BOW LAKE

LAKES LAY MONITORING PROGRAM

1985

Freshwater Biology Group (FBG)

University of New Hampshire

Durham

by

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LAKES LAY MONITORING PROGRAM

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This is a LEVEL II report. (See last page for definition.)

All data in this report are available to any person or organization upon request and payment of costs involved.

PREFACE

Importance of long-term monitoring

Lake monitoring carried out weekly over the course of several consecutive summers benefits the lake in a number of ways. The resulting data not only indicate the lake's condition for a particular summer, but they also suggest what it was like in the past, and make it possible to predict its condition in the future.

For this reason, it is important to distinguish between short-term and long-term results. As an example, a 30 year time-span may provide evidence for a long-term trend towards eutrophy (Fig. 1). Yet, if one looks at data over a 1-5 year time-span, one sees only short-term fluctuations; there are no apparent trends nor is it possible to separate the "signal" from "noise". Chlorophyll, water transparency, and phosphorus may fluctuate from year to year in response to annual variations in climate and activity on the lake, and may be unrelated to long-term trends. The more such "noise" in the data, whether due to real or analytical variations, the longer a monitoring program must continue to demonstrate long-term trends.

Use of long-term trends

Long-term trends serve several important functions. From them, past deterioration of the lake can be recognized. They can also be used to forecast the future condition of

They can also be used to forecast the future condition of the lake, and if necessary, management techniques can be implemented to keep potential problems from becoming worse. Finally, long-term trends provide a basis for evaluation of existing management programs so that necessary changes may be brought about.

It takes a great deal of motivation, perseverance, and a love for one's lake to be a lay monitor. Sometimes it may seem to be an inconvenience, or to be discouraging when it's unclear just what a year's worth of hard work means with respect to the "big picture" of the lake. Yet, each observation by a lay monitor is a significant contribution.

Thus, continuation of data collection is important. The LLMP data base is becoming more comprehensive and valuable each year. We are pleased with the interest and commitment of lakeshore volunteers. Keep up the great work!

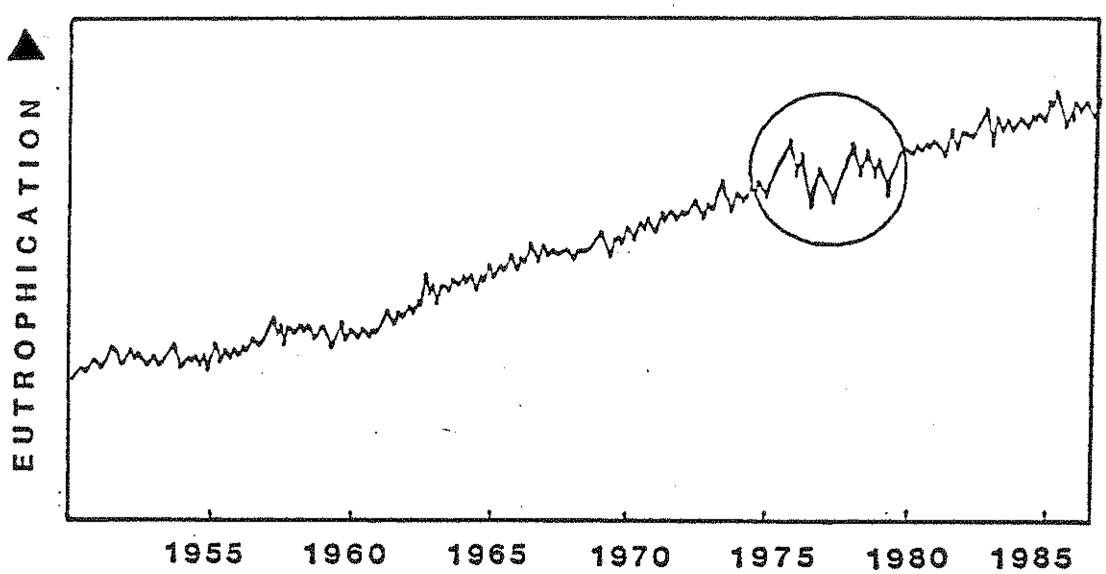

Figure 1. Long-term vs. short-term trends in a hypothetical lake approaching eutrophication.

