

**A Summary of Results of the 1997-2003
Kings County Volunteer Water Quality Monitoring Program***

Prepared for

Kings County Water Quality Monitoring Volunteers
and
Kings County Department of Community Development Services

By

M. Brylinsky
Acadia Centre for Estuarine Research
Acadia University
Wolfville, Nova Scotia
B0P 1X0

February 2004

*Supported by:
Municipality of Kings County
Nova Scotia Department of Environment
Acadia Centre for Estuarine Research
Environment Canada
Lake George Property Owners Association
Aylesford Lake Property Owners Association
Kings County Wildlife Association

Publication No. 73 of the Acadia Centre for Estuarine Research

A Summary of Results of the 1997-2003 Kings County Volunteer Water Quality Monitoring Program

The Kings County Volunteer Water Quality Monitoring Program has now completed seven years of data collection. Ten lakes were monitored during 2003. Tupper Lake, a small lake located south of Cambridge, was monitored for the first time. This report provides a summary of the monitoring results to date.

Water Temperature Monitoring

During 2003, temperature data loggers were installed at the surface and bottom of Hardwood Lake, Lake George, Aylesford Lake and Black River Lake. However, complete temperature records were not successfully collected at Aylesford Lake where the bottom temperature logger malfunctioned. As in previous years, Black River Lake exhibited the strongest temperature stratification (Figure 1).

Trophic State Indicators

In general, there appears to have been little change in total phosphorus, chlorophyll *a* and Secchi Disk depths, the three water quality parameters traditionally used to assess the trophic status of a lake (Figures 2 and 3). In most cases, mean total phosphorous concentrations remained in the 10-15 µg/l range and mean chlorophyll *a* values were generally below 3 µg/l.

During 2002, anomalies were noted in the total phosphorous concentrations measured during the month of August. Levels at all sites, except Hardwood and Little River Lake, were unusually low, ranging between 4 and 7 µg/l. The reason for the low values was not obvious, but it was suggested it might be related to the considerable delay (as long as ten days) between the time samples were collected and the time they were subsequently received by the QEII Environmental Chemistry laboratory. There were also anomalies during 2003. With the exception of Little River Lake, total phosphorus values measured during September were abnormally high, ranging between 0.015 and 0.024 mg/L. The reason for the high values is not obvious, as most other measured water quality parameters during this time appear to be within their normal range of values. An indication that these anomalies might be related to the laboratory analyses is suggested by the fact that the duplicate samples collected at Hardwood Lake in September varied widely (0.013 and 0.026 mg/l) for the total phosphorus values.

Alkalinity and pH

During 2002, alkalinity, a measure of buffering capacity (the ability for water to resist a change in pH), appeared to exhibit a decrease in a number of the lakes, especially those having low conductivity (i.e., Loon, Gaspereau, Black River and Lumsden). The implication of decreasing alkalinity is that these lakes may soon

experience the consequences of lake acidification. This trend seems to have continued during 2003 (Figures 5 and 6) and there now appears to also be a decrease in pH in these same lakes (Figures 5 and 7). Figure 8 shows the trend in alkalinity and pH for all lakes over time. This is somewhat worrisome since it appears that these lakes may now be in the early stages of becoming acidified.

Total Nitrogen

Another trend noted in 2002 was an increase in mean total nitrogen values for all of the lakes being monitored. During 2003, this trend continued (Figure 9), but only five of the nine lakes monitored exhibited an increase above the mean values reported in 2002.

Tupper Lake

Tupper Lake is a small, clear, headwater lake located in the Cornwallis River watershed. Its surface area is 36 hectares and its maximum depth is 3 metres. It is a relatively clear (low colour), soft water lake. Its conductivity is about 30 uSi/cm. Despite its low conductivity, its pH and alkalinity (Figure 10) are relatively high compared to the other lakes being monitored.

Based on its total phosphorus, chlorophyll *a* and Secchi Disk values (Figure 11), it appears to be a very unproductive (oligotrophic) and pristine lake.

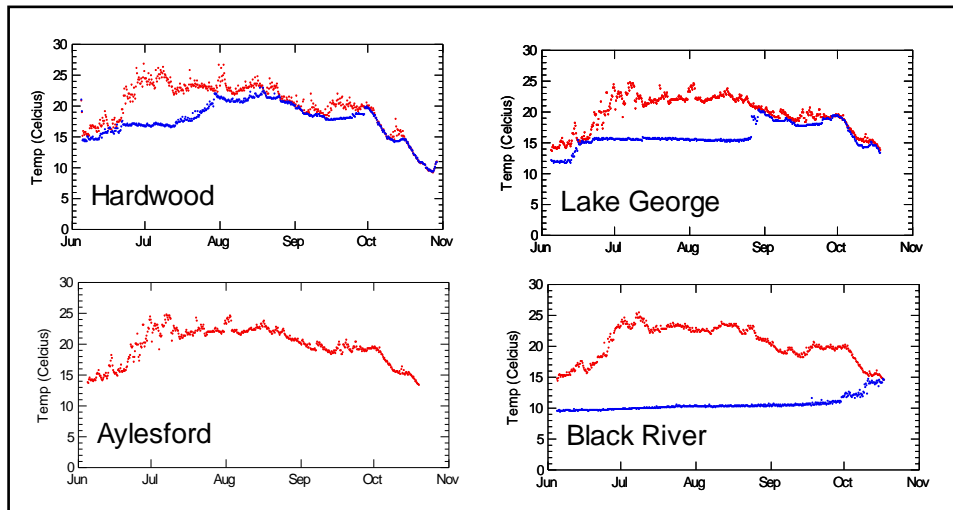


Figure 1. Bottom and surface water temperature during 2003.

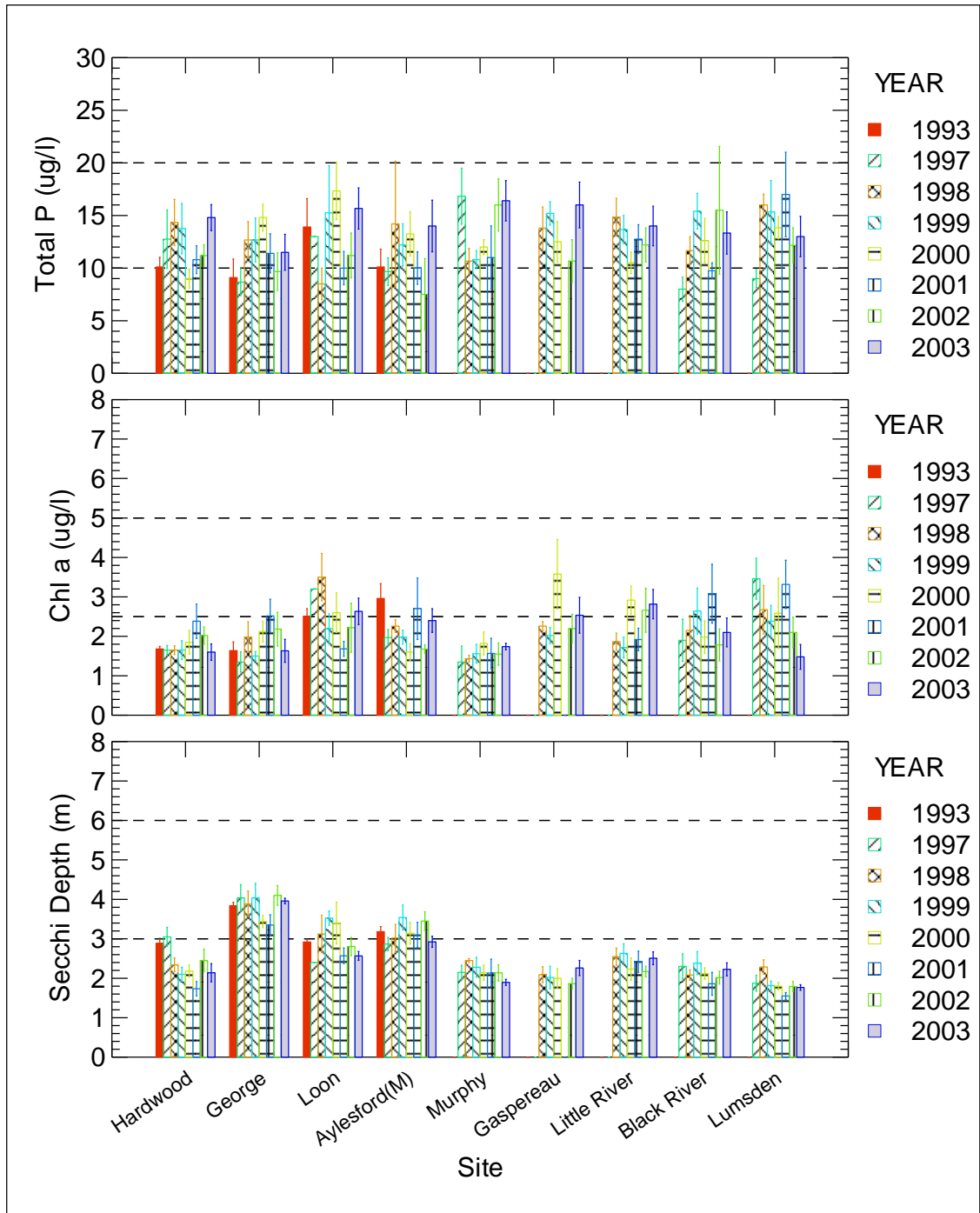


Figure 2. Mean values of total phosphorus, chlorophyll *a* and Secchi disk depth at each site for each year (error bars are one standard error of the mean).

