

2005 INTERPRETIVE SUMMARY

NEW YORK CITIZENS STATEWIDE LAKE ASSESSMENT PROGRAM (CSLAP)

MELODY LAKE

NY Federation of Lake Associations
NYS Department of Environmental Conservation

January, 2006

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 fifteen-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 2005 sampling results for **Melody Lake**.

Melody Lake (aka Ellis Pond) is a 38 acre, class C lake found in the Town of Willet in Cortland County, in central New York State. It has been sampled as part of CSLAP since 1987. The following volunteers have participated in CSLAP, and deserve most of the credit for the success of this program at **Melody Lake**: **Bob and Carol Rosati, William Woods, Harry Shannahan, Stanley Serowik, Fran Lamb, and Dennis Fortenbaugh**.

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 twenty 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, 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 Carol Matthews, Doug Gillard, 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 1000 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.

MELODY LAKE FINDINGS AND EXECUTIVE SUMMARY

Melody Lake was sampled as part of the New York Citizens Statewide Lake Assessment Program in 2005. 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 2005 CSLAP data and an historical comparison of the data collected within the 2005 sampling season and data collected at Melody Lake prior to 2005.

The majority of the short- and long-term analyses of the water quality conditions in Melody Lake are summarized in Table 2, divided into assessments of eutrophication indicators, other water quality indicators, and lake perception indicators. The 2005 data indicate that the lake could be classified as eutrophic, or highly productive, corresponding to much higher productivity than has been found in recent years. While this suggests that the long-term trend toward higher water clarity and lower nutrient and algae levels has reversed, in reality it appears that part of this “blip” is due to the significant loss in water level due to the dam leak. Tributary phosphorus levels were also slightly higher than in 2004, but probably did not contribute substantially to the increase in lake phosphorus levels (or would not have contributed as much if water volume in the lake was greater). Despite the overall higher productivity, water quality patterns persist: lake productivity increases during the summer, and there remains a moderately strong correlation between changes in phosphorus and chlorophyll, and between chlorophyll and Secchi disk transparency. Phosphorus levels in the lake exceeded the state phosphorus guidance value to a higher degree in 2005, although water transparency readings that occasionally fail to reach the minimum recommended water clarity for swimming beaches. In short, the lake was more productive in 2005, although it is suspected that this was due to much lower water level (and lower lake volume), rather than a reversal of the trend toward lower lake productivity found in previous sampling seasons.

The lake is moderately colored (intermediate 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 do not appear to be high enough to exert limits on the water transparency, even when algae levels are low. Melody Lake has soft water, slightly alkaline (above neutral) pH readings, and mostly low nitrate and ammonia readings. Conductivity readings have varied from sample to sample and year to year, and are indicative of softwater lakes. pH readings usually fall within the NYS water quality standards (=6.5 to 8.5), and should be adequate to support most organisms found in the lake. Neither nitrate nor ammonia levels are high enough to threaten the lake. Calcium levels are near the threshold needed to support zebra mussels, but these exotic animals have not been found in the lake.

The recreational suitability of Melody Lake was much less favorable in 2005, due to higher lake productivity (which may have been triggered by the substantially lower water level). Weed growth was lower, due to lower water clarity, at least relative to 2004. The lake has most often been described as having “not quite crystal clear” to having “definite algal greenness”, the latter when clarity falls below 2 meters, and subsurface to surface aquatic plant growth, the latter when clarity exceeds 2-3 meters. Recreational assessments appear to be linked to water clarity and weeds- clarity seems to be a more pervasive influence, but most significant impacts appear to be associated with excessive weeds.

The 1996 NYSDEC Priority Waterbody Listings (PWL) for the Susquehanna River drainage basin indicated that *recreation* and *aesthetics* are *stressed* in Melody Lake due to excessive algae and weeds. The recent CSLAP datasets suggest that these listings do not appear to be warranted (assuming the higher lake productivity in 2005 is mostly a product of much lower than normal water level), although these uses may often be *threatened* by excessive weeds. The next PWL review cycle for the Susquehanna River drainage basin will likely occur in 2006.

General Comments and Questions:

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

Until 2005, water quality conditions in Melody Lake steadily improved over a fifteen year period and may have been adequate to support most recreational uses of the lake during the summer. Water clarity readings consistently exceeded those recommended for swimming, due to nutrient (phosphorus) levels that regularly fell below the state guidance value, resulting in lower algae levels. However, the lake was much more productive in 2005, as manifested in lower water transparency and higher phosphorus and chlorophyll readings. While tributary phosphorus readings were slightly higher, this change was probably due to the dramatic drop in water level due to the dam leak. Recreational assessments of the lake were less favorable in 2005 due to lower water clarity (aquatic plant densities decreased with less light).

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

Melody Lake does not appear to be thermally stratified (warm water on top, cold water on bottom) in a consistent manner during the summer, so water quality conditions are probably similar from top to bottom.

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

The productivity of Melody Lake increases (lower clarity, higher nutrient and algae levels) during the summer, a phenomenon less common in 2005. The perceived and recreational condition of the lake is also less favorable later in the summer, also due to the seasonal increase in aquatic plants.

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

Melody Lake may be getting less productive, as manifested in higher water clarity and lower nutrient and algae levels. It is likely that the large increase in lake productivity in 2005 was due to the substantial drop in water level. While tributary data suggests that higher nutrient loading to the lake occurred in 2005, these readings remain fairly low relative to lake nutrient levels, and probably remain lower than in the late 1980s, perhaps due to continuing success in controlling nutrient sources.

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

Melody Lake is about as productive (re: clarity, nutrient and algae levels) as other nearby (Susquehanna River basin) lakes and other lakes classified for non-contact recreation (Class C), and perhaps less productive than other NYS lakes. Recreational assessment, likewise, have been consistently about as favorable as these other lakes in most years, despite the influence of aquatic plants.

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

It is presumed that the less favorable conditions in 2005 were the consequence of unstable (and low) water levels, and that water quality improvements prior to 2005 will be again realized once this water level situation is resolved. Additional nutrient reductions in the lake may be achievable by controlling nutrient sources feeding lake tributaries- these sources should continue to be evaluated in light of higher tributary loading in 2005. In most years, recreational use impacts now appear to be more closely tied to excessive weed growth, perhaps prompting management (or additional management) of these weeds.

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

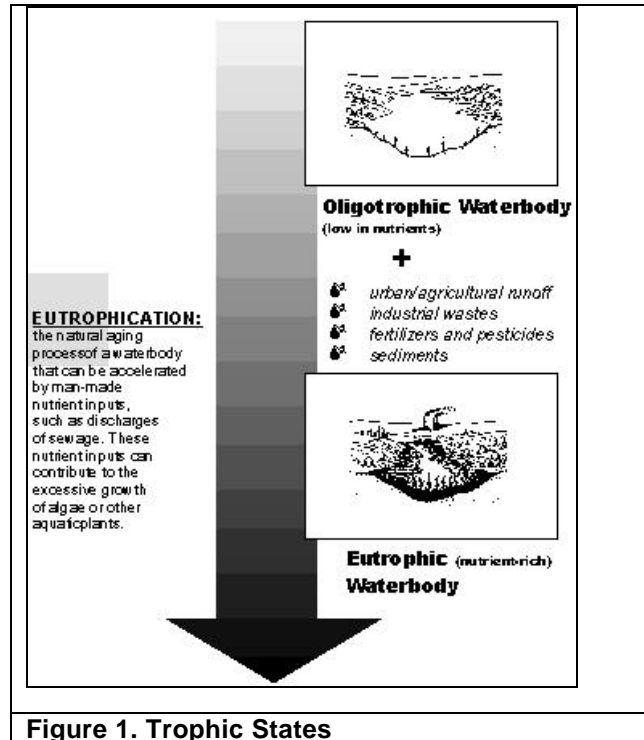
For these waterbodies, CSLAP can and should continue to be part of an extensive database used to comprehensively evaluate the entirety of the lake and its uses, but absent a more complete dataset, CSLAP data should be used with caution as a sole means for evaluating the lake. Water quality evaluations, 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, which involves stages of succession in biological productivity and water quality (see Figure 1). **Limnologists** (scientists who study fresh water 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.



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 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 nonpoint 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 of time.

II. CSLAP 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. 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 if water quality is improving, degrading or remaining stable. Such a determination answers a first critical question posed in the lake management process.

Ranges for Parameters Assessing Trophic Status and Melody Lake

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 2 shows ranges for phosphorus, chlorophyll *a*, and Secchi disk transparency (summer median) are representative for the major trophic classifications:

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.

Figure 2. Trophic Status Indicators

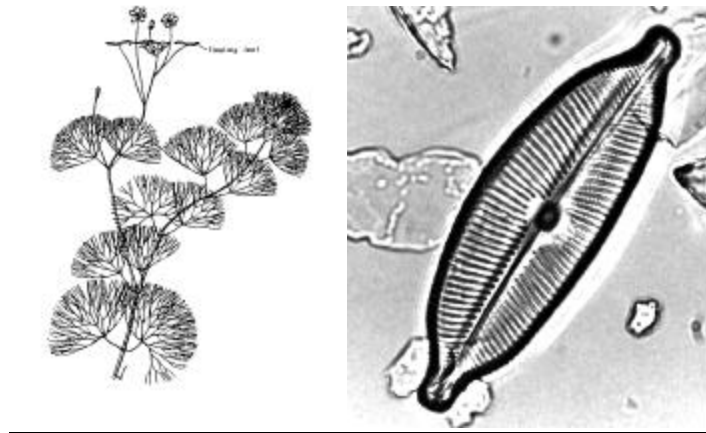
Parameter	Eutrophic	Mesotrophic	Oligotrophic	Melody Lake
Phosphorus (mg/l)	> 0.020	0.010 - 0.020	< 0.010	0.020
Chlorophyll <i>a</i> (µg/l)	> 8	2- 8	< 2	11.9
Secchi Disk Clarity (m)	< 2	2- 5	> 5	2.0

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.

Figure 3. 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 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 indicate 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 >10 generally indicate phosphorus limitation. Many lake management plans are centered around phosphorus controls. It is measured 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 <i>a</i> , 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.

By the Secchi disk transparency and total phosphorus trophic standards described above, the lake would be considered **mesotrophic, or moderately productive**, while by the chlorophyll *a* standards, the lake would be considered **eutrophic, or highly productive**. **The most appropriate trophic classification for the lake is probably mesoeutrophic, or moderately to highly productive.** The trophic classification for the lake has changed somewhat from year to year- the lake was mesotrophic from 1997 to 2004, and eutrophic from 1987 to 1991 and in 2005.



III. AQUATIC PLANTS

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**.

Of particular concern to many lakefront residents and recreational users are the *non-indigenous macrophytes* that can frequently dominate a native aquatic plant community 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 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.

Aquatic plant surveys conducted through CSLAP at Melody Lake have identified the following aquatic plants:

Species	CommonName	Subm/Emer?	Exotic?	Date	Location	%Cover	Abundance
Najas spp.	bushy pondw eed	submergent	no	9/2/1990	site 1-assoc. property	100	moderate
Najas spp.	bushy pondweed	submergent	no	9/2/1990	site 2-assoc. property	100	moderate
Graminea/ Sagittaria cuneata?	grass/arrowhead	submergent	no	9/2/1990	site 3-assoc. property	60	scarce
Najas spp.	bushy pondweed	submergent	no	9/2/1990	site 3-assoc. property	40	scarce
Myriophyllum spicatum	Eurasian watermilfoil	submergent	yes	9/20/1990	site 1-inlet channel	80	abundant
Najas spp.	bushy pondweed	submergent	no	9/20/1990	site 1-inlet channel	20	abundant
Najas spp.	bushy pondweed	submergent	no	9/20/1990	site 2-inlet channel	50	abundant
Myriophyllum spicatum	Eurasian watermilfoil	submergent	yes	9/20/1990	site 2-inlet channel	50	abundant
blue green algae		floating	no	9/20/1990	various locations	NA	NA
Myriophyllum spicatum	Eurasian watermilfoil	submergent	yes	7/26/1999	50f from CSLAP site- 4m deep/100f out	NA	NA
Potamogeton amplifolius	largeleaf pondweed, bass weed	submergent	no	7/26/1999	meeting right of way - 3m deep/70f out	NA	NA
Elodea nuttallii	waterweed	submergent	no	7/26/1999	meeting right of way - 3m deep/70f out	NA	NA
Potamogeton epihydrus	leafy pondweed	submergent	no	7/26/1999	meeting right of way - 1.5m deep/40f out	NA	NA
Gramineus spp.	unidentified grass	submergent	no	7/26/1999	meeting right of way - 1.5m deep/40f out	NA	NA
Potamogeton. zosteriformis	flat-stemmed pondweed	submergent	no	7/26/1999	meeting right of way - 1.5m deep/40f out	NA	NA
Najas flexilis	bushy pondweed	submergent	no	8/20/2000	Shanahan property- 0.33m out	100	NA
Najas spp.	bushy pondweed	submergent	no	8/6/2001	not reported- <1m deep	NA	NA
Potamogeton amplifolius	largeleaf pondweed, bassweed	submergent	no	7/18/2005	not reported	NA	NA
Potamogeton natans	floating leaf pondweed	submergent	no	7/18/2005	not reported	NA	NA
Nitella sp.	muskgrass	submergent	no	7/18/2005	not reported	NA	NA
?- Plant lost transit from lab				7/13/2002	Woods property - 1.5m deep/20f out	20	moderate

So What Does This Mean?

The aquatic plant communities in Melody Lake appear to be dominated by Eurasian watermilfoil and several pondweeds, a combination of exotic and native plants that are common to shallow lake with water level controlled by a dam (the milfoil grows opportunistically under a variety of conditions, and the pondweeds are seed producers that are not easily desiccated under winter drawdown or variable water levels). Aquatic plant densities have varied from year to year, perhaps in response to changing water levels. It is assumed that other native plants are also found in the lake, but have not been collected or otherwise identified through CSLAP.

The Other Kind of Aquatic Vegetation

Microscopic algae referred to as **phytoplankton** make up much of aquatic vegetation found in lakes. For this reason, and since 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 algae often grow in higher densities than do diatoms or most other species, although they are usually not 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 algae 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 aforementioned diatoms, green, and blue-green algae, to golden-brown algae to dinoflagellates and many others, with any given species able to dominate each lake community.

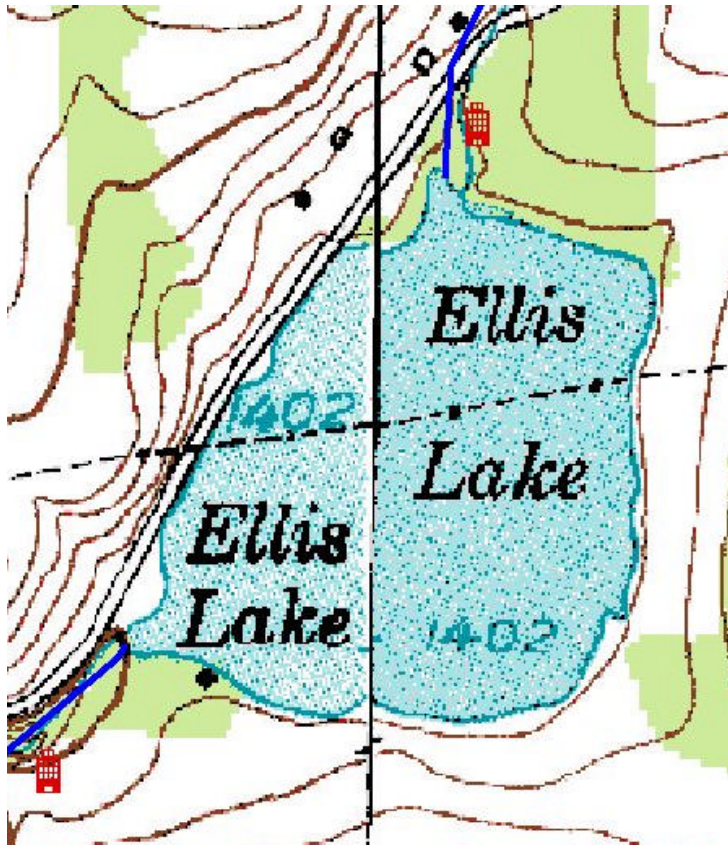
So how can this be evaluated through CSLAP? While algal differentiation is important, many CSLAP lake associations are primarily interested in “how much?”, not “what kind?”, and this is assessed through the chlorophyll *a* measurement. Phytoplankton communities have not been regularly identified and 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.

In CSLAP sampling seasons prior to about 1996, nearly all lakes were sampled once for phytoplankton identification, and since then some lakes have been sampled on one or more occasions. For these lakes, a summary of the most abundant phytoplankton species is included below. Some algal species are frequently associated with taste and odor problems, 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 Melody Lake.

Historical Information for Melody Lake

Melody Lake was not sampled as part of any of the major New York State water quality monitoring programs. It is not known if the lake was sampled in support of any fisheries management or other lake management activities conducted by state or local government.



NYSDEC Regulated Facilities on Melody Lake

There are two activities on or near Melody Lake that require a NYSDEC permit. These include repairing a tributary pipeline and riprap along a stream. A map indicating these facilities (as a “derrick” symbol) is shown on the left- this map does not show the Melody Lake/Ellis Lake dam.

IV. NYS AND CSLAP WATER QUALITY DATA: 1986-2004

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 the 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 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 4 through 14. 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 5a through 14a). 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 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 2005, there were 142 CSLAP lakes that have been sampled for at least five years- the change in these lakes is demonstrated in Figures 4 and 5; Figures 4a through 4j indicate “moderate” long-term change, while Figures 5a through 5j 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 $R^2 > 0.33$).

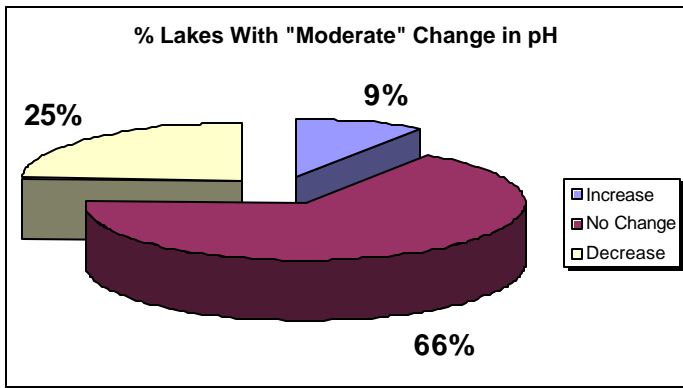


Figure 4a. %CSLAP Lakes Exhibiting Moderate Long-Term Change in pH

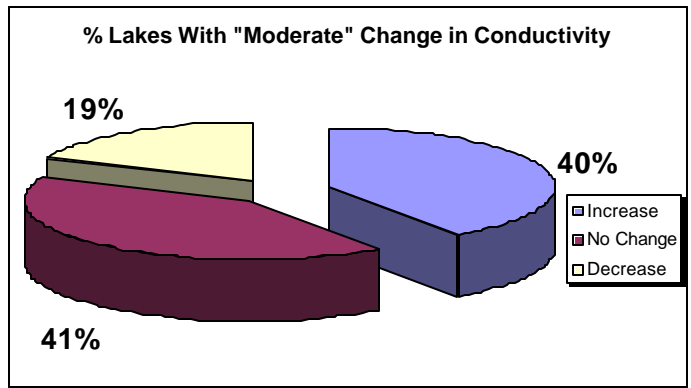


Figure 4b. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Conductivity

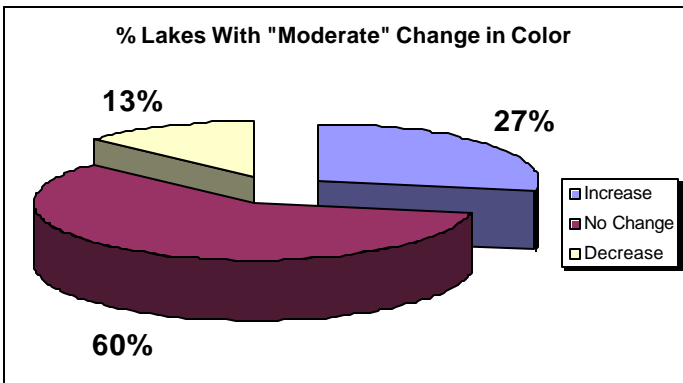


Figure 4c. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Color

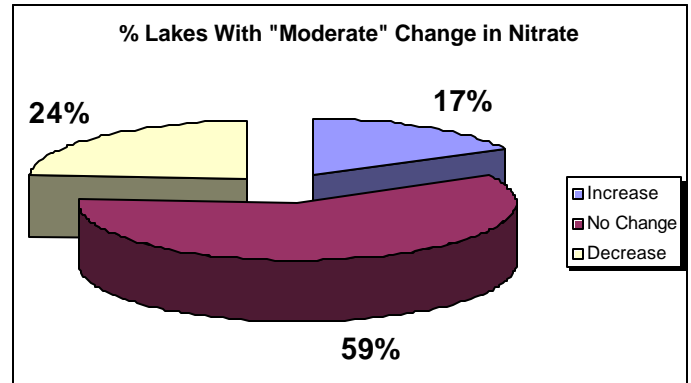


Figure 4d. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Nitrate

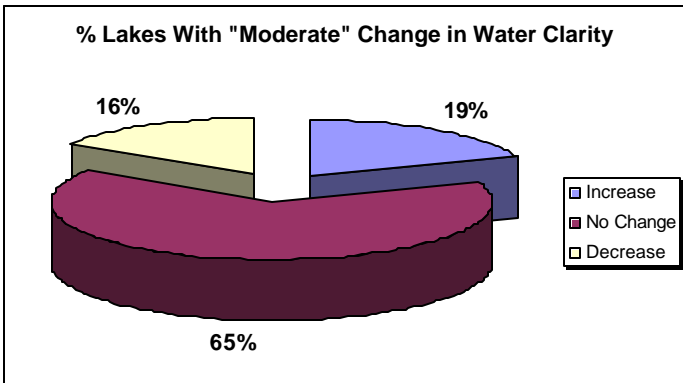


Figure 4e. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Water Clarity

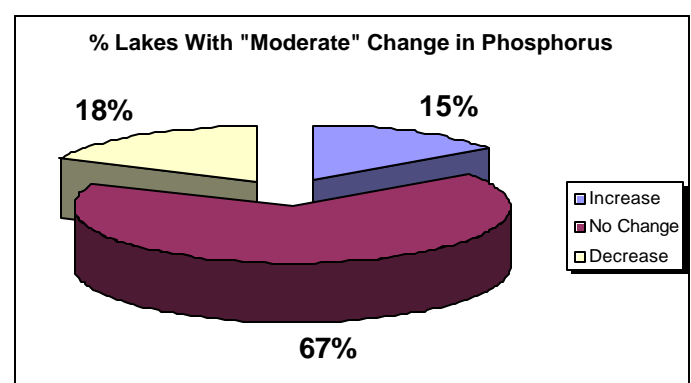


Figure 4f. %CSLAP Lakes Exhibiting Moderate Long-Term Changes in Phosphorus

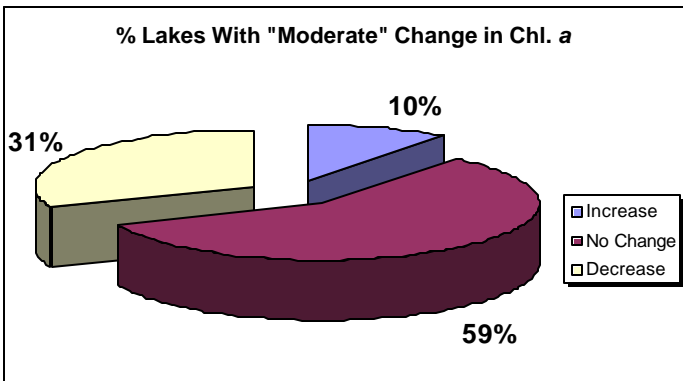


Figure 4g. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Chlorophyll a

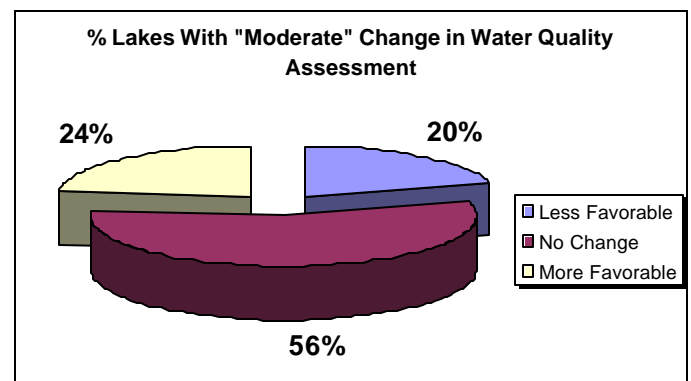


Figure 4h. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Water Quality Assessment

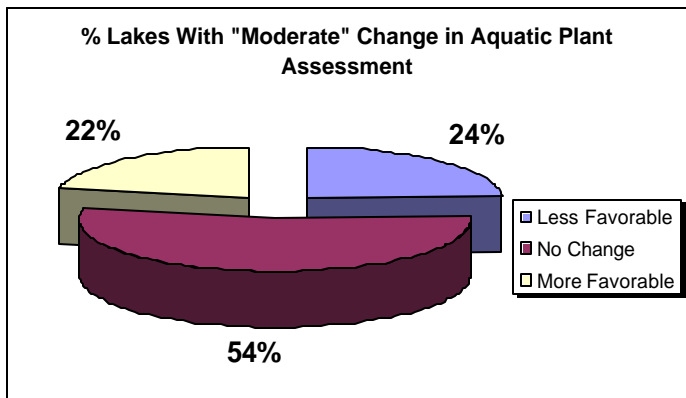


Figure 4i. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Aquatic Plant Assessment

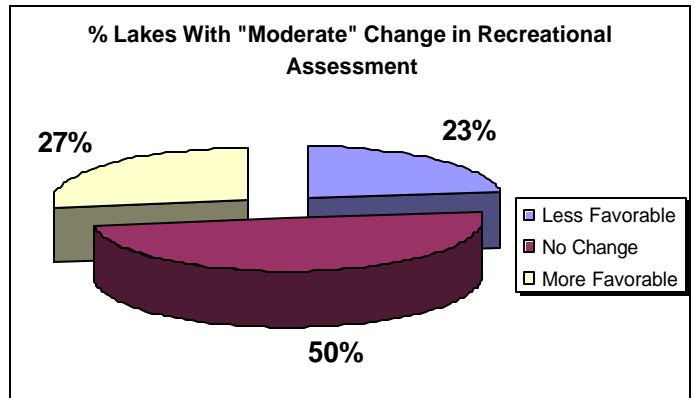


Figure 4j. %CSLAP Lakes Exhibiting Moderate Long-Term Change in Recreational Assessment

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 4c) and decrease in nitrate (Figure 4d) and chlorophyll *a* (Figure 4g) is probably due to the shift in laboratories, even though the analytical methods are comparable. The increase in conductivity (Figure 4b) and decrease in pH (Figure 4a) 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 5a through 5j 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 30% 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 heavily used, whether via residential development or other uses. The comparison between Figures 5b and 5e through 5g indicate that this has not (yet) translated into higher nutrient loading into lakes.

