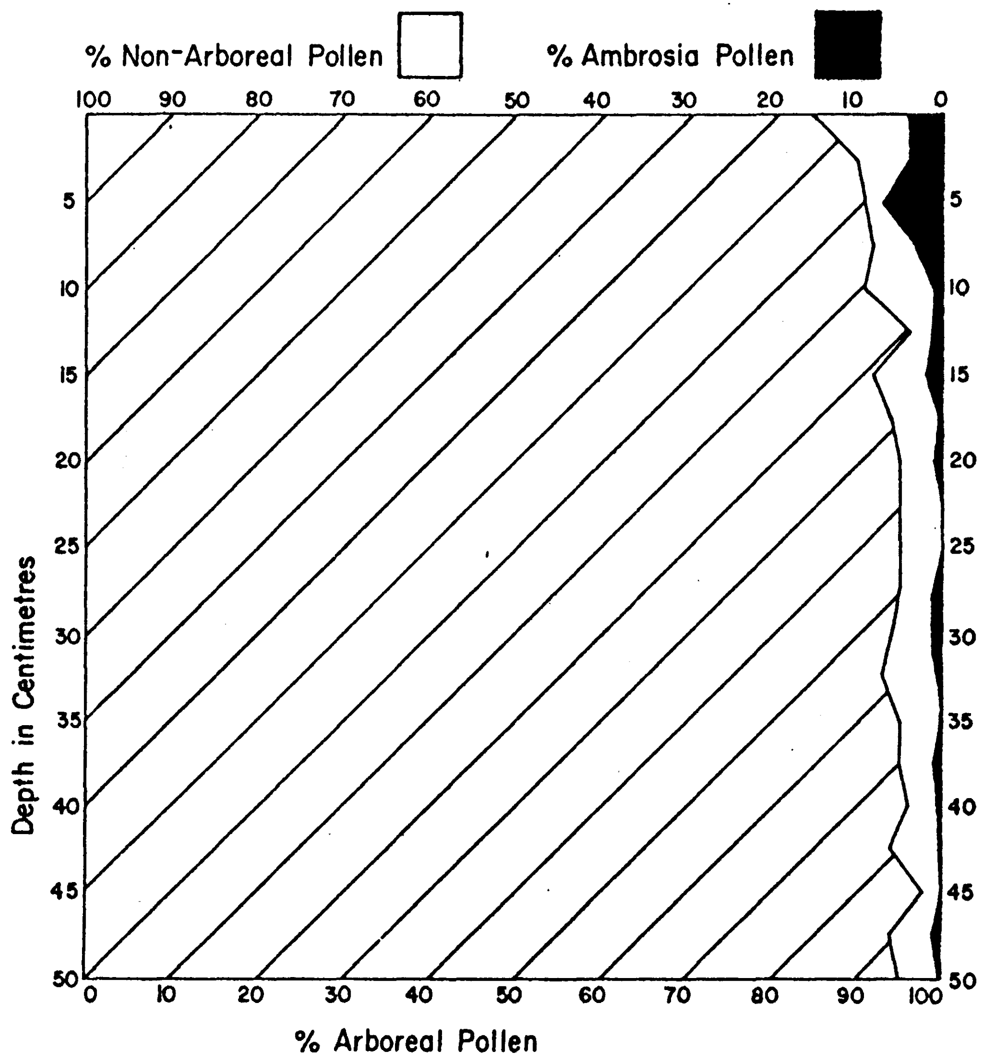
LAKE WATER CHEMISTRY PLOT

F - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE



The pollen diagram reflects regional forest composition, with a minor influx of southern pollen. The Amrosia rise is relatively distinct and indicates little mixing of lake bottom sediment.



 PALYNOLOGY NOTES

AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
F - 1 - 1	30230.	42320.	3430.	5430.	5130.	12440.	12460.	1613.	1755.	52.
F - 1 - 2	29340.	34900.	2529.	4590.	4580.	11320.	11490.	1557.	1540.	43.
F - 1 - 3	32010.	30460.	1787.	4280.	4480.	11720.	11830.	1711.	1538.	42.
F - 1 - 4	31810.	27730.	1599.	4130.	4370.	11820.	11610.	1769.	1537.	43.
F - 1 - 5	19620.	25800.	1474.	4260.	4380.	11820.	10540.	1786.	1608.	40.
F - 1 - 6	31100.	26080.	1495.	4440.	4490.	11340.	11510.	1818.	1592.	45.
F - 1 - 7	34280.	27250.	1362.	4530.	4610.	11510.	11860.	1903.	1596.	46.
F - 1 - 8	33100.	27520.	1189.	4400.	4830.	12010.	12090.	2012.	1598.	46.
F - 1 - 9	34780.	28610.	1200.	4190.	4710.	12250.	12590.	2107.	1612.	47.
F - 1 - 10	32060.	28940.	1199.	4130.	4850.	12520.	12690.	2129.	1647.	48.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
F - 2 - 1	26250.	51040.	4633.	4630.	5080.	10730.	11600.	1421.	1458.	44.
F - 2 - 2	33740.	40950.	2013.	5680.	5910.	11660.	12390.	1678.	1694.	52.
F - 2 - 3	33030.	32250.	1306.	5190.	5200.	10990.	11530.	1657.	1601.	46.
F - 2 - 4	33560.	30220.	1285.	4810.	4900.	11170.	11580.	1774.	1581.	43.
F - 2 - 5	31560.	27610.	1392.	4130.	4680.	10990.	10960.	1690.	1466.	41.
F - 2 - 6	31520.	26530.	1376.	3990.	4570.	10960.	10760.	1725.	1442.	41.
F - 2 - 7	32890.	24860.	1092.	4140.	4810.	11030.	10820.	1841.	1517.	43.
F - 2 - 8	33710.	25130.	1029.	4310.	4880.	10980.	10980.	1888.	1536.	43.
F - 2 - 9	34460.	25340.	1025.	4530.	5120.	11220.	11230.	1909.	1563.	46.
F - 2 - 10	34160.	25170.	1009.	4370.	5310.	11320.	11250.	1947.	1556.	46.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
F - 2 - 11	34410.	26500.	1059.	4070.	4910.	12080.	11910.	2109.	1597.	46.
F - 2 - 12	34360.	26750.	1056.	4190.	5430.	12450.	12190.	2173.	1602.	48.
F - 2 - 13	34010.	26750.	1038.	3870.	5000.	12380.	11900.	2155.	1585.	44.
F - 2 - 14	34950.	27580.	1049.	4050.	5400.	12660.	12010.	2262.	1614.	46.
F - 2 - 15	35700.	28460.	1080.	4160.	5560.	13020.	12390.	2328.	1677.	49.
F - 2 - 16	36790.	28800.	1109.	4310.	5470.	13560.	12930.	2460.	1717.	49.
F - 2 - 17	31740.	27680.	1064.	4310.	5650.	12840.	12250.	2492.	1687.	49.
F - 2 - 18	37230.	27610.	1043.	4510.	5940.	12940.	12630.	2458.	1739.	51.
F - 2 - 19	35420.	27520.	1042.	4480.	5590.	13250.	13000.	2535.	1733.	49.
F - 2 - 20	35210.	26550.	1018.	4810.	5780.	12940.	13200.	2577.	1761.	52.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
F - 1 - 1	*****	*****	38.0	F - 2 - 1	15.46	0.95	****	F - 2 - 11	31.70	4.24	38.2
F - 1 - 2	*****	*****	35.8	F - 2 - 2	22.75	2.12	39.0	F - 2 - 12	25.85	3.37	39.0
F - 1 - 3	*****	*****	34.2	F - 2 - 3	23.17	2.79	36.7	F - 2 - 13	20.08	2.77	38.1
F - 1 - 4	*****	*****	34.6	F - 2 - 4	24.76	3.23	36.7	F - 2 - 14	26.82	3.83	38.2
F - 1 - 5	*****	*****	33.6	F - 2 - 5	30.13	4.10	37.7	F - 2 - 15	26.07	3.57	38.2
F - 1 - 6	*****	*****	34.8	F - 2 - 6	20.34	2.87	36.5	F - 2 - 16	26.53	3.67	39.2
F - 1 - 7	*****	*****	34.8	F - 2 - 7	26.94	4.16	37.2	F - 2 - 17	28.27	3.70	39.7
F - 1 - 8	*****	*****	35.0	F - 2 - 8	24.35	3.35	37.6	F - 2 - 18	32.77	4.17	38.4
F - 1 - 9	*****	*****	35.8	F - 2 - 9	24.60	3.25	37.9	F - 2 - 19	30.88	4.63	38.1
F - 1 - 10	*****	*****	35.4	F - 2 - 10	23.12	3.49	37.8	F - 2 - 20	26.53	4.21	38.3

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
F - 1 - 1	****	11.3	122.0	57.9	*****	82.	115.	79.3	7.	1.0	61.4	193.
F - 1 - 2	****	13.4	89.3	57.4	*****	79.	70.	71.3	6.	1.0	55.2	151.
F - 1 - 3	****	13.3	113.4	61.0	*****	80.	30.	70.4	6.	1.5	56.2	124.
F - 1 - 4	****	12.1	117.5	63.2	*****	82.	15.	68.0	8.	2.0	56.4	114.
F - 1 - 5	****	15.0	119.4	66.0	*****	85.	10.	52.7	7.	0.5	58.7	120.
F - 1 - 6	****	*****	104.3	65.8	*****	79.	****	67.1	****	1.0	57.6	117.
F - 1 - 7	****	12.1	116.2	69.9	*****	85.	5.	69.1	9.	1.5	60.0	127.
F - 1 - 8	****	12.0	127.8	72.0	*****	87.	****	69.6	8.	1.5	61.2	128.
F - 1 - 9	****	9.9	134.8	74.8	*****	93.	5.	72.1	****	1.0	63.0	128.
F - 1 - 10	****	8.1	139.4	74.5	*****	95.	20.	72.8	****	1.5	63.8	126.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
F - 2 - 1	61.5	20.3	99.7	44.9	341.	70.	120.	72.8	7.	0.5	51.1	169.
F - 2 - 2	31.2	21.8	115.9	52.9	391.	83.	115.	81.6	9.	1.5	59.0	201.
F - 2 - 3	7.7	21.3	106.0	53.3	380.	79.	55.	75.2	9.	3.0	55.9	177.
F - 2 - 4	7.7	23.5	109.3	57.9	369.	81.	45.	73.4	8.	2.0	55.4	159.
F - 2 - 5	1.9	20.6	103.4	56.1	346.	80.	25.	68.1	8.	2.0	52.0	132.
F - 2 - 6	4.0	17.1	107.9	57.9	307.	80.	15.	67.2	8.	2.0	52.0	132.
F - 2 - 7	3.5	17.4	109.4	60.8	273.	82.	5.	67.7	8.	1.5	54.3	137.
F - 2 - 8	1.9	16.5	109.6	61.5	384.	82.	5.	69.7	9.	2.0	55.0	139.
F - 2 - 9	1.6	20.0	106.9	65.0	267.	86.	130.	71.0	10.	3.5	56.2	139.
F - 2 - 10	1.6	19.1	112.1	65.4	234.	86.	****	70.6	10.	1.5	55.8	145.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
F - 2 - 11	1.2	22.3	127.6	69.2	261.	95.	****	72.1	11.	2.0	58.5	148.
F - 2 - 12	1.1	23.0	127.1	71.6	267.	95.	5.	73.2	11.	2.0	58.8	151.
F - 2 - 13	1.1	21.3	129.0	72.2	239.	96.	****	73.4	10.	1.5	58.7	140.
F - 2 - 14	0.8	21.9	132.4	76.1	273.	102.	****	75.3	10.	1.5	60.1	154.
F - 2 - 15	1.2	22.5	134.7	75.4	267.	102.	****	75.1	10.	3.0	62.3	153.
F - 2 - 16	1.2	23.2	141.2	83.4	245.	107.	5.	76.5	12.	3.0	66.4	161.
F - 2 - 17	1.2	24.7	135.8	83.2	256.	106.	****	71.3	11.	1.5	64.4	157.
F - 2 - 18	0.9	22.6	124.9	84.9	267.	102.	****	78.8	11.	2.0	61.2	162.
F - 2 - 19	1.3	22.6	133.9	79.9	256.	103.	****	80.1	11.	2.5	60.7	170.
F - 2 - 20	1.3	22.9	132.5	79.6	256.	102.	****	83.1	12.	3.0	59.6	169.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
F - 1 - 1	*****	*****	38.0	F - 2 - 1	15.46	0.95	****	F - 2 - 11	31.70	4.24	38.2
F - 1 - 2	*****	*****	35.8	F - 2 - 2	22.75	2.12	39.0	F - 2 - 12	25.85	3.37	39.0
F - 1 - 3	*****	*****	34.2	F - 2 - 3	23.17	2.79	36.7	F - 2 - 13	20.08	2.77	38.1
F - 1 - 4	*****	*****	34.6	F - 2 - 4	24.76	3.23	36.7	F - 2 - 14	26.82	3.83	38.2
F - 1 - 5	*****	*****	33.6	F - 2 - 5	30.13	4.10	37.7	F - 2 - 15	26.07	3.57	38.2
F - 1 - 6	*****	*****	34.8	F - 2 - 6	20.34	2.87	36.5	F - 2 - 16	26.53	3.67	39.2
F - 1 - 7	*****	*****	34.8	F - 2 - 7	26.94	4.16	37.2	F - 2 - 17	28.27	3.70	39.7
F - 1 - 8	*****	*****	35.0	F - 2 - 8	24.35	3.35	37.6	F - 2 - 18	32.77	4.17	38.4
F - 1 - 9	*****	*****	35.8	F - 2 - 9	24.60	3.25	37.9	F - 2 - 19	30.88	4.63	38.1
F - 1 - 10	*****	*****	35.4	F - 2 - 10	23.12	3.49	37.8	F - 2 - 20	26.53	4.21	38.3

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
F - 1 - 1	0.3616	0.6804	3.2358	0.2951	0.2260	0.4501	0.2674	1.4402	0.2777	0.3235
F - 1 - 2	0.3510	0.5611	2.3858	0.2495	0.2018	0.4096	0.2466	1.3902	0.2437	0.2660
F - 1 - 3	0.3829	0.4897	1.6858	0.2326	0.1974	0.4240	0.2539	1.5277	0.2434	0.2605
F - 1 - 4	0.3805	0.4458	1.5085	0.2245	0.1925	0.4276	0.2491	1.5795	0.2432	0.2654
F - 1 - 5	0.2347	0.4148	1.3906	0.2315	0.1930	0.4276	0.2262	1.5946	0.2544	0.2481
F - 1 - 6	0.3720	0.4193	1.4104	0.2413	0.1978	0.4103	0.2470	1.6232	0.2519	0.2778
F - 1 - 7	0.4100	0.4381	1.2849	0.2462	0.2031	0.4164	0.2545	1.6991	0.2525	0.2840
F - 1 - 8	0.3959	0.4424	1.1217	0.2391	0.2128	0.4345	0.2594	1.7964	0.2528	0.2846
F - 1 - 9	0.4160	0.4600	1.1321	0.2277	0.2075	0.4432	0.2702	1.8812	0.2551	0.2889
F - 1 - 10	0.3835	0.4653	1.1311	0.2245	0.2137	0.4530	0.2723	1.9009	0.2606	0.2975

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
F - 2 - 1	0.3140	0.8206	4.3708	0.2516	0.2238	0.3882	0.2489	1.2687	0.2307	0.2710
F - 2 - 2	0.4036	0.6584	1.8991	0.3087	0.2604	0.4219	0.2659	1.4982	0.2680	0.3185
F - 2 - 3	0.3951	0.5185	1.2321	0.2821	0.2291	0.3976	0.2474	1.4795	0.2533	0.2833
F - 2 - 4	0.4014	0.4859	1.2123	0.2614	0.2159	0.4041	0.2485	1.5839	0.2502	0.2667
F - 2 - 5	0.3775	0.4439	1.3132	0.2245	0.2062	0.3976	0.2352	1.5089	0.2320	0.2525
F - 2 - 6	0.3770	0.4265	1.2981	0.2168	0.2013	0.3965	0.2309	1.5402	0.2282	0.2531
F - 2 - 7	0.3934	0.3997	1.0302	0.2250	0.2119	0.3991	0.2322	1.6437	0.2400	0.2660
F - 2 - 8	0.4032	0.4040	0.9708	0.2342	0.2150	0.3973	0.2356	1.6857	0.2430	0.2648
F - 2 - 9	0.4122	0.4074	0.9670	0.2462	0.2256	0.4059	0.2410	1.7045	0.2473	0.2833
F - 2 - 10	0.4086	0.4047	0.9519	0.2375	0.2339	0.4096	0.2414	1.7384	0.2462	0.2833

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
F - 2 - 11	0.4116	0.4260	0.9991	0.2212	0.2163	0.4370	0.2556	1.8830	0.2527	0.2809
F - 2 - 12	0.4110	0.4301	0.9962	0.2277	0.2392	0.4504	0.2616	1.9402	0.2535	0.2975
F - 2 - 13	0.4068	0.4301	0.9792	0.2103	0.2203	0.4479	0.2554	1.9241	0.2508	0.2741
F - 2 - 14	0.4181	0.4434	0.9896	0.2201	0.2379	0.4580	0.2577	2.0196	0.2554	0.2840
F - 2 - 15	0.4270	0.4576	1.0189	0.2261	0.2449	0.4711	0.2659	2.0786	0.2653	0.3006
F - 2 - 16	0.4401	0.4630	1.0462	0.2342	0.2410	0.4906	0.2775	2.1964	0.2717	0.3025
F - 2 - 17	0.3797	0.4450	1.0038	0.2342	0.2489	0.4645	0.2629	2.2250	0.2669	0.3025
F - 2 - 18	0.4453	0.4439	0.9840	0.2451	0.2617	0.4682	0.2710	2.1946	0.2752	0.3123
F - 2 - 19	0.4237	0.4424	0.9830	0.2435	0.2463	0.4794	0.2790	2.2634	0.2742	0.3012
F - 2 - 20	0.4212	0.4268	0.9604	0.2614	0.2546	0.4682	0.2833	2.3009	0.2786	0.3198

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
F - 1 - 1	*****	*****	38.0	F - 2 - 1	15.46	0.95	****	F - 2 - 11	31.70	4.24	38.2
F - 1 - 2	*****	*****	35.8	F - 2 - 2	22.75	2.12	39.0	F - 2 - 12	25.85	3.37	39.0
F - 1 - 3	*****	*****	34.2	F - 2 - 3	23.17	2.79	36.7	F - 2 - 13	20.08	2.77	38.1
F - 1 - 4	*****	*****	34.6	F - 2 - 4	24.76	3.23	36.7	F - 2 - 14	26.82	3.83	38.2
F - 1 - 5	*****	*****	33.6	F - 2 - 5	30.13	4.10	37.7	F - 2 - 15	26.07	3.57	38.2
F - 1 - 6	*****	*****	34.8	F - 2 - 6	20.34	2.87	36.5	F - 2 - 16	26.53	3.67	39.2
F - 1 - 7	*****	*****	34.8	F - 2 - 7	26.94	4.16	37.2	F - 2 - 17	28.27	3.70	39.7
F - 1 - 8	*****	*****	35.0	F - 2 - 8	24.35	3.35	37.6	F - 2 - 18	32.77	4.17	38.4
F - 1 - 9	*****	*****	35.8	F - 2 - 9	24.60	3.25	37.9	F - 2 - 19	30.88	4.63	38.1
F - 1 - 10	*****	*****	35.4	F - 2 - 10	23.12	3.49	37.8	F - 2 - 20	26.53	4.21	38.3

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
F - 1 - 1	******	0.3897	1.0000	0.8512	*******	0.829	8.846	0.2064	0.840	0.435	0.4513	2.5368
F - 1 - 2	******	0.4621	0.7320	0.8446	*******	0.800	5.385	0.1855	0.778	0.435	0.4060	1.9908
F - 1 - 3	******	0.4586	0.9295	0.8972	*******	0.808	2.308	0.1834	0.753	0.652	0.4132	1.6342
F - 1 - 4	******	0.4172	0.9631	0.9294	*******	0.827	1.154	0.1771	1.025	0.870	0.4149	1.5000
F - 1 - 5	******	0.5172	0.9787	0.9704	*******	0.856	0.769	0.1373	0.802	0.217	0.4319	1.5803
F - 1 - 6	******	*******	0.8549	0.9669	*******	0.801	******	0.1748	******	0.435	0.4236	1.5355
F - 1 - 7	******	0.4172	0.9525	1.0281	*******	0.859	0.385	0.1801	1.111	0.652	0.4410	1.6763
F - 1 - 8	******	0.4138	1.0475	1.0585	*******	0.881	******	0.1814	0.975	0.652	0.4499	1.6855
F - 1 - 9	******	0.3414	1.1049	1.0993	*******	0.942	0.385	0.1877	******	0.435	0.4629	1.6895
F - 1 - 10	******	0.2793	1.1426	1.0959	*******	0.963	1.538	0.1896	******	0.652	0.4694	1.6618

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
F - 2 - 1	34.167	0.7000	0.8169	0.6596	3.9651	0.703	9.246	0.1895	0.914	0.217	0.3757	2.2211
F - 2 - 2	17.333	0.7517	0.9500	0.7784	4.5465	0.841	8.846	0.2124	1.123	0.652	0.4340	2.6500
F - 2 - 3	4.278	0.7345	0.8689	0.7843	4.4186	0.794	4.231	0.1958	1.062	1.304	0.4110	2.3276
F - 2 - 4	4.278	0.8103	0.8959	0.8507	4.2907	0.822	3.462	0.1913	1.025	0.870	0.4071	2.0855
F - 2 - 5	1.056	0.7103	0.8475	0.8257	4.0233	0.807	1.923	0.1774	0.988	0.870	0.3821	1.7303
F - 2 - 6	2.222	0.5897	0.8844	0.8518	3.5698	0.803	1.154	0.1749	0.975	0.870	0.3824	1.7382
F - 2 - 7	1.944	0.6000	0.8967	0.8941	3.1744	0.823	0.385	0.1762	0.938	0.652	0.3993	1.7974
F - 2 - 8	1.056	0.5690	0.8984	0.9038	4.4651	0.830	0.385	0.1815	1.074	0.870	0.4047	1.8316
F - 2 - 9	0.889	0.6897	0.8762	0.9556	3.1047	0.866	10.000	0.1849	1.210	1.522	0.4132	1.8224
F - 2 - 10	0.889	0.6586	0.9189	0.9613	2.7209	0.873	******	0.1838	1.259	0.652	0.4099	1.9066

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
F - 2 - 11	0.667	0.7690	1.0459	1.0171	3.0349	0.958	******	0.1876	1.321	0.870	0.4304	1.9421
F - 2 - 12	0.611	0.7931	1.0418	1.0535	3.1047	0.964	0.385	0.1907	1.358	0.870	0.4322	1.9829
F - 2 - 13	0.611	0.7345	1.0574	1.0624	2.7791	0.967	******	0.1911	1.198	0.652	0.4313	1.8382
F - 2 - 14	0.444	0.7552	1.0852	1.1190	3.1744	1.027	******	0.1960	1.259	0.652	0.4416	2.0211
F - 2 - 15	0.667	0.7759	1.1041	1.1094	3.1047	1.028	******	0.1955	1.284	1.304	0.4583	2.0105
F - 2 - 16	0.667	0.8000	1.1574	1.2265	2.8488	1.085	0.385	0.1991	1.457	1.304	0.4879	2.1184
F - 2 - 17	0.667	0.8517	1.1131	1.2229	2.9767	1.071	******	0.1857	1.309	0.652	0.4737	2.0632
F - 2 - 18	0.500	0.7793	1.0238	1.2479	3.1047	1.026	******	0.2051	1.321	0.870	0.4500	2.1342
F - 2 - 19	0.722	0.7793	1.0975	1.1754	2.9767	1.041	******	0.2087	1.358	1.087	0.4465	2.2408
F - 2 - 20	0.722	0.7897	1.0861	1.1709	2.9767	1.029	******	0.2164	1.457	1.304	0.4386	2.2250

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
F - 1 - 1	*****	*****	38.0	F - 2 - 1	15.46	0.95	****	F - 2 - 11	31.70	4.24	38.2
F - 1 - 2	*****	*****	35.8	F - 2 - 2	22.75	2.12	39.0	F - 2 - 12	25.85	3.37	39.0
F - 1 - 3	*****	*****	34.2	F - 2 - 3	23.17	2.79	36.7	F - 2 - 13	20.08	2.77	38.1
F - 1 - 4	*****	*****	34.6	F - 2 - 4	24.76	3.23	36.7	F - 2 - 14	26.82	3.83	38.2
F - 1 - 5	*****	*****	33.6	F - 2 - 5	30.13	4.10	37.7	F - 2 - 15	26.07	3.57	38.2
F - 1 - 6	*****	*****	34.8	F - 2 - 6	20.34	2.87	36.5	F - 2 - 16	26.53	3.67	39.2
F - 1 - 7	*****	*****	34.8	F - 2 - 7	26.94	4.16	37.2	F - 2 - 17	28.27	3.70	39.7
F - 1 - 8	*****	*****	35.0	F - 2 - 8	24.35	3.35	37.6	F - 2 - 18	32.77	4.17	38.4
F - 1 - 9	*****	*****	35.8	F - 2 - 9	24.60	3.25	37.9	F - 2 - 19	30.88	4.63	38.1
F - 1 - 10	*****	*****	35.4	F - 2 - 10	23.12	3.49	37.8	F - 2 - 20	26.53	4.21	38.3

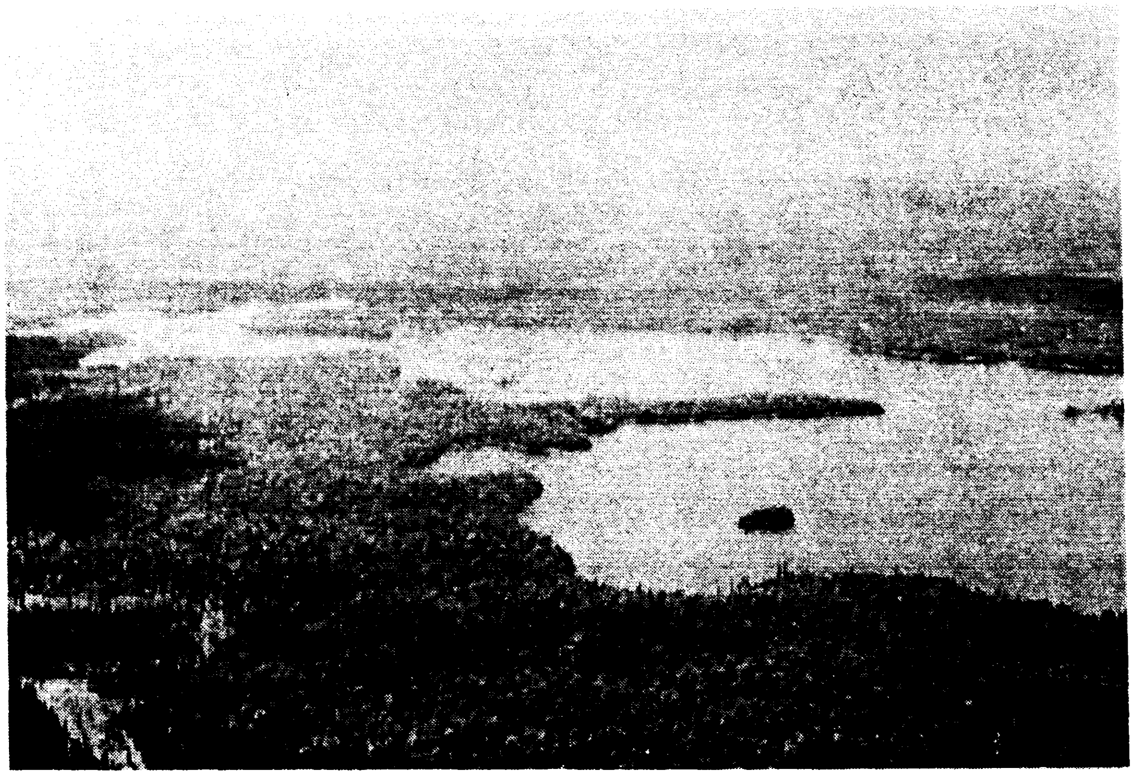
LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake G

pH 7·1

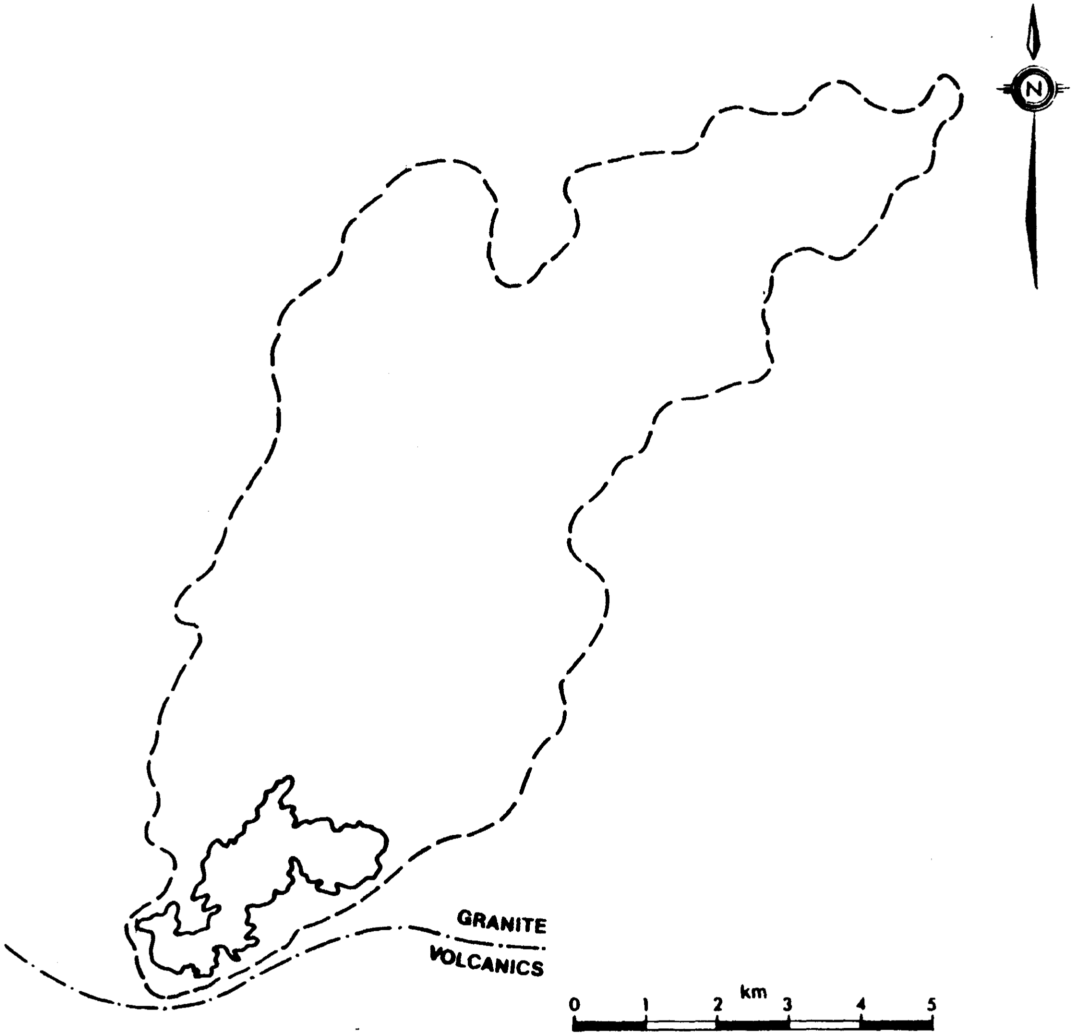
GENERAL SETTING

G - 2



GENERAL DESCRIPTION

Lake G is a relatively large rock basin that has been almost filled with outwash sand and gravel that cover much of the large watershed. The lake is shallow (most of it less that 3m) and bouldery shoals (probably till) are abundant. There are several small islands and both rock and surficial deposits comprise the shoreline.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-617841/5450573
Elevation of lake above sea level	412.5 m (1375 ft)
Lake depth at sampling point	4.2 m
Lake area	3 sq km
Lake catchment area	60 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	8
Distance from south end of sampling strip	45 km

Remarks

GEOLOGICAL / GEOGRAPHICAL INFORMATION

LAKE MICROBIOTA

G - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME	DENSITY (No./l)
	Holopedium gibberum	1.3
	Bosmina longirostris	22.4
	Daphnia galeata mendota	6.1
	Daphnia pulex	12.5
	Chydorus sphaericus	12.0
	Polyphemus sp.	0.2
	Total	54.5

ROTIFERS	SPECIES NAME	DENSITY (No./l)
	Asplanchna preodonta	0.7
	Kellicotia longispina	1.7
	Polyarthra vulgaris	0.2
	Total	2.6

CYANOPHYTA	SPECIES NAME	ABUNDANCE*
	Anabaena circinalis	5
	Coelosphaerium kutzinghiana	4
	(Average)	(5)

CHLOROPHYTA	SPECIES NAME	ABUNDANCE
	Gloeocystis gigas	4
	(Average)	(4)

BACILLARIOPHYTA	SPECIES NAME	ABUNDANCE
	Melosira distans	4
	Pinnularia nobilis	2
	Surirella linearis	2
	Tabellaria fenestrata	5
	(Average)	(3)

PYRROPHYTA	SPECIES NAME	ABUNDANCE
	Ceratium hirundinella	3
	(Average)	(3)

CILIOPHORA	SPECIES NAME	ABUNDANCE
	Epistylis sp.	0
	(Average)	(0)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Navicula capitata var hungarica	9	2	1.6
Cyclotella comta	22	2	4.0
Tabellaria fenestrata	144	4	25.8
Navicula gottlandica	11	4	2.0
Cyclotella glomerata	31	4	5.6
Cyclotella stelligera	76	4	13.7
Cyclotella bodanica	124	4	22.2
Nitzschia palea	6	4	1.1
Navicula cryptocephala	4	2	.72
Navicula pupula var mutata	6	4	1.1
Navicula laevissima	2	4	.36
Fragilaria leptostauron	3	2	.54
Tabellaria flocculosa	2	3	.36
Cymbella minuta var silesiaca	5	4	.90
Fragilaria construens var binodis	1	2	.18
Achnanthes cf hauckiana	11	**	2.0
Melosira distans	19	3	3.4
Melosira islandica	3	2	.54
Synedra tenera	2		.36
Fragilaria construens	18	2	3.2
Navicula bicephala	3	4	.54
Asterionella ralfsii	13	2	2.3
Fragilaria cf vaucheriae	1	2	.18
Asterionella formosa	12	2	2.2
Melosira ambigua	4	2	.72
Diploneis cf puella	2	4	.36
Navicula jaernefeltii	1	3	.18
Navicula capitata	1	2	.18
Navicula subhamulata	2	4	.36
Navicula mutica var cohnii	1	4	.18
Melosira granulata	2	2	.36
Melosira distans var alpigena	3	3	.54
Navicula sp	1		.18
Synedra miniscula	1		.18
Eunotia incisa	1	4	.18
Stauroneis smithii var incisa	2	4	.36
Stauroneis cf livingstonii	1	4	.18
Pinnularia biceps	1	4	.18
Synedra ulna var subequalis	1	4	.18
Nedium hitchcockii	1	4	.18
Cymbella cf gibba	1	4	.18
Melosira italica	2	4	.36
Pinnularia subcapitata	1	4	.18
Pinnularia hilseana	1	4	.18
Navicula exiqua var capitata	1	4	.18
Cocconeis sp	1		.18

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake G displayed an unusual morphometry. Although it possessed the largest drainage area (60 km^2) and the largest lake area (3.0 km^2), it was one of the shallowest of the 20 study lakes (mean depth less than 2m). Lake G was also humic (Secchi transparency of only 1.3m). This may be due to the numerous small bog lakes situated above it. Like F, G was an eighth-order drainage basin, with seven lakes situated above it. The sediment loss on ignition (20%) was the lowest of the study lakes, and the specific conductivity (38-41 micromhos/cm) was among the highest of the Wawa circumneutral lakes.

Temperature, oxygen, and conductivity depth profiles were all unstratified, as would be expected for such a large (long fetch), shallow-basin lake.

The yellow water lily was observed in Lake G but was rare. Littoral areas were dominated by sedges, water horsetail (Equisetum aquatilus) and Labrador tea. A beaver trapper's lodge was prominent at the outlet. Richardson's pond weed (Potamogeton richardsonii) formed a sparse to moderately dense cover over much of the lake's bottom.

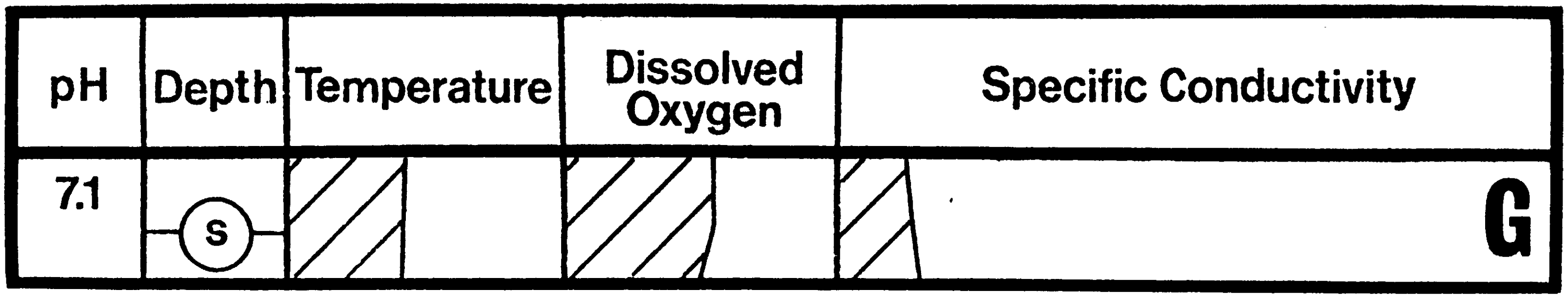
Lake G is located near the Trans Canada Highway. It has been given the curious name of Fungus Lake. Fish surveys by the Wawa branch of the Ministry of Natural Resources have reported five species: northern pike, white suckers, Burbott, yellow perch, and yellow pickerel.

DETAILS OF LAKE WATER CHEMISTRY

G - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		14.5	100	38
1	1.3	14.5	100	39
2		14.0	90	41

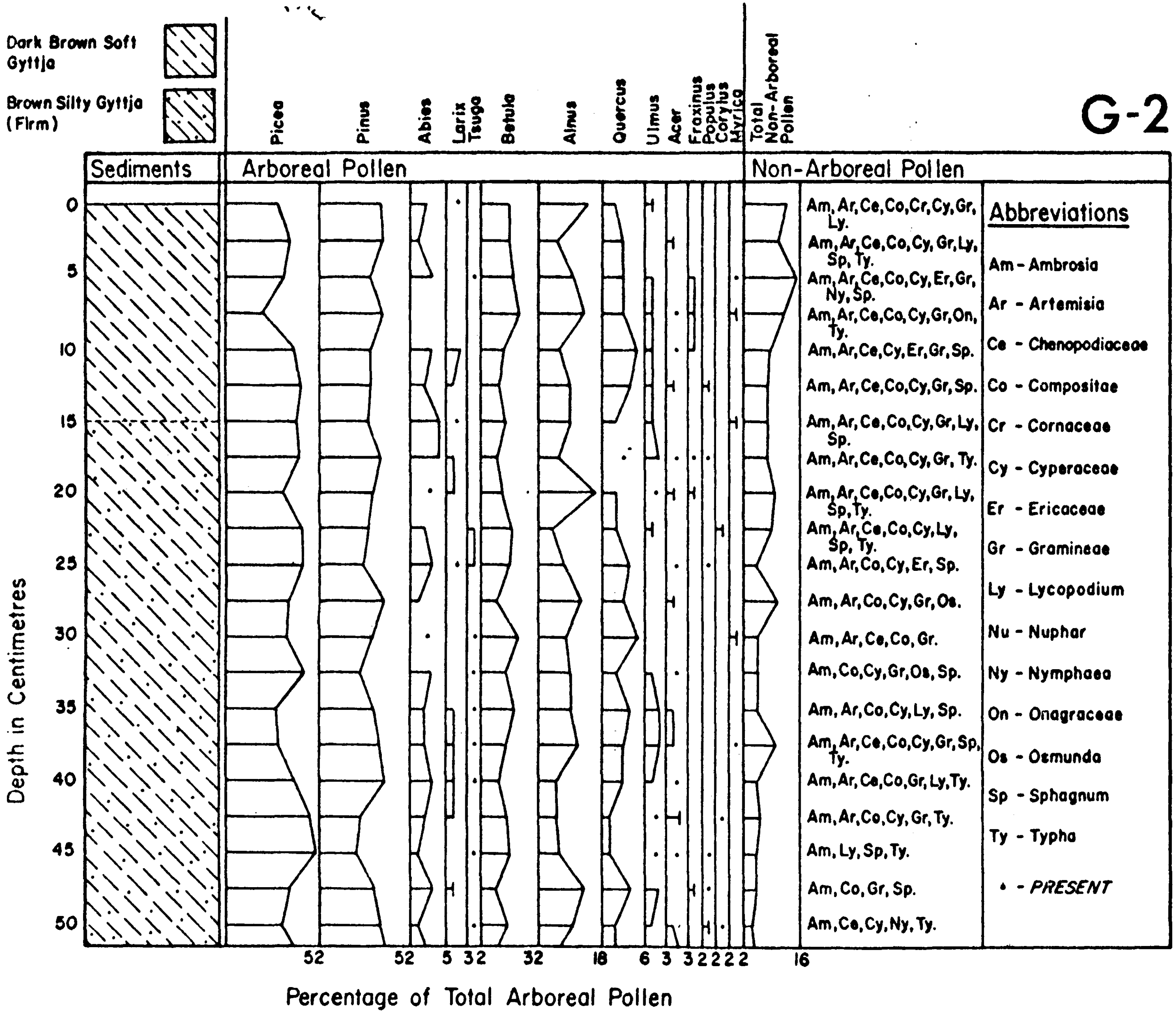
*Specific conductivity data are temperature-corrected (25° C).



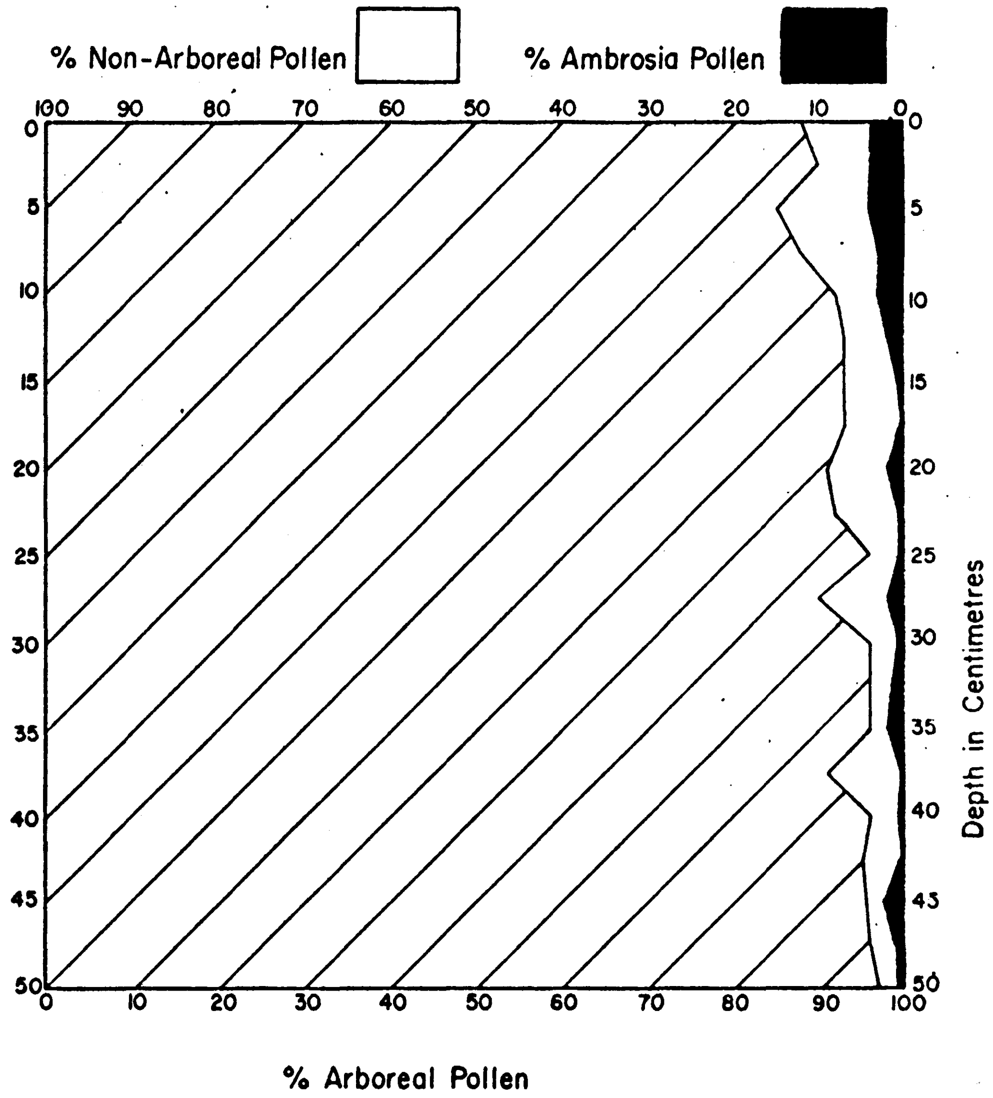
LAKE WATER CHEMISTRY PLOT

G - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE



Regional forest composition is well represented by the pollen diagram. Southern pollen influx is minor. Both spruce and pine pollen is rather abundant, probably reflecting extensive gravel and sand deposits in the watershed of the lake. *Ambrosia* rise is rather indistinct in the top 15 cm of gyttja.



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
G - 1 - 1	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 2	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 3	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 4	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 5	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 6	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 7	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 8	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 9	******	******	*****	******	******	******	******	******	*****	****
G - 1 - 10	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
G - 2 - 1	51020.	19040.	430.	15970.	15730.	6101.	14010.	1232.	1923.	91.
G - 2 - 2	50790.	18990.	439.	16010.	15870.	6093.	14040.	1214.	1877.	89.
G - 2 - 3	49440.	19440.	418.	16760.	17390.	6093.	13710.	1222.	1934.	94.
G - 2 - 4	50790.	19040.	411.	15860.	16620.	5902.	13830.	1218.	1880.	90.
G - 2 - 5	51680.	19880.	433.	15750.	15750.	6145.	14600.	1279.	1913.	91.
G - 2 - 6	51160.	19380.	419.	15460.	15680.	5935.	14110.	1300.	1837.	86.
G - 2 - 7	50840.	19530.	415.	15380.	15620.	5938.	14050.	1281.	1810.	85.
G - 2 - 8	48150.	19280.	411.	15700.	16790.	5875.	13600.	1346.	1877.	87.
G - 2 - 9	52820.	19690.	422.	15940.	16620.	6087.	14320.	1370.	1906.	90.
G - 2 - 10	52310.	19490.	416.	15440.	15640.	5927.	13990.	1372.	1845.	87.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
G - 2 - 11	52910.	19770.	422.	15420.	15590.	6006.	14190.	1399.	1891.	87.
G - 2 - 12	53690.	19850.	423.	15810.	16340.	6128.	14410.	1413.	1906.	88.
G - 2 - 13	53530.	19710.	420.	15810.	16220.	6125.	14480.	1417.	1926.	90.
G - 2 - 14	51480.	19960.	415.	15590.	16190.	6230.	14760.	1475.	1920.	89.
G - 2 - 15	52080.	20000.	405.	16020.	16340.	6363.	14940.	1380.	1921.	89.
G - 2 - 16	53350.	19750.	390.	17030.	17530.	6508.	15060.	1324.	2001.	94.
G - 2 - 17	54250.	19620.	385.	17420.	18210.	6554.	15220.	1285.	2002.	96.
G - 2 - 18	54680.	19990.	393.	17650.	18310.	6694.	15530.	1299.	2016.	98.
G - 2 - 19	52270.	19160.	377.	17290.	19020.	6374.	14630.	1277.	1933.	97.
G - 2 - 20	53870.	20120.	388.	17130.	17770.	6551.	15200.	1316.	1951.	94.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
G - 1 - 1	*****	*****	****	G - 2 - 1	10.59	2.40	17.2	G - 2 - 11	26.97	5.20	19.8
G - 1 - 2	*****	*****	****	G - 2 - 2	32.92	8.00	19.6	G - 2 - 12	31.76	7.40	20.7
G - 1 - 3	*****	*****	****	G - 2 - 3	24.93	5.14	18.6	G - 2 - 13	25.49	5.29	20.6
G - 1 - 4	*****	*****	****	G - 2 - 4	28.42	6.20	17.7	G - 2 - 14	31.72	7.35	20.2
G - 1 - 5	*****	*****	****	G - 2 - 5	28.02	5.43	18.5	G - 2 - 15	29.30	7.25	18.9
G - 1 - 6	*****	*****	****	G - 2 - 6	29.74	6.01	19.0	G - 2 - 16	34.90	10.15	17.3
G - 1 - 7	*****	*****	****	G - 2 - 7	21.87	4.95	19.7	G - 2 - 17	30.68	8.84	16.9
G - 1 - 8	*****	*****	****	G - 2 - 8	30.36	7.14	18.8	G - 2 - 18	33.20	9.55	16.8
G - 1 - 9	*****	*****	****	G - 2 - 9	31.95	7.51	19.5	G - 2 - 19	30.75	8.32	17.5
G - 1 - 10	*****	*****	****	G - 2 - 10	29.49	6.80	19.6	G - 2 - 20	27.37	7.51	17.5

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
G - 1 - 1	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 2	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 3	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 4	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 5	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 6	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 7	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 8	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 9	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
G - 1 - 10	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
G - 2 - 1	3.7	8.0	42.7	19.4	160.	22.	40.	201.0	12.	3.0	42.3	113.
G - 2 - 2	3.1	8.1	42.7	20.1	143.	24.	40.	200.6	12.	3.5	42.4	117.
G - 2 - 3	3.7	8.1	41.8	19.1	155.	24.	30.	200.5	11.	2.0	42.9	99.
G - 2 - 4	2.8	8.1	37.8	18.5	143.	22.	25.	198.6	11.	3.0	40.6	88.
G - 2 - 5	2.6	11.4	44.3	19.8	138.	23.	15.	203.7	14.	3.0	44.5	88.
G - 2 - 6	1.9	9.8	41.9	20.5	138.	22.	15.	200.3	12.	4.0	43.7	83.
G - 2 - 7	2.0	9.7	42.6	21.1	138.	22.	10.	197.4	13.	3.0	44.0	82.
G - 2 - 8	1.9	9.2	27.6	22.5	115.	22.	10.	192.1	12.	2.5	45.3	80.
G - 2 - 9	1.3	9.5	45.1	23.6	126.	23.	10.	199.2	13.	2.5	46.7	83.
G - 2 - 10	1.3	8.9	41.3	24.3	121.	20.	5.	196.2	13.	3.0	44.9	83.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SB PPM	TH PPM	U PPM	V PPM	ZN PPM
G - 2 - 11	1.4	8.8	45.0	25.8	115.	22.	5.	196.3	13.	2.0	48.3	85.
G - 2 - 12	1.3	9.5	44.8	25.6	138.	22.	10.	196.2	14.	2.0	48.8	85.
G - 2 - 13	1.1	9.5	45.0	24.8	121.	22.	10.	196.7	14.	3.0	48.5	84.
G - 2 - 14	1.4	12.0	45.6	26.8	110.	22.	10.	194.7	13.	3.0	50.3	87.
G - 2 - 15	1.4	12.8	46.4	26.7	87.	22.	10.	201.3	13.	4.5	49.6	89.
G - 2 - 16	1.0	11.9	44.9	24.8	70.	21.	10.	213.4	13.	3.5	50.5	85.
G - 2 - 17	1.0	11.9	44.5	24.0	98.	21.	10.	219.2	12.	3.0	49.8	84.
G - 2 - 18	1.0	13.5	46.2	24.5	82.	21.	5.	221.9	13.	3.5	50.8	86.
G - 2 - 19	1.1	12.2	43.9	25.0	76.	21.	5.	210.2	12.	2.5	48.9	83.
G - 2 - 20	1.1	13.6	47.0	26.3	127.	23.	10.	214.8	13.	2.0	49.3	86.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
G - 1 - 1	*****	*****	****	G - 2 - 1	10.59	2.40	17.2	G - 2 - 11	26.97	5.20	19.8
G - 1 - 2	*****	*****	****	G - 2 - 2	32.92	8.00	19.6	G - 2 - 12	31.76	7.40	20.7
G - 1 - 3	*****	*****	****	G - 2 - 3	24.93	5.14	18.6	G - 2 - 13	25.49	5.29	20.6
G - 1 - 4	*****	*****	****	G - 2 - 4	28.42	6.20	17.7	G - 2 - 14	31.72	7.35	20.2
G - 1 - 5	*****	*****	****	G - 2 - 5	28.02	5.43	18.5	G - 2 - 15	29.30	7.25	18.9
G - 1 - 6	*****	*****	****	G - 2 - 6	29.74	6.01	19.0	G - 2 - 16	34.90	10.15	17.3
G - 1 - 7	*****	*****	****	G - 2 - 7	21.87	4.95	19.7	G - 2 - 17	30.68	8.84	16.9
G - 1 - 8	*****	*****	****	G - 2 - 8	30.36	7.14	18.8	G - 2 - 18	33.20	9.55	16.8
G - 1 - 9	*****	*****	****	G - 2 - 9	31.95	7.51	19.5	G - 2 - 19	30.75	8.32	17.5
G - 1 - 10	*****	*****	****	G - 2 - 10	29.49	6.80	19.6	G - 2 - 20	27.37	7.51	17.5

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

G - 13

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
G - 1 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 3	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 6	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 7	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 8	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 9	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
G - 1 - 10	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
G - 2 - 1	0.6103	0.3061	0.4055	0.8679	0.6930	0.2207	0.3006	1.1000	0.3043	0.5611
G - 2 - 2	0.6075	0.3053	0.4145	0.8701	0.6991	0.2204	0.3013	1.0839	0.2970	0.5469
G - 2 - 3	0.5914	0.3125	0.3941	0.9109	0.7661	0.2204	0.2942	1.0911	0.3060	0.5802
G - 2 - 4	0.6075	0.3061	0.3875	0.8620	0.7322	0.2135	0.2968	1.0875	0.2975	0.5525
G - 2 - 5	0.6182	0.3196	0.4084	0.8560	0.6938	0.2223	0.3133	1.1420	0.3027	0.5636
G - 2 - 6	0.6120	0.3116	0.3952	0.8402	0.6907	0.2147	0.3028	1.1607	0.2907	0.5321
G - 2 - 7	0.6081	0.3140	0.3912	0.8359	0.6881	0.2148	0.3015	1.1437	0.2864	0.5272
G - 2 - 8	0.5760	0.3100	0.3875	0.8533	0.7396	0.2126	0.2918	1.2018	0.2970	0.5364
G - 2 - 9	0.6318	0.3166	0.3985	0.8663	0.7322	0.2202	0.3073	1.2232	0.3016	0.5525
G - 2 - 10	0.6257	0.3133	0.3924	0.8391	0.6890	0.2144	0.3002	1.2250	0.2919	0.5364

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
G - 2 - 11	0.6329	0.3178	0.3978	0.8380	0.6868	0.2173	0.3045	1.2491	0.2992	0.5358
G - 2 - 12	0.6422	0.3191	0.3989	0.8592	0.7198	0.2217	0.3092	1.2616	0.3016	0.5444
G - 2 - 13	0.6403	0.3169	0.3961	0.8592	0.7145	0.2216	0.3107	1.2652	0.3047	0.5525
G - 2 - 14	0.6158	0.3209	0.3916	0.8473	0.7132	0.2254	0.3167	1.3170	0.3038	0.5494
G - 2 - 15	0.6230	0.3215	0.3823	0.8707	0.7198	0.2302	0.3206	1.2321	0.3040	0.5512
G - 2 - 16	0.6382	0.3175	0.3676	0.9255	0.7722	0.2355	0.3232	1.1821	0.3166	0.5778
G - 2 - 17	0.6489	0.3154	0.3634	0.9467	0.8022	0.2371	0.3266	1.1473	0.3168	0.5932
G - 2 - 18	0.6541	0.3214	0.3708	0.9592	0.8066	0.2422	0.3333	1.1598	0.3190	0.6043
G - 2 - 19	0.6252	0.3080	0.3559	0.9397	0.8379	0.2306	0.3139	1.1402	0.3059	0.5988
G - 2 - 20	0.6444	0.3235	0.3664	0.9310	0.7828	0.2370	0.3262	1.1750	0.3087	0.5821

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
G - 1 - 1	*****	*****	****	G - 2 - 1	10.59	2.40	17.2	G - 2 - 11	26.97	5.20	19.8
G - 1 - 2	*****	*****	****	G - 2 - 2	32.92	8.00	19.6	G - 2 - 12	31.76	7.40	20.7
G - 1 - 3	*****	*****	****	G - 2 - 3	24.93	5.14	18.6	G - 2 - 13	25.49	5.29	20.6
G - 1 - 4	*****	*****	****	G - 2 - 4	28.42	6.20	17.7	G - 2 - 14	31.72	7.35	20.2
G - 1 - 5	*****	*****	****	G - 2 - 5	28.02	5.43	18.5	G - 2 - 15	29.30	7.25	18.9
G - 1 - 6	*****	*****	****	G - 2 - 6	29.74	6.01	19.0	G - 2 - 16	34.90	10.15	17.3
G - 1 - 7	*****	*****	****	G - 2 - 7	21.87	4.95	19.7	G - 2 - 17	30.68	8.84	16.9
G - 1 - 8	*****	*****	****	G - 2 - 8	30.36	7.14	18.8	G - 2 - 18	33.20	9.55	16.8
G - 1 - 9	*****	*****	****	G - 2 - 9	31.95	7.51	19.5	G - 2 - 19	30.75	8.32	17.5
G - 1 - 10	*****	*****	****	G - 2 - 10	29.49	6.80	19.6	G - 2 - 20	27.37	7.51	17.5

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
G - 1 - 1	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 2	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 3	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 4	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 5	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 6	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 7	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 8	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 9	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
G - 1 - 10	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
G - 2 - 1	2.056	0.2759	0.3498	0.2851	1.8605	0.218	3.077	0.5234	1.457	1.304	0.3111	1.4829
G - 2 - 2	1.722	0.2793	0.3503	0.2963	1.6628	0.240	3.077	0.5224	1.481	1.522	0.3121	1.5447
G - 2 - 3	2.056	0.2793	0.3424	0.2807	1.8023	0.239	2.308	0.5221	1.321	0.870	0.3153	1.2987
G - 2 - 4	1.556	0.2793	0.3101	0.2725	1.6628	0.218	1.923	0.5172	1.395	1.304	0.2987	1.1579
G - 2 - 5	1.444	0.3931	0.3634	0.2906	1.6047	0.229	1.154	0.5305	1.667	1.304	0.3275	1.1526
G - 2 - 6	1.056	0.3379	0.3435	0.3009	1.6047	0.221	1.154	0.5216	1.519	1.739	0.3216	1.0961
G - 2 - 7	1.111	0.3345	0.3494	0.3100	1.6047	0.221	0.769	0.5141	1.556	1.304	0.3237	1.0829
G - 2 - 8	1.056	0.3172	0.2263	0.3312	1.3372	0.222	0.769	0.5003	1.506	1.087	0.3334	1.0553
G - 2 - 9	0.722	0.3276	0.3693	0.3465	1.4651	0.230	0.769	0.5187	1.654	1.087	0.3434	1.0895
G - 2 - 10	0.722	0.3069	0.3389	0.3568	1.4070	0.206	0.385	0.5109	1.580	1.304	0.3300	1.0921

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
G - 2 - 11	0.778	0.3034	0.3689	0.3787	1.3372	0.220	0.385	0.5112	1.593	0.870	0.3549	1.1145
G - 2 - 12	0.722	0.3276	0.3675	0.3768	1.6047	0.222	0.769	0.5109	1.679	0.870	0.3590	1.1237
G - 2 - 13	0.611	0.3276	0.3689	0.3649	1.4070	0.223	0.769	0.5122	1.704	1.304	0.3568	1.1000
G - 2 - 14	0.778	0.4138	0.3741	0.3941	1.2791	0.221	0.769	0.5070	1.568	1.304	0.3695	1.1421
G - 2 - 15	0.778	0.4414	0.3803	0.3922	1.0116	0.221	0.769	0.5242	1.630	1.957	0.3644	1.1658
G - 2 - 16	0.556	0.4103	0.3676	0.3653	0.8140	0.210	0.769	0.5557	1.593	1.522	0.3715	1.1118
G - 2 - 17	0.556	0.4103	0.3651	0.3526	1.1395	0.211	0.769	0.5708	1.494	1.304	0.3664	1.1053
G - 2 - 18	0.556	0.4655	0.3788	0.3597	0.9535	0.213	0.385	0.5779	1.617	1.522	0.3732	1.1263
G - 2 - 19	0.611	0.4207	0.3598	0.3671	0.8837	0.209	0.385	0.5474	1.481	1.087	0.3597	1.0934
G - 2 - 20	0.611	0.4690	0.3853	0.3869	1.4767	0.228	0.769	0.5594	1.605	0.870	0.3623	1.1289

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
G - 1 - 1	*****	*****	****	G - 2 - 1	10.59	2.40	17.2	G - 2 - 11	26.97	5.20	19.8
G - 1 - 2	*****	*****	****	G - 2 - 2	32.92	8.00	19.6	G - 2 - 12	31.76	7.40	20.7
G - 1 - 3	*****	*****	****	G - 2 - 3	24.93	5.14	18.6	G - 2 - 13	25.49	5.29	20.6
G - 1 - 4	*****	*****	****	G - 2 - 4	28.42	6.20	17.7	G - 2 - 14	31.72	7.35	20.2
G - 1 - 5	*****	*****	****	G - 2 - 5	28.02	5.43	18.5	G - 2 - 15	29.30	7.25	18.9
G - 1 - 6	*****	*****	****	G - 2 - 6	29.74	6.01	19.0	G - 2 - 16	34.90	10.15	17.3
G - 1 - 7	*****	*****	****	G - 2 - 7	21.87	4.95	19.7	G - 2 - 17	30.68	8.84	16.9
G - 1 - 8	*****	*****	****	G - 2 - 8	30.36	7.14	18.8	G - 2 - 18	33.20	9.55	16.8
G - 1 - 9	*****	*****	****	G - 2 - 9	31.95	7.51	19.5	G - 2 - 19	30.75	8.32	17.5
G - 1 - 10	*****	*****	****	G - 2 - 10	29.49	6.80	19.6	G - 2 - 20	27.37	7.51	17.5

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake H

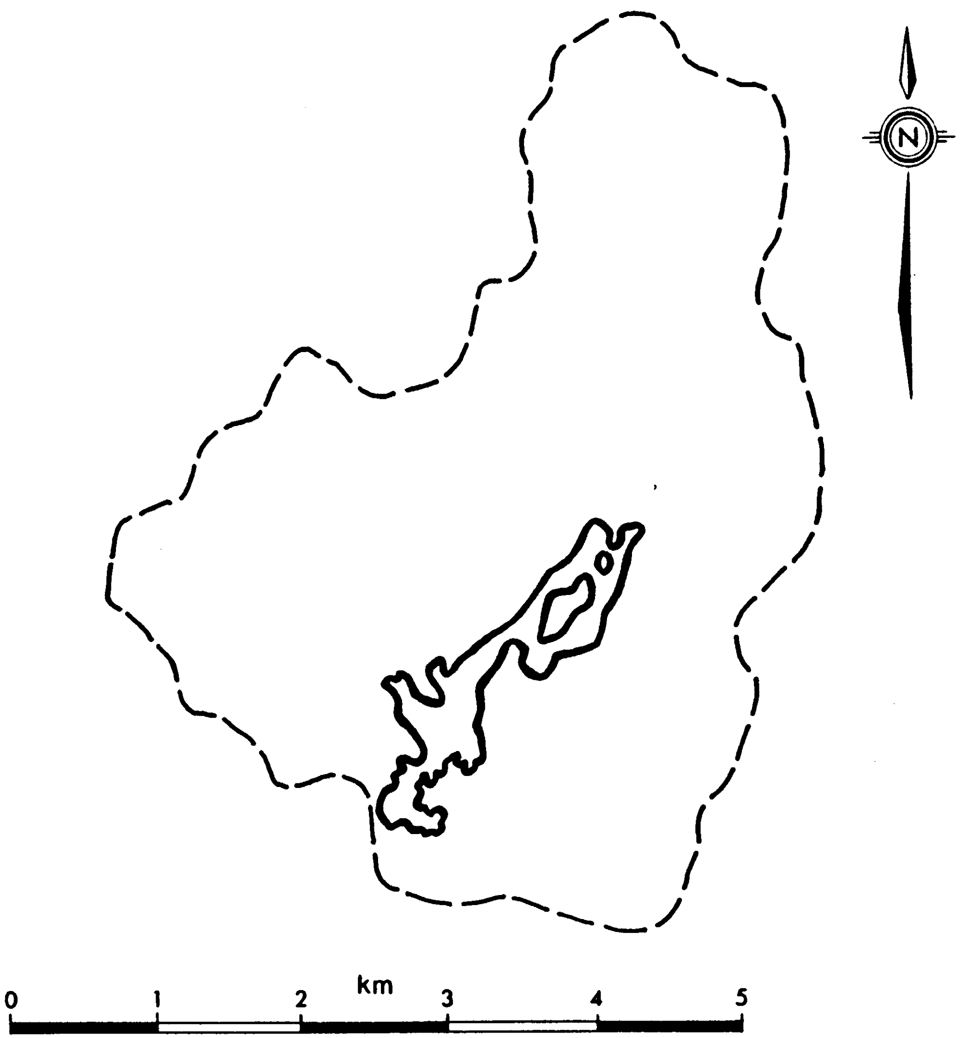
pH 7·0

GENERAL SETTING

H - 2

GENERAL DESCRIPTION

Lake H is a rather large rock basin partly modified by surficial deposits. It has several islands and a complex morphometry and shoreline configuration. Surficial deposits cover a significant proportion of the large watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-649406/5474299
Elevation of lake above sea level	430.5 m (1435 ft)
Lake depth at sampling point	5.0 m
Lake area	.9 sq km
Lake catchment area	17 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	6
Distance from south end of sampling strip	50 km

LAKE MICROBIOTA

H - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY (No./l)
	Holopedium gibberum		0.5
	Bosmina longirostris		2.3
		Total	2.8

COPEPODS	SPECIES NAME		DENSITY (No./l)
	Copepodites		3.0
	Cyclops bicuspidatus		1.2
	Diaptomus minutus		2.8
	Mesocyclops edax		3.0
		Total	10.0

ROTIFERS	SPECIES NAME		DENSITY (No./l)
	Kellicotia longispina		3.7
	Polyarthra vulgaris		0.6
		Total	4.3

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Ababaena circinalis		4
	Aphanocapsa grevillei		3
	Aphanocapsa elachista		2
	Coelosphaerium kutzinghiana		3
	Microcystis aeruginosa		4
		(Average)	(3)

CHLOROPHYTA	SPECIES NAME		ABUNDANCE
	Gloeocystis gigas		3
	Staurastrum sp.		2
	Staurastrum rotula		2
	Volvox sp.		4
		(Average)	(3)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Asterionella formosa		2
	Melosira sp.		4
	Tabellaria fenestrata		3
		(Average)	(3)

PYRROPHYTA	SPECIES NAME		ABUNDANCE
	Ceratium hirundinella		3
		(Average)	(3)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Dinobryon bavaricum		3
	Dinobryon divergens		3
	Dinobryon sertularia		3
	Mallomonas sp.		2
		(Average)	(3)

CILIOPHORA	SPECIES NAME		ABUNDANCE
	Epistylis sp.		1
		(Average)	(1)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE(%)
Cyclotella bodanica	207	4	33.2
Navicula Minuscula	3	4	.48
Melosira granulata	1	2	.16
Cyclotella stelligera	99	4	15.8
Cocconeis sp	2		.32
Cyclotella glomerata	37	4	5.9
Navicula bicephala	11	4	.18
Pinnularia hilseana	5	4	.80
Achnanthes hauckiana	4		.64
Nitzschia palea	10	4	1.6
Cyclotella comta	57	2	9.1
Anomoeoneis serians var brachysira	3	5	.48
Pinnularia microstauron	3	4	.48
Melosira distans	12	3	1.9
Navicula pupula var mutata	3	4	.48
Tabellaria fenestrata	59	4	9.5
Navicula cryptocephala	5	2	.80
Surirella robusta	2	4	.32
Pinnularia abaujensis var rostrata	1	4	.16
Tabellaria flocculosa	2	3	.32
Navicula heufleri	2	3	.32
Eunotia incisa	5	4	.80
Navicula subtilissima	2	3	.32
Navicula laevissima	4	4	.64
Cymbella minuta var silesica	4	4	.64
Melosira islandica	13	2	2.1
Fragilaria construens	9	2	1.4
Navicula gottlandica	6	4	.96
Melosira italica	9	4	1.4
Tetracyclus lacustris	2	3	.32
Asterionella ralfsii	7	2	1.1
Synedra tenera	1		.16
Pinnularia viridis	1	4	.16
Pinnularia sublinearis	1	4	.16
Navicula subhamulata	5	4	.80
Eunotia tenella	4	3	.64
Pinnularia capitata	2	4	.32
Stauroneis fluminea	1		.16
Nitzschia kutzingiana	1	4	.16
Pinnularia cf mesolepta var angusta	2	4	.32
Diploneis cf puella	2	4	.32
Navicula notha	4	4	.64
Stauroneis smithii var incisa	1	4	.16
Gomphonema angustatum var citera	1	2	.16

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidolphilous
4-Indifferent
5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake H was one of the most humic of the 20 study lakes (Secchi transparency = 1.8m). Like F and G, it also had a large drainage area (17 km^2) and was fed by numerous other lakes upstream from it (Lake H was a sixth-order lake).

The lake was essentially unstratified thermally, although a one degree Centigrade temperature drop was recorded just above its bottom (5m). Oxygen and specific conductivity were also essentially unstratified throughout the length of its water column.

