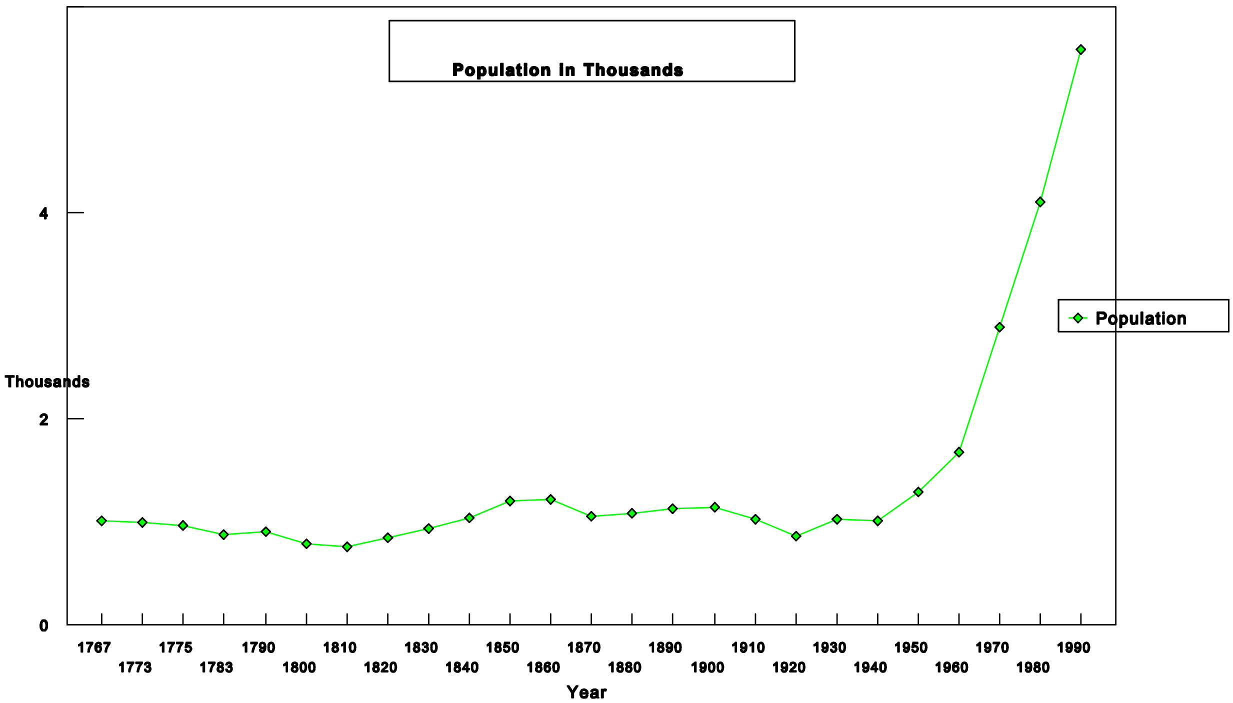
CHAPTER II HISTORICAL DATA

A. Kingston Historic Narrative

The following historic narrative was furnished by the Great Pond CAC who researched



and compiled it.

***KINGSTON** was described in the 1823 New Hampshire Gazetteer as being located in Rockingham County, "situated in lat. 42°55' 15", and bounded on the North by Brentwood, East by East-Kingston, South by Newtown[1] and Plaistow, and on the West by Hampstead and Hawke[2].*

[1] Newton.

[2] Danville.

It is distant from Concord 37 miles, from Exeter 6, from Portsmouth 20, and contains 12,188 acres, of which 800 are supposed to be water. There are several ponds in this town. The largest is Great pond, which lies on the west of the village, and contains upwards of 300 acres, with an island of 10 or 12 acres covered with wood[3]. Country Pond, in the south east and partly in Newtown, contains about 200 acres, and also has an island of 6 or 8 acres covered with wood. The other ponds are called Little, Moon[4], Long and Barberry[5] ponds. Near the center of the town is an extensive plain, on which is situated the principal village, the meeting-house, and the academy. There are no high hills in Kingston; those called the Great hill and Rockrimmon are the highest. The former is on the post-road to Exeter; the latter on the west of the plain near Hawke line, and is a body of granite extending over 20 or 30 acres, mostly covered with soil and a growth of wood. On its west side is an abrupt decent of nearly 100 feet to the plain. The soil of Kingston is generally loamy bottomed on sand and gravel, though in some places clay predominates. The plain is a rich loam and very fertile. The rocks are mostly granite, although green porphyry, and fragments of many other kinds may be seen. No metallic ores have been discovered excepting iron, and that principally bog ore, found in Great pond and the swamps. This was formerly wrought in considerable quantities, but with no great success. In some places red and yellow ochre have been found of a quality suitable for paint. The natural growth of wood was principally of the various kinds of oak and other hard timber, with cedar in the swamps. The Charter of Kingston was granted by Lt. Governor Usher, on August 6, 1694, to James Prescott, Ebenezer Webster and others, from Hampton. The grant also included what now forms the towns of East-Kingston, Hawke, and Sandown. Soon after the grant was made, the proprietors erected garrison houses on the plain, and commenced the cultivation of their lands. They were discouraged, however, from the dangers and difficulties of the succeeding hostilities, and many of them returned home within two years. After the war was concluded, they renewed their enterprise, but it was not until 1725, that they were able to procure the settlement

