Update of Soil and Nutrient Loss from Subwatersheds of Conesus Lake - 2001

Prepared for the Livingston County Planning Department

by

Joseph C. Makarewicz and Theodore W. Lewis

Center for Applied Aquatic Science and Aquaculture
Environmental Science Program
Department of Biological Sciences
SUNY College at Brockport

January 2002

Executive Summary

1. The purpose of this study was to add to and update decade old nutrient and soil loss data from the major subwatersheds of Conesus Lake, as recommended in the State of Conesus Lake: Watershed Characterization Report.

2. The Genesee Valley region was very dry during 2001 experiencing drought conditions throughout the summer characterized by the National Weather Service as mild to moderate in June and July, becoming moderate to severe through mid-August.

3. Four of the eighteen tributaries monitored during 2001 contributed over seventy percent of the total discharge measured. Those tributaries in descending order are Conesus Inlet, South McMillan, North McMillan and Southwest Creeks.

4. High concentrations of total phosphorus were observed in Graywood (Northwest Creek), Long Point Gully and South Gully during 2001 event conditions. In addition, the total phosphorus concentration of Graywood Creek during baseline conditions exceeds those of all other tributaries during baseline or event conditions.

5. Total suspended solids were generally low throughout the sampling period due to the lack of large events and drought conditions. One notable exception is South Gully, which averaged 195.3 mg/L during event conditions. This high value was primarily due to one event on 23 May 2001, where the TSS concentration was 972.5 mg/L. Field notes indicate that the town was ditch digging along East Lake Road near South Gully on this date.

6. The total phosphorus areal loading for the eighteen tributaries was dominated by losses during events. Graywood Creek had the highest total phosphorus loading on an areal basis during both events (2.00 g/ha/d) and non-events (0.48 g/ha/d) in 2001. Southwest Creeks was second in TP areal losses with 1.02 g/ha/d during events and 0.45 g/ha/d during baseline conditions. Graywood Creek is comparable to other watersheds in western and central New York that are dominated by agricultural land use and are polluting downstream receiving waters Southwest Creeks contributed the second highest areal total phosphorus loss and can be placed in a similar category. Conversely, Cottonwood Gully, Southeast Creeks, Densmore Creek and North McMillan Creek all had total phosphorus losses less than 0.10 g/ha/d during 2001. These creeks can be characterized as having areal total phosphorus losses comparable to those watersheds that are relatively unimpacted or forested in western and central New York.

7. South Gully dominated total suspended solids loss from the Conesus Lake sub-watersheds at a mean loss rate of 1239 g/ha/d for events. This determination is a little deceiving in that this value is very heavily influenced by a single event on 22 May 2001 where the loss for that day was estimated as 7424 g/ha/d. This was due to road ditching that was occurring on East Lake Road during the sampling period. Subsequent events that were sampled showed that this source was temporary as total suspended solids concentrations returned to earlier levels. The Central Gully sub-watershed lost the second-most soils including the most during non-event conditions. Cottonwood Gully, Long Point Gully, Southeast Creeks and Densmore Creek all

had total suspended solid losses of less than 10 g/ha/d for 2001.

8. In a decade-long comparison, the 1990 annual phosphorus areal loss rate (g P/ha/d) for most subwatersheds were higher than the event loss rate measured in 2001. Overall, this can be viewed as a positive for the Conesus Lake watershed in that no streams measured in both studies has increased dramatically in the intervening 10-year period. We would caution the trumpeting of vast improvements in the overall health of the watershed based on these results due mainly to the drought conditions with the lack of a large hydrometeorological event and the differences in monitoring methodology.

Introduction

The State of Conesus Lake: Watershed Characterization Report (2001) identified areas that required additional data to evaluate the current state of the Conesus Lake watershed. A comprehensive update of nutrient and soil loss from all of the major subwatersheds from a study undertaken in 1990-91 (Makarewicz *et al*. 1991) was listed as a high priority. This study was designed to estimate discrete losses of total phosphorus and total suspended solids in eighteen subwatersheds during the calendar period April to December under both baseline and event conditions. Results of this study will be the ability to assess the change in nutrient loss rates for subwatershed during the past ten years and the prioritization of subwatersheds for further identification of point and nonpoint sources of pollution and their eventual remediation. The skewing of sampling protocol toward events (equal number of baseline and event samples, which doesn't represent the proportion of event and baseline days in a calendar year) was done with the recognition that many of these streams run intermittently and a majority of their loadings to Conesus Lake occur during event periods (Makarewicz *et al*. 1991, Makarewicz and Lewis 1999 and 2000). In addition, this study will build upon and strengthen the data gathered in the past two years on the smaller stream and rivulets. Macrophyte beds consisting mainly of Eurasian milfoil exist at or near many of the creek mouths within the littoral zone of Conesus Lake (Fig. 1)(Bosch *et al*. 2001). These creek-associated beds are of interest because their presence appears to be associated with creeks that lose a large amount of nutrients and soils from their subwatersheds. Some suspected subwatersheds are candidates for a USDA grant to evaluate management plans that may reduce nutrient and soil loss.

Methods

SUNY Brockport personnel took stream water samples from eighteen subwatersheds of Conesus Lake from April to December 2001. The location and stream height measurement information for all sampling sites are presented in Figure 1 and Table 1. Sampling encompassed

twelve dates, six during baseline or non-event conditions and six during hydrometeorological events and included a point discharge estimate during each site visit. An additional water samle only was taken on Conesus Inlet at Sliker Hill road, closer to Conesus Lake, to assess the impact of the extensive wetlands between the monitoring site on Guiltner Road.

Soil loss (as total suspended solids) and total phosphorus were measured as a function of stream discharge and concentration. Samples were taken manually and transported to SUNY Brockport for water chemistry analysis. All sampling bottles were pre-coded so as to ensure exact identification of the particular sample and cleaned routinely with phosphate-free RBS. Prior to sample collection, containers were rinsed with the water being collected. In general, all procedures followed EPA standard methods (EPA 1979) or Standard Methods for the Analysis of Water and Wastewater (APHA 1999). Samples were held at 4°C until analysis.

Water Chemistry:

Total Phosphorus: Raw water was digested using the persulfate digestion procedure prior to analysis by the automated (Technicon autoanalyser) colorimetric ascorbic acid method (APHA 1999).

Total Suspended Solids: APHA (1999) Method 2540D was employed for this analysis.

Stream Velocity: Stream velocity was measured at equally spaced locations in either a culvert or cement channel of a bridge under a road with a Gurley flow meter (Chow 1964).

Stream Height and Cross-Sectional Area: Stream depth was measured as the difference between the vertical height of the culvert/bridge opening and the distance between the stream surface and upper portion of the culvert/bridge. Stream cross-sectional area for various stream heights was calculated by planimetry after measuring the cross-sectional dimensions of each stream monitored.

Watershed Area: Subwatershed areas were update for this report. They were obtained from the Livingston County Planning Department utilizing GIS digital depictions of the subwatersheds. Relatively large discrepancies from previous estimates were found for Greywood, Cottonwood and Southwest Creeks. In the case of the subwatershed draining the rivulet at Sutton Point, the subwatershed area was estimated from USGS topographic maps. CHECK!!

Nutrient Loading: Daily nutrient and sediment loadings from the watershed were calculated by multiplying the discharge on the day of the sample by the concentration of the nutrient or solids from the appropriate water sample.

Quality Assurance Internal Quality Control: Multiple sample control charts (APHA 1999) were constructed for each parameter analyzed, except total suspended solids. A prepared quality control solution was placed in the analysis stream for each sampling date. If the control solution was beyond the set limits of the control chart, corrective action was taken and the samples re-run.

External Quality Control: The Water Chemistry Laboratory at SUNY Brockport is State and Nationally certified through the National Environmental Laboratory Accreditation Conference (NELAC - EPA Lab Code # 01449) and New York State Department of Health's Environmental Laboratory Approval Program (ELAP - # 11439). This program includes biannual proficiency audits, annual inspections and good laboratory practices documentation of all samples, reagents and equipment.

Results and Discussion

Discharge:

The Genesee Valley region was very dry during 2001 with annual average precipitation 2.78 inches below normal as measured at the Rochester, NY National Weather Service office. The region experienced drought conditions throughout the summer characterized by the National Weather Service as mild to moderate in June and July, becoming moderate to severe through mid-August. Monthly precipitation departures from normal in inches were April (-1.42), May (-0.06), June (-1.16), July (-1.67) and August (+0.91, but most of the precipitation occurred in the second half of the month).

Four of the eighteen tributaries monitored during 2001 contributed over seventy percent of the total discharge measured. Those tributaries in descending order are Conesus Inlet, South McMillan, North McMillan and Southwest Creeks (Figure 2).

Concentration:

Concentration is the amount of a nutrient or a material per unit volume of water. Table 2 presents the baseline and event concentrations of total phosphorus and total suspended solids for the tributaries of Conesus Lake from April to December the 2001. In general, the large disparities previously observed (Makarewicz and Lewis 1999, 2000) between baseline and event total phosphorus concentrations was not as apparent in 2001. This is primarily due to the lack of any large-scale events and the drought conditions during the sample period.

High mean concentrations of total phosphorus were observed in Graywood (Northwest Creeks), Long Point Gully and South Gully event conditions during 2001. In addition, the total phosphorus concentration of Graywood Creek during baseline conditions exceeds those of all other tributaries during baseline or event conditions. Baseline total phosphorus concentrations ranged from 8.7 µg P/L in North McMillan Creek to 274.7 µg P/L in Graywood Creek, while event total phosphorus concentrations ranged from 8.9 µg P/L to 318.1 µg P/L in the same two creeks, respectively.