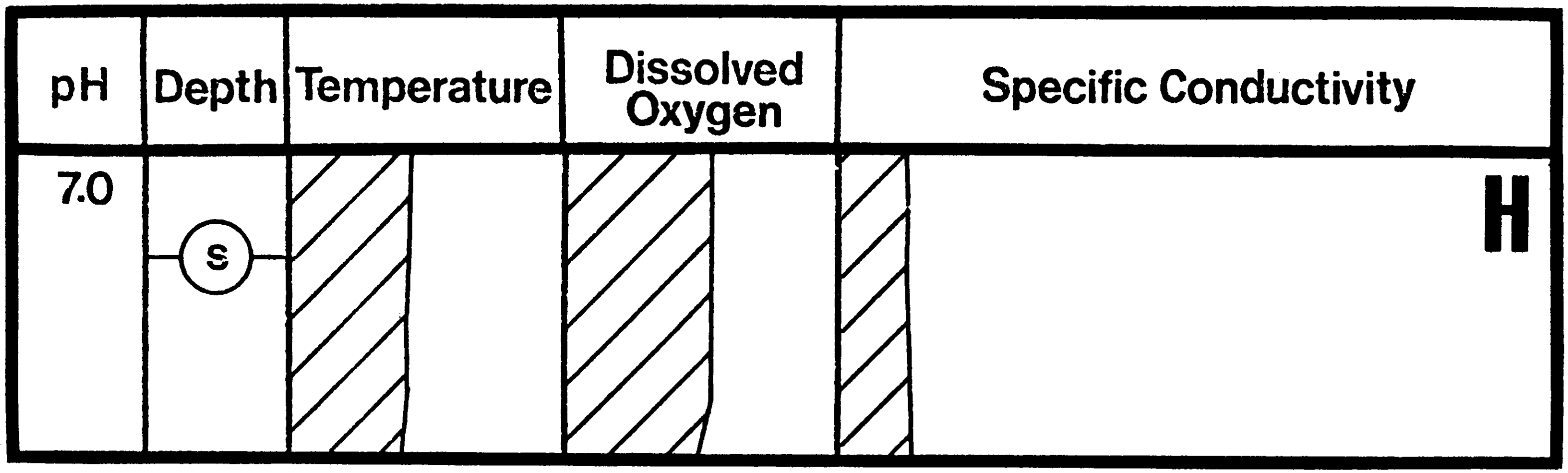
This double-basin lake was fringed by many small granitic outcrops. Muskeg conditions prevailed near its littoral margins.

DETAILS OF LAKE WATER CHEMISTRY

H - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		15.2	100	36
1	1.8	15.3	100	36
2		15.2	100	38
3		15.0	100	38
4		15.0	100	38
5		14.0	90	39

*Specific conductivity data are temperature-corrected (25° C).

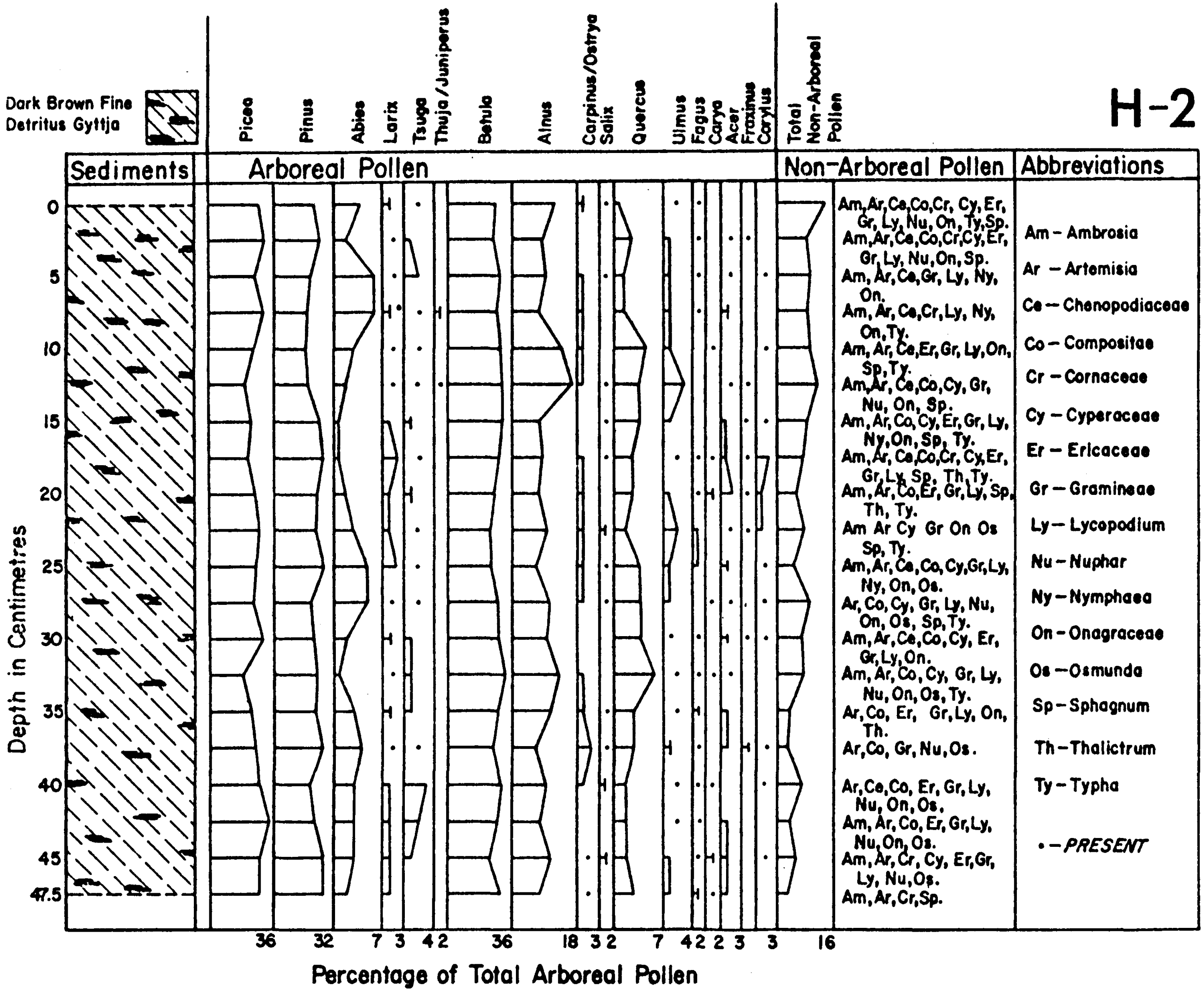


LAKE WATER CHEMISTRY PLOT

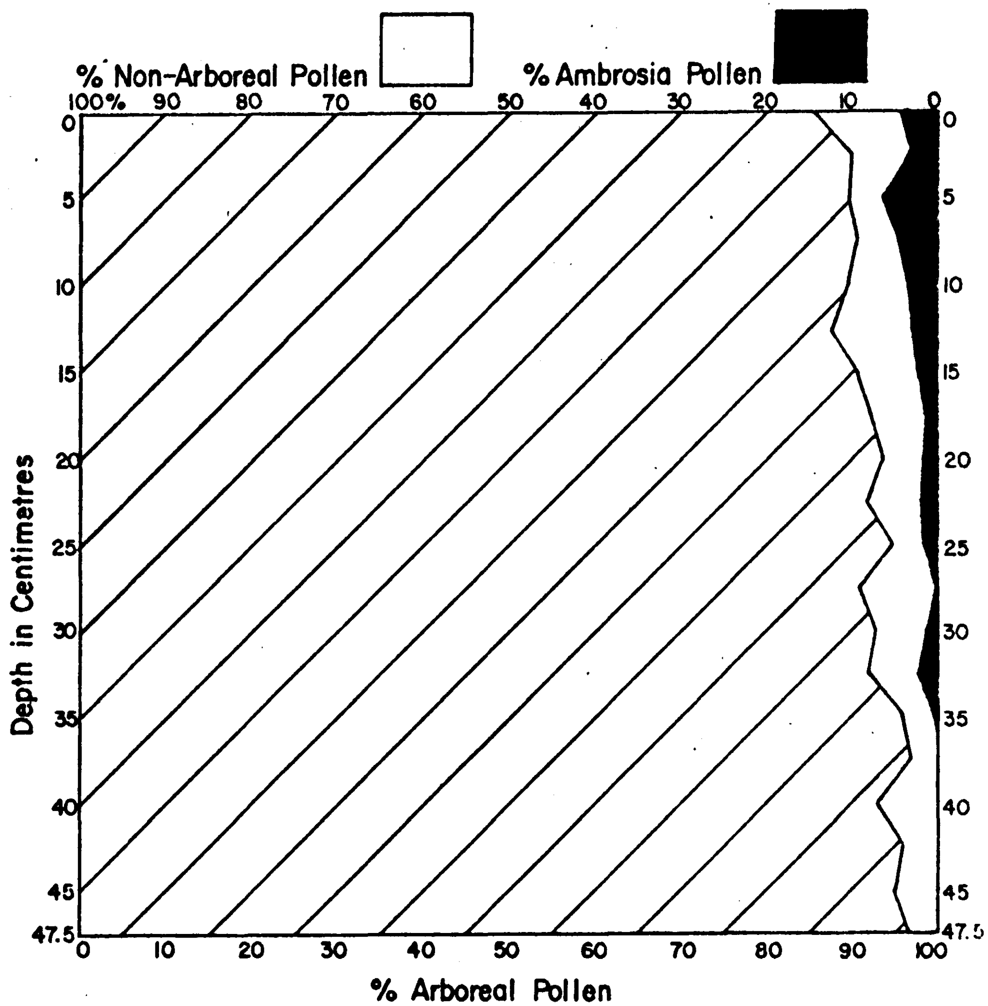
H - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE

H - 8



Regional forest composition is well represented by the pollen diagram. Southern pollen influx is minor. The abundance of alder (Alnus) pollen indicates a local source. The indistinct Ambrosia rise suggests some mixing of lake bottom sediment.



 PALYNOLOGY NOTES

AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
H - 1 - 1	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 2	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 3	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 4	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 5	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 6	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 7	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 8	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 9	******	******	*****	******	******	******	******	******	*****	****
H - 1 - 10	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
H - 2 - 1	39810.	12820.	204.	10890.	12200.	3900.	13350.	1159.	1269.	82.
H - 2 - 2	39930.	13050.	214.	10910.	11930.	3900.	13350.	1157.	1314.	85.
H - 2 - 3	38960.	12870.	212.	10600.	12040.	3914.	13070.	1066.	1250.	78.
H - 2 - 4	40440.	13270.	211.	11010.	12440.	3809.	13170.	1154.	1299.	83.
H - 2 - 5	40000.	13840.	209.	10800.	12460.	3787.	13310.	1156.	1243.	85.
H - 2 - 6	40430.	12520.	204.	11050.	12830.	3757.	13310.	1161.	1253.	87.
H - 2 - 7	40250.	11760.	201.	10760.	12490.	3669.	13060.	1129.	1219.	87.
H - 2 - 8	41010.	11460.	196.	10950.	13260.	3589.	12810.	1196.	1225.	81.
H - 2 - 9	40290.	11370.	197.	10460.	12320.	3575.	12840.	1235.	1192.	82.
H - 2 - 10	39260.	11190.	198.	9660.	11410.	3589.	13080.	1275.	1202.	83.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
H - 2 - 11	37950.	11450.	191.	9110.	10760.	3510.	12660.	1279.	1121.	75.
H - 2 - 12	39460.	11920.	196.	9480.	10750.	3643.	13160.	1290.	1166.	76.
H - 2 - 13	39380.	11540.	190.	9610.	11290.	3556.	12800.	1288.	1164.	77.
H - 2 - 14	40190.	11550.	188.	9660.	11290.	3570.	12990.	1298.	1184.	81.
H - 2 - 15	41500.	11780.	193.	9850.	11450.	3686.	13370.	1381.	1227.	78.
H - 2 - 16	42760.	12420.	197.	10140.	11570.	3842.	13700.	1333.	1240.	80.
H - 2 - 17	40530.	12510.	190.	10520.	12560.	3807.	13140.	1254.	1240.	81.
H - 2 - 18	41600.	12270.	187.	9940.	11560.	3740.	13250.	1213.	1188.	80.
H - 2 - 19	40640.	11390.	181.	9500.	11580.	3501.	13160.	1296.	1142.	79.
H - 2 - 20	40090.	10880.	175.	9070.	10980.	3354.	13060.	1296.	1067.	73.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
H - 1 - 1	*****	*****	****	H - 2 - 1	12.51	1.26	28.5	H - 2 - 11	29.94	4.71	32.8
H - 1 - 2	*****	*****	****	H - 2 - 2	10.07	2.07	29.2	H - 2 - 12	26.46	4.02	32.9
H - 1 - 3	*****	*****	****	H - 2 - 3	19.67	2.98	29.7	H - 2 - 13	23.47	3.17	32.5
H - 1 - 4	*****	*****	****	H - 2 - 4	20.81	3.60	29.2	H - 2 - 14	28.34	4.53	32.9
H - 1 - 5	*****	*****	****	H - 2 - 5	22.94	3.73	29.5	H - 2 - 15	23.92	4.01	33.5
H - 1 - 6	*****	*****	****	H - 2 - 6	17.40	2.91	28.7	H - 2 - 16	30.22	5.18	32.2
H - 1 - 7	*****	*****	****	H - 2 - 7	23.21	3.27	29.0	H - 2 - 17	18.56	3.29	31.5
H - 1 - 8	*****	*****	****	H - 2 - 8	27.66	4.62	29.4	H - 2 - 18	25.65	4.35	31.5
H - 1 - 9	*****	*****	****	H - 2 - 9	28.18	4.47	30.3	H - 2 - 19	30.68	5.32	33.3
H - 1 - 10	*****	*****	****	H - 2 - 10	24.99	3.81	31.5	H - 2 - 20	26.29	4.30	35.4

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

H - 11

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

H - 12

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
H - 1 - 1	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 2	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 3	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 4	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 5	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 6	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 7	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 8	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 9	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
H - 1 - 10	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
H - 2 - 1	4.0	11.0	29.7	20.0	205.	16.	60.	164.7	11.	3.0	30.1	100.
H - 2 - 2	3.5	13.6	29.4	20.0	211.	18.	55.	165.9	13.	2.0	30.9	92.
H - 2 - 3	4.9	11.1	28.3	35.3	222.	17.	50.	167.5	11.	2.0	29.6	87.
H - 2 - 4	5.4	10.9	25.2	19.8	216.	17.	40.	169.7	11.	2.0	30.1	80.
H - 2 - 5	4.4	14.4	29.0	19.3	205.	16.	30.	167.9	13.	2.0	29.8	76.
H - 2 - 6	2.3	9.3	28.4	18.2	183.	19.	15.	173.4	12.	2.0	29.1	65.
H - 2 - 7	2.4	9.5	27.6	17.9	172.	15.	20.	172.6	11.	2.0	28.2	58.
H - 2 - 8	2.1	6.0	28.9	19.0	155.	17.	10.	172.8	11.	2.5	27.4	56.
H - 2 - 9	1.8	7.8	27.7	19.8	155.	15.	10.	166.0	11.	2.5	28.0	57.
H - 2 - 10	1.5	9.7	18.2	20.6	132.	19.	10.	158.9	13.	3.0	29.9	62.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
H - 2 - 11	1.4	7.9	28.1	21.6	143.	15.	10.	147.4	13.	2.0	30.8	62.
H - 2 - 12	1.4	10.3	29.6	27.7	143.	38.	5.	153.5	14.	2.5	32.1	70.
H - 2 - 13	1.4	9.6	29.2	22.4	98.	18.	10.	150.7	14.	2.5	31.8	65.
H - 2 - 14	1.3	10.4	29.2	23.8	127.	17.	5.	151.1	14.	2.5	32.4	69.
H - 2 - 15	1.2	11.1	32.4	24.2	143.	23.	10.	153.7	14.	2.5	33.6	67.
H - 2 - 16	1.2	10.9	31.5	24.8	138.	18.	10.	162.4	14.	2.5	34.5	74.
H - 2 - 17	1.2	10.2	31.0	24.5	160.	17.	10.	161.3	13.	2.5	34.2	74.
H - 2 - 18	1.1	9.2	31.3	24.1	143.	19.	5.	160.8	14.	1.5	33.7	77.
H - 2 - 19	1.1	13.1	29.4	23.5	127.	16.	10.	154.3	14.	2.5	32.9	71.
H - 2 - 20	1.7	10.6	29.3	25.4	127.	18.	10.	153.1	15.	1.5	32.9	71.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
H - 1 - 1	*****	*****	****	H - 2 - 1	12.51	1.26	28.5	H - 2 - 11	29.94	4.71	32.8
H - 1 - 2	*****	*****	****	H - 2 - 2	10.07	2.07	29.2	H - 2 - 12	26.66	4.02	32.9
H - 1 - 3	*****	*****	****	H - 2 - 3	19.67	2.98	29.7	H - 2 - 13	23.67	3.17	32.5
H - 1 - 4	*****	*****	****	H - 2 - 4	20.81	3.60	29.2	H - 2 - 14	28.34	4.53	32.9
H - 1 - 5	*****	*****	****	H - 2 - 5	22.94	3.73	29.5	H - 2 - 15	23.92	4.01	33.5
H - 1 - 6	*****	*****	****	H - 2 - 6	17.40	2.91	28.7	H - 2 - 16	30.22	5.18	32.2
H - 1 - 7	*****	*****	****	H - 2 - 7	23.21	3.27	29.0	H - 2 - 17	18.56	3.29	31.5
H - 1 - 8	*****	*****	****	H - 2 - 8	27.66	4.62	29.4	H - 2 - 18	25.65	4.35	31.5
H - 1 - 9	*****	*****	****	H - 2 - 9	28.18	4.47	30.3	H - 2 - 19	30.68	5.32	33.3
H - 1 - 10	*****	*****	****	H - 2 - 10	24.99	3.81	31.5	H - 2 - 20	26.29	4.30	35.4

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
H - 1 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 3	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 6	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 7	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 8	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 9	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
H - 1 - 10	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
H - 2 - 1	0.4762	0.2061	0.1925	0.5918	0.5374	0.1411	0.2865	1.0348	0.2008	0.5062
H - 2 - 2	0.4776	0.2098	0.2018	0.5929	0.5256	0.1411	0.2865	1.0330	0.2079	0.5228
H - 2 - 3	0.4660	0.2069	0.2002	0.5761	0.5304	0.1416	0.2805	0.9518	0.1978	0.4809
H - 2 - 4	0.4837	0.2133	0.1989	0.5984	0.5480	0.1378	0.2826	1.0304	0.2055	0.5142
H - 2 - 5	0.4785	0.2225	0.1969	0.5870	0.5489	0.1370	0.2856	1.0321	0.1967	0.5228
H - 2 - 6	0.4836	0.2013	0.1923	0.6005	0.5652	0.1359	0.2856	1.0366	0.1983	0.5358
H - 2 - 7	0.4815	0.1891	0.1899	0.5848	0.5502	0.1327	0.2803	1.0080	0.1929	0.5340
H - 2 - 8	0.4906	0.1842	0.1851	0.5951	0.5841	0.1298	0.2749	1.0679	0.1938	0.5012
H - 2 - 9	0.4819	0.1828	0.1858	0.5685	0.5427	0.1293	0.2755	1.1027	0.1886	0.5062
H - 2 - 10	0.4696	0.1799	0.1869	0.5250	0.5026	0.1298	0.2807	1.1384	0.1902	0.5093

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
H - 2 - 11	0.4539	0.1841	0.1797	0.4951	0.4740	0.1270	0.2717	1.1420	0.1774	0.4636
H - 2 - 12	0.4720	0.1916	0.1849	0.5152	0.4736	0.1318	0.2824	1.1518	0.1845	0.4667
H - 2 - 13	0.4711	0.1855	0.1796	0.5223	0.4974	0.1287	0.2747	1.1500	0.1842	0.4778
H - 2 - 14	0.4807	0.1857	0.1769	0.5250	0.4974	0.1292	0.2788	1.1589	0.1873	0.5012
H - 2 - 15	0.4964	0.1894	0.1816	0.5353	0.5044	0.1334	0.2869	1.2330	0.1941	0.4784
H - 2 - 16	0.5115	0.1997	0.1862	0.5511	0.5097	0.1390	0.2940	1.1902	0.1962	0.4957
H - 2 - 17	0.4848	0.2011	0.1792	0.5717	0.5533	0.1377	0.2820	1.1196	0.1962	0.5006
H - 2 - 18	0.4976	0.1973	0.1765	0.5402	0.5093	0.1353	0.2843	1.0830	0.1880	0.4957
H - 2 - 19	0.4861	0.1831	0.1709	0.5163	0.5101	0.1267	0.2824	1.1571	0.1807	0.4864
H - 2 - 20	0.4795	0.1749	0.1653	0.4929	0.4837	0.1213	0.2803	1.1571	0.1688	0.4512

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
H - 1 - 1	*****	*****	****	H - 2 - 1	12.51	1.26	28.5	H - 2 - 11	29.94	4.71	32.8
H - 1 - 2	*****	*****	****	H - 2 - 2	10.07	2.07	29.2	H - 2 - 12	26.66	4.02	32.9
H - 1 - 3	*****	*****	****	H - 2 - 3	19.67	2.98	29.7	H - 2 - 13	23.67	3.17	32.5
H - 1 - 4	*****	*****	****	H - 2 - 4	20.81	3.60	29.2	H - 2 - 14	28.34	4.53	32.9
H - 1 - 5	*****	*****	****	H - 2 - 5	22.94	3.73	29.5	H - 2 - 15	23.92	4.01	33.5
H - 1 - 6	*****	*****	****	H - 2 - 6	17.40	2.91	28.7	H - 2 - 16	30.22	5.18	32.2
H - 1 - 7	*****	*****	****	H - 2 - 7	23.21	3.27	29.0	H - 2 - 17	18.56	3.29	31.5
H - 1 - 8	*****	*****	****	H - 2 - 8	27.66	4.62	29.4	H - 2 - 18	25.65	4.35	31.5
H - 1 - 9	*****	*****	****	H - 2 - 9	28.18	4.47	30.3	H - 2 - 19	30.68	5.32	33.3
H - 1 - 10	*****	*****	****	H - 2 - 10	24.99	3.81	31.5	H - 2 - 20	26.29	4.30	35.4

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
H - 1 - 1	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 2	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 3	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 4	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 5	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 6	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 7	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 8	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 9	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
H - 1 - 10	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
H - 2 - 1	2.222	0.3793	0.2433	0.2940	2.3837	0.161	4.615	0.4289	1.407	1.304	0.2212	1.3132
H - 2 - 2	1.944	0.4690	0.2410	0.2938	2.4535	0.185	4.231	0.4320	1.593	0.870	0.2272	1.2079
H - 2 - 3	2.722	0.3828	0.2320	0.5187	2.5814	0.172	3.846	0.4362	1.309	0.870	0.2173	1.1421
H - 2 - 4	3.000	0.3759	0.2069	0.2904	2.5116	0.170	3.077	0.4419	1.383	0.870	0.2212	1.0579
H - 2 - 5	2.444	0.4966	0.2374	0.2840	2.3837	0.162	2.308	0.4372	1.580	0.870	0.2191	1.0039
H - 2 - 6	1.278	0.3207	0.2325	0.2671	2.1279	0.187	1.154	0.4516	1.432	0.870	0.2143	0.8553
H - 2 - 7	1.333	0.3276	0.2261	0.2625	2.0000	0.149	1.538	0.4495	1.395	0.870	0.2076	0.7592
H - 2 - 8	1.167	0.2069	0.2366	0.2796	1.8023	0.169	0.769	0.4500	1.370	1.087	0.2018	0.7329
H - 2 - 9	1.000	0.2690	0.2267	0.2904	1.8023	0.151	0.769	0.4323	1.407	1.087	0.2059	0.7461
H - 2 - 10	0.833	0.3345	0.1493	0.3029	1.5349	0.195	0.769	0.4138	1.580	1.304	0.2200	0.8105

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
H - 2 - 11	0.778	0.2724	0.2299	0.3174	1.6628	0.154	0.769	0.3839	1.605	0.870	0.2261	0.8145
H - 2 - 12	0.778	0.3552	0.2426	0.4071	1.6628	0.379	0.385	0.3997	1.691	1.087	0.2358	0.9197
H - 2 - 13	0.778	0.3310	0.2396	0.3299	1.1395	0.183	0.769	0.3924	1.704	1.087	0.2340	0.8539
H - 2 - 14	0.722	0.3586	0.2393	0.3496	1.4767	0.168	0.385	0.3935	1.728	1.087	0.2380	0.9079
H - 2 - 15	0.667	0.3828	0.2652	0.3559	1.6628	0.233	0.769	0.4003	1.778	1.087	0.2468	0.8789
H - 2 - 16	0.667	0.3759	0.2582	0.3640	1.6047	0.177	0.769	0.4229	1.778	1.087	0.2535	0.9724
H - 2 - 17	0.667	0.3517	0.2540	0.3603	1.8605	0.173	0.769	0.4201	1.642	1.087	0.2517	0.9789
H - 2 - 18	0.611	0.3172	0.2566	0.3550	1.6628	0.187	0.385	0.4187	1.753	0.652	0.2477	1.0132
H - 2 - 19	0.611	0.4517	0.2412	0.3460	1.4767	0.165	0.769	0.4018	1.716	1.087	0.2421	0.9316
H - 2 - 20	0.944	0.3655	0.2398	0.3729	1.4767	0.178	0.769	0.3987	1.827	0.652	0.2423	0.9395

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
H - 1 - 1	*****	*****	****	H - 2 - 1	12.51	1.26	28.5	H - 2 - 11	29.94	4.71	32.8
H - 1 - 2	*****	*****	****	H - 2 - 2	10.07	2.07	29.2	H - 2 - 12	26.66	4.02	32.9
H - 1 - 3	*****	*****	****	H - 2 - 3	19.67	2.98	29.7	H - 2 - 13	23.67	3.17	32.5
H - 1 - 4	*****	*****	****	H - 2 - 4	20.81	3.60	29.2	H - 2 - 14	28.34	4.53	32.9
H - 1 - 5	*****	*****	****	H - 2 - 5	22.94	3.73	29.5	H - 2 - 15	23.92	4.01	33.5
H - 1 - 6	*****	*****	****	H - 2 - 6	17.40	2.91	28.7	H - 2 - 16	30.22	5.18	32.2
H - 1 - 7	*****	*****	****	H - 2 - 7	23.21	3.27	29.0	H - 2 - 17	18.56	3.29	31.5
H - 1 - 8	*****	*****	****	H - 2 - 8	27.66	4.62	29.4	H - 2 - 18	25.65	4.35	31.5
H - 1 - 9	*****	*****	****	H - 2 - 9	28.18	4.47	30.3	H - 2 - 19	30.68	5.32	33.3
H - 1 - 10	*****	*****	****	H - 2 - 10	24.99	3.81	31.5	H - 2 - 20	26.29	4.30	35.4

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

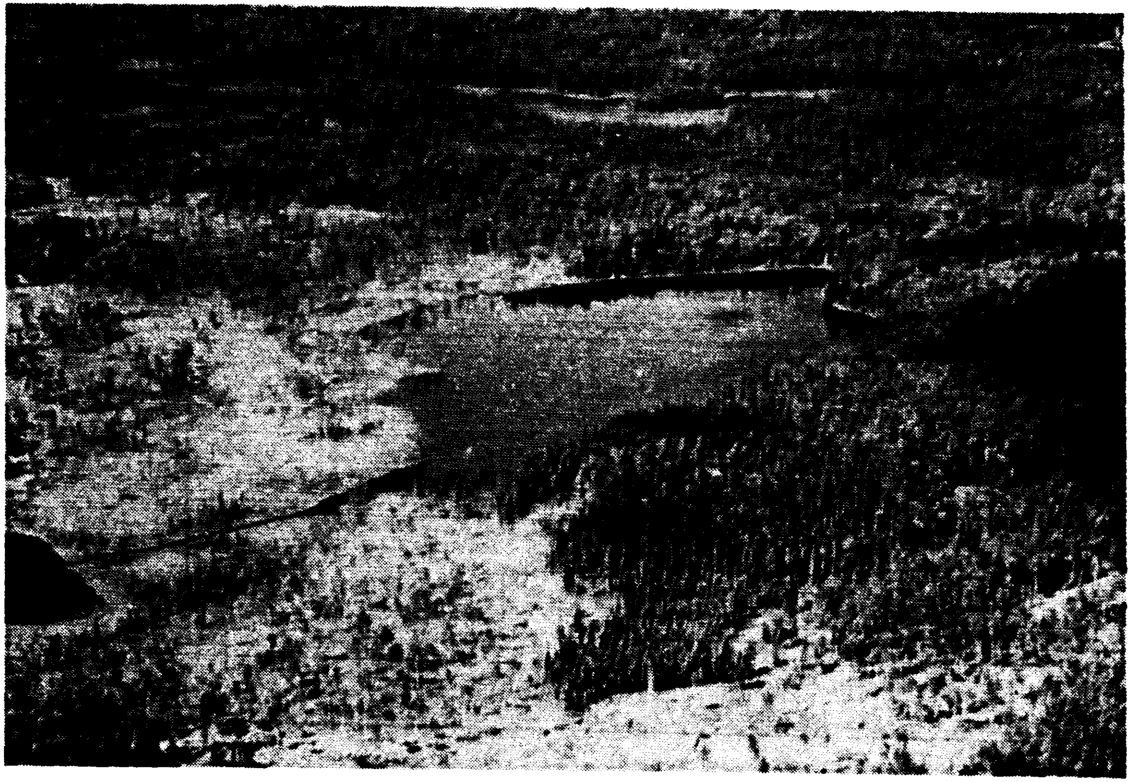
H - 17

Lake I

pH 6·7

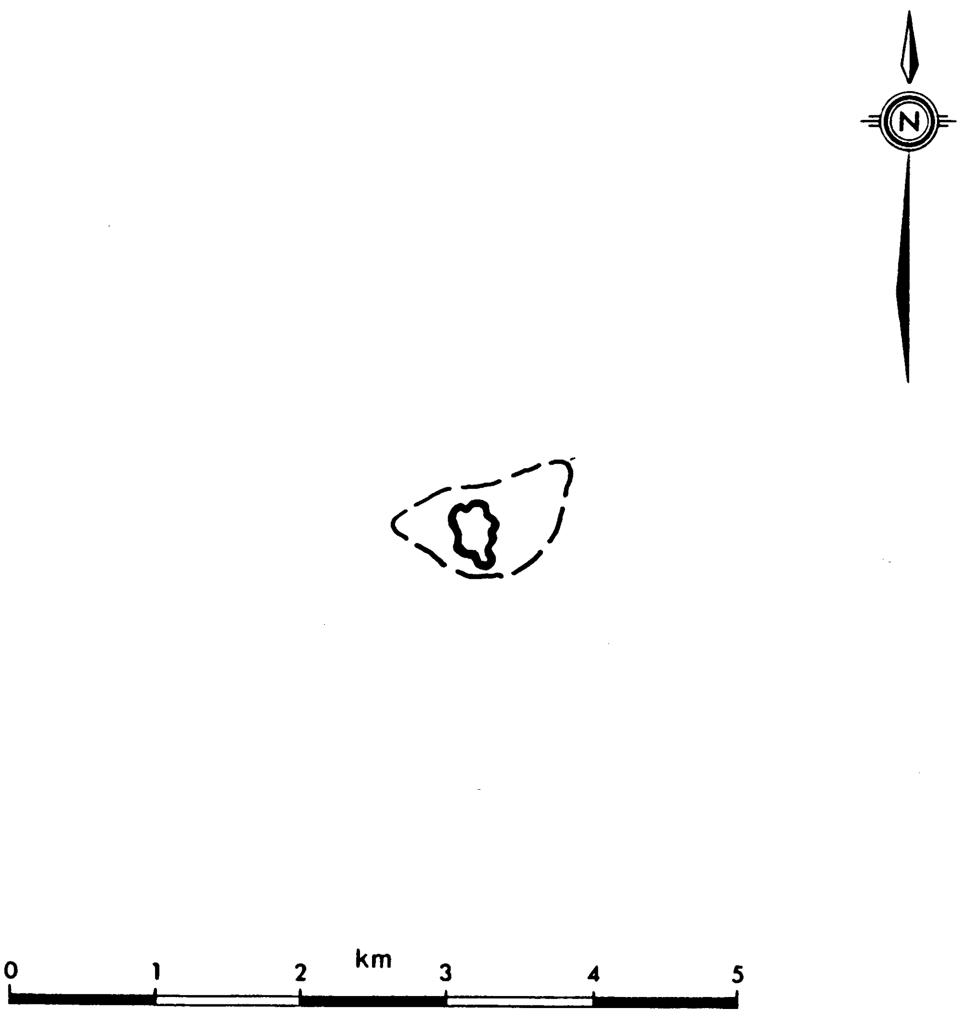
GENERAL SETTING

I - 2



GENERAL DESCRIPTION

Lake I is a small rock basin modified by surficial deposits. The morphometry appears to be simple, and surficial deposits (sand and gravel) cover much of the very small watershed that has been partly logged for pulpwood.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-576870/5470312
Elevation of lake above sea level	444 m (1480 ft)
Lake depth at sampling point	5.8 m
Lake area	.1 sq km
Lake catchment area	.6 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	1
Distance from south end of sampling strip	52 km

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY
	Holopedium gibberum		2.0
	Bosmina longirostris		0.3
	Daphnia galeata mendota		0.2
	Daphnia pulex		0.2
		Total	2.7

COPEPODS	SPECIES NAME		DENSITY
	Copepodities		0.1
	Cyclops bicuspidatus		0.1
	Diaptomus minutus		0.4
	Diaptomus copepodite		0.6
		Total	1.2

ROTIFERS	SPECIES NAME		DENSITY
	Conochilus sp.		1.5
	Asplanchna preodonta		0.8
	Kellicotia longispina		1.2
	Syncheata sp.		0.3
	Polyarthra sp.		0.7
		Total	4.5

CHLOROPHYTA	SPECIES NAME		ABUNDANCE*
	Staurastrum sp.		3
	Volvox sp.		3
		(Average)	(3)

PYRROPHYTA	SPECIES NAME		ABUNDANCE
	Ceratium hirundinella		2
	Gymnodinium sp.		5
		(Average)	(4)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Dinobryon bavaricum		5
	Dinobryon divergens		4
	Synura sp.		2
		(Average)	(4)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE
Navicula tripunctata	1	1	.20
Pinnularia mesolepta	4	4	.80
Pinnularia biceps	2	4	.40
Gomphonema acuminatum	1	2	.20
Navicula laevissima	4	4	.80
Eunotia elegans	1	4	.20
Cymbella lunata	1	**	.20
Navicula halophia	2	4	.40
Nedium iridis var ampliatum	1	4	.20
Diploneis cf puella	1	4	.20
Cyclotella stelligera	98	4	19.6
Tabellaria fenestrata	35	4	7.0
Melosira italica	14	4	2.8
Cyclotella comta	56	2	10.4
Melosira ambigua	23	2	4.6
Navicula bicephala	2	4	.40
Cyclotella bodanica	16	4	3.2
Navicula radiosa var tenella	1	4	.20
Cyclotella glomerata	66	4	13.2
Pinnularia braunii	7	4	1.4
Pleurosigma cf delicatulum	4	4	.80
Pinnularia cardinaliculus	1	4	.20
Stauroneis fluminea	5		1.
Asterionella formosa	31	2	6.2
Eunotia incisa	2	4	.40
Navicula cf menisculus var upsaliensis	2		.40
Achanthes cf lanceolata var omissa	1	2	.20
Navicula notha	7	4	1.4
Melosira distans	46	3	9.2
Cymbella minuta var silesica	6	4	1.2
Pinnularia abaujensis	1	4	.20
Nitzschia palea	11	4	2.2
Frustulia rhomboides var saxonica	1	3	.20
Navicula gottlandica	10	4	2.0
Surirella biserata	1	4	.20
Stauroneis phoenicenteron	2	4	.40
Eunotia pectinalis	2	3	.40
Pinnularia obscura	3		.60
Navicula cryptocephala	6	2	1.2
Tabellaria flocculosa	4	3	.80
Synedra tenera	11		2.2
Navicula subhamulata	3	4	.60

* pH CATEGORY
1-Alkalibiontic
2- Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake I was thermally stratified at only 4m. This is characteristic of a wind-sheltered, small-basin (0.1 km^2) lake. Dissolved oxygen dropped off quickly near its bottom, indicating a substantial amount of organic matter decomposing there. This is corroborated by the sudden increase in specific conductivity near the bottom (142 micromhos/cm). Approximately half of the core bottom sediment (47%) was lost on ignition, indicating that it displayed a fairly high organic content.

In addition to being one of the smallest of the study lakes (ponds), Lake I was also one of the highest in elevation (444 m AMSL).

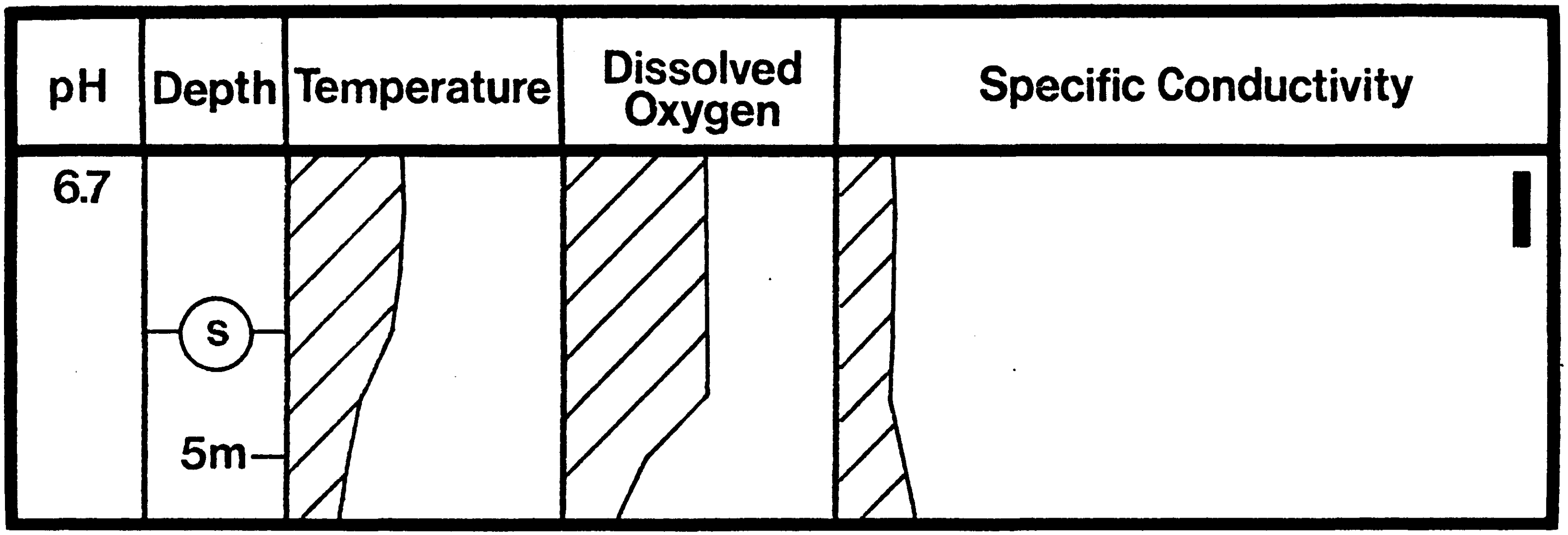
Species richness, pH, alkalinity, and calcium were all intermediate for Lake I, which was a first-order lake located above Lake J in the same watershed. One end of the lake had been recently logged (see photo). This may have contributed to its low hypolimnetic dissolved oxygen.

DETAILS OF LAKE WATER CHEMISTRY

I - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		14.0	100	30
1		14.2	100	30
2		13.8	100	30
3	3.1	12.6	100	29
4		9.6	100	29
5		7.8	60	35
6		6.4	38	42

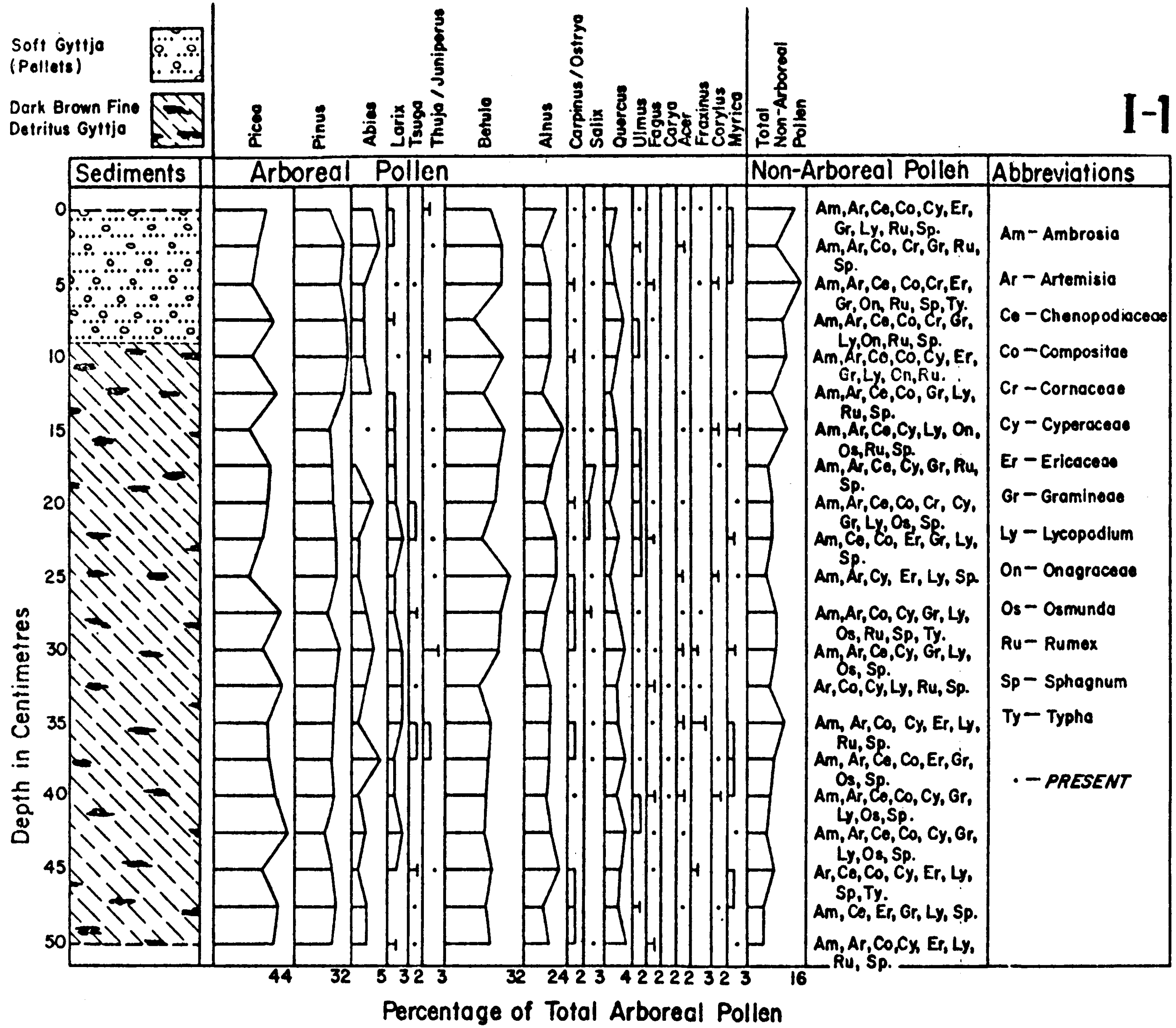
*Specific conductivity data are temperature-corrected (25° C).



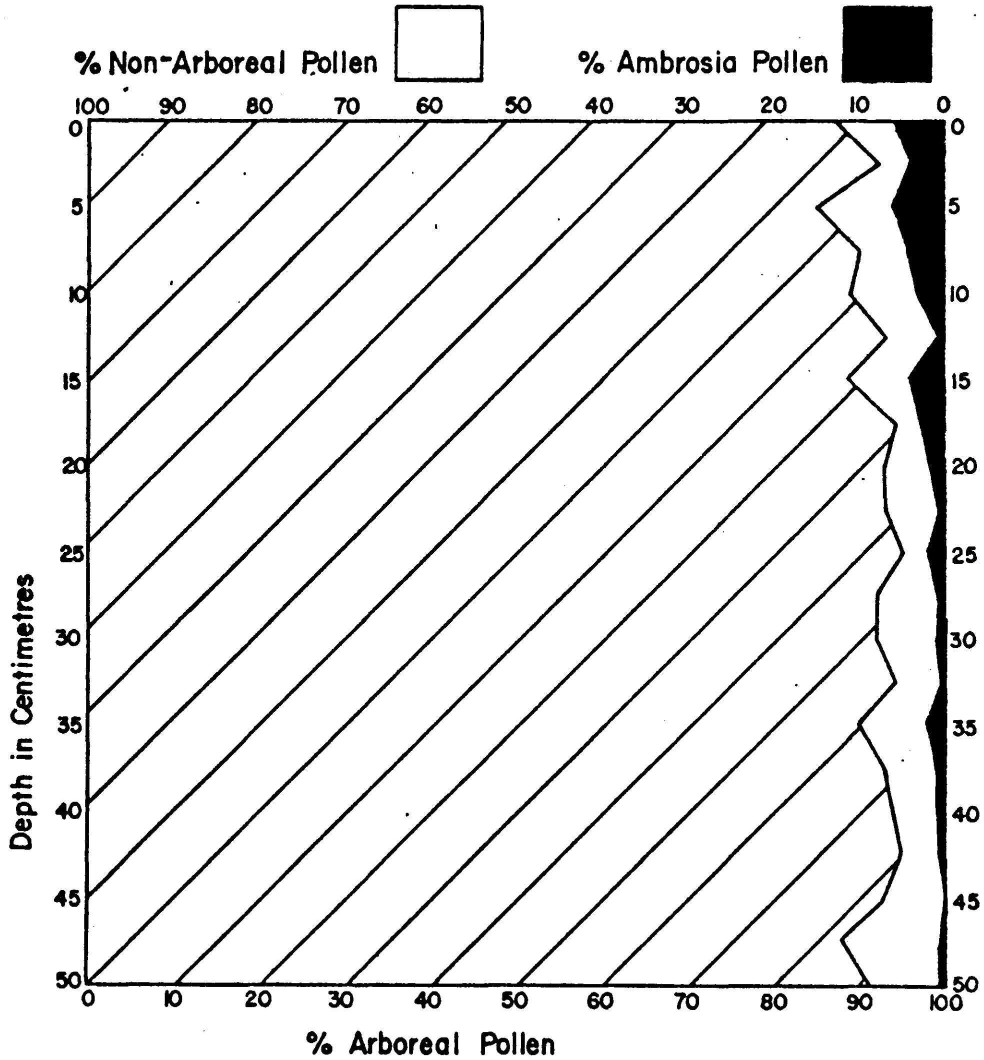
LAKE WATER CHEMISTRY PLOT

I - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE



The pollen diagram reflects regional forest composition, with minor influx of southern pollen. The Ambrosia rise is rathern indistinct in the top 20 cm of the gyttja, suggesting some mixing of lake bottom sediment.



AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

I - 10

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
I - 1 - 1	******	******	*****	******	******	******	******	******	*****	****
I - 1 - 2	20400.	11720.	122.	2640.	1610.	1441.	7529.	1443.	592.	24.
I - 1 - 3	21510.	13280.	120.	2520.	1430.	1458.	7415.	1331.	625.	26.
I - 1 - 4	21110.	11800.	124.	2350.	1530.	1420.	7137.	1305.	595.	26.
I - 1 - 5	20450.	11340.	127.	2030.	1300.	1316.	6871.	1333.	572.	25.
I - 1 - 6	21420.	9425.	134.	2000.	1970.	1296.	6656.	1355.	550.	26.
I - 1 - 7	20910.	7770.	126.	1710.	1440.	1165.	5898.	1481.	521.	23.
I - 1 - 8	20970.	8225.	125.	1750.	1490.	1152.	5762.	1479.	518.	23.
I - 1 - 9	20760.	7876.	119.	1670.	1620.	1094.	5152.	1411.	509.	23.
I - 1 - 10	22170.	7967.	126.	1660.	1510.	1146.	5389.	1458.	534.	23.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
I - 2 - 1	18420.	12520.	164.	2520.	1220.	1469.	6760.	1513.	537.	23.
I - 2 - 2	21890.	14760.	167.	2530.	1320.	1553.	7731.	1303.	684.	27.
I - 2 - 3	20700.	12420.	160.	2070.	1190.	1398.	7555.	1169.	589.	26.
I - 2 - 4	19820.	10870.	165.	1940.	1310.	1354.	7474.	1227.	572.	25.
I - 2 - 5	14830.	8725.	148.	1530.	930.	1176.	6476.	1274.	494.	21.
I - 2 - 6	18610.	8073.	141.	1420.	1110.	1213.	6259.	1319.	487.	21.
I - 2 - 7	19130.	7741.	140.	1440.	1090.	1238.	5979.	1330.	496.	22.
I - 2 - 8	20030.	7897.	148.	1550.	1160.	1325.	6234.	1339.	539.	23.
I - 2 - 9	20310.	8224.	157.	1720.	1240.	1450.	6542.	1356.	607.	26.
I - 2 - 10	18240.	8627.	162.	1870.	1330.	1544.	6542.	1337.	636.	27.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
I - 1 - 11	23120.	8126.	131.	1750.	1550.	1186.	5604.	1471.	557.	24.
I - 1 - 12	24060.	8202.	133.	1950.	2110.	1210.	5626.	1409.	577.	27.
I - 1 - 13	24060.	8270.	134.	1830.	1780.	1223.	5638.	1353.	587.	27.
I - 1 - 14	24120.	8505.	141.	1970.	1910.	1293.	5994.	1340.	599.	29.
I - 1 - 15	24910.	8771.	148.	2200.	2190.	1373.	6214.	1350.	626.	31.
I - 1 - 16	25170.	9090.	149.	2210.	2080.	1399.	6180.	1329.	629.	31.
I - 1 - 17	24130.	8725.	141.	1970.	1700.	1302.	5785.	1282.	597.	29.
I - 1 - 18	24600.	9166.	146.	1910.	1400.	1319.	5909.	1312.	619.	29.
I - 1 - 19	24630.	8642.	143.	2220.	2400.	1323.	5869.	1269.	601.	32.
I - 1 - 20	24600.	8748.	148.	2110.	2000.	1344.	6011.	1268.	602.	30.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
I - 1 - 1	16.67	0.42	****	I - 2 - 1	*****	*****	48.6	I - 1 - 11	16.18	1.24	47.5
I - 1 - 2	26.50	0.97	****	I - 2 - 2	*****	*****	45.2	I - 1 - 12	25.66	2.01	43.0
I - 1 - 3	25.16	1.57	47.4	I - 2 - 3	*****	*****	45.0	I - 1 - 13	24.94	1.93	44.0
I - 1 - 4	25.40	1.43	46.3	I - 2 - 4	*****	*****	44.8	I - 1 - 14	23.03	1.94	45.0
I - 1 - 5	25.74	1.49	46.4	I - 2 - 5	*****	*****	45.2	I - 1 - 15	27.02	2.48	45.5
I - 1 - 6	31.12	1.66	46.8	I - 2 - 6	*****	*****	42.2	I - 1 - 16	27.08	2.30	44.6
I - 1 - 7	22.29	1.27	42.0	I - 2 - 7	*****	*****	38.8	I - 1 - 17	23.64	2.33	44.9
I - 1 - 8	21.85	1.43	44.2	I - 2 - 8	*****	*****	39.4	I - 1 - 18	17.22	1.46	41.5
I - 1 - 9	24.13	1.91	45.2	I - 2 - 9	*****	*****	41.2	I - 1 - 19	24.59	2.55	44.7
I - 1 - 10	25.16	1.78	43.0	I - 2 - 10	*****	*****	42.8	I - 1 - 20	26.43	2.51	44.2

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

I - 11

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

I - 12

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
I - 1 - 1	5.7	*****	*****	*****	194.	****	****	******	****	****	*****	****
I - 1 - 2	8.5	11.3	22.0	36.8	301.	18.	100.	44.2	12.	0.5	26.4	107.
I - 1 - 3	7.2	14.5	21.9	40.3	256.	15.	85.	44.2	14.	1.5	29.2	99.
I - 1 - 4	5.6	11.2	21.5	38.5	273.	23.	65.	42.1	14.	1.5	28.6	88.
I - 1 - 5	5.6	13.2	21.2	36.9	228.	16.	50.	39.9	15.	1.5	27.0	78.
I - 1 - 6	3.3	*****	19.2	42.7	487.	11.	40.	40.5	12.	1.0	24.4	65.
I - 1 - 7	2.7	*****	18.2	40.3	306.	10.	30.	37.1	12.	1.0	22.5	55.
I - 1 - 8	1.9	*****	19.0	40.2	267.	14.	35.	36.1	13.	2.5	22.8	57.
I - 1 - 9	1.7	*****	16.8	39.0	296.	10.	20.	33.8	11.	2.5	23.3	47.
I - 1 - 10	1.4	*****	20.2	39.2	318.	9.	15.	34.1	13.	2.0	28.2	51.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
I - 2 - 1	****	*****	22.5	33.5	*****	14.	90.	38.0	12.	1.0	28.3	96.
I - 2 - 2	****	7.0	12.6	42.8	*****	15.	65.	42.9	10.	1.0	31.5	110.
I - 2 - 3	****	*****	13.6	40.0	*****	15.	45.	40.1	16.	1.0	28.5	82.
I - 2 - 4	****	5.2	24.2	38.1	*****	14.	35.	38.9	17.	1.5	28.3	69.
I - 2 - 5	****	*****	21.6	34.2	*****	13.	25.	29.6	13.	1.5	25.4	50.
I - 2 - 6	****	*****	19.1	33.9	*****	13.	15.	32.2	16.	2.0	23.7	49.
I - 2 - 7	****	*****	20.6	37.4	*****	13.	10.	31.4	15.	1.5	27.7	51.
I - 2 - 8	****	5.1	22.4	39.7	*****	15.	****	32.7	18.	1.5	29.6	44.
I - 2 - 9	****	*****	26.3	40.8	*****	15.	****	34.3	19.	2.0	32.7	49.
I - 2 - 10	****	*****	27.0	38.8	*****	17.	****	32.7	20.	1.5	33.1	52.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
I - 1 - 11	1.4	5.0	20.8	39.1	211.	10.	10.	35.1	14.	1.5	30.4	50.
I - 1 - 12	1.2	*****	20.7	39.5	262.	12.	10.	36.2	13.	1.5	30.0	48.
I - 1 - 13	1.1	*****	23.3	39.7	239.	13.	5.	35.6	14.	2.0	30.4	50.
I - 1 - 14	1.2	8.3	22.9	37.4	239.	11.	5.	35.1	17.	1.5	31.8	48.
I - 1 - 15	0.9	10.9	23.4	38.2	159.	13.	10.	36.0	18.	2.5	32.5	55.
I - 1 - 16	1.1	11.7	24.4	38.7	101.	14.	5.	36.4	19.	2.0	32.9	61.
I - 1 - 17	1.0	10.1	23.5	37.8	101.	17.	5.	34.5	17.	2.0	29.7	56.
I - 1 - 18	1.0	9.9	25.2	39.0	101.	23.	****	34.7	18.	2.0	29.1	54.
I - 1 - 19	0.8	10.1	23.6	41.6	90.	17.	****	34.6	18.	2.0	28.2	56.
I - 1 - 20	0.9	11.8	24.4	42.1	117.	16.	****	33.8	19.	1.5	30.7	57.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
I - 1 - 1	16.67	0.42	****	I - 2 - 1	*****	*****	48.6	I - 1 - 11	16.18	1.24	47.5
I - 1 - 2	26.50	0.97	****	I - 2 - 2	*****	*****	45.2	I - 1 - 12	25.66	2.01	43.0
I - 1 - 3	25.16	1.57	47.4	I - 2 - 3	*****	*****	45.0	I - 1 - 13	24.94	1.93	44.0
I - 1 - 4	25.40	1.43	46.3	I - 2 - 4	*****	*****	44.8	I - 1 - 14	23.03	1.94	45.0
I - 1 - 5	25.74	1.49	46.4	I - 2 - 5	*****	*****	45.2	I - 1 - 15	27.02	2.48	45.5
I - 1 - 6	31.12	1.66	46.8	I - 2 - 6	*****	*****	42.2	I - 1 - 16	27.08	2.30	44.6
I - 1 - 7	22.29	1.27	42.0	I - 2 - 7	*****	*****	38.8	I - 1 - 17	23.64	2.33	44.9
I - 1 - 8	21.85	1.43	44.2	I - 2 - 8	*****	*****	39.4	I - 1 - 18	17.22	1.46	41.5
I - 1 - 9	24.13	1.91	45.2	I - 2 - 9	*****	*****	41.2	I - 1 - 19	24.59	2.55	44.7
I - 1 - 10	25.16	1.78	43.0	I - 2 - 10	*****	*****	42.8	I - 1 - 20	26.43	2.51	44.2

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
I - 1 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
I - 1 - 2	0.2440	0.1884	0.1149	0.1435	0.0709	0.0521	0.1616	1.2884	0.0936	0.1494
I - 1 - 3	0.2573	0.2135	0.1131	0.1370	0.0630	0.0527	0.1591	1.1884	0.0989	0.1630
I - 1 - 4	0.2525	0.1897	0.1165	0.1277	0.0674	0.0514	0.1532	1.1652	0.0942	0.1593
I - 1 - 5	0.2446	0.1823	0.1200	0.1103	0.0573	0.0476	0.1474	1.1902	0.0906	0.1537
I - 1 - 6	0.2562	0.1515	0.1259	0.1087	0.0868	0.0469	0.1428	1.2098	0.0869	0.1599
I - 1 - 7	0.2501	0.1249	0.1192	0.0929	0.0634	0.0421	0.1266	1.3223	0.0824	0.1444
I - 1 - 8	0.2508	0.1322	0.1178	0.0951	0.0656	0.0417	0.1236	1.3205	0.0819	0.1420
I - 1 - 9	0.2483	0.1266	0.1125	0.0908	0.0714	0.0396	0.1106	1.2598	0.0806	0.1426
I - 1 - 10	0.2652	0.1281	0.1185	0.0902	0.0665	0.0415	0.1156	1.3018	0.0845	0.1432

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
I - 2 - 1	0.2203	0.2013	0.1547	0.1370	0.0537	0.0531	0.1451	1.3509	0.0850	0.1426
I - 2 - 2	0.2618	0.2373	0.1575	0.1375	0.0581	0.0562	0.1659	1.1634	0.1083	0.1660
I - 2 - 3	0.2476	0.1997	0.1510	0.1125	0.0524	0.0506	0.1621	1.0437	0.0932	0.1574
I - 2 - 4	0.2371	0.1748	0.1560	0.1054	0.0577	0.0490	0.1604	1.0955	0.0906	0.1519
I - 2 - 5	0.1774	0.1403	0.1400	0.0832	0.0410	0.0425	0.1390	1.1375	0.0781	0.1302
I - 2 - 6	0.2226	0.1298	0.1328	0.0772	0.0489	0.0439	0.1343	1.1777	0.0770	0.1296
I - 2 - 7	0.2288	0.1245	0.1325	0.0783	0.0480	0.0448	0.1283	1.1875	0.0784	0.1364
I - 2 - 8	0.2396	0.1270	0.1396	0.0842	0.0511	0.0479	0.1338	1.1955	0.0853	0.1401
I - 2 - 9	0.2429	0.1322	0.1485	0.0935	0.0546	0.0525	0.1404	1.2107	0.0960	0.1574
I - 2 - 10	0.2182	0.1387	0.1532	0.1016	0.0586	0.0559	0.1404	1.1937	0.1007	0.1685

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
I - 1 - 11	0.2766	0.1306	0.1239	0.0951	0.0683	0.0429	0.1203	1.3134	0.0881	0.1494
I - 1 - 12	0.2878	0.1319	0.1255	0.1060	0.0930	0.0438	0.1207	1.2580	0.0913	0.1667
I - 1 - 13	0.2878	0.1330	0.1265	0.0995	0.0784	0.0442	0.1210	1.2080	0.0929	0.1673
I - 1 - 14	0.2885	0.1367	0.1334	0.1071	0.0841	0.0468	0.1286	1.1964	0.0948	0.1765
I - 1 - 15	0.2980	0.1410	0.1393	0.1196	0.0965	0.0497	0.1333	1.2054	0.0990	0.1914
I - 1 - 16	0.3011	0.1461	0.1402	0.1201	0.0916	0.0506	0.1326	1.1866	0.0995	0.1907
I - 1 - 17	0.2886	0.1403	0.1327	0.1071	0.0749	0.0471	0.1241	1.1446	0.0944	0.1790
I - 1 - 18	0.2943	0.1474	0.1380	0.1038	0.0617	0.0477	0.1268	1.1714	0.0979	0.1809
I - 1 - 19	0.2946	0.1389	0.1351	0.1207	0.1057	0.0479	0.1259	1.1330	0.0951	0.1981
I - 1 - 20	0.2943	0.1406	0.1393	0.1147	0.0881	0.0486	0.1290	1.1321	0.0952	0.1877

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
I - 1 - 1	16.67	0.42	****	I - 2 - 1	*****	*****	48.6	I - 1 - 11	16.18	1.24	47.5
I - 1 - 2	26.50	0.97	****	I - 2 - 2	*****	*****	45.2	I - 1 - 12	25.66	2.01	43.0
I - 1 - 3	25.16	1.57	47.4	I - 2 - 3	*****	*****	45.0	I - 1 - 13	24.94	1.93	44.0
I - 1 - 4	25.40	1.43	46.3	I - 2 - 4	*****	*****	44.8	I - 1 - 14	23.03	1.94	45.0
I - 1 - 5	25.74	1.49	46.4	I - 2 - 5	*****	*****	45.2	I - 1 - 15	27.02	2.48	45.5
I - 1 - 6	31.12	1.66	46.8	I - 2 - 6	*****	*****	42.2	I - 1 - 16	27.08	2.30	44.6
I - 1 - 7	22.29	1.27	42.0	I - 2 - 7	*****	*****	38.8	I - 1 - 17	23.64	2.33	44.9
I - 1 - 8	21.85	1.43	44.2	I - 2 - 8	*****	*****	39.4	I - 1 - 18	17.22	1.46	41.5
I - 1 - 9	24.13	1.91	45.2	I - 2 - 9	*****	*****	41.2	I - 1 - 19	24.59	2.55	44.7
I - 1 - 10	25.16	1.78	43.0	I - 2 - 10	*****	*****	42.8	I - 1 - 20	26.43	2.51	44.2

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

I - 15

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
I - 1 - 1	3.167	*******	*******	*******	2.2558	******	******	********	******	******	*******	*******
I - 1 - 2	4.722	0.3897	0.1804	0.5418	3.5000	0.185	7.692	0.1150	1.519	0.217	0.1943	1.4132
I - 1 - 3	4.000	0.5000	0.1794	0.5921	2.9767	0.151	6.538	0.1152	1.667	0.652	0.2149	1.2961
I - 1 - 4	3.111	0.3862	0.1762	0.5660	3.1744	0.229	5.000	0.1095	1.716	0.652	0.2107	1.1632
I - 1 - 5	3.111	0.4552	0.1741	0.5426	2.6512	0.157	3.846	0.1039	1.815	0.652	0.1985	1.0303
I - 1 - 6	1.833	*******	0.1570	0.6282	5.6628	0.111	3.077	0.1055	1.531	0.435	0.1792	0.8566
I - 1 - 7	1.500	*******	0.1489	0.5922	3.5581	0.105	2.308	0.0965	1.444	0.435	0.1656	0.7250
I - 1 - 8	1.056	*******	0.1554	0.5913	3.1047	0.140	2.692	0.0940	1.556	1.087	0.1674	0.7487
I - 1 - 9	0.944	*******	0.1377	0.5735	3.4419	0.101	1.538	0.0881	1.407	1.087	0.1715	0.6158
I - 1 - 10	0.778	*******	0.1652	0.5769	3.6977	0.090	1.154	0.0888	1.568	0.870	0.2075	0.6671

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
I - 2 - 1	******	*******	0.1847	0.4926	*******	0.136	6.923	0.0990	1.444	0.435	0.2079	1.2645
I - 2 - 2	******	0.2414	0.1029	0.6287	*******	0.153	5.000	0.1116	1.198	0.435	0.2316	1.4421
I - 2 - 3	******	*******	0.1114	0.5876	*******	0.146	3.462	0.1045	1.963	0.435	0.2093	1.0842
I - 2 - 4	******	0.1793	0.1983	0.5604	*******	0.138	2.692	0.1013	2.037	0.652	0.2077	0.9026
I - 2 - 5	******	*******	0.1771	0.5029	*******	0.132	1.923	0.0771	1.605	0.652	0.1865	0.6605
I - 2 - 6	******	*******	0.1566	0.4987	*******	0.134	1.154	0.0840	1.938	0.870	0.1746	0.6395
I - 2 - 7	******	*******	0.1690	0.5496	*******	0.127	0.769	0.0818	1.889	0.652	0.2038	0.6724
I - 2 - 8	******	0.1759	0.1832	0.5840	*******	0.146	******	0.0852	2.222	0.652	0.2176	0.5737
I - 2 - 9	******	*******	0.2156	0.6004	*******	0.154	******	0.0894	2.383	0.870	0.2407	0.6487
I - 2 - 10	******	*******	0.2214	0.5709	*******	0.169	******	0.0852	2.432	0.652	0.2437	0.6895

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
I - 1 - 11	0.778	0.1724	0.1706	0.5751	2.4535	0.100	0.769	0.0915	1.691	0.652	0.2235	0.6579
I - 1 - 12	0.667	*******	0.1698	0.5806	3.0465	0.122	0.769	0.0942	1.654	0.652	0.2207	0.6250
I - 1 - 13	0.611	*******	0.1907	0.5841	2.7791	0.129	0.385	0.0928	1.765	0.870	0.2235	0.6618
I - 1 - 14	0.667	0.2862	0.1880	0.5499	2.7791	0.113	0.385	0.0913	2.062	0.652	0.2336	0.6303
I - 1 - 15	0.500	0.3759	0.1920	0.5624	1.8488	0.131	0.769	0.0937	2.185	1.087	0.2393	0.7263
I - 1 - 16	0.611	0.4034	0.1996	0.5694	1.1744	0.137	0.385	0.0947	2.296	0.870	0.2420	0.7987
I - 1 - 17	0.556	0.3483	0.1929	0.5553	1.1744	0.171	0.385	0.0899	2.136	0.870	0.2185	0.7408
I - 1 - 18	0.556	0.3414	0.2065	0.5732	1.1744	0.236	******	0.0904	2.235	0.870	0.2136	0.7145
I - 1 - 19	0.444	0.3483	0.1936	0.6119	1.0465	0.171	******	0.0901	2.185	0.870	0.2071	0.7395
I - 1 - 20	0.500	0.4069	0.1997	0.6190	1.3605	0.164	******	0.0879	2.309	0.652	0.2260	0.7461

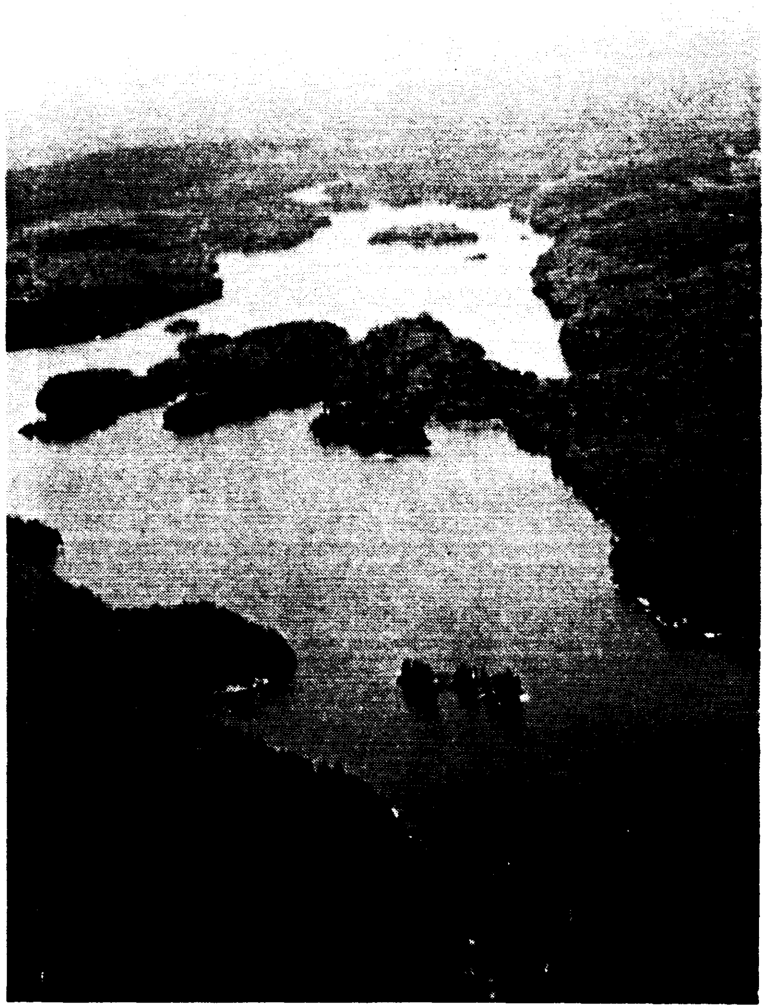
SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
I - 1 - 1	16.67	0.42	****	I - 2 - 1	*****	*****	48.6	I - 1 - 11	16.18	1.24	47.5
I - 1 - 2	26.50	0.97	****	I - 2 - 2	*****	*****	45.2	I - 1 - 12	25.66	2.01	43.0
I - 1 - 3	25.16	1.57	47.4	I - 2 - 3	*****	*****	45.0	I - 1 - 13	24.94	1.93	44.0
I - 1 - 4	25.40	1.43	46.3	I - 2 - 4	*****	*****	44.8	I - 1 - 14	23.03	1.94	45.0
I - 1 - 5	25.74	1.49	46.4	I - 2 - 5	*****	*****	45.2	I - 1 - 15	27.02	2.48	45.5
I - 1 - 6	31.12	1.66	46.8	I - 2 - 6	*****	*****	42.2	I - 1 - 16	27.08	2.30	44.6
I - 1 - 7	22.29	1.27	42.0	I - 2 - 7	*****	*****	38.8	I - 1 - 17	23.64	2.33	44.9
I - 1 - 8	21.85	1.43	44.2	I - 2 - 8	*****	*****	39.4	I - 1 - 18	17.22	1.46	41.5
I - 1 - 9	24.13	1.91	45.2	I - 2 - 9	*****	*****	41.2	I - 1 - 19	24.59	2.55	44.7
I - 1 - 10	25.16	1.78	43.0	I - 2 - 10	*****	*****	42.8	I - 1 - 20	26.43	2.51	44.2

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

I - 17

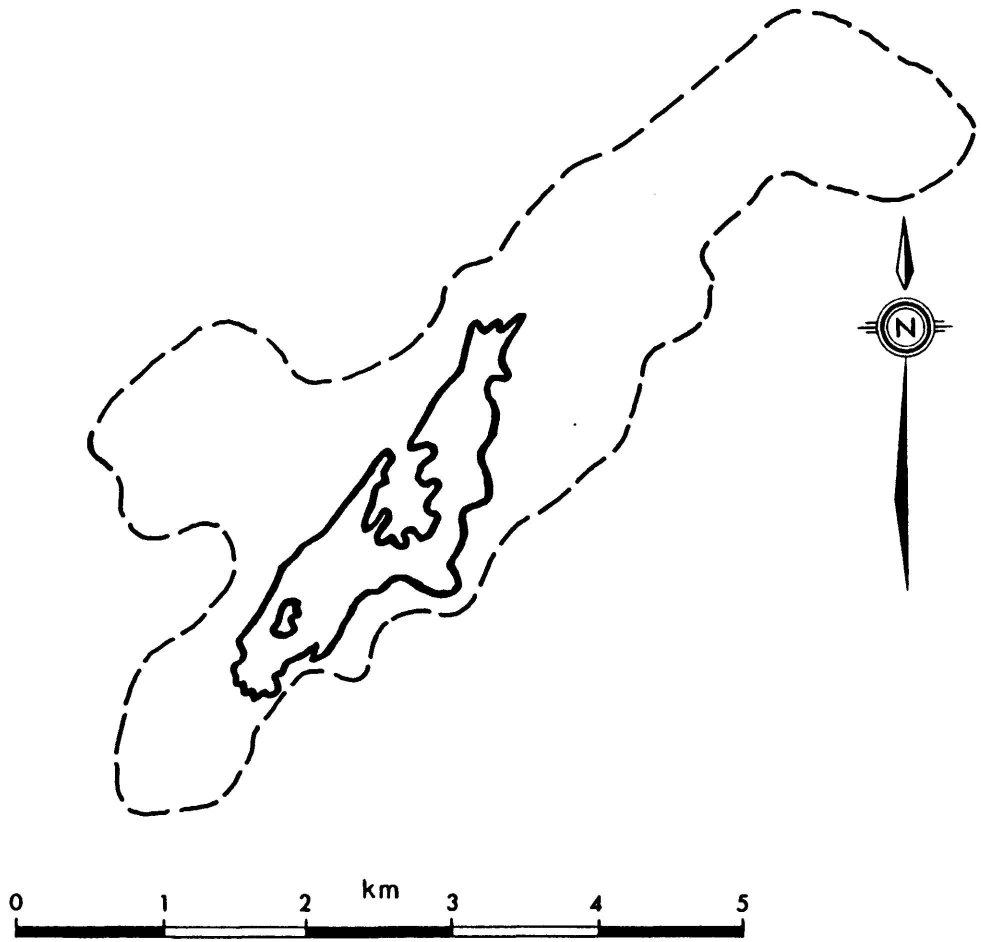
Lake J

pH 6·7



GENERAL DESCRIPTION

Lake J is a fairly large rock basin with several islands and a complex shoreline configuration and morphometry. Surficial deposits are not evident along the shore and they are discontinuous in the watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-668534/5469837
Elevation of lake above sea level	442.5 m (1475 ft)
Lake depth at sampling point	6.0 m
Lake area	1.25 sq km
Lake catchment area	10 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	5
Distance from south end of sampling strip	57 km

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY
	Holopedium gibberum		0.5
	Bosmina longirostris		3.9
		Total	4.4

COPEPODS	SPECIES NAME		DENSITY
	Copepodites		3.3
	Cyclops bicuspidatus		1.1
	Diaptomus minutus		2.3
	Diaptomus copepodite		1.7
		Total	8.4

ROTIFERS	SPECIES NAME		DENSITY
	Conochilus sp.		2.0
	Asplanchna preodonta		0.1
	Kellicotia longispina		2.7
	Polyarthra vulgaris		1.7
		Total	6.5

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Anabaena circinalis		5
	Aphanocapsa grevillei		3
		(Average)	(5)

CHLOROPHYTA	SPECIES NAME		ABUNDANCE
	Gloeocystis gigas		3
	Volvox sp.		3
		(Average)	(3)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Cyclotella stelligera	107	4	19.5
Navicula notha	5	4	.91
Tabellaria fenestrata	64	4	11.7
Melosira distans	11	3	2.0
Navicula subtilissima	4	3	.73
Cyclotella glomerata	68	4	12.4
Pinnularia biceps	8	4	1.5
Navicula bicephala	38	4	6.9
Cyclotella bodanica	9	4	22.5
Navicula angusta	22	**	4.0
Tetracyclus lacustris	17	3	3.1
Cyclotella comta	39	2	7.1
Cymbella minuta var silesica	8	4	1.5
Tabellaria flocculosa	38	3	6.9
Navicula laevissima	8	4	1.5
Navicula radiosa var parva	12	4	2.2
Navicula virdula var rostallata	2	2	.36
Pinnularia hilseana	14	4	2.6
Eunotia elegans	3	4	.55
Navicula cryptocephala var veneta	4	2	.73
Eunotia praerupta	1	4	.18
Navicula mutica var cohnii	1	4	.18
Navicula radiosa	9	4	1.6
Fragilaria construens	3	2	.55
Eunotia hexaglypis	2		.36
Synedra tenera	2		.36
Navicula falaisensis var lanceola	1	4	.18
Navicula salinarum var intermedia	1	4	.18
Achnanthes sp	5		.91
Anomoconeis serians	13	5	2.4
Navicula subhamulata	6	4	1.1
Cymbella microcephala	1	4	.18
Anomoeoneis follis	3	5	.55
Frustulia rhomboides var capitata	1	3	.18
Eunotia curvata	1	3	.18
Eunotia incisa	1	4	.18
Pinnularia maior	1	4	.18
Nitzschia palea	1	4	.18
Melosira distans	1	3	.18
Gomphonema acuminatum	1	2	.18
Frustulia rhomboides var saxonica	1	3	.18

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake J was one of five lakes which failed to stratify thermally. For that reason, dissolved oxygen, specific conductivity, and water chemistry were all relatively unchanged from top to bottom. Possibly as a result of this lack of diversity (i.e., high homogeneity) in the water column, the planktonic species richness (16 common species) was among the lowest of the study lakes. Only Lake D (13 spp) was lower in diversity, and this may have been due to the low oxygen content of its hypolimnion.

