

# **Trophic Status of Conesus Lake 2014: Long-term Trends in Lake Chemistry and the Plankton Community**

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## Executive Summary

- During the summer of 2014, Conesus Lake monitoring conducted by The College at Brockport assessed the current status of the health of the lake by determining if any changes (improvement or further degradation) had occurred. To accomplish this goal, the following were completed: a trophic state assessment of the lake, an evaluation of long-term trends in lake chemistry, and an evaluation of the phytoplankton and zooplankton community to determine if biomanipulation of the trophic web by the addition of the predaceous walleye was impacting alewife populations.
- Lake chemistry was monitored from 13 May to 16 September 2014. Total phosphorus (TP) provides an estimate of all fractions of phosphorus potentially available to aquatic plants. From 13 May to 27 May 2014, TP and soluble reactive phosphorus (SRP) concentrations were low and similar from the 0-m to 18-m depth. By 10 June, TP and SRP began to increase in the hypolimnion due to anaerobic conditions and remained high through the end of the sampling period. During the summer of 2012, the average epilimnetic TP concentration was for the first time in 30 years below the 20 µg P/L NYS guideline and was cautiously attributed to management efforts in various agriculturally dominated Conesus Lake watersheds. In 2014, the average epilimnetic TP concentration rose from 2012 and was slightly above the NYS guideline at 21.9 µg P/L.
- Algal abundance in lakes can be estimated by measuring chlorophyll *a* concentrations. In lakes where phosphorus is the limiting nutrient, algal abundance generally reflects any increase or decrease in phosphorus concentrations. Epilimnetic chlorophyll *a* concentrations in the summer of 2014 ranged from 5.2 to ~17.7 µg/L with an average of 7.8 µg/L. Considering chl *a* concentrations, the lake was classified for many years as eutrophic (chl *a* greater than 7.3). Since ~2000 chlorophyll *a* concentrations had been decreasing and since 2004 have fallen into the mesotrophic range (2.6 to 7.3 µg/L). However, in 2014 average chlorophyll levels increased back to above the 7.3 µg/L guideline to a eutrophic status.
- Sodium is a component of deicing salt, which is used heavily during the winter on roads in the Conesus Lake watershed. Sodium enters a watershed mainly through its use as a deicing salt for roads. In winters, these deicing salts are used heavily around Conesus Lake, and as a result sodium has had an increasing trend in lake waters since 1985. In 2014, average epilimnetic sodium ranged from 21.90 to 28.01 mg/L. Average 2014 epilimnetic sodium concentration (24.82 mg/L) was ~ 2 mg/L lower than in 2012 (27.85 mg/L) but still is much higher than EPA's 20 mg/L Drinking Water Equivalency Level (DWEL or guidance level) for sodium. Significant differences were not observed from the top of the lake to the bottom, suggesting the lake is not in danger of becoming meromictic (not mixing). The small reduction in sodium concentrations suggests

that recent efforts to reduce deicing salt usage on area roads may be effective – especially following the snowy winter of 2013-2014.

- Carlson's Trophic Status Index (TSI) was developed to assess the trophic state of North American lakes by considering summer epilimnetic TP, chl a concentrations, and summer secchi disk depth. This index is one of several that can be used to evaluate the trophic status of a lake; that is, what is the overall productivity of the lake. The TSI in 2014 for TP (48.7), chlorophyll (50.7), and secchi disk (48.6) averaged 49.3, suggesting a mesotrophic/eutrophic status for Conesus Lake. However, the proliferation of blue-green algae/bacteria (Cyanobacteria) and the presence of potential neurotoxin species of algae is of concern.
- The pre-alewife phytoplankton community was dominated by larger (>70 µm, greatest axial linear dimension) colonial, filamentous, and unicellular algae or net phytoplankton. A major shift in size composition of the phytoplankton community occurred from the pre- to the post-alewife period. In 1972, the net plankton (>70 µm) represented over 61% of the total phytoplankton biomass, as these large phytoplankton forms are not eaten by zooplankton. By 1985 and 1988, net plankton biomass decreased to less than 22% of the total phytoplankton biomass; that is, the biomasses of smaller size classes of phytoplankton were becoming more prevalent after the introduction of alewife and the selective removal of large cladoceran zooplankton that are more effective feeders on small phytoplankton. In particular, the 21- to 70-µm size range increased from 4.2% to ~ 30% of the total phytoplankton through 2014. There appears to have been no changes in the size structure of the phytoplankton community since the introduction of alewife. In 2014, the phytoplankton is still dominated by smaller phytoplankton compared to the pre-alewife period.
- An important note is the development of a bloom of algae called *Anabaena circinalis* in August of 2014. With densities exceeding 20,000 cells/ml, this algae is known to produce the neurotoxin saxitoxin. However, it must be remembered that only a limited number of strains have been reported to produce saxitoxins. We only counted and identified this organism but did not determine toxicity.

A second major change is that the abundance of phytoplankton cells has increased several fold since 1999 and 2004 to 2014. A check of stored slides from 1998 and 2014 indicated that this change was not a counting error or a method problem. Most of the increase is caused by the Cyanobacteria.

- The pre-alewife zooplankton community was dominated by *Daphnia pulex*, *Conochilus unicornis*, and *Cyclops bicuspidatus* (currently referred to as *Diacyclops bicuspidatus*). The overwhelming dominance of *D. pulex* in 1972 was impressive. It was the dominant cladoceran on each of the 50 sampling days throughout the year. The post-alewife zooplankton species composition represented a significant change since 1973 (pre-alewife). As a result of the

introduction of the alewife into Conesus Lake in 1978–79, the cladoceran community changed and was dominated by the small *Bosmina longirostris* by 1985. This dominance continued through the 2014 season. There has not been a resurgence of large more efficient zooplankton grazers by 2014.

- In general, the average length of crustaceans decreased from 1.03 mm in 1972 (pre-alewife) to 0.29 mm by 1988 (post-alewife) and remained under 0.38 mm through 2014 due to selective feeding by alewife. Similarly, the average crustacean biomass significantly decreased from a pre-alewife high of 228 mg/m<sup>3</sup> in 1972 to post-alewife lows of around 182 and 99 mg/m<sup>3</sup> by 1985 and 1998, respectively, and continued to hover at ~100 mg/m<sup>3</sup> through 2014. Conesus Lake is a classic example of size-selective predation by planktivorous fish that has resulted in a shift in prey composition to smaller zooplankton. Zooplankton crustacean length did not change from 2009 (0.36 mm) to 2014 (0.38 mm). This suggests that the impact from alewife predation has not changed.
- Biomanipulation is the deliberate alteration of an ecosystem by adding or removing species, especially predators. In Conesus Lake, the stocking of walleye by NYSDEC (and several other groups) has been underway for many years with two objectives: to increase the population of fishable walleye and to reduce the number of alewife in the lake. If alewife populations are reduced, it was believed that the large *Daphnia* populations that once existed in Conesus Lake may return to historic levels and then graze and reduce down the high phytoplankton levels in the lake. Unfortunately, there has been no significant change in the zooplankton community in the last 25 years. *Daphnia* abundance (<14.9/L) and biomass (<1 mg/m<sup>3</sup>) are still low while the overall size (length) of the zooplankton community is still less than 1/3 of the size in 1972.
- With walleye lake populations reaching as high as 22,000 in 2003 – almost twice as high prior to the alewife invasion - the return of large efficient zooplankton grazers that predominated prior to 1970 has not been observed. NYSDEC notes that the slower growth of walleye, the lower abundance, and a moderate decrease in walleye condition (K) may be due to a decline in the Conesus alewife population. Certainly, the reduction in alewife catch per unit effort in Conesus Lake supports this contention. However, average length of the crustacean zooplankton community has not changed and there were no observations of large *Daphnia* in the lake. Lastly, high walleye biomass may not be able to control alewife densities. For example, in the nearby Cayuta Lake the walleye population, despite a high stocking rate for five years, was unable to decrease alewife recruitment as the alewife biologically adjust to produce more eggs and thus young with higher predation.
- Although there was evidence of harmful algal blooms in the lake this summer, several different indicators suggest that Conesus Lake water quality and trophic

status may be improving. Total phosphorus is near the 20 µg P/L guideline of the NYSDEC; chlorophyll a levels have decreased into a less productive state (mesotrophic); and the trophic status index, a compilation of several indicators, also suggests a mesotrophic state and temporal improvement.

## Introduction

Conesus Lake, considered a eutrophic lake in the late 1960s (Mills, 1975) and one of the smaller of the Finger Lakes of western New York, is used for recreation and fishing and is a source of municipal water for several local communities. The shoreline area is densely populated with residences, primarily year-round homes. The upstream area is a mixture of agricultural land and mixed deciduous hardwood forests encompassing an area of 16,714 ha. In 1999 about half of the entire land use within the Conesus Lake watershed was and continues to be in agriculture. Much of the agriculture (~70%) is concentrated in the western subwatersheds of the lake (SOCL, 2002). In general, the watershed is characterized by slight slopes at the northern outlet and southern inlet areas and steeper slopes along the flanks and southern portion of the lake. There are numerous tributaries and rivulets that enter the lake (Forest *et al.*, 1978) and account for large amounts of erosion and sediment that enter the lake system. For example, in August 2005, Stantec Consulting Services (2005) indicated that most of the 12 stream reaches visited were in an unstable state due to the heavy sediment supplies of the past and the related geomorphic adjustment.

The New York State Department of Environmental Conservation (NYSDEC) listed Conesus Lake on its Priority Waterbody List (303d)(NYSDEC, 2013) due to elevated phosphorus levels and high oxygen demand. The DEC identified the lake as impaired for boating and bathing purposes, stressed relative to fishing and aesthetics, and threatened as a water supply. The Livingston County Planning Department reported the following problems as being critical to the degraded health of Conesus Lake: 1) weed growth and invasive species, 2) increased algae from phosphorus loading, 3) pathogens from animal waste, 4) pesticides from residential and agricultural sources, 5) increasing salts from deicing chemicals on impervious surfaces, and 6) erosion from various land-use practices and developments (SOCL, 2002). Since then, monitoring and management plans for land use have been recommended and/or updated (Makarewicz *et al.*, 2008, 2012a,b; Makarewicz and Lewis 2009; CLWC, 2011) A major achievement

of long-term monitoring on Conesus Lake is the creation of a database that can be used as a tool to assess the trophic health of the lake over time. Measuring selected chemicals, such as phosphorus, and the transparency of water and determining the amount of algae (chlorophyll measured) in the water allow us to answer whether management practices have had any effect on the lake. The goal of this project was to update information on the water chemistry of Conesus Lake to determine if any progress has been made in improving water quality.

## Methods

Water sampling and physical measurements were taken at ~the deepest point in the southern basin of Conesus Lake (GPS coordinates: 42.75473, -77.71535) beginning on 13 May and ending on 16 September 2014 (Fig. 1). Water samples for nutrient analysis were taken at depths of 1, 8, and 18 m, while a SeaBird CTD recorded temperature, chlorophyll *a* (chl *a*), pH, and dissolved oxygen at one-meter intervals from just below the surface of the water (0 m) to just above the sediment surface (between 21-22 m depending on the depth).

Water samples were taken with a Van Dorn water bottle, preserved, and analyzed using standard methodologies (APHA, 2012). All samples for dissolved nutrient analysis (SRP, NO<sub>3</sub>+NO<sub>2</sub>) were filtered immediately on site with 0.45- $\mu$ m MCI Magna Nylon 66 membrane filters and held at 4°C until analysis the next day. Samples for each depth were analyzed for TP [APHA Method 4500-P F and persulfate digestion (APHA 4500-p.b. 5)], NO<sub>3</sub>+NO<sub>2</sub> (APHA Method 4500-NO<sub>3</sub>-F), TN (APHA Method 4500-N C), and SRP (APHA Method 4500-P F). Analyses for these parameters were performed on a Technicon AutoAnalyser II. Direct Air-Acetylene Flame Method (APHA 3111 B) was used for the analysis of dissolved sodium. Method Detection limits were as follows: SRP (0.48  $\mu$ g P/L), TP (0.38  $\mu$ g P/L), TN (0.020 mg N/L), Na (0.78 mg Na/L), and NO<sub>3</sub>+NO<sub>2</sub> (0.005 mg N/L). The secchi disk depth was determined with a black and white 20-cm disk.

The SeaBird CTD was calibrated for dissolved oxygen and chlorophyll prior to each sampling date. Independent measurements of chl *a* were made using a Turner Model 111 Fluorometer. Five hundred-mL aliquots of each water sample were filtered through glass fiber filters and extracted with 90% alkaline acetone. Extracted samples were centrifuged and measured fluorometrically (Wetzel and Likens, 2000). Dissolved oxygen samples were collected at several depths using a Van Dorn Sampler and analyzed by the azide modification of the Winkler Method (APHA Method 4500-O C). Results for dissolved oxygen and chlorophyll *a* from the SeaBird CTD were compared to Winkler and fluorometric results. If required, the SeaBird was recalibrated prior to a field trip.

### **Quality Control:**

All water samples were analyzed within 24 hours of collection at the Water Chemistry Laboratory at The College at Brockport, State University of New York (NELAC – EPA Lab Code # NY01449). In general, this program includes biannual proficiency audits, annual inspections, and documentation of all samples, reagents, and equipment under good laboratory practices. All quality control (QC) measures are assessed and evaluated on an on-going basis. As required by NELAC and New York’s ELAP certification process, method blanks, duplicate samples, laboratory control samples, and matrix spikes are performed at a frequency of one per batch of 20 or fewer samples. Field blanks are routinely collected and analyzed. Analytical data generated with QC samples that fall within prescribed acceptance limits indicate the test method was in control. For example, QC limits for laboratory control samples and matrix spikes are based on the historical mean recovery plus or minus three standard deviations. QC limits for duplicate samples are based on the historical mean relative percent difference plus or minus three standard deviations. Data generated with QC samples that fall outside QC limits indicate the test method was out of control. These data are considered suspect and the corresponding samples are reanalyzed. As part of the NELAC certification, the lab participates semi-annually in proficiency testing program (blind audits, Table 1) for each category of ELAP approval. If the lab fails the proficiency audit for an analyte, the lab director is required to identify the source and correct the problem to the certification agency.

Water for phytoplankton (2014) samples was obtained from a 1-m depth with a Van Dorn bottle. Aliquots of 100 mL were preserved with glutaraldehyde (final concentration 1%). In 1996, 1999 and 2014, samples were thoroughly mixed and variable amounts were filtered [mixed ester nitrocellulose filters (0.45  $\mu\text{m}$ , 25 mm, plain)] to obtain ~ 20 to 30 cells per field at 200x. The filters were mounted on microscope slides with water-soluble embedding medium [2-hydroxypropyl methacrylate (HPMA)] (Crumpton, 1987). The slides were used to estimate cell concentration and biomass. The HPMA mounting technique was first described by Crumpton (1987) and has been used for quantitative analysis of the phytoplankton (e.g., Kang and Fryxell, 1991; Kang *et al.*, 1993a,b; Kang and Lee, 1995; Bidigare *et al.*, 1996).

The HPMA slides were examined with three months of collection using an Olympus BHT, research-grade compound microscope equipped with Nomarski optics (100x, 200x, 400x, and 1000x), Phase Optics (400x), epifluorescence (blue, green, and UV Excitation), and a trinocular head for photography and an Olympus BX60, research-grade compound microscope equipped with Nomarski optics (40x, 100x, 200x, 400x, and 1000x), Phase Optics (400x, 1000x), a 1.25-2X multiplier, epifluorescence (blue, green, and UV Excitation). Amount of material counted varied with composition (diatoms versus soft body forms) of the phytoplankton community and abundance (See <http://www.phycotech.com/technical.html>).

In other years (1972, 1985, 1988, 1991, 1993, 2004, and 2009), phytoplankton samples were immediately preserved with 10 mL of Lugol's solution, while formaldehyde was added upon arrival in the laboratory. The settling chamber procedure (Utermöhl, 1958) was used to identify (except for diatoms) and to enumerate phytoplankton at a magnification of 500x using a Wild Invert microscope. A second identification and enumeration of diatoms at 1,250 x was performed after the organic portion was oxidized with 30%  $\text{H}_2\text{O}_2$  and  $\text{HNO}_3$ . The cleaned diatom concentrate was air dried on a #1 cover slip and mounted on a slide (75 x 25 mm) with HYRAX™ mounting medium.

The cell volume of each species was computed by applying average dimensions from previous measurements to the geometrical shape, such as sphere, cylinder, prolate spheroid, etc., that most closely resembled the species form. At least 10 specimens of each species of each sample were measured for the cell volume calculation. When fewer than 10 specimens were present, those present were measured as they occurred. For most organisms, the measurements were taken from the outside wall to outside wall. The protoplast was measured with loricated forms, while the individual cells of filaments and colonial forms were measured. For comparative purposes, biovolume ( $\mu\text{m}^3/\text{L}$ ) was converted to biomass ( $\text{g}/\text{m}^3$ ) assuming the specific gravity of phytoplankton to be 1.0 (Willen, 1959; Nauwerck, 1963).

Along with phytoplankton, zooplankton were collected using a vertical (15 m to the surface) zooplankton tow ( $\frac{1}{2}$ -meter diameter plankton net, 63- $\mu\text{m}$  mesh net) equipped with a General Oceanics flowmeter to correct for the volume filtered. Samples were preserved with 70% ethanol. From each sample, a 1-mL subsample was withdrawn using a Hensen-Stemple pipette from a well-mixed sample and transferred to a Sedgwick-Rafter counting cell. All zooplankton were identified and the number of individuals enumerated using a phase contrast microscope at 100X; species identification of copepods and *Daphnia* were confirmed at 200X or 400X. Length measurements were made on the first 20 individuals of each species encountered per sample. Zooplankton taxonomy largely followed Balcer *et al.* (1984); other keys consulted included Ward and Whipple (1965), Stemberger (1979), Ruttner-Kolisko (1974), and Brooks (1957). The volume of each rotifer species was computed using the geometrical shape that most closely resembled the species (Downing and Rigler, 1984). Assuming a specific gravity of one, volume was converted to fresh weight and to dry weight assuming a ratio of dry to wet weight of 0.1 (Doohan, 1973) for all rotifer species except *Asplanchna* spp. A dry weight/wet weight ratio of 0.039 was used for *Asplanchna* spp. (Dumont *et al.*, 1975). The dry weight of Crustacea was calculated using the length – weight relationships found in Downing and Rigler (1984).

## **Results and Discussion**

### **Temperature and Dissolved Oxygen**

By the first sampling date on 13 May 2014, the lake was stratified and remained stratified to the last sampling date on 16 September 2014 (Fig. 2). The epilimnion reached its deepest depth on 16 September at ~9 m. Epilimnetic dissolved oxygen concentrations always remained above 7 mg/L (Fig. 2). On the first sampling date, the deep colder water area, the hypolimnion, had ~ 8 mg/L of oxygen present. A month later (10 June 2014), hypolimnetic oxygen was ~ 4 mg/L from ~17 to 20 m of depth. By 21 July, the hypolimnion was anaerobic below 10 m of water; that is, anoxic conditions were evident. Anoxia of the hypolimnion persisted through the entire summer (Fig. 2).

### **Phosphorus**

Soluble reactive phosphorus (SRP) consists of the inorganic orthophosphate ( $\text{PO}_4$ ) form of phosphorus that is soluble in water. Epilimnetic total nitrogen to total phosphorus ratios for Conesus Lake are greater than 23 (Table 2), also indicating that phosphorus is the key limiting factor of phytoplankton growth. Orthophosphates are directly taken up by algae and are generally considered the limiting factor for plant growth in New York lakes. Measuring SRP acts as an index of the amount of phosphorus immediately available for algal growth. Over the 2014 summer, epilimnetic (0 m) SRP ranged from <1.2 (detectable level) to 4.7  $\mu\text{g P/L}$ . Hypolimnetic SRP concentrations reached as high as 457.8  $\mu\text{g P/L}$  by 19 August as a result of the anoxic conditions that cause sediments to release phosphorus (Fig. 4). Since 2002, SRP has decreased in the epilimnion (Fig. 3).

Total phosphorus (TP) provides an estimate of all fractions of phosphorus potentially available to aquatic plants. From 13 May to 27 May 2014 (Fig. 4), TP and SRP concentrations were low and similar from the 0-m to 18-m depth. By 10 June, TP and SRP began to increase in the hypolimnion due to anaerobic conditions and remained high through the end of the sampling period (Table 2, Fig. 4). During the summer of 2012, the average epilimnetic TP concentration was for the first time in 30 years below the 20  $\mu\text{g P/L}$  NYS guideline (Fig. 5) and was cautiously attributed to management

efforts in various agriculturally dominated Conesus Lake watersheds (Makarewicz et al., 2009; 2012b). In 2014, the average epilimnetic TP concentration rose from 2012 and was slightly above the NYS guideline (Fig. 4) at 21.9  $\mu\text{g P/L}$ .

Hypolimnetic (below 9 m) TP concentrations remained similar to the epilimnion through May (Fig. 4) but began to increase in the hypolimnion after June 10 (Fig. 4) due to sediments releasing phosphorus as a byproduct of anaerobic redox reactions which develop with thermal stratification (Table 2, Fig. 2). Total phosphorus concentrations reached as high as  $\sim 480 \mu\text{g P/L}$  in the hypolimnion by 19 August, 2014. This is  $\sim 100 \mu\text{g P/L}$  lower than the  $600 \mu\text{g P/L}$  concentration of TP in the hypolimnion in 2009 (Makarewicz et al. 2009). Because the amount of P released from sediment to the hypolimnion is dependent on the length of stratification period, this result may or may not be directly related to improved management in Conesus Lake watersheds. As mentioned, TP concentrations both in the epilimnion and hypolimnion appear to be on a decreasing trend over the past few sampling years (Fig. 5).