An additional grab water sample was taken in Conesus Inlet at Sliker Hill Road over the base site on Guiltner Road to see if there are any changes due to the extensive wetlands between the two locations. Both total phosphorus and total suspended solids concentrations were higher at the downstream location. The base site on Guiltner Road was the location of the monitoring site in 1990-1991 (Makarewicz *et al*. 1991) and is a much better location for monitoring discharge than the downstream site. The higher concentrations found at the lower site may be due to primary production that is occurring as phytoplankton in the wetland area.

Total suspended solids were generally low throughout the sampling period again, due to the lack of large events and drought conditions. One notable exception is South Gully, which averaged 195.3 mg/L during event conditions. This high value was primarily due to one event on 23 May 2001, where the TSS concentration was 972.5 mg/L. Field notes indicate that the town was ditch digging along East Lake Road near South Gully on this date. This undoubtedly is the cause of this high value, as concentrations of total suspended solids never approached this level (next highest concentration = 2.2 mg/L) in any subsequent events.

Loss from the Sub-watersheds:

Loading is the amount of nutrients and soil that is lost from the watershed and carried by the stream into Conesus Lake. Unlike concentration, loading considers the volume of water being lost from the watershed per day (discharge, Fig. 2) and the concentration (Table 2) and is expressed as kilograms of nutrient per day entering the lake. Thus loading provides a better representation of the actual amount of soil and nutrient being lost from the subwatersheds and deposited into the lake. Table 3, which provides a summation of loss of materials from the watersheds for both baseline and event conditions. Appendix 1 presents the data by sampling date and the averages and maxima for events and nonevents. Greywood, Inlet, Southwest and South McMillan Creeks loaded over 63% of the phosphorus to Conesus Lake during 2001 (Figure 3).

Although loading expressed as kilograms of nutrient lost per day provides an overall impact of a subwatershed on a lake – the greater the loading, the greater the potential impact on water quality - it is not a good measure to compare subwatersheds. The reason is that larger watersheds would be expected, in general, to deliver larger loads of nutrients simply because of their larger size. To allow comparison of subwatersheds, the loading data is normalized by the size of the watersheds: that is, the loss of nutrients or soil per unit area of watershed per day (e.g., g/ha/day), where g is grams (1000 grams = 2.2 lbs) and ha is a hectare (1 ha = 2.47 acres).

This "normalization" procedure allows a fairer comparison between subwatersheds. A high "areal" loading value during a precipitation event compared to another subwatershed would suggest that the higher losses are due to material being swept off the watershed by rainwater or melt water. Those streams that have a high loss of materials from the watershed are likely due to land use practices within that watershed.

The total phosphorus areal loading for the eighteen tributaries was dominated by losses during events. Graywood Creek had the highest total phosphorus loading on an areal basis during both events (2.00 g/ha/d) and non-events (0.48 g/ha/d) in 2001 (Table 4, Figure 3). Southwest Creeks was second in TP areal losses with 1.02 g/ha/d during events and 0.45 g/ha/d during baseline conditions. South Gully had second highest event loading (1.29 g/ha/d) but nonevent loading was only 0.01 g/ha/d. The majority of the South Gully event loading occurred during one event in May, where town roadside ditch work was being performed near the sampling site. Conversely, Cottonwood Gully, Southeast Creeks, Densmore Creek and North McMillan Creek all had total phosphorus losses less than 0.10 g/ha/d during 2001 (Table 4, Figure 3).

South Gully dominated total suspended solids loss from the Conesus Lake sub-watersheds at a mean loss rate of 1239 g/ha/d for events. This determination is a little deceiving in that this value is very heavily influenced by a single event on 22 May 2001 where the loss for that day was estimated as 7424 g/ha/d. This again was due to road ditching that was occurring on East Lake Road during the sampling period causing a total suspended solids concentration of 972.5 mg/L. Subsequent events that were sampled showed that this source was temporary as total suspended solids concentrations returned to earlier levels. The Central Gully sub-watershed lost the second-most soils including the most during non-event conditions. Cottonwood Gully, Long Point Gully, Southeast Creeks and Densmore Creek all had total suspended solid loss of less than 10 g/ha/d for 2001.

Comparisons with previous data and other watersheds:

Comparisons of this type are plagued by the inherently high variation in environmental conditions year-to-year. 2001 was a very dry year with periods of drought declared by the National Weather Service during the study period, this would suggest that loss rates measured from the sub-watershed by low relative to their 'normal' levels. Grab samples and point discharge measurements were taken during the same number of baseline stream conditions as event conditions. The data presented for comparative purposes are from other studies that have been done on an annual basis, in other words they were sampled during regular intervals during the entire calendar year or the stream monitored continuously utilizing automated stream gauges

that trigger automatic samplers during events. The number of days in an annual cycle that a stream is in baseline condition far outweighs those in an event condition (mean of 40 event and 325 non-event days in 1997-1999 in the Canandaigua Lake watershed). But, those few stream events can contribute 50 to 95% of the annual watershed loss of nutrients and soil (Makarewicz and Lewis 1999, 2000, 2001). All things considered, this study took place during a very dry year which would underestimate loss, but is had equal numbers of event and baseline samples which will overestimate loss, but none of the events sampled would be considered a large event. Given all of those caveats, a comparison of this study's results with other watershed studies follows.

Many of the Conesus Lake sub-watersheds in 2001 can be compared with similar data generated on a weekly basis in 1990-91 (Figure 5, Table 5). The 1990 annual phosphorus areal loss rate (g P/ha/d) for most subwatersheds were higher than the event loss rate measured in 2001, with the following exceptions. Conesus Inlet and Sand Point Gully had a 1990 phosphorus loss rate that fell between the event and baseline average for 2001 and South Gully was higher in 2001, again due mainly to the one high event value measured in May 2001 attributed to road ditch maintenance. Overall, this can be viewed as a positive for the Conesus Lake watershed in that no streams measured in both studies has increased dramatically in the intervening 10-year period. We would caution the trumpeting of vast improvements in the overall health of the watershed based on these results due mainly to the drought conditions with the lack of a large hydrometeorological event and the differences in monitoring methodology.

Graywood Gully contributed the highest amount of total phosphorus per unit watershed area to Conesus Lake in 2001 with a rate of 2.00 g P/ha/d during events and 0.48 g P/ha/d during non-event periods. This is comparable to other watersheds in western and central New York that are dominated by agricultural land use and are polluting downstream receiving waters (Table 5). Southwest Creeks contributed the second highest areal total phosphorus loss and can be placed in a similar category. At the other end of the spectrum, Cottonwood, Southeast, Densmore and North McMillan Creeks can be characterized as having areal total phosphorus losses comparable to those watersheds that are relatively unimpacted or forested for western and central New York (Table 5).

Summary

As in 2000, The same two streams (Graywood Gully and Southwest Creeks [rivulet #5989]) that

drain subwatersheds of Conesus Lake contributed the largest amount of total phosphorus into Conesus Lake relative to similar nearby watersheds in 2001. The high loss of phosphorus undoubtedly stimulated algae and macrophyte growth "locally" at stream mouths and potentially played a role in deteriorating water quality of the entire lake. Bosch *et al*. (2001) have demonstrated that macrophyte beds consisting mainly of Eurasian milfoil and clouds of filamentous algae (metaphyton) exist at the stream mouths of many of the creeks monitored. The large amount of material being lost from these small subwatersheds was surprising when compared to larger nearby watersheds. A land-use practice in the watershed could be the cause. From a management perspective, the possibility exists that control of nutrient and soil loss through best management practices with the watershed may reduce the size of macrophyte beds and abundance of macrophytes within the beds. What affect management practices on these small watersheds have on the perimeter beds of macrophytes surrounding the lake is at best speculative. In general, reduction of nutrients should reduce the abundance of macrophytes simply because there are less nutrients. However, any reduction in the perimeter beds and in the stream-mouth associated beds will not be instantaneous. Improvements in water quality of Irondequoit Bay in Monroe County and Lake Erie were not realized until almost 20 to 25 years after implementation of either the phosphate abatement program or other management practices.

When comparing current data to a study done a decade ago, the phosphorus loss rate has decreased in all but three of the streams studied in both years. Overall, this can be viewed as a positive for the Conesus Lake watershed in that no streams measured in both studies has increased dramatically in the intervening 10-year period. We would caution the trumpeting of vast improvements in the overall health of the watershed based on these results due mainly to the drought conditions with the lack of a large hydrometeorological event and the differences in monitoring methodology.

Acknowledgements

Corey Laxson, Daniel White, Betsy Damaske and Peter D'Aiuto of SUNY Brockport aided in the collection and/or analysis of field water samples.

Literature Cited

APHA. 1999. Standard Methods for the Examination of Waste and Wastewater. American Public Health Association, 19th ed. New York, N.Y.

Bosch, I., Makarewicz, J.C., Emblidge, J.P., Johnson, D.A., Valentino, M. 2001. Population

Studies of Eurasian Watermilfoil (*Myriophyllum spicatum*) and Zebra Mussels (*Dreissena polymorpha*) in Conesus Lake, N.Y: Summer 2000. Livingston County Planning Department. Geneseo, NY.

EPA. 1979. Methods for the Chemical Analysis of Water and Wastes. Environmental Monitoring and Support Laboratory. Environmental Protection Agency. Cincinnati, Ohio. EPA-600/4-79-020.

Chow, Ven Te. 1964. Handbook of Applied Hydrology. McGraw-Hill Book Company. NY.

EPA. 1979. Methods for Chemical Analysis of Water and Wastes. Environmental Monitoring and Support Laboratory. Environmental Protection Agency. Cincinnati, Ohio. EPA-600/4-79-020.