ACKNOWLEDGEMENTS

Bow Lake has been a part of the Lakes Lay Monitoring Program since 1984. The program continued in 1985 through the direction of Mr. Charlie Palm and with the help of several interested monitors. Two sites on the lake were monitored weekly from July to September. Monitoring was carried out by Charlie Palm along with Rick Sawyer and other members of Troop 185 of Stratham, New Hampshire.

The Freshwater Biology Group congratulates the monitors on the quality of their work and the time and effort put forth. We encourage them, and other interested members of the Bow Lake Association to continue monitoring during the 1986 season. We would also like to thank Mr. Palm for his continued dedication to the maintenance and organization of the LLMP for the lake, and Mr. John Young for the use of his boat, the Lilypad.

Members of the Freshwater Biology Group included Kim Babbitt, Henry Burke, Tracy Kenealy, Sandra Lord, Elizabeth Trieff, Celia Acacia, and Deb Thunburg. Kim was the LLMP Coordinator, and was responsible for arranging the field trips and supervising the research team. Liz and Sandy were responsible for phosphorus, Henry for equipment production and upkeep, Celia for phytoplankton, and Deb for zooplankton. Tracy was responsible for data entry and analysis, and for writing the reports in the fall.

We would also like to recognize the UNH Office of Computer Services for their provision of computer time and data storage space. The final text is available on an IBM-compatible diskette.

NON-TECHNICAL SUMMARY OF LAY MONITOR DATA

1) Both water transparencies and chlorophyll a concentrations indicate that Bow Lake is oligotrophic. Seasonal readings for secchi disk and chlorophyll suggest that the lake is nutrient-poor and contains relatively few planktonic algae.

2) Results from dissolved water color indicate that Bow Lake has very little brown coloring from dissolved humic substances (dark-colored organic matter). The lower the water color, the more light can penetrate into the water, and the higher the water transparency.

3) Levels of total phosphorus were low in Bow Lake. Phosphorus is the nutrient that limits lake productivity the most. Low levels such as those found in Bow indicate that the lake is relatively unproductive and that nutrient loading is limited.

4) Bow Lake has a relatively high pH considering the low alkalinity (buffering capacity) in the lake. pH is generally lower in lakes with little alkalinity. The pH in Bow Lake has remained stable over the past several years. This suggests that adverse effects of acid precipitation may

be minor at this time, yet may become a problem in the future if the alkalinity becomes much lower.

5) The water in 1985 was more transparent and contained less green coloring from suspended algae than 1984. Short-term fluctuations such as these are common, possibly due to changes in the weather from year to year.

COMMENTS AND RECOMMENDATIONS

1) We recommend that the Bow Lake Association continue its long-term monitoring program in 1986. The Association has established a two-year data base which can be strengthened through further monitoring. A data base resulting from several years of monitoring will be a valuable resource in the future as trends in the chemistry and biology of the lake become evident. If possible, sampling should begin earlier in the year (May or June) to provide data on trends which are typically found throughout the season.

2) We strongly recommend the initiation of alkalinity testing in 1986. Alkalinity indicates the ability of water to buffer acids, and may be more reliable than pH in predicting the effects of acidification on a lake. It is important to establish a data base for alkalinity in order to detect changes as early as possible, especially in a lake such as Bow where the buffering capacity is already low.

3) Phosphorus sampling should be continued in 1986. While concentrations in 1985 were low, phosphorus levels can fluctuate from year to year in response to annual variations in the climate and activity in and around the lake. Because

phosphorus is usually the least abundant (most limiting) nutrient in a lake, high phosphorus levels will cause increased production, which in turn can accelerate the eutrophication process.