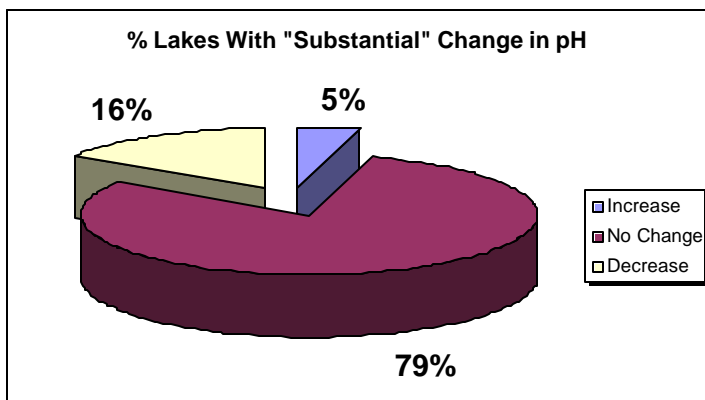


Figure 5a. %CSLAP Lakes Exhibiting Substantial Long-Term Change in pH

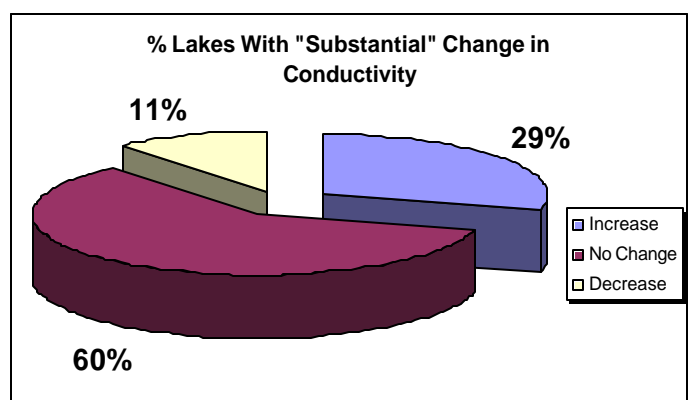


Figure 5b. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Conductivity

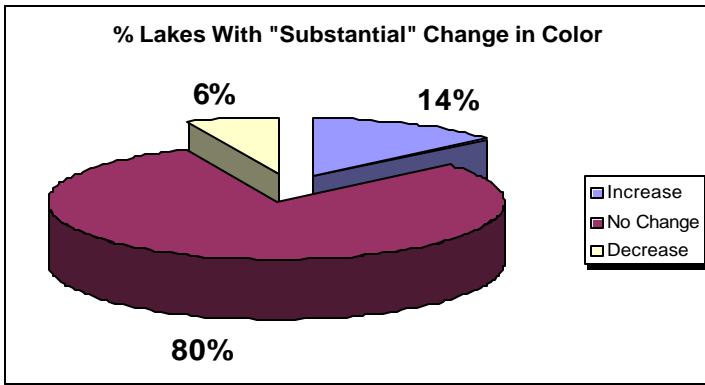


Figure 5c. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Color

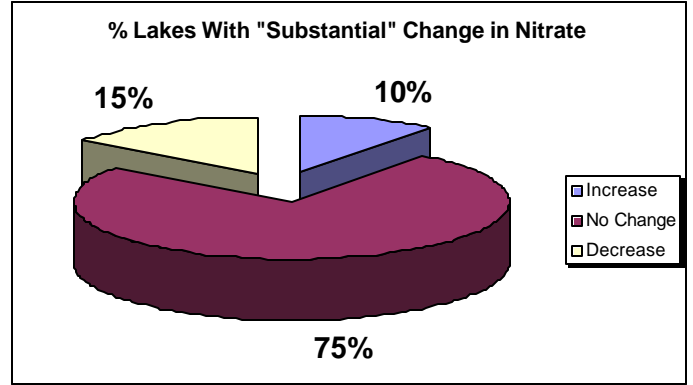


Figure 5d. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Nitrate

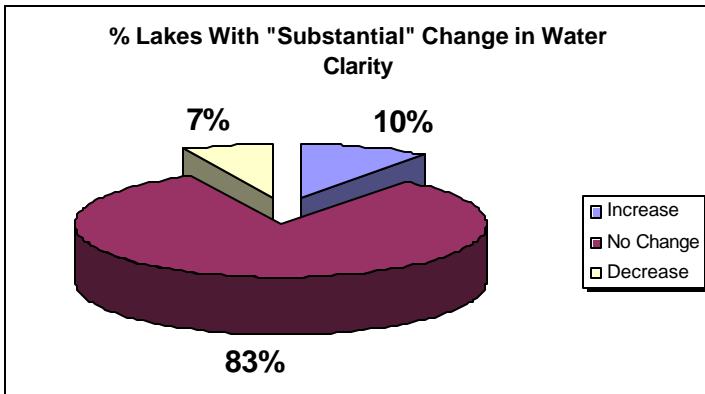


Figure 5e. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Water Clarity

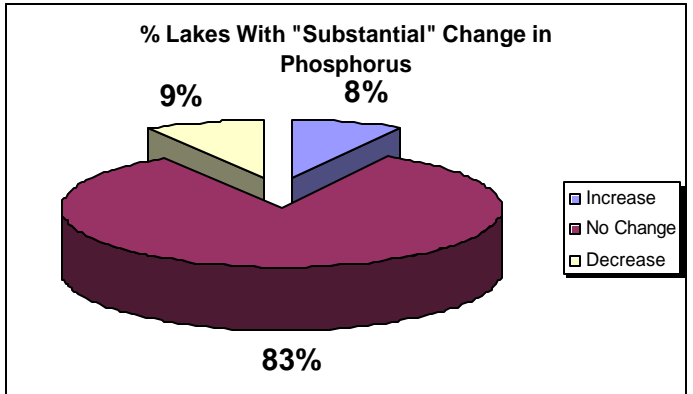


Figure 5f. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Phosphorus

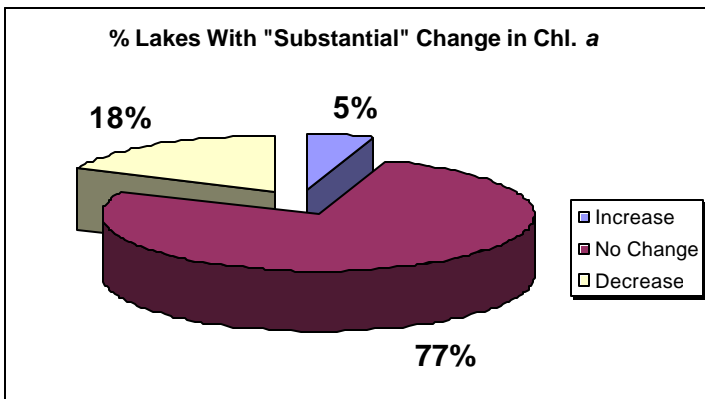


Figure 5g. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Chlorophyll a

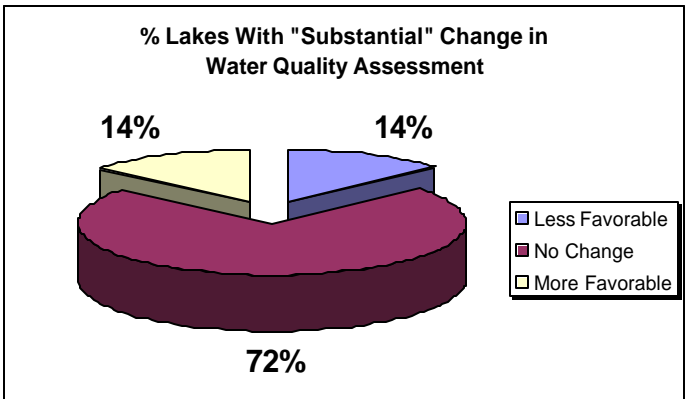


Figure 5h. %CSLAP Lakes Exhibiting Substantial Long-Term Changes in Water Quality Assessment

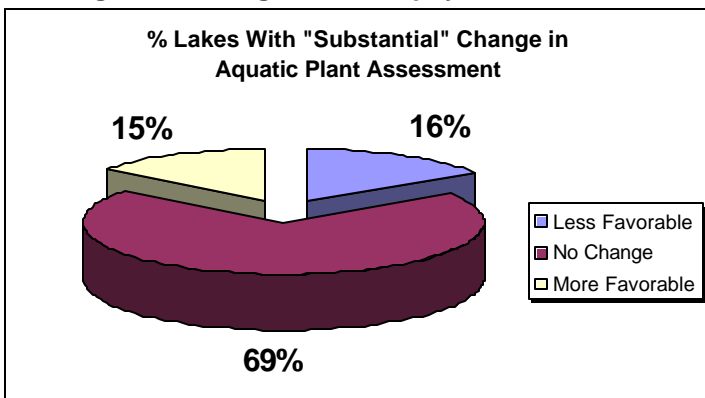


Figure 5i. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Aquatic Plant Assessment

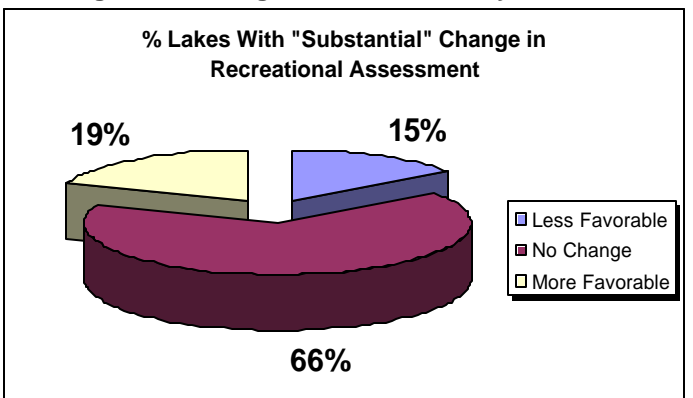


Figure 5j. %CSLAP Lakes Exhibiting Substantial Long-Term Change in Recreational Assessment

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 1970's, 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, since acidic rain continues to fall throughout the state. The CSLAP dataset is not adequate to evaluate any ecological changes associated 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 (14 years versus up to 20 years for some lakes), but 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 1/3 of all lakes exhibiting substantial change and nearly half have demonstrated moderate change. A more detailed analysis of these assessments (not presented here) indicate 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 6 through 15. 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 Melody Lake 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 years with relatively normal precipitation, although some of the other years with relatively low pH corresponded to wetter years (1996, 2000, and 2004). There does 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.

What Was Expected in 2005?

2005 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 at least most of the CSLAP sampling seasons, pH readings have generally been lower during wet years, most likely to due the input of acidic rain. Therefore, it is anticipated that pH readings may be slightly lower than usual, at least in some CSLAP lakes.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. pH readings were slightly higher than usual (probably consistent with the drier weather), but these readings were within the normal range of variability for the lake. Moreover, the significant drop in water level due to the dam leak probably created conditions not readily comparable to those in previous CSLAP sampling seasons.

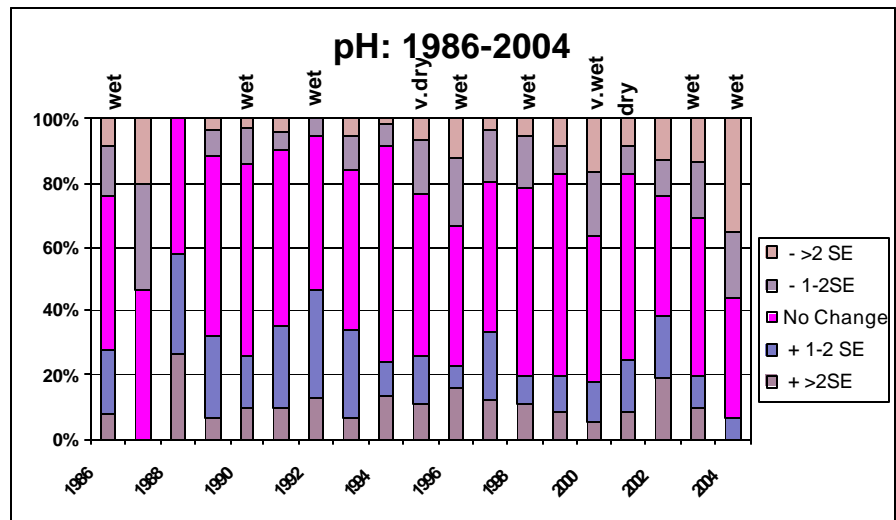


Figure 6a. Annual Change from “Normal” pH in CSLAP Lakes (SE = Standard Error)

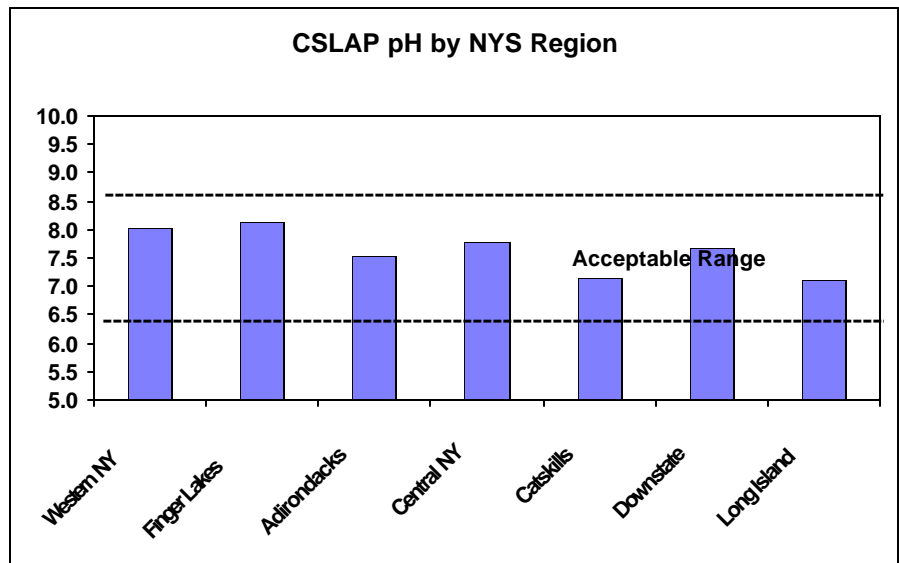


Figure 6b. pH in CSLAP Lakes by NYS Region

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 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, since 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, since CSLAP lakes are not really representative of the typical NYS lake as related to pH.

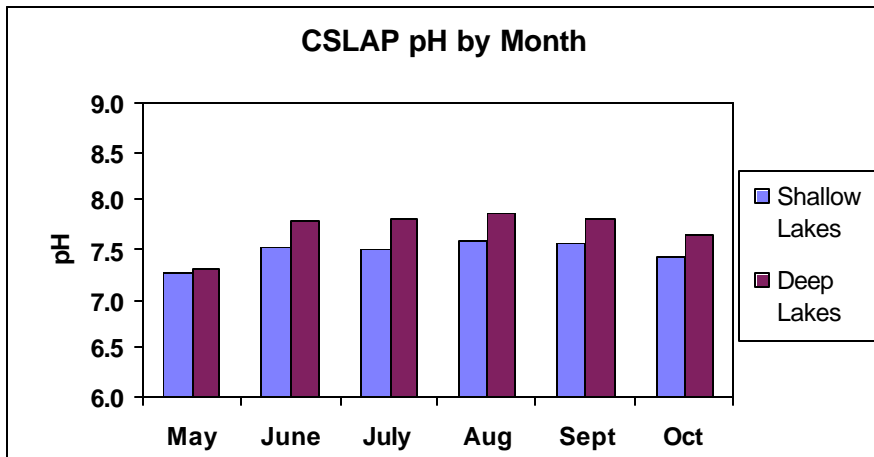


Figure 6c. pH in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

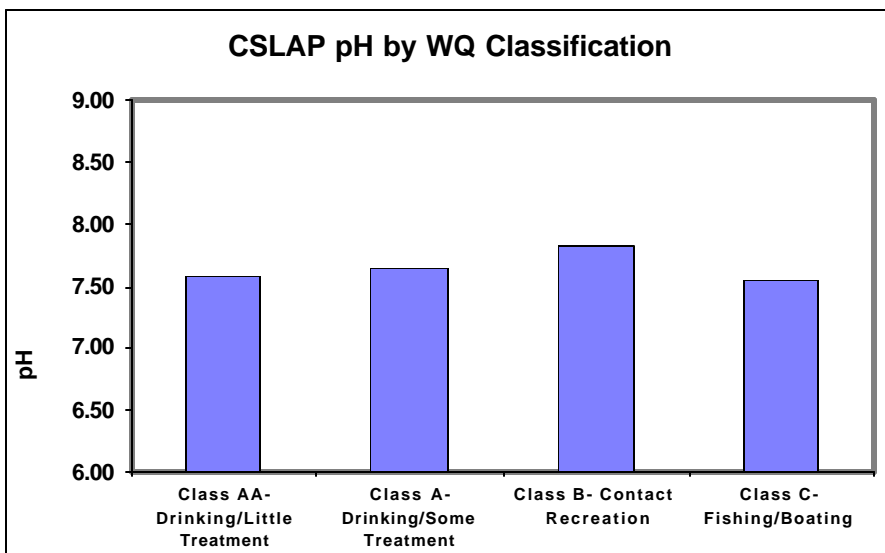


Figure 6d. pH in CSLAP Lakes by Lake Use

Seasonal Variability:

pH readings tend to increase slightly over the course of the summer, due largely to increasing algal photosynthesis (which consumes CO₂ 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 significant 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 6a, which shows that more lakes have exhibited higher readings in recent years that in the first several years of CSLAP sampling at the lake (although lower conductivity was apparent in 2004). Readings are generally higher in dry weather and lower in wetter weather, although the overall annual trend appears to be stronger than weather-impacted changes.

What Was Expected in 2005?

2005 was a relatively wet year, at least in most of the state during much of the summer sampling season. Conductivity readings have generally been lower during wet years, although this rather weak pattern “competes” with a more 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.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. As in 2004, conductivity readings were lower than usual (probably inconsistent with the drier weather), and these readings may have been slightly outside the normal range of variability for the lake. However, the significant drop in water level due to the dam leak probably created conditions not readily comparable to those in previous CSLAP sampling seasons.

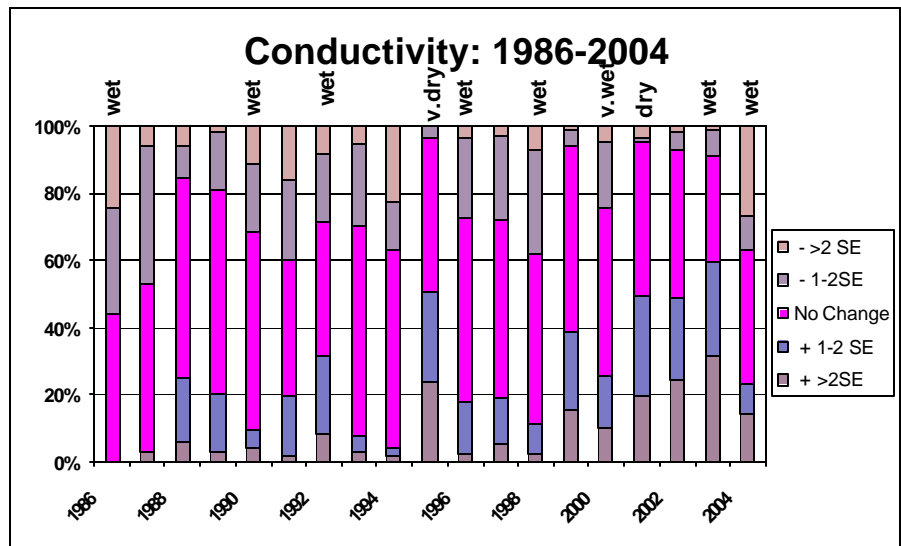


Figure 7a. Annual Change from “Normal” Conductivity in CSLAP Lakes (SE = Standard Error)

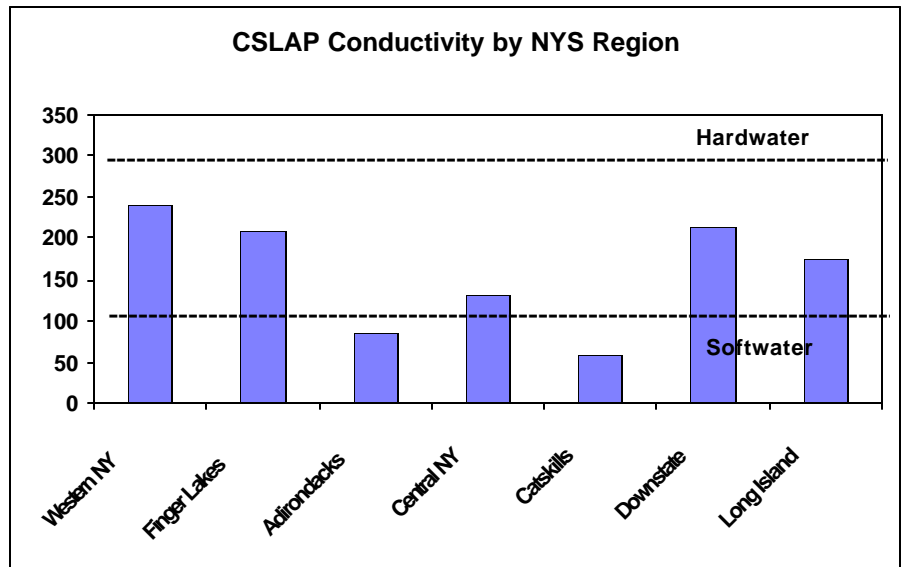


Figure 7b. Conductivity in CSLAP Lakes by NYS Region

Statewide Variability:

Although “hardwater” and “softwater” is 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 primary 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.