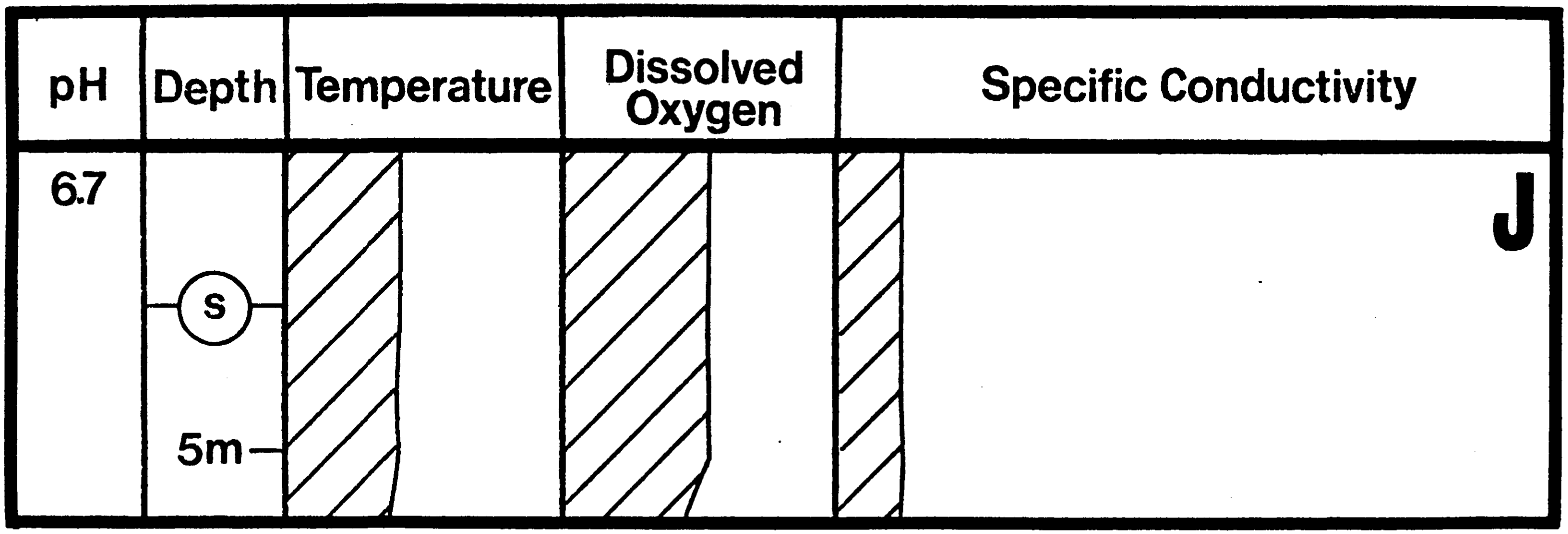
The littoral zone of this long, narrow lake was minimal. Pockets of muskeg were common along its perimeter; otherwise the habitat diversity, like the species diversity, was quite low.

DETAILS OF LAKE WATER CHEMISTRY

J - 6

Water Depth M	Secchi Depth M	Temperature ^{o}C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		14.6	100	34
1		14.6	100	34
2	2.6	14.5	100	34
3		14.5	100	33
4		14.4	100	34
5		14.3	100	34
6		13.6	80	35

*Specific conductivity data are temperature-corrected (25^{o} C).

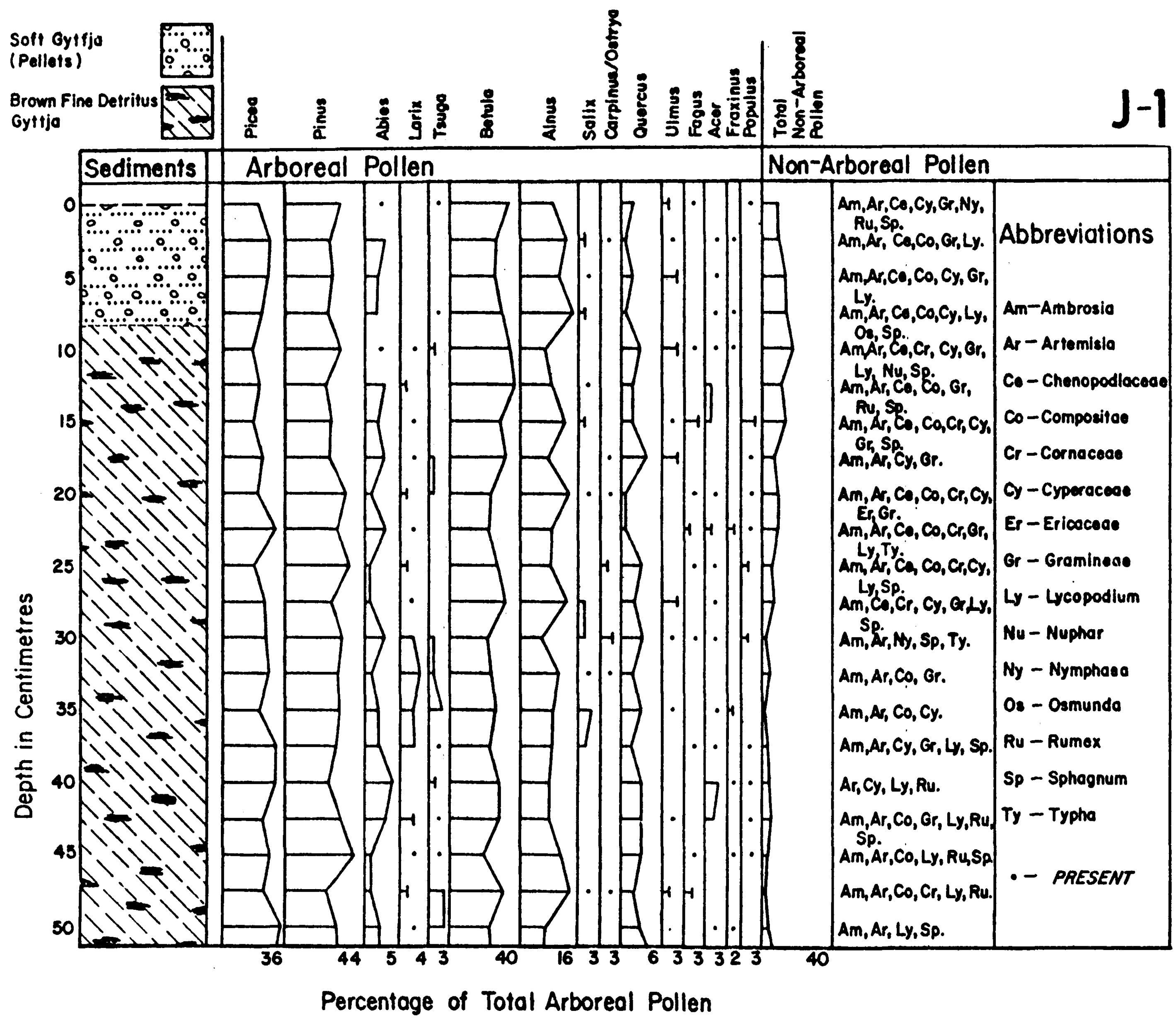


LAKE WATER CHEMISTRY PLOT

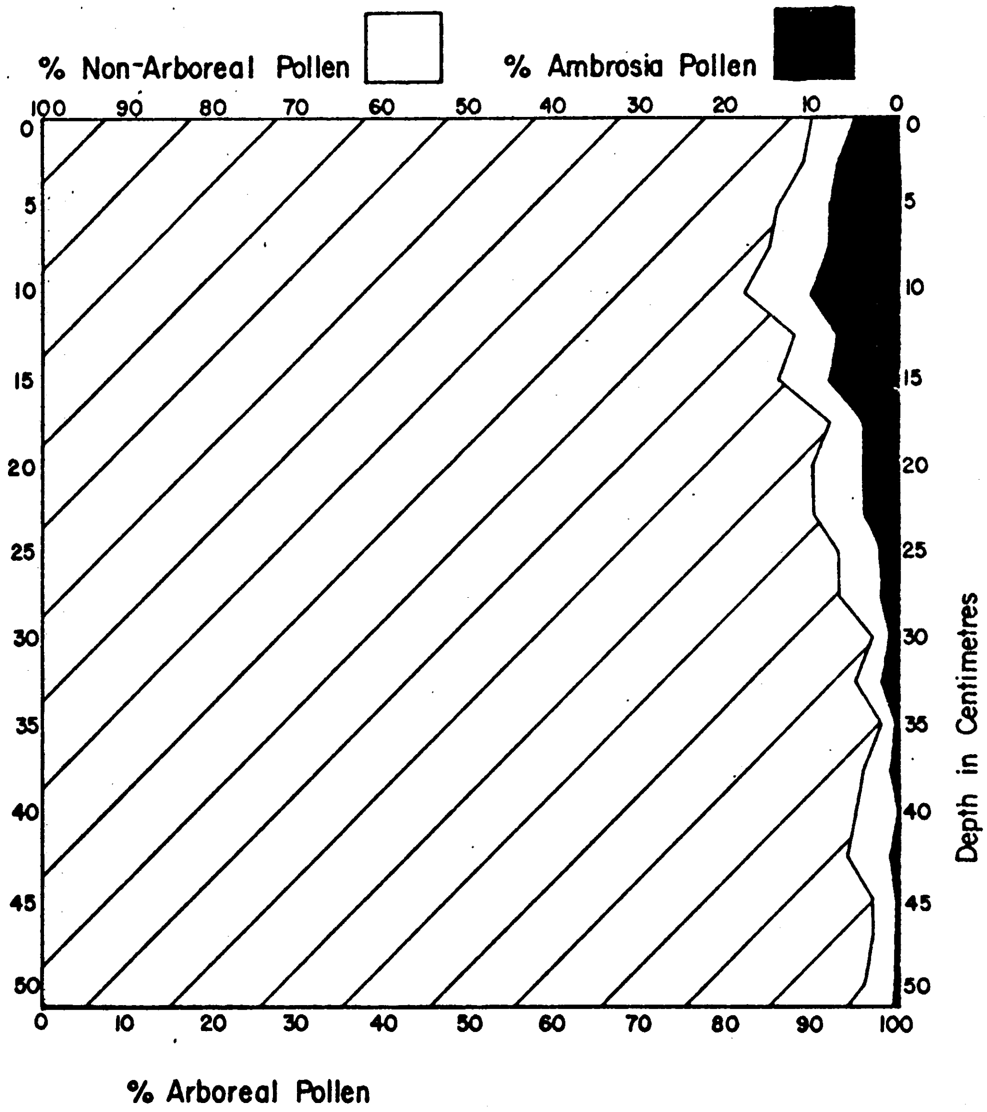
J - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE

J - 8



The pollen diagram reflects regional forest composition, with minor influx of southern pollen. There are no significant stratigraphic changes in the pollen percentages. The Ambrosia rise is quite indistinct, suggesting some mixing of bottom sediment.



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
J - 1 - 1	21040.	9525.	186.	4350.	4450.	1823.	7119.	730.	704.	32.
J - 1 - 2	28260.	11860.	151.	6020.	5540.	2268.	9256.	1065.	782.	51.
J - 1 - 3	29770.	11790.	147.	6110.	5390.	2357.	9491.	1160.	857.	50.
J - 1 - 4	29680.	13260.	152.	6310.	5570.	2380.	9438.	1154.	862.	55.
J - 1 - 5	29890.	12890.	147.	6310.	5960.	2429.	9364.	1133.	851.	52.
J - 1 - 6	29880.	14040.	147.	6110.	6150.	2398.	9358.	1072.	838.	50.
J - 1 - 7	27720.	13560.	154.	5310.	4650.	2121.	9369.	1051.	733.	44.
J - 1 - 8	28720.	12930.	158.	4980.	4640.	1954.	9208.	910.	699.	43.
J - 1 - 9	28950.	11910.	163.	4800.	4450.	1973.	9384.	980.	715.	47.
J - 1 - 10	28250.	11310.	164.	4860.	4450.	1938.	9278.	968.	721.	44.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
J - 2 - 1	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 2	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 3	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 4	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 5	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 6	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 7	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 8	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 9	******	******	*****	******	******	******	******	******	*****	****
J - 2 - 10	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
J - 1 - 11	27150.	10200.	147.	4580.	4490.	1818.	8971.	907.	656.	43.
J - 1 - 12	28350.	9987.	135.	4710.	4750.	1875.	9227.	953.	672.	44.
J - 1 - 13	28040.	9857.	131.	4490.	4530.	1924.	9378.	896.	632.	40.
J - 1 - 14	26390.	9128.	124.	4220.	4040.	1813.	9176.	843.	627.	41.
J - 1 - 15	28590.	10160.	127.	4500.	4260.	1872.	9277.	850.	661.	43.
J - 1 - 16	28720.	9450.	117.	4400.	4300.	1956.	9132.	900.	672.	50.
J - 1 - 17	28380.	9119.	114.	4720.	4770.	1927.	8914.	860.	665.	46.
J - 1 - 18	28080.	8574.	104.	4800.	5200.	1950.	8596.	796.	648.	44.
J - 1 - 19	28410.	9112.	112.	4950.	5070.	2122.	9449.	869.	679.	45.
J - 1 - 20	28700.	8945.	110.	5010.	5030.	2042.	9034.	827.	678.	44.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
J - 1 - 1	13.65	0.39	****	J - 2 - 1	*****	*****	****	J - 1 - 11	22.67	0.80	44.0
J - 1 - 2	16.00	0.95	38.0	J - 2 - 2	*****	*****	****	J - 1 - 12	24.74	0.90	58.0
J - 1 - 3	13.99	0.80	48.0	J - 2 - 3	*****	*****	****	J - 1 - 13	23.80	0.73	47.0
J - 1 - 4	19.91	1.29	50.3	J - 2 - 4	*****	*****	****	J - 1 - 14	26.59	1.94	53.0
J - 1 - 5	19.91	1.22	48.5	J - 2 - 5	*****	*****	****	J - 1 - 15	18.81	0.61	****
J - 1 - 6	20.76	0.93	46.0	J - 2 - 6	*****	*****	****	J - 1 - 16	21.12	0.73	40.0
J - 1 - 7	24.90	1.10	52.0	J - 2 - 7	*****	*****	****	J - 1 - 17	28.08	1.07	57.5
J - 1 - 8	15.15	0.78	53.0	J - 2 - 8	*****	*****	****	J - 1 - 18	25.82	2.28	48.0
J - 1 - 9	20.56	0.65	47.3	J - 2 - 9	*****	*****	****	J - 1 - 19	26.63	1.17	52.0
J - 1 - 10	25.66	1.05	49.0	J - 2 - 10	*****	*****	****	J - 1 - 20	22.30	0.86	47.0

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

J - 12

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
J - 1 - 1	****	*****	26.4	17.4	90.	10.	65.	82.2	****	6.0	16.7	103.
J - 1 - 2	3.5	5.3	29.7	18.2	106.	14.	70.	96.6	9.	8.0	20.1	109.
J - 1 - 3	4.7	*****	13.3	19.6	153.	17.	70.	100.8	13.	10.0	22.3	120.
J - 1 - 4	4.6	12.0	22.7	21.7	148.	18.	70.	98.6	11.	11.0	22.6	131.
J - 1 - 5	4.9	11.2	18.7	22.3	195.	16.	70.	97.6	12.	12.5	22.6	134.
J - 1 - 6	3.8	11.8	27.0	23.0	231.	19.	65.	95.8	12.	13.0	22.7	132.
J - 1 - 7	6.0	14.8	22.0	22.2	221.	17.	55.	87.4	13.	13.0	21.4	116.
J - 1 - 8	6.0	9.3	18.0	21.9	164.	15.	40.	87.1	12.	13.5	22.6	105.
J - 1 - 9	4.9	*****	11.3	24.0	174.	9.	10.	87.8	****	14.0	22.0	109.
J - 1 - 10	4.9	9.0	15.3	20.5	164.	15.	75.	84.0	11.	13.0	21.4	91.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
J - 2 - 1	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 2	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 3	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 4	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 5	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 6	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 7	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 8	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 9	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
J - 2 - 10	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
J - 1 - 11	3.8	9.4	17.9	19.2	169.	14.	25.	79.6	10.	12.5	19.8	75.
J - 1 - 12	3.3	*****	34.5	20.6	174.	24.	25.	81.3	11.	14.0	20.6	74.
J - 1 - 13	2.0	*****	20.3	20.6	148.	17.	20.	81.1	12.	14.0	20.1	72.
J - 1 - 14	2.3	13.2	8.7	18.6	127.	16.	10.	74.2	13.	13.5	19.9	66.
J - 1 - 15	2.9	*****	14.0	21.4	146.	7.	****	82.1	****	18.5	22.8	76.
J - 1 - 16	2.2	*****	*****	21.6	174.	8.	****	81.3	****	14.0	21.1	62.
J - 1 - 17	3.2	11.8	16.8	22.1	117.	16.	10.	78.3	14.	17.0	20.1	57.
J - 1 - 18	1.5	9.4	16.6	19.9	49.	16.	5.	77.8	13.	14.5	18.8	54.
J - 1 - 19	1.6	14.4	17.1	19.0	71.	18.	5.	80.3	15.	14.5	20.6	58.
J - 1 - 20	1.2	12.7	20.5	20.5	75.	16.	5.	80.8	13.	14.5	21.0	53.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
J - 1 - 1	13.65	0.39	****	J - 2 - 1	*****	*****	****	J - 1 - 11	22.67	0.80	44.0
J - 1 - 2	16.00	0.95	38.0	J - 2 - 2	*****	*****	****	J - 1 - 12	24.74	0.90	58.0
J - 1 - 3	13.99	0.80	48.0	J - 2 - 3	*****	*****	****	J - 1 - 13	23.80	0.73	47.0
J - 1 - 4	19.91	1.29	50.3	J - 2 - 4	*****	*****	****	J - 1 - 14	26.59	1.94	53.0
J - 1 - 5	19.91	1.22	48.5	J - 2 - 5	*****	*****	****	J - 1 - 15	18.81	0.61	****
J - 1 - 6	20.76	0.93	46.0	J - 2 - 6	*****	*****	****	J - 1 - 16	21.12	0.73	40.0
J - 1 - 7	24.90	1.10	52.0	J - 2 - 7	*****	*****	****	J - 1 - 17	28.08	1.07	57.5
J - 1 - 8	15.15	0.78	53.0	J - 2 - 8	*****	*****	****	J - 1 - 18	25.82	2.28	48.0
J - 1 - 9	20.56	0.65	47.3	J - 2 - 9	*****	*****	****	J - 1 - 19	26.63	1.17	52.0
J - 1 - 10	25.66	1.05	49.0	J - 2 - 10	*****	*****	****	J - 1 - 20	22.30	0.86	47.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

J - 14

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
J - 1 - 1	0.2517	0.1531	0.1757	0.2364	0.1960	0.0660	0.1528	0.6518	0.1113	0.1975
J - 1 - 2	0.3380	0.1907	0.1428	0.3272	0.2441	0.0821	0.1986	0.9509	0.1238	0.3117
J - 1 - 3	0.3561	0.1895	0.1385	0.3321	0.2374	0.0853	0.2037	1.0357	0.1356	0.3080
J - 1 - 4	0.3550	0.2132	0.1437	0.3429	0.2454	0.0861	0.2025	1.0304	0.1364	0.3407
J - 1 - 5	0.3575	0.2072	0.1385	0.3429	0.2626	0.0879	0.2009	1.0116	0.1347	0.3222
J - 1 - 6	0.3574	0.2257	0.1391	0.3321	0.2709	0.0868	0.2008	0.9571	0.1325	0.3080
J - 1 - 7	0.3316	0.2180	0.1452	0.2886	0.2048	0.0767	0.2011	0.9384	0.1160	0.2722
J - 1 - 8	0.3435	0.2079	0.1486	0.2707	0.2044	0.0707	0.1976	0.8125	0.1105	0.2648
J - 1 - 9	0.3463	0.1915	0.1541	0.2609	0.1960	0.0714	0.2014	0.8750	0.1132	0.2901
J - 1 - 10	0.3379	0.1818	0.1543	0.2641	0.1960	0.0701	0.1991	0.8643	0.1141	0.2685

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
J - 2 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 3	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 6	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 7	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 8	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 9	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
J - 2 - 10	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
J - 1 - 11	0.3248	0.1640	0.1389	0.2489	0.1978	0.0658	0.1925	0.8098	0.1037	0.2642
J - 1 - 12	0.3391	0.1606	0.1270	0.2560	0.2093	0.0678	0.1980	0.8509	0.1064	0.2691
J - 1 - 13	0.3354	0.1585	0.1234	0.2440	0.1996	0.0696	0.2012	0.8000	0.1000	0.2444
J - 1 - 14	0.3157	0.1468	0.1170	0.2293	0.1780	0.0656	0.1969	0.7527	0.0992	0.2525
J - 1 - 15	0.3420	0.1633	0.1194	0.2446	0.1877	0.0677	0.1991	0.7589	0.1046	0.2654
J - 1 - 16	0.3435	0.1519	0.1101	0.2391	0.1894	0.0708	0.1960	0.8036	0.1063	0.3086
J - 1 - 17	0.3395	0.1466	0.1075	0.2565	0.2101	0.0697	0.1913	0.7679	0.1052	0.2815
J - 1 - 18	0.3359	0.1378	0.0976	0.2609	0.2291	0.0705	0.1845	0.7107	0.1025	0.2710
J - 1 - 19	0.3398	0.1465	0.1054	0.2690	0.2233	0.0768	0.2028	0.7759	0.1074	0.2778
J - 1 - 20	0.3433	0.1438	0.1034	0.2723	0.2216	0.0739	0.1939	0.7384	0.1073	0.2728

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
J - 1 - 1	13.65	0.39	****	J - 2 - 1	*****	*****	****	J - 1 - 11	22.67	0.80	44.0
J - 1 - 2	16.00	0.95	38.0	J - 2 - 2	*****	*****	****	J - 1 - 12	24.74	0.90	58.0
J - 1 - 3	13.99	0.80	48.0	J - 2 - 3	*****	*****	****	J - 1 - 13	23.80	0.73	47.0
J - 1 - 4	19.91	1.29	50.3	J - 2 - 4	*****	*****	****	J - 1 - 14	26.59	1.94	53.0
J - 1 - 5	19.91	1.22	48.5	J - 2 - 5	*****	*****	****	J - 1 - 15	18.81	0.61	****
J - 1 - 6	20.76	0.93	46.0	J - 2 - 6	*****	*****	****	J - 1 - 16	21.12	0.73	40.0
J - 1 - 7	24.90	1.10	52.0	J - 2 - 7	*****	*****	****	J - 1 - 17	28.08	1.07	57.5
J - 1 - 8	15.15	0.78	53.0	J - 2 - 8	*****	*****	****	J - 1 - 18	25.82	2.28	48.0
J - 1 - 9	20.56	0.65	47.3	J - 2 - 9	*****	*****	****	J - 1 - 19	26.63	1.17	52.0
J - 1 - 10	25.66	1.05	49.0	J - 2 - 10	*****	*****	****	J - 1 - 20	22.30	0.86	47.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
J - 1 - 1	******	*******	0.2164	0.2559	1.0465	0.101	5.000	0.2141	******	2.609	0.1228	1.3605
J - 1 - 2	1.944	0.1828	0.2432	0.2675	1.2326	0.140	5.392	0.2516	1.160	3.478	0.1479	1.4395
J - 1 - 3	2.611	*******	0.1090	0.2882	1.7791	0.167	5.385	0.2625	1.605	4.348	0.1642	1.5789
J - 1 - 4	2.556	0.4138	0.1857	0.3194	1.7209	0.179	5.385	0.2568	1.383	4.783	0.1664	1.7197
J - 1 - 5	2.722	0.3862	0.1532	0.3279	2.2674	0.162	5.385	0.2543	1.432	5.435	0.1665	1.7684
J - 1 - 6	2.111	0.4069	0.2211	0.3382	2.6860	0.195	5.000	0.2493	1.519	5.652	0.1672	1.7421
J - 1 - 7	3.333	0.5103	0.1803	0.3263	2.5698	0.172	4.231	0.2276	1.605	5.652	0.1570	1.5263
J - 1 - 8	3.333	0.3207	0.1475	0.3221	1.9070	0.152	3.077	0.2267	1.481	5.870	0.1658	1.3855
J - 1 - 9	2.722	*******	0.0926	0.3529	2.0233	0.093	0.769	0.2286	******	6.087	0.1618	1.4276
J - 1 - 10	2.722	0.3103	0.1251	0.3009	1.9070	0.156	5.769	0.2186	1.358	5.652	0.1577	1.1947

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
J - 2 - 1	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 2	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 3	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 4	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 5	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 6	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 7	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 8	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 9	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
J - 2 - 10	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
J - 1 - 11	2.111	0.3241	0.1470	0.2826	1.9651	0.136	1.923	0.2072	1.259	5.435	0.1458	0.9882
J - 1 - 12	1.833	*******	0.2828	0.3029	2.0233	0.240	1.923	0.2116	1.333	6.087	0.1516	0.9697
J - 1 - 13	1.111	*******	0.1664	0.3029	1.7209	0.167	1.538	0.2111	1.481	6.087	0.1476	0.9474
J - 1 - 14	1.278	0.4552	0.0711	0.2741	1.4767	0.159	0.769	0.1931	1.605	5.870	0.1460	0.8618
J - 1 - 15	1.611	*******	0.1148	0.3147	1.6977	0.072	******	0.2138	******	8.043	0.1676	0.9934
J - 1 - 16	1.222	*******	*******	0.3176	2.0233	0.083	******	0.2117	******	6.087	0.1551	0.8145
J - 1 - 17	1.778	0.4069	0.1376	0.3250	1.3605	0.158	0.769	0.2040	1.667	7.391	0.1476	0.7513
J - 1 - 18	0.833	0.3241	0.1357	0.2922	0.5698	0.160	0.385	0.2025	1.543	6.304	0.1384	0.7039
J - 1 - 19	0.889	0.4966	0.1404	0.2799	0.8256	0.183	0.385	0.2091	1.790	6.304	0.1511	0.7632
J - 1 - 20	0.667	0.4379	0.1680	0.3021	0.8721	0.166	0.385	0.2103	1.654	6.304	0.1541	0.6947

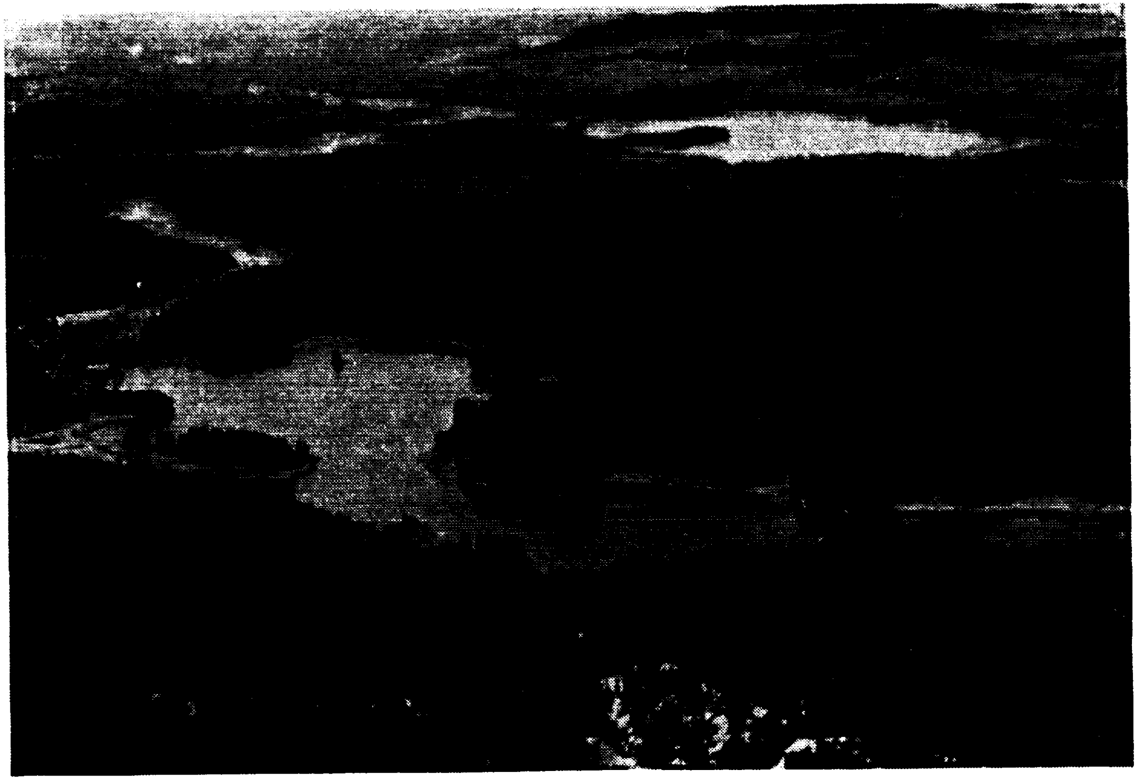
SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
J - 1 - 1	13.65	0.39	****	J - 2 - 1	*****	*****	****	J - 1 - 11	22.67	0.80	44.0
J - 1 - 2	16.00	0.95	38.0	J - 2 - 2	*****	*****	****	J - 1 - 12	24.74	0.90	58.0
J - 1 - 3	13.99	0.80	48.0	J - 2 - 3	*****	*****	****	J - 1 - 13	23.80	0.73	47.0
J - 1 - 4	19.91	1.29	50.3	J - 2 - 4	*****	*****	****	J - 1 - 14	26.59	1.94	53.0
J - 1 - 5	19.91	1.22	48.5	J - 2 - 5	*****	*****	****	J - 1 - 15	18.81	0.61	****
J - 1 - 6	20.76	0.93	46.0	J - 2 - 6	*****	*****	****	J - 1 - 16	21.12	0.73	40.0
J - 1 - 7	24.90	1.10	52.0	J - 2 - 7	*****	*****	****	J - 1 - 17	28.08	1.07	57.5
J - 1 - 8	15.15	0.78	53.0	J - 2 - 8	*****	*****	****	J - 1 - 18	25.82	2.28	48.0
J - 1 - 9	20.56	0.65	47.3	J - 2 - 9	*****	*****	****	J - 1 - 19	26.63	1.17	52.0
J - 1 - 10	25.66	1.05	49.0	J - 2 - 10	*****	*****	****	J - 1 - 20	22.30	0.86	47.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake K pH 7·0

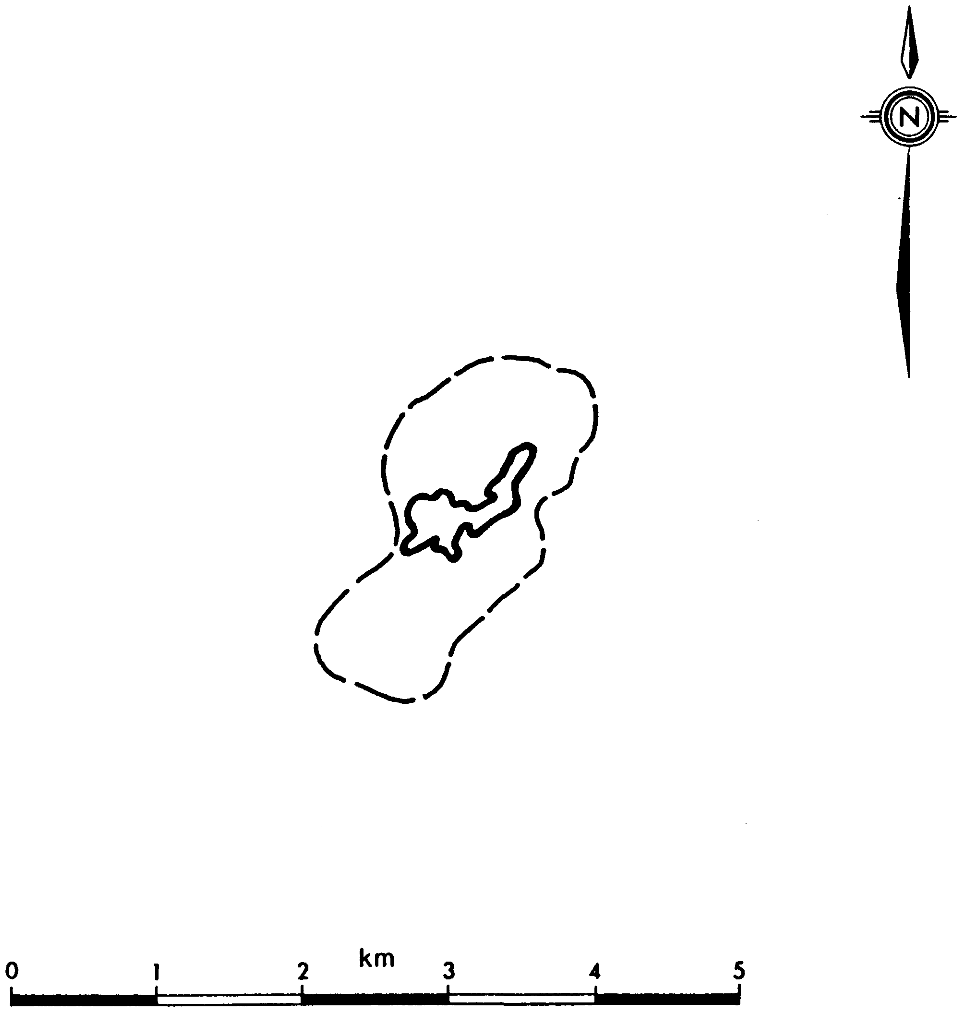
GENERAL SETTING

K - 2



GENERAL DESCRIPTION

Lake K is a rather small rock basin, modified by surficial deposits. Shoreline configuration is complex and some muskeg development has occurred in shallow bays. Surficial deposits are discontinuous in the small watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-669976/5465703
Elevation of lake above sea level	432 m (1440 ft)
Lake depth at sampling point	2.2 m
Lake area	.25 sq km
Lake catchment area	2.25 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	1
Distance from south end of sampling strip	60 km

LAKE MICROBIOTA

LAKE PLANKTON

CHRYSOPHYTA	SPECIES NAME	ABUNDANCE*
	Dinobryon divergens	4
	Dinobryon sertularia	4
	(average)	(4)

CLADOCERANS	SPECIES NAME	DENSITY
	Holopedium gibberum	0.3
	Bosmina longirostris	2.9
	Daphnia pulex	1.0
	Total	4.2

COPEPODS	SPECIES NAME	DENSITY
	Copepodites	2.3
	Cyclops bicuspidatus	1.4
	Diaptomus minutus	5.4
	Diaptomus copepodite	1.6
	Mesocyclops edax	0.9
	Total	11.6

ROTIFERS	SPECIES NAME	DENSITY
	Conochilus sp.	0.4
	Asplanchna preodonta	0.4
	Kellicotia longispina	3.6
	Polyarthra sp.	0.3
	Total	4.7

CYANOPHYTA	SPECIES NAME	ABUNDANCE
	Anabaena circinalis	2
	Aphanocapsa grevillei	2
	Microcystis aeruginosa	4
	Oscillatoria sp. small	2
	Oscillatoria sp. large	4
	Lyngbya sp.	2
	(average)	(3)

CHLOROPHYTA	SPECIES NAME	ABUNDANCE
	Spirogyra sp.	2
	Volvox sp.	5
	(average)	(4)

BACILLARIOPHYTA	SPECIES NAME	ABUNDANCE
	Pinnularia sp. A	2
	Pinnularia sp. B	2
	Surirella linearis	2
	Tabellaria fenestrata	2
	Tabellaria floculosa	2
	(average)	(2)

CHRYSOPHYTA	SPECIES NAME	ABUNDANCE
	Dinobryon bavaricum	2
	(average)	2

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	*pH CATEGORY	RELATIVE ABUNDANCE(%)
Anomoeoneis serians var brachysira	114	5	16.3
Tabellaria flocculosa	30	3	4.3
Pinnularia cf hilseana	29	4	4.1
Epithemia sp	1	2	.14
Cyclotella comta	14	2	2.0
Cyclotella glomerata	31	4	4.4
Navicula cryptocephala	87	2	12.4
Cymbella minuta var silesica	24	4	3.4
Anomoeoneis zellensis	25	5	3.6
Cyclotella stelligera	46	4	6.6
Tabellaria fenestrata	59	4	8.4
Navicula gottlandica	18	**	2.6
Nedium affine	1	4	.14
Tetracyclus lacustris	24	3	3.4
Navicula radiosa var tenella	12	4	1.7
Navicula subtilissima	28	4	4.
Navicula cf secreta var apiculata	20	4	2.9
Navicula angusta	16		2.3
Fragilaria construens	13	1	1.9
Navicula radiosa	6	4	.86
Gomphonema acuminatium	1	2	.14
Navicula bicephala	15	4	2.1
Pinnularia biceps	3	4	.43
Frustulia rhomboides	9	3	1.3
Gomphonema subtile	1	2	.14
Synedra minuscula	3		.43
Navicula variostriata	3	5	.43
Eunotia pectinalis	4	3	.57
Nitzschia palea	4	4	.57
Pinnularia cardinaliculus	1	4	.14
Navicula cryptocephala var veneta	15	2	2.1
Nedium bisalcatum var subundulatum	1	4	.14
Frustulia rhomboides var saxonica	1	3	.14
Melosira distans	1	3	.14
Navicula vanheurckii	4	4	.57
Nedium cf hermannii	1	4	.14
Pinnularia acuminata var bielawskii	2	4	.29
Eunotia tenella	1	3	.14
Nedium iridis var ampliatum	1	4	.14
Navicula cocconeiformis	1	3	.14
Eunotia septentrionalis	1	3	.14
Frustulia rhomboides var capitata	4	3	.57
Navicula temperei	3		.43
Stauroneis phoenicenteron	3	4	.43
Synedra tenera	3		.43
Cocconeis sp	1		.14
Fragilaria constricta	1	3	.14
Navicula pupula var rectangularis	1	4	.14
Navicula cf crimmei	1		.15
Eunotia vanheurckii	1	3	.14
Eunotia elegans	1	3	.14
Cymbella angusta	4	4	.57
Pinnularia abaujensis var linearis	1	4	.14

CILIOPHORA	SPECIES NAME	ABUNDANCE
	Epistylis sp.	1
	Halteria sp.	1
	(average)	1

INSECTA	SPECIES NAME	ABUNDANCE
	Chironomid head capsules	1
	(average)	1

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

Cymbella cymbiformis	1	4	.14
Fragilaria cf sinuata	1		.14

* pH CATEGORY
1-Alkalibiontia
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

** Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake K was one of ten first-order lakes. Like Lake C, it was one of the most diverse in species richness. This was true of both its planktonic and sediment diatom species. It also had a very low specific conductivity (18-20 micromhos/cm), which appeared anomalous, given its high alkalinity (238 microequivalents/l) and calcium (4mg/l). Its gently sloping basin (low relief) was dominated by gneissic rocks and was located near the top of its watershed (432m AMSL). The area of the lake was so small (0.25 km^2) and its depth so shallow (3m) that it should be referred to as a pond.

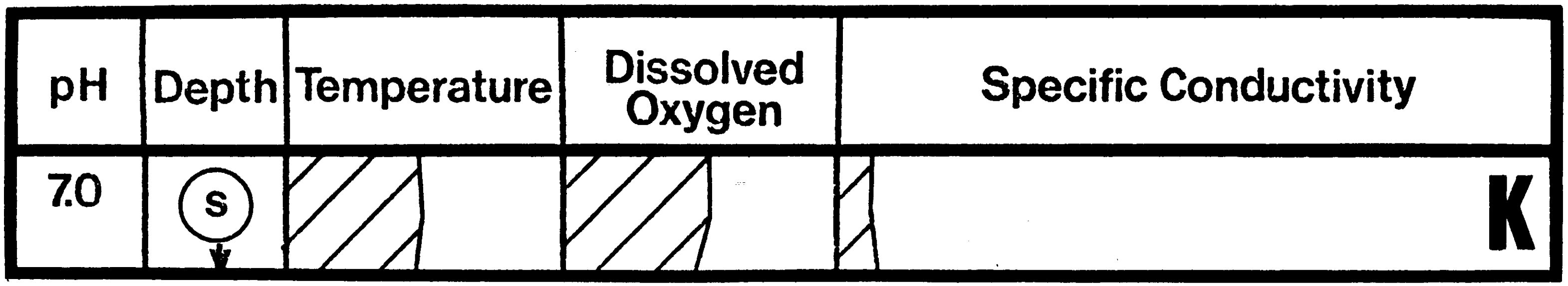
The water was clear and the Secchi disc was visible near the bottom (2.5m). Dissolved oxygen was essentially saturated to the bottom and the lake was thermally unstratified. Yellow water lilies (Nuphar) were observed in the inlet of this lake, but these were sparse. The majority of littoral areas contained typical muskeg vegetation.

DETAILS OF LAKE WATER CHEMISTRY

K - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		16.8	100	18
1		16.8	100	18
2	> 2.0	16.4	90	20

*Specific conductivity data are temperature-corrected (25° C).

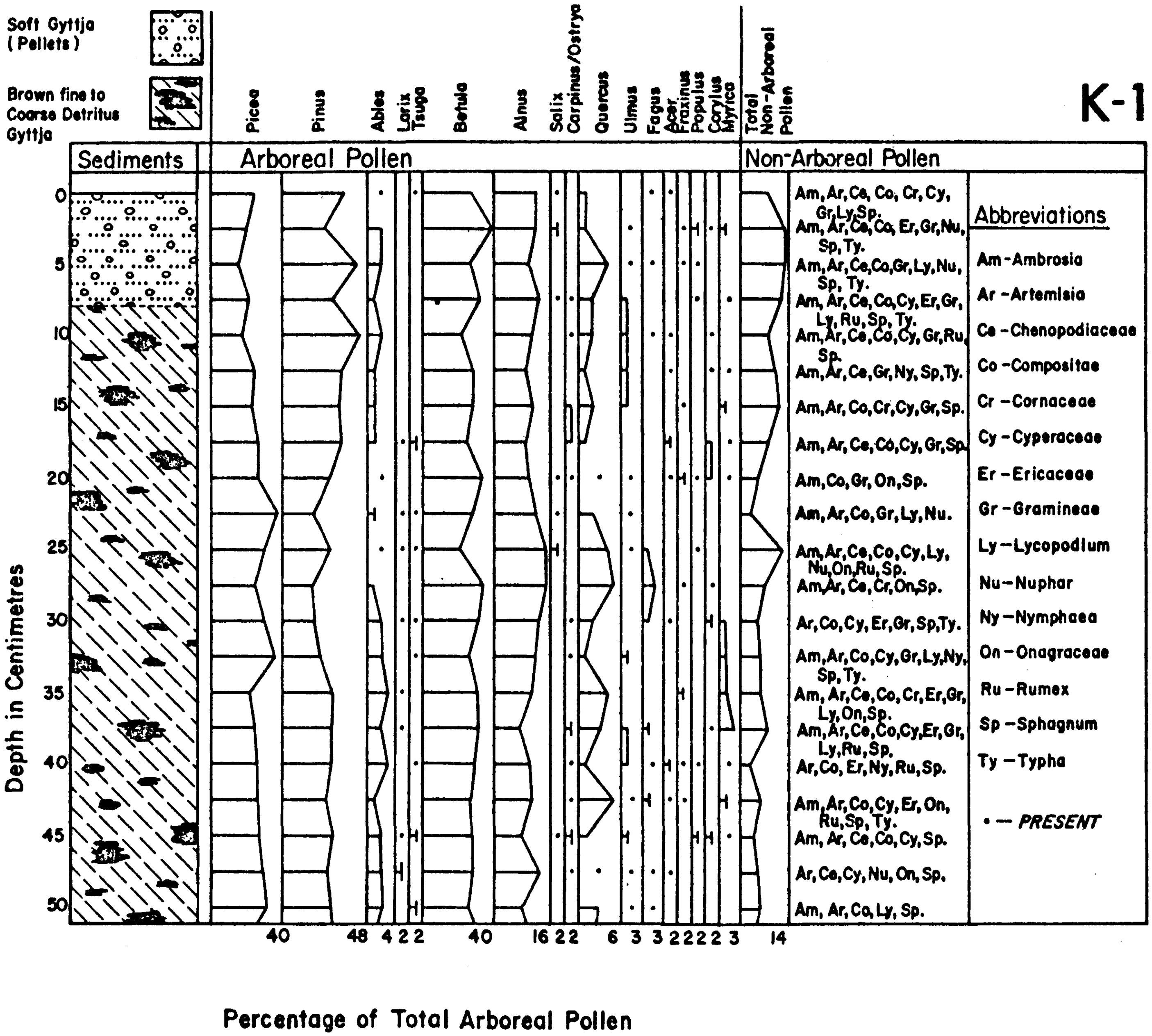


LAKE WATER CHEMISTRY PLOT

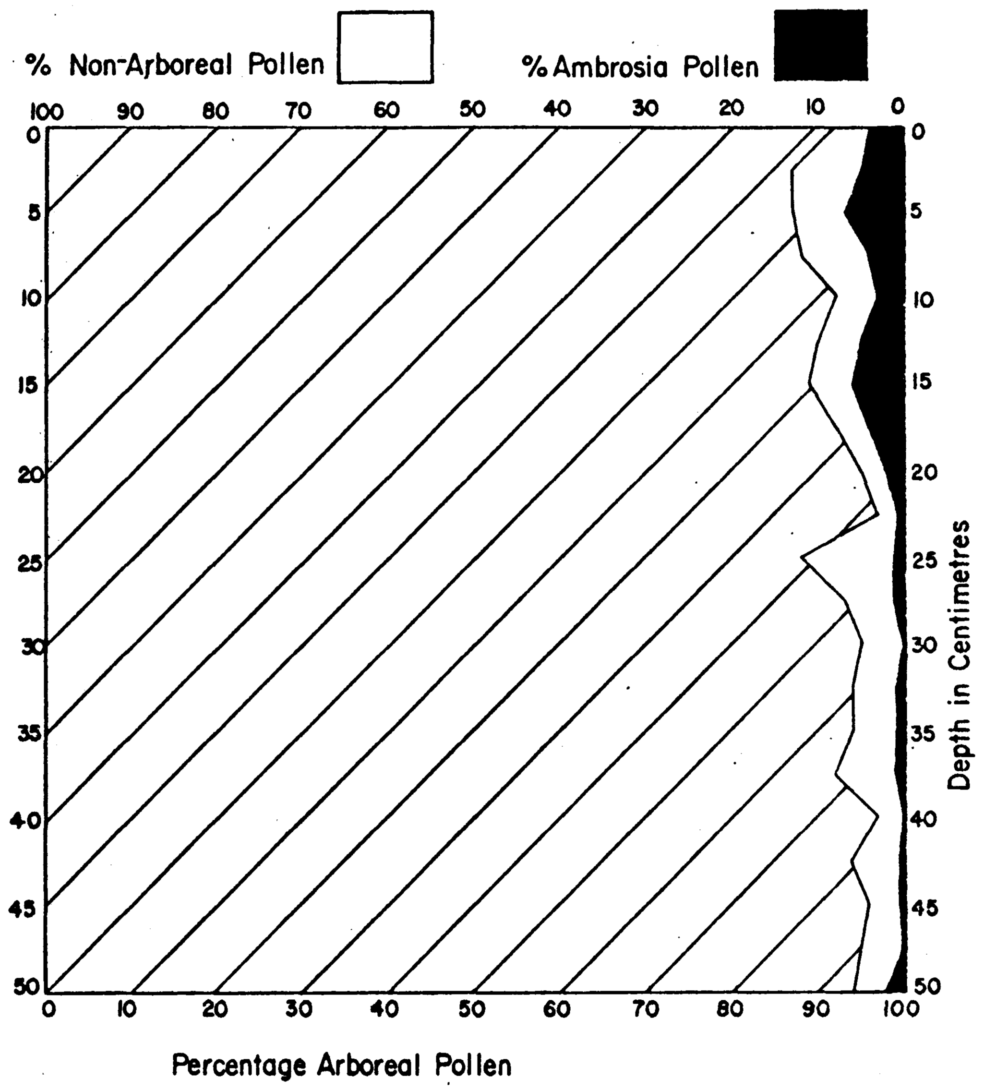
K - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE

K - 8



The pollen diagram reflects regional forest composition, with minor influx of southern pollen. The Ambrosia rise is reasonably distinct in the top 20 cm of gyttja. Probably some mixing has occurred in the lake bottom sediment.



PALYNOLOGY NOTES

AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
K - 1 - 1	8787.	4374.	65.	1800.	770.	1382.	10050.	670.	376.	****
K - 1 - 2	9200.	4044.	47.	1770.	850.	1264.	8990.	630.	367.	17.
K - 1 - 3	9978.	4205.	63.	1820.	810.	1279.	8358.	700.	387.	19.
K - 1 - 4	10880.	4376.	66.	1860.	1100.	1288.	8029.	691.	394.	21.
K - 1 - 5	11550.	4645.	71.	1760.	930.	1269.	8165.	607.	407.	22.
K - 1 - 6	10640.	4652.	71.	1860.	940.	1321.	8654.	671.	413.	22.
K - 1 - 7	10920.	4682.	68.	1860.	920.	1284.	8415.	689.	413.	20.
K - 1 - 8	11950.	4824.	54.	1950.	980.	1297.	8103.	604.	437.	23.
K - 1 - 9	12310.	4287.	49.	1700.	970.	1210.	8347.	544.	401.	24.
K - 1 - 10	12120.	4086.	42.	1570.	900.	1132.	8273.	509.	368.	22.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
K - 2 - 1	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 2	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 3	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 4	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 5	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 6	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 7	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 8	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 9	******	******	*****	******	******	******	******	******	*****	****
K - 2 - 10	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
K - 1 - 11	11570.	3498.	39.	1470.	790.	1033.	8103.	460.	374.	22.
K - 1 - 12	11600.	3461.	38.	1440.	820.	1054.	8506.	477.	379.	25.
K - 1 - 13	12100.	3461.	31.	1520.	910.	1104.	8733.	455.	383.	24.
K - 1 - 14	12340.	3203.	31.	1420.	1120.	1040.	8292.	420.	375.	24.
K - 1 - 15	11820.	3116.	30.	1260.	750.	972.	8364.	421.	360.	22.
K - 1 - 16	11970.	3436.	29.	1310.	790.	1002.	8811.	414.	377.	22.
K - 1 - 17	11590.	3203.	30.	1300.	790.	999.	8403.	387.	373.	22.
K - 1 - 18	12220.	3364.	28.	1410.	890.	1040.	8962.	412.	384.	23.
K - 1 - 19	12090.	3160.	29.	1420.	1010.	1028.	8867.	420.	375.	22.
K - 1 - 20	11920.	3145.	29.	1400.	900.	1040.	9001.	420.	382.	23.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
K - 1 - 1	18.27	0.32	****	K - 2 - 1	*****	*****	****	K - 1 - 11	20.22	1.27	47.5
K - 1 - 2	16.12	0.70	58.9	K - 2 - 2	*****	*****	****	K - 1 - 12	24.32	1.18	49.0
K - 1 - 3	21.12	1.04	53.0	K - 2 - 3	*****	*****	****	K - 1 - 13	24.30	1.11	47.0
K - 1 - 4	25.43	1.00	51.0	K - 2 - 4	*****	*****	****	K - 1 - 14	20.42	1.31	46.0
K - 1 - 5	17.95	1.03	52.0	K - 2 - 5	*****	*****	****	K - 1 - 15	21.08	1.24	46.0
K - 1 - 6	17.66	0.80	****	K - 2 - 6	*****	*****	****	K - 1 - 16	23.00	1.31	49.2
K - 1 - 7	17.33	0.92	56.0	K - 2 - 7	*****	*****	****	K - 1 - 17	23.23	1.49	47.0
K - 1 - 8	20.18	1.10	54.0	K - 2 - 8	*****	*****	****	K - 1 - 18	24.32	1.40	43.0
K - 1 - 9	23.10	1.25	49.0	K - 2 - 9	*****	*****	****	K - 1 - 19	25.20	1.39	44.5
K - 1 - 10	23.26	1.16	48.0	K - 2 - 10	*****	*****	****	K - 1 - 20	24.86	1.52	46.2

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
K - 1 - 1	****	*****	*****	16.2	85.	9.	70.	38.8	****	7.0	14.7	127.
K - 1 - 2	5.9	*****	*****	14.7	80.	11.	50.	36.3	****	****	15.5	92.
K - 1 - 3	5.5	*****	11.0	15.2	95.	11.	60.	33.3	7.	****	15.8	85.
K - 1 - 4	5.7	*****	10.4	16.3	76.	10.	55.	31.7	7.	****	15.7	74.
K - 1 - 5	4.3	8.3	12.6	18.5	98.	14.	35.	28.6	12.	3.0	17.4	75.
K - 1 - 6	4.3	9.2	11.3	17.3	104.	14.	50.	31.1	11.	3.5	16.3	77.
K - 1 - 7	7.7	8.3	10.4	16.8	109.	14.	50.	30.6	10.	4.5	15.6	80.
K - 1 - 8	4.3	10.0	3.9	18.4	109.	13.	40.	28.4	11.	4.5	17.2	82.
K - 1 - 9	3.2	13.8	11.4	20.4	80.	16.	20.	25.3	14.	1.0	18.5	74.
K - 1 - 10	3.8	13.8	11.7	20.3	85.	16.	15.	23.8	14.	5.5	18.5	64.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
K - 2 - 1	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 2	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 3	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 4	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 5	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 6	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 7	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 8	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 9	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
K - 2 - 10	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
K - 1 - 11	2.0	14.0	6.1	19.7	76.	15.	5.	21.1	15.	5.5	18.6	57.
K - 1 - 12	2.1	15.8	5.7	20.4	66.	16.	5.	19.9	15.	6.5	20.2	59.
K - 1 - 13	1.5	15.7	8.6	20.6	99.	16.	****	20.0	15.	5.0	20.0	55.
K - 1 - 14	1.4	8.2	12.5	22.6	66.	11.	****	21.0	11.	5.0	18.7	48.
K - 1 - 15	1.2	9.1	12.7	23.3	66.	13.	****	19.4	12.	5.5	18.8	46.
K - 1 - 16	1.2	9.9	12.3	25.2	61.	15.	****	20.1	11.	5.0	19.1	50.
K - 1 - 17	1.4	9.1	4.6	23.2	61.	12.	****	18.9	11.	5.0	18.5	46.
K - 1 - 18	1.0	9.9	10.6	31.8	52.	28.	****	20.1	11.	5.5	19.4	53.
K - 1 - 19	1.2	9.9	10.8	22.9	66.	14.	****	20.3	11.	5.0	19.4	50.
K - 1 - 20	1.2	10.8	13.5	23.5	76.	13.	****	19.0	12.	5.5	19.4	53.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
K - 1 - 1	18.27	0.32	****	K - 2 - 1	*****	*****	****	K - 1 - 11	20.22	1.27	47.5
K - 1 - 2	16.12	0.70	58.9	K - 2 - 2	*****	*****	****	K - 1 - 12	24.32	1.18	49.0
K - 1 - 3	21.12	1.04	53.0	K - 2 - 3	*****	*****	****	K - 1 - 13	24.30	1.11	47.0
K - 1 - 4	25.43	1.00	51.0	K - 2 - 4	*****	*****	****	K - 1 - 14	20.42	1.31	46.0
K - 1 - 5	17.95	1.03	52.0	K - 2 - 5	*****	*****	****	K - 1 - 15	21.08	1.24	46.0
K - 1 - 6	17.66	0.80	****	K - 2 - 6	*****	*****	****	K - 1 - 16	23.00	1.31	49.2
K - 1 - 7	17.33	0.92	56.0	K - 2 - 7	*****	*****	****	K - 1 - 17	23.23	1.49	47.0
K - 1 - 8	20.18	1.10	54.0	K - 2 - 8	*****	*****	****	K - 1 - 18	24.32	1.40	43.0
K - 1 - 9	23.10	1.25	49.0	K - 2 - 9	*****	*****	****	K - 1 - 19	25.20	1.39	44.5
K - 1 - 10	23.26	1.16	48.0	K - 2 - 10	*****	*****	****	K - 1 - 20	24.86	1.52	46.2

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
K - 1 - 1	0.1051	0.0703	0.0609	0.0978	0.0339	0.0500	0.2157	0.5982	0.0595	*******
K - 1 - 2	0.1100	0.0650	0.0442	0.0962	0.0374	0.0457	0.1929	0.5625	0.0580	0.1049
K - 1 - 3	0.1194	0.0676	0.0590	0.0989	0.0357	0.0463	0.1794	0.6250	0.0612	0.1160
K - 1 - 4	0.1301	0.0704	0.0626	0.1011	0.0485	0.0466	0.1723	0.6170	0.0623	0.1321
K - 1 - 5	0.1382	0.0747	0.0673	0.0957	0.0410	0.0459	0.1752	0.5420	0.0645	0.1352
K - 1 - 6	0.1273	0.0748	0.0673	0.1011	0.0414	0.0478	0.1857	0.5991	0.0654	0.1333
K - 1 - 7	0.1306	0.0753	0.0641	0.1011	0.0405	0.0465	0.1806	0.6152	0.0654	0.1228
K - 1 - 8	0.1429	0.0776	0.0511	0.1060	0.0432	0.0469	0.1739	0.5393	0.0691	0.1438
K - 1 - 9	0.1472	0.0689	0.0460	0.0924	0.0427	0.0438	0.1791	0.4857	0.0635	0.1481
K - 1 - 10	0.1450	0.0657	0.0397	0.0853	0.0396	0.0410	0.1775	0.4545	0.0582	0.1364

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
K - 2 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 3	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 6	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 7	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 8	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 9	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
K - 2 - 10	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
K - 1 - 11	0.1384	0.0562	0.0369	0.0799	0.0348	0.0374	0.1739	0.4107	0.0591	0.1346
K - 1 - 12	0.1388	0.0556	0.0358	0.0783	0.0361	0.0381	0.1825	0.4259	0.0599	0.1531
K - 1 - 13	0.1447	0.0556	0.0294	0.0826	0.0401	0.0399	0.1874	0.4063	0.0606	0.1500
K - 1 - 14	0.1476	0.0515	0.0293	0.0772	0.0493	0.0376	0.1779	0.3750	0.0594	0.1475
K - 1 - 15	0.1414	0.0501	0.0278	0.0685	0.0330	0.0352	0.1795	0.3759	0.0569	0.1333
K - 1 - 16	0.1432	0.0552	0.0271	0.0712	0.0348	0.0363	0.1891	0.3696	0.0596	0.1364
K - 1 - 17	0.1386	0.0515	0.0283	0.0707	0.0348	0.0361	0.1803	0.3455	0.0590	0.1383
K - 1 - 18	0.1462	0.0541	0.0260	0.0766	0.0392	0.0376	0.1923	0.3679	0.0607	0.1420
K - 1 - 19	0.1446	0.0508	0.0272	0.0772	0.0445	0.0372	0.1903	0.3750	0.0594	0.1383
K - 1 - 20	0.1426	0.0506	0.0272	0.0761	0.0396	0.0376	0.1932	0.3750	0.0604	0.1401

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
K - 1 - 1	18.27	0.32	****	K - 2 - 1	*****	*****	****	K - 1 - 11	20.22	1.27	47.5
K - 1 - 2	16.12	0.70	58.9	K - 2 - 2	*****	*****	****	K - 1 - 12	24.32	1.18	49.0
K - 1 - 3	21.12	1.04	53.0	K - 2 - 3	*****	*****	****	K - 1 - 13	24.30	1.11	47.0
K - 1 - 4	25.43	1.00	51.0	K - 2 - 4	*****	*****	****	K - 1 - 14	20.42	1.31	46.0
K - 1 - 5	17.95	1.03	52.0	K - 2 - 5	*****	*****	****	K - 1 - 15	21.08	1.24	46.0
K - 1 - 6	17.66	0.80	****	K - 2 - 6	*****	*****	****	K - 1 - 16	23.00	1.31	49.2
K - 1 - 7	17.33	0.92	56.0	K - 2 - 7	*****	*****	****	K - 1 - 17	23.23	1.49	47.0
K - 1 - 8	20.18	1.10	54.0	K - 2 - 8	*****	*****	****	K - 1 - 18	24.32	1.40	43.0
K - 1 - 9	23.10	1.25	49.0	K - 2 - 9	*****	*****	****	K - 1 - 19	25.20	1.39	44.5
K - 1 - 10	23.26	1.16	48.0	K - 2 - 10	*****	*****	****	K - 1 - 20	24.86	1.52	46.2

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
K - 1 - 1	******	*******	*******	0.2382	0.9884	0.093	5.385	0.1010	******	3.043	0.1081	1.6645
K - 1 - 2	3.278	*******	*******	0.2162	0.9302	0.115	3.846	0.0945	******	******	0.1140	1.2158
K - 1 - 3	3.056	*******	0.0904	0.2237	1.1047	0.109	4.615	0.0866	0.889	******	0.1165	1.1224
K - 1 - 4	3.167	*******	0.0851	0.2401	0.8837	0.102	4.231	0.0825	0.877	******	0.1155	0.9724
K - 1 - 5	2.389	0.2862	0.1034	0.2725	1.1395	0.140	2.692	0.0745	1.432	1.304	0.1277	0.9829
K - 1 - 6	2.389	0.3172	0.0926	0.2538	1.2093	0.144	3.846	0.0810	1.346	1.522	0.1199	1.0092
K - 1 - 7	4.278	0.2862	0.0856	0.2472	1.2674	0.136	3.846	0.0797	1.210	1.957	0.1144	1.0461
K - 1 - 8	2.389	0.3448	0.0321	0.2709	1.2674	0.135	3.077	0.0739	1.407	1.957	0.1268	1.0737
K - 1 - 9	1.778	0.4759	0.0934	0.2996	0.9302	0.160	1.538	0.0658	1.728	0.435	0.1362	0.9697
K - 1 - 10	2.111	0.4759	0.0957	0.2987	0.9884	0.160	1.154	0.0619	1.691	2.391	0.1363	0.8474

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
K - 2 - 1	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 2	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 3	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 4	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 5	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 6	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 7	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 8	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 9	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
K - 2 - 10	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
K - 1 - 11	1.111	0.4828	0.0498	0.2901	0.8837	0.147	0.385	0.0550	1.790	2.391	0.1366	0.7513
K - 1 - 12	1.167	0.5448	0.0466	0.2996	0.7674	0.162	0.385	0.0518	1.815	2.826	0.1487	0.7763
K - 1 - 13	0.833	0.5414	0.0705	0.3037	1.1512	0.165	******	0.0522	1.852	2.174	0.1468	0.7250
K - 1 - 14	0.778	0.2828	0.1028	0.3328	0.7674	0.115	******	0.0546	1.383	2.174	0.1374	0.6329
K - 1 - 15	0.667	0.3138	0.1039	0.3422	0.7674	0.129	******	0.0507	1.432	2.391	0.1384	0.5987
K - 1 - 16	0.667	0.3414	0.1006	0.3706	0.7093	0.146	******	0.0523	1.407	2.174	0.1403	0.6566
K - 1 - 17	0.778	0.3138	0.0374	0.3413	0.7093	0.122	******	0.0493	1.383	2.174	0.1362	0.6105
K - 1 - 18	0.556	0.3414	0.0865	0.4669	0.6047	0.280	******	0.0524	1.370	2.391	0.1424	0.6961
K - 1 - 19	0.667	0.3414	0.0885	0.3366	0.7674	0.143	******	0.0529	1.407	2.174	0.1425	0.6618
K - 1 - 20	0.667	0.3724	0.1105	0.3450	0.8837	0.133	******	0.0494	1.457	2.391	0.1424	0.6921

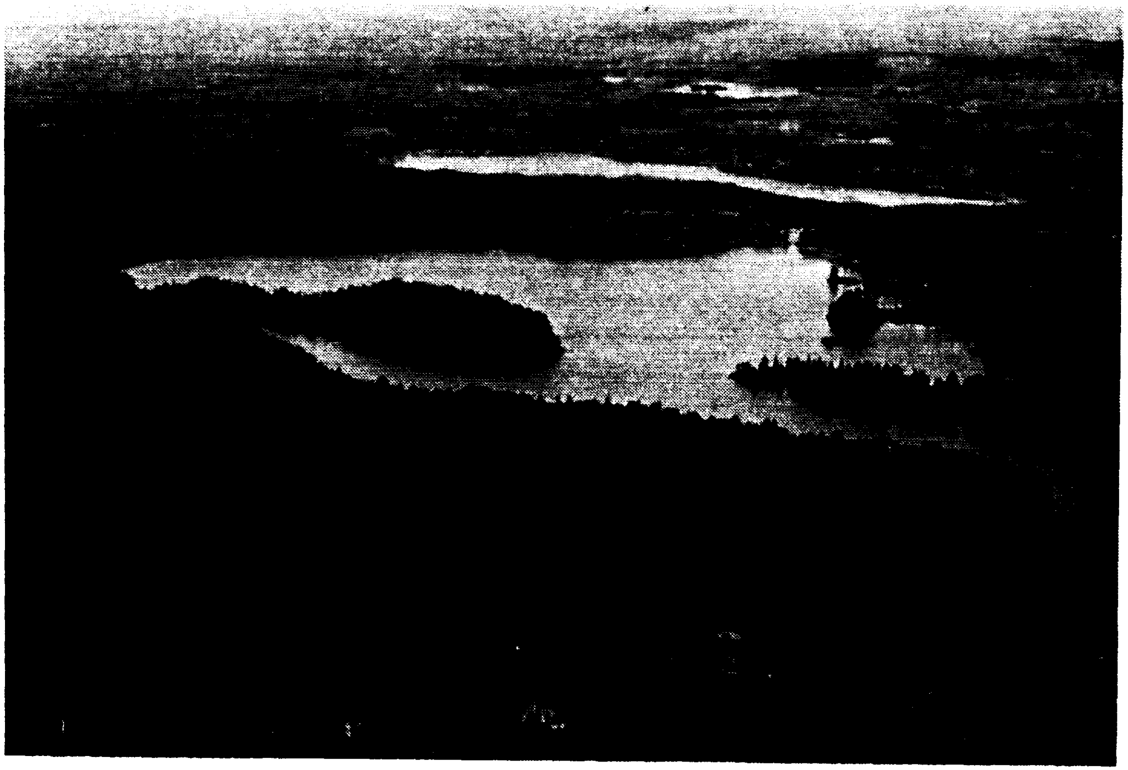
SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
K - 1 - 1	18.27	0.32	****	K - 2 - 1	*****	*****	****	K - 1 - 11	20.22	1.27	47.5
K - 1 - 2	16.12	0.70	58.9	K - 2 - 2	*****	*****	****	K - 1 - 12	24.32	1.18	49.0
K - 1 - 3	21.12	1.04	53.0	K - 2 - 3	*****	*****	****	K - 1 - 13	24.30	1.11	47.0
K - 1 - 4	25.43	1.00	51.0	K - 2 - 4	*****	*****	****	K - 1 - 14	20.42	1.31	46.0
K - 1 - 5	17.95	1.03	52.0	K - 2 - 5	*****	*****	****	K - 1 - 15	21.08	1.24	46.0
K - 1 - 6	17.66	0.80	****	K - 2 - 6	*****	*****	****	K - 1 - 16	23.00	1.31	49.2
K - 1 - 7	17.33	0.92	56.0	K - 2 - 7	*****	*****	****	K - 1 - 17	23.23	1.49	47.0
K - 1 - 8	20.18	1.10	54.0	K - 2 - 8	*****	*****	****	K - 1 - 18	24.32	1.40	43.0
K - 1 - 9	23.10	1.25	49.0	K - 2 - 9	*****	*****	****	K - 1 - 19	25.20	1.39	44.5
K - 1 - 10	23.26	1.16	48.0	K - 2 - 10	*****	*****	****	K - 1 - 20	24.86	1.52	46.2

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake L pH 6·9

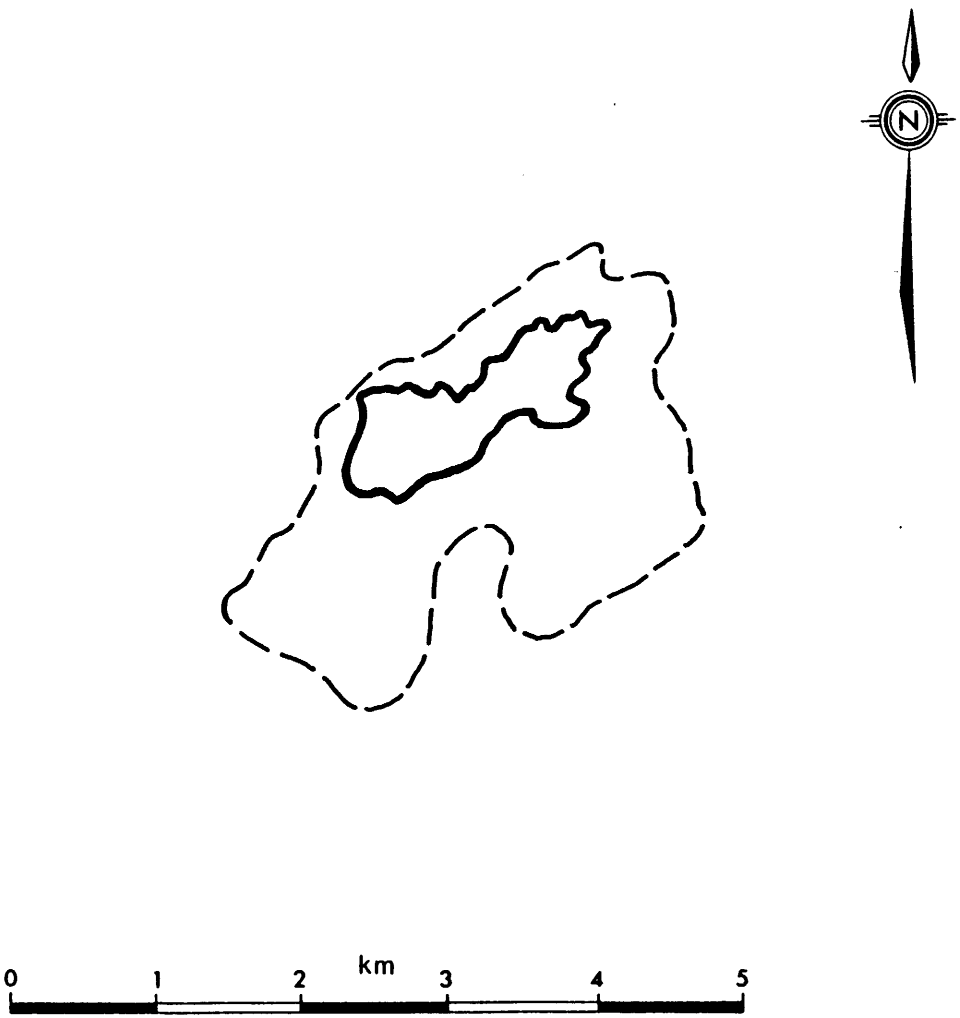
GENERAL SETTING

L - 2



GENERAL DESCRIPTION

Lake L is a fairly large rock basin with several islands and complex shoreline configuration. Some muskeg development exists in shallow bays. Surficial deposits are discontinuous in the watershed, and the railroad runs along the southeastern shore of this lake.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-665438/5440498
Elevation of lake above sea level	414 m (1380 ft)
Lake depth at sampling point	2.0 m
Lake area	.8 sq km
Lake catchment area	5 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	2
Distance from south end of sampling strip	64 km

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY
	Holopedium gibberum		0.5
	Bosmina longirostris		0.3
		Total	0.8

COPEPODS	SPECIES NAME		DENSITY
	Copepodites		1.3
	Cyclops bicuspidatus		1.1
	Diaptomus minutus		2.1
	Diaptomus copepodite		1.1
	Mesocyclops edax		2.1
		Total	7.8

ROTIFERS	SPECIES NAME		DENSITY
	Kellicotia longispina		0.9
	Syncheata sp.		0.8
	Polyarthra vulgaris		0.9
		Total	2.6

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Anabaena circinalis		3
	Aphanocapsa grevillei		3
	Aphanocapsa elachista		4
		(Average)	(3)

CHLOROPHYTA	SPECIES NAME		ABUNDANCE
	Volvox sp.		4
		(Average)	(4)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Pinnularia nobilis		2
	Tabellaria fenestrata		4
	Tabellaria floculosa		3
		(Average)	(3)

PYRROPHYTA	SPECIES NAME		ABUNDANCE
	Ceratium hirundinella		3
		(Average)	(3)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Chrysosphaerella longispina		3
	Dinobryon bavaricum		4
	Dinobryon divergens		4
		(Average)	(4)

MASTIGOPHORANS	SPECIES NAME		ABUNDANCE
	Euglypha sp.		1
		(Average)	(1)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Anomoeoneis serians var brachysira	46	5	8.3
Navicula radiosa var tenella	57	4	10.3
Tabellaria fenestrata	46	4	8.3
Pinnularia abaujensis var linearis	16	4	2.9
Navicula cryptocephala	109	2	19.7
Synedra tenera	8	**	1.4
Navicula bicephala	7	4	1.3
Cyclotella bodanica	5	4	.90
Nedium cf hercynicum f subrostratum	4	4	.72
Nitzschia palea	16	4	2.9
Navicula notha	5	4	.90
Navicula heufleri	2	4	.36
Melosira distans	2	3	.36
Eunotia arcus	2	4	.36
Tetracyclus lacustris	5	3	.90
Cyclotella glomerata	8	4	1.1
Cymbella minuta	19	4	3.4
Navicula pupula var rectangularis	3	4	.54
Navicula cryptocephala var veneta	6	2	1.1
Tabellaria flocculosa	15	3	2.7
Cyclotella stelligera	8	4	1.4
Pinnularia hilseana	11	4	2.0
Cyclotella comta	10	2	1.8
Navicula radiosa var parva	42	4	7.6
Stauroneis phoenicenteron	3	4	.54
Cymbella cymbiformis	4	4	.72
Navicula radiosa	20	4	3.6
Navicula angusta	8		1.4
Cymbella angusta	1		.
Synedra minuscula	3		.54
Diploneis puella	1	4	.18
Fragilaria construens	2	2	.36
Frustulia rhomboides	1	3	.18
Nedium affine	1	4	.18
Navicula subtilissima	6	4	1.1
Cymbella microcephala	7	4	1.3
Nitzschia kutzingiana	1	4	.18
Stauroneis fluminea	2		.36
Frustulia rhomboides var saxonica	5	3	.90
Nedium iridis	2		.36
Anomoeoneis zellensis	5	5	.90
Gomphonema quadripunctatum	1	2	.18
Nedium heufleri	1	4	.18
Navicula subhamulata	5		.90
Nedium iridis var ampliatum	5	4	.90
Pinnularia maior	1	4	.18
Pinnularia rupestris	1	4	.18
Navicula subtilissima	6	3	1.1
Eunotia vanheurckii	1		.18
Achnanthes cf levanderi	1	2	.18
Fragilaria sp	1		.18
Cymbella lunata	1		.18

* pH CATEGORY
1-Alkalibiontic 3-Acidophilous 5-Acidbiontic
2-Alkaliphilous 4-Indifferent

**Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake L was similar to Lake K in that both were vertically unstratified. No doubt they both mix to their bottoms throughout the summer. Lake L was a second-order lake with minimal topographic relief. The Secchi disc was visible on the lake's bottom (1.5m) and the water was slightly humic, as indicated by its pale yellow-brown colour. Possibly for this reason its sediments were more organic (67% loss on ignition) than those of most of the other lakes. The large littoral area of this 0.8 km^2 lake contributed to a variety of species in its water column, affording it a high species richness (higher than all but six of the other lakes). A family of loons inhabited the lake, as did a family of beavers.