Makarewicz, J.C., I. Bosch and T.W. Lewis. 2001. Soil and Nutrient Loss from Selected Subwatersheds of Conesus Lake. Prepared for the Livingston County Planning Department. Mount Morris, NY. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C., Lewis, T.W., Dilcher, R.C., Letson, M. and Puckett, N. 1991. Chemical Analysis and Nutrient Loading of Streams Entering Conesus Lake, NY. Prepared for the Livingston County Planning Department. Mount Morris, NY. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C., T.W. Lewis and R.K. Williams. 1991. Nutrient loading of streams entering Sodus Bay and Port Bay, NY. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C., T.W. Lewis and R.K. Williams. 1992. Nutrient loading of streams entering Sodus Bay and Port Bay, NY. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C., T.W. Lewis and R.K. Williams. 1993. Nutrient loading of streams entering Sodus Bay and Port Bay, NY. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C. and Lewis, T. W. 1994. Nutrient loading of streams entering Lake Neatahwanta, Oswego County, NY 46pp. Oswego County Soil and Water Conservation District. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C. and Lewis, T. W. 1998. The loss of nutrient and materials from watersheds draining into Lake Neatahwanta, Oswego County, NY. Oswego County Soil and Water Conservation District. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C. and Lewis, T. W. 1998a. Nutrient and sediment loss from watersheds of Orleans County. Orleans County Soil and Water Conservation District. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C. and Lewis, T.W. 1999. Soil and nutrient loss from subwatersheds in the southwest quadrant of Conesus Lake. Available form Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C. and Lewis, T. W. 1999a. Nutrient and sediment loss from watersheds of Orleans County – Year 2. Orleans County Soil and Water Conservation District. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C. and Lewis, T. W. 2000. Nutrient and sediment loss from the watersheds of Canandaigua Lake; January 1997 to January 2000. Available form Drake Memorial Library, SUNY Brockport, Brockport, NY.

Table 1. Summary data for sampling locations in the Conesus Lake watershed.

Watershed	Height Measurement	Latitude/Longitude
Hanna's Creek 3502 Pebble Beach Road	Triangle on East side of Bridge	42° 49.99 N 77° 42.46 W
Graywood area Creek 4003 West Lake Road Turn East at Greywood Center sign	Center of culvert near shore of lake	42° 48.64 N 77° 42.95 W
Sand Point Gully 4661 West Lake Rd. Left on Wadsworth Cove, veer left	Triangle on Bridge	42° 47.22 N 77° 43.34 W
Long Point Gully West Lake Road @ Creekside Lane	Triangle on East face of bridge	42° 46.82 N 77° 43.36 W
Cottonwood Gully 5341 W. Lake Rd. near pump station	Top of culvert on west side of road	42° 45.48 N 77° 43.67 W
No Name Creek 5577 W. Lake Rd	Triangle on East side of bridge	42° 44.95 N 77° 43.66 W
Sutton Point 5690 West Lake Rd.	Top of culvert on West side of road	42° 44.52 N 77° 43.67W
South West Creeks 5859 Rivulet 5859 West Lake Road	Center of culvert	42° 44.10 N 77° 43.50 W
Conesus Inlet Guiltner Road	Mark on North side of bridge face	42° 40.99 N 77° 42.19 W
Lower Inlet Sliker Hill Road	Take Water Sample ONLY	
South McMillan Creek 6157 East Lake Road	Mark on West side of bridge	42° 43.31 N 77° 42.13 W
North McMillan Creek 6134 East Lake Road	Mark on West side of bridge	42° 43.39 N 77° 42.14 W
South East Creeks 5829 East Lake Road	Culvert on West side of road	42° 44.32 N 77° 42.57 W
South Gully Hartson Pt 5112 East Lake Road	West side of road mark on top of bridge	42° 46.34 N 77° 42.73 W
North Gully 4990 East Lake Road	Triangle on West side bridge	42° 46.71 N 77° 42.65 W
Central Gully East Lake Road at Price Road	Culvert on West Side of Road	42° 47.09N 77° 42.48 W
Densmore Creek Old Orchard Point 4683 E. Lake Rd near storage place	Triangle on East side of Road	42° 47.56 N 77° 42.46 W
North East Creeks East Lake Road at Van Zandt Road	Mark on bridge on west side of road	42° 48.41 N 77° 42.08 W
Wilkins Creek East Lake Road	Mark on bridge on west side of road	42° 49.38 N 77° 41.61 W

Table 2. Watershed area, discharge, total phosphorus and total suspended solids concentration for Conesus Lake tributaries April to December 2001.

	Watershed	Discharge		Total Phosphorus		Total suspended solids	
	Area	Baseline	Event	Baseline	Event	Baseline	Event
	(ha)	(m^3/d)	(m^3/d)	(µg P/L)	(µg P/L)	(mg/L)	(mg/L)
Hanna	718	936	5,059	102.5	63.4	11.4	12.1
Graywood	443	866	2,799	274.7	318.1	12.1	18.5
Sand Pt	299	344	739	48.6	65.9	5.6	5.9
Long Pt	547	264	507	30.3	206.5	1.0	3.6
Cottonwood	458	69	206	63.9	74.2	12.2	3.0
No Name	386	467	3,127	32.3	59.6	0.5	1.4
Sutton Pt	62	295	639	40.0	52.3	7.8	2.2
Southwest	636	4,191	8,439	73.2	75.9	7.8	2.4
Inlet	4,666	12,871	26,785	12.6	31.1	2.3	2.3
S. McMillan	2,734	7,898	18,987	14.0	35.3	4.1	4.0
N. McMillan	2,085	6,168	8,815	8.7	8.9	4.4	1.6
Southeast	593	452	576	37.9	37.4	7.6	3.1
South Gully	310	199	945	21.4	219.1	4.6	195.3
North Gully	729	2,783	5,378	19.9	26.2	6.4	3.3
Central Gully	185	733	1,044	65.1	63.2	35.6	37.4
Densmore	654	1,071	1,871	31.7	25.1	6.8	3.1
Northeast	373	551	866	35.4	36.3	14.3	8.0
Wilkins	694	1,116	3,476	95.0	54.4	35.9	10.3
Lower Inlet				116.2	70.6	9.0	4.0

Table 3. Watershed area, discharge, total phosphorus and total suspended solids per day loadings for Conesus Lake tributaries April to December 2001.

	Watershed	Discharge		Total Phosphorus		Total suspended solids	
	Area	Baseline	Event	Baseline	Event	Baseline	Event
	(ha)	(m^3/d)	(m^3/d)	(kg/d)	(kg/d)	(kg/d)	(kg/d)
Hanna	718	936	5,059	0.10	0.40	7.03	64.05
Graywood	443	866	2,799	0.21	0.88	11.01	59.21
Sand Pt	299	344	739	0.02	0.05	2.10	4.22
Long Pt	547	264	507	0.01	0.05	0.28	1.07
Cottonwood	458	69	206	0.00	0.01	0.48	0.62
No Name	386	467	3,127	0.02	0.19	0.23	7.56
Sutton Pt	62	295	639	0.01	0.04	1.49	1.41
Southwest	636	4,191	8,439	0.29	0.65	17.24	18.93
Inlet	4,666	12,871	26,785	0.16	0.82	30.18	66.87
S. McMillan	2,734	7,898	18,987	0.09	0.69	10.57	92.91
N. McMillan	2,085	6,168	8,815	0.08	0.08	45.60	17.50
Southeast	593	452	576	0.01	0.02	2.39	2.02
South Gully	310	199	945	0.00	0.40	0.55	384.30
North Gully	729	2,783	5,378	0.04	0.14	16.87	20.46
Central Gully	185	733	1,044	0.05	0.07	27.17	39.35
Densmore	654	1,071	1,871	0.01	0.03	3.33	5.41
Northeast	373	551	866	0.02	0.03	6.72	6.96
Wilkins	694	1,116	3,476	0.14	0.19	71.90	33.99

Table 4. Watershed area, discharge, total phosphorus and total suspended solids areal loading for Conesus Lake tributaries April to December 2001.

	Watershed	Discharge		Total Phosphorus		Total suspended solids	
	Area	Baseline	Event	Baseline	Event	Baseline	Event
	(ha)	(m^3/d)	(m^3/d)	(g/ha/d)	(g/ha/d)	(g/ha/d)	(g/ha/d)
Hanna	718	936	5,059	0.15	0.55	9.79	89.21
Graywood	443	866	2,799	0.48	2.00	24.84	133.62
Sand Pt	299	344	739	0.05	0.17	7.03	14.13
Long Pt	547	264	507	0.01	0.10	0.51	1.96
Cottonwood	458	69	206	0.01	0.03	1.05	1.34
No Name	386	467	3,127	0.04	0.48	0.61	19.60
Sutton Pt	62	295	639	0.13	0.58	23.93	22.66
Southwest	636	4,191	8,439	0.45	1.02	27.09	29.76
Inlet	4,666	12,871	26,785	0.03	0.18	6.47	14.33
S. McMillan	2,734	7,898	18,987	0.03	0.25	3.87	33.98
N. McMillan	2,085	6,168	8,815	0.04	0.04	21.87	8.40
Southeast	593	452	576	0.02	0.03	4.03	3.41
South Gully	310	199	945	0.01	1.29	1.76	1238.81
North Gully	729	2,783	5,378	0.06	0.19	23.13	28.05
Central Gully	185	733	1,044	0.26	0.35	146.56	212.22
Densmore	654	1,071	1,871	0.02	0.04	5.10	8.28
Northeast	373	551	866	0.05	0.09	18.03	18.69
Wilkins	694	1,116	3,476	0.21	0.27	103.65	49.00

Table 5. Comparison of areal phosphorus loadings from the watersheds of Western and Central New York State. Irondequoit basin data are from 1980-81 (O'Brien and Gere 1983). All other data was generated by SUNY Brockport in Makarewicz 1988, Makarewicz *et al.* 1991, 1991a, 1992, 1993, Makarewicz and Lewis 1994, 1998, 1998a, 1999, 1999a, 2000 and this study.