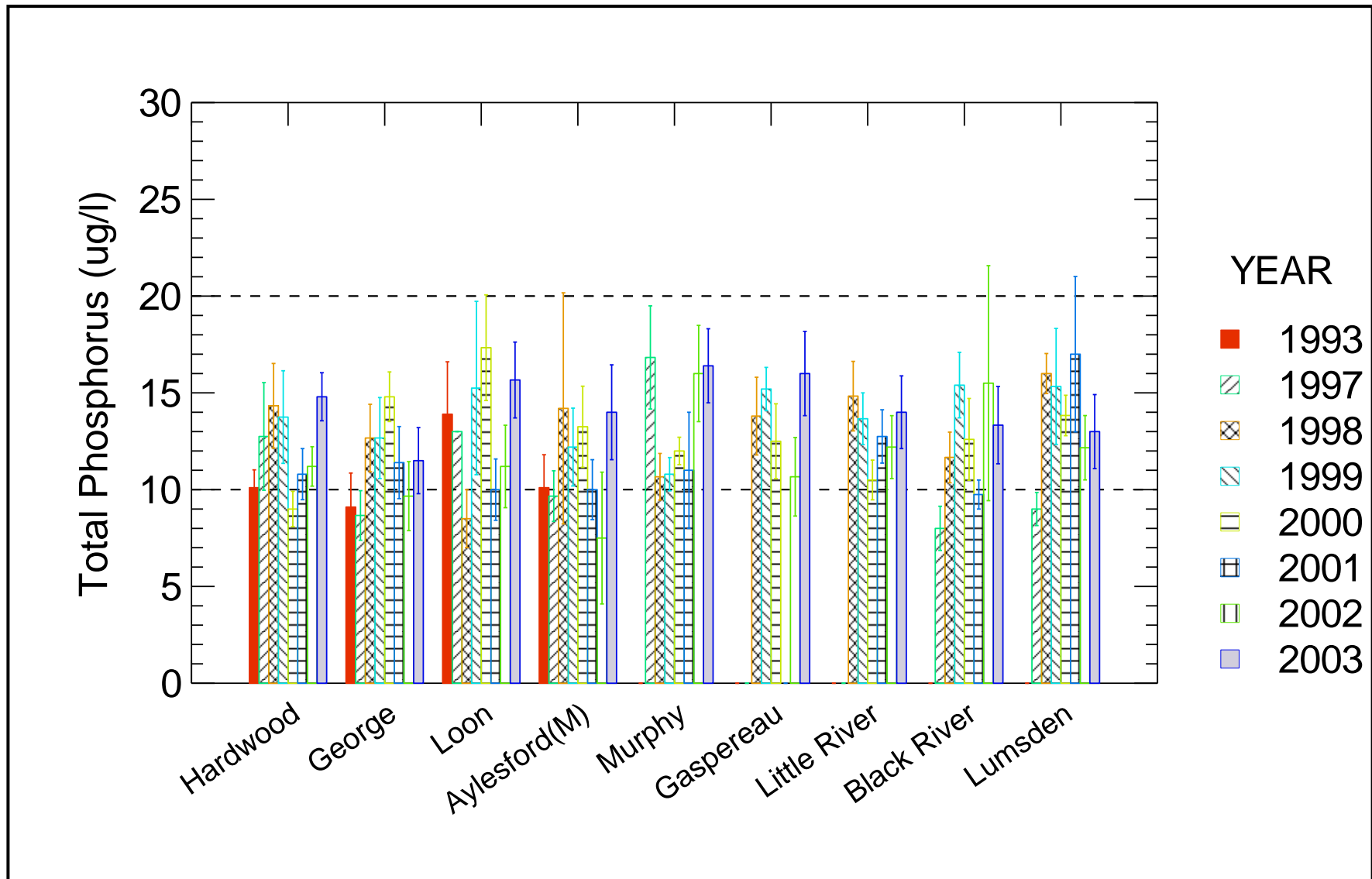


Figure 3. Mean values of total phosphorus concentration at each site for each year (error bars are one standard error of the mean).

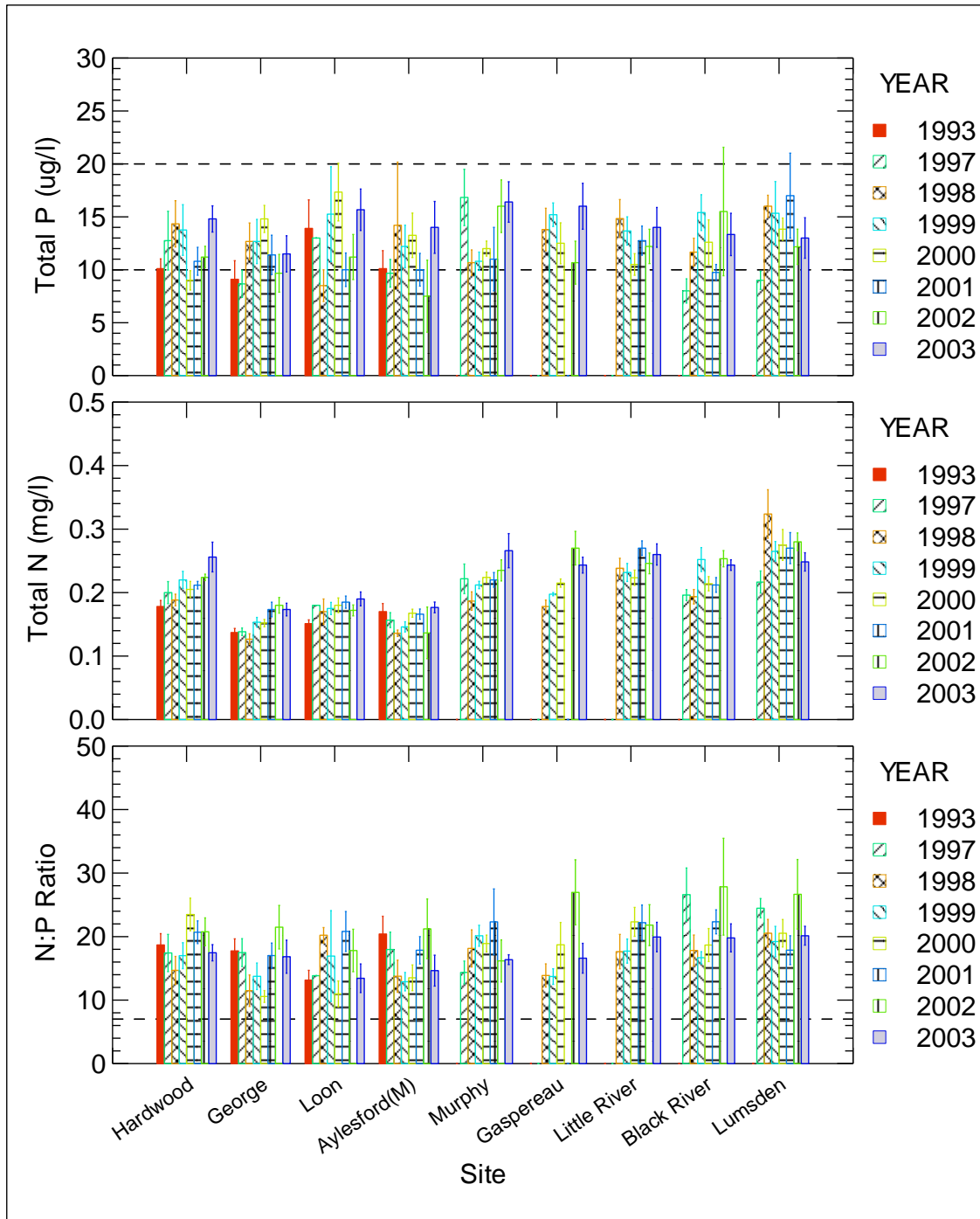


Figure 4. Mean values of total phosphorus, total nitrogen and N:P ratio at each site for each year (error bars are one standard error of the mean).