### **Chlorophyll a**

Algal abundance in lakes can be estimated by measuring chlorophyll *a* concentrations. In lakes where phosphorus is the limiting nutrient, algal abundance generally reflects any increase or decrease in phosphorus concentrations. With depth in Conesus Lake, chl *a* concentration generally peaks in the lower portion of the epilimnion (0 to 6 m) and into the metalimnion ( $\sim 6$  to  $\sim 9\text{m}$ , Fig. 2). This is particularly evident in the late spring and early summer. Epilimnetic chlorophyll *a* concentrations in the summer of 2014 ranged from 5.2 to  $\sim 17.7 \mu\text{g/L}$  with an average of  $7.8 \mu\text{g/L}$  (Table 2, Fig. 2). Since 1985, average summer epilimnetic concentrations are quite variable (average range = 3.0 to  $14.7 \mu\text{g/L}$ ). Considering chl *a* concentrations, the lake was classified for many years as eutrophic (chl *a* greater than 7.3, Table 3). Since  $\sim 2000$  chlorophyll *a* concentrations had been decreasing and since 2004 have fallen into the mesotrophic range (2.6 to  $7.3 \mu\text{g/L}$ , Table 2). However, in 2014 average chlorophyll levels increased back to above the  $7.3 \mu\text{g/L}$  guideline to a eutrophic status (Table 2). Much of the recent

variability observed in chlorophyll and phosphorus average concentrations likely reflects annual climatic variability and the bimonthly sampling design.

### **Nitrate and Total Nitrogen**

Nitrate is a compound which occurs naturally and may be augmented by point and nonpoint sources of nitrate, which include septic systems, fertilizers and manure, and industrial waste and landfills. At elevated levels, nitrate can be harmful to animals and people. In Conesus Lake, nitrate concentrations were generally very low (<0.11 mg/L) at all depths over the summer of 2014 (Table 2). Low levels of  $\text{NO}_3+\text{NO}_2$  tend to favor the growth of nuisance blue-green algae (Cyanobacteria), which in fact do dominate Conesus Lake during the summer, and are capable of fixing atmospheric nitrogen. Average epilimnetic nitrate has generally been increasing in the lake until 2004 when the levels began to decrease (Fig. 3). This trend continued in 2014 where the average epilimnetic concentration was 0.03 mg N/L and was not detectable at all depths by mid-August.

Total nitrogen represents the sum of organic and inorganic nitrogen compounds. In 2014 total nitrogen ranged from 0.19 to 0.51 mg N/L in the epilimnion and averaged 0.38 mg N/L. Hypolimnetic total nitrogen increased from 0.71 mg N/L in May to 1.10 mg N/L in August (Table 2, Fig. 4).

### **Sodium**

Sodium enters a watershed mainly through its use as a deicing salt for roads. In winters, these deicing salts are used heavily around Conesus Lake, and as a result sodium has had an increasing trend in the lake since 1985 (Fig. 3). Significant differences were not observed from the top of the lake to the bottom, suggesting the lake is not in danger of becoming meromictic (not mixing). In 2014, average epilimnetic sodium ranged from 21.90 to 28.01 mg/L. Of interest is that average 2014 epilimnetic sodium concentration (24.82 mg/L) was ~ 2 mg/L lower than in 2012 (27.85 mg/L) but still is much higher than the debated EPA's 20 mg/L Drinking Water Equivalency Level (DWEL or guidance

level) for sodium (Makarewicz *et al.*, 2009). Efforts to reduce deicing salt usage on area roads may be effective.

### **The Environmental Health of Conesus Lake**

Carlson's Trophic Status Index (TSI) was developed to assess the trophic state of North American lakes by considering summer epilimnetic TP, chl *a* concentrations, and summer secchi disk depth. This index is one of several that can be used to evaluate the trophic status of a lake; that is, what is the overall productivity of the lake. The TSI in 2014 for TP (48.7), chlorophyll (50.7), and secchi disk (48.6) averaged 49.3, suggesting a mesotrophic/eutrophic status for Conesus Lake (Tables 3, 4). Similarly, the TP concentrations (21.9 µg/L) and secchi disk (2.2 m) readings for the summer 2014 period also suggest a mesotrophic/eutrophic status for Conesus Lake (Table 3). Lastly, the temporal trends in TP and chl *a* (Fig. 3) and the overall Trophic Status Index (Table 4) have been decreasing over the past decade until the summer of 2014. For example, chl *a* concentrations have for years suggested a eutrophic state (chl *a* greater than 7.3, Table 3) for Conesus Lake. Since ~2000 chlorophyll *a* concentrations have been decreasing and have fallen into the mesotrophic range (2.6 to 7.3 µg/L, Fig. 3). However, in 2014 average chlorophyll levels increased back to above the 7.3 µg/L guideline to a eutrophic status.

Similarly the average epilimnetic TP concentrations in 2012 were for the first time in 30 years below the 20 µg P/L NYS guideline (Fig. 5). However, in 2014 TP concentration was once again above the 20 µg P/L NYS Guideline - but just barely and probably not significantly. Variability in the data set is large, and annual differences are impacted by yearly differences in weather (e.g., rainfall and runoff from the watershed). However, several different indicators are suggesting that Conesus Lake water quality and trophic status may be improving. However, the proliferation of blue-green algae/bacteria (Cyanobacteria) and the presence of potential neurotoxin species of algae is of concern (see phytoplankton below).

## **Alewife and Walleye**

Much of the following summary is derived from Sanderson (2014). Conesus Lake has long been a highly productive, regionally important fishery for cool and warm water fish species (Forest et al., 1978; Chiotti, 1980) but has been in a state of change that has been underway for nearly three decades since alewives and zebra mussels were introduced. For decades prior to the early 1980's it was best known for its yellow perch (*Perca flavescens*) fishing, particularly in winter (Lane, 1993). Also during the 1960s and into the early 1970s, walleye (*Sander vitreus*, formerly *Stizostedion vitreum*) fishing was outstanding at Conesus but waned severely by the mid 1970s and collapsed completely by the mid 1980s (Abraham, 1986). For example, abundance of the walleye decreased from a high of 12,000 individuals in 1966 to 9,614 individuals in 1975 to 1,850 individuals by 1985 in Conesus Lake (Abraham, 1988b). During the late 1970s (probably 1978 or 79), the alewife *Alosa pseudoharengus*, an obligate planktivore, was accidentally introduced and became established in the lake (Abraham, 1988a). The impact of the accidental introduction of the alewife has caused a major change in the food web of Conesus Lake (Makarewicz, 2001). In addition, because the alewife compete with yellow perch for zooplankton and can consume yellow perch fry (Brooking et al., 1998), the alewife invasion is believed to have resulted in the collapse of the popular yellow perch fishery (Abraham, 1986, 1988b; Lane, 1996; Brooking and Olson, 1999). Similarly, alewives in Conesus Lake have been implicated as the cause of declines in the natural reproduction of walleye (Abraham, 1986, 1988b; Brooking and Olson, 1999) as they feed on larval walleye (Brooking et al., 1998). Lack of suitable spawning habitat due to shoreline construction, overfishing, and consequently the lack of mature egg-laying females are other causes for the collapse of the fishery (Abraham, 1989). Yet alewife population estimates from the gang gill net survey conducted by the NYSDEC reveal a declining alewife population from 1985 to 1991 (Table 5). The suggested reduction of the alewife is presumably due to a decrease in the zooplankton forage base and/or walleye predation. However, Sanderson (2014) cautions about conclusions about alewife abundance derived from gill net surveys.

Efforts to restore the walleye fishery with annual fry stockings proved ineffective. However, beginning in 1985 a walleye fingerling stocking program was implemented, and stocking of advanced fingerlings in accordance with the New York State walleye management plan (Festa et al., 1987) commenced in 1989 and continues to this day (Table 6), augmented by purchased walleye fry by the Conesus Lake Association. The walleye population responded immediately and, with continuing stockings of advanced fingerlings through 1997 (except for 1996 when hatchery stocks were lost to disease), the adult population rose from a documented low of 1,300 fish in 1986 to 2,600 adults in 1998 to approximately 22,000 fish in the fall of 1994 (Abraham, 1993; Lane, 1996). The latter population level is roughly twice the 12,000 fish estimated to be in the 1966 population - when fishing was good (Abraham, 1986).

### **Phytoplankton**

The pre-alewife phytoplankton community was dominated by larger (>70  $\mu\text{m}$ , greatest axial linear dimension) colonial, filamentous, and unicellular algae or net phytoplankton (Mills, 1975). A major shift in size composition of the phytoplankton community occurred from the pre- to the post-alewife period. In 1972 the net plankton (>70  $\mu\text{m}$ ) represented over 61% of the total phytoplankton biomass as these large phytoplankton forms are not eaten by zooplankton. By 1985 and 1988, net plankton biomass decreased to less than 22% of the total phytoplankton biomass (Makarewicz, 2001); that is, the biomasses of smaller size classes of phytoplankton were becoming more prevalent after the introduction of alewife and the selective removal of large efficient herbivorous Cladocera. In particular, the 21- to 70- $\mu\text{m}$  size range increased from 4.2% to ~ 30% of the total phytoplankton through 2014 (Table 5). There appears to have been no changes in the size structure (Table 5, 7) of the phytoplankton community since the introduction of alewife. However, in 2014 average chlorophyll levels increased back to above the 7.3  $\mu\text{g/L}$  guideline to a eutrophic status. Although overall abundance and the number cells in the <10  $\mu\text{m}$  size has increased, the phytoplankton community of Conesus Lake is still dominated by smaller phytoplankton compared to the pre-alewife period. The large increase in abundance of phytoplankton cells has increased several fold since 1999 and 2004 to 2014 (Table 5). A check of stored slides from 1998 and

2014 indicated that this change appeared to be real. Most of the increase is caused by the Cyanophyta (Table 7, and Appendix 3).

An important note is the development of a bloom of *Anabaena circinalis* in August of 2014. With densities exceeding 20,000 cells/ml, this algae may produce a neurotoxin known as saxitoxin. However, only a limited number of strains have been reported to produce saxitoxins. We only counted and identified this organism but did not determine toxicity.

### **Zooplankton**

The pre-alewife zooplankton community was dominated by *Daphnia pulex*, *Conochilus unicornis*, and *Diacyclops bicuspidatus* (formerly *Cyclops bicuspidatus*). The overwhelming dominance of *D. pulex* in 1972 was impressive. It was the dominant cladoceran on each of the 50 sampling days throughout the year (Chamberlain, 1975). Abundance reached as high as 36 individuals/L in the summer and 13 individuals/L in December.

The post-alewife (1985 and 1988) zooplankton species composition represented a significant change since 1973 (pre-alewife). In 1973 Conesus Lake was dominated by the large *D. pulex*, the colonial rotifer *C. unicornis*, and *Diacyclops bicuspidatus* (Chamberlain, 1975). As a result of the introduction of the alewife into Conesus Lake in 1978–79, the cladoceran community changed and was dominated by the small *B. longirostris* by 1985. The smaller *Daphnia retrocurva* was the second most important Cladocera while *D. galeata mendotae* was somewhat rare in 1985. The last *D. pulex* was observed in 1984. *Diacyclops bicuspidatus* and *C. unicornis* were the dominant Copepoda and Rotifera in 1985, as in 1973 (Makarewicz, 1986, 2001).

With continued size-selective feeding by the alewife, further changes in the zooplankton community were observed by 1988. *Bosmina longirostris* and *Ceriodaphnia reticulata* were co-dominant in 1988, while the 1985 co-dominant *D. retrocurva* was rare in 1988. Zooplankton data exist for 1991, 1993, 1999, 2004, 2009, and now 2014. The results

are similar in that *B. longirostris* and *Ceriodaphnia* sp. are still the co-dominant species (Table 8). As in 1985, the large *D. pulex* was not present in the lake, but abundance of the smaller *Daphnia retrocurva* was low suggesting predation by alewife was still high (Tables 5, 8).

A large Copepoda *Skistodiaptomus pallidus* (formerly *Diaptomus pallidus*) (length ~1 mm), present in 1985 but with a reduced abundance compared to 1972, was completely eliminated by 1988 – 9 years after the introduction of alewife (Makarewicz, 2001). Some calanoids copepods, perhaps *S. pallidus*, were observed in 2014, but again abundance was low (Table 8). Similarly, the abundance and size of *Diacyclops thomasi* decreased from 1985 (12.3% of the Crustacea abundance; mean length of 0.92 mm) to 1988 (0.20% of the Crustacea abundance; mean length of 0.72 mm) (Makarewicz, 2001; Puckett, 1989) to only 3.06% of the abundance in 2014 (Tables 5, 8) but with a similar size (0.72 mm).

In general, the average length of crustaceans decreased from 1.03 mm in 1972 (pre-alewife) to 0.29 mm by 1988 (post-alewife) and remained under 0.38 mm through 2014 due to selective feeding by alewife. Similarly, the average crustacean biomass significantly decreased from a pre-alewife high of 228 mg/m<sup>3</sup> in 1972 to post-alewife lows of 182 and 99 mg/m<sup>3</sup> by 1985 and 1998, respectively, and continued to hover around 100 mg/m<sup>3</sup> through 2014 (Table 5). Conesus Lake is a classic example of size-selective predation by planktivorous fish that has resulted in a shift in prey composition to smaller zooplankton.

### **Biomanipulation**

An adverse impact of the proliferation of alewife in Conesus Lake is the extirpation of the larger-bodied zooplankton, such as *Daphnia* sp., which are effective grazers of the lake's phytoplankton. Biomanipulation is the deliberate alteration of an ecosystem by adding or removing species, especially predators. In Conesus Lake, the stocking of walleye by NYSDEC has been underway for many years with two objectives: to increase the population of fishable walleye and to reduce the number of alewife in the

lake. If alewife populations are reduced, it was believed that the large *Daphnia* populations that once existed in Conesus Lake may return to historic levels and then graze and reduce down the high phytoplankton levels in the lake (Makarewicz, 2001). Unfortunately, there has been no significant change in the zooplankton community in the last 25 years (Table 5,8). *Daphnia* abundance (<14.9/L) and biomass (<1 mg/m<sup>3</sup>)(Table 5) are still low while the overall size (length) of the zooplankton community is still less than 1/3 of the size in 1972 (Table 5,8). With walleye lake populations reaching as high as 22,000 in 2003 – almost twice as high prior to the alewife invasion - the return of large efficient zooplankton grazers that predominated prior to 1970 has not been observed. Sanderson (2014) notes that the slower growth of walleye, the lower abundance, and a moderate decrease in walleye condition (K) may be due to a decline in the Conesus alewife population. The reduction in alewife catch per unit effort in Conesus Lake supports this contention. Lastly, recent research suggests a high walleye biomass may not be able to control alewife densities (Rudstam et al., 2010). For example in Cayuta Lake, the walleye population, despite a high stocking rate for five years, was unable to decrease alewife recruitment as the alewife biologically adjust to produce more eggs and thus young with higher predation (Rudstam et al., 2010, 2011).

## References

- Abraham, W.J., 1986. An estimate of the adult walleye population of Conesus Lake, Spring 1986. New York State Department of Environmental Conservation file report. Avon, New York. 10 p.
- Abraham, W.J., 1988a. Colonization of Conesus Lake by the alewife. Bureau of Fisheries Report. New York State Department of Environmental Conservation (NYSDEC), Avon, N.Y., USA.
- Abraham, W.J., 1988b. The demise of the Conesus Lake yellow perch sport fishery following alewife colonization. New York State Department of Environmental Conservation file report. Avon, New York. 14 p.
- Abraham, W.J., 1989. Conesus Lake fish stock assessment comparisons between 1985 and 1988 netting data. Bureau of Fisheries Report. – New York State Department of Environmental Conservation (NYSDEC), Avon, N.Y., USA.
- Abraham, W.J., 1993. Conesus Lake fish stock assessment-comparisons between 1985 and 1988 netting data. New York State Department of Environmental Conservation file report. Avon, New York. 14 p.
- APHA, 2012. Standard Methods for the Examination of Waste and Wastewater, 22<sup>nd</sup> ed. American Public Health Association. New York, NY.

- Balcer, M.D., Korda, N.L., Dodson, S.I., 1984. Zooplankton of the Great Lakes. The University of Wisconsin Press. Madison, Wisconsin.
- Bidigare, R.R., Iriarte, J.L., Kang, S.H., Karentz, D., Ondrusek, M.E., Fryxell, G.A., 1996. Phytoplankton: Quantitative and qualitative assessments, in: Ross, R.M., Hofmann, E.E., Quetin, L.B. (Eds). Foundation for Ecological Research of the Antarctic Peninsula. Antarct. Res. Ser. 70, 173–198.
- Brooking, T.E., Rudstam, L.G., Olson, M.H., Van DeValk, A.J., 1998. Size-dependent alewife predation on larval walleyes in laboratory experiments. North American Journal of Fisheries Management 19, 960-965.
- Brooking, T.E., Olson, M.H., 1999. Investigation of nursery areas for stocking walleye fry in alewife dominated waters. NYSDEC Report.
- Brooks, J.L. 1957. The Systematics of North American Daphnia. Connecticut Academy of Arts and Sciences and the Yale University Press.
- Carlson, R.E., 1977. A trophic state index for lakes. Limnol. Oceanogr. 22, 361 -369
- Carlson, R.E., Simpson, J. 1996. A Coordinator's Guide to Volunteer Lake Monitoring Methods. North American Lake Management Society. 96 p.
- Chamberlain, H.D., 1975. A comparative study of the zooplankton communities of Skaneateles, Owasco, Hemlock and Conesus Lakes. Ph.D. dissertation, Cornell University, Ithaca, N.Y., USA
- CLWC, 2011. Assessment of the Conesus Lake Watershed management plan in 2011. 2012 Conesus Lake Watershed Council, Geneseo, NY.
- Chiotti, T.L., 1980. A strategic fisheries management plan for Conesus Lake. NYSDEC Bureau of Fisheries Publication, Albany, NY. 27 p.
- Crumpton, W.G., 1987. A simple and reliable method for making permanent mounts of phytoplankton for light and fluorescence microscopy. Limnol. Oceanogr. 32, 1154–1159.
- Department of Environmental Conservation (DEC), 2000. Water quality report. Section 305(b). Albany, NY. Water Assessment and Management Division of Water.
- Doohan, M., 1973. An energy budget for adult *Brachionus plicatilis* Muller (Rotaria). Oecologia 13, 351-362.
- Downing, J.A., Rigler, F.H., 1984. A manual on methods for the assessment of secondary productivity in fresh waters. IBP Handbook #17. Blackwell Scientific Publications, Oxford.
- Dumont, H.J., van de Velde, I., Dumont, S., 1975. The dry weight estimate of biomass in a selection of Cladocera, Copepoda and Rotifera for the plankton, periphyton and benthos of continental waters. Oecologia 19, 75-97.
- Festa, P.J., Forney, J.L., Colesante, R.T., 1987. Walleye Management in New York State. New York State Department of Environmental Conservation Bureau of Fisheries Publication. Albany, New York. 104 p.
- Forest, H.S., Wade, J.Q., Maxwell, T.F., 1978. The Limnology of Conesus Lake. Academic Press, New York.
- Kang, S.H., Fryxell, G.A., 1991. Most abundant diatom species in water column assemblages from five ODP Leg 119 drill sites in Prydz Bay, Antarctica: Distributional Patterns, Barron, J., Larsen, B. (Eds.). Proceeding of the ODP Scientific Results, 119, pp. 645-666, Ocean Drilling Program, College Station.
- Kang, S.H., Lee, S.H., 1995. Antarctic phytoplankton assemblage in the western Bransfield Strait region, February, 1993: composition, biomass, and mesoscale distributions. Mar. Ecol. Prog. Ser. 129, 253–267.
- Kang, S.H., Fryxell, G.A., Roelke, D.L., 1993a. *Fragilariopsis cylindrus* compared with other species of the diatom family Bacillariaceae in Antarctic marginal ice edge zones. Nova Hedwigia 106, 335–352.

- Kang, S.H., Suk, M.S., Chung, C.S., Nam, S.Y., Kang, C.Y., 1993b. Phytoplankton populations in the western Bransfield Strait and the southern Drake Passage, Antarctica. *Korean J. Polar Res.* 4, 29–43.
- Lane, G.A., 1993. Conesus Lake ice fishery 1941-1992. New York State Department of Environmental Conservation Draft file report. Avon, New York. 20 p.
- Lane, G., 1996. Conesus Lake fish stock assessment from standardized gill netting in fall 1991 and 1994. NYSDEC Draft File Report. Avon, NY. 20 p.
- Lane, G., 1997. Summary report of fall 1997 standard gang gill net survey of Conesus Lake. New York State Department of Environmental Conservation.
- Makarewicz, J.C., 1986. Water Quality of Conesus Lake. Prepared for the Villages of Avon and Geneseo, NY. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY 14420.
- Makarewicz, J.C., 2001. Trophic interactions: Changes in phytoplankton community structure coinciding with alewife introduction. *Verh. Internat. Verein Limnol.* 27, 1780-1786.
- Makarewicz, J.C., Lewis, T.W., 2009. Conesus Lake Limnology 2009. Department of Environmental Science and Biology: The College at Brockport. Brockport, NY. Technical Reports. Paper 9. [http://digitalcommons.brockport.edu/tech\\_rep/9](http://digitalcommons.brockport.edu/tech_rep/9)
- Makarewicz, J.C., Lewis, T.W., Severson, C., 2008. Conesus Lake 2008. Department of Environmental Science and Biology: The College at Brockport. Brockport, NY. Technical Reports. Paper 34. [http://digitalcommons.brockport.edu/tech\\_rep/34](http://digitalcommons.brockport.edu/tech_rep/34)
- Makarewicz, J.C., Lewis, T.W., Bosch, I., Noll, M.R., Herendeen, N., Simon, R.D., Zollweg, J., 2009. The impact of agricultural best management practices on downstream systems: Soil loss and nutrient chemistry and flux to Conesus Lake, New York, USA. *J. Great Lakes Res.* 35 (Supplement 1), 23–36.
- Makarewicz, J.C., Lewis, T.W., Pettenski, D., 2012a. Stream Water Quality Assessment of Long Point Gully, Graywood Gully, and Sand Point Gully: Conesus Lake Tributaries Spring 2012. Technical Reports. Paper 86. [http://digitalcommons.brockport.edu/tech\\_rep/86](http://digitalcommons.brockport.edu/tech_rep/86)
- Makarewicz, J.C., LaFountain, J.M., Lewis, T.W., 2012b. Long-term Trends and the Trophic Status of Conesus Lake: Report to the Livingston County Planning Department Geneseo, NY. Technical Reports. Paper 117. [http://digitalcommons.brockport.edu/tech\\_rep/117](http://digitalcommons.brockport.edu/tech_rep/117)
- Mills, E.L., 1975. Phytoplankton composition and comparative limnology of Four Finger Lakes, with emphasis on lake typology. Ph.D. dissertation, Cornell University, Ithaca, N.Y., USA.
- Nauwerck, A., 1963. The relation between zooplankton and phytoplankton in Lake Erken. *Symb. Bot. Ups.* 17, 163.
- NYSDEC. 2013. The Final New York State October 2012 (revised February 2013) 2012 Section 303(d) List of Impaired Waters Requiring a TMDL /Other Strategy [http://www.dec.ny.gov/docs/water\\_pdf/303dlistfinal12.pdf](http://www.dec.ny.gov/docs/water_pdf/303dlistfinal12.pdf)
- Oglesby, R.T., Schaffner, W.R., 1978. Phosphorus loadings to lakes and some of their responses. Part 2. Regression models of summer phytoplankton standing crops, winter total phosphorus and transparency of New York Lakes with known phosphorus loadings. *Limnol. Oceanogr.* 23: 135-145.
- Puckett, N.L., 1989. Trophic level changes and alewife predation in Conesus Lake. M.Sc. dissertation, State University of New York at Brockport, Brockport, NY, USA.
- Rudstam, L.G., Brooking, T.W., Krueger, S.D., Jackson, J.R., 2010. Walleye as a management tool for controlling alewife populations: a study of Cayuta and Canadarago Lakes. Final Report. Federal Aid project F-56-R. Job 1-2 and 1-3.