[3] Originally called Webster’s Island, now known as Clark’s Island.

[4] Now known as Half Moon Pond.

[5] Now known as Bayberry Pond.

of a minister. Before the settlement of Hampton[6]*, the Indians*[7] *gathered there for the variety of fish found in the ponds. During the wars, they (the Indians) were extremely troublesome to the inhabitants, and several were killed. In 1707, Stephen and Jacob Gilman, brothers, were ambushed between Kingston and Exeter, but fortunately escaped to the garrison. In 1712, Stephen Gilman and Ebenezer Stevens were wounded at Kingston, the former taken and put to death. Sept. 7, 1724, Jabez Colman and his son were killed while at work in their field. Four children were also taken, one escaped, and the others were afterwards redeemed. Many Indian implements, with some ancient French coin, have been ploughed up in the vicinity of the ponds, such as jasper and quartz arrow heads, axes, gouges, and hammers of different kinds of stones. This town is generally healthy*[8]*, though it has afforded no remarkable instances of longevity. Rev. Ward Clark was the first settled minister of Kingston, though religious services had been regularly performed for several years previous to his settlement by Rev. Mr. Choate from Ipswich. Mr. Clark was ordained in 1725, and died in 1737, aged 34. He was succeeded by Rev. Joseph Secombe, a learned divine, who died in 1760. In the year following, Rev. Amos Tappan was ordained, he died in 1771. In 1776, Rev. Elihu Thayer, D.D. was installed, who preached until 1812., and died aged 65. Rev. John Turner, was installed over a new congregational society in 1818. Major Ebenezer Stevens, one of the early settlers, was a very distinguished and useful citizen; and such was his integrity and benevolence, that differences among the people were submitted to his decision with perfect confidence. He sustained many important public functions, and discharged every duty with ability and faithfulness. His descendants now live in Kingston. This town was also the residence of the Hon. Josiah Bartlett*[9]*, one of the first worthies of the state,* and *an eminent physician. He commenced his practice in Kingston in 1761, and soon acquired a reputation for great skill, particularly in the treatment of the cynanche*

[6] Kingston was originally part of Hampton.

[7] Probably of the Algonquin or Abnaki group which was made up of sub tribes such as: Squamscotts, Piscataquas or Amoskeags, related to the Huron who were allied with the French accounting for the existence of French coins mixed with the Indian artifacts.

[8] It was common practice to note the ages of the oldest citizens in the various towns.

[9] Josiah Bartlett was one of signers of the Declaration of Independence from New Hampshire

malligna, or throat distemper, then so prevalent and mortal. His public career commenced in 1765, and from that time to his death he was an unwearied advocate and supporter of the liberties of America. He was for some time chief justice of the colony, afterwards president of the state, and the first governor under its free constitution. He died May 19, 1795, at the age of 65 years. Population in 1823 was 847."

B. Historical Development and Early Uses

Industry developed around the plains area of Kingston. Several carriage shops, which Kingston was known for, and at least one wheelwright shop were located on the perimeter of the plain. The town map from 1856 also shows carriage and wheelwright shops along Main Street from the north end of the plain to Chase Street. A cooperage was located on the south side of Chase Street roughly half way to Church Street. These industries needed a constant supply of wood for their business to prosper. The abundance of water required to power various saw and grist mills necessitated the construction of dams to control the water as it flowed through Kingston on its way to the Atlantic.

