

# Conesus Lake Limnology: 2004

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## 1. Stream Chemistry and Zooplankton

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## 2. Metaphyton Cover in Selected Eurasian Watermilfoil Beds

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## 3. Abundance of Zebra Mussel Veliger Larvae

(*Dreisseana polymorpha*)

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## TABLE OF CONTENTS

	<u>Page</u>
<b>Summary</b> .....	<b>iii</b>
<b>Introduction</b> .....	<b>1</b>
<b>Methods</b> .....	<b>5</b>
<b>Results and Discussion</b> .....	<b>9</b>
<b>Literature Cited</b> .....	<b>13</b>
<b>Acknowledgements</b> .....	<b>15</b>
<b>Figures</b> .....	<b>16</b>
<b>Tables</b> .....	<b>20</b>
<b>Appendices</b> .....	<b>23</b>
<b>Appendix A: Zooplankton abundance</b> .....	<b>I</b>
<b>Appendix B: Stream Chemistry</b> .....	<b>XIV</b>

## Summary

1. During the spring, summer, fall and winter of 2004 and 2005, limnological data were collected from Conesus Lake to assist in the implementation of the Conesus Lake Watershed Management Plan. In general, monitoring and analysis were designed to meet the following objectives: (a) Obtain estimates of loading of nutrients and soils from four creeks (Conesus Inlet, North Gully, No Name and Wilkens) not monitored by the SUNY Brockport USDA program; (b) Provide chemistry for the open water of Conesus Lake; and (c), Characterize the lake's community of zebra mussel larvae, phytoplankton, zooplankton and metaphyton to provide a benchmark against which the effectiveness of future management actions can be measured.
2. The stream data and zooplankton data are presented in tabular form as no report was requested.
3. Phytoplankton and lake chemistry were provided in the interim report (Makarewicz et al. 2004).
4. Metaphyton: The goal was to document the local distribution of filamentous algae (metaphyton) growing in macrophyte beds near streams and in areas not influenced by major sources of runoff. By comparing these two types of habitats we may gain a better understanding of the relative importance of external nutrient loading and in-lake nutrient sources in supporting the growth of these algae. The data will also provide a baseline reference that will help evaluate the impact of future lake management activities on metaphyton growth.

We used the percent of surface area covered by metaphyton growing on macrophyte beds as an indicator of metaphyton growth along 12 distinct nearshore sites. Six of the sites (4 managed, 2 reference) have been previously studied as part of an ongoing watershed management project in Conesus Lake. Six other sites, sampled for the first time, represent areas not directly under the influence of streams or other major sources of runoff.

Surface digital photographs of a 0.25 m<sup>2</sup> quadrat were used to estimate the percent cover of metaphyton. Surveys were conducted in July and August, when high algal cover was observed. At each site at least four replicate surface photos were taken over water depths of 1, 2, and 3 m, corresponding to different horizontal distances from shore (~5-75 m). The photographs were analyzed digitally to determine surface cover by algae.

Survey sites near streams draining reference watersheds (n=2), showed the highest average metaphyton cover at about 25%. The metaphyton cover at stream sites associated with the four managed watersheds (8.2%) and at six sites removed from major sources of runoff (6.4%) was statistically lower than at the reference sites. Metaphyton cover in the managed sites and the "no stream" sites were not statistically different.

The spring and early summer 2004 were characterized by high amounts of rainfall and runoff from the watershed. Consequently, there was extensive nuisance growth of metaphyton along shoreline areas. In the offshore macrophyte beds, metaphyton cover near reference streams was

statistically higher than cover in areas draining managed watersheds and areas away from sources of direct runoff. These trends indicate that metaphyton growth was enhanced extensively by runoff from the watershed during the spring and summer 2004, and that the influence of in-lake nutrients may have been relatively limited.

5. Zebra Mussels: The goal was to document the timing of spawning and larval production by zebra mussels in Conesus Lake relative to lunar cycles and to compare the numerical production of larvae to records from previous summers.

Samples of plankton were collected from surface waters on a weekly basis from June through September 2004, during the known reproductive season of zebra mussels in temperate North American lakes. Zebra mussel veliger larvae were isolated and their shell length was measured to estimate larval age and consequently the time of adult spawning.

The patterns of veliger abundance and size distribution indicate that in addition to moderate spawning activity throughout the summer there was one major peak in larval production in early July (maximum  $22,670 \text{ veligers} \cdot \text{m}^{-3}$ ) and a second smaller peak during the last week of August ( $2,914 \text{ veligers} \cdot \text{m}^{-3}$ ). This pattern of low level reproductive activity punctuated by mass spawning events is consistent with previous records in Conesus Lake and elsewhere.

The two peaks in larval numbers indicate that mass-spawning events occurred in the first few days of July and over the 4<sup>th</sup> week of August. These were periods of brightly moonlit nights around the time of the full moon. The tendency for zebra mussels to spawn near the time of the full moon has been evident in four of the five years that larval production has been studied in Conesus Lake, and is consistent with the hypothesis that moonlight may be providing a synchronizing cue for zebra mussel reproduction.

In 2004, the average number of veliger larvae in surface waters during the peak period of reproduction in July and August was  $4,975 \cdot \text{m}^{-3}$  ( $\pm 8423$ ). This average and the peak numbers recorded approach the maximum values recorded for the lake (summer 1995 mean  $12,231 \cdot \text{m}^{-3}$ , maximum  $29,600 \cdot \text{m}^{-3}$ ), and are much higher than those of intervening years. Thus it appears that lower levels of larval production recorded in 1996, 1997 and 1999 were not an indication of long-term declines of zebra mussel populations in Conesus Lake.

## Introduction

### **General:**

During the spring, summer, fall and winter of 2004 and 2005, limnological data were collected from Conesus Lake to assist in the implementation of the Conesus Lake Watershed Management Plan. In general, monitoring and analysis were designed to meet the following objectives: (1) Obtain estimates of loading of nutrients and soils from four creeks (Conesus Inlet, North Gully, No Name and Wilkens) not monitored by the SUNY Brockport USDA program; (2) Provide chemistry for the open water of Conesus Lake; and (3), Characterize the lake's community of zebra mussel larvae, phytoplankton, zooplankton and metaphyton to provide a benchmark against which the effectiveness of future management actions can be measured. Specific objectives of the sampling program are outlined below.

- a. A recommendation of the long-term monitoring program for Conesus Lake developed as part of the Characterization Report and Management Plan is to characterize the metaphyton, phytoplankton, zebra mussel larvae and zooplankton communities of Conesus Lake periodically. This effort will provide important information regarding the status of the lake's ecosystem. Phytoplankton and phosphorus data were provided in the Interim Report (Makarewicz et al. 2004).
- b. Refine the loading estimate of nutrients and sediment entering Conesus Lake through its tributary streams. Weekly samples and analysis of these four streams were conducted for one year (52 events). Samples were analyzed for the following parameters: total phosphorus, soluble reactive phosphorus, nitrate-nitrite, total Kjeldahl nitrogen, total suspended solids, and sodium.
- c. Estimate the abundance of metaphyton (large filamentous algae) in the lake's littoral areas. Sampling was conducted during the summer of 2004 at five sites. The five sites are as follows:
  - Harston Point on the South Basin, East Shore
  - Old Orchard Cove on the North Basin, East Shore
  - Sand Point, North where metaphyton tends to accumulate
  - Pebble Beach Cove North Basin, West Shore
  - Booher Hill Area, South Basin West Shore

### **Zooplankton and Stream Chemistry and Loading**

The data for zooplankton and stream chemistry and stream loading are presented in Appendix A (Table 1) and Appendix B (Tables 1-6). This portion of the report is a data report only and

does not include an interpretative report. That is, data summaries are provided that tabulate all results of the sampling and describe the sampling and analytical methods. In this interim report, information on lake chemistry, phytoplankton and internal hypolimnetic phosphorus release were provided (Makarewicz et al. 2004).

### **Metaphyton:**

The metaphyton is an assemblage of algae that grow loosely adhered or entangled to substrates on the littoral zone of lakes and streams. In most lakes, the metaphyton assemblage is dominated by filamentous algae, particularly species that grow into long multicelled and often branched filaments. Some of the best-known representatives of this assemblage include species of the green algal genera *Cladophora*, *Spirogyra* and *Zygnema*. All three genera are well represented by species in Conesus Lake (Savard and Bodine 1971).

Filamentous green algae normally pose very little threat to human use of water resources, but given adequate shelter from winds and currents (often provided by macrophytes), ample light, and plenty of nutrients, they can bloom to nuisance levels and that can be an impediment to recreation. In areas of restricted water flow (e.g. small coves), the extensive die-off and decay that follows a bloom can produce anoxic conditions and extensive growth of anaerobic bacteria. Odors emanating from these sites are a major detriment to lake water quality and a major concern for lakeshore residents.

Nuisance-level blooms of filamentous algae have been a regular occurrence in Conesus Lake for many years. In his treatise on the "Limnology of the Finger Lakes" (Forest 1981), professor Herman Forest reported that in the spring and summer large masses of the green algal genus *Spirogyra* were consistently present in shallow waters wherever there is some attachment. Muenscher (1927) reported *Cladophora* in Conesus Lake as far back as 1926, and Forest (1978) describes an incident in which *Cladophora* "festooned" rooted aquatic plants near the mouth of Wilkins Creek and actually attained a comparable mass.

Even in the context of this history, there is reliable anecdotal evidence that over the last ten years, the nuisance growth of filamentous algae in Conesus Lake has reached unprecedented

levels. One likely contributor to this increased growth is the zebra mussel, *Dreissena polymorpha*, first seen in large numbers in Conesus Lake during the fall of 1994. Large populations of zebra mussels such as those presently in Conesus Lake (Bosch et al. 2001) can, by their filter-feeding activities, increase the amount of light penetrating into the water, and deliver large amounts of carbon and other nutrients to the lake benthos. This phenomenon has been correlated with the increased growth of metaphyton and other benthic plants in the nearshore environment of Saginaw Bay and in other areas of the Great Lakes (Skubinna et al. 1995, Lowe and Pillsbury 1995).

While the characteristics of the aquatic ecosystem in Conesus Lake may have been altered by the invasion of zebra mussels, the principal agent that drives the nuisance growth of metaphyton remains the same: high nutrient levels. Studies conducted by SUNY Brockport students (D'Aiuto 2004) have demonstrated that stream effluent entering the lake contains high concentrations of soluble reactive phosphorus that promote growth of *Zygnema*, *Spirogyra* and other metaphyton on temporal scales of hours to days. These results are in agreement with the general observation that areas of nuisance metaphyton growth around the lake are frequently associated with sources of runoff from the watershed (D'Aiuto 2004).

In this study, we surveyed populations of metaphyton in Conesus Lake at six sites near streams, and at six other sites that were not proximate to streams or other sources of runoff ("non-stream") sites. Four of the streamside areas receive runoff from experimental watersheds in which farm management practices have been implemented for more than two years (J. Makarewicz, USDA funded project). Two of the stream areas are long-term reference sites associated with unmanipulated (reference) watersheds. We have a three-year record of metaphyton surface cover for the six stream sites. The first two years represent a baseline period of data collection prior to the implementation of farm management. The six "non-stream" sites have not been previously surveyed for metaphyton. They were selected specifically to provide information on the extent to which in-lake nutrients can drive the growth of nearshore metaphyton communities.

## Zebra Mussels

Large populations of zebra mussels occupied the whole south basin of Conesus Lake by the fall of 1994. Veliger larvae of *Dreissena* spread with the prevailing currents northward into the north basin and by the fall of 1998 occupied every suitable benthic habitat. In the summer 2000, SUNY Geneseo researchers reported maximum adult zebra mussel densities of 50, 1333  $\cdot$  m<sup>-3</sup> extending to depths of 8 m (Bosch et al. 2001). Large populations were also observed growing in the shallows within macrophyte beds, but the spatial complexity of the habitat and the generally small size of the mussels made it difficult to estimate their numbers. Quagga mussels (*Dreissena bugensis*) have supplanted zebra mussels as the dominant Eurasian invader in many North American lakes but to date have not been found in Conesus Lake.

Evidence from studies in the Great Lakes and elsewhere indicate that zebra mussels have a profound impact on native ecosystems. The feeding activity of large populations clear the water of suspended material, alter the nutrient balance between the water column and the benthic compartments of the ecosystem (e.g. carbon, nitrogen, phosphorus), and compete successfully with native species for food and space. The specific consequences of these changes are currently under investigation in other lakes. A well-known outcome of zebra mussel feeding is an increase in the amount of light penetrating the water and reaching the bottom of the lake. This phenomenon has been correlated with the increased growth of attached algae and macrophytes in the nearshore environment, a trend that has been readily apparent over the last decade in Conesus Lake.

The reproduction of zebra mussels is unusual among freshwater bivalves, most of which produce a few offspring that are either brooded, or live as parasites on the gills of fish. In contrast, a single female zebra mussel can produce upwards of 50 thousand eggs per reproductive season. The eggs, 70-80  $\mu$ m in diameter, are free-spawned into the water. A few hours after fertilization they develop into shelled veliger larvae. The veligers swim and disperse in surface waters, feeding on microscopic plankton as they increase in size and develop into drifting juveniles. The juveniles eventually settle onto bottom substrates and take up a sedentary lifestyle.

