LONG ISLAND

LAKE LAY MONITORING PROGRAM

1984

Freshwater Biology Group (FBG)

University of New Hampshire

Durham

by

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Coauthored and edited by

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LLMP

To obtain more information about the Lake Lay Monitoring Program (LLMP) please contact Dr. Baker at (603)-862-2060 or Dr. Haney at (603)-862-2100.

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ACKNOWLEDGMENTS

Long Island has been a part of the Lake Lay Monitoring Program (LLMP) since 1983. Through the efforts of Mr. Edwin Hoffmann and dedicated lay monitors, the program continued strongly in 1984. Lay monitors on Long Island were:

Site 42 -- Edward and Todd Mezzanotte
Site 45 -- Phillip and Ginger Parsons
Site 49 -- Phyllis and Robert Wetherby
Site 50 -- Rita and Richard Fox
Site 53 -- Edward McGuire, Jr.
Site 57 -- Sarah Smith and Donald Stecher
Site 61 -- Dorothy and Edwin Hoffmann
Site 64 -- Dorothy and Edwin Hoffmann
Site 65 -- Larry Stack

We congratulate the lay monitors on the quality of their work and anticipate that the monitors will continue their efforts next year. We wish to thank Mr. Hoffmann and all the members of the Long Island Landowners Association for their time and effort. Also, we would like to thank the members of the association who provided boats for our field team.

Members of our Freshwater Biology Group included Kim Babbitt, Matt Boyle, Chris Brown, Emily LeViness, Deb Thunberg, and Jennifer Turner. Kim was team leader, and was responsible for coordination of field trips and data analysis and interpretation. Matt was responsible for phosphorus analysis, Chris for chlorophyll a analysis, Emily for phytoplankton, and Deb for zooplankton. All team members helped with data organization and filing, and also with field trips throughout the summer. In the fall, Sara Hubner helped with word processing and report organization.

The Office of Computer Services kindly provided computer time and data storage space for the Lake Lay Monitoring program. The final text was set with Wordstar on Northstar and Zenith microcomputers, and printed on a letter-quality Spinwriter.

Brief Non-technical Summary

1) Long Island is oligotrophic (high water quality) based on high water transparency (deep Secchi disk depth), and small amounts of algae (low chlorophyll a concentration).

2) The pH of near-surface waters was moderate, 7.2-7.3. pH remained above 6.4 throughout the entire water column. Alkalinity values were low, and should be monitored closely in the future.

3) Phosphorus concentrations were high. High phosphorus concentrations at Long Island may be related to human activity.

4) Secchi disk depths were deeper on the east side of the island throughout the summer. Water transparency was higher in 1983 than in 1984. More data is needed to determine if a trend of decreasing water quality is developing.

Comments and Recommendations for Long Island, 1984

1) The consistency of data collection by the lay monitors was excellent from July to the end of the sampling period. Efforts should be made to begin sampling earlier next year. Variations in trophic indicators (Secchi disk depth, chlorophyll a and total phosphorus) occur throughout the summer period. In order to monitor these variations properly, data should be collected throughout the entire summer (June-August). If feasible, more collections for chlorophyll a should be made.

2) A program of lay monitor alkalinity (buffering capacity) and pH testing should be initiated to assess the effects of acid precipitation on the lake. It is important to establish a data base for alkalinity and pH in order to detect changes in these parameters as early as possible. This could be accomplished by training at least one lay monitor on the use of the pH meter and the chemical test for alkalinity. A workshop on "Testing for the Effects of Acid Precipitation" will be offered by the Freshwater Biology Group at the University of New Hampshire in late May or early June.

3) To provide data on changes in water color throughout the season, we suggest lay monitors collect samples for dissolved water color. Water color decreases the water transparency, and thus effects the Secchi disk depth. A more accurate assessment of water quality based on Secchi disk depth can be made by knowing both the chlorophyll a concentration and the amount of dissolved water color. Water color samples consist of the filtrate from the chlorophyll a sample, and sampling can be done with essentially no additional cost. Details on the method for collection of dissolved water color samples will be provided on request.

4) Phosphorus values found by the FBG were high; in the mesotrophic to eutrophic range. Lay monitors should collect samples for phosphorus to try and determine point sources. Sampling should begin during spring run-off, when levels of phosphorus are likely to be high, and should continue throughout the summer. Sampling should be done at the highest level feasible. Sampling at two or three stations weekly or bi-weekly is preferred to sampling many sites less frequently.

