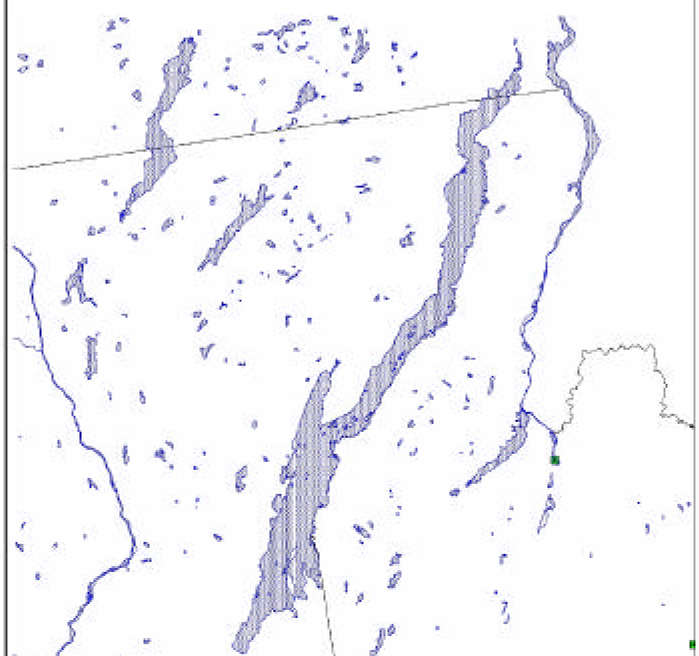
New York State Department of Environmental Conservation

Division of Water

New York
Citizens Statewide Lake Assessment Program
(CSLAP)

2006 Annual Report- Lake George

April, 2007



New York State Department of Environmental Conservation

2006 INTERPRETIVE SUMMARY

NEW YORK
CITIZENS STATEWIDE
LAKE ASSESSMENT PROGRAM
(CSLAP)

LAKE GEORGE

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NYS Department of Environmental Conservation
NY Federation of Lake Associations

April, 2007

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BACKGROUND AND ACKNOWLEDGMENT

The Citizens Statewide Lake Assessment Program (CSLAP) is a volunteer lake monitoring program conducted by the NYS Department of Environmental Conservation (NYSDEC) and the NYS Federation of Lake Associations (FOLA). Founded in 1986 with 25 pilot lakes, the program has involved more than 200 lakes, ponds, and reservoirs and 1000 volunteers from eastern Long Island to the northern Adirondacks to the western-most lake in New York, and from 10-acre ponds to several Finger Lakes, Lake Ontario, Lake George, and lakes within state parks. In this program, lay volunteers trained by the NYSDEC and FOLA collect water samples, observations, and perception data every other week in a 15 week interval between May and October. Water samples are analyzed by certified laboratories. Analytical results are interpreted by the NYSDEC and FOLA and utilized for a variety of purposes by the State of New York, local governments, researchers, and, most importantly, participating lake associations. This report summarizes the 2006 sampling results for **Lake George**.

Lake George is a 28,200 acre, class $AA_{special}$ lake found in multiple towns in Warren, Washington, and Essex Counties, in the southeastern portion of the Adirondack Park region of New York State. It was first sampled as part of CSLAP in 2004. The following volunteers have participated in CSLAP, and deserve most of the credit for the success of this program at Lake George: John Vice, Joanne and Mark Mueller, Susan and Roger Wilson, Nick and Vincent Scalia, Kelly Fuchs, Barry Leeds, Helene Wilkening, Marybeth, Jerry, Gerald and Matthew Hadeka, Cathy LaBombard, Anne Green, Catherine Aiken, Peter Gaddy, and Richard and Deborah Gasser.

In addition, the authors wish to acknowledge the following individuals, without whom this project and report would never have been completed:

From the Department of Environmental Conservation, N.G. Kaul, Sal Pagano, Dan Barolo, Italo Carcich, Phil DeGaetano, Dick Draper, and Jeff Myers for supporting CSLAP for the past 20 years; Jay Bloomfield and James Sutherland, for their work in developing and implementing the program, and the technical staff from the Lake Services Section, for continued technical review of program design.

From the Federation of Lake Associations, Anne Saltman, Dr. John Colgan, Don Keppel, Bob Rosati, Don Cook, Nancy Mueller and the Board of Directors, for their continued strong support of CSLAP.

The New York State Department of Health (prior to 2002), particularly Jean White and Upstate Freshwater Institute (since 2002), particularly Steve Effler and Jennifer Aicher, provided laboratory materials and all analytical services, reviewed the raw data, and implemented the quality assurance/quality control program.

Finally, but most importantly, the authors would like to thank the more than 1,000 volunteers who have made CSLAP a model for lay monitoring programs throughout the country and the recipient of a national environmental achievement award. Their time and effort have served to greatly expand the efforts of the state and the public to protect and enhance the magnificent water resources of New York State.

LAKE GEORGE
FINDINGS AND EXECUTIVE SUMMARY

Lake George was sampled as part of the New York Citizens Statewide Lake Assessment Program in 2006. For all program waters, water-quality conditions and public perception of the lake each year and historically have been evaluated within annual reports issued after each sampling season. This report attempts to summarize both the 2006 CSLAP data and an historical comparison of the data collected within the 2006 sampling season and data collected at Lake George prior to 2006.

The majority of the short- and long-term analyses of the water quality conditions in Lake George are summarized in Table 2, divided into assessments of eutrophication indicators, other water quality indicators, and lake perception indicators. The CSLAP data indicate that the lake can be classified as *oligotrophic*, or highly productive- this is typical of lakes with high water transparency, and low nutrient (primarily phosphorus) and algae levels. Lake productivity appears to increase from south to north, with the highest water clarity and lowest algae levels found at the northernmost sites. These data do not show a strong connection between changes in phosphorus, algae, or water transparency, although the nitrogen to phosphorus ratios indicate that algae levels in Lake George are probably controlled by phosphorus. Lake productivity did not change seasonally in a consistent manner at most sites, although water clarity readings at site 8 have steadily decreased during the summer. Phosphorus levels in the lake have been below the state phosphorus guidance value, and as a result, water transparency readings easily exceeded the minimum recommended water clarity for swimming beaches.

The lake is weakly colored (low levels of dissolved organic matter) and it is likely that these readings reflect the characteristics of the watershed (i.e. “natural” conditions at the lake). Color readings are usually not high enough to exert limits on the water transparency, even when algae levels are very low, although 2006 color readings were elevated at the southernmost site sampled in 2006, corresponding to lower water clarity readings. Lake George has soft water, slightly alkaline (above neutral) pH readings, and mostly undetectable nitrate and low ammonia readings. Conductivity readings were generally lower in 2006, but probably still within the normal range at the lake, while pH usually fell within the acceptable range at all sites. Nitrate and ammonia levels do not appear to warrant a threat to the lake, and the primary component of nitrogen appears to be organic. Calcium levels may be high enough to support zebra mussels at some sites, but additional monitoring should be conducted to determine if this represents a threat to the spread of zebra mussels to other parts of the lake.

The recreational suitability of Lake George was described very favorably at all but Site 1; at the other sites, the lake was most often described as “crystal clear” and “could not be nicer” for recreational uses. At Site 1, the lake was often described as “not quite crystal clear” to having “definite algal greenness”, and “excellent” to “slightly impaired” for recreational uses, despite water quality conditions similar to those at the other sites. The recreational assessments at Site 1 were occasionally impacted by “excessive weed growth”, although surface weed growth was not observed. The recreational assessments are stable during the summer at the other sites, coincident with stable water quality and lack of significant weed problems. These assessments were mostly comparable in all three sampling seasons.

The 2000 NYSDEC Priority Waterbody Listings (PWL) for the Lake Champlain drainage basin indicate *recreation* and *aquatic life habitat* are *impaired*, *public bathing* and *aesthetics* are *stressed*, and *water supply* is threatened. The CSLAP datasets have only limited utility in evaluating these PWL listings, though only at Site 1 does there appear to be any indication of use impairments. The next PWL review for the Lake Champlain drainage basin will likely occur in 2007.

General Comments and Questions:

- ***What is the condition of Lake George?***

Water quality conditions in Lake George appear to be more than adequate to support most recreational uses of the lake during the summer, at least at the sampled sites. Water clarity readings consistently exceed those recommended for siting a new swimming beach, due to low nutrient (phosphorus) and algae levels. Nuisance algae and aquatic plant growth was reported only by the volunteers at Site 1 (and there only infrequently), suggesting that these sites may not be representative of portions of the lake suffering from weed-induced use impairments. The lack of impact associated with nuisance weeds at some of the sampling sites may reflect the depth of the assessed sites rather than actual conditions in these parts of the lake. Recreational assessments of the lake are generally very favorable, befitting a lake with highly favorable water quality conditions.

- ***What about the dark and murky bottom waters of the lake?***

Deepwater nutrient levels were fairly close to those measured at the lake surface, although it is not known if samples were collected from the "true" bottom or if deepwater nutrient levels are elevated in other parts of the lake.

- ***How does this condition change from spring showers thru changing of the leaves?***

The productivity of Lake George varies in a somewhat inconsistent manner during the summer, although readings for most of these trophic indicators changed little from sample to sample. None of the other water quality indicators have exhibited strong seasonal patterns, with the possible exception of a drop in water clarity at site 8 during the summer.

- ***How has the condition changed since CSLAP sampling began on the lake and/or relative to historical values?***

It is premature to evaluate water quality trends with only three years of water quality data, and water quality trends in Lake George have been evaluated through other longer-term monitoring programs. The differences in water quality conditions among the three sampling seasons is probably not significant.

- ***How does Lake George compare to other similar lakes (nearby lakes,….)?***

Lake George is less productive (re: higher clarity, and lower nutrient and algae levels) than other nearby (Lake Champlain basin) lakes, other lakes classified for potable water use (Class AAspec), and other NYS lakes. Likewise, recreational assessments are also more favorable than in these other lakes, consistent with the favorable water quality and lack of invasive weed growth at these sites, although this may better reflect deepwater rather than nearshore conditions.

- ***Based on these data, what should be done to improve or maintain Lake George?***

The recreational assessments of Lake George seem to be highly favorable, consistent with the very clear water and lack of invasive weed growth in the areas assessed by the sampling volunteers. It is clear that there is no single "opinion" about water quality conditions or recreational suitability of Lake George, but these sites can continue to be evaluated to assess relative water quality or recreational use changes.

Context and Qualifiers

The NY Citizens Statewide Lake Assessment Program (CSLAP) is intended to be a long-term, standardized, trophic-based, water-quality monitoring program to facilitate comparison of water-quality data from season to season, year to year, and from lake to lake. The data and information collected through CSLAP can be utilized to identify water-quality problems, detect seasonal and long-term patterns, and educate sampling volunteers and lake residents about water-quality conditions and stressors at their lakes. It is particularly useful in evaluating the over-enrichment of aquatic plant (algae and rooted plant) communities in a lake, and the response of the lake to these trophic stressors.

Shorefront residents, lake managers, and government agencies are increasingly tasked to better assess and evaluate water-quality conditions and lake uses in NYS lakes, including those sampled through CSLAP, whether to address localized problems, meet water-quality standards, satisfy state and federal environmental reporting requirements, or enhance and balance a suite of lake uses. CSLAP data should be a part of this process, but only a part. For some lakes, particularly small lakes and ponds with limited public access by those who don't reside on the lake shore, CSLAP may be the sole source of data used to assess lake conditions. In addition, studies conducted through CSLAP find strong similarities between sampling sites in many, but not all, large lakes, and generally find a strong convergence of perceptions about lake and recreational use conditions within most lakes, based on a local familiarity with "normal" conditions and factors that might affect lake use. For the purpose of broad water-quality evaluations and understanding the connection between measured water-quality indicators and the support of broadly based recreational uses of the lake, CSLAP can be a singularly effective tool for standardizing the lake-assessment process. CSLAP volunteers, lake associations, and others engaged in lake assessment and management should continue to utilize CSLAP in this context.

However, for large, multi-use lakes, or those lakes that are threatened by pollutants not captured in eutrophication-based monitoring programs, CSLAP becomes a less effective primary tool for assessing lake condition and use impairments. For example, CSLAP data have only limited utility in evaluating the following:

(a) contamination from bacteria or other biological toxins, particularly related to the safety of water use for potable intake or swimming
(b) contamination from inorganic (e.g., metals) and organic (e.g., PCBs, DDT) compounds
(c) portions of a lake not well mixed with the "open water" or otherwise distant from the primary sampling site(s), including the shoreline, bottom sediment and isolated coves
(d) rooted aquatic plant impacts in areas of the lake not evaluated by the sampling volunteers
(e) diverging perceptions of recreational-use impacts, particularly in lakes with shorelines or isolated coves exhibiting conditions very different from those sampled or evaluated by the sampling volunteers
(f) impacts to fish or other fauna due to factors unrelated to eutrophication
(g) PWL or 303(d) listings for other pollutants or portions of the lake not sampled through CSLAP

For these waterbodies, CSLAP can and should continue to be part of an extensive database used to comprehensively evaluate the entirety of the lake and its uses, but absent a more complete dataset, CSLAP data should be used with caution as a sole means for evaluating the lake. Water-quality evaluations, recommended PWL listings, and other extrapolations of the data and analyses should be utilized in this context and by no means should be considered "the last word" on the lake.

I. INTRODUCTION: CSLAP DATA AND YOUR LAKE

Lakes are dynamic and complex ecosystems. They contain a variety of aquatic plants and animals that interact and live with each other in their aquatic setting. As water-quality changes, so too will the plants and animals that live there, and these changes in the food web also may affect water-quality. Water-quality monitoring provides a window into the numerous and complex interactions of lakes. Even the most extensive and expensive monitoring program **cannot completely assess** the water-quality of a lake. However, by looking at some basic chemical, physical, and biological properties, it is possible to gain a greater understanding of the general condition of lakes. CSLAP monitoring is a basic step in overall water-quality monitoring.

Understanding Trophic States

All lakes and ponds undergo **eutrophication,** an aging process, that involves stages of succession in biological productivity and water-quality (see Figure 1). **Limnologists** (scientists who study freshwater systems) divide these stages into **trophic** states. Each trophic state can represent a wide range of biological, physical, and chemical characteristics and any lake may "naturally" be categorized within any of these trophic states. In general, the increase in productivity and decrease in clarity corresponds to an enrichment of nutrients, plant and animal life. Lakes with low biological productivity and high clarity are considered **oligotrophic**. Highly productive lakes with low clarity are considered **eutrophic**. Lakes that are **mesotrophic** have intermediate or moderate productivity and clarity. It is important to remember that eutrophication is a natural process and is not necessarily indicative of man-made pollution.

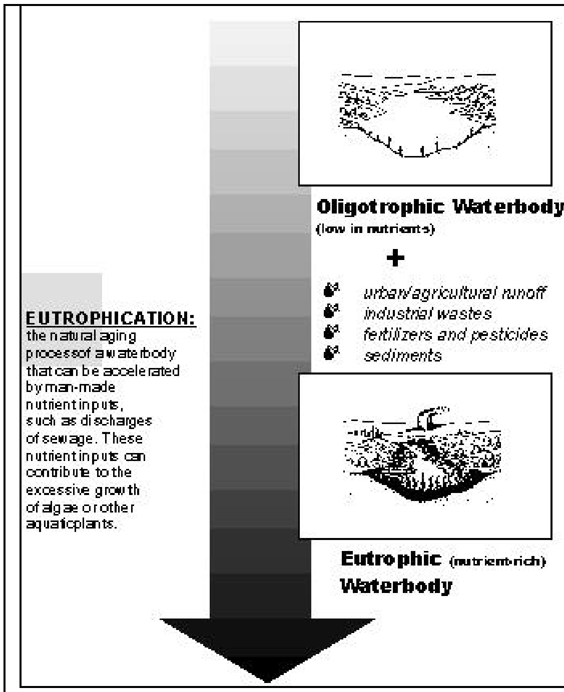


Figure 1. Trophic States

In fact, some lakes are thought to be "naturally" productive. Trophic classifications are not interchangeable with assessments of water-quality. Water-quality degradation from the perspective of one user may contrast with the perception of favorable conditions by a different lake user. For example, a eutrophic lake may support an excellent warm-water fishery because it is nutrient rich, but a swimmer may describe that same lake as polluted. A lake's trophic state is still important because it provides lake managers with a reference point to view changes in a lake's water-quality and they begin to understand how these changes may cause **use impairments** (threaten the use of a lake or swimming, drinking water or fishing)**.**

When human activities accelerate lake eutrophication, it is referred to as **cultural eutrophication**. Cultural eutrophication may result from shoreline erosion, agricultural and urban runoff, wastewater discharges or septic seepage, and other non-point source pollution sources. These can greatly accelerate the natural aging process of lakes, cause successional changes in the plant and animal life within the lake, shoreline and surrounding watershed, and impair the water-quality and value of a lake. They may ultimately extend aquatic plants and emergent vegetation throughout the lake, resulting in the transformation of the lake into a marsh, prairie, and forest. The extent of cultural eutrophication and the corresponding pollution problems can be signaled by significant changes in the trophic state over a short period.

Why is this important? New York State lakes can be affected by a variety of stressors, from acid rain to zebra mussels and almost everything in between. In any given part of the state, some of these stressors are more important than others. For example, there are probably more lakes affected by acid rain than any other pollutant, but these impacts are typically associated with a particular region (the Adirondacks and Catskills) and particular type of lake (small, high-elevation lakes in basins with thin soils and little buffering capacity). But for most lakes in New York, cultural eutrophication represents the most significant source of pollutants and threat to water-quality. As a result, water-quality indicators related to eutrophication comprise the foundation of most water-quality monitoring programs.

II. CSLAP SAMPLING PARAMETERS

CSLAP monitors several parameters related to the trophic state of a lake, including the clarity of the water, the amount of nutrients in the water, and the amount of algae resulting from those nutrients. Three parameters are the most important measures of eutrophication in most New York lakes: **total phosphorus, chlorophyll *a*** (estimating the amount of algae), and **Secchi disk transparency**. Because these parameters are closely linked to the growth of weeds and algae, they provide insight into "how the lake looks" and its suitability for recreation and aesthetics. Other CSLAP parameters help characterize water-quality at the lake. Each of these sampling parameters are outlined in Figure 2. In addition, CSLAP also uses the responses on the Field Observation Forms to gauge volunteer perceptions of lake water-quality. Most water-quality "problems" arise from impairment of accepted or desired lake uses, or the perception that such uses are somehow degraded. As such, any water-quality monitoring program should attempt to understand the link between perception and measurable quality.

The parameters analyzed in CSLAP provide valuable information for characterizing lakes. By adhering to a consistent sampling protocol provided in the CSLAP Sampling Protocol sampling volunteers collect and use data to assess both seasonal and yearly fluctuations in these parameters and to evaluate the water-quality conditions in their lake. By comparing a specific year's data to historical water-quality information, lake managers can pinpoint trends and determine whether water-quality is improving, degrading or remaining stable. Such a determination answers a first critical question posed in the lake-management process.

Figure 2. CSLAP Parameters

PARAMETER	SIGNIFICANCE
Water Temperature (°C)	Water temperature affects many lake activities, including the rate of biological growth and the amount of dissolved oxygen. It also affects the length of the recreational season.
Secchi Disk Transparency (m)	Determined by measuring the depth at which a black and white disk disappears from sight, the Secchi disk transparency estimates the clarity of the water. In lakes with low color and rooted macrophyte ("weed") levels, it is related to algal productivity.
Conductivity (μmho/cm)	Specific conductance measures the electrical current that passes through water, and is used to estimate the number of ions (charged particles). It is somewhat related to both the hardness and alkalinity (acid-buffering capacity) of the water and may influence the degree to which nutrients remain in the water. Generally, lakes with conductivity of less than 100 μmho/cm are considered softwater, while conductivity readings above 300 μmho/cm are found in hardwater lakes.
pH	pH is a measure of the (free) hydrogen ion concentration in solution. Most clearwater lakes must maintain a pH between 6 and 9 to support most types of plant and animal life. Low pH waters (<7) are acidic, while high pH waters (>7) are basic.
Color (true) (platinum color units)	The color of dissolved materials in water usually consists of organic matter, such as decaying macrophytes or other vegetation. It is not necessarily indicative of water-quality but may significantly influence water transparency or algae growth. Color in excess of 30 ptu indicates sufficient quantities of dissolved organic matter to affect clarity by imparting a tannic color to the water.
Phosphorus (total, mg/l)	Phosphorus is one of the major nutrients needed for plant growth. It is often considered the "limiting" nutrient in NYS lakes, for biological productivity is often limited if phosphorus inputs are limited. Nitrogen-to-phosphorus ratios of >25 generally indicate phosphorus limitation. Many lake management plans are centered on phosphorus controls. Phosphorus is reported as total phosphorus (TP)
Nitrogen (nitrate, ammonia, and total (dissolved), mg/l)	Nitrogen is another nutrient necessary for plant growth and can act as a limiting nutrient in some lakes, particularly in the spring and early summer. Nitrogen to phosphorus ratios <10 generally indicate nitrogen limitation (for algae growth). For much of the sampling season, many CSLAP lakes have very low or undetectable levels of one or more forms of nitrogen. It is measured in CSLAP in three forms_ nitrate/nitrite (NO_x) ammonia ($NH_{3/4}$), and total nitrogen (TN or TDN).
Chlorophyll *a* (μg/l)	The measurement of chlorophyll *a*, the primary photosynthetic pigment found in green plants, provides an estimate of phytoplankton (algal) productivity, which may be strongly influenced by phosphorus.
Calcium (mg/l)	Calcium is a required nutrient for most aquatic fauna and is required for the shell growth for zebra mussels (at least 8-10 mg/l) and other aquatic organisms. It is naturally contributed to lakes from limestone deposits and is often strongly correlated with lake buffering capacity and conductivity.

Ranges for Parameters Assessing Trophic Status and Lake George

The relationship between phosphorus, chlorophyll *a*, and Secchi disk transparency has been explored by many researchers, to assess the trophic status (the degree of eutrophication) of lakes. Figure 3 shows the ranges for phosphorus, chlorophyll a, and Secchi disk transparency (summer median) that are representative for the major trophic classifications:

Figure 3. Trophic Status Indicators

Parameter	Eutrophic	Mesotrophic	Oligotrophic	Lake George
Phosphorus (mg/l)	> 0.020	0.010 - 0.020	< 0.010	**0.009**
Chlorophyll a (μg/l)	> 8	2- 8	< 2	**0.8**
Secchi Disk Clarity (m)	< 2	2- 5	> 5	**7.5**

These classifications are valid for clear-water lakes only (with less than 30 platinum color units). Some humic or "tea color" lakes, for example, naturally have high levels of dissolved organic material, resulting in color readings that exceed 30 color units. This will cause the water transparency to be lower than expected, given low phosphorus and chlorophyll *a* levels in the lake. Water transparency can also be unexpectedly lower in shallow lakes due to influences from the bottom (or the inability to measure the maximum water clarity due to the visibility of the Secchi disk on the lake bottom). Even shallow lakes with high water clarity, low nutrient concentrations, and little algal growth may also have significant weed growth due to shallow water conditions. While such a lake may be considered unproductive by most water-quality standards, that same lake may experience severe aesthetic problems and recreational impairment related to weeds, not trophic state. Generally, however, the trophic relationships described above can be used as an accurate "first" gauge of productivity and overall water-quality.

By each of the trophic standards described above, the lake would be considered **oligotrophic**, or highly unproductive. These assessments were consistent across the seven sampling sites, although phosphorus readings varied significantly at a few sites (see below). The trophic condition of Lake George will be discussed in greater detail later in this report.

III. CSLAP LAKES

CSLAP sampling began in 1986 on 25 lakes generally distributed throughout the state, and in the following 20 years has expanded to more than 200 lakes. The program was developed primarily to identify water-quality problems, develop long-term databases, and educate lakefront property owners on small lakes with little historical information and few other contemporary studies. However, the program has been utilized by lake residents, lake associations and managers, municipalities, state and federal government and environmental organizations to gain insights about small ponds, large high-profile lakes and multi-use reservoirs from eastern Long Island to the northern Adirondacks, to the western border of New York State. A map showing each of the lakes sampled through CSLAP since 1986 is shown in Figure 4. The distribution of lakes roughly matches the distribution of lake associations in the state (or at least those affiliated with the NY Federation of Lake Associations, the largest lake association organization in the state). The relative paucity of CSLAP lakes in the Finger Lakes region reflects the small number of lakes in a region dominated by very large lakes, while the small number of lakes sampled in the Catskills, Long Island, and western NY reflects the shortage of organized lake associations in those areas.

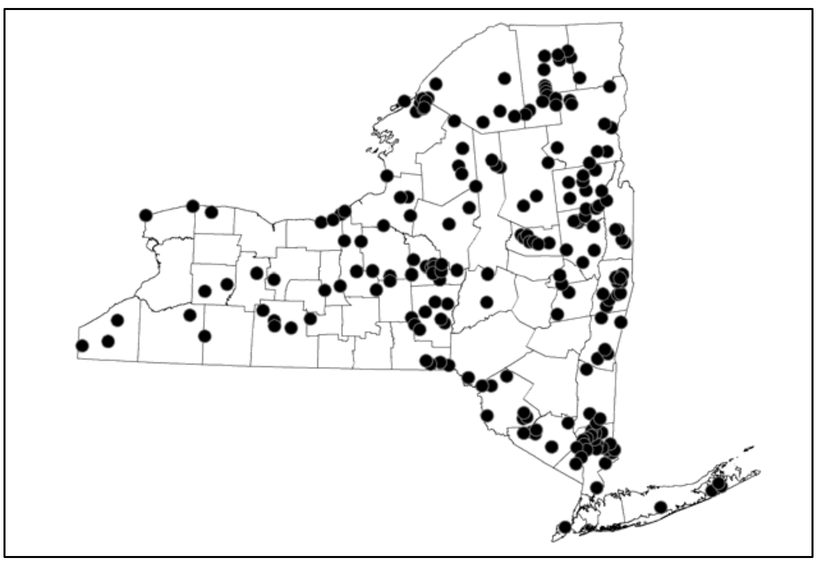


Figure 4: CSLAP Sampling Sites

CSLAP lakes have ranged from the very small (five acre Cranberry Lake in the downstate region) to the great (two state park beaches on Lake Ontario). It has included perhaps the clearest lake in New York State (Skaneateles Lake, one of the Finger Lakes, with as high as 50 feet of water transparency) and several lakes with clarity as low as one foot. There are a large number of lakes used for potable water, as well as those classified only for fishing and non-contact recreation. Some lakes (those on Long Island) sit just above sea level, while others are perched high in the clouds, including Summit Lake in central NY and Twitchell Lake in the Adirondacks, more than 2,000 feet above sea level.

Figures 5a through 5d summarize the variety of lakes sampled through CSLAP. In short, these lakes constitute a reprehensive cross-section of the lake conditions, uses, and settings encountered in New York State.

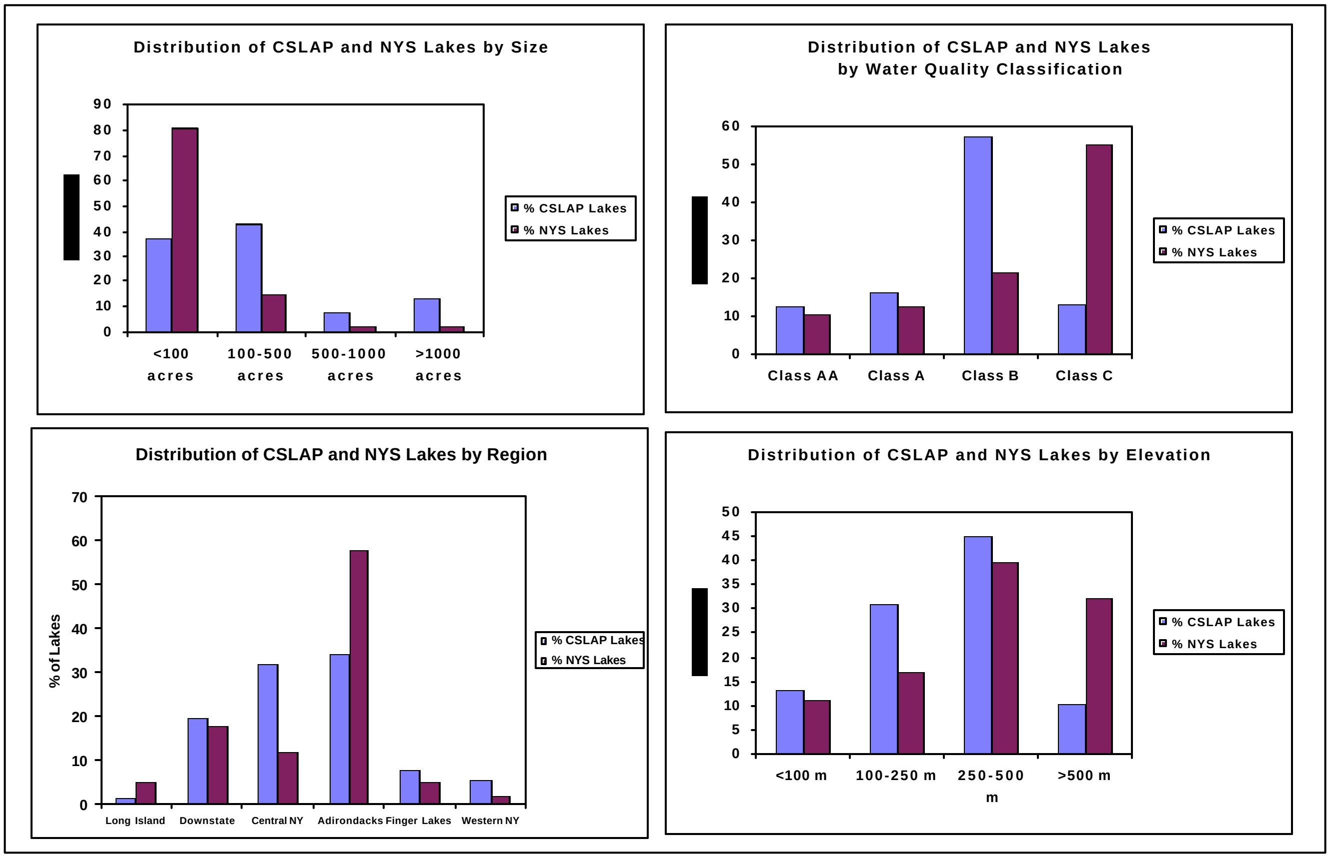


Figure 5- Comparison of CSLAP and New York State Lakes

The typical CSLAP lake is slightly larger than the typical New York State lake and is more likely to be found in central New York (between the Adirondacks, downstate and Finger Lakes regions). However, this profile, as well as the preponderance toward "mid-elevation" regions, is probably more typical of the "lake community" regions of the state. This corresponds to those regions in which large numbers of lakes are heavily populated, which in turn represents lower elevation waterbodies that support siting septic systems and have close proximity to roads and other non-lake communities (comprised of visitors and seasonal lake residents). The relatively higher percentage of Class B lakes in CSLAP and Class C lakes in the rest of the state reflects the large number of uninhabited Class C lakes in the Adirondacks. These lakes have been classified as Class C lakes, often by default, due in part to the lack of information about historical or contemporary lake uses and water-quality conditions.

The distribution of lakes in these categories does suggest that CSLAP lakes are mostly comparable to other New York State lakes, and that an evaluation of CSLAP data may serve as a reasonable surrogate for statewide water-quality evaluations, particularly since CSLAP serves as the primary long-term database maintained and supported by New York State.

IV: LAKE GEORGE- BACKGROUND INFORMATION

Lake George is a 28,200 acre, class $AA_{special}$ lake found in multiple towns in Warren, Washington, and Essex Counties, in the southeastern portion of the Adirondack Park region of New York State. It was first sampled as part of CSLAP in 2004. Figure 6 shows the location of Lake George, as well as the sampling sites. It is one of 12 CSLAP lakes among the >120 lakes found in Warren County, and one of 15 CSLAP lakes among the >240 lakes and ponds in the Lake Champlain drainage basin. Lake George is a Class $AA_{special}$ lake; this means that the best intended use for the lake is for potable water intake—drinking—with minimal treatment, and contact recreation—swimming and bathing. These "categories" will be used to evaluate water-quality conditions later in the report.

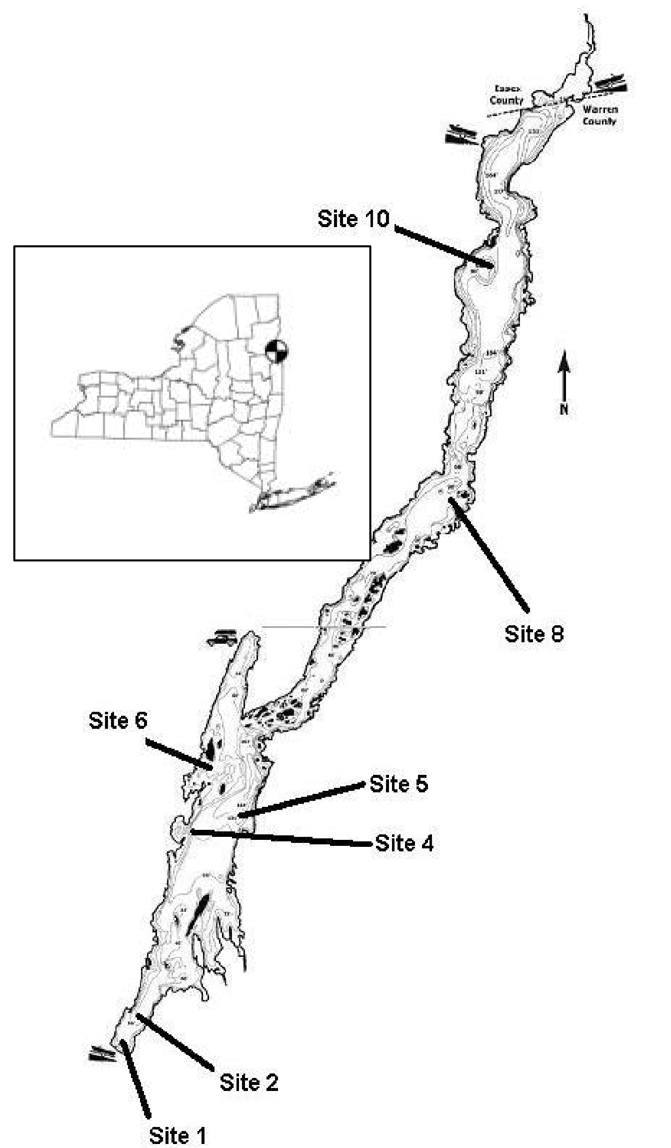


Figure 6- Location of Lake George

CSLAP samples have been collected from the several sites in the lake, all corresponding to a to the deepest part of these locations. Most lakes with a maximum depth of > 20 feet are thermally stratified, and the sampling data indicate that Lake George is stratified. As such, surface and deepwater samples have been collected at the lake.

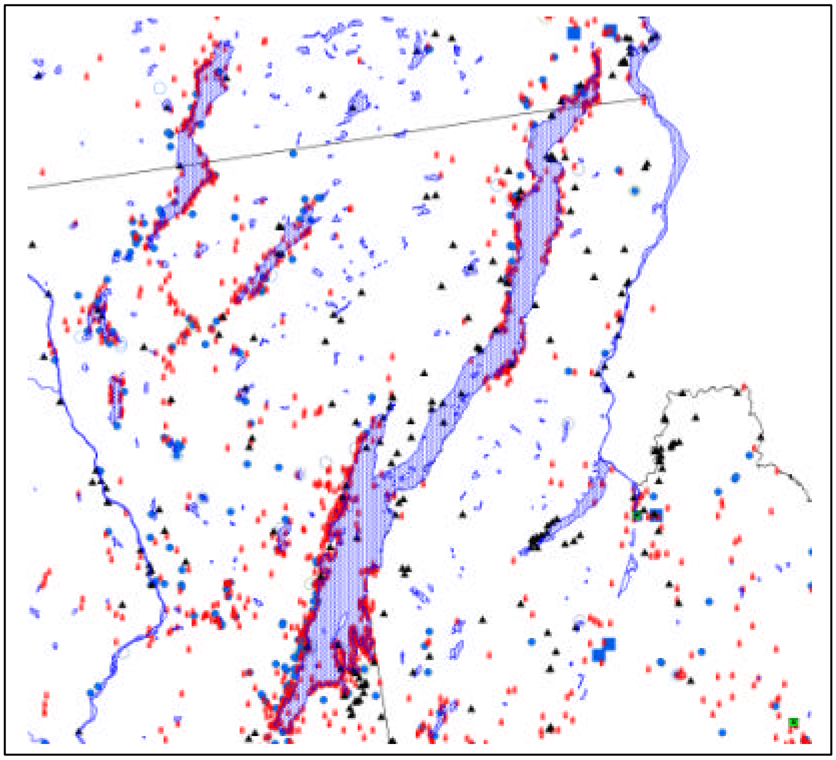
Historical Water-Quality Information for Lake George

Lake George has been extensively involved in multiple NYS monitoring programs. It is beyond the scope of this program to evaluate the entirety of these monitoring programs.

Historical Fisheries Information for Lake George

Lake George is stocked annually with about 1500 10.5" and 34,000 6.5" land-locked salmon. Lake trout have also been stocked- typically about 5000 7" trout. Other fish species in the lake include Atlantic salmon, bullhead, chain pickerel, largemouth bass, pumpkinseed sunfish, smallmouth bass, smelt, sunfish, trout, and yellow perch.

General statewide fishing regulations are applicable in Lake George. In addition, open season for yellow perch, trout and sunfish lasts all year, with no minimum size but a daily limit of 50 (5 for trout). The open season for lake trout and land-locked also lasts all year, with daily limits of 2 fish and minimum lengths of 23" for lake trout and 16" for land-locked salmon.



Permitted Facilities Associated with Lake George

There are a large number of facilities and activities on Lake George that require a DEC permit; these are shown as “derrick” symbols on the map to the left. The solid circles represent regulated wells, the solid squares represent above-ground chemical bulk storage facilities, and the triangles represent locations of rare, threatened, or endangered species.

V. NEW YORK STATE, CSLAP AND LAKE GEORGE WATER-QUALITY DATA: 1986-2005

Overall Summary:

Although water-quality conditions at each CSLAP lake have varied each year since 1986, and although detailed statistical analyses of the entire CSLAP dataset has not yet been conducted, general water-quality trends can be evaluated after 5-20 years' worth of CSLAP data from these lakes. Overall (regional and statewide) water-quality conditions and trends can be evaluated by a variety of different means. Each of the tested parameters ("analytes") can be evaluated by looking at how the analyte varies from year to year from the long-term average ("normal") condition for each lake, and by comparing these parameters across a variety of categories, such as across regions of the state, across seasons (or months within a few seasons), and across designated best uses for these lakes. Such evaluations are provided in the second part of this summary, via figures 7 through 17. The annual variability is expressed as the difference in the annual average (mean) from both the long-term average and the normal variability expected from this long-term average. The latter can be presented as the "standard error" (SE, calculated here within the 95% confidence interval)--one standard error away from the long-term average can be considered a "moderate" change from "normal," with a deviation of two or more standard errors considered to be a "significant" change. For each of these parameters, the percentage of lakes with annual data falling within one standard error from the long-term average are considered to exhibit "no change," with the percentage of lakes demonstrating moderate to significant changes also displayed on these graphs (figures 7a through 17a). Annual changes in these lakes can also be evaluated by standard linear regressions- annual means over time, with moderate correlation defined as $R^2 > 0.33$, and significant correlation defined as $R^2 > 0.5$. These methods are described in greater detail in Appendix D. Assessments of weather patterns--whether a given year was wetter or drier than usual--accounts for broad statewide patterns, not weather conditions at any particular CSLAP lake. As such, weather may have very different impacts at some (but not most) CSLAP lakes in some of these years.

Long-term trends can also be evaluated by looking at the summary findings of individual lakes and attempting to extrapolate consistent findings to the rest of the lakes. Given the (non-Gaussian) distribution of many of the water-quality parameters evaluated in this report, non-parametric tools may be the most effective means for assessing the presence of a water-quality trend. However, these tools do not indicate the magnitude of the trend. As such, a combination of parametric and non-parametric tools are employed here to evaluate trends. The Kendall tau ranking coefficient has been utilized by several researchers and state water-quality agencies to evaluate water-quality trends via non-parametric analyses and is utilized here. For parametric analyses, best-fit analysis of summer (June 15 through September 15) averages for each of the eutrophication indicators can be evaluated, with trends attributable to instances in which deviations in annual means exceed the deviations found in the calculation of any single annual mean. "Moderate" change is defined as $t > 0.33$, and "significant" change is defined as $t > 0.5$. It has been demonstrated in many of these programs that long-term trend analyses cannot be utilized to evaluate lake datasets until at least five years' worth of data have been collected.

As of 2006, there were 112 CSLAP lakes sampled in the last five years that have been sampled for at least five years. The change in these lakes is demonstrated in figures 7 and 8; figures 7a through 7j indicate "moderate" long-term change, while figures 8a through 8j indicate "significant" long-term change. When these lakes are analyzed by this combination of parametric and non-parametric analyses, these data suggest that while most NYS lakes have not demonstrated a significant change (either t or R^2 >0.5) or even a moderate changes (t or R^2 >0.33).