The spawning activity of zebra mussel populations usually begins in late May, when spring water temperatures surpass 12- 15 °C. Spawning continues into September in most temperate lakes. Within this broad window of reproductive competence, the spawning of local mussel populations is often synchronous, with 2-3 sharp peaks in larval production occurring approximately 1 month apart in some lakes (e.g. Haag and Garton 1992, Garton and Haag 1993). This episodic pattern of reproductive activity suggests that the onset of spawning may be triggered by some synchronizing external cue.

SUNY Geneseo researchers studied the abundance of zebra mussel larvae in Conesus Lake through the summers of 1995-97 and again in 1999 (Bosch, unpublished). These surveys revealed that larval populations were high in 1995 (average 12,231 m<sup>-3</sup>, maximum 29, 600 m<sup>-3</sup>) but declined to a maximum of 28 m<sup>-3</sup> in 1997 and 1999. Spawning in the population was continuous through the summer but there were limited periods of massive spawning activity that coincided with periods of bright moonlight near the full moon (Bosch, unpublished).

In this study we present data on temporal patterns of larval numbers and cohort development of zebra mussel veligers in Conesus Lake, during the summer 2004. The results of this latest study are compared to previous records and considered in the context of possible cues for spawning, and of changes in zebra mussel populations over time.

## **Methods**

### **Stream Chemistry**

Four subwatersheds (No Name, North Gully, Conesus Inlet and Wilkins creeks) were sampled weekly from May 2004 to May 2005. A point discharge estimate was derived from velocity readings taken with a Teledyne Gurley-pygmy meter combined with a cross-sectional area using the bridge or culvert at the sampling location (Rantz *et al.* 1982). When ice prevented access to the full width of the stream, a rating curve developed for each stream was used to estimate discharge. A water sample was taken and analyzed for soluble reactive phosphorus, total phosphorus, total Kjeldahl nitrogen, total suspended solids, sodium and nitrate/nitrite. Detailed analytical methods are presented below. Daily losses from the subwatershed of the

parameters analyzed were calculated by multiplying the daily discharge and the chemical concentration.

All sampling bottles were pre-coded so as to ensure exact identification of the particular sample. All sample bottles were routinely cleaned with phosphate free RBS between sampling dates. Containers were rinsed prior to sample collection with the water being collected. In general, all procedures followed Standard Methods for the Analysis of Water and Wastewater. Sample water for dissolved nutrient analyses (SRP, nitrate + nitrite) was filtered immediately with 0.45- $\mu\text{m}$  MCI Magna Nylon 66 membrane and either frozen or analyzed within 24 hours of collection.

**Nitrate+Nitrite:** Dissolved nitrate+nitrite nitrogen were performed by the automated (Technicon autoanalyser) cadmium reduction method (APHA 1999).

**Soluble Reactive Phosphorus:** Sample water was filtered through a 0.45- $\mu\text{m}$  membrane filter. The filtrate was analyzed for orthophosphate using the automated (Technicon) colorimetric ascorbic acid method (APHA 1999). The formation of the phosphomolybdeum blue complex was read colorimetrically at 880nm.

**Total Phosphorus:** The persulfate digestion procedure was used prior to analysis by the automated (Technicon autoanalyser) colorimetric ascorbic acid method (APHA 1999).

**Total Kjeldahl nitrogen:** Total Kjeldahl nitrogen was measured using method EPA 351.2 (EPA 1979).

**Total suspended solids:** Total suspended solids were measured using method 2540 D (APHA 1999).

**Sodium:** Sodium was performed by flame atomic absorption spectrophotometry using method 3500-Na B (APHA 1999).

### **Lake Zooplankton Sampling, Identification and Enumeration**

A vertical zooplankton tow from 15 meters of depth to the zone surface was done with a ½ meter diameter plankton net with 63 $\mu\text{m}$  mesh equipped with a General Oceanics flowmeter to

correct for the exact volume filtered. Samples were preserved with 10% formalin. Sampling was performed on thirteen dates (May 10, 23, June 8, 22, July 6, 20, August 3, 17, 31, September 14, 28, October 12 and 28 2004) during the 2004 field season at the deepest point in southern basin of Conesus Lake.

A one mL sub-sample 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 and eggs per species 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 twenty individuals of each species encountered per sample. Zooplankton taxonomy largely followed Balcer *et al.* (1984); other keys consulted included Edmondson (1959), 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 were calculated using the length – weight relationships found in Downing and Rigler (1984).

### **Zebra Mussels**

Collections were made in Conesus Lake, the western-most of the New York State Finger Lakes (42° 47' N, 77°43' W). Our primary sampling site was in the center of the south basin of the lake over a depth of 18-20 m. This open water station has been used extensively for plankton surveys of the lake by the Department of Environmental Conservation and by researchers from SUNY Brockport.

A volume of 100 L was filtered weekly from a depth of 2-6 m using a double action diaphragm pump (gal/min capacity, McMaster Carr # 4325 K18). The plankton was concentrated with a 25 µm mesh filter. Veligers were isolated live while viewing through

stereomicroscope until a minimum of 100 was obtained. During periods of low larval abundance the total number of larvae isolated may have been less than one hundred.

Isolated veligers were preserved in 50% alcohol and measured for size within a week after preservation. Size measurements were made with a calibrated ocular micrometer at a magnification of 100x. Our measure of size was defined as the maximum distance along a line parallel to the straight edge of the hinge on the D-shaped larva. This is the longest dimension of the veliger and it is generally referred to as the length of the larva (Sprung 1989, 1993). Since our objective was to estimate spawning times by identifying surges in the youngest veliger size-classes (i.e. early D-shaped larva) we restricted our abundance and size frequency analyses to sizes up to 200  $\mu\text{m}$ , which included veligers in the mid-umbonal stage. In these analyses, larvae ranging from 80 (the smallest observed) to 120  $\mu\text{m}$  in length are considered the youngest size classes.

**Metaphyton:** This study is in the form of digital images of a 0.25 m<sup>2</sup> surface area delineated by a PVC quadrat. The quadrat was a square of 0.5 m per side (0.25 m<sup>2</sup> surface area) made of PVC tubing and fitted with a grid made of monofilament line. The margins of the quadrat below the PVC were lined with sheets of clear plexiglass. To minimize water movement within the quadrat while digital photographs are being taken. Floats were attached to the sides of the PVC quadrat to make it neutrally buoyant during deployment. The camera (a Fuji Finepix A 330 megapixel digital camera fitted with a polarizing filter) is attached to a tripod mounted on the female end of PVC tees that make up the corners of the quadrat, Photographs were taken by deploying the imaging system (quadrat, tripod, and camera) from the side of a small inflatable boat with the gridded area held approximately 6 inches below the surface.

Populations of metaphyton in Conesus Lake were surveyed at six sites near streams, and at six other sites that were not proximate to streams or other sources of runoff (“non-stream”). Four of the streamside areas receive runoff from experimental watersheds in which farm management practices have been implemented for more than two years. Two of the stream areas are long-term reference sites associated with unmanipulated (reference) watersheds. Tables 1 and 2 provide a listing of all project sites.

At each site at least four replicate surface photos were taken over water depths of 1, 2 and 3 m, corresponding to different horizontal distances from shore. Only one transect was photographed in stream sites, typically in an area where measurements of high metaphyton cover had been taken in previous years. We were careful to identify and sample any other areas of high cover within immediate influence of the stream. In some cases three transects were photographed for the non-stream sites spanning a longshore distance of 30-45 m (10-15 m between transects). The photographs were analyzed digitally to determine surface cover by algae using *ImageJ*, a public domain Java image-processing program (National Institute of Health). When metaphyton was not detectable visually at the sampling site or within the quadrat, the observer logged a “zero percent cover” and no photograph was taken. Those samples are treated as zero percent cover for statistical analyses despite the fact that no individual quadrats were taken. Surveys were conducted during the weeks of July 26-30 and August 16-20, when maximum algal cover was observed at the respective sites.

To analyze the results statistically we compared the average percent cover of the two reference sites, four manipulated sites and six “no-stream” sites using two different approaches: a single-factor ANOVA, with only site as a variable and each site considered a replicate for one of the three conditions; and a two-factor ANOVA with depth and location as variables. Statistical differences between individual means were tested using a Tukeys post hoc test (SPSS Version 11.0 , SPSS Inc.).

## **Results and Discussion**

### **Zooplankton and Stream Chemistry and Loading**

See Appendix A (Table 1) and Appendix B (Tables 1-6) for data tables.

### **Zebra Mussels**

There were two peaks of larval abundance in 2004 and both occurred approximately near the times of the full moon on July 2-4 and August 29-31 (Figure 1). No major spawning event was detected during the full moon of August 1-2.

A significant population of veligers was already present in the Lake on June 1, when we made our first collection. The lake surface temperature was approximately 15 °C on this date. Larval numbers remained low through June. Size frequency analysis of veliger shell size showed that the dominant cohorts were 130-150 µm in size (Figure 2). On the 3<sup>rd</sup> of July, larval density was approximately 666 veligers · m<sup>-3</sup>. Of these larvae only 21% or 140 veligers · m<sup>-3</sup> were of the 80-120 µm cohorts. On July 6, larval numbers had increased to 22,670 · m<sup>-3</sup> and 91 % of the larvae or about 20, 630 · m<sup>-3</sup> were in the 80-120 µm size-class. This was approximately a 150-fold increase in the youngest size classes when compared to July 3. Based on an ambient water temperature of 22 °C and using development times for different temperatures reported in the literature (e.g. Sprung 1993) most of these larvae were less than 3-4 days old.

Following the July 6 peak there was a rapid decline in larval numbers to 1496 · m<sup>-3</sup> on July 13. Approximately 63% or 942 · m<sup>-3</sup> of these larvae were in the 80-120 µm cohorts (Figure 2), an indication that low levels of spawning resumed after the mass spawning in early July. The low density of larvae persisted until a small peak in larval numbers (2,914 · m<sup>-3</sup>) was detected on the 24<sup>th</sup> of August. Similar numbers were evident on August 31. In September larval numbers declined to levels that by the 18<sup>th</sup> were barely detectable.

As in previous years, July and August were the peak months of larval production for zebra mussels in Conesus Lake. The range in numbers of larvae for the ten collections during July-August was 110 – 22,670 · m<sup>-3</sup>. The median value was 1,496 and the mean was 5,428 · m<sup>-3</sup> ± 8680.

#### Zebra Mussels: Seasonal Spawning Patterns and Moonlight Cues

Our analyses of larval abundance and cohort production indicate that two highly synchronous periods of larval production occurred in Conesus Lake during the summer 2004. The July peak in larval numbers was the result of a massive recruitment of small veligers that developed from eggs fertilized during July 2-4. The full moon was on July 3. A second peak in larval numbers was detected on August 24. This peak most likely resulted from spawning

activity in the three or four days leading up to the August 24 collection. The full moon in late August was on the 30<sup>th</sup>. However, we noted there were several days of clear, brightly moonlit nights leading up to the full moon that might have triggered spawning.

Our correlative data set does not show conclusively that a direct link exists between moonlight intensity and zebra mussel spawning. However we now have a detailed five-year record of larval production by zebra mussels, and in four of those five years the coincidence of spawning and bright moonlight are readily evident. Similar trends can be found in records of synchronized zebra mussel larval development in the literature. Haag and Garston (1992), for example, observed sharp peaks in larval density on 14 June, 18 July and 17 August, 1989, at a station in western Lake Erie. They proposed that a combination of asynchronous spawning and delayed settlement produced these surges in larval abundance. An equally plausible explanation is that moonlight had triggered an episode of mass spawning ; the full moon occurred within 5 days of each of the three peaks in larval numbers reported by Haag and Garston (Bosch personal observation).

In summary, there is evidence to support the hypothesis that moonlight penetrating into shallow lake waters could serve as the initial trigger of mass spawnings by zebra mussels. Once initiated in shallow waters, spawning could propagate through the whole population by means of the pheromonal positive-feedback system that could lead to the massive spawning events recorded in many zebra mussel populations. Controlled laboratory experiments with simulated light regimes may be the only way to conduct a critical test of this hypothesis.

#### Zebra Mussels: Multi Year Trends in Larval Production

We now have a 5-year record of spawning activity and production of larvae by zebra mussels in Conesus Lake, spanning a 9-year time period from 1995-2004. A comparison of larval numbers in July and August shows that veliger production can differ greatly from one year to the next (Figure 3). The largest numbers of veligers (a maximum of  $29,600 \cdot m^{-3}$ ) were recorded during the summer of 1995, one year after a massive recruitment of zebra mussel juveniles was observed along shore in the south basin. Larval production declined in subsequent years. During the summers of 1997 and 1999, the highest density recorded was 28

veligers  $\cdot m^{-3}$  or less than 0.1 % of the peak reported for 1995. This trend may have led to the perception that zebra mussel populations in Conesus Lake were on the decline after an initial surge (State of Conesus Lake, 2001). Our 2004 data showing large densities of veligers in Conesus Lake dispel that notion. The average number recorded during the peak period of reproduction in July and August was  $4,975 \cdot m^{-3}$  ( $\pm 8423$ ). This is lower than the maximum values recorded for the 1995 (mean  $12,231 \cdot m^{-3}$ ) but much higher than those of intervening years. This may be taken as clear indication that the population of mussels in Conesus Lake is thriving. A simple extrapolation reinforces that point. The 2-6 m stratum in the water column of Conesus Lake has an estimated volume of  $7.26 \times 10^6 m^3$ . On the 6<sup>th</sup> of July, 2004 we calculated an average density of 22,670 veligers  $\cdot m^{-3}$ , thus the total number of zebra mussel veligers at depths of 2-6 m in all of Conesus Lake on that day is estimated to be about 164 billion.