Subbasin or Creek	Land Use	Total Phosphorus Loading (g P/ha/d)	TP Loading (g P/ha/d)	TP Loading (g P/ha/d)
		Annual	Non-Event	Event
Canandaigua Lake Watershed				
Clark Creek 1997-99	Forested	0.36		
Sucker Brook 1997-99	Ag. / Urban	2.68		
Irondequoit Creek at Browncroft Blvd. 1975-77 (pre-diversion)	Several Sewage Plants	5.60		
1978-79 (post-diversion)		2.00		
Monroe County 1987-88				
Larkin	Suburban	0.70		
Buttonwood	Suburban	1.58		
Lower Northrup	Sewage Plant	6.64		
Upper Northrup	Urban	3.23		
Wayne County 1991-93				
First	Forested	0.11		
Clark	Forested	0.22		
Sodus East	Agriculture	8.57		
Wolcott	Agriculture	5.01		
Bobolink	Forested	0.02		
Oswego County 93-94 & 96-97				
Sheldon	Muckland	24.10		
Summerville	Suburban	5.24		
Orleans County 1997-99				
Oak Orchard	Agriculture	3.17		
Johnson	Agriculture	2.34		
Sandy	Agriculture	0.88		
Conesus Lake Watershed		**1990-91**	**2001**	**2001**
Densmore	Ag / Single Family	0.23	0.02	0.04
Hanna's	Agriculture	1.16	0.15	0.55
Inlet	Ag / Single Family	0.13	0.03	0.18
Long Point Gully	Agriculture	0.49	0.01	0.10
No Name	Ag / Single Family	0.52	0.04	0.48
North Gully	Vacant / Ag.	0.79	0.06	0.19
North McMillan	Single Family	0.43	0.04	0.04
Sand Point Gully	Single Family	0.10	0.05	0.17
South Gully	Ag / Single Family	0.39	0.01	1.29
South McMillan	Single Family / Ag	0.48	0.03	0.25
Wilkins	Ag / Single Family	0.36	0.21	0.27
Greywood (Northwest)	Agriculture		0.48	2.00
Cottonwood	Agriculture		0.01	0.03
Sutton Point			0.13	0.58
Southwest	Ag / Single Family		0.45	1.02
Southeast	Single Family		0.02	0.03
Central Gully	Agriculture		0.26	0.35
Northeast	Agriculture		0.05	0.09

Figure 1. Location of stream sampling sites during 2001, Conesus Lake.

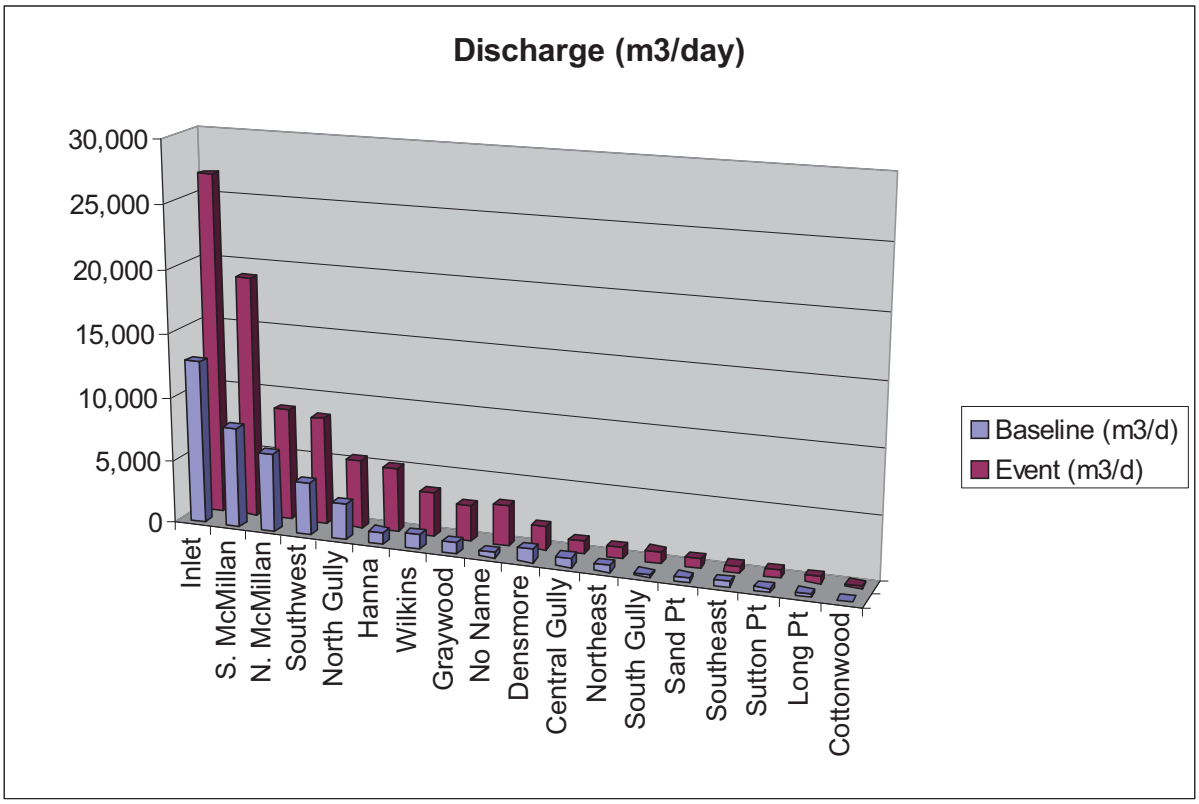
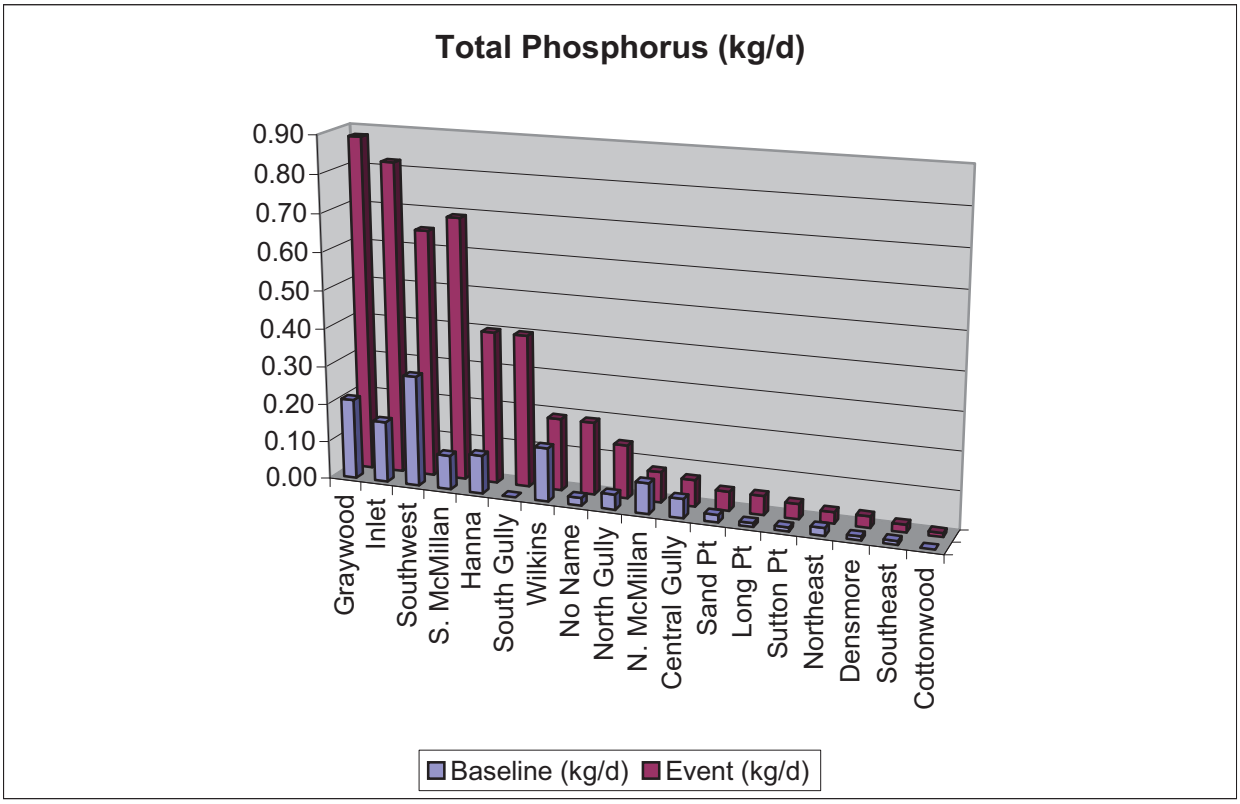


Figure 2. Discharge in m^3/d for the eighteen subwatersheds of Conesus Lake during both baseline and event conditions from April to December 2001.