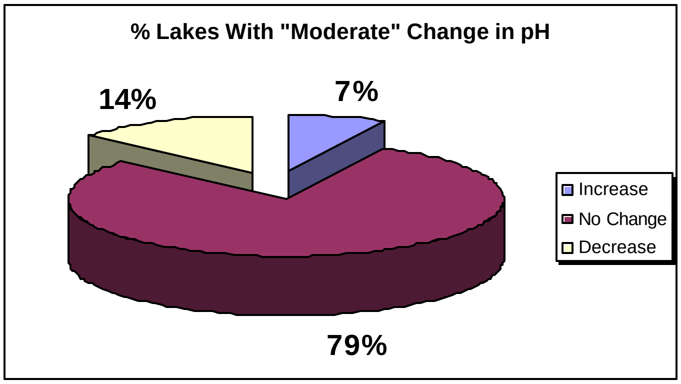


Figure 7a. %CSLAP Lakes Exhibiting Moderate Long-Term Change in pH

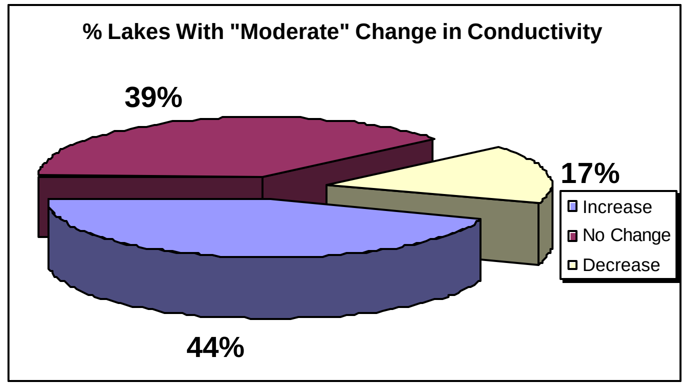


Figure 7b. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Conductivity

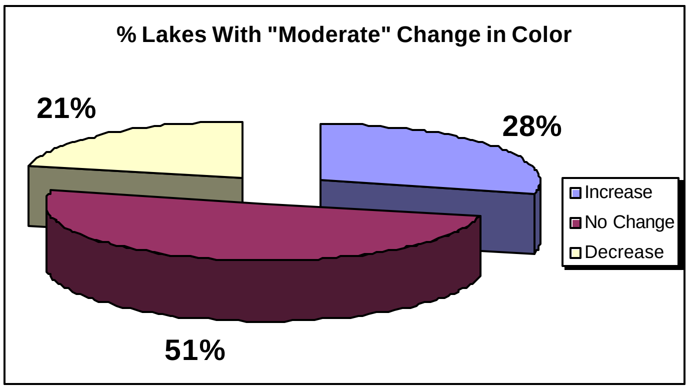


Figure 7c. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Color

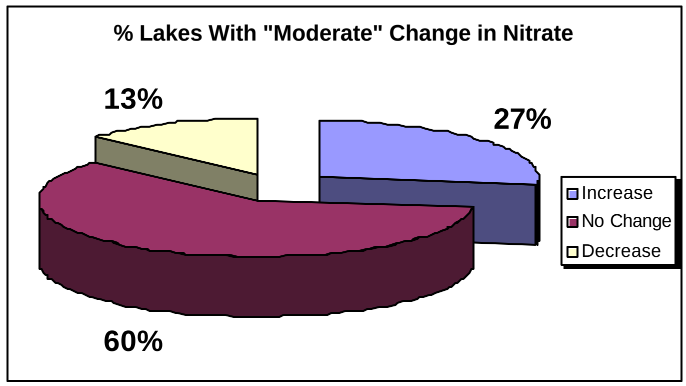


Figure 7d. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Nitrate

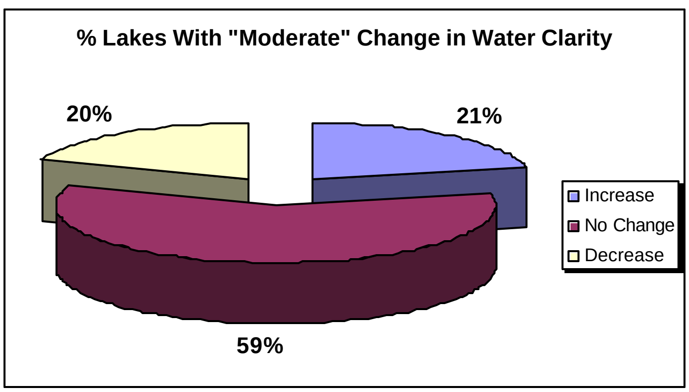


Figure 7e. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Water Clarity

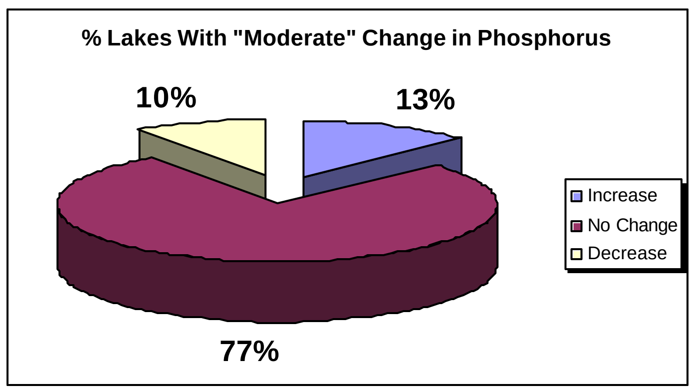


Figure 7f. %CSLAP Lakes Exhibiting Moderate Long-Term Changes in Phosphorus

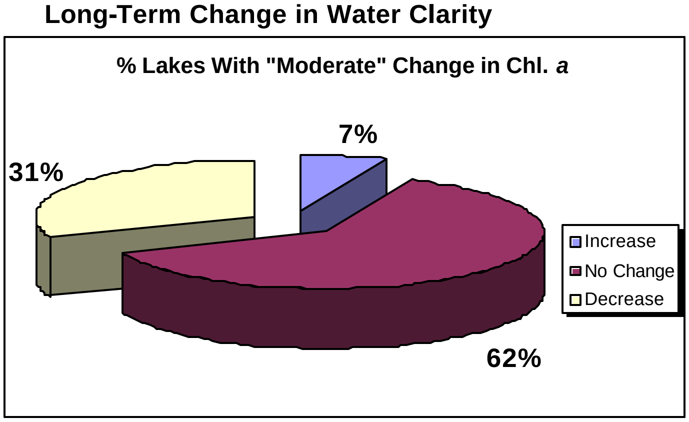


Figure 7g. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Chlorophyll *a*

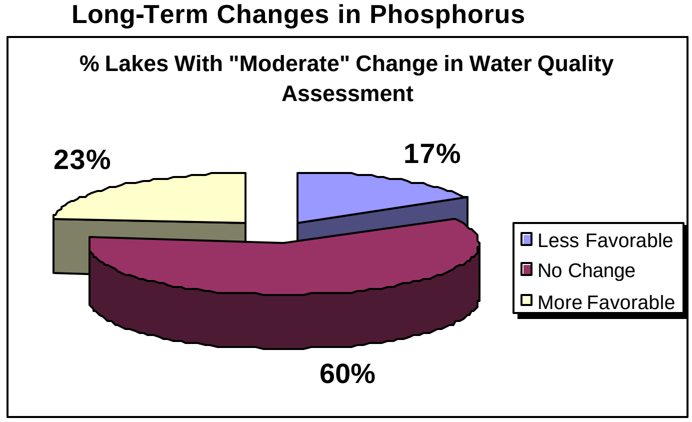


Figure 7h. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Water-quality Assessment

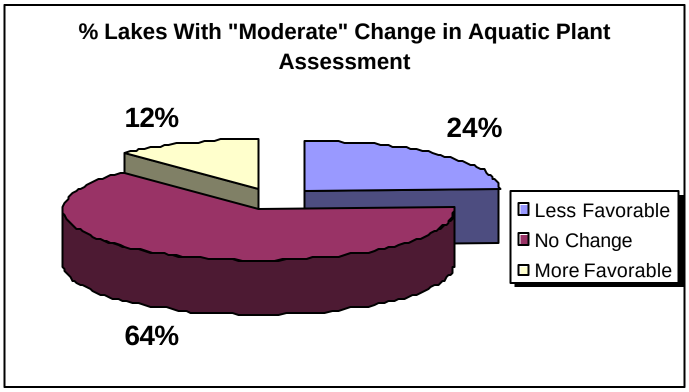


Figure 7i. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Aquatic Plant Assessment

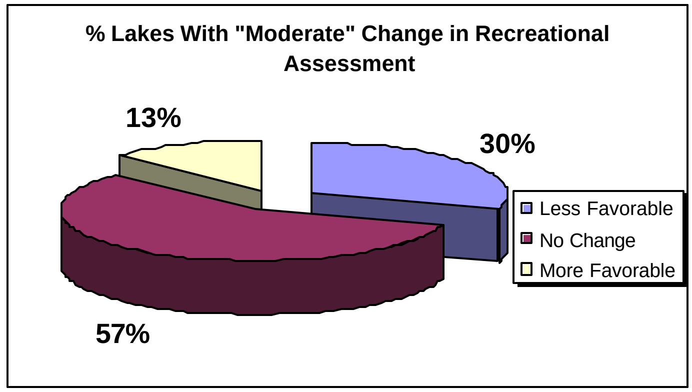


Figure 7j. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Recreational Assessment

Some of the lakes sampling through CSLAP have demonstrated a moderate change since CSLAP sampling began in 1986, at least for some of the sampling parameters measured through CSLAP. In general, between 50% and 65% of the CSLAP lakes have not exhibited even moderate changes. Some of the parameters that have exhibited moderate changes may not reflect actual water-quality change. For example, it appears that the increase in color (Figure 7c) and decrease in nitrate (Figure 7d) and chlorophyll *a* (Figure 7g) is probably due to the shift in laboratories, even though the analytical methods are comparable. The increase in conductivity (Figure 7b) and decrease in pH (Figure 7a) are probably real phenomena--both changes were evident to some degree prior to the shift in laboratories, and both are largely predictable. The difference between the increase and decrease in the other sampling parameter (or between more favorable and less favorable conditions) does not appear to be important and probably indicates random variability.

Figures 8a through 8j indicate that, not surprisingly, “substantial” change is less common. Substantial change follows the same patterns as discussed above with the evaluation of “moderate” change in CSLAP lakes, except that the percentage of CSLAP lakes not exhibiting significant change is much higher, rising to about 65-80% of these lakes. For those CSLAP lakes exhibiting substantial change, it is most apparent in the same parameters described above. About 25% of the CSLAP lakes have exhibited a substantial increase in conductivity, consistent with a broad (and expected) successional pattern, in which lakes generally concentrate materials washed in from the surrounding watershed (and as the runoff itself concentrates materials as these watersheds move from forested to more urbanized, whether via residential development or other uses. The comparison between figures 8b and 8e through 8g indicate that this has not (yet) translated into higher nutrient loading into lakes.

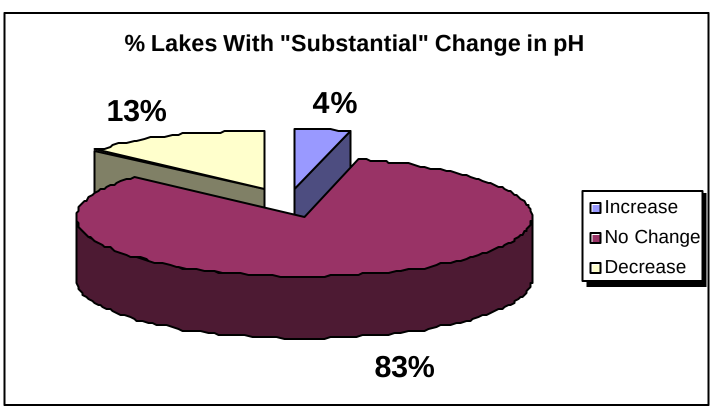


Figure 8a. %CSLAP Lakes Exhibiting Substantial Long-Term Change in pH

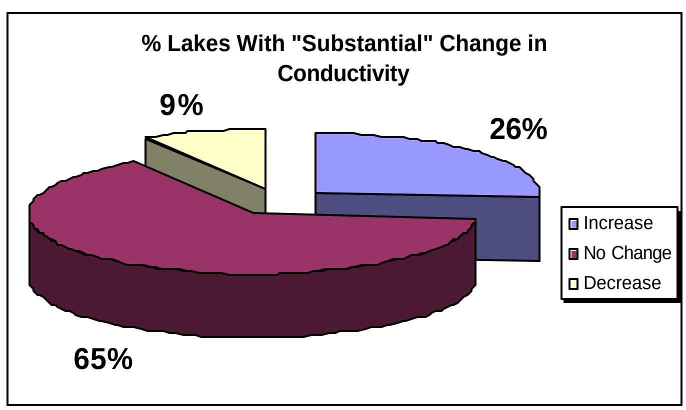


Figure 8b. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Conductivity

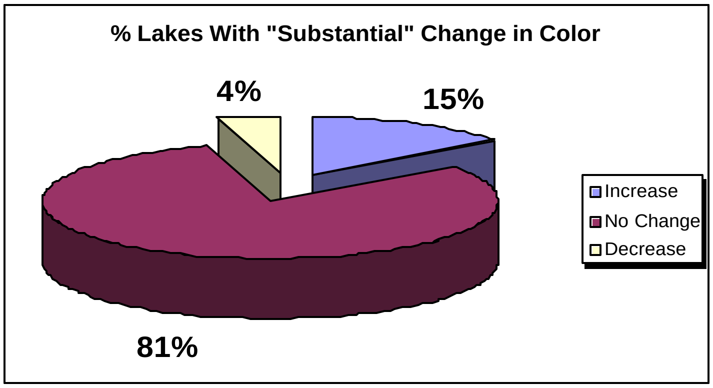


Figure 8c. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Color

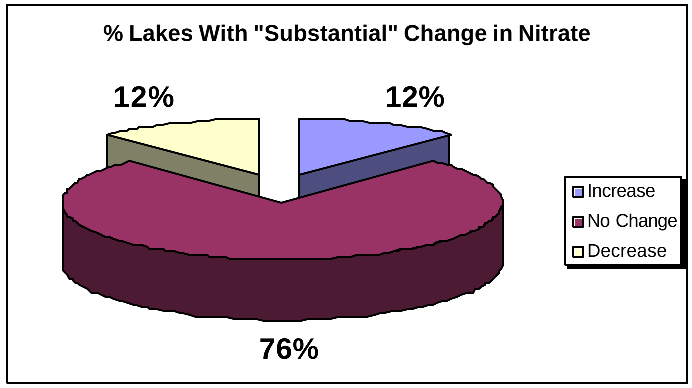


Figure 8d. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Nitrate

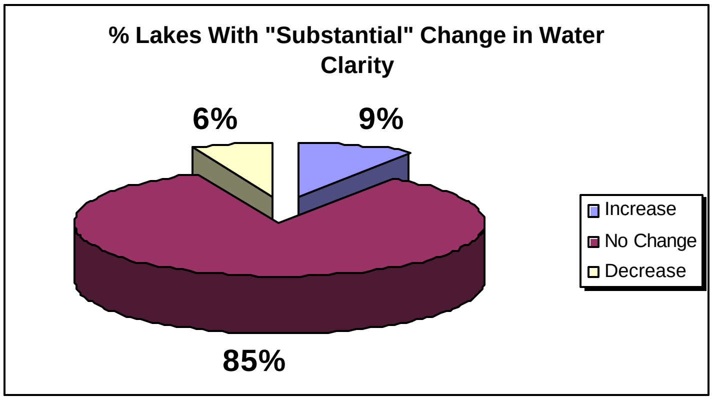


Figure 8e. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Water Clarity

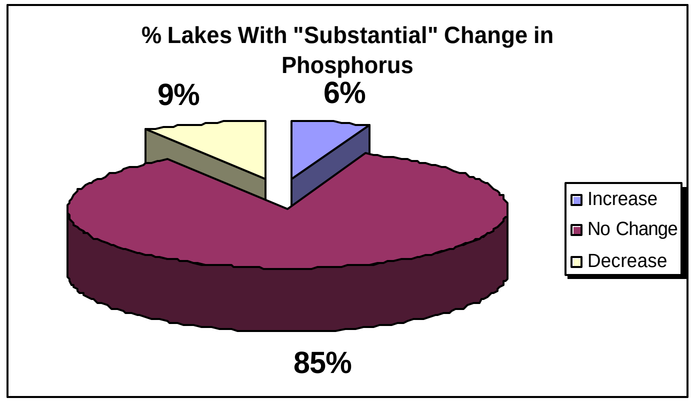


Figure 8f. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Phosphorus

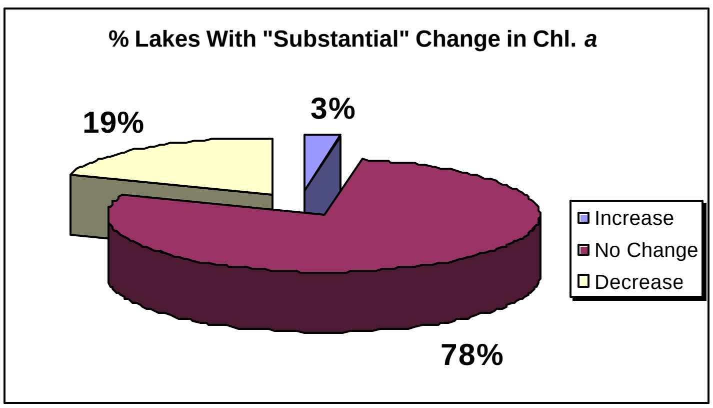


Figure 8g. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Chlorophyll *a*

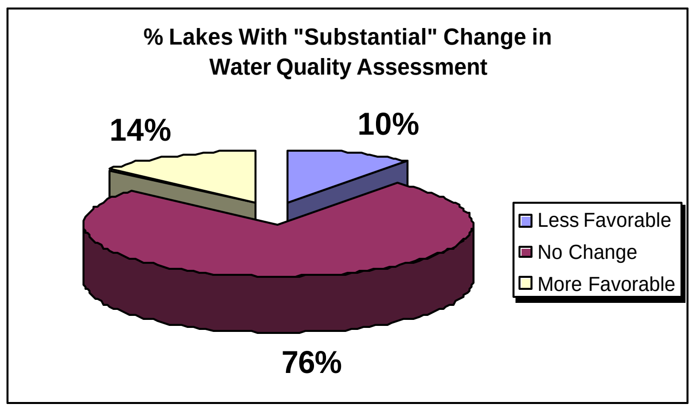


Figure 8h. %CSLAP Lakes Exhibiting Substantial Long-Term Changes in Water-quality Assessment

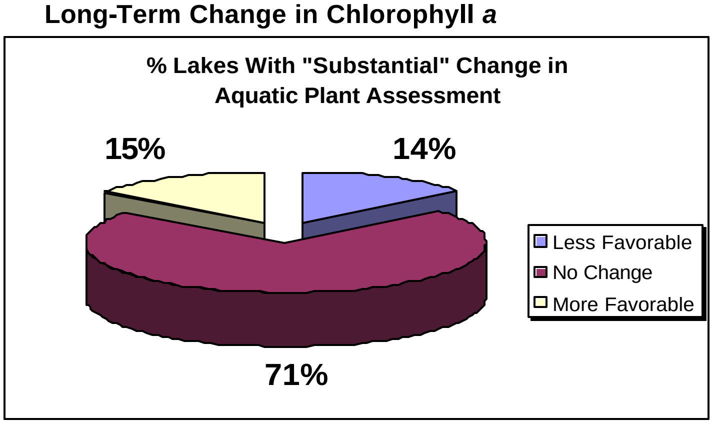


Figure 8i. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Aquatic Plant Assessment

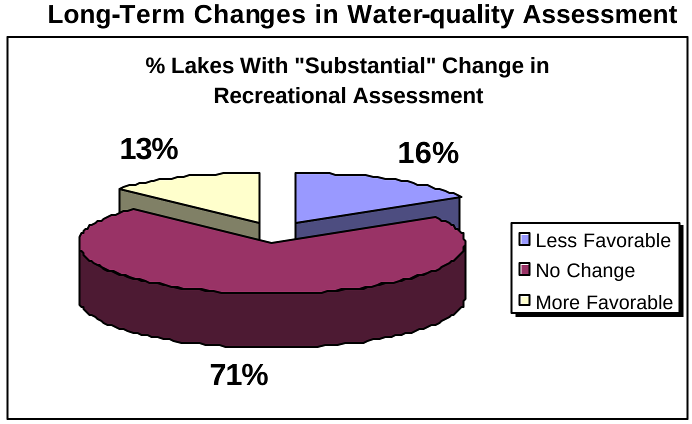


Figure 8j. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Recreational Assessment

As noted above, there does not appear to be any clear pattern between weather and water-quality changes, although some connection between changes in precipitation and changes in some water-quality indicators is at least alluded to in some cases. However, all of these lakes may be the long-term beneficiaries of the ban on phosphorus in detergents in the early 1970s, which, with other local circumstances (perhaps locally more "favorable" weather, local stormwater or septic management, etc.), has resulted in less productive conditions. Without these circumstances, water-quality conditions in many of these lakes might otherwise be more productive in the creeping march toward aging, eutrophication, and succession (as suggested from the steady rise in conductivity). In other words, the higher materials loading into these lakes may be largely balanced by a reduction in nutrients within the corresponding runoff.

The drop in pH in NYS lakes has been studied at length within the Adirondacks and may continue to be attributable on a statewide basis to acid rain, which continues to fall throughout the state. The CSLAP dataset is not adequate to evaluate any ecological changes associated with higher lake acidity, and it is certainly worth noting that the slight drop in pH in most CSLAP lakes does not bring these lakes into an acidic status (these lakes have, at worse, become slightly less basic). In addition, for lakes most susceptible to acidification, laboratory pH is only an approximation of actual pH. Fully accurate pH readings require field measurements using very specialized equipment, although for most lakes with even modest buffering capacity, laboratory pH is a good estimate of *in situ* pH readings. So while the decrease in pH in some CSLAP lakes should continue to be watched, it does not appear to be a cause for concern, at least relative to the low pH in small, undeveloped, high-elevation lakes within the Adirondack Park.

Lake perception has changed more significantly than water-quality (except conductivity), due in part to the shorter timeframe for evaluation and thus a lower statistical hurdle for quantifying change (15 years versus up to 20 years for some lakes), one perhaps due to the multiple influences of these phenomena. None of these indicators--water-quality perception, weeds perception, or recreational perception--have varied in a consistent manner, although variability is more common in each of these indicators. The largest change is in recreational assessments, with about one third of all lakes exhibiting substantial change and nearly half demonstrating moderate change. A more detailed analysis of these assessments (not presented here) indicates that the Adirondacks have demonstrated more "positive" change than other regions of the state, due to the perception that aquatic weed densities have not increased as significantly (and water-quality conditions have improved in some cases). However, the rapid spread of *Myriophyllum spicatum* into the interior Adirondacks will likely reverse this "trend" in coming years, and it is not clear if these "findings" can be extrapolated to other lakes within the Adirondack Park.

Larger trends and observations about each of the CSLAP sampling parameters are presented below in figures 8 through 18. As noted in the nitrate discussion, there is still an insufficient database for ammonia or total nitrogen to evaluate annual, geographic, seasonal, or lake-use variability in these sampling parameters. However, these parameters are discussed in the specific discussions for Lake George later in this document.

pH

Annual Variability:

The pH of most CSLAP lakes has consistently been well within acceptable ranges for most aquatic organisms during each sampling season. The average pH has not varied significantly from one sampling season to the next. There does not appear to be a strong connection between pH and weather; some of the years with the relatively highest pH--1988 and 1992--and the lowest pH--1987--correspond to dry (1988), wet (1992), and normal (1987) years, although some of the other years with relatively low pH corresponded to wetter years (1996, 2000, and 2004). There do not appear to be any significant annual pH trends in the CSLAP dataset. 90% of all samples had pH between 6.5 and 8.5 (the state water-quality standards); 6% of samples have pH > 8.5, and 4% have pH < 6.5.

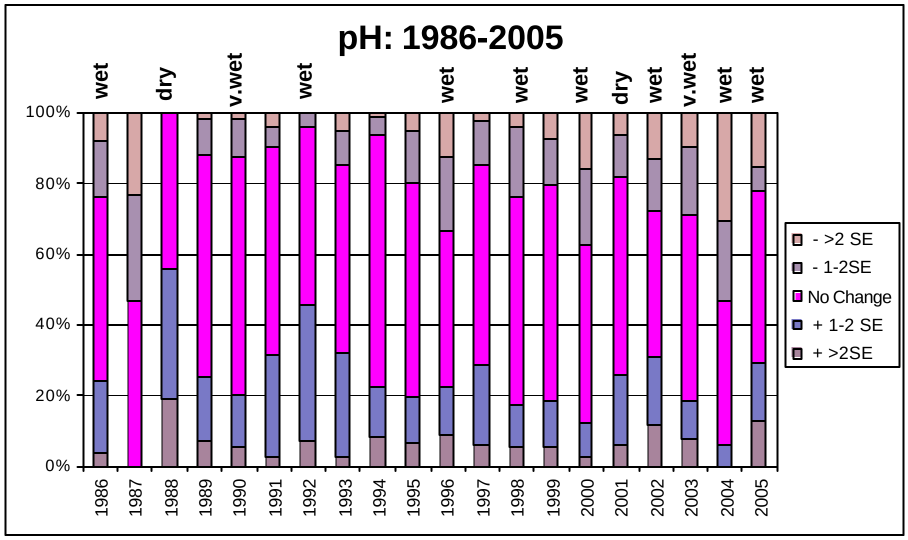


Figure 9a. *Annual Change from "Normal" pH in CSLAP Lakes (SE = Standard Error)*

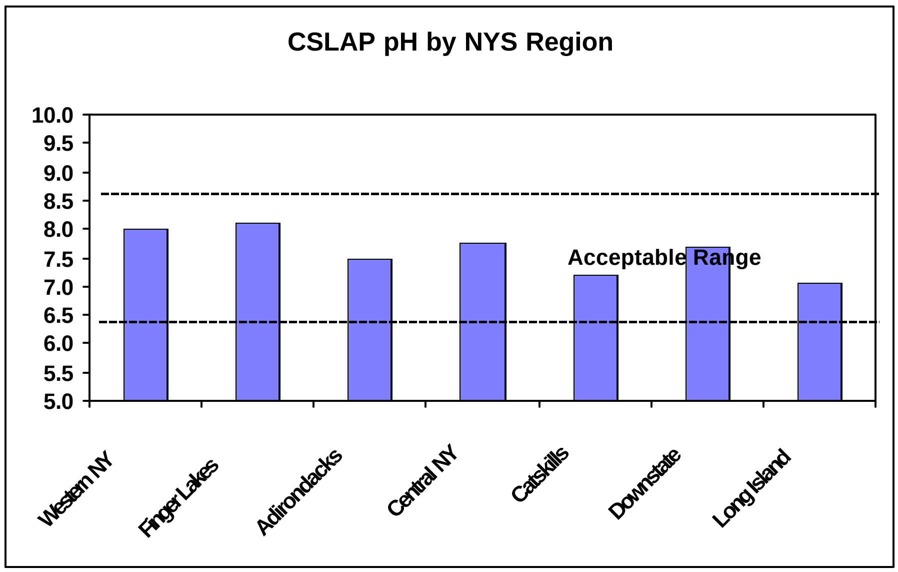


Figure 9b. *pH in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

2006 was a relatively wet year, at least in most of the state during much of the summer sampling season. While there is not a strong correlation between weather and pH during most of the CSLAP sampling seasons, pH readings have generally been lower during wet years, most likely due to the input of acidic rain. Therefore, it is anticipated that pH readings may be slightly lower than usual, at least in some CSLAP lakes.

What Happened at Lake George in 2006?

pH readings in Lake George have varied somewhat from year to year, but all readings have been typical of alkaline lakes. Readings at all sites were probably within the normal range in 2006, although elevated pH readings were measured at site 2 in 2006.

Statewide Variability:

As expected, pH readings are lowest in the high-elevation regions (Adirondacks and Catskills) or Long Island, which has primarily shallow and slightly colored lakes, and the highest in regions with relatively high conductivity (western NY and the Finger Lakes region). All of these readings are consistently within the acceptable range for most aquatic organisms. However, the CSLAP dataset does not reflect the low pH found in many high elevation NYS lakes overlying granite and poorly buffered soils, because the typical CSLAP lake resides in geological settings (primarily limestone) that allow for residential development. In other words, pH is one of the few CSLAP sampling parameters that does not yield comparable results when comparing CSLAP results to overall NYS results, because CSLAP lakes are not really representative of the typical NYS lake as related to pH.

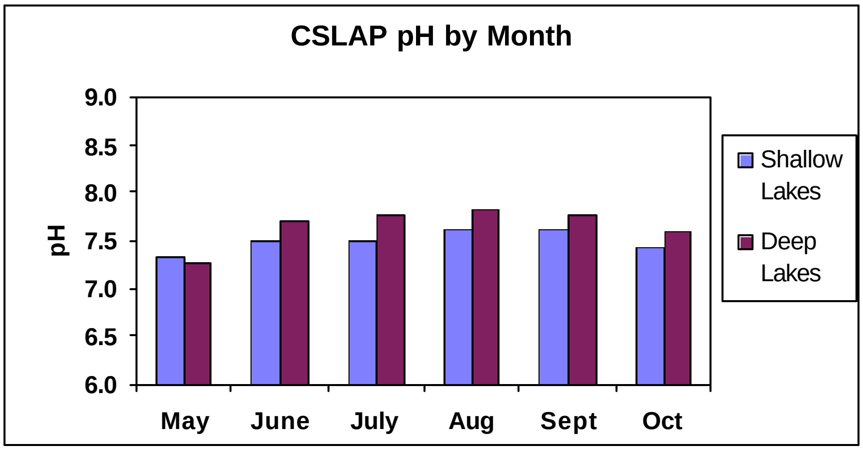


Figure 9c. *pH in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

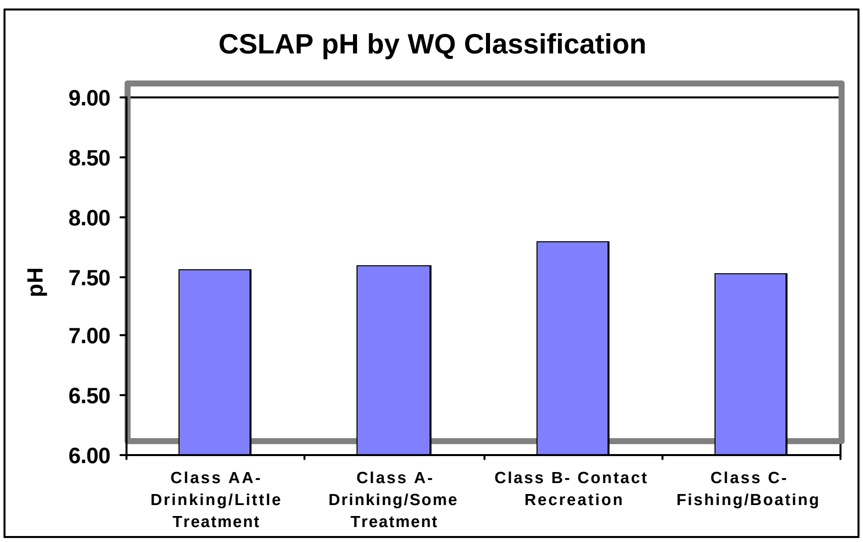


Figure 9d. *pH in CSLAP Lakes by Lake Use*

Seasonal Variability:

pH readings tend to increase slightly during the course of the summer, due largely to increasing algal photosynthesis (which consumes CO_2 and drives pH upward), although these seasonal changes are probably not significant. Low pH depressions are most common early in the sampling season (due to lingering effects from snowpack runoff), and high pH spikes occur mostly in mid- to late summer.

Lake-Use Variability:

pH does not vary significantly from one lake use to another, although in general, pH readings are slightly higher for lakes used primarily for contact recreation (Class B). However, this is probably more reflective of geographical differences (there are relatively more Class B CSLAP lakes in higher pH regions, and more Class A lakes in lower pH regions) than any inherent link between pH and lake usage.

Conductivity

Annual Variability:

The conductivity of most CSLAP lakes has varied somewhat from year to year and has been (slightly) increasing overall and in specific lakes since 1986. This is apparent from Figure 10a, which shows that more lakes have exhibited higher readings in recent years than in the first several years of CSLAP sampling at the lake (although lower conductivity was apparent in 2004). There does not appear to be a correlation between weather and conductivity, although the overall annual trend appears to be stronger than weather-impacted changes.

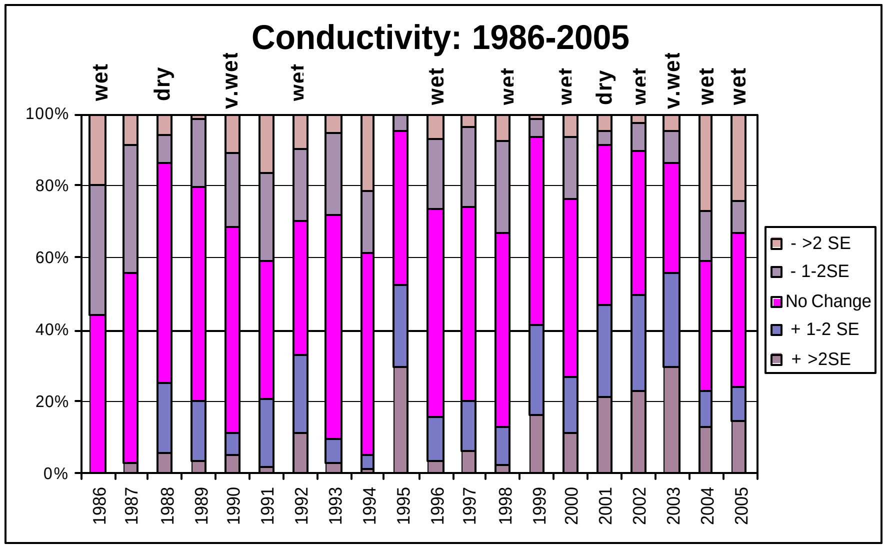


Figure 10a. *Annual Change from "Normal" Conductivity in CSLAP Lakes (SE = Standard Error)*

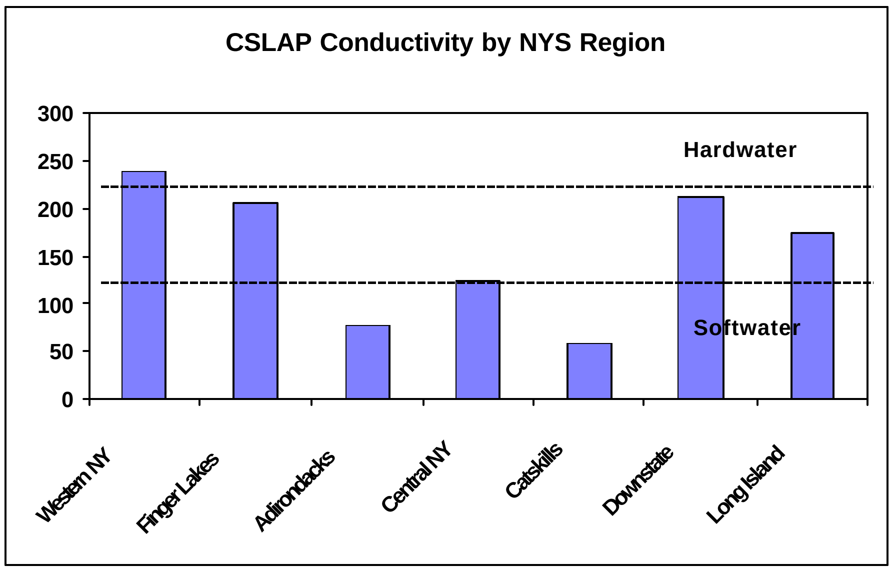


Figure 10b. *Conductivity in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

2006 was a relatively wet year, at least in most of the state during much of the summer sampling season. Conductivity readings have generally not been correlated with weather, and any weak weather patterns appear to be dwarfed with a significant trend toward increasing conductivity readings over time. Therefore, it is anticipated that conductivity readings may be within the normal range for most CSLAP lakes, although higher conductivity readings may be more likely than lower conductivity.

What Happened at Lake George in 2006?

Conductivity readings in 2006 were slightly lower than usual at most sites, although this probably represents the normal range of variability for the lake. All readings continue to be indicative of softwater lakes.

Statewide Variability:

Although "hardwater" and "softwater" are not consistently defined by conductivity, in general lakes in the Adirondacks and Catskills have lower conductivity (softer water), and lakes downstate, in western NY, and in the Finger Lakes region have higher conductivity (harder water). These regional differences are due primarily to surficial geology and "natural" conditions in these areas. However, within each of these broad geographical areas, there are usually some lakes with higher conductivity and some lakes with lower conductivity readings.

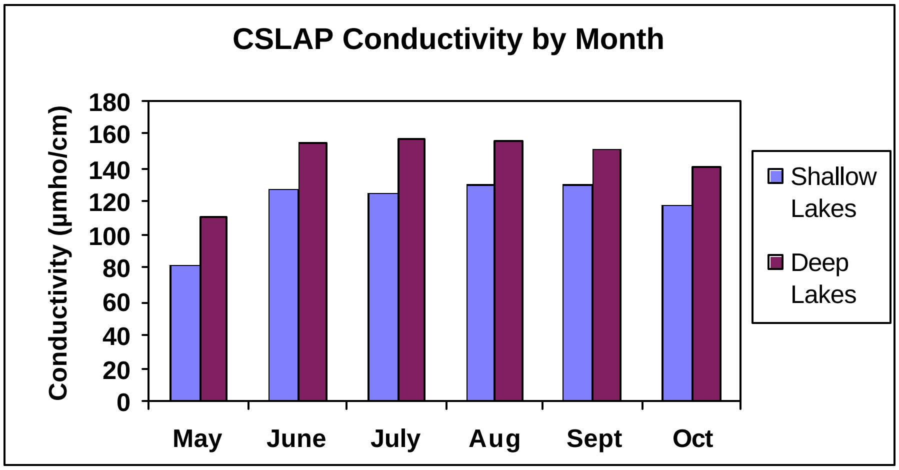


Figure 10c. *Conductivity in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

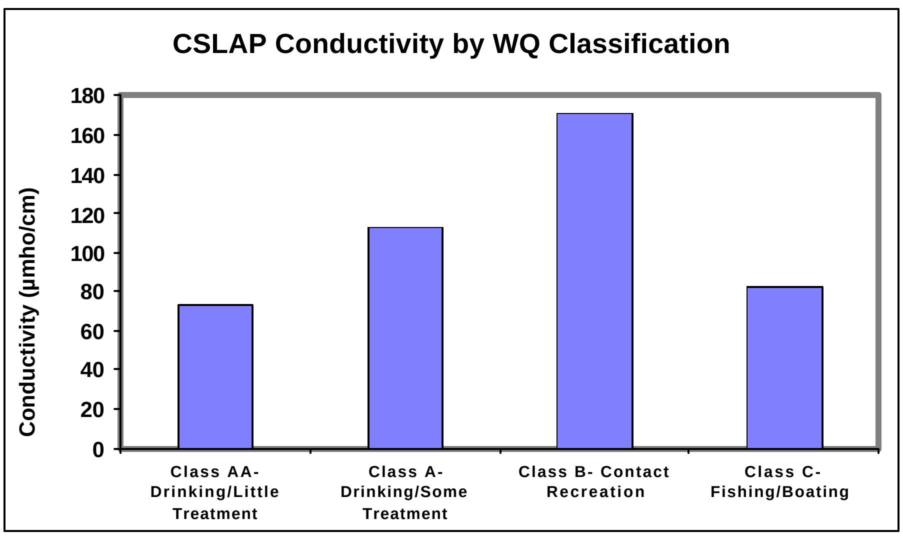


Figure 10d. *Conductivity in CSLAP Lakes by Lake Use*

Seasonal Variability:

Conductivity readings are much higher in the summer than in the late spring in many CSLAP lakes. These readings decreased in deep lakes in the summer and fall but remained fairly steady in shallow lakes during this period (actual readings within specific lakes, however, may often vary significantly from week to week). Although lake destratification (turnover) brings bottom waters with higher conductivity to the lake surface in deeper lakes, conductivity readings dropped in the fall. It is possible that fully mixed conditions may be missed in some NYS lakes by discontinuing sampling after the end of October. Conductivity readings overall were higher in deep lakes, although this may be an artifact of the sampling set (there are more CSLAP deep lakes in areas that "naturally" have harder water).

Lake-Use Variability:

Conductivity readings are substantially higher for lakes used primarily for contact recreation (Class B) and are somewhat higher for lakes used for drinking water with some treatment (Class A). However, this is probably more reflective of geographical differences (there are relatively more softwater CSLAP lakes in the Adirondacks, which tend to have more Class A or Class AA lakes, at least in CSLAP, and more Class B lakes are found in hardwater regions) than any *de facto* connection between conductivity and lake usage.

Color

Annual Variability:

The color of most CSLAP lakes has varied from year to year. The years with the lowest color readings, 1993 and 1995, had "normal" levels of precipitation, although four of the years with the highest color readings (1992 and 2002 through 2005) were wet, and the least-colored waters generally occurred during dry conditions. Most lake samples (92%) correspond to water-color readings too low (< 30 ptu) to significantly influence water clarity. Color readings were much higher in 2004 than in any other CSLAP sampling season. Given that color readings were also higher in 2002 and 2003, the increase in color may be attributable in part to the shift in laboratories, which occurred prior to the 2003 sampling season.

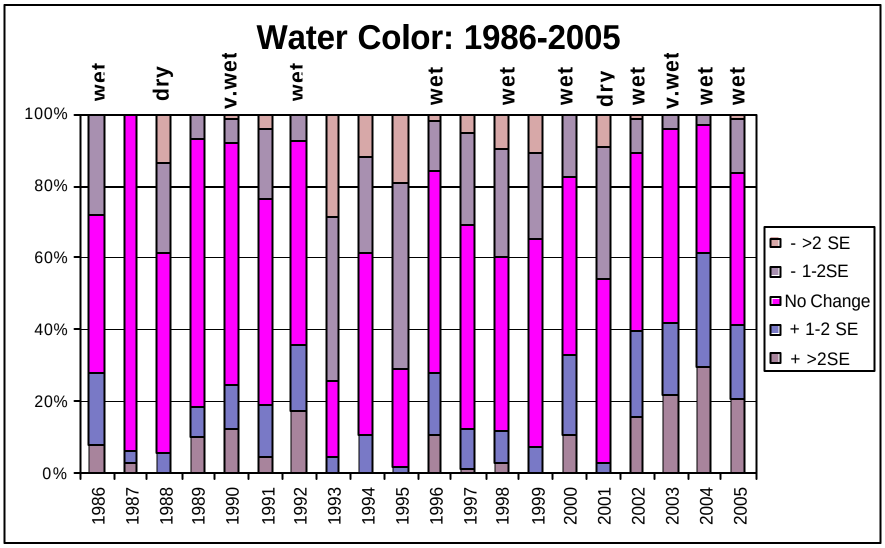


Figure 11a. *Annual Change from "Normal" Color in CSLAP Lakes (SE = Standard Error)*

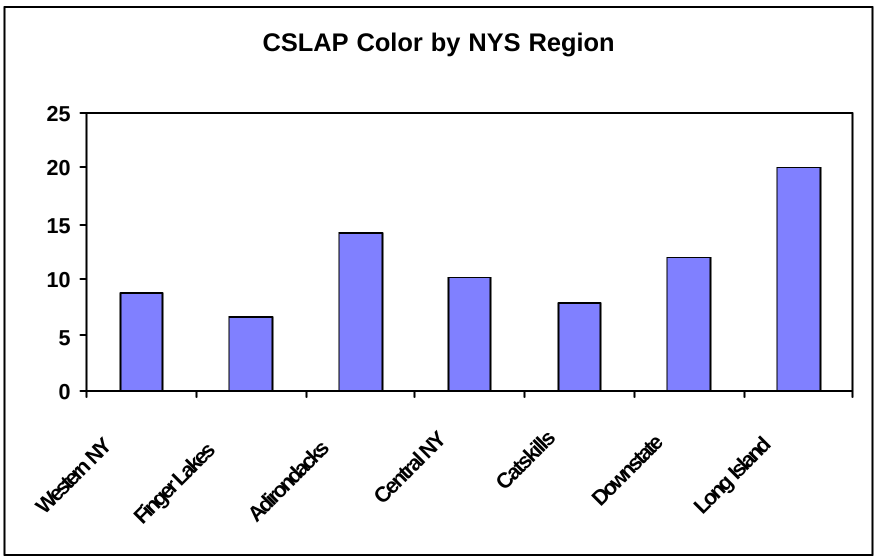


Figure 11b. *Color in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

As noted above, color readings have generally been higher during wet years, and readings have been higher in the last three years, perhaps due to slightly different analytical methodology. Since 2006 generally corresponded to a wet year, it is likely that color readings in 2006 will at least be higher than the long-term average, although readings may not be higher than in 2004, which was also generally a wet year.

What Happened at Lake George in 2006?

Water color readings at site 2 were higher in 2006 than in the typical CSLAP sampling season, and the highest color levels corresponded to the lowest water transparency readings in the lake. Color readings at the other sites were comparable in 2006 to those recorded in previous years.

Statewide Variability:

Water color is highest in Long Island and the Adirondacks, and lowest in the Finger Lakes, Catskill and western NY regions. This is mostly coincident with the statewide conductivity distribution (with softwater lakes more likely to be colored). The CSLAP dataset may be a representative cross-section of NYS lakes as related to color.

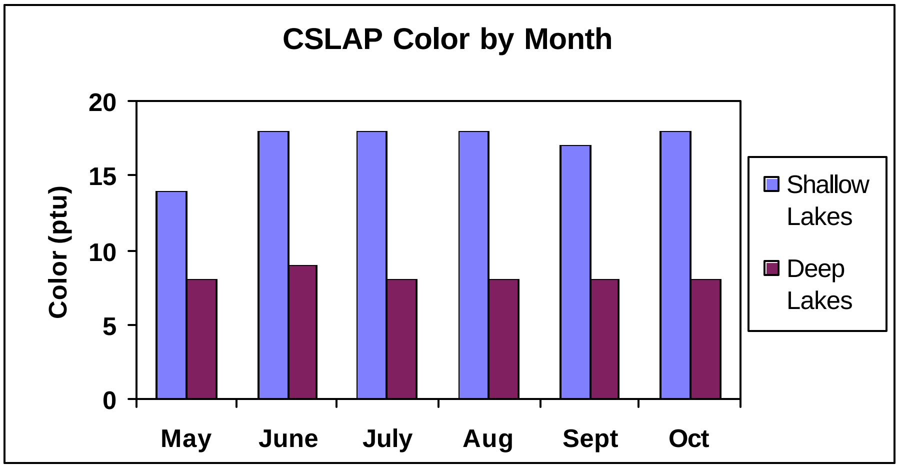


Figure 11c. *Color in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

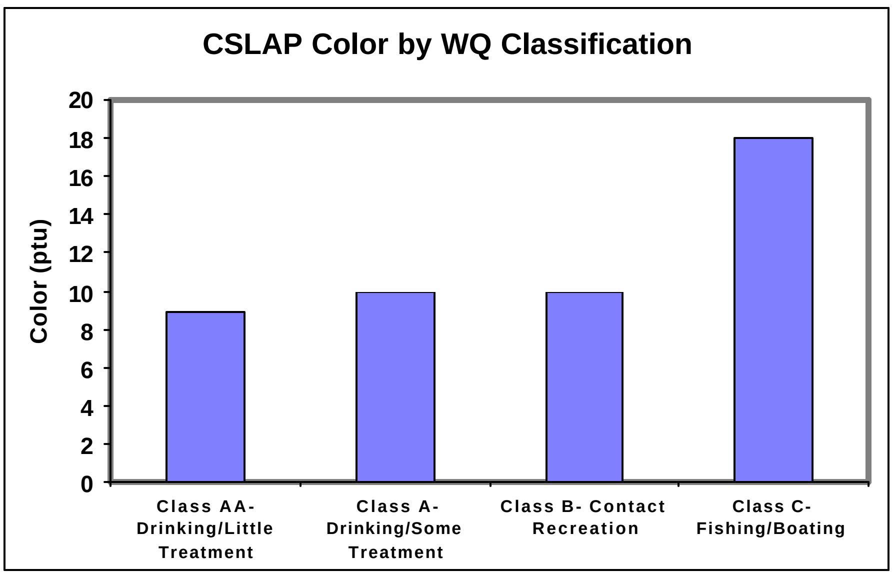


Figure 11d. *Color in CSLAP Lakes by Lake Use*

Seasonal Variability:

Color readings are significantly higher in shallow lakes than in deepwater lakes; these readings increase from spring to summer in these shallower lakes (perhaps due to dissolution of organic material, including algae, and wind-induced mixing during the summer) and then drop off again in late summer into the fall. Color generally follows the opposite trend in deeper lakes, with slightly decreasing color readings perhaps due to more particle setting in the summer and remixing in the fall, although the seasonal trend in the deeper lakes is not as pronounced as in shallow lakes.

Lake-Use Variability:

Color readings are substantially higher for lakes used primarily for non-contact recreation (Class C), but this is probably more reflective of morphometric differences, for Class C lakes tend to be shallow lakes (mean depth = 4 meters), while the other classes tend to be deeper lakes (mean depth = 9 meters). However, the elevated color readings correspond to elevated levels of dissolved organic matter and may also reflect impediments (via economically viable water treatment, aesthetics, and potential formation of hazardous compounds during chlorination) to the use of these waters for drinking.

Nitrate

Annual Variability:

Evaluating nitrate in CSLAP lakes is confounded by the relative lack of nitrate data for many sampling seasons (it was analyzed in water samples at a lower frequency, or not at all, for many years), the high number of undetectable nitrate readings, and some changes in detection levels. The limited data indicated that nitrate was highest in 1986 and 1989, two early CSLAP years in which nitrate was analyzed more frequently (including a relatively large number of early season samples), and in 2004 and 2005, which corresponded to the use of a new analytical tool. Readings were lowest in 1995, 2002 and 2003. Although nitrate levels are probably closely related to winter and spring precipitation levels (due to the higher nitrate readings in snowpacks), this is not apparent from Figure 12a. No readings have approached the state water-quality standard (= 10 mg/l) in any CSLAP sample.