- Rudstam, L.G., Brooking, T.E., Krueger, S.D., Jackson, J.R., Wetherbee, L., 2011. Analysis of compensatory responses in land-locked alewives to walleye predation: A tale of two lakes. *Trans. Am. Fish. Soc.* 140, 1587-1603.
- Ruttner-Kolisko, A., 1974. *Plankton Rotifers, Biology and Taxonomy*. Supplementary edition, English translation of Volume XXVI, part 1: Chapter "Die Rotatorien." E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany.
- Sanderson, M.J., 2014. Conesus Lake Fish Stock Assessment. NYS Department of Environmental Conservation. Region 8, Bureau of Fisheries, Avon, NY.
- SOCL, 2002. State of the Conesus Lake Watershed. Livingston County Planning Department, Geneseo, NY.
- Stantec Consulting Services, 2005. Streambank Remediation Study. Conesus Lake Watershed. Livingston County Planning Department, Geneseo, NY
- Stemberger, R.S., 1979. A Guide to Rotifers of the Laurentian Great Lakes. EPA-600/4-79-021. U.S. Environmental Protection Agency, NTIS, Springfield, VA
- Stewart, K.M., Markello, S.J., 1974: Seasonal variations in concentrations of nitrate and total phosphorus, and calculated nutrient loading for six lakes in western New York. *Hydrobiologia* 44, 61–89.
- Utermohl, H., 1958. Zur vervollkommung der quantitativen phytoplankton-mehtodik. *M.H. Int. Ver. Limnol.* 9, 1-38.
- Ward, H.B., Whipple, G.D., 1965. *Fresh Water Biology*. Edmondson, W.T. (Ed.), Wiley and Sons.
- Wetzel, R.G., Likens, G.E., 2000. *Limnological Analyses*. Springer Verlag, New York, NY.
- Willen, T., 1959. The phytoplankton of Gorwalm, a bay of Lake Malaren. *Oikos* 10, 241-274.

Table1. Results of proficiency audit for the Brockport water quality laboratory.

**WADSWORTH CENTER  
NEW YORK STATE DEPARTMENT OF HEALTH**

**New York ELAP Proficiency Test Report**

Lab Id: 11439      SUNY BROCKPORT  
 125 LENNON HALL  
 EPA Lab Code:    SUNY BROCKPORT  
 NY01449          BROCKPORT, NY 14420  
 (585) 395-5747  
 Director: DR. JOSEPH C. MAKAREWICZ

Shipment Date : 15-Jan-2013  
 Closing Date   : 28-Feb-2013  
 Score Date     : 18-Mar-2013

NYSDOH Wadsworth Center is an A2LA accredited Proficiency Testing Provider. Certificate Number 1785.01

Shipment: 360      Non Potable Water Chemistry

Analyte Name	Units	Sample ID	Test Method	Prep Method	Result/ Analysis Date	Mean/ Assigned Value	Standard Deviation/ Fixed %	Acceptance Limits	Score
<b>Sample: Non Potable Water Inorganic Nutrients</b>									
Nitrate (as N) Analyte Code: 1810	mg/L	6007	SM 18-21 4500-NO3 F (00)		23.56 2/13/13	23.9 24.1	1.71	18.8 - 29.1	Satisfactory <i>85 passed out of 86 reported results.</i>
Orthophosphate (as P) Analyte Code: 1870	mg/L	6007	SM 18-21 4500-P F		1.92 2/12/13	2.01 2.00	0.134	1.61 - 2.41	Satisfactory <i>71 passed out of 76 reported results.</i>
<b>Sample: Non Potable Water Minerals II</b>									
Sodium, Total Analyte Code: 1155	mg/L	6037	SM 18-21 3111B (99)		67.92 2/7/13	66.8 66.9	3.32	56.8 - 76.7	Satisfactory <i>50 passed out of 58 reported results.</i>
<b>Sample: Non Potable Water Nitrite</b>									
Nitrite as N Analyte Code: 1840	mg/L	6041	SM 18-21 4500-NO2 B (00)		3.15 2/13/13	3.13 3.13	0.157	2.66 - 3.60	Satisfactory <i>74 passed out of 79 reported results.</i>
<b>Sample: Non Potable Water Organic Nutrients</b>									
Kjeldahl Nitrogen, Total Analyte Code: 1795	mg/L	6004	EPA 351.2 Rev. 2.0		15.76 2/26/13	16.6 17.0	1.78	11.2 - 21.9	Satisfactory <i>60 passed out of 64 reported results.</i>
Phosphorus, Total Analyte Code: 1910	mg/L	6004	SM 18-21 4500-P F		3.1 2/14/13	3.13 3.1	0.203	2.52 - 3.74	Satisfactory <i>87 passed out of 88 reported results.</i>

Table 2. Conesus Lake water chemistry at the deepest point in the South Basin. TP =Total Phosphorus, TN=Total Nitrogen, SRP=Soluble Reactive Phosphorus, Na=Sodium. 13 May to 16 September 2014. ND=non-detectable.

Sample	Date	TP ( $\mu\text{g P/L}$ )	SRP ( $\mu\text{g P/L}$ )	Nitrate ( $\text{mg N/L}$ )	TN ( $\text{mg N/L}$ )	N/P ratio (molar)	Sodium ( $\text{mg/L}$ )	Chl ( $\mu\text{g N/L}$ )	Secchi disk (m)
1M	5/13	15.4	1.6	0.08	0.36	52.08	22.74	6.3	2.8
8M	5/13	15.7	2.4	0.10	0.55		24.53		
18M	5/13	18.2	1.8	ND	0.71		24.79		
1M	5/27	22.3	2.2	0.07	0.41	40.53	21.90	17.7	1.6
8M	5/27	14.4	1.6	0.07	0.55		22.86		
18M	5/27	23.9	1.5	ND	0.85		24.66		
1M	6/10	22.4	3.1	0.07	0.51	50.34	25.58	5.7	2.2
8M	6/10	15.5	< 1.2	0.11	0.50		26.19		
18M	6/10	95.3	46.3	ND	0.96		25.90		
1M	6/24	21.8	< 1.2	ND	0.48	48.46	25.56	5.6	2.3
8M	6/24	15.3	< 1.2	ND	0.54		25.24		
18M	6/24	71.8	43.3	ND	0.87		26.50		
1M	7/8	27.6	< 1.2	ND	0.45	35.69	26.44	10.6	1.6
8M	7/8	18.1	1.2	< 0.02	0.50		26.50		
18M	7/8	102.9	74.7	< 0.02	0.96		26.62		
1M	7/21	13.6	< 1.2	0.04	0.37	60.47	25.76	7.9	2.2
8M	7/21	19.4	< 1.2	ND	0.35		25.68		
18M	7/21	305.3	294.5	ND	1.01		26.56		
1M	8/5	26.9	< 1.2	0.02	0.36	29.82	25.99	7.4	2.8
8M	8/5	25.0	< 1.2	0.02	0.37		26.10		
18M	8/5	277.4	240.1	0.02	1.10		28.01		
1M	8/19	26.9	4.7	ND	0.29	24.14	25.97	5.2	2.2
8M	8/19	14.6	4.3	ND	0.35		25.35		
18M	8/19	481.1	457.8	ND	1.06		27.16		
1M	9/2	15.4	4.3	ND	0.34	48.78	25.03	5.2	1.7
8M	9/2	19.9	7.5	ND	0.19		25.38		
18M	9/2	455.3	421.4	ND	0.89		25.96		
1M	9/16	26.2	3.3	ND	0.19	15.86	23.22	6.7	2.2
8M	9/16	19.9	2.5	ND	0.22		23.46		
18M	9/16	413.5	302.9	ND	0.75		24.70		
Mean 1m	X $\pm$ S.E.	21.9 $\pm$ 1.7	2.2 $\pm$ 0.5	0.03 $\pm$ 0.01	0.38 $\pm$ 0.03	40.6 $\pm$ 4.4	24.82 $\pm$ 0.5	7.8 $\pm$ 1.2	2.2 $\pm$ 0.1
Mean 8m	X $\pm$ S.E.	17.8 $\pm$ 1.1	3.3 $\pm$ 0.7	0.10 $\pm$ 0.00	0.41 $\pm$ 0.04	54.7 $\pm$ 7.4	25.13 $\pm$ 0.4	7.3 $\pm$ 1.5	
Mean 18m	X $\pm$ S.E.	225 $\pm$ 57	188 $\pm$ 57	0.00 $\pm$ 0.00	0.92 $\pm$ 0.04	11.9 $\pm$ 4.4	26.09 $\pm$ 0.4	4.0 $\pm$ 1.4	

Table 3. General relationship of lake productivity in relation to phosphorus, nitrogen, transparency, and chlorophyll a compared to summer epilimnion values of Conesus Lake in 2014. Adapted from Carlson and Simpson (1996) and Carlson (1977). Conesus Lake secchi disk and epilimnetic (0 m) total phosphorus and chlorophyll a concentrations are from 13 May to 16 September 2014.

	Trophic Status Index	Epilimnetic Total Phosphorus ( $\mu\text{g P/L}$ )	Chl a ( $\mu\text{g/L}$ )	Secchi Disk (m)
Oligotrophic	<30	<6	<0.95	>8
Mesotrophic	40 to 50	12-24	2.6 - 7.3	2-4
Eutrophic	50 to 60	24-48	7.3-20	1-2
Hypereutrophic	>70	96-192	20-56	0.25-0.5
Conesus Lake (2014)	49.3	21.9	7.8	2.2

Table 4. Carlson TSI values for TP, chl a, and secchi disk depth from 1985-2012; and average TP, chl-a and secchi disk depth values for all years combined. ND=no data.

Carlson's Trophic Status Index				
	TP	Chl-a	Secchi	Mean TSI
1985	53.5	45.4	43.4	47.4
1988	49.7	52.0	43.6	48.4
1991	47.9	52.2	45.6	48.6
1993	53.0	55.4	48.0	52.1
1996	48.2	54.0	44.0	48.7
1999	48.1	52.3	ND	50.2
2000	46.0	53.7	ND	49.9
2000	48.0	56.3	ND	52.2
2003	53.0	ND	ND	53.0
2004	52.0	49.6	47.6	49.7
2009	48.0	47.9	45.0	47.0
2012	45.1	49.2	46.0	46.8
<b>2014</b>	<b>48.7</b>	<b>50.7</b>	<b>48.6</b>	<b>49.3</b>
Average	49.6	51.0	45.6	49.3

Table 5. Summary of selected biological and chemical data from 1972- 2014, Conesus Lake. NA=not available. Values represent the average for the May through October period, unless stated otherwise. Phytoplankton size class data are percent of biomass. One star (\*) indicates a significant difference from 1972 (P < 0.05). Two stars (\*\*) indicate a significant difference from 1972 and 1985 (P < 0.05). SRP=soluble reactive phosphorus. TP=total phosphorus. The 1996, 1999, and 2014 data were counted using the Crumpton (1987) method.

	1972	1985	1988	1991	1993	1996	1999	2004	2009	2014
Chemistry										
TP (µg P/L)	23.0 <sup>a</sup>	26.5	23.5	20.8	29.7	21.2	21.1	27.6	20.9	21.9
SRP (µg P/L)	4.4 <sup>b</sup>	5.8 <sup>c</sup>	13.5	2.5	3.8	3.4	5.4	10.3	3.1	2.2
Turbidity (NTU)	0.81	1.05	1.52	1.29	1.16	0.89	1.09	1.93	1.70	3.37
Zooplankton biomass										
Crustacea (mg/m <sup>3</sup> )	228 <sup>d</sup>	182	99	99	71	216	81	57	105	102
Calanoida (mg/m <sup>3</sup> )	30	7	0	0	0	0.1	0	0	0	0
Cladocera (mg/m <sup>3</sup> )	146	62	84	59	40	94	42	29	44	34
Daphnia spp. (mg/m <sup>3</sup> )	87	23	3	0	1	3	0.1	1	1	0.006
Rotifera (ind./L)	NA	567	1235	795	461	846	855	310	139	400
Zooplankton Length (mm)										
Crustacea	1.03	0.47	0.29	0.28	0.32	0.34	0.29	0.2	0.36	0.38
Crustacea + Rotifera	0.6	0.23	0.18	0.16	0.18	0.19	0.12	0.2	0.24	0.19
Phytoplankton										
Chlorophyll (µg/L)	3.4 <sup>e</sup>	3.8	7.3	9.0	12.3	10.9	9.1	6.9	5.8	7.8
Abundance (cells/mL)	1803 <sup>e</sup>	1068	3076	7870	13563	11249	29951	7095	NA	118451
Size Class										
< 10 µm	20.5 <sup>e</sup>	10.2	24.2	7.4	11.1	22.1	26.0	23.0	NA	60.1
10-20 µm	13.7 <sup>e</sup>	29.3	13.2	17.5	13.2	21.8	16.8	27.8	NA	2.7
21-70 µm	4.2 <sup>e</sup>	39.3	43.4	37.7	34.6	24.5	21.8	42.2	NA	26.8
> 70 µm	61.6 <sup>e</sup>	21.2	19.2	37.5	41.1	31.7	35.4	7.0	NA	10.4
Fish <sup>f</sup>										
Walleye (CPUE, #/net)	NA	3.3	7.8	9.8	33.1	19.1	9.0	8.4	12.3	NA
Alewife (CPUE, #/net)	0	45.1	7.3	1.8	12.1	14.1	3.3	2.8	1.9	NA
Yellow perch (CPUE, #/net)	NA	33.1	45.4	10.0	6.8	0.6	0.7	0.1	0.4	NA
	1975	1985	1986	1991	1994	1997	2001	2004	2009	2014
Walleye abundance	4800	1,850	1300	6500	22,000	13000	6000	5600	8500	7500

<sup>a</sup>1969 data of Stewart & Markello (1974). Graphical accuracy for the May through October period.

<sup>b</sup>1972 data of Oglesby and Schaffner. (1978). Data represent the stratification period: May 31 to September 26.

<sup>c</sup>Means are for the period May 25 to September 30.

<sup>d</sup>The 1972 biomass estimate represents the weighted mean for June through October of 1972. A net efficiency of 77.3% was applied to the 1972 data based on our 1985 data. Because a 150-µm mesh net was used in 1972, the 1972 biomass estimates are believed to be conservative (graphical accuracy; Chamberlain, 1975). Copepod nauplii are not included in the biomass estimates.

<sup>e</sup>1972 data of Mills (1975). Data represent the stratification period: May 31 to September 26.

<sup>f</sup>From Abraham (1989), Lane (1997), Sanderson (2014)

Walleye abundance in 1966=12000, 2002=20,000

Table 6. Fish Stocking Conesus Lake since 2013. Data from Livingston County Planning, October 2014. NS=no stocking. Walleye (*Sander vitreus*, formerly *Stizostedion vitreum*). Tiger muskellunge (hybrid of muskellunge (*Esox masquinongy*) and the northern pike (*Esox lucius*).

	Walleye			Tiger Muskies
	Fingerlings (2 to 3")	Advanced Fingerlings (4 to 6")	Sub-Adults (6 to 8")	
2003	10,600	NS	NS	NS
2004	90,000	NS	NS	NS
2005	6000	NS	NS	NS
2006	1500	NS	NS	NS
2007	20000	45,000	NS	NS
2008	NS	2250	NS	NS
2009	1700	NS	NS	9500
2010	65000	1500	NS	NS
2011	NS	NS	200	NS
2012	Ns	78	1000	12000
2013	200	125	NS	NS

Table 7. Mean abundance and biovolume of Conesus Lake phytoplankton, May to September, 2014.

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	Achnanthes minutissima	0.8	0.00%	13	0.00%
	Achnanthes sp.	1.4	0.00%	21	0.00%
	Anomoeoneis vitrea	0.8	0.00%	135	0.00%
	Asterionella formosa	27.0	0.02%	5,309	0.17%
	Cyclostephanos damasii	2.8	0.00%	1,347	0.04%
	Cyclotella ocellata	701.3	0.59%	25,094	0.78%
	Cyclotella pseudostelligera	10.2	0.01%	366	0.01%
	Cyclotella sp. 1	128.0	0.11%	4,581	0.14%
	Diatoma tenuis	6.8	0.01%	3,634	0.11%
	Fragilaria crotonensis	24.3	0.02%	9,578	0.30%
	Navicula sp.	1.4	0.00%	162	0.01%
	Nitzschia palea	2.1	0.00%	91	0.00%
	Stephanodiscus alpinus	5.3	0.00%	58,554	1.82%
	Stephanodiscus hantzschii	10.2	0.01%	13,532	0.42%
	Synedra delicatissima	40.8	0.03%	40,037	1.24%
	Synedra filiformis	20.7	0.02%	5,629	0.17%
	Synedra radians	20.4	0.02%	5,537	0.17%
	Synedra ulna	0.3	0.00%	365	0.01%
		<b>Total</b>	<b>1,004.7</b>	<b>0.85%</b>	<b>173,986</b>
Chlorophyta	Ankistrodesmus braunii	1.4	0.00%	463	0.01%
	Ankistrodesmus falcatus	57.2	0.05%	18,736	0.58%
	Carteria sp.	8.0	0.01%	1,049	0.03%
	Characium limneticum	1.4	0.00%	254	0.01%
	Chlamydomonas sp.	72.1	0.06%	19,713	0.61%
	Closterium moniliferum	2.8	0.00%	1,102	0.03%
	Closterium sp.	8.8	0.01%	11,310	0.35%
	Coelastrum microporum	1.6	0.00%	23	0.00%
	Coelastrum pseudomicroporum	16.9	0.01%	237	0.01%
	Cosmarium sp.	10.6	0.01%	24,512	0.76%
	Crucigenia quadrata	81.6	0.07%	26,679	0.83%
	Deasonia Gigantica	2.1	0.00%	1,482	0.05%
	Dictyosphaerium ehrenbergianum	79.0	0.07%	2,680	0.08%
	Dictyosphaerium pulchellum	16.9	0.01%	591	0.02%
	Dispora crucigenioides	91.0	0.08%	4,056	0.13%
	Eudorina elegans	216.8	0.18%	77,276	2.40%
	Franceia droescheri	8.9	0.01%	2,434	0.08%
	Gloeococcus minor	3.5	0.00%	3,574	0.11%
	Gloeocystis sp.	8.5	0.01%	566	0.02%
	Lagerheimia ciliata	18.5	0.02%	5,162	0.16%
	Monoraphidium arcuatum	7.1	0.01%	89	0.00%
	Monoraphidium capricornutum	9.3	0.01%	117	0.00%
	Oocystis parva	535.7	0.45%	90,650	2.82%
	Oocystis pusilla	16.3	0.01%	1,167	0.04%
	Pandorina morum	220.8	0.19%	33,247	1.03%
	Pediastrum boryanum	22.6	0.02%	1,129	0.04%
	Pyramichlamys dissecta	2.1	0.00%	516	0.02%
	Quadrigula lacustris	3.4	0.00%	185	0.01%
	Scenedesmus bicaudatus	1.7	0.00%	129	0.00%
	Scenedesmus bijuga	176.1	0.15%	29,442	0.92%
	Scenedesmus intermedius	11.3	0.01%	494	0.02%
	Scenedesmus quadricauda	13.7	0.01%	598	0.02%
	Scenedesmus serratus	15.2	0.01%	666	0.02%
Schroederia judayi	13.8	0.01%	5,874	0.18%	

Table 7 (cont.). Mean abundance and biovolume of Conesus Lake phytoplankton, May to September, 2014.

