Special Publication SJ2001-SP7

Final Report

Sediment and Nutrient Deposition in Harris Chain-of-Lakes

St. Johns River Water Management District
Contract No. 99W208

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March 2001

EXECUTIVE SUMMARY

Sediment and nutrient deposition were investigated in the Harris Chain-of-Lakes using paleolimnological techniques. Seventeen sediment cores were collected: 9 cores from Lake Harris-Little Lake Harris, 3 cores from Lake Weir, 3 cores from Lake Yale and 2 cores from Lake Beauclair. Three specific goals of this study were: 1) use paleolimnological methods (^{210}Pb-dated sediment cores) to describe historical changes in sediment and nutrient accumulation rates over the past 100 to 150 yr; 2) reconstruct past trends in the water quality of the study lakes based on the analysis of fossil diatom assemblages in the sediments; and 3) reconstruct past trends in historic plant communities of the study lakes from sediment chemical and biological stratigraphy including fossil diatom assemblages, biogenic silica, nutrient concentrations and total carbon/total nitrogen (TC/TN) ratios.

Nutrient concentrations in the water-column vary greatly among the study lakes. Mean total phosphorus (TP) concentrations (established from sampling in the 1980s and early 1990s) ranged from 15 µg/L in Lake Weir to 235 µg/L in Lake Beauclair. Mean TP concentrations were also relatively low in Lake Yale (25 µg/L) and Lake Harris (42 µg/L). In general, paleolimnological inferences from the present study ranked the trophic state of the lakes in the same order as that for historic total phosphorus (TP) concentrations in the water column. However, spatial differences among cores from Lake Weir, Lake Yale and Little Lake Harris complicate such a simple interpretation. For example, a greater nutrient enrichment was inferred from one core in Lake Weir and one core in Lake Yale than in the other cores from each lake. In addition, greater nutrient enrichment was inferred from Little Lake Harris cores than from Lake Harris cores. These difference were great enough that inferred nutrient enrichment in some cores from Lake Harris was no greater than cores from either Lake Weir or Lake Yale. Trophic state inferences from the Lake Beauclair cores provided evidence of much higher degree of nutrient enrichment than in other cores from the study lakes. These differences, particularly in Lake Weir and Lake Yale, probably reflect spatial differences in nutrient loading.

Accelerated nutrient enrichment of Lake Beauclair was linked to construction of the Apopka-Beauclair Canal and construction of levees on Lake Apopka that were used to facilitate agriculture in wetlands on the north shore. Loading of TP increased in the early 1900s after the Apopka-Beauclair Canal was completed and a much greater increase in loading occurred after the muck farms were established on Lake Apopka in the 1940s. Sedimentary evidence of these influences on trophic state in Lake Beauclair are profound compared to more subtle changes in trophic state in the other study lakes. Due to its short hydraulic residence time and small watershed, inferred accelerated nutrient enrichment in Lake Beauclair to its present hypereutrophic state is attributed to nutrient loading from Lake Apopka via the Apopka-Beauclair Canal.

Limnetic TP concentrations inferred from diatom microfossil assemblages in near-surface sediments also can be compared to mean water-column TP concentrations. Based on inferred limnetic P, the rank of lakes in order of increasing trophic condition is Lake Weir, Lake Harris, Lake Yale and Lake Beauclair. The mean modern TP and standard deviation for these lakes are 15 ± 10, 42 ± 38, 25 ± 47, and 235 ± 115 µg/L, respectively. Therefore, the rank order for mean water-column TP differs in that Lake Yale and Lake Harris are interchanged. However, it should be noted that statistically these means are not different due to the large standard deviations. The inferred TP concentration for Lake Beauclair decreases in the upper part of the core, an inference that is not consistent with other proxies. This disparity may be related to lower species diversity in these samples. It was noted in earlier studies of nutrient and sediment deposition that two distinct assemblages of microfossil diatoms characterize near-surface sediments of other hypereutrophic Florida lakes such as Lake Apopka, Lake Dora, Lake Eustis and Lake Jesup. A common feature of the assemblages in these hypereutrophic lakes is low species diversity.

Inferred historic changes in trophic state based on phosphorus accumulation rates were greater than those for any other proxy. These data from ^{210}Pb-dated sediment cores provide the basis for comparing nutrient accumulation rates among study lakes. These data show that TP accumulation rate increased more than the rates for other nutrients, providing evidence of changes in phosphorus loading rate to each lake. The relative increase in TP accumulation over the 20th century was much greater in Lake Beauclair and in two cores from Lake Harris than in the remaining cores. In all cores, TP accumulation was greater in the 1980s and 1990s than in older sediments. This evidence of increasing phosphorus enrichment was supported also by another proxy that is a measure of excess phosphorus storage by algae. If the phosphorus supply in a lake is greater than that required for the growth of phytoplankton, the excess supply can be stored in algal cells as polyphosphate. Polyphosphate storage by algae was measured chemically as corrected hot-water extractable phosphorus (CHEP). This index of excessive phosphorus enrichment increased markedly in the 1980s and 1990s in all of the study lakes, with by far the greatest increase in Lake Beauclair.

Relative increases in TP accumulation rates during the 20th century, however, in all the cores except from Lake Beauclair exceeded increases expected from an implicit assumption in phosphorus loading models. This assumption is that TP sedimentation rate is proportional to water column concentration and that TP sedimentation would increase linearly with increases in TP in the water column. This assumption is not supported by our data. For example, a relative increase in TP sedimentation of 6 to 10 fold in Lake Yale is not realistic because the mean TP at present is only 25 μg/L. With the linear model, the inferred historic TP (water column) would range from 2.5 to 4.1 μg/L. The historic TP inferred from the 20-fold increase in TP sedimentation in Lake Beauclair is 12 μg/L (present mean TP is 235 μg/L), a very low but more realistic value. We conclude the linear model is not appropriate for the study lakes because phosphorus is sedimented disproportionately to the other major nutrients and present hypotheses to explain this historic disproportionate sedimentation of nutrients.

Plots of nutrient ratios vs. depth show that historic TP sedimentation increases disproportionately relative to either TC or TN, the major nutrients that represent the major fraction of sedimentary organic matter. The historic disproportion in the Lake Beauclair cores is shown by relatively low TC/TP ratios (< 100) over most of the LB1-com profile and over most of the datable portion of LB2-99 compared to ratios of approximately 600 below 100 cm in LB2-99. By comparison, with the exception of LH7-99, TC/TP ratios <150 are found only in a relatively few near-surface samples in all the remaining cores. In addition, near-surface TC/TP ratios in the Lake Beauclair cores are < 75, much smaller than values in other cores. The Redfield Ratio for C:N:P for particulate matter in the water column is 106:16:1. This ratio has been used as a comparative index in many studies. Ratios for TC/TP at depth in the Lake Harris cores range from 600 to 800, and ratios as large as 1,000 are found in Lake Weir and Lake Yale cores. Ratios greater than 500 may reflect contributions of organic matter from terrestrial plants. The historic decrease in TC/TP or TC/TP in the upper part of the study cores also coincides with a general historic pattern of decreasing TC/TN ratios. These patterns show a historic shift toward increasing phytoplankton abundance that can be inferred from the TC/TN ratio that is coincident with a disproportionate increase in TP sedimentation. The small TC/TP ratio in Lake Beauclair sediments compared to the other lakes shows that in the study lakes the ratio decreases with nutrient enrichment.

Several hypotheses can be offered for historic increases in TP sedimentation that are disproportionately large relative to organic-matter proxies for nutrient enrichment of lakes that can be inferred from TC/TP and TN/TP ratios. First, TP represents an increasing proportion of sedimentary organic matter as phytoplankton or benthic algae increase in abundance and possibly replace macrophytes in the primary producer community. Second, algal species in the ecological succession induced by anthropogenic nutrient enrichment are those adapted to a smaller TC:TP stoichiometry than pristine algal populations. Thus, the algal community response to increased phosphorus loading is the selection of populations that produce organic matter increasingly enriched with phosphorus. Third, an increasing proportion of TP is sedimented as polyphosphate as lakes experience anthropogenic nutrient enrichment. Although sedimented CHEP increases historically as a consequence of excessive phosphorus enrichment, the proportion sedimented as CHEP is small relative to the disproportionate increase in TP sedimentation. Fourth, the presence of rooted aquatic macrophytes that are inferred from large TC/TN ratios in older sediments accentuates the disproportionately large increase in either TC/TP or TN/TP ratio in the study lakes. Macrophytes with a relatively large requirement for structural carbon and low turnover rates sequester relatively small quantities of phosphorus compared to phytoplankton. The relatively large requirement by macrophytes for highly recalcitrant structural organic carbon and the relatively small requirement by pristine periphytic and benthic algal communities for phosphorus contribute to the large variation in ratios and disproportionately large sedimentation of phosphorus.

Even if the ecological significance of these patterns is questioned on theoretical grounds, the empirical patterns are significant for lake management. These empirical patterns confirm that the TC/TP ratio decreases coincidentally with the TC/TN ratio, but taken alone is not evidence that these decreases represent a major biological change in the system. Theoretical models predict that dominance in the primary producer community will shift from macrophytes to phytoplankton with nutrient enrichment. Such a shift has been confirmed in previous studies of Lake Apopka. For the lake manager, these data show that the sedimentary response to phosphorus enrichment in the Harris Chain-of-Lakes is increased TP sedimentation. The conclusion from this finding is that the sedimentary record overestimates the relative increase in TP loading because historic phosphorus sedimentation is not directly proportional, but possibly exponentially proportional to historic increases in water column TP. There is uncertainty in this finding in that the factors that control the non-linear function are uncertain and apparently vary from site to site. However, extrapolating data from a few cores in a given lake may enable lake managers to establish best and worst case scenarios for phosphorus reduction goals.

Study of Sediment and Nutrient Deposition

in the Harris Chain of Lakes

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Acknowledgments

We acknowledge partial funding from Lake County Water Authority for this study.

A number of people are acknowledged for their role in successfully completing this project. Matt Waters and Byron Shumate assisted with core collection and laboratory analyses. Dr. Jason Curtis analyzed samples for total carbon and total nitrogen and stable isotopes. Dr. Joseph Smoak provided radiometric analyses and calculations of ^{210}Pb ages and mass sedimentation rates. Martha Love ably and cheerfully assisted with administrative matters and preparation of reports. The assistance of these people and others is gratefully acknowledged.

Finally, Dr. Rolland Fulton, St. Johns River Management District, is acknowledged for providing pertinent information and for his careful reading of the report for matters of style and continuity.

Chapter 1

INTRODUCTION

The Harris Chain of Lakes is a series of lakes in the upper Ocklawaha River basin. The headwaters of this basin originate with the Apopka Spring in Lake Apopka. Water from Lake Apopka flows to Lake Beauclair through the Apopka-Beauclair Canal and then to Lake Dora and Lake Eustis (Fig. 1.1). Presently, the major hydrologic flow to Lake Dora is from Lake Beauclair, whereas the hydrologic flows to Lake Eustis are more complex (Fulton 1995). The major hydrologic flows to Lake Eustis are from Lake Harris-Little Lake Harris through the Dead River and from Lake Dora through the Dora Canal. Water is discharged from Lake Eustis to Lake Griffin through Haines Creek. Efforts and actions to control water levels in the Harris Chain and Lake Apopka have been reviewed by Fulton (1995). The Apopka-Beauclair Canal was completed in 1887 connecting Lake Apopka with Lake Beauclair (Table 1.1). Water levels in the canal were stabilized in 1950 by a control structure. Before the construction of this canal, water flowed from Lake Apopka to Little Lake Harris through Double Run Swamp. Although not connected directly, Lake Weir and Lake Yale are in the upper Ocklawaha drainage basin.

A comparative study of the Harris Chain of Lake provides an opportunity to study lakes with a large range in water quality. The poorest water quality in the upper basin is in Lake Apopka and Lake Beauclair. Both of these lakes are clearly hypereutrophic with mean TP and TN concentrations >0.20 and 4.0 mg/L, respectively (Fig. 1.2). One concern about the eutrophication and subsequent hypereutrophication of Lake Apopka has been the effects of nutrient-enriched discharge of water on downstream lakes (Brezonik et al. 1978), beginning with Lake Beauclair. Discharges from Lake Apopka undoubtedly have affected water quality in the downstream lakes, particularly in the last 50 yr when outflowing waters were increasingly phosphorus enriched (Schelske 1997). By contrast, the best water quality is found in Lake Weir and Lake Yale which have mean TP and TN concentrations nearly an order of magnitude lower than Lake Beauclair and Lake Apopka.

Studies of sediment and nutrient deposition have been conducted on other lakes in the study area including Lake Apopka (Schelske 1997), Lake Dora and Lake Eustis (Schelske et al. 1999a), Lake Griffin (Schelske 1998) and Lake Weir (Crisman et al. 1992). Fulton (1995) has estimated nutrient loading and retention for lakes in the upper Ocklawaha River basin.

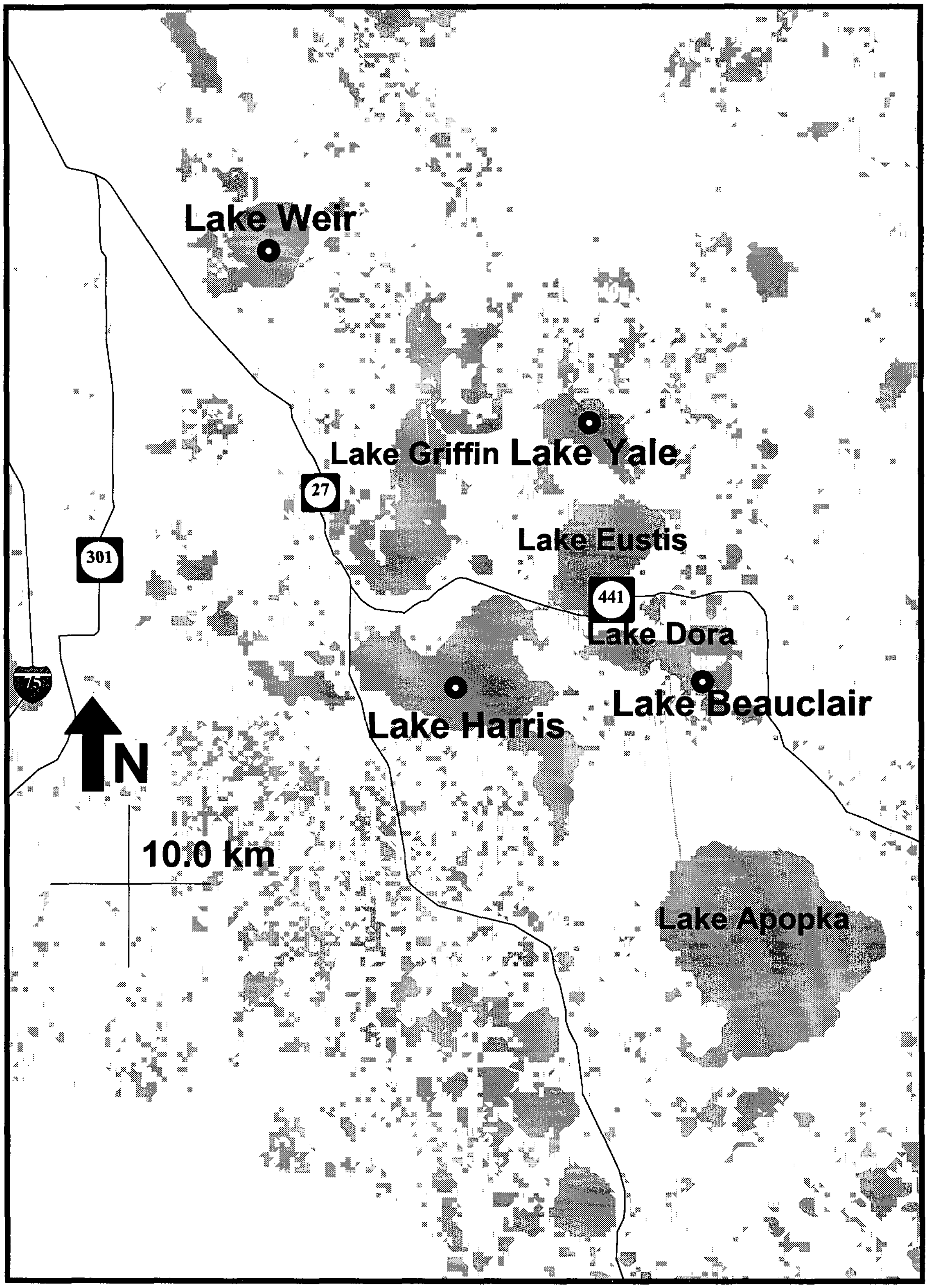


Figure 1.1. Map of study area showing Harris Chain of Lakes.

Table 1.1 Chronology of significant events in the study area (from Fulton 1995)

Year(s)	Event
1870-80	The Apopka Canal Company attempts to dredge a canal connecting Lakes Apopka, Beauclair, Dora, and Eustis to the Ocklawaha River to drain farmland and open a transportation route to ship vegetables and citrus
1890	Congress authorizes the Rivers and Harbors Act to provide a 4-ft channel from the mouth of the Ocklawaha River to Leesburg to facilitate navigation
1893	Canal connecting Lake Apopka through Lake Beauclair and Lake Dora to Lake Eustis was completed by the Delta Canal Company
1916	Rivers and Harbors Act includes provisions to construct a lock and dam at Moss Bluff to regulate water levels in Lake Griffin and accept private canals along Ocklawaha River in lieu of natural portions of the river bed
1920s	Direct discharge of primary and secondary sewage effluents and fruit processing wastes to the chain of lakes begins
1925	Construction of Moss Bluff lock and dam and dredging of the Ocklawaha River and Lake Griffin to Leesburg is completed by the U.S. Army Corps of Engineers under the Ocklawaha River Navigation Project
1942	Drainage water discharges from muck farms around Lake Apopka begin
1942-47	Expansion of agricultural activities in Lake Apopka Basin
1947	Hurricane disturbances in Lake Apopka; first algae blooms reported in Lake Apopka
1950	A wooden water control structure was constructed on the Apopka-Beauclair Canal by local interests to stabilize water levels on Lake Apopka and provide optimum levels for agricultural water supply and improved navigation
1956	A permanent water control structure was completed on the Apopka-Beauclair Canal by the Lake Apopka Authority to conserve and protect the water resources of Orange County
1957	Burrell lock and dam, located approximately midway along Haines Creek, was built by the Ocklawaha Basin Recreation and Water Conservation and Control Authority to stabilize water levels on Lake Griffin, Eustis, Dora, Beauclair, and Harris and to provide optimum levels for agricultural water supply and improved navigation
1962	The Four River Basins Project was authorized by Congress under the Flood Control Act to provide for flood protection and solve water control problems
1967	Lake County Pollution Control is established
1969-74	U.S. Army Corps of Engineers, working on the Four River Basins Project, completes construction on Moss Bluff lock and dam, Lake Griffin to Moss Bluff levee and canal, and Moss Bluff to the north end of Oklawaha Farms agricultural area levee and canal
1969	A no-discharge rule was adopted by Lake County Pollution Control
1970s	The discharge of most wastes from sewage treatment, food processing, and industrial facilities ceases
1978	Construction of new Burrell lock and dam water control structure completed
1979	The Lake Griffin Recreational Area receives Outstanding Florida Waters designation
1984	Drawdown of Lake Griffin conducted
1985	Lake Apopka restoration project begins; feasibility and diagnostic studies initiated
1987	The Surface Water Improvement and Management (SWIM) Act becomes law
1988	Consent order with A. Duda & Sons to reduce nutrient loading to Lake Apopka
1989	SWIM plans for the upper Ocklawaha River Basin and Lake Apopka adopted by the SJRWMD Governing Board and approved by the Florida Department of Environmental Regulation
1989	Consent order with Zellwood Drainage & Water Control District to reduce nutrient loading to Lake Apopka
1990	Shad removed from Lake Denham to test for food-chain and nutrient removal effects
1991	Pilot-scale Lake Apopka demonstration marsh flow-way begins operation period to test efficiency of marsh filtration
1991-93	Emeralda Marsh muck farms acquired; flooding and gamefish stocking of properties started
1994	Lake Griffin marsh flow-way pilot project initiated

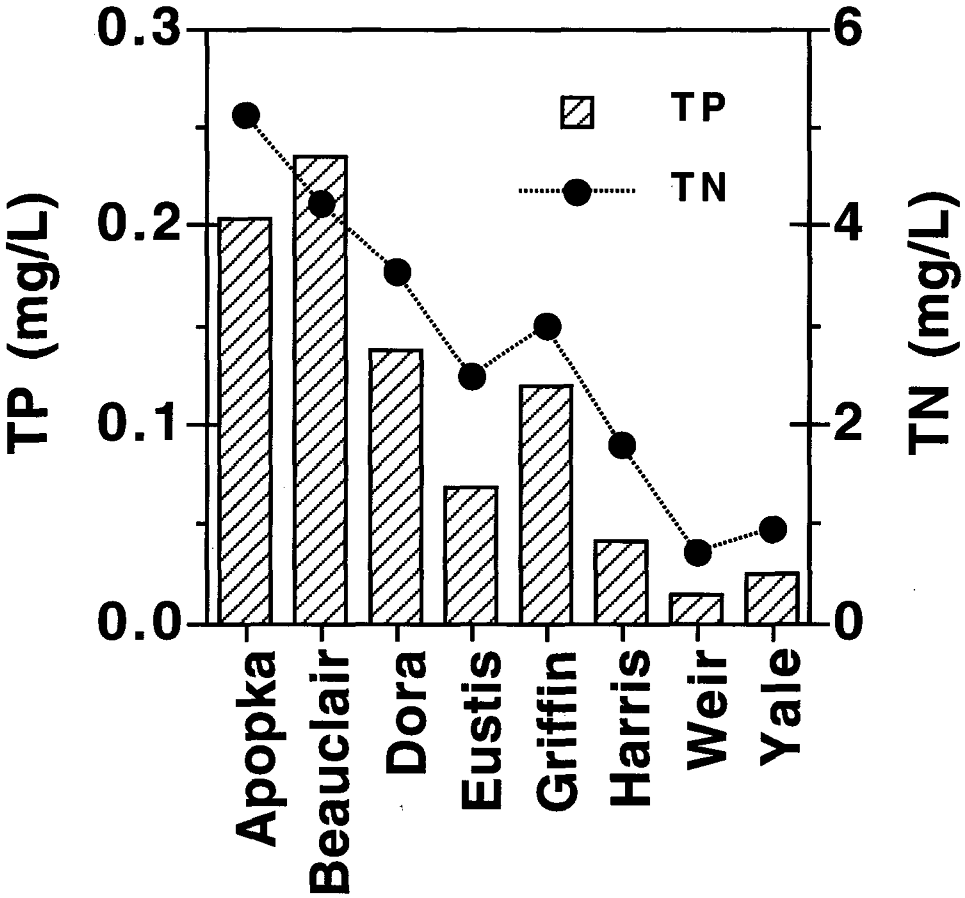


Figure 1.2. Mean water-column total phosphorus (TP) and total nitrogen (TN) for Harris Chain of Lakes (data from Fulton 1995).

This study on sediment and nutrient deposition in the Harris Chain-of-Lake was undertaken as a means to assess historic water quality and nutrient sedimentation rates. Such data are important in evaluating restoration and regulatory measures directed to improvement of water quality in these lakes. Studies of lake sediments are a necessary component of such evaluations for several reasons. Burial in bottom sediments is the ultimate fate of nutrients and other pollutants that are sedimented out of the overlying water mass. The net sedimentation of nutrients, which is generally proportional to concentrations in the overlying water mass, can be used to determine the allowable external loading that is required to meet water quality goals. These dynamics are important because releases of nutrients from the sediments may delay lake recovery for long periods after cessation of external nutrient loading. Finally, sediment proxies can be used to describe historic lake conditions that can be used to develop goals for lake water quality. Determination of such goals by the St. Johns River Water Management District (SJRWMD), termed Pollution Load Reduction Goals (PLRGs) has been legislatively mandated.

Several types of sediment proxies were used to determine historic changes in the study lakes. (Detailed information about methodology is provided in Chapter 2). The most basic of these proxies are gravimetric measures such as bulk dry density and loss on ignition (LOI). Bulk dry density is the dry weight density (g dry/cc wet sediment) and essentially represents the fraction dry weight of sediment. Sediments are ashed at 550 ^{o}C to determine LOI. This proxy represents the organic matter in sediment and, by rule of thumb, in many sediments total organic carbon equals half of the LOI.

Several nutrient proxies were employed. Among the most important of these is total phosphorus (TP) because this is an input variable in setting the PLRG for specific lakes. In addition, we measured three forms of phosphorus: water soluble P (H2O-P), corrected hot-water extractable phosphorus (CHEP) and sodium-hydroxide extractable P (NaOH-P). Measuring CHEP is important because it measures polyphosphate stored by algae when phosphorus supplies in the water mass exceed those required for algal production (Kenney et al. 2001). It, therefore, provides a proxy for historic phosphorus enrichment in lakes such as Lake Apopka (Aldridge et al. 1993) in which secondary nitrogen limitation was induced by excessive phosphorus enrichment (Schelske et al. 1999b). Total carbon (TC) and total nitrogen (TN) content of organic matter provide specific proxies that can be related to sources of sedimentary organic matter and to production and sedimentation of organic matter in the lake basin.

Two proxies were used to infer historic changes in macrophyte abundance. The first proxy utilized as an index of macrophyte abundance is the TC/TN ratio (Schelske et al. 1999c). Macrophytes generally require cellulose for structural support, producing a carbon content that is proportionately greater than in free-floating phytoplankton. Some living macrophytes such as hydrilla, however, have a relatively low TC/TN ratio (Brenner et. al. 1999a). Diagenetic processes in the sediment affect this sedimentary proxy with nitrogen compounds generally being more labile than the more recalcitrant carbon compounds. In addition, sedimentary organic matter is a mixture of organic compounds derived from different sources with different TC/TN signatures. Therefore, although useful in paleolimnological assessments, the sedimentary masses of TC and TN are not conserved and the TC/TN ratio cannot be used as an absolute value. For example, the ratio decreases with an increase in phytoplankton-derived organic carbon, a decrease in macrophyte-derived organic carbon, or to both. Biogenic silica (BSi) is the silica precipitated by diatoms in frustules (DSi) and by sponges in spicules (SSi). Either or both forms of BSi may be important sinks in sediments of Florida lakes (Conley and Schelske 1993). We have found the SSi is a proxy for macrophyte abundance because filter-feeding sponges utilize rooted macrophytes as a substrate in the soft-bottomed sediments of Florida lakes. Thus, the abundance of sponge spicules (inferred from SSi) decreases in Lake Apopka after a known shift from macrophyte to phytoplankton dominance (Schelske et al. 1999c).

Stable carbon and stable nitrogen isotopic ratios of organic matter are used as paleolimnological proxies. In the Laurentian Great Lakes, $\delta^{13}C$ of organic carbon is a proxy for lacustrine primary productivity (Schelske and Hodell 1991). Both $\delta^{13}C$ and $\delta^{15}N$ may be important in Florida lakes: $\delta^{13}C$ may be a proxy for lacustrine productivity and organic matter source (Gu et al. 1996a, Brenner et al. 1999b) and $\delta^{15}N$ a proxy for cyanobacterial abundance (Gu et al. 1996a) and for watershed disturbance and other anthropogenic effects (Brenner et al. 1999b). Both agricultural chemicals and domestic sewage provide nitrogen sources with anomalous $\delta^{15}N$ signatures. It should be pointed out also that the $\delta^{15}N$ signature of organic matter is enriched in food webs, increasing from 3 to 4 ‰ with each trophic transfer (Gu et al. 1996b). Allochthonous detrital carbon may confound the $\delta^{13}C$ signature of sedimentary organic matter due to variation in the signature of terrestrial sources (Meyers 1994). The stable carbon isotopic ratio of bulk organic matter and specific organic compounds is not affected by food chain transfer (Gu et al. 1996b) or diagenetic processes (Schelske and Hodell 1991, Hodell and Schelske 1998). However, specific organic compounds degrade at variable rates, possibly confounding sedimentary signals if source inputs are variable. Factors such of these confound interpretation of stable isotope data in small ecosystems with disturbed watersheds.

Some paleolimnological proxies apply independent of sedimentation rate. These include any ratio such as TC/TN and stable carbon and nitrogen isotopic ratios. However, proxies based on nutrient concentrations in sediments are confounded in lake basins with variable sediment accumulation rates because the concentration of sedimentary nutrients is affected by sedimentation rate. Because many watersheds have undergone anthropogenic disturbance, describing variation in sedimentation rates is an important component of paleolimnological studies (Schelske et al. 1994). Variable sedimentation rates are available because chronologies in our study are based on a constant rate of supply (CRS) model (Appleby and Oldfield 1983). Our approach is to use this model to calculate an age and mass sedimentation rate (MSR) for each sediment section, providing a contiguous ^{210}Pb chronology for each sediment core (Schelske et al. 1994). Because MSR generally increases upcore, the relative increase in nutrient accumulation rate (the product of MSR and concentration) is larger than the relative rate based on the measured concentration (see Appendices B and E).

Biological, chemical and physical processes affect sediment dynamics. Describing and quantifying processes such as nutrient regeneration and release from sediments have important implications related to understanding lake processes. However, in paleolimnological studies, only net accumulation of sediment or nutrients is estimated. An implicit assumption is that post-depositional factors that determine net dry mass sedimentation and nutrient accumulation are relatively constant over the period of record. In evaluating such paleolimnological data, the reader must recognize that an active zone of diagenesis characterizes depositional environments. This zone (depth scale of approximately 5-10 cm) is a zone of active chemical and biological degradation of organic compounds. Nutrients may be released from this zone or be lost by volatilization. Below this zone, these processes have relatively little effect on sedimentary characteristics. It is important to recognize these factors in interpreting data from sediment cores. We now have evidence that biological sequestration of phosphorus as polyP may represent an important sedimentary component that is not affected by post-depositional factors. The hypothesis is that this form of phosphorus is not subjected to diagenesis when sedimented with intact algal cells or propagules and may represent a biological sedimentary sink (Kenney et al. 2001).

The capability of resolving temporal events in the sedimentary record is affected by the rate of sediment accumulation at a specific site and the ^{210}Pb-age model. For example, if only 10 cm of sediment is deposited in 100 yr, it is intuitively obvious that temporal resolution (10 yr/cm) will be poor compared to 100 cm of sediment deposited in 100 yr (1.0 cm/yr) (see Appendix E). In addition, sediment mixing occurs as sediments are deposited, a process that blurs the sediment record. This process has a greater effect on resolving temporal events at low sedimentation sites than at high sedimentation sites. An inherent characteristic of the CRS model is that the error in estimating sediment ages is largest with the oldest sediments (see Appendix D). This error is greater in sediments with a shallow zone of datable sediments and low excess ^{210}Pb activity (A_0) than if the datable zone is deeper (see Appendix D). Thus, the age of sediments that can be dated with the same precision may vary, greatly influencing sediment and nutrient accumulation rates (Appendix E). In this study, we consider these factors in determining which sediment cores provide the most reliable chronological record for the purposes of the project. In addition, several independent proxies can be utilized to infer historic changes in trophic state.

There were three specific goals of this study of Lake Harris-Little Lake Harris, Lake Weir, Lake Yale and Lake Beauclair: use paleolimnological methods (^{210}Pb-dated sediment cores) to describe historical changes in sediment and nutrient accumulation rates at depositional sites in the lakes over the past 100 to 150 yr; reconstruct past trends in the water quality of the study lakes based on the analysis of fossil diatom assemblages in the sediments; and reconstruct past trends in historic plant communities of the study lakes from sediment chemical and biological stratigraphy including fossil diatom assemblages, biogenic silica, nutrient concentrations and TC/TN ratios. In addition, we present data for the stable carbon and stable nitrogen isotopic ratios of sedimentary organic matter that were not mandated by the contract.

Chapter 2

METHODS

Sediment cores were retrieved from seventeen stations in the Harris Chain of Lakes (Fig. 1.1). All of these cores were aged with ^{210}Pb and therefore would have been termed "historic" cores in previous studies on other Ocklawaha lakes (Schelske 1997, 1998; Schelske et al. 1999a). Cores were collected from nine stations in Lake Harris and Little Lake Harris (Fig. 2.1). Mean depth and surface area for these lakes and other lakes in the Harris Chain are plotted in Fig. 2.2. Cores were collected from three stations in Lake Weir, three stations in Lake Yale and two stations in Lake Beauclair (Figs. 2.3-2.5).

Coring stations were located with a Global Positioning System and latitude and longitude were recorded. At each station, thickness of soft sediment was determined using a steel spudding rod and an infrared nephelometer (Myers and Schelske 2000). The steel spudding rod calibrated in 5-cm intervals was driven vertically to hard bottom and depth relative to the water surface was recorded. Depth of the water column to the sediment surface was determined with the infrared nephelometer and this depth was subtracted from the spudding value to yield soft-sediment depth. A sediment core of up to1.5 m in length was collected with a piston corer, 1.8-m clear plastic core barrel and 6.99-cm inside diameter (Fisher et al. 1992). Depths of stratigraphic features in sediment cores were determined visually on deck after retrieval and measured directly in the core tube when such features were readily apparent (see Appendix A). Cores were either sectioned at the station immediately after collection or at an onshore site adjacent to the lake. All cores were sectioned at 4-cm intervals. Samples from each section were placed in 8-oz high-density polyethylene cups and then stored in insulated freezer chests during transit to our laboratory in the Department of Fisheries, Gainesville. In the laboratory, samples were kept at 4^{o}C until phosphorus analyses were completed within a few days (Kenney et al. 2001), then frozen at -20 ^{o}C until they were freeze dried. After freeze drying, dry samples were ground to fine powder using a mortar and pestle. Collection date, latitude and longitude, water depth and soft sediment thickness at these stations are listed in Appendix A.

Replicate cores whose collection was necessitated by a malfunction of the laboratory freeze-drying apparatus are designated with the suffix R. Because the thickness of recent sediments was greater than anticipated at station LB1, overlap cores designated LB1-99 and LB1-00 were collected. LB1-00 was needed because the first core (LB1-99) did not penetrate deep enough to sample sediments with only supported ^{210}Pb activity, a required input in ^{210}Pb-age models. Because core lengths with our piston corer are limited

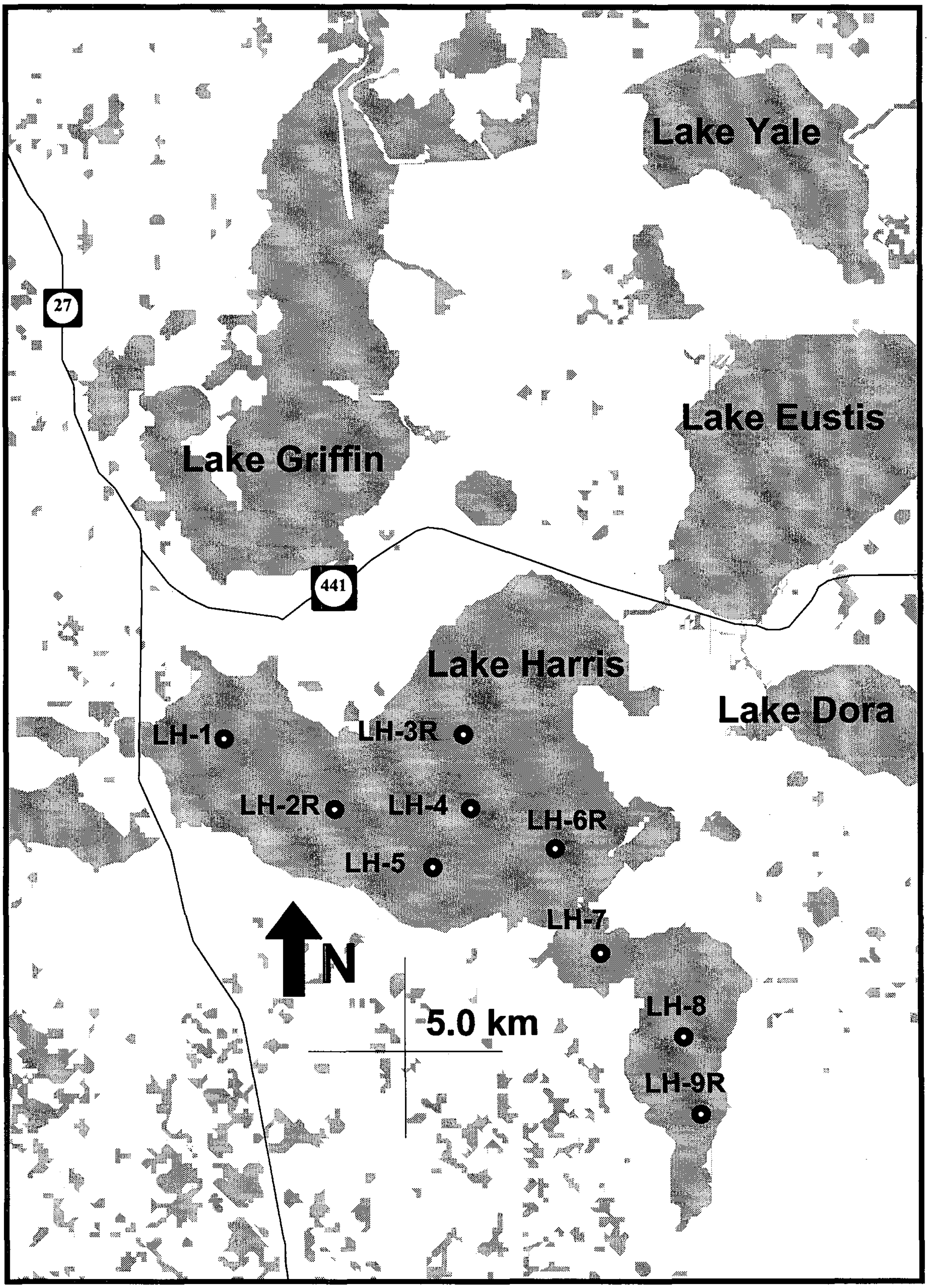


Figure 2.1. Map of Lake Harris-Little Lake Harris showing locations for nine coring stations.

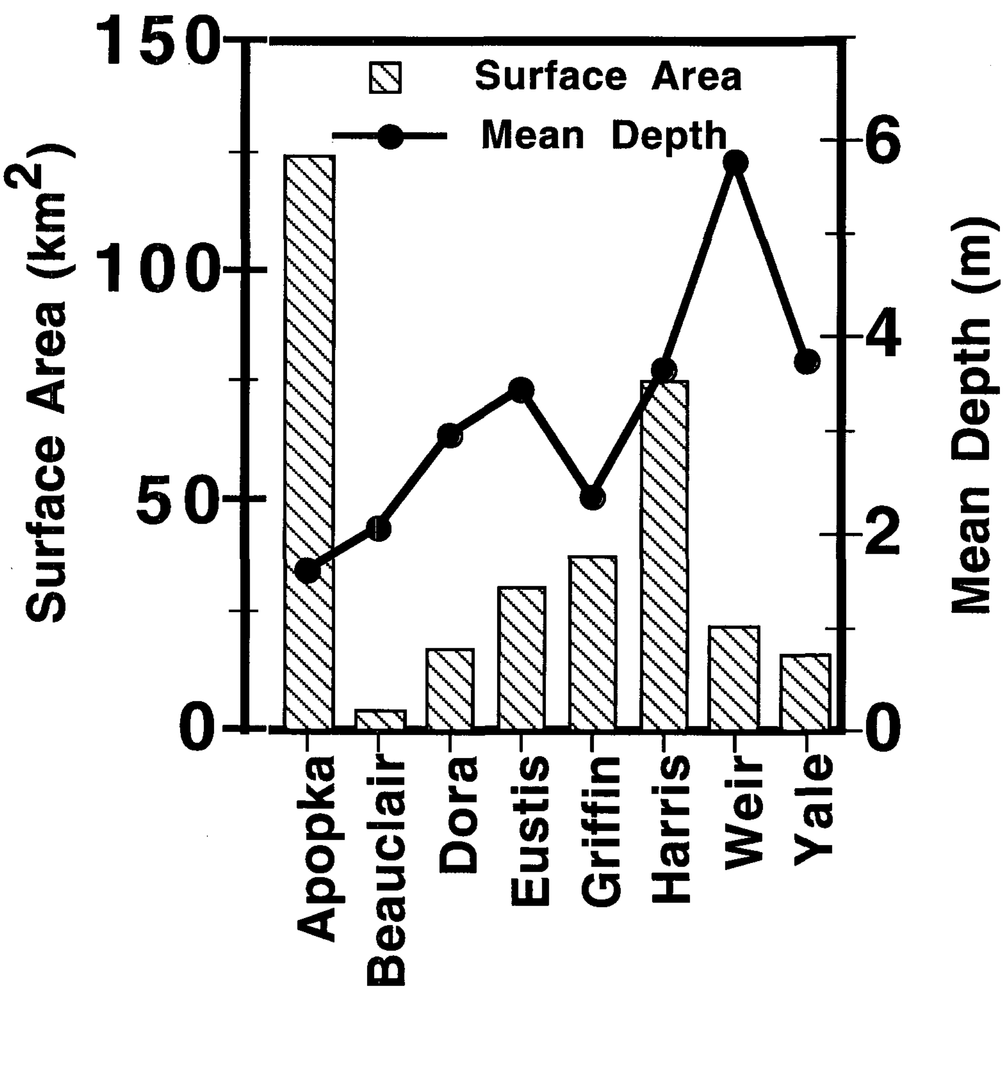


Figure 2.2. Plot of mean depth and surface area for Harris Chain of Lakes (data from Fulton 1995).

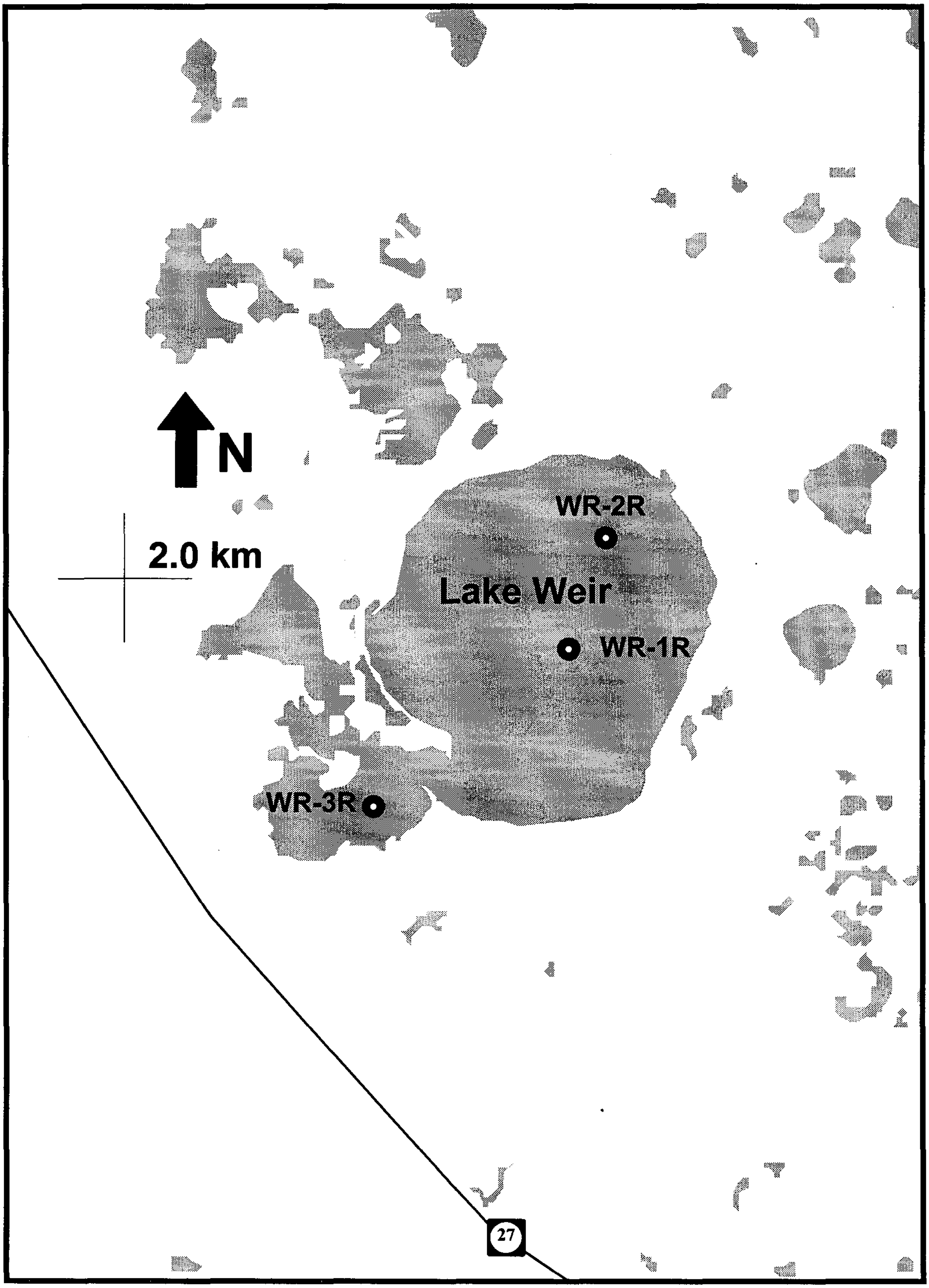


Fig 2.3

Figure 2.3. Map of Lake Weir showing locations for three coring stations.

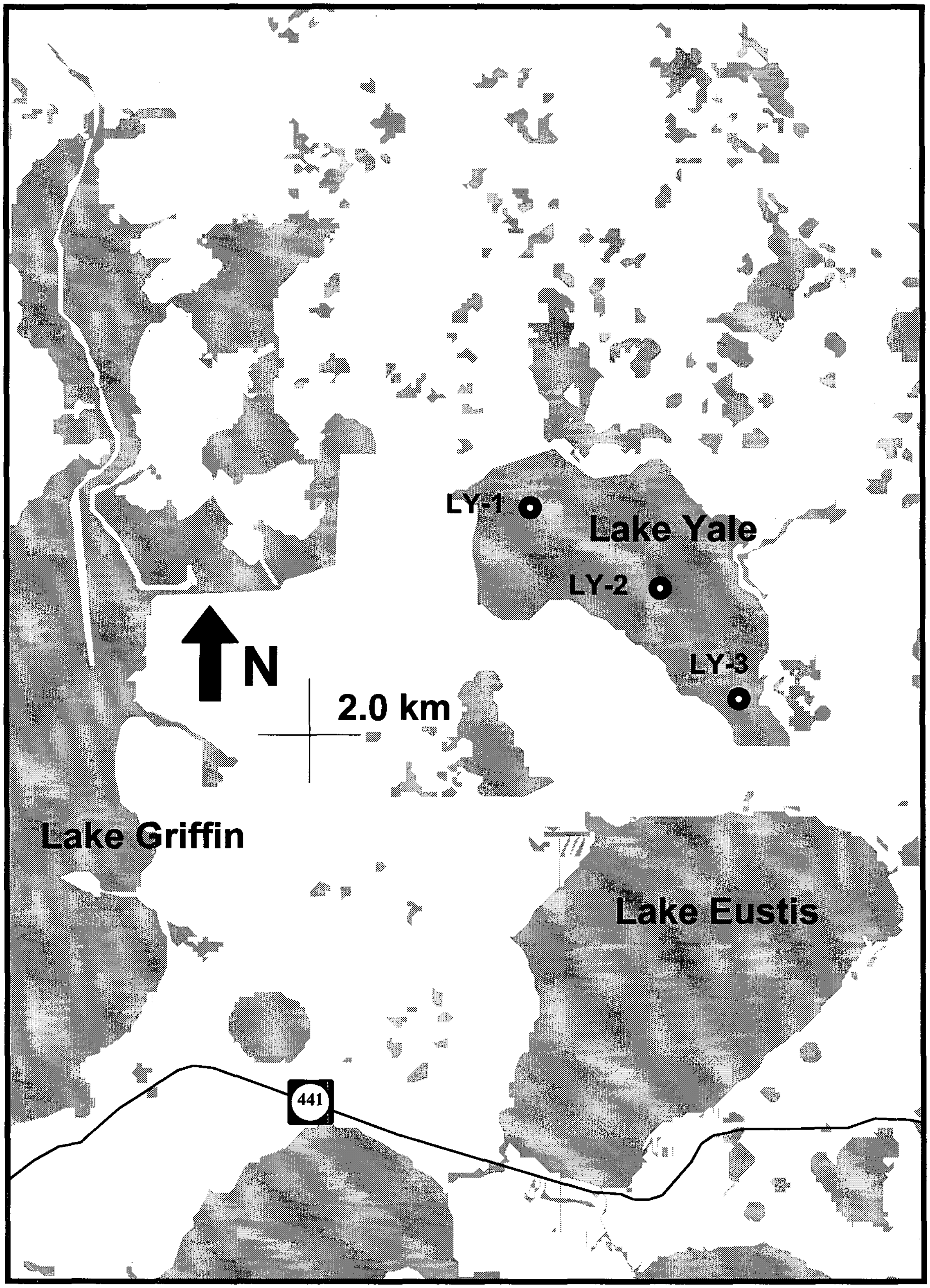


Fig 2.4

Figure 2.4. Map of Lake Yale showing locations for three coring stations.

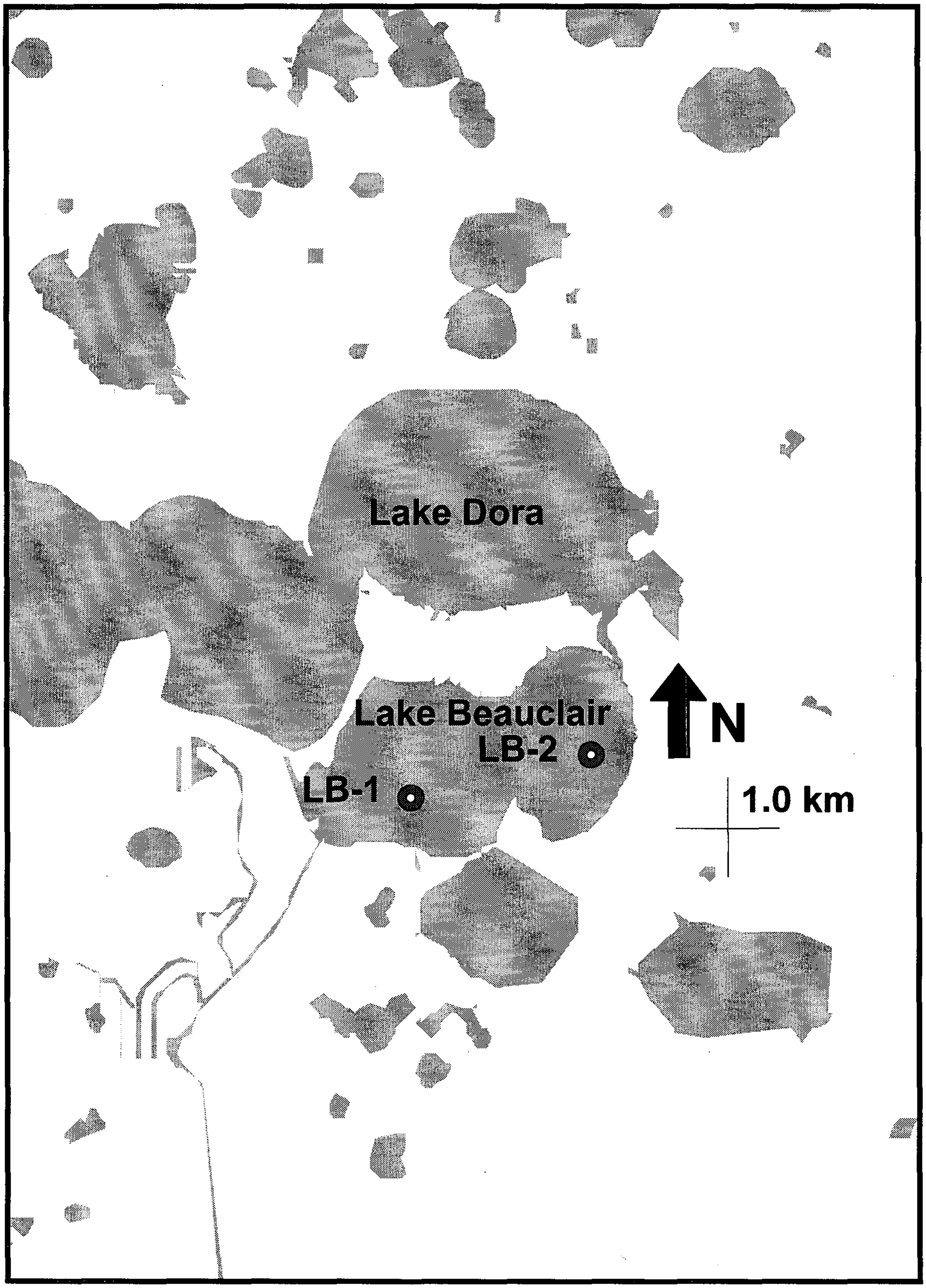


Figure 2.5. Map of Lake Beauclair showing locations for two coring stations.

to approximately 1.5 m, deeper sediments are sampled with cores that contain overlapping depths (overlap cores) that are used to confirm stratigraphic integrity between the two cores. However, as explained in the text, the overlap cores from this station (LB1) could not be dated.

Gravimetric analyses were conducted by weighing each section before and after freeze drying and calculating the dry weight mass and dry weight fraction (% dry weight). Organic matter content of dried sediments was measured as percent loss on ignition (LOI) at 550 °C for 2 hr in a Sybron Thermolyne muffle furnace (Håkanson and Jansson 1983). Inorganic or mineral sediment (ash fraction) was considered to represent the fraction remaining after combustion. We calculated dry bulk density (r) using an equation (Binford 1990)

$$r = \frac{D\,(2.5I_x + 1.6C_x)}{D + (1-D)\,(2.5I_x + 1.6C_x)}$$

where r is dry density (g dry cm^{-3} wet), x is depth in the sediment profile (cm), D is proportion of dry mass in wet sediment (dry mass/wet mass), I is the inorganic proportion of dry mass with density = 2.5 g cm^{-3} dry, and C is the organic proportion of dry material with density = 1.6 g cm^{-3} dry.

Several forms of phosphorus were measured using methods (Table 2.1) that were evaluated for trophic significance by Kenney et al. (2001). Total phosphorus (TP) and sodium-hydroxide extractable P (NaOH-P) were determined using dried sediment samples (Schelske et al. 1986, 1988). Non-apatite inorganic phosphorus (NAIP) or NaOH-P is a chemically determined form of phosphorus that has been shown to be biologically available (Williams et al. 1976). Water soluble P (H_2O-P) and hot-water extractable phosphorus (HEP) were measured on wet sediment samples (Kenney et al. 2001). HEP is measured to assess phosphorus stored by phytoplankton that can be sedimented if phosphorus supplies in the water are greater than those required to support phytoplankton growth. Data for HEP were corrected by subtracting the water-soluble component to obtain CHEP. Additional details about these methods are shown in Table 2.1. Phosphate was measured after digestion or leaching with a segmented flow autoanalyzer and an electronic data acquisition system.

Biogenic silica (BSi) was measured in sediment samples using procedures described in Conley and Schelske (1993, accepted). Two components of BSi were measured, diatom silica (DSi) and sponge silica (SSi).

Table 2.1. Methods for measurement of total phosphorus (TP) and forms of phosphorus (from Kenney et al. 2001). Phosphorus forms are water soluble phosphorus (H_2O-P), hot-water extractable P (HEP), nitrilo triacetic acid extractable P (NTA-P) and sodium-hydroxide extractable P (NaOH-P). The dry mass equivalent of sediment and volume of suspension are presented with the process, temperature and time required for each analysis. Samples were either wet-autoclaved or equilibrated at 85 revolutions per minute in a shaker bath.

Method	Dry Mass (g)	Volume (L)	Process	Temperature (^{o}C)	Time (Hr)	Solution
TP	0.05	0.03	Wet-autoclave	100	0.5	0.53 M sulfuric acid and 0.062 M potassium persulfate
H_2O-P	0.05	0.05	Equilibrate	25	20	18 mega-ohm water
HEP	0.05	0.05	Wet-autoclave	100	0.5	Sequential to H_2O-P
NTA-P	0.05	0.05	Equilibrate	25	20	0.01 M nitrilo triacetic acid, pH = 7
NaOH-P	0.05	0.05	Equilibrate	25	17	0.1 M sodium hydroxide

Total carbon (TC) and total nitrogen (TN) were measured with a Carlo Erba NA1500 CNS elemental analyzer equipped with an autosampler. Analysis of sediment samples was based on methodology described by Verardo et al. (1990).

A small portion of the freeze-dried sediment samples from each core section was used to determine stable carbon isotope ratios ($\delta^{13}C$) and stable nitrogen isotope ratios ($\delta^{15}N$) of sedimentary organic matter. Isotope ratios are reported as per mil (‰) relative to an internationally recognized reference.

Sediment cores were aged using measurements of the activity of naturally occurring radioisotopes in sediments. The method is based on determining the activity of total ^{210}Pb (22.3 yr half-life), a decay product of ^{226}Ra (half-life 1622 yr) in the ^{238}U decay series. Total ^{210}Pb represents the sum of excess ^{210}Pb and supported ^{210}Pb activity in sediments. The ultimate source of excess ^{210}Pb is the outgassing of chemically inert ^{222}Rn (3.83 d half-life) from continents as ^{226}Ra incorporated in soils and rocks decays. In the atmosphere, ^{222}Rn decays to ^{210}Pb, which is deposited at the earth's surface with atmospheric washout as unsupported or excess ^{210}Pb. Supported ^{210}Pb in lake sediments is produced by the decay of ^{226}Ra that is deposited as one fraction of erosional inputs. In the sediments gaseous ^{222}Rn produced from ^{226}Ra is trapped and decays to ^{210}Pb. By definition, supported ^{210}Pb is in secular equilibrium with sedimentary ^{226}Ra and is equal to total ^{210}Pb activity at depths where excess ^{210}Pb activity is not measurable due to decay. Because the decay of excess ^{210}Pb activity in sediments provides the basis for estimating sediment ages, it is necessary to make estimates of total and supported ^{210}Pb activities so excess ^{210}Pb activity can be determined by difference.

Radiometric measurements were made using low-background gamma counting systems with well-type intrinsic germanium detectors (Schelske et al. 1994). To prepare samples for radiometric analysis, dry sediment from each section was packed to a nominal height of 30 mm in a tared polypropylene tube (84 mm high x 14.5 mm outside diameter, 12 mm inside diameter). Sample height was recorded and tubes were weighed to obtain sample mass. Samples in the tubes were sealed with a layer of epoxy resin and polyamine hardener, capped, and stored before counting to ensure equilibrium between ^{226}Ra and ^{214}Bi. Activities for each radionuclide were calculated using empirically derived factors of variation in counting efficiency with sample mass and height (Schelske et al. 1994). Total ^{210}Pb activity was obtained from the 46.5 kev photon peak and ^{226}Ra activity was the mean activity obtained from the 295.1 and 351.7 peaks of ^{214}Pb and the 609 kev peak of ^{214}Bi. Mean ^{226}Ra activity was assumed to represent supported ^{210}Pb activity. Excess ^{210}Pb activity was calculated either by subtracting ^{226}Ra activity from total ^{210}Pb activity at each depth or by subtracting an estimate of supported ^{210}Pb activity based on measurements of total ^{210}Pb activity at depths where excess ^{210}Pb activity is negligible. Excess ^{210}Pb activity was corrected for decay from the coring date. The 662 kev photon peak was used to measure ^{137}Cs activity. The peak in ^{137}Cs activity can be used in some studies as an independent time marker for the peak period of fallout from nuclear weapons testing in 1962-63. But the absence of a sharp peak in activity in the study cores (Appendix D) limited its usefulness as an independent time marker in our study.

Sediment ages were calculated using a CRS model (Appleby and Oldfield 1983). This model calculates ages based on the assumption that the flux of excess ^{210}Pb to the lake was constant and therefore that variation in ^{210}Pb activity from a pattern of exponential decrease with depth was dependent on variation in rate of sedimentation. For small lakes, the assumption that sedimentation rate was not constant appears to be appropriate. The age of sediments at depth x is given by

$$t = (1/k)\ [\ln (A_o/A)]$$

where t is time in yr, k is 0.03114 (the ^{210}Pb decay constant), A_o is the total residual excess ^{210}Pb activity in the sediment core, and A is the integrated excess ^{210}Pb activity below depth x. Calculations for each depth provide a continuous profile of ages as a function of depth. Mass sedimentation rate (MSR) at depth x is given by

$$MSR = m/t$$

where m is dry mass of sediment (mg cm^{-2}) for the sampling interval. Errors in age and mass sedimentation rate were propagated using first-order approximations and calculated according to Binford (1990).

Diatom microfossils were enumerated in samples from seven cores, two from Lake Weir, Lake Yale and Lake Harris and one from Lake Beauclair. Sedimentary diatom analyses were performed on 10 sediment sections from each core. Samples were cleaned of organic matter using the potassium dichromate and hydrogen peroxide method of Van der Werff (1955), then mounted for microscopic analysis. A minimum of 500 diatom valves was counted per sample and identified to the lowest taxon possible. Historic concentrations of TP in the water column were inferred from the TROPH1 model using transfer functions based on relative abundance of diatom microfossils (Whitmore 1989). Historic limnetic total P concentrations were also inferred using a weighted-averaging regression model (WACALIB) with bootstrapping to provide error estimates (Line *et al.* 1994). Limnetic total P inferences were inferred from fossil diatom data by WACALIB using ln-transformed limnetic P values for a calibration set of 69 Florida lakes ($r^2 = 0.87$, $RMSE_{boot} = 0.70$: Whitmore *et al.* in prep.).

A tabulation of field notes taken at the time of core collection is given in Appendix A. Gravimetric and chemical data for all cores are listed in Appendix B. Data presented include fraction dry weight, organic matter determined by loss on ignition (LOI) at 550 ^{o}C, TP, NaOH-P, CHEP, TC, TN, TC/TN, stable carbon isotope ratio ($\delta^{13}C$), stable nitrogen isotope ratio ($\delta^{15}N$), DSi and SSi. In addition, data on

descriptive statistics of measured variables are given in Appendix C,
radiometric dating are given in Appendix D,
dry sediment and nutrient accumulation rates are presented in Appendix E and
enumeration of sedimentary diatoms are given in Appendix F.

Chapter 3
Lake Weir and Lake Yale

Based on comparison of water column TP and TN (Fig. 1.2), Lake Weir and Lake Yale exhibit the lowest trophic state among lakes in the Harris Chain. Mean TP and TN for both lakes are <50 µg/L and <1.0 mg/L, respectively. Sediment characteristics are similar for the two lakes (Appendix C), therefore, results are presented together in this chapter.

Physical Characteristics

Similarity in sedimentary characteristics between the two lakes can be illustrated with descriptive statistics (Appendix C). The mean LOI and TP for the two lakes range from 52 to 57% and from 0.25 to 0.27 mg/g, respectively. One noticeable difference is the larger mean TC/TN ratio for Lake Weir, which may be explained in part by sections in LY3-99 with TC/TN ratios < 6 (Appendix B), or values much smaller than the minimum of 9.6 in Lake Weir. In fact, no TC/TN ratio for LY3-99 is > 10.4. The larger mean ratio in Lake Weir may be the result of a greater contribution of macrophytes to sedimentary organic matter (Kenney et al. in review), to a greater contribution of organic matter derived from terrestrial sources (Meyers 1994), to a larger % TN in Lake Yale sediments, or to some combination of these factors.

The zone of sediments datable with ^{210}Pb was shallower and less variable in Lake Weir than in Lake Yale. The depth of 20th-century sediments in Lake Weir ranged from 32 to 36 cm (1898 to 1904) compared to 20 to 44 cm in Lake Yale (1899 to 1940) (Appendix D). Another measure of the zone of datable sediments is the depth with sediments dated no older than 1850. This zone in Lake Weir varied only from 48 to 52 cm (1852 to 1862) whereas it varied from 24 to 64 cm in Lake Yale (1858 to 1889). Among cores in Lake Yale, this zone varied from 24 cm (LY2-99) to 32 cm (LY1-99) to 64 cm (LY3-99). The shallow zone at LY2-99 reflects an average MSR so low that the stratigraphy at this station cannot be used to infer time dependent changes. By contrast, the high average MSR at LY3-99 is ideal for this purpose. Differences among the zone of datable sediments must be considered in comparing stratigraphic patterns among cores, particularly in identifying cores with a low inventory of excess ^{210}Pb, indicating an inadequate amount of sediment deposition for reliable dating from ^{210}Pb-age models.

Similar stratigraphic features in LOI and fraction dry weight were found at the top of cores (Fig. 3.1). In general LOI was largest at the top and decreased with depth to a stratigraphic discontinuity. The depth of this stratigraphic discontinuity ranged from approximately 20 cm in LW2R-99 and LY2-99 to approximately 50 cm in LY1-99. By contrast, fraction dry weight increased to a depth that was stratigraphically correlated with the discontinuity in LOI. In all cores with the exception of LW3R, the fraction dry weight was < 5% to depths of at least 20 cm. Maximum values for LOI at the top of cores were fairly constant, ranging from approximately 65 to 70%. Large variations in either parameter are generally restricted to sediments below the zone of datable sediments. For example, note the variation in both parameters below 24 cm at LY2-99 and below 64 cm in LY3-99, or at depths not datable with ^{210}Pb-age models. By contrast, datable sediments in LY3-99 (the upper 64 cm) are characterized by a zone of sediments (0 to 28 cm) with increasing fraction dry weight and decreasing LOI underlain by a zone in which both variables are relatively constant (32 to 64 cm).

Chemical Characteristics

The largest values for TC and TN were generally found at the top of cores with TC ranging from approximately 30 to 35% and TN ranging from 3 to 4% (Fig. 3.2). The stratigraphic patterns for TC and LOI (Fig 3.1) were similar for most cores. One exception is a more variable record for TC in LY1-99. The large values for TN in LY3-99 (as large as 6%) were found at depths well below the zone of datable sediments (64 cm). It is also interesting to note that two zones similar to that for LOI and fraction dry weight are also present in the TC and TN record of datable sediments for LY3-99, but the upper zone only extends to 20 cm. This shallower, upper zone is also defined by a sharp discontinuity.

Profiles of phosphorus forms were remarkably similar among the six cores from Lake Weir and Lake Yale (Fig. 3.3). In all cores, TP decreased with depth to a baseline that generally began at depths no greater than 50 cm. Near-surface concentrations of TP (ca 1.4 mg/g) were larger in LY3-99 than in other cores and <1.0 mg/g only in LW3R-99.

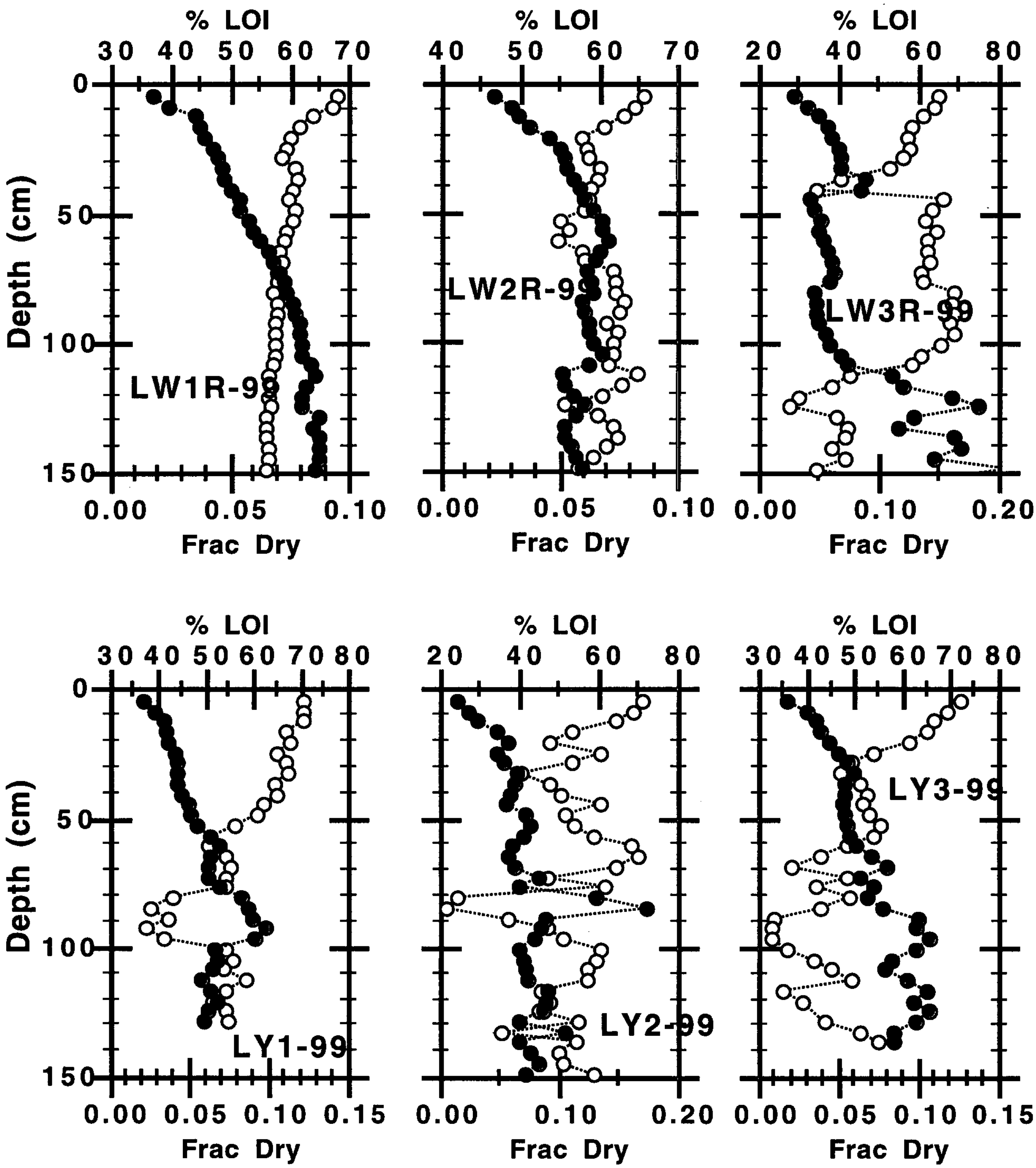


Figure 3.1. Loss on ignition (% LOI) and fraction dry weight (Frac Dry) vs. depth for Lake Weir and Lake Yale cores. Keys to symbols: solid circles are Frac Dry and open circles are % LOI.