Executive Summary for Long Island 1984

1) Long Island is oligotrophic based on low average chlorophyll a concentration (1.0 milligrams per cubic meter), and high average Secchi disk depth (7.3 meters). The density of phytoplankton was low (1674-1944 cells per milliliter), an indication of oligotrophic conditions. The dominant groups of phytoplankton were the Chrysophyceae, Cryptomonads, Cyanophyceae (blue-green bacteria) and Chlorophyceae. The presence of blue-green bacteria usually indicates eutrophic tendencies and may be related to high total phosphorus concentrations (see next paragraph). The density of herbivorous zooplankton, was moderate (9-10 animals per liter). The dominant group was the calanoid copepods.

2) The total phosphorus concentration was moderate (18.3 micrograms per liter) at site 49, and high (24.8 micrograms per liter) at site 64. Based on phosphorus, Long Island would be classed as mesotrophic to eutrophic. High total phosphorus values may be related to human activity.

3) The dissolved oxygen concentration was high, near or above 8.0 ppm throughout most of the water column. Such high oxygen concentrations in the late summer indicate oligotrophic conditions. Oxygen levels were well above the tolerance levels for cold-water fish, such as lake trout or land-locked salmon.

4) The pH of near-surface water was moderate, 7.2-7.3. pH values remained above 6.4 throughout the entire water column. The alkalinity was low, with an average of 4.3 milligrams calcium carbonate. The low level of alkalinity indicates that Long Island has a low capacity to resist the effects of acid precipitation. Data from Moultonboro Bay and Alton Bay suggest that the buffering capacity is decreasing in Lake Winnipesaukee. More data is needed to determine if a trend of decreasing alkalinity is developing at Long Island.

5) The specific conductivity was low (46.6 micromhos/cm). Chloride ion concentration was also low with an average of 1.8 parts per million. These values indicate low inputs of road salt and/or raw sewage.

6) Secchi disk depths were shallower this year than in 1983 during overlapping time periods (August-October). No chlorophyll a samples were taken in 1983, thus it is impossible to determine if the decrease in water clarity is due to an increase in algal production, or to other factors such as increased suspended sediments, or yearly variations in weather conditions. Continued monitoring is necessary to determine if a trend of decreasing water quality is developing.

METHODS OF LAY MONITORS

Lay monitors collected data on three parameters: thermal stratification, water clarity, and chlorophyll *a* concentration. Data were collected at weekly intervals whenever possible.

Thermal profiles were obtained by collecting lakewater samples at several depths with a modified Meyer bottle (Lind, 1979). Samples were obtained by lowering the empty but weighted bottle and sampling (by pulling out the stopper) at 1-meter intervals. The temperature of the samples was measured with Taylor pocket thermometers, and recorded in degrees Celsius.

Water clarity was measured while lowering an 8-inch (20 cm) Secchi disk and holding a view-scope just below the surface to eliminate the effects of surface reflection and wave-action. When the Secchi Disk disappeared the depth mark on the plastic suspension line was noted. The disk was raised until it just came into sight, and again the depth on the line was noted. The process was repeated two to three times, and an average between the two marks on the line (the point of disappearance and the point of re-appearance) was considered to be the Secchi Disk Depth (SDD), measured to the nearest one-tenth meter (0.1 meter) -- as for example, 5.2 meters. Readings were generally taken between 9 a.m. and 3 p.m., the period of maximum light penetration.

Chlorophyll *a* concentration was used as an estimator of algal biomass. A weighted tube 33 feet (10 meters) in length was used to collect an integrated water sample from the 'upper-lake' (epilimnion). The weighted end of the tube was slowly lowered to the interface of the epilimnion and the 'middle-lake' (metalimnion). The end of the tube was then bent double to shut off flow of air and water, and the weighted end of the tube (presently at the base of the epilimnion) was pulled up to the surface with a plastic line attached to it. The water in the tube (epilimnetic lakewater sample) was poured into a plastic bottle by placing the weighted end of the tube into the neck of the bottle and, while keeping the bent-off end above the weighted end, unbending the upper end (allowing the sample to discharge into the bottle).