In fact, Great Pond had an earthen dam at a very early date in the town's history; the existence of the stone wall from Clark's Island to the eastern shore of Great Pond indicates that Great Pond did not exist in today's configuration, but was enlarged at a very early date by the erection of a dam at Folly Brook. Today one can find remnants of a road that stretched from Nichol's Ridge to the vicinity of Clark's Island. This suggests that the road existed before the pond was dammed and covered both the aforementioned stone wall and this road.

Dams and mills dotted the local water courses from the head waters to the Massachusetts border and beyond. Most of the dams along Kelly and Folly brook were built in the early to mid 1800's. Lumber to feed the saw mills was supplied locally from wood lots located near the mills and within the watersheds of the ponds and streams that supplied the power to the mills. Much of the surrounding area was cleared for farming and the lumber operations. During the early part of this century the area known as Great Pond Park was logged for the box board industry which was flourishing at the time of World War I. There is evidence that even Clark's island, formerly known as Webster's island, was logged around 100 years ago.

It appears that there has been a saw mill in West Kingston since the very early days of the Town's existence. During those years when the King of England offered grants to encourage settlement in the colonies, the Page family was granted the site where the Cheney Mill still stands. One only has to visit the Cheney Mill, formerly known as the Squire John Page Mill, during the early spring when the water is high to see what it was like in those early years when water driven mills operated all along the rivers and streams of early New England. The impact of these mills on the local economy cannot be overestimated.

Iron ore operations took place in the Kingston area as well. Indeed, a very deep hole in the bottom of the pond northwest of Clark's Island is an artifact of the iron mining. Tanning, an industry that depended on water for its existence, may have operated in West Kingston around the late 1700's. A series of man-made ponds at the northeast end of Great Pond lend evidence to the existence of a tanning operation. An ice harvesting operation existed at the northeast corner of Great Pond, evidently run by the Modlick family. The ice house was located at the end of Modlick Road behind Clark's Fuel Oil business on the west side of the plains. Starting around 1925 and until the late 1940's and early 1950's the poultry business, known as the Broiler Industry, was a million dollar industry in Kingston. The Christie and Nichol's poultry operations were by far the largest in the area supplying hatching eggs and chicks around the world.

C. Recreational Development

During the early part of the century, the textile operations that were the predominant industry in New England moved to the southern states leaving the local economy in a precarious position. Many of the large homes in Kingston were opened to tourists. On April 19, 1930, Arthur Robbins opened Greenwood Lake Lodge as a hotel on Greenwood Lake (Little Pond). (Greenwood Lake originally flowed to the north and east until a "canal" was built to connect it to Great Pond.) Summer visitors to Kingston arrived by train and were met at the depot in East Kingston by carriages or automobile to be brought to the various accommodations in Kingston.

It was during these times of increased tourism that many of the architectural facades of New England villages turned white. To attract tourists to the area, many towns encouraged home owners to paint all or most of the dwellings white and some dealers sold white paint at greatly reduced prices to help create the “cute little white painted New England village” that Kingston remains to this day.

Camp Lincoln was established off Ball Road on the west shore of Great Pond in 1924 by the Rockingham County YMCA as a boys residence camp accommodating 40-50 youngsters at a time. During the 1960s ten camper cabins were added as well as a new beach area. An administration building and an arts and crafts building were also added during this time period. The camp was transferred to the New Hampshire YMCA in the mid 1970s, and in 1981 the struggling residential camping program was discontinued and a day camp program was substituted resulting in an attendance of over 300 children per week. 1935 saw the establishment of another children’s camp called Camp Zouka, now known as Pine Acres (and formerly known as Secomb Shore around 1900), on the eastern shore of Great Pond. And in 1941, yet another camp, Treasure Lea, was established adjacent to Camp Zouka for boys and girls aged 4-14.

Yet another change took place on Great Pond in November of 1933 when the Peaslee heirs convinced the state forestry department to purchase about forty acres to become what is today Kingston State Park. Plans were formulated under the direction of a land beautification expert hired from New Jersey to create over five years: a “natural” amphitheater with seating for up to 400 people, a toboggan slide that would run onto the lake, an archery course, skating cabins, a clay pigeon shooting course, tennis courts, a baseball field near the park entrance and an administration building and bath house. This was to be in addition to existing facilities which at that time included a red cross cabin (first aid), a shelter cabin, a diving raft and a protected swimming area. Parking for 300 cars was also present at the park. According to newspaper accounts[10] 90 men were engaged to clear brush and construct a septic system. Sand was hauled from the other side of the pond to extend the beach about 15 feet. A well was also constructed to supply fresh water. An estimated 1500 visitors were expected on a fair Sunday. In 1955, a bill in the New Hampshire Legislature for reconstruction of the Hampton sea wall was amended to

[10]Haverhill Evening Gazette, Nov 1933-Aug 1934

include free entrance to residents of Kingston to the State Park except for Sundays and holidays. This statute is still in effect and honored to the present day.