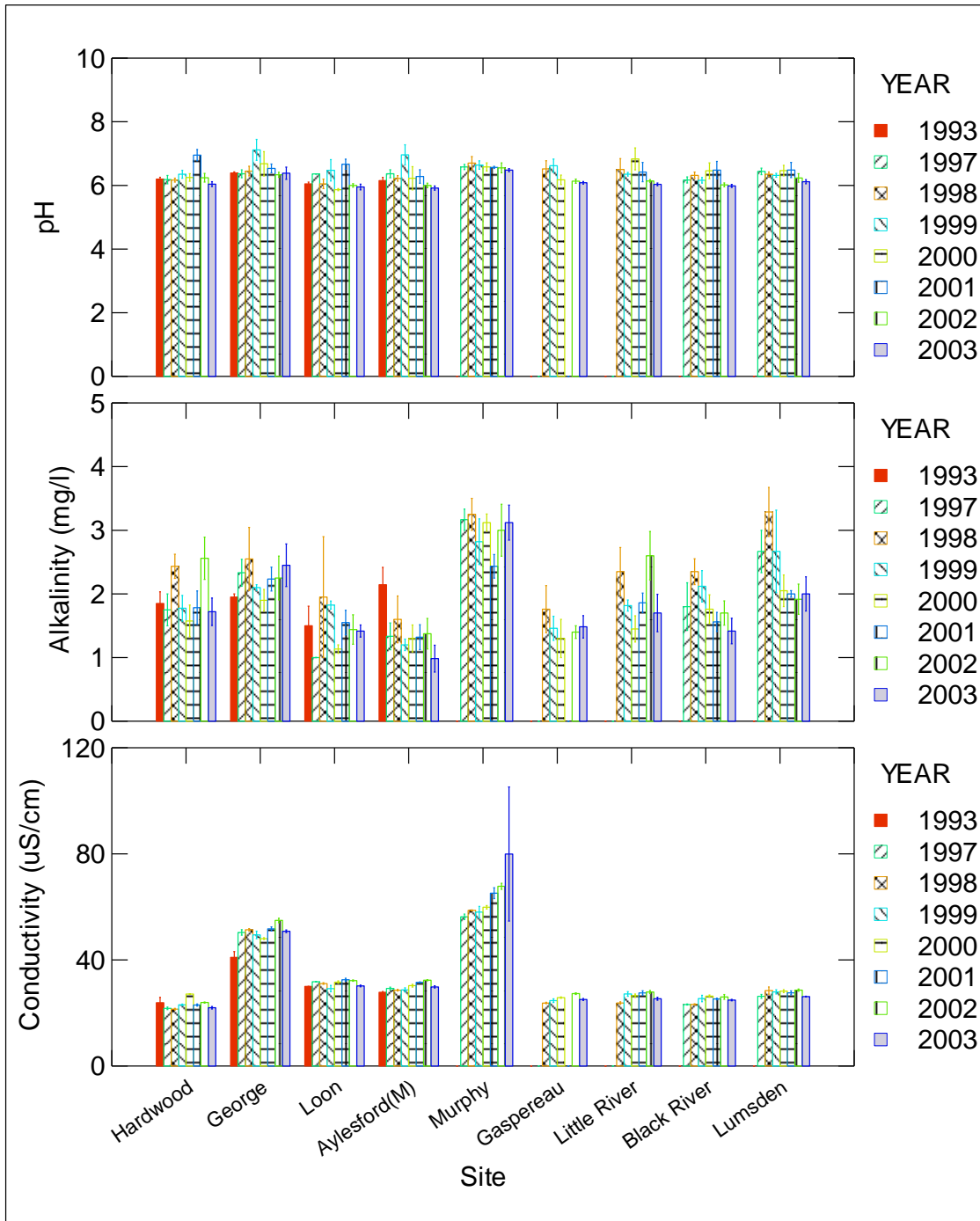


Figure 5. Mean values of pH, alkalinity and conductivity at each site for each year (error bars are one standard error of the mean).

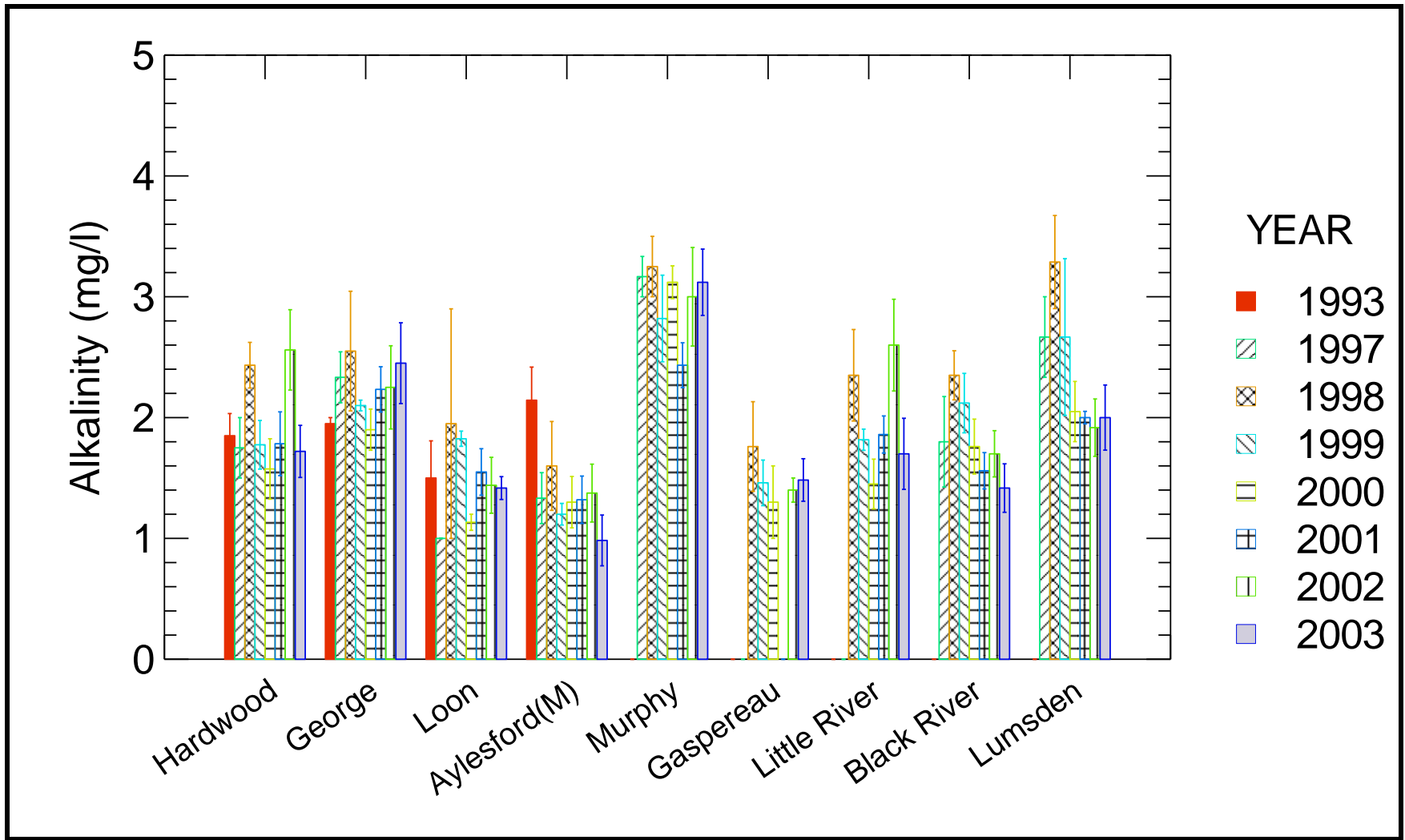


Figure 6. Mean values of alkalinity at each site for each year (error bars are one standard error of the mean).

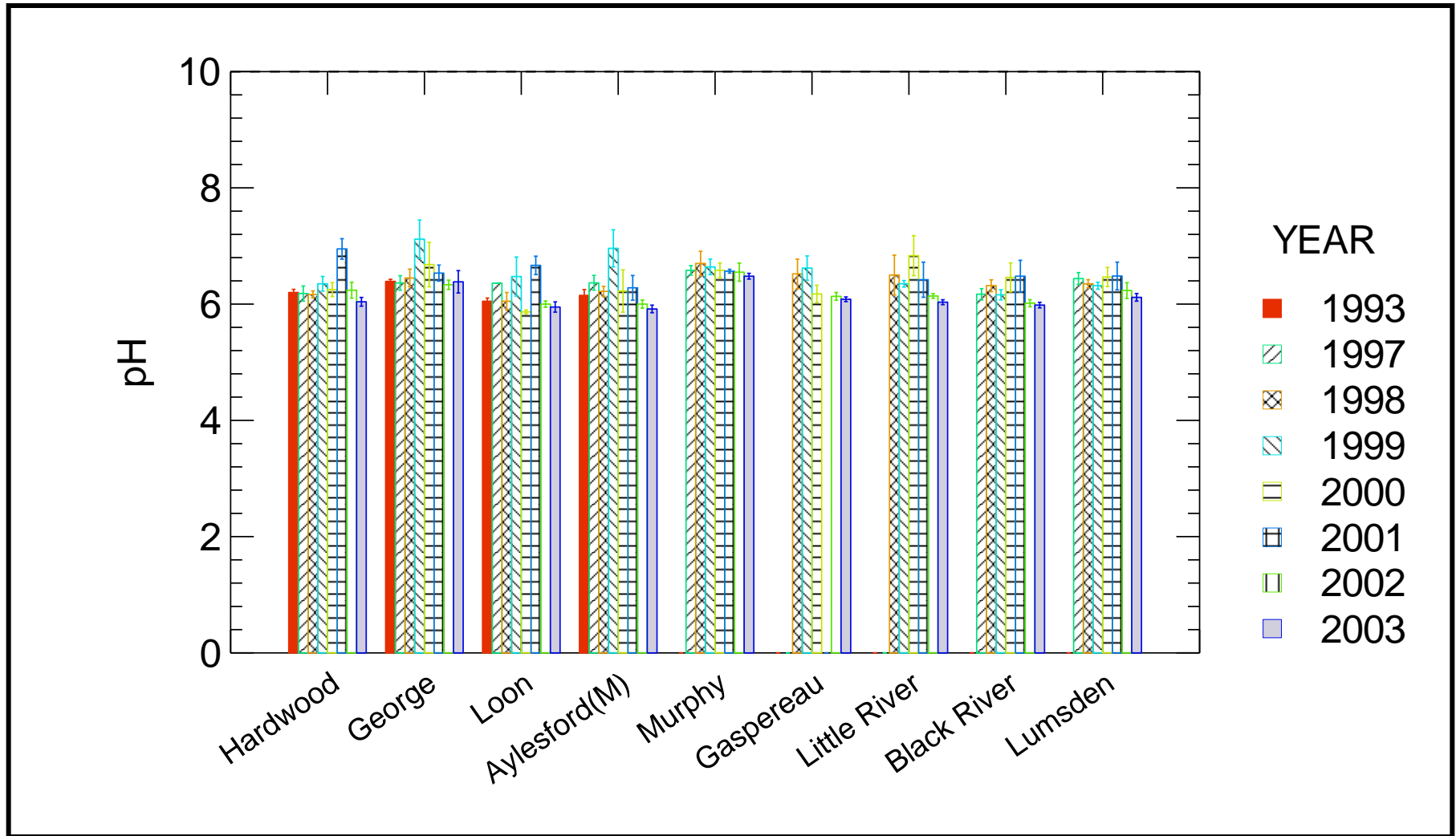


Figure 7. Mean values of pH at each site for each year (error bars are one standard error of the mean).