	Schroederia setigera	1.8	0.00%	485	0.02%
	Selenastrum minutum	1.4	0.00%	47	0.00%
	Sphaerocystis schroeteri	883.0	0.75%	50,063	1.56%
	Staurastrum sp.	9.2	0.01%	22,723	0.71%
	Stichococcus bacillaris	3.5	0.00%	59	0.00%
	Tetraedron minimum	4.2	0.00%	843	0.03%
	Tetraedron muticum	1.7	0.00%	337	0.01%
	Unidentified Chlorophyte	218.8	0.18%	384,997	11.97%
	<b>Total</b>	<b>2,880.6</b>	<b>2.43%</b>	<b>825,756</b>	<b>25.67%</b>
Chrysophyta	Chromulina sp.	2.8	0.00%	19	0.00%
	Dinobryon divergens	5.9	0.00%	1,205	0.04%
	Dinobryon sertularia	1.4	0.00%	291	0.01%
	Dinobryon sociale	38.1	0.03%	7,028	0.22%
	Dinobryon sp.	25.7	0.02%	5,290	0.16%
	Mallomonas akrokomas	1.4	0.00%	1,147	0.04%
	Mallomonas sp.	7.4	0.01%	6,020	0.19%
	Ochromonas sp.	32.1	0.03%	13,414	0.42%
	Polygoniochloris circularis	10.3	0.01%	462	0.01%
	Unidentified Chrysophyte	13.3	0.01%	870	0.03%
	<b>Total</b>	<b>138.4</b>	<b>0.12%</b>	<b>35,745</b>	<b>1.11%</b>
Cryptophyta	Cryptomonas erosa	134.0	0.11%	61,711	1.92%
	Cryptomonas rostratiformis	1.4	0.00%	8,640	0.27%
	Rhodomonas minuta	1,391.2	1.17%	156,030	4.85%
	<b>Total</b>	<b>1,526.6</b>	<b>1.29%</b>	<b>226,382</b>	<b>7.04%</b>
Cyanophyta	Anabaena circinalis	7,824.2	6.61%	110,635	3.44%
	Anabaena crassa	195.0	0.16%	50,095	1.56%
	Anabaena macrospora	2.6	0.00%	911	0.03%
	Anabaena planctonica	216.0	0.18%	55,477	1.72%
	Aphanocapsa delicatissima	4,003.0	3.38%	2,094	0.07%
	Aphanocapsa elachista	72.9	0.06%	128	0.00%
	Aphanocapsa holsatica	141.2	0.12%	74	0.00%
	Chroococcus limneticus	112.1	0.09%	22,354	0.69%
	Chroococcus minimus	122.8	0.10%	2,309	0.07%
	Chroococcus minutus	17.8	0.02%	334	0.01%
	Cyanogranis ferruginea	612.3	0.52%	40,020	1.24%
	Gomphosphaeria lacustris	1,487.1	1.26%	18,115	0.56%
	Limnothrix redekei	2,713.9	2.29%	62,257	1.94%
	Lyngbya birgei	0.8	0.00%	7	0.00%
	Merismopedia warmingiana	198.2	0.17%	351	0.01%
	Microcystis aeruginosa	281.0	0.24%	18,366	0.57%
	Microcystis viridis	6.0	0.01%	390	0.01%
	Nanoplankton	48,309.1	40.78%	697,277	21.68%
	Oscillatoria limnetica	1,693.8	1.43%	38,864	1.21%
	Oscillatoria splendida	518.7	0.44%	104,060	3.23%
	Pseudanabaena acicularis	831.0	0.70%	213,447	6.64%
	Pseudanabaena limnetica	181.1	0.15%	49,260	1.53%
	Pseudanabaena sp.	140.0	0.12%	35,952	1.12%
	Snowella litoralis	105.9	0.09%	1,682	0.05%
	Synechococcus elongatus	118.1	0.10%	285	0.01%
	Synechococcus sp. 1	36,662.4	30.95%	19,064	0.59%
	Synechocystis sp.	520.9	0.44%	272	0.01%
	<b>Total</b>	<b>107,088.0</b>	<b>90.41%</b>	<b>1,544,080</b>	<b>48.00%</b>

Table 7 (cont.). Mean abundance and biovolume of Conesus Lake phytoplankton, May to September, 2014.

Euglenophyta	Trachelomonas sp.	3.3	0.00%	18,193	0.57%
	Trachelomonas volvocina	6.7	0.01%	36,854	1.15%
	<b>Total</b>	<b>10.0</b>	<b>0.01%</b>	<b>55,047</b>	<b>1.71%</b>
Haptophyta	Chrysochromulina parva	5,208.5	4.40%	174,538	5.43%
	<b>Total</b>	<b>5,208.5</b>	<b>4.40%</b>	<b>174,538</b>	<b>5.43%</b>
Miscellaneous	Misc. Microflagellate	23.5	0.02%	131	0.00%
	<b>Total</b>	<b>23.5</b>	<b>0.02%</b>	<b>131</b>	<b>0.00%</b>
Pyrrhophyta	Glenodinium quadridens	3.9	0.00%	24,736	0.77%
	Gymnodinium sp. 2	3.0	0.00%	982	0.03%
	Gymnodinium sp. 3	1.7	0.00%	535	0.02%
	Peridinium polonicum	2.6	0.00%	42,550	1.32%
	Peridinium umbonatum	1.4	0.00%	2,434	0.08%
	Woloszynskia sp.	2.1	0.00%	29,933	0.93%
	<b>Total</b>	<b>14.7</b>	<b>0.01%</b>	<b>101,170</b>	<b>3.15%</b>
Xanthophyta	Nephrodiella lunaris	556.2	0.47%	79,978	2.49%
	<b>Total</b>	<b>556.2</b>	<b>0.47%</b>	<b>79,978</b>	<b>2.49%</b>
	<b>Total</b>	<b>118,451.3</b>	<b>100.00%</b>	<b>3,216,813</b>	<b>100.00%</b>

Table 8. Summary of all zooplankton species in Conesus Lake during May through September 2014 (n=10). Biomass is dry weight. See appendices for individual sampling day data.

	Mean Abundance (#/m <sup>3</sup> )	Percent Abundance	Mean Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	70,676.2	12.91%	32,111.4	22.61%	249
Ceriodaphnia sp.	13,731.5	2.51%	1,853.6	1.31%	326
Chydorus sphaericus	57.6	0.01%	10.6	0.01%	180
Daphnia retrocurva	14.9	0.00%	6.3	0.00%	480
Diaphanosoma sp.	39.8	0.01%	39.3	0.03%	630
<b>Total</b>	<b>84,520.0</b>	<b>15.44%</b>	<b>34,021.2</b>	<b>23.96%</b>	<b>262</b>
<b>Calanoida</b>					
Skistodiotomus sp. ?	14.9	0.00%	42.7	0.03%	1000
<b>Total</b>	<b>14.9</b>	<b>0.00%</b>	<b>42.7</b>	<b>0.03%</b>	<b>1000</b>
<b>Cyclopoida</b>					
Cyclopoid copepodids	10,903.1	1.99%	14,606.3	10.28%	545
Diacylops thomasi	16,767.6	3.06%	38,836.6	27.35%	718
Mesocyclops edax	2,880.6	0.53%	9,368.2	6.60%	877
Mesocyclops leuckarti ?	2,839.1	0.52%	4,762.6	3.35%	747
Microcyclops sp. ?	326.6	0.06%	429.2	0.30%	542
<b>Total</b>	<b>33,717.0</b>	<b>6.16%</b>	<b>68,002.9</b>	<b>47.88%</b>	<b>676</b>
<b>Total Crustacea</b>	<b>118,251.9</b>	<b>21.60%</b>	<b>102,066.8</b>	<b>71.87%</b>	<b>380</b>
<b>Copepoda nauplii</b>					
Copepod Nauplius	26,217.5	4.79%	10,487.0	7.38%	197
<b>Total</b>	<b>26,217.5</b>	<b>4.79%</b>	<b>10,487.0</b>	<b>7.38%</b>	<b>197</b>
<b>Rotifera</b>					
Ascomorpha ecaudis	36.4	0.01%	0.8	0.00%	120
Ascomorpha saltans	37.3	0.01%	0.8	0.00%	120
Asplanchna priodonta	6,160.0	1.13%	7,565.3	5.33%	513
Asplanchna sp.	477.8	0.09%	44.4	0.03%	218
Collotheca sp.	1,828.1	0.33%	153.3	0.11%	158
Conochilus unicornis	52,894.9	9.66%	632.1	0.45%	93
Filinia longiseta	10,738.3	1.96%	407.4	0.29%	167
Gastropus sp.	64.7	0.01%	2.0	0.00%	153
Gastropus stylifer	14.9	0.00%	0.4	0.00%	150
Kellicottia bostoniensis	1,701.9	0.31%	7.2	0.01%	99
Kellicottia longispina	1,980.3	0.36%	13.5	0.01%	117
Keratella cochlearis	52,713.1	9.63%	247.7	0.17%	105
Keratella cochlearis v. tecta	2,353.4	0.43%	4.6	0.00%	79
Keratella crassa	32,175.6	5.88%	4,168.9	2.94%	178
Keratella earlinae	88.7	0.02%	11.3	0.01%	176
Keratella quadrata	5,507.7	1.01%	361.3	0.25%	140
Monostyla comuta	36.4	0.01%	0.5	0.00%	100
Notholca acuminata	223.4	0.04%	45.7	0.03%	244
Pleosoma lenticulare ?	363.9	0.07%	48.0	0.03%	179
Pleosoma tricanthum	347.2	0.06%	26.6	0.02%	149
Polyarthra eurypta	5,454.5	1.00%	1,143.0	0.80%	189
Polyarthra major	14,171.0	2.59%	1,902.7	1.34%	163
Polyarthra remata	13,294.7	2.43%	323.3	0.23%	92
Polyarthra vulgaris	163,060.2	29.78%	9,873.4	6.95%	125
Pompholyx complanata	6,166.4	1.13%	76.6	0.05%	94
Pompholyx sulcata	14,526.1	2.65%	214.8	0.15%	99
Synchaeta oblonga	236.5	0.04%	12.3	0.01%	195
Synchaeta sp.	1,318.2	0.24%	126.2	0.09%	233
Trichocerca elongata	730.0	0.13%	111.6	0.08%	307
Trichocerca multicrinis	10,845.4	1.98%	831.5	0.59%	145
<b>Total</b>	<b>399,546.9</b>	<b>72.98%</b>	<b>28,357.1</b>	<b>19.97%</b>	<b>130</b>
<b>Veneroida</b>					
Dreissena polymorpha veliger	3,464.8	0.63%	1,108.6	0.78%	123
<b>Total</b>	<b>3,464.8</b>	<b>0.63%</b>	<b>1,108.6</b>	<b>0.78%</b>	<b>123</b>
<b>Total</b>	<b>547,481.0</b>	<b>100.00%</b>	<b>142,019.5</b>	<b>100.00%</b>	<b>188</b>

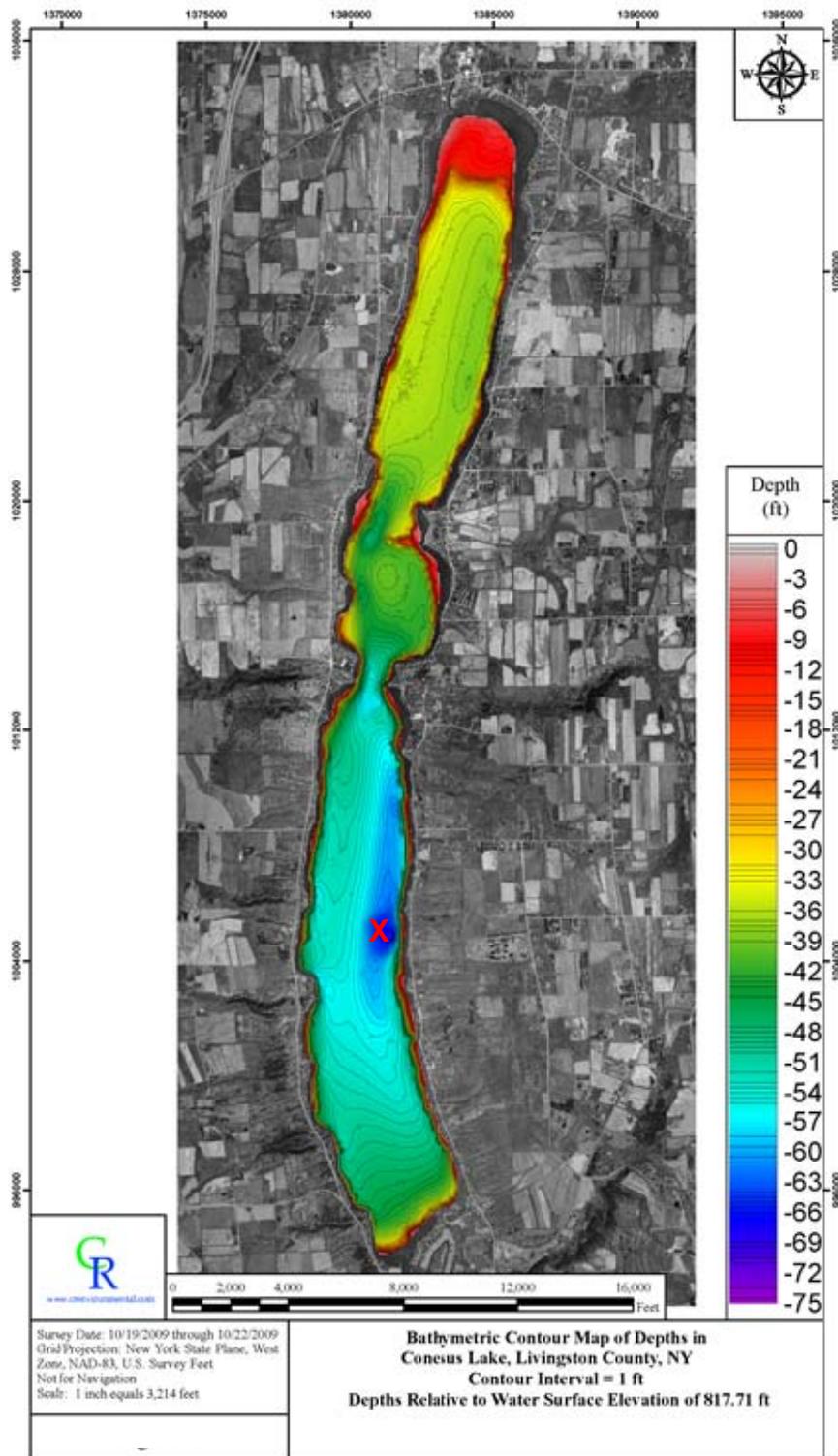


Figure 1. Bathymetric map of Conesus Lake showing the deepest point (X) and the site of all sampling in 2014.

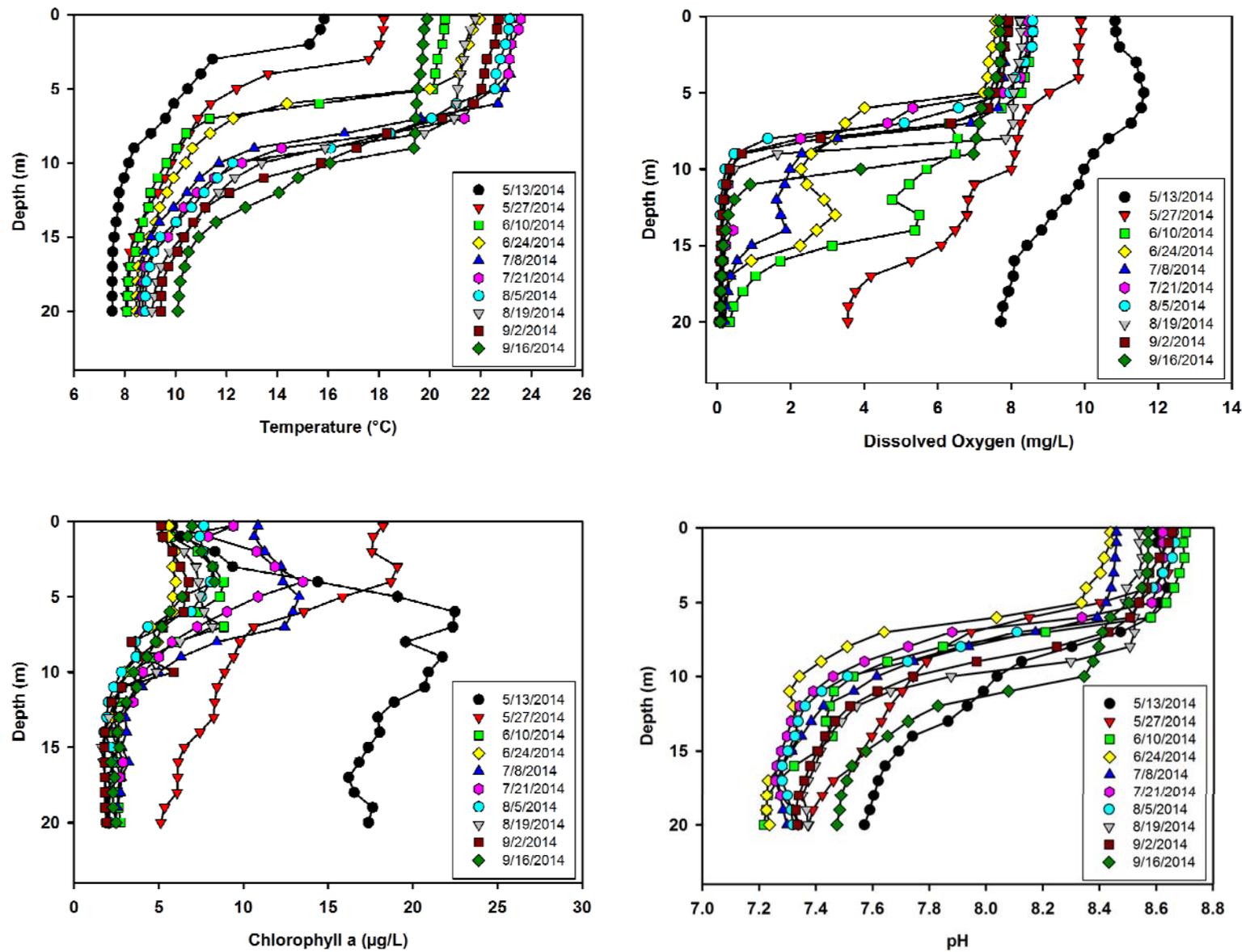


Figure 2. Depth profiles of temperature, pH, dissolved oxygen, and chlorophyll-a at the deepest location in Conesus Lake from 13 May to 16 September, 2014.

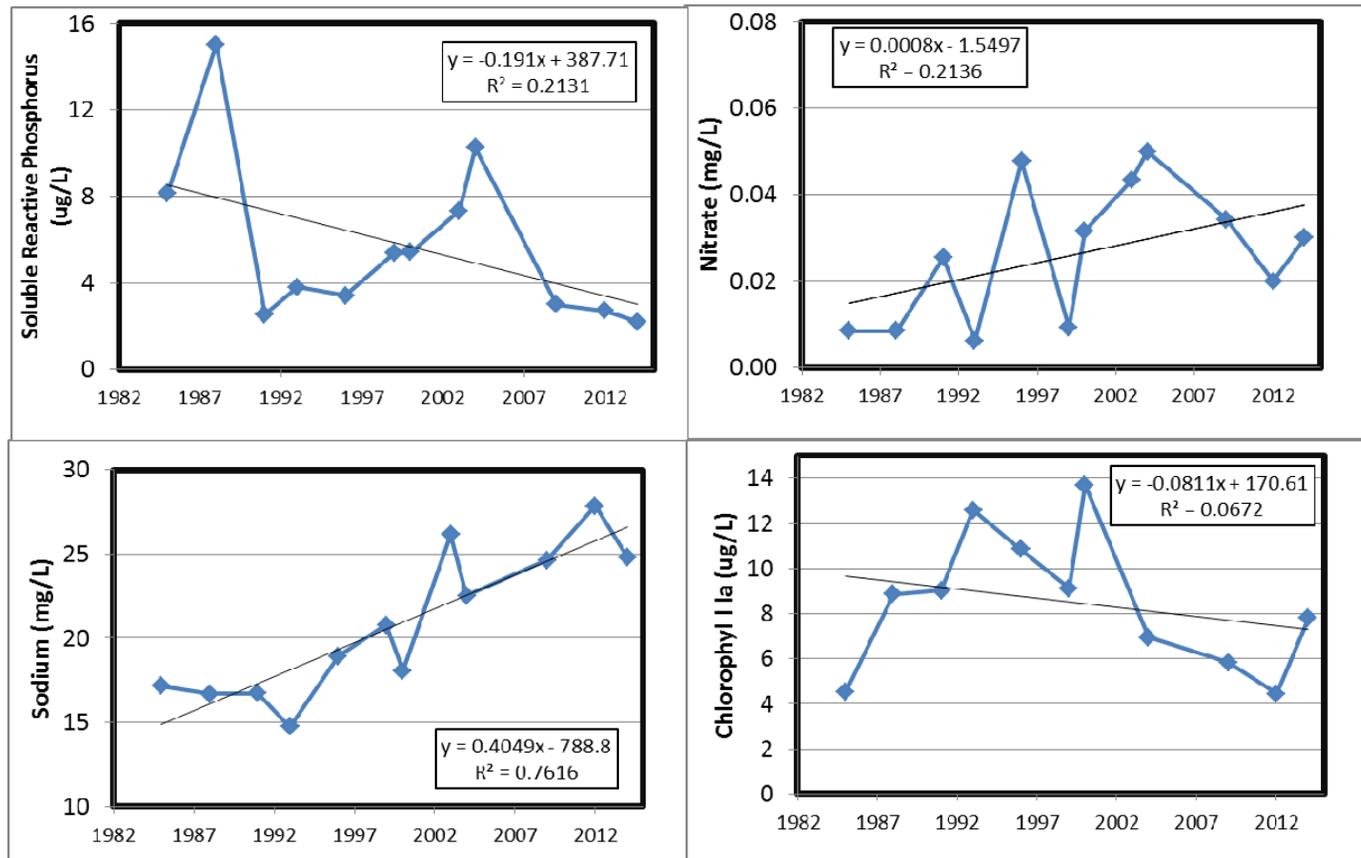


Figure 3. Average epilimnetic concentrations of soluble reactive phosphorus, nitrate, sodium, and chlorophyll a from 1985-2014. A mistake was found in one data point from the 2004 nitrate data previously reported (e.g., Makarewicz et al., 2008, 2012b). The current graphic has been corrected.