Activity in the area of Great Pond Park, a now large residential development, was confined to lumber operations until the late 1920s when William Lavin and his wife Mary sold to the Town of Kingston the land which is now known as Great Pond Road. The Lavins had purchased the complete parcel earlier from Edward Merrill on February 28, 1928. Small lots were designed (20' X 80') and roads were laid out on a plot plan that were neat and straight, largely ignoring such things as granite boulders the size of automobiles. The lots were flexible as well. Boundary markers were as easily moved as installed, often remaining within a short distance from the original location. This “flexibility” resulted in at least three plot plans being on record in Exeter, none of which bear any resemblance to the existing conditions in Great Pond Park. Lots were sold singly or in groups, for cash or goods. Legend persists that a can of beans could get you a lot in Great Pond Park. The area was primarily summer cottages until the 1960’s when some cottages became year round residences. There are now approximately 150 cottages in Great Pond Park, most of which remain summer camps.

Following the growth in tourism in Kingston that began in the 1930s, and the conversion of summer homes to year-round residences in the 1960s, the population of Kingston skyrocketed. After over 150 years of a stable population of just over 1000 citizens, the town population grew to nearly 6000 residents by 1990 (Figure II-1). This growth undoubtedly links to changes in the quality of the Great Pond watershed and its surface waters.

D. Historical Water Quality

1. Water Quality Surveys

a. New Hampshire Fish and Game Surveys. Great Pond was surveyed by the New Hampshire Fish and Game Department in 1938 (NHFGD, 1970). At that time, Great Pond was reported to be brown in color, to have a transparency to only 5 feet (1.6 meters), and a bottom composition of 85% mud and 15% gravel. Emergent vegetation was abundant and submerged vegetation was common; the shores were noted as being “100 percent wooded”. Fish and Game survey data is reported in Table II-1.

Table I-1
Great Pond Water Quality
NH Fish and Game Survey - June 7, 1938

Depth (feet)	Temperature (°F)	pH (units)	Oxygen (ppm)	ANC (M.O.ppm)	CO_2 (ppm)
0	69	6.8	--	8	--
10	66	7.0	7.8	11	6
20	60	6.2	5.2	10	5
30	56	6.2	2.4	9	8
40	52	6.2	0.6	10	16

The pond was stocked with mixed sizes of smallmouth bass in 1938,1939,1951,1952 and 1955. Yellow perch were stocked in 1940, and horned pout of mixed sizes were stocked in 1940, 1941, and 1950. Chain pickerel and white perch were also noted as being present in the pond. The Fish and Game Department noted that the lake is excellent for pan-fish and best suited for warm water fish since its oxygen was quite low. Historic Fish and Game data is summarized in Appendix II-1.

b. New Hampshire Department of Environmental Services Surveys. The New Hampshire Department of Environmental Services (NHDES) conducted a comprehensive limnological survey on Great Pond on July 26, 1976. The survey found a water transparency of 3.3 meters and a chlorophyll-*a* concentration of 4.85 µg/L. Bottom dissolved oxygen at a depth of 12.8 meters was 0.1 mg/L, and the lake was stratified into three layers. Biologists noted that emergent vascular plants were abundant. Epilimnetic total phosphorus was 23 µg/L, while bottom phosphorus was 20 µg/L. Using the 1976 survey data and the State of New Hampshire Trophic Classification Index, Great Pond was classified as eutrophic (NHWSPCC, 1981).

A second limnological survey was conducted on Great Pond on August 19, 1985. Biologists recorded a transparency reading of 3.4 meters and a chlorophyll-*a* concentration of

4.73 µg/L. Aquatic plant abundance was noted as abundant. Bottom dissolved oxygen was measured at a depth of 13.5 meters as 0.3 mg/L, and the lake had formed distinct thermal layers at the time of sampling. During this survey, epilimnetic total phosphorus was 14 µg/L, while the hypolimnetic phosphorus was only 4 µg/L. Using the same trophic index, the pond received the same number of trophic points as in 1976, with a final classification of eutrophic (NHWSPCC, 1987).