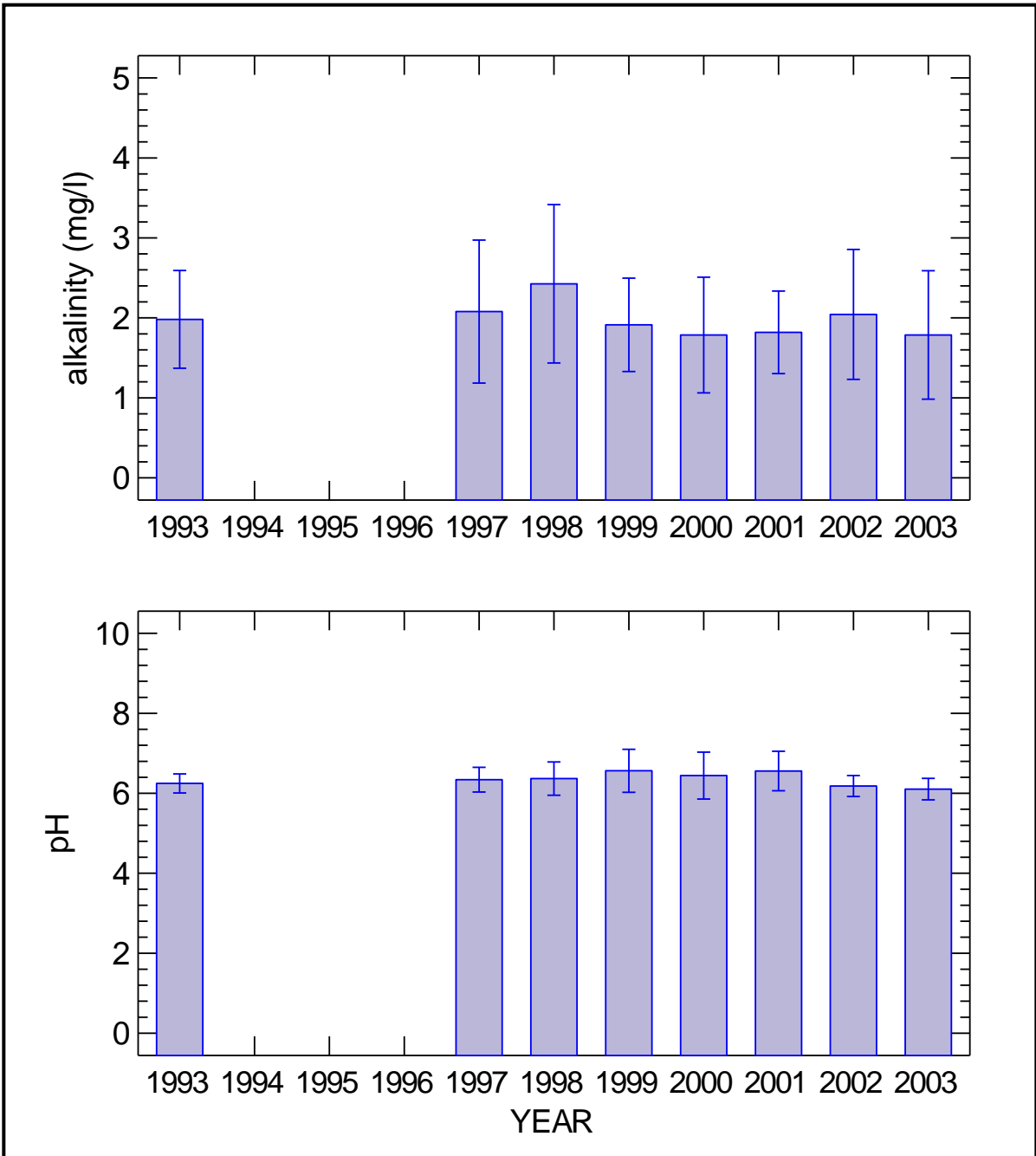


Figure 8. Annual mean alkalinity and pH of all lakes over time.

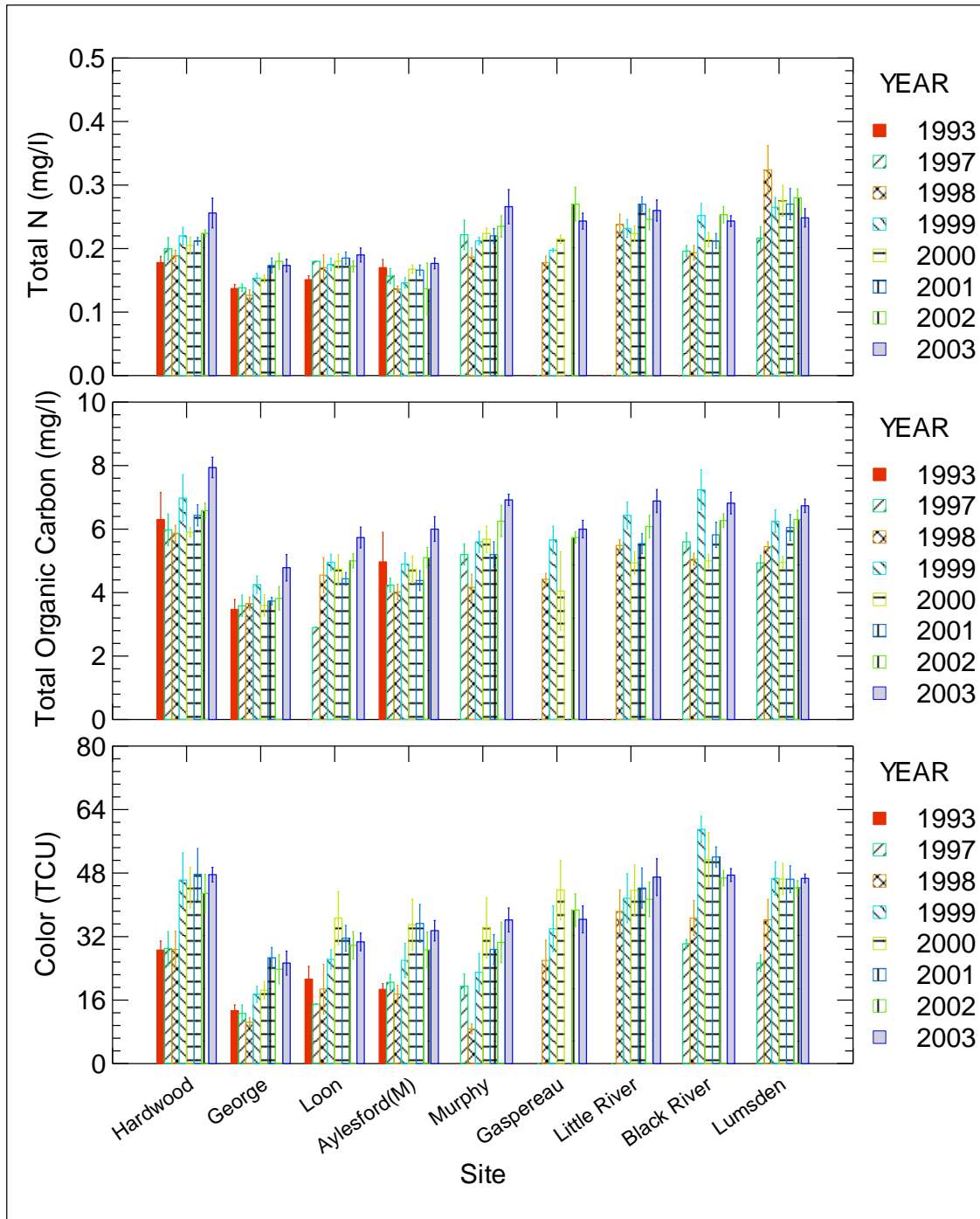


Figure 9. Mean values of total nitrogen, total organic carbon and color at each site for each year (error bars are one standard error of the mean).