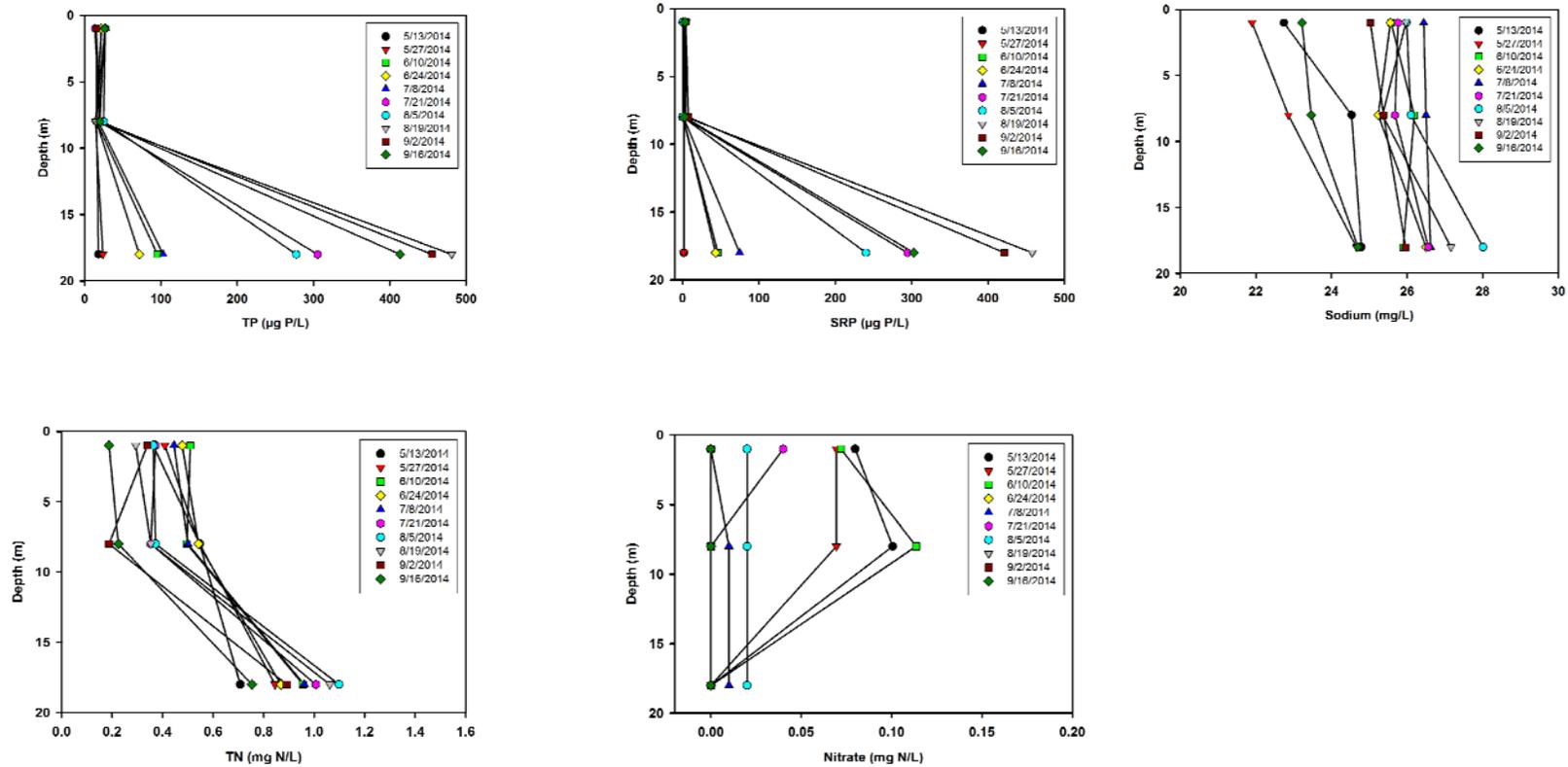


Figure 4. Depth profiles of total phosphorus (TP), soluble reactive phosphorus (SRP), nitrate, total nitrogen (TN) and sodium at the deepest location in Conesus Lake from May-August 2014.

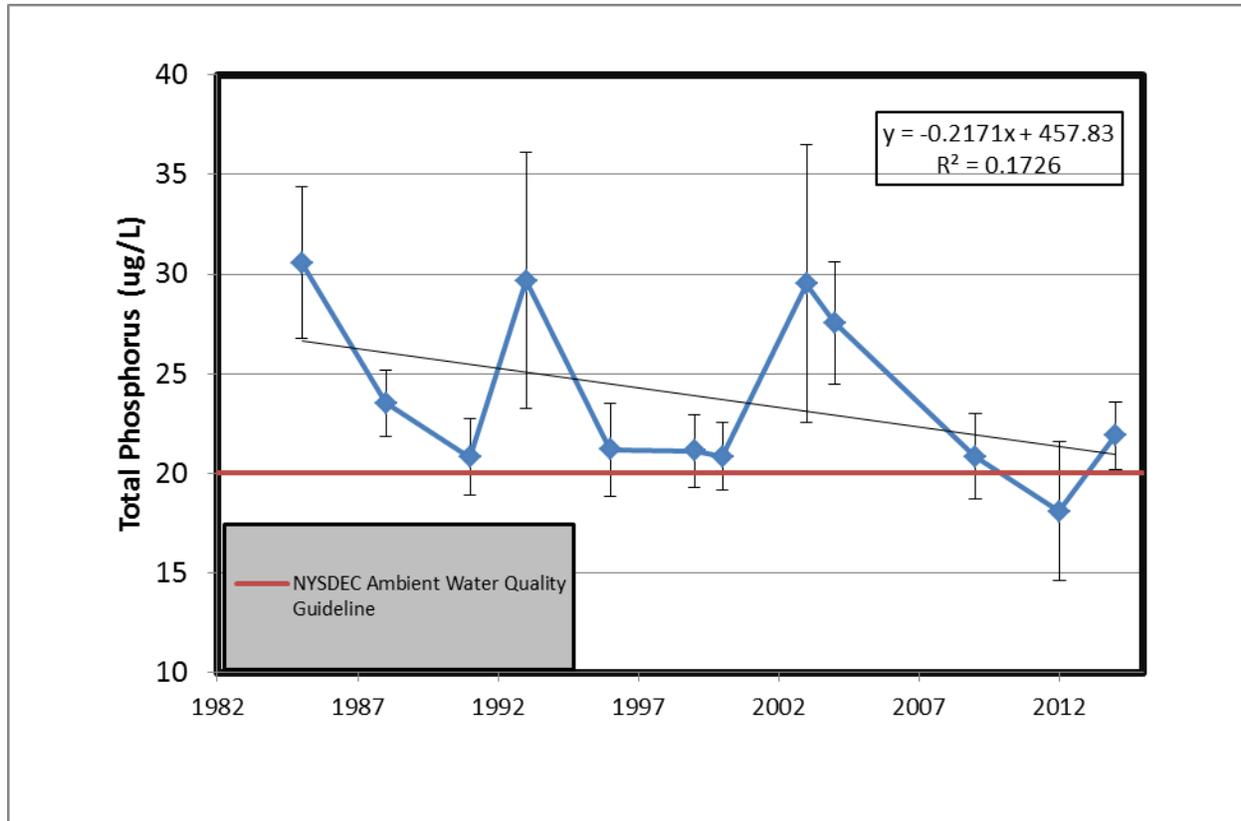


Figure 5. Average epilimnetic total phosphorus concentrations (µg P/L) from 1985-2014.

Appendix 1. Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
5/13/2014	0	15.84	8.61	5.8	10.8	2.80
5/13/2014	1	15.69	8.60	6.3	10.8	
5/13/2014	2	15.27	8.62	8.3	10.9	
5/13/2014	3	11.45	8.62	9.4	11.4	
5/13/2014	4	10.99	8.64	14.4	11.5	
5/13/2014	5	10.47	8.61	19.1	11.6	
5/13/2014	6	9.93	8.58	22.5	11.5	
5/13/2014	7	9.60	8.47	22.4	11.3	
5/13/2014	8	9.03	8.30	19.6	10.7	
5/13/2014	9	8.36	8.12	21.7	10.2	
5/13/2014	10	8.16	8.04	20.9	10.0	
5/13/2014	11	7.97	7.99	20.7	9.8	
5/13/2014	12	7.77	7.93	18.9	9.5	
5/13/2014	13	7.75	7.86	17.9	9.1	
5/13/2014	14	7.65	7.74	18.1	8.8	
5/13/2014	15	7.58	7.69	17.4	8.4	
5/13/2014	16	7.52	7.64	16.8	8.1	
5/13/2014	17	7.52	7.62	16.2	8.1	
5/13/2014	18	7.50	7.60	16.5	7.9	
5/13/2014	19	7.50	7.59	17.6	7.8	
5/13/2014	20	7.50	7.57	17.4	7.7	

Appendix 1 (cont). Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
5/27/2014	0	18.19	8.66	18.2	9.9	1.60
5/27/2014	1	18.17	8.66	17.7	9.9	
5/27/2014	2	18.02	8.65	17.6	9.8	
5/27/2014	3	17.61	8.64	19.1	9.8	
5/27/2014	4	13.64	8.57	18.7	9.8	
5/27/2014	5	12.39	8.40	15.9	9.0	
5/27/2014	6	11.38	8.15	13.6	8.5	
5/27/2014	7	10.87	7.95	10.6	8.3	
5/27/2014	8	10.54	7.85	9.8	8.2	
5/27/2014	9	10.14	7.79	9.4	8.1	
5/27/2014	10	9.83	7.74	8.9	8.0	
5/27/2014	11	9.58	7.70	8.4	7.0	
5/27/2014	12	9.29	7.66	8.3	6.8	
5/27/2014	13	8.91	7.63	8.2	6.8	
5/27/2014	14	8.61	7.60	7.4	6.5	
5/27/2014	15	8.36	7.56	6.5	6.1	
5/27/2014	16	8.20	7.53	6.1	5.3	
5/27/2014	17	8.14	7.46	6.1	4.2	
5/27/2014	18	8.08	7.42	6.1	3.8	
5/27/2014	19	8.05	7.39	5.3	3.6	
5/27/2014	20	8.04	7.37	5.1	3.6	

Appendix 1 (cont). Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
6/10/2014	0	20.60	8.70	9.4	8.3	2.17
6/10/2014	1	20.57	8.69	5.7	8.6	
6/10/2014	2	20.50	8.70	7.3	8.5	
6/10/2014	3	20.31	8.68	8.2	8.5	
6/10/2014	4	20.23	8.66	8.8	8.4	
6/10/2014	5	20.12	8.63	8.6	8.3	
6/10/2014	6	15.65	8.58	7.3	7.7	
6/10/2014	7	11.33	8.21	8.8	6.3	
6/10/2014	8	10.41	7.85	6.0	6.5	
6/10/2014	9	10.03	7.65	4.8	6.5	
6/10/2014	10	9.63	7.53	3.3	5.7	
6/10/2014	11	9.29	7.46	2.6	5.2	
6/10/2014	12	9.01	7.45	2.7	4.8	
6/10/2014	13	8.94	7.43	2.2	5.5	
6/10/2014	14	8.72	7.46	2.3	5.4	
6/10/2014	15	8.56	7.40	2.5	3.1	
6/10/2014	16	8.42	7.32	2.5	1.7	
6/10/2014	17	8.22	7.26	2.7	1.0	
6/10/2014	18	8.14	7.23	2.6	0.7	
6/10/2014	19	8.12	7.23	2.6	0.4	
6/10/2014	20	8.09	7.22	2.8	0.3	

Appendix 1 (cont). Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
6/24/2014	0	21.96	8.44	5.6	7.6	2.29
6/24/2014	1	21.69	8.44	5.6	7.6	
6/24/2014	2	21.53	8.41	6.0	7.5	
6/24/2014	3	21.25	8.40	5.8	7.4	
6/24/2014	4	21.18	8.35	6.0	7.4	
6/24/2014	5	20.01	8.33	5.8	7.2	
6/24/2014	6	14.38	8.04	5.8	4.0	
6/24/2014	7	12.26	7.64	4.5	3.5	
6/24/2014	8	11.35	7.51	4.9	3.2	
6/24/2014	9	10.66	7.42	3.8	2.6	
6/24/2014	10	10.40	7.34	3.0	2.3	
6/24/2014	11	9.91	7.31	2.8	2.4	
6/24/2014	12	9.66	7.32	2.3	2.9	
6/24/2014	13	9.37	7.32	2.2	3.2	
6/24/2014	14	9.22	7.34	2.7	2.7	
6/24/2014	15	8.96	7.31	2.4	2.3	
6/24/2014	16	8.76	7.28	2.2	0.9	
6/24/2014	17	8.52	7.23	2.2	0.3	
6/24/2014	18	8.50	7.23	2.0	0.2	
6/24/2014	19	8.46	7.23	2.0	0.2	
6/24/2014	20	8.46	7.24	2.1	0.2	

Appendix 1 (cont). Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
7/8/2014	0	23.20	8.46	10.9	7.9	1.63
7/8/2014	1	23.21	8.46	10.6	7.8	
7/8/2014	2	23.20	8.45	11.3	7.8	
7/8/2014	3	23.13	8.45	12.2	7.8	
7/8/2014	4	23.16	8.44	12.3	7.8	
7/8/2014	5	22.93	8.42	13.3	7.7	
7/8/2014	6	22.69	8.39	12.9	7.6	
7/8/2014	7	19.65	8.17	12.4	6.9	
7/8/2014	8	16.64	7.94	8.4	3.3	
7/8/2014	9	13.09	7.74	6.3	2.3	
7/8/2014	10	11.70	7.61	5.0	2.0	
7/8/2014	11	10.94	7.53	4.0	1.8	
7/8/2014	12	10.45	7.43	3.1	1.6	
7/8/2014	13	9.91	7.38	3.0	1.7	
7/8/2014	14	9.35	7.35	3.1	1.9	
7/8/2014	15	9.03	7.31	2.8	0.9	
7/8/2014	16	8.79	7.28	3.2	0.5	
7/8/2014	17	8.70	7.27	2.8	0.4	
7/8/2014	18	8.63	7.27	2.7	0.3	
7/8/2014	19	8.58	7.28	2.6	0.2	
7/8/2014	20	8.57	7.30	2.4	0.2	

Appendix 1 (cont). Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
7/21/2014	0	23.58	8.62	9.4	8.5	2.20
7/21/2014	1	23.50	8.62	7.9	8.4	
7/21/2014	2	23.21	8.62	10.8	8.4	
7/21/2014	3	23.14	8.62	11.9	8.3	
7/21/2014	4	23.09	8.60	13.5	8.3	
7/21/2014	5	22.54	8.58	10.9	7.8	
7/21/2014	6	21.68	8.34	9.0	5.3	
7/21/2014	7	21.36	7.88	7.3	4.6	
7/21/2014	8	18.47	7.72	5.8	2.3	
7/21/2014	9	14.16	7.57	5.0	0.6	
7/21/2014	10	12.61	7.46	4.1	0.4	
7/21/2014	11	11.52	7.39	3.7	0.3	
7/21/2014	12	10.83	7.34	3.5	0.2	
7/21/2014	13	10.32	7.31	2.8	0.2	
7/21/2014	14	10.04	7.30	2.5	0.4	
7/21/2014	15	9.70	7.28	2.6	0.2	
7/21/2014	16	9.12	7.26	2.9	0.2	
7/21/2014	17	8.81	7.26	2.7	0.2	
7/21/2014	18	8.73	7.28	1.9	0.1	
7/21/2014	19	8.69	7.32	1.9	0.1	
7/21/2014	20	8.69	7.34	1.9	0.1	

Appendix 1 (cont). Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
8/5/2014	0	23.14	8.66	7.7	8.6	2.76
8/5/2014	1	23.11	8.66	7.4	8.6	
8/5/2014	2	22.98	8.65	7.6	8.6	
8/5/2014	3	22.78	8.62	8.2	8.4	
8/5/2014	4	22.61	8.59	8.1	8.1	
8/5/2014	5	22.57	8.54	7.5	8.0	
8/5/2014	6	21.05	8.51	6.9	6.6	
8/5/2014	7	20.07	8.11	4.4	5.1	
8/5/2014	8	18.43	7.91	3.6	1.4	
8/5/2014	9	16.10	7.72	3.7	0.5	
8/5/2014	10	12.24	7.51	2.8	0.2	
8/5/2014	11	11.64	7.42	2.3	0.2	
8/5/2014	12	11.12	7.36	2.0	0.1	
8/5/2014	13	10.62	7.34	1.9	0.1	
8/5/2014	14	10.02	7.33	1.8	0.1	
8/5/2014	15	9.39	7.30	2.2	0.1	
8/5/2014	16	9.14	7.28	2.3	0.1	
8/5/2014	17	8.98	7.28	2.1	0.1	
8/5/2014	18	8.84	7.30	2.1	0.1	
8/5/2014	19	8.81	7.31	2.1	0.1	
8/5/2014	20	8.80	7.32	2.1	0.1	

Appendix 1 (cont). Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
8/19/2014	0	21.80	8.54	5.2	8.2	2.20
8/19/2014	1	21.61	8.54	5.2	8.3	
8/19/2014	2	21.38	8.55	6.5	8.3	
8/19/2014	3	21.33	8.54	7.2	8.2	
8/19/2014	4	21.22	8.49	7.3	8.1	
8/19/2014	5	21.10	8.49	7.4	8.1	
8/19/2014	6	21.06	8.52	7.7	8.1	
8/19/2014	7	20.96	8.52	8.2	8.1	
8/19/2014	8	19.79	8.51	6.3	7.9	
8/19/2014	9	15.88	8.30	4.4	1.6	
8/19/2014	10	13.38	7.88	4.9	0.5	
8/19/2014	11	12.33	7.66	2.8	0.3	
8/19/2014	12	11.69	7.54	2.4	0.2	
8/19/2014	13	11.14	7.49	2.1	0.2	
8/19/2014	14	10.76	7.44	1.8	0.1	
8/19/2014	15	10.25	7.42	1.6	0.1	
8/19/2014	16	9.76	7.40	1.7	0.1	
8/19/2014	17	9.42	7.37	1.8	0.1	
8/19/2014	18	9.24	7.35	1.9	0.1	
8/19/2014	19	9.16	7.37	1.9	0.1	
8/19/2014	20	9.06	7.37	2.0	0.1	

Appendix 1 (cont). Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
9/2/2014	0	22.71	8.65	5.1	7.9	1.73
9/2/2014	1	22.65	8.64	5.2	7.9	
9/2/2014	2	22.56	8.61	5.8	7.8	
9/2/2014	3	22.25	8.57	6.3	7.7	
9/2/2014	4	22.14	8.56	6.8	7.7	
9/2/2014	5	22.04	8.54	6.5	7.6	
9/2/2014	6	21.74	8.51	6.5	7.4	
9/2/2014	7	20.49	8.43	5.3	6.4	
9/2/2014	8	18.32	8.25	3.4	2.8	
9/2/2014	9	17.12	7.97	4.2	0.7	
9/2/2014	10	15.72	7.74	5.9	0.3	
9/2/2014	11	13.46	7.62	2.8	0.2	
9/2/2014	12	12.11	7.52	2.2	0.2	
9/2/2014	13	11.17	7.47	2.6	0.1	
9/2/2014	14	10.69	7.43	1.8	0.1	
9/2/2014	15	10.33	7.41	1.8	0.1	
9/2/2014	16	10.07	7.38	1.8	0.1	
9/2/2014	17	9.71	7.36	1.8	0.1	
9/2/2014	18	9.47	7.34	1.8	0.1	
9/2/2014	19	9.43	7.33	1.8	0.1	
9/2/2014	20	9.42	7.33	1.9	0.1	

Appendix 1. Field and Seabird data for the deepest location in Conesus Lake from May to September 2014.

Date	Depth (m)	Temp (°C)	pH	Chl-a (µg/L)	DO (mg/L)	Secchi Disk (m)
9/16/2014	0	19.89	8.57	7.0	7.7	2.20
9/16/2014	1	19.78	8.57	6.7	7.7	
9/16/2014	2	19.74	8.57	7.5	7.7	
9/16/2014	3	19.71	8.57	8.2	7.7	
9/16/2014	4	19.63	8.55	8.3	7.6	
9/16/2014	5	19.52	8.50	6.4	7.4	
9/16/2014	6	19.48	8.44	5.7	7.2	
9/16/2014	7	19.45	8.41	5.2	7.1	
9/16/2014	8	19.43	8.40	4.8	7.1	
9/16/2014	9	19.38	8.38	4.3	7.0	
9/16/2014	10	16.08	8.34	3.5	3.9	
9/16/2014	11	14.81	8.08	3.7	0.9	
9/16/2014	12	14.06	7.83	3.1	0.5	
9/16/2014	13	12.75	7.72	2.7	0.3	
9/16/2014	14	11.59	7.65	2.6	0.2	
9/16/2014	15	10.91	7.58	2.7	0.2	
9/16/2014	16	10.50	7.53	2.2	0.1	
9/16/2014	17	10.36	7.51	2.4	0.1	
9/16/2014	18	10.18	7.49	2.3	0.1	
9/16/2014	19	10.12	7.48	2.3	0.1	
9/16/2014	20	10.09	7.47	2.5	0.1	

## Appendix 2. Zooplankton data Conesus Lake 2014

Table A. Abundance and biomass of zooplankton in Conesus Lake. Biomass is dry weight.

13 May 2014.						
	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)	
<b>Crustacea</b>						
<b>Cladocera</b>						
Bosmina longirostris	1,618.1	0.98%	929.4	3.45%	273	
<b>Total</b>	<b>1,618.1</b>	<b>0.98%</b>	<b>929.4</b>	<b>3.45%</b>	<b>273</b>	
<b>Cyclopoida</b>						
Cyclopoid copepodid	2,613.9	1.58%	2,544.3	9.45%	465	
Diacyclops thomasi	3,609.7	2.19%	9,928.1	36.87%	775	
<b>Total</b>	<b>6,223.6</b>	<b>3.77%</b>	<b>12,472.4</b>	<b>46.32%</b>	<b>645</b>	
<b>Total Crustacea</b>	<b>7,841.7</b>	<b>4.75%</b>	<b>13,401.8</b>	<b>49.77%</b>	<b>568</b>	
<b>Copepoda nauplii</b>						
Copepod nauplius	5,103.3	3.09%	2,041.3	7.58%	214	
<b>Total</b>	<b>5,103.3</b>	<b>3.09%</b>	<b>2,041.3</b>	<b>7.58%</b>	<b>214</b>	
<b>Rotifera</b>						
Ascomorpha saltans	373.4	0.23%	7.7	0.03%	120	
Asplanchna priodonta	373.4	0.23%	878.1	3.26%	640	
Conochilis unicornis	871.3	0.53%	25.4	0.09%	112	
Filinia longiseta	97,585.7	59.13%	3,903.6	14.50%	171	
Gastropus sp.	497.9	0.30%	10.9	0.04%	140	
Kellicottia longispina	124.5	0.08%	0.9	0.00%	120	
Keratella cochlearis	8,961.9	5.43%	53.1	0.20%	114	
Keratella crassa	4,605.4	2.79%	388.5	1.44%	154	
Keratella earlinae	124.5	0.08%	14.1	0.05%	170	
Keratella quadrata	19,293.1	11.69%	849.7	3.16%	124	
Notholca acuminata	871.3	0.53%	190.6	0.71%	250	
Polyarthra remata	1,244.7	0.75%	29.9	0.11%	92	
Polyarthra vulgaris	3,734.1	2.26%	153.1	0.57%	110	
Synchaeta oblonga	2,365.0	1.43%	122.8	0.46%	195	
Synchaeta sp.	6,970.4	4.22%	949.8	3.53%	269	
<b>Total</b>	<b>147,996.6</b>	<b>89.67%</b>	<b>7,578.2</b>	<b>28.14%</b>	<b>165</b>	
<b>Veneroida</b>						
Dreissena polymorpha veliger	4,107.6	2.49%	3,906.7	14.51%	195	
<b>Total</b>	<b>4,107.6</b>	<b>2.49%</b>	<b>3,906.7</b>	<b>14.51%</b>	<b>195</b>	
<b>Total</b>	<b>165,049.2</b>	<b>100.00%</b>	<b>26,928.0</b>	<b>100.00%</b>	<b>186</b>	

Table A (cont.). Abundance and biomass of zooplankton in Conesus Lake.  
Biomass is dry weight.