**Metaphyton:** Growth and accumulation of metaphyton during the 2004 season was highest near our reference stream sites with an average cover of  $24.9 \pm 20.9$  (Table 3, Figure 4). The average cover for the managed stream sites and the non-stream sites were 8.2% and 6.4% respectively. The one exception to this trend was the high cover of metaphyton measured at 1 m in our managed Cottonwood Gully Site (See Table 1). We note that the shoreline in this area is influenced directly by a nearby rivulet that drains an agricultural field that is not part of the USDA. management project. Thus the data is not truly indicative of a managed site. A single factor ANOVA treating the different depths within each site as replicates yielded two statistically different subsets, one comprised of the reference sites, and the other comprised of the managed and no-stream sites ( $p = 0.035$ ). The managed and no-stream sites could not be distinguished statistically.

The invasive Eurasian watermilfoil is dominant at depths from approximately 1.5 -3.5 m where it seems to provide an ideal substrate for metaphyton growth. Therefore our sample quadrats were taken at depths of 1, 2 and 3 m to provide consistent coverage of these prime growth areas for metaphyton. In sampling sites with a steep slope, depths of 3 m could occur within 15 m of shore whereas in areas near streams, the shallow stream delta could extend for more than 30 m offshore. Thus, differences in depth and distance from shore among our

sampling sites could introduce a confounding effect in our statistical comparisons. To investigate this possibility we conducted a two-factor analysis of variance with depth and location (i.e. type of sampling site) as variables. The statistical significance for depth was  $p = 0.85$ , an indication that an offshore/depth trend was negligible. This statistic is not surprising considering some of the trends in the data. For example, the highest average percent cover at the McPhersons Point reference site were over depths of 1 and 2 m. (See Table 1). At the Sutton Point stream reference site the highest values were at depths of 2 and especially 3 m, whereas percent cover at 1 m was very low. Similarly among the steeper sided “no-stream” sites, the highest cover at Sunny Shores was over depths of 2 m whereas in Excelsior Springs the highest cover was usually at 1 m (See Table 2).

The year 2004 was atypical for metaphyton growth in Conesus Lake. High precipitation during late spring and early summer resulted in unusually high levels of runoff from the surrounding watershed. This may have to nuisance levels of metaphyton growth that was observed along the shoreline, particularly near streams and areas of runoff.

In contrast to the extensive shoreline growth, metaphyton cover on the offshore macrophyte beds was relatively limited in 2004 (Bosch, unpublished 4 year data set). This spatial trend of extensive growth nearshore and limited growth offshore is in stark contrast to the pattern observed in years of limited rainfall. For example in 2001, which was one of the driest summers in recent years, metaphyton cover on the milfoil beds was nearly 100% in some areas, whereas shoreline growth was comparatively low. There are several possible explanations for this apparent contrast between wet and dry summers. Persistent discharge during years of high rainfall could simply displace the metaphyton filaments from the macrophytes before significant biomass can accumulate. A second and more complex explanation involves the balance between limitation of growth by light and by nutrients. If growth of metaphyton is light-limited, then high incident irradiance during dry summers may produce a large offshore crop. Light may be less limiting for plants growing in the shallows. Thus inshore plant growth may be limited by nutrients rather than light. Consequently, during a wet growing season like that of 2004, runoff may provide an ample nutrient supply for growth in the more illuminated nearshore areas, but the accompanying low incident radiation

may limit growth offshore.

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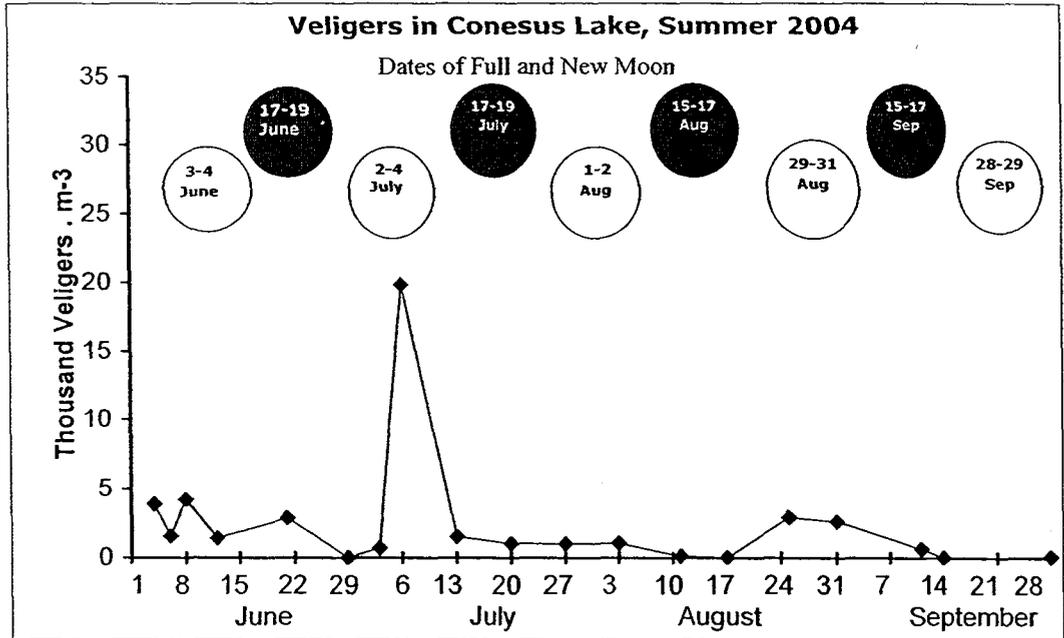


Figure 1. The numbers of zebra mussel veligers (thousands m<sup>3</sup>) in surface waters of Conesus Lake during the summer 2004. Periods of full moon and new moon are indicated by white and dark circles, respectively. The trends indicate there was low level spawning throughout the summer and one major peak in larval production in early July, near the time of the full moon in July 2-4.

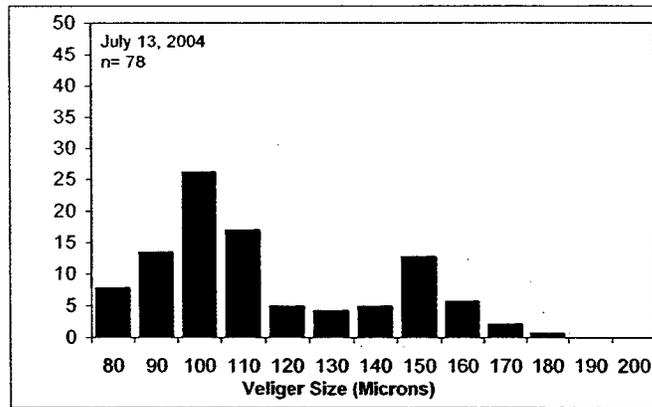
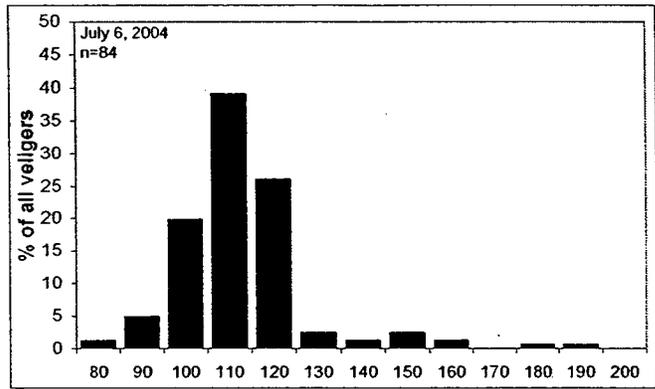
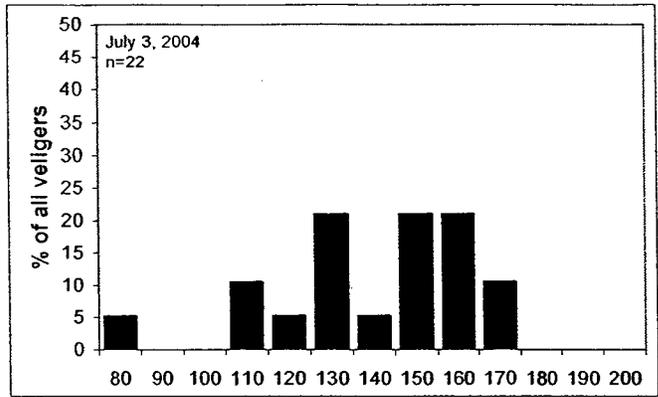


Figure 2. Size frequency distribution of zebra mussel veligers collected on three dates encompassing the period of peak veliger abundance for the summer 2004 in Conesus Lake. Note the shift in distribution toward lower size classes during the first week of July. We estimated that the four smaller size classes are less than one week old and were produced by spawnings during the first few days of July. The full moon period was on July 2-4.

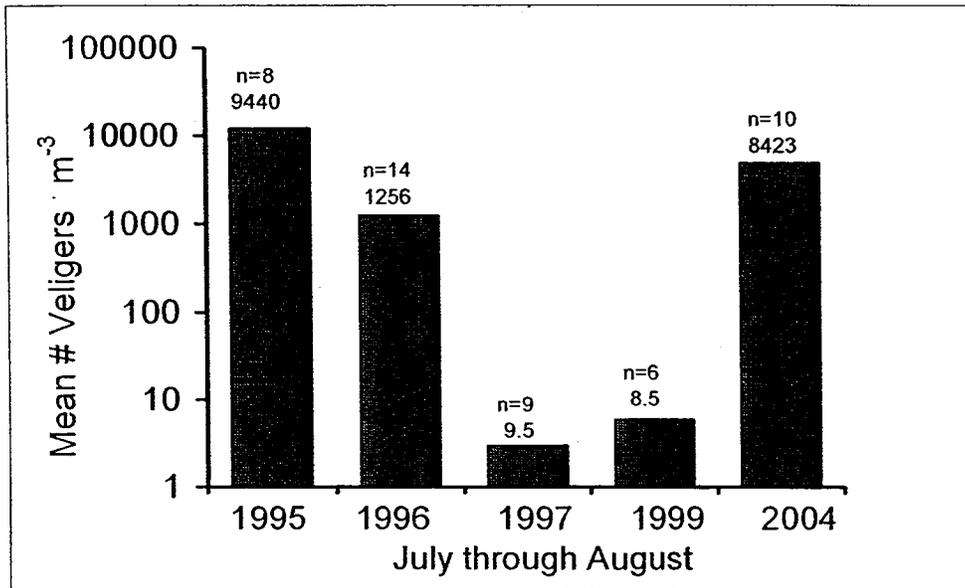
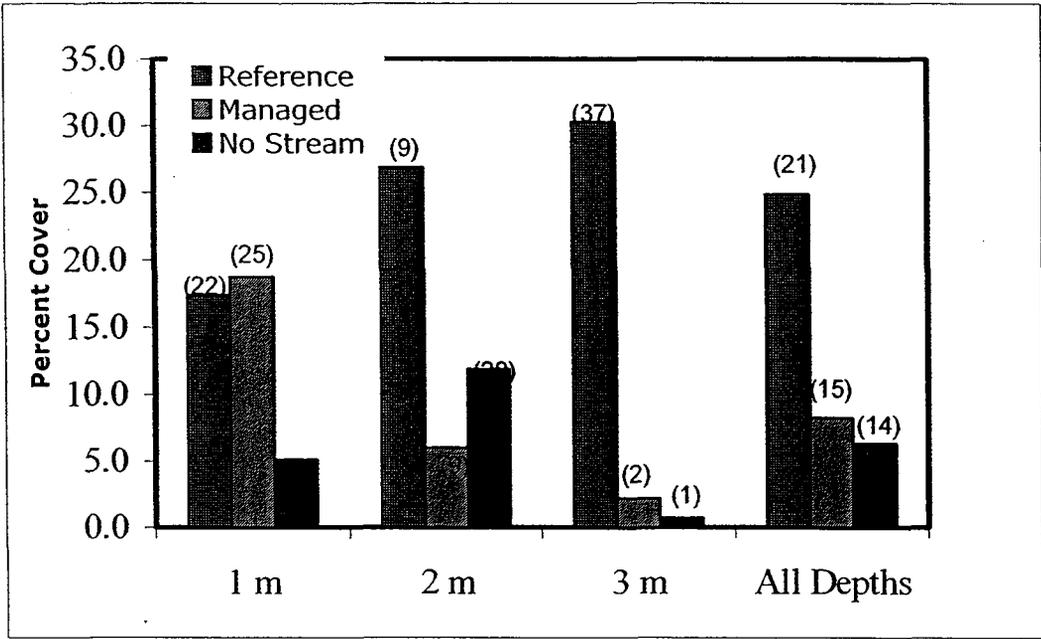


Figure 3. Annual trends in the numbers of zebra mussel veligers for Conesus Lake. The bar graphs represent an average number of larvae in surface waters during peak periods of production in July and August each year. The sample size and standard deviation of average larval numbers are shown above each bar graph. Note the log scale on the y-axis. Larval numbers in 2004 were closest to the maximum values recorded during the summer of 1995.



**Figure 4.** A graphical representation of the data on Table 1 showing the average percent cover of metaphyton at the three types of habitats surveyed. The numbers in parentheses above the bars are the standard deviations. The percent cover was usually highest at the reference site for all depths. The one exception at 1 m may be due to the proximity of a runoff pipe near the 1 m station at Cottonwood Gully, one of our managed sites.