4) As a general addition to our Lakes Lay Monitoring Program, we are suggesting that each lake in the Program begin monitoring the condition of the fish taken from the lake. The "Fish Monitoring" will require that at least one lay monitor record the species, length and weight and collect a sample of fish scales for each fish examined. In most lakes this will involve periodic creel census of sport fishermen on the lake. Equipment required will cost approximately $100. Special instruction will be given to the lay monitors who chose to do this parameter.

Length-to-weight ratios give a measure of the nutritional condition of the fish. Analysis of the fish scales (to be done at UNH) will tell how old each fish is. Together, these data will be extremely useful indicators of the "health" of the fish populations in the lake, and, of course, the "health" of the lake.

METHODS OF LAY MONITORS

This year data were collected on five parameters: thermal stratification, water clarity (secchi disk depth), chlorophyll a concentration, total phosphorus and dissolved water color. Whenever possible, testing was done weekly between the hours of 9 am and 3 pm, the period of maximum sunlight penetration into the water. All samples and data were mailed to the FBG at UNH for analysis.

Thermal (temperature) profiles were obtained by collecting lakewater samples at several successive depths using a modified Meyer bottle (Lind, 1979). A weighted, empty bottle with a stopper was lowered to a specific depth. At that depth, the stopper was pulled, allowing the bottle to be filled with water. The bottle was quickly pulled back up to the surface where the temperature of the sample was taken with a Taylor pocket thermometer, and recorded in degrees Celsius. This procedure was repeated at one meter intervals through the epilimnion and hypolimnion, and at one-half meter intervals throughout the metalimnion.

Water clarity was measured by lowering a secchi disk (approximately 20 cm. or 8 inches) through the water off the shady side of the boat, and noting the average depth at which it disappeared upon lowering and reappeared when being raised (the cord attached to the secchi disk was marked in one-half meters). This process was done while holding a view-scope just below the surface to eliminate effects of surface reflection and wave action. This was repeated two or three times, and an average to the nearest one-tenth of a meter was recorded.

Chlorophyll a concentration was used as an index of algal biomass that is useful in determining the trophic state of the lake. A weighted plastic tube (10 meters in length) was lowered through the epilimnion, or "upper lake" to the top of the metalimnion, or "middle lake" (the depths of the epilimnion and metalinmion are determined from the temperature profile). The end of the tube above water is folded to shut off the water flow into or out of the tube. The weighted end of the tube is pulled up out of the water with an attached cord, trapping an integrated sample of water representing the "upper lake" in the tube. This sample is poured into a plastic 2.5 liter bottle and stored for chlorophyll filtration.

Water samples for chlorophyll a filtration were filtered through a 0.45 micron membrane filter. Damp filters, containing chlorophyll-bearing algae, were air-dried for at least 15 minutes, out of the sun, to prevent decomposition or bleaching of the chlorophyll on the filter. These filters were sent to UNH where members of the FBG analyzed them for chlorophyll a (see Methods of the Freshwater Biology Group).

Dissolved water color was determined by saving the filtrate from the the chlorophyll filtration and storing it frozen in a 50 ml plastic bottle. The bottles were sent to UNH and the color was analyzed by reading the absorbance of the samples at two different wavelengths (440 and 493).

Samples for total phosphorus analysis were collected in two ways. For determination of epilimnetic phosphorus, water was taken from the integrated sample collected with the tube-sampler. On parts of the lake where it was suspected that phosphorus might be high, (eg. sites along the shoreline, inlets or outlets), surface samples were taken by dipping a bottle into the water and letting it fill. All samples were collected in acid-washed 250 ml bottles, fixed with 1.0 ml of concentrated sulfuric acid, and stored frozen until analysis by the FBG team. (See Methods by the Fresh-water Biology Group.)

METHODS OF THE FRESHWATER BIOLOGY GROUP

The Freshwater Biology Group (FBG) research team took two trips to the lake and conducted several tests which included measurements of sunlight penetration into the water, dissolved oxygen, alkalinity, free (unbound) carbon dioxide, pH, specific conductivity, chlorophyll a, total phosphorus, and a survey of the microscopic plants (phytoplankton) and animals (zooplankton) present. The FBG was also responsible for chlorophyll a and phosphorus analysis of lay monitor samples, as well as filing and analyzing 1985 data, performing statistical tests, and determining possible trends based on past data.