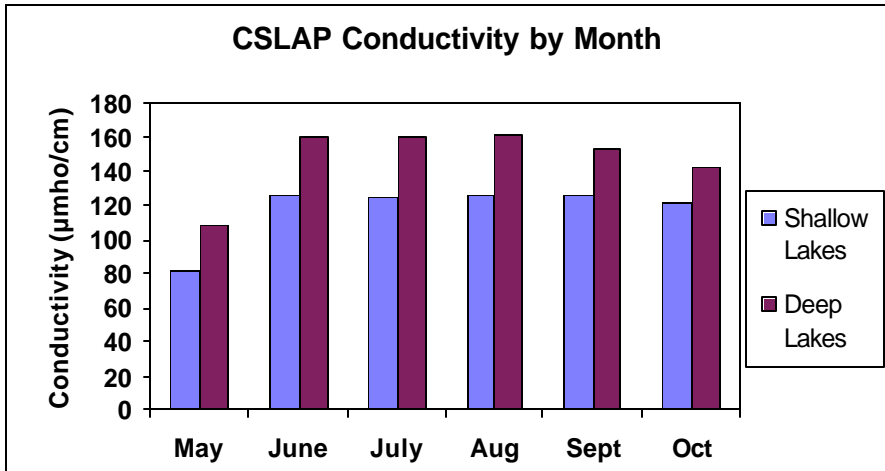


Figure 7c. Conductivity in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

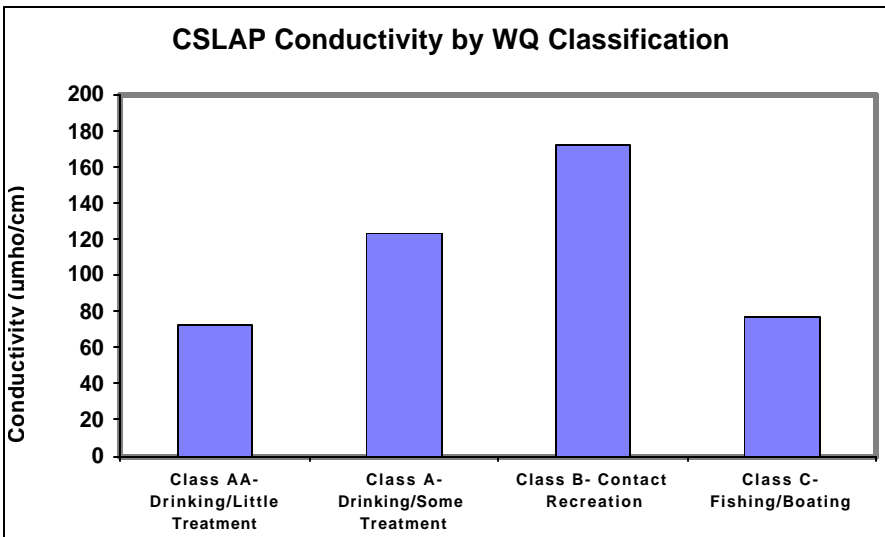


Figure 7d. Conductivity in CSLAP Lakes by Lake Use

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 over 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 is 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 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 year with the lowest color readings, 1993, had “normal” levels of precipitation, although three of the years with the highest color readings (1992, and 2002 through 2004) 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.

What Was Expected in 2005?

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 2005 generally corresponded to a wet year, it is likely that color readings in 2005 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.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. After very high color readings in 2004, color readings were only slightly higher than normal in 2005 (probably consistent with the drier weather), although these readings were still within the normal range of variability for the lake. That said, the significant drop in water level due to the dam leak probably created conditions not readily comparable to those in previous CSLAP sampling seasons.

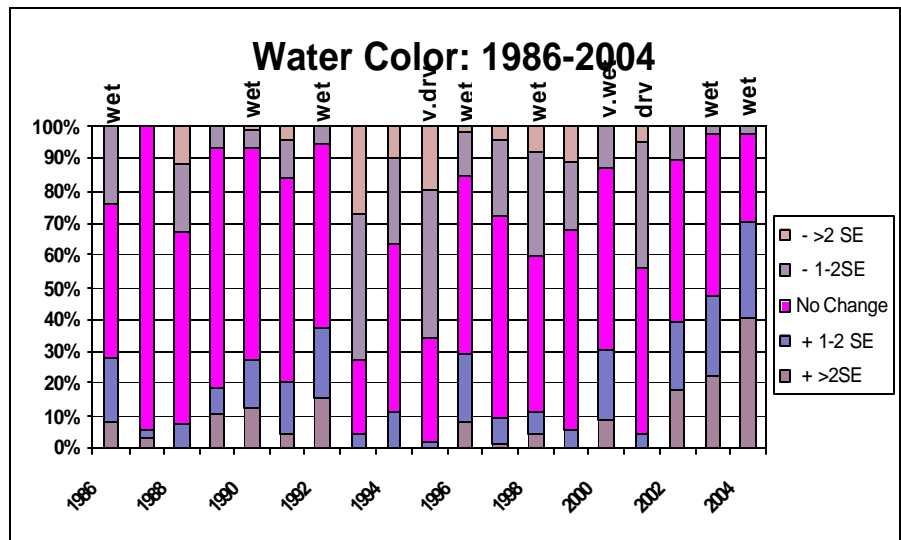


Figure 8a. Annual Change from “Normal” Color in CSLAP Lakes (SE = Standard Error)

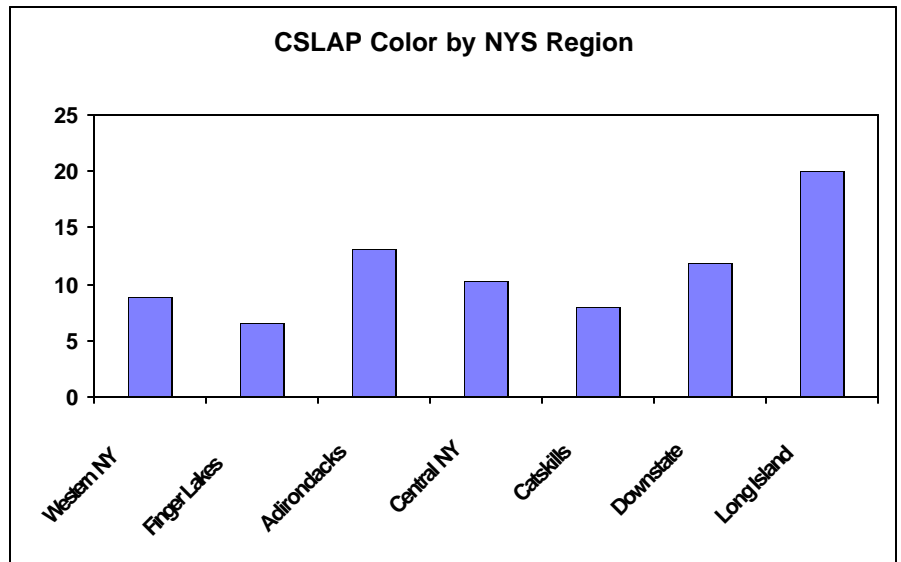


Figure 8b. Color in CSLAP Lakes by NYS Region

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), and both seem to be largely consistent with the distribution of these lakes within New York State (in other words, the CSLAP dataset may be a representative cross-section of NYS lakes as related to color).

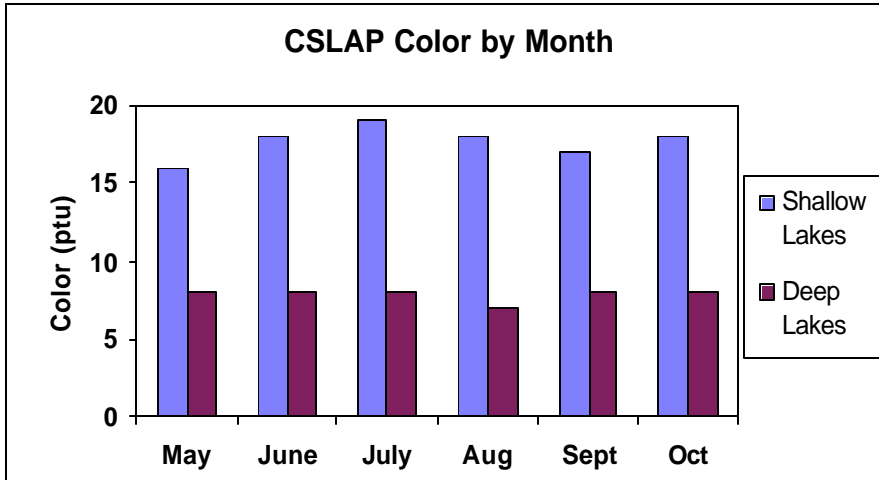


Figure 8c. Color in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

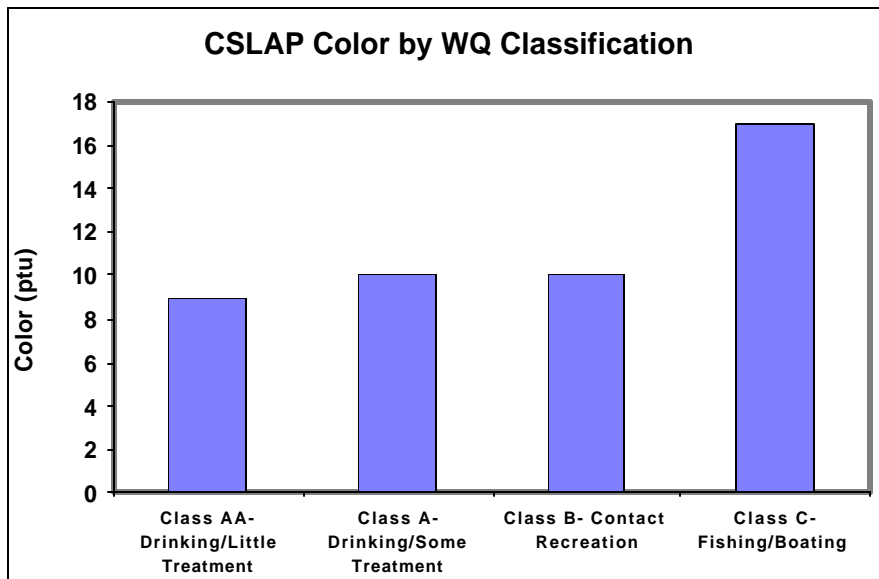


Figure 8d. Color in CSLAP Lakes by Lake Use

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 potable water.

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 levels 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),

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, in 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, 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 9a. No readings have approached the state water quality standard (= 10 mg/l) in any CSLAP sample.

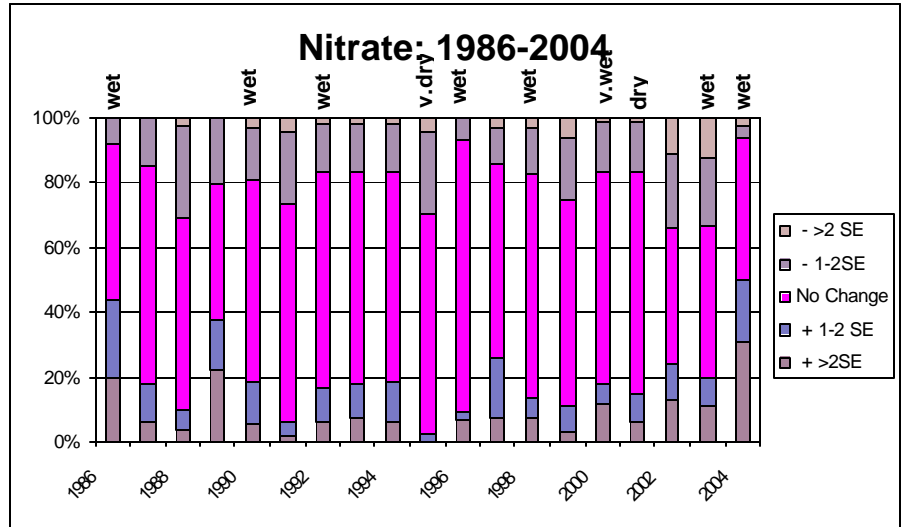


Figure 9a. Annual Change from “Normal” Nitrate in CSLAP Lakes (SE = Standard Error)

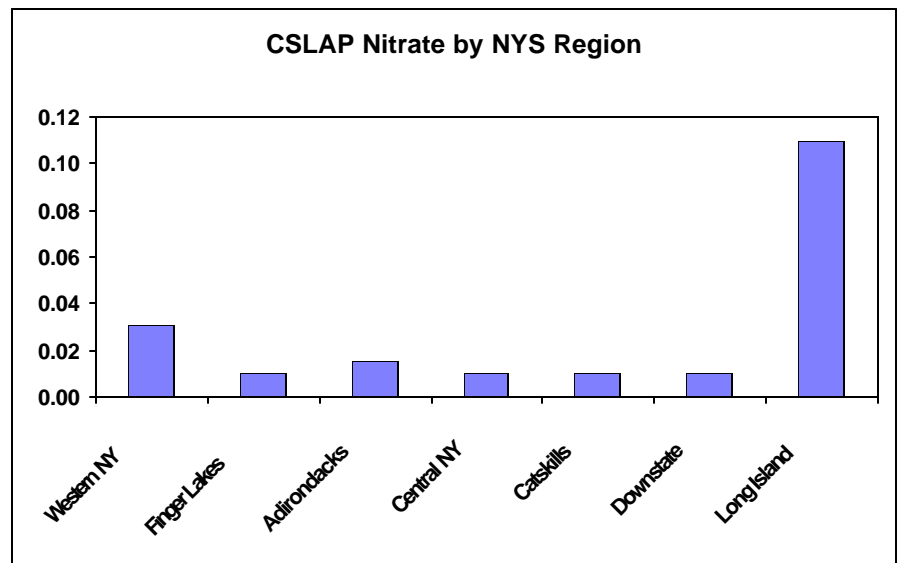


Figure 9b. Nitrate in CSLAP Lakes by NYS Region

What Was Expected in 2005?

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 2005.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. Nitrate readings were only slightly higher than normal in 2005 (probably consistent with the drier weather), although these readings were still very low and were within the normal range of variability for the lake. The significant drop in water level due to the dam leak probably created conditions not readily comparable to those in 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 the Long Island, Madison County, and the Adirondacks (spring only) are often elevated, although still well below water quality standards.

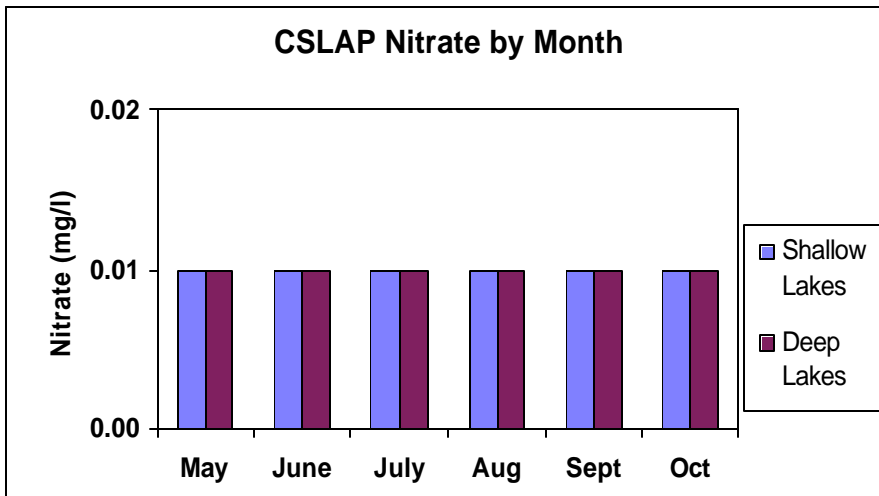


Figure 9c. Nitrate in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

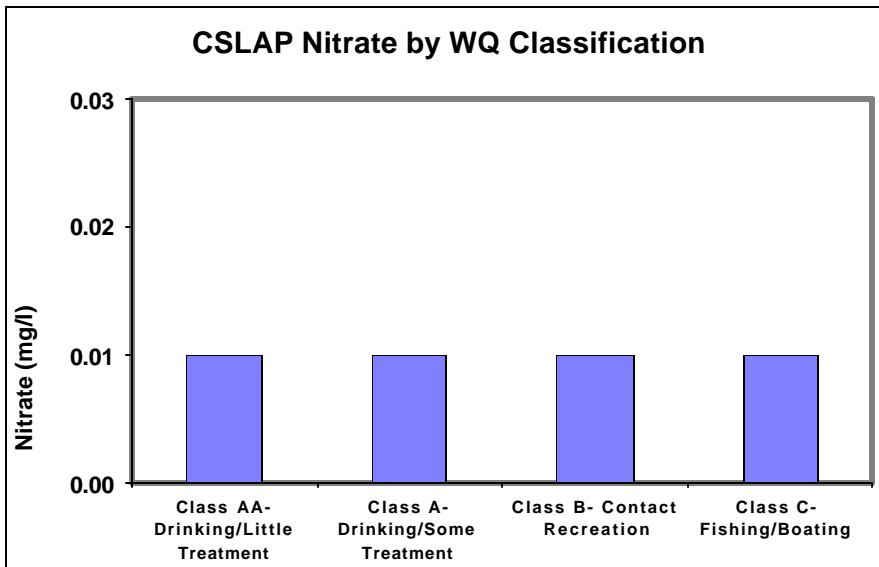


Figure 9d. Nitrate in CSLAP Lakes by Lake Use

Seasonal Variability:

Nitrate readings are not seasonally variable, as indicated in Figure 8c. 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 9c).

Lake Use Variability

Nitrate readings appeared to be identical for all classes of lake uses, as indicated in Figure 8d. 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).

Note- there is still insufficient ammonia and total dissolved nitrogen data (only three years) to include in these parameter-specific evaluations.

Trophic Indicators:
Water Clarity

Annual Variability

Water clarity (transparency) has varied annually in most CSLAP lakes. There appears to be at least a weak correlation between clarity and precipitation- the highest clarity occurred during the driest year (1995), and the lowest clarity during the two wettest 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 ($Zsd > 5$).

What Was Expected in 2005?

While there is a correlation between weather and water transparency readings, this only appears to occur with the extremes- very dry or very wet conditions. Since in general 2005 did not exhibit consistently strong weather patterns- it was very wet in the summer upstate, but dry downstate, and dry in the spring throughout most of the state- 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 2005.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. Water clarity readings were substantially lower than normal in 2005, reverting back to readings found in the late 1980s. However, while this is somewhat consistent with the drier weather, it is more likely that the significant drop in water level due to the dam leak probably created conditions not readily comparable to those in previous CSLAP sampling seasons (and triggered the dramatic decrease in measurable water clarity).

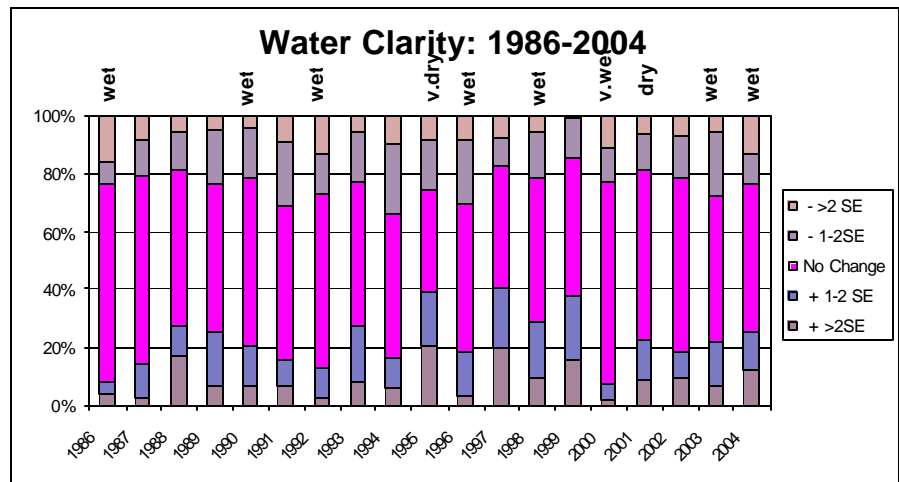


Figure 10a. Change from "Normal" Water Clarity in CSLAP Lakes (SE = Standard Error)

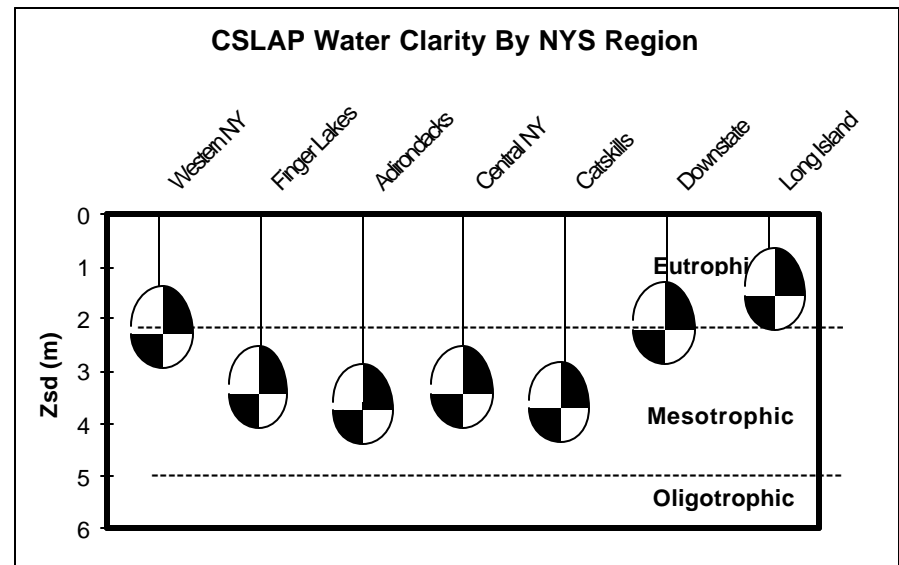


Figure 10b. Water Clarity in CSLAP Lakes by NYS Region

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*.

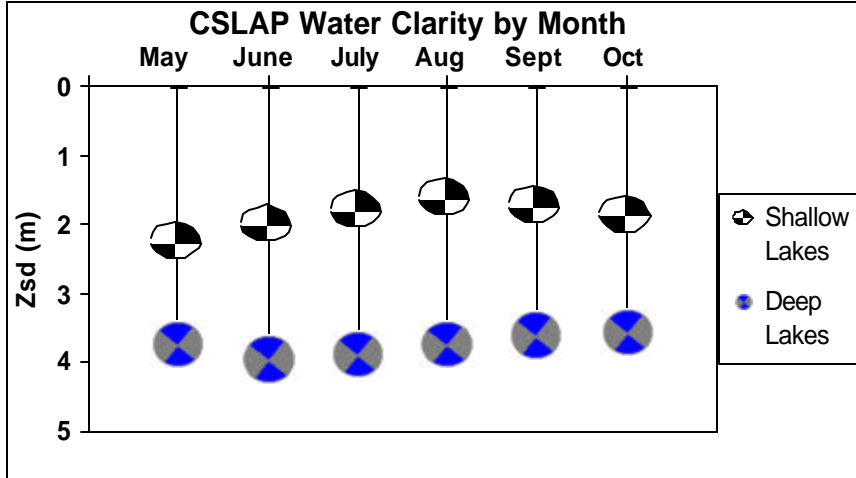


Figure 10c. Water Clarity in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

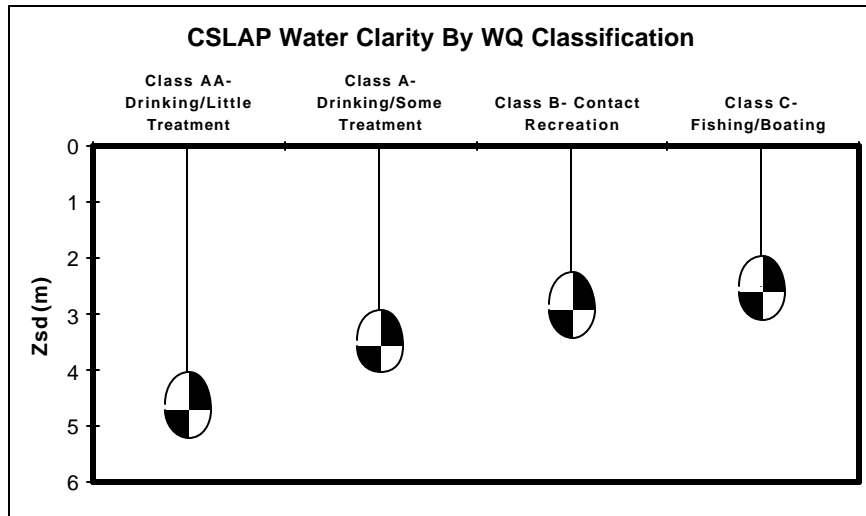


Figure 10d. Water Clarity in CSLAP Lakes by Lake Use

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.

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 over 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.

Trophic Indicators:
Phosphorus (TP)

Annual Variability

Total phosphorus (TP) has varied annually in most CSLAP lakes. As with clarity, there appears to be at least a weak correlation between phosphorus and precipitation- the highest phosphorus concentrations 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.