**Table 1.** Mean and standard deviation of percent metaphyton cover taken at the six stream sites. The sample size indicated the actual number of quadrats. The zero values included for some of the sampling sites were determined by direct estimation (indicated by a line in the position for sample size) and not by individual digital quadrats.

Sampling Location	Depth	Percent Cover (mean + S.D.)	Sample Size
<b>Reference Stream Sites</b>			
McPhersons Point	1 m	33.1 + 20.5	8
	July		
	2 m	33.3 ± 17.5	11
North Sutton Point	3 m	3.5 ± 2.6	6
	1 m	1.7 ± 2.6	5
	July		
	2 m	20.5 ± 11.3	4
	3 m	57.1 ± 15.1	9
<b>Managed Stream Sites</b>			
Graywood Gully	1 m	10.4 ± 10.2	6
	July		
	2 m	19.5 ± 9.9	10
Cottonwood Gully	3 m	4.5 ± 2.4	7
	1 m	55.8 ± 12.2	14
	July		
	2 m	0.7 ± 1.0	11
	3 m	0	4
Sand Point Gully	1 m	8.7 ± 10.0	8
	July		
	2 m	3.9 ± 1.3	8
	3 m	3.6 ± 2.1	5
Long Point Cove	1 m	0	-
	July		
	2 m	0	-
	3 m	0	-

**Table 2.** Mean and standard deviation of percent metaphyton cover at the six non-stream sites. As in Table 1, the sample size indicated the actual number of quadrats. We sampled three transects at some of the sites. The zero values included for some of the sampling sites were determined by direct estimation (indicated by a line in the position for sample size) and not by individual digital quadrats

Sampling Location	Depth	Percent Cover (mean + S.D.)	Sample Size
Harston Point July	1 m	0.9 ± 0.9	9
	2 m	67.2 ± 21.3	10
	3 m	0	4
Sunny Shores (North) August	1 m	5.4 ± 4.2	6
	2 m	10.5 ± 8.0	6
	3 m	1.2 ± 0.6	3
Sunny Shores (Mid) August	1 m	3.4 ± 2.2	5
	2 m	20.1 ± 9.3	7
	3 m	1.3 ± 0.6	7
Sunny Shores (South) August	1 m	0.9 ± 1.7	7
	2 m	0	4
	3 m	0	4
Excelsior Springs (North) August	1 m	16.0 ± 6.2	7
	2 m	7.3 ± 4.7	5
	3 m	0.6 ± 0.4	3
Excelsior Springs (Mid) August	1 m	1.3 ± 0.6	5
	2 m	6.0 ± 5.3	7
	3 m	0.6 ± 0.7	7
Excelsior Springs (South) August	1 m	23.5 ± 1.7	7
	2 m	8.0 ± 7.6	4
	3 m	3.6 ± 1.6	4
Cedar Crest August	1 m	0	-
	2 m	0	-
	3 m	0	-
South Wilkins Creek August	1 m	0	-
	2 m	0	-
	3 m	0	-
South Pebble Beach August	1 m	0	-
	2 m	0	-
	3 m	0	-

**Table 3.** Summary data for percent cover of metaphyton based on digital quadrats collected in Conesus Lake during July and August 2004. The different depths are correlates of distance from shore. The percent cover value is an average for each of the three types of habitats surveyed. The number of sites that produce the average is considered the sample size for this data set. Metaphyton cover was variable even within each specific type of habitat, as indicated by the relatively high standard deviations of the mean.

<b>Sampling Location</b>	<b>Depth</b>	<b>Percent Cover (mean)</b>	<b>Standard Deviation</b>	<b>Sample Size</b>
<i>Reference Stream Sites</i>	1	17.4	22.2	2
	2	26.9	9.1	2
	3	30.3	37.9	2
	All Depths	24.9	20.9	6
<i>Managed Stream Sites</i>	1	18.7	25.1	4
	2	6.0	9.1	4
	3	2.2	2.2	4
	All Depths	8.2	15.4	12
<i>No Stream Sites</i>	1	5.1	8.1	10
	2	11.9	20.5	10
	3	0.7	1.1	10
	All Depths	6.4	14.4	30

**Appendix A. Zooplankton abundance, biomass and mean length, summer 2004.**

Table 1. Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 10 May 2004.

Conesus Lake 10 May 2004	Mean Length (µm)		Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>				
<i>Alonella sp.</i>	205		0.33	0.10
<i>Bosmina longirostris</i>	275		9.66	5.54
<i>Bosmina sp. (young)</i>	195		0.17	0.04
<i>Eubosmina coregoni</i>	190		0.17	0.04
<b>Weighted Cladocera average</b>	<b>270</b>	<b>Total</b>	<b>10.33</b>	<b>5.71</b>
<b>Copepoda</b>				
Copepoda nauplii	195		23.49	9.40
Copepodid	495		10.00	3.24
<b>Weighted Copepoda average</b>	<b>285</b>	<b>Total</b>	<b>33.48</b>	<b>12.63</b>
<b>Harpacticoida</b>				
Harpacticoid copepod	520		0.17	0.10
<b>Weighted Crustacea average</b>	<b>282</b>	<b>Total</b>	<b>43.98</b>	<b>18.44</b>
<b>Rotifera</b>				
<i>Asplanchna sp.</i>	179		0.33	0.02
<i>Brachionus sp.</i>	90		0.33	0.00
<i>Conochilis unicornis</i>	95		0.67	0.01
<i>Filinia longiseta</i>	129		44.65	0.76
<i>Kellicottia longispina</i>	142		9.66	0.12
<i>Keratella cochlearis</i>	117		54.48	0.35
<i>Keratella earlinae</i>	203		34.98	6.79
<i>Keratella quadrata</i>	151		13.99	1.11
<i>Notholca sp.</i>	244		0.33	0.02
<i>Polyarthra dolichoptera</i>	90		29.15	0.71
Rotifer (?)	98		0.33	0.00
<b>Weighted Rotifera average</b>	<b>136</b>	<b>Total</b>	<b>188.91</b>	<b>9.90</b>
<b>Weighted sample average</b>	<b>163</b>	<b>Total</b>	<b>232.89</b>	<b>28.34</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 23 May 2004.

Conesus Lake 23 May 2004	Mean Length (µm)		Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>				
<i>Alonella sp.</i>	221		0.56	0.22
<i>Bosmina longirostris</i>	229		53.38	19.32
<i>Daphnia sp. (young)</i>	455		0.56	0.20
<b>Weighted Cladocera average</b>	<b>231</b>	<b>Total</b>	<b>54.51</b>	<b>19.74</b>
<b>Copepoda</b>				
Copepoda nauplii	159		63.50	25.40
Copepodid	527		32.03	13.22
<b>Weighted Copepoda average</b>	<b>283</b>	<b>Total</b>	<b>95.53</b>	<b>38.62</b>
<b>Cyclopoida</b>				
<i>Diacyclops thomasi</i>	923		0.56	2.13
<b>Weighted Crustacea average</b>	<b>266</b>	<b>Total</b>	<b>150.60</b>	<b>60.49</b>
<b>Rotifera</b>				
<i>Asplanchna priodonta</i>	590		1.69	3.11
<i>Conochilis unicornis</i>	114		52.82	1.00
<i>Filinia longiseta</i>	130		8.43	0.15
<i>Kellicottia longispina</i>	134		57.88	0.59
<i>Keratella cochlearis</i>	114		150.60	0.89
<i>Keratella earlinae</i>	192		282.09	45.93
<i>Keratella quadrata</i>	144		23.04	1.57
<i>Notholca sp.</i>	228		0.56	0.02
<i>Polyarthra dolichoptera</i>	78		0.56	0.01
<i>Polyarthra major</i>	160		0.56	0.07
<i>Polyarthra remata (?)</i>	85		3.37	0.06
<i>Polyarthra vulgaris</i>	95		3.37	0.09
<b>Weighted Rotifera average</b>	<b>156</b>	<b>Total</b>	<b>584.97</b>	<b>53.50</b>
<b>Weighted sample average</b>	<b>179</b>	<b>Total</b>	<b>735.56</b>	<b>113.99</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 8 June 2004.

Conesus Lake 8 June 2004	Mean Length (µm)	Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>			
<i>Bosmina sp.</i>	245	68.34	29.24
<i>Bosmina sp. (young)</i>	190	14.57	3.29
<i>Daphnia galeata mendotae</i>	940	0.35	1.34
<b>Weighted Cladocera average</b>	<b>238</b>	<b>Total 83.26</b>	<b>33.87</b>
<b>Copepoda</b>			
Copepoda nauplii	213	52.38	20.95
Copepodid (not Diacyclops)	519	32.96	12.86
<b>Weighted Copepoda average</b>	<b>331</b>	<b>Total 85.34</b>	<b>33.81</b>
<b>Cyclopoida</b>			
<i>Diacyclops thomasi</i>	929	0.35	1.33
<b>Harpacticoida</b>			
Harpacticoid copepod	850	0.35	0.66
<b>Weighted Crustacea average</b>	<b>288</b>	<b>Total 169.29</b>	<b>69.68</b>
<b>Rotifera</b>			
<i>Asplanchna priodonta</i>	434	33.65	24.74
<i>Conochilis unicornis</i>	82	622.70	8.46
<i>Filinia longiseta</i>	114	0.69	0.01
<i>Kellicottia longispina</i>	126	23.24	0.20
<i>Keratella cochlearis</i>	104	19.08	0.08
<i>Keratella crassa</i>	160	1.04	0.10
<i>Keratella earlinae</i>	195	24.98	4.28
<i>Keratella quadrata</i>	141	7.98	0.52
<i>Polyarthra dolichoptera</i>	100	0.35	0.01
<i>Polyarthra eurypta</i>	169	0.35	0.06
<i>Polyarthra major</i>	147	1.39	0.13
<i>Polyarthra vulgaris</i>	120	35.04	1.85
<i>Synchaeta sp.</i>	139	91.93	1.74
<i>Trichocerca multicornis</i>	182	17.00	1.52
<b>Weighted Rotifera average</b>	<b>110</b>	<b>Total 879.42</b>	<b>43.69</b>
<b>Weighted sample average</b>	<b>139</b>	<b>Total 1048.71</b>	<b>113.37</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 22 June 2004.

Conesus Lake 22 June 2004	Mean Length (µm)		Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>				
<i>Bosmina longirostris</i>	256		90.72	43.33
<i>Ceriodaphnia sp.</i>	468		0.31	0.48
<i>Daphnia retrocurva</i>	795		0.61	1.25
<b>Weighted Cladocera average</b>	<b>260</b>	<b>Total</b>	<b>91.64</b>	<b>45.06</b>
<b>Copepoda</b>				
Copepoda nauplii	178		21.76	8.70
Copepodid	554		36.78	18.62
<b>Weighted Copepoda average</b>	<b>414</b>	<b>Total</b>	<b>58.54</b>	<b>27.33</b>
<b>Cyclopoida</b>				
<i>Diacyclops thomasi</i>	610		0.61	1.02
<i>Mesocyclops edax</i>	832		1.23	3.11
<b>Weighted Cyclopoida average</b>	<b>758</b>	<b>Total</b>	<b>1.84</b>	<b>4.13</b>
<b>Weighted Crustacea average</b>	<b>325</b>	<b>Total</b>	<b>152.01</b>	<b>76.52</b>
<b>Rotifera</b>				
<i>Asplanchna priodonta</i>	510		2.76	3.28
<i>Conochilis unicornis</i>	83		7.66	0.11
<i>Filinia longiseta</i>	117		0.31	0.00
<i>Kellicottia longispina</i>	141		106.04	1.28
<i>Keratella cochlearis</i>	109		3.06	0.02
<i>Keratella crassa</i>	171		12.57	1.46
<i>Keratella quadrata</i>	130		3.37	0.17
<i>Polyarthra dolichoptera</i>	78		3.37	0.05
<i>Polyarthra eurypta</i>	180		0.92	0.18
<i>Polyarthra major</i>	131		19.31	1.35
<i>Polyarthra vulgaris</i>	104		184.50	6.43
<i>Synchaeta sp.</i>	130		0.31	0.00
<i>Trichocerca multicornis</i>	186		48.73	4.46
<b>Weighted Rotifera average</b>	<b>131</b>	<b>Total</b>	<b>392.90</b>	<b>18.79</b>
<b>Weighted sample average</b>	<b>185</b>	<b>Total</b>	<b>544.91</b>	<b>95.30</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 6 July 2004.

Conesus Lake 6 July 2004	Mean Length (µm)		Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>				
<i>Alonella sp.</i>	338		0.12	0.22
<i>Bosmina longirostris</i>	244		37.75	16.02
<b>Weighted Cladocera average</b>	244	<b>Total</b>	<b>37.87</b>	<b>16.23</b>
<b>Copepoda</b>				
Copepoda nauplii	188		3.81	1.52
Copepodid	641		3.33	3.00
<b>Weighted Copepoda average</b>	399	<b>Total</b>	<b>7.15</b>	<b>4.53</b>
<b>Cyclopoida</b>				
<i>Diacyclops thomasi</i>	880		0.12	0.41
<i>Mesocyclops edax</i>	804		0.36	0.79
<b>Weighted Cyclopoida average</b>	823	<b>Total</b>	<b>0.48</b>	<b>1.20</b>
<b>Weighted Crustacea average</b>	275	<b>Total</b>	<b>45.50</b>	<b>21.96</b>
<b>Rotifera</b>				
<i>Asplanchna priodonta</i>	455		3.10	2.62
<i>Conochlis unicornis</i>	83		27.99	0.39
<i>Kellicottia longispina</i>	130		20.72	0.19
<i>Keratella cochlearis</i>	101		6.07	0.02
<i>Keratella crassa</i>	169		5.72	0.63
<i>Polyarthra eurypta</i>	179		0.71	0.14
<i>Polyarthra major</i>	164		28.94	3.93
<i>Polyarthra remata</i>	81		0.48	0.01
<i>Polyarthra vulgaris</i>	124		25.25	1.47
<i>Trichocerca multicornis</i>	177		2.14	0.19
<b>Weighted Rotifera average</b>	136	<b>Total</b>	<b>121.12</b>	<b>9.59</b>
<b>Weighted sample average</b>	174	<b>Total</b>	<b>166.62</b>	<b>31.55</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 20 July 2004.