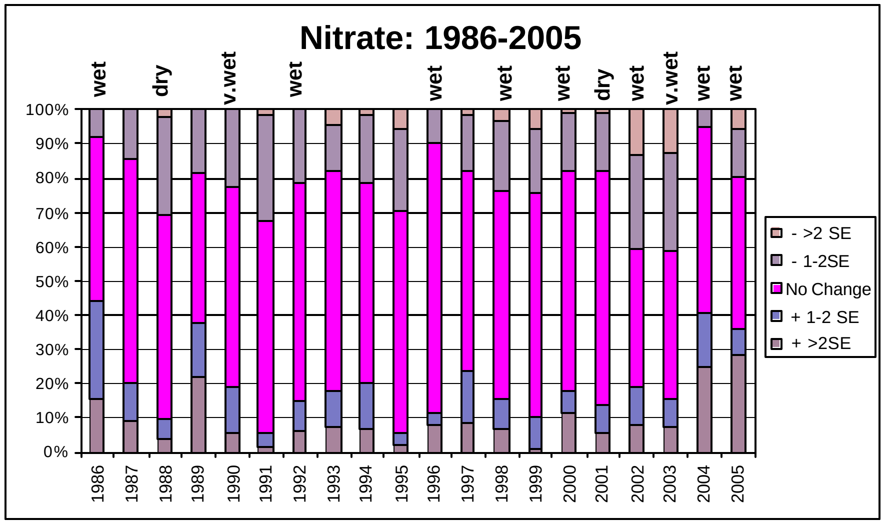


Figure 12a. *Annual Change from "Normal" Nitrate in CSLAP Lakes (SE = Standard Error)*

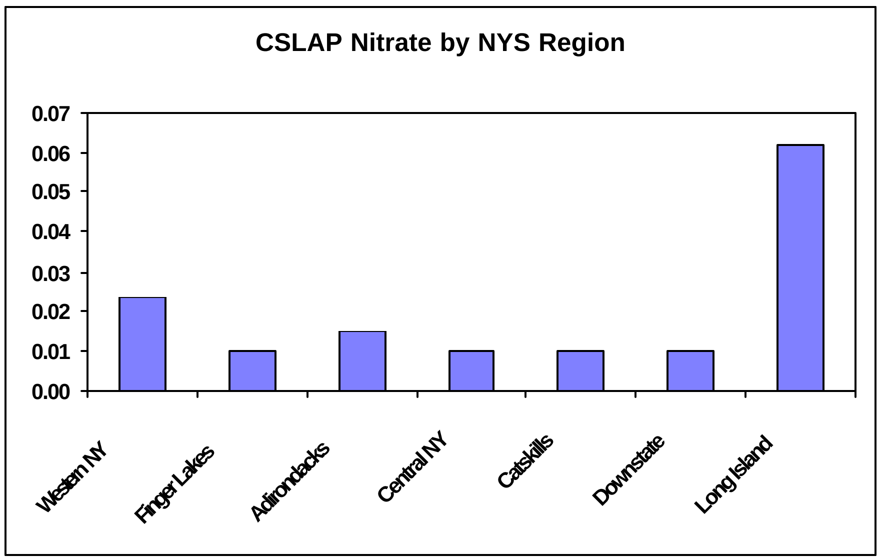


Figure 12b. *Nitrate in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

Nitrate readings have been very unpredictable, although at nearly all times, all nitrate readings are small. Given the higher readings found in 2004, it is presumed that nitrate readings may also be slightly higher in 2006.

What Happened at Lake George in 2006?

Nitrate readings in Lake George in 2006 were close to the analytical detection limits at all sites, and these readings were comparable to those measured in most previous CSLAP sampling seasons.

Statewide Variability:

Nitrate levels are highest in Long Island, western NY, and the Adirondacks, and lowest in the other NYS regions. However, none of these regions demonstrate readings that are particularly high. Readings from individual lakes in Long Island, Madison County, and the Adirondacks (spring only) are often elevated, although still well below water-quality standards.

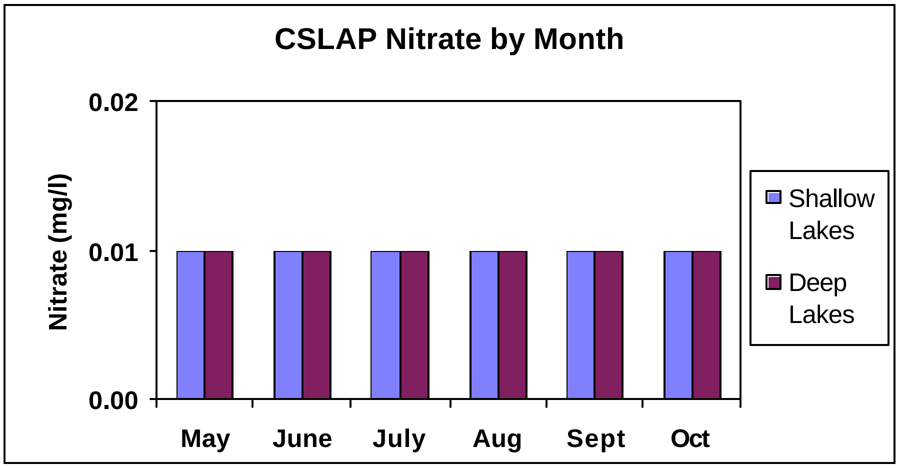


Figure 12c. *Nitrate in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

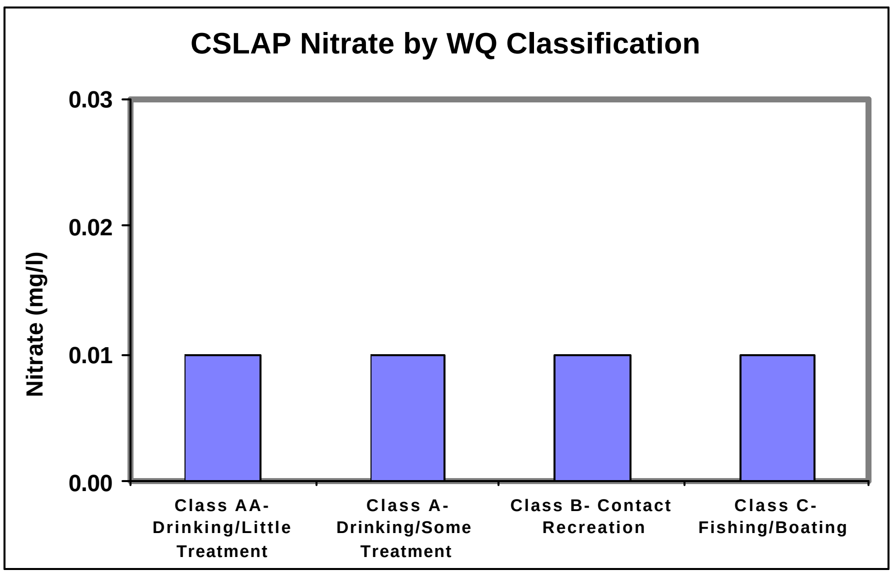


Figure 12d. *Nitrate in CSLAP Lakes by Lake Use*

Seasonal Variability:

Nitrate readings are not seasonally variable on a program-wide basis, as indicated in Figure 12c. However, in some individual lakes, in the regions listed above, nitrate is often detectable until early summer and then undetectable through the rest of the sampling season (the large number of lakes with undetectable nitrate levels throughout the year overwhelm the statistics in Figure 12c).

Lake-Use Variability:

Nitrate readings appeared to be identical for all classes of lake uses, as indicated in Figure 12d. Higher early-season nitrate readings are found in some lakes influenced by the melting of large winter snowpacks, such as some Class AA and A lakes in the Adirondacks, but these statistics cannot be easily teased from datasets strongly influenced by the large number of lakes with undetectable nitrate readings.

Trophic Indicators:
Water Clarity
Annual Variability:

Water clarity (transparency) has varied annually in most CSLAP lakes. There does not appears to be much of a correlation between clarity and precipitation--the highest clarity occurred in 1995, 1997, and 1999, which corresponded to normal precipitation (statewide), although the lowest clarity occurred during two wet years (1996 and 2000). There are no significant broad statewide water clarity trends, although (as described in other portions of this report), clear trends do exist on some lakes. The majority of water clarity readings in CSLAP lakes (56%) correspond to *mesotrophic* conditions (clarity between 2 and 5 meters), with 27% corresponding to *eutrophic* conditions (Zsd < 2) and 17% corresponding to *oligotrophic* conditions (Zsd > 5).

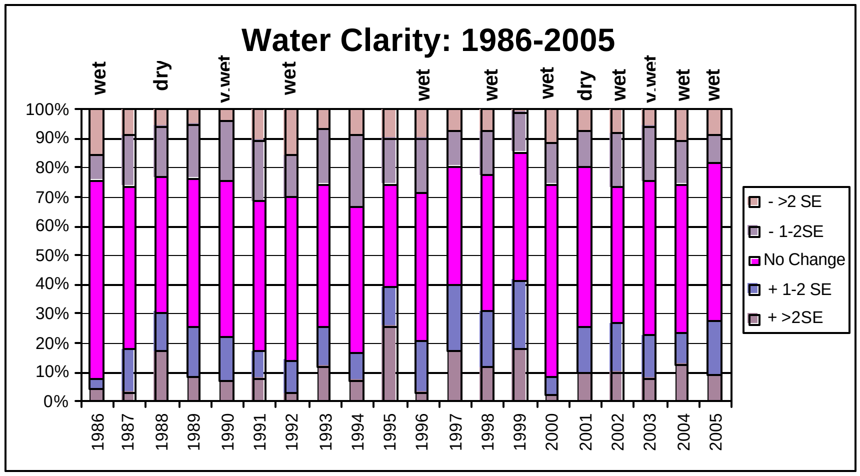


Figure 13a. *Change from "Normal" Water Clarity in CSLAP Lakes (SE = Standard Error)*

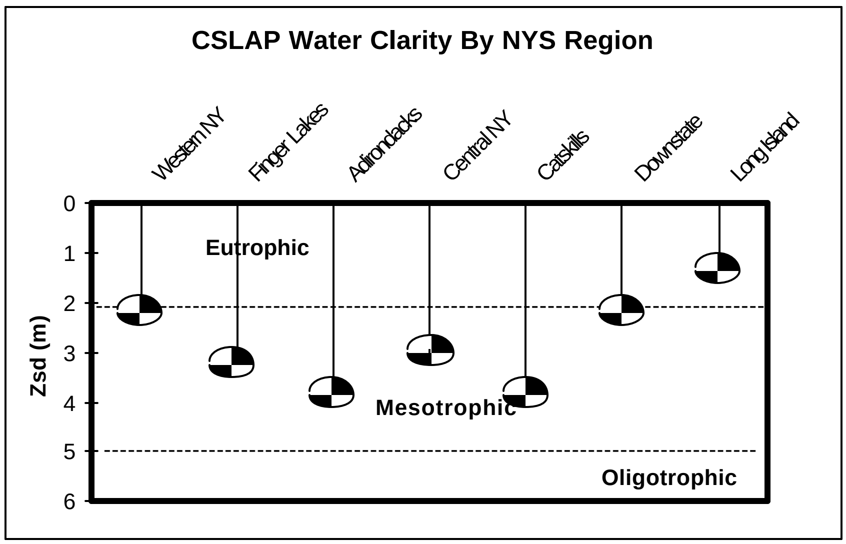


Figure 13b. *Water Clarity in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

Since there is not a strong correlation between weather and water transparency readings, it is difficult to identify expected conditions. However, since water clarity seems to be lowest during wet years, it is likely that more lakes would exhibit slightly lower water transparency readings in 2006.

What Happened at Lake George in 2006?

Water transparency readings in 2006 were lower than readings from previous years at three of the four sampling sites (sites 2, 8 and 10), while water clarity readings at site 4 have risen over the last three years. As noted above, this was attributable to higher water color at site 2.

Statewide Variability:

As expected, water clarity is highest in the Adirondacks, Catskills, and Finger Lakes regions, and lowest in Long Island, downstate, and western NY. The differences are more pronounced (at least for the Adirondacks) when "naturally" colored lakes are not considered. However, except for Long Island (for which water clarity is at least partially limited by the shallow water depth), the "typical" lake in each of these regions would be classified as *mesotrophic*.

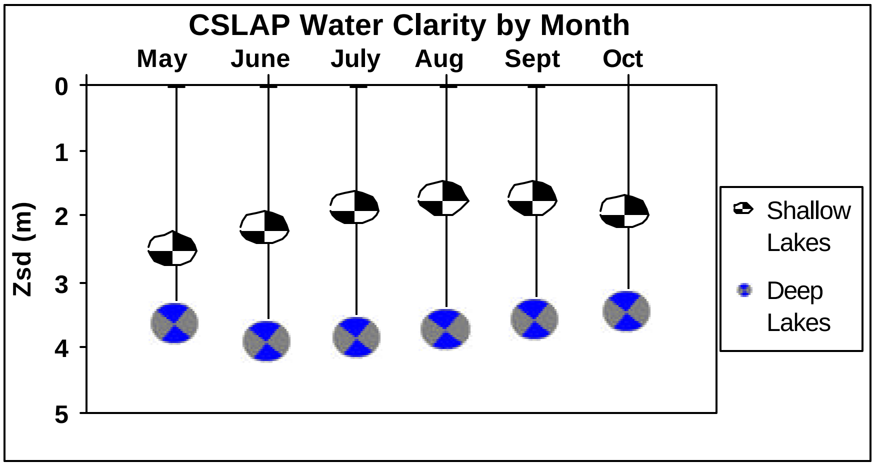


Figure 13c. *Water Clarity in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

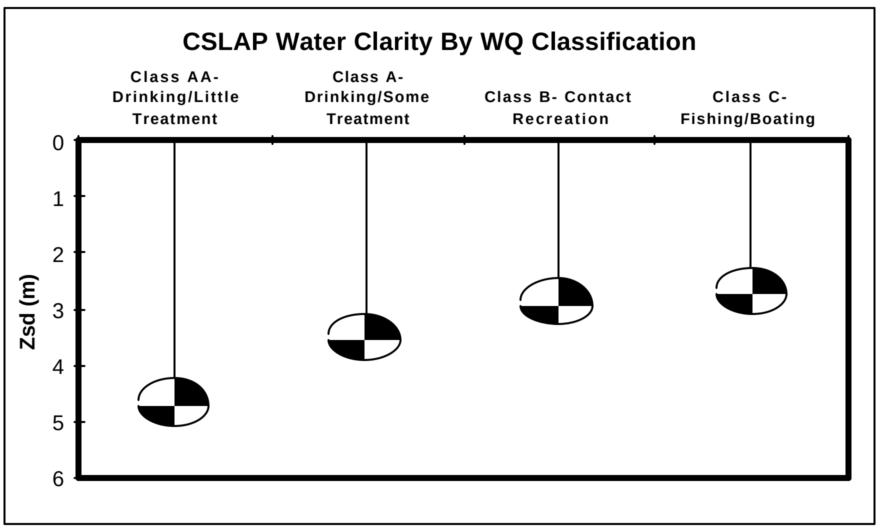


Figure 13d. *Water Clarity in CSLAP Lakes by Lake Use*

Seasonal Variability:

Water clarity readings are lower, as expected, in shallow lakes, even when water depth does not physically limit a water clarity measurement. Transparency decreases in both shallow and deep lakes during the course of the sampling season (the drop in clarity in shallower lakes is somewhat more significant), although clarity readings increase from spring to early summer in deeper CSLAP lakes. Water transparency rebounds slightly in shallower lakes in the fall, probably due to a drop in nutrient levels. The lack of "rebound" in deeper lakes may be due to occasional fall algal blooms in response to surface nutrient enrichment after lake turnover (see below).

Lake-Use Variability:

Water transparency decreases as the "sensitivity" of the lake use decreases, with higher clarity found in lakes used for potable water (Class AA), and lower clarity found in lakes used primarily for contact and non-contact (fishing and boating) recreation. As with many of the other water-quality indicators, this is due to both geographical and morphometric (depth) differences, although the original designation of these uses may also reflect these measurable and visually apparent water-quality differences.

Trophic Indicators: Phosphorus (TP)

Annual Variability:

Total phosphorus (TP) has varied annually in most CSLAP lakes. The highest phosphorus readings occurred during 1991, 1996, 1998, 2000, and 2003, the latter four of which corresponded to wet years. However, the lowest readings, from 1989, 1997, and 2002, did not correspond to unusually dry years, and 2004 was a fairly wet year. The majority of phosphorus readings in CSLAP lakes (39%) correspond to *mesotrophic* conditions (clarity of 2 to 5m), with 27% corresponding to *eutrophic* conditions (< 2m clarity) and 34% corresponding to *oligotrophic* conditions (> 5m clarity); the latter is a much higher percentage than the trophic designation for water clarity.

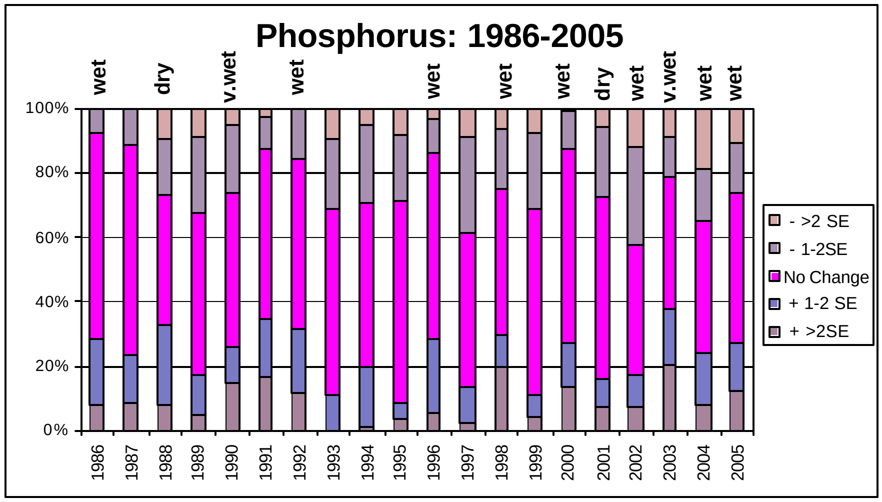


Figure 14a. *Annual Change from "Normal" TP in CSLAP Lakes (SE = Standard Error)*

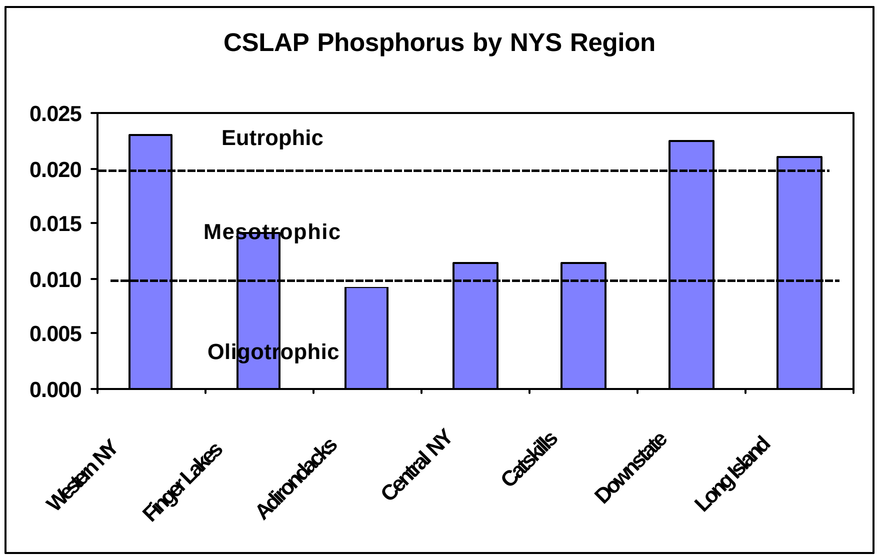


Figure 14b. *TP in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

As noted above, there is not a strong correlation between weather and total phosphorus, and there does not appear to be a consistent long-term pattern in the total phosphorus data. The data also does not appear to be significantly laboratory-dependent, at least as apparent in Figure 14a. As such, it is difficult to predict whether phosphorus levels might be expected to be higher or lower in most CSLAP lakes in 2006.

What Happened at Lake George in 2006?

Phosphorus readings in Lake George, whether measured in the surface or bottom waters, have been fairly stable and 2006 readings were very close to the long-term average for the lake. Phosphorus levels are similar in surface and deep waters of the lake, and this no doubt contributes to the lack of significant change in phosphorus readings over the summer.

Statewide Variability:

As expected, nutrient levels are lowest in the Adirondacks, Catskills, and Central New York (where clarity is highest) and highest in Long Island, downstate, and western NY, where clarity is lowest. In the latter three regions, the "typical" lake in each of these regions would be classified as *eutrophic*, while only in the Adirondacks could most lakes be described as *oligotrophic*, based on nutrients.

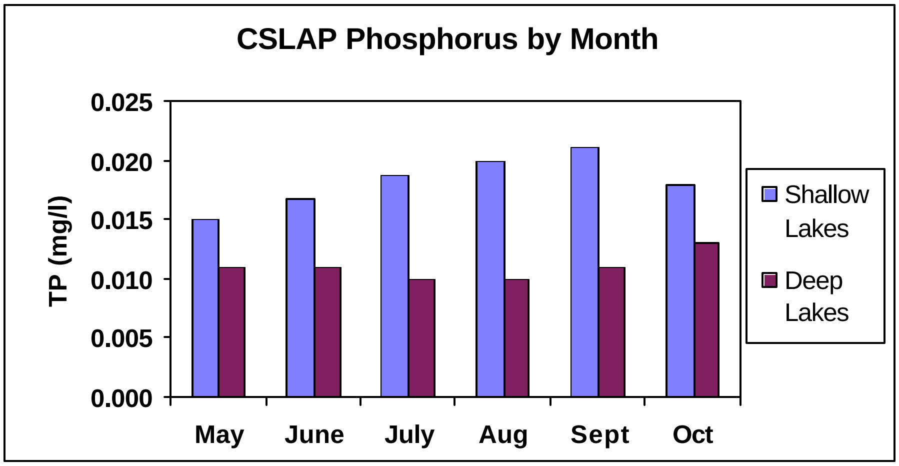


Figure 15c. *TP in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

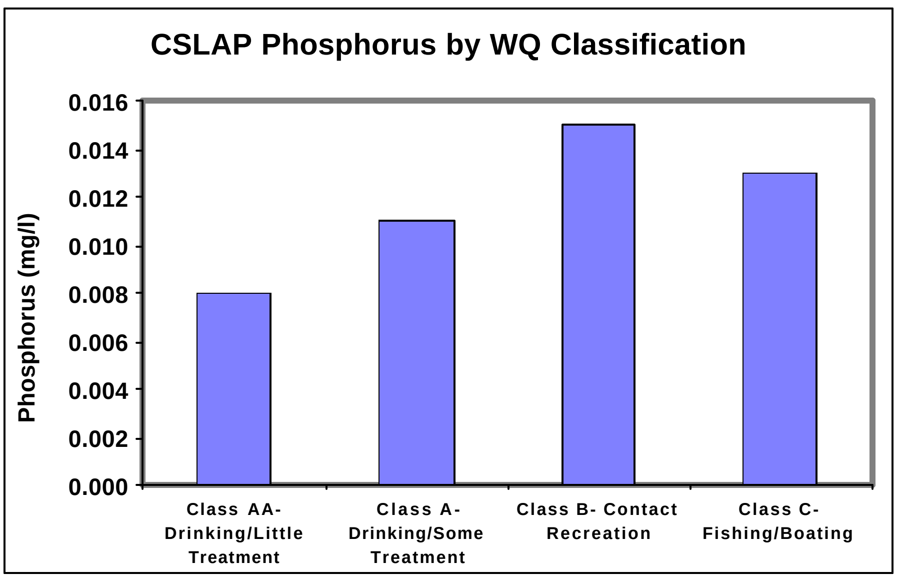


Figure 15d. *TP in CSLAP Lakes by Lake Use*

Seasonal Variability:

Nutrient levels are higher, as expected, in shallow lakes, and phosphorus levels increase in shallow lakes during the course of the sampling season, until dropping in the fall. However, phosphorus levels in deeper lakes are lower and decrease slightly through July, then increase into the fall. The latter phenomenon is due to surface nutrient enrichment after lake turnover (high nutrient water from the lake bottom, due to release of nutrients from poorly oxygenated lake sediments in the summer, migrates to the lake surface when the lake destratifies).

Lake-Use Variability

Phosphorus readings are lower in lakes used for minimally treated potable water intakes (Class AA) and are higher for other lake uses. Although Class B waters are utilized for a "higher" lake use than Class C lakes (contact recreation versus non-contact recreation), these lakes actually have higher nutrient levels, perhaps reflecting the influence of deepwater nutrient enrichments (these lakes are typically deeper) and the "unofficial" use of Class C waters for bathing and contact recreation.

Trophic Indicators: Chlorophyll *a* (Chl.a)

Annual Variability:

Chlorophyll *a* (Chl.a) has varied in most CSLAP lakes more significantly than the other trophic indicators, as is typical of biological indicators (which tend to grow "patchy"). With the exception of the very high readings in 1987 (probably due to a lab "problem"), the highest chlorophyll *a* levels occurred during 1990, 1991, 1996, and 2000, corresponding to wet years. However, the lowest readings, from 1989, 1997, and 2001 through 2005 also corresponded to normal to wet conditions in most of these years. The consistently lower chlorophyll readings in the last four years may also correspond to the shift in laboratories, although both labs use the same analytical methodology. The near majority of chlorophyll readings in CSLAP lakes (49%) correspond to *mesotrophic* conditions (clarity between 2 and 5 meters), with 33% corresponding to *eutrophic* conditions (Zsd < 2) and 18% corresponding to *oligotrophic* conditions (Zsd > 5); these percentages are more like those for water clarity rather than those for phosphorus.

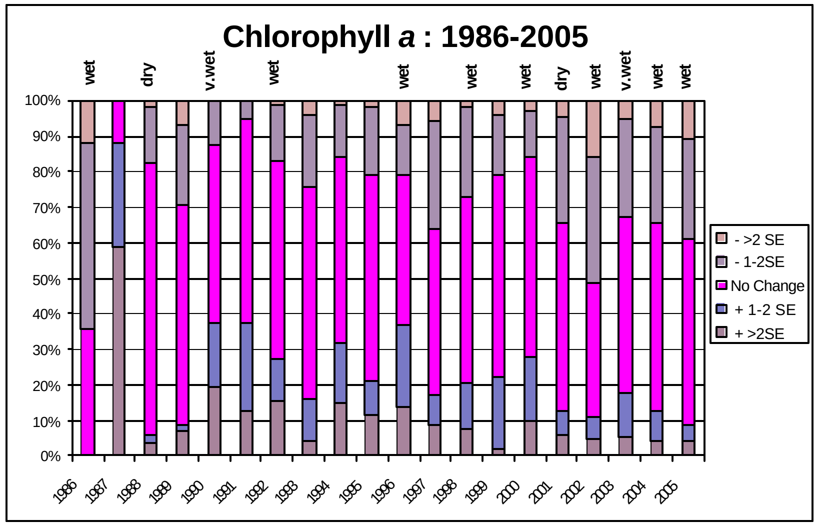


Figure 16a. *Annual Change from "Normal" Chlorophyll a in CSLAP Lakes (SE = Standard Error)*

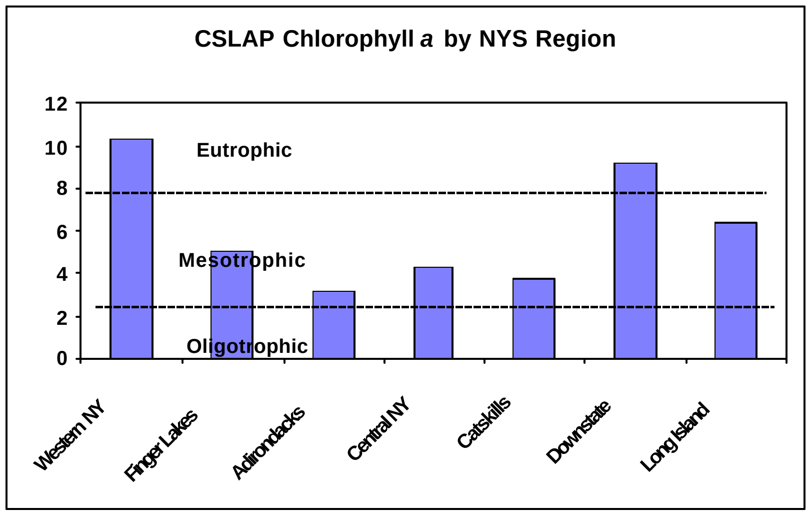


Figure 16b. *Chlorophyll a in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

It is likely that chlorophyll readings would be lower than the long-term average for most CSLAP lakes in 2006, due to consistently lower readings coming from the same laboratory in the last several years. Because 2006 was also generally a hotter and "stickier" year than is typical at most NYS lakes, it would not be surprising to see higher-than-usual chlorophyll readings, at least relative to the last several years. However, this did not consistently occur in previously hot/humid years.

What Happened at Lake George in 2006?

Chlorophyll *a* readings in 2006 were close to the long-term (CSLAP) average for the lake. This is mostly consistent with phosphorus and water clarity readings close to the long-term average for the lake. Moreover, chlorophyll *a* readings are close enough to the analytical detection limit that the site to site and annual variability measured is within the "rounding error" for this test.

Statewide Variability:

As with phosphorus, chlorophyll levels are lowest in the Adirondacks, Central New York, and the Catskills (where clarity is highest) and highest in Long Island, downstate, and western NY, where clarity is lowest. In the latter two regions, the "typical" lake in each of these regions would be classified as *eutrophic,* while lakes in the other regions would be described as *mesotrophic*.

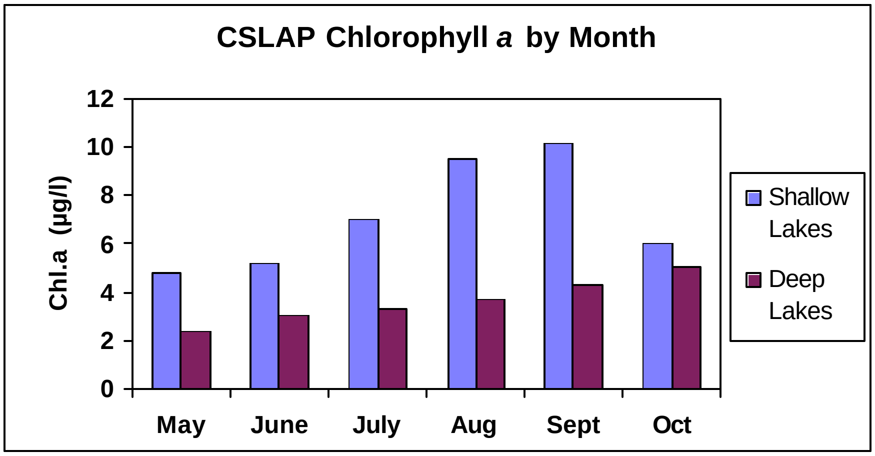


Figure 16c. *Chlorophyll a in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

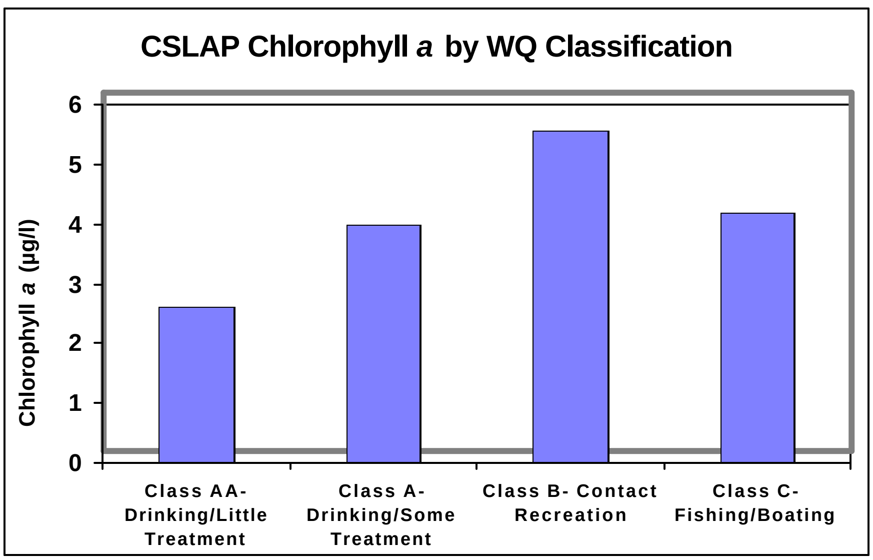


Figure 16d. *Chlorophyll a in CSLAP Lakes by Lake Use*

Seasonal Variability:

Chlorophyll levels are higher, as expected, in shallow lakes, and increase in both shallow and deep lakes during the course of the sampling season, with chlorophyll readings dropping in shallow lakes in the fall. The steady increase in chlorophyll in both shallow and (to a lesser extent) deep lakes is consistent with the change in phosphorus over the same period, due to steady migration of nutrients released from poorly oxygenated lake sediments during the summer and especially in the fall (as well as drier weather, increased lake use, and other factors).

Lake-Use Variability:

Chlorophyll readings are lower in lakes used for minimally treated potable water intakes (Class AA) and are higher for other lake uses. Although Class B waters are utilized for a "higher" lake use than Class C lakes (contact recreation versus non-contact recreation), these lakes actually have similar levels, perhaps reflecting the influence of deepwater nutrient enrichments (these lakes are typically deeper) and the "unofficial" use of Class C waters for bathing and contact recreation. This is similar to the use pattern for phosphorus.

Water-quality Assessment (QA on the Perception Form)

Annual Variability

Water-quality assessments (the perceived physical condition of the lake or QA on the use-impairment surveys) were least favorable in the very wet (2000) and very dry (1995) years, suggesting the lack of correlation between weather and perceived water-quality (although 1995 was also the year with the most "improved" conditions). The general perception of CSLAP lakes in 2005 indicated no strong changes in perceived water-quality, whether favorable or unfavorable. Although there is a strong connection between measured and perceived water clarity in most CSLAP lakes, this is not closely reflected in the comparison of Figures 14a and 17a.

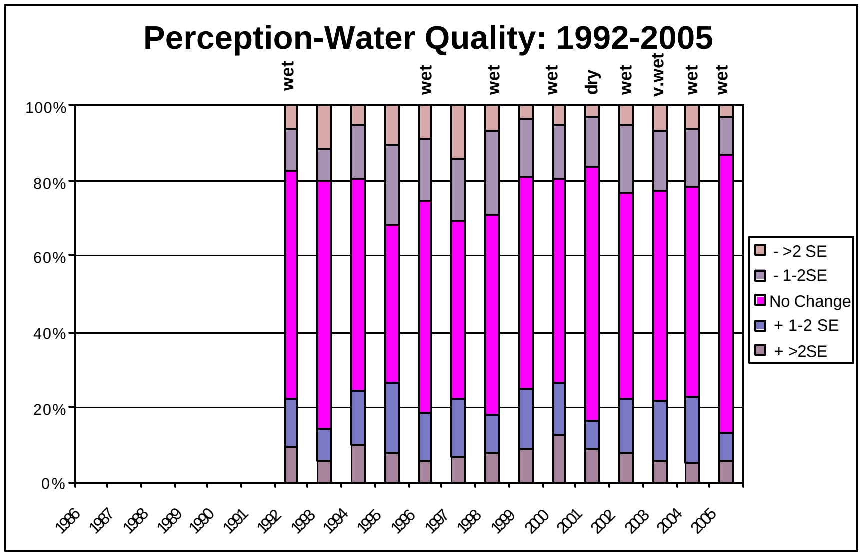


Figure 17a. *Annual Change from "Normal" Water-Quality Assessment in CSLAP Lakes (SE = Standard Error)*

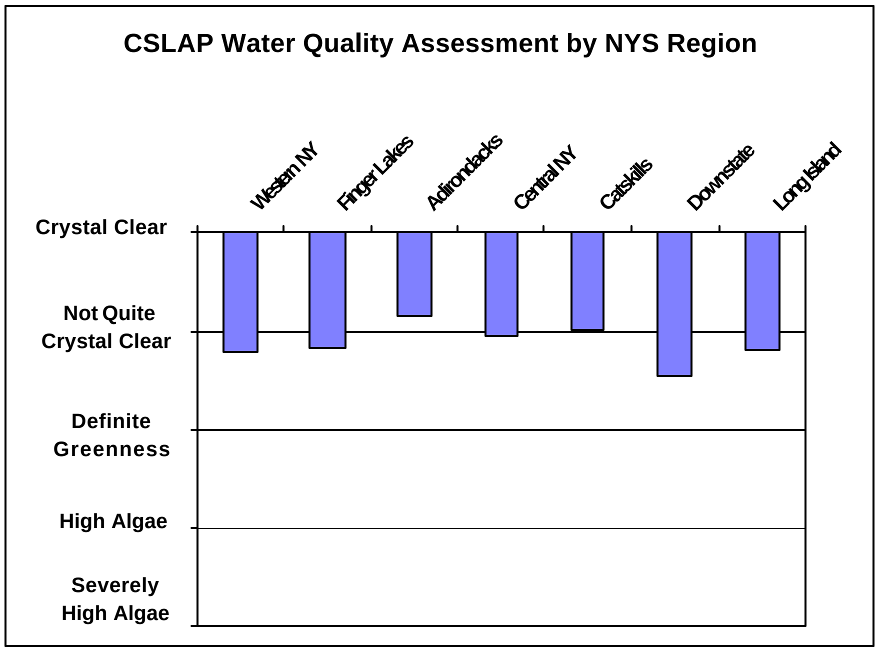


Figure 17b. *Water-Quality Assessment in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

There was not a strong connection between precipitation (within mostly normal weather patterns) and perceived water-quality, or even between measured and perceived water-quality conditions. As such, it is difficult to identify expected conditions in 2006, although because water clarity readings were mostly within normal ranges, it is reasonable to expect that perceived water-quality conditions would also largely be unchanged.

What Happened at Lake George in 2006?

Water-quality assessments in 2006 were highly favorable, as has been the case in each CSLAP sampling season.

Statewide Variability:

The most favorable water-quality assessments (at least in support of contact recreation) occurred in the Adirondacks, Catskills, and central New York, as expected, and water-quality assessments were slightly less favorable downstate, western NY, and on Long Island. This is mostly consistent with the water clarity readings in these regions. However, since the difference between the most favorable (Adirondacks) and least favorable (downstate) assessments is smaller that the measured water transparency differences, this suggests that the relatively low water clarity in the latter regions may be considered "normal" by lake residents.

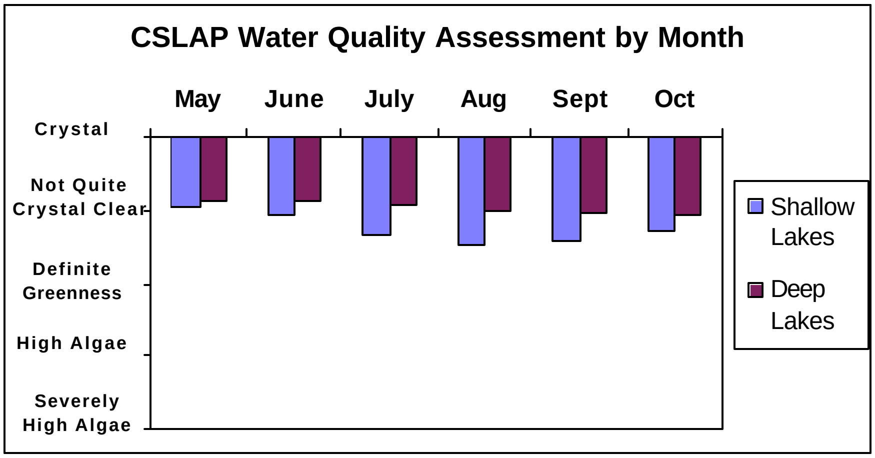


Figure 17c. *Water-Quality Assessment in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

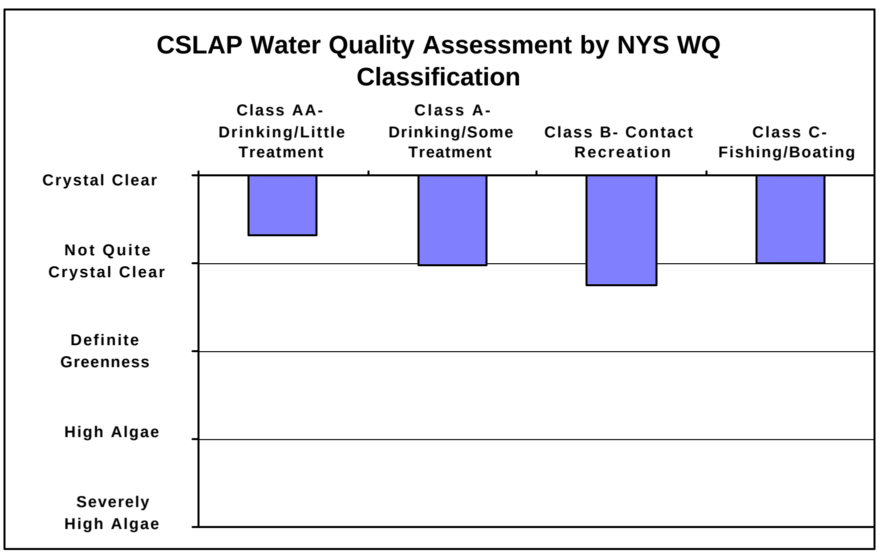


Figure 17d. *Water-Quality Assessment in CSLAP Lakes by Lake Use*

Seasonal Variability:

Water-quality assessments become less favorable as the summer progresses in both deep and (especially) shallow lakes, coincident with similar patterns for the trophic indicators. However, the seasonal changes in these assessments are not very large. These assessments become slightly more favorable in shallow lakes in the fall, consistent with the improved (measured) water clarity, although overall water-quality assessments are less favorable all year in shallow lakes.

Lake Use Variability:

Water-quality assessments are more favorable in lakes used for potable water intakes (Class AA and Class A) and less favorable for other lake uses. Although Class B waters are utilized for a "higher" lake use than Class C lakes (contact recreation versus non-contact recreation), these lakes actually have similar water-quality assessments, perhaps reflecting the influence of deepwater nutrient enrichments (these lakes are typically deeper) and the "unofficial" use of Class C waters for bathing and contact recreation. This is similar to the pattern seen for the trophic indicators.

Aquatic Plant (Weed) Assessment (QB)

Annual Variability:

Aquatic-plant assessments (the perceived extent of weed growth in the lake or QB on the use impairment surveys) indicated that weeds grew most significantly in 1995 (normal conditions) and 2000 (wet conditions), and weed growth was less extensive in 1994 and 1999, suggesting the lack of correlation between weather and weed densities. The highest weed growth occurred when the perceived physical condition (clarity) of the lake was also least favorable--these conditions may offer a selective advantage to invasive or exotic weeds (such as *Myriophyllum spicatum*).

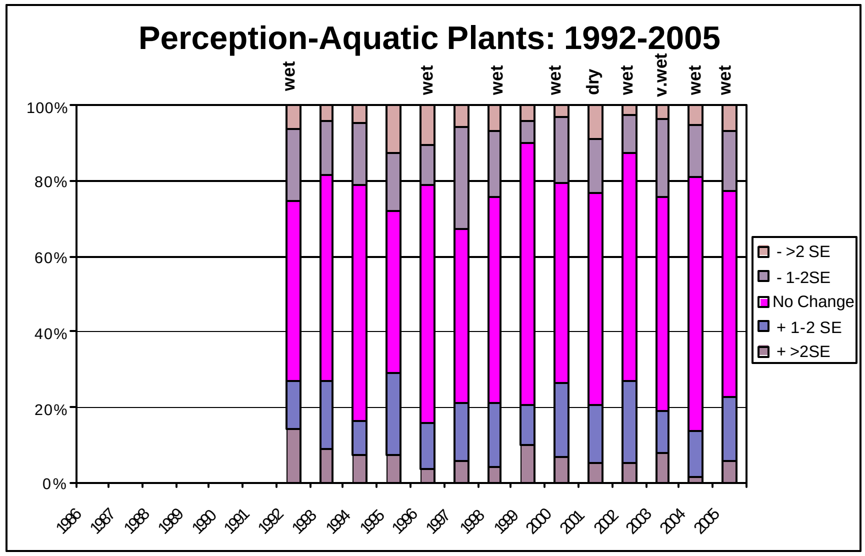


Figure 18a. *Annual Change from "Normal" Weed Assessment in CSLAP Lakes (SE = Standard Error)*

What Was Expected in 2006?

There was not a strong connection between precipitation and extent of weed growth, at least as measurable through CSLAP. This makes it difficult to identify expected conditions in 2006. As is always the case, it is likely that the extent of weed growth in any particular CSLAP lake in 2006 is unrelated to the extent of weed growth in most other NYS lakes and is not readily predictable given historical patterns of aquatic-plant growth in that lake.

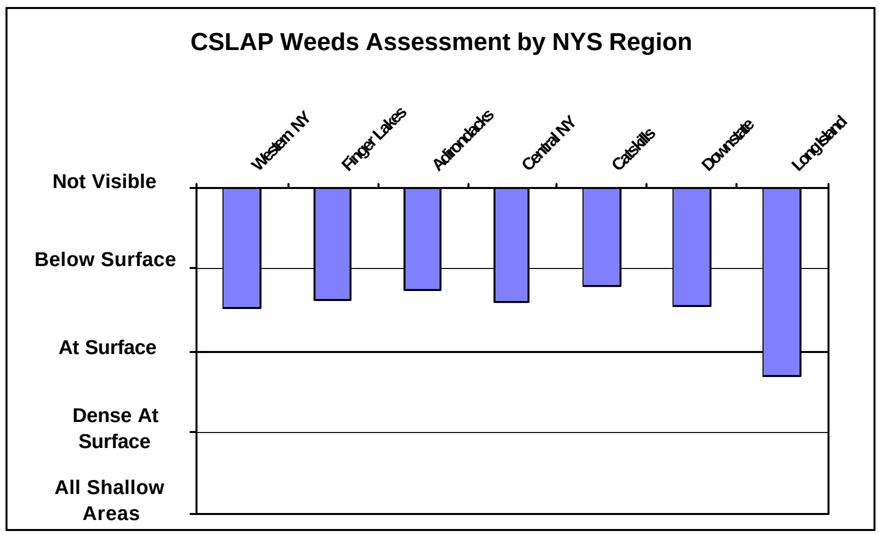


Figure 18d. *Weed Assessment in CSLAP Lakes by NYS Region*

And What Happened at Lake George in 2006?