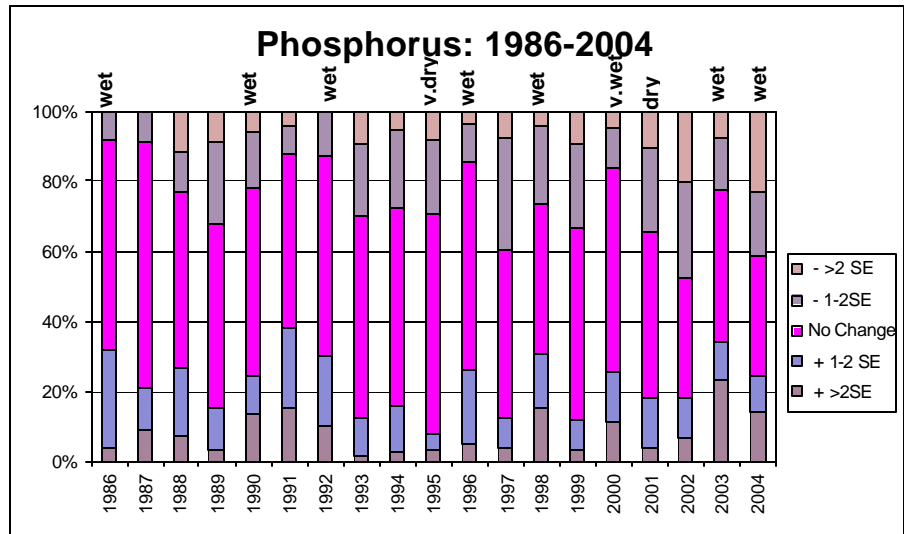


Figure 11a. Annual Change from "Normal" TP in CSLAP Lakes (SE = Standard Error)

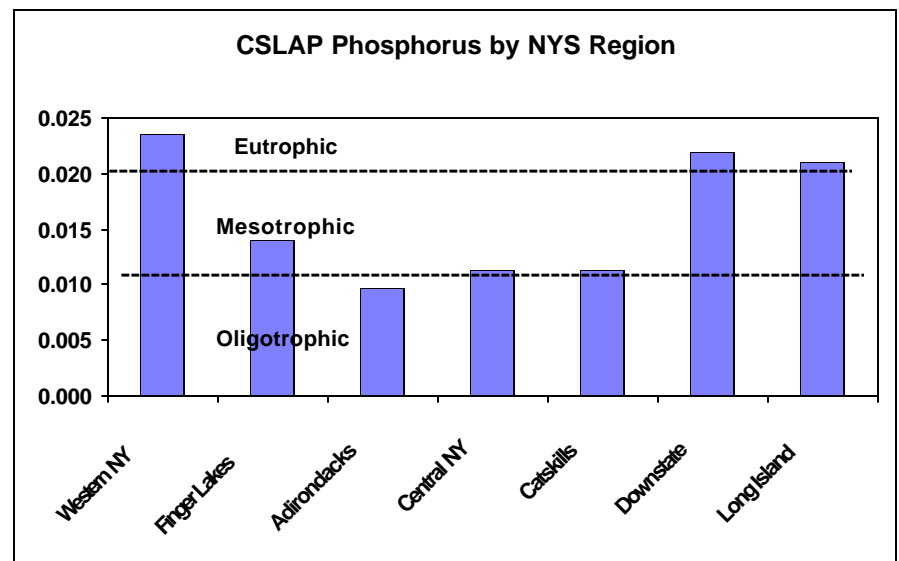


Figure 11b. TP in CSLAP Lakes by NYS Region

What Was Expected in 2005?

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 10a. As such, it is difficult to predict whether phosphorus levels might be expected to be higher or lower in most CSLAP lakes in 2005.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. Phosphorus readings were substantially higher than normal in 2005, reverting back to readings found in the late 1980s. However, while this may be consistent with the drier weather, it is more likely that the significant drop in water level due to the dam leak probably created conditions not readily comparable to those in previous CSLAP sampling seasons (and triggered the dramatic increase in phosphorus readings- due to scouring of the lake bottom, concentration of nutrients, and other phenomena). While tributary nutrient levels were also slightly higher, this was probably not sufficient to explain the large increase in lake phosphorus levels.

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.

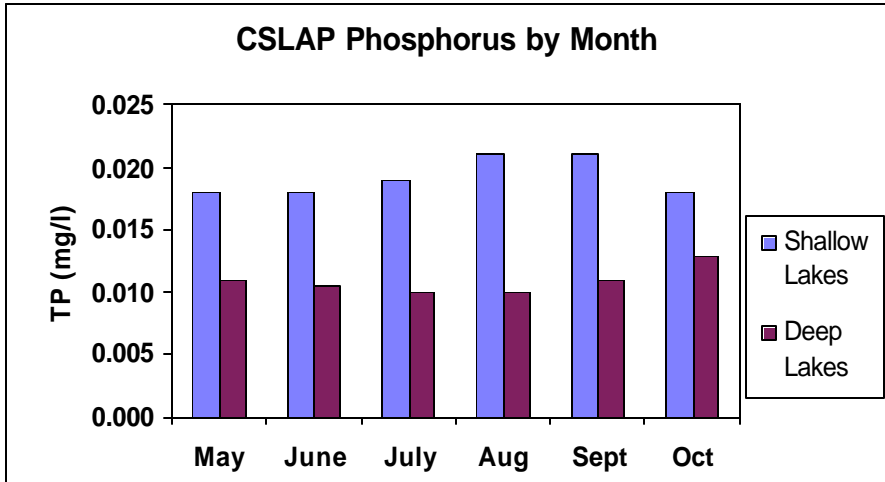


Figure 11c. TP in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

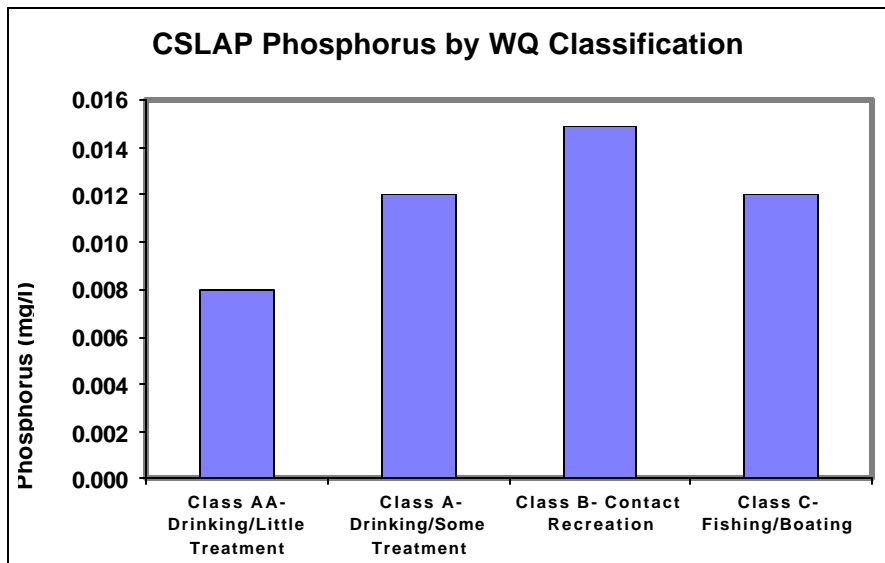


Figure 11d. TP in CSLAP Lakes by Lake Use

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.

Seasonal Variability:

Nutrient levels are higher, as expected, in shallow lakes, and phosphorus levels increase in shallow lakes over 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

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 phosphorus levels occurred during 1990, 1996, and 2000, corresponded to wet years. However, the lowest readings, from 1989, 1997, and 2001, 2002, 2003, and 2004 did not correspond to unusually dry years (except in 2001). The consistently lower chlorophyll readings in the last three 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 ($Z_{sd} < 2$) and 18% corresponding to *oligotrophic* conditions ($Z_{sd} > 5$); these percentages are more like those for water clarity rather than those for phosphorus.

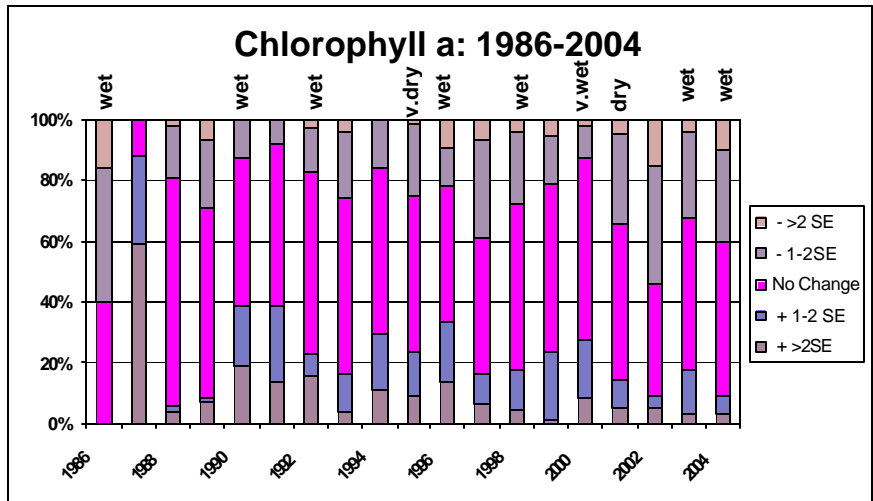


Figure 12a. Annual Change from “Normal” Chlorophyll *a* in CSLAP Lakes (SE = Standard Error)

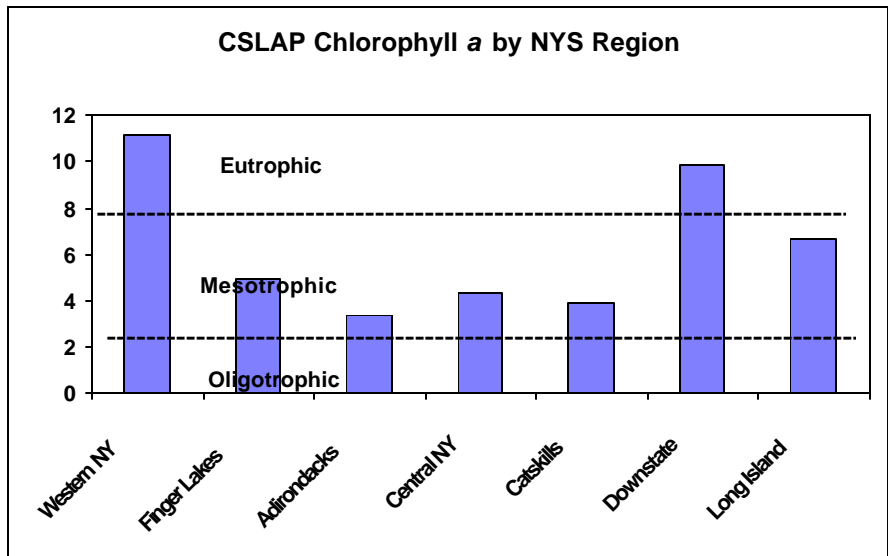


Figure 12b. Chlorophyll *a* in CSLAP Lakes by NYS Region

What Was Expected in 2005?

It is likely that chlorophyll readings would be lower than the long-term average for most CSLAP lakes in 2005, due to consistently lower readings coming from the same laboratory in the last several years. However, the shift to a higher sampling and analytical volume in 2005 may remove the “artificially” low readings that came from inaccurate volumetric measurements. Since 2005 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.

And What Happened at Melody Lake in 2005?

Algae readings were substantially higher than normal in 2005, probably due to the significant drop in water level. This probably created conditions not readily comparable to those in previous CSLAP sampling seasons (and triggered the dramatic increase in phosphorus and algae readings).

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*.

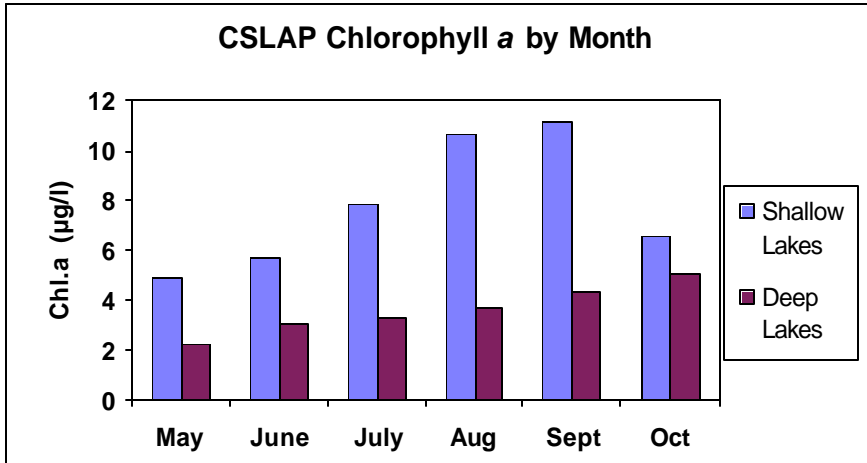


Figure 12c. Chlorophyll a in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

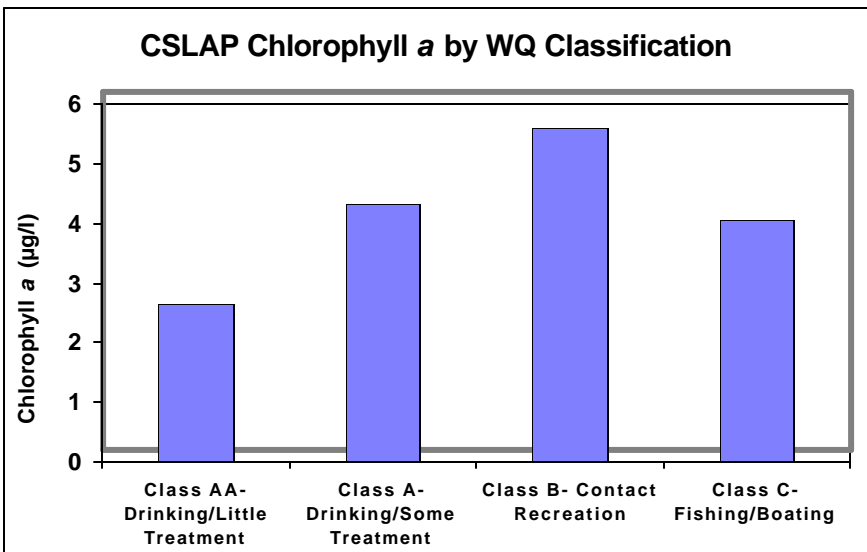


Figure 12d. Chlorophyll a in CSLAP Lakes by Lake Use

Seasonal Variability:

Chlorophyll levels are higher, as expected, in shallow lakes, and increase in both shallow and deep lakes over 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 2004 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 10a and 13a.

What Was Expected in 2005?

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 2005, 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.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. Water quality assessments were much less favorable in 2005, reverting back to readings found in the early 1990s. This appears to be directly related to the decrease in water clarity, as discussed earlier.

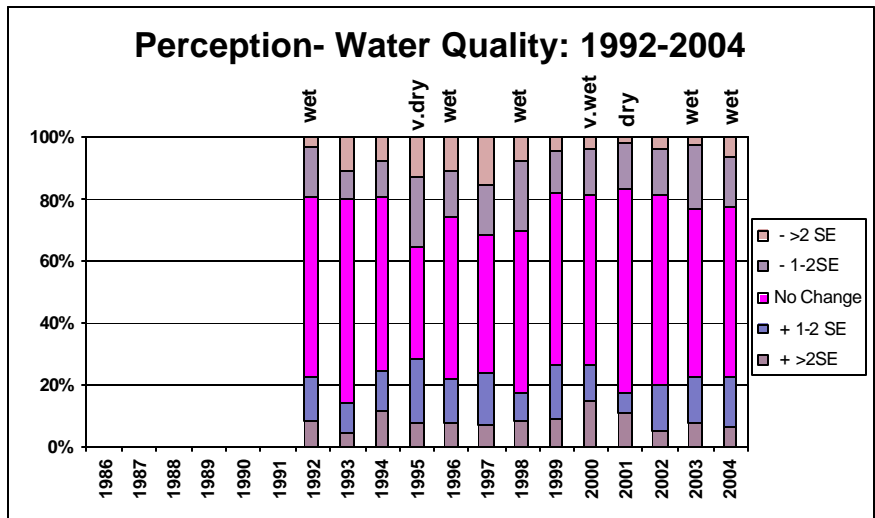


Figure 13a. Annual Change from “Normal” Water Quality Assessment in CSLAP Lakes (SE = Standard Error)

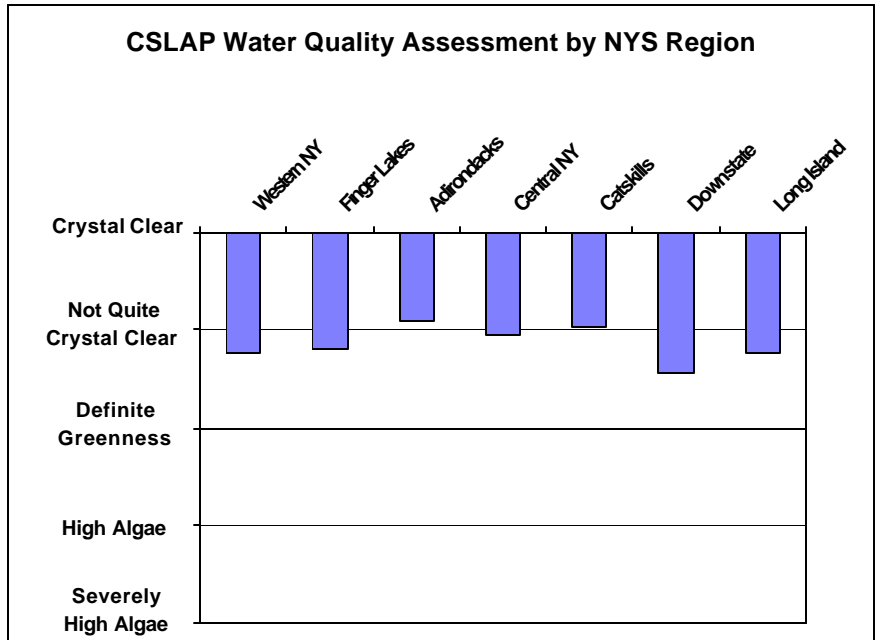


Figure 13b. Water Quality Assessment in CSLAP Lakes by NYS Region

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 in Downstate, Western NY, and 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 than the measured water transparency differences, this suggests that the relatively low water clarity in the latter regions may be considered “normal” by lake residents.

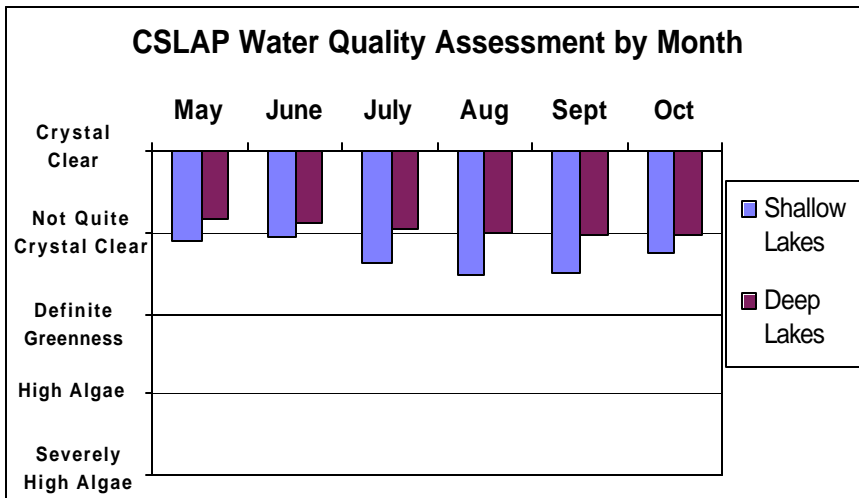
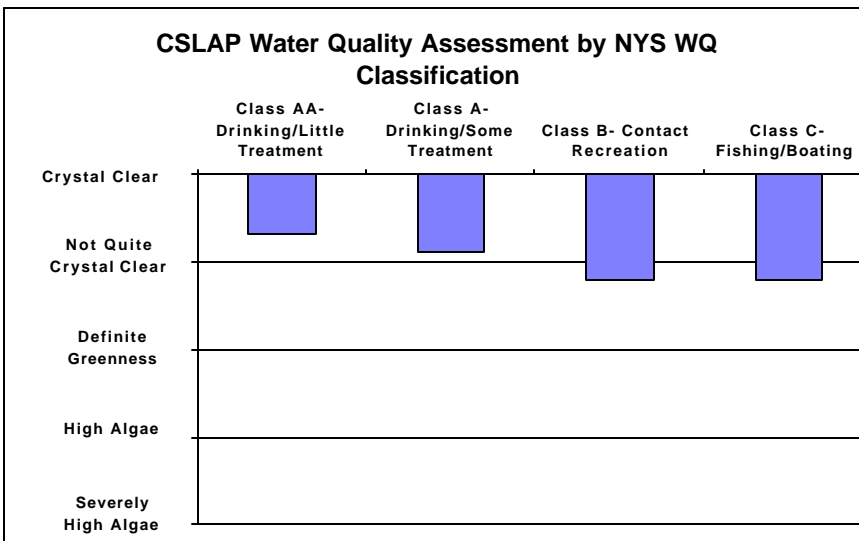


Figure 13c. Water Quality Assessment in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

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

Figure 13d. Water Quality Assessment in CSLAP Lakes by Lake Use
 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 (very dry conditions) and 2000 (very 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*).

What Was Expected in 2005?

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 2005. As is always the case, it is likely that the extent of weed growth in any particular CSLAP lake in 2005 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.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. Aquatic plant densities and coverage were much less significant in 2005. This appears to be directly related to the decrease in water clarity and perhaps loss of shoreline habitat due to the dramatic drop in water level.

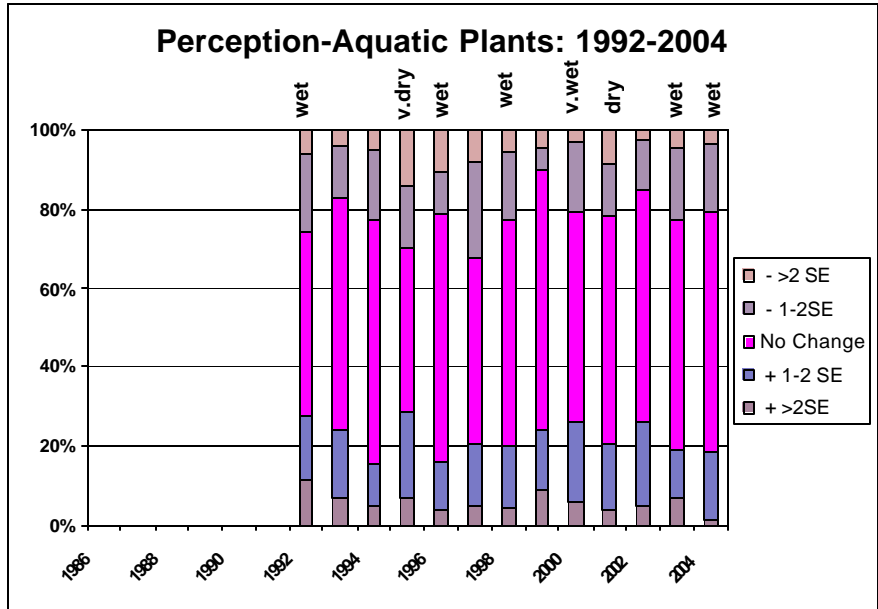


Figure 14a. Annual Change from "Normal" Weed Assessment in CSLAP Lakes (SE = Standard Error)

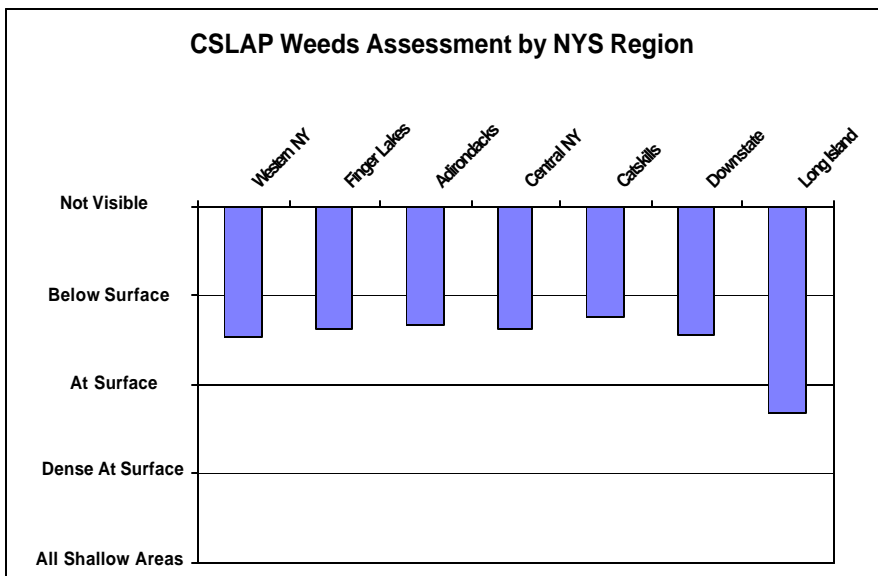


Figure 14d. Weed Assessment in CSLAP Lakes by Lake Use

Statewide Variability:

Aquatic plant growth was most significant in Long Island (and to a lesser extent Downstate and Western NY) and least significant in the Catskills and Adirondacks area. 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.

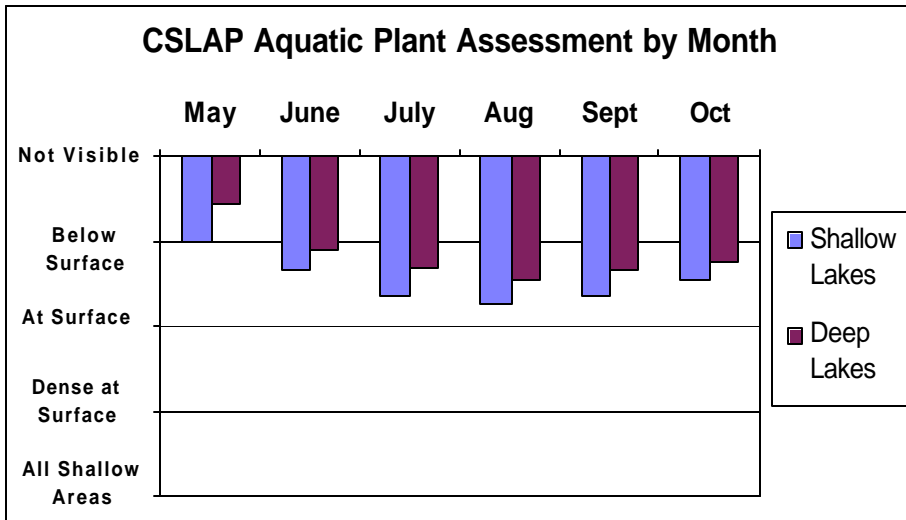


Figure 14c. Weed Assessment in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

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.