Historical NHDES surveys are located in Appendix II-2.

2. New Hampshire Volunteer Lake Assessment Program

Volunteer monitors began monitoring Great Pond in 1991, even before the federal study was initiated, through the state's Volunteer Lake Assessment Program (NHVLAP). Jim Rankin led the volunteer effort which included Muriel Ingalls, Carl Oppenheimer, Ridgewood Association members, and concerned people from the town. Dave Ingalls volunteered to represent the town to coordinate the federal study. Volunteers added a sampling site in the north basin of the lake once the federal study was initiated in 1995. With the federal study completed, volunteers have continued to participate in the State's Volunteer Lake Assessment Program in order to both build upon the baseline data collected during the diagnostic study and to further monitor for changes in the quality of watershed surface waters. Volunteers collected samples from the 2 basins in Great Pond as well as from the watershed tributaries which feed the pond. Equipment, analysis, and annual training has been provided to volunteers by the New Hampshire Department of Environmental Services (NHDES) Limnology Center. Volunteers have been trained to use field methods dictated by NHDES standard field sampling techniques and protocol.

All samples collected by NHVLAP volunteers are analyzed by NHDES Limnology Center staff. The Limnology Center is inspected by the Environmental Protection Agency (EPA) and utilizes EPA quality assurance and quality control protocols for all sample analyses and data management.

Historical NHVLAP data for Great Pond is presented in Appendix II-3.

a. pH and Acid Neutralizing Capacity (ANC). Historical tributary pH values ranged from 5.10 in Ball Road Inlet during 1996 to 7.50 in the same stream during 1992. Similarly, the lowest annual true mean pH of 5.21 was observed in Ball Road Inlet as well during 1996, while the highest true mean pH of 7.22 was observed in this stream during 1992. However, the overall true mean pH for this stream from 1991 to 1997 was 5.68. Kelley Brook and Thayer Road Inlet had somewhat higher true mean pH's during these six years, at 6.39 and 6.52 respectively. The acidic waters of Ball Road Inlet in 1991 were the result of a large volume of winter and spring runoff. .

Great Pond in-lake samples were collected from the North and South basins of the lake at all three layers while the lake was thermally stratified. Epilimnetic pH values ranged from a low of 6.48 in 1996 to a high of 7.25 in 1997, while true mean pH values ranged from 6.44 to 7.01. The hypolimnion was more acidic, particularly during the early summer samplings, with a low pH of 5.34 in 1995 and a high of 6.84 in 1994. True mean pH ranged from 5.96 to 6.42 in the hypolimnion since volunteers began monitoring. The seasonal pattern of greater acidity during the early summer corresponds with a similar pattern in many New Hampshire lakes; both acidic flush from the watershed in spring and an increase in the biological activity in the photic zone as the summer progresses create this cycle.

Acid neutralizing capacity values taken from the epilimnion of Great Pond ranged from 2.60 mg/L as $CaCO_3$ to 13.30 mg/L as $CaCO_3$, with an average ANC of 8.20 mg/L as $CaCO_3$ from 1991 and 1997. This average falls above the state average for ANC of 6.5 mg/L as $CaCO_3$.

b. Specific Conductance. Specific conductance readings in Great Pond tributaries ranged from 41.4 µmhos/cm in Ball Road Inlet in 1992 up to 293.2 µmhos/cm in the same tributary during 1991. Elevated conductivity values throughout the summer of 1991 in Ball Road Inlet may reflect efforts that were made to control a serious ice problem on the road that winter and spring; serious salting and sanding was necessary. All streams in the Great Pond watershed had conductivity values averaging around or above 100 µmhos/cm between 1991 and 1997.

The conductivity of Great Pond itself ranged from a low of 97.1 µmhos/cm in 1995 to a high of 143.6 µmhos/cm in 1991. While these values are well above the New Hampshire mean of 56.8 µmhos/cm, they can be attributed to natural watershed characteristics such as the underlying geology and the groundwater interactions within it, but may also be impacted from salted highway runoff and old, leaking leach fields.

c. Apparent Color. Color values in the lake's tributaries ranged from a low of 18 cpu's in Ball Road Inlet in 1991 to a high of 280 cpu's observed in this inlet from 1992 to 1994. Large volumes of runoff in 1991 diluted natural stream color in that year. From 1992 to 1994, lower stream flows allowed for greater wetland influence or tea coloring.