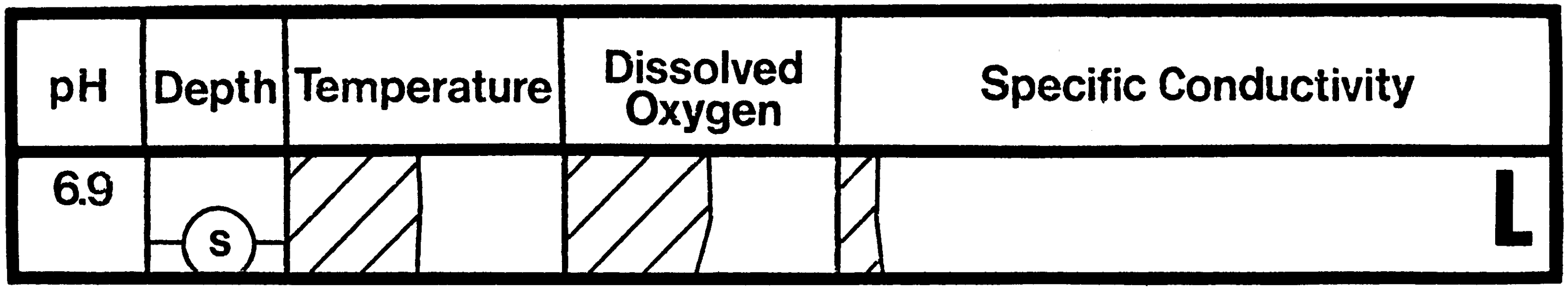
Lake L was similar to K in having an anomalously low specific conductivity. The rocks around the lakes are diabasic and its pH (6.9), alkalinity (253 microequivalents/l), and calcium (4.1mg/l) reflect this.

DETAILS OF LAKE WATER CHEMISTRY

L - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity * (Micromhos/cm)
0		16.4	100	20
1	1.5	16.8	100	20
2		16.6	90	22

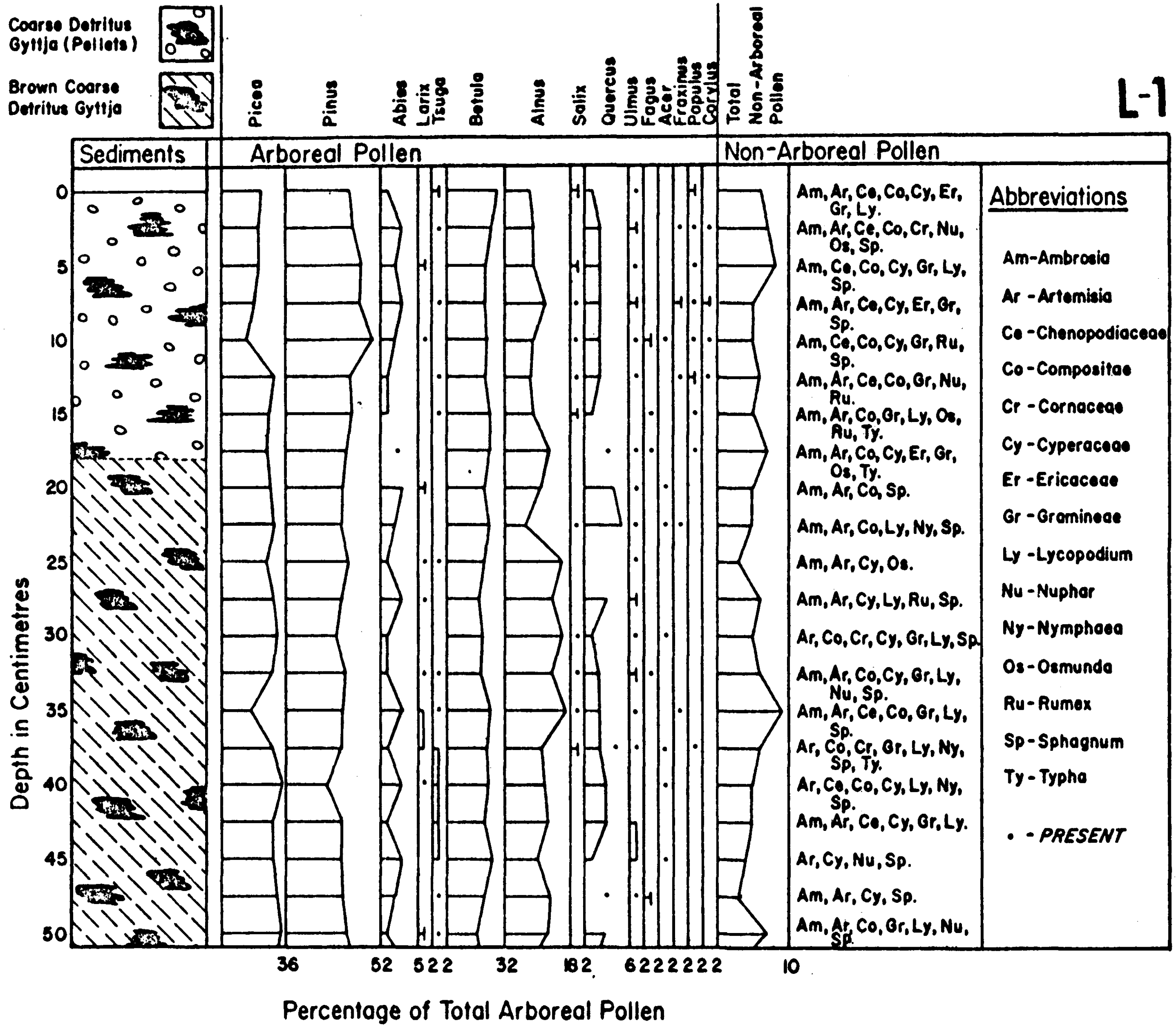
*Specific conductivity data are temperature-corrected (25° C).



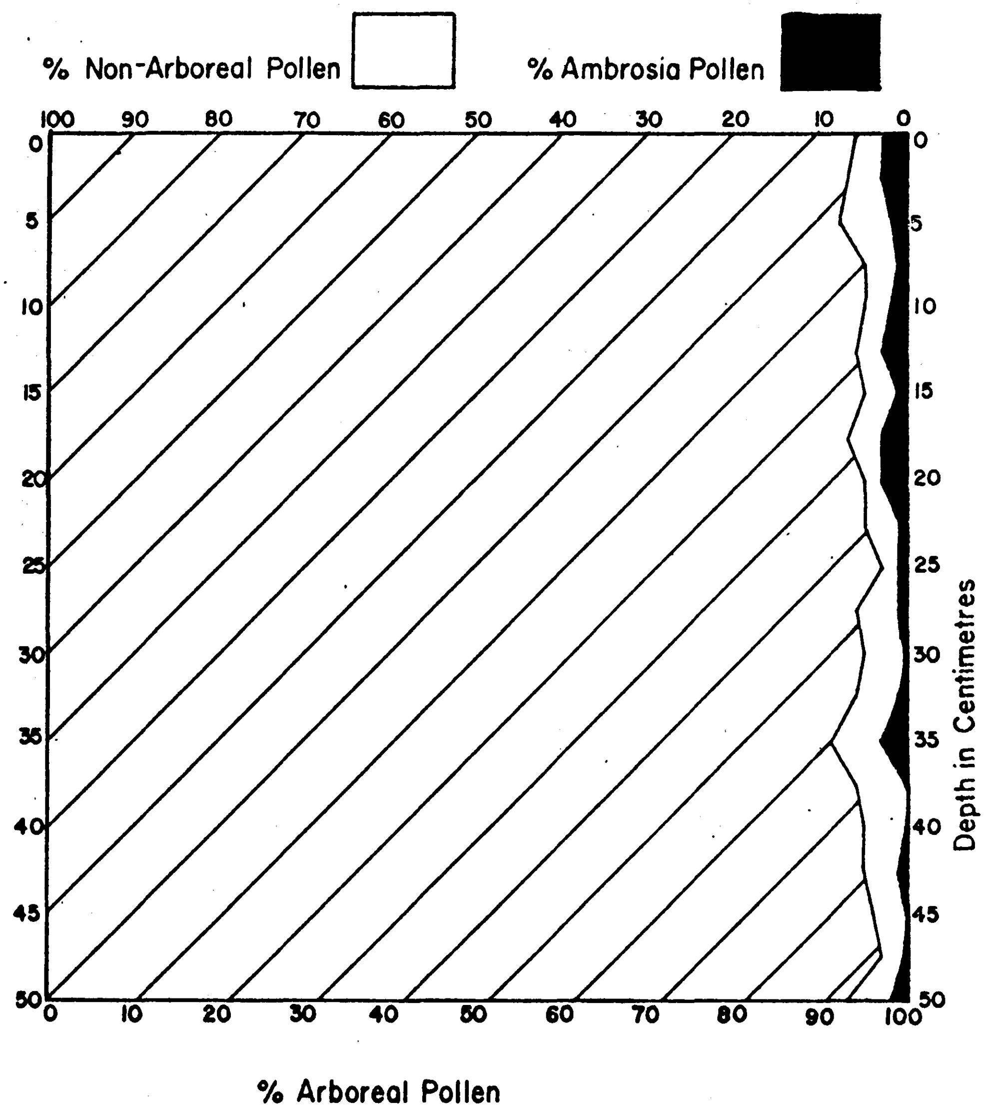
LAKE WATER CHEMISTRY PLOT

L - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE



The regional forest composition is quite clearly reflected by the pollen diagram, with a minor influx of southern pollen. The *Ambrosia* rise is indistinct and indicates considerable mixing of lake bottom sediment.



PALYNOLOGY NOTES

AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
L - 1 - 1	15310.	10420.	286.	3340.	2890.	1934.	9050.	654.	570.	31.
L - 1 - 2	16800.	10110.	202.	3670.	3380.	1965.	8779.	621.	596.	34.
L - 1 - 3	19270.	10250.	187.	4170.	4040.	2047.	9121.	593.	626.	42.
L - 1 - 4	15890.	9734.	185.	3390.	2840.	1953.	8825.	689.	570.	36.
L - 1 - 5	18520.	11810.	182.	4090.	3840.	2089.	8874.	663.	643.	33.
L - 1 - 6	19730.	11890.	182.	4160.	4000.	2092.	9074.	640.	646.	36.
L - 1 - 7	21470.	11440.	191.	4480.	4820.	2237.	9450.	593.	685.	41.
L - 1 - 8	18970.	10410.	176.	3930.	3580.	2060.	9154.	602.	616.	36.
L - 1 - 9	18570.	9558.	168.	3860.	3560.	1984.	8971.	551.	645.	35.
L - 1 - 10	20520.	9523.	169.	4270.	4260.	2130.	9317.	522.	660.	41.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
L - 2 - 1	8303.	6981.	192.	1890.	1460.	1369.	6376.	410.	389.	20.
L - 2 - 2	10740.	7918.	187.	2480.	2350.	1702.	8099.	660.	412.	25.
L - 2 - 3	11680.	8160.	195.	2950.	2000.	1551.	8349.	660.	433.	****
L - 2 - 4	11540.	7973.	180.	2550.	1680.	1602.	7922.	640.	459.	24.
L - 2 - 5	12370.	8038.	173.	2720.	1900.	1546.	7694.	706.	482.	23.
L - 2 - 6	14190.	9031.	159.	2870.	2150.	1680.	7937.	690.	520.	29.
L - 2 - 7	15090.	9700.	151.	3190.	2590.	1765.	7761.	753.	588.	29.
L - 2 - 8	16520.	9761.	143.	3320.	2700.	1912.	8182.	740.	611.	30.
L - 2 - 9	17790.	9194.	133.	3600.	3470.	1788.	8106.	627.	597.	30.
L - 2 - 10	17190.	8345.	130.	3440.	3250.	1767.	8318.	595.	630.	33.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
L - 2 - 11	15810.	7087.	113.	2640.	2610.	1526.	8139.	480.	524.	28.
L - 2 - 12	15460.	6347.	109.	2730.	2820.	1435.	7894.	571.	486.	30.
L - 2 - 13	15070.	6361.	108.	2590.	2500.	1451.	8092.	524.	480.	27.
L - 2 - 14	14770.	5932.	106.	2580.	2460.	1410.	8184.	587.	448.	27.
L - 2 - 15	15836.	5486.	116.	2560.	2360.	1287.	8032.	580.	459.	32.
L - 2 - 16	15370.	5711.	108.	2670.	2650.	1448.	8279.	585.	463.	33.
L - 2 - 17	16570.	5903.	106.	2750.	2850.	1497.	8347.	610.	509.	32.
L - 2 - 18	17120.	5725.	116.	3140.	3290.	1605.	8631.	560.	548.	35.
L - 2 - 19	17150.	5637.	106.	3180.	3360.	1476.	8170.	616.	487.	31.
L - 2 - 20	17470.	5659.	109.	3070.	3330.	1487.	8327.	630.	495.	30.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
L - 1 - 1	*****	*****	70.4	L - 2 - 1	28.70	0.77	****	L - 2 - 11	21.67	0.79	****
L - 1 - 2	*****	*****	66.6	L - 2 - 2	28.59	0.63	65.1	L - 2 - 12	25.30	0.83	52.0
L - 1 - 3	*****	*****	57.1	L - 2 - 3	22.05	0.36	****	L - 2 - 13	23.00	0.67	43.4
L - 1 - 4	*****	*****	66.2	L - 2 - 4	28.11	0.65	65.0	L - 2 - 14	24.06	0.74	****
L - 1 - 5	*****	*****	63.0	L - 2 - 5	25.37	0.71	****	L - 2 - 15	19.08	0.66	****
L - 1 - 6	*****	*****	59.0	L - 2 - 6	24.69	0.62	56.1	L - 2 - 16	23.61	0.73	****
L - 1 - 7	*****	*****	60.0	L - 2 - 7	28.95	0.85	59.0	L - 2 - 17	18.90	0.59	****
L - 1 - 8	*****	*****	61.0	L - 2 - 8	22.16	0.63	55.8	L - 2 - 18	23.70	0.99	53.5
L - 1 - 9	*****	*****	62.8	L - 2 - 9	26.47	0.93	49.0	L - 2 - 19	22.90	0.85	49.0
L - 1 - 10	*****	*****	59.4	L - 2 - 10	24.62	0.85	47.0	L - 2 - 20	20.30	0.73	****

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
L - 1 - 1	****	*****	20.0	29.1	*****	14.	75.	62.8	12.	3.5	18.9	139.
L - 1 - 2	****	*****	18.1	27.8	*****	14.	45.	67.8	12.	3.5	19.4	113.
L - 1 - 3	****	*****	18.0	24.3	*****	13.	25.	76.5	14.	4.0	19.6	95.
L - 1 - 4	****	*****	16.9	32.2	*****	15.	55.	62.0	10.	3.5	20.2	137.
L - 1 - 5	****	*****	17.0	29.8	*****	15.	55.	73.1	12.	3.5	21.3	137.
L - 1 - 6	****	*****	18.2	25.1	*****	14.	35.	76.5	12.	4.0	21.3	120.
L - 1 - 7	****	*****	18.8	22.4	*****	12.	15.	85.2	13.	4.5	21.3	95.
L - 1 - 8	****	5.1	18.8	23.1	*****	12.	15.	72.6	17.	5.5	20.9	87.
L - 1 - 9	****	*****	18.6	20.8	*****	11.	15.	72.6	12.	5.0	20.2	80.
L - 1 - 10	****	*****	20.3	20.4	*****	12.	15.	82.0	14.	5.5	21.3	73.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
L - 2 - 1	3.0	*****	3.7	35.8	52.	15.	70.	40.4	****	2.0	15.6	151.
L - 2 - 2	3.9	*****	5.1	33.2	190.	11.	60.	46.0	****	4.0	16.8	138.
L - 2 - 3	4.4	*****	*****	36.8	152.	96.	55.	52.4	****	8.5	21.6	158.
L - 2 - 4	2.5	*****	5.1	35.6	118.	11.	60.	49.0	****	5.0	19.0	143.
L - 2 - 5	4.5	*****	11.2	36.1	133.	14.	65.	48.2	8.	4.0	18.6	144.
L - 2 - 6	5.8	*****	3.4	40.9	142.	11.	65.	56.8	****	6.0	20.1	160.
L - 2 - 7	5.7	*****	13.0	36.8	137.	16.	65.	55.3	9.	4.0	20.9	152.
L - 2 - 8	4.4	*****	11.1	36.4	156.	46.	60.	65.4	****	10.0	22.6	149.
L - 2 - 9	4.6	7.4	12.8	25.8	151.	13.	45.	67.1	10.	6.0	20.0	113.
L - 2 - 10	4.4	7.6	11.1	26.5	148.	13.	40.	67.0	11.	5.5	19.7	105.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
L - 2 - 11	3.5	*****	16.0	23.7	158.	90.	35.	64.9	****	11.0	20.4	90.
L - 2 - 12	3.4	7.3	11.7	19.1	148.	12.	20.	59.8	12.	6.0	19.3	71.
L - 2 - 13	3.3	8.5	14.9	18.4	147.	15.	30.	59.4	14.	6.5	20.3	68.
L - 2 - 14	2.5	11.0	12.8	16.3	123.	14.	15.	58.0	13.	7.5	18.9	59.
L - 2 - 15	1.9	*****	*****	18.0	85.	****	30.	61.0	****	2.0	20.6	48.
L - 2 - 16	2.3	10.1	11.8	16.2	85.	15.	20.	61.3	14.	6.0	19.2	59.
L - 2 - 17	1.9	*****	5.0	17.1	118.	12.	15.	71.0	****	6.0	21.2	58.
L - 2 - 18	1.4	11.7	13.0	15.7	104.	15.	10.	71.1	15.	6.0	19.7	59.
L - 2 - 19	1.6	10.0	12.8	15.5	99.	13.	10.	67.4	13.	6.0	17.9	53.
L - 2 - 20	1.6	9.1	11.8	15.7	109.	15.	15.	68.2	13.	6.0	18.8	53.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
L - 1 - 1	*****	*****	70.4	L - 2 - 1	28.70	0.77	****	L - 2 - 11	21.67	0.79	****
L - 1 - 2	*****	*****	66.6	L - 2 - 2	28.59	0.63	65.1	L - 2 - 12	25.30	0.83	52.0
L - 1 - 3	*****	*****	57.1	L - 2 - 3	22.05	0.36	****	L - 2 - 13	23.00	0.67	43.4
L - 1 - 4	*****	*****	66.2	L - 2 - 4	28.11	0.65	65.0	L - 2 - 14	24.06	0.74	****
L - 1 - 5	*****	*****	63.0	L - 2 - 5	25.37	0.71	****	L - 2 - 15	19.08	0.66	****
L - 1 - 6	*****	*****	59.0	L - 2 - 6	24.69	0.62	56.1	L - 2 - 16	23.61	0.73	****
L - 1 - 7	*****	*****	60.0	L - 2 - 7	28.95	0.85	59.0	L - 2 - 17	18.90	0.59	****
L - 1 - 8	*****	*****	61.0	L - 2 - 8	22.16	0.63	55.8	L - 2 - 18	23.70	0.99	53.5
L - 1 - 9	*****	*****	62.8	L - 2 - 9	26.47	0.93	49.0	L - 2 - 19	22.90	0.85	49.0
L - 1 - 10	*****	*****	59.4	L - 2 - 10	24.62	0.85	47.0	L - 2 - 20	20.30	0.73	****

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
L - 1 - 1	0.1831	0.1675	0.2695	0.1815	0.1273	0.0700	0.1942	0.5839	0.0902	0.1914
L - 1 - 2	0.2010	0.1625	0.1901	0.1995	0.1489	0.0711	0.1884	0.5545	0.0943	0.2105
L - 1 - 3	0.2305	0.1648	0.1760	0.2766	0.1780	0.0741	0.1957	0.5295	0.0991	0.2593
L - 1 - 4	0.1901	0.1565	0.1741	0.1842	0.1251	0.0707	0.1894	0.6152	0.0902	0.2198
L - 1 - 5	0.2215	0.1899	0.1717	0.2223	0.1692	0.0756	0.1904	0.5920	0.1017	0.2019
L - 1 - 6	0.2360	0.1912	0.1715	0.2261	0.1762	0.0757	0.1947	0.5714	0.1022	0.2191
L - 1 - 7	0.2568	0.1839	0.1803	0.2435	0.2123	0.0809	0.2028	0.5295	0.1084	0.2500
L - 1 - 8	0.2269	0.1674	0.1663	0.2136	0.1577	0.0745	0.1964	0.5375	0.0974	0.2198
L - 1 - 9	0.2221	0.1537	0.1587	0.2098	0.1568	0.0718	0.1925	0.4920	0.1020	0.2173
L - 1 - 10	0.2455	0.1531	0.1592	0.2321	0.1877	0.0771	0.1999	0.4661	0.1044	0.2519

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
L - 2 - 1	0.0993	0.1122	0.1813	0.1027	0.0643	0.0495	0.1368	0.3661	0.0616	0.1235
L - 2 - 2	0.1285	0.1273	0.1762	0.1348	0.1035	0.0616	0.1738	0.5893	0.0652	0.1543
L - 2 - 3	0.1397	0.1312	0.1836	0.1603	0.0881	0.0561	0.1792	0.5893	0.0685	*******
L - 2 - 4	0.1380	0.1282	0.1693	0.1386	0.0740	0.0580	0.1700	0.5714	0.0726	0.1481
L - 2 - 5	0.1480	0.1292	0.1635	0.1478	0.0837	0.0559	0.1651	0.6304	0.0762	0.1432
L - 2 - 6	0.1697	0.1452	0.1502	0.1560	0.0947	0.0608	0.1703	0.6161	0.0823	0.1790
L - 2 - 7	0.1805	0.1559	0.1423	0.1734	0.1141	0.0639	0.1665	0.6723	0.0931	0.1809
L - 2 - 8	0.1976	0.1569	0.1351	0.1804	0.1189	0.0692	0.1756	0.6607	0.0967	0.1852
L - 2 - 9	0.2128	0.1478	0.1253	0.1957	0.1529	0.0647	0.1739	0.5598	0.0944	0.1864
L - 2 - 10	0.2056	0.1342	0.1225	0.1870	0.1432	0.0639	0.1785	0.5313	0.0997	0.2037

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
L - 2 - 11	0.1891	0.1139	0.1062	0.1435	0.1150	0.0552	0.1747	0.4286	0.0829	0.1728
L - 2 - 12	0.1849	0.1020	0.1029	0.1484	0.1242	0.0519	0.1694	0.5098	0.0768	0.1858
L - 2 - 13	0.1803	0.1023	0.1020	0.1408	0.1101	0.0525	0.1736	0.4679	0.0759	0.1673
L - 2 - 14	0.1767	0.0954	0.1002	0.1402	0.1084	0.0510	0.1756	0.5241	0.0709	0.1679
L - 2 - 15	0.1894	0.0882	0.1096	0.1391	0.1040	0.0466	0.1724	0.5179	0.0727	0.1975
L - 2 - 16	0.1839	0.0918	0.1019	0.1451	0.1167	0.0524	0.1777	0.5223	0.0732	0.2025
L - 2 - 17	0.1982	0.0949	0.0997	0.1495	0.1256	0.0542	0.1791	0.5446	0.0805	0.1975
L - 2 - 18	0.2048	0.0920	0.1095	0.1707	0.1449	0.0581	0.1852	0.5000	0.0867	0.2148
L - 2 - 19	0.2051	0.0906	0.1002	0.1728	0.1480	0.0534	0.1753	0.5500	0.0771	0.1926
L - 2 - 20	0.2090	0.0910	0.1025	0.1668	0.1467	0.0538	0.1787	0.5625	0.0783	0.1852

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
L - 1 - 1	*****	*****	70.4	L - 2 - 1	28.70	0.77	****	L - 2 - 11	21.67	0.79	****
L - 1 - 2	*****	*****	66.6	L - 2 - 2	28.59	0.63	65.1	L - 2 - 12	25.30	0.83	52.0
L - 1 - 3	*****	*****	57.1	L - 2 - 3	22.05	0.36	****	L - 2 - 13	23.00	0.67	43.4
L - 1 - 4	*****	*****	66.2	L - 2 - 4	28.11	0.65	65.0	L - 2 - 14	24.06	0.74	****
L - 1 - 5	*****	*****	63.0	L - 2 - 5	25.37	0.71	****	L - 2 - 15	19.08	0.66	****
L - 1 - 6	*****	*****	59.0	L - 2 - 6	24.69	0.62	56.1	L - 2 - 16	23.61	0.73	****
L - 1 - 7	*****	*****	60.0	L - 2 - 7	28.95	0.85	59.0	L - 2 - 17	18.90	0.59	****
L - 1 - 8	*****	*****	61.0	L - 2 - 8	22.16	0.63	55.8	L - 2 - 18	23.70	0.99	53.5
L - 1 - 9	*****	*****	62.8	L - 2 - 9	26.47	0.93	49.0	L - 2 - 19	22.90	0.85	49.0
L - 1 - 10	*****	*****	59.4	L - 2 - 10	24.62	0.85	47.0	L - 2 - 20	20.30	0.73	****

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
L - 1 - 1	******	*******	0.1642	0.4279	*******	0.137	5.769	0.1636	1.444	1.522	0.1393	1.8303
L - 1 - 2	******	*******	0.1484	0.4082	*******	0.142	3.462	0.1766	1.457	1.522	0.1426	1.4803
L - 1 - 3	******	*******	0.1472	0.3574	*******	0.127	1.923	0.1992	1.728	1.739	0.1440	1.2487
L - 1 - 4	******	*******	0.1387	0.4741	*******	0.149	4.231	0.1614	1.272	1.522	0.1487	1.8039
L - 1 - 5	******	*******	0.1397	0.4378	*******	0.149	4.231	0.1903	1.432	1.522	0.1564	1.7974
L - 1 - 6	******	*******	0.1489	0.3688	*******	0.138	2.692	0.1993	1.481	1.739	0.1564	1.5724
L - 1 - 7	******	*******	0.1539	0.3294	*******	0.117	1.154	0.2219	1.556	1.957	0.1569	1.2513
L - 1 - 8	******	0.1759	0.1544	0.3391	*******	0.123	1.154	0.1891	2.074	2.391	0.1540	1.1434
L - 1 - 9	******	*******	0.1521	0.3063	*******	0.114	1.154	0.1889	1.444	2.174	0.1487	1.0539
L - 1 - 10	******	*******	0.1664	0.2999	*******	0.121	1.154	0.2136	1.679	2.391	0.1563	0.9539

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
L - 2 - 1	1.667	*******	0.0303	0.5265	0.6047	0.147	5.385	0.1052	******	0.870	0.1147	1.9895
L - 2 - 2	2.167	*******	0.0418	0.4882	2.2093	0.112	4.615	0.1198	******	1.739	0.1235	1.8105
L - 2 - 3	2.444	*******	*******	0.5412	1.7674	0.973	4.231	0.1365	******	3.696	0.1588	2.0789
L - 2 - 4	1.389	*******	0.0418	0.5235	1.3721	0.111	4.615	0.1276	******	2.174	0.1397	1.8855
L - 2 - 5	2.500	*******	0.0920	0.5315	1.5465	0.143	5.000	0.1255	1.025	1.739	0.1368	1.8947
L - 2 - 6	3.222	*******	0.0279	0.6015	1.6512	0.108	5.000	0.1479	******	2.609	0.1478	2.1105
L - 2 - 7	3.167	*******	0.1062	0.5409	1.5930	0.164	5.000	0.1440	1.086	1.739	0.1537	1.9934
L - 2 - 8	2.444	*******	0.0910	0.5353	1.8140	0.465	4.615	0.1703	******	4.348	0.1662	1.9553
L - 2 - 9	2.556	0.2552	0.1052	0.3800	1.7558	0.132	3.462	0.1749	1.247	2.609	0.1471	1.4816
L - 2 - 10	2.444	0.2621	0.0906	0.3894	1.7209	0.132	3.077	0.1746	1.333	2.391	0.1450	1.3776

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
L - 2 - 11	1.944	*******	0.1311	0.3485	1.8372	0.904	2.692	0.1690	******	4.783	0.1500	1.2421
L - 2 - 12	1.889	0.2517	0.0957	0.2816	1.7209	0.124	1.538	0.1556	1.432	2.609	0.1422	0.9276
L - 2 - 13	1.833	0.2931	0.1221	0.2706	1.7093	0.155	2.308	0.1548	1.728	2.826	0.1492	0.9000
L - 2 - 14	1.389	0.3793	0.1047	0.2400	1.4302	0.142	1.154	0.1510	1.630	3.261	0.1389	0.7711
L - 2 - 15	1.056	*******	*******	0.2647	0.9884	******	2.308	0.1599	******	0.870	0.1515	0.6342
L - 2 - 16	1.278	0.3483	0.0964	0.2381	0.9884	0.149	1.538	0.1597	1.704	2.609	0.1410	0.7697
L - 2 - 17	1.056	*******	0.0410	0.2515	1.3721	0.117	1.154	0.1849	******	2.609	0.1559	0.7592
L - 2 - 18	0.778	0.4034	0.1063	0.2304	1.2093	0.154	0.769	0.1852	1.815	2.609	0.1450	0.7697
L - 2 - 19	0.889	0.3448	0.1045	0.2276	1.1512	0.128	0.769	0.1754	1.617	2.609	0.1315	0.7013
L - 2 - 20	0.889	0.3138	0.0968	0.2315	1.2674	0.146	1.154	0.1775	1.556	2.609	0.1379	0.7000

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
L - 1 - 1	*****	*****	70.4	L - 2 - 1	28.70	0.77	****	L - 2 - 11	21.67	0.79	****
L - 1 - 2	*****	*****	66.6	L - 2 - 2	28.59	0.63	65.1	L - 2 - 12	25.30	0.83	52.0
L - 1 - 3	*****	*****	57.1	L - 2 - 3	22.05	0.36	****	L - 2 - 13	23.00	0.67	43.4
L - 1 - 4	*****	*****	66.2	L - 2 - 4	28.11	0.65	65.0	L - 2 - 14	24.06	0.74	****
L - 1 - 5	*****	*****	63.0	L - 2 - 5	25.37	0.71	****	L - 2 - 15	19.08	0.66	****
L - 1 - 6	*****	*****	59.0	L - 2 - 6	24.69	0.62	56.1	L - 2 - 16	23.61	0.73	****
L - 1 - 7	*****	*****	60.0	L - 2 - 7	28.95	0.85	59.0	L - 2 - 17	18.90	0.59	****
L - 1 - 8	*****	*****	61.0	L - 2 - 8	22.16	0.63	55.8	L - 2 - 18	23.70	0.99	53.5
L - 1 - 9	*****	*****	62.8	L - 2 - 9	26.47	0.93	49.0	L - 2 - 19	22.90	0.85	49.0
L - 1 - 10	*****	*****	59.4	L - 2 - 10	24.62	0.85	47.0	L - 2 - 20	20.30	0.73	****

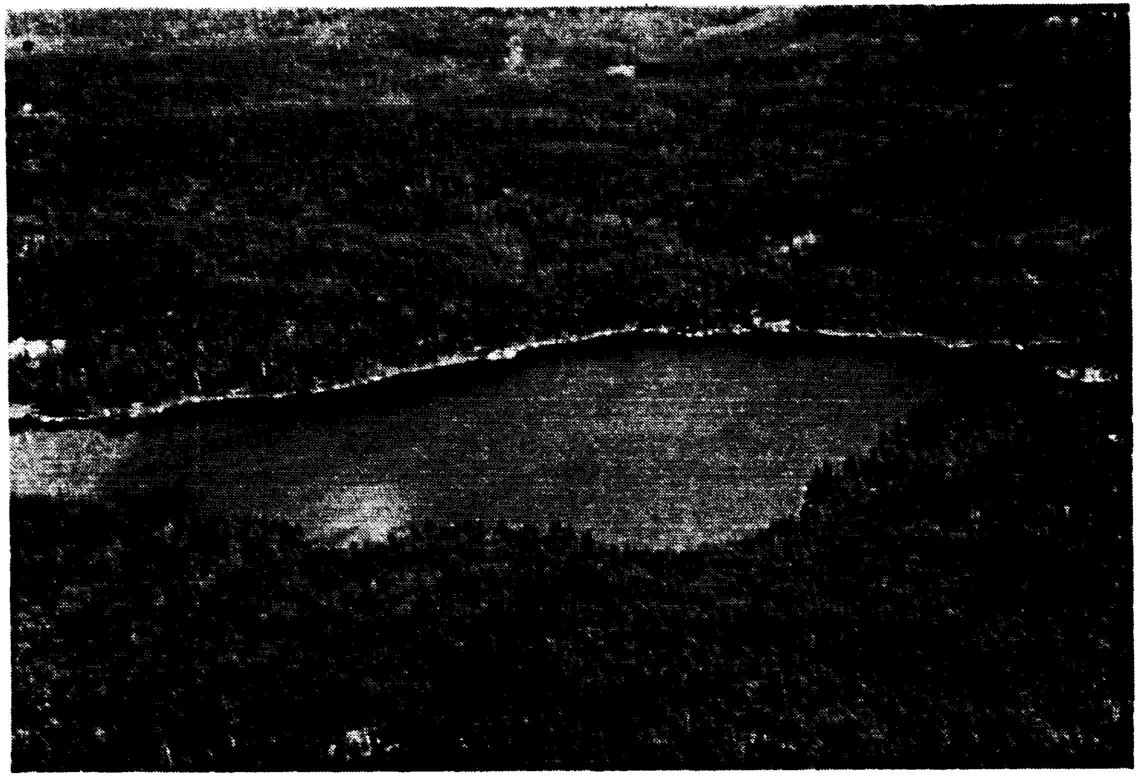
LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake M

pH 6·9

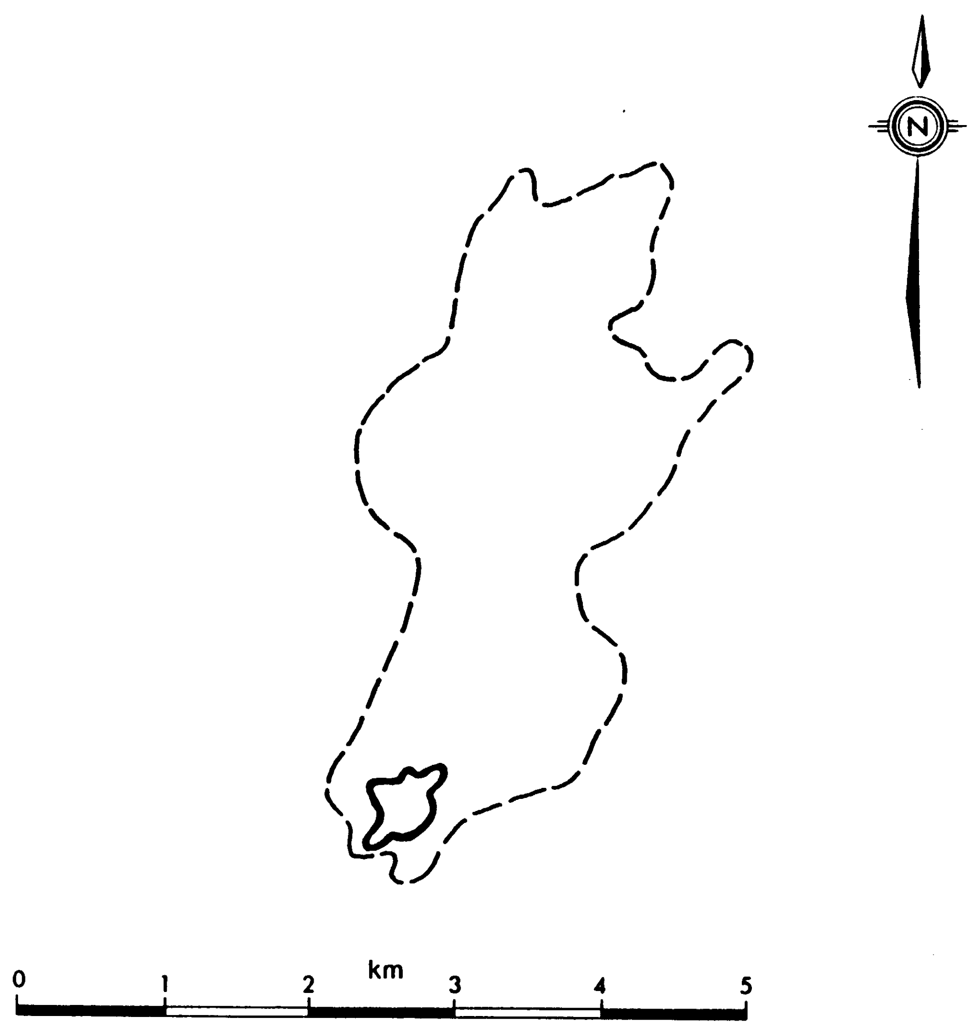
GENERAL SETTING

M - 2



GENERAL DESCRIPTION

Lake M is a rock basin of relatively simple morphometry. There is some muskeg development at the north end of the lake. Surficial deposits are discontinuous in the comparatively large watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-633649/5444806
Elevation of lake above sea level	397.5 m (1325 ft)
Lake depth at sampling point	6.5 m
Lake area	.25 sq km
Lake catchment area	6.5 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	5
Distance from south end of sampling strip	68 km

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY
	Holopedium gibberum		8.0
	Bosmina longirostris		0.1
	Daphnia pulex		0.7
		Total	8.8

COPEPODS	SPECIES NAME		DENSITY
	Diaptomus minutus		0.4
	Mesocyclops edax		0.2
		Total	0.6

ROTIFERS	SPECIES NAME		DENSITY
	Asplanchna sp.		0.8
	Conochilus sp.		2.2
	Asplanchna preodonta		1.2
	Kellicotia longispina		0.6
	Polyarthra vulgaris		1.6
		Total	6.4

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Anabaena circinalis		4
	Microcystis aeruginosa		6
		(Average)	(5)

CHLOROPHYTA	SPECIES NAME		ABUNDANCE
	Gloeocystis gigas		2
	Staurastrum sp.		2
		(Average)	(2)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Tabellaria fenestrata		3
		(Average)	(3)

PYRROPHYTA	SPECIES NAME		ABUNDANCE
	Ceratium hirundinella		3
		(Average)	(3)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Chrysosphaerella longispina		6
	Dinobryon bavaricum		3
	Dinobryon divergens		4
	Synura sp.		2
		(Average)	(4)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY	RELATIVE ABUNDANCE (%)
Tabellaria fenestrata	84	4	15.8
Cyclotella comta	42	2	7.9
Melosira islandica	42	2	7.9
Navicula angustata	3	4	.57
Navicula tripunctata var schizonemoides	5	1	.94
Cyclotella bodanica	7	4	1.3
Tetracyclus lacustris	8	3	1.5
Achnanthes linearis	54	**	10.2
Fragilaria construens	8	2	1.5
Asterionella formosa	17	2	3.2
Melosira granulata	26	2	4.9
Cyclotella stelligera	92	4	17.4
Navicula vulpina	1	2	.19
Tabellaria flocculosa	26	3	4.9
Cymbella naviculiformis	3		.57
Navicula vanheurckii	1		.19
Nitzschia palea	6		1.1
Melosira distans var alpigena	1	3	.19
Navicula bicephala	1	4	.19
Pinnularia maior	2	4	.38
Navicula radiosa var parva	2	4	.38
Navicula pupula	2	4	.38
Achnanthes levanderi	10	4	1.9
Eunotia elegans	1	4	.19
Stauroneis phoenicenteron	2	4	.38
Navicula cryptocephala	3	2	.57
Pinnularia biceps	4	4	.76
Synedra miniscula	2		.38
Synedra tenera	3		.57
Pinnularia abaujensis var rostrata	2	4	.38
Pinnularia biceps var petersenii	3		.57
Cymbella minuta	3	4	.57
Pinnularia abaujensis var linearis	1	4	.19
Frustulia rhomboides var saxonica	1	3	.19
Cymbella cymbiformis	1	4	.19
Melosira distans	11		
Pinnularia hilseana	5		.94
Gomphonema cf novacula	1	2	.19
Anomoeoneis serians var brachysira	1	5	.19
Achnanthes linearis var pusilla	1	2	.19
Cymbella cuspidata	1	4	.19
Fragilaria sp	1		.19
Nedium iridis	1	4	.19
Anomoeoneis zellensis	1	5	.19
Nitzschia kutzingiana	1		.19
Nedium iridis var ampliatum	1	4	.19

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

** Blanks indicate species which had no published autecologcial information regarding their pH preferences.

Lake M's species richness was substantially lower than Lake L's, although its sediment diatom species richness was similar. Lake M was both smaller (0.25 km^2) and more steep-sided than L.

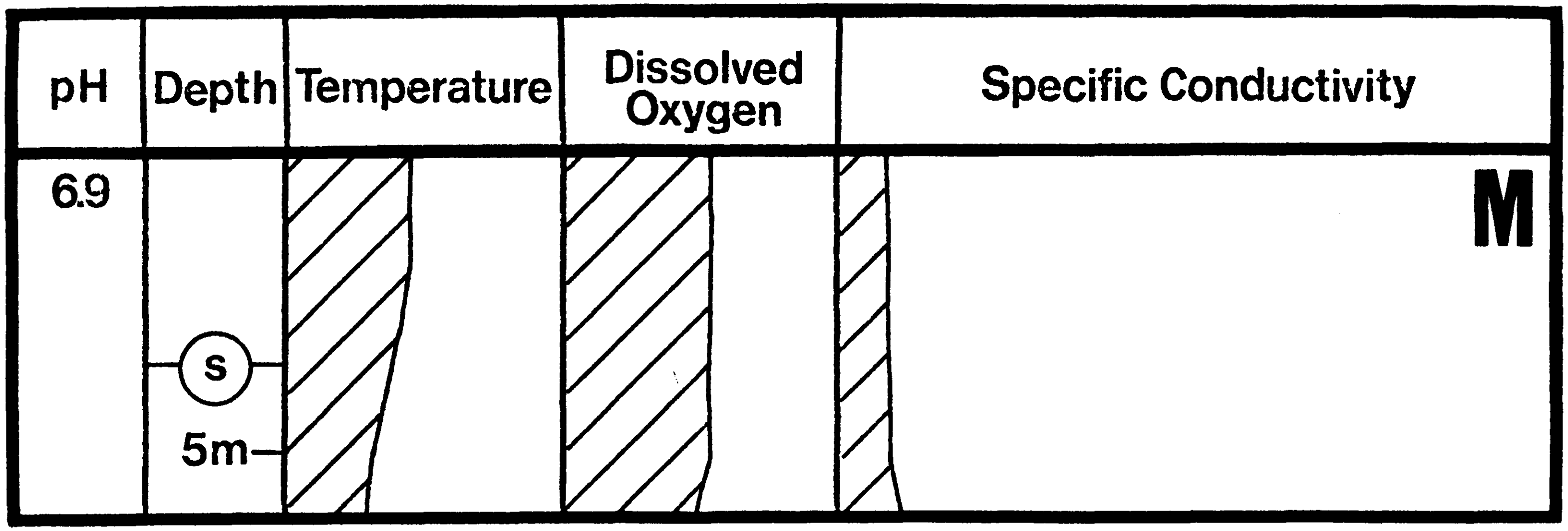
Lake M was weakly stratified thermally at 3m, indicating a fair degree of wind protection across its tiny area (only four lakes were smaller). The lake was quite clear (Secchi = 3.5m), and only 39% of its benthic sediment was lost on ignition. The gyttja extruded from the core taken from Lake M was coarser than average, due to its high percentage of coarse inorganic material. Pond weed (Potamogeton) was common in a small pond adjoining Lake M, but most of the lake's littoral vegetation was typified as muskeg.

DETAILS OF LAKE WATER CHEMISTRY

M - 6

Water Depth M	Secchi Depth M	Temperature ^oC	Dissolved Oxygen % Sat.	Specific Conductivity * (Micromhos/cm)
0		15.2	100	25
1		15.5	100	25
2		15.6	100	25
3	3.5	14.0	100	25
4		12.6	100	27
5		11.6	100	27
6		10.0	90	35

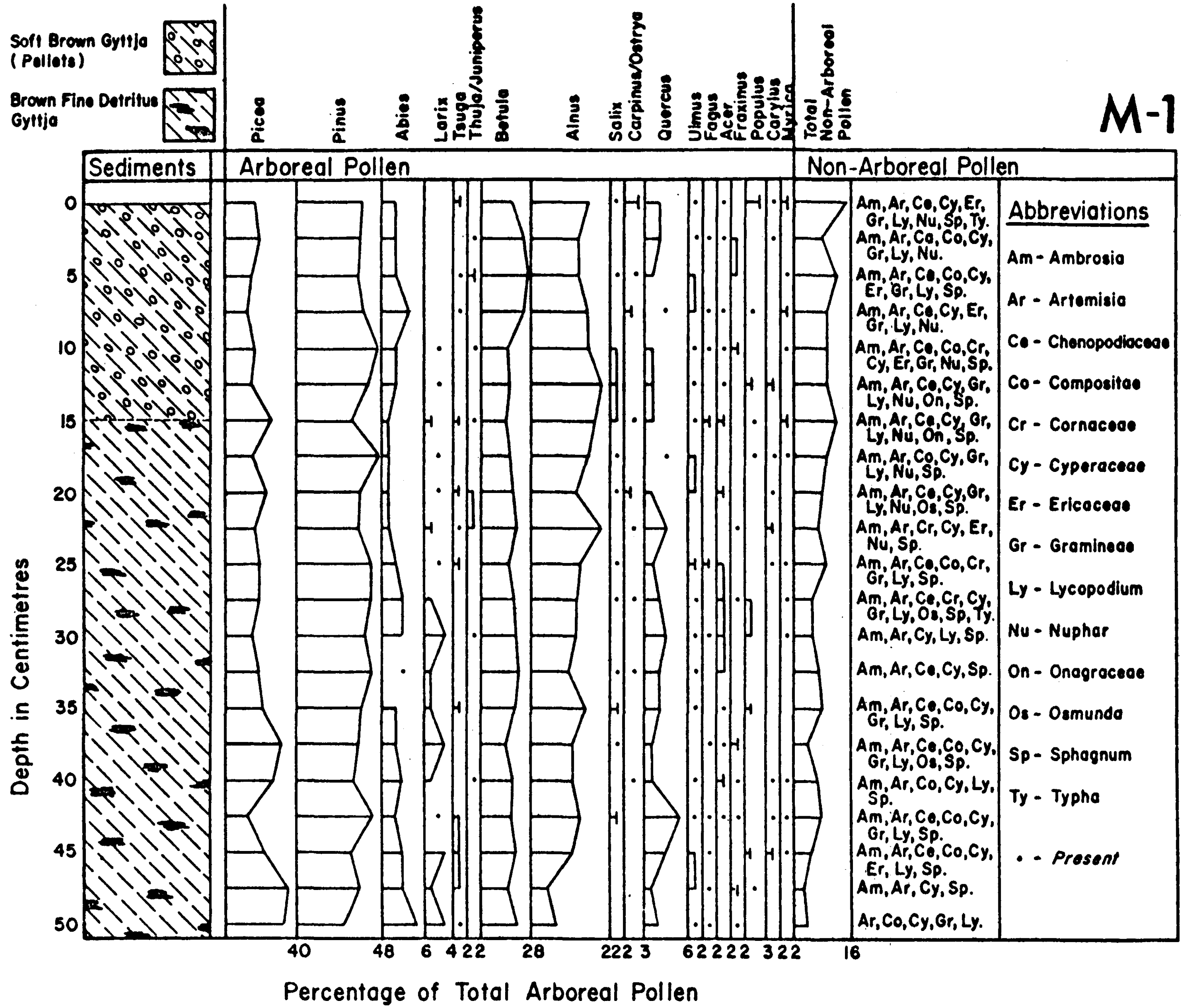
*Specific conductivity data are temperature-corrected (25^o C).



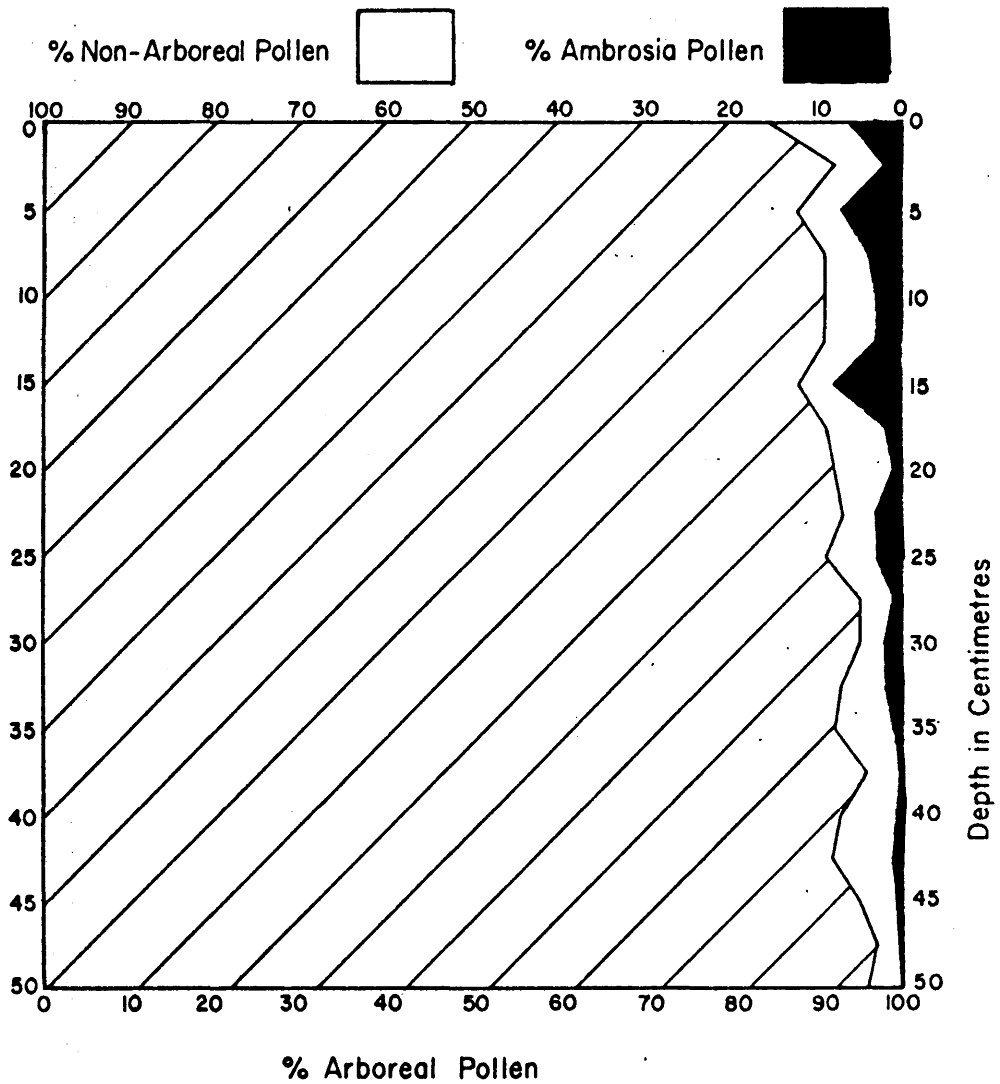
LAKE WATER CHEMISTRY PLOT
M - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE

M - 8



Regional forest composition is reflected well by the pollen diagram that contains a minor amount of southern pollen. The *Ambrosia* rise is rather indistinct, suggesting some mixing of lake bottom sediments.



AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
M - 1 - 1	******	******	*****	******	******	******	******	******	*****	****
M - 1 - 2	32600.	10240.	156.	8210.	7980.	3069.	10530.	1519.	975.	67.
M - 1 - 3	******	******	*****	******	******	******	******	******	*****	****
M - 1 - 4	35680.	10510.	151.	8990.	8850.	3292.	10990.	1569.	1018.	72.
M - 1 - 5	35470.	10670.	146.	8990.	8680.	3339.	10970.	1498.	1066.	70.
M - 1 - 6	36010.	10800.	159.	9040.	8830.	3324.	10910.	1424.	1044.	71.
M - 1 - 7	36610.	10860.	146.	9430.	9300.	3417.	11240.	1423.	1082.	79.
M - 1 - 8	36610.	10470.	145.	9350.	9560.	3359.	11380.	1390.	1051.	79.
M - 1 - 9	35500.	9967.	142.	8860.	9080.	3200.	11210.	1309.	952.	75.
M - 1 - 10	36790.	9925.	140.	9150.	9410.	3282.	11440.	1321.	1011.	79.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
M - 2 - 1	35510.	13650.	190.	9650.	9760.	3216.	11660.	1286.	992.	74.
M - 2 - 2	40780.	13310.	195.	11250.	11250.	3533.	12340.	1357.	1071.	81.
M - 2 - 3	40950.	13160.	193.	11250.	11360.	3546.	12230.	1321.	1108.	89.
M - 2 - 4	40340.	13130.	192.	11050.	11230.	3507.	11960.	1279.	1056.	80.
M - 2 - 5	40010.	13180.	191.	10810.	10970.	3520.	11870.	1288.	1096.	84.
M - 2 - 6	41500.	13260.	191.	11480.	11760.	3611.	12230.	1300.	1073.	81.
M - 2 - 7	40860.	12780.	188.	11290.	11580.	3549.	12160.	1271.	1058.	84.
M - 2 - 8	42810.	13340.	192.	11840.	12370.	3591.	12500.	1170.	1066.	87.
M - 2 - 9	46690.	12860.	193.	13490.	14730.	3590.	12930.	1001.	1036.	90.
M - 2 - 10	47200.	12380.	191.	13540.	14860.	3636.	13130.	988.	1067.	89.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
M - 1 - 11	37470.	9478.	142.	9330.	9730.	3317.	11590.	1320.	1023.	77.
M - 1 - 12	37630.	9239.	136.	9420.	9900.	3267.	11420.	1267.	1019.	83.
M - 1 - 13	38360.	9377.	136.	9620.	10060.	3307.	11620.	1263.	1041.	79.
M - 1 - 14	38270.	9362.	136.	9560.	10290.	3262.	11410.	1229.	1029.	81.
M - 1 - 15	39860.	9478.	136.	9890.	10610.	3250.	11270.	1238.	1000.	79.
M - 1 - 16	40580.	9993.	136.	9610.	10050.	3323.	11670.	1407.	1067.	83.
M - 1 - 17	41500.	10110.	135.	9720.	10200.	3311.	11570.	1437.	1044.	79.
M - 1 - 18	40790.	10050.	135.	9590.	10270.	3323.	11810.	1478.	1078.	77.
M - 1 - 19	41420.	10150.	136.	9770.	10750.	3377.	11950.	1511.	1074.	83.
M - 1 - 20	39410.	9727.	131.	9250.	9790.	3228.	11380.	1433.	1036.	77.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
M - 1 - 1	10.60	0.53	****	M - 2 - 1	*****	*****	44.6	M - 1 - 11	25.75	1.68	42.0
M - 1 - 2	13.92	1.17	20.5	M - 2 - 2	*****	*****	37.0	M - 1 - 12	28.22	1.85	40.9
M - 1 - 3	16.95	0.75	****	M - 2 - 3	*****	*****	37.6	M - 1 - 13	25.68	1.79	42.6
M - 1 - 4	21.95	1.49	43.8	M - 2 - 4	*****	*****	37.4	M - 1 - 14	25.58	1.88	40.6
M - 1 - 5	23.38	1.59	43.2	M - 2 - 5	*****	*****	36.8	M - 1 - 15	26.57	2.11	38.2
M - 1 - 6	25.67	1.76	42.4	M - 2 - 6	*****	*****	36.6	M - 1 - 16	27.72	2.10	40.3
M - 1 - 7	25.57	1.78	43.8	M - 2 - 7	*****	*****	37.6	M - 1 - 17	24.74	1.94	57.0
M - 1 - 8	27.75	1.93	42.1	M - 2 - 8	*****	*****	34.8	M - 1 - 18	29.10	2.25	41.2
M - 1 - 9	29.95	1.84	49.2	M - 2 - 9	*****	*****	32.0	M - 1 - 19	28.30	2.18	40.3
M - 1 - 10	29.85	1.85	41.0	M - 2 - 10	*****	*****	31.2	M - 1 - 20	24.24	2.08	40.3

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM
M - 11

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

M - 12

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
M - 1 - 1	4.4	*****	*****	*****	152.	****	****	******	****	****	*****	****
M - 1 - 2	5.0	11.6	22.9	16.7	161.	16.	55.	111.5	12.	11.5	24.1	91.
M - 1 - 3	5.0	*****	*****	*****	180.	****	****	******	****	****	*****	****
M - 1 - 4	4.9	12.2	24.7	18.2	180.	15.	60.	121.1	11.	33.5	25.5	90.
M - 1 - 5	4.5	10.4	24.4	18.0	185.	16.	60.	120.6	12.	13.0	25.8	91.
M - 1 - 6	4.3	10.3	24.3	18.0	190.	16.	55.	122.6	12.	13.0	25.8	87.
M - 1 - 7	5.5	9.6	25.2	17.2	142.	21.	45.	127.1	11.	13.0	24.0	84.
M - 1 - 8	4.5	11.6	16.9	16.5	156.	18.	35.	128.3	10.	14.5	22.8	76.
M - 1 - 9	3.3	11.7	27.3	16.0	151.	21.	25.	125.1	11.	16.0	21.4	65.
M - 1 - 10	2.6	9.8	26.8	15.8	142.	19.	20.	129.4	11.	15.5	21.7	60.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
M - 2 - 1	****	*****	24.6	13.1	*****	12.	45.	141.1	9.	8.0	22.1	60.
M - 2 - 2	****	*****	26.9	14.6	*****	14.	45.	161.5	10.	10.5	24.4	72.
M - 2 - 3	****	*****	27.1	15.2	*****	14.	50.	161.6	11.	8.5	24.8	79.
M - 2 - 4	****	*****	26.0	14.9	*****	14.	45.	159.9	10.	9.5	24.8	73.
M - 2 - 5	****	*****	26.3	15.2	*****	14.	45.	157.0	10.	10.5	24.8	72.
M - 2 - 6	****	*****	26.2	14.9	*****	14.	45.	165.2	11.	11.0	25.0	71.
M - 2 - 7	****	*****	27.0	14.8	*****	14.	45.	161.6	12.	13.0	24.8	77.
M - 2 - 8	****	*****	27.4	14.1	*****	13.	35.	171.9	12.	9.5	24.8	59.
M - 2 - 9	****	*****	26.8	12.0	*****	16.	15.	200.9	10.	9.0	23.3	50.
M - 2 - 10	****	*****	27.3	11.6	*****	12.	15.	202.1	9.	10.5	23.6	41.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
M - 1 - 11	2.5	11.7	26.0	15.3	147.	20.	15.	131.9	12.	15.5	21.7	57.
M - 1 - 12	2.0	10.9	19.8	14.8	138.	20.	15.	133.6	11.	16.0	21.4	53.
M - 1 - 13	1.8	11.7	12.1	15.0	115.	19.	15.	135.7	11.	18.0	21.9	53.
M - 1 - 14	1.5	10.9	17.4	14.3	115.	18.	10.	136.5	10.	16.5	21.7	50.
M - 1 - 15	1.1	6.3	27.0	14.4	124.	16.	15.	142.0	10.	16.5	21.4	48.
M - 1 - 16	1.0	9.6	28.9	15.3	106.	17.	10.	135.7	12.	22.0	22.8	54.
M - 1 - 17	1.0	6.0	27.5	15.9	110.	18.	5.	136.1	11.	19.5	22.7	49.
M - 1 - 18	1.0	11.4	24.5	15.6	115.	18.	10.	132.6	13.	15.0	23.6	51.
M - 1 - 19	1.0	11.3	26.1	15.7	133.	19.	10.	134.0	13.	16.5	23.8	48.
M - 1 - 20	1.0	8.9	26.7	15.3	124.	18.	10.	128.7	12.	17.5	22.8	45.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
M - 1 - 1	10.60	0.53	****	M - 2 - 1	*****	*****	44.6	M - 1 - 11	25.75	1.68	42.0
M - 1 - 2	13.92	1.17	20.5	M - 2 - 2	*****	*****	37.0	M - 1 - 12	28.22	1.85	40.9
M - 1 - 3	16.95	0.75	****	M - 2 - 3	*****	*****	37.6	M - 1 - 13	25.68	1.79	42.6
M - 1 - 4	21.95	1.49	43.8	M - 2 - 4	*****	*****	37.4	M - 1 - 14	25.58	1.88	40.6
M - 1 - 5	23.38	1.59	43.2	M - 2 - 5	*****	*****	36.8	M - 1 - 15	26.57	2.11	38.2
M - 1 - 6	25.67	1.76	42.4	M - 2 - 6	*****	*****	36.6	M - 1 - 16	27.72	2.10	40.3
M - 1 - 7	25.57	1.78	43.8	M - 2 - 7	*****	*****	37.6	M - 1 - 17	24.74	1.94	57.0
M - 1 - 8	27.75	1.93	42.1	M - 2 - 8	*****	*****	34.8	M - 1 - 18	29.10	2.25	41.2
M - 1 - 9	29.95	1.84	49.2	M - 2 - 9	*****	*****	32.0	M - 1 - 19	28.30	2.18	40.3
M - 1 - 10	29.85	1.85	41.0	M - 2 - 10	*****	*****	31.2	M - 1 - 20	24.24	2.08	40.3

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
M - 1 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
M - 1 - 2	0.3900	0.1646	0.1471	0.4462	0.3515	0.1110	0.2260	1.3562	0.1542	0.4154
M - 1 - 3	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
M - 1 - 4	0.4268	0.1690	0.1425	0.4886	0.3899	0.1191	0.2358	1.4009	0.1611	0.4444
M - 1 - 5	0.4243	0.1715	0.1381	0.4886	0.3824	0.1208	0.2354	1.3375	0.1687	0.4340
M - 1 - 6	0.4307	0.1736	0.1495	0.4913	0.3890	0.1203	0.2341	1.2714	0.1652	0.4395
M - 1 - 7	0.4379	0.1746	0.1380	0.5125	0.4097	0.1236	0.2412	1.2705	0.1712	0.4864
M - 1 - 8	0.4379	0.1683	0.1371	0.5082	0.4211	0.1215	0.2442	1.2411	0.1663	0.4864
M - 1 - 9	0.4246	0.1602	0.1342	0.4815	0.4000	0.1158	0.2406	1.1687	0.1506	0.4642
M - 1 - 10	0.4401	0.1596	0.1325	0.4973	0.4145	0.1187	0.2455	1.1795	0.1600	0.4864

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
M - 2 - 1	0.4248	0.2195	0.1792	0.5245	0.4300	0.1164	0.2502	1.1482	0.1569	0.4543
M - 2 - 2	0.4878	0.2140	0.1841	0.6114	0.4956	0.1278	0.2648	1.2116	0.1695	0.5025
M - 2 - 3	0.4898	0.2116	0.1824	0.6114	0.5004	0.1283	0.2624	1.1795	0.1753	0.5463
M - 2 - 4	0.4825	0.2111	0.1808	0.6005	0.4947	0.1269	0.2567	1.1420	0.1671	0.4914
M - 2 - 5	0.4786	0.2119	0.1804	0.5875	0.4833	0.1274	0.2547	1.1500	0.1734	0.5160
M - 2 - 6	0.4964	0.2132	0.1803	0.6239	0.5181	0.1306	0.2624	1.1607	0.1698	0.4969
M - 2 - 7	0.4888	0.2055	0.1777	0.6136	0.5101	0.1284	0.2609	1.1348	0.1674	0.5167
M - 2 - 8	0.5121	0.2145	0.1809	0.6435	0.5449	0.1299	0.2682	1.0446	0.1687	0.5352
M - 2 - 9	0.5585	0.2068	0.1821	0.7332	0.6489	0.1299	0.2775	0.8937	0.1639	0.5580
M - 2 - 10	0.5646	0.1990	0.1803	0.7359	0.6546	0.1315	0.2818	0.8821	0.1688	0.5469

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
M - 1 - 11	0.4482	0.1524	0.1339	0.5071	0.4286	0.1200	0.2487	1.1786	0.1619	0.4778
M - 1 - 12	0.4501	0.1485	0.1285	0.5120	0.4361	0.1182	0.2451	1.1312	0.1612	0.5093
M - 1 - 13	0.4589	0.1508	0.1284	0.5228	0.4432	0.1196	0.2494	1.1277	0.1647	0.4870
M - 1 - 14	0.4578	0.1505	0.1278	0.5196	0.4533	0.1180	0.2448	1.0973	0.1628	0.4975
M - 1 - 15	0.4768	0.1524	0.1283	0.5375	0.4674	0.1176	0.2418	1.1054	0.1582	0.4870
M - 1 - 16	0.4854	0.1607	0.1287	0.5223	0.4427	0.1202	0.2504	1.2562	0.1688	0.5123
M - 1 - 17	0.4964	0.1625	0.1275	0.5283	0.4493	0.1198	0.2483	1.2830	0.1652	0.4901
M - 1 - 18	0.4879	0.1616	0.1275	0.5212	0.4524	0.1202	0.2534	1.3196	0.1706	0.4722
M - 1 - 19	0.4955	0.1632	0.1280	0.5310	0.4736	0.1222	0.2564	1.3491	0.1699	0.5093
M - 1 - 20	0.4714	0.1564	0.1233	0.5027	0.4313	0.1168	0.2442	1.2795	0.1639	0.4753

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
M - 1 - 1	10.60	0.53	****	M - 2 - 1	*****	*****	44.6	M - 1 - 11	25.75	1.68	42.0
M - 1 - 2	13.92	1.17	20.5	M - 2 - 2	*****	*****	37.0	M - 1 - 12	28.22	1.85	40.9
M - 1 - 3	16.95	0.75	****	M - 2 - 3	*****	*****	37.6	M - 1 - 13	25.68	1.79	42.6
M - 1 - 4	21.95	1.49	43.8	M - 2 - 4	*****	*****	37.4	M - 1 - 14	25.58	1.88	40.6
M - 1 - 5	23.38	1.59	43.2	M - 2 - 5	*****	*****	36.8	M - 1 - 15	26.57	2.11	38.2
M - 1 - 6	25.67	1.76	42.4	M - 2 - 6	*****	*****	36.6	M - 1 - 16	27.72	2.10	40.3
M - 1 - 7	25.57	1.78	43.8	M - 2 - 7	*****	*****	37.6	M - 1 - 17	24.74	1.94	57.0
M - 1 - 8	27.75	1.93	42.1	M - 2 - 8	*****	*****	34.8	M - 1 - 18	29.10	2.25	41.2
M - 1 - 9	29.95	1.84	49.2	M - 2 - 9	*****	*****	32.0	M - 1 - 19	28.30	2.18	40.3
M - 1 - 10	29.85	1.85	41.0	M - 2 - 10	*****	*****	31.2	M - 1 - 20	24.24	2.08	40.3

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
M - 1 - 1	2.444	*******	*******	*******	1.7674	******	******	********	******	******	*******	*******
M - 1 - 2	2.778	0.4000	0.1878	0.2453	1.8721	0.160	4.231	0.2904	1.420	5.000	0.1771	1.1921
M - 1 - 3	2.778	*******	*******	*******	2.0930	******	******	********	******	******	*******	*******
M - 1 - 4	2.722	0.4207	0.2022	0.2679	2.0930	0.152	4.615	0.3154	1.383	14.565	0.1874	1.1829
M - 1 - 5	2.500	0.3586	0.2004	0.2651	2.1512	0.163	4.615	0.3141	1.481	5.652	0.1895	1.1947
M - 1 - 6	2.389	0.3552	0.1993	0.2641	2.2093	0.162	4.231	0.3193	1.457	5.652	0.1895	1.1461
M - 1 - 7	3.056	0.3310	0.2066	0.2525	1.6512	0.208	3.462	0.3310	1.346	5.652	0.1767	1.1066
M - 1 - 8	2.500	0.4000	0.1386	0.2425	1.8140	0.181	2.692	0.3341	1.259	6.304	0.1676	1.0000
M - 1 - 9	1.833	0.4034	0.2236	0.2351	1.7558	0.211	1.923	0.3258	1.370	6.957	0.1576	0.8526
M - 1 - 10	1.444	0.3379	0.2200	0.2316	1.6512	0.190	1.538	0.3370	1.358	6.739	0.1596	0.7829

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
M - 2 - 1	******	*******	0.2016	0.1928	*******	0.121	3.462	0.3674	1.148	3.478	0.1629	0.7895
M - 2 - 2	******	*******	0.2209	0.2141	*******	0.142	3.462	0.4206	1.185	4.565	0.1794	0.9487
M - 2 - 3	******	*******	0.2217	0.2238	*******	0.142	3.846	0.4208	1.358	3.696	0.1825	1.0408
M - 2 - 4	******	*******	0.2130	0.2190	*******	0.136	3.462	0.4164	1.247	4.130	0.1826	0.9645
M - 2 - 5	******	*******	0.2155	0.2240	*******	0.140	3.462	0.4089	1.272	4.565	0.1826	0.9513
M - 2 - 6	******	*******	0.2149	0.2188	*******	0.142	3.462	0.4302	1.383	4.783	0.1840	0.9303
M - 2 - 7	******	*******	0.2214	0.2172	*******	0.137	3.462	0.4208	1.519	5.652	0.1825	1.0079
M - 2 - 8	******	*******	0.2243	0.2074	*******	0.135	2.692	0.4477	1.494	4.130	0.1824	0.7763
M - 2 - 9	******	*******	0.2199	0.1762	*******	0.157	1.154	0.5232	1.272	3.913	0.1715	0.6539
M - 2 - 10	******	*******	0.2238	0.1713	*******	0.124	1.154	0.5263	1.062	4.565	0.1737	0.5368

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
M - 1 - 11	1.389	0.4034	0.2134	0.2251	1.7093	0.198	1.154	0.3435	1.444	6.739	0.1596	0.7447
M - 1 - 12	1.111	0.3759	0.1619	0.2171	1.6047	0.202	1.154	0.3479	1.383	6.957	0.1576	0.6974
M - 1 - 13	1.000	0.4034	0.0990	0.2207	1.3372	0.187	1.154	0.3534	1.346	7.826	0.1607	0.6947
M - 1 - 14	0.833	0.3759	0.1427	0.2107	1.3372	0.180	0.769	0.3555	1.222	7.174	0.1598	0.6539
M - 1 - 15	0.611	0.2172	0.2210	0.2125	1.4419	0.166	1.154	0.3698	1.222	7.174	0.1576	0.6329
M - 1 - 16	0.556	0.3310	0.2371	0.2243	1.2326	0.172	0.769	0.3534	1.469	9.565	0.1676	0.7066
M - 1 - 17	0.556	0.2069	0.2252	0.2343	1.2791	0.186	0.385	0.3544	1.395	8.478	0.1666	0.6487
M - 1 - 18	0.556	0.3931	0.2005	0.2296	1.3372	0.179	0.769	0.3453	1.617	6.522	0.1737	0.6697
M - 1 - 19	0.556	0.3897	0.2137	0.2304	1.5465	0.193	0.769	0.3490	1.605	7.174	0.1746	0.6276
M - 1 - 20	0.556	0.3069	0.2186	0.2251	1.4419	0.180	0.769	0.3352	1.444	7.609	0.1679	0.5974

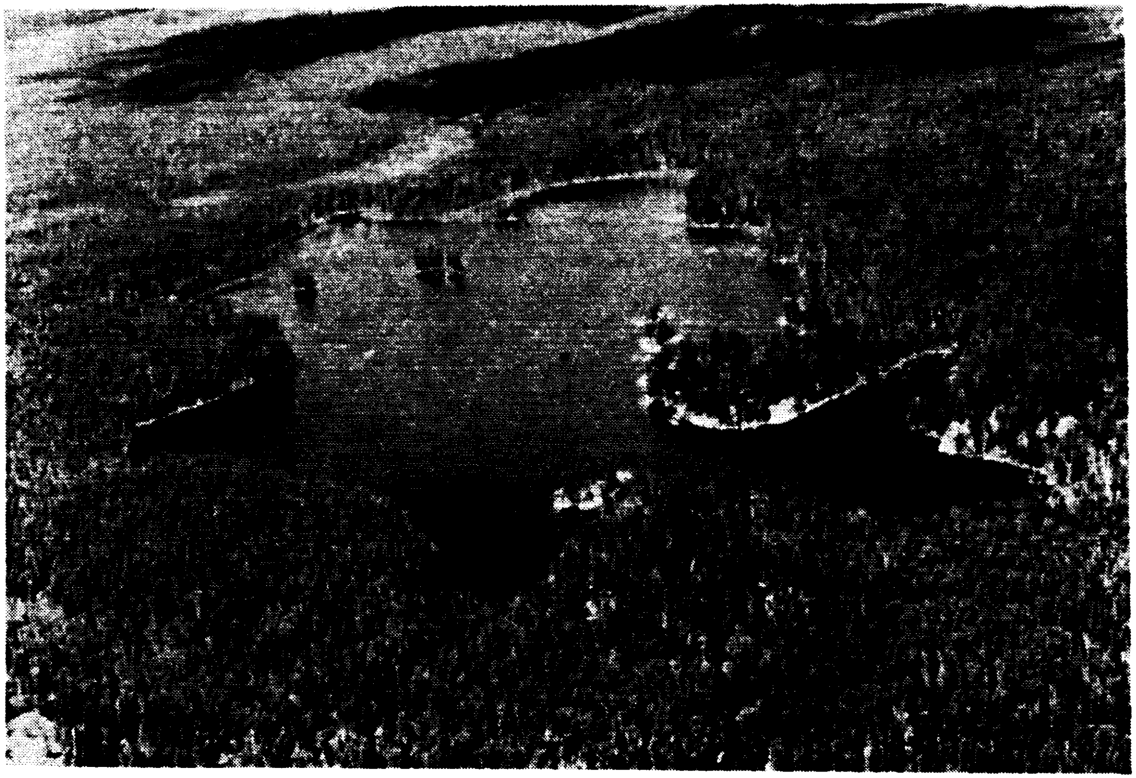
SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
M - 1 - 1	10.60	0.53	****	M - 2 - 1	*****	*****	44.6	M - 1 - 11	25.75	1.68	42.0
M - 1 - 2	13.92	1.17	20.5	M - 2 - 2	*****	*****	37.0	M - 1 - 12	28.22	1.85	40.9
M - 1 - 3	16.95	0.75	****	M - 2 - 3	*****	*****	37.6	M - 1 - 13	25.68	1.79	42.6
M - 1 - 4	21.95	1.49	43.8	M - 2 - 4	*****	*****	37.4	M - 1 - 14	25.58	1.88	40.6
M - 1 - 5	23.38	1.59	43.2	M - 2 - 5	*****	*****	36.8	M - 1 - 15	26.57	2.11	38.2
M - 1 - 6	25.67	1.76	42.4	M - 2 - 6	*****	*****	36.6	M - 1 - 16	27.72	2.10	40.3
M - 1 - 7	25.57	1.78	43.8	M - 2 - 7	*****	*****	37.6	M - 1 - 17	24.74	1.94	57.0
M - 1 - 8	27.75	1.93	42.1	M - 2 - 8	*****	*****	34.8	M - 1 - 18	29.10	2.25	41.2
M - 1 - 9	29.95	1.84	49.2	M - 2 - 9	*****	*****	32.0	M - 1 - 19	28.30	2.18	40.3
M - 1 - 10	29.85	1.85	41.0	M - 2 - 10	*****	*****	31.2	M - 1 - 20	24.24	2.08	40.3

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake N

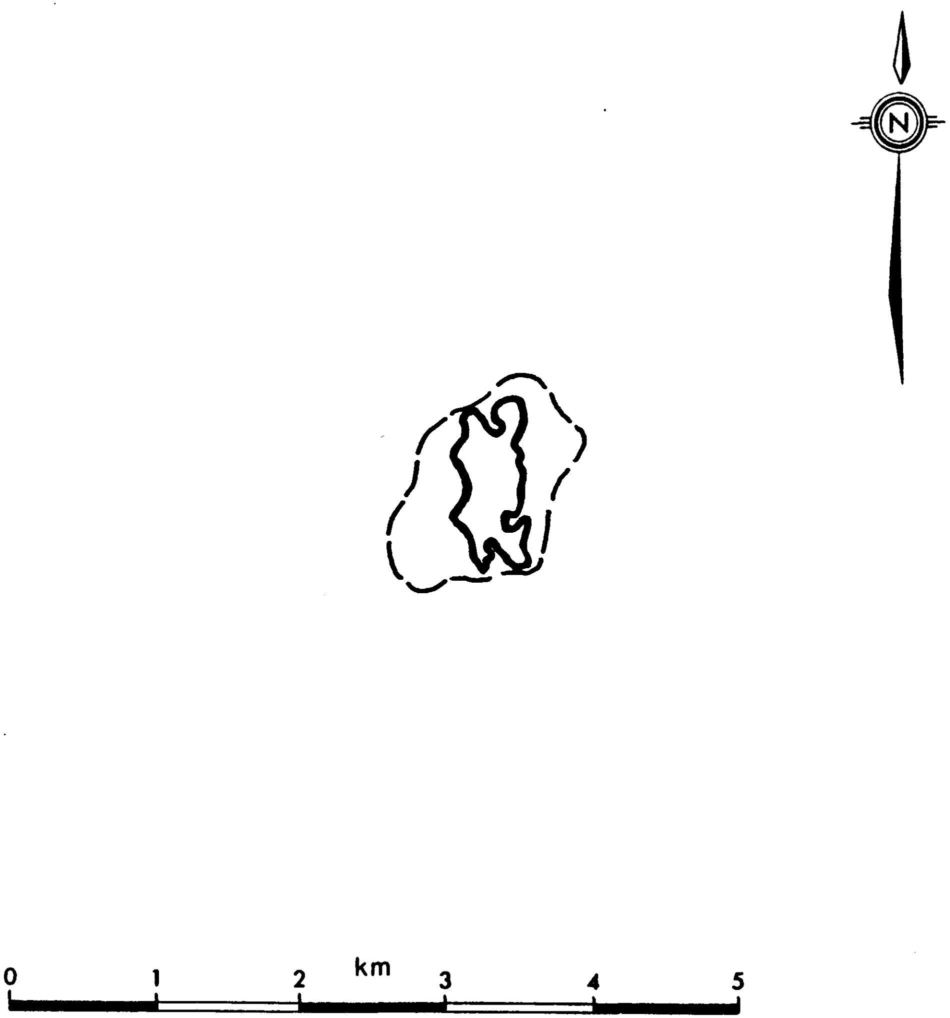
pH 6·7

GENERAL SETTING



GENERAL DESCRIPTION

Lake N is a rock basin with a complex shoreline configuration and morphometry. It has several rock islands, and floating muskeg in bays along the west side. The watershed is very small and surficial deposits are of minor importance.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-671286/5435058
Elevation of lake above sea level	432 m (1440 ft)
Lake depth at sampling point	7.0 m
Lake area	.4 sq km
Lake catchment area	1.25 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	1
Distance from south end of sampling strip	74 km

LAKE MICROBIOTA

N - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY
	Holopedium gibberum		0.9
	Bosmina longirostris		0.6
	Daphnia sp.		4.2
		Total	5.7

COPEPODS	SPECIES NAME		DENSITY
	Copepodites		1.0
	Cyclops bicuspidatus		1.4
	Diaptomus minutus		7.0
	Diaptomus copepodite		4.2
	Mesocyclops edax		2.6
		Total	16.2

ROTIFERS	SPECIES NAME		DENSITY
	Asplanchna preodonta		1.0
	Conochilus sp.		2.9
	Kellicotia longispina		0.3
	Syncheata sp.		0.4
		Total	4.6

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Anabaena circinalis		3
	Microcystis flos aquae		3
	Oscillatoria sp.		3
		(Average)	(3)

CHLOROPHYTA	SPECIES NAME		ABUNDANCE
	Volvox sp.		4
		(Average)	(4)

PYRROPHYTA	SPECIES NAME		ABUNDANCE
	Ceratium hirundinella		3
		(Average)	(3)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Dinobryon divergens		4
		(Average)	(4)

CILIOPHORA	SPECIES NAME		ABUNDANCE
	Vorticella sp.		0
	Epistylis sp.		0
		(Average)	(0)

INSECTA	SPECIES NAME		ABUNDANCE
	Chaoborus		0
		(Average)	(0)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY *	RELATIVE ABUNDANCE (%)
Frustulia rhomboides	1	3	.14
Nitzschia kutzingiana	17	**	2.4
Frustulia rhomboides var capitata	3	3	.43
Pinnularia divergens var bacillaris	1		.14
Synedra tenera	12		1.7
Cymbella cymbiformis	5	4	.72
Stauroneis phoenicenteron	7	4	1.0
Eunotia elegans	2	4	.29
Gomphonema subtile	1	2	.14
Pinnularia braunii	1	4	.14
Navicula cf pelliculosa	1		.14
Pinnularia maior	4	4	.58
Nedium iridis var ampliatum	3	4	.43
Nedium iridis	1	4	.14
Cymbella cuspidata	6	4	.86
Cyclotella bodanica	1	4	.14
Anomoeoneis zellensis	3	5	.43
Pinnularia abaujensis var linearis	1	4	.14
Navicula vanheurckii	3	4	.43
Gomphonema cf truncatum var elongata	1		.14
Pinnularia biceps	2	4	.29
Anomoeoneis serians var brachysira	18	5	2.6
Navicula cryptocephala	13	2	1.9
Nitzschia palea	10	4	1.4
Cyclotella stelligera	17	4	2.4
Pinnularia abaujensis var rostata	7	4	1.
Tabellaria fenestrata	91	4	13.1
Navicula tripunctata var schizonemoides	41	1	5.9
Cymbella microcephala	33		.48
Pinnularia hilseana	25	4	3.6
Cymbella minuta	40	4	5.8
Gomphonema acuminatum	6	2	.86
Navicula radiosa var parva	58	4	8.4
Achnanthes linearis	6	4	.86
Navicula subhamulata	3		.43
Navicula angusta	34	4	4.9
Frustulia rhomboides var saxonica	7	3	1.0
Tabellaria flocculosa	31	3	4.5
Synedra miniscula	3		.43
Eunotia arcus	4	4	.58
Cyclotella glomerata	21	4	3.0
Fragilaria construens	6	2	.86
Navicula radiosa	19	4	2.7
Navicula subtilissima	25		3.6
Eunotia pectinalis var recta	1	3	.14
Fragilaria vaucheriae	1	2	.14
Anomoeoneis vitrea	42	5	6.1
Navicula pupula var rectangularis	4	4	.58
Eunotia praerupta	7	4	1.0
Cyclotella comta	9	2	1.39
Tetracyclus lacustris	6	3	.86
Navicula capitata	17	4	2.4
Navicula mutica var cohnii	3		.43
Eunotia nymanniana	1		.14

Melosira distans	1	3	.14
Navicula latelongitudinalis	3		.43

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

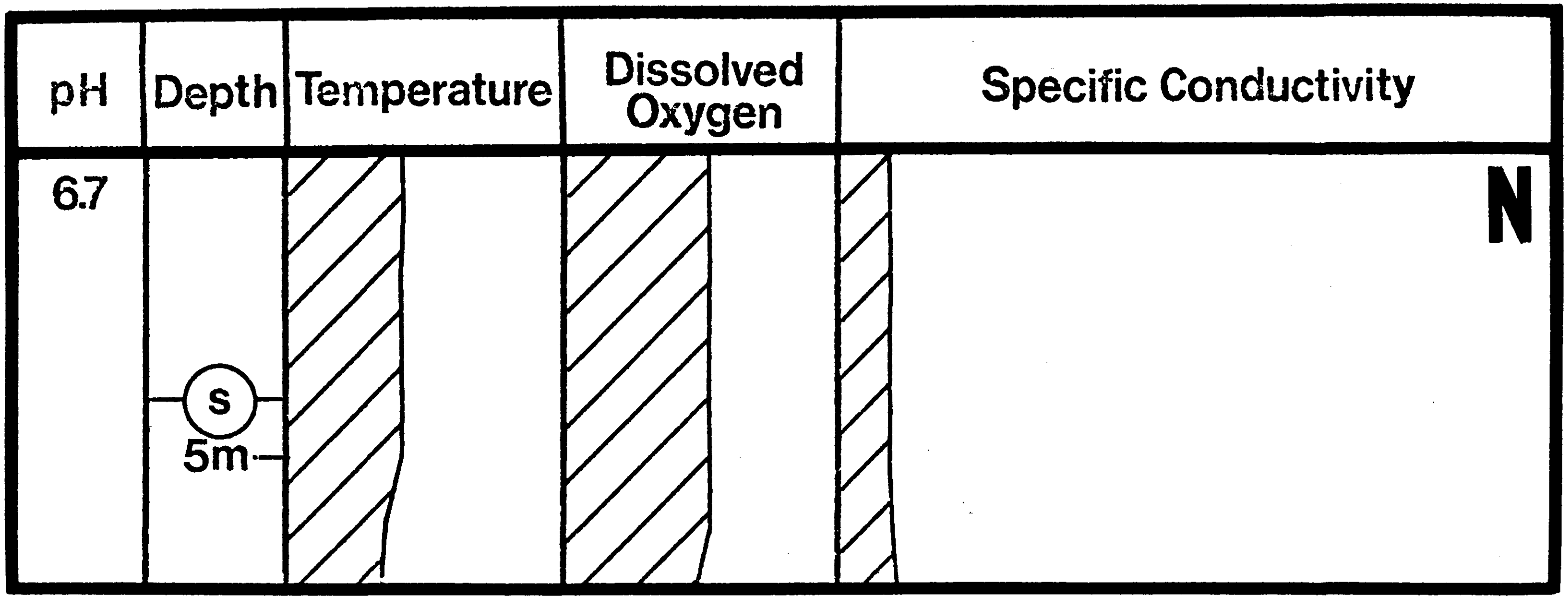
Lake N was thermally stratified at 6m and well oxygenated (90% saturation) to its bottom (7m). This first-order lake (439m AMSL) was one of the clearest (most transparent) of the lakes sampled (Secchi = 4m). The lake's deep thermocline (6m) was probably related to its minimal topographic relief and long fetch. Diabasic rocks in its 1.25 km^2 watershed contributed to its ionic loading (specific conductivity = 23-32 micromhos/cm). Calcium (2.6mg/l) and alkalinity (151 microequivalents/l) were both lower than anticipated. There were few higher aquatic plants growing in this lake as a result of its small rock-lined (largely granite) littoral zone.

DETAILS OF LAKE WATER CHEMISTRY

N - 6

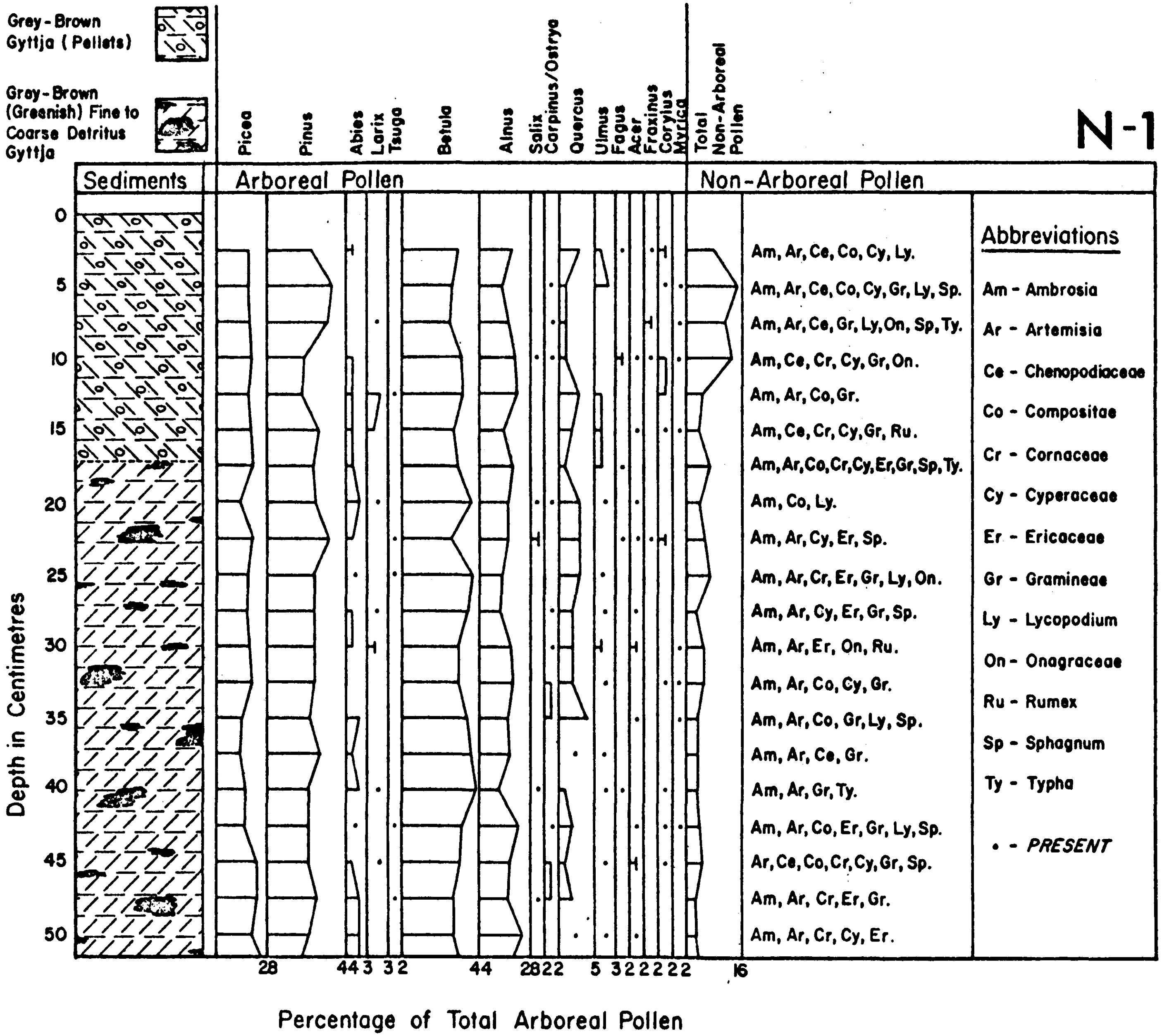
Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		14.4	100	26
1		14.8	100	26
2		14.8	100	26
3		14.8	100	26
4	4.0	14.8	100	26
5		14.8	100	26
6		12.2	100	29
7		12.0	90	32

*Specific conductivity data are temperature-corrected (25° C).

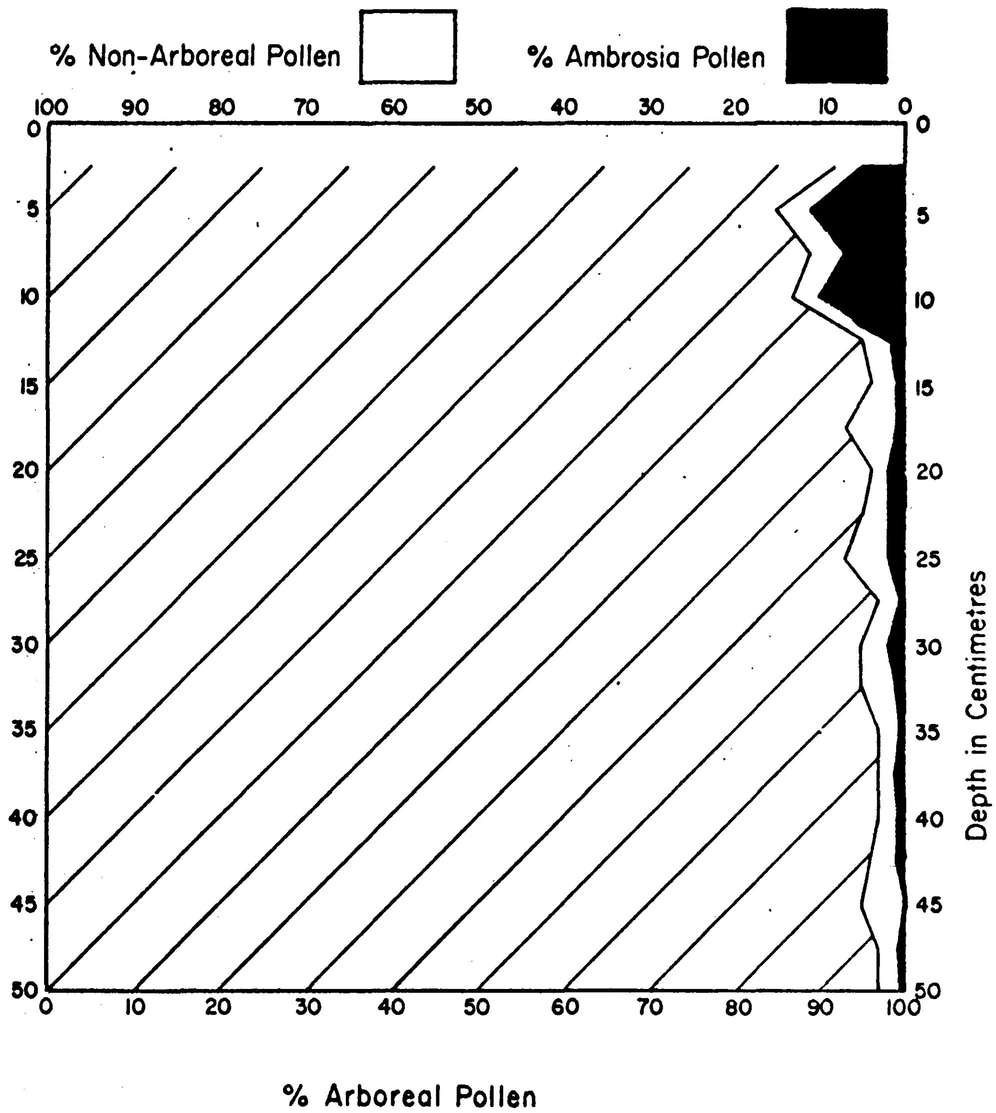


N - 7 LAKE WATER CHEMISTRY PLOT N - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE



Regional forest composition is well reflected by the pollen diagram, and there is a minor amount of southern pollen. The Ambrosia rise is distinct in the top 10 cm of gyttja and indicates no mixing of lake bottom sediment.



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
N - 1 - 1	******	******	*****	******	******	******	******	******	*****	****
N - 1 - 2	6393.	3395.	103.	1190.	810.	540.	2158.	325.	223.	12.
N - 1 - 3	22500.	11690.	307.	4220.	2900.	1843.	7397.	1095.	751.	46.
N - 1 - 4	25430.	11050.	231.	4440.	3250.	2010.	7981.	1095.	796.	47.
N - 1 - 5	27640.	10020.	205.	4460.	3450.	2061.	8599.	1078.	763.	50.
N - 1 - 6	29920.	9624.	194.	4730.	4670.	2075.	9079.	1025.	815.	56.
N - 1 - 7	30270.	9898.	197.	5170.	4330.	2168.	9185.	1035.	855.	61.
N - 1 - 8	32450.	9953.	190.	5400.	4740.	2309.	9486.	1033.	914.	58.
N - 1 - 9	35050.	10290.	190.	6190.	5860.	2460.	9927.	1031.	955.	64.
N - 1 - 10	37570.	10830.	192.	6680.	6130.	2767.	10600.	1135.	1163.	78.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
N - 2 - 1	24350.	14540.	400.	3780.	2350.	2016.	7968.	1133.	711.	42.
N - 2 - 2	25600.	14060.	252.	4110.	2700.	2006.	7610.	1124.	742.	46.
N - 2 - 3	25480.	15320.	265.	4170.	2640.	1994.	7368.	1139.	752.	44.
N - 2 - 4	25000.	14700.	229.	4120.	2740.	1784.	7349.	948.	744.	49.
N - 2 - 5	26270.	13460.	227.	3690.	2810.	1814.	7918.	1061.	693.	48.
N - 2 - 6	27610.	12100.	198.	3900.	3070.	1927.	7751.	916.	738.	46.
N - 2 - 7	29940.	12330.	195.	4400.	3580.	2105.	8323.	930.	800.	54.
N - 2 - 8	31100.	12160.	190.	5030.	4060.	2198.	8629.	935.	905.	60.
N - 2 - 9	31490.	11670.	187.	4740.	3850.	2195.	8837.	941.	861.	57.
N - 2 - 10	30320.	10660.	176.	4210.	3570.	2048.	8664.	902.	802.	51.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
N - 1 - 11	38910.	11330.	192.	7040.	6310.	2760.	10520.	1162.	1101.	79.
N - 1 - 12	38500.	11950.	190.	6650.	5680.	2801.	10490.	1197.	1127.	78.
N - 1 - 13	40230.	11900.	185.	6930.	6310.	2699.	10800.	1187.	1050.	78.
N - 1 - 14	39110.	12280.	186.	6080.	5420.	2757.	10570.	1184.	1036.	75.
N - 1 - 15	38520.	11770.	177.	5860.	5140.	2608.	10490.	1164.	994.	75.
N - 1 - 16	39130.	11180.	173.	6110.	5360.	2697.	10750.	1177.	1022.	81.
N - 1 - 17	39070.	10600.	166.	6640.	6120.	2847.	10720.	1103.	1041.	91.
N - 1 - 18	39630.	11230.	169.	6690.	6310.	2927.	10990.	1103.	1089.	87.
N - 1 - 19	37470.	11670.	168.	5840.	5350.	2682.	10620.	1033.	950.	84.
N - 1 - 20	36420.	11170.	159.	5870.	5440.	2606.	10530.	1003.	958.	84.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
N - 1 - 1	7.25	0.23	****	N - 2 - 1	*****	*****	51.6	N - 1 - 11	19.85	1.03	51.1
N - 1 - 2	9.60	0.53	****	N - 2 - 2	*****	*****	50.8	N - 1 - 12	26.86	1.25	55.5
N - 1 - 3	15.81	0.68	****	N - 2 - 3	*****	*****	49.4	N - 1 - 13	27.11	1.24	57.0
N - 1 - 4	14.51	0.92	35.0	N - 2 - 4	*****	*****	49.0	N - 1 - 14	24.26	1.13	57.0
N - 1 - 5	16.01	0.86	38.0	N - 2 - 5	*****	*****	50.4	N - 1 - 15	26.02	1.12	56.0
N - 1 - 6	18.49	0.89	40.0	N - 2 - 6	*****	*****	50.6	N - 1 - 16	23.13	0.90	53.0
N - 1 - 7	22.64	0.81	45.0	N - 2 - 7	*****	*****	50.8	N - 1 - 17	18.40	0.89	55.0
N - 1 - 8	21.12	1.02	47.0	N - 2 - 8	*****	*****	50.8	N - 1 - 18	23.35	1.17	49.0
N - 1 - 9	20.48	0.72	****	N - 2 - 9	*****	*****	50.6	N - 1 - 19	27.20	1.18	52.0
N - 1 - 10	27.27	1.57	52.0	N - 2 - 10	*****	*****	53.4	N - 1 - 20	22.87	1.05	50.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
N - 1 - 1	****	*****	*****	*****	135.	****	****	******	****	****	*****	****
N - 1 - 2	9.3	*****	7.9	5.6	142.	5.	35.	14.6	****	2.0	6.2	43.
N - 1 - 3	8.9	9.3	24.3	19.4	151.	15.	95.	50.3	12.	5.5	21.8	115.
N - 1 - 4	7.7	11.0	25.4	21.5	142.	16.	65.	53.1	17.	5.5	20.7	105.
N - 1 - 5	5.5	14.6	27.9	24.7	133.	16.	35.	55.5	20.	8.0	18.4	81.
N - 1 - 6	4.0	13.6	22.2	25.8	106.	17.	20.	65.2	21.	8.5	18.2	72.
N - 1 - 7	4.0	13.5	20.1	27.8	106.	16.	25.	64.6	22.	9.5	19.5	78.
N - 1 - 8	4.0	13.3	28.7	31.4	101.	17.	20.	66.8	24.	11.5	22.2	85.
N - 1 - 9	2.9	13.9	33.5	33.5	83.	20.	15.	79.0	24.	11.0	23.5	87.
N - 1 - 10	2.3	15.3	36.2	39.0	79.	20.	****	81.5	27.	12.0	30.6	113.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
N - 2 - 1	****	*****	23.7	25.3	*****	13.	80.	51.0	15.	7.0	25.2	135.
N - 2 - 2	-***	*****	24.6	24.8	*****	12.	80.	52.9	17.	10.5	25.5	103.
N - 2 - 3	****	*****	23.8	23.5	*****	12.	95.	51.9	18.	5.0	26.6	114.
N - 2 - 4	****	5.4	29.1	22.5	*****	11.	70.	51.8	17.	5.5	22.9	93.
N - 2 - 5	****	9.4	25.0	23.5	*****	12.	15.	51.4	23.	6.5	19.0	66.
N - 2 - 6	****	*****	31.8	23.0	*****	10.	15.	54.5	17.	6.5	17.8	55.
N - 2 - 7	****	10.8	35.3	27.4	*****	14.	10.	58.6	27.	6.5	22.0	55.
N - 2 - 8	****	10.7	38.5	29.5	*****	17.	5.	65.1	28.	8.5	25.1	60.
N - 2 - 9	****	6.9	37.5	29.6	*****	13.	****	63.5	26.	7.0	24.4	55.
N - 2 - 10	****	7.2	36.0	28.4	*****	13.	****	57.9	25.	8.0	23.2	50.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
N - 1 - 11	2.4	13.3	38.2	39.9	74.	19.	5.	83.2	29.	13.5	32.9	122.
N - 1 - 12	2.5	15.0	38.4	41.5	88.	20.	10.	80.0	29.	14.0	34.3	125.
N - 1 - 13	2.2	14.9	39.3	42.0	92.	18.	5.	86.8	30.	15.0	34.0	113.
N - 1 - 14	2.2	16.6	34.5	44.6	79.	18.	****	74.4	31.	15.5	31.4	109.
N - 1 - 15	2.0	16.8	36.0	46.5	79.	18.	****	72.0	31.	16.5	31.4	99.
N - 1 - 16	2.3	17.7	41.5	48.6	74.	18.	****	75.4	33.	17.5	35.5	103.
N - 1 - 17	2.2	17.0	37.3	48.0	69.	18.	****	81.0	31.	17.0	34.8	98.
N - 1 - 18	2.9	16.8	36.1	46.1	69.	19.	****	82.3	32.	17.0	37.5	105.
N - 1 - 19	1.5	17.3	37.6	52.3	69.	27.	****	73.8	33.	29.5	38.3	98.
N - 1 - 20	1.7	18.5	37.7	52.6	60.	20.	****	77.6	31.	26.5	37.3	86.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
N - 1 - 1	7.25	0.23	****	N - 2 - 1	*****	*****	51.6	N - 1 - 11	19.85	1.03	51.1
N - 1 - 2	9.60	0.53	****	N - 2 - 2	*****	*****	50.8	N - 1 - 12	26.86	1.25	55.5
N - 1 - 3	15.81	0.68	****	N - 2 - 3	*****	*****	49.4	N - 1 - 13	27.11	1.24	57.0
N - 1 - 4	14.51	0.92	35.0	N - 2 - 4	*****	*****	49.0	N - 1 - 14	24.26	1.13	57.0
N - 1 - 5	16.01	0.86	38.0	N - 2 - 5	*****	*****	50.4	N - 1 - 15	26.02	1.12	56.0
N - 1 - 6	18.49	0.89	40.0	N - 2 - 6	*****	*****	50.6	N - 1 - 16	23.13	0.90	53.0
N - 1 - 7	22.64	0.81	45.0	N - 2 - 7	*****	*****	50.8	N - 1 - 17	18.40	0.89	55.0
N - 1 - 8	21.12	1.02	47.0	N - 2 - 8	*****	*****	50.8	N - 1 - 18	23.35	1.17	49.0
N - 1 - 9	20.48	0.72	****	N - 2 - 9	*****	*****	50.6	N - 1 - 19	27.20	1.18	52.0
N - 1 - 10	27.27	1.57	52.0	N - 2 - 10	*****	*****	53.4	N - 1 - 20	22.87	1.05	50.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

N - 14

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
N - 1 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
N - 1 - 2	0.0765	0.0546	0.0971	0.0647	0.0357	0.0196	0.0463	0.2902	0.0352	0.0735
N - 1 - 3	0.2691	0.1879	0.2900	0.2293	0.1278	0.0667	0.1587	0.9777	0.1188	0.2821
N - 1 - 4	0.3042	0.1777	0.2183	0.2413	0.1432	0.0727	0.1713	0.9777	0.1259	0.2901
N - 1 - 5	0.3306	0.1611	0.1931	0.2424	0.1520	0.0746	0.1845	0.9625	0.1208	0.3086
N - 1 - 6	0.3579	0.1547	0.1829	0.2571	0.2057	0.0751	0.1948	0.9152	0.1290	0.3457
N - 1 - 7	0.3621	0.1591	0.1861	0.2810	0.1907	0.0784	0.1971	0.9241	0.1352	0.3753
N - 1 - 8	0.3882	0.1600	0.1790	0.2935	0.2088	0.0835	0.2036	0.9223	0.1446	0.3593
N - 1 - 9	0.4193	0.1654	0.1792	0.3364	0.2581	0.0890	0.2130	0.9205	0.1512	0.3957
N - 1 - 10	0.4494	0.1741	0.1812	0.3630	0.2700	0.1001	0.2275	1.0134	0.1840	0.4802

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
N - 2 - 1	0.2913	0.2338	0.3769	0.2054	0.1035	0.0729	0.1710	1.0116	0.1125	0.2605
N - 2 - 2	0.3062	0.2260	0.2381	0.2234	0.1189	0.0726	0.1633	1.0036	0.1173	0.2846
N - 2 - 3	0.3048	0.2463	0.2498	0.2266	0.1163	0.0721	0.1581	1.0170	0.1191	0.2698
N - 2 - 4	0.2990	0.2363	0.2161	0.2239	0.1207	0.0645	0.1577	0.8464	0.1178	0.3037
N - 2 - 5	0.3142	0.2164	0.2137	0.2005	0.1238	0.0656	0.1699	0.9473	0.1096	0.2944
N - 2 - 6	0.3303	0.1945	0.1870	0.2120	0.1352	0.0697	0.1663	0.8179	0.1167	0.2815
N - 2 - 7	0.3581	0.1982	0.1835	0.2391	0.1577	0.0762	0.1786	0.8304	0.1266	0.3358
N - 2 - 8	0.3720	0.1955	0.1789	0.2734	0.1789	0.0795	0.1852	0.8348	0.1432	0.3722
N - 2 - 9	0.3767	0.1876	0.1762	0.2576	0.1696	0.0794	0.1896	0.8402	0.1363	0.3525
N - 2 - 10	0.3627	0.1714	0.1658	0.2288	0.1573	0.0741	0.1859	0.8054	0.1269	0.3167

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
N - 1 - 11	0.4654	0.1822	0.1809	0.3826	0.2780	0.0999	0.2258	1.0375	0.1742	0.4877
N - 1 - 12	0.4605	0.1921	0.1794	0.3614	0.2502	0.1013	0.2251	1.0687	0.1783	0.4784
N - 1 - 13	0.4812	0.1913	0.1745	0.3766	0.2780	0.0976	0.2318	1.0598	0.1661	0.4802
N - 1 - 14	0.4678	0.1974	0.1750	0.3304	0.2388	0.0997	0.2268	1.0571	0.1639	0.4648
N - 1 - 15	0.4608	0.1892	0.1670	0.3185	0.2264	0.0944	0.2251	1.0393	0.1572	0.4599
N - 1 - 16	0.4681	0.1797	0.1629	0.3321	0.2361	0.0976	0.2307	1.0509	0.1617	0.5025
N - 1 - 17	0.4673	0.1704	0.1567	0.3609	0.2696	0.1030	0.2300	0.9848	0.1647	0.5617
N - 1 - 18	0.4740	0.1805	0.1596	0.3636	0.2780	0.1059	0.2358	0.9848	0.1723	0.5377
N - 1 - 19	0.4482	0.1876	0.1584	0.3174	0.2357	0.0970	0.2279	0.9223	0.1504	0.5179
N - 1 - 20	0.4356	0.1796	0.1499	0.3190	0.2396	0.0943	0.2260	0.8955	0.1516	0.5210

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
N - 1 - 1	7.25	0.23	****	N - 2 - 1	*****	*****	51.6	N - 1 - 11	19.85	1.03	51.1
N - 1 - 2	9.60	0.53	****	N - 2 - 2	*****	*****	50.8	N - 1 - 12	26.86	1.25	55.5
N - 1 - 3	15.81	0.68	****	N - 2 - 3	*****	*****	49.4	N - 1 - 13	27.11	1.24	57.0
N - 1 - 4	14.51	0.92	35.0	N - 2 - 4	*****	*****	49.0	N - 1 - 14	24.26	1.13	57.0
N - 1 - 5	16.01	0.86	38.0	N - 2 - 5	*****	*****	50.4	N - 1 - 15	26.02	1.12	56.0
N - 1 - 6	18.49	0.89	40.0	N - 2 - 6	*****	*****	50.6	N - 1 - 16	23.13	0.90	53.0
N - 1 - 7	22.64	0.81	45.0	N - 2 - 7	*****	*****	50.8	N - 1 - 17	18.40	0.89	55.0
N - 1 - 8	21.12	1.02	47.0	N - 2 - 8	*****	*****	50.8	N - 1 - 18	23.35	1.17	49.0
N - 1 - 9	20.48	0.72	****	N - 2 - 9	*****	*****	50.6	N - 1 - 19	27.20	1.18	52.0
N - 1 - 10	27.27	1.57	52.0	N - 2 - 10	*****	*****	53.4	N - 1 - 20	22.87	1.05	50.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
N - 1 - 1	******	*******	*******	*******	1.5698	******	******	********	******	******	*******	*******
N - 1 - 2	5.167	*******	0.0646	0.0816	1.6512	0.055	2.692	0.0380	******	0.870	0.0456	0.5605
N - 1 - 3	4.944	0.3207	0.1993	0.2860	1.7558	0.154	7.308	0.1309	1.519	2.391	0.1602	1.5158
N - 1 - 4	4.278	0.3793	0.2083	0.3166	1.6512	0.160	5.000	0.1382	2.086	2.391	0.1520	1.3816
N - 1 - 5	3.056	0.5034	0.2289	0.3635	1.5465	0.159	2.692	0.1445	2.469	3.478	0.1357	1.0711
N - 1 - 6	2.222	0.4690	0.1820	0.3790	1.2326	0.167	1.538	0.1699	2.605	3.696	0.1336	0.9461
N - 1 - 7	2.222	0.4655	0.1645	0.4088	1.2326	0.166	1.923	0.1681	2.728	4.130	0.1437	1.0263
N - 1 - 8	2.222	0.4586	0.2354	0.4615	1.1744	0.173	1.538	0.1738	2.926	5.000	0.1630	1.1211
N - 1 - 9	1.611	0.4793	0.2746	0.4921	0.9651	0.197	1.154	0.2058	3.012	4.783	0.1729	1.1395
N - 1 - 10	1.278	0.5276	0.2966	0.5737	0.9186	0.199	******	0.2123	3.321	5.217	0.2249	1.4855

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
N - 2 - 1	******	*******	0.1945	0.3721	*******	0.126	6.154	0.1328	1.840	3.043	0.1850	1.7803
N - 2 - 2	******	*******	0.2018	0.3653	*******	0.122	6.154	0.1379	2.074	4.565	0.1876	1.3513
N - 2 - 3	******	*******	0.1952	0.3456	*******	0.124	7.308	0.1353	2.185	2.174	0.1954	1.5039
N - 2 - 4	******	0.1862	0.2383	0.3312	*******	0.110	5.385	0.1349	2.049	2.391	0.1682	1.2224
N - 2 - 5	******	0.3241	0.2050	0.3454	*******	0.121	1.154	0.1337	2.802	2.826	0.1398	0.8671
N - 2 - 6	******	*******	0.2608	0.3378	*******	0.102	1.154	0.1418	2.049	2.826	0.1310	0.7250
N - 2 - 7	******	0.3724	0.2893	0.4037	*******	0.139	0.769	0.1525	3.296	2.826	0.1615	0.7276
N - 2 - 8	******	0.3690	0.3158	0.4338	*******	0.172	0.385	0.1697	3.420	3.696	0.1846	0.7868
N - 2 - 9	******	0.2379	0.3077	0.4347	*******	0.131	******	0.1653	3.185	3.043	0.1798	0.7197
N - 2 - 10	******	0.2483	0.2951	0.4178	*******	0.134	******	0.1508	3.099	3.478	0.1703	0.6618

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
N - 1 - 11	1.333	0.4586	0.3134	0.5871	0.8605	0.194	0.385	0.2166	3.556	5.870	0.2422	1.6079
N - 1 - 12	1.389	0.5172	0.3143	0.6097	1.0233	0.200	0.749	0.2082	3.605	6.087	0.2523	1.6395
N - 1 - 13	1.222	0.5138	0.3225	0.6171	1.0698	0.184	0.385	0.2260	3.667	6.522	0.2502	1.4829
N - 1 - 14	1.222	0.5724	0.2825	0.6560	0.9186	0.183	******	0.1938	3.840	6.739	0.2307	1.4289
N - 1 - 15	1.111	0.5793	0.2953	0.6841	0.9186	0.181	******	0.1874	3.840	7.174	0.2310	1.3053
N - 1 - 16	1.278	0.6103	0.3404	0.7140	0.8605	0.183	******	0.1965	4.012	7.609	0.2607	1.3605
N - 1 - 17	1.222	0.5862	0.3057	0.7059	0.8023	0.184	******	0.2108	3.864	7.391	0.2557	1.2842
N - 1 - 18	1.611	0.5793	0.2955	0.6776	0.8023	0.191	******	0.2144	3.901	7.391	0.2760	1.3842
N - 1 - 19	0.833	0.5966	0.3078	0.7694	0.8023	0.268	******	0.1923	4.074	12.826	0.2819	1.2855
N - 1 - 20	0.944	0.6379	0.3093	0.7734	0.6977	0.205	******	0.2022	3.864	11.522	0.2740	1.1368

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
N - 1 - 1	7.25	0.23	****	N - 2 - 1	*****	*****	51.6	N - 1 - 11	19.85	1.03	51.1
N - 1 - 2	9.60	0.53	****	N - 2 - 2	*****	*****	50.8	N - 1 - 12	26.86	1.25	55.5
N - 1 - 3	15.81	0.68	****	N - 2 - 3	*****	*****	49.4	N - 1 - 13	27.11	1.24	57.0
N - 1 - 4	14.51	0.92	35.0	N - 2 - 4	*****	*****	49.0	N - 1 - 14	24.26	1.13	57.0
N - 1 - 5	16.01	0.86	38.0	N - 2 - 5	*****	*****	50.4	N - 1 - 15	26.02	1.12	56.0
N - 1 - 6	18.49	0.89	40.0	N - 2 - 6	*****	*****	50.6	N - 1 - 16	23.13	0.90	53.0
N - 1 - 7	22.64	0.81	45.0	N - 2 - 7	*****	*****	50.8	N - 1 - 17	18.40	0.89	55.0
N - 1 - 8	21.12	1.02	47.0	N - 2 - 8	*****	*****	50.8	N - 1 - 18	23.35	1.17	49.0
N - 1 - 9	20.48	0.72	****	N - 2 - 9	*****	*****	50.6	N - 1 - 19	27.20	1.18	52.0
N - 1 - 10	27.27	1.57	52.0	N - 2 - 10	*****	*****	53.4	N - 1 - 20	22.87	1.05	50.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

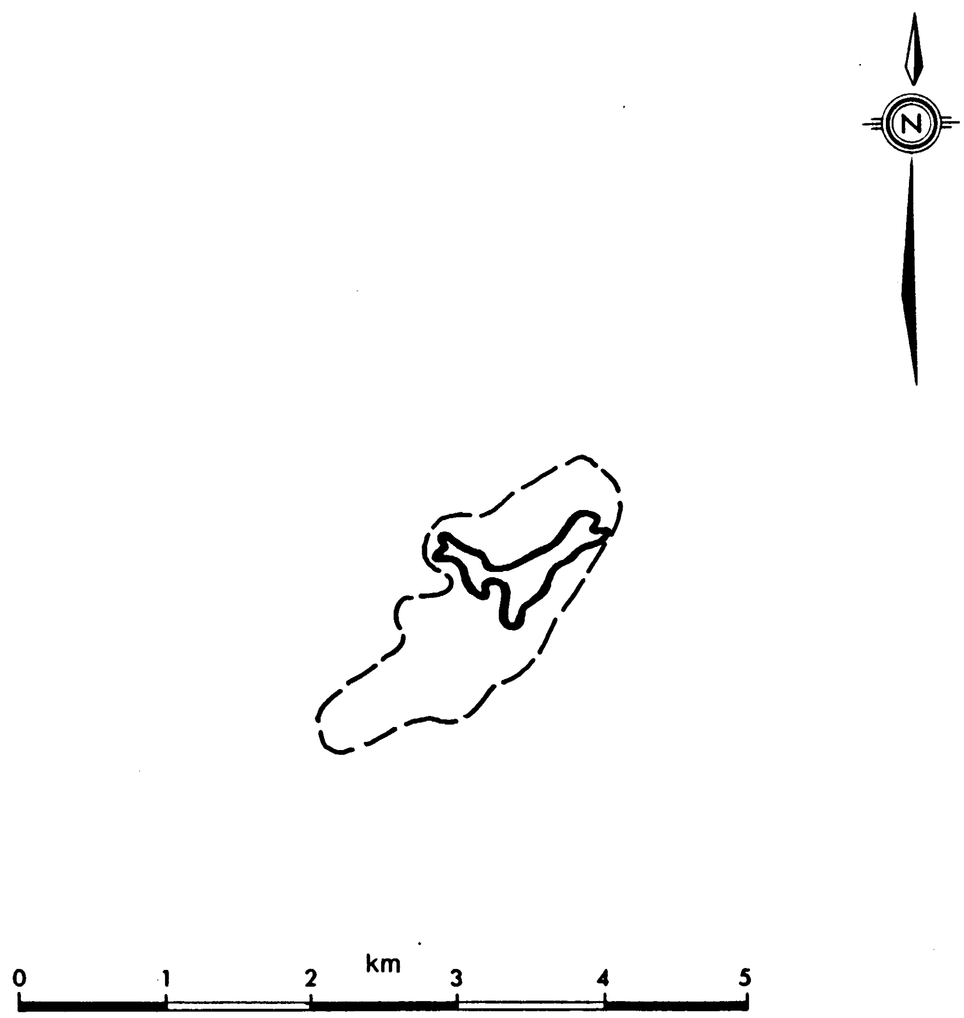
Lake O pH 6·9

GENERAL SETTING

O - 2

GENERAL DESCRIPTION

Lake O is a "V-shaped" narrow rock basin with apparently simple morphometry. Floating muskeg occurs at the ends of the lake and along parts of the shore. Most of the shoreline is rock and surficial deposits are of minor importance in the small watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-696270/5480714
Elevation of lake above sea level	384 m (1280 ft)
Lake depth at sampling point	1.8 m
Lake area	.25 sq km
Lake catchment area	1.5 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	1
Distance from south end of sampling strip	75 km

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY
	Holopedium gibberum		0.5
	Bosmina longirostris		0.5
	Daphnia pulex		0.1
		Total	1.1

COPEPODS	SPECIES NAME		DENSITY
	Copepodites		0.2
	Diaptomus minutus		0.3
	Cyclops bicuspidatus		0.1
		Total	0.6

ROTIFERS	SPECIES NAME		DENSITY
	Conochilus sp.		0.9
	Kellicotia longispina		0.1
	Syncheata sp.		0.1
		Total	1.1

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Aphanocapsa grevillei		3
	Aphanocapsa flachista		3
	Coelosphaerium kutzinghiana		2
	Microcystis aeruginosa		3
	Microcystis flos aquae		3
	Oscillatoria sp.		2
		(Average)	(3)

CHLOROPHYTA	SPECIES NAME		ABUNDANCE
	Gloeocystis gigas		2
	Volvox sp.		5
		(Average)	(4)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Frustulia rhomboides		2
	Melosira sp.		3
	Navicula sp.		3
	Pinnularia gibba		3
	Stauroneis phoenocentron		2
	Stauroneis anceps		3
		(Average)	(3)

MASTIGOPHORANS	SPECIES NAME		ABUNDANCE
	Euglypha sp.		1
		(Average)	(1)

PORIFERA	SPECIES NAME		ABUNDANCE
	Sponge monoaxon smooth spicule		1
		(Average)	(1)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Pinnularia abaujensis var rostata	8	4	1.9
Eundtia flexuosa	1	3	.24
Nedium iridis var ampliatum	6	4	1.4
Navicula capitata var hungarica	2	2	.48
Navicula contenta var biceps	5	4	1.2
Eunotia tenella	1	3	.24
Cymbella cuspidata	2	4	.48
Pinnularia rupestris	2	4	.48
Pinnulaira biceps	3	4	.72
Pinnularia abaujensis var linearis	1	4	.24
Nedium bisculatum var subundulatum	1	**	.24
Stenopterobia intermedia	1		.24
Navicula falaisensis var lanceolata			
Asterionella formosa	1	2	.24
Syneora tenera	5		1.2
Fragilaria vaucheriae	1	2	.24
Frustulia rhomboides	1	3	.24
Eunotia elegans	2	4	.48
Navicula capitata	2	2	.48
Navicula pupula var rectangularis	1	4	.24
Cyclotella bodanica	1	4	.24
Stauroncis smithii var incisa	1	4	.24
Stauroneis cf kregeri	1	4	.24
Eunotia fallax	2		.48
Nitzschia palea	21	4	5.0
Cyclotella stelligera	34	4	8.2
Navicula cryptocephala	19	2	4.6
Cymbella minuta	21	4	5.1
Tabellaria fenestrata	32	4	7.7
Synedra miniscula	6		1.4
Pinnularia hilseana	12	4	2.9
Navicula tripunctata var schizonemoides	15	1	3.6
Navicula pupula var capita	1	4	.24
Cymbella microcephala	12		2.9
Navicula sp	1		.14
Anomoeoneis vitrea	16	5	3.9
Navicula radiosa	13	4	3.1
Tabellaria flocculosa	13	3	3.1
Fragilaria construens	7	1	1.7
Navicula radiosa var parva	23	4	5.5
Navicula monmouthiana-stodderi	12		2.9
Navicula bicephala	3	4	.72
Anomoeoneis serians var brachysira	8	5	1.9
Navicula subtilissima	13	4	3.1
Stauroneis phoenicenteron f gracilis	9	4	2.2
Stauroneis anceps	2	4	.48
Achnanthes linearis	4		.96
Eunotia pectinalis	2	3	.48
Melosira distans	1	3	.24
Tabellaria quadrisepta	11	3	2.7
Navicula cryptocephala var veneta	2	2	.48
Fragilaria sp	1		.24
Nitzschia kutzingiana	12		2.9

Eunotia serra	1	2	.24
Frustulia rhomboides var saxonica	2	3	.48
Navicula vanheurckii	4		.96
Frustulia rhomboides var capitata	5	3	1.2
Navicula notha	1		.24
Anomoeoneis zellensis	3	5	.72
Cyclotella glomerata	7	4	1.7
Pinnularia mesolepta	2	4	.48
Navicula angusta	2	4	.48
Cyclotella comta	4	2	.96
Melosira italica	1	4	.24

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

** Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake O was essentially a pond (area = 0.25 km^2) with an estimated maximum depth of 4-5m. The waters of this pond were the most humic of any of the Wawa study lakes (Secchi = 1.2m). Many benthic bog-type diatoms were observed in its sediments. Sixty-two species of diatoms were identified, the highest diatom species richness of any of the study lakes. The sediment was fairly organic (54% loss on ignition), as is common in humic-rich systems.

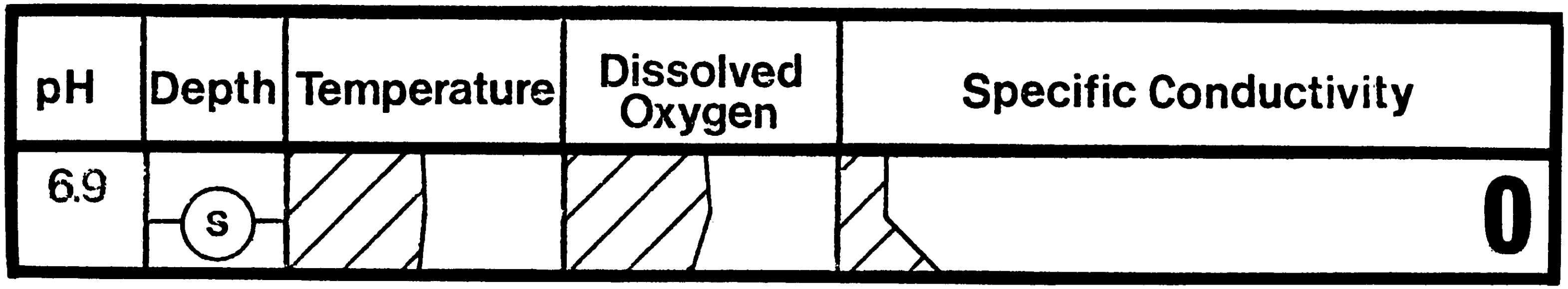
The pond was thermally unstratified and well oxygenated to the bottom at our sampling station (2m). The lake was located at an elevation of 384 AMSL and was a first-order lake. Alkalinity (287 microequivalents/l), calcium (3.8mg/l) and pH (6.9) were similar to most of the other circumneutral study lakes.

DETAILS OF LAKE WATER CHEMISTRY

0 - 6

Water Depth M	Secchi Depth M	Temperature ^{o}C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		16.8	100	25
1	1.2	17.2	100	25
2		16.8	90	59

*Specific conductivity data are temperature-corrected (25^{o} C).

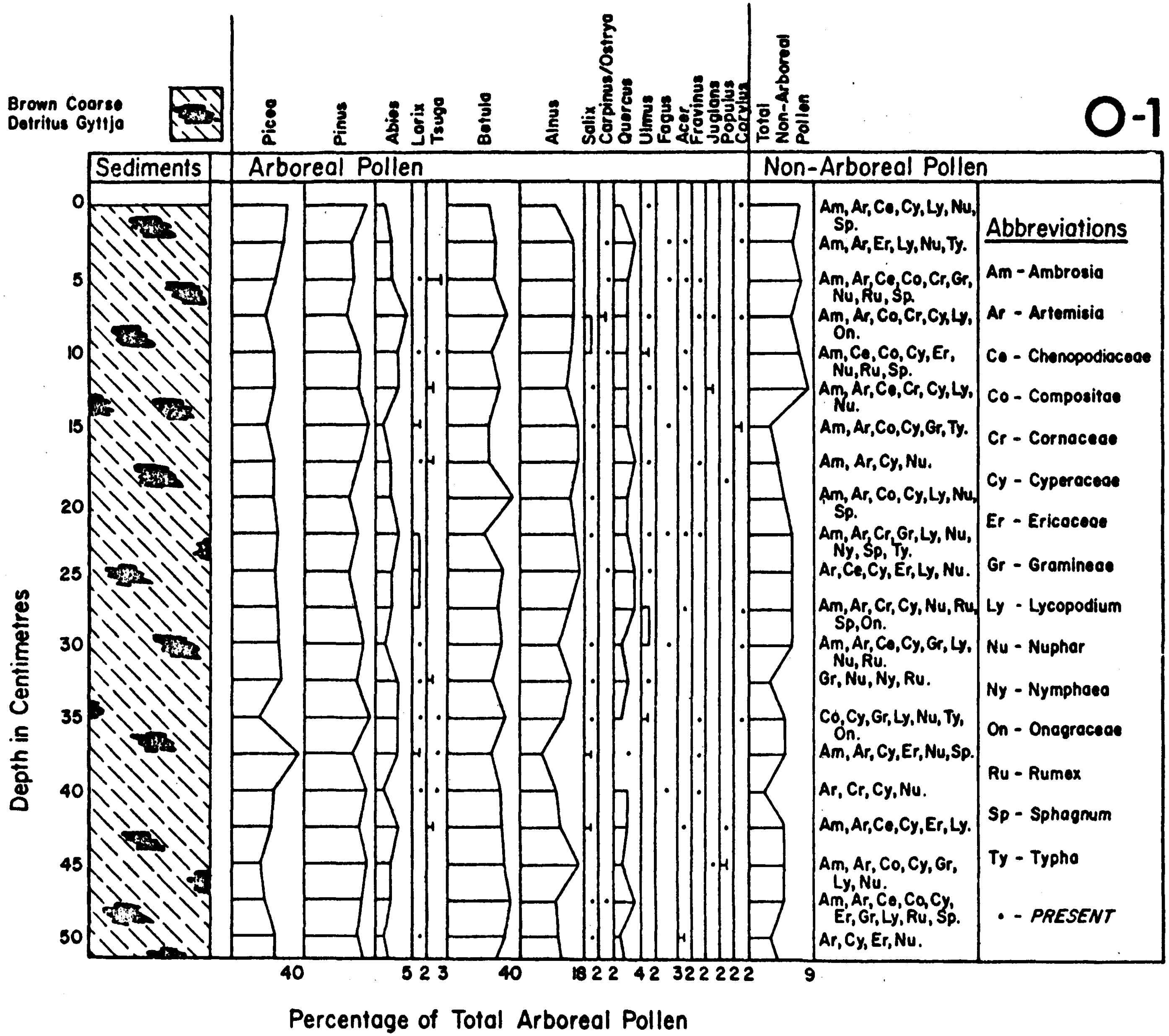


LAKE WATER CHEMISTRY PLOT

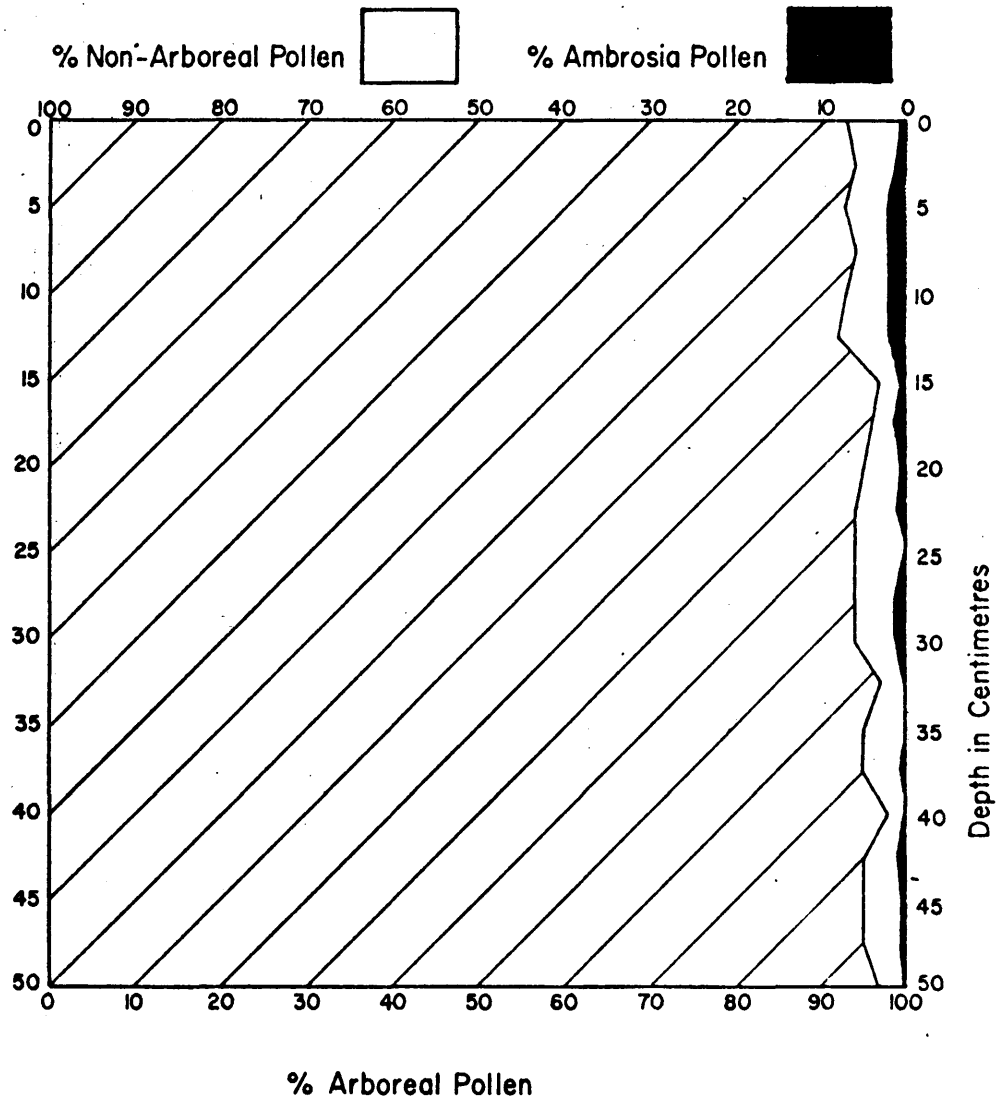
0 - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE

0 - 8



The pollen diagram reflects the regional forest composition, and the southern pollen influx is very minor. The *Ambrosia* rise is indistinct and probably indicates considerable mixing of lake bottom sediment.