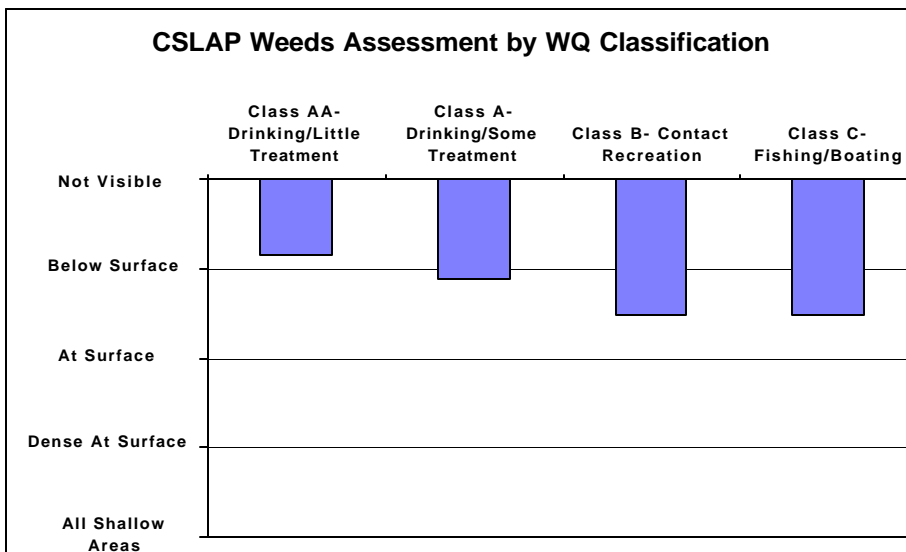


Figure 14d. Weed Assessment in CSLAP Lakes by Lake Use and Adirondacks, and Class C lakes tend to be shallower than Class AA or Class A lakes).

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

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 15a) has generally not changed significantly since perception surveys were first conducted in 1992.

What Was Expected in 2005?

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 2005, 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.

And What Happened at Melody Lake in 2005?

The majority of the 2005 sampling season found dry weather at Melody Lake. While aquatic plant densities and coverage were much less significant in 2005, water clarity (measured and perceived) was much less favorable. As a result, recreational assessments were much less favorable than in the typical CSLAP sampling season. As noted earlier, this appears to be directly related to the decrease in water clarity and perhaps loss of shoreline habitat due to the dramatic drop in water level.

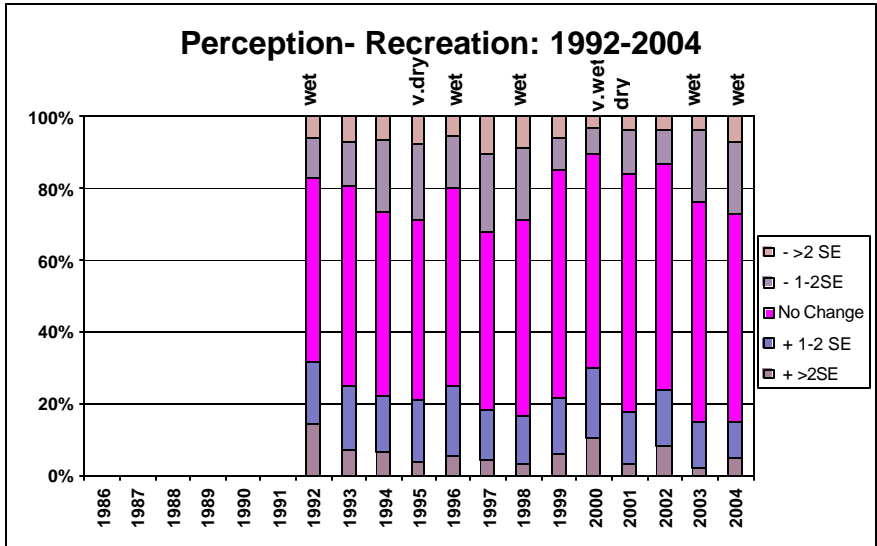


Figure 15a. Annual Change from “Normal” Recreational Assessment in CSLAP Lakes (SE = Standard Error)

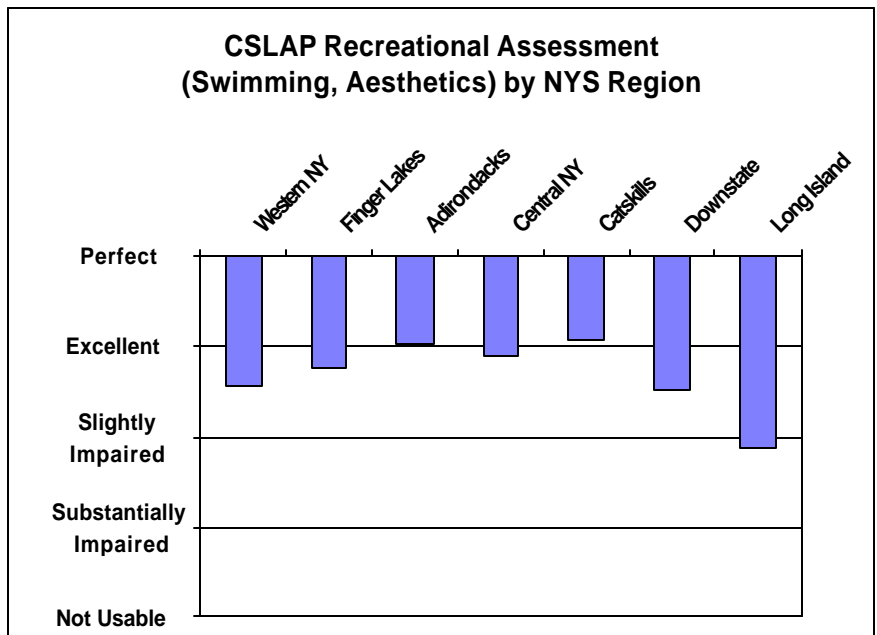


Figure 15b. Recreational Assessment in CSLAP Lakes by NYS Region

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.

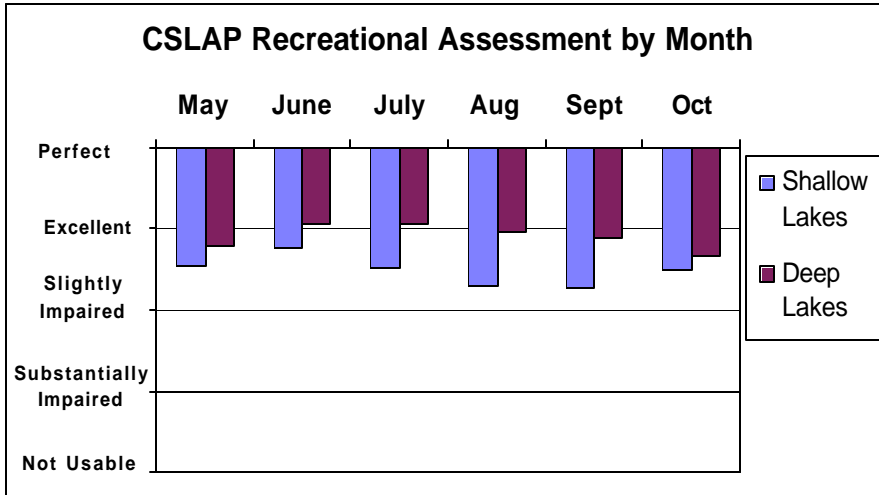


Figure 15c. Recreational Assessment in Shallow (<20ft deep) and Deep CSLAP Lakes by Month

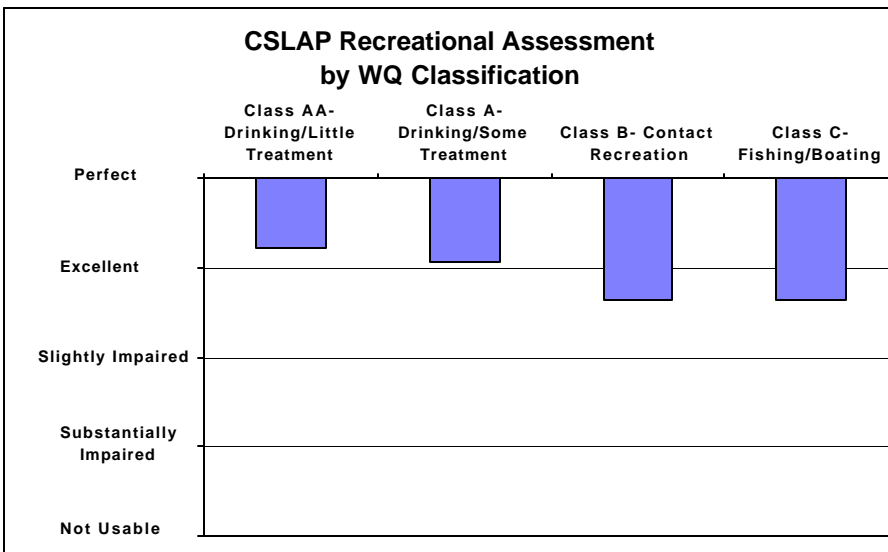


Figure 15d. Recreational Assessment in CSLAP Lakes by Lake Use

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).

V. MELODY LAKE CSLAP WATER QUALITY DATA

CSLAP is intended to provide the strong database, which will help lake associations understand lake conditions and foster sound lake protection and pollution prevention decisions. This individual lake summary for **2005** 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 information. Table 2 includes more detailed summaries of the 2005 and historical data sets, including some evaluation of water quality trends, comparison against existing water quality standards, and whether 2005 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 conditions. 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 2005 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 Melody Lake

Year	Min	Avg	Max	N	Parameter
1987-05	0.65	1.99	3.50	137	CSLAP Zsd
2005	1.10	1.44	1.90	8	CSLAP Zsd
2004	1.60	2.10	2.40	8	CSLAP Zsd
2003	2.50	2.88	3.10	8	CSLAP Zsd
2002	1.70	2.66	3.50	8	CSLAP Zsd
2001	1.60	2.23	2.90	8	CSLAP Zsd
2000	1.90	2.00	2.30	8	CSLAP Zsd
1999	1.60	2.39	3.20	8	CSLAP Zsd
1998	1.80	2.20	2.73	8	CSLAP Zsd
1997	1.65	2.44	3.05	8	CSLAP Zsd
1994	2.50	2.74	2.95	6	CSLAP Zsd
1991	0.95	1.43	1.95	8	CSLAP Zsd
1990	1.25	1.51	1.90	7	CSLAP Zsd
1989	0.90	1.54	2.60	13	CSLAP Zsd
1988	1.35	2.14	3.10	15	CSLAP Zsd
1987	0.65	1.19	1.60	16	CSLAP Zsd
Year	Min	Avg	Max	N	Parameter
1987-05	0.004	0.020	0.069	125	CSLAP Tot.P
2005	0.009	0.029	0.063	8	CSLAP Tot.P
2005	0.028	0.034	0.040	3	CSLAP TribTP
2004	0.004	0.019	0.028	8	CSLAP Tot.P
2004	0.024	0.032	0.038	4	CSLAP TribTP
2003	0.009	0.012	0.017	7	CSLAP Tot.P
2003	0.022	0.026	0.029	2	CSLAP TribTP
2002	0.006	0.016	0.031	8	CSLAP Tot.P
2001	0.011	0.017	0.028	8	CSLAP Tot.P
2000	0.014	0.017	0.021	7	CSLAP Tot.P
1999	0.013	0.016	0.022	8	CSLAP Tot.P
1998	0.010	0.016	0.020	3	CSLAP Tot.P
1997	0.010	0.015	0.024	8	CSLAP Tot.P
1991	0.013	0.018	0.022	8	CSLAP Tot.P
1990	0.012	0.017	0.021	7	CSLAP Tot.P
1989	0.015	0.020	0.029	14	CSLAP Tot.P
1988	0.013	0.019	0.025	15	CSLAP Tot.P
1987	0.015	0.035	0.069	16	CSLAP Tot.P
Year	Min	Avg	Max	N	Parameter
1987-05	0.00	0.02	0.37	107	CSLAP NO3
2005	0.01	0.02	0.04	8	CSLAP NO3
2004	0.01	0.01	0.04	8	CSLAP NO3
2003	0.00	0.01	0.02	8	CSLAP NO3
2002	0.00	0.01	0.05	7	CSLAP NO3
2001	0.01	0.09	0.37	8	CSLAP NO3
2000	0.01	0.01	0.01	8	CSLAP NO3

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:

L Name	Lake name
Date	Date of sampling
Zbot	Depth of the lake at the sampling site, meters
Zsd	Secchi disk transparency, meters
Zsp	Depth of the sample, meters
TAir	Temp of Air, °C
TH2O	Temp of Water Sample, °C
TotP	Total Phosphorus as P, in mg/l (Hypo = bottom sample)
NO3	Nitrate + Nitrite nitrogen as N, in mg/l
NH_{3/4}	Ammonia as N, in mg/l
TN-TDN	Total Nitrogen = NO _x + NH _{3/4} + organic nitrogen, as N, in mg/l
TP/TN	Phosphorus/Nitrogen ratios
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, jetskis, etc); (8) other

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

Year	Min	Avg	Max	N	Parameter
1987-05	0.00	0.02	0.37	107	CSLAP NO3
1999	0.01	0.01	0.01	8	CSLAP NO3
1998	0.01	0.01	0.01	7	CSLAP NO3
1997	0.01	0.01	0.04	8	CSLAP NO3
1991	0.01	0.01	0.01	4	CSLAP NO3
1990	0.01	0.01	0.01	4	CSLAP NO3
1989	0.01	0.01	0.03	4	CSLAP NO3
1988	0.01	0.01	0.03	9	CSLAP NO3
1987	0.01	0.01	0.02	16	CSLAP NO3
Year	Min	Avg	Max	N	Parameter
2002-05	0.00	0.02	0.13	30	CSLAP NH4
2005	0.01	0.01	0.04	8	CSLAP NH4
2004	0.01	0.04	0.13	8	CSLAP NH4
2003	0.00	0.02	0.06	7	CSLAP NH4
2002	0.02	0.03	0.04	7	CSLAP NH4
Year	Min	Avg	Max	N	Parameter
2002-05	0.10	0.43	0.68	31	CSLAP TDN
2005	0.10	0.31	0.42	8	CSLAP TDN
2004	0.11	0.44	0.65	8	CSLAP TDN
2003	0.27	0.40	0.68	7	CSLAP TDN
2002	0.48	0.56	0.65	8	CSLAP TDN
Year	Min	Avg	Max	N	Parameter
2002-05	2.67	32.67	139.92	30	CSLAP TN/TP
2005	2.67	15.53	40.47	8	CSLAP TN/TP
2004	6.95	34.81	139.92	8	CSLAP TN/TP
2003	19.97	37.86	74.84	6	CSLAP TN/TP
2002	20.48	43.78	110.35	8	CSLAP TN/TP
Year	Min	Avg	Max	N	Parameter
1987-05	2	22	68	128	CSLAP TColor
2005	9	24	42	8	CSLAP TColor
2004	24	42	68	8	CSLAP TColor
2003	5	20	37	8	CSLAP TColor
2002	24	38	52	8	CSLAP TColor
2001	17	25	37	8	CSLAP TColor
2000	30	34	37	8	CSLAP TColor
1999	2	14	18	8	CSLAP TColor
1998	14	21	25	8	CSLAP TColor
1997	12	15	20	8	CSLAP TColor
1991	6	15	24	8	CSLAP TColor
1990	13	15	18	7	CSLAP TColor
1989	15	20	26	14	CSLAP TColor
1988	10	16	22	15	CSLAP TColor
1987	20	23	26	12	CSLAP TColor

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

Year	Min	Avg	Max	N	Parameter
1987-05	6.43	7.37	8.43	130	CSLAP pH
2005	6.81	7.40	8.39	8	CSLAP pH
2004	6.82	7.08	7.41	8	CSLAP pH
2003	6.78	7.32	7.71	8	CSLAP pH
2002	7.11	7.45	7.72	8	CSLAP pH
2001	6.44	7.06	7.51	8	CSLAP pH
2000	6.64	7.33	7.94	8	CSLAP pH
1999	6.61	7.54	8.43	8	CSLAP pH
1998	7.40	7.61	7.74	8	CSLAP pH
1997	6.43	7.30	7.71	8	CSLAP pH
1991	6.99	7.47	7.75	8	CSLAP pH
1990	6.61	7.38	7.93	7	CSLAP pH
1989	6.88	7.49	7.85	14	CSLAP pH
1988	7.07	7.66	8.24	14	CSLAP pH
1987	6.70	7.06	7.75	15	CSLAP pH
Year	Min	Avg	Max	N	Parameter
1987-05	38	82	195	129	CSLAP Cond25
2005	42	73	114	8	CSLAP Cond25
2004	53	72	87	8	CSLAP Cond25
2003	77	98	195	8	CSLAP Cond25
2002	71	79	85	8	CSLAP Cond25
2001	72	79	84	7	CSLAP Cond25
2000	69	76	84	8	CSLAP Cond25
1999	87	91	96	8	CSLAP Cond25
1998	74	77	82	8	CSLAP Cond25
1997	77	84	89	8	CSLAP Cond25
1991	75	81	86	8	CSLAP Cond25
1990	38	72	86	7	CSLAP Cond25
1989	80	86	91	14	CSLAP Cond25
1988	87	93	100	14	CSLAP Cond25
1987	62	75	82	15	CSLAP Cond25
Year	Min	Avg	Max	N	Parameter
1987-05	7.6	8.4	9.7	5	CSLAP Ca
2005	7.6	8.2	8.7	2	CSLAP Ca
2004	9.7	9.7	9.7	1	CSLAP Ca
2003	7.6	8.1	8.6	2	CSLAP Ca
2002				0	CSLAP Ca
Year	Min	Avg	Max	N	Parameter
1987-05	0.40	11.9	106.0	123	CSLAP Chl.a
2005	8.43	15.44	27.58	8	CSLAP Chl.a
2004	0.64	8.98	24.50	7	CSLAP Chl.a
2003	3.52	7.03	10.36	7	CSLAP Chl.a
2002	0.51	5.27	14.84	8	CSLAP Chl.a
2001	3.15	9.86	17.60	7	CSLAP Chl.a
2000	4.45	8.38	18.40	8	CSLAP Chl.a

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

Year	Min	Avg	Max	N	Parameter
1987-05	0.40	11.9	106.0	123	CSLAP Chl.a
1999	3.20	7.45	17.50	8	CSLAP Chl.a
1998	1.58	7.19	20.30	8	CSLAP Chl.a
1997	4.14	7.98	14.40	8	CSLAP Chl.a
1991	7.03	16.78	29.00	8	CSLAP Chl.a
1990	5.78	15.14	32.50	7	CSLAP Chl.a
1989	6.16	11.91	22.20	14	CSLAP Chl.a
1988	4.29	10.51	16.30	15	CSLAP Chl.a
1987	0.40	30.16	106.00	10	CSLAP Chl.a
Year	Min	Avg	Max	N	Parameter
1994-05	1	2.1	3	76	QA
2005	2	2.8	3	8	QA
2004	1	2.3	3	8	QA
2003	1	1.7	2	7	QA
2002	1	2.1	3	8	QA
2001	2	2.1	3	8	QA
2000	2	2.1	3	8	QA
1999	1	1.9	2	8	QA
1998	1	1.9	2	8	QA
1997	1	1.9	2	7	QA
1994	2	2.8	3	6	QA
Year	Min	Avg	Max	N	Parameter
1994-05	1	2.3	4	77	QB
2005	1	1.8	2	8	QB
2004	1	2.5	3	8	QB
2003	1	2.0	4	7	QB
2002	1	2.8	4	8	QB
2001	1	2.1	3	8	QB
2000	2	2.4	3	8	QB
1999	1	2.3	3	8	QB
1998	1	2.1	3	8	QB
1997	1	2.4	4	8	QB
1994	3	3.0	3	6	QB
Year	Min	Avg	Max	N	Parameter
1994-05	1	2.5	4	74	QC
2005	2	3.4	4	8	QC
2004	1	2.4	3	7	QC
2003	1	2.1	4	7	QC
2002	2	2.7	3	7	QC
2001	1	2.4	3	8	QC
2000	2	2.3	3	8	QC
1999	1	1.9	2	7	QC
1998	1	2.3	3	8	QC
1997	1	2.4	4	8	QC
1994	3	3.0	3	6	QC

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

Year	Min	Avg	Max	N	Parameter
2003-05	3.6	4.9	6.5	4	TSS
2005				0	Trib TSS
2004	3.6	4.9	6.5	4	Trib TSS
2003				0	Trib TSS

- **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 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- Present Year and Historical Data Summaries for Melody Lake
Eutrophication Indicators**

Parameter	Year	Minimum	Average	Maximum
Zsd	2005	1.10	1.44	1.90
(meters)	All Years	0.65	1.99	3.50
Parameter	Year	Minimum	Average	Maximum
Phosphorus	2005	0.009	0.029	0.063
(mg/l)	All Years	0.004	0.020	0.069
Parameter	Year	Minimum	Average	Maximum
Chl.a	2005	8.43	15.44	27.58
(µg/l)	All Years	0.40	11.9	106.0

Parameter	Year	Was 2005 Clarity the Highest or Lowest on Record?	Was 2005 a Typical Year?	Trophic Category	Zsd Changing?	% Samples Violating DOH Beach Std?+
Zsd	2005	Within Normal Range	Lower Than Normal	Eutrophic	Not Yet Known	13
(meters)	All Years			Mesotrophic		9
Parameter	Year	Was 2005 TP the Highest or Lowest on Record?	Was 2005 a Typical Year?	Trophic Category	TP Changing?	% Samples Exceeding TP Guidance Value
Phosphorus	2005	Within Normal Range	Higher Than in Recent Years	Eutrophic	Not Yet Known	63
(mg/l)	All Years			Mesotrophic		35
Parameter	Year	Was 2005 Algae the Highest or Lowest on Record?	Was 2005 a Typical Year?	Trophic Category	Chl.a Changing?	
Chl.a	2005	Within Normal Range	Yes	Eutrophic	No	
(µg/l)	All Years			Eutrophic		

+ - 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 2005 CSLAP dataset indicates that Melody Lake was much more productive in 2005 than in most previous sampling seasons, especially in recent years, as manifested by lower water transparency and higher phosphorus and chlorophyll *a* readings. These changes appeared to reverse a long-term trend toward lower lake productivity; however, it is more likely that these were due to the dramatic drop in water level in the lake due to the dam leak, although tributary phosphorus readings in 2005 were higher than in 2004. It is not known if the lake will “recover” to the mesotrophic conditions found in recent years, prior to 2005, once the water level is stabilized and water depth returns to pre-2005 readings. There continues to be a moderately strong correlation between changes in clarity and algae, and between changes in phosphorus and algae, and as such it is likely that any lake management activities undertaken to maintain water transparency must necessarily continue to address algae levels in and nutrient loading to the lake (again, once water level is stabilized). Lake productivity increases through the end of the sampling season, even after water temperatures start to decrease. While phosphorus levels in Melody Lake have occasionally exceeded the state guidance value for lakes used for contact recreation (swimming), moreso in 2005, Secchi disk transparency readings usually exceed the minimum recommended water clarity for swimming beaches (= 1.2 meters)).

TABLE 2- Present Year and Historical Data Summaries for Melody Lake (cont)
Other Water Quality Indicators

Parameter	Year	Minimum	Average	Maximum
Nitrate	2005	0.01	0.02	0.04
(mg/l)	All Years	0.00	0.02	0.37
Parameter	Year	Minimum	Average	Maximum
NH ₄	2005	0.01	0.01	0.04
(mg/l)	All Years	0.00	0.02	0.13
Parameter	Year	Minimum	Average	Maximum
TDN	2005	0.10	0.31	0.42
(mg/l)	All Years	0.10	0.43	0.68
Parameter	Year	Minimum	Average	Maximum
True Color	2005	9	24	42
(ptu)	All Years	2	22	68
Parameter	Year	Minimum	Average	Maximum
pH	2005	6.81	7.40	8.39
(std units)	All Years	6.43	7.37	8.43
Parameter	Year	Minimum	Average	Maximum
Conductivity	2005	42	73	114
(µmho/cm)	All Years	38	82	195
Parameter	Year	Minimum	Average	Maximum
Calcium	2005	7.6	8.2	8.7
(mg/l)	All Years	7.6	8.4	9.7

*- These data indicate Melody Lake is a moderately colored, slightly alkaline (above neutral pH) lake with mostly low nitrate and ammonia levels and soft water. Color readings do not appear to impact water clarity even when algae levels are low. These data indicate that phosphorus controls algae growth (actual nitrogen to phosphorus ratios probably exceed 15-25), although overall nitrogen levels remain very low. Conductivity readings have varied somewhat randomly since 1987, and the lake continues to exhibit characteristics of a softwater lake. pH readings only occasionally fail to reach the state water quality standards (=6.5 to 8.5), and at all times appear to be adequate to support most aquatic organisms. Calcium levels approach the threshold found to support zebra mussels, but it is not believed that these exotic animals have been found in Melody Lake.