Field and Laboratory Methods

On the lake, a dissolved oxygen and temperature profile was taken using a Yellow Springs Instruments Model 54A Oxygen/Temperature meter with a submersible probe. Readings were taken at one-meter intervals throughout the epilimnion and hypolimnion, and at one-half meter intervals through the metalimnion.

Sunlight and skylight penetration into the water was measured with a Whitney submersible photometer model LMA-8A, off the sunny side of the boat. From the relative light intensities which were recorded, the coefficient of light extinction was later determined.

Samples for water chemistry (dissolved oxygen, alkalinity, free (unbound) carbon dioxide, pH, and specific conductivity) were collected with a 3-liter Van Dorn bottle at depths which represented the surface, mid-epilimnion, metalimnion, and hypolimnion. Alkalinity, free carbon dioxide, and pH samples were stored on ice in 250 milliliter polyethylene bottles and were analyzed in the field within 1 to 2 hours of sampling. Specific conductivity samples were analyzed in the FBG lab at room temperature.

In addition to the oxygen profile taken, the dissolved oxygen (DO) concentration of specific lakewater samples (epilimnetic and hypolimnetic) was determined chemically using the Winkler method for dissolved oxygen. The precision of the method allows us to to check the accuracy of the electronic probe, so that adjustments could be made in the probe readings if necessary. In the Winkler method, water is collected in Biological Oxygen Demand (BOD) bottles and fixed with manganese sulfate and alkali-iodine-azide. A loose precipitate (floc) of manganous hydroxide is formed that will absorb any dissolved oxygen present. The sample is then acidified with concentrated sulfuric acid in the presence of of iodide, and iodine is released in a quantity equal to the amount of dissolved oxygen present.

To determine the alkalinity, a two-endpoint titration was done with 0.002 N sulfuric acid to a pH of 4.5 and 5.1. The endpoint indicator used was methyl red/bromocresol green. The amount of titrant used (dilute sulfuric acid) was recorded to the nearest 0.1 ml, representing the equivalent milligrams of calcium carbonate per liter.

Free carbon dioxide concentration was determined by titrating the fresh lakewater samples with 0.0027 N Sodium Hydroxide to a final pH of 8.3, using the dye phenolphthalein as the end-point indicator.

Lakewater pH was measured with a digital pH meter (Orion model 231) equipped with a combination probe (Orion Co.)

Specific conductivity was measured with a Barnstead Conductivity Bridge Model PM-70CB , with a model B-10 probe (cell constant = 1.0). Corrections were made for sample temperatures with a standard curve.

Samples to be analyzed for chlorophyll _a_, total phosphorus, phytoplankton, and zooplankton were collected with a vertical tube sampler into a 2.5 liter plastic bottle. Chlorophyll samples were filtered through a 0.45 micron membrane filter and air-dried until analysis. The chlorophyll _a_ content was analyzed by extracting the chlorophyll with a 95% acetone solution saturated with magnesium carbonate. The samples were then centrifuged and their light absorbance read at two standard wavelengths (663 and 750 nanometers).

Phosphorus samples were fixed with 1.0 milliliter of concentrated sulfuric acid and stored refrigerated until analysis. Also, phosphorus samples from lay monitors were received by the FBG in a refrigerated or frozen state, and stored cold until analysis. To determine the total phosphorus content, ammonium persulfate and 11 N sulfuric acid was added to digest the total phosphorus, and the samples were autoclaved for one hour. A single-reagent method was employed using potassium antimony tartrate, ammonium molybdate, and a fresh solution of ascorbic acid (E.P.A. 1979). Absorbance of the blue phosphorus complex was measured with a spectrophotometer at 650 nm. Each sample was analyzed twice and an average of the two values taken as the phosphorus content in parts per billion.