27 May 2014.

	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	16,246.3	4.69%	11,779.9	7.95%	293
Ceriodaphnia sp.	238.9	0.07%	100.7	0.07%	480
<b>Total</b>	<b>16,485.2</b>	<b>4.76%</b>	<b>11,880.5</b>	<b>8.02%</b>	<b>296</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	15,529.5	4.48%	16,941.3	11.44%	493
Diacyclops thomasi	43,721.5	12.62%	89,144.5	60.18%	673
<b>Total</b>	<b>59,251.0</b>	<b>17.10%</b>	<b>106,085.7</b>	<b>71.62%</b>	<b>626</b>
<b>Total Crustacea</b>	<b>75,736.2</b>	<b>21.86%</b>	<b>117,966.3</b>	<b>79.64%</b>	<b>554</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	45,393.9	13.10%	18,157.6	12.26%	179
<b>Total</b>	<b>45,393.9</b>	<b>13.10%</b>	<b>18,157.6</b>	<b>12.26%</b>	<b>179</b>
<b>Rotifera</b>					
Asplanchna priodonta	7,406.4	2.14%	6,216.8	4.20%	454
Asplanchna sp.	4,778.3	1.38%	444.1	0.30%	218
Conochilus unicornis	477.8	0.14%	7.2	0.00%	90
Filinia longiseta	6,211.8	1.79%	92.5	0.06%	123
Kellicottia longispina	238.9	0.07%	2.0	0.00%	125
Keratella cochlearis	117,785.3	34.00%	644.3	0.44%	111
Keratella crassa	7,884.2	2.28%	760.1	0.51%	161
Keratella quadrata	8,362.0	2.41%	386.4	0.26%	126
Notholca acuminata	716.7	0.21%	156.8	0.11%	250
Polyarthra remata	955.7	0.28%	25.2	0.02%	95
Polyarthra vulgaris	64,029.3	18.48%	2,921.8	1.97%	114
Synchaeta sp.	6,211.8	1.79%	312.6	0.21%	193
Trichocerca multigrinis	238.9	0.07%	24.2	0.02%	160
<b>Total</b>	<b>225,297.3</b>	<b>65.03%</b>	<b>11,993.8</b>	<b>8.10%</b>	<b>131</b>
<b>Total</b>	<b>346,427.4</b>	<b>100.00%</b>	<b>148,117.7</b>	<b>100.00%</b>	<b>230</b>

Table A (cont). Abundance and biomass of zooplankton in Conesus Lake.  
Biomass is dry weight.

10 June 2014

	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	199,187.7	22.34%	79,349.3	22.68%	236
<b>Total</b>	<b>199,187.7</b>	<b>22.34%</b>	<b>79,349.3</b>	<b>22.68%</b>	<b>236</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	29,681.5	3.33%	44,408.2	12.69%	578
Diacylops thomasi	71,879.2	8.06%	172,424.3	49.29%	732
Mesocyclops edax	3,576.1	0.40%	6,841.8	1.96%	775
<b>Total</b>	<b>105,136.8</b>	<b>11.79%</b>	<b>223,674.3</b>	<b>63.93%</b>	<b>690</b>
<b>Total Crustacea</b>	<b>304,324.5</b>	<b>34.14%</b>	<b>303,023.6</b>	<b>86.62%</b>	<b>393</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	32,184.7	3.61%	12,873.9	3.68%	184
<b>Total</b>	<b>32,184.7</b>	<b>3.61%</b>	<b>12,873.9</b>	<b>3.68%</b>	<b>184</b>
<b>Rotifera</b>					
Asplanchna priodonta	14,304.3	1.60%	17,322.6	4.95%	513
Collotheca sp.	1,430.4	0.16%	272.5	0.08%	57
Conochilis unicornis	41,840.1	4.69%	611.0	0.17%	90
Filinia longiseta	1,788.0	0.20%	29.6	0.01%	128
Kellicottia longispina	715.2	0.08%	5.3	0.00%	120
Keratella cochlearis	206,697.5	23.18%	1,012.9	0.29%	107
Keratella cochlearis v. tecta	6,079.3	0.68%	11.5	0.00%	78
Keratella crassa	25,747.8	2.89%	3,526.9	1.01%	181
Keratella quadrata	11,801.1	1.32%	995.6	0.28%	154
Polyarthra remata	5,006.5	0.56%	105.1	0.03%	88
Polyarthra vulgaris	208,843.1	23.43%	7,661.1	2.19%	106
Trichocerca multirinis	30,754.3	3.45%	2,397.1	0.69%	149
<b>Total</b>	<b>555,007.8</b>	<b>62.25%</b>	<b>33,951.2</b>	<b>9.70%</b>	<b>122</b>
<b>Total</b>	<b>891,517.0</b>	<b>100.00%</b>	<b>349,848.6</b>	<b>100.00%</b>	<b>217</b>

Table A (cont). Abundance and biomass of zooplankton in Conesus Lake. Biomass is dry weight.

24 June 2014					
	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	203,969.1	14.22%	100,203.1	27.94%	258
<b>Total</b>	<b>203,969.1</b>	<b>14.22%</b>	<b>100,203.1</b>	<b>27.94%</b>	<b>258</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	16,136.8	1.12%	25,573.8	7.13%	595
Diacyclops thomasi	38,728.3	2.70%	94,388.7	26.32%	739
Mesocyclops edax	13,554.9	0.94%	55,036.8	15.34%	935
<b>Total</b>	<b>68,420.0</b>	<b>4.77%</b>	<b>174,999.3</b>	<b>48.79%</b>	<b>744</b>
<b>Total Crustacea</b>	<b>272,389.1</b>	<b>18.98%</b>	<b>275,202.4</b>	<b>76.73%</b>	<b>380</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	14,845.9	1.03%	5,938.3	1.66%	201
<b>Total</b>	<b>14,845.9</b>	<b>1.03%</b>	<b>5,938.3</b>	<b>1.66%</b>	<b>201</b>
<b>Rotifera</b>					
Asplanchna priodonta	21,300.6	1.48%	26,097.9	7.28%	515
Collotheca sp.	6,454.7	0.45%	423.0	0.12%	158
Conochilis unicornis	254,315.9	17.72%	2,948.4	0.82%	91
Filinia longiseta	645.5	0.04%	6.9	0.00%	110
Kellicottia longispina	2,581.9	0.18%	17.9	0.00%	118
Keratella cochlearis	68,420.0	4.77%	257.6	0.07%	98
Keratella cochlearis v. tecta	3,227.4	0.22%	6.6	0.00%	80
Keratella crassa	20,655.1	1.44%	2,262.4	0.63%	168
Keratella quadrata	14,845.9	1.03%	1,327.1	0.37%	157
Notholca acuminata	645.5	0.04%	109.9	0.03%	230
Polyarthra major	2,581.9	0.18%	390.7	0.11%	170
Polyarthra remata	87,784.2	6.12%	2,105.4	0.59%	92
Polyarthra vulgaris	638,371.6	44.49%	39,331.1	10.97%	126
Trichocerca multicrinis	25,173.4	1.75%	2,079.5	0.58%	146
<b>Total</b>	<b>1,147,003.4</b>	<b>79.94%</b>	<b>77,364.3</b>	<b>21.57%</b>	<b>123</b>
<b>Veneroida</b>					
Dreissena polymorpha veliger	645.5	0.04%	177.3	0.05%	120
<b>Total</b>	<b>645.5</b>	<b>0.04%</b>	<b>177.3</b>	<b>0.05%</b>	<b>120</b>
<b>Total</b>	<b>1,434,883.8</b>	<b>100.00%</b>	<b>358,682.3</b>	<b>100.00%</b>	<b>173</b>

Table A (cont). Abundance and biomass of zooplankton in Conesus Lake. Biomass is dry weight .

8 July 2014.

	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	47,792.4	15.84%	23,861.9	26.59%	260
Ceriodaphnia sp.	3,454.9	1.15%	176.8	0.20%	233
Chydorus sphaericus	575.8	0.19%	106.0	0.12%	180
<b>Total</b>	<b>51,823.1</b>	<b>17.18%</b>	<b>24,144.8</b>	<b>26.90%</b>	<b>257</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	8,061.4	2.67%	12,074.6	13.45%	578
Diacyclops thomasi	6,909.7	2.29%	15,412.5	17.17%	707
Mesocyclops edax	1,727.4	0.57%	5,150.1	5.74%	867
Mesocyclops leuckarti ?	7,485.6	2.48%	14,301.2	15.93%	772
<b>Total</b>	<b>24,184.1</b>	<b>8.02%</b>	<b>46,938.4</b>	<b>52.30%</b>	<b>695</b>
<b>Total Crustacea</b>	<b>76,007.2</b>	<b>25.19%</b>	<b>71,083.2</b>	<b>79.20%</b>	<b>397</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	9,213.0	3.05%	3,685.2	4.11%	208
<b>Total</b>	<b>9,213.0</b>	<b>3.05%</b>	<b>3,685.2</b>	<b>4.11%</b>	<b>208</b>
<b>Rotifera</b>					
Asplanchna priodonta	1,727.4	0.57%	2,178.7	2.43%	520
Conochilus unicornis	40,306.8	13.36%	308.1	0.34%	79
Filinia longiseta	1,151.6	0.38%	41.4	0.05%	165
Kellicottia longispina	2,303.2	0.76%	21.6	0.02%	130
Keratella cochlearis	14,971.1	4.96%	71.3	0.08%	106
Keratella crassa	3,454.9	1.15%	406.1	0.45%	172
Keratella quadrata	575.8	0.19%	36.5	0.04%	140
Ploesoma tricanthum	2,879.1	0.95%	210.3	0.23%	147
Polyarthra eurypta	2,879.1	0.95%	363.2	0.40%	160
Polyarthra major	33,972.9	11.26%	5,140.8	5.73%	170
Polyarthra remata	6,333.9	2.10%	183.6	0.20%	98
Polyarthra vulgaris	96,736.4	32.06%	5,148.5	5.74%	120
Trichocerca multicrinis	8,061.4	2.67%	624.1	0.70%	148
<b>Total</b>	<b>215,353.6</b>	<b>71.37%</b>	<b>14,734.3</b>	<b>16.42%</b>	<b>125</b>
<b>Veneroida</b>					
Dreissena polymorpha veliger	1,151.6	0.38%	248.7	0.28%	110
<b>Total</b>	<b>1,151.6</b>	<b>0.38%</b>	<b>248.7</b>	<b>0.28%</b>	<b>110</b>
<b>Total</b>	<b>301,725.4</b>	<b>100.00%</b>	<b>89,751.4</b>	<b>100.00%</b>	<b>196</b>

Table A (cont). Abundance and biomass of zooplankton in Conesus Lake. Biomass is dry weight.

21 July 2014					
	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	76,379.1	32.35%	31,290.4	34.95%	240
Ceriodaphnia sp.	7,179.2	3.04%	852.6	0.95%	305
<b>Total</b>	<b>83,558.3</b>	<b>35.39%</b>	<b>32,143.0</b>	<b>35.91%</b>	<b>246</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	7,777.5	3.29%	10,278.9	11.48%	543
Mesocyclops edax	3,190.8	1.35%	9,849.5	11.00%	874
Mesocyclops leuckarti ?	6,182.1	2.62%	10,971.6	12.26%	757
<b>Total</b>	<b>17,150.4</b>	<b>7.26%</b>	<b>31,099.9</b>	<b>34.74%</b>	<b>682</b>
<b>Total Crustacea</b>	<b>100,708.7</b>	<b>42.65%</b>	<b>63,242.9</b>	<b>70.65%</b>	<b>320</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	44,471.4	18.83%	17,788.5	19.87%	202
<b>Total</b>	<b>44,471.4</b>	<b>18.83%</b>	<b>17,788.5</b>	<b>19.87%</b>	<b>202</b>
<b>Rotifera</b>					
Asplanchna priodonta	997.1	0.42%	1,104.7	1.23%	498
Collotheca sp.	997.1	0.42%	68.5	0.08%	163
Conochilis unicornis	4,187.9	1.77%	45.5	0.05%	93
Kellicottia bostoniensis	1,196.5	0.51%	7.0	0.01%	111
Kellicottia longispina	1,196.5	0.51%	8.4	0.01%	118
Keratella cochlearis	8,774.6	3.72%	37.2	0.04%	102
Keratella cochlearis v. tecta	1,196.5	0.51%	2.3	0.00%	78
Keratella crassa	1,994.2	0.84%	206.9	0.23%	165
Keratella earlinae	398.8	0.17%	49.4	0.06%	175
Keratella quadrata	199.4	0.08%	17.2	0.02%	155
Polyarthra eurypta	5,783.3	2.45%	1,221.8	1.36%	190
Polyarthra major	11,965.4	5.07%	1,538.0	1.72%	161
Polyarthra remata	3,988.5	1.69%	154.7	0.17%	108
Polyarthra vulgaris	44,271.9	18.75%	3,583.6	4.00%	138
Pompholyx sulcata	797.7	0.34%	9.1	0.01%	91
Trichocerca elongata	199.4	0.08%	33.4	0.04%	320
Trichocerca multicrinis	2,393.1	1.01%	186.4	0.21%	146
<b>Total</b>	<b>90,538.1</b>	<b>38.34%</b>	<b>8,273.9</b>	<b>9.24%</b>	<b>141</b>
<b>Veneroida</b>					
Dreissena polymorpha veliger	398.8	0.17%	214.8	0.24%	155
<b>Total</b>	<b>398.8</b>	<b>0.17%</b>	<b>214.8</b>	<b>0.24%</b>	<b>155</b>
<b>Total</b>	<b>236,117.0</b>	<b>100.00%</b>	<b>89,520.1</b>	<b>100.00%</b>	<b>229</b>

Table A (cont). Abundance and biomass of zooplankton in Conesus Lake. Biomass is dry weight .

5 August 2014					
	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	52,181.1	8.28%	28,222.8	24.88%	268
Ceriodaphnia sp.	49,392.8	7.83%	6,109.9	5.39%	321
Diaphanosoma sp.	398.3	0.06%	393.0	0.35%	630
<b>Total</b>	<b>101,972.2</b>	<b>16.17%</b>	<b>34,725.6</b>	<b>30.62%</b>	<b>295</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	10,754.9	1.71%	14,157.5	12.48%	542
Diacyclops thomasi	1,195.0	0.19%	3,081.1	2.72%	760
Mesocyclops edax	4,381.6	0.69%	8,510.9	7.50%	773
Mesocyclops leuckarti ?	5,974.9	0.95%	8,509.7	7.50%	719
<b>Total</b>	<b>22,306.4</b>	<b>3.54%</b>	<b>34,259.2</b>	<b>30.20%</b>	<b>646</b>
<b>Total Crustacea</b>	<b>124,278.6</b>	<b>19.71%</b>	<b>68,984.9</b>	<b>60.82%</b>	<b>358</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	31,069.7	4.93%	12,427.9	10.96%	204
<b>Total</b>	<b>31,069.7</b>	<b>4.93%</b>	<b>12,427.9</b>	<b>10.96%</b>	<b>204</b>
<b>Rotifera</b>					
Asplanchna priodonta	3,585.0	0.57%	4,116.9	3.63%	504
Collotheca sp.	1,593.3	0.25%	125.0	0.11%	163
Conochilis unicornis	63,334.3	10.04%	730.5	0.64%	88
Kellicottia bostoniensis	5,576.6	0.88%	22.4	0.02%	98
Kellicottia longispina	11,551.5	1.83%	71.1	0.06%	113
Keratella cochlearis	34,256.3	5.43%	145.4	0.13%	102
Keratella cochlearis v. tecta	1,991.6	0.32%	4.1	0.00%	80
Keratella crassa	1,593.3	0.25%	205.8	0.18%	178
Polyarthra eurypta	14,738.2	2.34%	2,874.1	2.53%	185
Polyarthra major	7,966.6	1.26%	986.3	0.87%	159
Polyarthra remata	8,364.9	1.33%	175.6	0.15%	88
Polyarthra vulgaris	256,922.1	40.75%	20,347.6	17.94%	137
Pompholyx complanata	26,688.0	4.23%	322.0	0.28%	93
Pompholyx sulcata	27,883.0	4.42%	457.0	0.40%	103
Trichocerca multicrinis	5,178.3	0.82%	381.9	0.34%	141
<b>Total</b>	<b>471,223.1</b>	<b>74.73%</b>	<b>30,965.8</b>	<b>27.30%</b>	<b>126</b>
<b>Veneroida</b>					
Dreissena polymorpha veliger	3,983.3	0.63%	1,045.0	0.92%	118
<b>Total</b>	<b>3,983.3</b>	<b>0.63%</b>	<b>1,045.0</b>	<b>0.92%</b>	<b>118</b>
<b>Total</b>	<b>630,554.6</b>	<b>100.00%</b>	<b>113,423.6</b>	<b>100.00%</b>	<b>176</b>

Table A (cont). Abundance and biomass of zooplankton in Conesus Lake. Biomass is dry weight .

19 August 2014					
	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	43,662.8	8.94%	21,584.6	29.59%	258
Ceriodaphnia sp.	47,665.2	9.76%	7,957.2	10.91%	354
<b>Total</b>	<b>91,328.0</b>	<b>18.70%</b>	<b>29,541.7</b>	<b>40.50%</b>	<b>308</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	1,091.6	0.22%	1,441.3	1.98%	543
<b>Total</b>	<b>1,091.6</b>	<b>0.22%</b>	<b>1,441.3</b>	<b>1.98%</b>	<b>543</b>
<b>Total Crustacea</b>	<b>92,419.6</b>	<b>18.93%</b>	<b>30,983.0</b>	<b>42.48%</b>	<b>311</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	31,291.7	6.41%	12,516.7	17.16%	212
<b>Total</b>	<b>31,291.7</b>	<b>6.41%</b>	<b>12,516.7</b>	<b>17.16%</b>	<b>212</b>
<b>Rotifera</b>					
Ascomorpha ecaudis	363.9	0.07%	7.5	0.01%	120
Asplanchna priodonta	2,547.0	0.52%	1,946.2	2.67%	440
Collotheca sp.	2,910.9	0.60%	218.9	0.30%	174
Conochilus unicornis	14,918.1	3.06%	131.3	0.18%	94
Kellicottia bostoniensis	727.7	0.15%	1.6	0.00%	80
Kellicottia longispina	1,091.6	0.22%	7.7	0.01%	118
Keratella cochlearis	6,185.6	1.27%	26.3	0.04%	102
Keratella cochlearis v. tecta	363.9	0.07%	0.5	0.00%	70
Keratella crassa	27,289.3	5.59%	3,436.7	4.71%	176
Keratella earlinae	363.9	0.07%	49.0	0.07%	180
Monostyla comuta	363.9	0.07%	4.8	0.01%	100
Pleosoma lenticulare ?	3,638.6	0.75%	480.0	0.66%	179
Polyarthra eurypta	20,012.1	4.10%	5,080.4	6.97%	202
Polyarthra major	17,465.1	3.58%	1,889.1	2.59%	152
Polyarthra remata	4,730.1	0.97%	99.3	0.14%	88
Polyarthra vulgaris	156,822.2	32.12%	10,129.5	13.89%	128
Pompholyx complanata	16,737.4	3.43%	195.5	0.27%	92
Pompholyx sulcata	54,578.5	11.18%	747.2	1.02%	97
Trichocerca elongata	1,455.4	0.30%	198.2	0.27%	296
Trichocerca multicrinis	14,918.1	3.06%	996.8	1.37%	133
<b>Total</b>	<b>347,483.1</b>	<b>71.16%</b>	<b>25,646.4</b>	<b>35.16%</b>	<b>132</b>
<b>Veneroida</b>					
Dreissena polymorpha veliger	17,101.3	3.50%	3,787.7	5.19%	111
<b>Total</b>	<b>17,101.3</b>	<b>3.50%</b>	<b>3,787.7</b>	<b>5.19%</b>	<b>111</b>
<b>Total</b>	<b>488,295.7</b>	<b>100.00%</b>	<b>72,933.9</b>	<b>100.00%</b>	<b>170</b>

Table A (cont). Abundance and biomass of zooplankton in Conesus Lake. Biomass is dry weight

2 September 2014					
	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	52,736.8	7.64%	18,123.0	16.59%	224
Ceriodaphnia sp.	22,516.8	3.26%	1,969.1	1.80%	283
<b>Total</b>	<b>75,253.6</b>	<b>10.90%</b>	<b>20,092.1</b>	<b>18.40%</b>	<b>242</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	10,665.9	1.55%	11,475.9	10.51%	489
Diacylops thomasi	1,185.1	0.17%	2,801.7	2.57%	728
Mesocyclops edax	1,777.6	0.26%	6,578.4	6.02%	915
Mesocyclops leuckarti ?	7,703.1	1.12%	12,268.6	11.23%	740
Microcyclops sp. ?	2,370.2	0.34%	2,816.6	2.58%	529
<b>Total</b>	<b>23,701.9</b>	<b>3.43%</b>	<b>35,941.2</b>	<b>32.91%</b>	<b>619</b>
<b>Total Crustacea</b>	<b>98,955.6</b>	<b>14.33%</b>	<b>56,033.3</b>	<b>51.30%</b>	<b>332</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	27,849.8	4.03%	11,139.9	10.20%	187
<b>Total</b>	<b>27,849.8</b>	<b>4.03%</b>	<b>11,139.9</b>	<b>10.20%</b>	<b>187</b>
<b>Rotifera</b>					
Asplanchna priodonta	5,925.5	0.86%	8,556.8	7.83%	544
Collotheca sp.	4,147.8	0.60%	337.9	0.31%	174
Conochilus nicornis	94,215.2	13.65%	1,212.9	1.11%	104
Kellicottia bostoniensis	4,740.4	0.69%	19.6	0.02%	99
Keratella cochlearis	55,107.0	7.98%	207.5	0.19%	98
Keratella cochlearis v. tecta	9,480.8	1.37%	19.4	0.02%	80
Keratella crassa	119,102.2	17.25%	15,256.4	13.97%	177
Ploesoma tricanthum	592.5	0.09%	55.8	0.05%	160
Polyarthra eurypta	8,295.7	1.20%	1,346.0	1.23%	174
Polyarthra major	40,885.8	5.92%	5,158.0	4.72%	160
Polyarthra remata	11,851.0	1.72%	293.6	0.27%	93
Polyarthra vulgaris	123,250.1	17.85%	5,925.3	5.42%	116
Pompholyx complanata	15,998.8	2.32%	219.0	0.20%	97
Pompholyx sulcata	51,551.7	7.47%	773.3	0.71%	100
Trichocerca elongata	3,555.3	0.52%	512.5	0.47%	299
Trichocerca multicrinis	7,703.1	1.12%	501.4	0.46%	135
<b>Total</b>	<b>556,402.9</b>	<b>80.60%</b>	<b>40,395.4</b>	<b>36.98%</b>	<b>133</b>
<b>Veneroida</b>					
Dreissena polymorpha veliger	7,110.6	1.03%	1,655.3	1.52%	113
<b>Total</b>	<b>7,110.6</b>	<b>1.03%</b>	<b>1,655.3</b>	<b>1.52%</b>	<b>113</b>
<b>Total</b>	<b>690,318.8</b>	<b>100.00%</b>	<b>109,223.9</b>	<b>100.00%</b>	<b>163</b>

Table A (cont). Abundance and biomass of zooplankton in Conesus Lake. Biomass is dry weight.