**TABLE 2- Present Year and Historical Data Summaries for Melody Lake (cont)
Other Water Quality Indicators (cont)**

Parameter	Year	Was 2005 Nitrate the Highest or Lowest on Record?	Was 2005 a Typical Year?	Nitrate High?	Nitrate Changing?	% Samples Exceeding NO3 Standard	
Nitrate	2005	Within Normal Range	Yes	No	No	0	
(mg/l)	All Years			No		0	
Parameter	Year	Was 2005 NH4 the Highest or Lowest on Record?	Was 2005 a Typical Year?	NH4 High?	NH4 Changing?	% Samples Exceeding NH4 Standard	
NH4	2005	Within Normal Range	Yes	No	Yes	0	
(mg/l)	All Years			No		0	
Parameter	Year	Was 2005 TDN the Highest or Lowest on Record?	Was 2005 a Typical Year?	TDN High?	TDN Changing?	Ratios of TN/TP Indicate P or N Limitation?	
TDN	2005	Lowest at Times	Lower Than Normal	No	Yes	P Limitation	
(mg/l)	All Years			No		P Limitation	
Parameter	Year	Was 2005 Color the Highest or Lowest on Record?	Was 2005 a Typical Year?	Colored Lake?	Color Changing?		
True Color	2005	Within Normal Range	Yes	No	No		
(ptu)	All Years			No			
Parameter	Year	Was 2005 pH the Highest or Lowest on Record?	Was 2005 a Typical Year?	Acceptable Range?	pH Changing?	% Samples > Upper pH Standard	% Samples < Lower pH Standard
pH	2005	Within Normal Range	Yes	Yes	No	0	0
(std units)	All Years			Yes		0	2
Parameter	Year	Was 2005 Conductivity Highest or Lowest on Record?	Was 2005 a Typical Year?	Relative Hardness	Conductivity Changing?		
Conductivity	2005	Within Normal Range	Yes	Softwater	No		
(µmho/cm)	All Years						
Parameter	Year	Was 2005 Calcium Highest or Lowest on Record?	Was 2005 a Typical Year?	Support Zebra Mussels?	Calcium Changing?		
Calcium	2005	Within Normal Range	Yes	Uncertain	No		
(µmho/cm)	All Years			Uncertain			

+ - NYS Nitrate standard = 10 mg/l

+ - NYS Ammonia standard = 2 mg/l (as NH₃-NH₄)

+ - NYS pH standard- 6.5 < acceptable pH < 8.5

TABLE 2- Present Year and Historical Data Summaries for Melody Lake (cont)***Lake Perception Indicators (1= most favorable, 5= least favorable)***

Parameter	Year	Minimum	Average	Maximum
QA	2005	2	2.8	3
(Clarity)	All Years	1	2.1	3
Parameter	Year	Minimum	Average	Maximum
QB	2005	1	1.8	2
(Plants)	All Years	1	2.3	4
Parameter	Year	Minimum	Average	Maximum
QC	2005	2	3.4	4
(Recreation)	All Years	1	2.5	4

Parameter	Year	Was 2005 Clarity the Highest or Lowest on Record?	Was 2005 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	2005	Lowest at Times	Less Clear than Normal	No	75	0	63	38
(Clarity)	All Years				24	0	12	4
Parameter	Year	Was 2005 Weed Growth the Heaviest on Record?	Was 2005 a Typical Year?	Weeds Changed?	%Frequency Surface Weeds	%Frequency Dense Weeds	%Frequency 'Slightly Impaired' Due to Weeds	%Frequency 'Substantially Impaired' Due to Weeds
QB	2005	Lightest at Times	Less Weedy Than Normal	No	0	0	0	0
(Plants)	All Years				47	4	32	3
Parameter	Year	Was 2005 Recreation the Best or Worst on Record?	Was 2005 a Typical Year?	Recreation Changed?	%Frequency Slightly Impaired	%Frequency Substantially Impaired		
QC	2005	Worst at Times	Worse than Normal	No	88	50		
(Recreation)	All Years				49	8		

***- Recreational assessments of Melody Lake generally improved from the early 1990s to 2003, then degraded somewhat in the last two years due to excessive weeds (2004) and poor clarity driven by low water level (2005). As such, these assessments have varied from “excellent” to “substantially impaired” for most uses. Likewise, the perceived physical condition of the lake has been described most frequently as “not quite crystal clear”, with “slight algal greenness” more common when water clarity drops below 2 meters. Rooted aquatic plants occasionally grow to the lake surface, particularly when water transparency readings exceed 2-3 meters. Recreational conditions become less favorable later in the summer, corresponding to increasing weed coverage early in the summer, and reduced water clarity later in the summer.**

Recreational assessments appear to be slightly more sensitive to changes in water clarity than to changes in aquatic plants; however, both factors appear to influence lake use, and recreational use impairments are more likely to result from excessive weeds than excessive algae. The lake is described as at least “slightly impaired” about half of the time, but “substantially impaired” only about 10% of the time.

How Do the 2005 Data Compare to Historical Data from Melody Lake?

Seasonal Comparison of Eutrophication, Other Water Quality, and Lake Perception Indicators—2005 Sampling Season and in the Typical or Previous Sampling Seasons at Melody Lake

Figures 16 and 17 compare data for the measured eutrophication parameters for Melody Lake in 2005 and since CSLAP sampling began at Melody Lake. Figures 18 and 19 compare nitrogen to phosphorus ratios, Figures 20 through 27 compare other sampling indicators, and Figures 28 and 29 compare volunteer perception responses over the same time periods.

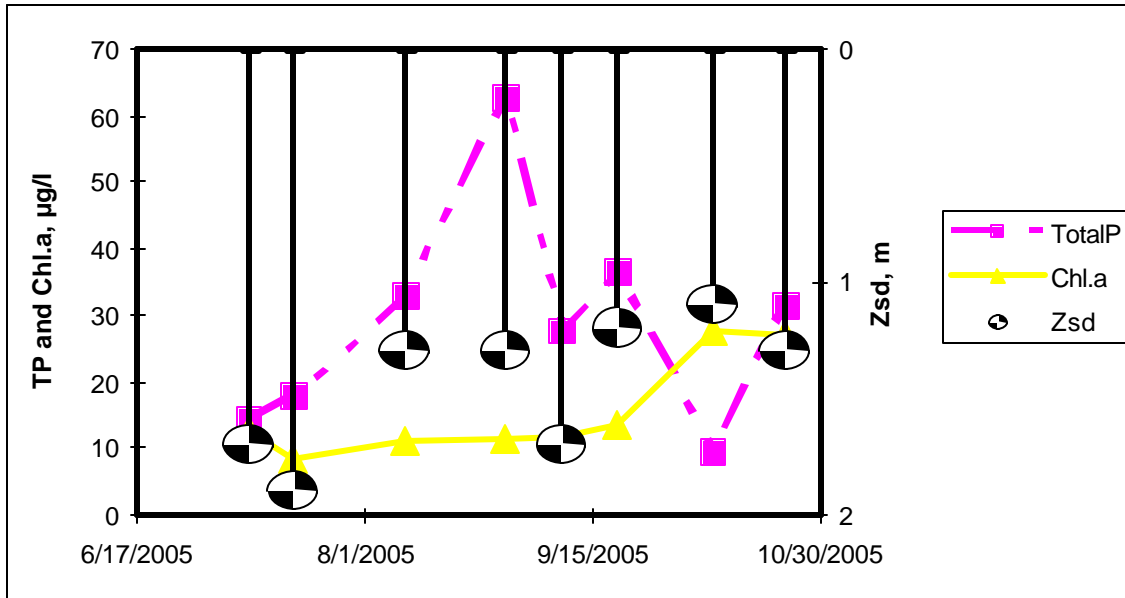


Figure 16. 2005 Eutrophication Data for Melody Lake

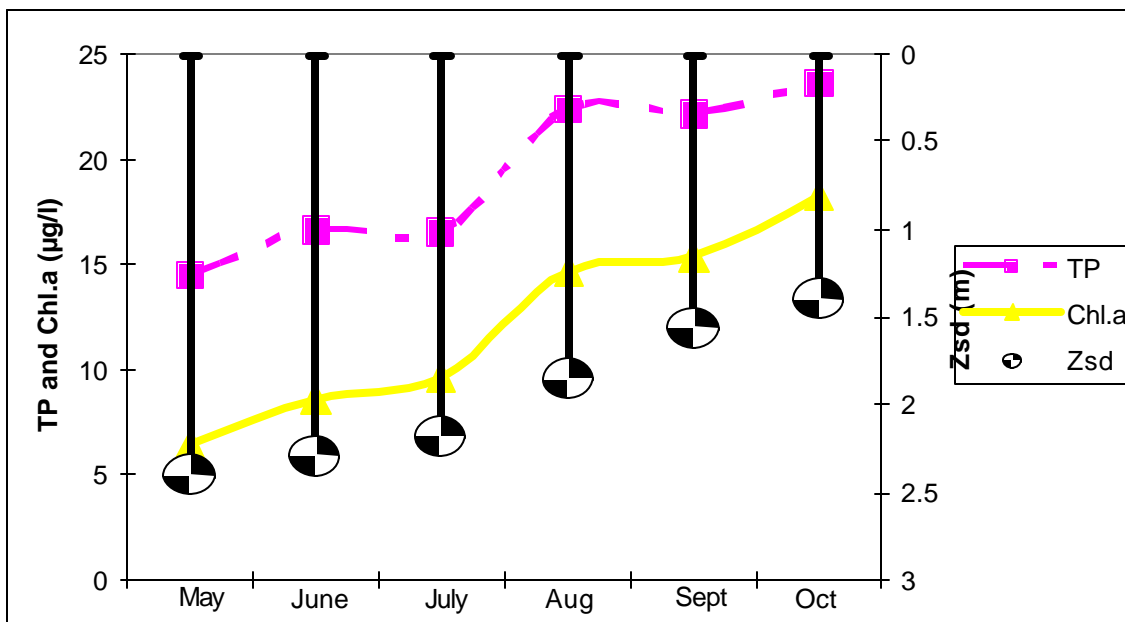


Figure 17- Eutrophication Data in a Typical (Monthly Mean) Year for Melody Lake

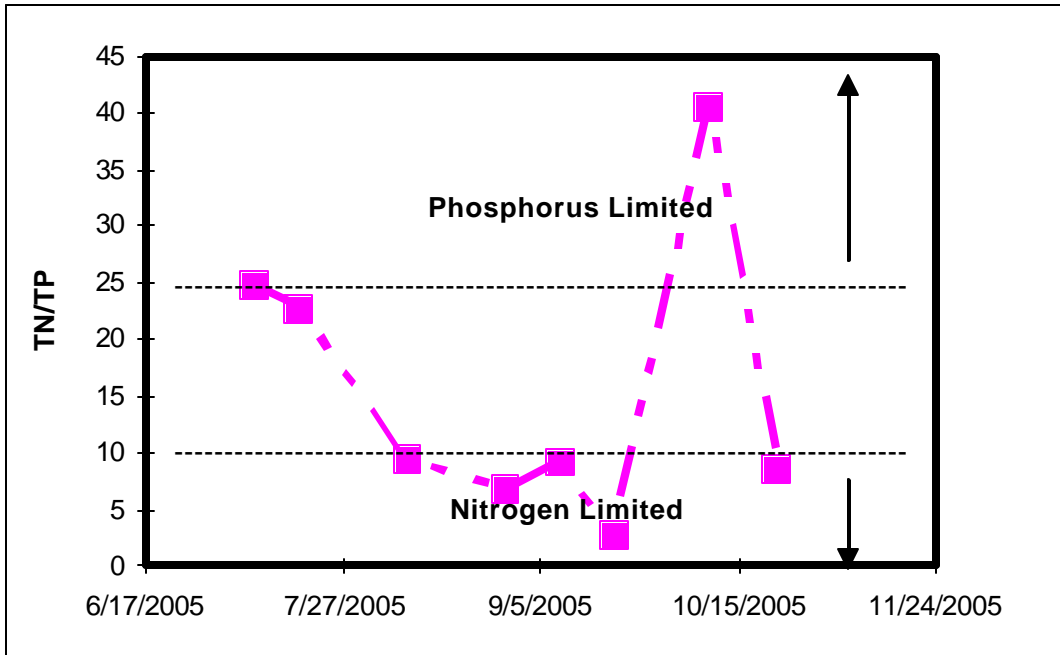


Figure 18. 2005 Nitrogen to Phosphorus Ratios for Melody Lake

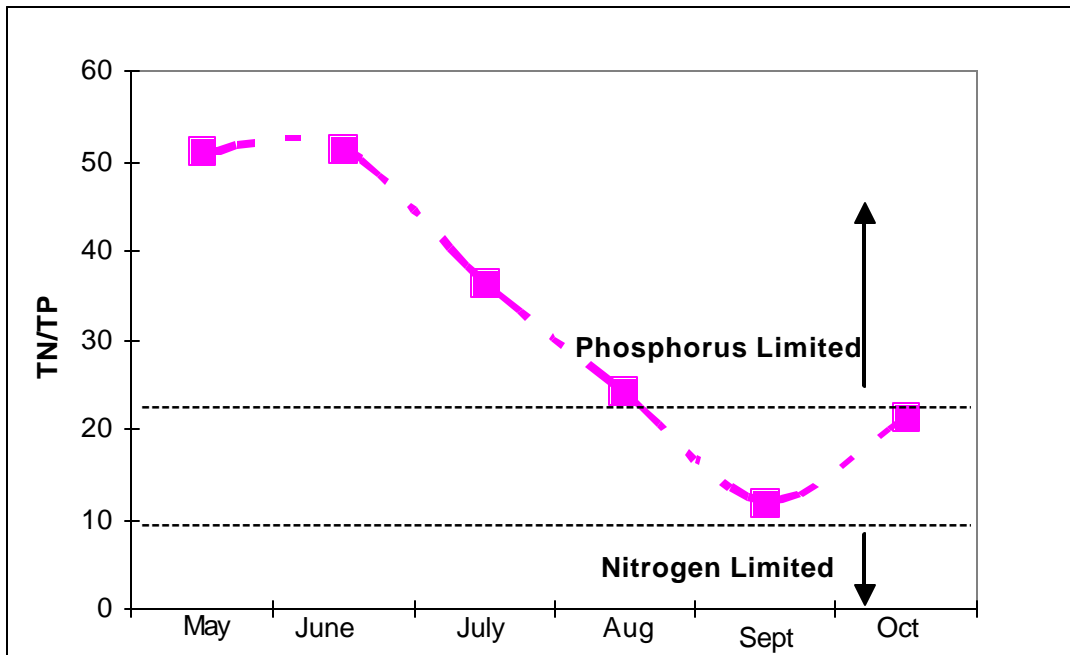


Figure 19- Nitrogen to Phosphorus Ratios in a Typical (Monthly Mean) Year for Melody Lake

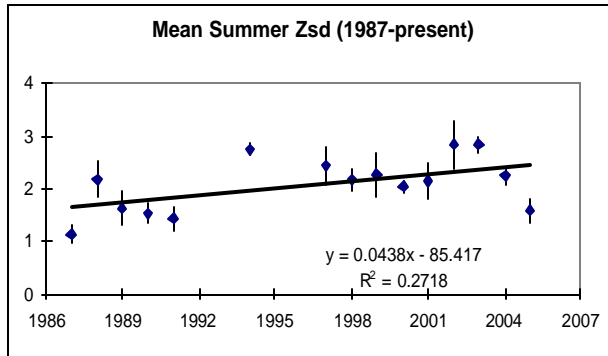


Figure 20. Annual Average Summer Water Clarity for Melody Lake

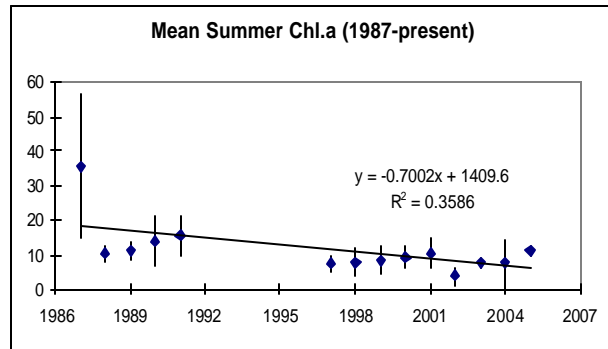


Figure 21. Annual Average Summer Chlorophyll a for Melody Lake

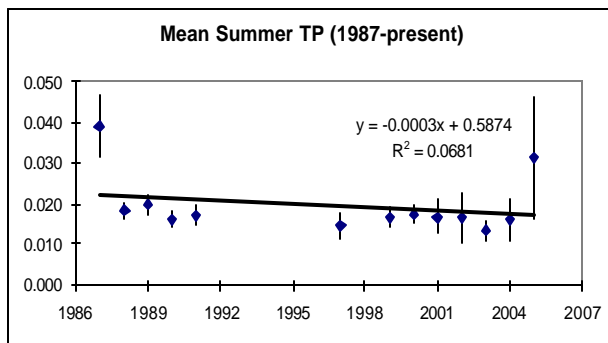


Figure 22. Annual Average Summer Total Phosphorus for Melody Lake

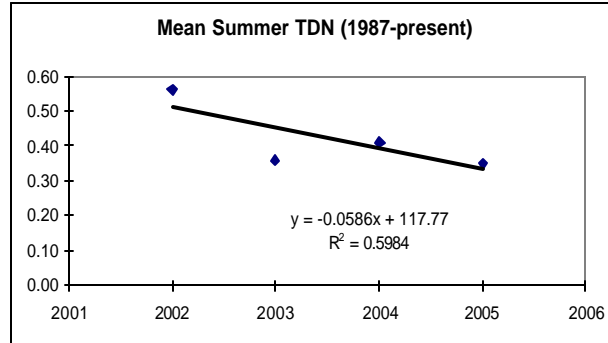


Figure 23. Annual Average Summer Total Nitrogen for Melody Lake

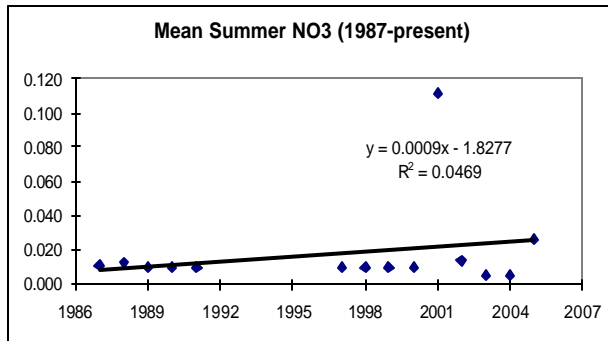


Figure 24. Annual Average Summer Nitrate for Melody Lake

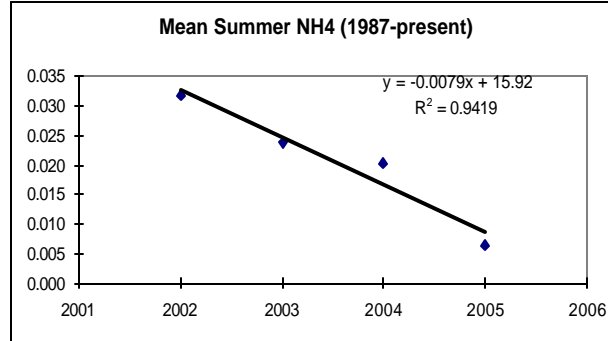


Figure 25. Annual Average Summer Ammonia for Melody Lake

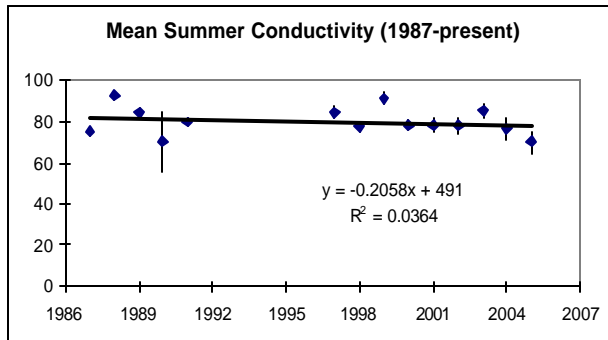


Figure 26. Annual Average Summer Conductivity for Melody Lake

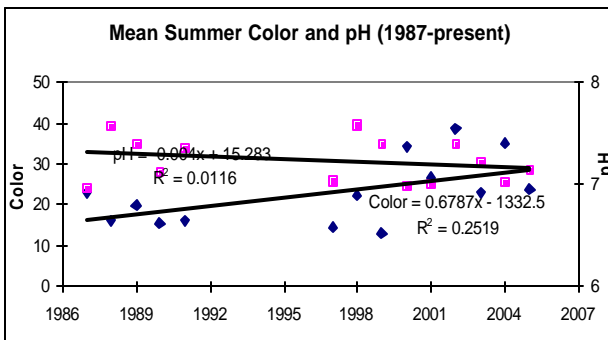


Figure 27. Annual Average Summer pH and Color for Melody Lake

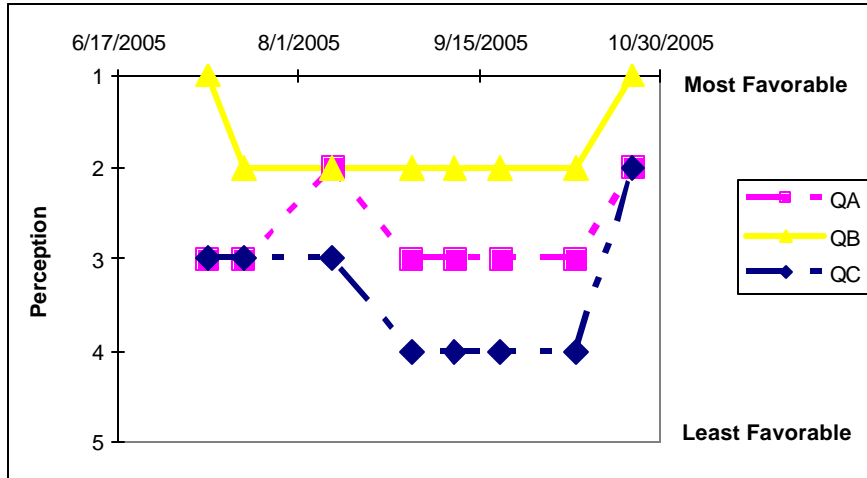


Figure 28. 2005 Lake Perception Data for Melody Lake

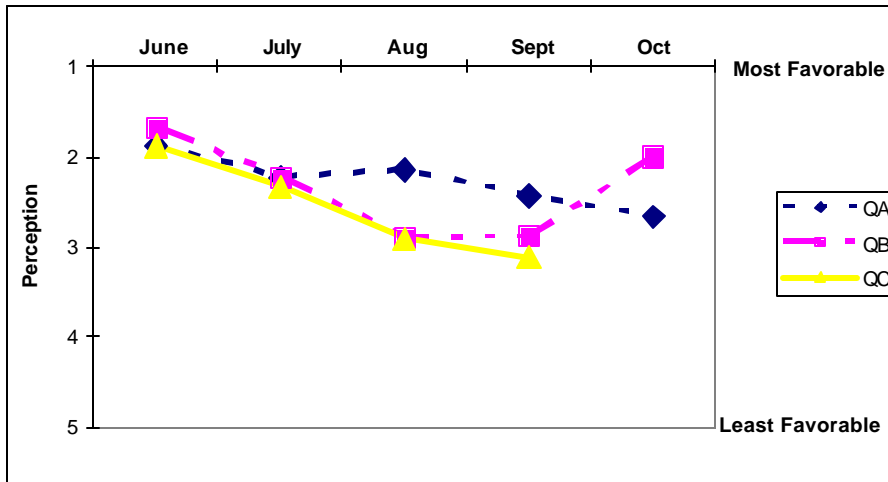


Figure 29- Lake Perception Data in a Typical (Monthly Mean) Year for Melody Lake

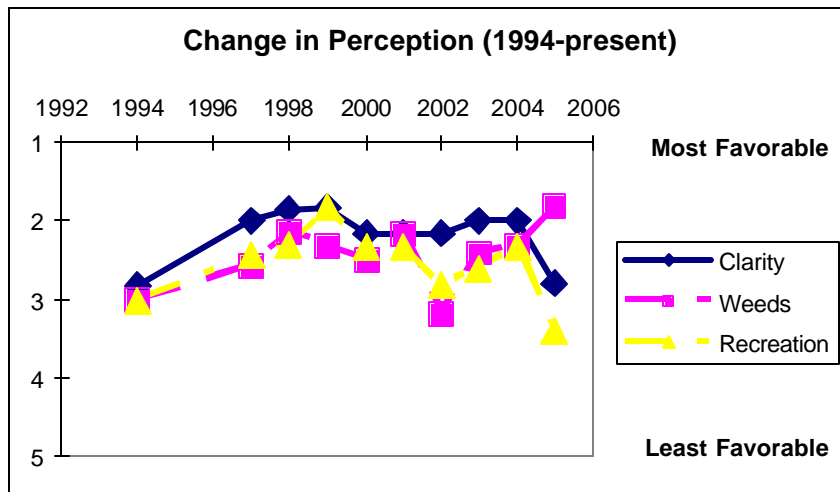


Figure 30- Annual Average Lake Assessments for Melody Lake

(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)

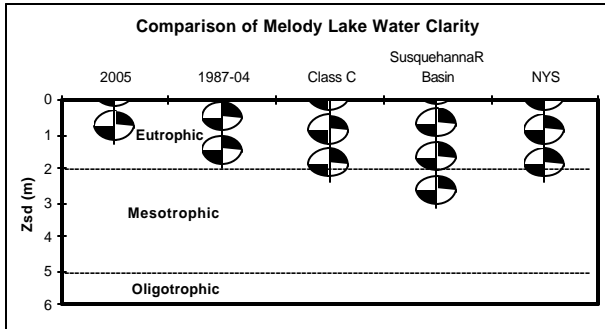


Figure 31. Comparison of 2005 Secchi Disk Transparency to Lakes With the Same Water Quality Classification, Neighboring Lakes, and Other CSLAP Lakes in 2005

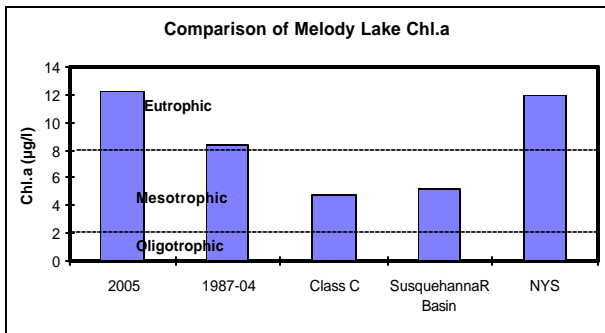


Figure 32. Comparison of 2005 Chlorophyll a to Lakes with the Same Water Quality Classification, Neighboring Lakes, and Other CSLAP Lakes in 2005

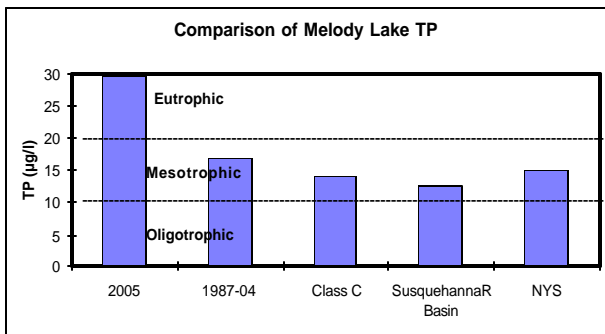


Figure 33. Comparison of 2005 Total Phosphorus to Lakes With the Same Water Quality Classification, Neighboring Lakes, and Other CSLAP Lakes in 2005

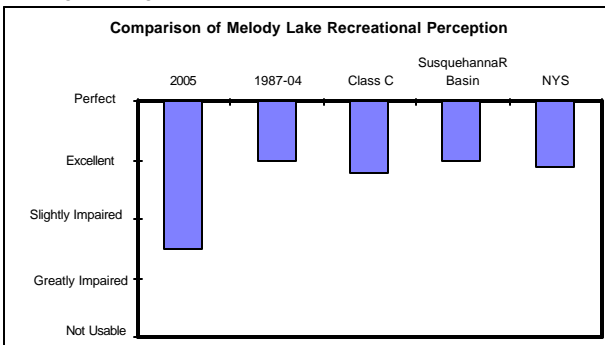


Figure 34. Comparison of 2005 Recreational Perception

How does Melody Lake compare to other lakes?