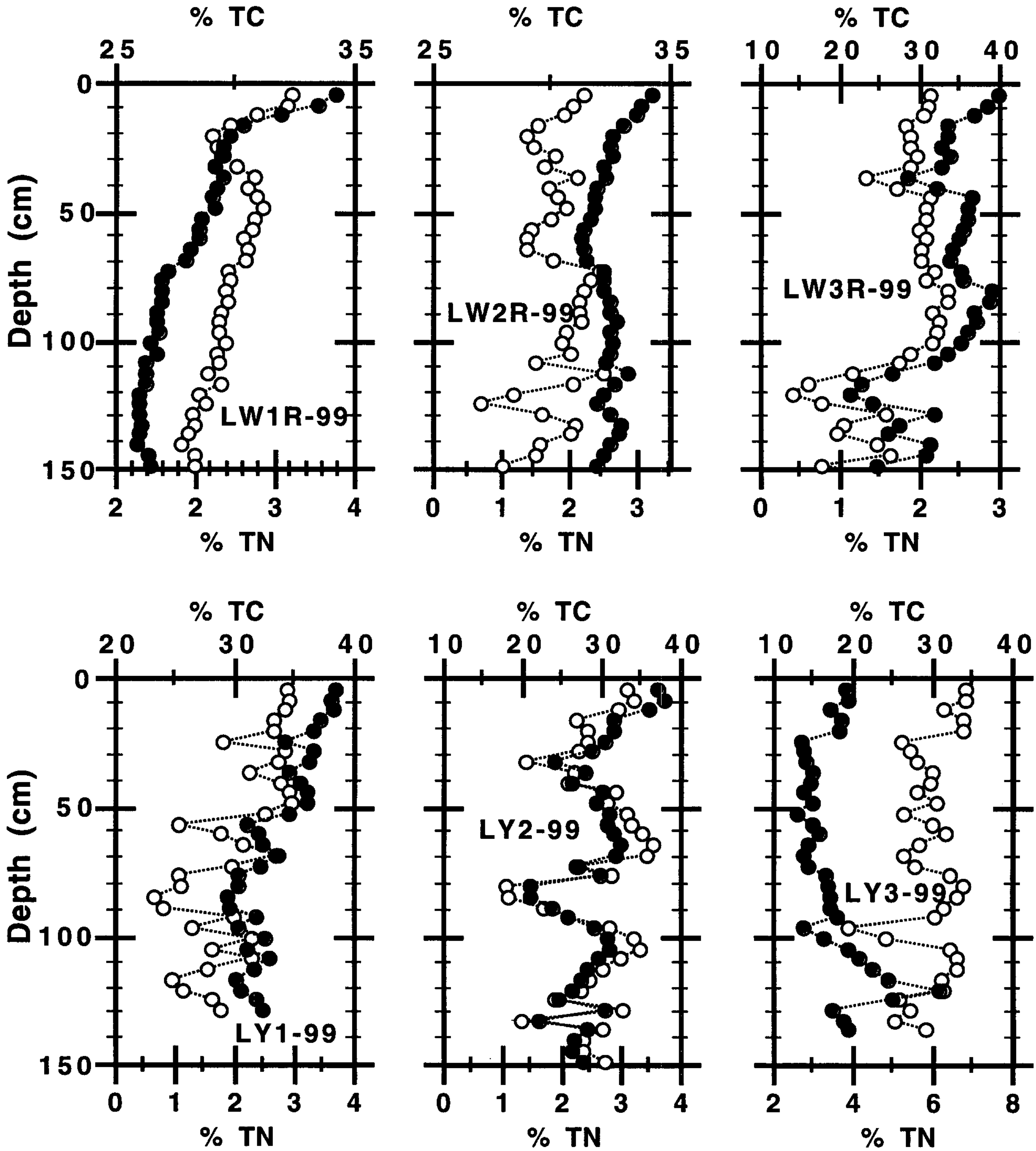


Figure 3.2. Percent total carbon (% TC) and percent total nitrogen (% TN) vs. depth for Lake Weir and Lake Yale cores. Keys to symbols: solid circles are %TN and open circles are %TC.

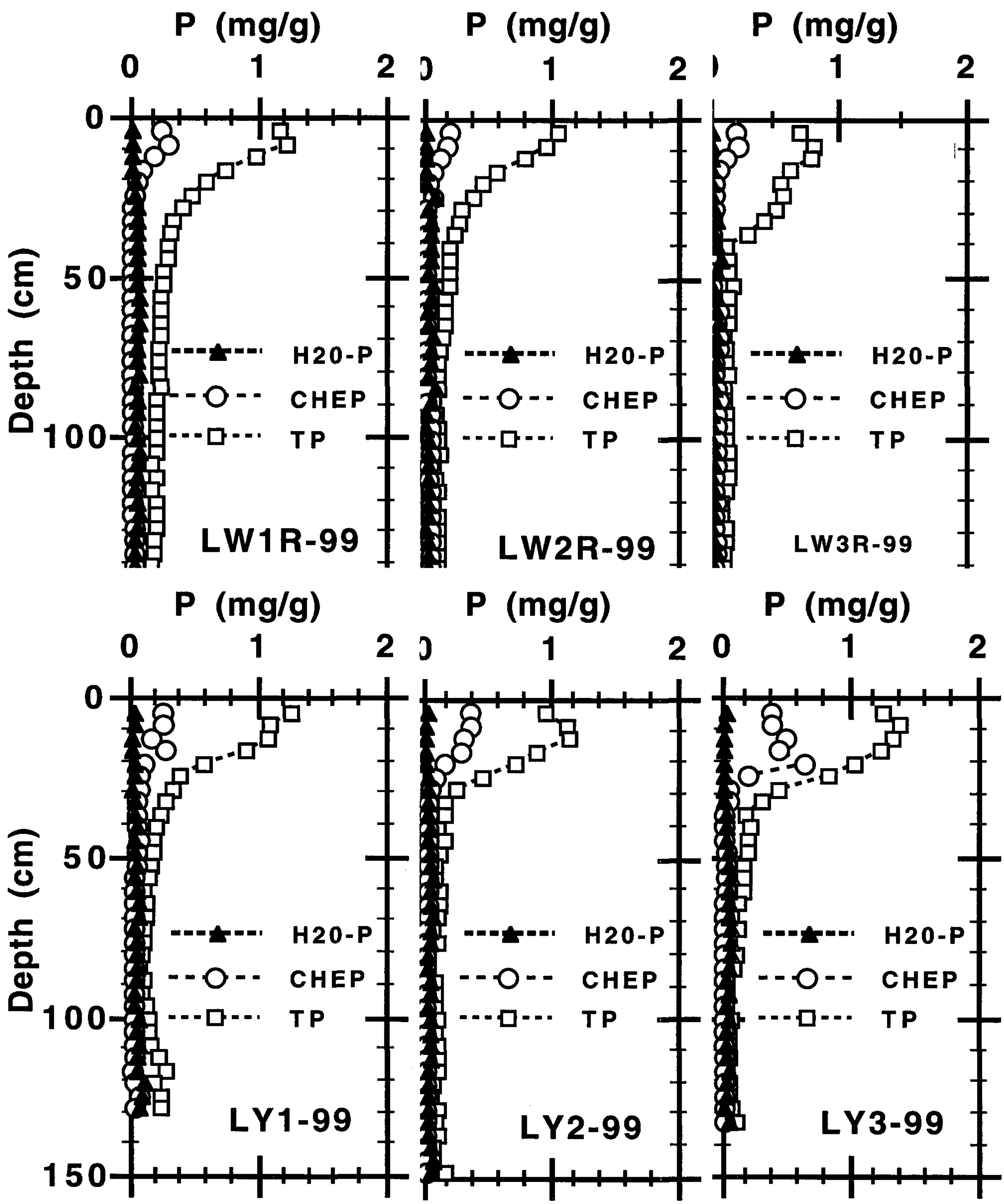


Figure 3.3. Phosphorus forms vs. depth for Lake Weir and Lake Yale cores. Forms shown are water soluble P (H2O-P), hot-water extractable P (CHEP) and total P (TP).

Concentrations of CHEP were small (<0.3 mg/g) and greater than baseline only in the upper 12 to 16 cm in the Lake Weir cores and to depths of 20 to 24 cm in LY2-99 and LY3-99, respectively. Concentrations in LY3-99 were noticeably larger than in other cores, ranging from 0.4 to 0.6 mg/g in the upper 20 cm. Concentrations of H20-P were low in the near-surface sediments with CHEP concentrations greater than baseline, but were greater than CHEP at depth in some cores.

Profiles of TC/TN and $\delta^{13}C$ were similar among cores in most respects (Fig. 3.4). As expected, TC/TN was lowest in near-surface sediments with the exception of values <9 in bottom sediments from LY3-99; these low values result from large % TN in these sediments (Fig. 3.2). Near-surface values were <10 only in LY3-99. Values for TC/TN in LY3-99 were low over a large part of the record, ranging from approximately 9 to 10 over the top 88 cm of sediments. This stratigraphic record indicates organic matter derived primarily from phytoplankton for a period beginning well before 1860 (64 cm), a feature not expected because a period with greater macrophyte importance was anticipated. The timing is reliable because age control appears to be good for this core (Appendix D). Another feature in all cores is that $\delta^{13}C$ generally became lighter upcore with the lightest values in the surface or near-surface samples. This decrease in $\delta^{13}C$ is a proxy for decreased primary production. The inferred decrease in primary production, however, occurs in stratigraphic regions with large increases in TP and CHEP (Fig. 3.3) that are inferences for nutrient enrichment and increased primary production. Therefore, these depleted values may be due to increased input of $\delta^{13}C$ depleted organic matter, either allochthonous detrital organic carbon (terrestrial plants, Meyers 1994) or autochthonous organic carbon (periphytic or benthic algae, Hecky and Hesslein 1995). An increase, which is a proxy for increased primary production, or a relatively flat profile for $\delta^{13}C$ was found at depth in all cores. It is not likely, however, that enriched $\delta^{13}C$ at depth is a proxy for higher lacustrine productivity.

Profiles of TC/TN and $\delta^{15}N$ (Fig. 3.5) were plotted to gain insight about the unexpected $\delta^{13}C$ stratigraphic relationships. Like $\delta^{13}C$, $\delta^{15}N$ decreased upcore in all cores from Lake Weir and in near-surface sediments in LY1-99. By contrast this parameter increased upcore in near-surface sediments from LY2-99 and LY3-99. An increase in

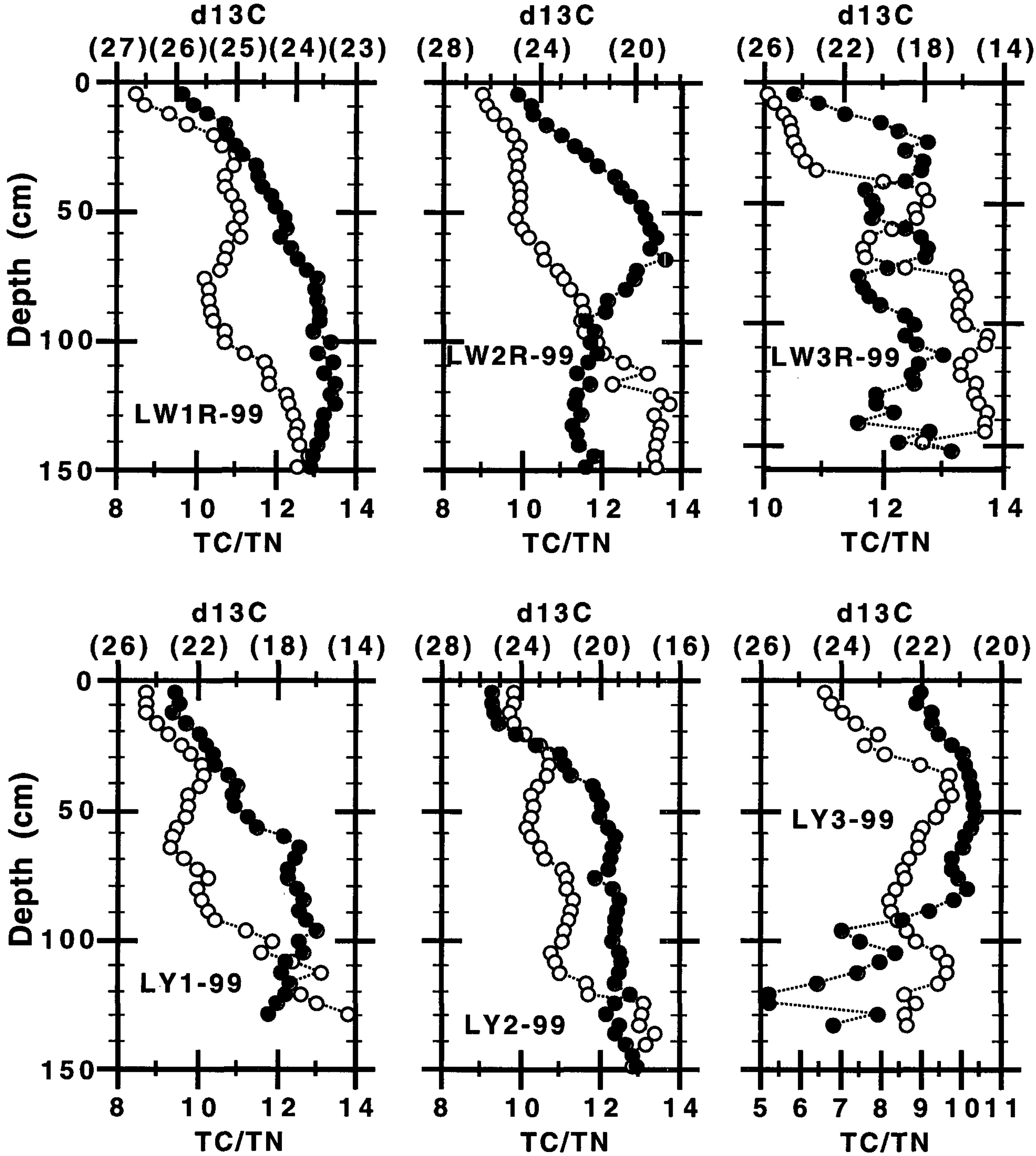


Figure 3.4. Total carbon (TC):total nitrogen (TN) weight ratio and stable carbon isotopic ratio ($\delta^{13}C$) vs. depth for Lake Weir and Lake Yale cores. Keys to symbols: solid circles are TC/TN weight ratio and open circles are stable carbon isotopic ratio ($\delta^{13}C$).

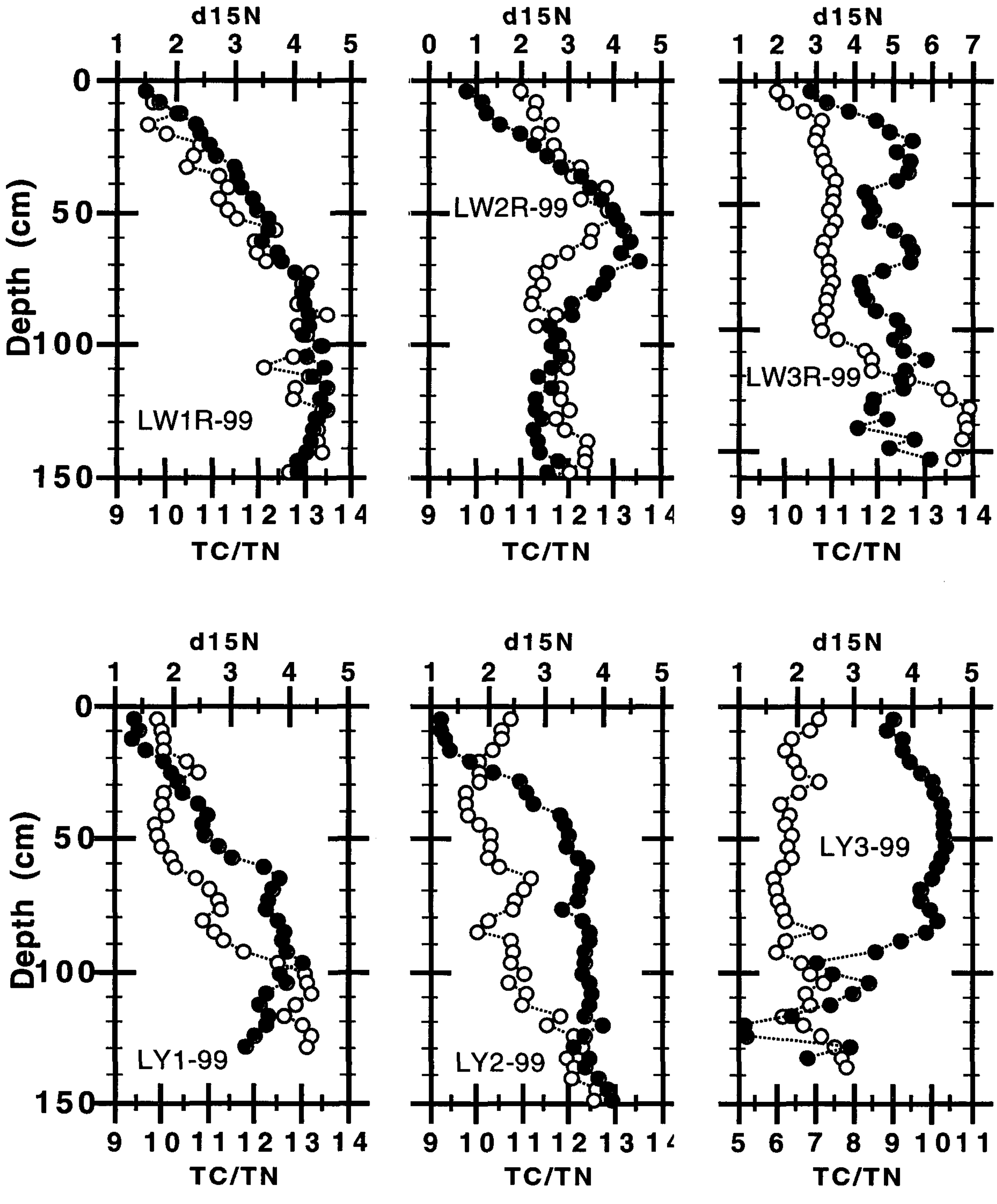


Figure 3.5. Total carbon (TC):total nitrogen (TN) weight ratio and stable nitrogen isotopic ratio ($\delta^{15}N$) vs. depth for Lake Weir and Lake Yale cores. Keys to symbols: solid circles are TC/TN weight ratio and open circles are stable nitrogen isotopic ratio ($\delta^{15}N$).

$\delta^{15}N$ may be attributed to an increase in primary production whereas a decrease is an inference for increasing importance of cyanobacteria (Gu et al. 1996a) or anthropogenic changes (Brenner et al. 1999b).

Stratigraphic patterns of BSi varied markedly among cores (Fig. 3.6). Only relatively small quantities of BSi were present in LW3R-99; concentration were <40 mg/g in the upper 36 cm and no greater than 10 mg/g below 36 cm. In the other cores, BSi was greater than 70 mg/g in near-surface sediments. This pattern of high BSi extended to the bottom of LW1R-99 and LY3-99. A sharp increase in BSi, mainly DSi, was found beginning at 60 cm in LW2R-99 whereas BSi increased beginning at 72 cm and DSi increased beginning at 36 cm in LY1-99. DSi was generally greater in the upper portions of cores and SSi was greater in the underlying sediments.

In previous studies of other Ocklawaha lakes, NAIP (NaOH-P) was correlated with TP (Schelske 1997, 1998; Schelske et al. 1999a). This strong statistical relationship was also present in the data sets for Lake Weir and Lake Yale (Fig. 3.7). These relationships show that NaOH-P comprises a greater fraction of TP in Lake Yale sediments than in Lake Weir sediments. Likewise, CHEP comprises a greater fraction of NaOH-P in Lake Yale sediments. The regression equation indicates CHEP represents 80% of NaOH-P in Lake Yale sediments and 59% in Lake Weir sediments. It should be noted that CHEP or NaOH-P concentrations of most samples are relatively small, <0.1 mg/g.

Temporal Changes

Plots of phosphorus forms relative to date show the time dependence of concentrations changes (Fig. 3.8). In all cores, TP concentration increased after 1850 with the largest increase after 1950. Relative increases in TP since 1850 were variable among the cores. In the Lake Weir cores, the relative increase ranged from 4 to 5 fold. By contrast, the relative increase in Lake Yale cores ranged from 2 fold in LY2-99 to approximately 10 fold in LY3-99. The small increase in LY2-99 reflects the low sedimentation rate at this station (only 24 cm of ^{210}Pb-datable sediments, Appendix D) that blurs the record to the extent that sediments with the baseline TP concentration (Fig. 3.3) were not dated. Changes in CHEP concentrations were very small and occurred

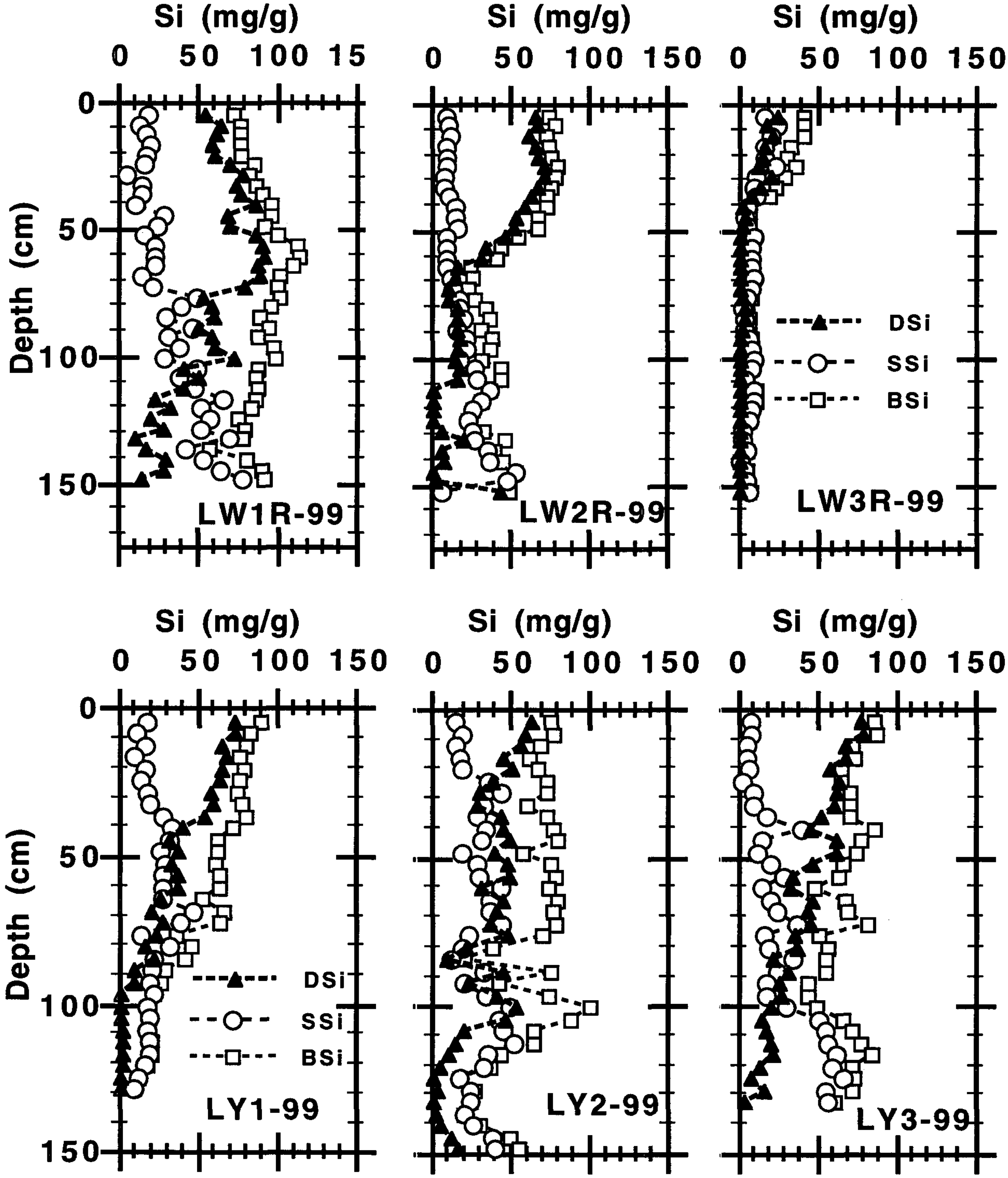


Figure 3.6. Biogenic silica forms vs. depth for Lake Weir and Lake Yale cores. Forms shown are diatom biogenic silica (DSi), sponge biogenic silica (SSi) and biogenic silica (BSi), the sum of DSi and SSi. All data are presented in units of SiO_2. Keys to symbols: solid triangles are DSi, open circles are SSi and open squares are BSi.

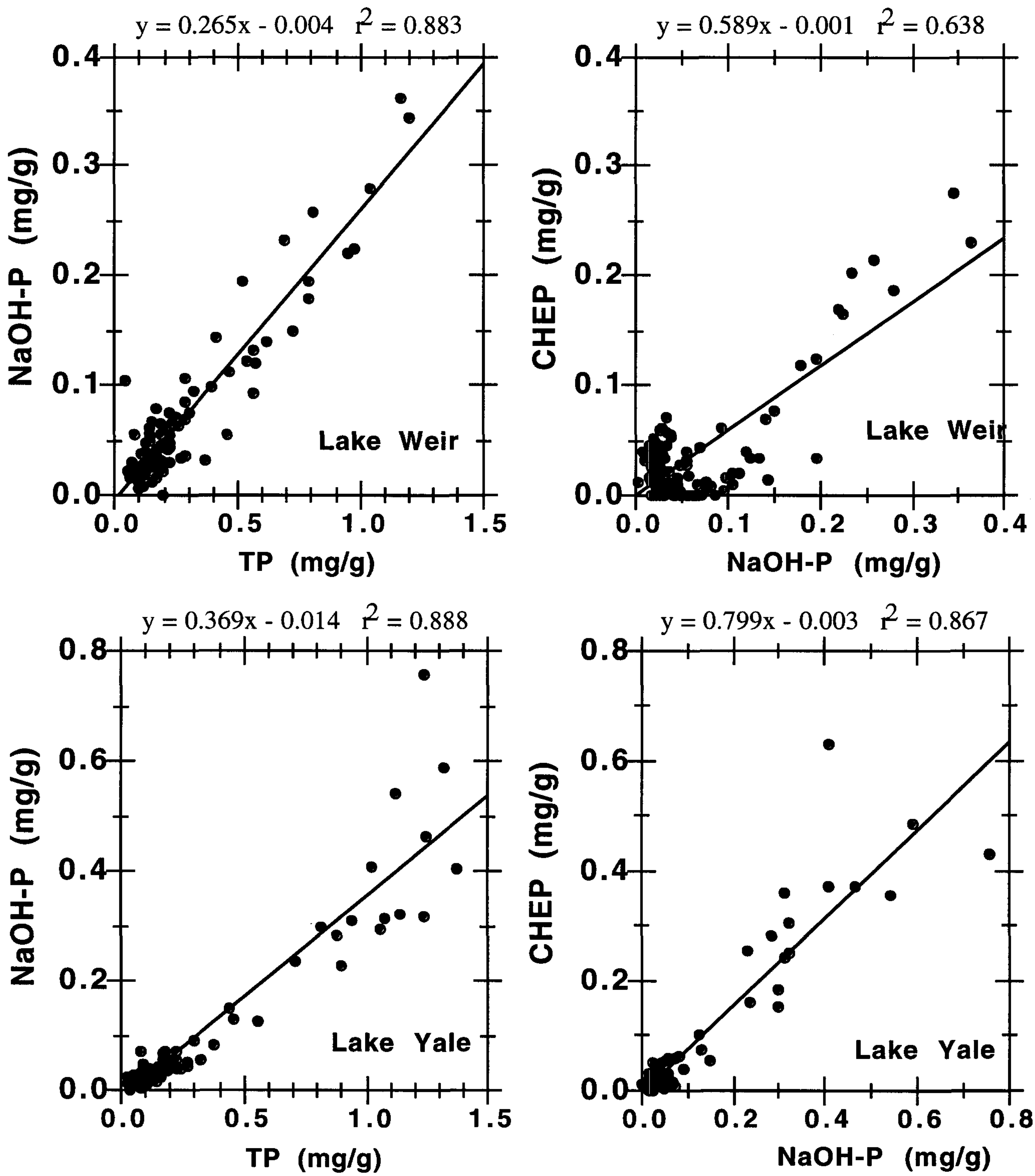


Figure 3.7. Correlation of sodium-hydroxide extractable P (NaOH-P) with total P (TP) and hot-water extractable P (CHEP) with sodium-hydroxide extractable P (NaOH-P) for all data for Lake Weir and Lake Yale cores. Equations for least-squares linear regression are shown for both plots.

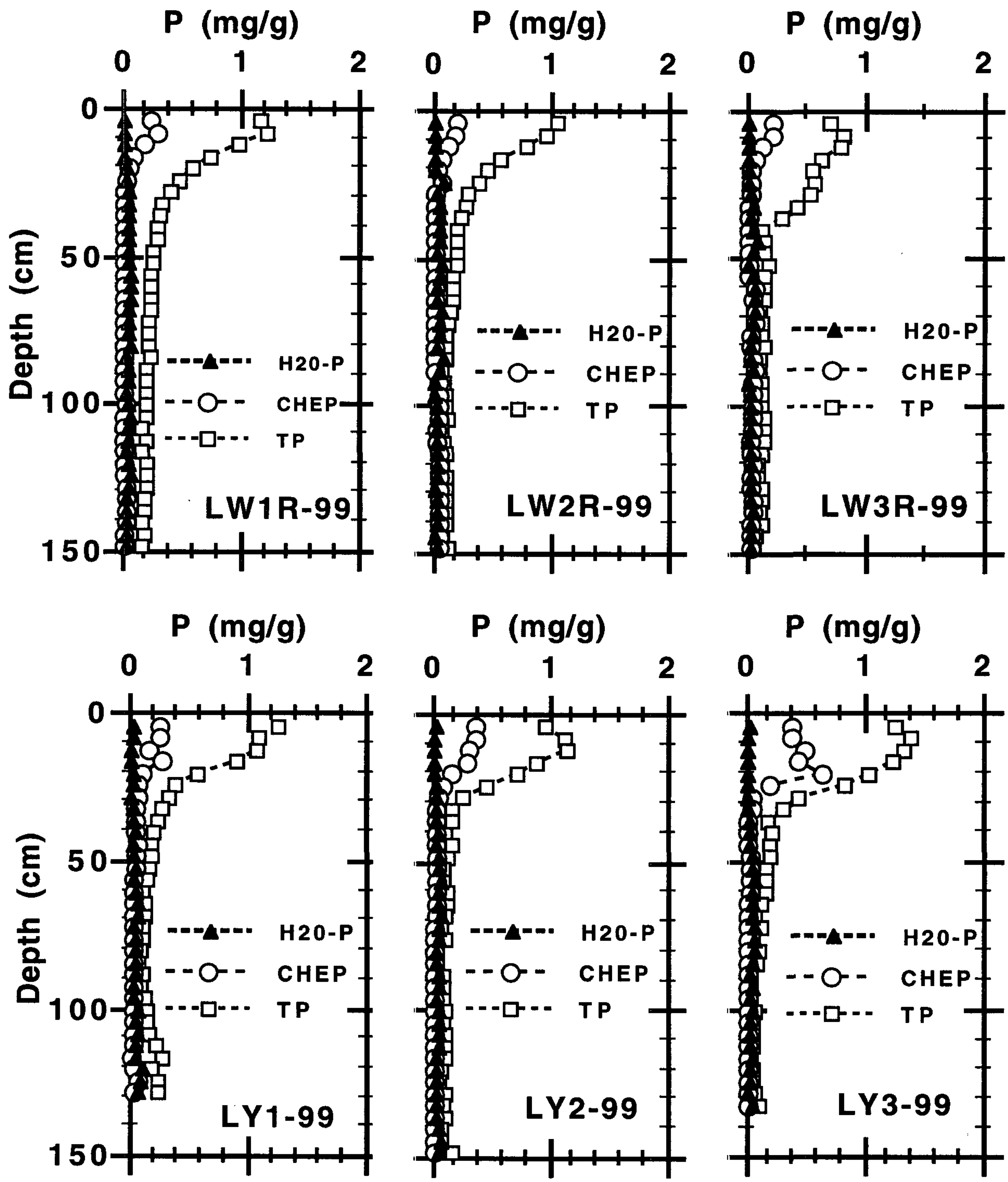


Figure 3.8. Phosphorus forms vs. date for Lake Weir and Lake Yale cores. Forms shown are water soluble P (H2O-P), hot-water extractable P (CHEP) and total P (TP). Keys to symbols: solid triangles are H2O-P, open circles are CHEP and open squares are TP.

mainly after 1970. The increase appeared to be greater in Lake Yale, particularly for LY3-99, than in cores from Lake Weir. Relatively small changes in CHEP were expected in these lakes with low TP concentrations in the water column (Fig. 1.2).

Changes in TC/TN and $\delta^{13}C$ are plotted to show time dependence (Fig. 3.9). In all cores, TC/TN decreases upcore for at least a portion of the record, but the pattern varies widely among cores, particularly in Lake Weir. In LW2-99 the period of decrease begins before 1900 with values decreasing from approximately 12 to <10. A similar pattern is present in LW1-99, although the decrease is not as sharp. By contrast, the period of decrease in LW3-99 begins much later, starting in 1940. The change in TC/TN is much smaller in the Lake Yale cores, with values ranging from 10.5 to 9. Because TC/TN is low with a small relative change over the datable record in Lake Yale, these data indicate that macrophytes with a high TC/TN were less important historically than in Lake Weir. However, this conclusion is not consistent with other studies reporting that *Hydrilla* and pondweed covered large areas of Lake Yale during the 1980s (Hestand et al. 1991), but aquatic macrophytes have not been abundant in Lake Weir over the last century (Crisman et al. 1992).

Changes in $\delta^{13}C$ after 1900 in cores from Lake Weir and Lake Yale were small, generally < 3 ‰) with a general pattern of lighter values upcore (Fig. 3.9). In Lake Weir, a pronounced decrease in $\delta^{13}C$ after 1900 was found in LW1-99 and LW2-99; but in LW3-99, the decrease occurred coincidentally with the decrease in TC/TN after 1940. In Lake Yale, profiles for $\delta^{13}C$ varied markedly among cores. The pattern in LY1-99 was similar to that for the Lake Weir cores, but differed in LY3-99. In LY3-99, $\delta^{13}C$ decreased upcore after 1910, but the most enriched samples occurred from samples dates ranging from approximately 1880 to 1910.

Changes in TC/TN and $\delta^{15}N$ are plotted to show time dependence (Fig. 3.10). In the Lake Weir cores, the stratigraphic record for TC/TN and $\delta^{15}N$ follow similar patterns. The $\delta^{15}N$ isotopic ratio becomes lighter upcore coincidentally with a decrease in TC/TN ratio. The only Lake Yale core which generally fits this pattern is LY1-99, but in this core the most enriched $\delta^{15}N$ occurs in the middle of the record, from approximately 1930 to 1950. In the other two cores, $\delta^{15}N$ is enriched in the surface sediments, but a period of

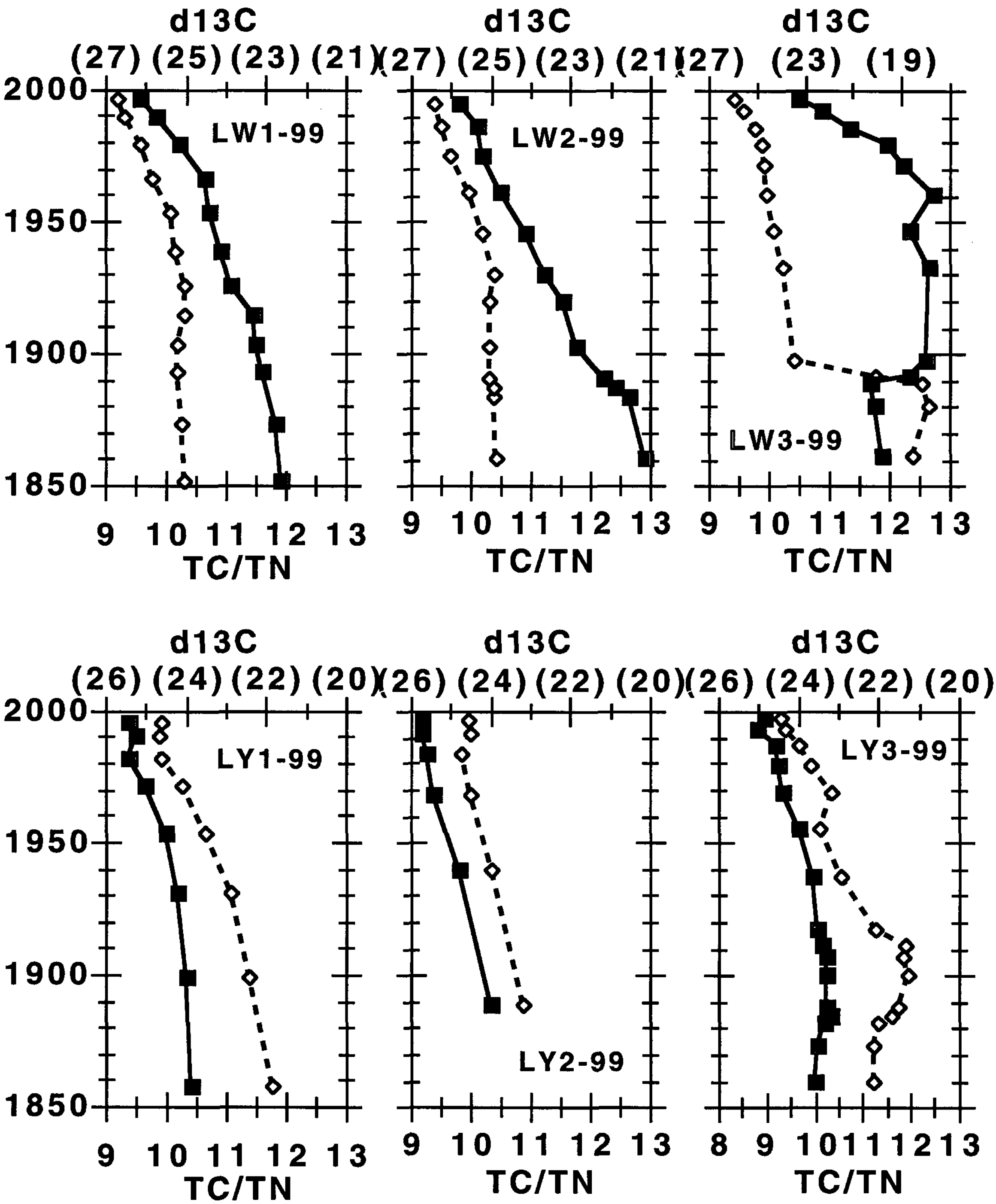


Figure 3.9. Total carbon (TC):total nitrogen (TN) weight ratio and stable carbon isotopic ratio ($\delta^{13}C$) vs. date for Lake Weir and Lake Yale cores. Keys to symbols: solid squares are TC/TN weight ratio and open diamonds are stable carbon isotopic ratio ($\delta^{13}C$).

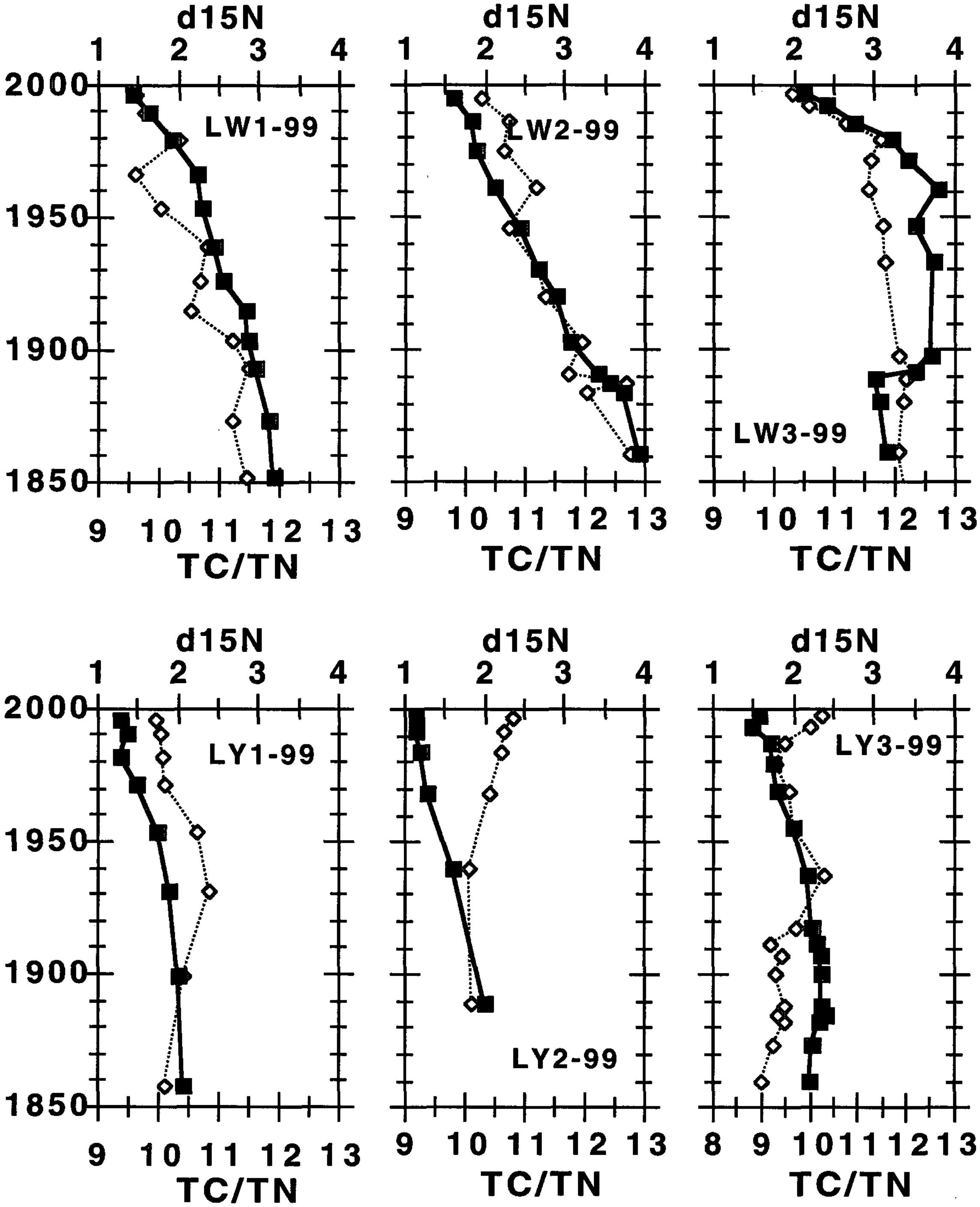


Figure 3.10. Total carbon (TC):total nitrogen (TN) weight ratio and stable nitrogen isotopic ratio ($\delta^{15}N$) vs. date for Lake Weir and Lake Yale cores. Keys to symbols: solid squares are TC/TN weight ratio and open diamonds are stable nitrogen isotopic ratio ($\delta^{15}N$).

should be noted that the relative change in $\delta^{15}N$ is much greater for the Lake Weir cores (1.5 to 4 ‰) than for that from Lake Yale (1.5 to 2.5 ‰).

Nutrient Accumulation Rates

Different temporal patterns in MSR are apparent in the ^{210}Pb-dated cores from Lake Weir and Lake Yale. Maximum rates in near surface sediments were generally <20 mg cm^{-2} yr^{-1} in four cores (LW1R-99, LW2R-99, LY1-99 and LY2-99) (Appendix D). Rates >30 mg cm^{-2} yr^{-1} were found to a depth of 20 cm in LW3R-99. Maximum rates were found at depth in three of the cores (LW-2R-99, LW-3R-99 and LY3-99). These maximum rates occurred in the 1880s and 1890s and ranged from 49 to 82 mg cm^{-2} yr^{-1}. These high rates correspond temporally with land clearance in the Lake Weir drainage basin (Crisman et al. 1992). In LY3-99, a smaller peak in MSR also occurred in sediments deposited between 1900 and 1917.

Total phosphorus accumulation rate (TPAR) in near-surface sediments varied little among cores with the exception of LY3-99 (Appendix E). The rate in LY3-99 was 37 μg cm^{-2} yr^{-1} in the upper 8 cm of sediments compared to lower rates that ranged from 15 to 26 μg cm^{-2} yr^{-1} in the other cores. Peaks in TPAR in Lake Weir cores (LW2R-99 and LW3R-99) occurred at depths corresponding to the peaks in MSR during the 1880s and 1890s. Subsurface peaks in MSR were also found in LY3-99, but rates in these peaks were smaller than in near-surface sediments.

Maximum corrected hot-water extractable phosphorus accumulation rates (CHEPAR) in Lake Weir cores were generally smaller than in Lake Yale cores (Appendix E). The largest rates for Lake Weir were 7 μg cm^{-2} yr^{-1} in the upper 8 cm of LW3R-99. Rates in LY3-99, by contrast, ranged from 9-11 μg cm^{-2} yr^{-1} in the upper 20 cm of the core. Periods of high CHEP sedimentation in Lake Yale cores began in the early 1970s compared to later periods of deposition beginning in the early 1980s in the Lake Weir cores.

Diatom Microfossils

Aulacoseira italica (Ehr.) Sim., a eutrophic indicator, averages about 15% of the diatom assemblages between the 52-cm and 96-cm levels in Lake Weir core LW1-99

(Appendix F). *Cyclotella stelligera* (Cl. & Gr.) V.H., which is found in oligotrophic to eutrophic conditions, averages approximately 60% of the assemblage in the same interval. *Cyclotella stelligera* represents 60-70% of the assemblage proceeding upward in the core to the 12-cm level, then declines to 30% in the top sample. *Synedra filiformis* var. *exilis* Cl-Eul., a mesotrophic to eutrophic indicator, increases from 3% beginning at the 32-cm level to 37% in the top sample. *Nitzschia amphibia* Gr., a eutrophic to hypereutrophic indicator and *S. filiformis* var. *exilis* suggest slightly higher productivity in Lake Weir after 1990.

Table (3.1) shows a slight decline in the percentage of eutrophic individuals in the center portion of core WR1-99 and a slight increase in the percentage of oligotrophic individuals. Trophic preferences of diatom assemblages remain generally constant, however, from the bottom to the top of the core.

Inferred limnetic total P inferences for core WR1-99 are approximately 20-23 μg/L at the top and bottom of the core as indicated by both the TROPH1 and WACALIB models (Table 3.2). Both models show a slight decline in inferred limnetic total P concentrations in the center portion of the core (Fig. 3.11), but 95% confidence intervals for inferences overlap throughout most of the core indicating that limnetic nutrient concentrations have remained fairly constant. Diatoms in core WR1-99 indicate that mesotrophic conditions persisted in Lake Weir since prior to c. 1900.

In Lake Weir core WR2-99, *Cyclotella stelligera* averages 50-70% of the assemblages between the 88-cm and 8-cm levels (Appendix F). *Aulacoseira italica* is not as abundant in the lower portion of core WR2-99 as in the lower portion of core WR1-99. *Aulacoseira italica*'s greatest abundance is 17.3% in the 52-cm interval. Diatom assemblages show slight differences in species dominance in the bottom of core WR2-99 than were observed in core WR1-99. *Navicula pupula* var. *rectangularis* (Greg.) Gr. and *Stauroneis phoenocenteron* (Nitz.) Ehr. var. *gracilis* represent approximately 10% of the assemblages between the 88-cm and 76-cm levels in core WR2-99. Both taxa indicate mesotrophic conditions but also indicate slightly more halophilous conditions that might represent an early period of low water levels. Core WR2-99 might constitute, therefore, a slightly longer depositional record than core WR1-99.

Table 3.1. Trophic-state preferences of diatoms in samples from Lake Weir core LW1R-99.

Depth in core (cm)	Hyper-eutrophic (%)	Eutrophic (%)	Meso-trophic (%)	Oligo-trophic (%)	Ultraoligo-trophic (%)	unknown (%)
0-4	3.10	40.91	36.45	18.91	0.19	0.43
8-12	2.55	42.21	35.25	19.76	0.00	0.24
12-16	1.35	38.27	36.24	23.69	0.00	0.45
16-20	0.16	36.91	34.95	27.74	0.00	0.27
24-28	0.37	35.48	33.15	30.82	0.00	0.08
32-36	0.60	36.16	32.14	30.83	0.00	0.28
52-56	0.28	39.81	29.64	29.64	0.00	0.63
64-68	0.10	40.60	28.77	29.47	0.00	1.06
76-80	1.72	48.90	25.09	23.94	0.00	0.25
92-96	2.84	43.65	27.31	25.55	0.00	0.65

Table 3.2. Inferred limnetic total P with 95% confidence intervals for the inferences for samples from Lake Weir core LW1R-99.

	TROPH1 inferred total P			WACALIB
Depth Interval (cm)	Inferred total P (µg/L)	Lower bound of 95% c.i. (µg/L)	Upper bound of 95% c.i. (µg/L)	Inferred total P (µg/L)
0-4	23	20	27	22
8-12	24	20	28	20
12-16	20	18	24	22
16-20	18	16	21	21
24-28	17	15	20	15
32-36	18	15	21	15
52-56	19	16	22	18
64-68	19	16	22	14
76-80	25	21	29	20
92-96	23	20	27	21

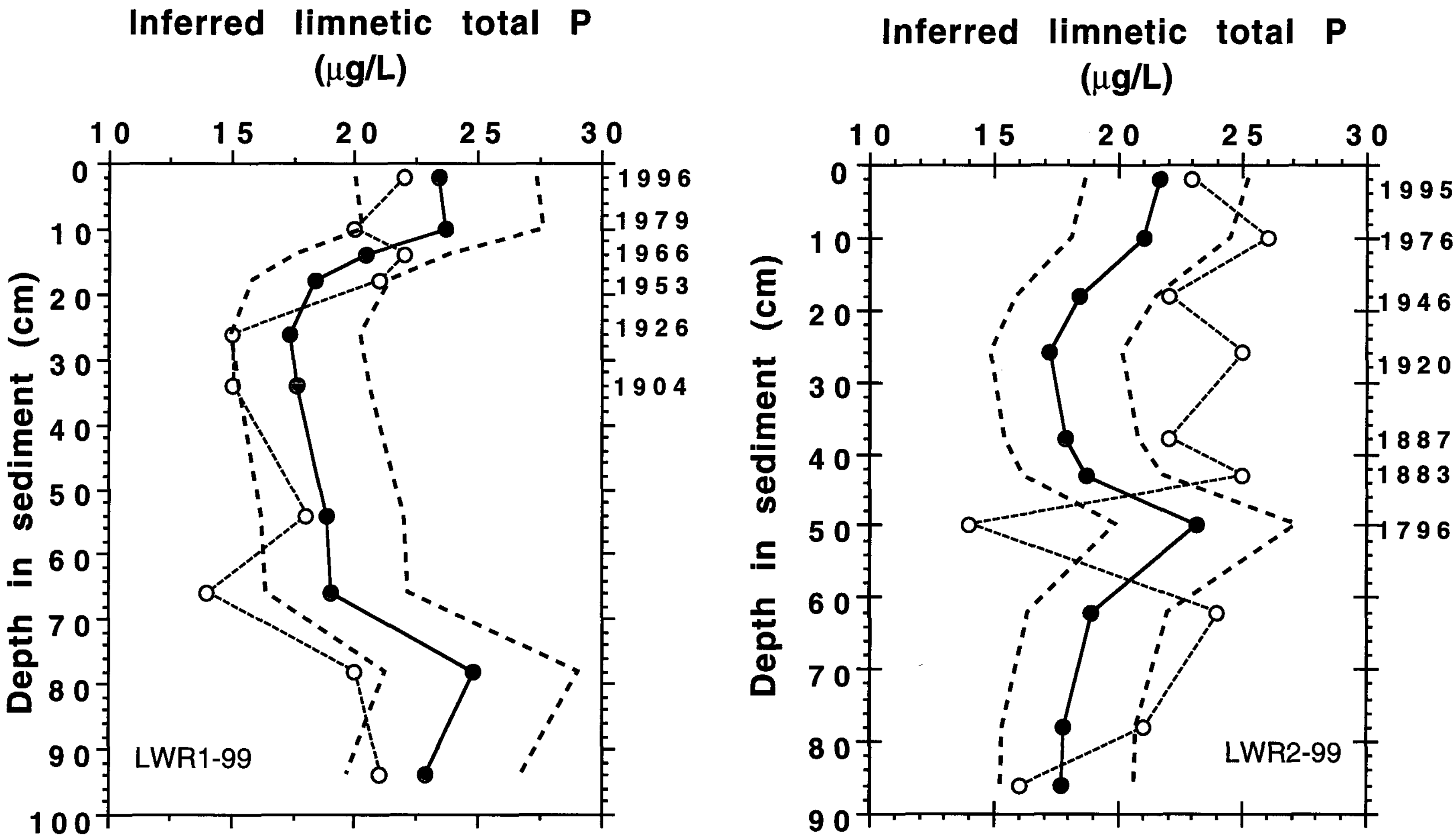


Figure 3.11. Limnetic total P inferences based on diatom assemblages in sediment cores LW1R-99 and LW2R-99. Closed circles represent inferences based on the LGTROPH1 model, and dashed lines represent 95% confidence intervals for those inferences. Open circles represent limnetic total P inferences based on the weighted-averaging calibration (WACALIB) model.

Table 3.3 shows very constant percentages in the trophic-state preferences of diatoms in the WR2-99 sediment core. Inferred limnetic total P values range between 15 and 25 µg/L throughout the core (Table 3.4), with WACALIB inferences being slightly higher than inferences obtained with the TROPH1 model (Fig. 3.11). Limnetic total P inferences indicate consistently mesotrophic conditions over time.

Diatom assemblages in Lake Yale cores LY1-99 and LY3-99 (Appendix F) are dominated primarily by *Aulacoseira ambigua* (Gr.) Sim. and *Aulacoseira italica* (Ehr.) Sim., both of which occur primarily in eutrophic conditions. In both cores, *A. ambigua* is most abundant below the 28-cm levels, whereas *A. italica* is variable in abundance. *Cyclotella stelligera* (Cl. & Gr.) V.H. is found in greater abundance near the bottom of both cores and again near the 28-cm level in both cores. Because *C. stelligera* is found in oligotrophic to eutrophic conditions, its presence suggests a period of slightly lower limnetic nutrient concentrations at these levels. *Anomoeoneis vitrea* (Gr.) Ross reaches 17.8% abundance in the 20-cm interval of core LY1-99. Although this taxon is tolerant of a wide range of nutrient conditions, it is acidiophilous and suggests a period in which water from wetland areas had greater influence on Lake Yale. *Synedra filiformis* var. *exilis* Cl-Eul., which is tolerant of mesotrophic to eutrophic and slightly more acidic conditions, is also more abundant in both cores near the 16- and 28-cm levels.

Trophic state preferences of diatoms in cores LY1-99 (Table 3.5) and LY3-99 (Table 3.6) show that eutrophic diatoms generally represent 60-75% of the assemblages thoughout both cores. Eutrophic diatoms are slightly more abundant near the tops of both cores. Limnetic total P inferences based on diatom assemblages in core LY1-99 (Table 3.7) and in core LY3-99 (Table 3.8) are slightly lower for the WACALIB method than for the TROPH1 method. Total P inferences are slightly higher at the tops of the cores than they are for the 20-cm level (c. 1970) in both cores (Fig. 3.12). Modern inferences, however, are not significantly higher than the values inferred for both cores between the 44- and 52-cm levels that represent a time prior to 1900.

Table 3.3. Trophic-state preferences of diatoms in samples from Lake Weir core LW2R-99.

Depth in core (cm)	Hyper-eutrophic (%)	Eutrophic (%)	Meso-trophic (%)	Oligo-trophic (%)	Ultraoligo-trophic (%)	unknown (%)
0-4	2.95	37.41	36.13	21.69	0.00	1.62
8-12	3.17	37.60	34.63	24.36	0.00	0.06
16-20	1.07	37.07	33.18	28.22	0.19	0.07
24-28	0.00	35.96	32.59	30.62	0.00	0.45
36-40	0.16	36.92	30.85	29.86	0.00	2.04
40-44	0.20	38.51	31.99	28.14	0.00	1.06
48-52	0.58	47.42	26.46	24.53	0.00	1.02
60-64	0.80	37.81	30.37	28.22	0.00	2.62
76-80	0.19	34.15	33.47	27.65	0.00	4.54
84-88	0.20	34.11	34.72	27.85	0.00	3.10

Table 3.4. Inferred limnetic total P with 95% confidence intervals for the inferences for samples from Lake Weir core LW2R-99.

	TROPH1 inferred total P			WACALIB
Depth Interval (cm)	Inferred total P (µg/L)	Lower bound of 95% c.i. (µg/L)	Upper bound of 95% c.i. (µg/L)	Inferred total P (µg/L)
0-4	22	19	25	23
8-12	21	18	24	26
16-20	18	16	21	22
24-28	17	15	20	25
36-40	18	15	21	22
40-44	19	16	22	25
48-52	23	20	27	14
60-64	19	16	22	24
76-80	18	15	21	21
84-88	18	15	21	16

Table 3.5. Trophic-state preferences of diatoms in samples from Lake Yale core LY1-99.

Depth in core (cm)	Hyper-eutrophic (%)	Eutrophic (%)	Meso-trophic (%)	Oligo-trophic (%)	Ultraoligo-trophic (%)	unknown (%)
0-4	1.09	76.25	15.93	6.02	0.71	0.01
8-12	2.85	72.74	16.72	7.33	0.00	0.36
16-20	2.27	49.79	28.05	19.65	0.00	0.24
24-28	2.26	58.73	24.65	14.14	0.00	0.22
32-36	1.82	71.01	15.85	10.53	0.00	0.79
40-44	4.75	61.09	20.43	12.53	0.00	1.20
48-52	3.64	65.18	17.15	11.25	0.00	2.78
56-60	0.79	52.06	26.12	17.45	0.00	3.58
64-68	2.85	61.49	20.32	11.98	0.00	3.36

Table 3.6. Trophic-state preferences of diatoms in samples from Lake Yale core LY3-99.

Depth in core (cm)	Hyper-eutrophic (%)	Eutrophic (%)	Meso-trophic (%)	Oligo-trophic (%)	Ultraoligo-trophic (%)	unknown (%)
0-4	5.67	74.56	14.36	5.38	0.00	0.01
8-12	9.51	61.55	21.11	6.58	0.00	1.16
16-20	5.73	57.56	28.29	7.43	0.00	1.00
24-28	5.19	58.98	22.83	12.39	0.00	0.62
32-36	2.09	75.24	13.79	7.36	0.00	1.52
40-44	2.98	74.17	13.99	8.30	0.00	0.56
48-52	3.44	67.35	16.20	10.89	0.00	2.13
56-60	2.09	64.37	22.47	10.05	0.00	1.01
64-68	2.28	68.08	15.01	13.22	0.00	1.41

Table 3.7. Inferred limnetic total P with 95% confidence intervals for the inferences for samples from Lake Yale core LY1-99.

Depth Interval (cm)	TROPH1 inferred total P: Inferred total P (ug/L)	TROPH1 inferred total P: Lower bound of 95% c.i. (ug/L)	TROPH1 inferred total P: Upper bound of 95% c.i. (ug/L)	WACALIB Inferred total P (ug/L)
0-4	56	44	70	52
8-12	59	47	75	51
16-20	27	23	32	25
24-28	35	29	42	28
32-36	52	42	65	37
40-44	42	35	51	31
48-52	48	39	59	40
56-60	29	24	34	31
64-68	41	34	50	34

Table 3.8. Inferred limnetic total P with 95% confidence intervals for the inferences for samples from Lake Yale core LY3-99.

Depth Interval (cm)	TROPH1 inferred total P: Inferred total P (ug/L)	TROPH1 inferred total P: Lower bound of 95% c.i. (ug/L)	TROPH1 inferred total P: Upper bound of 95% c.i. (ug/L)	WACALIB Inferred total P (ug/L)
0-4	75	58	98	42
8-12	55	44	69	47
16-20	42	34	51	41
24-28	40	33	49	33
32-36	66	51	84	47
40-44	63	50	81	45
48-52	51	41	63	39
56-60	43	35	52	34
64-68	47	38	58	38

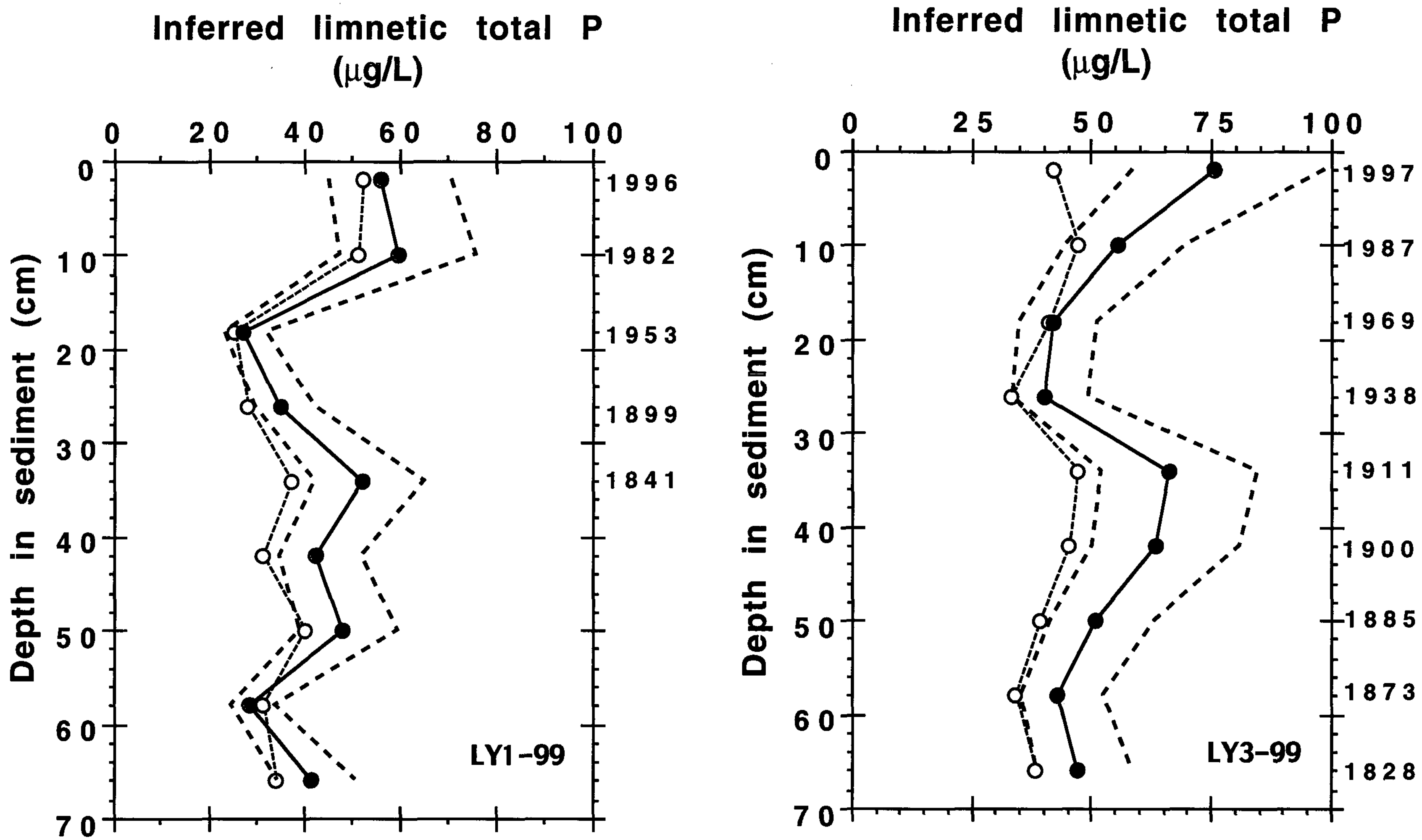


Figure 3.12. Limnetic total P inferences based on diatom assemblages in sediment cores LY1-99 and LY3-99. Closed circles represent inferences based on the LGTROPH1 model, and dashed lines represent 95% confidence intervals for those inferences. Open circles represent limnetic total P inferences based on the weighted-averaging calibration (WACALIB) model.

Chapter 4
Lake Harris

Lake Harris based on water column TP and TN (Fig. 1.2) is one of the more oligotrophic lakes in the Harris Chain. Only Lake Weir and Lake Yale have smaller TP and TN concentrations. Mean TP and TN (± standard deviation) are 42 ± 38 μg/L and 1.79 ± 0.49 mg/L, respectively (Fulton 1995).

Physical Characteristics

Sedimentary characteristics for Lake Harris are illustrated with descriptive statistics and compared with Lake Weir and Lake Yale. The mean LOI was 58% (Appendix C) which is essentially the same as the means for Lake Weir and Lake Yale (52 and 57%, respectively). The mean TP for Lake Harris (0.50 mg/g) was considerably larger than the mean for Lake Weir and Lake Yale (0.25 and 0.27 mg/g, respectively). Likewise, mean CHEP and NaOHP were greater in Lake Harris than in either Lake Weir or Lake Yale. The mean TC/TN ratio for Lake Harris (11.1) was smaller than that for Lake Weir (12.1), but greater than that for Lake Yale (10.7). The TC/TN ratio may increase by a greater contribution of macrophytes to sedimentary organic matter (Kenney et al. in review) or to a greater contribution of organic matter derived from terrestrial sources (Meyers 1994) or possibly to a decrease in algal standing crop.

The zone of sediments datable with ^{210}Pb varied appreciably among the nine cores from Lake Harris (Appendix D). The depth of 20th century sediments ranged from a minimum of 12 cm (LH2-99) to a maximum of 64 cm in LH9R-99. Based on this measure of variability in sedimentation rates, cores were divided into two groups: three cores with no more than 28 cm of datable sediments (LH1-99, LH2-99 and LH3R-99) and the remaining six cores with depths of 20th century sediments ranging from 36 to 64 cm and datable sediments ranging from 40 to 76 cm. If LH4-99 is excluded from the group with higher sedimentation rates, depths of 20th century sediments ranged only from 52 to 64 cm and datable sediments ranged from 56 to 76 cm. Cores LH1-99, LH2R-99 and LH3R-99, the low sedimentation sites are the westernmost and northernmost core sites in the lake (Fig. 2.1). As a result of lower sedimentation, sediments are much older at specific depths at the three stations with a limited zone of ^{210}Pb datable sediments than at the remaining six. Only data from the higher sedimentation site group will be presented in detail because temporal resolution is poor and nutrient storage is low at the three lower sedimentation sites.

Similar stratigraphic features in LOI and fraction dry weight were found generally in the uppermost sediments of all cores (Fig. 4.1). In general LOI was largest in near-surface sediments, but the stratigraphic pattern at depth varied greatly among cores. The record of relatively high LOI extended below the zone of datable sediments at the six stations with high sedimentation rates. Core LH5-99 was an exception in that % LOI decreased markedly from the surface to 12 cm and then increased with depth over the zone of datable sediments. By contrast, fraction dry weight increased with depth to a value > 0.04 g/g within the zone of datable sediments. With the exception of LH7-99, fraction dry weight was then relatively constant over some depth range. In LH7-99, fraction dry weight increased at depths > 100 cm, well below the zone of datable sediments. Maximum values for LOI at the top of cores were fairly constant, ranging from approximately 65 to nearly 75% at LH8-99 and LH9R-99. Large variations in either parameter were generally restricted to sediments below the zone of datable sediments. In several of these cores, a stratigraphic discontinuity in either LOI or fraction dry weight was found immediately below the zone of datable sediments.

Chemical Characteristics

The largest values for TC and TN were found at the top of cores with TC and TN ranging from approximately 31 to 36% and 3.5 to 4.0%, respectively (Fig. 4.2). The stratigraphic patterns for TC were similar to those LOI (Fig. 4.1), but were more variable. In the zone of datable sediments, TC and TN appeared to vary generally in similar patterns. The close relationship between TC and TN extended over most of the length of the cores, though TN represented a larger relative proportion in the uppermost sediments of most cores.

