# 2008 CSLAP State of the Lakes Reports

In 2008, the Three Lakes Council authorized the third year of sampling for all three lakes as part of the NY CSLAP program (Citizens Statewide Lake Assessment Program). Thanks again to all of the volunteers who helped collect the samples in 2008. Lake Waccabuc was in the program from 1986-1996, and so has more trend data. A lengthy report on each lake's results, prepared by NYS DEC, is posted on the Three Lakes Council website. Here are some highlights extracted from the reports. Reports on each lake are followed by some trend observations and management recommendations for all three lakes.

## LAKE WACCABUC

Lake Waccabuc sampling continues to indicate a *mesoeutrophic*, or moderately to highly productive lake. The phosphorus readings indicate that the lake was at a more productive level than usual in 2008, but chlorophyll *a* and water clarity readings were close to normal during most of the sampling season. The nitrogen to phosphorus ratios indicate that algae levels in Lake Waccabuc are controlled by the availability of phosphorus, and it is likely that phosphorus inputs need to be addressed to improve water clarity and prevent algal blooms. Lake productivity and the likelihood of algae blooms appears to increase significantly in the fall. Phosphorus levels in the lake occasionally exceed the state phosphorus guidance values, although water transparency readings only rarely fail to reach the minimum recommended water clarity for swimming beaches. Deepwater phosphorus readings are much higher than those measured at the lake surface, suggesting that internal nutrient cycling (release of phosphorus from bottom sediments to the deep waters, and then eventually into the surface waters) may be significant. This appears to trigger the autumn rise in lake productivity. The higher phosphorus readings in Lake Waccabuc were not apparent in either neighboring lake, so it is not yet known if this represents normal variability.

The rise in color in many CSLAP lakes since 2002 has not been apparent in Lake Waccabuc, which remains weakly colored. The lake has water of intermediate hardness, alkaline (above neutral) pH readings, low nitrate levels, and low to intermediate ammonia and total nitrogen readings. pH readings occasionally exceed the NYS water quality standards (=6.5 to 8.5), particularly in 2008, but are probably adequate to support most aquatic organisms. The rise in pH is probably weather related, but should be watched. Conductivity readings increased from 1986 to 1995, but have been lower since sampling resumed in 2006. Calcium levels from open water readings are marginally high enough for zebra mussels, since they are at the level as some other lakes with zebra mussel populations. Zebra mussels have not been found in the lake.

Water quality conditions in Lake Waccabuc appear to be adequate to support most recreational uses of the lake during the summer, although these conditions were typical of *mesoeutrophic*, or moderately to highly productive lakes. Algae is strongly influenced by phosphorus, and changes in algae are likely to impact water transparency. Recreational assessments are impacted by poor water clarity or excessive plant growth.

Plant coverage has increased in recent years, but it is not known if this is because of native or exotic plants.

The CSLAP datasets indicate that *recreation* may be *stressed* by excessive weeds and algae, *potable water* may be *threatened* by blue green algae, and *aquatic life* may be *threatened* by deepwater anoxia and elevated pH.

## LAKE OSCALETA

The CSLAP data from Lake Oscaleta indicate that the lake is best classified as *mesoeutrophic*, or moderately to highly productive. The lake was probably slightly less productive than normal in 2008, as manifested in lower phosphorus and algae levels (as contrasted with the increase in phosphorus in Lake Waccabuc). Water clarity readings were close to normal. It is premature to evaluate any long-term trends in these trophic indicators with only three years of water quality data. The nitrogen to phosphorus ratios indicate that algae levels in Lake Oscaleta are controlled by phosphorus, and it is likely that phosphorus inputs need to be addressed to improve water clarity and prevent algal blooms. Lake productivity appears to increase significantly later in the fall. Phosphorus levels in the lake regularly exceed the state phosphorus guidance value, although water transparency readings only rarely fail to reach the minimum recommended water clarity for swimming beaches. Deepwater phosphorus readings are slightly higher than those measured at the lake surface, suggesting that internal nutrient cycling (release of phosphorus from bottom sediments to the deep waters, and then eventually into the surface waters) is not as significant as in Lake Waccabuc. However, as in Waccabuc, this appears to trigger the fall rise in lake productivity.

The lake is weakly colored, with water of intermediate hardness, alkaline (above neutral) pH readings, low nitrate, ammonia and total nitrogen readings. Like Waccabuc, pH readings occasionally exceed the NYS water quality standards (=6.5 to 8.5), particularly in 2008, but are probably adequate to support most aquatic organisms. The rise in pH is probably weather related, but should be watched. Conductivity readings are typical of lakes with intermediate hardness. Calcium levels are marginally high enough to support zebra mussel growth, based on open water readings, and zebra mussels have not been found in the lake.

Recreational assessments are more closely impacted by “excessive weed growth” than by “poor water clarity”, although it is not known if this is due to exotic or native plants. The productivity of Lake Oscaleta (as measured by clarity, nutrient and algae levels) appears to decrease slightly during the summer, but increases in the fall. The latter appears to be influenced by deepwater phosphorus levels. Similarly, recreational assessments degrade throughout the summer, but improve slightly in the fall, coincident with seasonal changes in aquatic plant coverage and despite increasing fall algae levels. It is premature to evaluate any long-term trends with only three years of data. It is likely that the variations are within the normal range for the lake.