Water samples were filtered through a membrane filter with a porosity of 0.45 microns. The damp filters containing chlorophyll-bearing algae were air dried for at least 15 minutes to prevent decomposition. Filtration and drying were done in the shade to minimize destruction (by bleaching) of chlorophyll. The dried filters were then sent to UNH for analysis. [In Durham, members of the Freshwater Biology Group extracted chlorophyll in 90% acetone saturated with magnesium carbonate, and read the absorbance of the sample at standard wavelengths (663 and 750 nanometers).

METHODS OF FRESHWATER BIOLOGY GROUP (FBG) TEAM

The same as well as additional parameters were investigated by the FBG research team. The additional factors were primarily measurements of sunlight penetration into the lakewater, and water chemistry. The latter included dissolved oxygen, 'free' (unbound) carbon dioxide, pH, specific conductivity, chloride ion, and total phosphorus. In addition, the microscopic plants (phytoplanktonic algae) and animals (zooplanktonic invertebrates) were identified. Relative or absolute counts were made.

Dissolved oxygen and temperature were measured with a Yellow Springs Instruments Model 54A Oxygen/Temperature meter with a submersible probe. Readings were taken at 1-meter intervals throughout the 'upper-lake' (epilimnion) and 'lower-lake'(hypolimnion), and at half-meter intervals through the 'middle-lake' (metalimnion).

Sun- and skylight penetration into the lakewater was measured at 1-meter intervals with a Whitney submersible photometer model LMA-8A, and the relative light intensity was recorded. Measurements were taken on the sunny side of the boat.

Dissolved water color was measured by reading the absorbance of filtered lakewater (0.45 micron) at 440 and 493 nanometers, in a Bausch and Lomb Spectronic 710 with a 15 cm path length.

Water chemistry (alkalinity, 'free' (unbound) carbon dioxide, pH, and specific conductivity and chloride ion) samples were collected with a 3-liter Van Dorn bottle. Alkalinity, free carbon dioxide and pH samples were stored on ice in 250 ml polyethylene bottles, and were analyzed in the field within 1 to 2 hours. Specific conductivity and chloride ion samples were analyzed in the lab, at room temperature.

Alkalinity was determined titrimetrically with 0.002 N sulfuric acid to a final pH of 4.5, with a combination solution of the two dyes bromocresol green and methyl red as the end-point indicator (E.P.A.,1979). Alkalinity is expressed as equivalents of calcium carbonate.

Free (unbound) carbon dioxide concentration was determined by titrating the fresh lakewater samples with 0.0027 N NaOH to a final pH of 8.3, and with 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 equipped with model B-10 probe (cell constant = 1.0). Correction for sample temperature was made with a standard curve.

Chloride ion concentration was measured with a pH meter (Corning Model 10) equipped with a chloride electrode (Orion model 94-17B) and a double junction reference electrode (Orion Model 90-02). Standard curves were prepared every 2 hours during laboratory analysis.

Samples to be analyzed for total phosphorus, phytoplankton, and chlorophyll a were collected with a vertical 'tube' sampler. Chlorophyll a samples were filtered, dried and analysed in the same manner as those collected by lay monitors.

Total phosphorus samples were stored on ice in acid-washed 250 ml polyethylene bottles, and were fixed within 1 to 2 hours with 1.0 ml concentrated sulfuric acid. In Durham, the FBG members digested the total-phosphorus by adding ammonium persulfate and auto-claving the samples for at least 45 minutes. Finally, the phosphorus content of the samples was analyzed with the single-reagent method that included a fresh solution of ascorbic acid and potassium antimony tartrate (E.P.A., 1979). Absorbance of the blue phosphorus complex was measured spectrophotometrically at 650 nm.

Phytoplankton samples were fixed with iodine (Lugol's Solution) in the field, within 1 to 2 hours after collection. Phytoplankton were counted with a Unitron 'inverted' microscope after settling the samples for 24 hours in counting chambers. At least 200 individual algal 'units' were counted with a modified scan technique (Baker, 1973).

Zooplankton density was estimated in samples collected by towing up a plankton net (30 cm diameter, 150 micron porosity) through the oxygenated (>0.5 ppm) portion of the lake. Samples were fixed after collection with a 4% formalin-sucrose solution (Haney and Hall,1973), and subsampled with a 1-ml Hensen-Stemple pipet. Sufficient subsamples were taken to insure that at least 100 microcrustaceans were counted.