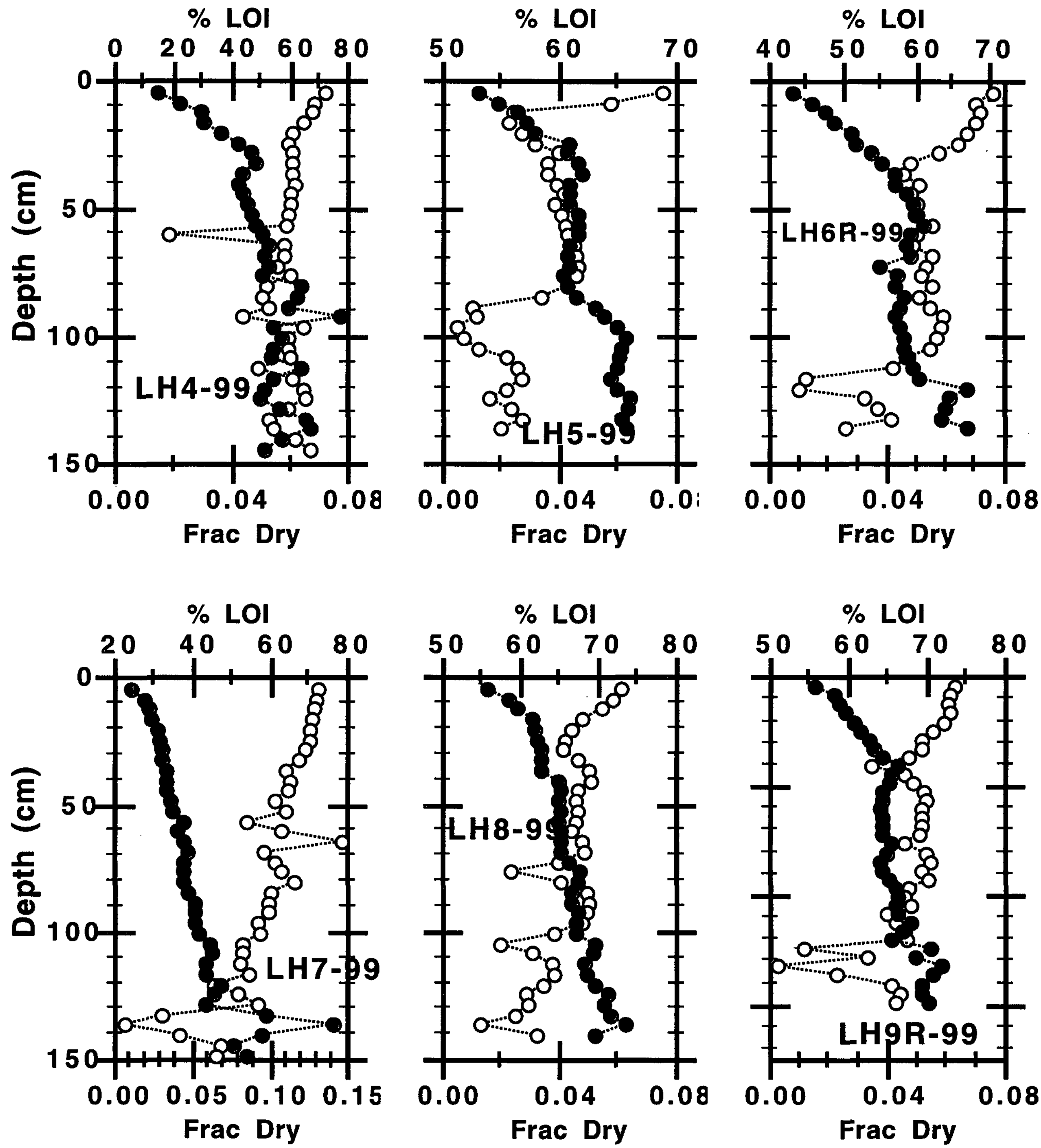


Figure 4.1. Loss on ignition (% LOI) and fraction dry weight (Frac Dry) vs. depth for Lake Harris cores. Keys to symbols: solid circles are Frac Dry and open circles are % LOI.

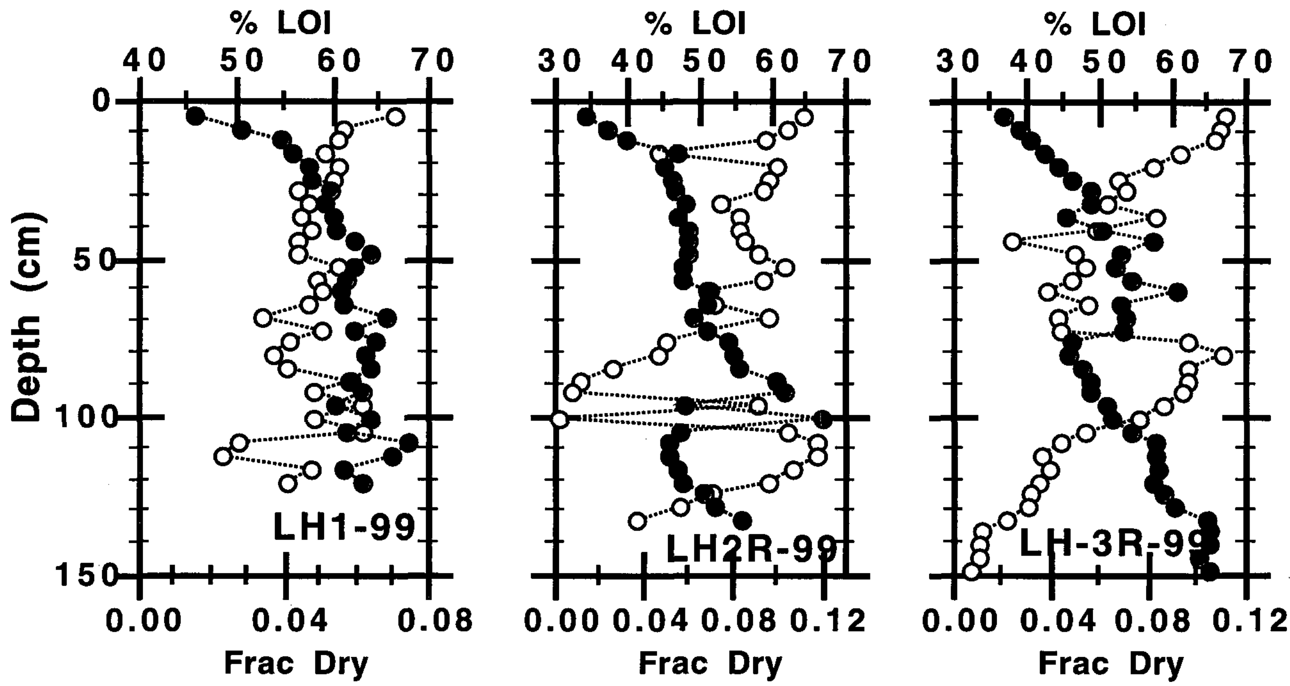


Figure 4.1 (Continued)

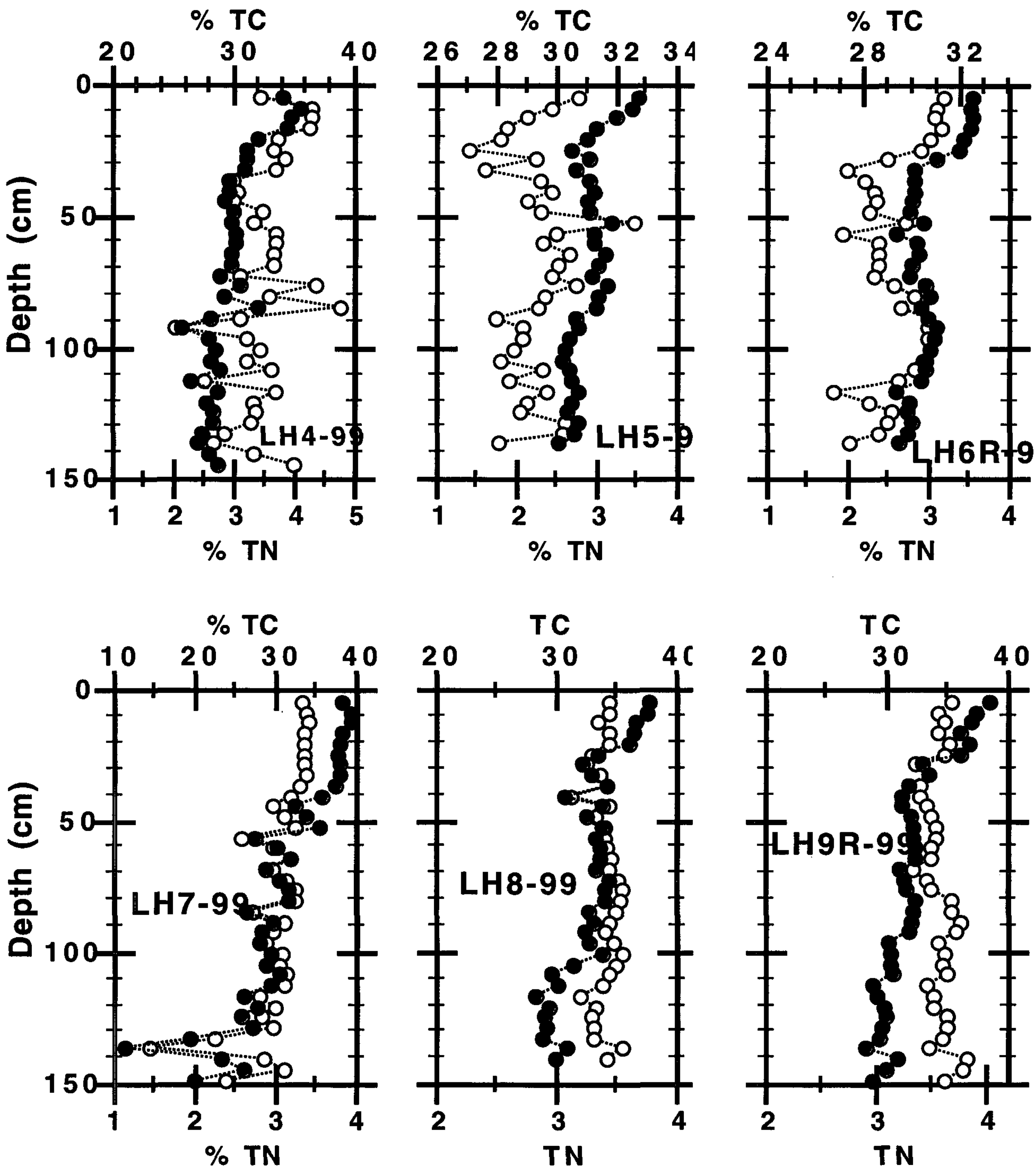


Figure 4.2. Percent total carbon (% TC) and percent total nitrogen (% TN) vs. depth for Lake Harris cores. Keys to symbols: solid circles are %TN and open circles are %TC.

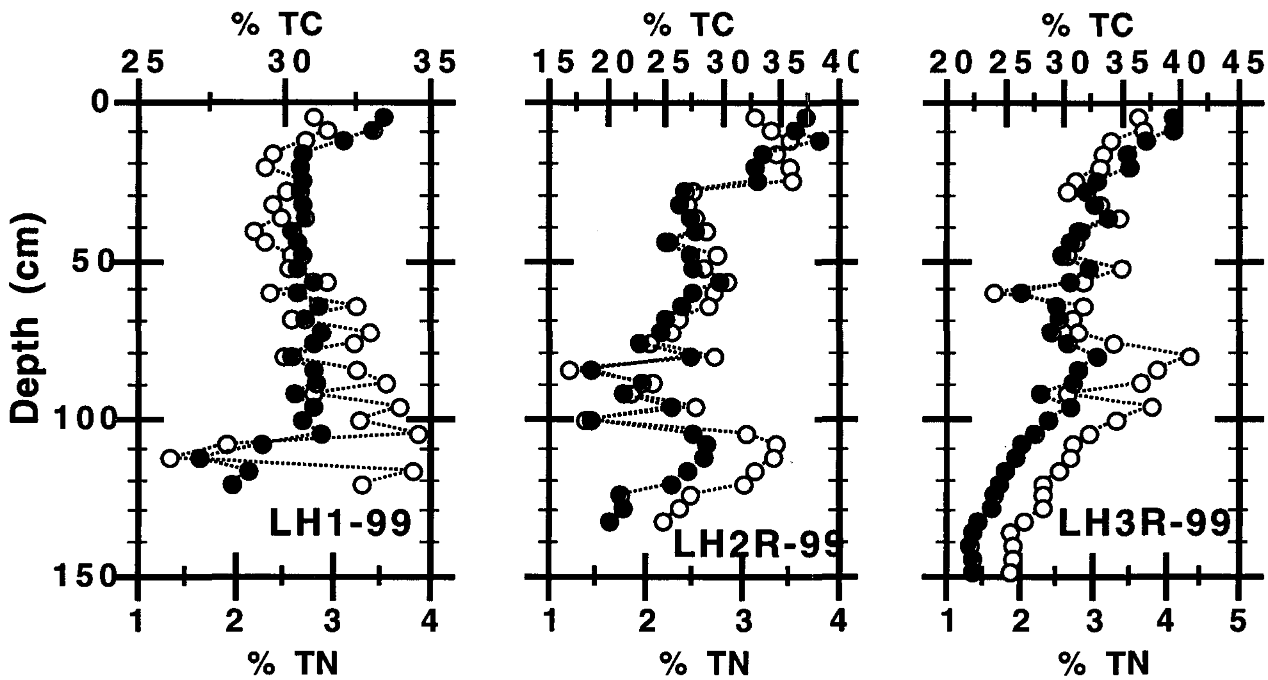


Figure 4.2. (Continued)

Profiles of phosphorus forms were similar among the six cores from the stations with the higher sedimentation rates (Fig. 4.3). TP in all cores decreased with depth to a baseline that was found near or below the zone of datable sediments. Near-surface concentrations of TP ranged from 1.1 to 1.4 mg/g with the maximum concentration in sections as deep as 16 cm. The zone of high TP concentration extended to 52 cm in LH7-99. Concentrations of CHEP ranged to as large as 0.6 mg/g, but the quantities and profile patterns varied markedly among cores. The smallest concentration of CHEP was found at LH4-99, and CHEP concentration was greater than baseline in only a few samples at this station. By contrast, CHEP concentrations were greater than baseline over the upper 50 cm of sediments in LH7-99. Small concentrations of H20-P were found over the entire profile for most cores except for a few samples at depths below 100 cm in LH4-99.

Profiles of TC/TN and $\delta^{13}C$ in all nine cores were similar in two respects (Fig. 4.4). First, the TC/TN ratio was lowest in near-surface sediments of all cores with near-surface values being approximately 9. Second, like the Lake Weir and Lake Yale cores, $\delta^{13}C$ generally became lighter upcore with the lightest values in the surface or near-surface samples in all cores. In the six cores with the higher sedimentation rates, the TC/TN ratio increases with depth from approximately 9 to 10 in the zone of datable sediments. With the exception of LH7-99, values > 9 were found over some depth in each core. The decrease in TC/TN in the most recent sediments is inferred to represent some combination of an increasing proportion of organic matter derived from phytoplankton or a decreasing proportion of organic matter derived from macrophytes. The observed decrease in $\delta^{13}C$ can be a proxy for decreased primary production (Schelske and Hodell 1991, Hodell and Schelske 1998). However, to infer decreased lacustrine productivity based on this proxy is not consistent with increased phosphorus loading to the lake basin that can be inferred from the TP and CHEP profiles (Fig. 4.3).

Profiles of TC/TN and $\delta^{15}N$ were plotted to gain insight about the unexpected stratigraphic relationship between $\delta^{13}C$ and TP (Fig. 4.5). Unlike $\delta^{13}C$ (Fig. 4.4), $\delta^{15}N$ either increased or was relatively constant in the zone of datable sediments. Enrichment of $\delta^{15}N$ in the upper sections of LH7-99 and LH9R-99 was greater than in the remaining cores. Enrichment in $\delta^{15}N$ may be a signal of increased lacustrine productivity that is

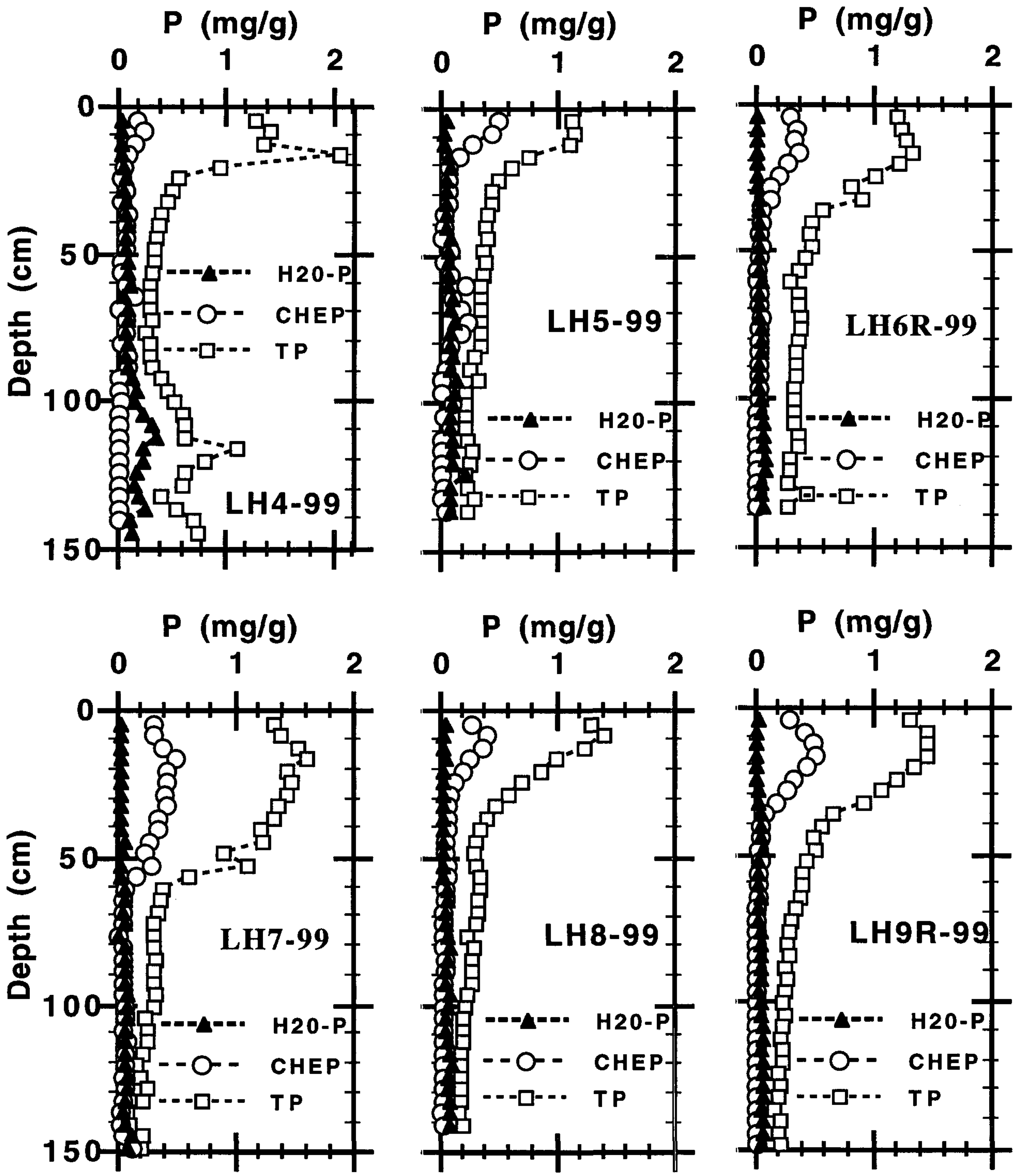


Figure 4.3. Phosphorus forms vs. depth for Lake Harris cores. Forms shown are water soluble P (H2O-P), hot-water extractable P (CHEP) and total P (TP). Keys to symbols: solid triangles are H2O-P, open circles are CHEP and open squares are TP.

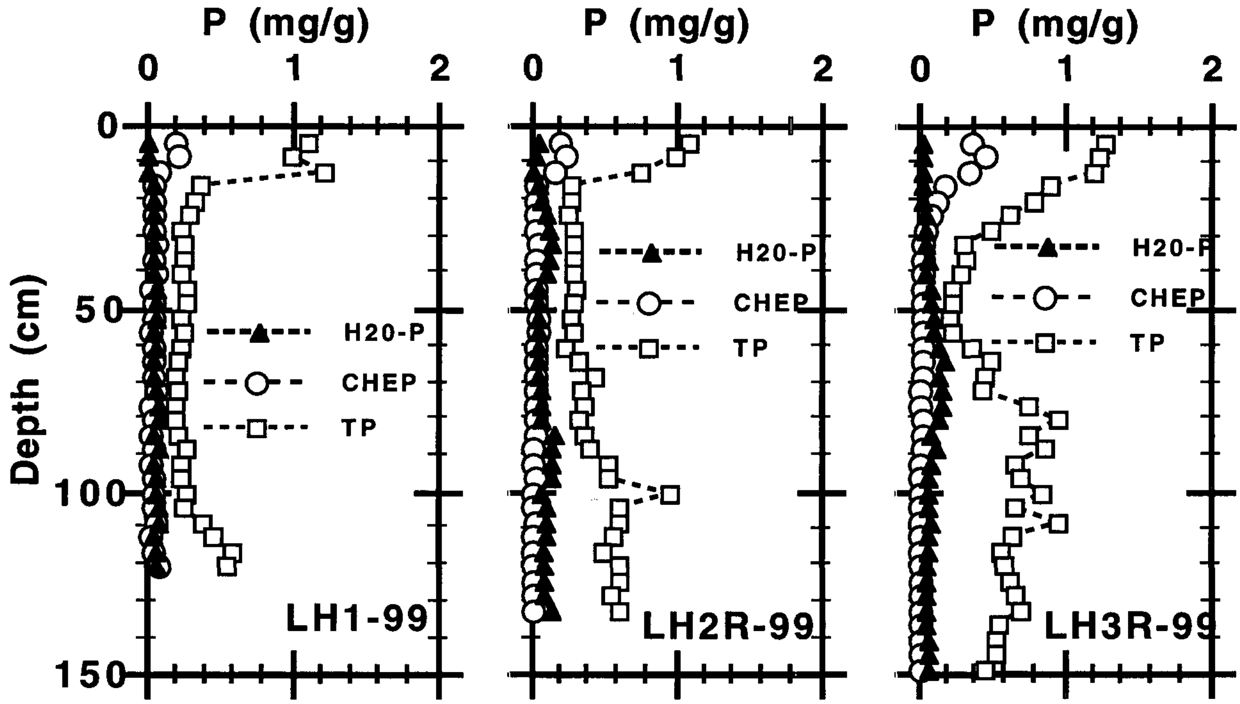


Figure 4.3. (Continued)

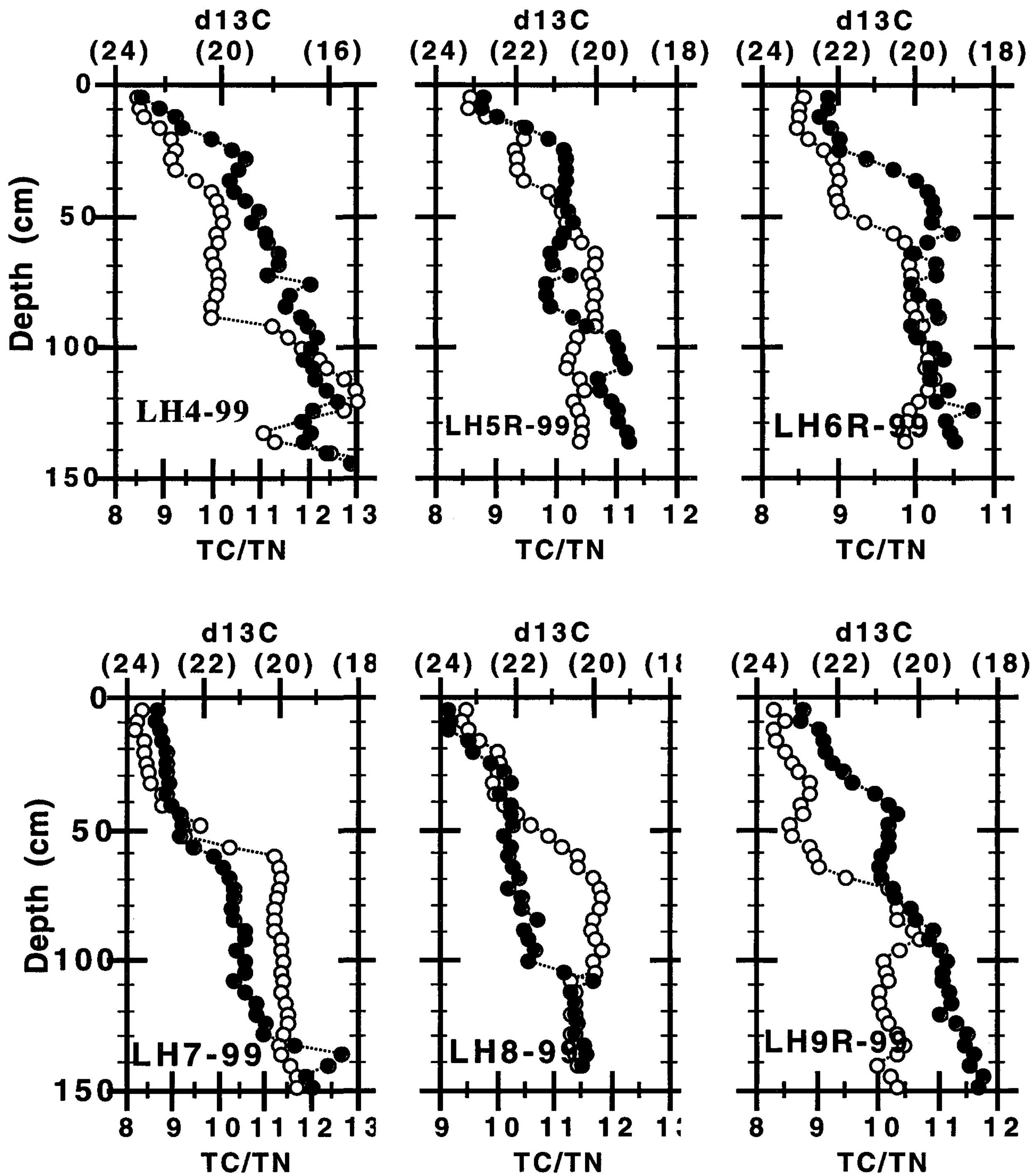


Figure 4.4. Total carbon (TC):total nitrogen (TN) weight ratio and stable carbon isotopic ratio ($\delta^{13}C$) vs. depth for Lake Harris cores. Keys to symbols: solid circles are TC/TN weight ratio and open circles are stable carbon isotopic ratio ($\delta^{13}C$).

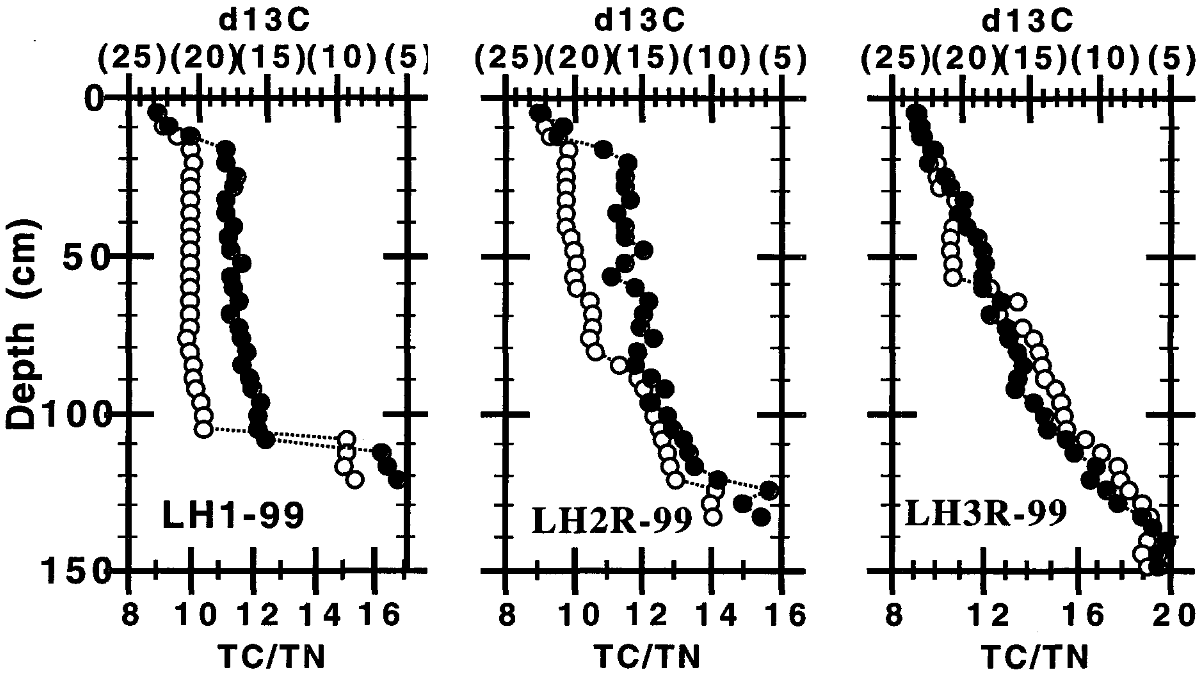


Figure 4.4. (Continued)

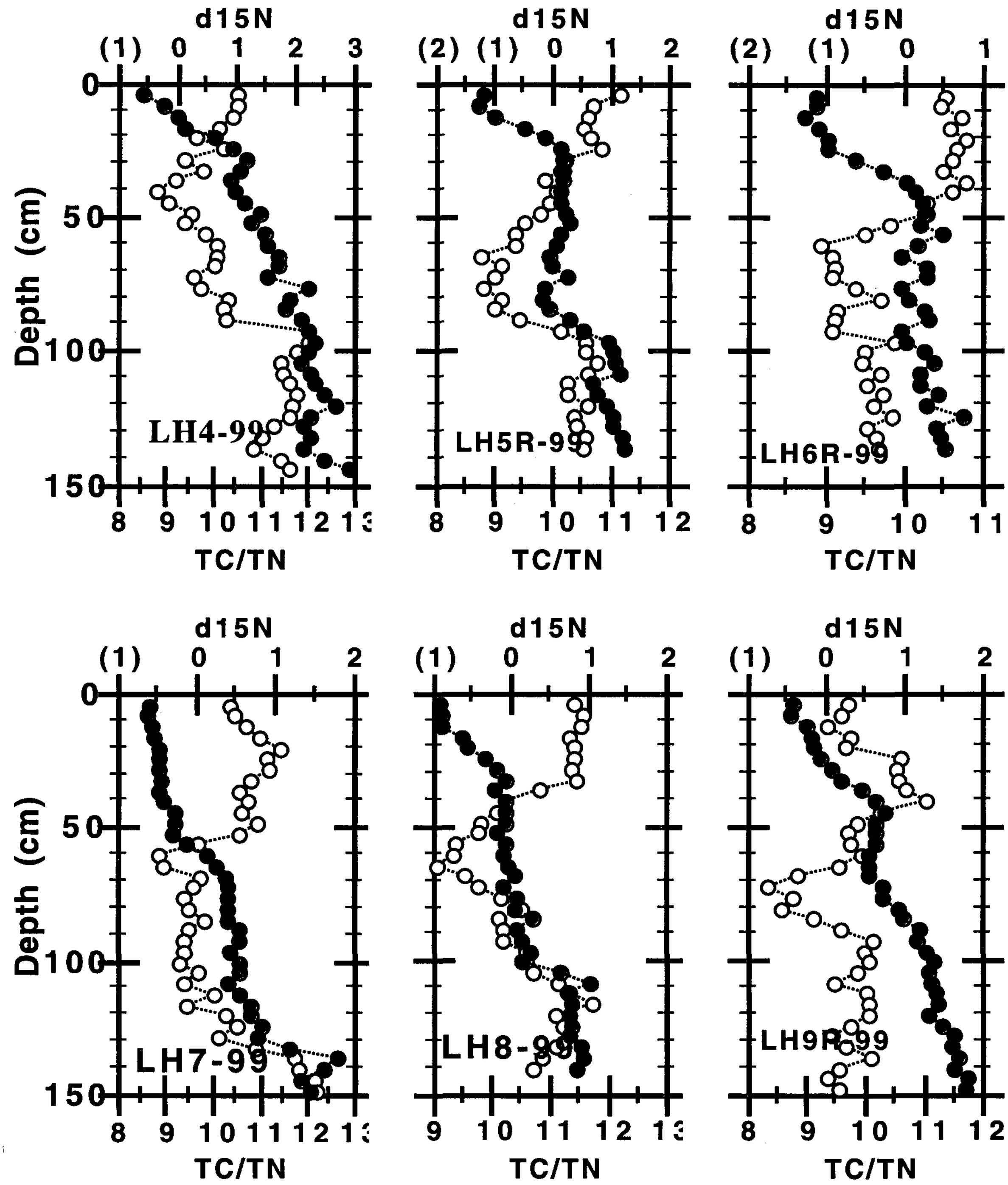


Figure 4.5. Total carbon (TC):total nitrogen (TN) weight ratio and stable nitrogen isotopic ratio ($\delta^{15}N$) vs. depth for Lake Harris cores. Keys to symbols: solid circles are TC/TN weight ratio and open circles are stable nitrogen isotopic ratio ($\delta^{15}N$).

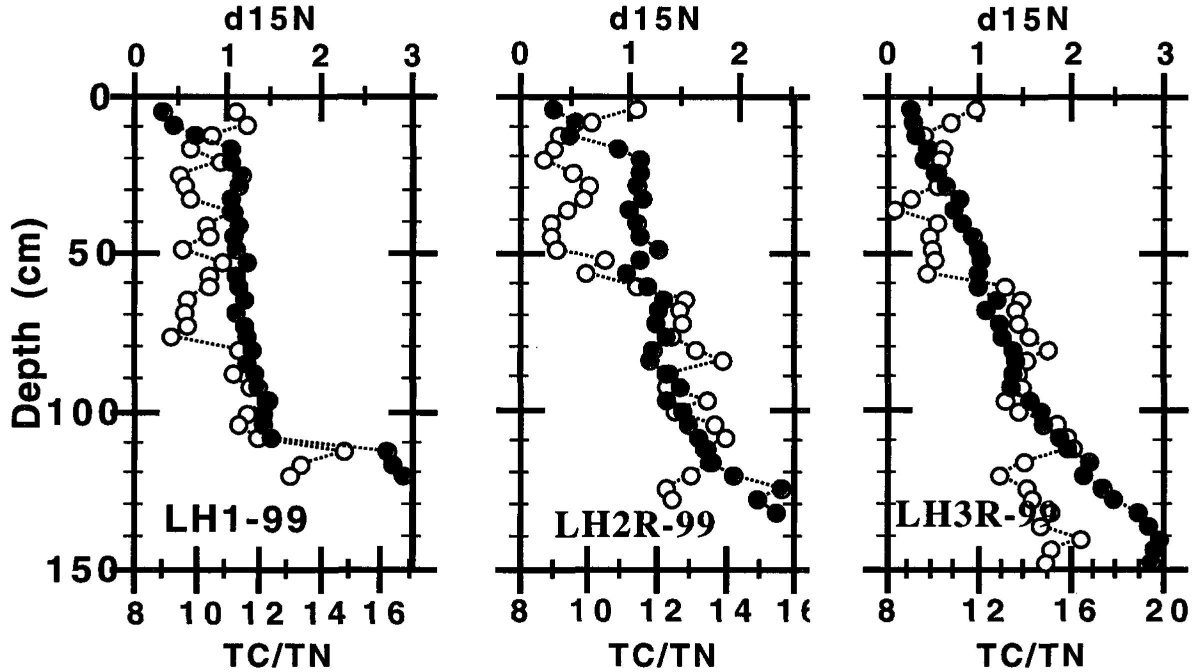


Figure 4.5. (Continued)

expected with increased phosphorus loading (Fig. 4.3). In core LH7-99, $\delta^{15}N$ was > 0 ‰ to depths of 52 cm which is in the zone of high CHEP. In addition, maximum values for $\delta^{15}N$ occurred at or near the bottom of the zone of datable sediments.

Stratigraphic patterns of BSi varied markedly among the six cores with high sedimentation rates (Fig. 4.6). In all cores except LH4-99, DSi was relatively high over most of the profile. In the remaining cores, BSi was relatively high over the entire profile or decreased only in a few bottom sections. DSi was the major component of BSi in the zone of datable sediments with the concentration generally being > 100 mg/g. With the exception of LH7-99, high concentrations decreased at or near the bottom of the datable sediment zone. The concentration of DSi in LH7-99 was generally > 100 mg/g to a depth of 128 cm, and the concentration of BSi was largest at depths from 96 to 128 cm due to high values for SSi at these depths. The patterns of DSi and BSi can be used to infer increased diatom productivity during the period represented by ^{210}Pb-datable sediments and for a much longer period at LH7-99.

A strong statistical correlation between NaOH-P and TP was found in data for Lake Harris (Fig. 4.7), as was the case for previous studies of other Ocklawaha lakes (Schelske 1997, 1998; Schelske et al. 1999a). Scatter of data points relative to the regression line indicates that the proportion of NaOH-P increases with TP. A linear relationship between CHEP and NaOH-P was found in the data set even though CHEP is corrected for water-soluble phosphorus and NaOH-P is not. The regression equation indicates CHEP represents 61% of NaOH-P in the sediments. It should be noted that either the CHEP or NaOH-P concentration of most samples is relatively small (< 0.2 mg/g).

Temporal Changes

Accumulation of sedimentary TP varied among the ^{210}Pb-dated cores with the highest sedimentation rates (Fig. 4.8). For most cores, the greatest increase in TP concentration occurred after approximately 1950 with the exception of LH7-99. In LH7-99, the TP concentration is generally greater than 1.0 mg/g for all dates after 1900 whereas concentrations as large as 1.0 mg/g were found only after approximately 1970 in

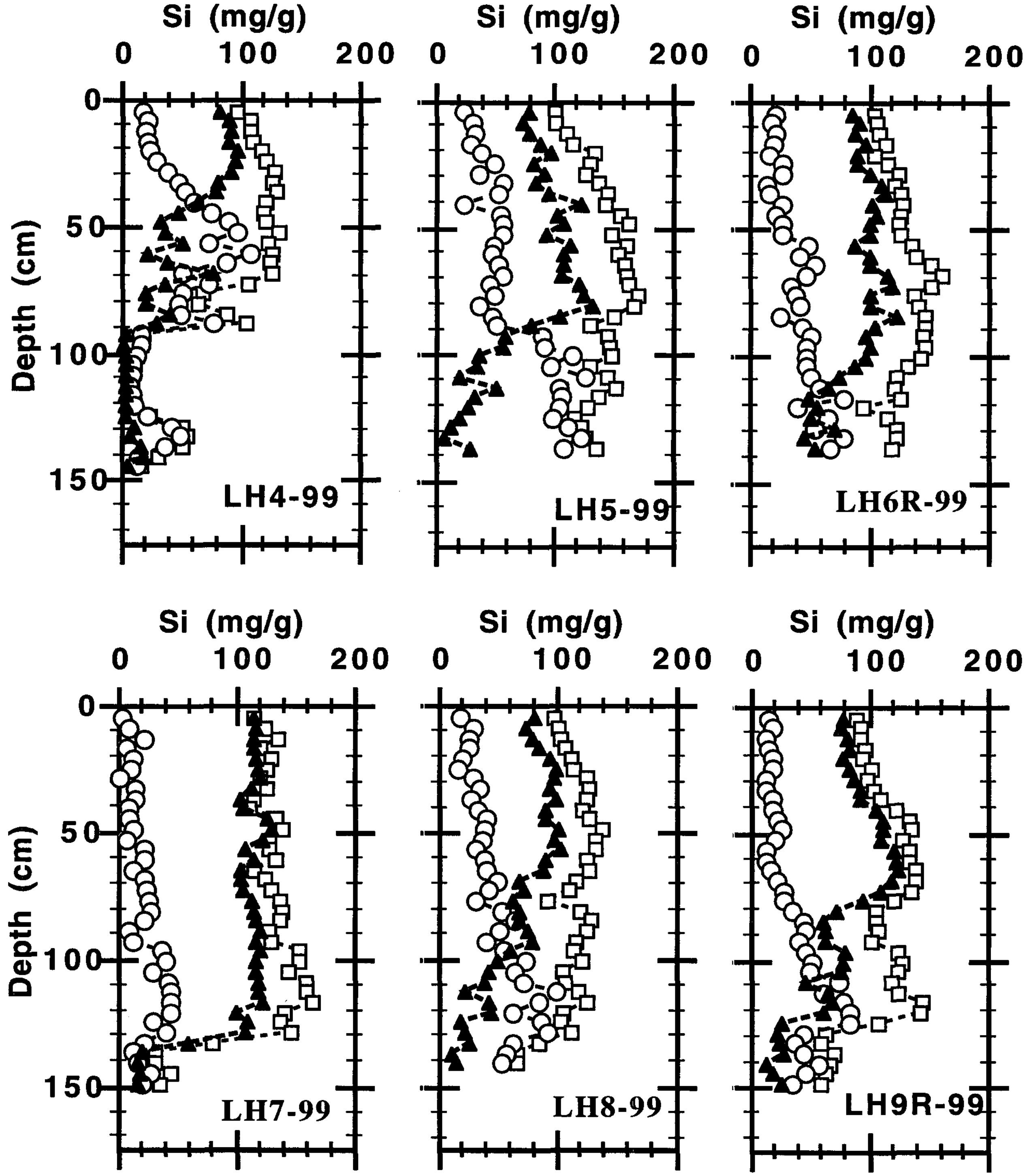


Figure 4.6. Biogenic silica forms vs. depth for Lake Harris cores. Forms shown are diatom biogenic silica (DSi), sponge biogenic silica (SSi) and biogenic silica (BSi), the sum of DSi and SSi. All data are presented in units of SiO_2. Keys to symbols: solid triangles are DSi, open circles are SSi and open squares are BSi.

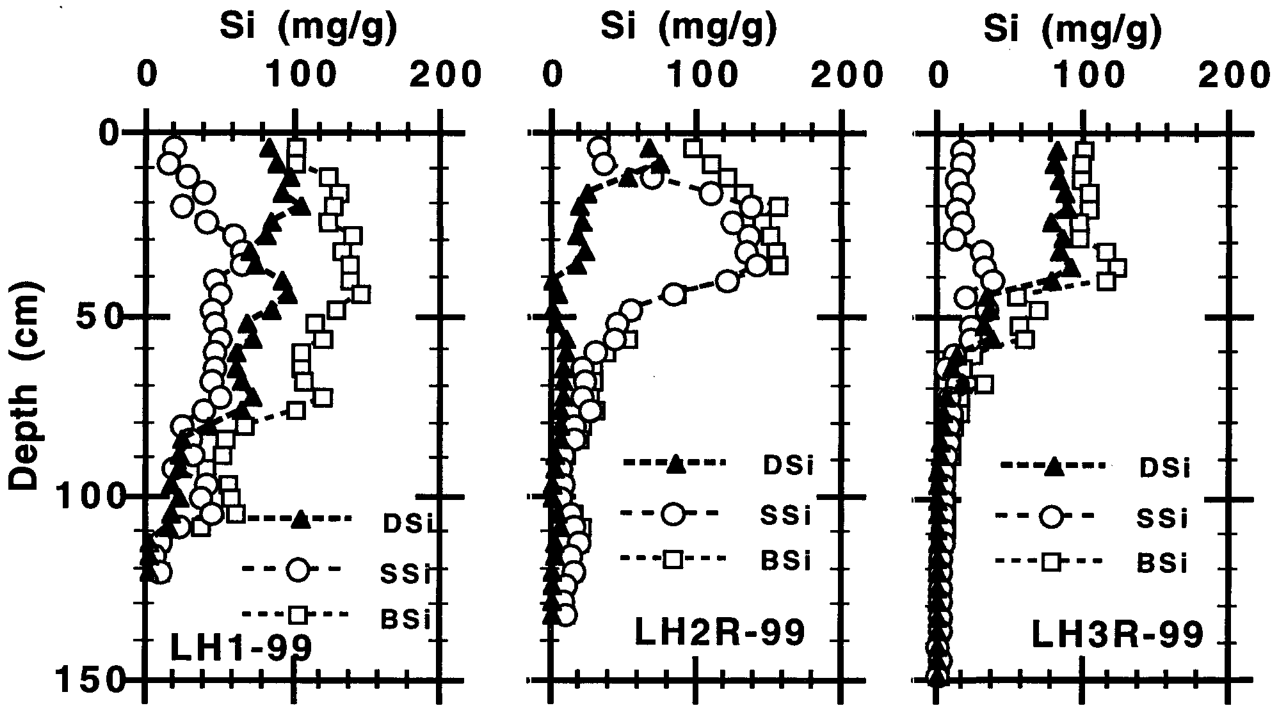


Figure 4.6 (Continued)

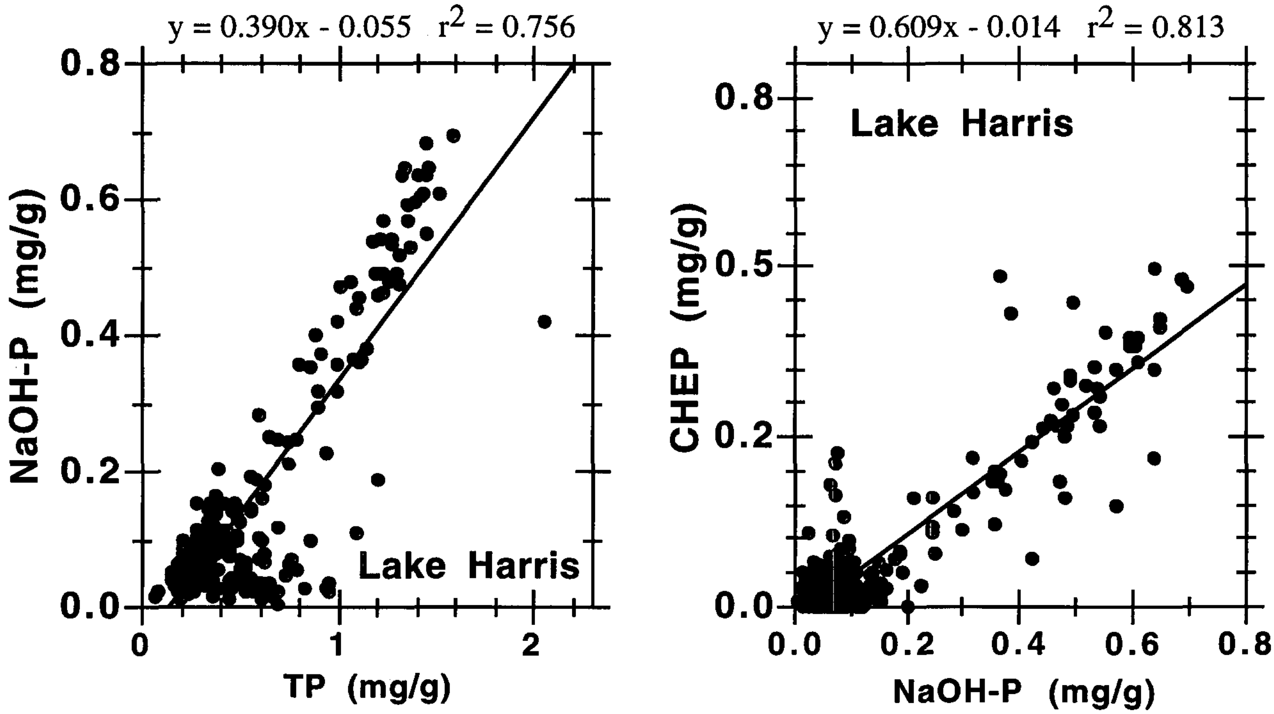


Figure 4.7. Correlation of sodium-hydroxide extractable P (NaOH-P) with total P (TP) and hot-water extractable P (CHEP) with sodium-hydroxide extractable P (NaOH-P) for all data for Lake Harris cores. Equations for least-squares linear regression are shown for both plots.

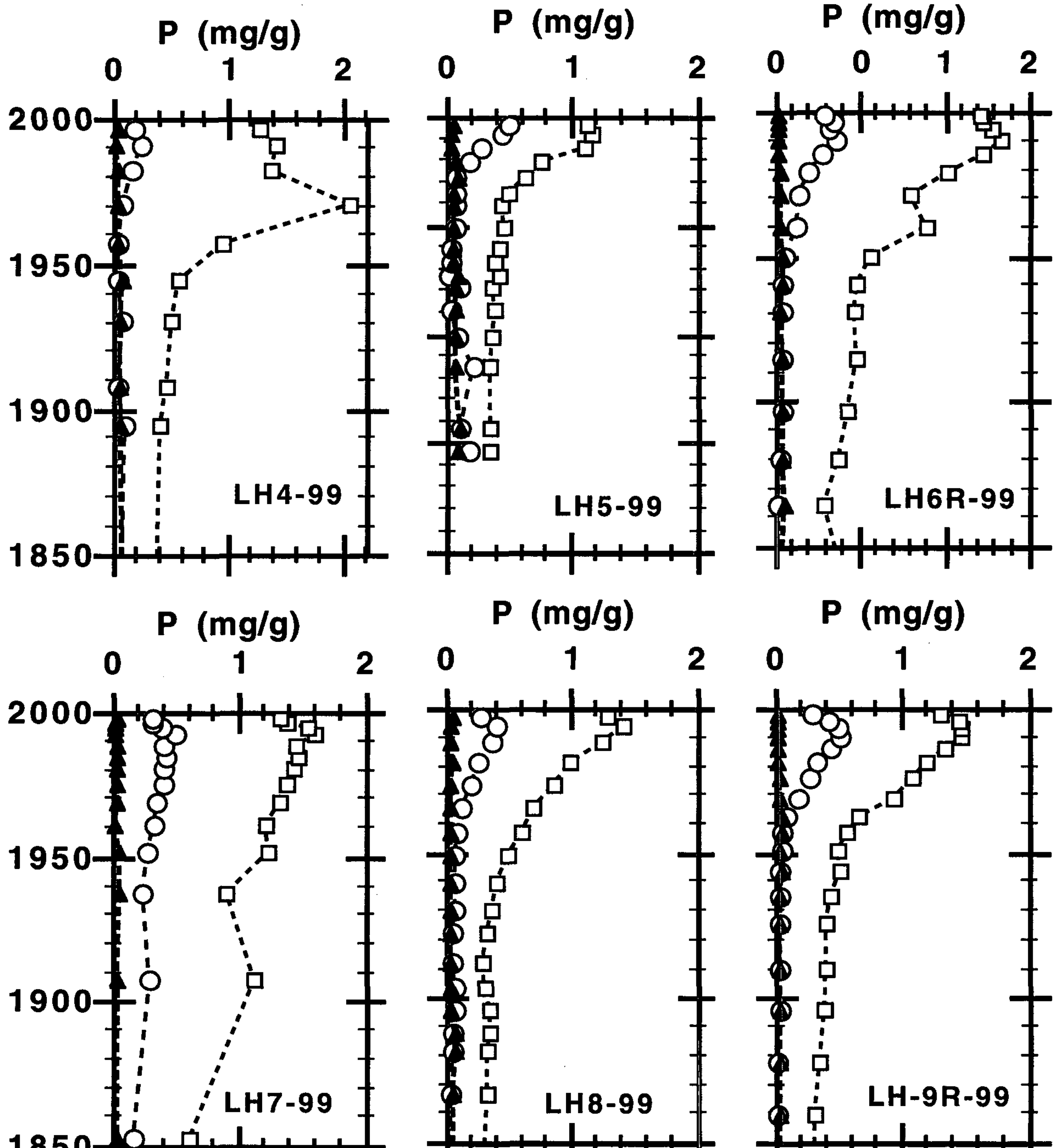


Figure 4.8. Phosphorus forms vs. date for Lake Harris cores. Forms shown are water soluble P (H2O-P), hot-water extractable P (CHEP) and total P (TP)). Keys to symbols: solid triangles are H2O-P, open circles are CHEP and open squares are TP.

the remaining cores. In addition, CHEP is also relatively high after 1900 in LH7-99, but in the other cores only increases above base-line levels after 1970. These data can be used to infer a record of increased phosphorus loading for more than 150 yr at this station. The wide variation in patterns of phosphorus accumulation among cores provides evidence that it is important to identify different depositional environments in paleolimnological studies (Whitmore et al. 1996). Phosphorus accumulation over time varies as a function of dry mass sediment accumulation (Schelske 1997).

The change in the TC/TN ratio for LH7-99 is also different from other ^{210}Pb-dated cores (Fig. 4.9). The TC/TN ratio at LH7-99 only varies from 8.5 to 9.5 and is 9 or lower after 1900. At the other stations, a larger change in the ratio is obvious with values increasing from 9 in near surface sediments to approximately 10 in older sediments. The change in the ratio begins at approximately 1950 in four of the remaining cores and at approximately 1980 in LH5-99. Data for TC/TN ratio also can be used to infer, therefore, that the contribution of phytoplankton-derived organic matter to the sedimentary record began earlier at LH7-99 than at the remaining stations, presumably as the result of increased phosphorus loading. The record at this station may be biased by its location in the strait between Little Lake Harris and Lake Harris (Fig. 2.1). This morphometric feature may affect lake hydrodynamics, providing a relatively high depositional site for phytoplankton-derived sediments.

The absolute change in $\delta^{13}C$ among the six cores with the longest record of ^{210}Pb-datable sediments ranged from approximately 3 to 3.5 ‰ (Fig. 4.9). The typical pattern of change was a profile with a decrease from 1850 and ending as early as 1900 and as late as 1930, followed by a period with relatively constant $\delta^{13}C$, and terminated by a final period of decrease beginning in 1970 or 1980. These results indicate that the time dependence of the $\delta^{13}C$ record is relatively strong among stations compared to that for other variables.

Evidence of time dependence also can be seen in the record of $\delta^{15}N$, but the dependence appears to have two temporal patterns (Fig. 4.10). First, $\delta^{15}N$ appears to increase moderately with time for LH4-99 and LH7-99, ranging from 0 to 1 ‰ over the ^{210}Pb-datable sediment record. Second, the $\delta^{15}N$ record for the four remaining cores shows a zone of enrichment beginning as early as 1940 and as late as 1965 that with the

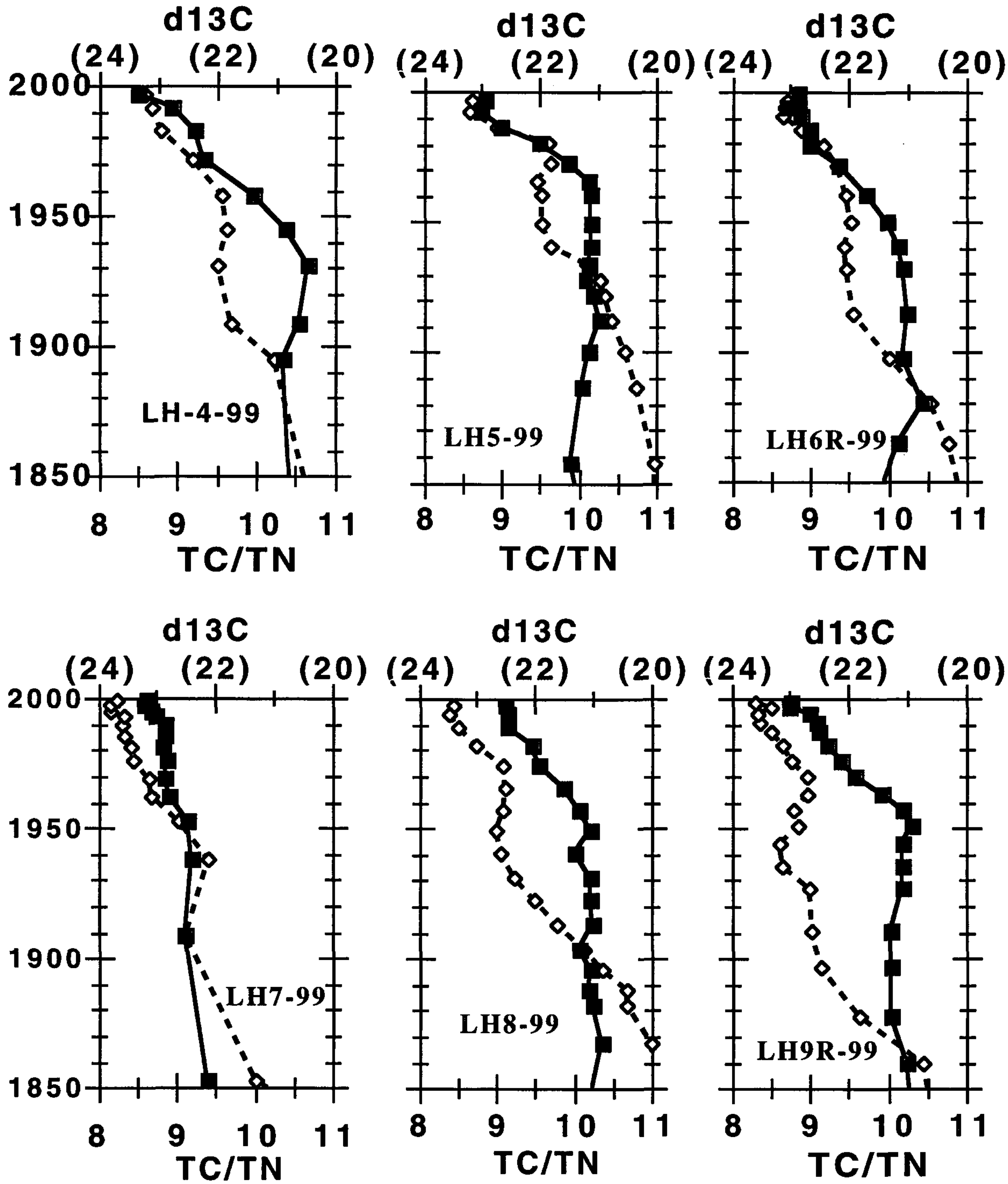


Figure 4.9. Total carbon (TC):total nitrogen (TN) weight ratio and stable carbon isotopic ratio ($\delta^{13}C$) vs. date for Lake Harris cores. Keys to symbols: solid squares are TC/TN weight ratio and open diamonds are stable carbon isotopic ratio ($\delta^{13}C$).

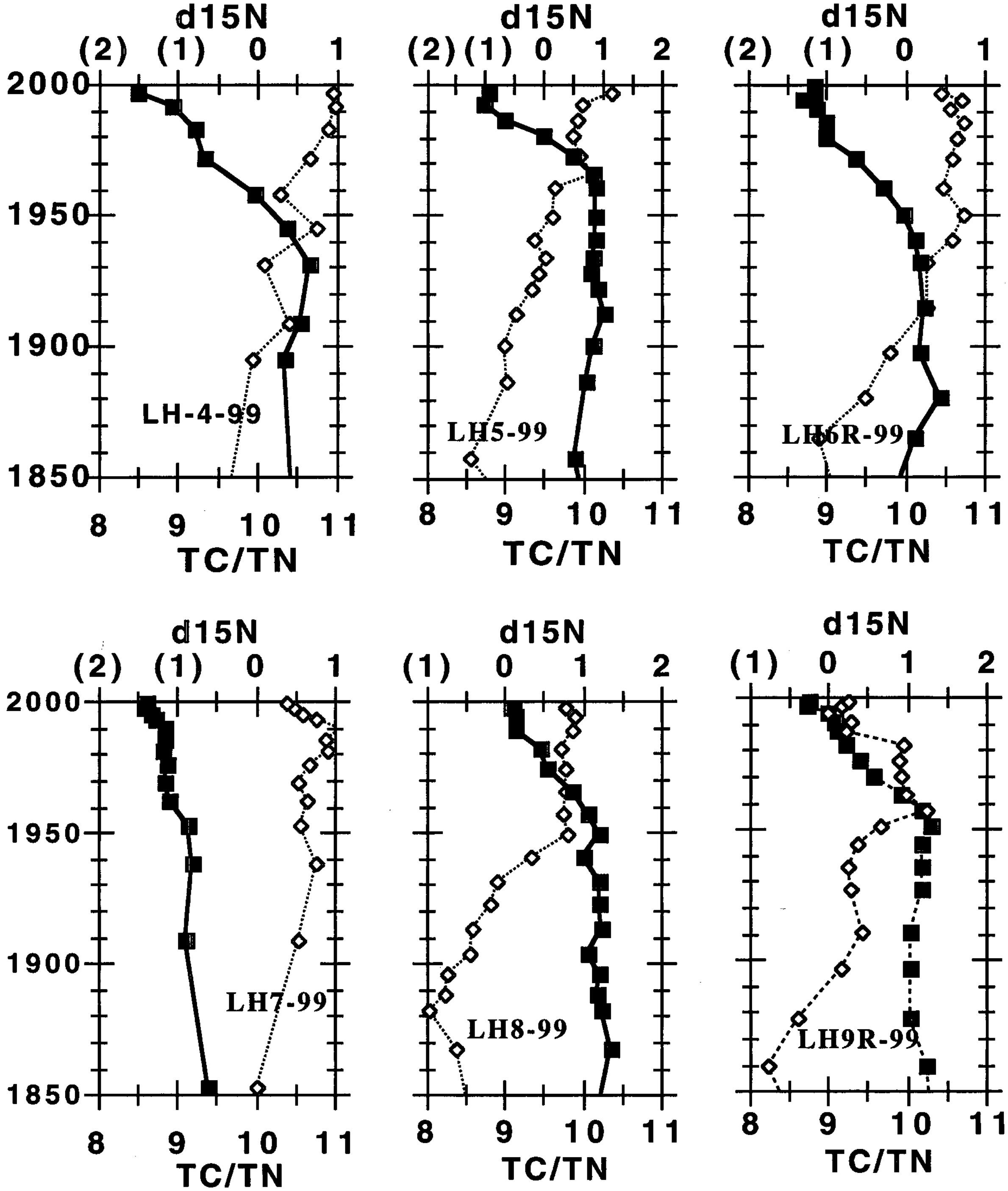


Figure 4.10. Total carbon (TC):total nitrogen (TN) weight ratio and stable nitrogen isotopic ratio ($\delta^{15}N$) vs. date for Lake Harris cores. Keys to symbols: solid squares are TC/TN weight ratio and open diamonds are stable nitrogen isotopic ratio ($\delta^{15}N$).

exception of LH9R-99 extends to the top of the core. The range in $\delta^{15}N$ for these four cores is relatively large compared to LH4-99 and LH7-99, ranging from -1 to 1 ‰. Two cores, LH7-99 and LH9R-99, also show lighter $\delta^{15}N$ in near-surface sediments deposited after approximately 1990.

Nutrient Accumulation Rates

The highest MSR was found in the surface sediments of LH7-99 (Appendix E). Rates ranged from 44 to 61 mg cm^{-2} yr^{-1} in the upper 12 cm of this core. Also, high rates ranged from 36 to 42 mg cm^{-2} yr^{-1} and 25 to 34 mg cm^{-2} yr^{-1} in the upper 16 cm of LH9R-99 mg cm^{-2} yr^{-1} and LH6R-99, respectively. Rates in the upper 12 cm of the remaining cores were lower, ranging from13 to 29 mg cm^{-2} yr^{-1}. Core LH5-99 differed from the other cores in that MSR was largest in two subsurface peaks. Dates for these peaks in MSR were 1961 to 1973 (26 to 32 mg cm^{-2} yr^{-1}) and 1922 to 1941 (25 to 32 mg cm^{-2} yr^{-1}). Subsurface MSR peaks in cores LH6R-99 (1932-1950), LH8-99 (1882 to 1904), and LH9R-99 (1945 to 1970) were not greater than near-surface rates. These peaks in MSR may represent watershed disturbance; but, because the timing varies over stations in the lake (Fig. 2.1), they would represent different small-scale events.

Accumulation rates for CHEP were greater in LH7-99 and in LH9R-99 than in any of the other cores (Appendix E). Maximum rates ranging from 12 to 18 μg cm^{-2} yr^{-1} were found in the upper 20 and 24 cm of these cores. These high rates of accumulation occurred after the mid 1980s. In addition, rates were >3.7 μg cm^{-2} yr^{-1} to a depth of 32 and 44 cm in LH9R-99 and LH7-99, respectively. This period of high rates began in 1952 in LH7-99 and in 1970 in LH9R-99. In the other cores, rates of CHEP ranged from 2-10 μg cm^{-2} yr^{-1} to depths of 24 and 28 cm in LH8-99 and LH6R-99, respectively. These high rates began in the late 1960s with maximum rates in the 1990s. Rates were lower in LH4-99 (2 to 4 μg cm^{-2} yr^{-1}) and LH5-99 (3 to 9 μg cm^{-2} yr^{-1}) and restricted to shallower depths, 12 and 16 cm, respectively. Periods of high rates in these cores began in the 1980s. Unexpectedly, rates of CHEP accumulation were relatively high in one of the low sedimentation cores, LH3R-99. In this core, the rate ranged from 2 to 8 μg cm^{-2} yr^{-1} in the upper 16 cm with the largest rates in the 1980s and 1990s. This high rate may reflect transitional phosphorus sedimentation at a non-depositional site (Schelske 1997).

Diatom Microfossils

Aulacoseira ambigua (Gr.) Sim. and *Aulacoseira italica* (Ehr.) Sim. are dominant throughout Lake Harris core LH5-99 (Appendix F). *A. ambigua* represents about 20% of the diatom assemblages throughout the core whereas *A. italica* averages about 30% of the assemblages. Both of these taxa are found generally in eutrophic conditions. *Synedra filiformis* var. *exilis* Cl-Eul., which indicates mesotrophic to eutrophic conditions, increases from 3% in the 44-cm sample to >20% above the 12-cm level.

Between the 80-cm and 44-cm levels in core LH5-99, the percentage of eutrophic diatoms increases while the percentage of mesotrophic individuals decreases (Table 4.1). This suggests a period of slightly higher primarily productivity in the lake during this period. Above the 44-cm level, mesotrophic and eutrophic percentages of diatoms return to what they were below the 80-cm level.

Inferred limnetic total P concentrations for core LH5-99 differ between the LGTROPH1 and the WACALIB models (Table 4.2). WACALIB-derived inferences indicate that limnetic total P has been rather constant over time and has averaged approximately 47 μg/L total P, which is also the value for the top sample. The LGTROPH1 model indicates that limnetic total P was >100 μg/L in the interval between 40 and 56 cm, which is significantly higher than the 53 μg/L total P inference for the top sample. The LGTROPH1 model, therefore, suggests that limnetic total P concentrations were somewhat higher in Lake Harris during the 1920s and 1930s than they are at present (Fig. 4.11).

Aulacoseira italica also dominates throughout Lake Harris core LH8-99 (Appendix F) and is generally greater than 30% of the assemblages. *Aulacoseira ambigua* is less abundant in core LH8-99 than in core LH5-99, however, and it averages about 10% of the assemblages. *Staurosira construens* Ehr. and *Staurosira construens* var. *venter* (Gr.) W.&R. are much more abundant in core LH8-99 than in core LH5-99. These taxa are tychoplanktonic and they indicate eutrophic and mesotrophic-eutrophic conditions, respectively. *S. construens* var. *venter* ranges between 12 and 24% of the assemblages between the 20-cm and 68-cm levels.

Table 4.1. Trophic-state preferences of diatoms in samples from Lake Harris core LH5-99.

Depth in core (cm)	Hyper- eutrophic unknown (%)	Eutrophic (%)	Meso- trophic (%)	Oligo- trophic (%)	Ultraoligo- trophic (%)	(%)
0-4	1.27	71.95	19.44	7.15	0.00	0.18
8-12	1.28	72.66	20.23	5.41	0.00	0.42
16-20	2.19	79.92	13.04	4.83	0.00	0.01
28-32	2.78	71.20	15.63	9.77	0.00	0.61
40-44	3.44	84.10	7.21	5.07	0.00	0.18
52-56	1.96	83.93	7.62	6.10	0.00	0.40
64-68	0.62	84.02	7.72	7.63	0.00	0.01
76-80	1.43	82.44	7.92	8.01	0.00	0.20
88-92	1.54	79.23	11.96	6.87	0.00	0.40
100-104	3.39	74.55	12.12	9.54	0.00	0.39

Table 4.2. Inferred limnetic total P with 95% confidence intervals for the inferences for samples from Lake Harris core LH5-99.

	LGTROPH1 inferred total P			WACALIB
Depth Interval (cm)	Inferred total P (μg/L)	Lower bound of 95% c.i. (μg/L)	Upper bound of 95% c.i. (μg/L)	Inferred total P (μg/L)
0-4	53	43	67	47
8-12	56	45	70	46
16-20	81	61	106	49
28-32	55	44	69	38
40-44	116	84	160	50
52-56	102	75	138	49
64-68	89	67	118	51
76-80	86	65	114	51
88-92	74	57	97	46
100-104	65	51	82	39

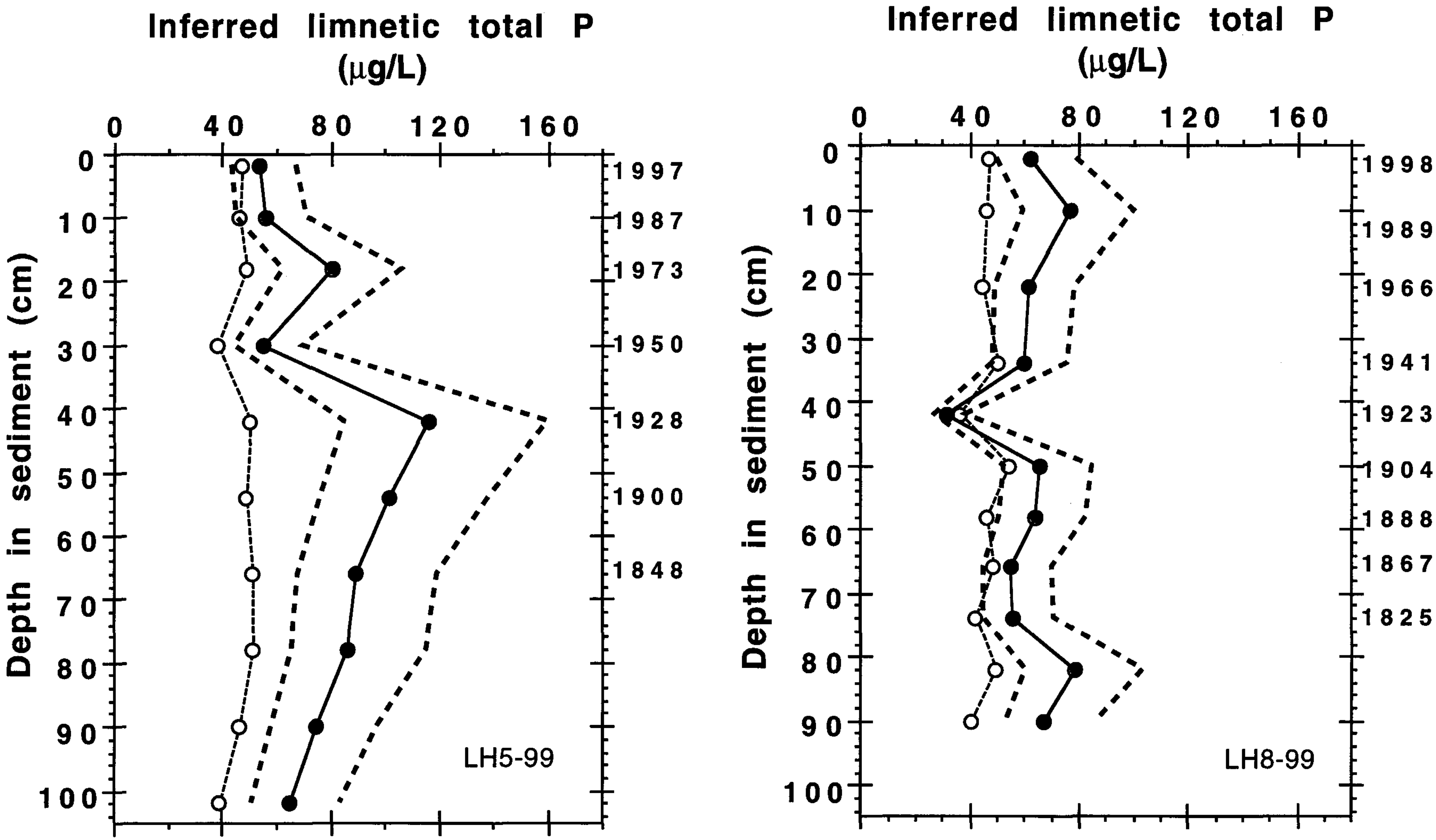


Figure 4.11. Limnetic total P inferences based on diatom assemblages in sediment cores LH5-99 and LH8-99. Closed circles represent inferences based on the LGTROPH1 model, and dashed lines represent 95% confidence intervals for those inferences. Open circles represent limnetic total P inferences based on the weighted-averaging calibration (WACALIB) model.