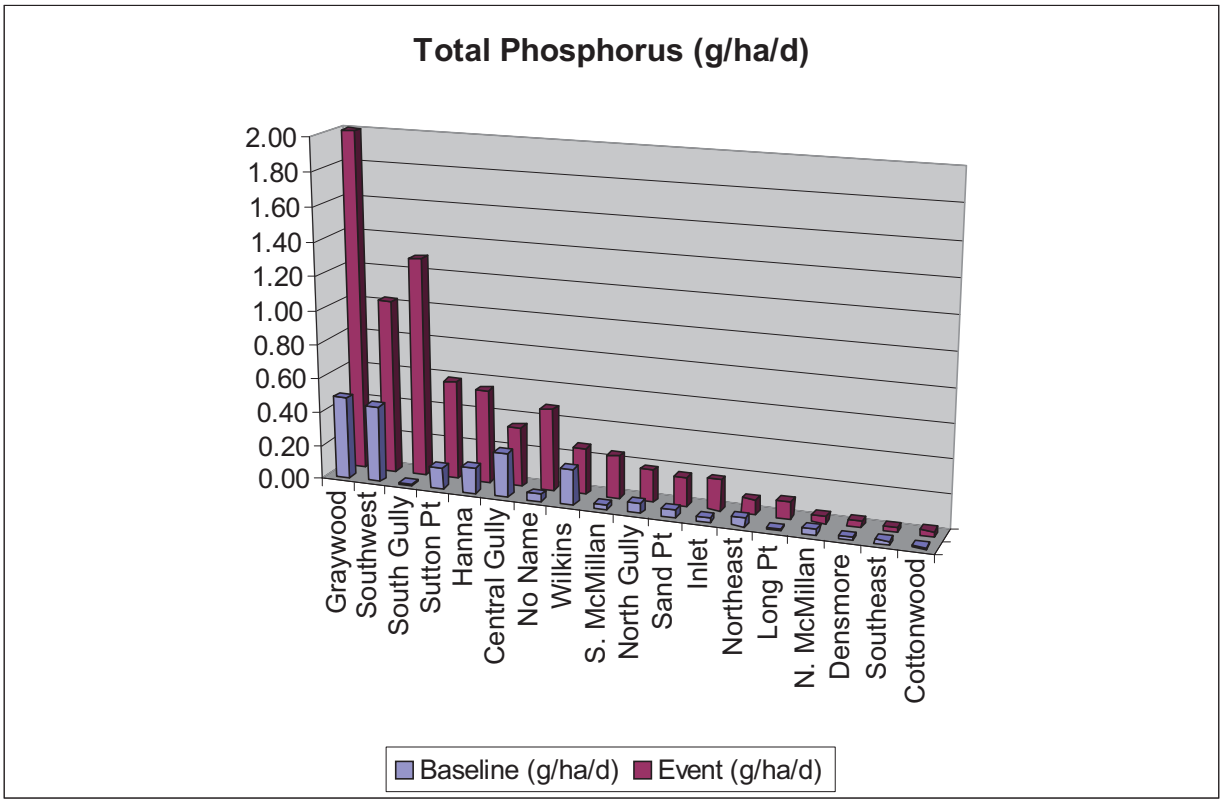
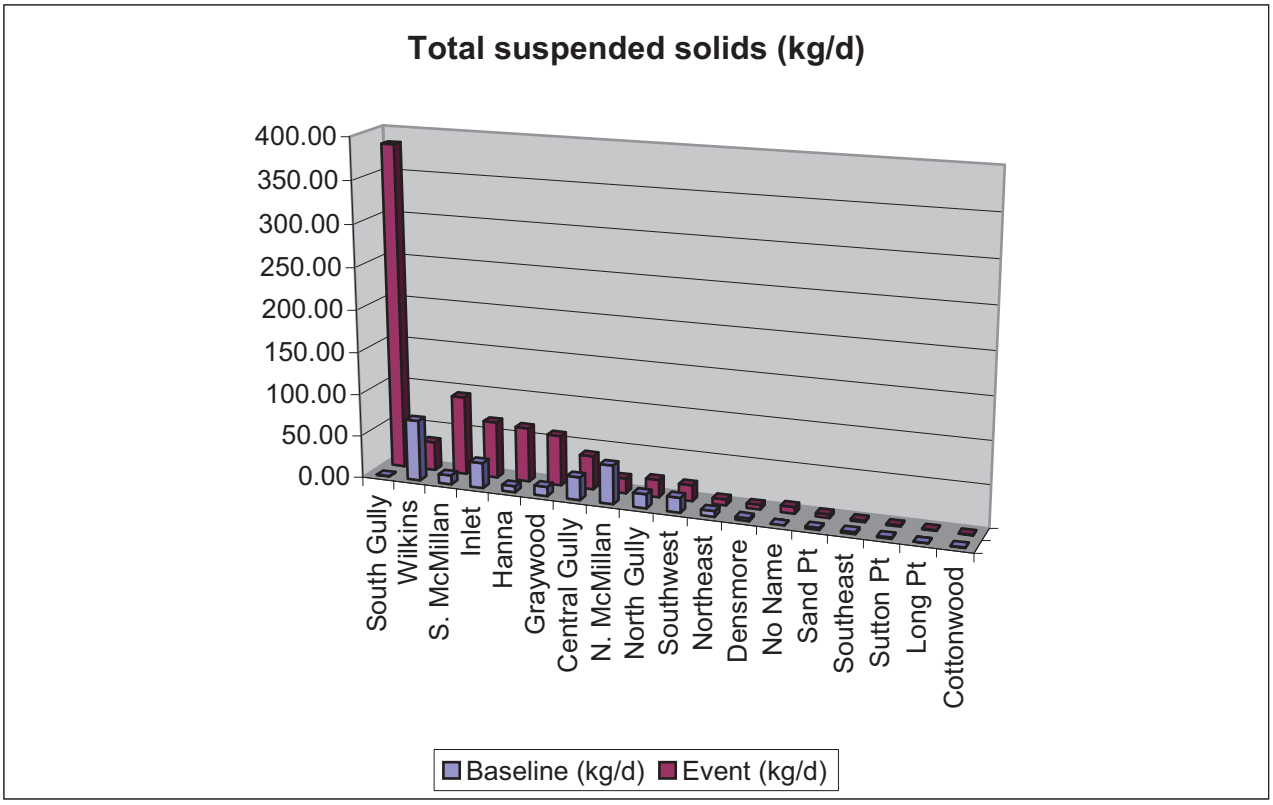


Figure 3. Total phosphorus loss rates for the eighteen subwatersheds of Conesus Lake during both baseline and event conditions from April to December 2001.



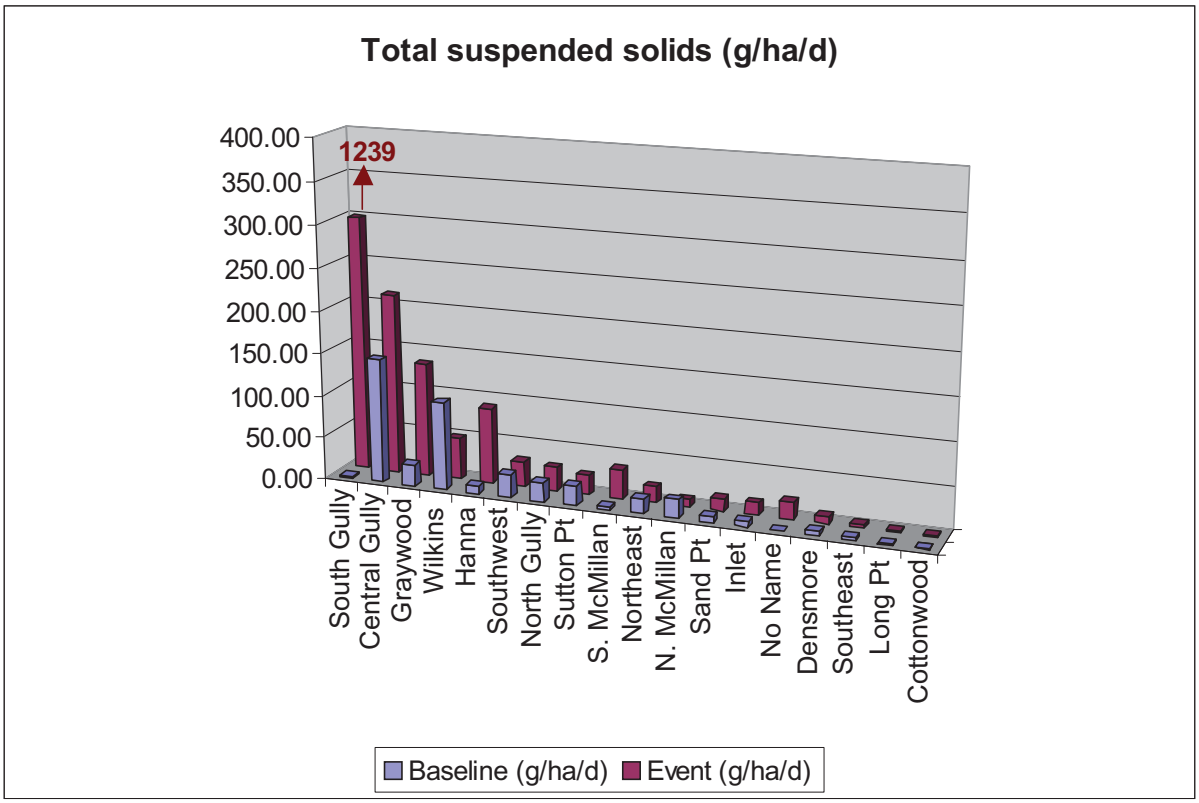


Figure 4. Total suspended solid loss rates for the eighteen subwatersheds of Conesus Lake during both baseline and event conditions from April to December 2001.