Conesus Lake 20 July 2004	Mean Length ( $\mu\text{m}$ )	Abundance (#/L)	Biomass ( $\mu\text{g/L}$ )
<b>Cladocera</b>			
<i>Bosmina sp.</i>	250	93.64	42.08
<i>Bosmina sp. (embryo)</i>	189	8.51	1.89
<i>Ceriodaphnia sp.</i>	620	0.23	0.86
<i>Daphnia retrocurva</i>	699	0.46	0.63
<b>Weighted Cladocera average</b>	<b>247</b>	<b>Total 102.84</b>	<b>45.45</b>
<b>Copepoda</b>			
Copepoda nauplii	199	24.85	9.94
Copepodid	525	9.66	3.95
<b>Weighted Copepoda average</b>	<b>290</b>	<b>Total 34.51</b>	<b>13.88</b>
<b>Cyclopoida</b>			
<i>Diacyclops thomasi</i>	960	0.23	0.94
<i>Mesocyclops edax</i>	810	0.69	1.57
<b>Weighted Cyclopoida average</b>	<b>847</b>	<b>Total 0.92</b>	<b>2.51</b>
<b>Weighted Crustacea average</b>	<b>262</b>	<b>Total 138.27</b>	<b>61.85</b>
<b>Rotifera</b>			
<i>Asplanchna priodonta</i>	468	3.91	3.60
<i>Conochilis unicomis</i>	82	32.44	0.44
<i>Kellicottia longispina</i>	130	11.27	0.11
<i>Keratella cochlearis</i>	114	10.35	0.06
<i>Keratella crassa</i>	176	18.18	2.30
<i>Polyarthra eurypta</i>	156	0.23	0.03
<i>Polyarthra major</i>	156	6.21	0.73
<i>Polyarthra remata</i>	81	1.38	0.02
<i>Polyarthra vulgaris</i>	108	38.65	1.50
<i>Trichocerca multicroinis</i>	177	8.28	0.72
<b>Weighted Rotifera average</b>	<b>131</b>	<b>Total 130.91</b>	<b>9.52</b>
<b>Weighted sample average</b>	<b>198</b>	<b>Total 269.18</b>	<b>71.37</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 3 August 2004.

Conesus Lake 3 August 2004	Mean Length (µm)	Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>			
<i>Alonella</i> sp.	195	0.15	0.04
<i>Bosmina longirostris</i>	263	24.24	12.49
<i>Ceriodaphnia reticulata</i>	391	6.25	5.48
<i>Daphnia retrocurva</i>	832	0.45	1.05
<b>Weighted Cladocera average</b>	<b>297</b>	<b>Total</b>	<b>31.08</b>
<b>Copepoda</b>			
Copepoda nauplii	232	16.21	6.48
Copepodid	601	8.92	6.21
<b>Weighted Copepoda average</b>	<b>363</b>	<b>Total</b>	<b>25.13</b>
<b>Cyclopoida</b>			
<i>Mesocyclops edax</i>	789	0.45	0.92
<i>Tropocyclops prasinus</i>	670	0.15	0.38
<b>Weighted Cyclopoida average</b>	<b>759</b>	<b>Total</b>	<b>0.59</b>
<b>Weighted Crustacea average</b>	<b>331</b>	<b>Total</b>	<b>56.81</b>
<b>Rotifera</b>			
<i>Asplanchna priodonta</i>	484	0.89	0.91
<i>Conochilis unicornis</i>	98	65.29	1.06
<i>Kellicottia longispina</i>	113	3.27	0.02
<i>Keratella cochlearis</i>	101	0.30	0.00
<i>Keratella crassa</i>	178	6.84	0.89
<i>Keratella quadrata</i>	130	0.15	0.01
<i>Polyarthra eurypta</i>	173	1.19	0.20
<i>Polyarthra major</i>	151	3.12	0.33
<i>Polyarthra remata</i>	78	0.15	0.00
<i>Polyarthra vulgaris</i>	113	1.49	0.07
<i>Trichocerca multicroinis</i>	163	0.15	0.01
<b>Weighted Rotifera average</b>	<b>113</b>	<b>Total</b>	<b>82.84</b>
<b>Weighted sample average</b>	<b>202</b>	<b>Total</b>	<b>139.65</b>
			<b>36.56</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 17 August 2004.

Conesus Lake 17 August 2004	Mean Length (µm)	Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>			
<i>Bosmina longirostris</i>	278	28.47	16.76
<i>Ceriodaphnia reticulata</i>	336	43.72	23.90
<i>Daphnia retrocurva</i>	528	0.81	0.46
<i>Diaphanosoma birgei</i>	585	0.20	0.14
<b>Weighted Cladocera average</b>	<b>316</b>	<b>Total 73.21</b>	<b>41.27</b>
<b>Copepoda</b>			
Copepoda nauplii	216	23.18	9.27
Copepodid	416	10.37	1.68
<b>Weighted Copepoda average</b>	<b>278</b>	<b>Total 33.55</b>	<b>10.95</b>
<b>Cyclopoida</b>			
<i>Mesocyclops edax</i>	579	2.24	1.34
<b>Weighted Crustacea average</b>	<b>310</b>	<b>Total 109.00</b>	<b>53.56</b>
<b>Rotifera</b>			
<i>Asplanchna priodonta</i>	537	0.61	0.85
<i>Conochilis unicornis</i>	96	27.86	0.45
<i>Keratella cochlearis</i>	112	0.41	0.00
<i>Keratella crassa</i>	173	17.08	2.03
<i>Polyarthra major</i>	143	5.90	0.53
<i>Polyarthra remata</i>	82	0.41	0.01
<i>Polyarthra vulgaris</i>	105	5.69	0.21
<i>Trichocerca multicornis</i>	152	1.42	0.11
<b>Weighted Rotifera average</b>	<b>130</b>	<b>Total 59.38</b>	<b>4.18</b>
<b>Weighted sample average</b>	<b>246</b>	<b>Total 168.38</b>	<b>57.74</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 31 August 2004.

Conesus Lake 31 August 2004	Mean Length (µm)		Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>				
<i>Alonella sp.</i>	182		0.29	0.06
<i>Bosmina longirostris</i>	267		31.66	16.83
<i>Ceriodaphnia reticulata</i>	314		17.72	7.84
<i>Daphnia retrocurva</i>	455		0.29	0.10
<b>Weighted Cladocera average</b>	<b>284</b>	<b>Total</b>	<b>49.96</b>	<b>24.83</b>
<b>Copepoda</b>				
Copepoda nauplii	188		45.02	18.01
Copepodid	497		14.52	4.78
<b>Weighted Copepoda average</b>	<b>264</b>	<b>Total</b>	<b>59.54</b>	<b>22.79</b>
<b>Cyclopoida</b>				
<i>Diacyclops thomasi</i>	823		2.03	6.15
<i>Mesocyclops edax</i>	897		2.03	6.95
<i>Tropocyclops prasinus</i>	500		2.90	2.87
<b>Weighted Cyclopoida average</b>	<b>710</b>	<b>Total</b>	<b>6.97</b>	<b>15.97</b>
<b>Weighted Crustacea average</b>	<b>299</b>	<b>Total</b>	<b>116.47</b>	<b>63.58</b>
<b>Rotifera</b>				
<i>Asplanchna priodonta</i>	504		11.91	13.71
<i>Conochilis unicornis</i>	93		43.28	0.67
<i>Kellicottia longispina</i>	126		0.29	0.00
<i>Keratella cochlearis</i>	103		3.49	0.02
<i>Keratella crassa</i>	176		45.89	5.78
<i>Polyarthra eurypta</i>	181		2.03	0.40
<i>Polyarthra major</i>	150		18.01	1.86
<i>Polyarthra remata</i>	72		3.19	0.04
<i>Polyarthra vulgaris</i>	121		55.18	3.01
<i>Trichocerca multicroinis</i>	172		6.97	0.59
<b>Weighted Rotifera average</b>	<b>156</b>	<b>Total</b>	<b>190.24</b>	<b>26.07</b>
<b>Weighted sample average</b>	<b>210</b>	<b>Total</b>	<b>306.71</b>	<b>89.65</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 14 September 2004.

Conesus Lake 14 September 2004	Mean Length (µm)	Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>			
<i>Alonella sp. (?)</i>	182	0.22	0.04
<i>Bosmina longirostris</i>	267	41.12	21.86
<i>Ceriodaphnia reticulata</i>	347	21.42	12.90
<i>Daphnia retrocurva</i>	712	0.87	1.25
Weighted Cladocera average	299	<b>Total 63.62</b>	<b>36.05</b>
<b>Copepoda</b>			
Copepoda nauplii	190	52.58	21.03
Copepodid	364	40.25	3.82
Weighted Copepoda average	265	<b>Total 92.83</b>	<b>24.85</b>
<b>Cyclopoida</b>			
<i>Diacyclops thomasi</i>	561	3.78	5.33
<i>Mesocyclops edax</i>	619	2.83	2.23
<i>Tropocyclops prasinus</i>	479	3.78	3.24
Weighted Cyclopoida average	547	<b>Total 10.39</b>	<b>10.79</b>
Weighted Crustacea average	296	<b>Total 166.84</b>	<b>71.70</b>
<b>Rotifera</b>			
<i>Asplanchna priodonta</i>	489	4.11	4.32
<i>Conochilis unicornis</i>	87	50.85	0.74
<i>Kellicottia longispina</i>	72	0.22	0.00
<i>Keratella cochlearis</i>	100	1.08	0.00
<i>Keratella crassa</i>	174	38.74	4.68
<i>Polyarthra eurypta</i>	168	1.51	0.24
<i>Polyarthra major</i>	143	1.51	0.14
<i>Polyarthra remata</i>	75	1.30	0.02
<i>Polyarthra vulgaris</i>	104	10.39	0.36
<i>Trichocerca multicornis</i>	169	3.46	0.29
<i>Trichocerca sp.</i>	176	0.22	0.02
Weighted Rotifera average	137	<b>Total 113.39</b>	<b>10.80</b>
Weighted sample average	232	<b>Total 280.23</b>	<b>82.50</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 28 September 2004.

Conesus Lake 28 September 2004	Mean Length (µm)	Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>			
<i>Bosmina longirostris</i>	275	80.66	46.27
<i>Ceriodaphnia reticulata</i>	353	13.98	8.90
<i>Daphnia retrocurva</i>	751	2.15	3.68
<b>Weighted Cladocera average</b>	<b>297</b>	<b>Total</b>	<b>96.79</b>
<b>Copepoda</b>			
Copepoda nauplii	170	107.54	43.02
Copepodid	381	72.05	8.24
<b>Weighted Copepoda average</b>	<b>255</b>	<b>Total</b>	<b>179.60</b>
<b>Cyclopoida</b>			
<i>Diacyclops thomasi</i>	634	5.02	9.04
<i>Mesocyclops edax</i>	550	10.04	4.94
<i>Tropocyclops prasinus</i>	497	30.11	29.14
<b>Weighted Cyclopoida average</b>	<b>524</b>	<b>Total</b>	<b>45.17</b>
<b>Weighted Crustacea average</b>	<b>305</b>	<b>Total</b>	<b>321.55</b>
<b>Rotifera</b>			
<i>Asplanchna priodonta</i>	406	153.79	92.05
<i>Conochilis unicornis</i>	82	268.86	3.67
<i>Kellicottia longispina</i>	108	1.08	0.01
<i>Keratella cochlearis</i>	102	41.94	0.18
<i>Keratella crassa</i>	175	206.48	25.47
<i>Polyarthra eurypta</i>	178	4.30	0.80
<i>Polyarthra major</i>	143	18.28	1.64
<i>Polyarthra remata</i> (?)	77	25.81	0.36
<i>Polyarthra vulgaris</i>	112	162.39	6.99
<i>Trichocerca multicornis</i>	177	9.68	0.84
<b>Weighted Rotifera average</b>	<b>168</b>	<b>Total</b>	<b>892.61</b>
<b>Weighted sample average</b>	<b>204</b>	<b>Total</b>	<b>1214.16</b>
			<b>285.23</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 12 October 2004.