The percentage of taxa in each of the trophic-state preference categories is rather constant throughout core LH8-99 (Table 4.3). Eutrophic individuals generally represent >70% of the assemblages. Minor changes in preferences occur in the 44-cm sample in which mesotrophic individuals are somewhat more abundant and between the 20-cm and 36-cm levels when hypereutrophic individuals are more abundant than in other levels.

Limnetic total P inferences based on both predictive methods are remarkably constant throughout core LH8-99 (Table 4.4). The LGTROPH1-based inferences average 61 μg/L total P with an inference of 62 μg/L total P in the top sample, and the WACALIB-derived inferences average 46 μg/L total P with an inference of 47 μg/L total P for the top sample. Both methods indicate that limnetic total P concentrations have remained essentially constant in Lake Harris since prior to 1882 (Fig. 4.11).

Table 4.3. Trophic-state preferences of diatoms in samples from Lake Harris core LH8-99.

Depth in core (cm)	Hyper-eutrophic unknown (%)	Eutrophic (%)	Meso-trophic (%)	Oligo-trophic (%)	Ultraoligo-trophic (%)	(%)
0-4	4.22	71.53	16.39	6.94	0.00	0.93
8-12	4.58	77.84	12.54	3.86	0.58	0.59
20-24	11.19	63.42	19.26	5.54	0.19	0.40
32-36	10.21	61.31	19.68	5.87	0.00	2.92
40-44	1.47	55.09	27.88	13.42	0.19	1.95
48-52	4.89	71.40	17.61	4.97	0.00	1.14
56-60	2.61	74.36	13.96	6.96	0.19	1.92
64-68	2.74	71.56	16.80	8.89	0.00	0.01
72-76	2.39	72.63	14.47	9.32	0.20	0.99
80-84	8.91	71.10	14.83	4.76	0.00	0.39
88-92	4.94	73.80	13.14	7.33	0.19	0.40

Table 4.4. Inferred limnetic total P with 95% confidence intervals for the inferences for samples from Lake Harris core LH8-99.

	LGTROPH1 inferred total P			WACALIB
Depth Interval (cm)	Inferred total P (μg/L)	Lower bound of 95% c.i. (μg/L)	Upper bound of 95% c.i. (μg/L)	Inferred total P (μg/L)
0-4	62	49	79	47
8-12	76	59	100	46
20-24	61	48	78	44
32-36	60	47	75	50
40-44	32	27	37	36
48-52	65	51	84	54
56-60	64	50	82	46
64-68	55	44	69	48
72-76	56	45	70	42
80-84	78	60	103	49
88-92	67	52	86	40

Chapter 5
Lake Beauclair

Lake Beauclair based on mean water column TP (0.235 mg/L) is more eutrophic than Lake Apopka (mean TP of 0.203 mg/L), but mean TN is greater in Lake Apopka (5.12 mg/L) than in Lake Beauclair (4.21 mg/L) (Fig. 1.2). Both lakes are clearly hypereutrophic based on either measurement. Anthropogenic nutrient enrichment of both lakes, therefore, has been greater than in the other lakes in the Harris Chain.

Paleolimnologic analysis of Lake Beauclair cores was complicated by an unexpected and unusual profile of excess ^{210}Pb activity for LB1-99. Because total ^{210}Pb activity in the deepest sample (132 cm) was greater than supported ^{210}Pb activity inferred from ^{226}Ra activity (Appendix D), an overlap core was retrieved to sample sediments at deeper depths (54-206 cm). This overlap core, as shown by data presented in this section, replicated the overlap portions of the profile. The overlap core, however, could not be used for its intended purpose, i.e., to obtain the missing portion of the excess ^{210}Pb profile. Low levels of excess ^{210}Pb activity (2-8 dpm/g) were found even though samples were counted to a depth of 194 cm in this core (Appendix D). Such a long record of low excess ^{210}Pb activity confounds the model used to calculate sediment ages. Therefore, only LB2-99 was dated with the ^{210}Pb CRS model. The datable record for this core extended back to 1895 at 88 cm and 1834 at 100 cm (Appendix D).

In the presentation of results, data from LB1-99 and LB1-00 (the overlap core) collected at Station LB1 will be presented. These overlapping data points can be used to evaluate the reproducibility of sampling and measurement for two independent sets of data.

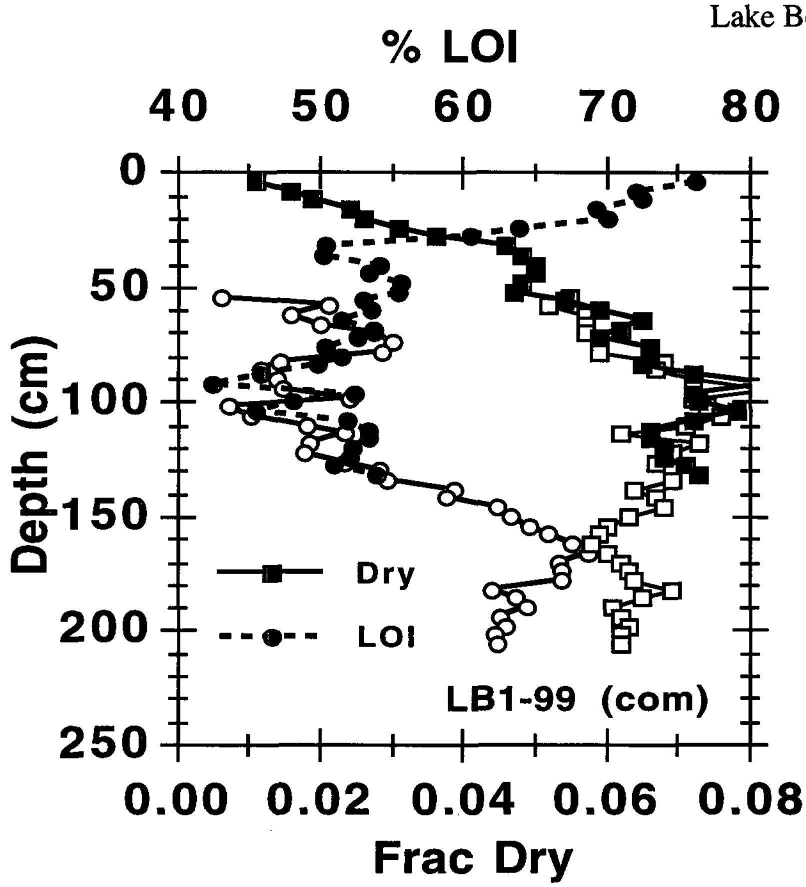
Physical Characteristics

Sedimentary characteristics of Lake Beauclair can be illustrated with descriptive statistics from LB1-99 and LB2-99 (Appendix C). Data for the overlap core LB-00 are included in the descriptive statistics for some variables. These data may bias the descriptive statistics because similar data are not available for other lakes. In addition, modern sediments (those that can be aged with ^{210}Pb dating) comprise a higher proportion of the Lake Beauclair samples compared to the other lakes (Appendix D). Mean LOI and TP are 59 % and 1.00 mg/g, respectively. Mean TP is several fold larger compared to other lakes sampled (Appendix C), an interesting statistic because TP in the Lake Beauclair samples ranges from 0.17 to 2.45 mg/g. These data indicate that TP is relatively high in many of the samples. Another indication of TP enrichment is the relatively large mean and maximum CHEP (0.23 and 0.85 mg/g, respectively) compared to other lakes (Appendix C). The range in $\delta^{13}C$ is nearly 10‰, essentially the same as in the other lakes sampled. The pattern with depth, however, is enrichment upcore in Lake Beauclair rather than being depleted as it is in the other lakes (Appendix B). If enrichment in $\delta^{13}C$ is a proxy for primary productivity (Schelske and Hodell 1991), the large range in Lake Beauclair indicates a large increase in lacustrine productivity. By contrast, the mean TC/TN ratio is similar to that for Lake Yale, but lower than the other lakes.

Similar stratigraphic features in LOI and fraction dry weight were found at the top of both cores (Fig. 5.1). In general, LOI was largest at the surface (76 to 78%) and then decreased with depth to a zone of minimum values (generally <50%). The zone extended from 32 to 132 in LB1-99 and from 52 to 72 cm in LB2-99. Except for the 52-cm sample, this zone of minimum LOI in LB1-99 is replicated by samples from LB1-00. This 52-cm sample may have been contaminated with overlying sediment during sampling. By contrast, fraction dry weight increased from the surface through the zone of low LOI to a maximum at depths of 104 cm and 72 cm in LB1-99 and LB2-99, respectively. The maximum in LB1-99 (approximately 8%) was greater than that for LB2-99 (approximately 6%). On the basis of dates shown for LB2-99 (Appendix D), this zone of low LOI and high fraction dry weight may be attributed to import of mineral sediments beginning in 1887 when the Apopka-Beauclair canal was opened and lake level was lowered approximately 1.0 m (Schelske et al. 2000). The timing of decreased LOI in this zone coincides temporally with this event.

Chemical Characteristics

Largest values for TC and TN were generally found at the top and near the bottom for cores from both stations (Fig. 5.2). Maximum values for TC were approximately



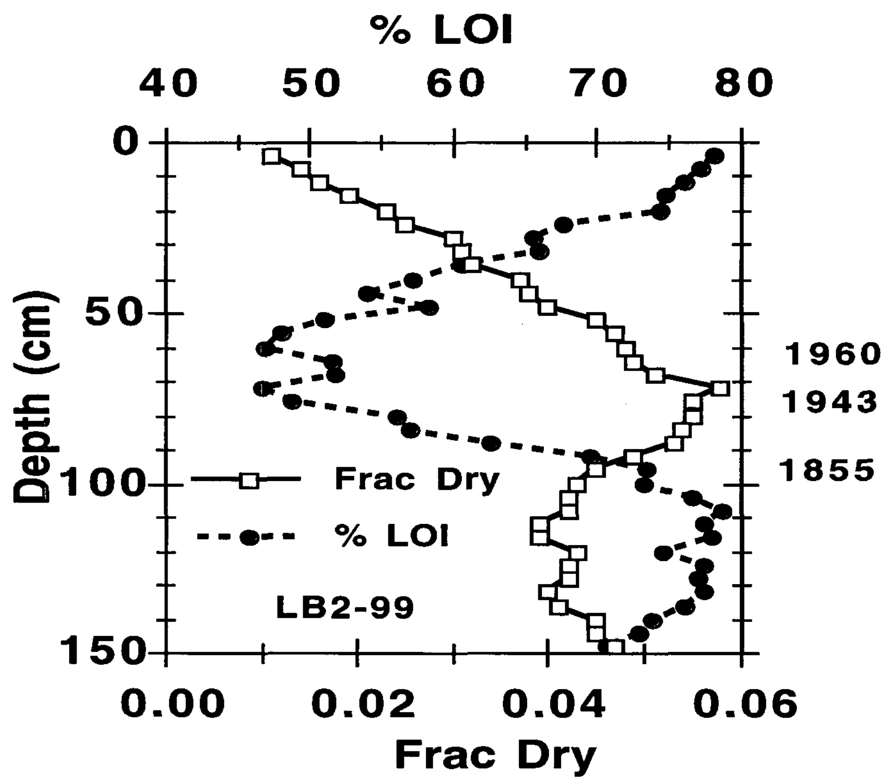


Figure 5.1. Loss on ignition (% LOI) and fraction dry weight (Frac Dry) vs. depth for Lake Beauclair cores. Keys to symbols: circles are % LOI and squares are Frac Dry. For the overlap cores at Station LB1, solid symbols are data for LB1-99 and open symbols are data for LB1-00.

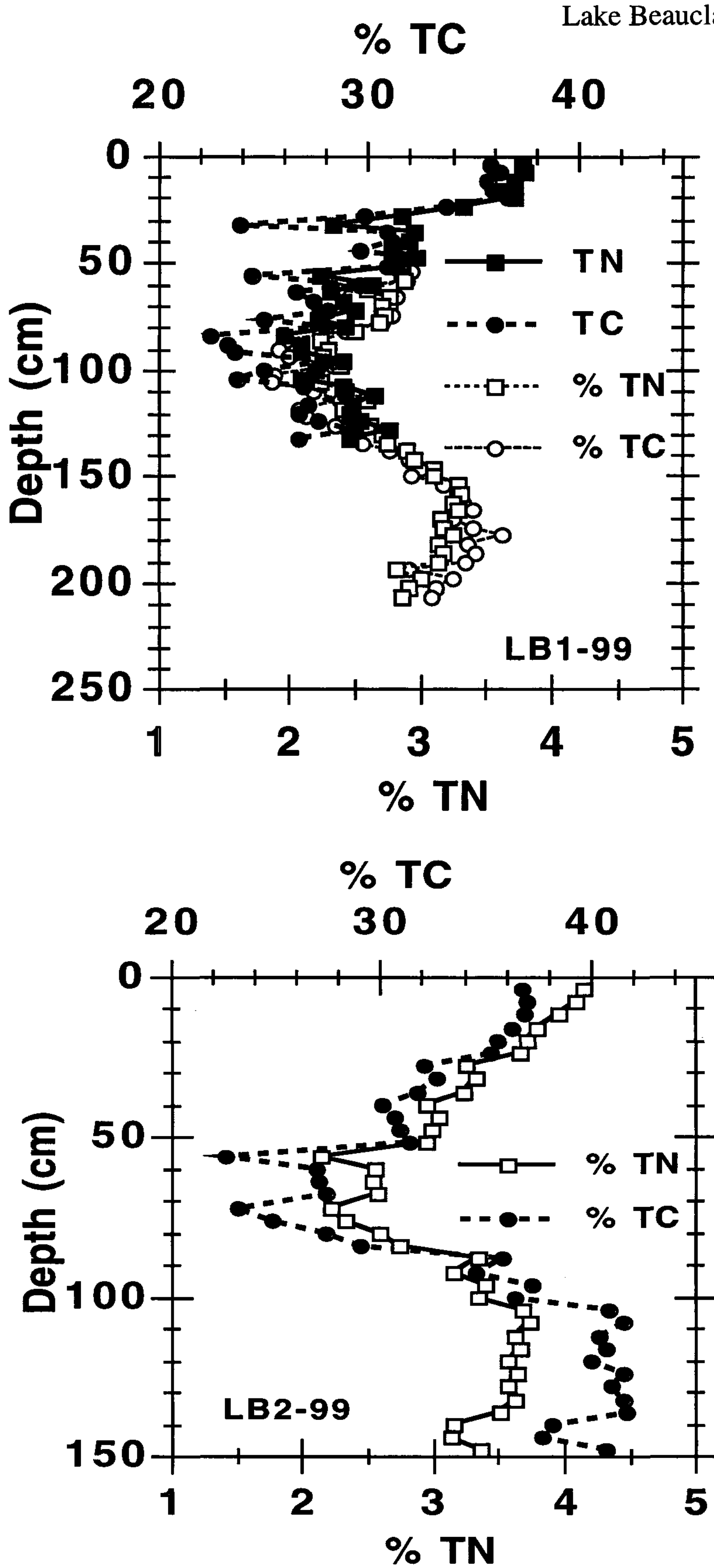
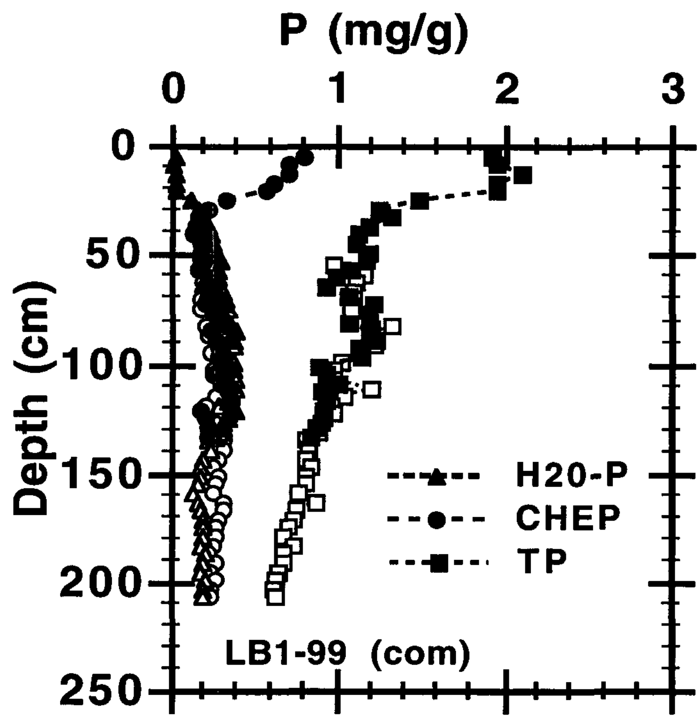


Figure 5.2. Percent total carbon (% TC) and percent total nitrogen (% TN) vs. depth for Lake Beauclair cores. Keys to symbols: circles are %TC and squares are %TN. See Fig. 5.1 for key to symbols for the overlap cores at Station LB1.

40% for sediments below 100 cm at LB2-99. For LB1, values for TC were approximately 36% at the surface and bottom of the overlay plots (LB1-99). Maximum values for TN (approximately 4%) occurred in near-surface sediments in both cores. Minimum values for TC and TN occurred in the zone of low LOI at both stations.

Profiles of TP and phosphorus fractions were similar in near-surface sediments (approximately 20 cm) for the two cores, but differed markedly at depth (Fig. 5.3). TP in the upper 20 cm was high in both cores, being about 0.5 mg/g greater in LB2-99. The patterns diverged below 20 cm—in LB1, TP decreased rapidly to <1.2 mg/g and was approximately 1.0 mg/g to approximately 100 cm. By contrast, the decrease in TP concentration was gradual down to 68 cm in LB2-99. Below this depth TP was <1.0 mg/g and decreased to a baseline concentration of approximately 0.2 mg/g at 100 cm. This baseline concentration was several fold less than the minimum concentration in LB1-00 (0.6 mg/g). Both cores are similar in that the upper 20 cm of sediments contain a large concentration of CHEP, being > 0.45 mg/g in both cores and representing as much as 41 and 34% of the TP in LB1-99 and LB2-99, respectively. These high fractions are indicative of surplus supplies of soluble reactive phosphorus for plant production and consequently historic development of excessive phosphorus enrichment in Lake Beauclair (Kenney et. al. 2001). A relatively small phosphorus enrichment can be inferred from CHEP over the entire record for LB1, an inference that is not supported by data from LB2-99. One hypothesis to explain this difference is that soluble reactive phosphorus supplied via the Apopka-Beauclair Canal is largely synthesized by algae near the inflow, an area represented by station LB1.

Profiles of TC/TN and $\delta^{13}C$ were similar for upper parts of both cores in most respects, but differed in that the TC/TN ratio was lower and $\delta^{13}C$ was greater in surface sediments of LB2-99 (Fig. 5.4). In LB1-99, TC/TN increased from 9.5 at the surface to 10.9 at 52 cm; and in LB2-99, TC/TN increased from 8.9 to 10.6 at 52 cm. Because TC/TN in near-bottom sediments was 12 and was greater than any value for LB1, the TC/TN record shows that older sediments were sampled at LB2-99 than in LB1-00. In both cores, $\delta^{13}C$ increases sharply from approximately -27 ‰ to -18 ‰. The increase



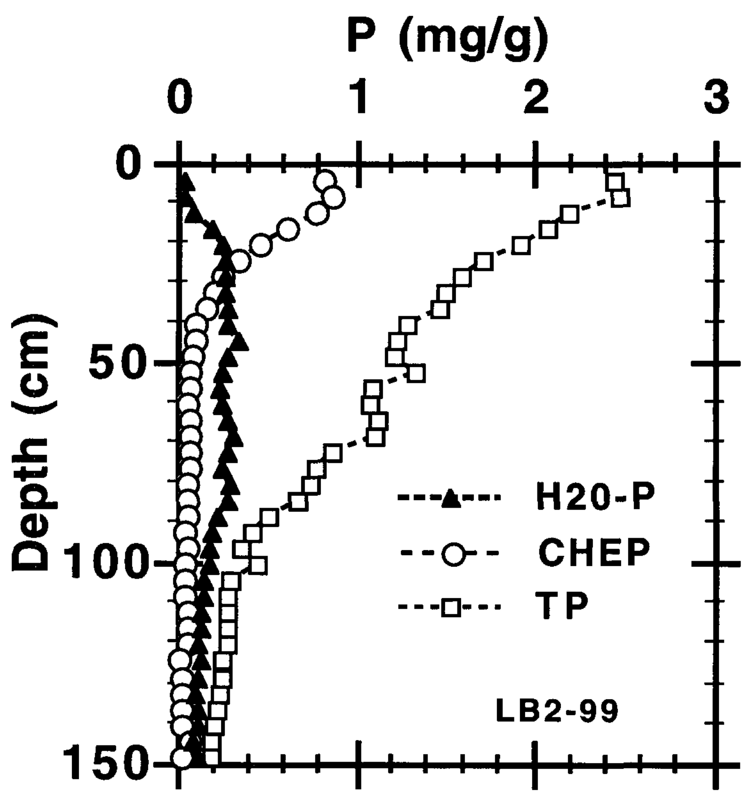


Figure 5.3. Phosphorus forms vs. depth for Lake Beauclair cores. Forms shown are water soluble P (H2O-P), hot-water extractable P (CHEP) and total P (TP). See Fig. 5.1 for key to symbols for the overlap cores at Station LB1.

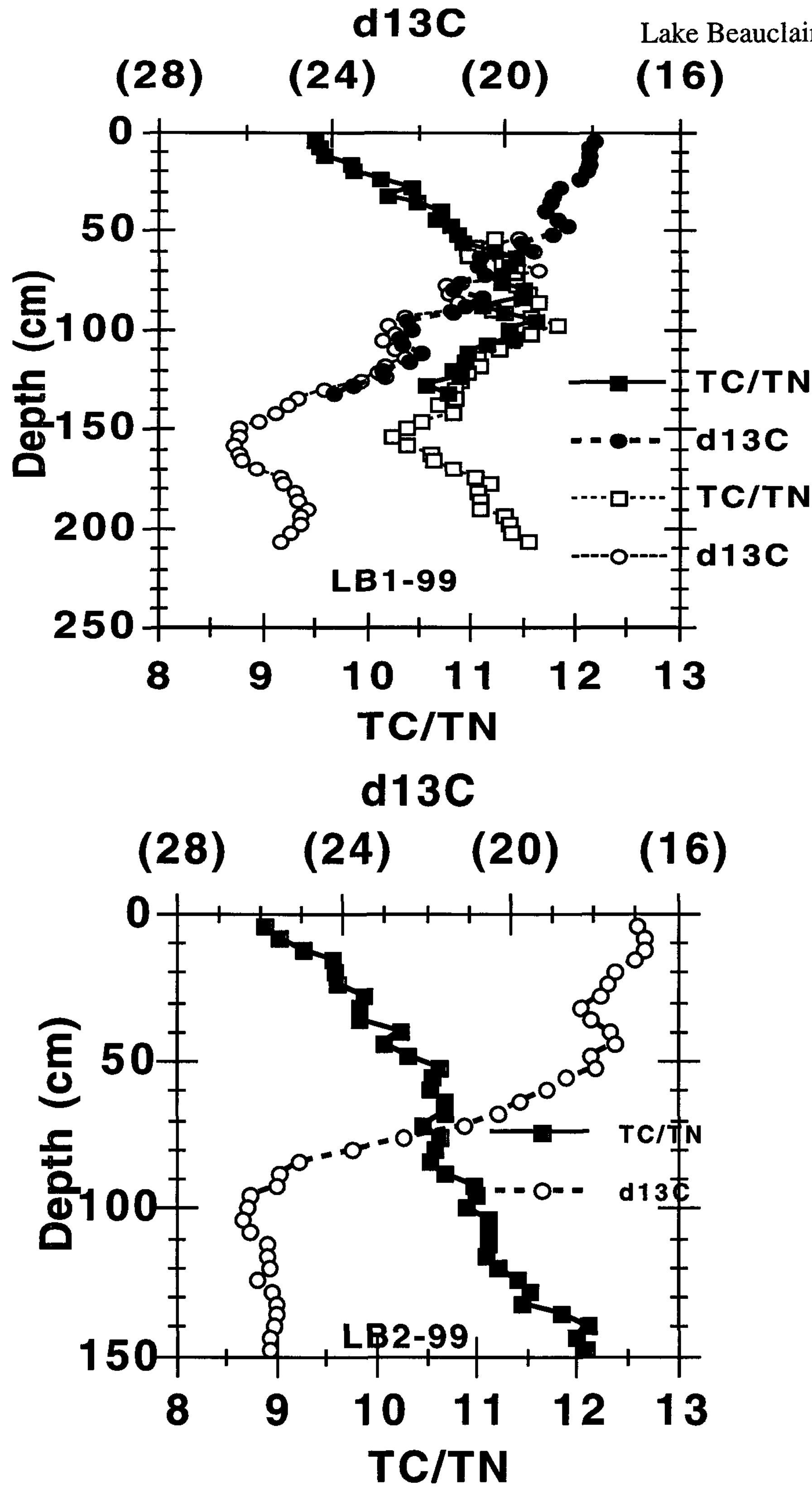


Figure 5.4. Total carbon (TC):total nitrogen (TN) weight ratio and stable carbon isotopic ratio ($\delta^{13}C$) vs. depth for Lake Beauclair cores. Keys to symbols: squares are TC/TN weight ratio and circles are stable carbon isotopic ratio ($\delta^{13}C$). See Fig. 5.1 for key to symbols for the overlap cores at Station LB1.

begins deeper at LB1-00, but the profile is relatively flat over the upper 50 cm in both cores. This large enrichment in $\delta^{13}C$ is greater than that attributed to increased lacustrine algal productivity, but this volumetric measure is magnified in the relatively shallow waters of Lake Beauclair (Schelske and Hodell 1991).

Profiles of TC/TN and $\delta^{15}N$ (Fig. 5.5) were plotted to gain insight about the unexpected $\delta^{13}C$ stratigraphic relationships. The stratigraphic pattern revealed a zone of light $\delta^{15}N$ below 92 cm that corresponded stratigraphically with light $\delta^{13}C$ in LB2-99 (Fig. 5.4). In this core, $\delta^{15}N$ increased upcore to a maximum at 76 cm whereas $\delta^{13}C$ increases upcore over a greater depth to a maximum at 52 cm. The $\delta^{15}N$ profile then decreases steadily from the maximum to a minimum value in the surface sample. Similar features also occur in the $\delta^{15}N$ profile of LB1 except the expanded temporal record does not contain the zone of light $\delta^{15}N$ at depth and that the expanded record also has a flat profile in the upper 16 cm. The $\delta^{15}N$ profile for LB2-99 also shows a sharp break except it is below 20 cm. Modeled ^{210}Pb dates for LB2-99 show that the age of the upper 16 cm is only 4 or 5 yr (Appendix D); therefore, it is not realistic to attempt to interpret this pattern. An increase in $\delta^{15}N$ may be attributed to an increase in lacustrine primary production whereas a decrease is an inference for increasing importance of nitrogen-fixing cyanobacteria (Gu et al. 1996a).

The stratigraphic profile of BSi in LB2-99 (Fig. 5.6) resembled that for $\delta^{15}N$ (Fig. 5.5). Both profiles for LB2-99 showed a low and relatively flat region below 96 cm and a sharp maximum at 72 cm. Above the maximum, the decrease in BSi was not as sharp as that for $\delta^{15}N$. Similar features are found in the expanded profile for LB1 as shown most noticeably by an expanded peak region (roughly 100 to 136 cm). It should be noted that DSi comprised a large fraction of BSi except at the bottom of both cores (Appendix B). This zone of high SSi relative to BSi encompasses the region below 100 cm in LB2-99.

In previous studies of other Ocklawaha lakes, NAIP (NaOH-P) was correlated with TP (Schelske 1997, 1998; Schelske et al. 1999a). This strong statistical relationship was also present in the data sets for Lake Beauclair (Fig. 5.7), but included samples with greater concentrations of NaOH-P than those sampled previously. The NaOH-P

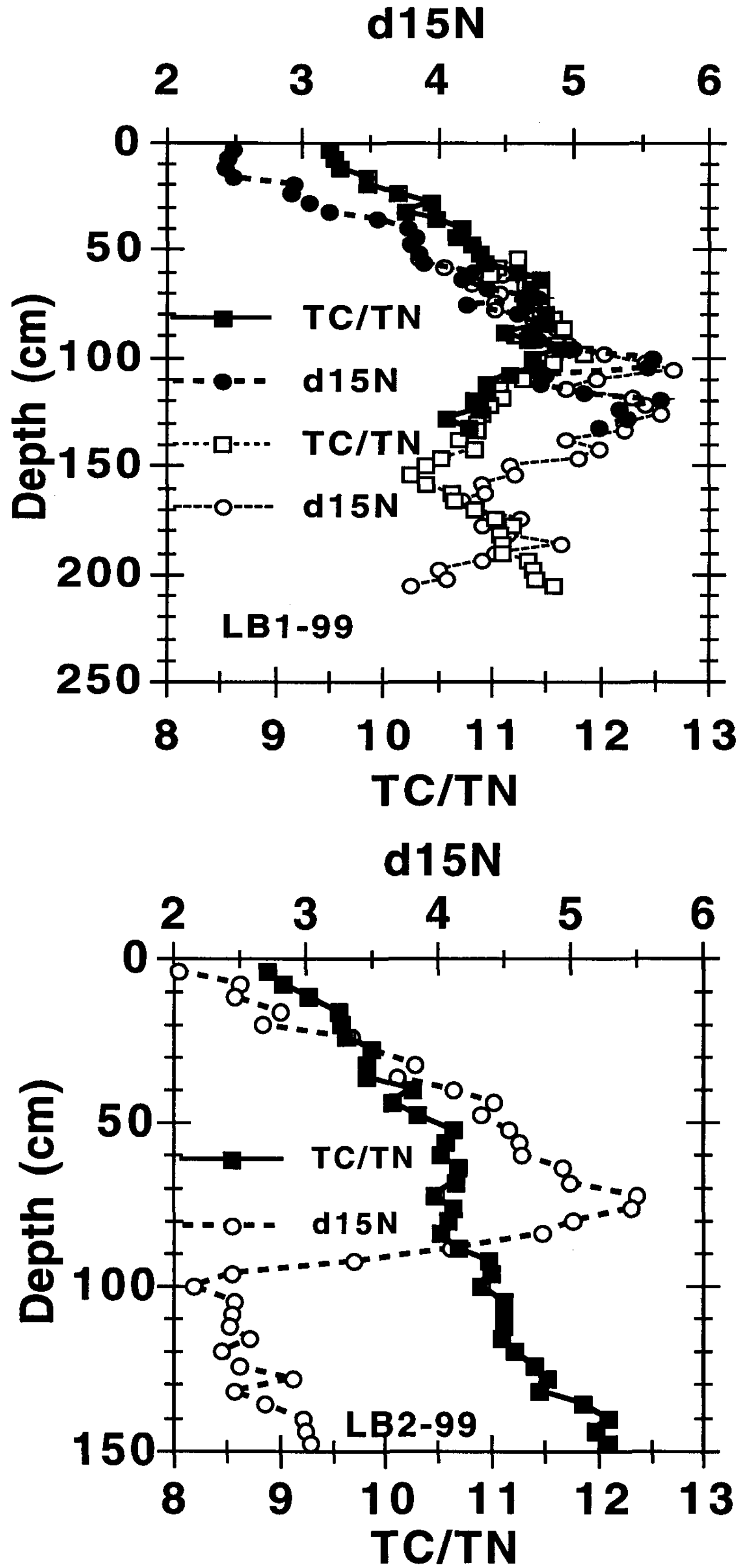


Figure 5.5. Total carbon (TC):total nitrogen (TN) weight ratio and stable nitrogen isotopic ratio ($\delta^{15}N$) vs. depth for Lake Beauclair cores. Keys to symbols: squares are TC/TN weight ratio and circles are stable nitrogen isotopic ratio ($\delta^{15}N$). See Fig. 5.1 for key to symbols for the overlap cores at Station LB1.

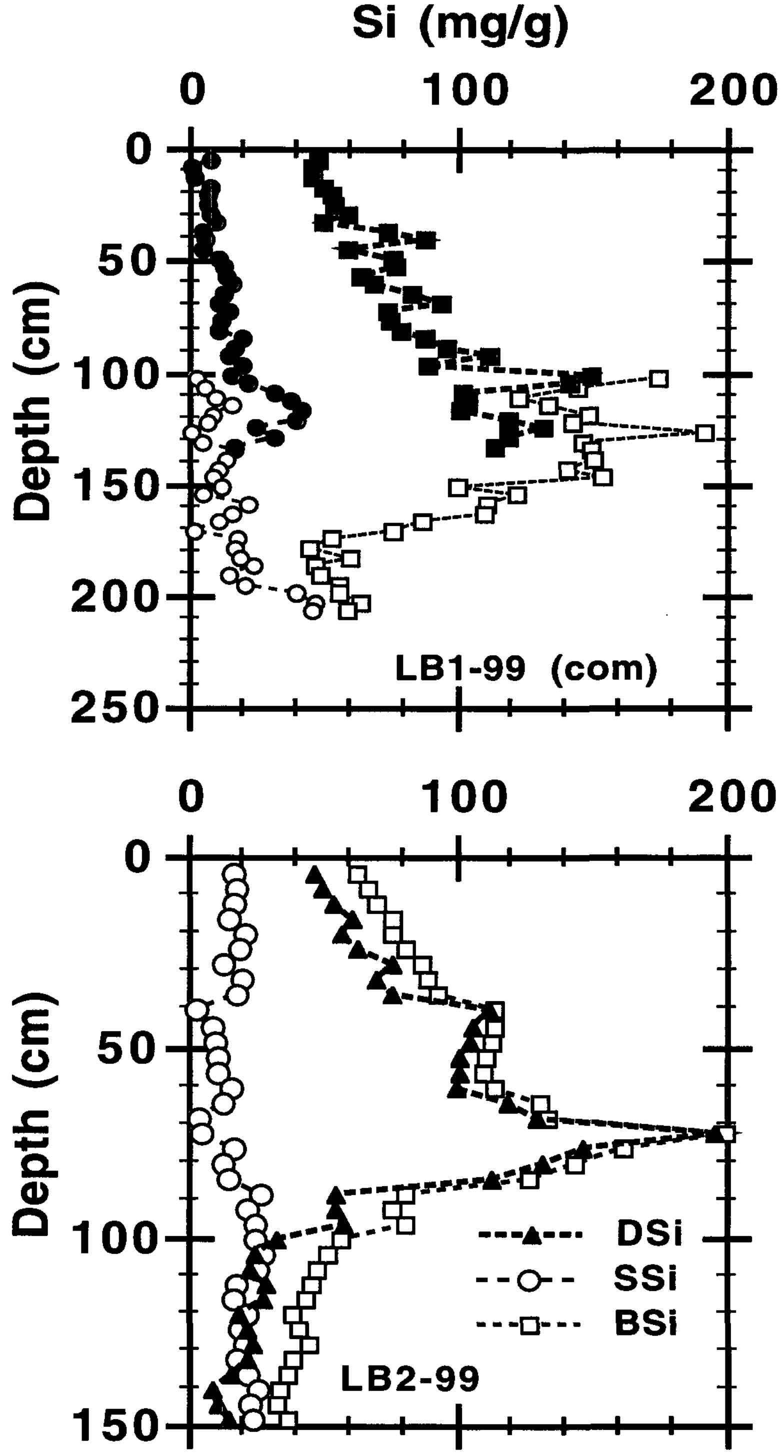


Figure 5.6. Biogenic silica forms vs. depth for Lake Beauclair cores. Forms shown are diatom biogenic silica (DSi), sponge biogenic silica (SSi) and biogenic silica (BSi) which is the sum of DSi and SSi. To simplify the plot, data for DSi are not graphed for LB1-99 (com). All data are presented in units of SiO_2. Keys to symbols: circles are SSi, squares are BSi and triangles are DSi. See Fig. 5.1 for key to symbols for the overlap cores at Station LB1.

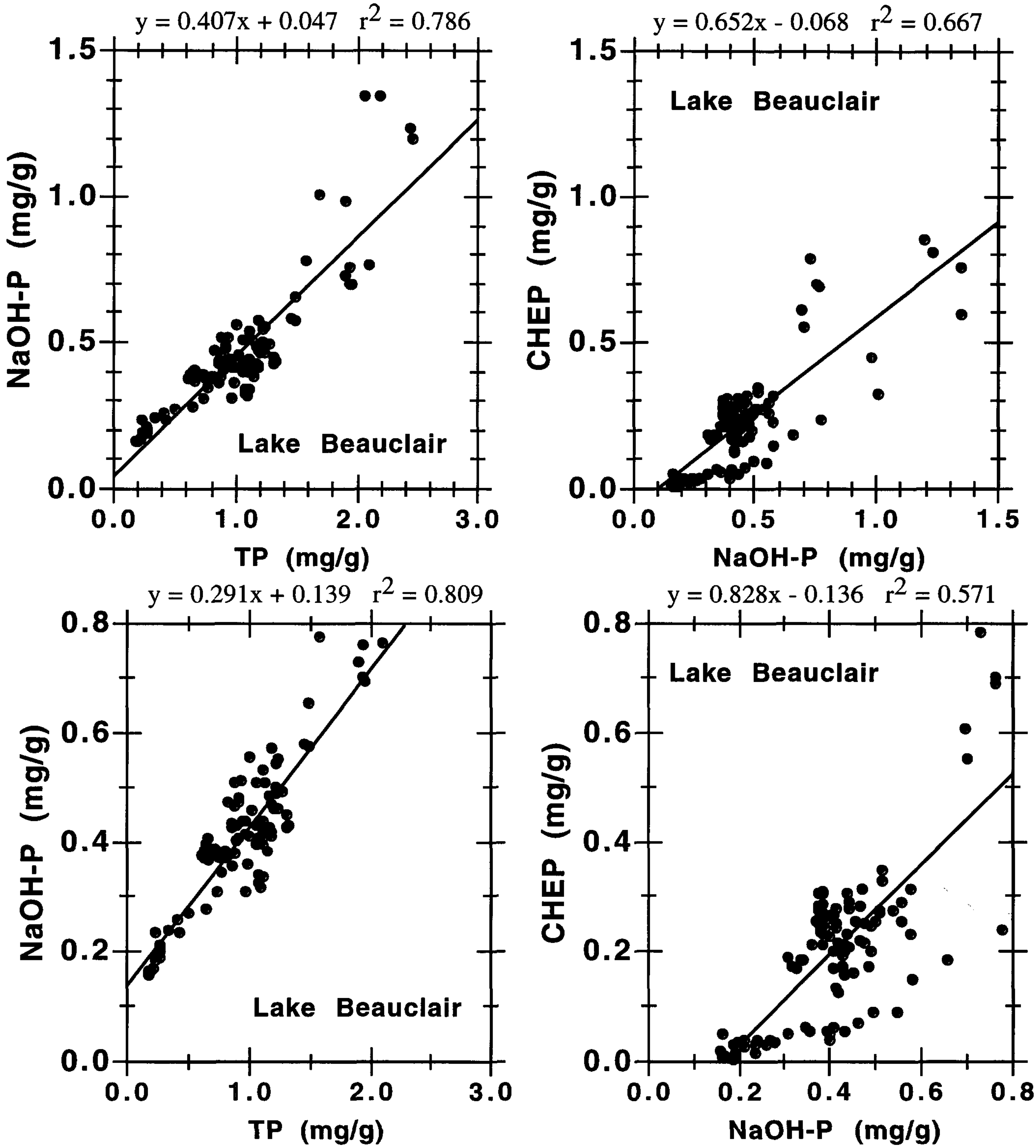


Figure 5.7. Correlation of sodium-hydroxide extractable P (NaOH-P) with total P (TP) and hot-water extractable P (CHEP) with sodium-hydroxide extractable P (NaOH-P) for all data for Lake Beauclair cores. Equations for least-squares linear regression are shown for both plots. Lower plots do not include data for upper 24 cm of LB2-99 which contain >0.8 mg/g NaOH-P.

concentration of six samples was unusually high, ranging from 1.0 to 1.3 mg/g. These samples represent the upper 24 cm of LB2-99 (Appendix B) so they appear not to be statistical outliers, but apparently represent a true change in NaOH-P sedimentation. Large CHEP concentrations compared to other lakes (Appendix C), also occur in the upper 24 cm of LB2-99 (Fig. 5.3). Without the six samples, the regression predicts that NaOH-P accounts for 29% of TP instead of 41% if the six are included. The regression equation without the six samples predicts CHEP represents 83% of NaOH-P in the lake.

Temporal Changes

Temporal changes in LOI and fraction dry weight are plotted to determine whether a record of upstream watershed disturbance is present in the sediment record. Two potential impacts are opening the Apopka-Beauclair Canal in 1887 and constructing levees along the north shore of Lake Apopka in the 1940s so marginal marshlands could be drained and used for agriculture. Changes in LOI (Fig. 5.1) can be related to both events due to increased input of non-volatile solids (NVS). By 1895 LOI had decreased from a baseline of 73% to 63% (Appendix B). This decrease continued until LOI was approximately 50% from 1936 to 1973. Increased sedimentation of NVS provides evidence of the impacts of these watershed disturbances (Appendix E).

Plots of phosphorus forms relative to date show that before 1900 TP concentrations averaged about 0.4 mg/g (Fig. 5.8), nearly twice as large as the baseline concentration (Fig. 5.3). After the opening of the Apopka-Beauclair canal, TP increased to 0.8 mg/g by 1943 and then increased to approximately 1.0 mg/g in 1949, presumably as a response to increase phosphorus supplies related to agricultural development. Beginning in the late 1970s, the TP concentration doubled to nearly 2.5 mg/g in the upper 8 cm of the core. These data can be used to infer that phosphorus loading to the lake increased before 1850 and that opening the Apopka-Beauclair Canal initially resulted in a moderate increase in phosphorus loading that was followed by larger increases in response to agricultural development on the north shore of Lake Apopka.

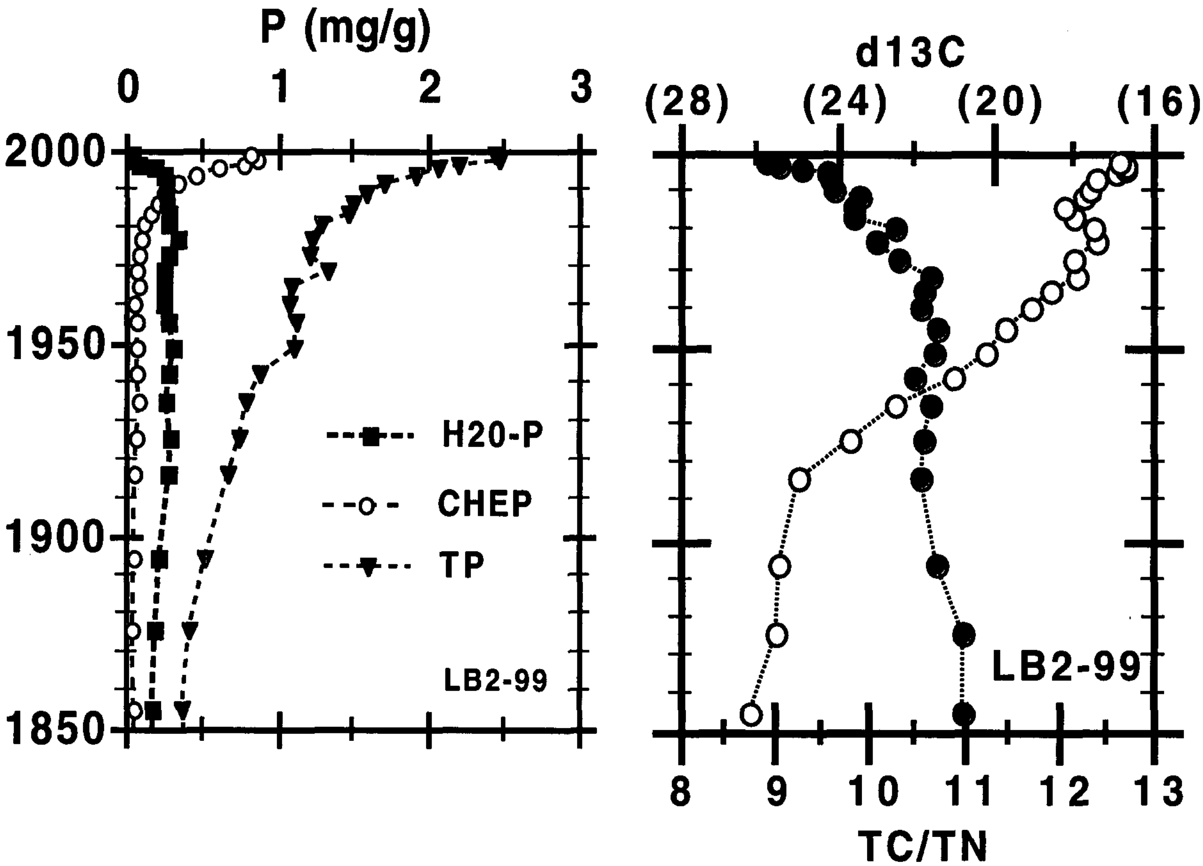


Figure 5.8. Phosphorus forms vs. date for Lake Beauclair cores. Forms shown are water soluble P (H2O-P), hot-water extractable P (CHEP) and total P (TP).

Figure 5.9. Total carbon (TC):total nitrogen (TN) weight ratio and stable carbon isotopic ratio ($\delta^{13}C$) vs. date for Lake Beauclair cores. Keys to symbols: solid circles are TC/TN weight ratio and open circles are stable carbon isotopic ratio ($\delta^{13}C$).

Large changes in CHEP concentrations (Fig. 5.8), which can be used to infer excessive phosphorus enrichment (Kenney et al. 2001), were restricted to the upper 24 cm of LB2-99. These sediments are loosely consolidated and, therefore, only represent sediments deposited in the 1990s. Lower CHEP concentrations below 24 cm indicate that relatively little phosphorus was sedimented as polyphosphate and that supplies of available P were low at LB2 (Kenney et al. 2001). It should be noted, however, that the CHEP record at station LB1 (Fig. 5.3) located closer to the outflow from the canal can be used to infer a longer period of moderate phosphorus enrichment.

Changes in TC/TN and $\delta^{13}C$ are plotted to show time dependence in LB2-99 (Fig. 5.9). Only a small change in TC/TN was found in most of the datable record. TC/TN decreased gradually from 11 in the early part of the record to 10.3 in the early 1970s and then decreased sharply to 9 in surface sediments. The results may indicate a shift to a greater contribution of phytoplankton to organic matter. However, LOI increases concurrently with the decrease in TC/TN ratio, also indicating that phytoplankton production increased.

Only a slight change in $\delta^{13}C$ occurred in the early part of LB2-99, but beginning in the 1920s $\delta^{13}C$ increased dramatically from -25 to -17.5 ‰ in the late 1970s (Fig. 5.9). A final sharp increase in the 1990s was preceded by a decrease in a few samples. The enrichment in $\delta^{13}C$, a proxy for increased lacustrine primary production (Schelske and Hodell 1991), shows that the largest increase during the 50-yr period of increase occurred after Lake Beauclair received diverted waters from Lake Apopka.

The time dependence of the peaks in $\delta^{15}N$ (Fig. 5.5) and BSi (Fig. 5.6) are shown in changes in TC/TN and $\delta^{15}N$ are plotted to show time dependence (Figs. 5.10 and 5.11). Both of these peaks occurred in sediments deposited after 1940, indicating that both variables increased in response to changes in loading from the Apopka-Beauclair Canal, at about the time when levee construction began. Before the peak, $\delta^{15}N$ had increased steadily from 1850 and DSi had increased since 1895. Thus, the peaks in both variables mark reversals in long-term trends. A similar reversal was not recorded in other proxies investigated in our study.

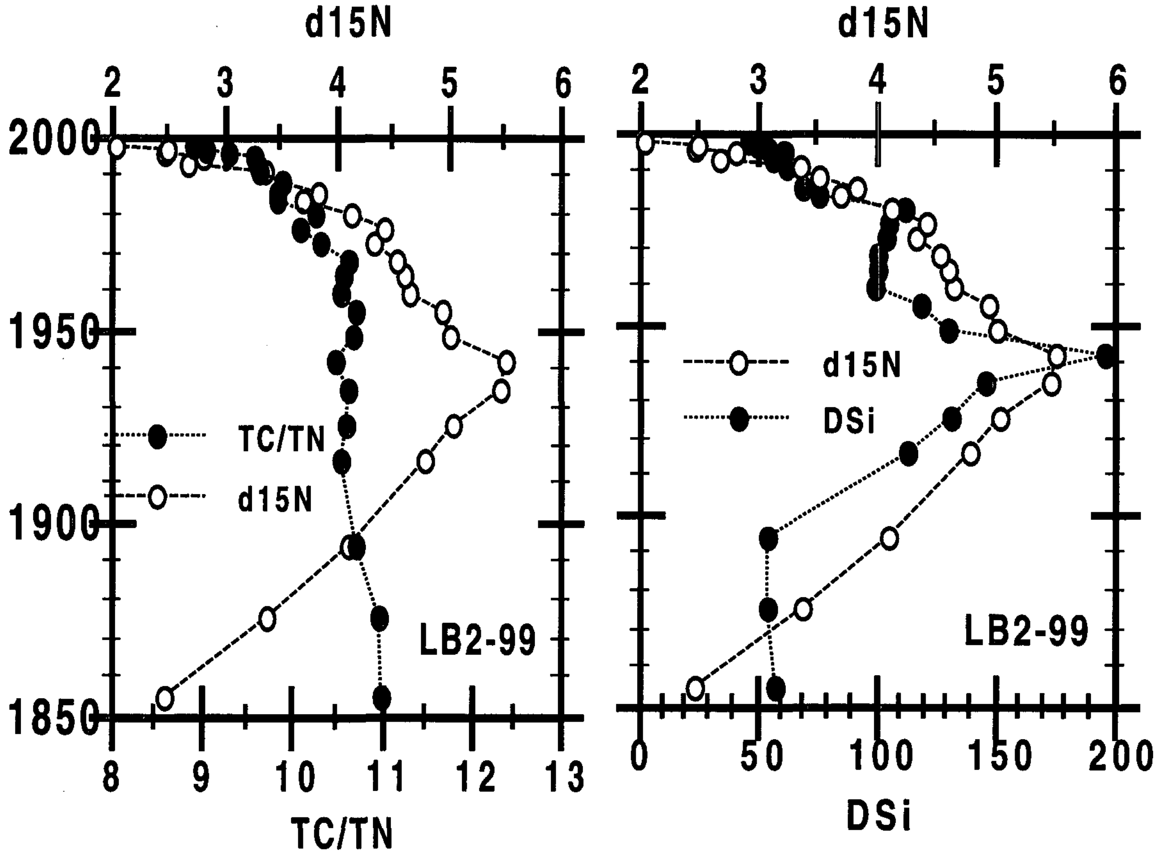


Figure 5.10. Total carbon (TC):total nitrogen (TN) weight ratio and stable nitrogen isotopic ratio ($\delta^{15}N$) vs. date for Lake Beauclair cores. Keys to symbols: solid circles are TC/TN weight ratio and open circles are stable nitrogen isotopic ratio ($\delta^{15}N$).

Figure 5.11. Stable nitrogen isotopic ratio ($\delta^{15}N$) and diatom biogenic silica (DSi) vs. date for Lake Beauclair cores. Keys to symbols: open circles are stable nitrogen isotopic ratio ($\delta^{15}N$) and solid circles are DSi in mg SiO_2/g.

Nutrient Accumulation Rates

In LB2-99, MSR increased generally upcore from approximately 10 mg cm^{-2} yr^{-1} in the late 1800s to an average of approximately 60 mg cm^{-2} yr^{-1} in the upper 16 cm of sediments, which were deposited after 1995 (Appendix E). It should be emphasized that high rates in these near-surface sediments represent a relatively short time span (approximately 5 yr) as well as a small quantity of dry mass (Appendix B). A doubling in rate after 1895 represents the largest relative increase in MSR. It should be pointed out that approximately half of the MSR from 1936 to 1973 is composed of NVS (Appendix E). As a result, the non-volatile solids accumulation rate (NVSAR) tripled between1895 and 1926 and increased about six fold from 1895 to a peak period in the 1960s. This period of high NSVAR is associated with a four-fold increase in MSR. This long period of increased NVS input is coincident temporally with opening the Apopka-Beauclair canal and lowering water levels in 1887 and the construction of the levees on the north shore of Lake Apopka in the 1940s. The increase in % LOI in recent sediments (Fig. 5.1) is not the result of decreased NVSAR, but to increased organic matter accumulation rate (OMAR). OMAR more than doubles after 1977 (Appendix E), but high rates in the upper few sections may be biased by a high proportion of labile organic carbon compounds that are undergoing diagenesis.

Given the long record of high NVS at LB1 that confounded ^{219}Pb-age models, it is somewhat surprising that a relatively small record of this event is present in LB2-99. This comparison indicates that the impact was greater at station (LB1) closer to the canal outflow from Lake Apopka.

By comparison with MSR, TPAR increased from approximately 5 μg cm^{-2} yr^{-1} in the late 1800s to an average of approximately 150 μg cm^{-2} yr^{-1} in the upper 16 cm of sediments or in the most recent 5 yr of the sediment record (Appendix E). This 30-fold increase in TPAR is much greater than the 6-fold increase in MSR. After 1949, TPAR increased more than 3 fold over the remainder of the record. In addition, the highest rates of CHEP accumulation coincide with the highest TPAR. It should be noted that the highest rates coincide with the upper 16 cm of the record in which LOI is >75% and NVS content is minimal (Appendix E). Labile organic carbon compounds that are being degraded by diagenetic processes may bias high LOI in the upper 16 cm. From 1989 to the top of the core, CHEP accumulation rate increased from 12 to 64 μg cm^{-2} yr^{-1} while TPAR only doubled; and from 1973 to the top of the core, CHEP accumulation rate increased from 2.8 to 64 μg/cm2/yr while TPAR increased from 46 to 192 μg cm^{-2} yr^{-1}. These comparisons show that CHEP accumulation increased more rapidly than TPAR accumulation, a pattern that can be used to infer increased availability of SRP that was stored as polyphosphate by algae in response to excessive phosphorus enrichment (Kenney et al. 2001).

Diatom Microfossils

Diatom assemblages in Lake Beauclair core LB2-99 show a distinct transition over time (Appendix F). *Aulacoseira italica* (Ehr.) Sim. and *Aulacoseira granulata* (Ehr.) Sim. are the two most abundant diatoms between the 100-cm and 80-cm levels. *A. granulata* is characteristic of mesotrophic to eutrophic conditions and *A. italica* is indicative of eutrophic conditions. Between the 72-cm and 44-cm levels, dominance shifts to *Fragilaria berolinensis* (Lemm.) Lange B. and *Pseudostaurosira brevistriata* (Gr.) W&R, which are indicative of hypereutrophic and eutrophic-hypereutrophic conditions, respectively. *P. brevistriata* represents 67% of the diatom assemblage in the 60-cm interval, but this species declines to about 20% of the assemblage at the top of the core. *Staurosira construens* var. *venter* (Gr.) W&R, which prefers mesotrophic to eutrophic conditions, becomes more abundant between the 24-cm and 16-cm levels as *P. brevistriata* declines. The eutrophic indicator *Aulacoseira ambigua* (Gr.) Sim. increases beginning at the 44-cm level to a maximum of 43% in the most recent sample.

Trophic-state preferences of individuals in the LB2-99 samples (Table 5.1) show that eutrophic taxa are most abundant in the base of the core to the 68-cm level. Hypereutrophic taxa increase in abundance between the 72-cm and 32-cm levels, but eutrophic taxa resume greater importance again above the 44-cm level.

Limnetic total P inferences based on diatoms in the LB2-99 core (Table 5.2) show a period of higher limnetic nutrient concentrations between the 60-cm and 44-cm levels, which ^{210}Pb dating indicates is approximately between 1960 and 1980 (Fig. 5.12).

Table 5.1. Trophic-state preferences of diatoms in samples from Lake Beauclair core LB2-99.

Depth in core (cm)	Hyper-eutrophic (%)	Eutrophic (%)	Meso-trophic (%)	Oligo-trophic (%)	Ultraoligo-trophic (%)	unknown (%)
0-4	16.33	69.32	8.69	4.60	0 .00	1.06
12-16	17.69	69.16	10.62	1.82	0 .00	0.71
20-24	19.76	63.57	11.72	4.75	0 .00	0.20
28-32	25.19	65.28	8.17	1.17	0 .00	0.19
40-44	44.68	45.93	7.13	1.93	0 .00	0.33
56-60	48.34	46.84	3.57	1.04	0 .00	0.20
68-72	26.93	56.55	14.27	2.25	0 .00	0.01
76-80	1.86	79.64	14.77	3.71	0 .00	0.01
84-88	5.52	59.00	24.68	8.61	0 .00	2.19
96-100	11.91	53.51	24.02	8.78	0 .00	1.77

Table 5.2. Inferred limnetic total P with 95% confidence intervals for the inferences for samples from Lake Beauclair, core LB2-99.

	LGTROPH1 inferred total P			WACALIB
Depth Interval (cm)	Inferred total P (ug/L)	Lower bound of 95% c.i. (ug/L)	Upper bound of 95% c.i. (ug/L)	Inferred total P (ug/L)
0-4	121	87	167	86
12-16	134	95	187	87
20-24	102	75	138	83
28-32	188	128	276	96
40-44	221	147	332	135
56-60	433	262	716	144
68-72	110	80	150	86
76-80	79	60	103	57
84-88	43	36	53	54
96-100	47	38	58	55

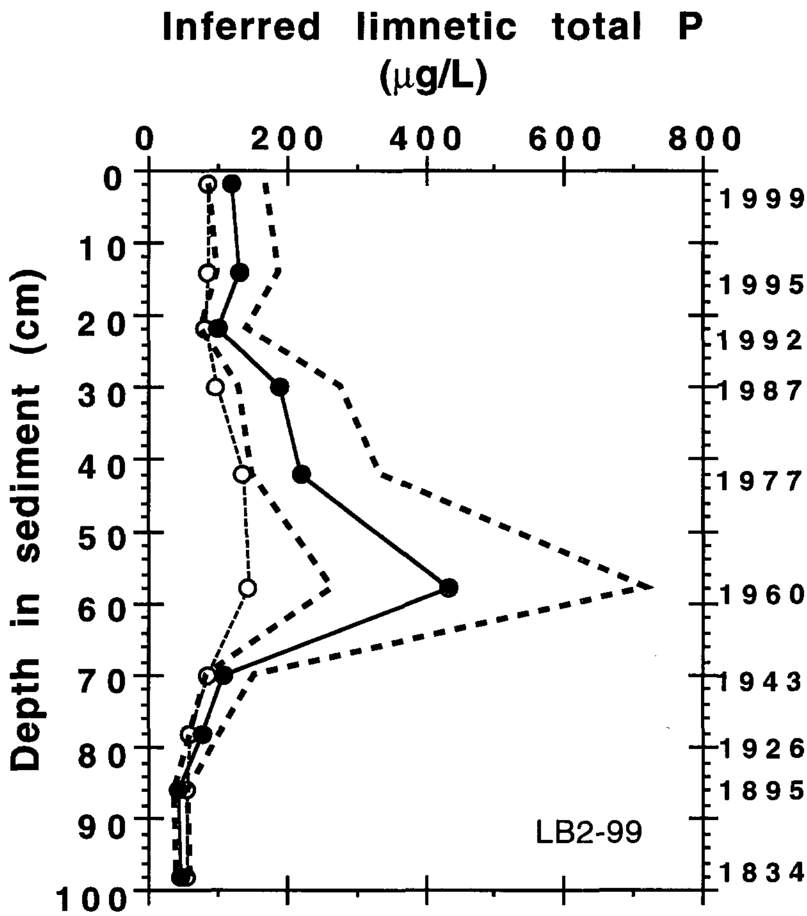


Figure 5.12. Limnetic total P inferences based on diatom assemblages in sediment cores LB2-99. Closed circles represent inferences based on the LGTROPH1 model, and dashed lines represent 95% confidence intervals for those inferences. Open circles represent limnetic total P inferences based on the weighted-averaging calibration (WACALIB) model.

Limnetic total P inferences above the 44-cm level are higher in general than inferences below the 60-cm level, indicating that the lake has undergone an increase in limnetic nutrient concentrations in recent decades as compared with c. 1900.

Limnetic total P inferences from the WACALIB model are similar to limnetic total P inferences from the LGTROPH1 model below the 72-cm level and above the 40-cm level (Fig. 5.12). LGTROPH1-based limnetic total P inferences, however, are significantly higher than those obtained from the WACALIB model between the 72- and 32-cm levels. The reason for this discrepancy relates to the structure of the LGTROPH1 model, which is weighted to give emphasis to hypereutrophic taxa that are often uncommon. For example, in the 60-cm interval of this core, *P. brevistriata* and *F. berolinensis* represent >81% of the assemblage, and the hypereutrophic classification of these taxa influences the LGTROPH1 model to produce inordinately high estimates of limnetic total P. WACALIB results show that *P. brevistriata* has optimum occurrence at a limnetic total P value of 127 μg/L among the 69 lakes used to construct the model. For the 60-cm sample in which *P. brevistriata* represents 67% of the assemblage, the WACALIB inference of 144 μg/L total P is more likely to be accurate than the LGTROPH1 inference of 433 μg/L total P (Table 5.2). Both models show, however, that limnetic total P inferences are distinctly higher in the 44- to 60-cm levels of the core.

Chapter 6
Discussion

Discussion of the Harris Chain of Lakes is presented in four parts: within-lake comparisons, present trophic state, historic changes in trophic state, inferences from diatom microfossils and primary producer community shifts.

Within-Lake Comparisons

Within-lake comparisons of paleolimnological results are possible because at least two coring stations were established in each of the study lakes. The importance of replicate stations can be shown by comparison of replicate cores that were collected in all of the study lakes. Multiple coring stations are important in paleolimnological studies because sediments are not deposited uniformly over the lake basin (Whitmore et al. 1996, Schelske 1997). Instead sediment focusing in lakes produces depositional, transitional and non-depositional zones over the lake basin. By definition, most of the soft sediments are deposited in depositional zones or basins. This phenomenon has been documented in Lake Apopka using grids of stations (Reddy and Graetz 1991, Schelske 1997). Areal differences among stations in the Harris Chain of Lakes can be shown using data from two or more cores for each lake.

Pronounced signals of environmental change and disturbance resulting from construction of the Apopka-Beauclair Canal are recorded in the sediments of Lake Beauclair. Construction of the canal was completed in 1887, lowering water level about 1.0 m in Lake Apopka and creating a new outflow for Lake Apopka. Paleolimnological signals that can be linked to this event were recorded in both cores collected in Lake Beauclair even though one core could not be aged with ^{210}Pb. The two coring sites were selected to sample the two basins in the lake (Fig. 2.5).

The two cores from Lake Beauclair differed markedly in the amount of sediment deposited since the construction of the Apopka-Beauclair Canal in 1887. The input of sediment from Lake Apopka to Station LB-1 (Fig. 2.5) was so large that sediments could not be aged with ^{210}Pb. This input was evident from the 80-cm record of sediment with relatively low excess ^{210}Pb activity at LB1-00, the overlap core (Appendix D). The most obvious signal of this sediment loading was an increase in NVS in both sediment cores that is shown by a decrease in LOI (Fig. 5.1). Because the core from LB-2 could be dated with ^{210}Pb, we could show that increased NVS input coincided with the opening of the Apopka-Beauclair Canal and that the input increased after muck farms on Lake Apopka were established in the 1940s (Appendix E).

We can conclude, based on the paleolimnological record from Lake Beauclair, that the outflow from Lake Apopka was a major factor in the eutrophication of Lake Beauclair. An historic record of increased P concentration was found in both sediment cores. In addition, a record of increased phosphorus loading is shown in the dated core (Appendix E). Increased phosphorus loading was evident by the early 1900s and accelerated after the establishment of the muck farms in the 1940s that later became the major source of phosphorus loading to Lake Apopka (Schelske et al. 2000). The potential effect of the outflow from Lake Apopka on water quality in downstream lakes is an issue for lake management and was an objective of earlier studies of the Harris Chain of Lakes (Brezonik et al. 1978).

Spatial differences in sedimentation also were found in the other study lakes. In Lake Yale, one site (LY2-99) was a marginal depositional site with only 24 cm of ^{210}Pb-dated sediments. By contrast, more than 60 cm of datable sediments were found at LY3-99, a high deposition site. Likewise, the sedimentation rate at one station in Lake Weir (LW3-99) reflected a higher deposition environment. Spatial differences in sedimentation were found also in Little Lake Harris and Lake Harris. Three of the nine cores (LH1-99, LH2R-99 and LH3R-99) were not depositional sites. These cores were all collected in Lake Harris (Fig. 2.1). No stations were established north of Station LH3 because little soft sediment is found in this part of the lake. These results indicate that sediments are being focused into Little Lake Harris and the southeastern part of Lake Harris. In addition, the highest sedimentation sites, LH7-99 and LH9R-99, are in Little Lake Harris. In fact, the sediment record for LH7-99 shows evidence of eutrophication earlier than any core and the highest rates of phosphorus loading in Little Lake Harris and Lake Harris. Possible explanations for this difference include morphological factors associated with the station location in the narrow constriction between lakes, effects of nutrient loading from adjacent shoreline sources, or some combination of both.

Present Trophic State

Several paleolimnologic proxies can be used to infer present trophic state from near-surface sediments and historic changes in trophic state from the remainder of the sediment record (Brenner et al. 1993, 1996). These proxies include chemical measurements such as TP concentration, CHEP concentration, diatom microfossils and BSi concentration and the TC:TN ratio of sedimentary organic matter. Changes in TP and CHEP concentration are used as proxies for anthropogenic phosphorus enrichment. In Florida lakes, an increase in CHEP is inferred to represent excessive phosphorus loading because algae store polyphosphate (CHEP) when phosphorus enrichment is greater than the amount required for algal growth. In Lake Apopka, for example, the importance of CHEP is shown as an increasing fraction of TP in recent sediments (Kenney et al. 2001).

Total phosphorus (TP) and other phosphorus fractions such as CHEP in sediments can be used to infer historic changes in phosphorus loading rates and, therefore, are used as proxies for anthropogenic phosphorus enrichment. The use of these proxies is based on the assumption that phosphorus sedimentation is proportional to water-column TP concentrations and that phosphorus mass is conserved below the zone of diagenesis. Such an assumption is usually implicit in models in which TP is estimated. In all the study lakes, as discussed below, TP and CHEP concentrations increase upcore to maximum concentrations in near-surface sediments.

The present trophic state of the study lakes can be ranked based on differences in TP concentration of near-surface sediments. Lake Weir and Lake Yale have the smallest concentrations and concentrations appear to be somewhat less in Lake Weir than in Lake Yale. Only a few near-surface samples in Lake Weir are greater than 1.0 mg/g whereas near-surface TP concentrations are >1.0 mg/g in all cores from Lake Yale. Near-surface TP concentrations in Lake Harris and Little Lake Harris are somewhat larger being >1.2 mg/g in all cores and also largest in the Little Lake Harris cores (LH7-99 and LH9R 99 in particular). By contrast, TP concentrations in near-surface sediments of both cores from Lake Beauclair are >2.0 mg/g, much greater than in any other cores from the study lakes. In fact, near-surface TP concentrations are >2.5 mg/g in LB2-99.

An increase in CHEP concentration among study lakes also can be used to infer differences in present trophic state. Near-surface CHEP concentrations in Lake Weir are generally <0.3 mg/g and in Lake Yale are generally <0.4 mg/g. Near-surface concentrations in Lake Harris and Little Lake Harris are generally greater, but only are greater than 0.4 mg/g in a few samples. By contrast, near-surface concentrations in both Lake Beauclair cores are 0.8 mg/g. For this parameter, differences are more dramatic than those for TP concentration in that the relative differences are greater among lakes.

Historic Changes in Trophic State

Data on concentrations of different forms of phosphorus alone are questionable in their use for paleolimnologic proxies of increased loading rate because the concentration may be affected by sedimentation rate. In the present study, TPAR data and other data on nutrient accumulation rates are available and can be used to show relative changes over time (Appendix E). Likewise, OMAR and BSiAR can be used as proxies for nutrient enrichment because OM production and sedimentation increase in response to increased nutrient supplies and an increase in BSi sedimentation, a proxy for DSi and SSi production, is dependent on nutrient supplies.

Changes in sedimentary nutrient concentration of TP or CHEP can be used to infer anthropogenic phosphorus enrichment and historic changes in phosphorus loading. Such inferences are based on the assumption that such changes reflect changes in phosphorus loading, an assumption that is valid only for the special case in which the sediment accumulation rate is relatively constant. Because mass sedimentation rate in lakes varies with time, data on accumulation rates of phosphorus are required for valid inferences related to historic phosphorus loading.