Overall (annual average) aquatic-plant densities and coverage were lower than or comparable in 2006 to those found in the typical CSLAP sampling season.

Statewide Variability:

Aquatic plant growth was most significant in Long Island (and to a lesser extent Downstate and in western NY) and least significant in the Catskills and Adirondacks. The former may have a larger concentration of shallow lakes (Long Island) or preponderance of exotic weeds (downstate and western NY), while the latter may correspond to deeper lakes or fewer instances of these invasive weeds, although it is also likely that invasive-weed growth may be increasing in many lakes within these "less impacted" areas.

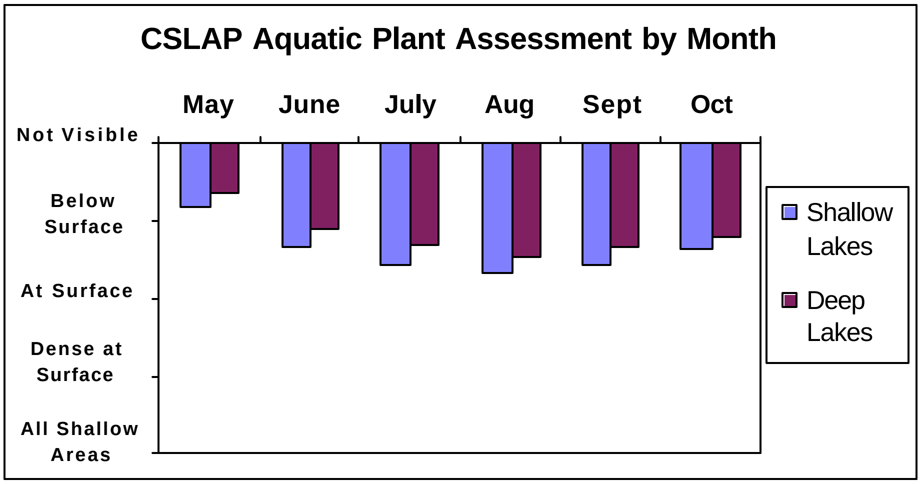


Figure 18c. *Weed Assessment in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

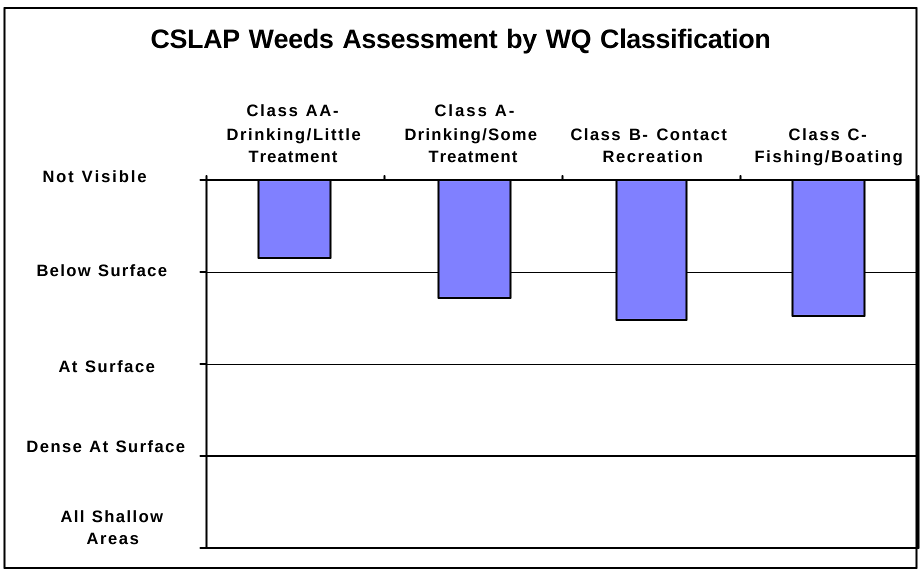


Figure 18d. *Weed Assessment in CSLAP Lakes by Lake Use*

Seasonal Variability:

As expected, aquatic-plant densities and coverage increase seasonally (through late summer) in both shallow and deep lakes, with greater aquatic-plant coverage and densities found in shallow lakes. Peak aquatic-plant densities tend to occur in late summer. The variability from one lake to another (from very little growth to dense growth at the lake surface) is more pronounced later in the summer. Despite higher clarity in shallow lakes in the fall, aquatic-plant coverage decreases, while the drop in fall plant coverage in deeper lakes is less pronounced.

Lake Use Variability:

Aquatic-plant coverage was more significant in Class B and Class C lakes than in other lakes, but this (again) is probably a greater reflection of geography or lake size and depth (Class B lakes tend to be found outside the high elevation areas in the Catskills and Adirondacks, and Class C lakes tend to be shallower than Class AA or Class A lakes).

Recreational Assessment (QC)

Annual Variability:

Recreational assessments (the perceived recreational suitability of the lake or QC on the use-impairment surveys) have varied from year to year, with no clear long-term pattern. The most favorable assessments were in 1997, corresponding to the year with the lowest aquatic-plant (weed) coverage. This was also among the years with the most favorable water-quality assessments. The years with the most favorable water-quality assessments (1995 and 1998) were among the years with the most favorable recreational assessments, despite higher than usual weed densities. This suggests that recreational assessments are influenced by both water-quality conditions and aquatic plant densities. The extent of "normal" conditions (the middle bar in Figure 19a) has generally not changed significantly since perception surveys were first conducted in 1992.

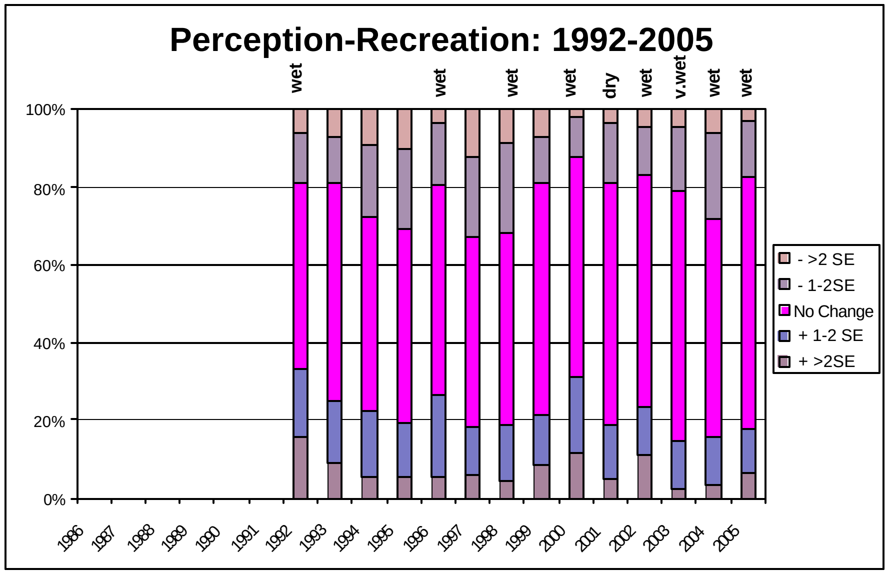


Figure 19a. *Annual Change from "Normal" Recreational Assessment in CSLAP Lakes (SE = Standard Error)*

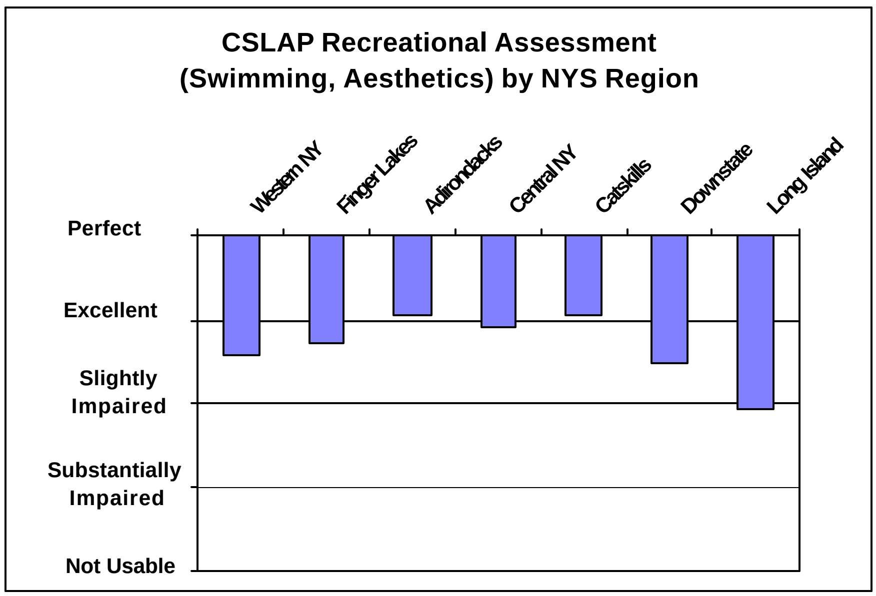


Figure 19b. *Recreational Assessment in CSLAP Lakes by NYS Region*

What Was Expected in 2006?

There was not a strong connection between precipitation (within mostly normal weather patterns) and perceived water-quality, or even between measured and perceived water-quality conditions. As such, it is difficult to identify expected conditions in 2006, although since water clarity readings were mostly within normal ranges, it is reasonable to expect that perceived water-quality conditions would also largely be unchanged.

What Happened at Lake George in 2006?

Recreational assessments have been highly favorable at all sampling sites (except site 1) in each CSLAP sampling season, including 2006.

Statewide Variability:

Recreational assessments are most favorable in the Adirondacks and Catskills, and less favorable in Long Island and (to a lesser extent) downstate and in western New York. This appears to be in response to less favorable assessments of water-quality and aquatic plant growth, respectively. Except for (the assessments in the small number of CSLAP lakes in) Long Island, overall recreational assessments in all regions are, in general, highly favorable.

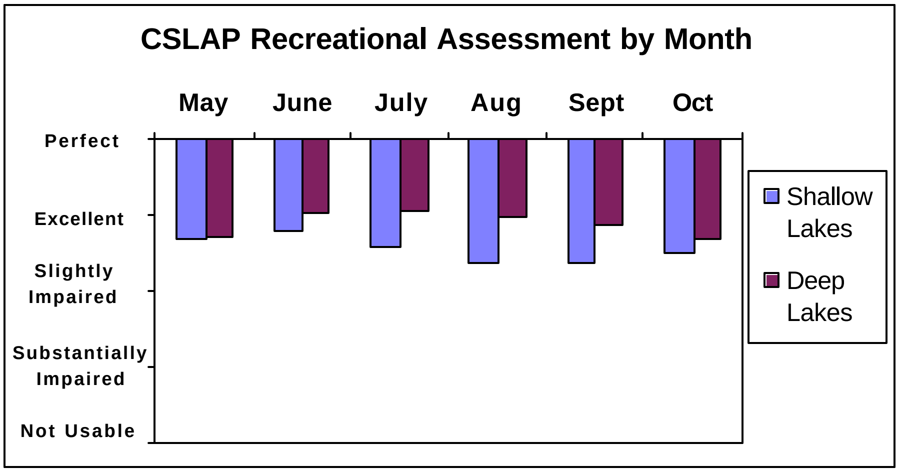


Figure 19c. *Recreational Assessment in Shallow (<20ft deep) and Deep CSLAP Lakes by Month*

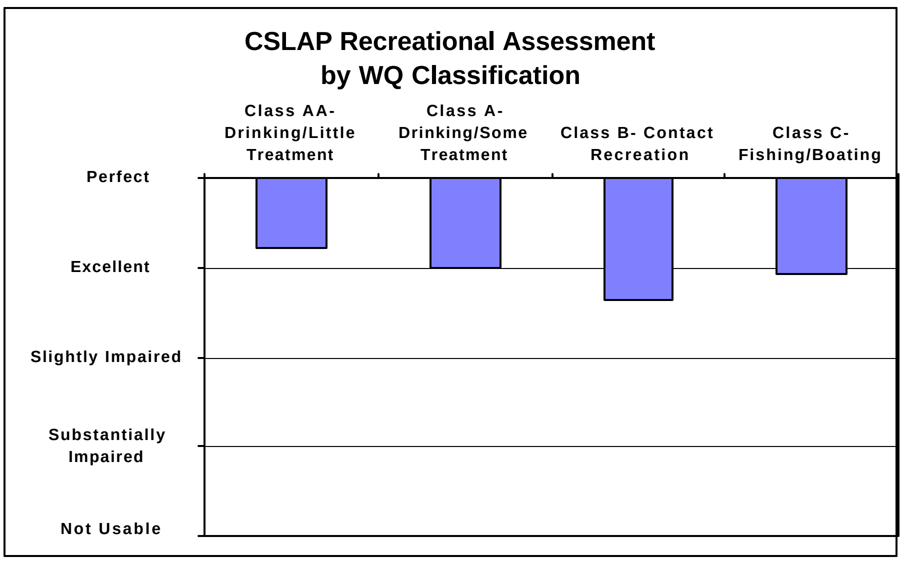


Figure 19d. *Recreational Assessment in CSLAP Lakes by Lake Use*

Seasonal Variability:

Recreational assessment in both shallow and deep lakes tends to improve from spring to early summer and then degrade through the summer, improving in shallow lakes in the fall. As expected, this generally corresponds to seasonal increases in aquatic plant coverage in deep lakes and also to seasonally degrading water-quality in shallow lakes. Overall recreational assessments are more favorable in deep lakes every month of the sampling season, although the differences are less pronounced in late spring and early fall (and winter, when every lake looks nice!).

Lake Use Variability:

Recreational assessment becomes less favorable as the designated lake use becomes less sensitive (drinking water to contact recreation), although recreational assessments of Class C lakes are only slightly less favorable than in Class AA and A lakes. This may be considered a validation of these classifications (recognizing, again, that many Class C lakes continue to fully support contact recreation and perhaps even potable-water use).

VI. DETAILED LAKE GEORGE WATER-QUALITY SUMMARY

CSLAP is intended to provide a database to help lake associations understand lake conditions and foster sound lake protection and pollution prevention decisions. This individual lake summary for 2006 contains two forms of information. The raw data and graphs present a snapshot or glimpse of water-quality conditions at each lake. They are based on (at most) eight or nine sampling events during the summer. As lakes are sampled through CSLAP for a number of years, the database for each lake will expand, and assessments of lake conditions and water-quality data become more accurate. For this reason, lakes new to CSLAP for only one year will not have information about annual trends.

Raw Data

Two **"**data sets**"** are provided below. The data presented in Table 1 include an annual summary of the minimum, maximum, and average for each of the CSLAP sampling parameters, including data from other sources for which sufficient quality-assurance/quality-control documentation is available for assessing the validity of the results. This data may be useful for comparing a particular data point for the current sampling year with historical data or information. Table 2 includes more detailed summaries of the 2006 and historical data sets, including some evaluation of water-quality trends, comparison against existing water-quality standards, and whether 2006 represented a typical year.

Graphs

The second form of data analysis for your lake is presented in the form of graphs. These graphs are based on the raw data sets to represent a snapshot of water-quality conditions at your lake. The more sampling that has been done on a particular lake, the more information that can be presented on the graph, and the more information you have to identify annual trends for your lake. For example, a lake that has been doing CSLAP monitoring consistently for five years will have a graph depicting five years' worth of data, whereas a lake that has been doing CSLAP sampling for only one year will only have one. Therefore, it is important to consider the number of sampling years of information in addition to where the data points fall on a graph when trying to draw conclusions about annual trends. There are certain factors not accounted for in this report that lake managers should consider:

- **Local weather conditions** (high or low temperatures, rainfall, droughts or hurricanes). Due to delays in receiving meteorological data from NOAA stations within NYS, weather data from individual weather stations or the present sampling season are not included in these reports. Some of the variability reported below can be attributed more to weather patterns than to a "real" water trend or change. However, it is presumed that much of the sampling "noise" associated with weather is dampened over multiple years of data collection and thus should not significantly influence the limited trend analyses provided for CSLAP lakes with longer and larger databases.

- **Sampling season and parameter limitations**. Because sampling is generally confined to June-September, this report does not look at CSLAP parameters during the winter and other seasons. Winter conditions can impact the usability and water-quality of a lake. In addition, there are other sampling parameters (fecal coliform, dissolved oxygen, etc.) that may be responsible for chemical and biological processes and changes in physical measurements (such as water clarity) and the perceived conditions in the lake. **The 2006 CSLAP report attempts to standardize some comparisons by limiting the evaluation to the summer recreational season and the most common sampling periods (mid-June through mid-September), in the event that samples are collected at other times of the year (such as May or October) during only some sampling seasons.**

TABLE 1: CSLAP Data Summary for Lake George

Year	Min	Avg	Max	N	Parameter
2004-06	**4.00**	**7.58**	**10.72**	**81**	**Zsd**
2006	6.25	7.19	7.75	7	Zsd-Site2
2006	6.10	7.64	9.05	8	Zsd-Site4
2006	7.80	8.37	9.25	3	Zsd-Site8
2006	7.50	8.10	9.00	5	Zsd-Site10
2005	6.25	6.83	7.45	4	Zsd-Site1
2005	6.25	7.38	8.50	4	Zsd-Site2
2005	5.75	7.20	8.25	8	Zsd-Site4
2005	7.00	8.17	9.50	6	Zsd-Site6
2005	8.50	9.18	9.85	2	Zsd-Site8
2005	8.30	8.60	9.00	3	Zsd-Site10
2004	5.15	6.73	9.30	8	Zsd-Site1
2004	6.80	8.08	9.35	6	Zsd-Site2
2004	6.20	7.33	8.80	8	Zsd-Site4
2004	6.50	8.00	9.50	2	Zsd-Site5
2004	4.00	5.08	6.75	3	Zsd-Site6
2004	8.00	9.28	10.72	4	Zsd-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**0.002**	**0.008**	**0.023**	**79**	**Tot.P**
2006	0.006	0.008	0.013	6	Tot.P-Site2
2006	0.006	0.007	0.008	5	HypTP-Site2
2006	0.004	0.005	0.007	8	Tot.P-Site4
2006	0.004	0.006	0.008	8	HypTP-Site4
2006	0.002	0.003	0.005	3	Tot.P-Site8
2006	0.009	0.009	0.010	2	HypTP-Site8
2006	0.004	0.010	0.017	5	Tot.P-Site10
2006	0.005	0.007	0.013	5	HypTP-Site10
2005	0.004	0.008	0.015	6	Tot.P-Site1
2005	0.007	0.019	0.053	6	HypTP-Site1
2005	0.003	0.006	0.007	4	Tot.P-Site2
2005	0.006	0.008	0.013	4	HypTP-Site2
2005	0.005	0.006	0.009	8	Tot.P-Site4
2005	0.005	0.008	0.013	8	HypTP-Site4
2005	0.009	0.012	0.016	6	Tot.P-Site6
2005	0.004	0.008	0.011	3	HypTP-Site6
2005	0.003	0.004	0.004	2	Tot.P-Site8
2005	0.010	0.016	0.022	2	HypTP-Site8
2005	0.009	0.012	0.015	2	Tot.P-Site10

DATA SOURCE KEY

CSLAP New York Citizens Statewide Lake Assessment Program

LCI the NYSDEC Lake Classification and Inventory Survey conducted during the 1980s and again beginning in 1996 on select sets of lakes, typically 1 to 4x per year

DEC other water-quality data collected by the NYSDEC Divisions of Water and Fish and Wildlife, typically 1 to 2x in any give year

ALSC the NYSDEC (and other partners) Adirondack Lake Survey Corporation study of more than 1500 Adirondack and Catskill lakes during the mid 1980s, typically 1 to 2x

ELS USEPA's Eastern Lakes Survey, conducted in the fall of 1982, 1x

NES USEPA's National Eutrophication Survey, conducted in 1972, 2 to 10x

EMAP USEPA and US Dept. of Interior's Environmental Monitoring and Assessment Program conducted from 1990 to present, 1 to 2x in four year cycles

Additional data source codes are provided in the individual lake reports

CSLAP DATA KEY:

The following key defines column headings and parameter results for each sampling season:

Min Minimum reading for the parameter

Avg Geometric average (mean) reading for the parameter

Max Maximum reading for the parameter

N Number of samples collected

Zsd Secchi disk transparency, meters

Tot.P Total Phosphorus as P, in mg/l (Hypo = bottom sample)

NO3 Nitrate + Nitrite nitrogen as N, in mg/l

NH_4 Ammonia as N, in mg/l

TDN Total Dissolved Nitrogen as N, in mg/l

TN Total Nitrogen as N, in mg/l

TP/TN Phosphorus/Nitrogen ratios, unitless (calculated from TDN prior to 2006)

Ca Calcium, in mg/l

Tcolor True color, as platinum color units

pH (negative logarithm of hydrogen ion concentration), standard pH

Cond25 Specific conductance corrected to 25°C, in µmho/cm

Chl.a Chlorophyll *a*, in µg/l

QA Survey question re: physical condition of lake: (1) crystal clear; (2) not quite crystal clear; (3) definite algae greenness; (4) high algae levels; and (5) severely high algae levels

QB Survey question re: aquatic plant populations of lake: (1) none visible; (2) visible underwater; (3) visible at lake surface; (4) dense growth at lake surface; (5) dense growth completely covering the nearshore lake surface

QC Survey question re: recreational suitability of lake: (1) couldn't be nicer; (2) very minor aesthetic problems but excellent for overall use; (3) slightly impaired; (4) substantially impaired, although lake can be used; (5) recreation impossible

QD Survey question re: factors affecting answer QC: (1) poor water clarity; (2) excessive weeds; (3) too much algae/odor; (4) lake looks bad; (5) poor weather; (6) litter, surface debris, beached/floating material; (7) too many lake users (boats, PWCs, etc); (8) other

TABLE 1: CSLAP Data Summary for Lake George (cont)

Year	Min	Avg	Max	N	Parameter
2004-06	**0.002**	**0.008**	**0.023**	**79**	**Tot.P**
2004	0.005	0.010	0.020	7	Tot.P-Site1
2004	0.006	0.011	0.025	8	HypTP-Site1
2004	0.004	0.010	0.014	6	Tot.P-Site2
2004	0.006	0.012	0.030	6	HypTP-Site2
2004	0.004	0.010	0.023	8	Tot.P-Site4
2004	0.002	0.005	0.007	8	HypTP-Site4
2004	0.006	0.007	0.009	2	Tot.P-Site5
2004	0.007	0.012	0.017	2	HypTP-Site5
2004	0.006	0.015	0.022	3	Tot.P-Site6
2004	0.004	0.008	0.011	3	HypTP-Site6
2004	0.003	0.004	0.007	3	Tot.P-Site8
2004	0.003	0.008	0.015	4	HypTP-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**0.00**	**0.01**	**0.09**	**71**	**NO3**
2006	0.01	0.01	0.01	4	NO3-Site2
2006	0.00	0.02	0.04	5	NO3-Site4
2006	0.01	0.01	0.02	2	NO3-Site8
2006	0.01	0.02	0.03	5	NO3-Site10
2005	0.01	0.01	0.01	4	NO3-Site1
2005	0.01	0.01	0.01	3	NO3-Site2
2005	0.01	0.01	0.04	8	NO3-Site4
2005	0.01	0.01	0.05	6	NO3-Site6
2005	0.01	0.01	0.02	2	NO3-Site8
2005	0.01	0.01	0.01	4	NO3-Site10
2004	0.01	0.03	0.09	8	NO3-Site1
2004	0.03	0.07	0.12	8	HypNO3-Site1
2004	0.01	0.01	0.01	6	NO3-Site2
2004	0.02	0.07	0.09	6	HypNO3-Site2
2004	0.01	0.02	0.02	8	NO3-Site4
2004	0.01	0.04	0.25	8	HypNO3-Site4
2004	0.01	0.01	0.01	1	NO3-Site5
2004	0.02	0.02	0.03	2	HypNO3-Site5
2004	0.01	0.01	0.01	2	NO3-Site6
2004	0.02	0.05	0.09	3	HypNO3-Site6
2004	0.01	0.01	0.01	3	NO3-Site8
2004	0.01	0.01	0.01	2	HypNO3-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**0.01**	**0.02**	**0.33**	**72**	**NH4**
2006	0.01	0.01	0.02	4	NH4-Site2
2006	0.01	0.02	0.04	5	NH4-Site4
2006	0.02	0.02	0.02	2	NH4-Site8
2006	0.01	0.02	0.03	5	NH4-Site10

TABLE 1: CSLAP Data Summary for Lake George (cont)

Year	Min	Avg	Max	N	Parameter
2004-06	**0.01**	**0.02**	**0.33**	**72**	**NH4**
2005	0.01	0.01	0.01	4	NH4-Site1
2005	0.01	0.01	0.01	3	NH4-Site2
2005	0.01	0.02	0.13	8	NH4-Site4
2005	0.01	0.06	0.33	6	NH4-Site6
2005	0.01	0.01	0.01	2	NH4-Site8
2005	0.01	0.01	0.04	4	NH4-Site10
2004	0.01	0.01	0.02	8	NH4-Site1
2004	0.01	0.01	0.03	8	HyNH4-Site1
2004	0.01	0.01	0.02	6	NH4-Site2
2004	0.01	0.08	0.42	6	HyNH4-Site2
2004	0.01	0.01	0.03	8	NH4-Site4
2004	0.01	0.01	0.02	8	HyNH4-Site4
2004	0.01	0.01	0.01	1	NH4-Site5
2004	0.01	0.01	0.01	2	HyNH4-Site5
2004	0.01	0.01	0.02	3	NH4-Site6
2004	0.01	0.01	0.01	3	HyNH4-Site6
2004	0.01	0.01	0.02	3	NH4-Site8
2004	0.01	0.03	0.09	3	HyNH4-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**0.01**	**0.28**	**1.04**	**56**	**TDN**
2006	0.00	#DIV/0!	0.00	0	TDN-Site2
2006	0.00	#DIV/0!	0.00	0	TDN-Site4
2006	0.00	#DIV/0!	0.00	0	TDN-Site8
2006	0.00	#DIV/0!	0.00	0	TDN-Site10
2005	0.06	0.11	0.16	4	TDN-Site1
2005	0.10	0.15	0.18	3	TDN-Site2
2005	0.01	0.18	0.39	8	TDN-Site4
2005	0.16	0.33	1.04	6	TDN-Site6
2005	0.26	0.29	0.32	2	TDN-Site8
2005	0.13	0.21	0.33	4	TDN-Site10
2004	0.11	0.39	0.85	8	TDN-Site1
2004	0.11	0.30	0.56	7	HypTDN-Site1
2004	0.13	0.28	0.38	6	TDN-Site2
2004	0.23	0.37	0.60	6	HypTDN-Site2
2004	0.23	0.36	0.63	7	TDN-Site4
2004	0.25	0.42	0.76	8	HypTDN-Site4
2004	0.15	0.48	0.81	2	TDN-Site5
2004	0.18	0.43	0.67	2	HypTDN-Site5
2004	0.19	0.25	0.34	3	TDN-Site6
2004	0.07	0.35	0.60	3	HypTDN-Site6
2004	0.21	0.35	0.44	3	TDN-Site8
2004	0.32	0.39	0.44	3	HypTDN-Site8

TABLE 1: CSLAP Data Summary for Lake George (cont)

Year	Min	Avg	Max	N	Parameter
2004-06	**0.83**	**40.93**	**183.37**	**56**	**TN/TP**
2006	0.00	#DIV/0!	0.00	0	TN/TP-Site2
2006	0.00	#DIV/0!	0.00	0	TN/TP-Site4
2006	0.00	#DIV/0!	0.00	0	TN/TP-Site8
2006	0.00	#DIV/0!	0.00	0	TN/TP-Site10
2005	7.06	13.28	26.10	4	TN/TP-Site1
2005	23.32	25.94	28.57	3	TN/TP-Site2
2005	0.83	25.94	55.03	8	TN/TP-Site4
2005	11.86	27.29	81.71	6	TN/TP-Site6
2005	61.97	78.23	94.49	2	TN/TP-Site8
2005	19.20	20.79	22.37	2	TN/TP-Site10
2004	5.30	57.22	183.37	8	TN/TP-Site1
2004	8.96	31.70	74.06	7	HypTN/TP-Site1
2004	9.32	36.07	92.43	6	TN/TP-Site2
2004	11.72	43.27	102.36	6	HypTN/TP-Site2
2004	10.59	49.96	105.34	7	TN/TP-Site4
2004	36.18	96.66	255.40	8	HypTN/TP-Site4
2004	17.57	80.45	143.32	2	TN/TP-Site5
2004	28.09	33.81	39.53	2	HypTN/TP-Site5
2004	8.76	27.06	60.41	3	TN/TP-Site6
2004	6.31	52.72	85.06	3	HypTN/TP-Site6
2004	63.34	109.69	156.05	3	TN/TP-Site8
2004	30.19	55.21	95.71	3	HypTN/TP-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**1**	**9**	**74**	**65**	**CSLAP TColor**
2006	6	18	27	4	CSLAP Tcolor-Site2
2006	2	7	11	7	CSLAP Tcolor-Site4
2006	5	8	10	2	CSLAP Tcolor-Site8
2006	1	7	11	4	CSLAP Tcolor-Site10
2005	3	6	11	4	CSLAP Tcolor-Site1
2005	1	11	33	4	CSLAP Tcolor-Site2
2005	1	4	7	7	CSLAP Tcolor-Site4
2005	1	4	5	5	CSLAP Tcolor-Site6
2005				0	CSLAP Tcolor-Site8
2005	9	15	20	2	CSLAP Tcolor-Site10
2004	1	8	34	6	CSLAP Tcolor-Site1
2004	1	5	12	5	CSLAP Tcolor-Site2
2004	1	8	22	7	CSLAP Tcolor-Site4
2004	7	14	21	2	CSLAP Tcolor-Site5
2004	6	29	74	3	CSLAP Tcolor-Site6
2004	2	4	7	3	CSLAP Tcolor-Site8

TABLE 1: CSLAP Data Summary for Lake George (cont)

Year	Min	Avg	Max	N	Parameter
2004-06	**6.54**	**7.67**	**9.16**	**77**	**CSLAP pH**
2006	7.93	8.34	9.16	6	CSLAP pH-Site2
2006	6.93	7.71	8.42	8	CSLAP pH-Site4
2006	7.50	7.80	8.02	3	CSLAP pH-Site8
2006	6.83	7.50	8.05	5	CSLAP pH-Site10
2005	7.49	7.82	8.27	5	CSLAP pH-Site1
2005	7.10	8.08	8.91	4	CSLAP pH-Site2
2005	6.65	7.52	8.00	8	CSLAP pH-Site4
2005	7.34	7.59	7.81	6	CSLAP pH-Site6
2005	7.78	7.78	7.78	1	CSLAP pH-Site8
2005	7.60	7.64	7.68	2	CSLAP pH-Site10
2004	6.54	7.33	8.16	8	CSLAP pH-Site1
2004	7.38	7.60	7.83	6	CSLAP pH-Site2
2004	6.60	7.46	8.40	8	CSLAP pH-Site4
2004	7.02	7.03	7.04	2	CSLAP pH-Site5
2004	6.85	7.68	8.51	2	CSLAP pH-Site6
2004	7.96	8.23	8.65	3	CSLAP pH-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**34**	**107**	**146**	**75**	**CSLAP Cond25**
2006	79	93	105	6	CSLAP Cond25-Site2
2006	59	109	135	8	CSLAP Cond25-Site4
2006	59	92	116	3	CSLAP Cond25-Site8
2006	79	98	120	5	CSLAP Cond25-Site10
2005	75	113	135	4	CSLAP Cond25-Site1
2005	78	114	134	3	CSLAP Cond25-Site2
2005	75	107	123	8	CSLAP Cond25-Site4
2005	100	112	119	5	CSLAP Cond25-Site6
2005	116	116	116	1	CSLAP Cond25-Site8
2005	102	107	112	2	CSLAP Cond25-Site10
2004	92	118	146	8	CSLAP Cond25-Site1
2004	96	115	132	6	CSLAP Cond25-Site2
2004	34	106	133	8	CSLAP Cond25-Site4
2004	85	99	112	2	CSLAP Cond25-Site5
2004	101	115	127	3	CSLAP Cond25-Site6
2004	96	99	104	3	CSLAP Cond25-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**5.1**	**11.6**	**16.5**	**20**	**CSLAP Ca**
2006	9.8	11.3	12.9	2	CSLAP Ca-Site2
2006	9.4	10.5	11.6	2	CSLAP Ca-Site4
2006	7.0	7.0	7.0	1	CSLAP Ca-Site8
2006	10.8	10.8	10.8	2	CSLAP Ca-Site10

TABLE 1: CSLAP Data Summary for Lake George (cont)

Year	Min	Avg	Max	N	Parameter
2005	12.4	12.4	12.4	1	CSLAP Ca-Site1
2005	11.6	11.6	11.6	1	CSLAP Ca-Site2
2005	11.1	11.5	11.8	2	CSLAP Ca-Site4
2005				0	CSLAP Ca-Site5
2005	12.1	12.1	12.1	1	CSLAP Ca-Site6
2005	13.0	13.0	13.0	1	CSLAP Ca-Site8
2005	5.1	5.1	5.1	1	CSLAP Ca-Site10
2004	13.7	15.1	16.5	2	CSLAP Ca-Site1
2004	12.6	13.3	13.9	2	CSLAP Ca-Site2
2004	13.2	13.2	13.2	1	CSLAP Ca-Site4
2004				0	CSLAP Ca-Site5
2004	12.2	12.2	12.2	1	CSLAP Ca-Site6
2004				0	CSLAP Ca-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**0.01**	**0.76**	**2.60**	**72**	**CSLAP Chl.a**
2006	0.64	1.05	1.32	6	CSLAP Chl.a-Site2
2006	0.32	0.93	1.43	8	CSLAP Chl.a-Site4
2006	0.01	0.23	0.38	3	CSLAP Chl.a-Site8
2006	0.10	0.43	0.83	5	CSLAP Chl.a-Site10
2005	0.19	0.82	1.55	6	CSLAP Chl.a-Site1
2005	0.05	0.33	0.88	4	CSLAP Chl.a-Site2
2005	0.16	0.66	1.02	7	CSLAP Chl.a-Site4
2005	0.05	0.09	0.16	5	CSLAP Chl.a-Site6
2005	0.41	0.44	0.46	2	CSLAP Chl.a-Site8
2005	0.68	0.72	0.76	2	CSLAP Chl.a-Site10
2004	0.20	0.97	1.70	6	CSLAP Chl.a-Site1
2004	0.22	1.42	2.39	5	CSLAP Chl.a-Site2
2004	0.30	1.20	2.60	7	CSLAP Chl.a-Site4
2004	0.50	0.50	0.50	1	CSLAP Chl.a-Site5
2004	0.50	0.75	1.00	2	CSLAP Chl.a-Site6
2004	0.14	0.43	0.60	3	CSLAP Chl.a-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**1**	**1.2**	**3**	**81**	**QA**
2006	1	1.0	1	6	QA-Site2
2006	1	1.0	1	8	QA-Site4
2006	1	1.0	1	3	QA-Site8
2006	1	1.0	1	5	QA-Site10
2005	2	2.5	3	4	QA-Site1
2005	1	1.0	1	4	QA-Site2
2005	1	1.0	1	8	QA-Site4
2005	1	1.0	1	6	QA-Site6
2005	1	1.0	1	2	QA-Site8
2005	1	1.0	1	4	QA-Site10

TABLE 1: CSLAP Data Summary for Lake George (cont)

Year	Min	Avg	Max	N	Parameter
2004-06	**1**	**1.2**	**3**	**81**	**QA**
2004	1	2.1	3	8	QA-Site1
2004	1	1.2	2	6	QA-Site2
2004	1	1.0	1	8	QA-Site4
2004	1	1.5	2	2	QA-Site5
2004	1	1.0	1	3	QA-Site6
2004	1	1.3	2	4	QA-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**1**	**1.2**	**3**	**81**	**QB**
2006	1	1.0	1	6	QB-Site2
2006	1	1.0	1	8	QB-Site4
2006	1	1.0	1	3	QB-Site8
2006	1	1.6	2	5	QB-Site10
2005	1	2.0	3	4	QB-Site1
2005	1	1.0	1	4	QB-Site2
2005	1	1.0	1	8	QB-Site4
2005	1	1.2	2	6	QB-Site6
2005	1	1.0	1	2	QB-Site8
2005	1	1.8	3	4	QB-Site10
2004	1	1.9	2	8	QB-Site1
2004	1	1.0	1	6	QB-Site2
2004	1	1.0	1	8	QB-Site4
2004	1	1.5	2	2	QB-Site5
2004	1	1.0	1	3	QB-Site6
2004	1	1.0	1	4	QB-Site8
Year	Min	Avg	Max	N	Parameter
2004-06	**1**	**1.2**	**3**	**80**	**QC**
2006	1	1.0	1	5	QC-Site2
2006	1	1.0	1	8	QC-Site4
2006	1	1.0	1	3	QC-Site8
2006	1	1.0	1	5	QC-Site10
2005	2	2.5	3	4	QC-Site1
2005	1	1.3	2	4	QC-Site2
2005	1	1.0	1	8	QC-Site4
2005	1	1.0	1	6	QC-Site6
2005	1	1.0	1	2	QC-Site8
2005	1	1.0	1	4	QC-Site10
2004	1	2.3	3	8	QC-Site1
2004	1	1.2	2	6	QC-Site2
2004	1	1.0	1	8	QC-Site4
2004	1	1.0	1	2	QC-Site5
2004	1	1.0	1	3	QC-Site6
2004	1	1.3	2	4	QC-Site8

- **Statistical analyses**. True assessments of water-quality trends and comparison to other lakes involve rigid statistical analyses. Such analyses are generally beyond the scope of this program, in part due to limitations on the time available to summarize data from nearly 100 lakes in the five months from data receipt to the next sampling season. This may be due in part to the inevitable inter-lake inconsistencies in sampling dates from year to year and in part to the limited scope of monitoring. Where appropriate, some statistical summaries, utilizing both parametric and non-parametric statistics, have been provided within the report (primarily in Table 2).

- **Mean versus Median.** Much of the water-quality summary data presented in this report is reported as the mean, or the average of all of the readings in the period in question (summer, annual, year to year). However, while mean remains one of the most useful, and often most powerful, ways to estimate the most typical reading for many of the measured water-quality indicators, it is a less useful and perhaps misleading estimate when the data are not "normally" distributed (most common readings in the middle of the range of all readings, with readings less common toward the end of the range).

  In particular, comparisons of one lake to another, such as comparisons within a particular basin, can be greatly affected by the spread of the data across the range of all readings. For example, the average phosphorus level of nine lakes with very low readings (say 10 µg/l) and one lake with very high readings (say 110 µg/l) could be much higher (in this case, 20 µg/l) than in the "typical lake" in this set of lakes (much closer to 10 µg/l). In this case, median, or the middle reading in the range, is probably the most accurate representation of "typical".

  This report will include the use of both mean and median to evaluate "central tendency," or the most typical reading, for the indicator in question. In most cases, "mean" is used most often to estimate central tendency. However, where noted, "median" may also be used.

TABLE 2- Current and Historical Data Summaries for Lake George-Site 2
Eutrophication Indicators

Parameter	Year	Minimum	Average	Maximum
Zsd	2006	6.25	7.19	7.75
(meters)	All Years	6.25	7.55	9.35
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Phosphorus	2006	0.006	0.008	0.013
(mg/l)	All Years	0.003	0.008	0.014
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Chl.a	2006	0.64	1.05	1.32
(µg/l)	All Years	0.05	0.98	2.39

Parameter	Year	Was 2006 Clarity the Highest or Lowest on Record?	Was 2006 a Typical Year?	Trophic Category	Zsd Changing?	% Samples Violating DOH Beach Std?+
Zsd	2006	Lowest at Times	Yes	Oligotrophic	No	0
(meters)	All Years			Oligotrophic		0
Parameter	**Year**	**Was 2006 TP the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Trophic Category**	**TP Changing?**	**% Samples Exceeding TP Guidance Value**
Phosphorus	2006	Within Normal Range	Yes	Oligotrophic	No	0
(mg/l)	All Years			Oligotrophic		0
Parameter	**Year**	**Was 2006 Algae the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Trophic Category**	**Chl.a Changing?**	
Chl.a	2006	Within Normal Range	Yes	Oligotrophic	No	
(µg/l)	All Years			Oligotrophic		

Minimum allowable water clarity for siting a new NYS swimming beach = 1.2 meters
NYS Total Phosphorus Guidance Value for Class B and Higher Lakes = 0.020 mg/l

TABLE 2- Current and Historical Data Summaries for Lake George-Site 4
Eutrophication Indicators

Parameter	Year	Minimum	Average	Maximum
Zsd	2006	6.10	7.64	9.05
(meters)	All Years	5.75	7.39	9.05
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Phosphorus	2006	0.004	0.005	0.007
(mg/l)	All Years	0.004	0.007	0.023
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Chl.a	2006	0.32	0.93	1.43
(µg/l)	All Years	0.16	0.93	2.60

Parameter	Year	Was 2006 Clarity the Highest or Lowest on Record?	Was 2006 a Typical Year?	Trophic Category	Zsd Changing?	% Samples Violating DOH Beach Std?+
Zsd	2006	Highest at Times	Yes	Oligotrophic	No	0
(meters)	All Years			Oligotrophic		0
Parameter	**Year**	**Was 2006 TP the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Trophic Category**	**TP Changing?**	**% Samples Exceeding TP Guidance Value**
Phosphorus	2006	Within Normal Range	Yes	Oligotrophic	No	0
(mg/l)	All Years			Oligotrophic		8
Parameter	**Year**	**Was 2006 Algae the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Trophic Category**	**Chl.a Changing?**	
Chl.a	2006	Within Normal Range	Yes	Oligotrophic	No	
(µg/l)	All Years			Oligotrophic		

Minimum allowable water clarity for siting a new NYS swimming beach = 1.2 meters
NYS Total Phosphorus Guidance Value for Class B and Higher Lakes = 0.020 mg/l

TABLE 2- Current and Historical Data Summaries for Lake George-Site 8

Eutrophication Indicators

Parameter	Year	Minimum	Average	Maximum
Zsd	2006	7.80	8.37	9.25
(meters)	All Years	7.80	8.95	10.72
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Phosphorus	2006	0.002	0.003	0.005
(mg/l)	All Years	0.002	0.004	0.007
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Chl.a	2006	0.01	0.23	0.38
(µg/l)	All Years	0.01	0.36	0.60

Parameter	Year	Was 2006 Clarity the Highest or Lowest on Record?	Was 2006 a Typical Year?	Trophic Category	Zsd Changing?	% Samples Violating DOH Beach Std?+
Zsd	2006	Lowest at Times	Yes	Oligotrophic	No	0
(meters)	All Years			Oligotrophic		0
Parameter	**Year**	**Was 2006 TP the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Trophic Category**	**TP Changing?**	**% Samples Exceeding TP Guidance Value**
Phosphorus	2006	Lowest at Times	Yes	Oligotrophic	No	0
(mg/l)	All Years			Oligotrophic		0
Parameter	**Year**	**Was 2006 Algae the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Trophic Category**	**Chl.a Changing?**	
Chl.a	2006	Lowest at Times	Yes	Oligotrophic	No	
(µg/l)	All Years			Oligotrophic		

Minimum allowable water clarity for siting a new NYS swimming beach = 1.2 meters
NYS Total Phosphorus Guidance Value for Class B and Higher Lakes = 0.020 mg/l

TABLE 2- Current and Historical Data Summaries for Lake George-Site 10
Eutrophication Indicators

Parameter	Year	Minimum	Average	Maximum
Zsd	2006	7.50	8.10	9.00
(meters)	All Years	7.50	8.29	9.00
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Phosphorus	2006	0.004	0.010	0.017
(mg/l)	All Years	0.004	0.011	0.017
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Chl.a	2006	0.10	0.43	0.83
(µg/l)	All Years	0.10	0.51	0.83

Parameter	Year	Was 2006 Clarity the Highest or Lowest on Record?	Was 2006 a Typical Year?	Trophic Category	Zsd Changing?	% Samples Violating DOH Beach Std?+
Zsd	2006	Both Highest and Lowest at Times	Yes	Oligotrophic	No	0
(meters)	All Years			Oligotrophic		0
Parameter	**Year**	**Was 2006 TP the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Trophic Category**	**TP Changing?**	**% Samples Exceeding TP Guidance Value**
Phosphorus	2006	Both Highest and Lowest at Times	Yes	Mesotrophic	No	0
(mg/l)	All Years			Mesotrophic		0
Parameter	**Year**	**Was 2006 Algae the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Trophic Category**	**Chl.a Changing?**	
Chl.a	2006	Both Highest and Lowest at Times	Yes	Oligotrophic	No	
(µg/l)	All Years			Oligotrophic		

Minimum allowable water clarity for siting a new NYS swimming beach = 1.2 meters
NYS Total Phosphorus Guidance Value for Class B and Higher Lakes = 0.020 mg/l

The CSLAP dataset usually indicates that Lake George is an *oligotrophic*, or moderately unproductive lake- this was also the case in 2006. Lake George was probably about as productive as usual in 2006. Water clarity, total phosphorus, and chlorophyll *a* readings have varied only slightly at each site during the three CSLAP sampling seasons. It is likely that most of the variability from sample to sample and site to site has been within the normal and expected range for the lake. There is only a weak correlation between changes in clarity and algae, and between changes in phosphorus and algae, though this is typical of highly unproductive lakes (since these small changes probably reflect normal variability). However, it is likely that any lake management activities undertaken to maintain water transparency must necessarily address algae levels in and nutrient loading to the lake. Lake productivity does not vary in any predictable way over the course of the summer, with the exception of a steady seasonal drop in water clarity at site 8. Deepwater nutrient levels are close to those measured at the lake surface, suggesting that deepwater anoxia (oxygen depletion) is not common at these sites. This also explains the lack of a strong seasonal pattern in phosphorus readings. Phosphorus levels in Lake George are consistently below the state guidance value for lakes used for contact recreation (swimming). Secchi disk transparency readings have at all times exceeded the minimum recommended water clarity for swimming beaches (= 1.2 meters)). In short, Lake George was about as productive in 2006 as in most previous years, based on water clarity, chlorophyll *a* and phosphorus readings close to the long-term average for the lake at all sampling sites.