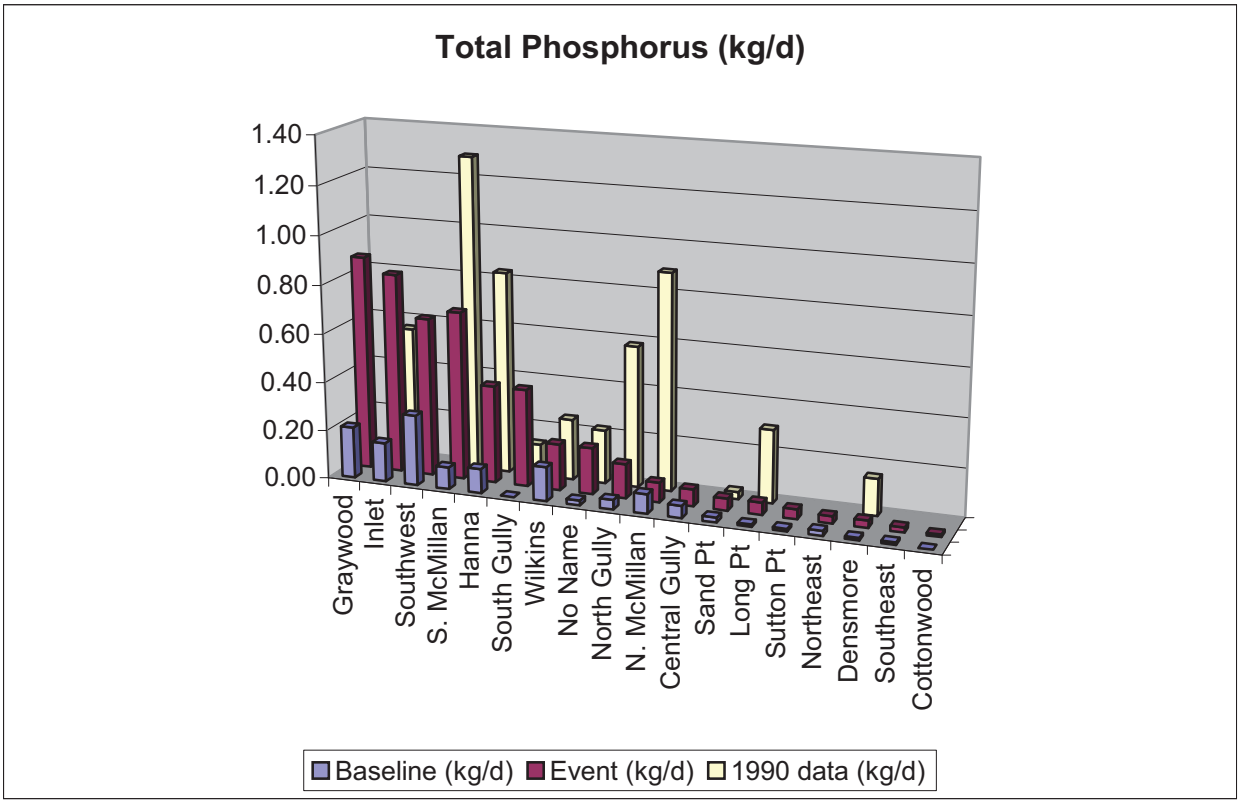


Figure 4. Comparison of total phosphorus areal loss rates for subwatersheds of Conesus Lake. 1990 data is from (Makarewicz et al (1991) and represents weekly sampling from March 1990 to February 1991. 2001 data from this study is for both baseline and event conditions from April to December 2001.

Appendix 1. Conesus Lake sub-watershed data, April to December 2001.

Hanna		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	30.8	1.8	1,456	0.04	2.62	0.06	3.65
5/10/2001	Baseline	60.5	6.5	1,456	0.09	9.47	0.12	13.18
5/23/2001	Event	79.7	8.0	1,630	0.13	13.04	0.18	18.16
6/11/2001	Event	21.7	5.7	1,229	0.03	7.00	0.04	9.75
6/22/2001	Baseline	189.1	8.7	2,377	0.45	20.68	0.63	28.80
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	36.2	14.2	6,092	0.22	86.51	0.31	120.49
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	129.4	28.6	329	0.04	9.41	0.06	13.11
11/29/2001	Event	108.5	12.9	14,340	1.56	184.99	2.17	257.64
11/30/2001	Event	85.9	28.5	2,807	0.24	80.00	0.34	111.42
12/17/2001	Event	48.4	3.0	4,256	0.21	12.77	0.29	17.78
Mean	Baseline	102.5	11.4	936	0.10	7.03	0.15	9.79
Mean	Event	63.4	12.1	5,059	0.40	64.05	0.55	89.21
Min	Baseline	30.8	1.8	0	0.00	0.00	0.00	0.00
Max	Baseline	189.1	28.6	2,377	0.45	20.68	0.63	28.80
Min	Event	21.7	3.0	1,229	0.03	7.00	0.04	9.75
Max	Event	108.5	28.5	14,340	1.56	184.99	2.17	257.64

Greywood		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	198.2	12.0	3,461	0.69	41.53	1.55	93.72
5/10/2001	Baseline	185.9	3.9	655	0.12	2.55	0.27	5.76
5/23/2001	Event	589.7	15.2	2,892	1.71	43.96	3.85	99.20
6/11/2001	Event	331.7	27.7	1,338	0.44	37.07	1.00	83.66
6/22/2001	Baseline	440	20.3	1,082	0.48	21.96	1.07	49.56
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	318.2	7.6	1,684	0.54	12.79	1.21	28.88
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/29/2001	Event	265.4	9.1	4,257	1.13	38.74	2.55	87.43
11/30/2001	Event	144.1	6.3	1,980	0.29	12.54	0.64	28.29
12/17/2001	Event	259.5	45.3	4,644	1.21	210.15	2.72	474.25
Mean	Baseline	274.7	12.1	866	0.21	11.01	0.48	24.84
Mean	Event	318.1	18.5	2,799	0.88	59.21	2.00	133.62
Min	Baseline	185.9	3.9	0	0.00	0.00	0.00	0.00
Max	Baseline	440.0	20.3	3,461	0.69	41.53	1.55	93.72
Min	Event	144.1	6.3	1,338	0.29	12.54	0.64	28.29
Max	Event	589.7	45.3	4,644	1.71	210.15	3.85	474.25

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

Sand Pt		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	20.7	1.6	673	0.01	1.08	0.05	3.60
5/10/2001	Baseline	43.9	0.7	257	0.01	0.18	0.04	0.60
5/23/2001	Event	59.4	8.7	911	0.05	7.92	0.18	26.52
6/11/2001	Event	105.2	8.2	257	0.03	2.11	0.09	7.05
6/22/2001	Baseline	81.8	9.7	451	0.04	4.37	0.12	14.63
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	85.5	2.2	1,710	0.15	3.76	0.49	12.59
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	47.8	10.2	685	0.03	6.99	0.11	23.38
11/29/2001	Event	55.0	1.2	0	0.00	0.00	0.00	0.00
11/30/2001	Event	64.9	14.0	779	0.05	10.91	0.17	36.52
12/17/2001	Event	25.1	0.8	779	0.02	0.62	0.07	2.09
Mean	Baseline	48.6	5.6	344	0.02	2.10	0.05	7.03
Mean	Event	65.9	5.9	739	0.05	4.22	0.17	14.13
Min	Baseline	20.7	0.7	0	0.00	0.00	0.00	0.00
Max	Baseline	81.8	10.2	685	0.04	6.99	0.12	23.38
Min	Event	25.1	0.8	0	0.00	0.00	0.00	0.00
Max	Event	105.2	14.0	1,710	0.15	10.91	0.49	36.52

Long Pt		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	34.5	1.3	922	0.03	1.20	0.06	2.19
5/10/2001	Baseline	26.1	0.7	662	0.02	0.46	0.03	0.85
5/23/2001	Event	88.3	4.0	1,058	0.09	4.23	0.17	7.74
6/11/2001	Event	DRY	DRY	0	0.00	0.00	0.00	0.00
6/22/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	97.5	3.0	506	0.05	1.52	0.09	2.77
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/29/2001	Event	162.0	0.2	1,003	0.16	0.20	0.30	0.37
11/30/2001	Event	634.0	9.6	0	0.00	0.00	0.00	0.00
12/17/2001	Event	50.7	1.0	477	0.02	0.48	0.04	0.87
Mean	Baseline	30.3	1.0	264	0.01	0.28	0.01	0.51
Mean	Event	206.5	3.6	507	0.05	1.07	0.10	1.96
Min	Baseline	26.1	0.7	0	0.00	0.00	0.00	0.00
Max	Baseline	34.5	1.3	922	0.03	1.20	0.06	2.19
Min	Event	50.7	0.2	0	0.00	0.00	0.00	0.00
Max	Event	634.0	9.6	1,058	0.16	4.23	0.30	7.74

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

Cottonwood		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	47.4	2.5	130	0.01	0.32	0.01	0.71
5/10/2001	Baseline	53.7	0.6	141	0.01	0.08	0.02	0.18
5/23/2001	Event	65.5	3.3	642	0.04	2.12	0.09	4.62
6/11/2001	Event	69.7	8.7	114	0.01	0.99	0.02	2.17
6/22/2001	Baseline	85.8	23.0	71	0.01	1.62	0.01	3.54
8/17/2001	Baseline	85.4	34.7	24	0.00	0.84	0.00	1.82
9/25/2001	Event	103.5	2.6	94	0.01	0.24	0.02	0.53
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	47.3	0.1	47	0.00	0.00	0.00	0.01
11/29/2001	Event	79.8	0.1	161	0.01	0.02	0.03	0.04
11/30/2001	Event	79.8	1.0	154	0.01	0.15	0.03	0.34
12/17/2001	Event	46.6	2.4	71	0.00	0.17	0.01	0.37
Mean	Baseline	63.9	12.2	69	0.00	0.48	0.01	1.05
Mean	Event	74.2	3.0	206	0.01	0.62	0.03	1.34
Min	Baseline	47.3	0.1	0	0.00	0.00	0.00	0.00
Max	Baseline	85.8	34.7	141	0.01	1.62	0.02	3.54
Min	Event	46.6	0.1	71	0.00	0.02	0.01	0.04
Max	Event	103.5	8.7	642	0.04	2.12	0.09	4.62

No Name		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	32.3	0.5	2,802	0.09	1.40	0.23	3.63
5/10/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
5/23/2001	Event	50.1	3.4	11,193	0.56	38.06	1.45	98.69
6/11/2001	Event	DRY	DRY	0	0.00	0.00	0.00	0.00
6/22/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	80.5	1.2	5,041	0.41	6.05	1.05	15.69
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/29/2001	Event	67.7	0.1	1,445	0.10	0.14	0.25	0.37
11/30/2001	Event	51.1	1.7	220	0.01	0.37	0.03	0.95
12/17/2001	Event	48.4	0.8	864	0.04	0.72	0.11	1.87
Mean	Baseline	32.3	0.5	467	0.02	0.23	0.04	0.61
Mean	Event	59.6	1.4	3,127	0.19	7.56	0.48	19.60
Min	Baseline	32.3	0.5	0	0.00	0.00	0.00	0.00
Max	Baseline	32.3	0.5	2,802	0.09	1.40	0.23	3.63
Min	Event	48.4	0.1	0	0.00	0.00	0.00	0.00
Max	Event	80.5	3.4	11,193	0.56	38.06	1.45	98.69