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
0 - 1 - 1	8244.	3001.	39.	1580.	1180.	1164.	7044.	430.	401.	20.
0 - 1 - 2	8500.	2619.	30.	1560.	990.	1152.	7448.	466.	409.	20.
0 - 1 - 3	8544.	2597.	30.	1630.	980.	1155.	7520.	467.	376.	20.
0 - 1 - 4	8499.	2635.	31.	1590.	990.	1166.	7509.	438.	383.	20.
0 - 1 - 5	8761.	2468.	35.	1640.	990.	1150.	7698.	448.	400.	21.
0 - 1 - 6	8742.	2407.	25.	1640.	1010.	1137.	7787.	446.	388.	21.
0 - 1 - 7	8525.	2301.	24.	1590.	970.	1087.	7810.	447.	383.	21.
0 - 1 - 8	8570.	2332.	26.	1510.	1010.	1094.	7899.	446.	375.	20.
0 - 1 - 9	9123.	2407.	26.	1490.	1040.	1107.	7965.	441.	399.	22.
0 - 1 - 10	9232.	2392.	25.	1450.	1050.	1063.	7798.	419.	383.	22.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
0 - 2 - 1	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 2	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 3	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 4	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 5	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 6	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 7	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 8	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 9	******	******	*****	******	******	******	******	******	*****	****
0 - 2 - 10	******	******	*****	******	******	******	******	******	*****	****

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
0 - 1 - 11	8952.	2241.	24.	1370.	980.	1055.	7709.	442.	379.	21.
0 - 1 - 12	9178.	2385.	25.	1430.	1020.	1063.	7693.	440.	399.	22.
0 - 1 - 13	8833.	2233.	25.	1440.	980.	1055.	7977.	441.	385.	22.
0 - 1 - 14	9277.	2270.	23.	1420.	1020.	1050.	7904.	454.	392.	23.
0 - 1 - 15	9086.	2195.	25.	1370.	1040.	1037.	7893.	418.	385.	23.
0 - 1 - 16	9214.	2180.	24.	1280.	1030.	1007.	7676.	414.	383.	24.
0 - 1 - 17	9086.	2165.	23.	1310.	960.	1024.	8021.	414.	377.	23.
0 - 1 - 18	8848.	2256.	27.	1490.	1010.	1076.	8533.	473.	381.	25.
0 - 1 - 19	8767.	2165.	24.	1470.	1000.	1044.	8366.	435.	371.	24.
0 - 1 - 20	9121.	2097.	30.	1370.	1220.	1007.	8366.	431.	361.	23.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
0 - 1 - 1	11.25	0.66	****	0 - 2 - 1	*****	*****	****	0 - 1 - 11	21.85	1.05	48.5
0 - 1 - 2	14.37	0.88	54.0	0 - 2 - 2	*****	*****	****	0 - 1 - 12	26.27	1.34	52.4
0 - 1 - 3	11.42	0.79	55.2	0 - 2 - 3	*****	*****	****	0 - 1 - 13	30.59	1.89	53.3
0 - 1 - 4	13.19	0.78	53.1	0 - 2 - 4	*****	*****	****	0 - 1 - 14	32.88	1.33	56.8
0 - 1 - 5	17.50	1.23	54.0	0 - 2 - 5	*****	*****	****	0 - 1 - 15	28.08	1.78	53.2
0 - 1 - 6	18.93	1.30	53.6	0 - 2 - 6	*****	*****	****	0 - 1 - 16	24.54	1.54	53.0
0 - 1 - 7	24.82	1.30	54.2	0 - 2 - 7	*****	*****	****	0 - 1 - 17	25.19	1.58	52.4
0 - 1 - 8	26.86	1.27	55.0	0 - 2 - 8	*****	*****	****	0 - 1 - 18	22.05	1.39	54.0
0 - 1 - 9	23.82	1.02	49.0	0 - 2 - 9	*****	*****	****	0 - 1 - 19	28.20	1.81	54.2
0 - 1 - 10	27.74	1.49	51.8	0 - 2 - 10	*****	*****	****	0 - 1 - 20	27.60	1.87	53.9

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
0 - 1 - 1	1.5	*****	21.1	13.9	88.	23.	30.	29.0	****	22.0	9.0	62.
0 - 1 - 2	1.8	7.0	9.7	14.1	88.	21.	30.	28.8	11.	18.0	8.7	48.
0 - 1 - 3	1.5	8.7	16.7	13.4	74.	23.	10.	28.5	13.	19.0	8.9	42.
0 - 1 - 4	1.4	6.9	15.8	17.7	74.	22.	5.	29.1	12.	23.0	8.9	37.
0 - 1 - 5	1.4	6.9	16.0	13.7	88.	23.	****	29.3	12.	24.5	8.9	37.
0 - 1 - 6	1.3	7.8	16.1	14.4	65.	23.	****	29.4	12.	20.0	9.1	37.
0 - 1 - 7	1.2	7.0	16.2	14.7	69.	23.	****	29.4	13.	30.5	8.7	35.
0 - 1 - 8	1.2	6.9	17.1	14.9	74.	23.	****	29.6	13.	32.5	8.7	36.
0 - 1 - 9	1.1	*****	13.9	15.8	65.	22.	****	33.2	11.	4.0	8.4	35.
0 - 1 - 10	0.9	*****	15.7	16.8	79.	21.	****	33.6	11.	36.0	7.9	32.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
0 - 2 - 1	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 2	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 3	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 4	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 5	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 6	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 7	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 8	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 9	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
0 - 2 - 10	****	*****	*****	*****	*****	****	****	******	****	****	*****	****

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
0 - 1 - 11	0.9	*****	15.5	16.0	69.	20.	****	32.3	10.	32.0	7.6	32.
0 - 1 - 12	1.1	*****	16.2	16.0	188.	20.	****	32.6	10.	19.0	7.9	32.
0 - 1 - 13	1.0	5.2	14.6	16.2	79.	22.	****	31.7	12.	18.5	8.4	33.
0 - 1 - 14	1.0	*****	18.5	17.6	60.	21.	****	33.8	11.	21.5	8.1	32.
0 - 1 - 15	1.0	*****	9.3	17.6	88.	21.	****	33.8	11.	21.5	8.1	32.
0 - 1 - 16	0.9	*****	16.4	18.8	60.	21.	****	34.7	11.	22.5	7.9	31.
0 - 1 - 17	0.9	*****	16.4	19.1	60.	22.	****	33.2	11.	23.5	8.1	33.
0 - 1 - 18	0.7	6.8	18.9	18.2	74.	25.	****	32.2	15.	23.0	9.5	35.
0 - 1 - 19	0.8	6.9	19.1	18.7	69.	24.	****	32.0	15.	36.0	9.5	35.
0 - 1 - 20	0.8	6.0	17.4	19.7	51.	24.	****	36.4	14.	31.0	8.9	34.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
0 - 1 - 1	11.25	0.66	****	0 - 2 - 1	*****	*****	****	0 - 1 - 11	21.85	1.05	48.5
0 - 1 - 2	14.37	0.88	54.0	0 - 2 - 2	*****	*****	****	0 - 1 - 12	26.27	1.34	52.4
0 - 1 - 3	11.42	0.79	55.2	0 - 2 - 3	*****	*****	****	0 - 1 - 13	30.59	1.89	53.3
0 - 1 - 4	13.19	0.78	53.1	0 - 2 - 4	*****	*****	****	0 - 1 - 14	32.88	1.33	56.8
0 - 1 - 5	17.50	1.23	54.0	0 - 2 - 5	*****	*****	****	0 - 1 - 15	28.08	1.78	53.2
0 - 1 - 6	18.93	1.30	53.6	0 - 2 - 6	*****	*****	****	0 - 1 - 16	24.54	1.54	53.0
0 - 1 - 7	24.82	1.30	54.2	0 - 2 - 7	*****	*****	****	0 - 1 - 17	25.19	1.58	52.4
0 - 1 - 8	26.86	1.27	55.0	0 - 2 - 8	*****	*****	****	0 - 1 - 18	22.05	1.39	54.0
0 - 1 - 9	23.82	1.02	49.0	0 - 2 - 9	*****	*****	****	0 - 1 - 19	28.20	1.81	54.2
0 - 1 - 10	27.74	1.49	51.8	0 - 2 - 10	*****	*****	****	0 - 1 - 20	27.60	1.87	53.9

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

0 - 14

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
0 - 1 - 1	0.0986	0.0482	0.0368	0.0859	0.0520	0.0421	0.1512	0.3839	0.0634	0.1235
0 - 1 - 2	0.1017	0.0421	0.0281	0.0848	0.0436	0.0417	0.1598	0.4161	0.0647	0.1259
0 - 1 - 3	0.1022	0.0418	0.0287	0.0886	0.0432	0.0418	0.1614	0.4170	0.0596	0.1241
0 - 1 - 4	0.1017	0.0424	0.0292	0.0864	0.0436	0.0422	0.1611	0.3911	0.0606	0.1259
0 - 1 - 5	0.1048	0.0397	0.0325	0.0891	0.0436	0.0416	0.1652	0.4000	0.0632	0.1302
0 - 1 - 6	0.1046	0.0387	0.0239	0.0891	0.0445	0.0411	0.1671	0.3982	0.0614	0.1321
0 - 1 - 7	0.1020	0.0370	0.0228	0.0864	0.0427	0.0393	0.1676	0.3991	0.0605	0.1278
0 - 1 - 8	0.1025	0.0375	0.0249	0.0821	0.0445	0.0396	0.1695	0.3982	0.0594	0.1222
0 - 1 - 9	0.1091	0.0387	0.0249	0.0810	0.0458	0.0401	0.1709	0.3937	0.0631	0.1340
0 - 1 - 10	0.1104	0.0385	0.0239	0.0788	0.0463	0.0385	0.1673	0.3741	0.0605	0.1333

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
0 - 2 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 3	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 6	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 7	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 8	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 9	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
0 - 2 - 10	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
0 - 1 - 11	0.1071	0.0360	0.0223	0.0745	0.0432	0.0382	0.1654	0.3946	0.0599	0.1265
0 - 1 - 12	0.1098	0.0383	0.0239	0.0777	0.0449	0.0385	0.1651	0.3929	0.0631	0.1346
0 - 1 - 13	0.1057	0.0359	0.0240	0.0783	0.0432	0.0382	0.1712	0.3937	0.0609	0.1327
0 - 1 - 14	0.1110	0.0365	0.0218	0.0772	0.0449	0.0380	0.1696	0.4054	0.0620	0.1420
0 - 1 - 15	0.1087	0.0353	0.0234	0.0745	0.0458	0.0375	0.1694	0.3732	0.0609	0.1420
0 - 1 - 16	0.1102	0.0350	0.0228	0.0696	0.0454	0.0364	0.1647	0.3696	0.0606	0.1457
0 - 1 - 17	0.1087	0.0348	0.0218	0.0712	0.0423	0.0370	0.1721	0.3696	0.0597	0.1438
0 - 1 - 18	0.1058	0.0363	0.0250	0.0810	0.0445	0.0389	0.1831	0.4223	0.0603	0.1519
0 - 1 - 19	0.1049	0.0348	0.0228	0.0799	0.0441	0.0378	0.1795	0.3884	0.0587	0.1457
0 - 1 - 20	0.1091	0.0337	0.0284	0.0745	0.0537	0.0364	0.1795	0.3848	0.0570	0.1438

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
0 - 1 - 1	11.25	0.66	****	0 - 2 - 1	*****	*****	****	0 - 1 - 11	21.85	1.05	48.5
0 - 1 - 2	14.37	0.88	54.0	0 - 2 - 2	*****	*****	****	0 - 1 - 12	26.27	1.34	52.4
0 - 1 - 3	11.42	0.79	55.2	0 - 2 - 3	*****	*****	****	0 - 1 - 13	30.59	1.89	53.3
0 - 1 - 4	13.19	0.78	53.1	0 - 2 - 4	*****	*****	****	0 - 1 - 14	32.88	1.33	56.8
0 - 1 - 5	17.50	1.23	54.0	0 - 2 - 5	*****	*****	****	0 - 1 - 15	28.08	1.78	53.2
0 - 1 - 6	18.93	1.30	53.6	0 - 2 - 6	*****	*****	****	0 - 1 - 16	24.54	1.54	53.0
0 - 1 - 7	24.82	1.30	54.2	0 - 2 - 7	*****	*****	****	0 - 1 - 17	25.19	1.58	52.4
0 - 1 - 8	26.86	1.27	55.0	0 - 2 - 8	*****	*****	****	0 - 1 - 18	22.05	1.39	54.0
0 - 1 - 9	23.82	1.02	49.0	0 - 2 - 9	*****	*****	****	0 - 1 - 19	28.20	1.81	54.2
0 - 1 - 10	27.74	1.49	51.8	0 - 2 - 10	*****	*****	****	0 - 1 - 20	27.60	1.87	53.9

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
0 - 1 - 1	0.833	*******	0.1730	0.2044	1.0233	0.228	2.308	0.0755	******	9.565	0.0662	0.8118
0 - 1 - 2	1.000	0.2414	0.0792	0.2076	1.0233	0.211	2.308	0.0751	1.395	7.826	0.0638	0.6276
0 - 1 - 3	0.833	0.3000	0.1372	0.1966	0.8605	0.233	0.769	0.0743	1.568	8.261	0.0657	0.5513
0 - 1 - 4	0.778	0.2379	0.1296	0.2607	0.8605	0.222	0.385	0.0757	1.432	10.000	0.0658	0.4921
0 - 1 - 5	0.778	0.2379	0.1312	0.2012	1.0233	0.230	******	0.0764	1.531	10.652	0.0657	0.4921
0 - 1 - 6	0.722	0.2690	0.1319	0.2124	0.7558	0.234	******	0.0766	1.420	8.696	0.0668	0.4868
0 - 1 - 7	0.667	0.2414	0.1331	0.2160	0.8023	0.231	******	0.0766	1.556	13.261	0.0637	0.4632
0 - 1 - 8	0.667	0.2379	0.1400	0.2187	0.8605	0.231	******	0.0771	1.605	14.130	0.0637	0.4763
0 - 1 - 9	0.611	*******	0.1139	0.2319	0.7558	0.223	******	0.0866	1.370	1.739	0.0618	0.4618
0 - 1 - 10	0.500	*******	0.1288	0.2468	0.9186	0.212	******	0.0875	1.346	15.652	0.0578	0.4237

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
0 - 2 - 1	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 2	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 3	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 4	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 5	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 6	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 7	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 8	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 9	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
0 - 2 - 10	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
0 - 1 - 11	0.500	*******	0.1267	0.2347	0.8023	0.197	******	0.0842	1.222	13.913	0.0557	0.4237
0 - 1 - 12	0.611	*******	0.1325	0.2347	2.1860	0.201	******	0.0849	1.222	8.261	0.0578	0.4171
0 - 1 - 13	0.556	0.1793	0.1194	0.2384	0.9186	0.223	******	0.0825	1.469	8.043	0.0618	0.4355
0 - 1 - 14	0.556	*******	0.1516	0.2588	0.6977	0.208	******	0.0880	1.309	9.348	0.0598	0.4158
0 - 1 - 15	0.556	*******	0.0766	0.2588	1.0233	0.208	******	0.0880	1.370	9.348	0.0599	0.4237
0 - 1 - 16	0.500	*******	0.1348	0.2765	0.6977	0.212	******	0.0903	1.383	9.783	0.0579	0.4039
0 - 1 - 17	0.500	*******	0.1348	0.2801	0.6977	0.223	******	0.0865	1.395	10.217	0.0598	0.4303
0 - 1 - 18	0.389	0.2345	0.1551	0.2671	0.8605	0.253	******	0.0838	1.815	10.000	0.0696	0.4658
0 - 1 - 19	0.444	0.2379	0.1561	0.2754	0.8023	0.245	******	0.0833	1.815	15.652	0.0698	0.4618
0 - 1 - 20	0.444	0.2069	0.1425	0.2893	0.5930	0.246	******	0.0948	1.765	13.478	0.0657	0.4474

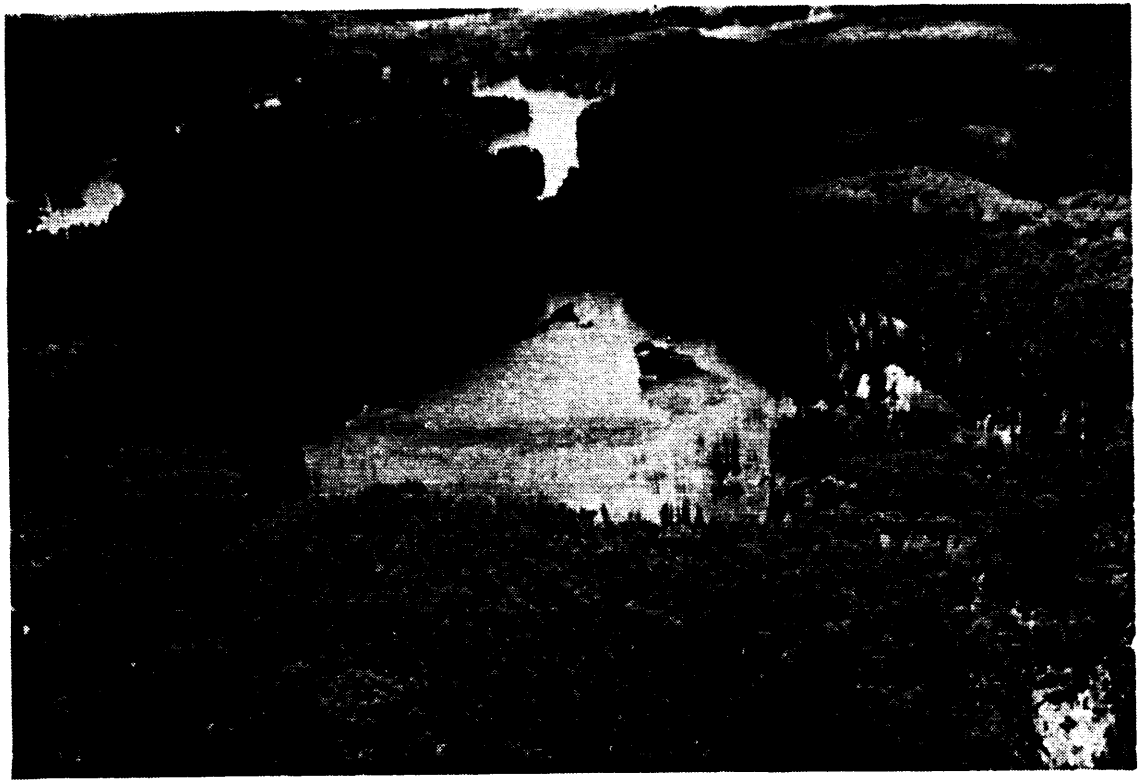
SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
0 - 1 - 1	11.25	0.66	****	0 - 2 - 1	*****	*****	****	0 - 1 - 11	21.85	1.05	48.5
0 - 1 - 2	14.37	0.88	54.0	0 - 2 - 2	*****	*****	****	0 - 1 - 12	26.27	1.34	52.4
0 - 1 - 3	11.42	0.79	55.2	0 - 2 - 3	*****	*****	****	0 - 1 - 13	30.59	1.89	53.3
0 - 1 - 4	13.19	0.78	53.1	0 - 2 - 4	*****	*****	****	0 - 1 - 14	32.88	1.33	56.8
0 - 1 - 5	17.50	1.23	54.0	0 - 2 - 5	*****	*****	****	0 - 1 - 15	28.08	1.78	53.2
0 - 1 - 6	18.93	1.30	53.6	0 - 2 - 6	*****	*****	****	0 - 1 - 16	24.54	1.54	53.0
0 - 1 - 7	24.82	1.30	54.2	0 - 2 - 7	*****	*****	****	0 - 1 - 17	25.19	1.58	52.4
0 - 1 - 8	26.86	1.27	55.0	0 - 2 - 8	*****	*****	****	0 - 1 - 18	22.05	1.39	54.0
0 - 1 - 9	23.82	1.02	49.0	0 - 2 - 9	*****	*****	****	0 - 1 - 19	28.20	1.81	54.2
0 - 1 - 10	27.74	1.49	51.8	0 - 2 - 10	*****	*****	****	0 - 1 - 20	27.60	1.87	53.9

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake P pH 7·1

GENERAL SETTING

P - 2

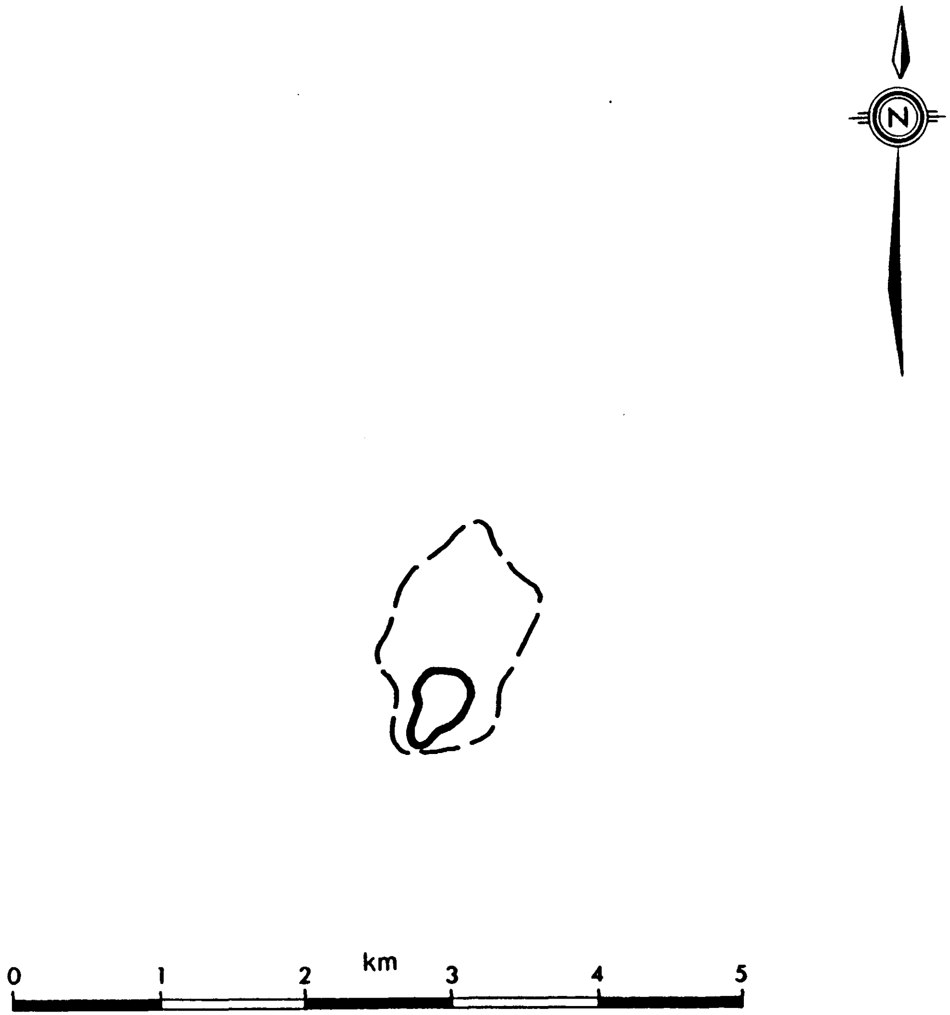


GENERAL DESCRIPTION

Lake P is a small rock basin with simple morphometry. Floating muskeg "ring" covers part of the lake indicating recent rise of water level, probably owing to beaver activity. It has a small watershed with minor surficial deposits.

GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-688246/5452459
Elevation of lake above sea level	357 m (1190 ft)
Lake depth at sampling point	3.1 m
Lake area	.07 sq km
Lake catchment area	1 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	1
Distance from south end of sampling strip	80 km



LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME	DENSITY
	Bosmina longirostris	0.1
	Total	0.1

COPEPODS	SPECIES NAME	DENSITY
	Cyclops bicuspidatus copepodite	1.0
	Diaptomus minutus	0.7
	Diaptomus copepodite	1.4
	Mesocyclops edax	2.0
	Total	5.1

ROTIFERS	SPECIES NAME	DENSITY
	Conochilus sp.	2.4
	Asplanchna preodonta	2.0
	Kellicotia longispina	0.3
	Polyarthra vulgaris	0.2
	Total	4.9

CYANOPHYTA	SPECIES NAME	ABUNDANCE*
	Anabaena circinalis	2
	Aphanocapsa grevillei	3
	Aphanocapsa flachista	4
	Microcystis aeruginosa	2
	(Average)	(3)

CHLOROPHYTA	SPECIES NAME	ABUNDANCE
	Closterium sp.	2
	Mougeotia sp.	2
	(Average)	(2)

BACILLARIOPHYTA	SPECIES NAME	ABUNDANCE
	Asterionella formosa	2
	Cymbella sp.	2
	Navicula sp.	3
	Pinnularia nobilis	3
	Tabellaria fenestrata	3
	(Average)	(3)

CHRYSOPHYTA	SPECIES NAME	ABUNDANCE
	Dinobryon divergens	2
	(Average)	(2)

CILIOPHORA	SPECIES NAME	ABUNDANCE
	Epistylis sp.	1
	(Average)	(1)

PORIFERA	SPECIES NAME	ABUNDANCE
	Sponge monoazon smooth spicule	1
	(Average)	(1)

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY *	RELATIVE ABUNDANCE (%)
Navicula angusta	2	4	.35
Gomphonema acuminatum	1	2	.18
Fragilaria constricta	1	3	.18
Melosira distans	2	3	.35
Nedium iridis var ampliatum	1	4	.18
Pinnularia mesolepta	1	4	.18
Frustulia rhomboides var saxonica	1	3	.18
Tabellaria fenestrata	51	4	9.
Nitzschia palea	18	4	3.2
Navicula cryptocephala	35	2	6.2
Tabellaria flocculosa	55	3	9.8
Cyclotella bodanica	60	4	10.6
Anomoeoneis serians var brachysira	3	5	.53
Cymbella microcephala	7	**	1.2
Pinnularia abaujensis var rostata	1	4	.18
Pinnularia hilseana	13	4	1.8
Cyclotella comta	45	2	8.0
Cyclotella glomerata	28	4	5.0
Tetracyclus lacustris	6	3	1.1
Nitzschia kutzingiana	25		4.4
Synedra miniscula	54		9.6
Cyclotella stelligera	80	4	14.2
Navicula contenta var biceps	17		3.0
Navicula heufleri	1	4	.18
Anomoeoneis vitrea	3		.53
Navicula capitata	1	2	.18
Surirella biserata	1	4	.18
Navicula radiosa var parva	17	4	3.0
Navicula radiosa var tenella	4	4	.71
Stauroneis anceps	1		.18
Fragilaria construens	1	2	.18
Synedra tenera	2		.35
Eunotia praerupta	1	4	.18
Cymbella minuta	6	4	1.1
Navicula subtilissima	5	3	.89
Pinnularia abaujensis var rostata	2	4	.35
Anomoeoneis zellensis	1	5	.18
Achnanthes linearis	2		.35
Pinnularia biceps	4	4	.71
Eunotia fallax	1		.18
Navicula radiosa	2	4	.35
Pinnularia maior	1	4	.18
Stauroneis phoenicenteron f gracilis	2	4	.35

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

** Blanks indicate species which had no published autecological information regarding their pH preferences.

HIGHER AQUATIC PLANT	SPECIES NAME		ABUNDANCE
	Nuphar scleroids	(Average)	1 / (1)

* Abundance codes explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

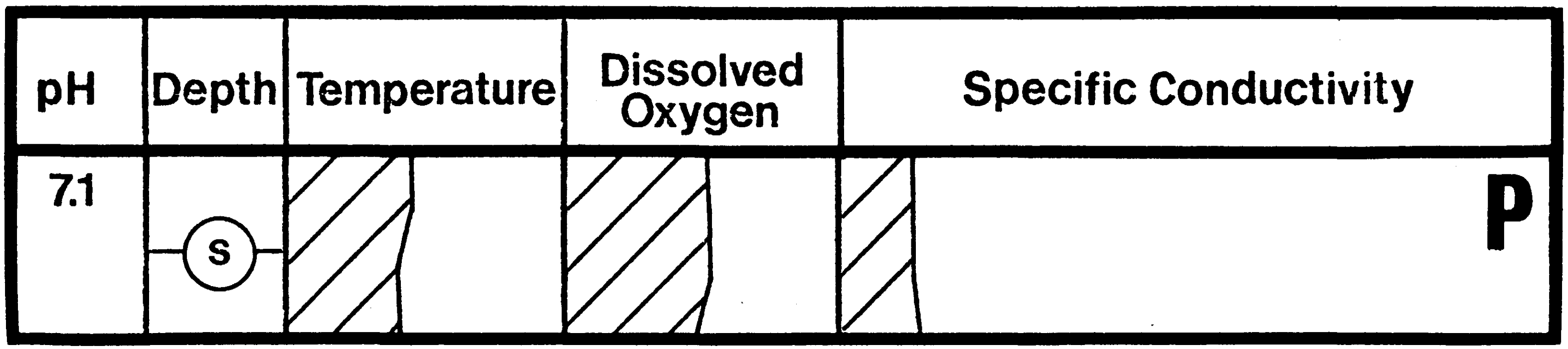
Ponds P and C were the smallest (0.07 and 0.06 km^2 respectively) of the 20 study lakes. Neither of them stratified thermally and both were well oxygenated to their bottoms. The main difference between the two was in their ionic composition. Pond P was nearly 40 km north of Pond C, and, as one moved northward, the quantity of calcareous overburden increased. For this reason and because of the diabasic greenstone rock in its watershed, the calcium (4.9mg/l) was two-and-a-half times higher in P than in C. Alkalinity (334 microequivalents/l) was nearly six-and-a-half times higher and specific conductivity (41-46 micromhos/cm) nearly two times higher in P. Both lakes were at the top of their respective watersheds (first-order lakes) and both had 45%-50% sediment loss on ignition. In addition, both ponds displayed slightly above-average species diversity and diatom species richness. Pond P, like Ponds O and Q, was humic (Secchi = 1.7m).

DETAILS OF LAKE WATER CHEMISTRY

P - 6

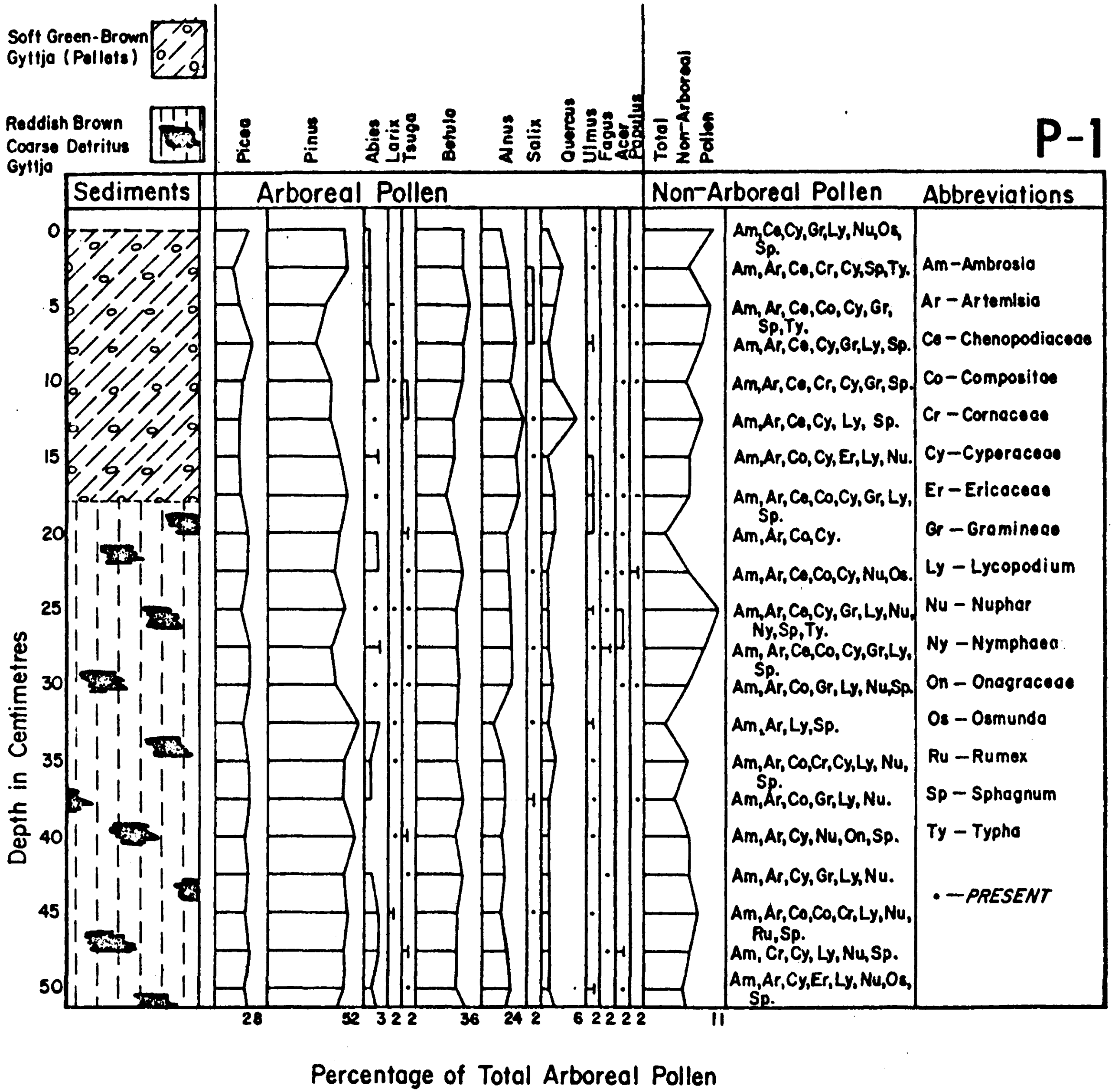
Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		15.6	100	41
1	1.7	15.5	100	41
2		14.4	100	42
3		14.4	90	46

*Specific conductivity data are temperature-corrected (25° C).

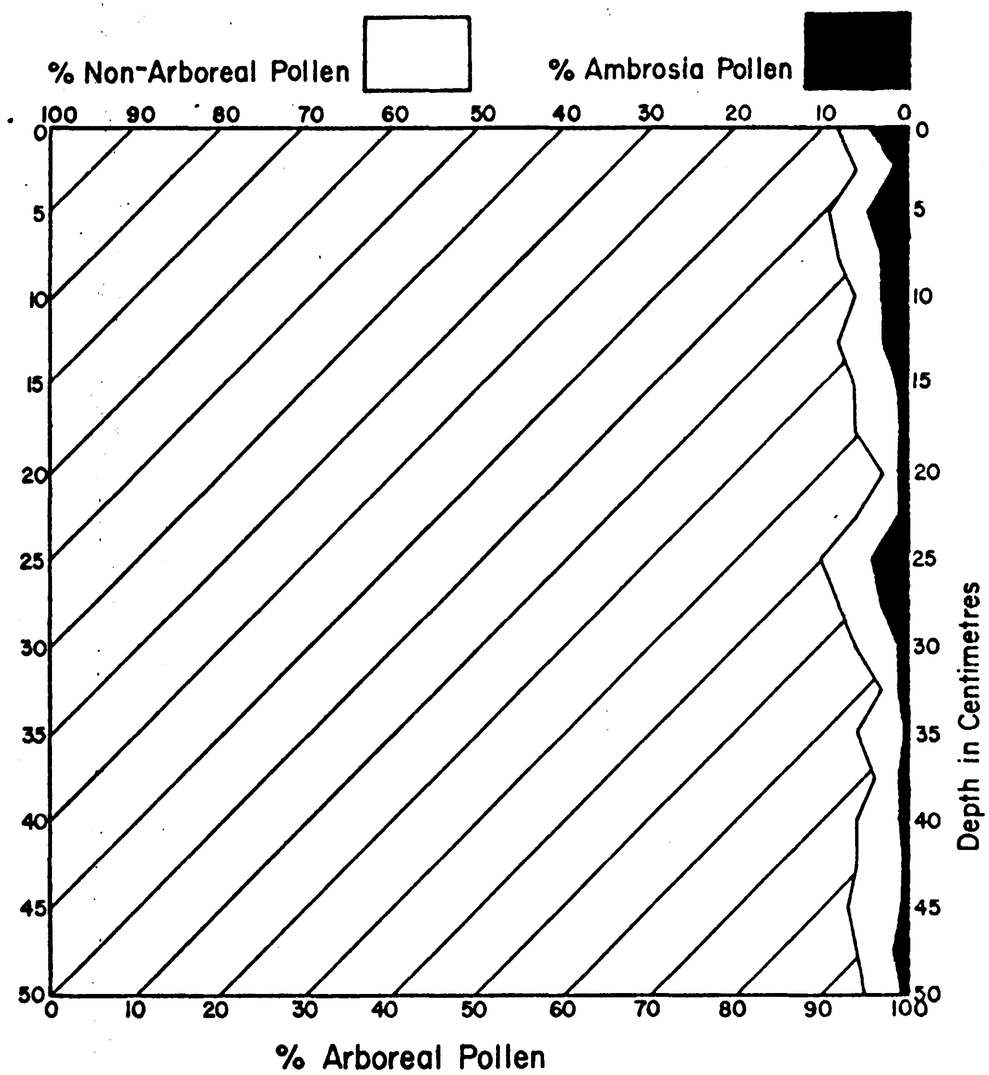


LAKE WATER CHEMISTRY PLOT

POLLEN DIAGRAM : LAKE SEDIMENT CORE



The pollen diagram reflects the regional forest composition, with a very minor component of southern pollen. The *Ambrosia* rise is indistinct and probably indicates mixing of lake bottom sediment.



AMBROSIA RISE DIAGRAM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

P - 10

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
P - 1 - 1	******	******	*****	******	******	******	******	******	*****	****
P - 1 - 2	7310.	3137.	55.	1720.	1030.	1299.	8021.	1019.	320.	18.
P - 1 - 3	5515.	2180.	37.	1220.	820.	934.	6131.	554.	233.	13.
P - 1 - 4	6623.	2188.	42.	1450.	1020.	1081.	7531.	573.	269.	27.
P - 1 - 5	3156.	998.	11.	700.	******	536.	3612.	270.	129.	13.
P - 1 - 6	6341.	1855.	33.	1260.	790.	1039.	7283.	517.	254.	24.
P - 1 - 7	6397.	1764.	27.	1200.	780.	988.	6896.	482.	242.	24.
P - 1 - 8	6350.	1825.	25.	1270.	820.	1048.	7312.	500.	249.	25.
P - 1 - 9	6106.	1797.	10.	1180.	770.	1012.	7017.	480.	231.	23.
P - 1 - 10	6451.	1795.	22.	1190.	850.	996.	7181.	444.	245.	27.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
P - 2 - 1	5941.	3401.	79.	1730.	800.	1486.	8993.	1319.	264.	13.
P - 2 - 2	6557.	3204.	76.	1820.	840.	1457.	9242.	1418.	271.	14.
P - 2 - 3	7615.	3764.	79.	1820.	940.	1503.	9104.	1390.	297.	18.
P - 2 - 4	8077.	4014.	75.	1750.	1000.	1465.	8443.	1075.	334.	21.
P - 2 - 5	7872.	3508.	71.	1690.	1060.	1389.	8133.	712.	338.	26.
P - 2 - 6	7448.	2883.	66.	1530.	1000.	1291.	7982.	572.	316.	26.
P - 2 - 7	7268.	2490.	61.	1460.	990.	1222.	7557.	489.	302.	26.
P - 2 - 8	7481.	2478.	58.	1480.	970.	1245.	7565.	508.	293.	26.
P - 2 - 9	7133.	2317.	54.	1360.	900.	1188.	7707.	530.	287.	26.
P - 2 - 10	7052.	2210.	54.	1330.	950.	1163.	7769.	462.	274.	28.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
P - 1 - 11	6269.	1643.	16.	1160.	850.	967.	7118.	429.	231.	26.
P - 1 - 12	6322.	1628.	15.	1200.	820.	998.	7363.	428.	240.	27.
P - 1 - 13	7050.	1764.	16.	1290.	910.	1063.	7477.	440.	263.	29.
P - 1 - 14	7579.	1931.	21.	1430.	1060.	1101.	7363.	398.	301.	31.
P - 1 - 15	7352.	1764.	20.	1380.	1040.	1063.	7192.	383.	293.	31.
P - 1 - 16	7169.	1704.	16.	1330.	1020.	1046.	7346.	384.	272.	30.
P - 1 - 17	6896.	1628.	18.	1230.	930.	1000.	7289.	372.	266.	29.
P - 1 - 18	7142.	1757.	19.	1200.	920.	981.	7409.	418.	261.	26.
P - 1 - 19	6541.	1461.	15.	1120.	880.	938.	7363.	407.	232.	27.
P - 1 - 20	6250.	1385.	12.	1040.	860.	898.	7375.	426.	210.	28.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
P - 1 - 1	11.32	0.51	****	P - 2 - 1	*****	*****	69.0	P - 1 - 11	21.00	0.71	****
P - 1 - 2	21.71	1.13	59.0	P - 2 - 2	*****	*****	67.6	P - 1 - 12	23.74	0.81	44.0
P - 1 - 3	22.37	0.88	****	P - 2 - 3	*****	*****	61.2	P - 1 - 13	24.58	0.74	****
P - 1 - 4	18.26	0.74	****	P - 2 - 4	*****	*****	57.2	P - 1 - 14	26.02	1.04	51.5
P - 1 - 5	15.64	0.75	****	P - 2 - 5	*****	*****	55.0	P - 1 - 15	26.82	1.09	53.0
P - 1 - 6	20.02	0.78	****	P - 2 - 6	*****	*****	55.0	P - 1 - 16	26.23	1.00	50.5
P - 1 - 7	15.96	0.74	****	P - 2 - 7	*****	*****	55.0	P - 1 - 17	23.76	0.98	46.0
P - 1 - 8	22.78	0.74	****	P - 2 - 8	*****	*****	53.8	P - 1 - 18	26.31	1.13	54.0
P - 1 - 9	24.40	0.78	****	P - 2 - 9	*****	*****	56.0	P - 1 - 19	24.10	1.03	40.0
P - 1 - 10	23.11	0.89	****	P - 2 - 10	*****	*****	55.0	P - 1 - 20	25.45	1.19	61.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

P - 12

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
P - 1 - 1	2.5	*****	*****	*****	106.	****	****	******	****	****	*****	****
P - 1 - 2	3.2	6.0	8.5	18.9	133.	16.	35.	29.0	10.	19.0	7.9	64.
P - 1 - 3	3.2	*****	5.9	15.9	115.	13.	15.	22.9	10.	15.5	6.0	45.
P - 1 - 4	2.5	7.1	12.0	20.1	101.	16.	15.	25.9	15.	31.0	7.9	50.
P - 1 - 5	2.1	*****	5.8	9.3	113.	8.	****	13.5	****	10.0	3.7	20.
P - 1 - 6	2.0	*****	11.0	19.5	122.	14.	10.	26.8	14.	22.0	7.2	43.
P - 1 - 7	1.7	*****	10.2	19.6	104.	11.	15.	26.6	13.	22.0	6.8	39.
P - 1 - 8	1.4	*****	10.5	19.1	99.	14.	15.	27.3	14.	14.0	7.5	42.
P - 1 - 9	1.7	*****	8.7	17.5	99.	12.	****	28.4	****	20.0	5.2	41.
P - 1 - 10	1.2	*****	10.1	20.6	104.	16.	5.	25.3	16.	33.5	7.2	39.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
P - 2 - 1	****	*****	15.7	16.2	*****	13.	55.	42.2	****	10.0	7.2	111.
P - 2 - 2	****	*****	13.2	15.8	*****	10.	45.	41.9	11.	12.0	8.4	71.
P - 2 - 3	****	8.1	13.7	20.1	*****	13.	45.	33.8	13.	12.0	9.1	66.
P - 2 - 4	****	8.1	14.9	21.8	*****	14.	40.	29.1	13.	13.0	9.3	78.
P - 2 - 5	****	6.3	15.3	21.9	*****	16.	25.	28.3	17.	13.0	8.1	70.
P - 2 - 6	****	*****	14.9	21.0	*****	13.	25.	28.9	17.	13.5	7.6	51.
P - 2 - 7	****	*****	14.4	19.7	*****	14.	15.	28.2	16.	15.5	7.1	45.
P - 2 - 8	****	*****	14.5	19.2	*****	14.	15.	28.6	16.	15.5	7.1	43.
P - 2 - 9	****	*****	14.5	19.7	*****	14.	15.	28.6	15.	15.5	7.1	43.
P - 2 - 10	****	*****	14.8	20.6	*****	15.	10.	28.5	18.	18.0	7.5	42.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
P - 1 - 11	1.3	*****	11.3	19.8	90.	14.	****	24.8	15.	23.5	7.1	37.
P - 1 - 12	1.3	7.3	11.3	20.1	95.	19.	****	24.6	16.	23.0	7.7	40.
P - 1 - 13	1.3	7.2	12.0	20.9	95.	16.	****	26.3	17.	27.5	8.0	39.
P - 1 - 14	0.8	8.0	14.1	22.1	95.	16.	****	26.9	19.	21.0	8.3	39.
P - 1 - 15	0.8	6.3	10.1	21.7	99.	16.	****	26.1	18.	37.0	8.0	36.
P - 1 - 16	0.7	6.3	12.1	21.7	72.	18.	****	26.4	19.	18.0	8.3	38.
P - 1 - 17	0.8	6.3	13.1	20.5	81.	14.	****	25.1	18.	19.5	8.0	35.
P - 1 - 18	0.7	*****	12.1	22.0	76.	13.	****	25.7	17.	20.5	8.8	37.
P - 1 - 19	0.7	6.4	12.0	21.4	90.	15.	****	23.4	19.	23.0	8.3	36.
P - 1 - 20	0.7	*****	10.7	21.4	71.	15.	****	23.1	16.	20.5	7.7	36.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
P - 1 - 1	11.32	0.51	****	P - 2 - 1	*****	*****	69.0	P - 1 - 11	21.00	0.71	****
P - 1 - 2	21.71	1.13	59.0	P - 2 - 2	*****	*****	67.6	P - 1 - 12	23.74	0.81	44.0
P - 1 - 3	22.37	0.88	****	P - 2 - 3	*****	*****	61.2	P - 1 - 13	24.58	0.74	****
P - 1 - 4	18.26	0.74	****	P - 2 - 4	*****	*****	57.2	P - 1 - 14	26.02	1.04	51.5
P - 1 - 5	15.64	0.75	****	P - 2 - 5	*****	*****	55.0	P - 1 - 15	26.82	1.09	53.0
P - 1 - 6	20.02	0.78	****	P - 2 - 6	*****	*****	55.0	P - 1 - 16	26.23	1.00	50.5
P - 1 - 7	15.96	0.74	****	P - 2 - 7	*****	*****	55.0	P - 1 - 17	23.76	0.98	46.0
P - 1 - 8	22.78	0.74	****	P - 2 - 8	*****	*****	53.8	P - 1 - 18	26.31	1.13	54.0
P - 1 - 9	24.40	0.78	****	P - 2 - 9	*****	*****	56.0	P - 1 - 19	24.10	1.03	40.0
P - 1 - 10	23.11	0.89	****	P - 2 - 10	*****	*****	55.0	P - 1 - 20	25.45	1.19	61.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

P- 13

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

P - 14

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
P - 1 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
P - 1 - 2	0.0874	0.0504	0.0518	0.0935	0.0454	0.0470	0.1721	0.9098	0.0507	0.1080
P - 1 - 3	0.0660	0.0350	0.0344	0.0663	0.0361	0.0338	0.1316	0.4946	0.0369	0.0796
P - 1 - 4	0.0792	0.0352	0.0397	0.0788	0.0449	0.0391	0.1616	0.5116	0.0426	0.1642
P - 1 - 5	0.0378	0.0160	0.0100	0.0380	*******	0.0194	0.0775	0.2411	0.0204	0.0802
P - 1 - 6	0.0758	0.0298	0.0308	0.0685	0.0348	0.0376	0.1563	0.4616	0.0402	0.1506
P - 1 - 7	0.0765	0.0284	0.0258	0.0652	0.0344	0.0358	0.1480	0.4304	0.0384	0.1451
P - 1 - 8	0.0760	0.0293	0.0239	0.0690	0.0361	0.0379	0.1569	0.4464	0.0395	0.1543
P - 1 - 9	0.0730	0.0289	0.0093	0.0641	0.0339	0.0366	0.1506	0.4286	0.0366	0.1420
P - 1 - 10	0.0772	0.0289	0.0205	0.0647	0.0374	0.0360	0.1541	0.3964	0.0387	0.1673

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
P - 2 - 1	0.0711	0.0547	0.0748	0.0940	0.0352	0.0538	0.1930	1.1777	0.0417	0.0809
P - 2 - 2	0.0784	0.0515	0.0719	0.0989	0.0370	0.0527	0.1983	1.2661	0.0428	0.0864
P - 2 - 3	0.0911	0.0605	0.0742	0.0989	0.0414	0.0544	0.1954	1.2411	0.0469	0.1117
P - 2 - 4	0.0966	0.0645	0.0708	0.0951	0.0441	0.0530	0.1812	0.9598	0.0528	0.1290
P - 2 - 5	0.0942	0.0564	0.0665	0.0918	0.0467	0.0503	0.1745	0.6357	0.0535	0.1580
P - 2 - 6	0.0891	0.0464	0.0620	0.0832	0.0441	0.0467	0.1713	0.5107	0.0500	0.1580
P - 2 - 7	0.0869	0.0400	0.0577	0.0793	0.0436	0.0442	0.1622	0.4366	0.0477	0.1630
P - 2 - 8	0.0895	0.0398	0.0547	0.0804	0.0427	0.0450	0.1623	0.4536	0.0464	0.1580
P - 2 - 9	0.0853	0.0373	0.0507	0.0739	0.0396	0.0430	0.1654	0.4732	0.0453	0.1580
P - 2 - 10	0.0844	0.0355	0.0511	0.0723	0.0419	0.0421	0.1667	0.4125	0.0434	0.1716

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
P - 1 - 11	0.0750	0.0264	0.0147	0.0630	0.0374	0.0350	0.1527	0.3830	0.0366	0.1617
P - 1 - 12	0.0756	0.0262	0.0142	0.0652	0.0361	0.0361	0.1580	0.3821	0.0380	0.1636
P - 1 - 13	0.0843	0.0284	0.0147	0.0701	0.0401	0.0385	0.1605	0.3929	0.0416	0.1784
P - 1 - 14	0.0907	0.0310	0.0198	0.0777	0.0467	0.0398	0.1580	0.3554	0.0477	0.1914
P - 1 - 15	0.0879	0.0284	0.0188	0.0750	0.0458	0.0385	0.1543	0.3420	0.0463	0.1889
P - 1 - 16	0.0858	0.0274	0.0147	0.0723	0.0449	0.0378	0.1576	0.3429	0.0431	0.1833
P - 1 - 17	0.0825	0.0262	0.0170	0.0668	0.0410	0.0362	0.1564	0.3321	0.0420	0.1796
P - 1 - 18	0.0854	0.0282	0.0182	0.0652	0.0405	0.0355	0.1590	0.3732	0.0412	0.1611
P - 1 - 19	0.0782	0.0235	0.0137	0.0609	0.0388	0.0339	0.1580	0.3634	0.0368	0.1673
P - 1 - 20	0.0748	0.0223	0.0114	0.0565	0.0379	0.0325	0.1583	0.3804	0.0332	0.1710

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
P - 1 - 1	11.32	0.51	****	P - 2 - 1	*****	*****	69.0	P - 1 - 11	21.00	0.71	****
P - 1 - 2	21.71	1.13	59.0	P - 2 - 2	*****	*****	67.6	P - 1 - 12	23.74	0.81	44.0
P - 1 - 3	22.37	0.88	****	P - 2 - 3	*****	*****	61.2	P - 1 - 13	24.58	0.74	****
P - 1 - 4	18.26	0.74	****	P - 2 - 4	*****	*****	57.2	P - 1 - 14	26.02	1.04	51.5
P - 1 - 5	15.64	0.75	****	P - 2 - 5	*****	*****	55.0	P - 1 - 15	26.82	1.09	53.0
P - 1 - 6	20.02	0.78	****	P - 2 - 6	*****	*****	55.0	P - 1 - 16	26.23	1.00	50.5
P - 1 - 7	15.96	0.74	****	P - 2 - 7	*****	*****	55.0	P - 1 - 17	23.76	0.98	46.0
P - 1 - 8	22.78	0.74	****	P - 2 - 8	*****	*****	53.8	P - 1 - 18	26.31	1.13	54.0
P - 1 - 9	24.40	0.78	****	P - 2 - 9	*****	*****	56.0	P - 1 - 19	24.10	1.03	40.0
P - 1 - 10	23.11	0.89	****	P - 2 - 10	*****	*****	55.0	P - 1 - 20	25.45	1.19	61.0

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
P - 1 - 1	1.389	*******	*******	*******	1.2326	******	******	********	******	******	*******	*******
P - 1 - 2	1.778	0.2069	0.0697	0.2774	1.5465	0.165	2.692	0.0756	1.235	8.261	0.0583	0.8021
P - 1 - 3	1.778	*******	0.0487	0.2338	1.3372	0.135	1.154	0.0596	1.198	6.739	0.0441	0.5855
P - 1 - 4	1.389	0.2448	0.0982	0.2949	1.1744	0.163	1.154	0.0675	1.840	13.478	0.0578	0.6566
P - 1 - 5	1.167	*******	0.0475	0.1368	1.3140	0.079	******	0.0352	******	4.348	0.0272	0.2684
P - 1 - 6	1.111	*******	0.0900	0.2865	1.4186	0.141	0.769	0.0697	1.753	9.565	0.0532	0.5684
P - 1 - 7	0.944	*******	0.0835	0.2876	1.2093	0.113	1.154	0.0693	1.654	9.565	0.0499	0.5079
P - 1 - 8	0.778	*******	0.0864	0.2815	1.1512	0.138	1.154	0.0711	1.753	6.087	0.0554	0.5553
P - 1 - 9	0.944	*******	0.0713	0.2574	1.1512	0.125	******	0.0740	******	8.696	0.0382	0.5408
P - 1 - 10	0.667	*******	0.0831	0.3032	1.2093	0.157	0.385	0.0659	1.975	14.565	0.0532	0.5079

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
P - 2 - 1	******	*******	0.1284	0.2387	*******	0.127	4.231	0.1099	******	4.348	0.0527	1.4658
P - 2 - 2	******	*******	0.1084	0.2328	*******	0.104	3.462	0.1091	1.383	5.217	0.0614	0.9382
P - 2 - 3	******	0.2793	0.1124	0.2953	*******	0.128	3.462	0.0880	1.580	5.217	0.0671	0.8618
P - 2 - 4	******	0.2793	0.1220	0.3200	*******	0.143	3.077	0.0758	1.654	5.652	0.0684	1.0237
P - 2 - 5	******	0.2172	0.1251	0.3216	*******	0.161	1.923	0.0738	2.099	5.652	0.0598	0.9145
P - 2 - 6	******	*******	0.1224	0.3084	*******	0.128	1.923	0.0753	2.049	5.870	0.0560	0.6645
P - 2 - 7	******	*******	0.1178	0.2896	*******	0.144	1.154	0.0734	1.975	6.739	0.0523	0.5855
P - 2 - 8	******	*******	0.1190	0.2821	*******	0.142	1.154	0.0746	1.938	6.739	0.0523	0.5671
P - 2 - 9	******	*******	0.1189	0.2896	*******	0.142	1.154	0.0744	1.864	6.739	0.0523	0.5697
P - 2 - 10	******	*******	0.1216	0.3028	*******	0.153	0.769	0.0743	2.198	7.826	0.0552	0.5487

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
P - 1 - 11	0.722	*******	0.0925	0.2915	1.0465	0.142	******	0.0646	1.901	10.217	0.0521	0.4829
P - 1 - 12	0.722	0.2517	0.0924	0.2953	1.1047	0.194	******	0.0640	2.025	10.000	0.0566	0.5316
P - 1 - 13	0.722	0.2483	0.0984	0.3072	1.1047	0.157	******	0.0685	2.099	11.957	0.0587	0.5171
P - 1 - 14	0.444	0.2759	0.1157	0.3250	1.1047	0.164	******	0.0700	2.358	9.130	0.0610	0.5092
P - 1 - 15	0.444	0.2172	0.0831	0.3191	1.1512	0.161	******	0.0679	2.210	16.087	0.0589	0.4671
P - 1 - 16	0.389	0.2172	0.0991	0.3190	0.8372	0.183	******	0.0687	2.346	7.826	0.0611	0.5053
P - 1 - 17	0.444	0.2172	0.1077	0.3012	0.9419	0.138	******	0.0654	2.272	8.478	0.0589	0.4632
P - 1 - 18	0.389	*******	0.0989	0.3231	0.8837	0.134	******	0.0669	2.148	8.913	0.0645	0.4803
P - 1 - 19	0.389	0.2207	0.0981	0.3150	1.0465	0.151	******	0.0610	2.296	10.000	0.0612	0.4697
P - 1 - 20	0.389	*******	0.0875	0.3151	0.8256	0.151	******	0.0603	2.025	8.913	0.0568	0.4697

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
P - 1 - 1	11.32	0.51	****	P - 2 - 1	*****	*****	69.0	P - 1 - 11	21.00	0.71	****
P - 1 - 2	21.71	1.13	59.0	P - 2 - 2	*****	*****	67.6	P - 1 - 12	23.74	0.81	44.0
P - 1 - 3	22.37	0.88	****	P - 2 - 3	*****	*****	61.2	P - 1 - 13	24.58	0.74	****
P - 1 - 4	18.26	0.74	****	P - 2 - 4	*****	*****	57.2	P - 1 - 14	26.02	1.04	51.5
P - 1 - 5	15.64	0.75	****	P - 2 - 5	*****	*****	55.0	P - 1 - 15	26.82	1.09	53.0
P - 1 - 6	20.02	0.78	****	P - 2 - 6	*****	*****	55.0	P - 1 - 16	26.23	1.00	50.5
P - 1 - 7	15.96	0.74	****	P - 2 - 7	*****	*****	55.0	P - 1 - 17	23.76	0.98	46.0
P - 1 - 8	22.78	0.74	****	P - 2 - 8	*****	*****	53.8	P - 1 - 18	26.31	1.13	54.0
P - 1 - 9	24.40	0.78	****	P - 2 - 9	*****	*****	56.0	P - 1 - 19	24.10	1.03	40.0
P - 1 - 10	23.11	0.89	****	P - 2 - 10	*****	*****	55.0	P - 1 - 20	25.45	1.19	61.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake Q

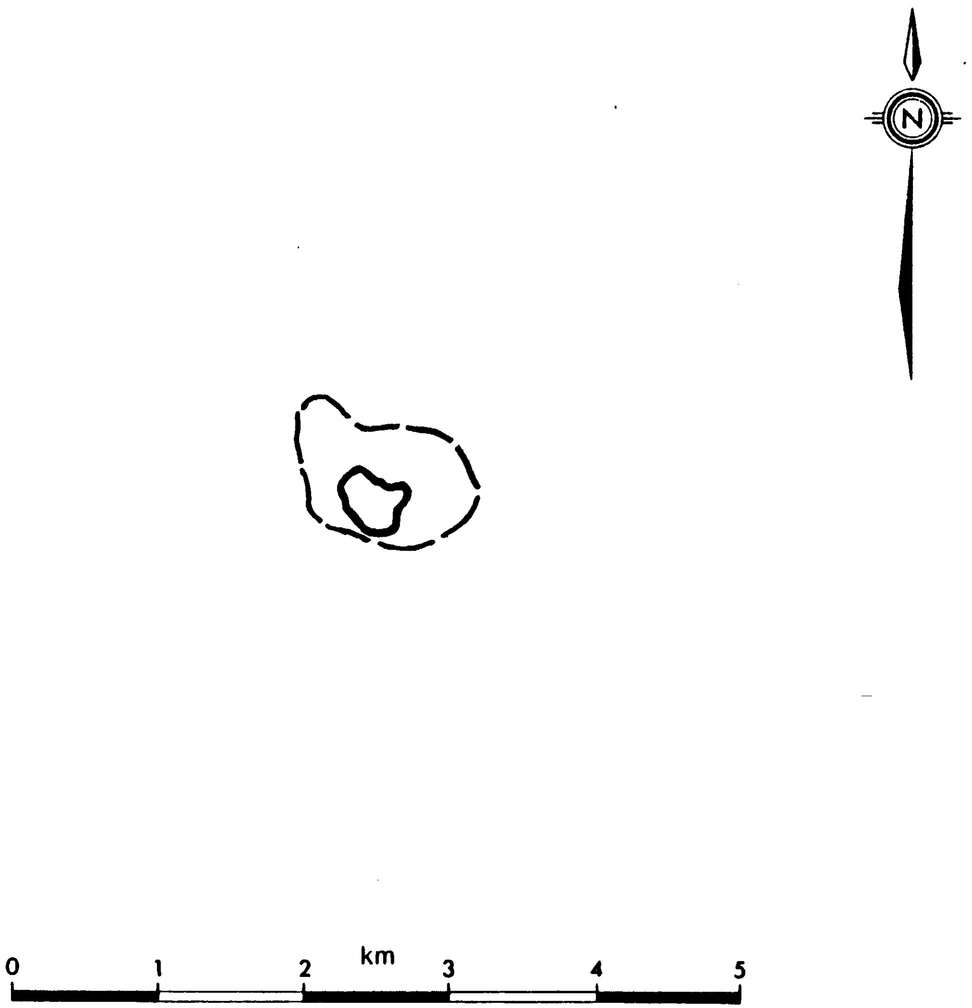
pH 6·9

GENERAL SETTING

Q - 2

GENERAL DESCRIPTION

Lake Q is a small rock basin with simple morphometry. Some muskeg occurs along the shoreline and surficial deposits appear to be of considerable importance within the rather small watershed.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-682868/5448369
Elevation of lake above sea level	367.5 m (1225 ft)
Lake depth at sampling point	3.2 m
Lake area	.06 sq km
Lake catchment area	.8 sq km
Bedrock geology under lake basin	granite
Position of lake in staircase	1
Distance from south end of sampling strip	90 km

LAKE MICROBIOTA

Q - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME	DENSITY
	Bosmina longirostris	1.2
	Daphnia sp.	0.1
	Total	1.3

COPEPODS	SPECIES NAME	DENSITY
	Diaptomus minutus	3.1
	Cyclops bicuspidatus	0.5
	Copepodites	2.1
	Mesocyclops edax	2.3
	Total	8.0

ROTIFERS	SPECIES NAME	DENSITY
	Conochilus sp.	1.1
	Asplanchna preodonta	0.3
	Syncheata sp.	0.2
	Total	1.6

CYANOPHYTA	SPECIES NAME	ABUNDANCE*
	Anabaena circinalis	4
	Aphanocapsa grevillei	4
	Aphanocapsa elachista	5
	Coelosphaerium kutzinghiana	3
	Microcystis aeruginosa	3
	Oscillatoria sp.	2
	(Average)	(4)

CHLOROPHYTA	SPECIES NAME	ABUNDANCE
	Mougeotia sp.	2
	(Average)	(2)

BACILLARIOPHYTA	SPECIES NAME	ABUNDANCE
	Navicula sp.	2
	Pinnularia sp.	2
	Stauroneis anceps	2
	Tabellaria fenestrata	3
	(Average)	(2)

PYRROPHYTA	SPECIES NAME	ABUNDANCE
	Ceratium hirundinella	2
		2
	(Average)	(2)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE(%)
Cyclotella stelligera	23	4	4.5
Cymbella minuta var silesiaca	60	4	11.6
Cymbella angusta	33	**	6.4
Tabellaria flocculosa	15	3	2.9
Nitzschia kutzingiana	17		3.3
Navicula angusta	42	4	8.1
Navicula gottlandica	27		5.2
Pinnularia mormonorum	2	4	..39
Pinnularia subcapitata	10	4	1.9
Navicula notha	9		1.7
Tabellaria fenestrata	41	4	7.9
Navicula radiosa	15	4	2.9
Synedra miniscula	7		1.4
Achnanthes sp	4		.77
Navicula cf rhynchocephala	9		1.7
Navicula subtilissima	15		2.9
Cyclotella comta	8	2	1.5
Synedra tenera	6		1.2
Pinnularia hilseana	13	4	2.5
Eunotia praerupta	10	4	2.5
Anomoeoneis serians var brachysira	16	5	3.1
Navicula cryptocephala	29	2	5.6
Tabellaria quadrisepta	10	3	1.9
Fragilaria sp	2		.39
Pinnularia abaujensis var rostata	3	4	.58
Anomoeoneis zellensis	2	5	.39
Cyclotella glomerata	12	4	2.3
Anomoeoneis vitrea	3	5	.58
Nedium temperei	1	4	.19
Stauroneis phoenicenteron f gracilis	10	4	1.9
Navicula pupula var capitata	3	4	.58
Gomphonema acuminatum	2	2	.39
Navicula heufleri	1	4	.19
Frustalia rhomboides var saxonica	1	3	..19
Tetracyclus lacustris	6	3	1.2
Gomphonema dichotomum	2	2	.39
Navicula bacillum	1		.19
Navicula radiosa var parva	22	4	4.2
Cymbella cymbiformis	2	4	.39
Diatoma cf vulgare var breve	2		.39
Nitzschia palea	1	4	.19
Nedium iridis var ampliatum	3	4	.58
Navicula vanheurckii	2		.39
Navicula pupula var rectangularis	1	4	.19
Navicula pysingensis	1	1	.19
Eunotia incisa	1	4	.19
Gomphonema subtile	3	2	.58
Navicula cocconeiformis	1	3	.19
Eunotia diodon	1	3	.19
Achnanthes linearis	1		.19
Cymbella cuspidata	1	4	.19

* pH CATEGORY
1-Alkalibiontic 3-Acidophilous 5-Acidobiontic
2-Alkaliphilous 4-Indifferent

**Blanks indicate species which had no published autecological information regarding their pH preferences.

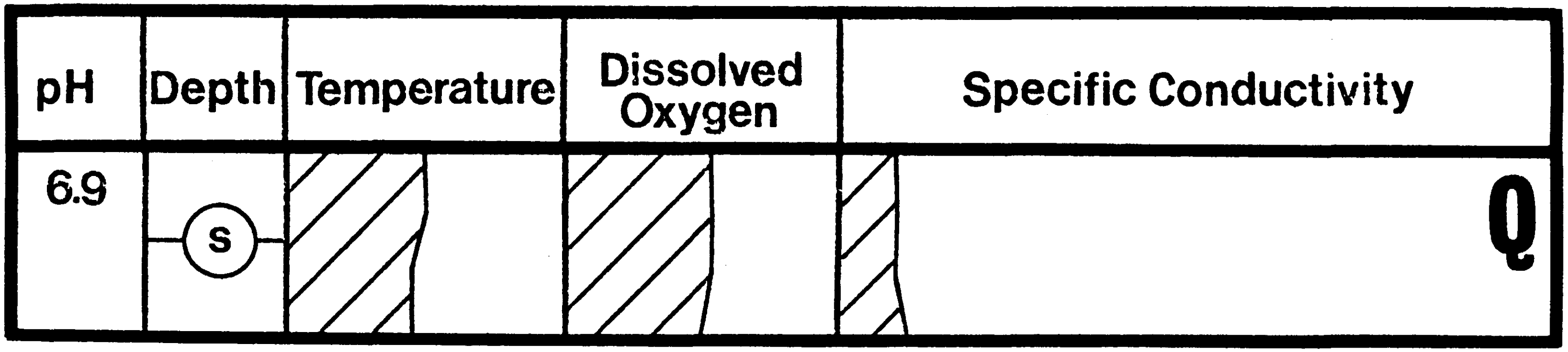
Pond Q (0.06 km^2) differed from Pond P largely in the type of bedrock which predominated its watershed. Pond Q's bedrock was dominated by gneiss, while diabasic bedrock was more common in the watershed of Pond P. Probably as a result, specific conductivity (33-38 micromhos/cm) was slightly lower in Q, and calcium (4.7mg/l) and alkalinity (292 microequivalents/l) were also lower. Both P and Q were thermally unstratified and well oxygenated to their bottoms. Both were dominated by large floating muskeg areas in their littoral regions.

DETAILS OF LAKE WATER CHEMISTRY

Q - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		16.9	100	33
1	1.5	17.4	100	33
2		15.6	100	33
3		15.4	90	38

*Specific conductivity data are temperature-corrected (25° C).