TABLE 2- Current and Historical Data Summaries for Lake George S-2 (cont.)

Other Water-Quality Indicators

Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Nitrate	2006	0.01	0.01	0.01
(mg/l)	All Years	0.01	0.01	0.01
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
NH4	2006	0.01	0.01	0.02
(mg/l)	All Years	0.01	0.01	0.02
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
TDN	2006			
(mg/l)	All Years	0.10	0.24	0.38
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
True Color	2006	6	18	27
(ptu)	All Years	0	10	33
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
pH	2006	7.93	8.34	9.16
(std units)	All Years	7.10	8.00	9.16
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Conductivity	2006	79	93	105
(µmho/cm)	All Years	38	102	134
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Calcium	2006	9.8	11.3	12.9
(mg/l)	All Years	9.8	12.1	13.9

TABLE 2- Current and Historical Data Summaries for Lake George-S2 (cont.)
Other Water-Quality Indicators (cont)

Parameter	Year	Was 2006 Nitrate the Highest or Lowest on Record?	Was 2006 a Typical Year?	Nitrate High?	Nitrate Changing?	% Samples Exceeding NO3 Standard	
Nitrate	2006	Within Normal Range	Yes	No	No	0	
(mg/l)	All Years			No		0	
Parameter	**Year**	**Was 2006 NH4 the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**NH4 High?**	**NH4 Changing?**	**% Samples Exceeding NH4 Standard**	
NH4	2006	Within Normal Range	Yes	No	No	0	
(mg/l)	All Years			No		0	
Parameter	**Year**	**Was 2006 TDN the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**TDN High?**	**TDN Changing?**	**Ratios of TN/TP Indicate P or N Limitation?**	
TDN	2006						
(mg/l)	All Years			No		P Limitation	
Parameter	**Year**	**Was 2006 Color the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Colored Lake?**	**Color Changing?**		
True Color	2006	Within Normal Range	Yes	No	No		
(ptu)	All Years			No			
Parameter	**Year**	**Was 2006 pH the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Acceptable Range?**	**pH Changing?**	**% Samples > Upper pH Standard**	**% Samples < Lower pH Standard**
pH	2006	Highest at Times	Yes	Yes	No	33	0
(std units)	All Years			Yes		25	0
Parameter	**Year**	**Was 2006 Conductivity Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Relative Hardness**	**Conductivity Changing?**		
Conductivity	2006	Within Normal Range	Yes	Softwater	No		
(µmho/cm)	All Years						
Parameter	**Year**	**Was 2006 Calcium Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Support Zebra Mussels?**	**Calcium Changing?**		
Calcium	2006	Lowest at Times	Yes	Uncertain	No		
(mg/l)	All Years			Yes			

NYS Nitrate standard = 10 mg/l
NYS Ammonia standard = 2 mg/l (as NH_3-NH_4)
NYS pH standard - 6.5 < acceptable pH < 8.5

TABLE 2- Current and Historical Data Summaries for Lake George S-4 (cont.)
Other Water-Quality Indicators

Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Nitrate	2006	0.00	0.02	0.04
(mg/l)	All Years	0.00	0.02	0.04
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
NH4	2006	0.01	0.02	0.04
(mg/l)	All Years	0.01	0.02	0.13
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
TDN	2006			
(mg/l)	All Years	0.01	0.26	0.63
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
True Color	2006	2	7	11
(ptu)	All Years	1	6	22
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
pH	2006	6.93	7.71	8.42
(std units)	All Years	6.60	7.56	8.42
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Conductivity	2006	59	109	135
(µmho/cm)	All Years	34	107	135
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Calcium	2006	9.4	10.5	11.6
(mg/l)	All Years	9.4	11.4	13.2

TABLE 2- Current and Historical Data Summaries for Lake George-S4 (cont.)
Other Water-Quality Indicators (cont)

Parameter	Year	Was 2006 Nitrate the Highest or Lowest on Record?	Was 2006 a Typical Year?	Nitrate High?	Nitrate Changing?	% Samples Exceeding NO3 Standard	
Nitrate	2006	Lowest at Times	Yes	No	No	0	
(mg/l)	All Years			No		0	
Parameter	**Year**	**Was 2006 NH4 the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**NH4 High?**	**NH4 Changing?**	**% Samples Exceeding NH4 Standard**	
NH4	2006	Within Normal Range	Yes	No	No	0	
(mg/l)	All Years			No		0	
Parameter	**Year**	**Was 2006 TDN the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**TDN High?**	**TDN Changing?**	**Ratios of TN/TP Indicate P or N Limitation?**	
TDN	2006						
(mg/l)	All Years			No		P Limitation	
Parameter	**Year**	**Was 2006 Color the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Colored Lake?**	**Color Changing?**		
True Color	2006	Within Normal Range	Yes	No	No		
(ptu)	All Years			No			
Parameter	**Year**	**Was 2006 pH the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Acceptable Range?**	**pH Changing?**	**% Samples > Upper pH Standard**	**% Samples < Lower pH Standard**
pH	2006	Highest at Times	Yes	Yes	No	0	0
(std units)	All Years			Yes		0	0
Parameter	**Year**	**Was 2006 Conductivity Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Relative Hardness**	**Conduct. Changing?**		
Conductivity	2006	Highest at Times	Yes	Softwater	No		
(µmho/cm)	All Years						
Parameter	**Year**	**Was 2006 Calcium Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Support Zebra Mussels?**	**Calcium Changing?**		
Calcium	2006	Lowest at Times	Yes	Uncertain	No		
(mg/l)	All Years			Uncertain			

NYS Nitrate standard = 10 mg/l
NYS Ammonia standard = 2 mg/l (as NH_3-NH_4)
NYS pH standard - 6.5 < acceptable pH < 8.5

TABLE 2- Current and Historical Data Summaries for Lake George S-8 (cont.)
Other Water-Quality Indicators

Parameter	Year	Minimum	Average	Maximum
Nitrate	2006	0.01	0.01	0.02
(mg/l)	All Years	0.01	0.01	0.02
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
NH4	2006	0.02	0.02	0.02
(mg/l)	All Years	0.01	0.01	0.02
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
TDN	2006			
(mg/l)	All Years	0.21	0.32	0.44
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
True Color	2006	5	8	10
(ptu)	All Years	2	5	10
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
pH	2006	7.50	7.80	8.02
(std units)	All Years	7.50	7.98	8.65
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Conductivity	2006	59	92	116
(µmho/cm)	All Years	59	98	116
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Calcium	2006	7.0	7.0	7.0
(mg/l)	All Years	7.0	10.0	13.0

TABLE 2- Current and Historical Data Summaries for Lake George-S8 (cont.)
Other Water-Quality Indicators (cont)

Parameter	Year	Was 2006 Nitrate the Highest or Lowest on Record?	Was 2006 a Typical Year?	Nitrate High?	Nitrate Changing?	% Samples Exceeding NO3 Standard	
Nitrate	2006	Within Normal Range	Yes	No	No	0	
(mg/l)	All Years			No		0	
Parameter	**Year**	**Was 2006 NH4 the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**NH4 High?**	**NH4 Changing?**	**% Samples Exceeding NH4 Standard**	
NH4	2006	Within Normal Range	Yes	No	No	0	
(mg/l)	All Years			No		0	
Parameter	**Year**	**Was 2006 TDN the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**TDN High?**	**TDN Changing?**	**Ratios of TN/TP Indicate P or N Limitation?**	
TDN	2006						
(mg/l)	All Years			No		P Limitation	
Parameter	**Year**	**Was 2006 Color the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Colored Lake?**	**Color Changing?**		
True Color	2006	Highest at Times	Yes	No	No		
(ptu)	All Years			No			
Parameter	**Year**	**Was 2006 pH the Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Acceptable Range?**	**pH Changing?**	**% Samples > Upper pH Standard**	**% Samples < Lower pH Standard**
pH	2006	Lowest at Times	Yes	Yes	No	0	0
(std units)	All Years			Yes		14	0
Parameter	**Year**	**Was 2006 Conductivity Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Relative Hardness**	**Conduct. Changing?**		
Conductivity	2006	Lowest at Times	Yes	Softwater	No		
(µmho/cm)	All Years						
Parameter	**Year**	**Was 2006 Calcium Highest or Lowest on Record?**	**Was 2006 a Typical Year?**	**Support Zebra Mussels?**	**Calcium Changing?**		
Calcium	2006	Lowest at Times	Yes	No	No		
(mg/l)	All Years			Uncertain			

NYS Nitrate standard = 10 mg/l
NYS Ammonia standard = 2 mg/l (as NH_3-NH_4)
NYS pH standard - 6.5 < acceptable pH < 8.5

TABLE 2- Current and Historical Data Summaries for Lake George S-10 (cont.)
Other Water-Quality Indicators

Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Nitrate	2006	0.01	0.02	0.03
(mg/l)	All Years	0.01	0.01	0.03
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
NH4	2006	0.01	0.02	0.03
(mg/l)	All Years	0.01	0.02	0.04
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
TDN	2006			
(mg/l)	All Years	0.13	0.21	0.33
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
True Color	2006	1	7	11
(ptu)	All Years	1	9	20
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
pH	2006	6.83	7.50	8.05
(std units)	All Years	6.83	7.54	8.05
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Conductivity	2006	79	98	120
(µmho/cm)	All Years	79	101	120
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
Calcium	2006	10.8	10.8	10.8
(mg/l)	All Years	5.1	8.9	10.8

These data indicate Lake George is a weakly colored, slightly alkaline (above neutral pH) lake with low nitrate and ammonia levels and moderately soft water. Water color readings are not high enough to influence water transparency readings, even when algae levels are low, and color readings have not varied significantly in response to weather changes. However, water color has been apparent at times at sites 1, 2 and 6. The nitrogen to phosphorus ratios suggest that phosphorus controls algae growth. Nitrate and ammonia do not appear to represent a threat to water-quality, whether evaluated in surface or bottom waters, although deepwater nitrate levels are slightly higher than those measured at the lake surface. pH readings are usually within the state water-quality standards (=6.5 to 8.5), and these readings are probably adequate to support most aquatic organisms. The slightly higher pH readings at sites 2 and 8 are unlikely to represent a problem. Conductivity readings have been indicative of softwater lakes. Conductivity readings were slightly lower than usual in 2006, but all readings continue to be indicative of lakes with moderately softwater. Calcium levels may be high enough to support zebra mussels in some of the sampling sites (particularly sites 1, 2 and 4), but it is not known by the report authors if zebra mussels have been found at these locations (or comparable near shore areas). None of these water-quality indicators have exhibited any significant long-term patterns, although it is premature to evaluate trends with only three years of water quality data.

TABLE 2- Current and Historical Data Summaries for Lake George-S10 (cont.)

Other Water-Quality Indicators (cont)

Parameter	Year	Was 2006 Nitrate the Highest or Lowest on Record?	Was 2006 a Typical Year?	Nitrate High?	Nitrate Changing?	% Samples Exceeding NO3 Standard	
Nitrate	2006	Highest at Times	Yes	No	No	0	
(mg/l)	All Years			No		0	

Parameter	Year	Was 2006 NH4 the Highest or Lowest on Record?	Was 2006 a Typical Year?	NH4 High?	NH4 Changing?	% Samples Exceeding NH4 Standard	
NH4	2006	Within Normal Range	Yes	No	No	0	
(mg/l)	All Years			No		0	

Parameter	Year	Was 2006 TDN the Highest or Lowest on Record?	Was 2006 a Typical Year?	TDN High?	TDN Changing?	Ratios of TN/TP Indicate P or N Limitation?	
TDN	2006						
(mg/l)	All Years			No		P Limitation	

Parameter	Year	Was 2006 Color the Highest or Lowest on Record?	Was 2006 a Typical Year?	Colored Lake?	Color Changing?		
True Color	2006	Lowest at Times	Yes	No	No		
(ptu)	All Years			No			

Parameter	Year	Was 2006 pH the Highest or Lowest on Record?	Was 2006 a Typical Year?	Acceptable Range?	pH Changing?	% Samples > Upper pH Standard	% Samples < Lower pH Standard
pH	2006	Both Highest and Lowest at Times	Yes	Yes	No	0	0
(std units)	All Years			Yes		0	0

Parameter	Year	Was 2006 Conductivity Highest or Lowest on Record?	Was 2006 a Typical Year?	Relative Hardness	Conduct. Changing?		
Conductivity	2006	Both Highest and Lowest at Times	Yes	Softwater	No		
(µmho/cm)	All Years						

Parameter	Year	Was 2006 Calcium Highest or Lowest on Record?	Was 2006 a Typical Year?	Support Zebra Mussels?	Calcium Changing?		
Calcium	2006	Highest at Times	Yes	Uncertain	No		
(mg/l)	All Years			Uncertain			

NYS Nitrate standard = 10 mg/l
NYS Ammonia standard = 2 mg/l (as NH_3-NH_4)
NYS pH standard - 6.5 < acceptable pH < 8.5

TABLE 2- Current and Historical Data Summaries for Lake George-S2 (cont)

Lake Perception Indicators (1= most favorable, 5= least favorable)

Parameter	Year	Minimum	Average	Maximum
QA	2006	1	1.0	1
(Clarity)	All Years	1	1.1	2
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
QB	2006	1	1.0	1
(Plants)	All Years	1	1.0	1
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
QC	2006	1	1.0	1
(Recreation)	All Years	1	1.1	2

Parameter	Year	Was 2006 Clarity the Highest or Lowest on Record?	Was 2006 a Typical Year?	Clarity Changed?	%Frequency 'Definite Algae Greenness'	%Frequency 'Severe Algae Levels'	%Frequency 'Slightly Impaired' Due to Algae	%Frequency 'Substantially Impaired' Due to Algae
QA	2006	Highest at Times	Yes	No	0	0	0	0
(Clarity)	All Years				0	0	0	0
Parameter	**Year**	**Was 2006 Weed Growth the Heaviest on Record?**	**Was 2006 a Typical Year?**	**Weeds Changed?**	**%Frequency Surface Weeds**	**%Frequency Dense Weeds**	**%Frequency 'Slightly Impaired' Due to Weeds**	**%Frequency 'Substantially Impaired' Due to Weeds**
QB	2006	Heaviest and Lightest	Yes	No	0	0	0	0
(Plants)	All Years				0	0	0	0
Parameter	**Year**	**Was 2006 Recreation the Best or Worst on Record?**	**Was 2006 a Typical Year?**	**Recreation Changed?**	**%Frequency Slightly Impaired**	**%Frequency Substantially Impaired**		
QC	2006	Best at Times	Yes	No	0	0		
(Recreation)	All Years				0	0		

TABLE 2- Current and Historical Data Summaries for Lake George-S4 (cont)

Lake Perception Indicators (1= most favorable, 5= least favorable)

Parameter	Year	Minimum	Average	Maximum
QA	2006	1	1.0	1
(Clarity)	All Years	1	1.0	1
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
QB	2006	1	1.0	1
(Plants)	All Years	1	1.0	1
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
QC	2006	1	1.0	1
(Recreation)	All Years	1	1.0	1

Parameter	Year	Was 2006 Clarity the Highest or Lowest on Record?	Was 2006 a Typical Year?	Clarity Changed?	%Frequency 'Definite Algae Greenness'	%Frequency 'Severe Algae Levels'	%Frequency 'Slightly Impaired' Due to Algae	%Frequency 'Substantially Impaired' Due to Algae
QA	2006	Highest and Lowest	Yes	No	0	0	0	0
(Clarity)	All Years				0	0	0	0
Parameter	**Year**	**Was 2006 Weed Growth the Heaviest on Record?**	**Was 2006 a Typical Year?**	**Weeds Changed?**	**%Frequency Surface Weeds**	**%Frequency Dense Weeds**	**%Frequency 'Slightly Impaired' Due to Weeds**	**%Frequency 'Substantially Impaired' Due to Weeds**
QB	2006	Heaviest and Lightest	Yes	No	0	0	0	0
(Plants)	All Years				0	0	0	0
Parameter	**Year**	**Was 2006 Recreation the Best or Worst on Record?**	**Was 2006 a Typical Year?**	**Recreation Changed?**	**%Freque ncy Slightly Impaired**	**%Frequency Substantially Impaired**		
QC	2006	Both Best and Worst at Times	Yes	No	0	0		
(Recreation)	All Years				0	0		

TABLE 2- Current and Historical Data Summaries for Lake George-S8 (cont)

Lake Perception Indicators (1= most favorable, 5= least favorable)

Parameter	Year	Minimum	Average	Maximum
QA	2006	1	1.0	1
(Clarity)	All Years	1	1.1	2
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
QB	2006	1	1.0	1
(Plants)	All Years	1	1.0	1
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
QC	2006	1	1.0	1
(Recreation)	All Years	1	1.1	2

Parameter	Year	Was 2006 Clarity the Highest or Lowest on Record?	Was 2006 a Typical Year?	Clarity Changed?	%Frequency 'Definite Algae Greenness'	%Frequency 'Severe Algae Levels'	%Frequency 'Slightly Impaired' Due to Algae	%Frequency 'Substantially Impaired' Due to Algae
QA	2006	Highest at Times	Yes	No	0	0	0	0
(Clarity)	All Years				0	0	0	0
Parameter	**Year**	**Was 2006 Weed Growth the Heaviest on Record?**	**Was 2006 a Typical Year?**	**Weeds Changed?**	**%Frequency Surface Weeds**	**%Frequency Dense Weeds**	**%Frequency 'Slightly Impaired' Due to Weeds**	**%Frequency 'Substantially Impaired' Due to Weeds**
QB	2006	Heaviest and Lightest	Yes	No	0	0	0	0
(Plants)	All Years				0	0	0	0
Parameter	**Year**	**Was 2006 Recreation the Best or Worst on Record?**	**Was 2006 a Typical Year?**	**Recreation Changed?**	**%Frequency Slightly Impaired**	**%Frequency Substantially Impaired**		
QC	2006	Best at Times	Yes	No	0	0		
(Recreation)	All Years				0	0		

TABLE 2- Current and Historical Data Summaries for Lake George-S10 (cont)

Lake Perception Indicators (1= most favorable, 5= least favorable)

Parameter	Year	Minimum	Average	Maximum
QA	2006	1	1.0	1
(Clarity)	All Years	1	1.0	1
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
QB	2006	1	1.6	2
(Plants)	All Years	1	1.7	3
Parameter	**Year**	**Minimum**	**Average**	**Maximum**
QC	2006	1	1.0	1
(Recreation)	All Years	1	1.0	1

Parameter	Year	Was 2006 Clarity the Highest or Lowest on Record?	Was 2006 a Typical Year?	Clarity Changed?	%Frequency 'Definite Algae Greenness'	%Frequency 'Severe Algae Levels'	%Frequency 'Slightly Impaired' Due to Algae	%Frequency 'Substantially Impaired' Due to Algae
QA	2006	Highest and Lowest	Yes	No	0	0	0	0
(Clarity)	All Years				0	0	0	0
Parameter	**Year**	**Was 2006 Weed Growth the Heaviest on Record?**	**Was 2006 a Typical Year?**	**Weeds Changed?**	**%Frequency Surface Weeds**	**%Frequency Dense Weeds**	**%Frequency 'Slightly Impaired' Due to Weeds**	**%Frequency 'Substantially Impaired' Due to Weeds**
QB	2006	Lightest at Times	Yes	No	0	0	0	0
(Plants)	All Years				11	0	0	0
Parameter	**Year**	**Was 2006 Recreation the Best or Worst on Record?**	**Was 2006 a Typical Year?**	**Recreation Changed?**	**%Frequency Slightly Impaired**	**%Frequency Substantially Impaired**		
QC	2006	Both Best and Worst at Times	Yes	No	0	0		
(Recreation)	All Years				0	0		

Recreational assessments in Lake George in 2006 were again highly favorable and comparable to those reported in previous CSLAP sampling seasons. This was coincident with water quality conditions that were close to normal for the lake. The lake is most frequently described as “crystal clear” to “not quite crystal clear”, an assessment typical of other lakes with similar water clarity readings. Aquatic plant densities and coverage comparable in 2006 to those reported in previous years. “Excessive weed growth” was not reported as impacting lake use except occasionally at site 1- however, it is expected that less favorable assessments in other (unsampled) parts of the lake may reflect more weed problems. Recreational conditions are usually reported as “could not be nicer”. These assessments are mostly stable during the summer, consistent with seasonal stability in water quality and plant coverage.

Lake George has been described by the CSLAP sampling volunteers as “slightly impaired” during 42% of the CSLAP sampling sessions at site 1, but unimpaired at other sites. Slightly impaired conditions were associated with excessive weed growth 29% of the time at site 1, and with poor water clarity 7% of the time at the same site. Recreational use impacts were not reported at any other sampling site.

How Do the 2006 Data Compare to Historical Data from Lake George?

Seasonal Comparison of Eutrophication, Other Water-quality, and Lake-Perception Indicators–2006 Sampling Season and in the Typical or Previous Sampling Seasons at Lake George

Figures 20 and 21 compare data for the measured eutrophication parameters for Lake George in 2006 and since CSLAP sampling began at Lake George. Figures 22 and 23 compare nitrogen to phosphorus ratios, figures 24 through 31 compare other sampling indicators, and figures 32 and 33 compare volunteer perception responses during the same periods.

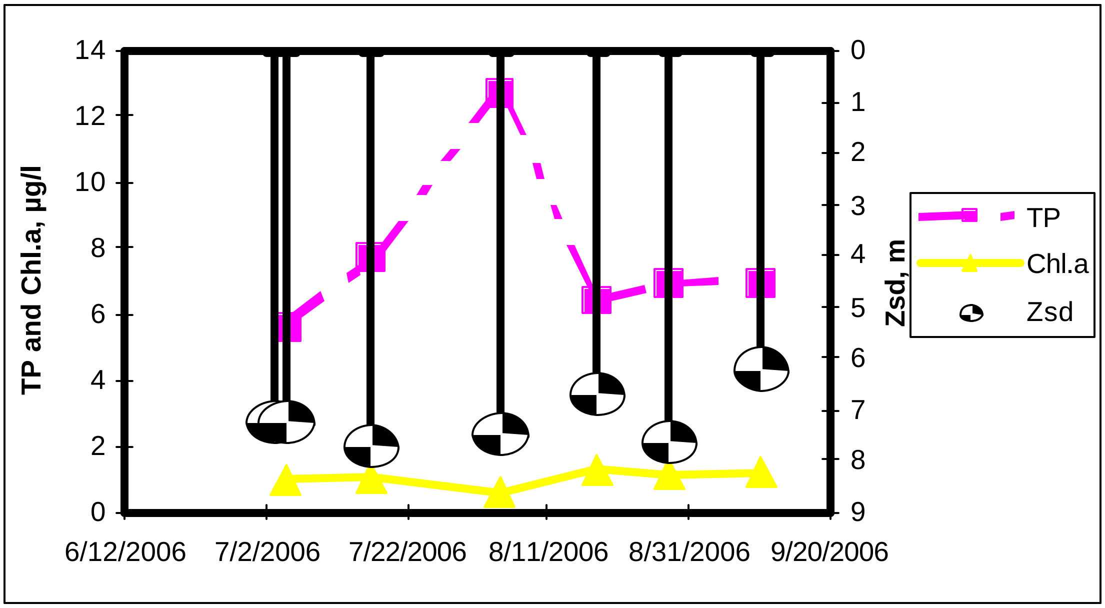


Figure 20a. 2006 Eutrophication Data for Lake George-Site 2

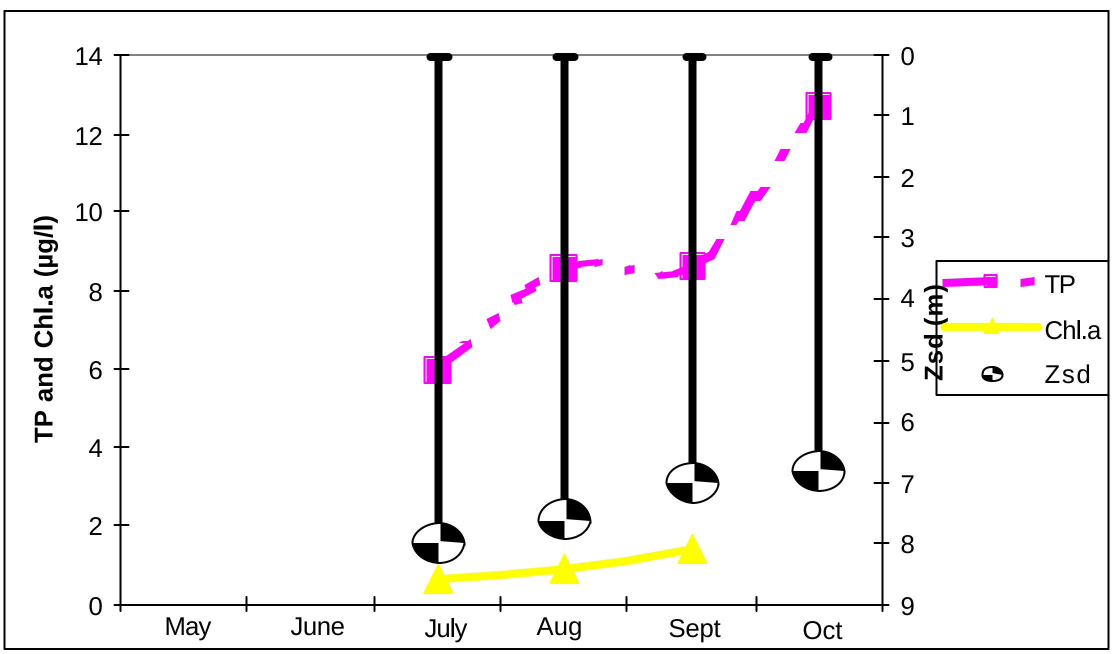


Figure 21a- Eutrophication Data in a Typical (Monthly Mean) Year for Lake George-Site 2

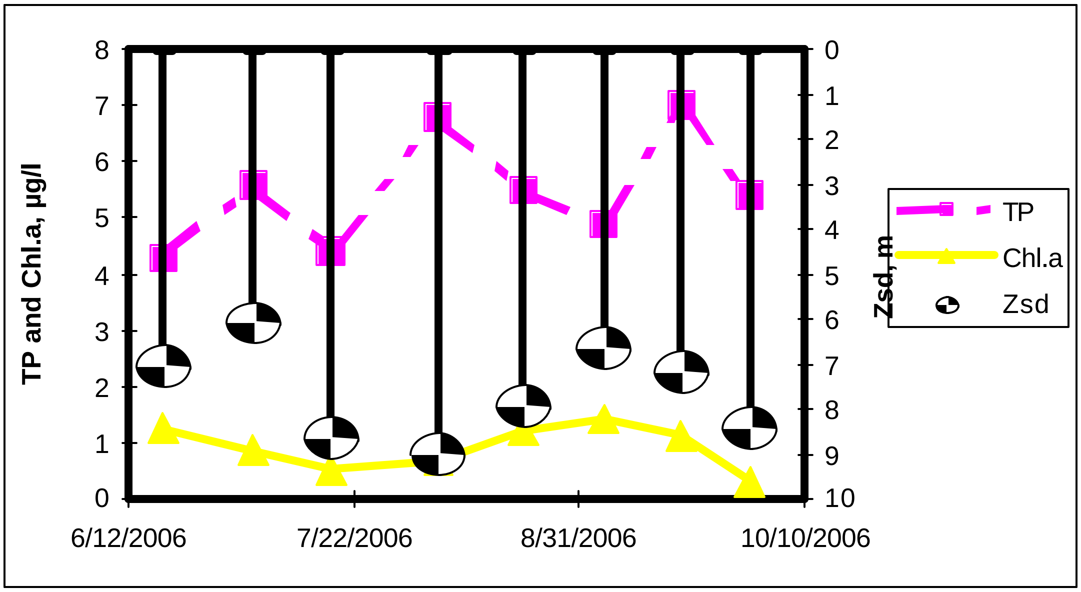


Figure 20b- 2006 Eutrophication Data for Lake George-Site 4

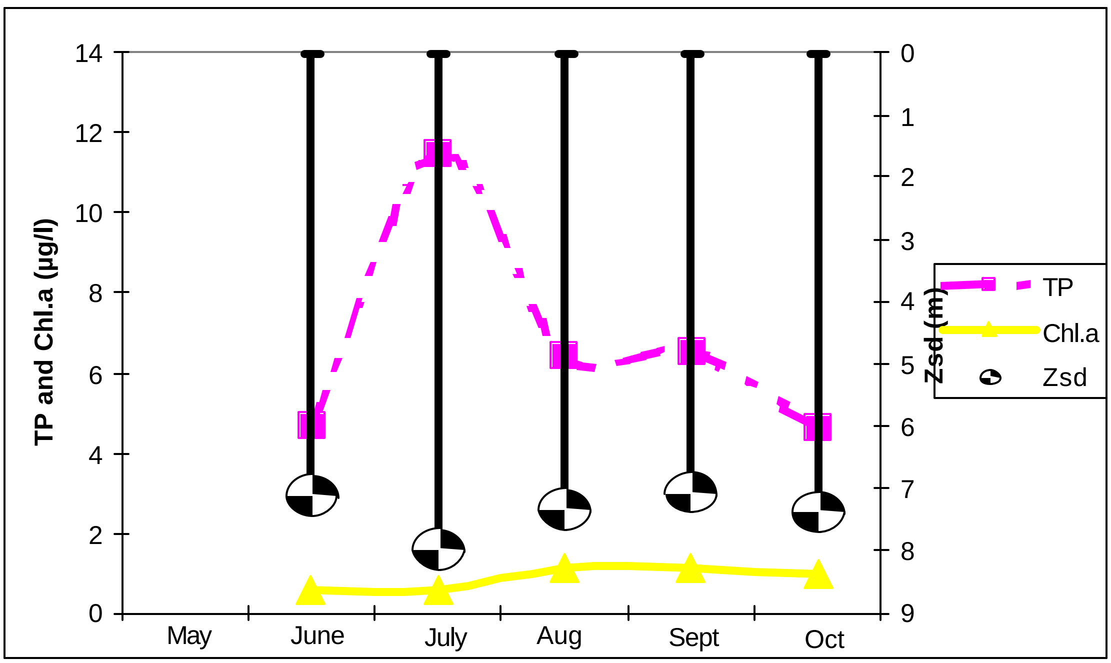


Figure 21b- Eutrophication Data in a Typical (Monthly Mean) Year for Lake George-Site 4

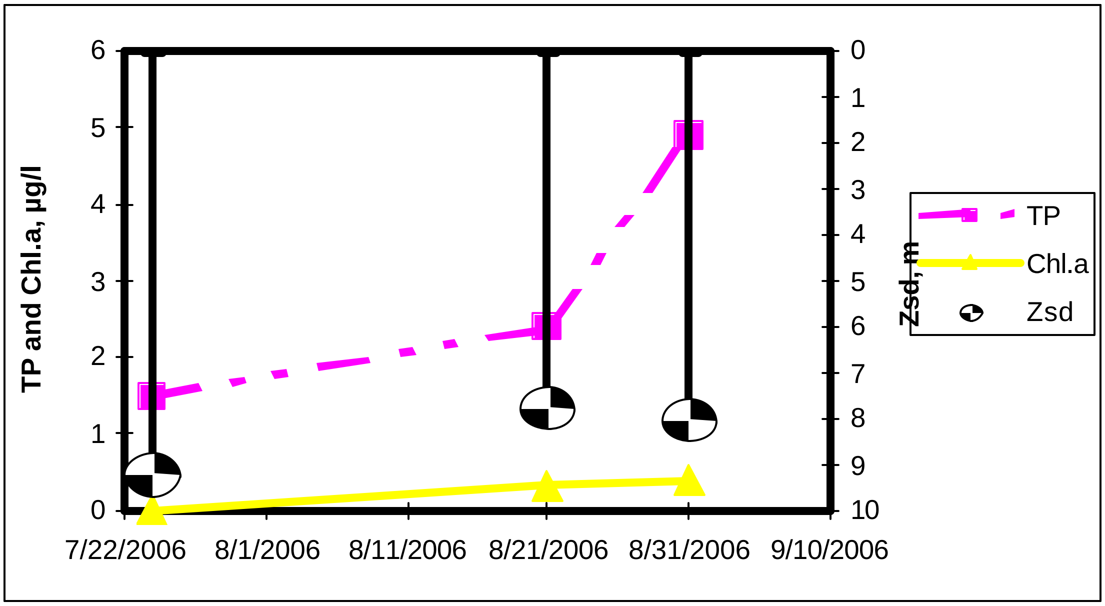


Figure 20c. 2006 Eutrophication Data for Lake George-Site 8

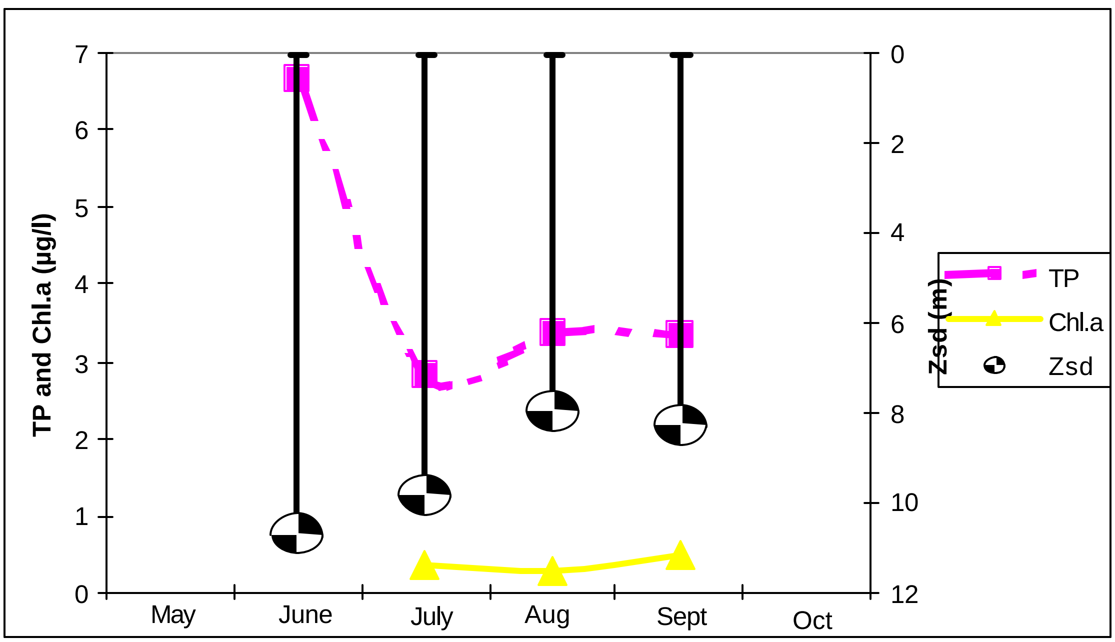


Figure 21c- Eutrophication Data in a Typical (Monthly Mean) Year for Lake George-Site 8

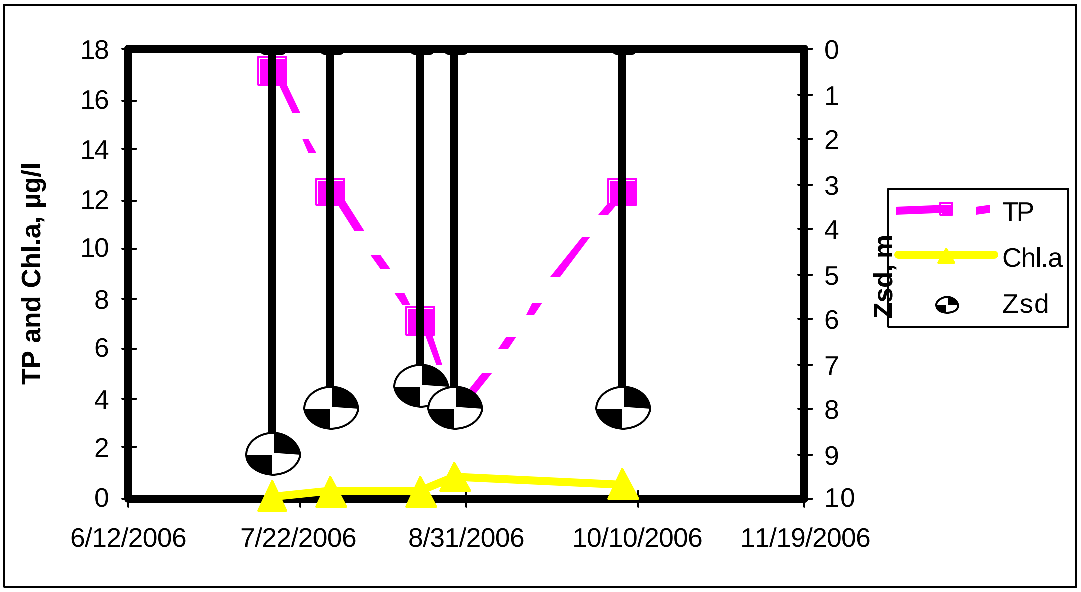


Figure 20d. 2006 Eutrophication Data for Lake George-Site 10

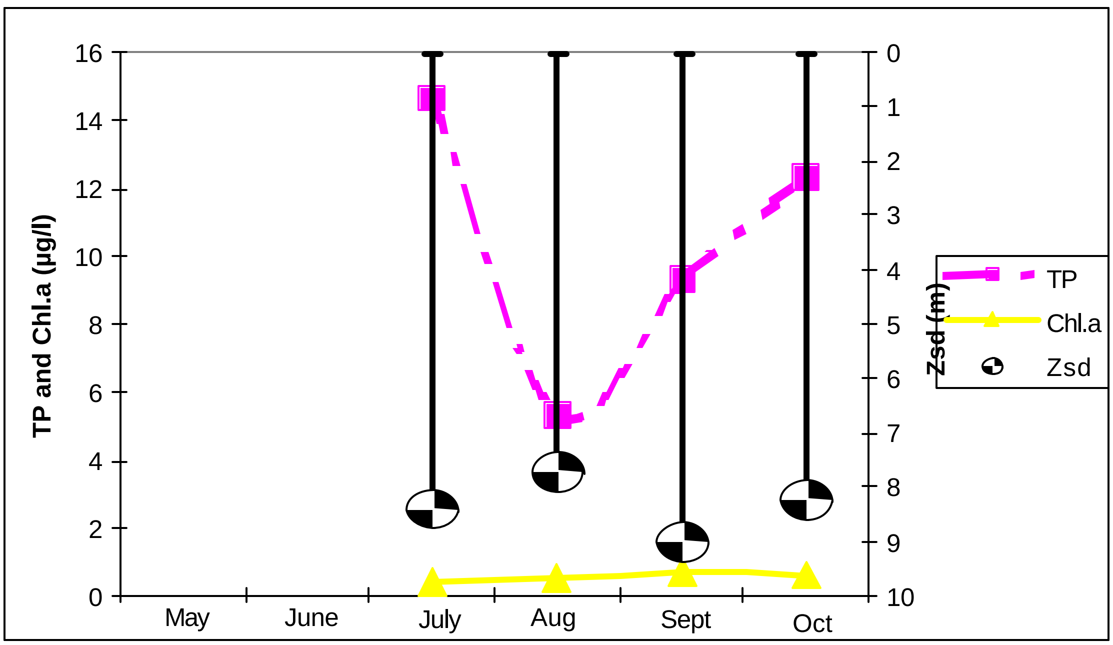


Figure 21d- Eutrophication Data in a Typical (Monthly Mean) Year for Lake George-Site 10

Not yet available

Figure 22a. 2006 Nitrogen-to-Phosphorus Ratios for Lake George-Site 2

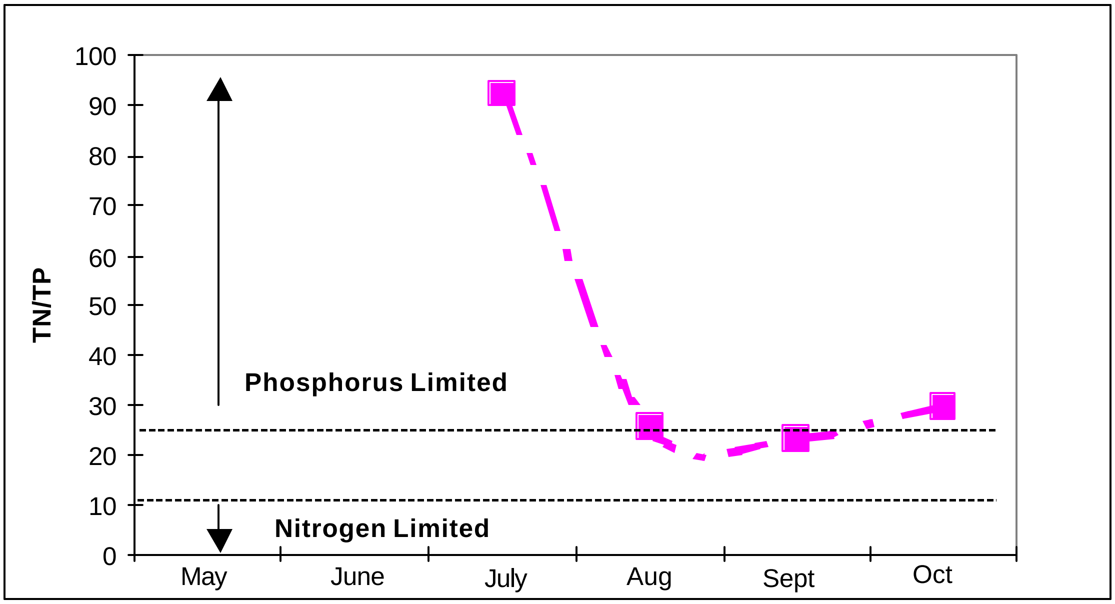


Figure 23a- Nitrogen–to-Phosphorus Ratios in a Typical (Monthly Mean) Year for Lake George- Site 2

Not yet available

Figure 22b. 2006 Nitrogen-to-Phosphorus Ratios for Lake George- Site 4

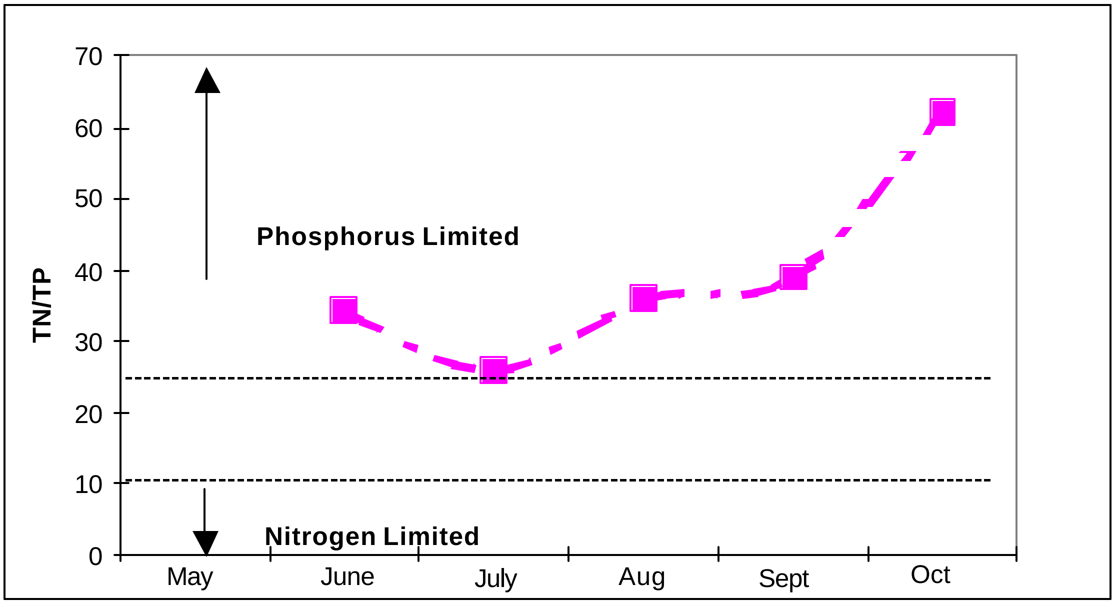


Figure 23b- Nitrogen–to-Phosphorus Ratios in a Typical (Monthly Mean) Year for Lake George- Site 4

Not yet available

Figure 22c. 2006 Nitrogen-to-Phosphorus Ratios for Lake George- Site 8

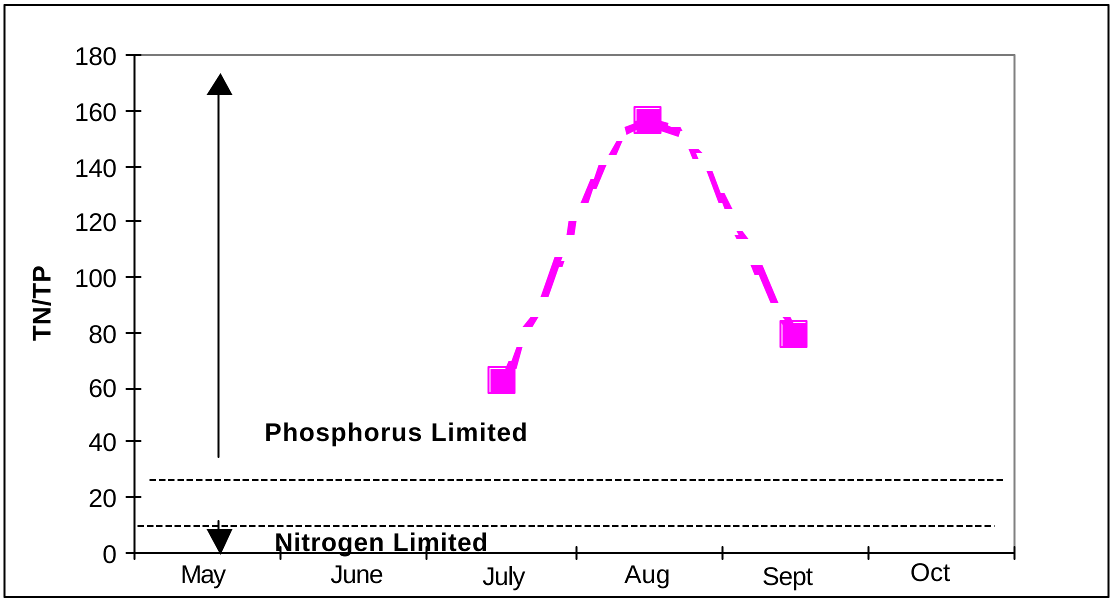


Figure 23c- Nitrogen–to-Phosphorus Ratios in a Typical (Monthly Mean) Year for Lake George- Site 8