Annual Comparison of Median Readings for Eutrophication Parameters and Recreational Assessment For Melody Lake in 2005 to Historical Data for Melody Lake, 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 Melody Lake-in 2005, 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 noted 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 data base for some regions of the state preclude a comprehensive comparison to neighboring lakes.

Based on these graphs, the following conclusions can be made about Melody Lake in 2005:

- Using water clarity as an indicator, Melody Lake is more productive than other Class C lakes, other Susquehanna River basin lakes, and other NYS lakes.
- Using chlorophyll *a* concentrations as an indicator, Melody Lake is usually more productive than other Susquehanna River basin and other Class C lakes, and less productive than other NYS lakes, although in 2005, it was about as productive as the typical NYS lake.
- Using total phosphorus concentrations as an indicator, Melody Lake is more productive than other Class C lakes, other Susquehanna River basin lakes, and other NYS lakes.
- Using QC on the field observations form as an indicator, Melody Lake has been about as suitable for recreation as other Class C lakes, other Susquehanna River basin lakes, and other NYS lakes, although in 2005, it was less suitable for recreational than other lakes in these groups.

VI: PRIORITY WATERBODY AND IMPAIRED WATERS LIST

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 of which are 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 and 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 five 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. 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.

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

<u>Parameter</u>	<u>Acceptable Level</u>	<u>To Protect.....</u>
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) are 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 since 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; while 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

pH readings fell below the lower water quality standard (=6.5) during two sampling sessions (in 1997 and 2001), but there is no evidence that pH is an ecological concern for Melody Lake. The phosphorus guidance value for NYS lakes (=0.020 mg/l) was exceeded during about 35% of the CSLAP sampling sessions at Melody Lake, including the last 3 in 2004 and 5 of the last 6 in 2005. Water transparency readings have fallen below the minimum recommended water clarity for swimming beaches (= 1.2 meters) during less than 10% of the CSLAP sampling sessions, but one once since 1991 (however, this was in 2005). It is not known if any of the narrative water quality standards listed in Table 3 have been violated at Melody Lake.

Melody Lake is presently among the lakes listed on the Susquehanna River Basin PWL. *Recreation and aesthetics* are listed as *stressed*, with the following narrative listed in the 1999 PWL report:

“Recreational uses (swimming, fishing, boating) in Ellis/Melody Pond are considered stressed by occasional algal blooms, high nutrient loads and excessive weed growth”

The CSLAP dataset prior to 2004, including water chemistry data, physical measurements, and volunteer samplers’ perception data, suggest that these listings appeared to be warranted at one time though not in recent years. However, changes in the last two years suggest that recreational impacts associated with nuisance weed growth (and to a lesser extent poor water clarity) have reoccurred. The next Susquehanna River basin PWL evaluation will likely occur by 2006.

VI: 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 which 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 CSLAP 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”, since there is insufficient information available through CSLAP to assess if 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 *bold* in this “considerations” section.

The primary focus of CSLAP monitoring is to evaluate lake condition and impacts associated with lake eutrophication. Since 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, since 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.

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. **The Melody Lake Association promotes and can attest to the effectiveness of dye testing and septic tank pumping, and only allows sealed tanks to be used.**
- 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 Reducing the Impacts of Stormwater Runoff 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 Controlling Agricultural Nonpoint Source Water Pollution in New York State. 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. **The lake association encourages the use of soil erosion practices through their newsletter.**

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. **Setback requirements are required by deed and the county health department code.**

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” at 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. **The lake association encourages, with some effectiveness, planting buffer strips between lawn and shoreline, and eliminating or restricting the use of lawn fertilizers.**

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. **The lack of large motorboat activity on Melody Lake (only electric motors have been allowed at the lake since 1964) has probably minimized the problem of shoreline erosion.**

Do not discard or introduce plants from one water source to another, or deliberately introduce a "new" species from 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 to 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.

SPECIFIC CONSIDERATIONS FOR MELODY LAKE

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 that water clarity readings are sufficient to support most uses of the lake, **a continuation of improvements noted in recent years. While**

copper sulfate was applied in 1964 and 1974, it is no longer allowed. This places the focus of water clarity management on maintaining present conditions. 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.

IT IS ASSUMED THAT THE INCREASE IN PHOSPHORUS CONCENTRATIONS, AND RESULTING INCREASING IN ALGAE LEVELS AND DECREASE IN WATER CLARITY, WAS THE RESULT OF DROPPING WATER LEVEL AND LEAKAGE IN THE DAM. IF THE DROP IN WATER CLARITY AND RECREATIONAL IMPACTS ASSOCIATED WITH THIS LOWER CLARITY, PERSISTS BEYOND THE REPAIR OF THE DAM, ADDITIONAL MEASURES MAY BE REQUIRED TO REDUCE NUTRIENT LOADING TO THE LAKE.

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; however, it is not yet known if the higher weed densities (and resulting use impairments) represent a return to conditions prior to 1994 or an anomaly that will not be repeated in future years. 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.

-Naturally occurring biological controls - may include native species of *aquatic weevils and moths* which eat aquatic plants. These organisms feed on Eurasian watermilfoil, and control nuisance plants in some Finger Lakes and throughout the Northeast. However, they also inhabit other lakes with varied or undocumented effectiveness for the long term. Because these organisms live in the canopy of weed beds and feed primarily on the top of the plants, harvesting may have severe negative impact on the population. Research is on-going about their natural occurrence, and as to their effectiveness both as a natural or deliberately- introduced control mechanism for Eurasian watermilfoil. **It is not known by the report authors if any herbivorous insects are indigenous to Melody 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.

-If you have a small amount of nuisance plant growth you may want to consider the following:

-Hand harvesting is a very labor-intensive means for controlling weed populations. If only a very small number of nuisance plant stems exist, this may be the best means of control, removing the roots and stems of the entire plant, and disposing properly before they propagate into larger, uncontrollable beds that become the obnoxious neighbors of beneficial native plants.

-Benthic barriers are small opaque mats (usually constructed from plastic, burlap, or other materials) anchored down on top of plants to prevent sunlight from reaching the plants, thus eventually killing the plants. These are limited to only small areas, and the mats must be anchored and perforated to prevent gas bubbles from dislodging the mats.

Appendix A. Raw Data for Melody Lake

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
31	Melody L	6/12/1987	3.0	1.50	1.5	0.023	0.01				22	7.75	62		17.70
31	Melody L	6/21/1987	2.5	1.30	1.5	0.034	0.01				23	7.32	71		15.30
31	Melody L	6/28/1987	2.5	1.30	1.5	0.039	0.01				24	6.70	77		34.00
31	Melody L	7/5/1987	2.5	1.50	1.5	0.044	0.01				23	6.80	76		
31	Melody L	7/12/1987	2.5	1.35	1.5	0.029	0.01				21	6.92	77		23.70
31	Melody L	7/19/1987	2.5	1.05	1.5	0.015	0.01				23	6.92	76		27.40
31	Melody L	7/26/1987	2.5	1.35	1.5	0.030	0.01				26	7.25	77		18.60
31	Melody L	8/3/1987	2.5	1.00	1.5	0.039	0.01				23	6.97	74		32.60
31	Melody L	8/9/1987	2.8	1.35	1.5	0.040	0.01				23	6.98	76		25.90
31	Melody L	8/16/1987	2.5	0.75	1.5	0.069	0.01				23				106.00
31	Melody L	8/23/1987	2.5	0.65	1.5	0.048	0.01				24	6.89	74		
31	Melody L	8/30/1987	2.5	0.95	1.5	0.044	0.01				20	7.24	71		
31	Melody L	9/13/1987	2.8	1.20	1.5	0.036	0.02					7.19	76		
31	Melody L	9/20/1987	2.9	1.00	1.5	0.031	0.02					6.79	82		
31	Melody L	9/27/1987	3.3	1.20	1.5	0.016	0.01					6.89	82		
31	Melody L	10/4/1987	3.5	1.60	1.5	0.027	0.01					7.24	81		0.40
31	Melody L	6/17/1988	4.5	2.88	1.5	0.020	0.01				19	7.70	94		5.18
31	Melody L	6/26/1988	4.0	2.00	1.5	0.016					18	7.58	88		8.73
31	Melody L	7/3/1988	3.0	1.35	1.5	0.019					16	7.60	98		12.00
31	Melody L	7/10/1988	4.3	2.35	1.5	0.014					15	7.83	93		4.29
31	Melody L	7/17/1988	4.5	3.10	1.5	0.017	0.01				15	7.61	89		5.55
31	Melody L	7/24/1988	4.5	3.00	1.5	0.016					16	7.79	91		6.29
31	Melody L	7/29/1988	4.5	2.75	1.5	0.014	0.01				15				6.44
31	Melody L	8/7/1988	4.5	2.00	1.5	0.013	0.03				16	8.24	87		15.60
31	Melody L	8/14/1988	2.3	2.30	1.5	0.016					10	7.41	87		10.40
31	Melody L	8/21/1988	2.5	2.55	1.5	0.020					22	7.74	97		8.26
31	Melody L	8/28/1988	4.5	1.45	1.5	0.025	0.01				18	7.60	97		16.30
31	Melody L	9/4/1988	4.5	1.35	1.5	0.025	0.01				15	7.58	94		15.50
31	Melody L	9/11/1988	4.5	1.40	1.5	0.022	0.01				14	7.07	95		15.50
31	Melody L	9/18/1988	4.5	1.60	1.5	0.021	0.01				12	7.54	95		14.20
31	Melody L	9/25/1988	4.5	2.00	1.5	0.020	0.01				14	7.90	100		13.40
31	Melody L	7/2/1989	4.5	2.60	1.5	0.017					26	6.88	83		8.50
31	Melody L	7/9/1989	4.5	2.45	1.5	0.015					22	7.47	82		7.79
31	Melody L	7/16/1989	4.5	2.25	1.5	0.016					25	7.21	80		6.16
31	Melody L	7/23/1989	4.5	1.80	1.5	0.018					25	7.39	81		7.98
31	Melody L	7/26/1989			1.5	0.021	0.01				23	7.29	84		6.73
31	Melody L	7/30/1989	4.3	1.65	1.5	0.024	0.01				17	7.71	85		7.03
31	Melody L	8/5/1989	4.3	1.25	1.5	0.018					17	7.54	85		9.75
31	Melody L	8/13/1989	4.3	1.35	1.5	0.017					20	7.58	86		11.30
31	Melody L	8/20/1989	4.5	1.30	1.5	0.029					15	7.85	86		14.20
31	Melody L	8/27/1989	4.5	1.35	1.5	0.018	0.01				15	7.77	89		11.60
31	Melody L	9/4/1989	4.5	0.90	1.5	0.022					17	7.45	89		19.20
31	Melody L	9/10/1989	4.3	1.00	1.5	0.022					17	7.66	89		22.20
31	Melody L	9/17/1989	4.4	1.05	1.5	0.019					17	7.59	90		15.90
31	Melody L	9/24/1989	4.5	1.05	1.5	0.026	0.03				22	7.51	91		18.40
31	Melody L	7/8/1990	4.5	1.70	1.5	0.017	0.01				15	7.39	82		12.90
31	Melody L	7/15/1990	4.5	1.50	1.5	0.017					18	6.99	82		8.32
31	Melody L	7/29/1990	4.5	1.55	1.5	0.012	0.01				15	7.93	83		5.78
31	Melody L	8/12/1990	4.5	1.35	1.5	0.015					13	7.85	84		11.20
31	Melody L	8/26/1990	4.5	1.90	1.5	0.021	0.01				14	6.61	38		32.50

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
31	Melody L	9/9/1990	4.5	1.25	1.5	0.016					16	7.49	52		12.70
31	Melody L	9/23/1990	4.5	1.30	1.5	0.019	0.01				15	7.42	86		22.60
31	Melody L	6/16/1991	4.5	1.70	1.5	0.016	0.01				24	6.99	75		12.60
31	Melody L	6/30/1991	4.5	1.95	1.5	0.013					17	7.75	77		7.03
31	Melody L	7/14/1991	4.2	1.55	1.5	0.021	0.01				13	7.13	79		9.58
31	Melody L	7/28/1991	4.2	1.20	1.5	0.014					15	7.61	79		17.20
31	Melody L	8/11/1991	4.2	0.95	1.5	0.020					17	7.42	81		22.70
31	Melody L	8/25/1991	4.2	1.35	1.5	0.014	0.01				15	7.44	83		9.95
31	Melody L	9/15/1991	4.3	1.40	1.5	0.021					12	7.75	85		29.00
31	Melody L	9/22/1991	4.3	1.30	1.5	0.022	0.01				6	7.66	86		26.20
31	Melody L	6/18/1994	4.3	2.95											
31	Melody L	7/3/1994	4.3	2.50											
31	Melody L	7/18/1994	4.3	2.80											
31	Melody L	7/31/1994	4.3	2.80											
31	Melody L	8/14/1994	4.3	2.80											
31	Melody L	8/28/1994	4.3	2.60											
31	Melody L	6/1/1997	4.8	2.35	1.5	0.018	0.04				20	7.06	77		12.40
31	Melody L	6/15/1997	4.2	3.05	1.5	0.011	0.01				15	7.46	78		4.14
31	Melody L	6/29/1997	4.4	3.00	1.5	0.010	0.01				15	7.62	81		4.14
31	Melody L	7/13/1997		2.33	1.5	0.024	0.01				15	6.84	84		5.73
31	Melody L	7/27/1997	4.3	2.65		0.014	0.01				15	6.43	89		7.14
31	Melody L	8/10/1997	4.2	2.53	1.5	0.011	0.01				14	7.71	87		5.94
31	Melody L	8/24/1997	4.2	1.65	1.5	0.016	0.01				12	7.56	87		14.40
31	Melody L	9/8/1997	4.1	1.95	1.5	0.017	0.01				15	7.69	88		9.98
31	Melody L	5/30/1998	4.2	2.38	1.5	0.010	0.01				16	7.70	76		1.58
31	Melody L	6/15/1998	4.3	2.73	1.5	0.020	0.01				19	7.74	74		8.59
31	Melody L	6/28/1998	4.3	2.05	1.5		0.01				14	7.74	77		5.65
31	Melody L	7/12/1998	4.4	1.90	1.5		0.01				25	7.68	74		6.27
31	Melody L	7/26/1998	4.3	2.35	1.5		0.01				24	7.58	77		4.41
31	Melody L	8/8/1998	4.3	2.30	1.5		0.01				24	7.60	78		4.14
31	Melody L	8/23/1998	4.3	2.10	1.5						25	7.40	79		6.60
31	Melody L	9/7/1998	4.2	1.80	1.5	0.018					24	7.47	82		20.30
31	Melody L	5/31/1999	4.5	2.88	1.5	0.015	0.01				16	7.43	87		4.98
31	Melody L	6/13/1999	4.4	2.60	1.5	0.013	0.01				16	6.61	88		4.32
31	Melody L	6/29/1999	4.3	3.20	1.5	0.014	0.01				11	7.63	88		3.20
31	Melody L	7/11/1999	4.5	2.30	1.5	0.016	0.01				17	6.77	89		17.50
31	Melody L	7/26/1999	4.4	2.48	1.5	0.014	0.01				12	8.43	88		7.15
31	Melody L	8/7/1999	4.3	1.60	1.5	0.022	0.01				2	7.61	93		4.03
31	Melody L	8/22/1999	4.2	1.90	1.5	0.019	0.01				18	8.00	95		12.60
31	Melody L	9/5/1999	4.2	2.15	1.5	0.014	0.01				17	7.82	96		5.85
31	Melody L	5/29/2000	4.1	1.90	1.5	0.018	0.01				35	7.41	69		4.45
31	Melody L	6/12/2000	4.0	1.90	1.5	0.016	0.01				31	7.80	70		5.65
31	Melody L	6/25/2000	4.0	1.90	1.5	0.014	0.01				37	7.94	74		5.40
31	Melody L	7/10/2000	4.3	2.00	1.5	0.015	0.01				37	7.77	77		9.95
31	Melody L	7/23/2000	4.0	1.90	1.5	0.021	0.01				34	6.64	75		18.40
31	Melody L	8/7/2000	4.0	2.20	1.5	0.017	0.01				33	7.02	79		8.35
31	Melody L	8/20/2000	3.9	1.90	1.5	0.017	0.01				34	7.40	80		7.50
31	Melody L	9/9/2000	4.1	2.30	1.5	0.021	0.01				30	6.66	84		7.30
31	Melody L	6/12/2001	4.2	2.55	1.5	0.014	0.01				17	7.36			7.30
31	Melody L	6/24/2001	4.2	1.60	1.5	0.028	0.37				30	6.83	72		14.10
31	Melody L	7/9/2001	3.9	2.10	1.5	0.017	0.20				26	7.07	76		17.60
31	Melody L	7/23/2001	3.9	2.10	1.5	0.015	0.07				22	7.43	77		7.50

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD	TSS
31	Melody L	6/12/1987	3.0	1.50	1.5	1	17	19					
31	Melody L	6/21/1987	2.5	1.30	1.5	1	22	24					
31	Melody L	6/28/1987	2.5	1.30	1.5	1	18	22					
31	Melody L	7/5/1987	2.5	1.50	1.5	1	21	23					
31	Melody L	7/12/1987	2.5	1.35	1.5	1	26	25					
31	Melody L	7/19/1987	2.5	1.05	1.5	1	28	24					
31	Melody L	7/26/1987	2.5	1.35	1.5	1	20	25					
31	Melody L	8/3/1987	2.5	1.00	1.5	1	22	24					
31	Melody L	8/9/1987	2.8	1.35	1.5	1	17	23					
31	Melody L	8/16/1987	2.5	0.75	1.5	1	25	22					
31	Melody L	8/23/1987	2.5	0.65	1.5	1	15	21					
31	Melody L	8/30/1987	2.5	0.95	1.5	1	13	17					
31	Melody L	9/13/1987	2.8	1.20	1.5	1	17	20					
31	Melody L	9/20/1987	2.9	1.00	1.5	1	11	15					
31	Melody L	9/27/1987	3.3	1.20	1.5	1	11	14					
31	Melody L	10/4/1987	3.5	1.60	1.5	1	3	11					
31	Melody L	6/17/1988	4.5	2.88	1.5	1	24	22					
31	Melody L	6/26/1988	4.0	2.00	1.5	1	15	23					
31	Melody L	7/3/1988	3.0	1.35	1.5	1	24	18					
31	Melody L	7/10/1988	4.3	2.35	1.5	1	28	26					
31	Melody L	7/17/1988	4.5	3.10	1.5	1	26	25					
31	Melody L	7/24/1988	4.5	3.00	1.5	1	24	24					
31	Melody L	7/29/1988	4.5	2.75	1.5	1	30	25					
31	Melody L	8/7/1988	4.5	2.00	1.5	1	22	26					
31	Melody L	8/14/1988	2.3	2.30	1.5	1	30	26					
31	Melody L	8/21/1988	2.5	2.55	1.5	1	20	24					
31	Melody L	8/28/1988	4.5	1.45	1.5	1	25	23					
31	Melody L	9/4/1988	4.5	1.35	1.5	1	16	19					
31	Melody L	9/11/1988	4.5	1.40	1.5	1	15	19					
31	Melody L	9/18/1988	4.5	1.60	1.5	1	20	17					
31	Melody L	9/25/1988	4.5	2.00	1.5	1	15	16					
31	Melody L	7/2/1989	4.5	2.60	1.5	1	34	23					
31	Melody L	7/9/1989	4.5	2.45	1.5	1	32	25					
31	Melody L	7/16/1989	4.5	2.25	1.5	1	20	23					
31	Melody L	7/23/1989	4.5	1.80	1.5	1	22	25					
31	Melody L	7/26/1989			1.5	1							
31	Melody L	7/30/1989	4.3	1.65	1.5	1	22	23					
31	Melody L	8/5/1989	4.3	1.25	1.5	1	26	24					
31	Melody L	8/13/1989	4.3	1.35	1.5	1	23	21					
31	Melody L	8/20/1989	4.5	1.30	1.5	1	19	22					
31	Melody L	8/27/1989	4.5	1.35	1.5	1	21	23					
31	Melody L	9/4/1989	4.5	0.90	1.5	1	14	20					
31	Melody L	9/10/1989	4.3	1.00	1.5	1	25	21					
31	Melody L	9/17/1989	4.4	1.05	1.5	1	18	16					
31	Melody L	9/24/1989	4.5	1.05	1.5	1	7	15					
31	Melody L	7/8/1990	4.5	1.70	1.5	1	21	22					
31	Melody L	7/15/1990	4.5	1.50	1.5	1	25	22					
31	Melody L	7/29/1990	4.5	1.55	1.5	1	28	27					
31	Melody L	8/12/1990	4.5	1.35	1.5	1	22	23					
31	Melody L	8/26/1990	4.5	1.90	1.5	1	19	21					
31	Melody L	9/9/1990	4.5	1.25	1.5	1	15	20					
31	Melody L	9/23/1990	4.5	1.30	1.5	1	11	15					
31	Melody L	6/16/1991	4.5	1.70	1.5	1	24	22					
31	Melody L	6/30/1991	4.5	1.95	1.5	1	22	25					
31	Melody L	7/14/1991	4.2	1.55	1.5	1	22	27					
31	Melody L	7/28/1991	4.2	1.20	1.5	1	30	25					
31	Melody L	8/11/1991	4.2	0.95	1.5	1	21	21					