Nutrient Accumulation Rates

A large range in TPAR was found among the study lakes (Appendix E). Although rates varied within each lake, maxima in near-surface samples from Lake Weir were generally smaller than in Lake Yale, particularly if LY2-99 (a low sedimentation site) is excluded. This pattern persisted even though the near-surface MSR in LW3R-99 was the largest of the six cores from Lake Weir and Lake Yale. In Lake Harris-Little Lake Harris, TPAR also varied greatly among cores. Near-surface rates in Lake Harris-Little Lake Harris at Stations 3-5 were comparable to those in Lake Weir and Lake Yale (with the exception of LY3-99) and were equal to or greater than those at LY3-99 at Stations 6-9. TPAR at Stations 7 and 9 in Little Lake Harris were the largest, ranging from approximately 60 $\mu g\ cm^{-2}\ yr^{-1}$ to 50 $\mu g\ cm^{-2}\ yr^{-1}$ at LH7-99 and LH9R-99, respectively. By far the largest rates, however, were those for near-surface samples from LB2-99 where rates averaged approximately 150 $\mu g\ cm^{-2}\ yr^{-1}$. Inferences based on TPAR show that trophic state increased from Lake Weir to Lake Yale to Lake Harris to Little Lake Harris to Lake Beauclair. These data, however, may be biased by the high rates in near-surface samples.

Relative changes in CHEPAR among lakes were similar to those for TPAR (Appendix E). Near-surface rates in Lake Weir, with the exception of LW3R-99, were smaller than in Lake Yale with CHEPAR being greatest in LY3-99. Rates for Stations 3-5 in Lake Harris were comparable to those for Lake Yale with the highest rates being in Little Lake Harris at LH7-99 and LH9R-99. These high rates in the upper 20 cm ranged from 12 to 18 $\mu g\ cm^{-2}\ yr^{-1}$ but were much less than CHEPAR in LB2-99. Rates in the upper 40 cm of LB2-99 ranged from 5 to 64 $\mu g\ cm^{-2}\ yr^{-1}$. Thus these data show that Lake Beauclair is much more eutrophic than any of the study lakes and that two cores (LH7-99 and LH9R-99) in Little Lake Harris are more eutrophic than any of the remaining cores.

Historic increases in OMAR, a proxy for increased primary production resulting from nutrient enrichment, were found in some cores, but not in others. In Lake Weir, maximum rates were found in historic sediments deposited in the 1880s in LW2R-99 and LW3R-99 (Appendix E). One explanation for these 19th century pulses in OM sedimentation is allochthonous input (Crisman et al. 1992). Only LW2R-99 provides a clear record for an increase in OMAR that is indicative of 20th century nutrient enrichment. Two cores (LY1-99 and LY2-99) show increases in OMAR during the 20th century providing evidence of nutrient enrichment in Lake Yale, but maxima in OMAR for LY3-99 are found in sediments deposited in the 1880s. Thus, Lake Yale cores also provide evidence for increased allochthonous input in the 1880s and for nutrient enrichment in the 20th century.

Among the study lakes, OMAR in near-surface sediments was greatest in LH7-99 and LH9R-99, cores from Little Lake Harris and in LB2-99, a core from Lake Beauclair (Appendix E). Rates were as large as 30 mg cm^{-2} yr^{-1} in LH9R-99, 40 mg cm^{-2} yr^{-1} in LH7-99 and 50 mg cm^{-2} yr^{-1} in LB2-99, or two- to four-fold greater than rates in other cores from the study lakes. In these cores, near-surface rates increased at least four-fold relative to pre-1900 sediments (LH9R-99) and possibly more in LH7-99. The greatest relative increase (at least six fold) was found in LB2-99. Thus, two cores from Little Lake Harris and the only dated core from Lake Beauclair provide the strongest evidence for increased OMAR and inferred anthropogenic nutrient enrichment in the 20th century.

BSi concentration can be used as a proxy for nutrient enrichment because BSi production of diatoms or sponges is dependent on nutrient supplies. In our investigation, DSi and SSi, two components of BSi were measured. Of these two components, DSi can be proxy for nutrient enrichment because changes in production of either planktonic or benthic, epiphytic and periphytic diatoms are included in this component. Greater sedimentation of diatoms in response to nutrient-stimulated diatom production is one consequence of anthropogenic nutrient enrichment in lacustrine environments. Among the study lakes, however, DSiAR increased historically in only two cores, LH7-99 and LH9R-99 from Little Lake Harris (Appendix E). This trend was most pronounced by a five- or six-fold increase in DSiAR in LH7-99 during the 20th century.

Decadal Phosphorus Accumulation Rates

Close-interval sampling may bias TPAR in near-surface samples that have a relatively small mass and large TP concentration (Appendix B). These disproportionately high rates are so large that historic increases relative to baseline conditions are not consistent with the assumption that TPAR increases proportionately with phosphorus loading rate. Therefore, data were normalized for decadal intervals in recognition of this potential artifact. Data for sectional TPAR and decadal TPAR (Appendix E) can be used to quantify differences in the two calculations. To illustrate this effect, TPAR in the upper two sections of LB2-99 are 151 and 192 μg cm^{-2} yr^{-1} compared to the decadal rate of 108 μg cm^{-2} yr^{-1} (Fig. 6.1).

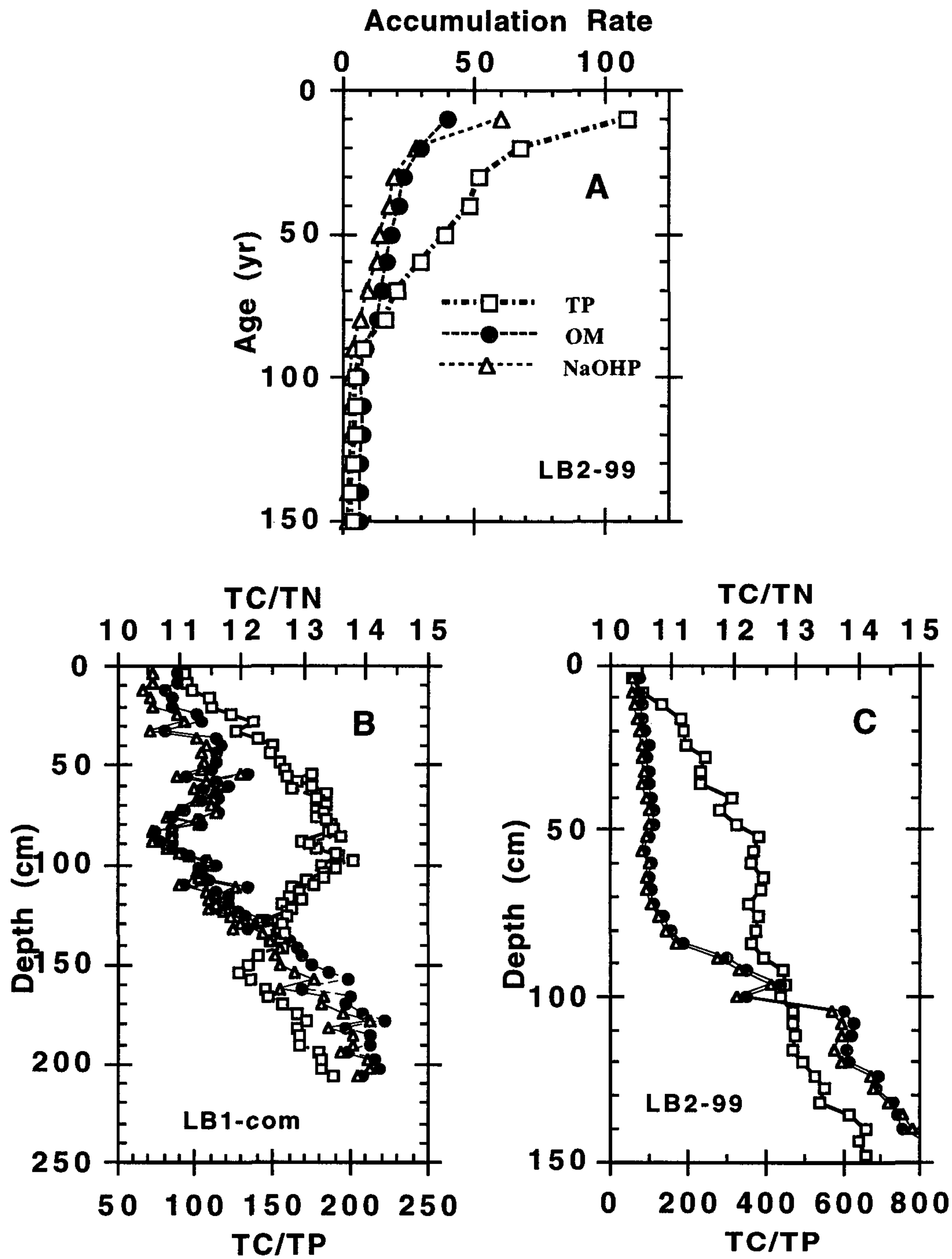


Figure 6.1. A. Nutrient accumulation rates for Lake Beauclair cores. Key to symbols: total phosphorus (TP), organic matter (OM) and sodium-hydroxide extractable phosphorus (NaOHP). Rates are in μg cm^{-2} yr^{-1} for TP and NaOHP and mg cm^{-2} yr^{-1} for OM. B and C. Nutrient ratios (atomic) plotted vs. depth. TN/TP ratios are multiplied by 10. Nutrients are total carbon (TC), total phosphorus (TP) and total nitrogen (TN). Key to symbols: open squares are TC/TN, open triangles are TC/TP and solid circles are TN/TP.

During the 20th century, increases in TPAR based on decadal changes in the most recent 10- or 20-yr decadal intervals were greater in Lake Yale than in Lake Weir (Fig. 6.2). Relative increases in the most recent 10-yr interval were >10 fold in LY1-99 and 8 or 9 fold in LY3-99. Relative increases for the 20-yr decadal interval were smaller, approximately 8 fold in LY1-99 and 6 or 7 fold in LY3-99. Large relative increases are also indicated in data for LY2-99, but the comparison is not warranted due to the relatively poor temporal resolution in this core. The relative increases in decadal TPAR for Lake Weir ranged from approximately 4 fold in LW1R-99 and LW2R-99 to approximately 6 fold in LW3R-99 for the most recent 10-yr interval. Relative increases were smaller for the 20-yr decadal interval, ranging from 2 or 3 fold in LW1R-99 and LW2R-99 to 5 fold in LW3R-99. Relative increases in decadal TPAR, although smaller than increases calculated section by section, are still greater than reasonable increases in historic phosphorus loading rates, particularly because the present mean TP is only 25 and 15 μg/L for Lake Yale and Lake Weir (Fulton 1995), respectively.

Phosphorus stored as polyphosphate represents excess supplies relative to phosphorus required for growth of phytoplankton (Kenney et al. 2001). Sedimentation of this phosphorus fraction measured as CHEP in the study lakes, therefore, confounds the simple assumption that phosphorus sedimentation is proportional to water column phosphorus concentration because CHEPAR increases with time (Appendix E). However, relative increases are still large when TPAR is reduced by CHEPAR. The adjusted relative increase is 6 fold in LY3-99 in both of the most recent 10-yr decades and ranges from 4 fold in LY1-99 in the 20-yr decadal interval to 9 fold in the most recent 10-yr period in LY1-99. Adjusted relative increases range from 3 fold in LW1R-99 and LW2R-99 to 5 fold in LW3R-99 in the most recent 10-yr period and from 2 fold in LW1R-99 and LW2R-99 to 5 fold in LW3R-99 in the 20-yr decadal interval.

During the 20th century, relative increases in decadal TPAR varied greatly among Lake Harris cores (Fig. 6.2). Relative increases in four of the cores (LH4-99, LH5-99, LH6R-99 and LH8-99) were comparable to those in Lake Weir, ranging from 2 to 4 fold in the 20-yr decadal interval to 3 to 6 fold in the most recent 10-yr interval. The largest

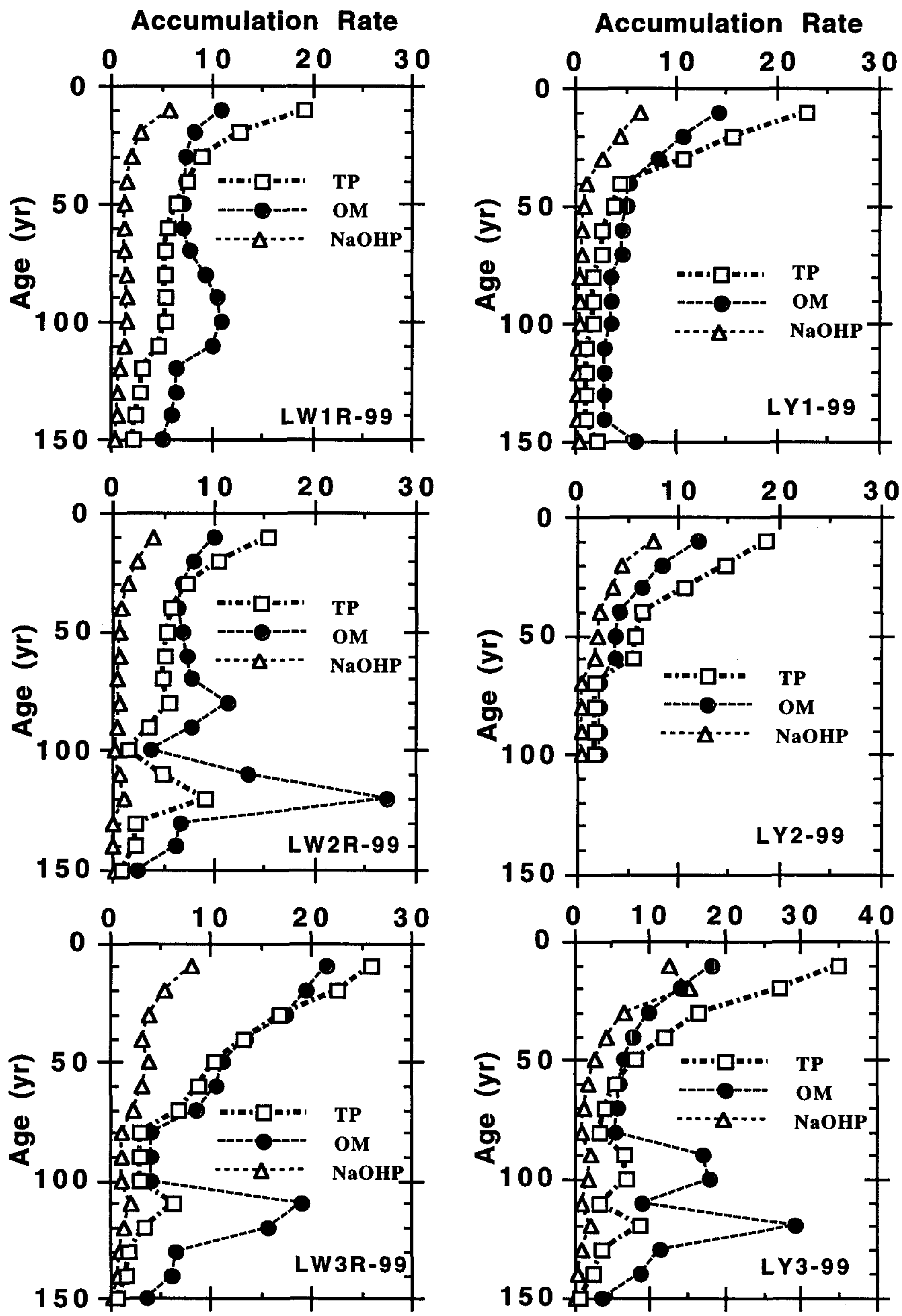


Figure 6. 2. Nutrient accumulation rates by decade for Lake Weir and Lake Yale cores. Key to symbols: total phosphorus (TP), organic matter (OM) and sodium-hydroxide extractable phosphorus (NaOHP). Rates are in $\mu g\ cm^{-2}\ yr^{-1}$ for TP and NaOHP and $mg\ cm^{-2}\ yr^{-1}$ for OM.

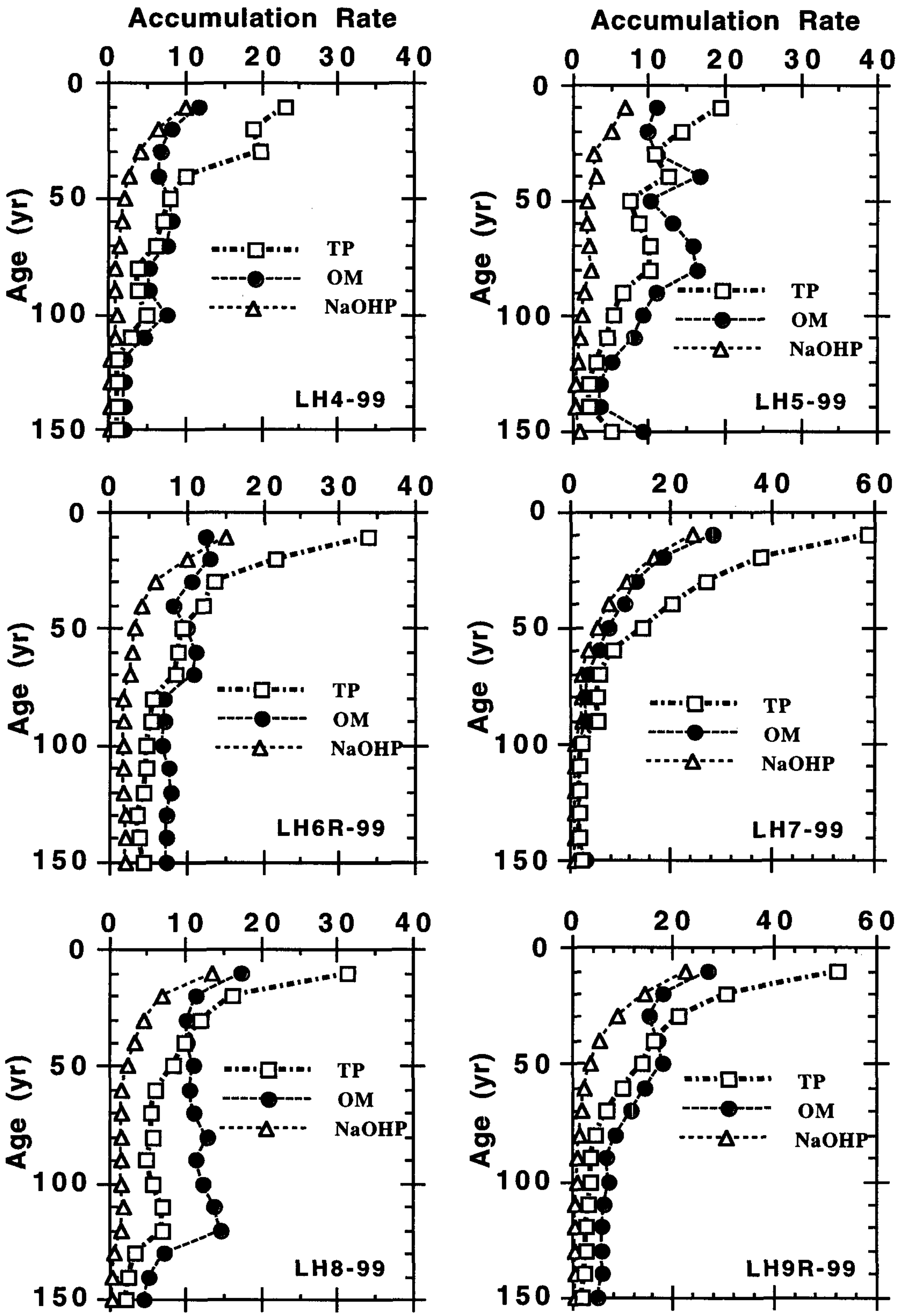


Figure 6.2 cont. Nutrient accumulation rates by decade for Lake Harris cores.

relative increases were found in LH7-99 and LH9R-99. These increases were > 10 and > 20 fold in the most recent 10-yr interval in LH9R-99 and LH7-99, respectively. These large increases could not be attributed to increased sedimentation of CHEP. Relative increases adjusted for the appropriate CHEPAR were still >20 fold in the most recent 10-yr interval for LH7-99 and 9 fold for LH9R-99 (see Appendix E). These relative increases in TP sedimentation also are greater than would be anticipated for a lake with a mean TP of 42 μg/L (Fulton 1995), if phosphorus sedimentation increased historically in proportion to phosphorus loading and water column TP concentration.

During the 20th century, large relative increases in decadal TPAR were also found in LB2-99 (Fig. 6.1), the dated core from Lake Beauclair. The relative increase in decadal TPAR in this core ranged from 12 fold in the 20-yr decadal interval to 20 fold in the most recent 10-yr period. Relative increases adjusted for CHEPAR ranged from 11 to 16 fold. Such large increases in TP sedimentation cannot be questioned solely on first principles for this lake with a mean TP of 235 μg/L (Fulton 1995).

Although not discussed, it can be seen that historic TP sedimentation in all of the cores increases disproportionately relative to OM sedimentation and that NaOH-P sedimentation increases proportionately to OM sedimentation in only two cores, LB2-99 and LH7-99 (Figs. 6.1 and 6.2). The relationship to NaOH sedimentation is interesting because this measurement represents bioavailable phosphorus in some sediments (Williams et al. 1976), but not in Lake Apopka sediments (Kenney et al. 2001). It should be noted that CHEP sedimentation is relatively large in these two cores (Appendix E). Therefore, the assumptions that TP sedimentation rate is a proxy for either lake-basin phosphorus loading or organic matter production and sedimentation in the Harris Chain of Lakes are not supported by paleolimnological data from the Harris Chain of Lakes. However, NaOH-P sedimentation rate was a proxy for organic matter sedimentation in a few cores.

Disproportionate Nutrient Accumulation Rates

Atomic ratios of TC/TP, TN/TP and TC/TN were plotted to determine the time course of relative change in major nutrient sedimentation in the Harris Chain of Lakes. Ratios plotted here are atomic ratios and not the mass ratios plotted earlier for the discussion of TC/TN as a proxy for primary producer composition. The Redfield ratio of 106:16:1 for C:N:P is commonly used as an index for the composition of phytoplankton-derived organic matter in aquatic systems (Redfield 1958), but is not characteristic of terrestrial systems due to structural carbohydrates in terrestrial plants (Elser et al. 2000). Data for TC and TN represent analyses of organic matter in sediments whereas the measurement of TP may include phosphorus in sedimentary components other than organic matter. The TC/TN ratio is a proxy for the relative importance of phytoplankton and macrophytes in the primary producer community. The TC/TN ratio of phytoplankton-derived organic matter is generally smaller than that for rooted macrophytes.

All of the study cores are characterized by upcore decreases in TC/TP and TN/TP ratios that are driven by the upcore increase in TP concentration and by upcore decreases in TC/TN ratio that signal increasing importance of phytoplankton (Fig. 6.3). In most cores, the TC/TP ratio is approximately 100 in near-surface sediments, or near the Redfield ratio. Notable exceptions are values of approximately 150 in the upper 36 cm of LW3R-99 and small ratios in several cores. Ratios <100 are found in the upper sediments of LH7-99 and LH9R-99. Much smaller ratios, < 75 in LB1-com and LB2-99, characterize the two cores from Lake Beauclair. Patterns for TN/TP ratios in the study cores are similar to those for TC/TP. Near-surface ratios in all cores are less than 16:1, the Redfield ratio, with the ratio in most cores being < 11. A TN/TP ratio smaller than the Redfield ratio would be expected in sedimentary organic matter because the nitrogenous component of organic compounds is generally more labile than other components of sedimentary organic matter. The upcore decrease in TC/TN ratio is generally represented by values of 14 to 15 at depth and by near-surface values ranging from 10 to 12. Exceptions to this pattern are the relatively invariant ratio of approximately 11 in LY3-99 that increases slightly with depth and the relatively small change in the ratio in LB1-com and LB2-99. In the Lake Beauclair cores, the ratio increases from approximately 11 in near-surface sediments to 13 at depth (Fig. 6.1).

Plots of nutrient ratios vs. depth show that historic TP sedimentation increases disproportionately relative to either TC or TN, the major nutrients that represent the

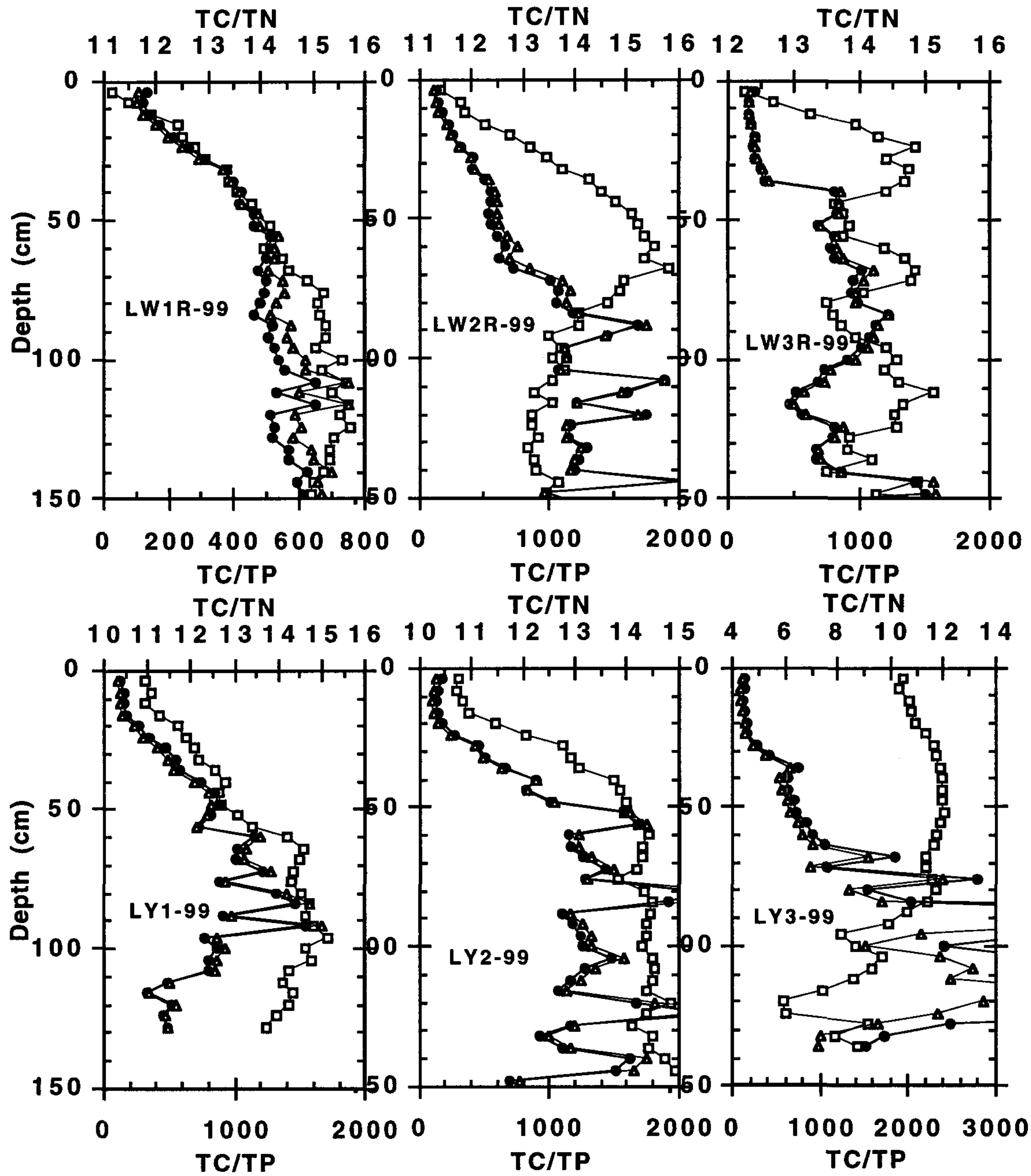


Figure 6.3. Nutrient ratios (atomic) plotted vs. depth for Lake Weir and Lake Yale cores. TN/TP ratios are multiplied by 10. Nutrients are total carbon (TC), total phosphorus (TP) and total nitrogen (TN). Key to symbols: open squares are TC/TN, open triangles are TC/TP and solid circles are TN/TP.

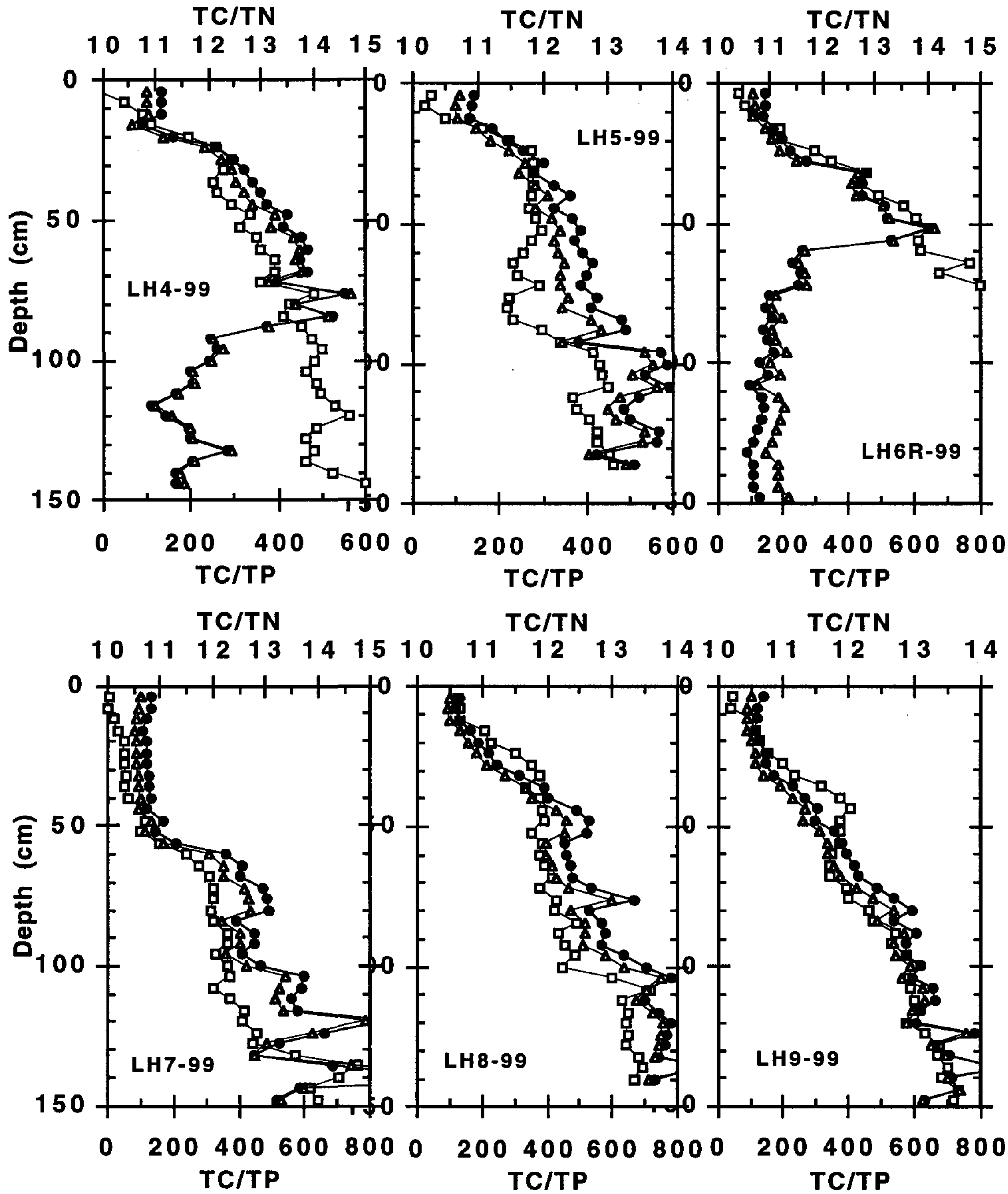


Figure 6. 3.cont. Nutrient ratios (atomic) plotted vs. depth for Lake Harris cores. TN/TP ratios are multiplied by 10.

major fraction of sedimentary organic matter. The historic disproportion in the Lake Beauclair cores is shown by relatively low TC/TP ratios (< 100) over most of the LB1-com profile and over most of the datable portion of LB2-99 compared to ratios of approximately 600 below 100 cm in LB2-99 (Fig. 6.1). By comparison, with the exception of LH7-99, TC/TP ratios <150 are found only in a relatively few near-surface samples in the remaining cores (Fig. 6.3). In addition, near-surface TC/TP ratios in the Lake Beauclair cores are < 75, much smaller than values in other cores. Ratios for TC/TP at depth in the Lake Harris cores range from 600 to 800, and ratios as large as 1,000 are found in Lake Weir and Lake Yale cores. No ready explanation can be given for large TC/TP ratios that exceed 600 to 800 except to note that these ratios are driven by relatively small TP concentrations (Appendix B). Ratios greater than 500 may reflect contributions of organic matter from terrestrial plants (Elser et al. 2000). The TC/TP ratio of suspended organic matter (seston) in a large sample of lakes is generally < 250 and rarely > 500 (Elser et al. 2000). The historic decrease in TC/TP in the upper part of the study cores also coincides with a general historic pattern of decreasing TC/TN ratios. These patterns show a historic shift toward increasing phytoplankton abundance that can be inferred from the TC/TN ratio that is coincident with a disproportionate increase in TP sedimentation. The small TC/TP ratio in Lake Beauclair sediments compared to the other lakes shows that in the study lakes the ratio decreases with nutrient enrichment.

Several hypotheses can be offered for historic increases in TP sedimentation that are disproportionately large relative to organic-matter proxies for nutrient enrichment of lakes that can be inferred from TC/TP and TN/TP ratios. First, TP represents an increasing proportion of sedimentary organic matter as phytoplankton or benthic algae increase in abundance and possibly replace macrophytes in the primary producer community. Second, algal species in the ecological succession induced by anthropogenic nutrient enrichment are those adapted to a smaller TC:TP stoichiometry than pristine algal populations. Thus, the algal community response to increased phosphorus loading is the selection of populations that produce organic matter increasingly enriched with phosphorus. Third, an increasing proportion of TP is sedimented as polyphosphate as lakes experience anthropogenic nutrient enrichment. Although sedimented CHEP (a chemical measure of polyphosphate) increases historically as a consequence of excessive phosphorus enrichment (Kenney et al. 2001), the proportion sedimented as CHEP is small relative to the disproportionate increase in TP sedimentation. Fourth, the presence of rooted aquatic macrophytes that are inferred from large TC/TN ratios in older sediments accentuates the disproportionately large increase in either TC/TP or TN/TP ratio in the study lakes. Macrophytes with a relatively large requirement for structural carbon and low turnover rates sequester relatively small quantities of phosphorus compared to phytoplankton. As a result, TC/TP ratios varied historically from 3 to 10 fold in the study cores with the largest ratios being inferred from macrophyte-derived sediments. Macrophytes, therefore, are similar to terrestrial plants (Elser et al. 2000) in that both produce organic matter that is a relatively poor source of phosphorus. The relatively large requirement by macrophytes for highly recalcitrant structural organic carbon and the relatively small requirement by pristine periphytic and benthic algal communities for phosphorus contribute to the large variation in ratios.

Even if the ecological significance of these patterns is questioned on theoretical grounds, the empirical patterns are significant for lake management. These empirical patterns confirm that the TC/TP ratio decreases coincidentally with the TC/TN ratio, but taken alone is not evidence that these decreases represent a major biological change in the system. Theoretical models predict that dominance in the primary producer community will shift from macrophytes to phytoplankton with nutrient enrichment (Scheffer et al. 1993, Moss et al. 1996). Such a shift has been confirmed using paleolimnological investigations of Lake Apopka (Schelske et al. 1999c, Kenney et al. in review). For the lake manager, these data show that the sedimentary response to phosphorus enrichment in lakes is increased TP sedimentation. The conclusion from this finding is that the sedimentary record overestimates the relative increase in TP loading because historic phosphorus sedimentation is not directly proportional, but possibly exponentially proportional to historic increases in water column TP. There is uncertainty in this finding in that the factors that control the non-linear function are uncertain and apparently vary from site to site. However, extrapolating data from a few cores in a given lake may enable lake managers to establish best and worst case scenarios for phosphorus reduction goals.

Inferences from Diatom Microfossils

Lake Weir

Cores WR1-99 and WR2-99 from Lake Weir show similar stratigraphic trends in inferred limnetic total P concentrations obtained with the TROPH1 model. In core WR1-99, inferred limnetic total P is 25 μg/L in the 80-cm interval, it declines to an average of approximately 18 μg/L between the 68- and 16-cm levels (pre-1852 to 1953), then it increases again to a value of 23 μg/L in the surface sample. In core WR2-99, inferred limnetic total P is 23 μg/L in the 52-cm interval, it declines to approximately 18 μg/L between the 44- and 20-cm levels (1884 to 1946), then it increases again to 22 μg/L in the surface sample. These inferences suggest that Lake Weir has averaged approximately 20 μg/L limnetic total P since c. 1850, and that the lake has been subject to periods of slightly higher limnetic P concentrations even prior to the time of significant European disturbance. WACALIB-based inferences are more erratic than TROPH1-based inferences in the Lake Weir cores. Limnetic total P inferences, such as these, which were derived using the WACALIB 2.1-version program, appear to be less stable in the range of 20 μg/L limnetic total P than inferences obtained with the TROPH1 model. Performance of the WACALIB model in the lower range of nutrient concentrations might be improved by the use of a more recent iteration of the program, such as WACALIB 3.3, which uses bootstrapping methods to obtain more accurate estimates of error (Line et al. 1994).

Lake Yale

Inferred limnetic total P values from the WACALIB and TROPH1 models track each other very well in Lake Yale cores LY1-99 and LY3-99. Because these models are derived by very different statistical methods, this concurrence implies good reliability in the inferred trends.

The 20-cm interval (c. 1953) in core LY1-99 yields a limnetic total P inference of 27 μg/L, which increases to 56 μg/L in the surface sample. Although this increase in inferred limnetic P is significant, it should be noted that inferences for samples between the 32-cm and 52-cm levels in core LY1-99 represent a period prior to 1900 and are within 95% confidence intervals of TROPH1 inferences for the modern sample. These inferences suggest that Lake Yale is subject to natural variation in limnetic total P concentrations, and is currently within the range of that variation. The mean of TROPH1-inferred limnetic total P values for core LY1-99 is 43 µg/L, which is higher than the recent measured mean of 25 µg/L total P. WACALIB inferences also support increased limnetic total P values above the 20-cm interval (post-1953).

Limnetic total P inferences in core LY3-99 are generally higher than in core LY1-99, but they show a trend similar to core LY1-99 and suggest a similar interpretation. TROPH1-based limnetic total P inferences for the 28-cm interval (c. 1938) and 20-cm interval (c. 1969) are approximately 40 µg/L, and are significantly lower than the inference of 75 µg/L in the surface sample. The inference for the modern sample, however, is within the 95% confidence intervals for samples at the 44-cm and 36-cm levels, which correspond to approximately 1900-1911. This again suggests that Lake Yale is subject to natural variation in limnetic total P concentrations, and that the modern measured values are within the range of historic values. TROPH1 limnetic total P inferences throughout the sediment core average 53 µg/L and WACALIB-derived inferences average 41 µg/L.

Lake Harris

Inferred limnetic total P estimates for Lake Harris cores LH5-99 and LH8-99 generally indicate that limnetic total P concentrations in the lake have changed little over time, and that modern limnetic total P values are very close to what they were prior to 1900. Limnetic TP inferences in core LH5-99 based on the TROPH1 model appear higher in the 56-cm sample (c. 1900) and in the 44-cm sample (c. 1928) than at other levels in the core. WACALIB-derived inferences for these samples, however, do not demonstrate a significant increase. The mean of WACALIB-derived samples for core LH5-99 is 47 µg/L total P, which is close to the reported modern mean of 42 µg/L. In core LH8-99, limnetic TP inferences from both models show an essentially unchanged pattern throughout the core, with modern TP values equal to those prior to c. 1900. Limnetic total P inferences based on the TROPH1 model average 61 µg/L throughout the core, whereas WACALIB-derived inferences are somewhat lower and average 46 µg/L throughout the core. Lake Harris appears to have remained stable in limnetic total P concentrations throughout the period of time represented by these study cores.

Lake Beauclair

Diatom analyses yielded modern limnetic total P inferences that are distinctly lower than the modern mean of 235 μg/L. Both diatom predictive models, nevertheless, show informative trends. The WACALIB-derived inferences for limnetic total P concentrations prior to the 80-cm level (c. 1926) in core LB2-99 are approximately 55 μg/L. Limnetic total P increases to a maximum of 144 μg/L in the 56-60-cm interval (c. 1960), then declines to 86 μg/L in the top sample. The TROPH1-based limnetic total P inferences are approximately 45 μg/L prior to the 80-cm sample. Limnetic P increases to a maximum of 433 μg/L in the 60-cm interval, then it declines to 121 μg/L in the most recent sample. Both models, therefore, indicate that Lake Beauclair was significantly lower in limnetic total P concentrations in the 1920s than at present, and that the lake sustained a period of higher limnetic nutrient concentrations in the 1960s and 1970s than it does at the present time. During this period of highest limnetic total P concentrations, diatom assemblages shifted from dominance by planktonic species of *Aulacoseira* to dominance by benthic taxa including *Fragilaria berolinensis* and *Pseudostaurosira brevistriata*. *Aulacoseira* spp. again were dominant in the recent period shown by the top 32 cm of the sediment core.

Limnetic TP concentrations inferred from diatom microfossil assemblages in near-surface sediments can be compared to mean water-column TP concentrations (Fig. 1.2). Based on inferred limnetic P, the rank of lakes in order of increasing trophic condition is Lake Weir (Fig. 3.11), Lake Harris (Fig. 4.11), Lake Yale (Fig. 3.12) and Lake Beauclair (Fig. 5.12). The mean modern TP and standard deviation for these lakes are 15 ± 10, 42 ± 38, 25 ± 47, and 235 ± 115 μg/L, respectively. Therefore, the rank order for mean water-column TP differs in that Lake Yale and Lake Harris are interchanged. However, it should be noted that statistically these means are not different due to the large standard deviations. The inferred TP concentration for Lake Beauclair decreases in the upper part of the core, an inference that is not consistent with other proxies. This disparity may be related to lower species diversity in these samples. It was noted earlier that two distinct assemblages of microfossil diatoms characterize near-surface sediments of other hypereutrophic Florida lakes such as Lake Apopka, Lake Dora, Lake Eustis and Lake Jesup (Schelske 1999a). A common feature of these assemblages is low species diversity.

Primary Producer Community Shifts

Two measured proxies, TC:TN ratio and SSi, can be used to infer shifts in primary producer communities from rooted macrophytes to phytoplankton. The shift from macrophytes to phytoplankton is one widely recognized consequence of nutrient enrichment (Scheffer et al. 1993, Moss et al. 1996). In Florida, Lake Apopka provides an excellent example of this type of a nutrient-driven shift in primary producer community structure (Schelske 1997, Schelske et al. 1999c, Kenney et al in review).

TC:TN Ratio

The TC:TN ratio of sedimentary organic matter is a proxy for primary producer community shifts from rooted macrophytes to phytoplankton because macrophytes utilize cellulose for structural purposes and thus have a greater relative carbon content than phytoplankton (Schelske et al. 1999c). This ratio is an excellent proxy for the well-known shift to phytoplankton dominance in Lake Apopka (Schelske 1997, Schelske et al. 1999c).

A decrease in the TC:TN ratio was found in all of the cores from the study lakes (Appendix B). The largest relative change in TC:TN during the 20th century was found in cores from Lake Weir and some of the smallest were in Lake Yale (Fig. 3.9). Temporal changes in TC:TN in these lakes were fairly gradual. By contrast, long periods of low TC:TN were found in some Lake Harris cores with the major change in the ratio after 1950 (Fig. 4.9) indicating a longer period of nutrient enrichment. In addition, large changes in TC:TN ratio were found in some Lake Harris cores before 1850 (Fig. 4.4). A somewhat different pattern characterizes the Lake Beauclair core (LB2-99). In this core, TC:TN increases gradually from approximately 9 in surface sediments to 12 at the bottom of the core (Fig. 5.4). However, the temporal pattern is different in that the ratio increases rapidly from 8.9 at the surface to 10.6 at the 52-cm interval with a ^{210}Pb-date of 1969 (Fig. 5.9). Before 1969, the ratio is relatively constant to 88 cm (1894), then increases to a maximum of 12.1 at the bottom of the core. Thus, this TC:TN proxy also shows that the study lakes were affected by anthropogenic phosphorus loading even though the temporal patterns differed markedly among lakes and between cores in some lakes. For the purposes of this report, we have not attempted to refine this general conclusion, particularly with respect to a possible relationship with phosphorus loading and to confounding effects of water depth among lakes.

Biogenic Silica

The record of SSi, one component of BSi, is a proxy for a system change in which the primary producer community shifts from macrophytes to phytoplankton (Kenney et al. in review). This proxy can be used to infer the composition of primary producer communities in Florida lakes with little hard-bottom substrate because the primary growth habit for sponges is rooted macrophytes. Thus, the abundance of sponges declines with the disappearance or decreased abundance of macrophytes providing the mechanism by which SSi is a proxy for shifts in primary producer communities. In the study lakes, SSi concentration is generally greatest at depth in all cores. We have not attempted to utilize this proxy in this report. If attempted, analysis of its importance should be based not only on the SSi proxy, but also on the fraction of SSi as a component of BSi (the ratio of SSi:BSi).

Stable Isotopes

Stable isotopic composition of carbon can be used to infer changes in trophic state and anthropogenic nutrient enrichment. An increase in the stable carbon isotopic ratio ($\delta^{13}C$) is a proxy for increased lacustrine primary production because the lighter isotope ^{12}C is utilized preferentially during photosynthesis increasing the relative abundance of the heavier isotope (^{13}C) in the dissolved inorganic carbon (DIC) pool (Schelske and Hodell 1991, Brenner et al. 1999b). Thus heavier organic carbon is produced photosynthetically as a function of the rate of DIC removal. The stable carbon isotopic ratio ($\delta^{13}C$) was used to infer historic changes in lacustrine primary productivity driven by phosphorus enrichment of Lake Ontario (Schelske and Hodell 1991) and phosphorus reduction in Lake Erie (Schelske and Hodell 1995). In theory, the stable nitrogen isotopic ratio ($\delta^{15}N$) is enriched as a function of the rate of removal of dissolved inorganic nitrogen (DIN) from the DIN pool (Brenner et al. 1999b, Hodell and Schelske 1998). Using either ratio as a proxy for nutrient-stimulated primary production is based on several assumptions. Among these are that either nutrient pool is not depleted during the period of interest and that the sources for either nutrient have a stable isotopic composition over time. Confirming the validity of these assumptions may require data not available in this report.

Two stratigraphic patterns in $\delta^{13}C$ were present in the study lakes. In all of the cores from Lake Weir, Lake Yale, Lake Harris and Little Lake Harris, $\delta^{13}C$ decreased in near-surface sediments (Figs. 3.9 and 4.9). Thus, one inference from this proxy is that lacustrine productivity decreased, an unlikely conclusion in that no other proxy could be interpreted in this manner. A decrease in $\delta^{13}C$ of 1.4 ‰ over the last 150 yr can be attributed to the Suess effect (a historic decrease in the isotopic signature of carbon dioxide due to increased fossil fuel consumption). The historic lacustrine productivity signal in Lake Erie was negative without correcting for this effect (Schelske and Hodell 1995). A more plausible hypothesis is that the contribution of detrital organic carbon to the DIC pool increased (McKenzie 1985). Relatively light organic carbon is formed by photosynthetic production of organic matter and its decomposition produces relatively light carbon dioxide. Patterns of decreased $\delta^{13}C$ with core depth have also been found in other oligotrophic systems in the northeastern United States (A. Linni, personal communication). The pattern differed in both cores from Lake Beauclair, the most eutrophic study lake. In these cores, $\delta^{13}C$ increased from –26 ‰ to -17 ‰, much more than the -2 to -4 ‰ decrease in the other cores. In addition, $\delta^{13}C$ increased rapidly from –25 ‰ in the 1920s to –17.5 ‰ in the late 1970s (Fig. 5.9). These results are consistent with the inference that lacustrine productivity increased rapidly in Lake Beauclair after 1920. A similar increase in $\delta^{13}C$ was found in a sediment core from Lake Apopka (unpublished results).

In general, sedimentary TC/TN ratios and stable carbon isotopic signatures are determined by sources of sedimentary organic matter (Meyers 1994). The TC/TN ratio of planktonic algae is generally <9 whereas the ratio for terrestrial plants is much greater, ranging from 30 to 60. In our studies of Florida lakes, TC/TN ratios >9 are generally considered to represent sediments with some contribution from aquatic macrophytes that have structural carbon and therefore greater TC/TN ratios than phytoplankton (see Schelske et al. 1999c, Brenner et al. 1999b). The $\delta^{13}C$ signature of sedimentary organic matter is determined by these different autochthonous sources of organic matter and also by the amount of detrital carbon in the system. The carbon isotopic signature of phytoplankton and C3 terrestrial plants (-20 to -28 ‰) is similar and much lighter than the signature of C4 terrestrial plants (-10 to -12 ‰) (Meyers 1994). Ordinarily, it is assumed that $\delta^{13}C$ of DIC is in isotopic equilibrium with atmospheric carbon dioxide, but the atmospheric pool has been depleted historically due to the Suess effect (Schelske and Hodell 1995). If detrital organic carbon is an important source of inorganic carbon in lakes, the isotopic signatures of phytoplankton and macrophytes will be affected accordingly and may vary markedly from the assumed condition (McKenzie 1985). Finally, growth habitat and type of primary producers may affect the isotopic signature of organic matter (Hecky and Hesslein 1995). To assess these confounding factors, data are needed on the carbon isotopic composition of the dissolved inorganic carbon pool. The isotopic composition of DIC was not measured in the present study.

Depletion in $\delta^{15}N$ was found in near-surface sediments in most cores from the study area (Figs 3.10, 4.10 and 5.10). Exceptions to this pattern were found in LY2-99 and LY3-99, but in these cores the degree of enrichment was relatively small compared to the degree of depletion in other cores. These results may indicate an increasing importance of nitrogen-fixing cyanobacteria. Such cyanobacteria utilize atmospheric N_2 as a nitrogen source producing light $\delta^{15}N$ (Gu et al. 1996a). Nitrogen-fixing cyanobacteria become important when inorganic nitrogen supplies are depleted generally as the result of excessive phosphorus enrichment (Aldridge et al. 1993, Schelske et al. 1999b). The onset of nitrogen-limited primary production limits the usefulness of $\delta^{15}N$ as a proxy for primary production. The most pronounced change in $\delta^{15}N$, a depletion of 3.5 ‰, occurred after 1940 in Lake Beauclair (LB2-99). This change can be used to infer increased importance of nitrogen-fixing bacteria. In addition, the initiation of the period of depletion (after 1940) coincides with the construction of levees so marginal wetlands on the north shore of Lake Apopka could be utilized for agricultural purposes. Therefore, agricultural practices may have induced secondary nitrogen limitation by increased phosphorus loading or agricultural chemicals may have affected the isotopic signature of the nitrogen input via the Apopka-Beauclair Canal. Factors such of these confound interpretation of stable isotope data in small ecosystems with disturbed watersheds.

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APPENDIX A

Station Locations and

Sediment Core Descriptions for

Harris Chain of Lakes

Key to Field Notes

Core Location Data for stations are latitude and longitude values obtained from a Trimble Navigation Global Positioning System Pathfinder. Station locations were stored as waypoint values on the system. An initial reading was taken after anchoring on station and a second reading was taken when work was completed. Only one reading is recorded here.

Sediment Survey Data include information on water depth, sediment thickness, and descriptions of the sediment cores retrieved.

Depth of the water column was determined by sounding with a Secchi disc on a metered line.

Depth to hard bottom was measured by inserting metered electrical conduit rods into the sediment until they bottomed on hard, sandy deposits.

Soft sediment thickness was estimated by subtracting the depth of the water column from the depth to hard bottom.

Sediment core length was determined by measuring the retrieved core with a meter stick.

Sediment core descriptions were made before sediment cores were extruded. Additional descriptions were made as the cores were sectioned.

Lake Beauclair
March 12, 1999
LB-01-99

Crew: C. Schelske and W. Kenney

Core Location:

Lat.: 28° 46' 12.1" N Long.: 81° 40' 02.0" W

Sediment Survey Data

Depth of water column:	187 cm
Depth to hard bottom:	755 cm
Soft sediment thickness (by difference):	568 cm
Sediment core length:	150 cm
Sectioned to:	132 cm

Sediment Core Description

0 to 8 cm	Brown organic sediment. Unconsolidated (sections extruded as suspensions). Consistency increases with depth.
8 to 52 cm	Brown organic sediment. Weakly consolidated, increasing to consolidated (sections extruded as suspensions with increasing number and size of peds).
52 to 84 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds). Samples contained plant fibers and sand. Samples emitted a slight smell of H_2S.
84 to 132 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Samples contained few plant fibers.

Lake Beauclair
March 12, 1999
LB-02-99

Crew: C. Schelske and W. Kenney

Core Location:
Lat.: 28° 46' 25.3" N Long.: 81° 38' 58.7" W

Sediment Survey Data

Depth of water column:	240 cm
Depth to hard bottom:	810 cm
Soft sediment thickness (by difference):	570 cm
Sediment core length:	150 cm
Sectioned to:	148 cm

Sediment Core Description

0 to 8 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth.
8 to 44 cm	Brown organic sediment. Weakly consolidated, increasing to consolidated (sections extruded as suspensions with increasing number and size of peds). Slight smell of H_2S in 40-cm sample. Note: H_2S was not noted as consistently in LB-02-99 as LB-01-99, possibly because of increased wind during sectioning.
44 to 60 cm	Brown organic sediment Consolidated (sections extruded as 2-cm peds). Samples contained plant fibers.
60 to 148 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Samples contained few plant fibers.

Lake Harris
May 17, 1999
LH-01-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location:
Lat.: 28° 47' 11.2" N   Long.: 81° 52' 05.7" W

Sediment Survey Data

Depth of water column:	315 cm
Depth to hard bottom:	640 cm
Soft sediment thickness (by difference):	325 cm
Sediment core length:	125 cm
Sectioned to:	120 cm

Sediment Core Description

0 to 12 cm	Brown organic sediment. Unconsolidated (sections extruded as suspensions). Consistency increases with depth. H_2S smell, cypress needle noticed. *Microcystis* sp. in the overlying water. Large snail shell in 12-cm section.
12 to 44 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds). H_2S smell noticed.
44 to 108 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). H_2S smell noticed. Horizontal breaks in the sediment at ~75 cm and ~94 cm.
108 to 120 cm	Red/ pink sediment with lower organic matter content. Consolidated (sections extruded as 4-cm peds). These samples contained higher amounts of sand and clay than the other samples in this core. We noticed small snail shells in the 116-cm section.

Lake Harris
August 3, 1999
LH-2R-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 46' 16.8" N Long.: 81° 50' 29.6" W

Sediment Survey Data

Depth of water column:	385 cm
Depth to hard bottom:	1010 cm
Soft sediment thickness (by difference):	625 cm
Sediment core length:	140 cm
Sectioned to:	132 cm

Sediment Core Description

0 to 16 cm	Brown organic sediment. Unconsolidated (sections extruded as suspensions). Consistency increases with depth. *Microcystis* sp. in the overlying water.
16 to 20 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
20 to 112 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Sand grains and macrophyte pieces in 92-cm section. Macrophyte pieces in 96-cm section.
112 to 120 cm	Brown organic sediment in transition to lighter brown or "pink" sediment with decreased organic matter content and some small snail shells. Consolidated (sections extruded as 4-cm peds).
120 to 132 cm	Lighter brown or "pink" sediment with decreased organic matter content and some small snail shells. Consolidated (sections extruded as 4-cm peds). The 132-cm sample is a partial sample (<4 cm).

Lake Harris
August 3, 1999
LH-3R-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 47' 14.6" N Long.: 81° 48' 36.5" W

Sediment Survey Data

Depth of water column:	385 cm
Depth to hard bottom:	940 cm
Soft sediment thickness (by difference):	555 cm
Sediment core length:	156 cm
Sectioned to:	152 cm

Sediment Core Description

0 to 20 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. Few *Microcystis* sp. in the overlying water.
20 to 32 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
32 to 100 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Sand grains in 56-cm section. Horizontal cracks at 67, 95 cm. Macrophyte pieces in 96-cm section.
100 to 152 cm	Brown organic sediment in transition to lighter brown or "pink" sediment with decreased organic matter content and some small snail shells. Consolidated (sections extruded as 4-cm peds).

Lake Harris
July 13, 1999
LH-04-99

Crew: W. Kenney and M. Waters

Core Location:

Lat.: 28° 46' 17.3" N   Long.: 81° 48' 30.5" W

Sediment Survey Data

Depth of water column:	425 cm
Depth to hard bottom:	830 cm
Soft sediment thickness (by difference):	405 cm
Sediment core length:	146 cm
Sectioned to:	144 cm

Sediment Core Description

0 to 24 cm   Brown organic sediment.
Unconsolidated (sections extruded as suspensions).
Consistency increases with depth.
Microcystis sp. in the overlying water.

24 to 40 cm   Brown organic sediment.
Consolidated (sections extruded as 2-cm peds).

40 to 144 cm   Brown organic sediment.
Consolidated (sections extruded as 4-cm peds).
Sand pockets in the 108-, 112-cm sections. 144-cm section is not a complete 4-cm section.

Lake Harris
July 13, 1999
LH-05-99

Crew: W. Kenney and M. Waters

Core Location:

Lat.: 28° 45' 31.6" N Long.: 81° 49' 0.36" W

Sediment Survey Data

Depth of water column:	365 cm
Depth to hard bottom:	>1200 cm
Soft sediment thickness (by difference):	835 cm
Sediment core length:	138 cm
Sectioned to:	136 cm

Sediment Core Description

0 to 28 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. *Microcystis* sp. in the overlying water.
28 to 56 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
56 to 136 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). 136-cm section is not a complete 4-cm section.

Lake Harris
October 13, 1999
LH-6R-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 45' 45.9" N Long.: 81° 47' 16.6" W

Sediment Survey Data

Depth of water column:	425 cm
Depth to hard bottom:	1465 cm
Soft sediment thickness (by difference):	1040 cm
Sediment core length:	140 cm
Sectioned to:	136 cm

Sediment Core Description

0 to 32 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. Surface *Microcystis* sp. Live snail in 20-cm section.
32 to 56 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
56 to 136 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Deciduous leaf (leaflet possibly *Fraxinus* sp.) in 88-cm section.

Lake Harris
May 17, 1999
LH-07-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location:

Lat.: 28° 44' 25.4" N Long.: 81° 46' 37.3" W

Sediment Survey Data

Depth of water column:	325 cm
Depth to hard bottom:	935 cm
Soft sediment thickness (by difference):	610 cm
Sediment core length:	160 cm
Sectioned to:	148 cm

Sediment Core Description

0 to 52 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. H_2S smell noticed. *Microcystis* sp. in the overlying water. Macrophyte fibers in the 16-cm section.
52 to 60 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds). H_2S smell noticed. Increased sand content. Sand pocket in 56-cm section.
60 to 148 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). H_2S smell noticed. Grass-type remains in 140-cm section. Below 132 cm, the color was darker brown. 148-cm section is not a complete 4-cm section.

Lake Harris
August 3, 1999
LH-08-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 43' 20.4" N Long.: 81° 45' 24.9" W

Sediment Survey Data

Depth of water column:	230 cm
Depth to hard bottom:	925 cm
Soft sediment thickness (by difference):	695 cm
Sediment core length:	144 cm
Sectioned to:	140 cm

Sediment Core Description

0 to 36 cm	Brown organic sediment. Unconsolidated (sections extruded as suspensions). Consistency increases with depth. *Microcystis* sp. in the overlying water.
36 to 60 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
60 to 140 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds).

Lake Harris
October 13, 1999
LH-9R-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 42' 20.0" N Long.: 81° 45' 10.3" W

Sediment Survey Data

Depth of water column:	195 cm
Depth to hard bottom:	805 cm
Soft sediment thickness (by difference):	610 cm
Sediment core length:	150 cm
Sectioned to:	148 cm

Sediment Core Description

0 to 36 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. *Microcystis* sp. in the overlying water.
36 to 72 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
72 to 148 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds).

Lake Weir
November 5, 1999
LW-1R-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 29° 00' 55.8" N Long.: 81° 56' 03.4" W

Sediment Survey Data

Depth of water column:	705 cm
Depth to hard bottom:	1320 cm
Soft sediment thickness (by difference):	615 cm
Sediment core length:	150 cm
Sectioned to:	148 cm

Sediment Core Description

0 to 28 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth.
28 to 40 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
40 to 148 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds).

Lake Weir
November 5, 1999
LW-2R-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 29° 01' 47.8" N Long.: 81° 55' 43.9" W

Sediment Survey Data

Depth of water column:	630 cm
Depth to hard bottom:	1025 cm
Soft sediment thickness (by difference):	395 cm
Sediment core length:	160 cm
Sectioned to:	152 cm

Sediment Core Description

0 to 28 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. Eustis-like "worm-casts" in 4-cm section.
28 to 36 cm	Brown organic sediment Consolidated (sections extruded as 2-cm peds).
36 to 152 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds).

Lake Weir
November 5, 1999
LW-3R-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 59' 42.1" N Long.: 81° 57' 46.9" W

Sediment Survey Data

Depth of water column:	445 cm
Depth to hard bottom:	610 cm
Soft sediment thickness (by difference):	165 cm
Sediment core length:	160 cm
Sectioned to:	152 cm

Sediment Core Description

0 to 20 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. "Worm-casts" in 4-cm section similar to those found in Lake Eustis.
20 to 32 cm	Brown organic sediment Consolidated (sections extruded as 2-cm peds).
32 to 152 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Horizontal crack in 52-cm section. A trace of red coloration begins below 104 cm. A sand layer at 116-cm. Black-red-grey mottled sediment below 116-cm. Terrestrial plant fragments between 116 and 124 cm.

Lake Yale
May 4, 1999
LY-01-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location:

Lat.: 28° 55' 26.0" N   Long.: 81° 45' 20.7" W

Sediment Survey Data

Depth of water column:	370 cm
Depth to hard bottom:	805 cm
Soft sediment thickness (by difference):	435 cm
Sediment core length:	132 cm
Sectioned to:	128 cm

Sediment Core Description

0 to 28 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. Numerous vertical, colorless macrophyte fibers below 12-cm, presumably root hairs.
28 to 40 cm	Brown organic sediment Consolidated (sections extruded as 2-cm peds). Numerous vertical, colorless macrophyte fibers and some sand.
40 to 128 cm	Brown organic sediment Consolidated (sections extruded as 4-cm peds). Red macrophyte fibers in the 68-cm section. Sand pocket in 88-cm section.

Lake Yale
May 4, 1999
LY-02-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location:

Lat.: 28° 54' 37.7" N Long.: 81° 43'53.7" W

Sediment Survey Data

Depth of water column:	430 cm
Depth to hard bottom:	895 cm
Soft sediment thickness (by difference):	465 cm
Sediment core length:	155 cm
Sectioned to:	148 cm

Sediment Core Description

0 to 24 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth.
24 to 44 cm	Brown organic sediment Consolidated (sections extruded as 2-cm peds). Sand layers at 38 and 40 cm. The sediment was horizontally cracked at 39 cm.
44 to 148 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Sand layers at 87, 124 and 33 cm. The 52- and 84-cm sections were relatively sandy. Partial oak leaf in the 80-cm section.

Lake Yale
May 4, 1999
LY-03-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location:
Lat.: 28° 53' 32.1" N Long.: 81° 43'01.1" W

Sediment Survey Data

Depth of water column:	285 cm
Depth to hard bottom:	662 cm
Soft sediment thickness (by difference):	377 cm
Sediment core length:	136 cm
Sectioned to:	136 cm

Sediment Core Description

0 to 24 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. Macrophyte fibers in all samples. Excessive amount of macrophyte fibers in the 24-cm section.
24 to 52 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds). Macrophyte fibers in all samples.
52 to 136 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Macrophyte fibers in all samples.

The Following Cores were Collected and Discarded after Freeze Dryer Malfunction

Additional Cores from these Stations were Collected and Analyzed
(see pages)

Lake Harris
Core Discarded after Freeze Dryer Malfunction
June 28, 1999
LH-02-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location:
Lat.: 28° 46' 16.2" N   Long.: 81° 50' 31.3" W

Sediment Survey Data

Depth of water column:	385 cm
Depth to hard bottom:	970 cm
Soft sediment thickness (by difference):	585 cm
Sediment core length:	144 cm
Sectioned to:	140 cm

Sediment Core Description

0 to 16 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. *Microcystis* sp. in the overlying water.
16 to 32 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
32 to 140 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Sand pocket in 40-cm section. Grey mottles and lighter brown material intermixed with brown organic matter below 92 cm. 140-cm section was not a full section.

Lake Harris
Core Discarded after Freeze Dryer Malfunction
June 28, 1999
LH-03-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location:
Lat.: 28° 47' 15.9" N   Long.: 81° 48' 36.3" W

Sediment Survey Data

Depth of water column:	400 cm
Depth to hard bottom:	960 cm
Soft sediment thickness (by difference):	560 cm
Sediment core length:	142 cm
Sectioned to:	136 cm

Sediment Core Description

0 to 32 cm	Brown organic sediment. Unconsolidated (sections extruded as suspensions). Consistency increases with depth. *Microcystis* sp. in the overlying water.
32 to 44 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
44 to 136 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Macrophyte fibers in 80-cm section. Sand pocket in 84-cm section. Below 104 cm there was a transition to light brown sediment with light grey carbonates. There was no brown organic sediment below 112 cm, all was light brown with intermixed carbonates.

Lake Harris
Core Discarded after Freeze Dryer Malfunction
August 17, 1999
LH-06-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 45' 43.8" N Long.: 81° 47' 18.0" W

Sediment Survey Data

Depth of water column:	395 cm
Depth to hard bottom:	1080 cm
Soft sediment thickness (by difference):	685 cm
Sediment core length:	155 cm
Sectioned to:	148 cm

Sediment Core Description

0 to 44 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth.
44 to 64 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
64 to 148 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds).

Lake Harris
Core Discarded after Freeze Dryer Malfunction
August 17, 1999
LH-09-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 42' 18.1" N Long.: 81° 45' 08.3" W

Sediment Survey Data

Depth of water column:	170 cm
Depth to hard bottom:	745 cm
Soft sediment thickness (by difference):	575 cm
Sediment core length:	144 cm
Sectioned to:	140 cm

Sediment Core Description

0 to 36 cm	Brown organic sediment Unconsolidated (sections extruded as suspensions). Consistency increases with depth. Microcystis sp. in the overlying water. Note: Piston slipped 1.0 cm while extruding, samples collected as 20-25 cm and 25-28 cm to correct for slippage.
36 to 68 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
68 to 140 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). Macrophyte fibers below 96-cm.

Lake Weir
Core Discarded after Freeze Dryer Malfunction
August 30, 1999
LW-01-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 29° 00' 57.4" N Long.: 81° 56' 02.1" W
Sediment Survey Data

Depth of water column:	700 cm
Depth to hard bottom:	1185 cm
Soft sediment thickness (by difference):	485 cm
Sediment core length:	155 cm
Sectioned to:	144 cm

Sediment Core Description

0 to 20 cm	Brown organic sediment. Unconsolidated (sections extruded as suspensions). Consistency increases with depth. Very few *Microcystis* sp. and *Botryococcus* sp. in the overlying water. Eustis-like "worm casts" found in 4-cm section.
20 to 32 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
32 to 144 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds).

Lake Weir
Core Discarded after Freeze Dryer Malfunction
August 30, 1999
LW-02-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 29° 01' 47.5" N Long.: 81° 55' 43.2" W
Sediment Survey Data

Depth of water column:	625 cm
Depth to hard bottom:	1025 cm
Soft sediment thickness (by difference):	400 cm
Sediment core length:	145 cm
Sectioned to:	144 cm

Sediment Core Description

0 to 24 cm	Brown organic sediment. Unconsolidated (sections extruded as suspensions). Consistency increases with depth. Microcystis sp. in the overlying water.
24 to 36 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
36 to 144 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds).

Lake Weir
Core Discarded after Freeze Dryer Malfunction
August 30, 1999
LW-03-99

Crew: W. Kenney, M. Waters and B. Shumate

Core Location: Lat.: 28° 59' 42.9" N Long.: 81° 57' 46.8" W

Sediment Survey Data

Depth of water column:	440 cm
Depth to hard bottom:	610 cm
Soft sediment thickness (by difference):	210 cm
Sediment core length:	144 cm
Sectioned to:	144 cm

Sediment Core Description

0 to 20 cm	Brown organic sediment. Unconsolidated (sections extruded as suspensions). Consistency increases with depth. H_2S smell in upper 8 cm.
20 to 32 cm	Brown organic sediment. Consolidated (sections extruded as 2-cm peds).
32 to 144 cm	Brown organic sediment. Consolidated (sections extruded as 4-cm peds). A trace of red coloration begins below 100 cm. A sand layer at 116 cm. Black-red-grey mottled sediment below 116 cm. Last sample is not a complete 4-cm section.

APPENDIX B

Physical and Chemical Data
Harris Chain of Lakes Cores

See Appendix A for collection date, location and description of cores.