Phytoplankton samples were fixed with iodine (Lugol's solution) immediately after collection. The preserved samples were later counted with an inverted microscope after settling for 24 hours in counting chambers. At least 200 individual algal "units" were counted with a modified scan technique (Baker, 1973).

Zooplankton samples were collected by taking a plankton tow through the oxygenated portion of the water (>0.5 ppm oxygen) using a 30 cm diameter, 150 micron porosity plankton net. Samples were immediately preserved in a 4% formalin-sucrose solution (Haney and Hall, 1973) and subsampled with a 1-milliliter Hensen-Stemple pipet. Sufficient subsamples were taken to insure that at least 100 zooplankters were counted.

How the data are analyzed

Incoming data are received through the mail during the sampling season and are first filed in an "incoming data" book. This provides temporary storage until the corresponding chlorophyll and/or phosphorus sample for each data sheet is analyzed. All data, including date, lake, site, secchi disk depth, chlorophyll a and phosphorus content, alkalinity, and color measurements, are filed and stored on a computerized data-management system of the University of New Hampshire. Data can be easily retrieved by lake, sampling station or date, and used for individual reports and for each year.

Statistical treatment of the data for each lake includes a comparison of seasonal tendencies found throughout the year, monthly means for the different parameters tested, and confidence levels for each site. The same comparisons mentioned above are made on a yearly basis if the lake has been in the program for two years or more. If sufficient data are available from several years, regression analyses and other statistical tests are performed. Such analyses may identify trends and help explain variations in the data (eg. secchi disk depth, chlorophyll a, color). In addition, data is compared with other lakes in the program and to published water quality classifications. Trophic boundaries of Forsberg and Ryding (1980) are used to classify each lake.

RESULTS AND DISCUSSION OF LAY MONITOR DATA

Results from the lay monitors are presented separately from those obtained by the Freshwater Biology Group, as the two groups conducted separate research.

In 1985, weekly monitoring was done from site 1 (Ledges) and site 3 (Bennett). Tests were done for water transparency, chlorophyll a concentration, phosphorus, and dissolved water color. See Figure 2 for 1985 sampling sites and Appendix A for lay monitor data for 1984-1985.