CSLAP datasets indicate that *recreation* may be *stressed* by excessive weeds and algae in Lake Oscaleta, and *aquatic life* may be *threatened* by deepwater anoxia and elevated pH.

## LAKE RIPPOWAM

The CSLAP data from Lake Rippowam indicate that the lake is best classified as *mesoeutrophic*, or moderately to highly productive. The lake was probably slightly less productive than normal in 2008, as manifested in decreasing phosphorus and increasing water clarity. It is premature to evaluate any long-term trends in these trophic indicators with only three years of water quality data, particularly since algae levels have increased slightly over this period. The nitrogen to phosphorus ratios indicate that algae levels in Lake Rippowam are controlled by phosphorus, and it is likely that phosphorus inputs need to be addressed to improve water clarity and prevent algal blooms. Lake productivity increases slightly during the summer and significantly in the fall. Phosphorus levels in the lake regularly exceed the state phosphorus guidance value, although water transparency readings only rarely fail to reach the minimum recommended water clarity for swimming beaches. Deepwater phosphorus readings are similar to those measured at the lake surface, suggesting that internal nutrient cycling (release of phosphorus from bottom sediments to the deep waters, and then eventually into the surface waters) is not as significant as in Lake Oscaleta and especially as in Lake Waccabuc.

The lake is moderately colored, with lake water of intermediate hardness, alkaline (above neutral) pH readings, and low nitrate, ammonia and total nitrogen readings. pH readings occasionally exceed the NYS water quality standards (=6.5 to 8.5), particularly in 2008, but are probably adequate to support most aquatic organisms. pH should be watched. Conductivity readings are typical of lakes with intermediate hardness, although they increase at the end of the summer.

Recreational assessments are more closely impacted by “excessive weed growth” than by “poor water clarity”. Recreational assessments are highly favorable in the spring, stable during the summer, and degrade in the fall, mostly coincident with seasonal changes in aquatic plant coverage. Recreational assessments are most frequently impacted by excessive weed growth, although it is not known if this is because of exotic or native plants. The productivity of Lake Rippowam increases slightly during the summer and more substantially in the fall, as manifested in decreasing water clarity and increasing nutrient and algae levels. This occurs despite deepwater nutrient levels close to those measured at the lake surface. Recreational assessments are stable and mostly favorable during the summer, but are highly favorable in the spring and highly unfavorable in the fall. Lake perception appears to be mostly comparable in Lakes Rippowam and Oscaleta.

It is premature to evaluate any long-term trends with only three years of data. It is likely that the variations are within the normal range for the lake, despite the steady increase in water clarity and calcium levels, and despite the decrease in phosphorus, nitrate and conductivity over this period.

CSLAP datasets indicate that *recreation* may be *stressed* by excessive weeds and algae in Lake Rippowam, and *aquatic life* may be *threatened* by deepwater anoxia and elevated pH.

## Important findings common to all three lakes:

Calcium levels from open water readings are marginally high enough for zebra mussels, since they are at the level as some other lakes with successful zebra mussel populations. Shoreline concrete walls may provide a microclimate that can support zebra or quagga mussels, although they have not been found in these lakes.

## Three Lakes management actions:

It is likely that the management of water quality conditions in the Three Lakes watershed should focus on reducing nutrient and sediment loading to the lakes, through pumping and maintaining septic systems, utilizing shoreline buffer zones, limiting use of lawn fertilizers, minimizing land disturbances in the near-lake watershed, and localized stormwater management. For Waccabuc, improvement in the operation of the aerators may be successful in reducing deepwater oxygen deficits and internal nutrient cycling, particularly since deepwater nutrients may be triggering fall increases in lake productivity. For Oscaleta and Rippowam, deepwater nutrient levels are not as significant as in Lake Waccabuc, so aeration or other means for reducing internal nutrient loading may not be as effective as in Lake Waccabuc. Continued vigilance in controlling new infestations of exotic plants, including any spread of the Brazilian elodea from Lake Waccabuc, may be critical to protecting the lakes from continued increases in aquatic plant coverage, and the resulting impacts to environmental and recreational uses of the lakes.

## Trends in Trophic State Indicators and Aquatic Plants:

The trophic state indicators are water clarity, phosphorus, and chlorophyll a.

For the three lakes, water clarity readings in 2008 generally increased through late summer, then decreased substantially through the fall, a seasonal pattern generally observed in lakes deep enough to stratify. This pattern was coincident with seasonal increases in algae and nutrient levels. For Waccabuc and Oscaleta, overall transparency readings have varied slightly from year to year, without any clear long-term trends. Rippowam has seen overall readings improve in the last three years. There is no clear correlation between changes in weather and changes in water clarity.