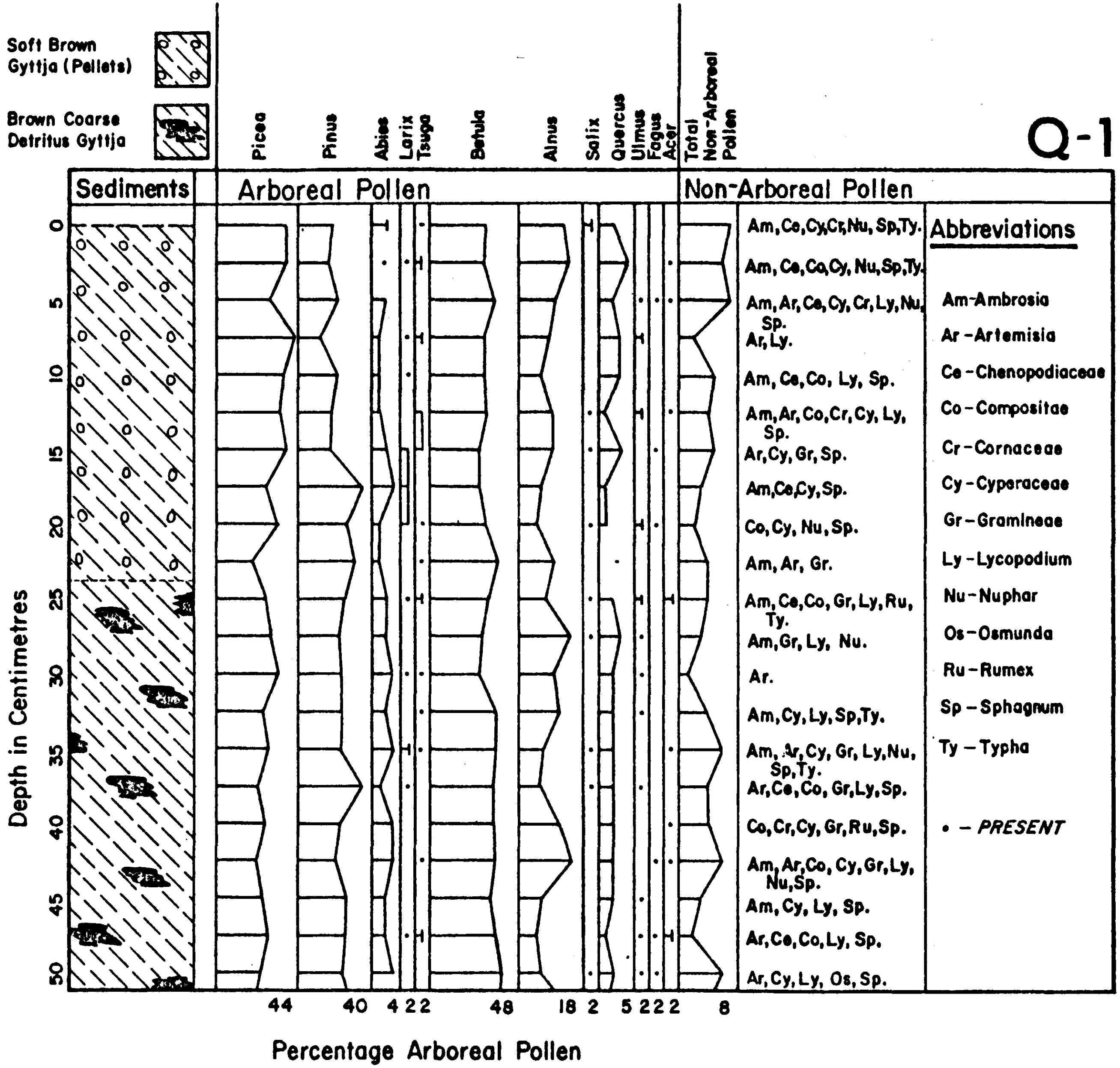


LAKE WATER CHEMISTRY PLOT

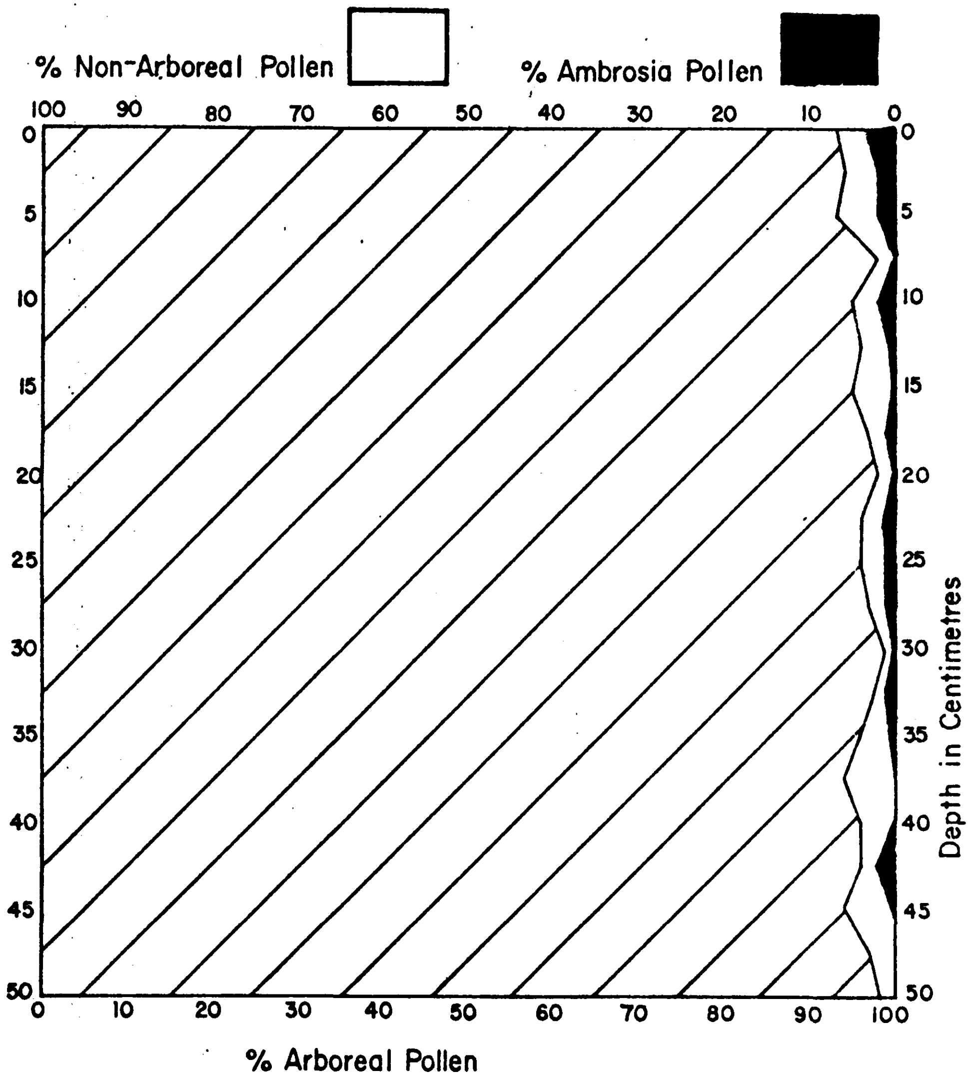
Q - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE

Q - 8



Regional forest composition is reflected by the pollen diagram, with a very small influx of southern pollen. There is no distinct *Ambrosia* rise in the diagram and probably there has been considerable mixing of the lake bottom sediment.



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
Q - 1 - 1	******	******	*****	******	******	******	******	******	*****	****
Q - 1 - 2	******	******	*****	******	******	******	******	******	*****	****
Q - 1 - 3	4705.	1495.	10.	800.	******	921.	7017.	370.	213.	14.
Q - 1 - 4	******	******	*****	******	******	******	******	******	*****	****
Q - 1 - 5	******	******	*****	******	******	******	******	******	*****	****
Q - 1 - 6	5869.	1607.	16.	1200.	570.	1150.	9152.	420.	261.	19.
Q - 1 - 7	5644.	1483.	26.	1110.	510.	1024.	8686.	421.	246.	19.
Q - 1 - 8	5262.	1430.	25.	1070.	460.	974.	8731.	428.	239.	18.
Q - 1 - 9	5315.	1453.	26.	1100.	480.	976.	8931.	429.	246.	19.
Q - 1 - 10	5307.	1453.	24.	1080.	520.	943.	8731.	446.	238.	18.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
Q - 2 - 1	4969.	1990.	50.	1340.	530.	1127.	8537.	688.	270.	15.
Q - 2 - 2	5164.	1926.	50.	1170.	520.	1073.	8180.	579.	247.	15.
Q - 2 - 3	5438.	1892.	51.	1170.	540.	1115.	8436.	560.	236.	16.
Q - 2 - 4	5462.	1901.	50.	1120.	520.	1118.	8550.	526.	243.	16.
Q - 2 - 5	5399.	1805.	51.	1070.	530.	1086.	8485.	495.	236.	17.
Q - 2 - 6	5617.	1785.	52.	1120.	540.	1103.	8558.	528.	247.	18.
Q - 2 - 7	5600.	1788.	51.	1130.	540.	1110.	8702.	517.	250.	18.
Q - 2 - 8	5403.	1685.	49.	1000.	500.	1060.	8401.	474.	242.	17.
Q - 2 - 9	5570.	1699.	50.	1180.	600.	1158.	8692.	542.	246.	18.
Q - 2 - 10	5629.	1723.	51.	1170.	810.	1203.	8747.	513.	248.	18.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
Q - 2 - 11	5457.	1756.	53.	1100.	500.	1108.	8566.	514.	260.	18.
Q - 2 - 12	5556.	1643.	51.	1120.	530.	1136.	8759.	517.	241.	17.
Q - 2 - 13	5418.	1577.	50.	1110.	540.	1124.	8981.	546.	238.	18.
Q - 2 - 14	5114.	1444.	49.	970.	490.	1039.	8683.	512.	222.	17.
Q - 2 - 15	5241.	1420.	47.	1040.	440.	1028.	8595.	519.	220.	15.
Q - 2 - 16	5291.	1460.	47.	1030.	560.	1040.	8593.	499.	233.	18.
Q - 2 - 17	5442.	1531.	48.	1060.	560.	1078.	8773.	501.	235.	18.
Q - 2 - 18	5530.	1469.	47.	1140.	530.	1016.	8596.	496.	257.	18.
Q - 2 - 19	5953.	1600.	49.	1330.	650.	1125.	8838.	518.	285.	19.
Q - 2 - 20	5683.	1612.	47.	1190.	570.	1059.	8667.	504.	256.	20.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
Q - 1 - 1	14.86	0.47	****	Q - 2 - 1	*****	*****	75.2	Q - 2 - 11	*****	*****	69.0
Q - 1 - 2	19.74	0.41	****	Q - 2 - 2	*****	*****	72.8	Q - 2 - 12	*****	*****	69.0
Q - 1 - 3	19.20	0.53	****	Q - 2 - 3	*****	*****	69.8	Q - 2 - 13	*****	*****	70.0
Q - 1 - 4	17.17	0.50	****	Q - 2 - 4	*****	*****	69.5	Q - 2 - 14	*****	*****	70.0
Q - 1 - 5	16.67	0.51	****	Q - 2 - 5	*****	*****	68.0	Q - 2 - 15	*****	*****	68.0
Q - 1 - 6	22.33	0.55	****	Q - 2 - 6	*****	*****	68.5	Q - 2 - 16	*****	*****	67.6
Q - 1 - 7	27.39	0.68	****	Q - 2 - 7	*****	*****	69.0	Q - 2 - 17	*****	*****	67.5
Q - 1 - 8	22.99	0.75	****	Q - 2 - 8	*****	*****	68.0	Q - 2 - 18	*****	*****	66.8
Q - 1 - 9	22.48	0.70	****	Q - 2 - 9	*****	*****	69.5	Q - 2 - 19	*****	*****	66.4
Q - 1 - 10	28.50	1.10	48.0	Q - 2 - 10	*****	*****	68.4	Q - 2 - 20	*****	*****	67.6

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
Q - 1 - 1	1.8	*****	*****	*****	95.	****	****	******	****	****	*****	****
Q - 1 - 2	2.3	*****	*****	*****	81.	****	****	******	****	****	*****	****
Q - 1 - 3	1.8	*****	5.6	30.5	86.	****	****	27.1	****	****	4.5	57.
Q - 1 - 4	1.5	*****	*****	*****	81.	****	****	******	****	****	*****	****
Q - 1 - 5	0.9	*****	*****	*****	76.	****	****	******	****	****	*****	****
Q - 1 - 6	1.0	*****	10.0	41.2	76.	9.	****	32.7	****	****	9.0	64.
Q - 1 - 7	0.8	*****	8.6	43.6	90.	8.	****	32.1	7.	****	8.3	58.
Q - 1 - 8	0.8	*****	8.7	41.5	86.	11.	****	30.5	9.	****	8.7	59.
Q - 1 - 9	1.0	*****	8.6	41.1	95.	9.	****	30.7	9.	****	8.6	61.
Q - 1 - 10	1.0	*****	8.7	41.1	86.	25.	****	30.4	9.	****	8.0	60.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
Q - 2 - 1	****	*****	11.9	25.8	*****	8.	35.	30.8	****	1.5	7.1	110.
Q - 2 - 2	****	*****	10.8	31.8	*****	8.	25.	30.1	****	1.5	7.3	94.
Q - 2 - 3	****	*****	10.1	35.9	*****	8.	15.	30.1	****	2.0	8.2	67.
Q - 2 - 4	****	*****	11.8	38.3	*****	9.	20.	30.7	****	3.5	7.6	67.
Q - 2 - 5	****	*****	10.2	38.4	*****	7.	10.	30.3	****	4.0	7.8	64.
Q - 2 - 6	****	*****	23.6	48.4	*****	8.	15.	30.5	6.	2.5	8.2	83.
Q - 2 - 7	****	*****	11.4	39.1	*****	9.	15.	31.1	****	2.0	7.8	68.
Q - 2 - 8	****	*****	10.2	39.4	*****	6.	10.	30.6	****	2.0	7.3	63.
Q - 2 - 9	****	*****	11.3	40.1	*****	9.	****	32.7	6.	2.5	8.0	66.
Q - 2 - 10	****	*****	11.0	40.0	*****	8.	5.	32.3	6.	2.5	8.0	64.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
Q - 2 - 11	****	*****	10.5	39.2	*****	9.	****	31.2	****	2.5	7.8	64.
Q - 2 - 12	****	*****	13.1	40.7	*****	8.	5.	32.9	6.	2.0	8.2	67.
Q - 2 - 13	****	*****	10.8	40.0	*****	8.	****	33.5	7.	2.5	8.1	64.
Q - 2 - 14	****	*****	10.1	38.7	*****	6.	****	32.1	****	2.0	7.1	59.
Q - 2 - 15	****	*****	10.8	40.0	*****	8.	****	32.0	6.	2.0	7.4	64.
Q - 2 - 16	****	*****	10.0	38.7	*****	7.	****	31.2	****	2.5	7.2	63.
Q - 2 - 17	****	*****	10.6	39.3	*****	9.	****	32.3	****	2.5	7.4	63.
Q - 2 - 18	****	*****	11.5	38.4	*****	10.	5.	30.8	7.	3.0	7.4	62.
Q - 2 - 19	****	5.3	12.3	41.9	*****	11.	****	31.8	12.	2.5	9.3	66.
Q - 2 - 20	****	*****	10.8	41.0	*****	10.	****	31.3	8.	2.5	8.3	61.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
Q - 1 - 1	14.86	0.47	****	Q - 2 - 1	*****	*****	75.2	Q - 2 - 11	*****	*****	69.0
Q - 1 - 2	19.74	0.41	****	Q - 2 - 2	*****	*****	72.8	Q - 2 - 12	*****	*****	69.0
Q - 1 - 3	19.20	0.53	****	Q - 2 - 3	*****	*****	69.8	Q - 2 - 13	*****	*****	70.0
Q - 1 - 4	17.17	0.50	****	Q - 2 - 4	*****	*****	69.5	Q - 2 - 14	*****	*****	70.0
Q - 1 - 5	16.67	0.51	****	Q - 2 - 5	*****	*****	68.0	Q - 2 - 15	*****	*****	68.0
Q - 1 - 6	22.33	0.55	****	Q - 2 - 6	*****	*****	68.5	Q - 2 - 16	*****	*****	67.6
Q - 1 - 7	27.39	0.68	****	Q - 2 - 7	*****	*****	69.0	Q - 2 - 17	*****	*****	67.5
Q - 1 - 8	22.99	0.75	****	Q - 2 - 8	*****	*****	68.0	Q - 2 - 18	*****	*****	66.8
Q - 1 - 9	22.48	0.70	****	Q - 2 - 9	*****	*****	69.5	Q - 2 - 19	*****	*****	66.4
Q - 1 - 10	28.50	1.10	48.0	Q - 2 - 10	*****	*****	68.4	Q - 2 - 20	*****	*****	67.6

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
Q - 1 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
Q - 1 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
Q - 1 - 3	0.0563	0.0240	0.0094	0.0435	*******	0.0333	0.1506	0.3304	0.0338	0.0864
Q - 1 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
Q - 1 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
Q - 1 - 6	0.0702	0.0258	0.0150	0.0652	0.0251	0.0416	0.1964	0.3750	0.0413	0.1173
Q - 1 - 7	0.0675	0.0238	0.0241	0.0603	0.0225	0.0370	0.1864	0.3759	0.0390	0.1167
Q - 1 - 8	0.0629	0.0230	0.0236	0.0582	0.0203	0.0352	0.1874	0.3821	0.0377	0.1117
Q - 1 - 9	0.0636	0.0234	0.0241	0.0598	0.0211	0.0353	0.1917	0.3830	0.0389	0.1148
Q - 1 - 10	0.0635	0.0234	0.0229	0.0587	0.0229	0.0341	0.1874	0.3982	0.0377	0.1136

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
Q - 2 - 1	0.0594	0.0320	0.0467	0.0728	0.0233	0.0408	0.1832	0.6143	0.0426	0.0914
Q - 2 - 2	0.0618	0.0310	0.0475	0.0636	0.0229	0.0388	0.1755	0.5170	0.0390	0.0914
Q - 2 - 3	0.0650	0.0304	0.0477	0.0636	0.0238	0.0403	0.1810	0.5000	0.0373	0.1012
Q - 2 - 4	0.0653	0.0306	0.0475	0.0609	0.0229	0.0404	0.1835	0.4696	0.0384	0.1012
Q - 2 - 5	0.0646	0.0290	0.0477	0.0582	0.0233	0.0393	0.1821	0.4420	0.0373	0.1068
Q - 2 - 6	0.0672	0.0287	0.0488	0.0609	0.0238	0.0399	0.1836	0.4714	0.0390	0.1111
Q - 2 - 7	0.0670	0.0287	0.0485	0.0614	0.0238	0.0402	0.1867	0.4616	0.0395	0.1123
Q - 2 - 8	0.0646	0.0271	0.0466	0.0543	0.0220	0.0384	0.1803	0.4232	0.0383	0.1043
Q - 2 - 9	0.0666	0.0273	0.0473	0.0641	0.0264	0.0419	0.1865	0.4839	0.0390	0.1123
Q - 2 - 10	0.0673	0.0277	0.0476	0.0636	0.0357	0.0435	0.1877	0.4580	0.0392	0.1123

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
Q - 2 - 11	0.0653	0.0282	0.0497	0.0598	0.0220	0.0401	0.1838	0.4589	0.0411	0.1093
Q - 2 - 12	0.0665	0.0264	0.0476	0.0609	0.0233	0.0411	0.1880	0.4616	0.0381	0.1068
Q - 2 - 13	0.0648	0.0254	0.0473	0.0603	0.0238	0.0407	0.1927	0.4875	0.0377	0.1111
Q - 2 - 14	0.0612	0.0232	0.0463	0.0527	0.0216	0.0376	0.1863	0.4571	0.0350	0.1043
Q - 2 - 15	0.0627	0.0228	0.0445	0.0565	0.0194	0.0372	0.1844	0.4634	0.0348	0.0914
Q - 2 - 16	0.0633	0.0235	0.0442	0.0560	0.0247	0.0376	0.1844	0.4455	0.0368	0.1123
Q - 2 - 17	0.0651	0.0246	0.0450	0.0576	0.0247	0.0390	0.1883	0.4473	0.0372	0.1093
Q - 2 - 18	0.0661	0.0236	0.0447	0.0620	0.0233	0.0368	0.1845	0.4429	0.0406	0.1080
Q - 2 - 19	0.0712	0.0257	0.0463	0.0723	0.0286	0.0407	0.1897	0.4625	0.0450	0.1191
Q - 2 - 20	0.0680	0.0259	0.0442	0.0647	0.0251	0.0383	0.1860	0.4500	0.0404	0.1204

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLF I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
Q - 1 - 1	14.86	0.47	****	Q - 2 - 1	*****	*****	75.2	Q - 2 - 11	*****	*****	69.0
Q - 1 - 2	19.74	0.41	****	Q - 2 - 2	*****	*****	72.8	Q - 2 - 12	*****	*****	69.0
Q - 1 - 3	19.20	0.53	****	Q - 2 - 3	*****	*****	69.8	Q - 2 - 13	*****	*****	70.0
Q - 1 - 4	17.17	0.50	****	Q - 2 - 4	*****	*****	69.5	Q - 2 - 14	*****	*****	70.0
Q - 1 - 5	16.67	0.51	****	Q - 2 - 5	*****	*****	68.0	Q - 2 - 15	*****	*****	68.0
Q - 1 - 6	22.33	0.55	****	Q - 2 - 6	*****	*****	68.5	Q - 2 - 16	*****	*****	67.6
Q - 1 - 7	27.39	0.68	****	Q - 2 - 7	*****	*****	69.0	Q - 2 - 17	*****	*****	67.5
Q - 1 - 8	22.99	0.75	****	Q - 2 - 8	*****	*****	68.0	Q - 2 - 18	*****	*****	66.8
Q - 1 - 9	22.48	0.70	****	Q - 2 - 9	*****	*****	69.5	Q - 2 - 19	*****	*****	66.4
Q - 1 - 10	28.50	1.10	48.0	Q - 2 - 10	*****	*****	68.4	Q - 2 - 20	*****	*****	67.6

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
Q - 1 - 1	1.000	*******	*******	*******	1.1047	******	******	********	******	******	*******	*******
Q - 1 - 2	1.278	*******	*******	*******	0.9419	******	******	********	******	******	*******	*******
Q - 1 - 3	1.000	*******	0.0459	0.4485	1.0000	******	******	0.0706	******	******	0.0331	0.7447
Q - 1 - 4	0.833	*******	*******	*******	0.9419	******	******	********	******	******	*******	*******
Q - 1 - 5	0.500	*******	*******	*******	0.8837	******	******	********	******	******	*******	*******
Q - 1 - 6	0.556	*******	0.0820	0.6059	0.8837	0.088	******	0.0852	******	******	0.0662	0.8461
Q - 1 - 7	0.444	*******	0.0703	0.6407	1.0465	0.084	******	0.0835	0.877	******	0.0608	0.7645
Q - 1 - 8	0.444	*******	0.0711	0.6109	1.0000	0.110	******	0.0795	1.049	******	0.0642	0.7789
Q - 1 - 9	0.556	*******	0.0708	0.6040	1.1047	0.088	******	0.0798	1.086	******	0.0630	0.8026
Q - 1 - 10	0.556	*******	0.0710	0.6040	1.0000	0.255	******	0.0791	1.099	******	0.0586	0.7908

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
Q - 2 - 1	******	*******	0.0972	0.3794	*******	0.082	2.692	0.0803	******	0.652	0.0518	1.4487
Q - 2 - 2	******	*******	0.0884	0.4669	*******	0.085	1.923	0.0783	******	0.652	0.0534	1.2395
Q - 2 - 3	******	*******	0.0825	0.5287	*******	0.085	1.154	0.0785	******	0.870	0.0601	0.8750
Q - 2 - 4	******	*******	0.0964	0.5635	*******	0.093	1.538	0.0798	******	1.522	0.0560	0.8803
Q - 2 - 5	******	*******	0.0838	0.5646	*******	0.070	0.769	0.0789	******	1.739	0.0574	0.8474
Q - 2 - 6	******	*******	0.1938	0.7119	*******	0.083	1.154	0.0793	0.753	1.087	0.0600	1.0882
Q - 2 - 7	******	*******	0.0938	0.5750	*******	0.086	1.154	0.0811	******	0.870	0.0573	0.8934
Q - 2 - 8	******	*******	0.0834	0.5791	*******	0.062	0.769	0.0796	******	0.870	0.0533	0.8276
Q - 2 - 9	******	*******	0.0928	0.5894	*******	0.086	******	0.0852	0.790	1.087	0.0585	0.8737
Q - 2 - 10	******	*******	0.0902	0.5884	*******	0.083	0.385	0.0841	0.753	1.087	0.0585	0.8461

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
Q - 2 - 11	******	*******	0.0862	0.5759	*******	0.094	******	0.0813	******	1.087	0.0574	0.8461
Q - 2 - 12	******	*******	0.1075	0.5987	*******	0.083	0.385	0.0856	0.790	0.870	0.0600	0.8803
Q - 2 - 13	******	*******	0.0883	0.5882	*******	0.083	******	0.0873	0.889	1.087	0.0599	0.8461
Q - 2 - 14	******	*******	0.0825	0.5697	*******	0.063	******	0.0837	******	0.870	0.0518	0.7803
Q - 2 - 15	******	*******	0.0889	0.5884	*******	0.084	******	0.0833	0.765	0.870	0.0546	0.8409
Q - 2 - 16	******	*******	0.0823	0.5697	*******	0.071	******	0.0813	******	1.087	0.0532	0.8342
Q - 2 - 17	******	*******	0.0872	0.5779	*******	0.087	******	0.0840	******	1.087	0.0545	0.8329
Q - 2 - 18	******	*******	0.0944	0.5646	*******	0.101	0.385	0.0802	0.840	1.304	0.0546	0.8171
Q - 2 - 19	******	0.1828	0.1007	0.6162	*******	0.112	******	0.0829	1.420	1.087	0.0685	0.8632
Q - 2 - 20	******	*******	0.0881	0.6028	*******	0.103	******	0.0814	0.975	1.087	0.0612	0.8026

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
Q - 1 - 1	14.86	0.47	****	Q - 2 - 1	*****	*****	75.2	Q - 2 - 11	*****	*****	69.0
Q - 1 - 2	19.74	0.41	****	Q - 2 - 2	*****	*****	72.8	Q - 2 - 12	*****	*****	69.0
Q - 1 - 3	19.20	0.53	****	Q - 2 - 3	*****	*****	69.8	Q - 2 - 13	*****	*****	70.0
Q - 1 - 4	17.17	0.50	****	Q - 2 - 4	*****	*****	69.5	Q - 2 - 14	*****	*****	70.0
Q - 1 - 5	16.67	0.51	****	Q - 2 - 5	*****	*****	68.0	Q - 2 - 15	*****	*****	68.0
Q - 1 - 6	22.33	0.55	****	Q - 2 - 6	*****	*****	68.5	Q - 2 - 16	*****	*****	67.6
Q - 1 - 7	27.39	0.68	****	Q - 2 - 7	*****	*****	69.0	Q - 2 - 17	*****	*****	67.5
Q - 1 - 8	22.99	0.75	****	Q - 2 - 8	*****	*****	68.0	Q - 2 - 18	*****	*****	66.8
Q - 1 - 9	22.48	0.70	****	Q - 2 - 9	*****	*****	69.5	Q - 2 - 19	*****	*****	66.4
Q - 1 - 10	28.50	1.10	48.0	Q - 2 - 10	*****	*****	68.4	Q - 2 - 20	*****	*****	67.6

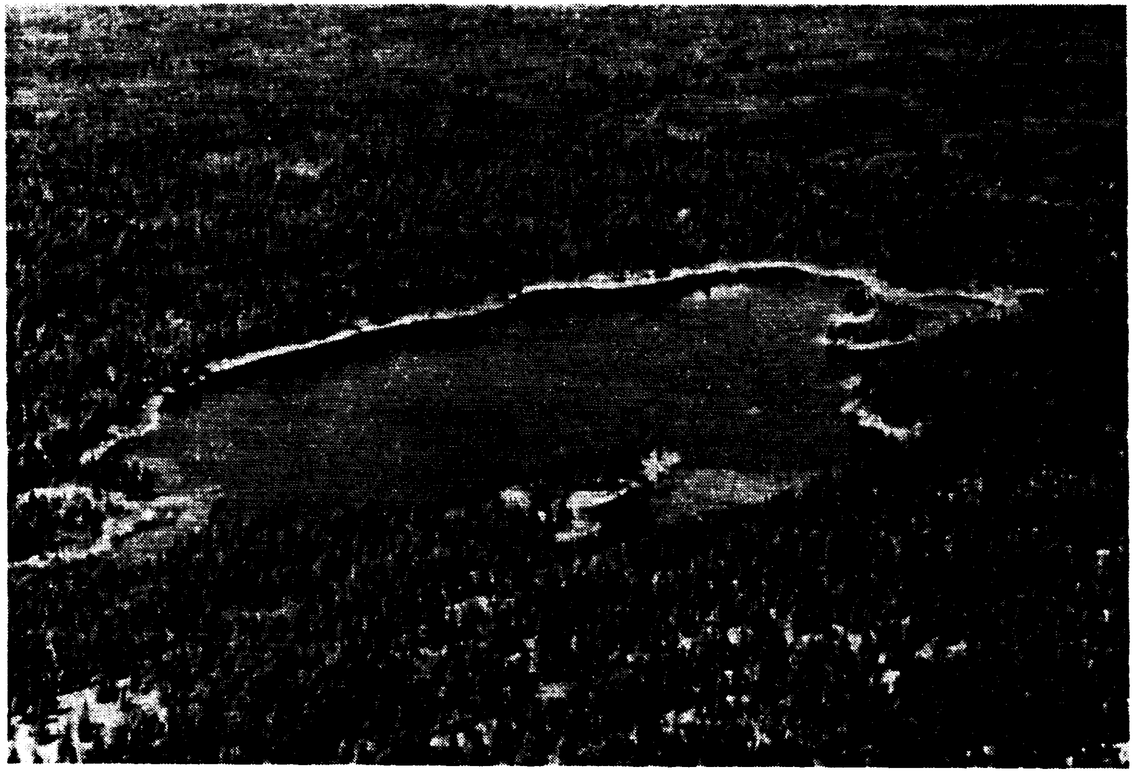
LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake R

pH 7·3

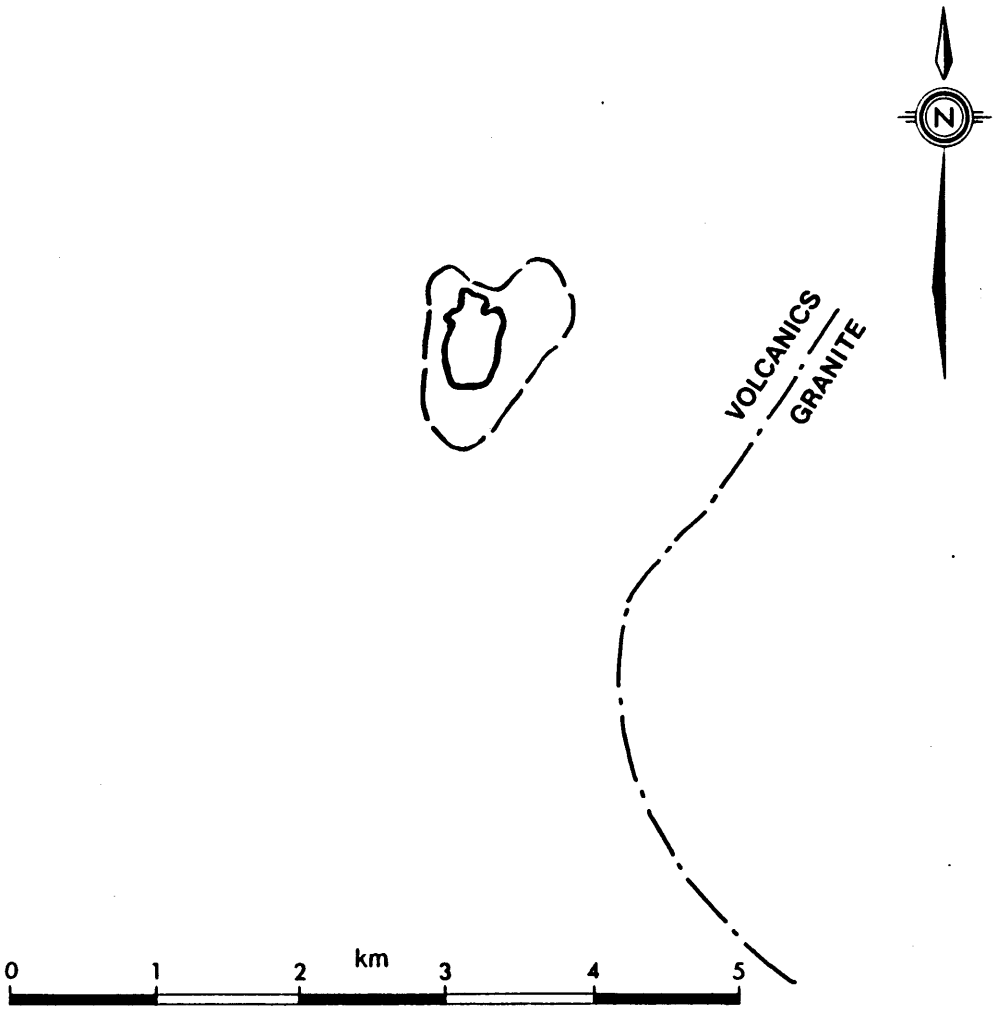
GENERAL SETTING

R - 2



GENERAL DESCRIPTION

Lake R is a small rock basin with relatively simple morphometry. It has a few islands. There is some muskeg in the bays of the lake and surficial deposits comprise some of the shoreline. It has a small watershed and surficial deposits appear to cover a considerable part of it.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-692169/5471247
Elevation of lake above sea level	367.5 m (1225 ft)
Lake depth at sampling point	3.5 m
Lake area	.2 sq km
Lake catchment area	.75 sq km
Bedrock geology under lake basin	volcanics
Position of lake in staircase	1
Distance from south end of sampling strip	97 km

GEOLOGICAL / GEOGRAPHICAL INFORMATION

R - 3

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME	DENSITY
	Holopedium gibberum	0.1
	Bosmina longirostris	0.2
	Daphnia sp.	0.1
	Total	0.4

COPEPODS	SPECIES NAME	DENSITY
	Cyclops bicuspidatus	3.3
	Diaptomus minutus	0.2
	Copepodites	0.6
	Mesocyclops edax	1.3
	Total	5.4

ROTIFERS	SPECIES NAME	DENSITY
	Conochilus sp.	0.6
	Keratella quadrata	0.8
	Kellicotia longispina	0.7
	Syncheata sp.	0.2
	Polyarthra sp.	0.3
	Total	2.6

CYANOPHYTA	SPECIES NAME	ABUNDANCE*
	Aphanocapsa grevillei	4
	Microcystis aeruginosa	3
	Gloeocapsa sp.	3
	(Average)	(3)

CHLOROPHYTA	SPECIES NAME	ABUNDANCE
	Desmids	2
	(Average)	(2)

BACILLARIOPHYTA	SPECIES NAME	ABUNDANCE
	Asterionella formosa	2
	Frustulia rhomboides	2
	Melosira sp.	2
	Navicula sp.	2
	Navicula radiosa	2
	Pinnulaira acrosphaeria	2
	Tabellaria fenestrata	2
	(Average)	(2)

PYRROPHYTA	SPECIES NAME	ABUNDANCE
	Ceratium hirundinella	2
	(Average)	(2)

CHRYSOPHYTA	SPECIES NAME	ABUNDANCE
	Dinobryon divergens	2
	(Average)	(2)

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE (%)
Cyclotella bodanica	10	4	4.5
Achnantes hauckiana	6	**	2.7
Tabellaria quadrisepta	10	3	4.5
Achnanthes linearis	8		3.6
Cyclotella stelligera	23	4	10.3
Tabellaria fenestrata	29	4	12.9
Cyclotella glomerata	13	4	5.8
Fragilleria construens	8	2	3.6
Cyclotella comta	10	2	4.4
Navicula elginensis var lata	3	4	1.3
Navicula notha	4		1.8
Navicula cryptocephala	3	2	1.3
Navicula radiosa	1	4	.45
Pinnularia sudetica	2		.89
Melosira islandica	12	2	5.4
Diploneis pseudovalis	1		.45
Navicula protracta	2		.89
Navicula pupula var capitata	2	4	.89
Achnanthes sp	2		.89
Melosira distans	22	2	9.8
Cymbella minuta	3	4	1.3
Pinnularia subcapitata	2	4	.89
Nitzschia palea	4	4	1.9
Fragilaria leptostauron	3	2	1.3
Gomphonema dichotomum	1	2	.45
Asterionella formosa	14	2	6.3
Synedra tenera	1		.45
Pinnularia hilseana	1	4	.45
Achnantes lanceolata	1	2	.45
Synedra radians	2	2	.89
Amphora ovalis	1	2	.45
Melosira grannulata	5	2	2.2
Synedra cyclopum	2		.89
Cymbella angusta	1		.45
Cocconeis fluvitalis	2		.89

* pH CATEGORY
- 1-Alkalibiontic
- 2-Alkaliphilous
- 3-Acidophilous
- 4-Indifferent
- 5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

MASTIGOPHORANS	SPECIES NAME		ABUNDANCE
	Euglypha sp.		1
	Difflugia		1
		(Average)	(1)

OSTRACODA	SPECIES NAME		ABUNDANCE
	Ostracod valves		1
		(Average)	(1)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

Lake R was approximately three times the size (0.2 km^2) of Pond Q, although their watersheds were similar in area (0.75 and 0.80 km^2 respectively). While Lake R was clear (Secchi = 2.8m), it had an exceptionally high sediment loss on ignition for a first-order lake (73%). This high percentage of loss on ignition was also shared by Pond Q.

The lake was only thermally stratified just above its bottom (4m), and its dissolved oxygen was well mixed from top to bottom. Lake R's watershed was dominated by diabasic bedrock. For this reason, it was not surprising to find a higher specific conductivity (59-70 micromhos/cm), alkalinity (603 microequivalents/l), and calcium (7.4mg/l) that in Pond Q, where gneiss formed the predominant bedrock.

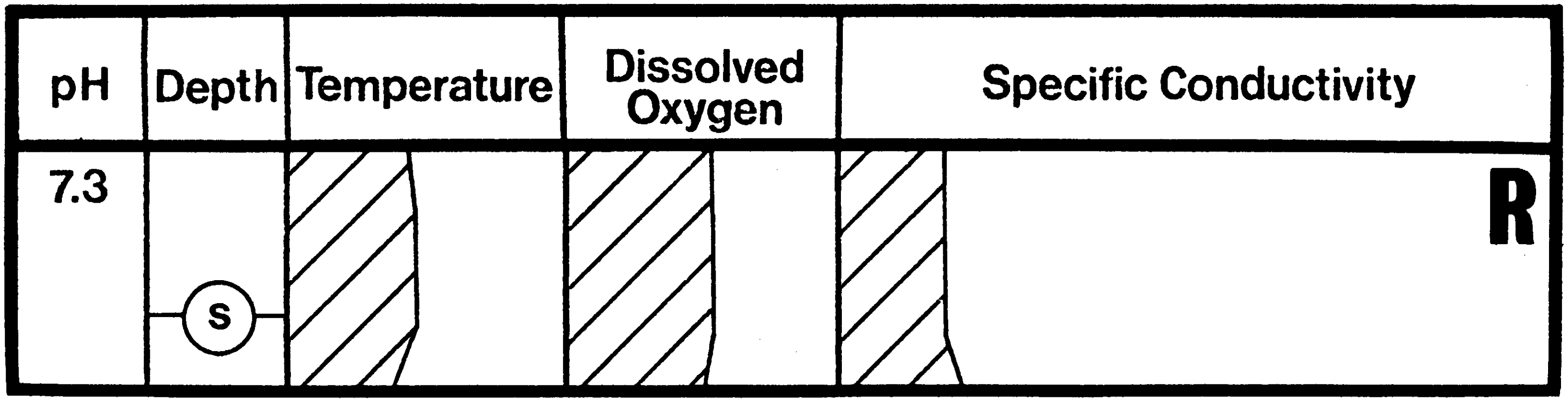
Lakes O, P, Q, R, S, and T were at low elevations for Wawa study lakes. Four of these lakes (P, R, S, and T) shared the highest specific conductivity. They were also the most alkaline of the lot (pH ranged from 7.1 to 8.2). Species richness ranged from low to moderate.

DETAILS OF LAKE WATER CHEMISTRY

R - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		14.8	100	59
1		15.5	100	59
2	2.8	15.5	100	59
3		15.4	100	59
4		12.8	90	70

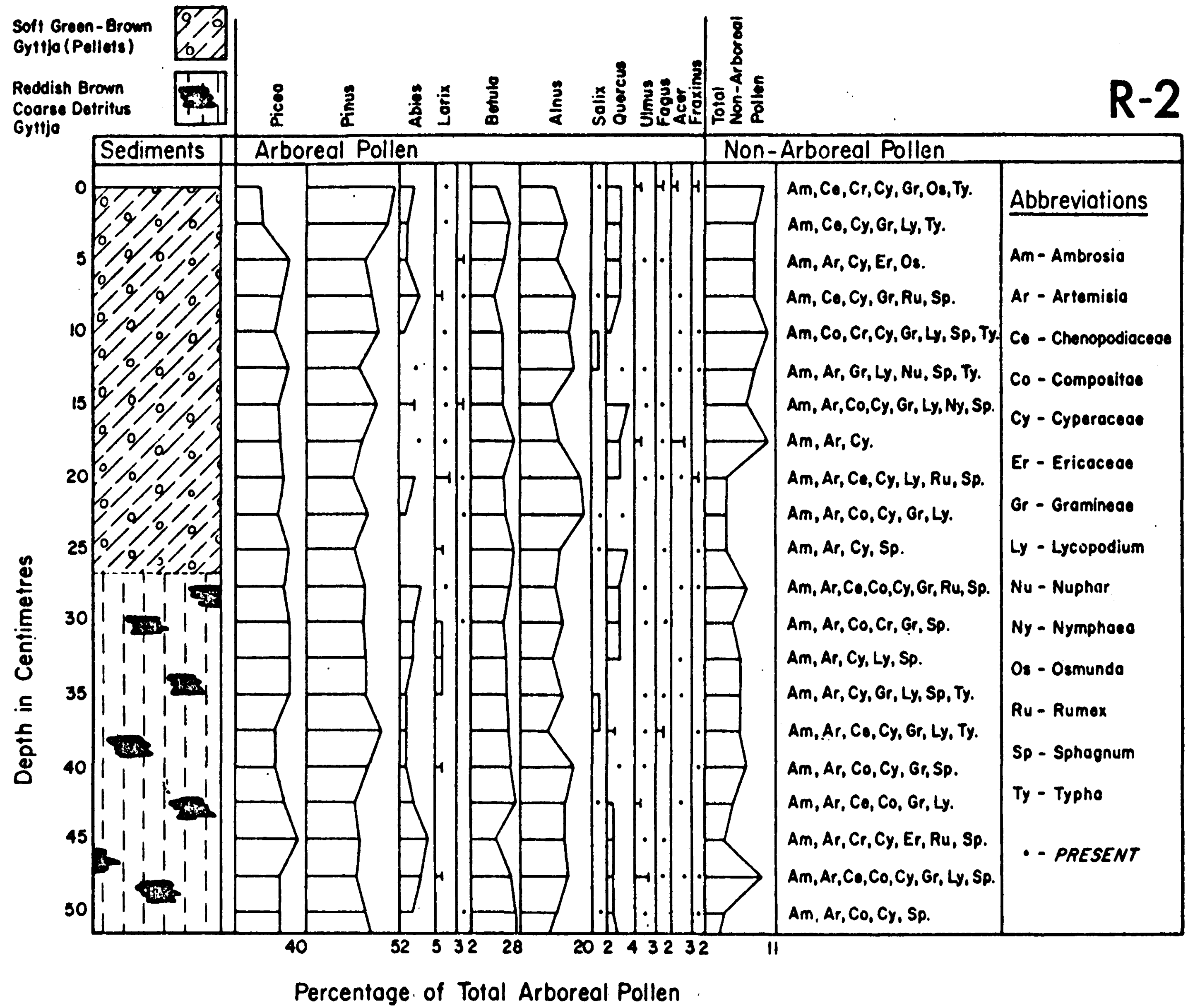
*Specific conductivity data are temperature-corrected (25° C).



LAKE WATER CHEMISTRY PLOT

R - 7

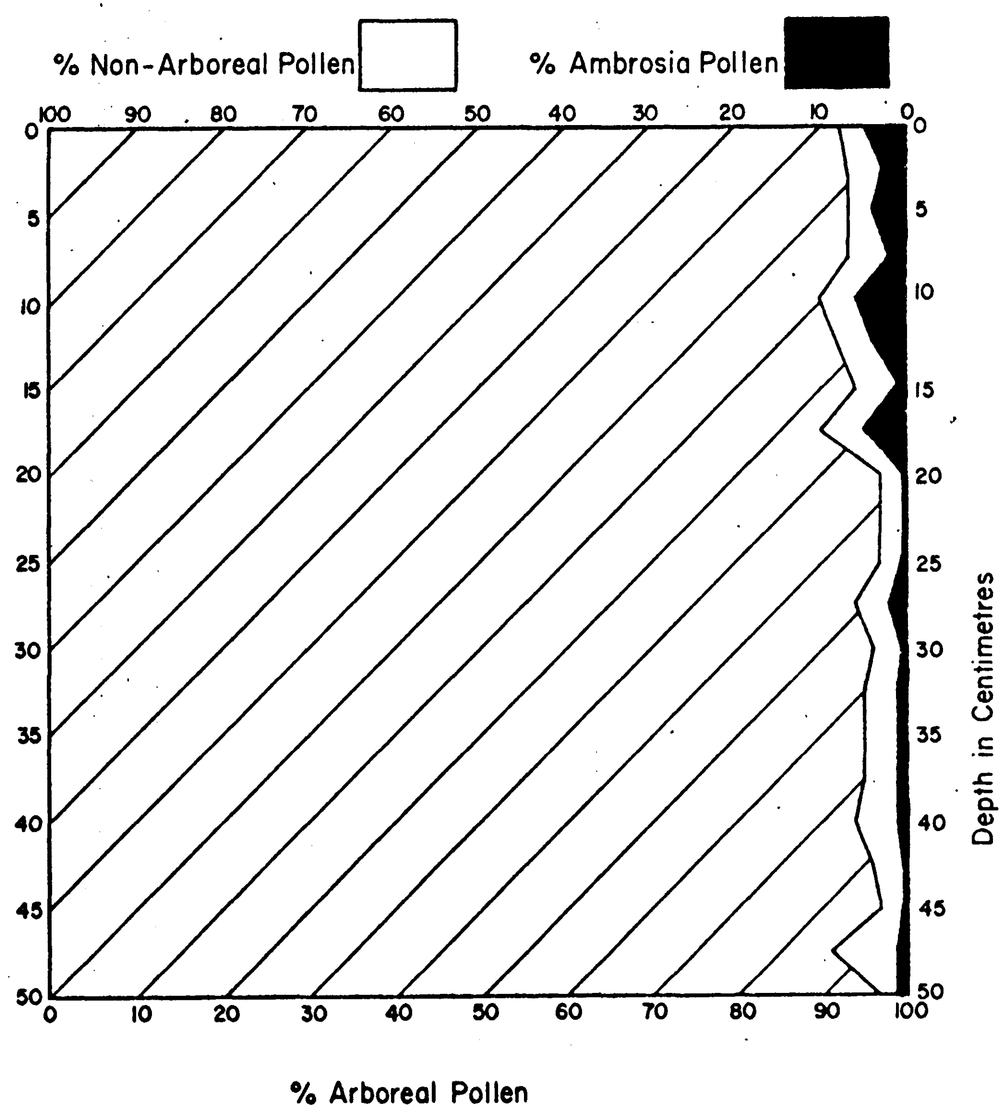
POLLEN DIAGRAM : LAKE SEDIMENT CORE



PALYNOLOGY NOTES

Regional forest composition is reflected rather well by the pollen diagram. The southern pollen component is nearly absent. The *Ambrosia* rise is reasonably distinct in the top 20 cm of gyttja.

AMBROSIA RISE DIAGRAM



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
R - 1 - 1	8025.	5319.	92.	2470.	1280.	1676.	9259.	1184.	383.	16.
R - 1 - 2	8640.	5076.	94.	2500.	1240.	1728.	9187.	1193.	384.	18.
R - 1 - 3	9352.	5436.	101.	2720.	1410.	1873.	9685.	1323.	419.	20.
R - 1 - 4	9882.	6620.	107.	2780.	1520.	1997.	9842.	1412.	467.	21.
R - 1 - 5	11790.	8177.	111.	2920.	1660.	2088.	10190.	1472.	521.	24.
R - 1 - 6	11990.	8780.	113.	3030.	1760.	2150.	10270.	1383.	566.	25.
R - 1 - 7	12290.	9573.	111.	3200.	1930.	2316.	10350.	1490.	591.	25.
R - 1 - 8	13830.	9346.	106.	3150.	1790.	2263.	10570.	1419.	582.	28.
R - 1 - 9	13030.	9164.	105.	3040.	1710.	2165.	10120.	1369.	540.	28.
R - 1 - 10	13340.	9096.	103.	2860.	1570.	2091.	10070.	1280.	549.	25.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
R - 2 - 1	******	******	*****	******	******	******	******	******	*****	****
R - 2 - 2	9979.	6928.	72.	2470.	1600.	1928.	9905.	1048.	443.	21.
R - 2 - 3	12150.	8684.	76.	2610.	1900.	2053.	9877.	1045.	516.	25.
R - 2 - 4	13460.	8870.	79.	2860.	2190.	2198.	10470.	1058.	573.	28.
R - 2 - 5	******	******	*****	******	******	******	******	******	*****	****
R - 2 - 6	8554.	5323.	49.	1620.	1060.	1366.	7047.	600.	334.	17.
R - 2 - 7	12150.	7793.	63.	2020.	1300.	1705.	10080.	850.	452.	21.
R - 2 - 8	9403.	6009.	46.	1370.	770.	1254.	8299.	770.	310.	16.
R - 2 - 9	9978.	6175.	49.	1140.	740.	1226.	9235.	780.	288.	16.
R - 2 - 10	6920.	4032.	29.	770.	680.	909.	7102.	550.	190.	****

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
R - 1 - 11	12840.	8798.	101.	2800.	1610.	1998.	9816.	1219.	522.	24.
R - 1 - 12	11410.	8401.	101.	2720.	1550.	1947.	9720.	1175.	519.	24.
R - 1 - 13	11380.	8016.	101.	2670.	1540.	1944.	9956.	1203.	474.	31.
R - 1 - 14	11880.	8197.	97.	2440.	1520.	1830.	9806.	1122.	471.	24.
R - 1 - 15	11020.	9134.	95.	2250.	1380.	1744.	9458.	1056.	457.	22.
R - 1 - 16	11110.	8648.	91.	1940.	1260.	1579.	9206.	1054.	415.	20.
R - 1 - 17	11320.	9267.	85.	1580.	910.	1376.	9256.	1069.	348.	17.
R - 1 - 18	10660.	10070.	82.	1330.	830.	1275.	9208.	1011.	309.	16.
R - 1 - 19	10180.	8724.	82.	1290.	810.	1260.	9321.	963.	297.	17.
R - 1 - 20	10170.	6238.	84.	1300.	830.	1256.	9766.	949.	288.	16.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
R - 1 - 1	*****	*****	79.4	R - 2 - 1	13.28	0.33	****	R - 1 - 11	*****	*****	71.0
R - 1 - 2	*****	*****	79.0	R - 2 - 2	21.25	0.70	****	R - 1 - 12	*****	*****	71.5
R - 1 - 3	*****	*****	78.5	R - 2 - 3	20.87	0.71	****	R - 1 - 13	*****	*****	72.2
R - 1 - 4	*****	*****	77.0	R - 2 - 4	26.51	0.73	****	R - 1 - 14	*****	*****	72.0
R - 1 - 5	*****	*****	74.0	R - 2 - 5	21.94	0.55	****	R - 1 - 15	*****	*****	72.2
R - 1 - 6	*****	*****	72.0	R - 2 - 6	24.48	0.55	****	R - 1 - 16	*****	*****	73.0
R - 1 - 7	*****	*****	70.4	R - 2 - 7	22.50	0.61	****	R - 1 - 17	*****	*****	74.5
R - 1 - 8	*****	*****	69.6	R - 2 - 8	26.63	0.54	****	R - 1 - 18	*****	*****	78.0
R - 1 - 9	*****	*****	70.5	R - 2 - 9	28.32	0.63	****	R - 1 - 19	*****	*****	79.2
R - 1 - 10	*****	*****	71.0	R - 2 - 10	25.05	0.54	****	R - 1 - 20	*****	*****	81.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NT PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
R - 1 - 1	****	5.4	13.6	34.9	*****	11.	55.	29.3	****	1.0	11.5	135.
R - 1 - 2	****	5.4	12.5	33.7	*****	12.	50.	27.6	****	0.5	11.3	80.
R - 1 - 3	****	8.8	13.8	36.1	*****	16.	65.	29.3	7.	0.5	13.2	84.
R - 1 - 4	****	8.4	16.6	43.3	*****	16.	65.	30.4	7.	0.5	14.8	96.
R - 1 - 5	****	6.8	15.3	45.3	*****	15.	70.	32.9	****	1.0	17.5	99.
R - 1 - 6	****	9.0	19.2	49.1	*****	17.	75.	33.7	7.	2.5	18.9	106.
R - 1 - 7	****	8.8	17.4	50.9	*****	18.	70.	33.3	****	1.0	21.6	108.
R - 1 - 8	****	11.1	17.0	52.6	*****	18.	60.	33.7	7.	2.0	21.3	109.
R - 1 - 9	****	13.5	16.4	53.8	*****	18.	60.	31.4	8.	1.0	20.9	103.
R - 1 - 10	****	7.7	16.6	56.3	*****	26.	50.	31.4	****	2.0	19.2	100.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
R - 2 - 1	2.2	*****	*****	*****	49.	****	****	******	****	****	*****	****
R - 2 - 2	2.3	8.4	14.6	41.7	94.	17.	50.	30.5	7.	****	15.4	105.
R - 2 - 3	3.8	7.9	17.1	48.9	134.	18.	45.	33.4	7.	****	18.2	91.
R - 2 - 4	4.0	8.6	15.9	54.1	130.	19.	45.	35.7	7.	****	19.9	97.
R - 2 - 5	4.0	*****	*****	*****	139.	****	****	******	****	****	*****	****
R - 2 - 6	3.7	*****	13.2	38.7	139.	19.	10.	23.7	****	****	14.4	60.
R - 2 - 7	3.4	13.0	17.4	62.9	134.	21.	15.	32.1	****	****	18.5	81.
R - 2 - 8	3.1	*****	15.2	58.1	143.	17.	5.	25.2	****	****	12.7	61.
R - 2 - 9	3.1	*****	12.2	68.9	130.	14.	5.	26.7	****	****	14.3	53.
R - 2 - 10	2.2	*****	8.4	50.7	107.	13.	****	19.1	****	****	10.9	35.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
R - 1 - 11	****	9.0	17.1	57.9	*****	19.	50.	30.6	8.	2.0	19.5	95.
R - 1 - 12	****	11.6	16.0	58.9	*****	19.	35.	30.5	7.	0.5	19.5	91.
R - 1 - 13	****	11.6	15.4	57.4	*****	19.	35.	30.5	7.	1.0	18.8	92.
R - 1 - 14	****	6.8	15.2	61.1	*****	17.	35.	30.4	****	1.0	1A.5	87.
R - 1 - 15	****	*****	16.2	65.8	*****	15.	35.	29.4	****	1.0	17.8	84.
R - 1 - 16	****	*****	13.7	63.8	*****	15.	30.	2A.0	****	0.5	15.7	76.
R - 1 - 17	****	6.8	12.8	70.1	*****	15.	35.	26.0	****	1.0	13.9	6A.
R - 1 - 18	****	6.7	11.6	71.4	*****	14.	25.	24.9	****	1.5	13.6	57.
R - 1 - 19	****	5.8	11.8	72.9	*****	13.	20.	25.2	****	1.0	14.1	53.
R - 1 - 20	****	8.6	14.6	72.8	*****	16.	10.	25.8	****	1.0	14.2	56.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
R - 1 - 1	*****	*****	79.4	R - 2 - 1	13.28	0.33	****	R - 1 - 11	*****	*****	71.0
R - 1 - 2	*****	*****	79.0	R - 2 - 2	21.25	0.70	****	R - 1 - 12	*****	*****	71.5
R - 1 - 3	*****	*****	7A.5	R - 2 - 3	20.87	0.71	****	R - 1 - 13	*****	*****	72.2
R - 1 - 4	*****	*****	77.0	R - 2 - 4	26.51	0.73	****	R - 1 - 14	*****	*****	72.0
R - 1 - 5	*****	*****	74.0	R - 2 - 5	21.94	0.55	****	R - 1 - 15	*****	*****	72.2
R - 1 - 6	*****	*****	72.0	R - 2 - 6	24.4A	0.55	****	R - 1 - 16	*****	*****	73.0
R - 1 - 7	*****	*****	70.4	R - 2 - 7	22.50	0.61	****	R - 1 - 17	*****	*****	74.5
R - 1 - 8	*****	*****	69.6	R - 2 - 8	26.63	0.54	****	R - 1 - 18	*****	*****	7A.0
R - 1 - 9	*****	*****	70.5	R - 2 - 9	28.32	0.63	****	R - 1 - 19	*****	*****	79.2
R - 1 - 10	*****	*****	71.0	R - 2 - 10	25.05	0.54	****	R - 1 - 20	*****	*****	81.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

R - 14

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
R - 1 - 1	0.0960	0.0855	0.0872	0.1342	0.0564	0.0606	0.1987	1.0571	0.0606	0.1000
R - 1 - 2	0.1033	0.0816	0.0886	0.1359	0.0546	0.0625	0.1971	1.0652	0.0607	0.1080
R - 1 - 3	0.1119	0.0874	0.0951	0.1478	0.0621	0.0678	0.2078	1.1812	0.0662	0.1216
R - 1 - 4	0.1182	0.1064	0.1009	0.1511	0.0670	0.0723	0.2112	1.2607	0.0738	0.1309
R - 1 - 5	0.1410	0.1315	0.1044	0.1587	0.0731	0.0755	0.2187	1.3143	0.0825	0.1494
R - 1 - 6	0.1434	0.1412	0.1063	0.1647	0.0775	0.0778	0.2204	1.2348	0.0895	0.1512
R - 1 - 7	0.1470	0.1539	0.1051	0.1739	0.0850	0.0838	0.2221	1.3304	0.0934	0.1562
R - 1 - 8	0.1654	0.1503	0.1004	0.1712	0.0789	0.0819	0.2268	1.2670	0.0920	0.1735
R - 1 - 9	0.1559	0.1473	0.0994	0.1652	0.0753	0.0783	0.2172	1.2223	0.0855	0.1698
R - 1 - 10	0.1596	0.1462	0.0971	0.1554	0.0692	0.0757	0.2161	1.1429	0.0869	0.1556

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
R - 2 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
R - 2 - 2	0.1194	0.1114	0.0676	0.1342	0.0705	0.0698	0.2126	0.9357	0.0701	0.1278
R - 2 - 3	0.1453	0.1396	0.0719	0.1418	0.0837	0.0743	0.2120	0.9330	0.0816	0.1537
R - 2 - 4	0.1610	0.1426	0.0742	0.1554	0.0965	0.0795	0.2247	0.9446	0.0906	0.1735
R - 2 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
R - 2 - 6	0.1023	0.0856	0.0459	0.0880	0.0467	0.0494	0.1512	0.5357	0.0529	0.1049
R - 2 - 7	0.1453	0.1253	0.0597	0.1098	0.0573	0.0617	0.2163	0.7589	0.0715	0.1296
R - 2 - 8	0.1125	0.0966	0.0434	0.0745	0.0339	0.0454	0.1781	0.6875	0.0491	0.0988
R - 2 - 9	0.1194	0.0993	0.0466	0.0620	0.0326	0.0444	0.1982	0.6964	0.0456	0.0988
R - 2 - 10	0.0828	0.0648	0.0270	0.0418	0.0300	0.0329	0.1524	0.4911	0.0301	*******

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
R - 1 - 11	0.1536	0.1414	0.0952	0.1522	0.0709	0.0723	0.2106	1.0884	0.0826	0.1500
R - 1 - 12	0.1365	0.1351	0.0950	0.1478	0.0683	0.0704	0.2086	1.0491	0.0821	0.1481
R - 1 - 13	0.1361	0.1289	0.0949	0.1451	0.0678	0.0703	0.2136	1.0741	0.0750	0.1889
R - 1 - 14	0.1421	0.1318	0.0912	0.1326	0.0670	0.0662	0.2104	1.0018	0.0744	0.1494
R - 1 - 15	0.1318	0.1468	0.0894	0.1223	0.0608	0.0631	0.2030	0.9429	0.0723	0.1383
R - 1 - 16	0.1329	0.1390	0.0856	0.1054	0.0555	0.0571	0.1976	0.9411	0.0656	0.1253
R - 1 - 17	0.1354	0.1490	0.0799	0.0859	0.0401	0.0498	0.1986	0.9545	0.0550	0.1068
R - 1 - 18	0.1275	0.1619	0.0774	0.0723	0.0366	0.0461	0.1976	0.9027	0.0488	0.0994
R - 1 - 19	0.1218	0.1403	0.0774	0.0701	0.0357	0.0456	0.2000	0.8598	0.0470	0.1031
R - 1 - 20	0.1217	0.1003	0.0796	0.0707	0.0366	0.0454	0.2096	0.8473	0.0455	0.1000

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
R - 1 - 1	*****	*****	79.4	R - 2 - 1	13.28	0.33	****	R - 1 - 11	*****	*****	71.0
R - 1 - 2	*****	*****	79.0	R - 2 - 2	21.25	0.70	****	R - 1 - 12	*****	*****	71.5
R - 1 - 3	*****	*****	78.5	R - 2 - 3	20.87	0.71	****	R - 1 - 13	*****	*****	72.2
R - 1 - 4	*****	*****	77.0	R - 2 - 4	26.51	0.73	****	R - 1 - 14	*****	*****	72.0
R - 1 - 5	*****	*****	74.0	R - 2 - 5	21.94	0.55	****	R - 1 - 15	*****	*****	72.2
R - 1 - 6	*****	*****	72.0	R - 2 - 6	24.48	0.55	****	R - 1 - 16	*****	*****	73.0
R - 1 - 7	*****	*****	70.4	R - 2 - 7	22.50	0.61	****	R - 1 - 17	*****	*****	74.5
R - 1 - 8	*****	*****	69.6	R - 2 - 8	26.63	0.54	****	R - 1 - 18	*****	*****	78.0
R - 1 - 9	*****	*****	70.5	R - 2 - 9	28.32	0.63	****	R - 1 - 19	*****	*****	79.2
R - 1 - 10	*****	*****	71.0	R - 2 - 10	25.05	0.54	****	R - 1 - 20	*****	*****	81.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
R - 1 - 1	******	0.1862	0.1119	0.5135	*******	0.111	4.231	0.0764	******	0.435	0.0843	1.7737
R - 1 - 2	******	0.1862	0.1028	0.4959	*******	0.120	3.846	0.0719	******	0.217	0.0830	1.0500
R - 1 - 3	******	0.3034	0.1134	0.5309	*******	0.166	5.000	0.0763	0.827	0.217	0.0972	1.1039
R - 1 - 4	******	0.2897	0.1357	0.6369	*******	0.158	5.000	0.0791	0.852	0.217	0.1088	1.2671
R - 1 - 5	******	0.2345	0.1253	0.6666	*******	0.154	5.385	0.0858	******	0.435	0.1285	1.3026
R - 1 - 6	******	0.3103	0.1573	0.7215	*******	0.170	5.769	0.0877	0.889	1.087	0.1387	1.3947
R - 1 - 7	******	0.3034	0.1425	0.7479	*******	0.179	5.385	0.0866	******	0.435	0.1590	1.4145
R - 1 - 8	******	0.3828	0.1395	0.7734	*******	0.184	4.615	0.0878	0.840	0.870	0.1563	1.4329
R - 1 - 9	******	0.4655	0.1344	0.7912	*******	0.180	4.615	0.0818	0.926	0.435	0.1539	1.3566
R - 1 - 10	******	0.2655	0.1357	0.8276	*******	0.266	3.846	0.0819	******	0.870	0.1409	1.3118

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
R - 2 - 1	1.222	*******	*******	*******	0.5698	******	******	********	******	******	*******	*******
R - 2 - 2	1.278	0.2897	0.1197	0.6137	1.0930	0.167	3.846	0.0794	0.852	******	0.1129	1.3816
R - 2 - 3	2.111	0.2724	0.1402	0.7199	1.5581	0.180	3.462	0.0871	0.840	******	0.1340	1.1934
R - 2 - 4	2.222	0.2966	0.1299	0.7951	1.5116	0.187	3.462	0.0929	0.840	******	0.1462	1.2750
R - 2 - 5	2.222	*******	*******	*******	1.6163	******	******	********	******	******	*******	*******
R - 2 - 6	2.056	*******	0.1082	0.5691	1.6163	0.191	0.769	0.0617	******	******	0.1059	0.7842
R - 2 - 7	1.889	0.4483	0.1426	0.9250	1.5581	0.214	1.154	0.0836	******	******	0.1360	1.0632
R - 2 - 8	1.722	*******	0.1246	0.8544	1.6628	0.176	0.385	0.0656	******	******	0.0934	0.8026
R - 2 - 9	1.722	*******	0.1000	1.0132	1.5116	0.144	0.385	0.0695	******	******	0.1051	0.7026
R - 2 - 10	1.222	*******	0.0689	0.7456	1.2442	0.126	******	0.0497	******	******	0.0801	0.4592

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
R - 1 - 11	******	0.3103	0.1399	0.8510	*******	0.190	3.846	0.0797	0.938	0.870	0.1436	1.2500
R - 1 - 12	******	0.4000	0.1312	0.8657	*******	0.191	2.692	0.0793	0.815	0.217	0.1437	1.1961
R - 1 - 13	******	0.4000	0.1261	0.8441	*******	0.188	2.692	0.0795	0.877	0.435	0.1382	1.2105
R - 1 - 14	******	0.2345	0.1244	0.8993	*******	0.176	2.692	0.0792	******	0.435	0.1359	1.1500
R - 1 - 15	******	*******	0.1329	0.9679	*******	0.146	2.692	0.0766	******	0.435	0.1308	1.1079
R - 1 - 16	******	*******	0.1120	0.9387	*******	0.148	2.308	0.0729	******	0.217	0.1152	0.9961
R - 1 - 17	******	0.2345	0.1050	1.0310	*******	0.146	2.692	0.0678	******	0.435	0.1021	0.8934
R - 1 - 18	******	0.2310	0.0952	1.0506	*******	0.136	1.923	0.0648	******	0.652	0.0997	0.7500
R - 1 - 19	******	0.2000	0.0965	1.0722	*******	0.132	1.538	0.0656	******	0.435	0.1035	0.7013
R - 1 - 20	******	0.2966	0.1199	1.0712	*******	0.164	0.769	0.0671	******	0.435	0.1047	0.7395

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
R - 1 - 1	*****	*****	79.4	R - 2 - 1	13.28	0.33	****	R - 1 - 11	*****	*****	71.0
R - 1 - 2	*****	*****	79.0	R - 2 - 2	21.25	0.70	****	R - 1 - 12	*****	*****	71.5
R - 1 - 3	*****	*****	78.5	R - 2 - 3	20.87	0.71	****	R - 1 - 13	*****	*****	72.2
R - 1 - 4	*****	*****	77.0	R - 2 - 4	26.51	0.73	****	R - 1 - 14	*****	*****	72.0
R - 1 - 5	*****	*****	74.0	R - 2 - 5	21.94	0.55	****	R - 1 - 15	*****	*****	72.2
R - 1 - 6	*****	*****	72.0	R - 2 - 6	24.48	0.55	****	R - 1 - 16	*****	*****	73.0
R - 1 - 7	*****	*****	70.4	R - 2 - 7	22.50	0.61	****	R - 1 - 17	*****	*****	74.5
R - 1 - 8	*****	*****	69.6	R - 2 - 8	26.63	0.54	****	R - 1 - 18	*****	*****	78.0
R - 1 - 9	*****	*****	70.5	R - 2 - 9	28.32	0.63	****	R - 1 - 19	*****	*****	79.2
R - 1 - 10	*****	*****	71.0	R - 2 - 10	25.05	0.54	****	R - 1 - 20	*****	*****	81.0

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

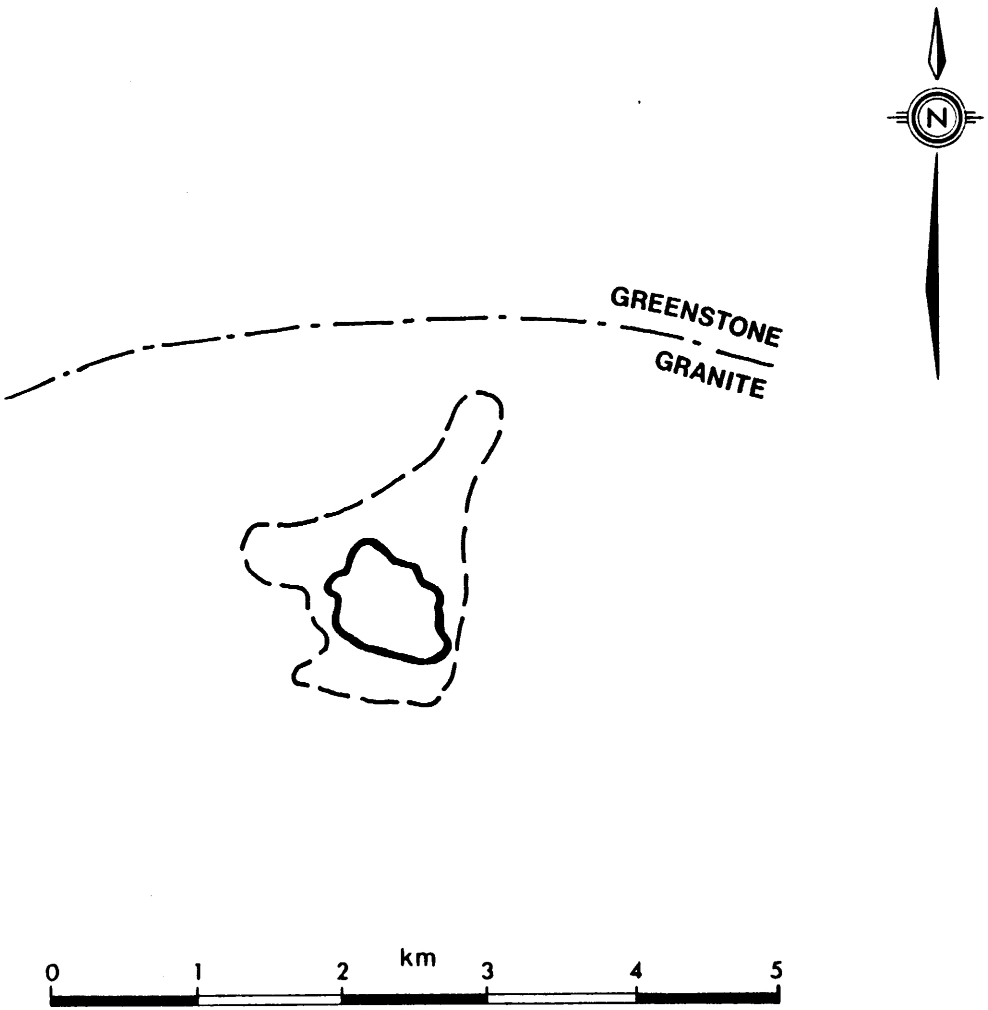
Lake S

pH 7·9

GENERAL SETTING

GENERAL DESCRIPTION

Lake S is small and has a simple morphometry. It may be a depression in surficial deposits although some rock outcrops within its small watershed. Floating muskeg occurs along most of its shoreline. Relief of the surrounding landscape is low and indicates considerable thickness of surficial deposits.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-689280/5436333
Elevation of lake above sea level	339 m (1130 ft)
Lake depth at sampling point	2.0 m
Lake area	.4 sq km
Lake catchment area	1.75 sq km
Bedrock geology under lake basin	volcanics
Position of lake in staircase	1
Distance from south end of sampling strip	100 km

GEOLOGICAL / GEGRAPHICAL INFORMATION

LAKE MICROBIOTA

S - 4

LAKE PLANKTON

CLADOCERANS	SPECIES NAME	DENSITY
	Bosmina longirostris	0.5
	Daphnia galeata mendota	0.8
	Daphnia pulex	1.3
	Total	2.6

COPEPODS	SPECIES NAME	DENSITY
	Copepodites	1.9
	Cyclops bicuspidatus	0.2
	Diaptomus minutus	1.9
	Mesocyclops edax	0.4
	Total	3.4

ROTIFERS	SPECIES NAME	DENSITY
	Conochilus sp.	0.4
	Asplanchna preodonta	1.9
	Kellicotia longispina	0.4
	Polyarthra vulgaris	1.1
	Alona sp.	0.1
	Total	3.9

CYANOPHYTA	SPECIES NAME	ABUNDANCE*
	Anabaena circinalis	4
	Microcystis aeruginosa	3
	Oscillatoria sp.	4
	(Average)	(4)

CHLOROPHYTA	SPECIES NAME	ABUNDANCE
	Pandorina sp.	3
	Volvox sp.	3
	(Average)	(3)

BACILLARIOPHYTA	SPECIES NAME	ABUNDANCE
	Asterionella formosa	4
	(Average)	(4)

PYRROPHYTA	SPECIES NAME	ABUNDANCE
	Ceratium hirundinella	3
	(Average)	(3)

CHRYSOPHYTA	SPECIES NAME	ABUNDANCE
	Dinobryon sp	4
	(Average)	(4)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY *	RELATIVE ABUNDANCE(%)
Navicula radiosa	2	4	.54
Pinnularia abaujensis var rostrata	2	4	.54
Cymbella inelegans	1	**	.27
Navicula elmorei	1		.27
Coscinodiscus	1		.27
Pleurosigma salinarum	1		.27
Melosira distans var alpigena	65	3	17.7
Cyclotella bodanica	12	4	3.3
Navicula bicephala	1	4	.27
Tabellaria fenestrata	36	4	10.0
Cyclotella comta	19	2	5.1
Nitzschia palea	2	4	.54
Cocconeis placentula linearis	3	2	.82
Melosira islandica	47	2	12.8
Melosira distans	92	3	25.0
Cyclotella stelligera	22	4	6.0
Melosira granulata	25	2	7.0
Tabellaria flocculosa	7	3	1.9
Navicula angusta	4	4	1.1
Navicula notha	3	4	.81
Pinnularia mesolepta	1	4	.27
Navicula cryptocephala	1	2	.27
Cymbella microcephala	2		.54
Coscinodiscus sp	6		1.4
Surirella robusta	1	4	.27
Nedium iridis	1	4	.27
Pinnularia maior var transversa	1	4	.27
Amphora ovalis	1		.27
Cymbella minuta	4	4	1.1
Navicula pupula var rectangularis	1	4	.27
Navicula pupula var capitata	2	4	.54
Tabellaria flocculosa	1	3	.27
Pinnularia rupestris	1	4	.27

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

**Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake S was humic and had an estimated depth of 20m. It had the highest percentage of loss on ignition of any of the 20 study lakes (77%). S and T had the highest pH (7.9 and 8.2 respectively), highest specific conductivity (250 micromhos/cm surface conductivity in both cases), and the highest calcium levels in the surface water samples (20 and 28mg/l respectively).