Mean epilimnetic apparent color for Great Pond was 35.6 cpu's, while hypolimnetic color averaged 94.1 cpu's. Elevated apparent color in the hypolimnion may be attributed the release of tannic and humic acids from the bottom sediments of the lake as a result of low hypolimnetic dissolved oxygen.

d. Total Phosphorus. The highest mean total phosphorus concentrations in the tributaries from 1991 to 1997 was observed in Ball Road Inlet in 1992 at a level of 149 µg/L and Thayer Road Inlet in 1996 at a level of 68 µg/L. The lowest mean tributary concentrations were observed at the Outlet in 1997 (9 µg/L) and at Kelley Brook Inlet (18 µg/L). Overall, total phosphorus values in the tributaries ranged from a maximum of 226 µg/L in Ball Road Inlet in 1992 to a minimum value of 6 µg/L in the Outlet in 1996 and 1997.

Great Pond's South station in-lake phosphorus concentrations ranged from 1 to 56 µg/L (with a mean of 11 µg/L) in the epilimnion, from 4 to 16 µg/L (with a mean of 11 µg/L) in the metalimnion, and from 7 to 47 µg/L (with a mean of 19 µg/L) in the hypolimnion. North station values ranged from 4 to 15 µg/L (with a mean of 10 g/L) in the epilimnion, from 6 to 22 µg/L (with a mean of 11 µg/L) in the metalimnion, and from 17 to 47 µg/L (with a mean of 28 g/L) in the hypolimnion. The mean phosphorus concentrations at both in-lake stations are average for New Hampshire lakes.

e. Chlorophyll-*a* and Transparency. Chlorophyll-*a* data collected through NHVLAP at Great Pond from 1991 to 1997 indicated a maximum concentration of 6.04 µg/L in 1995. The minimum chlorophyll-*a* concentration was recorded in 1997 at 1.82 µg/L. All chlorophyll-*a* results from 1991 to 1997 were below the New Hampshire average of 7.32 µg/L, a number compiled from tests at over 600 lakes in the state.

The lowest chlorophyll-*a* result did not correspond with the highest transparency reading, and vice versa, suggesting that other factors are more important in controlling water clarity at this lake. The maximum transparency recorded was 4.5 meters in 1995, and the minimum reading was 2.2 meters in 1997 at the South station. The average transparency from 1991 to 1997 was 3.5 meters, slightly below the New Hampshire average of 3.7 meters.

f. Phytoplankton. The net phytoplankton community of Great Pond was sampled in June or July of each year. In 1991, the phytoplankton was dominated by the Bacillariophyceae (diatoms), specifically, *Asterionella* (75%). In 1992, 1993, and 1994 the Chrysophyceae (golden browns) dominated the phytoplankton community, with *Dinobryon* having the greatest dominance in all three years (31%, 48%, and 54% respectively). *Synura* (golden brown) and *Ceratium* (dinoflagellate) rounded off the community in 1992 with 30% and 12% relative abundances. In 1993, *Asterionella* (30%) shared the community with *Dinobryon*, and in 1994 *Coelosphaerium* (blue-green, Cyanobacteria) appeared (26%).

Once the study began in 1995, *Dinobryon* was still the dominant species with a relative abundance of 37%, but the blue-green algae *Anabaena* was the second most abundant species (20%), and the golden brown algae *Synura* completed the community at 17% relative abundance. The 1996 phytoplankton community was comprised of *Asterionella*, *Tabellaria* (diatom), and *Microcystis* (blue-green) with relative abundances of 53%, 23%, and 15% respectively. In 1997, *Dinobryon* was again the most dominant plankton (69%), followed by *Asterionella* (21%), and the diatom *Melosira* (7%). The Cyanobacteria observed in Great Pond from 1994 to 1997 are commonly associated with nuisance algae blooms and eutrophic conditions. However, the phosphorus concentrations in the upper layers of the lake were not high enough to support such algae blooms, as indicated by the average chlorophyll-a concentration of 3.6 μg/L.

g. Temperature and Dissolved Oxygen. Great Pond exhibited the typical thermal stratification for a north temperate lake during the summers from 1991 to 1997. By mid-June to mid-July, the surface of the water was approximately 12 to 15°C warmer than the bottom waters at both in-lake stations.

Great Pond experiences a depletion of dissolved oxygen in the bottom waters as the summer progresses, a characteristic of many lakes. Great Pond had less than 5 mg/L of oxygen for the bottom 3 or 4 meters of the water column, with the bottom dissolved oxygen depleting to less than 1 mg/L by the end of the summer.