CODES:

Depth is depth (cm)
H2OP is water soluble P (mg/g)
CHEP hot-water extracted P, corrected for H2OP (mg/g)
NaOHP is sodium hydroxide extractable P (mg/g)
TP is total phosphorus (mg/g)
LOI is % loss on ignition
TN is total nitrogen (%)
TC is total carbon (%)
TC/TN is TC/TN mass ratio
d13C is $\delta^{13}C$ (‰) stable carbon isotope ratio
d15N is $\delta^{15}N$ (‰) stable nitrogen isotope ratio
Frac Dry is fraction dry weight
D Si is diatom biogenic silica (mg/g)
S Si is sponge biogenic silica (mg/g)
Min Si is mineral silica (mg/g)
n.d. is no datum

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LW1R-99	4	0.007	0.230	0.362	1.160	67.5	3.37	32.3	9.6	-26.7	1.45	0.0170	54.1	17.1	4.4
	8	0.008	0.276	0.345	1.203	66.8	3.26	32.2	9.9	-26.6	1.58	0.0239	63.8	12.3	4.5
	12	0.010	0.165	0.224	0.975	63.6	3.02	30.9	10.2	-26.2	2.02	0.0343	60.0	16.2	1.8
	16	0.013	0.077	0.150	0.723	61.3	2.79	29.7	10.7	-25.9	1.47	0.0367	57.2	18.4	2.0
	20	0.017	0.040	0.120	0.571	59.8	2.70	29.0	10.7	-25.4	1.79	0.0385	59.3	16.7	6.1
	24	0.027	0.021	0.113	0.467	58.9	2.67	29.2	10.9	-25.3	2.37	0.0416	68.9	15.2	0.6
	28	0.044	0.016	0.098	0.389	58.4	2.65	29.4	11.1	-25.0	2.27	0.0436	77.5	3.4	0.9
	32	0.049	0.004	0.095	0.317	60.6	2.61	29.9	11.5	-25.1	2.15	0.0455	72.4	13.3	10.6
	36	0.036	0.007	0.076	0.303	60.8	2.67	30.7	11.5	-25.2	2.68	0.0471	75.8	13.9	5.4
	40	0.048	0.000	0.086	0.281	60.2	2.62	30.5	11.6	-25.2	2.87	0.0497	85.4	9.7	2.8
	44	0.044	0.000	0.070	0.281	59.6	2.60	30.8	11.9	-25.1	2.68	0.0529	68.0	27.7	1.0
	48	0.043	0.000	0.064	0.255	60.4	2.61	31.1	11.9	-25.0	2.86	0.0532	68.6	22.5	8.8
	52	0.043	0.000	0.071	0.247	60.1	2.52	30.7	12.2	-25.0	2.99	0.0568	85.6	14.2	7.9
	56	0.056	0.000	0.048	0.222	59.0	2.51	30.6	12.2	-25.1	3.67	0.0590	89.3	22.0	1.0
	60	0.057	0.000	0.044	0.223	58.6	2.51	30.3	12.1	-25.0	3.33	0.0614	90.3	22.2	1.5
	64	0.067	0.000	0.056	0.224	58.0	2.46	30.4	12.4	-25.2	3.37	0.0650	86.1	22.2	0.2
	68	0.043	0.000	0.065	0.232	58.2	2.43	30.3	12.5	-25.2	3.52	0.0675	88.3	13.0	0.7
	72	0.050	0.000	0.049	0.210	57.6	2.32	29.6	12.8	-25.3	4.30	0.0695	79.0	20.9	1.2
	76	0.046	0.000	0.061	0.208	57.7	2.28	29.7	13.0	-25.5	4.15	0.0714	52.6	48.2	1.2
	80	0.061	0.000	0.042	0.216	57.0	2.28	29.5	12.9	-25.5	4.12	0.0727	57.3	37.9	3.3
	84	0.026	0.012	0.076	0.225	57.4	2.28	29.6	13.0	-25.5	4.07	0.0751	59.6	28.6	5.0
	88	0.039	0.010	0.045	0.197	57.4	2.24	29.3	13.1	-25.4	4.55	0.0766	49.5	44.8	2.0
	92	0.039	0.011	0.031	0.201	57.2	2.24	29.3	13.1	-25.4	4.05	0.0785	57.9	29.4	9.9
	96	0.024	0.016	0.045	0.195	57.2	2.26	29.2	12.9	-25.2	4.20	0.0785	59.1	36.7	6.6
	100	0.044	0.018	0.024	0.185	57.2	2.21	29.5	13.3	-25.2	4.43	0.0794	70.9	26.8	4.8
	104	0.063	0.010	0.031	0.183	57.2	2.24	29.1	13.0	-24.9	3.97	0.0794	39.2	47.4	4.3
	108	0.049	0.010	0.032	0.151	56.7	2.18	29.3	13.4	-24.6	3.47	0.0832	49.7	36.2	3.5
	112	0.053	0.005	0.047	0.186	56.1	2.18	28.7	13.2	-24.5	4.24	0.0848	40.2	46.7	0.1
	116	0.026	0.015	0.026	0.151	56.4	2.18	29.3	13.4	-24.5	4.00	0.0811	21.3	64.4	0.5

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LW1R-99	120	0.036	0.010	0.032	0.188	56.0	2.13	28.4	13.3	-24.2	3.98	0.0787	30.8	51.3	9.9
	124	0.055	0.011	0.066	0.183	56.3	2.13	28.7	13.5	-24.1	4.47	0.0795	18.2	56.8	8.2
	128	0.050	0.019	0.056	0.187	55.7	2.13	28.1	13.2	-24.1	4.40	0.0867	27.8	51.1	4.5
	132	0.027	0.022	0.036	0.171	55.6	2.15	28.3	13.1	-24.0	4.41	0.0842	8.8	68.6	8.1
	136	0.022	0.019	0.016	0.169	55.9	2.13	28.0	13.1	-24.1	4.39	0.0865	15.7	40.6	28.5
	140	0.034	0.017	0.013	0.153	56.2	2.12	27.6	13.0	-24.0	4.50	0.0864	28.1	51.8	6.3
	144	0.029	0.013	0.016	0.167	56.0	2.19	28.2	12.9	-23.8	4.07	0.0865	26.6	63.3	1.3
	148	0.025	0.011	0.027	0.163	55.9	2.20	28.2	12.8	-24.0	3.91	0.0844	13.3	77.3	12.5
LW2R-99	4	0.005	0.187	0.280	1.041	65.4	3.20	31.3	9.8	-26.4	1.95	0.0209	65.7	8.1	5.4
	8	0.004	0.170	0.220	0.950	64.4	3.05	30.9	10.1	-26.3	2.29	0.0285	66.9	10.7	0.2
	12	0.007	0.118	0.180	0.783	62.9	2.99	30.5	10.2	-26.0	2.24	0.0314	61.1	11.2	0.5
	16	0.009	0.061	0.093	0.559	60.4	2.79	29.3	10.5	-25.6	2.64	0.0362	65.8	8.0	0.2
	20	0.014	0.029	0.055	0.455	57.7	2.64	28.9	10.9	-25.2	2.31	0.0450	66.5	8.6	1.0
	24	0.081	0.057	0.033	0.369	58.1	2.59	29.2	11.3	-24.9	2.67	0.0488	70.9	8.7	0.6
	28	0.033	0.007	0.037	0.289	58.5	2.61	30.1	11.5	-25.0	2.76	0.0513	70.4	7.2	0.3
	32	0.036	0.013	0.035	0.270	59.8	2.51	29.6	11.8	-25.0	3.23	0.0525	67.3	7.6	0.3
	36	0.045	0.009	0.030	0.221	59.5	2.53	31.0	12.3	-25.0	3.05	0.0553	62.3	10.1	1.0
	40	0.045	0.013	0.023	0.196	58.7	2.40	29.9	12.4	-24.9	3.78	0.0578	58.0	13.9	2.4
	44	0.044	0.008	0.022	0.195	58.4	2.38	30.2	12.7	-24.9	3.27	0.0593	52.4	13.8	0.4
	48	0.033	0.012	0.001	0.196	57.8	2.36	30.5	12.9	-24.9	3.83	0.0629	51.4	15.2	0.7
	52	0.056	0.016	0.046	0.185	54.9	2.29	29.9	13.1	-25.1	4.04	0.0668	46.2	8.3	6.3
	56	0.038	0.000	0.042	0.164	55.9	2.21	29.1	13.2	-24.8	3.50	0.0673	34.2	9.3	5.6
	60	0.025	0.000	0.029	0.148	54.5	2.17	28.9	13.3	-24.5	3.45	0.0699	31.4	9.3	7.7
	64	0.030	0.000	0.029	0.160	57.6	2.20	28.9	13.1	-23.9	2.96	0.0656	15.8	8.6	10.3
	68	0.058	0.000	0.030	0.136	57.9	2.22	30.0	13.5	-23.9	2.55	0.0642	14.2	11.4	7.9
	72	0.052	0.000	0.029	0.112	61.6	2.49	31.9	12.8	-23.3	2.28	0.0600	9.8	13.4	7.1
	76	0.052	0.000	0.020	0.105	61.7	2.48	31.6	12.7	-23.1	2.40	0.0621	10.4	16.8	5.4
	80	0.033	0.000	0.021	0.106	61.9	2.50	31.3	12.5	-22.8	2.22	0.0630	15.6	17.6	3.8
	84	0.077	0.000	0.016	0.098	62.9	2.58	31.1	12.1	-22.3	2.16	0.0583	15.4	20.3	0.3

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LW2R-99	88	0.045	0.000	0.026	0.069	62.4	2.58	31.1	12.1	-22.2	2.73	0.0599	16.2	15.0	10.1
	92	0.016	0.040	0.019	0.084	60.7	2.70	31.2	11.6	-22.3	2.29	0.0617	16.6	21.2	4.0
	96	0.011	0.038	0.020	0.105	62.0	2.60	30.6	11.8	-22.2	2.73	0.0617	16.2	20.6	0.8
	100	0.023	0.041	0.018	0.104	61.4	2.61	30.4	11.6	-21.6	2.86	0.0637	13.8	16.6	7.2
	104	0.021	0.038	0.019	0.110	61.5	2.60	30.8	11.8	-21.4	2.94	0.0669	16.7	26.5	1.1
	108	0.027	0.031	0.017	0.060	61.0	2.52	29.3	11.6	-20.5	2.96	0.0611	15.0	27.8	2.1
	112	0.023	0.027	0.017	0.080	64.7	2.84	32.1	11.3	-19.5	2.58	0.0499	0.0	36.8	1.7
	116	0.025	0.036	0.013	0.098	62.6	2.65	30.8	11.6	-21.0	2.80	0.0507	0.0	30.5	7.6
	120	0.022	0.039	0.020	0.065	60.0	2.51	28.3	11.3	-18.9	2.82	0.0546	0.0	25.2	8.3
	124	0.032	0.046	0.015	0.092	55.3	2.39	27.0	11.3	-18.6	3.00	0.0594	0.0	22.3	8.3
	128	0.016	0.042	0.022	0.101	59.4	2.59	29.6	11.4	-19.2	2.71	0.0556	6.4	25.7	10.6
	132	0.027	0.045	0.022	0.096	61.5	2.75	30.9	11.2	-18.9	2.89	0.0507	19.2	26.7	7.4
	136	0.018	0.040	0.007	0.099	62.1	2.71	30.7	11.3	-19.1	3.38	0.0511	5.2	34.5	10.0
	140	0.024	0.039	0.025	0.097	60.6	2.59	29.4	11.4	-19.1	3.33	0.0543	7.6	36.9	4.0
	144	0.016	0.036	0.022	0.056	59.0	2.49	29.2	11.7	-19.3	3.36	0.0556	0.0	52.8	4.1
	148	0.028	0.043	0.027	0.111	57.0	2.41	27.8	11.5	-19.1	3.00	0.0589	2.0	46.9	0.9
	152	0.027	0.027	0.018	0.087	56.7	2.31	27.9	12.1	-20.2	1.76	0.0618	43.0	5.3	7.3
LW3R-99	4	0.009	0.203	0.233	0.687	64.6	2.98	31.3	10.5	-25.9	1.97	0.0275	24.0	16.0	6.2
	8	0.005	0.214	0.257	0.805	63.3	2.84	30.9	10.9	-25.5	2.18	0.0390	16.9	24.3	4.7
	12	0.008	0.124	0.195	0.783	60.7	2.67	30.3	11.4	-25.1	2.64	0.0486	20.9	19.1	1.0
	16	0.011	0.069	0.141	0.617	57.7	2.35	28.1	12.0	-24.7	3.09	0.0547	16.2	16.0	3.6
	20	0.010	0.034	0.123	0.536	56.6	2.34	28.6	12.2	-24.7	2.97	0.0596	14.0	15.9	5.0
	24	0.016	0.035	0.133	0.563	57.0	2.25	28.7	12.7	-24.6	2.95	0.0651	11.1	23.2	1.3
	28	0.022	0.034	0.195	0.516	55.7	2.38	29.4	12.4	-24.3	3.10	0.0671	19.2	9.5	5.6
	32	0.045	0.015	0.144	0.410	52.1	2.26	28.6	12.7	-24.0	3.15	0.0662	13.1	9.2	8.7
	36	0.026	0.011	0.106	0.287	39.9	1.83	23.1	12.6	-23.4	3.31	0.0861	7.9	10.6	7.1
	40	0.037	0.000	0.041	0.121	33.9	2.19	27.0	12.4	-20.1	3.49	0.0829	1.7	4.3	6.2
	44	0.086	0.000	0.049	0.143	65.3	2.66	31.1	11.7	-18.1	3.40	0.0396	2.5	3.0	8.6
	48	0.052	0.000	0.054	0.140	62.5	2.59	30.5	11.8	-17.9	3.38	0.0441	1.8	4.2	8.6

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LW3R-99	52	0.016	0.008	0.080	0.168	61.2	2.58	30.6	11.9	-18.5	3.31	0.0498	0.0	8.4	7.1
	56	0.042	0.000	0.061	0.140	63.7	2.53	29.8	11.8	-18.4	3.45	0.0484	0.0	7.4	8.8
	60	0.054	0.071	0.034	0.144	61.6	2.49	30.7	12.3	-19.6	3.37	0.0518	0.0	6.6	10.4
	64	0.057	0.053	0.037	0.133	61.5	2.39	30.1	12.6	-20.8	3.17	0.0561	0.0	7.1	8.9
	68	0.054	0.056	0.039	0.104	62.0	2.36	30.0	12.7	-21.1	3.10	0.0588	0.0	8.2	8.6
	72	0.045	0.062	0.028	0.119	60.0	2.50	31.7	12.7	-21.0	3.29	0.0608	0.0	7.5	8.0
	76	0.041	0.033	0.020	0.121	60.6	2.54	30.6	12.1	-19.0	3.29	0.0574	1.9	5.0	7.4
	80	0.019	0.033	0.027	0.133	68.5	2.89	33.4	11.6	-16.4	3.42	0.0440	3.4	1.7	7.6
	84	0.026	0.046	0.026	0.106	67.8	2.86	33.3	11.7	-16.2	3.30	0.0450	3.1	3.3	6.8
	88	0.036	0.060	0.025	0.107	68.4	2.68	31.5	11.8	-16.0	3.20	0.0460	1.8	3.4	8.5
	92	0.009	0.038	0.029	0.112	67.2	2.70	32.2	11.9	-16.3	3.20	0.0484	0.9	5.7	7.6
	96	0.018	0.048	0.021	0.115	68.2	2.58	31.9	12.4	-16.3	3.08	0.0532	0.0	6.7	8.1
	100	0.018	0.038	0.029	0.125	65.1	2.51	31.4	12.5	-16.0	3.13	0.0571	0.0	8.2	7.5
	104	0.034	0.046	0.033	0.142	60.1	2.33	28.7	12.3	-14.9	3.53	0.0655	0.0	6.7	7.5
	108	0.024	0.040	0.055	0.143	57.8	2.17	27.2	12.5	-14.9	4.24	0.0719	0.0	3.0	11.5
	112	0.014	0.022	0.030	0.143	42.3	1.65	21.4	13.0	-15.7	4.41	0.1088	0.8	9.1	2.6
	116	0.021	0.026	0.025	0.121	37.5	1.25	15.7	12.6	-16.1	4.40	0.1178	0.8	9.2	2.5
	120	0.034	0.043	0.024	0.090	29.3	1.11	13.8	12.5	-16.1	5.33	0.1599	0.0	7.5	1.9
	124	0.025	0.032	0.055	0.077	27.0	1.40	17.5	12.5	-15.4	6.22	0.1809	0.6	5.5	1.8
	128	0.018	0.029	0.048	0.121	39.0	2.16	25.6	11.9	-15.5	6.39	0.1281	0.0	1.4	10.4
	132	0.028	0.046	0.026	0.114	41.7	1.72	20.4	11.9	-15.3	6.88	0.1149	0.4	1.9	8.7
	136	0.037	0.051	0.019	0.107	41.2	1.59	19.3	12.2	-14.9	6.77	0.1607	0.0	3.9	0.8
	140	0.026	0.032	0.009	0.110	37.8	2.11	24.4	11.6	-14.9	6.86	0.1675	0.4	0.1	4.4
	144	0.027	0.034	0.030	0.065	41.2	2.06	26.3	12.8	-15.0	6.76	0.1439	0.9	2.9	5.3
	148	0.025	0.020	0.105	0.043	33.8	1.44	17.6	12.2	-18.0	7.39	0.2110	0.4	4.1	10.0
	152	0.041	0.044	0.068	0.151	49.4	1.93	25.3	13.1	-16.6	6.50	0.1406	0.0	5.6	5.2
LY1-99	4	0.017	0.251	0.320	1.237	70.1	3.66	34.3	9.4	-24.6	1.72	0.0200	72.1	15.7	0.9
	8	0.017	0.242	0.314	1.078	70.3	3.62	34.4	9.5	-24.7	1.78	0.0270	72.1	9.1	1.3
	12	0.013	0.154	0.296	1.058	70.2	3.64	34.1	9.4	-24.6	1.81	0.0330	63.8	15.0	1.3

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LY1-99	16	0.012	0.254	0.229	0.897	66.6	3.43	33.2	9.7	-24.1	1.84	0.0340	66.4	7.7	2.6
	20	0.015	0.103	0.128	0.560	67.6	3.32	33.3	10.0	-23.5	2.23	0.0350	63.1	14.3	0.4
	24	0.016	0.061	0.083	0.374	64.4	2.84	28.9	10.2	-22.9	2.40	0.0400	62.3	12.6	1.7
	28	0.012	0.054	0.055	0.319	66.6	3.30	34.1	10.3	-22.4	2.06	0.0410	56.7	16.2	1.5
	32	0.017	0.049	0.044	0.265	67.0	3.22	33.5	10.4	-21.8	1.84	0.0410	58.2	17.6	3.3
	36	0.026	0.039	0.040	0.226	64.2	2.90	31.2	10.7	-21.7	1.79	0.0420	53.0	26.0	0.7
	40	0.041	0.036	0.036	0.190	64.5	3.08	33.8	11.0	-22.0	1.85	0.0440	39.0	31.1	0.8
	44	0.029	0.058	0.057	0.168	62.0	3.18	34.5	10.9	-22.5	1.66	0.0480	30.5	30.5	1.0
	48	0.030	0.049	0.025	0.163	60.2	3.18	34.6	10.9	-22.5	1.71	0.0500	35.9	25.3	0.7
	52	0.039	0.046	0.028	0.161	55.9	2.89	32.4	11.2	-22.7	1.79	0.0530	31.6	27.6	5.7
	56	0.028	0.030	0.030	0.137	50.7	2.19	25.1	11.5	-23.1	1.93	0.0620	35.2	26.3	1.8
	60	0.041	0.027	0.041	0.093	50.4	2.37	28.8	12.2	-23.4	2.00	0.0670	35.4	26.5	0.9
	64	0.056	0.026	0.034	0.109	54.0	2.45	30.6	12.5	-23.4	2.35	0.0620	24.1	26.7	1.1
	68	0.058	0.024	0.029	0.122	54.8	2.70	33.5	12.4	-22.7	2.62	0.0600	19.5	45.7	0.8
	72	0.031	0.021	0.021	0.090	54.1	2.41	29.6	12.3	-22.1	2.77	0.0610	25.5	37.1	3.2
	76	0.036	0.018	0.024	0.105	53.9	2.06	25.2	12.2	-21.5	2.81	0.0680	21.4	12.9	21.6
	80	0.042	0.018	0.020	0.070	42.7	2.04	25.4	12.5	-22.1	2.47	0.0810	14.9	29.9	29.4
	84	0.038	0.023	0.026	0.057	38.0	1.84	23.2	12.6	-21.9	2.68	0.0850	19.9	20.3	32.8
	88	0.032	0.020	0.031	0.095	41.7	1.91	24.0	12.5	-21.6	2.83	0.0890	8.1	18.8	21.9
	92	0.022	0.016	0.020	0.069	37.3	2.35	29.8	12.7	-21.2	3.19	0.0970	7.4	17.4	32.3
	96	0.024	0.017	0.026	0.118	40.8	2.03	26.4	13.0	-19.7	3.79	0.0890	0.0	20.1	18.1
	100	0.054	0.030	0.031	0.131	54.0	2.50	31.3	12.5	-18.3	4.23	0.0650	0.0	16.7	15.8
	104	0.046	0.023	0.026	0.125	55.1	2.21	28.0	12.7	-18.8	4.26	0.0670	0.0	18.1	19.0
	108	0.058	0.021	0.030	0.143	53.5	2.56	31.3	12.2	-17.3	4.37	0.0630	0.9	16.1	15.0
	112	0.049	0.017	0.047	0.214	58.1	2.29	27.6	12.1	-15.9	4.10	0.0570	1.2	17.4	12.5
	116	0.047	0.013	0.052	0.272	54.1	2.00	24.6	12.3	-17.4	3.90	0.0620	1.4	17.3	15.2
	120	0.088	0.015	0.070	0.179	51.3	2.09	25.5	12.2	-16.8	4.21	0.0660	0.7	15.2	14.3
	124	0.076	0.058	0.072	0.227	53.9	2.33	27.9	12.0	-16.1	4.35	0.0610	0.0	10.2	17.5
	128	0.057	0.030	0.057	0.227	54.6	2.44	28.7	11.8	-14.5	4.28	0.0580	0.0	8.3	17.5

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LY2-99	4	0.020	0.362	0.312	0.942	70.8	3.60	33.2	9.2	-24.5	2.35	0.0130	61.9	13.2	0.6
	8	0.015	0.357	0.542	1.122	68.1	3.70	34.0	9.2	-24.5	2.23	0.0220	58.3	18.2	0.8
	12	0.014	0.304	0.321	1.143	64.0	3.46	32.1	9.3	-24.7	2.22	0.0300	54.7	13.2	0.4
	16	0.012	0.281	0.283	0.878	52.8	2.85	26.8	9.4	-24.5	2.06	0.0460	44.2	16.8	1.3
	20	0.011	0.162	0.238	0.708	47.4	2.85	28.0	9.8	-24.0	1.81	0.0550	49.1	17.7	0.4
	24	0.020	0.075	0.132	0.454	59.8	2.73	28.2	10.3	-23.2	1.84	0.0470	37.4	34.8	0.4
	28	0.035	0.038	0.039	0.243	53.0	2.48	27.1	10.9	-22.7	1.84	0.0510	29.1	42.4	6.4
	32	0.031	0.019	0.026	0.161	39.9	1.84	20.4	11.1	-22.7	1.58	0.0620	27.2	31.6	0.5
	36	0.033	0.032	0.025	0.160	46.9	2.36	26.4	11.2	-22.8	1.58	0.0600	43.3	27.9	2.9
	40	0.036	0.032	0.014	0.109	49.7	2.17	25.6	11.8	-23.3	1.63	0.0580	43.5	32.9	6.5
	44	0.029	0.032	0.015	0.147	60.2	2.67	31.7	11.9	-23.6	1.83	0.0530	48.1	30.5	7.1
	48	0.045	0.019	0.024	0.114	51.2	2.55	30.5	12.0	-23.5	2.01	0.0700	38.8	17.6	7.0
	52	0.051	0.024	0.018	0.079	53.5	2.77	33.1	12.0	-23.6	2.01	0.0740	46.8	27.9	7.7
	56	0.068	0.021	0.017	0.074	58.1	2.76	33.6	12.2	-23.8	1.99	0.0690	48.1	29.2	7.2
	60	0.051	0.030	0.019	0.111	67.9	2.85	35.2	12.4	-23.6	2.18	0.0590	30.7	43.2	5.8
	64	0.047	0.030	0.019	0.115	69.7	2.97	36.4	12.3	-23.1	2.70	0.0550	43.7	35.3	1.1
	68	0.067	0.023	0.020	0.104	63.8	2.90	35.5	12.2	-23.0	2.59	0.0610	39.4	36.0	4.5
	72	0.047	0.010	0.018	0.070	46.7	2.23	27.1	12.2	-22.0	2.45	0.0810	35.1	42.4	2.8
	76	0.048	0.008	0.026	0.093	60.9	2.63	31.2	11.9	-21.8	2.41	0.0640	46.1	22.3	23.0
	80	0.027	0.004	0.012	0.030	23.8	1.45	17.8	12.3	-21.8	1.99	0.1290	20.0	17.6	17.6
	84	0.026	0.004	0.014	0.034	21.2	1.45	18.0	12.4	-21.5	1.79	0.1730	7.8	10.5	4.5
	88	0.052	0.009	0.024	0.074	36.8	1.81	22.5	12.4	-21.6	2.36	0.0860	43.5	31.1	24.6
	92	0.042	0.012	0.031	0.079	46.4	2.08	25.6	12.3	-21.7	2.39	0.0830	22.4	18.7	12.3
	96	0.028	0.011	0.022	0.091	50.4	2.52	31.0	12.3	-21.9	2.37	0.0780	40.1	33.6	21.7
	100	0.051	0.010	0.030	0.099	59.9	2.76	33.8	12.3	-22.0	2.62	0.0640	52.2	47.8	17.9
	104	0.041	0.009	0.071	0.085	58.7	2.79	34.7	12.4	-22.6	2.33	0.0690	45.6	41.4	18.3
	108	0.049	0.002	0.047	0.092	56.7	2.59	32.3	12.5	-22.4	2.66	0.0700	19.6	43.6	19.9
	112	0.047	0.006	0.038	0.093	56.9	2.42	30.1	12.4	-22.2	2.58	0.0720	13.2	50.3	15.6
	116	0.034	0.012	0.022	0.097	44.9	2.31	28.5	12.3	-20.8	3.23	0.0880	9.1	34.2	17.1
	120	0.024	0.009	0.017	0.058	47.2	2.14	27.3	12.7	-20.7	2.99	0.0870	4.2	31.1	20.1

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LY2-99	124	0.024	0.012	0.000	0.039	44.5	1.94	23.9	12.3	-17.9	3.44	0.0840	0.0	16.0	16.7
	128	0.022	0.011	0.019	0.105	54.5	2.70	32.6	12.1	-18.0	3.60	0.0650	3.0	22.8	13.4
	132	0.033	0.011	0.004	0.077	34.8	1.59	19.8	12.4	-18.1	3.35	0.1030	0.0	22.9	11.9
	136	0.034	0.004	0.012	0.099	54.0	2.43	30.0	12.3	-17.4	3.44	0.0650	0.6	18.9	16.6
	140	0.052	0.000	0.017	0.061	49.4	2.19	27.6	12.6	-17.8	3.42	0.0730	3.9	24.7	9.6
	144	0.064	0.000	0.018	0.064	50.7	2.15	27.5	12.8	-18.5	3.83	0.0810	11.2	37.5	10.7
	148	0.052	0.000	0.024	0.150	58.2	2.34	30.2	12.9	-18.5	3.80	0.0690	14.3	39.0	14.1
LY3-99	4	0.021	0.373	0.464	1.245	71.7	3.78	33.9	9.0	-24.4	2.37	0.0160	76.9	8.3	1.2
	8	0.009	0.371	0.406	1.370	69.1	3.82	33.7	8.8	-24.3	2.21	0.0290	78.4	8.2	1.7
	12	0.008	0.486	0.588	1.314	66.2	3.39	31.2	9.2	-24.0	1.89	0.0350	67.4	4.3	1.7
	16	0.008	0.432	0.759	1.235	64.5	3.63	33.5	9.2	-23.7	1.78	0.0380	67.5	5.0	1.4
	20	0.008	0.632	0.408	1.018	60.8	3.57	33.4	9.4	-23.2	1.94	0.0430	57.7	6.7	1.4
	24	0.010	0.186	0.299	0.818	53.5	2.66	25.8	9.7	-23.5	2.00	0.0480	62.4	1.7	6.1
	28	0.015	0.053	0.149	0.440	48.8	2.70	26.9	10.0	-22.9	2.38	0.0540	61.0	9.0	1.8
	32	0.016	0.040	0.091	0.298	46.7	2.76	27.7	10.1	-22.1	2.03	0.0590	60.5	9.4	2.1
	36	0.031	0.012	0.068	0.175	50.6	2.90	29.5	10.2	-21.3	1.72	0.0520	52.5	16.9	1.9
	40	0.024	0.010	0.056	0.209	52.0	2.86	29.3	10.2	-21.4	1.86	0.0520	45.7	39.3	1.3
	44	0.031	0.016	0.049	0.197	51.1	2.71	27.8	10.3	-21.3	1.78	0.0510	62.0	14.3	1.3
	48	0.052	0.030	0.052	0.189	52.5	2.93	30.1	10.3	-21.5	1.90	0.0520	61.9	11.9	1.1
	52	0.038	0.022	0.043	0.157	54.9	2.52	26.1	10.4	-21.7	1.81	0.0540	46.3	20.0	0.6
	56	0.066	0.023	0.033	0.157	53.4	2.91	29.7	10.2	-22.0	1.89	0.0550	34.1	28.6	0.5
	60	0.049	0.024	0.045	0.152	47.8	3.10	31.2	10.1	-22.1	1.74	0.0600	32.7	14.7	1.1
	64	0.046	0.013	0.024	0.120	42.6	2.81	28.1	10.0	-22.1	1.60	0.0690	46.2	20.5	1.3
	68	0.041	0.007	0.009	0.066	36.2	2.70	26.2	9.7	-22.3	1.62	0.0790	44.1	24.2	1.3
	72	0.065	0.009	0.020	0.118	47.8	2.81	27.3	9.7	-22.5	1.66	0.0620	44.4	37.2	1.2
	76	0.058	0.006	0.021	0.052	41.7	3.23	32.0	9.9	-22.5	1.74	0.0710	34.9	15.6	11.4
	80	0.059	0.012	0.033	0.097	48.5	3.33	33.6	10.1	-22.7	1.77	0.0670	37.1	19.1	18.4
	84	0.052	0.006	0.024	0.074	42.5	3.35	32.8	9.8	-22.9	2.35	0.0760	20.9	34.2	20.6
	88	0.025	0.009	0.023	0.026	32.7	3.38	30.9	9.2	-22.8	1.78	0.0990	30.8	24.1	20.9

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LY3-99	92	0.040	0.009	0.013	0.030	32.2	3.51	29.8	8.5	-22.6	1.61	0.0970	25.9	17.6	16.9
	96	0.025	0.007	0.016	0.034	32.0	2.72	19.0	7.0	-22.4	2.05	0.1050	27.2	17.0	14.7
	100	0.040	0.011	0.018	0.060	35.3	3.20	23.7	7.4	-22.2	2.23	0.0970	20.2	29.1	14.5
	104	0.034	0.013	0.018	0.052	41.0	3.81	31.8	8.3	-21.6	2.44	0.0820	14.7	50.8	18.4
	108	0.030	0.010	0.016	0.046	44.5	4.10	32.6	8.0	-21.4	2.12	0.0780	17.1	54.2	11.4
	112	0.034	0.010	0.027	0.051	48.8	4.44	32.7	7.4	-21.4	2.23	0.0910	19.8	56.5	1.9
	116	0.036	0.006	0.024	0.031	34.7	4.83	30.8	6.4	-21.6	1.74	0.1040	21.3	62.2	2.8
	120	0.030	0.009	0.024	0.042	38.9	6.09	31.2	5.1	-22.4	2.09	0.0960	12.8	58.6	2.1
	124	0.025	0.007	0.015	0.042	40.4	4.90	25.3	5.2	-22.2	2.40	0.1060	7.3	65.2	3.0
	128	0.017	0.008	0.030	0.062	43.3	3.41	26.8	7.9	-22.5	2.66	0.0970	15.6	55.3	4.0
	132	0.036	0.010	0.036	0.096	51.0	3.68	24.9	6.8	-22.4	2.74	0.0830	3.7	56.3	2.9
	136	n.d.	n.d.	0.040	0.113	54.4	3.83	28.7	7.5	-22.2	2.84	0.0830	0.0	40.1	11.3
LH1-99	4	0.011	0.184	0.360	1.098	66.3	3.50	31.0	8.9	-23.0	1.09	0.0150	82.4	17.8	2.9
	8	0.008	0.200	0.357	0.989	61.0	3.40	31.4	9.2	-22.7	1.20	0.0280	88.0	13.1	6.0
	12	0.011	0.081	0.189	1.196	60.3	3.10	30.7	9.9	-21.8	0.82	0.0390	97.4	26.4	1.2
	16	0.048	0.046	0.088	0.346	58.9	2.67	29.6	11.1	-20.7	0.58	0.0420	91.6	38.6	2.4
	20	0.030	0.033	0.093	0.317	60.4	2.65	29.3	11.1	-20.6	0.89	0.0460	104.1	22.2	30.2
	24	0.031	0.037	0.063	0.271	59.8	2.68	30.6	11.4	-20.8	0.48	0.0470	83.6	39.9	17.3
	28	0.033	0.042	0.057	0.227	56.3	2.66	30.1	11.3	-20.8	0.52	0.0520	80.7	58.8	3.5
	32	0.040	0.063	0.071	0.242	57.4	2.68	29.6	11.0	-20.8	0.57	0.0510	68.5	64.2	11.2
	36	0.032	0.040	0.057	0.235	56.4	2.69	29.9	11.1	-20.7	1.04	0.0530	73.8	63.8	12.3
	40	0.034	0.052	0.073	0.231	57.5	2.56	28.9	11.3	-20.8	0.77	0.0540	92.0	46.2	7.8
	44	0.052	0.028	0.084	0.255	56.2	2.62	29.2	11.2	-20.8	0.78	0.0590	95.2	49.2	12.4
	48	0.053	0.031	0.086	0.261	56.3	2.68	30.2	11.3	-20.7	0.49	0.0630	84.2	44.2	6.2
	52	0.056	0.031	0.062	0.223	60.4	2.61	30.2	11.6	-20.6	0.92	0.0590	67.2	45.6	4.8
	56	0.034	0.026	0.032	0.246	58.1	2.79	31.4	11.3	-20.7	0.79	0.0570	71.2	48.5	2.3
	60	0.058	0.031	0.038	0.224	58.7	2.61	29.5	11.3	-20.8	0.80	0.0550	59.5	44.5	14.8
	64	0.044	0.034	0.032	0.208	57.4	2.83	32.4	11.5	-20.8	0.55	0.0560	59.2	45.6	15.7
	68	0.042	0.040	0.021	0.192	52.7	2.69	30.2	11.2	-20.8	0.51	0.0680	63.3	43.5	14.5

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH1-99	72	0.062	0.061	0.068	0.197	58.7	2.87	32.9	11.5	-20.7	0.54	0.0590	71.0	48.1	14.1
	76	0.074	0.027	0.039	0.179	55.4	2.79	32.4	11.6	-20.8	0.37	0.0650	63.2	38.1	9.5
	80	0.073	0.037	0.022	0.196	53.7	2.55	29.9	11.7	-20.7	1.11	0.0620	41.3	23.9	13.9
	84	0.046	0.024	0.039	0.199	55.2	2.79	32.4	11.6	-20.6	1.21	0.0630	23.2	28.6	1.3
	88	0.074	0.037	0.043	0.256	61.6	2.82	33.4	11.9	-20.6	1.04	0.0580	21.7	29.8	0.8
	92	0.037	0.023	0.028	0.219	57.8	2.58	30.9	12.0	-20.3	1.23	0.0610	22.1	17.9	13.2
	96	0.050	0.046	0.022	0.231	63.0	2.79	34.0	12.2	-20.0	1.44	0.0540	14.9	40.3	1.9
	100	0.066	0.037	0.024	0.259	58.0	2.68	32.6	12.2	-19.8	1.21	0.0630	20.5	35.4	3.8
	104	0.080	0.040	0.025	0.247	62.8	2.86	34.6	12.1	-19.8	1.11	0.0570	15.9	43.4	2.4
	108	0.074	0.049	0.017	0.363	50.2	2.26	28.0	12.4	-9.4	1.30	0.0740	14.1	21.3	8.7
	112	0.043	0.028	0.013	0.443	48.4	1.61	26.0	16.2	-9.4	2.24	0.0690	0.6	8.6	0.6
	116	0.066	0.041	0.031	0.566	57.6	2.11	34.4	16.3	-9.5	1.77	0.0560	0.8	4.1	6.5
	120	0.062	0.068	0.033	0.530	55.0	1.96	32.6	16.6	-8.9	1.66	0.0610	0.1	7.7	2.7
LH2R-99	4	0.041	0.196	0.366	1.075	64.0	3.65	32.6	8.9	-22.6	1.05	0.0130	65.4	30.7	0.1
	8	0.018	0.218	0.317	0.991	61.7	3.54	34.0	9.6	-22.4	0.64	0.0230	73.4	35.2	2.5
	12	0.014	0.162	0.214	0.741	58.9	3.77	35.6	9.4	-21.9	0.34	0.0320	51.5	68.4	2.0
	16	0.043	0.024	0.066	0.273	44.2	3.19	34.5	10.8	-20.5	0.30	0.0550	22.7	108.4	6.3
	20	0.068	0.015	0.044	0.264	60.3	3.10	35.6	11.5	-20.7	0.21	0.0490	17.5	136.8	1.0
	24	0.089	0.017	0.037	0.254	59.4	3.14	35.9	11.4	-20.7	0.47	0.0510	19.9	123.7	0.7
	28	0.114	0.018	0.045	0.275	58.4	2.39	27.2	11.4	-20.7	0.62	0.0530	15.4	134.2	0.3
	32	0.130	0.035	0.046	0.275	52.5	2.32	26.8	11.5	-20.8	0.57	0.0570	21.1	132.6	2.3
	36	0.124	0.022	0.077	0.278	55.3	2.45	27.4	11.2	-20.7	0.42	0.0540	16.5	139.2	1.6
	40	0.101	0.020	0.046	0.277	55.2	2.49	28.4	11.4	-20.7	0.28	0.0590	0.1	118.8	1.4
	44	0.042	0.025	0.063	0.308	55.8	2.20	25.1	11.4	-20.3	0.28	0.0590	2.9	81.8	15.1
	48	0.038	0.032	0.046	0.287	57.8	2.45	29.3	12.0	-20.2	0.33	0.0590	0.3	53.3	9.2
	52	0.043	0.037	0.043	0.270	61.4	2.46	28.1	11.4	-19.9	0.76	0.0570	1.1	43.6	7.7
	56	0.043	0.035	0.046	0.279	58.7	2.74	30.3	11.0	-20.1	0.58	0.0570	8.8	42.8	2.0
	60	0.034	0.027	0.033	0.233	51.0	2.48	29.1	11.7	-19.9	1.06	0.0680	8.8	28.6	5.0
	64	0.044	0.025	0.038	0.314	52.0	2.36	28.6	12.1	-19.0	1.49	0.0670	6.2	20.1	10.9

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH2R-99	68	0.045	0.031	0.080	0.434	59.1	2.18	26.1	12.0	-18.8	1.44	0.0610	6.3	21.5	8.5
	72	0.063	0.020	0.050	0.337	50.6	2.13	25.4	11.9	-18.9	1.46	0.0670	6.1	20.1	9.3
	76	0.058	0.023	0.036	0.352	45.3	1.92	23.5	12.3	-19.0	1.36	0.0770	4.2	25.0	4.2
	80	0.067	0.024	0.032	0.315	43.9	2.45	29.0	11.8	-18.5	1.58	0.0790	5.5	14.4	7.9
	84	0.147	0.024	0.039	0.354	37.9	1.41	16.6	11.8	-16.9	1.83	0.0820	4.2	14.7	8.1
	88	0.140	0.013	0.029	0.394	33.2	1.94	23.7	12.2	-15.5	1.35	0.0990	0.7	7.8	7.6
	92	0.139	0.014	0.058	0.528	32.1	1.74	21.9	12.6	-15.1	1.32	0.1020	0.7	4.9	10.2
	96	0.132	0.017	0.031	0.515	57.6	2.26	27.6	12.2	-14.7	1.69	0.0570	0.0	7.3	8.6
	100	0.066	0.009	0.027	0.939	30.4	1.42	18.0	12.7	-14.3	1.39	0.1190	0.0	5.9	1.0
	104	0.099	0.005	0.023	0.596	62.0	2.48	31.8	12.8	-13.9	1.77	0.0550	2.4	11.7	5.1
	108	0.101	0.017	0.038	0.602	65.8	2.62	34.5	13.2	-13.6	1.85	0.0500	5.3	13.7	0.8
	112	0.090	0.001	0.036	0.560	65.9	2.57	34.2	13.3	-13.4	1.69	0.0510	0.8	17.1	1.7
	116	0.072	0.007	0.055	0.490	62.6	2.42	32.6	13.5	-13.2	1.73	0.0550	1.3	11.6	3.6
	120	0.077	0.002	0.038	0.596	59.4	2.24	31.8	14.2	-12.7	1.55	0.0560	0.4	13.7	1.1
	124	0.082	0.000	0.026	0.591	51.4	1.73	27.0	15.6	-9.9	1.33	0.0660	0.0	8.8	3.2
	128	0.082	0.000	0.034	0.550	47.0	1.75	26.0	14.9	-10.2	1.37	0.0700	0.0	7.2	5.3
	132	0.129	0.000	0.014	0.604	40.9	1.61	24.8	15.4	-10.1	1.28	0.0830	0.0	7.9	5.7
LH3R-99	4	0.024	0.351	0.534	1.259	66.9	4.06	36.2	8.9	-23.2	0.94	0.0200	82.9	18.1	1.5
	8	0.020	0.447	0.493	1.229	66.5	4.06	36.7	9.0	-23.0	0.67	0.0270	81.2	17.5	1.2
	12	0.024	0.343	0.490	1.180	65.6	3.71	34.0	9.2	-22.8	0.38	0.0310	84.2	13.9	0.9
	16	0.025	0.167	0.319	0.891	60.8	3.46	33.3	9.6	-22.1	0.58	0.0370	86.9	17.3	1.3
	20	0.027	0.116	0.246	0.785	57.0	3.47	33.0	9.5	-22.0	0.57	0.0420	90.4	14.7	6.5
	24	0.042	0.071	0.180	0.623	52.2	3.03	30.8	10.2	-21.8	0.50	0.0480	79.0	17.8	4.7
	28	0.036	0.048	0.135	0.482	53.2	2.89	30.2	10.4	-21.7	0.53	0.0550	86.2	11.5	16.3
	32	0.046	0.025	0.088	0.299	50.6	3.00	33.1	11.0	-20.6	0.23	0.0550	83.8	30.9	8.5
	36	0.060	0.031	0.083	0.325	57.5	3.17	34.5	10.9	-20.3	0.07	0.0450	90.9	32.3	8.8
	40	0.050	0.028	0.078	0.285	49.3	2.79	31.2	11.2	-20.7	0.53	0.0600	78.1	37.4	3.5
	44	0.084	0.024	0.026	0.235	37.8	2.65	30.8	11.6	-20.9	0.45	0.0810	34.9	19.4	1.1
	48	0.082	0.027	0.047	0.221	46.3	2.54	30.1	11.8	-20.9	0.48	0.0680	35.4	34.4	0.1

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH3R-99	52	0.093	0.029	0.050	0.205	47.8	2.91	34.9	12.0	-20.8	0.51	0.0660	33.2	22.5	12.0
	56	0.106	0.029	0.033	0.226	45.8	2.66	31.5	11.8	-20.7	0.42	0.0720	38.2	22.5	4.9
	60	0.129	0.019	0.033	0.348	42.6	2.01	23.9	11.9	-18.1	1.27	0.0910	13.8	11.4	4.2
	64	0.163	0.027	0.051	0.493	48.2	2.49	31.6	12.7	-16.1	1.44	0.0680	10.3	6.8	5.7
	68	0.139	0.023	0.029	0.452	44.2	2.52	30.7	12.2	-17.4	1.39	0.0700	17.7	13.8	0.7
	72	0.152	0.001	0.041	0.439	44.3	2.42	31.1	12.9	-15.6	1.40	0.0690	6.8	8.8	3.1
	76	0.160	0.006	0.064	0.738	61.9	2.64	34.2	13.0	-14.9	1.54	0.0480	4.1	10.9	0.7
	80	0.127	0.024	0.038	0.950	66.8	3.04	40.6	13.4	-14.6	1.74	0.0470	3.9	7.4	5.4
	84	0.078	0.024	0.070	0.750	61.9	2.79	37.8	13.5	-14.3	1.49	0.0520	2.2	7.6	6.8
	88	0.117	0.033	0.098	0.854	61.7	2.71	36.4	13.4	-14.2	1.40	0.0550	2.9	6.5	6.3
	92	0.074	0.000	0.023	0.658	61.1	2.27	30.1	13.3	-13.2	1.45	0.0560	1.8	4.7	5.8
	96	0.053	0.009	0.004	0.694	58.6	2.65	37.3	14.1	-12.9	1.25	0.0620	1.5	4.0	7.0
	100	0.067	0.009	0.030	0.828	55.0	2.36	34.3	14.6	-12.8	1.42	0.0640	1.7	4.2	5.0
	104	0.069	0.013	0.037	0.649	47.8	2.18	32.0	14.7	-12.5	1.82	0.0720	1.2	4.6	4.4
	108	0.076	0.013	0.025	0.955	44.4	1.99	30.7	15.4	-11.2	1.94	0.0820	1.1	5.1	4.9
	112	0.061	0.002	0.029	0.640	41.9	1.93	30.5	15.8	-10.0	1.99	0.0820	0.0	4.1	5.4
	116	0.058	0.003	0.024	0.562	43.0	1.77	29.6	16.7	-9.0	1.48	0.0830	0.0	3.2	5.5
	120	0.050	0.001	0.026	0.573	41.4	1.71	28.2	16.5	-8.6	1.22	0.0810	0.0	3.2	5.6
	124	0.051	0.006	0.030	0.608	40.4	1.63	28.1	17.3	-8.0	1.49	0.0860	0.0	2.4	6.7
	128	0.045	0.005	0.017	0.660	39.8	1.59	28.2	17.7	-7.0	1.55	0.0900	0.0	3.1	4.6
	132	0.044	0.000	0.023	0.691	37.1	1.41	26.5	18.8	-6.6	1.75	0.1030	0.0	2.3	5.4
	136	0.040	0.000	0.027	0.539	33.5	1.32	25.4	19.2	-6.4	1.64	0.1050	0.0	2.5	5.5
	140	0.059	0.000	0.023	0.529	33.1	1.29	25.5	19.8	-6.7	2.08	0.1040	0.0	1.0	6.9
	144	0.057	0.000	0.035	0.531	33.2	1.31	25.5	19.5	-7.2	1.76	0.1000	1.2	1.9	4.7
	148	0.054	0.000	0.044	0.455	32.3	1.31	25.4	19.4	-6.7	1.70	0.1040	1.0	1.6	5.1
	152	0.062	0.000	0.044	0.546	33.9	1.32	25.8	19.5	-7.2	1.68	0.1010	1.8	2.9	4.4
LH4-99	4	0.014	0.159	0.480	1.258	71.7	3.76	32.0	8.5	-23.2	0.97	0.0140	80.2	15.3	2.8
	8	0.011	0.220	0.637	1.396	67.7	4.07	36.3	8.9	-23.1	0.99	0.0220	88.0	19.0	3.4
	12	0.026	0.149	0.569	1.347	67.2	3.93	36.3	9.2	-22.9	0.90	0.0290	89.2	17.8	1.5

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH4-99	16	0.023	0.072	0.420	2.048	64.0	3.86	36.1	9.4	-22.4	0.66	0.0300	87.2	20.2	2.3
	20	0.029	0.033	0.228	0.933	60.4	3.36	33.5	10.0	-21.9	0.28	0.0360	95.0	21.0	4.9
	24	0.057	0.014	0.141	0.552	59.0	3.19	33.1	10.4	-21.8	0.76	0.0420	92.9	26.3	4.4
	28	0.045	0.054	0.100	0.486	60.0	3.19	34.0	10.7	-22.0	0.09	0.0460	90.5	35.9	4.5
	32	0.051	0.026	0.087	0.440	60.0	3.16	33.3	10.5	-21.8	0.41	0.0480	79.1	44.9	17.8
	36	0.053	0.086	0.096	0.380	60.5	2.88	29.8	10.4	-21.0	-0.06	0.0430	77.6	51.7	16.1
	40	0.076	0.066	0.092	0.364	61.3	2.89	30.2	10.4	-20.4	-0.36	0.0420	61.2	59.0	16.5
	44	0.065	0.065	0.099	0.337	59.8	2.80	29.8	10.7	-20.3	-0.18	0.0430	45.1	72.7	11.4
	48	0.051	0.052	0.084	0.317	59.6	2.94	32.3	11.0	-20.1	0.22	0.0450	30.0	88.8	17.8
	52	0.073	0.025	0.080	0.319	58.9	2.92	31.5	10.8	-20.0	0.08	0.0460	34.7	94.8	2.9
	56	0.073	0.008	0.087	0.297	58.2	3.00	33.2	11.1	-20.3	0.46	0.0480	49.9	72.0	16.2
	60	0.090	0.067	0.086	0.288	18.2	2.99	33.3	11.1	-20.2	0.65	0.0500	19.1	105.7	11.0
	64	0.042	0.133	0.086	0.292	57.2	2.91	33.1	11.4	-20.4	0.64	0.0520	36.0	86.2	15.6
	68	0.080	0.007	0.081	0.283	57.6	2.92	33.2	11.4	-20.4	0.59	0.0510	75.4	49.0	17.7
	72	0.083	0.052	0.080	0.309	55.2	2.73	30.4	11.1	-20.2	0.25	0.0520	33.6	70.5	16.5
	76	0.063	0.056	0.072	0.251	59.6	3.06	36.7	12.0	-20.2	0.36	0.0500	17.5	48.9	11.5
	80	0.076	0.027	0.057	0.289	51.8	2.82	32.7	11.6	-20.3	0.83	0.0630	16.9	45.3	13.5
	84	0.067	0.070	0.069	0.290	49.6	3.36	38.6	11.5	-20.5	0.77	0.0620	37.5	48.0	13.2
	88	0.073	0.075	0.067	0.312	52.2	2.57	30.4	11.8	-20.4	0.80	0.0590	27.4	75.7	9.2
	92	0.121	0.000	0.203	0.386	42.9	2.09	25.0	12.0	-18.2	2.18	0.0770	0.7	14.5	9.0
	96	0.159	0.000	0.077	0.439	63.9	2.55	31.0	12.2	-17.6	2.20	0.0540	0.0	14.1	10.4
	100	0.136	0.018	0.070	0.497	59.2	2.66	32.0	12.0	-17.1	2.00	0.0570	0.4	10.4	10.6
	104	0.222	0.000	0.102	0.589	58.8	2.60	30.8	11.9	-16.4	1.71	0.0540	0.9	7.1	7.0
	108	0.300	0.000	0.100	0.606	59.6	2.74	33.0	12.0	-16.2	1.77	0.0530	0.7	5.9	9.2
	112	0.345	0.000	0.066	0.614	48.7	2.26	27.4	12.1	-15.5	1.87	0.0630	0.3	5.6	7.9
	116	0.221	0.000	0.112	1.086	60.7	2.70	33.4	12.4	-15.1	2.00	0.0540	0.2	5.8	8.3
	120	0.224	0.000	0.057	0.786	64.2	2.50	31.5	12.6	-15.0	1.94	0.0510	0.2	9.1	6.6
	124	0.153	0.000	0.078	0.613	64.6	2.63	31.7	12.0	-15.5	1.88	0.0490	0.8	20.2	1.1
	128	0.148	0.000	0.073	0.595	58.9	2.63	31.3	11.9	-17.1	1.61	0.0560	8.4	40.7	0.9
	132	0.172	0.000	0.057	0.383	52.1	2.42	29.1	12.0	-18.6	1.42	0.0650	5.6	47.4	5.0

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH4-99	136	0.234	0.000	0.068	0.525	53.6	2.36	28.1	11.9	-18.1	1.27	0.0660	13.7	34.9	7.5
	140	0.094	0.007	0.120	0.686	61.4	2.55	31.4	12.3	-16.0	1.74	0.0570	16.4	11.9	7.0
	144	n.d.	n.d.	0.047	0.729	66.6	2.71	34.8	12.9	-14.4	1.89	0.0510	3.3	11.1	6.9
LH5-99	4	0.033	0.487	0.366	1.113	68.7	3.49	30.7	8.8	-23.2	1.13	0.0120	77.3	21.3	1.1
	8	0.019	0.430	0.383	1.135	64.2	3.41	29.8	8.7	-23.2	0.65	0.0180	71.0	29.1	1.5
	12	0.026	0.264	0.441	1.089	55.9	3.22	29.0	9.0	-22.8	0.58	0.0250	77.3	30.5	0.2
	16	0.052	0.160	0.244	0.739	55.5	2.98	28.3	9.5	-21.9	0.49	0.0280	86.5	27.4	1.2
	20	0.080	0.053	0.163	0.600	56.6	2.85	28.1	9.9	-21.8	0.61	0.0310	95.3	37.1	2.9
	24	0.033	0.067	0.105	0.475	57.7	2.67	27.1	10.1	-22.0	0.82	0.0430	81.0	47.5	7.1
	28	0.034	0.055	0.101	0.434	59.8	2.88	29.2	10.2	-22.0	0.19	0.0420	90.1	35.3	17.6
	32	0.033	0.055	0.103	0.437	58.8	2.71	27.5	10.2	-22.0	0.12	0.0460	81.9	55.2	2.4
	36	0.039	0.022	0.087	0.400	58.9	2.89	29.4	10.2	-21.8	-0.17	0.0470	94.1	51.3	4.3
	40	0.046	0.026	0.078	0.368	59.7	2.94	29.7	10.1	-21.2	0.03	0.0430	121.5	20.8	12.3
	44	0.069	0.000	0.084	0.398	60.2	2.87	29.0	10.1	-21.0	-0.10	0.0430	101.7	53.7	2.2
	48	0.053	0.086	0.084	0.353	59.5	2.89	29.4	10.2	-20.9	-0.22	0.0430	107.2	55.2	2.2
	52	0.050	0.029	0.095	0.369	60.0	3.17	32.5	10.3	-20.8	-0.49	0.0460	91.9	54.8	15.2
	56	0.067	0.070	0.079	0.358	60.4	2.95	29.9	10.1	-20.6	-0.68	0.0460	112.1	48.3	1.0
	60	0.057	0.210	0.071	0.341	60.5	2.94	29.5	10.0	-20.4	-0.65	0.0460	106.1	46.1	2.9
	64	0.093	0.104	0.070	0.336	61.1	3.07	30.4	9.9	-20.1	-1.25	0.0430	106.4	51.9	6.3
	68	0.072	0.163	0.072	0.340	61.3	3.01	30.0	10.0	-20.0	-0.91	0.0420	105.1	54.5	1.4
	72	0.107	0.228	0.077	0.340	61.5	2.91	29.8	10.2	-20.2	-1.02	0.0430	118.8	43.4	1.6
	76	0.079	0.179	0.064	0.330	61.2	3.11	30.6	9.8	-20.1	-1.22	0.0410	123.0	46.8	5.0
	80	0.083	0.076	0.062	0.331	60.6	3.01	29.5	9.8	-20.1	-0.88	0.0420	130.7	34.4	4.8
	84	0.100	0.060	0.053	0.278	58.3	2.96	29.3	9.9	-20.1	-1.02	0.0450	103.2	45.2	3.3
	88	0.083	0.044	0.034	0.250	52.3	2.72	27.9	10.3	-20.0	-0.59	0.0520	79.0	48.9	5.4
	92	0.132	0.000	0.080	0.325	52.7	2.74	28.8	10.5	-20.1	0.10	0.0550	56.2	88.0	3.9
	96	0.113	0.000	0.072	0.209	51.1	2.63	28.8	11.0	-20.5	0.54	0.0590	55.2	90.7	2.7
	100	0.095	0.099	0.097	0.200	51.7	2.59	28.5	11.0	-20.6	0.53	0.0620	34.6	113.3	1.6
	104	0.081	0.017	0.085	0.215	53.0	2.54	28.1	11.1	-20.7	0.74	0.0610	33.2	95.1	1.4

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH5-99	108	0.070	0.080	0.078	0.203	55.4	2.65	29.5	11.1	-20.7	0.58	0.0600	18.1	125.2	15.1
	112	0.096	0.000	0.074	0.231	56.2	2.66	28.4	10.7	-20.4	0.24	0.0590	48.9	102.9	9.6
	116	0.096	0.000	0.071	0.256	56.6	2.76	29.6	10.7	-20.3	0.22	0.0570	30.9	105.4	7.0
	120	0.096	0.000	0.083	0.240	55.4	2.66	29.0	10.9	-20.6	0.57	0.0590	24.6	103.2	29.4
	124	0.207	0.000	0.073	0.208	53.9	2.61	28.7	11.0	-20.5	0.33	0.0640	18.7	96.8	22.6
	128	0.073	0.026	0.068	0.222	55.7	2.75	30.2	11.0	-20.4	0.38	0.0630	10.8	110.4	8.4
	132	0.085	0.000	0.059	0.289	56.7	2.70	30.2	11.2	-20.4	0.54	0.0610	4.4	121.6	3.0
	136	0.073	0.033	0.069	0.221	54.7	2.50	28.0	11.2	-20.4	0.52	0.0620	27.0	107.4	1.7
LH6R-99	4	0.007	0.275	0.552	1.197	70.2	3.52	31.2	8.9	-23.0	0.48	0.0070	83.7	18.7	0.2
	8	0.004	0.335	0.491	1.216	67.8	3.50	31.0	8.9	-23.1	0.44	0.0140	88.9	15.3	7.4
	12	0.003	0.311	0.541	1.271	68.4	3.54	30.9	8.7	-23.1	0.70	0.0180	86.9	19.3	1.2
	16	0.003	0.348	0.638	1.322	67.9	3.50	31.1	8.9	-23.1	0.56	0.0210	94.8	17.2	0.4
	20	0.006	0.267	0.544	1.209	66.6	3.41	30.6	9.0	-22.8	0.74	0.0270	88.3	14.9	8.0
	24	0.014	0.184	0.470	1.008	65.4	3.37	30.3	9.0	-22.4	0.63	0.0290	88.8	25.3	0.6
	28	0.014	0.122	0.356	0.791	62.8	3.09	28.9	9.4	-22.2	0.59	0.0340	99.5	24.2	1.7
	32	0.022	0.112	0.296	0.888	58.8	2.80	27.2	9.7	-22.1	0.47	0.0380	107.5	11.5	8.3
	36	0.025	0.050	0.194	0.556	57.9	2.80	28.0	10.0	-22.0	0.74	0.0420	111.6	14.3	11.1
	40	0.025	0.036	0.147	0.476	60.2	2.80	28.3	10.1	-22.1	0.59	0.0420	100.7	25.8	15.0
	44	0.020	0.030	0.144	0.457	58.8	2.79	28.4	10.2	-22.1	0.26	0.0460	104.3	19.9	21.3
	48	0.028	0.034	0.154	0.469	59.9	2.75	28.1	10.2	-21.9	0.26	0.0480	98.8	24.6	14.7
	52	0.026	0.024	0.155	0.417	59.7	2.91	29.6	10.2	-21.3	-0.20	0.0490	98.7	25.9	15.1
	56	0.029	0.013	0.123	0.363	62.0	2.59	27.1	10.5	-20.6	-0.52	0.0520	86.3	47.8	2.0
	60	0.050	0.009	0.153	0.276	59.9	2.82	28.6	10.1	-20.3	-1.09	0.0470	98.2	39.6	7.5
	64	0.031	0.019	0.155	0.349	59.2	2.87	28.6	10.0	-20.2	-0.95	0.0460	98.7	52.8	1.0
	68	0.016	0.027	0.164	0.365	61.9	2.78	28.5	10.3	-20.2	-0.92	0.0470	114.5	45.6	0.6
	72	0.023	0.033	0.138	0.369	61.1	2.76	28.3	10.3	-20.2	-0.94	0.0370	117.2	33.4	0.6
	76	0.049	0.025	0.142	0.373	60.5	2.94	29.2	9.9	-20.1	-0.66	0.0430	99.4	36.3	6.7
	80	0.040	0.023	0.148	0.353	62.0	3.00	30.1	10.0	-20.2	-0.34	0.0420	99.7	39.7	3.7
	84	0.036	0.023	0.143	0.346	60.2	2.88	29.5	10.2	-20.2	-0.87	0.0450	120.8	23.9	6.2

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH6R-99	88	0.020	0.030	0.140	0.338	61.7	2.97	30.6	10.3	-20.0	-0.90	0.0440	103.4	41.2	2.7
	92	0.021	0.026	0.135	0.340	63.3	3.08	30.6	9.9	-19.9	-0.93	0.0420	94.7	48.8	2.3
	96	0.027	0.020	0.113	0.321	63.0	3.06	30.5	10.0	-20.0	-0.16	0.0440	99.6	45.4	1.9
	100	0.039	0.016	0.128	0.324	62.5	3.00	30.7	10.2	-19.8	-0.52	0.0450	95.9	46.1	1.4
	104	0.046	0.010	0.147	0.328	61.5	2.94	30.4	10.3	-19.7	-0.55	0.0450	86.3	44.5	9.5
	108	0.068	0.002	0.112	0.327	58.7	2.95	30.0	10.2	-19.8	-0.34	0.0460	72.7	48.6	16.4
	112	0.062	0.000	0.123	0.352	56.5	2.89	29.4	10.2	-19.6	-0.51	0.0480	63.4	56.6	10.6
	116	0.052	0.005	0.124	0.352	44.6	2.57	26.7	10.4	-19.8	-0.30	0.0500	48.1	76.6	4.8
	120	0.071	0.000	0.115	0.286	43.7	2.75	28.2	10.3	-20.0	-0.41	0.0670	55.3	38.7	20.5
	124	0.075	0.000	0.103	0.275	52.6	2.71	29.1	10.7	-20.2	-0.19	0.0610	48.9	64.2	12.7
	128	0.044	0.006	0.116	0.272	54.6	2.79	28.9	10.4	-20.2	-0.49	0.0590	69.2	52.1	13.2
	132	0.044	0.001	0.103	0.424	56.4	2.73	28.5	10.4	-20.4	-0.40	0.0580	43.9	77.1	21.9
	136	0.054	0.000	0.049	0.260	50.0	2.61	27.4	10.5	-20.3	-0.36	0.0670	51.9	65.0	18.2
LH7-99	4	0.019	0.298	0.475	1.306	71.7	3.83	33.0	8.6	-23.7	0.39	0.0100	111.6	0.9	5.2
	8	0.012	0.288	0.530	1.365	71.3	3.93	33.8	8.6	-23.8	0.46	0.0190	113.8	7.8	2.1
	12	0.012	0.362	0.609	1.519	71.1	3.92	34.0	8.7	-23.8	0.60	0.0210	112.7	19.9	2.3
	16	0.010	0.472	0.696	1.584	70.3	3.82	33.4	8.8	-23.6	0.77	0.0220	113.0	4.4	6.3
	20	0.013	0.397	0.608	1.427	69.9	3.79	33.6	8.9	-23.6	1.06	0.0270	115.0	11.5	0.8
	24	0.016	0.413	0.649	1.453	69.6	3.77	33.3	8.8	-23.5	0.88	0.0280	115.3	8.7	1.0
	28	0.015	0.383	0.605	1.415	68.4	3.78	33.4	8.8	-23.4	0.91	0.0290	118.8	0.1	1.3
	32	0.018	0.396	0.592	1.354	67.0	3.80	33.8	8.9	-23.4	0.68	0.0290	110.4	13.3	3.3
	36	0.018	0.325	0.517	1.312	63.6	3.72	32.9	8.9	-23.1	0.52	0.0320	100.5	12.3	4.0
	40	0.012	0.321	0.461	1.194	64.8	3.57	31.8	8.9	-23.1	0.63	0.0320	103.0	6.5	0.9
	44	0.045	0.265	0.464	1.222	64.0	3.23	29.5	9.2	-22.6	0.55	0.0330	122.9	7.6	0.8
	48	0.036	0.216	0.401	0.885	60.8	3.36	30.9	9.2	-22.1	0.75	0.0350	126.9	9.9	1.8
	52	0.024	0.273	0.456	1.095	63.8	3.53	32.2	9.1	-22.5	0.52	0.0370	120.4	5.1	7.4
	56	0.022	0.143	0.283	0.588	53.4	2.73	25.7	9.4	-21.3	0.01	0.0440	105.7	19.3	1.6
	60	0.049	0.052	0.139	0.375	62.7	3.00	29.6	9.9	-20.2	-0.50	0.0400	112.4	19.3	1.6
	64	0.054	0.027	0.102	0.350	78.0	3.17	31.9	10.1	-20.1	-0.45	0.0440	100.5	11.4	10.4

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH7-99	68	0.038	0.028	0.096	0.322	58.1	2.88	29.4	10.2	-20.0	0.02	0.0470	102.1	19.5	0.7
	72	0.047	0.033	0.088	0.292	60.9	3.05	31.3	10.3	-20.1	-0.07	0.0440	103.9	22.5	0.3
	76	0.003	0.003	0.089	0.292	62.3	3.15	32.4	10.3	-20.1	-0.18	0.0430	110.6	23.8	0.5
	80	0.046	0.042	0.079	0.291	65.7	3.16	32.5	10.3	-20.2	-0.13	0.0440	111.7	24.9	1.8
	84	0.049	0.037	0.070	0.303	59.6	2.62	27.0	10.3	-20.2	0.07	0.0470	114.3	20.7	4.7
	88	0.057	0.033	0.055	0.299	59.0	2.94	31.0	10.5	-20.2	-0.13	0.0510	117.1	7.7	17.8
	92	0.047	0.025	0.077	0.284	59.3	2.82	29.7	10.5	-20.0	-0.17	0.0510	115.1	11.7	16.7
	96	0.072	0.041	0.062	0.309	56.1	2.79	28.8	10.3	-20.0	-0.18	0.0510	117.2	34.4	5.6
	100	0.073	0.047	0.045	0.284	56.9	2.92	30.7	10.5	-20.0	-0.23	0.0530	113.4	38.6	4.3
	104	0.077	0.052	0.047	0.218	52.3	2.87	30.3	10.6	-20.0	0.01	0.0600	114.6	27.2	2.5
	108	0.054	0.035	0.047	0.232	52.5	3.04	31.3	10.3	-20.0	-0.18	0.0620	116.8	39.8	2.8
	112	0.054	0.063	0.044	0.235	51.8	2.92	30.8	10.6	-20.0	0.21	0.0580	116.2	41.4	0.7
	116	0.046	0.056	0.033	0.201	54.2	2.58	27.8	10.8	-19.9	-0.14	0.0580	119.2	42.7	2.5
	120	0.054	0.045	0.039	0.147	45.2	2.76	29.7	10.8	-19.8	0.34	0.0670	96.8	42.1	2.8
	124	0.065	0.034	0.056	0.175	51.4	2.55	28.0	11.0	-19.9	0.50	0.0630	106.7	28.3	5.1
	128	0.074	0.045	0.061	0.236	56.6	2.71	29.7	10.9	-20.0	0.27	0.0570	105.3	38.9	2.1
	132	0.058	0.025	0.014	0.195	31.8	1.92	22.3	11.6	-20.1	0.73	0.0960	57.7	20.1	2.5
	136	0.035	0.009	0.016	0.074	22.4	1.12	14.2	12.6	-20.0	1.22	0.1400	18.3	10.2	15.8
	140	0.060	0.023	0.023	0.083	36.1	2.30	28.4	12.3	-19.8	1.28	0.0940	14.2	14.7	10.3
	144	0.101	0.033	0.048	0.200	47.0	2.60	30.8	11.9	-19.6	1.48	0.0750	17.1	25.0	6.7
	148	0.074	0.108	0.023	0.173	45.9	1.97	23.7	12.0	-19.6	1.50	0.0840	15.1	17.4	15.0
LH8-99	4	0.033	0.266	0.485	1.275	72.8	3.76	34.2	9.1	-23.4	0.78	0.0150	79.4	16.0	0.2
	8	0.030	0.383	0.596	1.395	71.6	3.74	34.2	9.1	-23.5	0.90	0.0220	71.2	27.4	0.8
	12	0.030	0.347	0.571	1.228	70.3	3.64	33.2	9.1	-23.3	0.87	0.0250	77.5	22.7	0.9
	16	0.032	0.242	0.422	0.984	67.7	3.62	34.3	9.5	-23.0	0.72	0.0300	82.1	23.3	1.4
	20	0.016	0.185	0.352	0.847	66.3	3.58	34.2	9.6	-22.5	0.78	0.0310	91.8	17.6	2.1
	24	0.020	0.111	0.246	0.686	65.5	3.32	32.7	9.9	-22.5	0.78	0.0320	98.3	13.7	11.9
	28	0.027	0.080	0.189	0.582	65.3	3.20	32.3	10.1	-22.6	0.75	0.0330	95.9	28.0	2.9
	32	0.027	0.065	0.148	0.472	67.1	3.28	33.5	10.2	-22.7	0.81	0.0330	92.6	31.9	7.2