Not yet available

Figure 22d. 2006 Nitrogen-to-Phosphorus Ratios for Lake George- Site 10

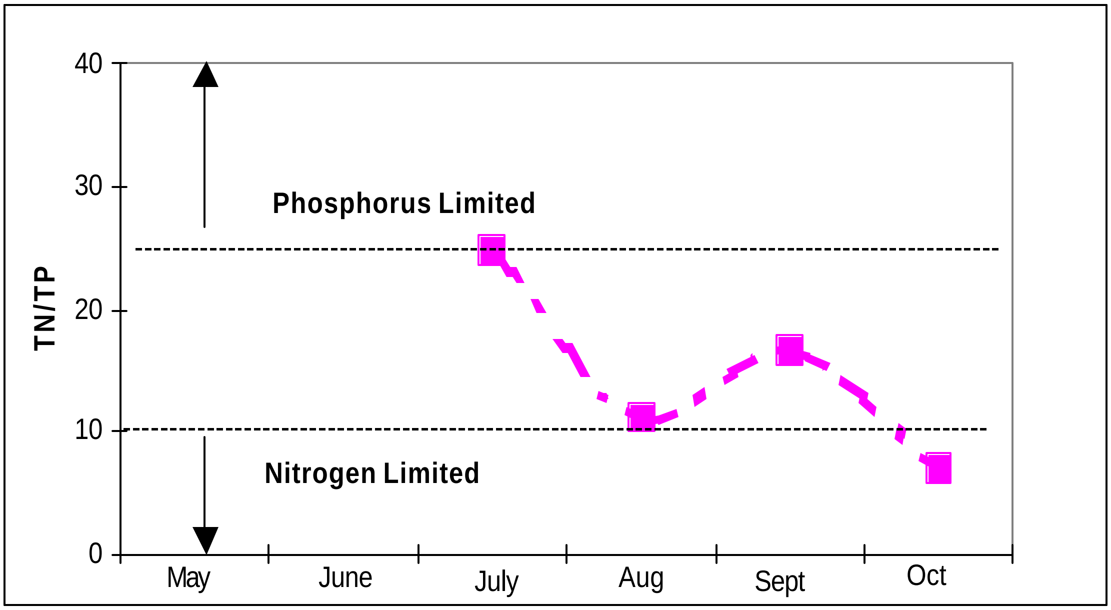


Figure 23d- Nitrogen–to-Phosphorus Ratios in a Typical (Monthly Mean) Year for Lake George- Site 10

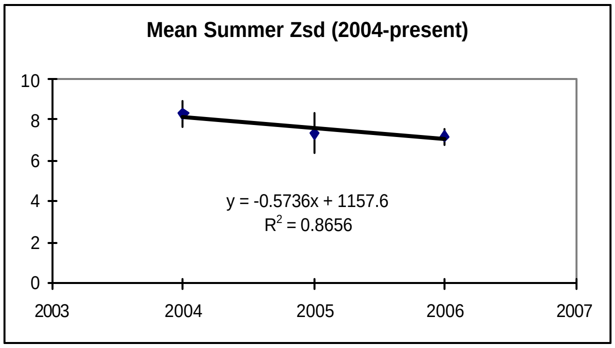


Figure 24a. Annual Average Summer Water Clarity for Lake George-Site 2

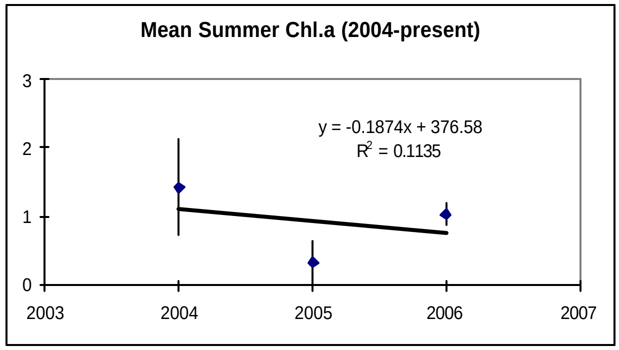


Figure 25a. Annual Average Summer Chlorophyll a for Lake George- Site 2

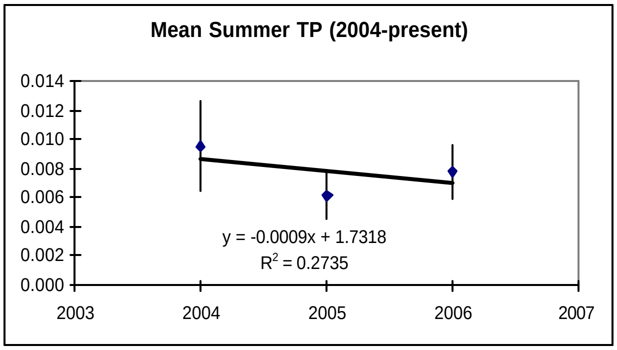


Figure 26a. Annual Average Summer Total Phosphorus for Lake George- S2

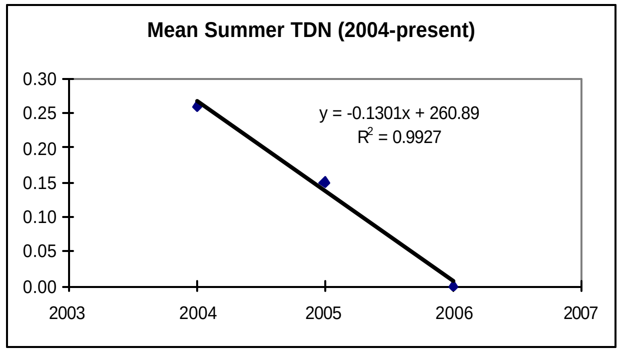


Figure 27a. Annual Average Summer Total Nitrogen for Lake George-Site 2

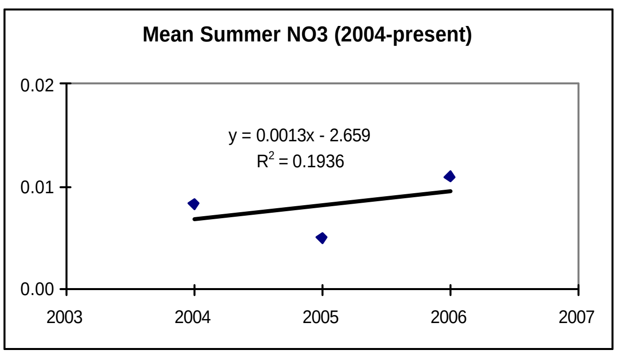


Figure 28a. Annual Average Summer Nitrate for Lake George-Site 2

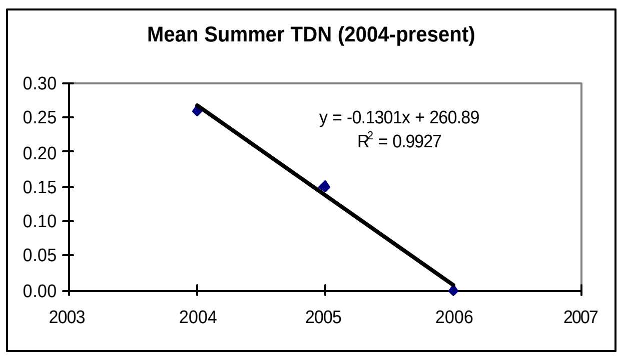


Figure 29a. Annual Average Summer Ammonia for Lake George-Site 2

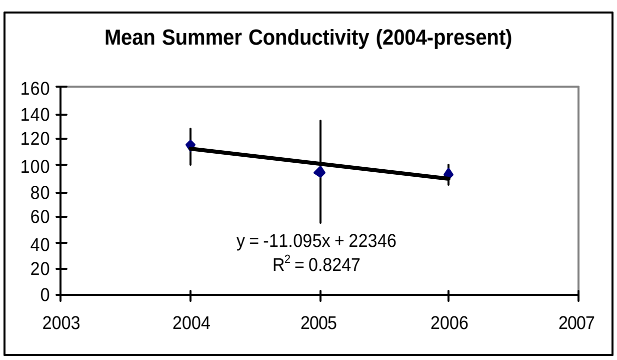


Figure 30a. Annual Average Summer Conductivity for Lake George-Site 2

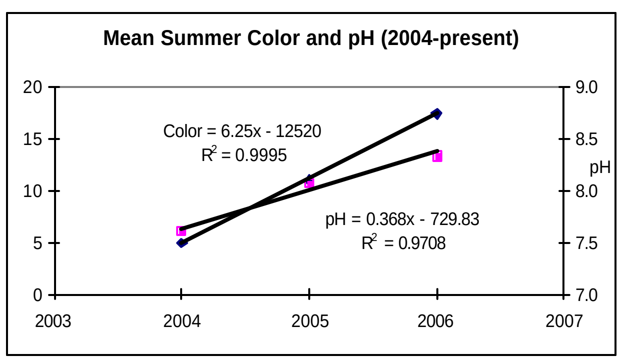


Figure 31a. Annual Average Summer pH and Color for Lake George-Site 2

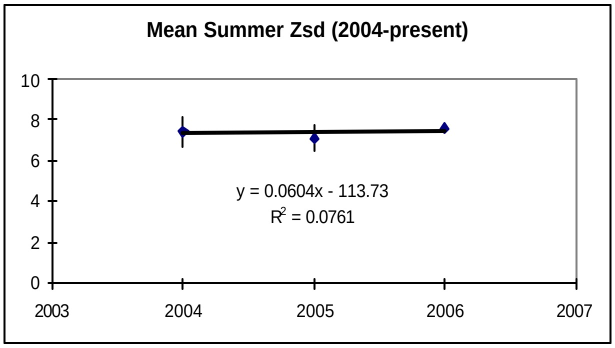


Figure 24b. Annual Average Summer Water Clarity for Lake George-Site 4

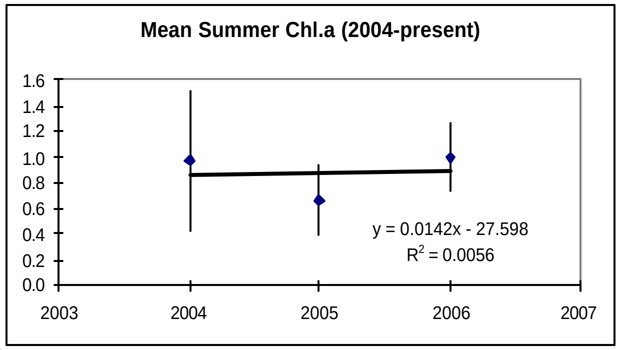


Figure 25b. Annual Average Summer Chlorophyll a for Lake George-Site 4

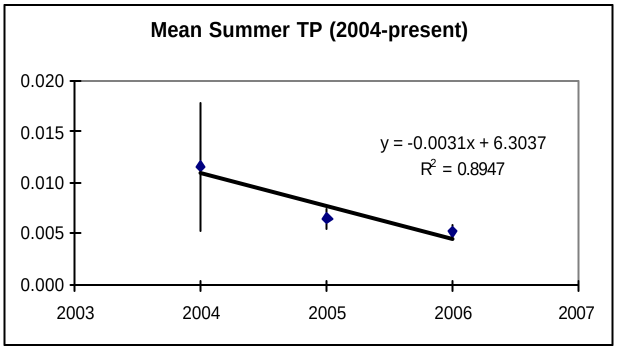


Figure 26b. Annual Average Summer Total Phosphorus for Lake George-S4

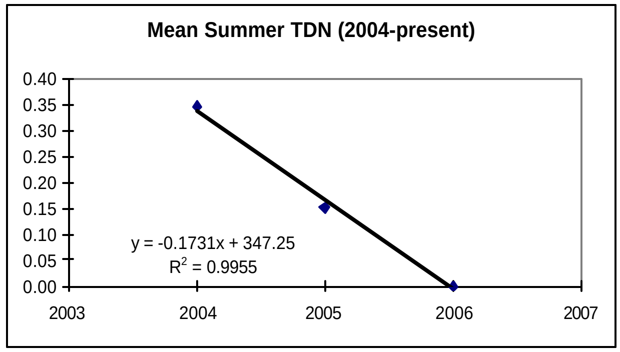


Figure 27b. Annual Average Summer Total Nitrogen for Lake George-Site 4

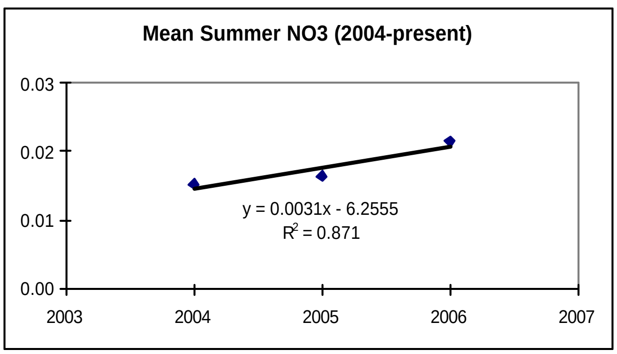


Figure 28b. Annual Average Summer Nitrate for Lake George-Site 4

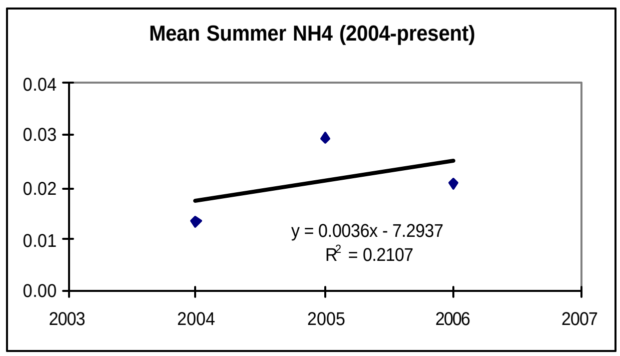


Figure 29b. Annual Average Summer Ammonia for Lake George-Site 4

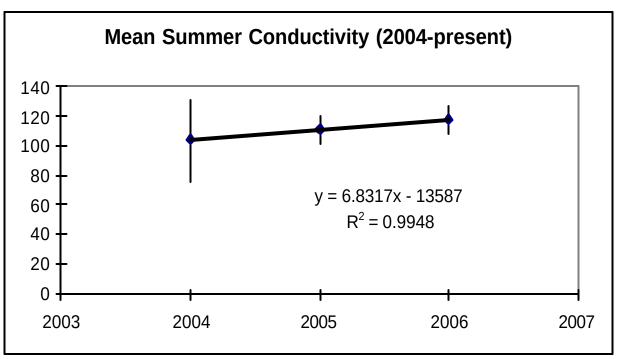


Figure 30b. Annual Average Summer Conductivity for Lake George-Site 4

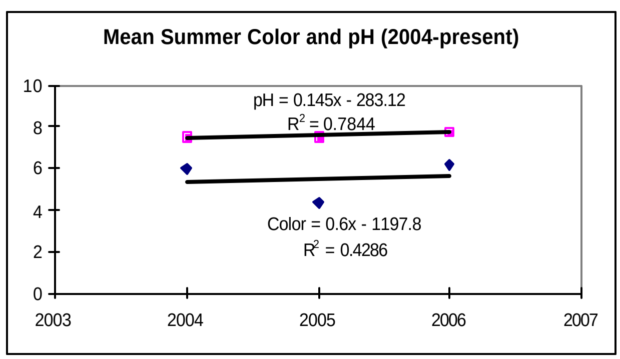
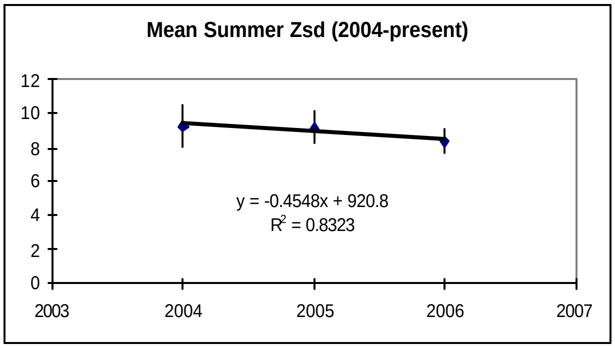


Figure 31b. Annual Average Summer pH and Color for Lake George-Site 4



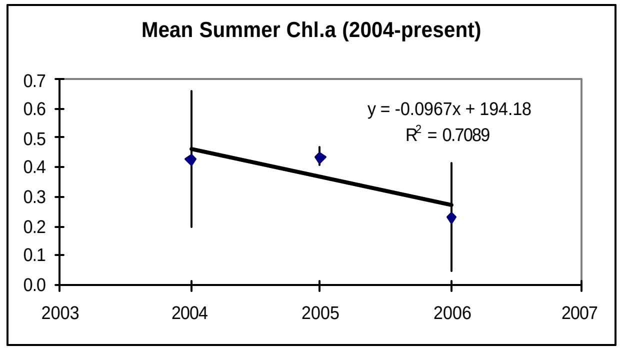
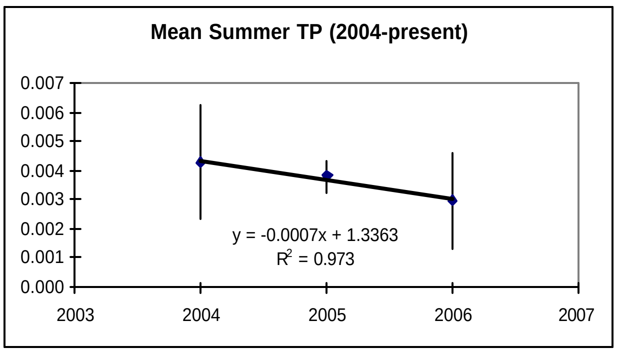


Figure 24c. Annual Average Summer Water Clarity for Lake George-Site 8

Figure 25c. Annual Average Summer Chlorophyll a for Lake George-Site 8



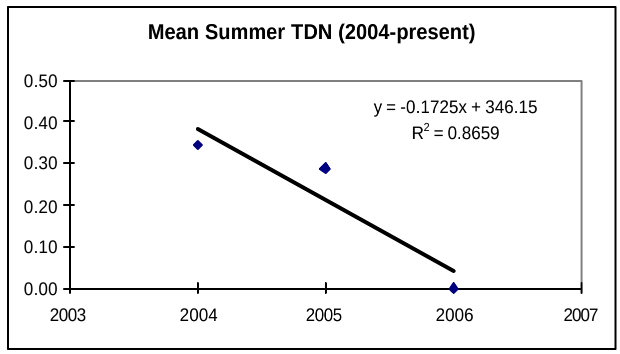
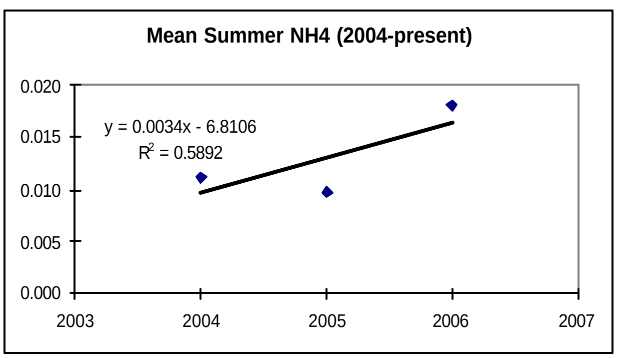


Figure 26c. Annual Average Summer Total Phosphorus for Lake George-S8

Figure 27c. Annual Average Summer Total Nitrogen for Lake George-Site 8



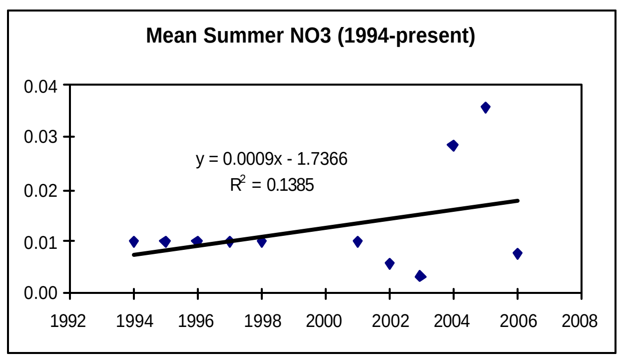
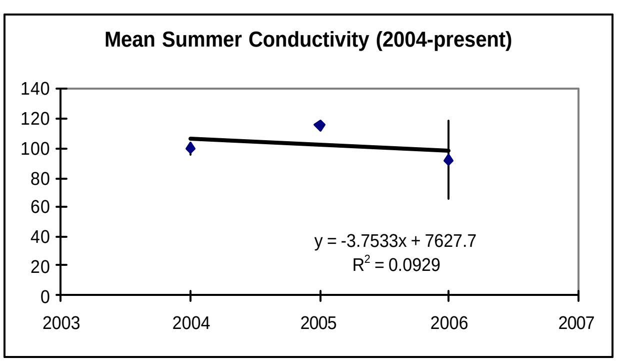


Figure 28c. Annual Average Summer Nitrate for Lake George-Site 8

Figure 29c. Annual Average Summer Ammonia for Lake George-Site 8



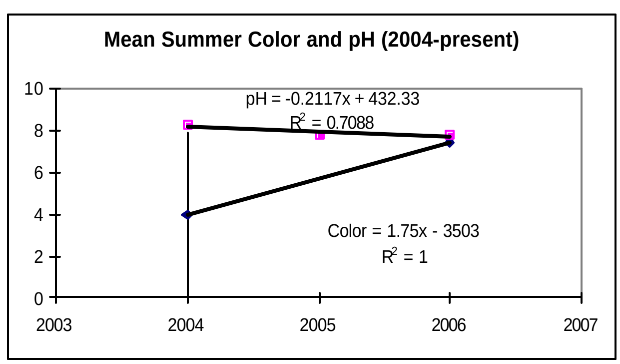
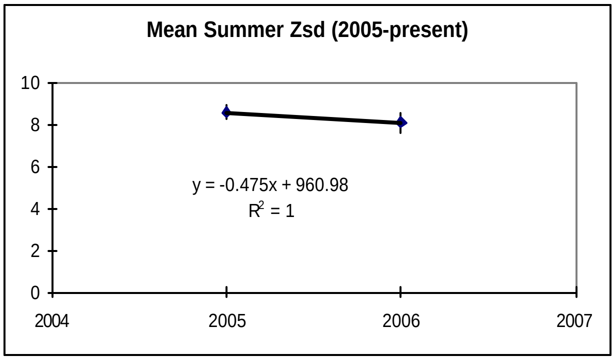


Figure 30c. Annual Average Summer Conductivity for Lake George-Site 8

Figure 31c. Annual Average Summer pH and Color for Lake George-Site 8



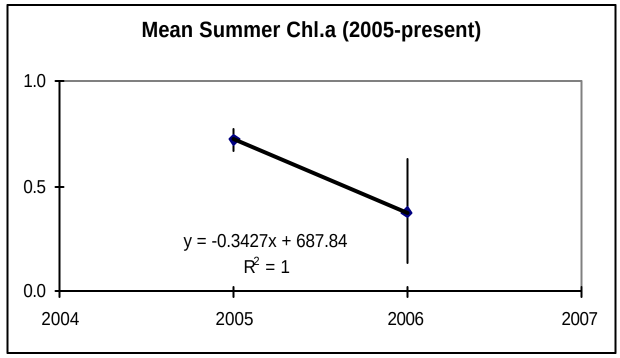
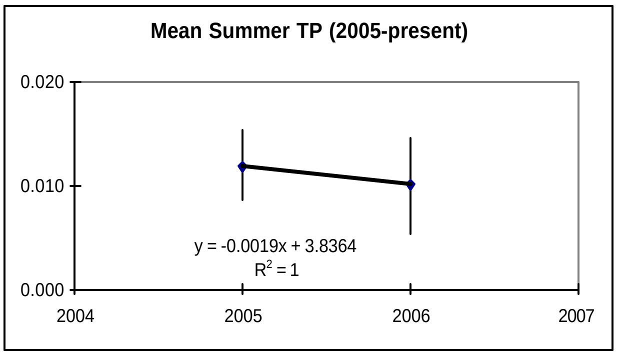


Figure 24d. Annual Average Summer Water Clarity for Lake George-Site 10

Figure 25d. Annual Average Summer Chlorophyll a for Lake George-Site 10



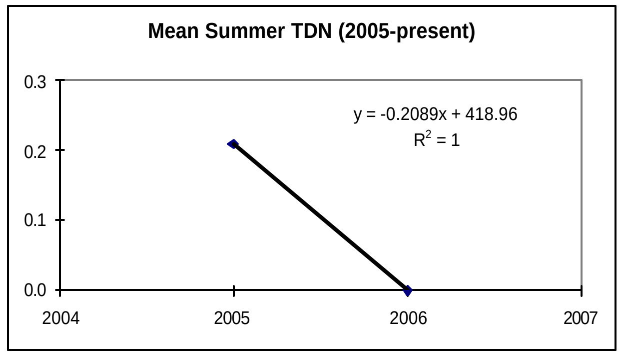
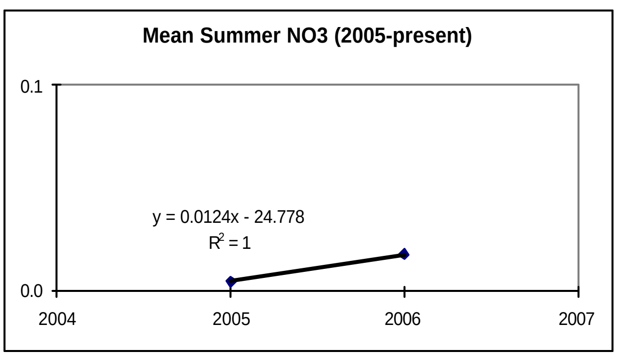


Figure 26d. Annual Average Summer Total Phosphorus for Lake George-S10

Figure 27d. Annual Average Summer Total Nitrogen for Lake George-Site 10



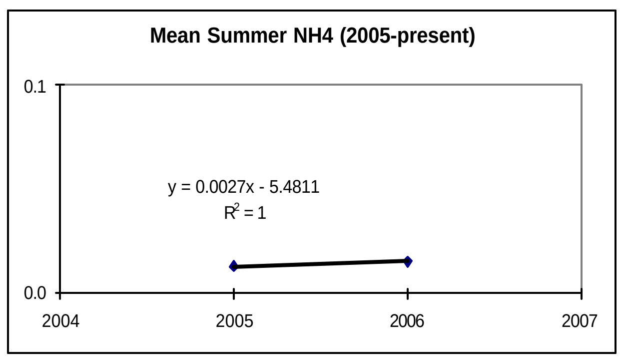
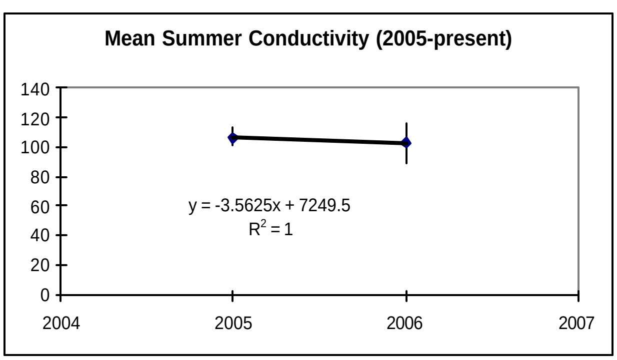


Figure 28d. Annual Average Summer Nitrate for Lake George-Site 10

Figure 29d. Annual Average Summer Ammonia for Lake George-Site 10



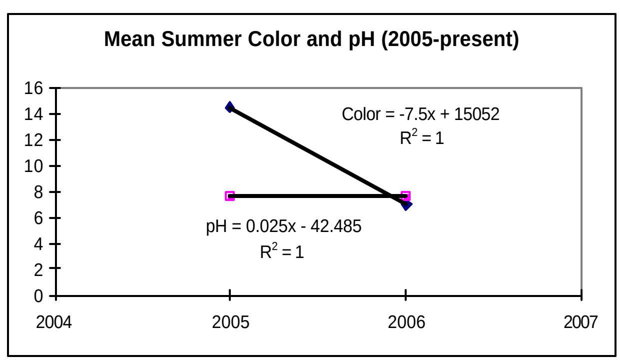


Figure 30d. Annual Average Summer Conductivity for Lake George-Site 10

Figure 31d. Annual Average Summer pH and Color for Lake George-Site 10

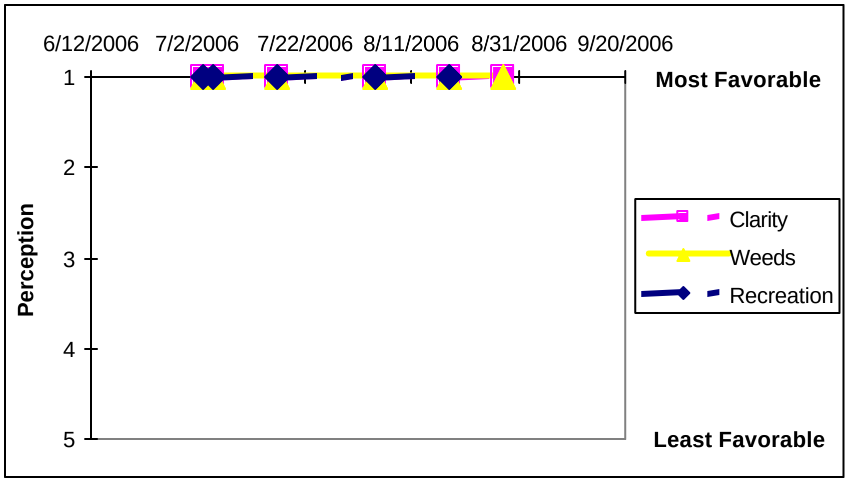


Figure 32a. 2006 Lake Perception Data for Lake George-Site 2

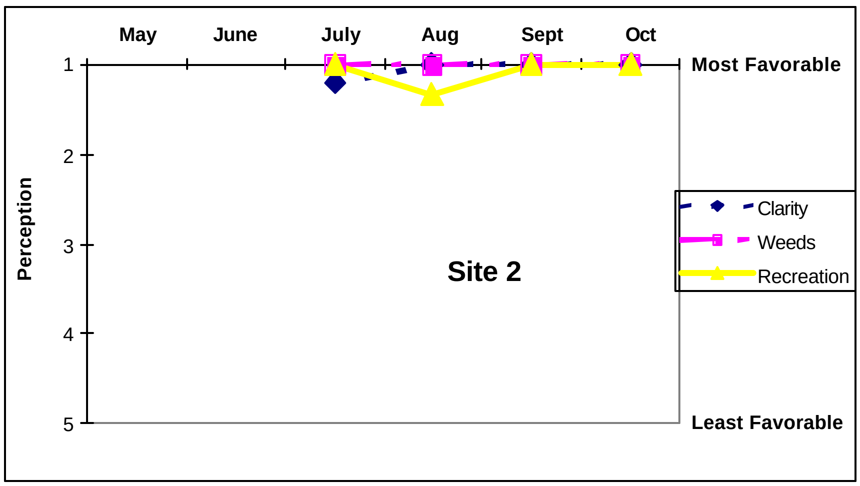


Figure 33a- Lake Perception Data in a Typical (Monthly Mean) Year for Lake George-Site 2

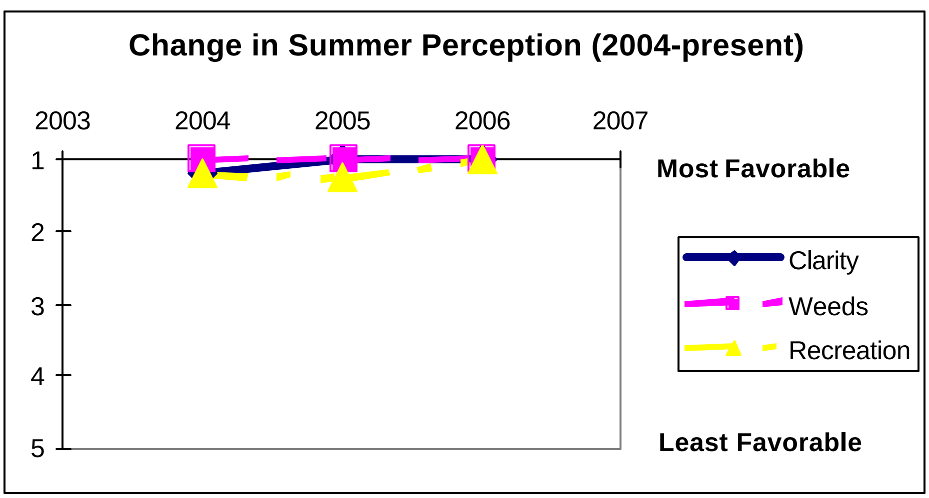


Figure 34a- Annual Average Lake Assessments for Lake George-Site 2

(QA = clarity, ranging from (1) crystal clear to (3) definite algae greenness to (5) severely high algae levels; QB = weeds, ranging from (1) not visible to (3) growing to the surface to (5) dense growth covers lake; QC = recreation, ranging from (1) could not be nicer to (3) slightly impaired to (5) lake not usable)

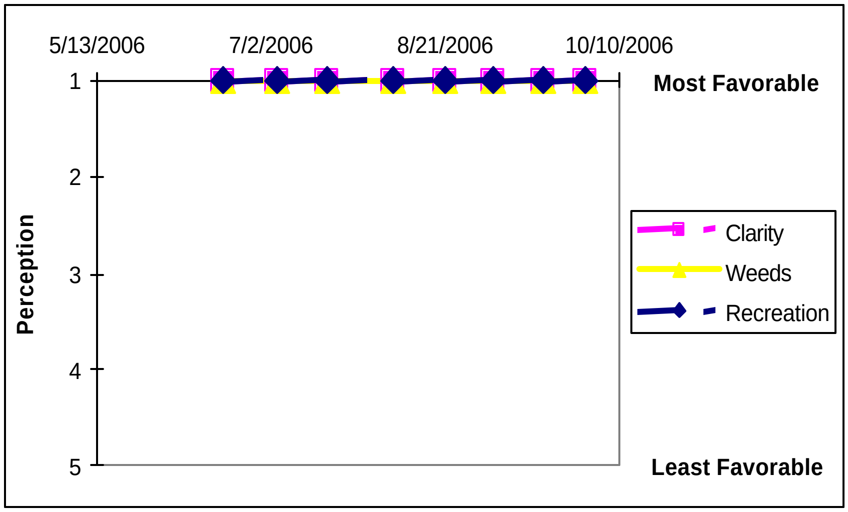


Figure 32b. 2006 Lake Perception Data for Lake George- Site 4

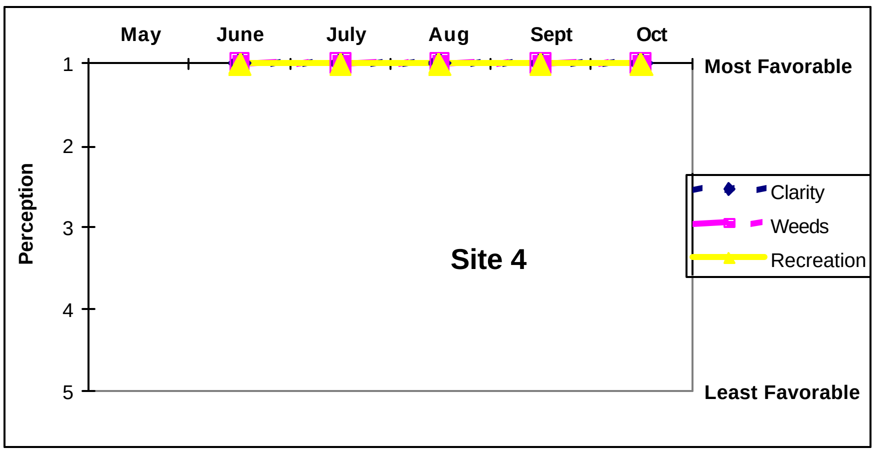


Figure 33b- Lake Perception Data in a Typical (Monthly Mean) Year for Lake George-Site 4

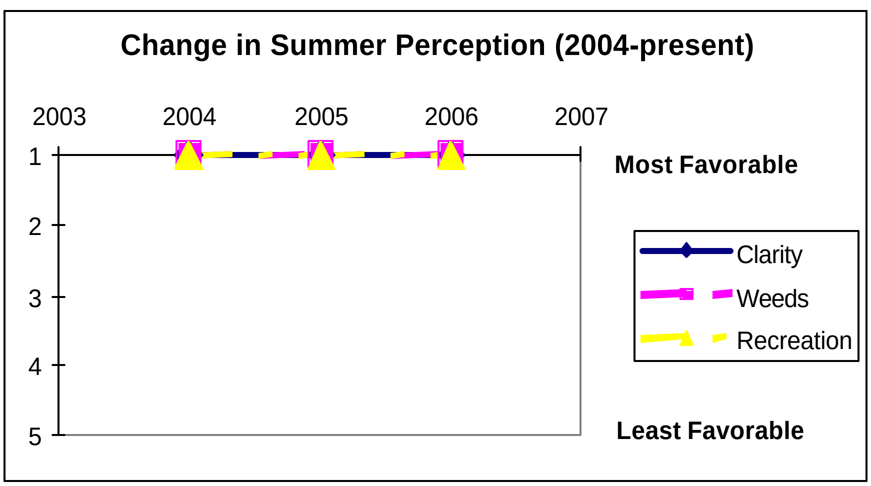


Figure 34b- Annual Average Lake Assessments for Lake George-Site 4

(QA = clarity, ranging from (1) crystal clear to (3) definite algae greenness to (5) severely high algae levels; QB = weeds, ranging from (1) not visible to (3) growing to the surface to (5) dense growth covers lake; QC = recreation, ranging from (1) could not be nicer to (3) slightly impaired to (5) lake not usable)

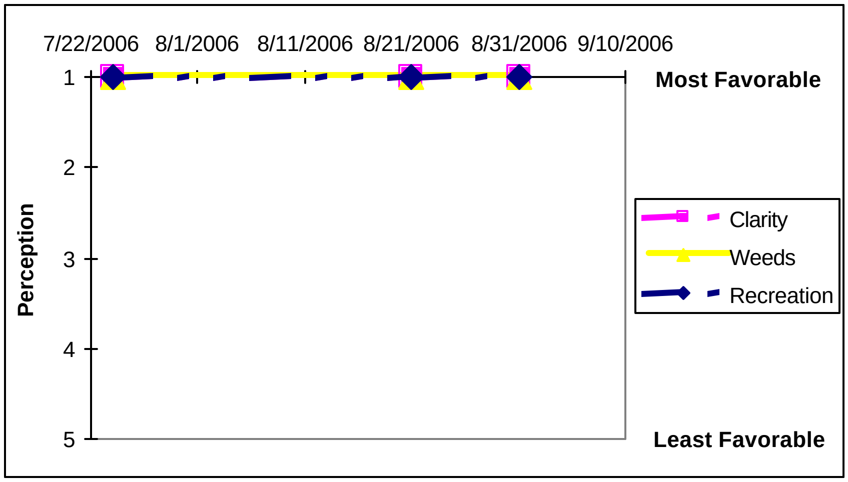


Figure 32c. 2006 Lake Perception Data for Lake George-Site 8

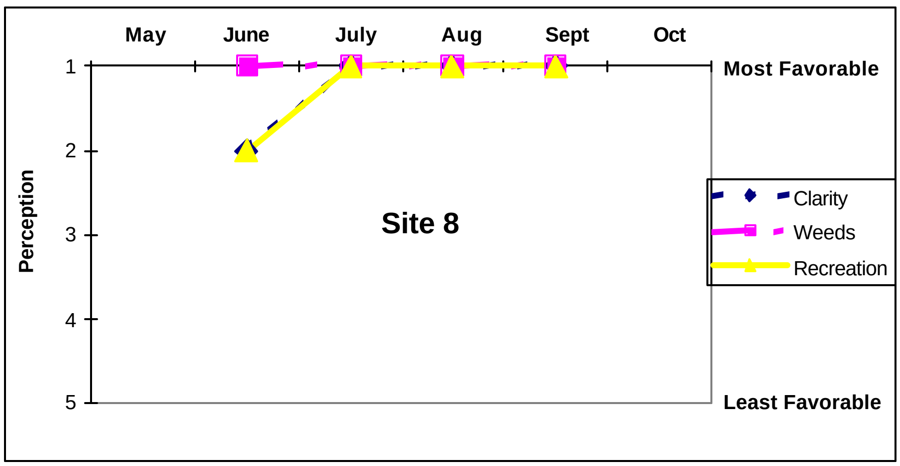


Figure 33c- Lake Perception Data in a Typical (Monthly Mean) Year for Lake George-Site 8

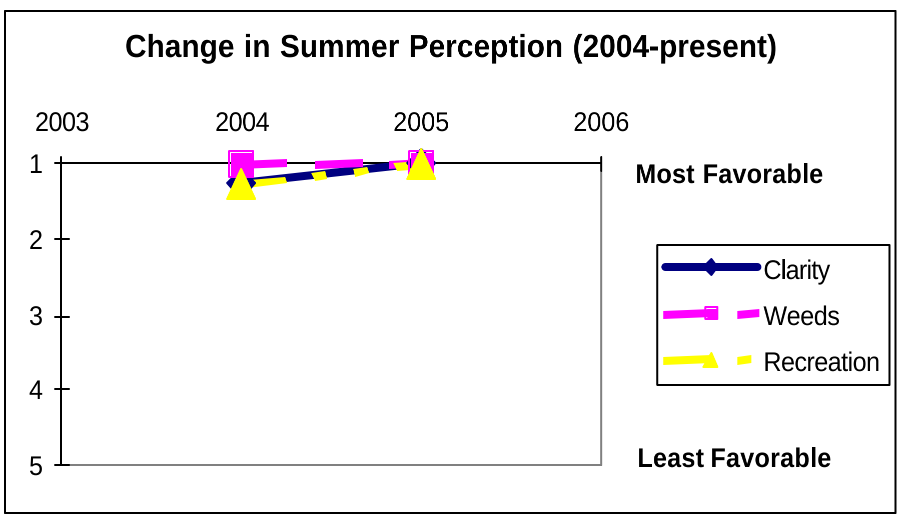


Figure 34c- Annual Average Lake Assessments for Lake George-Site 8

(QA = clarity, ranging from (1) crystal clear to (3) definite algae greenness to (5) severely high algae levels; QB = weeds, ranging from (1) not visible to (3) growing to the surface to (5) dense growth covers lake; QC = recreation, ranging from (1) could not be nicer to (3) slightly impaired to (5) lake not usable)

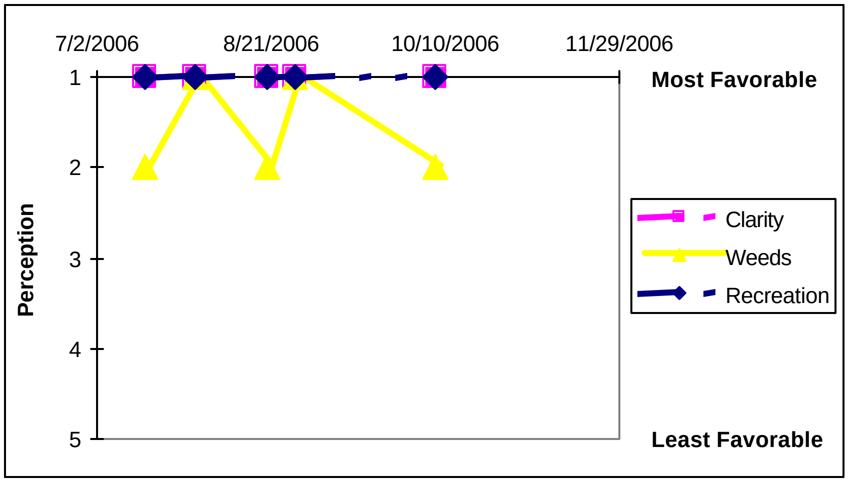


Figure 32d. 2006 Lake Perception Data for Lake George-Site 10

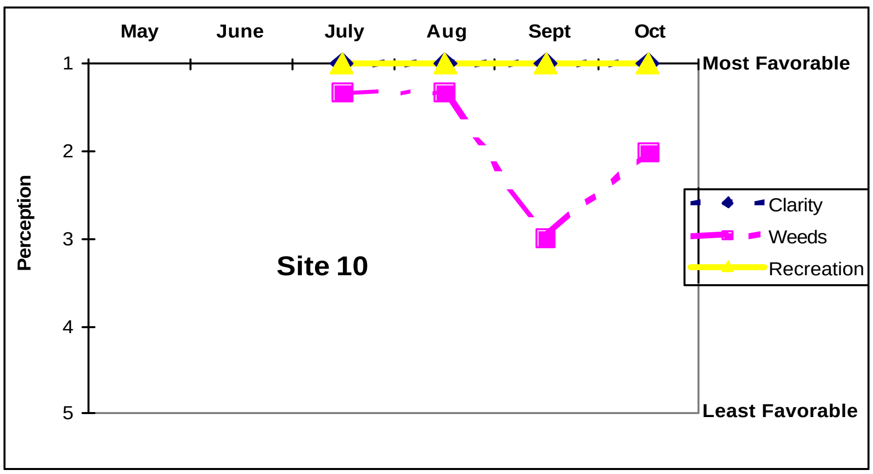


Figure 33d- Lake Perception Data in a Typical (Monthly Mean) Year for Lake George-Site 10

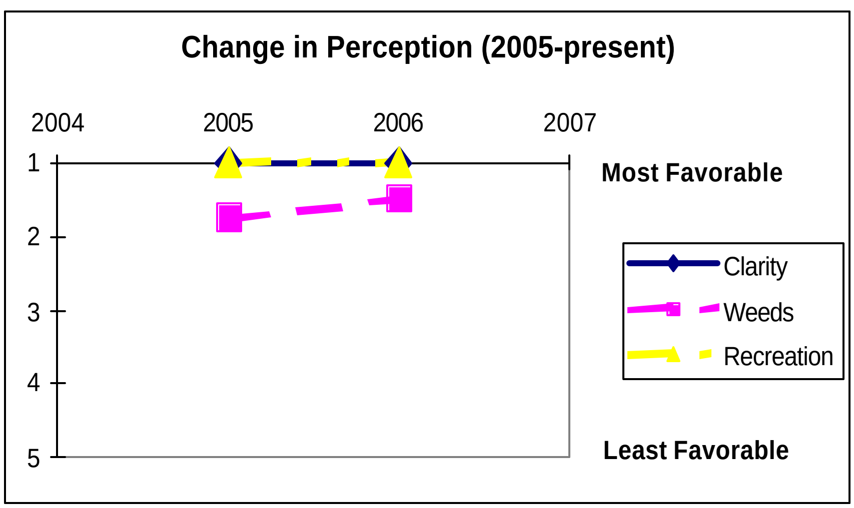


Figure 34d- Annual Average Lake Assessments for Lake George-Site 10

(QA = clarity, ranging from (1) crystal clear to (3) definite algae greenness to (5) severely high algae levels; QB = weeds, ranging from (1) not visible to (3) growing to the surface to (5) dense growth covers lake; QC = recreation, ranging from (1) could not be nicer to (3) slightly impaired to (5) lake not usable)

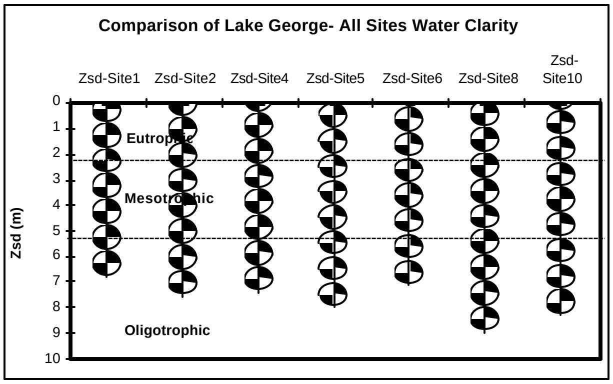


Figure 35. *Comparison of 2006 Secchi Disk Transparency From Site to Site*

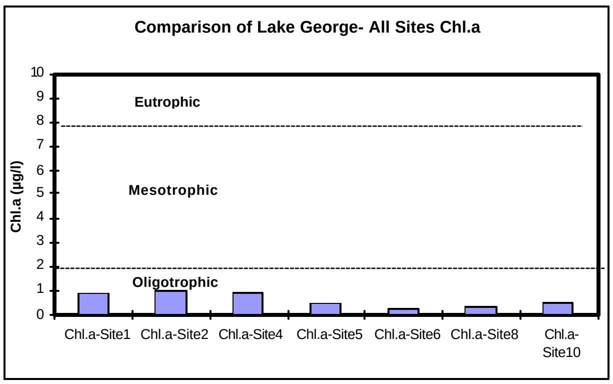


Figure 36. *Comparison of 2006 Chlorophyll a From Site to Site*

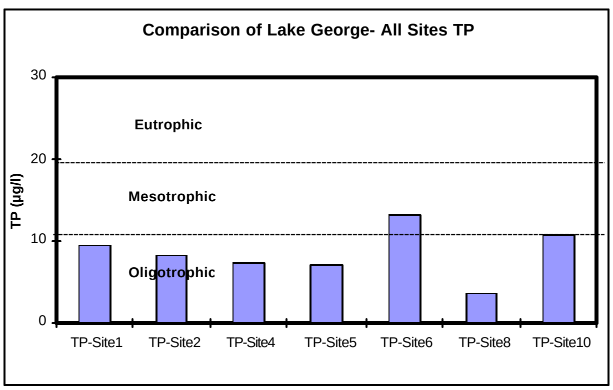


Figure 37. *Comparison of 2006 Total Phosphorus From Site to Site*

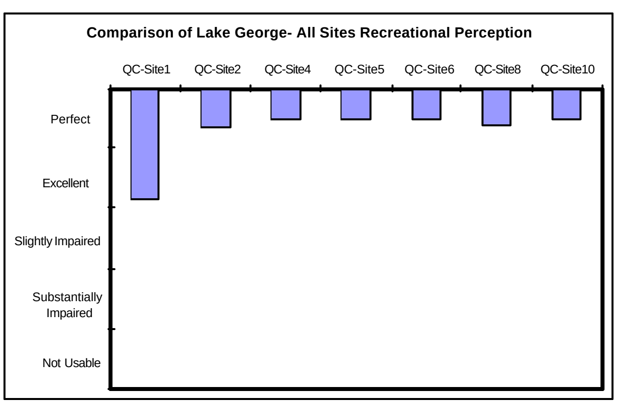


Figure 38. *Comparison of 2006 Recreational Perception From Site to Site*

How do the Lake George sites compare to each other?