LNum	PName	Date	Zbot	Zsd	Zsamp	QaQc	TAir	TH20	QA	QB	QC	QD	TSS
31	Melody L	8/25/1991	4.2	1.35	1.5	1	23	24					
31	Melody L	9/15/1991	4.3	1.40	1.5	1	20	20					
31	Melody L	9/22/1991	4.3	1.30	1.5	1	12	17					
31	Melody L	6/18/1994	4.3	2.95					2	3	3	2	
31	Melody L	7/3/1994	4.3	2.50					3	3	3	2	
31	Melody L	7/18/1994	4.3	2.80					3	3	3	2	
31	Melody L	7/31/1994	4.3	2.80					3	3	3	3	
31	Melody L	8/14/1994	4.3	2.80					3	3	3	3	
31	Melody L	8/28/1994	4.3	2.60					3	3	3	3	
31	Melody L	6/1/1997	4.8	2.35	1.5	1	19	18	1	1	2	5	
31	Melody L	6/15/1997	4.2	3.05	1.5	1	25	25		2	2	1	
31	Melody L	6/29/1997	4.4	3.00	1.5	1	29	27	2	2	1		
31	Melody L	7/13/1997		2.33	1.5	1	32	26	2	1	2		
31	Melody L	7/27/1997	4.3	2.65		1	29	26	2	3	2		
31	Melody L	8/10/1997	4.2	2.53	1.5	1	29	26	2	3	3	2	
31	Melody L	8/24/1997	4.2	1.65	1.5	1	23	22	2	3	3	2	
31	Melody L	9/8/1997	4.1	1.95	1.5	1	18	21	2	4	4	2	
31	Melody L	5/30/1998	4.2	2.38	1.5	1	25	25	2	2	2	25	
31	Melody L	6/15/1998	4.3	2.73	1.5	1	19	20	1	1	1		
31	Melody L	6/28/1998	4.3	2.05	1.5	1	32	27	2	1	2	5	
31	Melody L	7/12/1998	4.4	1.90	1.5	1	21	24	2	2	2		
31	Melody L	7/26/1998	4.3	2.35	1.5	1	25	25	2	2	2	2	
31	Melody L	8/8/1998	4.3	2.30	1.5	1	27	26	2	3	3	2	
31	Melody L	8/23/1998	4.3	2.10	1.5	1	28	25	2	3	3	2	
31	Melody L	9/7/1998	4.2	1.80	1.5	1	17	23	2	3	3	25	
31	Melody L	5/31/1999	4.5	2.88	1.5	1	32	23	2	2	2		
31	Melody L	6/13/1999	4.4	2.60	1.5	1	27	24	2	2		25	
31	Melody L	6/29/1999	4.3	3.20	1.5	1	29	26	2	2	2		
31	Melody L	7/11/1999	4.5	2.30	1.5	1	22	25	2	1	1		
31	Melody L	7/26/1999	4.4	2.48	1.5	1	27	27	1	2	2		
31	Melody L	8/7/1999	4.3	1.60	1.5	1	27	25	2	3	2	2	
31	Melody L	8/22/1999	4.2	1.90	1.5	1	26	23	2	3	2		
31	Melody L	9/5/1999	4.2	2.15	1.5	1	27	26	2	3	2		
31	Melody L	5/29/2000	4.1	1.90	1.5	1	20	18	2	2	2		
31	Melody L	6/12/2000	4.0	1.90	1.5	1	22	23	2	2	2		
31	Melody L	6/25/2000	4.0	1.90	1.5	1	32	25	2	2	2	2	
31	Melody L	7/10/2000	4.3	2.00	1.5	1	25	23	2	3	3	2	
31	Melody L	7/23/2000	4.0	1.90	1.5	1	25	21	2	2	2	2	
31	Melody L	8/7/2000	4.0	2.20	1.5	1	31	24	2	2	3	2	
31	Melody L	8/20/2000	3.9	1.90	1.5	1	19	22	2	3	2	5	
31	Melody L	9/9/2000	4.1	2.30	1.5	1	25	22	3	3	2		
31	Melody L	6/12/2001	4.2	2.55	1.5	1	25	23	2	1	2		
31	Melody L	6/24/2001	4.2	1.60	1.5	1	26	21	3	1	3	1	
31	Melody L	7/9/2001	3.9	2.10	1.5	1	25	23	2	1	1		
31	Melody L	7/23/2001	3.9	2.10	1.5	1	28	27	2	2	2		
31	Melody L	8/6/2001	3.9	2.90	1.5	1		28	2	3	3	2	
31	Melody L	8/25/2001	3.6	1.90	1.5	1	29	25	2	3	2	2	
31	Melody L	9/9/2001	3.5	2.30	1.5	1	26	24	2	3	3	2	
31	Melody L	9/23/2001	3.5	2.40	1.5	1	23	21	2	3	3	2	
31	Melody L	05/21/02	4.1	2.00	1.5	1	16	12	2	1		5	
31	Melody L	06/03/02	3.8	2.30	1.5	1	20	21	2	2	2	5	
31	Melody L	06/16/02	4.1	1.70	1.5	1	18	19	3	3	2	12	
31	Melody L	07/02/02	4.6	2.60		1	28	25	3	3	3	28	
31	Melody L	07/13/02	4.3	3.20	1.5	1	28	25	2	4	3	2	
31	Melody L	07/29/02	4.3	3.50	1.5	1	28	26	2	3	3	2	

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 (say arranging water clarity readings by date). Starting with the left-hand (say earliest date) pair, the number of times that the variable not ordered (in this case 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:

$$D > 3.29 = 0.05\% \text{ significance}$$

$$2.58 < D < 3.29 = 0.5\% \text{ significance}$$

$$1.96 < D < 2.58 = 2.5\% \text{ significance}$$

$$D < 1.96 = > 2.5\% \text{ significance}$$

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 if 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 (R 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). Since 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, since 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 appx. 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 forty 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) over the period of sampling (roughly corresponding to Δy). 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 MELODY LAKE

CSLAP Number	31
Lake Name	Melody L
First CSLAP Year	1987
Sampled in 2004?	yes
Latitude	422808
Longitude	755240
Elevation (m)	427
Area (ha)	15.5
Volume Code	16
Volume Code Name	Susquehanna River
Pond Number	39
Qualifier	none
Water Quality Classification	C
County	Cortland
Town	Willet
Watershed Area (ha)	500
Retention Time (years)	0.1138816
Mean Depth (m)	2.1
Runoff (m/yr)	0.571646341
Watershed Number	6
Watershed Name	Susquehanna River
NOAA Section	2
Closest NOAA Station	Cincinnatus
Closest USGS Gaging Station-Number	1510000
Closest USGS Gaging Station-Name	Otselic River at Cincinnatus
CSLAP Lakes in Watershed	Arnold L, Beaver L, Canadarago L, Chenango L, Craine L, Crooked L, Eatonbrook R, Echo L, Geneganslet L, Gorton L, Guilford L, Hatch L, L Gerry, L Moraine, L Warn, Lebanon R, Melody L, Petonia L, Plymouth R, Song L, White Birch L

APPENDIX E: AQUATIC PLANTS FOUND IN MELODY LAKE

SPECIES NAME: *Elodea nuttallii*

COMMON NAME: western waterweed, St. John waterweed, Nuttall's waterweed

ECOLOGICAL VALUE: Like all submergents, *Elodea* harbors aquatic insects, provides hiding, nurseries and spawning areas for amphibians and fish, and provides some food for waterfowl, including ducks and beaver. *E. nuttallii* provides wildfowl food of variable importance. This plant may suppress other plants under certain circumstances



DISTRIBUTION: usually in acidic to moderately alkaline softwater, soft-bottomed lakes from northern Maine and southern Quebec, west to Idaho, south to North Carolina, Mississippi, Oklahoma, and New Mexico.

DISTRIBUTION IN NEW YORK: common, particularly in slightly acidic or brackish waters, found most frequently along the Hudson River, the Catskills, and Long Island.

DEGREE OF NUISANCE: it may be frequent and common, but only occasionally is *Elodea* present at nuisance levels. Not surprisingly, the most abundant growth is found in shallow lakes, and the plant can form a dense canopy along the lake bottom only, since it does not often grow to the lake surface.

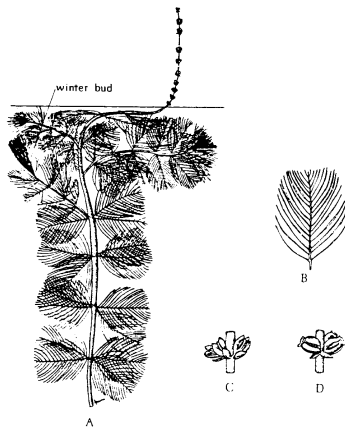
COMMENTS: *Elodea* is entirely submersed, often forming large masses near the lake bottom, typically in 3-12 feet of water. The stem pattern is similar to that of the *Potamogeton*, *Ruppia*, *Zanichellia*, *Najas*, *Callitriche*, and *Utricularia*. It is a member of the frogbit family (*Hydrocharitaceae*), along with *Vallisneria* and other genera. There are three species of this genus found in New York, one of which (*Elodea* or *Egeria densa*) is a common aquarium or laboratory plant that has been introduced and still persists in parts of Long Island. The genus was once known as *Anacharis* and *Philotria*. It produces tiny white flowers above the surface, but generally reproduces vegetatively. This species is distinguished from the slightly more common *Elodea canadensis* by its narrower leaves without a long, thread-like tube that reaches the surface in the *canadensis*.

Line drawing- <http://www.esu.edu/~jjewett/aquaticplants.html>

SPECIES NAME: *Myriophyllum spicatum*

COMMON NAME: Eurasian water milfoil

ECOLOGICAL VALUE: like most submergents, *Myriophyllum* harbors aquatic insects, provides hiding, nurseries, and spawning areas for amphibians and fish, and provides some food for waterfowl. However, *Myriophyllum spicatum* may dominate a water system, restricting boat traffic, recreational activities and water movement. While infestations of milfoil create favorable shelter for small fishes and invertebrates, they also commonly crowds out more desirable waterfowl plants



Myriophyllum spicatum: A. habit of submersed form with emergent inflorescence, $\times \frac{1}{2}$. B. leaf, $\times 1$. C. flower, $\times 2$. D. fruits, $\times 2$.

DISTRIBUTION IN UNITED STATES: locally abundant and aggressive from Quebec and New England west to Ontario, Michigan, Wisconsin, and British Columbia, south to Florida, Oklahoma, Texas, Washington, California, and Mexico (the range of this plant continues to increase each year)

DISTRIBUTION IN NEW YORK: found in increasing amounts throughout the State, except in the interior Adirondacks and the Long Island area (although it has recently been discovered in both locations)

DEGREE OF NUISANCE: like most exotics, *M. spicatum* establishes easily, and once established, often becomes the dominant plant in the macrophyte community, growing abundantly to nuisance levels

COMMENTS: while some species of *Myriophyllum* have earned a reputation for aggressive and opportunistic growth, most of the species in this genus are not nearly so robust, and often peacefully coexist with other submergent plants. The individual species within the *Myriophyllum* genus are superficially similar, so complete plants, including flowers (often pink) and fruits, are often needed for positive identification. The leaf structures and patterns of the milfoil closely resemble those of the *Ceratophyllum* (coontail) and *Utricularia* (bladderwort), and as a result, these plants are often confused for each other, particularly when viewed from a slight distance. Peak growth for most species is in mid-summer. *M. spicatum* is distinguished from other milfoils by having smaller flower-leaf structures on the emergent spike, flat-topped ends on the upper most submerged leaves, and red tips during the peak growing season and white to slightly pinkish stems. *Myriophyllum* spreads and reproduces vegetatively. This is one of the most discussed and well-known plants in the state, due to its propensity to form dense canopies that overwhelm the underlying native plant populations. Improved surveillance has greatly expanded the known range of this species within the state, though the range may have concurrently extended due to spread from boat traffic, waterfowl, and water transport from infected to uncontaminated lakes. Appropriate control strategies avoid excessive fragmentation.

SPECIES NAME: *Najas flexilis*

COMMON NAME: slender naiad, slender water nymph, bushy pondweed

ECOLOGICAL VALUE: like all submergents, *Najas* harbors aquatic insects, provides hiding, nurseries and spawning areas for amphibians and fish, and provides some food for waterfowl. However, *Najas* is thought to be the most important food for wildfowl and marshbirds, and also important for coots and turtles



DISTRIBUTION: common and widespread throughout the country, from Newfoundland west to Minnesota, Alberta, and British Columbia, south to Virginia, Ohio, Indiana, Iowa and Oregon

DISTRIBUTION IN NEW YORK: common to abundant in lakes and streams in all regions of the state

DEGREE OF NUISANCE: It may be frequent or common in many lakes, but only occasionally is *Najas* present at nuisance levels. *N. flexilis* is more likely to be present in nuisance proportions than other *Najas* species, with the possible exception of *N. minor*, which has become more prominent in NYS lakes in recent years.

COMMENTS: *Najas* is a member of the pondweed family (*Najadaceae*). It is distinguished from *Elodea* (which is in a different family but superficially resembles the *Najas*) by the latter's broadening at the base of the leaves, from *Zanichellia* by having seeds tapered to each end and not toothed down one side (and also having narrower, longer, and less crowded leaves), and from *Potamogeton* and *Ruppia* by having opposite, not alternative, leaves. There are seven species of *Najas*, all of which are found in New York State, two or three of which are relatively common. Specimen within and among species are highly variable, and usually require microscopes for positive identification (the teeth on the leaves that also characterize the plant are visible only through a lens in all but one species). One species of this genus, *Najas marina* (holly-leaved naiad), and one subspecies of this genus, *Najas guadalupensis* var. *olivacea* (unnamed naiad), are on the NYS Rare Native Plant list. This plant is highly variable in structure, proportions of leaves, and length of stem, ranging

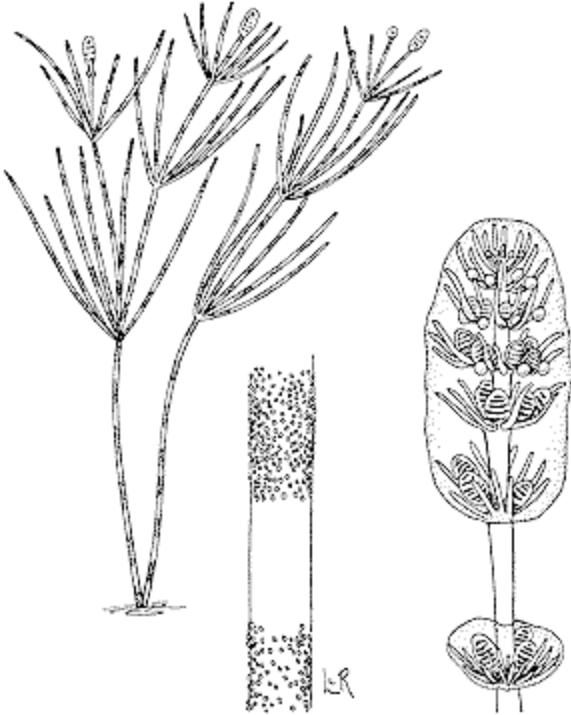
from long and slender to closely tufted. It is the most common *Najas* in New York state lakes.

Line drawing: http://www.awc-america.com/plant_id_utility/plants/najfle.html

GENUS NAME: *Nitella*

COMMON NAME: stonewort, muskgrass

ECOLOGICAL VALUE: *Nitella* is a multicellular green algae which attaches to bottom of lakes or ponds. It is considered by some biologists to be a desirable plant.



DISTRIBUTION: not reported, but common in shallow soft or acidic waters, probably widespread and common throughout the country

DISTRIBUTION IN NEW YORK: not reported, but probably common throughout the state.

DEGREE OF NUISANCE: it may be frequent and common in some lakes, and can occasionally outcompete other native plants, but rarely is *Nitella* present at nuisance levels

COMMENTS: *Nitella* is an alga with cylindrical whorled branches, with each joint of the stem consisting of a single algal cell. The plant is frequently found in shallow waters, but can grow in depths up to 8 meters. It can sometimes be distinguished by

hand lens from *Chara*, which belongs to the same algal family (*Characeae*), by a smooth, unlined appearance. *Nitella* also tends to be bushier, less bristly, and usually without the lime coating and foul smell found with *Chara*. It reproduces by fragmentation and sexually. There are nearly 35 species of this plant found in the United States, at least two species of which are found in New York State lakes.

Line drawing: http://www.ecy.wa.gov/programs/wq/plants/plantid2/drawings/drawing_nitella.html

SPECIES NAME: *Potamogeton amplifolius*

COMMON NAME: largeleaf pondweed, bass weed, muskie weed

ECOLOGICAL VALUE like most submergents, *Potamogeton* harbors aquatic insects, provides hiding, nurseries and spawning areas for amphibians and fish, and provides some food for waterfowl. The leaves are eaten by bluegills, while both the seeds and foliage are used for food by muskrats and waterfowl. *Potamogeton* is often a favorite food of wildfowl and eaten heavily by beaver, deer, and moose, sometimes eaten whole, and sometimes in parts (all species are edible). *Potamogeton* can soften water, removing lime and carbon dioxide and depositing marl. *P.amplifolius* provides shady cover for perch and bluegills. Snails are often found on the underside of leaves. This is also a particularly good duck food.



DISTRIBUTION: common in shallow and deep water from Nova Scotia west to British Columbia, south to Virginia, Georgia, Alabama, Arkansas, and Oklahoma, with scattered locations near the west coast. It is most abundant in the Great Lakes basin and northeast U.S.

DISTRIBUTION IN NEW YORK: common and often abundant in the deep water of lakes and streams throughout the state (except Long Island, perhaps due to water depth)

DEGREE OF NUISANCE: most of the *Potamogeton* species are native to New York, and only infrequently are present at nuisance levels. However, at least relative to other pondweeds, *P.amplifolius* occasionally grows in abundance, but rarely abundant at depths or locations necessary for nuisance conditions.

COMMENTS: *Potamogeton* is a highly variable genus within the pondweed family. Species within the genus often are characterized by two leaf types- firm floating leaves and thin emersed leaves. Many mature species have flowers borne in spikes (for wind pollination), conspicuous in early summer. Identification of the individual species can be extremely difficult, particularly among the narrow-leaved pondweeds. The *Potamogeton* are distinguished from the other genus within the pondweed family by having alternate leaves (unlike the *Zanichellia* and *Najas*), and by their presence in fresh or estuarine waters (unlike the *Zostera*). There are nearly 30 species found within New York State, some quite rare and others extremely common. *P.amplifolius* is considered (with *P. pectinatus* and *P. natans*) one of the major pondweeds for wildlife management

Line drawing: http://www.ecy.wa.gov/programs/wq/plants/plantid2/drawings/drawing_amplifolius.html

SPECIES NAME: *Potamogeton epihydrus*

COMMON NAME: leafy pondweed, ribbonleaf pondweed

ECOLOGICAL VALUE like most submergents, *Potamogeton* harbors aquatic insects, provides hiding, nurseries and spawning areas for amphibians and fish, and provides some food for waterfowl. The leaves are eaten by bluegills, while both the seeds and foliage are used for food by muskrats and waterfowl. *Potamogeton* is often a favorite food of wildfowl and eaten heavily by beaver, deer, and moose, sometimes eaten whole, and sometimes in parts (all species are edible). *Potamogeton* can soften water, removing lime and carbon dioxide and depositing marl. *P. epihydrus* is especially utilized for food by ducks and muskrats.



Potamogeton epihydrus
(Pondweed)
Illustration by T.C. Brayshaw

DISTRIBUTION: found in acidic and alkaline lakes, pools, and streams from Newfoundland and Labrador west to southern Manitoba and southern Alaska, south to western North Carolina, Tennessee, northern Mississippi, Colorado, and California. It is most abundant in New England and the northeast.

DISTRIBUTION IN NEW YORK: common and often abundant; widely distributed across the state, especially the Adirondacks region.

DEGREE OF NUISANCE: although *P. epihydrus* is common and often abundant in lakes, only occasionally is this plant present at nuisance levels.

COMMENTS: *Potamogeton* is a highly variable genus within the pondweed family. Species within the genus often are characterized by two leaf types—firm floating leaves and thin emersed leaves. Many mature species have flowers borne in spikes (for wind pollination), conspicuous in early summer. Identification of the individual species can be extremely difficult, particularly among the narrow-leaved pondweeds. The *Potamogeton* are distinguished from the other genus within the

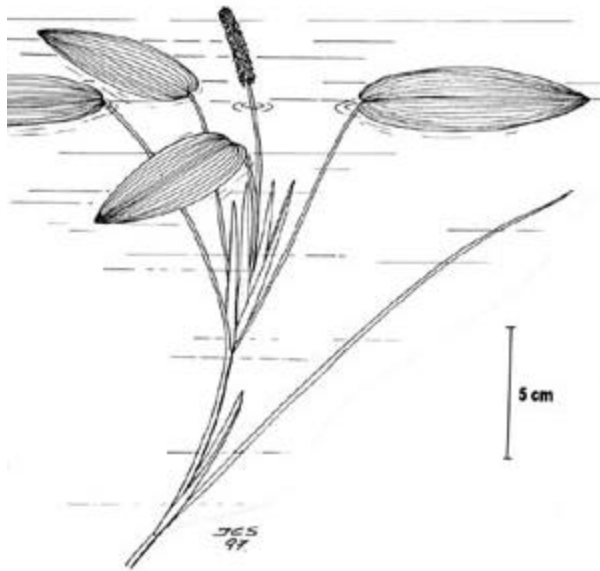
pondweed family by having alternate leaves (unlike the *Zanichellia* and *Najas*), and by their presence in fresh or estuarine waters (unlike the *Zostera*). There are nearly 30 species found within New York State, some quite rare and others extremely common. There are two major subvarieties of this species (var. *ramosus* and var. *epihydrus*), which can be differentiated only at the extremes of their appearance.

Line drawing: <http://www.royalbcmuseum.bc.ca/notes/underwat.html>

SPECIES NAME: *Potamogeton natans*

COMMON NAME: floating brownleaf pondweed, floating leaf pondweed, brownleaf pondweed

ECOLOGICAL VALUE: like most submergents, *Potamogeton* harbors aquatic insects, provides hiding, nurseries and spawning areas for amphibians and fish, and provides some food for waterfowl. The leaves are eaten by bluegills, while both the seeds and foliage are used for food by muskrats and waterfowl. *Potamogeton* is often a favorite food of wildfowl and eaten heavily by beaver, deer, and moose, sometimes eaten whole, and sometimes in parts (all species are edible). *Potamogeton* can soften water, removing lime and carbon dioxide and depositing marl.



DISTRIBUTION: extremely common, particularly in New England, and found from Newfoundland to Alaska, south to New Jersey, northern Indiana, Nebraska, Colorado, Arizona, and southern California.

DISTRIBUTION IN NEW YORK: common and often abundant in lakes and streams throughout the state, with limited occurrences only in the Catskill and Long Island.

DEGREE OF NUISANCE: *P. natans* may be common, but only occasionally is it present at nuisance levels.

COMMENTS: *Potamogeton* is a highly variable genus within the pondweed family. Species

within the genus often are characterized by two leaf types- firm floating leaves and thin emersed leaves. Many mature species have flowers borne in spikes (for wind pollination), conspicuous in early summer. Identification of the individual species can be extremely difficult, particularly among the narrow-leaved pondweeds. The *Potamogeton* are distinguished from the other genus within the pondweed family by having alternate leaves (unlike the *Zanichellia* and *Najas*), and by their presence in fresh or estuarine waters (unlike the *Zostera*). There are nearly 30 species found within New York State, some quite rare and others extremely common. *P. natans* is considered (with *P. pectinatus* and *P. amplifolius*) one of the major pondweeds for wildlife management.

Line drawing: <http://miljolare.no/aktiviteter/vann/natur/vn16/ferskvannsplanter.php>

SPECIES NAME: *Potamogeton zosteriformis*

COMMON NAME: flatstem pondweed, eelgrass pondweed

ECOLOGICAL VALUE: like most submergents, *Potamogeton* harbors aquatic insects, provides hiding, nurseries and spawning areas for amphibians and fish, and provides some food for waterfowl. The leaves are eaten by bluegills, while both the seeds and foliage are used for food by muskrats and waterfowl. *Potamogeton* is often a favorite food of wildfowl and eaten heavily by beaver, deer, and moose, sometimes eaten whole, and sometimes in parts (all species are edible). *Potamogeton* can soften water, removing lime and carbon dioxide and depositing marl. Sometimes *P. zosteriformis* is good duck food, but this plant does not generally support insects.

DISTRIBUTION: found in mostly alkaline lakes from Quebec west to Manitoba, south to northern Virginia, southern Ohio and Nebraska, with minor ranges and scattered occurrences throughout the country.

DISTRIBUTION IN NEW YORK: common in lakes and quiet streams throughout the state, especially along the Great Lakes and Finger Lakes regions, and the Hudson River basin.

DEGREE OF NUISANCE: it may be frequent or common, but seldom is *P. zosteriformis* present at nuisance levels.

COMMENTS: *Potamogeton* is a highly variable genus within the pondweed family. Species within the genus often are characterized by two leaf types- firm floating leaves and thin emersed leaves. Many mature species have flowers borne in spikes (for wind pollination), conspicuous in early summer. Identification of the individual species can be extremely difficult, particularly among the narrow-leaved pondweeds. The *Potamogeton* are distinguished from the other genus within the pondweed family by having alternate leaves (unlike the *Zanichellia* and *Najas*), and by their presence in fresh or estuarine waters (unlike the *Zostera*). There are nearly 30 species found within New York State, some quite rare and others extremely common. there is at least one subvariety of *P. robbinsii*- this is limited primarily to local occurrences. *P. zosteriformis* has been known at times as *P. zosterifolius* and *P. compressus*, and it is on the rare and endangered plant list in at least one New England state.

Line drawing- Crowe, G.E. and C.B. Hellquist. Aquatic and wetlands plants of northeastern North America. 2000.