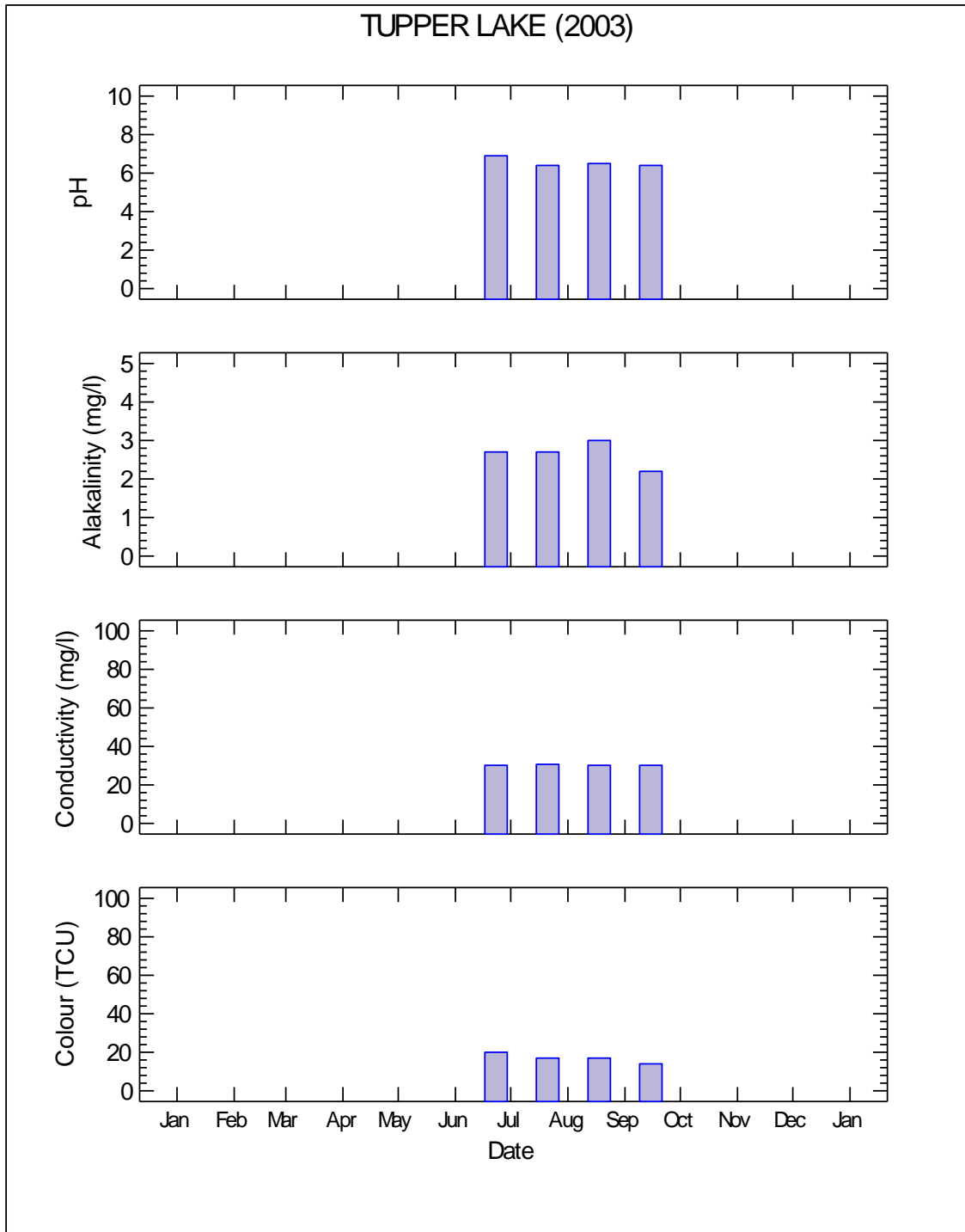


Figure 10 Time series of pH, alkalinity, conductivity and colour for Tupper Lake during 2003.

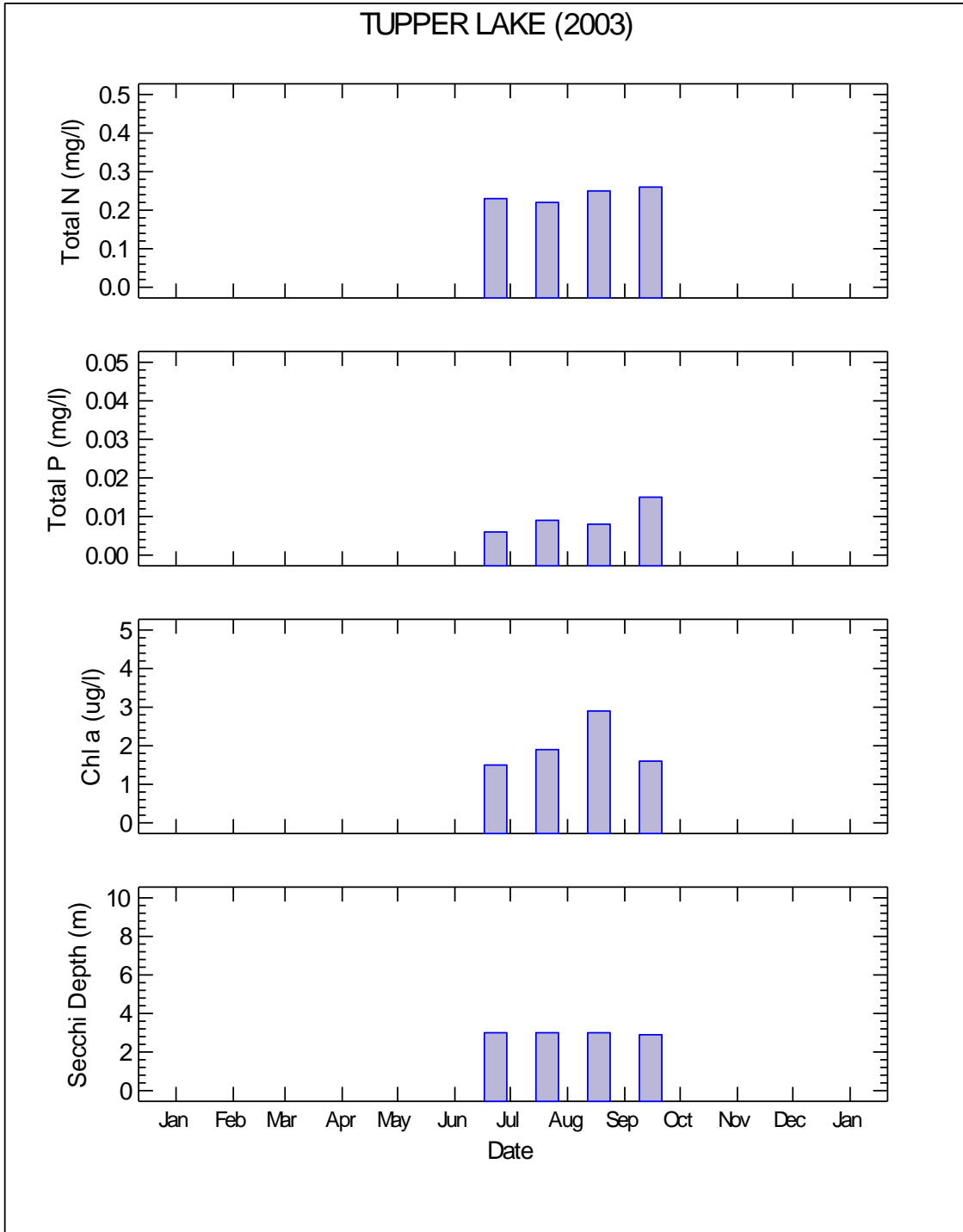
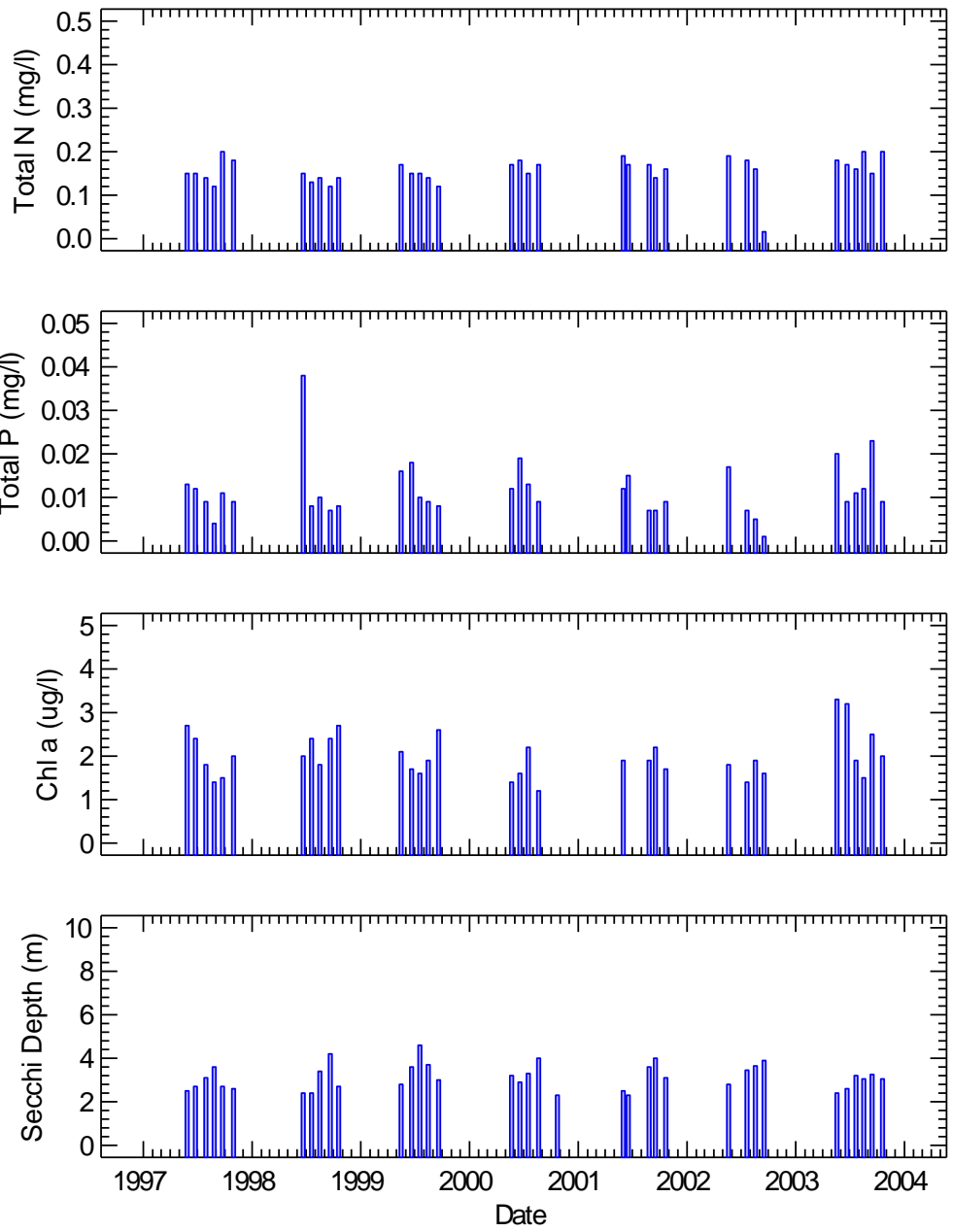