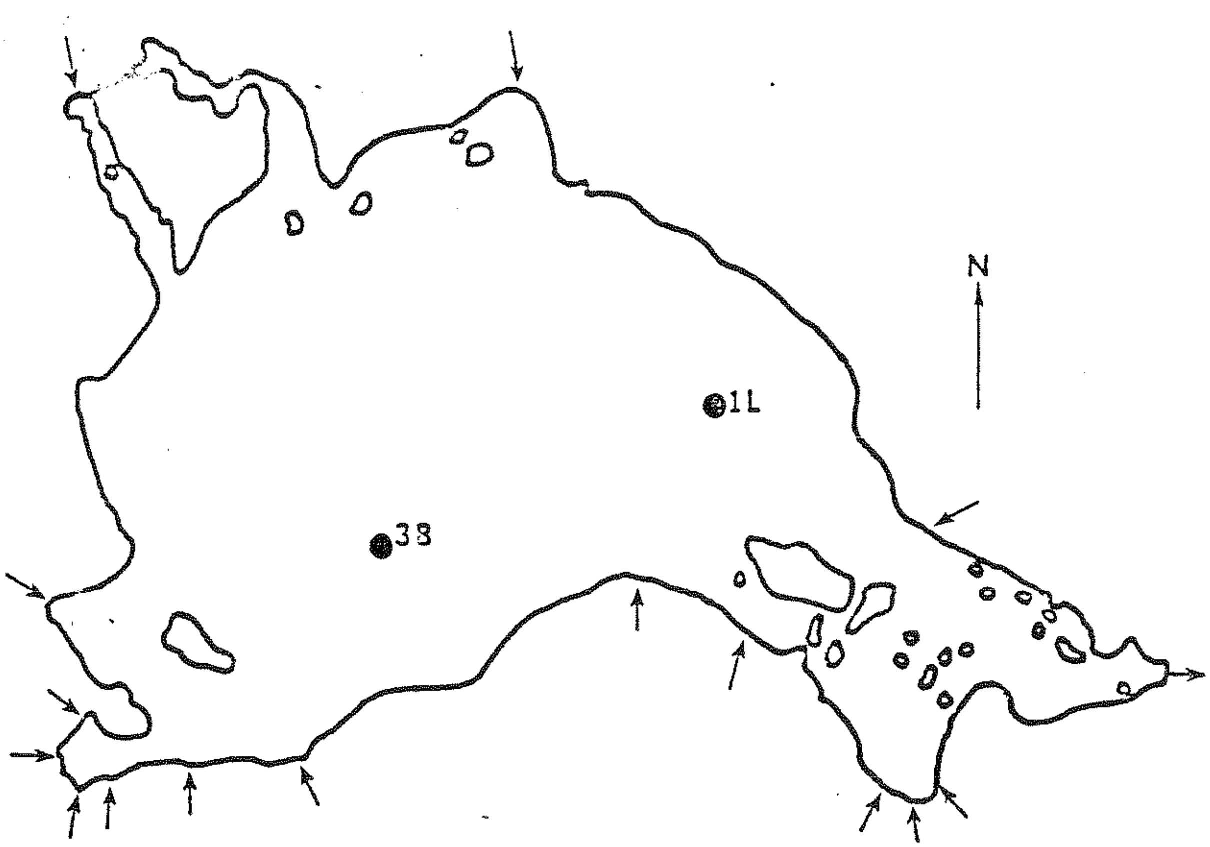

Figure 2. Bow Lake, Town of Strafford, New Hampshire. Outline map and location of 1985 sampling sites.

Water Transparency and Chlorophyll *a*

Water transparency (secchi disk depth), was in the range of 6.8 to 9.1 meters, with an average of 8.0 meters. At site 1, water transparency was low in the beginning of July, highest in mid-July, and lower in late August and early September. At site 3, water transparency was highest in early August and lowest in early September.

Chlorophyll *a* concentrations were in the range of 0.4 to 2.4 milligrams per cubic meter, with an average 1.2 mg per cubic meter. At site 1, chlorophyll was relatively high in the beginning of July, lowest in mid-July, and highest in late August and early September. At site 3, chlorophyll concentrations were highest in late August and early September.

An inverse relationship appears to exist between the water transparency and the chlorophyll *a* concentrations where the higher chlorophyll concentrations correspond to the shallower secchi disk depths. This indicates that the water transparency may be regulated largely by the phytoplankton populations. This relationship varies for different lakes, as dissolved water color also influences the secchi disk depth.

The water transparency and chlorophyll *a* concentrations indicate that Bow Lake is oligotrophic. In 1984, the water transparency was lower and the chlorophyll *a* concentrations were higher than in 1985. This may be due to differences in the weather for the two years, as similar results were found for many other lakes in the LLMP for 1984-1985.

Dissolved Water Color

The dissolved water color, which is the brown coloring of lakewater due primarily to dissolved humic acids, was very low on Bow Lake. Measured as the absorbance of light per 5 centimeters at 440 nanometers, it averaged 0.01. Values for water color remained relatively constant throughout the sampling season. Unlike the chlorophyll a concentration, the water color did not vary inversely with the secchi disk depth. This supports the idea that the water transparency on Bow lake may be influenced primarily by planktonic algae populations.

Total Phosphorus

Bow Lake was sampled twice for phosphorus. The concentration was 6.4 parts per billion (micrograms per liter) at site 1, and 4.4 at site 3. These levels indicate oligotrophic conditions, and that there is little nutrient loading into the lake.

pH

Frequent pH readings were taken in 1985. Epilimnetic pH values were in the range of 6.6 to 6.7 at both sites, and a surface reading taken after a rainstorm (August 30) was recorded at 5.7. The pH of the rain was 4.6. These data indicate that rain falling on the lake is acidic, but the pH of the epilimnion is still high enough so that organisms in the lake may not be affected yet. However, the pH as well as the alkalinity of Bow Lake should be carefully monitored in the future. Alkalinity results from the FBG are very low, suggesting that the pH of the lake may easily decrease in the future as the problem of acid rain persists (see "Results and Discussion of FBG Data").