Dissolved oxygen was 100% from top to bottom at the sample site in Lake S, and there was no thermal stratification. Only Ponds P and T were at lower elevations than S (339m AMSL) and only two lakes, D and F, had lower diatom diversity. Richardson's pondweed (Potamogeton richardsonii) comprised the common littoral zone vegeation in this muskeg-dominated lake.

DETAILS OF LAKE WATER CHEMISTRY

S - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		15.6	100	250
1	> 1 m	15.5	100	251

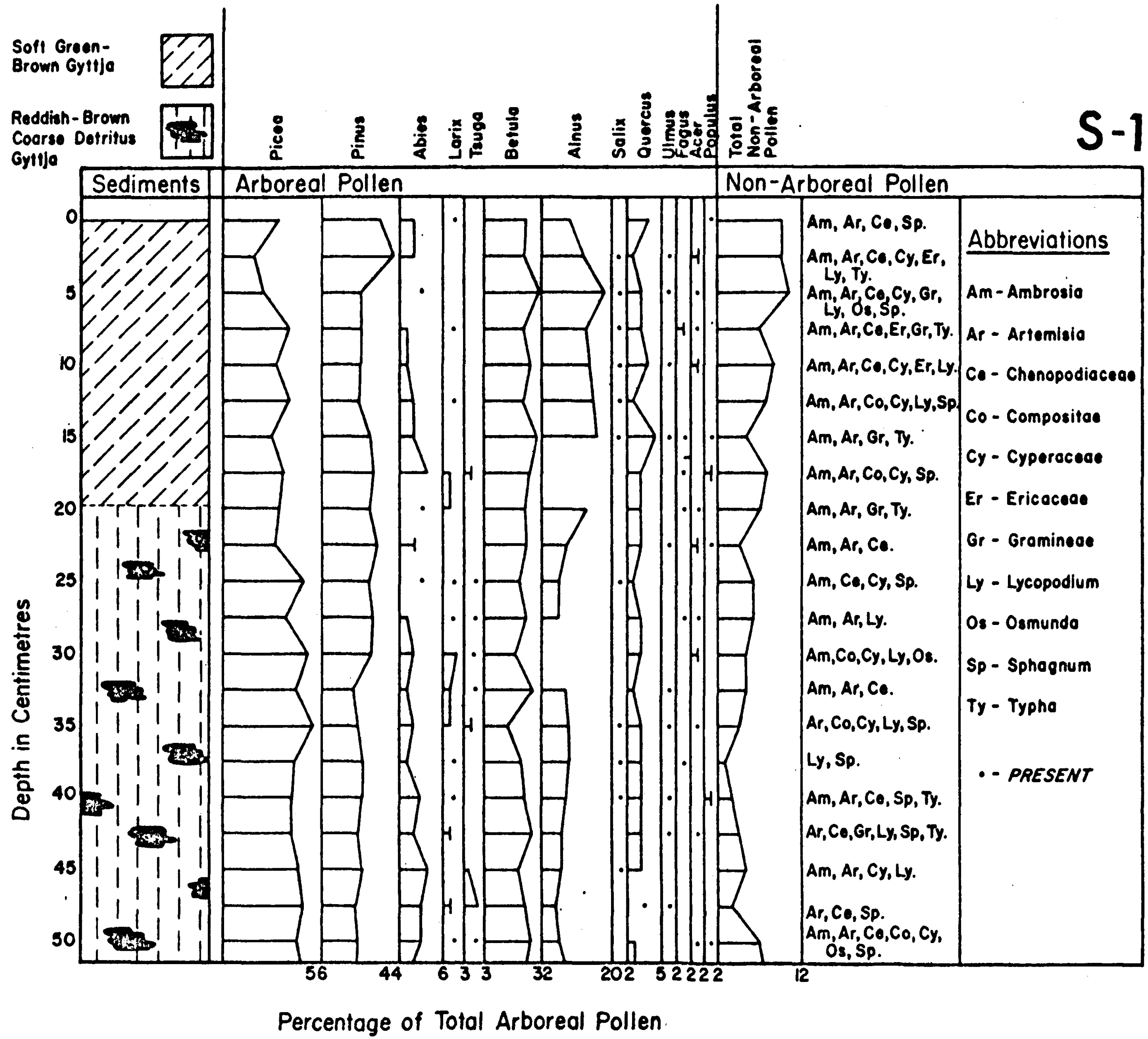
*Specific conductivity data are temperature-corrected (25° C).

pH	Depth	Temperature	Dissolved Oxygen	Specific Conductivity
7.9				S

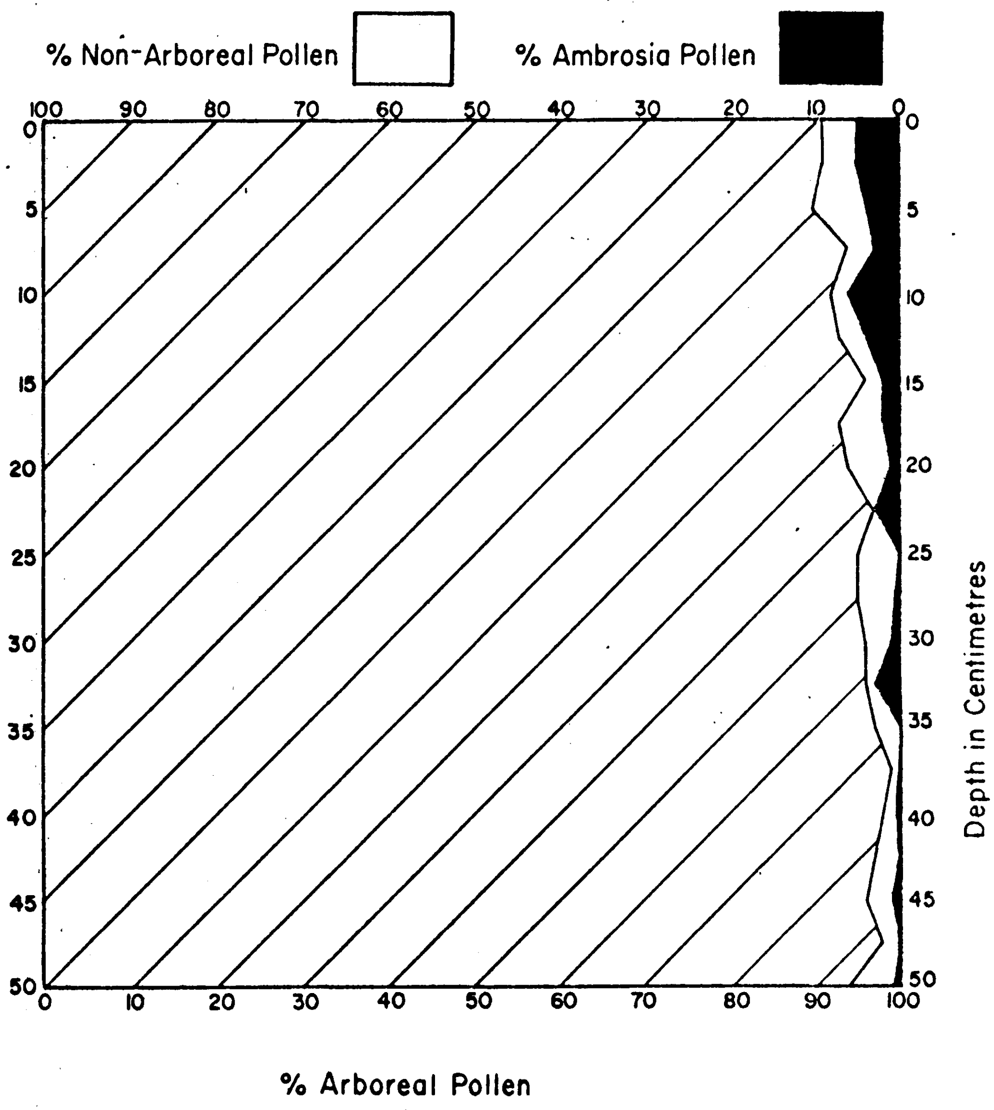
LAKE WATER CHEMISTRY PLOT

S - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE



Regional forest composition is reflected by the pollen diagram. The southern pollen component is insignificant. The Ambrosia rise is rather poorly defined and some mixing of lake bottom sediment has probably occurred.



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
S - 1 - 1	******	******	*****	******	******	******	******	******	*****	****
S - 1 - 2	******	******	*****	******	******	******	******	******	*****	****
S - 1 - 3	7354.	2937.	41.	2420.	1140.	2109.	11100.	780.	401.	14.
S - 1 - 4	10670.	4598.	42.	3340.	1790.	2397.	12510.	688.	547.	24.
S - 1 - 5	10240.	3766.	41.	3230.	2150.	2392.	12620.	749.	476.	22.
S - 1 - 6	6879.	2707.	27.	2170.	1320.	1906.	10540.	569.	347.	15.
S - 1 - 7	8483.	3103.	32.	2680.	1630.	2225.	12590.	607.	417.	18.
S - 1 - 8	11050.	3522.	35.	3520.	3250.	2485.	13860.	720.	457.	25.
S - 1 - 9	9425.	3577.	30.	3070.	1730.	2450.	12010.	780.	490.	21.
S - 1 - 10	9874.	3873.	43.	3230.	1720.	2576.	13750.	818.	520.	22.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
S - 2 - 1	******	******	*****	******	******	******	******	******	*****	****
S - 2 - 2	9182.	3613.	62.	3090.	1480.	2020.	10980.	653.	653.	20.
S - 2 - 3	9461.	3646.	60.	3100.	1520.	2018.	11130.	561.	496.	22.
S - 2 - 4	******	******	*****	******	******	******	******	******	*****	****
S - 2 - 5	******	******	*****	******	******	******	******	******	*****	****
S - 2 - 6	9887.	4558.	58.	3130.	1620.	2232.	12140.	572.	497.	21.
S - 2 - 7	8106.	5147.	54.	2640.	1450.	2126.	12080.	652.	432.	19.
S - 2 - 8	7832.	3729.	54.	2560.	1390.	2170.	12240.	644.	426.	19.
S - 2 - 9	6874.	3014.	49.	2230.	1190.	1982.	11730.	625.	350.	16.
S - 2 - 10	7033.	2768.	48.	2260.	1350.	2039.	11770.	630.	381.	17.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
S - 1 - 11	9499.	3429.	37.	2970.	1720.	2274.	12360.	736.	475.	21.
S - 1 - 12	******	******	*****	******	******	******	******	******	*****	****
S - 1 - 13	7608.	3076.	28.	2360.	1290.	2042.	11240.	608.	381.	17.
S - 1 - 14	6909.	2532.	21.	2070.	1200.	1917.	9960.	590.	351.	14.
S - 1 - 15	7841.	2945.	22.	2360.	1400.	2105.	11820.	650.	396.	17.
S - 1 - 16	8009.	2824.	16.	2270.	1520.	2019.	11500.	620.	389.	15.
S - 1 - 17	******	******	*****	******	******	******	******	******	*****	****
S - 1 - 18	7475.	2697.	24.	2260.	1420.	2023.	11880.	590.	384.	15.
S - 1 - 19	10580.	3499.	29.	3070.	2120.	2621.	14760.	730.	545.	21.
S - 1 - 20	9080.	3267.	32.	2770.	1510.	2226.	11980.	678.	476.	22.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
S - 1 - 1	31.22	0.64	****	S - 2 - 1	28.62	*****	78.0	S - 1 - 11	25.46	0.74	****
S - 1 - 2	33.30	0.68	****	S - 2 - 2	18.79	*****	****	S - 1 - 12	21.75	0.48	****
S - 1 - 3	33.61	1.08	****	S - 2 - 3	23.77	*****	****	S - 1 - 13	29.08	0.70	****
S - 1 - 4	29.85	1.53	59.8	S - 2 - 4	26.96	*****	78.0	S - 1 - 14	24.26	0.56	****
S - 1 - 5	23.80	0.95	69.0	S - 2 - 5	14.91	*****	****	S - 1 - 15	28.58	0.64	****
S - 1 - 6	25.33	0.73	****	S - 2 - 6	19.70	*****	78.5	S - 1 - 16	28.64	0.58	****
S - 1 - 7	25.89	0.69	****	S - 2 - 7	27.36	*****	****	S - 1 - 17	22.84	0.49	****
S - 1 - 8	23.18	0.59	****	S - 2 - 8	23.24	*****	****	S - 1 - 18	29.75	0.63	****
S - 1 - 9	24.25	0.67	****	S - 2 - 9	24.55	*****	81.5	S - 1 - 19	30.67	0.67	****
S - 1 - 10	30.41	2.19	67.7	S - 2 - 10	22.75	*****	****	S - 1 - 20	30.42	0.74	****

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
S - 1 - 1	1.6	*****	*****	*****	94.	****	****	******	****	****	*****	****
S - 1 - 2	2.1	*****	*****	*****	89.	****	****	******	****	****	*****	****
S - 1 - 3	2.1	*****	7.8	17.6	98.	37.	60.	22.1	****	2.0	9.5	86.
S - 1 - 4	4.1	*****	10.0	15.2	116.	12.	50.	31.7	****	2.0	10.3	106.
S - 1 - 5	3.6	*****	9.2	13.9	112.	11.	50.	32.6	****	2.0	12.1	93.
S - 1 - 6	2.7	*****	6.3	11.2	85.	10.	25.	22.6	****	1.5	9.1	66.
S - 1 - 7	3.0	*****	7.4	12.7	98.	12.	25.	28.9	****	1.0	11.4	75.
S - 1 - 8	3.7	*****	10.0	15.0	125.	29.	40.	37.3	****	1.0	14.0	92.
S - 1 - 9	3.5	*****	10.0	12.0	107.	15.	50.	28.3	****	7.5	14.8	98.
S - 1 - 10	4.1	*****	11.2	14.6	139.	12.	60.	27.9	****	1.5	13.9	112.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
S - 2 - 1	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
S - 2 - 2	****	*****	12.2	13.8	*****	7.	60.	23.9	****	1.0	11.7	96.
S - 2 - 3	****	*****	10.9	13.4	*****	7.	45.	25.4	****	2.0	12.0	95.
S - 2 - 4	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
S - 2 - 5	****	*****	*****	*****	*****	****	****	******	****	****	*****	****
S - 2 - 6	****	*****	10.8	14.4	*****	8.	50.	28.0	****	1.5	13.4	95.
S - 2 - 7	****	*****	8.9	13.9	*****	12.	35.	28.6	****	1.0	12.1	76.
S - 2 - 8	****	*****	10.1	13.9	*****	10.	25.	28.5	****	2.0	12.4	73.
S - 2 - 9	****	*****	8.7	12.9	*****	9.	25.	26.3	****	2.0	9.6	65.
S - 2 - 10	****	*****	9.3	13.7	*****	9.	15.	27.5	****	1.5	10.0	66.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SB PPM	TH PPM	U PPM	V PPM	ZN PPM
S - 1 - 11	6.4	*****	9.7	12.9	94.	12.	45.	29.6	****	2.0	12.8	95.
S - 1 - 12	4.5	*****	*****	*****	89.	****	****	******	****	****	*****	****
S - 1 - 13	5.1	*****	8.1	12.0	89.	8.	35.	24.9	****	2.0	10.7	78.
S - 1 - 14	2.9	*****	4.6	9.5	85.	9.	****	25.0	****	1.0	9.8	65.
S - 1 - 15	2.8	*****	9.1	29.9	76.	11.	20.	29.3	****	1.0	10.2	76.
S - 1 - 16	2.3	*****	5.2	12.9	63.	6.	****	31.6	****	1.0	8.0	66.
S - 1 - 17	1.8	*****	*****	*****	49.	****	****	******	****	****	*****	****
S - 1 - 18	1.0	*****	6.0	12.5	49.	7.	****	30.7	****	1.0	10.5	66.
S - 1 - 19	2.0	*****	5.1	16.1	54.	64.	****	44.7	****	4.0	13.4	84.
S - 1 - 20	2.0	*****	8.6	15.6	67.	17.	15.	31.7	****	1.5	12.2	86.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
S - 1 - 1	31.22	0.64	****	S - 2 - 1	28.62	*****	78.0	S - 1 - 11	25.66	0.74	****
S - 1 - 2	33.30	0.68	****	S - 2 - 2	18.79	*****	****	S - 1 - 12	21.75	0.48	****
S - 1 - 3	33.61	1.08	****	S - 2 - 3	23.77	*****	****	S - 1 - 13	29.08	0.70	****
S - 1 - 4	29.85	1.53	59.8	S - 2 - 4	26.96	*****	78.0	S - 1 - 14	24.26	0.56	****
S - 1 - 5	23.80	0.95	69.0	S - 2 - 5	14.91	*****	****	S - 1 - 15	28.58	0.64	****
S - 1 - 6	25.33	0.73	****	S - 2 - 6	19.70	*****	78.5	S - 1 - 16	28.64	0.58	****
S - 1 - 7	25.89	0.69	****	S - 2 - 7	27.36	*****	****	S - 1 - 17	22.84	0.49	****
S - 1 - 8	23.18	0.59	****	S - 2 - 8	23.24	*****	****	S - 1 - 18	29.75	0.63	****
S - 1 - 9	24.25	0.67	****	S - 2 - 9	24.55	*****	81.5	S - 1 - 19	30.67	0.67	****
S - 1 - 10	30.41	2.19	67.7	S - 2 - 10	22.75	*****	****	S - 1 - 20	30.42	0.74	****

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
S - 1 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
S - 1 - 2	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
S - 1 - 3	0.0880	0.0472	0.0395	0.1315	0.0502	0.0763	0.2382	0.6964	0.0634	0.0864
S - 1 - 4	0.1276	0.0739	0.0397	0.1815	0.0789	0.0867	0.2695	0.6143	0.0866	0.1457
S - 1 - 5	0.1225	0.0605	0.0386	0.1755	0.0347	0.0865	0.2708	0.6687	0.0753	0.1354
S - 1 - 6	0.0823	0.0435	0.0252	0.1179	0.0581	0.0690	0.2262	0.5080	0.0548	0.0944
S - 1 - 7	0.1015	0.0499	0.0305	0.1457	0.0718	0.0805	0.2700	0.5920	0.0660	0.1130
S - 1 - 8	0.1322	0.0566	0.0328	0.1913	0.1432	0.0899	0.2974	0.6429	0.0723	0.1543
S - 1 - 9	0.1127	0.0575	0.0286	0.1668	0.0762	0.0886	0.2577	0.6964	0.0776	0.1296
S - 1 - 10	0.1181	0.0623	0.0401	0.1755	0.0758	0.0932	0.2951	0.7304	0.0822	0.1327

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
S - 2 - 1	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
S - 2 - 2	0.1098	0.0581	0.0583	0.1679	0.0652	0.0731	0.2356	0.5830	0.1034	0.1228
S - 2 - 3	0.1132	0.0586	0.0566	0.1685	0.0670	0.0730	0.2388	0.5009	0.0785	0.1333
S - 2 - 4	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
S - 2 - 5	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
S - 2 - 6	0.1183	0.0733	0.0543	0.1701	0.0714	0.0808	0.2605	0.5107	0.0787	0.1302
S - 2 - 7	0.0970	0.0827	0.0505	0.1435	0.0639	0.0769	0.2592	0.5821	0.0683	0.1167
S - 2 - 8	0.0937	0.0600	0.0508	0.1391	0.0612	0.0785	0.2627	0.5750	0.0674	0.1167
S - 2 - 9	0.0822	0.0485	0.0464	0.1212	0.0524	0.0717	0.2517	0.5580	0.0554	0.0988
S - 2 - 10	0.0841	0.0445	0.0453	0.1228	0.0595	0.0738	0.2526	0.5625	0.0602	0.1025

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
S - 1 - 11	0.1136	0.0551	0.0346	0.1614	0.0758	0.0823	0.2652	0.6571	0.0752	0.1284
S - 1 - 12	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
S - 1 - 13	0.0910	0.0495	0.0262	0.1283	0.0568	0.0739	0.2412	0.5429	0.0603	0.1037
S - 1 - 14	0.0826	0.0407	0.0200	0.1125	0.0529	0.0657	0.2137	0.5268	0.0556	0.0864
S - 1 - 15	0.0938	0.0473	0.0208	0.1283	0.0617	0.0762	0.2536	0.5804	0.0627	0.1049
S - 1 - 16	0.0958	0.0454	0.0146	0.1234	0.0670	0.0730	0.2468	0.5536	0.0616	0.0926
S - 1 - 17	*******	*******	*******	*******	*******	*******	*******	*******	*******	*******
S - 1 - 18	0.0894	0.0434	0.0222	0.1228	0.0626	0.0732	0.2549	0.5268	0.0609	0.0926
S - 1 - 19	0.1266	0.0563	0.0276	0.1668	0.0934	0.0948	0.3167	0.6519	0.0862	0.1296
S - 1 - 20	0.1086	0.0525	0.0297	0.1505	0.0665	0.0805	0.2571	0.6050	0.0752	0.1333

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
S - 1 - 1	31.22	0.64	****	S - 2 - 1	28.62	*****	78.0	S - 1 - 11	25.66	0.74	****
S - 1 - 2	33.30	0.68	****	S - 2 - 2	18.79	*****	****	S - 1 - 12	21.75	0.48	****
S - 1 - 3	33.61	1.08	****	S - 2 - 3	23.77	*****	****	S - 1 - 13	29.08	0.70	****
S - 1 - 4	29.85	1.53	59.8	S - 2 - 4	26.96	*****	78.0	S - 1 - 14	24.26	0.56	****
S - 1 - 5	23.80	0.95	69.0	S - 2 - 5	14.91	*****	****	S - 1 - 15	28.58	0.64	****
S - 1 - 6	25.33	0.73	****	S - 2 - 6	19.70	*****	78.5	S - 1 - 16	28.64	0.58	****
S - 1 - 7	25.89	0.69	****	S - 2 - 7	27.36	*****	****	S - 1 - 17	22.84	0.49	****
S - 1 - 8	23.18	0.59	****	S - 2 - 8	23.24	*****	****	S - 1 - 18	29.75	0.63	****
S - 1 - 9	24.25	0.67	****	S - 2 - 9	24.55	*****	81.5	S - 1 - 19	30.67	0.67	****
S - 1 - 10	30.41	2.19	67.7	S - 2 - 10	22.75	*****	****	S - 1 - 20	30.02	0.74	****

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

S - 15

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SB KK	TH KK	U KK	V KK	ZN KK
S - 1 - 1	0.889	*******	*******	*******	1.0930	******	******	********	******	******	*******	*******
S - 1 - 2	1.167	*******	*******	*******	1.0349	******	******	********	******	******	*******	*******
S - 1 - 3	1.167	*******	0.0639	0.2588	1.1395	0.378	4.615	0.0576	******	0.870	0.0699	1.1316
S - 1 - 4	2.278	*******	0.0822	0.2235	1.3448	0.117	3.846	0.0825	******	0.870	0.1049	1.4099
S - 1 - 5	2.000	*******	0.0756	0.2044	1.3023	0.109	3.846	0.0859	******	0.870	0.0991	1.2276
S - 1 - 6	1.500	*******	0.0517	0.1644	0.9884	0.105	1.923	0.0587	******	0.652	0.0668	0.8711
S - 1 - 7	1.667	*******	0.0607	0.1872	1.1395	0.118	1.923	0.0754	******	0.435	0.0840	0.9842
S - 1 - 8	2.056	*******	0.0820	0.2206	1.0535	0.293	3.077	0.0971	******	0.435	0.1029	1.2105
S - 1 - 9	1.944	*******	0.0820	0.1765	1.2442	0.146	3.846	0.0737	******	3.261	0.1088	1.2933
S - 1 - 10	2.278	*******	0.0919	0.2149	1.6163	0.119	4.615	0.0727	******	0.652	0.1025	1.4750

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SB KK	TH KK	U KK	V KK	ZN KK
S - 2 - 1	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
S - 2 - 2	******	*******	0.0997	0.2032	*******	0.069	4.615	0.0623	******	0.435	0.0857	1.2579
S - 2 - 3	******	*******	0.0893	0.1963	*******	0.069	3.462	0.0661	******	0.870	0.0883	1.2500
S - 2 - 4	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
S - 2 - 5	******	*******	*******	*******	*******	******	******	********	******	******	*******	*******
S - 2 - 6	******	*******	0.0884	0.2121	*******	0.079	3.846	0.0729	******	0.652	0.0985	1.2526
S - 2 - 7	******	*******	0.0733	0.2049	*******	0.116	2.692	0.0743	******	0.435	0.0887	0.9947
S - 2 - 8	******	*******	0.0831	0.2049	*******	0.101	1.923	0.0741	******	0.870	0.0912	0.9658
S - 2 - 9	******	*******	0.0712	0.1893	*******	0.086	1.923	0.0684	******	0.870	0.0709	0.8579
S - 2 - 10	******	*******	0.0761	0.2009	*******	0.086	1.154	0.0716	******	0.652	0.0735	0.8658

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
S - 1 - 11	3.556	*******	0.0795	0.1903	1.0930	0.118	3.462	0.0771	******	0.870	0.0938	1.2461
S - 1 - 12	2.500	*******	*******	*******	1.0349	******	******	********	******	******	*******	*******
S - 1 - 13	2.833	*******	0.0662	0.1768	1.0349	0.081	2.692	0.0648	******	0.870	0.0790	1.0316
S - 1 - 14	1.611	*******	0.0377	0.1397	0.9884	0.085	******	0.0651	******	0.435	0.0647	0.8553
S - 1 - 15	1.556	*******	0.0746	0.4397	0.8837	0.115	1.538	0.0763	******	0.435	0.0750	1.0026
S - 1 - 16	1.278	*******	0.0426	0.1897	0.7326	0.059	******	0.0823	******	0.435	0.0588	0.8658
S - 1 - 17	1.000	*******	*******	*******	0.5698	******	******	********	******	******	*******	*******
S - 1 - 18	0.556	*******	0.0492	0.1838	0.5698	0.074	******	0.0799	******	0.435	0.0772	0.8711
S - 1 - 19	1.111	*******	0.0418	0.2368	0.6279	0.649	******	0.1160	******	1.739	0.0985	1.0987
S - 1 - 20	1.111	*******	0.0706	0.2294	0.7791	0.169	1.154	0.0825	******	0.652	0.0899	1.1316

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
S - 1 - 1	31.22	0.64	****	S - 2 - 1	28.62	*****	78.0	S - 1 - 11	25.66	0.74	****
S - 1 - 2	33.30	0.68	****	S - 2 - 2	18.79	*****	****	S - 1 - 12	21.75	0.48	****
S - 1 - 3	33.61	1.08	****	S - 2 - 3	23.77	*****	****	S - 1 - 13	29.08	0.70	****
S - 1 - 4	29.85	1.53	59.8	S - 2 - 4	26.96	*****	78.0	S - 1 - 14	24.26	0.56	****
S - 1 - 5	23.80	0.95	69.0	S - 2 - 5	14.91	*****	****	S - 1 - 15	28.58	0.64	****
S - 1 - 6	25.33	0.73	****	S - 2 - 6	19.70	*****	78.5	S - 1 - 16	28.64	0.58	****
S - 1 - 7	25.89	0.69	****	S - 2 - 7	27.36	*****	****	S - 1 - 17	22.84	0.49	****
S - 1 - 8	23.18	0.59	****	S - 2 - 8	23.24	*****	****	S - 1 - 18	29.75	0.63	****
S - 1 - 9	24.25	0.67	****	S - 2 - 9	24.55	*****	81.5	S - 1 - 19	30.67	0.67	****
S - 1 - 10	30.41	2.19	67.7	S - 2 - 10	22.75	*****	****	S - 1 - 20	30.42	0.74	****

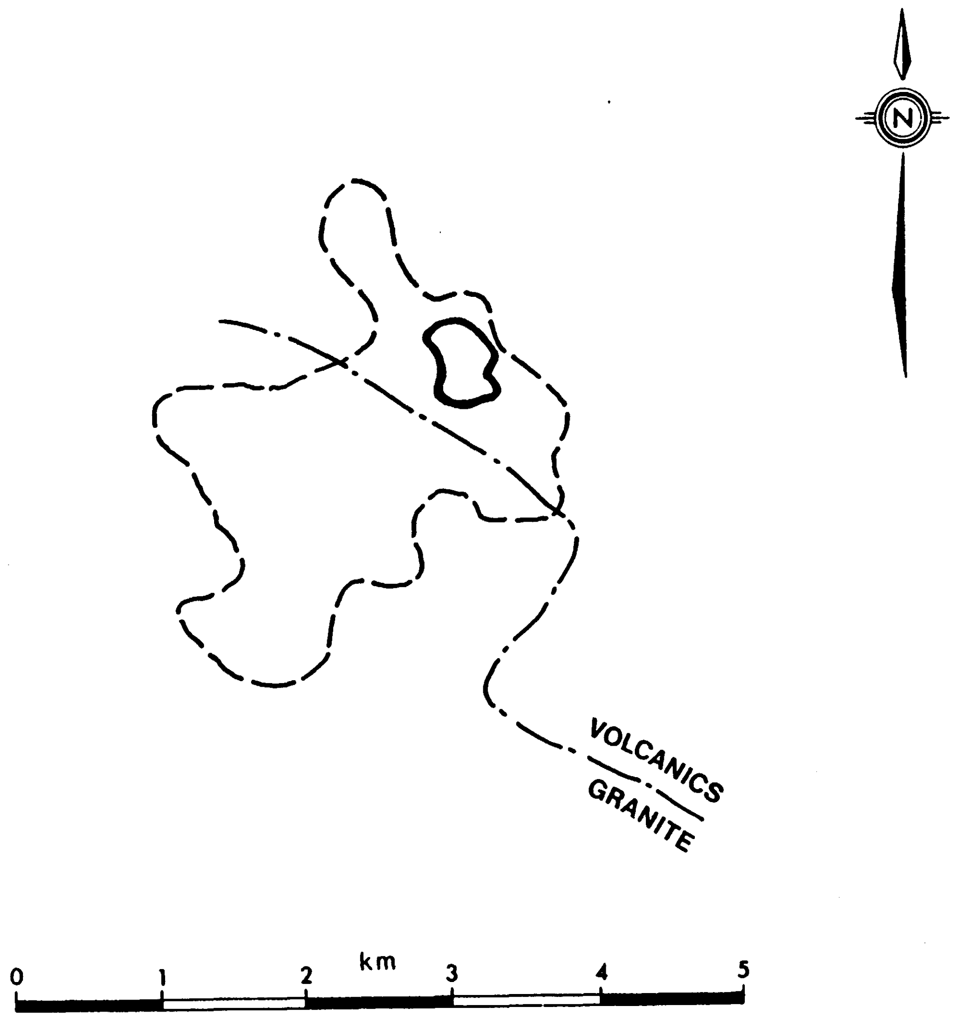
LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

Lake T pH 8·2

GENERAL SETTING

GENERAL DESCRIPTION

Lake T is small and has a simple morphometry. It seems to be a depression primarily in surficial deposits that comprise most of the shoreline. Rock outcrop appears to be minor in the watershed. Some of the surficial deposits are sand and silty sand.



GEOLOGICAL/GEOGRAPHICAL INFORMATION

UTM Coordinates of the sample point	16-710452/5457463
Elevation of lake above sea level	312 m (1040 ft)
Lake depth at sampling point	11.5 m
Lake area	.15 sq km
Lake catchment area	.4 sq km
Bedrock geology under lake basin	volcanics
Position of lake in staircase	5
Distance from south end of sampling strip	103 km

LAKE MICROBIOTA

LAKE PLANKTON

CLADOCERANS	SPECIES NAME		DENSITY
	Bosmina longirostris		0.7
	Daphnia pulex		0.4
		Total	1.1

COPEPODS	SPECIES NAME		DENSITY
	Cyclops bicuspidatus copepodite		1.4
	Diaptomus minutus		3.3
	Diaptomus copepodite		0.8
	Mesocyclops edax		0.8
		Total	6.3

ROTIFERS	SPECIES NAME		DENSITY
	Conochilus sp.		0.8
	Asplanchna preodonta		0.9
	Kellicotia longispina		0.1
	Polyarthra vulgaris		0.4
		Total	2.2

CYANOPHYTA	SPECIES NAME		ABUNDANCE*
	Anabaena circinalis		3
	Aphanocapsa grevillei		4
	Microcystis aeruginosa		6
	Microcystis flos aquae		6
		(Average)	(5)

CHLOROPHYTA	SPECIES NAME		ABUNDANCE
	Desmids		2
		(Average)	(2)

BACILLARIOPHYTA	SPECIES NAME		ABUNDANCE
	Melosira sp.		3
	Navicula sp.		3
	Tabellaria fenestrata		2
		(Average)	(3)

PYRROPHYTA	SPECIES NAME		ABUNDANCE
	Ceratium hirundinella		4
		(Average)	(4)

CHRYSOPHYTA	SPECIES NAME		ABUNDANCE
	Dinobryon bavaricum		2
		(Average)	(2)

MASTIGOPHORANS	SPECIES NAME		ABUNDANCE
	Euglypha sp.		1
	Difflugia		1
		(Average)	(1)

* Abundance codes are explained in the text
1 = rare, 2 = moderate, 3 = common, 4 = abundant and 5 = very abundant

SURFACE SEDIMENT DIATOMS

SPECIES NAME	NUMBER COUNTED	pH CATEGORY*	RELATIVE ABUNDANCE
Tetracyclus lacustris	10	3	1.7
Cymbella minuta var silesiaca	37	4	6.2
Cyclotella comta	14	2	2.3
Navicula bicephala	98	4	16.4
Cyclotella glomerata	34	4	5.7
Pinnularia subcapitata	10	4	1.7
Anomoeoneis serians var brachysira	51	5	8.6
Nedium iridis	4	4	.67
Navicula radiosa var parva	96	4	16.1
Navicula variostriata	2	**	.34
Nitzschia kutzingiana	19	2	3.2
Pinnularia cf brebissonii var diminuta	2		.34
Tabellaria flocculosa	6	3	1.0
Tabellaria fenestrata	22	4	3.7
Cyclotella stelligera	32	4	5.4
Navicula radiosa	40	4	6.7
Nedium affine var ceylonicum	9	4	1.5
Cymbella angusta	20	4	3.4
Surirella sublinearis	4	4	.67
Navicula contenta var biceps	22	4	3.7
Synedra miniscula	5		.84
Navicula subilissima	6	3	1.0
Eunotia arcus	2	2	.34
Navicula vulpina	2	2	.34
Nedium bisulcatum var nipponicum	16	4	2.7
Pinnularia biceps	3	4	.50
Stauroneis phoenicenteron f gracilis	5	4	.84
Navicula cf odiosa	2		.34
Pinnularia sp	1		.17
Pinnularia mormonorum	7		1.2
Cymbella inequalis	1	2	.17
Pinnularia abaujensis var subundulata	2	4	.34
Fragilaria sp	1		.17
Eunotia praerupta	1	4	.17
Navicula subhamulata	2		.34
Stauroneis phoenicenteron	1	4	.17
Cymbella cymbiformis	3	4	.50
Stauroneis anceps	1	4	.17
Gomphonema truncatum	1	4	.17
Nedium gracile f aequale	1	4	.17

* pH CATEGORY
1-Alkalibiontic
2-Alkaliphilous
3-Acidophilous
4-Indifferent
5-Acidobiontic

** Blanks indicate species which had no published autecological information regarding their pH preferences.

Lake T (0.15 km^2) was the most northerly of the Wawa study lakes. It displayed the highest pH (8.2), alkalinity (3,028 microequivalents/l), and calcium (28.2mg/l). Although its bedrock was gneiss, it was covered with a thick deposit of carbonate-rich clay (overburden), contributing to a hypolimnetic specific conductivity of 290 micromhos/cm, also the highest level in the 20-lake study.

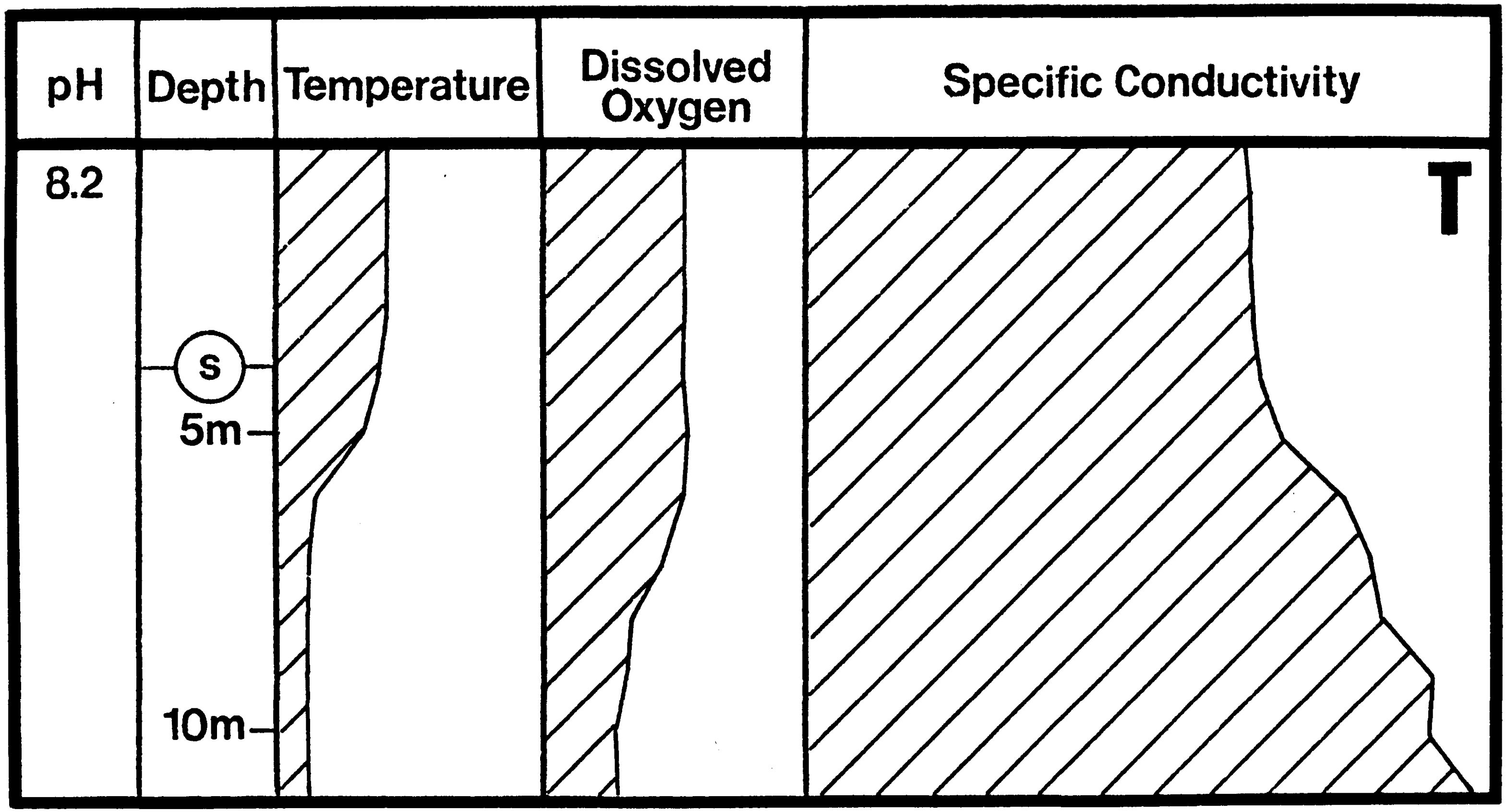
The waters of this lake were clear (Secchi = 3.8m) and relatively productive (meso-eutrophic), as indicated by the low hypolimnetic dissolved oxygen (51%). Diversity was moderate to low, which is typical for most meso-eutrophic systems. The lake was thermally stratified at 4m, indicating a high degree of wind shelter. This fifth-order lake displayed moderate topographic relief. Aquatic grasses and sedges dominated its littoral vegetation.

DETAILS OF LAKE WATER CHEMISTRY

T - 6

Water Depth M	Secchi Depth M	Temperature °C	Dissolved Oxygen % Sat.	Specific Conductivity* (Micromhos/cm)
0		14.2	101	250
1		14.4	101	258
2		14.6	104	259
3	3.8	14.4	105	259
4		13.2	101	262
5		11.0	105	275
6		5.3	101	312
7		4.7	88	320
8		4.3	65	326
9		4.0	62	341
10		4.0	56	341
11		4.0	51	390

*Specific conductivity data are temperature-corrected (25° C).

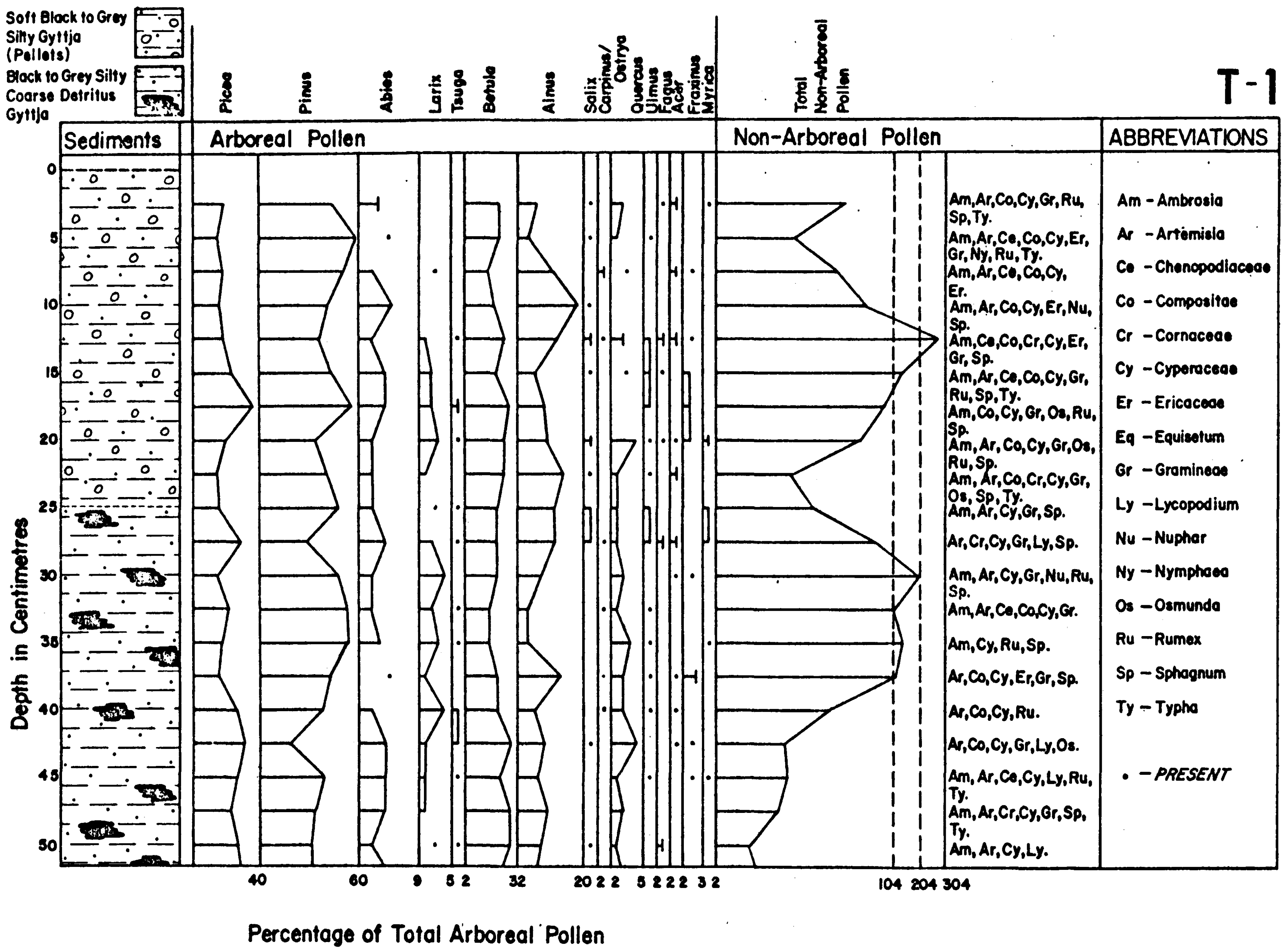


LAKE WATER CHEMISTRY PLOT

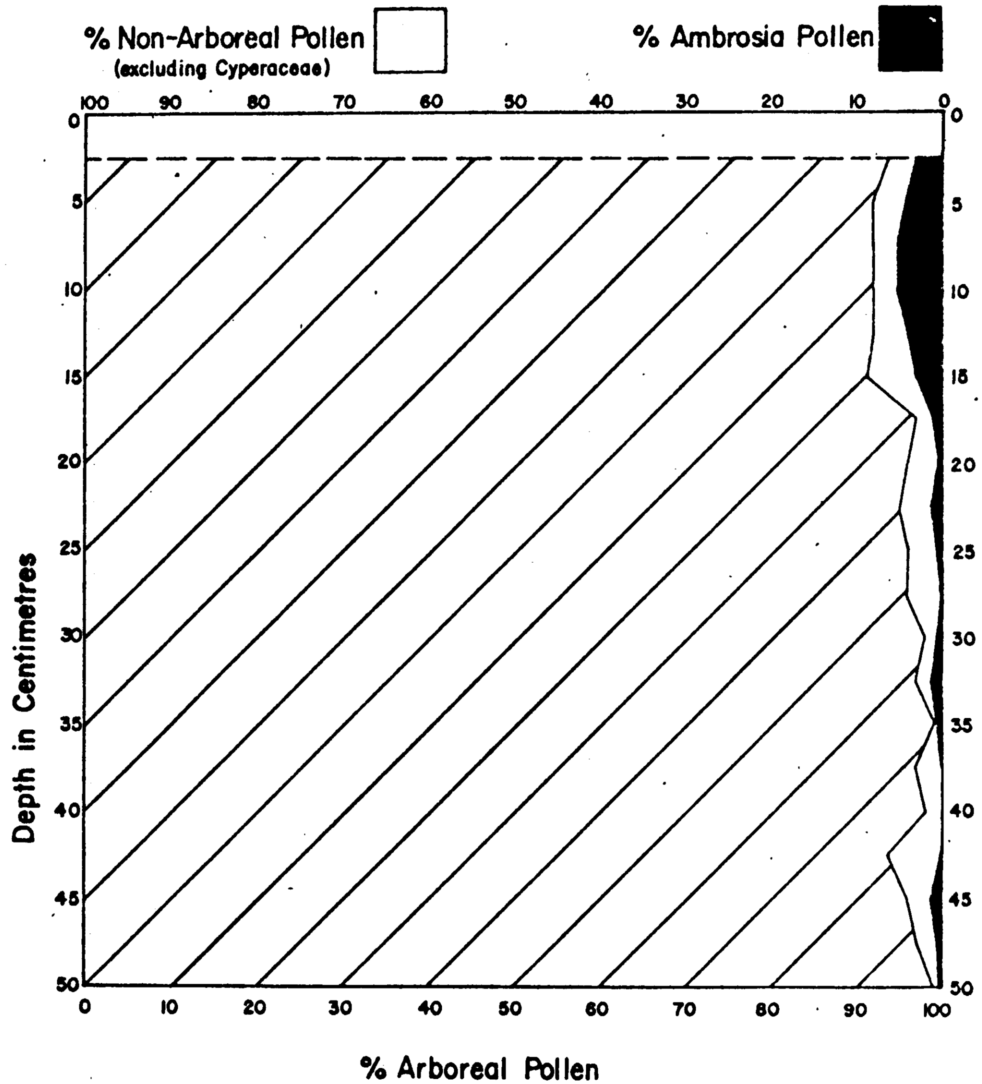
T - 7

POLLEN DIAGRAM : LAKE SEDIMENT CORE

T - 8



The pollen diagram represents reasonably well the regional forest composition. The southern pollen component is insignificant. The very high percentage of sedge (Cyperaceae) pollen is derived from local source, a sedge meadow. The *Ambrosia* rise is quite distinct in the top 15 cm of gyttja and indicates relatively little mixing of lake bottom sediment.



LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
T - 1 - 1	15410.	43700.	604.	5660.	3700.	10400.	121000.	1220.	683.	40.
T - 1 - 2	15490.	38600.	532.	5660.	3770.	9379.	114000.	933.	674.	41.
T - 1 - 3	15650.	36000.	565.	5520.	3440.	8994.	132000.	860.	691.	39.
T - 1 - 4	11240.	25940.	601.	4300.	2510.	8058.	173000.	743.	543.	31.
T - 1 - 5	8624.	24400.	623.	3440.	2120.	7706.	202000.	751.	399.	28.
T - 1 - 6	8298.	25070.	782.	3200.	2030.	7231.	205000.	822.	361.	25.
T - 1 - 7	5502.	20360.	973.	2180.	1370.	6371.	241000.	701.	256.	19.
T - 1 - 8	5913.	23130.	1017.	2310.	1480.	6278.	232000.	731.	264.	22.
T - 1 - 9	6386.	22990.	986.	2570.	1670.	6691.	226000.	752.	295.	23.
T - 1 - 10	6872.	20940.	823.	2820.	1850.	7292.	241000.	672.	313.	23.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
T - 2 - 1	13320.	34810.	362.	4850.	3020.	8815.	******	812.	630.	35.
T - 2 - 2	14810.	30910.	393.	5240.	3000.	8700.	******	679.	715.	40.
T - 2 - 3	10310.	22250.	454.	3720.	2250.	8052.	******	570.	507.	30.
T - 2 - 4	8581.	21020.	554.	2970.	1770.	7625.	******	580.	394.	25.
T - 2 - 5	6645.	18490.	759.	2200.	1310.	6755.	******	527.	320.	19.
T - 2 - 6	6834.	18100.	737.	2290.	1420.	6815.	******	502.	327.	20.
T - 2 - 7	8177.	17360.	631.	2920.	1850.	7856.	******	498.	389.	26.
T - 2 - 8	8169.	18210.	669.	2860.	1820.	7431.	******	504.	381.	25.
T - 2 - 9	8832.	18480.	713.	3150.	1950.	7891.	******	512.	417.	27.
T - 2 - 10	10100.	16900.	607.	3720.	2330.	8789.	******	510.	483.	30.

SAMPLE I.D.	AL PPM	FE PPM	MN PPM	K PPM	NA PPM	MG PPM	CA PPM	P PPM	TI PPM	ZR PPM
T - 1 - 11	8104.	23000.	851.	3260.	2180.	7549.	240000.	718.	356.	26.
T - 1 - 12	8205.	22130.	864.	3210.	2200.	7272.	233000.	730.	370.	27.
T - 1 - 13	8481.	21640.	907.	3290.	2120.	8006.	228000.	785.	391.	28.
T - 1 - 14	9414.	19460.	768.	3750.	2340.	8635.	219000.	916.	445.	30.
T - 1 - 15	9642.	18740.	727.	3860.	2450.	8688.	221000.	854.	430.	30.
T - 1 - 16	9498.	18220.	724.	3820.	2450.	8900.	231000.	744.	438.	31.
T - 1 - 17	9418.	15690.	713.	3770.	2530.	8514.	236000.	717.	415.	30.
T - 1 - 18	10170.	14030.	680.	3890.	2570.	8683.	1950.	733.	422.	31.
T - 1 - 19	9263.	16980.	741.	3750.	2390.	8829.	241000.	1992.	424.	30.
T - 1 - 20	11370.	17880.	741.	4740.	2940.	9762.	217000.	772.	491.	35.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
T - 1 - 1	19.44	0.87	****	T - 2 - 1	*****	*****	49.8	T - 1 - 11	25.82	3.10	45.4
T - 1 - 2	18.01	1.17	46.5	T - 2 - 2	*****	*****	45.4	T - 1 - 12	26.98	3.83	45.4
T - 1 - 3	23.20	1.27	46.2	T - 2 - 3	*****	*****	45.6	T - 1 - 13	23.37	3.49	46.5
T - 1 - 4	23.06	1.85	47.6	T - 2 - 4	*****	*****	45.8	T - 1 - 14	27.18	4.28	44.9
T - 1 - 5	26.42	1.84	46.6	T - 2 - 5	*****	*****	46.2	T - 1 - 15	26.32	4.69	44.5
T - 1 - 6	25.44	1.91	48.6	T - 2 - 6	*****	*****	46.8	T - 1 - 16	28.11	4.79	44.7
T - 1 - 7	21.90	1.98	46.5	T - 2 - 7	*****	*****	45.6	T - 1 - 17	22.30	4.21	44.8
T - 1 - 8	26.81	2.39	47.8	T - 2 - 8	*****	*****	45.2	T - 1 - 18	32.82	7.80	43.8
T - 1 - 9	22.97	1.76	47.8	T - 2 - 9	*****	*****	45.2	T - 1 - 19	29.85	6.08	43.4
T - 1 - 10	25.77	3.14	46.7	T - 2 - 10	*****	*****	45.2	T - 1 - 20	30.20	5.79	43.6

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
T - 1 - 1	1.5	*****	14.8	24.8	130.	17.	150.	36.1	****	5.0	21.4	93.
T - 1 - 2	17.7	*****	12.8	18.0	134.	14.	65.	29.9	****	4.5	20.5	86.
T - 1 - 3	12.6	*****	12.2	19.6	143.	13.	55.	23.9	****	4.0	20.4	80.
T - 1 - 4	5.7	*****	12.6	13.1	94.	16.	30.	5.8	****	3.0	16.0	52.
T - 1 - 5	4.5	*****	9.5	10.9	80.	16.	20.	******	****	3.0	11.4	37.
T - 1 - 6	3.9	*****	7.2	12.1	76.	18.	20.	******	****	2.0	9.9	28.
T - 1 - 7	2.6	*****	5.8	19.0	58.	18.	15.	******	****	1.5	7.1	15.
T - 1 - 8	2.1	*****	5.6	11.1	58.	16.	10.	******	****	1.5	9.6	12.
T - 1 - 9	2.0	*****	7.6	16.6	54.	17.	5.	******	****	1.5	10.5	16.
T - 1 - 10	****	*****	7.2	19.5	54.	17.	5.	******	****	2.5	9.5	17.

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SR PPM	TH PPM	U PPM	V PPM	ZN PPM
T - 2 - 1	****	*****	27.8	14.6	*****	5.	85.	31.2	****	0.5	14.1	69.
T - 2 - 2	****	*****	27.8	16.0	*****	8.	45.	24.2	****	0.5	16.6	49.
T - 2 - 3	****	*****	19.9	11.2	*****	9.	20.	******	****	****	8.6	20.
T - 2 - 4	****	*****	15.4	9.8	*****	7.	20.	******	****	0.5	4.6	10.
T - 2 - 5	****	*****	13.2	9.2	*****	8.	10.	******	****	1.0	2.3	****
T - 2 - 6	****	*****	13.1	10.0	*****	8.	****	******	****	0.5	3.4	****
T - 2 - 7	****	*****	15.1	9.5	*****	8.	****	******	****	1.0	5.1	****
T - 2 - 8	****	*****	14.2	10.8	*****	8.	10.	******	****	0.5	4.8	****
T - 2 - 9	****	*****	16.6	11.6	*****	10.	****	******	****	1.5	8.5	****
T - 2 - 10	****	*****	18.5	11.7	*****	10.	****	******	****	2.0	10.5	****

SAMPLE I.D.	AS PPM	CO PPM	CR PPM	CU PPM	HG PPB	NI PPM	PB PPM	SB PPM	TH PPM	U PPM	V PPM	ZN PPM
T - 1 - 11	2.0	*****	7.1	11.5	58.	15.	5.	******	****	2.5	10.7	15.
T - 1 - 12	2.2	*****	8.1	15.2	50.	17.	5.	******	****	2.5	10.9	15.
T - 1 - 13	2.3	*****	9.7	15.4	49.	19.	****	******	****	4.0	13.6	20.
T - 1 - 14	2.3	*****	11.4	16.6	45.	19.	****	******	****	3.5	15.7	23.
T - 1 - 15	2.2	*****	11.4	12.2	45.	25.	****	******	****	3.5	13.4	23.
T - 1 - 16	2.4	*****	9.9	11.8	36.	19.	****	******	****	2.0	12.5	19.
T - 1 - 17	1.9	*****	9.5	11.1	31.	19.	****	******	****	2.0	11.1	17.
T - 1 - 18	1.9	19.7	17.9	18.8	27.	19.	****	111.1	61.	2.0	20.5	41.
T - 1 - 19	2.2	*****	10.7	13.3	31.	20.	****	******	****	2.5	13.3	29.
T - 1 - 20	2.3	*****	12.4	12.1	45.	22.	****	7.1	****	3.0	16.7	23.

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
T - 1 - 1	19.44	0.87	****	T - 2 - 1	*****	*****	49.8	T - 1 - 11	25.82	3.10	45.4
T - 1 - 2	18.01	1.17	46.5	T - 2 - 2	*****	*****	45.4	T - 1 - 12	26.98	3.83	45.4
T - 1 - 3	23.20	1.27	46.2	T - 2 - 3	*****	*****	45.6	T - 1 - 13	23.37	3.49	46.5
T - 1 - 4	23.06	1.85	47.6	T - 2 - 4	*****	*****	45.8	T - 1 - 14	27.18	4.28	44.9
T - 1 - 5	26.42	1.84	46.6	T - 2 - 5	*****	*****	46.2	T - 1 - 15	26.32	4.69	44.5
T - 1 - 6	25.44	1.91	48.6	T - 2 - 6	*****	*****	46.8	T - 1 - 16	28.11	4.79	44.7
T - 1 - 7	21.90	1.98	46.5	T - 2 - 7	*****	*****	45.6	T - 1 - 17	22.30	4.21	44.8
T - 1 - 8	26.81	2.39	47.8	T - 2 - 8	*****	*****	45.2	T - 1 - 18	32.82	7.80	43.8
T - 1 - 9	22.97	1.76	47.8	T - 2 - 9	*****	*****	45.2	T - 1 - 19	29.85	6.08	43.4
T - 1 - 10	25.77	3.14	46.7	T - 2 - 10	*****	*****	45.2	T - 1 - 20	30.20	5.79	43.6

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-PPM

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
T - 1 - 1	0.1843	0.7026	0.5702	0.3076	0.1630	0.3763	2.5901	1.0893	0.1090	0.2469
T - 1 - 2	0.1853	0.6206	0.5021	0.3076	0.1661	0.3393	2.4442	0.8330	0.1073	0.2549
T - 1 - 3	0.1872	0.5788	0.5329	0.3000	0.1515	0.3254	2.8391	0.7679	0.1093	0.2383
T - 1 - 4	0.1344	0.4170	0.5665	0.2337	0.1106	0.2915	3.7082	0.6634	0.0859	0.1920
T - 1 - 5	0.1032	0.3923	0.5874	0.1870	0.0934	0.2788	4.3283	0.6705	0.0632	0.1722
T - 1 - 6	0.0993	0.4031	0.7377	0.1739	0.0894	0.2616	4.3948	0.7339	0.0572	0.1519
T - 1 - 7	0.0658	0.3273	0.9177	0.1185	0.0604	0.2305	5.1781	0.6259	0.0405	0.1198
T - 1 - 8	0.0707	0.3719	0.9594	0.1255	0.0652	0.2271	5.1030	0.6527	0.0418	0.1327
T - 1 - 9	0.0764	0.3696	0.9302	0.1397	0.0736	0.2421	4.8863	0.6714	0.0467	0.1389
T - 1 - 10	0.0822	0.3367	0.7759	0.1533	0.0815	0.2638	5.1695	0.6000	0.0496	0.1407

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
T - 2 - 1	0.1593	0.5596	0.3419	0.2636	0.1330	0.3189	2.5107	0.7250	0.0996	0.2154
T - 2 - 2	0.1772	0.4969	0.3709	0.2848	0.1322	0.3149	3.2790	0.6062	0.1132	0.2457
T - 2 - 3	0.1233	0.3577	0.4280	0.2022	0.0991	0.2913	4.6245	0.5089	0.0803	0.1852
T - 2 - 4	0.1026	0.3379	0.5229	0.1614	0.0780	0.2759	4.9893	0.5179	0.0623	0.1543
T - 2 - 5	0.0795	0.2973	0.7159	0.1196	0.0577	0.2444	5.5622	0.4705	0.0507	0.1185
T - 2 - 6	0.0817	0.2910	0.6950	0.1245	0.0626	0.2466	5.3734	0.4482	0.0517	0.1247
T - 2 - 7	0.0978	0.2791	0.5955	0.1587	0.0815	0.2842	5.2704	0.4446	0.0615	0.1580
T - 2 - 8	0.0977	0.2928	0.6309	0.1554	0.0802	0.2688	5.3433	0.4500	0.0603	0.1556
T - 2 - 9	0.1056	0.2971	0.6726	0.1712	0.0859	0.2855	5.2618	0.4571	0.0660	0.1673
T - 2 - 10	0.1208	0.2717	0.5730	0.2022	0.1026	0.3180	5.0386	0.4554	0.0764	0.1870

SAMPLE I.D.	AL KK	FE KK	MN KK	K KK	NA KK	MG KK	CA KK	P KK	TI KK	ZR KK
T - 1 - 11	0.0969	0.3698	0.8028	0.1772	0.0960	0.2731	5.1545	0.6411	0.0564	0.1623
T - 1 - 12	0.0981	0.3558	0.8149	0.1745	0.0969	0.2631	4.9957	0.6518	0.0586	0.1636
T - 1 - 13	0.1014	0.3479	0.8556	0.1788	0.0934	0.2897	4.8991	0.7009	0.0618	0.1698
T - 1 - 14	0.1126	0.3129	0.7249	0.2038	0.1031	0.3124	4.7060	0.8179	0.0704	0.1864
T - 1 - 15	0.1153	0.3013	0.6859	0.2098	0.1079	0.3143	4.7339	0.7625	0.0680	0.1833
T - 1 - 16	0.1136	0.2929	0.6830	0.2076	0.1079	0.3220	4.9528	0.6643	0.0692	0.1907
T - 1 - 17	0.1127	0.2523	0.6727	0.2049	0.1115	0.3080	5.1116	0.6402	0.0656	0.1846
T - 1 - 18	0.1217	0.2256	0.6414	0.2114	0.1132	0.3141	0.0427	0.6545	0.0667	0.1919
T - 1 - 19	0.1108	0.2730	0.6986	0.2038	0.1053	0.3194	5.1760	1.7786	0.0671	0.1846
T - 1 - 20	0.1360	0.2875	0.6990	0.2576	0.1295	0.3532	4.6524	0.6893	0.0776	0.2148

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
T - 1 - 1	19.44	0.87	****	T - 2 - 1	*****	*****	49.8	T - 1 - 11	25.82	3.10	45.4
T - 1 - 2	18.01	1.17	46.5	T - 2 - 2	*****	*****	45.4	T - 1 - 12	26.98	3.83	45.4
T - 1 - 3	23.20	1.27	46.2	T - 2 - 3	*****	*****	45.6	T - 1 - 13	23.37	3.49	46.5
T - 1 - 4	23.06	1.85	47.6	T - 2 - 4	*****	*****	45.8	T - 1 - 14	27.18	4.28	44.9
T - 1 - 5	26.42	1.84	46.6	T - 2 - 5	*****	*****	46.2	T - 1 - 15	26.32	4.69	44.5
T - 1 - 6	25.44	1.91	48.6	T - 2 - 6	*****	*****	46.8	T - 1 - 16	28.11	4.79	44.7
T - 1 - 7	21.90	1.98	46.5	T - 2 - 7	*****	*****	45.6	T - 1 - 17	22.30	4.21	44.8
T - 1 - 8	26.81	2.39	47.8	T - 2 - 8	*****	*****	45.2	T - 1 - 18	32.82	7.80	43.8
T - 1 - 9	22.97	1.76	47.8	T - 2 - 9	*****	*****	45.2	T - 1 - 19	29.85	6.08	43.4
T - 1 - 10	25.77	3.14	46.7	T - 2 - 10	*****	*****	45.2	T - 1 - 20	30.20	5.79	43.6

LAKE SEDIMENT GEOCHEMICAL DATA: MAJOR ELEMENTS-KK

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
T - 1 - 1	0.833	*******	0.1213	0.3647	1.5116	0.172	11.538	0.0940	******	2.174	0.1574	1.2237
T - 1 - 2	9.833	*******	0.1048	0.2651	1.5581	0.138	5.000	0.0779	******	1.957	0.1504	1.1276
T - 1 - 3	7.000	*******	0.0998	0.2885	1.6628	0.131	4.231	0.0623	******	1.739	0.1503	1.0500
T - 1 - 4	3.167	*******	0.1030	0.1934	1.0930	0.161	2.308	0.0150	******	1.304	0.1177	0.6829
T - 1 - 5	2.500	*******	0.0779	0.1601	0.9302	0.158	1.538	********	******	1.304	0.0840	0.4908
T - 1 - 6	2.167	*******	0.0588	0.1774	0.8837	0.186	1.538	********	******	0.870	0.0725	0.3645
T - 1 - 7	1.444	*******	0.0479	0.2793	0.6744	0.177	1.154	********	******	0.652	0.0522	0.1947
T - 1 - 8	1.167	*******	0.0459	0.1629	0.6744	0.162	0.769	********	******	0.652	0.0704	0.1632
T - 1 - 9	1.111	*******	0.0619	0.2440	0.6279	0.169	0.385	********	******	0.652	0.0773	0.2053
T - 1 - 10	******	*******	0.0589	0.2862	0.6279	0.175	0.385	********	******	1.087	0.0699	0.2197

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SR KK	TH KK	U KK	V KK	ZN KK
T - 2 - 1	******	*******	0.2278	0.2149	*******	0.054	6.538	0.0813	******	0.217	0.1034	0.9026
T - 2 - 2	******	*******	0.2276	0.2356	*******	0.083	3.462	0.0630	******	0.217	0.1217	0.6395
T - 2 - 3	******	*******	0.1627	0.1641	*******	0.088	1.538	********	******	******	0.0633	0.2618
T - 2 - 4	******	*******	0.1261	0.1447	*******	0.072	1.538	********	******	0.217	0.0337	0.1263
T - 2 - 5	******	*******	0.1080	0.1356	*******	0.079	0.769	********	******	0.435	0.0170	*******
T - 2 - 6	******	*******	0.1075	0.1475	*******	0.078	******	********	******	0.217	0.0251	*******
T - 2 - 7	******	*******	0.1234	0.1400	*******	0.078	******	********	******	0.435	0.0376	*******
T - 2 - 8	******	*******	0.1161	0.1590	*******	0.080	0.769	********	******	0.217	0.0350	*******
T - 2 - 9	******	*******	0.1364	0.1701	*******	0.102	******	********	******	0.652	0.0627	*******
T - 2 - 10	******	*******	0.1514	0.1725	*******	0.102	******	********	******	0.870	0.0769	*******

SAMPLE I.D.	AS KK	CO KK	CR KK	CU KK	HG KK	NI KK	PB KK	SB KK	TH KK	U KK	V KK	ZN KK
T - 1 - 11	1.111	*******	0.0583	0.1687	0.6744	0.155	0.385	********	******	1.087	0.0789	0.2026
T - 1 - 12	1.222	*******	0.0666	0.2231	0.6279	0.169	0.385	********	******	1.087	0.0802	0.2000
T - 1 - 13	1.278	*******	0.0795	0.2265	0.5698	0.189	******	********	******	1.739	0.1001	0.2605
T - 1 - 14	1.278	*******	0.0936	0.2441	0.5233	0.189	******	********	******	1.522	0.1157	0.2987
T - 1 - 15	1.222	*******	0.0932	0.1796	0.5233	0.252	******	********	******	1.522	0.0986	0.2971
T - 1 - 16	1.333	*******	0.0809	0.1741	0.4186	0.190	******	********	******	0.870	0.0916	0.2447
T - 1 - 17	1.056	*******	0.0780	0.1626	0.3605	0.189	******	********	******	0.870	0.0820	0.2263
T - 1 - 18	1.056	0.6793	0.1467	0.2768	0.3140	0.194	******	0.2893	7.494	0.870	0.1506	0.5368
T - 1 - 19	1.222	*******	0.0874	0.1950	0.3605	0.204	******	********	******	1.087	0.0976	0.3763
T - 1 - 20	1.278	*******	0.1012	0.1781	0.5233	0.219	******	0.0186	******	1.304	0.1225	0.3000

SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %	SAMPLE I.D.	WET WT. G	DRY WT. G	L.O.I. %
T - 1 - 1	19.44	0.87	****	T - 2 - 1	*****	*****	49.8	T - 1 - 11	25.82	3.10	45.4
T - 1 - 2	18.01	1.17	46.5	T - 2 - 2	*****	*****	45.4	T - 1 - 12	26.98	3.83	45.4
T - 1 - 3	23.20	1.27	46.2	T - 2 - 3	*****	*****	45.6	T - 1 - 13	23.37	3.49	46.5
T - 1 - 4	23.06	1.85	47.6	T - 2 - 4	*****	*****	45.8	T - 1 - 14	27.18	4.23	44.9
T - 1 - 5	26.42	1.84	46.6	T - 2 - 5	*****	*****	46.2	T - 1 - 15	26.32	4.69	44.5
T - 1 - 6	25.44	1.91	48.6	T - 2 - 6	*****	*****	46.8	T - 1 - 16	28.11	4.79	44.7
T - 1 - 7	21.90	1.98	46.5	T - 2 - 7	*****	*****	45.6	T - 1 - 17	22.30	4.21	44.8
T - 1 - 8	26.81	2.39	47.8	T - 2 - 8	*****	*****	45.2	T - 1 - 18	32.82	7.80	43.8
T - 1 - 9	22.97	1.76	47.8	T - 2 - 9	*****	*****	45.2	T - 1 - 19	29.85	6.08	43.4
T - 1 - 10	25.77	3.14	46.7	T - 2 - 10	*****	*****	45.2	T - 1 - 20	30.20	5.79	43.6

LAKE SEDIMENT GEOCHEMICAL DATA: MINOR ELEMENTS-KK