RESULTS AND DISCUSSION OF LAY MONITOR DATA

Lay monitor research was conducted separately from Freshwater Biology Group (FBG) research, thus the results are presented separately. Nine sampling sites were active on Long Island (Fig. 1). The lay monitor raw data for 1984 are presented in Appendix A.

Lay monitors collected information on three parameters: water transparency (Secchi disk depth), productivity (chlorophyll a), and thermal stratification. Information on thermal stratification is used primarily to determine the sampling depth of the chlorophyll a sample.

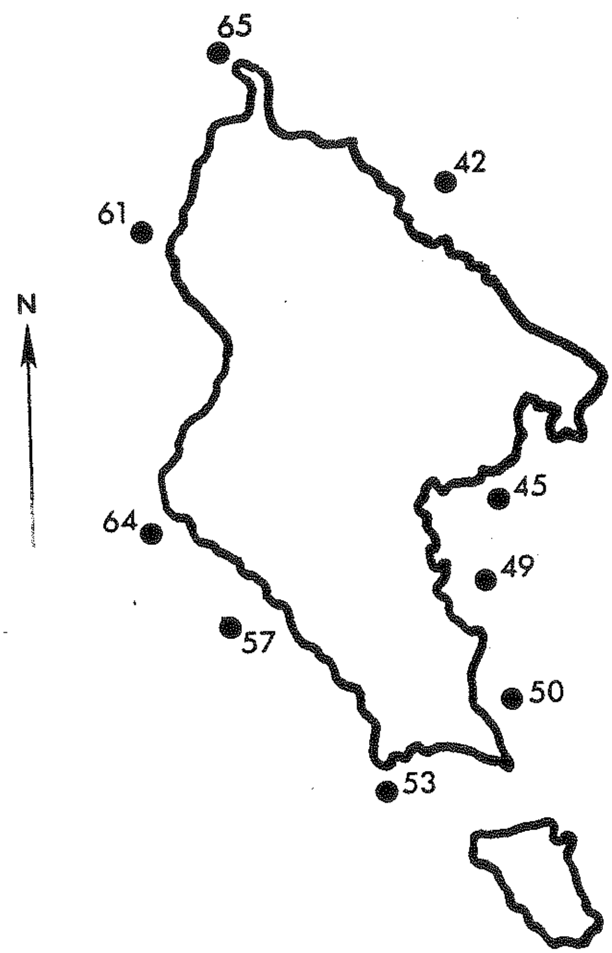

Figure 1. Long Island, Lake Winnipesaukee, New Hampshire. Outline map and location of 1984 sampling sites.

Secchi Disk Depth (Lay monitor)

The water clarity at Long Island was high, with an average of 7.3 meters, and a range 5.3-10.0 meters. On a seasonal basis, the sites on the western side on Long Island (57, 61 and 64) generally had the deepest Secchi disk depths (Table 1). Sites on the eastern side (45, 49, 50) had the lowest Secchi disk depth, and the sites at the tips of the island (53 and 65) had Secchi disk values between those found on the east and west sides. Generally, Secchi disk depths were lowest in July and highest in August.

Chlorophyll a (Lay monitor)

Chlorophyll a samples were not collected consistently throughout the sampling season, thus seasonal trend in chlorophyll a concentrations cannot be determined. Chlorophyll a concentrations were in the range 0.4-2.4 milligrams per cubic meter. The highest chlorophyll a concentration was found at in July at site 45. Generally highest chlorophyll a concentrations were found in the early part of the sampling season (Table 1).