Figure 11 Time series of total nitrogen, total phosphorus, chlorophyll *a* and Secchi depth for Tupper Lake during 2003.

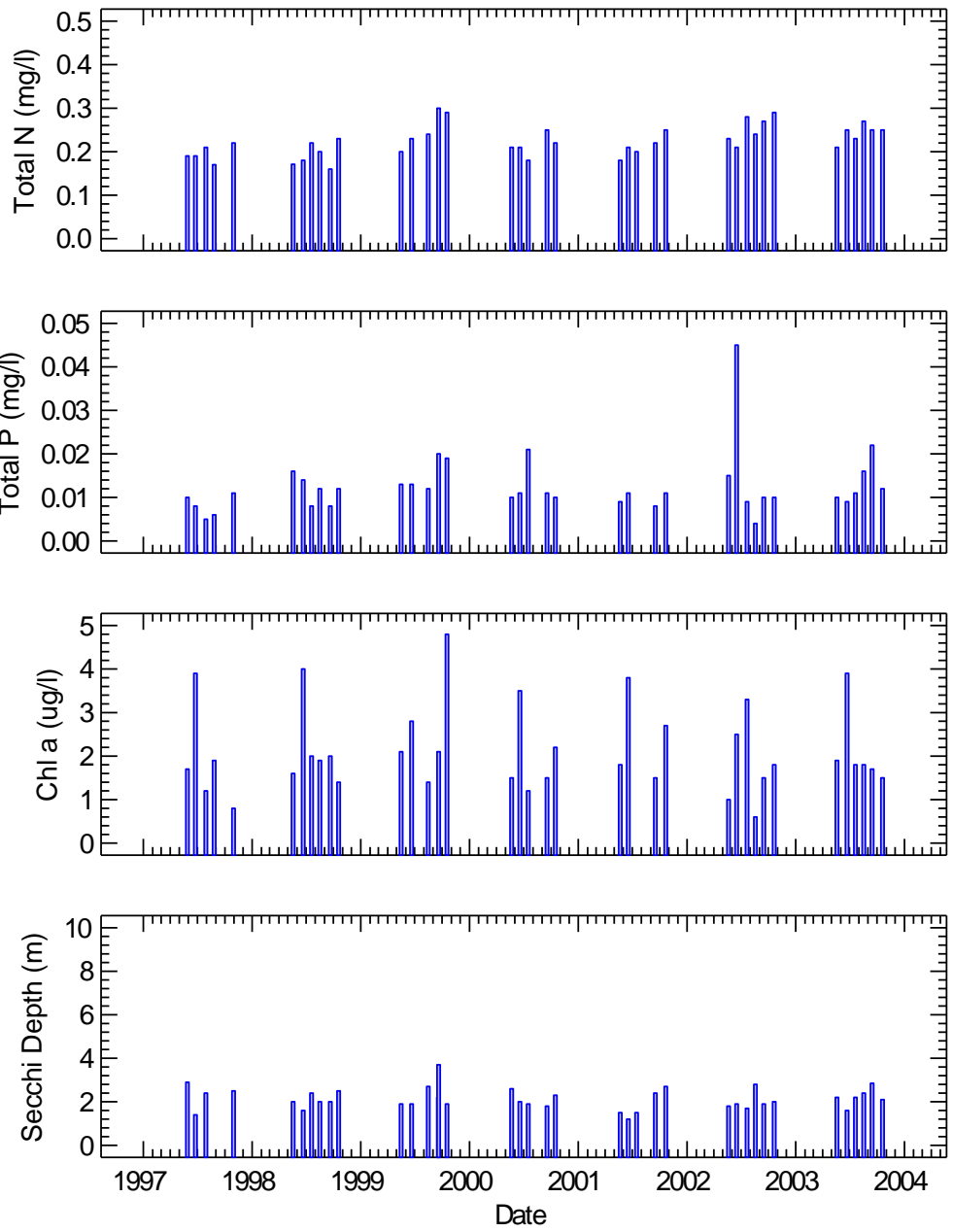
APPENDIX

Time Series Data for All Lakes

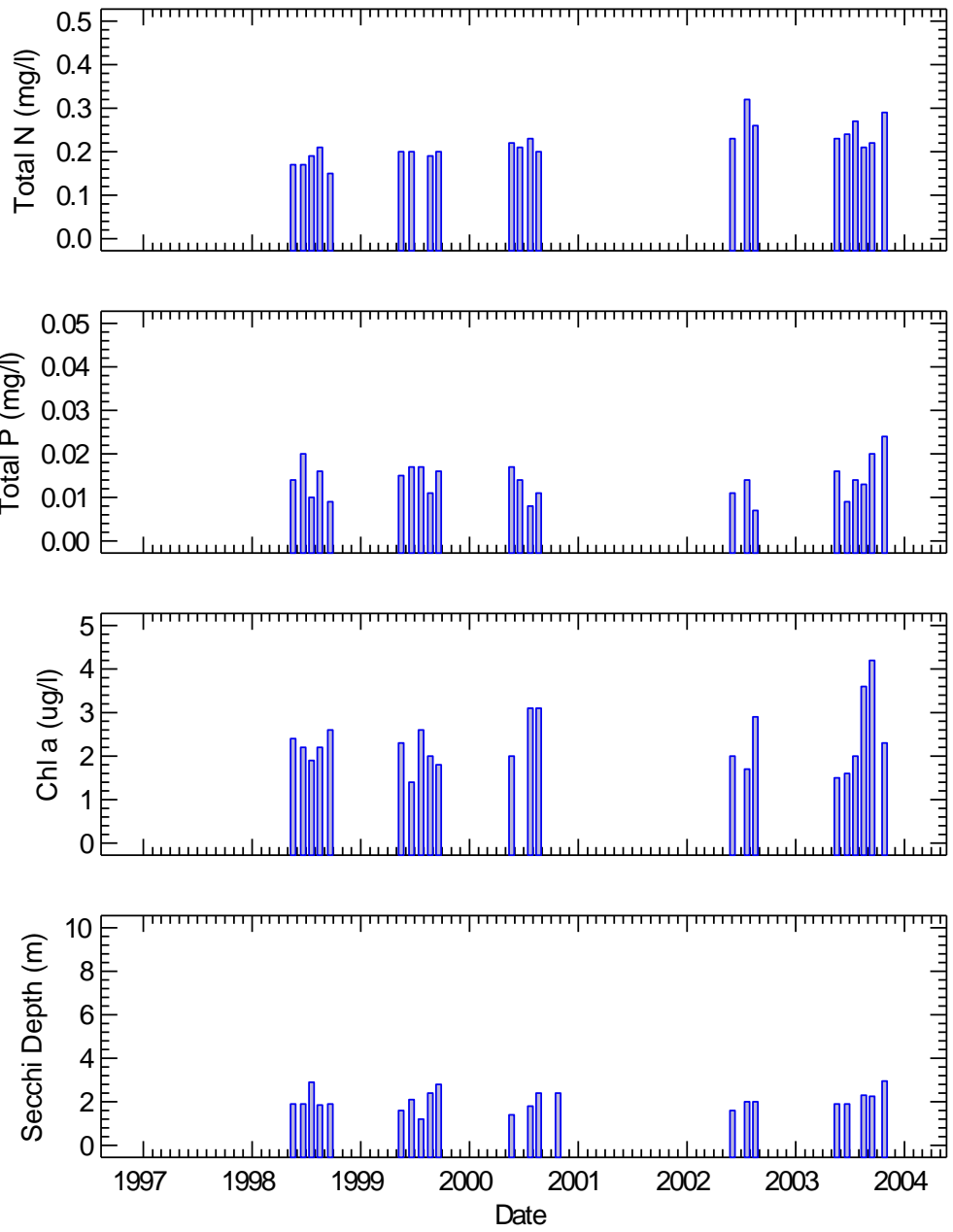
AYLESFORD LAKE (M)