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

Sutton Pt		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	15.4	1.0	1,062	0.02	1.06	0.26	17.07
5/10/2001	Baseline	24.9	0.7	353	0.01	0.25	0.14	3.97
5/23/2001	Event	42.1	3.4	1,429	0.06	4.86	0.97	78.12
6/11/2001	Event	46	3.6	446	0.02	1.61	0.33	25.81
6/22/2001	Baseline	61.8	23.0	322	0.02	7.40	0.32	118.92
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	48.6	3.6	437	0.02	1.57	0.34	25.31
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	57.8	6.4	35	0.00	0.23	0.03	3.64
11/29/2001	Event	79.8	0.1	1,246	0.10	0.12	1.60	2.00
11/30/2001	Event	56.7	0.8	167	0.01	0.14	0.15	2.23
12/17/2001	Event	40.8	1.4	111	0.00	0.16	0.07	2.50
Mean	Baseline	40.0	7.8	295	0.01	1.49	0.13	23.93
Mean	Event	52.3	2.2	639	0.04	1.41	0.58	22.66
Min	Baseline	15.4	0.7	0	0.00	0.00	0.00	0.00
Max	Baseline	61.8	23.0	1,062	0.02	7.40	0.32	118.92
Min	Event	40.8	0.1	111	0.00	0.12	0.07	2.00
Max	Event	79.8	3.6	1,429	0.10	4.86	1.60	78.12

Southwest		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	56.2	0.3	13,612	0.77	4.08	1.20	6.42
5/10/2001	Baseline	78.4	14.6	5,078	0.40	74.14	0.63	116.54
5/23/2001	Event	78.5	2.1	21,796	1.71	45.77	2.69	71.95
6/11/2001	Event	87.2	1.3	6,633	0.58	8.62	0.91	13.55
6/22/2001	Baseline	88.8	3.9	6,379	0.57	24.88	0.89	39.11
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	69.4	1.6	16,335	1.13	26.14	1.78	41.08
11/9/2001	Baseline	74.3	16.2	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	68.2	4.2	73	0.01	0.31	0.01	0.48
11/29/2001	Event	89.7	7.2	4,350	0.39	31.32	0.61	49.24
11/30/2001	Event	77.1	1.3	609	0.05	0.81	0.07	1.28
12/17/2001	Event	53.6	1.0	913	0.05	0.91	0.08	1.43
Mean	Baseline	73.2	7.8	4,191	0.29	17.24	0.45	27.09
Mean	Event	75.9	2.4	8,439	0.65	18.93	1.02	29.76
Min	Baseline	56.2	0.3	0	0.00	0.00	0.00	0.00
Max	Baseline	88.8	16.2	13,612	0.77	74.14	1.20	116.54
Min	Event	53.6	1.0	609	0.05	0.81	0.07	1.28
Max	Event	89.7	7.2	21,796	1.71	45.77	2.69	71.95

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

Inlet		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	7.1	1.8	23,624	0.17	42.52	0.04	9.11
5/10/2001	Baseline	8.9	3.4	18,794	0.17	63.90	0.04	13.69
5/23/2001	Event	16.2	4.3	37,999	0.62	163.40	0.13	35.02
6/11/2001	Event	102.4	3.3	25,481	2.61	84.09	0.56	18.02
6/22/2001	Baseline	19.5	2.0	11,110	0.22	22.22	0.05	4.76
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	34.3	2.2	25,327	0.87	55.72	0.19	11.94
11/9/2001	Baseline	9.2	2.3	2,849	0.03	6.55	0.01	1.40
11/26/2001	Baseline	18.1	2.2	20,847	0.38	45.86	0.08	9.83
11/29/2001	Event	14.8	2.6	25,908	0.38	67.36	0.08	14.44
11/30/2001	Event	10.3	0.7	25,196	0.26	16.80	0.06	3.60
12/17/2001	Event	8.7	0.7	20,799	0.18	13.87	0.04	2.97
Mean	Baseline	12.6	2.3	12,871	0.16	30.18	0.03	6.47
Mean	Event	31.1	2.3	26,785	0.82	66.87	0.18	14.33
Min	Baseline	7.1	1.8	0	0.00	0.00	0.00	0.00
Max	Baseline	19.5	3.4	23,624	0.38	63.90	0.08	13.69
Min	Event	8.7	0.7	20,799	0.18	13.87	0.04	2.97
Max	Event	102.4	4.3	37,999	2.61	163.40	0.56	35.02

Lower Inlet		TP (µg P/L)	TSS (mg/L)
4/27/2001	Baseline	NS	NS
5/10/2001	Baseline	65.5	5.3
5/23/2001	Event	48.9	5.7
6/11/2001	Event	125	4.8
6/22/2001	Baseline	149	3.5
8/17/2001	Baseline	184.2	22.3
9/25/2001	Event	78.0	3.4
11/9/2001	Baseline	DRY	DRY
11/26/2001	Baseline	66.0	4.8
11/29/2001	Event	71.5	5.8
11/30/2001	Event	69.9	2.8
12/17/2001	Event	30.3	1.5
Mean	Baseline	116.2	9.0
Mean	Event	70.6	4.0
Min	Baseline	65.5	3.5
Max	Baseline	184.2	22.3
Min	Event	30.3	1.5
Max	Event	125.0	5.8

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

S. McMillan		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	9.8	1.5	23,452	0.23	35.18	0.08	12.86
5/10/2001	Baseline	8.3	0.7	10,076	0.08	7.05	0.03	2.58
5/23/2001	Event	26	9.2	31,515	0.82	289.94	0.30	106.03
6/11/2001	Event	17.7	1.4	6,211	0.11	8.70	0.04	3.18
6/22/2001	Baseline	22.4	2.7	5,324	0.12	14.38	0.04	5.26
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	31.4	2.4	5,733	0.18	13.76	0.07	5.03
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	15.3	0.8	8,536	0.13	6.83	0.05	2.50
11/29/2001	Event	53.3	3.0	19,712	1.05	59.14	0.38	21.63
11/30/2001	Event	62.7	5.8	22,019	1.38	128.44	0.50	46.97
12/17/2001	Event	20.4	2.0	28,731	0.59	57.46	0.21	21.01
Mean	Baseline	14.0	1.4	7,898	0.09	10.57	0.03	3.87
Mean	Event	35.3	4.0	18,987	0.69	92.91	0.25	33.98
Min	Baseline	8.3	0.7	0	0.00	0.00	0.00	0.00
Max	Baseline	22.4	2.7	23,452	0.23	35.18	0.08	12.86
Min	Event	17.7	1.4	5,733	0.11	8.70	0.04	3.18
Max	Event	62.7	9.2	31,515	1.38	289.94	0.50	106.03

N. McMillan		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	9.9	1.1	11,381	0.11	12.52	0.05	6.01
5/10/2001	Baseline	4.6	0.4	3,757	0.02	1.50	0.01	0.72
5/23/2001	Event	11.2	2.7	25,990	0.29	70.17	0.14	33.66
6/11/2001	Event	9.8	1.3	3,527	0.03	4.58	0.02	2.20
6/22/2001	Baseline	5.3	1.0	5,470	0.03	5.47	0.01	2.62
8/17/2001	Baseline	24.1	21.7	11,430	0.28	248.03	0.13	118.97
9/25/2001	Event	9.7	2.4	4,201	0.04	10.08	0.02	4.84
11/9/2001	Baseline	2.6	1.5	3,003	0.01	4.50	0.00	2.16
11/26/2001	Baseline	5.9	0.8	1,967	0.01	1.57	0.01	0.75
11/29/2001	Event	9.2	0.4	8,121	0.07	3.25	0.04	1.56
11/30/2001	Event	9.2	1.0	3,699	0.03	3.70	0.02	1.77
12/17/2001	Event	4.1	1.8	7,351	0.03	13.23	0.01	6.35
Mean	Baseline	8.7	4.4	6,168	0.08	45.60	0.04	21.87
Mean	Event	8.9	1.6	8,815	0.08	17.50	0.04	8.40
Min	Baseline	2.6	0.4	1,967	0.01	1.50	0.00	0.72
Max	Baseline	24.1	21.7	11,430	0.28	248.03	0.13	118.97
Min	Event	4.1	0.4	3,527	0.03	3.25	0.01	1.56
Max	Event	11.2	2.7	25,990	0.29	70.17	0.14	33.66

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

Southeast		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	14.3	1.3	1,740	0.02	2.26	0.04	3.82
5/10/2001	Baseline	34.1	12.2	893	0.03	10.90	0.05	18.39
5/23/2001	Event	23.6	3.7	2,269	0.05	8.40	0.09	14.17
6/11/2001	Event	28.5	2.2	493	0.01	1.08	0.02	1.83
6/22/2001	Baseline	65.3	14.8	79	0.01	1.16	0.01	1.96
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	40.9	5.0	447	0.02	2.23	0.03	3.77
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	DRY	2.2	0	0.00	0.00	0.00	0.00
11/29/2001	Event	56.7	1.7	245	0.01	0.40	0.02	0.68
11/30/2001	Event	DRY	DRY	0	0.00	0.00	0.00	0.00
12/17/2001	Event	Trickle	Trickle	0	0.00	0.00	0.00	0.00
Mean	Baseline	37.9	7.6	452	0.01	2.39	0.02	4.03
Mean	Event	37.4	3.1	576	0.02	2.02	0.03	3.41
Min	Baseline	14.3	1.3	0	0.00	0.00	0.00	0.00
Max	Baseline	65.3	14.8	1,740	0.03	10.90	0.05	18.39
Min	Event	23.6	1.7	0	0.00	0.00	0.00	0.00
Max	Event	56.7	5.0	2,269	0.05	8.40	0.09	14.17