Conesus Lake 12 October 2004	Mean Length (µm)		Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>				
<i>Bosmina longirostris</i>	309		22.63	17.40
<i>Ceriodaphnia reticulata</i>	376		2.68	2.08
<i>Daphnia retrocurva</i>	377		0.30	0.06
<b>Weighted Cladocera average</b>	<b>316</b>	<b>Total</b>	<b>25.61</b>	<b>19.54</b>
<b>Copepoda</b>				
Copepoda nauplii	188		5.96	2.38
Copepodid	571		2.08	1.19
<b>Weighted Copepoda average</b>	<b>287</b>	<b>Total</b>	<b>8.04</b>	<b>3.57</b>
<b>Cyclopoida</b>				
<i>Mesocyclops edax</i> (?)	579		0.30	0.18
<b>Weighted Crustacea average</b>	<b>312</b>	<b>Total</b>	<b>33.95</b>	<b>23.29</b>
<b>Rotifera</b>				
<i>Asplanchna priodonta</i>	512		0.89	1.07
<i>Cocochilis unicornis</i>	75		8.34	0.10
<i>Kellicottia longispina</i>	75		0.30	0.00
<i>Keratella cochlearis</i>	100		44.67	0.18
<i>Keratella cochlearis f. tecta</i>	67		0.30	0.00
<i>Keratella crassa</i>	175		58.96	7.30
<i>Polyarthra eurypta</i>	204		2.98	0.83
<i>Polyarthra major</i>	141		48.54	4.16
<i>Polyarthra remata</i>	81		17.27	0.28
<i>Polyarthra vulgaris</i>	115		182.84	8.48
<i>Trichocerca multicornis</i>	174		11.02	0.94
<b>Weighted Rotifera average</b>	<b>127</b>	<b>Total</b>	<b>376.10</b>	<b>23.34</b>
<b>Weighted sample average</b>	<b>142</b>	<b>Total</b>	<b>410.05</b>	<b>46.63</b>

Table 1 (cont.). Abundance, biomass (dry weight) and mean length of Conesus Lake zooplankton, 28 October 2004.

Conesus Lake 28 October 2004	Mean Length (µm)		Abundance (#/L)	Biomass (µg/L)
<b>Cladocera</b>				
<i>Alonella sp. (?)</i>	195		0.11	0.03
<i>Bosmina longirostris</i>	285		21.54	13.56
<i>Ceriodaphnia reticulata</i>	507		0.33	0.65
<i>Daphnia retrocurva</i>	727		1.41	2.18
<b>Weighted Cladocera average</b>	<b>315</b>	<b>Total</b>	<b>23.39</b>	<b>16.43</b>
<b>Copepoda</b>				
Copepoda nauplii	204		4.35	1.74
Copepodid	615		6.20	4.74
<b>Weighted Copepoda average</b>	<b>445</b>	<b>Total</b>	<b>10.55</b>	<b>6.48</b>
<b>Cyclopoida</b>				
<i>Diacyclops thomasi</i>	844		2.18	6.90
<i>Mesocyclops edax</i>	727		2.28	3.38
<b>Weighted Cyclopoida average</b>	<b>784</b>	<b>Total</b>	<b>4.46</b>	<b>10.29</b>
<b>Weighted Crustacea average</b>	<b>405</b>	<b>Total</b>	<b>38.40</b>	<b>33.19</b>
<b>Rotifera</b>				
<i>Conochilis unicornis</i>	75		0.22	0.00
<i>Filinia longiseta</i>	110		0.11	0.00
<i>Kellicottia bostoniensis</i>	94		0.11	0.00
<i>Kellicottia longispina</i>	68		3.59	0.00
<i>Keratella cochlearis</i>	108		4.68	0.02
<i>Keratella crassa</i>	174		4.24	0.51
<i>Polyarthra (thin fin)</i>	108		1.31	0.05
<i>Polyarthra eurypta</i>	176		0.11	0.02
<i>Polyarthra major</i>	142		0.65	0.06
<i>Polyarthra remata</i>	85		0.11	0.00
<i>Trichocerca multigrinis</i>	156		1.52	0.12
<b>Weighted Rotifera average</b>	<b>121</b>	<b>Total</b>	<b>16.65</b>	<b>0.79</b>
<b>Weighted sample average</b>	<b>319</b>	<b>Total</b>	<b>55.05</b>	<b>33.99</b>

## Appendix 2. Annual chemistry data for No Name Creek, Conesus Inlet, North Gully and Wilkens Creeks, Conesus Lake, Livingston County

Table 1. Chemistry data for No Name Creek, Conesus Lake, Livingston County, N.Y. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed

Date	TP ( $\mu\text{g P/L}$ )	SRP ( $\mu\text{g P/L}$ )	Nitrate ( $\text{mg N/L}$ )	TKN ( $\mu\text{g N/L}$ )	TSS ( $\text{mg N/L}$ )	Sodium ( $\text{mg Na/L}$ )
5/11/2004	49.4	47.3	5.75	850	4.2	27.77
5/18/2004	121	74.2	2.66	700	13.7	30.13
5/24/2004	921.9	127.1	1.34	1730	570.8	13.62
6/1/2004	137.8	65.7	2.93	750	20	20.78
6/8/2004	88.9	99.4	2.65	390	5.3	22.15
6/15/2004	85.2	37	1.95	380	5.4	30.67
6/22/2004	91.3	46.2	3.17	1190	7	31.53
6/29/2004	102.2	22.4	1.93	420	19.6	30.33
7/6/2004	dry	dry	dry	dry	dry	dry
7/13/2004	dry	dry	dry	dry	dry	dry
7/20/2004	112.4	45.5	6.6	620	6.3	32.01
7/27/2004	167.8	15.8	4.08	990	48.5	27.33
8/3/2004	dry	dry	dry	dry	dry	dry
8/10/2004	dry	dry	dry	dry	dry	dry
8/17/2004	dry	dry	dry	dry	dry	dry
8/25/2004	dry	dry	dry	dry	dry	dry
8/31/2004	160.2	40.5	10.29	1120	18.2	23.78
9/7/2004	dry	dry	dry	dry	dry	dry
9/14/2004	106.8	52.5	1.32	490	9.5	24.03
9/21/2004	113.2	100.2	7.14	460	16.7	27.36
9/28/2004	92.5	22.8	4.5	510	0.5	28
10/5/2004	dry	dry	dry	dry	dry	dry
10/12/2004	dry	dry	dry	dry	dry	dry
10/19/2004	87.5	42.8	1.41	750	6.1	32.54
10/26/2004	dry	dry	dry	dry	dry	dry
11/2/2004	73.8	40.3	0.18	250	0.3	31.89
11/9/2004	61.4	33.6	3.44	580	7.9	22.28
11/16/2004	65.6	22.5	4.67	1380	6.5	22.43
11/23/2004	51.8	11.2	1.93	390	0.4	30.81
11/29/2004	65.3	49.4	5.67	520	2.5	25.81
12/7/2004	43.4	22.1	0.25	250	3.6	30.73
12/15/2004	47.9	16	0.47	470	2.2	29.01
12/21/2004	46.7	46.7	10.12	490	1.2	29.64
12/27/2004	55.4	54.8	9.98	300	1.2	32.48
1/4/2005	123.9	70.1	7.46	1130	21	37.45
1/10/2005	42.3	34	12.09	600	8.5	32.26
1/19/2005	46.8	46.8	6.52	3160	1	34.05

Table 1. (Cont.) Chemistry data for No Name Creek, Conesus Lake, Livingston County, N.Y. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed

1/25/2005	43.3	27	10.51	360	0.5	30.81
2/1/2005	47.4	42	7.35	370	6	32.61
2/8/2005	202.4	107.3	3.13	50	53	79.85
2/15/2005	164.2	69.7	2.96	540	52	35.94
2/22/2005	36.7	26.1	0.41	190	1.1	43.35
3/1/2005	38.1	25	7.77	400	1.7	48.32
3/8/2005	161.1	115	3.82	780	10.7	36.82
3/15/2005	43.3	29.6	6.2	270	5.4	46.33
3/22/2005	191.9	37.2	1	800	172	29.69
3/29/2005	74.3	39	5.69	1330	25	30.81
4/5/2005	88.2	50.8	0.95	1320	11.8	30.25
4/12/2005	37.6	27.7	8.4	970	0.5	30.01
4/19/2005	36.3	24.6	2.45	820	3.2	28.96
4/26/2005	33.8	17.1	3.64	320	1.2	32.27
5/3/2005	20.3	6.6	2.78	190	0.5	31.18
5/10/2005	21.1	18.5	1.62	300	1.5	28.28
Average	83.1	36.8	3.57	563.8	21.8	25.6

Table 2. Discharge and loading rates for No Name Creek, Conesus Lake, Livingston County, N.Y. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed

Date	Discharge (m <sup>3</sup> /d)	TP (kg P/d)	SRP (kg P/d)	Nitrate (kg N/d)	TKN (kg N/d)	TSS (kg /d)	Sodium (kg Na/d)
5/11/2004	6,469	0.32	0.31	37.2	5.50	27.2	180
5/18/2004	1,706	0.21	0.13	4.54	1.19	23.4	51.4
5/24/2004	113,735	105	14.5	152	197	64,920	1549
6/1/2004	149,596	21	9.8	438	112	2,992	3,109
6/8/2004	5,942	0.53	0.59	15.7	2.32	31.5	132
6/15/2004	4,656	0.40	0.17	9.08	1.77	25.1	143
6/22/2004	4,853	0.44	0.22	15.4	5.78	34.0	153
6/29/2004	2,382	0.24	0.05	4.60	1.00	46.7	72.3
7/6/2004	dry	dry	dry	dry	dry	dry	dry
7/13/2004	dry	dry	dry	dry	dry	dry	dry
7/20/2004	1,400	0.16	0.06	9.24	0.87	8.8	44.8
7/27/2004	18,980	3.18	0.30	77.4	18.8	921	519
8/3/2004	dry	dry	dry	dry	dry	dry	dry
8/10/2004	dry	dry	dry	dry	dry	dry	dry
8/17/2004	dry	dry	dry	dry	dry	dry	dry
8/25/2004	dry	dry	dry	dry	dry	dry	dry
8/31/2004	5,543	0.89	0.22	57.0	6.21	101	132
9/7/2004	dry	dry	dry	dry	dry	dry	dry
9/14/2004	1,904	0.20	0.10	2.51	0.93	18.1	45.7
9/21/2004	2,764	0.31	0.28	19.7	1.27	46.2	75.6
9/28/2004	36	0.003	0.001	0.16	0.02	0.02	1.0
10/5/2004	dry	dry	dry	dry	dry	dry	dry
10/12/2004	dry	dry	dry	dry	dry	dry	dry
10/19/2004	1,640	0.14	0.07	2.31	1.23	10.0	53.4
10/26/2004	dry	dry	dry	dry	dry	dry	dry
11/2/2004	90	0.01	0.004	0.02	0.02	0.03	2.9
11/9/2004	786	0.05	0.03	2.70	0.46	6.2	17.5
11/16/2004	464	0.03	0.01	2.17	0.64	3.0	10.4
11/23/2004	571	0.03	0.01	1.10	0.22	0.2	17.6
11/29/2004	2,472	0.16	0.12	14.0	1.29	6.2	63.8
12/7/2004	1,885	0.08	0.04	0.47	0.47	6.8	57.9
12/15/2004	992	0.05	0.02	0.47	0.47	2.2	28.8
12/21/2004	21,290	0.99	0.99	215	10.43	25.5	631
12/27/2004	5,679	0.31	0.31	56.7	1.70	6.8	184
1/4/2005	39,476	4.89	2.77	294	44.6	829	1478
1/10/2005	4,362	0.18	0.15	52.7	2.62	37.1	141
1/19/2005	31,170	1.46	1.46	203	98.5	31.2	1061
1/25/2005	24,672	1.07	0.67	259	8.88	12.3	760
2/1/2005	24,672	1.17	1.04	181	9.13	148	805
2/8/2005	125,992	25.5	13.5	394	6.30	6,678	10,060

Table 2. (cont.) Discharge and loading rates for No Name Creek, Conesus Lake, Livingston County, N.Y. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed

2/15/2005	16,484	2.71	1.15	48.8	8.90	857	592
2/22/2005	14,565	0.53	0.38	5.97	2.77	16.0	631
3/1/2005	27,523	1.05	0.69	214	11.01	46.8	1330
3/8/2005	46,799	7.54	5.38	179	36.5	501	1723
3/15/2005	29,889	1.29	0.88	185	8.1	161	1385
3/22/2005	22,369	4.29	0.83	22	17.9	3847	664
3/29/2005	6,649	0.49	0.26	38	8.8	166	205
4/5/2005	24,361	2.15	1.24	23	32.2	287	737
4/12/2005	8,440	0.32	0.23	71	8.2	4	253
4/19/2005	3,708	0.13	0.09	9	3.0	12	107
4/26/2005	4,014	0.14	0.07	15	1.3	5	130
5/3/2005	7,998	0.16	0.05	22	1.5	4	249
5/10/2005	8,496	0.34	0.30	26	4.8	24	456
Average	16,139	3.58	1.12	63.8	13.0	1,565	567

Table 3. Chemistry data for Conesus Inlet, Conesus Lake, Livingston County, N.Y. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream.