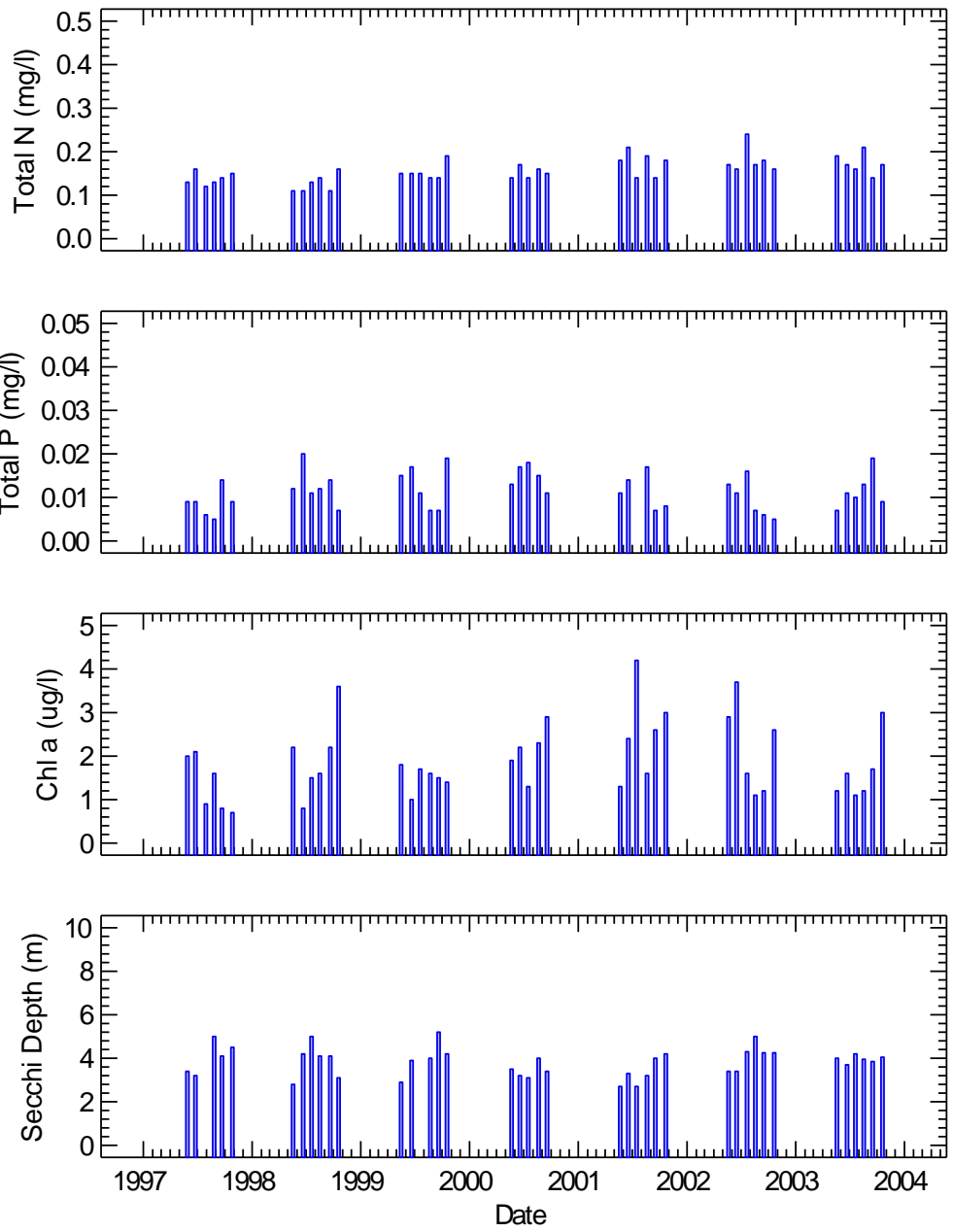
BLACK RIVER LAKE



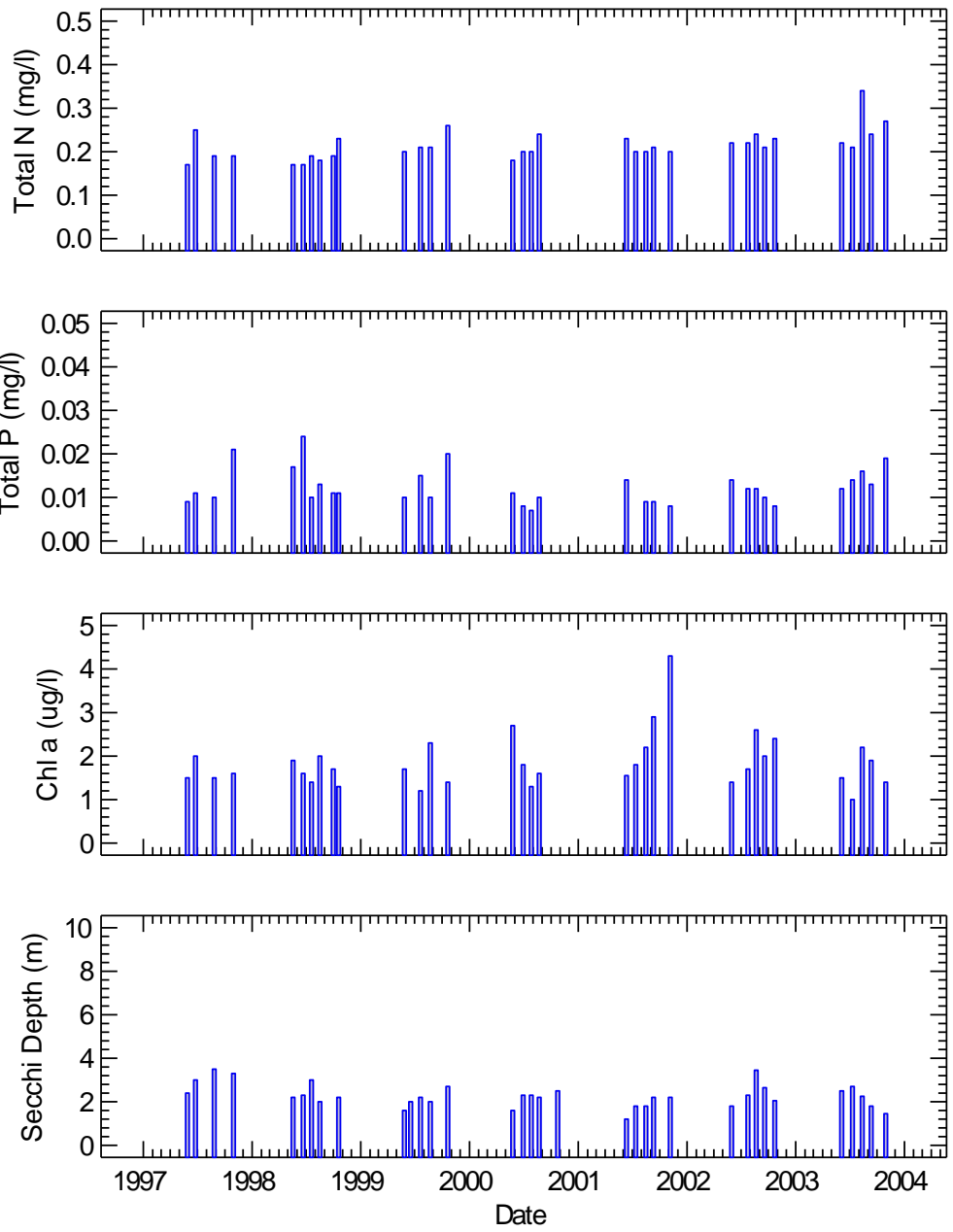
GASPEREAU LAKE



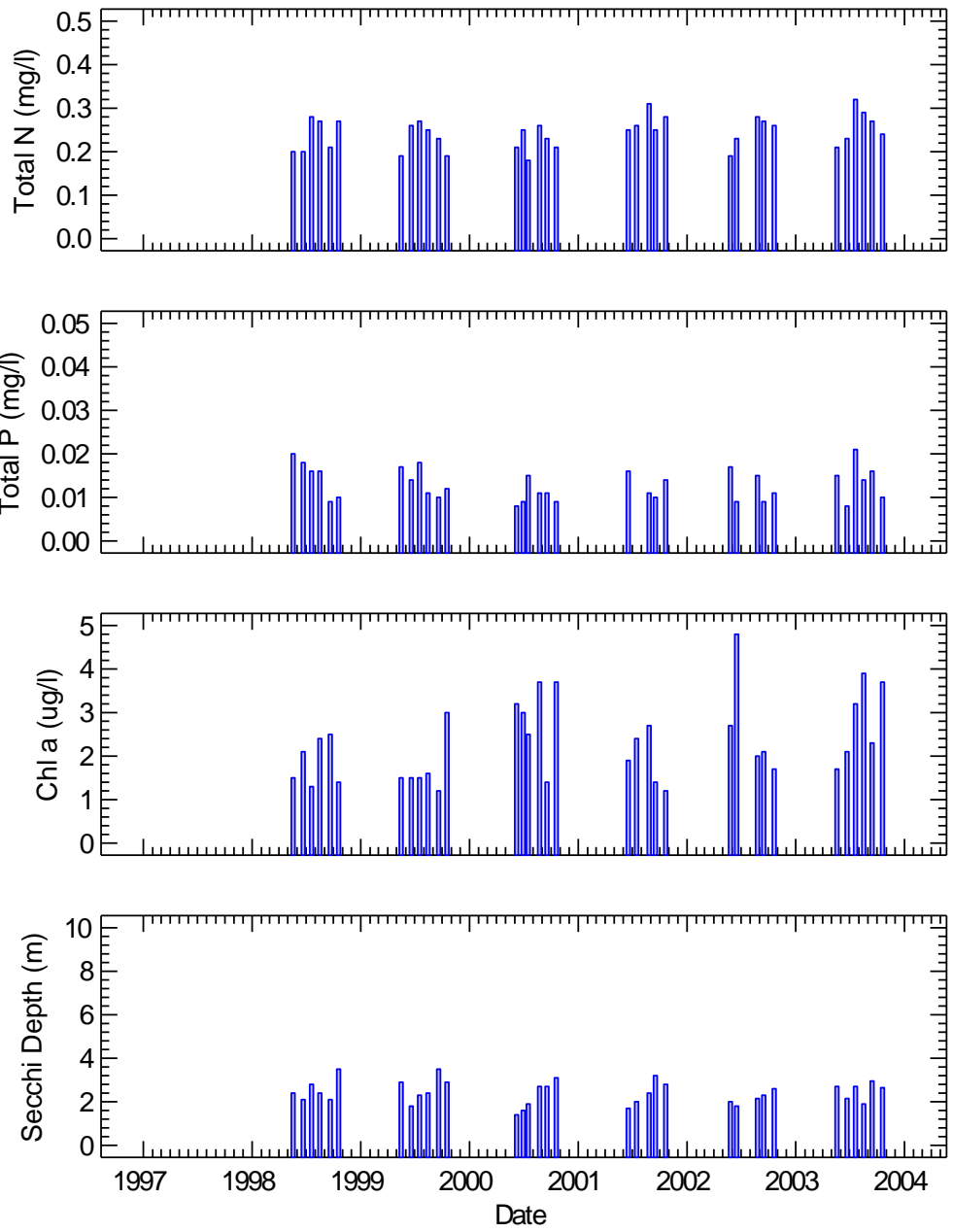
LAKE GEORGE