Table 1. Comparison of Secchi disk depth (SDD) and chlorophyll a (chl a) for 1984. (SDD=meters, Chl a=mg/cubic meter)

		June	July	Aug	Sept	Oct
Site 42	SDD	---	6.4	6.9	6.4	---
	Chl a	---	2.3	1.3	0.5	---
Site 45	SDD	6.0	6.7	7.4	6.4	6.8
	Chl a	---	1.6	0.9	---	1.4
Site 49	SDD	6.7	6.2	6.9	6.3	---
	Chl a	---	0.8	0.9	0.9	---
Site 50	SDD	---	5.9	7.6	---	---
	Chl a	---	---	---	---	---

Table 1 cont.		June	July	Aug	Sept	Oct
Site 53	SDD	---	7.9	7.3	---	---
	Chl a	---	---	---	---	---
Site 57	SDD	---	7.4	8.9	8.0	---
	Chl a	---	1.1	---	---	---
Site 61	SDD	---	8.2	8.6	8.8	---
	Chl a	---	---	0.8	0.5	---
Site 64	SDD	---	8.6	8.9	8.5	---
	Chl a	---	1.4	0.9	0.6	---
Site 65	SDD	---	7.6	8.2	---	---
	Chl a	---	---	1.7	---	---

Discussion of Lay Monitor Data

Based on deep Secchi disk depth, and low chlorophyll a concentration, Long Island would be classed as oligotrophic.

Water clarity was greater on the west side of the island. This may be due to greater amounts of suspended solids on the east side because of more human activity on that side of the island. Lower water clarity on the east side of the island may also be influenced by wind action and differences in lake morphology from one side of the island to the other.

Compared to Secchi disk depths taken from August to October in 1983, Secchi disk depths in 1984 were generally shallower. Because no chlorophyll a data is available for 1983, it is impossible to know if the decrease in water clarity is due to an increase in algal growth. Continued monitoring is necessary to determine if a trend of decreasing water quality is developing.

RESULTS AND DISCUSSION OF FRESHWATER BIOLOGY GROUP DATA

Temperature and Dissolved Oxygen (FBG)

Long Island was thermally stratified at both test sites on August 24, the FBG test date. The epilimnetic-metalimnetic interface was relatively deep, 6.5 meters at site 49 and 8.0 meters at site 64, indicating that Long Island is exposed to the mixing forces of the wind.

Dissolved oxygen concentrations were above or near 8.0 ppm throughout most of the water column. Concentrations below 4.0 ppm, the lower tolerance level for cold-water fish, were only found in the last half meter of water. Such high oxygen concentrations late in the summer indicate oligotrophic conditions.

Water Clarity and Dissolved Color (FBG)

The Secchi disk depths measured by the FBG were 8.1 meters at site 49 and 7.3 meters at site 64. These values are in the oligotrophic range.

Dissolved water color (absorbance per 15 cm. at 440 nm.), primarily due to humic acids, was .011 at site 49 and .008 at site 64. These values are low compared to other lakes in the LLMP. The effect of having low water color is a high water transparency, and thus a high Secchi disk depth.

Chlorophyll a (FBG)

Chlorophyll a concentrations measured by the FBG were 1.1 micrograms per cubic meter at site 49 and 1.4 micrograms per cubic meter at site 64.

Total Phosphorus

Total phosphorus is usually the most limiting (least abundant) nutrient to algae in freshwater systems. Phosphorus regulates algal productivity and therefore regulates chlorophyll a concentration, and indirectly (through chlorophyll a) influences water transparency. Increases in algal growth may occur with increases of phosphorus loading. The total phosphorus concentration was moderate (18.3 micrograms per liter) at site 49 and high (24.8 micrograms per liter) at site 64. These values are surprising considering the low chlorophyll a concentrations. Based on total phosphorus concentration, Long Island would be classed as mesotrophic to eutrophic.

Alkalinity, pH, and Free Carbon Dioxide

The pH values of near-surface water was in the range 7.2-7.3. pH values were above 6.4 throughout the entire water column. Alkalinity was low, with an average of 5.3 milligrams calcium carbonate. Low levels of alkalinity indicate that Long Island has a low capacity to resist the effects of acid precipitation. Data from Moultonboro Bay and Alton Bay suggest that the buffering capacity is decreasing in Lake Winnipesaukee. More data is needed to determine if a trend of decreasing alkalinity is being established at Long Island.

Free carbon dioxide accumulated in the hypolimnion, lowering the pH of the lakewater in that depth zone. The low amount of accumulated free carbon dioxide is an indication of low productivity.

Specific Conductivity and Chloride Ion

The specific conductivity at Long Island was low, with an average of 46.6 micromhos per centimeter from all depths at both sites. The chloride ion concentration was also low, with an average of 1.8 parts per million. These low values indicate that Long Island is receiving low inputs of road salt and/or raw sewage.