Date	TP ( $\mu\text{g P/L}$ )	SRP ( $\mu\text{g P/L}$ )	Nitrate ( $\text{mg N/L}$ )	TKN ( $\mu\text{g N/L}$ )	TSS ( $\text{mg N/L}$ )	Sodium ( $\text{mg Na/L}$ )
5/11/2004	15.6	9.5	0.83	400	2.00	14.96
5/18/2004	13.8	6.5	0.57	440	1.60	16.81
5/24/2004	357.2	28.2	0.37	510	442.00	7.42
6/1/2004	28.2	18	0.67	180	6.00	24.27
6/8/2004	20.4	5.6	0.55	320	3.10	17.6
6/15/2004	16.2	3.3	0.7	340	2.20	20.77
6/22/2004	15.5	4	0.9	820	5.00	25.22
6/29/2004	19.5	8.4	0.71	250	14.00	22.74
7/6/2004	28.4	28.4	0.86	440	2.60	24.4
7/13/2004	20.6	12	0.71	670	1.60	25.2
7/20/2004	11.9	1.5	0.99	340	0.90	21.37
7/27/2004	52.8	5.8	1.06	530	18.20	16
8/3/2004	16	2.8	0.92	800	1.70	23.48
8/10/2004	14.8	8.6	0.99	320	1.60	24.94
8/17/2004	15	9.3	0.57	430	2.30	23.93
8/25/2004	16.8	3.8	0.5	350	3.00	24.01
8/31/2004	28.6	5.1	0.98	650	4.30	18.26
9/7/2004	18.3	4.6	0.57	360	0.90	22.57
9/14/2007	18.5	17.8	0.57	160	3.00	21.42
9/21/2004	16.5	12.7	1.12	130	1.80	20.75
9/28/2004	15.3	8	0.72	390	0.80	22.18
10/5/2004	10.8	5.8	0.67	190	0.90	20.96
10/12/2004	14.2	6.5	0.4	640	0.90	22.54
10/19/2004	21.1	1.7	0.31	430	5.50	18.56
10/26/2004	9.4	5	0.43	300	0.40	22.49
11/2/2004	9	3.3	0.61	210	0.70	19.14
11/9/2004	7.1	4.4	0.79	610	1.90	18.6
11/16/2004	11	7.7	0.72	250	2.00	17.85
11/23/2004	7.1	5.1	0.51	220	1.30	18.75
11/29/2004	19	12.5	0.61	480	2.20	14.59
12/7/2004	6.7	4.2	0.62	620	1.70	16.4
12/15/2004	10.6	3	0.05	50	2.00	14.75
12/21/2004	6.1	6.1	1.25	280	2.00	17.83
12/27/2004	11.5	8.9	1.44	270	2.80	17.07
1/4/2005	40.5	11.9	0.91	560	12.40	15.55
1/10/2005	12.4	9.2	1.03	290	1.90	17.73
1/19/2005	11.1	11.1	1.62	890	2.60	18.15
1/25/2005	9.1	9.1	1.03	250	1.80	17.31
2/1/2005	10.3	9.4	1.02	170	0.60	18.5

Table 3 (Cont.). Chemistry data for Conesus Inlet, Conesus Lake, Livingston County, Ny

Date	TP (µg P/L)	SRP (µg P/L)	Nitrate (mg N/L)	TKN (µg N/L)	TSS (mg N/L)	Sodium (mg Na/L)
2/22/2005	8.4	7.8	1.11	220	0.80	20.51
3/1/2005	9.3	6.3	0.99	310	2.30	23.26
3/8/2005	54.6	14.3	1.5	490	26.70	18.18
3/15/2005	8.1	5.2	0.95	110	2.90	20.43
3/22/2005	15.1	4.2	1.14	190	7.00	20.49
3/29/2005	14.5	6.4	0.53	320	2.00	16.73
4/5/2005	32	16.1	1.1	740	16.10	15.11
4/12/2005	9.3	3.9	0.36	1280	2.90	18.13
4/19/2005	7.1	3.8	0.74	450	0.50	19.73
4/26/2005	10.3	7	1.2	75	1.40	17.4
5/3/2005	6.2	5.3	1.39	75	0.60	18.3
5/10/2005	7.4	5.8	0.63	180	0.01	20.74
Average	28.9	8.8	0.82	395	17.2	19.5

Table 4. Discharge and loading rates for Conesus Inlet, Conesus Lake, Livingston County, NY. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed

Date	Discharge (m <sup>3</sup> /d)	TP (kg P/d)	SRP (kg P/d)	Nitrate (kg N/d)	TKN (kg N/d)	TSS (kg /d)	Sodium (kg Na/d)
5/11/2004	24,100	0.38	0.23	20.0	9.64	48.2	361
5/18/2004	32,259	0.45	0.21	18.4	14.2	51.6	542
5/24/2004	120,252	43.0	3.39	44.5	61.3	53,151	892
6/1/2004	31,354	0.88	0.56	21.0	5.64	188	761
6/8/2004	19,706	0.40	0.11	10.8	6.31	61.1	347
6/15/2004	14,797	0.24	0.05	10.4	5.03	32.6	307
6/22/2004	11,787	0.18	0.05	10.6	9.67	58.9	297
6/29/2004	2,303	0.04	0.02	1.64	0.58	32.2	52.4
7/6/2004	4,879	0.14	0.14	4.20	2.15	12.7	119
7/13/2004	8,557	0.18	0.10	6.08	5.73	13.7	216
7/20/2004	3,534	0.04	0.01	3.50	1.20	3.18	75.5
7/27/2004	79,020	4.17	0.46	83.8	41.9	1,438	1,264
8/3/2004	6,649	0.11	0.02	6.12	5.32	11.3	156
8/10/2004	2,903	0.04	0.02	2.87	0.93	4.64	72.4
8/17/2004	4,348	0.07	0.04	2.48	1.87	10.0	104
8/25/2004	4,298	0.07	0.02	2.15	1.50	12.9	103
8/31/2004	21,092	0.60	0.11	20.7	13.7	90.7	385
9/7/2004	2,570	0.05	0.01	1.47	0.93	2.31	58.0
9/14/2007	14,205	0.26	0.25	8.10	2.27	42.6	304
9/21/2004	34,340	0.57	0.44	38.5	4.46	61.8	713
9/28/2004	15,996	0.24	0.13	11.5	6.24	12.8	355
10/5/2004	13,878	0.15	0.08	9.30	2.64	12.5	291
10/12/2004	8,657	0.12	0.06	3.46	5.54	7.79	195
10/19/2004	26,705	0.56	0.05	8.28	11.5	147	496
10/26/2004	11,356	0.11	0.06	4.88	3.41	4.54	255
11/2/2004	14,087	0.13	0.05	8.59	2.96	9.86	270
11/9/2004	13,705	0.10	0.06	10.8	8.36	26.0	255
11/16/2004	11,968	0.13	0.09	8.62	2.99	23.9	214
11/23/2004	6,422	0.05	0.03	3.28	1.41	8.35	120
11/29/2004	33,555	0.64	0.42	20.5	16.1	73.8	490
12/7/2004	14,696	0.10	0.06	9.11	9.11	25.0	241
12/15/2004	21,924	0.23	0.07	1.10	1.10	43.8	323
12/21/2004	20,103	0.12	0.12	25.1	5.63	40.2	358
12/27/2004	7,458	0.09	0.07	10.7	2.01	20.9	127
1/4/2005	108,648	4.40	1.29	98.9	60.8	1,347	1,689
1/10/2005	32,259	0.40	0.30	33.2	9.36	61.3	572
1/19/2005	26,305	0.29	0.29	42.6	23.4	68.4	477

Table 4. Discharge and loading rates for Conesus Inlet, Conesus Lake, Livingston County, NY. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed

Date	Discharge (m <sup>3</sup> /d)	TP (kg P/d)	SRP (kg P/d)	Nitrate (kg N/d)	TKN (kg N/d)	TSS (kg /d)	Sodium (kg Na/d)
2/1/2005	26,305	0.27	0.25	26.8	4.47	15.8	487
2/8/2005	351,893	106	13.2	215	215	91,492	8,885
2/15/2005	54,532	3.50	0.67	58.9	19.1	1,500	807
2/22/2005	22,769	0.19	0.18	25.3	5.01	18.2	467
3/1/2005	12,915	0.12	0.08	12.8	4.00	29.7	300
3/8/2005	76,156	4.16	1.09	114	37.3	2,033	1,385
3/15/2005	21,988	0.18	0.11	21	2.4	64	449
3/22/2005	31,209	0.47	0.13	36	5.9	218	639
3/29/2005	66,098	0.96	0.42	35	21.2	132	1,106
4/5/2005	81,103	2.60	1.31	89	60.0	1,306	1,225
4/12/2005	38,812	0.36	0.15	14	49.7	113	704
4/19/2005	22,240	0.16	0.08	16	10.0	11	439
4/26/2005	37,944	0.39	0.27	46	2.8	53	660
5/3/2005	26,716	0.17	0.14	37	2.0	16	489
5/10/2005	10,611	0.08	0.06	7	1.9	0	220
Average	32,895	3.38	0.53	26.7	15.38	2,912	616

Table 5. Chemistry data for Wilkins Creek, Conesus Lake, Livingston County, N.Y. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed

Date	TP ( $\mu\text{g P/L}$ )	SRP ( $\mu\text{g P/L}$ )	Nitrate ( $\text{mg N/L}$ )	TKN ( $\mu\text{g N/L}$ )	TSS ( $\text{mg N/L}$ )	Sodium ( $\text{mg Na/L}$ )
5/11/2004	15.6	5.7	0.22	430	4.0	68.99
5/18/2004	31.2	12.6	0.18	560	4.0	88.19
5/24/2004	220.5	43.5	0.29	1280	148.5	38.18
6/1/2004	53.6	22.3	0.29	500	6.7	54.91
6/8/2004	22.1	23.2	0.24	390	1.5	93.52
6/15/2004	69.2	5.3	0.2	550	25.6	97.86
6/22/2004	47.4	4.7	0.52	640	13.2	106.1
6/29/2004	48	13.3	0.28	75	16.6	126.06
7/6/2004	46.7	32	0.13	370	1.6	145.48
7/13/2005	54.7	36.5	0.18	420	9.5	134.2
7/20/2004	40.7	7.6	0.26	460	2.2	96.84
7/27/2004	56	8.4	1.01	710	16.7	65.9
8/3/2004	35.8	6.1	0.22	700	5.1	154.72
8/10/2004	28.9	27.5	0.38	350	1.9	153.06
8/17/2004	24.3	3.3	0.13	580	0.2	142.56
8/25/2004	40.7	2.7	0.22	580	6.5	136.12
8/31/2004	58	47.8	0.63	570	5.5	68.06
9/7/2004	37.4	14.3	0.16	280	0.4	120.94
9/14/2004	38.6	38.6	0.4	250	1.5	84.06
9/21/2004	36.9	27.9	0.33	200	1	89.5
9/28/2004	34.7	28	0.05	560	1.1	121.16
10/5/2004	28	22.1	0.07	380	0.8	118.36
10/12/2004	34.4	5.7	0.14	300	0.6	111.04
10/19/2004	32.5	4.7	0.08	330	1.5	77.57
10/26/2004	29.7	29.3	0.05	470	0.7	98.1
11/2/2004	27.3	27.3	0.01	280	0.5	83.42
11/9/2004	14.4	3.9	0.05	330	0.4	86.72
11/16/2004	12.1	5.8	0.04	380	1.9	78.36
11/23/2004	12.1	8.1	0.04	330	0.4	88.16
11/29/2004	29.4	17.2	0.32	340	4.2	63.54
12/7/2004	16.5	7.9	0.46	500	3.6	103.88
12/15/2004	13.8	0.62	0.39	390	2.1	152.13
12/21/2004	10.6	10.5	0.72	300	2.4	94.46
12/27/2004	18.9	17.1	0.89	210	2.4	82.5
1/4/2005	30.7	14.1	0.76	580	6.3	67.13
1/10/2005	16.5	3.2	0.65	310	1.9	118.86
1/19/2005	19.7	14	0.87	740	5.9	91.84
1/25/2005	14.7	11.8	0.62	260	2.3	118.22
2/1/2005	22.2	9.1	0.63	250	5.4	111.28

Table 5. Chemistry data for Wilkins Creek, Conesus Lake, Livingston County, NY

Date	TP (µg P/L)	SRP (µg P/L)	Nitrate (mg N/L)	TKN (µg N/L)	TSS (mg N/L)	Sodium (mg Na/L)
2/8/2005	390.8	33.1	0.81	980	194	156.28
2/15/2005	96.7	28.6	0.99	440	59	63.63
2/22/2005	11.5	13.3	0.61	170	2.7	123.32
3/1/2005	13.4	9.9	0.57	75	3	532.74
3/8/2005	42.7	13.4	1.03	680	23.9	79.22
3/15/2005	17.7	5.8	0.58	270	2.5	91.96
3/22/2005	15.7	2.8	0.67	200	5.3	95.58
3/29/2005	9.5	8.3	0.48	1060	2.3	69.36
4/5/2005	26.4	8.6	0.76	300	5.6	67.32
4/12/2005	7	4.4	0.33	1350	1	72.12
4/19/2005	8.9	1.9	0.07	420	1.1	82.5
4/26/2005	10.9	3.3	0.46	270	0.7	63.37
5/3/2005	9.4	2.6	0.1	75	2.2	68.88
5/10/2005	11.9	3.3	0.16	150	1.2	87
Average	39.6	14.4	0.39	445	11.7	105.4

Table 6. Discharge and loading rates for Wilkens Creek, Livingston County, NY.