Annual Comparison of Median Readings for Eutrophication Parameters and Recreational Assessment For Lake George From 2004 to 2006 From Site to Site

The graphs to the left illustrate comparisons of each eutrophication parameter and recreational perception at Lake George--in 2006, other lakes in the same drainage basin, lakes with the same water-quality classification (each classification is summarized in Appendix B), and all of CSLAP. Readers should note that differences in watershed types, activities, lake history and other factors may result in differing water-quality conditions at your lake relative to other nearby lakes. In addition, the limited database for some regions of the state precludes a comprehensive comparison to neighboring lakes.

Based on these graphs, the following conclusions can be made about Lake George in 2006:

a) Water clarity readings have been highest at the northern sites (sites 8 and 10) and lowest at the southernmost site (site 1). This is consistent with findings in other monitoring programs. All readings have been indicative of oligotrophic lakes.
b) Chlorophyll *a* readings have been very low at all sites, but were slightly higher in the southern sites (sites 1 and 2). This is consistent with findings in other monitoring programs, and consistent with the water clarity findings. All readings have been indicative of oligotrophic lakes.
c) Total phosphorus readings are lowest in one of the northern-most sites (site 8), corresponding to the highest water transparency readings, but have been highest at sites 6 and 10.
d) Recreational assessments (QC on the field-observations form) have been highly favorable at all sites north of site 1. This is mostly consistent with the spatial patterns associated with water quality conditions in the lake.

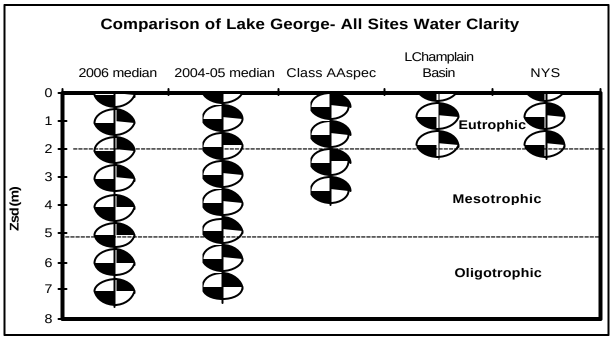


Figure 35b. *Comparison of 2006 Secchi Disk Transparency to Lakes With the Same Water-Quality Classification, Neighboring Lakes, and Other CSLAP Lakes in 2006*

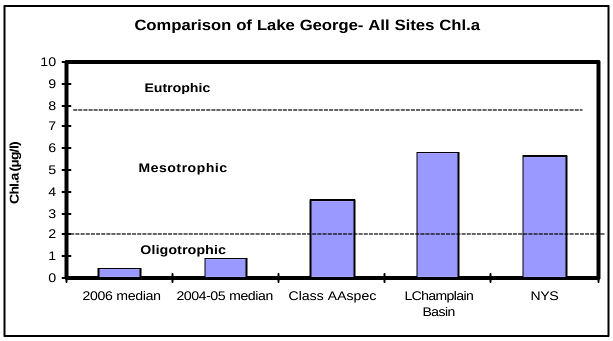


Figure 36b. *Comparison of 2006 Chlorophyll a to Lakes with the Same Water-Quality Classification, Neighboring Lakes, and Other CSLAP Lakes in 2006*

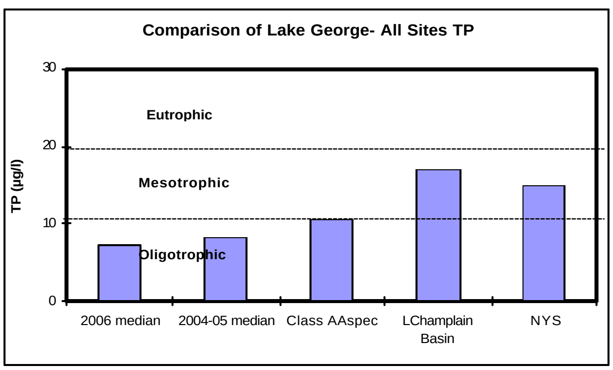


Figure 37b. *Comparison of 2006 Total Phosphorus to Lakes With the Same Water-Quality Classification, Neighboring Lakes, and Other CSLAP Lakes in 2006*

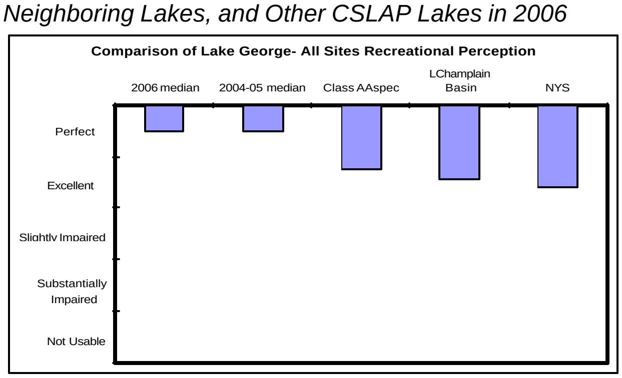


Figure 38b. *Comparison of 2006 Recreational Perception to Lakes With the Same Water-Quality Classification, Neighboring Lakes, and Other CSLAP Lakes in 2006*

How does Lake George compare to other lakes?

Annual Comparison of Median Readings for Eutrophication Parameters and Recreational Assessment For Lake George (Average for All Sampling Sites) in 2006 to Historical Data for Lake George, Neighboring Lakes, Lakes with the Same Lake Classification, and Other CSLAP Lakes

The graphs to the left illustrate comparisons of each eutrophication parameter and recreational perception at Lake George--in 2006, other lakes in the same drainage basin, lakes with the same water-quality classification (each classification is summarized in Appendix B), and all of CSLAP. Readers should note that differences in watershed types, activities, lake history and other factors may result in differing water-quality conditions at your lake relative to other nearby lakes. In addition, the limited database for some regions of the state precludes a comprehensive comparison to neighboring lakes.

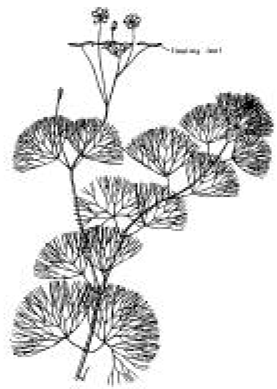
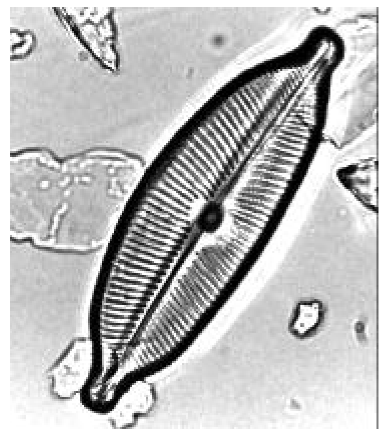
Based on these graphs, the following conclusions can be made about Lake George in 2006:

a) Using water clarity as an indicator, Lake George is less productive than other Class $AA_{special}$, Lake Champlain basin and NYS lakes.

b) Using chlorophyll *a* concentrations as an indicator, Lake George is less productive than other Class $AA_{special}$, Lake Champlain basin and NYS lakes.

c) Using total phosphorus concentrations as an indicator, Lake George is less productive than other Class $AA_{special}$, Lake Champlain basin and NYS lakes.

d) Using QC on the field-observations form as an indicator, Lake George is less productive than other Class $AA_{special}$, Lake Champlain basin and NYS lakes.

VII. AQUATIC PLANTS

a. Macrophytes:

Aquatic plants should be recognized for their contributions to lake beauty as well as for providing food and shelter for other life in the lake. Emergent and floating plants such as water lilies floating on the lake surface may provide aesthetic appeal with their colorful flowers; sedges and cattails help to prevent shoreline erosion and may provide food and cover for birds. Submergent plants like pondweeds and leafy waterweed harbor insects, provide nurseries for amphibians and fish, and provide food for birds and other animals. Those who enjoy fishing at the lake appreciate a diverse plant population. Aquatic plants can be found throughout the *littoral zone*, the near-shore areas in which sufficient light reaches the lake bottom to promote photosynthesis. Plant growth in any particular part of the lake is a function of available light, nutrition and space, bottom substrate, wave action, and other factors, and extensive plant growth can occur in both “clean” and “polluted” lakes. A large portion of aquatic vegetation consists of the microscopic algae referred to as phytoplankton; the other portion consists of the larger rooted plants called macrophytes**.**

As invasive plants colonize and spread into a lake, native plant species can be threatened or even eliminated from aquatic plant communities. The most susceptible of these are those that reside in marginal regions, limited by water depth, sediment type, or inability to compete for space. As a result, many plants identified as *rare, threatened* or *endangered (RTE) species* are protected under New York State law. The New York State Natural Heritage Program has reported the following RTE species in Lake George:

Endangered: *Subularia aquatica var. americana* (water awlwort)
Neobeckia aquatica (lake cress)
Myriophyllum pinnatum (green parrotsfeather)

Threatened: *Myriophyllum alterniflorum* (small watermilfoil)
Potamogeton alpinus (northern pondweed)
Potamogeton hillii (Hills pondweed)

Of particular concern to many lakefront residents and recreational users are the *non-indigenous macrophytes* that can frequently dominate native aquatic plants and crowd out more beneficial plant species. The invasive plant species may be introduced to a lake by waterfowl, but in most cases they are introduced by fragments or seedlings that remain on watercraft from already-infested lakes. Once introduced, these species have tenacious survival skills, crowding out, dominating and eventually aggressively overtaking the indigenous (native) plant communities in a variety of water-quality conditions. When this occurs, they interfere with recreational activities such as fishing, swimming or water skiing. These species need to be properly identified to be effectively managed.

Non-native Invasive Macrophyte Species

Examples of the common non-native invasive species found in New York are:

- **Eurasian watermilfoil** *(Myriophyllum spicatum)*
- **Curly-leaf pondweed** *(Potamogeton crispus)*
- **Eurasian water chestnut** *(Trapa natans)*
- **Fanwort** *(Cabomba caroliniana).*

If these plants are not present, efforts should be made to continue protecting the lake from the introduction of these species.

Whether the role of the lake manager is to better understand the lake ecosystem or better manage the aquatic plant community, knowledge of plant distribution is paramount to the management process. There are many procedures available for assessing and monitoring aquatic vegetation. The CSLAP Sampling Protocol contains procedures for a “semi-quantitative” plant-

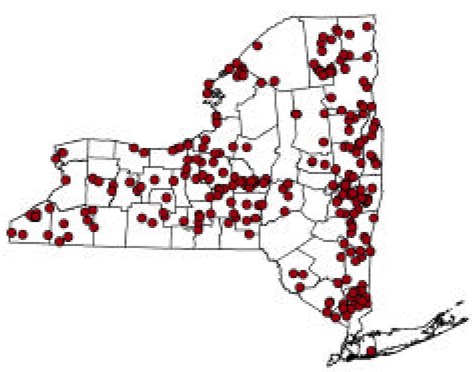


Figure 39a. Myriophyllum spicatum distribution in New York State

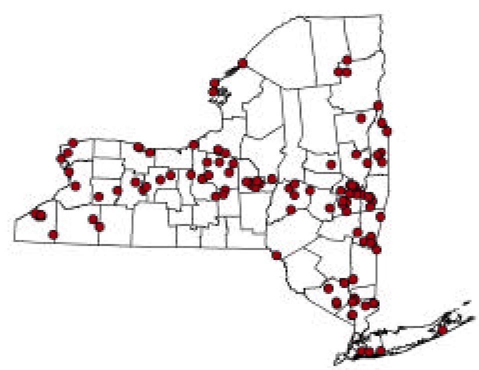


Figure 39b. Potamogeton crispus distribution in New York State

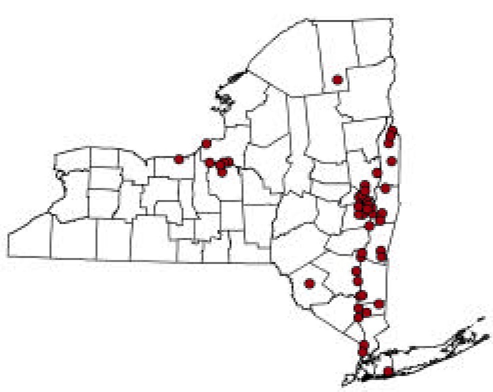


Figure 39c. Trapa natans distribution in New York State

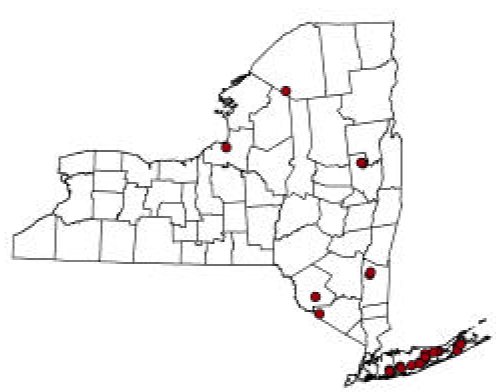


Figure 39d. Cabomba caroliniana distribution in New York State

monitoring program. Volunteers collect plant specimens and provide field information and qualitative abundance estimates for an assessment of the macrophyte communities within critical areas of the lake. While these techniques are no substitute for professional plant surveys, they can help provide better information for lake managers. Lake associations planning to devote significant time and expenditures toward a plant-management program are advised to pursue more extensive plant surveying activities.

Formal and informal survey work has been effective in developing statewide distribution maps of each of the major submergent exotic species, and CSLAP data has figured prominently in this process. As of 2006, the statewide distribution maps of confirmed identifications are shown on Figures 39a to 39d.

Aquatic plant surveys have not been conducted through CSLAP at Lake George, although the Darrin Freshwater Institute and others have conducted plant surveys in the lake.

b. Algae

Microscopic algae referred to as phytoplankton make up much of aquatic vegetation found in lakes. For this reason, and because phytoplankton are the primary producers of food (through photosynthesis) in lakes, they are the most important component of the complex food web that governs ecological interactions in lakes.

In a lake, phytoplankton communities are usually very diverse and are comprised of hundreds of species having different requirements for nutrients, temperature and light. In many lakes, including those of New York, diatom populations are greatest in the spring, due to a competitive advantage in cooler water and relatively high levels of silica. In most lakes, however, diatom densities rarely reach nuisance portions in the spring. By the summer, green algae take advantage of warmer temperatures and greater amounts of nutrients (particularly nitrogen) in the warm water and often increase in density. These alga often grow in higher densities than do diatoms or most other species, although they are often not the types of algae most frequently implicated in noxious algae blooms. Later in the summer and in the early fall, blue-green algae, which possess the ability to utilize atmospheric nitrogen to provide this required nutrient, increase in response to higher phosphorus concentrations. This often happens right before turnover or destratification in the fall. These alga are most often associated with taste and odor problems, bloom conditions, and the “spilled paint” slick that prompts the most complaints about algae. Each lake possesses a unique blend of algal communities, often varying in population size from year to year and with differing species proportional in the entire population. The most common types range from the mentioned diatoms, green, and blue-green algae, to golden-brown algae to dinoflagellates and many others, dominating each lake community.

So how can this be evaluated through CSLAP? CSLAP does assess algal biomass through the chlorophyll *a* measurement. While algal differentiation is important, many CSLAP lake associations are primarily interested in “how much?,” not “what kind?,” and this is assessed through the chlorophyll *a* measurement. Phytoplankton communities have not been regularly identified and monitored through CSLAP, in part due to the cost and difficulty in analyzing samples and in part due to the difficulty in using a one-time sample to assess long-term variability in lake conditions. A phytoplankton analysis may reflect a temporary, highly unstable and dynamic water-quality condition.

Prior to 1998, nearly all CSLAP lakes were sampled once for phytoplankton identification, but since then, phytoplankton sampling has not been a regular part of CSLAP. For these sampled lakes, a summary of the most abundant phytoplankton species is included below. Algal species frequently associated with taste and odor problems are specifically noted in this table, although it should be mentioned that these samples, like all other water samples collected through CSLAP, come from near the center of the lake, a location not usually near water intakes or swimming beaches. Since algal communities can also be spatially quite variable, even a preponderance of taste- and odor-causing species in the water samples might not necessarily translate to potable-water-intake or aesthetic impairments, although the threat of such an impairment might be duly noted in the "Considerations" section below.

Phytoplankton surveys have not been conducted through CSLAP at Lake George. Extensive phytoplankton and zooplankton surveys have been conducted by the RPI Darrin Freshwater Institute and others.

VIII: PRIORITY WATERBODY LISTS AND IMPACTS TO LAKE USE

The Priority Waterbody List (PWL) is presently an inventory of all waters in New York State (lakes, ponds, reservoirs, rivers, streams, and estuaries) known to have designated water uses with some degree of impairment, or those threatened by potential impairment. However, the PWL is slowly evolving into an inventory of all waterbodies for which sufficient information is available to assess the condition and/or usability of the waterbody. PWL waterbodies are identified through a broad network of county and state agencies, with significant public outreach and input, and the list is maintained and compiled by the NYSDEC Division of Water. Monitoring data from a variety of sources, including CSLAP, have been utilized by state agencies to evaluate lakes for inclusion on the PWL, and the process for incorporating lakes data has become more standardized.

Specific numeric criteria have recently been developed to characterize sampled lakes in the available use-based PWL categories (*precluded*, *impaired*, *stressed*, or *threatened*). Evaluations utilize the NYS phosphorus guidance value, water-quality standards, criteria utilized by other states, and the trophic ranges described earlier to supplement the other more antidotal inputs to the listing. The procedures by which waterbodies are evaluated are known as the Consolidated Assessment and Listing Methodology (CALM) process. This process is undertaken on an annual rotating basin, with waterbodies in several drainage basins evaluated each year. Each of the 17 drainage basins in the state is assessed within every 5 years. In general, waterbodies that violate pertinent water-quality standards (such as those listed in Table 3) at a frequency of greater than 25% are identified as *impaired*, at a frequency of 10-25% are identified as *stressed*, and at a frequency of 0-10% are identified as *threatened*, although some evidence of use impairment (including through CSLAP lake-perception surveys) might also be required. Mean (average) phosphorus levels are evaluated against the state guidance value. Evidence of use prohibitions (via beach closures, etc.) is often required to identify a waterbody as *precluded*, while evidence of actual use restrictions or necessary management must accompany an *impaired* listing, at least for lakes evaluated in recent years.

Lakes that have been identified as *precluded* or *impaired* on the PWL are likely candidates for the federal 303(d) list, an "Impaired Waters" designation mandated by the federal Clean Water Act. Lakes on this list must be closely evaluated for the causes and sources of these problems. Remedial measures must be undertaken, under a defined schedule, to solve these water-quality problems. This entire evaluation and remediation process is known as the "TMDL" process, which refers to the Total Maximum Daily Load calculations necessary to determine how much (pollution that causes the water-quality problems) is too much.

Lake George is identified as *impaired* for recreation and aquatic life habitat, *stressed* for public bathing and aesthetics, and *threatened* for water supply. The actual PWL listing (2000 report) is as follows:

"Water supply, public bathing, and various other recreational uses (fishing, boating, etc) as well as aesthetics in Lake George are affected by pollutants from a number of sources. Public bathing and other recreational uses of the lake are also affected by urban runoff, siltation and excessive sediment loads from runoff and lake tributaries, and failing and/or inadequate on-site septic systems. Nuisance aquatics (Eurasian milfoil) and exotic species (zebra mussels) also impact water supply and recreation use. Navigation buoys are used to restrict areas of the lake to recreational boating due to tributary stream deltas and large milfoil beds. Occasional beach closings at the southern end of the lake around Lake George Village due to high coliform levels have occurred in the past, but such closures have not been issued recently. Dumping from recreational boating (and the over-use of the lake for recreational activity, in general) is also a concern. (DEC/DOW, Region 5, March 2000)

Sediment loadings to the lake from streambank erosion, winter road sanding (and salting) and construction activities in the lake watershed also affect uses. Areas of roadbank erosion have been inventoried through the Warren County Critical Area Treatment Seeding Program. Significant sedimentation deltas have formed at the mouths of many tributary segments, the largest of these being Hague, Indian, Finkle, English, West and Foster Brooks, and to lesser extent East and Prospect Mountain Brooks (Bathymetric Mapping of Selected Delta Areas of Lake George, Eichler etal, Darrin Freshwater Institute, 1999). These deltas impede recreational boat navigation and present opportunities for the establishment of non-native aquatic vegetation. Environmental Protection and Bond Act Fund projects to reduce sediment loads to the lake are underway for several tribs. See also various Lake George Tributary segments. (Warren County WQSC, June 2000)

While the lake fishery is considered good, fishery habitat in the lake is affected by sediment as well. Sand applied to roads during the winter and sediment from erosion runs off into tributary streams (and eventually the lake) during spring snowmelt and other high flow events. Once in the streams and lake, sand and silt fills in gravel spawning beds, decreasing salmonid spawning success, limiting macroinvertebrate production and increasing winter mortality of fish and invertebrates due to loss of escape cover from the effects of anchor ice. Percent embeddedness has been determined to show a reliable correlation to restriction of trout/salmon spawning habitat. Additionally, fish migration and spawning is known to be restricted by the sediment deltas at the mouths of numerous lake tribs. The DEC Region 5 Fisheries Unit plans continued field investigations of the lake and tribs to monitor the extent of propagation impairment. (DEC/FWMR, Region 5, April 2000)

A study conducted for the Lake George Association by the Darrin Fresh Water Institute sampled sediment in deltas at the mouths of many lake tributaries. The study found measurable quantities of various metals and other substances expected in urban and roadway runoff. (Analysis of Sedimentary Metals Associated with Stormwater Runoff in the Lake George Basin, Eichler etal, DFWI, 1997)

In other parts of the lake inadequate and/or failing on-site septic systems serving homes along the lake shore are thought to be contributing nutrient and pathogen contamination to the lake. Numerous summer cottages as well as year-round residences coupled with poor site conditions (small lots, inadequate soils) and poorly designed systems *appear to be the major problems. Sanitary surveys by the Lake George Park Commission have confirmed the discharge of inadequately treated wastewater to the lake. Even where systems do not discharge to the lake directly, movement of nutrients via groundwater seep is a concern. (Essex County WQCC, June 2000)*

Recreation in Lake George is also limited by nuisance aquatics in the lake. Eurasian milfoil beds have been documented in both the northern and southern ends of the lake. Navigation buoys are used in the lake to restrict areas of the lake that have large milfoil beds. Zebra mussels and their impact on water supply uses are also a concern. (DEC/DOW, Lake Services, 1999)

A number of water quality studies have been conducted on Lake George; many of which have focused on urban runoff. These include an extensive USEPA National Urban Runoff Program study (Lake George Urban Runoff Study, Sutherland etal, 1983), a more recent stormwater runoff study by NYS Park Management and Research Institute and NYSDEC (Feasibility of Reducing the Impacts of Runoff in Developed Areas of Lake George Park, Hyatt etal, 1995), various RPI Freshwater Institute studies, Darrin Freshwater Institute studies and investigations sponsored by the Warren County Office of Lake George Affairs. An update of the Lake George Watershed Plan has recently been completed. (Warren County WQSC and Essex County WQCC, June 2000)

The lake was the focus of a Phase II Clean Lakes Project in 1989-1993. This effort sought to address various water quality issues including nuisance aquatic vegetation control, stormwater management, environmental monitoring. The project also included a public participation component. (DEC/DOW, Lake Services, 1999)

Lake George (as well as all tribs to the lake) have been designated Class AA-special waters, suitable for use as a drinking water supply. Consequently, the lake is considered a highly valued resource which would be included on the DEC/DOW Priority Waterbodies List as a Threatened water, even in the absence of identified water quality impacts. (DEC/DOW, BWAR, December 2000)

As a result of these listing, Lake George has been cited on the federal 303(d) list of impaired waters, requiring the development of a management strategy- computation of a Total Maximum (allowable) Daily Load (TMDL) of pollutants triggering these water quality problems.

TABLE 3- Water-Quality Standards Associated With Class B and Higher Lakes

Parameter	Acceptable Level	To Protect…..
Secchi Disk Transparency	> 1.2 meters*	Swimming
Total Phosphorus	< 0.020 mg/L and Narrative*	Swimming
Chlorophyll a	none	NA
Nitrate Nitrogen	< 10 mg/L and Narrative*	Drinking Water
Ammonia Nitrogen	2 mg/L*	Drinking Water
True Color	Narrative*	Swimming
pH	< 8.5 and > 6.5*	Aquatic Life
Conductivity	None	NA

Narrative Standards and Notes:
Secchi Disk Transparency: The 1.2 meter (4 feet) guidance is applied for safety reasons (to see submerged swimmers or bottom debris) and strictly applies only to citing new swimming beaches, but may be appropriate for all waterbodies used for contact recreation (swimming).
Phosphorus and Nitrogen: "None in amounts that will result in the growths of algae, weeds and slimes that will impair the waters for their best usages" (Class B= swimming)

-The 0.020 mg/l threshold for TP corresponds to a guidance value, not a standard; it strictly applies to Class B and higher waters but may be appropriate for other waterbodies used for contact recreation (swimming). NYS (and other states) is in the process of identifying numerical nutrient (phosphorus and perhaps Secchi

disk transparency, chlorophyll *a*, and nitrogen) standards, but this is unlikely to be finalized within the next several years.
-The 10 mg/L Nitrate standard strictly applies to only Class A or higher waters, but is included here because some Class B lakes are informally used for potable-water intake.
-For the form of ammonia (NH3+NH4) analyzed, a 2 mg/l human health standard applies to Class A or higher waters. Lower un-ionized ammonia standards apply to all classes of NYS lakes, this form is not analyzed through CSLAP.

Color: "None in amounts that will adversely affect the color or impair the waters for their best usages" (for Class B waters, this is swimming).
pH: The standard applies to all classes of waterbodies

1. Water-quality Standards Evaluation on Lake George:

pH readings have exceeded the NYS water-quality standards (=6.5 to 8.5) during 25% of the CSLAP sampling sessions at site 2 and 14% of the samples at site 8 in Lake George. Phosphorus levels at Lake George have never exceeded the phosphorus guidance value for NYS lakes (=0.020 mg/l), and water transparency readings at all times exceeded the minimum recommended water clarity for swimming beaches (= 1.2 meters). It is not known whether any of the narrative water-quality standards listed in Table 3 have been violated at Lake George; none of the other numeric standards summarized in Table 3 have been violated.

2. Lake Uses:

Water-quality monitoring programs are devised to evaluate lake conditions as they relate to a variety of lake indicators, from water-quality standards to trophic conditions to invasive species to other measures of the physical, chemical, and biological integrity of these ecological systems. One of these indicators is intended to be lake uses--whether these lakes and ponds can be used for potable water, swimming and bathing, fishing and use of the water by aquatic life, and aesthetics. This is consistent with the broad goals of the 1972 federal Clean Water Act, the governing legislation for federal and state management of lakes and ponds, which states that a fundamental goal of environmental management was to make all waterbodies "fishable and swimmable" by 1983.

The "fishability" of a lake or pond is a function of water-quality (are there pollutants that will kill the fish or render them inedible?); substrate and habitat (is there enough cold water and high oxygen for coldwater fish?; is there enough food for the fish? is there enough cover from predators or structure for fishermen?); space (is there enough flowing water for survival or reproduction?; is there enough room to support all of the various fish species in the lake?), and even access (can anglers get to the areas where the fish can be found?).

Likewise, the "swimmability" of a lake or pond also depends on water-quality (will I get sick due to bacterial contamination from sewage, stormwater or waterfowl?); safety (can swimmers or bottom debris be seen in deeper water?); aesthetics (is the water too green, too weedy, or too cold?; is the bottom too mucky?); user conflicts (can I swim where people use PWCs?); the physical characteristics of the lake and shoreline (how quickly does the lake get too deep? is the shoreline flat enough for a beach?); legal considerations (will the threat of litigation prevent a lake community from establishing public beaches?), and also access (can swimmers from less hospitable parts of the lake or from the outside swim at a beach?).

Although other designated lake uses are not identified as primary goals of the Clean Water Act, they should be evaluated as part of the lake-assessment process. These include potable water, non-contact recreational uses such as boating, aquatic life support unrelated to fishing, and aesthetics. Similar questions could be posed about the suitability of a particular lake or pond for this use, although many of the concerns addressed in evaluating the fishability or swimmability of a waterbody are pertinent to evaluating drinking-water quality, the ability of a lake to support power boating or sailing, or the adequacy of the lake bottom for salamanders, frogs, and other valued biota.

CSLAP is not really designated to answer many of these questions, at least directly. Some of these issues relate to the physical characteristics of the entire shoreline and bottom of the lake or pond and cannot be easily evaluated in simple water-quality surveys. Other important water-quality indicators, such as bacteria, cannot be sampled at the frequency needed to compare lake conditions to existing water-quality standards or are limited by logistic considerations. Other indicators, such as sediment toxins, are too expensive to be included in standard water-quality monitoring programs. It is anticipated that future generations of CSLAP will look to better address some of these questions through expanded monitoring and partnerships with other monitoring agencies, academic institutions, lake residents, and other parties invested in the lake-assessment and management process. It is also anticipated that data from other sources will be more completely included in the lake- and pond-assessment process in the future. Until that time, however, it should again be stated that these assessments are both preliminary and incomplete, based on data presently collectable through the monitoring programs summarized in this report.

Lake George is a Class $AA_{special}$ lake, which means it is designated for potable water use (drinking), contact recreation (swimming and bathing), aquatic life (including fishing), non-contact recreation (such as boating) and aesthetics. As such, Lake George should be evaluated for its best intended uses--support of drinking, swimming, aquatic life, non-contact recreation, and aesthetics.

a. Potable Water

Lake George s classified for potable-water use, even though it may not presently sustain this use.

CSLAP is not intended to evaluate the suitability of lakes or ponds for potable water use. Most of the water quality indicators measured through CSLAP provide little insight into potability, even when a water quality standard exists for that indicator. For example, while there is a potable water quality standard for nitrate, the 10 mg/l standard will not be exceeded in any lake or pond not dominated by wastewater influent. The highest lake nitrate readings measured through CSLAP--those from the Finger Lakes region or Long Island--do not exceed 3-4 mg/l. Likewise, ammonia readings in the surface waters of lakes rarely approach the 2 mg/l standard, although these numbers are within the range found in the bottom of some lakes with extreme deepwater anoxia. The highest deepwater ammonia readings in Lake George were about 0.4

mg/l, well below levels that represent a problem. While dissolved oxygen deficits do indicate susceptibility to impacts from other oxygen-sensitive pollutants, such as arsenic, iron, and manganese, these are not presently measured through CSLAP. Deepwater anoxia is not apparent from the deepwater nutrient readings, although temperature and oxygen profiles are not measured through CSLAP.

Nuisance algae can create some significant impacts to potable water use. Several algal species, especially blue green algae, are often associated with taste- and odor-producing compounds. Many of the same blue green algae produce toxins. Unfortunately, phytoplankton sampling results are not available through CSLAP.

Overall Evaluation- Potable Water

The CSLAP dataset at Lake George, including water chemistry data, physical measurements, and volunteer samplers' perception data, is insufficient to evaluate potable water intake.

b. Swimming/Contact Recreation

It is presumed that Lake George is used for swimming, bathing, or other forms of contact recreation, although the frequency of and opportunities for swimming are not evaluated through CSLAP. As noted above, it is not classified for bathing and swimming.

A number of water-quality indicators are measured in CSLAP that relate to the suitability of lake for swimming and contact recreation. Water clarity measurements can be used to evaluate the lake against the NYS Department of Health guidelines for siting new swimming beaches (= 4 feet). Public-perception data collected through CSLAP assess swimming conditions, and regional or statewide criteria connecting water transparency readings (or nutrient and algae levels) to recreational-use impacts will likely be developed in the near future. However, there remains a relatively strong correlation between contact recreational conditions and phosphorus readings, with recreational-use impacts generally corresponding to the state guidance value for phosphorus (= 20 parts per billion total phosphorus). Algae levels are measured as chlorophyll *a*, while rooted aquatic-plant populations are broadly quantified through CSLAP, and are linked to potential impacts on swimming and aesthetics. These water-quality-based and perception-based evaluations of swimming conditions are outlined below.

1. Water-quality Evaluation of Swimming/Contact Recreation

These data showed that none of the Lake George samples possessed total phosphorus readings exceeding 20 parts per billion (=µg/l), which corresponds to the state phosphorus guidance value. Water transparency readings exceeded 2 meters during each of the CSLAP sampling sessions. This roughly corresponds to the distinction between *eutrophic* and *mesotrophic* lakes and a water clarity reading that would roughly be equivalent to the state phosphorus guidance value. Perhaps more importantly, this may correspond to the saddle point between high-quality and reduced-quality swimming, based on lake perception data (see below).

Although there is no state water-quality standard for chlorophyll *a*, readings exceeding 8 µg/l generally correspond to water clarity readings lower than 2 meters and total phosphorus readings in excess of 20 µg/l- each of these indicator thresholds marks the distinction between *mesotrophic* and *eutrophic* lake. None of the Lake George samples corresponded to chlorophyll *a* readings > 8 µg/l.

Bacteria or algal toxin data have not been collected through CSLAP on Lake George.

2. Lake Perception Evaluation

Lake perception data from CSLAP provide insights into recreational (swimming) conditions, perceptions of water clarity, and the density and coverage of aquatic plants. Recreational assessments indicating "beautiful, could not be nicer" and "..excellent for swimming, boating, and overall enjoyment" conditions suggest no limits to recreational use. The frequency of "slightly" to "substantially" impaired conditions may be closely related to the need to implement lake-management actions. These surveys also assess the extent to which these impacts are influenced by excessive weed growth, nuisance algae or poor water clarity.

The evaluation of these survey results, and the extrapolation of these results to a lake-wide assessment, are restricted by the small sample size and the potential for responses that are not representative of the responses from the typical lake resident, whether due to the impact of local conditions or different goals for different lake users. However, these assessments may serve as an instructive starting point for evaluating impacts on lake uses.

The CSLAP volunteers reported that Lake George was described as "slightly impaired" during 42% of the CSLAP sampling sessions at Site 1 (near Lake George Village), but none of the other sites, and the lake was never described as "substantially impaired". Slightly impaired conditions were associated with "poor water clarity" or "excessive algae growth" 7% of the time (at Site 1), and with "excessive weed growth" 29% of the time.

3. Overall Evaluation- Swimming and Contact Recreation

The CSLAP dataset at Lake George, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that swimming and contact recreation should be fully supported, although potential impacts in the lake near Lake George Village (corresponding to site 1) should continue to be evaluated.

c. Aquatic Life/Non-Contact Recreation

Lake George supports fishing and other forms of non-contact recreation. Other forms of non-contact recreation, such as boating, may be a function of access points, whether the lake shoreline is inhabited, and water depth, but it is also presumed that Lake George may be used for boating.

While water-quality plays a role in evaluating non-contact recreation, particularly cold-water fisheries, the information needed to properly evaluate fishing quality, angler success, and boating enjoyment and viability are not collected in most routine monitoring programs. It is anticipated that future generations of the CSLAP report will include more comprehensive evaluations of non-contact recreational conditions in lakes and ponds, as databases containing this information become more readily available, but until that time, only ancillary measures can be evaluated.

The primary indicators from these monitoring programs used to evaluate fisheries, aquatic life, and non-contact recreation (boating, etc.) include lake perception surveys, aquatic plant densities (and the presence of invasive exotic plants), and water-quality indicators related to fish habitat and survival, such as pH and ammonia. While other water-quality indicators, such as other forms of nitrogen, can also be used to evaluate water-quality impacts to aquatic life, these indicators are generally found at low enough levels to minimize their utility in evaluating lake conditions. Dissolved oxygen can be very useful in evaluating habitat, but temperature and oxygen profiles are not collected through CSLAP. These datasets can provide at least some insights into the ability of lakes and ponds to support these uses.

1. Fisheries and Aquatic Life Evaluation

pH data are collected through CSLAP. Fish consumption advisories are issued by the NYS Department of Health, and fishing regulations are instituted by the NYSDEC. Lake recreational perception data related to non-contact recreation (fishing and boating) and aesthetics are also collected through CSLAP, and these can be used to evaluate fisheries and aquatic life impacts to Lake George.

These data indicate that pH readings in 25% of the Lake George samples at site 2 and 14% of the samples at site 8 exceeded the state water-quality standards (= 6.5 to 8.5). While laboratory pH is not as accurate as field pH for evaluating lake acidity, these data suggest that fisheries or aquatic life impacts probably do not occur as a result of depressed or elevated pH, although pH readings at these sites should continue to be watched.

It is not known if fishing regulations result in any impact to the use of Lake George for fishing. The presence of very low oxygen-sensitive fish species (such as lake trout) may render the lake less susceptible to some aquatic life impacts from low deepwater dissolved oxygen levels. The deepwater nutrient data indicate that some deepwater oxygen deficits do not occur in Lake George, although it is suspected that near-bottom samples have not been collected at some of these sites (due to equipment limitations).

2. Boating (Recreation) and Aesthetics Evaluation

Impacts to non-contact recreation, such as boating and aesthetics, can only be peripherally evaluated through CSLAP. Sampling volunteers can report that the lake “looks bad,” as a direct measure of impacts to lake aesthetics, while “poor water clarity,” “excessive algae growth,” and “excessive weed growth” may be indirect measures of these impacts.

The CSLAP volunteers never reported that Lake George "looks bad". Surface weed growth was reported during 8% of the CSLAP sessions at site 1, and 11% of the sessions at site 10, but at none of the other sites. "Dense" weed growth was never reported at the lake.

3. Overall Evaluation- Aquatic Life and Non-Contact Recreation

The CSLAP dataset on Lake George, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life or non-contact recreation in Lake George should be fully supported, although impacts from nuisance weed growth in other portions of the lake should be considered.

IX: CONSIDERATIONS FOR LAKE MANAGEMENT

CSLAP is intended for a variety of uses, such as collecting needed information for comprehensive lake management, although it is not capable of collecting all the needed information. To this end, this section includes a broad summary of the major lake problems and "considerations" for lake management. These include only those lake problems that may have been defined by CSLAP sampling, such as physical condition (algae and water clarity), aquatic plant coverage (type and extent of weed populations), and recreational suitability of the lake, as related to contact recreation. These broad categories may not encompass the most pressing issue at a particular time at any given CSLAP lake, for example, local concerns about filamentous algae or concerns about other parameters not analyzed in the CSLAP sampling. While there is some opportunity for CLSAP-trained volunteers to report and assess some site-specific conditions or concerns on the CSLAP Field Observations Form, such as algae blooms or shoreline vegetation, this section is limited to the confines of this program. The categories represent the most common, broadest issues within the lake management as reported through CSLAP.

Each summarized management strategy is more extensively outlined in *Diet for a Small Lake*, and this joint NYSDEC-NYSFLA publication should be consulted for more details and for a broader context of in-lake- or watershed- management techniques. These "considerations" should not be construed as "recommendations," because there is insufficient information available through CSLAP to assess whether or how a lake should be managed. Issues associated with local environmental sensitivity, permits, and broad community-management objectives also cannot be addressed here. Rather, the following section should be considered as "tips" or a compilation of suggestions for a lake association to manage problems defined by CSLAP water-quality data or articulated by perception data. When appropriate, lake-specific management information, and other lake-specific or local "data" (such as the presence of a controllable outlet structure) is reported in *italics* in this "considerations" section.