Phytoplankton

The density of phytoplankton was low (1674-1944 cells per liter), an indication of oligotrophic conditions. The dominant phytoplankton groups at Long Island on August 24 included the Chrysophyceae (*Chrysochromulina*), Cryptomonads (*Chroomonas*), Cyanophyceae (blue-green bacteria) and the Chlorophyceae (*Polytoma*, *Sphaerocystis*). The presence of blue-green bacteria usually indicates eutrophic tendencies, and may be related to the high total phosphorus concentrations.

Zooplankton

The density of herbivorous crustacean zooplankton was moderate, (9 animals per liter) at site 49 and (10 animals per liter) at site 64. The dominant group at both sites was calanoid copepods. *Diaphanosoma* was also of numerical importance at site 64.

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APPENDIX A

LLMP 1984 -- Lay Monitor Data: Long Island (Winnipesaukee)

Jan-29-85 15:30.13

Date	Lake	Site	SDD	Chl
Jul-23-84	Winnipesaukee	42 Ene Li	6.00	2.26
Jul-30-84	Winnipesaukee	42 Ene Li	6.70	---
Aug-05-84	Winnipesaukee	42 Ene Li	6.50	1.22
Aug-12-84	Winnipesaukee	42 Ene Li	6.60	---
Aug-20-84	Winnipesaukee	42 Ene Li	7.00	1.41
Aug-26-84	Winnipesaukee	42 Ene Li	7.50	---
Sep-03-84	Winnipesaukee	42 Ene Li	6.80	.48
Sep-09-84	Winnipesaukee	42 Ene Li	6.00	---
Jun-26-84	Winnipesaukee	45 Ese Li	6.00	---
Jul-02-84	Winnipesaukee	45 Ese Li	6.25	---
Jul-10-84	Winnipesaukee	45 Ese Li	6.50	.86
Jul-15-84	Winnipesaukee	45 Ese Li	6.25	---
Jul-22-84	Winnipesaukee	45 Ese Li	7.00	2.36
Jul-31-84	Winnipesaukee	45 Ese Li	7.25	---
Aug-05-84	Winnipesaukee	45 Ese Li	7.00	---

Aug-07-84	Winnipesaukee	45 Ese Li	7.50	1.00
Aug-13-84	Winnipesaukee	45 Ese Li	7.50	---
Aug-20-84	Winnipesaukee	45 Ese Li	7.50	.78
Aug-28-84	Winnipesaukee	45 Ese Li	7.25	---
Sep-04-84	Winnipesaukee	45 Ese Li	6.50	---
Sep-10-84	Winnipesaukee	45 Ese Li	6.50	---
Sep-18-84	Winnipesaukee	45 Ese Li	6.00	---
Sep-24-84	Winnipesaukee	45 Ese Li	6.50	---
Oct-01-84	Winnipesaukee	45 Ese Li	6.75	1.43
Oct-09-84	Winnipesaukee	45 Ese Li	6.25	---
Oct-16-84	Winnipesaukee	45 Ese Li	7.25	---

Jun-26-84	Winnipesaukee	49 GrBths	6.70	---
Jul-03-84	Winnipesaukee	49 GrBths	6.60	---
Jul-10-84	Winnipesaukee	49 GrBths	5.80	---
Jul-17-84	Winnipesaukee	49 GrBths	5.80	---
Jul-23-84	Winnipesaukee	49 GrBths	6.50	.77
Jul-31-84	Winnipesaukee	49 GrBths	6.50	---
Aug-07-84	Winnipesaukee	49 GrBths	6.90	1.00
Aug-12-84	Winnipesaukee	49 GrBths	7.00	---
Aug-21-84	Winnipesaukee	49 GrBths	6.80	.71
Aug-27-84	Winnipesaukee	49 GrBths	6.80	---
Sep-04-84	Winnipesaukee	49 GrBths	6.50	1.21
Sep-10-84	Winnipesaukee	49 GrBths	5.30	---
Sep-18-84	Winnipesaukee	49 GrBths	6.20	.61
Sep-24-84	Winnipesaukee	49 GrBths	7.00	---
Oct-16-84	Winnipesaukee	49 GrBths	7.60	.93