Date	Discharge (m <sup>3</sup> /d)	TP (kg P/d)	SRP (kg P/d)	Nitrate (kg N/d)	TKN (kg N/d)	TSS (kg /d)
2/15/2005	56,727	5.49	1.62	56.2	25.0	3,347
2/22/2005	6,072	0.07	0.08	3.70	1.03	16.4
3/1/2005	8,248	0.11	0.08	4.70	0.62	24.7
3/8/2005	10,852	0.46	0.15	11.2	7.38	259
3/15/2005	10,384	0.18	0.06	6.0	2.80	26
3/22/2005	20,894	0.33	0.06	14.0	4.18	111
3/29/2005	15,524	0.15	0.13	7.5	16.46	36
4/5/2005	10,434	0.28	0.09	7.9	3.13	58
4/12/2005	6,956	0.05	0.03	2.3	9.39	7
4/19/2005	3,330	0.03	0.01	0.2	1.40	4
4/26/2005	3,600	0.04	0.01	1.7	0.97	3
5/3/2005	2,163	0.02	0.01	0.2	0.16	5
5/10/2005	679	0.01	0.00	0.1	0.10	1
Average	10,650	1.17	0.26	5.53	7.56	643

Table 6. Discharge and loading rates for Wilkens Creek, Livingston County, NY.  
 TP = Total Phosphorus, SRP = Soluble Reactive Phosphorus, Nitrate = Nitrate +Nitrite,  
 TSS = Total Suspended Solids, TKN = Total Kjeldahl nitrogen

Date	Discharge (m <sup>3</sup> /d)	TP (kg P/d)	SRP (kg P/d)	Nitrate (kg N/d)	TKN (kg N/d)	TSS (kg /d)
5/11/2004	807	0.01	0.005	0.18	0.35	3.23
5/18/2004	4,632	0.14	0.06	0.83	2.59	18.5
5/24/2004	147,705	32.6	6.43	42.8	189	21,934
6/1/2004	10,559	0.57	0.24	3.06	5.28	70.7
6/8/2004	2,058	0.05	0.05	0.49	0.80	3.09
6/15/2004	3,342	0.23	0.02	0.67	1.84	85.5
6/22/2004	4,576	0.22	0.02	2.38	2.93	60.4
6/29/2004	3,747	0.18	0.05	1.05	0.28	62.2
7/6/2004	1,422	0.07	0.05	0.18	0.53	2.27
7/13/2005	4,141	0.23	0.15	0.75	1.74	39.3
7/20/2004	6,162	0.25	0.05	1.60	2.83	13.6
7/27/2004	21,203	1.19	0.18	21.4	15.05	354
8/3/2004	3,245	0.12	0.02	0.71	2.27	16.6
8/10/2004	125	0.004	0.003	0.05	0.04	0.24
8/17/2004	10,955	0.27	0.04	1.42	6.35	2.19
8/25/2004	923	0.04	0.002	0.20	0.54	6.00
8/31/2004	30,550	1.77	1.46	19.2	17.4	168
9/7/2004	232	0.01	0.003	0.04	0.06	0.09
9/14/2004	1,785	0.07	0.07	0.71	0.45	2.68
9/21/2004	3,808	0.14	0.11	1.26	0.76	3.81
9/28/2004	2,264	0.08	0.06	0.11	1.27	2.49
10/5/2004	1,261	0.04	0.03	0.09	0.48	1.01
10/12/2004	1,066	0.04	0.01	0.15	0.32	0.64
10/19/2004	8,419	0.27	0.04	0.67	2.78	12.6
10/26/2004	3,021	0.09	0.09	0.15	1.42	2.11
11/2/2004	11,852	0.32	0.32	0.12	3.32	5.93
11/9/2004	1,056	0.02	0.004	0.05	0.35	0.42
11/16/2004	3,817	0.05	0.02	0.15	1.45	7.25
11/23/2004	3,417	0.04	0.03	0.14	1.13	1.37
11/29/2004	5,605	0.16	0.10	1.79	1.91	23.5
12/7/2004	9,387	0.15	0.07	4.32	4.69	33.8
12/15/2004	2,329	0.03	0.001	0.91	0.91	4.89
12/21/2004	6,679	0.07	0.07	4.81	2.00	16.0
12/27/2004	3,481	0.07	0.06	3.10	0.73	8.35
1/4/2005	5,224	0.16	0.07	3.97	3.03	32.9
1/10/2005	15,316	0.25	0.05	9.96	4.75	29.1
1/19/2005	8,248	0.16	0.12	7.18	6.10	48.7
1/25/2005	9,556	0.14	0.11	5.92	2.48	22.0
2/1/2005	8,248	0.18	0.08	5.20	2.06	44.5
2/8/2005	36,364	14.2	1.20	29.5	35.6	7,055

Table 9. Discharge and loading rates for North Gully Creek, Conesus Lake, Livingston County, NY. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed

Date	Discharge (m <sup>3</sup> /d)	TP (kg P/d)	SRP (kg P/d)	Nitrate (kg N/d)	TKN (kg N/d)	TSS (kg /d)
2/22/2005	13,496	0.36	0.26	15.1	1.35	158
3/1/2005	593	0.01	0.01	0.56	0.22	1.78
3/8/2005	32,072	2.76	2.76	49.4	14.1	330
3/15/2005	3,466	0.09	0.03	3.2	0.8	33
3/22/2005	4,538	0.15	0.07	3.0	1.0	59
3/29/2005	3,363	0.07	0.06	1.8	1.3	31
4/5/2005	12,451	0.59	0.28	51.9	12.6	172
4/12/2005	2,538	0.02	0.01	1.1	5.3	2
4/19/2005	3,974	0.05	0.01	0.3	1.2	35
4/26/2005	9,603	0.19	0.08	7.0	2.5	16
5/3/2005	3,767	0.03	0.01	14.7	0.3	11
5/10/2005	185	0.00	0.00	0.0	0.0	0
Average	9,320	1.21	0.29	7.62	5.40	929

Table 9. Discharge and loading rates for North Gully Creek, Conesus Lake, Livingston County, NY. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed.

Date	Discharge (m <sup>3</sup> /d)	TP (kg P/d)	SRP (kg P/d)	Nitrate (kg N/d)	TKN (kg N/d)	TSS (kg /d)
5/18/2004	835	0.02	0.005	0.23	0.30	2.09
5/24/2004	78,185	45.4	5.50	33.6	104	44,041
6/1/2004	2,265	0.19	0.11	1.74	2.08	61.2
6/8/2004	202	0.01	0.01	0.09	0.08	1.62
6/15/2004	11,692	0.44	0.14	4.68	5.26	74.8
6/22/2004	5,099	0.25	0.03	3.16	2.45	56.1
6/29/2004	24,393	0.61	0.17	9.76	1.83	70.7
7/6/2004	8,868	0.22	0.16	3.46	2.75	9.75
7/13/2004	3,709	0.09	0.08	1.26	1.71	7.79
7/20/2004	799	0.03	0.00	0.31	0.20	2.80
7/27/2004	34,334	2.39	0.28	27.8	18.2	755
8/3/2004	1,769	0.04	0.01	0.69	1.49	5.13
8/10/2004	194	0.003	0.003	0.06	0.06	0.66
8/17/2004	7,540	0.08	0.02	1.96	3.17	4.52
8/24/2004	6,893	0.13	0.10	1.24	2.21	53.8
8/31/2004	13,659	1.16	0.52	14.2	16.9	167
9/7/2004	3,357	0.09	0.04	1.01	1.21	6.38
9/14/2004	11,632	0.54	0.12	6.63	2.68	50.0
9/21/2004	14,723	0.64	0.65	8.83	6.48	23.6
9/28/2004	4,401	0.11	0.02	1.23	1.58	1.32
10/5/2004	12,396	0.23	0.21	2.36	2.98	3.72
10/12/2004	5,176	0.09	0.07	0.88	0.39	1.55
10/19/2004	11,840	0.29	0.04	0.95	2.84	42.6
10/26/2004	1,268	0.01	0.003	0.09	0.27	0.25
11/2/2004	827	0.01	0.005	0.01	0.24	0.08
11/9/2004	1,330	0.02	0.02	0.15	0.51	0.66
11/16/2004	714	0.01	0.01	0.04	0.10	0.29
11/23/2004	735	0.005	0.003	0.19	0.16	0.59
11/29/2004	1,930	0.06	0.05	1.10	0.62	2.51
12/7/2004	2,416	0.06	0.04	1.59	1.40	5.07
12/15/2004	1,408	0.04	0.004	0.38	0.38	5.91
12/21/2004	13,956	0.31	0.31	12.4	4.19	40.5
12/27/2004	487	0.02	0.01	0.46	0.16	0.88
1/4/2005	20,271	1.27	0.71	21.5	12.8	452
1/10/2005	880	0.03	0.02	0.87	0.32	3.26
1/19/2005	20,563	0.53	0.50	20.2	18.3	43.2
1/25/2005	26,070	0.64	0.45	20.9	5.47	125
2/1/2005	20,563	0.51	0.31	17.7	6.17	51.4
2/8/2005	5,290	0.54	0.30	5.71	3.54	274
2/15/2005	11,918	1.38	0.47	18.8	4.65	1,025

Table 7 (Cont). Chemistry data for North Gully Creek, Conesus Lake, Livingston County, N.Y. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed.

Date	TP	SRP	Nitrate	TKN	TSS	Sodium
	( $\mu\text{g P/L}$ )	( $\mu\text{g P/L}$ )	( $\text{mg N/L}$ )	( $\mu\text{g N/L}$ )	( $\text{mg N/L}$ )	( $\text{mg Na/L}$ )
2/15/2005	115.6	39.3	1.58	390	86	32.42
2/22/2005	26.5	18.9	1.12	100	11.7	37.55
3/1/2005	22.6	11.7	0.95	370	3	31.45
3/8/2005	86.1	86.1	1.54	440	10.3	41.92
3/15/2005	26.7	9.4	0.93	240	9.4	34.77
3/22/2005	34	16.1	0.67	220	13.1	38.52
3/29/2005	21.9	17.8	0.54	390	9.3	29.21
4/5/2005	47.6	22.5	4.17	1010	13.8	27.2
4/12/2005	9.3	5.2	0.42	2080	0.9	24.19
4/19/2005	12.2	2	0.07	300	8.7	22.39
4/26/2005	19.7	8.1	0.73	260	1.7	24.86
5/3/2005	7	2.4	3.89	75	2.9	23.8
5/10/2005	7.7	7.7	0.14	120	0.8	21.2
Average	43.6	18.7	0.69	438	18.5	26.3

Table 7. Chemistry data for North Gully Creek, Conesus Lake, Livingston County, N.Y. TP = Total Phosphorus, Nitrate = Nitrate + Nitrite, TSS = Total Suspended Solids, TKN = Total Kjeldhal Nitrogen, SRP = Soluble Reactive Phosphorus, dry = no flowing water in stream bed.

Date	TP ( $\mu\text{g P/L}$ )	SRP ( $\mu\text{g P/L}$ )	Nitrate ( $\text{mg N/L}$ )	TKN ( $\mu\text{g N/L}$ )	TSS ( $\text{mg N/L}$ )	Sodium ( $\text{mg Na/L}$ )
5/18/2004	29.1	5.6	0.28	360	2.5	24.63
5/24/2004	580.4	70.4	0.43	1330	563.3	16.21
6/1/2004	81.7	49.3	0.77	920	27	18.75
6/8/2004	41.8	36.4	0.46	410	8	19.14
6/15/2004	37.9	12.3	0.4	450	6.4	21.01
6/22/2004	49.2	6.8	0.62	480	11	20.66
6/29/2004	25	6.8	0.4	75	2.9	23.76
7/6/2004	24.35	18.3	0.39	310	1.1	19.06
7/13/2004	23.7	20.9	0.34	460	2.1	21.5
7/20/2004	36.9	3.5	0.39	250	3.5	14.11
7/27/2004	69.6	8.2	0.81	530	22	31.06
8/3/2004	22.7	4.1	0.39	840	2.9	26.48
8/10/2004	17.7	15.6	0.32	330	3.4	26.43
8/17/2004	10.7	2.6	0.26	420	0.6	25.45
8/24/2004	19.4	14.7	0.18	320	7.8	26.2
8/31/2004	84.6	38.1	1.04	1240	12.2	25.47
9/7/2004	26.5	11.4	0.3	360	1.9	24.13
9/14/2004	46.1	10.6	0.57	230	4.3	24.9
9/21/2004	43.6	44	0.6	440	1.6	25.63
9/28/2004	25	4.3	0.28	360	0.3	22.91
10/5/2004	18.6	16.7	0.19	240	0.3	22.01
10/12/2004	16.9	13.4	0.17	75	0.3	21.65
10/19/2004	24.9	3.8	0.08	240	3.6	21.53
10/26/2004	9.7	2.5	0.07	210	0.2	26.13
11/2/2004	13.5	6	0.01	290	0.1	25.59
11/9/2004	16.4	16.4	0.11	380	0.5	28.63
11/16/2004	10.2	8.6	0.06	140	0.4	24.83
11/23/2004	6.8	3.6	0.26	220	0.8	28.02
11/29/2004	31.2	25.6	0.57	320	1.3	26.14
12/7/2004	25.2	18.2	0.66	580	2.1	15.57
12/15/2004	30.3	2.9	0.27	270	4.2	27.78
12/21/2004	22.5	22.5	0.89	300	2.9	24.35
12/27/2004	33	24.5	0.94	330	1.8	23.74
1/4/2005	62.8	35	1.06	630	22.3	31.8
1/10/2005	34.7	26.1	0.99	360	3.7	34.02
1/19/2005	25.6	24.4	0.98	890	2.1	26.22
1/25/2005	24.4	17.4	0.8	210	4.8	27.31
2/1/2005	25	15.3	0.86	300	2.5	28.94
2/8/2005	102.4	57	1.08	670	51.7	56.29