RESULTS AND DISCUSSION OF FBG DATA

The Freshwater Biology Group (FBG) visited Bow Lake and tested it on several parameters on June 19 and August 27, 1985.

Temperature and Dissolved Oxygen

Bow Lake was thermally stratified at each site during both trips made by the FBG. The thermocline was found between 8 and 9 meters at both sites, and extended nearly to the bottom. Oxygen concentrations were high at the surface at both sites in June (approximately 9 parts per million, or ppm) and remained high to the bottom (above 7.0 ppm). Oxygen was less abundant in August when surface concentrations were approximately 8.0 ppm, and near depletion at the bottom. This is a result of increased respiratory activity by animals and plankton in the lake. The very low oxygen concentrations found at the bottom in August limit the growth and abundance of cold water fish and other aquatic animals. Distribution of such animals may vary over the course of the summer as oxygen concentrations change.

Water Transparency

Water transparency was high on Bow Lake. The average secchi disk depth measured by the FBG was 7.8 m at site 1, and 7.1 m at site 3. The water was more transparent in June than August. These results are comparable to those found by the lay monitors. Secchi disk depths in this range (oligotrophic) are typical of nutrient-poor conditions.

Chlorophyll a and Dissolved Water Color

Water transparency is regulated by three major factors: the planktonic algae in the water column (assessed by the chlorophyll a concentration), the dissolved water color, and suspended particles in the water column. By measuring two of these parameters, the chlorophyll a concentration and dissolved water color, the FBG can estimate the relative effect each has in influencing the secchi disk depth.

The average chlorophyll concentration was 1.6 mg/cubic m at both sites. Concentrations were slightly higher in August, corresponding to the lower water transparency on that date.

Dissolved water color was very low, with an average of 0.01. The same results were found by the lay monitors. Numbers in this range are very low, and represent the average for lakes in the LLMP. Both the dissolved water color and the low concentrations of chlorophyll help account for the high water transparency observed.

Total Phosphorus

Total phosphorus concentrations were in the range of 1.5 and 8.4 parts per billion (micrograms per liter), with an average of 6.7 at site 1 and 1.9 at site 3. At both sites, phosphorus levels were higher in June than in August. These values fall in the oligotrophic range and indicate that nutrient loading into the lake is low.

Alkalinity and pH

Surface values of alkalinity at both sites were in the range of 2.8 and 3.5 mg calcium carbonate per liter, and increased slightly towards the bottom (hypolimnetic range was 3.4 - 3.6 mg/l). The pH was in the range of 6.2 - 6.7 at the surface and 5.8 - 5.9 in the hypolimnion.

The alkalinity on Bow Lake is very low. Alkalinity measures the capacity of water to buffer acids, and is an important parameter to assess in New Hampshire where the rain is often acidic. The average for the state is approximately 9 milligrams per liter. A critical point occurs at alkalinity values of about 2 when there is little or no resistance of a lake to acidification. With little buffering capacity, the pH of the water is unstable and will decrease rapidly if further acid is added. Low pH can have adverse effects on animals in a lake. At a pH of 5.5 or lower, some species of fish and crustaceans fail to reproduce. Results from recent scientific literature have shown that adverse changes in the food chain affecting fish and invertebrates can occur at a pH as high as 5.9 (Schindler, 1985).

In Bow Lake, adverse effects of acidification may not be present at this time due to the relatively high pH. It is unusual that a lake with such low alkalinity has a pH in this range. This may be related to the relatively large volume of the lake, which allows for greater stability. Bow Lake has had pH and alkalinity values in the same range since at least 1979, when the New Hampshire Water Supply and Pollution Control Commission tested the lake on several parameters. Both pH and alkalinity should be carefully monitored in the future. Alkalinity may be a more reliable early indicator of lake acidification than pH, and a decrease in either parameter should prompt an investigation of possible effects of acidification on the lake.