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH8-99	36	0.028	0.052	0.113	0.396	68.7	3.40	34.0	10.0	-22.6	0.35	0.0330	97.2	25.6	1.9
	40	0.021	0.050	0.107	0.344	68.8	3.05	31.1	10.2	-22.4	-0.09	0.0390	88.7	31.5	0.8
	44	0.020	0.044	0.091	0.308	67.2	3.36	34.3	10.2	-22.0	-0.19	0.0400	87.4	38.6	1.6
	48	0.020	0.041	0.090	0.278	66.9	3.24	33.1	10.2	-21.7	-0.42	0.0390	99.1	36.7	0.3
	52	0.029	0.055	0.084	0.291	67.3	3.36	33.9	10.1	-21.2	-0.45	0.0400	95.3	35.4	1.6
	56	0.030	0.053	0.092	0.328	66.9	3.31	33.8	10.2	-20.9	-0.73	0.0390	101.9	29.0	1.6
	60	0.057	0.038	0.089	0.330	66.4	3.34	34.0	10.2	-20.4	-0.76	0.0400	87.9	35.5	0.8
	64	0.064	0.033	0.078	0.319	67.9	3.35	34.3	10.2	-20.4	-0.97	0.0400	86.0	38.9	1.5
	68	0.038	0.029	0.072	0.311	68.0	3.31	34.3	10.4	-20.0	-0.60	0.0400	66.6	47.5	2.8
	72	0.038	0.030	0.066	0.291	64.7	3.43	34.9	10.2	-19.9	-0.45	0.0430	69.4	39.2	2.0
	76	0.065	0.023	0.053	0.229	58.5	3.39	35.3	10.4	-19.8	-0.14	0.0470	60.0	29.2	10.4
	80	0.074	0.025	0.069	0.289	65.1	3.38	35.1	10.4	-19.9	0.11	0.0460	66.7	50.7	1.2
	84	0.057	0.035	0.063	0.261	68.3	3.26	34.9	10.7	-20.1	-0.17	0.0440	65.2	61.5	1.2
	88	0.043	0.035	0.063	0.258	68.7	3.29	34.3	10.4	-20.1	-0.11	0.0440	73.4	49.8	1.8
	92	0.048	0.025	0.051	0.258	68.3	3.22	33.9	10.5	-20.0	-0.13	0.0460	77.1	37.7	16.1
	96	0.082	0.016	0.058	0.231	67.8	3.25	34.6	10.7	-19.8	0.17	0.0450	58.8	53.5	6.3
	100	0.058	0.015	0.056	0.215	64.1	3.36	35.3	10.5	-20.1	0.17	0.0450	48.0	71.8	0.7
	104	0.042	0.017	0.054	0.180	57.3	3.12	34.8	11.1	-20.0	0.25	0.0520	40.5	62.7	7.2
	108	0.041	0.019	0.062	0.188	61.4	2.94	34.3	11.7	-20.6	0.58	0.0510	35.5	68.9	9.0
	112	0.067	0.016	0.047	0.193	64.0	2.99	33.7	11.3	-20.5	0.74	0.0480	18.9	97.5	3.1
	116	0.085	0.016	0.052	0.171	64.2	2.81	31.9	11.3	-20.5	1.01	0.0490	40.5	82.4	1.5
	120	0.089	0.018	0.048	0.169	62.8	2.92	33.1	11.3	-20.6	0.56	0.0520	42.3	60.4	4.1
	124	0.054	0.020	0.044	0.169	60.4	2.88	32.7	11.4	-20.8	0.64	0.0560	15.3	85.2	1.6
	128	0.053	0.019	0.034	0.172	60.9	2.91	32.9	11.3	-20.6	0.72	0.0550	20.5	90.3	0.3
	132	0.083	0.015	0.038	0.174	59.2	2.86	32.9	11.5	-20.6	0.55	0.0570	22.7	60.6	2.3
	136	0.083	0.011	0.051	0.155	54.6	3.07	35.4	11.5	-20.5	0.39	0.0620	8.4	54.9	0.7
	140	0.072	0.019	0.064	0.185	61.8	2.98	34.1	11.4	-20.4	0.27	0.0520	11.6	52.0	9.4

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH9R-99	4	0.010	0.281	0.492	1.287	73.3	4.02	35.2	8.8	-23.6	0.26	0.0150	74.9	12.7	3.9
	8	0.007	0.404	0.549	1.440	72.8	3.90	34.0	8.7	-23.3	0.18	0.0210	74.0	15.8	0.0
	12	0.005	0.484	0.683	1.444	72.4	3.85	34.6	9.0	-23.6	0.00	0.0230	79.1	11.4	0.8
	16	0.005	0.497	0.636	1.446	72.7	3.75	34.0	9.1	-23.5	0.29	0.0250	81.6	12.1	1.2
	20	0.003	0.425	0.649	1.330	71.9	3.83	34.9	9.1	-23.3	0.24	0.0280	76.0	17.2	0.4
	24	0.007	0.320	0.538	1.175	70.4	3.75	34.6	9.2	-23.2	0.94	0.0300	82.1	17.0	0.2
	28	0.014	0.251	0.479	1.062	69.2	3.41	32.1	9.4	-23.0	0.88	0.0330	84.9	10.6	1.1
	32	0.022	0.174	0.372	0.912	69.1	3.47	33.2	9.6	-22.7	0.92	0.0350	90.1	11.6	2.1
	36	0.040	0.079	0.250	0.651	67.5	3.28	32.6	9.9	-22.7	0.98	0.0380	89.8	16.9	1.4
	40	0.039	0.034	0.147	0.550	62.7	3.21	32.6	10.2	-23.0	1.25	0.0430	103.5	15.8	1.1
	44	0.030	0.031	0.133	0.479	66.8	3.21	33.1	10.3	-22.9	0.66	0.0410	109.6	20.8	0.6
	48	0.048	0.022	0.127	0.495	68.1	3.29	33.5	10.2	-23.2	0.37	0.0400	109.1	23.3	0.4
	52	0.025	0.030	0.113	0.422	69.4	3.32	33.8	10.2	-23.2	0.25	0.0380	106.7	18.6	1.7
	56	0.021	0.021	0.101	0.392	69.7	3.32	33.8	10.2	-22.7	0.30	0.0380	118.4	12.0	0.4
	60	0.020	0.018	0.108	0.386	69.1	3.33	33.5	10.1	-22.6	0.43	0.0370	120.0	11.8	2.6
	64	0.029	0.013	0.090	0.363	69.2	3.33	33.4	10.0	-22.5	0.16	0.0380	121.7	15.0	0.9
	68	0.028	0.009	0.085	0.335	69.0	3.19	32.0	10.0	-21.8	-0.39	0.0380	115.9	21.0	2.1
	72	0.024	0.007	0.076	0.302	68.8	3.23	33.1	10.3	-20.7	-0.76	0.0380	107.5	25.4	1.5
	76	0.036	0.000	0.088	0.275	67.0	3.26	33.5	10.3	-20.6	-0.45	0.0410	91.6	26.8	0.4
	80	0.030	0.001	0.082	0.254	69.7	3.34	35.2	10.5	-20.5	-0.59	0.0390	69.6	33.4	0.6
	84	0.036	0.000	0.100	0.280	70.3	3.31	35.1	10.6	-20.5	-0.16	0.0370	60.0	43.0	0.6
	88	0.037	0.000	0.086	0.246	69.2	3.30	35.9	10.9	-20.1	0.17	0.0380	60.5	44.5	1.1
	92	0.037	0.003	0.083	0.258	69.9	3.28	35.6	10.8	-20.0	0.58	0.0400	60.9	38.1	5.3
	96	0.025	0.003	0.082	0.242	67.6	3.09	34.0	11.0	-20.5	0.47	0.0420	78.2	44.1	1.9
	100	0.030	0.000	0.089	0.228	67.0	3.11	34.6	11.1	-20.9	0.54	0.0430	75.9	49.3	1.4
	104	0.039	0.000	0.081	0.236	67.8	3.11	34.4	11.1	-20.8	0.38	0.0420	73.1	47.9	2.5
	108	0.055	0.000	0.082	0.216	64.6	3.14	34.8	11.1	-20.7	0.08	0.0430	44.6	72.6	2.8
	112	0.047	0.000	0.088	0.202	65.9	2.96	33.0	11.2	-21.0	0.50	0.0470	63.0	58.9	4.5
	116	0.037	0.000	0.093	0.219	67.0	3.00	33.6	11.2	-21.0	0.52	0.0440	66.9	76.2	4.9
	120	0.052	0.000	0.085	0.227	67.3	3.05	33.6	11.0	-20.9	0.53	0.0410	58.9	80.9	9.0

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LH9R-99	124	0.058	0.000	0.054	0.178	54.1	3.08	34.7	11.3	-20.8	0.29	0.0540	24.4	80.8	5.3
	128	0.057	0.000	0.061	0.207	62.2	3.04	34.9	11.5	-20.5	0.05	0.0490	19.7	41.7	8.9
	132	0.062	0.000	0.036	0.193	50.8	3.01	34.4	11.4	-20.4	0.23	0.0580	22.7	34.9	8.9
	136	0.042	0.000	0.047	0.152	58.4	2.88	33.3	11.6	-20.5	0.55	0.0550	25.3	43.0	8.4
	140	0.060	0.000	0.071	0.201	65.1	3.17	36.4	11.5	-21.0	0.14	0.0510	10.4	54.8	10.1
	144	0.058	0.000	0.062	0.190	66.4	3.08	36.1	11.7	-20.7	-0.01	0.0510	17.2	43.8	5.7
	148	0.046	0.000	0.062	0.213	65.8	2.96	34.5	11.7	-20.6	0.14	0.0530	23.6	33.3	7.7
LB1-99	4	0.015	0.785	0.728	1.906	76.2	3.77	35.8	9.5	-17.9	2.49	0.0110	47.0	6.4	2.4
	8	0.011	0.702	0.760	1.944	72.2	3.80	36.3	9.5	-18.1	2.45	0.0160	45.2	0.1	10.3
	12	0.012	0.690	0.763	2.100	72.4	3.72	35.7	9.6	-18.1	2.43	0.0190	45.1	1.0	10.4
	16	0.014	0.609	0.695	1.948	69.4	3.65	36.0	9.9	-18.1	2.48	0.0240	48.5	6.9	0.3
	20	0.017	0.553	0.701	1.942	70.1	3.71	36.6	9.9	-18.1	2.93	0.0260	52.4	5.9	0.1
	24	0.102	0.314	0.576	1.482	64.0	3.33	33.7	10.1	-18.3	2.92	0.0310	53.2	6.2	1.9
	28	0.151	0.220	0.463	1.236	60.4	2.86	29.8	10.4	-18.7	3.04	0.0360	58.4	6.9	0.2
	32	0.172	0.161	0.450	1.310	50.4	2.34	23.9	10.2	-18.9	3.19	0.0460	48.7	9.1	0.3
	36	0.209	0.132	0.412	1.180	50.2	2.94	30.9	10.5	-19.0	3.56	0.0480	73.0	4.3	4.4
	40	0.229	0.127	0.417	1.120	54.1	2.91	31.2	10.7	-19.1	3.78	0.0500	86.7	5.0	1.4
	44	0.244	0.167	0.409	1.107	53.3	2.78	29.7	10.7	-18.8	3.83	0.0500	57.8	4.0	1.1
	48	0.266	0.172	0.427	1.172	55.6	2.96	32.0	10.8	-18.6	3.79	0.0480	75.5	9.8	0.9
	52	0.287	0.169	0.428	1.156	55.4	2.84	30.9	10.9	-18.9	3.85	0.0470	75.8	12.1	1.1
	56	0.279	0.158	0.431	1.074	52.9	2.24	24.5	10.9	-19.6	3.90	0.0540	63.1	12.8	0.7
	60	0.278	0.212	0.360	0.983	53.6	2.63	29.6	11.2	-19.4	4.27	0.0590	67.8	15.2	0.5
	64	0.256	0.200	0.408	0.924	51.4	2.32	26.5	11.4	-20.6	4.18	0.0650	82.3	12.0	1.1
	68	0.283	0.212	0.433	1.050	53.8	2.41	27.4	11.4	-20.6	4.36	0.0620	92.9	9.8	1.2
	72	0.305	0.198	0.491	1.213	52.7	2.49	28.1	11.3	-20.5	4.73	0.0590	72.8	13.8	2.5
	76	0.311	0.247	0.487	1.175	50.4	2.22	25.1	11.3	-21.0	4.21	0.0660	73.8	11.2	0.8
	80	0.339	0.273	0.510	1.052	51.6	2.43	27.9	11.5	-21.2	4.59	0.0660	78.4	9.6	1.7
	84	0.373	0.230	0.574	1.191	49.9	1.96	22.5	11.5	-20.6	4.74	0.0650	86.9	18.6	1.1
	88	0.360	0.255	0.554	1.229	45.9	2.09	23.3	11.1	-20.9	4.69	0.0720	95.0	16.3	1.1

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LB1-99	92	0.312	0.275	0.535	1.116	42.4	2.09	23.7	11.3	-21.2	4.74	0.0830	111.3	14.0	2.2
	96	0.313	0.269	0.508	1.127	52.4	2.41	28.0	11.6	-22.3	5.00	0.0720	88.5	18.5	1.5
	100	0.342	0.283	0.465	0.878	48.1	2.20	25.0	11.4	-22.2	5.57	0.0730	149.7	14.8	3.0
	104	0.308	0.249	0.476	0.914	45.5	2.08	23.8	11.4	-22.4	5.54	0.0780	141.1	21.3	6.2
	108	0.356	0.291	0.556	1.000	51.8	2.41	26.9	11.2	-22.4	4.80	0.0720	100.8	31.2	3.3
	112	0.355	0.328	0.511	0.888	53.4	2.64	28.9	11.0	-21.9	4.75	0.0660	103.2	36.5	5.4
	116	0.330	0.347	0.512	0.925	53.4	2.48	27.1	10.9	-22.2	5.07	0.0660	100.3	41.3	5.4
	120	0.377	0.173	0.482	0.909	52.2	2.46	26.7	10.8	-22.9	5.63	0.0680	118.4	39.2	3.9
	124	0.333	0.198	0.431	0.904	52.1	2.54	27.7	10.9	-22.8	5.34	0.0680	131.2	23.6	2.0
	128	0.302	0.211	0.428	0.859	50.9	2.77	29.3	10.6	-23.5	5.40	0.0710	118.4	30.8	3.5
	132	0.254	0.217	0.474	0.830	53.9	2.47	26.6	10.8	-24.0	5.18	0.0730	113.0	16.3	9.5
LB2-99	4	0.024	0.810	1.234	2.434	78.2	4.14	36.8	8.9	-16.9	2.04	0.0110	46.0	16.4	0.5
	8	0.020	0.854	1.196	2.455	77.3	4.10	37.0	9.0	-16.8	2.49	0.0140	49.3	16.9	1.1
	12	0.073	0.758	1.348	2.183	76.2	3.97	36.8	9.3	-16.8	2.46	0.0160	53.3	16.2	2.2
	16	0.170	0.592	1.348	2.060	74.8	3.80	36.3	9.6	-17.0	2.80	0.0190	60.4	14.2	2.6
	20	0.231	0.448	0.983	1.905	74.5	3.71	35.6	9.6	-17.5	2.67	0.0230	55.9	19.6	1.3
	24	0.247	0.327	1.008	1.690	67.7	3.66	35.2	9.6	-17.7	3.34	0.0250	61.9	17.9	1.3
	28	0.255	0.238	0.777	1.580	65.6	3.25	32.1	9.9	-17.8	3.50	0.0300	74.8	11.7	2.2
	32	0.248	0.185	0.656	1.488	66.1	3.32	32.7	9.8	-18.3	3.82	0.0310	68.8	19.3	2.5
	36	0.269	0.150	0.579	1.457	60.6	3.23	31.7	9.8	-18.1	3.68	0.0320	75.2	17.2	2.3
	40	0.265	0.092	0.495	1.271	57.2	2.94	30.1	10.3	-17.6	4.12	0.0370	111.3	2.0	2.3
	44	0.320	0.090	0.547	1.217	54.1	3.05	30.7	10.1	-17.5	4.41	0.0380	104.8	8.3	0.3
	48	0.269	0.072	0.462	1.195	58.3	2.99	30.8	10.3	-18.1	4.32	0.0400	103.8	8.6	2.6
	52	0.242	0.054	0.430	1.323	51.1	2.95	31.4	10.6	-18.0	4.53	0.0450	100.4	9.9	0.6
	56	0.229	0.064	0.408	1.072	48.0	2.14	22.6	10.6	-18.7	4.60	0.0470	99.7	9.4	2.1
	60	0.230	0.039	0.396	1.065	47.0	2.56	27.0	10.5	-19.1	4.63	0.0480	98.8	14.6	2.2
	64	0.260	0.054	0.395	1.107	51.6	2.53	27.1	10.7	-19.8	4.94	0.0490	118.2	11.6	1.7
	68	0.296	0.052	0.400	1.095	51.8	2.57	27.4	10.7	-20.3	4.99	0.0510	129.5	3.1	0.8
	72	0.263	0.056	0.357	0.861	46.7	2.21	23.1	10.5	-21.1	5.50	0.0580	195.2	4.2	1.5

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LB2-99	76	0.243	0.063	0.345	0.769	48.9	2.33	24.8	10.6	-22.6	5.45	0.0550	146.0	15.5	0.7
	80	0.277	0.049	0.309	0.731	56.1	2.59	27.4	10.6	-23.8	5.02	0.0550	131.3	12.3	4.4
	84	0.260	0.035	0.277	0.651	57.0	2.75	29.0	10.5	-25.1	4.78	0.0540	112.1	14.2	0.7
	88	0.203	0.039	0.271	0.499	62.7	3.35	35.8	10.7	-25.5	4.09	0.0530	54.0	25.8	3.3
	92	0.178	0.031	0.259	0.405	69.6	3.15	34.6	11.0	-25.6	3.37	0.0490	53.9	21.3	6.8
	96	0.159	0.038	0.241	0.349	73.6	3.39	37.3	11.0	-26.2	2.45	0.0450	57.0	23.5	4.0
	100	0.162	0.031	0.235	0.432	73.3	3.34	36.4	10.9	-26.3	2.16	0.0430	32.1	24.0	2.7
	104	0.138	0.029	0.210	0.276	76.7	3.68	40.9	11.1	-26.4	2.46	0.0420	24.0	26.7	1.7
	108	0.127	0.031	0.190	0.269	78.7	3.74	41.5	11.1	-26.2	2.44	0.0420	22.1	24.5	4.7
	112	0.118	0.037	0.204	0.263	77.4	3.63	40.4	11.1	-25.8	2.42	0.0390	28.3	17.2	4.2
	116	0.116	0.039	0.213	0.273	77.9	3.67	40.7	11.1	-25.8	2.57	0.0390	27.3	16.0	4.5
	120	0.106	0.037	0.198	0.261	74.6	3.57	40.1	11.2	-25.8	2.36	0.0430	17.6	20.7	6.7
	124	0.124	0.004	0.186	0.239	77.4	3.64	41.5	11.4	-26.0	2.50	0.0420	21.3	18.2	9.0
	128	0.108	0.015	0.235	0.235	77.1	3.56	41.0	11.5	-25.7	2.91	0.0420	23.2	20.2	8.0
	132	0.094	0.014	0.193	0.225	77.5	3.63	41.6	11.5	-25.6	2.46	0.0400	21.1	16.8	8.9
	136	0.109	0.012	0.170	0.214	76.1	3.52	41.7	11.9	-25.6	2.70	0.0410	14.7	21.0	8.8
	140	0.106	0.009	0.163	0.189	73.9	3.15	38.2	12.1	-25.7	2.97	0.0450	7.6	25.4	11.7
	144	0.071	0.050	0.163	0.174	73.0	3.14	37.7	12.0	-25.8	2.99	0.0450	9.8	22.0	8.7
	148	0.100	0.018	0.158	0.180	70.7	3.37	40.8	12.1	-25.7	3.04	0.0470	13.7	22.6	8.9
LB1-00	54	0.239	0.187	0.309	0.961	43.0	2.85	32.0	11.2	-19.7	3.85	0.0550	n.d.	n.d.	n.d.
	58	0.258	0.211	0.385	1.149	50.6	2.88	31.8	11.0	-20.4	4.04	0.0520	n.d.	n.d.	n.d.
	62	0.261	0.185	0.338	1.105	47.9	2.60	28.6	11.0	-20.8	4.48	0.0570	n.d.	n.d.	n.d.
	66	0.310	0.186	0.340	1.084	50.0	2.77	31.3	11.3	-19.7	4.25	0.0570	n.d.	n.d.	n.d.
	70	0.325	0.171	0.316	1.092	53.8	2.71	31.0	11.5	-19.3	4.46	0.0570	n.d.	n.d.	n.d.
	74	0.336	0.169	0.327	1.069	55.1	2.73	31.2	11.4	-20.0	4.41	0.0590	n.d.	n.d.	n.d.
	78	0.323	0.244	0.411	1.178	54.3	2.68	30.7	11.4	-21.4	4.41	0.0590	n.d.	n.d.	n.d.
	82	0.348	0.193	0.428	1.308	47.3	2.50	28.9	11.6	-21.3	4.69	0.0680	n.d.	n.d.	n.d.
	86	0.353	0.217	0.419	1.182	45.9	2.24	26.1	11.7	-21.1	4.86	0.0670	n.d.	n.d.	n.d.
	90	0.368	0.256	0.500	1.211	47.1	2.30	25.8	11.2	-21.3	4.58	0.0720	n.d.	n.d.	n.d.

	Depth	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
LB1-00	94	0.304	0.230	0.438	1.120	47.3	2.26	26.2	11.6	-22.3	4.96	0.0830	n.d.	n.d.	n.d.
	98	0.362	0.279	0.412	1.009	52.1	2.39	28.3	11.8	-22.7	5.22	0.0720	n.d.	n.d.	n.d.
	102	0.360	0.249	0.414	0.963	43.6	2.20	25.5	11.6	-22.5	5.53	0.0740	174.3	2.0	6.4
	106	0.375	0.291	0.439	0.959	45.1	2.23	25.4	11.4	-22.8	5.72	0.0760	143.7	5.2	9.4
	110	0.376	0.315	0.469	1.185	49.0	2.43	27.4	11.3	-22.5	5.17	0.0710	121.9	9.1	2.0
	114	0.355	0.253	0.457	1.031	51.7	2.59	28.7	11.1	-22.3	4.95	0.0620	132.9	14.7	6.9
	118	0.280	0.206	0.440	0.949	49.2	2.40	26.7	11.1	-22.8	5.42	0.0730	148.6	7.7	2.8
	122	0.340	0.279	0.439	0.964	48.8	2.46	27.0	11.0	-22.9	5.52	0.0690	142.0	5.4	5.9
	126	0.309	0.266	0.403	0.896	51.8	2.61	28.5	10.9	-23.4	5.64	0.0670	191.1	0.0	0.0
	130	0.285	0.285	0.382	0.873	54.1	2.70	29.3	10.9	-24.2	5.38	0.0690	146.3	4.0	13.4
	134	0.210	0.304	0.374	0.807	54.7	2.74	29.8	10.9	-24.8	5.38	0.0690	149.0	15.6	2.7
	138	0.236	0.308	0.385	0.814	59.4	2.90	31.0	10.7	-25.1	4.94	0.0640	150.1	13.0	3.7
	142	0.184	0.274	0.372	0.805	58.8	2.95	32.0	10.8	-25.3	5.18	0.0670	139.7	9.9	2.8
	146	0.165	0.239	0.378	0.829	62.3	3.09	32.5	10.5	-25.7	5.03	0.0680	153.7	7.9	3.6
	150	0.175	0.282	0.372	0.802	63.2	3.09	32.1	10.4	-26.2	4.52	0.0630	98.7	10.4	9.8
	154	0.156	0.258	0.374	0.795	64.6	3.28	33.6	10.3	-26.2	4.57	0.0600	121.1	4.2	10.7
	158	0.127	0.249	0.374	0.752	66.0	3.30	34.3	10.4	-26.3	4.32	0.0590	109.9	20.5	4.5
	162	0.154	0.305	0.437	0.868	67.6	3.25	34.5	10.6	-26.2	4.35	0.0580	109.6	14.5	10.8
	166	0.169	0.305	0.386	0.742	68.8	3.29	35.0	10.6	-26.1	4.17	0.0600	86.2	9.6	9.6
	170	0.180	0.270	0.382	0.727	66.7	3.15	34.1	10.8	-25.8	4.26	0.0620	75.0	0.7	18.2
	174	0.179	0.253	0.387	0.693	67.0	3.17	35.0	11.0	-25.2	4.60	0.0630	52.3	17.0	4.4
	178	0.180	0.254	0.370	0.662	67.0	3.25	36.4	11.2	-25.1	4.33	0.0640	43.5	15.5	2.5
	182	0.171	0.242	0.388	0.722	62.1	3.14	34.7	11.1	-24.8	4.51	0.0690	59.1	17.5	0.6
	186	0.193	0.212	0.382	0.673	63.7	3.17	35.1	11.1	-24.8	4.90	0.0650	46.4	23.4	2.4
	190	0.184	0.266	0.406	0.665	64.4	3.13	34.7	11.1	-24.6	4.41	0.0610	48.0	13.4	13.7
	194	0.168	0.226	0.396	0.639	62.5	2.82	32.0	11.3	-24.8	4.32	0.0620	54.7	19.9	1.9
	198	0.196	0.259	0.373	0.626	62.9	3.00	34.1	11.4	-24.8	4.01	0.0630	55.4	38.9	2.8
	202	0.177	0.237	0.378	0.605	62.1	2.92	33.3	11.4	-25.0	4.07	0.0620	63.3	45.8	1.1
	206	0.184	0.233	0.386	0.622	62.4	2.85	33.0	11.6	-25.2	3.79	0.0620	58.1	44.6	3.9

APPENDIX C

Descriptive Statistics

Harris Chain of Lakes Cores

See Appendix A for collection date, location and description of cores.

CODES:

- H2OP is water soluble P (mg/g)
- CHEP hot-water extractable P, corrected for H2OP (mg/g)
- NaOHP is sodium hydroxide extracted P (mg/g)
- TP is total phosphorus (mg/g)
- LOI is % loss on ignition
- TN is total nitrogen (%)
- TC is total carbon (%)
- TC/TN is TC/TN mass ratio
- d13C is $\delta^{13}C$ (‰) stable carbon isotope ratio
- d15N is $\delta^{15}N$ (‰) stable nitrogen isotope ratio
- Frac Dry is fraction dry weight
- D Si is diatom biogenic silica (mg/g)
- S Si is sponge biogenic silica (mg/g)
- Min Si is mineral silica (mg/g)

Lake Weir Descriptive Statistics

	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
Mean	0.0328	0.046	0.063	0.254	57.4	2.42	29.0	12.1	-22.2	3.43	0.0675	29.7	19.6	5.2
Median	0.029	0.034	0.035	0.164	58.7	2.49	29.6	12.2	-24.0	3.27	0.0600	16.6	14.2	5.2
Mode	0.027	0.040	0.029	0.121	57.2	2.51	30.7	12.1	-25.2	2.68	0.0532	0.0	15.2	1.0
St Dev	0.0173	0.053	0.068	0.243	8.0	0.37	3.3	0.9	3.7	1.19	0.0320	29.2	16.6	4.1
Minimum	0.004	0.004	0.001	0.043	27.0	1.11	13.8	9.6	-26.7	1.45	0.0170	0.0	0.1	0.1
Maximum	0.086	0.276	0.362	1.203	68.5	3.37	33.4	13.5	-14.9	7.39	0.2110	90.3	77.3	28.5
Count	113	89	113	113	113	113	113	113	113	113	113	113	113	113

Lake Yale Descriptive Statistics

	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
Mean	0.036	0.066	0.086	0.269	52.2	2.85	29.4	10.7	-21.8	2.41	0.0654	32.7	25.8	8.6
Median	0.034	0.021	0.030	0.118	53.2	2.76	29.8	10.9	-22.2	2.22	0.0630	34.1	22.8	4.5
Mode	0.052	0.009	0.024	0.093	54.0	2.70	31.2	12.4	-22.4	1.78	0.0620	0.0	17.6	1.3
St Dev	0.017	0.119	0.138	0.352	10.8	0.74	4.1	1.8	2.1	0.75	0.0242	22.2	14.1	8.4
Minimum	0.008	0.000	0.000	0.026	21.2	1.45	17.8	5.1	-24.7	1.58	0.0130	0.0	1.7	0.4
Maximum	0.088	0.632	0.759	1.370	71.7	6.09	36.4	13.0	-14.5	4.37	0.1730	78.4	65.2	32.8
Count	102	102	103	103	102	103	103	103	103	103	103	103	103	103

Lake Harris Descriptive Statistics

	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
Mean	0.059	0.086	0.141	0.5049	58.4	2.87	31.1	11.1	-19.6	0.54	0.0505	59.3	36.5	5.7
Median	0.050	0.034	0.079	0.347	59.8	2.89	31.0	10.8	-20.5	0.54	0.0490	69.3	29.2	4.3
Mode	0.030	0.033	0.062	0.231	58.9	2.79	30.1	10.2	-20.7	0.58	0.0430	0.0	17.8	1.6
St Dev	0.045	0.115	0.162	0.363	9.3	0.55	3.4	1.9	3.6	0.74	0.0187	41.2	28.9	5.4
Minimum	0.003	0.001	0.004	0.074	18.2	1.12	14.2	8.6	-23.8	-1.25	0.0070	0.0	0.1	0.0
Maximum	0.345	0.497	0.696	2.048	78.0	4.07	40.6	19.8	-6.4	2.24	0.1400	130.7	139.2	30.2
Count	314	264	313	314	312	312	312	312	311	310	314	314	314	314

Lake Beauclair Descriptive Statistics

	H2OP	CHEP	NaOHP	TP	% LOI	%TN	%TC	TC/TN	d13C	d15N	Frac Dry	D Si	S Si	Min Si
Mean	0.226	0.227	0.454	1.001	59.4	2.99	31.8	10.7	-21.2	3.79	0.0588	83.0	15.3	4.0
Median	0.243	0.217	0.412	0.964	55.6	2.95	30.9	10.8	-20.6	3.83	0.0612	75.2	14.6	2.6
Mode	0.184	0.212	0.428	1.120		2.41		10.7	-18.1	2.46	0.0450	111.3	6.9	1.1
St Dev	0.098	0.177	0.221	0.482	10.4	0.59	5.7	0.7	3.2	1.08	0.0113	43.3	9.7	3.7
Minimum	0.011	0.004	0.158	0.174	42.4	1.96	22.5	8.9	-26.4	2.04	0.0300	7.6	0.0	0.0
Maximum	0.377	0.854	1.348	2.455	78.7	4.14	41.7	12.1	-16.8	5.63	0.0826	195.2	45.8	18.2
Count	109	109	109	109	109	70	70	70	70	70	109	97	97	97

APPENDIX D

Radiometric Data
Harris Chain of Lakes Cores

See Appendix A for collection date, location and description of cores.

CODES:
Depth is depth (cm)
Total ^{210}Pb is activity (dpm g^{-1})
^{226}Ra is activity (dpm g^{-1})
^{137}Cs is activity (dpm g^{-1})
^{210}Pb error is error in Total ^{210}Pb activity (dpm g^{-1})
^{226}Ra error is error in ^{226}Ra activity (dpm g^{-1})
^{137}Cs error is error in ^{137}Cs activity (dpm g^{-1})
Excess ^{210}Pb is activity (dpm g^{-1}), A_o is the sum of excess ^{210}Pb activity
Excess ^{210}Pb error is error in ^{210}Pb activity (dpm g^{-1})
Age is age in years at relative to bottom of each section
Date is calendar year at each depth
Age error is error in age in years
MSR is mass sedimentation rate (mg cm^{-2} g^{-1})
MSR error is error in mass sedimentation rate (mg cm^{-2} g^{-1})
MSR error (%) is % error in mass sedimentation rate

Ap D/Radiometric Data

Depth Interval (cm)	Total Pb-210 Activity (dpm/g)	Total Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Excess Pb-210 Activity (dpm/g)	Excess Pb-210 Error	Exces Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
Lake Weir LW1R-99									28.48						
0-4	48.14	0.81	2.04	0.47	12.39	0.24	46.39	0.94	25.30	3.8	0.4	1996.1	18.0	0.4	2.1
4-8	49.13	0.62	1.92	0.16	12.95	0.19	47.51	0.64	20.69	10.2	0.5	1989.7	15.0	0.2	1.6
8-12	44.20	0.83	2.14	0.33	13.50	0.27	42.34	0.90	14.79	21.0	0.5	1978.9	12.9	0.3	2.2
12-16	33.91	0.48	1.92	0.24	13.17	0.17	32.20	0.54	9.97	33.7	0.6	1966.2	11.8	0.2	2.1
16-20	23.06	0.42	2.14	0.14	9.82	0.16	21.07	0.45	6.67	46.6	0.8	1953.3	12.1	0.3	2.8
20-24	15.55	0.44	1.57	0.08	4.38	0.14	14.08	0.45	4.27	60.9	1.1	1939.0	11.9	0.5	3.9
24-28	9.69	0.27	1.64	0.20	3.64	0.09	8.11	0.34	2.83	74.1	1.5	1925.8	13.5	0.7	5.2
28-32	5.89	0.21	1.58	0.14	2.43	0.08	4.34	0.25	2.02	84.9	1.9	1915.0	17.3	1.2	7.2
32-36	4.60	0.19	1.52	0.17	2.00	0.07	3.11	0.25	1.42	96.2	2.4	1903.7	17.1	1.7	9.7
36-40	3.12	0.16	1.20	0.18	1.79	0.07	1.94	0.24	1.03	106.7	3.0	1893.2	19.5	2.7	13.7
40-44	3.74	0.21	1.59	0.24	1.66	0.08	2.17	0.32	0.56	126.4	3.9	1873.5	11.0	1.8	16.4
44-48	2.58	0.14	1.34	0.15	1.23	0.05	1.26	0.21	0.28	148.3	5.6	1851.6	10.0	2.0	20.1
48-52	2.38	0.15	1.19	0.14	0.76	0.05	1.20	0.21	0.00						
Lake Weir LW2R-99									28.2						
0-4	48.27	0.75	2.01	0.06	13.16	0.23	47.59	0.78	24.15	4.9	0.4	1995.0	17.1	0.3	1.8
4-8	49.40	0.64	1.97	0.02	13.82	0.20	48.80	0.66	18.51	13.5	0.5	1986.4	13.5	0.2	1.6
8-12	42.32	0.64	2.01	0.10	13.56	0.21	41.49	0.67	13.21	24.3	0.6	1975.6	11.8	0.2	1.9
12-16	33.68	0.51	2.50	0.03	11.80	0.18	32.09	0.53	8.48	38.5	0.8	1961.4	10.4	0.2	2.3
16-20	19.24	0.46	2.03	0.21	7.48	0.17	17.71	0.52	5.22	54.1	1.0	1945.8	11.8	0.4	3.6
20-24	11.22	0.29	1.64	0.10	4.45	0.11	9.86	0.32	3.25	69.4	1.5	1930.5	13.1	0.6	4.6
24-28	5.82	0.20	1.53	0.18	3.06	0.08	4.42	0.28	2.32	80.2	1.9	1919.7	19.4	1.5	7.5
28-32	5.61	0.20	1.40	0.22	3.05	0.08	4.33	0.30	1.38	96.8	2.7	1903.1	13.0	1.2	9.0
32-36	3.32	0.16	1.44	0.10	2.09	0.07	1.94	0.20	0.94	109.1	3.6	1890.8	18.4	2.4	13.0
36-40	1.86	0.11	1.45	0.24	1.71	0.05	0.42	0.27	0.84	112.7	3.2	1887.2	65.5	40.7	62.2
40-44	2.31	0.14	1.97	0.05	1.45	0.06	0.36	0.15	0.75	116.2	3.2	1883.7	69.6	29.0	41.6
44-48	3.17	0.15	1.73	0.02	1.38	0.05	1.49	0.16	0.37	139.3	5.6	1860.6	11.3	1.8	15.7
48-52	2.88	0.14	1.76	0.02	1.55	0.06	1.15	0.15	0.05	204.3	32.0	1795.6	4.3	1.7	40.5
52-56	1.86	0.10	1.69	0.13	-0.04	0.01	0.17	0.17	0.00						

Ap D/Radiometric Data

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
Lake Weir LW3-99									41.90						
0-4	34.04	0.62	2.46	0.09	12.52	0.22	32.37	0.64	38.34	2.9	0.4	1997.0	38.6	0.8	2.1
4-8	36.02	0.63	3.05	0.26	13.25	0.23	33.79	0.70	32.96	7.7	0.4	1992.2	32.8	0.7	2.2
8-12	31.39	0.45	2.52	0.05	13.23	0.17	29.59	0.47	27.07	14.1	0.5	1985.8	31.5	0.6	1.8
12-16	24.31	0.49	2.52	0.19	12.23	0.20	22.34	0.54	22.05	20.6	0.5	1979.3	34.1	0.9	2.6
16-20	21.21	0.52	2.70	0.15	12.91	0.24	18.97	0.55	17.39	28.3	0.6	1971.6	32.2	1.0	3.0
20-24	21.19	0.52	2.41	0.14	12.29	0.23	19.26	0.55	12.21	39.6	0.7	1960.3	23.7	0.7	3.0
24-28	17.12	0.47	2.17	0.13	11.33	0.22	15.33	0.50	7.95	53.4	0.8	1946.5	20.2	0.7	3.6
28-32	12.52	0.42	2.50	0.18	8.68	0.20	10.27	0.47	5.13	67.4	1.0	1932.5	19.5	0.9	4.7
32-36	10.71	0.24	1.58	0.16	6.64	0.11	9.36	0.30	1.75	101.9	1.9	1898.0	10.5	0.5	5.0
36-40	1.98	0.09	1.14	0.08	1.49	0.05	0.86	0.12	1.45	107.9	2.1	1892.0	57.8	8.4	14.6
40-44	2.23	0.14	1.38	0.24	2.70	0.08	0.88	0.28	1.31	111.2	2.0	1888.7	48.8	15.3	31.3
44-48	2.94	0.15	1.39	0.03	2.77	0.08	1.61	0.16	1.02	119.2	2.4	1880.7	22.5	2.5	11.2
48-52	3.50	0.14	1.34	0.14	3.06	0.07	2.23	0.21	0.57	138.2	3.6	1861.7	10.8	1.3	12.0
52-56	3.22	0.14	1.37	0.13	2.81	0.07	1.90	0.20	0.19	173.5	8.3	1826.4	5.6	1.1	19.2
56-60	2.20	0.13	1.34	0.18	2.38	0.07	0.89	0.23	0.00						
Lake Yale LY1-99									22.80						
0-4	30.58	0.83	0.90	0.11	5.80	0.21	29.94	0.84	20.36	3.6	0.5	1995.8	22.4	0.6	2.9
4-8	30.63	0.83	1.02	0.21	4.72	0.19	29.88	0.87	17.12	9.1	0.5	1990.3	19.5	0.6	2.9
8-12	30.18	0.52	0.75	0.05	5.55	0.13	29.77	0.53	13.13	17.7	0.5	1981.7	15.7	0.3	2.0
12-16	26.44	0.58	1.02	0.09	5.51	0.15	25.65	0.59	9.55	27.9	0.6	1971.5	13.7	0.3	2.5
16-20	29.08	0.53	0.66	0.20	5.17	0.13	28.76	0.57	5.42	46.1	0.9	1953.3	7.9	0.2	2.6
20-24	17.94	0.51	1.37	0.16	3.61	0.13	16.72	0.54	2.67	68.8	1.3	1930.6	7.2	0.3	4.1
24-28	10.94	0.36	1.17	0.01	2.66	0.10	9.86	0.36	1.01	100.0	2.7	1899.4	5.4	0.3	6.4
28-32	5.43	0.22	1.14	0.24	1.40	0.06	4.33	0.32	0.28	141.2	7.3	1858.2	4.1	0.6	15.1
32-36	1.54	0.12	0.87	0.30	1.05	0.05	0.67	0.33	0.17	158.0	5.7	1841.4	10.1	4.8	47.3
36-40	1.66	0.14	0.74	0.09	1.17	0.06	0.92	0.16	0.00						
Lake Yale LY2-99									16.20						
0-4	25.25	0.50	1.35	0.09	3.47	0.11	24.08	0.52	14.86	2.7	0.7	1996.7	20.1	0.5	2.5
4-8	26.26	0.63	1.40	0.12	4.87	0.16	25.05	0.65	12.63	7.9	0.7	1991.5	17.1	0.5	2.9
8-12	23.96	0.59	1.30	0.32	4.57	0.15	22.84	0.67	9.85	15.9	0.8	1983.5	15.2	0.5	3.3
12-16	20.81	0.51	1.00	0.33	3.48	0.12	19.97	0.62	6.09	31.3	1.0	1968.1	12.2	0.4	3.5

Ap D/Radiometric Data

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
16-20	16.52	0.45	0.86	0.26	3.32	0.12	15.79	0.52	2.53	59.5	1.6	1939.9	8.0	0.4	4.6
20-24	11.42	0.41	0.96	0.34	3.07	0.12	10.56	0.54	0.51	110.7	3.9	1888.7	3.7	0.4	9.7
24-28	3.38	0.19	0.96	0.22	1.52	0.07	2.44	0.30	0.00						
Lake Yale LY3-99									28.10						
0-4	29.43	0.80	1.39	0.23	3.95	0.17	28.39	0.84	26.25	2.2	0.5	1997.3	29.8	0.9	3.1
4-8	29.05	0.69	1.09	0.05	4.75	0.16	28.32	0.70	22.92	6.5	0.6	1992.9	27.0	0.7	2.6
8-12	28.65	0.65	1.42	0.24	4.59	0.15	27.57	0.70	19.02	12.5	0.6	1986.9	23.6	0.6	2.7
12-16	25.48	0.62	1.02	0.44	4.03	0.14	24.77	0.77	15.23	19.6	0.6	1979.8	21.5	0.7	3.2
16-20	25.52	0.59	0.89	0.15	4.49	0.14	24.94	0.62	10.89	30.4	0.8	1969.0	16.2	0.5	2.9
20-24	19.61	0.39	0.71	0.25	4.18	0.11	19.14	0.47	7.09	44.2	1.0	1955.2	14.4	0.5	3.3
24-28	14.28	0.41	1.00	0.34	3.41	0.12	13.46	0.54	4.09	61.9	1.4	1937.6	12.6	0.6	4.9
28-32	8.61	0.33	0.77	0.22	1.64	0.08	7.94	0.40	2.16	82.4	2.2	1917.1	11.9	0.8	6.8
32-36	2.41	0.13	0.79	0.32	0.94	0.04	1.64	0.35	1.81	88.0	2.3	1911.4	37.5	7.7	20.6
36-40	1.70	0.12	0.64	0.30	0.81	0.04	1.07	0.33	1.58	92.4	2.1	1907.0	49.2	14.5	29.4
40-44	2.14	0.13	0.78	0.09	0.76	0.04	1.38	0.17	1.29	99.0	2.5	1900.4	32.1	4.2	13.0
44-48	2.73	0.15	0.84	0.15	0.70	0.04	1.91	0.21	0.87	111.4	3.2	1888.0	17.4	2.2	12.9
48-52	1.20	0.10	0.85	0.08	0.86	0.04	0.36	0.14	0.80	114.4	3.3	1885.0	72.6	27.3	37.6
52-56	1.20	0.10	0.92	0.03	0.42	0.03	0.29	0.11	0.73	117.2	3.4	1882.2	81.9	30.7	37.5
56-60	1.58	0.09	0.88	0.06	0.61	0.03	0.72	0.11	0.55	126.2	4.2	1873.2	27.5	4.9	17.8
60-64	1.37	0.10	0.72	0.06	0.53	0.03	0.67	0.12	0.36	139.7	5.7	1859.7	21.0	4.5	21.3
64-68	1.22	0.09	0.55	0.04	0.47	0.03	0.69	0.10	0.13	171.5	12.8	1827.9	10.3	3.0	29.1
68-72	1.40	0.10	0.89	0.18	0.50	0.03	0.52	0.21	0.00						
Lake Harris LH1-99									5.76						
0-4	24.96	0.63	1.83	0.87	3.93	0.15	23.48	1.09	4.53	7.7	2.8	1991.7	6.8	0.5	7.4
4-8	22.42	0.56	1.92	0.87	4.06	0.14	20.80	1.05	2.62	25.4	4.0	1974.0	5.2	0.5	9.6
8-12	15.35	0.50	1.92	0.79	3.41	0.14	13.63	0.95	0.86	61.0	10.0	1938.4	3.6	0.7	18.8
12-16	3.71	0.21	2.39	0.34	1.12	0.06	1.34	0.40	0.56	74.8	14.3	1924.6	16.3	7.3	44.7
16-20	2.21	0.12	0.67	0.89	0.74	0.04	1.56	0.91	0.25	100.6	21.9	1898.8	7.7	5.8	74.9
20-24	1.89	0.16	0.71	0.79	0.63	0.05	1.20	0.81	0.00						

Ap D/Radiometric Data

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
Lake Harris LH2R-99									4.89						
0-4	22.66	0.55	1.37	0.15	2.84	0.11	21.69	0.58	3.76	8.5	1.0	1991.2	6.2	0.2	3.2
4-8	18.92	0.44	2.14	0.35	2.49	0.09	17.09	0.57	2.18	25.9	1.2	1973.8	5.3	0.2	3.9
8-12	14.92	0.41	1.84	0.02	2.18	0.09	13.32	0.41	0.47	75.4	3.2	1924.3	2.6	0.2	6.5
12-16	3.15	0.15	1.11	0.14	0.62	0.04	2.08	0.21	0.00						
LH3R-99									18.47						
0-4	27.85	0.45	1.76	0.02	3.71	0.10	26.61	0.46	16.36	3.9	0.4	1995.8	20.4	0.4	1.8
4-8	28.67	0.50	2.30	0.13	3.93	0.11	26.90	0.53	13.43	10.2	0.4	1989.5	17.2	0.4	2.0
8-12	28.27	0.35	1.97	0.10	4.25	0.08	26.84	0.37	10.00	19.7	0.5	1980.0	13.5	0.2	1.7
12-16	23.98	0.47	1.60	0.03	5.22	0.13	22.84	0.48	6.56	33.2	0.6	1966.5	11.1	0.3	2.3
16-20	19.76	0.35	2.85	0.10	5.53	0.11	17.27	0.37	3.60	52.5	0.8	1947.2	8.9	0.2	2.6
20-24	13.04	0.24	2.70	0.02	5.40	0.09	10.55	0.25	1.53	80.0	1.3	1919.7	7.1	0.3	3.6
24-28	8.75	0.23	2.62	0.05	2.27	0.07	6.27	0.24	0.10	167.1	9.1	1832.6	2.6	0.3	11.9
28-32	1.81	0.11	1.37	0.06	0.55	0.03	0.45	0.13	0.00						
Lake Harris LH4-99									16.60						
0-4	26.31	0.66	1.85	0.11	3.52	0.14	24.65	0.68	15.21	2.8	0.5	1996.8	20.1	0.6	2.9
4-8	26.91	0.62	1.91	0.19	3.15	0.12	25.20	0.65	12.94	7.9	0.6	1991.7	17.4	0.5	2.7
8-12	28.36	0.52	1.49	0.54	3.45	0.11	27.08	0.76	9.81	16.8	0.6	1982.8	13.0	0.4	2.9
12-16	25.19	0.52	1.75	0.14	3.63	0.12	23.63	0.54	6.91	28.1	0.7	1971.5	10.9	0.3	2.7
16-20	17.87	0.37	1.68	0.27	4.85	0.11	16.32	0.46	4.53	41.6	0.9	1958.0	10.8	0.4	3.3
20-24	10.26	0.27	1.77	0.06	3.02	0.09	8.56	0.28	3.06	54.3	1.2	1945.3	13.6	0.6	4.2
24-28	7.19	0.19	1.54	0.26	1.36	0.05	5.70	0.32	1.98	68.1	1.5	1931.5	13.6	0.9	6.3
28-32	6.64	0.19	1.57	0.12	1.09	0.04	5.10	0.23	0.97	91.0	2.6	1908.6	8.7	0.6	7.0
32-36	3.13	0.13	1.27	0.16	0.92	0.04	1.88	0.21	0.64	104.4	3.4	1895.2	13.2	1.7	13.2
36-40	4.16	0.17	1.18	0.13	0.73	0.04	3.00	0.21	0.12	158.0	15.2	1841.6	3.2	0.7	22.0
40-44	1.72	0.12	1.04	0.30	0.34	0.03	0.69	0.33	0.00						
Lake Harris LH5-99									14.10						
0-4	24.29	0.44	1.20	0.09	3.33	0.09	23.23	0.45	12.96	2.6	0.6	1997.0	18.1	0.4	2.2
4-8	23.45	0.30	1.81	0.00	3.46	0.07	21.77	0.30	11.37	6.8	0.6	1992.8	17.4	0.3	1.9
8-12	20.74	0.50	2.15	0.39	3.47	0.12	18.72	0.64	9.45	12.8	0.6	1986.8	17.3	0.6	3.5
12-16	17.14	0.40	2.18	0.01	4.80	0.12	15.06	0.40	7.72	19.3	0.7	1980.3	17.7	0.5	3.0

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
16-20	14.17	0.39	1.55	0.04	5.54	0.14	12.70	0.40	6.09	26.9	0.8	1972.7	16.9	0.6	3.5
20-24	8.08	0.20	1.53	0.06	2.01	0.06	6.60	0.21	4.93	33.7	0.9	1965.9	25.9	1.0	3.8
24-28	5.88	0.25	1.48	0.27	1.22	0.07	4.43	0.37	4.17	39.1	1.0	1960.5	31.9	2.6	8.2
28-32	7.82	0.24	1.53	0.00	1.07	0.05	6.34	0.25	2.98	49.9	1.2	1949.7	17.4	0.8	4.6
32-36	5.21	0.25	1.48	0.07	0.91	0.06	3.76	0.26	2.26	58.7	1.4	1940.9	21.6	1.6	7.2
36-40	3.54	0.15	1.04	0.01	0.75	0.04	2.52	0.15	1.82	65.6	1.6	1934.0	25.1	1.7	7.0
40-44	3.17	0.16	1.34	0.14	0.76	0.04	1.85	0.22	1.50	71.9	1.8	1927.7	27.9	3.3	11.9
44-48	2.36	0.15	1.02	0.05	0.65	0.04	1.36	0.16	1.26	77.5	1.9	1922.1	31.5	3.8	12.0
48-52	2.81	0.14	1.07	0.12	0.55	0.03	1.76	0.18	0.93	87.4	2.3	1912.2	19.2	2.2	11.3
52-56	2.49	0.14	0.95	0.01	0.57	0.04	1.55	0.14	0.63	99.6	3.1	1900.0	15.4	1.8	11.4
56-60	2.15	0.13	0.98	0.07	0.42	0.03	1.19	0.15	0.41	113.4	4.2	1886.2	13.5	2.1	15.7
60-64	2.28	0.15	0.91	0.01	0.38	0.03	1.39	0.15	0.17	142.1	9.0	1857.5	6.1	1.3	20.9
64-68	1.14	0.12	0.89	0.10	0.22	0.03	0.26	0.16	0.12	151.9	10.0	1847.7	17.6	10.8	61.6
68-72	1.71	0.12	1.02	0.18	0.26	0.03	0.70	0.22	0.00						
Lake Harris LH6R-99									25.30						
0-4	24.13	0.51	1.11	0.15	3.62	0.11	23.15	0.54	24.64	0.9	0.4	1999.0	33.6	0.8	2.5
4-8	27.07	0.38	1.97	0.05	3.56	0.08	25.25	0.38	23.16	2.9	0.4	1997.0	29.5	0.5	1.7
8-12	27.01	0.50	2.12	0.01	3.66	0.11	25.05	0.50	21.36	5.5	0.4	1994.4	27.7	0.6	2.2
12-16	26.43	0.47	1.43	0.13	3.44	0.10	25.17	0.49	19.18	8.9	0.5	1991.0	25.1	0.5	2.1
16-20	27.52	0.44	1.28	0.33	2.99	0.08	26.43	0.55	16.32	14.1	0.5	1985.8	20.9	0.5	2.3
20-24	25.25	0.45	1.33	0.13	4.14	0.11	24.09	0.48	13.45	20.3	0.5	1979.6	19.2	0.4	2.3
24-28	22.08	0.46	0.96	0.15	4.66	0.12	21.28	0.49	10.54	28.1	0.6	1971.7	17.5	0.5	2.6
28-32	21.17	0.44	1.21	0.14	4.53	0.12	20.11	0.47	7.44	39.3	0.8	1960.5	13.8	0.4	2.8
32-36	12.69	0.33	1.07	0.01	3.06	0.09	11.71	0.33	5.41	49.5	1.0	1950.3	16.9	0.6	3.6
36-40	9.01	0.26	1.14	0.05	1.29	0.06	7.94	0.27	4.05	58.8	1.2	1941.0	18.4	0.8	4.5
40-44	6.66	0.24	1.31	0.22	1.19	0.06	5.41	0.32	3.04	68.1	1.5	1931.8	20.3	1.4	6.8
44-48	7.13	0.26	0.86	0.00	1.33	0.06	6.35	0.26	1.80	84.8	2.3	1915.0	11.6	0.8	6.7
48-52	4.69	0.20	0.97	0.22	0.79	0.05	3.76	0.30	1.04	102.4	3.6	1897.5	11.5	1.3	11.2
52-56	2.87	0.13	0.89	0.26	0.53	0.03	2.00	0.30	0.62	119.1	5.1	1880.7	12.6	2.3	18.2
56-60	2.43	0.16	1.20	0.34	0.82	0.05	1.24	0.38	0.38	134.8	5.6	1865.1	12.3	3.8	30.8
60-64	1.95	0.14	1.20	0.12	0.31	0.03	0.76	0.18	0.24	150.0	7.6	1849.9	12.4	3.6	28.8
64-68	1.48	0.14	0.51	0.19	0.26	0.03	0.98	0.24	0.05	200.2	21.2	1799.7	3.8	1.8	47.7
68-72	1.24	0.12	0.92	0.18	0.57	0.04	0.33	0.21	0.00						

Ap D/Radiometric Data

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
Lake Harris LH7-99									34.10						
0-4	18.18	0.61	1.09	0.59	1.89	0.12	17.25	0.86	33.41	0.6	0.3	1998.8	60.9	3.0	5.0
4-8	22.82	0.46	1.49	0.43	2.17	0.08	21.55	0.63	31.74	2.3	0.3	1997.1	47.1	1.4	3.0
8-12	23.42	0.57	1.70	0.41	2.34	0.11	21.93	0.71	29.91	4.2	0.3	1995.2	43.8	1.4	3.2
12-16	24.61	0.39	1.83	0.05	2.19	0.07	23.00	0.39	27.84	6.5	0.3	1992.9	39.1	0.7	1.8
16-20	26.73	0.49	1.29	0.35	2.57	0.09	25.70	0.61	25.07	9.9	0.3	1989.5	32.0	0.8	2.4
20-24	26.72	0.47	1.31	0.17	2.45	0.08	25.67	0.50	22.13	13.9	0.4	1985.5	28.6	0.6	2.0
24-28	25.52	0.44	1.35	0.10	2.57	0.08	24.43	0.45	19.29	18.3	0.4	1981.1	26.4	0.5	2.0
28-32	25.22	0.46	1.44	0.12	2.92	0.09	24.03	0.48	16.46	23.4	0.4	1976.0	23.1	0.5	2.1
32-36	25.23	0.43	1.29	0.20	2.80	0.08	24.20	0.48	13.35	30.1	0.5	1969.3	19.1	0.4	2.2
36-40	22.21	0.27	1.44	0.17	2.64	0.06	21.00	0.33	10.63	37.4	0.6	1962.0	17.7	0.4	2.0
40-44	21.93	0.40	1.43	0.22	2.80	0.08	20.70	0.45	7.86	47.1	0.7	1952.3	13.8	0.4	2.6
44-48	21.84	0.52	1.70	0.38	3.52	0.12	20.37	0.65	5.00	61.6	0.9	1937.8	9.7	0.3	3.6
48-52	21.30	0.44	1.46	0.31	3.10	0.10	20.06	0.55	2.01	90.8	1.6	1908.6	5.1	0.2	4.3
52-56	9.98	0.35	0.95	0.26	1.20	0.07	9.14	0.44	0.36	146.2	5.5	1853.2	3.3	0.3	10.6
56-60	1.81	0.17	0.93	0.25	0.18	0.03	0.88	0.30	0.21	162.6	5.3	1836.8	9.9	3.4	34.2
60-64	2.27	0.13	1.08	0.15	0.33	0.03	1.20	0.20	0.00						
Lake Harris LH8-99									18.60						
0-4	21.05	0.46	1.63	0.22	1.96	0.08	19.52	0.51	17.36	2.2	0.5	1997.6	28.6	0.8	2.7
4-8	20.96	0.45	1.51	0.12	2.13	0.08	19.55	0.46	15.62	5.5	0.5	1994.2	26.2	0.7	2.5
8-12	23.09	0.42	1.13	0.26	2.41	0.08	22.07	0.50	13.41	10.4	0.5	1989.3	20.4	0.5	2.4
12-16	23.23	0.45	1.38	0.11	2.83	0.09	21.97	0.46	10.75	17.5	0.6	1982.2	17.1	0.4	2.3
16-20	20.42	0.34	1.09	0.16	3.36	0.08	19.43	0.38	8.33	25.7	0.7	1974.0	15.2	0.4	2.4
20-24	15.79	0.42	1.42	0.13	4.16	0.12	14.45	0.44	6.46	33.9	0.8	1965.9	15.9	0.5	3.4
24-28	12.95	0.34	1.77	0.15	4.37	0.11	11.24	0.37	4.96	42.4	0.9	1957.4	15.7	0.6	3.8
28-32	9.17	0.22	1.24	0.20	2.23	0.06	7.98	0.30	3.89	50.2	1.1	1949.6	17.2	0.8	4.5
32-36	8.05	0.24	1.13	0.28	0.90	0.05	6.97	0.37	2.94	59.1	1.3	1940.6	15.2	0.9	5.9
36-40	5.90	0.19	0.97	0.14	0.98	0.05	4.96	0.24	2.16	69.0	1.6	1930.8	15.9	1.0	6.0
40-44	3.77	0.16	0.88	0.08	0.71	0.04	2.91	0.18	1.69	77.0	2.0	1922.8	20.5	1.6	7.7
44-48	3.51	0.16	0.84	0.12	0.63	0.04	2.69	0.20	1.25	86.5	2.5	1913.2	16.9	1.6	9.5
48-52	2.97	0.14	1.01	0.12	0.69	0.04	1.97	0.18	0.94	95.9	3.1	1903.9	17.2	2.1	11.9
52-56	2.37	0.14	1.11	0.07	0.50	0.04	1.26	0.16	0.74	103.6	3.8	1896.1	20.5	3.2	15.5

Ap D/Radiometric Data

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
56-60	1.89	0.12	0.93	0.08	0.47	0.03	0.96	0.14	0.58	111.3	4.7	1888.4	21.1	4.0	18.9
60-64	1.65	0.12	1.04	0.07	0.51	0.03	0.62	0.14	0.48	117.5	5.5	1882.2	26.5	6.8	25.8
64-68	2.04	0.11	0.96	0.24	0.40	0.03	1.09	0.26	0.30	132.6	7.4	1867.2	10.9	3.1	28.6
68-72	1.91	0.13	1.01	0.15	0.32	0.03	0.91	0.20	0.14	157.3	13.8	1842.5	7.1	2.6	36.0
72-76	1.27	0.10	0.97	0.24	0.25	0.02	0.30	0.26	0.08	174.7	12.9	1825.1	11.1	9.5	85.8
76-80	1.32	0.08	0.91	0.15	0.23	0.02	0.42	0.17	0.00						
Lake Harris LH9R-99									27.30						
0-4	20.48	0.31	0.86	0.31	2.43	0.06	19.95	0.45	26.14	1.4	0.4	1998.4	41.7	1.0	2.4
4-8	19.16	0.32	0.86	0.23	2.03	0.06	18.62	0.40	24.60	3.4	0.4	1996.5	42.4	1.0	2.3
8-12	21.17	0.41	1.02	0.05	2.44	0.08	20.50	0.42	22.67	6.0	0.4	1993.9	35.9	0.8	2.2
12-16	19.57	0.41	0.87	0.40	2.59	0.09	19.03	0.59	20.73	8.9	0.4	1991.0	35.5	1.1	3.1
16-20	22.41	0.42	1.40	0.36	2.61	0.08	21.38	0.56	18.32	12.8	0.5	1987.0	28.4	0.8	2.7
20-24	21.89	0.34	1.03	0.02	3.00	0.07	21.23	0.35	15.71	17.8	0.5	1982.1	24.9	0.5	1.9
24-28	20.19	0.39	1.23	0.15	3.07	0.09	19.31	0.42	13.09	23.6	0.5	1976.2	23.2	0.6	2.4
28-32	18.59	0.39	1.59	0.20	3.96	0.10	17.32	0.44	10.62	30.4	0.6	1969.5	21.2	0.6	2.8
32-36	13.97	0.31	1.54	0.10	4.28	0.10	12.69	0.34	8.66	36.9	0.7	1963.0	23.6	0.7	3.1
36-40	8.88	0.21	1.14	0.09	2.49	0.06	7.86	0.24	7.27	42.5	0.8	1957.4	31.5	1.1	3.5
40-44	9.18	0.29	1.57	0.02	1.98	0.08	7.77	0.30	5.98	48.8	0.9	1951.1	26.5	1.1	4.3
44-48	8.23	0.23	1.54	0.05	1.13	0.05	6.83	0.24	4.87	55.4	1.1	1944.5	24.7	1.1	4.4
48-52	8.51	0.22	1.00	0.02	0.04	0.01	7.67	0.23	3.68	64.4	1.4	1935.5	17.3	0.8	4.5
52-56	7.08	0.23	1.29	0.70	-0.05	0.01	5.91	0.75	2.78	73.4	1.2	1926.5	16.9	2.0	12.0
56-60	8.00	0.28	1.18	0.42	0.02	0.02	6.97	0.51	1.71	88.9	1.3	1910.9	9.8	0.7	7.5
60-64	4.68	0.20	0.72	0.09	0.86	0.05	4.04	0.22	1.09	103.3	1.8	1896.5	10.6	0.7	6.6
64-68	3.63	0.15	0.63	0.03	0.79	0.04	3.06	0.15	0.62	121.8	2.9	1878.1	8.5	0.7	8.2
68-72	2.63	0.14	0.97	0.16	0.46	0.03	1.69	0.21	0.35	139.7	4.1	1860.1	8.7	1.3	15.1
72-76	1.99	0.10	0.94	0.15	0.11	0.01	1.08	0.19	0.17	162.8	6.0	1837.1	7.3	1.5	21.3
76-80	1.45	0.09	0.82	0.15	-0.04	0.01	0.65	0.18	0.07	192.8	7.7	1807.1	5.3	1.8	33.2
80-84	1.17	0.10	0.73	0.03	0.18	0.02	0.45	0.11	0.00						
LB1-99															
0-4	16.77	0.40	1.12	0.14	1.53	0.07	15.73	0.43							
4-8	16.80	0.32	1.85	0.35	1.42	0.05	15.03	0.48							
8-12	15.38	0.39	1.05	0.16	1.40	0.07	14.40	0.42							

Ap D/Radiometric Data

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
12-16	16.87	0.45	1.86	0.22	1.32	0.07	15.08	0.50							
16-20	17.17	0.32	1.70	0.05	1.63	0.06	15.55	0.32							
20-24	15.91	0.40	1.68	0.03	1.75	0.08	14.32	0.40							
24-28	15.78	0.39	1.57	0.13	1.95	0.08	14.30	0.42							
28-32	14.08	0.33	1.65	0.13	2.03	0.07	12.52	0.36							
32-36	13.39	0.32	1.66	0.23	2.31	0.08	11.81	0.40							
36-40	12.37	0.34	1.85	0.05	2.67	0.09	10.59	0.35							
40-44	11.66	0.32	1.76	0.16	3.18	0.10	9.97	0.36							
44-48	15.46	0.41	2.13	0.10	3.80	0.12	13.43	0.43							
48-52	13.88	0.34	2.19	0.53	3.92	0.10	11.78	0.63							
52-56	10.94	0.31	2.13	0.14	5.54	0.13	8.87	0.35							
56-60	7.29	0.24	1.82	0.09	6.45	0.13	5.52	0.26							
60-64	7.18	0.23	1.67	0.19	6.04	0.12	5.55	0.30							
64-68	8.92	0.31	1.60	0.11	6.42	0.15	7.37	0.34							
68-72	10.02	0.33	2.38	0.08	6.76	0.15	7.71	0.34							
72-76	9.64	0.34	2.48	0.28	8.05	0.18	7.23	0.45							
76-80	7.01	0.31	2.47	0.34	7.88	0.18	4.57	0.46							
80-84	7.54	0.32	2.80	0.22	8.89	0.19	4.78	0.39							
84-88	9.28	0.36	2.94	0.10	7.85	0.18	6.40	0.38							
88-92	7.43	0.33	2.60	0.47	4.51	0.14	4.88	0.58							
92-96	6.93	0.32	2.80	0.18	5.06	0.15	4.17	0.37							
96-100	11.61	0.63	2.34	0.26	5.42	0.24	9.36	0.69							
100-104	6.17	0.34	2.82	0.49	4.46	0.16	3.38	0.60							
104-108	8.95	0.38	3.04	0.10	3.18	0.13	5.97	0.39							
108-112	10.91	0.52	2.35	0.12	2.27	0.13	8.64	0.53							
112-116	9.14	0.53	2.22	0.57	1.46	0.12	7.00	0.78							
116-120	9.49	0.36	2.51	0.24	1.74	0.09	7.06	0.44							
120-124	8.45	0.41	2.28	0.33	1.26	0.09	6.24	0.53							
124-128	6.27	0.35	1.87	0.28	0.85	0.07	4.45	0.46							
128-132	8.21	0.51	2.32	0.37	1.07	0.10	5.95	0.64							

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
LB1-00															
114-118	6.07	0.09	3.54	0.38	1.61	0.01	2.63	0.40							
118-122	7.94	0.10	2.53	1.09	1.58	0.01	5.62	1.14							
122-126	7.88	0.11	1.59	0.58	0.69	0.01	6.53	0.61							
126-130	6.29	0.10	1.80	0.45	0.76	0.01	4.66	0.47							
130-134	8.05	0.09	1.56	0.38	0.56	0.01	6.75	0.41							
134-138	8.09	0.07	1.80	0.16	0.54	0.01	6.53	0.18							
138-142	8.49	0.08	1.56	0.38	0.34	0.01	7.20	0.40							
142-146	8.02	0.07	1.82	0.22	0.47	0.01	6.45	0.24							
146-150	9.60	0.06	2.02	0.50	0.39	0.01	7.89	0.52							
150-154	7.84	0.05	1.30	0.17	0.36	0.01	6.81	0.19							
154-158	7.52	0.05	1.73	0.22	0.43	0.01	6.02	0.23							
158-162	7.75	0.05	1.88	0.70	0.34	0.01	6.11	0.73							
162-166	6.90	0.05	1.50	0.22	0.44	0.01	5.63	0.24							
166-170	4.66	0.04	1.27	0.18	0.42	0.01	3.53	0.19							
170-174	4.88	0.05	1.69	0.11	0.20	0.01	3.33	0.12							
174-178	4.61	0.04	1.76	0.13	0.20	0.01	2.98	0.15							
178-182	4.20	0.05	1.55	0.25	0.49	0.01	2.76	0.26							
182-186	4.45	0.04	1.78	0.27	0.27	0.00	2.78	0.28							
186-190	3.55	0.04	1.88	0.10	0.20	0.00	1.74	0.11							
190-194	4.35	0.04	1.36	0.28	0.14	0.01	3.12	0.29							
LB2-99									36.96						
0-4	14.29	0.63	0.23	0.30	1.38	0.11	14.46	0.72	36.31	0.6	0.5	1998.7	78.9	4.0	5.1
4-8	18.03	0.86	0.40	0.20	-0.34	0.05	18.12	0.91	35.26	1.5	0.5	1997.8	61.5	3.1	5.1
8-12	19.72	0.81	0.57	0.09	1.22	0.12	19.68	0.84	33.98	2.7	0.5	1996.6	54.8	2.4	4.3
12-16	16.71	0.86	0.93	0.35	-0.36	0.05	16.21	0.95	32.71	3.9	0.5	1995.4	64.1	3.8	5.9
16-20	20.60	0.98	1.29	0.62	0.87	0.13	19.83	1.19	30.85	5.8	0.5	1993.5	49.9	3.0	6.0
20-24	19.02	0.54	1.18	0.03	1.56	0.09	17.94	0.55	29.01	7.8	0.5	1991.5	52.0	1.7	3.2
24-28	18.48	0.51	1.28	0.05	2.07	0.10	17.30	0.51	26.92	10.2	0.5	1989.1	50.3	1.6	3.1
28-32	16.75	0.53	1.21	0.02	2.26	0.11	15.64	0.53	24.92	12.7	0.6	1986.6	51.6	1.8	3.5
32-36	16.01	0.46	1.23	0.11	2.13	0.10	14.86	0.47	22.96	15.3	0.6	1984.0	50.1	1.7	3.4
36-40	15.11	0.48	1.66	0.44	2.93	0.12	13.54	0.66	20.93	18.3	0.6	1981.0	50.5	2.5	4.9
40-44	15.98	0.33	1.81	0.18	2.91	0.08	14.27	0.38	18.71	21.9	0.6	1977.4	43.2	1.3	3.0

Ap D/Radiometric Data

Depth Interval (cm)	Pb-210 Activity (dpm/g)	Pb-210 Error	Ra-226 Activity (dpm/g)	Ra-226 Error	Cs-137 Activity (dpm/g)	Cs-137 Error	Pb-210 Activity (dpm/g)	Pb-210 Error	Pb-210 Activity (dpm/cm2)	Age (yr)	Age Error	Date	MSR	MSR Error	MSR Error (%)
44-48	15.63	0.60	1.86	0.39	3.64	0.17	13.87	0.73	16.46	26.0	0.7	1973.3	39.4	2.1	5.2
48-52	12.72	0.40	1.71	0.15	3.70	0.12	11.09	0.43	14.43	30.2	0.7	1969.1	43.3	1.8	4.1
52-56	10.08	0.32	1.41	0.13	4.09	0.11	8.74	0.34	12.75	34.2	0.8	1965.1	48.4	2.0	4.2
56-60	10.45	0.35	1.82	0.08	6.27	0.15	8.70	0.37	11.01	38.9	0.8	1960.4	42.4	1.9	4.5
60-64	9.60	0.40	1.96	0.11	8.24	0.21	7.70	0.42	9.47	43.7	0.9	1955.6	41.4	2.3	5.7
64-68	10.05	0.39	1.79	0.45	9.04	0.20	8.33	0.60	7.72	50.3	0.9	1949.0	32.0	2.3	7.1
68-72	7.27	0.41	1.62	0.08	5.01	0.18	5.70	0.42	6.36	56.5	1.0	1942.8	38.3	2.8	7.3
72-76	6.78	0.30	1.15	0.33	1.88	0.09	5.68	0.45	5.07	63.8	1.0	1935.5	31.2	2.4	7.8
76-80	6.28	0.31	0.72	0.22	0.57	0.05	5.60	0.38	3.81	73.0	1.1	1926.3	24.5	1.7	6.8
80-84	5.25	0.20	0.85	0.00	0.54	0.04	4.44	0.21	2.82	82.7	1.4	1916.6	23.0	1.3	5.6
84-88	7.78	0.27	1.49	0.32	0.60	0.04	6.35	0.42	1.42	104.7	1.8	1894.6	10.0	0.8	7.5
88-92	4.40	0.19	1.35	0.14	0.37	0.03	3.08	0.24	0.80	122.9	2.5	1876.4	10.9	1.0	9.2
92-96	3.53	0.18	1.44	0.17	0.44	0.04	2.11	0.25	0.42	143.9	3.2	1855.4	8.7	1.1	13.2
96-100	2.38	0.13	1.25	0.08	0.38	0.03	1.14	0.16	0.22	164.9	4.5	1834.4	8.4	1.4	16.7
100-104	2.41	0.14	1.23	0.03	0.38	0.03	1.19	0.14	0.01	253.0	41.6	1746.3	1.9	0.8	41.4
104-108	1.56	0.10	1.48	0.02	0.44	0.03	0.08	0.11	0.00						

APPENDIX E

Section and Decadal
Nutrient Accumulation Rates
Harris Chain of Lakes Cores

See Appendix A for collection date, location and description of cores.