Jul-10-84	Winnipesaukee	50 Se Li	5.70	---
Jul-21-84	Winnipesaukee	50 Se Li	6.40	---
Jul-28-84	Winnipesaukee	50 Se Li	5.70	---
Aug-06-84	Winnipesaukee	50 Se Li	7.50	---
Aug-15-84	Winnipesaukee	50 Se Li	8.00	---
Aug-27-84	Winnipesaukee	50 Se Li	6.70	---
Jul-16-84	Winnipesaukee	53 South	7.75	---
Jul-30-84	Winnipesaukee	53 South	8.00	---
Aug-06-84	Winnipesaukee	53 South	7.75	---
Aug-14-84	Winnipesaukee	53 South	7.50	---
Aug-27-84	Winnipesaukee	53 South	6.75	---
Jul-01-84	Winnipesaukee	57 Downing	7.10	---
Jul-14-84	Winnipesaukee	57 Downing	7.60	---
Jul-22-84	Winnipesaukee	57 Downing	7.20	---
Jul-28-84	Winnipesaukee	57 Downing	7.60	1.12
Aug-05-84	Winnipesaukee	57 Downing	8.10	---
Aug-11-84	Winnipesaukee	57 Downing	8.20	---
Aug-18-84	Winnipesaukee	57 Downing	8.80	---
Aug-26-84	Winnipesaukee	57 Downing	10.00	---
Sep-03-84	Winnipesaukee	57 Downing	7.60	---
Sep-09-84	Winnipesaukee	57 Downing	8.60	---
Sep-16-84	Winnipesaukee	57 Downing	8.50	---
Sep-23-84	Winnipesaukee	57 Downing	7.30	---
Sep-29-84	Winnipesaukee	57 Downing	8.00	---

Oct-07-84	Winnipesaukee	57 Downing	7.90	---
Oct-14-84	Winnipesaukee	57 Downing	7.40	---
Oct-21-84	Winnipesaukee	57 Downing	6.40	---

Jul-02-84	Winnipesaukee	61 West Pt	8.60	---
Jul-09-84	Winnipesaukee	61 West Pt	7.50	---
Jul-17-84	Winnipesaukee	61 West Pt	7.90	---
Jul-23-84	Winnipesaukee	61 West Pt	8.10	---
Jul-28-84	Winnipesaukee	61 West Pt	8.80	---
Aug-06-84	Winnipesaukee	61 West Pt	7.60	---
Aug-11-84	Winnipesaukee	61 West Pt	8.20	---
Aug-12-84	Winnipesaukee	61 West Pt	8.60	.71
Aug-20-84	Winnipesaukee	61 West Pt	8.80	---
Aug-27-84	Winnipesaukee	61 West Pt	9.25	.79
Sep-11-84	Winnipesaukee	61 West Pt	8.80	.36
Sep-17-84	Winnipesaukee	61 West Pt	9.70	---
Sep-23-84	Winnipesaukee	61 West Pt	7.90	.60

Jul-02-84	Winnipesaukee	64 Jon Ldg	9.25	---
Jul-09-84	Winnipesaukee	64 Jon Ldg	8.80	---
Jul-17-84	Winnipesaukee	64 Jon Ldg	7.60	---
Jul-23-84	Winnipesaukee	64 Jon Ldg	8.60	---
Jul-28-84	Winnipesaukee	64 Jon Ldg	8.60	1.39
Aug-06-84	Winnipesaukee	64 Jon Ldg	8.40	---
Aug-12-84	Winnipesaukee	64 Jon Ldg	9.40	.93
Aug-20-84	Winnipesaukee	64 Jon Ldg	8.85	---

Aug-27-84	Winnipesaukee	64 Jon Ldg	9.10	.84
Sep-11-84	Winnipesaukee	64 Jon Ldg	9.20	.52
Sep-17-84	Winnipesaukee	64 Jon Ldg	8.40	---
Sep-23-84	Winnipesaukee	64 Jon Ldg	7.90	.64
Jul-23-84	Winnipesaukee	65 North	7.30	---
Jul-30-84	Winnipesaukee	65 North	7.90	---
Aug-04-84	Winnipesaukee	65 North	7.80	1.71
Aug-13-84	Winnipesaukee	65 North	8.50	---
Aug-21-84	Winnipesaukee	65 North	8.20	---

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