Free Carbon Dioxide

At both sites, free carbon dioxide levels near the surface were very low (0.6 milligrams/liter). Carbon dioxide accumulated at the bottom (4.0 mg/l), which indicates production in the epilimnion.

Specific Conductivity

Bow Lake had very low specific conductivity. Values were slightly lower in June (average of 30.6 micromhos at both sites) than in August (average 31.8 micromhos), possibly due to increased activity on the lake as the summer progressed. Specific conductivity in this range indicate that low levels of raw sewage and/or road salt enter the lake.

Phytoplankton

Phytoplankton density was moderate on Bow Lake and was greater in August than June. During both test dates, phytoplankton density was higher at site 3 than site 1. In June, the epilimnetic density was 2556 cells per milliliter (cells/ml) at site 1 and 3144 cells/ml at site 3. The Chrysophyceae (golden algae) and Chlorophyceae (greens) were co-dominant at site 1, and the Chrysophyceae dominated at site 3. Ochromonas was the most abundant Chrysophyte at both sites. In August, the epilimnetic density was 2796 cells/ml at site 1 and 4568 cells/ml at site 3. The Prymnesiophyceae (Chrysochromulina) were dominant at both sites.

Zooplankton

The density of herbivorous zooplankton was moderate on Bow lake, with 19.5 animals per liter at site 1 in June. Kellicottia longispina and the calanoid copepods were the dominant organisms. Due to an error of the FBG, no zooplankton data are available for August.

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APPENDIX A

LLMP -- Lay Monitor Data: Bow Feb-20-86 13:05.20

Date	Lake	Site	SDD	Chl
Jul-18-84	Bow	1 Ledges	6.30	1.14
Aug-01-84	Bow	1 Ledges	5.40	1.00
Aug-23-84	Bow	1 Ledges	6.90	1.71
Jul-07-85	Bow	1 Ledges	7.33	1.14
Jul-15-85	Bow	1 Ledges	8.60	.71
Jul-22-85	Bow	1 Ledges	9.10	.43
Jul-31-85	Bow	1 Ledges	8.10	.57
Aug-25-85	Bow	1 Ledges	7.80	1.57
Sep-01-85	Bow	1 Ledges	6.80	1.57
Jul-11-84	Bow	3 Bennett	6.00	1.14
Jul-18-84	Bow	3 Bennett	5.80	2.28
Aug-01-84	Bow	3 Bennett	5.30	1.41
Aug-23-84	Bow	3 Bennett	6.70	1.43
Jul-15-85	Bow	3 Bennett	8.30	---
Jul-22-85	Bow	3 Bennett	8.60	.86
Jul-31-85	Bow	3 Bennett	7.30	.71
Aug-07-85	Bow	3 Bennett	8.70	.00
Aug-25-85	Bow	3 Bennett	8.10	1.71
Sep-01-85	Bow	3 Bennett	7.40	2.43

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APPENDIX B

LLMP -- Lay Monitor Data: Bow   Feb-21-86   11:57.43

Date	Lake	Site	Alk (ppm)	Tot-P
Jul-22-85	Bow	1 Ledges	---	6.4
Jul-22-85	Bow	3 Bennett	---	4.4

>>> END OF LIST <<<

NOTE

There are three levels of reports available to participating lake associations in the LLMP. They are differentiated as follows:

LEVEL I - This is a basic report that includes sections on the methods employed, comments and recommendations, and a brief summary of results. It also contains an appendix listing data from the present and past years.

LEVEL II - This is a mid-level report that includes methods employed, a non-technical summary of lay monitor and FBG data, comments and recommendations and an in-depth results and discussion section. It contains an appendix listing data from the present and past years.

LEVEL III - This is a full report which includes the following sections: methods employed, a non-technical summary, comments and recommendations, a technical summary, and a complete results and discussion section supplemented by computerized graphics. It also contains 3-4 appendixes: a listing of present-year and past data, limnological concepts and technical terms, and a glossary.