CODES for Sections (Pages E1-E5):

- Depth is depth (cm)
- MSR is mass sedimentation rate (mg cm^{-2} yr^{-1})
- CHEPAR is hot-water extractable P accumulation rate (μg cm^{-2} yr^{-1})
- TPAR is total P accumulation rate (μg cm^{-2} yr^{-1})
- OMAR is organic matter accumulation rate (mg cm^{-2} yr^{-1})
- TNAR is total nitrogen accumulation rate (mg cm^{-2} yr^{-1})
- TCAR is total carbon accumulation rate (mg cm^{-2} yr^{-1})
- D SiAR is diatom biogenic silica accumulation rate (mg cm^{-2} yr^{-1})
- S SiAR is sponge biogenic silica accumulation rate (mg cm^{-2} yr^{-1})
- Date is ^{210}Pb-date at the bottom of the core section
- NVSAR is non-volatile solids accumulation rate (mg cm^{-2} yr^{-1})

CODES for Decades (Pages E6-E10):

- Core is alphanumeric core identification
- Age represents successive decadal intervals with depth (yr)
- Decadal MSR is mass sedimentation rate (mg cm^{-2} yr^{-1})
- Decadal CHEP-AR is hot-water extractable P accumulation rate (μg cm^{-2} yr^{-1})
- Decadal NaOH-AR is sodium-hydroxide extractable P accumulation rate (μg cm^{-2} yr^{-1})
- Decadal TPAR is total P accumulation rate (μg cm^{-2} yr^{-1})
- Decadal OMAR is organic matter accumulation rate (mg cm^{-2} yr^{-1})
- Decadal TNAR is total nitrogen accumulation rate (mg cm^{-2} yr^{-1})
- Decadal TCAR is total carbon accumulation rate (mg cm^{-2} yr^{-1})
- Decadal D SiAR is diatom biogenic silica accumulation rate (mg cm^{-2} yr^{-1})
- Decadal S SiAR is sponge biogenic silica accumulation rate (mg cm^{-2} yr^{-1})
- Decadal NVSAR is non-volatile solids accumulation rate (mg cm^{-2} yr^{-1})

Ap E - Nutrient Accumulation Rate

	Depth (cm)	MSR mg/cm2	CHEP-AR µg/cm2	TPAR µg/cm2	OMAR mg/cm2	TNAR mg/cm2	TCAR mg/cm2	D SiAR mg/cm2	S SiAR mg/cm2	NVSAR mg/cm2	Date
LW1R-99	4	18.0	4.15	20.91	12.17	0.608	5.82	0.98	0.31	5.86	1996.1
LW1R-99	8	15.0	4.15	18.07	10.04	0.490	4.83	0.96	0.18	4.99	1989.7
LW1R-99	12	12.9	2.13	12.61	8.22	0.390	3.99	0.78	0.21	4.71	1978.9
LW1R-99	16	11.8	0.91	8.55	7.25	0.330	3.51	0.68	0.22	4.58	1966.2
LW1R-99	20	12.1	0.49	6.93	7.26	0.328	3.52	0.72	0.20	4.88	1953.3
LW1R-99	24	11.9	0.25	5.56	7.01	0.318	3.47	0.82	0.18	4.89	1939.0
LW1R-99	28	13.5	0.22	5.23	7.86	0.357	3.96	1.04	0.05	5.60	1925.8
LW1R-99	32	17.3	0.07	5.47	10.46	0.450	5.17	1.25	0.23	6.80	1915.0
LW1R-99	36	17.1	0.12	5.18	10.39	0.456	5.25	1.30	0.24	6.70	1903.7
LW1R-99	40	19.5	0.00	5.48	11.73	0.511	5.93	1.66	0.19	7.76	1893.2
LW1R-99	44	11.0	0.00	3.09	6.56	0.286	3.39	0.75	0.30	4.45	1873.5
LW1R-99	48	10.0	0.00	2.54	6.02	0.260	3.10	0.68	0.22	3.95	1851.6
LW2R-99	4	17.1	3.20	17.79	11.18	0.547	5.36	1.12	0.14	5.91	1995.0
LW2R-99	8	13.5	2.30	12.86	8.72	0.413	4.18	0.91	0.14	4.82	1986.4
LW2R-99	12	11.8	1.39	9.23	7.42	0.353	3.59	0.72	0.13	4.38	1975.6
LW2R-99	16	10.4	0.63	5.79	6.26	0.289	3.04	0.68	0.08	4.10	1961.4
LW2R-99	20	11.8	0.34	5.38	6.82	0.312	3.41	0.79	0.10	5.00	1945.8
LW2R-99	24	13.1	0.75	4.85	7.63	0.340	3.83	0.93	0.11	5.50	1930.5
LW2R-99	28	19.4	0.14	5.62	11.37	0.507	5.85	1.37	0.14	8.07	1919.7
LW2R-99	32	13.0	0.17	3.52	7.79	0.327	3.85	0.88	0.10	5.23	1903.1
LW2R-99	36	18.4	0.17	4.07	10.97	0.466	5.71	1.15	0.19	7.47	1890.8
LW2R-99	40	65.5	0.85	12.84	38.44	1.572	19.55	3.80	0.91	27.05	1887.2
LW2R-99	44	69.6	0.56	13.58	40.67	1.657	21.00	3.65	0.96	28.97	1883.7
LW2R-99	48	11.3	0.14	2.21	6.53	0.266	3.45	0.58	0.17	4.76	1860.6
LW2R-99	52	4.3	0.07	0.79	2.34	0.098	1.27	0.20	0.04	1.92	1795.6
LW3R-99	4	38.6	7.84	26.52	24.94	1.150	12.07	0.93	0.62	13.66	1997.0
LW3R-99	8	32.8	7.02	26.40	20.76	0.931	10.14	0.55	0.80	12.04	1992.2
LW3R-99	12	31.5	3.90	24.66	19.11	0.841	9.55	0.66	0.60	12.38	1985.8
LW3R-99	16	34.1	2.35	21.06	19.69	0.802	9.58	0.55	0.55	14.44	1979.3
LW3R-99	20	32.2	1.10	17.27	18.24	0.754	9.23	0.45	0.51	13.99	1971.6
LW3R-99	24	23.7	0.83	13.34	13.50	0.533	6.79	0.26	0.55	10.19	1960.3
LW3R-99	28	20.2	0.69	10.41	11.23	0.480	5.93	0.39	0.19	8.93	1946.5
LW3R-99	32	19.5	0.29	8.00	10.17	0.441	5.59	0.26	0.18	9.35	1932.5
LW3R-99	36	10.5	0.12	3.00	4.17	0.191	2.41	0.08	0.11	6.29	1898.0
LW3R-99	40	57.8	0.00	7.00	19.61	1.267	15.64	0.10	0.25	38.23	1892.0
LW3R-99	44	48.8	0.00	6.99	31.90	1.299	15.18	0.12	0.15	16.95	1888.7
LW3R-99	48	22.5	0.00	3.15	14.08	0.584	6.88	0.04	0.09	8.45	1880.7
LW3R-99	52	10.8	0.09	1.81	6.60	0.278	3.30	0.00	0.09	4.18	1861.7
LW3R-99	56	5.6	0.00	0.79	3.58	0.142	1.68	0.00	0.04	2.04	1826.4
LY1-99	4	22.41	5.624	27.72	15.71	0.820	7.69	1.62	0.35	6.70	1995.8
LY1-99	8	19.49	4.716	21.01	13.70	0.705	6.71	1.40	0.18	5.79	1990.3
LY1-99	12	15.73	2.423	16.64	11.04	0.573	5.36	1.00	0.24	4.69	1981.7
LY1-99	16	13.65	3.468	12.25	9.09	0.468	4.53	0.91	0.11	4.56	1971.5
LY1-99	20	7.89	0.813	4.42	5.34	0.262	2.63	0.50	0.11	2.56	1953.3
LY1-99	24	7.24	0.441	2.71	4.66	0.206	2.09	0.45	0.09	2.58	1930.6
LY1-99	28	5.39	0.291	1.72	3.59	0.178	1.84	0.31	0.09	1.80	1899.4
LY1-99	32	4.09	0.200	1.08	2.74	0.132	1.37	0.24	0.07	1.35	1858.2
LY1-99	36	10.10	0.394	2.28	6.48	0.293	3.15	0.54	0.26	3.62	1841.4

Ap E - Nutrient Accumulation Rate

	Depth (cm)	MSR mg/cm2	CHEP-AR µg/cm2	TPAR µg/cm2	OMAR mg/cm2	TNAR mg/cm2	TCAR mg/cm2	D SiAR mg/cm2	S SiAR mg/cm2	NVSAR mg/cm2	Date
LY2-99	4	20.05	7.259	18.89	14.20	0.722	6.65	1.24	0.26	5.86	1996.7
LY2-99	8	17.06	6.089	19.14	11.62	0.631	5.81	0.99	0.31	5.44	1991.5
LY2-99	12	15.25	4.636	17.43	9.76	0.528	4.90	0.83	0.20	5.49	1983.5
LY2-99	16	12.19	3.427	10.71	6.44	0.348	3.26	0.54	0.20	5.76	1968.1
LY2-99	20	8.00	1.296	5.66	3.79	0.228	2.24	0.39	0.14	4.21	1939.9
LY2-99	24	3.73	0.280	1.70	2.23	0.102	1.05	0.14	0.13	1.50	1888.7
LY3-99	4	29.79	11.110	37.08	21.36	1.126	10.09	2.29	0.25	8.43	1997.3
LY3-99	8	27.00	10.018	36.99	18.66	1.032	9.11	2.12	0.22	8.34	1992.9
LY3-99	12	23.62	11.482	31.04	15.64	0.801	7.36	1.59	0.10	7.99	1986.9
LY3-99	16	21.45	9.266	26.49	13.84	0.779	7.18	1.45	0.11	7.61	1979.8
LY3-99	20	16.16	10.213	16.45	9.82	0.577	5.40	0.93	0.11	6.33	1969.0
LY3-99	24	14.41	2.681	11.79	7.71	0.383	3.72	0.90	0.02	6.70	1955.2
LY3-99	28	12.62	0.669	5.55	6.16	0.341	3.40	0.77	0.11	6.46	1937.6
LY3-99	32	11.85	0.474	3.53	5.54	0.327	3.29	0.72	0.11	6.32	1917.1
LY3-99	36	37.52	0.450	6.57	18.98	1.088	11.07	1.97	0.63	18.53	1911.4
LY3-99	40	49.25	0.492	10.29	25.61	1.409	14.43	2.25	1.94	23.64	1907.0
LY3-99	44	32.11	0.514	6.33	16.41	0.870	8.93	1.99	0.46	15.70	1900.4
LY3-99	48	17.36	0.521	3.28	9.12	0.509	5.22	1.07	0.21	8.25	1888.0
LY3-99	52	72.62	1.598	11.40	39.87	1.830	18.94	3.36	1.45	32.75	1885.0
LY3-99	56	81.94	1.885	12.87	43.76	2.385	24.35	2.79	2.34	38.19	1882.2
LY3-99	60	27.48	0.660	4.18	13.14	0.852	8.58	0.90	0.40	14.35	1873.2
LY3-99	64	21.01	0.273	2.52	8.95	0.590	5.90	0.97	0.43	12.06	1859.7
LY3-99	68	10.32	0.072	0.68	3.74	0.279	2.70	0.46	0.25	6.58	1827.9
LH1-99	4	6.8	1.25	7.46	4.51	0.24	2.11	0.56	0.12	2.29	1991.7
LH1-99	8	5.2	1.04	5.16	3.19	0.18	1.64	0.46	0.07	2.04	1974.0
LH1-99	12	3.6	0.29	4.32	2.18	0.11	1.11	0.35	0.10	1.43	1938.4
LH1-99	16	16.3	0.75	5.64	9.60	0.44	4.82	1.49	0.63	6.70	1924.6
LH1-99	20	7.7	0.25	2.44	4.65	0.20	2.26	0.80	0.17	3.05	1898.8
LH2R-99	4	6.2	1.21	6.64	3.95	0.23	2.02	0.40	0.19	2.22	1991.2
LH2R-99	8	5.3	1.15	5.23	3.26	0.19	1.80	0.39	0.19	2.02	1973.8
LH2R-99	12	2.6	0.42	1.93	1.53	0.10	0.93	0.13	0.18	1.07	1924.3
LH3R-99	4	20.4	7.14	25.63	13.62	0.83	7.36	1.69	0.37	6.74	1995.8
LH3R-99	8	17.2	7.68	21.13	11.43	0.70	6.30	1.40	0.30	5.76	1989.5
LH3R-99	12	13.5	4.63	15.93	8.86	0.50	4.59	1.14	0.19	4.64	1980.0
LH3R-99	16	11.1	1.86	9.91	6.76	0.38	3.70	0.97	0.19	4.36	1966.5
LH3R-99	20	8.9	1.03	6.98	5.07	0.31	2.93	0.80	0.13	3.82	1947.2
LH3R-99	24	7.1	0.51	4.45	3.73	0.22	2.20	0.56	0.13	3.41	1919.7
LH3R-99	28	2.6	0.13	1.26	1.39	0.08	0.79	0.23	0.03	1.22	1832.6

Ap E - Nutrient Accumulation Rate

	Depth (cm)	MSR mg/cm2	CHEP-AR µg/cm2	TPAR µg/cm2	OMAR mg/cm2	TNAR mg/cm2	TCAR mg/cm2	D SiAR mg/cm2	S SiAR mg/cm2	NVSAR mg/cm2	Date
LH4-99	4	20.1	3.19	25.25	14.39	0.00	0.00	1.61	0.31	5.68	1996.8
LH4-99	8	17.4	3.82	24.24	11.75	0.71	6.30	1.53	0.33	5.61	1991.7
LH4-99	12	13.0	1.94	17.51	8.74	0.51	4.71	1.16	0.23	4.26	1982.8
LH4-99	16	10.9	0.79	22.34	6.98	0.42	3.94	0.95	0.22	3.93	1971.5
LH4-99	20	10.8	0.36	10.04	6.50	0.36	3.61	1.02	0.23	4.26	1958.0
LH4-99	24	13.6	0.19	7.52	8.04	0.43	4.52	1.27	0.36	5.59	1945.3
LH4-99	28	13.6	0.73	6.59	8.13	0.43	4.61	1.23	0.49	5.42	1931.5
LH4-99	32	8.7	0.23	3.81	5.20	0.27	2.89	0.69	0.39	3.47	1908.6
LH4-99	36	13.2	1.13	5.01	7.97	0.38	3.93	1.02	0.68	5.20	1895.2
LH4-99	40	3.2	0.21	1.18	1.98	0.09	0.97	0.20	0.19	1.25	1841.6
LH5-99	4	18.11	8.82	20.16	12.44	0.63	5.56	1.40	0.39	5.67	1997.0
LH5-99	8	17.38	7.47	19.73	11.16	0.59	5.17	1.23	0.51	6.22	1992.8
LH5-99	12	17.27	4.56	18.81	9.66	0.56	5.00	1.34	0.53	7.62	1986.8
LH5-99	16	17.69	2.83	13.07	9.82	0.53	5.00	1.53	0.48	7.87	1980.3
LH5-99	20	16.85	0.89	10.11	9.54	0.48	4.73	1.61	0.63	7.31	1972.7
LH5-99	24	25.92	1.74	12.31	14.96	0.69	7.01	2.10	1.23	10.96	1965.9
LH5-99	28	31.88	1.75	13.84	19.06	0.92	9.32	2.87	1.13	12.82	1960.5
LH5-99	32	17.38	0.96	7.59	10.22	0.47	4.78	1.42	0.96	7.16	1949.7
LH5-99	36	21.59	0.47	8.64	12.72	0.62	6.34	2.03	1.11	8.87	1940.9
LH5-99	40	25.10	0.65	9.24	14.98	0.74	7.46	3.05	0.52	10.11	1934.0
LH5-99	44	27.89	0.00	11.10	16.79	0.80	8.08	2.84	1.50	11.10	1927.7
LH5-99	48	31.50	2.71	11.12	18.74	0.91	9.27	3.38	1.74	12.76	1922.1
LH5-99	52	19.16	0.56	7.07	11.49	0.61	6.23	1.76	1.05	7.66	1912.2
LH5-99	56	15.43	1.08	5.52	9.32	0.46	4.61	1.73	0.75	6.11	1900.0
LH5-99	60	13.48	2.83	4.60	8.16	0.40	3.98	1.43	0.62	5.33	1886.2
LH5-99	64	6.10	0.63	2.05	3.73	0.19	1.85	0.65	0.32	2.37	1857.5
LH5-99	68	17.61	2.87	5.99	10.79	0.53	5.27	1.85	0.96	6.81	1847.7
LH6R-99	4	33.6	9.24	40.23	0.00	1.18	10.48	2.81	0.63	33.61	1999.0
LH6R-99	8	29.5	9.87	35.83	0.00	1.03	9.13	2.62	0.45	29.47	1997.0
LH6R-99	12	27.7	8.60	35.17	18.92	0.98	8.54	2.40	0.53	8.74	1994.4
LH6R-99	16	25.1	8.72	33.12	17.01	0.88	7.79	2.38	0.43	8.04	1991.0
LH6R-99	20	20.9	5.57	25.23	13.90	0.71	6.39	1.84	0.31	6.97	1985.8
LH6R-99	24	19.2	3.53	19.33	12.54	0.65	5.81	1.70	0.49	6.64	1979.6
LH6R-99	28	17.5	2.13	13.82	10.97	0.54	5.05	1.74	0.42	6.50	1971.7
LH6R-99	32	13.8	1.54	12.24	8.10	0.39	3.75	1.48	0.16	5.68	1960.5
LH6R-99	36	16.9	0.85	9.42	9.81	0.47	4.74	1.89	0.24	7.13	1950.3
LH6R-99	40	18.4	0.66	8.78	11.10	0.52	5.23	1.86	0.48	7.34	1941.0
LH6R-99	44	20.3	0.61	9.27	11.93	0.57	5.77	2.12	0.40	8.36	1931.8
LH6R-99	48	11.6	0.39	5.45	6.96	0.32	3.27	1.15	0.29	4.66	1915.0
LH6R-99	52	11.5	0.28	4.79	6.86	0.33	3.40	1.13	0.30	4.63	1897.5
LH6R-99	56	12.6	0.16	4.58	7.83	0.33	3.42	1.09	0.60	4.80	1880.7
LH6R-99	60	12.3	0.11	3.39	7.35	0.35	3.51	1.20	0.49	4.92	1865.1
LH6R-99	64	12.4	0.24	4.32	7.34	0.36	3.54	1.22	0.65	5.06	1849.9
LH6R-99	68	3.8	0.10	1.39	2.35	0.11	1.08	0.44	0.17	1.45	1799.7

Ap E - Nutrient Accumulation Rate

	Depth (cm)	MSR mg/cm2	CHEP-AR µg/cm2	TPAR µg/cm2	OMAR mg/cm2	TNAR mg/cm2	TCAR mg/cm2	D SiAR mg/cm2	S SiAR mg/cm2	NVSAR mg/cm2	Date
LH7-99	4	60.9	18.15	79.56	43.68	2.33	20.12	6.80	0.05	17.24	1998.8
LH7-99	8	47.1	13.56	64.26	33.57	1.85	15.89	5.36	0.37	13.51	1997.1
LH7-99	12	43.8	15.84	66.48	31.12	1.72	14.87	4.93	0.87	12.65	1995.2
LH7-99	16	39.1	18.45	61.91	27.48	1.49	13.06	4.42	0.17	11.61	1992.9
LH7-99	20	32.0	12.72	45.71	22.39	1.21	10.75	3.68	0.37	9.64	1989.5
LH7-99	24	28.6	11.81	41.55	19.90	1.08	9.53	3.30	0.25	8.69	1985.5
LH7-99	28	26.4	10.10	37.31	18.03	1.00	8.80	3.13	0.00	8.33	1981.1
LH7-99	32	23.1	9.16	31.30	15.49	0.88	7.80	2.55	0.31	7.63	1976.0
LH7-99	36	19.1	6.21	25.08	12.16	0.71	6.29	1.92	0.24	6.96	1969.3
LH7-99	40	17.7	5.68	21.14	11.47	0.63	5.63	1.82	0.12	6.23	1962.0
LH7-99	44	13.8	3.66	16.87	8.83	0.45	4.08	1.70	0.10	4.97	1952.3
LH7-99	48	9.7	2.09	8.56	5.88	0.32	2.99	1.23	0.10	3.79	1937.8
LH7-99	52	5.1	1.39	5.58	3.25	0.18	1.64	0.61	0.03	1.85	1908.6
LH7-99	56	3.3	0.47	1.92	1.75	0.09	0.84	0.35	0.06	1.52	1853.2
LH7-99	60	9.9	0.52	3.71	6.21	0.30	2.93	1.11	0.19	3.69	1836.8
LH8-99	4	28.6	7.62	36.52	20.85	1.08	9.81	2.27	0.46	7.79	1997.6
LH8-99	8	26.2	10.05	36.62	18.79	0.98	8.97	1.87	0.72	7.45	1994.2
LH8-99	12	20.4	7.09	25.11	14.37	0.74	6.79	1.58	0.46	6.07	1989.3
LH8-99	16	17.1	4.13	16.79	11.55	0.62	5.85	1.40	0.40	5.51	1982.2
LH8-99	20	15.2	2.81	12.88	10.08	0.54	5.20	1.40	0.27	5.13	1974.0
LH8-99	24	15.9	1.76	10.88	10.38	0.53	5.19	1.56	0.22	5.47	1965.9
LH8-99	28	15.7	1.26	9.15	10.27	0.50	5.07	1.51	0.44	5.46	1957.4
LH8-99	32	17.2	1.12	8.11	11.52	0.56	5.75	1.59	0.55	5.65	1949.6
LH8-99	36	15.2	0.79	6.01	10.43	0.52	5.17	1.48	0.39	4.75	1940.6
LH8-99	40	15.9	0.80	5.48	10.95	0.49	4.95	1.41	0.50	4.97	1930.8
LH8-99	44	20.5	0.90	6.32	13.79	0.69	7.04	1.79	0.79	6.73	1922.8
LH8-99	48	16.9	0.69	4.70	11.31	0.55	5.60	1.68	0.62	5.60	1913.2
LH8-99	52	17.2	0.95	5.01	11.59	0.58	5.83	1.64	0.61	5.63	1903.9
LH8-99	56	20.5	1.09	6.73	13.74	0.68	6.94	2.09	0.60	6.80	1896.1
LH8-99	60	21.1	0.80	6.97	14.03	0.71	7.18	1.86	0.75	7.10	1888.4
LH8-99	64	26.5	0.87	8.44	17.97	0.89	9.08	2.28	1.03	8.50	1882.2
LH8-99	68	10.9	0.32	3.39	7.40	0.36	3.73	0.72	0.52	3.48	1867.2
LH8-99	72	7.1	0.21	2.07	4.61	0.24	2.49	0.49	0.28	2.52	1842.5
LH8-99	76	11.1	0.26	2.54	6.50	0.38	3.92	0.67	0.32	4.61	1825.1

Ap E - Nutrient Accumulation Rate

	Depth (cm)	MSR mg/cm2	CHEP-AR µg/cm2	TPAR µg/cm2	OMAR mg/cm2	TNAR mg/cm2	TCAR mg/cm2	D SiAR mg/cm2	S SiAR mg/cm2	NVSAR mg/cm2	Date
LH9R-99	4	41.7	11.73	53.71	30.59	0.00	0.00	3.13	0.53	11.14	1998.4
LH9R-99	8	42.4	17.14	61.09	30.89	1.65	14.44	3.14	0.67	11.54	1996.5
LH9R-99	12	35.9	17.37	51.81	25.98	1.38	12.43	2.84	0.41	9.90	1993.9
LH9R-99	16	35.5	17.64	51.32	25.80	1.33	12.07	2.90	0.43	9.69	1991.0
LH9R-99	20	28.4	12.07	37.79	20.43	1.09	9.91	2.16	0.49	7.98	1987.0
LH9R-99	24	24.9	7.97	29.27	17.54	0.93	8.62	2.05	0.42	7.37	1982.1
LH9R-99	28	23.2	5.81	24.60	16.03	0.79	7.43	1.97	0.25	7.13	1976.2
LH9R-99	32	21.2	3.70	19.38	14.68	0.74	7.06	1.91	0.25	6.57	1969.5
LH9R-99	36	23.6	1.86	15.35	15.92	0.77	7.68	2.12	0.40	7.66	1963.0
LH9R-99	40	31.5	1.07	17.31	19.73	1.01	10.27	3.26	0.50	11.74	1957.4
LH9R-99	44	26.5	0.82	12.68	17.68	0.85	8.76	2.90	0.55	8.79	1951.1
LH9R-99	48	24.7	0.54	12.21	16.79	0.81	8.25	2.69	0.57	7.87	1944.5
LH9R-99	52	17.3	0.52	7.28	11.98	0.57	5.83	1.84	0.32	5.28	1935.5
LH9R-99	56	16.9	0.36	6.63	11.79	0.56	5.72	2.00	0.20	5.13	1926.5
LH9R-99	60	9.8	0.18	3.80	6.80	0.33	3.30	1.18	0.12	3.04	1910.9
LH9R-99	64	10.6	0.14	3.86	7.36	0.35	3.55	1.29	0.16	3.28	1896.5
LH9R-99	68	8.5	0.08	2.84	5.84	0.27	2.71	0.98	0.18	2.62	1878.1
LH9R-99	72	8.7	0.06	2.62	5.97	0.28	2.87	0.93	0.22	2.71	1860.1
LH9R-99	76	7.3	0.00	2.00	4.86	0.24	2.43	0.66	0.19	2.39	1837.1
LH9R-99	80	5.3	0.01	1.35	3.71	0.18	1.88	0.37	0.18	1.61	1807.1
LB2-99	4	78.9	63.93	192.12	61.73	3.268	29.05	3.63	1.29	17.20	1998.7
LB2-99	8	61.5	52.51	150.95	47.54	2.521	22.74	3.03	1.04	13.95	1997.8
LB2-99	12	54.8	41.52	119.58	41.75	2.175	20.16	2.92	0.88	13.02	1996.6
LB2-99	16	64.1	37.93	131.99	47.90	2.435	23.27	3.87	0.91	16.17	1995.4
LB2-99	20	49.9	22.36	95.06	37.20	1.851	17.76	2.79	0.98	12.70	1993.5
LB2-99	24	52.0	16.99	87.81	35.19	1.902	18.29	3.21	0.93	16.77	1991.5
LB2-99	28	50.3	11.98	79.50	32.99	1.635	16.14	3.76	0.59	17.32	1989.1
LB2-99	32	51.6	9.55	76.78	34.08	1.713	16.85	3.55	1.00	17.51	1986.6
LB2-99	36	50.1	7.52	73.05	30.37	1.620	15.90	3.77	0.86	19.77	1984.0
LB2-99	40	50.5	4.64	64.14	28.87	1.484	15.20	5.61	0.10	21.59	1981.0
LB2-99	44	43.2	3.89	52.60	23.38	1.318	13.27	4.53	0.36	19.84	1977.4
LB2-99	48	39.4	2.84	47.11	22.97	1.179	12.16	4.09	0.34	16.46	1973.3
LB2-99	52	43.3	2.34	57.33	22.15	1.278	13.59	4.35	0.43	21.18	1969.1
LB2-99	56	48.4	3.10	51.85	23.22	1.035	10.93	4.82	0.45	25.15	1965.1
LB2-99	60	42.4	1.66	45.20	19.95	1.087	11.44	4.19	0.62	22.49	1960.4
LB2-99	64	41.4	2.23	45.80	21.34	1.047	11.19	4.89	0.48	20.03	1955.6
LB2-99	68	32.0	1.67	35.06	16.57	0.823	8.78	4.15	0.10	15.45	1949.0
LB2-99	72	38.3	2.15	33.02	17.92	0.848	8.87	7.49	0.16	20.43	1942.8
LB2-99	76	31.2	1.97	24.01	15.26	0.728	7.73	4.56	0.48	15.96	1935.5
LB2-99	80	24.5	1.20	17.92	13.75	0.635	6.71	3.22	0.30	10.76	1926.3
LB2-99	84	23.0	0.81	14.99	13.13	0.633	6.67	2.58	0.33	9.89	1916.6
LB2-99	88	10.0	0.39	4.99	6.26	0.335	3.58	0.54	0.26	3.73	1894.6
LB2-99	92	10.9	0.34	4.43	7.62	0.345	3.79	0.59	0.23	3.33	1876.4
LB2-99	96	8.7	0.33	3.04	6.40	0.295	3.24	0.50	0.20	2.30	1855.4
LB2-99	100	8.4	0.26	3.62	6.14	0.280	3.05	0.27	0.20	2.24	1834.4
LB2-99	104	1.9	0.06	0.54	1.49	0.071	0.79	0.05	0.05	0.45	1746.3

Ap E - Decadal Nutrient Accumulation Rates

Core	Age (yr)	Decadal MSR mg/cm2	Decadal CHEP-AR µg/cm2	Decadal NaOHP-AR µg/cm2	Decadal TPAR µg/cm2	Decadal OMAR mg/cm2	Decadal TNAR mg/cm2	Decadal TCAR mg/cm2	Decadal D SiAR mg/cm2	Decadal S SiAR mg/cm2	Decadal NVSAR mg/cm2
LW1R-99	10	16.17	4.15	5.69	19.15	10.85	0.53	5.21	0.96	0.23	5.32
LW1R-99	20	12.98	2.18	2.95	12.74	8.27	0.39	4.01	0.78	0.21	4.71
LW1R-99	30	11.94	1.04	1.89	8.97	7.35	0.34	3.56	0.69	0.22	4.59
LW1R-99	40	12.02	0.64	1.57	7.53	7.26	0.33	3.52	0.70	0.21	4.77
LW1R-99	50	12.06	0.41	1.42	6.47	7.17	0.32	3.50	0.75	0.20	4.88
LW1R-99	60	11.90	0.25	1.34	5.56	7.01	0.32	3.47	0.82	0.18	4.89
LW1R-99	70	13.31	0.22	1.32	5.26	7.78	0.35	3.91	1.02	0.06	5.53
LW1R-99	80	15.68	0.13	1.51	5.37	9.38	0.41	4.66	1.16	0.15	6.30
LW1R-99	90	17.17	0.09	1.47	5.32	10.42	0.45	5.21	1.27	0.23	6.75
LW1R-99	100	18.00	0.07	1.44	5.29	10.90	0.48	5.51	1.44	0.22	7.10
LW1R-99	110	16.65	0.00	1.37	4.68	10.00	0.44	5.08	1.36	0.23	6.65
LW1R-99	120	11.00	0.00	0.77	3.09	6.56	0.29	3.39	0.75	0.30	4.45
LW1R-99	130	10.63	0.00	0.72	2.89	6.36	0.28	3.29	0.72	0.28	4.26
LW1R-99	140	9.97	0.00	0.64	2.54	6.02	0.26	3.10	0.68	0.22	3.95
LW1R-99	150	8.32	0.00	0.53	2.12	5.03	0.22	2.59	0.57	0.19	3.30
LW2R-99	10	15.30	2.74	3.87	15.30	9.93	0.48	4.76	1.01	0.14	5.36
LW2R-99	20	12.40	1.71	2.42	10.50	7.87	0.37	3.80	0.79	0.14	4.53
LW2R-99	30	10.98	0.96	1.47	7.28	6.76	0.32	3.28	0.70	0.10	4.22
LW2R-99	40	10.57	0.59	0.92	5.73	6.34	0.29	3.09	0.70	0.09	4.23
LW2R-99	50	11.82	0.34	0.65	5.38	6.82	0.31	3.41	0.79	0.10	5.00
LW2R-99	60	12.59	0.58	0.52	5.06	7.29	0.33	3.65	0.87	0.11	5.29
LW2R-99	70	13.53	0.71	0.45	4.89	7.86	0.35	3.96	0.96	0.12	5.66
LW2R-99	80	19.44	0.14	0.72	5.62	11.37	0.51	5.85	1.37	0.14	8.07
LW2R-99	90	13.15	0.17	0.46	3.56	7.86	0.33	3.89	0.89	0.10	5.29
LW2R-99	100	6.32	0.06	0.19	1.42	3.76	0.16	1.96	0.40	0.06	2.57
LW2R-99	110	22.67	0.23	0.64	4.86	13.44	0.57	6.96	1.39	0.25	9.23
LW2R-99	120	46.51	0.48	0.95	9.09	27.19	1.11	13.98	2.53	0.65	19.32
LW2R-99	130	11.29	0.14	0.01	2.21	6.53	0.27	3.45	0.58	0.17	4.76
LW2R-99	140	10.77	0.13	0.02	2.11	6.22	0.25	3.29	0.55	0.16	4.55
LW2R-99	150	4.26	0.07	0.20	0.79	2.34	0.10	1.27	0.20	0.04	1.92
LW3R-99	10	34.18	6.55	8.07	26.04	21.59	0.97	10.57	0.69	0.70	12.58
LW3R-99	20	33.06	2.98	5.35	22.52	19.46	0.82	9.57	0.60	0.57	13.60
LW3R-99	30	30.86	1.13	3.88	16.83	17.51	0.72	8.83	0.42	0.52	13.35
LW3R-99	40	23.56	0.82	3.18	13.23	13.42	0.53	6.75	0.27	0.54	10.14
LW3R-99	50	20.17	0.69	3.93	10.41	11.23	0.48	5.93	0.39	0.19	8.93
LW3R-99	60	19.74	0.43	3.19	8.82	10.53	0.45	5.70	0.30	0.18	9.21
LW3R-99	70	17.21	0.25	2.38	6.73	8.64	0.38	4.78	0.21	0.16	8.57
LW3R-99	80	10.46	0.12	1.11	3.00	4.17	0.19	2.41	0.08	0.11	6.29
LW3R-99	90	10.46	0.12	1.11	3.00	4.17	0.19	2.41	0.08	0.11	6.29
LW3R-99	100	10.46	0.12	1.11	3.00	4.17	0.19	2.41	0.08	0.11	6.29
LW3R-99	110	46.75	0.02	2.13	6.22	19.12	1.06	12.97	0.10	0.20	27.64
LW3R-99	120	24.92	0.01	1.34	3.53	15.73	0.65	7.64	0.05	0.10	9.18
LW3R-99	130	10.78	0.09	0.86	1.81	6.60	0.28	3.30	0.00	0.09	4.18
LW3R-99	140	9.83	0.07	0.77	1.62	6.04	0.25	3.00	0.00	0.08	3.79
LW3R-99	150	5.63	0.00	0.34	0.79	3.58	0.14	1.68	0.00	0.04	2.04

Ap E - Decadal Nutrient Accumulation Rates

Core	Age (yr)	Decadal MSR mg/cm2	Decadal CHEP-AR µg/cm2	Decadal NaOHP-AR µg/cm2	Decadal TPAR µg/cm2	Decadal OMAR mg/cm2	Decadal TNAR mg/cm2	Decadal TCAR mg/cm2	Decadal D SiAR mg/cm2	Decadal S SiAR mg/cm2	Decadal NVSAR mg/cm2
LY1-99	10	20.20	4.84	6.37	23.02	14.18	0.73	6.95	1.45	0.24	6.02
LY1-99	20	15.25	2.67	4.30	15.62	10.59	0.55	5.17	0.98	0.21	4.66
LY1-99	30	12.44	2.91	2.68	10.59	8.30	0.42	4.12	0.82	0.11	4.14
LY1-99	40	7.89	0.81	1.01	4.42	5.34	0.26	2.63	0.50	0.11	2.56
LY1-99	50	7.64	0.67	0.85	3.75	5.07	0.24	2.42	0.48	0.10	2.57
LY1-99	60	7.24	0.44	0.60	2.71	4.66	0.21	2.09	0.45	0.09	2.58
LY1-99	70	7.02	0.42	0.56	2.59	4.53	0.20	2.06	0.43	0.09	2.48
LY1-99	80	5.39	0.29	0.30	1.72	3.59	0.18	1.84	0.31	0.09	1.80
LY1-99	90	5.39	0.29	0.30	1.72	3.59	0.18	1.84	0.31	0.09	1.80
LY1-99	100	5.39	0.29	0.30	1.72	3.59	0.18	1.84	0.31	0.09	1.80
LY1-99	110	4.09	0.20	0.18	1.08	2.74	0.13	1.37	0.24	0.07	1.35
LY1-99	120	4.09	0.20	0.18	1.08	2.74	0.13	1.37	0.24	0.07	1.35
LY1-99	130	4.09	0.20	0.18	1.08	2.74	0.13	1.37	0.24	0.07	1.35
LY1-99	140	4.09	0.20	0.18	1.08	2.74	0.13	1.37	0.24	0.07	1.35
LY1-99	150	9.37	0.37	0.38	2.14	6.03	0.27	2.93	0.50	0.24	3.34
LY2-99	10	17.48	6.10	7.53	18.71	11.92	0.63	5.84	1.03	0.28	5.56
LY2-99	20	14.00	4.14	4.30	14.67	8.40	0.45	4.23	0.71	0.20	5.60
LY2-99	30	12.19	3.43	3.45	10.71	6.44	0.35	3.26	0.54	0.20	5.76
LY2-99	40	8.56	1.58	2.11	6.33	4.14	0.24	2.38	0.41	0.15	4.41
LY2-99	50	8.00	1.30	1.90	5.66	3.79	0.23	2.24	0.39	0.14	4.21
LY2-99	60	7.79	1.25	1.83	5.47	3.71	0.22	2.18	0.38	0.14	4.07
LY2-99	70	3.73	0.28	0.49	1.70	2.23	0.10	1.05	0.14	0.13	1.50
LY2-99	80	3.73	0.28	0.49	1.70	2.23	0.10	1.05	0.14	0.13	1.50
LY2-99	90	3.73	0.28	0.49	1.70	2.23	0.10	1.05	0.14	0.13	1.50
LY2-99	100	3.73	0.28	0.49	1.70	2.23	0.10	1.05	0.14	0.13	1.50
LY3-99	10	26.43	10.76	12.60	34.94	18.19	0.97	8.71	1.97	0.19	8.24
LY3-99	20	21.80	9.85	15.33	27.27	14.14	0.78	7.16	1.47	0.11	7.66
LY3-99	30	16.16	10.21	6.59	16.45	9.82	0.58	5.40	0.93	0.11	6.33
LY3-99	40	14.48	2.98	4.40	11.98	7.80	0.39	3.78	0.90	0.03	6.69
LY3-99	50	13.37	1.51	2.90	8.16	6.81	0.36	3.53	0.82	0.08	6.56
LY3-99	60	12.62	0.67	1.88	5.55	6.16	0.34	3.40	0.77	0.11	6.46
LY3-99	70	12.00	0.51	1.23	3.91	5.65	0.33	3.31	0.73	0.11	6.34
LY3-99	80	11.85	0.47	1.08	3.53	5.54	0.33	3.29	0.72	0.11	6.32
LY3-99	90	33.80	0.46	2.25	6.59	17.13	0.97	9.90	1.73	0.77	16.67
LY3-99	100	34.77	0.51	1.79	6.98	17.90	0.96	9.88	1.96	0.79	16.87
LY3-99	110	17.36	0.52	0.90	3.28	9.12	0.51	5.22	1.07	0.21	8.25
LY3-99	120	55.00	1.27	2.17	8.67	29.25	1.53	15.66	2.20	1.24	25.75
LY3-99	130	25.02	0.51	0.96	3.55	11.54	0.75	7.56	0.93	0.41	13.48
LY3-99	140	20.74	0.27	0.49	2.48	8.82	0.58	5.82	0.96	0.43	11.92
LY3-99	150	10.32	0.07	0.09	0.68	3.74	0.28	2.70	0.46	0.25	6.58

Core	Age (yr)	Decadal MSR mg/cm2	Decadal CHEP-AR µg/cm2	Decadal NaOHP-AR µg/cm2	Decadal TPAR µg/cm2	Decadal OMAR mg/cm2	Decadal TNAR mg/cm2	Decadal TCAR mg/cm2	Decadal D SiAR mg/cm2	Decadal S SiAR mg/cm2	Decadal NVSAR mg/cm2
LH4-99	10	17.20	3.26	9.91	23.12	11.85	0.47	4.24	1.47	0.30	5.35
LH4-99	20	12.34	1.57	6.51	19.04	8.18	0.48	4.47	1.09	0.23	4.16
LH4-99	30	10.88	0.70	4.17	19.98	6.89	0.41	3.87	0.96	0.22	3.99
LH4-99	40	10.76	0.36	2.45	10.04	6.50	0.36	3.61	1.02	0.23	4.26
LH4-99	50	13.16	0.22	2.01	7.93	7.79	0.42	4.37	1.23	0.34	5.37
LH4-99	60	13.59	0.50	1.60	6.99	8.10	0.43	4.57	1.24	0.43	5.49
LH4-99	70	12.65	0.64	1.24	6.07	7.59	0.40	4.29	1.13	0.47	5.06
LH4-99	80	8.67	0.23	0.75	3.81	5.20	0.27	2.89	0.69	0.39	3.47
LH4-99	90	8.67	0.23	0.75	3.81	5.20	0.27	2.89	0.69	0.39	3.47
LH4-99	100	12.72	1.04	1.21	4.89	7.69	0.37	3.82	0.99	0.65	5.03
LH4-99	110	7.65	0.62	0.73	2.88	4.64	0.22	2.29	0.56	0.41	3.01
LH4-99	120	3.23	0.21	0.30	1.18	1.98	0.09	0.97	0.20	0.19	1.25
LH4-99	130	3.23	0.21	0.30	1.18	1.98	0.09	0.97	0.20	0.19	1.25
LH4-99	140	3.23	0.21	0.30	1.18	1.98	0.09	0.97	0.20	0.19	1.25
LH4-99	150	3.23	0.21	0.30	1.18	1.98	0.09	0.97	0.20	0.19	1.25
LH5-99	10	17.54	6.91	6.95	19.55	11.02	0.59	5.22	1.31	0.48	6.52
LH5-99	20	17.51	3.18	5.13	14.47	9.75	0.53	4.98	1.48	0.51	7.76
LH5-99	30	19.67	1.16	2.74	10.80	11.22	0.55	5.44	1.76	0.81	8.45
LH5-99	40	28.35	1.67	2.90	12.70	16.74	0.79	8.05	2.45	1.15	11.61
LH5-99	50	17.44	0.95	1.79	7.61	10.26	0.47	4.81	1.43	0.96	7.19
LH5-99	60	22.04	0.50	1.89	8.71	13.01	0.64	6.49	2.16	1.03	9.03
LH5-99	70	26.32	0.37	2.13	10.05	15.77	0.77	7.73	2.96	0.95	10.54
LH5-99	80	27.75	1.66	2.38	10.11	16.57	0.81	8.29	2.87	1.52	11.18
LH5-99	90	18.19	0.69	1.66	6.67	10.93	0.57	5.81	1.75	0.97	7.26
LH5-99	100	15.35	1.16	1.21	5.48	9.27	0.45	4.58	1.72	0.74	6.08
LH5-99	110	13.48	2.83	0.96	4.60	8.16	0.40	3.98	1.43	0.62	5.33
LH5-99	120	8.64	1.39	0.61	2.93	5.25	0.26	2.59	0.92	0.42	3.39
LH5-99	130	6.10	0.63	0.43	2.05	3.73	0.19	1.85	0.65	0.32	2.37
LH5-99	140	6.10	0.63	0.43	2.05	3.73	0.19	1.85	0.65	0.32	2.37
LH5-99	150	15.17	2.40	1.09	5.15	9.30	0.46	4.55	1.60	0.82	5.87
LH6R-99	10	26.91	8.62	15.15	33.96	12.31	0.94	8.34	2.41	0.47	14.60
LH6R-99	20	19.87	4.37	9.97	21.75	13.10	0.67	6.05	1.76	0.41	6.77
LH6R-99	30	16.83	2.07	5.91	13.70	10.48	0.51	4.83	1.69	0.38	6.35
LH6R-99	40	13.99	1.50	4.03	12.05	8.21	0.39	3.81	1.51	0.16	5.77
LH6R-99	50	17.01	0.84	3.26	9.39	9.87	0.48	4.76	1.89	0.25	7.14
LH6R-99	60	18.66	0.66	2.74	8.84	11.20	0.52	5.29	1.89	0.47	7.46
LH6R-99	70	18.60	0.57	2.70	8.53	10.96	0.52	5.28	1.93	0.38	7.64
LH6R-99	80	11.62	0.39	1.79	5.45	6.96	0.32	3.27	1.15	0.29	4.66
LH6R-99	90	11.55	0.33	1.78	5.11	6.91	0.33	3.34	1.14	0.29	4.64
LH6R-99	100	11.49	0.28	1.78	4.79	6.86	0.33	3.40	1.13	0.30	4.63
LH6R-99	110	12.35	0.19	1.61	4.63	7.59	0.33	3.41	1.10	0.53	4.76
LH6R-99	120	12.60	0.16	1.58	4.48	7.79	0.33	3.42	1.10	0.59	4.81
LH6R-99	130	12.27	0.11	1.88	3.39	7.35	0.35	3.51	1.20	0.49	4.92
LH6R-99	140	12.33	0.18	1.90	3.88	7.34	0.35	3.52	1.21	0.57	4.99
LH6R-99	150	12.35	0.23	1.91	4.31	7.31	0.35	3.53	1.22	0.65	5.04

Ap E - Decadal Nutrient Accumulation Rates

Core	Age (yr)	Decadal MSR mg/cm2	Decadal CHEP-AR µg/cm2	Decadal NaOHP-AR µg/cm2	Decadal TPAR µg/cm2	Decadal OMAR mg/cm2	Decadal TNAR mg/cm2	Decadal TCAR mg/cm2	Decadal D SiAR mg/cm2	Decadal S SiAR mg/cm2	Decadal NVSAR mg/cm2
LH7-99	10	40.14	15.10	24.11	58.53	28.37	1.55	13.49	4.56	0.40	11.77
LH7-99	20	26.66	10.60	16.56	37.90	18.31	1.01	8.91	3.10	0.15	8.35
LH7-99	30	20.46	7.20	11.16	27.17	13.28	0.77	6.80	2.13	0.26	7.18
LH7-99	40	16.71	5.16	7.72	20.07	10.80	0.58	5.23	1.79	0.11	5.91
LH7-99	50	12.61	3.21	5.68	14.47	7.98	0.41	3.76	1.56	0.10	4.63
LH7-99	60	9.67	2.09	3.88	8.56	5.88	0.32	2.99	1.23	0.10	3.79
LH7-99	70	5.83	1.50	2.57	6.06	3.67	0.20	1.86	0.71	0.04	2.16
LH7-99	80	5.10	1.39	2.33	5.58	3.25	0.18	1.64	0.61	0.03	1.85
LH7-99	90	5.10	1.39	2.33	5.58	3.25	0.18	1.64	0.61	0.03	1.85
LH7-99	100	3.42	0.54	1.04	2.22	1.87	0.10	0.90	0.37	0.06	1.55
LH7-99	110	3.27	0.47	0.93	1.92	1.75	0.09	0.84	0.35	0.06	1.52
LH7-99	120	3.27	0.47	0.93	1.92	1.75	0.09	0.84	0.35	0.06	1.52
LH7-99	130	3.27	0.47	0.93	1.92	1.75	0.09	0.84	0.35	0.06	1.52
LH7-99	140	3.27	0.47	0.93	1.92	1.75	0.09	0.84	0.35	0.06	1.52
LH7-99	150	5.80	0.49	1.10	2.60	3.45	0.17	1.64	0.64	0.11	2.35
LH8-99	10	24.18	8.21	13.50	31.46	17.27	0.90	8.18	1.83	0.55	6.91
LH8-99	20	16.75	3.93	6.94	16.18	11.31	0.60	5.73	1.41	0.37	5.44
LH8-99	30	15.48	2.36	4.73	12.03	10.21	0.54	5.20	1.47	0.25	5.27
LH8-99	40	15.78	1.45	3.33	9.82	10.31	0.51	5.12	1.53	0.35	5.46
LH8-99	50	16.83	1.15	2.64	8.36	11.23	0.55	5.59	1.57	0.52	5.60
LH8-99	60	15.28	0.80	1.73	6.00	10.49	0.51	5.16	1.47	0.40	4.78
LH8-99	70	16.38	0.81	1.72	5.56	11.24	0.51	5.16	1.45	0.53	5.14
LH8-99	80	19.43	0.84	1.76	5.83	13.04	0.65	6.60	1.76	0.74	6.39
LH8-99	90	17.02	0.78	1.50	4.81	11.41	0.56	5.68	1.66	0.62	5.61
LH8-99	100	18.60	1.01	1.63	5.73	12.48	0.62	6.29	1.83	0.60	6.12
LH8-99	110	20.91	0.91	1.88	6.89	13.92	0.70	7.09	1.94	0.69	6.99
LH8-99	120	21.89	0.73	1.72	6.99	14.82	0.73	7.50	1.84	0.87	7.06
LH8-99	130	10.89	0.32	0.78	3.39	7.40	0.36	3.73	0.72	0.52	3.48
LH8-99	140	8.09	0.24	0.55	2.41	5.33	0.27	2.81	0.55	0.34	2.76
LH8-99	150	7.13	0.21	0.47	2.07	4.61	0.24	2.49	0.49	0.28	2.52
LH9R-99	10	37.04	16.00	22.46	52.18	26.92	1.19	10.67	2.88	0.49	10.12
LH9R-99	20	25.52	8.66	14.32	30.65	18.02	0.95	8.72	2.06	0.40	7.49
LH9R-99	30	21.94	4.46	9.06	21.27	15.17	0.76	7.19	1.93	0.25	6.77
LH9R-99	40	25.93	1.68	5.58	16.10	17.05	0.85	8.46	2.46	0.42	8.88
LH9R-99	50	27.51	0.85	3.75	13.78	18.09	0.89	9.08	2.97	0.54	9.42
LH9R-99	60	21.24	0.53	2.59	9.93	14.57	0.70	7.13	2.30	0.46	6.67
LH9R-99	70	17.07	0.43	1.81	6.92	11.88	0.57	5.77	1.93	0.25	5.19
LH9R-99	80	12.25	0.24	1.28	4.76	8.50	0.41	4.12	1.46	0.15	3.75
LH9R-99	90	9.93	0.17	1.05	3.81	6.86	0.33	3.32	1.19	0.12	3.07
LH9R-99	100	10.63	0.14	0.96	3.86	7.36	0.35	3.55	1.29	0.16	3.28
LH9R-99	110	9.19	0.10	0.80	3.18	6.35	0.30	2.99	1.09	0.17	2.84
LH9R-99	120	8.46	0.08	0.72	2.84	5.84	0.27	2.71	0.98	0.18	2.62
LH9R-99	130	8.64	0.06	0.67	2.66	5.95	0.28	2.84	0.94	0.21	2.69
LH9R-99	140	8.64	0.06	0.66	2.60	5.94	0.28	2.86	0.93	0.22	2.70
LH9R-99	150	7.25	0.00	0.64	2.00	4.86	0.24	2.43	0.66	0.19	2.39

Ap E - Decadal Nutrient Accumulation Rates

Core	Age (yr)	Decadal MSR mg/cm2	Decadal CHEP-AR µg/cm2	Decadal NaOHP-AR µg/cm2	Decadal TPAR µg/cm2	Decadal OMAR mg/cm2	Decadal TNAR mg/cm2	Decadal TCAR mg/cm2	Decadal D SiAR mg/cm2	Decadal S SiAR mg/cm2	Decadal NVSAR mg/cm2
LB2-99	10	55.47	28.38	60.08	108.41	40.09	2.07	19.58	3.31	0.89	15.37
LB2-99	20	49.40	6.61	28.26	67.88	29.68	1.55	15.47	4.40	0.58	19.72
LB2-99	30	41.71	2.83	19.39	52.25	22.72	1.24	12.94	4.28	0.38	18.99
LB2-99	40	44.71	2.31	17.96	48.16	21.45	1.07	11.25	4.53	0.53	23.25
LB2-99	50	35.48	1.88	14.12	39.04	18.34	0.91	9.67	4.42	0.24	17.15
LB2-99	60	35.69	2.07	12.65	29.95	16.96	0.81	8.47	6.37	0.27	18.73
LB2-99	70	27.04	1.49	8.78	20.21	14.32	0.67	7.10	3.72	0.37	12.72
LB2-99	80	23.47	0.92	6.74	15.86	13.32	0.63	6.68	2.77	0.32	10.15
LB2-99	90	13.47	0.50	3.69	7.66	8.10	0.41	4.40	1.09	0.28	5.38
LB2-99	100	9.99	0.39	2.71	4.99	6.26	0.33	3.58	0.54	0.26	3.73
LB2-99	110	10.50	0.36	2.78	4.69	6.98	0.34	3.69	0.57	0.24	3.52
LB2-99	120	10.95	0.34	2.84	4.43	7.62	0.34	3.79	0.59	0.23	3.33
LB2-99	130	9.36	0.33	2.31	3.45	6.76	0.31	3.40	0.52	0.21	2.60
LB2-99	140	8.70	0.33	2.10	3.04	6.40	0.29	3.24	0.50	0.20	2.30
LB2-99	150	8.50	0.29	2.02	3.39	6.24	0.29	3.13	0.36	0.20	2.26

APPENDIX F

Data from Microfossil Diatom Analysis
Harris Chain of Lakes Cores

Data are percent relative abundance for species with >3% abundance in at least one core sample from a specified lake.

Ap F Diatom Microfossil Counts

Key to Diatom Taxa in Appendix F.

Acronym	Taxonomic name
ACHMIN	*Achnanthes minutissima* Kutz.
AMPOV	*Amphora ovalis* Kutz.
ANOMVIT	*Anomoeoneis vitrea* (Gr.) Ross
AULAALP	*Aulacoseira alpegina* (Gr.) Kram.
AULAAM	*Aulacoseira ambigua* (Gr.) Sim.
AULADIS	*Aulacoseira distans* (Ehr.) Sim.
AULAGR	*Aulacoseira granulata* (Ehr.) Sim.
AULAGRAN	*Aulacoseira granulata* v. *angustissima* Sim.
AULAITAL	*Aulacoseira italica* (Ehr.) Sim.
AULAM	*Aulacoseira ambigua* (Gr.) Sim.
CYCMEN	*Cyclotella meneghiniana* (Kutz.)
CYCSTEL	*Cyclotella stelligera* (Cl. & Gr.) V.H.
CYMLUN	*Cymbella lunata* W.Sm.
FRAGBER	*Fragilaria berolinensis* (Lemm.) Lange B.
GOMADIC	*Gomphonema dichotomum* Kutz.
NAVGOT	*Navicula gottlandica* Gr.
NAVLAN	*Navicula lanceolata* (Ag.) Ehr.
NAVOBL	*Navicula oblonga* (Kutz.) Kutz.
NAVPURE	*Navicula pupula* var. *rectangularis* (Greg.) Gr.
NAVRA	*Navicula radiosa* Kutz.
NAVRAPA	*Navicula radiosa* var. *parva* Wallace
NAVSEMIN	*Navicula seminulum* var. *intermedia* Hust.
NITZAM	*Nitzschia amphibia* Gr.
NITZPAL	*Nitzschia palea* (Kutz.) W. Sm.
PINLEG	*Pinnularia legumen* (Ehr.) Ehr.
PINVIR	*Pinnularia viridis* (Nitz.) Ehr.
PSSTBREV	*Pseudostaurosira brevistriata* (Gr.) W&R
STASCON	*Staurosira construens* Ehr.
STASCONP	*Staurosira construens* var. *pumila* (Gr.) W&R
STASCONV	*Staurosira construens* var. *venter* (Gr.) W&R
STAUPHGR	*Stauroneis phoenocenteron* (Nitz.) Ehr.var. *gracilis*
SYNFILEX	*Synedra filiformis* var. *exilis* Cl-Eul.
SYNRUMFA	*Synedra rumpens* var. *familiaris* (Kutz.) Gr.

Diatom Counts: Lake Weir, LW1R-99.

Percentages of species with >3% abundance in at least one core sample.

Depth (cm)	ANOM VIT	AULA ITAL	CYC STEL	CYM LUN	NAV PURE	NAV RAPA	NITZ AM	NITZ PAL	PIN LEG	PIN VIR	STAU PHGR	SYN FILEX
0-4	2.71	2.71	30.43	2.91	1.55	0.00	5.81	5.81	0.00	0.00	0.00	37.21
8-12	4.51	6.27	38.82	0.39	1.37	1.76	4.90	1.96	0.00	0.00	0.39	30.20
12-16	0.00	1.93	57.14	3.09	0.97	0.19	2.70	1.74	0.00	0.00	0.19	25.48
16-20	0.20	3.91	69.92	1.76	0.59	0.59	0.20	0.59	0.00	0.00	0.20	17.19
24-28	0.00	3.35	79.52	2.05	1.30	0.00	0.56	0.56	0.93	0.00	0.37	7.45
32-36	0.20	7.65	71.63	5.84	1.41	0.80	0.40	0.40	0.40	0.00	0.60	2.62
52-56	0.37	13.06	64.74	5.97	2.43	0.75	0.00	0.37	1.31	0.00	0.93	1.12
64-68	0.20	14.71	63.42	3.58	2.19	0.60	0.00	0.20	2.58	0.20	0.60	0.60
76-80	0.00	17.21	57.36	2.49	1.34	0.57	3.44	0.00	0.76	0.57	0.38	0.00
92-96	0.00	11.94	60.27	2.74	1.57	0.20	5.68	0.39	0.98	0.20	0.00	1.96

Diatom Counts: Lake Weir, LW2R-99.

Percentages of species with >3% abundance in at least one core sample.

Depth (cm)	ANOM VIT	AULA ITAL	CYC STEL	CYM LUN	NAV PURE	NAV RAPA	NITZ AM	NITZ PAL	PIN LEG	PIN VIR	STAU PHGR	SYN FILEX
0-4	2.36	1.18	37.13	1.18	1.96	1.57	5.89	3.34	0.59	0.00	0.20	29.27
8-12	0.96	1.54	53.55	2.11	1.54	0.96	6.33	2.11	0.19	0.19	0.58	21.88
16-20	1.17	5.06	68.09	2.14	2.14	0.39	2.14	0.39	0.58	0.39	1.36	8.37
24-28	0.00	5.24	76.59	4.87	0.94	0.56	0.00	0.00	0.94	0.37	1.12	1.50
36-40	0.00	8.54	73.07	5.25	1.81	0.00	0.33	0.00	1.64	0.16	0.16	0.16
40-44	0.00	8.50	70.16	3.75	1.78	0.79	0.40	0.59	0.59	0.00	0.59	5.93
48-52	0.19	17.31	54.04	2.88	2.69	0.00	1.15	0.00	1.92	0.58	1.15	0.77
60-64	0.00	7.47	56.97	1.57	3.93	0.39	1.18	0.00	3.14	3.14	6.68	0.00
76-80	0.00	2.52	53.59	0.58	10.87	2.33	0.39	0.00	1.36	1.36	11.07	0.19
84-88	0.00	0.81	58.59	1.82	13.13	3.03	0.40	0.00	0.00	0.00	9.09	0.00

Diatom Counts: Lake Yale Historic Core LY1-99.

Percentages of species with >3% abundance in at least one core sample.

Depth (cm)	ANOM VIT	AULA AM	AULA ITAL	CYC STEL	GOMA DIC	NAV LAN	NAV OBL	NAV PURE
0-4	0.00	0.00	51.32	1.59	1.06	0.00	1.06	0.53
8-12	0.17	0.00	46.25	3.49	0.00	0.00	1.92	1.22
16-20	17.79	3.16	11.46	15.22	1.38	0.00	0.79	1.38
24-28	5.30	10.02	18.07	15.72	1.96	0.98	0.20	0.79
32-36	0.19	13.42	34.82	5.06	0.58	0.97	0.19	1.95
40-44	0.39	25.34	13.95	8.45	2.36	3.73	3.34	3.54
48-52	0.00	14.96	27.95	9.25	1.38	0.00	6.50	4.92
56-60	3.16	12.62	13.81	16.17	1.58	0.99	3.75	4.54
64-68	0.79	11.20	20.63	12.38	4.32	0.00	2.55	6.09

Diatom Counts Continued: Lake Yale Core LY1-99.

Depth (cm)	NAV RA	NAV RAPA	NITZ AM	NITZ PAL	STAS CON	STAS CONP	STAS CONV	SYN FILEX
0-4	1.76	1.23	1.06	4.76	7.41	0.18	8.29	7.76
8-12	1.05	0.52	2.09	4.36	7.16	0.00	6.11	7.50
16-20	5.34	1.98	3.75	0.40	1.98	0.00	1.38	19.57
24-28	4.72	4.72	4.52	0.98	1.57	0.00	4.91	14.34
32-36	7.98	9.34	0.78	0.00	2.53	0.39	5.06	1.75
40-44	1.77	7.47	0.98	0.20	3.34	3.73	4.52	2.16
48-52	4.13	4.72	2.56	0.00	0.79	1.57	2.17	0.20
56-60	1.97	9.86	1.18	0.39	4.14	0.20	1.97	5.72
64-68	6.09	4.32	3.34	1.18	2.95	0.20	0.79	2.36

Diatom Counts: Lake Yale Core LY3-99.

Percentages of species with >3% abundance in at least one core sample.

Depth (cm)	ANOM VIT	AULA AM	AULA ITAL	CYC STEL	GOMA DIC	NAV LAN	NAV OBL	NAV PURE
0-4	0.00	12.06	33.85	2.14	0.39	0.00	1.17	0.97
8-12	0.96	3.44	19.89	3.44	1.34	0.00	3.06	0.96
16-20	1.57	2.55	11.39	4.13	2.95	0.00	5.89	1.38
24-28	6.88	7.86	16.70	12.97	2.36	0.00	1.38	3.14
32-36	0.17	16.50	32.66	4.55	2.02	0.00	0.17	2.36
40-44	0.37	14.68	39.27	4.04	1.65	0.00	0.55	2.39
48-52	0.38	12.67	28.02	8.64	0.96	0.00	0.96	2.88
56-60	0.50	13.06	20.33	9.26	16.53	0.00	0.99	2.31
64-68	0.00	18.65	24.60	11.90	1.59	0.00	2.98	1.79

Diatom Counts Continued: Lake Yale Core LY3-99.

Depth (cm)	NAV RA	NAV RAPA	NITZ AM	NITZ PAL	STAS CON	STAS CONP	STAS CONV	SYN FILEX
0-4	0.00	0.39	0.39	2.72	13.81	4.28	8.95	5.64
8-12	0.76	1.15	1.53	0.57	16.25	7.65	17.78	6.88
16-20	0.20	1.96	0.79	0.98	14.54	3.93	17.88	14.15
24-28	5.11	3.14	3.73	0.98	3.34	2.36	7.07	7.86
32-36	8.42	5.72	1.52	0.00	3.54	0.34	6.73	3.20
40-44	4.95	5.14	0.73	0.18	1.83	1.65	4.22	3.30
48-52	8.64	6.14	0.38	0.58	2.50	2.30	6.14	2.88
56-60	7.27	8.26	1.32	0.00	1.65	0.50	2.64	1.65
64-66	8.13	7.14	1.59	0.20	0.99	0.20	1.19	0.79

Diatom Counts: Lake Harris Historic Core LH5-99

Percentages of species with >3% abundance in at least one core sample.

Depth (cm)	ACH MIN	AULA AM	AULA DIS	AULA ITAL	CYC STEL	NAV GOT	NAV RA	NAV RAPA
0-4	1.62	21.23	3.57	24.31	2.11	0.81	0.81	1.30
8-12	0.27	22.64	0.00	24.12	2.56	0.40	2.29	0.27
16-20	1.46	21.90	0.91	31.93	4.38	0.55	3.83	1.46
28-32	2.58	15.90	0.00	15.90	7.36	5.37	6.36	2.78
40-44	1.89	37.80	0.52	23.54	2.41	1.37	3.61	3.95
52-56	1.36	21.75	0.00	40.19	5.24	1.17	4.47	2.52
64-68	0.00	31.67	0.00	39.73	2.69	0.77	6.53	6.53
76-80	0.00	24.05	0.00	49.24	2.10	1.53	2.67	10.31
88-92	0.19	24.76	0.00	32.25	4.61	1.73	7.10	4.80
100-104	0.38	15.87	0.00	32.89	3.82	3.63	8.60	6.69

Diatom Counts Continued: Lake Harris Core LH5-99.

Depth (cm)	NAV SEMIN	NITZ AM	NITZ PAL	STAS CON	STAS CONP	STAS CONV	SYN FILEX	SYN RUMFA
0-4	0.00	2.11	3.40	4.05	0.16	2.27	22.53	6.16
8-12	0.00	2.56	3.37	1.48	0.00	4.04	25.47	6.74
16-20	0.00	2.19	2.19	7.85	1.09	5.47	11.31	0.36
28-32	0.40	5.37	0.99	9.74	0.00	1.99	12.52	4.37
40-44	0.00	6.87	2.75	8.76	0.00	0.00	3.26	0.52
52-56	0.00	3.11	3.30	7.77	0.19	0.00	2.72	1.75
64-68	0.00	0.19	4.41	1.73	0.38	0.19	0.38	0.19
76-80	0.00	1.72	2.86	1.53	0.38	0.19	0.00	0.00
88-92	0.00	1.15	1.54	3.07	0.38	7.87	0.00	0.77
100-104	0.76	0.38	2.49	5.74	2.29	4.97	1.34	0.19

Diatom Counts: Lake Harris Core LH8-99.

Percentages of species with >3% abundance in at least one core sample.

Depth (cm)	ACH MIN	AULA AM	AULA DIS	AULA ITAL	CYC STEL	NAV GOT	NAV RA	NAV RAPA
0-4	0.37	10.83	0.00	41.65	3.67	0.00	0.37	0.73
8-12	0.78	12.48	0.39	49.12	3.12	0.00	0.19	0.19
20-24	0.19	8.95	0.39	27.43	5.64	0.39	0.97	0.19
32-36	1.36	1.95	0.00	22.18	2.72	0.97	1.75	0.97
40-44	13.65	6.15	0.38	8.46	5.96	0.19	2.88	1.54
48-52	1.13	11.29	0.81	26.29	1.94	0.48	1.29	1.45
56-60	0.95	8.02	0.00	35.11	4.01	0.38	9.35	3.63
64-68	1.59	6.94	0.20	34.13	6.35	0.40	8.93	5.16
72-76	0.79	10.83	0.39	35.63	4.13	1.18	6.10	5.91
80-84	0.19	10.81	0.58	28.76	3.28	1.35	5.79	3.09
88-92	0.00	9.11	0.39	31.01	5.81	1.94	7.75	5.43

Diatom Counts Continued: Lake Harris Core LH8-99.

Depth (cm)	NAV SEMIN	NITZ AM	NITZ PAL	STAS CON	STAS CONP	STAS CONV	SYN FILEX	SYN RUMFA
0-4	1.47	2.57	2.94	2.75	2.94	3.49	17.06	1.47
8-12	1.56	0.58	0.97	4.09	4.29	8.77	8.19	0.00
20-24	3.11	0.97	1.75	6.81	10.70	18.09	9.53	0.00
32-36	4.86	1.75	0.58	16.73	9.34	24.12	3.31	0.39
40-44	7.31	2.31	1.54	12.69	0.19	19.62	8.85	0.96
48-52	3.55	1.94	0.65	16.45	3.87	22.90	1.29	0.00
56-60	1.15	3.44	0.95	8.40	0.76	12.60	2.86	0.00
64-68	1.39	2.18	1.19	6.94	1.39	12.50	1.59	0.40
72-76	2.76	2.95	0.00	7.87	0.59	7.68	0.79	0.20
80-84	0.58	2.51	0.19	10.81	7.34	14.86	0.19	0.00
88-92	0.19	3.68	0.00	12.98	3.10	9.50	0.39	0.39

Diatom Counts: Lake Beauclair Core LB2-99.

Percentages of species with >3% abundance in at least one core sample.

Depth (cm)	AMP OV	AULA ALP	AULA AM	AULA GR	AULA GRAN	AULA ITAL	CYC MEN	FRAG BER
0-4	0.00	0.52	42.68	0.35	0.87	0.52	2.79	5.05
12-16	0.00	0.70	41.02	0.00	0.53	2.46	1.76	6.87
20-24	0.00	1.36	35.99	0.19	1.56	2.14	1.36	7.98
28-32	0.00	0.00	29.55	0.57	4.17	9.66	1.52	9.47
40-44	0.00	0.16	6.49	1.30	3.41	1.95	0.49	16.72
56-60	0.00	0.00	3.12	0.97	2.92	2.92	0.19	14.81
68-72	0.00	0.17	1.85	3.70	15.97	22.35	1.68	12.27
76-80	0.00	2.23	6.69	7.62	12.64	48.51	5.76	0.19
84-88	0.20	4.73	13.41	3.94	12.62	13.81	1.38	0.79
96-100	3.32	0.00	4.88	2.93	6.45	13.67	1.56	4.10

Diatom Counts Continued: Lake Beauclair Core LB2-99.

Depth (cm)	NAV OBL	NAV PURE	NITZ PAL	PSST BREV	STAS CON	STAS CONV
0-4	0.00	0.00	10.28	21.25	0.00	6.97
12-16	0.00	0.00	2.46	20.25	0.00	17.25
20-24	0.00	0.00	6.03	22.37	0.00	11.48
28-32	0.00	0.00	2.46	29.17	0.00	8.71
40-44	0.00	0.00	2.92	55.52	0.16	5.52
56-60	0.00	0.00	1.56	66.67	2.73	0.97
68-72	0.00	0.00	3.19	28.40	0.00	4.37
76-80	0.19	0.00	7.25	0.74	0.00	0.37
84-88	0.59	0.39	11.24	1.18	4.14	13.41
96-100	4.88	7.62	5.08	14.65	0.98	5.86