Similarly, phosphorus readings decreased through late summer, then increased through the end of the CSLAP sampling season. The latter is consistent with deepwater nutrient levels that are higher than those measured at the surfaces of the lakes in 2008. In the case of Waccabuc, phosphorus readings have been higher than normal in the last three years, but this translated into higher algae levels and lower water clarity only in 2006. Deepwater phosphorus levels have been substantially higher than at the surface in the last three years. For Oscaleta, deepwater phosphorus levels are slightly higher than

those measured at the lake surface. Phosphorus readings have been similar in the last two years, at a level lower than 2006. It is not yet known if the readings in the last two years or those from 2006 were more representative of normal conditions in the lake. For Rippowam, phosphorus readings were relatively stable through late summer, then increased through the end of the CSLAP sampling season, consistent with the seasonal decrease in water clarity and increase in algae levels. However, these readings were close to normal (as defined by the 2006-07 sampling) during most of the summer. Deepwater phosphorus levels are mostly comparable to those measured at the lake surface. Phosphorus readings have decreased over the last three years, consistent with the water clarity pattern over the same period. The variability was much higher in 2006 and 2007 than in 2008.

The steady increase in chlorophyll *a* during the year is generally 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). For Waccabuc, chlorophyll *a* readings have varied slightly and unpredictably since 1986, and these changes have not been consistent with changes in water clarity readings over the same period. For Oscaleta, chlorophyll *a* readings have varied, at times significantly, and these changes are mostly consistent with changes in water clarity readings over the same period. For Rippowam, chlorophyll *a* readings have varied, at times significantly, over the last three years, without any clear patterns.

As expected, aquatic plant densities and coverage increase seasonally (through late summer). In Waccabuc and Oscaleta, aquatic plant coverage was higher than normal in 2008, with surface plant growth common. The recreational use impacts are more often due to “excessive weeds” on Oscaleta, with “poor water clarity” also cited as impact on Waccabuc and especially on Rippowam. On Waccabuc, aquatic plant coverage has increased slightly in the last three years (relative to the early to mid 1990s). Trends are not yet available for Oscaleta and Rippowam. Recreational assessments generally improve through early fall, then degrade rapidly, consistent with seasonal changes in water quality assessments and aquatic plant coverage.

On Oscaleta, aquatic plant coverage was higher than normal in 2008, with surface plant growth common. It is not known if surface plant growth is associated with exotic or native plants. The lake is most often described as “excellent” to “slightly impaired” for most recreational uses, with the occasional use impacts due to “excessive weeds”. It is not yet known if any of these assessments have exhibited any long-term changes, but this may be apparent with additional data. Recreational assessments generally degrade through early fall, then improve into late fall, consistent with seasonal changes in aquatic plant coverage.

## Statewide temperature trends:

Water temperature readings have increased in 10-15% of the CSLAP lakes that have been sampled for more than 5 years. More precisely, water temperature readings have increased in about 20-30% of the lakes in a statistically significant manner, and have

decreased in 10-15% of the lakes. The overall change in any of these lakes is probably less than 2ºC, and given the lack of sensitivity in the pocket thermometers used in CSLAP, it is not clear if this change is outside the normal variability. But if this increase has occurred, the implications may be significant. The increase in water temperature will effectively increase the growing season in these lakes. This may trigger an increase in the growth and duration of algae and rooted aquatic vegetation. The increasing suitability of New York lakes for more traditionally southern exotic plants, such as *Hydrilla verticillatum* (hydrilla) and *Egeria densa* (Brazilian elodea), will make these lakes more susceptible to invasive growth of these exotics.

## Scorecards:

**Tropic Status Scorecard:**
Trophic Status Indicators are shorthand for the conditions of the lakes and their changes over time. Standards based on phosphorus, chlorophyll a, and Secchi disk readings define the stages of a lake from oligotrophic (least productive) to eutrophic (most productive). These readings are better than those in 2006, when most lake readings indicated eutrophic states.

O=oligotrophic, M=metatrophic, E=eutrophic

| **Parameter** (Eutrophic range) | **Waccabuc** | **TSI** | **Oscaleta** | **TSI** | **Rippowam** | **TSI** |
|---|---|---|---|---|---|---|
| Phosphorus (>0.02) | 0.033 | E | 0.019 | M | 0.023 | E |
| Chloraphyll a (>8) | 13.4 | E | 11.3 | E | 11.4 | E |
| Secchi Disk (<2) | 2.7 | M | 2.8 | M | 2.3 | M |

**CSLAP Scorecard**. Number of samples (out of 8) **better** than guidelines or standards, and change from last year's readings.

| Parameter | Guideline | **Waccabuc** | Vs 2007 | **Oscaleta** | Vs 2007 | **Rippowam** | Vs 2007 |
|---|---|---|---|---|---|---|---|
| Phosphorus | 0.02 mg/l | 3 | -1 | 6 | = | 7 | +2 |
| Secchi disk | 1.2 m | 8 | = | 8 | = | 8 | = |
| pH | 6.5 to 8.5 | 4 | -3 | 7 | -1 | 5 | -3 |