16 September 2014					
	Abundance (#/m <sup>3</sup> )	Percent Abundance	Biomass (µg/m <sup>3</sup> )	Percent Biomass	Weighted mean size (µm)
<b>Crustacea</b>					
<b>Cladocera</b>					
Bosmina longirostris	12,988.2	4.48%	5,770.0	9.34%	247
Ceriodaphnia sp.	6,867.3	2.37%	1,369.9	2.22%	371
Daphnia retrocurva	149.3	0.05%	62.9	0.10%	480
<b>Total</b>	<b>20,004.9</b>	<b>6.90%</b>	<b>7,202.8</b>	<b>11.66%</b>	<b>291</b>
<b>Calanoida</b>					
Skistodiotomus sp. ?	149.3	0.05%	426.6	0.69%	1000
<b>Total</b>	<b>149.3</b>	<b>0.05%</b>	<b>426.6</b>	<b>0.69%</b>	<b>1000</b>
<b>Cyclopoida</b>					
Cyclopoid copepodid	6,718.1	2.32%	7,167.3	11.60%	487
Diacyclops thomasi	447.9	0.15%	1,185.1	1.92%	770
Mesocyclops edax	597.2	0.21%	1,714.9	2.78%	835
Mesocyclops leuckarti ?	1,045.0	0.36%	1,574.8	2.55%	721
Microcyclops sp. ?	895.7	0.31%	1,474.9	2.39%	578
<b>Total</b>	<b>9,703.9</b>	<b>3.35%</b>	<b>13,116.9</b>	<b>21.24%</b>	<b>555</b>
<b>Total Crustacea</b>	<b>29,858.0</b>	<b>10.30%</b>	<b>20,746.4</b>	<b>33.59%</b>	<b>381</b>
<b>Copepoda nauplii</b>					
Copepod nauplius	20,751.3	7.16%	8,300.5	13.44%	219
<b>Total</b>	<b>20,751.3</b>	<b>7.16%</b>	<b>8,300.5</b>	<b>13.44%</b>	<b>219</b>
<b>Rotifera</b>					
Asplanchna priodonta	3,433.7	1.18%	7,234.5	11.71%	617
Collotheca sp.	746.5	0.26%	87.0	0.14%	186
Conochilis unicornis	14,481.1	4.99%	301.4	0.49%	122
Gastropus sp.	149.3	0.05%	8.9	0.01%	195
Gastropus stylifer	149.3	0.05%	4.0	0.01%	150
Kellicottia bostoniensis	4,777.3	1.65%	21.1	0.03%	101
Keratella cochlearis	5,971.6	2.06%	21.8	0.04%	97
Keratella cochlearis v. tecta	1,194.3	0.41%	1.9	0.00%	74
Keratella crassa	109,429.6	37.74%	15,239.2	24.67%	182
Polyarthra eurypta	2,836.5	0.98%	544.2	0.88%	184
Polyarthra major	26,872.2	9.27%	3,924.5	6.35%	168
Polyarthra remata	2,687.2	0.93%	60.3	0.10%	90
Polyarthra vulgaris	37,621.1	12.98%	3,532.5	5.72%	145
Pompholyx complanata	2,239.4	0.77%	29.7	0.05%	96
Pompholyx sulcata	10,450.3	3.60%	161.5	0.26%	101
Trichocerca elongata	2,090.1	0.72%	372.0	0.60%	327
Trichocerca multirinis	14,033.3	4.84%	1,123.3	1.82%	150
<b>Total</b>	<b>239,162.6</b>	<b>82.49%</b>	<b>32,667.8</b>	<b>52.89%</b>	<b>167</b>
<b>Veneroida</b>					
Dreissena polymorpha veliger	149.3	0.05%	50.9	0.08%	130
<b>Total</b>	<b>149.3</b>	<b>0.05%</b>	<b>50.9</b>	<b>0.08%</b>	<b>130</b>
<b>Total</b>	<b>289,921.2</b>	<b>100.00%</b>	<b>61,765.6</b>	<b>100.00%</b>	<b>193</b>

**Appendix 3. Table A. Abundance and biovolume of Conesus Lake phytoplankton, May. 13, 2014**

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	Asterionella formosa	101.6	0.09%	19,983	0.53%
	Cyclotella ocellata	2,269.8	1.98%	81,221	2.17%
	Diatoma tenuis	60.3	0.05%	32,240	0.86%
	Fragilaria crotonensis	120.0	0.10%	47,354	1.27%
	Stephanodiscus hantzschii	101.6	0.09%	135,319	3.62%
	Synedra delicatissima	408.2	0.36%	400,371	10.71%
	Synedra filiformis	101.6	0.09%	27,572	0.74%
	Synedra radians	204.1	0.18%	55,374	1.48%
	<b>Total</b>	<b>3,367.3</b>	<b>2.93%</b>	<b>799,434</b>	<b>21.38%</b>
Chlorophyta	Ankistrodesmus falcatus	135.5	0.12%	44,410	1.19%
	Chlamydomonas sp.	33.9	0.03%	9,258	0.25%
	Coelastrum microporum	16.4	0.01%	229	0.01%
	Crucigenia quadrata	816.4	0.71%	266,785	7.13%
	Lagerheimia ciliata	33.9	0.03%	9,456	0.25%
	Monoraphidium capricornutum	33.9	0.03%	425	0.01%
	Scenedesmus bijuga	423.5	0.37%	70,793	1.89%
	Scenedesmus serratus	135.5	0.12%	5,922	0.16%
	Unidentified Chlorophyte	101.6	0.09%	178,838	4.78%
	<b>Total</b>	<b>1,730.5</b>	<b>1.51%</b>	<b>586,117</b>	<b>15.67%</b>
Chrysophyta	Dinobryon sp.	101.6	0.09%	20,929	0.56%
	Polygoniochloris circularis	67.8	0.06%	3,038	0.08%
	Unidentified Chrysophyte	33.9	0.03%	2,220	0.06%
<b>Total</b>	<b>203.3</b>	<b>0.18%</b>	<b>26,187</b>	<b>0.70%</b>	
Cryptophyta	Cryptomonas erosa	67.8	0.06%	31,197	0.83%
	Rhodomonas minuta	169.4	0.15%	18,998	0.51%
<b>Total</b>	<b>237.1</b>	<b>0.21%</b>	<b>50,195</b>	<b>1.34%</b>	
Cyanophyta	Aphanocapsa delicatissima	8,552.2	7.45%	4,473	0.12%
	Chroococcus minutus	67.8	0.06%	1,274	0.03%
	Limnothrix redekei	24,492.6	21.35%	561,861	15.02%
	Nanoplankton	43,882.6	38.25%	633,386	16.94%
	Synechococcus sp. 1	8,164.2	7.12%	4,245	0.11%
	Synechocystis sp.	1,321.2	1.15%	691	0.02%
<b>Total</b>	<b>86,480.6</b>	<b>75.38%</b>	<b>1,205,930</b>	<b>32.24%</b>	
Euglenophyta	Trachelomonas sp.	1.0	0.00%	5,620	0.15%
	<b>Total</b>	<b>1.0</b>	<b>0.00%</b>	<b>5,620</b>	<b>0.15%</b>
Haptophyta	Chrysochromulina parva	19,900.2	17.35%	666,857	17.83%
	<b>Total</b>	<b>19,900.2</b>	<b>17.35%</b>	<b>666,857</b>	<b>17.83%</b>
Miscellaneous	Misc. Microflagellate	33.9	0.03%	189	0.01%
	<b>Total</b>	<b>33.9</b>	<b>0.03%</b>	<b>189</b>	<b>0.01%</b>
Xanthophyta	Nephrodiella lunaris	2,777.9	2.42%	399,436	10.68%
	<b>Total</b>	<b>2,777.9</b>	<b>2.42%</b>	<b>399,436</b>	<b>10.68%</b>
<b>Total</b>	<b>114,731.9</b>	<b>100.00%</b>	<b>3,739,965</b>	<b>100.00%</b>	

Table B. Abundance and biovolume of Conesus Lake phytoplankton, May 27, 2014

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3$ /mL)	Percent Biovolume
Bacillariophyta	Asterionella formosa	61.4	0.04%	12,063	0.19%
	Cyclotella ocellata	2,964.2	2.06%	106,072	1.70%
	Cyclotella sp. 1	52.9	0.04%	1,894	0.03%
	Diatoma tenuis	7.7	0.01%	4,098	0.07%
	Stephanodiscus alpinus	52.9	0.04%	585,536	9.37%
	Synedra filiformis	105.9	0.07%	28,721	0.46%
	Synedra ulna	2.6	0.00%	3,654	0.06%
	<b>Total</b>	<b>3,247.5</b>	<b>2.26%</b>	<b>742,039</b>	<b>11.87%</b>
Chlorophyta	Ankistrodesmus falcatus	158.8	0.11%	52,043	0.83%
	Chlamydomonas sp.	105.9	0.07%	28,933	0.46%
	Cosmarium sp.	105.9	0.07%	245,118	3.92%
	Lagerheimia ciliata	105.9	0.07%	29,551	0.47%
	Oocystis parva	264.7	0.18%	44,784	0.72%
	Oocystis pusilla	52.9	0.04%	3,791	0.06%
	Scenedesmus bijuga	105.9	0.07%	17,698	0.28%
	<b>Total</b>	<b>899.9</b>	<b>0.63%</b>	<b>421,917</b>	<b>6.75%</b>
Chrysophyta	Ochromonas sp.	264.7	0.18%	110,553	1.77%
	<b>Total</b>	<b>264.7</b>	<b>0.18%</b>	<b>110,553</b>	<b>1.77%</b>
Cryptophyta	Cryptomonas erosa	211.7	0.15%	97,490	1.56%
	Rhodomonas minuta	4,631.6	3.22%	519,467	8.31%
	<b>Total</b>	<b>4,843.3</b>	<b>3.37%</b>	<b>616,957</b>	<b>9.87%</b>
Cyanophyta	Aphanocapsa delicatissima	4,877.4	3.39%	2,551	0.04%
	Limnothrix redekei	2,646.6	1.84%	60,714	0.97%
	Nanoplankton	102,052.6	70.95%	1,472,992	23.57%
	Pseudanabaena acicularis	7,145.9	4.97%	1,835,372	29.37%
	Synechococcus sp. 1	5,102.6	3.55%	2,653	0.04%
	Synechocystis sp.	794.0	0.55%	415	0.01%
<b>Total</b>	<b>122,619.1</b>	<b>85.25%</b>	<b>3,374,697</b>	<b>54.00%</b>	
Euglenophyta	Trachelomonas volvocina	52.9	0.04%	290,952	4.66%
	<b>Total</b>	<b>52.9</b>	<b>0.04%</b>	<b>290,952</b>	<b>4.66%</b>
Haptophyta	Chrysochromulina parva	9,051.5	6.29%	303,316	4.85%
	<b>Total</b>	<b>9,051.5</b>	<b>6.29%</b>	<b>303,316</b>	<b>4.85%</b>
Miscellaneous	Misc. Microflagellate	158.8	0.11%	885	0.01%
	<b>Total</b>	<b>158.8</b>	<b>0.11%</b>	<b>885</b>	<b>0.01%</b>
Xanthophyta	Nephrodiella lunaris	2,699.6	1.88%	388,171	6.21%
	<b>Total</b>	<b>2,699.6</b>	<b>1.88%</b>	<b>388,171</b>	<b>6.21%</b>
<b>Total</b>	<b>Total</b>	<b>143,837.3</b>	<b>100.00%</b>	<b>6,249,487</b>	<b>100.00%</b>

Table C. Abundance and biovolume of Conesus Lake phytoplankton, June 10, 2014.

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	Asterionella formosa	105.0	0.14%	20,641	0.95%
	Cyclotella ocellata	1,030.4	1.33%	36,873	1.69%
	Cyclotella sp. 1	28.2	0.04%	1,010	0.05%
	Fragilaria crotonensis	122.7	0.16%	48,431	2.23%
	Navicula sp.	14.1	0.02%	1,620	0.07%
	<b>Total</b>	<b>1,300.5</b>	<b>1.68%</b>	<b>108,574</b>	<b>4.99%</b>
Chlorophyta	Ankistrodesmus falcatus	28.2	0.04%	9,252	0.43%
	Chlamydomonas sp.	98.8	0.13%	27,004	1.24%
	Closterium sp.	28.2	0.04%	36,484	1.68%
	Monoraphidium arcuatum	28.2	0.04%	354	0.02%
	Oocystis parva	118.6	0.15%	20,063	0.92%
	Scenedesmus bijuga	56.5	0.07%	9,439	0.43%
	Staurastrum sp.	1.5	0.00%	3,802	0.17%
	Unidentified Chlorophyte	98.8	0.13%	173,870	7.99%
	<b>Total</b>	<b>458.9</b>	<b>0.59%</b>	<b>280,267</b>	<b>12.88%</b>
Chrysophyta	Dinobryon divergens	14.1	0.02%	2,907	0.13%
	Dinobryon sertularia	14.1	0.02%	2,907	0.13%
	Dinobryon sociale	381.1	0.49%	70,282	3.23%
	Dinobryon sp.	155.3	0.20%	31,975	1.47%
	Mallomonas sp.	14.1	0.02%	11,467	0.53%
	Ochromonas sp.	14.1	0.02%	5,896	0.27%
	Polygoniochloris circularis	14.1	0.02%	633	0.03%
	Unidentified Chrysophyte	14.1	0.02%	925	0.04%
	<b>Total</b>	<b>621.1</b>	<b>0.80%</b>	<b>126,991</b>	<b>5.84%</b>
Cryptophyta	Cryptomonas erosa	14.1	0.02%	6,499	0.30%
	Rhodomonas minuta	479.9	0.62%	53,827	2.47%
	<b>Total</b>	<b>494.0</b>	<b>0.64%</b>	<b>60,326</b>	<b>2.77%</b>
Cyanophyta	Aphanocapsa delicatissima	2,540.8	3.29%	1,329	0.06%
	Cyanogranis ferruginea	6,123.2	7.92%	400,197	18.39%
	Nanoplankton	50,516.0	65.34%	729,131	33.51%
	Pseudanabaena acicularis	1,164.5	1.51%	299,098	13.75%
	Synechococcus sp. 1	10,715.5	13.86%	5,572	0.26%
	Synechocystis sp.	14.1	0.02%	7	0.00%
	<b>Total</b>	<b>71,074.1</b>	<b>91.93%</b>	<b>1,435,334</b>	<b>65.97%</b>
Euglenophyta	Trachelomonas sp.	1.0	0.00%	5,620	0.26%
	<b>Total</b>	<b>1.0</b>	<b>0.00%</b>	<b>5,620</b>	<b>0.26%</b>
Haptophyta	Chrysochromulina parva	3,260.7	4.22%	109,265	5.02%
	<b>Total</b>	<b>3,260.7</b>	<b>4.22%</b>	<b>109,265</b>	<b>5.02%</b>
Miscellaneous	Misc. Microflagellate	28.2	0.04%	157	0.01%
	<b>Total</b>	<b>28.2</b>	<b>0.04%</b>	<b>157</b>	<b>0.01%</b>
Pyrrhophyta	Peridinium polonicum	1.0	0.00%	16,714	0.77%
	Peridinium umbonatum	14.1	0.02%	24,340	1.12%
	<b>Total</b>	<b>15.1</b>	<b>0.02%</b>	<b>41,054</b>	<b>1.89%</b>
Xanthophyta	Nephrodiella lunaris	56.5	0.07%	8,119	0.37%
	<b>Total</b>	<b>56.5</b>	<b>0.07%</b>	<b>8,119</b>	<b>0.37%</b>
<b>Total</b>	<b>Total</b>	<b>77,310.0</b>	<b>100.00%</b>	<b>2,175,707</b>	<b>100.00%</b>

Table D. Abundance and biovolume of Conesus Lake phytoplankton, June 24, 2014

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	Achnanthes sp.	14.1	0.02%	212	0.01%
	Asterionella formosa	2.0	0.00%	402	0.02%
	Cyclotella ocellata	42.3	0.06%	1,515	0.07%
	<b>Total</b>	<b>58.5</b>	<b>0.08%</b>	<b>2,129</b>	<b>0.09%</b>
Chlorophyta	Ankistrodesmus braunii	14.1	0.02%	4,626	0.20%
	Ankistrodesmus falcatus	14.1	0.02%	4,626	0.20%
	Characium limneticum	14.1	0.02%	2,537	0.11%
	Chlamydomonas sp.	211.7	0.31%	57,865	2.54%
	Closterium moniliferum	28.2	0.04%	11,023	0.48%
	Closterium sp.	42.3	0.06%	54,725	2.40%
	Dictyosphaerium ehrenbergianum	790.5	1.14%	26,797	1.17%
	Lagerheimia ciliata	28.2	0.04%	7,880	0.35%
	Monoraphidium capricornutum	42.3	0.06%	531	0.02%
	Oocystis parva	529.3	0.76%	89,567	3.93%
	Pediastrum boryanum	225.8	0.33%	11,294	0.49%
	Sphaerocystis Schroeteri	1,468.0	2.12%	83,228	3.65%
	Staurastrum sp.	42.3	0.06%	104,959	4.60%
	Unidentified Chlorophyte	197.6	0.29%	347,740	15.24%
	<b>Total</b>	<b>3,648.8</b>	<b>5.27%</b>	<b>807,399</b>	<b>35.38%</b>
Chrysophyta	Chromulina sp.	28.2	0.04%	189	0.01%
	Dinobryon divergens	14.1	0.02%	2,907	0.13%
	Mallomonas akrokomas	14.1	0.02%	11,467	0.50%
	<b>Total</b>	<b>56.5</b>	<b>0.08%</b>	<b>14,562</b>	<b>0.64%</b>
Cryptophyta	Cryptomonas erosa	381.1	0.55%	175,483	7.69%
	Cryptomonas rostratiformis	14.1	0.02%	86,403	3.79%
	Rhodomonas minuta	1,341.0	1.94%	150,398	6.59%
	<b>Total</b>	<b>1,736.2</b>	<b>2.51%</b>	<b>412,284</b>	<b>18.07%</b>
Cyanophyta	Anabaena circinalis	32.7	0.05%	463	0.02%
	Anabaena crassa	25.6	0.04%	6,566	0.29%
	Anabaena macrospora	5.1	0.01%	1,822	0.08%
	Aphanocapsa delicatissima	338.8	0.49%	177	0.01%
	Microcystis aeruginosa	44.0	0.06%	2,874	0.13%
	Nanoplankton	54,343.0	78.49%	784,368	34.38%
	Synechococcus sp. 1	6,123.2	8.84%	3,184	0.14%
	Synechocystis sp.	169.4	0.24%	89	0.00%
<b>Total</b>	<b>61,081.7</b>	<b>88.22%</b>	<b>799,542</b>	<b>35.04%</b>	
Euglenophyta	Trachelomonas sp.	14.1	0.02%	77,587	3.40%
	Trachelomonas volvocina	14.1	0.02%	77,587	3.40%
	<b>Total</b>	<b>28.2</b>	<b>0.04%</b>	<b>155,174</b>	<b>6.80%</b>
Haptophyta	Chrysochromulina parva	2,583.1	3.73%	86,560	3.79%
	<b>Total</b>	<b>2,583.1</b>	<b>3.73%</b>	<b>86,560</b>	<b>3.79%</b>
Miscellaneous	Misc. Microflagellate	14.1	0.02%	79	0.00%
	<b>Total</b>	<b>14.1</b>	<b>0.02%</b>	<b>79</b>	<b>0.00%</b>
Xanthophyta	Nephrodiella lunaris	28.2	0.04%	4,059	0.18%
	<b>Total</b>	<b>28.2</b>	<b>0.04%</b>	<b>4,059</b>	<b>0.18%</b>
<b>Total</b>	<b>Total</b>	<b>69,235.3</b>	<b>100.00%</b>	<b>2,281,788</b>	<b>100.00%</b>