South Gully		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	16.8	2.0	903	0.02	1.81	0.05	5.82
5/10/2001	Baseline	19.3	9.0	109	0.00	0.98	0.01	3.16
5/23/2001	Event	958.2	972.5	2,368	2.27	2303.13	7.32	7424.30
6/11/2001	Event	27.9	1.1	835	0.02	0.92	0.08	2.96
6/22/2001	Baseline	28.1	2.7	185	0.01	0.50	0.02	1.61
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	34.5	2.2	677	0.02	1.49	0.08	4.80
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/29/2001	Event	54.4	0.1	1,644	0.09	0.16	0.29	0.53
11/30/2001	Event	DRY	DRY	0	0.00	0.00	0.00	0.00
12/17/2001	Event	20.7	0.6	145	0.00	0.09	0.01	0.28
Mean	Baseline	21.4	4.6	199	0.00	0.55	0.01	1.76
Mean	Event	219.1	195.3	945	0.40	384.30	1.29	1238.81
Min	Baseline	16.8	2.0	0	0.00	0.00	0.00	0.00
Max	Baseline	28.1	9.0	903	0.02	1.81	0.05	5.82
Min	Event	20.7	0.1	0	0.00	0.00	0.00	0.00
Max	Event	958.2	972.5	2,368	2.27	2303.13	7.32	7424.30

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

North Gully		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	7.1	2.2	7,030	0.05	15.47	0.07	21.20
5/10/2001	Baseline	16.9	7.6	6,174	0.10	46.92	0.14	64.33
5/23/2001	Event	31	7.3	11,640	0.36	84.97	0.49	116.50
6/11/2001	Event	34.1	7.3	2,954	0.10	21.57	0.14	29.57
6/22/2001	Baseline	39	16.4	2,187	0.09	35.87	0.12	49.19
8/17/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
9/25/2001	Event	33.4	1.6	4,295	0.14	6.87	0.20	9.42
11/9/2001	Baseline	20.0	3.7	268	0.01	0.99	0.01	1.36
11/26/2001	Baseline	16.4	1.9	1,037	0.02	1.97	0.02	2.70
11/29/2001	Event	23.0	3.2	2,442	0.06	7.81	0.08	10.71
11/30/2001	Event	23.0	0.1	4,283	0.10	0.43	0.14	0.59
12/17/2001	Event	12.8	0.2	6,653	0.09	1.11	0.12	1.52
Mean	Baseline	19.9	6.4	2,783	0.04	16.87	0.06	23.13
Mean	Event	26.2	3.3	5,378	0.14	20.46	0.19	28.05
Min	Baseline	7.1	1.9	0	0.00	0.00	0.00	0.00
Max	Baseline	39.0	16.4	7,030	0.10	46.92	0.14	64.33
Min	Event	12.8	0.1	2,442	0.06	0.43	0.08	0.59
Max	Event	34.1	7.3	11,640	0.36	84.97	0.49	116.50

Central Gully		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	43.3	21.0	1,130	0.05	23.74	0.26	128.03
5/10/2001	Baseline	48.9	28.4	617	0.03	17.51	0.16	94.44
5/23/2001	Event	64.9	34.0	1,156	0.08	39.30	0.40	211.99
6/11/2001	Event	87.2	52.3	812	0.07	42.49	0.38	229.18
6/22/2001	Baseline	95.1	65.3	579	0.06	37.81	0.30	203.93
8/17/2001	Baseline	78.8	46.5	1,443	0.11	67.10	0.61	361.93
9/25/2001	Event	67.3	57.4	1,182	0.08	67.83	0.43	365.85
11/9/2001	Baseline	85.7	35.1	336	0.03	11.78	0.16	63.53
11/26/2001	Baseline	38.5	17.5	292	0.01	5.10	0.06	27.52
11/29/2001	Event	49.5	16.9	797	0.04	13.46	0.21	72.62
11/30/2001	Event	39.0	21.7	1,203	0.05	26.06	0.25	140.57
12/17/2001	Event	71.1	42.2	1,112	0.08	46.93	0.43	253.10
Mean	Baseline	65.1	35.6	733	0.05	27.17	0.26	146.56
Mean	Event	63.2	37.4	1,044	0.07	39.35	0.35	212.22
Min	Baseline	38.5	17.5	292	0.01	5.10	0.06	27.52
Max	Baseline	95.1	65.3	1,443	0.11	67.10	0.61	361.93
Min	Event	39.0	16.9	797	0.04	13.46	0.21	72.62
Max	Event	87.2	57.4	1,203	0.08	67.83	0.43	365.85

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

Densmore		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	6.8	0.6	3,396	0.02	2.04	0.04	3.12
5/10/2001	Baseline	12.6	5.6	2,852	0.04	15.97	0.05	24.43
5/23/2001	Event	18.6	7.0	3,503	0.07	24.52	0.10	37.50
6/11/2001	Event	22.3	4.4	389	0.01	1.71	0.01	2.62
6/22/2001	Baseline	39.5	11.6	146	0.01	1.69	0.01	2.59
8/17/2001	Baseline	67.8	9.4	31	0.00	0.30	0.00	0.45
9/25/2001	Event	53.4	4.1	210	0.01	0.86	0.02	1.32
11/9/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/26/2001	Baseline	DRY	DRY	0	0.00	0.00	0.00	0.00
11/29/2001	Event	34.1	1.0	860	0.03	0.86	0.04	1.32
11/30/2001	Event	15.3	1.2	703	0.01	0.82	0.02	1.25
12/17/2001	Event	7.0	0.7	5,563	0.04	3.71	0.06	5.67
Mean	Baseline	31.7	6.8	1,071	0.01	3.33	0.02	5.10
Mean	Event	25.1	3.1	1,871	0.03	5.41	0.04	8.28
Min	Baseline	6.8	0.6	0	0.00	0.00	0.00	0.00
Max	Baseline	67.8	11.6	3,396	0.04	15.97	0.05	24.43
Min	Event	7.0	0.7	210	0.01	0.82	0.01	1.25
Max	Event	53.4	7.0	5,563	0.07	24.52	0.10	37.50

Northeast		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	17.6	5.3	839	0.01	4.45	0.04	11.94
5/10/2001	Baseline	27.3	3.8	501	0.01	1.90	0.04	5.11
5/23/2001	Event	51.3	13.2	708	0.04	9.34	0.10	25.08
6/11/2001	Event	60.6	15.3	839	0.05	12.84	0.14	34.46
6/22/2001	Baseline	46.1	19.2	435	0.02	8.36	0.05	22.43
8/17/2001	Baseline	95.4	53.5	434	0.04	23.23	0.11	62.36
9/25/2001	Event	42.9	14.2	868	0.04	12.32	0.10	33.07
11/9/2001	Baseline	11.8	2.5	756	0.01	1.89	0.02	5.07
11/26/2001	Baseline	14.2	1.4	337	0.00	0.47	0.01	1.27
11/29/2001	Event	18.1	0.8	438	0.01	0.35	0.02	0.94
11/30/2001	Event	16.4	1.0	512	0.01	0.51	0.02	1.37
12/17/2001	Event	28.6	3.5	1,831	0.05	6.41	0.14	17.20
Mean	Baseline	35.4	14.3	551	0.02	6.72	0.05	18.03
Mean	Event	36.3	8.0	866	0.03	6.96	0.09	18.69
Min	Baseline	11.8	1.4	337	0.00	0.47	0.01	1.27
Max	Baseline	95.4	53.5	839	0.04	23.23	0.11	62.36
Min	Event	16.4	0.8	438	0.01	0.35	0.02	0.94
Max	Event	60.6	15.3	1,831	0.05	12.84	0.14	34.46

Appendix 1 (cont.). Conesus Lake sub-watershed data, April to December 2001.

Wilkins		TP (µg P/L)	TSS (mg/L)	Discharge m3/d	TP kg/d	TSS kg/d	TP g/ha/d	TSS g/ha/d
4/27/2001	Baseline	10.8	1.9	2,144	0.02	4.07	0.03	5.87
5/10/2001	Baseline	8.9	3.6	996	0.01	3.59	0.01	5.17
5/23/2001	Event	45.8	5.3	5,549	0.25	29.41	0.37	42.40
6/11/2001	Event	45.1	2.5	3,331	0.15	8.33	0.22	12.01
6/22/2001	Baseline	346.7	200.5	2,090	0.72	419.13	1.04	604.21
8/17/2001	Baseline	92.6	3.5	435	0.04	1.52	0.06	2.19
9/25/2001	Event	84.8	16.4	3,091	0.26	50.70	0.38	73.09
11/9/2001	Baseline	34.0	3.3	361	0.01	1.19	0.02	1.72
11/26/2001	Baseline	77.1	2.8	673	0.05	1.88	0.07	2.72
11/29/2001	Event	64.4	9.8	1,619	0.10	15.87	0.15	22.88
11/30/2001	Event	38.5	14.2	667	0.03	9.45	0.04	13.63
12/17/2001	Event	47.8	13.7	6,600	0.32	90.19	0.45	130.02
Mean	Baseline	95.0	35.9	1,116	0.14	71.90	0.21	103.65
Mean	Event	54.4	10.3	3,476	0.19	33.99	0.27	49.00
Min	Baseline	8.9	1.9	361	0.01	1.19	0.01	1.72
Max	Baseline	346.7	200.5	2,144	0.72	419.13	1.04	604.21
Min	Event	38.5	2.5	667	0.03	8.33	0.04	12.01
Max	Event	84.8	16.4	6,600	0.32	90.19	0.45	130.02