The primary focus of CSLAP monitoring is to evaluate lake condition and impacts associated with lake eutrophication. Because lake eutrophication is often manifested in excessive plant growth, whether algae or aquatic macrophytes (weeds), it is likely that lake-management activities, whether promulgated to reduce algae or weed growth or to maintain water clarity and the existing makeup and density of aquatic plants in the lake, will need to address watershed inputs of nutrients and sediment to the lake, because both can contribute to either algal blooms or excessive weed growth. A core group of nutrient and sediment control activities will likely serve as the foundation for most comprehensive lake-management plans and activities and can be summarized below.

a. GENERAL CONSIDERATIONS FOR ALL CSLAP LAKES

Nutrient controls can take several forms, depending on the original source of the nutrients:

- Septic systems can be regularly pumped or upgraded to reduce the stress on the leach fields which can be replaced with new soil or moving the discharge from the septic tank to a new field). Pumpout programs are usually quite inexpensive, particularly when lakefront residents negotiate a bulk rate discount with local pumping companies. Upgrading systems can be expensive, but may be necessary to handle the increased loading from camp expansion or conversion to year-round residency. Replacing leach fields alone can be expensive and limited by local soil or slope conditions, but may be the only way to reduce actual nutrient loading from septic systems to the lake. It should be noted that upgrading or replacing the leach field may do little to change any bacterial loading to the lake, since bacteria are controlled primarily within the septic tank, not the leach field.
- Stormwater runoff control plans include street cleaning, artificial marshes, sedimentation basins, runoff conveyance systems, and other strategies aimed at minimizing or intercepting pollutant discharge from impervious surfaces. The NYSDEC has developed a guide called <u>Reducing the Impacts of Stormwater Runoff</u> to provide more detailed information about developing a stormwater management plan. This is a strategy that cannot generally be tackled by an individual homeowner, but rather requires the effort and cooperation of lake residents and municipal officials.
- There are numerous agriculture management practices such as fertilizer controls, soil erosion practices, and control of animal wastes, which either reduce nutrient export or retain particles lost from agricultural fields. These practices are frequently employed in cooperation with county Soil and Water Conservation District offices, and are described in greater detail in the NYSDEC's <u>Controlling Agricultural Nonpoint Source Water Pollution in New York State.</u> Like stormwater controls, these require the cooperation of many watershed partners, including farmers.
- Streambank erosion can be caused by increased flow due to poorly managed urban areas, agricultural fields, construction sites, and deforested areas, or it may simply come from repetitive flow over disturbed streambanks. Control strategies may involve streambank stabilization, detention basins, revegetation, and water diversion.

Land use restrictions development and zoning tools such as floodplain management, master planning to allow for development clusters in more tolerant areas in the watershed and protection of more sensitive areas, deed or contracts which limit access to the lake, and cutting restrictions can be used to reduce pollutant loading to lakes. This approach varies greatly from one community to the next and frequently involves balancing lake-use protection with land-use restrictions. State law gives great latitude to local government in developing land-use plans.

Lawn fertilizers frequently contain phosphorus, even though nitrogen is more likely to be the limiting nutrient for grasses and other terrestrial plants. By using lawn fertilizers with little or no phosphorus, eliminating lawn fertilizers or using lake water as a "fertilizer" on shoreline properties, fewer nutrients may enter the lake. Retaining the original flora as much as possible, or planting a buffer strip (trees, bushes, shrubs) along the shoreline, can reduce the nutrient load leaving a residential lawn.

Waterfowl introduce nutrients, plant fragments, and bacteria to the lake water through their feces. Feeding the waterfowl encourages congregation which in turn concentrates and increases this nutrient source and will increase the likelihood that plant fragments, particularly from Eurasian watermilfoil and other plants that easily fragment and reproduce through small fragments, can be introduced to a previously uncolonized lake.

Although not really a "watershed control strategy", establishing **no-wake zones** can reduce shoreline erosion and local turbidity. Wave action, which can disturb flocculent bottom sediments and unconsolidated shoreline terrain is ultimately reduced, minimizing the spread of fertile soils to susceptible portions of the lake.

Do not discard or introduce plants from one water source to another or deliberately introduce a "new" species from a catalogue or vendor. For example, do not empty bilge or bait bucket water from another lake upon arrival at another lake, for this may contain traces of exotic plants or animals. Do not empty aquaria wastewater or plants in the lake.

Boat propellers are a major mode of transport to uncolonized lakes. Propellers, hitches, and trailers frequently get entangled by weeds and weed fragments. Boats not cleaned of fragments after leaving a colonized lake may introduce plant fragments to another location. New introductions of plants are often found near public access sites.

b. SPECIFIC CONSIDERATIONS FOR LAKE GEORGE

Management Focus: **Water Clarity/Algae/Physical Condition/Recreational Condition**

Issue	Through	By?
Maintain water clarity	Maintaining or reducing algae levels	Maintaining or reducing nutrient Inputs to the lake

Discussion:

User perception and water quality data indicate a favorable physical condition and water clarity of the lake. This places the focus of water clarity management on maintaining present conditions, an enviable position for many other lake associations. Although some increase in nutrient loading is inevitable, the lake association should devote efforts to minimize the input of nutrients to the lake, or change activities that otherwise influence water clarity.

Management Focus: **The Impact of Weeds on Recreational Condition**

Issue	Effect on Lake Use
Low weed growth	**No use impairments associated with weed growth**

Discussion:
Weed growth in this lake is not dense enough to have an impact on recreational or aesthetic quality of the lake, *at least in the areas evaluated through CSLAP*. For many lake associations this is the ideal situation, even though an ideal condition for swimmers, boaters and lakefront residents may not be ideal for a significant sports fishery. For lakes in this condition, lake management is largely a task of maintaining course, of keeping siltation from the watershed at a very low level, and of keeping nuisance plants under control or out of the lake. The DEC publication, Common Nuisance Aquatic Plants in New York State, contains information about nuisance plants

Preventative measures should address:

- *Boat propellers* frequently get entangled by weeds and weed fragments. Propellers not cleaned after leaving an "infected" lake or before entering an "uncontaminated" lake may introduce plant fragments to the lake. This is a particular problem for many nuisance plants that propagate through fragmentation.
- *Waterfowl* may introduce to plant fragments to lakes, particularly nuisance weeds like *Eurasian watermilfoil* that easily fragment. Encouraging the congregation of waterfowl by feeding will increase the likelihood that these fragments can be introduced to a previously uncolonized lake.
- *Weed watcher* ("...look out for this plant..") signs have been successful in reducing the spread of nuisance aquatic plants. They are usually placed near high traffic areas, such as boat launch sites, marinas, and inlets and outlets.

c. SPECIFIC MONITORING CONSIDERATIONS FOR LAKE GEORGE

Discussion:
Lake George has sampled through CSLAP for several years. More extensive data will help to continue evaluating "normal" conditions on the lake, and to identify water quality or use problems at the lake. However, some additional parameters may be appropriate for evaluation at the lake:

1. *Bacteria*- Lake George is classified for use for contact recreation (swimming), and the lake is extensively used for swimming. The use of the lake for swimming and bathing can best be evaluated with bacteriological data. A comparison of sampling results to the state water quality standards requires at least five samples per month. This would also help to evaluate the appropriate PWL status for the lake. These data cannot be collected through CSLAP.
2. *Algal toxins*- Algal toxins, usually associated with blue-green algae, may affect swimmers and others who ingest small amounts of water (as well as any lake residents who utilize Lake George as a potable water supply). These may be analyzed in standard water samples as part of CSLAP in coming years. This may be particularly important for Lake George since previous phytoplankton surveys (1995) indicated the presence of taste- and odor-producing algae in the lake.
3. *Aquatic plants*- Aquatic plant surveys have not been conducted through CSLAP at Lake George. CSLAP samplers can continue to collect and submit for identification

any plant samples thought to be exotic or otherwise invasive, as well as any rare or unusual plants. Sampling protocols are also available to conduct systematic monitoring of aquatic plants for the purpose of evaluating aquatic plant management actions utilized at the lake.

4. *Temperature and oxygen profiles*- the suitability of the lake for supporting sensitive fish, the susceptibility of the lake to nutrient release from bottom sediments and fall algal blooms, and the environment for aquatic plant growth can be evaluated through temperature and oxygen profiles. These can be created through the use of electronic meters or through chemical titrations conducted on site, but have not been collected through CSLAP. These would also help if deepwater anoxia occurs, and whether deepwater zones of high oxygen/low temperature water exist as a refuge to support the coldwater fisheries in the lake.

Appendix A. Raw Data for Lake George

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
199.01	L George Site 1	7/2/2004	30.3	7.75	1.5	0.020	0.01	0.01	0.11	5.30	5	6.54	127	16.5	0.2
199.01	L George Site 1	7/28/2004	30.5	9.30	1.5		0.01	0.01	0.43		0	7.24	134		0.3
199.01	L George Site 1	8/10/2004	30.5	6.10	1.5	0.014	0.01	0.01	0.19	13.55	2	8.16	123		1.2
199.01	L George Site 1	8/17/2004	30.5	5.15		0.012	0.08	0.02	0.44	36.51	34	7.39	146		1.5
199.01	L George Site 1	9/14/2004	30.5	6.75	1.5	0.010	0.09	0.01	0.36	37.31	3	7.08	106	13.7	0.9
199.01	L George Site 1	9/21/2004	30.5	6.45	1.5	0.007	0.02	0.01	0.44	60.83	1	8.07	107		
199.01	L George Site 1	10/8/2004	30.5	6.40	1.5	0.005	0.01	0.01	0.29	63.63	0	6.73	111		
199.01	L George Site 1	10/25/2004	30.5	5.95	1.5	0.005	0.01	0.01	0.85	183.37	3	7.43	92.4		1.7
199.01	L George Site 1	6/27/2005				0.004					3	8.27	113		0.2
199.01	L George Site 1	7/11/2005		7.45	1.5	0.010	0.01	0.01	0.11	11.01				12.4	1.6
199.01	L George Site 1	7/26/2005	17.9	7.15	1.5	0.015	0.01	0.01	0.13	8.94	11	7.90	130		0.8
199.01	L George Site 1	8/8/2005	18.0	6.45	1.5	0.006	0.01	0.01	0.16	26.10	7	7.65	75		1.0
199.01	L George Site 1	9/11/2005	18.1	6.25	1.5	0.009	0.01	0.01	0.06	7.06	4	7.77	135		1.1
199.01	L George Site 1	10/2/2005				0.007						7.49	48		0.3
199.01	L George Site 1	7/2/2004	30.3			0.008	0.06	0.03	0.28	34.89					
199.01	L George Site 1	7/28/2004	30.5		30.0	0.025	0.03	0.01	0.35	14.25					
199.01	L George Site 1	8/10/2004	30.5		30.0	0.012	0.04	0.01	0.11	8.96					
199.01	L George Site 1	8/17/2004	30.5		30.0	0.010	0.09	0.01	0.32	33.92					
199.01	L George Site 1	9/14/2004	30.5		30.0	0.009	0.10	0.01	0.35	41.47					
199.01	L George Site 1	9/21/2004	30.5		30.0	0.008	0.12	0.01	0.56	74.06					
199.01	L George Site 1	10/8/2004	30.5		30.0	0.009	0.09	0.01	0.13	14.36					
199.01	L George Site 1	10/25/2004	30.5		30.0	0.006	0.08	0.01							
199.01	L George Site 1	6/27/2005				0.027									
199.01	L George Site 1	7/11/2005			17.8	0.053									
199.01	L George Site 1	7/26/2005	17.9		17.0	0.011									
199.01	L George Site 1	8/8/2005	18.0		16.5	0.007									
199.01	L George Site 1	9/11/2005	18.1		17.5	0.009									
199.01	L George Site 1	10/2/2005				0.008									

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
199.02	L George Site 2	7/22/2004	30.5	9.35	1.5	0.004	0.01	0.01	0.33	92.43	2	7.55	132	13.948	0.2
199.02	L George Site 2	8/6/2004	30.8	8.05	1.5	0.014	0.01	0.01	0.13	9.32	6	7.44	130		0.9
199.02	L George Site 2	8/19/2004	31.1	8.75	2.0	0.009	0.01	0.01	0.38	41.28	12	7.82	119		2.4
199.02	L George Site 2	9/2/2004	30.8	8.25	2.0	0.012	0.01	0.01	0.32	26.92	4	7.83	97.7		1.4
199.02	L George Site 2	9/15/2004	30.8	7.30	2.0	0.009	0.01	0.01	0.14	16.58	1	7.38	96.3	12.552	2.2
199.02	L George Site 2	10/1/2004	30.8	6.80	2.0	0.013	0.01	0.02	0.38	29.88	0	7.58	113		
199.02	L George Site 2	7/20/2005	30.5	8.50	1.5	0.007					1	7.10	134	11.6	0.3
199.02	L George Site 2	8/7/2005	30.2	6.50	1.5	0.007	0.01	0.01	0.17	23.32	5	7.69	130		0.1
199.02	L George Site 2	8/25/2005	30.5	8.25	1.5	0.003	0.01	0.01	0.10	28.57	5	8.63	78		0.1
199.02	L George Site 2	9/7/2005	30.5	6.25	1.5	0.007	0.01	0.01	0.18	25.95	33	8.91	38		0.9
199.02	L George Site 2	7/3/2006	30.5	7.25	3.0										
199.02	L George Site 2	7/5/2006	30.5	7.25	3.5	0.006	0.01	0.02			15	8.13	79	9.78	0.97
199.02	L George Site 2	7/17/2006	30.5	7.75	3.0	0.008	0.01	0.02			6	8.03	103		1.06
199.02	L George Site 2	8/4/2006	29.9	7.50	3.0	0.013	0.01	0.02				9.16	93		0.64
199.02	L George Site 2	8/18/2006	30.5	6.70	3.0	0.006	0.01	0.01				8.72	105		1.32
199.02	L George Site 2	8/28/2006	30.5	7.65	3.0	0.007					22	8.07	87	12.86	1.11
199.02	L George Site 2	9/10/2006	30.5	6.25	3.0	0.007					27	7.93	90		1.19
199.02	L George Site 2	7/22/2004	30.5		29.8	0.006	0.05	0.42	0.32	50.49					
199.02	L George Site 2	8/6/2004	30.8		30.5	0.030	0.02	0.03	0.35	11.72					
199.02	L George Site 2	8/19/2004	31.1		30.5	0.006	0.07	0.02	0.60	102.36					
199.02	L George Site 2	9/2/2004	30.8		30.5	0.010	0.08	0.02	0.41	39.73					
199.02	L George Site 2	9/15/2004	30.8		30.5	0.013	0.09	0.01	0.23	18.03					
199.02	L George Site 2	10/1/2004	30.8		30.5	0.009	0.08	0.01	0.32	37.28					
199.02	L George Site 2	7/20/2005	30.5		30.0	0.013				0.00					
199.02	L George Site 2	8/7/2005	30.2		29.9	0.007				0.00					
199.02	L George Site 2	8/25/2005	30.5		30.5	0.006				0.00					
199.02	L George Site 2	9/7/2005	30.5		30.5	0.007				0.00					
199.02	L George Site 2	7/3/2006	30.5												
199.02	L George Site 2	7/5/2006	30.5		32.0	0.008									
199.02	L George Site 2	7/17/2006	30.5		30.5										

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
199.02	L George Site 2	8/4/2006	29.9		30.2	0.008									
199.02	L George Site 2	8/18/2006	30.5		29.3	0.006									
199.02	L George Site 2	8/28/2006	30.5		30.5	0.006									
199.02	L George Site 2	9/10/2006	30.5		29.9	0.006									

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
199.04	L George Site 4	6/27/2004	18.0	7.60		0.005	0.01	0.01	0.33	67.54	8	6.60	123		0.40
199.04	L George Site 4	7/11/2004	16.5	8.35		0.023	0.01	0.01	0.25	10.59	9	6.68	34		0.30
199.04	L George Site 4	7/25/2004	15.5	8.80		0.021	0.02	0.02	0.63	29.36		7.97	131		0.42
199.04	L George Site 4	8/1/2004	15.0	7.43		0.008	0.02	0.03	0.23	30.63	1	7.65	112		1.30
199.04	L George Site 4	8/22/2004	14.0	6.30		0.007	0.02	0.01	0.38	57.77	9	7.72	133	13.2	2.19
199.04	L George Site 4	9/5/2004	13.0	6.30		0.006	0.01	0.01	0.27	48.46	3	8.40	89		1.20
199.04	L George Site 4	9/19/2004	9.0	6.20		0.008	0.01	0.02			3	6.70	116		2.60
199.04	L George Site 4	10/3/2004	10.5	7.70		0.004	0.02	0.01	0.41	105.34	22	7.95	107		
199.04	L George Site 4	6/26/2005	13.5	6.60		0.005	0.01	0.01	0.01	1.01	5	7.20	99	11.8	0.16
199.04	L George Site 4	7/10/2005	8.5	7.65		0.009	0.04	0.02	0.26	29.95	4	8.00	110		
199.04	L George Site 4	7/24/2005	15.0	8.25		0.006	0.01	0.01	0.19	33.36	1	6.65	122		0.88
199.04	L George Site 4	8/8/2005	19.5	7.55		0.006	0.03	0.13	0.35	55.03		7.81	120		0.45
199.04	L George Site 4	8/21/2005	14.0	5.75		0.006	0.01	0.01	0.01	0.83	5	7.72	123		1.02
199.04	L George Site 4	9/6/2005	13.5	7.15		0.008	0.01	0.01	0.11	14.81	7	7.72	94	11.1	0.76
199.04	L George Site 4	9/18/2005	8.5	7.60		0.007	0.01	0.01	0.39	53.81	3	7.92	113		0.34
199.04	L George Site 4	10/2/2005	12.0	7.05		0.005	0.01	0.01	0.10	18.73	5	7.15	75		0.99
199.04	L George Site 4	6/18/2006	9.0	7.10		0.004	0.01	0.01			11	7.61	122	9.4	1.27
199.04	L George Site 4	7/4/2006	11.0	6.10		0.006					10	7.17	98		0.86
199.04	L George Site 4	7/18/2006	10.0	8.65		0.004					4	8.42	125		0.53
199.04	L George Site 4	8/6/2006		9.05		0.007	0.01	0.01			2	7.69	135		0.68
199.04	L George Site 4	8/21/2006	14.5	7.95		0.006	0.04	0.04			4	7.97	110	11.6	1.21
199.04	L George Site 4	9/4/2006	10.5	6.65		0.005						7.90	115		1.43
199.04	L George Site 4	9/18/2006	11.0	7.20		0.007	0.00	0.01			9	7.98	59		1.11
199.04	L George Site 4	9/30/2006	11.0	8.45		0.005	0.02	0.02			9	6.93	106		0.32
199.04	L George Site 4	6/27/2004	18.0		16.5	0.002	0.01	0.01	0.53	255.40					
199.04	L George Site 4	7/11/2004	16.5		15.5	0.007	0.02	0.01	0.32	43.21					
199.04	L George Site 4	7/25/2004	15.5		14.5	0.005	0.25	0.02	0.45	83.97					
199.04	L George Site 4	8/1/2004	15.0		14.0	0.004	0.01	0.02	0.25	70.00					
199.04	L George Site 4	8/22/2004	14.0		13.0	0.006	0.01	0.02	0.76	129.14					
199.04	L George Site 4	9/5/2004	13.0		13.0	0.006	0.01	0.01	0.40	67.85					
199.04	L George Site 4	9/19/2004	9.0		8.0	0.007	0.01	0.01	0.26	36.18					
199.04	L George Site 4	10/3/2004	10.5		9.5	0.005	0.02	0.01	0.43	87.51					
199.04	L George Site 4	6/26/2005	13.5			0.009				0.00					
199.04	L George Site 4	7/10/2005	8.5			0.007				0.00					
199.04	L George Site 4	7/24/2005	15.0			0.013				0.00					
199.04	L George Site 4	8/8/2005	19.5			0.011				0.00					
199.04	L George Site 4	8/21/2005	14.0			0.005				0.00					
199.04	L George Site 4	9/6/2005	13.5			0.007				0.00					
199.04	L George Site 4	9/18/2005	8.5			0.007				0.00					
199.04	L George Site 4	10/2/2005	12.0			0.005				0.00					
199.04	L George Site 4	6/18/2006	9.0		7.5	0.007									
199.04	L George Site 4	7/4/2006	11.0		9.5	0.008									
199.04	L George Site 4	7/18/2006	10.0		8.5	0.007									
199.04	L George Site 4	8/6/2006			12.5	0.006									
199.04	L George Site 4	8/21/2006	14.5		13.0	0.007									
199.04	L George Site 4	9/4/2006	10.5			0.004									
199.04	L George Site 4	9/18/2006	11.0		9.5	0.007									
199.04	L George Site 4	9/30/2006	11.0		9.5	0.005									

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
199.5	L George Site 5	6/28/2004	23.0	9.50		0.006			0.81		7	7.04	112		0.5
199.5	L George Site 5	8/14/2004		6.50	2.0	0.009	0.01	0.01	0.15	17.57	21	7.02	85.3		
199.5	L George Site 5	6/28/2004	23.0			0.017	0.02	0.01	0.67	39.53					
199.5	L George Site 5	8/14/2004			20.0	0.007	0.03	0.01	0.18	28.09					

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
199.06	L George Site 6	6/29/2004	19.5	4.50		0.006		0.01	0.34	60.41	8	3.92	101	12.188	0.5
199.06	L George Site 6	7/20/2004	19.5	4.00		0.017	0.01	0.01	0.21	12.01	6	6.85	118		
199.06	L George Site 6	8/3/2004	19.5	6.75		0.022	0.01	0.02	0.19	8.76	74	8.51	127		1.0
199.06	L George Site 6	6/28/2005	20.1	8.00		0.013	0.01	0.33	1.04	81.71	4	7.75	119	12.1	0.2
199.06	L George Site 6	7/12/2005	18.3	8.50		0.009	0.05	0.02	0.21	23.42	1	7.70	109		
199.06	L George Site 6	7/19/2005	19.5	7.00		0.016	0.01	0.01	0.18	11.86	5	7.58	203		0.2
199.06	L George Site 6	7/26/2005	18.3	9.50		0.016	0.01	0.01	0.23	14.73		7.34	118		0.1
199.06	L George Site 6	8/23/2005	18.3	8.50		0.011	0.01	0.01	0.16	13.89	5	7.81	100		0.1
199.06	L George Site 6	9/12/2005	18.3	7.50		0.010	0.01	0.01	0.17	18.12	3	7.38	112		0.1
199.06	L George Site 6	6/29/2004	19.5		19.5	0.009	0.03	0.01	0.60	66.78					
199.06	L George Site 6	7/20/2004	19.5		19.5	0.011	0.02	0.01	0.07	6.31					
199.06	L George Site 6	8/3/2004				0.004	0.09	0.01	0.37	85.06					
199.06	L George Site 6	6/28/2005	20.1		18.3	0.011									
199.06	L George Site 6	7/12/2005	18.3		15.2	0.014									
199.06	L George Site 6	7/19/2005	19.5		15.2	0.006									
199.06	L George Site 6	7/26/2005	18.3		15.2	0.019									
199.06	L George Site 6	8/23/2005	18.3		15.2	0.007									
199.06	L George Site 6	9/12/2005	18.3		15.2	0.008									

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
199.08	L George Site 8	6/29/2004	21.6	10.7	0.5	0.007									
199.08	L George Site 8	7/11/2004	15.0	10.4	1.5		0.01	0.01	0.38		2	8.65	104		0.60
199.08	L George Site 8	8/29/2004	22.0	8.0		0.003	0.01	0.02	0.44	156.05	3	7.96	97		0.14
199.08	L George Site 8	9/12/2004	25.0	8.0		0.003	0.01	0.01	0.21	63.34	7	8.07	96		0.54
199.08	L George Site 8	7/10/2005	18.0	9.9	0.5	0.004	0.02	0.01	0.26	61.97				13.0	0.46
199.08	L George Site 8	9/4/2005		8.5		0.003	0.01	0.01	0.32	94.49		7.78	116		0.41
199.08	L George Site 8	7/24/2006		9.3		0.002	0.01	0.02			10	8.02	59	7.0	0.01
199.08	L George Site 8	8/21/2006		7.8		0.002	0.02	0.02			5	7.89	116		0.31
199.08	L George Site 8	8/31/2006		8.1		0.005						7.50	100		0.38
199.08	L George Site 8	6/29/2004	21.6		17.7	0.005									
199.08	L George Site 8	7/11/2004	15.0		13.5	0.003	0.01	0.01	0.32	95.71					
199.08	L George Site 8	8/29/2004	22.0		22.0	0.015		0.09	0.44	30.19					
199.08	L George Site 8	9/12/2004				0.010	0.01	0.01	0.41	39.72					
199.08	L George Site 8	7/10/2005	18.0			0.022				0.00					
199.08	L George Site 8	9/4/2005			10.5	0.010				0.00					
199.08	L George Site 8	7/24/2006			17.0	0.009									
199.08	L George Site 8	8/21/2006													
199.08	L George Site 8	8/31/2006			~18	0.010									

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
199.10	L George Site 10	7/31/2005	21.9	8.30	1.5	0.015	0.01	0.04	0.33	22.37	20	7.68	102	5.1	0.76
199.10	L George Site 10	8/27/2005	22.5		1.5		0.01	0.01	0.20						
199.10	L George Site 10	9/12/2005	21.9	9.00	1.5	0.009	0.01	0.01	0.18	19.20	9	7.60	112		0.68
199.10	L George Site 10	10/2/2005	22.0	8.50	1.5		0.01	0.01	0.13						
199.10	L George Site 10	7/16/2006		9.00	1.5	0.017	0.01	0.02				7.38	103	10.8	0.10
199.10	L George Site 10	7/30/2006	21.0	8.00	1.5	0.012	0.02	0.02			11	8.05	111		0.31
199.10	L George Site 10	8/20/2006		7.50	1.5	0.007	0.01	0.01			1	7.32	120		0.28
199.10	L George Site 10	8/28/2006	21.9	8.00	1.5	0.004	0.03	0.01			9	7.91	79		0.83
199.10	L George Site 10	10/7/2006		8.00	1.5	0.012	0.02	0.03			5	6.83	79	10.8	0.63
199.10	L George-10	7/16/2006			15.0	0.006									
199.10	L George-10	7/30/2006	21.0		15.0	0.013									
199.10	L George-10	8/20/2006			15.0	0.009									
199.10	L George-10	8/28/2006	21.9		15.0	0.005									
199.10	L George-10	10/7/2006			20.0	0.005									

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD
199.1	L George Site 1	7/2/2004	30.3	7.75	1.5	1	25	21	1	1	1	7
199.1	L George Site 1	7/28/2004	30.5	9.30	1.5	1	23	23	2	2	3	2
199.1	L George Site 1	8/10/2004	30.5	6.10	1.5	1	25	23	2	2	2	26
199.1	L George Site 1	8/17/2004	30.5	5.15		1	18	22	3	2	3	26
199.1	L George Site 1	9/14/2004	30.5	6.75	1.5	1	12	19	2	2	2	0
199.1	L George Site 1	9/21/2004	30.5	6.45	1.5	1	17	19	2	2	3	68
199.1	L George Site 1	10/8/2004	30.5	6.40	1.5	1	16	17	2	2	2	3
199.1	L George Site 1	10/25/2004	30.5	5.95	1.5	1	15	14	3	2	2	2
199.01	L George Site 1	6/27/2005				1						
199.01	L George Site 1	7/11/2005		7.45	1.5	1	29	22	3	2	2	126
199.01	L George Site 1	7/26/2005	17.9	7.15	1.5	1	27	25	2	1	2	0
199.01	L George Site 1	8/8/2005	18.0	6.45	1.5	1	24	25	2	2	3	267
199.01	L George Site 1	9/11/2005	18.1	6.25	1.5	1	19	23	3	3	3	236
199.01	L George Site 1	10/2/2005				1						
199.1	L George Site 1	7/2/2004	30.3			2		10				
199.1	L George Site 1	7/28/2004	30.5		30.0	2		13				
199.1	L George Site 1	8/10/2004	30.5		30.0	2		11				
199.1	L George Site 1	8/17/2004	30.5		30.0	2		11				
199.1	L George Site 1	9/14/2004	30.5		30.0	2		10				
199.1	L George Site 1	9/21/2004	30.5		30.0	2		10				
199.1	L George Site 1	10/8/2004	30.5		30.0	2		10				
199.1	L George Site 1	10/25/2004	30.5		30.0	2		10				
199.01	L George Site 1	6/27/2005				2						
199.01	L George Site 1	7/11/2005			17.8	2		17				
199.01	L George Site 1	7/26/2005	17.9		17.0	2		12				
199.01	L George Site 1	8/8/2005	18.0		16.5	2		15				
199.01	L George Site 1	9/11/2005	18.1		17.5	2		15				
199.01	L George Site 1	10/2/2005				2						

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD
199.02	L George Site 2	7/22/2004	30.5	9.35	1.5	1	30	24	2	1	1	8
199.02	L George Site 2	8/6/2004	30.8	8.05	1.5	1	20	23	1	1	1	8
199.02	L George Site 2	8/19/2004	31.1	8.75	2.0	1	22	22	1	1	2	5
199.02	L George Site 2	9/2/2004	30.8	8.25	2.0	1	16	21	1	1	1	0
199.02	L George Site 2	9/15/2004	30.8	7.30	2.0	1	19	19	1	1	1	5
199.02	L George Site 2	10/1/2004	30.8	6.80	2.0	1	21	18	1	1	1	8
199.02	L George Site 2	7/20/2005	30.5	8.50	1.5	1	28	23	1	1	1	0
199.02	L George Site 2	8/7/2005	30.2	6.50	1.5	1	28	26	1	1	1	
199.02	L George Site 2	8/25/2005	30.5	8.25	1.5	1	28	24	1	1	2	0
199.02	L George Site 2	9/7/2005	30.5	6.25	1.5	1	27	24	1	1	1	0
199.02	L George Site 2	7/3/2006	30.5	7.25	3.0	1	30	22	1	1	1	5
199.02	L George Site 2	7/5/2006	30.5	7.25	3.5	1	30	23	1	1	1	0
199.02	L George Site 2	7/17/2006	30.5	7.75	3.0	1	32	23	1	1	1	0
199.02	L George Site 2	8/4/2006	29.9	7.50	3.0	1	28	24	1	1	1	0
199.02	L George Site 2	8/18/2006	30.5	6.70	3.0	1	28	22	1	1	1	5
199.02	L George Site 2	8/28/2006	30.5	7.65	3.0	1	25	21	1	1		0
199.02	L George Site 2	9/10/2006	30.5	6.25	3.0	1	23	20				
199.02	L George Site 2	7/22/2004	30.5		29.8	2		14				
199.02	L George Site 2	8/6/2004	30.8		30.5	2		22				
199.02	L George Site 2	8/19/2004	31.1		30.5	2		10				
199.02	L George Site 2	9/2/2004	30.8		30.5	2		9				
199.02	L George Site 2	9/15/2004	30.8		30.5	2		9				
199.02	L George Site 2	10/1/2004	30.8		30.5	2		8				
199.02	L George Site 2	7/20/2005	30.5		30.0	2		10				
199.02	L George Site 2	8/7/2005	30.2		29.9	2		12				
199.02	L George Site 2	8/25/2005	30.5		30.5	2		32				
199.02	L George Site 2	9/7/2005	30.5		30.5	2		18				
199.02	L George Site 2	7/3/2006	30.5			2		10				

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD
199.02	L George Site 2	7/5/2006	30.5		32.0	2		12				
199.02	L George Site 2	7/17/2006	30.5		30.5	2		10				
199.02	L George Site 2	8/4/2006	29.9		30.2	2		9				
199.02	L George Site 2	8/18/2006	30.5		29.3	2		13				
199.02	L George Site 2	8/28/2006	30.5		30.5	2		10				
199.02	L George Site 2	9/10/2006	30.5		29.9	2		10				

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD
199.04	L George Site 4	6/27/2004	18.0	7.60		1	17	15	1	1	1	5
199.04	L George Site 4	7/11/2004	16.5	8.35		1	20	14	1	1	1	5
199.04	L George Site 4	7/25/2004	15.5	8.80		1	20	15	1	1	1	8
199.04	L George Site 4	8/1/2004	15.0	7.43		1	18	19	1	1	1	8
199.04	L George Site 4	8/22/2004	14.0	6.30		1	16	17	1	1	1	8
199.04	L George Site 4	9/5/2004	13.0	6.30		1	18	21	1	1	1	5
199.04	L George Site 4	9/19/2004	9.0	6.20		1	13	19	1	1	1	5
199.04	L George Site 4	10/3/2004	10.5	7.70		1	12	18	1	1	1	8
199.04	L George Site 4	6/26/2005	13.5	6.60		1	27	15	1	1	1	8
199.04	L George Site 4	7/10/2005	8.5	7.65		1	23	20	1	1	1	8
199.04	L George Site 4	7/24/2005	15.0	8.25		1	23		1	1	1	0
199.04	L George Site 4	8/8/2005	19.5	7.55		1	30		1	1	1	78
199.04	L George Site 4	8/21/2005	14.0	5.75		1	25		1	1	1	5
199.04	L George Site 4	9/6/2005	13.5	7.15		1	18		1	1	1	0
199.04	L George Site 4	9/18/2005	8.5	7.60		1	19	20	1	1	1	5
199.04	L George Site 4	10/2/2005	12.0	7.05		1	16	18	1	1	1	0
199.04	L George Site 4	6/18/2006	9.0	7.10		1	22	16	1	1	1	0
199.04	L George Site 4	7/4/2006	11.0	6.10		1	22	16	1	1	1	5
199.04	L George Site 4	7/18/2006	10.0	8.65		1	28	21	1	1	1	0
199.04	L George Site 4	8/6/2006		9.05		1	19	19	1	1	1	0
199.04	L George Site 4	8/21/2006	14.5	7.95		1	19	17	1	1	1	0
199.04	L George Site 4	9/4/2006	10.5	6.65		1	19	20	1	1	1	5
199.04	L George Site 4	9/18/2006	11.0	7.20		1	24	19	1	1	1	5
199.04	L George Site 4	9/30/2006	11.0	8.45		1	14	17	1	1	1	0
199.04	L George Site 4	6/27/2004	18.0		16.5	2						
199.04	L George Site 4	7/11/2004	16.5		15.5	2						
199.04	L George Site 4	7/25/2004	15.5		14.5	2						
199.04	L George Site 4	8/1/2004	15.0		14.0	2						
199.04	L George Site 4	8/22/2004	14.0		13.0	2						
199.04	L George Site 4	9/5/2004	13.0		13.0	2						
199.04	L George Site 4	9/19/2004	9.0		8.0	2						
199.04	L George Site 4	10/3/2004	10.5		9.5	2						
199.04	L George Site 4	6/26/2005	13.5			2						
199.04	L George Site 4	7/10/2005	8.5			2						
199.04	L George Site 4	7/24/2005	15.0			2		14.0				
199.04	L George Site 4	8/8/2005	19.5			2		13.0				
199.04	L George Site 4	8/21/2005	14.0			2		15.0				
199.04	L George Site 4	9/6/2005	13.5			2		16.0				
199.04	L George Site 4	9/18/2005	8.5			2						
199.04	L George Site 4	10/2/2005	12.0			2						
199.04	L George Site 4	6/18/2006	9.0		7.5	2						
199.04	L George Site 4	7/4/2006	11.0		9.5	2						
199.04	L George Site 4	7/18/2006	10.0		8.5	2						
199.04	L George Site 4	8/6/2006			12.5	2						
199.04	L George Site 4	8/21/2006	14.5		13.0	2						
199.04	L George Site 4	9/4/2006	10.5			2						
199.04	L George Site 4	9/18/2006	11.0		9.5	2						
199.04	L George Site 4	9/30/2006	11.0		9.5	2						

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD
199.5	L George Site 5	6/28/2004	23.0	9.50		1			1	1	1	0
199.5	L George Site 5	8/14/2004		6.50	2.0	1	30	23	2	2	1	57
199.5	L George Site 5	6/28/2004	23.0			2						
199.5	L George Site 5	8/14/2004			20.0	2						

LNum	PName	Date	Zbot	Zsd	Zsamp	TAir	TH20	QA	QB	QC	QD
199.06	L George Site 6	6/29/2004	19.5	4.50		27	21	1	1	1	0
199.06	L George Site 6	7/20/2004	19.5	4.00		28	24	1	1	1	8
199.06	L George Site 6	8/3/2004	19.5	6.75		25	23	1	1	1	7
199.06	L George Site 6	6/28/2005	20.1	8.00		44	27	1	1	1	7
199.06	L George Site 6	7/12/2005	18.3	8.50		27	24	1	1	1	0
199.06	L George Site 6	7/19/2005	19.5	7.00		30	26	1	1	1	0
199.06	L George Site 6	7/26/2005	18.3	9.50		32	26	1	1	1	5
199.06	L George Site 6	8/23/2005	18.3	8.50		24	25	1	1	1	7
199.06	L George Site 6	9/12/2005	18.3	7.50		27	23	1	2	1	0
199.06	L George Site 6	6/29/2004	19.5		19.5		12				
199.06	L George Site 6	7/20/2004	19.5		19.5		13				
199.06	L George Site 6	8/3/2004			0.0		21				
199.06	L George Site 6	6/28/2005					15				
199.06	L George Site 6	7/12/2005					19				
199.06	L George Site 6	7/19/2005					16				
199.06	L George Site 6	7/26/2005					14				
199.06	L George Site 6	8/23/2005					17				
199.06	L George Site 6	9/12/2005					19				

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD
199.08	L George Site 8	6/29/2004	21.6	10.7	0.5	1	18		2	1	2	78
199.08	L George Site 8	7/11/2004	15.0	10.4	1.5	1	27	22	1	1	1	0
199.08	L George Site 8	8/29/2004	22.0	8.0		1	28		1	1	1	0
199.08	L George Site 8	9/12/2004	25.0	8.0		1	24		1	1	1	0
199.08	L George Site 8	7/10/2005	18.0	9.9	0.5	1	34	23	1	1	1	0
199.08	L George Site 8	9/4/2005		8.5		1	27	22	1	1	1	0
199.08	L George Site 8	7/24/2006		9.3		1	30	23	1	1	1	0
199.08	L George Site 8	8/21/2006		7.8		1	26	24	1	1	1	0
199.08	L George Site 8	8/31/2006		8.1		1	21	21	1	1	1	0
199.08	L George Site 8	6/29/2004	21.6		17.7	2						
199.08	L George Site 8	7/11/2004	15.0		13.5	2						
199.08	L George Site 8	8/29/2004	22.0		22.0	2						
199.08	L George Site 8	9/12/2004				2						
199.08	L George Site 8	7/10/2005	18.0			2						
199.08	L George Site 8	9/4/2005			10.5	2						
199.08	L George Site 8	7/24/2006			17.0	2						
199.08	L George Site 8	8/21/2006				2						
199.08	L George Site 8	8/31/2006			~18	2						

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD
199.10	L George Site 10	7/31/2005	21.9	8.30	1.5	1	28	25	1	1	1	0
199.10	L George Site 10	8/27/2005	22.5		1.5	1	25	24	1	1	1	5
199.10	L George Site 10	9/12/2005	21.9	9.00	1.5	1	26	26	1	3	1	5
199.10	L George Site 10	10/2/2005	22.0	8.50	1.5	1	28	20	1	2	1	0
199.10	L George Site 10	7/16/2006		9.00	1.5	1	30	25	1	2	1	0
199.10	L George Site 10	7/30/2006	21.0	8.00	1.5	1	25	25	1	1	1	0
199.10	L George Site 10	8/20/2006		7.50	1.5	1	23	22	1	2	1	
199.10	L George Site 10	8/28/2006	21.9	8.00	1.5	1	24	22	1	1	1	0
199.10	L George Site 10	10/7/2006		8.00	1.5	1	21	17	1	2	1	0
199.10	L George Site 10	7/16/2006			15.0	2		15				
199.10	L George Site 10	7/30/2006	21.0		15.0	2		15				

199.10	L George Site 10	8/20/2006			15.0	2		15				
199.10	L George Site 10	8/28/2006	21.9		15.0	2		15				
199.10	L George Site 10	10/7/2006			20.0	2		15				

Appendix B. New York State Water Quality Classifications

Class N: Enjoyment of water in its natural condition and where compatible, as source of water for drinking or culinary purposes, bathing, fishing and fish propagation, recreation and any other usages except for the discharge of sewage, industrial wastes or other wastes or any sewage or waste effluent not having filtration resulting from at least 200 feet of lateral travel through unconsolidated earth. These waters should contain no deleterious substances, hydrocarbons or substances that would contribute to eutrophication, nor shall they receive surface runoff containing any such substance.

Class $AA_{special}$: Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. These waters shall be suitable for fish propagation and survival, and shall contain no floating solids, settleable solids, oils, sludge deposits, toxic wastes, deleterious substances, colored or other wastes or heated liquids attributable to sewage, industrial wastes or other wastes. There shall be no discharge or disposal of sewage, industrial wastes or other wastes into these waters. These waters shall contain no phosphorus and nitrogen in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.

Class $A_{special}$: Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. These waters shall be suitable for fish propagation and survival. These international boundary waters, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to remove naturally present impurities, will meet New York State Department of Health drinking water standards and will be considered safe and satisfactory for drinking water purposes

Class AA: Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. These waters shall be suitable for fish propagation and survival. These waters, if subjected to approved disinfection treatment, with additional treatment if necessary to remove naturally present impurities, will meet New York State Department of Health drinking water standards and will be considered safe and satisfactory for drinking water purposes

Class A: Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. These waters shall be suitable for fish propagation and survival. These waters, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to remove naturally

	present impurities, will meet New York State Department of Health drinking water standards and will be considered safe and satisfactory for drinking water purposes
Class B	Suitable for primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival
Class C:	Suitable for fishing, and fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Class D:	Suitable for fishing. Due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support fish propagation. These waters shall be suitable for fish survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Class (T):	Designated for trout survival, defined by the Environmental Conservation Law Article 11 (NYS, 1984b) as brook trout, brown trout, red throat trout, rainbow trout, and splake

APPENDIX C:
SUMMARY OF STATISTICAL METHODS USED TO EVALUATE TRENDS

1. Non-Parametric Analyses

Kendall tau ranking orders paired observations by one of the variables (arranging water clarity readings by date). Starting with the left-hand (earliest date) pair, the number of times that the variable not ordered (clarity readings) is exceeded by the same variable in subsequent pairs is computed as P, and the number of times in which the unordered variable is not exceeded is computed as Q. This computation is completed for each ordered pair, with N= total number of pairs (samples), and the sum of the differences $S = \Sigma(P-Q)$. The Kendall tau rank correlation coefficient **t** is computed as:

$$t = 2S/(N*(N-1))$$

Values for t range from –1 (complete negative correlation) to +1 (complete positive correlation). As above, strong correlations (or simply "significance") may be associated with values for t greater than 0.5 (or less than –0.5), and moderate correlations may be associated with values for t between 0.3 and 0.5 (or between –0.3 and –0.5), but the "significance" of this correlation must be further computed. Standard charts for computing the probabilities for testing the significance of S are provided in most statistics text books, and for values of N greater than 10, a standard normal deviate D can be computed by calculating the quotient:

$$D = S\sqrt{18} / \sqrt{[(N(N-1)(2N+5)]}$$

and attributing the following significance:

$D > 3.29$ = 0.05% significance
$2.58 < D < 3.29$ = 0.5% significance
$1.96 < D < 2.58$ = 2.5% significance
$D < 1.96$ = > 2.5% significance

For the purpose of this exercise, 2.5% significance or less is necessary to assign validity (or, using the vernacular above, "significance") to the trend determined by the Kendall tau correlation. It should be noted again that this evaluation does not determine the magnitude of the trend but only whether a trend is likely to occur.

Parametric trends can be defined by standard best-fit linear regression lines, with the significance of these data customarily defined by the magnitude of the best-fit regression coefficient ® or R^2. This can be conducted using raw or individual data points, or seasonal summaries (using some indicator of central tendency, such as mean or median). Because the former can be adversely influenced by seasonal variability and/or imprecision in the length and breadth of the sampling season during any given year, seasonal summaries may provide more realistic measures for long-term trend analyses. However, because the summaries may not adequately reflect variability within any given sampling season, it may be appropriate to compare deviations from seasonal means or medians with the "modeled" change in the mean/median resulting from the regression analyses.

When similar parametric and non-parametric tools are utilized to evaluate long-term trends in NYS lakes, a few assumptions must be adopted:

- Using the non-parametric tools, trend "significance" (defined as no more than approx. 3% "likelihood" that a trend is calculated when none exists) can only be achieved with at least four years of averaged water-quality data. When looking at all summer data points (as opposed to data averaging), a minimum of 40 data points is required to achieve some confidence in data significance. This corresponds to at least five years of CSLAP data. The "lesson" in these assumptions is that data trends assigned to data sets collected over fewer than five years assume only marginal significance.

As noted above, summer data only are utilized (as in the previous analyses) to minimize seasonal effects and different sampling schedules around the fringes (primarily May and September) of the sampling season. This reduces the number of data points used to compile averages or whole data sets but is considered necessary to best evaluate the CSLAP datasets.

2. Parametric Analyses

Parametric analyses are conducted by comparing annual changes in summer mean values for each of the analyzed sampling parameters. Summer is defined as the period from June 15 thru September 15, and roughly corresponds to the window between the end of spring runoff (after ice out) and start of thermal stratification, and the onset of thermal destratification. This period also corresponds to the peak summer recreational season and (for most lakes) the most critical period for water-quality impacts. It also bounds the most frequent range of sampling dates for the majority of both the primarily seasonal volunteers and full-time residents of CSLAP lakes.

Trends in the parametric analyses are determined by the least squares method, in which "significance" requires both a high correlation coefficient (R^2>0.5) and intra-seasonal variance to be lower than the predicted change (trend) during the period of sampling (roughly corresponding to ? y). Changes in water-quality indicators are also evaluated by the two-sided t-test, in which the change (z statistic) in the mean summer value for each of the indicators by decade of sampling (1980s, 1990s, 2000s) is compared to the t statistic distribution within the 95% confidence interval, with the null hypothesis corresponding to no significant change.

APPENDIX D: BACKGROUND INFO FOR LAKE GEORGE

CSLAP Number	199
Lake Name	L George
First CSLAP Year	2004
Sampled in 2005?	yes
Latitude	435035
Longitude	732555
Elevation (m)	97
Area (ha)	11400.8
Volume Code	2
Volume Code Name	Lake Champlain
Pond Number	367
Qualifier	none
Water Quality Classification	AAspec
County	Warren
Town	Hague
Watershed Area (ha)	60372.46964
Retention Time (years)	8.7
Mean Depth (m)	18
Runoff (m/yr)	0.510947047
Watershed Number	10
Watershed Name	Lake Champlain
NOAA Section	3
Closest NOAA Station	North Creek
Closest USGS Gaging Station-Number	4276842
Closest USGS Gaging Station-Name	Putnam Point East of Crown Point Center
CSLAP Lakes in Watershed	Augur L, Bartlett P, Glen L, Hadlock L, L Clear, L Colby, L George, L Kiwassa, L Placid, L Sunnyside, Lincoln P, Mirror L, Silver L-C