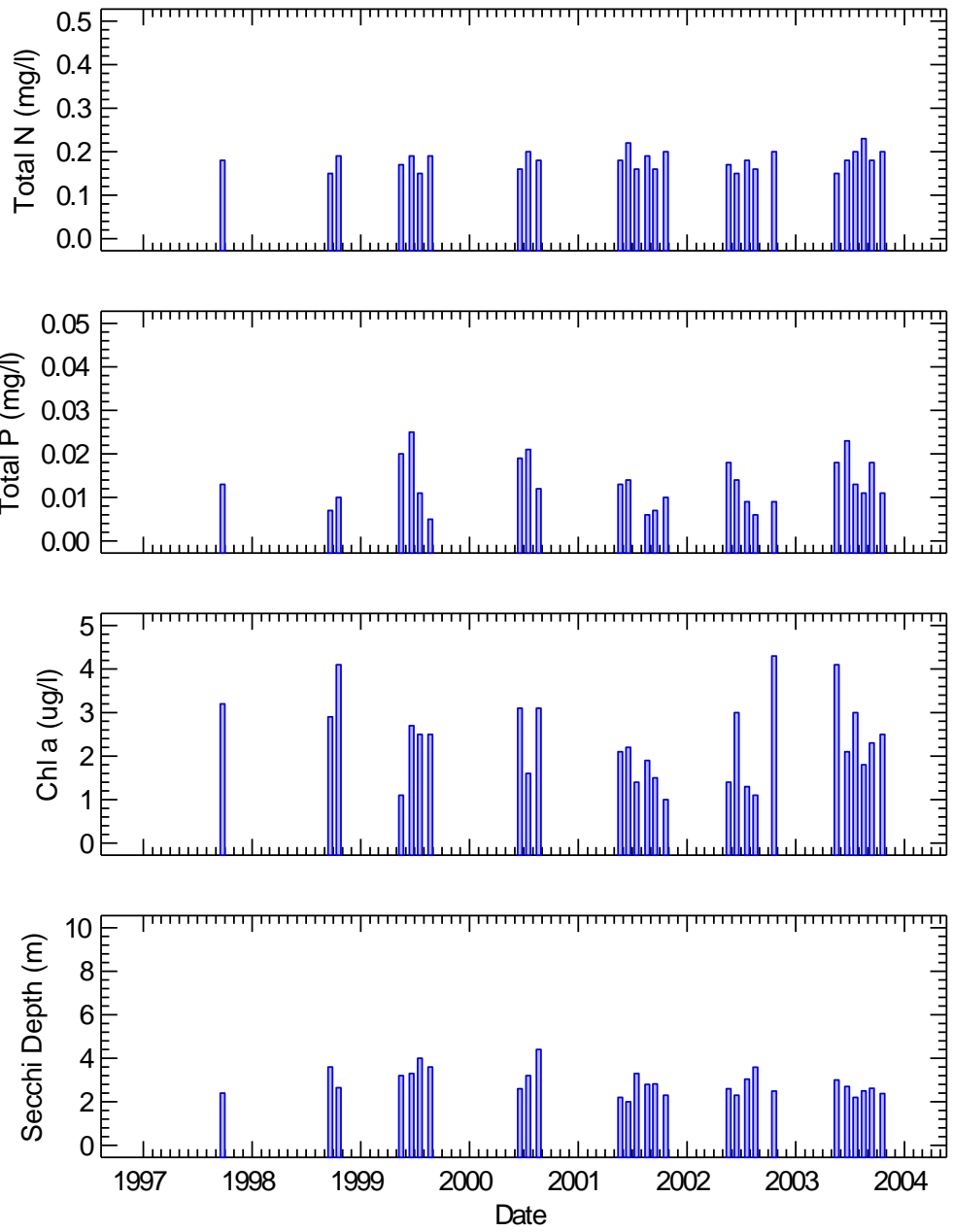
HARDWOOD LAKE



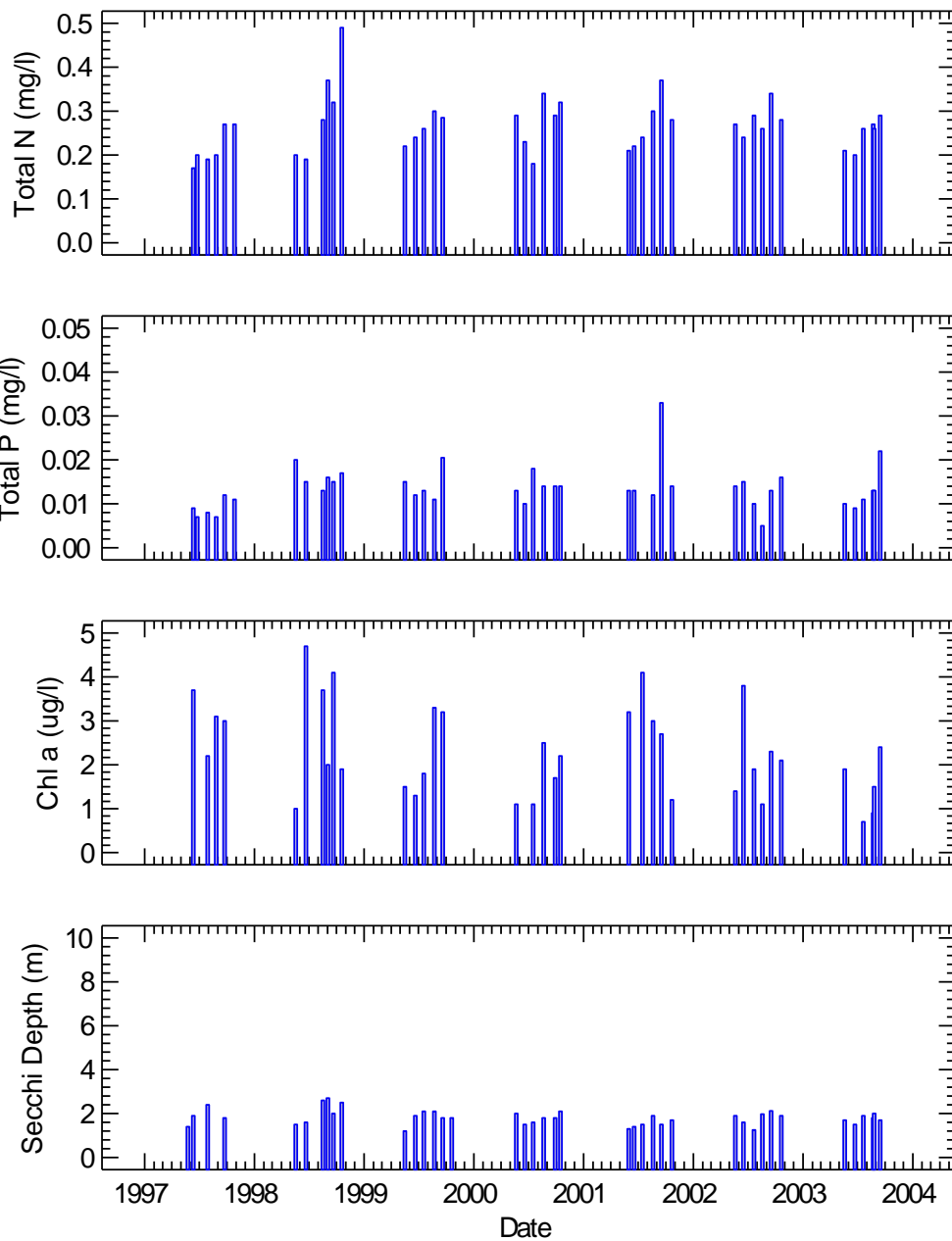
LITTLE RIVER LAKE



LOON LAKE



LUMSDEN POND



MURPHY LAKE