Table E. Abundance and biovolume of Conesus Lake phytoplankton, July 8, 2014

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume	
Bacillariophyta	Cyclotella sp. 1	1,117.9	0.41%	40,004	1.09%	
		1,117.9	0.41%	40,004	1.09%	
Chlorophyta	Ankistrodesmus falcatus	152.4	0.06%	49,962	1.36%	
	Carteria sp.	33.9	0.01%	4,417	0.12%	
	Chlamydomonas sp.	84.7	0.03%	23,146	0.63%	
	Closterium sp.	16.9	0.01%	21,890	0.60%	
	Dispora crucigenioides	910.4	0.34%	40,562	1.10%	
	Eudorina elegans	2,168.1	0.80%	772,757	21.04%	
	Franceia droescheri	67.8	0.03%	18,547	0.51%	
	Lagerheimia ciliata	16.9	0.01%	4,728	0.13%	
	Monoraphidium capricornutum	16.9	0.01%	212	0.01%	
	Oocystis parva	1,817.6	0.67%	307,558	8.38%	
	Oocystis pusilla	67.8	0.03%	4,852	0.13%	
	Pandorina morum	1,355.1	0.50%	204,076	5.56%	
	Quadrigula lacustris	33.9	0.01%	1,850	0.05%	
	Scenedesmus bijuga	450.6	0.17%	75,324	2.05%	
	Scenedesmus quadricauda	33.9	0.01%	1,481	0.04%	
	Sphaerocystis schroeteri	1,814.8	0.67%	102,891	2.80%	
	Tetraedron minimum	33.9	0.01%	6,740	0.18%	
	Tetraedron muticum	16.9	0.01%	3,370	0.09%	
	Unidentified Chlorophyte	457.3	0.17%	804,769	21.92%	
	<b>Total</b>	9,549.9	3.53%	2,449,133	66.69%	
Chrysophyta	Dinobryon divergens	2.0	0.00%	421	0.01%	
		Ochromonas sp.	33.9	0.01%	14,151	0.39%
		<b>Total</b>	35.9	0.01%	14,572	0.40%
Cryptophyta	Cryptomonas erosa	135.5	0.05%	62,394	1.70%	
		Rhodomonas minuta	118.6	0.04%	13,298	0.36%
		<b>Total</b>	254.1	0.09%	75,692	2.06%
Cyanophyta	Anabaena circinalis	258.1	0.10%	3,650	0.10%	
	Anabaena crassa	20.5	0.01%	5,253	0.14%	
	Anabaena macrospora	10.2	0.00%	3,644	0.10%	
	Aphanocapsa delicatissima	18,369.5	6.79%	9,607	0.26%	
	Aphanocapsa elachista	677.5	0.25%	1,192	0.03%	
	Gomphosphaeria lacustris	508.2	0.19%	6,190	0.17%	
	Microcystis aeruginosa	40.9	0.02%	2,673	0.07%	
	Nanoplankton	51,281.4	18.95%	740,178	20.16%	
	Synechococcus sp. 1	185,990.8	68.72%	96,715	2.63%	
	Synechocystis sp.	16.9	0.01%	9	0.00%	
	<b>Total</b>	257,174.0	95.02%	869,112	23.67%	
Euglenophyta	Trachelomonas sp.	16.9	0.01%	93,105	2.54%	
		<b>Total</b>	16.9	0.01%	93,105	2.54%
Haptophyta	Chrysochromulina parva	2,490.0	0.92%	83,438	2.27%	
		<b>Total</b>	2,490.0	0.92%	83,438	2.27%
Pyrrhophyta	Gymnodinium sp. 3	16.9	0.01%	5,346	0.15%	
		Peridinium polonicum	2.6	0.00%	41,787	1.14%
		<b>Total</b>	19.5	0.01%	47,133	1.28%
<b>Total</b>		270,658.2	100.00%	3,672,190	100.00%	

Table F. Abundance and biovolume of Conesus Lake phytoplankton, July 21, 2014

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	Cyclotella ocellata	21.2	0.02%	758	0.03%
	Cyclotella pseudostelligera	42.3	0.04%	1,515	0.06%
	Cyclotella sp. 1	42.3	0.04%	1,515	0.06%
	Nitzschia palea	21.2	0.02%	908	0.04%
	<b>Total</b>	127.0	0.13%	4,697	0.19%
Chlorophyta	Ankistrodesmus falcatus	21.2	0.02%	6,939	0.28%
	Chlamydomonas sp.	42.3	0.04%	11,573	0.47%
	Franceia droescheri	21.2	0.02%	5,796	0.23%
	Gloeocystis sp.	84.7	0.09%	5,657	0.23%
	Oocystis parva	1,778.5	1.79%	300,946	12.19%
	Pyramichlamys dissecta	21.2	0.02%	5,164	0.21%
	Schroederia judayi	63.5	0.06%	27,110	1.10%
	Sphaerocystis schroeteri	2,465.7	2.48%	139,793	5.66%
	Staurastrum sp.	21.2	0.02%	52,479	2.12%
	Unidentified Chlorophyte	127.0	0.13%	223,547	9.05%
	<b>Total</b>	4,646.6	4.67%	779,004	31.54%
Chrysophyta	Polygoniochloris circularis	21.2	0.02%	949	0.04%
	Unidentified Chrysophyte	63.5	0.06%	4,163	0.17%
	<b>Total</b>	84.7	0.09%	5,112	0.21%
Cryptophyta	Rhodomonas minuta	2,540.8	2.55%	284,965	11.54%
	<b>Total</b>	2,540.8	2.55%	284,965	11.54%
Cyanophyta	Anabaena circinalis	3,438.5	3.46%	48,621	1.97%
	Anabaena macrospora	10.2	0.01%	3,644	0.15%
	Aphanocapsa delicatissima	2,096.1	2.11%	1,096	0.04%
	Aphanocapsa elachista	51.1	0.05%	90	0.00%
	Chroococcus minimus	677.5	0.68%	12,738	0.52%
	Chroococcus minutus	42.3	0.04%	796	0.03%
	Gomphosphaeria lacustris	529.3	0.53%	6,448	0.26%
	Microcystis aeruginosa	61.4	0.06%	4,010	0.16%
	Nanoplankton	26,788.8	26.93%	386,660	15.66%
	Synechococcus sp. 1	53,577.6	53.86%	27,860	1.13%
	Synechocystis sp.	1,016.3	1.02%	532	0.02%
<b>Total</b>	88,289.3	88.75%	492,495	19.94%	
Haptophyta	Chrysochromulina parva	3,726.5	3.75%	124,874	5.06%
	<b>Total</b>	3,726.5	3.75%	124,874	5.06%
Pyrrhophyta	Glenodinium quadridens	21.2	0.02%	133,172	5.39%
	Peridinium polonicum	21.2	0.02%	346,108	14.01%
	Woloszynskia sp.	21.2	0.02%	299,328	12.12%
	<b>Total</b>	63.5	0.06%	778,608	31.53%
<b>Total</b>	99,478.3	100.00%	2,469,755	100.00%	

Table G. Abundance and biovolume of Conesus Lake phytoplankton, August 5, 2014

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	<i>Cyclotella pseudostelligera</i>	17.6	0.02%	631	0.04%
	<i>Cyclotella</i> sp. 1	17.6	0.02%	631	0.04%
	<b>Total</b>	35.3	0.05%	1,263	0.07%
Chlorophyta	<i>Ankistrodesmus falcatus</i>	17.6	0.02%	5,783	0.34%
	<i>Chlamydomonas</i> sp.	70.6	0.10%	19,288	1.13%
	<i>Gloeococcus minor</i>	35.3	0.05%	35,743	2.08%
	<i>Oocystis parva</i>	323.5	0.44%	54,735	3.19%
	<i>Pandorina morum</i>	141.2	0.19%	21,258	1.24%
	<i>Scenedesmus quadricauda</i>	35.3	0.05%	1,542	0.09%
	<i>Schroederia judayi</i>	17.6	0.02%	7,530	0.44%
	<i>Schroederia setigera</i>	17.6	0.02%	4,849	0.28%
	<i>Sphaerocystis schroeteri</i>	2,742.9	3.70%	155,507	9.07%
	<i>Staurastrum</i> sp.	17.6	0.02%	43,733	2.55%
	Unidentified Chlorophyte	211.7	0.29%	372,578	21.73%
	<b>Total</b>	3,631.0	4.89%	722,545	42.14%
	Chrysophyta	<i>Mallomonas</i> sp.	17.6	0.02%	14,333
<b>Total</b>		17.6	0.02%	14,333	0.84%
Cryptophyta	<i>Cryptomonas erosa</i>	52.9	0.07%	24,373	1.42%
	<i>Rhodomonas minuta</i>	1,535.0	2.07%	172,166	10.04%
	<b>Total</b>	1,588.0	2.14%	196,539	11.46%
Cyanophyta	<i>Anabaena circinalis</i>	188.3	0.25%	2,663	0.16%
	<i>Anabaena crassa</i>	51.1	0.07%	13,131	0.77%
	<i>Anabaena planctonica</i>	53.3	0.07%	13,678	0.80%
	<i>Aphanocapsa delicatissima</i>	2,161.4	2.91%	1,130	0.07%
	<i>Chroococcus limneticus</i>	317.6	0.43%	63,345	3.69%
	<i>Gomphosphaeria lacustris</i>	4,940.4	6.66%	60,184	3.51%
	<i>Merismopedia warmingiana</i>	141.2	0.19%	250	0.01%
	<i>Microcystis viridis</i>	59.6	0.08%	3,898	0.23%
	Nanoplankton	24,875.3	33.52%	359,042	20.94%
	<i>Synechococcus</i> sp. 1	31,891.4	42.98%	16,584	0.97%
	<i>Synechocystis</i> sp.	211.7	0.29%	111	0.01%
<b>Total</b>	64,891.4	87.45%	534,016	31.15%	
Haptophyta	<i>Chrysochromulina parva</i>	4,022.9	5.42%	134,807	7.86%
	<b>Total</b>	4,022.9	5.42%	134,807	7.86%
Pyrrhophyta	<i>Glenodinium quadridens</i>	17.6	0.02%	110,976	6.47%
	<b>Total</b>	17.6	0.02%	110,976	6.47%
<b>Total</b>	<b>Total</b>	74,203.8	100.00%	1,714,479	100.00%

Table H. Abundance and biovolume of Conesus Lake phytoplankton, August 19, 2014

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	Cyclotella ocellata	148.2	0.12%	5,304	0.13%
	Cyclotella pseudostelligera	42.3	0.03%	1,515	0.04%
	Cyclotella sp. 1	21.2	0.02%	758	0.02%
	<b>Total</b>	<b>211.7</b>	<b>0.17%</b>	<b>7,577</b>	<b>0.19%</b>
Chlorophyta	Ankistrodesmus falcatus	21.2	0.02%	6,939	0.17%
	Carteria sp.	21.2	0.02%	2,761	0.07%
	Chlamydomonas sp.	42.3	0.03%	11,573	0.28%
	Coelastrum pseudomicroporum	169.4	0.13%	2,372	0.06%
	Deasonia Gigantica	21.2	0.02%	14,821	0.36%
	Oocystis parva	177.9	0.14%	30,095	0.73%
	Schroederia judayi	42.3	0.03%	18,073	0.44%
	Sphaerocystis schroeteri	338.8	0.27%	19,206	0.47%
	Stichococcus bacillaris	21.2	0.02%	355	0.01%
	Unidentified Chlorophyte	508.2	0.40%	894,188	21.83%
	<b>Total</b>	<b>1,363.5</b>	<b>1.07%</b>	<b>1,000,383</b>	<b>24.43%</b>
Chrysophyta	Mallomonas sp.	42.3	0.03%	34,400	0.84%
	Unidentified Chrysophyte	21.2	0.02%	1,388	0.03%
	<b>Total</b>	<b>63.5</b>	<b>0.05%</b>	<b>35,788</b>	<b>0.87%</b>
Cryptophyta	Cryptomonas erosa	84.7	0.07%	38,996	0.95%
	Rhodomonas minuta	571.7	0.45%	64,117	1.57%
	<b>Total</b>	<b>656.4</b>	<b>0.52%</b>	<b>103,113</b>	<b>2.52%</b>
Cyanophyta	Anabaena circinalis	24,366.0	19.16%	344,535	8.41%
	Anabaena crassa	685.9	0.54%	176,178	4.30%
	Anabaena planctonica	1,048.1	0.82%	269,188	6.57%
	Aphanocapsa delicatissima	529.3	0.42%	277	0.01%
	Chroococcus limneticus	317.6	0.25%	63,345	1.55%
	Chroococcus minimus	465.8	0.37%	8,757	0.21%
	Gomphosphaeria lacustris	4,658.1	3.66%	56,744	1.39%
	Merismopedia warmingiana	338.8	0.27%	600	0.01%
	Microcystis aeruginosa	159.8	0.13%	10,442	0.25%
	Nanoplankton	53,577.6	42.13%	773,321	18.88%
	Oscillatoria splendida	5,187.4	4.08%	1,040,598	25.41%
	Synechococcus elongatus	1,079.8	0.85%	2,602	0.06%
	Synechococcus sp. 1	26,788.8	21.06%	13,930	0.34%
	Synechocystis sp.	889.3	0.70%	465	0.01%
	<b>Total</b>	<b>120,092.3</b>	<b>94.43%</b>	<b>2,760,983</b>	<b>67.42%</b>
	Haptophyta	Chrysochromulina parva	4,763.9	3.75%	159,640
<b>Total</b>		<b>4,763.9</b>	<b>3.75%</b>	<b>159,640</b>	<b>3.90%</b>
Pyrrhophyta	Gymnodinium sp. 2	21.2	0.02%	7,013	0.17%
	Peridinium polonicum	1.3	0.00%	20,893	0.51%
	<b>Total</b>	<b>22.5</b>	<b>0.02%</b>	<b>27,905</b>	<b>0.68%</b>
<b>Total</b>	<b>127,173.8</b>	<b>100.00%</b>	<b>4,095,389</b>	<b>100.00%</b>	

Table I. Abundance and biovolume of Conesus Lake phytoplankton, September 2, 2014

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	Cyclostephanos damasii	28.2	0.02%	13,473	0.44%
	Cyclotella ocellata	367.0	0.30%	13,133	0.42%
	<b>Total</b>	395.2	0.33%	26,606	0.86%
Chlorophyta	Ankistrodesmus falcatus	14.1	0.01%	4,626	0.15%
	Chlamydomonas sp.	14.1	0.01%	3,858	0.12%
	Oocystis parva	211.7	0.17%	35,828	1.16%
	Oocystis pusilla	42.3	0.03%	3,032	0.10%
	Scenedesmus bijuga	225.8	0.19%	37,756	1.22%
	Scenedesmus intermedius	112.9	0.09%	4,935	0.16%
	Schroederia judayi	14.1	0.01%	6,024	0.19%
	Selenastrum minutum	14.1	0.01%	472	0.02%
	Staurastrum sp.	0.5	0.00%	1,267	0.04%
	Stichococcus bacillaris	14.1	0.01%	237	0.01%
	Unidentified Chlorophyte	155.3	0.13%	273,224	8.83%
	<b>Total</b>	819.2	0.68%	371,260	11.99%
	Chrysophyta	Dinobryon divergens	28.2	0.02%	5,814
<b>Total</b>		28.2	0.02%	5,814	0.19%
Cryptophyta	Cryptomonas erosa	155.3	0.13%	71,493	2.31%
	Rhodomonas minuta	2,117.3	1.74%	237,471	7.67%
	<b>Total</b>	2,272.6	1.87%	308,964	9.98%
Cyanophyta	Anabaena circinalis	28,795.4	23.73%	407,167	13.15%
	Anabaena crassa	621.1	0.51%	159,519	5.15%
	Anabaena planctonica	1,058.7	0.87%	271,907	8.78%
	Aphanocapsa delicatissima	564.6	0.47%	295	0.01%
	Aphanocapsa holsatica	1,411.5	1.16%	738	0.02%
	Chroococcus limneticus	451.7	0.37%	90,091	2.91%
	Gomphosphaeria lacustris	3,387.7	2.79%	41,269	1.33%
	Merismopedia warmingiana	1,298.6	1.07%	2,299	0.07%
	Microcystis aeruginosa	14.1	0.01%	923	0.03%
	Nanoplankton	45,923.7	37.85%	662,846	21.41%
	Pseudanabaena limnetica	1,129.2	0.93%	307,154	9.92%
	Pseudanabaena sp.	1,399.8	1.15%	359,522	11.61%
	Synechococcus sp. 1	29,850.4	24.60%	15,522	0.50%
	Synechocystis sp.	14.1	0.01%	7	0.00%
<b>Total</b>	115,920.6	95.53%	2,319,260	74.92%	
Haptophyta	Chrysochromulina parva	1,905.6	1.57%	63,856	2.06%
	<b>Total</b>	1,905.6	1.57%	63,856	2.06%
<b>Total</b>	<b>Total</b>	121,341.4	100.00%	3,095,759	100.00%

Table J. Abundance and biovolume of Conesus Lake phytoplankton, September 16, 2014

Division	Taxon	Abundance (Cells/mL)	Percent Abundance	Biovolume ( $\mu\text{m}^3/\text{mL}$ )	Percent Biovolume
Bacillariophyta	Achnanthes minutissima	8.5	0.01%	127	0.00%
	Anomoeoneis vitrea	8.5	0.01%	1,349	0.05%
	Cyclotella ocellata	169.4	0.20%	6,061	0.23%
	<b>Total</b>	<b>186.3</b>	<b>0.22%</b>	<b>7,537</b>	<b>0.28%</b>
Chlorophyta	Ankistrodesmus falcatus	8.5	0.01%	2,776	0.10%
	Carteria sp.	25.4	0.03%	3,313	0.12%
	Chlamydomonas sp.	16.9	0.02%	4,629	0.17%
	Dictyosphaerium pulchellum	169.4	0.20%	5,912	0.22%
	Monoraphidium arcuatum	42.3	0.05%	531	0.02%
	Oocystis parva	135.5	0.16%	22,929	0.86%
	Pandorina morum	711.4	0.82%	107,140	4.01%
	Scenedesmus bicaudatus	16.9	0.02%	1,294	0.05%
	Scenedesmus bijuga	498.9	0.58%	83,406	3.12%
	Scenedesmus quadricauda	67.8	0.08%	2,961	0.11%
	Scenedesmus serratus	16.9	0.02%	740	0.03%
	Staurastrum sp.	8.5	0.01%	20,992	0.79%
	Tetraedron minimum	8.5	0.01%	1,685	0.06%
	Unidentified Chlorophyte	330.3	0.38%	581,222	21.74%
	<b>Total</b>	<b>2,057.3</b>	<b>2.38%</b>	<b>839,530</b>	<b>31.40%</b>
Chrysophyta	Ochromonas sp.	8.5	0.01%	3,538	0.13%
	<b>Total</b>	<b>8.5</b>	<b>0.01%</b>	<b>3,538</b>	<b>0.13%</b>
Cryptophyta	Cryptomonas erosa	237.1	0.27%	109,189	4.08%
	Rhodomonas minuta	406.5	0.47%	45,594	1.71%
	<b>Total</b>	<b>643.7</b>	<b>0.74%</b>	<b>154,784</b>	<b>5.79%</b>
Cyanophyta	Anabaena circinalis	21,163.3	24.45%	299,250	11.19%
	Anabaena crassa	546.3	0.63%	140,304	5.25%
	Chroococcus limneticus	33.9	0.04%	6,757	0.25%
	Chroococcus minimus	84.7	0.10%	1,592	0.06%
	Chroococcus minutus	67.8	0.08%	1,274	0.05%
	Gomphosphaeria lacustris	846.9	0.98%	10,317	0.39%
	Lyngbya birgei	8.2	0.01%	67	0.00%
	Merismopedia warmingiana	203.3	0.23%	360	0.01%
	Microcystis aeruginosa	2,490.0	2.88%	162,738	6.09%
	Nanoplankton	29,850.4	34.49%	430,850	16.11%
	Oscillatoria limnetica	16,938.5	19.57%	388,638	14.54%
	Pseudanabaena limnetica	681.8	0.79%	185,444	6.94%
	Snowella litoralis	1,058.7	1.22%	16,815	0.63%
	Synechococcus elongatus	101.6	0.12%	245	0.01%
	Synechococcus sp. 1	8,419.3	9.73%	4,378	0.16%
	Synechocystis sp.	762.2	0.88%	399	0.01%
	<b>Total</b>	<b>83,256.7</b>	<b>96.20%</b>	<b>1,649,429</b>	<b>61.69%</b>
Haptophyta	Chrysochromulina parva	381.1	0.44%	12,771	0.48%
	<b>Total</b>	<b>381.1</b>	<b>0.44%</b>	<b>12,771</b>	<b>0.48%</b>
Pyrrhophyta	Glenodinium quadridens	0.5	0.00%	3,216	0.12%
	Gymnodinium sp. 2	8.5	0.01%	2,805	0.10%
	<b>Total</b>	<b>9.0</b>	<b>0.01%</b>	<b>6,021</b>	<b>0.23%</b>
<b>Total</b>	<b>86,542.5</b>	<b>100.00%</b>	<b>2,673,609</b>	<b>100.00%</b>	

Hey Joe, no, the methodology has not changed, but I did notice that the blue-greens were noticeably more abundant in 2014 than in the 1996/1999 samples. I pulled the slides when I started to make sure I was being as consistent as I could be. For water quality, I would analyze the data without the picoplankton, and I can send you a list of what I consider to be the picoplankton. That said, the blue-greens were much more abundant in 2014. Does that help? Thanks much, ann.

**From:** Makarewicz, Joseph [mailto:jmakarew@brockport.edu]

**Sent:** Friday, October 31, 2014 3:48 PM

**To:** St. Amand, Ann

**Subject:** question

Hi Anne: Is there anyway you can verify something for us. The 2014 summary of total abundances for 2014 is 118, 451, while in 1996 and 1999, it was in the 10,000 to 20,000 range. The number of cyanophyte cells for 2014, especially in August, appears to be higher than either 1996 or 1999 counts you did for us. In particular, the abundance of *Anabaena circinalis*, nanoplankton, and *Synechococcus* sp.1 appear to be much higher. The methodology has not changed. Are we reading something wrong?

Joe

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